

Appendix – 4-Intervenor-106h)



Burlington **hydro** *inc.*

BURLINGTON HYDRO INC.

2024 TREE TRIMMING

REQUEST FOR PROPOSAL (RFP)

CLOSING DATE: October 4, 2024

BURLINGTON HYDRO INC.

1340 BRANT STREET

BURLINGTON

ONTARIO

L7R 3Z7

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1. REQUEST FOR PROPOSALS

- 1.1** Burlington Hydro Inc. (hereto “BHI” or “Purchaser”) is inviting Proposals from selected Proponents hereto (“Proponent”, “Contractor” or “Supplier”) for the work described in Schedule “A” hereto (“Work”)

This Request For Proposal (“RFP”) sets out the evaluation criteria and selection process for evaluating Proposals received and selecting the successful Proponent or Proponents.

Invited Proponents are encouraged to submit a signed and dated Proposal addressed as follows:

Supply Chain Manager
Purchasing@burlingtonhydro.com
Burlington Hydro Inc.
1340 Brant Street
Burlington, ON L7R 3Z7

- 1.2** PROPOSALS MUST BE SUBMITTED ELECTRONICALLY TO THE SUPPLY CHAIN MANAGER BEFORE THE CLOSING DATE.

CONFIRMATION OF RECEIPT OF ELECTRONIC SUBMISSION OR DELIVERY IS THE SOLE RESPONSIBILITY OF THE PROPONENT.

PROPOSALS RECEIVED AFTER THE CLOSING TIME WILL NOT BE ACCEPTED.

A Proponent who has already submitted a Proposal may submit a further Proposal at any time up to the official closing time. The last Proposal received shall supersede and invalidate all Proposals previously submitted by that Proponent as it applies to this RFP.

Amendments to a submitted Proposal will be permitted if received in writing prior to closing and if endorsed by the same party or parties who signed and sealed the Proposal.

BHI will not be responsible for any cost, expense, liability, loss or damage incurred or suffered by a Proponent because of acceptance or rejection of any Proposal, delay in acceptance of a Proposal or non-award of contract.

2. EVALUATION AND SELECTION PROCESS

- 2.1** All Proposals shall be opened after the Closing Time in the presence of the BHI Supply Chain Manager or designate. The opening will not be public. At the conclusion of the award process only the name of the successful Proponent will be disclosed to all Proponents.

BHI shall be entitled to reject any Proposal if:

- (a) A Proposal is not typed or completed in ink or is not computer-generated.

- (b) A Proposal is not properly executed by an individual having the authority to bind the Proponent.
- (c) A Proposal is submitted after the closing date and time.
- (d) A Proposal is received on other than the supplied Proposal Documents, if provided.
- (e) A Proposal is incomplete (all items are not quoted on), except where the Proposal Documents clearly state that a Contract Award may be made for individual items.
- (f) Unauthorized alterations have been made to any part of the Proposal Documents, if provided.
- (g) A Proposal contains material errors.
- (h) A Proposal contains substitutions or deviations from specifications provided by BHI.

2.2 BHI reserves the right to consider the following during the evaluation of the Proposals:

- (a) Information provided in the Proposal.
- (b) Information provided in response to enquiries of credit, experience and Industry references set out in the Proposal.
- (c) Information received in response to enquiries made by BHI of third parties apart from those disclosed in the Proposal in relation to the reputation, reliability, experience, and capabilities of the Proponent.
- (d) The manner in which the Proponent provides services to others.
- (e) The experience and qualification of the Proponent's senior management and project team.
- (f) The compliance of the Proponent with BHI's requirements and specifications.
- (g) Innovative approach(es) proposed by the Proponent in the Proposal where requested in Proposal Documents.
- (h) The ability of a proposed solution to meet or exceed the requirements or needs of BHI.
- (i) Warranties offered by Proponent.
- (j) Price.
- (k) Proponent's financial position and recent financial statements, if requested.
- (l) Proponent's WSIB Certificate of Clearance.
- (m) Insurance requirements as identified in **Schedule G**.
- (n) Proponent's Health and Safety policy and health and safety experience, and confirmation that it complies with the Occupational Health and Safety Act, if requested.
- (o) Proponent's environmental policy, if requested.
- (p) Proponent's data protection policies, if requested.
- (q) Proponent's privacy policies, if requested.
- (r) Any other criteria that the BHI, in its discretion, finds relevant.

2.3 BHI is not obligated to disclose the weighting given to individual evaluation criteria or reasons for weighting given to any criteria.

3. PROPOSAL REQUIREMENTS

- 3.1** To meet the Proposal requirements, proponents must provide the information identified in **Schedule D**.
- 3.2** If there is a conflict between any of the terms and conditions in this RFP Agreement and Schedules “**A**” “**E**” and “**H**” the conflict shall be resolved in the following order of precedence:
- (a) Schedule “**A**”, Tree Trimming Specifications
 - (b) RFP Agreement
 - (c) Schedule “**E**”, Pricing/Technical Requirements
 - (d) Schedule “**H**”, Service Agreement Contract Terms

4. PRICING AND SOURCES

- 4.1** Prices and Sources will be treated as Confidential Information and will not be shared with Competitors. At the conclusion of the award process, only the name of the successful Proponent will be disclosed to the Proponents. The lowest priced or any Proposals will not necessarily be accepted.
- 4.2** Prices will be quoted FIRM and valid for acceptance within ninety (90) calendar days, with Harmonized Sales Tax (HST) shown separately. Standard payment terms are Net 30 days.
- 4.3** All prices submitted must be in Canadian Funds and will be submitted in accordance with all instructions contained in the Proposal.
- 4.4** All pricing and crew availability information must be completed as set out in **Schedule “E”** contained herein and be signed by the proponent, with its business address fully outlined therein. The submission must be verified by the Statutory Declaration of the party or parties making the submission that all matters stated herein are in all respects true.

5. INQUIRIES, CLARIFICATIONS AND ADDENDA

- 5.1** BHI expressly reserves the right to request clarifications or explanations at its sole discretion by contacting a Proponent without the obligation to contact any other Proponents.
- 5.2** All questions and clarifications relating to the RFP must be in writing and delivered or e-mailed to the Supply Chain Manager.

Addenda may be issued during the RFP period. All Addenda issued will become part of the RFP Documents. Proponents shall include the impact of all Addenda in the quoted price.

Changes to the original RFP are only binding when confirmed by written Addenda.

Clarifications requested by Proponents must be received not less than two (2) weeks before the closing date. The reply will be made in the form of an Addendum, a copy of which will be made available to all active Proponents.

6. RELEASE OF INFORMATION

- 6.1** BHI expressly reserves the right to request clarifications or explanations at its sole discretion by contacting a Proponent without the obligation to contact any other Proponents.

7. CONFIDENTIALITY

- 7.1** Confidentiality of records and information concerning this RFP must always be maintained.
- 7.2** The contents of each submission during the evaluation process will be held in strict confidence and no details of any Proposal may be discussed with any other Proponent or with anyone other than those employees of BHI involved in the evaluation process or fulfillment of any subsequent contract.
- 7.3** All correspondence, documentation and information provided by BHI staff to any Proponent concerning, or arising out of this RFP and/or the acceptance of any submissions:
- (a) remains the property of BHI;
 - (b) must be treated as confidential; and
 - (c) must not be used for any purpose other than for replying to this RFP and for fulfillment of any subsequent contract.

All correspondence, documentation and information provided to BHI in connection with or arising out of this RFP and the submissions will become the property of BHI. The successful Proponent's name, at a minimum, may be made public on request.

8. NEGOTIATIONS WITH PROPONENTS

- 8.1** BHI may identify one or more Proponents with whom it may enter into negotiations with a view to obtaining a contract or arrangement that is responsive to BHI needs. Selection as a Proponent with whom BHI will negotiate does not guarantee that BHI will enter into a contract with the Proponent. BHI expressly reserves the right to terminate the RFP process before a Proponent is selected, to terminate negotiations with Selected Proponent(s) or to determine that BHI's needs can be met, or have been met, in a different manner.
- 8.2** BHI may negotiate with a preferred Proponent for additional services to those requested in this RFP.

9. TERMINATION OF PROCESS

9.1 BHI reserves the right to:

- (a) Terminate the process described in this RFP at any time, including before the closing date, for any reason whatsoever and will not be responsible for any costs incurred by vendors in the preparation and submission of Proposals.
- (b) Not to accept any Proposal and is expressly permitted to reject any or all Proposals.
- (c) To terminate negotiations with an RFP Proponent at any time.

10. CONTRACT

10.1 BHI will issue a Purchase Order to the successful Proponent. The contract between BHI and the successful Proponent will be composed of the following:

- (a) Purchase Order.
- (b) The terms and conditions set out in this RFP including Schedules.
- (c) The Proposal submitted by the successful Proponent as modified by any negotiations between the Proponent and BHI or any changes requested by BHI. AND The successful Proponent shall be required to execute a formal Service Agreement, (Schedule H) with BHI for provision of the Work.

10.2 On or before the date the work or services are to commence, the Contractor shall deliver to BHI a certified cheque or bank draft payable to Burlington Hydro Inc. for the lesser of (i) 10 percent of the contract price, or (ii) \$25,000.00 ("Security Bond"), to be held by BHI as security for fulfillment of the Contractor's obligations under the Agreement.

The Security Bond may be cashed at any time should BHI determine, in the exercise of a sole discretion, that the Contractor has not satisfactorily completed or will not satisfactorily complete its obligations under the Agreement. Should BHI determine that the Contractor has satisfactorily completed its obligations under the Agreement, BHI may return the said Security Bond or such amount as BHI determines to be fair in the circumstances, to the Contractor.

11. TERM AND TERMINATION OF A CONTRACT

11.1 The term of the Contract shall Commence on **January 1, 2025** and end no later than **December 31, 2027**.

11.2 The Contract may be terminated by either Party by giving **ninety (90) days** written notice of termination to the other Party.

11.3 In the event of the bankruptcy or insolvency of the successful Proponent or in the event of an appointment of a receiver for the assets of the successful Proponent or if the successful proponent ceases to carry on business, BHI may terminate the Contract by giving ten (10) days written notice to the successful Proponent, trustee or receiver as the case may be.

- 11.4** BHI may terminate a Contract through a “three strike process” based on risk and severity of performance problems, including failure to complete work within agreed upon timelines, health and safety violations, customer service incidents, outage violations, adverse environmental impacts, or other performance violations. Should three such events occur within any three-month period that are, in the opinion of BHI’s Contract Supervisor exercising a sole discretion, sufficiently serious to warrant termination of the Contract, BHI may immediately terminate the Contract upon written notice to the Contractor.
- 11.5** The agreed upon timelines referenced in 11.4 represents a submitted work plan schedule for the awarded zones. The work plan schedule will include a timeline for completion by month for each awarded zone that will be mutually agreed to by the Contractor and BHI Director of Operations prior to commencing work.

12. INSURANCE AND INDEMNIFICATION

- 12.1** The successful Proponent shall maintain throughout the term of the contract the insurance coverages described in **Schedule G** hereto and shall provide to BHI certificates or policies evidencing those coverages.
- 12.2** The Proponent, if successful, indemnifies BHI, its officers, directors and employees (collectively “Indemnified Parties”) from and against any and all claims, demands, losses, costs, damages, interest, actions or lawsuits or other proceedings by whomsoever made, that may be advanced against the Indemnified Parties or any of them, arising directly or indirectly from the Contract, save and except any such claim, demands, losses, costs damages, interest, actions or lawsuits or other proceedings by whomsoever made, arising from the negligence or wilful misconduct of the Indemnified Parties, or any of them, in connection with the performance of the Contract.

13. WARRANTY

- 13.1** The warranty period with regard to the Contract is one year from the date of completion of each assigned project.
- 13.2** The Contractor shall be responsible for the proper performance of the Work to the extent that the design and Contract Documents permit such performance.
- BHI shall promptly give the Contractor notice in writing of observed defects and deficiencies that occur during the warranty period. The Contractor shall correct promptly, at the Contractor’s expense, defects or deficiencies in the Work which appear prior to and during the warranty period. The Contractor shall correct and pay for damage resulting from corrections made under the requirements of the Contract.
- 13.3** Warranty items not remedied by the Contractor in a timely manner to the satisfaction of BHI shall be dealt with via drawing on the letter of credit provided by the contractor and may result in the Contractor being removed from the BHI Approved Contractor List.

14. CLAIMS FOR WORK OUTSIDE OF ORIGINAL QUOTE

- 14.1** Any claim for extra costs by the Contractor, including performing Services on overtime, must be submitted to and approved by BHI in writing PRIOR to the commencement of that work. The Contractor shall make such claims in a timely manner to not delay the work and to allow BHI reasonable time to consider and evaluate the claim. BHI shall make reasonable efforts not to delay the Contractor pending decisions or proposed changes and to minimize any such delays which may occur. The Contractor may make no claims for extras due to any such delays or without written approval.

15. DUE DILIGENCE

- 15.1** Due Diligence documentation forms parts of this agreement. The successful Contractor must and agrees to provide BHI with updated Certificates of Qualification, Insurance and WSIB Certificates of Clearance throughout the year prior to expiration dates automatically and routinely.

16. CONTRACTOR RESPONSIBILITIES

- 16.1** The Contractor will be responsible for providing its own transportation and associated operating costs, computers, cell phones and the associated operating costs, digital cameras, company uniforms and all the PPE required to perform the associated duties. BHI will be responsible to setup the contractor's photo identification and provide "BHI Contractor" vehicle magnets if needed.

17. SUBCONTRACTING

- 17.1** All workers shall be employed by the Contractor, or Subcontractors as designated on the Proposal. Other individuals on contract or Subcontractors shall only be permitted with the written permission of BHI.

18. SAFETY

- 18.1** BHI's safety policy establishes a clear commitment "to providing a safe and healthy workplace." Contractors and Subcontractors must at a minimum, adhere to the same health and safety standards as BHI including adherence to the following: the Electrical Utilities Safety Association's (EUSA) rule book, relevant legislation and BHI's own safety rules".

In addition, the Contractors will abide by the Occupational Health and Safety Act, RSO 1990 ("OHSA") as amended and all relevant Ontario Regulations that apply to the work, i.e. Regulations for Construction Projects Ontario.

- 18.2** Any work performed contrary to BHI's rules must be stopped and progressively disciplined by the Contractor. Failure by a Contractor to correct a violation of the rules will be considered a breach of contract and result in suspension of the contract.

18.3 All Contractors shall save harmless BHI from any charge or responsibility what-so-ever arising from any accident occurring from the improper safety practices of the Contractors or their personnel.

18.4 BHI has the right to stop work at any time where:

- (a) its representative deems that the Contractor or Subcontractor is not fulfilling their obligation in accordance with the specifications of the Contract or quoted work;
- (b) its representative deems infractions in safety are not being addressed on the Contractor, which is part of the above.

Once the work stoppage has been ordered by BHI, BHI has no further financial obligation until it is mutually agreed that work shall resume.

18.5 Contractor shall be required to comply with BHI Tree Trimming Specifications (**Schedule "A"**), City of Burlington Standards (**Schedule "B"**) and Ontario Regulation 22/04 (see **Schedule "C"**, ESA Distributor Safety Bulletin)

19. INVOICE PROCEDURE

19.1 All invoices for work completed are to be broken down into areas and zones as identified in **Schedule "E"**. Invoices in duplicate, are to be emailed to accountspayable@burlingtonhydro.com with a copy to the BHI Director of Operations before the end of the month, based on the previous month's activities.

20. CONTRACTOR REPRESENTATION

20.1 The contractor must have a reliable representative to deal with BHI's Director of Operations or his appointed delegate. This representative must have the power to sign, and when requested, except for completion any service work order, replace order or additional service installations issued by the Director of Operations.

21. TREE TRIMMING BY BHI AND AFFILIATES

21.1 It is understood and agreed that during the term of a Contract and any extensions or renewals thereof, BHI and/or its affiliates may also undertake tree trimming using their own employees as determined by BHI in BHI's sole discretion.

22. GENERAL TERMS AND CONDITIONS

22.1 **Disclosure of Conflicts of Interest.** Proponents are required to disclose to BHI prior to submitting a Proposal and/or entering into the Contract, any actual or potential conflict of interest. If BHI staff determines that such a conflict of interest does exist, BHI may, at its discretion, withhold the assignment of work from the Proponent until the matter is resolved to BHI's satisfaction. If a conflict of interest is deemed to exist, then the

Proponent shall be ineligible for the Contract or shall take such steps as are deemed necessary to remove the conflict of interest without penalty to BHI. The determination of whether a conflict of interest renders a Proponent ineligible for the Contract will be made by BHI in its sole discretion.

- 22.2 Litigation Exclusion.** Proponents shall disclose to BHI any current or pending litigation against BHI which may prevent consideration of any Proposal submitted by that Proponent in BHI's sole discretion.
- 22.3 Anti-Kickback/Anti-Bribery/Anti-Lobbying.** A Proponent and any director, officer, shareholder, employee, partner, principal or agent of a Proponent shall not offer or attempt to offer to any officer, agent or employee of BHI any benefits, financial or otherwise, in connection with this project or the transactions contemplated by the contract, other than as specified in the contract. The Proponent warrants that no bribe, gift or other inducement has been given, promises or offered to any officer, agent or employee of BHI for, or with a view to influencing acceptance of a Proposal. The Proponent further warrants that no broker, finder or other intermediary or adviser has been retained by or is authorized to act on behalf of the Proponent who might be entitled to any fee, commission, or reimbursement of expenses from the Proponent or BHI upon consummation of the transactions contemplated by the Contract.
- 22.4 Publicity.** The contractor or its employees shall not make, participate in, distribute or cause to permit to be distributed, any announcement, press release, interview, article, story, appearance, marketing material or advertisement, whether in print, radio, television or any other medium or media, regarding this Agreement or the terms and conditions thereof or regarding the Project or any aspect thereof without BHI's prior written consent
- 22.5 Protection of Personal Information.** The successful Proponent will be required to execute BHI's standard Confidentiality, Non-Disclosure and Protection of Personal Information Agreement if the Work could potentially require access to BHI customer information.
- 22.6 Assignment.** If a contract is awarded to a Proponent, the contract may not be assigned by the successful Proponent without the prior written consent of BHI.
- 22.7 Proposals for Acceptance.** Proposals shall be irrevocable and open for acceptance by BHI for ninety (90) calendar days after the closing date.
- 22.8 Right to Reject any or all Proposals.** BHI reserves the right to reject any or all Proposals. Lowest-priced Proposal will not necessarily be accepted.
- 22.9 Part or Multiple Contracts may be Awarded.** BHI reserves the right to award part or parts of the Work to a Proponent or to award parts of the Work to more than one Proponent.

The undersigned offers to do the Work described in this RFP in accordance with all specifications, plans, requirements, and conditions set out in this RFP for the prices or sum set out in this submission.

Name of Proponent

Signature

Name and Title of Signing Officer

Address

Telephone

E-Mail

I have authority to bind the Proponent

SCHEDULE A – Tree Trimming Specifications

1. SCOPE

- 1.1** The purpose of these specifications is to establish standard practices for line clearing operations on all BHI power lines. The specifications, as written, will govern all line clearing operations authorized by BHI unless specifically amended by the substitution of approved clauses or otherwise, to meet special conditions. Pruning shall be done to meet the Ontario Electrical Safety Code (“OESC”) requirement of 3 metres of clearance all round while still maintaining the structural integrity and safety of the trees.

2. PERIOD OF CONTRACT

- 2.1** This period of contract is from January 1, 2025 to December 31, 2027. All work identified in Schedule E has been divided into smaller zones and must be complete within the year stated. Please note that certain species of trees shall not be trimmed while the sap is running. If the Contractor comes across any such tree during this time, they must return before June 30th of said year to complete the trimming requirements.

3. PERMISSION

- 3.1** Before any work on trees is commenced, the permission of private property owners, Highways and Road Officials and Municipal Authorities must be obtained. BHI will obtain necessary permits from Highways and Road Officials and Municipal Authorities. The Contractor shall obtain permission of private property owners. BHI staff will render any assistance necessary in this respect.

4. NOTIFICATIONS

- 4.1** The contractor is required to distribute Notification Material to all customers a minimum of 48 hrs prior to commencing work in that area.
- 4.2** “Notification Material” means a hand-delivered letter to each affected customer in the affected area specifying contractor work times, expected outage times, and general disruption to road traffic.
- 4.3** BHI will provide the Contractor with the Notification Material to be distributed by the Contractor. Reference [Schedule J](#).

5. PAYMENT AND PENALTIES

- 5.1** Payment for a zone will not be made until all work has been completed in the zone to the satisfaction of BHI’s Contract Supervisor unless arrangements for partial payment have been

agreed upon. Should any work be delayed by the inclemency of the weather or by reason of a general strike in any particular trade or calling, BHI shall have the discretion to extend the time for the completion of the work, making a just and reasonable extension for that purpose.

- 5.2 BHI reserves the right to award unfinished or delayed zone work to an alternate contractor or to BHI internal staff in order to complete the work as per the agreed upon timelines in the submitted work plan schedule. The Contractor will pay any increase between the cost to complete the incomplete work and the awarded bid through an invoice deduction or a claim from the security bond.
- 5.3 Emergency Response work may be awarded to multiple Contractors. This decision on which Contractor(s) to contact in an emergency, and in which order, is at the sole discretion of BHI. The Contractor requires confirmation from a BHI authorized representative prior to mobilizing to the site.

6. EXPERIENCE

- 6.1 The Contractor shall be actively engaged in the line of work required by the document and shall be able to refer to work of similar scope and nature performed by them. The Contractor must be prepared, when requested, to present evidence of experience, ability, capacity, services facilities, financial resources and managerial controls when necessary to satisfactorily meet the requirements set forth or implied in the document. The Contractor must have competent staff as prescribed by regulations; this includes competent Utility/Arborists, Arborists, Foresters or apprentices within the Arboriculture trade. All grounds persons, labourers, equipment operators or other staff shall be competent as prescribed in regulations and rules.

7. PROVISION FOR TRAFFIC

- 7.1 The Contractor shall at all times carry on the work in a manner that will create the least interference with traffic. The Contractor shall not close the road or reduce the width or number of traffic lanes available for traffic except as specified in the contract documents or as approved. The Contractor shall, at its own expense and to the satisfaction of BHI provide all vehicular traffic control equipment, material, and labour required to perform the work in a safe manner in accordance with the "Occupational Health and Safety Act" and the "Ontario Traffic Manual" (Book 7 Workers shall be competent in the application of traffic and pedestrian control measures). This includes training, experience, and knowledge to execute traffic and pedestrian control measures. The contractor shall follow all road authority measures (e.g., City of Burlington, Halton Region) as prescribed, including notification and times of work requirements.

8. PROTECTION OF WORK AND PROPERTY

- 8.1 The Contractor shall continuously maintain adequate protection of the work area from damage or injury and shall make good any property damage or injury. If damage or injury does occur, the Contractor shall restore such property to its original state.

- 8.2** The Contractor shall provide, erect, and maintain all guard rails, barriers, night lights, sidewalk and curb protection as may be necessary or as by-laws of the City of Burlington may require.

9. COMMERCIAL VEHICLE OPERATOR'S REGISTRATION (CVOR)

- 9.1** When applicable, Contractors are required to have a valid CVOR with a minimum rating of satisfactory. While under contract with BHI, the Contractor is required to operate under its own CVOR operating authority. Prior to any work being performed for BHI, the Contractor must submit a copy of its current CVOR abstract with its RFP submission (as identified in **Schedule "F"**) and thereafter each six-month period following the course of the contract via email to the Director of Health and Safety. During the term of the contract, if there is any change to the Contractor's CVOR rating, the Contractor must immediately notify BHI and submit a revised CVOR abstract. An unsatisfactory CVOR abstract or rating is cause for contract cancellation or disqualification.

10. SAFETY REGULATIONS

- 10.1** The Contractor shall be a member of the Infrastructure Health & Safety Association and abide by the most current edition of Electrical Utility Safety Rules and regulations regarding line clearing in proximity to energized conductors including the use of Hazard 2 or 8 Cal/cm² Arc Rated Clothing that meets American Standard for Testing and Materials "ASTM" F1506 for regular clothing and ASTM 1891 for arc and flame-resistant rain wear. Proof of Utility Work Prevention Code "UWPC" Training shall ensure that the employees are conversant with the appropriate rules and regulations and anyone failing to abide by the rules may be required to leave the work site. Documentation of membership must be submitted to BHI in the pre-qualification process.
- 10.2** All work must be performed in accordance with the Occupational Health and Safety Act including the appropriate regulations that apply.

11. SUPERVISION

- 11.1** The Contractor shall provide competent and adequate supervision of crews at all times throughout the duration of this contract. BHI's Contract Supervisor is only responsible for the overall supervision of the contract and has no responsibility for direct supervision of the Contractor's crews.

12. PERFORMANCE SPECIFICATIONS

- 12.1** The Contractor will be required to comply with the following:
- a. Perform the work in accordance with specifications based on approved arboriculture practices; follow International Society of Arboriculture "ISA" or the American National

Standards Institute “ANSI” pruning standards; comply with all statutes, orders, regulations, rules and by-laws of every governmental authority relating to the work.

- b. Must submit weekly, to BHI’s Director of Operations and Contract Supervisor, the “Line Clearing Weekly Contractor Time Sheet” showing the streets worked on, the number of hours worked, along with the number of crews used on the job.
- c. The Contractor shall, each day, before commencing work, communicate with BHI’s Control Room (905-336-2004) advising of the following:
 - i) Location and duration of area in which work is to be performed including secondary line clearing.
 - ii) “Hold Off” requirements.
- d. At the end of each working day, inform the Control Room Operator that all employees are clear of the work area and surrender all “Hold Off’s”.
- e. Inform the Control Room Operator immediately should they cause a limb to fall across a line or other incident that may result in a feeder that might cause a power interruption.

13. CIRCUITS AND APPARATUS TO BE CLEARED

- 13.1** Branches and limbs will be pruned to provide a minimum clearance of three metres in all directions, from the 27,600 volt to the 13,800 volt and 4,160 high voltage lines including primary services.
- 13.2** Clearance shall provide for at least three years growth, except where this would seriously mutilate the tree. This should be particularly borne in mind when dealing with fast growing trees. (See IHSA Safe Practice Guide Section 600 for reference). All limbs that are liable by falling, swaying or other means, to make contact the conductor, shall be removed wherever practical.
- 13.3** In establishing clearances, the possibility of children climbing trees and making contact with live apparatus must always be borne in mind and particular caution shall be exercised regarding trees on or near school yards, residential neighbourhoods and playground areas.
- 13.4** Where adequate clearance cannot be obtained without mutilating the tree inform the BHI Contract Supervisor at once, in writing.
- 13.5** Sufficient clearance should also be provided so that guy wires and strain insulators are not in contact with heavy limbs.

- 13.6** Branches, limbs and vines will be pruned to provide a minimum clearance of 1.5 metres in all directions, from transformers, open drop leads, secondary wires and services. In addition, poles will be cleared such that a lineman can climb, without being obstructed by branches and limbs.
- 13.7** Remove all dead wood, regardless of location of the tree, which, under normal wind conditions, could strike the conductors or any part of the electrical equipment, in falling.

14. PROTECTING THE BARK OF TREES

- 14.1** Spurs will not be used for climbing trees unless emergency rescue is required.

15. PRUNING

15.1 Cuts

Saw and pruner cuts shall be made using good arboriculture practices. This includes following good pruning practices that do not result in additional damage to the tree. (Stripping, cracking or damaging remaining tree structure)

15.2 Cut Branches

Ropes shall be used for lowering cut branches where necessary, to prevent damage to trees, conductors, fences and other property. No "hangers" shall be left in trees after pruning and no twigs or branches shall be left on the conductors.

15.3 Saw Cuts to be Protected

There is no need to paint, cover or treat pruning cuts to reduce decay or rot.

15.4 Corrective Pruning

Old stubs remaining from previous line clearing operations shall be removed as well as any stubs, broken or damaged limbs on the line side of the tree, resulting from storm damage.

15.5 Shaping

When a line passes through a tree, the opening should be cut back in a slope, away from the line towards the top, so that the notch is a Vee shape. The cutting of slots is not permitted. The cutting of Vee notches shall be kept to a minimum.

Where lines run alongside a tree, the tree should be trimmed to give correct clearance at the lowest BHI line and slope away from the upper circuits.

If in obtaining the desired line clearance, trees are rendered unsightly due to lack of symmetry, further pruning to restore their appearance shall be carried out. The extent of such shaping shall be governed by the location of the trees to the nature of their surroundings etc. Full shaping shall consist of:

- a. The removal or shortening by natural or "drop-branch attachment" method, of branches in crown of tree. Sufficient growth must be left on branches that are cut back, ensure the health of the tree. When possible, the branch being removed shall be cut in such a way as to preserve the natural appearance of the tree. "Hedge-pruning" or excessive clipping with pole pruners and brush saws shall be avoided.
- b. Removal or shortening of long straggly branches at side of trees.
- c. Removal or shortening of branches at backs of trees, to restore balance which has suffered as a result of limbs being removed to obtain clearance of the line side. Care must be exercised to avoid an effect similar to girdling, as a result of removing too many adjacent branches.
- d. Removal or shortening of side branches on line side of tree to eliminate or reduce to a minimum a gouged effect.

15.6 Limbs Under Conductors

Limbs growing up into the conductors from the side of a tree shall be removed at the main trunk. If this appears impractical, or inadvisable, the limbs shall be shortened to avoid whipping up into the line.

15.7 Limbs Parallel with Conductors

Limbs that are growing out from the side of a tree, parallel with conductors, and could sway or be blown into the conductors, shall be removed wherever practical. Otherwise they shall be shortened.

15.8 Trees Below a Line

Young trees growing directly under a line are to be topped and rounded in a pleasing manner.

15.9 Overhanging Limbs

Limbs directly over the conductors shall be removed if possible; otherwise they shall be shortened sufficiently to prevent their dropping into the conductors under the additional weight of wind, snow or ice.

15.10 Dead Limbs

All dead wood, level with, or above the conductors, in trees immediately adjacent to the line shall be removed together with dead limbs that might be blown into the line from trees located across the road or elsewhere in the near vicinity.

15.11 Tops of Weak-Wooded Trees to be Lowered

All tall weak-wooded trees towering above the line shall have their tops lowered as much as practical. To lower the tops, the "crown reduction" method shall be used so that the tree will not appear to have been chopped off at a definite height.

15.12 Vines

Vines growing on poles, down guys and span guys are to be cut at grade elevation and removed. Where the vines have encroached within the safe limits of approach for removal from overhead high voltage conductors and secondary service conductors, notify BHI in writing. BHI will dispatch a crew to create a safe condition in order to remove the vines.

16. DISPOSAL OF WOOD, BRUSH AND DEBRIS

16.1 The disposal of brush, wood and other debris resulting from Contractor's activities shall be governed by the following:

- a) If the Council or other road authority does not wish to retain timber cut from road allowances, adjacent property owners shall be afforded the privilege of using it. Such timber and branches over 4" in diameter shall be trimmed and cut into convenient lengths for handling unless otherwise designated by the property owner. Alternatively, dispose of all debris at an approved dumping site.
- b) Timber and branches that are to be given to property owners shall be piled neatly on the land of the property owner, immediately adjacent to the road allowance, during the progress of the line clearing operation.
- c) Wood or brush, which has been cut from private property during the progress of a line clearing operation, shall be cleared up to the satisfaction of the property owner, providing the request is reasonable.
- d) Brush, wood and debris, shall not be left lying overnight along streets, highways, county roads or any main travelled road. Brush left overnight on lightly travelled roads shall be stacked neatly so as not to obstruct traffic and shall be removed the following day. Lawns and grassed areas shall be raked to eliminate small twigs, branches, and debris.

17. OUTAGES

17.1 BHI generally permits one outage per contractor per day. The contractors are expected to apply all resources available to work on the scheduled outage to ensure the outage time is minimized and work completed. The following are additional planned outage requirements:

- a) No outages are permitted on Fridays.
- b) When an outage is required, work plans must be submitted two weeks in advance of the required outage date
- c) Acceptable outage times are stated below; requested outage times will not be permitted outside of these time frames:
 - March 15 – November 15 8:30am to 2:30pm

- November 15 – March 15 8:30am to 2:30pm
 - Max duration is 4 hours (Winter)
- d) Scheduled outages may be cancelled subject to:
 - Special weather conditions
 - Availability of internal resources required

18. TREES OF DOUBTFUL STRENGTH

- 18.1 Report in writing,** all trees of doubtful strength that in falling could strike BHI lines. These shall include all trees especially Ash trees that are over-mature, diseased or showing signs of decay, as well as all Oak, Beech, and Basswood Trees, regardless of their outward appearance, since trees of these species are particularly prone to internal decay.

SCHEDULE B – City of Burlington Standards

The following pages have been extracted from the City of Burlington Standards and should be read in conjunction with the preceding requirements. Where a discrepancy occurs, notify the Engineer in writing. However, special regard to the needs of Burlington Hydro Inc. shall be overriding factor.

The City of Burlington standards for tree pruning are in reference to “City” trees. These are trees located within the City Road allowance and “Shared” trees that are located principally on the property boundary with the City Road allowance and private property.

1. Pruning Objectives for All Pruning Work

Pruning shall be completed such that all Primary Pruning Objectives listed below are achieved. Various factors which may inform the overall pruning approach and establishment of specific pruning objectives shall be considered prior to commencement of pruning. Such factors may include, but are not limited to, tree structure and health; tree-associated risk; species characteristics such as growth rate, growth habit and expected response to pruning; the necessary amount of pruning; and site characteristics.

1.1 Deadwood and Hangers

Irrespective of the Primary Pruning Objectives, all dead or decaying branches greater than 2.5 cm in diameter at the point of attachment shall be removed from all trees scheduled for pruning using proper pruning cuts, as per relevant ANSI A300 standards and ISA Best Management Practices. All unattached or weakly-attached hanging or hung-up branches (generally referred to as ‘hangers’) shall be removed.

1.2 High Risk Situations

The Contractor shall notify the City Representative immediately if the Contractor determines that there is a high likelihood of whole tree or component part failure and target impact with significant consequences to the Contractor, public utilities, vehicles, structures and/or person exists within a radius of 1.5 times tree height around a tree scheduled for pruning.

1.3 Oak Trees and Oak Wilt

In order to help prevent the introduction of Oak Wilt to Ontario the following measures will be required; No oak trees on the grid prune list will be pruned before October 31st of the year.

Pruning of Oak trees after October 31st will be included in the lump sum pricing. ; no additional costs will be bestowed upon by the City. Pruning of oaks is not to be done before October 31 unless its an emergency or a hazardous limb. If pruning is necessary, the contractor must treat the limb with lac Balsam paste or similar treatment supplied by the contractor. It is recommended to make larger cuts rather than many small cuts.

2. Primary Pruning Objectives

The following pruning objectives shall be considered to be appropriate for implementation during the performance of the Work. The Contractor shall undertake pruning to achieve all of these objectives unless achieving one, or more, of the objectives will negatively impact the tree's health and structure. In situations where one, or more, of the pruning objectives are not achievable, the Contractor shall identify and implement the most appropriate objectives based on the tree's requirements. If no Primary Pruning Objectives can be established for a tree, that tree shall not be pruned, unless otherwise approved by the City.

2.1 Risk Mitigation

Pruning for Risk Mitigation includes the selective removal of specified tree parts to reduce or eliminate the likelihood of whole-tree or component part failure and its resulting impact on a given target, such as persons, vehicles, utilities or property.

2.2 Structural Development

Pruning for Structural Development selectively and judiciously removes branches, buds and/or shoots for a specified purpose, such as improved overall branch and trunk structure, prevention and mitigation of poorly-attached branches, management of development of, and competition between leaders, improvement of branch spacing, encouragement of growth in a specified direction, or other purposes related to structural development and reduction in the likelihood of future whole-tree or component part failure.

2.3 Health Promotion and Management

Pruning for Health Promotion and Management removes branches, buds, shoots and/or other tree parts to improve the overall health and vitality of trees. Pruning to reduce the potential spread of infestation or infection, commonly referred to as sanitation pruning, may also be considered as pruning for Health Promotion and Management. Conditions or factors which may require pruning for Health Promotion and Management include, but are not limited to, dead, dying, diseased or otherwise unhealthy branches or foliage.

2.4 Restoration

Pruning for Restoration is intended to correct damage occurring as a result of external forces such as wind, ice, impact or collision, previous inappropriate pruning, or other actions which have damaged or disturbed a tree's structure, form or appearance.

2.5 Clearance, Elevation or Line-of-Sight

Pruning for Clearance, Elevation or Line-of-Sight includes the selective removal of branches and/or other parts for a specified purpose, such as ensuring safe and reliable utility service; preventing or removing interference with infrastructure, traffic, buildings, other trees or other objects; reducing or removing line-of-sight obstructions; or other specific clearance requirements.

The extent of clearance shall be based on intended site uses, maintenance cycle length, tree structure, species characteristics, and/or anticipated growth response.

3. Inappropriate Pruning Objectives

Unless approved by the City, the following pruning objectives shall generally be considered inappropriate for implementation under this contract, unless they are secondary to a Primary Pruning Objective referred to above.

If no Primary Pruning Objectives can be established for a tree, that tree shall not be pruned, unless otherwise approved by the City. An Inappropriate Pruning Objective shall not be the sole cause of tree pruning for any tree under this contract.

3.1 Aesthetic Improvement

Pruning for Aesthetic Improvement is intended to improve the visual appearance of tree, with no anticipated benefit to tree risk management, structural development, health, restoration or clearance.

3.2 View Improvement

Pruning for View Improvement is intended to improve aesthetic vistas or views of commercial signage. Pruning to improve line-of-sight for vehicular or pedestrian traffic, views of roadway signage, or other safety-related clearance objectives shall be undertaken under the Primary Pruning Objective of Clearance, Elevation or Line-of- Sight.

3.3 Managing Size and Shape

Pruning to Manage Size and Shape includes pruning to achieve a desired tree size or shape, exclusive of pruning to provide clearance or encourage good structural development.

4. Pruning Methodology

The Contractor shall only use approved pruning methods, as described below, when undertaking the work. Approved pruning methods shall consist of the Natural Form Pruning System and the application of proper pruning cuts, as described in these specifications.

4.1 Requirements for Ash Trees (*Fraxinus* spp.)

The Contractor shall only prune Ash Trees (*Fraxinus* species) to remove broken branches (hangers) or limbs and meet the requirements for clearance, elevation and line-of-sight.

4.2 Trees Originating on Private Property

The Contractor shall prune trees originating on private property in order to meet the requirements for clearance, elevation and line-of-sight only. The Contractor shall complete all work from the municipal road allowance. Should access to private property be required to complete the work, the Contractor shall notify the City. The Contractor shall not enter any private property without prior written permission from the City and the private property owner. There is no separate item for the pruning of trees originating on private property. This work shall be considered to be part of the work under the contract

and the Contractor's block prices for structural pruning of trees shall include all costs associated with pruning trees originating on private property, as required.

4.3 Pruning for Natural Form

Unless otherwise specified, pruning for natural form shall be implemented for all trees. Pruning for natural form seeks to maintain and encourage development, to a reasonable degree, of a tree's naturally occurring form, while enabling achievement of the Primary Pruning Objectives. Pruning undertaken shall consider the following:

- tree species growth characteristics including, but not limited to, growth habit (excurrent vs. decurrent); apical dominance tendencies and branch spacing Habit;
- tree species biological characteristics including, but not limited to: general vigour; wound closure and decay compartmentalization ability; general tolerance for pruning and loss of photosynthetic area; and susceptibility to pests and pathogens after pruning;
- characteristics of the individual tree to be pruned including, but not limited to, size; form; overall health and vitality; and pest and/or disease infestation or infection.

All efforts shall be made to maintain a reasonable overall balance of woody material and foliage throughout the crown, without unevenly balancing or transferring weight to one or more sides of the tree.

4.4 Extent of Pruning and Limitations

Pruning operations should remove no more living material than is necessary to achieve the Primary Pruning Objectives. Determination of the amount of living material to be removed and the location of pruning within the crown shall take into consideration the Primary Pruning Objectives, species and individual tree characteristics as described in the specifications and site characteristics. In general, no more than 20% of living material should be removed during pruning unless determined necessary to achieve the Primary Pruning Objectives and with reasonable expectation of no adverse effects upon the tree's health and overall condition.

If achievement of Primary Pruning Objectives requires excessive pruning which is likely to be detrimental to the long-term health and condition of the tree, alternative approaches, which may include, but are not limited to, removal or relocation, shall be considered and shall only be implemented with the prior approval of the City.

4.5 Pruning Methods to Achieve Risk Mitigation

To achieve the Pruning Objective of Risk Mitigation, all dead, decayed, wounded and/or otherwise weakened branches with an elevated likelihood of failure, and which are greater than 2.5 cm in diameter at the point of attachment shall be removed. Wherever possible, branch shortening, by using appropriate pruning cuts of a branch which exhibits excessive end-weight and thereby an increased likelihood of failure, shall be favoured over branch removal, if the retention of the branch does not conflict with other Primary Pruning Objectives.

4.6 Pruning Methods to Achieve Structural Development

To achieve the Pruning Objective of Structural Development:

- Trees shall be pruned to maintain or promote, to a reasonable degree, resemblance to the species' natural form. Excurrent trees shall be pruned to maintain or encourage an excurrent form, and decurrent trees shall be pruned to maintain and encourage a decurrent form.
- Efforts shall be made by the use of appropriate pruning cuts to promote even branch spacing and distribution along the dominant leader. However, existing trees which do not exhibit these branch arrangement characteristics shall only be corrected if such pruning is not likely to compromise health or structure, create excessively large pruning wounds, result in the promotion of wood decay, or result in excessive loss of live wood material or foliage.
- Growth of branches with included bark shall be suppressed by the use of reduction or heading cuts (if necessary), if the removal of such branches may compromise health or structure, create excessively large pruning wounds, result in the promotion of wood decay, or result in excessive loss of live wood material or foliage.

4.7 Pruning Methods to Achieve Health Promotion and Management

To achieve the Pruning Objective of Health Promotion and Management, trees shall be pruned using appropriate pruning cuts to remove living or dead woody material which is:

- Locally infested by a transmissible pest which has the potential to cause tree mortality in the event of wider spread within the tree or to other trees.
- Locally infected by a transmissible pathogen which has the potential to cause tree mortality or decay in the event of wide spread within the tree or to other trees.
- Supporting foliage which exhibits evidence of a perennial or recurrent foliar infection.

Tree branches or other component parts shall not be pruned to remove infested or infected parts if the tree is broadly infested or infected by a pest or pathogen, and if it is reasonably expected that such pruning would have no positive effect upon the control of the pest or pathogen or improvement of the health of the tree, unless such pruning is required to achieve other Pruning Objective(s). Tree branches or other component parts shall not be pruned for the purpose of controlling a temporary or seasonal pest or pathogen with no significant expected adverse effect upon the health or condition of the tree, unless such pruning is required to achieve other Primary Pruning Objectives.

4.8 Pruning Methods to Achieve Restoration

Restoration pruning should be performed following damage to trees in order to redevelop good structure, natural form, and overall appearance. Restoration pruning should be considered when replacing damaged plants is impractical due to economic, aesthetic or other reasons. If the Contractor determines that a tree is too badly damaged for reasonable expectation of successful restoration, the Contractor shall not prune the tree and shall notify the City. Suitable branches or shoots should be identified and retained for development, and competing or undesirable (e.g., damaged, weakened) branches and shoots should be selectively subordinated or removed. When selecting branches for retention, subordination or removal, characteristics including, but not limited to, species natural form and growth habit, likely response, and overall tree health and condition shall be considered.

4.9 Pruning Methods to Achieve Clearance, Elevation or Line-of-Sight

To achieve the Pruning Objective of Clearance, Elevation or Line-of-Sight, trees shall be pruned to establish the following minimum clearances.

- A minimum clearance height of 2.5 metres (8ft) over any public walkway, lawns, driveways and 4.3 metres (14ft) over any public roadway.
- As per any coniferous tree with bows touching the ground, the City Representative will make a judgement call on pruning on a per site basis.
- A minimum clearance of 2 metres shall be established between the lowest
- branches of all deciduous trees and ground level. As per Columnar trees (oaks, hornbeam, etc) the City Representative will make the pruning decision based on site factors.
- A minimum clearance of 2.5 metres shall be provided between branches and permanent structures.
- The minimum clearance height for road signs and signals and roadway sight lines shall be in accordance with applicable legislation, policies, and guidelines.

All regulatory and warning signs shall be cleared to provide the following minimal sight lines:

- Posted speed of 50 km/h – minimum sight distance of 110 metres
- Posted speed of 60 km/h – minimum sight distance of 140 metres
- Posted speed of 70 km/h – minimum sight distance of 170 metres
- Posted speed of 80 km/h – minimum sight distance of 210 metres

Street lights shall be cleared in such a way as to permit maximum illumination of roadways and sidewalks while maintaining a trees natural form. Branch shortening or pruning to direct growth in order to provide the minimum necessary clearances shall be favored over branch removal, if retention of the branch does not conflict with other Primary Pruning Objectives and if there is a reasonable expectation that minimum clearances will not be encroached upon within seven (7) years. Utility service drops shall be cleared to minimum standards.

5. Prohibited Pruning Methods

The following pruning methods shall not be applied to any trees under this Contract, unless otherwise specified and previously approved by the City.

- i. Topping/Hedging/Shearing/Rounding Over – Topping, hedging, shearing and/or rounding over generally refers to the indiscriminate and/or widespread application of heading cuts, typically undertaken to reduce tree size or achieve a certain canopy form.
- ii. Lion's-tailing – Lion's-tailing refers to the excessive removal or thinning of the inner portion of the crown or of one or more branches, such that the outermost branches are retained.
- iii. Specialized Methods – Pollarding, coppicing, espalier, pleaching, and topiary refer to specialized methods which may, or may not, include varied application of removal, reduction and/or heading cuts to achieve the desired shape and growth characteristics. These specialized methods, although appropriate when specified, shall not be used for trees in this contract.

6. Pruning Cuts

All pruning work shall be undertaken using one, or more, of the pruning cut types described in this section, as appropriate for the situation. Smaller pruning cuts shall be preferred over larger pruning cuts whenever the smaller pruning cuts are compatible with the specified Primary Pruning Objectives. Wherever possible, the completed pruning cut should be generally circular or moderately oval-shaped and shall have a flat surface with firmly attached and cleanly cut adjacent bark. Where a cut results in torn, frayed or otherwise damaged bark, bark shall be properly traced over as small an area as necessary to remove the damaged bark and ensure firm bark attachment. Where branches or limbs are located over structures/utilities and cannot be handled and lowered safely by hand, they shall be rigged and lowered using appropriate arboriculture techniques, as per relevant ANSI A300 standards and ISA Best Management Practices.

6.1 Three-Cut Method

The three-cut method (also known as a drop-cut or under-cut method) shall be used in all instances where there is a possibility of bark tearing or other damage as a result of a pruning cut on the part of the tree to be retained.

6.2 Branch Removal Cut

A branch removal cut shall be used to remove a branch from its point of origin. It shall be made without cutting into the branch collar or branch bark ridge, and without leaving a stub. A removal cut made to remove a branch with a narrow angle of attachment shall be made inwards from the outside of the branch to avoid damage to the parent stem. Smaller cuts shall be favoured over larger cuts when smaller cuts can be used to achieve the specified Pruning Objective(s). Characteristics including, but not limited to, species wood decay resistance, ability to compartmentalize decay, tree size, vitality, and overall condition, shall be considered when determining the maximum size of branch removal cuts.

6.3 Reduction Cut

A reduction cut shall be used to reduce the length of a stem or branch by removing the terminal portion back to a lateral branch of equal or smaller diameter that is large enough to assume apical dominance. The size of the remaining lateral should be at least 1/3 to 1/2 the diameter of the cut stem. The angle of the cut shall be determined by bisecting the angle between the branch bark ridge and an imaginary line perpendicular to the stem or branch to be removed.

6.4 Heading Cut

A heading cut shall remove a branch or stem between nodes, to a branch less than 1/3 of the diameter of the cut stem, or to a bud. Heading cuts shall only be used to achieve specific Primary Pruning Objectives and shall not be used as a commonplace practice.

7. Pruning Tools

Tools permitted for use in undertaking the work shall include tools commonly referred to as:

- Hand pruners or secateurs (bypass type only; straight anvil type are not permitted);
- Loppers (bypass type only; straight anvil type or hedging shears are not permitted);
- Hand saw (tri-edge 'Japanese-style' or other arborist-specific types only; bow saw or carpenter saw are not permitted);
- Extension pruners or saws meeting the above characteristics are permitted
- Chain saws and power pole saws.

Hand pruners shall not be used for making pruning cuts on branches larger than 1.5 cm in diameter at the location of pruning. Loppers shall not be used for making pruning cuts on branches larger than 2.5 cm in diameter at the location of pruning. Only saws (hand or powered, as appropriate for the circumstance) shall be used for making pruning cuts on branches larger than 2.5 cm in diameter. All tools used in the performance of the work shall be clean, sharp, and in good working order. When used on trees known or suspected to be infected by a pathogen, or when working in areas where pruning is known to have a high potential to spread pathogenic disease, tools shall be sanitized with 70% ethyl or isopropyl alcohol, benzalkonium chloride or another non-chlorine disinfecting agent prior to use on subsequent trees.

8. Cleanliness of Site

Once removed, all wood chips, brush, limbs, trunks and logs, unless otherwise specified in the contract documents, will be considered the property of the contractor who will dispose of them in a manner consistent with applicable Provincial Statutes and Municipal by-laws.

Where a chipper is to be used, all wood chip debris will be removed from the site and disposed of by the Contractor. Spreading chips will not be permitted except as allowed for in the contract documents or in writing by the City Representative.

In natural, meadow, or rural areas all branches, limbs and twigs over 1 inch (2.54cm) in diameter will be removed from the site. In all industrial, residential, commercial, park and similarly maintained areas, all grass, gravel and garden areas will be left "fan rake clean". All driveways, walkways, roads, curbs, patios, and other asphalt, concrete, stone and similar surfaces will be "broom clean" when the site is vacated at the end of each shift and at the end of each day. Reasonable efforts must be taken to remove sawdust.

It is expected that clean-up operations will progress with the job and that a minimum of one ground person will be engaged in brush removal for two climbers or pruners.

It is understood that all damage caused by the Contractor in performing the work under these specifications will be repaired by the Contractor and at the Contractor's sole expense. Damaged turf areas will be levelled and seeded or sodded, all horticultural planting damaged beyond repair will be replaced and any damage to structures, utilities, signs, light fixtures, irrigation systems, landscape furniture, etc. will be repaired or replaced. Repair work will be carried out by skilled workers acceptable to the City Representative. All repairs and replacements will be approved by the City Representative prior to final payment.

SCHEDULE C – ESA Distributor Safety Bulletin



Distributor Safety Bulletin

Tree Trimming Obligations

GENERAL STATEMENT: **Electrical Distribution Safety**

LDCs have a legal obligation set out in O. Reg. 22/04 to manage vegetation around all LDC owned overhead conductors including secondary. There have been a number of incidents and public safety concerns due to trees in direct contact with powerlines. One incident involved tree branches pushing the LDC owned secondary service against the eaves trough of a home, wearing away the service insulation and energizing the eaves trough. This resulted in the homeowner receiving an electric shock causing injury when a ladder was placed against the eaves trough. ESA is also concerned that the number of powerline contacts by DIY homeowners and arborist trimming trees near powerlines continues to increase.

O. Regulation 22/04 states:

- Section 4(4) “All overhead distribution lines, **including secondary distribution lines**, shall meet the following safety standards... (3) Energized conductors and live parts shall be barriered such that vegetation, equipment or unauthorized persons do not come in contact with them or draw arcs under reasonably foreseeable circumstances.”



ESA RECOMMENDS:

- LDCs review and modify as necessary their Conditions of Service to ensure it aligns with O. Reg. 22/04
- Ensure LDC tree trimming practices and other measures be taken to meet the obligations set out in O. Reg. 22/04

ADDITIONAL INFORMATION: If you can provide additional information on this Bulletin or any other Utility issue, please contact ESA to share your experiences. Additional information requests, and follow-up information, may be directed to ESA. Please be prepared to quote Bulletin “DSB-02/09”.

June 9, 2009

1 of 1

Bulletin DSB-02/09

Provincial Office 155A Matheson Blvd. West, Suite 200, Mississauga, Ontario L5R
3L5 Fax 905-507-4572

Website: www.esaeds.info E-Mail: Utility.Regulations@ElectricalSafety.on.ca

SCHEDULE D – Quote Submission Requirements

1. Complete **Schedule "E"** Pricing/Technical requirements.
2. Complete **Schedule "F"** BHI Qualifying Contractor Requirements.
3. Provide your organization's financial statements or alternatively a Bank Reference Letter.
4. Provide an overview of the Quality Assurance and Quality control processes to be utilized.
5. Provide your organization's escalation procedures in the event of a dispute.
6. Provide your organization's methods used to control scope, quality and cost of services.
7. Provide Signed **Schedule "G"** Insurance Requirements.
8. Proof of Bonding: Initial beside section 10.2 of the RFP to confirm acceptance if awarded a contract.

SCHEDULE E - Pricing/Technical Requirements

BHI requires trees to be trimmed clear of all primary and secondary circuits in a manner described in **Schedule "A"**. It should be noted that all zones will be inspected by BHI and payment will be withheld until the zone is completed to the satisfaction of BHI's Contract Supervisor. Payments for partial zone completion may be prearranged at the sole discretion of BHI upon awarding of the contract.

Proposal Requirements

Proponents to complete the below in full and indicate any additional charges that may apply with explanations e.g. overtime charges, minimum call-out or travel time. Exclude HST. Only charges described in the RFP will be considered for payment during the contract period.

The proposed areas to be trimmed are identified on the maps provided with the RFP. Each large area is divided into smaller numbered zones. BHI reserves the right to award the contract by zone (i.e. multiple proponent(s) could be awarded in each year). Work must be completed in all zones listed in the specified calendar year.

If guided tours of the zones are required, please contact:

Jeff Taylor, Line Supervisor
Cell: 905-320-0127
jtaylor@burlingtonhydro.com

I/we certify that I/we have visited all zones as outlined on the maps provided, prior to determining cost by zone. _____ *Initial Here*

1. Fixed Pricing by Zone

Provide cost to complete each zone by year in the tables below. The proposed areas and zones to be trimmed are identified on the provided maps. Each large area is divided into smaller numbered zones. Exclude HST.

2025 – 3 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 1		
Zone 13 East		
Zone 13 West		
Zone 14		
Total Area		

2026 – 6 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 6		
Zone 8		
Zone 9		
Zone 12		
Zone 15		
Zone 17		
Total Area		

2027 – 6 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 2		
Zone 3		
Zone 4		
Zone 5		
Zone 7		
Zone 16		
Total Area		

2. Time and Material

In addition to work completed by zone under this contract, there may at times be a need for additional planned time and material work as required, including specific customer requests. There is also additional “emergency work” that is considered unscheduled overtime, for which crews must be available 24 hours a day, 7 days a week, 365 (366) days a year. Crews must be equipped to work at night and additional crews may be required.

2025 Tree Contractor Hourly Rates for Time and Material Work ¹			
Description	Normal Working Hours ²	Scheduled Overtime Rates (outside normal working hours)	Emergency Response Rates (unscheduled) ³
Applicable Hours			
Applicable Days of Week			
2-person crew and bucket truck (rate per hour)			
Additional person including bucket truck (rate per hour)			
Additional person including pick-up truck (rate per hour)			
Minimum Call Out Charge	n/a		

1. Rates may be escalated by a maximum of 2% annually for 2026 and 2027.
2. These rates also apply for emergencies in normal working hours.
3. These rates should reflect contractor’s emergency response times identified below.

3. Emergency Response Time

In the event of an emergency and a crew is not already on site:

- a. I can provide _____ crew(s) within 1 hour response time.

_____ ← *Initial Here*

- b. I can provide _____ crew (s) within 4 hours response time.

_____ ← *Initial Here*

Completed by:

Name: _____

Title: _____

Date: _____

I, /WE, THE UNDERSIGNED, declare that, after having carefully read the General Conditions, BHI Tree Trimming Specifications (**Schedule "A"**), City of Burlington Standards (**Schedule "B"**), and the Service Agreement (**Schedule "H"**) and after having examined the plans and profiles of the streets upon which the works are to be performed.

WE DO HEREBY OFFER to perform the work described for furnishing all labour and materials as specified that may be necessary to complete the said works in accordance with said specifications, plans, etc. and to conform to all conditions therein at and for the price or sum as shown on the attached Schedule. This Proposal is irrevocable and open for acceptance for ninety (90) calendar days from the closing date.

Signature of Authorized Officer: _____

I have the authority to bind the Company

Name and Title (print): _____

Title: _____

Company Name: _____

Address: _____

Phone Number: _____

E-Mail Address: _____

SCHEDULE F – BHI Qualifying Contractor Requirements
(For Line Clearing Operations in Proximity to Energized Apparatus)

1. A copy of the following list of documents must be provided as part of the due diligence evaluation for this RFP:

- Currently dated and signed Corporate Health and Safety Policy ☐
(Must be signed and dated each year)
- Currently dated and signed Corporate Environmental Policy (if not included in preceding policy) ☐
- Policy on Management of the Electrical Utility Safety Rules (EUSR) as appropriate ☐
(EUSR 101 requires the employer to establish a policy on the management of the Rules)
- Current WSIB Clearance Certificate ☐
(Renewable every 90 days please include industry experience rating)
- Proof of current valid driver's licenses for all pertinent drivers along with the most recent date of abstract searches – a signed letter to this effect will meet the intent of this requirement ☐
- Certificate of Insurance as identified in Schedule G ☐
- Proof of current appropriate Health and Safety Association Membership ☐
- Occupational Health and Safety Program including work site emergency plan, and Job Plan Procedures ☐
(Managed System such as COR, CSA Z1000, or equivalent)

2. Provide current and complete pertinent employee listing, including competencies and proof of qualifications. Provide competencies and / or copies of training certificates by an approved / accredited training agency or agent.

All Crew members must have:

- Standard First Aid and CPR (AED if equipped) ☐
- Safe Operating and Maintenance of Chain Saws ☐
- Safe Operation and Maintenance of Chippers ☐
- Work Area Protection (MTO Traffic control, Book 7) ☐
- Safety and Awareness for Line Clearing ☐
- Appropriate Working at Heights (Fall Protection) ☐
- Tree Trimming and Removal Techniques ☐

3. Provide proof of the following competencies if available:

- an MTCU Utility Arborist Certificate (will consider / accept an ISA Certified Arborist/Forester who holds competencies equivalent to Utility Arborist 444B) ☐
- Utility Line Clearing Technician Proficiency (IHSA or approved equivalent) ☐
- Pertinent Working at Heights and Rescue (IHSA] or approved equivalent) ☐
- Appropriate Supervision per the Occupational Health & Safety Act (as a minimum) ☐

- **Additional Proof of Training for Crew Member to Hold Work Protection as an Authorized Worker (as governed by Electrical Utility Safety Rules):**

Utility Work Protection Code (must complete and pass the examination for this IHSA Administered Program in order to apply and hold UWPC Work Protection) ☐

- **Additional Proof of Training for Crew Member working from Bucket Truck and/or providing Rescue Support to a Member in Bucket Truck:**

Pertinent Hydraulic Aerial Equipment (IHSA or approved equivalent manufacturer) ☐

Pertinent Working at Heights including Rescue Techniques (IHSA or approved equivalent) ☐

- **Additional Proof of Training for Crew Member Performing General Ground**

Support Functions (NOT rescue support):

Electrical Safety and Awareness – Line Clearing Ground Support (IHSA or approved equivalent) ☐

Rescue Techniques and Practice ☐

4. Provide the following Inspection Documents:

- Current CVOR records for pertinent vehicles ☐
- Lifting / hoisting Inspection Records for pertinent vehicles ☐
- Annual Small Vehicle Inspections (Preventative Maintenance Programs) ☐
- Pertinent current Certification of Dielectric Tools ☐
- Current Certification of Dielectrics for Aerial Devices ☐
- Current Certification of Voltage Rated Gloves ☐

PPE Minimum Requirements

Workers working in proximity are expected to wear Arc Rated clothing as required from EUSR, the min requirement is for the arc rated clothing to have HC 2 or 8 cal/cm² as min, the clothing must meet ASTM F 1506 standards and rainwear must meet ASTM 1891 Standards. The Clothing shall be used in accordance to manufacture instructions and provincial regulations:

- Class E Head Protection
- CSA Approved Safety Glasses with UVA/B protection
- CSA Approved Work Boots
- Chain Saw Cut Protection (not required if in Aerial Device unless prescribe though contractor policy)

Sub Contactors

Any sub-contractors working for the prime contractor must be approved through the same process. No sub-contractors are to perform any work without the written consent of BHI Prequalification procedure.

5. Provide the Following Performance Metrics Documents:

- Health and Safety Metrics from previous year (summary only) of fatalities, critical injuries, lost time incidents, medical aid claims, first aid incidents, and near miss incidents. For contractors working under multiple rate groups, only provide metrics under rate group 830. ☐
- WSIB NEER previous year experience rating against rate group 830 ☐
- CVOR previous years' experience summary ☐
- Inspections previous year summaries from supervisors, regulators, or subject matter experts on health and safety performance from previous year. ☐
- Environmental Metrics, previous year summary of spills, impacts or incidents related to environmental losses. ☐
- Three (3) industry references related to experience in performing line clearing operations. ☐
- Awards or recognition in business, health and safety, environmental or community recognition. ☐

RFP responses will be evaluated on the basis of all requirements identified in this RFP, of which price is only one component. Once the contract is awarded, the successful contractor (s) shall be responsible to maintain the competencies, insurance, inspections, testing and requirements as described throughout this RFP.

Additional Notes Forming Part of this Qualification Process

1. Following awarding of the contract the successful contractor (s) must complete all the requirements for the employees who will be approved to request a "Hold Off":
 - Proof of worker certificates for each employee that will request a "Hold Off" (1 of the 2 required options):
 - a. Utility Arborist Certificate (MTCU Utility Arborist Certificate 444B) plus the following training:
 - Proof of Utility Work Protection Code Overview (½ day) Training
 - b. Arborist Certificate (MTCU 444A or ISA Certified Arborist) plus the following 2 training courses:
 - Proof of Utility Work Protection Code Overview (½ day) Training
 - IHSA Utility Line Clearing Technician Proficiency (Utility Arborist) course, or equivalent (completed within the last 5 years)
 - In addition, all applicable employees must participate in the Mandatory "Hold Off" Orientation Training provided by Burlington Hydro. Training will be on-site and attended in person. The orientation is only required to be taken once.
2. Approval under this process is based on the personnel included in the authorization process. Should crew members change, or a new crew member be added, their qualifications must be submitted for approval prior to the individual being assigned to any pertinent contract work.
3. The Electrical Utility Safety Rules (EUSR) will govern the qualifications and clearances required to work in proximity to BHI's distribution system.

4. The names of all applicable employees will be kept on a Master List. These employees will be considered as authorized to request a “Hold Off” from BHI’s Control Room. Please note that the sole purpose of a “Hold Off” is for system equipment protection and is not in any way to be considered personal protection. This latter point will be a main orientation topic.

The Authorization process is required based on BHI Contract renewals or City of Burlington Contract Awards.

1. Only the contractor’s pertinent authorized individuals may request “Hold Offs” from BHI’s control room; the authorized individual must be on the affected work site to request the “Hold Off” and remain on the site while the “Hold Off” is in effect. The “Hold Off” must be surrendered at the completion of the workday and / or before leaving the site. Abuse of this requirement may be subject to the three strike procedures up to and including termination of the contract described in Section 11 – Term and Termination of a Contract.
2. Upon contract award (if applicable), the contractor will receive notice as to whether or not they will be an approved contractor for working in proximity to energized apparatus. The notification will serve as a letter of authorization to perform line clearing operations in proximity to BHI’s distribution system. The intent of this letter is only for the scope of the work as defined within the contract. This authorization will not apply to work such as private work, weekend or outside of scope work of crew members of the contractor.

Contractor Compliance Third-Party Management Program

1. Burlington Hydro has partnered with *Contractor Compliance* to assist with Third-Party Management. *Contractor Compliance* is used to monitor contractor Occupational Health & Safety (OHS) and regulatory compliance requirements on behalf of Burlington Hydro.
2. As a result, your company is required to register with *Contractor Compliance* for Burlington Hydro to submit and have your OHS information tracked. Your company's subscription must be in place before any work is scheduled.
3. There is a nominal fee for this service. If your company is a current subscriber to *Contractor Compliance*, there is no additional fee. Burlington Hydro believes that the benefits of this partnership will exceed any associated costs.
4. Once your subscription to *Contractor Compliance* is established, your company will be able to utilize the provided user guides to access the system and load the information required by Burlington Hydro.

SCHEDULE G - Insurance Requirements

WSIB

Workplace Safety and Insurance Board coverage.

INSURANCE COVERAGES

Commercial General Liability Insurance

Commercial General Liability insurance ensuring against damage or injury to persons or property with limits of not less than Five Million Dollars (\$5,000,000.00) per occurrence.

Professional Liability Insurance

On contracts for consulting or professional services, Professional Liability Insurance (Errors & Omissions) with an inclusive limit of not less than Five Million Dollars (\$5,000,000) per occurrence.

Automobile Insurance

Owned and unowned automobile insurance with an inclusive limit of not less than Two Million Dollars (\$2,000,000) per occurrence.

Contractor's Insurance

The Contractor shall also maintain adequate insurance of its own interest during the term of the contract or any extensions or renewals thereof.

Insurance Policy Requirements

The policies of insurance shall:

- (a) Name Burlington Hydro Inc. as an additional insured and the City of Burlington as an additional insured if required;
- (b) Be non-contributing and apply only as primary and not be excess to any other insurance or self-insurance available to a Party;
- (c) Contain a cross liability and separation of insureds clause;
- (d) Be written with an insurer licensed to do business in the Province of Ontario;
- (e) Require 30 days' notice to Burlington Hydro Inc. in the event the that such policies are to be cancelled, not renewed or materially altered such that they no longer comply with the requirements of this section; and
- (f) Contain a waiver of the rights of subrogation against BHI and those for whom BHI is, at law, responsible.

No Limitation of Liability

The Contractor shall agree that the insurance requirements do not in any way limit the Contractor's liability pursuant to any of the indemnity provisions in the contract.

Certificate of Insurance

The Contractor shall provide BHI with a Certificate of Insurance evidencing the required insurance coverages upon execution of the contract. The Contractor shall not commence work until such Certificate of Insurance has been provided.

SCHEDULE H - Service Agreement Contract Terms

SERVICES AGREEMENT

THIS AGREEMENT is dated as of [Insert date]

B E T W E E N :

[Insert Provider name]

(the “**Provider**”)

- and -

BURLINGTON HYDRO INC.

(“**BHI**”)

CONTEXT

1. The Provider provides a range of services that will meet the operational requirements of BHI.
2. BHI requires that the Provider provide the Services to facilitate the operation of the Business.

THEREFORE, the Parties agree as follows:

ARTICLE 1 INTERPRETATION

1.1 Definitions

In this Agreement, in addition to the terms defined elsewhere in this Agreement, the following terms have the following meanings:

- 1.1.1 “**Additional Services**” is defined in Section 4.2.
- 1.1.2 “**Affiliate**” means an affiliate as that term is defined in the *Business Corporations Act* (Ontario).
- 1.1.3 “**Agreement**” means this agreement, including all Schedules and Exhibits, as it may be confirmed, amended, modified, supplemented or restated by written agreement between the Parties.
- 1.1.4 “**Applicable Law**” means, at any time, with respect to any Person, property, transaction or event, all applicable laws, statutes, regulations, treaties, judgments and decrees and (whether or not having the force of law) all applicable official directives, rules, consents, approvals, by-laws, permits, authorizations, guidelines, orders and policies of any Governmental Authority having authority over that Person, property, transaction or event.
- 1.1.5 “**Arbitration Act**” is defined in Section 8.1.

- 1.1.6 “**Arbitrator**” is defined in Section 8.1.
- 1.1.7 “**Business**” means the business carried on by BHI.
- 1.1.8 “**Business Day**” means any day excluding a Saturday, Sunday or statutory holiday in the Province of Ontario, and also excluding any day on which the principal chartered banks located in the City of Burlington are not open for business during normal banking hours.
- 1.1.9 “**Communication**” means any notice, demand, request, consent, approval or other communication which is required or permitted by this Agreement to be given or made by a Party.
- 1.1.10 “**Confidential Information**” means any information relating to BHI or its Business,

whether communicated in written form, orally, visually, demonstratively, technically or by any other electronic form or other media, or committed to memory, and whether or not designated, marked, labelled or identified as confidential or proprietary, but excluding information, other than Personal Information, which:
- 1.1.10.1 was, is or becomes available to or known by the public, other than as a result of improper disclosure by the Provider or any of its Representatives, before the end of the Term; or
- 1.1.10.2 was or is obtained from a source other than BHI, any of its Representatives, or any Person bound by a duty of confidentiality to BHI or the Business.
- 1.1.11 “**Customer**” means any Person who is a customer or client of BHI.
- 1.1.12 “**Disputes**” is defined in Section 8.1.
- 1.1.13 “**Failing Party**” is defined in Section 3.4.
- 1.1.14 “**Force Majeure**” means: acts of God; laws, orders, rules, regulations, acts and restraints of armies, militaries, enemies, terrorists, and Governmental Authorities; war, revolutions, mobilization, political and civil unrest or insurrection, embargos, disturbances and riots; epidemics, outbreak of disease, and quarantine; inclement weather including floods, storms, tornados, hurricanes, tsunamis, earthquakes, volcanic eruptions and landslides; explosions and fire; labour issues including disputes, walkouts, strikes, slowdowns, lockouts and picketing; damage, destruction or expropriation of property; delays or defaults in or caused by, and shortages of, power, water, transportation and common carriers, facilities, labour, subcontractors, goods, materials and supplies; breakdowns in or the loss of production; the non-availability of relevant markets and the state of the marketplace; and any other event or occurrence beyond the reasonable control of the applicable Party.
- 1.1.15 “**Governmental Authority**” means:
- 1.1.15.1 any federal, provincial, state, local, municipal, regional, territorial, aboriginal, or other government, governmental or public department, branch, ministry, or court, domestic or foreign, including any district, agency, commission, board, arbitration panel or authority and any subdivision of any of them exercising or entitled to exercise any administrative, executive, judicial, ministerial, prerogative, legislative, regulatory, or taxing authority or power of any nature; and

- 1.1.15.2 any quasi-governmental or private body exercising any regulatory, expropriation or taxing authority under or for the account of any of them, and any subdivision of any of them.
- 1.1.16 **"Indemnified Party"** is defined in Section 7.2.
- 1.1.17 **"Indemnifying Party"** is defined in Section 7.2.
- 1.1.18 **"Initial Term"** is defined in Section 3.1.
- 1.1.19 **"Intellectual Property"** means all trade-marks and trade-mark applications, trade names, certification marks, patents and patent applications, copyrights, domain names, industrial designs, trade secrets, know-how, formulae, processes, inventions, technical expertise, research data and other similar property.
- 1.1.20 **"Loss"** means:
 - 1.1.20.1 any loss, liability, damage, cost, expense, charge, fine, penalty or assessment including the costs and expenses of any action, suit, proceeding, demand, assessment, judgment, settlement or compromise and all interest, fines, penalties and all professional fees and disbursements on a 100 percent, complete indemnity basis;

but excluding
 - 1.1.20.2 any indirect, special, punitive or consequential losses, or damages.
- 1.1.21 **"Parties"** means the Provider and BHI, collectively, and **"Party"** means any one of them.
- 1.1.22 **"Person"** will be broadly interpreted and includes:
 - 1.1.22.1 a natural person, whether acting in their own capacity, or in their capacity as executor, administrator, estate trustee, trustee or personal or legal representative, and the heirs, executors, administrators, estate trustees, trustees or other personal or legal representatives of a natural person;
 - 1.1.22.2 a corporation or a company of any kind, a partnership of any kind, a sole proprietorship, a trust, a joint venture, an association, an unincorporated association, an unincorporated syndicate, an unincorporated organization or any other association, organization or entity of any kind; and
 - 1.1.22.3 a Governmental Authority.
- 1.1.23 **"Personal Information"** means information relating to identifiable individuals.
- 1.1.24 **"Provider"** is defined in the recital of the Parties above.
- 1.1.25 **"Renewal Period"** is defined in Section 3.2.
- 1.1.26 **"Representatives"** means the Affiliates of a Party, and the advisors, agents, consultants, directors, officers, management, employees, subcontractors, and other representatives, including accountants, auditors, financial advisors, lenders and lawyers of a Party and of that Party's Affiliates.

- 1.1.27 **"Secondary Information"** is defined in Section 5.2.
- 1.1.28 **"Services"** is defined in Section 4.1.1.
- 1.1.29 **"Term"** means the Initial Term and each Renewal Period, if any.
- 1.1.30 **"Territory"** means Ontario.
- 1.1.31 "WSIB" means the Workplace Safety and Insurance Board of Ontario.

1.2 **Certain Rules of Interpretation**

- 1.2.1 In this Agreement, words signifying the singular number include the plural and vice versa, and words signifying gender include all genders. Every use of the words "including" or "includes" in this Agreement is to be construed as meaning "including, without limitation" or "includes, without limitation", respectively.
- 1.2.2 The division of this Agreement into Articles and Sections, the insertion of headings and the inclusion of a table of contents are for convenience of reference only and do not affect the construction or interpretation of this Agreement.
- 1.2.3 References in this Agreement to an Article, Section, or Schedule or Exhibit are to be construed as references to an Article, Section, or Schedule or Exhibit of or to this Agreement unless otherwise specified.
- 1.2.4 Unless otherwise specified in this Agreement, time periods within which or following which any calculation or payment is to be made, or action is to be taken, will be calculated by excluding the day on which the period begins and including the day on which the period ends. If the last day of a time period is not a Business Day, the time period will end on the next Business Day.
- 1.2.5 Unless otherwise specified, any reference in this Agreement to any statute includes all regulations and subordinate legislation made under or in connection with that statute at any time, and is to be construed as a reference to that statute as amended, modified, restated, supplemented, extended, re-enacted, replaced or superseded at any time.

1.3 **Governing Law**

This Agreement is governed by, and is to be construed and interpreted in accordance with, the laws of the Province of Ontario and the laws of Canada applicable in that Province.

1.4 **Entire Agreement**

This Agreement constitutes the entire agreement between the Parties pertaining to the subject matter of this Agreement and supersedes all prior agreements, understandings, negotiations and discussions, whether oral or written, of the Parties, and there are no representations, warranties or other agreements between the Parties in connection with the subject matter of this Agreement except as specifically set out in this Agreement. No Party has been induced to enter into this Agreement in reliance on, and there will be no liability assessed, either in tort or contract, with respect to, any warranty, representation, opinion, advice or assertion of fact, except to the extent it has been reduced to writing and included as a term in this Agreement.

1.5 Business Day

Whenever any calculation or payment to be made or action to be taken under this Agreement is required to be made or taken on a day other than a Business Day, the calculation or payment is to be made, or action is to be taken on the next Business Day.

ARTICLE 2 REPRESENTATIONS AND WARRANTIES

2.1 Representations and Warranties of the Provider

The Provider represents and warrants in favour of BHI as follows:

- 2.1.1 if it is a corporation, it is duly incorporated, amalgamated or continued, and existing, under the laws of the jurisdiction of its incorporation, amalgamation or continuance, and has all necessary corporate power and capacity to enter into and perform its obligations under this Agreement;
- 2.1.2 if it is a corporation, it has taken all necessary corporate action to authorize the execution and delivery by it of its obligations under this Agreement;
- 2.1.3 it has duly executed and delivered this Agreement, and this Agreement constitutes a legal, valid and binding obligation enforceable against it in accordance with its terms, subject only to bankruptcy, insolvency, liquidation, reorganization, moratorium and other similar laws generally affecting the enforcement of creditors' rights, and to the fact that equitable remedies, such as specific performance and injunction, are discretionary remedies;
- 2.1.4 no authorization, consent, permit, exemption, approval or other action by, or filing with, or notice to, any Governmental Authority is required in connection with the execution and delivery by it of this Agreement or the performance of its obligations under this Agreement;
- 2.1.5 the execution and delivery by it of this Agreement, and the performance of its obligations under this Agreement, do not and will not breach or result in a default under:
 - 2.1.5.1 any of its constating documents;
 - 2.1.5.2 any Applicable Law to which it is subject; or
 - 2.1.5.3 any contract or covenant by which it is bound;
- 2.1.6 there is no action, litigation or other proceeding in progress, pending or, to its knowledge, threatened against it which might result in a material adverse change in its financial condition or which would materially adversely affect its ability to perform its obligations under this Agreement;
- 2.1.7 it has the necessary qualifications, knowledge, abilities, skills, experience and availability to provide the Services and perform its obligations in accordance with this Agreement;

2.2 Representations and Warranties Continuously Given

All representations and warranties of the Parties will be deemed to be continuously given throughout the Term.

ARTICLE 3 TERM AND TERMINATION

3.1 Term

The term of the Provider's engagement under this Agreement (the "**Initial Term**") will begin and end on the dates set out at Schedule "A" unless terminated on any earlier date in accordance with this Agreement.

3.2 Renewals

The Initial Term may be extended at any time for additional periods (each a "**Renewal Period**") by mutual written agreement of the Parties.

3.3 Termination

3.3.1 The provisions of Services under this Agreement may be terminated by BHI as follows:

- 3.3.1.1 for any reason upon at least ninety (90) days prior written notice to the Provider;
- 3.3.1.2 immediately in the case of a material breach of this Agreement by the Provider, which breach is not remedied within thirty (30) days of written notice of such breach; or
- 3.3.1.3 upon ten (10) days written notice to the Provider in the event that :
 - 3.3.1.3.1 the Provider becomes insolvent, makes an assignment for the benefit of creditors or is the subject of any proceeding under any bankruptcy and/or insolvency law
 - 3.3.1.3.2 the Provider winds up, dissolves, liquidates or takes steps to do so or otherwise ceases to function as a going concern; or
 - 3.3.1.3.3 if a receiver or other custodian (interim or permanent) of any of the assets of the Provider is appointed by private instrument or by court order or if any execution or other similar process of any court becomes enforceable against the Provider or its assets or if distress is made against any of the Provider's assets.

3.4 Force Majeure

If the Provider (the "**Failing Party**") is unable or fails to perform any of its duties and obligations under this Agreement by reason of Force Majeure, the Failing Party will not be liable to BHI during the period of Force Majeure and to the extent of its inability or failure, but:

- 3.4.1 the Failing Party claiming Force Majeure must notify BHI in writing within 24 hours after the Force Majeure event, setting out in reasonable detail the nature of the event, giving a good faith estimate of the expected duration of the event and outlining the steps the Failing Party intends to take to mitigate the effect of the event; and
- 3.4.2 the Failing Party will make best efforts in the circumstances to surmount the event of Force Majeure, and to resume full performance as soon as it is reasonably possible to do so, provided that the Failing Party will not be required to settle any labour issues including disputes, walkouts, strikes, slowdowns, lockouts or picketing on commercially unreasonable terms.

3.5 **Effect of Termination**

Despite termination of the provision of Services under this Agreement, the Parties will complete a final reconciliation of amounts owed to the Provider under this Agreement.

ARTICLE 4 SERVICES

4.1 **Provision of Services**

- 4.1.1 The Provider agrees to provide to BHI throughout the Term the services, as described more particularly in Schedule A (the “**Services**”).
- 4.1.2 The Provider shall devote a substantial and sufficient amount of the Provider’s full business time and attention in delivering the Services so as to meet the requirements and objectives set out herein.
- 4.1.3 If there is a conflict between any of the terms and conditions in this Agreement and Schedules “A” and “B” the conflict shall be resolved in the following order of precedence:
 - a) This Services Agreement
 - b) Schedule “A”, Services and Term
 - c) Schedule “B”, Service Fees and Payment

4.2 **Additional Services**

If BHI identifies additional required services that the Provider can provide (the “**Additional Services**”), the Parties will promptly negotiate in good faith to arrange for the provision of those Additional Services by the Provider upon mutually agreeable terms and conditions.

4.3 **Performance Standards**

- 4.3.1 The Provider will perform the Services in a professional, diligent and competent manner with a degree of skill, care and expertise consistent with industry best practices, in compliance with:
 - 4.3.1.1 the terms and conditions of this Agreement;

4.3.1.2 all applicable federal, provincial and municipal laws, regulations, ordinances, permits, licenses, notices and other similar requirements (including, but not limited to, privacy laws and occupational health and safety laws); and

4.3.1.3 BHI's policies, procedures, and guidelines as disclosed to the Provider from time to time.

4.3.2 The provider shall:

4.3.2.1 comply with all specifications, drawings, samples, descriptions and requirements specified in this Agreement; and

4.3.2.2 act cooperatively and in good faith with BHI and any other contractor or service providers engaged by BHI.

(j) all work product provided by it will be free from defects in material and workmanship, and will meet the requirements for the work product (including those set out in the applicable Statement of Work)..

4.4 **Personnel**

The Provider will provide all necessary and appropriate personnel to perform the Services in accordance with the standard of care required by Section 4.3. The Provider's personnel will have appropriate education and training to perform the Services in a professional and workmanlike manner. The Services will be performed during the Provider's normal business hours. While providing the Services, the Provider's personnel will remain employees of the Provider. The Provider will be responsible for all wages, benefits, withholdings for tax purposes, and all other employer liabilities and responsibilities relating to all of its personnel. The Provider will make best efforts to provide the Services in a timely manner consistent with the Provider's operation of its business.

4.5 **Status of Parties**

The Parties acknowledge that they are separate entities, that the Provider and BHI have each entered into this Agreement for independent business reasons, and that the execution and performance of this Agreement does not create a partnership or joint venture between them.

4.6 **Fees and Expenses**

Subject to the terms and conditions of this Agreement, the Provider will be paid the service fees (the "**Service Fees**") set out at Schedule "B" in the manner set out therein.

ARTICLE 5 COVENANTS

5.1 **Confidentiality**

5.1.1 The Provider acknowledges and agrees that:

5.1.1.1 BHI is the exclusive owner of all right, title and interest in and to the Confidential Information; and

- 5.1.1.2 the Provider has no right, title, licence, or interest in or to the Confidential Information, except for the right, subject to this Agreement, to review the Confidential Information for the purpose of carrying out its obligations under this Agreement.

Accordingly, the Provider agrees to hold in strict confidence and not disclose or use, and the Provider will not allow any of its Representatives to disclose or use, any Confidential Information, for any purpose, except as provided in this Section 5.1.

- 5.1.2 BHI or any of its Representatives will disclose Confidential Information to the Provider or any of its Representatives upon the following conditions:

- 5.1.2.1 the Provider will hold, and will cause its Representatives to hold, all Confidential Information in trust for BHI and will not use, or permit any of its Representatives to use, any of the Confidential Information, at any time or in any manner, except as is required by the Provider to carry out its obligations under this Agreement;

- 5.1.2.2 the Provider will limit the disclosure of the Confidential Information to those of its Representatives who have a need to know the Confidential Information to assist the Provider in carrying out its obligations under this Agreement, who are informed by the Provider of the confidential nature of the Confidential Information and who agree in writing to act in accordance with and be bound by the terms and conditions of this Agreement; and

- 5.1.2.3 the Provider will be responsible for any breach of this Section 5.1, or any disclosure, divulgence, communication or use of any Confidential Information in a manner not authorized by this Agreement by any of its Representatives.

- 5.1.3 The Provider will take appropriate measures to protect the Confidential Information and will keep a record of the location of the Confidential Information and all of its Representatives to whom Confidential Information is provided. The Provider will store the Confidential Information properly and securely and ensure that appropriate technical and organizational means and physical or electronic storage media are in place to protect the Confidential Information against unauthorized or unlawful access or processing, and against accidental loss, destruction or damage, including taking reasonable steps to ensure the reliability of any Representative of the Provider permitted by the Provider to have access to the Confidential Information.

- 5.1.4 The Provider will, upon the written request of BHI, return promptly to BHI, or destroy, and provide written certification of the destruction of, all documents, physical or tangible manifestations and electronic and computerized forms of the Confidential Information received from BHI, including all copies, reproductions and applications of the Confidential Information, without retaining any copies or records.

- 5.1.5 If the Provider or any Representative of the Provider is required by any Applicable Law or by any Governmental Authority to disclose any Confidential Information, the Provider or that Representative will provide BHI with prompt written notice of that requirement, so that BHI may contest the disclosure of the Confidential Information and seek an appropriate protective order or other appropriate remedy.

- 5.1.6 If, in the absence of a protective order or other appropriate remedy, the Provider or any Representative of the Provider is, in the reasonable opinion of its lawyers, required by any

Applicable Law or by any Governmental Authority to disclose any Confidential Information or stands liable for contempt or to suffer other censure or penalty, then the Provider or that Representative may, without liability under this Agreement, disclose that portion of the Confidential Information, but only that portion, that the Provider or the Representative is legally required to disclose.

- 5.1.7 The Provider will notify BHI immediately upon discovery of any breach of this Section 5.1 or any unauthorized or unlawful disclosure, divulgence, communication or use of any Confidential Information.
- 5.1.8 The Provider covenants and agrees to execute, to be bound by and to comply with all terms and conditions set out in BHI's "Confidentiality Non-Disclosure and Protection of Personal Information" agreement attached as Schedule C to this Agreement.
- 5.1.9 The covenants and obligations contained in this Section 5.1 will be perpetual.

5.2 **Computer Back-up**

The Parties acknowledge that the computers and data storage and retrieval systems or network of the Provider and, if applicable, its Representatives, may automatically back up Confidential Information stored in electronic form. The Parties agree that to the extent that those back-up procedures automatically create electronic copies of Confidential Information (the "**Secondary Information**"), each of the Provider and, if applicable, its Representatives, may, despite any requirement under this Agreement to return or destroy Confidential Information, retain Secondary Information in its archival storage for the period that it would normally archive electronic data, provided that those data are periodically and systematically overwritten or otherwise destroyed. Secondary Information will be subject to the provisions of this Agreement until destroyed and may not be accessed by the Provider or any of its Representatives during its period of archival storage.

5.3 **Insurance**

- 5.3.1 The Provider shall carry at all times during the performance of the Services, including any warranty period, at a minimum and at its own cost and expense, the types and amounts of insurance coverage set out at Schedule D ("**Insurance**").
- 5.3.2 The Provider shall also maintain adequate insurance of its own interest during the term of this Agreement or any extensions or renewals thereof.
- 5.3.3 The above insurance requirements shall not be read to limit the Provider's liability and will not be deemed a waiver by BHI of its right to damages or indemnity for any default by the Provider or for any loss arising out of or in any way related to the performance or non-performance of the Provider's obligations under this Agreement.
- 5.3.4 The Provider shall provide BHI with a certificate of insurance evidencing the required insurance coverages upon execution of this Agreement and from time to time thereafter on request by BHI.
- 5.3.5 The Provider shall provide to BHI with an original Clearance Certificate from the WSIB and shall provide additional Certificates with respect to such coverage from time to time on request by BHI.

5.4 Health and Safety

The Provider is responsible for ensuring that its officers, directors, employees, contractors and agents, while on the property and/or premises of BHI or carrying out the Services hereunder, shall comply with all of BHI's rules, regulations and policies pertaining to BHI property and/or premises and for complying with all applicable health and safety regulations and requirements.

5.5 Covenants Reasonable

The Provider acknowledges and agrees that:

- 5.5.1 without the covenants included in this Article 5, BHI would not have entered into the this Agreement;
- 5.5.2 the covenants included in this Article 5 are reasonable in the circumstances and are necessary to protect the economic position of BHI;
- 5.5.3 the breach of any of the Sections of this Article 5 would cause serious and irreparable harm to BHI which could not be compensated adequately by monetary damages, and that BHI may enforce the Sections of this Article 5 by injunction or specific performance upon application to a court of competent jurisdiction without proof of actual damage, and despite that damages may be readily quantifiable, and the Provider will not plead, and will not permit any of its Representatives to plead, sufficiency of damages as a defence in the proceeding for injunctive relief; and
- 5.5.4 the remedies provided by this Section 5.3 are in addition to, and not a substitute for, any other remedies for breach to which BHI would be entitled.

5.6 Covenants Independent

The existence of any claim or cause of action of the Provider against BHI, whether under this Agreement or otherwise, will not constitute a defence to the enforcement by BHI of this Article 5 against the Provider.

5.7 Costs of Litigation

If any litigation relating to this Agreement ensues and a court of competent jurisdiction determines in a final, non-appealable order that this Agreement has been breached by the Provider or any of its Representatives, then the Provider will reimburse BHI for all of its respective costs and expenses (including legal fees and disbursements) incurred in connection with the litigation.

5.8 Books of Account and Information

Each of BHI and the Provider will maintain at its head office appropriate books of account and records with respect to all transactions entered into in the performance of this Agreement. Each of BHI and the Provider will provide to the other whatever additional reports and information relating to the Services provided under this Agreement which the other may reasonably request.

ARTICLE 6 INTELLECTUAL PROPERTY

6.1 Limited Rights

- 6.1.1 Notwithstanding any other term contained herein or in any schedule hereto, payment of the Service Fees are solely for the Services as described herein and do not and shall not: (a) constitute payment of a license or other similar fee; (b) grant Provider any right, title or interest in, or allow Provider to use, Intellectual Property of BHI without BHI's prior express written consent; or (c) otherwise permit Provider to incorporate the Intellectual Property of BHI into any work, service, product or marketing.
- 6.1.2 For greater certainty, each Party shall retain all ownership, right, title and interest to their respective Intellectual Property.

ARTICLE 7 INDEMNIFICATION

7.1 Indemnification by Provider

The Provider agrees to defend, indemnify and save harmless BHI, its agents or employees, from and against any Loss sustained or incurred by BHI, its agent or employees, which arises or results directly from:

- 7.1.1 the breach by the Provider of any representation, warranty or covenant contained in this Agreement;
- 7.1.2 the failure to deliver the Services in accordance with the terms of this Agreement;
- 7.1.3 the failure of any of the Services to meet the specifications set out in Schedule A; or
- 7.1.4 any negligent or wilful act or omission of the Provider or its Representatives.

7.2 Third Party Claims

- 7.2.1 Upon receipt of a claim by BHI (the "**Indemnified Party**") from a third party for which the Provider (the "**Indemnifying Party**") has agreed to indemnify the Indemnified Party, the Indemnified Party will notify the Indemnifying Party in writing of that claim.
- 7.2.2 Upon receipt of that notice, the Indemnifying Party will have the right to defend and/or settle any such claim at its own expense, provided that the Indemnifying Party advises the Indemnified Party of its intention to do so with 30 days of receipt of that notice.
- 7.2.3 If the Indemnifying Party fails to advise the Indemnified Party within the time specified in Section 7.2.2, the Indemnified Party will have the right but not the obligation to defend or settle that claim, employing counsel chosen exclusively by the Indemnified Party, in which case the Indemnifying Party will indemnify the Indemnified Party for all amounts which it is required to pay in settlement or satisfaction of those claims and will reimburse the Indemnified Party for all expenses (including reasonable legal fees and costs) incurred in the defence or compromise that claim.

- 7.2.4 Any settlement of any claim by the Indemnifying Party must include a full and complete release of the Indemnified Party.

7.3 Continuing Obligation

The indemnities in this Article 7 are continuing and irrevocable and the obligations of a Party under this Agreement will not be released, discharged, impaired or affected by:

- 7.3.1 any extensions of time or variations of obligations which the Party may grant or permit in respect of the observance or performance of any of the obligations of the Party;
- 7.3.2 any waiver by or neglect or failure of the Party to enforce any of the terms, covenants and conditions in respect of this Agreement; or
- 7.3.3 any amendment to this Agreement.

ARTICLE 8 DISPUTE RESOLUTION

8.1 Arbitration

In the event of any disputes, disagreements, controversies, questions or claims arising out of or relating to this Agreement, including with respect to its formation, execution, validity, application, interpretation, performance, breach, termination or enforcement, ("**Disputes**" and each a "**Dispute**"), one Party shall provide the other Party with a written notice setting out the particulars of the Dispute. The Parties will use all reasonable efforts to resolve the Dispute promptly and in good faith according to the following protocol:

- 8.1.1 if the representatives cannot resolve the dispute within ten (10) Business Days, the Dispute will be referred to the President and Chief Executive Officer of BHI and the President or Chief Executive Office of the Provider (collectively, the "**Second Level**") for resolutions;
- 8.1.2 if the Dispute is not resolved within fifteen (15) Business Days of referral to the Second Level, BHI shall have the option, in its sole and absolute discretion, to refer the Dispute to be determined by a sole arbitrator (the "**Arbitrator**") under the *Arbitration Act, 1991* (Ontario) (the "**Arbitration Act**"). In the event that BHI elects not to refer the Dispute to an Arbitrator, then the balance of Article 8 shall not apply and instead Section 9.4 shall apply to such Dispute. In the event that BHI elects to refer the Dispute to an Arbitrator, the following provisions of this Article 8 shall apply;
- 8.1.3 Section 7(2) of the Arbitration Act will not apply to the arbitration of a Dispute;
- 8.1.4 unless otherwise mutually agreed, the dispute shall be heard by one arbitrator who has not previously been employed or otherwise retained by or affiliated with any of the Parties, and does not have a direct or indirect interest in any of the Parties or the subject matter of the dispute. Such arbitrator shall either be as mutually agreed by the Parties or the Arbitrator will be appointed by a judge of the Superior Court of Justice of Ontario on the application of any Party on notice to the other Party. No person will be appointed as Arbitrator unless the person agrees in writing to be bound by the provisions of this Article 8;
- 8.1.5 the law of Ontario will apply to the substance of all Disputes;

- 8.1.6 the arbitration will take place in the City of Burlington unless otherwise agreed in writing by the Parties;
- 8.1.7 the language to be used in the arbitration will be English;
- 8.1.8 the Arbitrator, after giving the Parties an opportunity to be heard, will determine the procedures for the arbitration of the Dispute, provided that those procedures will include an opportunity for written submissions and responses to written submissions by or on behalf of all Parties, and may also include an opportunity for exchange of oral argument and any other procedures as the Arbitrator considers appropriate. However, if the Parties agree on a code of procedures or on specific matters of procedure, that agreement will be binding on the Arbitrator;
- 8.1.9 the Arbitrator will have the right to determine all questions of law and jurisdiction, including questions as to whether a Dispute is arbitrable, and will have the right to grant legal and equitable relief including permanent and interim injunctive relief, and final and interim damages awards. The Arbitrator will also have the discretion to award costs of the arbitration, including reasonable legal fees and expenses, reasonable experts' fees and expenses, reasonable witnesses' fees and expenses, and pre-award and post-award interest and costs, provided that the Arbitrator will not make an award of costs on a distributive basis;
- 8.1.10 the Parties intend, and will take all reasonable action necessary or desirable to ensure, that there be a speedy resolution to any Dispute, and the Arbitrator will conduct the arbitration of the Dispute with a view to making a determination and order as soon as possible;
- 8.1.11 the Parties desire that any arbitration should be conducted in strict confidence and that there will be no disclosure to any Person of the existence or any aspect of a Dispute except as is necessary for the resolution of the Dispute. Any proceedings before the Arbitrator will be attended only by those Persons whose presence, in the opinion of any Party or the Arbitrator, is reasonably necessary for the resolution of the Dispute. All matters relating to, all evidence presented to, all submissions made in the course of, and all documents produced in accordance with, an arbitration under this Article, as well as any arbitral award, will be kept confidential and will not be disclosed to any Person without the prior written consent of all the Parties except as required in connection with an application of a Party under section 46 or section 50 of the Arbitration Act, by Applicable Law, or by an order of an Arbitrator;
- 8.1.12 the fees of the Arbitrator will be paid equally by the Parties; and
- 8.1.13 subject to section 44 of the Arbitration Act, the Arbitrator's determination of a Dispute will be final and binding and there will be no appeal of that determination on any ground.
- 8.2 **Interim Relief**
 - 8.2.1 Prior to the appointment of the Arbitrator, the Parties may apply to the courts for interim relief. A request for interim relief by a Party to court will not be considered to be incompatible with Section 8.1 or as a waiver of that provision.
 - 8.2.2 At the request of either Party, the Arbitrator may take any interim measures that the Arbitrator considers necessary in respect of the Dispute, including measures for the preservation of assets, the conservation of goods or the sale of perishable goods. The Arbitrator may require security for the costs of those measures.

ARTICLE 9 GENERAL PROVISIONS

9.1 Time of Essence

Time is of the essence in all respects of this Agreement.

9.2 Notices

Any Communication must be in writing and either:

- 9.2.1 delivered personally or by courier;
- 9.2.2 sent by prepaid registered mail; or
- 9.2.3 transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission, charges (if any) prepaid.

Any Communication must be sent to the intended recipient at its address as follows:

to the Provider at:

●

Attention: ●
Tel No.: ●
Facsimile No.: ●
E-mail: ●

to BHI at:

Burlington Hydro Inc.
1340 Brant Street, Burlington ON L7R 3Z7

Attention: ●
Tel No.: ●
E-mail: ●

or at any other address as any Party may at any time advise the others by Communication given or made in accordance with this Section 9.2. Any Communication delivered to the Party to whom it is addressed will be deemed to have been given or made and received on the day it is delivered at that Party's address, provided that if that day is not a Business Day then the Communication will be deemed to have been given or made and received on the next Business Day. Any Communication sent by prepaid registered mail will be deemed to have been given or made and received on the fifth Business Day after which it is mailed. If a strike or lockout of postal employees is then in effect, or generally known to be impending, every Communication must be delivered personally or by courier or transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission. Any Communication transmitted by facsimile, e-mail or other functionally equivalent electronic means of transmission will be deemed to have been given or made and received on the day on which it is transmitted; but if the Communication is transmitted on a day which is not a Business Day or after 4:00pm (local time of the

recipient), the Communication will be deemed to have been given or made and received on the next Business Day.

9.3 Severability

Each Section of this Agreement is distinct and severable. If any Section of this Agreement, in whole or in part, is or becomes illegal, invalid, void, voidable or unenforceable in any jurisdiction by any court of competent jurisdiction, the illegality, invalidity or unenforceability of that Section, in whole or in part, will not affect:

- 9.3.1 the legality, validity or enforceability of the remaining Sections of this Agreement, in whole or in part; or
- 9.3.2 the legality, validity or enforceability of that Section, in whole or in part, in any other jurisdiction.

9.4 Submission to Jurisdiction

Each of the Parties irrevocably and unconditionally submits and attorns to the exclusive jurisdiction of the courts of the Province of Ontario to determine all issues, whether at law or in equity, arising from this Agreement. To the extent permitted by Applicable Law, each of the Parties:

- 9.4.1 irrevocably waives any objection, including any claim of inconvenient forum, that it may now or in the future have to the venue of any legal proceeding arising out of or relating to this Agreement in the courts of that Province, or that the subject matter of this Agreement may not be enforced in those courts;
- 9.4.2 irrevocably agrees not to seek, and waives any right to, judicial review by any court which may be called upon to enforce the judgment of the courts referred to in this Section 9.4, of the substantive merits of any suit, action or proceeding; and
- 9.4.3 to the extent a Party has or may acquire any immunity from the jurisdiction of any court or from any legal process, whether through service or notice, attachment before judgment, attachment in aid of execution, execution or otherwise, with respect to itself or its property, that Party irrevocably waives that immunity in respect of its obligations under this Agreement.

9.5 Amendment and Waiver

No amendment, discharge, modification, restatement, supplement, termination or waiver of this Agreement or any Section of this Agreement is binding unless it is in writing and executed by the Party to be bound. No waiver of, failure to exercise or delay in exercising, any Section of this Agreement constitutes a waiver of any other Section (whether or not similar) nor does any waiver constitute a continuing waiver unless otherwise expressly provided.

9.6 Further Assurances

Each Party will, at that Party's own cost and expense, execute and deliver any further agreements and documents and provide any further assurances, undertakings and information as may be reasonably required by the requesting Party to give effect to this Agreement and, without limiting the generality of this Section 9.6, will do or cause to be done all acts and things, execute and deliver or cause to be executed and delivered all agreements and documents and provide any assurances, undertakings and

information as may be required at any time by all Governmental Authorities having jurisdiction over the affairs of a Party or as may be required at any time under Applicable Law.

9.7 Assignment and Enurement

Neither this Agreement nor any right or obligation under this Agreement may be assigned by any Party without the prior written consent of the other Parties. This Agreement enures to the benefit of and is binding upon the Parties and their respective heirs, executors, administrators, estate trustees, trustees, personal or legal representatives, successors and permitted assigns.

9.8 Electronic Signatures and Delivery

This Agreement and any counterpart of it may be:

9.8.1 signed by manual, digital or other electronic signatures; and

9.8.2 delivered or transmitted by any digital, electronic or other intangible means, including by e-mail or other functionally equivalent electronic means of transmission,

and that execution, delivery and transmission will be valid and legally effective to create a valid and binding agreement between the Parties.

9.9 Counterparts

This Agreement may be signed and delivered by the Parties in counterparts, with the same effect as if each of the Parties had signed and delivered the same document, and that execution and delivery will be valid and legally effective.

9.10 Payment and Currency

Any money to be advanced, paid or tendered by one Party to another under this Agreement must be advanced, paid or tendered by bank draft, certified cheque or wire transfer of immediately available funds payable to the Person to whom the amount is due. Unless otherwise specified, the word "dollar" and the "\$" sign refer to Canadian currency, and all amounts to be advanced, paid, tendered or calculated under this Agreement are to be advanced, paid, tendered or calculated in Canadian currency.

9.11 No Contra Proferentem

This Agreement has been reviewed by each Party's professional advisors, and revised during the course of negotiations between the Parties. Each Party acknowledges that this Agreement is the product of their joint efforts, that it expresses their agreement, and that, if there is any ambiguity in any of its provisions, no rule of interpretation favouring one Party over another based on authorship will apply.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK

Each of the Parties has executed and delivered this Agreement as of the date noted at the beginning of this Agreement.

[Provider Name]

Per:

Name: ●
Title: ●

Name: ●
Title: ●

I/We have authority to bind the corporation.

BURLINGTON HYDRO INC.

Per:

Name: ●
Title: ●

Name: ●
Title: ●

I/We have authority to bind the corporation.

SCHEDULE I - Confidentiality, Non-Disclosure Agreement

INTRODUCTION

Burlington Hydro Inc. ("BHI") and _____ ("Contractor") acknowledge and agree that the Contractor's performance of the services ("Services") under the Agreement to which this Schedule is attached (the "Contract") will require the Contractor to have access to personal information collected by BHI pertaining to BHI's customers ("*Personal Customer Information*").

Personal Customer Information constitutes "*personal information*" under the *Municipal Freedom of Information and Protection of Privacy Act* ("MFIPPA") and therefore, BHI deals with such information in a manner that complies with MFIPPA and with BHI's Electricity Distribution License issued by the Ontario Energy Board.

The Contractor acknowledges and agrees that a fundamental term and condition of the Contract is that the Contractor comply with the terms and conditions set out below for the protection of *Personal Customer Information*.

DEFINITION OF PERSONAL CUSTOMER INFORMATION

Personal Customer Information means any information, regardless of its form or format (i.e., hard copy, electronic, digital, etc.), that can be used to identify, or to assist in the identification of, an individual who is a customer of BHI. *Personal Customer Information* shall remain the property of BHI at all times.

REQUIREMENTS FOR PROTECTION OF PERSONAL CUSTOMER INFORMATION

The Contractor shall:

1. In conjunction with the execution of this Appendix, provide to BHI:
 - (a) the name and contact information of the Privacy Officer appointed by the Contractor to be responsible for ensuring its compliance with the requirements herein and for providing prompt responses to BHI in regard to matters arising hereunder; and
 - (b) a copy of the Contractor's policies and procedures for protecting *Personal Customer Information* for approval by BHI's Privacy Officer. Should the Contractor's policies and procedures not be satisfactory to BHI's Privacy Officer, the Contractor shall be given sixty (60) days to file amended policies and procedures satisfactory to BHI's Privacy Officer, failing which BHI may terminate the Contract on thirty (30) days' notice without further liability to the Contractor other than payment for goods and/or Services provided by the Contractor to date of termination.
2. Promptly inform BHI of any change in the position of Privacy Officer.
3. Take all reasonable steps to ensure that all *Personal Customer Information* is kept secure and confidential.

4. Not disclose any *Personal Customer Information* to any third party unless expressly authorized by BHI.
5. Ensure that only employees that it has explicitly authorized may have access to, or use, *Personal Customer Information*; the Contractor shall monitor and control such authorizations to ensure they are kept up to date at all times and it shall maintain records of all such authorizations and all changes thereto, including any revocations of such authorizations; upon the request of BHI, the Contractor shall provide a copy of such records to BHI.
6. Not use *Personal Customer Information* for any purpose not expressly authorized by BHI.
7. (a) return to BHI all hard copies of *Personal Customer Information* and/or erase or destroy all *Personal Customer Information* in electronic or digital form that is in the Contractor's possession or control, within seven (7) days of any of the following (as may be applicable):
 - i. the date the Contractor completes the Services under the Contract;
 - ii. the date the *Personal Customer Information* is no longer required by the Contractor for its performance of the Services under the Contract;
 - iii. the date the Contract is terminated;
 - iv. the date BHI provides its written request to the Contractor for the return of hard copies of *Personal Customer Information* and/or for the erasure or destruction by the Contractor of *Personal Customer Information* in the Contractor's possession or control.
- (b) provide to BHI within the relevant seven (7) day period, written confirmation of its compliance with sub-paragraph 7(a) above.
8. Notify BHI within one business day of any request it receives for disclosure of *Personal Customer Information* from a law enforcement authority and or any other third party, and shall not make such disclosure without BHI's written authorization.
9. Notify BHI within one business day of any accidental disclosure or unauthorized access to *Personal Customer Information* in its possession or control.
10. Indemnify defend and hold harmless BHI and its directors, officers and employees, from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments relating to, arising out of, or in connection with, the breach by the Contractor of any of its obligations under this Schedule.

Signed this _____ day of _____, 20____.

BURLINGTON HYDRO INC.

Per:

Per:

(Signature)

(Signature)

(Authorized Officer) (Please Print)

(Authorized Officer) (Please Print)

SCHEDULE J - Notification Material to be distributed by the Contractor

To Whom it may concern,

Please be advised that (Contractor Name) will be performing our annual vegetation Management program in your area. This is notice that they will require access to your back yards/property to perform their duties safely and in accordance with the electricity Act BHI or designates may enter any land for the purpose of cutting down or removing trees, branches, or other obstructions, if in the opinion of BHI, it is necessary to do so to maintain the safe and reliable operation of the distribution system.

You can also refer to Burlington Hydro's conditions of service which can be accessed here.

www.burlingtonhydro.com

If you have any questions, please feel free to reach out at 905 332 1851 or

cservice@burlingtonhydro.com

Sincerely,

Burlington Hydro

Appendix – 4-Intervenor-106i)

SERVICES AGREEMENT

THIS AGREEMENT is dated as of 2025-01-01

B E T W E E N :

DAVEY TREE EXPERT CO. OF CANADA, LIMITED

(the “**Provider**”)

- and -

BURLINGTON HYDRO INC.

(“**BHI**”)

CONTEXT

1. The Provider provides a range of services that will meet the operational requirements of BHI.
2. BHI requires that the Provider provide the Services to facilitate the operation of the Business.

THEREFORE, the Parties agree as follows:

ARTICLE 1 INTERPRETATION

1.1 Definitions

In this Agreement, in addition to the terms defined elsewhere in this Agreement, the following terms have the following meanings:

- 1.1.1 “**Additional Services**” is defined in Section 4.2.
- 1.1.2 “**Affiliate**” means an affiliate as that term is defined in the *Business Corporations Act* (Ontario).
- 1.1.3 “**Agreement**” means this agreement, including all Schedules and Exhibits, as it may be confirmed, amended, modified, supplemented or restated by written agreement between the Parties.
- 1.1.4 “**Applicable Law**” means, at any time, with respect to any Person, property, transaction or event, all applicable laws, statutes, regulations, treaties, judgments and decrees and (whether or not having the force of law) all applicable official directives, rules, consents, approvals, by-laws, permits, authorizations, guidelines, orders and policies of any Governmental Authority having authority over that Person, property, transaction or event.
- 1.1.5 “**Arbitration Act**” is defined in Section 8.1.
- 1.1.6 “**Arbitrator**” is defined in Section 8.1.
- 1.1.7 “**Business**” means the business carried on by BHI.

- 1.1.8 **“Business Day”** means any day excluding a Saturday, Sunday or statutory holiday in the Province of Ontario, and also excluding any day on which the principal chartered banks located in the City of Burlington are not open for business during normal banking hours.
- 1.1.9 **“Communication”** means any notice, demand, request, consent, approval or other communication which is required or permitted by this Agreement to be given or made by a Party.
- 1.1.10 **“Confidential Information”** means any information relating to BHI or its Business,
whether communicated in written form, orally, visually, demonstratively, technically or by any other electronic form or other media, or committed to memory, and whether or not designated, marked, labelled or identified as confidential or proprietary, but excluding information, other than Personal Information, which:
- 1.1.10.1 was, is or becomes available to or known by the public, other than as a result of improper disclosure by the Provider or any of its Representatives, before the end of the Term; or
- 1.1.10.2 was or is obtained from a source other than BHI, any of its Representatives, or any Person bound by a duty of confidentiality to BHI or the Business.
- 1.1.11 **“Customer”** means any Person who is a customer or client of BHI.
- 1.1.12 **“Disputes”** is defined in Section 8.1.
- 1.1.13 **“Failing Party”** is defined in Section 3.4.
- 1.1.14 **“Force Majeure”** means: acts of God; laws, orders, rules, regulations, acts and restraints of armies, militaries, enemies, terrorists, and Governmental Authorities; war, revolutions, mobilization, political and civil unrest or insurrection, embargos, disturbances and riots; epidemics, outbreak of disease, and quarantine; inclement weather including floods, storms, tornados, hurricanes, tsunamis, earthquakes, volcanic eruptions and landslides; explosions and fire; labour issues including disputes, walkouts, strikes, slowdowns, lockouts and picketing; damage, destruction or expropriation of property; delays or defaults in or caused by, and shortages of, power, water, transportation and common carriers, facilities, labour, subcontractors, goods, materials and supplies; breakdowns in or the loss of production; the non-availability of relevant markets and the state of the marketplace; and any other event or occurrence beyond the reasonable control of the applicable Party.
- 1.1.15 **“Governmental Authority”** means:
- 1.1.15.1 any federal, provincial, state, local, municipal, regional, territorial, aboriginal, or other government, governmental or public department, branch, ministry, or court, domestic or foreign, including any district, agency, commission, board, arbitration panel or authority and any subdivision of any of them exercising or entitled to exercise any administrative, executive, judicial, ministerial, prerogative, legislative, regulatory, or taxing authority or power of any nature; and
- 1.1.15.2 any quasi-governmental or private body exercising any regulatory, expropriation or taxing authority under or for the account of any of them, and any subdivision of any of them.

- 1.1.16 **“Indemnified Party”** is defined in Section 7.2.
- 1.1.17 **“Indemnifying Party”** is defined in Section 7.2.
- 1.1.18 **“Initial Term”** is defined in Section 3.1.
- 1.1.19 **“Intellectual Property”** means all trade-marks and trade-mark applications, trade names, certification marks, patents and patent applications, copyrights, domain names, industrial designs, trade secrets, know-how, formulae, processes, inventions, technical expertise, research data and other similar property.
- 1.1.20 **“Loss”** means:
 - 1.1.20.1 any loss, liability, damage, cost, expense, charge, fine, penalty or assessment including the costs and expenses of any action, suit, proceeding, demand, assessment, judgment, settlement or compromise and all interest, fines, penalties and all professional fees and disbursements on a 100 percent, complete indemnity basis;

but excluding
 - 1.1.20.2 any indirect, special, punitive or consequential losses, or damages.
- 1.1.21 **“Parties”** means the Provider and BHI, collectively, and **“Party”** means any one of them.
- 1.1.22 **“Person”** will be broadly interpreted and includes:
 - 1.1.22.1 a natural person, whether acting in their own capacity, or in their capacity as executor, administrator, estate trustee, trustee or personal or legal representative, and the heirs, executors, administrators, estate trustees, trustees or other personal or legal representatives of a natural person;
 - 1.1.22.2 a corporation or a company of any kind, a partnership of any kind, a sole proprietorship, a trust, a joint venture, an association, an unincorporated association, an unincorporated syndicate, an unincorporated organization or any other association, organization or entity of any kind; and
 - 1.1.22.3 a Governmental Authority.
- 1.1.23 **“Personal Information”** means information relating to identifiable individuals.
- 1.1.24 **“Provider”** is defined in the recital of the Parties above.
- 1.1.25 **“Renewal Period”** is defined in Section 3.2.
- 1.1.26 **“Representatives”** means the Affiliates of a Party, and the advisors, agents, consultants, directors, officers, management, employees, subcontractors, and other representatives, including accountants, auditors, financial advisors, lenders and lawyers of a Party and of that Party's Affiliates.
- 1.1.27 **“Secondary Information”** is defined in Section 5.2.

1.1.28 **"Services"** is defined in Section 4.1.1.

1.1.29 **"Term"** means the Initial Term and each Renewal Period, if any.

1.1.30 **"Territory"** means Ontario.

1.1.31 "WSIB" means the Workplace Safety and Insurance Board of Ontario.

1.2 **Certain Rules of Interpretation**

1.2.1 In this Agreement, words signifying the singular number include the plural and vice versa, and words signifying gender include all genders. Every use of the words "including" or "includes" in this Agreement is to be construed as meaning "including, without limitation" or "includes, without limitation", respectively.

1.2.2 The division of this Agreement into Articles and Sections, the insertion of headings and the inclusion of a table of contents are for convenience of reference only and do not affect the construction or interpretation of this Agreement.

1.2.3 References in this Agreement to an Article, Section, or Schedule or Exhibit are to be construed as references to an Article, Section, or Schedule or Exhibit of or to this Agreement unless otherwise specified.

1.2.4 Unless otherwise specified in this Agreement, time periods within which or following which any calculation or payment is to be made, or action is to be taken, will be calculated by excluding the day on which the period begins and including the day on which the period ends. If the last day of a time period is not a Business Day, the time period will end on the next Business Day.

1.2.5 Unless otherwise specified, any reference in this Agreement to any statute includes all regulations and subordinate legislation made under or in connection with that statute at any time, and is to be construed as a reference to that statute as amended, modified, restated, supplemented, extended, re-enacted, replaced or superseded at any time.

1.3 **Governing Law**

This Agreement is governed by, and is to be construed and interpreted in accordance with, the laws of the Province of Ontario and the laws of Canada applicable in that Province.

1.4 **Entire Agreement**

This Agreement constitutes the entire agreement between the Parties pertaining to the subject matter of this Agreement and supersedes all prior agreements, understandings, negotiations and discussions, whether oral or written, of the Parties, and there are no representations, warranties or other agreements between the Parties in connection with the subject matter of this Agreement except as specifically set out in this Agreement. No Party has been induced to enter into this Agreement in reliance on, and there will be no liability assessed, either in tort or contract, with respect to, any warranty, representation, opinion, advice or assertion of fact, except to the extent it has been reduced to writing and included as a term in this Agreement.

1.5 Business Day

Whenever any calculation or payment to be made or action to be taken under this Agreement is required to be made or taken on a day other than a Business Day, the calculation or payment is to be made, or action is to be taken on the next Business Day.

ARTICLE 2 REPRESENTATIONS AND WARRANTIES

2.1 Representations and Warranties of the Provider

The Provider represents and warrants in favour of BHI as follows:

- 2.1.1 if it is a corporation, it is duly incorporated, amalgamated or continued, and existing, under the laws of the jurisdiction of its incorporation, amalgamation or continuance, and has all necessary corporate power and capacity to enter into and perform its obligations under this Agreement;
- 2.1.2 if it is a corporation, it has taken all necessary corporate action to authorize the execution and delivery by it of its obligations under this Agreement;
- 2.1.3 it has duly executed and delivered this Agreement, and this Agreement constitutes a legal, valid and binding obligation enforceable against it in accordance with its terms, subject only to bankruptcy, insolvency, liquidation, reorganization, moratorium and other similar laws generally affecting the enforcement of creditors' rights, and to the fact that equitable remedies, such as specific performance and injunction, are discretionary remedies;
- 2.1.4 no authorization, consent, permit, exemption, approval or other action by, or filing with, or notice to, any Governmental Authority is required in connection with the execution and delivery by it of this Agreement or the performance of its obligations under this Agreement;
- 2.1.5 the execution and delivery by it of this Agreement, and the performance of its obligations under this Agreement, do not and will not breach or result in a default under:
 - 2.1.5.1 any of its constating documents;
 - 2.1.5.2 any Applicable Law to which it is subject; or
 - 2.1.5.3 any contract or covenant by which it is bound;
- 2.1.6 there is no action, litigation or other proceeding in progress, pending or, to its knowledge, threatened against it which might result in a material adverse change in its financial condition or which would materially adversely affect its ability to perform its obligations under this Agreement;
- 2.1.7 it has the necessary qualifications, knowledge, abilities, skills, experience and availability to provide the Services and perform its obligations in accordance with this Agreement;

2.2 Representations and Warranties Continuously Given

All representations and warranties of the Parties will be deemed to be continuously given throughout the Term.

ARTICLE 3 TERM AND TERMINATION

3.1 Term

The term of the Provider's engagement under this Agreement (the "**Initial Term**") will begin and end on the dates set out at Schedule "A" unless terminated on any earlier date in accordance with this Agreement.

3.2 Renewals

The Initial Term may be extended at any time for additional periods (each a "**Renewal Period**") by mutual written agreement of the Parties.

3.3 Termination

3.3.1 The provisions of Services under this Agreement may be terminated by BHI as follows:

3.3.1.1 for any reason upon at least ninety (90) days prior written notice to the Provider;

3.3.1.2 immediately in the case of a material breach of this Agreement by the Provider, which breach is not remedied within thirty (30) days of written notice of such breach; or

3.3.1.3 upon ten (10) days written notice to the Provider in the event that :

3.3.1.3.1 the Provider becomes insolvent, makes an assignment for the benefit of creditors or is the subject of any proceeding under any bankruptcy and/or insolvency law

3.3.1.3.2 the Provider winds up, dissolves, liquidates or takes steps to do so or otherwise ceases to function as a going concern; or

3.3.1.3.3 if a receiver or other custodian (interim or permanent) of any of the assets of the Provider is appointed by private instrument or by court order or if any execution or other similar process of any court becomes enforceable against the Provider or its assets or if distress is made against any of the Provider's assets.

3.4 Force Majeure

If the Provider (the "**Failing Party**") is unable or fails to perform any of its duties and obligations under this Agreement by reason of Force Majeure, the Failing Party will not be liable to BHI during the period of Force Majeure and to the extent of its inability or failure, but:

- 3.4.1 the Failing Party claiming Force Majeure must notify BHI in writing within 24 hours after the Force Majeure event, setting out in reasonable detail the nature of the event, giving a good faith estimate of the expected duration of the event and outlining the steps the Failing Party intends to take to mitigate the effect of the event; and
- 3.4.2 the Failing Party will make best efforts in the circumstances to surmount the event of Force Majeure, and to resume full performance as soon as it is reasonably possible to do so, provided that the Failing Party will not be required to settle any labour issues including disputes, walkouts, strikes, slowdowns, lockouts or picketing on commercially unreasonable terms.

3.5 **Effect of Termination**

Despite termination of the provision of Services under this Agreement, the Parties will complete a final reconciliation of amounts owed to the Provider under this Agreement.

ARTICLE 4 SERVICES

4.1 **Provision of Services**

- 4.1.1 The Provider agrees to provide to BHI throughout the Term the services, as described more particularly in Schedule A (the “**Services**”).
- 4.1.2 The Provider shall devote a substantial and sufficient amount of the Provider’s full business time and attention in delivering the Services so as to meet the requirements and objectives set out herein.
- 4.1.3 If there is a conflict between any of the terms and conditions in this Agreement and Schedules “A” and “B” the conflict shall be resolved in the following order of precedence:
 - a) This Services Agreement
 - b) 2024 Tree Trimming Request for Proposal (RFP)
 - c) Schedule “A”, Services and Term
 - d) Schedule “B”, Service Fees and Payment

4.2 **Additional Services**

If BHI identifies additional required services that the Provider can provide (the “**Additional Services**”), the Parties will promptly negotiate in good faith to arrange for the provision of those Additional Services by the Provider upon mutually agreeable terms and conditions.

4.3 **Performance Standards**

- 4.3.1 The Provider will perform the Services in a professional, diligent and competent manner with a degree of skill, care and expertise consistent with industry best practices, in compliance with:

- 4.3.1.1 the terms and conditions of this Agreement;
- 4.3.1.2 all applicable federal, provincial and municipal laws, regulations, ordinances, permits, licenses, notices and other similar requirements (including, but not limited to, privacy laws and occupational health and safety laws); and
- 4.3.1.3 BHI's policies, procedures, and guidelines as disclosed to the Provider from time to time.

4.3.2 The provider shall:

- 4.3.2.1 comply with all specifications, drawings, samples, descriptions and requirements specified in this Agreement; and
- 4.3.2.2 act cooperatively and in good faith with BHI and any other contractor or service providers engaged by BHI.

(j) all work product provided by it will be free from defects in material and workmanship, and will meet the requirements for the work product (including those set out in the applicable Statement of Work)..

4.4 **Personnel**

The Provider will provide all necessary and appropriate personnel to perform the Services in accordance with the standard of care required by Section 4.3. The Provider's personnel will have appropriate education and training to perform the Services in a professional and workmanlike manner. The Services will be performed during the Provider's normal business hours. While providing the Services, the Provider's personnel will remain employees of the Provider. The Provider will be responsible for all wages, benefits, withholdings for tax purposes, and all other employer liabilities and responsibilities relating to all of its personnel. The Provider will make best efforts to provide the Services in a timely manner consistent with the Provider's operation of its business.

4.5 **Status of Parties**

The Parties acknowledge that they are separate entities, that the Provider and BHI have each entered into this Agreement for independent business reasons, and that the execution and performance of this Agreement does not create a partnership or joint venture between them.

4.6 **Fees and Expenses**

Subject to the terms and conditions of this Agreement, the Provider will be paid the service fees (the "**Service Fees**") set out at Schedule "B" in the manner set out therein.

ARTICLE 5 COVENANTS

5.1 **Confidentiality**

5.1.1 The Provider acknowledges and agrees that:

5.1.1.1 BHI is the exclusive owner of all right, title and interest in and to the Confidential Information; and

5.1.1.2 the Provider has no right, title, licence, or interest in or to the Confidential Information, except for the right, subject to this Agreement, to review the Confidential Information for the purpose of carrying out its obligations under this Agreement.

Accordingly, the Provider agrees to hold in strict confidence and not disclose or use, and the Provider will not allow any of its Representatives to disclose or use, any Confidential Information, for any purpose, except as provided in this Section 5.1.

5.1.2 BHI or any of its Representatives will disclose Confidential Information to the Provider or any of its Representatives upon the following conditions:

5.1.2.1 the Provider will hold, and will cause its Representatives to hold, all Confidential Information in trust for BHI and will not use, or permit any of its Representatives to use, any of the Confidential Information, at any time or in any manner, except as is required by the Provider to carry out its obligations under this Agreement;

5.1.2.2 the Provider will limit the disclosure of the Confidential Information to those of its Representatives who have a need to know the Confidential Information to assist the Provider in carrying out its obligations under this Agreement, who are informed by the Provider of the confidential nature of the Confidential Information and who agree in writing to act in accordance with and be bound by the terms and conditions of this Agreement; and

5.1.2.3 the Provider will be responsible for any breach of this Section 5.1, or any disclosure, divulgence, communication or use of any Confidential Information in a manner not authorized by this Agreement by any of its Representatives.

5.1.3 The Provider will take appropriate measures to protect the Confidential Information and will keep a record of the location of the Confidential Information and all of its Representatives to whom Confidential Information is provided. The Provider will store the Confidential Information properly and securely and ensure that appropriate technical and organizational means and physical or electronic storage media are in place to protect the Confidential Information against unauthorized or unlawful access or processing, and against accidental loss, destruction or damage, including taking reasonable steps to ensure the reliability of any Representative of the Provider permitted by the Provider to have access to the Confidential Information.

5.1.4 The Provider will, upon the written request of BHI, return promptly to BHI, or destroy, and provide written certification of the destruction of, all documents, physical or tangible manifestations and electronic and computerized forms of the Confidential Information received from BHI, including all copies, reproductions and applications of the Confidential Information, without retaining any copies or records.

5.1.5 If the Provider or any Representative of the Provider is required by any Applicable Law or by any Governmental Authority to disclose any Confidential Information, the Provider or that Representative will provide BHI with prompt written notice of that requirement, so that BHI may contest the disclosure of the Confidential Information and seek an appropriate protective order or other appropriate remedy.

- 5.1.6 If, in the absence of a protective order or other appropriate remedy, the Provider or any Representative of the Provider is, in the reasonable opinion of its lawyers, required by any Applicable Law or by any Governmental Authority to disclose any Confidential Information or stands liable for contempt or to suffer other censure or penalty, then the Provider or that Representative may, without liability under this Agreement, disclose that portion of the Confidential Information, but only that portion, that the Provider or the Representative is legally required to disclose.
- 5.1.7 The Provider will notify BHI immediately upon discovery of any breach of this Section 5.1 or any unauthorized or unlawful disclosure, divulgence, communication or use of any Confidential Information.
- 5.1.8 The Provider covenants and agrees to execute, to be bound by and to comply with all terms and conditions set out in BHI's "Confidentiality Non-Disclosure and Protection of Personal Information" agreement attached as Schedule C to this Agreement.
- 5.1.9 The covenants and obligations contained in this Section 5.1 will be perpetual.

5.2 **Computer Back-up**

The Parties acknowledge that the computers and data storage and retrieval systems or network of the Provider and, if applicable, its Representatives, may automatically back up Confidential Information stored in electronic form. The Parties agree that to the extent that those back-up procedures automatically create electronic copies of Confidential Information (the "**Secondary Information**"), each of the Provider and, if applicable, its Representatives, may, despite any requirement under this Agreement to return or destroy Confidential Information, retain Secondary Information in its archival storage for the period that it would normally archive electronic data, provided that those data are periodically and systematically overwritten or otherwise destroyed. Secondary Information will be subject to the provisions of this Agreement until destroyed and may not be accessed by the Provider or any of its Representatives during its period of archival storage.

5.3 **Insurance**

- 5.3.1 The Provider shall carry at all times during the performance of the Services, including any warranty period, at a minimum and at its own cost and expense, the types and amounts of insurance coverage set out at Schedule D ("**Insurance**").
- 5.3.2 The Provider shall also maintain adequate insurance of its own interest during the term of this Agreement or any extensions or renewals thereof.
- 5.3.3 The above insurance requirements shall not be read to limit the Provider's liability and will not be deemed a waiver by BHI of its right to damages or indemnity for any default by the Provider or for any loss arising out of or in any way related to the performance or non-performance of the Provider's obligations under this Agreement.
- 5.3.4 The Provider shall provide BHI with a certificate of insurance evidencing the required insurance coverages upon execution of this Agreement and from time to time thereafter on request by BHI.

- 5.3.5 The Provider shall provide to BHI with an original Clearance Certificate from the WSIB and shall provide additional Certificates with respect to such coverage from time to time on request by BHI.

5.4 **Health and Safety**

The Provider is responsible for ensuring that its officers, directors, employees, contractors and agents, while on the property and/or premises of BHI or carrying out the Services hereunder, shall comply with all of BHI's rules, regulations and policies pertaining to BHI property and/or premises and for complying with all applicable health and safety regulations and requirements.

5.5 **Covenants Reasonable**

The Provider acknowledges and agrees that:

- 5.5.1 without the covenants included in this Article 5, BHI would not have entered into the this Agreement;
- 5.5.2 the covenants included in this Article 5 are reasonable in the circumstances and are necessary to protect the economic position of BHI;
- 5.5.3 the breach of any of the Sections of this Article 5 would cause serious and irreparable harm to BHI which could not be compensated adequately by monetary damages, and that BHI may enforce the Sections of this Article 5 by injunction or specific performance upon application to a court of competent jurisdiction without proof of actual damage, and despite that damages may be readily quantifiable, and the Provider will not plead, and will not permit any of its Representatives to plead, sufficiency of damages as a defence in the proceeding for injunctive relief; and
- 5.5.4 the remedies provided by this Section 5.3 are in addition to, and not a substitute for, any other remedies for breach to which BHI would be entitled.

5.6 **Covenants Independent**

The existence of any claim or cause of action of the Provider against BHI, whether under this Agreement or otherwise, will not constitute a defence to the enforcement by BHI of this Article 5 against the Provider.

5.7 **Costs of Litigation**

If any litigation relating to this Agreement ensues and a court of competent jurisdiction determines in a final, non-appealable order that this Agreement has been breached by the Provider or any of its Representatives, then the Provider will reimburse BHI for all of its respective costs and expenses (including legal fees and disbursements) incurred in connection with the litigation.

5.8 **Books of Account and Information**

Each of BHI and the Provider will maintain at its head office appropriate books of account and records with respect to all transactions entered into in the performance of this Agreement. Each of BHI and the Provider will provide to the other whatever additional reports and information relating to the Services provided under this Agreement which the other may reasonably request.

5.9 Security Bond

On or before the date the work or services are to commence, the Contractor shall deliver to BHI a certified cheque or bank draft payable to Burlington Hydro Inc. for the lesser of (i) 10 percent of the contract price, or (ii) \$25,000.00 ("Security Bond"), to be held by BHI as security for fulfillment of the Contractor's obligations under the Agreement.

The Security Bond may be cashed at any time should BHI determine, in the exercise of a sole discretion, that the Contractor has not satisfactorily completed or will not satisfactorily complete its obligations under the Agreement. Should BHI determine that the Contractor has satisfactorily completed its obligations under the Agreement, BHI may return the said Security Bond or such amount as BHI determines to be fair in the circumstances, to the Contractor.

ARTICLE 6 INTELLECTUAL PROPERTY

6.1 Limited Rights

- 6.1.1 Notwithstanding any other term contained herein or in any schedule hereto, payment of the Service Fees are solely for the Services as described herein and do not and shall not: (a) constitute payment of a license or other similar fee; (b) grant Provider any right, title or interest in, or allow Provider to use, Intellectual Property of BHI without BHI's prior express written consent; or (c) otherwise permit Provider to incorporate the Intellectual Property of BHI into any work, service, product or marketing.
- 6.1.2 For greater certainty, each Party shall retain all ownership, right, title and interest to their respective Intellectual Property.

ARTICLE 7 INDEMNIFICATION

7.1 Indemnification by Provider

The Provider agrees to defend, indemnify and save harmless BHI, its agents or employees, from and against any Loss sustained or incurred by BHI, its agent or employees, which arises or results directly from:

- 7.1.1 the breach by the Provider of any representation, warranty or covenant contained in this Agreement;
- 7.1.2 the failure to deliver the Services in accordance with the terms of this Agreement;
- 7.1.3 the failure of any of the Services to meet the specifications set out in Schedule A; or
- 7.1.4 any negligent or wilful act or omission of the Provider or its Representatives.

7.2 Third Party Claims

- 7.2.1 Upon receipt of a claim by BHI (the “**Indemnified Party**”) from a third party for which the Provider (the “**Indemnifying Party**”) has agreed to indemnify the Indemnified Party, the Indemnified Party will notify the Indemnifying Party in writing of that claim.
- 7.2.2 Upon receipt of that notice, the Indemnifying Party will have the right to defend and/or settle any such claim at its own expense, provided that the Indemnifying Party advises the Indemnified Party of its intention to do so with 30 days of receipt of that notice.
- 7.2.3 If the Indemnifying Party fails to advise the Indemnified Party within the time specified in Section 7.2.2, the Indemnified Party will have the right but not the obligation to defend or settle that claim, employing counsel chosen exclusively by the Indemnified Party, in which case the Indemnifying Party will indemnify the Indemnified Party for all amounts which it is required to pay in settlement or satisfaction of those claims and will reimburse the Indemnified Party for all expenses (including reasonable legal fees and costs) incurred in the defence or compromise that claim.
- 7.2.4 Any settlement of any claim by the Indemnifying Party must include a full and complete release of the Indemnified Party.

7.3 Continuing Obligation

The indemnities in this Article 7 are continuing and irrevocable and the obligations of a Party under this Agreement will not be released, discharged, impaired or affected by:

- 7.3.1 any extensions of time or variations of obligations which the Party may grant or permit in respect of the observance or performance of any of the obligations of the Party;
- 7.3.2 any waiver by or neglect or failure of the Party to enforce any of the terms, covenants and conditions in respect of this Agreement; or
- 7.3.3 any amendment to this Agreement.

ARTICLE 8 DISPUTE RESOLUTION

8.1 Arbitration

In the event of any disputes, disagreements, controversies, questions or claims arising out of or relating to this Agreement, including with respect to its formation, execution, validity, application, interpretation, performance, breach, termination or enforcement, (“**Disputes**” and each a “**Dispute**”), one Party shall provide the other Party with a written notice setting out the particulars of the Dispute. The Parties will use all reasonable efforts to resolve the Dispute promptly and in good faith according to the following protocol:

- 8.1.1 if the representatives cannot resolve the dispute within ten (10) Business Days, the Dispute will be referred to the President and Chief Executive Officer of BHI and the President or Chief Executive Office of the Provider (collectively, the “**Second Level**”) for resolutions;

- 8.1.2 if the Dispute is not resolved within fifteen (15) Business Days of referral to the Second Level, BHI shall have the option, in its sole and absolute discretion, to refer the Dispute to be determined by a sole arbitrator (the “**Arbitrator**”) under the *Arbitration Act, 1991* (Ontario) (the “**Arbitration Act**”). In the event that BHI elects not to refer the Dispute to an Arbitrator, then the balance of Article 8 shall not apply and instead Section 9.4 shall apply to such Dispute. In the event that BHI elects to refer the Dispute to an Arbitrator, the following provisions of this Article 8 shall apply;
- 8.1.3 Section 7(2) of the Arbitration Act will not apply to the arbitration of a Dispute;
- 8.1.4 unless otherwise mutually agreed, the dispute shall be heard by one arbitrator who has not previously been employed or otherwise retained by or affiliated with any of the Parties, and does not have a direct or indirect interest in any of the Parties or the subject matter of the dispute. Such arbitrator shall either be as mutually agreed by the Parties or the Arbitrator will be appointed by a judge of the Superior Court of Justice of Ontario on the application of any Party on notice to the other Party. No person will be appointed as Arbitrator unless the person agrees in writing to be bound by the provisions of this Article 8;
- 8.1.5 the law of Ontario will apply to the substance of all Disputes;
- 8.1.6 the arbitration will take place in the City of Burlington unless otherwise agreed in writing by the Parties;
- 8.1.7 the language to be used in the arbitration will be English;
- 8.1.8 the Arbitrator, after giving the Parties an opportunity to be heard, will determine the procedures for the arbitration of the Dispute, provided that those procedures will include an opportunity for written submissions and responses to written submissions by or on behalf of all Parties, and may also include an opportunity for exchange of oral argument and any other procedures as the Arbitrator considers appropriate. However, if the Parties agree on a code of procedures or on specific matters of procedure, that agreement will be binding on the Arbitrator;
- 8.1.9 the Arbitrator will have the right to determine all questions of law and jurisdiction, including questions as to whether a Dispute is arbitrable, and will have the right to grant legal and equitable relief including permanent and interim injunctive relief, and final and interim damages awards. The Arbitrator will also have the discretion to award costs of the arbitration, including reasonable legal fees and expenses, reasonable experts’ fees and expenses, reasonable witnesses’ fees and expenses, and pre-award and post-award interest and costs, provided that the Arbitrator will not make an award of costs on a distributive basis;
- 8.1.10 the Parties intend, and will take all reasonable action necessary or desirable to ensure, that there be a speedy resolution to any Dispute, and the Arbitrator will conduct the arbitration of the Dispute with a view to making a determination and order as soon as possible;
- 8.1.11 the Parties desire that any arbitration should be conducted in strict confidence and that there will be no disclosure to any Person of the existence or any aspect of a Dispute except as is necessary for the resolution of the Dispute. Any proceedings before the Arbitrator will be attended only by those Persons whose presence, in the opinion of any Party or the Arbitrator, is reasonably necessary for the resolution of the Dispute. All matters relating to, all evidence presented to, all submissions made in the course of, and all documents produced in accordance with, an arbitration under this Article, as well as any arbitral award, will be kept

confidential and will not be disclosed to any Person without the prior written consent of all the Parties except as required in connection with an application of a Party under section 46 or section 50 of the Arbitration Act, by Applicable Law, or by an order of an Arbitrator;

8.1.12 the fees of the Arbitrator will be paid equally by the Parties; and

8.1.13 subject to section 44 of the Arbitration Act, the Arbitrator's determination of a Dispute will be final and binding and there will be no appeal of that determination on any ground.

8.2 **Interim Relief**

8.2.1 Prior to the appointment of the Arbitrator, the Parties may apply to the courts for interim relief. A request for interim relief by a Party to court will not be considered to be incompatible with Section 8.1 or as a waiver of that provision.

8.2.2 At the request of either Party, the Arbitrator may take any interim measures that the Arbitrator considers necessary in respect of the Dispute, including measures for the preservation of assets, the conservation of goods or the sale of perishable goods. The Arbitrator may require security for the costs of those measures.

ARTICLE 9 GENERAL PROVISIONS

9.1 **Time of Essence**

Time is of the essence in all respects of this Agreement.

9.2 **Notices**

Any Communication must be in writing and either:

9.2.1 delivered personally or by courier;

9.2.2 sent by prepaid registered mail; or

9.2.3 transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission, charges (if any) prepaid.

Any Communication must be sent to the intended recipient at its address as follows:

to the Provider at:

Davey Tree Expert Co. of Canada, Limited
500-611 Tradewind Drive, Ancaster ON L9G 4V5

Attention: Mike Perri
Tel No.: 905-304-7359 x 2028
E-mail: mike.perri@davey.com

to BHI at:

Burlington Hydro Inc.
1340 Brant Street, Burlington ON L7R 3Z7

Attention: Paul Heeg
Tel No.: 905-332-1851 x 2273
E-mail: pheeg@burlingtonhydro.com

or at any other address as any Party may at any time advise the others by Communication given or made in accordance with this Section 9.2. Any Communication delivered to the Party to whom it is addressed will be deemed to have been given or made and received on the day it is delivered at that Party's address, provided that if that day is not a Business Day then the Communication will be deemed to have been given or made and received on the next Business Day. Any Communication sent by prepaid registered mail will be deemed to have been given or made and received on the fifth Business Day after which it is mailed. If a strike or lockout of postal employees is then in effect, or generally known to be impending, every Communication must be delivered personally or by courier or transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission. Any Communication transmitted by facsimile, e-mail or other functionally equivalent electronic means of transmission will be deemed to have been given or made and received on the day on which it is transmitted; but if the Communication is transmitted on a day which is not a Business Day or after 4:00pm (local time of the recipient), the Communication will be deemed to have been given or made and received on the next Business Day.

9.3 Severability

Each Section of this Agreement is distinct and severable. If any Section of this Agreement, in whole or in part, is or becomes illegal, invalid, void, voidable or unenforceable in any jurisdiction by any court of competent jurisdiction, the illegality, invalidity or unenforceability of that Section, in whole or in part, will not affect:

- 9.3.1 the legality, validity or enforceability of the remaining Sections of this Agreement, in whole or in part; or
- 9.3.2 the legality, validity or enforceability of that Section, in whole or in part, in any other jurisdiction.

9.4 Submission to Jurisdiction

Each of the Parties irrevocably and unconditionally submits and attorns to the exclusive jurisdiction of the courts of the Province of Ontario to determine all issues, whether at law or in equity, arising from this Agreement. To the extent permitted by Applicable Law, each of the Parties:

- 9.4.1 irrevocably waives any objection, including any claim of inconvenient forum, that it may now or in the future have to the venue of any legal proceeding arising out of or relating to this Agreement in the courts of that Province, or that the subject matter of this Agreement may not be enforced in those courts;
- 9.4.2 irrevocably agrees not to seek, and waives any right to, judicial review by any court which may be called upon to enforce the judgment of the courts referred to in this Section 9.4, of the substantive merits of any suit, action or proceeding; and

- 9.4.3 to the extent a Party has or may acquire any immunity from the jurisdiction of any court or from any legal process, whether through service or notice, attachment before judgment, attachment in aid of execution, execution or otherwise, with respect to itself or its property, that Party irrevocably waives that immunity in respect of its obligations under this Agreement.

9.5 **Amendment and Waiver**

No amendment, discharge, modification, restatement, supplement, termination or waiver of this Agreement or any Section of this Agreement is binding unless it is in writing and executed by the Party to be bound. No waiver of, failure to exercise or delay in exercising, any Section of this Agreement constitutes a waiver of any other Section (whether or not similar) nor does any waiver constitute a continuing waiver unless otherwise expressly provided.

9.6 **Further Assurances**

Each Party will, at that Party's own cost and expense, execute and deliver any further agreements and documents and provide any further assurances, undertakings and information as may be reasonably required by the requesting Party to give effect to this Agreement and, without limiting the generality of this Section 9.6, will do or cause to be done all acts and things, execute and deliver or cause to be executed and delivered all agreements and documents and provide any assurances, undertakings and information as may be required at any time by all Governmental Authorities having jurisdiction over the affairs of a Party or as may be required at any time under Applicable Law.

9.7 **Assignment and Enurement**

Neither this Agreement nor any right or obligation under this Agreement may be assigned by any Party without the prior written consent of the other Parties. This Agreement enures to the benefit of and is binding upon the Parties and their respective heirs, executors, administrators, estate trustees, trustees, personal or legal representatives, successors and permitted assigns.

9.8 **Electronic Signatures and Delivery**

This Agreement and any counterpart of it may be:

- 9.8.1 signed by manual, digital or other electronic signatures; and
- 9.8.2 delivered or transmitted by any digital, electronic or other intangible means, including by e-mail or other functionally equivalent electronic means of transmission,

and that execution, delivery and transmission will be valid and legally effective to create a valid and binding agreement between the Parties.

9.9 **Counterparts**

This Agreement may be signed and delivered by the Parties in counterparts, with the same effect as if each of the Parties had signed and delivered the same document, and that execution and delivery will be valid and legally effective.

9.10 Payment and Currency

Any money to be advanced, paid or tendered by one Party to another under this Agreement must be advanced, paid or tendered by bank draft, certified cheque or wire transfer of immediately available funds payable to the Person to whom the amount is due. Unless otherwise specified, the word "dollar" and the "\$" sign refer to Canadian currency, and all amounts to be advanced, paid, tendered or calculated under this Agreement are to be advanced, paid, tendered or calculated in Canadian currency.


9.11 No Contra Proferentem

This Agreement has been reviewed by each Party's professional advisors, and revised during the course of negotiations between the Parties. Each Party acknowledges that this Agreement is the product of their joint efforts, that it expresses their agreement, and that, if there is any ambiguity in any of its provisions, no rule of interpretation favouring one Party over another based on authorship will apply.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK

Each of the Parties has executed and delivered this Agreement as of the date noted at the beginning of this Agreement.

**DAVEY TREE EXPERT CO. OF
CANADA, LIMITED**

Signed by:

0778E38B21604AC...


Per: _____

Name: Mike Perri

Title: Regional Vice President, Eastern Utility

I have authority to bind the corporation.

BURLINGTON HYDRO INC.

Signed by:

6A7E2FF83667454...

Per: _____

Name: Paul Heeg

Title: Vice-President, Engineering Services and
Network Operations

I have authority to bind the corporation.

SCHEDULE A SERVICES AND TERM

- (1) **Services.** Any customer-facing services or solutions must meet AODA (Accessibility for Ontarians with Disability Act) requirements and be AODA compliant. During the Term, the Provider will provide the following services:

BHI requires trees to be trimmed clear of all primary and secondary circuits in a manner described in 2024 Tree Trimming Request for Proposal (RFP) Schedule "A".

Davey Tree Expert Co. of Canada, Limited is the provider for Zones 1 and 2 as shown in the Tree Trimming Zones_Detailed_OH only_ALL_240904.pdf

Zone 2 will be completed in year 2026 and 2027 with delineating of work to ensure the volume of work split is congruent with the price in schedule E- Pricing/Technical Requirements from Davey Tree Expert Co. of Canada, Limited RFP submission file: Davey Tree Submission - Tree Trimming RFP.pdf

- (2) **Term.** Subject to the terms and conditions of this Agreement, the Term will commence on the date of this Agreement and continue until the date that is thirty six (36) months following the date of this Agreement.

SCHEDULE B

SERVICE FEES AND PAYMENT

Service Fees

As provided in schedule E- Pricing/Technical Requirements from Davey Tree Expert Co. of Canada, Limited RFP submission file: Davey Tree Submission - Tree Trimming RFP.pdf

2025 – 1 Zone		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 1		26%

2026-2027 – 1 Zone		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 2		15%

Time and Material

In addition to work completed by zone under this contract, there may at times be a need for additional planned time and material work as required, including specific customer requests. There is also additional “emergency work” that is considered unscheduled overtime, for which crews must be available 24 hours a day, 7 days a week, 365 (366) days a year. Crews must be equipped to work at night and additional crews may be required.

2025 Tree Contractor Hourly Rates for Time and Material Work ¹			
Description	Normal Working Hours ²	Scheduled Overtime Rates (outside normal working hours)	Emergency Response Rates (unscheduled) ³
Applicable Hours	7:00AM-4:30 PM		
Applicable Days of Week	Monday-Friday	Monday-Friday	Sunday-Saturday
2-person crew and bucket truck (rate per hour)	██████	██████	██████
Additional person including bucket truck (rate per hour)	██████	██████	██████
Additional person including pick-up truck (rate per hour)	██████	██████	██████
Minimum Call Out Charge	██	█	█
Wood Chipper	██████	██████	██████

- 1. Rates may be escalated by a maximum of 2% annually for 2026 and 2027.
- 2. These rates also apply for emergencies in normal working hours.
- 3. These rates should reflect contractor’s emergency response times identified below.

Reconciliation and Invoicing

On the 15th day of each month the Provider will prepare and deliver to BHI an invoice for amounts payable to it in respect of the Services provided in the preceding month.

Within 30 days after the end of the Term, the Provider will prepare and deliver to BHI a final invoice for Services rendered during the Term.

Payment

Payment of amounts owed by BHI to the Provider will be made by the 30th day from the date of receipt of the invoice by BHI. Payments will be made to an account specified by the Provider in writing. If there is a dispute as to the amount payable to the Provider for Services rendered, BHI will, within 15 days of

receipt of the Provider's invoice, notify the Provider in writing that it disputes the Provider's invoice. BHI will be deemed to have finally accepted the Provider's invoice unless it delivers its dispute notice to the Provider within the applicable time period. Despite the submission of a dispute notice by BHI, BHI will pay to the Provider, in accordance with the terms of this Agreement, all amounts that are not in dispute. BHI and the Provider will negotiate in good faith to resolve any invoice dispute. If within 15 days of receipt of BHI's dispute notice BHI and the Provider are unable to resolve the invoice dispute, the invoice dispute will be submitted to arbitration in accordance with Article 8

SCHEDULE C

CONFIDENTIALITY, NON-DISCLOSURE AND PROTECTION OF PERSONAL INFORMATION OF BURLINGTON HYDRO INC. CUSTOMERS

Introduction

Burlington Hydro Inc. ("BHI") and Davey Tree Expert Co. of Canada, Limited ("Contractor") acknowledge and agree that the Contractor's performance of the services ("Services") under the Contract to which this Appendix is attached (the "Contract") will require the Contractor to have access to personal information collected by BHI pertaining to BHI's customers ("*Personal Customer Information*").

Personal Customer Information constitutes "*personal information*" under the *Municipal Freedom of Information and Protection of Privacy Act* ("MFIPPA") and therefore, BHI deals with such information in a manner that complies with MFIPPA and with BHI's Electricity Distribution License issued by the Ontario Energy Board.

The Contractor acknowledges and agrees that a fundamental term and condition of the Contract is that the Contractor comply with the terms and conditions set out below for the protection of *Personal Customer Information*.

Definition of *Personal Customer Information*

Personal Customer Information means any information, regardless of its form or format (i.e., hard copy, electronic, digital, etc.), that can be used to identify, or to assist in the identification of, an individual who is a customer of BHI. *Personal Customer Information* shall remain the property of BHI at all times.

Requirements for Protection of *Personal Customer Information*

The Contractor shall:

1. in conjunction with the execution of this Appendix, provide to BHI:
 - (a) the name and contact information of the Privacy Officer appointed by the Contractor to be responsible for ensuring its compliance with the requirements herein and for providing prompt responses to BHI in regard to matters arising hereunder;
 - (b) a copy of the Contractor's policies and procedures for protecting *Personal Customer Information* for approval by BHI's Privacy Officer. Should the Contractor's policies and procedures not be satisfactory to BHI's Privacy Officer, the Contractor shall be given sixty (60) days to file amended policies and procedures satisfactory to BHI's Privacy Officer, failing which BHI may terminate the Contract on thirty (30) days' notice without further liability to the Contractor other than payment for goods and/or services provided by the Contractor to date of termination;
2. promptly inform BHI of any change in the position of Privacy Officer;

3. take all reasonable steps to ensure that all *Personal Customer Information* is kept secure and confidential;
4. not disclose any *Personal Customer Information* to any third party unless expressly authorized by BHI;
5. ensure that only employees that it has explicitly authorized may have access to, or use, *Personal Customer Information*; the Contractor shall monitor and control such authorizations to ensure they are kept up-to-date at all times and it shall maintain records of all such authorizations and all changes thereto, including any revocations of such authorizations; upon the request of BHI, the Contractor shall provide a copy of such records to BHI;
6. not use *Personal Customer Information* for any purpose not expressly authorized by BHI;
7. (a) return to BHI all hard copies of *Personal Customer Information* and/or erase or destroy all *Personal Customer Information* in electronic or digital form that is in the Contractor's possession or control, within seven (7) days of any of the following (as may be applicable):
 - i. the date the Contractor completes the Services under the Contract;
 - ii. the date the *Personal Customer Information* is no longer required by the Contractor for its performance of the Services under the Contract;
 - iii. the date the Contract is terminated;
 - iv. the date BHI provides its written request to the Contractor for the return of hard copies of *Personal Customer Information* and/or for the erasure or destruction by the Contractor of *Personal Customer Information* in the Contractor's possession or control;
- (b) provide to BHI within the relevant seven (7) day period, written confirmation of its compliance with sub-paragraph 7 (a) above.
8. Notify BHI within one business day of any request it receives for disclosure of *Personal Customer Information* from a law enforcement authority and or any other third party, and shall not make such disclosure without BHI's written authorization;
9. Notify BHI within one business day of any accidental disclosure or unauthorized access to *Personal Customer Information* in its possession or control;
10. indemnify defend and hold harmless BHI and its directors, officers and employees, from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments relating to, arising out of, or in connection with, the breach by the Contractor of any of its obligations under this Appendix;

12/16/2024 12/17/2024

Signed this _____ day of _____, 202____.

Burlington Hydro Inc.

Davey Tree Expert Co. of Canada, Limited

per _____
Signature

Signed by:



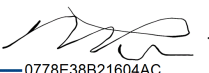
6A7E2FF83667454...

Print name and Title:

Paul Heeg,
Vice-President, Engineering Services and
Network Operations

per _____
Signature

Signed by:



0778E38B21604AC...

Print name and Title:

Mike Perri,
Regional Vice President, Eastern Utility

SCHEDULE D

INSURANCE

WSIB

Workplace Safety and Insurance Board coverage.

INSURANCE COVERAGES

Commercial General Liability Insurance

Commercial General Liability insurance ensuring against damage or injury to persons or property with limits of not less than Five Million Dollars (\$5,000,000.00) per occurrence.

Professional Liability Insurance

On contracts for consulting or professional services, Professional Liability Insurance (Errors & Omissions) with an inclusive limit of not less than Five Million Dollars (\$5,000,000) per occurrence.

Automobile Insurance

Owned and unowned automobile insurance with an inclusive limit of not less than Two Million Dollars (\$2,000,000) per occurrence.

Contractor's Insurance

The Contractor shall also maintain adequate insurance of its own interest during the term of the contract or any extensions or renewals thereof.

Insurance Policy Requirements

The policies of insurance shall:

- (a) Name Burlington Hydro Inc. as an additional insured;
- (b) Be non-contributing and apply only as primary and not be excess to any other insurance or self-insurance available to a Party;
- (c) Contain a cross liability and separation of insureds clause;
- (d) Be written with an insurer licensed to do business in the Province of Ontario;
- (e) Require 30 days' notice to Burlington Hydro Inc. in the event the that such policies are to be cancelled, not renewed or materially altered such that they no longer comply with the requirements of this section; and
- (f) Contain a waiver of the rights of subrogation against BHI and those for whom BHI is, at law, responsible.

No Limitation of Liability

The Contractor shall agree that the insurance requirements do not in any way limit the Contractor's liability pursuant to any of the indemnity provisions in the contract.

Certificate of Insurance

The Contractor shall provide BHI with a Certificate of Insurance evidencing the required insurance coverages upon execution of the contract. The Contractor shall not commence work until such Certificate of Insurance has been provided.

SERVICES AGREEMENT

THIS AGREEMENT is dated as of 2025-01-01

B E T W E E N :

BESWICK TREE SERVICES

(the “**Provider**”)

- and -

BURLINGTON HYDRO INC.

(“**BHI**”)

CONTEXT

1. The Provider provides a range of services that will meet the operational requirements of BHI.
2. BHI requires that the Provider provide the Services to facilitate the operation of the Business.

THEREFORE, the Parties agree as follows:

ARTICLE 1 INTERPRETATION

1.1 Definitions

In this Agreement, in addition to the terms defined elsewhere in this Agreement, the following terms have the following meanings:

- 1.1.1 “**Additional Services**” is defined in Section 4.2.
- 1.1.2 “**Affiliate**” means an affiliate as that term is defined in the *Business Corporations Act* (Ontario).
- 1.1.3 “**Agreement**” means this agreement, including all Schedules and Exhibits, as it may be confirmed, amended, modified, supplemented or restated by written agreement between the Parties.
- 1.1.4 “**Applicable Law**” means, at any time, with respect to any Person, property, transaction or event, all applicable laws, statutes, regulations, treaties, judgments and decrees and (whether or not having the force of law) all applicable official directives, rules, consents, approvals, by-laws, permits, authorizations, guidelines, orders and policies of any Governmental Authority having authority over that Person, property, transaction or event.
- 1.1.5 “**Arbitration Act**” is defined in Section 8.1.
- 1.1.6 “**Arbitrator**” is defined in Section 8.1.
- 1.1.7 “**Business**” means the business carried on by BHI.

- 1.1.8 **“Business Day”** means any day excluding a Saturday, Sunday or statutory holiday in the Province of Ontario, and also excluding any day on which the principal chartered banks located in the City of Burlington are not open for business during normal banking hours.
- 1.1.9 **“Communication”** means any notice, demand, request, consent, approval or other communication which is required or permitted by this Agreement to be given or made by a Party.
- 1.1.10 **“Confidential Information”** means any information relating to BHI or its Business,
whether communicated in written form, orally, visually, demonstratively, technically or by any other electronic form or other media, or committed to memory, and whether or not designated, marked, labelled or identified as confidential or proprietary, but excluding information, other than Personal Information, which:
- 1.1.10.1 was, is or becomes available to or known by the public, other than as a result of improper disclosure by the Provider or any of its Representatives, before the end of the Term; or
- 1.1.10.2 was or is obtained from a source other than BHI, any of its Representatives, or any Person bound by a duty of confidentiality to BHI or the Business.
- 1.1.11 **“Customer”** means any Person who is a customer or client of BHI.
- 1.1.12 **“Disputes”** is defined in Section 8.1.
- 1.1.13 **“Failing Party”** is defined in Section 3.4.
- 1.1.14 **“Force Majeure”** means: acts of God; laws, orders, rules, regulations, acts and restraints of armies, militaries, enemies, terrorists, and Governmental Authorities; war, revolutions, mobilization, political and civil unrest or insurrection, embargos, disturbances and riots; epidemics, outbreak of disease, and quarantine; inclement weather including floods, storms, tornados, hurricanes, tsunamis, earthquakes, volcanic eruptions and landslides; explosions and fire; labour issues including disputes, walkouts, strikes, slowdowns, lockouts and picketing; damage, destruction or expropriation of property; delays or defaults in or caused by, and shortages of, power, water, transportation and common carriers, facilities, labour, subcontractors, goods, materials and supplies; breakdowns in or the loss of production; the non-availability of relevant markets and the state of the marketplace; and any other event or occurrence beyond the reasonable control of the applicable Party.
- 1.1.15 **“Governmental Authority”** means:
- 1.1.15.1 any federal, provincial, state, local, municipal, regional, territorial, aboriginal, or other government, governmental or public department, branch, ministry, or court, domestic or foreign, including any district, agency, commission, board, arbitration panel or authority and any subdivision of any of them exercising or entitled to exercise any administrative, executive, judicial, ministerial, prerogative, legislative, regulatory, or taxing authority or power of any nature; and
- 1.1.15.2 any quasi-governmental or private body exercising any regulatory, expropriation or taxing authority under or for the account of any of them, and any subdivision of any of them.

- 1.1.16 “**Indemnified Party**” is defined in Section 7.2.
- 1.1.17 “**Indemnifying Party**” is defined in Section 7.2.
- 1.1.18 “**Initial Term**” is defined in Section 3.1.
- 1.1.19 “**Intellectual Property**” means all trade-marks and trade-mark applications, trade names, certification marks, patents and patent applications, copyrights, domain names, industrial designs, trade secrets, know-how, formulae, processes, inventions, technical expertise, research data and other similar property.
- 1.1.20 “**Loss**” means:
 - 1.1.20.1 any loss, liability, damage, cost, expense, charge, fine, penalty or assessment including the costs and expenses of any action, suit, proceeding, demand, assessment, judgment, settlement or compromise and all interest, fines, penalties and all professional fees and disbursements on a 100 percent, complete indemnity basis;

but excluding
 - 1.1.20.2 any indirect, special, punitive or consequential losses, or damages.
- 1.1.21 “**Parties**” means the Provider and BHI, collectively, and “**Party**” means any one of them.
- 1.1.22 “**Person**” will be broadly interpreted and includes:
 - 1.1.22.1 a natural person, whether acting in their own capacity, or in their capacity as executor, administrator, estate trustee, trustee or personal or legal representative, and the heirs, executors, administrators, estate trustees, trustees or other personal or legal representatives of a natural person;
 - 1.1.22.2 a corporation or a company of any kind, a partnership of any kind, a sole proprietorship, a trust, a joint venture, an association, an unincorporated association, an unincorporated syndicate, an unincorporated organization or any other association, organization or entity of any kind; and
 - 1.1.22.3 a Governmental Authority.
- 1.1.23 “**Personal Information**” means information relating to identifiable individuals.
- 1.1.24 “**Provider**” is defined in the recital of the Parties above.
- 1.1.25 “**Renewal Period**” is defined in Section 3.2.
- 1.1.26 “**Representatives**” means the Affiliates of a Party, and the advisors, agents, consultants, directors, officers, management, employees, subcontractors, and other representatives, including accountants, auditors, financial advisors, lenders and lawyers of a Party and of that Party’s Affiliates.
- 1.1.27 “**Secondary Information**” is defined in Section 5.2.

1.1.28 **"Services"** is defined in Section 4.1.1.

1.1.29 **"Term"** means the Initial Term and each Renewal Period, if any.

1.1.30 **"Territory"** means Ontario.

1.1.31 "WSIB" means the Workplace Safety and Insurance Board of Ontario.

1.2 **Certain Rules of Interpretation**

1.2.1 In this Agreement, words signifying the singular number include the plural and vice versa, and words signifying gender include all genders. Every use of the words "including" or "includes" in this Agreement is to be construed as meaning "including, without limitation" or "includes, without limitation", respectively.

1.2.2 The division of this Agreement into Articles and Sections, the insertion of headings and the inclusion of a table of contents are for convenience of reference only and do not affect the construction or interpretation of this Agreement.

1.2.3 References in this Agreement to an Article, Section, or Schedule or Exhibit are to be construed as references to an Article, Section, or Schedule or Exhibit of or to this Agreement unless otherwise specified.

1.2.4 Unless otherwise specified in this Agreement, time periods within which or following which any calculation or payment is to be made, or action is to be taken, will be calculated by excluding the day on which the period begins and including the day on which the period ends. If the last day of a time period is not a Business Day, the time period will end on the next Business Day.

1.2.5 Unless otherwise specified, any reference in this Agreement to any statute includes all regulations and subordinate legislation made under or in connection with that statute at any time, and is to be construed as a reference to that statute as amended, modified, restated, supplemented, extended, re-enacted, replaced or superseded at any time.

1.3 **Governing Law**

This Agreement is governed by, and is to be construed and interpreted in accordance with, the laws of the Province of Ontario and the laws of Canada applicable in that Province.

1.4 **Entire Agreement**

This Agreement constitutes the entire agreement between the Parties pertaining to the subject matter of this Agreement and supersedes all prior agreements, understandings, negotiations and discussions, whether oral or written, of the Parties, and there are no representations, warranties or other agreements between the Parties in connection with the subject matter of this Agreement except as specifically set out in this Agreement. No Party has been induced to enter into this Agreement in reliance on, and there will be no liability assessed, either in tort or contract, with respect to, any warranty, representation, opinion, advice or assertion of fact, except to the extent it has been reduced to writing and included as a term in this Agreement.

1.5 **Business Day**

Whenever any calculation or payment to be made or action to be taken under this Agreement is required to be made or taken on a day other than a Business Day, the calculation or payment is to be made, or action is to be taken on the next Business Day.

ARTICLE 2 REPRESENTATIONS AND WARRANTIES

2.1 **Representations and Warranties of the Provider**

The Provider represents and warrants in favour of BHI as follows:

- 2.1.1 if it is a corporation, it is duly incorporated, amalgamated or continued, and existing, under the laws of the jurisdiction of its incorporation, amalgamation or continuance, and has all necessary corporate power and capacity to enter into and perform its obligations under this Agreement;
- 2.1.2 if it is a corporation, it has taken all necessary corporate action to authorize the execution and delivery by it of its obligations under this Agreement;
- 2.1.3 it has duly executed and delivered this Agreement, and this Agreement constitutes a legal, valid and binding obligation enforceable against it in accordance with its terms, subject only to bankruptcy, insolvency, liquidation, reorganization, moratorium and other similar laws generally affecting the enforcement of creditors' rights, and to the fact that equitable remedies, such as specific performance and injunction, are discretionary remedies;
- 2.1.4 no authorization, consent, permit, exemption, approval or other action by, or filing with, or notice to, any Governmental Authority is required in connection with the execution and delivery by it of this Agreement or the performance of its obligations under this Agreement;
- 2.1.5 the execution and delivery by it of this Agreement, and the performance of its obligations under this Agreement, do not and will not breach or result in a default under:
 - 2.1.5.1 any of its constating documents;
 - 2.1.5.2 any Applicable Law to which it is subject; or
 - 2.1.5.3 any contract or covenant by which it is bound;
- 2.1.6 there is no action, litigation or other proceeding in progress, pending or, to its knowledge, threatened against it which might result in a material adverse change in its financial condition or which would materially adversely affect its ability to perform its obligations under this Agreement;
- 2.1.7 it has the necessary qualifications, knowledge, abilities, skills, experience and availability to provide the Services and perform its obligations in accordance with this Agreement;

2.2 Representations and Warranties Continuously Given

All representations and warranties of the Parties will be deemed to be continuously given throughout the Term.

ARTICLE 3 TERM AND TERMINATION

3.1 Term

The term of the Provider's engagement under this Agreement (the "**Initial Term**") will begin and end on the dates set out at Schedule "A" unless terminated on any earlier date in accordance with this Agreement.

3.2 Renewals

The Initial Term may be extended at any time for additional periods (each a "**Renewal Period**") by mutual written agreement of the Parties.

3.3 Termination

3.3.1 The provisions of Services under this Agreement may be terminated by BHI as follows:

3.3.1.1 for any reason upon at least ninety (90) days prior written notice to the Provider;

3.3.1.2 immediately in the case of a material breach of this Agreement by the Provider, which breach is not remedied within thirty (30) days of written notice of such breach; or

3.3.1.3 upon ten (10) days written notice to the Provider in the event that :

3.3.1.3.1 the Provider becomes insolvent, makes an assignment for the benefit of creditors or is the subject of any proceeding under any bankruptcy and/or insolvency law

3.3.1.3.2 the Provider winds up, dissolves, liquidates or takes steps to do so or otherwise ceases to function as a going concern; or

3.3.1.3.3 if a receiver or other custodian (interim or permanent) of any of the assets of the Provider is appointed by private instrument or by court order or if any execution or other similar process of any court becomes enforceable against the Provider or its assets or if distress is made against any of the Provider's assets.

3.4 Force Majeure

If the Provider (the "**Failing Party**") is unable or fails to perform any of its duties and obligations under this Agreement by reason of Force Majeure, the Failing Party will not be liable to BHI during the period of Force Majeure and to the extent of its inability or failure, but:

- 3.4.1 the Failing Party claiming Force Majeure must notify BHI in writing within 24 hours after the Force Majeure event, setting out in reasonable detail the nature of the event, giving a good faith estimate of the expected duration of the event and outlining the steps the Failing Party intends to take to mitigate the effect of the event; and
- 3.4.2 the Failing Party will make best efforts in the circumstances to surmount the event of Force Majeure, and to resume full performance as soon as it is reasonably possible to do so, provided that the Failing Party will not be required to settle any labour issues including disputes, walkouts, strikes, slowdowns, lockouts or picketing on commercially unreasonable terms.

3.5 **Effect of Termination**

Despite termination of the provision of Services under this Agreement, the Parties will complete a final reconciliation of amounts owed to the Provider under this Agreement.

ARTICLE 4 SERVICES

4.1 **Provision of Services**

- 4.1.1 The Provider agrees to provide to BHI throughout the Term the services, as described more particularly in Schedule A (the “**Services**”).
- 4.1.2 The Provider shall devote a substantial and sufficient amount of the Provider’s full business time and attention in delivering the Services so as to meet the requirements and objectives set out herein.
- 4.1.3 If there is a conflict between any of the terms and conditions in this Agreement and Schedules “A” and “B” the conflict shall be resolved in the following order of precedence:
 - a) This Services Agreement
 - b) 2024 Tree Trimming Request for Proposal (RFP)
 - c) Schedule “A”, Services and Term
 - d) Schedule “B”, Service Fees and Payment

4.2 **Additional Services**

If BHI identifies additional required services that the Provider can provide (the “**Additional Services**”), the Parties will promptly negotiate in good faith to arrange for the provision of those Additional Services by the Provider upon mutually agreeable terms and conditions.

4.3 **Performance Standards**

- 4.3.1 The Provider will perform the Services in a professional, diligent and competent manner with a degree of skill, care and expertise consistent with industry best practices, in compliance with:

- 4.3.1.1 the terms and conditions of this Agreement;
- 4.3.1.2 all applicable federal, provincial and municipal laws, regulations, ordinances, permits, licenses, notices and other similar requirements (including, but not limited to, privacy laws and occupational health and safety laws); and
- 4.3.1.3 BHI's policies, procedures, and guidelines as disclosed to the Provider from time to time.

4.3.2 The provider shall:

- 4.3.2.1 comply with all specifications, drawings, samples, descriptions and requirements specified in this Agreement; and
- 4.3.2.2 act cooperatively and in good faith with BHI and any other contractor or service providers engaged by BHI.

(j) all work product provided by it will be free from defects in material and workmanship, and will meet the requirements for the work product (including those set out in the applicable Statement of Work)..

4.4 **Personnel**

The Provider will provide all necessary and appropriate personnel to perform the Services in accordance with the standard of care required by Section 4.3. The Provider's personnel will have appropriate education and training to perform the Services in a professional and workmanlike manner. The Services will be performed during the Provider's normal business hours. While providing the Services, the Provider's personnel will remain employees of the Provider. The Provider will be responsible for all wages, benefits, withholdings for tax purposes, and all other employer liabilities and responsibilities relating to all of its personnel. The Provider will make best efforts to provide the Services in a timely manner consistent with the Provider's operation of its business.

4.5 **Status of Parties**

The Parties acknowledge that they are separate entities, that the Provider and BHI have each entered into this Agreement for independent business reasons, and that the execution and performance of this Agreement does not create a partnership or joint venture between them.

4.6 **Fees and Expenses**

Subject to the terms and conditions of this Agreement, the Provider will be paid the service fees (the "**Service Fees**") set out at Schedule "B" in the manner set out therein.

ARTICLE 5 COVENANTS

5.1 **Confidentiality**

5.1.1 The Provider acknowledges and agrees that:

- 5.1.1.1 BHI is the exclusive owner of all right, title and interest in and to the Confidential Information; and
- 5.1.1.2 the Provider has no right, title, licence, or interest in or to the Confidential Information, except for the right, subject to this Agreement, to review the Confidential Information for the purpose of carrying out its obligations under this Agreement.

Accordingly, the Provider agrees to hold in strict confidence and not disclose or use, and the Provider will not allow any of its Representatives to disclose or use, any Confidential Information, for any purpose, except as provided in this Section 5.1.

- 5.1.2 BHI or any of its Representatives will disclose Confidential Information to the Provider or any of its Representatives upon the following conditions:
 - 5.1.2.1 the Provider will hold, and will cause its Representatives to hold, all Confidential Information in trust for BHI and will not use, or permit any of its Representatives to use, any of the Confidential Information, at any time or in any manner, except as is required by the Provider to carry out its obligations under this Agreement;
 - 5.1.2.2 the Provider will limit the disclosure of the Confidential Information to those of its Representatives who have a need to know the Confidential Information to assist the Provider in carrying out its obligations under this Agreement, who are informed by the Provider of the confidential nature of the Confidential Information and who agree in writing to act in accordance with and be bound by the terms and conditions of this Agreement; and
 - 5.1.2.3 the Provider will be responsible for any breach of this Section 5.1, or any disclosure, divulgence, communication or use of any Confidential Information in a manner not authorized by this Agreement by any of its Representatives.
- 5.1.3 The Provider will take appropriate measures to protect the Confidential Information and will keep a record of the location of the Confidential Information and all of its Representatives to whom Confidential Information is provided. The Provider will store the Confidential Information properly and securely and ensure that appropriate technical and organizational means and physical or electronic storage media are in place to protect the Confidential Information against unauthorized or unlawful access or processing, and against accidental loss, destruction or damage, including taking reasonable steps to ensure the reliability of any Representative of the Provider permitted by the Provider to have access to the Confidential Information.
- 5.1.4 The Provider will, upon the written request of BHI, return promptly to BHI, or destroy, and provide written certification of the destruction of, all documents, physical or tangible manifestations and electronic and computerized forms of the Confidential Information received from BHI, including all copies, reproductions and applications of the Confidential Information, without retaining any copies or records.
- 5.1.5 If the Provider or any Representative of the Provider is required by any Applicable Law or by any Governmental Authority to disclose any Confidential Information, the Provider or that Representative will provide BHI with prompt written notice of that requirement, so that BHI may contest the disclosure of the Confidential Information and seek an appropriate protective order or other appropriate remedy.

- 5.1.6 If, in the absence of a protective order or other appropriate remedy, the Provider or any Representative of the Provider is, in the reasonable opinion of its lawyers, required by any Applicable Law or by any Governmental Authority to disclose any Confidential Information or stands liable for contempt or to suffer other censure or penalty, then the Provider or that Representative may, without liability under this Agreement, disclose that portion of the Confidential Information, but only that portion, that the Provider or the Representative is legally required to disclose.
- 5.1.7 The Provider will notify BHI immediately upon discovery of any breach of this Section 5.1 or any unauthorized or unlawful disclosure, divulgence, communication or use of any Confidential Information.
- 5.1.8 The Provider covenants and agrees to execute, to be bound by and to comply with all terms and conditions set out in BHI's "Confidentiality Non-Disclosure and Protection of Personal Information" agreement attached as Schedule C to this Agreement.
- 5.1.9 The covenants and obligations contained in this Section 5.1 will be perpetual.

5.2 **Computer Back-up**

The Parties acknowledge that the computers and data storage and retrieval systems or network of the Provider and, if applicable, its Representatives, may automatically back up Confidential Information stored in electronic form. The Parties agree that to the extent that those back-up procedures automatically create electronic copies of Confidential Information (the "**Secondary Information**"), each of the Provider and, if applicable, its Representatives, may, despite any requirement under this Agreement to return or destroy Confidential Information, retain Secondary Information in its archival storage for the period that it would normally archive electronic data, provided that those data are periodically and systematically overwritten or otherwise destroyed. Secondary Information will be subject to the provisions of this Agreement until destroyed and may not be accessed by the Provider or any of its Representatives during its period of archival storage.

5.3 **Insurance**

- 5.3.1 The Provider shall carry at all times during the performance of the Services, including any warranty period, at a minimum and at its own cost and expense, the types and amounts of insurance coverage set out at Schedule D ("**Insurance**").
- 5.3.2 The Provider shall also maintain adequate insurance of its own interest during the term of this Agreement or any extensions or renewals thereof.
- 5.3.3 The above insurance requirements shall not be read to limit the Provider's liability and will not be deemed a waiver by BHI of its right to damages or indemnity for any default by the Provider or for any loss arising out of or in any way related to the performance or non-performance of the Provider's obligations under this Agreement.
- 5.3.4 The Provider shall provide BHI with a certificate of insurance evidencing the required insurance coverages upon execution of this Agreement and from time to time thereafter on request by BHI.

- 5.3.5 The Provider shall provide to BHI with an original Clearance Certificate from the WSIB and shall provide additional Certificates with respect to such coverage from time to time on request by BHI.

5.4 **Health and Safety**

The Provider is responsible for ensuring that its officers, directors, employees, contractors and agents, while on the property and/or premises of BHI or carrying out the Services hereunder, shall comply with all of BHI's rules, regulations and policies pertaining to BHI property and/or premises and for complying with all applicable health and safety regulations and requirements.

5.5 **Covenants Reasonable**

The Provider acknowledges and agrees that:

- 5.5.1 without the covenants included in this Article 5, BHI would not have entered into the this Agreement;
- 5.5.2 the covenants included in this Article 5 are reasonable in the circumstances and are necessary to protect the economic position of BHI;
- 5.5.3 the breach of any of the Sections of this Article 5 would cause serious and irreparable harm to BHI which could not be compensated adequately by monetary damages, and that BHI may enforce the Sections of this Article 5 by injunction or specific performance upon application to a court of competent jurisdiction without proof of actual damage, and despite that damages may be readily quantifiable, and the Provider will not plead, and will not permit any of its Representatives to plead, sufficiency of damages as a defence in the proceeding for injunctive relief; and
- 5.5.4 the remedies provided by this Section 5.3 are in addition to, and not a substitute for, any other remedies for breach to which BHI would be entitled.

5.6 **Covenants Independent**

The existence of any claim or cause of action of the Provider against BHI, whether under this Agreement or otherwise, will not constitute a defence to the enforcement by BHI of this Article 5 against the Provider.

5.7 **Costs of Litigation**

If any litigation relating to this Agreement ensues and a court of competent jurisdiction determines in a final, non-appealable order that this Agreement has been breached by the Provider or any of its Representatives, then the Provider will reimburse BHI for all of its respective costs and expenses (including legal fees and disbursements) incurred in connection with the litigation.

5.8 **Books of Account and Information**

Each of BHI and the Provider will maintain at its head office appropriate books of account and records with respect to all transactions entered into in the performance of this Agreement. Each of BHI and the Provider will provide to the other whatever additional reports and information relating to the Services provided under this Agreement which the other may reasonably request.

5.9 Security Bond

On or before the date the work or services are to commence, the Contractor shall deliver to BHI a certified cheque or bank draft payable to Burlington Hydro Inc. for the lesser of (i) 10 percent of the contract price, or (ii) \$25,000.00 ("Security Bond"), to be held by BHI as security for fulfillment of the Contractor's obligations under the Agreement.

The Security Bond may be cashed at any time should BHI determine, in the exercise of a sole discretion, that the Contractor has not satisfactorily completed or will not satisfactorily complete its obligations under the Agreement. Should BHI determine that the Contractor has satisfactorily completed its obligations under the Agreement, BHI may return the said Security Bond or such amount as BHI determines to be fair in the circumstances, to the Contractor.

ARTICLE 6 INTELLECTUAL PROPERTY

6.1 Limited Rights

6.1.1 Notwithstanding any other term contained herein or in any schedule hereto, payment of the Service Fees are solely for the Services as described herein and do not and shall not: (a) constitute payment of a license or other similar fee; (b) grant Provider any right, title or interest in, or allow Provider to use, Intellectual Property of BHI without BHI's prior express written consent; or (c) otherwise permit Provider to incorporate the Intellectual Property of BHI into any work, service, product or marketing.

6.1.2 For greater certainty, each Party shall retain all ownership, right, title and interest to their respective Intellectual Property.

ARTICLE 7 INDEMNIFICATION

7.1 Indemnification by Provider

The Provider agrees to defend, indemnify and save harmless BHI, its agents or employees, from and against any Loss sustained or incurred by BHI, its agent or employees, which arises or results directly from:

- 7.1.1 the breach by the Provider of any representation, warranty or covenant contained in this Agreement;
- 7.1.2 the failure to deliver the Services in accordance with the terms of this Agreement;
- 7.1.3 the failure of any of the Services to meet the specifications set out in Schedule A; or
- 7.1.4 any negligent or wilful act or omission of the Provider or its Representatives.

7.2 Third Party Claims

- 7.2.1 Upon receipt of a claim by BHI (the “**Indemnified Party**”) from a third party for which the Provider (the “**Indemnifying Party**”) has agreed to indemnify the Indemnified Party, the Indemnified Party will notify the Indemnifying Party in writing of that claim.
- 7.2.2 Upon receipt of that notice, the Indemnifying Party will have the right to defend and/or settle any such claim at its own expense, provided that the Indemnifying Party advises the Indemnified Party of its intention to do so with 30 days of receipt of that notice.
- 7.2.3 If the Indemnifying Party fails to advise the Indemnified Party within the time specified in Section 7.2.2, the Indemnified Party will have the right but not the obligation to defend or settle that claim, employing counsel chosen exclusively by the Indemnified Party, in which case the Indemnifying Party will indemnify the Indemnified Party for all amounts which it is required to pay in settlement or satisfaction of those claims and will reimburse the Indemnified Party for all expenses (including reasonable legal fees and costs) incurred in the defence or compromise that claim.
- 7.2.4 Any settlement of any claim by the Indemnifying Party must include a full and complete release of the Indemnified Party.

7.3 Continuing Obligation

The indemnities in this Article 7 are continuing and irrevocable and the obligations of a Party under this Agreement will not be released, discharged, impaired or affected by:

- 7.3.1 any extensions of time or variations of obligations which the Party may grant or permit in respect of the observance or performance of any of the obligations of the Party;
- 7.3.2 any waiver by or neglect or failure of the Party to enforce any of the terms, covenants and conditions in respect of this Agreement; or
- 7.3.3 any amendment to this Agreement.

ARTICLE 8 DISPUTE RESOLUTION

8.1 Arbitration

In the event of any disputes, disagreements, controversies, questions or claims arising out of or relating to this Agreement, including with respect to its formation, execution, validity, application, interpretation, performance, breach, termination or enforcement, (“**Disputes**” and each a “**Dispute**”), one Party shall provide the other Party with a written notice setting out the particulars of the Dispute. The Parties will use all reasonable efforts to resolve the Dispute promptly and in good faith according to the following protocol:

- 8.1.1 if the representatives cannot resolve the dispute within ten (10) Business Days, the Dispute will be referred to the President and Chief Executive Officer of BHI and the President or Chief Executive Office of the Provider (collectively, the “**Second Level**”) for resolutions;

- 8.1.2 if the Dispute is not resolved within fifteen (15) Business Days of referral to the Second Level, BHI shall have the option, in its sole and absolute discretion, to refer the Dispute to be determined by a sole arbitrator (the “**Arbitrator**”) under the *Arbitration Act, 1991* (Ontario) (the “**Arbitration Act**”). In the event that BHI elects not to refer the Dispute to an Arbitrator, then the balance of Article 8 shall not apply and instead Section 9.4 shall apply to such Dispute. In the event that BHI elects to refer the Dispute to an Arbitrator, the following provisions of this Article 8 shall apply;
- 8.1.3 Section 7(2) of the Arbitration Act will not apply to the arbitration of a Dispute;
- 8.1.4 unless otherwise mutually agreed, the dispute shall be heard by one arbitrator who has not previously been employed or otherwise retained by or affiliated with any of the Parties, and does not have a direct or indirect interest in any of the Parties or the subject matter of the dispute. Such arbitrator shall either be as mutually agreed by the Parties or the Arbitrator will be appointed by a judge of the Superior Court of Justice of Ontario on the application of any Party on notice to the other Party. No person will be appointed as Arbitrator unless the person agrees in writing to be bound by the provisions of this Article 8;
- 8.1.5 the law of Ontario will apply to the substance of all Disputes;
- 8.1.6 the arbitration will take place in the City of Burlington unless otherwise agreed in writing by the Parties;
- 8.1.7 the language to be used in the arbitration will be English;
- 8.1.8 the Arbitrator, after giving the Parties an opportunity to be heard, will determine the procedures for the arbitration of the Dispute, provided that those procedures will include an opportunity for written submissions and responses to written submissions by or on behalf of all Parties, and may also include an opportunity for exchange of oral argument and any other procedures as the Arbitrator considers appropriate. However, if the Parties agree on a code of procedures or on specific matters of procedure, that agreement will be binding on the Arbitrator;
- 8.1.9 the Arbitrator will have the right to determine all questions of law and jurisdiction, including questions as to whether a Dispute is arbitrable, and will have the right to grant legal and equitable relief including permanent and interim injunctive relief, and final and interim damages awards. The Arbitrator will also have the discretion to award costs of the arbitration, including reasonable legal fees and expenses, reasonable experts’ fees and expenses, reasonable witnesses’ fees and expenses, and pre-award and post-award interest and costs, provided that the Arbitrator will not make an award of costs on a distributive basis;
- 8.1.10 the Parties intend, and will take all reasonable action necessary or desirable to ensure, that there be a speedy resolution to any Dispute, and the Arbitrator will conduct the arbitration of the Dispute with a view to making a determination and order as soon as possible;
- 8.1.11 the Parties desire that any arbitration should be conducted in strict confidence and that there will be no disclosure to any Person of the existence or any aspect of a Dispute except as is necessary for the resolution of the Dispute. Any proceedings before the Arbitrator will be attended only by those Persons whose presence, in the opinion of any Party or the Arbitrator, is reasonably necessary for the resolution of the Dispute. All matters relating to, all evidence presented to, all submissions made in the course of, and all documents produced in accordance with, an arbitration under this Article, as well as any arbitral award, will be kept

confidential and will not be disclosed to any Person without the prior written consent of all the Parties except as required in connection with an application of a Party under section 46 or section 50 of the Arbitration Act, by Applicable Law, or by an order of an Arbitrator;

8.1.12 the fees of the Arbitrator will be paid equally by the Parties; and

8.1.13 subject to section 44 of the Arbitration Act, the Arbitrator's determination of a Dispute will be final and binding and there will be no appeal of that determination on any ground.

8.2 **Interim Relief**

8.2.1 Prior to the appointment of the Arbitrator, the Parties may apply to the courts for interim relief. A request for interim relief by a Party to court will not be considered to be incompatible with Section 8.1 or as a waiver of that provision.

8.2.2 At the request of either Party, the Arbitrator may take any interim measures that the Arbitrator considers necessary in respect of the Dispute, including measures for the preservation of assets, the conservation of goods or the sale of perishable goods. The Arbitrator may require security for the costs of those measures.

ARTICLE 9 GENERAL PROVISIONS

9.1 **Time of Essence**

Time is of the essence in all respects of this Agreement.

9.2 **Notices**

Any Communication must be in writing and either:

9.2.1 delivered personally or by courier;

9.2.2 sent by prepaid registered mail; or

9.2.3 transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission, charges (if any) prepaid.

Any Communication must be sent to the intended recipient at its address as follows:

to the Provider at:

Beswick Tree Service
418A Whitney Ave Unit C2, Hamilton ON L8S 2H8

Attention: Tyler Burke
Tel No.: 905-529-5612
E-mail: tyler@beswicktreeservice.com

to BHI at:

Burlington Hydro Inc.
1340 Brant Street, Burlington ON L7R 3Z7

Attention: Paul Heeg
Tel No.: 905-332-1851 x 2273
E-mail: pheeg@burlingtonhydro.com

or at any other address as any Party may at any time advise the others by Communication given or made in accordance with this Section 9.2. Any Communication delivered to the Party to whom it is addressed will be deemed to have been given or made and received on the day it is delivered at that Party's address, provided that if that day is not a Business Day then the Communication will be deemed to have been given or made and received on the next Business Day. Any Communication sent by prepaid registered mail will be deemed to have been given or made and received on the fifth Business Day after which it is mailed. If a strike or lockout of postal employees is then in effect, or generally known to be impending, every Communication must be delivered personally or by courier or transmitted by facsimile, e-mail or functionally equivalent electronic means of transmission. Any Communication transmitted by facsimile, e-mail or other functionally equivalent electronic means of transmission will be deemed to have been given or made and received on the day on which it is transmitted; but if the Communication is transmitted on a day which is not a Business Day or after 4:00pm (local time of the recipient), the Communication will be deemed to have been given or made and received on the next Business Day.

9.3 **Severability**

Each Section of this Agreement is distinct and severable. If any Section of this Agreement, in whole or in part, is or becomes illegal, invalid, void, voidable or unenforceable in any jurisdiction by any court of competent jurisdiction, the illegality, invalidity or unenforceability of that Section, in whole or in part, will not affect:

- 9.3.1 the legality, validity or enforceability of the remaining Sections of this Agreement, in whole or in part; or
- 9.3.2 the legality, validity or enforceability of that Section, in whole or in part, in any other jurisdiction.

9.4 **Submission to Jurisdiction**

Each of the Parties irrevocably and unconditionally submits and attorns to the exclusive jurisdiction of the courts of the Province of Ontario to determine all issues, whether at law or in equity, arising from this Agreement. To the extent permitted by Applicable Law, each of the Parties:

- 9.4.1 irrevocably waives any objection, including any claim of inconvenient forum, that it may now or in the future have to the venue of any legal proceeding arising out of or relating to this Agreement in the courts of that Province, or that the subject matter of this Agreement may not be enforced in those courts;
- 9.4.2 irrevocably agrees not to seek, and waives any right to, judicial review by any court which may be called upon to enforce the judgment of the courts referred to in this Section 9.4, of the substantive merits of any suit, action or proceeding; and

- 9.4.3 to the extent a Party has or may acquire any immunity from the jurisdiction of any court or from any legal process, whether through service or notice, attachment before judgment, attachment in aid of execution, execution or otherwise, with respect to itself or its property, that Party irrevocably waives that immunity in respect of its obligations under this Agreement.

9.5 **Amendment and Waiver**

No amendment, discharge, modification, restatement, supplement, termination or waiver of this Agreement or any Section of this Agreement is binding unless it is in writing and executed by the Party to be bound. No waiver of, failure to exercise or delay in exercising, any Section of this Agreement constitutes a waiver of any other Section (whether or not similar) nor does any waiver constitute a continuing waiver unless otherwise expressly provided.

9.6 **Further Assurances**

Each Party will, at that Party's own cost and expense, execute and deliver any further agreements and documents and provide any further assurances, undertakings and information as may be reasonably required by the requesting Party to give effect to this Agreement and, without limiting the generality of this Section 9.6, will do or cause to be done all acts and things, execute and deliver or cause to be executed and delivered all agreements and documents and provide any assurances, undertakings and information as may be required at any time by all Governmental Authorities having jurisdiction over the affairs of a Party or as may be required at any time under Applicable Law.

9.7 **Assignment and Enurement**

Neither this Agreement nor any right or obligation under this Agreement may be assigned by any Party without the prior written consent of the other Parties. This Agreement enures to the benefit of and is binding upon the Parties and their respective heirs, executors, administrators, estate trustees, trustees, personal or legal representatives, successors and permitted assigns.

9.8 **Electronic Signatures and Delivery**

This Agreement and any counterpart of it may be:

- 9.8.1 signed by manual, digital or other electronic signatures; and
- 9.8.2 delivered or transmitted by any digital, electronic or other intangible means, including by e-mail or other functionally equivalent electronic means of transmission,

and that execution, delivery and transmission will be valid and legally effective to create a valid and binding agreement between the Parties.

9.9 **Counterparts**

This Agreement may be signed and delivered by the Parties in counterparts, with the same effect as if each of the Parties had signed and delivered the same document, and that execution and delivery will be valid and legally effective.

9.10 Payment and Currency

Any money to be advanced, paid or tendered by one Party to another under this Agreement must be advanced, paid or tendered by bank draft, certified cheque or wire transfer of immediately available funds payable to the Person to whom the amount is due. Unless otherwise specified, the word "dollar" and the "\$" sign refer to Canadian currency, and all amounts to be advanced, paid, tendered or calculated under this Agreement are to be advanced, paid, tendered or calculated in Canadian currency.

9.11 No Contra Proferentem

This Agreement has been reviewed by each Party's professional advisors, and revised during the course of negotiations between the Parties. Each Party acknowledges that this Agreement is the product of their joint efforts, that it expresses their agreement, and that, if there is any ambiguity in any of its provisions, no rule of interpretation favouring one Party over another based on authorship will apply.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK

Each of the Parties has executed and delivered this Agreement as of the date noted at the beginning of this Agreement.

BESWICK TREE SERVICES

Signed by:
Tyler Burke
09AF11B423254CC...

Per: _____

Name: Tyler Burke
Title: Owner

I have authority to bind the corporation.

BURLINGTON HYDRO INC.

Signed by:
Paul Heeg
6A7E2FF83667454...

Per: _____

Name: Paul Heeg
Title: Vice-President, Engineering Services and
Network Operations

I have authority to bind the corporation.

SCHEDULE A SERVICES AND TERM

- (1) **Services.** Any customer-facing services or solutions must meet AODA (Accessibility for Ontarians with Disability Act) requirements and be AODA compliant. During the Term, the Provider will provide the following services:

BHI requires trees to be trimmed clear of all primary and secondary circuits in a manner described in 2024 Tree Trimming Request for Proposal (RFP) Schedule "A".

Beswick Tree Service is the provider for Zones 13 East/West, 14, 6, 8, 9, 12, 15, 17, 3, 4, 5, 7, & 16 as shown in the Tree Trimming Zones_Detailed_OH only_ALL_240904.pdf

- (2) **Term.** Subject to the terms and conditions of this Agreement, the Term will commence on the date of this Agreement and continue until the date that is thirty six (36) months following the date of this Agreement.

SCHEDULE B**SERVICE FEES AND PAYMENT****Service Fees**

As provided in schedule E- Pricing/Technical Requirements from Beswick Tree Service RFP submission file: Beswick Tree Service BHI Inc. RFP Submission - V.Final.pdf

2025 – 2 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 13 East	██████	15%
Zone 13 West	██████	0%
Zone 14	██████	0%

2026 – 6 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 6	██████	15%
Zone 8	██████	5%
Zone 9	██████	0%
Zone 12	██████	0%
Zone 15	██████	0%
Zone 17	██████	0%

2027 – 5 Zones		
Zone	Cost	Estimated Percentage Zone Required Outages
Zone 3	██████	0%
Zone 4	██████	0%
Zone 5	██████	0%
Zone 7	██████	10%
Zone 16	██████	0%

Time and Material

In addition to work completed by zone under this contract, there may at times be a need for additional planned time and material work as required, including specific customer requests. There is also additional “emergency work” that is considered unscheduled overtime, for which crews must be available 24 hours a day, 7 days a week, 365 (366) days a year. Crews must be equipped to work at night and additional crews may be required.

2025 Tree Contractor Hourly Rates for Time and Material Work¹			
Description	Normal Working Hours ²	Scheduled Overtime Rates (outside normal working hours)	Emergency Response Rates (unscheduled) ³
Applicable Hours	██████	██████	██████
Applicable Days of Week	Monday-Friday	Anyday/Sunday-Saturday	Anyday
2-person crew and bucket truck (rate per hour)	██████	██████	██████
Additional person including bucket truck (rate per hour)	██████	██████	██████
Additional person including pick-up truck (rate per hour)	██████	██████	██████
Minimum Call Out Charge	██████		

1. Rates may be escalated by a maximum of 2% annually for 2026 and 2027.
2. These rates also apply for emergencies in normal working hours.
3. These rates should reflect contractor’s emergency response times identified below.

Reconciliation and Invoicing

On the 15th day of each month the Provider will prepare and deliver to BHI an invoice for amounts payable to it in respect of the Services provided in the preceding month.

Within 30 days after the end of the Term, the Provider will prepare and deliver to BHI a final invoice for Services rendered during the Term.

Payment

Payment of amounts owed by BHI to the Provider will be made by the 30th day from the date of receipt of the invoice by BHI. Payments will be made to an account specified by the Provider in writing. If there is a dispute as to the amount payable to the Provider for Services rendered, BHI will, within 15 days of receipt of the Provider’s invoice, notify the Provider in writing that it disputes the Provider’s invoice. BHI

will be deemed to have finally accepted the Provider's invoice unless it delivers its dispute notice to the Provider within the applicable time period. Despite the submission of a dispute notice by BHI, BHI will pay to the Provider, in accordance with the terms of this Agreement, all amounts that are not in dispute. BHI and the Provider will negotiate in good faith to resolve any invoice dispute. If within 15 days of receipt of BHI's dispute notice BHI and the Provider are unable to resolve the invoice dispute, the invoice dispute will be submitted to arbitration in accordance with Article 8

SCHEDULE C

CONFIDENTIALITY, NON-DISCLOSURE AND PROTECTION OF PERSONAL INFORMATION OF BURLINGTON HYDRO INC. CUSTOMERS

Introduction

Burlington Hydro Inc. ("BHI") and Beswick Tree Service ("Contractor") acknowledge and agree that the Contractor's performance of the services ("Services") under the Contract to which this Appendix is attached (the "Contract") will require the Contractor to have access to personal information collected by BHI pertaining to BHI's customers ("*Personal Customer Information*").

Personal Customer Information constitutes "*personal information*" under the *Municipal Freedom of Information and Protection of Privacy Act* ("MFIPPA") and therefore, BHI deals with such information in a manner that complies with MFIPPA and with BHI's Electricity Distribution License issued by the Ontario Energy Board.

The Contractor acknowledges and agrees that a fundamental term and condition of the Contract is that the Contractor comply with the terms and conditions set out below for the protection of *Personal Customer Information*.

Definition of *Personal Customer Information*

Personal Customer Information means any information, regardless of its form or format (i.e., hard copy, electronic, digital, etc.), that can be used to identify, or to assist in the identification of, an individual who is a customer of BHI. *Personal Customer Information* shall remain the property of BHI at all times.

Requirements for Protection of *Personal Customer Information*

The Contractor shall:


1. in conjunction with the execution of this Appendix, provide to BHI:
 - (a) the name and contact information of the Privacy Officer appointed by the Contractor to be responsible for ensuring its compliance with the requirements herein and for providing prompt responses to BHI in regard to matters arising hereunder;
 - (b) a copy of the Contractor's policies and procedures for protecting *Personal Customer Information* for approval by BHI's Privacy Officer. Should the Contractor's policies and procedures not be satisfactory to BHI's Privacy Officer, the Contractor shall be given sixty (60) days to file amended policies and procedures satisfactory to BHI's Privacy Officer, failing which BHI may terminate the Contract on thirty (30) days' notice without further liability to the Contractor other than payment for goods and/or services provided by the Contractor to date of termination;
2. promptly inform BHI of any change in the position of Privacy Officer;

3. take all reasonable steps to ensure that all *Personal Customer Information* is kept secure and confidential;
4. not disclose any *Personal Customer Information* to any third party unless expressly authorized by BHI;
5. ensure that only employees that it has explicitly authorized may have access to, or use, *Personal Customer Information*; the Contractor shall monitor and control such authorizations to ensure they are kept up-to-date at all times and it shall maintain records of all such authorizations and all changes thereto, including any revocations of such authorizations; upon the request of BHI, the Contractor shall provide a copy of such records to BHI;
6. not use *Personal Customer Information* for any purpose not expressly authorized by BHI;
7. (a) return to BHI all hard copies of *Personal Customer Information* and/or erase or destroy all *Personal Customer Information* in electronic or digital form that is in the Contractor's possession or control, within seven (7) days of any of the following (as may be applicable):
 - i. the date the Contractor completes the Services under the Contract;
 - ii. the date the *Personal Customer Information* is no longer required by the Contractor for its performance of the Services under the Contract;
 - iii. the date the Contract is terminated;
 - iv. the date BHI provides its written request to the Contractor for the return of hard copies of *Personal Customer Information* and/or for the erasure or destruction by the Contractor of *Personal Customer Information* in the Contractor's possession or control;
- (b) provide to BHI within the relevant seven (7) day period, written confirmation of its compliance with sub-paragraph 7 (a) above.
8. Notify BHI within one business day of any request it receives for disclosure of *Personal Customer Information* from a law enforcement authority and or any other third party, and shall not make such disclosure without BHI's written authorization;
9. Notify BHI within one business day of any accidental disclosure or unauthorized access to *Personal Customer Information* in its possession or control;
10. indemnify defend and hold harmless BHI and its directors, officers and employees, from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments relating to, arising out of, or in connection with, the breach by the Contractor of any of its obligations under this Appendix;

Signed this _____ day of _____, 202____. 12/5/2024 12/5/2024

Burlington Hydro Inc.

Beswick Tree Service

Signed by:

6A7E2FF83667454...

Signed by:

09AF11B423254CC...

per _____
Signature

per _____
Signature

Print name and Title:

Print name and Title:

Paul Heeg,
Vice-President, Engineering Services and
Network Operations

Tyler Burke,
Owner

SCHEDULE D

INSURANCE

WSIB

Workplace Safety and Insurance Board coverage.

INSURANCE COVERAGES

Commercial General Liability Insurance

Commercial General Liability insurance ensuring against damage or injury to persons or property with limits of not less than Five Million Dollars (\$5,000,000.00) per occurrence.

Professional Liability Insurance

On contracts for consulting or professional services, Professional Liability Insurance (Errors & Omissions) with an inclusive limit of not less than Five Million Dollars (\$5,000,000) per occurrence.

Automobile Insurance

Owned and unowned automobile insurance with an inclusive limit of not less than Two Million Dollars (\$2,000,000) per occurrence.

Contractor's Insurance

The Contractor shall also maintain adequate insurance of its own interest during the term of the contract or any extensions or renewals thereof.

Insurance Policy Requirements

The policies of insurance shall:

- (a) Name Burlington Hydro Inc. as an additional insured;
- (b) Be non-contributing and apply only as primary and not be excess to any other insurance or self-insurance available to a Party;
- (c) Contain a cross liability and separation of insureds clause;
- (d) Be written with an insurer licensed to do business in the Province of Ontario;
- (e) Require 30 days' notice to Burlington Hydro Inc. in the event the that such policies are to be cancelled, not renewed or materially altered such that they no longer comply with the requirements of this section; and
- (f) Contain a waiver of the rights of subrogation against BHI and those for whom BHI is, at law, responsible.

No Limitation of Liability

The Contractor shall agree that the insurance requirements do not in any way limit the Contractor's liability pursuant to any of the indemnity provisions in the contract.

Certificate of Insurance

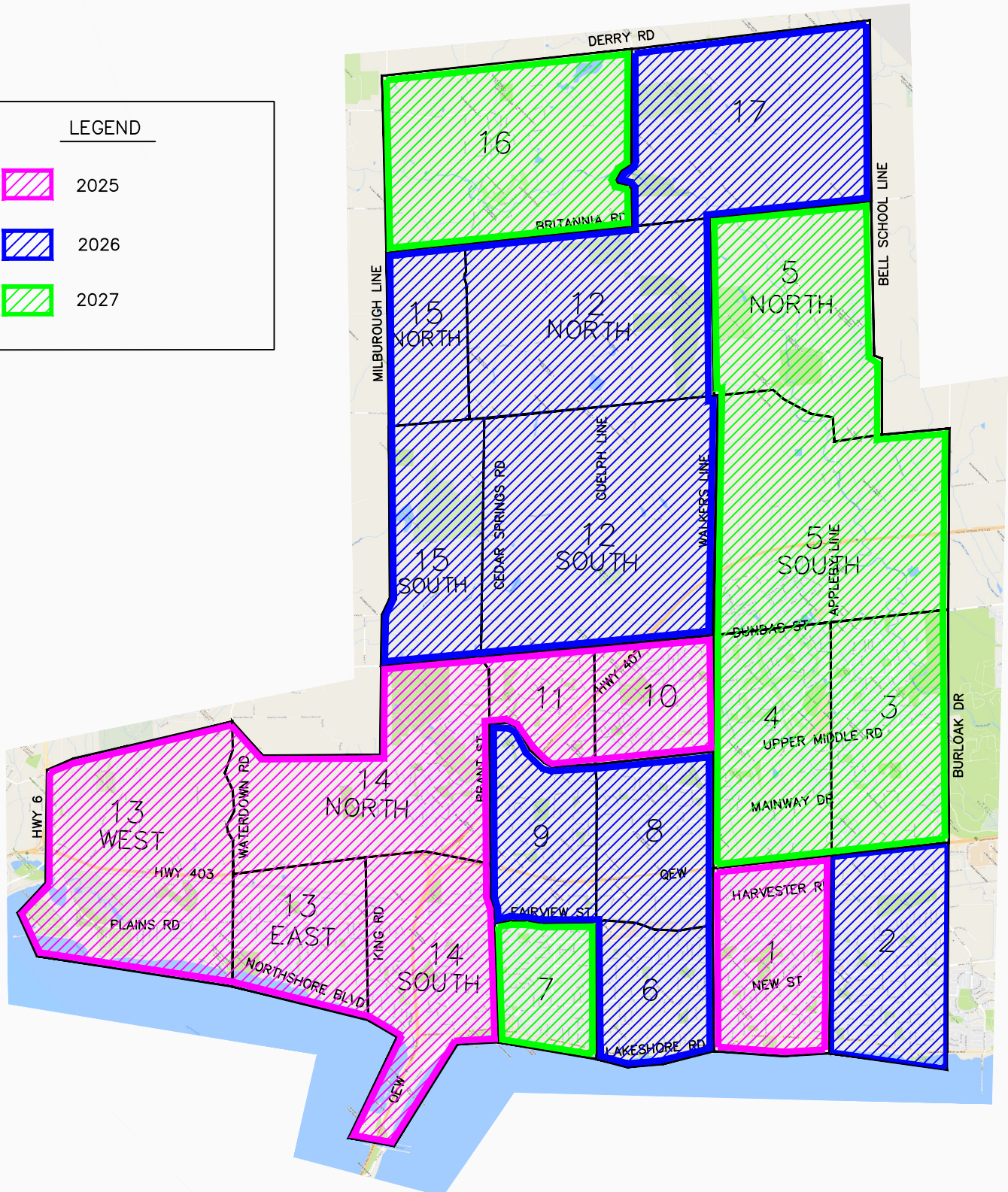
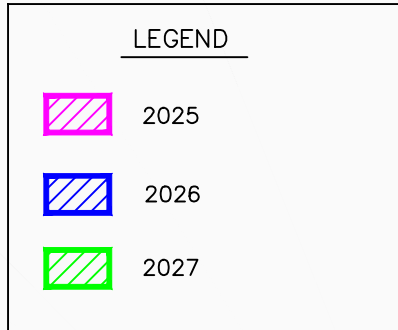
The Contractor shall provide BHI with a Certificate of Insurance evidencing the required insurance coverages upon execution of the contract. The Contractor shall not commence work until such Certificate of Insurance has been provided.

Appendix – 4-Intervenor-107a)

Tree Trimming Areas for 2025-2027



Burlingtonhydro inc.



Appendix – 4-Intervenor-110a)

JOB DESCRIPTION

JOB TITLE: **Business Applications/Data Specialist**
DEPARTMENT: I.T.
POSITION REVIEW: Fred Mughal (Leader) / Diana Lo (HR)
DATE: August 2024

POSITION SUMMARY:

As the Business Applications Specialist, you will provide applications support and data analytics for the organization. In this role, you will coordinate application software upgrades and update application and system documentation, work with the Project Manager in information gathering, coordinate with internal users and external vendors, and support teams to achieve successful project outcomes. This position will work with internal users and external vendors to translate business requirements into technical implementation using a variety of enterprise applications.

This role is expected to develop in-depth knowledge of business systems and applications for the purpose of data analytics, business intelligence reporting and application support. These software applications may include Geographical Information Systems (GIS), Outage Management System (OMS), Advanced Metering Infrastructure (AMI), Customer Information Systems (CIS), Asset Management Systems, Enterprise Resource Planning (ERP) and Supervisory Control and Data Acquisition (SCADA) applications.

DIMENSIONS:

PRIMARY RESPONSIBILITIES:

Departmental Activity

- Maintain up-to-date expertise in the application(s) and support the team in translating product needs into enhancements and or fixes for the supported application.
- Provide actionable recommendations based on data analysis to drive informed decision-making and strategic initiatives, emphasizing the interpretation of insights to guide organizational goals.
- Facilitate data-driven discussions and workshops to empower stakeholders with insights and foster a culture of data literacy within the organization.
- Leverages data science (statistics, NLP, ML, AI) to conduct broad and deep testing to identify data quality concerns, or potential weaknesses in data governance.
- Collect data from various digital sources and aggregate to create comprehensive datasets for analysis.
- Utilize statistical techniques, machine learning algorithms, and data visualization tools to analyze digital data to identify trends, patterns, and correlations within the data to inform decision-making and drive strategic initiatives.
- Collaborate with users to design and implement effective measurement strategies, ensuring that key performance indicators (KPIs) align with business objectives and provide actionable insight.

- Design and develop analytic dashboards using reporting development tools i.e. SSRS, SSIS, SSAS and Power BI.
- Lead tasks and projects related to the modelling, analysis, and interpretation of divisional data and other external datasets, including those with a spatial component.
- Use Predictive Analytics to create best in class commercial reporting, ensure standardization across the organization on tracking the right KPI's and ensure consistency.
- Create comprehensive documentation for data / reporting processes, including step-by-step guides and best practices, regularly update documentation to reflect changes and improvements in processes.
- Foster successful relationships with divisional staff and partners through consultation, mediation, and communication.
- Adopts hands-on approach in the detailed analysis of new and existing business processes including preparation of work specifications/design, testing, debugging, and end-user training.
- Oversee cross-departmental 'Integration Team' discussions for strategic integrated solutions between various software applications as well as with external system environments.
- Perform data analysis, develop performance measures, and create decision support information from operational systems, surveys, and third-party data sources.
- All other duties as assigned.

HEALTH & SAFETY RESPONSIBILITIES:

Ensure that those activities over which they have control are conducted in a safe manner and in accordance with the company's policies, programs and applicable legislation. This can be achieved through:

- Attending mandatory health and safety training;

QUALIFICATIONS:

Education:

- An undergraduate degree in Computer Science or related discipline or an equivalent combination of education and work experience.

Work Experience:

- Minimum 3-5 years of experience in business intelligence, business analytics or data analysis, solutions analyst, or a similar technical role.
- Hands-on programming, Business Intelligence Reporting and technical experience.
- Solid understanding of and demonstrated working knowledge in the construction of quality, performance-based SQL.
- Experience with Report Writers (IBM COGNOS Business Intelligence would be an asset).

Knowledge and Skills:

- Significant and demonstrable experience in writing SQL queries (T SQL, P/L SQL, SAS) and Python with a minimum of 3+ years of experience.
- Hands-on coding skills using a variety of programming languages

- Strong hands-on experience with data analysis and ETL (SQL, Python, Java, XML, and JSON), Power BI, Power Query, advanced knowledge of DAX, M languages Advanced proficiency in MS Excel (advanced functions, pivot tables, AI add-ons)
- Knowledge of software development life cycle, including functional and technical specification, documentation, QA processes, source control, maintenance, and deployments
- Proven experience in a related role in providing scheduled and ad-hoc analytics or reporting
- Expertise with relational databases and ability to navigate through relational data structure and experience working with SQL
- Ability to be flexible when needed, take initiative and demonstrate accountability
- Proven advanced analytical and problem solving skills for resolution of complex assignments.

Personal Characteristics:

- Work independently, with a high degree of responsibility with a demonstrated commitment to high ethical standards
- High energy level, positive attitude
- Able to maintain composure during all situations
- Excellent verbal and written communication skills, interpersonal skills and a positive approach to work, co-workers, external vendors and key stakeholders that promotes a safe and respectful workplace

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts

Internal Contacts:

- I.T. department staff
- Internal departments across the company

Outside Contacts:

- External vendors

WORKING CONDITIONS & PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in an office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

JOB DESCRIPTION

POSITION NAME:	Director, Information Technology, Cyber Security & Business Transformation
COMPETENCY PROFILE:	Directors (Level 4)
DEPARTMENT:	Information Technology (Functional Area – Corporate)
POSITION REVIEW	EVP Corporate
DATE:	April 2025

POSITION SUMMARY:

This position reports to the Executive Vice-President, Corporate. The successful incumbent will have the relevant experience to recommend innovative technologies and effective solutions to address evolving infrastructure challenges, changing demands, and the ever-increasing threats of cyber security.

The Director will manage BHI systems, security, and infrastructure including managing a team of IT professionals. This is a hands-on role and is responsible for the overall health and maintenance of all IT infrastructure security operations with an additional focus on cyber security administration. This position will play a critical role in supporting BHI in its business transformation journey leading IT initiatives to meet changing business needs, evolving customer expectations, operational process improvements, and cyber security risks.

POSITION SUMMARY:

Departmental Leadership:

- Oversee the day-to-day responsibilities of the IT department and responsible for the supervision and the performance management of IT staff
- Manage the deployment, monitoring, maintenance, development, upgrade, and support of all Infrastructure systems, including servers, operating systems, hardware, software, storage area networks and backup systems and manage replacement schedules
- Facilitate remote monitoring and management infrastructure implementation which includes all IT and OT assets
- Manage the IT help desk and technical support services for all users
- Manage, prioritizes, and expedites multiple IT infrastructure work assignments in accordance with scheduled IT service commitments, including coordination with our key Managed Service Providers.
- Lead business transformation initiatives including integrating internal BHI application solutions, managing cyber security and mitigating risks, and ensuring the appropriate business processes and systems infrastructure are in place to effectively support the business and BHI customers
- Lead IT related projects from inception to implementation, partners with key stakeholders, utilizes project management methodology and leading practices
- Develop, leads, and implements the IT Roadmap outlining the investments in infrastructure that will enable the Company's strategic plans and deliver high availability IT resources

- Recommend and implement appropriate security controls to protect the BHI information assets from unauthorized access and compromise/loss and to mitigate cyber related risks
- Lead the design, procurement, installation, and maintenance all IT infrastructure including servers, PC/laptops, network components and related configurations, telecommunications equipment, telephony, mobility, email, operations related software, backup/recovery systems and license compliance with a focus on cyber security
- Participate in the strategic planning and prepares the budgeting requirements for IT
- Implement and manage IT policies and procedures
- Benchmark, analyze, develops reports, and make recommendations for the improvement and growth of the IT infrastructure and IT systems and produce regular KPI and SLA reports and dashboards
- Participate in the BHI'S business continuity plan as it relates to IT and OT operations
- All other duties as assigned

PEOPLE LEADERSHIP RESPONSIBILITIES:

1. Provide safety leadership ensuring safe, efficient, and timely completion of all required tasks in accordance with the Occupational Health & Safety Act & Regulations, applicable legislation, and Company Policies & Procedures; enforced as required.
2. Ensure positive labour relations through proper administration and company policies.
3. Provide direction, including establishing goals and training requirements, performance evaluations, and coaching.
4. Direct team performance to ensure the company's policies/procedures are followed according to established guidelines.
5. Participate in the formulation of cascading strategic goals and objectives (task planning, budgeting, and staffing) for the department.
6. Other duties as assigned.

CYBER SECURITY RESPONSIBILITIES:

- Establish and maintain organization information security strategy, develop, and implement comprehensive security strategy that aligns with organization's business goals.
- Create and maintain a roadmap for evolving the security posture of organization.
- Identify and manage cybersecurity risks across the organization and oversee development of policies and procedures.
- Lead organization's incident response efforts, develop and test BCP and DR plans.
- Establish security governance structure, including roles, responsibilities, and oversight for security initiatives.
- Work closely with internal and external security service providers, vendors, and partners to manage and control the defense in depth strategy for the organization in alignment with business vision, mission and strategies.

HEALTH & SAFETY RESPONSIBILITIES:

Ensure that those activities over which they have control are conducted in a safe manner and in accordance with the Company's policies, programs, and applicable legislation. This can be achieved

through:

- Respond promptly to employee health and safety concerns.
- Lead with a safety-first mentality and participate in safety training and meetings; ensure compliance with WSIB, health and safety legislations.
- Review hazard/risk assessment reports for their department to ensure that employees receive appropriate training and that controls are in place to prevent injuries.
- Conduct and record regular workplace inspections.
- Develop, implement, and maintain emergency response and standard operating procedures/guidelines on work activities.
- Implement and enforce relevant safety rules and programs (e.g., use of personal protective equipment; advising staff of the existence of any potential and existing health and safety hazards; ensuring staff work in accordance with set instructions, procedures, and guidelines; etc.)
- Investigate workplace accidents that occur, identifying root cause(s) and implementing remedial and preventative action.

QUALIFICATIONS:

Education: Post-Secondary education with a focus in Information Technology, Management Information Systems, Computer Science, Engineering, Math or equivalent education and experience

Work Experience.

- Minimum 10 years of relevant experience with a minimum of five years of progressive leadership experience

Knowledge and Skills:

- Experience with Disaster Recovery, Business Continuity Planning, Incident Response Management
- Experience with the National Institute of Standards and Technology (NIST) Cyber Control Set
- Advanced working knowledge of cyber security administration and network protocols
- Advanced working knowledge of disaster recovery planning and penetration testing and execution

License or Registration Requirements: Certification preferred: CISSP, CISM, CCNP Security

COMPETENCIES:

1. **Drive for Results** – Achieving goals, striving for excellence, and managing work deliverables and processes effectively. Sustaining a high level of drive, showing enthusiasm and a positive attitude when coping with pressures at work. Focusing attention on accomplishing performance indicators and positive outcomes for self, the team, and the overall organization.
2. **Accountability** – Understanding your role responsibilities and following through on those commitments without directing blame onto others when faced with challenges. In addition, accountability requires an understanding of the personal impact you have on others and the company and are held responsible for your decisions, performance, and actions.
3. **Managing Risk** – Understanding your role in helping to manage risks or liability to BHI's reputation, financial, organization, health and safety or human capital risk. Within the scope of

your role, you are responsible for the identification, evaluation, and prioritization of risks and adherence to the established processes to manage the identified risks.

4. **Lead by Example** - Demonstrating a positive attitude, motivating others through your behaviour and actions with an intention to inspire others by modelling the way by 'walking the talk'. Demonstrating the highest level of ethics, self-awareness, authenticity, and living BHI's values.
5. **Teamwork & Relationship Management** - Developing collaborative relationships within and beyond the team with internal stakeholders across the company and with external stakeholders including customers, vendors, the public, contractors, etc.
6. **Critical Thinking** – Developing informed decisions by evaluating different sources of information, identifying patterns, and determining underlying issues across situations of varying complexity. Demonstrating analysis, challenging assumptions, effective problem-solving, asking thoughtful questions leading to the development of optimal solutions.
7. **Innovative Change Leader** – Creating new or innovative solutions, generating enthusiasm, and readily adapting to change. Being innovative can be both small and large scale. Understanding that change is constant and able to remain professional, resilient, and positive in the face of challenges or uncertainty. Viewing change as an opportunity for better outcomes and positively leading others to embrace the change.
8. **Strategic Thinking & Execution** – Developing clearly defined business strategies into actionable steps to implement those plans. Ability to be proactive and anticipate change and balance short term and long-term priorities.

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts.

Internal Contacts:

- Directors, People and Culture and Director, Health & Safety – employee/labour relations issues, facilities/security, and due diligence
- Directors, Engineering Services and Director, Network Operations – coordination of projects
- Director, Finance/Controller – budgets and expenditures
- User department staff for hardware and software support

External Contacts:

- Third party business partners (vendors and consultants) provide supplementary support.

WORKING ENVIRONMENT AND PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in the lower-level office area and is mostly sedentary.
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)
 - Psychological (external contact which could be hostile /distressed in nature)

JOB DESCRIPTION

POSITION NAME:	IT and Operations Technology Systems Specialist
COMPETENCY PROFILE	Professional Individual Contributor – Non-Union (Level 2)
DEPARTMENT:	IT
POSITION REVIEW:	EVP Corporate / Human Resources
DATE:	June 2023

POSITION SUMMARY:

Reporting to the Director of IT and Business Transformation, the incumbent is customer service oriented and possess good communication skills to foster cooperation and collaboration with internal IT staff, end users and external vendors.

The role will provide technical support for various projects, coordinating application software upgrades, maintaining project implementation schedules and completing appropriate systems documentation. The role will provide application support to IT's computer operations and end user departments including daily engagement in IT's support of Corporate Business Intelligence Reporting involving both the creation of B/I content as well as training and support for end users and be assigned to various IT operations related tasks.

PRIMARY RESPONSIBILITIES:

- Assist with definition, creation and maintenance of report content for operational reporting, business intelligence, (dashboards, KPI reporting and some 'Big Data' analysis) and provide effective training and assistance to end user report authors
- Under the direction of the Senior Project Manager, participate in the preparation of work specifications for in-house and 3rd party vendor modifications
- Construct test plans, perform testing/debugging, documentation, implementation and end-user training for software change requests
- Provide updates to team project implementation schedule for assigned tasks with responsibility for completing assigned itemized tasks on-time
- Provide application and technical support for a variety of implementation tasks including data conversion, data verification, software configuration setup, access permissions setup, screen script changes, forms/document changes, internal programming modifications, program upgrades and end user training
- Complete documentation for all assignments in alignment with IT documentation standards
- Facilitates and/or develops processes to support improvement or efficiencies in the business function through use of technology
- Assists vendors with understanding and developing new software features based on end user requirements

QUALIFICATIONS:

Education: An undergraduate degree in Computer Science, Programming or related discipline

Years of Experience: Minimum two (2) years of related experience.

- Good understanding of, and demonstrated working knowledge in the construction of quality, performance-based SQL (Oracle, MS SQL Server)
- Exposure to Java, XML, Microsoft SSIS, IBM COGNOS Reporting platform

License or Registration Requirements: N/A

COMPETENCIES:

1. **Drive for Results** – Achieving goals, striving for excellence, and managing work deliverables and processes effectively. Sustaining a high level of drive, showing enthusiasm and a positive attitude when coping with pressures at work. Focusing attention on accomplishing performance indicators and positive outcomes for self, the team, and the overall organization.
2. **Accountability** – Understanding your role responsibilities and following through on those commitments without directing blame onto others when faced with challenges. In addition, accountability requires an understanding of the personal impact you have on others and the company and are held responsible for your decisions, performance, and actions.
3. **Managing Risk** – Understanding your role in helping to manage risks or liability to BHI's reputation, financial, organization, health and safety or human capital risk. Within the scope of your role, you are responsible for the identification, evaluation, and prioritization of risks and adherence to the established processes to manage the identified risks.
4. **Lead by Example** - Demonstrating a positive attitude, motivating others through your behaviour and actions with an intention to inspire others by modelling the way by 'walking the talk'. Demonstrating the highest level of ethics, self-awareness, authenticity, and living BHI's values.
5. **Teamwork & Relationship Management** - Developing collaborative relationships within and beyond the team with internal stakeholders across the company and with external stakeholders including customers, vendors, the public, contractors, etc.
6. **Critical Thinking** – Developing informed decisions by evaluating different sources of information, identifying patterns, and determining underlying issues across situations of varying complexity. Demonstrating analysis, challenging assumptions, effective problem-solving, asking thoughtful questions leading to the development of optimal solutions.
7. **Innovative Change Leader** – Creating new or innovative solutions, generating enthusiasm, and readily adapting to change. Being innovative can be both small and large scale. Understanding that change is constant and able to remain professional, resilient, and positive in the face of challenges or uncertainty. Viewing change as an opportunity for better outcomes and positively leading others to embrace the change.



WORKING RELATIONSHIPS:

Reporting to: Director of IT & Business Transformation

Team: EVP Corporate
Network & Security Specialist
IT Business Analyst (2)
IT Administration & Technical Support

WORKING ENVIRONMENT & PHYSICAL DEMANDS:

The work is primarily sedentary and carried out at an ergonomically equipped workstation in an office area. The workload is heavy, with high expectations. Potential hazards - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports).

JOB DESCRIPTION

JOB TITLE: IT Business Analyst
DEPARTMENT: Information Services
REPORTING: Director, IT, Cyber Security, & Business Transformation
DATE: July 2023

POSITION SUMMARY:

This position reports to the Director, IT, Cyber Security & Business Transformation.

This role will liaise between users, IT teams and external vendors to analyze business and functional requirements and establish data requirements and processes related to existing and new enterprise applications. In this role, the incumbent will assist in evaluating business requests to determine requirements, feasibility and recommend business solutions. You will work with internal users and external vendors to translate business requirements into technical implementation using a variety of enterprise applications.

This position will provide application support for the organization and work with Business Intelligence Reporting involving creating report content and training and support for end users. The incumbent will coordinate application software upgrades and update application and system documentation. This role will work with the Project Manager in information gathering, coordination with internal users and external vendors, and assisting with meeting organization objectives for the success of projects.

PRIMARY RESPONSIBILITIES:

- Assists with business requirements definition, creation, and maintenance of content for business reporting, including business intelligence, dashboards, KPI reporting and data analysis for application integration
- Contributes to the design and development of enterprise-level applications, solving diverse and complex business problems to continuously deliver against their respective goals, objectives, and business case
- Assists to develop, document, and maintain business and functional requirements. Conducts structured walkthroughs of requirements with business and project team members
- Work with project teams to support requirements gathering
- Facilitates the identification of business requirements and their definition
- Assists in developing test matrices and conducting thorough tests (UAT; QA as required)
- Assists in performing task automation and implements process improvements; recommends enhancements that result in increased quality and service
- Adopts hands-on approach in the detailed analysis of new and existing business processes for in-house and 3rd party vendor applications, including preparation of work specifications/design, code changes, testing, debugging, documentation, implementation, and end-user training

- Participates in cross-departmental 'Integration Team' discussions for strategic integrated solutions between various software applications as well as with external system environments
- Uses programming skills for new inquiries/screens/processes for 3rd party applications according to work specifications
- Facilitates and develops processes to support improvement or efficiencies in the business function through the use of technology
- Assists vendors with understanding and developing new software features based on end-user requirements
- Assists Users with Unit and QA Testing, including the construction of test scenarios, staging of test data sets, participating in the testing process and final analysis of test results
- Works with our Customer Information System (CIS) application, Cleo VL Trader, customer portals, and integration between different applications hosted internally and externally
- Works with business stakeholders and external partners to analyze business challenges and prioritize work to maximize the business value delivered
- All other duties as assigned

HEALTH & SAFETY RESPONSIBILITIES:

Take all reasonable and necessary precautions to ensure your health and safety and that of anyone else who may be affected by your work or activities. Participate in safety orientation/training along with the Internal Responsibility System (IRS). Perform duties in a safe and productive manner.

QUALIFICATIONS:

Education: An undergraduate degree in Computer Science or related discipline or an equivalent combination of education and work experience

Experience:

- Minimum 1-2 years of experience in business analysis, solutions analyst, or a similar technical role

Knowledge and Skills:

- Hands-on programming/technical experience
- Demonstrated knowledge of Data Structures
- Solid understanding of and demonstrated working knowledge in the construction of quality, performance-based SQL
- Experience with Report Writers (IBM COGNOS Business Intelligence would be an asset)
- Knowledge of software development life cycle, including functional and technical specification, documentation, QA processes, source control, maintenance, and deployments
- Hands-on coding skills using a variety of programming languages

- Expertise with relational databases and ability to navigate through relational data structure and experience working with SQL
- Experience with the use of business analysis practices and tools (e.g. MS Excel Pivot tables, MS Visio)
- Familiarity with integrations

Personal Characteristics:

- Ability to effectively prioritize and execute tasks in a high-pressure environment
- Understand and document data flows and system interactions
- Ability to be flexible when needed, take initiative and demonstrate accountability
- Intermediate interpersonal skills
- Ability to work well within a team environment and participate in department/team projects
- Ability to translate business needs and problems into viable/accepted solutions
- Basic negotiating and persuasion skills

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts.

Internal Contacts:

- I.T. department staff
- User department staff for hardware and software support

Outside Contacts:

- Numerous 3rd party business partners (vendors and consultants) providing supplementary support

WORKING CONDITIONS AND PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in bottom level office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

JOB DESCRIPTION

JOB TITLE: IT Infrastructure Specialist
DEPARTMENT: Information Services
REPORTING: Director, IT, Cyber Security, & Business Transformation
DATE: April 2025

POSITION SUMMARY:

The I.T. Infrastructure Specialist, under the direction of the Director, IT, Cyber Security, & Business Transformation is responsible for cyber security infrastructure administration, and all computer related technical support to end users, disaster recovery planning and execution, telephony and mobile applications.

PRIMARY RESPONSIBILITIES:

Security

- Implement appropriate security controls, to deter cyber-attacks and mitigate risks.
- Perform regularly scheduled Vulnerability Assessments to identify potential weaknesses in the IT infrastructure (hardware, software, and networks), protecting BHI data from unauthorized access and compromise/loss.
- Perform Penetration Tests (ethical hack) simulating real life hack attempts to determine degree of access available and tighten as necessary.
- Continually monitor IT networks for performance and abnormal activity.
- Maintain, administer and coordinate patch management on all devices.
- Ensure user staff is in compliance with security policies and procedures.

Disaster Recovery

- Architect, design, build to meet business defined requirements (BIA driven)
- Monitor Disaster Recovery site
- Ensure Disaster Recovery site is in synch with Data Center
- Annual Disaster Recovery testing – technical
- Annual Business Disaster Recovery testing – oversight

Technical Support

- Oversee service desk support position
- Provide support for PC workstations, servers, and associated devices (e.g. printers). This includes the initial setup of new equipment, and all operations necessary to replace or return repaired/upgraded equipment back into active service.
- Provide guidance and training to BHI staff in the proper use and care of PCs and micro software.
- Provide Virtual Server administration, after initial setup by the Network Administrator.

- Administer the Active Directory domain assignments.
- Maintain a computer assets log to track configurations, and replacement/upgrades schedule.

Email, Mobile & Telephony

- Administration and support of the corporate systems (1) email, (2) smart phone/mobile device standard (e.g. Blackberry) and (3) telephone working with outsourced service provider (e.g. Bell).

CYBER SECURITY RESPONSIBILITIES:

- Manage and monitor the performance, availability, and capacity of servers, networks, and other IT infrastructure components.
- Perform regular maintenance activities, such as patching, updates, backups, and configuration management.
- Manage cloud infrastructure (e.g., Azure) and virtualization environments (e.g., VMware, Hyper-V) to optimize performance and scalability.
- Provide technical support for infrastructure-related issues, including server failures, network outages, and storage problems.
- Regularly test disaster recovery procedures to ensure readiness in case of an incident.

HEALTH & SAFETY RESPONSIBILITIES:

Take all reasonable and necessary precautions to ensure your health and safety and that of anyone else who may be affected by your work or activities. Participate in safety orientation/training along with the Internal Responsibility System (IRS). Perform duties in a safe and productive manner.

QUALIFICATIONS:

Education: Completion of post-secondary education in Computer Science combined with continuing education

Experience: 3 – 5 years of cyber security and computer support experience. Industry and business applications experience such as SCADA and GIS mapping would be an asset.

Knowledge and Skills:

- In-depth working knowledge of cyber security administration and network protocols
- In-depth working knowledge of disaster recovery planning and execution
- General knowledge of technical hardware and network applications
- Experience managing multiple projects simultaneously
- Knowledge of electrical utility processes would be an asset

Personal Characteristics:

- Demonstrated record of leadership, team building, problem solving and organizational skills

- Strong internal customer/client service skills
- Excellent interpersonal and analytical skills
- Strong time management skills

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts.

Internal Contacts:

- I.T. department staff
- User department staff for hardware and software support

Outside Contacts:

- Numerous 3rd party business partners (vendors and consultants) providing supplementary support

WORKING CONDITIONS AND PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in bottom level office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

JOB DESCRIPTION

JOB TITLE: **Manager, Projects & Business Applications (Operational Technology)**
DEPARTMENT: I.T.
POSITION REVIEW: Fred Mughal (Leader) / Diana Lo (HR)
DATE: August 2024

POSITION SUMMARY:

Reporting to the Director, IT, Cyber Security & Business Transformation is responsible for leading projects and business applications related initiatives in the organization. In this role, the incumbent will oversee business applications lifecycle and management in areas of Geographical Information Systems (GIS), Outage Management System (OMS), Supervisory Control and Data Acquisition (SCADA) and other business applications. The incumbent is customer service oriented and possesses strong communication skills to foster positive relationships with internal IT staff, Engineering, Operations and external vendors.

In addition, reporting indirectly to the Director, Engineering Services, this role is also responsible for the functionality of GIS related to Engineering day to day processes by ensuring the connectivity is correct to retrieve accurate asset counts and that asset attributes are entered accurately by operators.

DIMENSIONS:

Departmental Reports (Direct / Indirect)

Direct – 3

PRIMARY RESPONSIBILITIES:

Departmental Activity

- Develop detailed project plans, identify requirements, manage project risks, issues, and dependencies in collaboration with all stakeholders.
- Work closely with cross-functional teams to ensure seamless project execution within defined timelines. Foster collaboration and communication among team members and stakeholders.
- Liaison between various departments/vendors to coordinate and administer software deployments, application testing, licenses, change requests, and bug fixes.
- Facilitate regular project meetings, providing clear direction and resolving any conflicts. Track project progress and performance against established metrics and KPIs.
- Oversee implementation, maintenance, and optimization of GIS and other components of OMS (including SCADA) that support the organization's operational processes.
- Act as facilitator and coordinator for application integration for grid modernization solutions.
- Integration with OMS, distribution management systems (DMS), and other DA systems to increase benefits of each individual smart grid technology.
- Coordinate with external vendors and service providers to ensure successful delivery of application services.
- Participate in industry working groups and committees to maintain best practices and influence decision making and improvement.

- Ensure that technology applications comply with relevant regulations, industry standards, and company policies.
- Work as part of IT security team to implement and maintain robust security measures for all applications.
- Develop and implement metrics to measure the effectiveness and ROI of applications.
- Lead initiatives to optimize processes, reduce costs, and improve the efficiency and effectiveness of applications.
- Foster a collaborative environment that encourages continuous learning and professional development.
- Incident analysis, using traditional analysis methods as well as emerging technologies such as machine learning and predictive analytics.
- Support operational and strategic business decisions, identify problem areas and opportunities.
- Manage a team of highly motivated, creative, and skilled individuals that includes a diverse skill set such as database administration, data engineering and GIS data modelling and analysis.
- Make appropriate business decisions to avoid unsafe or costly decisions to the organization and be able to analyze information to understand to make appropriate, realistic, and timely decisions.
- Confidently leads and develops people and teams in a changing and dynamic environment leveraging the skills of others and delegates courses of action towards the achievement of the strategy and vision of the Company.

Team Performance

1. Provide safety leadership ensuring safe, efficient, and timely completion of all required tasks in accordance with the Occupational Health & Safety Act & Regulations and Burlington Hydro Policies & Procedures; enforced as required
2. Ensure positive labour relations through proper administration of the Collective Agreement and company policies to ensure performance expectations are met and a positive work environment is maintained
3. Provide direction, including establishing goals and training requirements, performance evaluations, and coaching
4. Participate in the formulation of cascading strategic goals and objectives (task planning, budgeting, and staffing) for the department
5. Complete and file all work, progress and employee reports and/or records as required
6. Other duties as assigned

HEALTH & SAFETY RESPONSIBILITIES:

Ensure that those activities over which they have control are conducted in a safe manner and in accordance with the company's policies, programs and applicable legislation. This can be achieved through:

- Responding promptly to employee health and safety concerns;
- Attending mandatory health and safety training;
- Reviewing hazard/risk assessment reports for their department to ensure that employees receive appropriate training and that controls are in place to prevent injuries;

- Conducting and recording regular workplace inspections;
- Developing, implementing and maintaining emergency response and standard operating procedures/guidelines on work activities;
- Implementing and enforcing relevant safety rules and programs (e.g., use of personal protective equipment; advising staff of the existence of any potential and existing health and safety hazards; ensuring staff work in accordance with set instructions, procedures and guidelines; etc.);
- Investigating workplace accidents that occur, identifying root cause(s) and implementing remedial and preventative action

QUALIFICATIONS:

Education:

- University Degree related to Computer Science or Engineering, or a combination of education, training, and experience. A post graduate degree in a technical field will be an asset.
- PMP designation will also be an asset.

Work Experience:

- More than 5 years in a related IT/OT position with industry experience
- Minimum 3 years' experience as a manager or supervisor
- Prior management experience working in a highly collaborative environment with minimal supervision in all areas of responsibility.
- Strong understanding of utility operations technologies
- Proven experience with effectively managing a variety of projects with a demonstrated ability to manage people, projects, and multiple tasks with conflicting priorities.
- Experience in driving digital transformation and delivering improved business outcomes through effective deployment of technology.
- Experience initiating, influencing and gaining support across the organization for change initiatives.

Knowledge and Skills:

- Strong project management and analytical skills.
- Strong understanding of utility technologies.
- Strategic thinking and problem-solving abilities.
- Familiarity with Agile, Lean, or other project management methodologies.
- Proficiency in database management and system integration.
- Excellent communication and interpersonal skills, with the ability to work effectively with both technical and non-technical stakeholders.
- Demonstrated capability to effectively manage external service providers while fostering good working relationships.
- Proven advanced analytical and problem solving skills for resolution of complex assignments.

Personal Characteristics:

- Participative management style—advocate of team concept
- Excellent reasoning abilities with sound judgment and decisiveness
- Work independently, with a high degree of responsibility with a demonstrated commitment to high ethical standards
- High energy level, positive attitude
- Able to maintain composure during all situations
- Excellent verbal and written communication skills, interpersonal skills and a positive approach to work, co-workers, external vendors and key stakeholders that promotes a safe and respectful workplace
- Must be prepared to work under emergency and on-call situations

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts

Internal Contacts:

- I.T. department staff
- Internal departments across the company

Outside Contacts:

- External vendors

WORKING CONDITIONS & PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in an office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

JOB DESCRIPTION

JOB TITLE: Network and Security Specialist
DEPARTMENT: Information Services
REPORTING: Director, IT, Cyber Security, & Business Transformation
DATE: April 2025

POSITION SUMMARY:

The incumbent is responsible for BHI's overall network (LAN/WAN/Wireless/Firewalls) administration and implementation of security controls to protect organization networks, systems, and data. In addition, the Network and Security Specialist is responsible for the redesign of the corporate internal network on core, access, and distribution platforms. This role requires working closely with managed service providers to improve corporate security posture in compliance with Ontario Cyber Security Framework (OCSF).

One of the key responsibilities is managing security operations using various tools to monitor and work closely with vendors to reduce risk to organizational assets and data. The incumbent will play an integral role in recommending and implementing appropriate security controls to protect the BHI information assets from unauthorized access and compromise/loss, mitigate cyber-related risks, and ensure the overall network and security posture is aligned with business needs.

PRIMARY RESPONSIBILITIES:

- Design, implement, and troubleshoot the corporate network infrastructure, including core, access, and distribution layer network platforms.
- Manage firewall policies, rules, and IPSec tunnels. Routers and network switches (layer 2/3) installation, configuration (including backup / restore) and security management.
- Manage and configure the corporate wireless network, network security devices, VPN setup, RADIUS, DMZ and NAT configurations.
- Use SIEM to create reports, dashboards, and queries for security requirements.
- Implement security controls, defenses, and countermeasures to prevent attacks.
- Conduct threat analysis, including researching evolving threats, and provide recommendations to improve overall security posture.
- Maintain and manage policies for network access through vNets, NSGs and subnets in the Microsoft Azure environment.
- Assist in creating information security policies and procedures to support the organization's risk and information security governance program.
- Work with security vendors regularly to protect against emerging threats and develop controls to protect against security breaches.
- Assist in implementing information systems controls as per OCSF guidelines.
- Identify risk areas and provide recommendations to improve the organization's security posture, both for on-premises and cloud environments.

- Act as Subject Matter Expert (SME) and lead in implementing CIS best practices to strengthen the cybersecurity landscape for the organization.
- Support the corporate Business Continuity and Disaster Recovery (BCPDR) exercises and tests regularly.
- All other duties as assigned.

CYBER SECURITY RESPONSIBILITIES:

- Implement and maintain firewalls, intrusion detection/prevention systems (IDS/IPS), and other security solutions.
- Design, install, configure, and maintain network infrastructure, including routers, switches, firewalls, VPNs, and wireless networks.
- Perform regular security assessments, vulnerability scans, and penetration testing to identify and mitigate potential threats.
- Assist in the design and implementation of secure network architecture, applications, and systems.
- Evaluate and recommend security solutions, tools, and technologies to enhance the organization's security posture.

HEALTH & SAFETY RESPONSIBILITIES:

Take all reasonable and necessary precautions to ensure your health and safety and that of anyone else who may be affected by your work or activities. Participate in safety orientation/training along with the Internal Responsibility System (IRS). Perform duties in a safe and productive manner.

QUALIFICATIONS:

Education: Completion of post-secondary education in Computer Science combined with continuing education

Experience: 3 – 5 years of cyber security and computer support experience. Industry and business applications experience such as SCADA and GIS mapping would be an asset.

Knowledge and Skills:

- In-depth working knowledge of cyber security administration and network protocols
- In-depth working knowledge of disaster recovery planning and execution
- General knowledge of technical hardware and network applications
- Experience managing multiple projects simultaneously
- Knowledge of electrical utility processes would be an asset

Personal Characteristics:

- Demonstrated record of leadership, team building, problem solving and organizational skills
- Strong internal customer/client service skills

- Excellent interpersonal and analytical skills
- Strong time management skills

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts.

Internal Contacts:

- I.T. department staff
- User department staff for hardware and software support

Outside Contacts:

- Numerous 3rd party business partners (vendors and consultants) providing supplementary support

WORKING CONDITIONS AND PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in bottom level office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

JOB DESCRIPTION

JOB TITLE: Technical Support Analyst
DEPARTMENT: Information Services
REPORTING: Director, IT, Cyber Security, & Business Transformation
DATE: April 2025

POSITION SUMMARY:

The Technical Support Analyst, under the direction of the Director, IT, Cyber Security, & Business Transformation is responsible for providing first-level technical support to employees across all levels of the company.

PRIMARY RESPONSIBILITIES:

- Provide support for PC workstations, servers, and associated devices (e.g. printers). This includes the initial setup of new equipment, and all operations necessary to replace or return repaired/upgraded equipment back into active service.
- Provide guidance and training to BHI staff in the proper use and care of PCs and micro software.
- Provide Virtual Server administration, after initial setup by the Network Administrator.
- Administer the Active Directory domain assignments.
- Maintain computer assets log to track configurations, and replacement/upgrades schedule.
- Desktop support and deployment of new PCs/Laptops
- Network administration support
- Monitoring and recording of resource utilization (CPU/Disk/Memory utilization)
- Monitoring of backups
- Telephone VoIP support
- Telecommunications support
- Preparation of IT operations-based documentation
- Provides necessary written documentation per Burlington Hydro standards on a timely basis

CYBER SECURITY RESPONSIBILITIES:

- Manage and track IT assets, including hardware, software licenses, and warranties.
- Perform routine security system checks, updates, and maintenance tasks to prevent issues from arising.
- Provide basic network troubleshooting, including connectivity issues, password resets, and account access.
- Assist with setting up user accounts, email accounts, and permissions in compliance with IT policies.

HEALTH & SAFETY RESPONSIBILITIES:

Take all reasonable and necessary precautions to ensure your health and safety and that of anyone else who may be affected by your work or activities. Participate in safety orientation/training along with the Internal Responsibility System (IRS). Perform duties in a safe and productive manner.

QUALIFICATIONS:

Education: Post-Secondary degree/diploma in an IT-related discipline is required; preferably Network Administration

Experience: one to three years of related experience in an IT-related help-desk support role.

Knowledge and Skills:

- Ability to trouble shoot, problem solve and analyze issues for timely resolution of Technical Support Tickets and assignments
- Knowledge of operating systems, virtual machines, mail filters, network administration, vulnerability and patch management, release upgrade management, VPN communications, telecommunications, cloud and hosting related technology solutions, and desktop technical support would be an asset
- General knowledge of technical hardware and network applications
- Experience managing multiple projects simultaneously
- Knowledge of electrical utility processes would be an asset

Personal Characteristics:

- Results oriented with a strong sense of accountability and ownership with the ability to complete tasks on time and on budget
- Ability to work well under pressure
- Excellent attendance record
- Strong organizational and technical skills to support independent management and timely completion of work plan assignments and priorities
- Strong internal customer/client service skills
- Excellent interpersonal and analytical skills
- Strong time management skills

WORKING RELATIONSHIPS:

This position works frequently with internal and external contacts.

Internal Contacts:

- I.T. department staff

- User department staff for hardware and software support

Outside Contacts:

- Numerous 3rd party business partners (vendors and consultants) providing supplementary support

WORKING CONDITIONS AND PHYSICAL DEMANDS:

- Work is performed at an ergonomically equipped workstation located in bottom level office area and is mostly sedentary
- Potential hazards (minimal):
 - Ergonomic (extended visual concentration on computer monitor and paper based detailed reports)

CYBER SECURITY RELATED RESPONSIBILITIES:

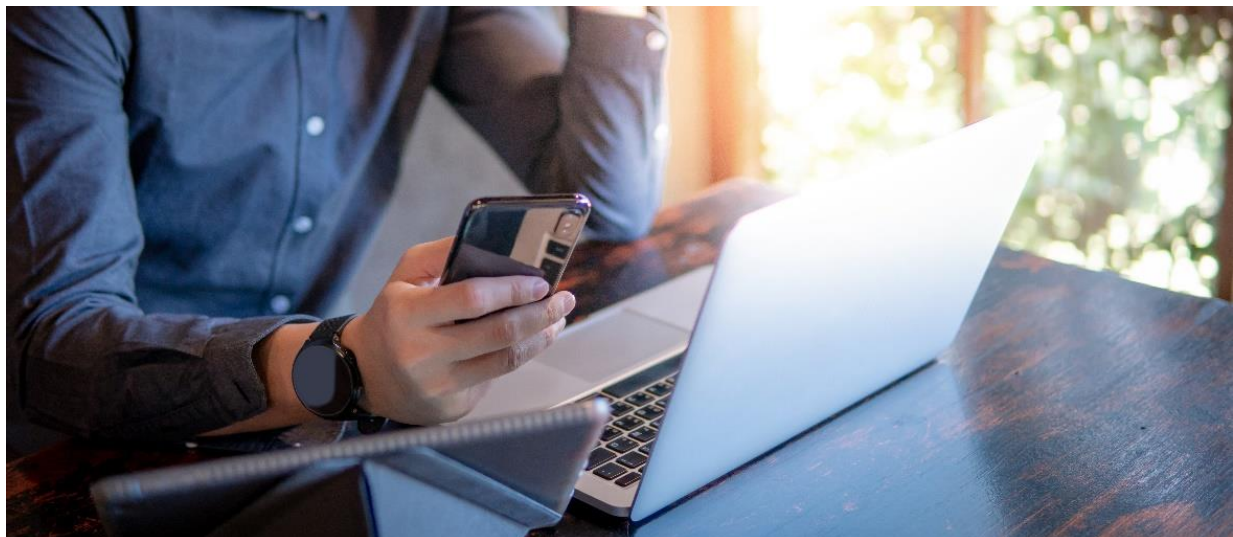
- Manage and track IT assets, including hardware, software licenses, and warranties.
- Perform routine security system checks, updates, and maintenance tasks to prevent issues from arising.
- Provide basic network troubleshooting, including connectivity issues, password resets, and account access.
- Assist with setting up user accounts, email accounts, and permissions in compliance with IT policies.

Appendix – 4-Intervenor-110h)

BURLINGTON HYDRO TECHNOLOGY STRATEGY OVERVIEW 2024



Burlington **hydro** inc.



CONFIDENTIAL – OCTOBER 2023

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EXECUTIVE SUMMARY

Burlington Hydro's corporate technology program focusses on aligning its technology strategies with the organization's corporate mission and vision, as well as its Enterprise Risk Management plans. Given the critical nature of the infrastructure and electricity distribution industry, integrating Information Technology (IT), Operations Technology (OT), and Internet of Things (IoT) into a corporate technology and cybersecurity management program is a wise approach.

The key elements outlined in this business plan aim to show in detail how the technology strategy will meet safety, reliability, value-based rates, infrastructure, efficiencies, and customer service needs, cybersecurity integration, Data management, sustainability, regulatory compliance, and emergency response as per the corporate plan.

INTRODUCTION

The Burlington Hydro (BHI) strategy focusses on a comprehensive approach to transforming the organization's technology and information systems that focuses on modernizing and integrating technology across the organization, with a strong emphasis on security, compatibility, and collaboration. It aligns with the broader goal of managing the organization's digital footprint effectively and ensuring information security from the outset of projects.

As the organization transitions to operate as an integrated enterprise, the shift from working as independent functional units to becoming an integrated enterprise is made abundantly clear resulting in breaking down silos between different departments and systems and ensuring that technology plays a central role in facilitating this integration. Allowing the technology department visibility and active participation in all aspects of the enterprise and its business applications. This ensures that technology is not an isolated entity but is deeply embedded in all operations.

By integrating various systems and applications, the strategy aims to reduce the risk of compatibility issues between different products and technologies. This is critical for seamless operations. This includes enhancing the organization's security and compliance with a robust cybersecurity framework, digitizing the organization by advising on system design, analysis, deployment, and enhancements, having a management overview of all operating environments, including IT, OT, and the Internet of Things (IoT), supporting other departments with the necessary technological requirements and ensuring medium to long-term technological strategic objectives for the organizations are successful.

CURRENT STATE

Through careful, collaborative, and pragmatic investments in technology, BHI continues to develop an effective and functional set of systems and toolsets that are positioned to meet both current and future needs of the organization. The following sections briefly describe BHI's current technology solutions, including On Premises, cloud, and hosted environments.

On Premises

Enterprise Resource Planning (ERP)
Supervisory Control and Data Acquisition (SCADA)
Outage Map System (OMS)
Geographic Information System (GIS)

Hosted

Customer Information System (CIS)
Public Outage Map System
Customer Account Portal

Cloud

Electronic Document Records Management System
Payroll Administration and HR Management System
Health & Safety Training Management System
HR Applicant Tracking Management System
Corporate Telephone System & Customer Call Centre

Customer Information System (CIS) Application

BHI successfully replaced our core Customer Information System (CIS) in 2021 with a current technology solution that is integrated with both a new Meter Data Management (MDM) System (2020) and a new 24X7 Customer Portal (2023). BHI is now preparing to launch the CIS system's integrated 24X7 Customer Move In/Move Mobile Application to provide our customers with the most current technology applications for timely processing of their Move In/Move requests. We note that the new MDM contains all customer consumption data which has positioned BHI for improved efficiency and accuracy in the preparation of key financial and operational reporting including Unbilled Revenue, Settlement Processing and Line Losses.

Enterprise Resource Planning (ERP) Application

BHI effectively upgraded the legacy version of the Enterprise Resource Management (ERP) application to a stable, supported, and secure version in Oct 2023. This organization wide project included training, testing and verification of modules functionality in new versions of the application. With this upgrade, the ERP system is now positioned for future integrations and sets the organization to meet its long-term strategic objectives.

Customer Portal

In 2020 a new integrated 24X7 Customer Portal was implemented which provides our customers with e-bill and TOU presentation. BHI is currently working with a third party to develop enhancements to its Customer Portal solution as part of the integration with our CIS using APIs. This new and enhance portal version is planned to be fully operational by the end of Oct 2023.

Outage Management System (OMS)

In the past, BHI partnered with its previous GIS mapping Vendor to develop and implement a custom Outage Management System (OMS). This OMS aggregates data from the SMART metering, SCADA, and GIS Pin Map platforms - producing a comprehensive central information repository of current system outages. Along with the Control Room operations staff, this outage information repository is also made available to the Customer Service department providing customers with the most up to date and complete outage information. Furthermore, this same outage information (including map illustrations of affected communities) is uploaded to the BHI corporate website for public viewing. BHI is going to work with a third party to implement a new OMS solution that is going to be fully integrated with a vendor specific SCADA system in future. This OMS solution will have a new public facing component as part of this solution.

Supervisory Control and Data Acquisition (SCADA)

BHI operates a fully functional SCADA system. This application utilizes a Windows based SCADA platform providing the organization with a complete perspective of its distribution network. The system includes robust alarming capabilities and interacts with automated switches that have assisted in reducing power outage occurrences across large sectors of the utility's service area. The utility continues to install radio controlled smart switches into its distribution network to further enhance the stability of its system. BHI has instituted significant measures to ensure the SCADA system is designed with effective failover coverage. A fully functional secondary control system is located at Milton Hydro, and a further fallback control mechanism is available remotely through most of BHI's substations.

In future, BHI intends to replace this SCADA system to fully integrate with a new OMS solution that is going to be in place for Year 2024.

Geographic Information System (GIS)

BHI upgraded to a technologically current and robust new GIS system in 2020. This product employs an open architecture solution enabling BHI to revisit and clean its spatial mapping and asset management data, in turn establishing a solid base for future integration with other enterprise systems. This recent GIS upgrade is a significant initial step in BHI's strategic move towards an integrated enterprise system. In 2022, BHI also implemented a real-time CIS-MDM-GIS integrated Transformer Capacity Inquiry which provides engineering with accurate and immediate information regarding transformer usage.

Electronic Document Records Management

Digitization of paper documents converts hardcopy documents to electronic format. Converting documents to electronic format allows BHI to implement integrated business processes with legacy systems for key electronic documents. Electronic documents are retrievable through cloud-based

instances and provide a secure method to access these documents from outside the corporate repository platforms.

Document imaging in addition provides improved security and protection. Instead of keeping sensitive records physically accessible, documents can be protected digitally using appropriate computer security measures. In 2018, BHI implemented a centralized Electronic Document Records Management System (EDRMS) that provides a secure repository for digitized key source business documents and supports full integration with other legacy systems. Initial digitization of key paper documents focused on value-based initiatives for HR, Payroll and Customer Service.

HR and Health & Safety Related Applications

BHI moved to cloud based HRIS systems in 2020 including Payroll Administration and Human Resources Management. Recent investments in 2021 included a recruiting module for applicant management and tracking. BHI invested in a cloud-based Health & Safety Training Management System in 2021 that provides for enterprise integration of all corporate training mandates.

Corporate Telephone System & Customer Call Centre

BHI upgraded to a cloud based corporate telephone system and call center to improve customer service experience and for effective management of customer requests. The system incorporates technological features which present opportunities for smart integration of Customer communication resulting in faster response to Customer inquiries. Pending upgrades include integrated Customer email, Customer chat sessions, enhanced reporting capability, improved internal operational efficiencies and cost savings.

CYBER SECURITY

Enterprise Risk Management (ERM) program categorizes different risk areas, and BHI's information security management program is focused to reduce these risks by implementing various security controls. Critical infrastructure and the local distribution services industry are under constant threats of cyber-attacks. BHI is currently working with several entities to secure interconnected networks, systems, and applications in readiness for an unforeseen cyber-attack.

While risk to information systems cannot be eliminated completely, BHI is focused on implementing security controls for residual risks for technology and digital footprint. BHI's participation in security governance programs managed by regulators and other entities is important to provide safeguards against every increasing threat of cyber-attacks.

As part of the inter-connected North American electricity grid, Burlington Hydro is an integral component of North America's critical infrastructure, which is under constant threat from other establishments and rogue nation-state actors. Therefore, it is imperative that BHI continues to coordinate cyber security collaboration with governmental agencies such as the Canadian Centre for Cyber Security (CCCS) at the Communications Security Establishment and the Canadian Cyber Threat Exchange and the IESO Cyber Security Forums.

BHI has strategic relationships with organizations that provide security services, including Managed Detection and Response (MDR) and Egress / Ingress Traffic monitoring on 24/7 basis. These services are

set up with the ability to disrupt the attacks before they can spread out to the entire network. BHI has network segmentation between IT and OT networks to reduce risk of network attacks to be able to infiltrate across all critical networks.

BHI is working closely with OEB to develop a new Ontario Cyber Security Framework (OCSF) which is based on NIST 800-53 security framework. This comprehensive security framework is focused on reducing risk in areas of ERM and expanding cyber threat landscape. BHI is working with other LDCs through OEB's Cyber Security Advisory Committee (CSAC) to get feedback for development of Maturity Indicator Levels (MIL) in this framework.

BHI is also working with other LDCs in Ontario through Grid Smart City Consortium (GSC) to utilize shared services where possible that will assist all LDCs to make progress on security functions identified in OCSF version 2.0. This shared services model helps BHI and other LDCs to learn from shared experiences and distribute costs associated with implementation of these security controls, to meet our budgetary requirements.

Below is a high-level overview of some of the BHI's Information Security program components.

1. Participation in IESO project lighthouse
2. Participation in security feeds provided by CCCS.
3. Participation in OEB's OCSF Development and Implementation
4. Participation in GSC Shared Services Model for Cyber Security
5. Strategic Partnership with MDR Service providers for 24/7 monitoring
6. Strategic Partnership with Organizations to protect perimeter network 24/7
7. Compliance with OEB OCSF security framework
8. Internal security controls as per industry best practice standards
9. Management of security risks associated with supply chain and third-party management.
10. Regular Security penetration tests to verify effectiveness of security controls.
11. Information Security Governance through Corporate Information Security Policies
12. Risk Assessment for all hosted and cloud solutions utilized by BHI on regular basis.
13. Evaluate Critical Vendors security controls effectiveness through Security Assessment Questionnaires
14. Internal evaluation of security controls and procedures on quarterly basis

IT STAFF DEVELOPMENT

Organizations spend considerable time and resources, starting all the way from hiring processes to staff training and so on. It is becoming challenging for organizations to retain trained, experienced, and knowledgeable staff. It could be more challenging for organizations with resources working in senior technical positions. With the changing market conditions for these technical roles, it has become important to define a strategy that would minimize the risks associated with staffing challenges.

BHI technology department is working to develop a strategy to retain the skill set required to support the organization's long-term strategy.

1. Role based positions have visibility in other areas of technology.

With integration of IT/OT/IoT technologies, and with intent to have visibility and awareness in all areas of digital footprint in BHI, the following roles are positioned to support BHI in achieving its objectives. The following roles will have visibility in other areas of technology and act as backups (as mentioned below), so shared knowledge is retained as part of risk mitigation strategy if a single resource leaves the organization. Here is an overview of different roles and their focused areas.

IT Infrastructure Specialist: This role is primarily focused on core technology infrastructure, with visibility into End User Compute role.

Technical Support Specialist: This role is primarily focused on End User Compute, with visibility into core technology infrastructure.

Network and Security Specialist: This role is primarily focused on IT/OT/IoT network layers and Cyber Security, with visibility into core technology infrastructure.

IT Business Analysts: These roles are primarily focused on supporting BHI's business applications such as CIS, ERP, and other enterprise applications, with each role having visibility into different enterprise applications.

Contractors / Temp Staff

As full-time staff with backup resources (mentioned above) are getting trained, dependency on contractors or temp staff will be reduced significantly that will help to bring down the cost.

2. Cyber Security and Critical Network Services

While BHI full time staff continues to work on day-to-day operational duties, projects, and support, it is vital to maintain strategic partnership with industry leading organizations who specializes in these areas and are market leaders to protect BHI against cyber and network security threats, especially on 24/7 basis.

These services include:

1. Managed Detection and Response (MDR)
2. Threat Response Unit (TRU)
3. Incident Response Unit and Retainers (IRUR)
4. Perimeter Network Security Management

These services are critical for protection against ever increasing cyber threat landscape. Given a smaller LDC, it is not financially feasible to hire internal staff to look after these security services on a 24/7 basis. Secondly, these partner organizations have sophisticated systems, network feeds and industry experience to protect organizations like BHI. This strategic partnership is required regardless of current staff duties and assignments.

3. Critical Vendor Management

Enterprise and Business applications such as CIS, ERP, OMS are critical and sophisticated applications software. Developers of these products are well positioned to make modifications to code libraries based on changing business requirements. For example, JOMAR for CIS, Milsoft for ERP and Hitachi / Sienna for OMS products are providing strategic support and services as part of BHI's critical vendor management program. BHI works with these partner vendors on a regular basis for continuous risk management, supply chain management and ensure availability of services within reasonable cost and budgetary constraints. BHI strategy is currently focused on working on a balance between getting these services directly from vendor while take on some of that work by internal BHI staff (IT Business Analysts)

FUTURE OUTLOOK

With innovations in technology and increasing cyber threats to organization, BHI is focused on utilizing modern solutions to improve services provided to its customers. Below is a list of some of the technologies that BHI plans to integrate into its digital footprint.

- **Cloud Based Applications** - BHI has started utilizing cloud computing services for many enterprises and business applications to improve customer service, enhance business processes, and availability of services for remote access.
- **Mobile Computing** - BHI has started utilizing mobile computing tablets to use out in the field for current and upcoming projects such as smart metering integration with CIS system.
- **Generative Technologies** - BHI is in the constant process of reviewing generative technologies for digital transformation and business processes improvements.
- **Upgrade and Update of Existing Applications** - BHI constantly updated and upgrade existing systems and applications based on vendor recommendations, and security advisories to bring products to stable and support releases, and to address security concerns as part of information systems governance program.

- **Information Security Policies** - With recent developments in technology and increased risk of cyber-attacks, BHI is in process of developing information security policies as part of cyber security governance program.

The following are some of the technology strategies and activities that is planned for 2024:

1. The development of an enterprise technology governance framework to assist the organization in its digital transformation efforts.
2. Enhancements to BHI's Information Security Management and governance program to align with changing trends and evolving threat landscapes.
3. The implementation of critical functions identified in Ontario Cyber Security Framework (OCSF) based on the NIST 800-53 cyber security framework.
4. We will engage with the GridSmartCity cooperative to leverage and utilize solutions as part of shared services initiatives.
5. Initiate security enhancements to our systems, networks, and applications will be conducted within the allocated and planned budgets for 2024.
6. Ensure continuous and regular updates of all relevant technology solutions to reduce risk associated with legacy systems and applications.
7. Where applicable, identify new technologies to improve business efficiency, productivity and service to customers. This includes, but is not limited to, Cloud applications, hosted applications, and use of new generative applications.
8. Enhancements to our strategic partnerships with industry vendors, suppliers and organizations that provide 24/7 critical monitoring of all systems and applications, with the ability to deploy disrupters to reduce risk associated with widespread security exploitation.
9. The creation of centralized repositories to document information flow and system mappings as part of our digitization efforts. We will use these libraries for future enhancements, including business intelligence reporting.
10. The development of benchmarks for enhancements in enterprise applications, such as Customer Information Systems (CIS), Enterprise Resource Planning (ERP), Customer Portal and Outage Map systems.
11. Enhancements to the Business Continuity Planning and Disaster Recovery (BCPDR) program to support the organization's Enterprise Risk Management (ERM) program.

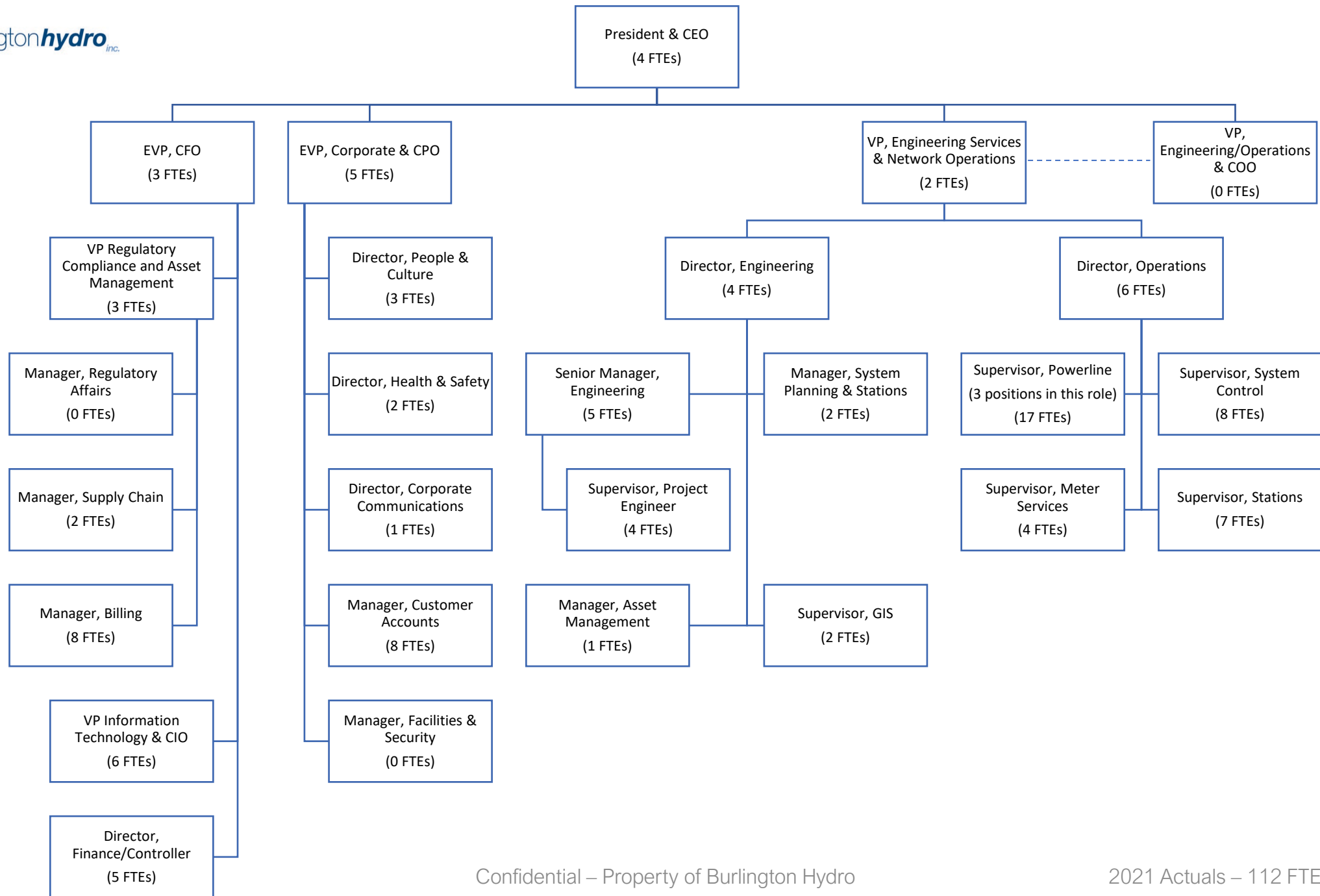
SUMMARY

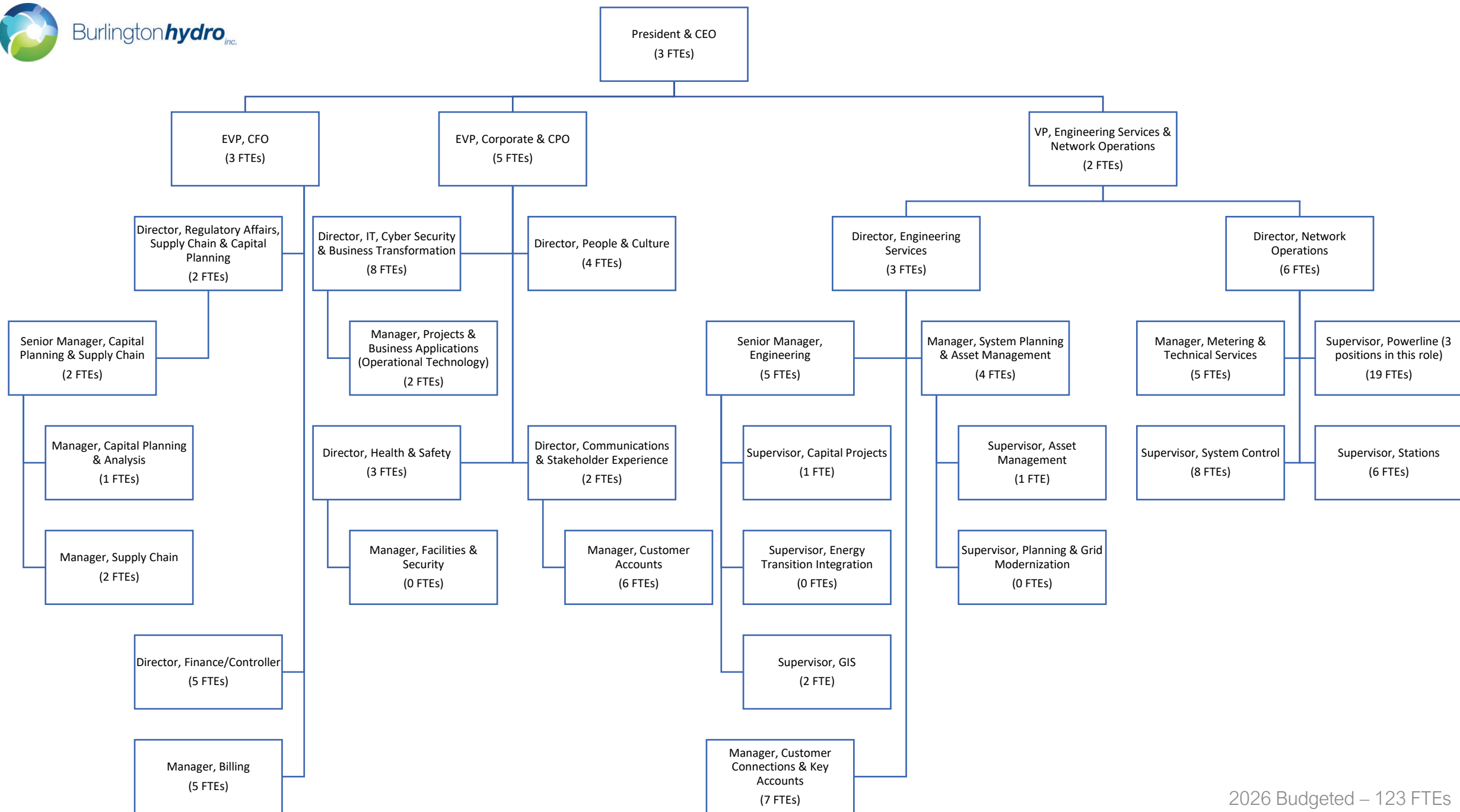
The BHI Technology department's primary focus is to align its strategy with the broader corporate strategy and the Enterprise Risk Management program where technology initiatives are not pursued in isolation but are driven by the organization's overarching goals and risk management considerations.

The organization stays vigilant by continuously monitoring the development and adaptation of new technologies with initiatives designed with the end-users in mind, aiming to enhance their experience and satisfaction.

The BHI Technology department intends to operate with a strategic and risk-aware approach, emphasizing collaboration, compliance, cost-effectiveness, and customer satisfaction.

Appendix – 4-Intervenor-115f)





Appendix – 4-Intervenor-117b)



Burlington **hydro** inc.

2024 INCENTIVE COMPENSATION PLAN

MANAGEMENT and NON UNION EMPLOYEES

CONFIDENTIAL

INCENTIVE COMPENSATION PLAN

OBJECTIVE:

The Burlington Hydro Inc. Incentive Compensation Plan is designed to promote teamwork and encourage all plan participants to achieve the overall mission, strategy, and objectives of the Company.

THE PLAN:

The Plan will activate if there is no negative impact to our forecasted Shareholder Dividend as approved by the Board of Directors. Corporate Financial Objectives are measured at the end of the fiscal year, after receipt and approval of the audited financial statements. Payment of the forecasted Dividend must be achieved in order for the Incentive Plan to activate.

When the above is achieved, the following two components to the Plan will be activated:

1. Corporate Objectives:

Corporate Objectives are established at the beginning of each fiscal year.

The Corporate objectives component of the Plan includes the overall Company's achievements that are measured against the Balanced Scorecard. The following are the four corporate objective categories:

- Financial,
- Customer Service/Stakeholder,
- Operations and Internal Processes and
- Employee.

Please see figure 2 for goals and objectives for this component of the plan. The Corporate objectives weightings assigned for each position grade are outlined in Figure 1 below.

2. Individual Performance Objectives:

The second component of the plan is comprised of individual performance objectives. Each eligible employee will work with their respective manager to develop annual performance objectives that link to the organizational goals and objectives of improved financial performance, improved customer service, learning and growth of the organization and/or improved processes. If the employees stated objectives are met or exceeded, the individual Incentive component would activate.

Depending on the individuals position to impact the Corporate Balanced Scorecard Objectives there could be as few as two and as many as five objectives will be selected for each employee.

- a) Annual individual performance objectives will be measured in terms of each participant's achievement of key individual objectives mutually determined in advance with the participant's Manager and the President. Individual goals will be established to reflect truly significant accomplishments which support the organization's Balanced Scorecard. Adjustments may be made to the list of contributions and achievements in order to more fully recognize significant individual results during the fiscal year.
- b) The objectives will be mutually agreed upon, with weightings assigned to each. The total weight assigned to all must equal 100%.

The Individual Performance objectives weightings assigned for each position grade are outlined in Figure 1 below.

ELIGIBILITY:

All management and management support staff are eligible to participate in the Incentive Compensation Plan. The target incentives are payable on the previous year's base earnings. Incentive compensation payments will be at the sole discretion of the Board of Directors and are not considered automatic, retroactive, or precedent based. Employees must achieve their individual objectives and an employee must be in active, full-time employment with the company at the time of payout. Employees also must meet acceptable standards of performance to be eligible for this incentive.

The Board reserves the right to claw back incentive payments awarded if financials are materially restated or misconduct has occurred by Management.

Figure 1: Salary Grade and Incentive Eligibility

Position	Target Incentive	Corporate BSC Measures Weighting	Individual Measures linked to BSC Weighting
President		70% of Incentive	30% of Incentive
EVP Vice President		60% of Incentive	40% of Incentive
Director		50% of Incentive	50% of Incentive
Manager/Supervisor		40% of Incentive	60% of Incentive
Management Professionals		30% of Incentive	70% of Incentive
Support staff for Management		30% of Incentive	70% of Incentive

Target Performance Incentive:

When setting corporate and individual performance targets and ranges, consideration will be given to the probability of achieving each level of performance. Therefore, when taking into consideration the above target performance incentive, threshold performance should be achievable most of the time (80-90%), target performance approximately half the time (50-60%) and maximum performance only 20% of the time. Maximum performance range is considered a real stretch and if attained the reward opportunity will be set at 1.5x target incentive payout eligibility. See below example:

Example	Payout Opportunity (% of Salary) (% of Target Bonus)			
	Min	Threshold	Target	Maximum
Position	0.0%	2.5% 50%	5% 100%	7.5% 150%

Figure 2: Corporate 'Balanced Scorecard' Components

OBJECTIVES:

1. Financial – EBIT - Weighting 50%

Target – (10% above Budget)

	Thresh	%	%	%	%	Target	%	%	%	%	Max
EBIT	90%	94%	98%	102%	106%	110% Budget	112%	115%	117%	120%	122%
Payout	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5

2. Customer/Stakeholder – Customer Experience Satisfaction - Weighting 15%

Target – BHI Customer Experience Rating – Historical Average

	Thresh	%	%	%	%	Target	%	%	%	%	Max
Customer Experience Satisfaction	86%	87%	88%	89%	90%	91%	92%	93%	94%	95%	96%
Payout	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5

3. Operations - Reliability – CAIDI (OEB) Weighting 15%

Target – 1.59

	Thresh	%	%	%	Target	%	%	%	Max
Reliability	10% of Target 1.74	1.70	1.66	1.62	1.59	1.55	1.51	1.47	10% under Target 1.43
Payout	0.5	0.625	0.75	0.875	1.0	1.125	1.25	1.375	1.5

4. **Employee – No Lost Time Injuries - Safe Work Environment – Weighting 10%**

Target – LTI - 3 year Rolling Average Frequency – 1.2

	Thresh			Target					Max
LTI Frequency	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0
Payout	0.5	0.666	0.832	1.0	1.1	1.2	1.3	1.4	1.5

5. **Employee – Non-Lost Time Injuries - Safe Work Environment – Weighting 10%**

Target – NLTI 3 year rolling average Frequency – 3.5

	Thresh					Target					Max
NLTI Frequency	5.5	5.1	4.7	4.3	3.9	3.5	3.28	3.06	2.84	2.62	2.4
Payout	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5

Appendix – 4-Intervenor-120c)

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
3M	Fast Moving Consumer Goods			ON
3sHealth	Services			SK
A&W Food Services of Canada Inc.	Retail			BC
AbeBooks	Retail			BC
Abercrombie & Fitch Co. - Abercrombie	Retail			ON
AB-InBev Group	Fast Moving Consumer Goods			ON
Acciona	Construction and Materials			BC
Aegion	Utilities			AB
Agnico-Eagle Mines Limited	Natural Resources			ON
Air Products Canada Ltd.	Chemicals			ON
Akzo Nobel Coatings Ltd.	Chemicals			ON
Akzo Nobel Wood Coatings Ltd.	Chemicals			ON
Alamos Gold Inc.	Natural Resources			ON
Alectra Utilities Inc.	Utilities			ON
Alimentation Couche-Tard	Retail			QC
Alkegen	High Technology			ON
Allied Universal	Services			ON
ALSTOM Power Canada Inc	Transportation			AB
Amazon Canada	Retail			ON
Ambler Metals LLC	Natural Resources			YT
Amcor Rigid Plastics	Industrial Goods			ON
American Eagle Outfitters Canada Inc.	Retail			ON
Amgen Canada, Inc (CA)	Life sciences			ON
Amway Canada Corporation	Retail			ON
AOC Aliancys	Chemicals			ON
ArcelorMittal - Baffinland Iron Mines Corporation	Natural Resources			ON
ArcelorMittal Mines Canada	Natural Resources			QC
ArcelorMittal TOPEX	Natural Resources			ON
ArcelorMittal Tubular Products Canada G.P.	Industrial Goods			ON
Archer-Daniels-Midland Company (Canada) Ltd.	Industrial Goods			ON
Argonaut Gold Inc.	Natural Resources			ON
Arlanxeo Canada Inc.	Chemicals			ON
Armaceil Canada Inc.	Construction and Materials			ON
Artemis Gold	Natural Resources			BC
AT&T Inc.	Telecommunications			ON
ATCO Wood Products Ltd.	Natural Resources			BC
Atlantic Gold Corporation	Natural Resources			BC
Atlantic Lottery Corporation	Leisure and Hospitality			NB
Atlantic Packaging Products Ltd.	Consumer Durables			ON
Autoliv	Industrial Goods			ON
Avis Budget Group, Inc.	Transportation			ON
Axiall Canada Inc.	Chemicals			QC
Baker Hughes Canada Company	Oil and Gas			AB
Ball Aerosol Packaging	Natural Resources			ON
Ball Corporation	Consumer Durables			ON
Ball Metal Beverage Packaging	Natural Resources			ON
Barilla	Fast Moving Consumer Goods			ON
Barrick Gold Corporation	Natural Resources			ON
Bass Pro Shops	Retail			ON
Bath and Body Works	Retail			ON
Bayer Inc.	Life sciences			ON
Bed Bath & Beyond	Retail			BC
Bell Canada	Telecommunications			QC
Bericap North America Inc.	Industrial Goods			ON
BHP Billiton Limited	Natural Resources			ON
BigSteelBox Corporation	Retail			BC
Black Cat Blades Ltd.	Industrial Goods			AB
Bluewater Power Distribution Corporation	Utilities			ON
BMW AG	Industrial Goods			ON
Boehringer Ingelheim (Canada) Ltd.	Life sciences			ON
Boortmalt	Fast Moving Consumer Goods			SK
Boyd Group Services, Inc.	Services			MB
Brand Loyalty Canada Corp.	Services			ON
Brand Loyalty International	Services			ON
Brantford Energy Group of Companies	Utilities			ON
Bristol-Myers Squibb Canada Co.	Life sciences			QC
British Columbia Lottery Corporation	Leisure and Hospitality			BC
Buckman Laboratories of Canada Ltd.	Chemicals			QC
Burberry Canada	Retail			AB
Burger King Corporation	Leisure and Hospitality			ON

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
Bylands Nurseries Ltd.	Natural Resources			BC
Cabot Canada Ltd.	Chemicals			ON
Canada Post Corporation	Transportation			ON
Canna	Retail			ON
Canpotex Limited	Natural Resources			SK
Capstone Mining Corp.	Natural Resources			BC
Carrier Corporation	High Technology			ON
Carter's Canada	Retail			ON
Caterpillar of Canada Corporation	Industrial Goods			ON
Centerra Gold Inc.	Natural Resources			ON
Centre for Probe Development and Commercialization	Life sciences			ON
CEPSA Química Bécancour	Chemicals			QC
Ceva Sante Animale	Life sciences			ON
Charlotte Tilbury	Retail			ON
CHEP Canada Inc.	Industrial Goods			ON
Church & Dwight Canada	Fast Moving Consumer Goods			ON
CI Investments Inc.	Services			ON
CKF Inc.	Fast Moving Consumer Goods			NS
Cloudflare	High Technology			ON
Coke Canada Bottling	Fast Moving Consumer Goods			ON
COLAS SA	Construction and Materials			ON
Coloplast	Life sciences			ON
Copper Mountain Mining Corporation	Natural Resources			BC
Corbion Canada	Chemicals			ON
Corteva Agriscience	Chemicals			AB
COWI	Services			ON
CRH Canada Group Inc.	Construction and Materials			ON
CSG International	High Technology			AB
CSW Industrials, Inc.	Industrial Goods			BC
Curium North America	Life sciences			QC
Danfoss Canada	Industrial Goods			ON
Dart Canada Inc	Industrial Goods			ON
DB Schenker	Transportation			ON
Deckers	Retail			BC
Delicato Family Wines	Fast Moving Consumer Goods			BC
Desigual	Retail			QC
Destination Canada	Services			BC
Devanlay Lacoste	Retail			QC
Digital Boundary Group	Services			ON
Dominion Diamond Corporation - Ekati Diamond Mine	Natural Resources			NT
Dr. Oetker Canada Ltd.	Fast Moving Consumer Goods			ON
Draeger	Life sciences			ON
Dymax Corporation	Chemicals			ON
Dyno Nobel Canada Inc.	Chemicals			AB
E.L.K. Energy Inc.	Utilities			ON
Eaton Corporation	Industrial Goods			ON
EDP Renewables	Utilities			ON
Elemental Technologies	Retail			ON
Elexicon Energy	Utilities			ON
Energy+ Inc.	Utilities			ON
EnerSys Canada Inc.	Industrial Goods			ON
Entegrus Inc.	Utilities			ON
EnWin Utilities Ltd.	Utilities			ON
EPCOR Electricity Distribution Ontario Inc.	Utilities			ON
Epocal Inc.	Life sciences			ON
ERTH Power Corporation	Utilities			ON
ESAB	Industrial Goods			ON
ESC Corporate Services Ltd.	Services			ON
Essex Powerlines Corporation	Utilities			ON
Evolution Mining	Natural Resources			ON
Evonik Canada Inc.	Chemicals			ON
Exact Sciences	Life sciences			NS
Ferrero Canada Limited	Fast Moving Consumer Goods			ON
Festival Hydro Inc.	Utilities			ON
First Majestic Silver Corp.	Natural Resources			BC
First Quantum Minerals	Natural Resources			BC
Fisher & Paykel Healthcare	Life sciences			QC
Fort Frances Power Corporation	Utilities			ON
FortisBC Alternative Energy Services Inc.	Utilities			BC
FortisBC Energy Inc.	Utilities			BC

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
FortisBC Holdings Inc.	Utilities			BC
FortisBC Inc.	Utilities			BC
FortisBC Midstream Inc.	Utilities			BC
Fossil Canada	Retail			ON
Franklin Electric	Utilities			ON
Frulact - Canada	Retail			ON
Fundserv Inc.	Services			ON
Gallant Custom Laboratories, Inc	Life sciences			ON
Gap (Canada) Inc.	Retail			ON
GE Gas Power	Utilities			ON
General Kinetics Engineering Corporation	Industrial Goods			ON
Gerdau Long Steel North America	Natural Resources			ON
Glatfelter Gatineau Ltée	Natural Resources			QC
GlaxoSmithKline Inc.	Life sciences			ON
Glencore Canada Corporation - Copper	Natural Resources			ON
Glencore Canada Corporation - Nickel - Sudbury	Natural Resources			ON
Glencore Canada Corporation - Zinc	Natural Resources			QC
Global Infrastructure Hub	Services			ON
GrandBridge Energy Inc.	Construction and Materials			ON
Granite Construction Inc.	Construction and Materials			AB
Greater Sudbury Hydro Inc.	Utilities			ON
Greater Toronto Airports Authority	Transportation			ON
Greater Victoria Harbour Authority	Transportation			BC
Grieg Seafood BC	Natural Resources			BC
Griffith Foods Limited	Fast Moving Consumer Goods			ON
Grimsby Power Incorporated	Utilities			ON
Groupe SEB Canada Inc.	Consumer Durables			ON
Halliburton	Oil and Gas			AB
Halton Hills Hydro Inc.	Utilities			ON
Hendrix Genetics	Life sciences			ON
Holt Renfrew	Retail			ON
Home Depot	Retail			ON
Home Hardware Stores Limited	Retail			ON
Honda Canada Inc.	Industrial Goods			ON
Hong Kong Tourism Board	Leisure and Hospitality			ON
Hotelbeds	Leisure and Hospitality			BC
Hottinger Bruel & Kjaer Inc.	High Technology			QC
HudBay Minerals Inc.	Natural Resources			ON
Huntsman Polyurethanes	Chemicals			ON
Husky Injection Molding Systems Ltd.	Chemicals			ON
Hydro Ottawa Limited	Utilities			ON
Hydrofarm Holdings Group Inc.	Industrial Goods			BC
Hyundai	Industrial Goods			ON
IAMGOLD Corporation	Natural Resources			ON
IFCO Systems Management GmbH	Industrial Goods			ON
IFF Nutrition and Biosciences	Chemicals			ON
Impala Canada Ltd.	Natural Resources			ON
Ineos Composites	Chemicals			AB
INEOS Group	Chemicals			AB
Information Services Corporation	Services			SK
Innophos Canada Inc.	Chemicals			ON
InnPower Corporation	Utilities			ON
Instacart	Retail			ON
International Flavors & Fragrances Canada Ltd.	Chemicals			ON
International Institute of Business Analysis	Services			ON
Intrepid Travel Pty. Ltd.	Leisure and Hospitality			ON
Ivanhoe Mines Ltd.	Natural Resources			BC
J.D. Irving, Limited	Natural Resources			NB
Jaguar Land Rover	Industrial Goods			ON
John Deere Limited Canada	Industrial Goods			ON
Johnson & Johnson	Life sciences			ON
JTI-Macdonald Corp.	Fast Moving Consumer Goods			ON
K92 Mining Inc.	Natural Resources			BC
Kellogg Canada Inc.	Fast Moving Consumer Goods			ON
Kia	Industrial Goods			ON
Kimberly-Clark Corporation	Fast Moving Consumer Goods			ON
Kinross Gold Corporation	Natural Resources			ON
Kirkland Lake Gold Inc.	Natural Resources			ON
Kitchener-Wilmot Hydro Inc.	Utilities			ON
Kiva	Retail			ON

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
Klockner-Pentaplast	Chemicals			QC
Kognitiv Corporation	High Technology			ON
Komatsu Mining Corp. Group	Industrial Goods			AB
Kongsberg Maritime Canada Ltd.	High Technology			BC
Koninklijke Vopak	Oil and Gas			QC
Kubota Canada Ltd.	Industrial Goods			ON
Lake Shore Gold Corp.	Oil and Gas			ON
Lakefront Utility Services Inc.	Utilities			ON
Lakeland Power Distribution Ltd.	Utilities			ON
Lantic Inc.	Industrial Goods			QC
LANXESS Canada Co./Cie	Chemicals			ON
Lavazza Group	Fast Moving Consumer Goods			BC
LEGO	Consumer Durables			ON
Lhoist North America, Inc.	Natural Resources			BC
LifeLabs	Life sciences			ON
LifeScan	Life sciences			BC
London Hydro	Utilities			ON
Louisiana-Pacific Corporation	Construction and Materials			QC
Lowe's	Retail			ON
Loyalty Solutions Canada Inc	High Technology			ON
Lundin Mining Corporation	Natural Resources			ON
Luxottica Group	Retail			ON
LVMH Moët Hennessy Louis Vuitton	Retail			ON
Magna International Inc.	Industrial Goods			ON
Magotteaux International	Industrial Goods			QC
MAHLE Filter Systems North America, Inc.	Chemicals			ON
Mallinckrodt Pharmaceuticals	Life sciences			QC
Malvern Panalytical	Life sciences			QC
Marathon Gold	Natural Resources			ON
Maritime Electric Company	Utilities			PE
Mary Kay	Retail			ON
Mazda Canada	Industrial Goods			ON
McElhanney Ltd.	Services			BC
McEwen Mining Inc.	Natural Resources			ON
Mega Group Inc.	Retail			SK
Messer Canada Inc.	Chemicals			ON
Methanex Corporation	Chemicals			BC
Metrolix	Transportation			ON
Mexichem Fluor Canada Inc.	Chemicals			ON
Michaels Stores, Inc.	Retail			ON
Michelin North America (Canada) Inc.	Natural Resources			QC
Milton Hydro Distribution Inc.	Utilities			ON
Mission Group Enterprises -- Construction	Construction and Materials			BC
Mitsubishi Canada Limited	Natural Resources			BC
Mitsubishi Motor Sales of Canada, Inc.	Natural Resources			ON
Mobis Parts Canada Corporation	High Technology			ON
Montréal-Pierre Elliott Trudeau Airport	Transportation			QC
Moosehead Breweries	Fast Moving Consumer Goods			NB
Nalcor Energy	Utilities			NL
NB Power Holding Corporation	Utilities			NB
NDT Global Ltd.	Oil and Gas			AB
New Gold Inc.	Natural Resources			ON
Newfoundland and Labrador Hydro	Utilities			NL
Newmarket-Tay Power Distribution Ltd.	Utilities			ON
Newmont Mining Corporation	Natural Resources			BC
Niagara Peninsula Energy Inc.	Utilities			ON
Nickel Institute	Natural Resources			ON
Nike Canada	Retail			ON
Nissan	Industrial Goods			ON
Nokian Tyres Canada Inc.	Industrial Goods			ON
Nordstrom, Inc.	Retail			ON
North Bay Hydro Distribution Limited	Utilities			ON
Northern Ontario Wires Inc.	Utilities			ON
Nutreco Canada Inc.	Natural Resources			ON
Nvision Insight Group	High Technology			ON
Occidental Chemical Corporation	Chemicals			ON
OceanaGold Corporation	Natural Resources			BC
Oldcastle Building Products Canada, Inc.	Construction and Materials			NB
Olin Corporation	Chemicals			QC
Omega	Industrial Goods			QC

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
Ontario Cannabis Store	Retail			ON
Ontario Lottery and Gaming Corporation	Leisure and Hospitality			ON
Ontario Power Generation	Utilities			ON
Orangeville Hydro Limited	Utilities			ON
Orla Mining Ltd.	Services			BC
Oshawa PUC Networks Inc.	Utilities			ON
Össur Americas	Life sciences			BC
Ottawa River Power Corporation	Utilities			ON
Pandora Jewelry LTD	Retail			ON
Pandora Retail Canada LTD	Retail			ON
Penske Truck Leasing	Transportation			ON
Pet Valu Canada Inc.	Retail			ON
Peterborough Utilities Group	Utilities			ON
PetSmart, Inc.	Retail			ON
Philippine Airlines Inc.	Transportation			ON
Pluralsight	Services			ON
Popeye's Louisiana Kitchen	Leisure and Hospitality			ON
Porsche	Industrial Goods			ON
Prima Solutions	High Technology			QC
PRYSMIAN	High Technology			ON
PUC Services Inc.	Utilities			ON
Qualico	Construction and Materials			MB
Rain Carbon Canada	Chemicals			ON
Ralph Lauren Corporation	Retail			BC
Randstad Global	Services			ON
Red Bull	Fast Moving Consumer Goods			ON
Resideo Technologies	Retail			ON
Restaurant Brands International	Leisure and Hospitality			ON
Richemont	Retail			ON
Rio Tinto Alcan	Natural Resources			QC
Rocket Software	High Technology			ON
Rothmans, Benson & Hedges Inc.	Fast Moving Consumer Goods			ON
Royal DSM	Life sciences			ON
Royal Group Inc.	Construction and Materials			ON
SABIC Innovative Plastics Canada Incorporated	Chemicals			ON
SaskTel	Telecommunications			SK
Save on Foods	Retail			BC
Schweitzer Engineering Laboratories	Industrial Goods			BC
SeneGence International	Consumer Durables			ON
Sherritt International Corporation	Natural Resources			ON
SHPP Canada Inc.	Chemicals			ON
Siegwerk Canada Inc.	Chemicals			ON
Siemens Canada Limited	High Technology			ON
Siemens Electronic Design Automation	High Technology			ON
Siemens Energy AG	Industrial Goods			ON
Siemens Healthineers	Life sciences			ON
Siemens Industry Software	High Technology			ON
Siemens Logistics	Transportation			ON
Siemens Mobility	Industrial Goods			ON
Sika Canada Inc.	Construction and Materials			QC
Sioux Lookout Hydro	Utilities			ON
Smurfit Kappa Bag-In-Box Canada	Fast Moving Consumer Goods			ON
Solar Turbines Incorporated	Industrial Goods			AB
Solvay Canada	Chemicals			ON
South32	Natural Resources			BC
Spectrum Brands	Consumer Durables			ON
St. Lawrence Seaway Management Corporation	Utilities			ON
Standex International -- Mold-Tech - Canada	Chemicals			ON
Standex International -- ATC Frost Magnetics	High Technology			ON
Staples Business Depot	Retail			ON
Star Diamond Corporation	Natural Resources			SK
Subway Franchise World Headquarters LLC	Fast Moving Consumer Goods			BC
Suncorp Valuations	Services			SK
SwordFish	Retail			ON
Syncreon	Transportation			ON
Synergy North	Utilities			ON
Tafisa Canada	Natural Resources			QC
Tapestry	Retail			ON
Targray Technology International Inc	High Technology			QC
Teck Resources Limited	Natural Resources			BC

Organization Name	Segment	Revenue Category	Number of Employees Category	Head Quarter Location
The Andersons, Inc.	Natural Resources			ON
The Beer Store	Retail			ON
The Chemours Company	Chemicals			ON
The Children's Place	Retail			ON
The Lubrizol Corporation	Chemicals			ON
The Mosaic Company	Natural Resources			SK
Thermal & Specialized Solutions (TSS)	Chemicals			ON
Thunder Bay Port Authority	Transportation			ON
Ticketmaster	Leisure and Hospitality			ON
Tim Horton's	Leisure and Hospitality			ON
TJX Companies	Retail			ON
TMF Canada Operations Inc.	Services			ON
Tolko Industries Ltd.	Natural Resources			BC
Torex Gold Resources Inc.	Natural Resources			ON
Torrid	Retail			ON
Toyota Canada Inc.	Industrial Goods			ON
Toyota Motor Corporation	Industrial Goods			ON
Toyota Motor Manufacturing Canada Inc.	Industrial Goods			ON
Travel Alberta	Leisure and Hospitality			AB
Travel Nation Canada	Leisure and Hospitality			ON
Trilogy Metals Inc.	Natural Resources			BC
Twitch	Retail			ON
Under Armour Canada	Retail			ON
uniPHARM Wholesale Drugs Ltd.	Retail			BC
Unisys	High Technology			NS
United Farmers of Alberta Co-operative Limited	Retail			AB
UPM Raflatac	Natural Resources			QC
Utilities Kingston	Utilities			ON
VAISALA OYJ	High Technology			BC
Vale Canada Limited	Natural Resources			ON
Valentino SPA	Retail			ON
Valmet Ltd.	Industrial Goods			ON
Valvoline Canada Corp.	Chemicals			ON
Vancouver Fraser Port Authority	Transportation			BC
VF Corporation	Retail			ON
Victoria Secret	Retail			QC
VinFast	Industrial Goods			BC
Volkswagen	Industrial Goods			ON
Votorantim Cement North America	Construction and Materials			ON
Wal-Mart Canada Corp.	Retail			ON
Warby Parker	Retail			ON
Wärtsilä Canada Incorporated	Industrial Goods			BC
Wasaga Distribution Inc.	Utilities			ON
Wataynikaneyap Power	Utilities			ON
Waterloo North Hydro	Utilities			ON
Wayfair	Retail			ON
WD-40 Products Canada Ltd.	Fast Moving Consumer Goods			ON
Welland Hydro-Electric System Corp.	Utilities			ON
Wesgroup Equipment	Construction and Materials			BC
Westario Power Inc.	Utilities			ON
Westmoreland Coal Company - Canada	Natural Resources			AB
Wilton	Fast Moving Consumer Goods			ON
WNS Global Services	Services			QC
Xtreme Blockchain Labs, Inc.	High Technology			ON
Zale Canada Co.	Retail			ON

Appendix – 4-Intervenor-122a)

SERVICES AGREEMENT

AGREEMENT made May 01, 2020.

BETWEEN:

BURLINGTON HYDRO INC.

hereinafter called "BHI"
OF THE FIRST PART

- and –

BURLINGTON ENTERPRISES CORPORATION

hereinafter called "BEC"
OF THE SECOND PART

- and –

BURLINGTON ELECTRICITY SERVICES INC.

hereinafter called "BESI"
OF THE THIRD PART

WHEREAS BHI, BEC and BESI are corporations incorporated pursuant to the laws of the Province of Ontario;

AND WHEREAS BHI is a "distributor" as defined in the *Electricity Act*, 1998;

AND WHEREAS BEC is a holding company which holds all of the issued shares in BHI and in BESI;

AND WHEREAS BESI is a provider of Services, including water and wastewater billing services for the Regional Municipality of Halton and control room services for Milton Hydro Distribution Inc.;

AND WHEREAS BHI, BEC and BESI are affiliates within the meaning of the *Business Corporations Act*, R.S.O. 1990, as amended;

AND WHEREAS BHI provides Services, Shared Corporate Services and Shared Support Services to BESI and BEC and BESI from time to time provides Services to BHI.

NOW THEREFORE in consideration of the mutual covenants and agreements contained in this Agreement and the payment of the sum of TWO DOLLARS (\$2.00) each to the others, the receipt and sufficiency of which is hereby acknowledged, BHI, BEC and BESI (together the "Parties") agree with each other as follows:

1. DEFINITIONS AND INTERPRETATION

1.1 The following words and expressions wherever used in this Agreement shall have the following meanings, unless the context expressly or by necessary implication, otherwise requires:

- (a) "Affiliate" has the same meaning as in the *Business Corporations Act* (Ontario).
- (b) "Agreement" means this Services Agreement and any subsequent amendments thereto.
- (c) "ARC" means the OEB Affiliate Relationships Code for Electricity Distributors and Transmitters revised March 15, 2010, and any amendments or revisions thereto.
- (d) "Confidential Information" means information obtained by BHI relating to a specific smart sub-metering provider, wholesaler, consumer, retailer or generator in the process of providing current or prospective utility service.
- (e) "Fully Allocated Cost" means the sum of direct costs plus a proportional share of indirect costs.
- (f) "HOEP" means the hourly Ontario electricity price.
- (g) "Indirect Costs" means costs that cannot be identified with a specific unit of product or service or with a specific operation or cost centre, and includes, but is not limited to, overhead costs, administrative and general expenses and taxes.
- (h) "Information Services" means computer systems, service databases and persons knowledgeable about BHI's information technology systems, and includes programming services.
- (i) "MFIPPA" means the *Municipal Freedom of Information and Protection of Privacy Act*.
- (j) "OEB" means the Ontario Energy Board.
- (k) "Parties" means BHI, BEC and BESI collectively, and "Party" means any one of them as the case may be.
- (l) "Personal Information" means information about an identifiable individual including a person's name, address, phone number, fax number, e-mail address, social insurance number or other government-issued identifier, credit card information and IP addresses, in any media or format including computerized or electronic records as well as paper-based files, used or collected from consumers, utility customers or employees or any other person or individual.

- (m) "Qualifying Facility" means a generation facility or an energy storage facility that meets the requirements set out in subsection 71(3) of the *Ontario Energy Board Act*, 1988;
- (n) "Representatives" means any employee, agent or subcontractor of the Party in question, including without limitation any third party retained to perform any or all of the Shared Services pursuant to this Agreement.
- (o) "Service(s)" means any service that is not a Shared Corporate Service or a Shared Support Service, and includes without limiting the generality thereof, goods, services, products, resources or use of assets.
- (p) "Shared Corporate Services" means business functions that provide strategic management and policy support relating to legal, regulatory, procurement services, building or real estate support services, Information Services, information technology services, corporate administration, finance, tax, treasury, pensions, risk management, audit services, corporate planning, human resources, health and safety, communications, investor relations, trustee or public affairs.
- (q) "Shared Support Services" means support services including, without limiting the generality thereof, payment, billing and collection services, engineering services, receiving and stores services, office space, storage space, space for equipment and operations, programming services, and other support services as from time to time required.
- (r) "Term" shall have the meaning ascribed to it in Article 2 of this Agreement.

2. TERM AND TERMINATION

- 2.1 The Parties agree that, notwithstanding any provision contained therein, any prior Services Agreements made between them are hereby terminated effective May 01, 2020.
- 2.2 This Agreement shall commence as of May 01, 2020, and remain in effect until April 30, 2025, unless terminated by one or more of the Parties as permitted in this Agreement, or unless otherwise approved by the OEB.
- 2.3 This Agreement may be terminated for convenience by any one of the Parties upon thirty (30) days written notice to the other Parties.
- 2.4 Any Party to this Agreement may terminate the supply or purchase of any Shared Support Service, Shared Corporate Service or Service, upon thirty (30) days written notice to the Party supplying or purchasing such Shared Support Service, Shared Corporate Service or Service.

3. SHARED SUPPORT SERVICES AND SHARED CORPORATE SERVICES

- 3.1 BHI will provide Shared Support Services and Shared Corporate Services to BEC and BESI from time to time upon request. The Party making the request shall give the other Party notice, reasonable in the circumstances, of the type and quantity of Shared Support Services and/or Shared Corporate Services it requires, and the Party receiving the request shall supply the Shared Corporate Services and/or Shared Corporate Services, provided it has the capacity to do so without detriment to its own business or operations.
- 3.2 The quality of the Shared Support Services and Shared Corporate Services provided by BHI will be equivalent to the quality BEC and BESI could expect to receive from third party suppliers. Where no market exists for a Shared Support Service or a Shared Corporate Service, the quality of such Shared Support Service or Shared Corporate Service will be equivalent to the quality provided in the supplier's own business and operations.
- 3.3 The Shared Support Services and Shared Corporate Services required by BEC and BESI shall be provided by BHI at mutually agreed upon transfer prices determined in accordance with this Article 3 and the Schedules attached hereto, and subject to the following:
- (a) The terms, conditions and prices shall be compliant with the requirements of the ARC.
 - (b) Where a reasonably competitive market exists for a Shared Support Service or Shared Corporate Service, the price charged by BHI for such Shared Support Service or Shared Corporate Service shall be no less than the greater of (i) the market price for such Shared Support Service or such Shared Corporate Service and (ii) BHI's Fully Allocated Cost to provide such Shared Support Service or Shared Corporate Service, and the Fully Allocated Cost shall include a return on BHI's invested capital no less than BHI's approved weighted average cost of capital.
 - (c) Where a reasonably competitive market does not exist for a Shared Support Service or Shared Corporate Service, the price charged by BHI for such Shared Support Service or Shared Corporate Service shall be no less than BHI's Fully Allocated Cost to provide the Shared Support Service or Shared Corporate Service, and the Fully Allocated Cost shall include a return on BHI's invested capital no less than BHI's approved weighted average cost of capital.
- 3.4 Prices charged to affiliates for Shared Corporate Services and Shared Support Services shall be subject to HST.
- 3.5 It is understood and agreed that as between BHI and BESI, invoicing for Shared Support Services and Shared Corporate Services provided by BHI to BESI may include an agreed upon annual cost (using the above described cost and pricing mechanisms) based on estimated annual usage of Shared Support Services and Shared Corporate Services by BESI, unless either Party requests that invoicing be based on actual costs and actual hours, in which case, Shared Support

Services and Shared Corporate Services shall be invoiced on an actual costs and actual hours basis commencing in the year following the year in which the request was made.

- 3.6 It is understood and agreed that as between BHI and BEC, invoicing for certain Shared Support Services and certain Shared Corporate Services provided by BHI, using the foregoing pricing mechanisms, may be at an agreed upon annual cost as set out in Schedule “A” hereto (using the above described cost and pricing mechanisms) based on estimated annual usage of those Shared Support Services and those Shared Corporate Services by BEC, unless either Party requests that payment be based on actual usage, in which case Shared Support Services and Shared Corporate Services shall be invoiced on an actual costs and actual hours basis commencing in the year following the year in which the request was made.
- 3.7 Invoices will be rendered by BHI to BESI and BEC for Shared Support Services and Shared Corporate Services (other than for Shared Support Services provided to BESI which are related to the Regional Municipality of Halton Agreement for Water and Wastewater Billing Services) respectively supplied to BESI and BEC pursuant to this Agreement as soon as practicable following BHI's year end, and will be paid by BESI and BEC within thirty (30) days of the date thereof. In the event this Agreement is terminated mid-year, the amounts payable will be pro-rated. Invoices will be rendered by BHI to BESI on a monthly basis for Shared Support Services related to the Regional Municipality of Halton Agreement for Water and Wastewater Billing Services, and will be paid by BESI within thirty (30) days of the date thereof.
- 3.8 The particulars of Shared Corporate Services and Shared Support Services provided by BHI to BESI and BEC, are set out in Schedule “A” to this Agreement.

4. BHI OUTSOURCING TO AN AFFILIATE

- 4.1 From time to time an Affiliate may supply a Service to BHI. The Party desiring to initiate such a transaction shall give the other Party a written offer setting out the essential terms of the proposed transaction, including the type, quantity, quality and the price to be charged for the Service, and where applicable, the start date and the term of the proposed transaction. The Party receiving the offer shall within a period of time reasonable in the circumstances, indicate acceptance or rejection of the offer, or acceptance with modifications.
- 4.2 Where the annual value of a proposed outsourcing contract with an Affiliate for the supply of a Service that BHI previously provided to itself, which does not pertain to a Qualifying Facility and is not less than \$100,000 or 0.1 per cent of BHI's utility revenue in the last preceding year, whichever is greater, BHI shall conduct a business case analysis as required by article 2.3.2.1 of the ARC prior to making or accepting a written offer pertaining to the proposed outsourcing contract.
- 4.3 Where a reasonably competitive market exists for a Service, BHI shall pay no more than the market price for that Service.

- 4.4 Where no reasonably competitive market exists for a Service, BHI shall pay a price based on the Affiliate's fully-allocated costs to provide the Service, including a return on the Affiliate's invested capital equal to BHI's approved weighted average cost of capital.
- 4.5 Where a Service pertains exclusively to the ownership and operation of one or more Qualifying Facilities, the price may be based on the Affiliate's fully-allocated cost to provide the Service, including a return on the Affiliate's invested capital equal to BHI's approved weighted average cost of capital.
- 4.6 Prices charged for Services supplied to BHI by an Affiliate shall be subject to HST.
- 4.7 All such transactions shall be subject to and in accordance with the provisions of the ARC.
- 4.8 The particulars of outsourcing transactions are set out in Schedule "A" to this Agreement.

5. AFFILIATE OUTSOURCING TO BHI

- 5.1 From time to time an Affiliate may outsource a Service to BHI. The Party desiring to initiate such a transaction shall give the other Party a written offer setting out the essential terms of the proposed transaction, including the type, quantity, quality and the price to be charged for the Service, and where applicable, the start date and the term of the proposed transaction. The Party receiving the offer shall within a period of time reasonable in the circumstances, indicate acceptance or rejection of the offer, or acceptance with modifications.
- 5.2 Where a reasonably competitive market exists for a Service, BHI shall charge the Affiliate no less than the greater of:
 - i. the market price for that Service; and
 - ii. BHI's fully-allocated cost to provide the Service to the Affiliate, and the Fully Allocated Cost shall include a return on BHI's invested capital no less than BHI's approved weighted average cost of capital..
- 5.3 Where no reasonably competitive market exists for a Service, BHI shall charge a price based on BHI's fully allocated costs to provide the Service, including a return on BHI's invested capital no less than BHI's approved weighted average cost of capital.
- 5.4 Where a Service pertains exclusively to the ownership and operation of one or more Qualifying Facilities, the price may be based on BHI's fully-allocated cost to provide the Service, including a return on BHI's invested capital equal to BHI's approved weighted average cost of capital.
- 5.5 Prices charged for Services supplied by BHI to an Affiliate shall be subject to HST.

- 5.6 All such transactions shall be subject to and in accordance with the provisions of the ARC.
- 5.7 The particulars of outsourcing transactions are set out in Schedule "A" to this Agreement.
- 5.8 BHI shall be the employer of all employees at or engaged in providing a Service to an Affiliate, and all such employees shall be on the payroll of BHI. BHI shall define personnel requirements, staffing patterns and personnel policies and shall hire, promote, discharge and supervise the work of all employees performing a Service for an Affiliate. BHI shall use reasonable care in the selection of qualified, competent and trustworthy employees to perform a Service for an Affiliate.
- 5.9 BHI and the Affiliates acknowledge and agree that for all purposes, BHI is and will be an independent contractor in providing a Service to an Affiliate. The personnel of BHI shall at all times be employees of BHI and shall not be the employees of the Affiliate. BHI and the Affiliates acknowledge and agree that the provision of a Service by BHI to an Affiliate shall not be construed to make BHI and the Affiliate a partner or agent of the other.

6. PERSONAL AND CONFIDENTIAL INFORMATION

- 6.1 BHI, BEC and BESI mutually undertake and agree that they will not request from each other or disclose to each other or to any third party Personal or Confidential Information unless the party to whom the Personal or Confidential Information relates, consents, or unless disclosure is permitted under the ARC, MFIPPA or otherwise required by law.
- 6.2 It is understood and agreed that subject to any amendment to the ARC or MFIPPA, all Personal and Confidential Information will be protected from access by the Parties and from access by third parties, and access to BHI's information services shall include appropriate data management and data access protocols. The Parties further agree to comply with all such protocols and in the case of corporate management cross appointments, that BHI corporate management will not utilize such Personal or Confidential Information while acting in the capacity of corporate management for BEC and/or BESI.
- 6.3 The Parties further undertake and agree that should a breach of any access protocol occur, the Parties will take immediate steps to remedy such breach.

7. DISPUTE RESOLUTION

- 7.1 Disputes between the Parties with respect to any provision of this Agreement which cannot be resolved by the Parties, shall be referred to arbitration in compliance with the provisions of the *Arbitrations Act* R.S.O. 1990, as amended, and in particular subject to the following requirements:

- (a) There shall be a single arbitrator agreeable to the Parties to the dispute unless the Parties are not able to agree on a single arbitrator, in which case if the dispute is between two of the Parties, there shall be a panel of three arbitrators with each Party appointing one arbitrator and those two arbitrators appointing a third, who shall be the chair of the panel. If the dispute is among all three Parties and they cannot agree on a single arbitrator, there shall be a panel of four arbitrators, with each Party appointing one arbitrator and those three arbitrators appointing a fourth, who shall be the chair of the panel. In the event of a deadlock among the four arbitrators, the chair will have a second vote.
- (b) The decision of the arbitrator or arbitrators as the case may be, shall be final.
- (c) The costs of the arbitration shall be borne equally by the Parties unless the arbitrator or arbitrators decide otherwise.
- (d) Nothing in this Article 6 shall preclude a Party from commencing legal action in the Small Claims Court of Ontario on any matter related to this Agreement.
- (e) Notwithstanding the existence of any such disputes, BHI, BEC and BESI shall continue to carry out their respective obligations under this Agreement in a timely fashion, and such carrying out of obligations shall be without prejudice to their respective rights under this Agreement.

8. RATE OF RETURN

The return on invested capital used in calculating fully allocated cost pursuant to this Agreement shall be BHI's weighted average cost of capital from time to time approved by the OEB.

9. INSURANCE AND APPORTIONMENT OF RISK

- 9.1 Each Party will maintain policies of insurance as will protect the Parties from claims for damages for personal injury, including death, and from claims for property damage which may arise from the Parties' business or operations, including any act or omission of the Parties' agents, representatives or employees, and such coverage shall include all costs, charges and expenses reasonably incurred with respect to any injury or damage.
- 9.2 Each Party shall bear all risks associated with the business and operations of such Party.
- 9.3 In addition to such coverage, each Party shall be named as an added insured on the policy or policies of the others, and all policies shall include a provision for cross liability.

- 9.4 Where one Party provides vehicles for the use of another Party, the providing Party will so notify the insurer of the vehicles, and the receiving Party will be responsible for reimbursing the providing Party for any resulting additional premiums charged by the said insurer.

10. INDEMNIFICATION

Each Party agrees to indemnify and save harmless the other Parties against all losses, damages, claims, actions, demands, suits, costs and interest arising directly or indirectly from anything done by the Party in connection with this Agreement, whether in performance of, outside of, or contrary to this Agreement.

11. WORKPLACE SAFETY AND INSURANCE BOARD COVERAGE

BHI shall procure and carry Workplace Safety and Insurance Board coverage for its employees while providing Shared Support Services and Shared Corporate Services to the other Parties, the cost of which shall be apportioned between BHI, BEC and BEI on an agreed upon basis.

12. ENTIRE AGREEMENT

This Agreement is the entire agreement among the Parties regarding the subject of this Agreement and it can be amended or supplemented only by a document executed in writing by all of the Parties.

13. SEVERABILITY

If any term of this Agreement is found to be invalid, illegal or unenforceable by a court or tribunal having the jurisdiction to do so, that term is to be considered to have been severed from the rest of this Agreement and the rest of this Agreement remains in force unaffected by that finding or by the severance of that term.

14. CONTEXT

In this Agreement, unless the context otherwise requires, the singular includes the plural and the masculine includes the feminine gender and a corporation.

15. GOVERNING LAW

This Agreement shall be governed by and construed and enforced in accordance with the laws of the Province of Ontario.

16. ASSIGNMENT

A Party may only assign this Agreement with the written consent of the other Parties, such consent not to be unreasonably withheld.

17. SUCCESSORS AND ASSIGNS

This Agreement shall be binding upon and shall enure to the benefit of the Parties hereto and their respective permitted successors and assigns.

18. SCHEDULE “A” – PRICING MECHANISMS

Pricing mechanisms for Shared Corporate Services, Shared Support Services and Services, are as set out in Schedule “A” hereto, which forms part of this Agreement.

19. SCHEDULE “A” – ANNUAL REVIEW

Schedule “A” will be reviewed annually for any changes required to the Shared Corporate Services, Shared Support Services or Shared Services and the Pricing Methodology, such review to be completed not later than December 31st in each calendar year.

20. NOTICE

Any notice required or permitted to be given hereunder or any tender or delivery of documents shall be given by delivery, facsimile or e-mail to the following individuals or to such other individual a Party may stipulate by notice to the other Parties:

For BHI

Name: Sally Blackwell
Title: Vice-President, Regulatory Compliance and Asset Management
Telephone: 905-336-4373
e-mail: SBlackwell@burlingtonhydro.com

For BEC

Name: Michael Kysley
Title: Chief Financial Officer
Telephone: 905-332-2265
e-mail: MKysley@burlingtonhydro.com

For BESI

Name: Joe Saunders
Title: President
Telephone: 905-332-2258
e-mail: JSaunders@burlingtonhydro.com

IN WITNESS WHEREOF the Corporate parties have affixed their Corporate Seals under the hands of their officers duly authorized in that behalf.

EXECUTED at Burlington as of May 01, 2020.

BURLINGTON HYDRO INC.

Per: 

Name: Gerry Smallegange
Title: Chief Executive Officer

Per: 

Name: Michael Kysley
Title: Chief Financial Officer

We have the authority to bind the Corporation

BURLINGTON ENTERPRISES CORPORATION

Per: 

Name: Gerry Smallegange
Title: Chief Executive Officer

Per: 

Name: Michael Kysley
Title: Chief Financial Officer

We have the authority to bind the Corporation

BURLINGTON ELECTRICITY SERVICES INC.

Per: 

Name: Joe Saunders
Title: President



Per: _____

Name: Gerry Smallegange

Title: Chief Executive Officer

We have the authority to bind the Corporation

SCHEDULE "A"

Provider of Shared Corporate Services and Shared Services	Recipient	Service	Pricing Methodology
BHI	BESI	Water and Wastewater Billing Services (outsourcing)	Fully allocated cost, including a return on invested capital equal to BHI's approved weighted average cost of capital
BHI	BESI	Control Room Services (outsourcing)	Fully allocated cost, including a return on invested capital equal to BHI's approved weighted average cost of capital
BHI	BESI	Management Services	Fully allocated cost based on time incurred at BHI's fully burdened cost per hour including a return on invested capital equal to BHI's approved weighted average cost of capital
BHI	BESI	Facilities	Based on fixed annual charge based on square footage
BHI	BEC	Accounting	Fully allocated cost based on time incurred at BHI's fully burdened cost per hour including a return on invested capital equal to BHI's approved weighted average cost of capital
BESI	BHI	Standby Charge for use of Micro Turbine for Heating Supply and Back-up Generation (a Qualifying Facility)	Fixed Monthly Fee

Prices are subject to change in accordance with the terms of this Agreement and the ARC.

Prices are subject to HST where applicable except as noted in this Agreement.

Appendix – 8-Intervenor-139e)



DT-10-015 R3

***DISTRIBUTED GENERATION
TECHNICAL INTERCONNECTION
REQUIREMENTS
INTERCONNECTIONS AT VOLTAGES 50kV
AND BELOW***

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**LIMITATION OF LIABILITY AND DISCLAIMER**

Hydro One Networks Inc.'s ("Hydro One" or "HONI") "Distributed Generation Technical Interconnection Requirements: Interconnections at Voltages 50kV and Below", including any updates of technical interconnection requirements in the form of bulletins and/or amendments that are published periodically by Hydro One on its website (the "TIR"), identifies minimum requirements for generation projects connecting to Hydro One's distribution system or the distribution system of Embedded LDCs. Additional requirements may need to be met by the owner of the generation project to ensure that the final connection design meets all local and national standards and codes and is safe for the application intended. The requirements outlined in TIR are based on a number of assumptions, only some of which have been identified. Changing system conditions, standards and equipment may make those assumptions invalid. Use of the TIR and the information it contains is at the user's sole risk. Hydro One, nor any person employed on its behalf, makes no warranties or representations of any kind with respect to the TIR, including, without limitation, its quality, accuracy, completeness or fitness for any particular purpose, and Hydro One will not be liable for any loss or damage arising from the use of the TIR, any conclusions a user derives from the information in the TIR or any reliance by the user on the information it contains. Hydro One reserves the right to amend any of the requirements at any time. Any person wishing to make a decision based on the content of the TIR should consult with Hydro One prior to making any such decision.

CONTACT/PUBLISHER

Please forward questions/comments regarding the TIR to the following email address:

EMAIL: DGConnectionReq@HydroOne.com

REVISION HISTORY

DATE	VERSION	COMMENTS
March 2013	Rev. 3	Added some definitions; updated the requirements for <i>Customer Owned New Line</i> and corrected the ratings for <i>Surge Arrester</i> in Section 2.1; some modifications to <i>Breaker Failure</i> , <i>Three Phase Generators</i> and <i>Anti-Islanding Protection</i> in Section 2.3; clarified the calculations in Appendix C; removed the COVER template in Appendix H.
June 2011	Rev. 2	Updated several sections as per the <i>Distributed Generation Technical Interconnected Requirements (TIR) Amendments Webinars, Part 1 and 2</i> – which can be seen via: http://www.hydroone.com/Generators/Pages/Webinars.aspx



**DISTRIBUTED GENERATION TECHNICAL INTERCONNECTION REQUIREMENTS
INTERCONNECTIONS AT VOLTAGES 50kV AND BELOW**

HYDRO ONE NETWORKS INC.

**DT-10-015 REV. 3
MARCH 2013**

DATE	VERSION	COMMENTS
February 2010	Rev. 1	Updated voltage & power factor requirements; minor adjustments in all diagrams; replaced "tap line" requirement with "new line" requirement; added missing definitions; minor modifications to "Capacity Limitations"; clarified PCC and Point of Connection.
November 2009	Rev. 0	New Report

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1 INTRODUCTION

The “Distributed Generation Technical Interconnection Requirements: Interconnections at Voltages 50kV and Below” (the “TIR”) outlines the technical requirements for the installation or modification of Distributed Generation (DG) Facilities connecting to Hydro One Networks Inc.’s (“Hydro One”) Distribution System feeders at $\leq 50\text{kV}$.

Certain requirements including, but not limited to, transfer trip and control and monitoring may also apply to DG Facilities connecting to the Distribution System of an Embedded LDC other than Hydro One.

Connection of DG Facilities to Hydro One’s Distribution System feeders impacts the steady-state and transient voltage profiles and current distribution along the feeder in response to changing supply, load and fault conditions. These impacts must be controlled to:

- ensure that the safety, reliability and efficiency of Hydro One’s Distribution System is not materially adversely affected by the connection of DG Facilities to Hydro One’s Distribution System or the Distribution System of an Embedded LDC;
- abide by the requirements of the Distribution System Code (“DSC”) issued by the Ontario Energy Board, Ontario Electrical Safety Code (“OESC”) and applicable CSA and IEEE standards; and
- be compatible with Hydro One’s standard operating, protection, control and metering systems and practices.

To accomplish this, the design of the power equipment, protection, control and metering systems used at or for the connection of the DG Facility must meet specific minimum requirements. Depending on the capacity and electrical characteristics of the connecting DG Facility, specific additions and/or modifications may be required to Hydro One’s power equipment, protection, control and metering systems to facilitate the connection.

The TIR has been developed with reference to the Canadian Standards Association such as CAN/CSA C22.3 No. 9-08 – Interconnection of Distributed Resources and Electricity Supply Systems, the DSC and international standards such as the Institute of Electrical and Electronics Engineers (IEEE) Standard 1547 – Interconnecting Distributed Resources with Electric Power Systems.

It is imperative that these requirements are understood as required by those delegated or contracted by the owner of a DG Facility (“DG Owner”), Hydro One and other affected Local

Distribution Company (LDC) owners for the planning, design, equipment manufacture and supply, construction, commissioning, operation and maintenance of the DG Facility and Distribution Systems.

1.1 SCOPE

The TIR applies to the following DG Facilities connecting to Hydro One's Distribution System (50kV and below):

1. Single-phase installations with an aggregate capacity > 10 kW; and
2. Three-phase installations with an aggregate capacity > 30 kW

The document is intended to be applied to electric power generators using all types of energy sources, energy storage and energy conversion technologies – directly connected synchronous and asynchronous rotating machines, and those connecting via inverters or static power converters which are above the thresholds mentioned above. The TIR does not apply to DG Facilities parallel with Hydro One's Distribution System for less than 100ms (Momentary Closed Transition Switching) except as noted in Section 2.1.23.

Section 2 contains minimum requirements that the DG Owner is required to comply with in order to connect its Generation Facility to Hydro One's Distribution System. Depending on the size of the DG Facility, the voltage of the interconnected distribution feeder, and whether the DG Facility is single-phase or three-phase (3-wire or 4-wire) certain requirements may not apply.

It is the DG Owner's responsibility to ensure that all TIR requirements are met. These TIR requirements have been developed by Hydro One to ensure that the integrity and power quality of Hydro One's Distribution System are maintained to acceptable levels after the connection of the DG Facility. The DG Owner may also have to meet additional or modified requirements to address unique situations and the DG Owner shall be advised of any such requirements at the appropriate stage by Hydro One. Any exemptions to the TIR require Hydro One's prior written approval.

The TIR does not specify protection requirements for the protection of the generator and other equipment at the DG Facility. The DG Owner is responsible for installing, owning and operating adequate generator protections as well as protections for other equipment within the DG Facility to protect them from damage from faults or abnormal conditions which may originate at the DG Facility or from Hydro One's Transmission System and/or Distribution System.

The TIR does not constitute a design handbook and is not a substitute for the Ontario Electrical Safety Code. DG Owners who are considering the development of a DG Facility to connect to Hydro One's system¹ shall engage the services of a professional engineer or a registered consulting firm qualified to provide design and consulting services for electrical interconnection facilities in the Province of Ontario.

1.2 OBJECTIVES

Hydro One is committed to connecting DG Facilities to the Distribution System while preserving a safe and reliable electrical supply to all of its customers. The connection of the DG Facilities must conform to relevant Ontario and Canadian regulations and international design standards. The TIR has been developed in accordance with the following objectives. These objectives shall be integrated into all steps to the connection process - design specification, construction, operation and maintenance of the DG Facility.

SAFETY

The connection of a DG Facility must not create a safety hazard for the general public, other Hydro One customers, Hydro One employees or others that work on the Distribution System, nor to personnel working in the DG Facility.

POWER QUALITY

The connection of a DG Facility must not materially degrade the power quality of Hydro One's Distribution System below acceptable levels.

RELIABILITY

The connection of a DG Facility must not materially compromise the reliability of Hydro One's Distribution System as required by the DSC and defined by Hydro One's Conditions of Service document.

ACHIEVABILITY

The connection requirements for DG Facilities must be achievable, fair and competitive to allow equitable access for all DG Owners.

OPERABILITY

¹ The TIR also applies to DG Facilities connecting to Hybrid Feeders (feeders owned partially by Hydro One)

The connection of a DG Facility must not restrict the operation of Hydro One's Distribution System. All aspects of the connection that can impact Hydro One's Distribution System must be compatible with Hydro One's standard operating, protection, control and metering systems and practices.

1.3 RESPONSIBILITIES

Connecting DG Facilities to Hydro One's Distribution System involves several steps and both Hydro One and the DG Owner have distinct responsibilities.

Hydro One is responsible for:

- the safety, reliability, power quality and operation of Hydro One's Distribution System, and ensuring the connection of the DG Facility does not adversely affect the system or Hydro One's existing customers;
- maintaining the integrity of Hydro One's Transmission and Distribution Systems;
- operating in compliance with all applicable laws (including its license and codes issued by the Ontario Energy Board) and within the guidelines of all applicable Ontario, Canadian and international standards; and
- establishing the terms and conditions for the TIR that are consistent with the "Objectives" described above in Section 1.2.

DG Owners are responsible for:

- the safety, design, construction, operation, metering, protection and control, and maintenance of the DG Facility;
- operating in compliance with all applicable laws (including its license and codes issued by the Ontario Energy Board) and within the guidelines of all applicable Ontario, Canadian and international standards;
- ensuring that the DG Facility is compatible with Hydro One's standard operating, protection, control and metering systems and practices; and
- abiding by the terms and conditions of the TIR.

1.4 REQUIREMENT ORIGINS

Table 1 below shows the origins of the requirements found within the TIR.

Table 1: Origins of Requirements

Hydro One Networks Inc. Requirements are classified as:								If:	
Verbatim			They are a direct application (no change) of stated standards						
Selective			HONI has chosen the most applicable requirements from standards having varying requirements						
Optimal			HONI has found an optimal solution for its Distribution System to meet the stated standards						
Unique			Requirements are unique to meet HONI's Business Practice objectives						
Regulation and Standards									
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC		
2.1	General Requirements								
2.1.1	Safety	Verbatim	2-200	1.2		1.4	4.6 Appx. F.1 & F.2		
2.1.2	Active Power	Optimal		4.1.1		5	Appx. F.1; F.2 - 3.1, 5.1		
2.1.3	Reactive Power	Optimal		4.1.1		5, 7.2.4	Appx. F.1; F.2 – 3.1, 5.1		
2.1.4	Equipment Rating and Requirements	Verbatim	2-004, 2-010(d), 2-024	4.1.1		5, 7.4.2	6.2.14, 6.2.29, Appx. F.1 & F.2 – 3.1, 5		
2.1.5	Point of Common Coupling	Optimal	84-026	1.2, 3.1.3		1.1,3, Figure 1	Appx. F.2 – 1		
2.1.6	Customer Owned New Line	Optimal	Bulletin 36-17-4	4.1.7		1.1, 7.3.1	Appx. F.2 – 1		
2.1.7	Isolation Device	Selective	84-024, 84-026	4.1.7		7.3.1	4.5.2, Appx. F.2 – 1, 1		
2.1.8	Interrupting Device Rating	Selective	2-004, 2-024			7.4.2	Appx. F.2 – 5		
2.1.9	Phasing	Verbatim				6.10, 7.3.4			
2.1.10	Temporary Over-Voltage (TOV)	Selective		4.1.2		7.3.3, 7.4.7.1	Appx. F.2 – 2		



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Regulation and Standards							
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC
2.1.11	Grounding	Selective	10, 84-28	4.1.2		7.3.3	Appx. F.2 – 2
2.1.12	Interconnection Transformer Configuration	Optimal		4.1.2		7.3.2, 7.3.3, 7.4.9	Appx. F.2 – 2
2.1.13	High Voltage Interrupting Device (HVI)	Optimal				7.3.5	Appx. F.2 – 2
2.1.14	Station Service for Essential Loads	Optimal				7.4.19	4.1.6
2.1.15	Batteries/DC Supply	Optimal	46-104			7.4.19	4.1.6
2.1.16	Fault Levels	Optimal	2-004, 2-024			6.8, 7.4.2	Appx. F.2 – 5
2.1.17	Insulation Coordination	Optimal	26-500			7.4.18	
2.1.18	Instrument Transformers for Use in Protection Systems	Optimal		C57.13		7.4.2.1	
2.1.19	Power Quality Monitoring Device	Optimal		4.3		7.2	4.1.1, 4.1.3, Appx. F.2 – 10
2.1.20	Protection from Electromagnetic Interference (EMI)	Verbatim		4.1.8.1		7.4.17	Appx. F.2 – 10.4
2.1.21	Surge Withstand	Verbatim	84-014	4.1.8.2		7.4.18	Appx. F.2 – 10.5
2.1.22	DG Facility Acceptance	Optimal					6.2.18, Appx. F.1
2.1.23	Generators Paralleling for 6 Cycles or Less (Closed Transition Switching)	Selective		1.3, 4.1.4		7.4.13	
2.1.24	Provision for Future Changes	Optimal					2.4.8, 6.2.29
2.2	Performance Requirements						
2.2.1	General	Optimal					3.1.1, 4.1.1, 4.1.4, 4.2.6, 4.4.1, Appx. F1
2.2.2	Power Quality						
2.2.2.1	Voltage	Verbatim		4.1.1, 4.2.3		6.2	4.1.2, 6.2.14, Appx. F.2 – 3.1
2.2.2.2	Voltage and Current Unbalance	Selective				7.2.5	Appx. F.2 – 3.2



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Regulation and Standards							
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC (Appendix F)
2.2.2.3	Voltage Fluctuations (Flicker)	Verbatim		4.1.3, 4.3.2, 5.1.2		6.4, 7.2.2, 7.4.14	Appx. F.2 – 3.2, 10.1
2.2.2.4	Voltage and Current Harmonics	Verbatim		4.3.3, 5.1.6, Tables 3 & 6		6.4, 7.2.1, Table 1, B2	Appx. F.2 – 10.2
2.2.2.5	Frequency	Verbatim		4.2.4, Table 2		7.2.3, 7.4.15, Table 3	Appx. F.2 – 6.5
2.2.2.6	Power Factor	Selective				7.2.4	Appx. F.2 – 4
2.2.2.7	Limitation of DC Injection	Verbatim		4.3.1		7.2.7	Appx. F.2 – 10.3
2.2.3	Disturbances	Verbatim				7.3.3	Appx. F.2 – 2
2.2.4	Resonance Analysis	Optimal				7.2.6	
2.2.5	Self-Excitation Analysis	Optimal				7.2.6	
2.3	Protection Requirements						
2.3.1	General Requirements	Optimal		4.1.2, 4.2, 4.4		4, 6.8, 6.11, 6.13, 7.4	2.4.6, 3.1.2, 3.2.11, 4.1.1, 4.4.3, 6.2.11, 6.2.14, 6.2.18, Appx. F.1
2.3.2	Sensitivity and Coordination	Optimal				7.3.3, 7.4.1.3	Appx. F.2 – 2, 6.4
2.3.3	Protection Operating Times	Optimal		4.2		7.4	
2.3.4	Breaker Fail (BF)	Optimal				7.4.20.1	4.1.6, Appx. F.2 - 6.4
2.3.5	Single Phase Generators	Optimal		4.2.3, IEEE Std 929		7.4	Appx. F.2 – 6.4
2.3.6	Three Phase Generators	Optimal	64-112, 84-008, 84-018	4.2		7.4	Appx. F.2 – 6.4
2.3.7	Phase and Ground Fault Protection	Selective		4.2.1		7.4.4	Appx. F.2 – 6.4
2.3.8	Open Phase Protection	Optimal				7.4.5	
2.3.9	Feeder Relay Directioning	Verbatim					Appx. F.2 – 8
2.3.10	Over Frequency/Under Frequency Protection	Verbatim		4.2.4, Table 2		7.2.3, 7.4.6, 7.4.15, Table 3	Appx. F.2 – 6.5
2.3.11	Overvoltage/Undervoltage Protection	Verbatim		4.2.3, Table 1		7.4.7, Table 4	Appx. F.2 – 6.5



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2.3.12	Anti-Islanding Protection	Optimal		4.4.1		7.4.8	Appx. F.2 – 6.1.2
Regulation and Standards							
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC (Appendix F)
2.3.13	Transfer Trip	Optimal		4.4.1		7.4.8, 7.4.12	Appx. F.2 – 6.1.2
2.3.14	Distributed Generator End Open (DGEO)	Optimal		4.2.2		6.11	Appx. F.2 – 6
2.3.15	Low Set Block Signal (LSBS)	Optimal		4.2.2		6.11	Appx. F.2 – 6
2.3.16	DGEO and LSBS Design	Optimal		4.2.2		6.11	Appx. F.2 – 6
2.3.17	Special Interconnection Protection	Optimal					2.4.8, 6.2.29
2.3.18	Protection Scheme Failures	Optimal		4.2.2		7.4.20	4.1.6, Appx. F.2 – 6.4
2.3.19	Interconnection Protection Acceptance	Optimal				4, 6.8	2.4.6, 3.1.2, 3.2.11, 4.1.1, 4.4.3, 6.2.11, 6.2.11, 6.2.14, 6.2.18, Appx. F.1
2.3.20	Protection Changes	Optimal				8.6	
2.4	Operating Requirements						
2.4.1	General	Optimal					3.1.1, 4.1.1, 4.1.4, 4.2.6, 4.4.1, Appx. F.1
2.4.2	Islanding	Verbatim		4.4.1		7.4.8	Appx. F.2 – 6.1.2
2.4.3	Unintentional Energization	Verbatim		4.1.5		7.4.10	Appx. F.2 – 6
2.4.4	Synchronization	Verbatim		4.1.3, 1547.2 (8.1.3, 9.2.3)		7.4.14, Table 6	Appx. F.1 – 3.2
2.4.5	Single Connection Path	Optimal				6.12	
2.4.6	Automatic Disconnection of Generation and HV Ground Sources	Optimal		4.1.2		7.3.3	Appx. F.2 – 2, 6.4
2.4.7	Automatic Reconnection of Generation and HV Ground Sources	Optimal		4.2.6		7.4.11	Appx. F.2 – 2, 6.4
2.4.8	Reconnection of DG Facility Generation Following a Sustained Outage or Shutdown	Optimal		4.2.6		7.4.11	Appx. F.2 – 2, 6.4



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Regulation and Standards							
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC (Appendix F)
2.5	Control and Monitoring Requirements						
2.5.1	General	Selective		1547.3 (Section 4)			Appx. F.2 – 9, TSC App 1, sch E, Section 1.6
2.5.2	Control Facilities	Selective					TSC Schedule G
2.5.3	Operating Data, Telemetry and Monitoring	Selective		1547.3 (Section 5)			
2.6	Telecommunications Requirements						
2.6.1	General	Unique					
2.6.2	Telecommunications Facilities for Teleprotection	Unique					
2.6.3	Telecommunications Facilities for Real-Time Control and Monitoring	Selective		1547.3 (Section 4)			
2.6.4	Reliability Requirements	Selective		1547.3 (Section 4)	IEC 60834-1		
2.7	Reporting Requirements						
2.7.1	General Reporting Requirements	Selective					4.1.3
2.7.2	Power Quality Recording	Optimal		1547.3			
2.7.3	Disturbance Fault Recording	Optimal		1547.3			
2.7.4	Sequence of Events Recording	Optimal		1547.3			
2.8	Metering Requirements	Optimal	6-400 – 6-412				5.2, Appx. F.1, F.2 – 7



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Regulation and Standards							
#	TIR Section	HONI	OESC	IEEE (1547)	IEC 60834	C22.3 No. 9-08	DSC (Appendix F)
2.9	Commissioning and Verification Requirements	Optimal	Appx. B 14-102	5.4		8.4	6.2.19, Appx. F.1
2.10	Maintenance Requirements	Optimal	2-006, 2-010, 2-300			8.5	4.4, 6.2.15, 6.2.27, 6.4.3, Appx. F.2
2.11	Connection Process Requirement	Optimal					Appx. F.1

1.5 TERMINOLOGY

Throughout the TIR, the term:

- “shall” is used to express a mandatory requirement – i.e. a provision that the DG Facility is obligated to satisfy in order to comply with the requirements of the TIR;
- “should” is used to express a recommendation or that which is advised but not required;
- “may” is used to express an option or that which is permissible within the limits of the TIR; and
- “can” is used to express possibility or capability.

Individual TIR requirement may be followed by a “Background Information” and “Design Considerations” section which do not include requirements or alternative requirements. The purpose of these sections is to provide informative material, rationale on which the requirements in the section are based on and some design considerations. These sections are included where Hydro One considered them necessary or helpful and are not necessarily present for all TIR requirements. Hydro One does not take any responsibility for this information and the engineering consultant designing the DG Facility can decide whether to take the information into consideration when designing the project.

Appendices are designated as normative if they are mandatory requirements or informative if they are not mandatory requirements to define their application.

1.6 CAPACITY LIMITATIONS ON GENERATOR INTERCONNECTIONS FEEDER LOADING LIMITS

The capacity for all sections of all feeders, the “feeder limitation,” is based mainly on the distance from Hydro One supply station to the Point of Common Coupling (PCC) of the DG Facility. The feeder limitation applies to all DG Facilities connected or connecting to the feeder and considers the rated output capacity of each DG Facility. Any single DG Facility connection can affect the capacity available for all sections of the feeder.

For all sections of the feeder, the total current shall not exceed:

- a) 400 Amps for Hydro One feeders operating at voltages 13kV or greater; and
- b) 200 Amps for Hydro One feeders operating at voltages below 13kV.

ACCEPTABLE GENERATION LIMIT AT A TS OR A DS

The acceptable generation limit at a Hydro One TS or a Hydro One DS is established by adding together: 60% of maximum MVA rating of the single transformer and the minimum station load.

SHORT CIRCUIT (SC) LIMITS

The SC limits at TS low voltage bus or at any portion of distribution feeder shall not be exceeded by the addition of DG Facilities. Refer to Section 2.1.16 for the requirement.

1.6.1 THREE PHASE GENERATORS

- i) The acceptable individual generation limits for three-phase DG Facilities connecting to Hydro One's Distribution System feeders shall not exceed:
 - a) 1 MW per connection on feeders operating at voltages below 13kV; and
 - b) 5 MW per connection on 27.6kV feeders supplied via a 44kV:27.6kV step-down transformer.
- ii) The feeder limitation determines the total acceptable three-phase generation allowed for all sections of Hydro One's Distribution System feeders and shall not exceed:
 - a) 30 MW for feeders operating at 44kV;
 - b) 19 MW for feeders operating at 27.6kV;
 - c) 9.6 MW for feeders operating at 13.8kV;
 - d) 4.3 MW for feeders operating at 12.48kV;
 - e) 2.9 MW for feeders operating at 8.32kV; and
 - f) 1.45 MW for feeders operating at 4.16kV.

1.6.2 SINGLE PHASE GENERATORS

- i) The acceptable individual generation limits for single-phase DG Facilities connecting to Hydro One's Distribution System shall not exceed:
 - a) 150 kW per connection on feeders operating at nominal voltage levels of 13kV or greater; and
 - b) 100 kW per connection on feeders operating at nominal voltage levels less than 13kV.

Note: While the absolute limits are stated above, the actual acceptable individual single phase generation limit for specific feeders or TS/DS is determined in Connection Impact Assessment (CIA).

1.7 DOCUMENT REPRODUCTION

The TIR may be reproduced or copied in whole or in part provided that credit is given to Hydro One and is not sold for profit.

1.8 TERMS AND DEFINITIONS

The Term	means...
ANSI	American National Standards Institute
Anti-Islanding	A protection system aimed at detecting islanded conditions (see island) and disconnecting the DG Facility from the Distribution System if an island forms
AVR	Automatic Voltage Regulator
BF	Breaker Fail
Breaker	Fault Interrupting Device: this may be a breaker, circuit switcher, HVI, LVI
CCE	Connection Cost Estimate
CCA	Connection Cost Agreement
CEA	The Canadian Electricity Association
CIA	Connection Impact Assessment
Class 1	DG Facility aggregate capacity at PCC \leq 250kW
Class 2	250kW < DG Facility aggregate capacity at PCC < 1500kW
Class 3	1.5MW \leq DG Facility aggregate capacity at PCC \leq 10MW
Class 4	DG Facility aggregate capacity at PCC > 10MW
Clearing Time	See Trip Time

CO	Central Office: a local telephone company office that provides a central point for the termination of telecommunication lines and trunks, and where they can be interconnected.
COG	<p>Coefficient of grounding - is defined as $100\% \times E_{LG}/E_{LL}$ where:</p> <ul style="list-style-type: none"> E_{LG} is the highest rms, line-to-ground, power-frequency voltage, on a sound phase, at a selected location, during a line-to-ground fault affecting one or more phases. E_{LL} is the line-to-line power-frequency voltage that would be obtained, at a selected location, with the power fault removed. COG for three-phase systems are calculated from the phase-sequence impedance components, as viewed from the fault location. <p>The COG is useful in the selection of a surge arrester rating for a selected location</p>
COMTRADE	Common Format for Transient Data Exchange
COVER	Confirmation of Verification Evidence Report
CSA	The Canadian Standards Association
DESN	Dual Element Spot Network – Type of TS
DCA	Distribution Connection Agreement
Demarcation Point	The point at which the Hydro One equipment ends and another party's equipment begins.
DFR	Disturbance Fault Recorder
DG	<p>See Distributed Generation</p> <p>*Formerly referred to as EG – Embedded Generator</p>
DGEO	<p>Distributed Generator End Open: a signal used to confirm the status of the generator breaker – used to prevent out-of-phase reclosing onto the generator</p> <p>*Formerly referred to as EGEO – Embedded Generator End Open</p>
DG Facility	All equipment including generators, transformers, protections, and line on the DG Facility side of the PCC
DGIT or DG Interconnection Transformer	The transformer used to step up the voltage from the DG to distribution voltage levels.
DG Owner	A person who owns or operates a generation facility.

Distributed Generation (DG)	A generation facility which is not directly connected to the IESO-controlled grid but instead is connected to a Distribution System.
Distributed Generation Technical Interconnection Requirements: Interconnections at Voltages 50kV and Below	This document as well as any updates of technical interconnection requirements in the form of bulletins and/or amendments that are published periodically by Hydro One on its website.
Distributed Generator (DG)	See Distributed Generation
Distribution Connection Agreement	The DG Owner is required to enter into a Distribution Connection Agreement with Hydro One prior to generating electricity into the system
Distribution Lines	Distribution System lines that operate at nominal line-line voltages below 27.6 kV.
Distribution System	Any power line facilities under the operating authority of the Wires owner (Hydro One or LDC) that operate at nominal line-line voltages of 50 kV or below. This includes sub-transmission power lines that operate at 27.6 kV or 44 kV and distribution lines that operate at voltages below 27.6 kV.
Distributor	The electric utility owning or operating the distribution lines.
DNP 3.0	Distributed Network Protocol
DO	Drop Out
DS	An electrical station that is used to step down a sub-transmission voltage to a distribution voltage for distribution to the end use customer.
DSC	Distribution System Code
Effectively Grounded	A system grounded through a sufficiently low impedance so that COG does not exceed 80%. This value is obtained approximately when, for all system conditions, the ratio of the zero-sequence reactance to the positive-sequence reactance (X_0/X_1) is positive and ≤ 3 , and the ratio of zero-sequence resistance to positive-sequence reactance (R_0/X_1) is positive and < 1 .

Embedded LDC	A distributor who is not a wholesale market participant and is provided electricity by a host distributor.
EMI	Electromagnetic Interference
ESA	Electrical Safety Authority
Essential Loads	Part of the load that requires continuous quality electric power for its successful operation or devices and equipment whose failure to operate satisfactorily jeopardizes the health or safety of personnel, and/or results in loss of function, financial loss, or damage to property deemed essential by the user
F Class Feeder	Distribution feeder emanating from a Hydro One DS or HVDS
Feeder	A single-phase or three-phase line emanating from a substation to supply load.
Ferroresonance	A phenomenon caused by the interaction of system capacitance and nonlinear inductance of a transformer, usually resulting in very high transient or sustained overvoltage.
Ferroresonance Protection (59I)	Ferroresonance detection can be accomplished with a peak detecting overvoltage element (59I). This type of element is able to respond to the sub cycle high peak voltages that are characteristic of the ferroresonance phenomena. Standard overvoltage elements typically employ RMS calculations to the waveform and may not be able to detect the high peaks as they will be averaged with low peak values that also may occur. Where ferroresonance is expected or found to be a problem, ferroresonance detection will be required by the interconnection protection at the DG Facility location to disconnect the DG Facility.
Generator	See DG Owner
GPR	Ground Potential Rise: IEEE defines this as the voltage that a station grounding grid may attain relative to a distant grounding point assumed to be at the potential of remote earth.
GPS	Global Positioning System
Harmonics	Sinusoidal voltages and currents at frequencies that are integral multiples of the fundamental power frequency (60Hz).
High Voltage	In TIR, high voltage refers to Hydro One's system voltage and can be referred to as medium voltage.

Hydro One or "HONI"	Hydro One Networks Inc.
HVDS	High Voltage Distribution Station: the distribution station connected directly to Hydro One's transmission system (115kV system) which steps down transmission voltage to distribution voltage for distribution to the end use customer.
HVGT	HV Grounding Transformer
HV Ground Source	Three-phase ground sources are any three-phase power transformers or grounding transformers that provide a ground-current (zero-sequence) return path to phase-ground faults on the HV side of the DGIT. That includes separate HV grounding transformers or DGITs that have star-connected HV winding with the star-point neutral connected to ground, either solidly or through a reactor.
HVI	High Voltage Interrupter – any breaker/fault clearing device that is on the Hydro One side of the DGIT – voltage rating is usually at medium voltage distribution level.
Hybrid Feeders	Feeders owned partly by Hydro One and partly by other entities (e.g. Hydro One owns the first 50% of the feeder, and an LDC owns the remainder of the feeder).
ICCP	Inter-Control Center Communications Protocol
IEEE	The Institute of Electrical and Electronics Engineers
IED	Intelligent Electronic Device
IESO	Independent Electricity System Operator
Interrupting Device	The device used to disconnect generation from Hydro One's Distribution System: this may be a high voltage interrupter (HVI) or through a low voltage interrupter/breaker (LVI).
Island	An operating condition where a DG Facility(ies) is (are) supplying load(s) that is electrically separated from the main electric utility.
Load	The amount of power supplied or required at a specific location.

Load Factor	Ratio of average load during a designated period to the peak (maximum) load in the same period.
Load Flow Study	Steady state computer simulation study of voltages and currents in the Distribution System.
LSBS	Low Set Block Signal – signal sent over the same channel as DGEO which blocks the Low Set Instantaneous Protections at Hydro One's stations - to prevent inadvertent trips due to transformer inrush during energization.
LVGT	Low Voltage Grounding Transformer
LVI	Low Voltage Interrupter
MCOV	Maximum Continuous Operating Voltage
Medium Voltage	See High Voltage
M Class Feeder	Distribution feeder emanating from a Hydro One TS
NDZ	Non Detection Zone – range where passive anti-islanding protection may not operate within required time due to the small mismatch between generation and load
NERC	North American Electric Reliability Corporation
NEV	Neutral to Earth Voltage
NPCC	NorthEast Power Coordinating Council
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
OEB	Ontario Energy Board
OESC	Ontario Electrical Safety Code
OGCC	Ontario Grid Control Centre
Parallel Operation	The state and operation where the DG Facility is connected to the Distribution System and supplies loads along with the electric grid.
PCC or Point of Common Coupling	The point where the DG Facility is connected to Hydro One's Distribution System

Point of Connection	The point where the new DG Facility's connection assets or new line expansion assets will be connected to Hydro One's existing Distribution System
Pst	A measure of short-term perception of flicker obtained for a ten minute interval
PSS	Power System Stabilizer
Plt	A measure of long-term perception of flicker obtained for a two-hour period
PQ	Power Quality
Protection Scheme	Protection functions including associated sensors, relays, CTs, VTs, power supplies, intended to protect a Distribution System or interconnected facility.
PT	Potential Transformer
PU	Pick Up
Resonance	A tendency of a system to oscillate at maximum amplitude at certain frequencies, usually resulting in very high voltages and currents.
RLSS	Rotational Load Shedding Schedules
ROCOF	Rate-of-change-of-frequency
RMS	Root Mean Square
RTU	Remote terminal unit
SC	Short Circuit Current
SCADA	Supervisory Control and Data Acquisition
SER	Sequence of Events Recorder
Service Provider	A Service Provider is an entity that provides services to other entities.
SIA	System Impact Assessment

SLD	Single Line Diagram
SPS	Special Protection Scheme
Stabilized	A Distribution System returning to normal frequency and voltage after a disturbance for a period of 5 minutes or as determined by the Wires Owner.
Sub-transmission Lines	27.6kV or 44kV Hydro One owned distribution lines
Synchronized	See Parallel Operation
Telemeter	Transfer of metering data using communication systems
TCA	Transmission Connection Agreement
THD	Total Harmonic Distortion – a measurement of the harmonic distortion present. It is defined as a ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency.
TIR	Abbreviation for “Distributed Generation Technical Interconnection Requirements: Interconnections at Voltages 50kV and Below”
TOV	Temporary Overvoltage – oscillatory power frequency overvoltages of relatively long duration – from a few cycles to hours.
Transmission System	Any power line facilities under the operating authority of the Wires Owner usually operating at voltages higher than 50kV, line to line.
Transfer Trip	A signal sent over communication channels from upstream devices commanding the DG Facility to disconnect from Hydro One's Distribution System.
Trip Time	The time between the start of the abnormal condition to the time where the system disconnects and ceases to energize the Distribution System.
TS	An electrical station that is used to step down transmission voltage to a sub-transmission voltage for distribution to the end use customer and Distribution Stations (“DS”).
TSC	Transmission System Code
TT	See Transfer Trip

Type Test	Test performed on a sample of a particular model or device to verify its operation and design.
ULTC	Under-Load Tap Changer
UTC	Coordinated Universal Time
VT	Voltage Transformer
Wires Owner	The entity who owns and/or operates a Distribution System or distribution lines.

2 TECHNICAL INTERCONNECTION REQUIREMENTS

2.1 GENERAL REQUIREMENTS

2.1.1 SAFETY

- i) The connection, installation and operation of a DG Facility shall not create a safety hazard to Hydro One's personnel, customers, general public and personnel working in the DG Facility.

BACKGROUND INFORMATION

Safety is of primary concern and shall be the main consideration when designing the DG Facility. The primary concern of the TIR is to provide interconnection specifications to ensure that safety will be maintained.

2.1.2 ACTIVE POWER

- i) The DG Facility shall have to restrict their active power export to the project capacity which was applied for and assessed in the Connection Impact Assessment.

[Note: Typically the generator's Name Plate Capacity or Gen-Set Name Plate Capacity shall be considered as project size.]

2.1.3 REACTIVE POWER

- i) The DG Facility shall comply with voltage and power factor requirements in Section 2.2.2.1 and Section 2.2.2.6 respectively.

2.1.4 EQUIPMENT RATING AND REQUIREMENTS

- i) All electrical equipment and its installation shall be approved as required by Rule 2-024 and Rule 2-004, respectively, of the Ontario Electric Safety Code.
- ii) The DG Facility shall have a connection authorization from ESA prior to a Distribution Connection Agreement with Hydro One.
- iii) The DG Facility shall be maintained throughout the life of the assets to ensure that the DG Facility operates as designed.

- iv) The DG Facility interface equipment shall be compatible with Hydro One's Distribution System equipment at the connection voltage which includes but not limited to:
 - a) Maximum Voltage;
 - b) Basic Impulse Limit;
 - c) Short Circuit Ratings; and
 - d) Capacity.
- v) Connection of DG Facilities shall not cause the ratings of Hydro One's Distribution and Transmission System equipment to be exceeded for all operating conditions. This includes, but is not limited to:
 - a) equipment thermal loading limits; and
 - b) equipment short circuit limits.
- vi) Where reverse power flow is possible, all existing voltage regulating and metering devices shall be made suitable for bi-directional flow.
- vii) Changes to Hydro One's Distribution and Transmission System equipment ratings due to the interconnection of DG Facilities shall be assessed by the Hydro One's CIA.

BACKGROUND INFORMATION

All existing Hydro One's equipment in the distribution or transmission system shall not be overloaded beyond acceptable limits. All interrupting devices shall be capable of interrupting the maximum fault current under all operating conditions of the DG Facility. It must be ensured that conductors, voltage regulators, regulating stations, reclosers, circuit breakers, transformers, etc. in Hydro One's Distribution and Transmission System are operating within their respected ratings.

All regulating devices and metering devices which are designed for unidirectional power flow may need to be upgraded or replaced to ensure they are capable of handling bi-directional power flow.

2.1.5 POINT OF COMMON COUPLING

- i) The PCC must be identified on the single line diagram (SLD).
- ii) The DG Owner shall be responsible for the design, construction, maintenance and operation of the facilities and equipment on the DG Facility side of the PCC.
- iii) All equipment on the DG Facility side of the PCC shall be in accordance with Section 2.1.4.
- iv) Hydro One shall be responsible for the design, construction, maintenance and operation of the facilities on the Hydro One's side of the PCC.
- v) When specifications and parameters (such as voltage, frequency, and power quality) are mentioned throughout the TIR, they must be met at the PCC unless otherwise stated.
- vi) Hydro One or the DG Owner may require that their equipment be located on the other side of the PCC. In this case, the DG owner must provide the necessary space for Hydro One to install such equipment and Hydro One is to approve this site.
- vii) A 120V AC power service is to be available for Item (vi) above.

BACKGROUND INFORMATION

The Point of Connection means the point where the new DG Facility's connection assets or new line expansion assets will be connected to the existing Hydro One's Distribution System. The Point of Common Coupling (PCC) means the point where the DG Facility is to connect to Hydro One's Distribution System. The Point of Connection may be the same as the PCC, especially if the DG Facility lies along the existing Hydro One's Distribution System. The PCC may be located somewhere between the Point of Connection and the DG Facility if the new line will be owned by Hydro One. These definitions have been adopted by Hydro One to align with the DSC and not with CSA C22.3 No. 9-08 standard. Refer to Figure 1 for interconnection terminology. The PCC shall be identified on the single line diagram (SLD), as shown below in Figure 1.

In addition to the Items mentioned above, Hydro One will also carry out the engineering, design and construction required for additional changes to Hydro One's system in order to facilitate the connection of the DG Facility. The DG Owner may be responsible for some or all of the costs of such changes.

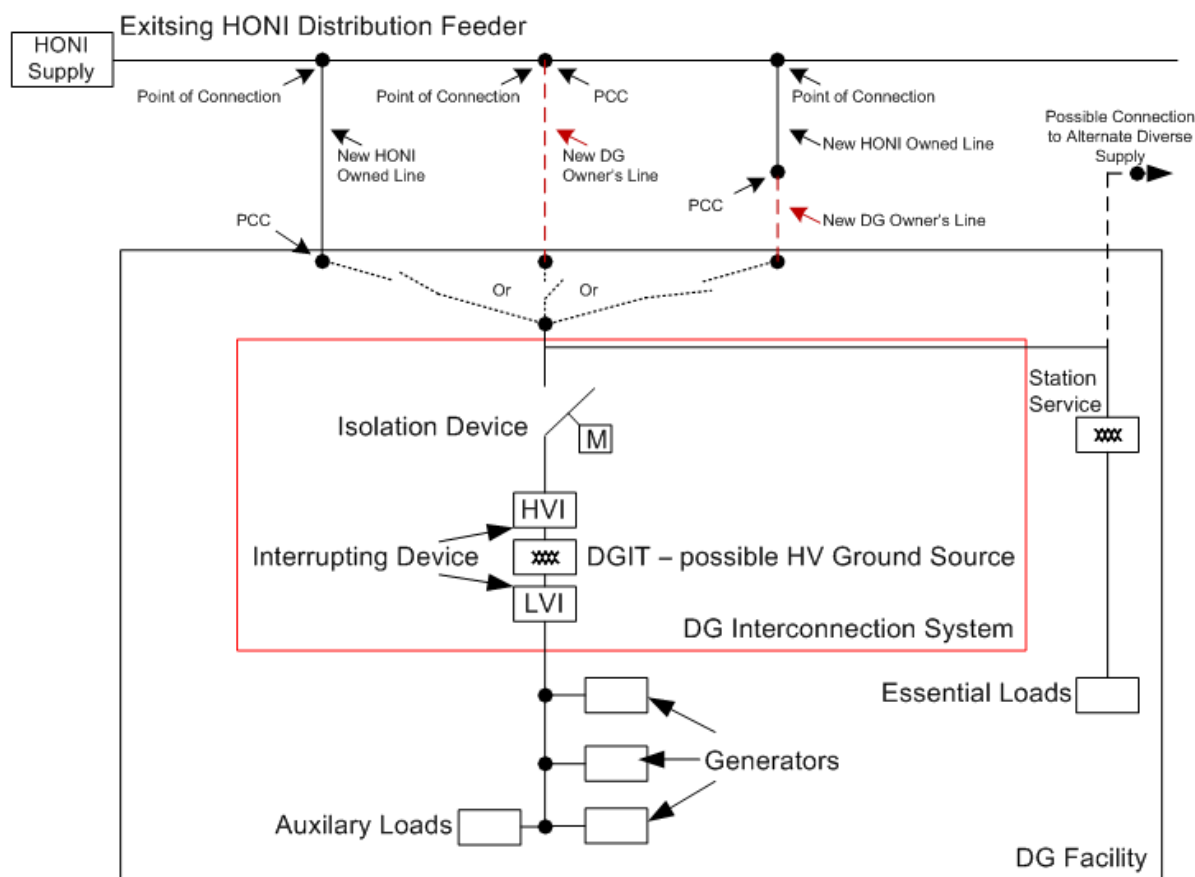


Figure 1: Simplified SLD – Interconnection Terminology

2.1.6 CUSTOMER OWNED NEW LINE

This section applies to DG Owner's new lines that connect to Hydro One's Distribution System at the PCC. It does not apply to those DG Facilities that are connecting to existing customer owned facilities.

- i) A load break switch for a new line owned by the DG Owner is required at the PCC to manually disconnect the DG Owner's line from Hydro One's Distribution System:
 - a) The load break switch shall be gang-operated for multi-phase applications;
 - b) The switch shall have the same requirements as the isolation device in Section 2.1.7 except that it does not have to be motorized;
 - c) The load break switch must be capable of taking the line off potential safely based on, but not limited to, circuit capacitance, transformer connections and load considerations;

-
- d) An overcurrent protection device as outlined in Item (ii) below can serve the purpose of the load break switch provided that it is located at the PCC and it can manually disconnect load simultaneously on all phases. If the overcurrent protection device cannot be visually verified to be open, an additional isolating device shall be provided for work protection purpose. This may be in the form of single phase solid blade switch, opener, etc.
 - ii) An overcurrent protection device is required to automatically disconnect the DG Owner's line from Hydro One's Distribution System for faults on the DG Owner's line or equipment, as outlined below:
 - a) For DG Facilities connecting to Hydro One's 3-wire systems, the overcurrent protection device should provide 3-phase gang-operated fault interruption. For those connecting to Hydro One's 4-wire systems, the overcurrent protection device can be single-phase or three-phase gang-operated;
 - b) The overcurrent protection device shall meet, but not be limited to, the following criteria:
 - 1) The interrupting rating shall account for present and future anticipated fault levels;
 - 2) The setting shall be coordinated with the timed elements of upstream protective devices, and it shall be sensitive enough to operate for minimum Hydro One infeed to faults on the customer owned new line;
 - 3) If fuses are used, they should not operate for maximum DG infeed to faults on the interconnected feeder;
 - 4) If a recloser is used, automatic reclosing shall be disabled.
 - c) The location of the overcurrent protection device must be as close to the PCC as practical. It can be either on the first or second pole after the PCC, depending on whether a dedicated pole is required to be used for the revenue metering. Under the following circumstances, the overcurrent protection device can be located at or near the DGIT, on the high voltage side:
 - 1) For new line length not exceeding 200m;
 - 2) For DG Facilities with more than one interconnection transformer where the total HV circuit length from the PCC does not exceed 200m;
 - 3) For 44kV connections where fault levels are higher than any available overcurrent protection device interrupting ratings.
-

- iii) Fault indicators with directional functionality are required for each phase between the PCC and the first pole on the customer owned new line and should be visible from the PCC location.
- iv) The DG Owner shall be responsible for the installation, operation and ownership of the load break switch, overcurrent protection device and fault indicators required to be used for the new line.
- v) Any additional requirements shall be determined in the CIA.

BACKGROUND INFORMATION

Distribution System reliability considerations dictate the requirement for overcurrent protection device to automatically isolate power system faults on the customer owned line. This is necessary to avoid prolonged interruption of supply to other customers on the feeder for permanent or recurring faults on a single customer-owned line. Fuses, reclosers, circuit switchers or circuit breakers may be used as an overcurrent protection, the selection of which will be determined by the specifics of the Distribution System and the connection configuration of the DG Facilities.

The use of single-phase overcurrent protection device in 3-wire systems might increase the probability of Ferro-resonance. For this reason, a three-phase gang-operated protective device is required for customer owned new line connecting to Hydro One's 3-wire systems.

Fault indicators are required on each phase of the customer owned new line, as a means to quickly identify a faulted phase on the customer's line.

2.1.7 ISOLATION DEVICE

- i) A means of electrically isolating the DG Facility from Hydro One's Distribution System shall be provided.
- ii) The isolation device shall:
 - a) be in compliance with the OESC²;
 - b) be capable of being energized from both sides³;
 - c) plainly indicate whether in the open or closed position³;
 - d) be capable of being opened at rated load (Load Break Switch)³;

² As outlined by the OESC Section 84

³ In accordance with OESC Section 84-024

- e) be located between the Hydro One system and the DG Facility, upstream of all transformers, generation and HV ground sources;
 - f) be readily accessible by Hydro One³;
 - g) not be located in a locked facility;
 - h) not be located in a hazardous location⁴;
 - i) have provision for being locked in the open position³;
 - j) have a manual override;
 - k) have no keyed interlocks;
 - l) have contact operation verifiable by direct visible means (be a Visible Break type)³;
 - m) conform to OESC Sections 14, 28 and 36 if it includes an overcurrent device³;
 - n) be capable of being closed with safety to the operator with a fault on the system³;
 - o) be capable of being operated without exposing the operator to any live parts; and
 - p) bear a warning to the effect that inside parts can be energized from sources on both sides when disconnecting means is open³.
- iii) In addition to the requirements in Item (ii) above, all three phase DG Facility's isolation device shall:
- a) be gang operated and disconnect all ungrounded conductors of the circuit simultaneously⁵;
 - b) be motorized if the DG Facility is larger than:
 - 1) 250 kW when connecting to feeders operating below 15kV; and
 - 2) 500 kW when connecting to feeders operating above 15kV.
 - c) have a protection interface for tripping if used as a backup for interrupting device failure (HVI Breaker Failure or LVI Breaker Failure).

⁴ As defined by OESC Section 18

⁵ In accordance with OESC Section 84-024

- iv) If the isolation device is motorized as required by Item (iii)(b) above, it shall be powered from a reliable source such as a DC battery to power a DC motor or via a battery-supplied DC/AC inverter to power an AC motor.
- v) If multiple generators are connected at the DG Facility, one disconnect switch shall be capable of isolating all of the generators simultaneously.
- vi) Switching, tagging and lockout procedures shall be coordinated with Hydro One.
- vii) The DG Owner and Hydro One shall mutually agree to the exact location of the disconnect switch.

BACKGROUND INFORMATION

To ensure a safe and reliable means of electrically isolating the DG Facility from Hydro One's Distribution System, an isolating device that conforms to OESC Section 84 and additional Hydro One requirements is required.

This point of disconnection is required for the purpose of work protection of Hydro One and DG Facility personnel. Operation of the isolation device shall not be a source of injury to the operator during operation, even when closed into a faulted system. It may also be used for breaker fail schemes.

The DG Facility isolation device, if motorized, must have a reliable uninterruptable power source. An AC motor supplied from the AC station service supply may be used to power the motor providing there is an auto-transfer from a DC/AC inverter. For example, if the HV disconnect switch (isolation device) motor is AC rated and powered from the AC station service and if all load derived from the AC station service are considered "non-critical", then, AC power may not be available when the HV disconnect switch is required to operate (example: backup to HVI breaker failure).

If the DG Facility consists of multiple generators, one disconnect switch must be capable of isolating all of the generators simultaneously. There may be other means of meeting this requirement and any proposals must be reviewed by Hydro One.

2.1.8 INTERRUPTING DEVICE RATING

- i) All fault current interrupting devices shall be sized appropriately using present and anticipated future fault levels.

- ii) The interrupting device used to disconnect generation from Hydro One's Distribution System shall operate fast enough to meet the timing requirement of the quickest protection operation and shall:
 - a) operate in no more than 160ms, which includes the protection element detection time for DG Facilities not equipped with Transfer Trip; and
 - b) operate within the required time for DG Facilities equipped with Transfer Trip as shown in Table 13 – maximum interrupting device time is dependent on the speed of Transfer Trip communications.

BACKGROUND INFORMATION

Fault contribution from both the DG Facility and Hydro One's Distribution System shall be used to adequately size all fault current interrupting devices. Hydro One will provide present and anticipated future fault contribution levels from Hydro One's Distribution System.

For generators that have a time variant fault contribution characteristics, the characteristics producing the highest fundamental component fault current shall be used – synchronous and induction generators shall use sub transient reactance to calculate fault contribution. Inverter based generators typically contribute fault current marginally higher than rated full load current (usually 1.2 to 1.5 times the rated load current of the inverter for self-commutated designs and less for line-commutated inverters). Depending on the design, the rotor of double-fed asynchronous motors may be shorted by crowbar action in response to severe faults causing the generator to behave like an induction generator.

The interrupting device shall have a maximum operating time such that when combined with the timings of other protection elements will ensure that the minimum clearing times are achieved. Appendix F contains sample timing diagrams.

2.1.9 PHASING

- i) The DG Facility must connect rotating machines as required to match the phase sequence and direction of rotation of Hydro One's Distribution System.

2.1.10 TEMPORARY OVER-VOLTAGE (TOV)

- i) Grounding of DG Facilities and connection systems shall be in accordance with Section 2.1.11 and not cause any voltage disturbances.

- ii) When connecting to Hydro One's 4-wire Distribution System, TOV that may be caused by the DG Facility connection should not exceed 125% of nominal system voltage (line to neutral) anywhere on the distribution system and under no circumstance shall exceed 130%.
- iii) Hydro One may advise on action needed to reduce TOV to limits by specifying the requirement of grounding transformer on the HV side.

BACKGROUND INFORMATION

Connection of DG Facilities causes fault levels, fault current distributions and voltage profiles to change on the Distribution System. The extent of these changes depends on many factors associated with the distribution system and the DG Facility connection. Those factors include but are not limited to:

- Pre-fault voltages of the utility and generator sources;
- Type of fault;
- Fault resistance;
- Utility supply configuration and corresponding source impedances;
- DG Facility supply configuration and corresponding source impedances to the PCC. These are affected by:
 - generator capacity (MVA);
 - generator type(s) – synchronous, asynchronous (induction), inverters and static power converters;
 - the effective net generator impedances (that will likely change during various fault conditions and time periods);
 - generator ground connections;
 - DGIT winding configurations;
 - DGIT capacity and impedances;
 - DGIT ground connections; and
 - DG intermediate transformer impedances (where used).
- Fault location and feeder impedances;

- Location of the fault in relation to the sources (circuit impedances between the fault and the sources); and
- Location of the Distributor and DG Facility sources in relation to each other (circuit impedances between the sources)

A sufficiently comprehensive model of the distribution system and DG Facility connection characteristics is required to predict the extreme worst-case currents and voltages that will occur for various fault conditions. The CIA will determine this and the need for the DG Facility is to ensure that the interconnection will maintain the distribution system's effective grounding and shall not cause TOV to exceed allowable levels.

It should be noted that TOV is an issue not only when the DG Facility is islanded, but may also occur when the DG Facility is still working in parallel with Hydro One's Distribution System before Hydro One's breaker trips.

2.1.11 GROUNDING

- i) The grounding of the DG Facility shall not cause overvoltages that exceed the rating of equipment connected to Hydro One's Distribution System.
- ii) The grounding of the DG Facility shall ensure that TOV limits in Section 2.1.10 are not exceeded.
- iii) The grounding of the DG Facility shall not disrupt the coordination of ground fault protection of Hydro One's Distribution System.
- iv) The DG Facility's grounding shall be per manufacturer's recommendation, the OESC and the requirements in Section 2.1.11 of the TIR.
- v) The connection of a DG Facility shall not cause the Neutral to Earth Voltage (NEV) to exceed CSA requirements (i.e., less than 10 V rms) on 4-wire multi-grounded distribution system.
- vi) In the case of shared-use poles, voltages induced on the under-strung neutral must be minimized so as not to increase NEV.
- vii) If the primary HV winding of the DGIT is grounded or a grounding transformer on the HV side of the DGIT is installed, the ground grid of the DG Facility shall be connected to Hydro One's ground grid (neutral).
- viii) DG Facilities with a grounded HV DGIT, either utilizing a grounding transformer or a neutral reactor connected to the HV neutral, shall be sized as required in either Item

(ix) below to ensure that TOV limits are not exceeded or Item (x) below to ensure the impact to ground fault protection coordination requirements in Item (iii) above is satisfied.

- ix) For DG Facilities connecting to Hydro One's 4-wire Distribution System, TOV is a major concern and the neutral reactor (X_n) or grounding transformer shall be sized by the DG Owner and reviewed during the Connection Impact Assessment based on a Thevenin Equivalent of the Positive (X_{DG1}) and Zero Sequence (X_{DG0}) Reactance of the DG Facility (example: at the Point of Connection with the Point of Connection OPEN) that will result in:

- a) For Conventional (Rotating) Generators:

$$1.5 \leq \frac{X_{DG0}}{X_{DG1}} \leq 2.5$$

This will achieve an overall Thevenin Equivalent Positive and Zero Sequence impedance at any point on the feeder with any or all DG Facility sources and Hydro One sources In-Service of:

$$\frac{Z_0}{1} \leq \frac{Z_1}{3} \text{ and } \frac{Z_0}{1} \leq X_{0.4}; \text{ or}$$

- b) For DG Facilities with an Inverter Interface:

$$0.6 \text{ p.u.} \leq \frac{X_{DG0}}{X_{DG1}} \leq 10\% \text{ and } \frac{X_{DG0}}{X_{DG1}} \geq 1$$

where 1 p.u. impedance is based on:

- 1) the total MVA rating of the DG Facility (sum of DGITs MVA ratings) and high side kV rating of the DGIT(s) for Grounding Transformer sizing; or
- 2) the MVA and high side kV rating of the DGIT for Neutral Reactors sizing.

[Note: DGIT MVA rating is assumed to be approximately equal to the generation capacity. See Appendix C for calculation examples.]

- x) For DG Facilities connecting to Hydro One's 3-wire Distribution System, a grounded HV DGIT is not required. However, if the DG Owner decides to have the DGIT grounded, the ground source contribution from the DG shall be limited as follows. The neutral reactor (X_n) or grounding transformer shall be sized by the DG Owner and reviewed during the Connection Impact Assessment based on a Thevenin Equivalent of the Positive (X_{DG1}) and Zero Sequence (X_{DG0}) Reactance of the DG Facility (example: at the Point of Connection with the Point of Connection OPEN) that will result in:

- a) For Conventional (Rotating) Generators:

$$X_{1X} > X_B ; \text{ or}$$

- b) For DG Facilities with an Inverter Interface:

$$X_{1X} > X_{24}$$

[Note: For (a) above, X_{DG1} is the equivalent of X''_d plus X_t of the DG Facility. For (b) above, X_{DG1} is the reactance of the DGIT. See Appendix C for calculation examples.]

- xi) The installation of a wind farm shall not increase the lightning transfer to Hydro One's system.
- xii) In wind installations, to limit the exposure of lightning to Hydro One's Distribution System, lightning protection grounding shall be electrically separated from the grounding grid of the wind tower.
- xiii) Where the separation in Item (xii) above is not possible or practical, then the ground grids of the towers shall be electrically separated from the DG Facility Station ground grid from the point of view of transferred lightning surges. The latter can be achieved by ensuring that the wind towers are not bonded to the station's ground grid.
- xiv) Stand alone studies are required to ensure that GPR meets step and touch potential and OESC requirements.
- xv) The report in Item (xiv) above must be submitted to Hydro One.

DESIGN CONSIDERATION

Multi-grounded 4-wire distribution feeders are effectively grounded and the DG Facility shall appropriately size its neutral reactor such that for the entire feeder and for all system conditions the ratio of zero-sequence reactance to positive-sequence reactance (X_{1X}) is positive and less than 3, and the ratio of zero-sequence resistance to positive-sequence reactance (X_{1X}) is positive and less than 1. Further, to restrict ground fault contribution, a lower limit is placed on X_{1X} .

Lightning drainage conductors must be electrically separated from the wind tower's ground grid (> 6 ft). If this is not possible or practical, then the ground grid of the tower shall be separated from the DG Facility Station ground from the point of view of transferred lightning surges. This can be achieved by ensuring that the wind towers are not bonded to the

station's ground grid. There are different ways to achieve this, such as ensuring that the cables are not bonding the two systems together (can be achieved by designing a span or section of the line overhead). Separation from a transferred lightning point of view can also be achieved if sufficient lightning drainage is provided between the wind turbine tower and the facility. A study would have to be provided to support such a solution.

2.1.12 INTERCONNECTION TRANSFORMER CONFIGURATION

- i) The DG Interconnection Transformer (DGIT) shall not cause voltage disturbances or disrupt co-ordination of distribution system ground fault protection.
- ii) The DG Owner shall choose one of the DGIT configuration options outlined in Section 2.1.12.1 if the DG Facility is connecting to Hydro One's 4-wire Distribution System.
- iii) The DG Owner shall choose the DGIT configuration outlined in Section 2.1.12.2 if the DG Facility is connecting to Hydro One's 3-wire Distribution System.
- iv) The DG Owner shall ensure that there is no back feed from the DGIT when the generator is out of service and shall be responsible for all consequences resulting from such back-feeds.
- v) The DGIT may supply unbalance current to support the unbalanced load on the feeder even when the generator is out of service. The DG Owner is responsible to ensure the design is adequate to handle the unbalance current. Refer to Requirements in Section 2.2.2.2.
- vi) Items (i), (ii) and (iii) above apply to all DG Facilities connecting directly to Hydro One's Distribution System or indirectly through a hybrid feeder.
- vii) Items (i), (ii) and (iii) above may apply to DG Facilities connecting indirectly to Hydro One's Transmission or Distribution System through an embedded LDC if the connections may negatively impact Hydro One's system.

BACKGROUND INFORMATION

As per the DSC, Appendix F.2 Section 2, the interconnection transformer shall not cause voltage disturbances or disrupts co-ordination of distribution system ground fault protection. Annex C of CAN/CSA Standard C22.3 No.9-08 discusses different DG interconnection transformer configurations and presents their advantages and disadvantages.

Since the winding configuration of any three phase transformer(s) between the DG Facility and Hydro One will have an impact on the distribution system, both under steady state and

fault conditions, Hydro One has analyzed the different options and has standardized the DGIT configuration to a few specific alternatives. This section presents a description of the allowable transformer configurations for the connection of a DG Facility to Hydro One's 3-Wire and 4-Wire Distribution System. Other connections may also be allowed as long as they are electrically equivalent. Hydro One will accept any alternate proposals and if approved, will add them to the available options in this section. Written approval from Hydro One will be required for any alternate configuration. The DGIT may supply unbalance current to support the unbalanced load on the feeder. This unbalance current may be present even if the generator is out of service. The proportion of unbalance load current from the DGIT will vary based on the feeder topology, unbalanced loads, voltage and the DG Facility location.

2.1.12.1 DG FACILITY INTERCONNECTION TO 4-WIRE DISTRIBUTION SYSTEMS

- i) The DG Facility shall connect to Hydro One's 4-Wire Distribution System using one of the following options:
 - a) Wye-Ground:delta DGIT as shown in Figure 2;
 - b) Wye-Ground:wyeground with a Delta tertiary DGIT as shown in Figure 3;
 - c) Wye-Ground:wyeground (LV may be ungrounded) DGIT with an HV Grounding Transformer as shown in Figure 4; or
 - d) Delta:wyeground DGIT with HV Grounding Transformer as shown in Figure 6;
- ii) In addition to the DGIT options in Item (i) above, the DG Facility may also connect through a Wye-Ground:wyeground DGIT without an HV Grounding Transformer as shown in Figure 5 if generators are solidly grounded and the requirements of Section 2.1.10 and Section 2.1.11 are met. The CIA shall determine whether this option is feasible.
- iii) In addition to the DGIT options in Items (i) and (ii) above, the DG Facilities smaller than 1 MVA having generators grounded through an impedance may also connect through a Wye-Ground:wyeground or a Delta:wyeground transformer without installing an HV Grounding Transformer as shown in Figure 7 if the CIA determines that the TOV requirements in Section 2.1.10 are met.
- iv) For generation being added to existing critical load installations, such as hospitals and water treatment plants, existing Delta-wye load transformer can be used to connect the generation as shown in Figure 8 provided that the requirements in

Item (vi) below are met and that an HVI is provided to isolate the HV Grounding Transformer from the Distribution System whenever the generation is disconnected from the Distribution System.

- v) A neutral reactor in the primary winding of DGIT options in Items (i)(a), (i)(b), (ii) and (iii) above may be necessary to limit the ground short circuit current and shall be sized in accordance with Section 2.1.11 Item (ix).
- vi) An HV Grounding Transformer on the HV side of the DGIT shall be required to keep TOV within limits for DGIT options in Items (i)(c), (i)(d) and (iv) above and shall:
 - a) be sized in accordance with Section 2.1.11 Item (ix);
 - b) be located on DG Facility side of the HVI;
 - c) be a zig-zag design;
 - d) be either solidly connected (not fused) to ensure that the transformer is in service at all times, or if fused, the fuses shall be monitored and the DG Facility's HVI shall be tripped in the event of a failure of the grounding transformer;
 - e) have the neutral of the grounding transformer connected to Hydro One's neutral conductor; and
 - f) have adequate protection to provide an alarm when the neutral overcurrent rating of the grounding transformer is exceeded and to automatically remove the grounding transformer from service and disconnect all generation when internal phase or ground faults occur.
- vii) The DGIT options in Items (i), (ii) and (iv) above shall require the installation of a high side interrupting device (HVI) in accordance with Section 2.1.13 to ensure that the HV Ground Source is disconnected from Hydro One's Distribution System during abnormal conditions. The requirement of an HVI for the option in Item (iii) above shall be determined in the CIA.
- viii) The DGIT's ground shall be connected to Hydro One's neutral conductor.
- ix) The DGIT design and installation shall meet all other grounding requirements in Section 2.1.11.
- x) The design of the DGIT shall ensure that all Power Quality requirements are adhered to.

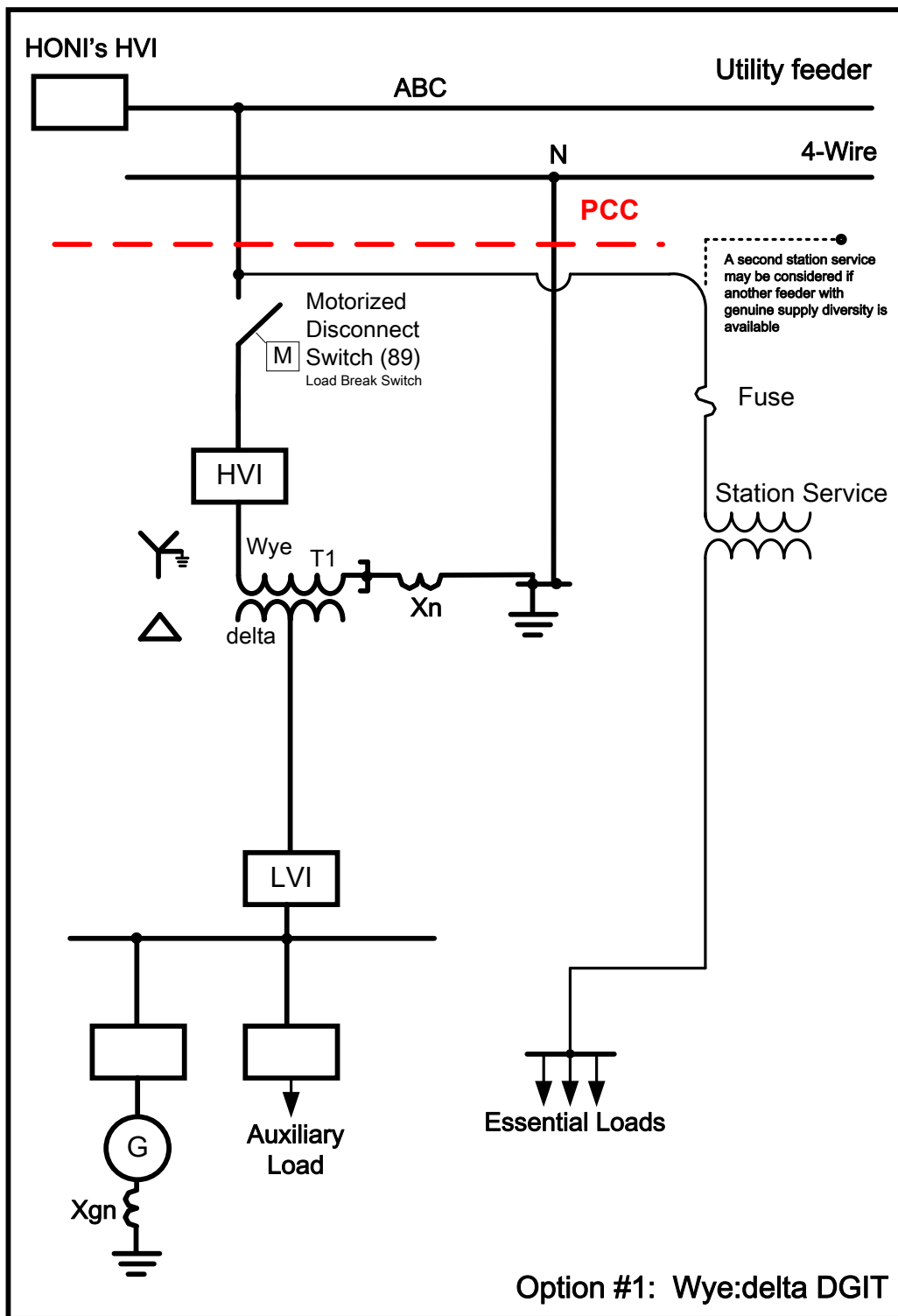


Figure 2: 4-Wire DGIT Option #1

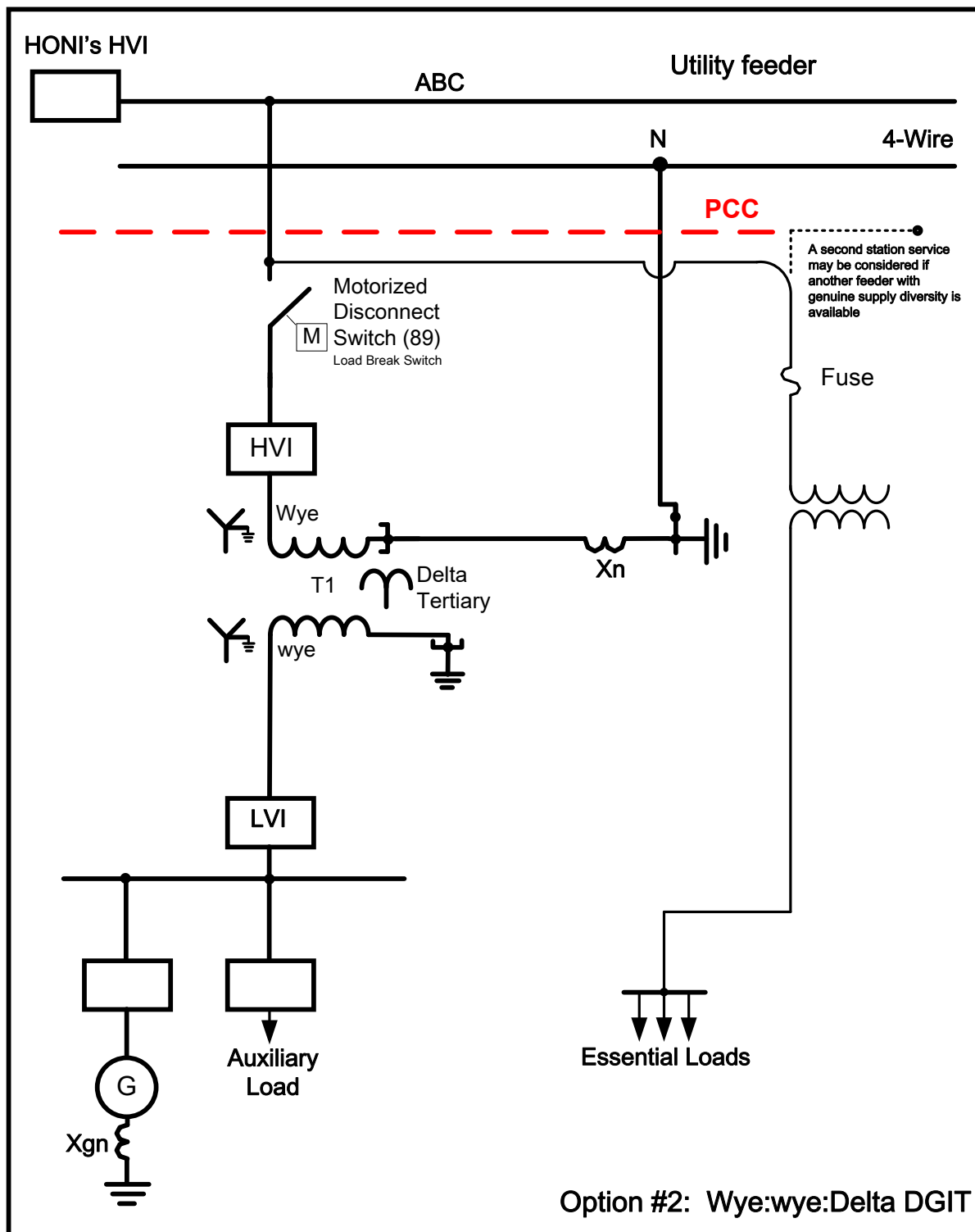


Figure 3: 4-Wire DGIT Option #2

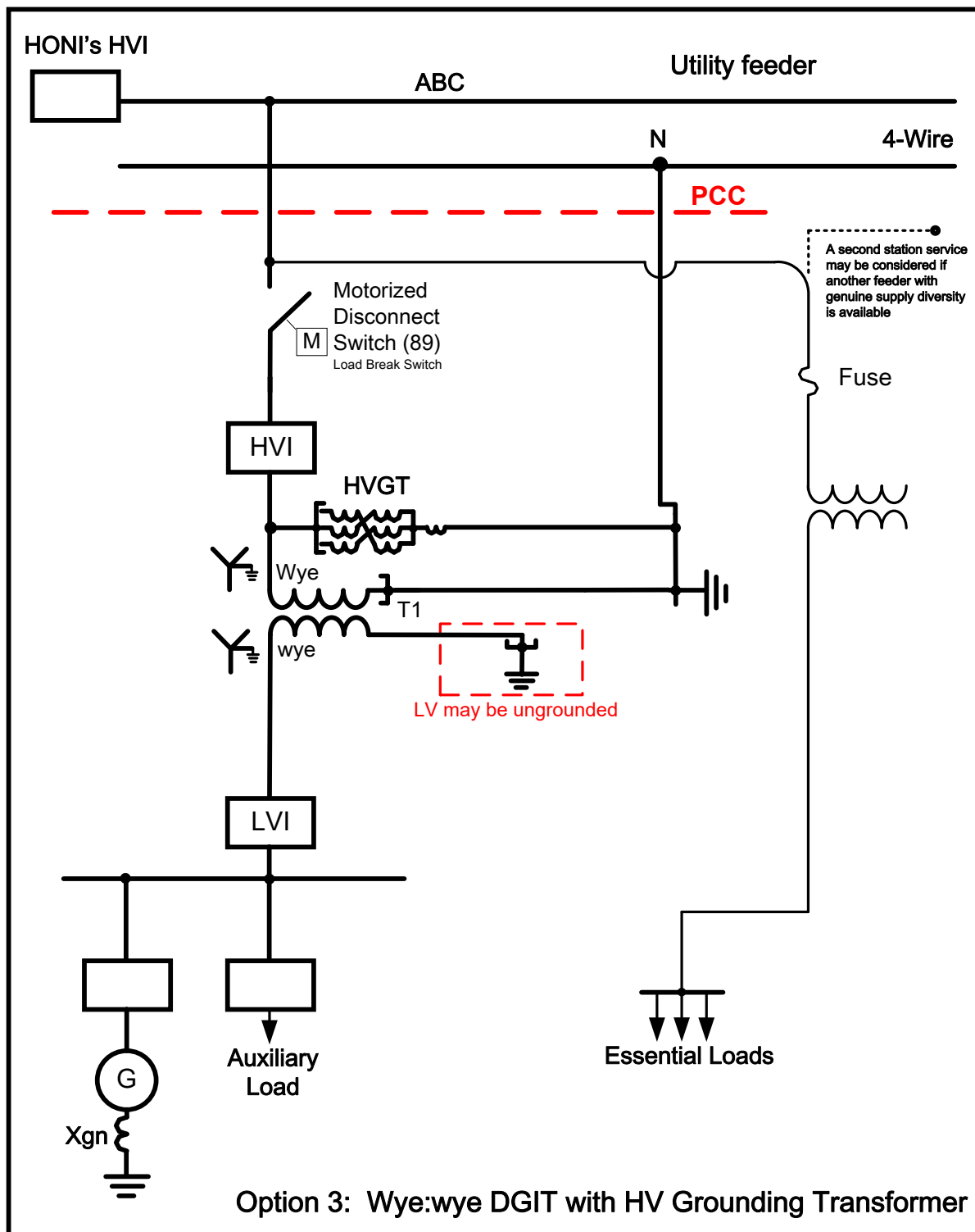


Figure 4: 4-Wire DGIT Option #3

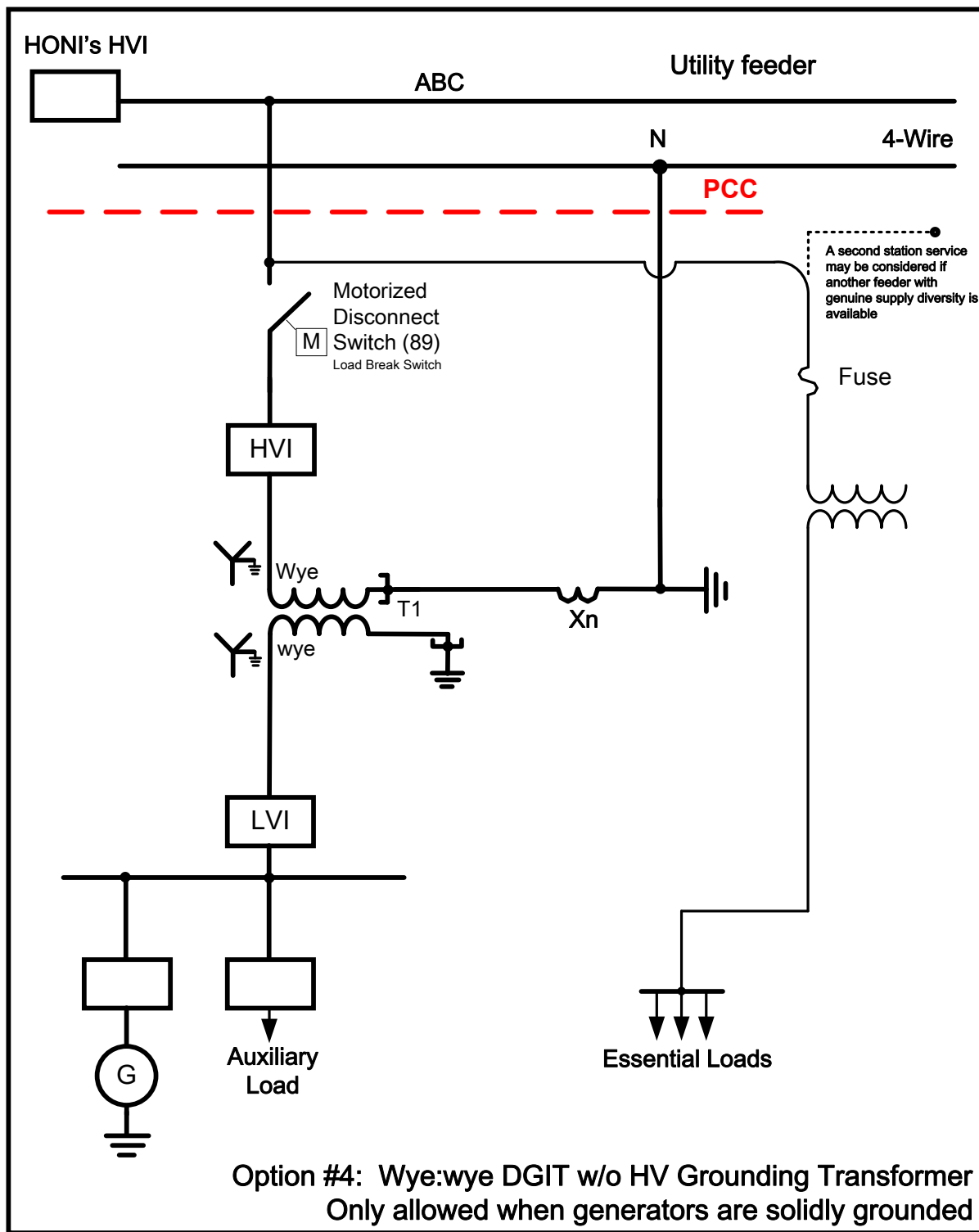


Figure 5: 4-Wire DGIT Option #4

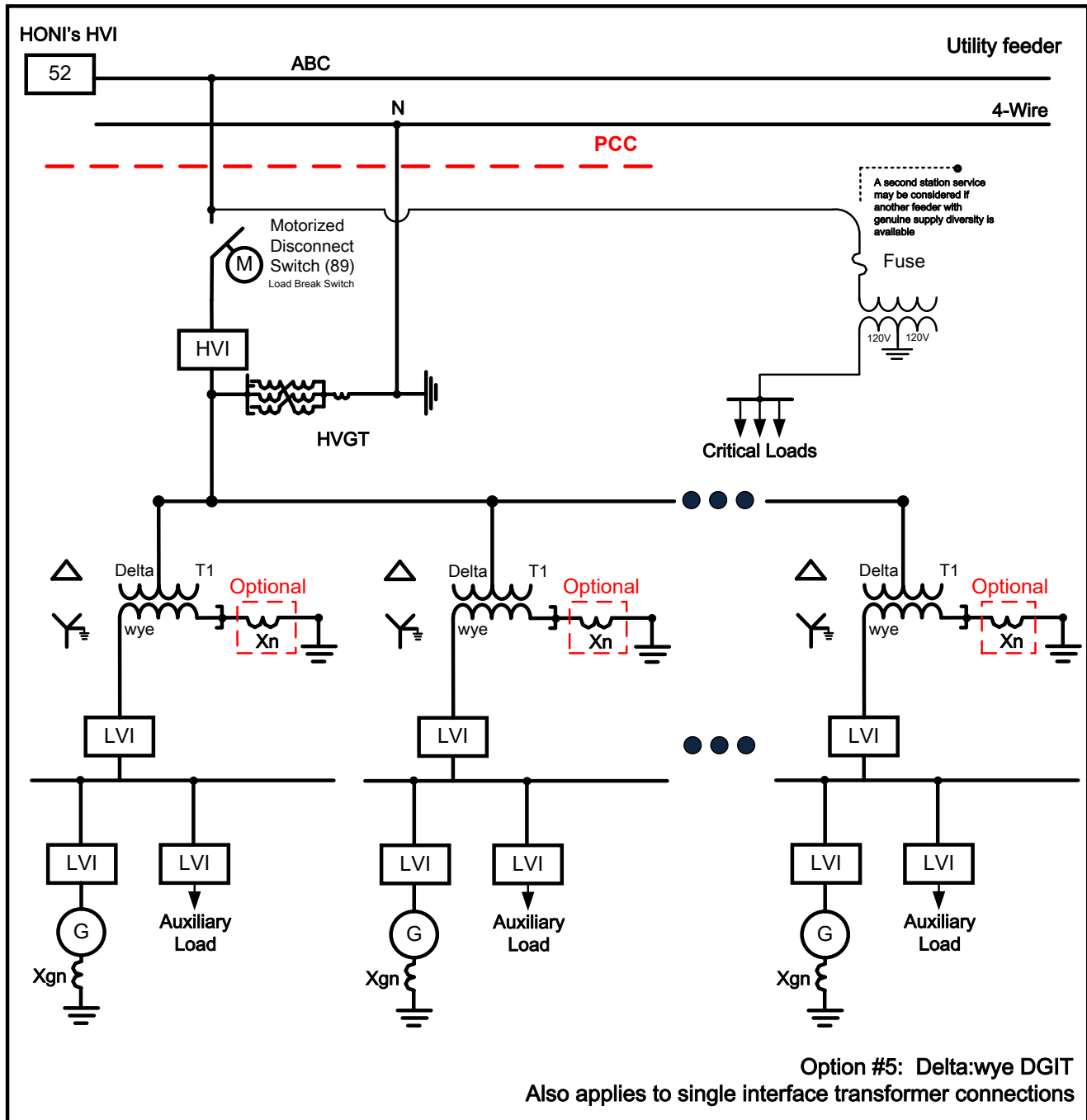


Figure 6: 4-Wire DGIT Option #5

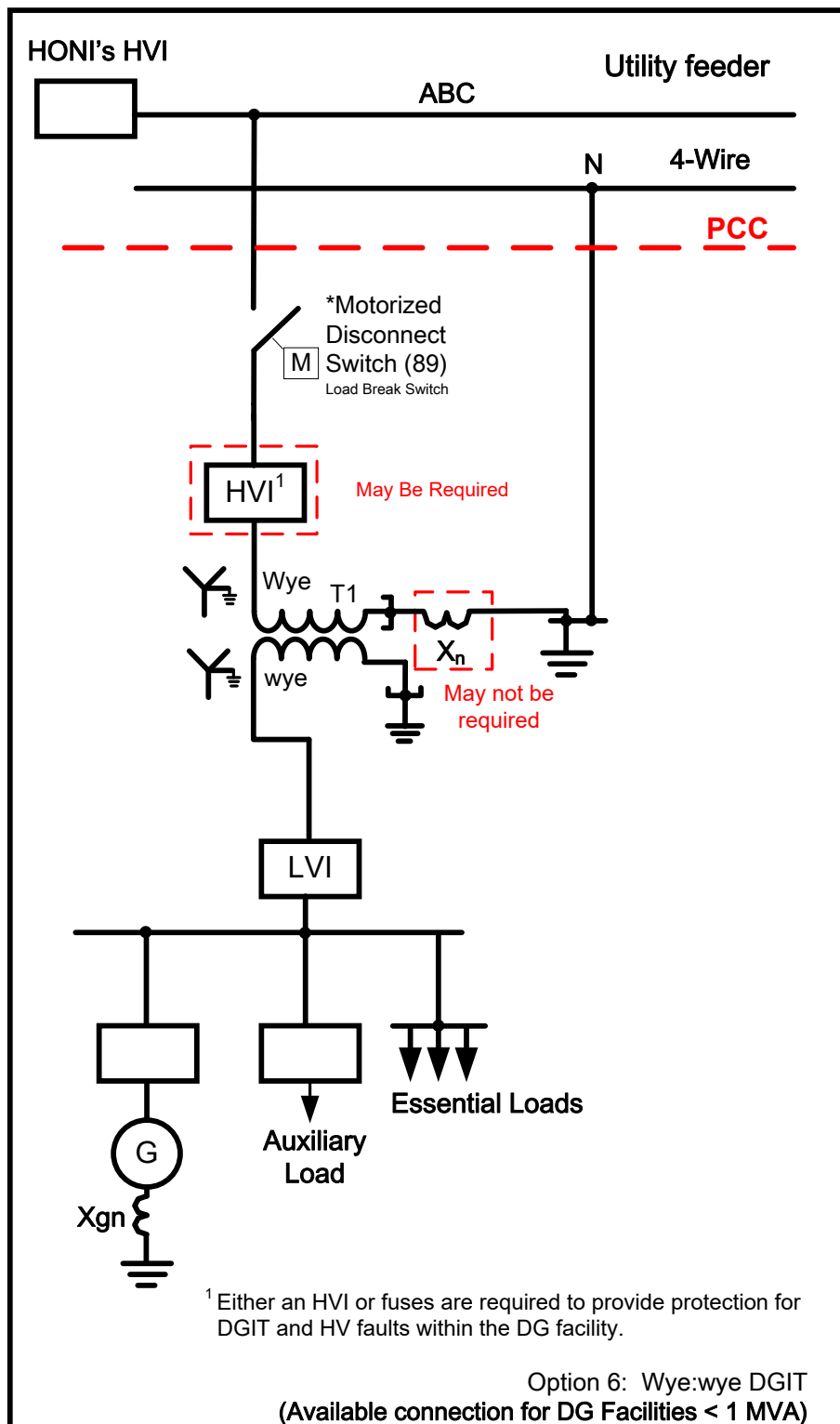


Figure 7: 4-Wire DGIT Option #6

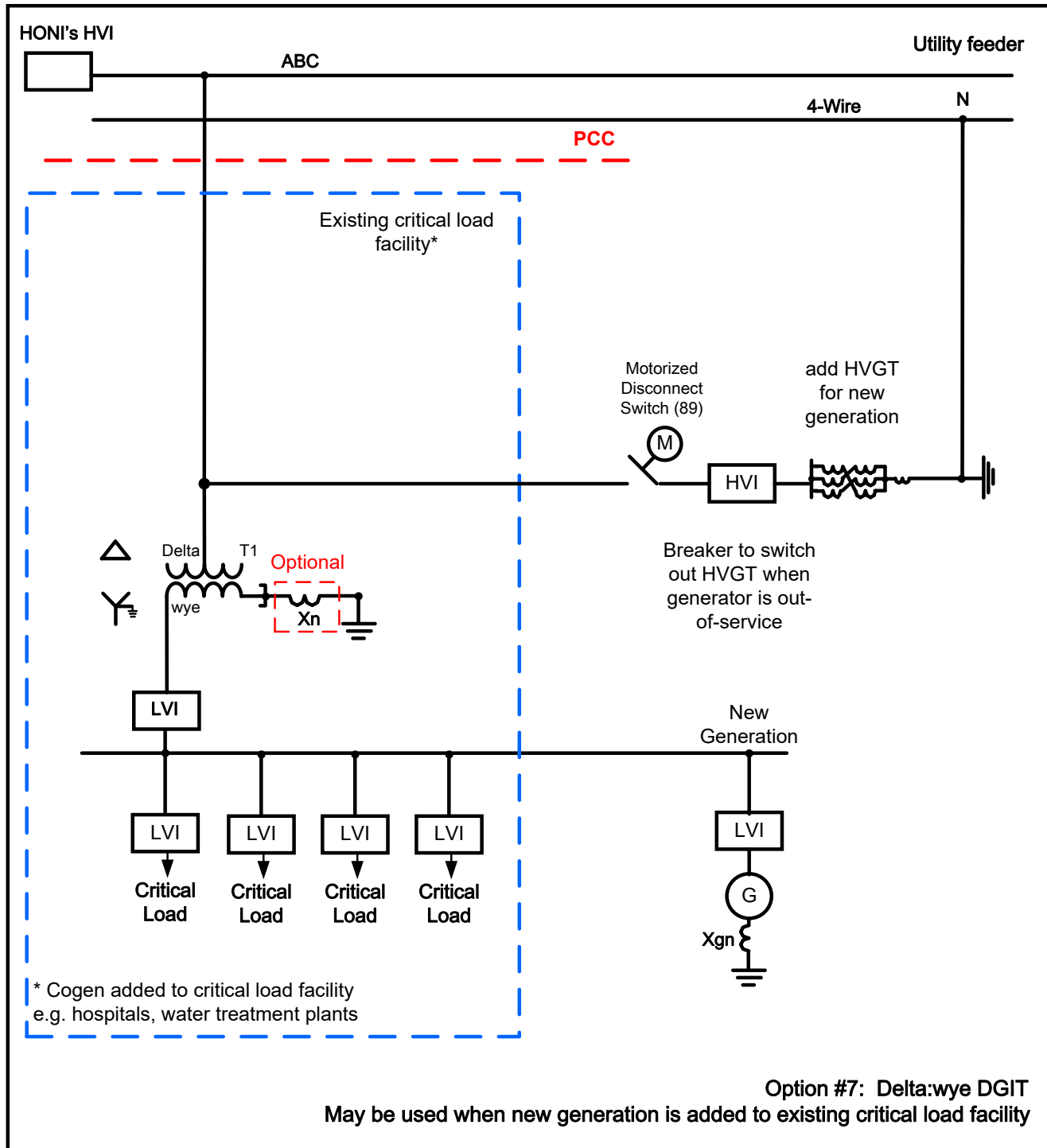


Figure 8: 4-Wire DGIT Option #7

BACKGROUND INFORMATION

HONI requires that interconnections to the 4-Wire distribution system do not cause excess Temporary Overvoltages (TOV) and ground protections to become compromised. To achieve this, HONI requires that DGITs are effectively grounded. This will prevent the damaging TOV associated with high side ungrounded transformer configurations. However, this introduces a HV ground source which desensitizes HONI's protections and increases ground fault short circuit levels. To minimize these effects, a neutral grounding reactor at the primary winding (HV) may be necessary to limit the ground short circuit current.

When HONI's feeder Low Set instantaneous protection operates, the HV ground sources along with the generators shall be disconnected. This allows the timed overcurrent protection on HONI's distribution system, such as feeder breakers, inline reclosers, and fuses, to detect all faults on HONI's Distribution System and coordinate properly after HONI's supply is reconnected. Please refer to Appendix A.9 for an explanation of HONI's Distribution System protection scheme.

Different options are provided for DG Owners to choose from when selecting the transformer winding configuration for their DG Facility. All are electrically equivalent with the exception of the option provided in Item (iii) for DG Facilities smaller than 1 MVA.

The Wye-Ground:wye-Ground with a Delta tertiary is an option. The delta tertiary is required to limit the harmonic distortion to HONI's distribution system and to limit the TOV's on HONI's distribution system due to the introduction of the DG on the feeder if the generator is ungrounded or high impedance grounded. This configuration should eliminate the need for grounding transformers on both the HV and LV side of the DGIT.

DG Facility installations which utilize multiple transformers that step up the voltage directly to the distribution voltage level and connect to HONI distribution system through a common PCC may wish to utilize a DGIT with a HV Delta winding. This option will require a grounding transformer (zig-zag) to be connected on the HV side of the DGITs to limit the TOV on HONI's distribution system. This grounding transformer shall be sized by the DG Owner and reviewed during the Connection Impact Assessment. Since this makes this configuration electrically equivalent, an HVI is required to ensure all HV Ground Sources are disconnected from HONI's Distribution System. This option may be preferable for inverter based DG Facilities as it may be more economical to use grounding transformers as opposed to neutral reactors due to the impedance required – Refer to Section 2.1.11 Item (ix) for sizing requirements.

If the option available to only DG Facilities smaller than 1 MVA is chosen, and if there is single phase reclosing upstream of the DG Facility on HONI's distribution system, consideration should be given to use 3 separate single phase transformers. This will eliminate the problems associated with backfeed onto faulted phases due to a shared magnetic core. Therefore in the case of a downed conductor, without the presence of a HVI at the DG Facility to disconnect the transformer, the public would not be put at risk due to magnetically coupled voltage on the conductor.

The design of the DG Facility should take into consideration the possibility of ferroresonance due to the loss of one or two phases and shall take steps to ensure that the DG Facility is protected under such an occurrence.

2.1.12.2 DG FACILITY INTERCONNECTION TO 3-WIRE DISTRIBUTION SYSTEMS

- i) The DG Facility shall connect to Hydro One's 3-Wire Distribution System through:
Delta:wyed DGIT as shown in Figure 9
- ii) For DGIT configurations that connect the DG Facility to Hydro One's system as a ground source, the DG Facility shall meet the grounding requirements in Section 2.1.11 Item (x).
- iii) The design of the DGIT shall ensure that all Power Quality requirements are adhered to.

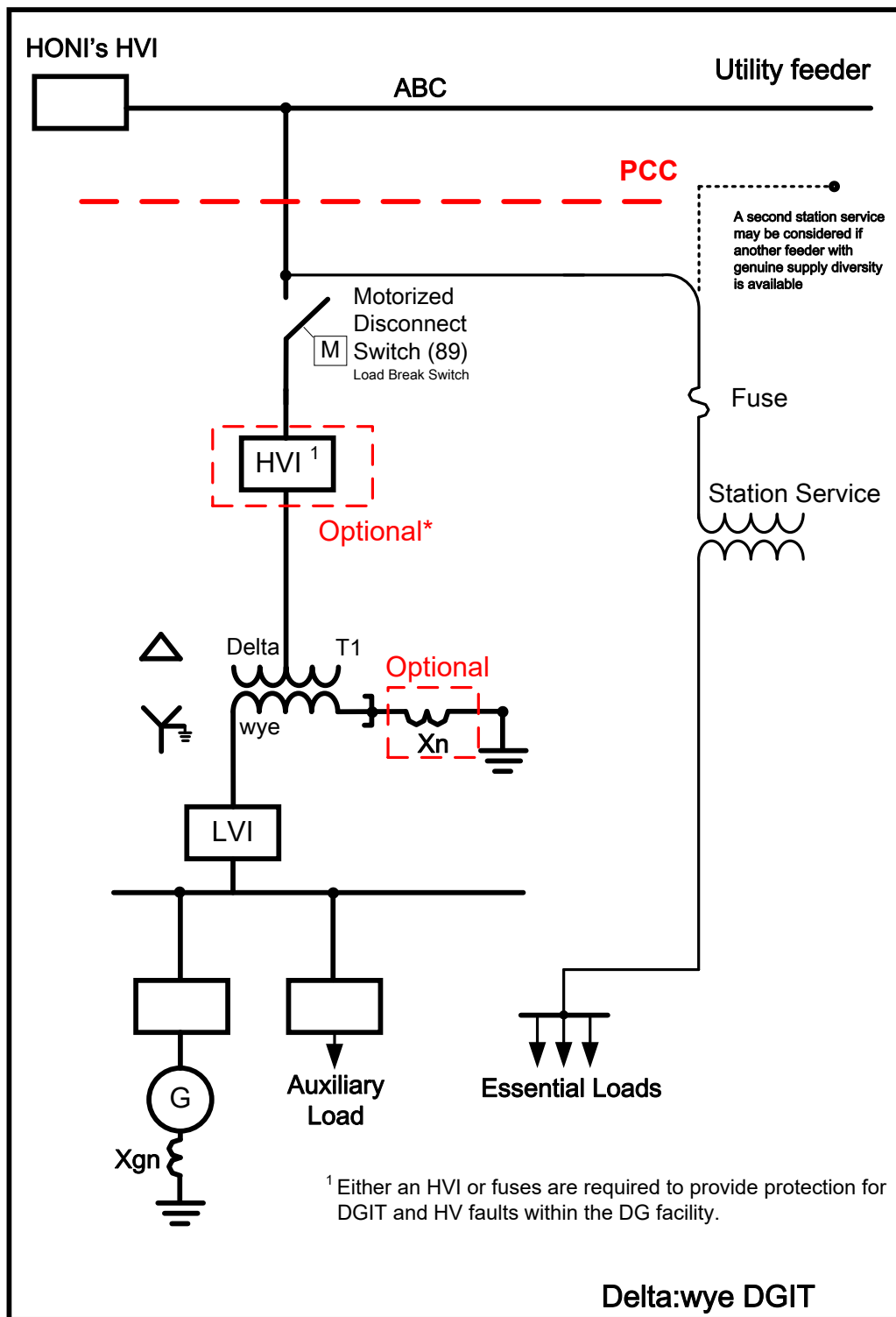


Figure 9: 3-Wire DGIT

BACKGROUND INFORMATION

HONI's 3-Wire Distribution Systems have been designed to withstand phase to phase voltage magnitudes on all phase conductors and thus there is no concern of TOV for these connections. Since TOV is not a problem, HONI does not stipulate the need for an effectively grounded DGIT. If one is chosen, it shall be sized as required in the grounding requirements in Section 2.1.11 Item (x). An HVI shall be required in this case. In the absence of a HVI, an interrupting device(s) shall be installed on the LV side of the DGIT.

The design of the DG Facility should take into consideration the possibility of ferroresonance due to the loss of one or two phases and shall take steps to ensure that the DG facility is protected under such an occurrence.

Protection systems shall be designed accordingly to ensure that ground faults on HONI's distribution system are detected.

2.1.13 HIGH VOLTAGE INTERRUPTING DEVICE (HVI)

- i) The DG Facility shall be equipped with a High Voltage Interrupter (HVI), with a protection interface for tripping, upstream of all interconnection transformers and HV ground sources if:
 - a) the DG Facility is connecting to Hydro One's 4-wire Distribution System and is grounded in accordance with Section 2.1.11 Item (ix); or
 - b) the DG Facility is connecting to Hydro One's 3-wire Distribution System and is effectively grounded or is grounded in accordance with Section 2.1.11 Item (x).
- ii) DG Facilities at critical load installations, such as hospitals and water treatment plants, interconnecting to Hydro One's 4-wire Distribution System using the DGIT option in Section 2.1.12.1 Item (iv) shall be equipped with an HVI, with a protection interface for tripping, upstream of the HV Grounding Transformer.
- iii) DG Facilities < 1 MW, connecting to Hydro One's 4-wire Distribution System through a Wye-Ground:wye-Ground transformer may be exempt from the requirement in Item (i) above if the CIA determines that:
 - a) ground fault source contribution from the DG Facility does not cause coordination problems with Hydro One ground protections; and
 - b) the installation does not contain HV grounding transformers.

- iv) If the DG Facility does not require an HVI, a low voltage interrupter(s) must be provided to disconnect the DG Facility's generation from Hydro One's Distribution System.
- v) The HVI status must be monitored.
- vi) The HVI shall be sized properly to account for present and future anticipated fault levels.
- vii) Breaker fail protection for the HVI shall be in accordance with requirements in Section 2.3.4.
- viii) The HVI's interrupting time shall be in accordance with the timing requirements in Section 2.1.8.

BACKGROUND INFORMATION

NOTE: For the purpose of the TIR, the term HVI will refer to interrupting devices on Hydro One side of the DG Interconnection Transformer (DGIT) – whether it is high voltage or medium voltage.

DG Facilities connecting to Hydro One's 4-wire distribution system require that the HV ground source is removed and thus, have a need for a high side interrupter. The only exception is for DG Facilities smaller than 1 MW which are connected through typical load transformers (Wye-Gnd:wye-Gnd) if it can be shown that they will not negatively affect Hydro One's protection systems. This connection is one of the options shown in Section 2.1.12.1 Item (iii) and is allowable only if the CIA determines that TOV is not a concern with the specific DG Facility.

DG Facilities connecting to Hydro One's 3-wire distribution system through an HV Delta DGIT without the use of a grounding transformer do not require an HVI as no ground source is present that needs to be removed. For all other connections, an HVI is required. More information on allowable DGIT configurations and grounding requirements can be found in Section 2.1.12 and Section 2.1.11 respectively.

This requirement is driven by the configuration of the DGIT and the need to remove the additional HV ground source from the distribution system before the 1st reclose to ensure that the DG Facilities will not adversely affect overcurrent protection devices on Hydro One's distribution system. The feeder and DG Facility HVI will be tripped for feeder faults or feeder islanding conditions (feeder breaker trips instantaneously and independently of DG Facility HVI tripping). Before the first reclose, all the generators and HV ground sources on the distribution feeder shall be disconnected from the feeder. Upon reclose, the

feeder 51 & 51N timed overcurrent devices will co-ordinate with reclosers and lateral fuses on Hydro One's Distribution System since all current infeeds from the generators and the HV ground source are removed. Requirements for disconnection and reconnection to Hydro One's Distribution System following momentary and permanent faults can be found within Sections 2.4.6, 2.4.7 and 2.4.8.

An HVI is also required to prevent back-feed whenever single phase switching can occur upstream of the DG Facility on Hydro One's Distribution System. Refer to Appendix A.9 for more information regarding Hydro One's Distribution System protection practices and standards.

2.1.14 STATION SERVICE FOR ESSENTIAL LOADS

- i) Wherever genuine supply diversity is possible, at Hydro One's sole discretion, a second connection for AC station service from another feeder may be allowed to supply essential loads (such as station battery).
- ii) The station service in Item (i) above, shall not be electrically connected to the DG Facility's electrical system that is associated with the power transfer from the DG Facility to Hydro One's Distribution System.
- iii) The station service load shall not impose operating restrictions on Hydro One's system when either the Motorized Disconnect Switch (Isolation Device – Section 2.1.7) or the HVI is opened.
- iv) The station service shall comply with all required load connection standards.
- v) The station service shall be in compliance with all metering standards and regulations.
- vi) Station GPR shall not be transferred to the neutral of the LV system supplying station service for critical loads.
- vii) A backup generator may be used to satisfy Item (i) above.

BACKGROUND INFORMATION

The DG Owner might classify loads at the DG Facility as being either "critical" or "non-critical" based on the outage frequency and expected duration of each outage. "Critical" loads may only tolerate a momentary loss of power and may include such loads as battery charging equipment, emergency lighting or equipment supplying safety or shutdown

systems. The DG Owner may not deem any loads at the DG Facility as being “critical” for their operation.

The intent of the above requirements is to make the DG Owner be aware that the HVI at the DG Facility will be tripped from time to time, typically to clear faults on the distribution circuit, and may be out-of-service for longer periods during maintenance or severe disturbances of the distribution system. The HVI at the DG Facility will be required to remain open until the distribution circuit is re-energized and after the staggered restoration delay has expired as per Section 2.4.7. The DG Owner should recognize and accept these extended outages if all DG Facility’s loads are supplied from the LV side of the DGIT. The DG Owner may also consider a backup generator to supply critical loads as an alternative to a dedicated station service supply.

If a separate station service AC service power source is obtained from either Hydro One or a local distribution company, the DG Owner shall ensure that the above station service AC power source cannot be electrically connected to the DG Facility’s electrical system that is associated with the power transfer from the DG Facility to Hydro One’s distribution system (example: the intent is to prevent reverse power from the DG Facility to the station service AC supply source and vice versa).

2.1.15 BATTERIES/DC SUPPLY

- i) Batteries shall be provided and shall have adequate capacity to ensure that all protection functions operate when the main source of power fails.
- ii) They shall remain operational for the time required for protection functions to operate properly and disconnect the DG Facility from Hydro One’s Distribution System. They shall be capable of sustaining continuous telemetry about the DG Facility connection status and DGEO signals.
- iii) Items (i) and (ii) above shall be implemented by using batteries and chargers connected to the main service supply or by using an uninterruptable power supply with sufficient capacity for the application.
- iv) The battery voltage shall be monitored and upon failure, the protection scheme shall be considered failed and the DG Facility’s generation and HV ground sources shall be disconnected from Hydro One’s Distribution System.
- v) Relays connected to the DC supply shall not be subjected to sustained overvoltages – if there is a possibility that the DC rating of the equipment will be exceeded, steps shall be taken to ensure that DC voltage limiting devices be installed at each relay.

- vi) Dual station batteries shall not be required for protection and control equipment.
- vii) Protection systems designed to back each other up, shall be supplied by physically separated and protected (i.e. fused) DC Circuits.
- viii) Circuit breakers and the DG Facility's Interrupting Device shall be powered by separate and dedicated DC Circuits.
- ix) Separate and independent means are to be used for tripping the DG Facility's Interrupting Device and the DG Facility's Isolation Device (when motorized – See Section 2.1.7 Item (iii)(b)).
- x) Upon low voltage (DC) conditions, the protections shall trip the generators and all HV Ground Sources.
- xi) Capacitors shall not be used as the primary means to store energy in lieu of batteries.

2.1.16 FAULT LEVELS

- i) Maximum fault levels must be maintained within the limits set by the Transmission System Code (TSC) as shown in Table 2 and the connection of DG Facilities shall not cause these limits to be exceeded.

Table 2: TSC Maximum Fault Levels⁶

Fault Levels	Requirement		
	Nominal Voltage (kV)	Maximum Three-Phase Fault (kA)	Maximum SLG Fault (kA)
Maximum fault values are symmetrical fault values. Higher values may exist for short times during switching	44	20	19 (usually limited to 8 kA)
	27.6 (4-wire)	17	12
	27.6 (3-wire)	17	0.45
	13.8	21	10

2.1.17 INSULATION COORDINATION

- i) The DG Facility shall be protected against lightning and switching surges.
- ii) Surge arresters shall be located as close as possible to the equipment they protect and shall have adequate ratings to withstand the TOV during single-line-ground faults (Hydro One's Surge Arrester ratings are shown below in Table 3).

⁶ Extract from Ontario Energy Board - Transmission System Code Appendix 2 – Transmission System Connection Point Performance Standards

- iii) Insulation coordination shall conform with CAN/CSA C71-1-99-1 and CAN/CSA C71-1-99-2.

Table 3: Surge Arrester Ratings

Hydro One Distribution System Surge Arrester Ratings		
System Voltage (kV rms)	Arrester MCOV (kV rms)	Duty Cycle Rating (kV rms)
2.4 / 4.16	2.55	3
4.8 / 8.32	5.1	6
7.2 / 12.5	7.65	9
8.0 / 13.8	8.4	10
14.4 / 24.9	15.3	18
16.0 / 27.6	17	21
44*	39	48

*Three-wire sub-transmission from effectively grounded-wye supply

BACKGROUND INFORMATION

Unavoidable transient overvoltages might occur on the Distribution System and the DG Facility due to lightning and switching surges. The DG Facility equipment must be protected as required against these voltage stresses to prevent equipment damage and to prevent the propagation of these transients into Hydro One's Distribution System. Overvoltage protection usually includes using station and line shielding against direct lightning strikes and surge arresters for all wound equipment.

2.1.18 INSTRUMENT TRANSFORMERS FOR USE IN PROTECTION SYSTEMS

- i) All instrument transformers used in DG Facilities for protections shall meet the requirement of CSA-C60044-6 or IEEE C57.13.

2.1.19 POWER QUALITY MONITORING DEVICE

- i) DG Facilities > 250kW shall be equipped with a Power Quality (PQ) monitoring device capable of providing the reports required in Section 2.7.2.
- ii) The PQ monitoring device shall have the ability to perform sampling at the rate of 256 samples / cycle (~15 kHz) for a minimum of 96 cycles. This will ensure that the device is capable of recording voltage and current harmonics up to the 50th harmonic (3 kHz), impulsive transients in the milliseconds range (monitoring possible to at most 7 kHz), and low frequency oscillatory transients (<5 kHz).

- iii) The instrument transformers used for PQ monitoring shall be capable of monitoring transients up to 7 kHz, and swells up to 1.2 p.u. for a period of 1 minute.
- iv) PQ monitoring applies to phase voltages, neutral to ground voltage and phase currents.

2.1.20 PROTECTION FROM ELECTROMAGNETIC INTERFERENCE (EMI)

- i) EMI shall not cause the protection, control and communication functions of the DG Facility interconnection to fail, change state, misoperate or provide inaccurate information.
- ii) The DG Facility interconnection must have the capability to withstand electromagnetic interference (EMI) environments in accordance with:
 - a) ANSI/IEEE Std. C37.90.2, "IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers."; or
 - b) CAN/CSA-CEI/IEC 61000-4-3, using Level X, 35 V/m, in accordance with IEEE C37.90.2.
- iii) The DG Owner shall provide documentation to show compliance with Item (ii)(a) or (ii)(b) above.

2.1.21 SURGE WITHSTAND

- i) The protection, control and communication equipment of the DG Facility interconnection system shall not fail, misoperate, or provide misinformation due to voltage or current surges⁷.
- ii) The interconnection system shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE/ANSI Std. C62.41.2, "IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits" or IEEE Std. C37.90.1, "IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus – Description."

⁷ CSA Std. C22.3 No.9-08 Section 7.4.18 provides more detailed information.

2.1.22 DG FACILITY ACCEPTANCE

- i) The DG Owner must have a professional engineer licensed in the Province of Ontario declare (stamp and seal) that the DG Facility has been designed, tested and constructed in accordance with the requirements of the TIR, Hydro One's site-specific requirements, prudent utility practice and all applicable standards and codes.
- ii) The DG Owner shall provide the proposed design of all power equipment, protection, control, and metering systems used at the DG Facility to Hydro One for review.

2.1.23 GENERATORS PARALLELING FOR 6 CYCLES OR LESS (CLOSED TRANSITION SWITCHING)⁸

- i) The generator shall be exempt from all requirements in the TIR except for the requirements in Items (ii) and (iii) below.
- ii) DG Facilities paralleling for 6 cycles or less shall have the following protections:
 - a) Under-voltage protection to ensure that the generator is not capable of energizing Hydro One's Distribution System if it is de-energized; and
 - b) A 6 cycle timer to ensure that the DG Facility will not parallel with Hydro One's Distribution System for more than 6 cycles.
- iii) Synchronization facilities, where required, must follow the requirements specified in Section 2.4.4.

2.1.24 PROVISION FOR FUTURE CHANGES

- i) The DG Owner shall be responsible to stay aware of future changes to the business environment and technical requirements.
- ii) The DG Owner shall make any necessary changes to the DG Facility promptly in response to:
 - a) New or revised standards;
 - b) New or revised codes;
 - c) Legislation changes; and
 - d) Safety concerns.

⁸ As per CSA 22.3 No.9-8 section 7.4.13 Momentary closed transition switching



HYDRO ONE NETWORKS INC.

**DISTRIBUTED GENERATION TECHNICAL INTERCONNECTION REQUIREMENTS
INTERCONNECTIONS AT VOLTAGES 50kV AND BELOW**

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-
- iii) The DG Owner may be responsible for some or all costs associated with the changes in Item (ii) above.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 GENERAL

- i) The connection of the DG Facility must not materially compromise the reliability or restrict the operation of Hydro One's Distribution System.
- ii) The connection of the DG Facility must not degrade power quality below acceptable levels listed in Section 2.2.2 (Power Quality Requirements).
- iii) The DG Owner shall ensure that the facility is equipped to measure, record and report on performance related events to demonstrate compliance with the applicable sections of the TIR.
- iv) If the DG Facility is found to significantly deteriorate the performance of the Hydro One's Distribution System, it shall be disconnected from Hydro One's Distribution System until appropriate measures are taken to mitigate the negative impacts.

2.2.2 POWER QUALITY

2.2.2.1 VOLTAGE

- i) The DG Owner shall ensure that the operation of the DG Facility does not have an objectionable impact on voltage at the PCC or the interconnected feeder and shall not cause any violation of CSA Standard CAN3-C235-83 "Preferred Voltage Levels for AC Systems, 0 to 50,000V Electric Power Transmission and Distribution" along the entire interconnected feeder.
- ii) PCC voltage shall be maintained within 0.94~1.06 p.u. and shall not be lower than pre-connection voltage.
- iii) The DG Facility shall not actively regulate the voltage at the PCC. Voltage at the PCC shall be maintained within acceptable limits by following the requirements in Item (vii) below.
- iv) Voltage variations at the PCC shall be limited in accordance with the "Voltage Fluctuations (Flicker) Requirements" in Section 2.2.2.3.

- v) At the feeder level, DG Facility shall not contribute to short-term voltage fluctuation anywhere on the feeder by more than 1%⁹.
- vi) At the station level, all DG Facilities connected to the TS/DS shall not collectively contribute to short-term voltage fluctuation at the station LV bus by more than 1%¹⁰.
- vii) Tripping of all DG Facilities connected to the station shall not cause abrupt voltage change to result in a voltage above 110% of nominal bus voltage, or less than 90% of nominal bus voltage, after a single contingency and before the station ULTC /feeder VR operates¹¹. The operating power factor of the DG Facility at the PCC shall be as required in Section 2.2.2.6 Item (v).
- viii) During normal operation, the DG Facility shall be loaded and unloaded gradually to allow adequate time for regulating devices on Hydro One's Distribution System to respond and avoid excessive voltage fluctuations.
- ix) The DG Facility shall protect itself from abnormal voltage conditions which the distribution system is subjected to. These may include but are not limited to:
 - a) voltage transients; and
 - b) sags and swells caused by lightning, switching, faults, and the loss or switching of customer loads.
- x) Insulation levels and protective equipment at the DG Facility shall be capable of withstanding abnormal voltages from Hydro One's Distribution System.

BACKGROUND INFORMATION

Hydro One's station LV bus voltages are regulated within 1.035~1.055 p.u. regardless of load levels. This ensures that the voltage anywhere in the feeder, including the PCC, is within 0.94~1.06 p.u. of the nominal voltage under normal operating conditions. To conform to the existing practice, DG Facilities shall not decrease the pre-connection PCC voltages under all normal operating conditions. During abnormal conditions, voltage variations may exceed the values.

Hydro One's Distribution System was designed to operate for unidirectional power flow (flowing from the substation to the customers). Voltage regulating devices were designed to correctly operate under these conditions. However, with the addition of DG Facilities

⁹ Operational and power quality requirement

¹⁰ Operations requirement

¹¹ IESO requirement (Ontario Resource and Transmission Assessment Criteria Section 4.3)

into the system, the power flow can be reversed when the DG Facility is supplying power. This may inhibit the voltage regulators to properly regulate the voltage on the feeder. If there is a possibility of reverse power flow, regulating devices (line voltage regulators, regulating stations and transformer under-load tap changers at the Transformer Station (TS) or Distribution Station (DS)) on Hydro One's distribution system may need to be either upgraded or replaced with suitable devices that allow bi-directional flow. Note: Hydro One operates all voltage regulating devices on its distribution system to $125V \pm 1.5V$ on a 120V base.

Without DG Facilities, the short-term voltage fluctuation on Hydro One feeders are well below 1%, or half of the dead band of voltage regulating facilities. This ensures the voltage regulating facilities respond only to necessarily voltage fluctuations and the quality of supply to customers during normal (non-emergency) operating conditions. Existing DG Facilities connected to Hydro One's system have shown continuous minute-to-minute power fluctuations in the range of 10%~30% of their ratings and this would cause higher levels of voltage fluctuation. In order to maintain similar duty imposed on the voltage regulating facilities, and similar quality of supply to the customers, DG Facilities shall not contribute to feeder voltage short-term fluctuation by more than 1%.

The post-tripping voltage requirement of the DG Facility is consistent with the Transmission System Code and the IESO System Impact Assessment criteria. DG Facilities that do not have ride-through capability are likely to trip off due to a feeder fault close to the Station's LV bus, regardless of the feeder to which the DG Facilities are connected. This requires that reactive power drawn by the DG Facility at a given power output level and therefore lost immediately after the tripping of the DG Facility, should be minimized to prevent excessive voltage change before ULTC/feeder VR tap changers can react.

2.2.2.2 VOLTAGE AND CURRENT UNBALANCE

- i) The DG Facility shall be capable of operating under existing unbalance conditions.
- ii) The DG Facility shall not cause deterioration of existing unbalance voltage and current conditions at the PCC and in the distribution system.
- iii) A single phase generator shall not negatively impact the unbalance of the nearest three-phase distribution system.

- iv) The DG Facility shall protect itself from highly unbalanced voltages and currents, especially when connected to Hydro One's Distribution System where single phase reclosing is used.
- v) The DG Facility and its interconnection transformer's design shall take into consideration the unbalance current it may supply to the unbalanced load on the feeder.
- vi) Single phase generators shall not cause an unbalance of greater than 2% when connected alone.
- vii) If multiple single phase generators are installed, they shall be connected so that an equal amount of generation is applied to each single phase of the distribution line, and this balance shall be maintained if one or more of the generating units go offline.

BACKGROUND INFORMATION

Voltage and current unbalance are normal on many distribution feeders as they supply many single phase loads and thereby all three phases are never equally loaded. Phase voltage unbalance of 2% and phase current unbalance of 10-20% of total feeder load is common. Unbalanced loads that result in unbalanced phase voltages and currents can cause high neutral currents, negative sequence voltages and currents, zero sequence voltages, thermal overloading of transformers and three-phase motors, and can cause protective relaying to mis-operate.

To protect Hydro One's distribution system and customers, the DG Facility must not further deteriorate existing unbalance conditions at the PCC and the distribution system. The phase-phase voltage unbalance at the unloaded generator terminals of three-phase DG Facilities must not be greater than 1%. The DG Facility and its interconnection transformer's design shall take into consideration the unbalance current it may supply to support the unbalanced load on the feeder. This unbalance current may be present even if the generator is out of service. The proportion of unbalance load current from the DGIT will vary based on feeder topology, unbalanced loads, voltage and DG location. During abnormal conditions such as faults and single pole reclosing, the unbalance may be very high (current unbalance may be significantly higher than 20%) and it is up to the DG Owner to ensure that the DG Facilities are protected from damage due to unbalance.

Single phase DG Facilities connected to a single phase of Hydro One's distribution system are limited in size (kVA rating) due to the potential impact they may have on distribution system voltage unbalance.

2.2.2.3 VOLTAGE FLUCTUATIONS (FLICKER)

- i) The DG Facility shall not create objectionable flicker for other customers on Hydro One's Distribution System.
- ii) The voltage dip at the PCC should not be more than 4% on connecting the single largest generation unit in the facility and should remain within 10% of nominal voltage when the entire DG Facility and all other DG Facilities on the interconnected feeder trip.
- iii) Item (i) above shall include flicker caused by energization inrush.
- iv) The DG Owner shall take steps to make sure that flicker requirements in Items (i) and (ii) are met - may need to add loss of synchronism protection, stagger generator energization, etc.
- v) The DG Facility shall conform to the flicker requirements in CAN/CSA C61000-3-7 and meet the P_{st} and P_{lt} limits shown below in Table 4.

Table 4: P_{st} and P_{lt} Flicker Limits

	27.6/25/13.8/12/8/4 kV	44kV
P_{st}	0.9	0.8
P_{lt}	0.7	0.6

Source: CSA/CAN C61000-3-7

- vi) Flicker measurements shall be conducted by the DG Owner using a device that conforms to CAN/CSA-C61000-4-15 if requested by Hydro One. Hydro One shall request this measurement if flicker complaints are received in the surrounding area.
- vii) Induction generators and inverter-based generators that do not produce fundamental voltage before the paralleling device is closed, and double-fed generators whose excitation is precisely controlled by power electronics to produce a voltage with magnitude, phase angle, and frequency that match those of the distribution system shall be tested to determine the maximum startup current¹². The results shall be used, along with the Distribution System source impedance for the proposed location, to estimate the starting voltage magnitude change and

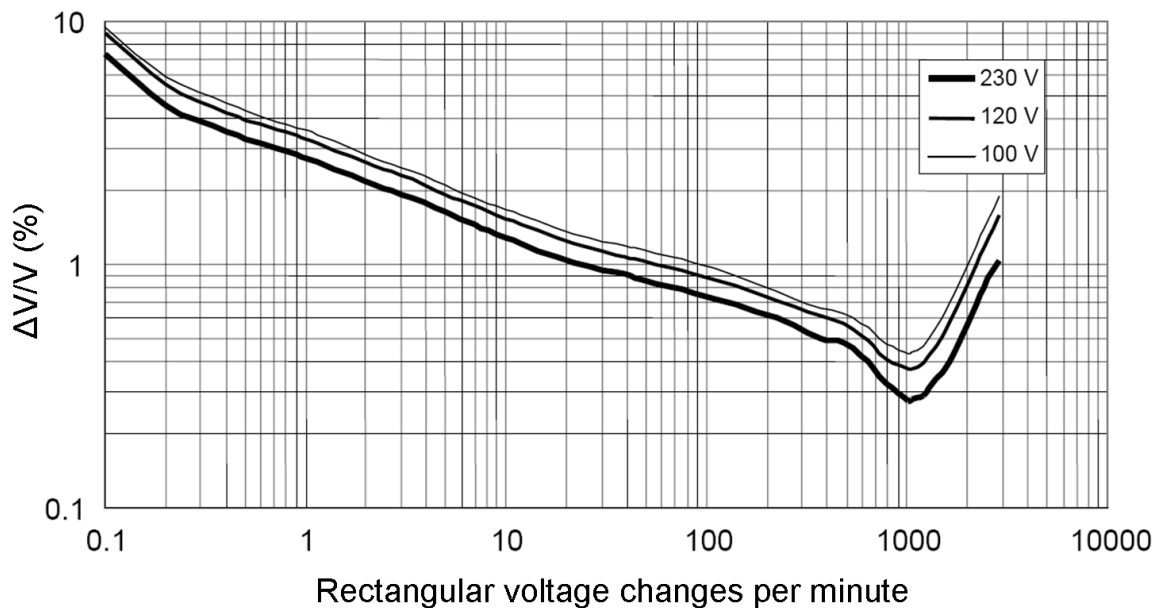
¹² The DG Owner may use the generator manufactures data as opposed to actual site tests. However, the DG Owner must ensure that the maximum startup current does not violate the flicker requirements above.

verify that the unit will not cause a voltage fluctuation at the PCC greater than $\pm 4\%$ of the prevailing voltage level of the distribution system at the PCC.

- viii) Induction generators may be connected and brought up to synchronous speed by direct application of rated voltage provided that they meet the requirement of voltage drop given above and/or they do not exceed flicker limits at the PCC. Otherwise, other methods such as reduced voltage starting or speed matching using the prime mover prior to connection must be used to respect these voltage drop and flicker limits.
- ix) Large DG Facilities with multiple generator units, shall stagger the generator reconnections to Hydro One's Distribution System to meet the above requirements.

BACKGROUND INFORMATION

The following graph in Figure 10 supplements the Table 4 presented above.



Note – Two consecutive voltage changes (one positive and one negative) constitute one "cycle", i.e., two voltage changes per second mean a 1 Hz fluctuation

Figure 10: IEC/CSA Standard for Flicker

2.2.2.4 VOLTAGE AND CURRENT HARMONICS

- i) The DG Facility shall not inject harmonic current that causes unacceptable voltage distortion on Hydro One's Distribution System.
- ii) The DG Facility shall follow the requirements of CAN/CSA C61000-3-06.
- iii) The DG Facility shall operate within the Voltage distortion limits as indicated in Table 5 and Table 6 below.

Table 5: Voltage Distortion limits for Odd Harmonics

Odd Harmonics Non Multiples of 3			Odd Harmonics Multiples of 3		
	Harmonic Voltage (%)			Harmonic Voltage (%)	
	4-27.6kV	44kV		4-27.6kV	44kV
5	5	2	3	4	2
7	4	2	9	1.2	1
11	3	1.5	15	0.3	0.3
13	2.5	1.5	21	0.2	0.2
17	1.6	1	>21	0.2	0.2
19	1.2	1			
23	1.2	0.7			
25	1.2	0.7			
>25	$0.2 \times 0.5 \frac{\sqrt{25}}{X_h}$	$0.2 \times 0.5 \frac{\sqrt{25}}{X_h}$			

* Source: CAN/CSA C61000-3-06

Table 6: Voltage Distortion limits for Even Harmonics

	Even Harmonics	
	Harmonic Voltage (%)	
	4-27.6kV	44kV
2	1.6	1.5
4	1	1
6	0.5	0.5
8	0.4	0.4
10	0.4	0.4
12	0.2	0.2
>12	0.2	0.2

* Source: CAN/CSA C61000-3-06

- iv) Total Harmonic Distortion (THD) shall be a maximum of 3% on 44kV systems and 6.5% on other systems.
- v) The DG Facility shall operate within the current harmonic limits as listed in Table 7.

Table 7: Harmonic Current Limits

Harmonic Number h	5	7	11	13	$\sqrt{\sum i_X^2}$
Admissible harmonic current $i_h = I_h/I_1$ (%)	5-6	3-4	1.5-3	1-2.5	6-8

* Source: CAN/CSA C61000-3-06

* I_h is the total harmonic current of order h caused by the consumer and I_1 is the rms current corresponding to his agreed power (fundamental frequency)

- vi) The DG Owner and/or Hydro One may be required to implement measures that will mitigate the harmonic distortions caused by the DG Facility such as by adding harmonic filters, at the DG Owner's sole expense.
- vii) The limits presented in Items (iii), (iv) and (v) above exclude the harmonic distortions present on Hydro One's Distribution System when the DG Facility is disconnected from the distribution system.

- viii) The TIR does not impose design limits to limit harmonic-caused telephone interference problems as it is almost impossible to predict. However, the DG Owner shall make sure that the design complies with all applicable standards and shall not cause telephone interference.

BACKGROUND INFORMATION

CAN/CSA C61000-3-06 details methods for evaluating the effects of a load or generation facility on actual network characteristics. Although the limits in stage 1 may be respected, DG Facilities must still ensure that global network effects are within the limits specified in CAN/CSA C61000-3-06.

2.2.2.5 FREQUENCY

- i) The generators at the DG Facility shall operate at a nominal frequency of 60Hz.
- ii) The generators at the DG Facility shall remain synchronously connected over the frequency range presented below in Table 8.
- iii) The generators shall trip in the time required in accordance with Section 2.3.10 for any frequencies beyond what is presented in Table 8.

Table 8: Operating Frequency Range

Generator Size	Frequency Range (Hz)	
	Low Range	High Range
≤ 30 kW	59.3	60.5
≥ 30 kW	57.0-59.8 (adjustable set point)	60.5

* Source: IEEE 1547

2.2.2.6 POWER FACTOR

- i) DG Facilities > 30 kW shall be capable of operating in constant power factors anywhere between 0.95 leading and 0.95 lagging.
- ii) DG Facilities ≤ 30 kW shall not be required to adjust their power factor.
- iii) If warranted by local distribution system conditions (such as causing a violation of CSA/CAN3-C235-83 voltage limits at the PCC), this range may be narrower or wider and will be specified by Hydro One in the CIA.

- iv) The DG Facility shall be capable of operating within lagging and leading power factor ranges with or without other DG Facilities in service on the feeder.
- v) Hydro One shall determine the required operating power factor of the DG Facility during the CIA study and shall specify this to the DG Owner.
- vi) Power factor correction or reactive power compensation techniques may be required.
- vii) Induction generators consume reactive power and the DG Owner shall be required to provide reactive power compensation to correct the power factor at the PCC.
- viii) DG Facilities greater than 10 MW (Class 4 DGs) shall be assessed by the IESO to determine whether the proposed connection is IESO-impactive¹³ and whether the reactive power compensation at the generator units shall be sufficient so as not to cause any material increase in the reactive power requirements at the transmission system transformer station due to the operation of the DG Facilities at all load conditions on the feeder.

BACKGROUND INFORMATION

Hydro One shall determine the required operating power factor of the DG Facility during the CIA study and shall specify this to the DG Owner. Typically, this operating power factor will be in the range of 1.0 to 0.95 leading (importing reactive power from Hydro One's Distribution System).

2.2.2.7 LIMITATION OF DC INJECTION

- i) The DC current injection by the DG Facility shall not be greater than 0.5% of the full rated output current at the PCC after a period of six cycles following the energization of Hydro One's Distribution System.

¹³ IESO-impactive; The Independent Electricity System Operator (IESO) will determine whether a DG Facility impacts the bulk transmission system and whether additional reactive power compensation shall be required.

2.2.3 DISTURBANCES

- i) The DG Facility shall be designed, built and maintained in accordance with all applicable codes, regulations and standards, along with the requirements of the TIR. The design shall minimize the impact of:
 - a) overvoltages during ground faults;
 - b) electric disturbances which can cause irregular power flows;
 - c) interference – radio, television and telephone;
 - d) audible noise; and
 - e) other disturbances which may reduce the reliability of Hydro One's distribution system.

2.2.4 RESONANCE ANALYSIS

- i) The prudent design of a DG Facility should include careful consideration of resonance and ferroresonance.
- ii) Ferroresonance or resonance studies are not mandatory.
- iii) If resonance problems do arise, full co-operation and data sharing on the part of the DG Owner shall be required.

BACKGROUND INFORMATION

The design of the DG Facility should include a careful examination of resonance. Resonance can cause damage to Hydro One's Distribution System, electrical equipment of Hydro One's customers, and the electrical equipment at the DG Facility.

Ferro-resonance in a distribution feeder can take place, primarily, under single-phasing conditions on three-phase segments of feeders. In this case, overvoltages would last until anti-islanding, or open-phase protection removes all DG Facilities from the affected feeder.

2.2.5 SELF-EXCITATION ANALYSIS

- i) DG Facilities with induction generators and not equipped with Transfer Trip (Section 2.3.13) shall conduct studies to assess whether there is a possibility of self-excitation.
- ii) Self-excitation analysis, if required by Item (i) above, shall be submitted to Hydro One for review.

2.3 PROTECTION REQUIREMENTS

2.3.1 GENERAL REQUIREMENTS

- i) All protective device settings and protection scheme designs must be submitted to Hydro One for review.
- ii) Protections must not be interlocked with the position of any isolating/interrupting devices.
- iii) Protection settings may be required to be changed over time to maintain adequate system protection as the system configuration changes.
- iv) All protection operations shall ensure that the generator(s) and all HV Ground Sources are isolated from Hydro One's Distribution System within the required time from the start of the disturbance.
- v) All protection designs must:
 - a) ensure proper coordination with Hydro One's protections;
 - b) be failsafe; and
 - c) ensure that both the DG Facility and Hydro One's distribution system, customers and general public safety are maintained.
- vi) The design of the protections at the DG Facility shall be performed by a qualified professional engineer to ensure that the overall protection scheme will ensure a safe and reliable interconnection to Hydro One's Distribution System.
- vii) Protection relays shall be "utility grade" and shall meet the minimum requirements specified in IEEE C37.90, "Standard for Relays and Relay Systems Associated with Electrical Power Apparatus," latest edition as well as meet the requirements in Section 2.1.20 and Section 2.1.21. "Industrial grade" relays shall not be permitted for the interconnection protection.
- viii) Protection functions shall remain operational after distribution system disturbances or loss of supply from the distribution system for the required period of time needed to operate properly.
- ix) Communication facilities between Hydro One's TS and recloser and the DG Facility may be required as a result of DG Facility interconnections.

- x) The interconnection protection is required to have a dedicated device but if the DG Owner decides to combine some of the protection functions in other relays, this would be subject to Hydro One's approval.
- xi) Additional protections other than the ones listed in the TIR may be required depending on the application and shall be communicated to the DG Owner at the appropriate stage.

BACKGROUND INFORMATION

The protection schemes shall be designed to detect the conditions presented in this section of this requirements document including but not limited to:

- balanced and unbalanced faults (line to ground, line to line, three phase) at the DG Facility and Hydro One's distribution system (entire distribution feeder that DG Facility is connected to);
- abnormal frequencies;
- abnormal voltages; and
- islanding conditions.

The protection schemes employed shall coordinate with Hydro One's distribution system protections and shall be designed for current and anticipated future fault levels. Dedicated communications may be required to facilitate timely clearing of faults. In some cases, communication facilities between the TS and recloser may be required to facilitate coordinated tripping and reclosing for all of the protective devices.

Protections must not be interlocked with the position of any isolating/interrupting devices. This avoids un-necessary protection complexity that would cause reliability to be compromised.

All protection operations shall ensure that the DG Facility's generator(s) and all sources of ground current are tripped within the required time from the start of the disturbance. For DG Facilities utilizing a DGIT with Wye-Ground configuration on the high voltage side (refer to Section 2.1.12, "Interconnection Transformer Configuration"), both the DGIT and the generators must be tripped within the required clearing time (refer to Section 2.1.8).

All protection scheme proposals will need to be reviewed and accepted by Hydro One.

2.3.2 SENSITIVITY AND COORDINATION

- i) The DG Facility's interconnection protection shall provide adequate sensitivity to detect abnormal conditions as required in Section 2.3 and isolate its generator(s) and if present, its HV ground source, from Hydro One's Distribution System.
- ii) The design of the DG Facility's interconnection protection system shall coordinate with other Hydro One protection system devices.

2.3.3 PROTECTION OPERATING TIMES

- i) The DG Facility's interconnection protection shall disconnect the DG Facility's generation and HV ground sources, if present, from Hydro One's Distribution System within the required time as specified in the individual requirements throughout the TIR.

BACKGROUND INFORMATION

Example: For any phase and ground faults: "a maximum of 500ms from inception of the fault condition and islanding conditions for DG Facilities equipped with Transfer Trip". This time is measured from the start of the abnormal condition to the time the generator will cease energizing Hydro One's distribution system. This is a maximum clearing time and in certain instances, the clearing time may be more stringent. Hydro One will determine this in the CIA.

Timing diagrams for different events are shown for reference in Appendix F.

2.3.4 BREAKER FAIL (BF)

- i) DG Facilities with an aggregate output > 500kW shall provide breaker failure protection for the primary interrupting device (i.e. breaker, HVI, LVI) that is responsible for disconnecting the generator and/or the HV ground sources from Hydro One's Distribution System.
- ii) The breaker failure protection should have a maximum pickup time delay of 0.3s after initiation.
- iii) In the event of an HVI breaker fail condition, the breaker fail protection shall:
 - a) trip the next zone at the DG Facility, specifically the upstream isolation device and all LV breakers shall be tripped; and

- b) remove the prime mover and excitation system as appropriate.
- iv) In the event of an LVI breaker fail condition, the breaker fail protection shall ensure that a fault in the DG Facility is cleared and will not affect the Distribution System by:
 - a) tripping the HVI if an HVI exists;
 - b) opening the motorized disconnect switch (Isolation Device) as explained in Item (vi) below if an HVI does not exist;
 - c) removing the prime mover and excitation system as appropriate.
- v) The motorized disconnect switch (see requirements in Section 2.1.7 Item (iii)(b)) shall be opened by a separate auxiliary relay in the event of a breaker fail condition to ensure that the DG Facility is properly isolated from Hydro One's Distribution System.
- vi) The motorized disconnect switch shall be used to automatically isolate the DG Facility from the distribution system. In the event that an alternate interrupting means (fuses or otherwise) is not provided by the DG Facility or if such alternate interrupting means fail to coordinate with the opening of the motorized disconnect switch, then the disconnect switch may incur significant damage when attempting to interrupt a sustained fault current condition as it is not rated for breaking fault current. The design of the DG Facility shall take this into consideration when deciding on a location for the Isolation Device to ensure that safety of the DG Facility personnel, Hydro One's personnel and general public will be ensured.
- vii) In the case of a circuit switcher being used, the interrupter and the motorized disconnect shall be specifically chosen to operate independently and no additional BF protection shall be required. If the motorized disconnect switch in the circuit switcher is not rated to break load, an additional load break switch shall be required to satisfy the requirement in Section 2.1.7.
- viii) The design of the BF protection for the HVI shall be submitted to Hydro One for review and acceptance.
- ix) DG Facilities $\leq 500\text{kW}$ shall be exempted from Items (i) through (viii) above, but shall have an alternate means of disconnecting the DG Facility generation energy source from the Distribution System when the associated breaker fails to open for any interconnection protection operations. This can be achieved by the opening of the isolation device, disabling an inverter, or by removing the prime mover and excitation system as appropriate.

BACKGROUND INFORMATION

Breaker Fail protection needs to be included in the DG Facility's interconnection protection design for both the High Voltage Interrupter and Low Voltage Interrupter to ensure that a breaker/interrupter failure will not disrupt Hydro One's Distribution System and/or the DG Facility by ensuring that faults are cleared in a timely fashion. A means of automatic backup isolation is required to allow quick restoration of the distribution feeder.

DESIGN CONSIDERATION

In normal operation, when the HVI isolates the facility, the motorized disconnect switch will follow, opening a short period afterwards. It can also be designed to open sequentially – motorized disconnect opens if the HVI does not OPEN following a trip initiation.

2.3.5 SINGLE PHASE GENERATORS

- i) Minimum protection requirements for single phase DG Facilities shall be in accordance with Table 9 below and are mandatory for all generators to which this TIR document is applicable.
- ii) Inverter type generators shall be compliant with CSA Standards, C 22.2-107.1 “General use Power Supply” **and** CAN/CSA 22.2 No 257-06 “Interconnecting inverter based micro distributed resources to distribution system” **and** bear a certification mark recognized by the Ontario Electrical Safety Code.
- iii) The final design of the protection system shall be submitted to Hydro One for approval in accordance with Section 2.3.19 of the TIR.

Table 9: Minimum Protections Required for Single Phase DG Facilities

Protection Description	IEEE Device #
Interconnect Disconnect Device	89
Generator Disconnect Device	
Over-Voltage Trip	59
Under-Voltage Trip	27
Over Frequency Trip	81O
Under Frequency Trip	81U
Overcurrent**	50/51
Distance ***	21
Synchronizing Check*	25
Anti-Islanding Protection	Refer to Section 2.3.12
Additional Protections May Be Required	

* Only required for synchronous generators and other types which have stand-alone capability

** Could be provided by magnetic circuit breaker or fuse

*** Distance may be required to be able to detect faults along the entire length of the feeder

DESIGN CONSIDERATION

Figure 11 below shows a typical protection SLD for single phase DG Facilities and is given for information purposes only. The protection system can be designed differently than shown in this figure.

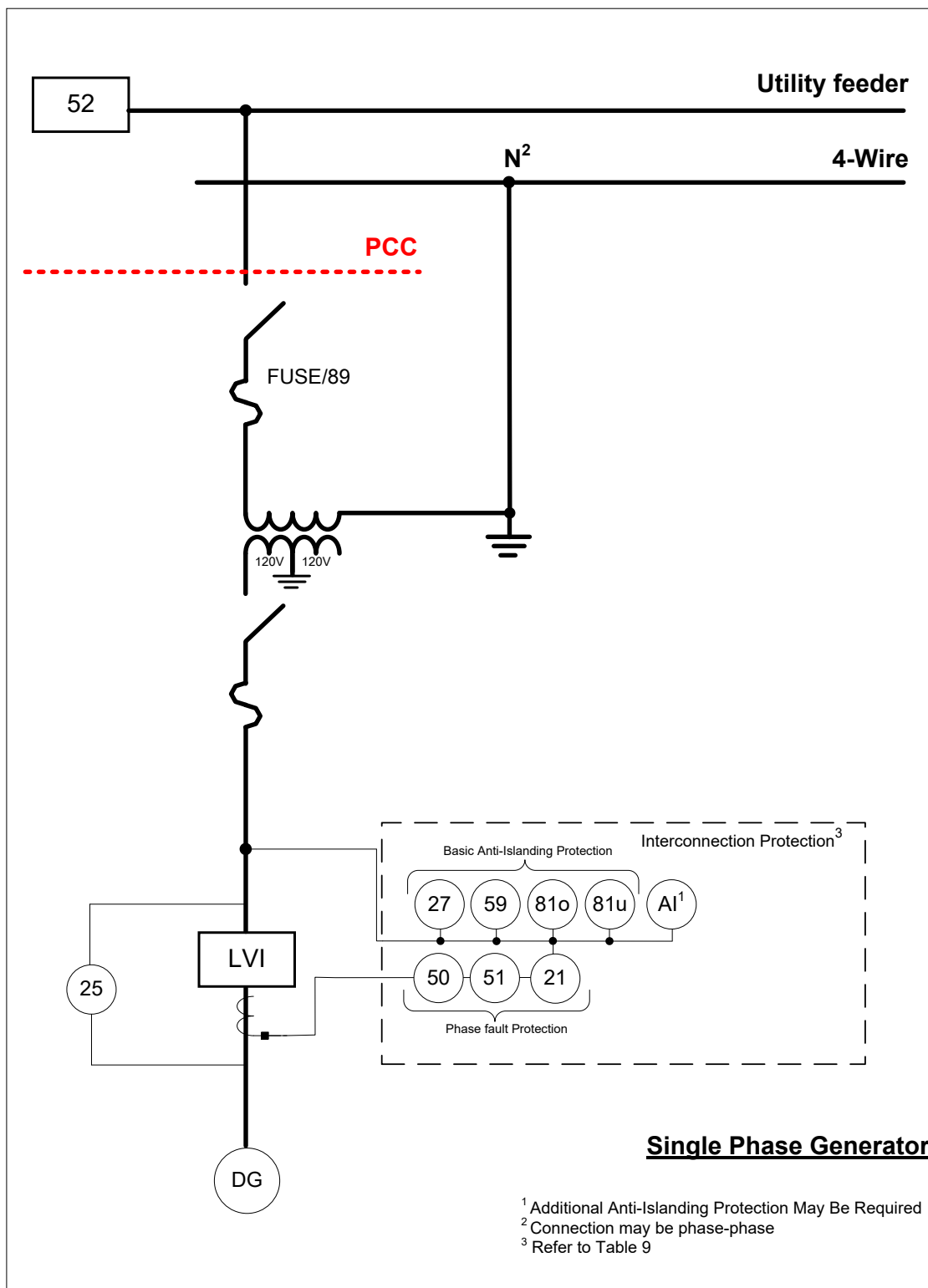


Figure 11: Typical Protection for Single Phase DG Facility Installations

2.3.6 THREE PHASE GENERATORS

- i) Three Phase DG Facilities shall have the minimum protection requirements as shown below in Table 10 and are mandatory for all generators to which the TIR is applicable.
- ii) Inverter type generators shall be compliant with CSA Standards, C 22.2-107.1 "General use Power Supply" **and** CAN/CSA 22.2 No 257-06 "Interconnecting inverter based micro distributed resources to distribution system" **and** bear a certification mark recognized by the Ontario Electrical Safety Code.
- iii) All three-phase DG Facilities, including those using multiple three-phase inverters or multiple single-phase inverters, shall meet the following conditions:
 - a) be able to maintain a balanced 3-phase output under all operating conditions;
 - b) be able to detect the loss of voltage in one or more phases of Hydro One's distribution system and automatically cease to energize all phases from the interconnected system; and
 - c) be able to detect the loss of voltage in one or more phases of the DG Facility's electric power production source and automatically cease to energize all phases from the interconnected system.
- iv) The final design of the protection system shall be submitted to Hydro One for approval in accordance with Section 2.3.19 of the TIR.

Table 10: Typical Interconnection Protections for Three Phase DG Facilities

Function Requirement	Protection Element function	Device # ¹⁴	Synchronous	Induction	Inverter ¹⁵	Section
Basic Anti-Islanding	Over-Voltage	59	Required	Required	Required	2.3.11, 2.3.12 iii)
	Under-Voltage	27	Required	Required	Required	
	Over-Frequency	81O	Required	Required	Required	2.3.10, 2.3.12 iii)
	Under-Frequency	81U	Required	Required	Required	
Tele-protections	Transfer Trip Receive	TTR	as per Section	as per Section	as per Section	2.3.13
	DGEO/LSBS	DGEO	as per Section	as per Section	as per Section	2.3.14
Other passive Anti-islanding (Application Specific)	Rate of Change of Frequency (ROCOF)	81R	≤ 500 kW	≤ 500 kW	Not required ¹⁶	2.3.12 iv)
	Vector Surge	78	≤ 500 kW	≤ 500 kW	Not required ¹⁶	
	Directional Reactive Power Relay ¹⁷	32R	≤ 500 kW ¹⁷	≤ 500 kW ¹⁷	Not required ¹⁶	
Phase Fault Protection	Phase Over-current	50	Required	Required	Required	2.3.7
	Phase Inverse Timed Over-current ¹⁸	51	See Note ¹⁸	See Note ¹⁸	See Note ¹⁸	
	Voltage Controlled Over-current ^{18, 19}	51V	See Notes ^{18, 19}	See Notes ^{18, 19}	See Notes ^{18, 19}	
	Directional Phase Over-current ²⁰	67	Required ²⁰	Required ²⁰	Required ²⁰	
	Phase Distance ^{19, 20}	21	See Notes ^{19, 20}	See Notes ^{19, 20}	See Notes ^{19, 20}	
	Under-Voltage ²¹	27	See Note ²¹	See Note ²¹	See Note ²¹	
Ground Fault Protection	Neutral Over-current	50N	Required	Required	Required	
	Neutral Inverse Timed Over-current ¹⁸	51N	See Note ¹⁸	See Note ¹⁸	See Note ¹⁸	
	Directional Neutral Over-current ²⁰	67N	Required ²⁰	Required ²⁰	Required ²⁰	
	Ground Distance ^{19, 20}	21N	See Notes ^{19, 20}	See Notes ^{19, 20}	See Notes ^{19, 20}	
	Under-Voltage ²¹	27	See Note ²¹	See Note ²¹	See Note ²¹	
	Ground Overvoltage ²²	59G	Required ²²	Required ²²	Required ²²	

¹⁴ All protection element functions must be shown on Single Line Diagrams

¹⁵ Three-phase DG Facilities up to 500kW comprised of a single three-phase inverter unit that is CSA certified and bears a certification mark recognized by OESC shall be deemed compliant to Table 10. DG Facilities that consist of multiple three-phase inverters or multiple single-phase inverters shall comply with Section 2.3.6 of the TIR.

¹⁶ Other passive anti-islanding protection functions may not be required if inverters have active anti-islanding controls

¹⁷ Directional Reactive Power relay is an alternative to 78 (Vector Surge) provided that there is a predictable reverse reactive power flow for island conditions

¹⁸ An alternative or complement to Over-current (50, 50N). Special caution is needed for selection of inverse-time characteristics that meet time constraints

¹⁹ May be used to provide distinction between normal load and feeder-end fault conditions when basic over-current (50, 50N) is insufficient

²⁰ May be used to provide distinction between internal and external faults for the reconnection of DG Facility

²¹ May be used to provide fault protection for DG Facilities where fault current in-feed levels are too small for practical detection by over-current or distance elements

²² Required for DG Facilities that do not contribute ground current to ground faults on Hydro One's distribution system

Function Requirement	Protection Element function	Device # ¹⁴	Synchronous	Induction	Inverter ¹⁵	Section
Open Phase and Phase Unbalance	Negative Sequence Current	46	as per Section	as per Section	as per Section	2.2.2.2
	Negative Sequence Voltage	47	as per Section	as per Section	as per Section	2.3.8
Ferro-resonance	Peak detecting Overvoltage ²³	59I	See Note ²³	See Note ²³	See Note ²³	2.3.8
Synchronization	Synchronizing	25	Required	as per Section	as per Section	2.4.4

²³ May be required if DGIT connection is vulnerable to ferro-resonance e.g. open phase and HV delta connections

DESIGN CONSIDERATION

Figure 12, Figure 13, Figure 14, Figure 15, Figure 16, Figure 17, and Figure 18 shown on the next seven pages contain typical protection drawings for three-phase DG Facilities connecting to Hydro One's 4-Wire Distribution System.

Figure 19 contains a typical protection drawing for three-phase DG Facilities connecting to Hydro One's 3-Wire Distribution System.

The protection systems can be designed differently and the examples shown in the TIR are for informational purposes only. Additional protections may be required. Generator protections are not the focus of the TIR and no requirements are set by Hydro One. It is up to the DG Owner to ensure that the generators are protected sufficiently.





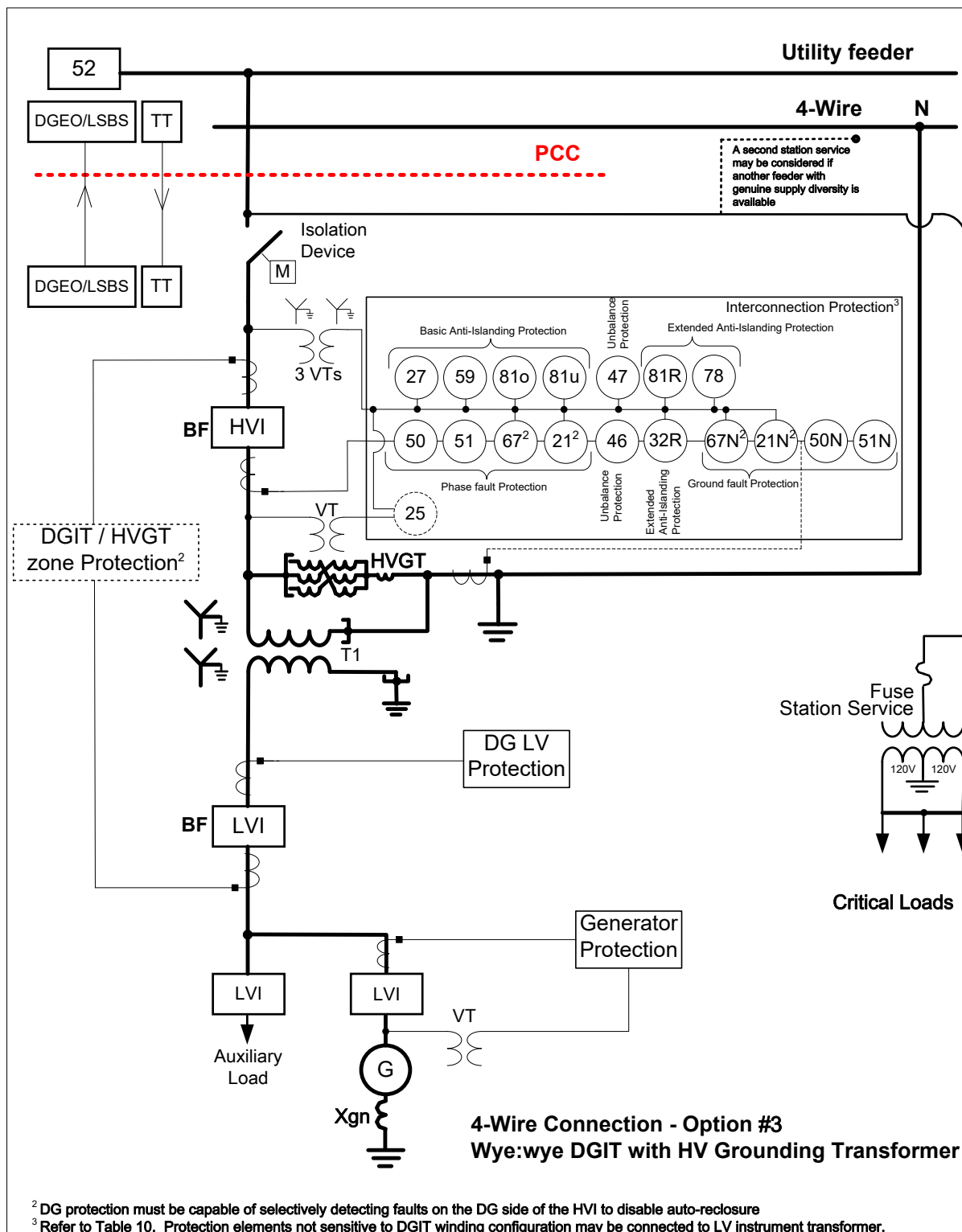


Figure 14: 4-Wire DGIT Option #3 Typical Protections

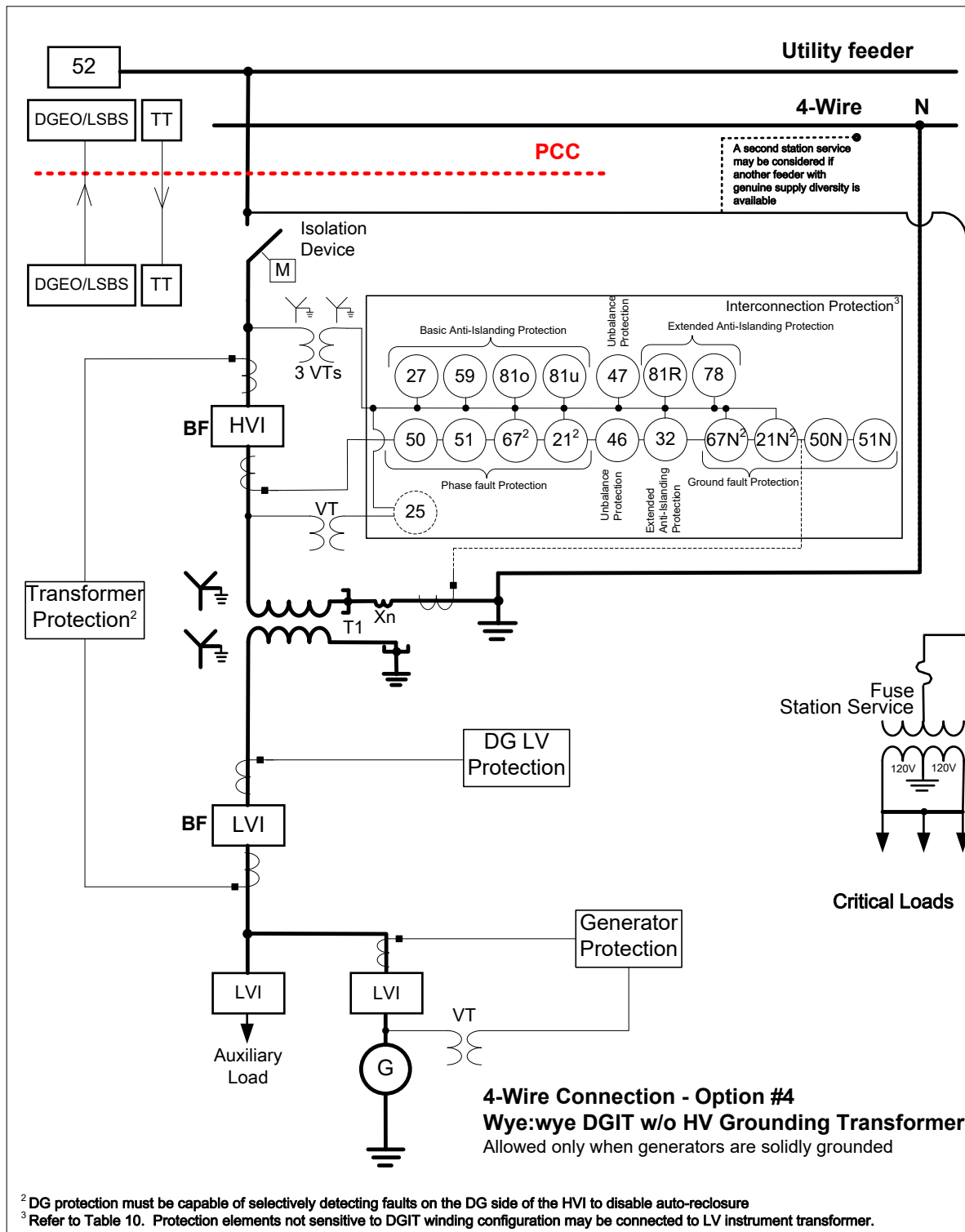


Figure 15: 4-Wire DGIT Option #4 Typical Protections

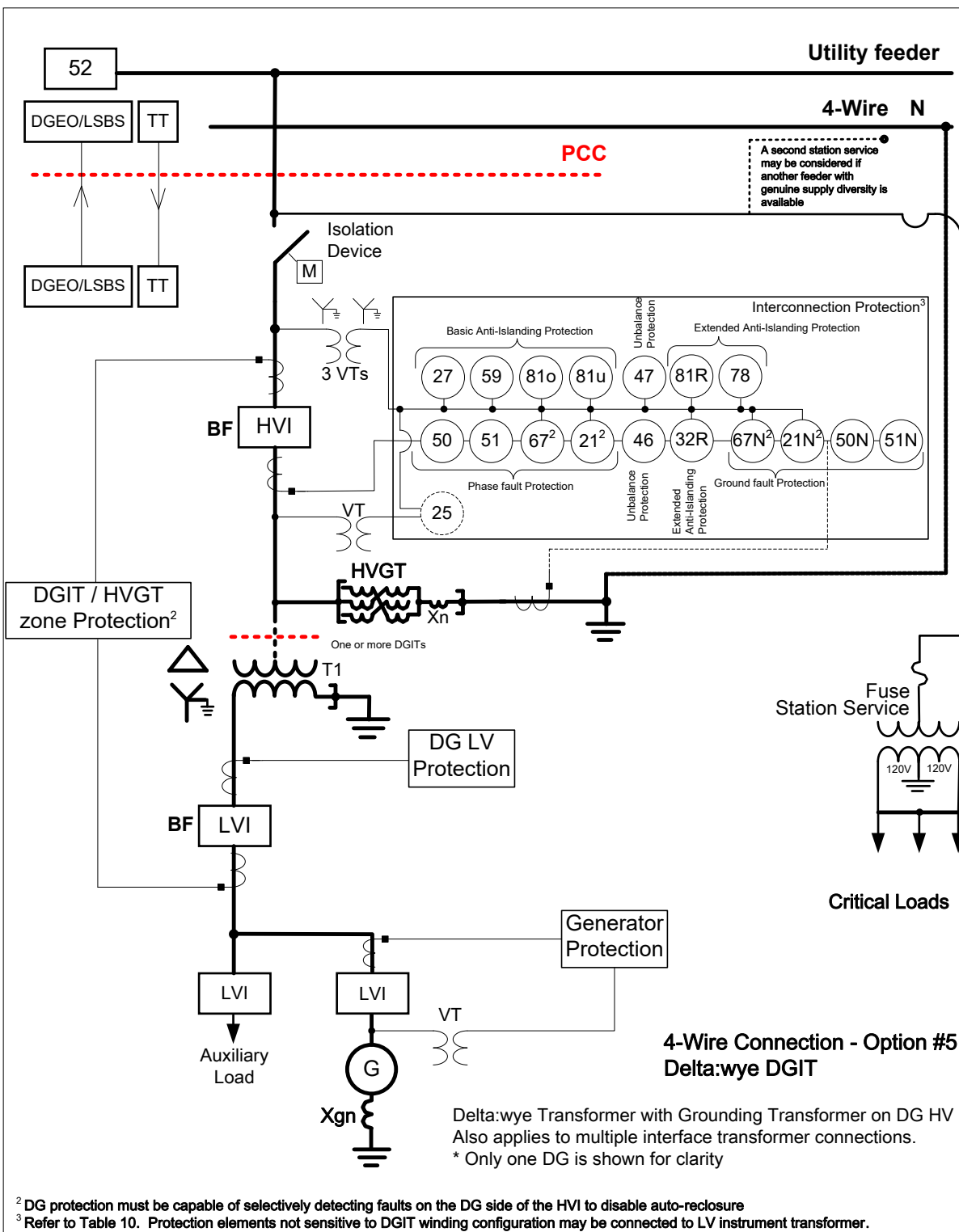


Figure 16: 4-Wire DGIT Option #5 Typical Protections

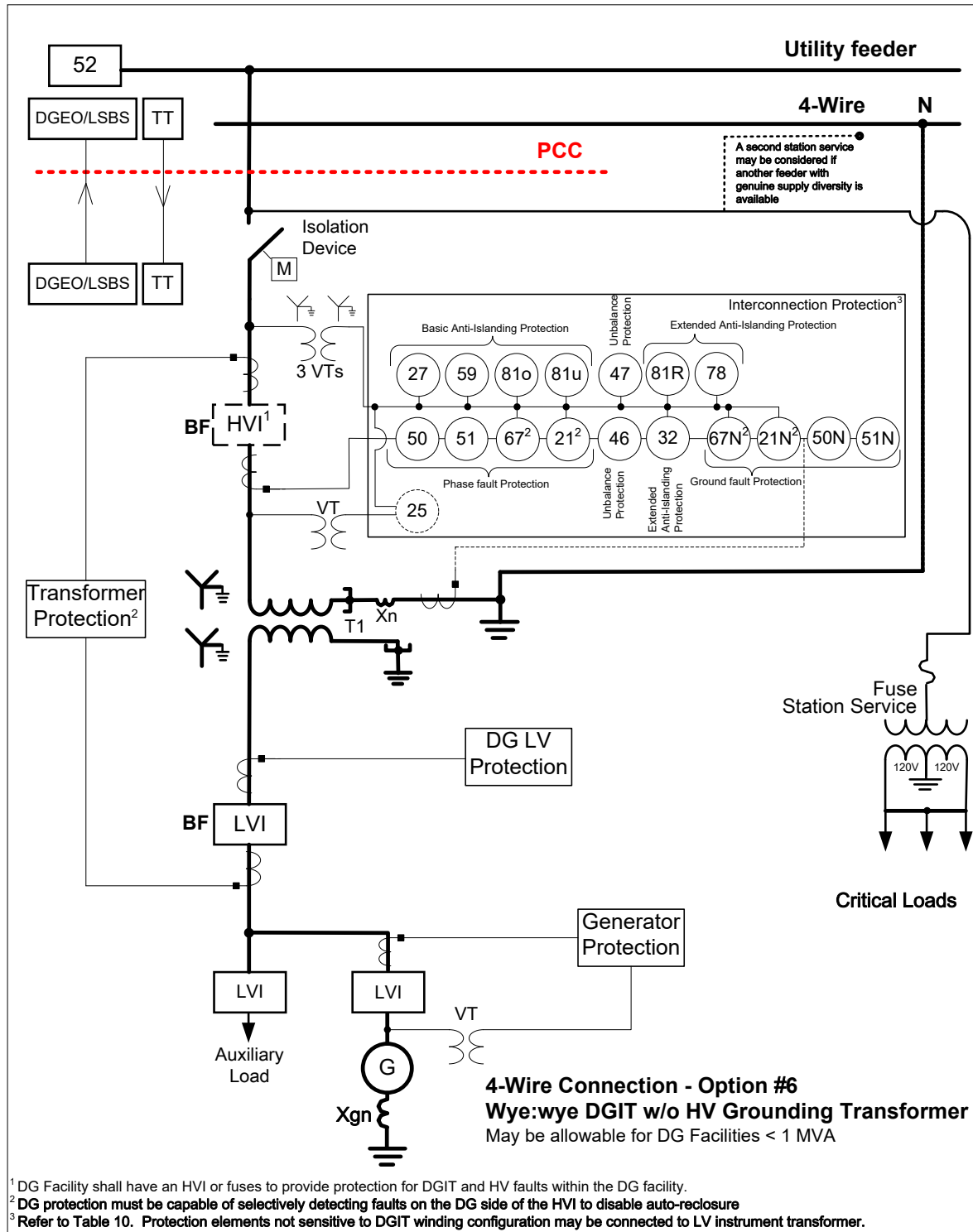


Figure 17: 4-Wire DGIT Option #6 Typical Protections

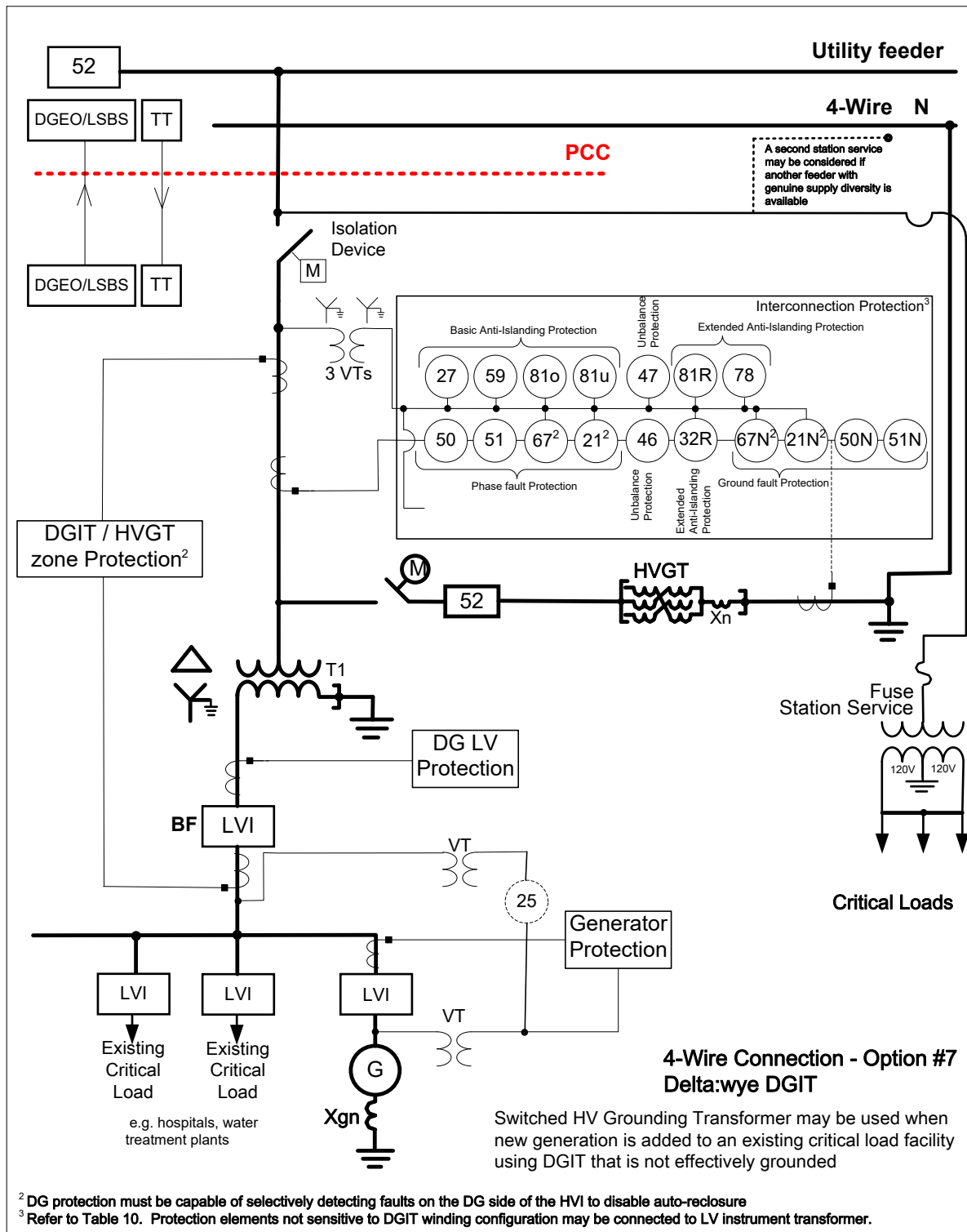


Figure 18: 4-Wire DGIT Option #7 Typical Protections

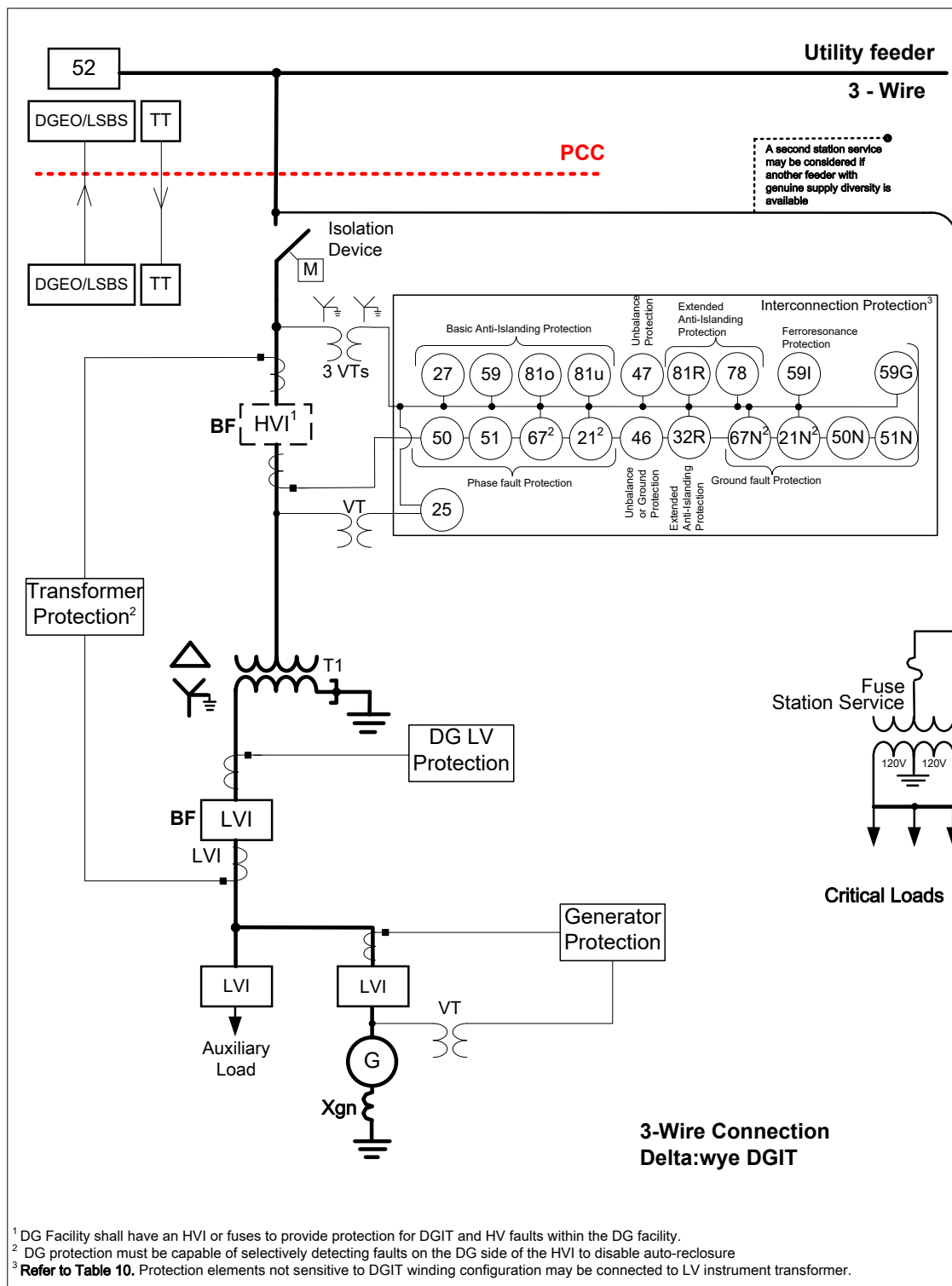


Figure 19: 3-Wire DGIT Typical Protections

2.3.7 PHASE AND GROUND FAULT PROTECTION

- i) The DG Facility's interconnection protection shall ensure that the DG Facility will detect and isolate itself and any HV ground sources²⁴ from Hydro One's Distribution System for:
 - a) All internal faults within the DG Facility; and
 - b) All external faults on the interconnected feeder including single phase lateral taps²⁵. This applies to all phase-phase and phase-ground faults.
- ii) Phase and ground protections shall always be operational whenever phase and ground current can be sourced from the DG Facility.
- iii) The protective device selectivity and sensitivity shall be maintained over the full range of minimum to maximum fault currents (present and anticipated future levels) with the DGs infeed.
- iv) The DG Facility shall be capable of selectively detecting faults on the DG Facility side of the HVI, and shall disable the HVI auto-reclosure scheme – Refer to Section 2.4.7.
- v) The total clearing time for faults on Hydro One's Distribution System or for faults in the DG Facility shall be no more than:
 - a) 500ms for DG Facilities equipped with fast Transfer Trip; or
 - b) 200ms for DG Facilities not equipped with fast Transfer Trip. This can be relaxed to 500ms if the DG Owner can demonstrate that the DG Facility fault contributions will not encroach on Hydro One's Distribution System minimum fuse melt characteristic.

[**Note:** The total clearing time is measured from the start of the abnormal condition to the time that the DG Facility ceases to energize Hydro One's Distribution System].

BACKGROUND INFORMATION

Phase and ground protections are required to clear infeed from the DG Facility into faults on the interconnected feeder and to isolate the DG Facility from Hydro One's Distribution System when faults occur within the DG Facility.

Hydro One will provide the DG Owner the maximum phase and ground fault currents and Thevenin equivalent impedances at the PCC with existing DG Facilities connected and

²⁴ Refer to Section 1.8 for definition of HV Ground Source.

²⁵ Must see entire feeder for phase and ground faults – past reclosers/sectionalizers/fuses

without the concerned DG Facility connected in the CIA. Hydro One will also provide the DG Owner the maximum impedance faults that the DG Facility shall be capable of detecting during the design stage.

Whenever the fault infeed from the DG Facility is large enough to melt fuses, a 200ms clearing time is required for installations without Transfer Trip in order to prevent the fuses on the interconnected feeder from starting to melt. Otherwise the reliability and restoration times of Hydro One's Distribution System would be compromised. Protections must not be interlocked with the position of any isolating/interrupting devices to avoid introducing unnecessary complexity that would cause reliability to be compromised.

Consideration must be given to the possibility of DG Facility ground source currents being present when the generation is out-of-service if the HV Ground Source is not disconnected. This will depend on the HV grounding configuration (see Section 2.1.12). These ground sources must be isolated upon detection of the conditions outlined in Section 2.3.7 Item (i).

A means of automatic backup isolation is required to cater for an HVI or LVI failure condition. The automatic backup isolation is required to allow quick restoration of the distribution system feeder following an HVI or LVI failure condition. Refer to Section 2.3.4 for Breaker Fail requirements.

DESIGN CONSIDERATION

Standard over-current phase and ground elements (type 50, 51 or 67) may not be capable of detecting all faults along the entire feeder and may not coordinate with Hydro One's protection systems. Distance (21) type protections may need to be considered to provide the required protection coverage. The settings for the distance elements shall be determined by the DG Owner with the information provided by Hydro One. Another consideration could be using undervoltage (27) protection to detect feeder faults provided that the voltage at the location of DG Facility's interconnection protection drops significantly for phase or ground faults on the feeder.

It may not be feasible for the DG Facility's interconnection protection to detect all faults on the feeder prior to Hydro One disconnecting its feeder breaker or recloser because of the reduction of fault current in-feeds from the sources²⁶. If DG Facility's interconnection

²⁶ The presence of multiple sources can cause fault current in-feeds from each source to be significantly reduced if the individual source in-feeds sum together at one or more nodes (PCCs) resulting in increased total fault current flowing over sections of the feeder. Each reduction in fault current in-feed requires the sensitivity of the protections to be increased to maintain adequate fault detection capability. Increased protection sensitivity generally decreases the load carrying capability of the sources, particularly with over-current protections. Distance protections are affected to a much lesser extent and can usually be used to preserve load carrying capability.

protections are delayed to allow Hydro One's protections to operate first, the timing requirements in Section 2.3.7 Item (v) must be respected. All protection settings must take into account the natural decay of fault contribution from DG Facility sources such as direct-connected rotating machines.

2.3.8 OPEN PHASE PROTECTION

- i) The DG Facility's interconnection protection must be capable of detecting the loss of any phase to which the DG Facility is connected which occurs within the DG Facility or on the interconnected feeder.
- ii) Upon the detection of the open-phase condition the DG protection shall:
 - a) Disconnect the generation from the Distribution System within 500ms; and
 - b) Disconnect the DGIT from the Distribution System via an HVI or an HV Motorized Disconnect Switch whenever the DGIT is three-phase with a common (shared) magnetic core.

BACKGROUND INFORMATION

Open-phase protections are required to detect open-phases condition between the Distribution System and a DG Facility to prevent uncontrolled voltages from appearing on the conductors isolated from the Hydro One source of supply. The probability of open-phase conditions is highest when the DG Facility is installed on a section of Hydro One's distribution system that utilizes single phase tripping.

Uncontrolled Voltage from Generation

Any connected DG Facility's generation will directly energize the phase conductor that is islanded from the Hydro One source, but the voltage will not be regulated and can be expected to deviate outside of acceptable limits.

Uncontrolled Voltage from DGIT Back-Feed

If the DG Facility's generation is not connected, the open-phase conductor can be back-energized from the remaining connected phases via the three-phase shared-core DGIT. This back-feed produces abnormal voltages (high or low). In some cases extreme over-voltages associated with ferroresonance can occur if the DGIT is ungrounded and there is significant phase-ground capacitance on the open phase circuit.

In both cases the voltage on the open-phase Distribution System conductors will pose a safety hazard to maintenance personnel and will not be maintained within acceptable limits.

Open-phase protections may also be used for a single-phase DG Facility to detect islanding condition.

In all cases the generators must be isolated from Hydro One's distribution system within 500ms to prevent the phase from remaining energized during recloser operations.

DESIGN CONSIDERATION

The system over and under-voltage protection elements required in Section 2.3.11 may be capable of detecting most open-phase conditions if the elements are connected phase-ground. However these voltage elements may not be sensitive enough to detect certain types of open-phase conditions when generation is connected or when there is back-feed via a three-phase shared-core DGIT. Alternate detection schemes such as phase-ground connected voltage elements, negative-sequence or negative/zero-sequence current or negative/zero-sequence voltage detection schemes may be required to provide adequate sensitivity.

2.3.9 FEEDER RELAY DIRECTIONING

- i) Hydro One feeder relay phase and ground over-current elements may need to be directioned.
- ii) Inline reclosers on the feeder upstream of the DG Facility may need to be directioned.
- iii) The need for Items (i) and (ii) above shall be specified in the CIA for the proposed DG Facility connection.

BACKGROUND INFORMATION

Non-directional over-current protections provide adequate protection for the clearance of downstream phase and ground faults for a radial (single source) distribution system feeders. These simple over-current protections include non-directional feeder relay over-current elements, inline reclosers and fuses.

Connection of DG Facilities provides additional sources of fault current that can cause non-directional over-current protections to operate for reverse faults, upstream of the protected zone²⁷. For these non-radial situations, directioning of the protections will be required to prevent operation for the reverse faults.

Distance relays are inherently directional and can be used to avoid this problem.

²⁷ Mis-operation will occur if the aggregate DG Facility fault in-feed exceeds the operational setting of the over-current protection.

2.3.10 OVER FREQUENCY/UNDER FREQUENCY PROTECTION

- i) The DG Facility's interconnection protection scheme shall have the capability of detecting abnormal frequencies shown below in Table 11.
- ii) The DG Facility shall disconnect from Hydro One's Distribution System in the clearing times specified in Table 11.
- iii) The clearing time in Table 11 shall be measured from the start of the abnormal condition until the time that the DG Facility ceases to energize Hydro One's Distribution System.
- iv) More stringent clearing times may be specified in the CIA if required.
- v) DG Facilities > 30kW shall have the frequency set point field adjustable.
- vi) DG Facilities \leq 30kW shall have the frequency set point either fixed or field adjustable.
- vii) DG Facilities \geq 1MW shall have the lower frequency set points set to comply with the NorthEast Power Coordinating Council (NPCC) "Directory D12", as shown below in Figure 20.
- viii) DG Facilities > 10MW shall follow the frequency set points and clearing times specified by the IESO's SIA.

Table 11: Over/Under Frequency Protection Set Points and Clearing Times

Generator Size	Frequency Range (Hz)	Clearing Times(s)*
\leq 30 kW	> 60.5	0.16
	< 59.3	0.16
> 30 kW	> 60.5	0.16
	< (59.8 – 57.0) - adjustable	Adjustable 0.166 to 300
	< 57.0	0.16

* Generators \leq 30kW – Maximum clearing time

* Generators > 30kW – Default clearing time

Source: IEEE 1547

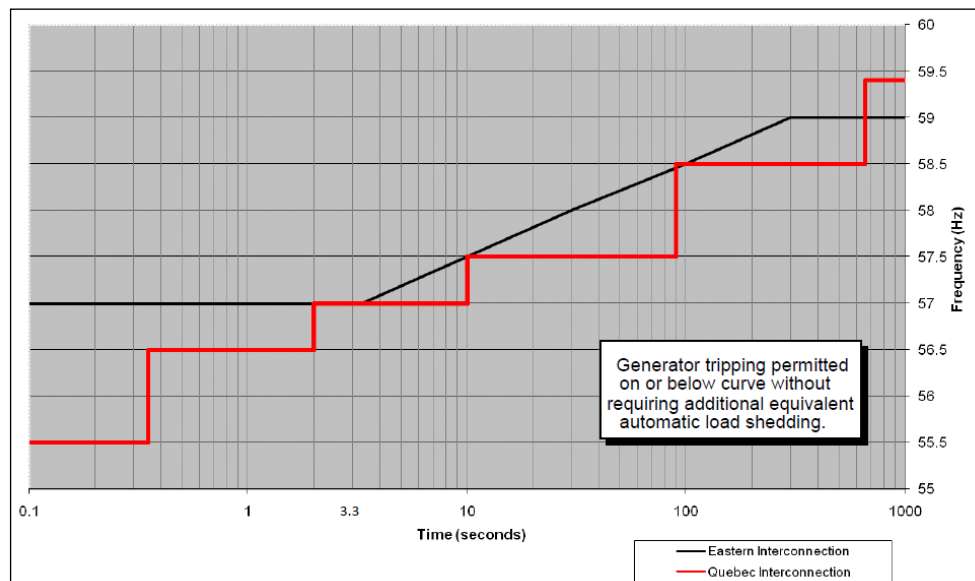


Figure 20: NPCC Directory D12 Generator Underfrequency Setting Requirement

2.3.11 OVERVOLTAGE/UNDERVOLTAGE PROTECTION

- i) The DG Facility's interconnection protection scheme shall have the capability of detecting abnormal voltages shown in Table 12.
- ii) The DG Facility shall disconnect from Hydro One's Distribution System in the clearing times specified in Table 12.
- iii) Voltage shall be measured:
 - a) phase-neutral for single phase installations;
 - b) phase-neutral for grounded Wye-Wye transformer configurations; or
 - c) phase-phase for all other installations.
- iv) The voltages shall be detected at the PCC.
- v) If the requirement in Item (iv) above is not practical or feasible, estimated values may be used if approved by Hydro One.
- vi) The clearing time in Table 12 shall be measured from the start of the abnormal condition until the time that the DG Facility ceases to energize Hydro One's Distribution System.
- vii) More stringent clearing times may be specified in the CIA if required.

- viii) DG Facilities > 30kW shall have the voltage set point field adjustable.
- ix) DG Facilities \leq 30kW shall have the voltage set point either fixed or field adjustable.
- x) Undervoltage relays should be time-delayed to avoid unnecessary tripping while over-voltage relays may be instantaneous.
- xi) High speed instantaneous voltage protection may be considered for detecting ferroresonance and self-excitation conditions.
- xii) DG Facilities > 10MW shall follow the voltage set points and clearing times specified by the IESO's SIA.

Table 12: Over/Under Voltage Protection Setting and Clearing Time

Voltage Range (% of base voltage)	Clearing Time(s)*
$V < 50$	0.16
$50 \leq V < 88$	2.00
$110 < V < 120$	1.00
$V \geq 120$	0.16

* DG \leq 30 kW – Maximum clearing time

Source: IEEE 1547

* DG > 30 kW – Normal clearing time

2.3.12 ANTI-ISLANDING PROTECTION

- i) Upon loss of voltage in one or more phases of Hydro One's Distribution System, the DG Facility shall automatically disconnect from Hydro One's Distribution System within 500ms.
- ii) The DG Owner shall demonstrate to Hydro One that it shall not sustain an island for longer than the time requirements in Item (i) above.
- iii) All DG Facilities shall have anti-islanding protection. This may involve different protection functions, however all DG Facilities shall have:
 - a) Under/Over Frequency protection (Section 2.3.10);
 - b) Under/Over Voltage protection (Section 2.3.11); and
 - c) Transfer Trip for anti-islanding protection may be required as stipulated in Section 2.3.13.
- iv) DG Facilities \leq 500kW shall be exempted from Item (iii)(c) above and allowed to install the following passive anti-islanding schemes in lieu of Transfer Trip as an

interim protection until Hydro One standardizes on a Transfer Trip solution for DG Facilities $\leq 500\text{kW}$ ²⁸:

- a) Rate of Change of Frequency (ROCOF); and
- b) Vector Surge or Reverse Reactive Power.
- v) The passive anti-islanding protection scheme in Item (iv) above shall be submitted to Hydro One for approval.
- vi) The passive anti-islanding protections in Item (iv) above shall be set as sensitive as possible to reduce the non-detection zone and can be changed in the future if it is found to cause unjustified nuisance trips. These settings changes shall have to be pre-approved by Hydro One prior to implementation.
- vii) If Hydro One does not find a suitable standardized solution to Transfer Trip for DG Facilities $\leq 500\text{kW}$, the interim passive anti-islanding protections in Item (iv) above shall be changed out to Transfer Trip as referred in Section 2.3.13.
- viii) The DG Owner shall be aware and accept the consequences of utilizing passive anti-islanding schemes in Item (iv) above as a primary anti-islanding protection and shall not hold Hydro One responsible for any damage incurred due to islanded operation from events such as out-of-phase reclosing.
- ix) DG Facilities $\leq 500\text{kW}$ shall have provision for the capability to receive Hydro One trip signals and cease generation; i.e., shall have provision for the installation of equipment required to accommodate standardized Transfer Trip solution for DG Facilities $\leq 500\text{kW}$. The actual implementation is not required but may be requested by Hydro One at a later date to be implemented at the DG Owner's cost within 90 days.

BACKGROUND INFORMATION

An electric island is a section of the distribution system which, when disconnected from the rest of the Hydro One system, remains energized by DG Facilities connected to the feeders. At the present time, Hydro One will not allow islanded operation. Anti-islanding protection is required to:

- ensure that Hydro One customers do not experience power quality problems;
- prevent out-of-phase reclosing between Hydro One's distribution system and the DG Facility;

²⁸ Hydro One is currently testing ENERPULSAR technology to be used as a low cost Transfer Trip Solution.

- reduce the risks of safety hazards caused by islanding; and
- add redundancy to other protections.

Anti-islanding protection may involve different protection functions. Each DG Facility connected to Hydro One's system shall contain this protection and must demonstrate that the DG Facility will not sustain an island longer than permitted. In certain installations, the installation of dedicated communications (transfer trip) and protection schemes may be required for anti-islanding protection and is discussed in Section 2.3.13. Appendix D has detailed information on Anti-Islanding Protection and discusses the different requirements for Transfer Trip. Please refer to this appendix for more information. Induction generators, due to the possibility of self-excitation, also have this requirement.

To facilitate the connection of DG Facilities 500kW and less, passive Anti-Islanding protections, specifically Rate of Change of Frequency and Vector Surge or Reverse Reactive Power, may be considered as an interim solution until other effective low-cost alternate solutions are available and approved (i.e. ENERPULSAR pilot projects currently underway – pulse based anti-islanding protection). These special considerations for DG Facilities less than 500kW have been made to enable these generators to connect with the associated risks of passive anti-islanding technologies without having to wait for an approved standardized solution.

DG owners that decide to connect without TT must understand the risks and shall accept the liabilities associated with adverse impacts caused by prolonged islanding of their generation for greater than 500ms.

The DG Facility, instead of using transfer trip for anti-islanding protection may use an approved Hydro One Anti-Islanding Protection Scheme. At present, there are tests being conducted and if and when any of these schemes are approved by Hydro One to meet anti-islanding protection requirements, they will be posted in this section in a future revision.

2.3.13 TRANSFER TRIP

- i) A Transfer Trip (TT) signal from the station feeder breaker(s) to the DG Facility shall be required for all DG Facilities whose aggregate capacity is 1 MW or larger.

- ii) A Transfer Trip (TT) signal **from** the feeder breaker(s) and/or upstream recloser(s) (where the recloser is located between the DG Facility and feeder breaker) **to** the DG Facility shall be required for any or all of the following conditions²⁹:
 - a) When the aggregate DG Facility capacity is greater than 50% of the minimum feeder load or the minimum load downstream of recloser(s); or
 - b) When the aggregate generation, comprising of existing generation, other earlier proposed DG Facilities, and the concerned DG Facility is greater than 50% of the minimum feeder load or minimum load downstream of the recloser; or
 - c) If the existing reclosing interval of the feeder breaker(s) and/or upstream recloser(s) is less than 1.0s.
- iii) A Transfer Trip (TT) signal **from** upstream feeder breaker(s) and/or recloser(s) **to** the DG Facility connected at downstream of Distribution Station (DS) supplied by that feeder shall be required. This is required when the aggregate generation comprising of existing generation, other earlier proposed DG Facilities, at the feeder or at the DS including concerned DG Facility is greater than 50% of minimum feeder load or the minimum load downstream of recloser respectively.
- iv) A Transfer Trip (TT) signal **from** transmission line terminal breaker(s) of an upstream Transformer Station (TS) **to** the DG Facility shall also be required if the TS where the DG Facility is being proposed is radially supplied by that transmission line and there is a possibility of islanding of the entire transmission line, or where Wide area islands could exist – aggregate generation on transmission line is greater than 50% of the minimum load on the transmission line. This signal will be cascaded onto the TT signal that will be required between the TS feeder breaker and the DG Facility in Item (ii) above.
- v) The DG Facility's shall cease to energize Hydro One's Distribution System with no intentional time delay and isolate all generation and HV ground sources upon receipt of a Transfer Trip signal.
- vi) Transfer Trip communications shall meet the timing requirements in Table 13. The maximum TT time shall depend on the operational speed of the DG Facilities interrupting device.

²⁹ Appendix D contains information on different possible islanding conditions and discusses when and where TT needs to be sent.

Table 13: TT Timing Requirements

Maximum TT Communication Time (ms)	Speed of DG Facility's Interrupting Device (cycles)
83	3
67	4
50	5
33	6
17	7

- vii) The DG Facility shall remain disconnected from Hydro One's Distribution System if the Transfer Trip (TT) channel is unavailable.
- viii) The Transfer Trip (TT) teleprotection system shall be failsafe.
- ix) Upon loss of the Transfer Trip (TT) communication channel, the generation and HV ground sources shall disconnect within 5 seconds of the channel failing. A controlled shutdown may be allowed and must be submitted to Hydro One for approval.
- x) The DG Facility shall remain disconnected until the Transfer Trip (TT) channel is repaired and the controlling authority has been advised that all DG Facility interconnection protections have been restored to service.
- xi) DG Facilities with an aggregate capacity of 500kW and less, may be exempted from Items (ii) and (iii) above and permitted to use passive anti-islanding protections in accordance with Section 2.3.12 Item (iv).

2.3.14 DISTRIBUTED GENERATOR END OPEN (DGEO)

- i) A Distributed Generator End Open (DGEO) real-time signal from the DG Facility to Hydro One is required whenever Transfer Trip is required, as outlined in Section 2.3.13.
- ii) The DGEO and LSBS (Refer to Section 2.3.15) signals shall be combined into one composite communications channel signal as outlined in the DGEO and LSBS Design Requirement in Section 2.3.16.
- iii) Upon failure of the DGEO channel, Hydro One may block its feeder reclosing until the channel is repaired.
- iv) The DG Owner shall make repairs in the event of channel failure as quickly as possible.

- v) In the event of Item (iii) above, Hydro One can seal in Transfer Trip to the affected DG Facility until the channel is repaired to enable automatic reclosing on its feeders.

BACKGROUND INFORMATION

Distributed Generator End Open (DGEO) is a real-time signal that is continuously sent from the DG Facility to the Hydro One supply source breaker or recloser. It establishes the connection status of the generation equipment. Hydro One will utilize this signal for auto-reclose supervision of the TS feeder breaker or any upstream protective device. This will ensure that out-of-phase reclosing of the DG Facility does not occur.

2.3.15 LOW SET BLOCK SIGNAL (LSBS)

- i) A Low Set Block Signal (LSBS) from the DG Facility to the Hydro One supply source breaker or recloser is required whenever Transfer Trip is required as outlined in Section 2.3.13.
- ii) The LSBS and DGEO (Refer to Section 2.3.14) signals shall be combined into one composite communications channel signal as outlined in the DGEO and LSBS Design Requirement in Section 2.3.16.

BACKGROUND INFORMATION

A Low Set Block Signal (LSBS) is a transient signal that is sent from the DG Facility to the Hydro One supply source breaker or recloser, whenever a large DGIT is being energized. Detection of this signal transition at the Hydro One supply source breaker or recloser location will cause the most sensitive low-set (fuse-saving) protection to be temporarily blocked. This will prevent tripping of the Hydro One supply source during the period when there is large energizing inrush current due to the DGIT. Refer to Appendix E for more information regarding the LSBS signal.

2.3.16 DGEO AND LSBS DESIGN

- i) The DGEO and LSBS (Refer to Section 2.3.14 and Section 2.3.15 respectively) signals shall be combined into one composite communications channel signal.
- ii) This dual function signal shall be set to '1' when the breaker is open and set to '0' 1s **prior** to the energization of the DGITs.

BACKGROUND INFORMATION

The DGEO signal must be derived from the logical combination of all breakers/circuit switchers at the DG Facility interconnection between the DG Facility and the PCC necessary to establish connectivity of the DG Facility. DGEO is required at the Hydro One connection location to block closing of the breaker while the DG Facility is connected. DGEO may also be required to be sent as real-time-operating data to the OGCC, so the controlling authorities of the distribution system are aware of the connection status (as per Section 2.5). The momentary LSBS signal will always be sent just prior to reconnection, (near the end of the DGEO open condition).

“Design Considerations” and timing information can be found in Appendix E.

2.3.17 SPECIAL INTERCONNECTION PROTECTION

- i) Other protections not specified in this requirements document may be required depending on the application.
- ii) The DG Owner shall be aware of site specific conditions and the nature of Hydro One’s Distribution System to properly assess the need for additional protections.

2.3.18 PROTECTION SCHEME FAILURES

- i) The DG Facility generation and HV ground sources shall be disconnected from Hydro One’s Distribution System and notify Hydro One’s system operators if:
 - a) The DG Facility’s local interconnection protection system fails³⁰;
 - b) The breaker trip coil or interrupting device fails;
 - c) The DC supply is lost; or
 - d) The TT signal channel fails.
- ii) Alarm Telemetry shall be provided to Hydro One directly from the DG Facility as required in Section 2.5.
- iii) With the exception of Item (i)(d) above, disconnection shall be automatic and immediate (no intentional time delay).
- iv) Disconnection following TT signal failure shall be automatic but can be delayed as outlined in Section 2.3.13 Item (ix).

³⁰ Interconnection protection systems provided by IEDs shall have self-diagnostic (control healthy) features that detect internal relay failures

- v) Hydro One may send TT to the DG Facility following a DGEO signal failure as outlined in Section 2.3.14 Item (v).
- vi) The device(s) used to disconnect the generation shall remain open until such a time when the affected system is returned to normal service condition and the DG Facility is safe for reconnection to Hydro One's distribution system.
- vii) The interconnection protection design submitted to Hydro One during the implementation phase of the Connection Process shall provide sufficient detail to ensure that the protection scheme failure requirements outlined in Item (i) above are addressed.
- viii) In designs where self-diagnostic features do not trip the appropriate breakers upon failure, sufficient backup and/or redundancy protections shall be provided.
- ix) If electro-mechanical relays are used, the protection and control design shall be of a fail-safe nature to ensure the integrity of the protection scheme under malfunctioning conditions.

2.3.19 INTERCONNECTION PROTECTION ACCEPTANCE

- i) The DG Owner shall provide Hydro One with complete documentation on the proposed DG Facility's interconnection protection scheme to ensure compliance with the requirements of the TIR and all applicable standards. Documentation shall include, but is not limited to:
 - a) a detailed Single Line Diagram;
 - b) an overall description on how the protection will function;
 - c) a description on failure modes;
 - d) detailed engineering drawings that includes design details on protection and control, teleprotection and telemetering schemes and components including manufacturer and model #;
 - e) the protection element settings (pickup, timers, etc.);
 - f) details on monitoring for the protection system performance (DFR, SER, and telemetry);
 - g) details on backup supply to any critical loads;
 - h) details on the Breaker Failure protection if required by Section 2.3.4; and

- i) details on the disconnecting and interrupting device.
- ii) If Hydro One proposes any changes from the review in Item (i) above, the DG Owner shall revise and re-submit the protection information to Hydro One.
- iii) All documentation must be submitted together.
- iv) The latest submissions will be filed by Hydro One and MUST MATCH the documentation retained by the DG Owner.

2.3.20 PROTECTION CHANGES

- i) The DG Owner shall obtain Hydro One's prior written approval of all:
 - a) interconnection equipment replacements;
 - b) design modifications; and
 - c) setting changes.
- ii) Any changes without prior approval shall be deemed a violation of Distribution Connection Agreement (DCA) and may result in immediate disconnection from Hydro One's Distribution System.

2.4 OPERATING REQUIREMENTS

2.4.1 GENERAL

- i) Switching that involves manual operation of air break switches shall require all connected DG Facilities to disconnect their generation from the system as directed by the Controlling Authority.
 - ii) In the event that the source configuration changes, other than what was studied in the DG Owner's CIA or listed in their DCA, all connected DG Facilities shall disconnect their generation from the distribution system as directed by the Controlling Authority. It shall be the DG Owner's responsibility to ensure that their protections are capable of detecting all external faults.
 - iii) Any temporary feeder parallels shall require that all connected DG Facilities to come off-line as directed by the OGCC.
 - iv) Transfer Trip and DGEO communications shall be required for DG Facilities that are 1 MW and larger connecting to Hydro One's Distribution System at voltages less than 50 kV.
 - v) For feeders with multiple feeder reclosers, 50% minimum feeder load calculations shall identify remaining loading levels with reclosers in open position.
 - vi) The DG Facility shall parallel with Hydro One's Distribution System without causing a voltage fluctuation at the PCC greater than $\pm 4\%$ of the prevailing voltage level of the distribution system at the PCC and meet the flicker requirements in Section 2.2.2.3.
 - vii) The DG Facility (synchronous and permanent magnet generators) shall remain in synchronism with Hydro One's Distribution System while operating in parallel to Hydro One's Distribution System. The DG Facility is expected to have loss-of-field protection as part of the generator protection to quickly disconnect the generator should the excitation to the generator fail.
 - viii) No automatic reconnection to the system shall be allowed unless:
 - a) there is always contact with the DG Owner or DG Facility operator who has the ability to immediately disconnect the DG Facility from the system if requested by the Controlling Authority (24 hours/7 days per week); or
 - b) the Distributor's Controlling Authority has the ability to remotely disconnect the DG Facility from the system, and
-

- c) feeder relay studies must be updated if circuit configuration is materially altered. If the source changes from the configuration studied in the CIA, the generator will not be allowed to reconnect.
- ix) Automatic Reconnection to Hydro One's distribution system shall be locked out once voltage and frequency are not within operating ranges for a period of 15 minutes on any phase for any DG Facilities limited to one connection path if stipulated in their DCA.
- x) Legacy DG Facilities need to meet the operating requirements of the TIR.

2.4.2 ISLANDING

- i) Intentional islanding is not allowed at this time.
- ii) Islanding detection and protection is required as per Section 2.3.12.

2.4.3 UNINTENTIONAL ENERGIZATION

- i) The DG Facility shall not energize Hydro One's Distribution System when the distribution system is de-energized.

2.4.4 SYNCHRONIZATION

- i) Any DG Facility that is capable of generating its own voltage while disconnected from Hydro One's Distribution System shall require proper synchronization facilities before connection is permitted.
- ii) Interconnection shall be prevented if the DG Facility and Hydro One's Distribution System are operating outside the limits specified in Item (iii) below.
- iii) Synchronous generators, self-excited induction generators or inverter-based generators that produce fundamental voltage before the paralleling device is closed shall only parallel with Hydro One's Distribution System when the frequency, voltage, and phase angle differences are within the ranges given below in Table 14 at the moment of synchronization.

Table 14: Resynchronization Requirements

Aggregate Rating of Generators (kVA)	Frequency Difference (Δf , Hz)	Voltage Difference (ΔV , %)	Phase Angle Difference ($\Delta \Phi$,)
0-500	0.3	10	20
>500 – 1500	0.2	5	15
>1500	0.1	3	10

* Source: IEEE 1547

- iv) For synchronous generators, an approved automatic synchronization device shall be required if the plant is unattended (IEEE device number 25) to ensure that the DG Facility will not connect to an energized feeder out of synchronism.
- v) Induction generators and inverter-based generators that do not produce fundamental voltage before the paralleling device is closed, and double-fed generators whose excitation is precisely controlled by power electronics to produce a voltage with magnitude, phase angle, and frequency that match those of the distribution system may not require synchronization facilities.
- vi) Any proposed synchronizing scheme shall be submitted to Hydro One prior to installation and shall be able to accommodate automatic reclosing on Hydro One's distribution facilities.

2.4.5 SINGLE CONNECTION PATH

- i) The requirements in Items (ii), (iii) and (v) below shall apply to DG Facility connections which have a restriction to only a single connection path (normal configuration) as stipulated in their DCA.
- ii) DG Facility generation connection shall be restricted only to the "normal Distribution System supply configuration"³¹ and when all required protection and control systems required for safe and reliable connection to the Distribution System are operational.
- iii) DG Facility generation connection shall be restricted only to Transmission System supply configurations that have adequate minimum load connected or have adequate TT facilities in-service to prevent a Wide-Area DG island.

³¹ The "normal Distribution System supply configuration" is considered to be when the feeder is supplied from one TS feeder breaker (the normal supply breaker) or DS recloser and all normally open line switches are open, as defined by Hydro One's operating diagrams.

- iv) Upon request the DG Facility connection can be approved for "Alternate Grid Connection Path" if deemed acceptable by Hydro One. An additional assessment on Transmission System supply configurations shall be required.
- v) The CIA and DCA shall clearly identify the Distribution System and Transmission System supply configuration(s) studied and determined to be acceptable for safe and reliable DG Facility connection in accordance with Items (i) and (iii) above.
- vi) If an alternate configuration exists and if Items (ii) and (iii) above apply to the DG Facility, then the DG Facility shall be disconnected until the normal configuration is restored.

BACKGROUND INFORMATION

Alternate (abnormal) supply configurations may be required from time-to-time to circumvent planned or unplanned contingency situations (equipment failures, maintenance, upgrading and repairs) for the purpose of maintaining or restoring an adequate supply to load customers. DG Facility connections to alternate supply configurations would cause changes to short circuit levels, circuit loading, steady-state voltage profiles, transient overvoltages, protection coordination and DG island configurations.

DG Facility generation, if stipulated in their DCA, must be disconnected during alternate supply configurations unless specific provisions have been made by the CIA and implementation stages of the connection to assure the DG Facility can safely and reliably remain connected for the specific alternate connection according to all of the Technical Requirements outlined in the TIR.

Although other supply configurations may be of concern, the expected most common alternate Distribution System supply configurations that may not facilitate DG connection are as follows:

- Back-up supply of load customers from the adjacent TS feeder breaker (TS feeder tie switch closed);
- Back-up supply of load customers from another TS; or
- Extending supply to load customers connected to an isolated section of an adjacent feeder normally supplied from another source by closing a normally-open feeder-end switch.

The expected most common alternate Transmission System supply configurations that may not facilitate DG connection are as follows:

- Transfer of a TS or DS that is supplied from a single 115kV or 230kV circuit to another main terminal station that does not have adequate minimum load connected or does not have adequate TT facilities in place to prevent Wide-Area DG islands.

Different conditions need to be met before reconnecting to Hydro One's system, depending if the outage is a momentary outage or sustained outage or shutdown. They are explained in Section 2.4.7 and Section 2.4.8. Automatic Reconnection of the DG Facility to Hydro One's system is subject to specific requirements which can be found in Sections 2.4.1, 2.4.7 and 2.4.8.

2.4.6 AUTOMATIC DISCONNECTION OF GENERATION AND HV GROUND SOURCES

- i) All DG Facility generation and sources of ground current shall be automatically disconnected from the Distribution System whenever the DG Facility's interconnection protection or TT operates, as required by the other sections in the TIR. The timing requirements for automatic disconnection are detailed below in Items (ii), (iii), (v), (vi) and (vii).
- ii) For those DG Facilities that require TT, all generation shall be disconnected immediately (without any intentional delay) upon the receipt of a TT signal from Hydro One.
- iii) For those DG Facilities that require TT, all generation shall be disconnected within 500ms of when external faults are detected on the Distribution System by the DG Facility's interconnection protection.
- iv) For those self-clearing DG Facilities that do not require TT, all generation shall be disconnected within 200ms of the start of the abnormal condition on the Distribution System by the DG Facility's interconnection protection.
- v) All sources of DG Facility generation shall be disconnected within 500ms when the DG Facility Anti-islanding Protection operates.

- vi) All three-phase DG Facility ground sources shall be disconnected within 500ms if any of the items (ii) to (v) above operates.³²
- vii) A back-up means shall be provided for disconnecting the DG Facility generation and all grounded DGIT or HV grounding transformers that provide a ground return path for ground faults on the HV side of the DGIT, should the interrupting device fail.³³

BACKGROUND INFORMATION

The DG Facility generation cannot remain connected to any part of the Distribution System in island mode, for many reasons, as outlined in Appendix D.

Hydro One uses a very sensitive high-speed low-set protection to clear the first occurrence of a fault on overhead circuits. This protection normally clears the fault from Hydro One in-feed in less than 100ms (from fault inception to breaker fault current interruption). Such rapid clearance is intended to be fast enough to minimize fault duration and equipment damage, and avoid melting fuses for the most common transient faults on overhead circuits such as lightning, wind and momentary foreign contacts. For overhead circuits, Hydro One also uses an automatic reclosure scheme that quickly re-energizes the circuit. The Hydro One feeder breaker or recloser is automatically reclosed after a short delay that allows time for transient faults to extinguish and motor loads to disconnect. For transient faults, automatic reclosure restores supply quickly to load customers to avoid prolonged outages³⁴.

Similarly, all DG Facilities must be disconnected quickly, to avoid the following:

- prolonged fault current contributions that could increase equipment damage and melt fuses;
- a sustained DG island condition;
- interference with successful Hydro One automatic reclosure that quickly restores supply to load customers for the most common transient faults; and
- asynchronous reclosure that can damage the generator(s) at DG Facility, other load customers connected to Hydro One's distribution system and/or Hydro One equipment.

³² three-phase ground sources are any three-phase power transformers or grounding transformers that provide a ground-current return path in excess of 10 Amps to phase-ground faults on the HV side of the DGIT. That includes separate three-phase HV grounding transformers or three-phase DGIT that have star-connected HV windings with the star-point neutral connected to ground, either solidly or through a reactor.

³³ As per Section 2.3.4 Breaker Failure

³⁴ Typical reclosing times are 0.5 to 1 second for feeder breakers and 1.5 to 2 seconds for reclosers

At the time of manual or automatic reclosure, Hydro One low-set protection is temporarily blocked (typically for 10 seconds). This allows Hydro One timed protections to selectively isolate a faulted section of the feeder, should the fault be “permanent” (re-strike immediately after reclosure).

Additional sources of fault current from DG Facilities can reduce Hydro One in-feed to faults and cause current back-feeds. This would interfere with the time-coordination of the Distribution System protections for the selective isolation of non-transient faults. For this reason all DG Facility ground sources that can provide significant in-feed to faults on the Distribution System must be disconnected before the Hydro One source reconnects. A 500ms disconnection of DG Facility ground sources following protection operations should ensure that they will not be present when Hydro One re-energizes the circuit.

2.4.7 AUTOMATIC RECONNECTION OF GENERATION AND HV GROUND SOURCES

- i) Reconnection to Hydro One’s distribution system shall be a two-step process as outlined below. Both steps can occur simultaneously if the DG Facility uses HVI to synchronize generation.
- ii) Step 1 outlined in Items (iii) and (iv) below shall apply only if the DGIT is required to be disconnected by an HVI as outlined in Section 2.1.13.

Step 1: Automatic DGIT Reconnection (HVI reclosing)

- iii) The DGIT may be automatically re-energized using an HVI automatic reclosing scheme providing:
 - a) Automatic reclosing to the HVI is initiated only when the DG Facility’s interconnection protection or TT operates;
 - b) The fault is not on the DG Facility side of the HVI³⁵;
 - c) The Distribution System feeder has successfully re-energized from the normal Hydro One source; and
 - d) The Distribution System voltages are stable within normal limits³⁶ for continuous period of 15 seconds.³⁷

³⁵ The DG Facility’s interconnection protection must be capable of distinguishing between external faults on the Distribution System and internal faults within the DG Facility as per Section 2.3.7

³⁶ For normal limits refer to Appendix A.3 for details on operating characteristics of Hydro One’s Distribution System

³⁷ Reconnection of multiple generator units on a feeder may require staggered delay times. Hydro One shall assign individual delay times if this is the case.

- e) Once Items (iii)(a) to (d) above are satisfied, reconnection must occur within 15 seconds.
- iv) For DG Facilities requiring LSBS, the LSBS signal shall be sent 1 second before the DGIT is re-energized.

Step 2: Automatic Generator Reconnection

- v) DG Facility shall not be automatically reconnected to the Distribution System until the Distribution System voltage is stabilized within 6% of nominal and the frequency is between 59.5Hz and 60.5Hz, for a definite time period defined in Item (vi) below.
- vi) Automatic reconnection of the DG Facility shall include an adjustable delay that may delay the reconnection for 5 minutes.
- vii) Additional requirements listed in Section 2.2.2.3 and Section 2.4.4 shall be met for this automatic reconnection following a momentary outage to occur.
- viii) Should restoration attempts of Hydro One source to the Distribution System fail to re-establish stable voltages within 15 minutes, automatic reconnection of the DG Facility shall be disabled.
- ix) For all DG Facilities with a limit to connect through only one "normal configuration" path in accordance with their DCA, Hydro One's operators shall give permission to the DG Facility operators to manually reconnect when stable voltages have not been restored within 15 minutes. No automatic reconnection shall take place after the 15 minutes.

BACKGROUND INFORMATION

All DG Facility generation shall be disconnected following protection operations as outlined in Section 2.4.6 above.

The following outlines what must take place before the DG Facility can reconnect. Refer to Appendix G for a detailed sequence of events and timing diagram. Figure 30 illustrates a typical successful reconnection sequence for a transient fault. Figure 31 illustrates a typical lock-out sequence for a permanent fault.

As noted in Section 2.4.6 above, at the time of manual or automatic reclosure, Hydro One low-set protection is temporarily blocked (typically for 10 seconds). This allows Hydro One timed protections to selectively isolate a faulted section of the feeder, should the fault be "permanent" (re-strike immediately after reclosure).

Blocking of the low-set protection also prevents an immediate trip upon energizing, caused by the cumulative inrush current associated with energizing customer transformers and cold-load effects.

Hydro One feeder protections should be restored to their normal state (complete with the low-set protections enabled) approximately 10 seconds after a successful manual closure or automatic reclosure. Restricting auto-reconnection of DGIT to 15 seconds allows the Hydro One protections to return to their normal state prior to re-energizing the DGIT. That allows the load customers to be restored first without the additional inrush associated with re-energizing the DGIT.

For large DG facilities not equipped with an HVI, there may be a requirement to send out a Low Set Block Signal prior to closing of the disconnect switch to energize the DGIT. (Refer to Section 2.3.15 for LSBS requirements.)

For persistent or re-occurring faults, automatic restoration attempts will be unsuccessful and the Hydro One supply will have to be manually restored. Manual restoration of the feeder will be attempted by the Hydro One Controlling Authority. That may occur within a few minutes where remote control is available. If a remote-controlled manual restoration attempt is successful, and within 15 minutes of the loss of supply, then DG Facility reconnection can proceed in accordance with Section 2.4.7.

If normal Distribution System voltages are not restored within 15 minutes, it is likely that there is a permanent fault or other serious problem with the Distribution System or Hydro One's Transmission System. This will require manual assessment and restoration by the Controlling Authority. All DG Facility automatic reconnection schemes must be disabled after 15 minutes to avoid interference with these restoration efforts.

DESIGN CONSIDERATIONS

Hydro One's feeder reclosers may have multiple reclose attempts to allow sectionalizers to operate to clear the fault. Some protective devices have as many as four reclose attempts before reclosing is locked out the Distribution System voltages must be stable within normal limits³⁸ for a continuous period of 15 seconds that will only occur after the final successful reclose. The healthy voltage time delay must be reset every time the feeder is de energized.

The HVI automatic reclosing must initiate immediately following the 15-second healthy voltage time delay, and must be set between 0 and 15 seconds. For multiple DGITs, there

³⁸ For normal limits refer to Appendix A.3 for details on operating characteristics of Hydro One's Distribution system)

may be a need to stagger re-energization to minimize the effects of inrush on Hydro One's distribution system and the resulting voltage sag and flicker. Hydro One shall assign the individual delay times if this is the case.

Protections for feeders with extensive underground cable sections are not likely to use instantaneous low-set protections and auto-reclosure, because cable faults are much more likely to be permanent requiring repairs. Automatic reconnection of DG Facilities would not be used for these configurations.

2.4.8 RECONNECTION OF GENERATION FOLLOWING A SUSTAINED OUTAGE OR SHUTDOWN

- i) No automatic reconnection of the DG Facility shall occur following a sustained outage or shutdown – when the voltage and/or frequency out of normal operating range on any phase for more than 15 minutes for any DG Facilities limited to one connection path if stipulated in their DCA. Permission to reconnect shall be given by Hydro One's Controlling Authority in accordance with the terms of the DCA.

2.5 CONTROL AND MONITORING REQUIREMENTS

2.5.1 GENERAL

- i) Control and monitoring facilities shall be required at DG Facilities connected to the Hydro One's and Distribution System for provision of real-time operating data.
- ii) The DG Owner shall provide battery backup for telemetry in the event that the DG Facility is removed from Hydro One's Distribution System.
- iii) Battery backup capacity shall be sufficient for the connection to be re-established.
- iv) Alternatives to Item (iii) above are subject to approval by Hydro One.
- v) Under the DSC and terms of the TIR, DG Owners of DG Facilities connected to Hydro One's Distribution System shall have the obligation to provide real time data pertaining to their equipment as required by the capacity at the PCC.
- vi) Monitoring and control may be required as a result of Renewable Energy Supply Integration initiatives regardless of the capacity as will be determined by Hydro One.
- vii) Installation capacity descriptions shall be consistent with the class definitions in the TIR listed below in Table 15 for convenience.

Table 15: DG Classification

Class	Generation Capacity at PCC
1	0 kW < DG Facility Rating ≤ 250 kW
2	250 kW < DG Facility Rating < 1500 kW
3	1.5 MW ≤ DG Facility Rating ≤ 10 MW
4	DG Facility Rating > 10 MW

- viii) The requirements for real time operating information shall apply to all DG Facilities connected to Hydro One's Distribution System.
- ix) The quantities and device statuses, defined below, shall be provisioned, monitored and controlled for continuous transmission to Hydro One.
- x) All details shall be captured in DCA, or an appendix in the DCA as required by Hydro One and the applicable codes.
- xi) Some or all of the control and monitoring requirements in the TIR may apply to DG Facilities connected to the Distribution Systems of Embedded LDCs.

2.5.2 CONTROL FACILITIES

- i) Subject to the agreement between the DG Owner and Hydro One, all or some of the following remote controls, if applicable, shall be provided to Hydro One:
 - a) Station breakers and switchers;
 - b) Motorized disconnect switches;
 - c) Transformers' ULTC;
 - d) 3% and 5% voltage reduction;
 - e) Hold off on feeder breakers;
 - f) Dynamic generator output control; and
 - g) Other location specific devices.
- ii) At any time, one and only one operating authority shall have remote control of the DG Facility.
- iii) Where the DG Owner maintains an operating centre and control of the DG Facility is handed off from the DG Owner to Hydro One at scheduled times, Hydro One will consider the use of an ICCP link between the two control centres.

2.5.3 OPERATING DATA, TELEMETRY AND MONITORING

- i) Quantities provided from the DG Facility shall be in engineering units.
- ii) The quantities shall provide an overall end-to-end measurement error no greater than two percent of the nominal rating. The error shall include all primary, secondary and analog to digital conversions.
- iii) The resolution shall meet or exceed the accuracy rating of the device performing the analog to digital conversion.
- iv) Real-time data to be provided to Hydro One by the DG Owner will depend on the output rating of the DG Facility as listed below in Section 2.5.3.1 to Section 2.5.3.4.

2.5.3.1 CLASS 1 GENERATORS

- i) DG Facilities with a capacity of less than or equal to 250kW shall have the provision for monitoring the disconnecting device at the PCC.

- ii) Provisions for other quantities may be required and shall be determined by Hydro One.
- iii) The actual implementation to install the SCADA link and modem is not required, but may be requested by Hydro One at a later date to be implemented at the DG Owner's cost within 90 days.

2.5.3.2 CLASS 2 GENERATORS

- i) DG Facilities with a capacity of greater than 250kW but less than 1500kW shall provide the following information:
 - a) Analogue Quantities which include the following:
 - 1) Net active power (MW) output and reactive power (MVAR) flow and direction for each unit or total for the DG Facility;
 - 2) Phase to phase voltages for three-phase generators or phase to neutral voltages for single-phase generators; and
 - 3) Three phase currents.
 - b) Device Statuses:
 - 1) Consolidated Connection Status at the PCC (HVI/LVI);
 - 2) Status of individual generating units at the DG Facility; and
 - 3) All generation rejection selections.
 - c) Alarms:
 - 1) Where facilities exist to provide independent monitoring of the interconnection protection fail as stated in Section 2.3.18 provision shall be made for an alarm signal to be generated and transmitted to Hydro One;
 - 2) A separate alarm shall be provided for each circuit supplying the DG Facility;
 - 3) The alarms shall identify the name of the DG Facility and the designation of the affected circuit; and
 - 4) Hydro One shall determine requirements based on controlling authority and equipment ownership.

- ii) Monitoring and control may be required as a result of Renewable Energy Supply Integration initiatives regardless of the capacity as will be determined by Hydro One.

2.5.3.3 CLASS 3 GENERATORS

- i) DG Facilities with a capacity of greater than or equal to 1500kW but less than or equal to 10MW shall provide the same data as identified for Class 2 generators.

2.5.3.4 CLASS 4 GENERATORS

- i) DG Facilities with a capacity of greater than 10MW shall provide the same data as identified for Class 2 generators.

2.5.3.5 TELEMETRY REPORTING RATES

- i) The minimum requirements for telemetry reporting rates for DG Facilities (Class 1 to Class 4) connecting to Hydro One's Distribution System shall be as shown below in Table 16.

Table 16: Telemetry Reporting Rates³⁹

Function	Performance
Data measurements	Less than 10s from change in field monitored quantity
Equipment status change	Less than 10s from field status change
Data skew	Not applicable
Scan period for data measurements	Minimum 4s
Scan period for equipment status	Minimum 4s

³⁹ Hydro One may poll less frequently than the minimum

2.6 TELECOMMUNICATIONS REQUIREMENTS

2.6.1 GENERAL

- i) Telecommunication infrastructure is required for DG Facilities connected to Hydro One's Distribution system for provision of protection and real-time operating data.
- ii) Telecommunication infrastructure shall be fast, secure, reliable, and shall meet the technical requirements for protection, control and monitoring as described in Sections 2.3 and 2.5 of the TIR.
- iii) Hydro One will indicate the viable alternative technologies that may be used for Telecommunications, which may include licensed/unlicensed microwave radio, optical fiber or Carrier-based leased circuits.
- iv) Cellular based Telecommunication infrastructure shall only be considered for real-time control and monitoring.
- v) DG Owners shall provide the GPS coordinates of the DG Facility to assist in the evaluation of wireless communication alternatives.

2.6.2 TELECOMMUNICATIONS FACILITIES FOR TELEPROTECTION

- i) A robust Telecommunication infrastructure will support the stringent reliability and latency requirements for Teleprotection.
- ii) The purpose of Teleprotection is to transmit critical information about the power system conditions from one end of the protected line to the other.
- iii) The proposed Telecommunication infrastructure for Teleprotection shall meet the requirements for Transfer Trip (TT) and DGEO as per Section 2.3.
- iv) Telecommunication infrastructure for Teleprotection will be reviewed by Hydro One to ensure the requirements for Teleprotection are met.

2.6.3 TELECOMMUNICATIONS FACILITIES FOR REAL-TIME CONTROL AND MONITORING

- i) The DG Owner shall provide real-time operating information to Hydro One as specified in Section 2.5 either directly from the station(s) as described in Item (ii) below, or from the DG Facilities' SCADA master as described in Item (iii) below.

Note: For DG Facilities connecting to the Distribution System of an Embedded LDC, the Embedded LDC shall provide real-time operating information to Hydro One from the Embedded LDC's SCADA master. For DG Facilities connecting to the Distribution System of an Embedded LDC that are not monitored by the Embedded LDC, the DG Owner shall provide monitoring to Hydro One as described in Item (ii) below.

- ii) Real time operating information provided to Hydro One may be from an Intelligent Electronic Device (IED) at the DG Facility's station to Hydro One's control centre using Distributed Network Protocol (DNP 3.0 protocol):
 - a) to Hydro One's wireless cellular data hub site and through the gateway to one of Hydro One's Control Centres, with the demarcation point being the wireless access point to the Service Provider's cellular network; or
 - b) where Item (ii)(a) above is not feasible, through a common carrier connection to one of Hydro One's Control Centres, with the demarcation point being the Central Office nearest to DG Facility's station; or
 - c) where Items (ii)(a) and (b) above are not feasible, Hydro One will suggest communication options available to a particular site.
- iii) Real time operating information provided to Hydro One may be from a SCADA master through Hydro One's SCADA master using Inter-Control Center Communications Protocol (ICCP). Where the Embedded LDC has an existing ICCP link to Hydro One, all telemetry for Embedded LDC connections shall be provided through the existing ICCP link.
- iv) Where modems will be used in any of the above communication methods, Hydro One will determine the modem type and requirements considering communication media, site location, reliability, and amount of data transfer. The DG Owner will provide all the required hardware and software and make arrangements, as needed, with a commercial provider of communication services to deliver the operating data to the demarcation point.

2.6.4 RELIABILITY REQUIREMENTS

2.6.4.1 TELEPROTECTION

The Telecommunication infrastructure shall comply with the following:

- a) Provide at least an annual average availability of 99.65%.

- b) Meet the Teleprotection dependability requirement defined as the probability of a missed command be less than 10^{-4} for DG application. As defined in IEC 60834-1.
- c) Meet the Teleprotection security requirement defined as an unwanted command shall be less than 10^{-10} for DG application. As defined in IEC 60834-1.

2.6.4.2 REAL-TIME CONTROL AND MONITORING

- i) The delivery of real-time data at the communication demarcation point shall have a:
 - a) MTBF (Mean Time between Failure) of four (4) years; and
 - b) MTTR (Mean Time to Repair) of seven (7) days.
- ii) The DG Owner may be required to disconnect the DG Facility until problems are corrected if the failure rates or repair time performance in Item (i) above fails to achieve their targets by the following significant amounts:
 - a) less than 2 years MTBF; or
 - b) MTTR greater than 7 days.
- iii) If the DG Facility is involved in a Special Protection System (SPS) or automated dispatch, the Telecommunication Mean Time to Repair (MTTR) requirement shall be 24 hours.
- iv) Upon loss of telecommunications, the DG Owner is required to immediately report the failure cause and estimated repair time to the Controlling Authority.
- v) Mean Time to Repair time shall start from the time when the communications was lost and not from when it was discovered.
- vi) The DG Owner shall coordinate any planned interruption to the delivery of real time data with Hydro One.

2.7 REPORTING REQUIREMENTS

Note: For the purpose of this section, the word “Distributor” shall mean Hydro One if the DG Facility is connecting to Hydro One’s Distribution System or shall mean an Embedded LDC if the DG Facility is connecting to an Embedded LDC’s Distribution System.

2.7.1 GENERAL

- i) The DG Owner shall keep a written or electronic log. This log will record the date and time, along with a description of the incident.
- ii) Data file names shall contain the date and time in accordance with IEEE Standard C37.232 - Recommended Practice for Naming Time Sequence Data Files.
- iii) The incidents recorded, shall include, but are not limited to those in the sections below.
- iv) The DG Owner shall make the log, or a copy of the log, available for the Distributor’s review upon request, within five (5) working days of that request or as specified in the DCA.
- v) The DG Facility shall monitor:
 - a) Phase Voltages;
 - b) Neutral to earth voltage;
 - c) Frequency;
 - d) Phase and neutral amps;
 - e) Active Power (kW or MW);
 - f) Reactive Power (kVAR or MVAR);
 - g) Status of switching devices which are part of a protection and control scheme; and
 - h) Alarm conditions.
- vi) The DG Facility shall provide an alarm to the Distributor when there is a failure of recording or logging capability.
- vii) The recording device shall be capable of recording event time in either UTC or Eastern Standard Time.
- viii) DG Facilities rated greater than 250kW and less than 10MW reporting protection initiated events shall meet the following performance requirements:

- a) The maximum difference in time stamps produced by different devices on the network for the same event shall be 4ms or less.
- b) The maximum difference between the time generated by the internal clock and the actual time [e.g. - Eastern Standards Time (EST) or Coordinated Universal Time (UTC)] shall be limited to 4ms.
- ix) DG Facilities rated 10MW and greater reporting protection initiated events shall meet the following performance requirements:
 - a) The maximum difference in time stamps produced by different devices on the network for the same event shall be 1ms or less.
 - b) The maximum difference between the time generated by the internal clock and the actual time [e.g. - Eastern Standards Time (EST) or Coordinated Universal Time (UTC)] shall be limited to 1ms.

2.7.2 POWER QUALITY RECORDING

- i) Power quality recording shall be provided for DG Facilities rated greater than 250kW.
- ii) The PQ device shall generate an alarm if there is a loss of signal at an AC input terminal.
- iii) The PQ device shall be capable of communicating with Hydro One monitoring facilities using ION 2.0, DNP 3.0 and GPSTRUETIME/DATUM protocols via RS 232/485 or Ethernet ports.
- iv) The PQ device shall be capable of recording impulsive transients in the milliseconds range (monitoring possible to 7 kHz).
- v) The PQ device shall be capable of recording low frequency oscillatory transients ($f < 5$ kHz).
- vi) The PQ device shall be capable of recording medium frequency transients ($5 \text{ kHz} < f < 500 \text{ kHz}$).⁴⁰
- vii) The PQ device shall be capable of recording sags/swells/interruptions.
- viii) The PQ device shall be capable of capturing voltage and current channels simultaneously.

⁴⁰ Assuming that the device selected for PQ monitoring has a maximum sampling rate of 256 samples per cycle (~ 15 kHz) the device will only be capable of monitoring medium frequency transients up to 7 kHz.

- ix) The PQ device shall be capable of recording the duration of voltage sag and swell events based on programmable setpoints.
- x) Waveforms, rms voltage variations, trends, and histograms shall be reported in IEEE P1159.3 PQDIF format.

2.7.3 DISTURBANCE FAULT RECORDING

- i) Disturbance reporting shall be provided for each class of DG Facility as specified in Items (iii), (iv) and (v) below.
- ii) Data file format shall be compatible with - IEEE Std C37.111-1999 "IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems." This format shall be used when sharing files.
- iii) DG Facilities rated less than or equal to 250kW shall provide waveforms from IEDs used for protection.
- iv) DG Facilities rated greater than 250kW up to 1500kW shall provide:
 - a) a minimum rate of 240Hz (4 samples/cycle) at a minimum resolution of 0.05% of full scale (alternatively a 12 bit resolution is acceptable); and
 - b) a minimum record duration shall be the sum of 4 cycles of pre-fault + 2 cycles post fault + total clearing time of longest time delayed protection (i.e. when phase protections are set at 500ms delay and a 85ms breaker is used, the total time for recording would be 66ms + 500ms + 85ms + 33ms = 685ms).
- v) DG Facilities rated 1500kW or greater shall provide:
 - a) a minimum rate of 1 kHz (16 samples/cycle) at a minimum resolution of 0.05% of full scale (alternatively a 12 bit resolution is acceptable);
 - b) a minimum duration of 1 second; and
 - c) a minimum pre-fault duration of 250ms.
- vi) All reports shall provide unfiltered records. If filtered records are also available they shall be included in the report as well.
- vii) Multiple consecutive triggered disturbance records shall be acceptable, if required, to achieve the 1 second duration requirement.

2.7.4 SEQUENCE OF EVENTS RECORDING

- i) Sequence of Event reporting shall be provided for each class of DG Facility as specified in Items (iii), (iv) and (v) below.
- ii) Recorded points shall include:
 - a) the generator connection status (individual units);
 - b) the Transfer Trip signal status;
 - c) the Distributed Generation End Open (DGEO) signal status;
 - d) which relays operated (targets & description); and
 - e) any available sequence of events records (SER) related to the above.
- iii) DG Facilities rated less than or equal to 250kW shall provide SER reporting from IEDs used for protection.
- iv) DG Facilities rated greater than 250kW and less than 10MW shall provide:
 - a) SER from switching devices which are part of a protection and control scheme; and
 - b) Event records with resolution of 1ms.
- v) DG Facilities rated 10MW or greater shall also provide in addition to the requirements in Item (iv) above:
 - a) Events within the same facility recorded to within 1ms accuracy if reporting is required to a compliance authority other than Hydro One.

2.8 METERING REQUIREMENTS

Metering requirements vary with the type and intent of the DG Facility. Please consult the IESO Market Rules and Section 5 of the Distribution System Code for details. Hydro One has published a Metering policy for DG Facilities and it is located at the following link:

<http://www.hydroone.com/Generators/Pages/Feed-inTariff.aspx>

2.9 COMMISSIONING AND VERIFICATION REQUIREMENTS

- i) Commissioning and Verification shall be in accordance with the OEB Distribution System Code Connection Process as outlined in Appendix F.1.
- ii) Hydro One may witness any Commissioning and Verification of DG Facilities greater than 10kW.
- iii) A specific Commissioning and Verification plan shall be developed that corresponds to the specific design of the DG Facility and implemented using the Hydro One Cover Process outlined in Section 2.9.1.
- iv) The specific Commissioning and Verification plan in Item (iii) above shall incorporate the Generic Requirements as outlined in Section 2.9.2.

2.9.1 COVER PROCESS

- i) The DG Owner shall use a "Confirmation of Verification Evidence Report" (COVER) to track the DG Facility's Commissioning and Verification plans and execution. The complete COVER form will be provided to the DG Owner at the appropriate stage of the project.

2.9.2 COMMISSIONING AND VERIFICATION GENERIC REQUIREMENTS

- i) Testing of the DG Facility interconnection system shall conform to IEEE Standard 1547.1 – "*Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems*".
- ii) Hydro One's participation in the commissioning of the DG Facility shall be limited to those protection and control systems that impact Hydro One's Distribution System.
- iii) Commissioning of the protection and control systems shall be complete and thorough.
- iv) Testing must include end-end verification of all inputs to the protection and control schemes (instrument transformers, breaker positions, transfer trips, distributed generator end open schemes), correct processing of those inputs by the protection and control systems for anti-islanding and clearance of external faults, and end-end verification of all outputs - breaker tripping, breaker failure initiation, closing interlocks, alarms, and telemetry.
- v) The expected commissioning testing and supporting documentation must include:

-
- a) Instrument transformer checks (insulation, ratio/polarity, excitation and resistance results);
 - b) Breaker timing trip tests for those breakers used to disconnect the DG Facility from the Distribution System as a result of protection operations;
 - c) Verification of the transformer and neutral reactor impedances that impact the DG Facility's ground integration with the Distribution System and correct connection, where applicable;
 - d) Relay setting field work sheets (showing the measured results of the relay calibration checks). Relay element settings/directioning are to be confirmed by AC secondary injection;
 - e) Voltage measurements for any external power supplies used to supply the protections shall be recorded;
 - f) Verification that all AC and DC measurements have test equipment traceable to NRC standards;
 - g) Functional tests confirming the protection and control logic and timer settings;
 - h) Verification of test trips and alarm processing. Monitoring of breakers outputs using suitable indicators can be used to avoid repeated tripping of the same from different protections, but at least one live trip test per breaker (where the breaker is proven to open) needs to be demonstrated;
 - i) Verification of control interlocks in protections;
 - j) Verification of synchronizing system and synch-check controls;
 - k) Voltage phasing checks (prior to first connection);
 - l) Secondary load readings, voltage and current phasor checks (immediately after first connection) to prove correct magnitude and phase angle of all secondary AC voltage and current circuits correspond to primary quantities. Primary current, voltage, MW and MVA_r values shall be calculated from the measured secondary values and compared to known primary quantities at adjacent locations; and
 - m) Verification of Transfer Trips and DGEO end-end checks. This will require participation and coordination with Hydro One.
- vi) The DG Owner shall make modifications to correct any problems that are found during commissioning.
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BACKGROUND INFORMATION

IEEE Std. 1547.1 – “*Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems*” specifies the type, production, and commissioning tests that shall be performed to demonstrate that the interconnection functions and equipment of the distributed resources (DR) conform to IEEE Std. 1547.

2.9.3 DOCUMENTATION OF TEST RESULTS

- i) Documentation of Test Results shall be provided as outlined in the COVER sections as follows:
 - a) In accordance with Section 6 of “Electrical Safety” all DG Owners must provide a letter signed and stamped by a Professional Engineer registered in the province of Ontario stating that their equipment and installation meets CSA and/or other applicable electrical safety standards, prior to ready for Service Date;
 - b) In accordance with Appendix F of DSC and Section 8 of the “Test Summary Reports” the DG Owner of any DG Facility larger than 10kW, at Hydro One’s request, shall provide Hydro One with a summary of testing results, including any certificates of inspection or other applicable authorizations or approvals certifying that any of the DG Owner’s new, modified or replacement facilities have passed the relevant tests and comply with all applicable instruments and standards referred to in the code;
 - c) As-constructed drawings (single line diagram showing protection and metering, AC and DC schematics, final relay settings, testing and commissioning results for interconnection protection etc.) shall be submitted to the Distributor for its records, as stipulated in the Distribution Connection Agreement; and
 - d) The completed documentations shall clearly indicate the station, protection designation, settings date, test date, the name of the tester(s), relay type (manufacturer and model), test equipment details (manufacturer, model, serial number, accuracy, last calibration date), instrument transformer ratios. There shall be a cross-reference to the submitted design documentation (drawing numbers and revision).
- ii) The DG Owner shall keep the information provided in Item (i) above for a period of seven (7) years.

2.10 MAINTENANCE REQUIREMENTS

2.10.1 PROTECTION AND CONTROL SYSTEMS EQUIPMENT

- i) The DG Owner shall re-verify its interconnection Protection and Control sub-systems that impact Hydro One's Distribution System on a periodic basis, according to the following schedule:
 - a) whenever any protection and control sub-system equipment requires replacement, design modification or changes to settings⁴¹;
 - b) every 8 years for IED-based protection sub-systems that employ comprehensive self-diagnostic features⁴² to detect and provide alarm telemetry to Hydro One for internal sub-system failures;
 - c) every 4 years for electromechanical or other non IED-based protection sub systems that do not employ comprehensive self-diagnostic features to detect and provide alarm telemetry to Hydro One for internal sub-system failures; and
 - d) The above periodic re-verification intervals may need to be made more frequent if required to restore or sustain the safety or reliability of Hydro One's Distribution System to acceptable levels of performance, as required by the Distribution System Code and the Conditions of Service.
- ii) The protection and control systems that require periodic maintenance are the same ones that were required to be confirmed and verified during commissioning as part of the COVER process (Section 2.9: Commissioning and Verification Requirements).
- iii) Within three (3) months of Connection, the DG Owner shall provide Hydro One with their proposed Protection and Control re-verification program (including test procedures and schedules). It is expected that the re-verification tests will be similar to the tests conducted during commissioning, with the exception of checking equipment conditions that are obviously proven to be functional during normal day-to-day operation as described below.

⁴¹ Hydro One must be advised of and approve all interconnection equipment replacement, design modification and setting changes

⁴² Hydro One will assess the adequacy of the self-diagnostic features of protection sub-systems based on the same criteria used for assessing Hydro One feeder protections

- a) Instrument transformer checks (insulation, ratio/polarity, excitation and resistance results) – *should not require re-verification providing secondary load readings of Item (l) below are correct*;
- b) Breaker timing trip tests for those breakers used to disconnect the DG Facility from the Distribution System as a result of protection operations – *may not be required if adequate SER or DFR records are available to show correct timing has been sustained*;
- c) Verification of the transformer and neutral reactor impedances that impact the DG Facility's ground integration with the Distribution System and correct connection, where applicable - *should not require re-verification unless this equipment is replaced*;
- d) Relay setting field work sheets (showing the measured results of the relay calibration checks). Relay element settings/directioning are to be confirmed by AC secondary injection – *shall require re-verification*;
- e) Voltage measurements for any external power supplies used to supply the protections shall be recorded – *shall require re-verification*;
- f) Verification that all AC and DC measurements have test equipment traceable to NRC standards – *shall require re-verification*;
- g) Functional tests confirming the protection and control logic and timer settings - *shall require re-verification*;
- h) Verification of test trips and alarm processing. Monitoring of breakers outputs using suitable indicators can be used to avoid repeated tripping of the same from different protections, but at least one live trip test per breaker (where the breaker is proven to open) needs to be demonstrated - *shall require re-verification*;
- i) Verification of control interlocks in protections - *shall require re-verification*;
- j) Verification of synchronizing system and synch-check controls – *should not require re-verification providing the DG Facility has been connected and disconnected on a regular basis (at least once per month)*;
- k) Voltage phasing checks (prior to first connection) – *should not require re-verification unless three-phase power equipment is replaced*;
- l) Secondary load readings, voltage and current phasor checks (immediately after first connection) to prove correct magnitude and phase angle of all secondary

AC voltage and current circuits correspond to primary quantities. Primary current, voltage, MW and MVAR values shall be calculated from the measured secondary values and compared to known primary quantities at adjacent locations - *shall require re-verification*; and

- m) Verification of Transfer Trips and DGEO end-end checks. This will require participation and coordination with Hydro One - *shall require re-verification*.
- iv) The DG Owner shall make modifications to correct any problems that are found during re-verification.
- v) Within thirty (30) working days of receiving the above documentation or as required by the Code, Hydro One shall notify the DG Owner that it:
 - a) agrees with the proposed re-verification program and test procedures; or
 - b) requires changes in the interest of safety or maintaining the reliability of the Distribution System. Such request for changes shall be sent to the DG Owner promptly.
- vi) For those tests that require Hydro One's participation or witnessing, the DG Owner shall provide Hydro One with no less than fifteen (15) working days notice prior to the test date.
- vii) All tests shall be coordinated and approved ahead of time through the normal outage and work management system planning processes.
- viii) The DG Owner shall complete the re-verification in accordance with Item (v) above and submit complete documentation of the test results to Hydro One within one month of the completed tests.

BACKGROUND INFORMATION

Maintenance requirements are equivalent to what Hydro One requires for re-verification of its own facilities that have similar potential impact to the Distribution System.

2.11 CONNECTION PROCESS REQUIREMENTS

For Connection Process Requirements please visit www.HydroOne.com and look for "Generators" or click on the following link:

<http://www.hydroone.com/Generators/Pages/Feed-inTariff.aspx>

3 REFERENCES

The following documents are subject to revisions from time to time. When the stated version of the following documents is superseded by an approved revision, then the approved revision shall apply.

- [1] **Ontario Energy Board Distribution System Code Appendix F** - Process and Technical Requirements for Connecting Embedded Generation Facilities - Section F.2 Technical Requirements
- [2] **Ontario Energy Board Distribution System Code** – <http://www.oeb.gov.on.ca>
- [3] **OESC - 24th Edition 2009** – Ontario Electrical Safety Code, - Twenty-fourth edition
- [4] **CSA C22.1-2009** - Canadian Electrical Code, Part I Safety Standard for Electrical Installations - Twenty-first edition
- [5] **CSA C22.2** - Canadian Electric Code Part II
- [6] **CSA C22.3** - Canadian Electric Code Part III (Electricity Distribution and Transmission Systems).
- [7] **CAN/CSA C22.3 No. 9-2008** - Interconnection of Distributed Resources and Electricity Supply Systems
- [8] **CSA C235-83-CAN3** - Preferred Voltage Levels for AC Systems, 0 to 50,000 V Electric Power Transmission and Distribution
- [9] **CAN/CSA C22.2 No. 257-06** - Interconnecting Inverter-Based Micro-Distributed Resources to Distribution Systems.
- [10] **CAN/CSA-CEI/IEC 61000-4-4-06** – Electromagnetic Compatibility (EMC) – Part 4-4 Testing and Measurement Techniques – Electrical Fast Transient/Burst Immunity Test (Adopted CEI/IEC 61000-4-4:2004, second edition, 2004-07)
- [11] **CAN/CSA-CEI/IEC 61000-4-2-01** – Electromagnetic Compatibility (EMC) – Part 4-2 Testing and Measurement Techniques – Electrostatic Discharge Immunity Test (Adopted CEI/IEC 61000-4-2:1995 + A1:1998, edition 1.1, 1999-05)
- [12] **CAN/CSA-CEI/IEC 61000-4-30-04** – Electromagnetic Compatibility (EMC) – Part 4-30: Testing and Measurement Techniques – Power Quality Measurement Methods (Adopted CEI/IEC 61000-4-30:2003, first edition, 2003-02)

- [13] **CAN/CSA-CEI/IEC 61000-4-15-03** - Electromagnetic Compatibility (EMC) – Part 4-15: Testing and Measurement Techniques – Section 15: Flickermeter—Functional and Design Specifications (Adopted CEI/IEC 61000-4-15:1997 + A1:2003, edition 1.1, 2003 02)
- [14] **CAN/CSA-CEI/IEC C61000-3-7-09** - Electromagnetic Compatibility (EMC) – Part 3-7: Limits: Assessment of Emission Limits for Fluctuating Loads in MV, HV and EHV Power Systems (Adopted IEC/TR 61000-3-7:2008, second edition, 2008-02)
- [15] **CAN/CSA-C61000-3-06-09** - Electromagnetic compatibility (EMC) - Part 3-6: Limits Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems (Adopted IEC/TR 61000-3-6:2008, second edition, 2008-02, with Canadian deviations)
- [16] **UL 1741** - Inverters, Converters, and Controllers for Use in Independent Power Systems
- [17] **IEEE 1547-2003** - IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems
- [18] **IEEE C37.232** - Recommended Practice for Naming Time Sequence Data Files
- [19] **IEEE C37.111-1999** - IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems
- [20] **IEEE 1547.1-2005** - IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems
- [21] **IEEE P1547.2/D11** - Draft Application Guide for IEEE Standard 1547, Interconnecting Distributed Resources with Electric Power Systems
- [22] **IEEE 1547.3-2007** - IEEE Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems
- [23] **IEEE 519-1992** - IEEE recommended practices and requirements for harmonic control in electrical power systems
- [24] **IEEE 929-1988** - IEEE recommended practice for utility interface of residential and intermediate photovoltaic (PV) systems
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- [26] **IEEE C37.90.3-2001** - IEEE standard electrostatic discharge tests for protective relays
- [27] **IEEE 1159-1995** - IEEE Recommended Practice for Monitoring Electric Power Quality.

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- [28] **IEEE 1453-2004** - IEEE Recommended Practice for Measurement and Limits of Voltage Flicker on AC Power Systems
 - [29] **NPCC Directory D12** – NPCC Regional Reliability Reference Directory #12 Under Frequency Load Shedding Program Requirements
 - [30] **CAN/CSA-C71-1-99** – Insulation Co-ordination – Part 1: Definitions, Principles and Rules (Adopted CEI/IEC 71-1:1993, seventh edition, 1993-12, with Canadian deviations)
 - [31] **CAN/CSA-C71-2-98** – Insulation Co-ordination – Part 2: Application Guide (Adopted CEI/IEC 71-2:1996, third edition, 1996-12, with Canadian deviations)
 - [32] **CSA C22.2 No. 31-04** - Switchgear Assemblies
 - [33] **CSA C22.2 No. 107.1-01** - General Use Power Supplies
 - [34] **IEEE C37.90-2005** - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus
 - [35] **IEEE C37.90.2-2004** - IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
 - [36] **CAN/CSA-C60044-1-07** - Part 1: Current Transformers (Adopted CEI/IEC 60044-1:1996 + A1:2000 + A2:2002, edition 1.2, 2003-02, with Canadian deviations)
 - [37] **CAN/CSA-C60044-2-07** - Part 2: Inductive Voltage Transformers (Adopted CEI/IEC 60044-2:1997 + A1:2000 + A2:2002, edition 1.2, 2003-02, with Canadian deviations)
 - [38] **CAN/CSA-C60044-3-07** - Part 3: Combined Transformers (Adopted CEI/IEC 60044 3:2002, second edition, 2002-12, with Canadian deviations)
 - [39] **CAN/CSA-C60044-5-07** - Part 5: Capacitor Voltage Transformers (Adopted CEI/IEC 60044-5:2004, first edition, 2004-04, with Canadian deviations)
 - [40] **CAN/CSA-C60044-6-07** - Part 6: Requirements for Protective Current Transformers for Transient Performance (Adopted CEI/IEC 44-6:1992, first edition, 1992-03, with Canadian deviations)
 - [41] **CAN/CSA-C60044-7-07** - Part 7: Electronic Voltage Transformers (Adopted CEI/IEC 60044-7:1999, first edition, 1999-12, with Canadian deviations)
 - [42] **CAN/CSA-C60044-8-07** - Part 8: Electronic Current Transformers (Adopted IEC 60044 8:2002, first edition, 2002-07, with Canadian deviations)
 - [43] **IEEE C57.13-2008** - IEEE Standard Requirements for Instrument Transformers
 - [44] **IEEE C57.13.1-2006** - IEEE Guide for Field Testing of Relaying Current Transformers
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- [45] **IEEE C57.13.2-2005** - IEEE Standard Conformance Test Procedures for Instrument Transformers
 - [46] **IEEE 242-2001** - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - IEEE Buff Book
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 - [48] **IEEE 1001-1988** - IEEE Guide For Interfacing Dispersed Storage and Generation Facilities with Electric Utility Systems
 - [49] **IEEE 493-2007** - Gold Book - IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems
 - [50] **IEEE 1100-2005** - Emerald Book - IEEE Recommended Practice for Powering and Grounding Electronic Equipment
 - [51] **IEEE 1250-1995** - IEEE Guide for Service to Equipment Sensitive to Momentary Voltage Disturbances
 - [52] **IEEE 100-1997** - IEEE Standard Dictionary of Electrical and Electronics Terms
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 - [54] **IEEE C37.2-2008** - IEEE Standard Electrical Power System Device Function Numbers, Acronyms, and Contact Designations
 - [55] **IEEE C37.1-2007** - IEEE Standard for SCADA & Automation Systems
 - [56] **IEEE 80-2000** - Safety in AC Substation Grounding
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- [62] **CAN/CSA-C227.3-06** - Low-Profile, Single-Phase, Pad-Mounted Distribution Transformers with Separable Insulated High-Voltage Connectors
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 - [64] **CAN/CSA-C88-M90** - Power Transformers and Reactors
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 - [77] **NEMA LA-1** – Surge Arresters
 - [78] **NEMA MG-1** – Motors
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 - [81] Wencong Wang, Jacek Kliber, Guibin Zhang, Wilsun Xu, Blair Howell and Tony Palladino, "*A Power Line Signaling Based Scheme for Anti-islanding Protection of Distributed Generators: Part II: Field Test Results*", IEEE Trans. Power Delivery , v22, n3, July 2007, pp. 1767 – 1772.
 - [82] W. Freitas, Z. Huang, W. Xu, "*A practical method for assessing the effectiveness of vector surge relays for distributed generation applications*", IEEE Trans. Power Delivery, v20, n1, pp. 57-63, Jan. 2005.

A APPENDIX A – HYDRO ONE SYSTEM CHARACTERISTICS (*INFORMATIVE*)

This section describes the characteristics of Hydro One's Distribution System and identifies aspects that must be taken into consideration when designing a generation connection. The DG Owner must be able to operate within the ranges specified in this section. In the TIR, Distribution System may refer to either three phase systems or single phase systems operating at voltages of 50kV and below – includes systems falling under the definition of distribution lines and sub-transmission lines. This section contains no requirements for the connection of DG Facilities and has been provided for informational purposes only.

A.1 GENERAL CHARACTERISTICS

Most distribution circuits or feeders in Hydro One's distribution system are supplied radially from a single substation (point of supply). In some areas, some feeders may have alternate points of supply, but will be operated with more than one source of supply only momentarily during switching operations. Hydro One's distribution feeders operate at the following voltages (phase-phase/phase-neutral): 44kV (3-Wire), 27.6/16kV, 25/14.4kV, 13.8/8kV, 12.48/7.2kV, 8.32/4.8kV, 4.16/2.4kV.

A.2 SYSTEM FREQUENCY

The nominal frequency of Hydro One's system is 60Hz. During normal operation (steady state), the frequency may deviate from 59.3Hz to 60.5Hz, or as supplied by the transmission system. Under contingencies the frequency deviations may be larger.

A.3 VOLTAGE

The CSA Standard CAN3-C235-83 "Preferred Voltage Levels for AC Systems, 0 to 50,000V Electric Power Transmission and Distribution" provides general guidance for the steady state service voltage levels on the distribution system. Customers supplied by the distribution feeder must have voltage levels in accordance with this standard, with and without distributed generation supplying power for minimum and maximum loading conditions. The operating voltages found on the distribution feeder vary depending on load variation, generation variation and contingency situations. Hydro One's standard for voltages on the Distribution System at the point of delivery during normal operation is typically in the range of +/- 6% of nominal voltage as shown in Table 17.

These values may be exceeded under abnormal conditions. Voltage transients and swells can occur on the distribution system at any time due to lightning strikes, single phase to ground faults, and switching, among others.

Table 17: Voltage Limits 0 to 50 kV on Distribution System

Low Limit (% of nominal)	Nominal Voltage (%)	High Limit (% of nominal)
94	100	106

A.4 VOLTAGE REGULATION

Hydro One utilizes voltage regulating devices throughout the distribution system to maintain an adequate voltage profile along the feeders and ensure that customers receive voltages in the range specified in CSA Standard CAN3-235-83. These regulating devices include line voltage regulators, regulating stations and transformer under-load tap changers at the Transformer Station (TS) or Distribution Station (DS). Hydro One operates all voltage regulating devices on its distribution system to 125V ±1.5V on a 120V base.

A.5 VOLTAGE AND CURRENT UNBALANCE

Voltage unbalance due to unbalanced loading and single phase voltage regulation is typically under 2% but may be higher in some areas. The voltage unbalance is calculated using the root-mean square (rms) voltage levels at the fundamental frequency measured at the service entrance (Point of Connection) under no-load and no generation as in the following equation:

$$\text{Voltage Unbalance (\%)} = 100 \times \frac{V_2}{V_1}$$

where V_2 is the negative sequence voltage (fundamental frequency component)

V_1 is the positive sequence voltage (fundamental frequency component)

Current unbalance is usually 10-20% of total feeder load current but may be higher in some areas. During abnormal conditions such as faults and single pole reclosing, the unbalance may be very high (current unbalance may be significantly higher than 20%).

A.6 POWER QUALITY

In Hydro One's distribution system, all interconnected equipment must comply with Hydro One's standards for power quality. IEEE Std. 519, *IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems*, has been accepted by industry

to provide guidance for appropriate performance and power quality limits such as voltage flicker and harmonic contribution limits. This standard states that the recommended practice for utilities is to limit individual frequency voltage harmonics to 3% of the fundamental frequency and the total voltage harmonic distortion (THD) to 5% on the utility side of the PCC.

A.7 FAULT LEVELS

Fault levels on Hydro One's distribution system vary greatly throughout the system and are in accordance with the Transmission System Code Appendix 2. Some factors such as location, generation pattern and contingencies all contribute to varying fault levels. These fault levels may also change with time as the system expands and new generation comes online.

A.8 SYSTEM GROUNDING

Hydro One's distribution facilities are typically operated as uni-grounded (for three-phase 3 wire systems) or multi-grounded (for three-phase 4-wire systems). The transformer neutral at the substation is either solidly grounded, without any impedance, or effectively grounded through a low impedance at the station through a neutral reactor, a resistor, or a grounding transformers to limit the fault levels on ground faults.

A.9 DISTRIBUTION SYSTEM FEEDER PROTECTION

The general feeder protection scheme utilized on Hydro One's distribution system where DG Facilities are connecting is described below for M Class feeders emanating from TSs. The feeder protections can be divided into three states:

High Set Instantaneous – Instantaneous protection for close-in feeder faults is usually set to the first tap on the feeder and traditionally employed High Set 50A/50NA elements. The current Hydro One standard for feeders with DG Facilities connected is to use the Zone 1 distance (21 – Phase & Ground) element to set the High Set Instantaneous protection.

Low Set Instantaneous – Instantaneous protection for faults on the entire length of the feeder. This is used primarily as a fuse saving scheme to clear transient faults before fuse elements start melting. It is traditionally utilized using Low Set 50B/50NB elements. The current Hydro One standard for feeders with DG Facilities connected is to use the Zone 2 distance (21 – Phase & Ground) element to set the Low Set Instantaneous protection.

Timed – Directionally supervised 51/51N overcurrent elements load/fault discrimination are used for timed protection of Hydro One's distribution feeders. They are set to detect and clear faults in their required zone. All timed overcurrent elements on the distribution system are coordinated with each other to ensure that a minimum number of customers are affected in the case of permanent faults. For the timed overcurrent elements to function properly, all DG Facility sources (both positive sequence and zero sequence sources) need to be removed from the distribution system – refer to the requirements in Section 2.1.13 High Voltage Interrupting Device.

F Class feeders radiating from DSs have varying levels of sophistication in their protection schemes.

A.10 AUTOMATIC RECLOSING (FAULT CLEARING)

Hydro One's Distribution System utilizes automatic reclosing to quickly clear non permanent faults on the sub-transmission and distribution system, thus, quickly restoring supply. In general, feeder circuit breakers at Transmission Stations use single-shot reclosing. Reclosers at Distribution Stations and other locations along the distribution feeder may use single-shot or multi-shot automatic reclosing. Reclosers can trip a single phase, when single phase loads are connected to the feeder, or all three phases. If after a number of preset reclose attempts the fault persists, then the recloser will lockout and stay open (single phase or three phases will be tripped). The reclose "dead time" (time that the distribution line is de-energized between reclose attempts) varies depending on location and type of recloser. That data can be obtained from Hydro One along with all other relevant protection data.

A.11 PHASING

Conductor phasing may not be standardized and as such, the phase sequence and the direction of rotation can be obtained from Hydro One.

A.12 MULTIPLE SOURCE (NETWORKED) SYSTEM

In some areas of Hydro One's Distribution System, there may be instances where portions of a distribution feeder are supplied from two different sources (such as during switching events). There is added complexity in these instances as the risk of out-of-phase reclosing for a DG Facility is now from multiple possible sources.

A.13 FREQUENCY OF INTERRUPTION

Hydro One's distribution feeders are mainly unshielded overhead lines spanning vast distances. They are equipped with insulation levels adequate to withstand expected voltages. Lightning strikes directly to Hydro One's distribution line result in flashovers of the insulators on the feeder and result in protection systems tripping the distribution line. The faults may be temporary in which case a successful reclose will occur. Most faults on overhead distribution lines are temporary in nature. If they are permanent, and they trip the line, repair crews are dispatched and repair the feeder.

Due to the vast distances of the lines and the possibility of frequent momentary trips, the DG Facility proponent may consider a design that will be suitable for these conditions such as auto-restart.

A.14 ABNORMAL CONDITIONS

Many disturbances can occur on the distribution system at varying frequencies. These disturbances can include, but are not limited to the following:

- Faults on the system;
- Frequency excursions;
- Partial or complete loss of load;
- Transient overvoltages – caused by lightning strikes or switching operations;
- Temporary overvoltages;
- Single phasing of the three phase system – caused by Hydro One's protection equipment, switching or broken conductors; and
- Ferroresonance overvoltages due to resonance conditions.

B APPENDIX B – DEVICE NUMBER DESCRIPTION (*INFORMATIVE*)

The following is a list of relevant device numbers and their meaning:

- 21 - Distance Relay
- 25 - Synchronizing or Synchronism-Check Device
- 27 - Undervoltage Relay
- 31 - Separate Excitation Device
- 32 - Directional Power Relay
- 37 - Undercurrent or Underpower Relay
- 42 - Running Circuit Breaker
- 46 - Reverse-phase or Phase-Balance Relay
- 47 - Phase-Sequence Voltage Relay
- 49 - Machine or Transformer Thermal Relay
- 50 - Instantaneous Overcurrent
- 51 - AC Time Overcurrent Relay
- 52 - AC Circuit Breaker
- 53 - Exciter or DC Generator Relay
- 55 - Power Factor Relay
- 57 - Short-Circuiting or Grounding Device
- 59 - Overvoltage Relay
- 60 - Voltage or Current Balance Relay
- 61 - Machine Split Phase Current Balance
- 64 - Ground Detector Relay
- 67 - AC Directional Overcurrent Relay
- 68 - Blocking Relay
- 79 - AC-Reclosing Relay
- 81 - Frequency Relay
- 86 - Lockout Relay
- 87 - Differential Protective Relay
- 88 - Auxiliary Motor or Motor Generator
- 89 - Line Switch
- 90 - Regulating Device
- 91 - Voltage Directional Relay
- 92 - Voltage and Power Directional Relay

C APPENDIX C – NEUTRAL REACTOR AND GROUNDING TRANSFORMER IMPEDANCE CALCULATIONS FOR DG FACILITIES (*INFORMATIVE*)

C.1 INTERCONNECTING TO HONI'S 4-WIRE DISTRIBUTION SYSTEM

For Inverter based DG Facilities connecting to Hydro One's 4-wire Distribution System, grounding transformers can be used to serve as a ground source whenever the DGIT winding configuration is not Wye-Ground:delta. Examples 1 and 2 are to provide the impedance calculations for Inverter based DG Facilities that require separate grounding transformers. As per Section 2.1.11 Grounding, the Zero Sequence Reactance (X_{DG0}) of the DG Facility should be about 0.6 times the base impedance, where the base impedance is calculated based on the total MVA rating of the DG Facility.

Example 1: A 10MVA DG Facility is connected at 27.6kV, via ten parallel 1MVA DGITs, and the DGITs have Delta-connected 27.6kV windings.

Base impedance = $27.6\text{kV}^2 / (10 \times 1\text{MVA}) = 76.2\Omega$,

Then the required Zero Sequence Reactance of the DG Facility is:

$$X_{DG0} = 0.6 \times 76.2\Omega \pm 10\% = 45.7\Omega \pm 10\%$$

Therefore, if a separate 27.6kV zig-zag grounding transformer is used to serve as a ground source, the impedance of the grounding transformer should be 45.7Ω per phase with a tolerance of $\pm 10\%$.

Example 2: A 2MVA DG Facility is connected at 27.6 kV, via a single 2MVA DGIT, and the DGIT has Wye-Ground:wye-Ground windings.

Base impedance = $27.6\text{kV}^2 / 2\text{MVA} = 381\Omega$,

Then the required Zero Sequence Reactance of the DG Facility is:

$$X_{DG0} = 0.6 \times 381\Omega \pm 10\% = 228.6\Omega \pm 10\%$$

Therefore, if a separate 27.6kV zig-zag grounding transformer is used to serve as a ground source, the impedance of the grounding transformer should be 228.6Ω per phase with a tolerance of $\pm 10\%$.

The continuous rating of the grounding devices shall be able to handle the maximum expected voltage unbalance with margin. As per Hydro One's Conditions of Service, the voltage unbalance on Hydro One feeders can reach 5%. Therefore, the grounding device should be sized for a minimum of 5% continuous voltage unbalance. The short time (5 sec) fault rating shall be sized for the maximum fault current that will flow through the grounding device for a close-in fault.

For Inverter based DG Facilities connecting to Hydro One's 4-wire Distribution System, neutral reactors may be required to limit the fault current contributions from DG Facilities for ground faults on the interconnected feeder when the DGIT winding configuration is Wye-Ground:delta. Examples 3 and 4 are to provide the impedance calculations for neutral reactors that can be connected between the neutral of Wye-Ground:delta DGITs and the ground. As per Section 2.1.11 Grounding, the Zero Sequence Reactance (X_{DG0}) of the DG Facility should be about 0.6 times the base impedance, where the base impedance is calculated based on the MVA rating of individual DGIT. The size of neutral reactor (X_n) for each DGIT should be one third of the required Zero Sequence Reactance of the neutral reactor ($X_{0,NGR}$):

Example 3: A 10MVA DG Facility is connected at 27.6kV, via ten parallel 1MVA DGITs, and the DGITs have Wye-Ground:delta windings.

Base impedance = $27.6kV^2 / 10MVA = 762\Omega$,

Then the required Zero Sequence Reactance of the DG Facility is:

$$X_{DG0} = 0.6 \times 762\Omega \pm 10\% = 457.2\Omega \pm 10\%$$

Assuming the reactance of each DGIT is 0.05p.u. on a 1 MVA base,

Then the required Zero Sequence Reactance of neutral reactor is:

$$X_{0,NGR} = (457\Omega - 0.05 \times 762\Omega) \pm 10\% = 419\Omega \pm 10\%$$

Therefore, the size of neutral reactor for each DGIT is:

$$X_n = 419\Omega / 10 \pm 10\% = 41.9\Omega \pm 10\%$$

Example 4: A 2MVA DG Facility is connected at 27.6kV, via a single 2MVA DGIT, and the DGIT has Wye-Ground:delta windings.

Base impedance = $27.6kV^2 / 2MVA = 381\Omega$,

Then the required Zero Sequence Reactance of the DG Facility is:

$$X_{DG0} = 0.6 \times 381\Omega \pm 10\% = 228.6\Omega \pm 10\%$$

Assuming the reactance of the DGIT is 0.05p.u. on a 2 MVA base,

Then the required Zero Sequence Reactance of neutral reactor is:

$$X_{0,NGR} = (229\Omega - 0.05 \times 381\Omega) \pm 10\% = 210\Omega \pm 10\%$$

Therefore, the size of neutral reactor for the DGIT is:

$$X_n = 210\Omega / 3 \pm 10\% = 70\Omega \pm 10\%$$

The continuous rating of the grounding devices shall be able to handle the maximum expected voltage unbalance with margin. As per Hydro One's Conditions of Service, the voltage unbalance on Hydro One feeders can reach 5%. Therefore, the grounding device should be sized for a minimum of 5% continuous voltage unbalance. The short time (5 sec) fault rating shall be sized for the maximum fault current that will flow through the grounding device for a close-in fault.

C.2 INTERCONNECTING TO HONI'S 3-WIRE DISTRIBUTION SYSTEM

For DG Facilities connecting to Hydro One's 3-wire Distribution System, neutral reactors are required to limit the fault current contributions from DG Facilities for ground faults on the interconnected feeder when the DGIT winding configuration is Wye-Ground:delta. Examples 5 and 6 are to provide the impedance calculations for neutral reactors that can be connected between the neutral of Wye-Ground:delta DGITs and the ground. As per Section 2.1.11 Grounding, for DG Facility with Conventional (Rotating) Generators, the Zero Sequence Reactance (X_{DG0}) should be greater than 8 times the Positive Sequence Reactance (X_{DG1}). For DG Facility with an Inverter Interface, the Zero Sequence Reactance (X_{DG0}) should be greater than 24 times the reactance of the DGIT.

Example 5: A 10MVA Rotating Machine DG Facility is connected at 44kV, via a single 10MVA DGIT, and the DGIT has Wye-Ground:delta windings.

Base impedance = $44\text{kV}^2 / 10\text{MVA} = 193.6\Omega$,

Assuming the Positive Sequence Reactance of the DG Facility is:

$X_{DG1} = X''_d + X_t = 0.12\text{p.u.} + 0.05\text{p.u.} = 0.17\text{p.u.}$ on a 10MVA base,

Then the required Zero Sequence Reactance of the DG Facility is:

$X_{DG0} > 8 \times 0.17 \times 193.6\Omega = 263.3\Omega$

The required Zero Sequence Reactance of neutral reactor is:

$X_{0,NGR} > 263.3\Omega - 0.05 \times 193.6\Omega = 263.3\Omega - 9.7\Omega = 254\Omega$

Therefore, the size of neutral reactor should be greater than:

$X_n = 254\Omega / 3 = 85\Omega$

Example 6: A 10MVA Inverter based DG Facility is connected at 44kV, via a single 10MVA DGIT, and the DGIT has Wye-Ground:delta windings.

Base impedance = $44\text{kV}^2 / 10\text{MVA} = 193.6\Omega$,

Assuming the reactance of the DGIT is 0.05p.u. on a 10MVA base,

Then the required Zero Sequence Reactance of the DG Facility is:

$X_{DG0} > 24 \times 0.05 \times 193.6\Omega = 232.3\Omega$

The required Zero Sequence Reactance of neutral reactor is:

$X_{0,NGR} > 232.3\Omega - 0.05 \times 193.6\Omega = 232.3\Omega - 9.7\Omega = 223\Omega$

Therefore, the size of neutral reactor should be greater than:

$X_n = 223\Omega / 3 = 74\Omega$

The continuous rating of the grounding devices shall be able to handle the maximum expected voltage unbalance with margin. As per Hydro One's Conditions of Service, the voltage unbalance on Hydro One feeders can reach 5%. Therefore, the grounding device should be sized for a minimum of 5% continuous voltage unbalance. The short

time (5 sec) fault rating shall be sized for the maximum fault current that will flow through the grounding device for a close-in fault.

D APPENDIX D – ANTI-ISLANDING PROTECTION (*INFORMATIVE*)

The following is background information on Anti-Islanding Protection, its purpose, and some rationale behind some requirements. Transfer Trip and Distributed Generator End Open is discussed. Also, a typical distribution system is shown and possible island formations are discussed. This information is provided as informational only. Requirements are listed in Section 2.3.12 and Section 2.3.13 of the TIR.

D.1 DG ISLANDING

A DG island is formed if a DG Facility remains connected to a portion of the Distribution System after that portion is separated from the normal Hydro One supply. DG islanding can expose Hydro One's Transmission and Distribution Systems and customers to unstable voltage and frequency and other adverse impacts. Most typically, DG islanding can occur when the feeder breaker or other isolating device at a TS or DS or along a radial-connected feeder is opened. Some of the causes that may lead to DG islanding are as follows:

- [1] A fault that is detected and cleared by the utility before it can be detected and cleared by the DG Facility. Most DG islands will be established this way;
- [2] Emergency switching of the Distribution System and loads;
- [3] Equipment malfunction;
- [4] Operating or human error; and
- [5] Foreign interference or other acts of nature.

D.2 SUMMARY OF ADVERSE IMPACTS CAUSED BY DG ISLANDING

Potential adverse impacts of DG islands include but are not limited to following:

- [1] Abnormal voltage and frequency excursions outside of the acceptable ranges because of DG Facility voltage regulation limitations;
- [2] Excessive temporary overvoltage (TOV) can occur if DG Facility sources that are not effectively grounded back-feed single-line-ground faults;
- [3] Extreme overvoltage from ferroresonance between the nonlinear magnetizing inductance of DGIT/induction generators and connected capacitance and system capacitance;

- [4] Unpredictable DG energy sources that are not controlled by the utility. This includes generation sources and abnormal phase voltages caused by back-feed through multi-core three-phase DGITs in the presence of single-phase switching or other open circuit supply conditions;
- [5] Failure to clear certain faults that cannot be detected by DG Facility self-clearing protections within required time;
- [6] Interference with the restoration of normal supply from the utility;
- [7] Asynchronous paralleling if DG Facility is present when Hydro One supply is restored.

D.3 Risks

The risks associated with the adverse impacts include:

- [1] Inadequate power quality - voltage and frequency;
- [2] Damage - to customer and utility line equipment as a result of overvoltages or sustained or prolonged electrical faults where protections are insensitive or slow clearing;
- [3] Prolonged customer outages resulting from failed automatic-reclosure or delays in establishing safe conditions for isolation and repair of damaged equipment;
- [4] Safety hazards to public and utility workers since lines may be energized when it is assumed to be disconnected from all energy sources; and
- [5] Increased liability and costs associated with all of the above.

These impacts must be avoided by maintaining adequate controls over the design and operation of the DG Facility connections. Transfer Trip (TT) and Distributed Generator End Open (DGEO) schemes are important tools that are required to avoid these adverse effects for certain configurations.

D.4 TYPES OF DG ISLANDS

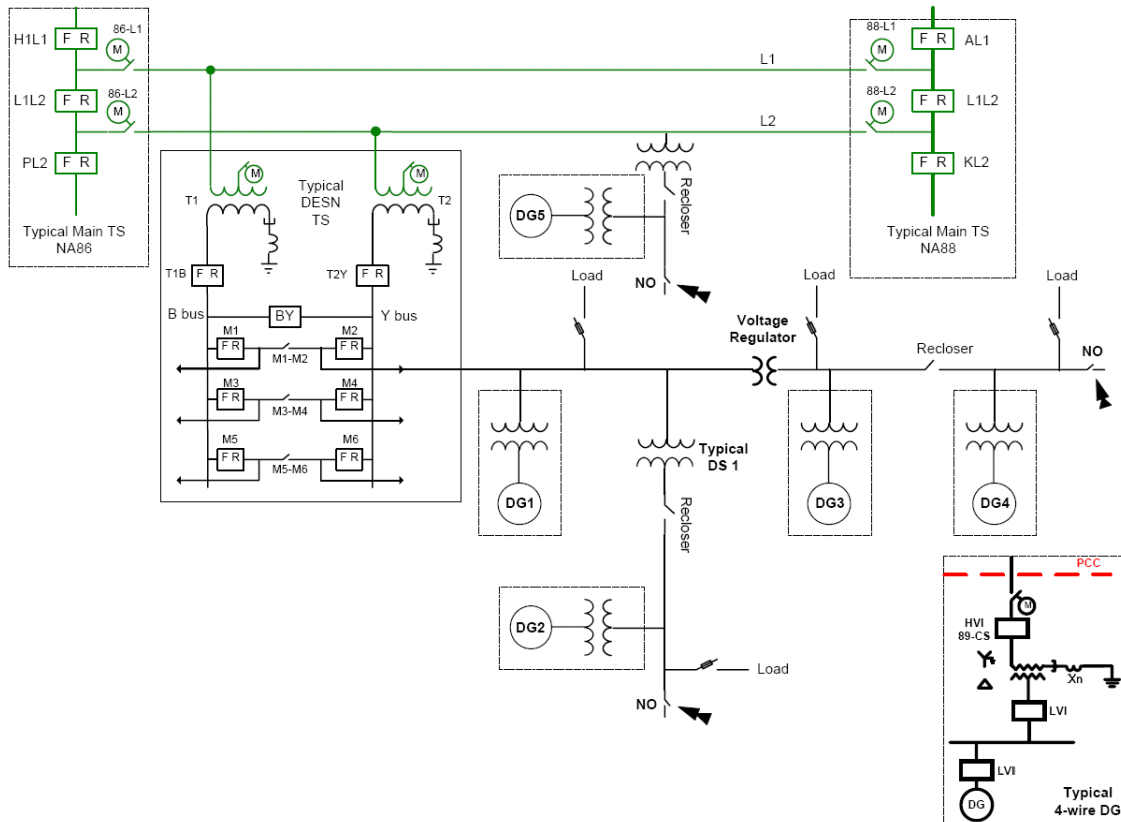


Figure 21: Typical Distribution System with DG Connections

DG Islands are formed whenever feeder reclosers or TS breakers are tripped from feeder or line protections interrupting the supply to a portion of the Transmission or Distribution System. The DG Facility must be removed from service before fuses are melted and before automatic reclosure takes place, to avoid interference with Hydro One restoration and asynchronous reclosure.

Appendix F includes graphs that show timing requirements for TT and DG Facility self-clearing protections, for various automatic-reclosure, fault detection and breaker times. For each DG island scenario, the aggregate capacity of the islanded DG Facility must be assessed in relation to the minimum connected islanded load.

Generally, if the islanded DG Facility aggregate capacity is greater than 50% of the minimum load of the connected island, then TT will be required to be sent from the most strategic Hydro One supply location(s) to disconnect the DG Facility to ensure successful automatic-reclosure

operations.⁴³ The TT may be sent directly from the location of Hydro One's switching device to the DG Facility or a cascading arrangement may be used to redirect the TT to the DG Facility via another marshalling location (usually the TS).

RECLOSER DG ISLAND

- i) A Recloser DG Island forms when a feeder recloser operates, interrupting the Hydro One supply to a section of a feeder to which the DG Facility is connected.
- ii) In the example shown in Figure 21, DG2, DG4 and DG5 will be islanded by the adjacent Hydro One source-side reclosers opening.
- iii) Typical automatic-reclose times for reclosers are 1.5 to 2 seconds.

FEEDER-BREAKER DG ISLAND

- i) A Feeder-breaker DG island forms when feeder protection operates, opening a TS feeder-breaker and interrupting the Hydro One supply to the whole feeder to which the DG Facility is connected.
- ii) In the example shown in Figure 21, DG1 - DG4 will be islanded by the opening of the M2 feeder breaker.
- iii) Typical automatic-reclosure times for feeder-breakers are 0.5 to 1 seconds.

LV BUS DG ISLAND

- i) An LV Bus DG island forms when a main terminal line protection operates for an HV line fault interrupting the Hydro One supply to a DESN TS LV bus to which the DG Facility is connected.
- ii) In the example shown in Figure 21, an LV bus DG island would only occur if the bus-tie breaker BY was open and the L2 line protection opens LV transformer-breaker T2Y interrupting the Hydro One supply to the Y bus to which DG1 – DG4 are connected.
- iii) Automatic-reclosure is initiated from the HV line protection and the LV transformer-breaker Transfer Trip or Remote Trip Receive protections. The typical automatic reclosure time for a DESN TS LV transformer-breaker is typically 1 second, but that will only be completed after the HV line protection at the main terminal TS automatically recloses, typically in 5 seconds (may be as low as 2 seconds).

⁴³ The significance of the 50% criteria is presented later in this Appendix.

DESN TS LV ISLAND

- iv) A DESN TS LV island forms when one or more main terminal line protections operate for HV line faults, interrupting the Hydro One supply to a DESN TS to which the DG Facility is connected.
- v) In the example shown in Figure 21, a DESN TS LV would occur if transformer breakers T1B and T2Y are both opened from operation of HV line protections, isolating all of the DG Facilities connected to the DESN TS (DG1 - DG4).
- vi) Automatic-reclosure is initiated from the HV line protection and the LV transformer-breaker Transfer Trip or Remote Trip Receive protections. The typical automatic reclosure time for a DESN TS LV transformer-breaker is typically 1 second, but that only after the HV line protection at the main terminal TS automatically recloses, typically in 5 seconds (may be as low as 2 seconds).

WIDE-AREA DG ISLAND

- i) A Wide-Area DG island can be formed when one or more main terminal line protections operate for HV line faults, interrupting the Hydro One supply to all DESN stations and to any HV-connected DS to which the DG Facility is connected.
- ii) For a two-circuit supply, both circuits would have to be interrupted to cause a wide area DG island.
- iii) In the example shown in Figure 21, a wide area DG island would occur if supply to both HV lines L1 and L2 are interrupted (a double circuit interruption). This is a relatively rare event but can happen during wind storms or other adverse conditions.
- iv) For a single-circuit HV supply, operation of the line protection for that circuit would cause a Wide-Area DG island.
- v) A Wide-Area DG island will occur if there is no TT from the main terminal station to the DESN station or HV-connected DS or that TT fails causing the DESN station LV breakers to remain closed. In that case, automatic-reclosure of the HV lines will restore Hydro One supply to all of the affected Wide-Area, typically in 5 seconds (may be as low as 2 seconds) provided that there is no back-fed voltage detected on the HV lines by the HV breaker automatic-reclosure schemes.
- vi) A Wide-Area DG island may also occur if the next zone (upstream from Terminal Stations) is tripped. This may occur if the net generation in the wide area network can sustain the load at the time of occurrence.

D.5 DG ISLANDING NOT PERMITTED

At present DG islanding is not allowed due to the fact that DG Facility is neither responsible nor capable of maintaining the integrity of distribution system. Key points are shown below:

HYDRO ONE'S RESPONSIBILITY

Hydro One is responsible for the supply and voltage regulation of Hydro One's Distribution System and the maintenance of Distribution System voltages at acceptable levels as required by the OEB. Frequency is maintained very close to 60 Hz by the synchronized interconnection of Hydro One's Transmission System to the Eastern Interconnection of the North American Electric Reliability Corporation ("NERC"). Voltage and frequency will be maintained under normal system conditions as long as normal Hydro One supply remains connected to the Distribution System.

EXPECTED FREQUENCY AND VOLTAGE DEVIATIONS IN DG ISLANDS

When a DG island occurs, island voltages and frequency will depend entirely on the interaction between the islanded generation and load. Maintaining an island within acceptable limits would require at least one DG Facility in the island to actively regulate frequency and voltage to match changing island load demands. Furthermore the DG Facility capacity would have to be large enough to sustain the extreme range of load demands that may exist in the island. DG Facilities cannot meet these conditions for the following reasons:

- i) Hydro One does not permit DG Facility voltage regulation systems to actively regulate voltage. This avoids mal-coordination of Distribution System voltage regulation and excessive operation of Hydro One's tap-changers and voltage regulators.
- ii) Variable production conditions prevent DG Facility capacity from being capable of meeting the exact demands of any specific local loads or power transfers. As a result, DG island frequency and voltage can be expected to drift outside of the acceptable limits because of these inherent DG control and capacity limitations.
- iii) The direction (over or under) of frequency and voltage change for a DG island will depend upon the relative mismatch of net real and reactive power between the islanded DG Facility and load. If the active power generation is less than the active power consumed by the load, the island frequency will drop. If the active power generation exceeds the active power consumed by the load, the island frequency will rise.
- iv) Change in island voltage magnitude depends similarly on mismatch between distributed generation reactive power output and the reactive power demands of the islanded load.

- v) The rate-of-change of frequency and voltage for a DG island will depend upon many factors. These factors include the amount of power unbalance, network impedances, voltage dependency of the feeder loads and dynamic characteristics of the islanded generation and loads (inertias of the interconnected machines and transient reactance).
- vi) Even short duration DG islands may be too long to prevent adverse DG islanding impacts, unless specific design precautions are implemented.

POSSIBILITY OF EXTREME OVER-VOLTAGES AND BACK-FEEDS THROUGH TRANSFORMERS

- i) Ferroresonance and single-line-ground faults can cause extreme or excessive over-voltages for some DG island configurations. These over-voltages are capable of causing damage to customer and Hydro One equipment.
- ii) Back-feeds through multi-core three-phase DGITs in the presence of single-phase switching or other open circuit supply conditions. These voltages pose a safety hazard to public and utility workers for fallen conductors or when circuits are assumed to be dead but in fact are energized.
- iii) These over-voltage and back-feed effects are largely dependent upon the size, grounding and magnetic-core characteristics of the DGIT connections. There are many ways to avoid or minimize these effects. That includes the following:
 - Use of Transfer Trip;
 - Use of a DG HVI to be tripped whenever an unbalanced condition is detected at the DG Facility location;
 - Effective-grounding of the DGIT;
 - Avoiding the use of multi-core transformers for three-phase connections in the presence of single phase switching upstream, by using three individual single-phase (single-core) DGIT connections; and
 - Avoiding single-phase switching of three-phase transformers (where possible) or minimizing circuit capacitance from the DGIT to these locations.

D.6 AUTOMATIC-RECLOSURE

Transient faults on over-head line conductors caused by lightning, wind, tree branches falling, or other momentary foreign contact constitute approximately 85-90% of all faults.

Hydro One uses the standard utility practice of automatic-reclosure on distribution feeders with over-head line-sections to minimize supply interruptions for transient faults.

Automatic-reclosure is not generally used for feeders with extensive underground cable sections because cable faults are exposed to far fewer naturally occurring transient fault conditions. Also faults on cables are much more likely to be permanent requiring repairs.

D.7 BENEFITS OF AUTOMATIC-RECLOSURE

Automatic-reclosure has the following advantages:

- i) It minimizes supply interruption to customers by automatically restoring the feeder to service as quickly as possible following transient faults.
- ii) It minimizes damage at the fault and stress on equipment supplying the fault.
- iii) It reduces operating costs. Less time and materials required to repair damage and restore service.
- iv) It prevents blowing of fuses at tapped Distribution stations and lateral feeds resulting in all of the above.

D.8 HOW AUTOMATIC-RECLOSURE WORKS

- i) For the first occurrence of the fault on any portion of the faulted feeder, high-speed sensitive low set protection operates quickly to de-energize the feeder.
- ii) Following the first protection operation, the Hydro One feeder breaker or reclosers are automatically reclosed to restore supply to load customers as quickly as possible.
- iii) Typical reclosing times are 0.5 to 1 second for feeder breakers and 1.5 to 2 seconds for reclosers.
- iv) Reclosing time must allow for the fault to extinguish and de-ionize.
- v) Reclosing time must also allow some time for the inertia and back emf of large motors to decay (to about 40% of normal voltage) and be disconnected by automatic controls.

D.9 AUTOMATIC-RECLOSURE REQUIRES DG TO DISCONNECT QUICKLY

Automatic-reclosure can succeed only if the fault arc is extinguished and de-ionized. Otherwise the fault is likely to re-strike after the feeder is re-energized.

- i) If the DG Facility has not disconnected at the time that automatic-reclosure takes place, the automatic-reclosure would asynchronously re-parallel to all DG Facilities and any rotating motors that remained connected in the island.
- ii) Extreme mechanical stresses associated with asynchronous paralleling could damage DG Facility generators, customer motors, switching equipment and any transformers that are connected in series between these energy sources.
- iii) The potential impact of asynchronous connection of inverter-fed DG Facilities is less certain and will depend on their individual design. However since island voltage can be sustained by other generators and motors that remain connected, asynchronous reclosure must be avoided.
- iv) For the above reasons, all DG Facilities must be quickly disconnected whenever a feeder fault is detected, before reclosure takes place.

D.10 LIMITATIONS OF DG SELF-CLEARING PROTECTION RESPONSE TIMES

- i) Based on fault in-feed, DG Facilities cannot distinguish between faults on either side of the utility feeder breaker or recloser that supplies them. To avoid nuisance trips, some time delay is required by the DG Facility's interconnection protection to allow coordination with the faster utility protections to clear those out-of-zone faults. If that delay is too long, automatic-reclosure will be impaired.
- ii) The DG Facility anti-islanding protection cannot prevent DG islanding. It can only detect an island after islanding occurs.
- iii) All passive DG Facility anti-islanding detection methods rely on an unbalance or mismatch between distributed generation power output and power demands of the connected load on the isolated island. DG island frequency and voltage can be expected to drift, as outlined above.
- iv) Close matching of both active and reactive power would be an extremely unlikely condition for a prolonged period. Sooner or later, mismatches will cause the voltage or frequency to drift outside the protection limits specified in Sections 2.3.

- v) If by chance the active and reactive power produced by islanded DG Facility happens to be close to the islanded load demand, then the island may survive for a longer period before DG Facility self-clearing protections will detect and disconnect the generation.
- vi) In some cases, DG Facility self-clearing anti-islanding protections cannot be relied on to guarantee that the DG Facility will disconnect itself before automatic-reclosure takes place. In those cases, TT and DGEO schemes are required. Refer to appropriate sections for requirement conditions.

D.11 MAXIMUM DETECTION TIMES AVAILABLE FOR DG SELF-CLEARING PROTECTIONS

AUTOMATIC-RECLOSURE CONSIDERATION

There are limited time windows available following the formation of an island during which time DG self-clearing protections have to disconnect the generator before automatic-reclosure takes place.

- i) If there is a fault on the feeder at the time the DG island is formed, the DG Facility fault protection must detect the fault and initiate clearance.
- ii) If there is no fault on the feeder at the time the DG island is formed, the DG Facility's anti-islanding protection must detect the island condition and disconnect the generation from the Distribution System.

Timing diagrams and graphs for self-clearing DG Facility's interconnection protection are shown in Appendix F.

The times are based on the following assumptions and constraints:

- i) The Hydro One automatic-reclosure timer is initiated without delay, immediately after the fault is detected by the Hydro One feeder protection.
- ii) The assumed maximum Hydro One fault clearance time is 83ms after the fault is detected (5-cycle breaker opening time for oil dead-tank breakers).
- iii) 200ms fault extinction and de-ionization time and/or drop out of motor controls is required after the last source trips, prior to reclosure.
- iv) The graph shows the effect of DG Facility interrupter times on available Fault detection and Island detection times to avoid interference with Automatic-Reclosure.

For example, to prevent interference with automatic-reclosure (1 second reclosure), a DG Facility with a 5-cycle interrupter would require:

- i) Self-clearing DG Facility anti-islanding protections capable of island detection within 633ms.
- ii) DG Facility fault protection must be capable of detecting all three-phase and phase-ground faults to the extreme ends of the supply feeder within 717ms.
- iii) For reclosure times longer than 1 second, the protection response times can be lengthened by equivalent amounts.

TT will be required to speed up DG Facility clearance if the above conditions cannot be met.

To prevent interference with automatic-reclosure with a reclose time of 500ms:

- i) Self-clearing DG Facility anti-islanding protections capable of detecting an island condition within 133ms.
- ii) DG Facility fault protections must be capable of detecting all three-phase and phase-ground faults to the extreme ends of the supply feeder within 217ms.
- iii) It is expected that DG Facility self-clearing protections cannot selectively and reliably detect fault and island conditions in such a short time. TT and DGEO will always be required to speed up DG clearance where 0.5-second reclosure times are used.

FUSE SAVING CONSIDERATIONS

Slow-clearing DG Facility in-feeds to faults can cause Distribution System fuses to melt can cause prolonged customer outages resulting from melted fuses. To reduce this all DG Facility shall be disconnected within 200ms of when external faults are detected on the Distribution System.

D.12 TRANSIENT RESPONSE OF DG ISLANDS (THE BASIS OF THE “50% RULE”)

- i) Hydro One’s transient stability studies for some typical synchronous generators have demonstrated some consistent effects that various generation-to-feeder load ratios have on DG Facility voltage and speed (frequency).
- ii) These studies have shown that for 50% generator rating to feeder load ratios, generator frequency declined steadily to about 53Hz within 1 second. Voltage declined rapidly to about 75% within about 100ms and recovered somewhat to about 93% within 1 second.
- iii) Such frequency excursion to 53Hz should ensure that the under-frequency protections set as per Section 2.3.10 will clear in much less than 1 second (160ms for frequency < 57 Hz).

- iv) Such voltage excursion to 75% may take up to 2 seconds to clear for protection set as per Section 2.3.11 (2 seconds for $50 \leq V < 88\%$).
- v) For higher generator rating to feeder load ratios, frequency and voltage does not drift outside the limits specified in Sections 2.2.2.5 and Section 2.2.2.1.
- vi) Generic models for other types of generators - self-fed induction ("SFIG"), Double-fed Asynchronous ("DFAG"), inverters and static power converters are not sufficiently available to guarantee that DG Facility anti-islanding protections will operate in sufficient time for all conditions to prevent interference with automatic-reclosure.
- vii) Based on the above, Hydro One has established a 50% active power unbalance threshold (DG Facility aggregate capacity / minimum load) above which TT is required to be used to avoid interference with Distribution System automatic-reclosure schemes.
- viii) This only applies where automatic-reclosure time is 1-second or longer.

D.13 TRANSFER TRIP PROVIDES PREDICTABLE ANTI-ISLANDING PROTECTION CLEARANCE TIMES

Transfer Trip (TT) application provides predictable DG Facility clearance times and is the only protection which can guarantee anti-islanding. Distributed Generator End Open (DGEO) is always used with TT to guarantee disconnection of DG Facility before the feeder is re-energized or the breaker is re-closed. Thus, TT, DGEO and Re-closing shall be discussed.

There is no direct relation of Low Set Block Signal (LSBS) with anti-islanding protection, but this signal can utilize the same channel which is to be utilized by DGEO. Thus LSBS shall also be discussed briefly.

TRANSFER TRIP APPLICATION

Transfer Trip (TT) is a protection trip signal that is sent from the Hydro One supply source breaker or recloser to the DG Facility when the DG Facility is required to be disconnected. Transfer Trip (TT) is often required to mitigate the adverse impacts of DG Facility connection and islanding.

TT TIMING REQUIREMENTS

Refer to Section 2.3.13 and Appendix F for TT timing requirements.

D.14 DISTRIBUTED GENERATOR END OPEN (DGEO)

DGEO is a real time signal that is continuously sent from the DG Facility to Hydro One's supply source breaker or recloser. It establishes the connection status of the generation equipment.

- i) For ungrounded 3-wire connections, where the DG Facility source cannot contribute ground fault current, the DGEO signal is derived from all breakers/circuit switchers at the interface between the DG Facility generation and the PCC necessary to establish DG Facility generation connectivity. It establishes the connection status of the generation equipment and is used to block automatic-reclosure should DG Facility fail to disconnect after the Hydro One supply is disconnected. For 3-wire connections that do not have an HVI, connectivity of the generators will be established by LVI connection logic that mimics all of the possible generation connection paths.
- ii) For 4-wire connections, the DGEO signal must be derived from the DG Facility HVI switch only. For 4-wire connections all DG Facility ground sources must be connected to the DG Facility side of the HVI switch and must be disconnected before Hydro One source can be permitted to energize the feeder. That is because any fault that occurs immediately following Hydro One energization of the feeder is almost certain to be permanent, and Hydro One low-set fuse-saving protections are blocked. This allows coordinated clearance of the down-stream reclosers and fuses with the Hydro One source timed protections.

DGEO requirements are specified in Section 2.3.14. Design recommendations are included in Appendix E.

D.15 APPLICATION OF TT AND DGEO "50% RULE" REQUIREMENTS TO DG ISLANDS

The 50% TT rule is intended to preserve the benefits of automatic-reclosure following transient line fault conditions, by ensuring DG Facilities do not interfere with the successful operation of automatic-reclosure schemes.

Automatic-reclosure is not initiated for other types of permanent faults – recurring line faults, transformer faults, bus faults or breaker failure condition. In these cases, providing other adverse impacts are minimal for short-duration DG islanding, self-clearing anti-islanding protections (over/under voltage and over/under frequency) may be sufficient to disconnect the generation from the island when frequency and voltage transcend the limits specified in Sections 2.2.2.5 and 2.2.2.1 respectively. In all cases, high reliability is required for all

protection schemes that are required to maintain the integrity of Hydro One's Distribution System.

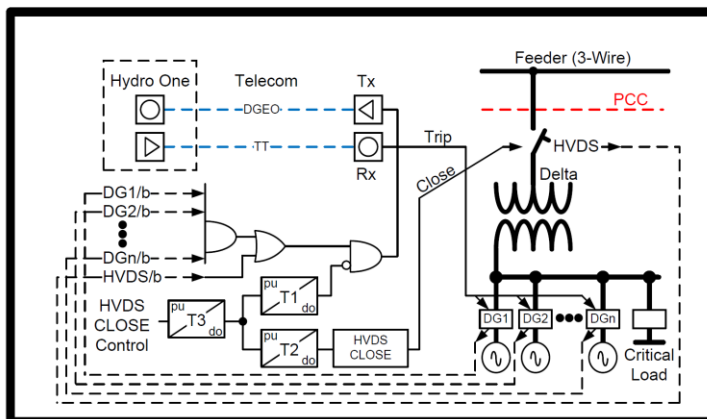
Typical DG islands that can be formed during transient fault conditions are illustrated in Figure 21 and discussed earlier under "Types of DG islanding".

D.16 LOW SET BLOCK SIGNAL (LSBS)

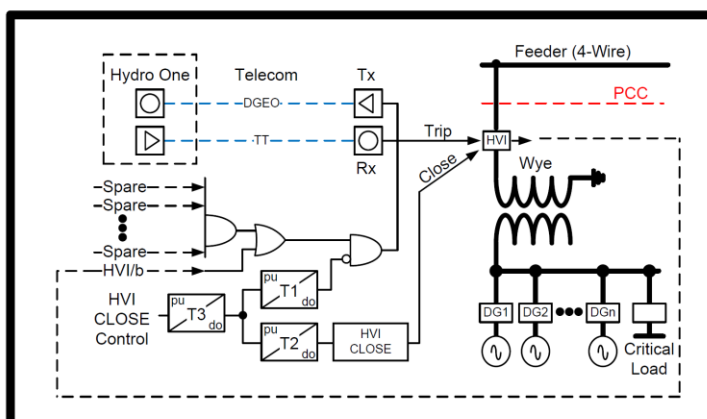
- i) Low Set Block Signal (LSBS) is a signal that is sent from the DG Facility to the Hydro One supply source breaker or recloser, whenever a large DGIT is being energized. Detection of this signal transition at the Hydro One supply source breaker or recloser location will cause the most sensitive low-set (fuse-saving) protection to be temporarily blocked. This will prevent the tripping of the Hydro One supply source during the period when there is large energizing inrush current due to the DGIT. Refer to Appendix E for more information regarding the LSBS signal.
- ii) Because the momentary LSBS signal will always be sent just prior to reconnection (near the end of the DGEO open condition), both DGEO and the LSBS functions shall be combined as one signal through a communication channel from the DG Facility to the Hydro One source energizing location(s).

E APPENDIX E – DGEO & LSBS DESIGN CONSIDERATION (*INFORMATIVE*)

The following information is a design consideration for Section 2.3.16 (DGEO and LSBS Design Requirement). It is an example of how the signals can be implemented for installations utilizing a High Voltage Interrupter or a High Voltage Disconnect Switch (motorized Isolation Device – See Section 2.1.7). This is for informational purposes only and actual design and implementation may be different.



HVDS on 3-Wire



HVI on 4-Wire

*HVDS - High Voltage Disconnect Switch
Based on Blocking the Low Set Inst at Hydro One for **5 seconds** on a falling edge DGEO signal transition

Example #	Teleprotection Delay		HVI	HVDS	Timer T1		Timer T2		Timer T3	
	TT Delay	DGEO Delay	Close Time	Close Time	PU Delay	DO Delay	PU Delay	DO Delay	PU Delay	DO Delay
1	16ms	16ms	100ms		0ms	0ms	1s	0ms	0ms	6s
2	16ms	16ms		1s	0ms	0ms	1s	0ms	0ms	6s
3	30ms	250ms	100ms		0ms	0ms	1s	0ms	0ms	6s
4	30ms	250ms		1s	0ms	0ms	1s	0ms	0ms	6s

Figure 22: DGEO & LSBS Design Consideration

F APPENDIX F – TIMING DIAGRAMS (INFORMATIVE)

The following are a few sample timing diagrams for informational purposes. These have been created to represent a realistic sequence of events and the associated timings for different fault clearing and anti-islanding applications. These times may change due to site specific requirements and thus, timing requirements shall be confirmed with Hydro One for specific DG Facility projects.

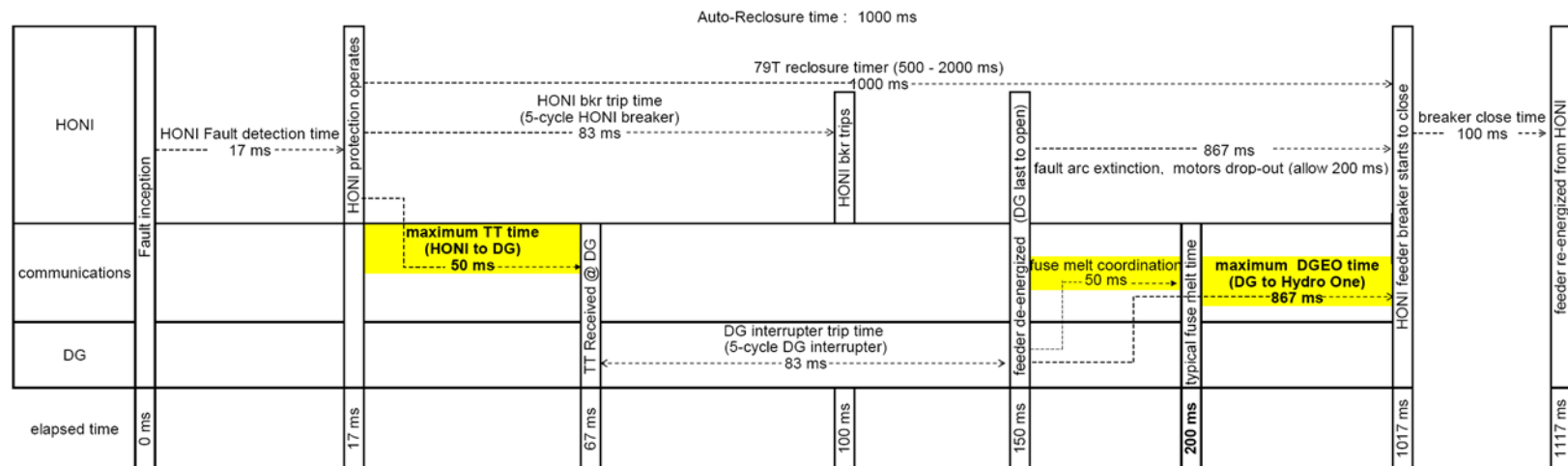


Figure 23: Typical Transfer Trip timing

Figure 23 illustrates typical trip/reclose timing for a feeder fault detected by a Hydro One feeder low-set protection. The Hydro One supply is isolated by a 5-cycle Hydro One breaker and Transfer Trip to the DG Facility. If the DG Facility interrupter opens in 5 cycles, a 50ms end-to-end TT transfer trip time is required to clear DG Facility infeed to the fault within 150ms.

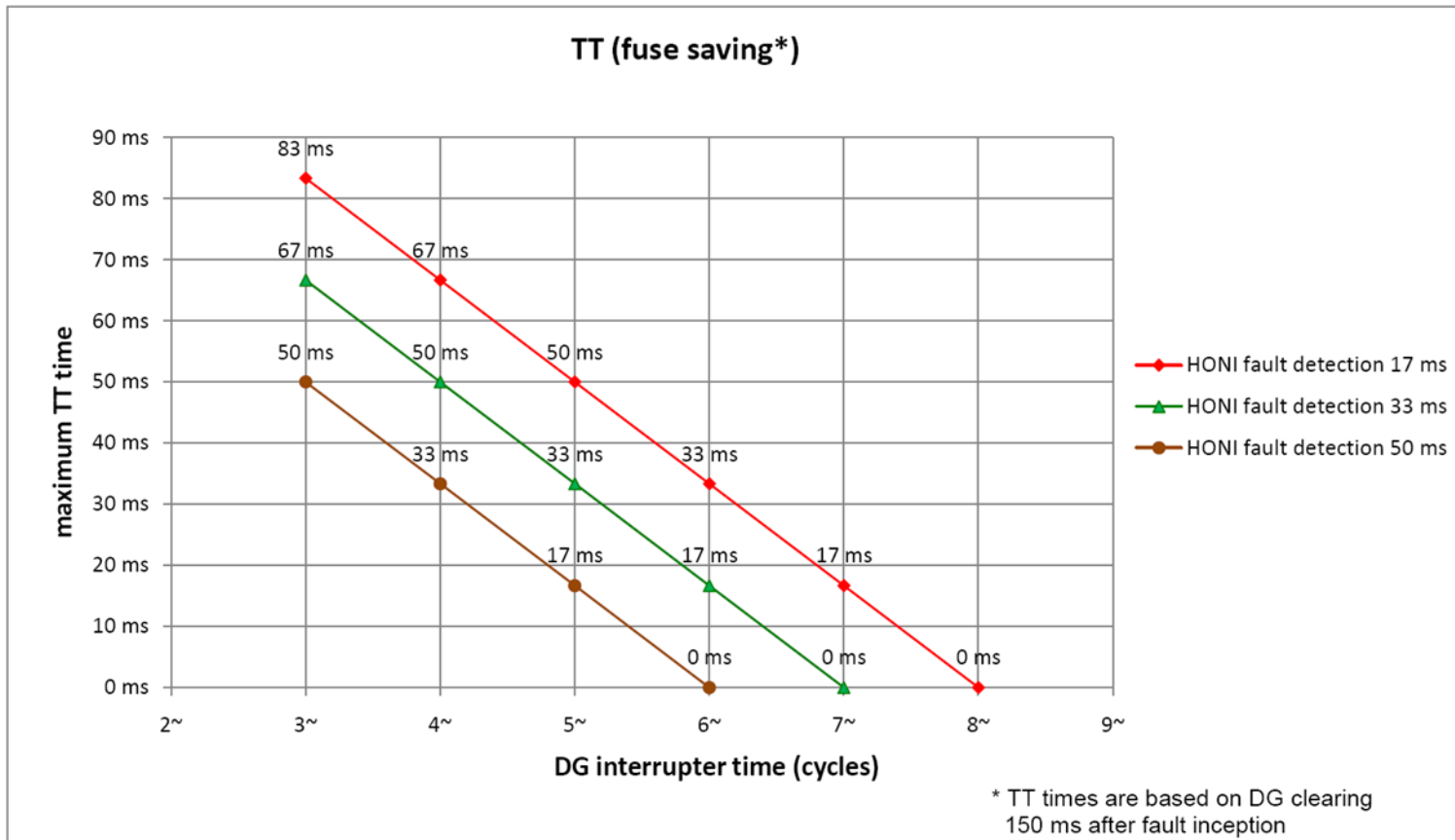


Figure 24: Relationship between timing variables for DG self-clearing

Figure 24 illustrates the end-to-end TT timing requirements to clear the DG Facilities infeed to a fault within 150ms, for various DG Facility interrupting devices operating times. The three curves show how various Hydro One fault detection times would affect the required TT times. Hydro One instantaneous low-set protections will typically detect the fault within 17ms, so the red curve will normally apply.

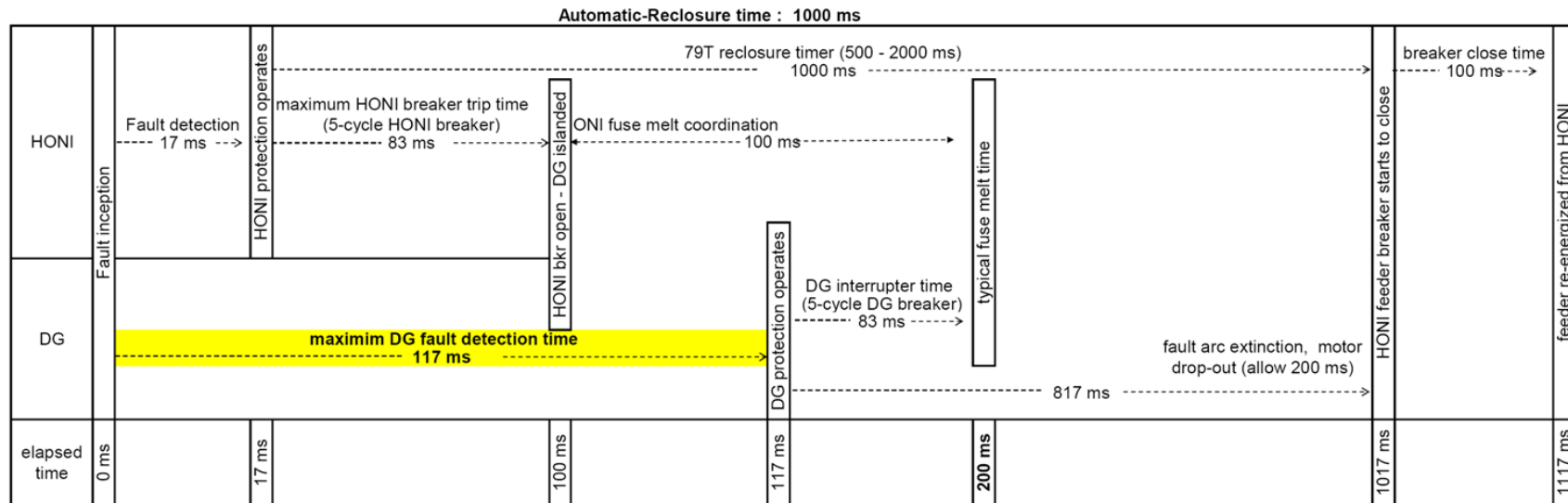


Figure 25: Typical DG self-clearing fault clearance (Fuse Saving considerations)

Figure 25 illustrates trip/reclose timing for typical feeder fault detected by a self-clearing DG Facility's interconnection protection with a 5-cycle interrupter. In order to clear the DG Facility infeed to the fault within 200ms to avoid fuse melting, the DG Facility fault detection protection needs to operate within 117ms.

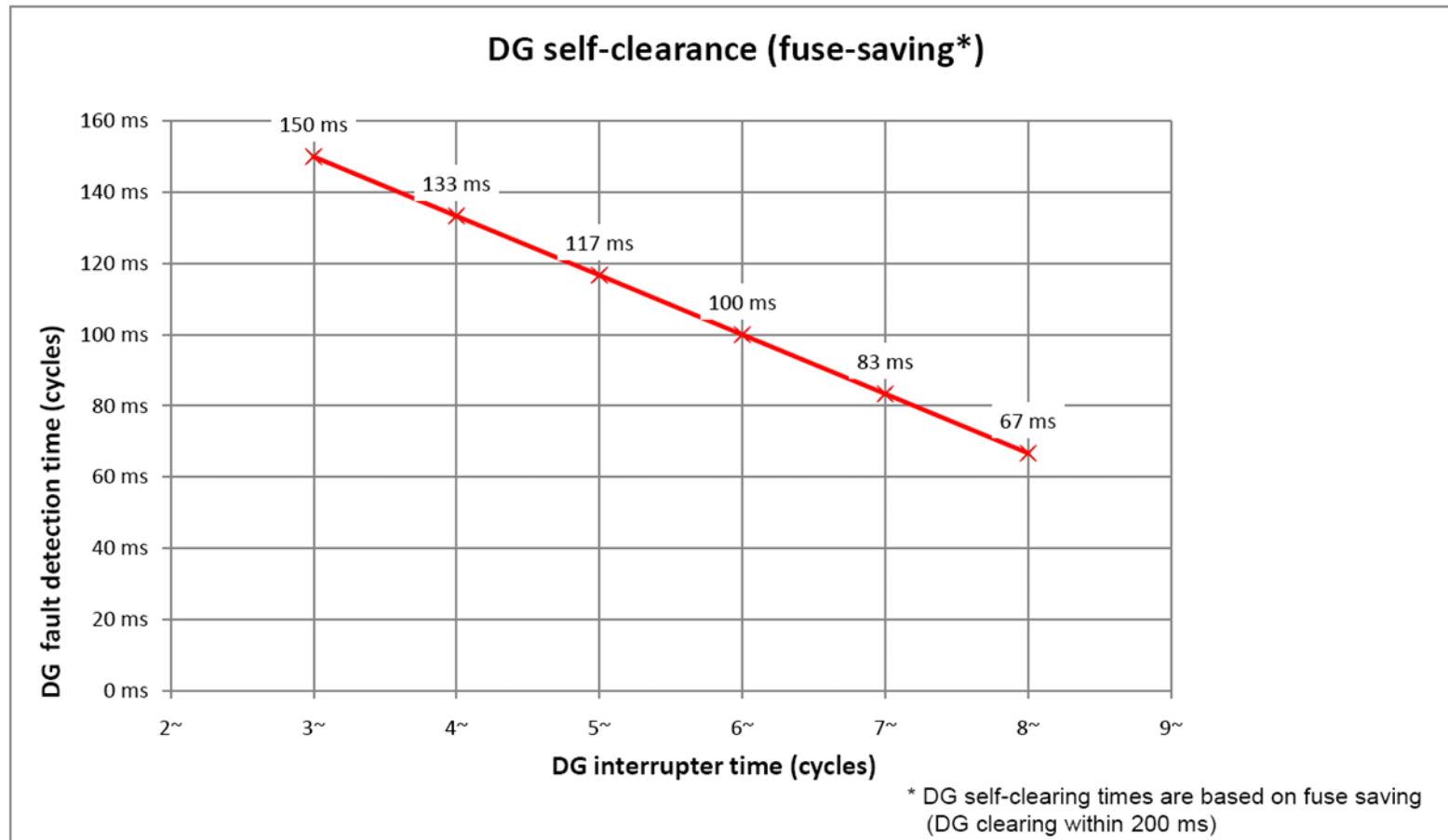


Figure 26: Relationship between DG self-clearing protection and interrupter times (fuse saving considerations)

Figure 26 illustrates the timing requirements for DG Facility's external fault detecting protections to clear the DG Facility infeed to the fault within 150ms, for various DG Facility interrupting device operating times.

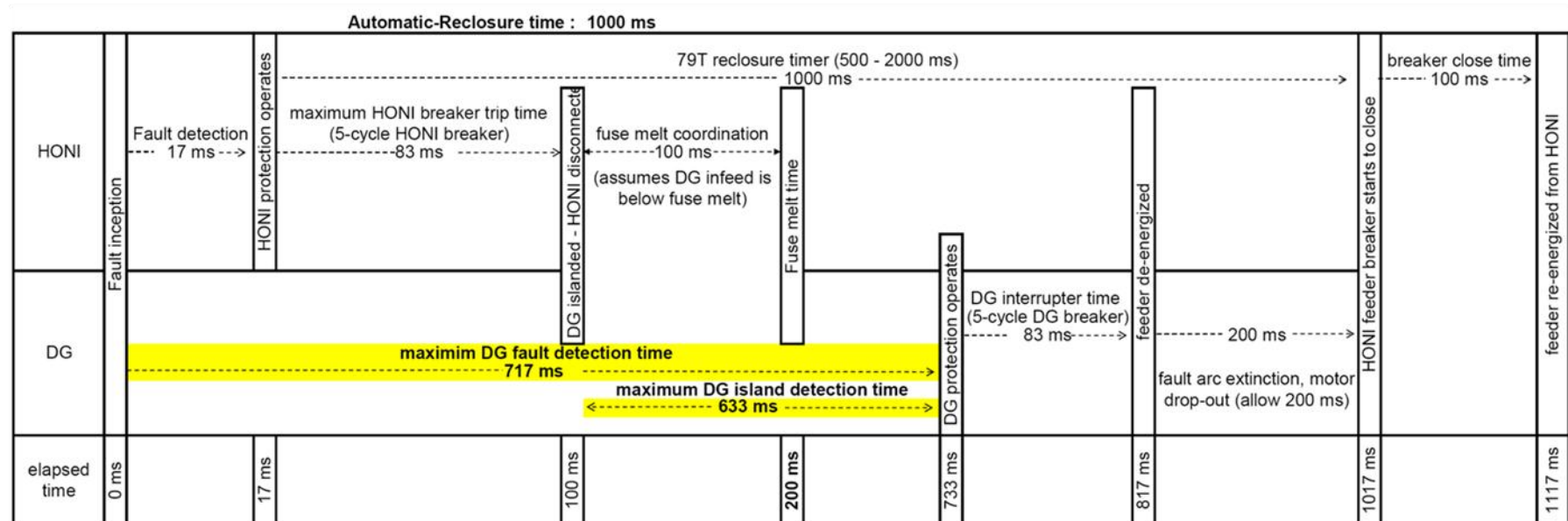


Figure 27: Typical DG self-clearing fault clearance (Auto-Reclosure timing considerations)

Figure 27 illustrates trip/reclose timing for a typical feeder fault detected by a self-clearing DG Facility's interconnection protection with a 5-cycle interrupter. In order to avoid interference with a 1-second Auto-Reclosing sequence, the DG Facility's external fault detecting protections needs to operate within 717ms. If there is no fault, the DG Facility's anti-islanding protection needs to detect faults within 633ms.

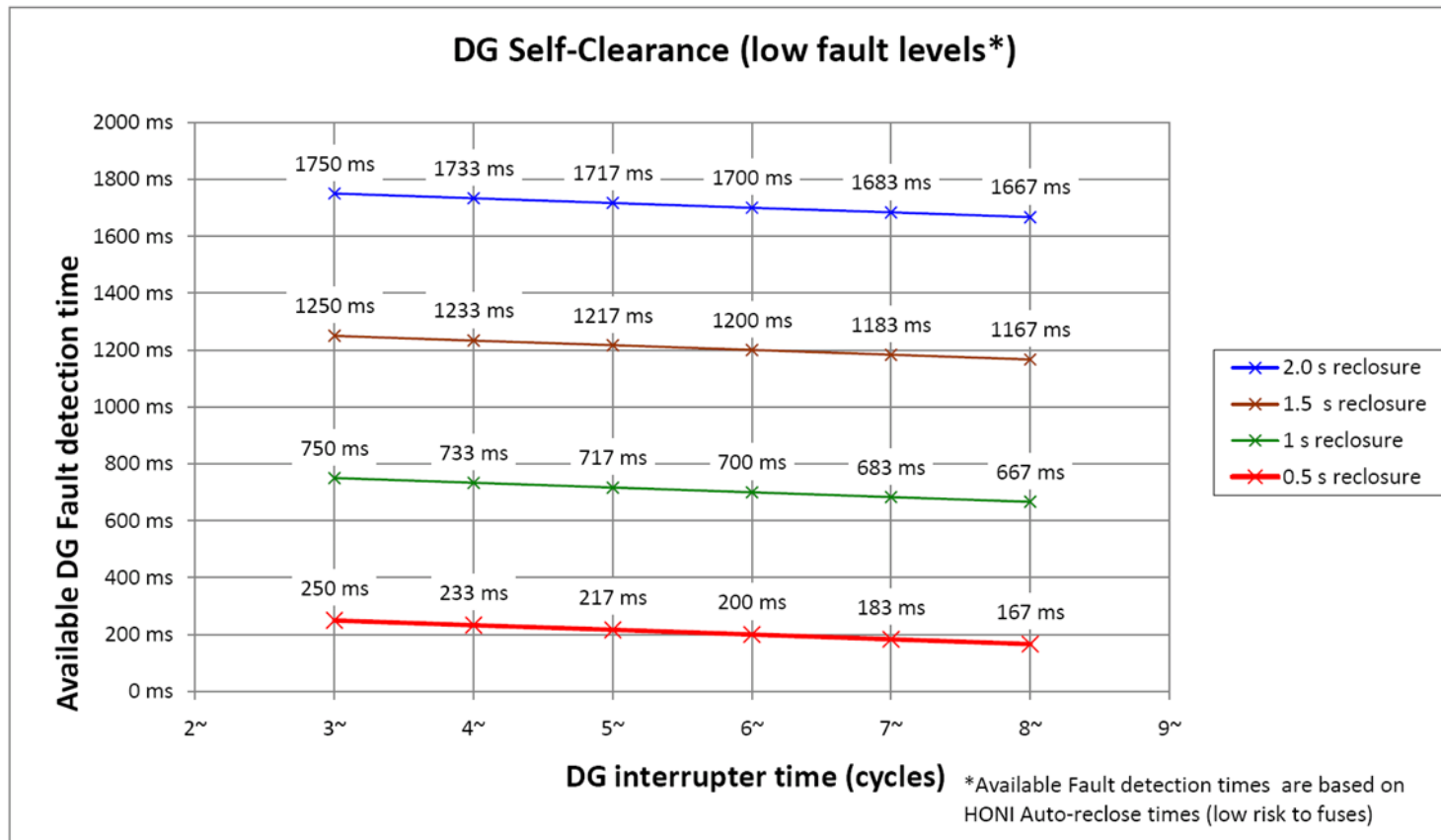


Figure 28: Relationship between DG self-clearing protection and breaker times (Auto-Reclosure timing considerations)

Figure 28 illustrates timing requirements for DG Facility's self-clearing interconnection protection to detect external feeder faults for various DG Facility fault interrupter times, in order to avoid interference with various Auto-Reclosure times.

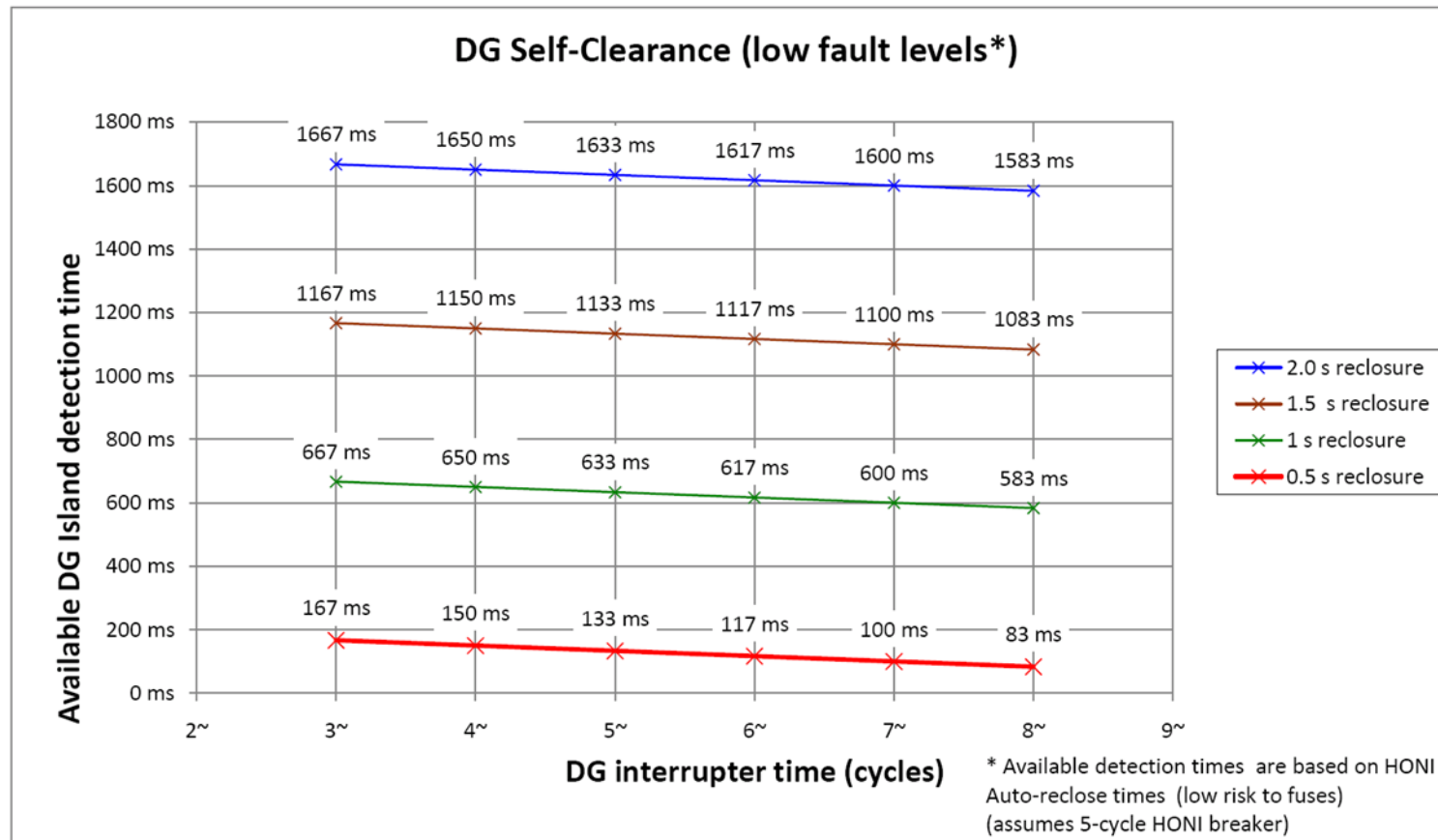


Figure 29: Relationship between DG island detection and breaker times (Auto-Reclosure timing considerations)

Figure 29 illustrates the timing requirements for DG Facility's self-clearing interconnection protection to detect island conditions for various DG Facility fault interrupter times, in order to avoid interference with various Auto-Reclosure times.

G APPENDIX G – SEQUENCE OF EVENTS DURING FAULT CONDITIONS: EXAMPLE (INFORMATIVE)

The following two figures are a typical sequence of events during abnormal conditions, for both a transient fault and a permanent fault. Note: These diagrams assume that the DG Facility requires Transfer Trip and an HVI. This is for informational purposes only. Note: Viewing may be easier if viewed on computer and zoomed in.

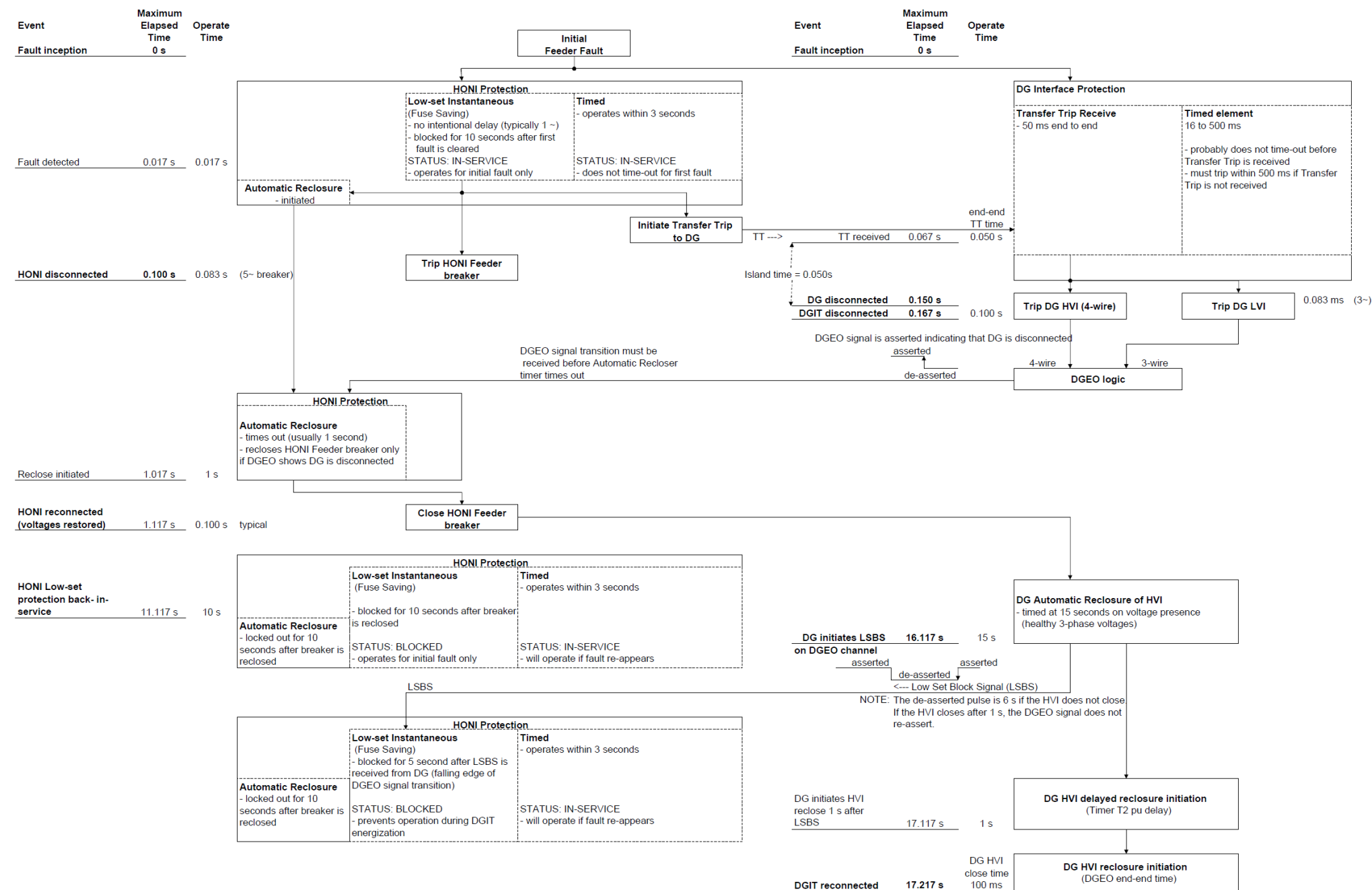


Figure 30: Sequence and Timing Diagram for Transient Faults

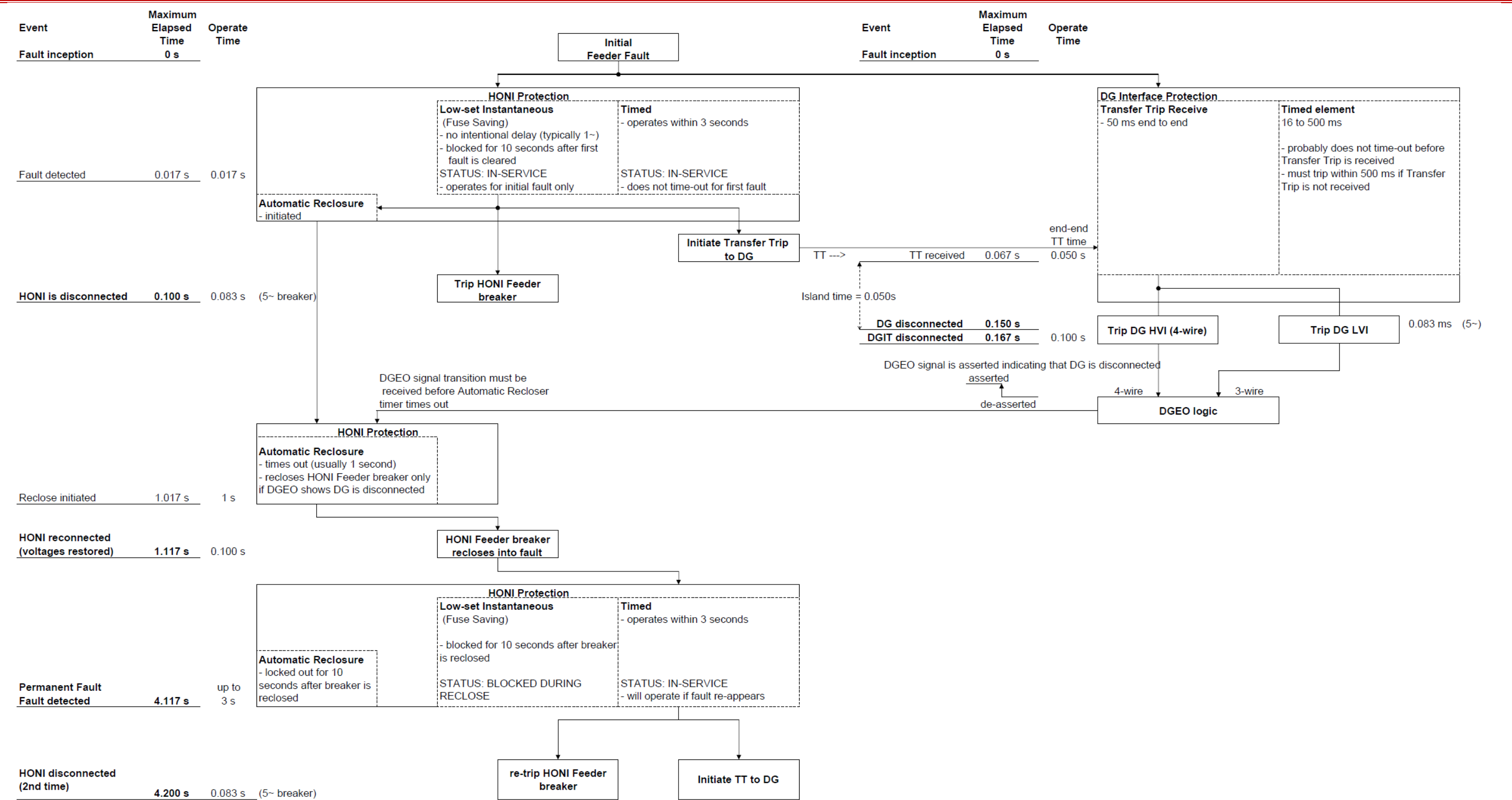


Figure 31: Sequence and Timing Diagram for Permanent Fault

End of Document

Appendix – 8-Intervenor-142c)



GSC DT-3PAD
(Issue #4)

SPECIFICATION FOR
THREE-PHASE PAD-MOUNTED LOOP FEED TRANSFORMERS

Effective Date

August 2019

Approved by: 

Approval is given in accordance with Ontario Regulation 22/04.

Date: 2020-01-27

SPECIFICATION FOR
THREE-PHASE PAD-MOUNTED LOOP FEED TRANSFORMERS

1. Scope

This specification covers the requirements for standard three-phase pad-mounted, 60 Hz, loop feed, ONAN distribution transformers manufactured and tested in accordance with CSA C227.4. Transformers shall be designed for operation on an effectively grounded wye system.

Where conflict exists between this specification and CSA C227.4, this specification will govern.

Quantities, sizes, and voltage ratings shall be specified in the request for quotation. Bidders must detail any variations from this specification when submitting their quotes. Quotes containing unacceptable variations from the requirements of this specification shall be rejected.

2. Reference Publications

Reference to CSA C227.4 implies also latest revision.

In addition to all Publications listed in CSA C227.4, transformers shall meet the requirements of ISO 9001-00 Quality Management Systems.

Stainless steel shall meet the requirements of American Iron and steel Institute (AISI) Type 304L.

3. Rated Voltages

In addition to rated voltages listed in table 1 of CSA C227.4, dual voltage transformers may be specified. Designation of HV winding will be in the form of V x V1; example: 8320 GrdY/4800 x 27600 GrdY/16000 V.

4. Electrical Characteristics

4.1 kVA Ratings

The kVA ratings at rated voltages shall be 75, 150, 225, 300, 500, 750, 1000, 1500, 2000, 2500, and 3000.

4.2 Voltage Taps

Transformers shall have $\pm 2.5\%$ voltage taps, 2 full capacity above and 2 reduced capacity below normal voltage, as per CSA C227.4 Clause 4.5.2. Taps shall be labeled numerically on the nameplate as follows:

Numerical	1	2	3	4	5
% of High Voltage Winding	105	102.5	100	97.5	95

If required, high voltage taps for designated dual voltage transformers may be specified by the individual utility.

4.3 Impedance

Transformers will have guaranteed minimum impedance as per CSA C227.4 Clause 4.11, unless the Purchaser specifies an alternate minimum impedance to accommodate a specific field or system condition.

5. Electrical Connection and Mechanical Features

5.1 Dimensions

All transformers shall have dimensions as per CSA C227.4.

5.2 Transformer Tank, Doors and Sill

The transformer tank, doors, and sill shall be manufactured as per CSA C227.4.

The purchaser may specify for the transformer tank, doors and sill to be constructed from Stainless Steel Type 304L.

5.3 Fusing

Bayonet fuse assembly and warning labels shall conform to CSA C227.4 Clause 5.3, and all sub-clauses. Transformers shall be protected by a removable "Bay-O-Net" expulsion fuse link, in series with a partial range current-limiting fuse.

Each unit shall come fully equipped with an interlocking device such that the fuses cannot be removed unless the load break switch for the transformer winding is in the open position, as per CSA C227.4 Clause 10(c).

5.4 Maximum Indicating Thermometer

All units shall be equipped with a maximum indicating thermometer, as per CSA C227.4 Clause 10(j).

6. Bushings, Terminals, and Grounding

6.1 High Voltage Bushing Inserts

High Voltage Busing inserts shall not be supplied.

6.2 Low-Voltage Bushings

Low voltage bushings must be spade type, and suitable for use with copper or aluminum cable lugs. They shall be in accordance with CSA C227.4 Clause 6.1.3 and all sub-clauses. All transformers shall have 8-hole spades as per CSA C227.4 Figure 11(c).

7. Switches

7.1 Load Break Switches

All transformers shall be supplied with 3 load break switches, arranged in accordance with CSA 227.4 Figure 2. Load break switches shall conform to CSA C227.4 Clause 5.1.12. and all sub clauses with clear nomenclature indicating open and closed positions.

8. Losses

8.1 Loss Formula

For the purpose of tender comparison, the LDC shall use the following formula for the evaluation of transformer losses:

$$\text{Present value of losses} = 7.4 \times L + 22.4 \times N (\$)$$

Where:

L = Full load losses in Watts @ rated voltage and kVA, corrected to 85°C

N = No load losses in Watts @ 105% of rated voltage, corrected to 85°C

8.2 Total Owning cost

The present value of losses (see formula ①) shall be added to the tender price to arrive at the Total Owning Cost (TOC). Tender award not necessarily depend on the lowest TOC, but shall also include other considerations such as delivery, manufacturing quality, and historical quality of contract performance.

8.3 Guaranteed Losses

The manufacturer shall provide the guaranteed values for no-load and full load losses. For dual voltage transformers, losses are to be specified for each voltage. A penalty will be imposed using the above equation if the no-load losses or the load losses exceed the guaranteed value. No credit will be given if the losses are lower than the guarantees.

In cases where the final average measured losses of identical units exceed the guaranteed values, the purchaser reserves the right to reject all of said units. If the purchaser should choose to accept these units, the manufacturer shall reimburse the purchaser for the additional cost of the transformer losses, which will be deducted from the manufacturer's invoice.

In order to assess the value of non-guarantee, the average value of the measured no load and full load losses, taken from all of the identical units or order, will be used as the basis for the losses calculation. In recognition of the inconsistent quality of the core steel, however, the cost of losses will be calculated as follows:

1. If the no load losses exceed the guarantee while the full load losses are within the guarantee, the calculation for the cost of losses will be based on the no load losses component of formula ②.
2. If the no load losses are within guarantee while the full load losses exceed the guarantee, the calculation for the additional cost of losses will be based on the full load losses component of formula ② only.
3. If both no load and full load losses exceed the guarantee, the calculation for the cost of losses will be based on formula ②.

$$\text{Loss Penalty} = (7.4 \times \Delta L + 22.4 \times \Delta N) \times (\# \text{ of Units in Order}) \quad \text{②}$$

where:

$$\Delta N = (\text{Average Actual No Load Losses in Watts}) - (\text{Guaranteed No Load Losses in Watts})$$

$$\Delta L = (\text{Average Actual Full Load Loss in Watts}) - (\text{Guaranteed Full Load Loss in Watts})$$

9. Exterior Finish

The exterior finish colour shall be Equipment Green Munsell 9GY1.5/2.6 as per CSA C227.4 Clause 8.2.

10. Drawings

When tendering, 2 copies of the following drawings shall be submitted. One copy will be returned to the manufacturer with comments/approval. Drawing re-submission may be necessary if major changes are necessary. Final approved drawings must be secured before start of manufacturing.

- Outline and dimensions
- Name plate data as detailed in CSA C227.4

11. Tests and Inspection:

11.1 Type Tests

Upon request, the manufacturer shall supply a record of type tests listed in Clause 7.4.2 of CSA C227.4. Test data may be provided from tests performed on other units equivalent to those being purchased.

11.2 Routine Tests

All routine tests listed in Clause 7.2 of CSA C227.4 shall be performed on each unit and a report shall be submitted to the LDC for approval prior to delivery of the transformers. The LDC reserves the right to reject any units that do not comply with the requirements stated herein.

11.3 Variations

The purchaser has the right to reject any unit whose test results are outside the allowable tolerance limits stated in CSA C227.4.

11.4 Inspection

Transformers may be inspected or test-witnessed by the LDC representative. The manufacturer shall advise the LDC of four production days prior to test dates.

11.5 Delivery and Shipping

The manufacturer shall quote a guaranteed delivery date(s). Transformers shall be ready for shipment on time as noted on the P.O., but shipment will only be made when authorization is given by the LDC. Authorization may be dependent on review and approval of routine tests provided in 11.2. Any delay preventing the LDC from meeting customer's requirement will cause a penalty of maximum 10% of the price of delayed shipment.

The manufacturer shall take all necessary precautions to avoid, and will be responsible for, any damage to the unit, both internally and externally during shipment.

12. Guarantees

Any transformer found damaged upon arrival, or malfunction under normal operating conditions for a period of one year from its in-service date or 24 months after delivery will be returned to the manufacturer for repair or replacement at the manufacturer expense. Any claims against the transport company will be the responsibility of the manufacturer.