CCKT Interrogatory No. 1:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, Concerned Citizens of King Township ("CCKT") states that consistent with its letter of September 12, 2009 they continue to believe that the York Energy Centre's ("YEC") Application is premature. In the absence of any certainty about the ability of Pristine Power Inc. to start construction and operation, the YEC's ability to participate reliably is affected.

- Lake Simcoe Region Conservation Authority ("LSRCA") has not recommended approval of the site plan. LSRCA issued an update to their assessment on December 3, 2009. They do acknowledge that the proponent has addressed many of their earlier identified concerns but their review is not complete. I have confirmed in a telephone conversation with Michael Walters, Director Watershed Management that their review is not yet complete.

- In their December 3rd letter LSRCA clearly states that safe access has not yet been resolved. The provision of safe access (depth of flooding not to exceed 0.3 meters) to the site is a requirement of the LSRCA's Watershed Development Policies. Further, it is our understanding that the LSRCA Board will be having a meeting with the Authority's legal counsel to discuss the application with respect to the Provincial Policy Statement. The latter has not yet occurred. Further communication with LSRCA indicates that the Board will likely not be ruling on the application until January.

- There is significant debate on the conformity of the proponent's proposal with Provincial Policy Statement (2005). As the proponent has already referred the site plan approval to the Ontario Municipal Board it is reasonable to conclude that conformity will be judged by the OMB. The hearing at the OMB has not been scheduled yet.

- As indicated in our November 6th letter to the OEB we are sceptical of the robustness of the YEC's Stage 2 Archaeological Assessment dated May, 2009 ("Archaeological Report"). We have commissioned a Peer Review and are anticipating results early in the new year. We do acknowledge that YEC's Legal Counsel has informed us that a clearance letter was issued by Ministry of Culture on August 26 and that an Archaeological Clearance letter was subsequently issued October 8. Notwithstanding this, pending the peer review results more studies may be appropriate given the risk of destroying significant archaeological artefacts from the Paleo-Indian period, and which had been established as part of a registered Paleo-Indian site in 1982.

Response

As noted, YEC has appealed to the Ontario Municipal Board ("OMB") for site plan approval. The matter of safe access and all other issues raised by the LSRCA, including conformity with the Provincial Policy Statement, are being addressed as part of the OMB process. The OMB hearing is scheduled to take place on February 2, 2010.

As indicated in a letter to the Board Secretary from Dillon Consulting, dated November 19, 2009, all archaeological matters have been properly addressed to the satisfaction of the appropriate authorities.

CCKT Interrogatory No. 2:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, CCKT states that flooding is common in the area and they are most concerned that in a flood, York Energy Centre will not be able to evacuate workers and emergency vehicles will not be able to reach the generator. A small fire could go uncontrolled and result in the total loss of the generator for months.

Questions

1. With the improvements coming to the canal and dyke system, and in a flood event that causes the water on the outside of the Holland Marsh to reach the top of the dykes but not to breach them, what would the water levels be on Dufferin Street from the canal bridge to the intersection with the Claireville line?

2. What would the water levels be on Dufferin Street from the canal bridge to the intersection with the Claireville line for a flood event that causes the dyke system to be breached?

Response

The matter of safe access and all other issues raised by the LSRCA are being addressed as part of the OMB process. Please refer to YEC Response to CCKT Interrogatory No. 1.

CCKT Interrogatory No. 3:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, CCKT states it has "no information regarding whether the YEC has submitted applications for its Certificate of Approval for Industrial Sewage Works and Certificate of Approval for Air and Noise to the Ministry of the Environment ("MOE"). These applications were anticipated to be submitted in July, 2009."

Request

1. CCKT requests copies of the application in the event they have been submitted.

2. CCKT requests a comprehensive list of all approvals (major and minor) required for the York Energy Centre Generation Project.

Response

1. YEC declines this request. Final Certificates of Approval for both Air and Industrial Sewage Works have been obtained from the Ontario Ministry of the Environment. The content of the applications giving rise to these approvals is not considered by YEC to be relevant to YEC's ability to own and operate a generation station and to participate reliably in the energy market.

2. A listing of the other regulatory approvals required for the construction and operation of the Project was provided at Attachment A to the Application. YEC's reference to and omission of "minor approvals" from Attachment A was based on the fact that minor approvals can be dependent upon the outcome of major approvals and in any event subject to change. For example, approvals for signage may be dependent upon the outcome of the applied-for the Site Plan and/or Building Permit. YEC notes that all regulatory approvals (major and minor) required for the construction and operation of the Project will be obtained before electricity is generated under the applied-for license. Given this, the requested information relating to "minor approvals" is not considered by YEC to be relevant to the Board's consideration of YEC's ability to own and operate a generation station or participate reliably in the energy market.

CCKT Interrogatory No. 4:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, CCKT states that the Ontario Power Authority has said that Northern York Region is served by only one major transmission line. Much of the rationale for the York Energy Centre generator is based on a need to provide an alternate source of power should the Claireville line be incapacitated.

Having seen the recent effects of ice storms and tornados, CCKT states it was quite hopeful that the YEC would indeed solve the problem of "all our eggs in one basket", the basket being the Claireville line.

With the cancellation of a new south-eastern transmission line to bring power to the Armitage TS from a second source, CCKT understood the rationale for the rating scale in the OPA's Request for Proposal for potential generator locations: sites at Armitage or on the Armitage tap line were preferred over sites on the Claireville line. CCKT also considered that the "islanding" feature made explicit in the July final version of the RFP made sense – construct the new generator in such a manner that the maximum reliability of power in northern York Region was achieved.

Requests

1. Will the YEC achieve a B or C connection (as defined in the RFP) to the IESO-controlled grid?

2. Will the YEC provide the islanding capability defined in the RFP?

3. Have the IESO Connection Assessment and the Customer Impact Assessments been completed? If so, please provide copies of each? If they have not been completed, when will they be?

4. Since the connection point is different than was proposed in the original response to the OPA's Request for Proposal, has YEC informed First Nations of their new connection point? If so, please provide a copy of the letter.

Response

1. The requested information concerns the criteria determined and used by the Ontario Power Authority ("OPA") in its Request for Proposal ("RFP") process. While the YEC Project was selected by the OPA in that RFP process YEC is not in the position to comment on how OPA considered its criteria or the basis upon which it made its selection determination. In any event, YEC does not consider historical RFP criteria relevant to the relief now sought or relevant to the purpose of this interrogatory process,

namely, obtaining an understanding of YEC's ongoing ability to own and operate a generation station and its ability to participate reliably in the energy market. YEC therefore declines to provide a response.

2. Please refer to YEC's Response to CCKT Interrogatory 4 part 1 above.

3. The Independent Electric System Operator ("IESO") System Impact Assessment Report and Hydro One Customer Impact Assessment have been completed. Attached please find a copy of the Final System Impact Assessment Report issued by the IESO on December 8, 2009. The Customer Impact Assessment (CIA) Study is a requirement of the Ontario Energy Board ("OEB") to assess the potential impacts of the proposed York Energy Center on the existing transmission connected customer(s) in the vicinity of the facility. The assessment is undertaken by Hydro One on a confidential basis. While Hydro One has provided YEC with a copy of the CIA, YEC is not permitted to publicly disclose its contents.

4. The new connection point was considered in the Environmental Review Report submitted to the Ontario Ministry of the Environment in October, 2008 and subsequently approved in August, 2009. The new connection point is located on property owned by York Energy Centre LP and connects to an existing Hydro One transmission line situated within an existing right of way. The area is situated on privately owned lands and not within a treaty area or situated upon traditional lands or lands in which First Nations have asserted aboriginal rights.

CCKT Interrogatory No. 5:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, CCKT states that the Chippewas of Georgina Island are planning to produce in total 120 MW renewable energy. Accordingly, Chief Donna Big Canoe of the Chippewas wrote a letter to York Energy Centre in October 2008, about this project. (CCKT believes this letter should have been included in the Stakeholder Report of the Environmental Review Report but a copy could not be found). It is also CCKT's understanding that the renewable energy produced by the Chippewas is fed into the Claireville line.

CCKT states it can appreciate that YEC may consider the question below to be the responsibility of the OPA to answer and therefore is not appropriate for this process. CCKT believes the question is relevant to this process as it is sure that the OEB's interest in assessing the ability of the proponent to operate reliably is on the basis that renewables should not be constrained.

Requests

1. Has a System Impact Assessment been conducted on the Claireville line to ensure that there is capacity for the both the 393 MW planned by YEC and the 120 MW renewable energy planned by the Chippewas of Georgina Island in addition to whatever is already being transmitted?

Response

1. System Impact Assessments are the responsibility of the IESO. YEC has received the Final System Impact Assessment Report for the proposed connection of YEC. Please refer to YEC's Response to CCKT Interrogatory 4 part 3. YEC is not in a position to comment on any other System Impact Assessment Reports that the IESO may or may not have conducted for other generators.

CCKT Interrogatory No. 6:

Preamble

In its letter to the Ontario Energy Board dated December 16, 2009, CCKT states its concern that large gas-fired generators are a relatively new component of the Ontario power grid. As they are new to Ontario, they may also be new to companies such as Pristine replying to OPA procurement RFPs. CCKT states its expectation that a company with practical experience building and operating large gas-fired generators would produce a reliable product. Similarly, a company new to the field might use their first large generator as a proving ground for their corporate expertise. With only one transmission line serving northern York Region, CCKT states that it cannot afford to be a test bed.

Requests

1. What is the name, location and capacity of the largest gas-fired generator that Pristine Power Inc has built in the last three years?

2. What is the name, location and capacity of the largest generator that Pristine Power Inc has operated for the past 12 months?

3. If the answer to either of the above two questions is a generator of less than 200 megawatts capacity, what steps will Pristine take to ensure that the YEC will be built and operated in a reliable manner?

Responses

1. Please refer to information provided in Attachment B and Attachment D to the Application. Members of the management team at Pristine Power Inc. have been involved in the development of power generation projects having the capacity to produce in excess of 5,000 MW. On average, the management team possesses 22 years of experience in the power industry.

2. Pristine Power Inc. currently operates the 84 MW East Windsor Cogeneration Centre in Windsor, Ontario.

3. Pristine is committed to the successful construction and operation of YEC. YEC has executed a contract with Siemens Energy Inc. for the supply of two gas turbine generator packages and has executed a contract with Lill and DiFazio Constructors Canada for the engineering, procurement and construction of the YEC. Pristine Power Inc. will operate YEC by employing an experienced facility manager and six qualified employees dedicated to the operation and maintenance of the facility. In addition, if required, YEC may choose to employ remote operations capability. Maintenance for the gas turbines

will be supplemented by a Long-Term Service Agreement with Siemens and capital has been allocated to the establishment of a spare parts pool.

CCKT Interrogatory No. 7:

Preamble

The Applicant's public financial statements show an inadequate capital structure to assure any kind of reliability. Further, their operating statements indicate a company whose investments are producing negative returns on investment. This puts in to question their ability to continue operations on an on-going and long term basis, and to deliver contracted product for the duration of the term of the agreement.

There have been statements made by Pristine Power Inc with regard to sources of financing featuring a partnership with Harbert. As CCKT understands that Harbert is a US entity funded by private equity and that the private equity market is not strong, CCKT believes that more information about the structure of the partnership is required.

Requests

1. What are the assurances that the promised capital from Harbert will materialize?

2. In the agreement with Harbert, are there any "performance measurements" which would trigger an opportunity for Harbert to withdraw from the partnership?

3. What are the financial contingencies to respond to construction delays which would delay earning a revenue stream and which would likely trigger a financial penalty from the Ontario Power Authority? (Given CCKT's understanding that Pristine Power Inc's track record does not include constructing a plant of this size, it is sound financial planning to consider this possibility.)

4. What are the financial contingencies to manage a cost overrun of minimum 10% which is not unusual?

5. The project has been identified as being a $365 million capital project. What is Harbert's share? How is Pristine Power financing the remainder given that their market capitalization is $50 million?

Response

York Energy Centre LP, owner of the facility, is a partnership between Pristine Power Inc., Harbert York Canada Company and York Energy Centre Inc. The partnership has executed agreements that set out the rights of ownership and the responsibilities of both parties to fund the partnership.

The partners have spent considerable time and resources developing the project and have outstanding credit posted with counterparties to secure the continued development, construction and operations of the facility. The partners will be called upon to provide additional equity funding to the project, as required, and the partners are making significant progress toward securing non-recourse debt financing through a syndicate of financial institutions. Project costs have been conservatively estimated and include contingencies where appropriate. In addition, YEC has negotiated with key suppliers and contractors terms and conditions that significantly reduce the risk of cost overruns or financial penalties resulting from delays, including price, performance specifications, delivery date guarantees, warranties and other performance assurances.

The total capital cost of the York Energy Centre is estimated to be approximately $365 million. YEC's financing plan consists of funding the total project cost through non-recourse debt of up to 80% or approximately $292 million, with the remaining $73 million project equity funded by cash contributions by the partners. Pristine Power Inc.'s equity contribution is estimated to be between $21 million and $31 million, net of a 2% success fee. To the extent that the project returns exceed a threshold rate of return, Pristine's partner will fund a disproportionately higher equity contribution, based on a predefined formula. Based upon current project economics, expected returns and the above financing assumptions, Pristine currently anticipates being able to fund its proportionate equity interest in YEC from cash on hand.

Until financial close, Pristine expects to internally fund development costs and equipment deposits. Funds advanced by Pristine to YEC will form part of its required equity contribution at financial close. Any excess would be refunded at that time. Pristine retains the right to call on Harbert's capital prior to financial close for up to 50% of project costs incurred to date. To the extent that Pristine exercises such right, the additional equity contribution of Harbert over and above its 50% share is reduced in accordance with a predefined formula. Performance security and other forms of security required up to debt financing are expected to be shared equally by the partners.

YEC RESPONSE TO CCKT INTERROGATORY NO. 4 - PART 3
ATTACHMENT #1

IESO SYSTEM IMPACT ASSESSMENT REPORT

REPORT

Power to Ontario.
On Demand.

System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

Final

CAA ID: 2008-348
Project: York Energy Centre GS
Applicant: York Energy Centre LP

Market Facilitation Department
Independent Electricity System Operator

Date: December 8th, 2009

Document ID	IESO_REP_0564
Document Name	System Impact Assessment Report
Issue	Final
Reason for Issue	First issue
Effective Date	December 8th, 2009

System Impact Assessment Report

Acknowledgement

The IESO wishes to acknowledge the assistance of Hydro One in completing this assessment.

<u>Disclaimers</u>

IESO

This report has been prepared solely for the purpose of assessing whether the connection applicant's proposed connection with the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IESO should issue a notice of conditional approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

Conditional approval of the proposed connection is based on information provided to the IESO by the connection applicant and Hydro One at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by Hydro One at the request of the IESO. Furthermore, the conditional approval is subject to further consideration due to changes to this information, or to additional information that may become available after the conditional approval has been granted.

If the connection applicant has engaged a consultant to perform connection assessment studies, the connection applicant acknowledges that the IESO will be relying on such studies in conducting its assessment and that the IESO assumes no responsibility for the accuracy or completeness of such studies including, without limitation, any changes to IESO base case models made by the consultant. The IESO reserves the right to repeat any or all connection studies performed by the consultant if necessary to meet IESO requirements.

Conditional approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed facility to the IESO-controlled grid. However, the conditional approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant and the IESO in accordance with Chapter 4, section 6 of the Market Rules. The IESO assumes no responsibility to any third party for any use, which it makes of this report. Any liability which the IESO may have to the connection applicant in respect of this report is governed by Chapter 1, section 13 of the Market Rules. In the event that the IESO provides a draft of this report to the connection applicant, the connection applicant must be aware that the IESO may revise drafts of this report at any time in its sole discretion without notice to the connection applicant. Although the IESO will use its best efforts to advise you of any such changes, it is the responsibility of the connection applicant to ensure that the most recent version of this report is being used.

Hydro One

The results reported in this report are based on the information available to Hydro One, at the time of the study, suitable for a preliminary assessment of this transmission system reinforcement proposal.

The short circuit and thermal loading levels have been computed based on the information available at the time of the study. These levels may be higher or lower if the connection information changes as a result of, but not limited to, subsequent design modifications or when more accurate test measurement data is available.

This study does not assess the short circuit or thermal loading impact of the proposed facilities on load and generation customers.

In this report, short circuit adequacy is assessed only for Hydro One circuit breakers. The short circuit results are only for the purpose of assessing the capabilities of existing Hydro One circuit breakers and identifying upgrades required to incorporate the proposed facilities. These results should not be used in the design and engineering of any new or existing facilities. The necessary data will be provided by Hydro One and discussed with any connection applicant upon request.

The ampacity ratings of Hydro One facilities are established based on assumptions used in Hydro One for power system planning studies. The actual ampacity ratings during operations may be determined in real-time and are based on actual system conditions, including ambient temperature, wind speed and facility loading, and may be higher or lower than those stated in this study.

The additional facilities or upgrades which are required to incorporate the proposed facilities have been identified to the extent permitted by a preliminary assessment under the current IESO Connection Assessment and Approval process. Additional facility studies may be necessary to confirm constructability and the time required for construction. Further studies at more advanced stages of the project development may identify additional facilities that need to be provided or that require upgrading.

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Summary and Conclusions

The York Energy Centre (YEC) LP is to construct a new natural gas fired, simple cycle power plant on the Dufferin Street in the Township of King. The proposed facility, called York Energy Centre generation station (YEC GS), is a developmental project that will consist of two gas turbine generators (G1 & G2) rated at 204 MVA each in summer.

The YEC GS will be tapped to Hydro One's 230 kV double circuits B82V/B83V, on the section from Holland Marsh junction to Brown Hills TS. The tap point is between towers 846 and 847, about 500m from Holland Marsh junction. The YEC LP signed a contract with the Ontario Power Authority (OPA) to supply up to 400 MW of generation from YEC GS as part of the Northern York Region RFP. YEC GS is scheduled for electrical back feed in February 1^{st}, 2011 and for full commercial operation by November 1^{st}, 2011.

The following conclusions are achieved based on this assessment:

(1) The proposed connection arrangement and equipment for YEC GS are acceptable to the IESO.

(2) The voltage performance and thermal loading with the proposed YEC GS are expected to be acceptable under both pre-contingency and post-contingency operating conditions.

(3) The proposed generator control systems for G1 and G2 are expected to meet the applicable performance requirements in the Market Rules.

(4) YEC generators G1 and G2 and the power system are expected to be transiently stable following fault conditions.

(5) Provided that the generator's facilities are designed and constructed to satisfy the Ontario Electricity Market Rules requirements for generators, including the requirements specified in this report, and provided the generator's facilities are connected as described in this report, YEC GS will be granted final approval via the IESO Market Entry process to be connected to the IESO-controlled grid and to participate in the IESO-administered market.

NOCA and IESO Requirements

Notification of Approval

The proposed connection of YEC GS, subject to the requirements specified in this report, is expected to have no material adverse impact on the reliability of the integrated power system.

It is recommended that a *Notification of Conditional Approval for Connection* be issued for the YEC GS project subject to the implementation of the requirements outlined in this report.

IESO Requirements

A. The YEC LP

Provided the generator's facilities are designed and constructed to satisfy the Market Rules requirements for generators, including the requirements specified in this report, and provided the generator's facilities are connected as described in this report, YEC GS will be granted final approval via the IESO Market Entry process to connect to the IESO-controlled grid and to participate in the IESO-administered market.

Final connection of this project may be subject to additional requirements specified in the Hydro One's Customer Impact Assessment.

The IESO has the following requirements:

1. The connection applicant must complete the IESO Facility Registration/Market Entry process in a timely manner before IESO final approval for connection is granted. Models and data, including any controls that would be operational, must be provided to the IESO. This information should be submitted at least seven months before energization to the IESO-controlled grid, to allow the IESO to incorporate this project into IESO work systems and to perform any additional reliability studies.

   If the submitted models and data differ materially from the ones used in this assessment, then further analysis of the project will need to be done by the IESO.

2. As part of the IESO Facility Registration/Market Entry process, the connection applicant must provide evidence to the IESO confirming that the equipment installed meets the Market Rules requirements and matches or exceeds the performance predicted in this assessment. This evidence shall be either type tests done in a controlled environment or commissioning tests done on-site. In either case, the testing must be done not only in accordance with widely recognized standards, but also to the satisfaction of the IESO. Until this evidence is provided and found acceptable to the IESO, the Facility Registration/Market Entry process will not be considered complete and the connection applicant must accept any restrictions the IESO may impose upon this project's participation in the IESO administered market or connection to the IESO-controlled grid.

   The evidence must be supplied to the IESO within 30 days after completion of commissioning tests. Failure to provide evidence may result in disconnection from the IESO-controlled grid.

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3. The facility must satisfy the Generator Facility requirements in Appendix 4.2, References 1 to 16 of the Market Rules.

4. The proposed facility shall have the capability to start-up, synchronize and provide electricity to the IESO-controlled grid after a permanent fault occurs on the double circuits B82V/B83V and the faulted section is isolated.
5. The 230-kV equipment in the facility must have a maximum continuous voltage rating of at least 250 kV.
6. Fault interrupting devices must be able to interrupt fault current at the maximum continuous voltage of 250 kV.
7. If revenue metering equipment is being installed as part of this project, please be aware that revenue metering installations must comply with Chapter 6 of the IESO Market Rules for the Ontario electricity market. For more details the applicant is encouraged to seek advice from their Metering Service Provider (MSP) or from the IESO metering group.
8. Synchronizing circuit breakers must be capable of withstanding at least a 2 pu voltage across their open terminals.
9. The Transmission System Code (TSC) requires that new equipment be designed to sustain the fault levels in the area where the equipment is installed. If any future system enhancement results in an increased fault level higher than the equipment's capability, the applicant is required to replace the equipment at its own expense with higher rated equipment capable of sustaining the increased fault level, up to the TSC's maximum fault level of 63 kA for the 230 kV system.

   The TSC also requires that all 230 kV circuit breakers have a rated interrupting time of three cycles (50 ms) or less.
10. Connection equipment must be designed so that the adverse effects of their failure on the IESO-controlled grid are mitigated. This includes ensuring that all circuit breakers fail in the open position.

    Connection equipment must be designed so that it will be fully operational in all reasonably foreseeable ambient temperature conditions. This includes ensuring that SF6 circuit breakers are equipped with heaters to maintain adequate gas pressure.
11. Protection systems must be designed to meet all the requirements of the Transmission System Code as specified in Schedules E, F and G of Appendix 1 (Version B) and any additional requirements identified by the transmitter. New protection systems must be coordinated with existing protection systems.
12. Facilities must be protected by two redundant protection systems according to section 8.2.1a of the TSC. These redundant protection systems must satisfy all requirements of the TSC but in particular they may not use common components, common battery banks or common secondary CT or PT windings.
13. Protective relaying must be set to ensure that transmission equipment remains in-service for voltages between 94% of the minimum continuous and 105% of the maximum continuous values in the Market Rules, Appendix 4.1.
14. The applicant is required to have adequate provision in the design of protections and controls at the facility to allow for future installation of Special Protection Scheme (SPS) equipment.
15. The connection applicant is required to initiate an assessment of the existing protection systems with the transmitter.
16. Protection systems within the facility must operate correctly to only trip the appropriate equipment required to isolate the fault. After the facility begins commercial operation, if the improper tripping of the 230 kV circuits B82V and B83V occurs due to events within the facility,

the facility may be required to be disconnected from the IESO-controlled grid until the problem is resolved.

17. The design of protection and control at the facility must not preclude the installation of protection and control facilities for generation rejection should they be required in the future.
18. The facility must be capable of operating continuously for grid frequencies in the range between 59.4 Hz and 60.6 Hz as specified in Appendix 4.2, Reference 3 of the Market Rules.
19. The facility must be capable of operating at full active power for a limited period of time for grid frequencies as low 58.8 Hz. Generators must not trip for under-frequency system conditions that are below 60 Hz but above 57.0 Hz and above the curve shown in Figure 1.
20. In accordance with the telemetry requirements for a generation facility (see Appendices 4.15 and 4.19 of the Market Rules) the connection applicant must install equipment at this project with specific performance standards to provide telemetry data to the IESO. The data is to consist of certain equipment status and operating quantities which will be identified during the IESO Market Entry Process.
21. As part of the IESO Facility Registration/Market Entry process, the connection applicant must also complete end to end testing of all necessary telemetry points with the IESO to ensure that standards are met and that sign conventions are understood. All found anomalies must be corrected before IESO final approval to connect any phase of the project is granted.
22. Prior to connecting to the IESO controlled grid, the proposed facility must be compliant with the applicable reliability standards set by the North American Electric Reliability Corporation (NERC) and the North East Power Coordinating Council (NPCC). A list of applicable standards, based on the proponent's/connection applicant's market role/OEB licence can be found here: http://www.ieso.ca/imoweb/ircp/reliabilityStandards.asp .
23. The NERC Critical Infrastructure Protection (CIP) cyber security standards (CIP-002 to CIP-009) require the use of a risk-based methodology to identify critical assets, which must then be protected. We have developed the methodology for Ontario, in collaboration with market participants, and applied it to the proposed facility. The facilities identified in this connection assessment meet the critical asset criteria, and must comply with CIP-002 to -009 as part of the standards identified above.
24. The facility must operate in voltage control mode. Operation of the facility in power factor control or reactive power control is not acceptable unless approved by the IESO.
25. All plant auxiliaries at YEC GS must be capable of operating continuously for all normal voltage variations on the 230-kV power system. These voltage variations are expected to range from 220 kV to 250 kV.

B. Hydro One

The IESO has the following requirements and one recommendation:

1. The transmitter shall identify any relay protection modifications (equipment and settings) required to incorporate the new facility.
2. To allow sufficient time to assess the impact on system reliability, the transmitter must submit to the IESO any proposed relay protection changes as soon as the protection assessment for the new facility is finished but at least six (6) months before any actual changes are to be implemented on the existing protection systems.

3. It is recommended that Hydro One install on each circuit of B82V and B83V two isolating devices: one device at York Energy Centre Junction, on the section from York Energy Centre Junction to Brown Hill TS, and the other at Holland Junction, on the section from Holland Junction to Woodbridge Junction.

– End of Section –

1. Introduction

The purpose of this System Impact Assessment (SIA) is to examine the system impact of the proposed York Energy Centre generation station (YEC GS), which is to be located on Dufferin Street in the Township of King, on the reliability of the integrated power system.

York Energy Centre LP (YEC LP) has signed a contract with the Ontario Power Authority (OPA) to supply up to 400 MW of generation from the proposed YEC GS as part of the Northern York Region RFP.

In particular, this report assesses the changes in the proposed connection arrangement, compares the performance characteristics of the proposed generators where possible and associated equipment against the Market Rules standards, analyzes the adequacy of the short circuit capability of the local transmission system with the proposed facility connected, and assesses the impact of the proposed facility on the local transmission system.

The report also provides YEC LP a list of requirements to the proposal to ensure that the new facility, when connected, will not have a material adverse impact on the reliability of the integrated power system, and also points out significant Market Rules requirements for generators.

YEC GS is scheduled for electrical back feed in February 1st, 2011 and for full commercial operation by November 1st, 2011.

– End of Section –

2. Proposed Project Details

The YEC GS is located on the Dufferin Street in the Township of King. The approximate geographic location relative to Claireville TS to Minden TS 230kV transmission corridor is shown in Figure 2.

The YEC GS will be tapped to Hydro One's 230 kV double circuits B82V/B83V on the section from Holland Marsh junction to Brown Hills TS. The tap point is between towers 846 and 847, about 500 m from Holland Marsh junction. The facility is about 200 m away from the tap point. The YEC single-line diagram is shown in Figure 3.

The YEC GS consists of two gas fired simple cycle generators G1 & G2 each having a nominal summer rating of 204 MVA at an air ambient temperature of 35^{O}C. Each generator will have a dedicated 16.5kV LV breaker and generator step up (GSU) transformers to raise the voltage from 16.5kV to the transmission voltage level of 238kV at nominal conditions.

Generator G1 is connected through the generator-breaker T1G1 to GSU Transformer T1. There is a 230 kV circuit breaker B82V-T1 at the HV side of T1. The circuit breaker is connected to an isolating disconnect switch B82V-L1. This disconnect is still located within the GS property and connected to the tap point on B82V though an overhead line. Likewise, the generator G2 is connected through the generator-breaker T2G2 to GSU Transformer T2. There is a 230 kV circuit breaker B823-T2 at the HV side of T2. The circuit breaker is connected to an isolating disconnect switch B83V-L2, which is in turn connected to the tap point on B83V though an overhead conductor. As required by the Transmission System Code (TSC), both disconnect switches (B82V-L1, B83V-L2) are motorized switches.

Both transformers T1 and T2 are connected wye-ground on the HV 230kV side and delta on the LV 16.5kV side and rated at ONAN/ONAF/ONAF of 155/210/260 MVA sized to carry maximum generation from each unit. The impedance HV-LV winding will satisfy the 13% rule for voltage control at a constant 230 kV voltage and translates to about 7.5% on 155MVA.

There is a normally-open tie bus breaker 52-T1T2 that can be closed to enable the outputs from both units to flow out on one circuit B82V or B83V in the event that one of the companion circuits is out of service and directed by the system operator per the operating agreement. Inter-locking mechanism will be installed to prevent paralleling of the circuits via the tie breaker. Tie breaker 52-T1T2 can only be closed if either (i) disconnects switch 89-B82V-L1 or breaker 52-B82V-T1 is in the open positions, or (ii) disconnects switch 89-B83V-L2 or breaker 52-B83V-T2 is open.

– End of Section –

3. General Requirements

Facility Registration/Market Entry

1. The connection applicant must complete the IESO Facility Registration/Market Entry process in a timely manner before IESO final approval for connection is granted. Models and data, including any controls that would be operational, must be provided to the IESO. This information should be submitted at least seven months before energization to the IESO-controlled grid, to allow the IESO to incorporate this project into IESO work systems and to perform any additional reliability studies.

   If the submitted models and data differ materially from the ones used in this assessment, then further analysis of the project will need to be done by the IESO.

2. As part of the IESO Facility Registration/Market Entry process, the connection applicant must provide evidence to the IESO confirming that the equipment installed meets the Market Rules requirements and matches or exceeds the performance predicted in this assessment. This evidence shall be either type tests done in a controlled environment or commissioning tests done on-site. In either case, the testing must be done not only in accordance with widely recognized standards, but also to the satisfaction of the IESO. Until this evidence is provided and found acceptable to the IESO, the Facility Registration/Market Entry process will not be considered complete and the connection applicant must accept any restrictions the IESO may impose upon this project's participation in the IESO administered market or connection to the IESO-controlled grid.

   The evidence must be supplied to the IESO within 30 days after completion of commissioning tests. Failure to provide evidence may result in disconnection from the IESO-controlled grid.

Generators

1. The proposed facility must satisfy the Generator Facility requirements in Appendix 4.2, References 1 to 16 of the Market Rules.

In particular, references 1 and 2 require that a synchronous generator connecting to the IESO-controlled grid must have the minimum capability to perform the following:

- Supply reactive power continuously at all active power outputs in the range of 90% lagging to 95% leading power factor based on rated active power at its generator terminals for at least one constant 230 kV system voltage, and
- Supply rated active power continuously while operating at a terminal voltage ranging from 0.95 pu to 1.05 pu of the generator's rated terminal voltage.

The above two requirements effectively limit the impedance between the generator terminals and HV side of the transformer to a maximum of 0.13 pu based on the MVA rating of the generator(s), which is normally based on the maximum continuous active power rating at a 90% power factor. However, if a generator is capable of supplying the full reactive power range at its terminals for at least one constant system voltage while operating at a terminal voltage outside the range between 0.95 pu and 1.05 pu, the effective maximum impedance allowed between the generator terminals and the HV side of the generator step-up transformer could be higher than 0.13 pu.

Connection Equipment (Circuit breakers, Disconnects, Transformers, Buses)

Appendix 4.1, reference 2 of the Market Rules states that under normal conditions voltages are maintained within the range of 220 kV to 250 kV. Thus, the IESO requires that the 230kV equipment in Ontario must have a maximum continuous voltage rating of at least 250 kV.

1. The 230-kV equipment in the facility must have a maximum continuous voltage rating of at least 250 kV.

2. Fault interrupting devices must be able to interrupt fault current at the maximum continuous voltage of 250 kV.

3. If revenue metering equipment is being installed as part of this project, please be aware that revenue metering installations must comply with Chapter 6 of the IESO Market Rules for the Ontario electricity market. For more details the applicant is encouraged to seek advice from their Metering Service Provider (MSP) or from the IESO metering group.

4. All synchronizing circuit breakers must be capable of withstanding at least a 2 pu voltage across their open terminals.

The Transmission System Code (TSC), Appendix 2 establishes maximum fault levels for the transmission system. For the 230 kV voltage level, maximum 3-phase symmetrical fault level is 63 kA and single line to ground (SLG) symmetrical fault level is 80 kA (usually limited to 63 kA).

5. The Transmission System Code (TSC) requires that new equipment be designed to sustain the fault levels in the area where the equipment is installed. If any future system enhancement results in an increased fault level higher than the equipment's capability, the applicant is required to replace the equipment at its own expense with higher rated equipment capable of sustaining the increased fault level, up to the TSC's maximum fault level of 63 kA for the 230 kV system.

   The TSC also requires that 230 kV circuit breakers have a rated interrupting time of three cycles (50 ms) or less.

6. Connection equipment must be designed so that the adverse effects of their failure on the IESO-controlled grid are mitigated. This includes ensuring that all circuit breakers fail in the open position.

   Connection equipment must be designed so that it will be fully operational in all reasonably foreseeable ambient temperature conditions. This includes ensuring that SF6 circuit breakers are equipped with heaters to prevent freezing.

Protection Systems

1. Protection systems must be designed to meet all the requirements of the Transmission System Code as specified in Schedules E, F and G of Appendix 1 (Version B) and any additional requirements identified by the transmitter. New protection systems must be coordinated with existing protection systems.

2. Facilities designated as essential to power system reliability must be protected by two redundant protection systems according to section 8.2.1a of the TSC. These redundant protections systems must satisfy all requirements of the TSC but in particular they may not use common components, common battery banks or common secondary CT or PT windings. *This facility is designated as essential to power system reliability and therefore this protection requirement applies.*

3. Protective relaying must be set to ensure that transmission equipment remains in-service for voltages between 94% of the minimum continuous and 105% of the maximum continuous values in the Market Rules, Appendix 4.1.

4. The applicant is required to have adequate provision in the design of protections and controls at the facility to allow for future installation of Special Protection Scheme (SPS) equipment.

5. The connection applicant is required to initiate an assessment of the existing protection systems with the transmitter.

6. The transmitter shall identify any relay protection modifications (equipment and settings) required to incorporate the new facility.

The IESO will evaluate the impact on system reliability due to any relay protection modifications and in this regard changes to functionality, timing, or reach. The IESO will not assess aspects of protection systems which are solely the accountability of the transmitter (e.g. coordination of relay protections).

Send documentation for protection changes triggered by new or modified primary equipment (i.e. new or replacement relays) to connection.assessments@ieso.ca.

7. To allow sufficient time to assess the impact on system reliability, the transmitter must submit to the IESO any proposed relay protection changes as soon as the protection assessment for the new facility is finished but at least six (6) months before any actual changes are to be implemented on the existing protection systems.

8. Protection systems within the facility must operate correctly to only trip the appropriate equipment required to isolate the fault. After the facility begins commercial operation, if the improper tripping of the 230 kV circuits B82V and B83V occurs due to events within the facility, the facility may be required to be disconnected from the IESO-controlled grid until the problem is resolved.

9. The design of protection and control at the facility must not preclude the installation of protection and control facilities for generation rejection should they be required in the future.

10. The facility must be capable of operating continuously for grid frequencies in the range between 59.4 Hz and 60.6 Hz as specified in Appendix 4.2, Reference 3 of the Market Rules.

11. The facility must be capable of operating at full active power for a limited period of time for grid frequencies as low 58.8 Hz. Generators must not trip for under-frequency system conditions that are below 60 Hz but above 57.0 Hz and above the curve shown in Figure 1.

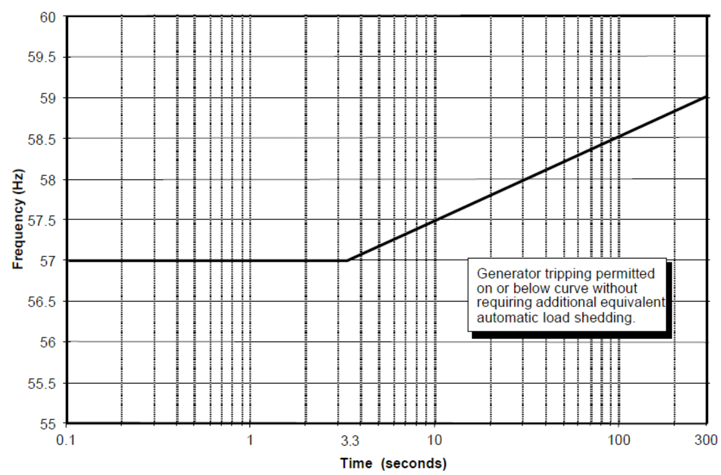


Figure 1: Setting for Grid Under-frequency Trip Protection

IESO Monitoring and Telemetry Data

1. In accordance with the telemetry requirements for a generation facility (see Appendices 4.15 and 4.19 of the Market Rules) the connection applicant must install equipment at this project with specific performance standards to provide telemetry data to the IESO. The data is to consist of certain equipment status and operating quantities which will be identified during the IESO Market Entry Process.

2. As part of the IESO Facility Registration/Market Entry process, the connection applicant must also complete end to end testing of all necessary telemetry points with the IESO to ensure that standards are met and that sign conventions are understood. All found anomalies must be corrected before IESO final approval to connect any phase of the project is granted.

Reliability Standards

1. Prior to connecting to the IESO controlled grid, the proposed facility must be compliant with the applicable reliability standards set by the North American Electric Reliability Corporation (NERC) and the North East Power Coordinating Council (NPCC). A list of applicable standards, based on the proponent's/connection applicant's market role/OEB licence can be found here:

http://www.ieso.ca/imoweb/ircp/reliabilityStandards.asp

2. The NERC Critical Infrastructure Protection (CIP) cyber security standards (CIP-002 to CIP-009) require the use of a risk-based methodology to identify critical assets, which must then be protected. We have developed the methodology for Ontario, in collaboration with market participants, and applied it to the proposed facility. The facilities identified in this connection assessment meet the critical asset criteria, and must comply with CIP-002 to -009 as part of the standards identified above.

In support of the NERC standard EOP-005, the proponent/ connection applicant may meet the restoration participant criteria. Please refer to section 3 of Market Manual 7.8 (Ontario Power System Restoration Plan) to determine its applicability to the proposed facility.

The IESO monitors and assesses market participant compliance with these standards as part of the IESO Reliability Compliance Program. To find out more about this program, visit the webpage referenced above or write to ircp@ieso.ca.

Also, to obtain a better understanding of the applicable reliability obligations and find out how to engage in the standards development process, we recommend that the proponent/ connection applicant join the IESO's Reliability Standards Standing Committee (RSSC) or at least subscribe to their mailing list at rssc@ieso.ca. The RSSC webpage is located at: http://www.ieso.ca/imoweb/consult/consult_rssc.asp.

Miscellaneous

1. The proposed facility must operate in voltage control mode. Operation of the facility in power factor control or reactive power control is not acceptable unless approved by the IESO.

2. All plant auxiliaries at YEC GS must be capable of operating continuously for all normal voltage variations on the 230-kV power system. These voltage variations are expected to range from 220 kV to 250 kV.

-End of Section-

4. Data Verification

4.1 Connection Arrangement

The YEC GS shown in Figure 3 will not reduce the level of reliability of the integrated power system and is, therefore, acceptable to the IESO.

4.1 Gas Turbine Generators

As per the Market Rules, Appendix 4.2, Reference 1, generators G1 and G2 must have the capability to supply reactive power continuously at all levels of active power outputs in the range of 90% lagging to 0.95% leading power factor based on rated active power at its generator terminals. Rated active power is defined as the lesser of the registered maximum continuous active power and 90% of the unit nameplate MVA.

Table 1: Generator Data

Gen#	Season	MVA	Rated PF	Max MW	kV	Q max Required	Q max Actual	Qmin Required	Qmin Actual
G1/G2	Summer	204	0.9	184	16.5	89	89	-61	-64
	Winter	243	0.9	219		106	106	-72	-75

Table 1 shows the generator data provided by the applicant. The actual reactive power is obtained based on the power capability curves. Table 1 indicates that the units would be able to provide the required capabilities.

The over-excitation limiters (OEL) and under-excitation limiters (UEL) for G1 and G2 must be set to allow the units to provide the required reactive power range based on the summer and winter maximum continuous ratings (MCRs) of each unit.

4.2 Generator Step-Up (GSU) Transformers

Table 2: Generator Step-Up Transformers Data

Rating (MVA) (ONAN/ONAF1/ONAF2)	Impedance (pu)		Taps
	S_B=155MVA	S_B=243 MVA	
155/210/260 MVA	0.0075+j0.075	0.0118+j0.118	OLTC: 226, 232, 238, 244, 250kV In-service off-load tap position: 238 kV

The impedance of each GSU transformer must be limited to a maximum of 0.13 pu based on the MVA rating of the connected generator. Table 2 shows the generator step-up transformer data provided by the applicant. The system base of 243 MVA is the maximum generation MVA under the winter condition as shown in Table 1. The impedance of GSU transformer is less than the required impedance of 0.13 pu.

In all cases, the transformer impedances are less than 13% when expressed on the generator's MVA rating. Therefore, the YEC generators should be able to supply the required full reactive power range based on rated active power for at least one constant 230 kV system voltage.

4.3 Connection Equipment

The connection equipment specifications are assessed based on information provided by the YEC LP.

4.3.1 230 kV Switches

Specifications for Motorized Switches B82V-L1 and B83V-L2:

Type	Disconnect
Voltage Rating	250 kV
Continuous Current Rating	2000 A
Short Circuit Symmetrical Rating	63 kA

All switches meet the maximum continuous voltage rating requirement of 250 kV.

4.3.2 230 kV Circuit Breakers

Specifications for Circuit Breakers B82V-T1 and B83V-T2:

Type	SF6
Voltage Rating	250 kV
Interrupting time rating	3 cycles (50 ms)
Continuous Current Rating	2000 A
Short Circuit Symmetrical Rating	63 kA

All the circuit breakers meet the maximum continuous voltage rating requirement of 250 kV. The interrupting time and short circuit symmetrical duty ratings meet the requirements of the Transmission System Code (TSC).

4.3.3 Connection Conductors

The tap lines from the facility to B82V/B83V consist of an overhead (O/H) circuit 200 m long. The characteristics and ratings of the lines are shown in Table 3.

Table 3: Tap Lines to B82V/B83V – Characteristics & Ratings

Conductor	Ambient Temp & Wind Speed	Continuous-93^{o}C or sag, whichever is lower (A)	Long-term Emergency 127 ^{o}C or sag, whichever is lower (A)	15 Minute – sag @ 100% pre-load (A)
1843.5 kcmil ASCR 72/7	35ºC & 4 km/hr (Summer)	1350	1750	1900
	10ºC & 4 km/hr (Winter)	1700	2000	2400

Based on ratings in Table 3, each tap line will be able to sustain the maximum output from both units at the same time should outage conditions require it.

4.4 Dynamic Models

(a) Generators

Table 4: Generator Dynamic Data – Model GENROU

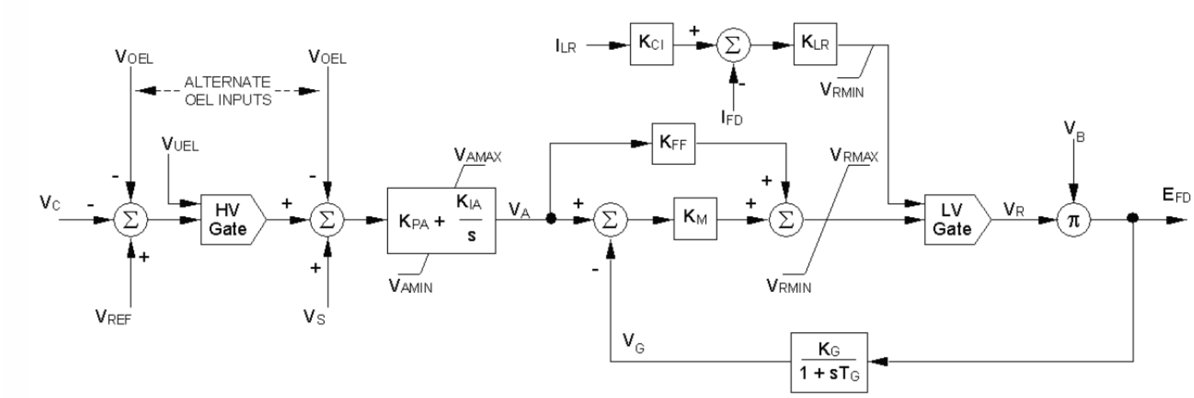
CONs	Value	Description
J	10.48	T'_{D0} (sec) (>0)
J+1	0.048	T''_{D0} (sec) (>0)
J+2	1.164	T'_{Q0} (sec) (>0)
J+3	0.087	T''_{Q0} (sec) (>0)
J+4	7.29	Inertia, H
J+5	0	Speed damping,
J+6	1.6932	X_D
J+7	1.6493	X_Q
J+8	0.215	X'_D
J+9	0.3889	X'_Q
J+10	0.1616	$X''_D = X''_Q$
J+11	0.1373	X_L
J+12	0.114	S(1.0)
J+13	0.489	S(1.2)

(b) Excitation Systems

Table 5: Excitation System Data – Model UST6B

CONs	Value	Description
J	0.012	T_R (sec)
J+1	100.0	K_{PA} (>0)
J+2	59.6	K_{IA}
J+3	0	K_{DA}
J+4	0	T_{DA} (sec)
J+5	6.4	V_{AMAX}
J+6	-5.1	V_{AMIN}
J+7	1	K_{FF}
J+8	1	K_M
J+9	1	K_{CI}
J+10	30	K_{LR}
J+11	3.74	I_{LR}
J+12	6.4	V_{RMAX}

J+13	-5.1	V_{RMIN}
J+14	1	K_G
J+15	0.02	T_G (sec) (>0)

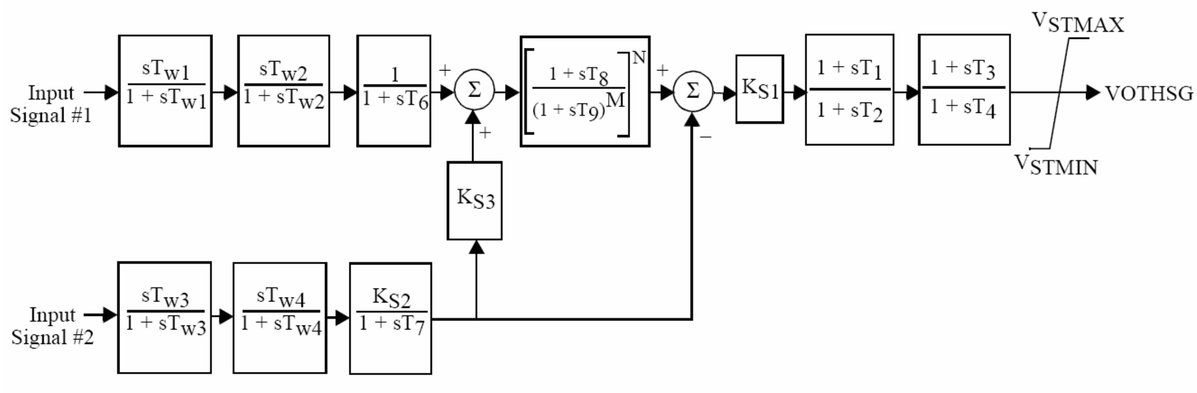


(c) Power System Stabilizers

Table 6: PSS Data – Model PSS2A

ICONs	Value	Description
IC	1	V_{S1} (ICS1), 1st stabilizer input code
IC+1	0	REMBUS1
IC+2	3	V_{S2} (ICS2), 2nd stabilizer input code
IC+3	0	REMBUS1
IC+4	5	M
IC+5	1	N

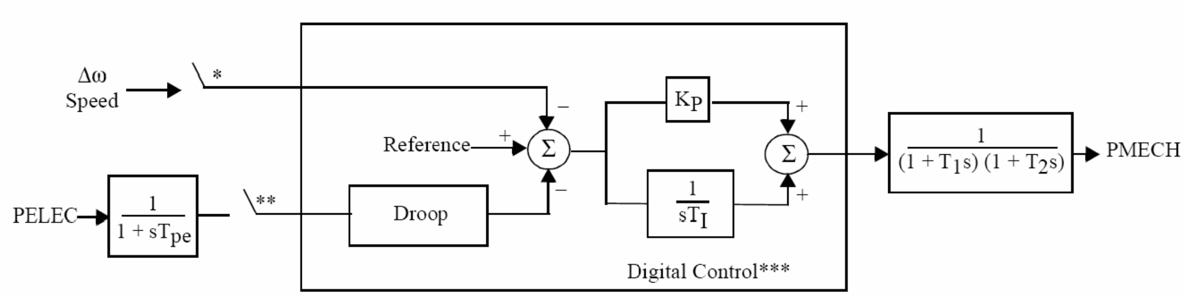
CONs	Value	Description
J	10	T_{W1} (>0)
J+1	10	T_{W2}
J+2	0	T_6
J+3	10	T_{W3} (>0)
J+4	0	T_{W4}
J+5	10	T_7
J+6	0.66	K_{S2}
J+7	1	K_{S3}
J+8	0.6	T_8
J+9	0.12	T_9 (>0)
J+10	20	K_{S1}
J+11	0.14	T_1
J+12	0.014	T_2
J+13	0.14	T_3
J+14	0.014	T_4
J+15	0.1	V_{STMAX}
J+16	-0.1	V_{STMIN}



(d) Governors

Table 7: Governor Data – Model WESGOV

CONs	Value	Description
J	0.06	ΔTC (sec)
J+1	0.06	ΔTP (sec)
J+2	0.04	Droop
J+3	27.6	K_P
J+4	0.13	T_I (sec) (>0)
J+5	0.3	T_1 (sec)
J+6	0.59	T_2 (sec)
J+7	0.63	A_{LIM}
J+8	0.1	T_{PE} (sec)



*Sample hold with sample period defined by ΔTC.

**Sample hold with sample period defined by ΔTP.

***Maximum change is limited to A_{LIM} between sampling times.

-End of Section-

5. Short Circuit Assessment

Fault level studies were completed by Hydro One to examine the effect of YEC GS on fault levels at existing facilities in the vicinity of the proposed connection point. Besides YEC GS, there are 6 RES III awarded wind projects that will be in-service at a time close to the in-service date of YEC GS. Thus, Hydro One performed a combined short circuit analysis for 6 RES III awarded projects and YEC GS. The 6 RES III awarded projects are:

- Kruger Energy Chatham Wind Project
- Greenwich Windfarm
- Talbot Windfarm
- Raleigh Wind Energy Centre
- Byran Wind Project
- Gosfield Wind Project

The following base conditions were assumed for the combined short circuit analysis:

A. Generation in service

- 8 Bruce units
- 4 Darlington units
- 6 Pickering units
- 8 Nanticoke units
- 4 Lambton units
- 4 Lennox units
- All hydraulic generation
- GTAA (44 kV buses at Bramalea TS and Woodbridge TS)
- TransAlta Douglas (44 kV buses at Bramalea TS)
- TransAlta Sarnia (N6S/N7S)
- West Windsor Power (J2N)
- Brighton Beach (J20B/J1B)
- Imperial Oil (N6S/N7S)
- Greenfield Energy Centre (Lambton SS)
- St. Clair Energy Centre (L25N & L27N)
- Erie Shores WGS (W8T)
- Kingsbridge WGS (Goderich TS)
- Amaranth WGS – Amaranth I (B4V) & Amaranth II (B5V)
- Ripley WGS (B22D/B23D)
- Prince I & II WGS (K24)
- Underwood (B4V/B5V)
- Kruger Port Alma (C23Z/C24Z)

B. New generation facilities

- Wolfe Island (X4H & X2H)
- Kingsbridge II (159 MW)
- Sithe Goreway GS (V41H(V72RS)/V42H(V73RS))
- Thorold GS (Q10P)
- East Windsor Cogen (E8F & E9F) + existing Ford generation
- Beck I G7 conversion to 60 Hz

- Greenfield South GS (R24C)
- Halton Hills GS (T38B/T39B)
- Portlands GS (Hearn SS)
- Bruce standby generators

C. New Transmission facilities

- 500kV Bruce x Milton double-circuit line
- Bruce x Orangeville 230 kV circuits up-rated
- Hurontario SS in service with R19T+V41H(V72RS) open from R21T+V42H(V73RS) (230 kV circuits V41H(V72RS) and V42H (V73RS) extended and connected from Cardiff TS to Hurontario SS)
- Allanburg x Middleport 230 kV circuits (Q35M and Q26M) installed
- Claireville TS 230 kV re-configured as per SIA CAA ID 2006-220 and operated ***open***
- V75R terminated at Richview for a total of six 230 kV circuits between Claireville TS and RichviewTS
- Two 245 Mvar (@ 230 kV) shunt capacitor banks installed at Orangeville TS and Detweiler TS, one per station
- Four 250 Mvar (@ 250 kV) shunt capacitor banks installed at Middleport TS
- Two 250 Mvar (@ 250 kV) shunt capacitor banks installed at Nanticoke TS
- One 250 Mvar (@ 250 kV) shunt capacitor banks installed at Buchanan TS
- LV shunt capacitor banks installed at Meadowvale and Halton TS
- Essa-Stayner 115 kV circuit replaced by 2 x 230 kV circuits; Stayner TS converted to 230 kV; 230/115 kV auto installed to supply Meaford TS
- New 230/115 kV autotransformer at Cambridge-Preston TS
- 1250 MW HVDC line ON-HQ in service
- Tilbury West DS second connection point for DESN arrangement using K2Z and K6Z
- Windsor area transmission reinforcement :
  - 230 kV transmission line from Sandwich JCT (C21J/C22J) to Lauzon TS
  - New 230/27.6 DESN, Leamington TS, that will connect C21J and C22J and supply part of the existing Kingsville TS load
  - Replace Keith 230/115 kV T11 and T12 transformers
  - 115 kV circuits J3E and J4E upgrades

D. System configuration

- Lambton TS 230 kV operated ***open***
- Richview TS 230 kV operated ***open***
- Claireville TS 230 kV operated ***open***
- Leaside TS 230 kV operated ***open***
- Leaside TS 115 kV operated ***open***
- Middleport TS 230 kV bus operated ***open***
- Hearn SS 115 kV bus operated ***open* –** as required in the Portlands SIA
- Cooksville TS 230 kV bus operated ***closed***
- Cherrywood TS north & south 230kV buses operated ***open***
- All capacitors in service
- All tie-lines in service and phase shifters on neutral taps
- Maximum voltages on the buses

Table 8 summarizes the projected fault levels at facilities near YEC GS with and without YEC GS and 6 RES III projects in-service.

Table 8: Fault Levels at Facilities near YEC GS

	Symmetrical (kA)*		**Asymmetrical (kA)***		**Circuit Breaker Lowest Ratings (kA)**	
	3-Phase	**L-G**	**3-Phase**	**L-G**	**Symmetrical**	**Asymmetrical**
(1)_System without YEC GS and 6 RES III projects						
Claireville 500 kV	56.4	52.9	75.2	72.9	*80*	*96*
Claireville 230 kV	62.8	64.1	86.5	91.6	*80*	*96*
Brown Hills B82V 230 kV	8.1	6.9	9.1	8.2	*50*	*59.9*
Brown Hills B83V 230kV	8.1	6.9	9.1	8.2	*50*	*59.9*
Minden 230 kV	10.4	7.4	11.7	8.7	*40*	*42.1*
(2) System with YEC and 6 RES III projects						
Claireville 500 kV	57.3	53.5	76.2	73.6	*80*	*96*
Claireville 230 kV	64.3	65.4	88.5	93.3	*80*	*96*
Brown Hills B82V 230 kV	9.0	8.1	10.3	9.7	*50*	*59.9*
Brown Hills B83V 230kV	9.0	8.1	10.3	9.6	*50*	*59.9*
Minden 230 kV	10.6	7.5	12.0	8.8	*40*	*42.1*
YEC B82V 230 kV	13.3	13.1	15.7	15.4	*63*	*(unknown)***
YEC B83V 230kV	13.3	13.1	15.6	15.4	*63*	*(unknown)***

* Based on a pre-fault voltage level of 550 kV for 500 kV stations, 250 kV for 230 kV stations, and 127 kV for 115 kV stations.

** The YEC LP to provide asymmetrical rating of 230 kV circuit breakers during the IESO Market Entry process.

The results in Table 8 show that fault levels increase with the addition of YEC GS, but do not exceed the interrupting capabilities of the worst rated circuit breakers.

As mentioned before, the proposed HV breakers are adequate for the anticipated fault levels.

-End of Section-

6. System Impact Assessment

The technical studies focused on identifying the impact of the new generation station on the reliability of the IESO-controlled grid. It includes thermal loading assessment of 230-kV transmission lines along Claireville to Minden transmission corridor, system voltage performance assessment in the York region area, and transient stability assessment of the proposed and major surrounding generation units. The section also investigates the performance of the proposed control system for the two new generators.

6.1 Study Assumptions

In this assessment, the 2012 summer base case was used with the following assumptions:

- Transmission facilities – All existing and proposed major transmission facilities with 2012 in-service dates or earlier were assumed in service, including 500kV Bruce-Milton double-circuit line.
- Generation facilities – All existing and proposed major generation facilities with 2012 in-service dates or earlier were assumed in service.
- System load – A load of approximately 28,092 MW with a load power factor of 0.91.
- Equipment Ratings: Continuous and emergency ratings as provided by the equipment owners. Circuit thermal ratings used for 230 kV circuits surrounding YEC GS are summarized in Table 9.
- Keele Valley GS is in-service with maximum generation output of 30 MW.
- The net active power output of YEC GS was 436 MW based on the winter capability. For the transient stability studies, YEC generators G1 and G2 were assumed operating at unity power factor under pre-contingency.

Table 9: Circuit Thermal Ratings

Circuit/Section	*Conductor*	*Max Operating Temperature*	*Continuous[b] (A,MVA)*		*LTE[c] (A,MVA)*		*15-MIN STE[d] (A,MVA)*	
B82V & B83V								
Claireville to Woodbridge JCT(1)[a]	*1843.2 kcmil 72/7*	*127℃*	*1350*	*550*	*1800*	*734*	*2170*	*885*
Woodbridge to Holland Marsh(2)	*795 kcmil 26/7*	*127℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
Holland Marsh to Armitage TS(3)	*795 kcmil 26/7*	*150℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
Holland Marsh to Brown Hill TS(4)	*795 kcmil 26/7*	*127℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
M80B								
Minden TS to Beaverton JCT(9)	*795 kcmil 26/7*	*104℃*	*840*	*342*	*930*	*379*	*970*	*395*
Beaverton JCT to Beaver JCT (7)	*795 kcmil 26/7*	*134℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
Beaver JCT to Beaverton TS(6) *Beaverton JCT to Lindsay TS(8)*	*795 kcmil 26/7*	*150℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
Beaver JCT to Brown Hill TS(5)	*795 kcmil 26/7*	*127℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
M81B								
Minden TS to Beaverton JCT(9) *Beaverton JCT to Beaver JCT(7)*	*795 kcmil 26/7*	*104℃*	*840*	*342*	*930*	*379*	*970*	*395*
Beaver JCT to Beaverton T S(6)	*795 kcmil 26/7*	*150℃*	*840*	*342*	*1090*	*444*	*1210*	*493*
Beaverton JCT to Lindsay TS(8) *Beaver JCT to Brown Hill TS(5)*	*795 kcmil 26/7*	*127℃*	*840*	*342*	*1090*	*444*	*1210*	*493*

Note:

(a) The number in parenthesis refers to the section number in Figure 2.

(b) Continuous ratings are obtained based on 235-kV voltage, 35°C ambient temperature at 4 km/hr wind velocity, with 93°C maximum operating temperature or individual sag temperature if lower.

(c) Long term emergency (LTE) ratings are obtained based on 235-kV voltage, 35°C ambient temperature at 4 km/hr wind velocity, with 127 °C maximum operating temperature or individual sag temperature if lower.

(d) 15-Min short time emergency (STE) are obtained based on 235-kV voltage, pre-load equal to continuous rating, 35°C ambient temperature at 4 km/hr wind velocity, with individual sag temperature.

6.2 Area Load Forecasting

Hydro One provided the historical load and the load forecasting for the stations supplied by B82V/B83V and M80B/M81B, as shown in Table 11.

Table 10: Load Forecast (MW)

Station	Actual Load				Forecast Load						
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Armitage	351.0	367.2	407.3	394.1	317.0	317.0	317.0	317.0	317.0	317.0	317.0
Holland					93.3	105.4	119.1	134.6	152.1	171.9	187.6
Brown Hill	66.8	69.5	69.0	69.8	70.4	71.1	71.7	72.3	73.0	73.6	74.2
Beaverton	60.9	60.7	62.8	63.1	63.7	64.4	65.3	66.0	67.0	68.2	70.4
Lindsay	69.3	70.5	71.0	71.4	71.7	72.0	72.3	72.6	73.0	73.4	73.8
Total	548.0	567.9	610.1	598.4	616.1	629.9	645.4	662.5	682.1	704.1	723.0

Note: the load in excess of 317 MW at Armitage TS was transferred to Holland TS.

6.3 Thermal Loading Assessment

This section covers an investigation of loading capability of 230 kV circuits supplying the new project. A power flow analysis was performed under summer peak load conditions for all elements in service and for single element contingencies. The criteria applied in assessing the thermal loading capability of the 230 kV circuits is:

- With all elements in-service, loading of any line shall be within their continuous rating; and
- For the single circuit contingency, post-contingency flow on any circuit shall not exceed the long term emergency rating.

The flows along circuits M80B/M81B and B82V/B83V are significantly affected by the generation output at Des Joachims. Thus two generating scenarios were considered, with all eight units at Des Joachims GS in service and out of service.

Figure 4 - Figure 7 show the load flow diagrams before and after the integration of YEC GS, with Des Joachims in-service and out-of-service. The load flow results indicated that the B82V/B83V section from Woodbridge Junction to Holland Marsh Junction and the M80B/M81B section from Beaverton Junction to Minden TS are the most limiting sections. Table 11 shows the loading of these two sections before and after the integration of YEC GS, with and without Des Joachims GS. Table 11 indicates that the loading of local transmission circuits is significantly alleviated due to the incorporation of YEC GS.

Table 11: Circuit Loading Before and After Integration of YEC

Circuit	Limiting Section	Continuous Rating (MVA)	Des Joachims In-Service				Des Joachims Out-of-Service			
			Before		After		Before		After	
			Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*
B82V	Woodbridge to Holland Marsh	342	206.4	*60.4*	50.7	*14.8*	270.8	*79.2*	111.1	*32.5*
B83V	Woodbridge to Holland Marsh	342	205.6	*60.1*	50.0	*14.6*	269.8	*78.9*	110.2	*32.2*
M80B	Beaverton JCT. To Minden	342	123.2	*36.0*	96.6	*28.2*	58.6	*17.1*	31.2	*9.1*
M81B	Beaverton JCT. To Minden	342	122.9	*35.9*	96.3	*28.2*	58.3	*17.0*	30.9	*9.0*

Table 12: Pre- and Post-Contingency Circuit Loading

Circuit	Limiting Section	Continuous Rating (MVA)	Des Joachims In-Service				Des Joachims Out-of-Service			
			Pre-Contingency		Post-Contingency		Pre-Contingency		Post-Contingency	
			Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*	Flow (MVA)	*Loading (%)*
Contingency 1: Loss of B82V										
B83V	Woodbridge to Holland Marsh	342	50.0	*14.6*	256.5	*75.0*	110.2	*32.2*	338.2	*98.9*
M80B	Beaverton JCT. To Minden	342	96.6	*28.2*	85.0	*24.9*	31.2	*9.1*	73.1	*21.4*
M81B	Beaverton JCT. To Minden	342	96.3	*28.2*	142.2	*41.6*	30.9	*9.0*	70.8	*20.7*
Contingency 2: Loss of M80B										
B82V	Woodbridge to Holland Marsh	342	50.7	*14.8*	71.4	*20.9*	111.1	*32.5*	89.3	*26.1*
B83V	Woodbridge to Holland Marsh	342	50.0	*14.6*	53.9	*15.8*	110.2	*32.2*	112.5	*32.9*
M81B	Beaverton JCT. To Minden	342	96.3	*28.2*	136.3	*39.9*	30.9	*9.0*	49.5	*14.5*

Two contingencies were considered which most stress circuits M80B/M81B and B82V/B83V: (1) loss of circuit B82V; (2) loss of circuit M80B; The post-contingency load flow diagrams are shown in Figure 8 - Figure 11 and the pre- and post-contingency flows are summarized in Table 12.

The study results indicate that the power flows on all transmission circuits are well below circuit continuous ratings for both pre- and post-contingency conditions, with or without generating units at Des Joachims. There is no overloading foreseen under the system pre- and post-contingencies conditions.

6.4 Voltage Analysis

The voltage performance of the IESO-controlled grid due to the incorporation of the YEC was evaluated by examining if post contingency voltage declines remain within criteria at various facilities. The following criteria must be satisfied:

- The pre-contingency voltage on 230 kV buses cannot be less than 220 kV;
- The post-contingency voltage on 230 kV buses cannot be less than 207 kV; and
- The voltage drop following a contingency cannot exceed 10% pre-ULTC and 10% post-ULTC.

Two generating scenarios were considered, with all eight units at Des Joachims GS in service and out of service and three contingencies were simulated: (1) loss of circuit B82V; (2) loss of circuit M80B; and (3) loss of whole YEC GS. For the first two contingencies, both systems before and after the integration of YEC GS were studied to identify the impact of YEC GS on the system voltage performance.

The loss of circuit B82V was identified as the most critical contingency and the system condition with all Des Joachims units out-of-service was found as the worse condition, thus, only the results due to the loss of circuit B82V without Des Joachims units are recorded, as shown in Table 13 and Table 14, for the systems before and after the integration of YEC GS, respectively. Table 15 shows the system voltage performance due to the loss of whole YEC GS.

The study results shows that the incorporation of YEC GS significantly improve the system voltage performance. The loss of whole YEC GS has also no adverse impact on the system voltage performance.

Table 13: System Voltage Performance due to Loss of Circuit B82V

(YEC GS not in-service and Des Joachims out-of-service)

Bus	Pre-contingency (kV)	Pre-ULTC		Post-ULTC	
		Pre-ULTC (kV)	% Change	Post-ULTC (kV)	% Change
Claireville 230 kV bus	241.5	241.1	-0.2	240.0	-0.7
Holland 230 kV bus (B82V)	240.2	-	-	-	-
Holland 230 kV bus (B83V)	240.2	230.1	-4.6	234.7	-2.5
Armitage 230 kV bus (B82V)	239.3	-	-	-	-
Armitage 230 kV bus (B83V)	239.3	226.6	-5.8	232.2	-3.2
Brown Hills 230 kV bus (B82V)	240.0	-	-	-	-
Brown Hills 230 kV bus (B83V)	240.0	229.5	-4.8	234.2	-2.6
Beaverton 230 kV (M80B)	241.3	239.3	-0.9	243.3	0.9
Beaverton 230 kV (M81B)	241.3	232.9	-3.8	237.5	-1.7
Lindsay 230 kV (M80B)	241.4	239.3	-1.0	243.3	0.9
Lindsay 230 kV (M81B)	241.4	232.9	-3.9	237.6	-1.7
Minden 230 kV	243.1	239.2	-1.8	242.8	-0.1

Table 14: System Voltage Performance due to Loss of Circuit B82V

(YEC GS in-service and Des Joachims out-of-service)

Bus	Pre-contingency (kV)	Pre-ULTC		Post-ULTC	
		Pre-ULTC (kV)	% Change	Post-ULTC (kV)	% Change
Claireville 230 kV bus	242.7	241.7	-0.5	241.9	-0.4
Holland 230 kV bus (B82V)	242.4	-	-	-	-
Holland 230 kV bus (B83V)	242.4	237.8	-2.1	239.1	-1.5
Armitage 230 kV bus (B82V)	241.4	-	-	-	-
Armitage 230 kV bus (B83V)	241.5	235.0	-3.0	236.7	-2.2
YEC 230 kV bus (B82V)	242.3	-	-	-	-
YEC 230 kV bus (B83V)	242.3	237.6	-2.1	238.9	-1.5
Brown Hills 230 kV bus (B82V)	242.1	-	-	-	-
Brown Hills 230 kV bus (B83V)	242.1	236.6	-2.5	238.1	-1.8
Beaverton 230 kV (M80B)	243.0	242.9	0.0	245.1	1.0
Beaverton 230 kV (M81B)	243.1	238.6	-2.0	240.5	-1.2
Lindsay 230 kV (M80B)	243.1	242.8	-0.1	245.1	0.9
Lindsay 230 kV (M81B)	243.1	238.7	-2.0	240.6	-1.1
Minden 230 kV	244.1	241.9	-1.0	244.0	0.0

Table 15: System Voltage Performance due to Loss of whole YEC GS

(Des Joachims out-of-service)

Bus	Pre-contingency (kV)	Pre-ULTC		Post-ULTC	
		Pre-ULTC (kV)	% Change	Post-ULTC (kV)	% Change
Claireville 230 kV bus	242.7	241.5	-0.5	241.5	-0.5
Holland 230 kV bus (B82V)	242.4	239.9	-1.1	240.2	-1.0
Holland 230 kV bus (B83V)	242.4	239.9	-1.1	240.2	-1.0
Armitage 230 kV bus (B82V)	241.4	238.9	-1.1	239.3	-1.0
Armitage 230 kV bus (B83V)	241.5	239.0	-1.1	239.3	-1.0
YEC 230 kV bus (B82V)	242.3	-	-	-	-
YEC 230 kV bus (B83V)	242.3	-	-	-	-
Brown Hills 230 kV bus (B82V)	242.1	239.5	-1.2	240.0	-1.0
Brown Hills 230 kV bus (B83V)	242.1	239.5	-1.2	240.1	-0.9
Beaverton 230 kV (M80B)	243.0	240.5	-1.1	241.3	-0.8
Beaverton 230 kV (M81B)	243.1	240.5	-1.2	241.4	-0.8
Lindsay 230 kV (M80B)	243.1	240.5	-1.2	241.4	-0.8
Lindsay 230 kV (M81B)	243.1	240.6	-1.1	241.4	-0.8
Minden 230 kV	244.1	241.7	-1.1	243.1	-0.5

6.5 Operation Following a N-2 Contingency (Load Restoration)

As per “Request for Proposals for approximately 350 MW of Peaking Generation in Northern York Region” (Issued by the Ontario Power Authority, July 31, 2008), the proposed facility must be able to provide adequate Load Restoration Capability when a disturbance occurs on B82V/B83V.

> The proposed facility shall have the capability to start-up, synchronize and provide electricity to the IESO-controlled grid after a permanent fault occurs on the double circuits B82V/B83V and the faulted section is isolated.

The *Ontario Resource and Transmission Assessment Criteria* has established the following load restoration criteria for high voltage supply to a transmission customer.

The transmission system must be planned such that, following design criteria contingencies on the transmission system, affected loads can be restored within the restoration times listed below:

a) All load must be restored within approximately 8 hours.

b) When the amount of load interrupted is greater than 150MW, the amount of load in excess of 150MW must be restored within approximately 4 hours.

c) When the amount of load interrupted is greater than 250MW, the amount of load in excess of 250MW must be restored within 30 minutes.

The load supplied off the 230 kV circuits from Claireville to Brown Hills in-line breakers will peak at 458.5 MW in 2012. For a permanent loss of the double circuits B82V and B83V, the supply to the entire 458.5 MW of load would be interrupted. In this case, it is likely that the restoration criteria will not be met because any major damage suffered by the line could not be repaired in 30 minutes. Restoring essential load that is above 250 MW in 30 minutes is not be possible and restoring the entire load in 8 hours could also be a challenge.

Although this is an existing problem, it is one of the incentives for the proposed facility to improve the level of load restoration for the load supplied off the double circuit B82V and B83V. To expedite the load restoration, additional isolating devices, such as Mid-Span Opener (MSO), are recommended to be installed on the local transmission system.

Recommended isolating devices should be installed on circuits B82V and B83V. As shown in Figure 12, two isolating devices are needed along each circuit:

(1) One device is at York Energy Centre Junction, on the section from York Energy Centre Junction to Brown Hill TS. This device is to isolate the section from York Energy Centre Junction to Brown Hill TS.

(2) The other is at Holland Junction, on the section from Holland Junction to Woodbridge Junction. This device is to isolate the section from Holland Junction to Claireville TS.

It is recommended that Hydro One install on each circuit of B82V and B83V two isolating devices such as MSO: one device at York Energy Centre Junction, on the section from York Energy Centre Junction to Brown Hill TS, and the other at Holland Junction, on the section from Holland Junction to Woodbridge Junction.

6.6 Control Systems Assessments

Dynamic studies were performed to demonstrate that the generator control systems for G1 and G2 meet some of the specific performance standard requirements of Appendix 4.2 of the Market Rules.

6.6.1 Excitation System Response

Each synchronous generating unit that is rated at 10 MVA or larger shall be equipped with an excitation system that meets the requirements outlined in Reference 12 of Appendix 4.2. Specifically, each excitation system must have:

- A voltage response time not longer than 50 ms for a voltage reference step change not to exceed 5%,
- A positive ceiling voltage of at least 200% of the rated field voltage, and
- A negative ceiling voltage of at least 140% of the rated field voltage.

(a) Response Ration Test

Response ratio tests using PSS/E were conducted to evaluate the positive ceiling voltage (bullet two) for the proposed exciters. The generator G1 (or G2) is initialized to its rated MVA at a 90% lagging power factor. At t = 0, the voltage set point is raised suddenly to drive to the exciter's ceiling voltage as quickly as possible. The response plot of the response ratio test is shown in Figure 13.

It can be observed that the rated field voltage (Efd_{rated}) is 2.6 pu and the positive ceiling voltage is 6.4 pu. The positive ceiling voltage exceeds 200% of the rated field voltage for approximately 500ms and then steadily drops to 3.62 pu (140% of rated field voltage) at 3 seconds. The drop occurs because the ceiling limitation of the field current is integrated into the model and is set at 140% of rated field current. The IESO understands that the field current ceiling limitation cannot be set above this value due to the physical limitations of the power electronics employed in the exciter. As mentioned in Section 6.7, the field current ceiling limitation of the excitation system does not negatively affect the transient performance of the units.

(b) Open Circuit Test

Open circuit tests using PSS/E were conducted to evaluate the voltage response time (bullet one) for the proposed exciter. The generator is initialized to rated terminal voltage on an open circuit. At t = 0, the voltage set point is increased or reduced by 5% to evaluate the exciter's voltage response time. The response plots associated with the open circuit test are shown in Figure 14 and Figure 15. The initial open circuit voltage (Efd_{oc}) is about 1.1 pu.

Based on the Market Rule's requirement, for the +5% step response, the field voltage is required to reach 2 $E_{fd,rated}$ within

$$RT_{OC_{POS}} = 50 * \frac{2\ Efd_{rated} - Efd_{oc}}{2\ Efd_{rated} - Efd_{rated}} = 78.8\ (ms);$$

and for the -5% step response, the field voltage is required to reach -1.4 $E_{fd,rated}$ within

$$RT_{OC_{NEG}} = 50 * \frac{1.4\ Efd_{rated} + Efd_{oc}}{1.4\ Efd_{rated} + Efd_{rated}} = 38\ (ms).$$

Figure 14 and Figure 15 show that the filed voltage can get to its positive ceiling value or negative ceiling value within 5 ms, thus meet the requirement of the Market Rules.

Results in Figure 15 also show that the field voltage has a negative ceiling voltage of -5.1 pu which is below the required -1.4 Efd_{rated}, -3.64 pu. Therefore, the negative ceiling voltage for the proposed exciter satisfies the Market Rules requirements (bullet three).

The results show that based on the initial data provided the G1 and G2 exciters will meet the Market Rules requirements.

6.6.2 Governor Response

The G1 and G2 speed governors must meet the requirements outlined in Reference 16 of Appendix 4.2. In particular, the governor must have a permanent speed droop that can be set in the range between 3% and 7% and the intentional dead band must not be wider than ±36 mHz (±0.006 pu).

A governor response test using PSS/E was completed for the proposed G1 (or G2) governor and is shown Figure 16.

As can be observed in the diagram, the governing unit presented well damped response. The calculated droop was approximately 4%. No intentional frequency dead band is added to the proposed governor model.

The results show that based on the initial data provided the G1 and G2 governors will meet the Market Rules requirement.

6.6.3 Power System Stabilizer

The power system stabilizer (PSS) shall, to the practicable extent, be tuned to increase damping torque with reducing synchronizing torque.

The generator performance with and without PSS in-service following a severe disturbance on the power system are compared in Figure 17. The disturbance is a 3-phase fault on Circuit B82V at Claireville. As it can be seen, the swing magnitudes are reduced and angle stability is regained faster when the PSS is in-service.

6.7 Transient Stability Performance

Transient stability simulations were completed to determine if the power system will be transiently stable with the incorporation of YEC GS for recognized fault conditions. In particular, rotor angles of generators at Sithe Goreway GS, Des Joachims GS and YEC GS were monitored.

The following contingencies were simulated assuming typical, high-speed fault clearing times:

- a 3-phase fault on 230 kV circuit B82V at Claireville with normal fault clearing time,
- a 3-phase fault on 500 kV circuit B561M at Milton TS with normal fault clearing time.

The simulation results are shown in Figure 18 and Figure 19. The transient responses show that the generators remain synchronized to the power system and the oscillations are sufficiently damped following both contingencies. In addition, the results also show that the field current ceiling limitation of the excitation system does not negatively affect the transient performance of the units or the system.

6.8 Finalized Data

The YEC LP is required to provide finalized data from commissioning tests associated with the generator control systems to validate the models and data provided to the IESO. These tests must be performed and results be supplied to the IESO within 30 days of in-service date.

-End of Section-

Figures

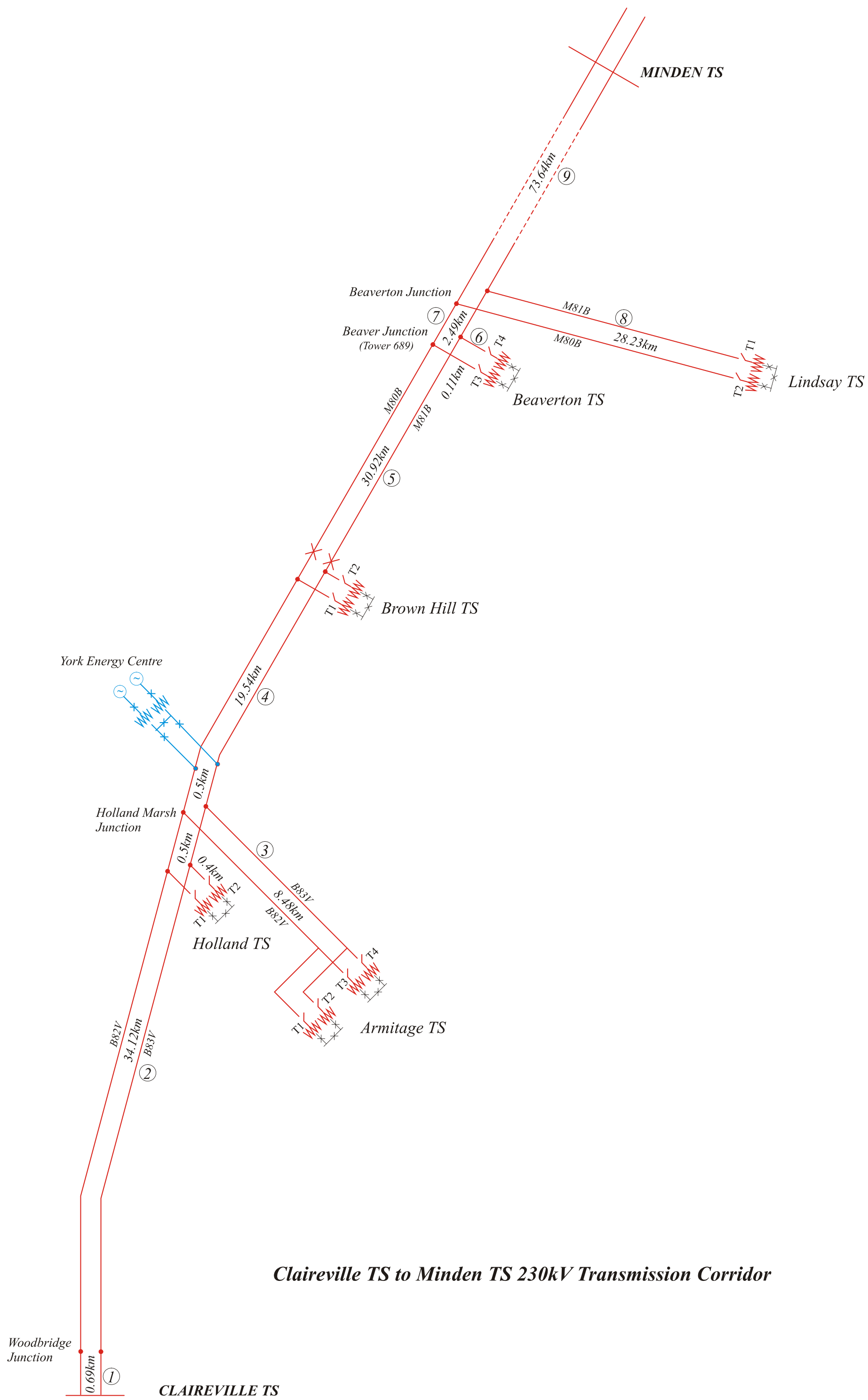


Figure 2: Location of York Energy Centre

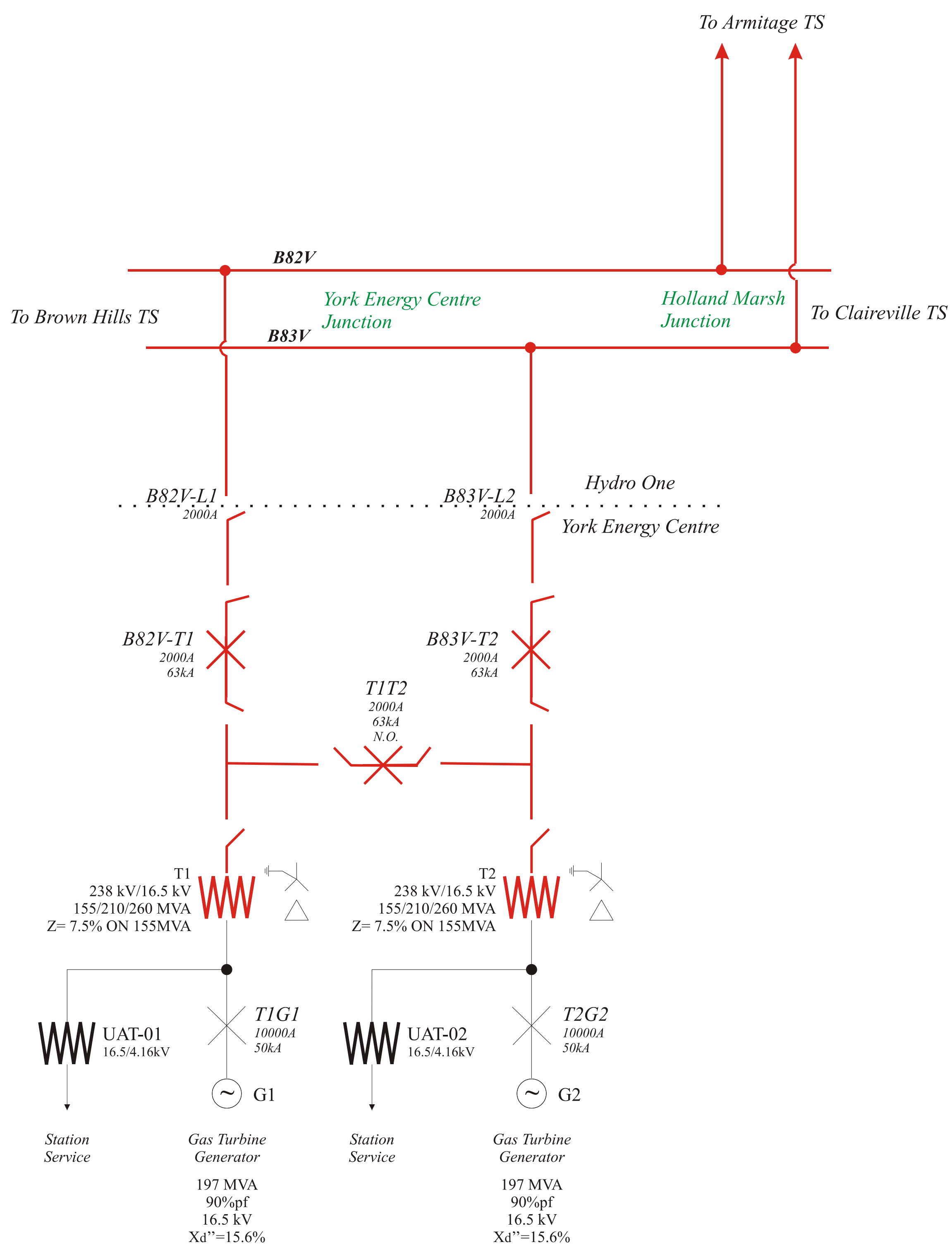


Figure 3: Single-Line Diagram of York Energy Centre

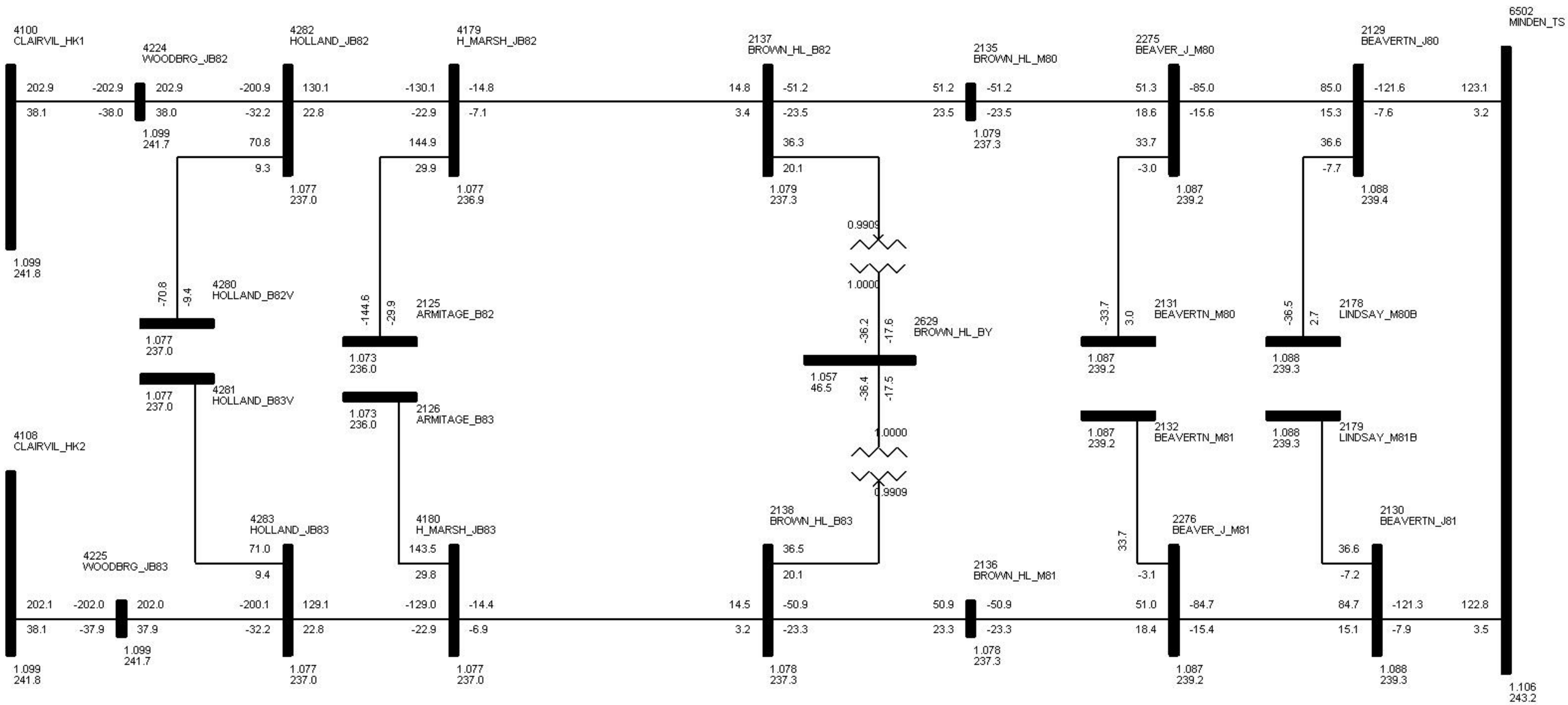


Figure 4: Load Flow Diagram – Before Integration of YEC (Des Joachims In-Service)

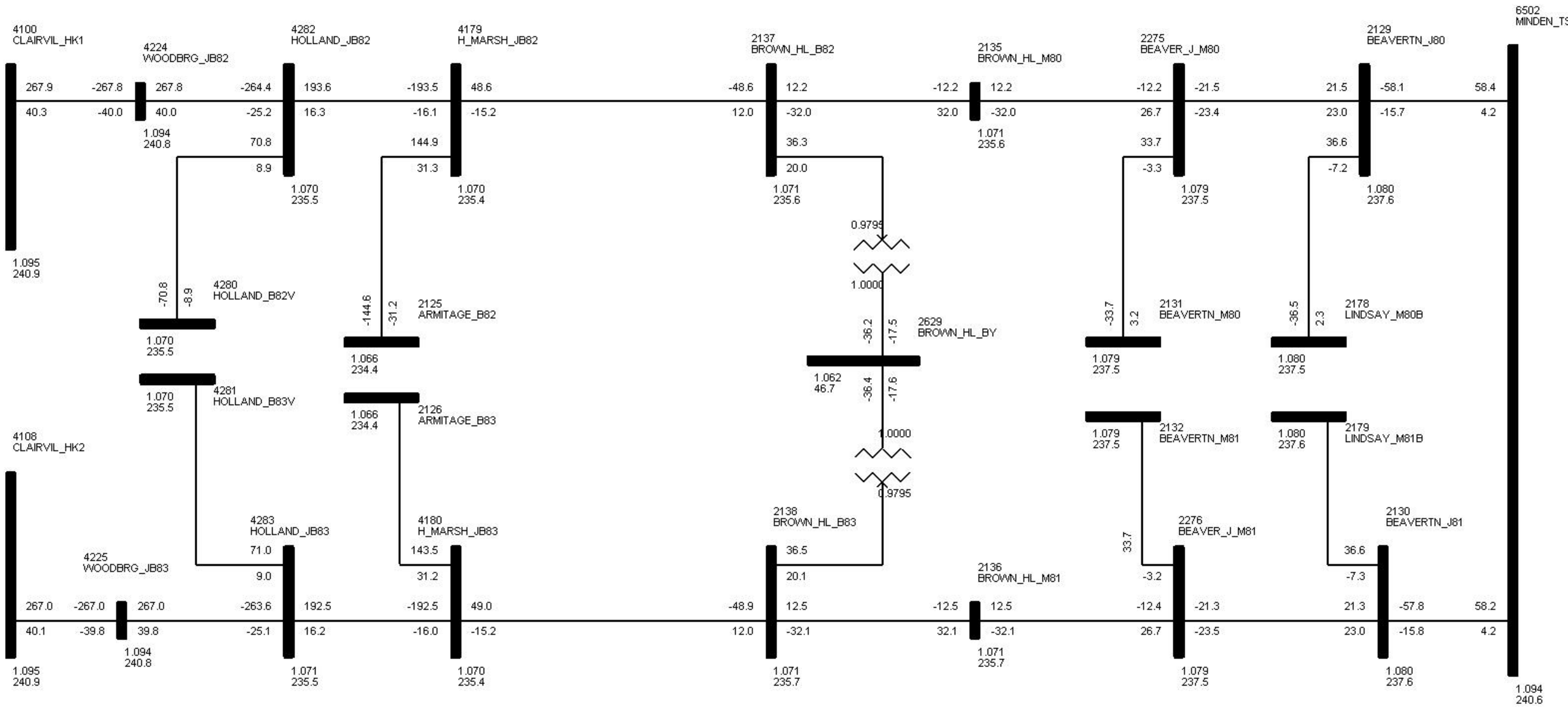


Figure 5: Load Flow Diagram – Before Integration of YEC (Des Joachims Out-Of-Service)

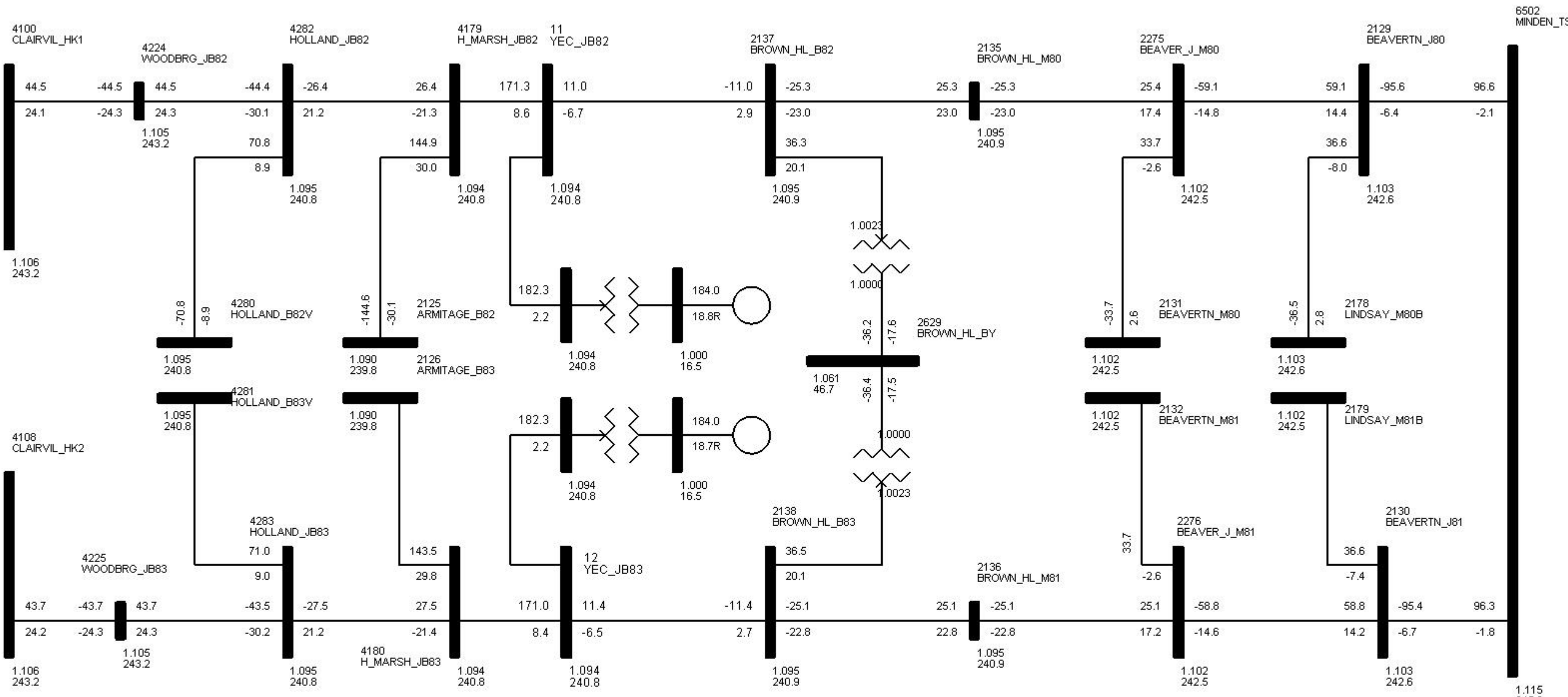


Figure 6: Load Flow Diagram – After Integration of YEC (Des Joachims In-Service)

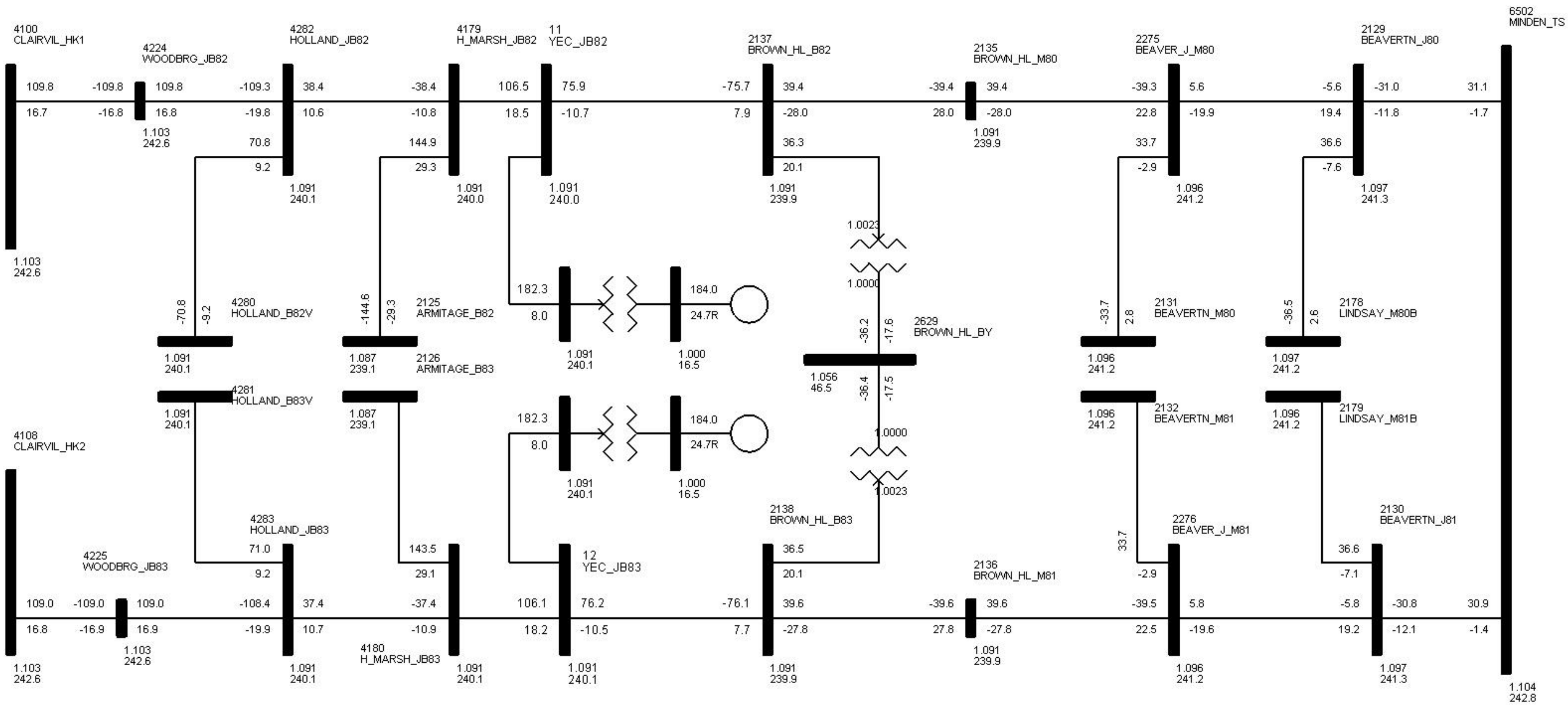


Figure 7: Load Flow Diagram – After Integration of YEC (Des Joachims Out-Of-Service)

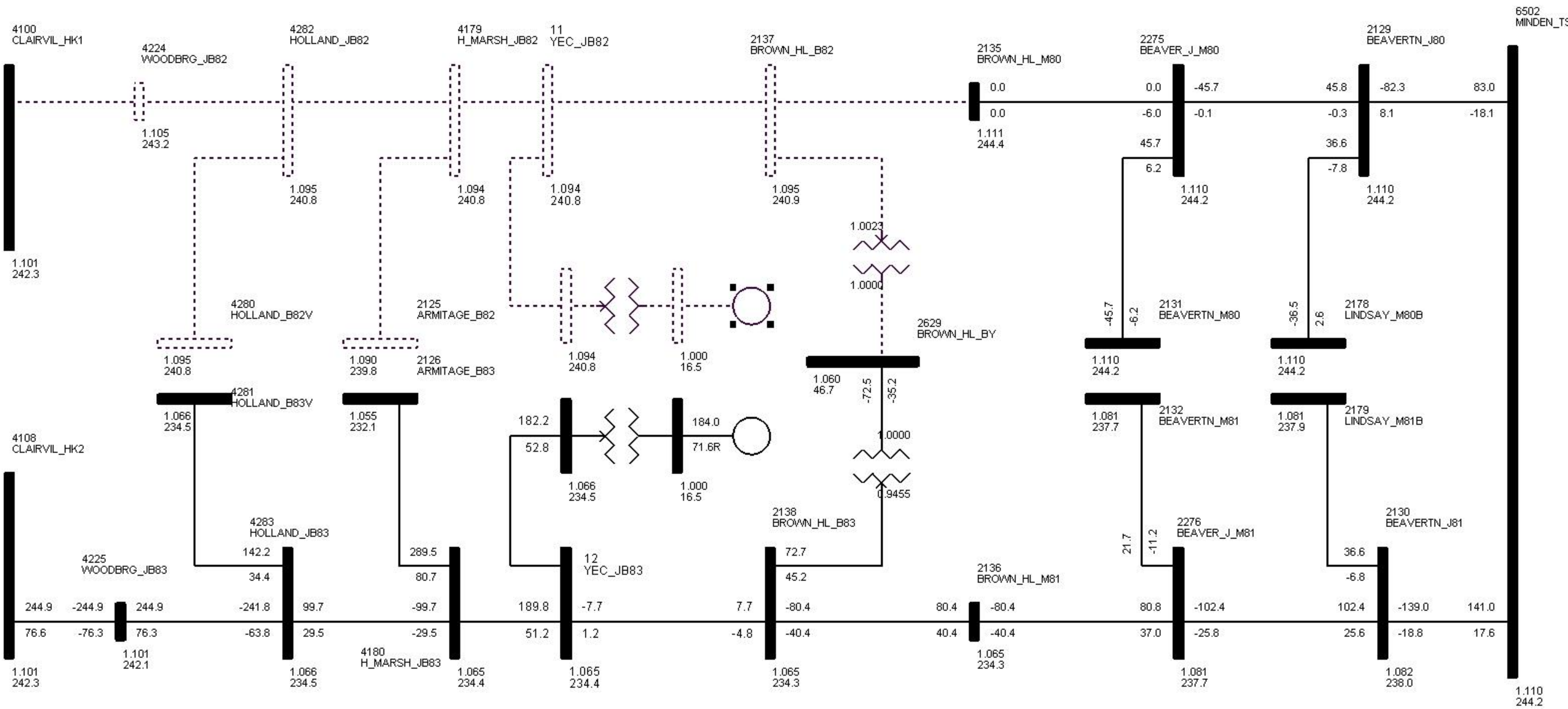


Figure 8: Load Flow Diagram – Loss of B82V (Des Joachims In-Service)

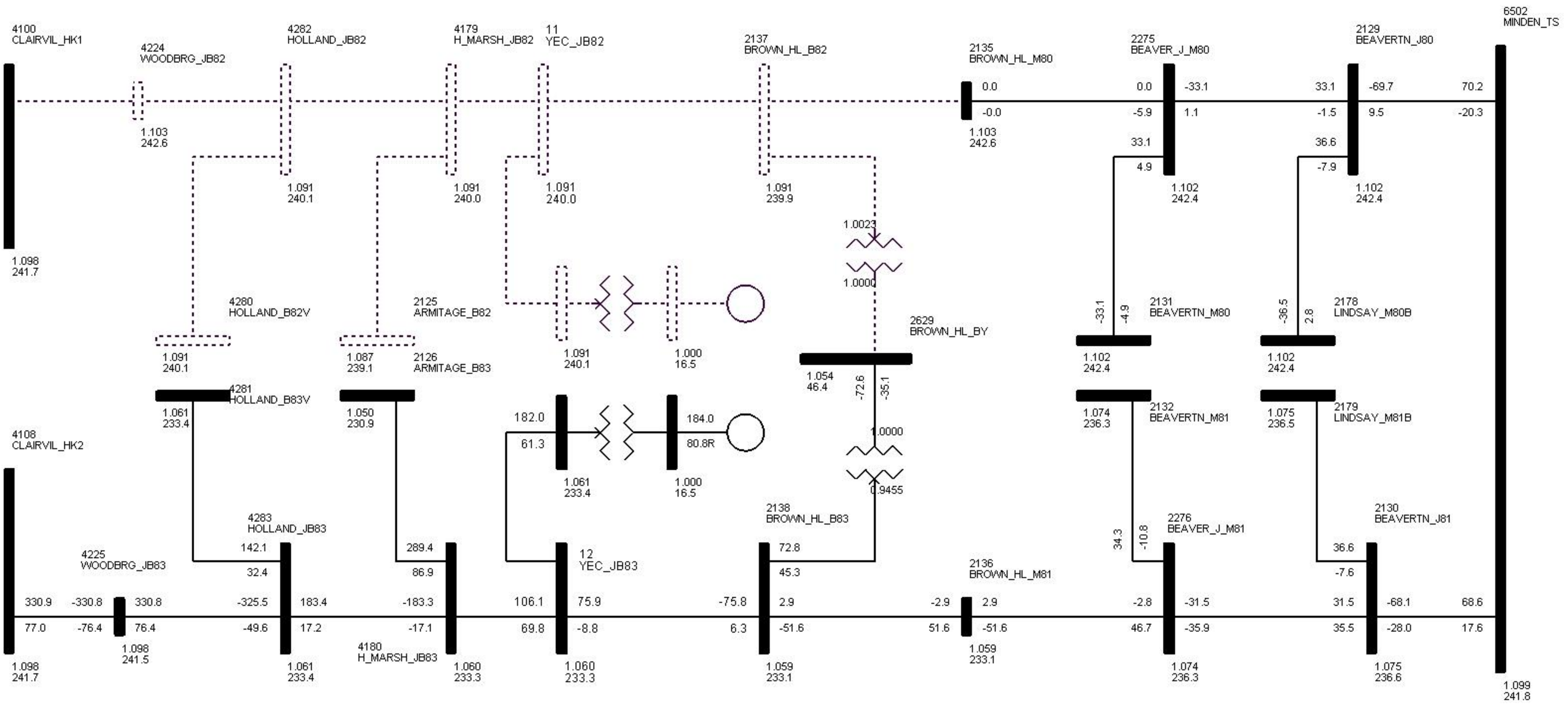


Figure 9: Load Flow Diagram – Loss of B82V (Des Joachims Out-Of-Service)

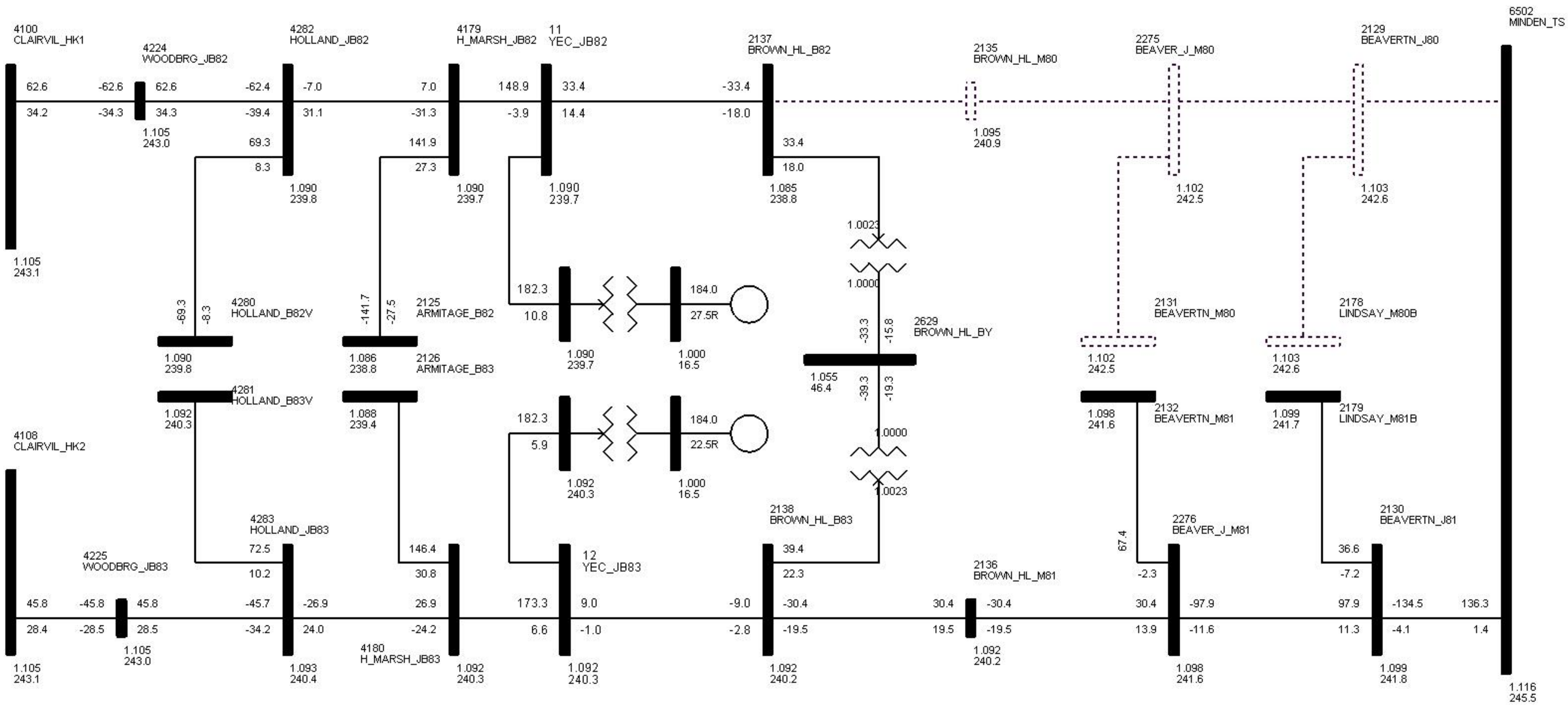


Figure 10: Load Flow Diagram – Loss of M80B (Des Joachims In-Service)

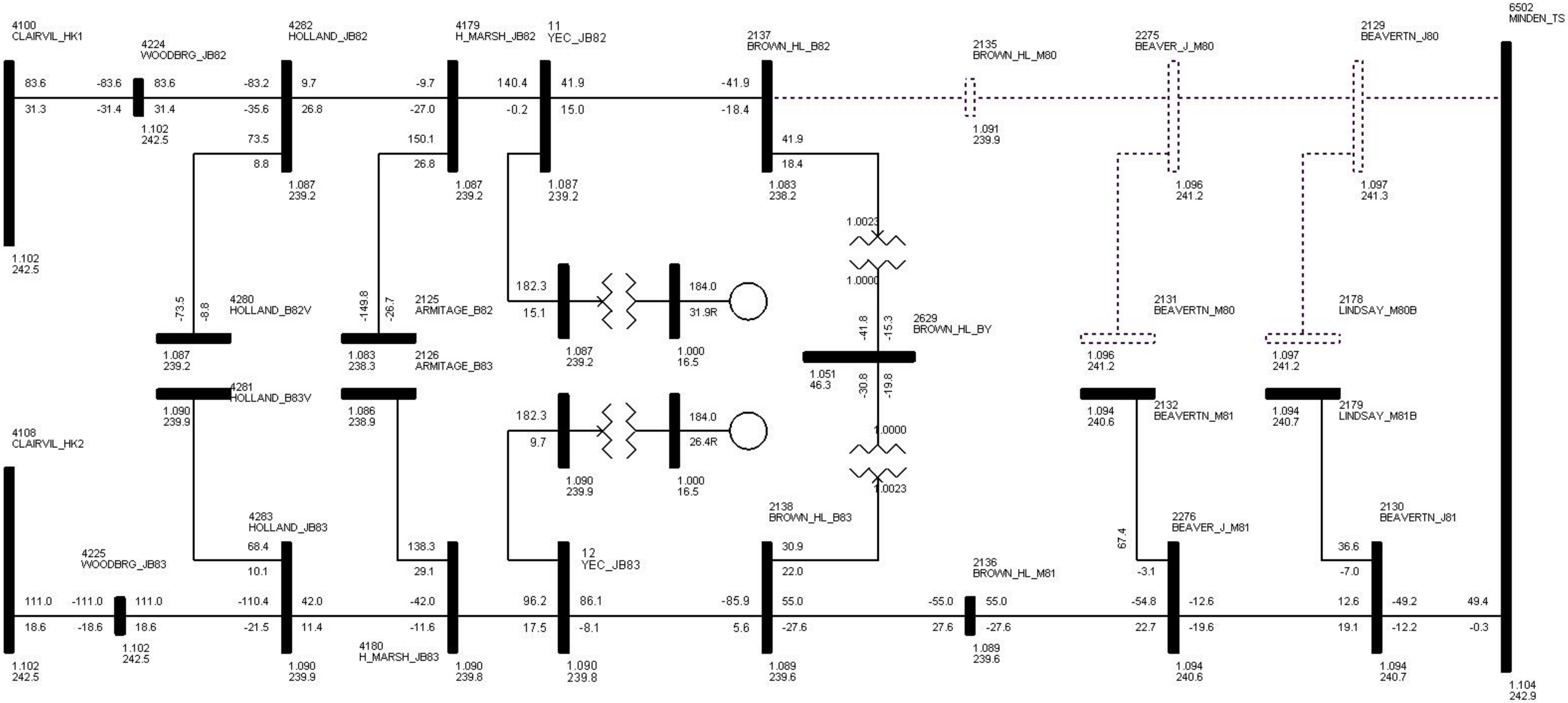


Figure 11: Load Flow Diagram – Loss of M80B (Des Joachims Out-Of-Service)

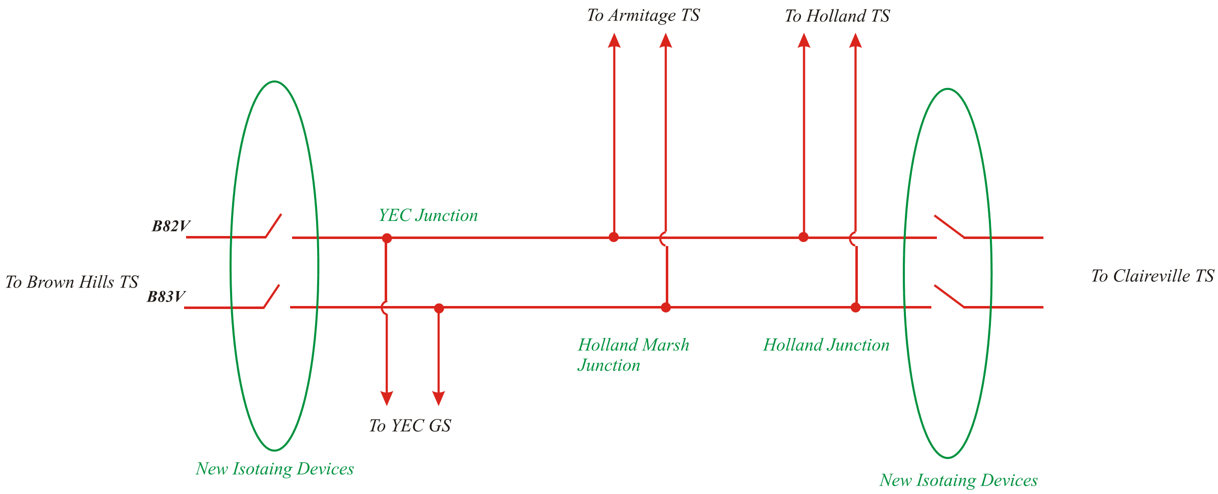


Figure 12: Locations of new isolating devices on B82V/B83V for load restoration

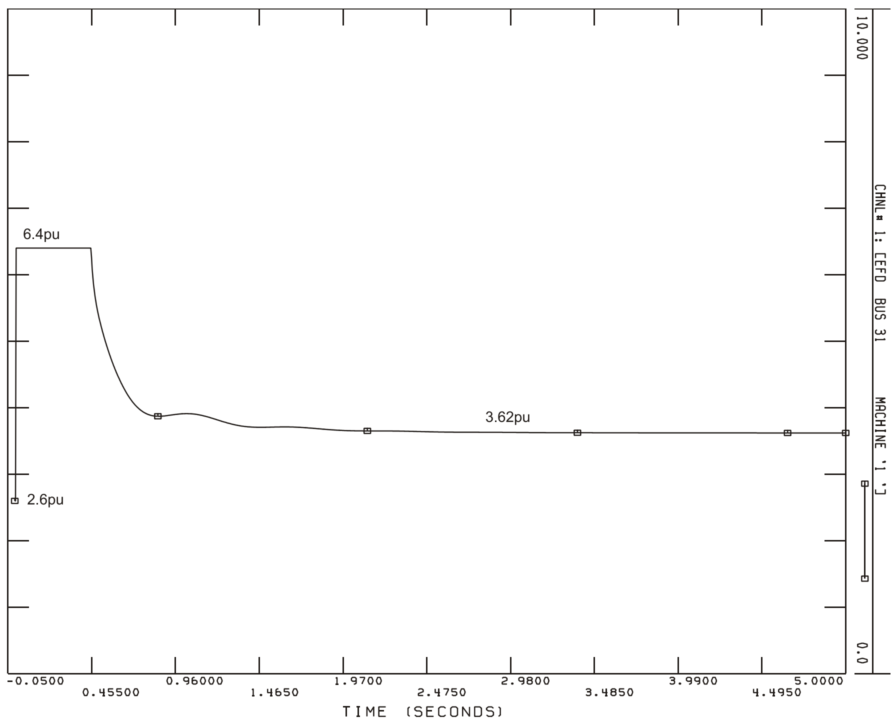


Figure 13: Response Ratio Test of Excitation system

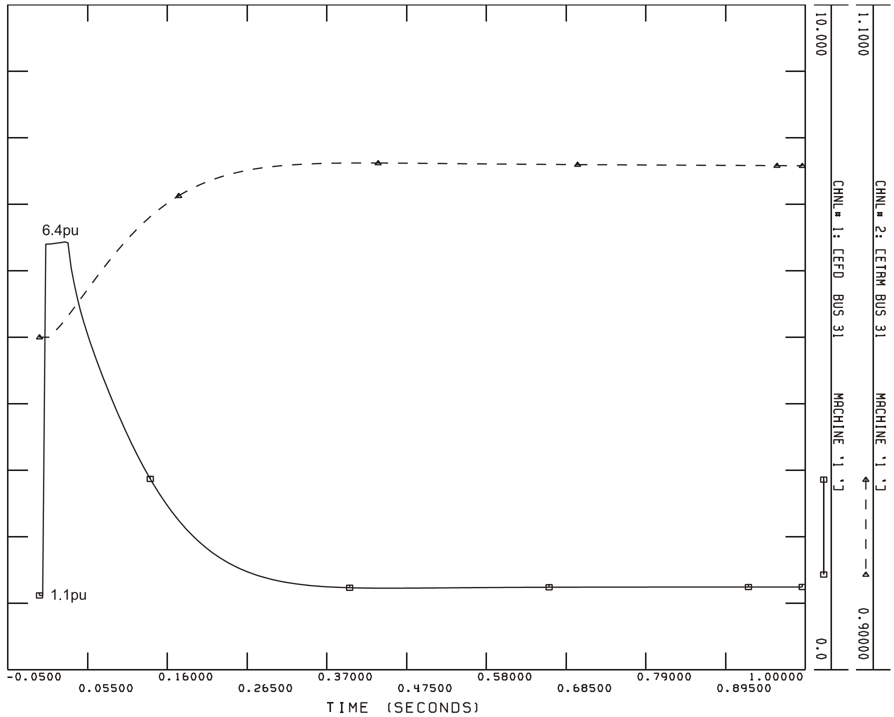


Figure 14: Open Circuit Test of Excitation System (+5% Step)

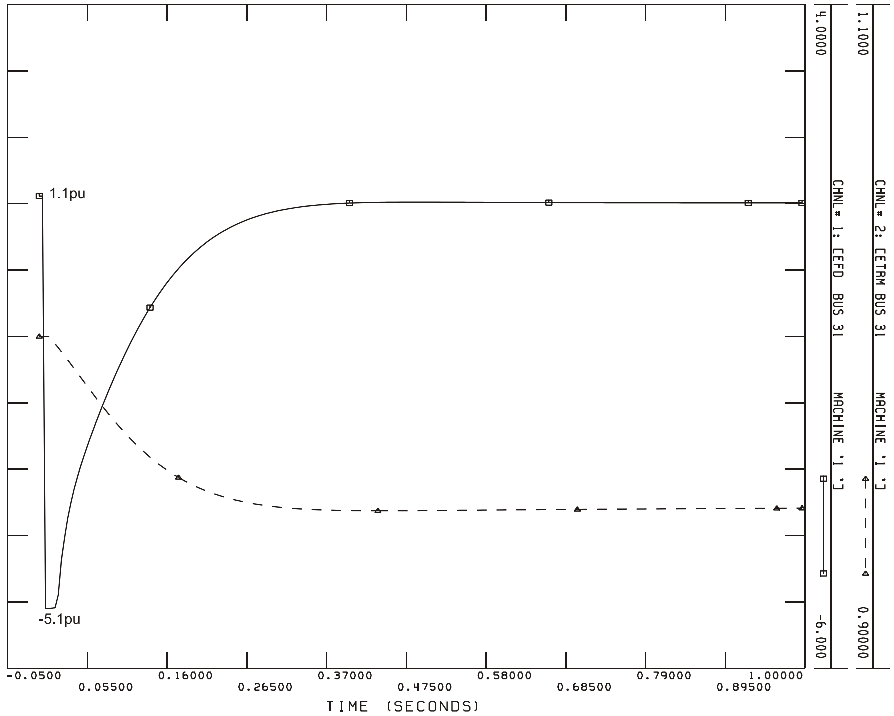


Figure 15: Open Circuit Test of Excitation System (-5% Step)

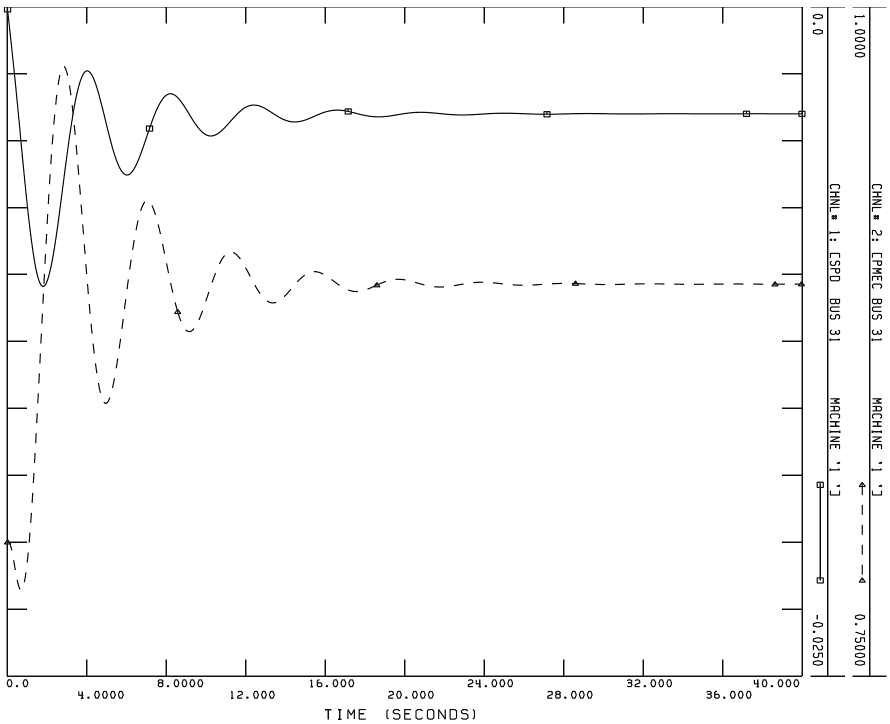


Figure 16: Governor Test (4% Droop)

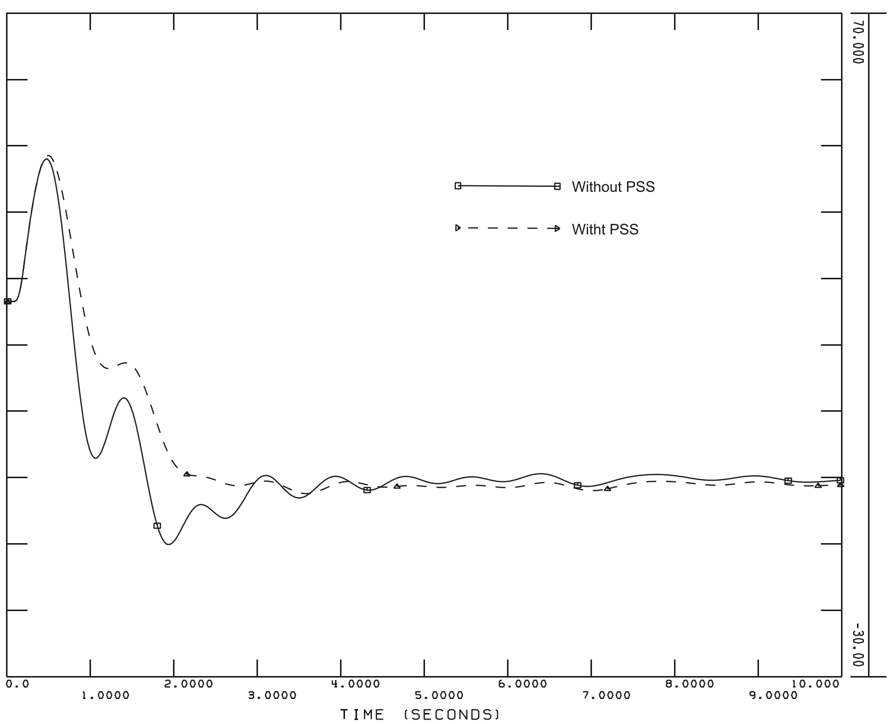


Figure 17: YEC G2 Rotor Angle Response, with and without PSS, due to a 3-phase fault on Circuit B82V at Claireville

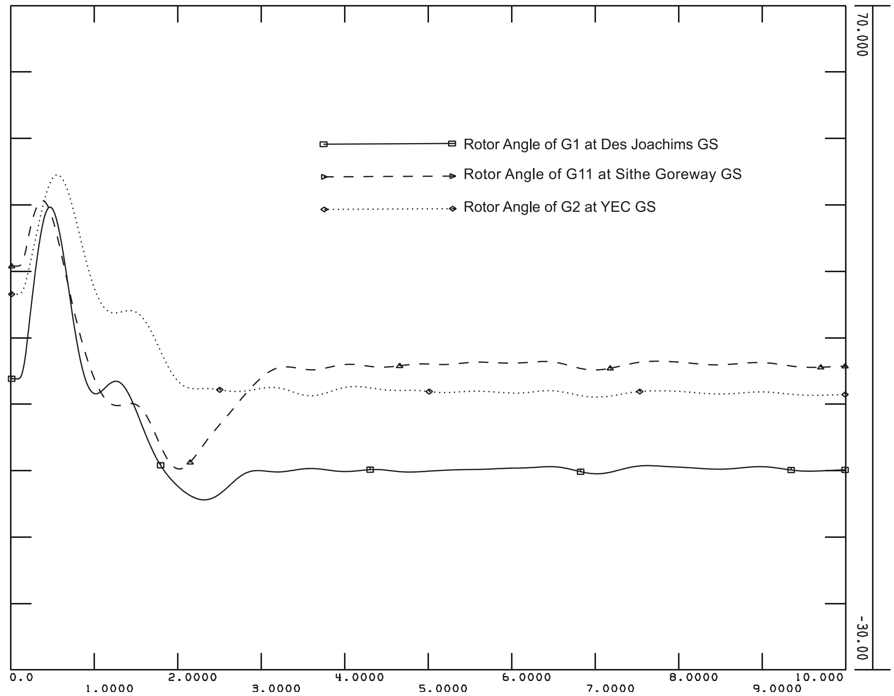


Figure 18: Major Generator Rotor Angle Response due to a 3-phase fault on Circuit B561M at Milton TS

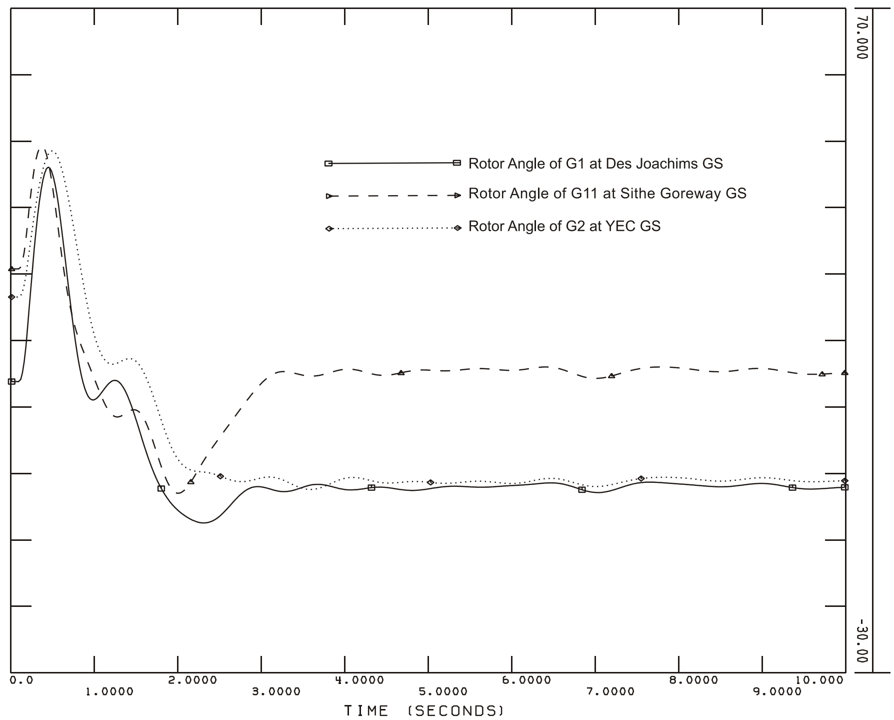


Figure 19: Major Generator Rotor Angle Response due to a 3-phase fault on Circuit B82V at Claireville

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