| Condition Rating | Corresponding Condition |
|---|---|
| D | Bushings are cracked or have large chips or flashover burns that compromise the safe creepage distance or cementing or fasteners are not secure and cannot be repaired. Bushings need replacement during next planned outage. |
| E | Bushings are damaged to the extent that there is very high risk of failure in service and an unplanned outage is required to replace bushings immediately. |

**Table 63: Criteria for Oil Leaks**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No evidence of oil leakage, Oil levels are acceptable. |
| B | Minor oil leaks exist, but no moisture ingress likely. |
| C | Clear evidence of oil leaks, but rate of loss is not likely to cause any operational or environmental impacts if no repairs are made. |
| D | Significant oil leakage and probable moisture ingress indicate immediate need for a major reconditioning or replacement. |
| E | Major oil leakage and moisture ingress resulting in damage/degradation beyond repair. |

## A.8. Pad-Mounted Transformers

**Table 64: Criteria for Service Age**

| Condition Rating | Corresponding Condition |
|---|---|
| A | 0 to 10 years |

| Condition Rating | Corresponding Condition |
|---|---|
| B | 11 to 20 years |
| C | 21 to 30 years |
| D | 31 to 40 years |
| E | 41 years or older |

**Table 65: Criteria for Condition of Enclosure**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Good condition as new |
| C | Poor condition, remedial action required |
| E | Immediate replacement required |

**Table 66: Criteria for Condition of Pad**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Good condition as new |
| C | Poor condition, remedial action required |
| E | Civil structure degraded beyond repairs, unlevel, crumbling cement, trees and vegetation growth; Immediate replacement required |

**Table 67: Criteria for Oil Leaks**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No evidence of oil leakage, Oil levels are acceptable. |
| B | Minor oil leaks exist, but no moisture ingress likely. |
| C | Clear evidence of oil leaks, but rate of loss is not likely to cause any operational or environmental impacts if no repairs are made. |
| D | Significant oil leakage and probable moisture ingress indicate immediate need for a major reconditioning or replacement. |
| E | Major oil leakage and moisture ingress resulting in damage/degradation beyond repair. |

## A.9. Overhead Load Break Switches

**Table 68: Criteria for Service Age**

| Condition Rating | Corresponding Condition |
|---|---|
| A | 0 to 10 years |
| B | 11 to 20 years |
| C | 21 to 30 years |
| D | 31 to 40 years |
| E | 41 years or older |

**Table 69: Criteria for Condition of Insulators**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Insulators are not broken and are free of chips, radial cracks, flashover burns, copper splash and copper wash. Cementing and fasteners are secure |
| C | Insulators are not broken, however there are some major chips and cracks. Some evidence of flashover burns or copper splash or copper wash. Cementing and fasteners are secure |
| E | Insulators, cementing or fasteners are broken/damaged beyond repair |

**Table 70: Criteria for Condition of Housing**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Housing is clean, free from corrosion, cracks, distortion, abrasion or obstruction. |
| C | Significant signs of wear with respect to the above listed deficiencies, but the deficiencies are not critical to the safe operation of the switch |
| E | Housing is damaged/degraded beyond repair, requiring immediate replacement |

**Table 71: Criteria for Condition of Operating Mechanism**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Operating mechanism is in good condition and all parts are moving with adequate speed. No evidence of rust or friction in moving parts |

| Condition Rating | Corresponding Condition |
|---|---|
| C | Significant wear of operating mechanism based on the above listed characteristics, but it does not affect safe operation of the disconnect switch |
| E | Switch operating mechanism defective, damaged, or degraded, requiring immediate replacement |

**Table 72: Criteria for IR Scan**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No hot spots detected; no deficiency identified for switch and no further action required |
| C | Intermediate temperature rises between 10 to 20°C; maintenance required at next available outage |
| E | Critical temperature rises larger than 30°C; immediate action is required to correct the issue |

## A.10. Station Transformers

**Table 73: Gas Concentration (ppm) limits**

| Gas | O2/N2 Ratio <= 0.2 | | | | O2/N2 Ratio >0.2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Transformer Age in Years | | | | Transformer Age in Years | | | |
| | Unknown | 1-9 | 10-30 | >30 | Unknown | 1-9 | 10-30 | >30 |
| $H_2$ | 80 | 75 | | 100 | 40 | 40 | | |
| $CH_4$ | 90 | 45 | 90 | 110 | 20 | 20 | | |

| Gas | O2/N2 Ratio <= 0.2 | | | | O2/N2 Ratio >0.2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Transformer Age in Years | | | | Transformer Age in Years | | | |
| | Unknown | 1-9 | 10-30 | >30 | Unknown | 1-9 | 10-30 | >30 |
| $C_2H_6$ | 90 | 30 | 90 | 150 | 15 | 15 | | |
| $C_2H_4$ | 50 | 20 | 50 | 90 | 50 | 25 | 60 | |
| $C_2H_2$ | 1 | 1 | | | 2 | 2 | | |
| CO | 900 | 900 | | | 500 | 500 | | |
| $CO_2$ | 9000 | 5000 | 10000 | | 5000 | 3500 | 5500 | |

**Table 74: Gas Rate of Change Limits (ppm)**

| Gas | Maximum (ppm) variation between consecutive DGA samples | |
|---|---|---|
| | O2/N2 Ratio <= 0.2 | O2/N2 Ratio >0.2 |
| $H_2$ | 40 | 25 |
| $CH_4$ | 30 | 10 |
| $C_2H_6$ | 25 | 7 |
| $C_2H_4$ | 20 | |
| $C_2H_2$ | Any Increase | |
| CO | 250 | 175 |

| Gas | Maximum (ppm) variation between consecutive DGA samples | |
|---|---|---|
| | O2/N2 Ratio <= 0.2 | O2/N2 Ratio >0.2 |
| $CO_2$ | 2500 | 1750 |

**Table 75: Criteria for DGA Results**

| Condition Rating | Corresponding Condition |
|---|---|
| A | All parameters within acceptable limits |
| B | 1 parameter does not meet acceptability limits. |
| C | 2 parameters do not meet acceptability limits. |
| D | 3 parameters do not meet acceptability limits. |
| E | 4 or more parameters do not meet acceptability limits. |

**Table 76: Criteria for Oil Quality Tests**

| Test | Station Transformer Voltage Class | Grade |
|---|---|---|
| | U ≤ 69 kV | |
| Acid Number | ≤0.05 | A |
| | 0.05-0.20 | C |
| | ≥0.20 | E |

| Test | Station Transformer Voltage Class | Grade |
|---|---|---|
| | U ≤ 69 kV | |
| IFT [mN/m] | ≥30 | A |
| | 25-30 | C |
| | ≤25 | E |
| Dielectric Strength [kV] | >23 (1mm gap)<br>>40 (2 mm gap) | A |
| | ≤40 | E |
| Water Content [ppm] | <35 | A |
| | ≥35 | E |

**Table 77: Criteria for Service Age**

| Condition Rating | Corresponding Condition |
|---|---|
| A | 0 to 15 years |
| B | 16 to 30 years |
| C | 31 to 45 years |
| D | 46 to 60 years |
| E | More than 60 years |

**Table 78: Criteria for Loading History**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Peak Load less than 50% of its rating |
| B | Peak Load of 50% to 75% its rating |
| C | Peak Load 75% to 100% its rating |
| D | Peak Load 100% to 125% of its rating |
| E | Peak Load Greater then 125% of its rating |

**Table 79: Criteria for Main Tank Condition**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No rust, corrosion, or moisture evident on main tank. |
| B | No rust or corrosion on main tank, but some evidence of moisture ingress or condensation. |
| C | Some rust and corrosion on main tank. |
| D | Significant corrosion on main tank – repairable. |
| E | Significant corrosion on main tank – degradation beyond repair. |

**Table 80: Criteria for Cooling Fan Equipment and Control**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No rust or corrosion on body of radiators. Fan and pump enclosures are free of rust and corrosion and securely mounted in position. Pump bearings are in good condition and fan controls are operating per design. |
| B | Normal signs of wear with respect to the above characteristics. |
| C | One or two of the above characteristics are unacceptable. |
| D | More than two of the above characteristics are unacceptable. Fan and pump enclosures may be damaged/degraded beyond repair. |
| E | Fan and pump enclosures damaged/degraded beyond repair. |

**Table 81: Criteria for Oil Tank Corrosion**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No rust, corrosion, or moisture evident on oil tank. |
| B | No rust or corrosion on oil tank, but some evidence of moisture ingress or condensation. |
| C | Some rust and corrosion on oil tank. |
| D | Significant corrosion on oil tank – repairable. |
| E | Significant corrosion on oil tank – degradation beyond repair. |

**Table 82: Criteria for Foundation Condition**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Concrete foundation is level and free from cracks and spalling. Support steel and/or anchor bolts are tight and free from corrosion. No issues with settling. |
| B | Normal signs of wear with respect to the above characteristics. |
| C | One of the above characteristics is unacceptable. |
| D | Two of the above characteristics are unacceptable. |
| E | Foundation or supports are damaged/degraded beyond repair. |

**Table 83: Criteria for Grounding**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Ground connections are tight and free of corrosion. Connections are made directly to tanks, radiators, cabinets and supports without any intervening paint or corrosion. |
| B | Normal signs of wear with respect to the ground connections. |
| C | One ground connection is visibly detached/missing. |
| D | Two ground connections are visibly detached/missing. |
| E | Ground connections are damaged/degraded beyond repair or more than two missing ground connections. |

**Table 84: Criteria for Oil Leaks**

| Condition Rating | Corresponding Condition |
|---|---|
| A | No oil leakage or water ingress at any of the bushing-metal interfaces or at gaskets, weld seals, flanges, valve fittings, gauges, monitors. |
| B | Minor oil leaks evident, but no moisture ingress is likely. |
| C | Clear evidence of oil leaks but rate of loss is not likely to cause any operational or environmental impacts. |
| D | Major oil leakage and probable moisture ingress. If left uncorrected it could cause operational and/or environmental problems. |
| E | Oil leaks or moisture ingress have resulted in complete failure or damage/degradation beyond repair. |

**Table 85: Criteria for Oil Level**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Transformer oil level is acceptable with insignificant variation from the previous inspection. |
| B | Transformer oil level is acceptable with noticeable variation from the previous inspection. |
| C | Transformer oil level is acceptable, but considerable variation from the previous inspection. |
| D | Transformer oil level is unacceptable. Topped up during inspection. |
| E | Transformer oil level is unacceptable and could not be topped up; and/or oil level indicates unsafe transformer operation or hazardous rate of oil loss. |

**Table 86: Criteria for Turns Test Ratio**

| Condition Rating | Corresponding Condition |
|---|---|
| A | Maximum Deviation: 0-0.09% |
| B | 0.10-0.29% |
| C | 0.03-0.39% |
| D | 0.40-0.49% |
| E | ≥ 0.5% |

**Table 87: Criteria for DC Winding Resistance Testing**

| Condition Rating | Corresponding Condition |
|---|---|
| A | 0-0.49% |
| B | 0.50-2.49% |
| C | 2.5-3.99% |
| D | 4.0-4.99% |
| E | ≥ 5% |

**Table 88: Criteria for Insulation Resistance**

| Condition Rating | Corresponding Condition |
|---|---|
| A | IR ≥ 5 GΩ |
| B | 4.0 < IR ≤ 5.0 GΩ |

| Condition Rating | Corresponding Condition |
|---|---|
| C | 2.5 < IR ≤ 4.0 GΩ |
| D | 0.5 < IR ≤ 2.5 GΩ |
| E | 0 < IR ≤ 0.5 GΩ |

# APPENDIX H. ERTH Substation Inspection Report

ERTH POWER

# MAINTENANCE INSPECTION REPORT

ERTH Power Corporation
143 Bell St Ingersoll, ON
N5C 3K5

**Re:** **Maintenance Inspection Report – Ref: H-23-001**

**Site:** **Semi-Annual Inspections (Spring 2023)**

**Date:** **June 14, 2023**

# Index





# Introductory

Please find the enclosed report for the maintenance work and inspections completed May 16th and 17th 2023 for stations identified below.

Erth Corp cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and the International Electrical Testing Association (NETA) where applicable.

All other equipment that ERTH Corp tested appears in satisfactory condition, suitable for continued service. Please contact us should you wish us to provide pricing and services for any or all of the recommended repairs listed in this report.

**Oil and dissolved gas analysis:**

A snap shot of the diagnostics from the oil and dissolved gas analysis can be found below with the formal report from AVO at the end of this report. The diagnostics, have been placed in order of priority.
The bolded text are of areas of concern, and require further investigation and in some cases recommend online surveillance.

| **Clinton: Serial#: 301687** | |
|---|---|
| DGA Diagnostics Roger's Ratio | Not Determined |
| Duval Triangles | **Triangle 1: Thermal fault (t > 700°C)**<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>**Triangle 5: Thermal fault (t > 700°C)** |
| Duval Pentagons | **Pentagon 1: High energy discharge**<br>**Pentagon 2: High energy discharge** |
| Cellulose insulation | **CO2/CO ratio = 26 (>20) -Indication of slow degradation of the paper due to low temperature (< 140 °C).**<br>**Verify insulation condition with furans/methanol tests.** |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing.**<br>**Probably suspicious - perform fault identification and transformer assessment.**<br>**Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates.**<br>**Consider online monitoring and comprehensive engineering assessment.** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities

| Goderich MS4 | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | **CO2/CO ratio = 42 (>20) -Indication of slow degradation of the paper due to low temperature (< 140 °C). Verify insulation condition with furans/methanol tests.** |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment.** |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities

| **Beachville:** | |
|---|---|
| DGA Diagnostics Roger's Ratio | **Thermal > 700 °C** |
| Duval Triangles | **Triangle 1: Thermal fault (t > 700°C)**<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>**Triangle 5: Thermal fault (t > 700°C)** |
| Duval Pentagons | **Pentagon 1: Thermal fault (t > 700°C)**<br>**Pentagon 2: Thermal fault in oil only** |
| Cellulose insulation | CO2/CO ratio = 9 (3< ratio <= 20) - No indication of a fault involving paper |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment.** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities



| **Ingersoll:** | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO2/CO ratio = 4 (3< ratio <= 20) - No indication of a fault involving paper |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing.**<br>**Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates.**<br>**Consider online monitoring and comprehensive engineering assessment.** |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities

| **Port Stanley** | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO2/CO ratio = 10 (3< ratio <= 20) - No indication of a fault involving paper |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing.**<br>**Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment.** |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities

| **Tavistock** | |
|---|---|
| DGA Diagnostics Roger's Ratio | Unit normal. |
| Duval Triangles | **Pentagon 1: Stray Gassing (t < 200°C)**<br>**Pentagon 2: Stray Gassing (t< 200°C)** |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO and CO2 levels are normal. No indication of a fault involving paper. |
| DGA Status | **Status 2 - Elevated gas levels and/or possible gassing.**<br>**Possibly suspicious - warrants additional investigation. Increase surveillance and DGA frequency.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Resample within 3 months.** |

Recommendation:

- Increase sampling frequency to quarterly and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities



| AYLMER | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO2/CO ratio = 10 (3< ratio <= 20) - No indication of a fault involving paper |
| DGA Status | **Status 2 - Elevated gas levels and/or possible gassing.<br>Possibly suspicious - warrants additional investigation. Increase surveillance and DGA frequency.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | Routine Screening |
| Dielectric Breakdown ASTM D-1816: | Resample within 3 months. |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Increase sampling frequency to quarterly and consider online monitoring.
- Consult a transformer specialist, to discuss appropriate measures. We would suggest Vankooy Transformer Consulting, whom specializes with local Ontario Based Utilities

| AYLMER - MCBRIEN | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO and CO2 levels are normal. No indication of a fault involving paper. |
| DGA Status | Status 1 - Normal gas levels and no Indication of gassing. Continue routine DGA and normal transformer operation. |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | Routine Screening |
| Dielectric Breakdown ASTM D-1816: | Resample within 1 year. |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Routine maintenance.

| Goderich MS3 | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO and CO2 levels are normal. No indication of a fault involving paper. |
| DGA Status | Status 1 - Normal gas levels and no Indication of gassing.<br>Continue routine DGA and normal transformer operation. |
| Resampling Protocol | Routine Surveillance |
| AVO Resampling Recommendation | Resample within 1 year. |
| Dielectric Breakdown ASTM D-1816: | **Below limit for in-service oil (40 kV min @ 2mm).** |

Recommendation:

- Routine maintenance.

| Clinton - Serial#: 062108 | |
|---|---|
| DGA Diagnostics Roger's Ratio | Diagnostic not applicable - Gas levels normal. |
| Duval Triangles | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| Duval Pentagons | Diagnostic not applicable - Gas levels normal. |
| Cellulose insulation | CO and CO2 levels are normal. No indication of a fault involving paper. |
| DGA Status | Status 1 - Normal gas levels and no Indication of gassing. Continue routine DGA and normal transformer operation. |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | Routine Screening |
| Dielectric Breakdown ASTM D-1816: | Resample within 1 year. |

Recommendation:

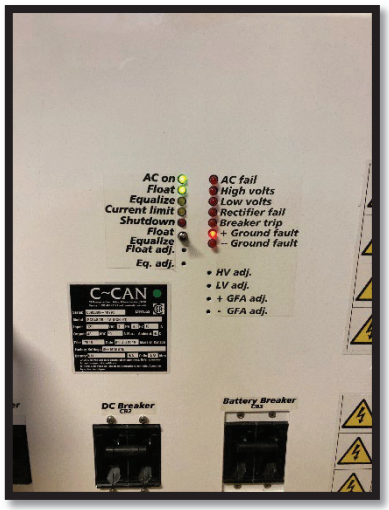
- Routine maintenance.

# Ingersoll Substation MS1

***Site: Substation # MS1***
***Address: 110 Mill Street, Ingersoll***

***Findings:***

- Leaves were cleaned up within the transformer station.
- Battery bank still has a positive ground fault indicator.




# Beachville Substation MS1

***Site: Substation # MS1***
***Address: 434839 Zorra Line, Beachville***

***Findings:***

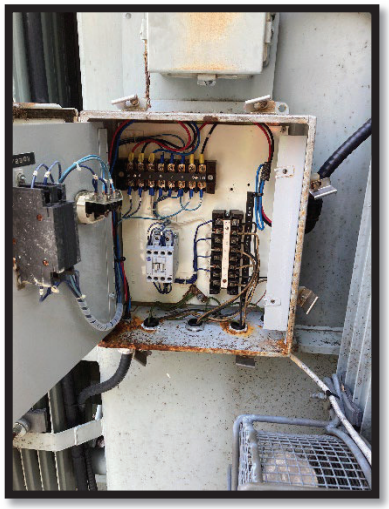
- Vines are growing along / through the South-West corner and side of the fence.
- The service for the heater in the main incoming switch still needs to be completed.
- The transformer and switch should be painted.

# Port Stanley Substation MS1

***Site: Substation # MS1***
***Address: 288 Carlow Road, Port Stanley***

***Findings:***

- The fan controller no longer has 120/240V since the station building was taken out of service. Temperature of the transformer should be monitored and kept below 65 ºC. A new service could be installed on the pole in the station if required.

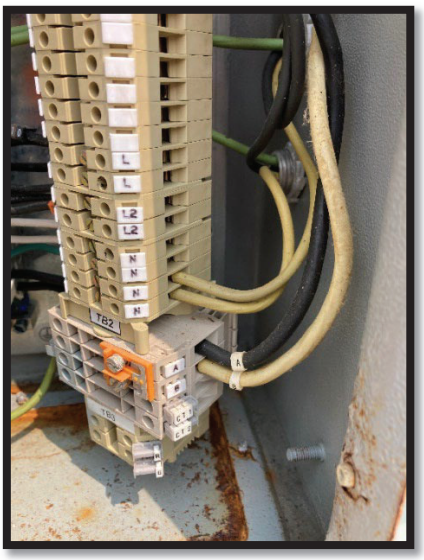


# Tavistock Substation MS1

***Site: Substation # MS1***
***Address: 17 Decew Street West, Tavistock***

***Findings:***

- Power has never been routed to the fan controller. Temperature of the transformer should be monitored to see if it is necessary to install power.



# Aylmer Substation MS1

***Site: Substation # MS1***
***Address: 118 Myrtle Street, Aylmer***

***Findings:***

- A cedar tree is growing through the North-West corner of the fence.

# Aylmer Substation MS2

***Site: Substation # MS2***
***Address: 209 Caverly Road, Aylmer***

***Findings:***

- Both transformers have one fan that is seized and not operational. Each transformer still has 3 functioning fans. All fan nameplate data was recorded in the event replacements are requested.
- Weed spray is needed soon.

# Clinton Substation MS1

***Site: Substation # MS1***
***Address: 17 Park Lane, Clinton***

***Findings:***

- The breaker was found off for the fan controller. When testing the fans, it was found that the fans turn on in auto or manual switch positions. The breaker was turned off prior to leaving the station.



# Goderich Substation MS2

***Site: Substation # MS2***
***Address: 211 Britannia Road East, Goderich***

***Findings:***

- Weeds were pulled and removed from the station.
- The fan controller and timer were both found in the off position. The operation of the fans was verified and the controls were left in the off position prior to leaving the station.
- Emergency light unit at the main entrance does not work and requires a new battery.

# Goderich Substation MS3

***Site: Substation # MS3***
***Address: 436 Mooney Street, Goderich***

***Findings:***

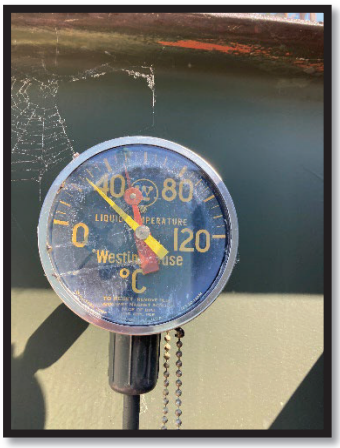
- A "DO NO OPERATE POWER FUSES" sign is required on the tower switch.

*OESC Rule # 36-006 (3) - Suitable warning signs shall be erected in a conspicuous place adjacent to fuses and shall warn operators not to replace fuses while the supply circuit is energized.*

- A single line diagram is required on the metal enclosed switchgear.

*OESC Rule # 36-006 (5a) - A permanent, legible, single-line diagram of the switchgear shall be provided in a conspicuous location within sight of the switchgear, and this diagram shall clearly identify interlocks, isolation means, and all possible sources of voltage to the installation under normal or emergency conditions, including all equipment contained in each cubicle, and the marking on the switchgear shall cross reference the diagram;*

- Conservator shows slightly less than 25°C while temperature gauge is at 25°C. Some oil should be added during the next outage.

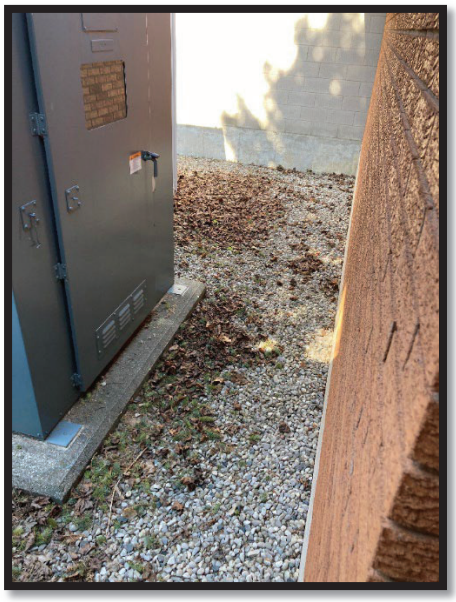




# Goderich Substation MS4

***Site: Substation # MS4***
***Address: 77 Lee Street, Goderich***

***Findings:***

- All leaves within the station were bagged and taken away.
- The fan controller and timer were both found in the off position. The operation of the fans was verified and the controls left in the off position prior to leaving the station.



# Oil Reports



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**TEST REPORT**
**01-7647787-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 301687
**Location:** CLINTON
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 607

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1971
**Syringe ID:** 8001815
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647787
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647787 | 7590311 | 7535757 | 7505531 | 7425759 |
| | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 45 | 40 | 45 | 45 | 45 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.05 | 0.06 | 0.07 | 0.07 | 0.04 |
| **ASTM** | **Transformer Age (yrs):** | 52 | 51 | 51 | 50 | 50 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | **101** | 85 | 84 | 85 | 86 |
| | **Methane (CH4) (µL/L):** | 10 | 9 | 9 | 10 | 11 |
| | **Ethane (C2H6) (µL/L):** | 3 | 3 | 3 | 3 | 3 |
| | **Ethylene (C2H4) (µL/L):** | **121** | 107 | 114 | 119 | 116 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 601 | 555 | 638 | 687 | 759 |
| | **Carbon Dioxide (CO2) (µL/L):** | **15810** | 14705 | 16222 | 15971 | 1640 |
| | **Nitrogen (N2) (µL/L):** | 64201 | 55251 | 68634 | 70234 | 76472 |
| | **Oxygen (O2) (µL/L):** | 3257 | 3056 | 4508 | 4602 | 3439 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 101 | Elevated (> 100) | 16 | Normal Variation (<= 40) | 10 | No active gassing (<= 20) |
| **Methane (CH4)** | 10 | Normal (<= 110) | 1 | Normal Variation (<= 30) | 0 | No active gassing (<= 10) |
| **Ethane (C2H6)** | 3 | Normal (<= 150) | 0 | Normal Variation (<= 25) | 0 | No active gassing (<= 9) |
| **Ethylene (C2H4)** | 121 | Elevated (> 90) | 14 | Normal Variation (<= 20) | 1 | No active gassing (<= 7) |
| **Acetylene (C2H2)** | <1 | Normal (<= 1) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 601 | Normal (<= 900) | 46 | Normal Variation (<= 250) | -61 | No active gassing (<= 100) |
| **Carbon Dioxide (CO2)** | 15810 | High (> 14000) | 1105 | Normal Variation (<= 2500) | -320 | No active gassing (<= 1000) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Not Determined |
| **Duval Triangles** | Triangle 1: Thermal fault (t > 700°C)<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Triangle 5: Thermal fault (t > 700°C) |
| **Duval Pentagons** | Pentagon 1: High energy discharge<br>Pentagon 2: High energy discharge |
| **Cellulose insulation** | CO2/CO ratio = 26 (>20) -Indication of slow degradation of the paper due to low temperature (< 140 °C). Verify insulation condition with furans/methanol tests. |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647787-701058-00**


ERTH (Holdings) Inc

**Serial#:** 301687 **Mfr:** FERRANTI PACKARD **Control#:** 7647787
**Location:** CLINTON **kV:** 27.6 **Order#:** 701058
**Equipment:** TRANSFORMER **kVA:** 5000 **Account:** 110229
INGERSOLL, . N5C2N9 CA **Compartment:** MAIN(BOTTOM) **Year Mf'd:** 1971 **Received:** 06/06/2023
ATTN: MARC GALECKAS **Breathing:** SEAL **Syringe ID:** 8001815 **Reported:** 06/28/2023
PO#: POH007255 **Bank:** **Phase:** 3 **Bottle ID:**
**Project ID:** H-23-001 **Fluid:** MIN **USGal:** 607 **Sampled By:** CC
**Customer ID:** MS1

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647787 | 7590311 | 7535757 | 7505531 | 7425759 |
| | | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 45 | 40 | 45 | 45 | 45 |
| **AVO Resampling Recommendation** | | | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. | | | | |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 21 | 32 | 22 | 38 | 11 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 36.02 | 35.42 | 36.16 | 35.91 | 36.21 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.030 | 0.022 | 0.024 | 0.025 | 0.026 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.0 | L1.0 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 60 (23 C) | 73 (24 C) | 41 (22 C) | 44 (23°C) | 59 (24°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8933 | 0.8933 | 0.894 | 0.8941 | 0.8913 |
| **GOQ Diagnostics** | | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). | | | | |
| **PER IEEE C57.106-2015** | | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). | | | | |
| (most recent sample) | | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). | | | | |
| | | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. | | | | |
| | | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). | | | | |
| **Comment:** | | | | | | | |

## End of Test Report

Authorized By: _____
JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647789-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 225151
**Location:** BEACHVILLE
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 574

**Mfr:**
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1976
**Syringe ID:** 8003346
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647789
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647789 | 7590319 | 7535750 | 7515375 | 7425750 |
| | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 11/30/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | **Oil Temp:** | 40 | | 38 | 30 | 20 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.2 | 0.21 | 0.2 | 0.2 | 0.21 |
| **ASTM** | **Transformer Age (yrs):** | 47 | 46 | 46 | 45 | 45 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 4 | 5 | 4 | 4 | 4 |
| | **Methane (CH4) (µL/L):** | 12 | 11 | 11 | 12 | 13 |
| | **Ethane (C2H6) (µL/L):** | 5 | 4 | 4 | 5 | 5 |
| | **Ethylene (C2H4) (µL/L):** | **72** | 67 | 64 | 69 | 71 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | **952** | 908 | 829 | 931 | 977 |
| | **Carbon Dioxide (CO2) (µL/L):** | **8943** | 8885 | 7752 | 8790 | 8349 |
| | **Nitrogen (N2) (µL/L):** | 67950 | 63595 | 64025 | 69111 | 71385 |
| | **Oxygen (O2) (µL/L):** | 13857 | 13422 | 12604 | 13895 | 14827 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 4 | Normal (<= 40) | -1 | | 0 | No active gassing (<= 10) |
| **Methane (CH4)** | 12 | Normal (<= 20) | 1 | Normal Variation (<= 10) | 0 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 5 | Normal (<= 15) | 1 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 72 | Elevated (> 60) | 5 | Normal Variation (<= 20) | 3 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 952 | High (> 600) | 44 | Normal Variation (<= 175) | 37 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 8943 | High (> 8000) | 58 | Normal Variation (<= 1750) | 386 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Thermal > 700 °C |
| **Duval Triangles** | Triangle 1: Thermal fault (t > 700°C)<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Triangle 5: Thermal fault (t > 700°C) |
| **Duval Pentagons** | Pentagon 1: Thermal fault (t > 700°C)<br>Pentagon 2: Thermal fault in oil only |
| **Cellulose insulation** | CO2/CO ratio = 9 (3< ratio <= 20) - No indication of a fault involving paper |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647789-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 225151
**Location:** BEACHVILLE
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 574

**Mfr:**
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1976
**Syringe ID:** 8003346
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647789
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647789 | 7590319 | 7535750 | 7515375 | 7425750 |
| | | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 11/30/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | | **Oil Temp:** | 40 | | 38 | 30 | 20 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 3 | 5 | 4 | 2 | 3 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 37.62 | 38.02 | 38.19 | 38.27 | 38.75 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.016 | 0.008 | 0.014 | 0.010 | 0.010 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.0 | L1.0 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 47 (23 C) | 50 (23 C) | 68 (22 C) | 44 (23°C) | 64 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.859 | 0.8586 | 0.8597 | 0.8589 | 0.8594 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647788-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 0265001001
**Location:** INGERSOLL
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **Liters:** 3437

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1985
**Syringe ID:** 8005730
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647788
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647788 | 7590318 | 7535753 | 7515374 | 7425760 |
| | **Date Sampled:** | 05/16/2023 | 09/28/2022 | 04/07/2022 | 11/30/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | **Oil Temp:** | 42 | 35 | 32 | 30 | 20 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **ASTM** | **Transformer Age (yrs):** | 38 | 37 | 37 | 36 | 36 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 85 | 78 | 79 | 76 | 78 |
| | **Methane (CH4) (µL/L):** | 40 | 42 | 40 | 41 | 45 |
| | **Ethane (C2H6) (µL/L):** | 12 | 12 | 12 | 12 | 12 |
| | **Ethylene (C2H4) (µL/L):** | 18 | 18 | 18 | 19 | 20 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | **1137** | 1184 | 1162 | 1179 | 1274 |
| | **Carbon Dioxide (CO2) (µL/L):** | 4696 | 5106 | 4617 | 8014 | 4706 |
| | **Nitrogen (N2) (µL/L):** | 71651 | 70984 | 75612 | 78398 | 79655 |
| | **Oxygen (O2) (µL/L):** | 620 | 670 | 1101 | 856 | 893 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 85 | Normal (<= 100) | 7 | Normal Variation (<= 40) | 6 | No active gassing (<= 20) |
| **Methane (CH4)** | 40 | Normal (<= 110) | -2 | | 0 | No active gassing (<= 10) |
| **Ethane (C2H6)** | 12 | Normal (<= 150) | 0 | Normal Variation (<= 25) | 0 | No active gassing (<= 9) |
| **Ethylene (C2H4)** | 18 | Normal (<= 90) | 0 | Normal Variation (<= 20) | -1 | No active gassing (<= 7) |
| **Acetylene (C2H2)** | <1 | Normal (<= 1) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 1137 | High (> 1100) | -47 | | -23 | No active gassing (<= 100) |
| **Carbon Dioxide (CO2)** | 4696 | Normal (<= 10000) | -410 | | -1751 | No active gassing (<= 1000) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO2/CO ratio = 4 (3< ratio <= 20) - No indication of a fault involving paper |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647788-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 0265001001
**Location:** INGERSOLL
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **Liters:** 3437

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1985
**Syringe ID:** 8005730
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647788
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647788 | 7590318 | 7535753 | 7515374 | 7425760 |
| | | **Date Sampled:** | 05/16/2023 | 09/28/2022 | 04/07/2022 | 11/30/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | | **Oil Temp:** | 42 | 35 | 32 | 30 | 20 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 5 | 9 | 5 | 13 | 3 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 41.86 | 41.67 | 40.78 | 41.47 | 41.81 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.011 | 0.003 | 0.008 | 0.005 | 0.005 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.0 | L1.0 | L1.0 | L1.0 | L1.0 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | **27 (23 C)** | 60 (23 C) | 71 (22 C) | 67 (23°C) | 59 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8628 | 0.8623 | 0.8632 | 0.8626 | 0.8639 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Below limit for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____
JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647786-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** T1

**Serial#:** A3S6029
**Location:** GODERICH MS 3
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** CONS
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 850

**Mfr:** WESTINGHOUSE
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1968
**Syringe ID:** 8006754
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647786
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647786 | 7590313 | 7535759 | 7505532 | 7425752 |
| | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 25 | 40 | 30 | 35 | 18 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.45 | 0.46 | 0.48 | 0.45 | 0.45 |
| **ASTM** | **Transformer Age (yrs):** | 55 | 54 | 54 | 53 | 53 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 4 | 5 | 4 | 7 | 4 |
| | **Methane (CH4) (µL/L):** | 2 | 2 | 2 | 2 | 2 |
| | **Ethane (C2H6) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Ethylene (C2H4) (µL/L):** | 10 | 11 | 9 | 11 | 11 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 108 | 134 | 111 | 155 | 142 |
| | **Carbon Dioxide (CO2) (µL/L):** | 1232 | 1306 | 1260 | 1391 | 1372 |
| | **Nitrogen (N2) (µL/L):** | 58056 | 55719 | 58892 | 64216 | 68745 |
| | **Oxygen (O2) (µL/L):** | 26356 | 25430 | 28038 | 29012 | 30903 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 4 | Normal (<= 40) | -1 | | -2 | No active gassing (<= 10) |
| **Methane (CH4)** | 2 | Normal (<= 20) | 0 | Normal Variation (<= 10) | 0 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 0 | Normal (<= 15) | 0 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 10 | Normal (<= 60) | -1 | | 0 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 108 | Normal (<= 500) | -26 | | -23 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 1232 | Normal (<= 5500) | -74 | | -83 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO and CO2 levels are normal. No indication of a fault involving paper. |
| **DGA Status** | Status 1 - Normal gas levels and no Indication of gassing. Continue routine DGA and normal transformer operation. |
| **Resampling Protocol** | Routine Screening |
| **AVO Resampling Recommendation** | Resample within 1 year. |
| **Comment:** | |
| **General Oil Quality (GOQ)** | |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647786-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** T1

**Serial#:** A3S6029
**Location:** GODERICH MS 3
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** CONS
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 850

**Mfr:** WESTINGHOUSE
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1968
**Syringe ID:** 8006754
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647786
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647786 | 7590313 | 7535759 | 7505532 | 7425752 |
| | | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 25 | 40 | 30 | 35 | 18 |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 7 | 13 | 7 | 13 | 4 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 36.94 | 36.28 | 36.9 | 37.16 | 37.16 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.014 | 0.017 | 0.019 | 0.016 | 0.010 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.5 | L1.5 | L2.0 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS | PASS | PASS | PASS | PASS |
| | | | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | **26 (23 C)** | 39 (23 C) | 67 (22 C) | 43 (23°C) | 73 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8604 | 0.8593 | 0.8608 | 0.8607 | 0.8568 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Below limit for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647790-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:**

**Serial#:** G135721
**Location:** TAVISTOCK
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** FB
**Bank:** **Phase:** 3
**Fluid:** MIN **Liters:** 3720

**Mfr:** PIONEER ELECTRIC
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 2005
**Syringe ID:** 8004950
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647790
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647790 | 7590317 | 7535749 | 7505535 | 7425757 |
| | **Date Sampled:** | 05/16/2023 | 09/20/2022 | 04/05/2022 | 10/03/2021 | 02/10/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 30 | 35 | 20 | 35 | 6 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.24 | 0.25 | 2.47 | 0.26 | 0.26 |
| **ASTM** | **Transformer Age (yrs):** | 18 | 17 | 17 | 16 | 16 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | **48** | 43 | 40 | 51 | 47 |
| | **Methane (CH4) (µL/L):** | 8 | 8 | 7 | 8 | 9 |
| | **Ethane (C2H6) (µL/L):** | 6 | 6 | 6 | 6 | 6 |
| | **Ethylene (C2H4) (µL/L):** | 3 | 3 | 3 | 3 | 3 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 416 | 377 | 333 | 423 | 379 |
| | **Carbon Dioxide (CO2) (µL/L):** | 2858 | 2841 | 2514 | 2971 | 2588 |
| | **Nitrogen (N2) (µL/L):** | 64043 | 58905 | 5508 | 68749 | 64918 |
| | **Oxygen (O2) (µL/L):** | 15078 | 14693 | 13578 | 17598 | 16559 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 48 | Elevated (> 40) | 5 | Normal Variation (<= 25) | -1 | No active gassing (<= 10) |
| **Methane (CH4)** | 8 | Normal (<= 20) | 0 | Normal Variation (<= 10) | 0 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 6 | Normal (<= 15) | 0 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 3 | Normal (<= 60) | 0 | Normal Variation (<= 20) | 0 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 416 | Normal (<= 500) | 39 | Normal Variation (<= 175) | 6 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 2858 | Normal (<= 5500) | 17 | Normal Variation (<= 1750) | 1 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Unit normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Pentagon 1: Stray Gassing (t < 200°C)<br>Pentagon 2: Stray Gassing (t< 200°C) |
| **Cellulose insulation** | CO and CO2 levels are normal. No indication of a fault involving paper. |
| **DGA Status** | Status 2 - Elevated gas levels and/or possible gassing. Possibly suspicious - warrants additional investigation. Increase surveillance and DGA frequency. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling** | Resample within 3 months. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647790-701058-00**


ERTH (Holdings) Inc

**Serial#:** G135721 **Mfr:** PIONEER ELECTRIC **Control#:** 7647790
**Location:** TAVISTOCK **kV:** 27.6 **Order#:** 701058
**Equipment:** TRANSFORMER **kVA:** 5000 **Account:** 110229
INGERSOLL, . N5C2N9 CA **Compartment:** MAIN(BOTTOM) **Year Mf'd:** 2005 **Received:** 06/06/2023
ATTN: MARC GALECKAS **Breathing:** FB **Syringe ID:** 8004950 **Reported:** 06/28/2023
PO#: POH007255 **Bank:** **Phase:** 3 **Bottle ID:**
**Project ID:** H-23-001 **Fluid:** MIN **Liters:** 3720 **Sampled By:** CC
**Customer ID:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647790 | 7590317 | 7535749 | 7505535 | 7425757 |
| | | **Date Sampled:** | 05/16/2023 | 09/20/2022 | 04/05/2022 | 10/03/2021 | 02/10/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 30 | 35 | 20 | 35 | 6 |
| **Recommendation** | | | | | | | |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 4 | 8 | 2 | 7 | 2 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 31.93 | 31.3 | 32.4 | 31.83 | 31.46 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.014 | 0.008 | 0.008 | 0.013 | 0.010 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L0.5 | L0.5 | L0.5 | L0.5 | L0.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | FAIL H2O | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | TRACE | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 52 (23 C) | 50 (23 C) | 62 (22 C) | 48 (23°C) | 58 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8865 | 0.886 | 0.887 | 0.8872 | 0.8851 |
| **GOQ Diagnostics** | | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). | | | | |
| **PER IEEE C57.106-2015** | | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). | | | | |
| (most recent sample) | | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). | | | | |
| | | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. | | | | |
| | | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). | | | | |
| **Comment:** | | | | | | | |

## End of Test Report

Authorized By: _____
JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647795-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** T1

**Serial#:** A3S6467
**Location:** GODERICH MS 4
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** FB
**Bank:** **Phase:** 3
**Fluid:** MIN **IMPGal:** 710

**Mfr:** WESTINGHOUSE
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1979
**Syringe ID:** 8001933
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647795
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647795 | 7590308 | 7535748 | 7505534 | 7425755 |
| | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 40 | | 45 | 52 | 40 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.01 | 0.03 | 0.02 | 0.02 | 0.01 |
| **ASTM** | **Transformer Age (yrs):** | 44 | 43 | 43 | 42 | 42 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 30 | 17 | 17 | 22 | 17 |
| | **Methane (CH4) (µL/L):** | 34 | 31 | 32 | 36 | 38 |
| | **Ethane (C2H6) (µL/L):** | 8 | 7 | 7 | 7 | 8 |
| | **Ethylene (C2H4) (µL/L):** | 8 | 7 | 6 | 5 | 6 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 549 | 482 | 526 | 630 | 631 |
| | **Carbon Dioxide (CO2) (µL/L):** | **23237** | 22223 | 22533 | 24390 | 23843 |
| | **Nitrogen (N2) (µL/L):** | 73947 | 62005 | 69062 | 78983 | 78444 |
| | **Oxygen (O2) (µL/L):** | 986 | 1584 | 1067 | 1192 | 780 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 30 | Normal (<= 100) | 13 | Normal Variation (<= 40) | 5 | No active gassing (<= 20) |
| **Methane (CH4)** | 34 | Normal (<= 110) | 3 | Normal Variation (<= 30) | -1 | No active gassing (<= 10) |
| **Ethane (C2H6)** | 8 | Normal (<= 150) | 1 | Normal Variation (<= 25) | 1 | No active gassing (<= 9) |
| **Ethylene (C2H4)** | 8 | Normal (<= 90) | 1 | Normal Variation (<= 20) | 2 | No active gassing (<= 7) |
| **Acetylene (C2H2)** | <1 | Normal (<= 1) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 549 | Normal (<= 900) | 67 | Normal Variation (<= 250) | -48 | No active gassing (<= 100) |
| **Carbon Dioxide (CO2)** | 23237 | High (> 14000) | 1014 | Normal Variation (<= 2500) | -620 | No active gassing (<= 1000) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO2/CO ratio = 42 (>20) -Indication of slow degradation of the paper due to low temperature (< 140 °C). Verify insulation condition with furans/methanol tests. |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647795-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** T1

**Serial#:** A3S6467
**Location:** GODERICH MS 4
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** FB
**Bank:** **Phase:** 3
**Fluid:** MIN **IMPGal:** 710

**Mfr:** WESTINGHOUSE
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1979
**Syringe ID:** 8001933
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647795
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647795 | 7590308 | 7535748 | 7505534 | 7425755 |
| | | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 40 | | 45 | 52 | 40 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 5 | 9 | 2 | 10 | 3 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 39.49 | 37.87 | 38.8 | 39.88 | 39.77 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.027 | 0.018 | 0.025 | 0.021 | 0.018 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.0 | L1.0 | L1.0 | L1.0 | 1.0 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | FAIL H2O | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 52 (23 C) | 40 (23 C) | 60 (22 C) | 43 (23°C) | 55 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8582 | 0.858 | 0.8589 | 0.8588 | 0.8582 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647792-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 307425
**Location:** PORT STANLEY
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 665

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1979
**Syringe ID:** 8000826
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647792
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647792 | 7590316 | 7535754 | 7505536 | 7425756 |
| | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 10/28/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 40 | 40 | 38 | 40 | 28 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.01 | 0.02 | 0.01 | 0.05 | 0.01 |
| **ASTM** | **Transformer Age (yrs):** | 44 | 43 | 43 | 42 | 42 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 31 | 26 | 27 | 27 | 29 |
| | **Methane (CH4) (µL/L):** | 27 | 27 | 26 | 28 | 30 |
| | **Ethane (C2H6) (µL/L):** | 8 | 7 | 7 | 8 | 8 |
| | **Ethylene (C2H4) (µL/L):** | 21 | 21 | 21 | 21 | 23 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | **1483** | 1435 | 1386 | 1438 | 1612 |
| | **Carbon Dioxide (CO2) (µL/L):** | **14782** | 14558 | 14425 | 14898 | 15314 |
| | **Nitrogen (N2) (µL/L):** | 74826 | 70694 | 72365 | 78241 | 82350 |
| | **Oxygen (O2) (µL/L):** | 541 | 1134 | 1045 | 3816 | 655 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 31 | Normal (<= 100) | 5 | Normal Variation (<= 40) | 2 | No active gassing (<= 20) |
| **Methane (CH4)** | 27 | Normal (<= 110) | 0 | Normal Variation (<= 30) | 0 | No active gassing (<= 10) |
| **Ethane (C2H6)** | 8 | Normal (<= 150) | 1 | Normal Variation (<= 25) | 0 | No active gassing (<= 9) |
| **Ethylene (C2H4)** | 21 | Normal (<= 90) | 0 | Normal Variation (<= 20) | 0 | No active gassing (<= 7) |
| **Acetylene (C2H2)** | <1 | Normal (<= 1) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 1483 | High (> 1100) | 48 | Normal Variation (<= 250) | 39 | No active gassing (<= 100) |
| **Carbon Dioxide (CO2)** | 14782 | High (> 14000) | 224 | Normal Variation (<= 2500) | -19 | No active gassing (<= 1000) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO2/CO ratio = 10 (3< ratio <= 20) - No indication of a fault involving paper |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647792-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 307425
**Location:** PORT STANLEY
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 665

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 1979
**Syringe ID:** 8000826
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647792
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647792 | 7590316 | 7535754 | 7505536 | 7425756 |
| | | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 10/28/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 40 | 40 | 38 | 40 | 28 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 15 | 12 | 9 | 17 | 5 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 36.13 | 36.49 | 36.58 | 36.12 | 36.97 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.045 | 0.026 | 0.047 | 0.040 | 0.039 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.5 | L1.5 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | **21 (23 C)** | 39 (23 C) | 45 (22 C) | 53 (23°C) | 65 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8595 | 0.859 | 0.8601 | 0.8602 | 0.8593 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Below limit for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647793-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS2 TX1

**Serial#:** T29931
**Location:** AYLMER - MCBRIEN
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** FB
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 739

**Mfr:** PIONEER ELECTRIC
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1967
**Syringe ID:** 8006681
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647793
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647793 | 7590309 | 7535751 | 7505537 | 7425758 |
| | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 08/04/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 30 | 25 | 15 | 30 | 11 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.49 | 0.48 | 0.5 | 0.47 | 0.48 |
| **ASTM** | **Transformer Age (yrs):** | 56 | 55 | 55 | 54 | 54 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 2 | 4 | 2 | 6 | 3 |
| | **Methane (CH4) (µL/L):** | 1 | 1 | 1 | 2 | 1 |
| | **Ethane (C2H6) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Ethylene (C2H4) (µL/L):** | 2 | 3 | 2 | 3 | 3 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 84 | 78 | 72 | 124 | 96 |
| | **Carbon Dioxide (CO2) (µL/L):** | 913 | 974 | 893 | 1105 | 984 |
| | **Nitrogen (N2) (µL/L):** | 61749 | 55331 | 57653 | 63819 | 71242 |
| | **Oxygen (O2) (µL/L):** | 30540 | 26652 | 28970 | 29975 | 33964 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 2 | Normal (<= 40) | -2 | | -2 | No active gassing (<= 10) |
| **Methane (CH4)** | 1 | Normal (<= 20) | 0 | Normal Variation (<= 10) | -1 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 0 | Normal (<= 15) | 0 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 2 | Normal (<= 60) | -1 | | 0 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 84 | Normal (<= 500) | 6 | Normal Variation (<= 175) | -20 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 913 | Normal (<= 5500) | -61 | | -90 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO and CO2 levels are normal. No indication of a fault involving paper. |
| **DGA Status** | Status 1 - Normal gas levels and no Indication of gassing. Continue routine DGA and normal transformer operation. |
| **Resampling Protocol** | Routine Screening |
| **AVO Resampling Recommendation** | Resample within 1 year. |

**Comment:**

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647793-701058-00**


ERTH (Holdings) Inc
INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS2 TX1

**Serial#:** T29931
**Location:** AYLMER - MCBRIEN
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** FB
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 739

**Mfr:** PIONEER ELECTRIC
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1967
**Syringe ID:** 8006681
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647793
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647793 | 7590309 | 7535751 | 7505537 | 7425758 |
| | | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 08/04/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 30 | 25 | 15 | 30 | 11 |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 14 | 18 | 10 | 18 | 5 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 36.66 | 42.84 | 37.23 | 36.7 | 37.03 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.018 | 0.018 | 0.024 | 0.018 | 0.016 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.0 | L1.0 | L1.0 | L1.0 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS | PASS | PASS | PASS | PASS |
| | | | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT | CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | **28 (23 C)** | 45 (24 C) | 43 (22 C) | 51 (23°C) | 56 (24°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8544 | 0.8539 | 0.8249 | 0.8551 | 0.8553 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Below limit for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____
JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647797-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:**

**Serial#:** 2305405
**Location:** AYLMER
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 409

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1992
**Syringe ID:** 8007673
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647797
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647797 | 7590315 | 7535758 | 7505538 | 7425749 |
| | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 08/04/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 45 | 45 | 38 | 45 | 28 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.02 | 0.01 | 0.03 | 0.02 | 0.02 |
| **ASTM** | **Transformer Age (yrs):** | 31 | 30 | 30 | 29 | 29 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 8 | 9 | 8 | 10 | 8 |
| | **Methane (CH4) (µL/L):** | 49 | 46 | 44 | 48 | 47 |
| | **Ethane (C2H6) (µL/L):** | 13 | 12 | 12 | 12 | 12 |
| | **Ethylene (C2H4) (µL/L):** | 82 | 79 | 75 | 81 | 81 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | **922** | 852 | 825 | 941 | 869 |
| | **Carbon Dioxide (CO2) (µL/L):** | 9327 | 9169 | 7850 | 9475 | 7495 |
| | **Nitrogen (N2) (µL/L):** | 77605 | 66926 | 73014 | 75451 | 73094 |
| | **Oxygen (O2) (µL/L):** | 1659 | 852 | 2538 | 1420 | 1255 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 8 | Normal (<= 100) | -1 | | -1 | No active gassing (<= 20) |
| **Methane (CH4)** | 49 | Normal (<= 110) | 3 | Normal Variation (<= 30) | 1 | No active gassing (<= 10) |
| **Ethane (C2H6)** | 13 | Normal (<= 150) | 1 | Normal Variation (<= 25) | 1 | No active gassing (<= 9) |
| **Ethylene (C2H4)** | 82 | Normal (<= 90) | 3 | Normal Variation (<= 20) | 1 | No active gassing (<= 7) |
| **Acetylene (C2H2)** | <1 | Normal (<= 1) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 922 | Elevated (> 900) | 70 | Normal Variation (<= 250) | -7 | No active gassing (<= 100) |
| **Carbon Dioxide (CO2)** | 9327 | Normal (<= 10000) | 158 | Normal Variation (<= 2500) | 98 | No active gassing (<= 1000) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO2/CO ratio = 10 (3< ratio <= 20) - No indication of a fault involving paper |
| **DGA Status** | Status 2 - Elevated gas levels and/or possible gassing. Possibly suspicious - warrants additional investigation. Increase surveillance and DGA frequency. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Resample within 3 months. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647797-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:**

**Serial#:** 2305405
**Location:** AYLMER
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 409

**Mfr:** FERRANTI PACKARD
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1992
**Syringe ID:** 8007673
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647797
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647797 | 7590315 | 7535758 | 7505538 | 7425749 |
| | | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 08/04/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 45 | 45 | 38 | 45 | 28 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 5 | 6 | 4 | 9 | 2 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 31.07 | 31.09 | 31.32 | 30.46 | 31.45 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.044 | 0.029 | 0.042 | 0.035 | 0.034 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L3.0 | L3.0 | L2.5 | L2.5 | 3.0 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS<br>CLR&BRIGHT | PASS<br>CLR&BRIGHT | PASS<br>CLR&BRIGHT | PASS<br>CLR&BRIGHT | PASS<br>CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | TRACE | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | **26 (23 C)** | 71 (24 C) | 55 (22 C) | 47 (23°C) | 55 (24°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8631 | 0.8622 | 0.8638 | 0.8635 | 0.8633 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Below limit for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647796-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** REPLACEMENT

**Serial#:** 062108
**Location:** CLINTON ON
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **Liters:** 3247

**Mfr:** NORTHERN
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 2007
**Syringe ID:** 8006869
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647796
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647796 | 7590310 | 7535755 | 7505533 | 7425753 |
| | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | **Oil Temp:** | 19 | 30 | 15 | 15 | |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.37 | 0.39 | 0.43 | 0.4 | 0.46 |
| **ASTM** | **Transformer Age (yrs):** | 16 | 15 | 15 | 14 | 14 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 3 | <2 | <2 | 3 | <2 |
| | **Methane (CH4) (µL/L):** | 2 | 2 | 2 | 2 | 2 |
| | **Ethane (C2H6) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Ethylene (C2H4) (µL/L):** | 32 | 30 | 27 | 31 | 26 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | 254 | 211 | 170 | 223 | 126 |
| | **Carbon Dioxide (CO2) (µL/L):** | 1126 | 1160 | 946 | 1272 | 890 |
| | **Nitrogen (N2) (µL/L):** | 61352 | 53552 | 57034 | 66728 | 62752 |
| | **Oxygen (O2) (µL/L):** | 22662 | 21072 | 24270 | 26920 | 28861 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 3 | Normal (<= 40) | 1 | Normal Variation (<= 25) | 0 | No active gassing (<= 10) |
| **Methane (CH4)** | 2 | Normal (<= 20) | 0 | Normal Variation (<= 10) | 0 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 0 | Normal (<= 15) | 0 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 32 | Normal (<= 60) | 2 | Normal Variation (<= 20) | 1 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 254 | Normal (<= 500) | 43 | Normal Variation (<= 175) | 28 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 1126 | Normal (<= 5500) | -34 | | -38 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Diagnostic not applicable - Gas levels normal. |
| **Duval Triangles** | Diagnostic not applicable – Triangle 1 gas levels normal.<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Diagnostic not applicable – Triangle 5 gas levels normal. |
| **Duval Pentagons** | Diagnostic not applicable - Gas levels normal. |
| **Cellulose insulation** | CO and CO2 levels are normal. No indication of a fault involving paper. |
| **DGA Status** | Status 1 - Normal gas levels and no Indication of gassing. Continue routine DGA and normal transformer operation. |
| **Resampling Protocol** | Routine Screening |
| **AVO Resampling Recommendation** | Resample within 1 year. |
| **Comment:** | |
| **General Oil Quality (GOQ)** | |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647796-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** REPLACEMENT

**Serial#:** 062108
**Location:** CLINTON ON
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **Liters:** 3247

**Mfr:** NORTHERN
**kV:** 27.6
**kVA:** 5000
**Year Mf'd:** 2007
**Syringe ID:** 8006869
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647796
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647796 | 7590310 | 7535755 | 7505533 | 7425753 |
| | | **Date Sampled:** | 05/17/2023 | 09/20/2022 | 04/06/2022 | 10/21/2021 | 02/10/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 666239 | 647030 |
| | | **Oil Temp:** | 19 | 30 | 15 | 15 | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 5 | 6 | 3 | 17 | 2 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 35.11 | 34.83 | 35.46 | 35.68 | 35.69 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.032 | 0.031 | 0.027 | 0.021 | 0.021 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.0 | L1.0 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | TRACE | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 62 (23 C) | 50 (23 C) | 54 (22 C) | 69 (23°C) | 44 (24°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.8858 | 0.8853 | 0.8861 | 0.8864 | 0.8829 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____
JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

# APPENDIX I. ERTH Substation Maintenance Report

ERTH POWER

# MAINTENANCE INSPECTION REPORT

ERTH Power Corporation
143 Bell St Ingersoll, ON
N5C 3K5

**Re:** **Maintenance Inspection Report – Ref: H-23-001**

**Site:** **Beechville**

**Date:** **October 22, 2023**

# Index





# Introductory

Please find the enclosed report for the maintenance work completed October 22, 2023 for the Beechville MS1 station identified below.

Erth Corp cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and the International Electrical Testing Association (NETA) where applicable.

All other equipment that ERTH Corp tested appears in satisfactory condition, suitable for continued service. Please contact us should you wish us to provide pricing and services for any or all of the recommended repairs listed in this report.

**Oil and dissolved gas analysis:**

A snap shot of the diagnostics from the oil and dissolved gas analysis can be found below with the formal report from AVO in Appendix A.

| **Beechville (Existing Oil):** | |
|---|---|
| DGA Diagnostics Roger's Ratio | **Thermal > 700 °C** |
| Duval Triangles | **Triangle 1: Thermal fault (t > 700°C)**<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>**Triangle 5: Thermal fault (t > 700°C)** |
| Duval Pentagons | **Pentagon 1: Thermal fault (t > 700°C)**<br>**Pentagon 2: Thermal fault in oil only** |
| Cellulose insulation | CO2/CO ratio = 9 (3< ratio <= 20) - No indication of a fault involving paper |
| DGA Status | **Status 3 - High gas levels and/or probable active gassing.**<br>**Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy.** |
| Resampling Protocol | Surveillance |
| AVO Resampling Recommendation | **Increase frequency to verify gassing rates.**<br>**Consider online monitoring and comprehensive engineering assessment.** |

Recommendation:

- Increase sampling frequency and consider online monitoring.
- Next Oil Sample schedule for March 2024

**Test Reports:**

All equipment tested are in align with NETA recommendations. The test reports can be found in Appendix B.



# Beachville Substation MS1

***Site: Substation # MS1***
***Address: 434839 Zorra Line, Beachville***

***Spring Inspection Comments/Follow up:***

- Vines are growing along / through the South-West corner and side of the fence.
    - Vines cut back.
- The service for the heater in the main incoming switch still needs to be completed.
    - Heater replaced, in good working order.
- The transformer and switch should be painted.
    - Transformer and switch painted.

***October Maintenance Comments:***

- Maintenance was conducted during night time shutdown.
- Transformer and switch painted between spring maintenance and fall. The paint job is satisfactory, showing not signs of early rusting.
- Transformer showed signs of condensation inside high voltage hood. We recommend installing an anti-condensate material, or a cell heater to help reduce condensation.


- Transformer and switch with new paint.

- Transformer hood, showing signs of condensation.

# Appendix A - Oil Report

AVO DIAGNOSTIC SERVICES
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**TEST REPORT**
**01-7647789-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 225151
**Location:** BEACHVILLE
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 574

**Mfr:**
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1976
**Syringe ID:** 8003346
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647789
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Lab Control Number:** | 7647789 | 7590319 | 7535750 | 7515375 | 7425750 |
| | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 11/30/2021 | 02/11/2021 |
| | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | **Oil Temp:** | 40 | | 38 | 30 | 20 |
| **Dissolved Gas Analysis (DGA)** | **O2/N2 Ratio:** | 0.2 | 0.21 | 0.2 | 0.2 | 0.21 |
| **ASTM** | **Transformer Age (yrs):** | 47 | 46 | 46 | 45 | 45 |
| **D-3612**[1] | **Hydrogen (H2) (µL/L):** | 4 | 5 | 4 | 4 | 4 |
| | **Methane (CH4) (µL/L):** | 12 | 11 | 11 | 12 | 13 |
| | **Ethane (C2H6) (µL/L):** | 5 | 4 | 4 | 5 | 5 |
| | **Ethylene (C2H4) (µL/L):** | **72** | 67 | 64 | 69 | 71 |
| | **Acetylene (C2H2) (µL/L):** | <1 | <1 | <1 | <1 | <1 |
| | **Carbon Monoxide (CO) (µL/L):** | **952** | 908 | 829 | 931 | 977 |
| | **Carbon Dioxide (CO2) (µL/L):** | **8943** | 8885 | 7752 | 8790 | 8349 |
| | **Nitrogen (N2) (µL/L):** | 67950 | 63595 | 64025 | 69111 | 71385 |
| | **Oxygen (O2) (µL/L):** | 13857 | 13422 | 12604 | 13895 | 14827 |

**Dissolved Gas Analysis Diagnostics – IEEE Std C57.104-2019**

| | **Absolute Gas Levels (µL/L)** | | **Gas Level Deltas( µL/L) (2 most recent samples)** | | **Gas Generation Rates ( µL/L per yr) (3-6 most recent samples within 4-24 mos.)** | |
|---|---|---|---|---|---|---|
| **Gas** | **Level** | **Diagnostic** | **Delta** | **Diagnostic** | **Rate** | **Diagnostic** |
| **Hydrogen (H2)** | 4 | Normal (<= 40) | -1 | | 0 | No active gassing (<= 10) |
| **Methane (CH4)** | 12 | Normal (<= 20) | 1 | Normal Variation (<= 10) | 0 | No active gassing (<= 3) |
| **Ethane (C2H6)** | 5 | Normal (<= 15) | 1 | Normal Variation (<= 7) | 0 | No active gassing (<= 2) |
| **Ethylene (C2H4)** | 72 | Elevated (> 60) | 5 | Normal Variation (<= 20) | 3 | No active gassing (<= 5) |
| **Acetylene (C2H2)** | <1 | Normal (<= 2) | 0 | Normal Variation (<= 0) | 0 | No active gassing (<= 0) |
| **Carbon Monoxide (CO)** | 952 | High (> 600) | 44 | Normal Variation (<= 175) | 37 | No active gassing (<= 80) |
| **Carbon Dioxide (CO2)** | 8943 | High (> 8000) | 58 | Normal Variation (<= 1750) | 386 | No active gassing (<= 800) |

| | |
|---|---|
| **DGA Diagnostics** **Roger's Ratio** | Thermal > 700 °C |
| **Duval Triangles** | Triangle 1: Thermal fault (t > 700°C)<br>Diagnostic not applicable – Triangle 4 gas levels normal.<br>Triangle 5: Thermal fault (t > 700°C) |
| **Duval Pentagons** | Pentagon 1: Thermal fault (t > 700°C)<br>Pentagon 2: Thermal fault in oil only |
| **Cellulose insulation** | CO2/CO ratio = 9 (3< ratio <= 20) - No indication of a fault involving paper |
| **DGA Status** | Status 3 - High gas levels and/or probable active gassing. Probably suspicious - perform fault identification and transformer assessment. Take appropriate action based on transformer assessment results and company policy. |
| **Resampling Protocol** | Surveillance |
| **AVO Resampling Recommendation** | Increase frequency to verify gassing rates. Consider online monitoring and comprehensive engineering assessment. |

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

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**TEST REPORT**
**01-7647789-701058-00**


ERTH (Holdings) Inc

INGERSOLL, . N5C2N9 CA
ATTN: MARC GALECKAS
PO#: POH007255
**Project ID:** H-23-001
**Customer ID:** MS1

**Serial#:** 225151
**Location:** BEACHVILLE
**Equipment:** TRANSFORMER
**Compartment:** MAIN(BOTTOM)
**Breathing:** SEAL
**Bank:** **Phase:** 3
**Fluid:** MIN **USGal:** 574

**Mfr:**
**kV:** 27.6
**kVA:** 3000
**Year Mf'd:** 1976
**Syringe ID:** 8003346
**Bottle ID:**
**Sampled By:** CC

**Control#:** 7647789
**Order#:** 701058
**Account:** 110229
**Received:** 06/06/2023
**Reported:** 06/28/2023

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Lab Control Number:** | 7647789 | 7590319 | 7535750 | 7515375 | 7425750 |
| | | **Date Sampled:** | 05/16/2023 | 09/29/2022 | 04/05/2022 | 11/30/2021 | 02/11/2021 |
| | | **Order Number:** | 701058 | 686680 | 674258 | 668835 | 647030 |
| | | **Oil Temp:** | 40 | | 38 | 30 | 20 |
| **Comment:** | | | | | | | |
| **General Oil Quality (GOQ)** | | | | | | | |
| **ASTM D-1533**[1] | **Moisture in Oil** | **(mg/kg):** | 3 | 5 | 4 | 2 | 3 |
| **ASTM D-971**[1] | **Interfacial Tension** | **(mN/m):** | 37.62 | 38.02 | 38.19 | 38.27 | 38.75 |
| **ASTM D-974**[1] | **Acid Number** | **(mg KOH/g):** | 0.016 | 0.008 | 0.014 | 0.010 | 0.010 |
| **ASTM D-1500**[1] | **Color Number** | **(ASTM):** | L1.5 | L1.5 | L1.0 | L1.0 | 1.5 |
| **ASTM D-1524**[1] | **Visual Exam.** | **(Relative):** | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT | PASS CLR&BRIGHT |
| **ASTM D-1524**[1] | **Sediment Exam.** | **(Relative):** | ND | ND | ND | ND | ND |
| **ASTM D-1816**[1] | **Dielectric Breakdown 2 mm** | **(kV °C):** | 47 (23 C) | 50 (23 C) | 68 (22 C) | 44 (23°C) | 64 (23°C) |
| **ASTM D-4052**[1] | **Density @15°C** | **(g/mL):** | 0.859 | 0.8586 | 0.8597 | 0.8589 | 0.8594 |

| | | |
|---|---|---|
| **GOQ Diagnostics** | **Moisture in Oil:** | Acceptable for in-service oil (35 mg/kg max). |
| **PER IEEE C57.106-2015** | **Interfacial Tension:** | Acceptable for in-service oil (25 mN/m min). |
| (most recent sample) | **Acid Number:** | Acceptable for in-service oil (0.2 mg KOH/g max). |
| | **Color Number and Visual:** | Diagnostic not applicable. Diagnostic not applicable. |
| | **Dielectric Breakdown ASTM D-1816:** | Acceptable for in-service oil (40 kV min @ 2mm). |

**Comment:**

## End of Test Report

Authorized By: _____

JANET KAROLAT
SUPV CHEMIST

Notations: 1. Analysis is ISO/IEC 17025:2017 accredited, ANAB Accredited Certificate Number L2303 2. This test is conducted by a subcontracted laboratory. 3. Subcontracted laboratory has received ISO Standard 17025 accreditation for this test. 5. This test is conducted by AVO Diagnostic Services Laboratory other than Primary Lab. 6. AVO Diagnostic Services Laboratory has received ISO Standard 17025 accreditation for this test. 7. Imported Sample: AVO Diagnostic Services accepts no responsibility for these results; accreditation status does not apply to these results. 8. Imported Equipment 10. mg/kg , µg/g, µg/mL, µL/L = ppm, µg/L = ppb, mN/m = dynes/cm, mm²/s = cSt

# Appendix B - Test Report



ERTH CORPORATION

# HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

**System ID** 27.6kV **Device ID** TB1-L

| | | | |
|---|---|---|---|
| Customer | ERTH POWER | Date | October 22, 2023 |
| Customer Address | 143 BELL ST INGERSOLL | Job # | H-23-001 |
| Site | BEECHVILLE MS1 | | |
| Site Address | BEECHVILLE MS1 | | |

## Nameplate Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Switch Mounting | Metal Enclosed [X] | Pole [ ] | Tower [ ] | Other | | | |
| Switch Type | Load Break [X] | Air Break [ ] | | Other | | | |
| Manufacturer | S&C | | BIL Rating | 150 | kV | | |
| Date Of Manufacture | 2/95 | | Feeder ID | TB1-L | | | |
| Serial # | N/A | | Feeds To | MAIN POWER XFMR | | | |
| Catalog # | CDT-27691692 | | Interrupting Rating | 40000 | A | | |
| Nom. / Max. Voltage | 27.6 / 29.0 kV | | Continuous Ampacity | 600 | A | | |
| Comments | | | | | | | |

## Lightning Arrestors

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Class | Distribution [ ] | Intermediate [X] | Station [ ] | | | | |
| Composition | Ceramic [ ] | Polymer [X] | | | | | |
| Manufacturer | GE | | Max. / MCOV Rating | 24.0 / 19.5 kV | | | |
| Catalog # | 9L12PPA024S | | | | | | |
| Comments | | | | | | | |

## Protective Device Data

### Primary Fuse Holder Data

| | |
|---|---|
| Manufacturer | S&C |
| Type | SMU40 |
| Nom. / Max. Voltage | 25.0 / 29.0 kV |
| Holder Max. Fuse Link | 100E |
| Holder Catalog # | N/A |

### Primary Fuse Link Data

| | |
|---|---|
| Manufacturer | S&C |
| Type | 100E SMU40 |
| Link Size | 100E A |
| TCC # | 153-2 |
| Link Catalog # | N/A |

### Primary Fuse Link Spares / Location

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spare Primary Fuses | Yes [X] | No [ ] | # of Spares | 3 | | | |
| Spare Location | | | | | | | |
| Comments | | | | | | | |

## Interlock

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Key Interlock | Yes [X] | No [ ] | | | | | |
| Interlock Type | Elec. [ ] | Mech. [ ] | Utility Lock [X] | | | | |
| Devices Interlocked | H.V. Switch [ ] | Breaker [ ] | Trans. Encl. [ ] | Other [ ] | | | |
| Manufacturer | UTILITY LOCK | | Key Interlock # | | | | |
| Comments | | | | | | | |

## Load Side Conductor Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Conductor Type | Cable [X] | Bus Bar [ ] | Conductor Size / Dim. | 2/0 | | | |
| Conductor Material | Aluminum [X] | Copper [ ] | Conductors per Phase | 1 / Phase | | | |
| Tape Shield | Aluminum [ ] | Copper [ ] | Bond Size / Dim. | 2/0 | | | |
| Concentric Neutral | Aluminum [X] | Copper [ ] | # of Bond Coductors | 2 | | | |
| Insulation Voltage | 28KV | | # of Neutral Conductors | N/A | | | |
| Insulation Type | XLPE 90 | | Neutral Size / Dim. | | | | |
| Comments | | | | | | | |

Recorded By: MARC GALECKAS, CHAD CARON, MARCO KEUBER

ERTH CORPORATION

# HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

**System ID** 27.6kV **Device ID** TB1-L

## Visual Inspection / Mechanical Tests

| | Satisfactory | Not Satisfactory | N/A | Comments |
|---|---|---|---|---|
| Nameplate Condition | X | | | |
| Insulator Condition | X | | | |
| Ground Connections | X | | | |
| Lightning Arrestors | X | | | |
| Arc Suppressors | X | | | |
| Key Interlock Operation | | | X | |
| Ground Straps & Materials | | | X | |

## Switch Condition / Operation

| | Satisfactory | Not Satisfactory | N/A | Comments |
|---|---|---|---|---|
| Switch Operation As Left | X | | | |
| Contact Surface Condition | X | | | |
| Simultaneous Closure | X | | | |

## Electrical Tests

### Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance **NA** Ω

### Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

| | | |
|---|---|---|
| Phase A | 0.3 | Ω |
| Phase B | 0.4 | Ω |
| Phase C | 0.4 | Ω |

### Switch Insulation Resistance

**Resistance in Meg-Ohms after 1 minute.**

Test Voltage 1 kV ☐ 2 kV ☐ 5 kV ☐ 10 kV ☐

| | Phase A | Phase B | Phase C |
|---|---|---|---|
| Phase to GND | MΩ | MΩ | MΩ |

### Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current **10A**

| | Phase A | Phase B | Phase C |
|---|---|---|---|
| Contacts | 150 µΩ | 147 µΩ | 153 µΩ |
| Fuse | 866 µΩ | 694 µΩ | 901 µΩ |
| Overall | N/A µΩ | N/A µΩ | N/A µΩ |

### Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ **V DC** after 1 minute

| | |
|---|---|
| Phase A to Ground | MΩ |
| Phase B to Ground | MΩ |
| Phase C to Ground | MΩ |

### Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ **V DC** after 1 minute

| | |
|---|---|
| Phase A to Ground | MΩ |
| Phase B to Ground | MΩ |
| Phase C to Ground | MΩ |

## Comments / Observations

| Test Instrument(s) | Manufacturer / Model | Megger | Ductor | | | |
|---|---|---|---|---|---|---|
| | Serial # | MIT1025 | DLRO-10 | | | |

Tested By: **MARC GALECKAS, CHAD CARON, MARCO KEUBER**

ERTH CORPORATION

# HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

**System ID** 4.160kV **Device ID** BEA1F1

| | | | |
|---|---|---|---|
| Customer | ERTH POWER | Date | October 22, 2023 |
| Customer Address | 143 BELL ST INGERSOLL | Job # | H-23-001 |
| Site | BEECHVILLE MS1 | | |
| Site Address | BEECHVILLE MS1 | | |

## Nameplate Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Switch Mounting | Metal Enclosed [X] | Pole [ ] | Tower [ ] | Other | | | |
| Switch Type | Load Break [X] | Air Break [ ] | | Other | | | |
| Manufacturer | S&C | | BIL Rating | 95 | kV | | |
| Date Of Manufacture | 06/17 | | Feeder ID | BEA1F1 | | | |
| Serial # | 173774 | | Feeds To | BE42 SOLID DISCONNECT | | | |
| Catalog # | | | Interrupting Rating | 36400 | A | | |
| Nom. / Max. Voltage | 14.4 / 17.0 kV | | Continuous Ampacity | 600 | A | | |
| Comments | | | | | | | |

## Lightning Arrestors

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Class | Distribution [ ] | Intermediate [ ] | Station [ ] | | | | |
| Composition | Ceramic [ ] | Polymer [ ] | | | | | |
| Manufacturer | NA | | Max. / MCOV Rating | / kV | | | |
| Catalog # | NA | | | | | | |
| Comments | | | | | | | |

## Protective Device Data

### Primary Fuse Holder Data

| | |
|---|---|
| Manufacturer | S&C |
| Type | SMU20 |
| Nom. / Max. Voltage | 14.4 / 17.0 kV |
| Holder Max. Fuse Link | 200E |
| Holder Catalog # | N/A |

### Primary Fuse Link Data

| | |
|---|---|
| Manufacturer | S&C |
| Type | SMU20 |
| Link Size | 200E A |
| TCC # | 153-2 |
| Link Catalog # | N/A |

### Primary Fuse Link Spares / Location

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spare Primary Fuses | Yes [X] | No [ ] | # of Spares | 3 | | | |
| Spare Location | | | | | | | |
| Comments | DOOR | | | | | | |

## Interlock

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Key Interlock | Yes [X] | No [ ] | | | | | |
| Interlock Type | Elec. [ ] | Mech. [ ] | Utility Lock [X] | | | | |
| Devices Interlocked | H.V. Switch [ ] | Breaker [ ] | Trans. Encl. [ ] | Other [ ] | | | |
| Manufacturer | UTILITY LOCK | | Key Interlock # | | | | |
| Comments | | | | | | | |

## Load Side Conductor Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Conductor Type | Cable [X] | Bus Bar [ ] | Conductor Size / Dim. | 2/0 | | | |
| Conductor Material | Aluminum [X] | Copper [ ] | Conductors per Phase | 1 / Phase | | | |
| Tape Shield | Aluminum [ ] | Copper [ ] | Bond Size / Dim. | 2/0 | | | |
| Concentric Neutral | Aluminum [ ] | Copper [ ] | # of Bond Coductors | 2 | | | |
| Insulation Voltage | 28KV | | # of Neutral Conductors | N/A | | | |
| Insulation Type | XLPE 90 | | Neutral Size / Dim. | | | | |
| Comments | | | | | | | |

Recorded By: MARC GALECKAS, CHAD CARON, MARCO KEUBER

ERTH CORPORATION

# HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

**System ID** | **Device ID** BEA1F1

## Visual Inspection / Mechanical Tests

| | Satisfactory | Not Satisfactory | N/A | Comments |
|---|---|---|---|---|
| Nameplate Condition | X | | | |
| Insulator Condition | X | | | |
| Ground Connections | X | | | |
| Lightning Arrestors | | | X | |
| Arc Suppressors | X | | | |
| Key Interlock Operation | X | | | |
| Ground Straps & Materials | X | | | |

## Switch Condition / Operation

| | Satisfactory | Not Satisfactory | N/A | Comments |
|---|---|---|---|---|
| Switch Operation As Left | X | | | |
| Contact Surface Condition | X | | | |
| Simultaneous Closure | X | | | |

## Electrical Tests

### Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance **NA** Ω

### Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

| | | |
|---|---|---|
| Phase A | **NA** | Ω |
| Phase B | **NA** | Ω |
| Phase C | **NA** | Ω |

### Switch Insulation Resistance

**Resistance in Meg-Ohms after 1 minute.**

Test Voltage 1 kV ☐ 2 kV ☐ 5 kV ☐ 10 kV ☐

| | Phase A | Phase B | Phase C |
|---|---|---|---|
| Phase to GND | **9000** MΩ | **11200** MΩ | **10400** MΩ |

### Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current **10A**

| | Phase A | Phase B | Phase C |
|---|---|---|---|
| Contacts | **109** µΩ | **101** µΩ | **111** µΩ |
| Fuse | **376** µΩ | **390** µΩ | **409** µΩ |
| Overall | **N/A** µΩ | **N/A** µΩ | **N/A** µΩ |

### Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ **V DC** after 1 minute

| | |
|---|---|
| Phase A to Ground | MΩ |
| Phase B to Ground | MΩ |
| Phase C to Ground | MΩ |

### Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ **V DC** after 1 minute

| | |
|---|---|
| Phase A to Ground | MΩ |
| Phase B to Ground | MΩ |
| Phase C to Ground | MΩ |

## Comments / Observations

**DAMP WELL TESTING**

| Test Instrument(s) | Manufacturer / Model | Megger | Ductor | | | |
|---|---|---|---|---|---|---|
| | Serial # | MIT1025 | DLRO-10 | | | |

Tested By: **MARC GALECKAS, CHAD CARON, MARCO KEUBER**

ERTH CORPORATION

# TRANSFORMER DATA SHEET (Pg. 1 of 4)

**System ID** 27.6kV_38M44 **Device ID** MAIN POWER TX

| | | | |
|---|---|---|---|
| Customer | ERTH POWER | Date | October 22, 2023 |
| Customer Address | 143 BELL ST INGERSOLL | Job # | H-23-001 |
| Site | BEECHVILLE MS1 | | |
| Site Address | BEECHVILLE MS1 | | |

## Nameplate Data

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Transformer Class | Unit Padmount | X | Padmount | | Station | | | | Other | |
| Transformer Cooling | ONAN | X | ONAF | | LNAN | | DRY | | Other | |
| Bushing Configuration | Dead Front | | Top - Top | X | Top - Side | | Side - Side | | Other | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Manufacturer | PORTER | | Core & Windings | 8700 | kg | | lb | X |
| Date of Manufacture | 1976 | | Tanks & Fittings | 6260 | kg | | lb | X |
| Serial # | 22515-1 | | Coolant Volume | 574 | L | | Gal | X |
| KVA / Prov. KVA Rating | 3000 | KVA | Coolant Weight | 4940 | kg | | lb | X |
| Primary Voltage | 276000 | V | Total Weight | 19900 | kg | | lb | X |
| Primary Ampacity | 66.1 | A | Temperature Rise | 65 | °C | X | °F | |
| Secondary Voltage | 4160/2400 | V | HV BIL Rating | 200 | kV | | | |
| Secondary Ampacity | NA | A | LV BIL Rating | 75 | kV | | | |
| HV Winding Material | NA | | Percent Impedance | 5.65 % | ONAN | X | ONAF | |
| LV Winding Material | NA | | Tamper Resistant | | YES | X | NO | |
| CSA Specification(s) | NA | | Transformer Colour | GREY | | | | |
| Comments | | | | | | | | |

## Visual Inspection

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nameplate Condition | Satisfactory | X | Not Satisfactory | | N/A | | Comments | |
| Fan / Pump Operation | Satisfactory | | Not Satisfactory | | N/A | X | Comments | |
| Ground Connections | Satisfactory | X | Not Satisfactory | | N/A | | Comments | |
| Liquid Levels In Tanks | Satisfactory | X | Not Satisfactory | | N/A | | Comments | |
| Interlock Operation | Satisfactory | | Not Satisfactory | | N/A | X | Comments | |
| Temp. Gauge Operation | Satisfactory | X | Not Satisfactory | | N/A | | Comments | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Coolant Temperature | 35 | °C | X | °F | | Max. Coolant Temperature | 50 | °C | X | °F | |
| Comments | | | | | | | | | | | |

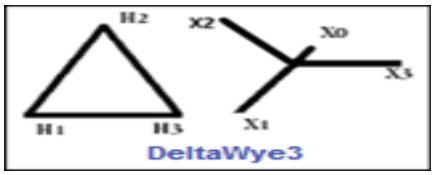
## Oil Conservator

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Oil Conservator | Yes | | No | | | Conservator Volume | | L | | Gal | |
| Silica Gel Breather | Yes | | No | | | Breather Volume | | L | | Gal | |
| Silica Gel Colour | Good | | Bad | | Replaced | N/A | | | | | |
| Comments | | | | | | | | | | | |

## Tap Changer Data

| Position / Designation | | Tap Voltages (V) | As Found | As Left |
|---|---|---|---|---|
| 1 / A | 105.00% | 27600 | | |
| 2 / B | 102.50% | 26910 | X | X |
| 3 / C | 100.00% | 26220 | | |
| 4 / D | 97.50% | 25530 | | |
| 5 / E | 95.00% | 24840 | | |

## Vector Diagram:




Primary Vector X Secondary Vector X

Comments:

Tested By: MARC GALECKAS, CHAD CARON, MARCO KEUBER

ERTH CORPORATION

# TRANSFORMER DATA SHEET (Pg. 2 of 4)

**System ID** 27.6kV_38M44 **Device ID** MAIN POWER TX

## Neutral Grounding Resistor (NGR)

NGR Present: Yes [ ] No [ ]

Manufacturer: | NGR Serial #:

NGR Voltage: V | Maximum Current: A

NGR Resistance: Ω | NGR Location:

Comments:

## Transformer Lightning Arrestors

Class: Distribution [ ] Intermediate [X] Station [ ]

Composition: Ceramic [ ] Polymer [X]

Manufacturer: GE | Max. / MCOV Rating: 24.0 / 19.5 kV

Catalog #: 9L12PPA024S

Comments:

## Interlock

Key Interlock: Yes [ ] No [ ]

Interlock Type: Elec. [ ] Mech. [ ] Utility Lock [ ]

Devices Interlocked: H.V. Switch [ ] Breaker [ ] Trans. Encl. [ ] Other [ ]

Manufacturer: | Key Interlock #:

Comments:

## Fans

# of Fans: | Fan Voltage:

Fan Size: | Frame Size:

Horsepower:

Comments:

## Transformer Load Side Conductor Data

Conductor Type: Cable [ ] Bus Bar [ ] | Conductor Size / Dim.:

Conductor Material: Aluminum [ ] Copper [ ] | Conductors per Phase: / Phase

Tape Shield: Aluminum [ ] Copper [ ] | Bond Size / Dim.:

Concentric Neutral: Aluminum [ ] Copper [ ] | # of Bond Conductors:

Insulation Voltage: | # of Neutral Conductors:

Insulation Type: | Neutral Size / Dim.:

Comments:

Tested By: MARC GALECKAS, CHAD CARON, MARCO KEUBER

ERTH CORPORATION

# TRANSFORMER TEST SHEET (Pg. 3 of 4)

**System ID** 27.6kV_38M44 **Device ID** MAIN POWER TX

## Electrical Tests

### Turn Ratio Test

Test Voltage: Automatic [X] Other ____ V

| Tap Position / Designation | | Tap Voltage V | Calculated Ratio | H To H<br>X To X | H 2 To H<br>X 2 To X | H To H<br>X To X |
|---|---|---|---|---|---|---|
| 1 / A | 105.00% | 27600 | | | | |
| 2 / B | 102.50% | 26910 | | 11.212 | 11.211 | 11.213 |
| 3 / C | 100.00% | 26220 | | | | |
| 4 / D | 97.50% | 25530 | | | | |
| 5 / E | 95.00% | 24840 | | | | |

| | | Excitation Currrent | Percent Deviation | Excitation Currrent | Percent Deviation | Excitation Currrent | Percent Deviation |
|---|---|---|---|---|---|---|---|
| Tap Position As Found | 2 | 3.200 mA | 0.140 % | 3.100 mA | 0.120 % | 2.700 mA | 0.150 % |
| Tap Position As Left | | mA | % | mA | % | mA | % |

### Primary Winding Resistance

Resistance in ohms at 0.05 A after 1 minute

| | | | |
|---|---|---|---|
| H0 - H1 | Ω | H1 - H2 | 1.387 Ω |
| H0 - H2 | Ω | H2 - H3 | 1.372 Ω |
| H0 - H3 | Ω | H3 - H1 | 1.374 Ω |

Stabilization Time > _____ Minute

### Secondary Winding Resistance

Resistance in milli-ohms at 5 A after 1 minute

| | | | |
|---|---|---|---|
| X0 - X1 | 10.122 mΩ | X1 - X2 | 19.781 mΩ |
| X0 - X2 | 10.056 mΩ | X2 - X3 | 19.857 mΩ |
| X0 - X3 | 10.064 mΩ | X3 - X1 | 19.910 mΩ |

Stabilization Time > _____ Minute

### Capacitance Test

| | Low - Ground | Low - Guard | UST (High - Low) | High - Guard | High - Ground |
|---|---|---|---|---|---|
| Capacitance in pico-farads | pF | pF | pF | pF | pF |
| Uncorrected D.F. (%) | % | % | % | % | % |
| Corrected to 20 °C (%) | % | % | % | % | % |

Temp. Correction Factor _____

### Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ V DC after 1 minute

TESTED WITH TRANSFORMER

| | |
|---|---|
| Phase A to Ground | MΩ |
| Phase B to Ground | MΩ |
| Phase C to Ground | MΩ |

### Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ V DC after 1 minute

| | | | |
|---|---|---|---|
| Phase A to Ground | MΩ | Phase A to Phase B | MΩ |
| Phase B to Ground | MΩ | Phase B to Phase C | MΩ |
| Phase C to Ground | MΩ | Phase C to Phase A | MΩ |

### Comments / Observations

| Test Instrument(s) | Manufacturer / Model | Ratio | Winding | Cap Bridge | Megger | |
|---|---|---|---|---|---|---|
| | Serial # | TR-MARK III 250 | WR-14 | CB-100 | MIT1025 | |

Tested By: MARC GALECKAS, CHAD CARON, MARCO KEUBER

ERTH CORPORATION

# *TRANSFORMER TEST SHEET (Pg. 4 of 4)*

**System ID** 27.6kV_38M44 **Device ID** MAIN POWER TX

## *Dielectric Absorption Test (Insulation Resistance)*

| Time | High to Low & Gnd Uncorrected | High to Low & Gnd Corrected | Low to High & Gnd Uncorrected | Low to High & Gnd Corrected | High & Low to Gnd Uncorrected | High & Low to Gnd Corrected |
|---|---|---|---|---|---|---|
| 15 sec | **2100 MΩ** | **5250 MΩ** | **7190 MΩ** | **17975 MΩ** | **4000 MΩ** | **10000 MΩ** |
| 30 sec | **3000 MΩ** | **7500 MΩ** | **9000 MΩ** | **22500 MΩ** | **4620 MΩ** | **11550 MΩ** |
| 45 sec | **3160 MΩ** | **7900 MΩ** | **12330 MΩ** | **30825 MΩ** | **5100 MΩ** | **12750 MΩ** |
| 1 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 2 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 3 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 4 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 5 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 6 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 7 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 8 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 9 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| 10 min | **3400 MΩ** | **8500 MΩ** | **13570 MΩ** | **33925 MΩ** | **5790 MΩ** | **14475 MΩ** |
| Test Voltage | 10000 **V** | | 1000 **V** | | 1000 **V** | |
| Multiplier | 1 | | 1 | | 1 | |
| Polarization Index | **1.00** | | **1.00** | | **1.00** | |
| TCC **2.50** | Insulation Resistance Readings Corrected to 20 °C | | | | | |

### *Insulation Resistance*

Resistance in meg-ohms after 1 minute.

| | | | | |
|---|---|---|---|---|
| High to Low & Ground | **8500** | **MΩ @** | **10000** | **V** |
| Low to High & Ground | **33925** | **MΩ @** | **1000** | **V** |
| High & Low to Ground | **14475** | **MΩ @** | **1000** | **V** |

### *Core Ground Insulation Resistance*

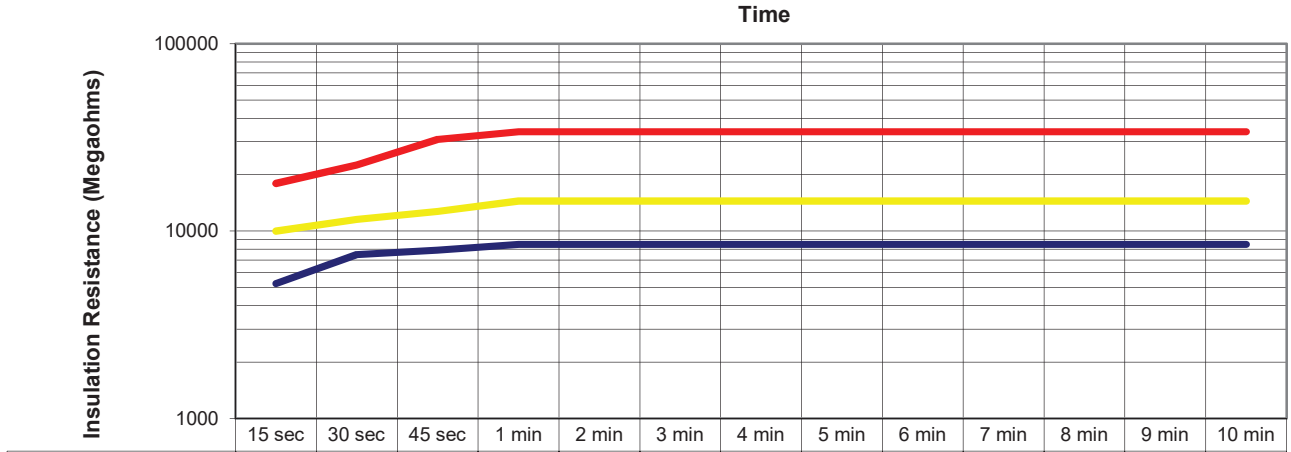
Resistance in meg-ohms after 1 minute.

Core Ground Accessible Yes ☐ No ☐

Test Voltage **V**

Core Ground Resistance **MΩ**

### *Dielectric Absorption Test*




| | 15 sec | 30 sec | 45 sec | 1 min | 2 min | 3 min | 4 min | 5 min | 6 min | 7 min | 8 min | 9 min | 10 min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High to Low & Gnd | 5250 | 7500 | 7900 | 8500 | 8500 | 8500 | 8500 | 8500 | 8500 | 8500 | 8500 | 8500 | 8500 |
| Low to High & Gnd | 17975 | 22500 | 30825 | 33925 | 33925 | 33925 | 33925 | 33925 | 33925 | 33925 | 33925 | 33925 | 33925 |
| High & Low to Gnd | 10000 | 11550 | 12750 | 14475 | 14475 | 14475 | 14475 | 14475 | 14475 | 14475 | 14475 | 14475 | 14475 |

| Test Instrument(s) | Manufacturer / Model | Ratio | Winding | Cap Bridge | Megger | |
|---|---|---|---|---|---|---|
| | Serial # | **TR-MARK III 250** | **WR-14** | **CB-100** | **MIT1025** | |

Comments:

Tested By: **MARC GALECKAS, CHAD CARON, MARCO KEUBER**

ERTH CORPORATION

# *INSULATION RESISTANCE TEST SHEET (Pg. 1 of 1)*

**System ID** 4160V **Device ID** BEA1F1

Customer **ERTH POWER**
Customer Address **143 BELL ST INGERSOLL**
Site **BEECHVILLE MS1**
Site Address **BEECHVILLE MS1**

Date **22-Oct-23**
Job # **H-23-001**

Device Name **TRANSFORMER SECONDARY** Location **BEECHVILLE TX**
Description **15kV FEEDER CABLE FROM TX SECONDARY TO S&C ELECTRIC SWITCH BEA1F1**

Test Voltage 500 V ☐ 1000 V ☐ 2500 V ☐ 5000 V ☐ 10000 V ☒

| | | | |
|---|---|---|---|
| AΦ - Gnd | **105000 MΩ** | AΦ - BΦ | **MΩ** |
| BΦ - Gnd | **88000 MΩ** | BΦ - CΦ | **MΩ** |
| CΦ - Gnd | **93000 MΩ** | CΦ - AΦ | **MΩ** |

Comments

Device Name **SWITCH FEEDER** Location **BEECHVILLE TX**
Description **15kV FEEDER CABLE FROM S&C ELECTRIC SWITCH BE42 SOLID DISCONNECT**

Test Voltage 500 V ☐ 1000 V ☐ 2500 V ☐ 5000 V ☐ 10000 V ☒

| | | | |
|---|---|---|---|
| AΦ - Gnd | **13000 MΩ** | AΦ - BΦ | **MΩ** |
| BΦ - Gnd | **17000 MΩ** | BΦ - CΦ | **MΩ** |
| CΦ - Gnd | **15400 MΩ** | CΦ - AΦ | **MΩ** |

Comments

Device Name Location
Description

Test Voltage 500 V ☐ 1000 V ☐ 2500 V ☐ 5000 V ☐ 10000 V ☐

| | | | |
|---|---|---|---|
| AΦ - Gnd | **MΩ** | AΦ - BΦ | **MΩ** |
| BΦ - Gnd | **MΩ** | BΦ - CΦ | **MΩ** |
| CΦ - Gnd | **MΩ** | CΦ - AΦ | **MΩ** |

Comments

Device Name Location
Description

Test Voltage 500 V ☐ 1000 V ☐ 2500 V ☐ 5000 V ☐ 10000 V ☐

| | | | |
|---|---|---|---|
| AΦ - Gnd | **MΩ** | AΦ - BΦ | **MΩ** |
| BΦ - Gnd | **MΩ** | BΦ - CΦ | **MΩ** |
| CΦ - Gnd | **MΩ** | CΦ - AΦ | **MΩ** |

Comments

| Test Instrument(s) | | | | | | |
|---|---|---|---|---|---|---|
| Manufacturer / Model | **MEGGER** | | | | | |
| Serial # | **MIT1025** | | | | | |

Tested By: **MARC GALECKAS, CHAD CARON, MARCO KEUBER**

# APPENDIX J. Infrared Inspection Report

Boldstar
Infrared Services Inc.

# Infrared Thermographic Survey

- Electrical Distribution System -

## ERTH Power

*Date:*

June 6th, 7th and 8th, 2023

Mitchell
Dublin
Clinton
Goderich
Tavistock
Thamesford
Embro

| ***Report Completed By:*** | |
|---|---|
| **Boldstar Infrared Services Inc.**<br>Tel: 1-888-847-0517<br>**www.boldstarinfrared.com** | ACADEMY OF INFRARED THERMOGRAPHY<br>CERTIFIED<br>Jeff Lebold #2-280<br>THERMOGRAPHER<br>Certification Stamp |

# Infrared Report Summary

**Purpose:** Infrared inspection to identify thermal anomaly conditions on electrical distribution equipment that suggest an unwanted condition exists and repairs are required.
**Method:** Complete infrared inspection of selected ERTH Power distribution system. Save infrared images of all noted anomaly conditions. Detail the findings of the scanning in a report.
**Conditions:** Equipment operating under normal daytime loading conditions.
**Inspection Equipment:** FLIR model T460 thermal imaging systems, serial # 62113652.

# Observations

*Note*: Boldstar Infrared Services Inc. is in no way responsible for any expenses resulting in actions or repair of reported anomalies. This report is not a warranty or guarantee of any equipment condition or reliability.

Please see report for details on all noted suspect conditions.

All of the report infrared images are classified as follows:
**HIGH Priority:** Component temperature over 50 Celsius rise over ambient.
Plan and execute repairs as soon as possible, within the next few days. Do not ignore.
**MEDIUM Priority**: Component temperature 25 to 50 Celsius rise over ambient.
Plan and execute repairs at the next opportunity, within the next few weeks. Do not ignore.
**LOW Priority**: Component temperature below 25 Celsius rise over ambient.
Plan and execute repairs at the next convenient opportunity. Do not ignore.
**No Problems Noted (N/A):** No anomaly conditions noted. Condition good.

All reported condition should be investigated further as soon as possible to verify the reported condition. Use all safety procedures. Electrical hazards exist.

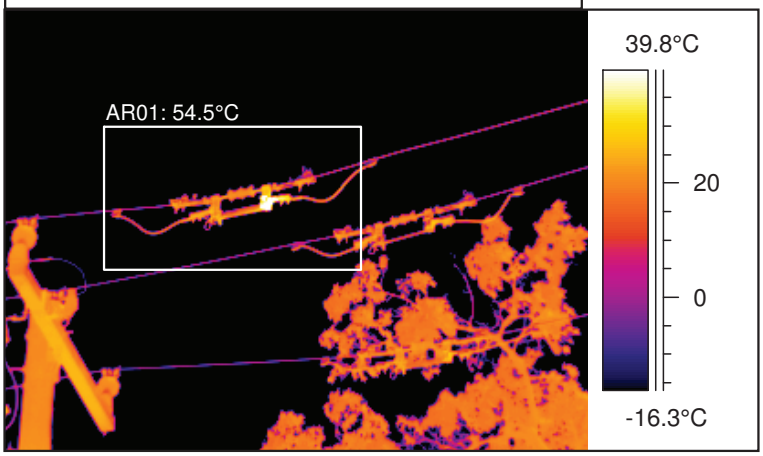
# CONTENTS OF REPORT

Priority: *H= High M= Medium L= Low N/A= Not Applicable*

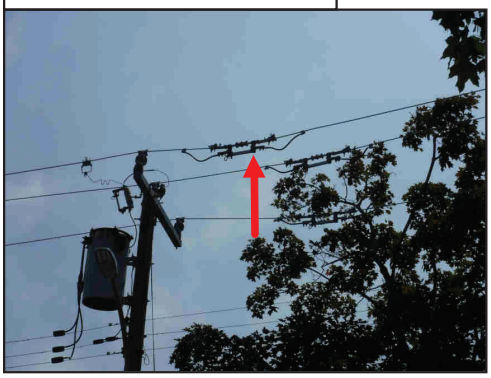
| Identification: | DATE |
|---|---|
| Pole ET9235 (Clinton) | 2023-06-06 |

**Description:** Switches

## INFRARED IMAGE




## PHOTO



Temperature rise: 33.46 °C
(over ambient)

| IR information | Value |
|---|---|
| Date of creation | 2023-06-06 |
| Time of creation | 11:26:53 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |
| **Label** | **Value** |
| AR01 : max | 54.5°C |

**Status:**

Repaired Date:

Notes:

## INFORMATION:

Infrared image of in-line switches (332). At pole ET9235.
Located at the intersection of Orange Street and Rattenbury Street in Clinton.
Elevated heating was noted at the indicated location on the road-side switch (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

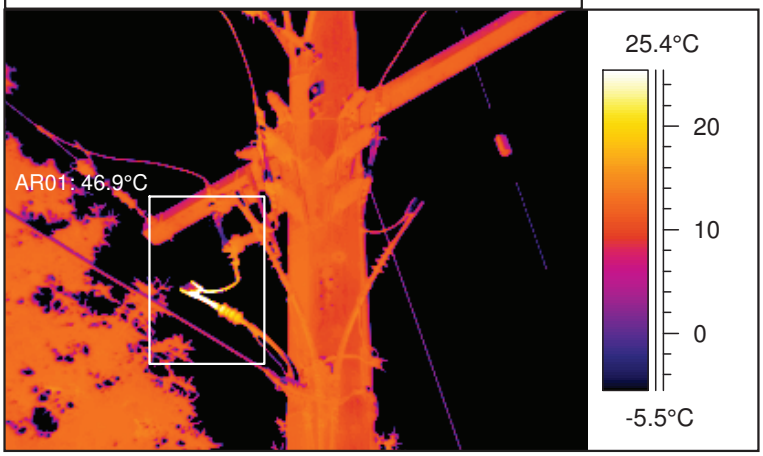
**PRIORITY:** High **Medium** Low

**ANOMALY:** Heating switch

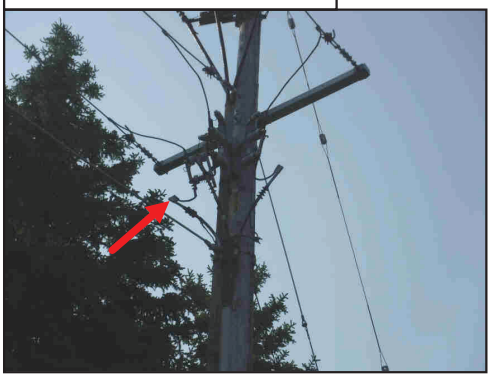
| Identification: | DATE |
|---|---|
| Pole 10815 (Goderich) | 2023-06-07 |

**Description:** Riser Pole

## INFRARED IMAGE




## PHOTO



Temperature rise: 33.87 °C
(over ambient)

| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 7:50:19 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 13.0°C |
| **Label** | **Value** |
| AR01 : max | 46.9°C |

**Status:**

Repaired Date:

Notes:

## INFORMATION:

Infrared image of riser pole 10815 for the 259 switch feeder.
Located at 396 Eldon Street in Goderich.
Elevated heating was noted at the indicated field-side ampact (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

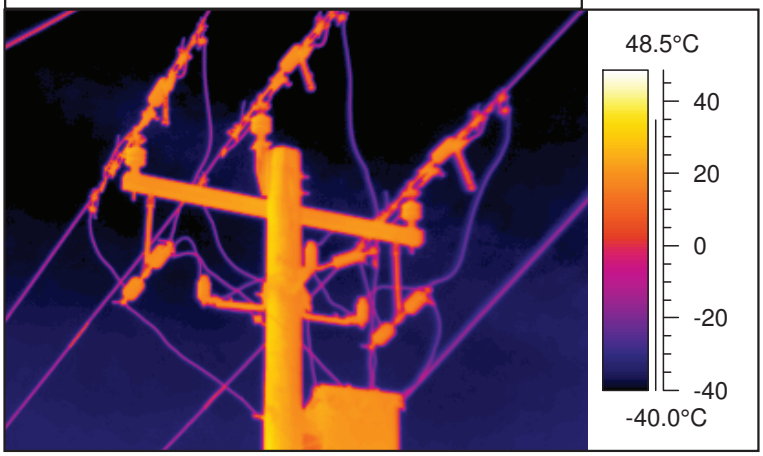
**PRIORITY:** High **Medium** Low

**ANOMALY:** Heating connection

| Identification: | DATE |
|---|---|
| Pole ET8947 (Dublin) | 2023-06-06 |

**Description:** Metering Point

## INFRARED IMAGE




## PHOTO

| IR information | Value |
|---|---|
| Date of creation | 2023-06-06 |
| Time of creation | 9:14:17 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 18.0°C |

## INFORMATION:

Infrared image of a metering point. On pole ET8947.
Located in Dublin.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

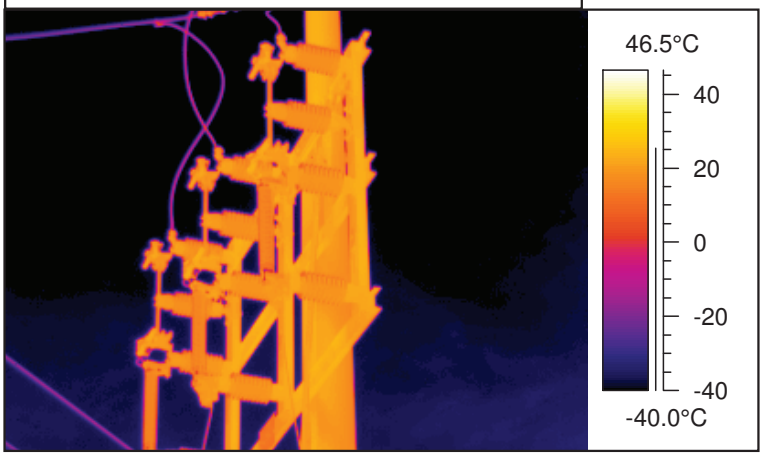
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| MS1 (Clinton) | 2023-06-06 |

**Description:** Riser Pole

## INFRARED IMAGE




| IR information | Value |
|---|---|
| Date of creation | 2023-06-06 |
| Time of creation | 10:51:44 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 20.0°C |

## PHOTO

## INFORMATION:

Infrared image of riser switches.
Located at MS1 in Clinton.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

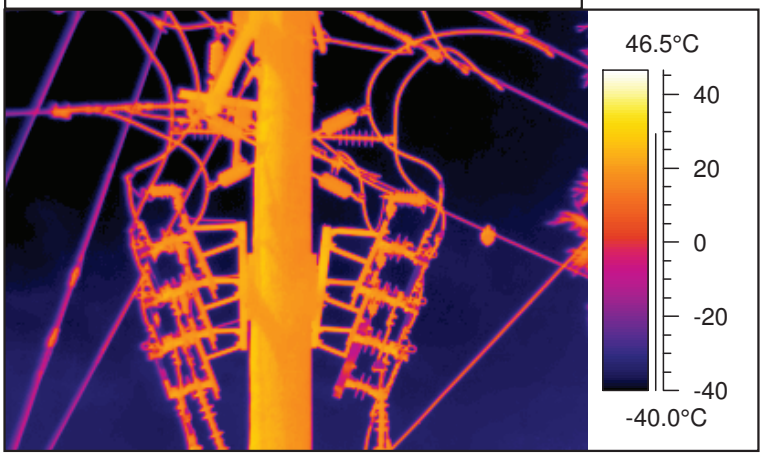
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| Pole ET9358, MS1 (Clinton) | 2023-06-06 |

**Description:** Switches

## INFRARED IMAGE




| IR information | Value |
|---|---|
| Date of creation | 2023-06-06 |
| Time of creation | 10:52:44 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 20.0°C |

## PHOTO

## INFORMATION:

Infrared image of riser switches 505 & 339. On pole ET9358.
Located at MS1 in Clinton.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

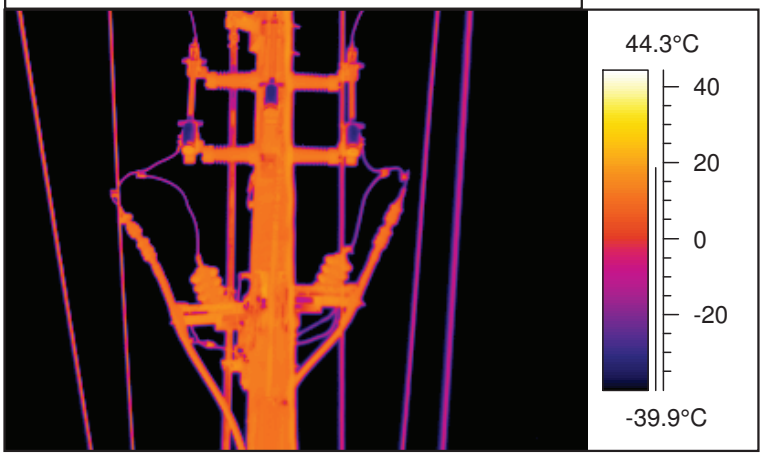
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| Pole 11907, MS2 (Goderich) | 2023-06-06 |

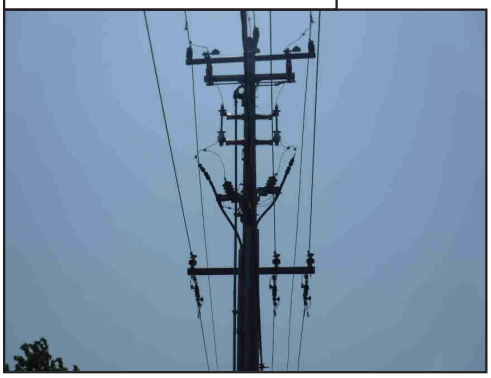
**Description:** Riser Pole

## INFRARED IMAGE




| IR information | Value |
|---|---|
| Date of creation | 2023-06-06 |
| Time of creation | 1:23:51 PM |
| **Object parameter** | **Value** |
| Ambient temperature | 20.0°C |

## PHOTO



## INFORMATION:

Infrared image of riser pole 11907.
Located at MS2 in Goderich.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

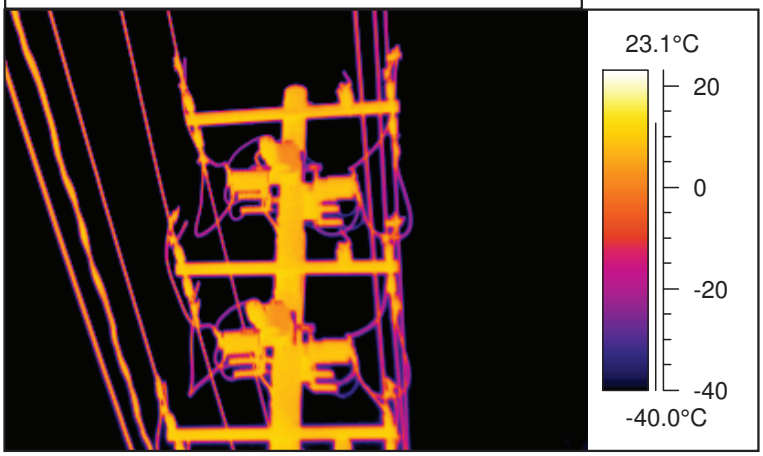
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| 31M4 (Goderich) | 2023-06-07 |

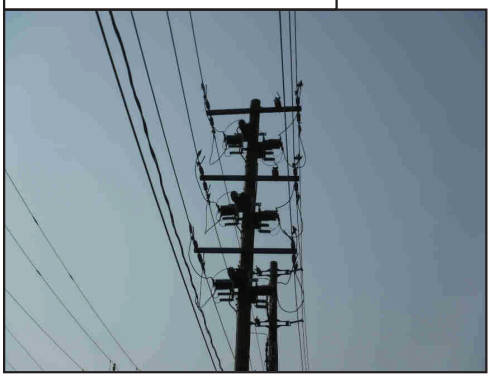
**Description:** Metering Point

## INFRARED IMAGE




| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 7:11:38 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 10.0°C |

## PHOTO



## INFORMATION:

Infrared image of metering point for the 31M4.
Located at the Goderich TS.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

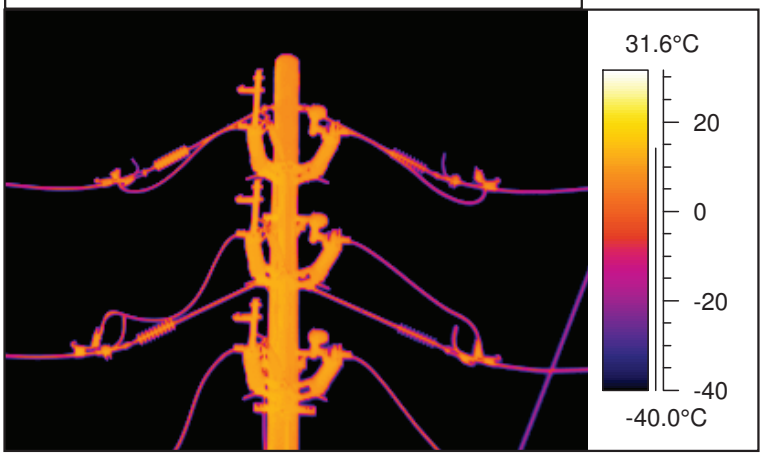
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

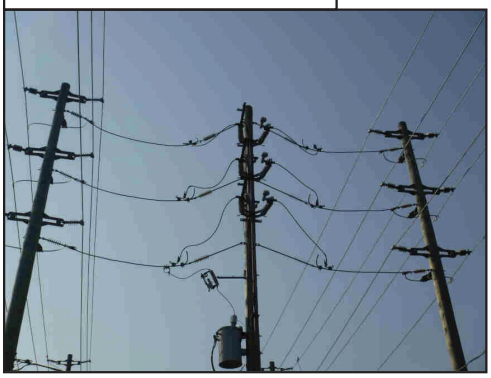
| Identification: | DATE |
|---|---|
| M3, Pole 11871 (Goderich) | 2023-06-07 |

**Description:** Switch

## INFRARED IMAGE




## PHOTO



| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 7:14:53 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 10.0°C |

## INFORMATION:

Infrared image of the M3 switches. On pole 11871.
Located at the Goderich TS.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

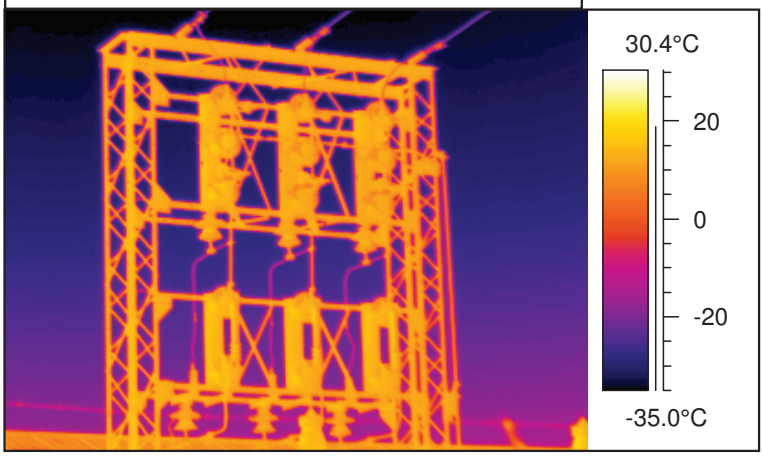
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| MS3 (Goderich) | 2023-06-07 |

**Description:** Sub-Station

## INFRARED IMAGE




## PHOTO


| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 7:28:56 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 12.0°C |

## INFORMATION:

Infrared image of the MS3 substation switches.
Located in Goderich.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

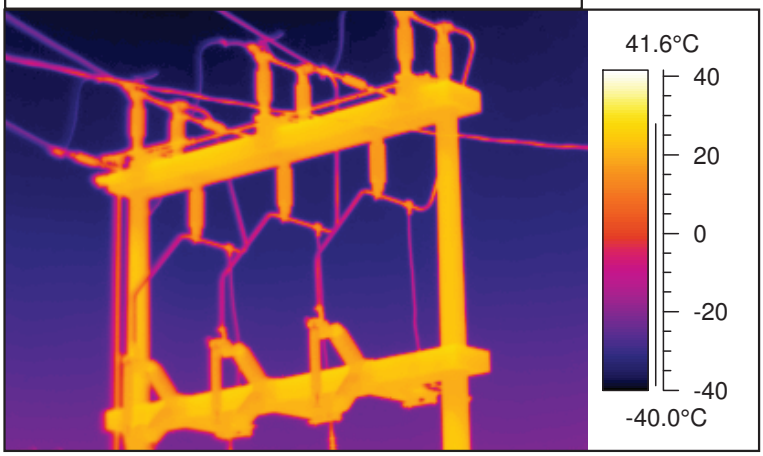
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| MS1 Sub-Station (Tavistock) | 2023-06-07 |

**Description:** Sub-Station

## INFRARED IMAGE




| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 11:57:47 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |

## PHOTO

## INFORMATION:

Infrared image of the MS1 substation switches.
Located at 17 Decew Street in Tavistock.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

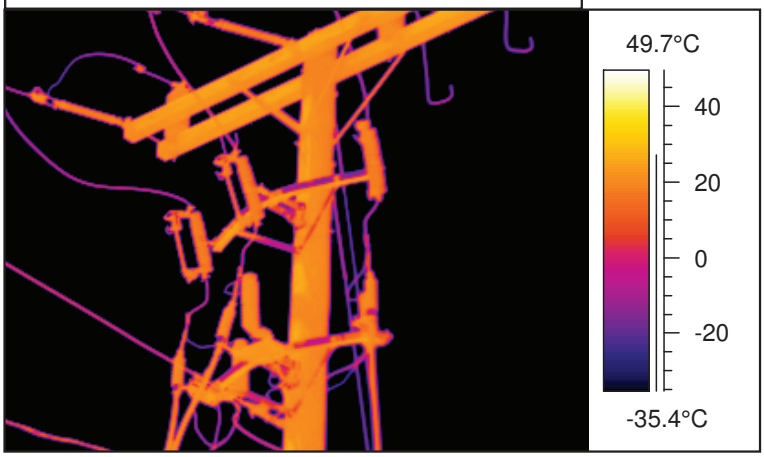
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| MS1 (Tavistock) | 2023-06-07 |

**Description:** Riser Pole

## INFRARED IMAGE




## PHOTO

| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 1:30:47 PM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |

## INFORMATION:

Infrared image of the MS1 riser pole.
Located at 17 Decew Street in Tavistock.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

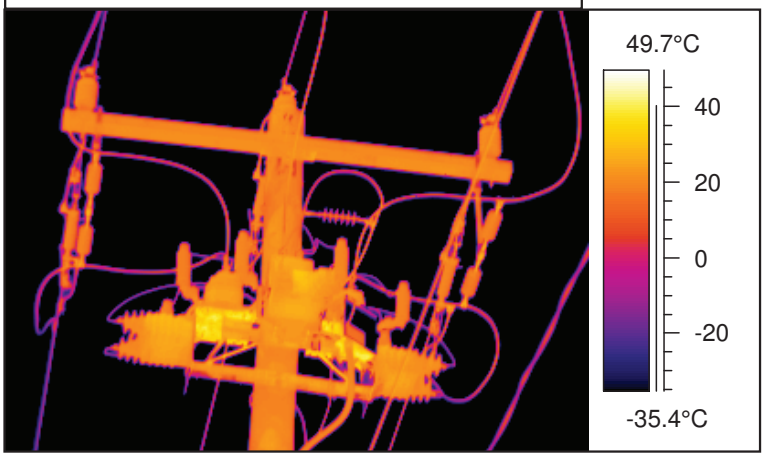
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

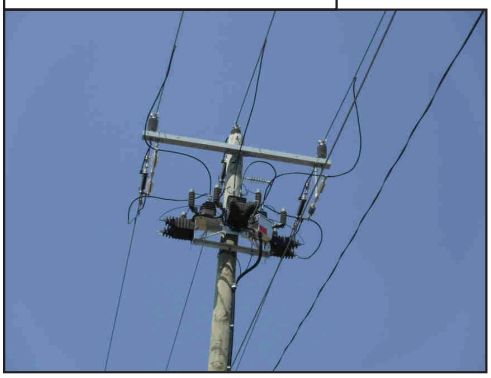
| Identification: | DATE |
|---|---|
| Pole ET11645 (Tavistock) | 2023-06-07 |

**Description:** Metering Point

## INFRARED IMAGE




## PHOTO



| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 1:23:42 PM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |

## INFORMATION:

Infrared image of the PME 15170S metering point.
Located on pole ET11645 in Tavistock.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

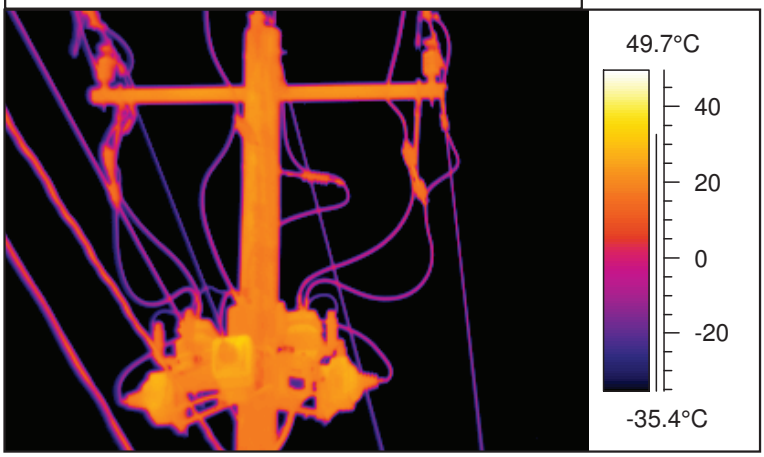
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| Pole ET2331 (Tavistock) | 2023-06-07 |

**Description:** Metering Point

## INFRARED IMAGE




## PHOTO

| IR information | Value |
|---|---|
| Date of creation | 2023-06-07 |
| Time of creation | 1:35:16 PM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |

## INFORMATION:

Infrared image of the EZT68 metering point.
Located on pole ET2331 in Tavistock.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

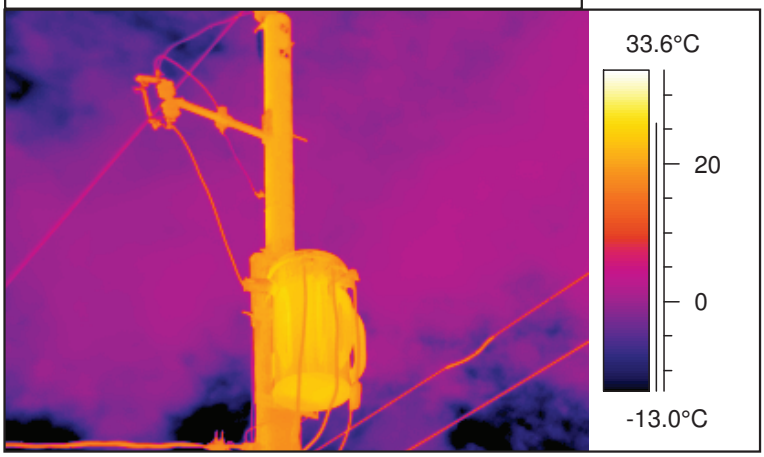
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

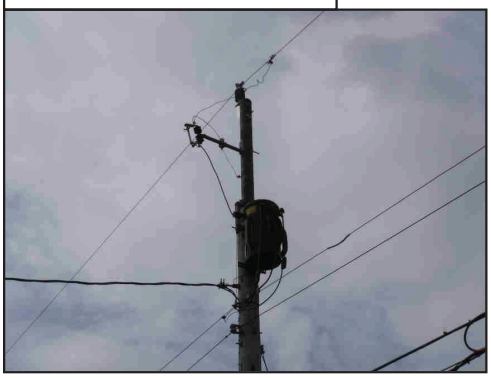
| Identification: | DATE |
|---|---|
| Pole ET2141, E620 (Embro) | 2023-06-08 |

**Description:** Transformer & Switch

## INFRARED IMAGE




## PHOTO



| IR information | Value |
|---|---|
| Date of creation | 2023-06-08 |
| Time of creation | 9:39:46 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 21.0°C |

## INFORMATION:

Infrared image of the E620 transformer.
Located on pole ET2141 in Embro.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

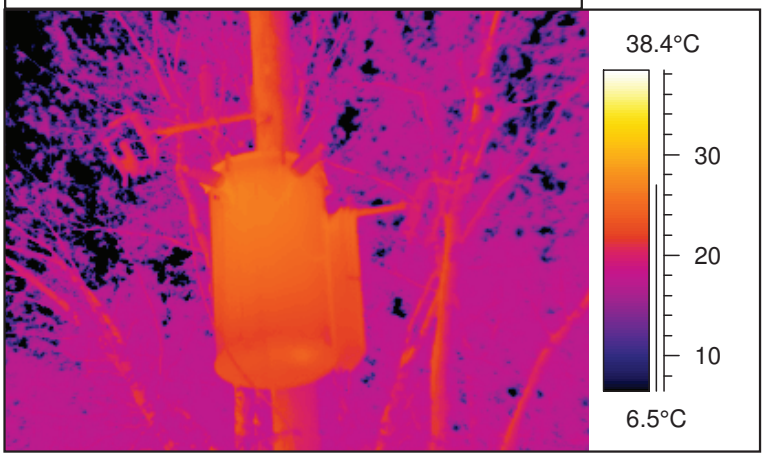
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

| Identification: | DATE |
|---|---|
| Pole ET2649, E500 (Embro) | 2023-06-08 |

**Description:** Transformer & Switch

## INFRARED IMAGE




## PHOTO

| IR information | Value |
|---|---|
| Date of creation | 2023-06-08 |
| Time of creation | 9:52:00 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 22.0°C |

## INFORMATION:

Infrared image of the E500 transformer.
Located on pole ET2649 at 375745 37th Line in Embro.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

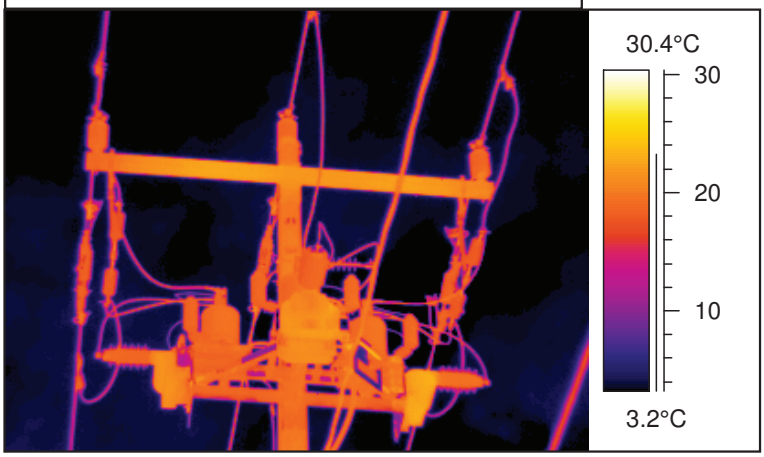
**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

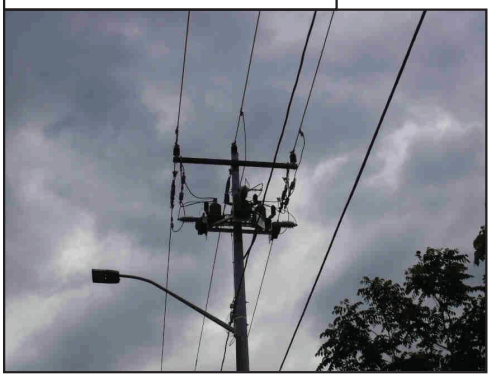
| Identification: | DATE |
|---|---|
| Pole ET4499 (Tavistock) | 2023-06-08 |

**Description:** Metering Point

## INFRARED IMAGE




## PHOTO



| IR information | Value |
|---|---|
| Date of creation | 2023-06-08 |
| Time of creation | 10:55:21 AM |
| **Object parameter** | **Value** |
| Ambient temperature | 22.0°C |

## INFORMATION:

Infrared image of a metering point.
Located on pole ET4488 on Highway 2 in Thamesford.
**No problem was noted**.
This image is provided to show the typical thermal patterns that were noted on the inspected equipment that did not indicate any suspect conditions. Normal heating was noted only.
No action is required.

**PRIORITY:** **High** **Medium** **Low**

**ANOMALY:** No problem noted

# APPENDIX K. 2025 Project Narratives

## 2025 - Project Assessment Form

**Project Name** ALL-SRVRES-Residential Connections

Municipality: All
Cost Category: Capital
Project Type: New Residential

## General Information

**Project Description**

This project represents the cost associated with the connection of new residential customers. This includes modifications and/or expansions (subdivisions) to the existing distribution system to accommodate the connection of new customers.

**Investment Category**

System Access

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Residential Connections | Gross ($) | $406,776 | $798,932 | $753,124 | $663,717 | $1,144,173 | $339,858 | $684,430 |
| | Contributions ($) | -$23,382 | $79,463 | $57,670 | $81,477 | $120,389 | $209,472 | $87,515 |
| | Net ($) | $430,158 | $719,469 | $695,454 | $582,240 | $1,023,784 | $130,386 | $596,915 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Residential Connections | Gross ($) | $266,770 | $600,232 | $612,237 | $624,481 | $636,971 | $649,710 | $624,726 |
| | Contributions ($) | $66,770 | $150,232 | $153,237 | $156,301 | $159,427 | $162,616 | $156,363 |
| | Net ($) | $200,000 | $450,000 | $459,000 | $468,180 | $477,544 | $487,094 | $468,364 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | Varies - Customer Driven |
| Customer Load (if available) | Varies - Customer Driven |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 25% |
| Q2 | 25% |
| Q3 | 25% |
| Q4 | 25% |

**Risks and Mitigation**

Residential service connections are a common practice throughout any given year and ERTH Power has well developed standards and guidelines to guide all stages of design, construction and administration. Risks associated with residential connections are primarily a result of ensuring that all procedures and requirements are followed by the utility and the customers. These risks are mitigated through frequent communication between both parties.

**Comparative Information**

See Capital investment tables above for historical comparisons

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

**Project Drivers**

Residential service connections are mandatory service requirements and are driven by customer requests and timelines.

**Investment Priority**

All customer service connections are top priority and are dependent on customer timelines.

| | |
|---|---|
| **Project Alternatives** | Residential service connections follow a standardized process in line with ERTH Powers Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground, meter base location etc. ) Each connection is evaluated by ERTH Power staff and a suitable connection is made with input from the customer in line with developed standards. |
| **Operational Benefits** | New customer service connections do not look to address specific operational issues however are constructed to current standards which will provide incremental operational benefits moving forward. (ex. accessible meter base location) |
| **Reliability Benefits** | New customer service connections do not look to address specific reliability issues however are constructed to current standards which will provide incremental reliability benefits moving forward. (ex. underground secondary installed in duct on customer property) |
| **Customer Benefits** | Not applicable |
| **Safety** | New customer service connections do not look to address specific safety issues however are constructed to current standards which will provide incremental safety benefits moving forward. |
| **Cyber-Security, Privacy** | Not applicable |
| **Co-ordination, Interoperability** | This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| **Economic Development** | Not applicable |
| **Environmental Benefits** | Not applicable |

## Category Specific Requirements

**System Access Project**

The factors affecting the timing of residential service connections are primarily driven by timelines set out by the customer and are a top priority.

Customer preferences and input are always taken into consideration during the design of a new connection, however all connections are made ensuring that current standard practices are followed in a consistent manner.

The final cost of the project as a whole is driven by customer requests and can vary year to year. On a more granular level each connection is evaluated and the cost of the connection can vary depending on the size & type of service along with existing conditions.

The connection of new residential customers is completed through well established procedures that have continuously improved over time to provide cost efficiency to both ERTH Power and customers. Any material used by ERTH Power is purchased through a buying group of multiple local utilities that aims to standardize and minimize costs.

On a project by project basis ERTH Power evaluates the connection requirements to see if other planning objectives can be accomplished. Examples of this include expansions to service new developments from the 28kV system or service requirements to leverage future conditions.



Residential service connections follow a standardized process in line with ERTH Powers Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground, meter base location etc. ) Each connection is evaluated by ERTH Power staff and a suitable connection is made with input from the customer in line with developed standards.

When a capital contribution is applicable it is calculated in accordance with the methodology included in the DSC and is completed on a project by project basis. These contributions vary on a year by year basis depending on demand and historical trends are used to budget.

Typically individual residential connections and subdivision developments have a very minimal impact to the distributions system. If a connection drives a substantial investment to the distribution system a separate project will be created and evaluated.

## 2025 - Project Assessment Form

**Project Name** ALL-SRVCI-Commercial & Industrial Connections

Municipality: All
Cost Category: Capital
Project Type: New C&I

### General Information

**Project Description**

This project represents the cost associated with the connection of new commercial and industrial customers. This includes modifications and/or expansions to the existing distribution system to accommodate the connection of new customers.

**Investment Category**

System Access

**Capital Investment**

| | | Historical Expenditures | | | | | | Average |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | (2018 to 2023) |
| C&I Connections | Gross ($) | $544,073 | $687,835 | $328,555 | $531,235 | $788,841 | $821,408 | $616,991 |
| | Contributions ($) | $260,383 | $539,664 | $225,952 | $418,314 | $591,287 | $602,876 | $439,746 |
| | Net ($) | $283,690 | $148,171 | $102,603 | $112,921 | $197,554 | $218,532 | $177,245 |

| | | Forecast Expenditures | | | | | | Average |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | (2025 to 2029) |
| C&I Connections | Gross ($) | $370,308 | $679,325 | $692,912 | $706,770 | $720,906 | $735,324 | $707,047 |
| | Contributions ($) | $270,308 | $495,877 | $505,794 | $515,910 | $526,228 | $536,753 | $516,112 |
| | Net ($) | $100,000 | $183,449 | $187,118 | $190,860 | $194,677 | $198,571 | $190,935 |

**Customer Information**

Number of Customer Attachments: Varies - Customer Driven
Customer Load (if available): Varies - Customer Driven

**Expected Project Timing**

Start Date: Q1
End Date: Q4

**Expected Expenditure Timing**

Q1: 25%
Q2: 25%
Q3: 25%
Q4: 25%

**Risks and Mitigation**

C&I service connections are a common practice throughout any given year and ERTH Power has well developed standards and guidelines to guide all stages of design, construction and administration. Risks associated with C&I connections are primarily a result of ensuring that all procedures and requirements are followed by the utility and the customers. These risks are mitigated through frequent communication between both parties.

**Comparative Information**

See Capital Investment tables above for historical comparisons

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| **Project Drivers** | C&I service connections are mandatory service requirements and are driven by customer requests and timelines. |
| **Investment Priority** | All customer service connections are top priority and are dependent on customer timelines. |
| **Project Alternatives** | C&I service connections follow a standardized process in line with ERTH Power Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground) Each connection is evaluated by ERTH Power staff and a suitable connection is made with input from the customer in line with developed standards. |
| **Operational Benefits** | New customer service connections do not look to address specific operational issues however are constructed to current standards which will provide incremental operational benefits moving forward. (ex. accessible metering) |
| **Reliability Benefits** | New customer service connections do not look to address specific reliability issues however are constructed to current standards which will provide incremental reliability benefits moving forward. |
| **Customer Benefits** | Not applicable |
| **Safety** | New customer service connections do not look to address specific safety issues however are constructed to current standards which will provide incremental safety benefits moving forward. |
| **Cyber-Security, Privacy** | Not applicable |
| **Co-ordination, Interoperability** | This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| **Economic Development** | Not applicable |
| **Environmental Benefits** | Not applicable |

## Category Specific Requirements

**System Access Project**

| | |
|---|---|
| **Factors Affecting Project Timing/Priority** | The factors affecting the timing of C&I service connections are primarily driven by timelines set out by the customer and are a top priority. |
| **Factors Relating to Customer Preference** | Customer preferences and input are always taken into consideration during the design of a new connection, however all connections are made ensuring that current standard practices are followed in a consistent manner. |
| **Factors Affecting Project Cost** | The final cost of the project as a whole is driven by customer requests and can vary year to year. On a more granular level each connection is evaluated and the cost of the connection can vary depending on the size & type of service along with existing conditions. |
| **Controllable Cost Minimization** | The connection of new C&I customers is completed through well established procedures that have continuously improved over time to provide cost efficiency to both ERTH Power and |



| | |
|---|---|
| | customers. Any material used by ERTH Power is purchased through a buying group of multiple local utilities that aims to standardize and minimize costs. |
| **Other Planning Objectives Met** | On a project by project basis ERTH Power evaluates the connection requirements to see if other planning objectives can be accomplished. Examples of this include expansions to service new developments from the 28kV system or service requirements to leverage future conditions. |
| **Technically Feasible Project Options** | C&I service connections follow a standardized process in line with ERTH Powers Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground) Each connection is evaluated by ERTH Power staff and a suitable connection is made with input from the customer in line with developed standards. |
| **Results of Economic Evaluation** | When a capital contribution is applicable it is calculated in accordance with the methodology included in the DSC and is completed on a project by project basis. These contributions vary on a year by year basis depending on demand and historical trends are used to budget. |
| **Nature and Magnitude of System Impacts, Costs & Cost Recovery** | Typically individual C&I connections have a very minimal impact to the distributions system. If a connection drives a substantial investment to the distribution system a separate project will be created and evaluated. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ALL-METERS-Meter Stock | Municipality | All |
| | | Cost Category | Capital |
| | | Project Type | Metering |

### General Information

**Project Description**

This project represents the cost associated with replacement of metering equipment which includes single and three phase meters, associated hardware and AMI equipment (i.e. collector units) The replacement of these units is driven by failures and regulatory requirements, and also includes meter costs associated with new connections.

In addition, ERTH has included an additional $1,250,000 per year in 2027, 2028, & 2029 to begin our transition to AMI 2.0. **This investment is detailed further in a separate Project Assessment Form specific to AMI 2.0;** however, the spend is included in the totals below.

**Investment Category**

System Access

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Meter Management | Gross ($) | $172,527 | $203,982 | $187,291 | $453,318 | $220,494 | $216,502 | $242,352 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $172,527 | $203,982 | $187,291 | $453,318 | $220,494 | $216,502 | $242,352 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Meter Management | Gross ($) | $266,750 | $250,835 | $255,851 | $1,385,968 | $1,385,968 | $1,391,188 | $933,962 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $266,750 | $250,835 | $255,851 | $1,385,968 | $1,385,968 | $1,391,188 | $933,962 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | ALL |
| Customer Load (if available) | ALL |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 25% |
| Q2 | 25% |
| Q3 | 25% |
| Q4 | 25% |

**Risks and Mitigation**

There are minimal risks associated with the typical completion of this project as planned. With that being said a portion of the budget is dependent on meter failures which are unpredictable and based on historical failure rates.

**Comparative Information**

2023: $215,502
2022: $130,236
2021: $453,318
2020: $187,291
2019: $203,982

**REG Investment**

This project is not associated with a REG investment

| | |
|---|---|
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | Mandatory regulatory requirements. (DSC & Measurement Canada) |
| Investment Priority | New customer connections and upgrades are a top priority and typically organized by engineering staff in compliance with DSC requirements. Measurement Canada compliance is again a top priority and handled by metering staff. |
| Project Alternatives | Not applicable. |
| Operational Benefits | Not applicable. |
| Reliability Benefits | Not applicable. |
| Customer Benefits | Not applicable. |
| Safety | Not applicable. |
| Cyber-Security, Privacy | Not applicable |
| Co-ordination, Interoperability | Not applicable |
| Economic Development | Not applicable |
| Environmental Benefits | Not applicable |

## Category Specific Requirements

**System Access Project**

| | |
|---|---|
| Factors Affecting Project Timing/Priority | The factors affecting the timing of metering replacements/upgrades are typically customer preferences, failures and regulatory requirements. |
| Factors Relating to Customer Preference | Meter replacements, especially for commercial/industrial customers are scheduled to best meet customer preferences. |
| Factors Affecting Project Cost | Meter failure rates are one of the largest factors affecting this project. |
| Controllable Cost Minimization | There a minimal controllable factors for cost mitigation. |
| Other Planning Objectives Met | Metering requirements typically do not meet any other planning objectives however; the use of smart meters will enable more informed decision making for both the customer and the LDC. |
| Technically Feasible Project Options | Not applicable |
| Results of Economic Evaluation | Not applicable |
| Nature and Magnitude of System Impacts, Costs & Cost Recovery | Not applicable |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ALL-METERS-Meter Stock - AMI 2.0 | Municipality | All |
| | | Cost Category | Capital |
| | | Project Type | Metering |

### General Information

**Project Description**

This project represents the cost associated with ERTHs transition to AMI 2.0 starting in 2027.

That being said, ERTH still requires a great deal of investigation to build a proper business case to fully support this investment, which is estimated to cost upwards of $5 million. ERTH is part of the Grid Smart City Cooperative that has recently launched an RFP to choose a technical consultant who will be tasked with providing a report on AMI 2.0. It will include a comparison of various vendors, their technological capabilities, costs & lead times. This report will form the basis of our AMI 2.0 strategy moving forward and is expected in 2025.

**Investment Category**

System Access

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| AMI 2.0 (included in Meter Management) | Gross ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| AMI 2.0 (included in Meter Management) | Gross ($) | $0 | $0 | $0 | $1,125,000 | $1,125,000 | $1,125,000 | $675,000 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $0 | $0 | $0 | $1,125,000 | $1,125,000 | $1,125,000 | $675,000 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | ALL |
| Customer Load (if available) | ALL |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 25% |
| Q2 | 25% |
| Q3 | 25% |
| Q4 | 25% |

**Risks and Mitigation**

ERTH is still in the preliminary stages of evaluating AMI 2.0 options, which include vendor selection, timing, pace of investment, and technical capabilities. There are always risks with a large investment in new technology, however ERTH plans to mitigate this through intensive research and industry collaboration with GSC and other groups over the next 2 years.

**Comparative Information**

Not applicable

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | There are two drivers for this investment; firstly the AMI 1.0 system is approximately 15 years old and nearing or beyond its end of useful life. In comparison to the Kinetrics Report K-418033-RA-001-R000 completed in 2010 outlining Asset Depreciation for the OEB; the Typical Useful Life for a Smart Meter is 5-15 years. The secondary driver for this investment is the need for enhanced grid efficiency, reliability, and real-time data analytics to support advanced energy management, customer engagement, and the integration of renewable energy sources. |
| Investment Priority | To be determined through the development of a thorough business plan in 2025/2026. |
| Project Alternatives | To be determined through the development of a thorough business plan in 2025/2026. |
| Operational Benefits | To be determined through the development of a thorough business plan in 2025/2026. |
| Reliability Benefits | To be determined through the development of a thorough business plan in 2025/2026. |
| Customer Benefits | To be determined through the development of a thorough business plan in 2025/2026. |
| Safety | To be determined through the development of a thorough business plan in 2025/2026. |
| Cyber-Security, Privacy | To be determined through the development of a thorough business plan in 2025/2026. |
| Co-ordination, Interoperability | To be determined through the development of a thorough business plan in 2025/2026. |
| Economic Development | To be determined through the development of a thorough business plan in 2025/2026. |
| Environmental Benefits | To be determined through the development of a thorough business plan in 2025/2026. |

Although ERTH is in the initial stages of evaluating AMI 2.0 options and values, which will be detailed in a formal business, plan in 2025/2026 the following are high-level expectations moving forward.

**1. Operational Benefits:**

- Advanced Data Analytics: AMI 2.0 goes beyond simple meter readings, providing utilities with deeper insights into consumption patterns, load forecasting, and grid optimization. This is an improvement over AMI 1.0's basic remote meter reading.
- Faster Response Time: While AMI 1.0 allows for remote meter reading, AMI 2.0 enables real-time data transmission, allowing for near-instant responses to grid issues and outages.
- Advanced Demand-Side Management: AMI 2.0 facilitates more effective demand response programs, allowing utilities to control loads in real time, as opposed to the limited load management in AMI 1.0.

**2. Reliability Benefits:**

- Proactive Maintenance: AMI 2.0 enhances predictive maintenance capabilities by identifying potential issues (like voltage fluctuations) before they lead to outages, surpassing AMI 1.0's reactive outage detection.
- Grid Resilience: Enhanced data collection and analysis in AMI 2.0 enable more efficient outage restoration and grid optimization compared to AMI 1.0.

**3. Customer Benefits:**

- Deeper Usage Insights: AMI 2.0 provides customers with more granular, real-time data and personalized energy-saving recommendations, improving on AMI 1.0's basic consumption reports.
- Enhanced Engagement Tools: Customers using AMI 2.0 have access to mobile apps and online platforms with interactive data visualization, while AMI 1.0 offers only basic usage information.

**4. Safety Benefits:**

- Advanced Hazard Detection: AMI 2.0 can detect grid anomalies, like overheating equipment or downed power lines, in real-time. AMI 1.0 lacks this level of detail and real-time hazard monitoring.
- Remote Operation: AMI 2.0 offers remote connection and disconnection capabilities with enhanced security and control, improving on the simpler, less secure remote actions of AMI 1.0.

**5. Cybersecurity Benefits:**

- Stronger Encryption & Security Protocols: AMI 2.0 improves upon the cybersecurity features of AMI 1.0 with stronger encryption, real-time threat detection, and multi-layered security protocols to defend against increasingly sophisticated cyberattacks.
- Dynamic Security Updates: Unlike AMI 1.0, AMI 2.0 systems can support more frequent and seamless updates to security protocols to combat emerging threats.

**6. Interoperability:**

- Broader Integration: AMI 2.0 is designed to work seamlessly with modern smart grid technologies like distributed energy resources (DERs), battery storage, and electric vehicle (EV) charging infrastructure, surpassing the limited interoperability of AMI 1.0.
- Support for IoT Devices: AMI 2.0 can integrate with IoT devices, sensors, and home energy management systems, offering a smarter, more connected ecosystem than AMI 1.0.

**7. Economic Benefits:**

- Lower Operational Costs: AMI 2.0 reduces costs more effectively by automating more processes and optimizing grid performance. AMI 1.0 mainly focuses on remote meter reading and basic data collection, offering limited cost savings.
- Improved Energy Efficiency: With better real-time data and predictive analytics, AMI 2.0 enables utilities and customers to optimize energy consumption, leading to greater long-term economic benefits compared to AMI 1.0.

**8. Environmental Benefits:**

- Support for Clean Energy: AMI 2.0 better integrates renewable energy sources like solar and wind, optimizing their use and allowing for greater adoption of green energy. AMI 1.0 has more limited capabilities for renewable integration.
- Reduced Carbon Footprint: AMI 2.0's advanced load management reduces the need for peak power plants and lowers overall emissions more effectively than AMI 1.0.

## Category Specific Requirements

**System Access Project**

| | |
|---|---|
| Factors Affecting Project Timing/Priority | To be determined through the development of a thorough business plan in 2025/2026. |
| Factors Relating to Customer Preference | To be determined through the development of a thorough business plan in 2025/2026. |
| Factors Affecting Project Cost | To be determined through the development of a thorough business plan in 2025/2026. |
| Controllable Cost Minimization | To be determined through the development of a thorough business plan in 2025/2026. |
| Other Planning Objectives Met | To be determined through the development of a thorough business plan in 2025/2026. |
| Technically Feasible Project Options | To be determined through the development of a thorough business plan in 2025/2026. |
| Results of Economic Evaluation | To be determined through the development of a thorough business plan in 2025/2026. |
| Nature and Magnitude of System Impacts, Costs & Cost Recovery | To be determined through the development of a thorough business plan in 2025/2026. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-FACRL-Relocation of Plant | Municipality | All |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

This project represents the cost associated with the relocation of hydro infrastructure within the municipal road allowance to accommodate road widening and other modifications. ERTH Power meets and communicates with our municipalities to have a better understanding of the facility relocations required for future years. When specific projects are known in advance, a dedicated project is created. This particular project is to accommodate facility relocation requests that arise throughout the year without prior knowledge.


**Investment Category**

System Access

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Facility Relocations | Gross ($) | $438,339 | $258,195 | $38,264 | $88,235 | $7,014 | $393,802 | $203,975 |
| | Contributions ($) | $194,326 | $1,216 | $10,454 | $9,941 | $0 | $110,645 | $54,430 |
| | Net ($) | $244,013 | $258,195 | $38,264 | $88,235 | $7,014 | $393,802 | $171,587 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Facility Relocations | Gross ($) | $105,796 | $177,593 | $181,145 | $184,767 | $188,463 | $192,232 | $184,840 |
| | Contributions ($) | $20,796 | $43,449 | $44,318 | $45,204 | $46,108 | $47,030 | $45,222 |
| | Net ($) | $85,000 | $177,593 | $181,145 | $184,767 | $188,463 | $192,232 | $184,840 |

| | | |
|---|---|---|
| **Customer Information** | Number of Customer Attachments | Varies – Municipally Driven |
| | Customer Load (if available) | Varies – Municipally Driven |
| **Expected Project Timing** | Start Date | Q1 |
| | End Date | Q4 |
| **Expected Expenditure Timing** | Q1 | 10% |
| | Q2 | 40% |
| | Q3 | 40% |
| | Q4 | 10% |

**Risks and Mitigation**

As this project is driven by municipal infrastructure upgrades, there is an inherent risk related to the utility's limited control over the project's timelines and design. To mitigate these risks, ERTH Power participates in regular coordination meetings with municipal authorities across the majority of our service areas. These meetings, along with maintaining open and continuous communication, ensure alignment between municipal and utility goals, helping to minimize potential delays or design conflicts and ensuring the project remains on track.

**Comparative Information**

See Capital investment tables above for historical comparisons

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

**Project Drivers**

The primary driver for this project is to accommodate infrastructure upgrades driven by municipal requirements. ERTH Power maintains regular communication with municipal authorities to align municipal projects with areas that need upgrades, thereby minimizing unnecessary replacement of assets that are not yet at their end of life. However, full alignment is not always achievable, and some asset replacements may occur as part of these municipal-driven initiatives. This approach ensures that infrastructure improvements meet both municipal needs and asset management objectives.

**Investment Priority**

These projects are mandatory and are driven by municipal requests.

**Project Alternatives**

ERTH Power works with local municipalities to explain the available options and associated costs however the relocation is dictated by the road modifications and often few alternatives exist.

**Operational Benefits**

Facility relocations do not look to address specific operational issues however construction is completed to current standards which will provide incremental benefits. When additional benefits can be achieved in conjunction with the relocation ERTH Power will incorporate these into the design.

| | |
|---|---|
| **Reliability Benefits** | Facility relocations do not look to address specific reliability issues however construction is completed to current standards, which will provide incremental benefits. When additional benefits can be achieved in conjunction with the relocation ERTH Power will incorporate these into the design. |
| **Customer Benefits** | Not applicable |
| **Safety** | Facility relocations do not look to address specific safety issues however construction is completed to current standards, which will provide incremental benefits. When additional safety benefits can be achieved in conjunction with the relocation ERTH Power will incorporate these into the design. |
| **Cyber-Security, Privacy** | Not applicable |
| **Co-ordination, Interoperability** | This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| **Economic Development** | Not applicable |
| **Environmental Benefits** | Not applicable |

## Category Specific Requirements

**System Access Project**

| | |
|---|---|
| **Factors Affecting Project Timing/Priority** | The factors affecting the timing of facility relocations are primarily driven by timelines set out by the municipality and are a top priority. |
| **Factors Relating to Customer Preference** | Municipal preferences and input are always taken into consideration during the design and alternative options and costs are communicated to the municipality when applicable. Regular communication between the utility and the municipality often result in a solution that meets the requirements of the relocation while minimizing the financial impacts. |
| **Factors Affecting Project Cost** | The final cost of the project as a whole is driven by requirements of the municipality. Cost sharing between the municipality and ERTH Power is completed in accordance with the Public Service Works on Highways Act and results in the municipality contributing 50% to the cost of labour and labour saving devices. |
| **Controllable Cost Minimization** | Controllable costs are minimized through effective communication and standard design practices. |
| **Other Planning Objectives Met** | On a project by project basis ERTH Power evaluates the requirements to see if other planning objectives can be accomplished. Examples of this include the ability to complete voltage conversions or prepare for future plans. |
| **Technically Feasible Project Options** | ERTH Power works with local municipalities to explain the available options and associated costs however, the relocation is dictated by the road modifications and often few alternatives exist. |
| **Results of Economic Evaluation** | Not applicable |
| **Nature and Magnitude of System Impacts, Costs & Cost Recovery** | Typically, facility relocations have a minimal impact to the distributions system as a whole. If a specific relocation drives a substantial investment to the distribution system, a separate project will be created and evaluated. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-Fixed Dx Asset Replacement | Municipality | ALL |
| | | Cost Category | Capital |
| | | Project Type | Preventative |

### General Information

**Project Description**

System renewal projects are driven by the need to address distribution systems or assets that no longer meet acceptable performance standards, aiming to minimize negative impacts on customers, the public, and workers. These projects are prioritized primarily based on asset condition, as identified in the Asset Management Plan, and are aligned with goals such as reducing load on municipal substations, as outlined in the Distribution System Plan. The historical and forecast expenditures under this program are shown below. The goal is to increase spending in these categories to maintain asset replacement levels in light of increases in material, equipment and labour costs.

**This project is a high-level investment that includes spending in the following "sub-projects". The sub-project spend is captured in the tables below however separate project narratives have been created to show the level of spending for each and capture all necessary project drivers, etc.**

- Substation Upgrades
- Maps & Records
- Pole Replacements Program
- Transformer Painting Program
- Unplanned Capital Projects
- Pole Line Rebuilds
- Underground System Rebuilds

**Investment Category**

System Renewal

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Fixed DX Asset Replacement | Gross ($) | $2,497,000 | $2,900,000 | $3,077,500 | $3,255,000 | $3,432,500 | $3,610,000 | $3,255,000 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $2,497,000 | $2,900,000 | $3,077,500 | $3,255,000 | $3,432,500 | $3,610,000 | $3,255,000 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Fixed DX Asset Replacement | Gross ($) | $2,274,681 | $2,588,287 | $2,692,631 | $2,540,938 | $2,396,658 | $2,656,248 | $2,524,907 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $2,274,681 | $2,588,287 | $2,692,631 | $2,540,938 | $2,396,658 | $2,656,248 | $2,524,907 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | VARIES |
| Customer Load (if available) | VARIES |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

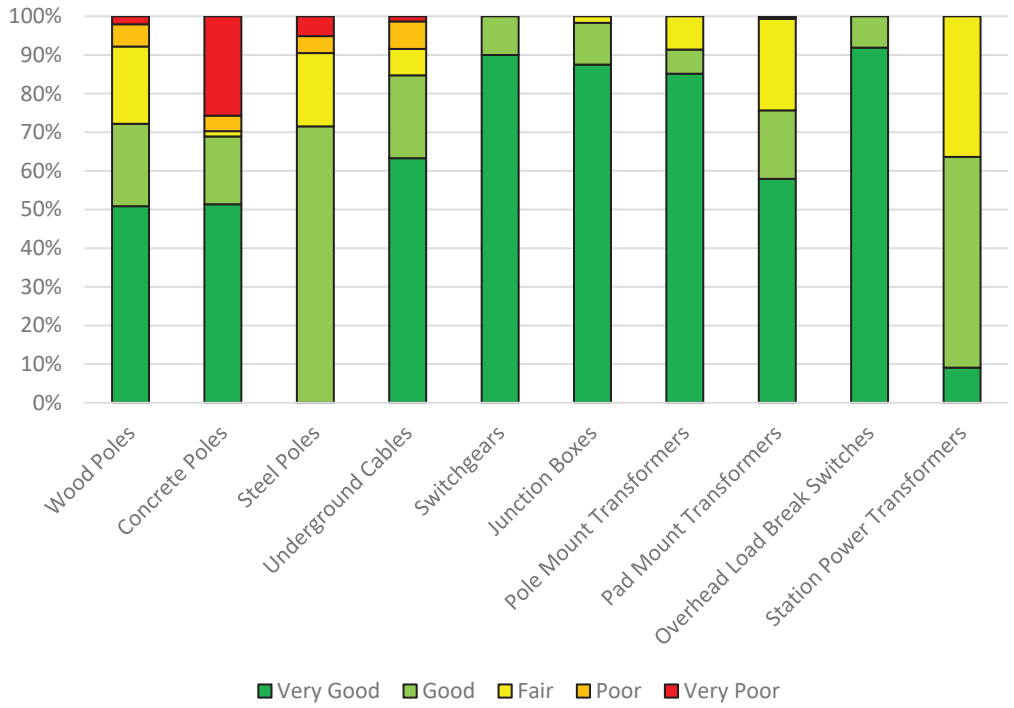
| | |
|---|---|
| Q1 | 20% |
| Q2 | 30% |
| Q3 | 30% |
| Q4 | 20% |

| | |
|---|---|
| **Risks and Mitigation** | System Renewal Projects, often centered on infrastructure upgrades or rebuilds, face a wide array of challenges. Risks include the current condition of underground infrastructure, potential public opposition to change, and disruptions to commercial or industrial operations. Coordination with municipal bodies, developers, and external contractors introduces schedule dependencies and limited control over timelines. Additionally, customer property and service modifications may cause dissatisfaction, especially when outages are required. By maintaining proactive communication, effective planning, and relying on trusted contractors and field assessments, these risks can be managed to minimize delays, control costs, and ensure smoother project execution. |
| **Comparative Information** | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. Pole replacements because of pole testing and reactive causes are tracked historically to ensure proper budgets and best practices are developed and improved as necessary. |
| **REG Investment** | These projects are not associated with a REG investment |
| **Leave to Construct Approval** | These projects do not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| **Project Drivers** | These projects are primarily driven by the need to upgrade or replace critical infrastructure to ensure system safety, reliability, and efficiency, as identified in the Asset Management Plan. Aging underground cables, pole-mounted transformers, and copper conductors that have reached the end of their useful life or are experiencing increased failures, make upgrades essential. Additionally, aging poles and padmount transformers are highlighted in the Asset Condition Assessment as requiring the most significant investment as shown in the figure below. Upgrades such as voltage conversion and overhead infrastructure replacements are crucial for modernizing the grid and improving overall system performance. By focusing on proactive replacements, these projects address key safety concerns, reduce operational risks, and align with long-term asset management goals. |




**System-wide Health-Index**

To maintain asset conditions, the Asset Management Plan, guided by the Asset Condition Assessment, has established specific asset replacement targets, as outlined in the table below. However, rising material, equipment, and labor costs due to inflation have made asset replacement more difficult to budget, supporting the need for an increase.

| Asset | Target | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Average |
|---|---|---|---|---|---|---|---|---|
| **Wood Poles** | **145** | 185 | 167 | 144 | 146 | 79 | 106 | 138 |
| **Concrete Poles** | **4** | 2 | 1 | 10 | 0 | 2 | 2 | 3 |
| **Steel Poles** | **4** | 1 | 1 | 0 | 0 | 1 | 1 | 1 |
| **UG Cable** | **2.8** | 0.31 | 0.91 | 0.15 | 0.51 | 0 | 2 | 1 |
| **Polemount Transformers** | **30** | 31 | 94 | 62 | 38 | 42 | 38 | 51 |
| **Padmount Transformers** | **19** | 14 | 23 | 7 | 23 | 15 | 35 | 20 |

**Investment Priority**

ERTH Power implements a software based Investment Optimizer, which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

**Project Alternatives**

Alternative designs were not considered for this program as a whole; instead, alternatives are evaluated on a project-by-project basis. Typically, the main alternative to asset replacement is a run-to-failure approach, which leads to increased risks for customer service, safety, and system reliability, and makes budgeting and planning more difficult.

For each project, alternatives are measured against the project constraints and criteria to determine the most appropriate solution.

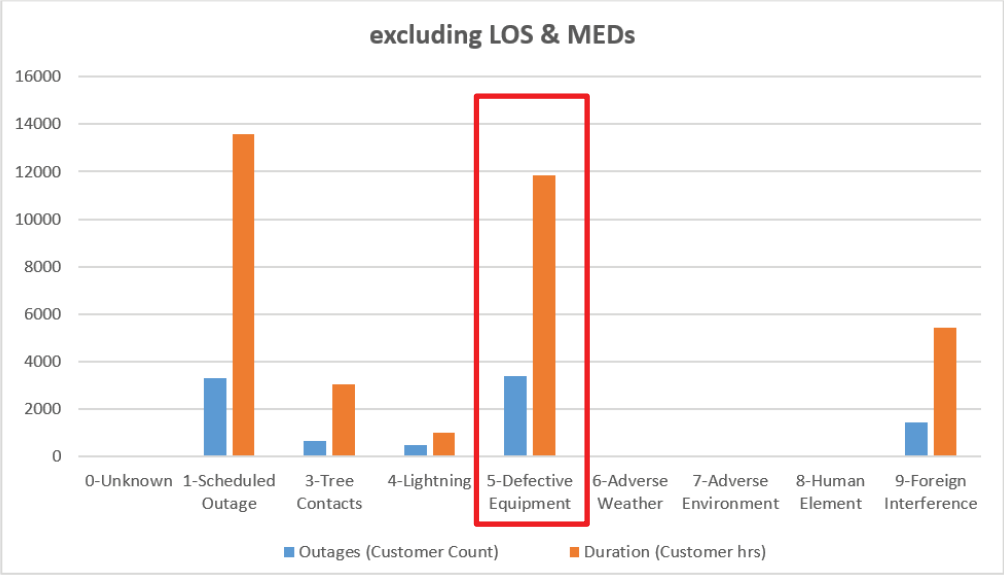
| | |
|---|---|
| **Operational Benefits** | The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. |
| **Reliability Benefits** | The completion of the project will upgrade the existing aged assets as required and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets. |
| **Customer Benefits** | The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long-term plan for the system to current design standards. |
| **Safety** | All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards. The construction of a proper mobile substation will prevent an instance where crews would need to improvise temporary solutions to restore power during a substation failure. |
| **Cyber-Security, Privacy** | Not applicable to this project |
| **Co-ordination, Interoperability** | This project does not apply to the regional infrastructure-planning framework. |
| **Economic Development** | This project does not directly relate to any economic growth however with any system renewal ERTH Power considers any potential for customer connections or load growth and addresses these with an appropriate design. |
| **Environmental Benefits** | System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| **Asset Condition Relative to Typical Life Cycle** | The projects that are completed as part of this program have been identified through the Asset Management Plan as requiring expedient replacement. Therefore, nearly all assets replaced under this program are considered at the end of their useful life. The goal of the System Renewal program is to minimize outage, financial and safety risks by proactively testing, inspecting, assessing and replacing aging assets. The Health Index distribution of ERTH Power's assets is shown in Figure 1 below. |
| **Number of Customers in Each Class Potentially Affected** | ERTH Power supplies power to approximately 25,000 customers, of which around 22,000 are residential and 2800 are commercial & industrial. |
| **Quantitative Customer Impacts** | Outages related to defective equipment are regularly one of the largest causes of system outages. Robust capital programs that address aging assets in a considered, strategic and data-driven approach will have the largest impact on outages related to defective equipment. |

| Duration (Customer hrs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Total | % |
| 0-Unknown | 1011 | 57 | 537 | 231 | 486 | 5800 | 124 | 61 | 8307 | 1.51% |
| 1-Scheduled Outage | 4472 | 2691 | 5836 | 4832 | 8852 | 13531 | 1631 | 13594 | 55439 | 10.06% |
| 2-Loss of Supply | 39869 | 18594 | 39803 | 42636 | 31467 | 67975 | 26440 | 57129 | 323913 | 58.75% |
| 3-Tree Contacts | 9851 | 2134 | 4512 | 1457 | 4605 | 10925 | 13038 | 3054 | 49577 | 8.99% |
| 4-Lightning | 0 | 294 | 1 | 23 | 387 | 218 | 40 | 1022 | 1985 | 0.36% |
| 5-Defective Equipment | 2021 | 4870 | 5243 | 11843 | 2463 | 18232 | 3056 | 11865 | 59593 | 10.81% |
| 6-Adverse Weather | 18338 | 1639 | 5318 | 1049 | 114 | 1687 | 4128 | 0 | 32273 | 5.85% |
| 7-Adverse Environment | 0 | 0 | 0 | 0 | 0 | 2532 | 0 | 0 | 2532 | 0.46% |
| 8-Human Element | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0.00% |
| 9-Foreign Interference | 202 | 5809 | 478 | 3007 | 1950 | 169 | 661 | 5444 | 17721 | 3.21% |
| Total | 75764 | 36088 | 61728 | 65078 | 50324 | 121069 | 49121 | 92170 | 551342 | 100.00% |




**Qualitative Customer Impacts**

This program is aimed at improving system reliability within a broad asset set, which overall will improve customer satisfaction.

**Value of Customer Impact**

Fixed Distribution Asset Replacement projects can affect all customer classes depending on the scope of the projects. As mentioned, assets that are replaced under this program are at or near end of life with a much higher risk of failure. As a result, this program can greatly reduce outage times for all customers.

**Other Factors Affecting Project Timing**

Unforeseen events and projects outside our control often require that we adjust the budget as the year progresses, which can mean that some projects are pushed back due to cost or availability of personnel.

**Consequences for System O&M Costs**

System O&M costs are not expected to be materially affected by this project.

**Reliability and Safety Factors**

Reliability indicators will be positively affected with the replacement of aging and failing assets.

**Analysis of Project Benefits & Timing**

There are no alternatives that can be considered regarding the timing and completion of this program due to the nature of the end of life assets.

**Like for Like Renewal Analysis**

Like for Like Renewal Analysis is project-specific and considered on a case-by-case basis. When it is determined that there is the opportunity to reconfigure the system or meet other planning objectives, alternatives are weighed against project constraints and criteria to determine the best possible solution.

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-STNUPGD- Substation Upgrades | Municipality | ALL |
| | | Cost Category | Capital |
| | | Project Type | Preventative |

### General Information

**Project Description**

This project consists of expenditures allocated to upgrades with our remaining ten (10) substations. Typically, this investment has been associated with smaller expenditures along the lines of replacing switches, or individual components with the substations. In 2024 and the forecast period there are larger material investments into the construction of a mobile substation. This will allow ERTH Power to Provide reliable and flexible contingency for substation failures; 10 remain in service w/ average transformer age of 44. In addition it will allow station maintenances to be completed without customer outages; customers are more and more reliant on uninterrupted supply and planned outages for substation maintenance are a significant driver of SAID and SAIFI within our system reliability indices. The mobile substation is expected to be ready for service in late 2024, with connection point upgrades and engineering analysis continuing into 2025, and 2026.

The mobile substation accounts for the following spending:
**2024**: $300,000
**2025:** $150,000
**2026:** $50,000

The existing substations step voltage down from 27,600Y/16,000V (28kV) to 4,160Y/2,400V (4kV). ERTH made the decision along with many other provincial LDC's to eliminate the lower 4kV voltage from its distribution system and convert it to the preferred 28kV system. This allows LDC's to standardize & reduce inventory level, eliminate substations, provide more capacity and less line losses. ERTH's capital expenditure program aim to convert entirely to 28kV where possible and eliminate the need for our 4kV substations however this will take approximately 10-20 years. Therefore, the existing substations must remain in good working order for at least that amount of time.

**Investment Category** System Renewal

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Substation Upgrades | Gross ($) | $34,900 | $93,311 | $10,609 | $10,705 | $44,818 | $18,694 | $35,506 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $34,900 | $93,311 | $10,609 | $10,705 | $44,818 | $18,694 | $35,506 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Substation Upgrades | Gross ($) | $310,000 | $181,842 | $82,798 | $33,782 | $34,795 | $35,839 | $73,811 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $310,000 | $181,842 | $82,798 | $33,782 | $34,795 | $35,839 | $73,811 |

| | | |
|---|---|---|
| Customer Information | Number of Customer Attachments | VARIES |
| | Customer Load (if available) | VARIES |

| | | |
|---|---|---|
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 20% |
| | Q2 | 30% |
| | Q3 | 30% |
| | Q4 | 20% |

| | |
|---|---|
| Risks and Mitigation | The largest risk within this investment is the unique nature of the construction of a mobile substation. There are very few standards that apply to the construction or distribution system connections that are required to successfully integrate a mobile substation into our operations. ERTH engaged multiple firms that have experience building mobile substations and connecting multiple substations and are confident that the project will be completed effectively. |
| Comparative Information | No comparative information exists. As noted earlier ERTH engaged multiple firms for competitive pricing on the construction of the mobile substation. |
| REG Investment | This project is not associated with a REG investment |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver of this project is to provide a reliable contingency plan in the event that one of our ten (10) substations has a failure. A secondary driver for the project is to allow ERTH to complete regular substation maintenance to our substations without customers experiencing outages as a result; historically we have been completing substation maintenance utilizing an outage to our customers. |
| Investment Priority | The priority for this investment is driven by the deteriorating condition of ERTH's remaining substation transformers. The transformer is the most critical component within a substation and the most costly to replace. As noted earlier the average age of our substation transformers is 44 years old, and the following executive summary was provided by a consultant in 2023 after reviewing all relevant transformer oil testing, transformer testing results and yearly maintenance records for each of the remaining 10 substations. |



| Location/ID | Transformer Manufacturer | Serial # | Year Built | Base kVA | Rating 2023 |
|---|---|---|---|---|---|
| Aylmer MS2-TX2 | Ferranti-Packard | 2305405 | 1992 | 3000 | 3.1 |
| Aylmer Forest MS1 | Westinghouse | A3S6273 | 1974 | 5000 | 3.4 |
| Aylmer-McBrein MS2-TX1 | Federal Pioneer | T 2993-1 | 1967 | 3000 | 3.3 |
| Beachville MS1 | HK Porter | 225151 | 1976 | 3000 | 3.0 |
| Clinton MS1 | Ferranti-Packard | 301687 | 1971 | 5000 | 3.5 |
| Goderich MS2-T1 | Westinghouse | A3S6815 | 1985 | 5000 | 3.0 |
| Goderich MS3-T1 | Westinghouse | A3S6029 | 1968 | 5000 | 3.3 |
| Goderich MS4-T1 | Westinghouse | A3S6467 | 1979 | 5000 | 3.2 |
| Ingersoll MS1 | Ferranti-Packard | 0265001001 | 1985 | 5000 | **2.9** |
| Port Stanley MS1 | Ferranti-Packard | 307425 | 1979 | 5000 | 3.4 |
| Tavistock | Pioneer | G13572-1 | 2005 | 5000 | 1 |
| | | | | | |
| | | | | | |

**Rating System Summary**
1 – Suitable for continued use
**2** – Suitable for continued use with increased monitoring, investigation
3 – Suitability of continued use in question, requires increased monitoring and evaluation
4 – Suitability of continued use doubtful, immediate evaluation > removal from service

As you can see the 2023 Rating varies, however the majority of the substation transformers are scored as *" 3 - Suitability for continued use in questions, requires increased monitoring and evaluation"*

The alternative to the large material investment in a mobile substation are the following:

**Do-Nothing (Status Quo):** Continue to operate and maintain the remaining ten (10) substations. ERTH continues to complete voltage conversion within its distribution system which will eventually eliminate the need for the substations, however this will take 10-20 years to accomplish, leaving our customers at risk of a prolonged outage as a result of a substation transformer failure.

Project Alternatives

**Replace Existing Substations "Like-for-Like":** ERTH indicated in our 2015 AMP that the costs associated with replacing a substation would be approximately $780,000. Assuming an inflationary factor of 3% that equates to approximately $1.05million per substation in 2025, which is though to be an extremely conservative figure considering the costs increases we have seen in transformers and associated equipment over the past 5 years. This would result in >$10million in expenditure required to replace the existing substations. In addition, our 2015 AMP outlined that ERTH could reasonably expect $10,000 per year in savings per substation related to O&M costs savings once the substations are removed.

As a result, of the alternatives above, ERTH believes the most prudent approach is to continue with its voltage conversion efforts, with an objective of eliminating our 4kV substations. While also creating a suitable contingency plan via a mobile substation in the event we have a substation failure.

Operational Benefits

The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff.



| | |
|---|---|
| | In addition, the inclusion of a material spend on a mobile substation will provide operational benefits allowing substation maintenances being done more often, without outages to customers. |
| Reliability Benefits | The completion of the project will upgrade the existing aged assets as required and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets.<br><br>The mobile substation will provide a reliable contingency plan in the case of a substation transformer failure. This will drastically reduce the amount of time that will be required to restore customers resulting from a failure. It will also reduce the number of customer hours of outages (SAIDI) resulting from typical substation maintenance practices. |
| Customer Benefits | The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. |
| Safety | All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards. The construction of a proper mobile substation will prevent an instance where crews would need to improvise temporary solutions to restore power during a substation failure. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | This project does not apply to the regional infrastructure-planning framework. |
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH Power considers any future potential for customer connections or load growth and addresses these with an appropriate design. |
| Environmental Benefits | System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods. |

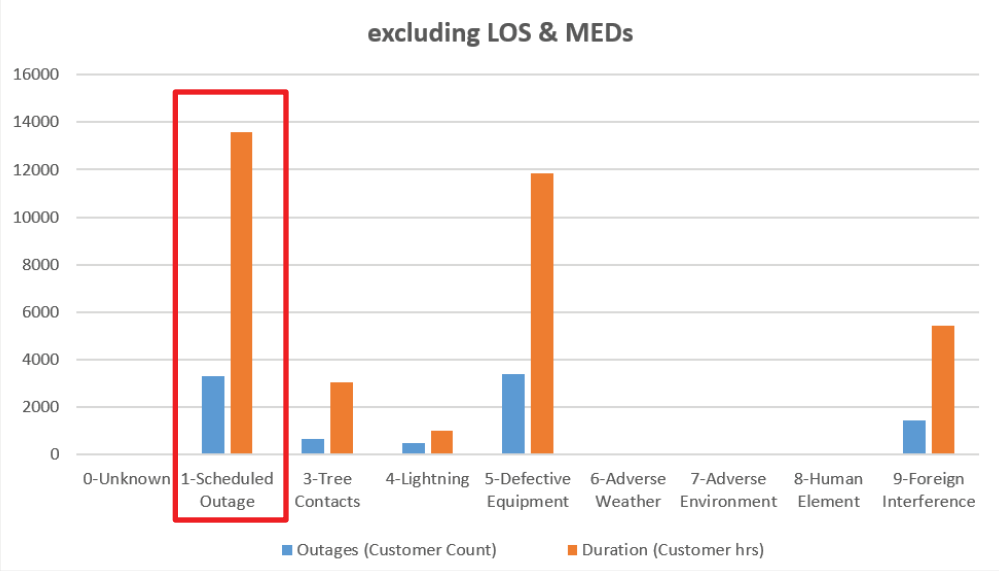
## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | As noted above, the average age for ERTH substation transformers are 44 years old. In comparison to the Kinetrics Report K-418033-RA-001-R000 completed in 2010 outlining Asset Depreciation for the OEB; the Typical Useful Life for a Power Transformer is 45 years and the Maximum Useful Life is 60 years. This age related comparison along with analysis of our oil testing and maintenance records indicate that overall our substation transformers are at or nearing their useful life and at a higher risk of failure. |
| Number of Customers in Each Class Potentially Affected | Approximately 7500 of ERTHs customer are supplied via our 4kV system which equates to nearly 30% of our customer base. Of these customers, the vast majority are residential and small commercial customers. |
| Quantitative Customer Impacts | To date, unplanned substation outages have not caused major reliability concerns however they pose a large risk of a prolonged outages should a transformer fail. The following figures from our annual reliability report show that Scheduled Outages comprise a significant portion of customer hours (SAIDI) in a give year. A mobile substation will reduce this drastically. |



| Duration (Customer hrs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Total | % |
| 0-Unknown | 1011 | 57 | 537 | 231 | 486 | 5800 | 124 | 61 | 8307 | 1.51% |
| 1-Scheduled Outage | 4472 | 2691 | 5836 | 4832 | 8852 | 13531 | 1631 | 13594 | 55439 | 10.06% |
| 2-Loss of Supply | 39869 | 18594 | 39803 | 42636 | 31467 | 67975 | 26440 | 57129 | 323913 | 58.75% |
| 3-Tree Contacts | 9851 | 2134 | 4512 | 1457 | 4605 | 10925 | 13038 | 3054 | 49577 | 8.99% |
| 4-Lightning | 0 | 294 | 1 | 23 | 387 | 218 | 40 | 1022 | 1985 | 0.36% |
| 5-Defective Equipment | 2021 | 4870 | 5243 | 11843 | 2463 | 18232 | 3056 | 11865 | 59593 | 10.81% |
| 6-Adverse Weather | 18338 | 1639 | 5318 | 1049 | 114 | 1687 | 4128 | 0 | 32273 | 5.85% |
| 7-Adverse Environment | 0 | 0 | 0 | 0 | 0 | 2532 | 0 | 0 | 2532 | 0.46% |
| 8-Human Element | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0.00% |
| 9-Foreign Interference | 202 | 5809 | 478 | 3007 | 1950 | 169 | 661 | 5444 | 17721 | 3.21% |
| Total | 75764 | 36088 | 61728 | 65078 | 50324 | 121069 | 49121 | 92170 | 551342 | 100.00% |




| | |
|---|---|
| Qualitative Customer Impacts | This program is aimed at maintaining system reliability, within a high risk asset class which will improve customer satisfaction. |
| Value of Customer Impact | Constructing a mobile substation offers significant value in minimizing customer outages during failure. By deploying such a unit, the utility can restore power to affected areas without prolonged interruptions. This proactive measure ensures that customers experience minimal disruption to their daily lives and operations. Additionally, the mobile substation enhances the utility's responsiveness to emergencies, demonstrating a commitment to reliability and customer satisfaction. |
| Other Factors Affecting Project Timing | The non-standard nature of a mobile substation can result in delays and unexpected costs, as detailed in previous sections ERTH consultant multiple reputable consultant to help construct, and design the project including connection to our system. |
| Consequences for System O&M Costs | System O&M costs are not expected to be materially affected by this project. |
| Reliability and Safety Factors | Reliability indicators will be positively affected with the introduction of a mobile substation into our operations. |
| Analysis of Project Benefits & Timing | There are no alternatives that can be considered regarding the timing and completion of this program due to the nature of the end of life assets. |
| Like for Like Renewal Analysis | Like for Like renewal analysis is outlined in the “Project Alternatives” section above. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-MAPS-Maps & Records | Municipality | All |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

## General Information

**Project Description**

This project represents the costs associated with updating maps and records within ERTH Powers Geographical Information System (GIS). This includes adding and modifying new and upgraded services and updating maps based on system renewal type projects. These are simply tracked in a separate budget due to the timing of when updates are completed and when the physical construction of projects is done. This project will also contain expenditures from third party vendors for GIS/OMS functionality upgrades.

**Investment Category**

System Renewal

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Maps & Records | Gross ($) | $87,403 | $123,362 | $99,284 | $82,606 | $108,207 | $103,889 | $100,792 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $87,403 | $123,362 | $99,284 | $82,606 | $108,207 | $103,889 | $100,792 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Maps & Records | Gross ($) | $85,000 | $104,320 | $106,406 | $108,534 | $110,705 | $112,919 | $108,577 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $85,000 | $104,320 | $106,406 | $108,534 | $110,705 | $112,919 | $108,577 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | Varies - Customer Driven |
| Customer Load (if available) | Varies - Customer Driven |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 25% |
| Q2 | 25% |
| Q3 | 25% |
| Q4 | 25% |

**Risks and Mitigation**

None

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | Having up-to-date, accurate maps are an operational requirement that must be completed. |
| Investment Priority | Due to the project driver this is a high priority and considered mandatory. |

| | |
|---|---|
| Project Alternatives | None |
| Operational Benefits | Up-to-date and accurate maps allow staff to efficiently and safely execute all aspects of their daily work. |
| Reliability Benefits | Up-to-date and accurate maps allow staff to efficiently restore outages and complete switching to minimize outages during planned work. |
| Customer Benefits | Up-to-date and accurate maps allow staff to minimize outages and complete work as efficiently as possible. |
| Safety | Up-to-date and accurate maps allow staff to establish work protection in order to safely execute projects. |
| Cyber-Security, Privacy | Not applicable |
| Co-ordination, Interoperability | This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | Not applicable |
| Environmental Benefits | Not applicable |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | Not applicable, however this project is tied to all other system renewal projects and is linked to their asset condition. |
| Number of Customers in Each Class Potentially Affected | All |
| Quantitative Customer Impacts | Up-to-date and accurate maps allow staff to efficiently restore outages and complete switching to minimize outages during planned work. |
| Qualitative Customer Impacts | Difficult to quantify however customer satisfaction is generally linked to the utilities ability to efficiently perform work and minimize outages. |
| Value of Customer Impact | Difficult to quantify |
| Other Factors Affecting Project Timing | None |
| Consequences for System O&M Costs | Exact consequences are difficult to quantify for this budget. |
| Reliability & Safety Factors | Exact impacts are difficult to quantify for this budget. |
| Analysis of Project Benefits & Timing | Not applicable |
| Like for Like Renewal Analysis | Not applicable |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-OHUPG-Planned Pole Replacements | Municipality | ALL |
| | | Cost Category | Capital |
| | | Project Type | Preventative |

### General Information

**Project Description**

The pole replacement project is a blanket project used to account for the typical number of end of life pole replacements identified as part of the ERTH Power yearly pole testing program. The current pole testing program tests 1/9 of the ERTH Power service area every year along with “re-tests” based remaining strength estimates. The pole testing schedule has been created to ensure a consistent level of pole replacements are assigned to each operations center in any given year. This project is also used to account for reactive pole replacements based on poor condition.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | VARIES | Primary Conductor: | VARIES |
| Pole Type: | Wood | Secondary Conductor: | VARIES |
| Area Description: | VARIES | Traffic Volume: | VARIES |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB’s | ☐ | Open Bus | ☐ |
| Broken Equipment | ☒ | Clearances | ☐ | Capacity | ☐ |
| Revitalization | ☐ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☐ | Structural | ☒ |

**Investment Category**

System Renewal

**Capital Investment**

| | |
|---|---|
| Gross Capital | $300,000 |
| Customer Contribution | $0 |
| Net Capital | $300,000 |
| O&M Costs (if applicable) | $0 |

| | | |
|---|---|---|
| **Customer Information** | Number of Customer Attachments | VARIES |
| | Customer Load (if available) | VARIES |
| **Expected Project Timing** | Start Date | Q1 |
| | End Date | Q4 |
| **Expected Expenditure Timing** | Q1 | 20% |
| | Q2 | 30% |
| | Q3 | 30% |
| | Q4 | 20% |
| **Risks and Mitigation** | The vast majority of projects require varying degrees of outages to complete upgrades to the distribution system, which can create the risk of customer displeasure. ERTH Power staff has a great deal of experience and construction practices are in place to ensure that outages are always minimized and communicated with customers. In addition ERTH Power staff is aware of these requirements and budgeting and planning is completed with this in mind. | |
| **Comparative Information** | 2024: In Progress - $300,000 budgeted<br>2023: $293,913<br>2022: $224,782<br>2021: $467,757<br>2020: $357,124 | |
| **REG Investment** | This project is not associated with a REG investment | |
| **Leave to Construct Approval** | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | The primary driver for this project is the replacement of end of life poles as identified by regular pole testing. This type of project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers as set out in the Asset Management Plan. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | No alternative designs were examined as part of this program. The majority of pole replacements are completed on a one for one basis and only minor changes to the distribution system as a whole are made. |
| Operational Benefits | The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. |
| Reliability Benefits | The completion of the project will upgrade the existing aged assets as required and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets. |
| Customer Benefits | The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable |



system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.

Safety

All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH Power considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits

System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

## Category Specific Requirements

**System Renewal Project**

Asset Condition Relative to Typical Life Cycle

The pole replacements that are completed as part of this program have been identified through annual testing as requiring expedient replacement. Therefore all assets replaced under this program are considered at the end of their useful life. The goal of the pole replacement program is to minimize outage, financial and safety risks by proactively testing, assessing and replacing aging pole assets. The Health Index distribution of wood poles is shown in Figure 1 below.

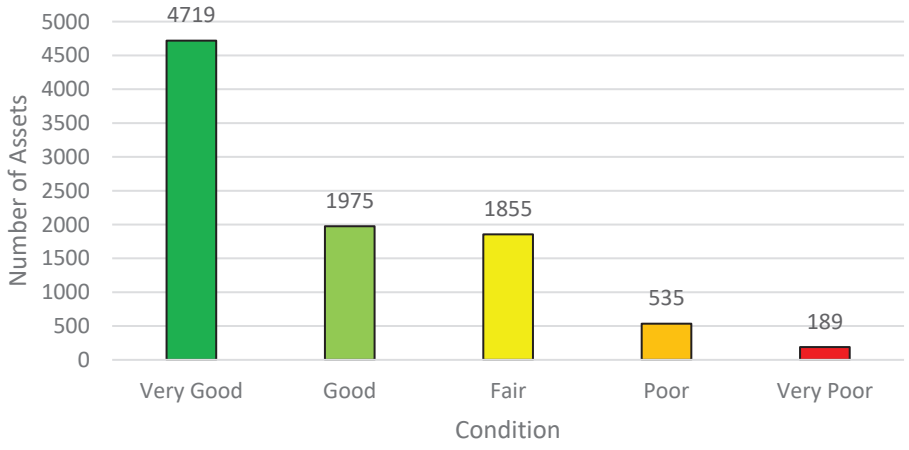



Figure 1: Extrapolated Wood Pole HI Results

| | |
|---|---|
| Number of Customers in Each Class Potentially Affected | Pole replacements as identified by pole testing and reactive replacements due to failure can affect a wide range of customers including residential, commercial and industrial. This can include hospitals, large manufacturing facilities and other important loads depending on the location of the required replacement. Pole failures can result in large outages affecting entire feeders depending on the severity. Since the poles replaced under this program have been identified through testing as end of life the probability of a failure is much more likely as compared to typical useful life approximations. |
| Quantitative Customer Impacts | If the poles identified through the testing program are not replaced it is likely that an afterhours unplanned replacement would be required at some point. Depending on the severity of the failure a large feeder outage could be expected with an extended duration. In contrast a planned pole replacement can typically be completed with minimal to no outages to customers. |
| Qualitative Customer Impacts | This program is aimed at maintaining system reliability and public safety by eliminating all poles reaching end of life. This will ensure that current customer satisfaction levels are maintained. |
| Value of Customer Impact | The pole replacement program can affect all customer classes depending on the poles that are identified as requiring replacement. As previously mentioned the risk of failure is much higher since the poles have been identified through testing as requiring replacement and an unplanned replacement due to failure can result in a larger outage with a greater duration. A planned pole replacement very rarely results in a loss of service to customers. |
| Other Factors Affecting Project Timing | Due to the nature of the project and condition of the assets identified this program must be completed on a yearly basis. |
| Consequences for System O&M Costs | The largest consequence for system O&M costs is the resulting unplanned pole replacements that are likely if the program is not completed. This results in larger outage for customers and higher costs. |
| Reliability and Safety Factors | The poles identified are at their end of life and require expedient replacement to avoid any reliability and safety concerns. |
| Analysis of Project Benefits & Timing | There are no alternatives that can be considered regarding the timing and completion of this program due to the nature of the end of life assets. |
| Like for Like Renewal Analysis | The majority of pole replacements are completed in a like-for-like manner aside from upgrades to the materials, and design standards that are implemented. If a pole identified for replacement can be leveraged to cost effectively improve the distribution system outside of a like-for-like replacement than it is considered on a pole by pole basis. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ALL-UGUPG-Transformer Painting | Municipality | ALL |
| | | Cost Category | Capital |
| | | Project Type | Preventative |

### General Information

**Project Description**

The pad-mounted transformer painting project is a blanket project used to identify and repair transformers that have not reached their end-of-life but have deteriorated externally due to environmental factors. Currently, the project will select a small number of candidate transformers for resurfacing, focusing on transformers deteriorating faster than typical, in order to extend their useful life and improve their appearance.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 10-20 years | Construction Standards: | Legacy |
| Primary Voltage: | VARIES | Primary Conductor: | VARIES |
| Pole Type: | N/A | Secondary Conductor: | VARIES |
| Area Description: | VARIES | Traffic Volume: | VARIES |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☐ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☐ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☐ | Structural | ☐ |


**Investment Category**

System Renewal

**Capital Investment**

| | |
|---|---|
| Gross Capital | $20,000 |
| Customer Contribution | $0 |
| Net Capital | $20,000 |
| O&M Costs (if applicable) | $0 |

| | | |
|---|---|---|
| Customer Information | Number of Customer Attachments | VARIES |
| | Customer Load (if available) | VARIES |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 20% |
| | Q2 | 30% |
| | Q3 | 30% |
| | Q4 | 20% |

| | |
|---|---|
| Risks and Mitigation | Most projects necessitate varying degrees of outages to facilitate upgrades to the distribution system, which can lead to customer dissatisfaction. ERTH Power mitigates this risk by implementing effective construction practices aimed at minimizing the duration and impact of outages. Additionally, staff ensure that outages are communicated clearly and promptly to affected customers. Comprehensive budgeting and planning are conducted with these considerations in mind, leveraging ERTH Power's extensive experience to manage and reduce the impact of outages on customers. |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. Transformer refurbishment and reactive causes are tracked historically to ensure proper budgets and best practices are developed and improved as necessary. |
| REG Investment | This project is not associated with a REG investment |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is the extension of the working life of pad-mounted transformers. Secondary drivers are the improvement in appearance of this equipment. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer, which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | The alternative to refurbishment is replacement and run-to-failure. A small number of transformers are selected for refurbishment based on cost and expected remaining life. The majority of refurbishments are completed on a one for one basis and no changes to the distribution system as a whole are made. |
| Operational Benefits | The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. |
| Reliability Benefits | The completion of the project will upgrade the existing aged assets as required and in turn provide a more reliable system simply based on the installation of upgraded distribution assets. |
| Customer Benefits | The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable |



| | |
|---|---|
| | system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses. |
| Safety | All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH Power considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | Assets refurbished under this project are not at their end of life. The goal of the program is to extend the useful life of pad-mounted equipment. |
| Number of Customers in Each Class Potentially Affected | Transformer replacements as identified by inspection and reactive replacements due to failure can affect a wide range of customers including residential, commercial and industrial. This can include hospitals, large manufacturing facilities and other important loads depending on the location of the required replacement. Transformer failures can result in large outages affecting entire feeders depending on the severity. Since the transformers replaced under this program have been identified through inspection as not yet end of life but needing immediate attention, the probability of a failure is much more likely as compared to typical useful life approximations. |
| Quantitative Customer Impacts | If the transformers identified through the inspection program are not repaired, it is likely that an afterhours, unplanned replacement would be required at some point. Depending on the severity of the failure, a large feeder outage could be expected with an extended duration. In contrast, a planned refurbishment can typically be completed with minimal to no outages to customers. |
| Qualitative Customer Impacts | This program is aimed at maintaining system reliability and public safety by refurbishing transformers that are reaching end of life at an accelerated rate. This will ensure that current customer satisfaction levels are maintained. |
| Value of Customer Impact | The refurbishment program can affect all customer classes depending on the transformers that are identified as requiring refurbishment. As previously mentioned the risk of failure is much higher since the transformers have been identified through inspection as requiring |



| | |
|---|---|
| | attention and an unplanned replacement due to failure can result in a larger outage with a greater duration. |
| Other Factors Affecting Project Timing | Due to the nature of the project and condition of the assets identified, this program must be completed on a yearly basis. |
| Consequences for System O&M Costs | The largest consequence for system O&M costs is the resulting unplanned transformer replacements that are likely if the program is not completed. This results in larger outage for customers and higher costs. |
| Reliability and Safety Factors | The transformers identified are at not their end of life but would otherwise require expedient replacement to avoid any reliability and safety concerns. |
| Analysis of Project Benefits & Timing | The timing of the project is based on need as determined through inspections. Transformers are selected such that the repairs significantly increase the expected life of the unit with an aim of maximizing cost savings as compared to replacement. |
| Like for Like Renewal Analysis | Transformers are selected based on their compatibility with current standards. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ALL-UNPLND-Unplanned Capital Projects | Municipality | All |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

| | | |
|---|---|---|
| Project Description | This project budget is allocated for unplanned capital expenditures that come up within a given year and have not been budgeted for. The majority of this spending includes items such as transformer/cable replacements, MVA's (motor vehicle accidents) and storm damage and are typically associated with asset replacement (System Renewal). | |
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $175,000 |
| | Customer Contribution | $0 |
| | Net Capital | $175,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Varies |
| | Customer Load (if available) | Varies |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 25% |
| | Q2 | 25% |
| | Q3 | 25% |
| | Q4 | 25% |
| Risks and Mitigation | The risks and mitigations measures for this budget are difficult to predict based on the nature of the project. | |
| Comparative Information | 2024: In Progress - $175,000 Budgeted<br>2023: $275,126<br>2022: $295,195<br>2021: $376,395<br>2020: $275,126 | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

### Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | The drivers for this budget are difficult to predict based on the nature of the project, however the majority are based on asset failure and external factors such as MVA's and weather. |
| Investment Priority | The projects typically encompassed by this budget are high priority and usually considered mandatory. |
| Project Alternatives | The majority of spending that falls within this budget does not have any alternatives. With that being said each situation is examined by engineering and operations staff to ensure the best decision is made. |

| | |
|---|---|
| Operational Benefits | Not applicable |
| Reliability Benefits | Not applicable |
| Customer Benefits | Not applicable |
| Safety | Not applicable |
| Cyber-Security, Privacy | Not applicable |
| Co-ordination, Interoperability | Not applicable |
| Economic Development | Not applicable |
| Environmental Benefits | Not applicable |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | Typically the condition of the assets replaced under this budget will be at their end of life, since they are replaced based on a failure. Other investments under this budget such as storm damage and MVA's can vary and are difficult to predict. |
| Number of Customers in Each Class Potentially Affected | Varies |
| Quantitative Customer Impacts | Not applicable |
| Qualitative Customer Impacts | Not applicable |
| Value of Customer Impact | Not applicable |
| Other Factors Affecting Project Timing | Not applicable |
| Consequences for System O&M Costs | Not applicable |
| Reliability & Safety Factors | Not applicable |
| Analysis of Project Benefits & Timing | Not applicable |
| Like for Like Renewal Analysis | Not applicable |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | AYL-OHCONV-Parkview Heights | Municipality | Aylmer |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

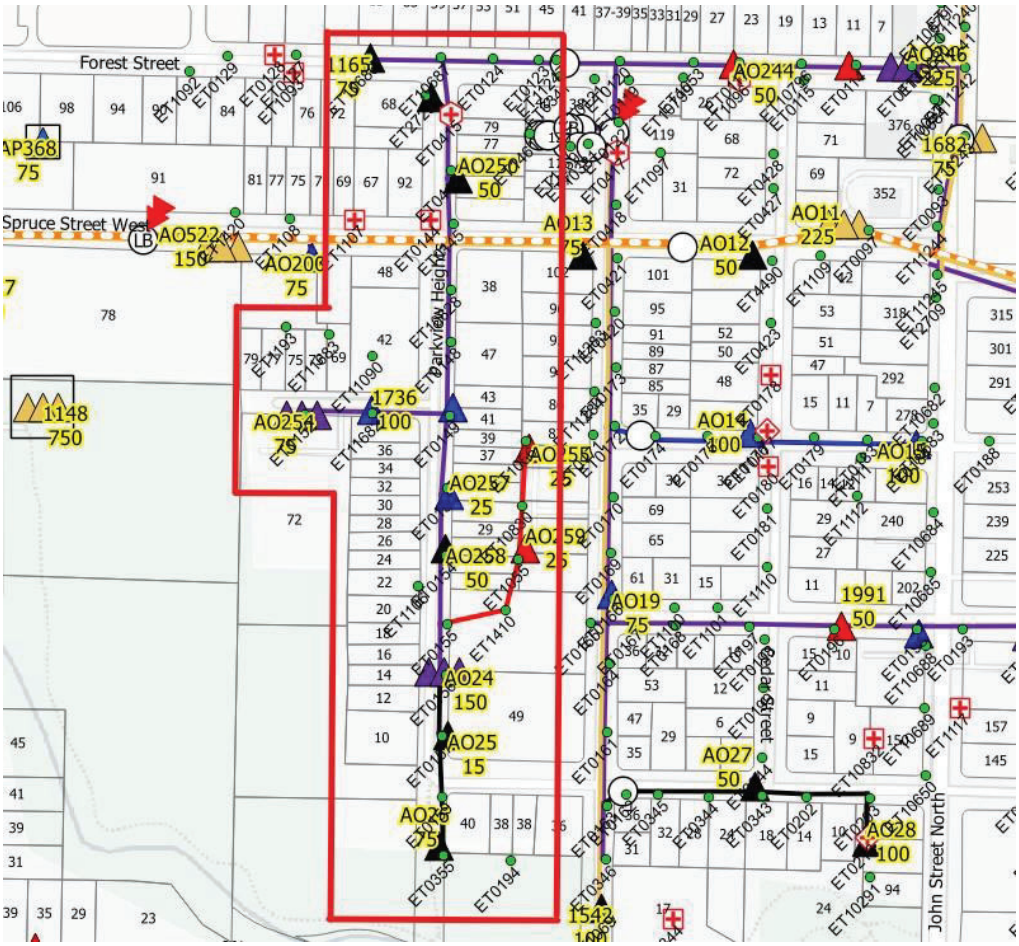
This project will convert the area of Parkview Heights from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is to alleviate load from the Forest St substation, the replacement of aging assets and open bus secondary, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 1/0 ACSR |
| Pole Type: | Wood | Secondary Conductor: | Open Bus |
| Area Description: | Residential | Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☒ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $470,000 |
| | Customer Contribution | $0 |
| | Net Capital | $470,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 100 Residential |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 10% |
| | Q2 | 50% |
| | Q3 | 40% |
| | Q4 | 0% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate |

| | |
|---|---|
| | clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers. |
| Customer Benefits | The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the GSC Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | |

| | |
|---|---|
| | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 100 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | AYL-OHCONV-South St E | Municipality | Aylmer |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

This project will convert the area of South St E from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets and open bus secondary, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 1/0 ACSR |
| Pole Type: | Wood | Secondary Conductor: | Open Bus |
| Area Description: | Residential | Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |


**Investment Category**

System Renewal

**Capital Investment**

| | |
|---|---|
| Gross Capital | $220,000 |
| Customer Contribution | $0 |
| Net Capital | $220,000 |
| O&M Costs (if applicable) | $0 |

**Customer Information**

Number of Customer Attachments: Approx. 50 Residential

| | | |
|---|---|---|
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 10% |
| | Q2 | 50% |
| | Q3 | 40% |
| | Q4 | 0% |

| | |
|---|---|
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. |
| REG Investment | This project is not associated with a REG investment |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute |

| | |
|---|---|
| | power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers. |
| Customer Benefits | The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the GSC Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 50 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | CLI-OHCONV-Albert St Alley | Municipality | Clinton |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

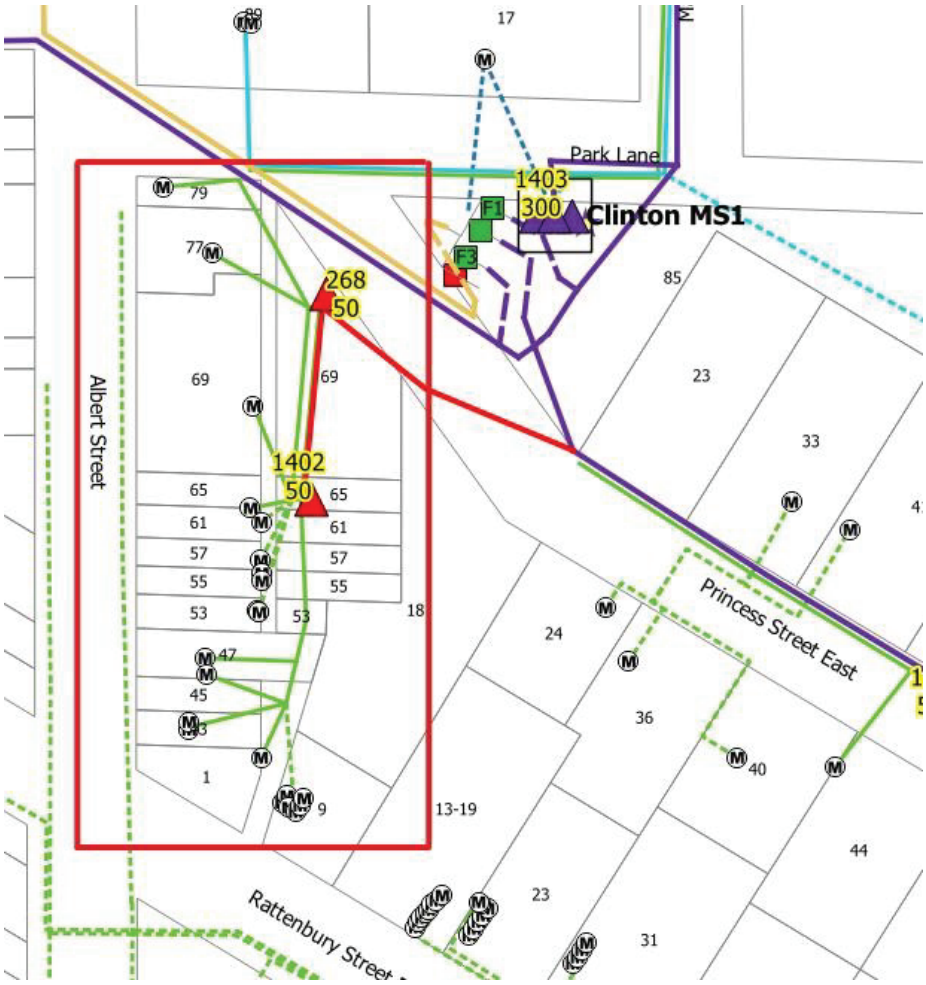
This project will convert the alley behind Albert St in Clinton from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, improving system reliability and alleviating customer complaints in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 1/0 ACSR |
| Pole Type: | Wood | Secondary Conductor: | 1/0 Triplex |
| Area Description: | Commercial | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☐ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☒ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $100,000 |
| | Customer Contribution | $0 |
| | Net Capital | $100,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 15 Residential, 5 Commercial |
| Expected Project Timing | Start Date | Q2 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 90% |
| | Q2 | 10% |
| | Q3 | 0% |
| | Q4 | 0% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate |

clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices.

Reliability Benefits

This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers.

Customer Benefits

The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers.

Safety

This project will improve health and safety by removing aging copper primary conductors, which have become brittle and prone to failure. The replacement of these conductors will reduce the risk of downed hydro lines, particularly during adverse weather conditions, thereby enhancing the safety of both the public and utility workers. Upgrading to materials that are more durable will not only improve system reliability but also significantly mitigate potential safety hazards associated with failing infrastructure.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the Grid Smart City Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

| | |
|---|---|
| Environmental Benefits | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 15 residential and 5 Commercial |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | GDE-OHCONV-Blake & Gibbons | Municipality | Goderich |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

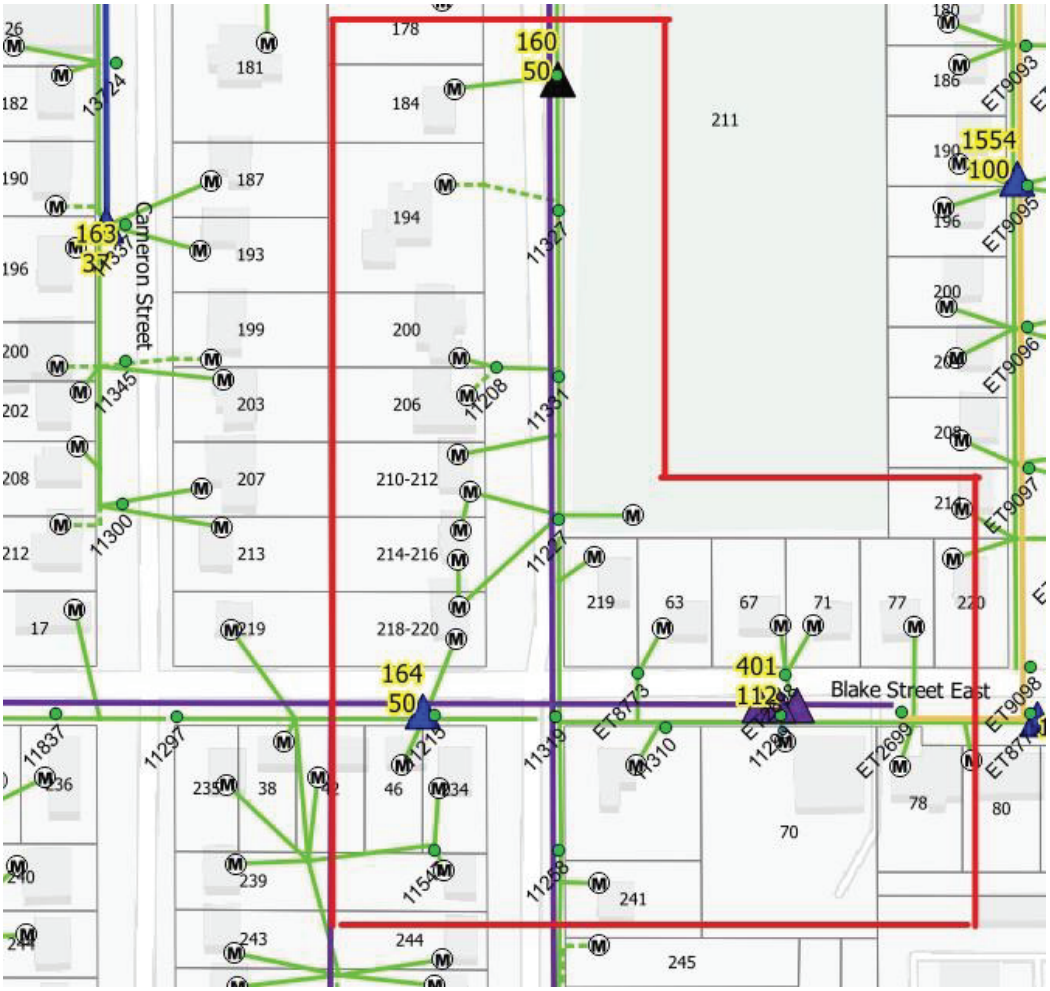
This project will convert a portion of Blake St and Gibbons St from 4kV primary to the preferred 27.6kV. The goal of the project is to connect a new apartment building at 27.6kV so that its load does not strain the 4kV system while also replacing some end of life assets.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 40-50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 4/0 Copper |
| Pole Type: | Wood | Secondary Conductor: | Open Bus |
| Area Description: | Residential | Traffic Volume: | Medium |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☐ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☐ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $160,000 |
| | Customer Contribution | $0 |
| | Net Capital | $160,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 20 Residential, 2 C&I |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q2 |
| Expected Expenditure Timing | Q1 | 70% |
| | Q2 | 30% |
| | Q3 | 0% |
| | Q4 | 0% |
| Risks and Mitigation | This project is driven by a third-party development, which presents a risk due to the utility's limited control over project timelines. Delays or extended periods of inactivity on the developer's part can affect the utility's schedule. To mitigate these risks, ERTH Power maintains proactive and frequent communication with developers to stay informed of any changes or delays. However, despite these efforts, certain factors remain outside the utility's control, which may result in timeline adjustments. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to accommodate servicing requirements dictated by development activities. In most cases, this initiative also aligns with the replacement of end-of-life assets as justified in the Asset Management Plan. By addressing both development needs and asset management objectives, the project ensures that infrastructure improvements are made in line with both immediate servicing demands and long-term asset sustainability goals. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce |



| | |
|---|---|
| | maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers. |
| Customer Benefits | The completion of this project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | This project has been driven by the need to connect a new development. This will create a positive impact to Ontario economic growth and job creation; the exact measure of this impact is outside the expertise of ERTH Power. |
| Environmental Benefits | Voltage Conversion projects help to reduce the distribution line losses and in turn aid in the reduction of power consumption and at the same time implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The condition of the assets encompassed by this project are nearing end of life but not at risk of immediate failure. The replacement is being driven by voltage conversion and the need to connect a new apartment complex in the area. |
| Number of Customers in Each Class Potentially Affected | 2 C&I and approx. 20 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. By diverting this new service from the 4kV system to the more robust 28kV system, improvements in system reliability and power quality are expected for the 4kV customers in the area. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will divert load from the station. |
| Value of Customer Impact | This particular project indirectly affects a large number of customers connected to the 4kV system, which is nearing its end of life and needs to have load removed from it. |
| Other Factors Affecting Project Timing | Since this project is primarily to accommodate connection of a new customer, their progress can affect project timelines. This is mitigated through good communication with the developer. In this case, we have been assured that we will have ample time to complete the project as planned. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability or safety factors however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ING-OHCONV-Victoria Park | Municipality | Ingersoll |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

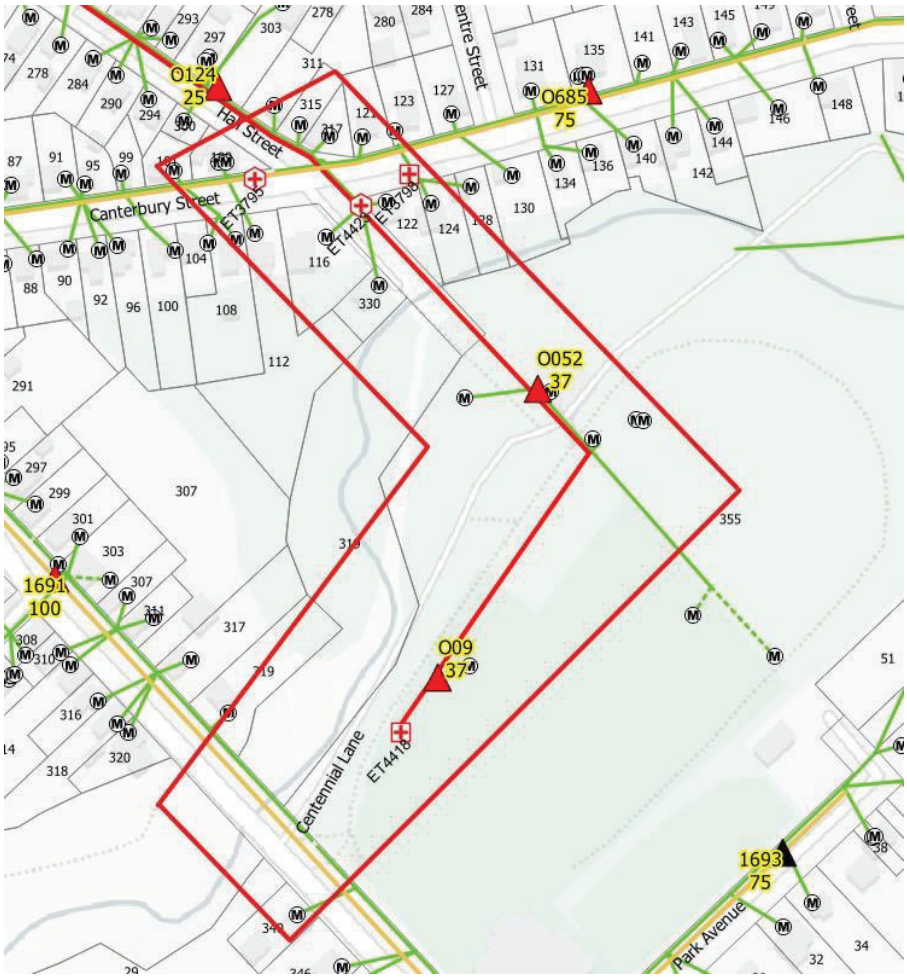
This project will convert a section of overhead 4kV primary to 28kV underground at Victoria Park, Ingersoll. This conversion will facilitate the further reduction in load on the 4kV MS1 station. Converting the park to underground primary supply also eliminates a significant public safety concern.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 30-40 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 1/0 ACSR |
| Pole Type: | Wood | Secondary Conductor: | Choose an item. |
| Area Description: | Park | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☐ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☒ |
| Backyard | ☒ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $125,000 |
| | Customer Contribution | $0 |
| | Net Capital | $125,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Various commercial (park lights, amenities) |
| Expected Project Timing | Start Date | Q2 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 0% |
| | Q2 | 40% |
| | Q3 | 60% |
| | Q4 | 0% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | No other alternative have been considered |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and |

| | |
|---|---|
| | manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers. |
| Customer Benefits | The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participates in the GSCC (Grid Smart City Cooperative) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH considers any future customer connections or load growth and addresses these with an appropriate design. System renewal projects, especially voltage conversion, will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | |

| | |
|---|---|
| | System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The condition of the assets encompassed by this project are nearing end of life. The replacement is being driven by voltage conversion and the need to remove overhead primary from the park. |
| Number of Customers in Each Class Potentially Affected | Various commercial (park lights, amenities) |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. The Mill St MS is nearing its end of life and voltage conversion is needed to extend the life of the station transformer and ensure a failure does not occur, as it would affect a large number of customers. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | This particular project indirectly affects a large number of customers connected to the Clinton DS which is nearing its end of life and need to have load removed from it. |
| Other Factors Affecting Project Timing | The primary factor affecting the timing of this project is the requirement to remove load from the Mill St MS. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability or safety factors however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will not be a like-for-like replacement. New infrastructure will be constructed underground. There is no practical alternative that would eliminate the safety concern from overhead primary in the park. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | ING-UGCONV-Oxford Lane | Municipality | Ingersoll |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

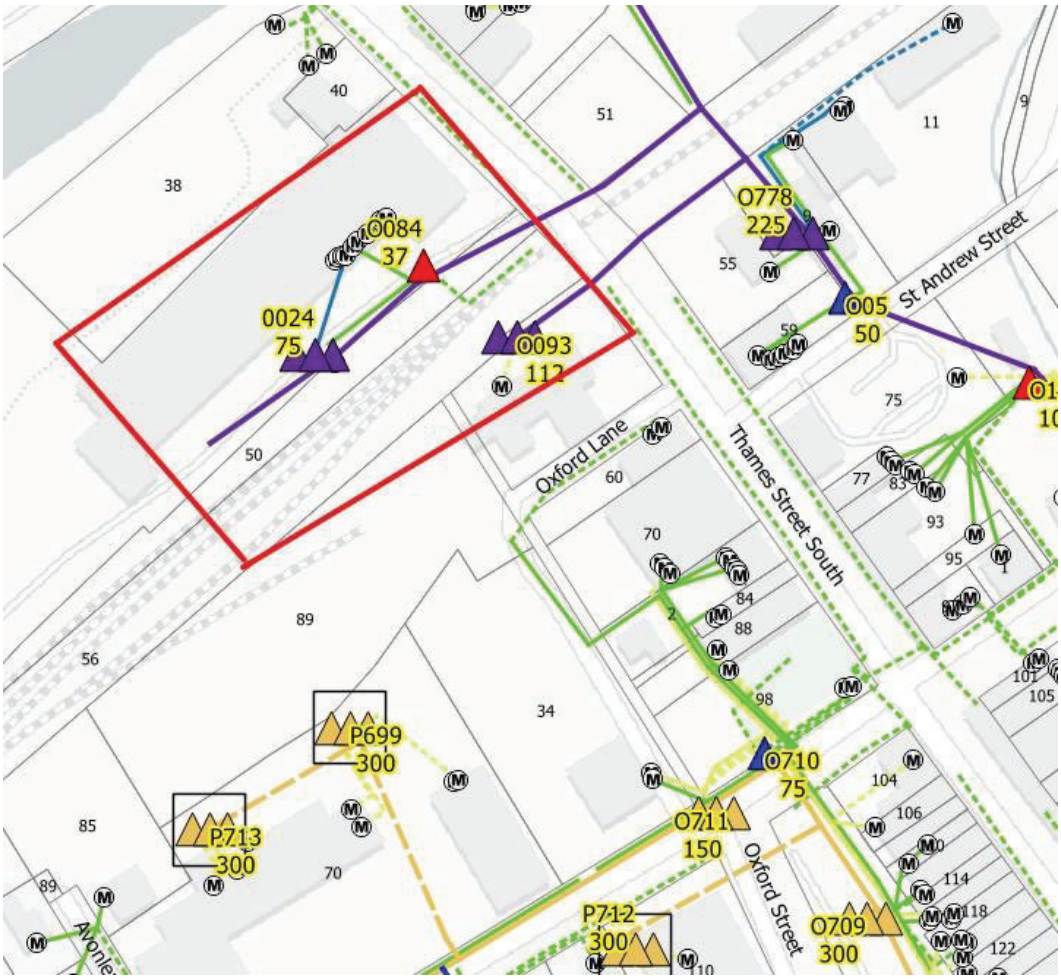
This project will convert services on Thames St S in Ingersoll from 4kV to the preferred 27.6kV using a newly installed underground feed on Oxford Lane. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, improving system access & reliability and alleviating customer complaints in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 1/0 ACSR |
| Pole Type: | Wood | Secondary Conductor: | 1/0 Triplex |
| Area Description: | Commercial | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☐ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☒ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $230,000 |
| | Customer Contribution | $0 |
| | Net Capital | $230,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 15 Commercial |
| Expected Project Timing | Start Date | Q2 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 0% |
| | Q2 | 80% |
| | Q3 | 20% |
| | Q4 | 0% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate |

clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices.

Reliability Benefits

This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers.

Customer Benefits

The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers.

Safety

This project will improve health and safety by removing aging copper primary conductors, which have become brittle and prone to failure. The replacement of these conductors will reduce the risk of downed hydro lines, particularly during adverse weather conditions, thereby enhancing the safety of both the public and utility workers. Upgrading to materials that are more durable will not only improve system reliability but also significantly mitigate potential safety hazards associated with failing infrastructure.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the Grid Smart City Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

| | |
|---|---|
| Environmental Benefits | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 15 Commercial |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | MIT-UGCONV-Maple & St Andrews | Municipality | Mitchell |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

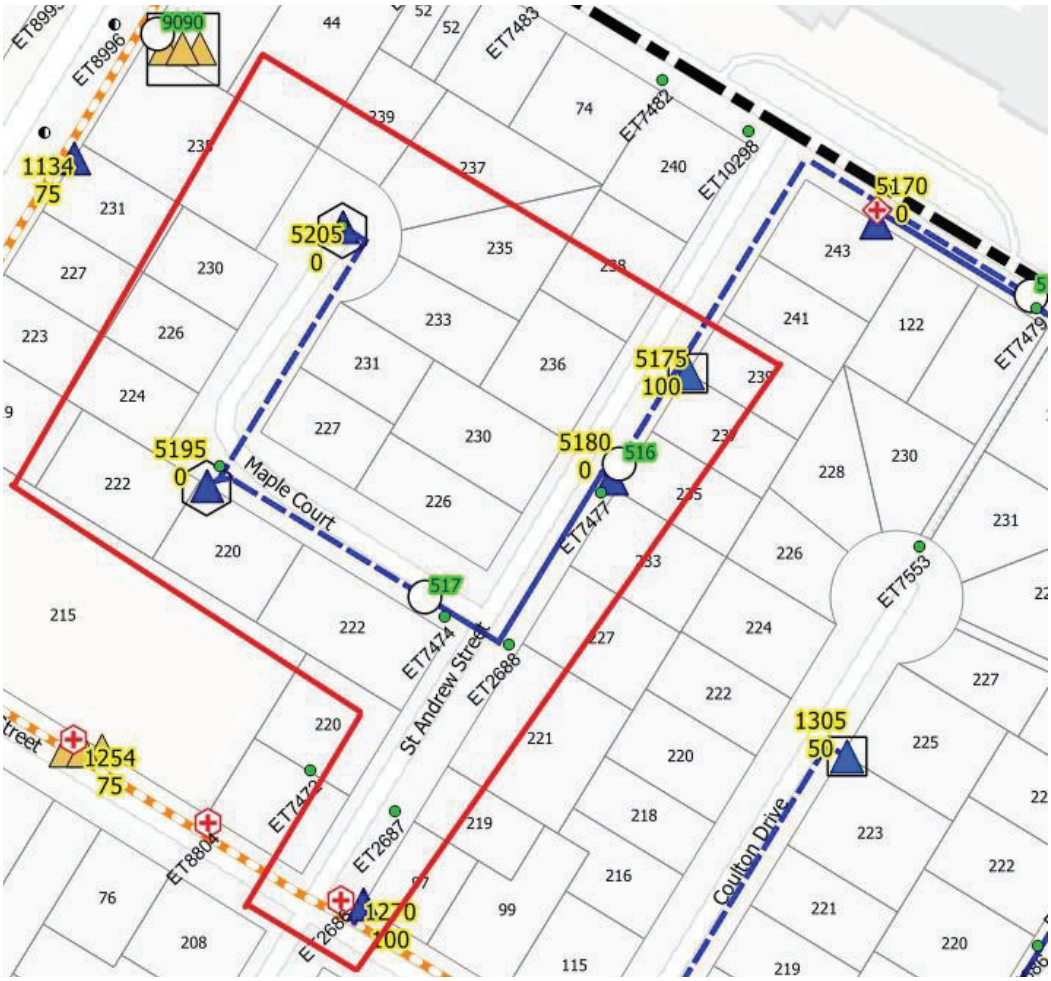
This project will convert the area of Maple Ct and St Andrew St in Mitchell from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 30-40 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 5kV UG Cable |
| Pole Type: | Wood | Secondary Conductor: | UG Triplex |
| Area Description: | Residential | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☒ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☒ |
| TX Base | ☒ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $150,000 |
| | Customer Contribution | $0 |
| | Net Capital | $150,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 30 Residential |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 20% |
| | Q2 | 40% |
| | Q3 | 30% |
| | Q4 | 10% |

**Risks and Mitigation**

This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution.

The use of external contractors to install civil infrastructure introduces risks related to dependence on their timelines, availability, and quality of workmanship. To mitigate this risk, ERTH Power engages in thorough planning to secure contractors early in the project timeline. Additionally, relationships are established with trusted contractors who are well versed in ERTH Power's construction standards, ensuring that work is completed to the required quality and within the project's schedule. This proactive approach minimizes delays and ensures compliance with utility expectations.

**Comparative Information**

ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

**Project Drivers**

The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality.



| | |
|---|---|
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers |
| Customer Benefits | The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the GSC Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |



| | |
|---|---|
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | Voltage Conversion projects help to reduce the distribution line losses and in turn aid in the reduction of power consumption and at the same time implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 30 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | CLI-UGCONV-Rattenbury St E | Municipality | Clinton |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

This project will convert the area of Rattenbury St E in Clinton from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 30-40 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 5kV UG Cable |
| Pole Type: | Wood | Secondary Conductor: | UG Triplex |
| Area Description: | Residential | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☐ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☐ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☒ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☒ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |

| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $115,000 |
| | Customer Contribution | $0 |
| | Net Capital | $115,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 40 Residential, 2 C&I |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 20% |
| | Q2 | 40% |
| | Q3 | 40% |
| | Q4 | 0% |

**Risks and Mitigation**

This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution.

The use of external contractors to install civil infrastructure introduces risks related to dependence on their timelines, availability, and quality of workmanship. To mitigate this risk, ERTH Power engages in thorough planning to secure contractors early in the project timeline. Additionally, relationships are established with trusted contractors who are well versed in ERTH Power's construction standards, ensuring that work is completed to the required quality and within the project's schedule. This proactive approach minimizes delays and ensures compliance with utility expectations.

**Comparative Information**

ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

**Project Drivers**

The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality.

| | |
|---|---|
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices. |
| Reliability Benefits | This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers |
| Customer Benefits | The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers. |
| Safety | All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety. |
| Cyber-Security, Privacy | Not applicable to this project |
| Co-ordination, Interoperability | ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the GSC Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.<br><br>This project does not apply to the regional infrastructure planning framework.<br><br>ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible. |

| | |
|---|---|
| Economic Development | This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. |
| Environmental Benefits | Voltage Conversion projects help to reduce the distribution line losses and in turn aid in the reduction of power consumption and at the same time implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 40 Residential, 2 C&I |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |

## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | MIT-UGCONV-St David | Municipality | Mitchell |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

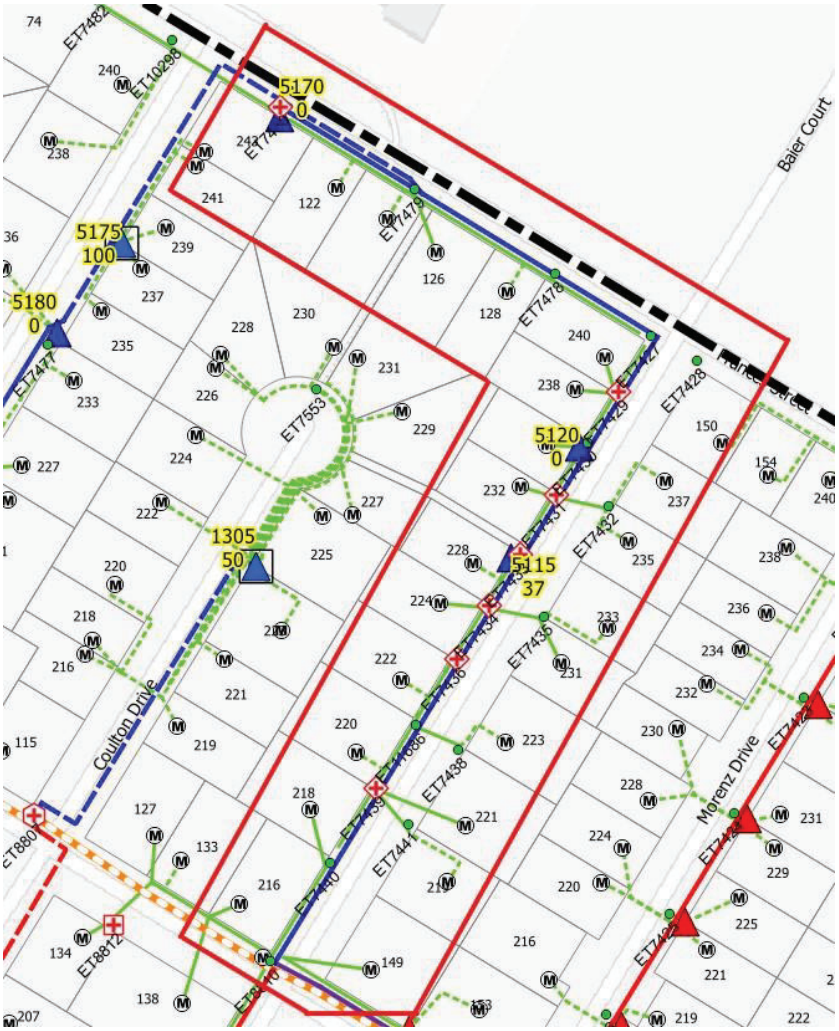
This project will convert the area of St David St in Mitchell from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | 30-40 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | 5kV UG Cable |
| Pole Type: | Wood | Secondary Conductor: | UG Triplex |
| Area Description: | Residential | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☐ |
| Broken Equipment | ☐ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☒ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $185,000 |
| | Customer Contribution | $0 |
| | Net Capital | $185,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 30 Residential |
| Expected Project Timing | Start Date | Q1 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 20% |
| | Q2 | 40% |
| | Q3 | 30% |
| | Q4 | 10% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate |

clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices.

Reliability Benefits

This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers

Customer Benefits

The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers.

Safety

All system renewal projects involve upgrading existing distribution assets, which significantly enhances safety for both customers and workers. By replacing outdated infrastructure with modern equipment constructed to current standards, the risk of equipment failure is greatly reduced. These upgrades not only mitigate potential safety hazards but also ensure that the system adheres to the latest clearance and material standards. This leads to a safer system, reducing the likelihood of accidents and enhancing overall public safety.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the GSC Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits

| | |
|---|---|
| | Voltage Conversion projects help to reduce the distribution line losses and in turn aid in the reduction of power consumption and at the same time implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as transformer insulating fluids and pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 30 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | PTS-OHCONV-Walnut St | Municipality | Port Stanley |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

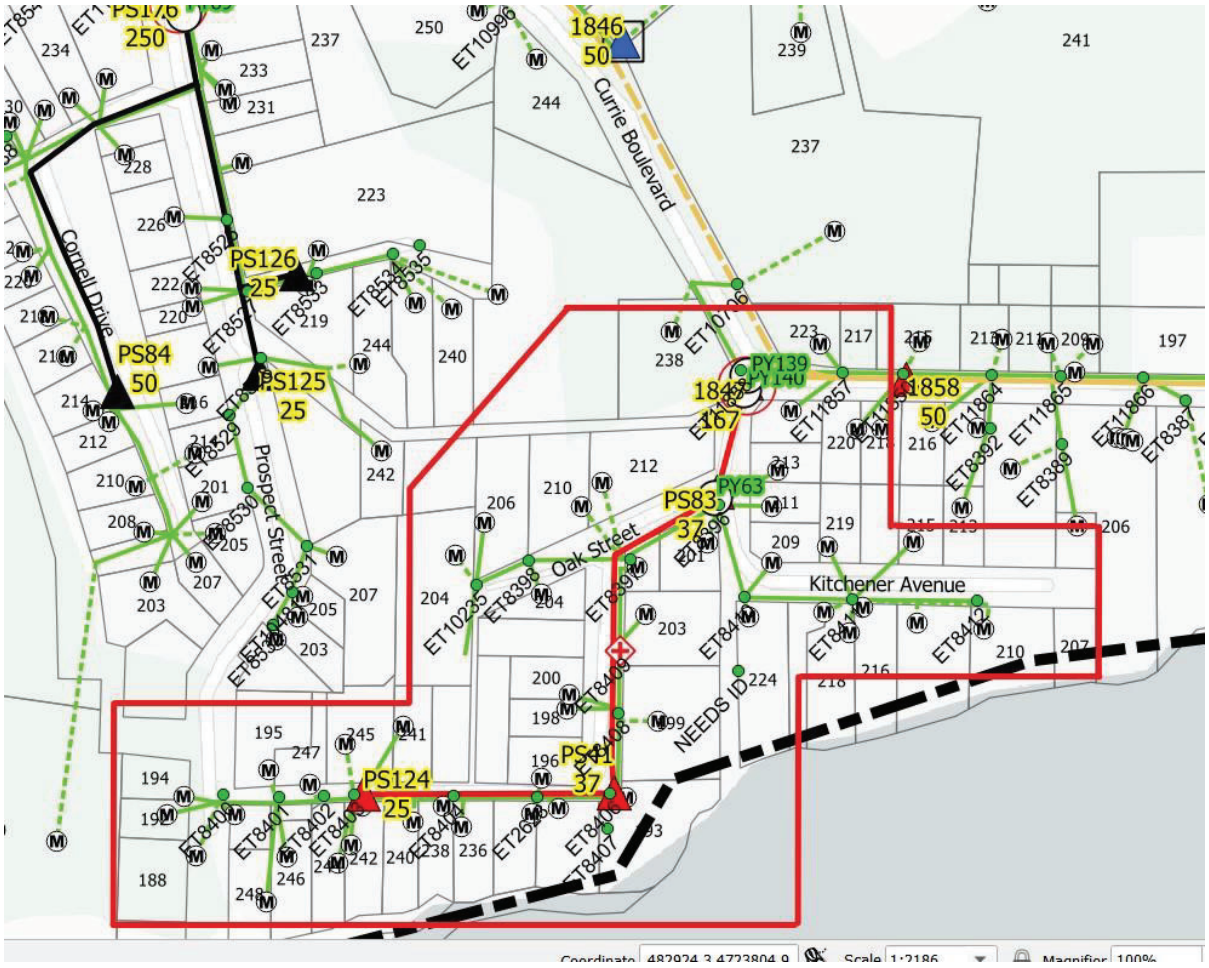
This project will convert Walnut St in Port Stanley from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, copper primary and open bus secondary, improving system reliability and alleviating customer complaints in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | #6 Copper |
| Pole Type: | Wood | Secondary Conductor: | Open Bus |
| Area Description: | Residential | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☒ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |



| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $150,000 |
| | Customer Contribution | $0 |
| | Net Capital | $150,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 45 Residential |
| Expected Project Timing | Start Date | Q2 |
| | End Date | Q3 |
| Expected Expenditure Timing | Q1 | 0% |
| | Q2 | 90% |
| | Q3 | 10% |
| | Q4 | 0% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate clearances, spacing, protective devices, and other equipment that are more accessible and |

manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices.

Reliability Benefits

This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers.

Customer Benefits

The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers.

Safety

This project will improve health and safety by removing aging copper primary conductors, which have become brittle and prone to failure. The replacement of these conductors will reduce the risk of downed hydro lines, particularly during adverse weather conditions, thereby enhancing the safety of both the public and utility workers. Upgrading to materials that are more durable will not only improve system reliability but also significantly mitigate potential safety hazards associated with failing infrastructure.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the Grid Smart City Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits



| | |
|---|---|
| | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 45 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| Project Name | TAV-OHCONV-Wellington St | Municipality | Tavistock |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

This project will convert the area of Wellington, Decew and Hendershot from 4kV to the preferred 27.6kV. The primary driver for this project is voltage conversion. The secondary driver for this project is the replacement of aging assets, copper primary and open bus secondary, improving system reliability in the area.

**Preliminary Project Information**

| | | | |
|---|---|---|---|
| Age of Plant: | >50 years | Construction Standards: | Legacy |
| Primary Voltage: | 4kV | Primary Conductor: | #6 Copper |
| Pole Type: | Wood | Secondary Conductor: | Open Bus |
| Area Description: | Residential | Traffic Volume: | Low |

**Asset Condition Issues**

| | | | | | |
|---|---|---|---|---|---|
| Rotten Poles | ☒ | PCB's | ☐ | Open Bus | ☒ |
| Broken Equipment | ☒ | Clearances | ☒ | Capacity | ☒ |
| Revitalization | ☒ | Road Construction | ☐ | 5kV UG Cable | ☐ |
| Direct Buried Cable | ☐ | Submersible TX | ☐ | Poletrans | ☐ |
| TX Base | ☐ | Grounding | ☐ | Meter Access | ☐ |
| Backyard | ☐ | Access | ☒ | Structural | ☐ |

| | | |
|---|---|---|
| Investment Category | System Renewal | |
| Capital Investment | Gross Capital | $300,000 |
| | Customer Contribution | $0 |
| | Net Capital | $300,000 |
| | O&M Costs (if applicable) | $0 |
| Customer Information | Number of Customer Attachments | Approx. 65 Residential |
| Expected Project Timing | Start Date | Q2 |
| | End Date | Q4 |
| Expected Expenditure Timing | Q1 | 0% |
| | Q2 | 30% |
| | Q3 | 50% |
| | Q4 | 20% |
| Risks and Mitigation | This project involves the installation of infrastructure components such as poles, transformers, and junctions, which will alter the visual landscape of the area. These changes may raise concerns among local residents. To mitigate this risk, ERTH Power will leverage its extensive experience in customer communication, proactively engaging with the community to explain the necessity of the installations. This approach helps to address concerns and fosters a clearer understanding of the project's objectives, minimizing potential resistance and ensuring smoother project execution. | |
| Comparative Information | ERTH Power completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. | |
| REG Investment | This project is not associated with a REG investment | |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act | |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

| | |
|---|---|
| Project Drivers | The primary driver for this project is to convert existing infrastructure to be supplied from the preferred 28kV distribution system. This conversion aligns with the replacement of end-of-life assets as outlined in the Asset Management Plan. While some newer assets may need to be replaced to meet 28kV design requirements (such as pole heights), this is necessary due to the distribution system's design. In the long term, voltage conversion will deliver significant benefits to customers, including improved system efficiency and reliability. This project supports ERTH Power's asset management objectives by modernizing the distribution system and enhancing overall service quality. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Project Alternatives | N/A |
| Operational Benefits | The completion of the voltage conversion project to 28kV will enhance system flexibility by improving switching operations during outages and facilitating load shifting. This conversion aligns with current infrastructure standards, ensuring the installation of appropriate |

clearances, spacing, protective devices, and other equipment that are more accessible and manageable for operations staff. Additionally, the voltage conversion will lead to the elimination of ERTH Power municipal substations, which will streamline operations and reduce maintenance costs. Overall, the project enhances system efficiency, reliability, and cost-effectiveness by modernizing infrastructure and optimizing operational practices.

Reliability Benefits

This project's conversion of the area to a 28kV distribution system will significantly enhance reliability by providing greater flexibility for switching operations. This flexibility will reduce outage durations, as operators will be able to more efficiently isolate faults and reroute power. Once the system is standardized to a single distribution voltage, overall reliability will improve, resulting in fewer and shorter outages. This modernization reduces complexity in operations and maintenance, further enhancing the system's performance and ensuring more consistent and reliable service to customers.

Customer Benefits

The completion of this system renewal project will provide significant benefits to customers by upgrading distribution assets in line with the long-term plan and current design standards. These upgrades will enhance public safety, reduce the risk of equipment failure, and increase system reliability. The modernization of infrastructure will also lead to more cost-effective operations through improved equipment, easier access for maintenance, and a reduction in line losses. Collectively, these improvements will result in lower operational costs and fewer service interruptions, delivering both immediate and long-term benefits to customers.

Safety

This project will improve health and safety by removing aging copper primary conductors, which have become brittle and prone to failure. The replacement of these conductors will reduce the risk of downed hydro lines, particularly during adverse weather conditions, thereby enhancing the safety of both the public and utility workers. Upgrading to materials that are more durable will not only improve system reliability but also significantly mitigate potential safety hazards associated with failing infrastructure.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participate in the Grid Smart City Buying Group which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ERTH Power communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ERTH considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

| | |
|---|---|
| Environmental Benefits | Voltage conversion projects reduce distribution line losses, lowering overall power consumption. They also upgrade infrastructure by incorporating modern equipment that meets stricter environmental standards, such as advanced transformer insulating fluids and improved pole treatment methods. |

## Category Specific Requirements

**System Renewal Project**

| | |
|---|---|
| Asset Condition Relative to Typical Life Cycle | The conditions of the assets encompassed by this project are at their end of life. |
| Number of Customers in Each Class Potentially Affected | Approx. 65 residential |
| Quantitative Customer Impacts | Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. |
| Qualitative Customer Impacts | More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station. |
| Value of Customer Impact | The value of the project is difficult to isolate and quantify however achieves multiple strategic objectives including voltage conversion, enabling development etc. which overall provide a great benefit to all ERTH Power customers. |
| Other Factors Affecting Project Timing | Not applicable. |
| Consequences for System O&M Costs | If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify. |
| Reliability & Safety Factors | This project does not directly address any reliability however indirectly affects a large number of customers by reducing load on the DS. |
| Analysis of Project Benefits & Timing | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP. |
| Like for Like Renewal Analysis | This project will be a like-for-like replacement aside from the voltage conversion aspects. |



## 2025 - Project Assessment Form

| | | | |
|---|---|---|---|
| **Project Name** | ALL-AUTOMATION-System Automation | Municipality | ALL |
| | | Cost Category | Capital |
| | | Project Type | Enhancement |

### General Information

**Project Description**

This project covers the costs associated with automation initiatives aimed at enhancing the performance of the distribution system through the implementation of advanced technology-enabled devices to achieve the following objectives.

1. **Improved Reliability and Faster Outage Response:** grid automation devices can quickly detect faults and isolate affected sections, reducing the impact of outages and minimizing downtime.
2. **Faster Restoration:** Utilities can restore power more quickly by automatically rerouting electricity through alternative pathways, avoiding prolonged outages. Achieved utilizing "self-healing" configurations or remote controlled operator functions.
3. **Increased Operational Flexibility**: automated devices provide real-time data about grid conditions, allowing operators to make better decisions and respond to issues proactively.
4. **Reduced Operational Costs**: by automating tasks like fault detection and switching, utilities save on labor, equipment, and vehicle deployment costs. Fault Indication at strategic locations allows us to determine if trucks need to be dispatched or not; saving hours

In addition to the objectives detailed above System Automation, investments will help to support future technologies, reduced environmental impacts, increase worker, and public safety.

Over the forecast period ERTH plans to focus on the installation of Remotely Operable Smart Switches, namely G&W Viper Reclosers with SEL Relays for control and SCADA enabled fault indicators throughout our system in strategic locations. Due to the dis-contiguous nature of our service territory, and being embedded to Hydro One in many communities a large focus will be at our demarcation points with Hydro One. This will allow us to have real time data and determine if outages are caused by upstream Loss of Supply or within our system. This will allow us to make more informed, efficient decisions to dispatch crews, to restore outages quicker or avoid costly responses when the issue is not within our system.

System Automation spending will comprise approximately 1.9% of our yearly expenditures, and plan to install on average one (1) smart switch, and 2-3 sets of fault indicators over the forecast period.

**Investment Category**

System Service

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| System Automation | Gross ($) | $58,179 | $26,011 | $0 | $6,108 | $114,378 | $95,720 | $50,066 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $58,179 | $26,011 | $0 | $6,108 | $114,378 | $95,720 | $50,066 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| System Automation | Gross ($) | $34,800 | $120,000 | $122,400 | $124,848 | $127,345 | $129,892 | $124,897 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $34,800 | $120,000 | $122,400 | $124,848 | $127,345 | $129,892 | $124,897 |

| | | |
|---|---|---|
| **Customer Information** | Number of Customer Attachments | ALL |
| | Customer Load (if available) | ALL |
| **Expected Project Timing** | Start Date | Q1 |
| | End Date | Q4 |
| **Expected Expenditure Timing** | Q1 | 20% |
| | Q2 | 30% |
| | Q3 | 30% |
| | Q4 | 20% |

**Risks and Mitigation**

When implementing distribution system automation projects, various risks can arise, ranging from technical challenges to operational and financial concerns.

1. **New Technology**
   - **Risk:** Integration issues with existing systems and infrastructure, such as compatibility problems between legacy equipment and new automation technologies, not all locations within our unique service territory will be able to equally utilize smart grid enabled technology. (i.e. upstream protective devices are incompatible)
   - **Mitigation:** ERTH has installed five (5) automated switches and multiple SCADA enable fault indicators over the historical period and as such has developed knowledge and experience to efficiently implement new devices into the forecast period. In addition, we have paced our investment in a relatively modest fashion to ensure we are not at the "bleeding-edge" of the new technology, but in a way that allows us to learn from others and implement more known solutions.

2. **Supply Chain and Vendor Risks**
   - **Risk**: Delays in equipment delivery or supply chain disruptions that can affect project timelines.
   - **Mitigation**: work with industry groups, primarily Grid Smart City (GSC) to create standardized installations and secure group-purchasing benefits. Ensure via proper longer term planning that equipment is ordered well in advance of the project to avoid delays.

3. **Cybersecurity Risks**
   - **Risk**: Increased exposure to cyberattacks due to the integration of communication technologies and remote access capabilities.
   - **Mitigation**: Implement robust cybersecurity measures, and regular security audits.

| | |
|---|---|
| **Comparative Information** | As noted above, ERTH has installed five (5) automated switches and multiple SCADA enabled fault indicators. These are reflected in historical spending, however thee (3) of the switches were purchased and installed prior to the historical period. |
| **REG Investment** | This project is not associated with a REG investment |
| **Leave to Construct Approval** | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| **Project Drivers** | The primary driver for all system automation type projects is to maximize operational and reliability benefits leveraging advances in distribution technology. Ultimately it will lead to reduced outage frequency and duration and will drive operational efficiency allowing the system to be monitored and controlled remotely. ERTH Power operates the distribution system spanning a large geographical area; implementation of system automation will provide real time feedback and control of the system to utilize resources more efficiently. |
| **Investment Priority** | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP. |
| **Project Alternatives** | On a high level the alternative to investing in system automation is to do nothing and maintain the status quo.<br><br>**Do-Nothing (Status Quo):** Continue operating the current system without any upgrades or automation. The benefits of this approach would be reduced upfront costs and the avoidance of risks associated with new technology. This would however result in missed opportunities for efficiency, reliability and cost savings, that new technology can provide. ERTH evaluates each project to determine if an automated switch is suitable for the application and continues to install some manually operated devices in certain situations to balance the cost/benefit throughout our system.<br><br>On a more granular level, each type of system automation solution has an alternative manufacturer, varying capabilities and varying costs. Each solution is evaluated based on these criteria and implemented to maximize the benefits to the distribution system in line with customer preferences. |
| **Operational Benefits** | System automation enables remote operation of critical switching points, allowing staff to respond quickly to system issues rather than manually performing switching procedures. Remote monitoring devices provide real-time data, allowing ERTH Power to promptly identify and address problems. This reduces the time spent patrolling lines to locate faults and enables staff to allocate resources more efficiently to the exact location of the issue, resulting in faster restoration and enhanced operational efficiency. |
| **Reliability Benefits** | Automating the distribution system leads to significant improvements in reliability. It reduces outage durations by enabling quicker load transfers and better sectionalizing capabilities. In the event of faults, automation allows for more precise isolation of affected sections, limiting the number of customers impacted and improving overall system resilience. This increased reliability directly translates into better service quality and customer satisfaction. |
| **Customer Benefits** | Automation enhances the customer experience by minimizing both the duration and frequency of outages. The system's ability to "self-heal" through automatic fault detection and sectionalization reduces the impact on customers, ensuring fewer interruptions in service. In addition, the real-time data collected from automated systems improves communication with |

customers, providing more accurate and timely updates during outages or system disturbances, resulting in greater transparency.

**Safety**

While system automation projects do not directly address specific safety issues, they significantly improve safety for field personnel. Remotely operated switches reduce the need for manual operations in hazardous conditions, such as during storms or fault scenarios. This limits the exposure of staff to dangerous environments, enhancing overall worker safety and reducing the likelihood of accidents or injuries.

**Cyber-Security, Privacy**

Various security and privacy measure will be implemented; ERTH Power is involved in industry working groups and will look to implement and maintain cyber security measures as they evolve within the industry.

**Co-ordination, Interoperability**

ERTH Power is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ERTH Power also actively participates in the GSCC (Grid Smart City Cooperative) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

System automation projects typically require very little coordination with third parties and distribution infrastructure changes (poles, lines etc.) are minimal.

**Economic Development**

While the project is not directly tied to economic growth, the improved reliability and efficiency of the distribution system can indirectly support the economic development of the community. With automation in place, ERTH Power will be better equipped to accommodate the growing population and business demands by ensuring consistent, high-quality power delivery to new customers. This reliability makes the area more attractive for future residential, commercial, and industrial development.

**Environmental Benefits**

Though the project's primary focus is not on environmental improvements, automation can lead to minor environmental benefits. By optimizing power distribution and reducing the need for manual field interventions, the project can decrease the use of utility vehicles, thereby slightly lowering the carbon footprint associated with system maintenance and operation. Additionally, a more reliable grid with faster restoration times reduces energy waste during outages.

## Category Specific Requirements

**System Service Project**

| | |
|---|---|
| Assessment of the Benefits to Customers | See Customer Benefits section above |
| **Information Related to Regional Planning** | Not applicable |
| **Integration of Advanced Technology** | All system automation projects will include the implementation of more advanced technology including switches, reclosers & fault indicators capable of remote monitoring and control through the SCADA system, as well as other software systems that will promote efficiency. |

| | |
|---|---|
| **System Benefits to Reliability, Efficiency and Safety** | System automation will result in reduced outage duration through quicker load transfers and the ability to better sectionalize the system.<br><br>Automating the distribution system will allow for remote operation of strategic switching points allowing staff to be directed quickly to system issues rather than switching procedures. The installation of remote monitoring equipment will provide data to ERTH Power to help identify issues and provide the ability to focus resources directly to the issue; resulting in less time patrolling lines to find issues.<br><br>System automation type projects do not look to address specific safety issues however remotely operated switches will result in less exposure to manual switching operations which is most often done in less than favourable outage scenarios (i.e. storm & fault conditions) |
| **Factors Affecting Implementation Timing & Priority** | See Risks & Mitigation section detailed above |
| **Alternative Solution Analysis** | See Project Alternatives section detailed above |

## 2025 - Project Assessment Form

**Project Name** ALL-DEVICES-IT Hardware & Software

| | |
|---|---|
| Municipality | ALL |
| Cost Category | Capital |
| Project Type | Enhancement |

### General Information

**Project Description**

This project represents costs associated with upgrades and replacements of various IT related devices such as desktops, laptops, printers, firewalls & servers. These are typically replaced on a proactive basis based on current requirements, performance etc. In 2025, there is additional spending related to SCADA, workstation firewall and switches to maintain functionality and cyber-security requirements.

ERTH Power has recently created a "Digital Roadmap" with a vision to harness the potential of technologies to create an interconnected and sustainable digital ecosystem. Our vision is to empower customers, optimize operations, and participate in a transition towards a greener, more efficient future. This involves items like digitized work order and service order packages, digitized inspections, OMS system upgrades, and hardware for field staff. In addition, we will be exploring options to modernize our customer service experience through chat bots, phone system enhancements, and improved communication options. Many of these initiatives are still being evaluated for capabilities, options available etc. and will be thoroughly evaluated year-to-year.

In addition, ERTH has included an additional $1,750,000 in 2026 & 2027 for an upgrade to its ERP System (Enterprise Resource Planning). **This large investment is detailed in a separate Project Assessment form;** however, the costs are included below.

**Investment Category** General Plant

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| IT Hardware & Software | Gross ($) | $112,621 | $34,983 | $49,150 | $85,160 | $92,683 | $33,669 | $68,044 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $112,621 | $34,983 | $49,150 | $85,160 | $92,683 | $33,669 | $68,044 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| IT Hardware & Software | Gross ($) | $164,000 | $344,550 | $1,188,254 | $514,135 | $470,093 | $472,795 | $597,965 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $164,000 | $344,550 | $1,188,254 | $514,135 | $470,093 | $472,795 | $597,965 |

| | | |
|---|---|---|
| **Customer Information** | Number of Customer Attachments | ALL |
| | Customer Load (if available) | ALL |
| **Expected Project Timing** | Start Date | Q1 |
| | End Date | Q4 |
| **Expected Expenditure Timing** | Q1 | 20% |
| | Q2 | 30% |
| | Q3 | 30% |
| | Q4 | 20% |

| | |
|---|---|
| **Risks and Mitigation** | There are minimal risks associated with the standard hardware replacement program (i.e. laptops, servers, firewalls, etc.) as these types of projects generally follow a predictable schedule. The implementation of additional Digital Roadmap objectives come with risks associated with new technology and software platforms. ERTH has a highly skilled and knowledgeable IT department and will utilize consultants, industry professionals and collaboration groups to help mitigate these risks. |
| **Comparative Information** | Each year these types of replacements occur and there is not a great deal of comparative information that is used to adjust or modify the budget from year to year. |
| **REG Investment** | This project is not associated with a REG investment |
| **Leave to Construct Approval** | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| **Project Drivers** | The primary driver for IT related purchases is to ensure that the proper systems are in place for staff to be efficient and enable them to perform their job. Other items such as firewalls, servers etc. also take into consideration regulatory requirements and industry best practices with regards to security and data handling. Digital Roadmap initiatives are driven by the need to not only modernize our operations but also improve the way we interact with our customers, partners, employees, and the environment. |
| **Investment Priority** | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP. |
| **Project Alternatives** | On a high level the alternative to investing in IT is to do nothing or scale back spending and only reactively replace equipment as it fails. This would result in increased O&M costs based on inefficiencies with staff not being able to effectively accomplish their required tasks. ERTH is confident that it will need to digitize its system to meet our customers expectations with regards to improved communication and reliability, energy management, the ability to connect EVs and DERs. |
| **Operational Benefits** | Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Reliability Benefits** | Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Customer Benefits** | Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |

**Safety**

IT infrastructure does not directly relate to safety for either the public or employees however it indirectly enables the ability to efficiently provide training to employees, allow customers to report outages and safety concerns, enable effective planning to reduce safety concerns etc.

**Cyber-Security, Privacy**

Various security and privacy measure are implemented; ERTH Power is involved in industry working groups and will look to implement and maintain cyber security measures as they evolve within the industry.



**Co-ordination, Interoperability**

IT projects typically require very little coordination with third parties and distribution infrastructure changes (poles, lines etc.) are minimal. As ERTH evaluates options for software it will ensure that they are coordinated and interoperable as possible with other systems and work flows.

**Economic Development**

This project does not directly relate to any economic growth, however moving towards a digital utility will enable connections of EVs & DERs.

**Environmental Benefits**

Minimal environmental benefits are expected, as a direct result of this project however moving towards a digital utility will enable connections of EVs & DERs.

## Category Specific Requirements

**System Service Project**

| | |
|---|---|
| **Assessment of the Benefits to Customers** | Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. Moving to ESRI GIS will allow ERTH to better prepare for the changing utility environment that will include digital systems, driving many improvements in operations that will ultimately benefit the customer. |
| **Information Related to Regional Planning** | Planned IT spending will not be applicable to the regional planning process. |
| **Integration of Advanced Technology** | All IT spending will include the implementation of more advanced technology from simple components like upgrade computers to more substantial improvements such as firewalls to maintain security requirements. |
| **System Benefits to Reliability, Efficiency and Safety** | Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Factors Affecting Implementation Timing & Priority** | There are minimal risks associated with the timing of these types of projects. |
| **Alternative Solution Analysis** | On a high level the alternative to investing in IT is to do nothing or scale back spending and only reactively replace equipment as it fails. This would result in increased O&M costs based on inefficiencies with staff not being able to effectively accomplish their required tasks. |



## 2025 - Project Assessment Form

**Project Name** Financial/ERP System Upgrade

| | |
|---|---|
| Municipality | ALL |
| Cost Category | Capital |
| Project Type | Enhancement |

### General Information

**Project Description**

This project represents costs associated with an upgrade to our ERP System (Enterprise Resource Planning) System. ***This investment is included within our IT Hardware & Software Plan however; an assessment form has been completed specifically for it due to the materiality of the project.***

ERTH Power's current Financial System is outdated and approaching end of support by Microsoft and its associated VARs. The system is not a comprehensive Enterprise Resource Planning solution, thereby causing inefficiencies in operations, data management, and decision-making. Upgrading the ERP system will streamline business processes, improve reliability, and enhance the company's ability to adapt to future challenges. The proposed investment will modernize infrastructure, improve integration, and drive long-term cost savings while delivering better service to customers.

**Investment Category** General Plant

**Capital Investment**

| | | Historical Expenditures | | | | | | Average |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | (2018 to 2023) |
| ERP System (included in IT Plan | Gross ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |

| | | Forecast Expenditures | | | | | | Average |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | (2025 to 2029) |
| ERP System (included in IT Plan | Gross ($) | $0 | $0 | $1,166,666 | $583,333 | $0 | $0 | $350,000 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $0 | $0 | $1,166,666 | $583,333 | $0 | $0 | $350,000 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | ALL |
| Customer Load (if available) | ALL |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q1 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 20% |
| Q2 | 30% |
| Q3 | 30% |
| Q4 | 20% |

**Risks and Mitigation**

**Training and Change Management**: Upgrading an ERP system will require significant employee training and adjustment to new processes. Proper change management strategies must be in place to minimize disruption.

**Integration Challenges**: Ensuring that the new ERP system integrates smoothly with existing infrastructure and third-party systems may pose technical challenges, but these can be mitigated with careful planning and testing.

| | |
|---|---|
| Comparative Information | ERTH is in contact with other Ontario LDCs to understand their experiences with ERP System upgrades. |
| REG Investment | This project is not associated with a REG investment |
| Leave to Construct Approval | This project does not require Leave to Construct approval under section 92 of the OEB Act |

## Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

With the added risk of mental health and burnout of staff in recent years and to mitigate enterprise risk across the organization, ERTH requires the implementation of solutions that will create efficiencies in the organization. An updated ERP system will streamline processes for the organization, leading to reduced manual effort and improved decision making.

| | |
|---|---|
| Project Drivers | ERTH Power's current Enterprise Resource Planning (ERP) system is outdated, and approaching end of life and product support causing risk along with inefficiencies in operations, data management, and decision-making. Upgrading the ERP system will streamline business processes, improve reliability, and enhance the company's ability to adapt to future challenges. The proposed investment will modernize infrastructure, improve integration, and drive long-term cost savings while delivering better service to customers. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP. |
| Project Alternatives | As product support will no longer be available, maintaining the status quo will present a risk to the organization. As part of the implementation of the ERP, a tender process will be used whereby alternatives will be reviewed and alternate solutions and vendors will be evaluated. At this time, the selected solution is unknown until the evaluation is conducted. Based on cost/benefit analysis, the full scope of the ERP solution will be evaluated thereby contributing to a final prize of the solution and implementation. |
| Operational Benefits | The current ERP system lacks modern features that streamline operations, such as advanced automation, real-time data processing, human resource management, inventory barcoding, and budgeting analytics. Upgrading will reduce manual processes and improve workflows across departments, from supply chain management to human resources. |
| Reliability Benefits | ERTHs upgrade of its ERP system aims primarily to enhance operational efficiency, leading to indirect reliability benefits. |
| Customer Benefits | ERTHs upgrade of its ERP system aims primarily to enhance operational efficiency, leading to indirect benefits for customers through improved back end processes. A modern ERP can offer enhanced customer management tools, leading to improved service levels, faster response times, and better overall customer satisfaction, which is crucial in a highly competitive market. |

Safety

ERTHs upgrade of its ERP system aims primarily to enhance operational efficiency, this may lead to improved safety programs, tracking and data however is not a primary objective.

Cyber-Security, Privacy

A new ERP system will comply with all necessary cybersecurity requirements and have more up-to-date security systems in place as compared to our legacy solution.

Co-ordination, Interoperability



| | |
|---|---|
| | The implementation of a new ERP system can create interoperability benefits by improving how different software systems, departments, and business processes communicate and work together. This is accomplished with a centralized database, standardized processes, real-time data access, scalability and cross-department collaboration. |
| Economic Development | Again, ERTHs upgrade of its ERP system aims primarily to enhance operational efficiency, and is not directly linked to economic development however increased efficiency will allow the LDC to better handle economic development. |
| Environmental Benefits | Implementing a new ERP system can bring environmental benefits by reducing paper usage through digital processes, optimizing resource management, and lowering energy consumption. It improves supply chain efficiency, reduces overproduction and waste, and enables better tracking of sustainability metrics. Additionally, ERP systems help businesses comply with environmental regulations and can support greener supply chain choices. |

## Category Specific Requirements

**System Service Project**

| | |
|---|---|
| Assessment of the Benefits to Customers | See Customer Benefits Section above |
| Information Related to Regional Planning | Not applicable |
| Integration of Advanced Technology | The new ERP system itself will be a new technology with advanced capabilities, offering significant improvements over our current legacy system. We will assess various vendors and compare their features to select the most suitable solution. |
| System Benefits to Reliability, Efficiency and Safety | See applicable sections above. |
| Factors Affecting Implementation Timing & Priority | See Risks & Mitigation section above. |
| Alternative Solution Analysis | See Project Alternatives section above |

## 2025 - Project Assessment Form

**Project Name** ALL-LEASEHOLD-Leasehold Improvements

| | |
|---|---|
| Municipality | ALL |
| Cost Category | Capital |
| Project Type | Enhancement |

### General Information

**Project Description**

This project represents costs associated with upgrades at the ERTH Aylmer and Goderich Operating Centers. **This line item does NOT include any costs associated with the new Ingersoll Operations Center.**

**Investment Category**

General Plant

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Leasehold Improvements | Gross ($) | $96,396 | $33,722 | $50,037 | $67,178 | $52,847 | $22,911 | $53,849 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $96,396 | $33,722 | $50,037 | $67,178 | $52,847 | $22,911 | $53,849 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Leasehold Improvements | Gross ($) | $45,000 | $15,000 | $15,300 | $15,606 | $15,918 | $16,236 | $15,612 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $45,000 | $15,000 | $15,300 | $15,606 | $15,918 | $16,236 | $15,612 |

**Customer Information**

| | |
|---|---|
| Number of Customer Attachments | ALL |
| Customer Load (if available) | ALL |

**Expected Project Timing**

| | |
|---|---|
| Start Date | Q2 |
| End Date | Q4 |

**Expected Expenditure Timing**

| | |
|---|---|
| Q1 | 20% |
| Q2 | 30% |
| Q3 | 30% |
| Q4 | 20% |

**Risks and Mitigation**

There are minimal risks associated with these types of projects.

**Comparative Information**

Each year these types of replacements occur and there is not a great deal of comparative information that is used to adjust or modify the budget from year to year.

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

### Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

**Project Drivers**

The primary driver for Leasehold Improvement spending is to ensure that the proper facilities are in place for staff to be efficient and enable them to perform their job.

**Investment Priority**

ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.

| | |
|---|---|
| **Project Alternatives** | The most obvious alternative to yearly leasehold improvements would be constructing new operations centers which do not financially make sense at this point as our current facilities are able to be maintained at a suitable level without too much investment year over year. |
| **Operational Benefits** | Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Reliability Benefits** | Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Customer Benefits** | Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| **Safety** | Maintaining proper facilities ensures that day-to-day operations are able to be completed as safely as possible. |
| **Cyber-Security, Privacy** | Not applicable |
| **Co-ordination, Interoperability** | Not applicable |
| **Economic Development** | Not applicable |
| **Environmental Benefits** | Minimal environmental benefits are expected as a result of spending within this budget. |

## Category Specific Requirements

**General Plant Project**

| | |
|---|---|
| Qualitative & Quantitative Analyses including Assessment of Options | The most obvious alternative to yearly leasehold improvements would be constructing new operations centers which do not financially make sense at this point as our current facilities are able to be maintained at a suitable level without too much investment year over year. |
| Business Case for projects that substantially exceed the materiality threshold. | Not applicable |

## 2025 - Project Assessment Form

**Project Name** ALL-VEHICLE-Fleet Replacement

Municipality: All
Cost Category: Capital
Project Type: Vehicle

## General Information

**Project Description**

This project budget covers the yearly replacement of rolling stock including large & small vehicles, forklifts, and trailers. The replacement schedule is outlined in the 5-Year Fleet Sustainment Plan.

**Investment Category**

General Plant

**Capital Investment**

| | | Historical Expenditures | | | | | | Average (2018 to 2023) |
|---|---|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| Fleet Replacements | Gross ($) | $63,466 | $107,147 | $288,850 | $266,957 | $455,932 | $340,431 | $253,797 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $63,466 | $107,147 | $288,850 | $266,957 | $455,932 | $340,431 | $253,797 |

| | | Forecast Expenditures | | | | | | Average (2025 to 2029) |
|---|---|---|---|---|---|---|---|---|
| | | 2024 (Bridge) | 2025 | 2026 | 2027 | 2028 | 2029 | |
| Fleet Replacements | Gross ($) | $882,701 | $697,701 | $445,000 | $445,000 | $350,000 | $575,000 | $502,540 |
| | Contributions ($) | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Net ($) | $882,701 | $697,701 | $445,000 | $445,000 | $350,000 | $575,000 | $502,540 |

**Customer Information**

Number of Customer Attachments: ALL
Customer Load (if available): ALL

**Expected Project Timing**

Start Date: Q1
End Date: Q4

**Expected Expenditure Timing**

Details Provide in Fleet Plan

**Risks and Mitigation**

There are very minimal risks associated with the completion of this project as planned. The primary risk is associated with the timing of the planned expenditures. Since 2020, both large and small vehicle lead times have drastically increased and become more unpredictable. This seems to have stabilized with small vehicles but continues to be an issue with large trucks that currently have an unstable lead time of nearly 3 years.

**Comparative Information**

AVERAGE: $291,863
2023: $340,431
2022: $455,932
2021: $266,957
2020: $288,850
2019: $107,147

**REG Investment**

This project is not associated with a REG investment

**Leave to Construct Approval**

This project does not require Leave to Construct approval under section 92 of the OEB Act

## Evaluation Criteria & Information Requirements

**Efficiency, Customer Value & Reliability**

| | |
|---|---|
| Project Drivers | The primary driver for this project is to maintain a fleet that enables staff to be safe and efficient when completing required activities. |
| Investment Priority | ERTH Power implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP. On a more granular level individual vehicles are prioritized based a number of factors outlined in the Fleet Sustainment Plan. |
| Project Alternatives | There are not really any alternatives to maintaining a fleet capable of safely constructing, maintaining and operating the system. There are however numerous variations of the pace of replacement, type of vehicle etc. ERTH Power looks at its requirements each time a vehicle is scheduled for replacement to see if a smaller/larger version is required, or whether the fleet can be reconfigured to reduce financial requirements. |
| Operational Benefits | Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| Reliability Benefits | Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| Customer Benefits | Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| Safety | Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits. |
| Cyber-Security, Privacy | Not applicable |
| Co-ordination, Interoperability | Not applicable |
| Economic Development | Not applicable |
| Environmental Benefits | Not applicable |

## Category Specific Requirements

**General Plant Project**

| | |
|---|---|
| Qualitative & Quantitative Analyses including Assessment of Options | There are numerous variations of the pace of replacement, type of vehicle etc. when scheduling fleet replacements. ERTH Powers looks at its requirements each time a vehicle is scheduled for replacement to see if a smaller/larger version is required, or whether the fleet can be reconfigured to reduce financial requirements. |
| Business Case for projects that substantially exceed the materiality threshold. | Not applicable. |

# APPENDIX L. Fleet Sustainment Plan

ERTH POWER

# Fleet Sustainment Plan

UPDATED:
2024

# Contents





# Executive Summary

ERTH currently has 10 large vehicles consisting of 7 bucket trucks and 3 RBD's, 17 small vehicles consisting of engineering, operations and metering vans, SUV's and pickup trucks along with multiple trailers and 2 forklifts.

ERTH uses vehicle age as the primary method for creating long term spending projections and then prioritizes replacements on a yearly basis based on condition, maintenance costs, failure risks, and utilization. The following illustrates the guidelines used to project replacements and is compared to the planned replacement age over the next 15 years.

| | ERTH Replacement Guidelines | Planned Average Replacement Age |
|---|---|---|
| **Large Vehicles:** | 12-15 years | **17.25** |
| **Small Vehicles:** | 8-12 years | **10.75** |

Over the next 5 years, ERTH plans to replace four (4) large vehicles and six (6) small vehicles. This will result in an average fleet spend of approximately $502,540 and does not include trailers or forklift upgrades. This is an increase from the previous 5 year average from 2019-2023 was $291,863.

ERTH is satisfied with the current performance of our fleet however will need to increase fleet spending over the next five (5) years to ensure our fleet remains reliable and efficient.



# Background

In 2010 the Ontario Energy Board (OEB) commissioned Kinetrics to analyze and study the useful life of Local Distribution Companies' assets. Findings from this report revealed that the useful life range for large utility trucks/bucket trucks are 5-15 years and pickups/vans are 5-10 years taking into account utilization and daily conditions under which the equipment operates.

ERTH Power first created a fleet sustainment plan in 2010, which created a road map for long term planning ensuring that we are able to provide safe, reliable hydro service to our customers. ERTH Power service territory creates unique challenges concerning fleet management due to the large geographic area that our communities span. Due to this fact, we operate three (3) operations centers, which makes sharing of fleet resources challenging, and ERTH must own and maintain additional vehicles as compared to a contiguous LDC with a similar customer base. In addition, ERTH vehicles typically experience an increased number of kilometers, again due to the physical separation of each of our communities.

# Optimal Fleet

The following is what ERTH has determined to be our optimal fleet as of 2024; any vehicle denoted with an **(*)** indicates that ERTH will evaluate options of **EV or Hybrid** replacements to align with our environmental goals and corporate mission & vision.

**LARGE VEHICLES**

| INGERSOLL | AYLMER | Goderich |
|---|---|---|
| 65' Bucket | 47' Bucket Truck (Hybrid) | 55' Bucket Truck |
| 50' Bucket | Single Axle RBD | 47' Bucket Truck |
| 42' Bucket | | Tandem Axle RBD |
| Tandem Axle RBD | | |
| 37' Service Truck | | |

**SMALL VEHICLES**

| INGERSOLL | AYLMER | Goderich |
|---|---|---|
| Crew Pickup (2500) | Crew/Foreperson Pickup (2500) | Crew Pickup (2500) |
| Crew Pickup (2500) | | Foreperson Pickup (2500) |
| Foreperson Pickup (2500) | | **Supervisor Pickup (1500) |
| **Supervisor Pickup (1500) | | **Field Services Vehicle (Small Pickup) |
| Inventory/Dump Truck (F550) | | |
| | | |
| ** Metering Vehicle (Small Van) | | |
| ** Metering Vehicle (Small Van) | | |
| | | |
| ** Engineering Vehicle (Small Truck) | | |
| ** Engineering Vehicle (XUV) | | |
| ** Events Vehicle (EV Bolt) | | |
| | | |
| **Manager of Ops Vehicle (XUV or Truck) | | |

# Existing Fleet

The existing fleet is detailed below, with any differences between the optimal fleet highlighted in red. In general ERTH is nearing our optimal fleet with a few notable changes that will occur in the future.

1. EV or Hybrid options for most small vehicles. ERTH currently has 2/9 vehicles replaced with EV alternatives.
2. 50’ Bucket Truck in Aylmer to be replaced with a 37’ Bucket Truck in Ingersoll. ERTH has determined that a smaller service truck will be less costly to replace, operate and maintain, without compromising our operational abilities.
3. 50’ Bucket Truck in Goderich replaced with a 47’ Bucket Truck. We have again determined that a 47’ truck will be less costly to replace, operate and maintain without compromising our operation abilities at the Goderich Ops Center.

## LARGE VEHICLES

| INGERSOLL | AYLMER | Goderich |
|---|---|---|
| 65' Bucket | 47' Bucket Truck ~~(Hybrid)~~ | 55' Bucket Truck |
| 50' Bucket | Single Axle RBD | 50' Bucket Truck |
| 42' Bucket | 50' Bucket Truck | Tandem Axle RBD |
| Tandem Axle RBD | | |
| ~~37' Service Truck~~ | | |

## SMALL VEHICLES

| INGERSOLL | AYLMER | Goderich |
|---|---|---|
| Crew Pickup (2500) | Crew/Foreperson Pickup (2500) | Crew Pickup (2500) |
| Crew Pickup (2500) | | Foreperson Pickup (2500) |
| Foreperson Pickup (2500) | | **Supervisor Pickup (1500) |
| **Supervisor Pickup (1500) | | **Field Services Vehicle (Small Pickup) |
| Inventory/Dump Truck (F550) | | |
| | | |
| ** Metering Vehicle (Small Van) | | |
| ** Metering Vehicle (Small Van) | | |
| | | |
| ** Engineering Vehicle (Small Truck) | | |
| ** Engineering Vehicle (XUV) | | |
| ** Events Vehicle (EV Bolt) | | |
| | | |
| **Manager of Ops Vehicle (XUV or Truck) | | |



# Long Term Fleet Plan

The small & large vehicles that are currently in service primarily align with the optimal fleet for each operations center and therefore both small and large vehicles are simply in “maintenance” mode and will be scheduled for replacement based on their end of life.

In order to complete long term planning, vehicle age is used as the primary indicator of replacement requirements. This allows ERTH to determine suitable spending requirements over a long period ensuring that we are able to create a relatively level investment schedule and avoid large increases and decreases year over year. With that being said, when prioritizing vehicles for replacement on a yearly basis we consider condition, maintenance costs, failure risks, and utilization (i.e. the oldest vehicles are not always replaced solely based on vehicle age.)

A snapshot of our fleet age in 2025 vehicle age is shown below:

| | Average Age |
|---|---|
| **Large Vehicles:** | 10.4 |
| **Small Vehicles:** | 6.4 |

The following indicates ERTH’s current guidelines for vehicle useful life and indicates the average replacement age based on the long-term replacement schedule. The guidelines used are within the range provided by Kinetrics in the Asset Depreciation Study for the Ontario Energy Board. ERTH’s planned replacement age will typically be older than the guideline in an attempt to keep spending as low as possible while still maintaining a fleet capable of efficiently managing the distribution system.

| | ERTH Replacement Guidelines | Planned Average Replacement Age |
|---|---|---|
| **Large Vehicles:** | 12-15 years | **17.25** |
| **Small Vehicles:** | 8-12 years | **10.75** |

.

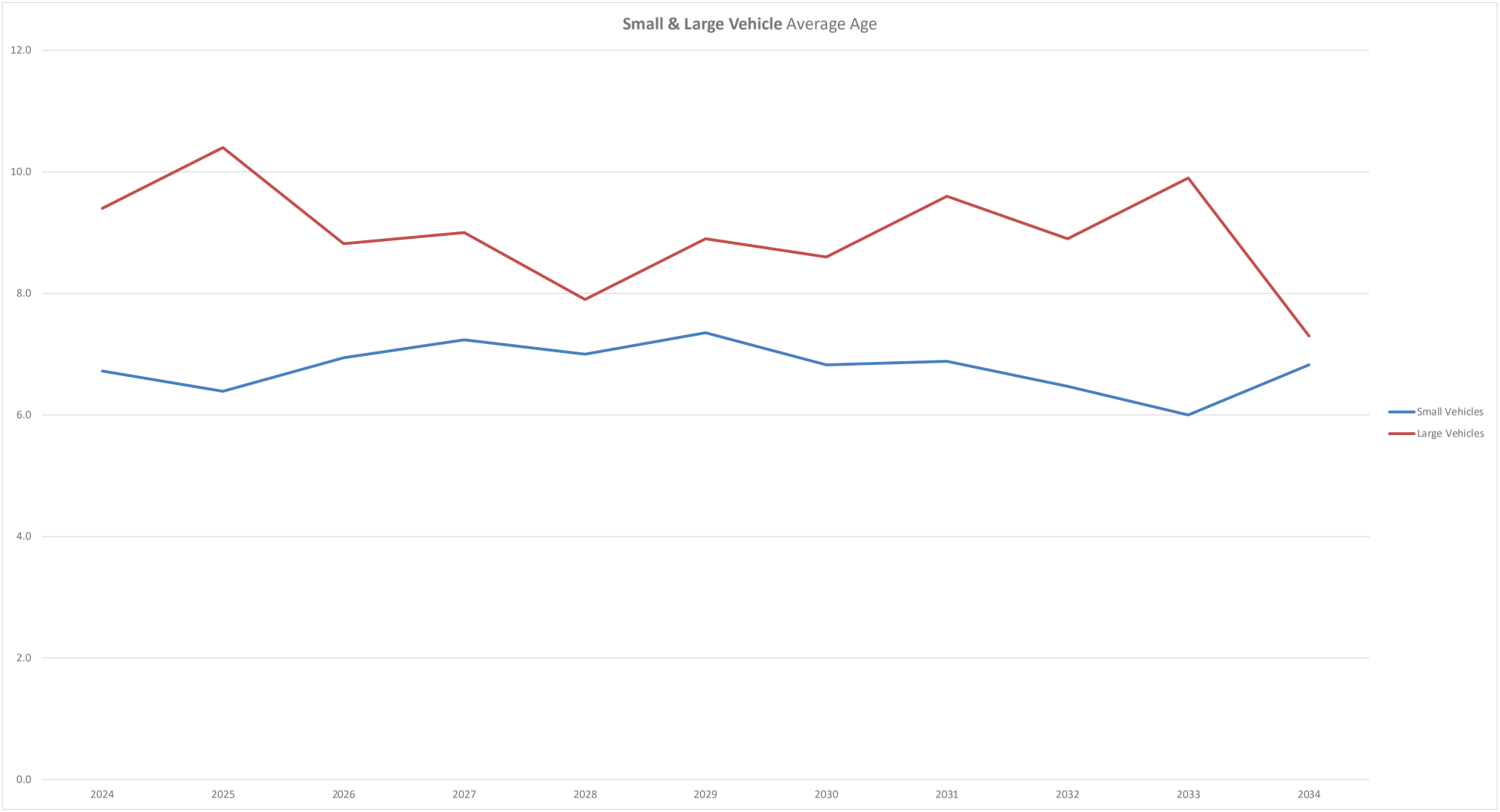


## LARGE VEHICLES

| Area | Vehicle # | Description | Year | Age | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingersoll | 28-14 | 65' DBL BUCKET ING | 2014 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1 |
| | ~~21-16~~ | 50' DBL BUCKET ING (move to GDE) | 2016 | 8 | 8 | 9 | | | | | | | | | |
| | 23-20 | 42' POSI BUCKET ING | 2020 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | TBD | 550 - 40' SERVICE TRUCK | TBD | TBD | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 08-23 | 900-52 RBD ING | 2023 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Aylmer | 09-16 | 50' DBL BUCKET AYL | 2016 | 8 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 1 |
| | 05-07 | 47' POSI BUCKET AYL | 2007 | 17 | 17 | 18 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 22-06 | 50-48 RBD ING | 2006 | 18 | 18 | 19 | 20 | 21 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | ~~08-07~~ | ~~40-47 RBD AYL~~ | ~~2007~~ | ~~17~~ | | | | | | | | | | | |
| Goderich | 103-09 | 55' DBL BUCKET GDE | 2009 | 15 | 15 | 16 | 17 | | | | | | | | |
| | 21-16 | 50' DBL BUCKET ING (from ING) | 2016 | 8 | | | 10 | 11 | 12 | 13 | 1 | 2 | 3 | 4 | 5 |
| | 15-09 | 50' DOUBLE BUCKET POSI GDE | 2010 | 14 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | 102-14 | 50-48 RBD Terex GDCH | 2014 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 1 | 2 | 3 |
| | | | | **Average Age** | **9.4** | **10.4** | **8.8** | **9** | **7.9** | **8.9** | **8.6** | **9.6** | **8.9** | **9.9** | **7.3** |

## SMALL VEHICLES

| Area | Vehicle # | Description | Year | Age | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingersoll | 12-14 | CHEV SILVERADO - ING - SUPV (1500) | 2014 | 10 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | 10-22 | DODGE RAM - ING - FOREMAN (2500) | 2022 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 1 | 2 | 3 | 4 |
| | 29-23 | GMC SIERRA - ING - CREW (2500) | 2023 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 101-11 | GMC SIERRA - AYL - CREW (2500) | 2011 | 13 | 13 | 13 | 14 | 15 | 15 | 16 | 17 | 17 | 18 | 19 | 19 |
| | 35-19 | FORD 550 - ING - OPS/STORES Dump | 2019 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 1 | 2 |
| Aylmer | 06-20 | CHEV SILVERADO - AYL - FOREMAN 3/4 | 2020 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 |
| Goderich | 27-17 | CHEV SILVERADO - GDE - SUPV (1500) | 2017 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 14-22 | DODGE RAM - GDE - FOREMAN (2500) | 2022 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 |
| | 110-23 | GMC SIERRA - GDE - CREW (2500) | 2012 | 12 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 30-16 | CHEV COLORADO - GDE - FIELD SERVICES | 2016 | 8 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 |
| Pool Vehicles | 24-17 | NISSAN VAN - ING - METERING | 2017 | 7 | 7 | 1 | 2 | 3 | 2 | 3 | 4 | 3 | 4 | 5 | 4 |
| | 34-20 | NISSAN VAN - ING - METERING | 2020 | 4 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| | TBD | EQUINOX EV | 2024 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | 43-18 | CHEV BOLT EV - ING - COMMS/REL | 2018 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 1 | 2 | 3 |
| | TBD | F150 LIGHTNING | TBD | TBD | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | 106-14 | TOYOTA TACOMA - GDCH - FIELD SERV. | 2014 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 1 | 2 | 3 | 4 | 5 |
| | N/A | CHEVY EQUINOX - ING -OPS MNGR | 2018 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 | 4 | 5 |
| | | | | **Average Age** | **6.7** | **6.4** | **6.9** | **7.2** | **7.0** | **7.4** | **6.8** | **6.9** | **6.5** | **6.0** | **6.8** |


Small & Large Vehicle Average Age
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
Small Vehicles
Large Vehicles

## Financial Projections

The fleet replacement plan is balanced with small & large vehicles purchases to create a relatively level capital spend from year-to-year.

| | Vehicle # | Description | Replacement $ | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|---|---|---|---|---|---|---|---|---|---|
| Large Vehicles | 05-07 | 47' POSI BUCKET AYL | $592,701 | | $462,701 | | | | |
| | TBD | 550 - 40' SERVICE TRUCK | $300,000 | | | $300,000 | | | |
| | 22-06 | 50-48 RBD ING | $450,000 | | | $125,000 | $325,000 | | |
| | 21-16 | 50' DBL BUCKET ING | $625,000 | | | | | $150,000 | $475,000 |
| | 102-14 | 50-48 RBD Terex GDCH | $450,000 | | | | | | |
| | | | **SUB TOTAL** | $0 | $462,701 | $425,000 | $325,000 | $150,000 | $475,000 |
| Small Vehicles | TBD | EQUINOX EV | $60,000 | $60,000 | | | | | |
| | TBD | F150 LIGHTNING | $100,000 | | $100,000 | | | | |
| | 24-17 | NISSAN VAN - ING - METERING | $80,000 | | $80,000 | | | | |
| | 12-14 | CHEV SILVERADO - ING - SUPV (1500) | $100,000 | | | | $100,000 | | |
| | 27-17 | CHEV SILVERADO - GDE - SUPV (1500) | | | | | | $100,000 | |
| | 34-20 | NISSAN VAN - ING - METERING | | | | | | $80,000 | |
| | 30-16 | CHEV COLORADO - GDE - FIELD SERVICES | | | | | | | $80,000 |
| | N/A | CHEVY EQUINOX - ING -OPS MNGR | | | | | | | |
| | 106-14 | TOYOTA TACOMA - GDCH - FIELD SERV. | | | | | | | |
| | 10-22 | DODGE RAM - ING - FOREMAN (2500) | | | | | | | |
| | | | **SUB TOTAL** | $60,000 | $180,000 | $0 | $100,000 | $180,000 | $80,000 |
| Trailers & Forklifts | TBD | ING - Job/Reel Trailer w/ Brake | $30,000 | $30,000 | | | | | |
| | T-52 | AYL - Job/Reel Trailer w/ Brake | $35,000 | | $35,000 | | | | |
| | All | Paint & Refurbishment | $20,000 | | $20,000 | $20,000 | $20,000 | $20,000 | $20,000 |
| | | Forklift Replacement | | | | | | | |
| | | | SUBTOTAL | $30,000 | $55,000 | $20,000 | $20,000 | $20,000 | $20,000 |
| | | | **TOTAL** | **$90,000** | **$697,701** | **$445,000** | **$445,000** | **$350,000** | **$575,000** |
| | | | | **$419,088** | **$419,088** | **$419,088** | **$419,088** | **$419,088** | **$419,088** |