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System Impact Assessment Report

CONNECTION ASSESSMENT & APPROVAL PROCESS

Issue 1.0

Final Report

Project: Timmins West Mine CTS

Applicant: Lake Shore Gold Corp

CAA ID 2007-259

Transmission Assessments & Performance Department
July 3, 2007

REPORT

System Impact Assessment Report for Timmins West Mine TS – Disclaimer

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System Impact Assessment Report

Timmins West Mine CTS

Acknowledgement

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

Disclaimers

IESO

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

Approval of the proposed connection is based on information provided to the IESO by the connection applicant and the transmitter(s) at the time the assessment was carried out. The IESO assumes no responsibility for the accuracy or completeness of such information, including the results of studies carried out by the transmitter(s) at the request of the IESO. Furthermore, the connection approval is subject to further consideration due to changes to this information, or to additional information that may become available after the approval has been granted. Approval of the proposed connection means that there are no significant reliability issues or concerns that would prevent connection of the proposed facility to the IESO-controlled grid. However, connection approval does not ensure that a project will meet all connection requirements. In addition, further issues or concerns may be identified by the transmitter(s) during the detailed design phase that may require changes to equipment characteristics and/or configuration to ensure compliance with physical or equipment limitations, or with the Transmission System Code, before connection can be made.

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

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Special Notes and Limitations of Study Results

The results reported in this study are based on the information available to Hydro One, at the time of the study, suitable for a preliminary assessment of a new generation or load connection proposal.

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

This study does not assess the short circuit or thermal loading impact of the proposed connection on facilities owned by other load and generation (including OPGI) customers.

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

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

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

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TIMMINS WEST MINE CTS PROJECT IESO SYSTEM IMPACT ASSESSMENT

SIA Findings

The System Impact Assessment has examined the effect of supplying a new station, Timmins West Mine CTS, off the 115 kV line T61S on the reliability of the IESO-controlled grid. The incorporation of the new station is a connection project needed to accommodate a new load.

Conclusions

The assessment concluded that the addition of the new station:

1. Will not materially affect the reliability of the IESO-controlled grid and
2. Will not have an effect on the short circuit current at Timmins TS

The study results concluded the following:

1. Thermal capability of single circuit radial line, T61S, will be sufficient to supply the new load.
2. Pre and post-contingency voltage declines are within the IESO's assessment criteria.
3. About 3 MVAR of reactive power will be needed on the low voltage side of the transformer station to bring the power factor at defined metering point (high voltage side of the transformer) to 0.9 as required by the Market Rules.
4. As a part of Northeast Special Protection Scheme load rejection facilities, circuit T61S and the customers connected to the circuit could be rejected for contingencies associated with D501P, P502X circuits, or Porcupine T3 and T4 transformers.

IESO's Requirements for Connection

For the connection of the proposed new Timmins West Mine CTS, the following requirements were identified in this assessment:

- To meet the load power factor requirements Lake Shore Gold Corp is required to install a low voltage shunt capacitor bank of the minimum size of 3 MVAR at the new station, or compensate for required reactive power by any other means before commencing the commissioning of the station.
- In addition to satisfying all the protection requirements for tapped transformer stations supplying load, imposed by the Transmission System Code, connection applicant must coordinate its protection systems with Hydro One.
- As per Appendix 4.1 of Market Rules, all 115 kV equipment must be capable of continuously operating in the range between 113 kV and 132 kV.

- Transmission equipment must remain in service, and not automatically trip, for the voltages up to 5% above the maximum continuous rating, in this case 138 kV, for up to 30 minutes, to allow the system to be re-dispatched to return voltages within their normal range.
- Since the new load will be a non-dispatchable facility not exceeding 20 MVA, there are no requirements for installation of monitoring facilities or voltage reduction facilities at the new station.
- As per Appendix 4.3 of Market Rules, a wholesale customer connected to the IESO-controlled grid may be required to participate in underfrequency load shedding (UFLS). However, since the line T61S is a part of Timmins TS UFLS scheme, Lake Shore Gold Corp is not required to install UFLS facilities at the station at this time.

Notification of Approval for Connection Proposal

It is recommended that a Notification of Conditional Approval for connection be issued to Lake Shore Gold Corp, subject to IESO's Requirements for Connection listed above, and any further requirements that may be identified by Hydro One Networks Inc. in the Customer Impact Assessment.

1. Project Description

To accommodate a new load in the Northeastern region, Lake Shore Gold Corp is proposing to build a new 10 MVA transformer station. The new station is proposed to be supplied from 115 kV radial single circuit line T61S, which emanates from Timmins TS.

Single line diagram of the Timmins 115 kV system as well as the location of the proposed station is shown in the Diagram 1.

The proposed in-service date for the new station is fall of 2007. The initial station load is estimated to be 4.5 MW with an ultimate load of approximately 8 MW.

The purpose of the System Impact Assessment is to evaluate the results of the studies and to identify the effect of the new facility on system reliability.

– **End of Section** –

2. Review of Connection Proposal

2.1 Proposed Connection Arrangement

The proposed Timmins West Mine CTS will be connected to T61S line via a single 10 MVA, 115-4.2/2.4 kV transformer. The mine tap point is to be 20 km from Timmins TS toward Weston Lake DS. The tap line will run approximately 840 m into the proposed mine site.

Based on single line diagram E01-R0 provided by the connection applicant, the transformer is separated from the transmission system via a 115 kV circuit switcher and a motorized air break disconnect switch, while the low voltage isolation of the transformer is to be provided by a circuit breaker. The ratings of all proposed equipment are described in section 3 of this report.

Voltage control is to be provided via an on-load tap changer located on the high voltage winding with a voltage range of ± 11.5 kV achieved in 32 steps.

The station will have six 4.16 kV feeders.

More detailed view of the facilities that are proposed to be installed at the new station is provided in Diagram 2.

The points of connection or defined meter points will be located on the high voltage side of the transformer. The exact location of the revenue meter has to be provided by the connection applicant as part of the facility registration process.

2.2 Power Factor

The Market Rules (Chapter 4, Appendix 4.3) require that wholesale customers and distributors connected to the IESO-controlled grid shall operate at a power factor within the range 90% lagging to 90% leading as measured at the defined meter point.

The connection applicant has advised that the power factor of the new load is 0.8. The power factor at the high voltage side of the transformer, i.e. defined meter point, will drop below 0.8 when accounting for the transformer losses. To meet the power factor requirements, reactive compensation on the low voltage side is required. The load flow analysis indicates that for the new station initial load level of 4.5 MW, 1.5 MVAR of reactive compensation will be required. By the time the station reaches its anticipated peak load of 8 MW, minimum of 3.0 MVAR of reactive compensation will be needed. The summary of the study with the time schedule for the needed reactive compensation is given in Table 1.

Table 1: Reactive Power Compensation at Timmins West Mine CTS

TIMMINS WEST MINE CTS	YEAR 2007	YEAR 2008
P_{LOAD} (MW)	4.5	8
Q_{LOAD} with 0.8 power factor (MVar)	3.4	6
$Q_{LOAD} + Q_{TR LOSS}$ (MVar)	3.7	6.9
Power factor at the HV side	0.77	0.75
Compensation needed for 0.9 pf (MVar)	1.5	3.0

To meet the load power factor requirement at the new Timmins West Mine CTS, it is required that a 3MVar shunt capacitor bank be installed and available for service along with the new station.

2.3 Protection Systems

With respect to the protection and telecommunication requirements, the transmitter and connection applicant shall follow the Transmission System Code technical requirements for tapped transformer stations supplying load.

– End of Section –

3. Data Verification

Lake Shore Gold Corp has provided the following equipment specification for the new equipment proposed for the installation:

- *Step-down Transformer*

Quantity	1
Thermal ratings	10/13 MVA
Rated voltage	115 kV-4.16/2.4kV
Under-load tap changer (ULTC)	±11.5 kV in 32 steps in HV winding
Transformer connections	HV Delta LV WYE (neutral grounded)
Limited time rating (LTR)	13 MVA

Since the transformer impedance was not provided by the connection applicant, for the study purpose the following typical value was assumed:

Impedance	8.72 % on 10 MVA base
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- *Line Tap*

Length	0.84 km
--------	---------
- *115 kV Transformer Circuit Switcher*

Quantity	1
Rated voltage	138 kV
Maximum Continuous Operating Voltage	145 kV
Rated continuous current	1200 A
Rated short-circuit capacity	40 kA (symmetrical)
Short time short-circuit capacity	64 kV
- *115 kV Transformer Disconnect Switches*

Quantity	2
Type	Air break
Rated voltage	138 kV
Rated continuous current	1200 A

Low Voltage Switching Facilities

- *Transformer Breaker*

Quantity	1
Nominal voltage	4.16 kV
Rated continuous current	3000 A
Short circuit interrupting capability	40 kA (symmetrical)

- *Bus Tie Breaker*

Quantity	1
Nominal voltage	4.16 kV
Rated continuous current	2000 A
Short circuit interrupting capability	40 kA (symmetrical)
Normal operation	Closed

- *Feeder Breakers*

Quantity	6
Nominal voltage	4.16 kV
Rated continuous current	1200 A
Short circuit interrupting capability	40 kA (symmetrical)

– End of Section –

4. Fault Level Assessment

The load supplied from the new station will be industrial load mostly comprising of induction motors. The connection applicant has advised that that there will be no synchronous motors connected to the low voltage system and that the emergency generator connected to the secondary bus will not operate in parallel with the IESO controlled grid at any time. The generator will be used only during the power failure.

In general, radial loads do not contribute significantly to the short circuit levels on the high voltage side. Short circuit study results provided by Hydro One concluded that the proposed development does not contribute to the single-line-to-ground fault or three phase fault currents.

– End of Section –

5. Impact on System Reliability

The system impact assessment studies examined the effect of the proposed new station on the 115 kV transmission system bounded by two Porcupine TS 500/115 kV transformers and Hunta SS. This included the evaluation of the system voltages and thermal loadings, and a comparison between the performance of the existing system and the performance of the system with the new load incorporated.

5.1 Existing Transmission

The new substation will be supplied from radial 115 kV single circuit line T61S which is part of Timmins area 115 kV system. Also part of this system are Timmins TS to Porcupine TS transmission corridor which consist of two single circuit lines namely P13T & P15T, and Timmins TS to Hunta SS transmission link composed of two single circuit lines, H6T and H7T. A connection of this 115 kV system to the 500 kV system is provided by the two Porcupine TS 500/115 kV transformers.

There are five stations connected to the Porcupine TS to Hunta SS 115 kV system, i.e. Timmins TS, Shiningtree DS, Weston Lake DS, Kidd Minesite CTS and La Forest Road DS.

The 115 kV Timmins transmission system is shown in Diagram 1.

5.2 Area Loads and Load Forecast

The IESO historical records indicate that the area related to the proposed project is winter critical area. The maximum peak loadings of the stations in the area encompassed by Timmins TS and Hunta SS were recorded in January 2005 and are summarized in the Table 1 below. Historical peak load data for the Kid Creek Minesite CTS were lower than the one provided by the mine. Therefore, the customer data were used in the analysis. The anticipated load growth in the Northeastern part of the system is about 1% per year.

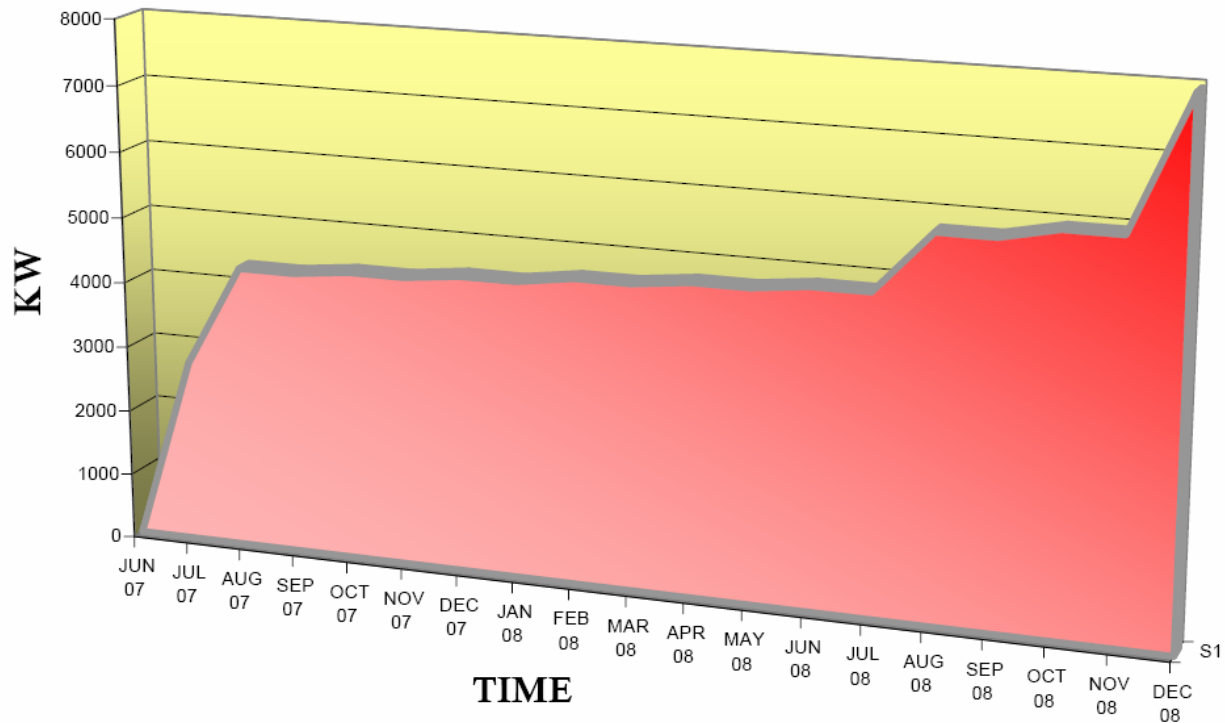
Table 1: Stations' Coincident Peak Load

Substation	Peak Load (MW)
Kidd Minesite CTS	43.8*
La Forest Road DS	13.4
Shiningtree DS	2.6
Timmins TS	72.6
Weston Lake DS	2.9
Grand Total	135.3

*data provided by the customer

The connection applicant has advised that the peak load of the new station will be 8 MW, as shown in Diagram 3.

Diagram 3. Timmins West Mine CTS Load Forecast



5.3 Study Assumptions

The studies were performed for the winter 2008 load conditions with jul06 base case used as a starting point with the following assumptions made:

- The area was considered winter critical.
- All elements in-service pre-contingency.
- Since the new transformer data were not provided by the connection applicant at the time of the study, 8.72% impedance was assumed.
- Natural load power factor at all five existing stations was 0.9.
- Natural load power factor of 0.8 was assumed at the new station.
- The active and reactive loads were represented as *constant MVA* loads.
- Power inflows into local area from Porcupine TS and Hunta SS were at the ratio of about 40% to 60% respectively.
- Pre-contingency voltages at Porcupine TS, Timmins TS, and Hunta SS were maintained within the operating range given in 115 kV Voltage Limits SCO and shown in Table 2.

Table 2. Voltage Limits for 115 kV Local System

Station	Minimum Voltage (kV)	Maximum Voltage (kV)
Porcupine TS	125	135
Timmins TS	125	138
Hunta SS	123	138

5.4 Thermal Loading Assessment

The study examines pre and post-contingency loading capability of the Porcupine TS to Hunta SS 115 kV transmission system.

The thermal capability of the circuits is evaluated based on the occurrence of a single contingency with the loads represented by *constant MVA* load model. The following single contingencies were simulated:

Loss of Porcupine T3	Loss of T61S
Loss of P13T	Loss of H6T
Loss of P15T	Loss of H7T

The ratings used in this assessment were design ratings provided by Hydro One. The ratings, shown in Table 4, were calculated for the peak ambient conditions, i.e. temperature of 10°C for winter and 30°C for summer, wind speed of 4 km/h, for the day time.

Table 4. Timmins 115 kV Transmission System Thermal Ratings

CIRCUIT	FROM	TO	WINT CONT (Amps)	SUM CONT (Amps)
T61S	Timmins TS	Timmins JCT	640	470
	Timmins JCT	Shiningtree DS	430	340
	Timmins JCT	Ogden JCT	640	470
	Ogden JCT	Weston Lake DS	640	470
H6T	Hunta SS	Tisdale JCT	610	530
	Tisdale JCT	La Forest Road JCT	610	530
	La Forest Road JCT	Timmins TS	490	380
H7T	Hunta SS	Warkus JCT	610	530
	Warkus JCT	Timmins TS	490	380
P13T	Porcupine TS	Timmins TS	1030	890
P15T	Porcupine TS	Timmins TS	1030	890

Study results for the initial transmission configuration and a system configuration that includes the proposed new load are summarized in Tables 5 and 6 respectively in Appendix A. The results indicate the following:

With the addition of the new load, the total peak load that is going to be supplied from the radial single circuit line T61S will be about 13.5 MW. The winter and summer thermal capabilities of the line are about 138 MVA and 101 MVA calculated at 125 kV respectively. Thus, there is sufficient transmission capacity available to supply the proposed load.

With all elements in service, loading of the P13T, P15T, H6T, and H7T lines are well under continuous ratings of the lines.

Since there is no alternative point of supply to loads connected to T61S line, the contingency associated with this circuit would result in the loss of all loads connected to it, thus slightly decreasing the post-contingency loading on some 115 kV lines. Also, Timmins TS configuration is such that following the loss of P15T line, K23 bus and T61S line would be lost by configuration.

The loss of H7T was identified as the most critical single contingency resulting in the 16% increase in H6T post-contingency loading. However, it should be noted that this critical contingency is inherent to the Timmins 115 kV system configuration and that the addition of the new load will not affect the loading of H6T or H7T lines.

As a result of new load incorporation, pre and post-contingency loading of P15T will increase for about 6%. However, the line's loading will still remain well below its continuous rating.

Also, the transformation capacity of Porcupine TS transformers is sufficient to supply anticipated load growth under both pre and post-contingency conditions.

5.4.1 Additional Studies

The study results indicate that the addition of the new load will not materially affect Porcupine TS to Hunta SS 115 kV system thermal capability. Sensitivity studies have indicated that thermal capability of the local system is closely interrelated with the direction of the power flow into the area. Hence, to identify any possible future thermal issues, the system's thermal capability was also studied with the maximized generation output of the generators connected to Hunta SS circuits. This resulted in about 80% of the Timmins TS to Hunta SS load being supplied from Hunta SS and 20% of the load being supplied from Porcupine TS. The study results are summarized in Table 7.

The studies concluded the following:

Change in the generation pattern i.e. increasing the power inflow into Hunta SS, will increase the power flow over the H6T, H7T, and P13T and decrease the flow on Porcupine TS to Timmins TS P15T circuit and Porcupine TS 500/115 kV transformers.

The occurrence of the most critical contingency, H7T, would cause the remaining Hunta SS to Timmins TS circuit, H6T, being loaded to 75.9 % of its winter continuous rating. However, if the same peak load conditions were to occur in summer, the line would be loaded to 97.9% of its continuous rating.

5.5 Voltage Assessment

The IESO's Ontario Resource and Transmission Assessment Criteria require the post-contingency voltage decline on 115 kV system to be limited to 10%. An immediate post-contingency voltage decline and voltage decline following the tap-changer response on the low voltage side shall be limited to 10% and 5% respectively.

Due to fact that there is no alternative point of supply to loads connected to T61S, H6T and H7T circuits, the loss of any of these circuits would result in the loss of supply to the connected load. Consequently, voltage change following the occurrence of these contingencies was insignificant. Hence, post-contingency system voltage decline was studied for the 2008 system conditions and for contingencies involving Porcupine TS to Timmins TS circuits, P13T & P15T, and one of the Porcupine TS transformers. Loads in this study were represented as constant MVA.

The study results for the initial and proposed system configurations are given in Table 8 and 9. The results indicate that the voltage performance in the area will not be significantly affected by the addition of the new load. Following the occurrence of the most critical contingency, loss of P15T, voltage decline of 3.1% on high voltage side was recorded; 8.1% and 3.1% voltage decline prior to the ULTC action and following the ULTC response respectively were recorded on the low voltage side.

– End of Section –

Diagrams

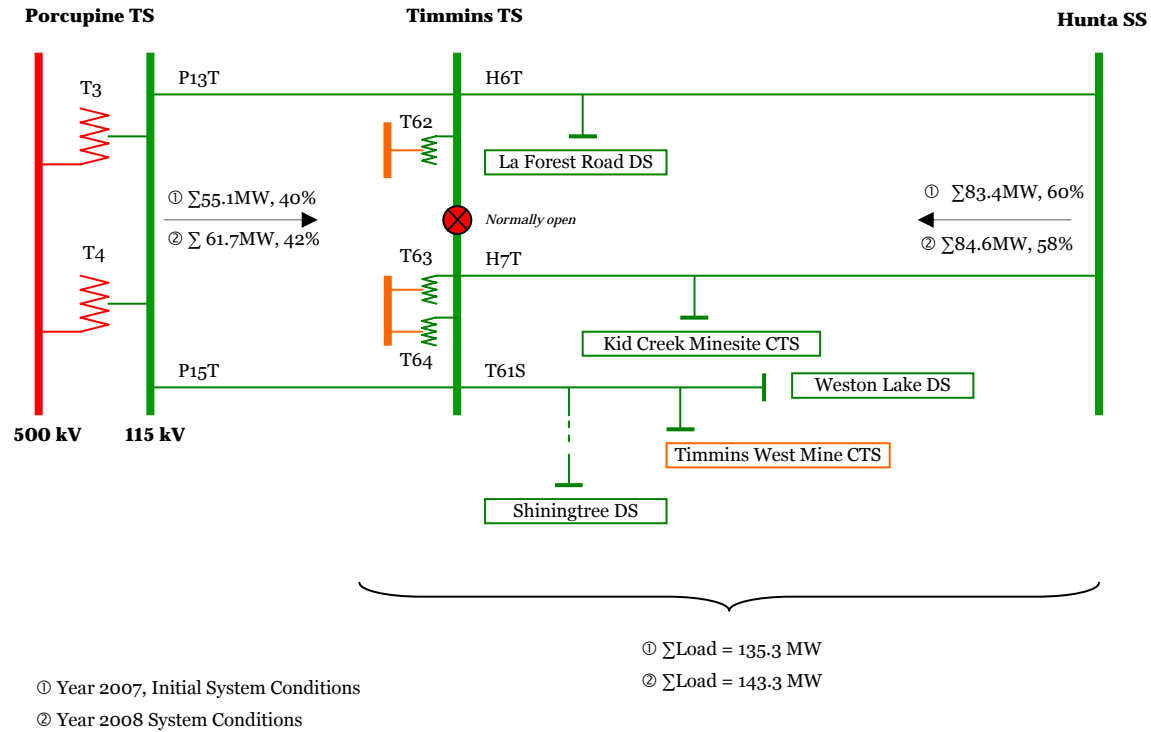


Diagram 1: 115 kV Area Transmission System and Supply Arrangement for the New Timmins West Mine CTS

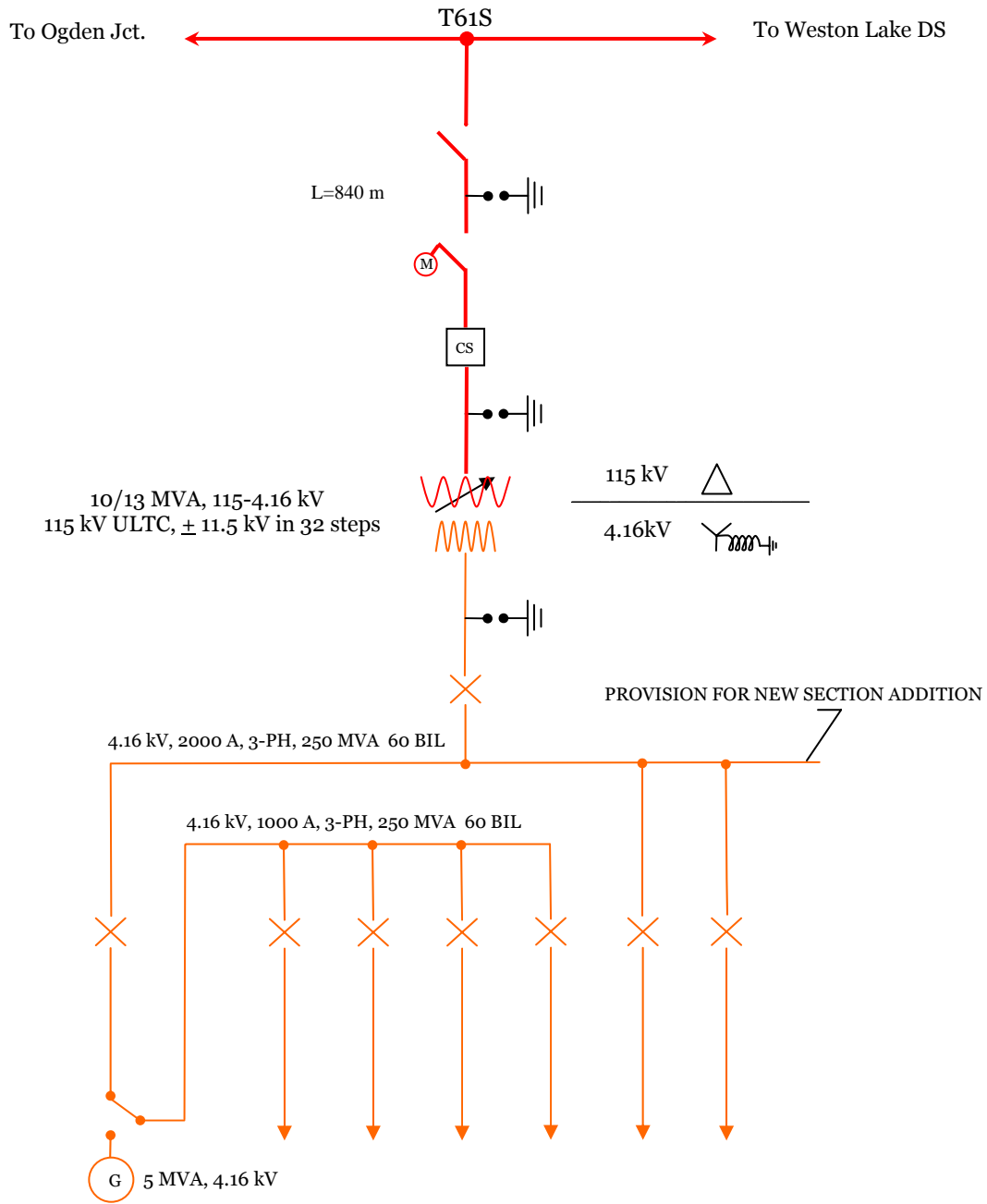


Diagram 2: Proposed Arrangement of the new Timmins West Mine CTS

Appendix A: Thermal Assessment Study Results

Table 5. Thermal Loading Study Results

<i>Year 2007, Timmins West Mine CTS NOT in-service</i>																
			Summer Continuous	Winter Continuous	Pre-contingency		Loss of H6T		Loss of H7T		Loss of P13T		Loss of P15T (Timmins K23 Bus)		Loss of T3 (Porcupine)	
Monitored Element			Amp	Amp	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint
Cct	From	To			(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
T61S	TIMM K23	TIMT61SJ	470	640	8	5.9	8	5.9	8	5.9	8	5.9	0	0	8	5.9
	TIMT61SJ	OGDEN J	470	640	3.1	2.3	3.1	2.3	3.1	2.3	3.1	2.3	0	0	3.1	2.3
	OGDEN J	WESTON L	470	640	2.9	2.2	2.9	2.2	2.9	2.1	2.9	2.2	0	0	3	2.2
	TIMT61SJ	SHINGT61	340	430	7.2	5.7	7.3	5.7	7.3	5.8	7.2	5.7	0	0	7.2	5.7
H7T	TIMM K23	WARKUS J	380	490	18.6	14.5	31.5	24.4	0	0	28.1	21.8	0	0	20.4	15.8
	WARKUS J	HUNTA	530	610	41.8	36.3	53.3	46.3	0	0	50.1	43.5	41.9	36.4	45.1	39.2
	WARKUS J	KD CK MI	640	700	33.2	30.3	33.1	30.2	0	0	33.3	30.4	34.7	31.7	33.6	30.7
H6T	TIMM K1	LAFORSTJ	380	490	27.7	21.5	0	0	48.3	37.5	0	0	32	24.9	31.2	24.2
	LAFORSTJ	TISDAL J	530	610	28.7	24.9	0	0	43.7	38	13.4	11.7	31.7	27.5	31.9	27.7
	TISDAL J	HUNTA	530	610	28.7	24.9	0	0	43.7	38	13.4	11.6	31.7	27.5	31.8	27.6
	LAFORSTJ	LAFORST	260	330	27.5	21.7	0	0	27.4	21.6	27.3	21.5	27.4	21.6	27.6	21.7
P15T	PORCUPIN	TIMM K23	890	1030	29	25.1	25.7	22.2	27.3	23.6	44.8	38.7	0	0	28	24.2
P13T	PORCUPIN	TIMM K1	890	1030	17	14.7	16.6	14.4	19.6	17	0	0	44	38	16.8	14.5
PORCUPINE T4	(MVA)		225	225	24.3	24.3	24.2	24.2	20.4	20.4	25.3	25.3	24.6	24.6	47.5	47.5

Table 6. Thermal Loading Study Results

<i>Year 2008, Timmins West Mine CTS IN-service</i>																
Monitored Element			Summer Continuous	Winter Continuous	Pre-contingency		Loss of H6T		Loss of H7T		Loss of P13T		Loss of P15T (Timmins K23 Bus)		Loss of T3 (Porcupine)	
Cct	From	To	Amp	Amp	Summ (%)	Wint (%)	Summ (%)	Wint (%)	Summ (%)	Wint (%)	Summ (%)	Wint (%)	Summ (%)	Wint (%)	Summ (%)	Wint (%)
T61S	TIMM K23	TIMT61SJ	470	640	13.9	10.2	13.9	10.2	13.8	10.2	13.9	10.2	0	0	14	10.3
	TIMT61SJ	OGDEN J	470	640	12.7	9.3	12.7	9.3	12.7	9.3	12.8	9.4	0	0	12.8	9.4
	OGDEN J	TIMMWM J	470	640	13	9.5	13	9.5	12.9	9.5	13	9.6	0	0	13.1	9.6
	TIMMWM J	WESTON L			2.9	2.1	2.9	2.1	2.9	2.1	2.9	2.1	0	0	2.9	2.1
	TIMT61SJ	SHINGT61	340	430	7.2	5.7	7.2	5.7	7.2	5.7	7.2	5.7	0	0	7.2	5.7
H7T	TIMM K23	WARKUS J	380	490	17.4	13.5	31.1	24.1	0	0	27.5	21.3	0	0	20.3	15.8
	WARKUS J	HUNTA	530	610	42.9	37.3	54.5	47.4	0	0	51.3	44.6	41.6	36.1	46.2	40.1
	WARKUS J	KD CK MI	640	700	33.3	30.5	33.2	30.4	0	0	0	30.6	34.5	31.5	33.6	30.7
H6T	TIMM K1	LAFORSTJ	380	490	27.6	21.4	0	0	48.7	37.8	33.4	30.6	31.7	24.6	32	24.8
	LAFORSTJ	TISDAL J	530	610	29.2	25.4	0	0	44.6	38.7	13.6	11.8	31.8	27.7	32.5	28.3
	TISDAL J	HUNTA	530	610	29.2	25.4	0	0	44.6	38.7	13.6	11.8	31.9	27.7	32.4	28.2
	LAFORSTJ	LAFORSTJ	260	330	27.5	21.7	0	0	27.4	21.6	27.7	21.8	27.8	21.9	27.7	21.8
P15T	PORCUPIN	TIMM K23	890	1030	35.2	30.4	31.9	27.6	33.7	29.1	50.4	43.5	0	0	34.3	29.6
P13T	PORCUPIN	TIMM K1	890	1030	15.2	13.1	16	13.8	17.5	15.2	0	43.5	44.3	38.3	15.4	13.3
PORCUPINE T4	(MVA)		225	225	26.4	26.4	26.6	26.6	22.9	22.9	27.8	27.8	24.8	24.8	52.4	52.4

Table 7. Additional Thermal Loading Study Results

<i>Year 2008, Maximized Output of the Generation Connected to Hunta SS Circuits</i>																
			Summer Continuous	Winter Continuous	Pre-contingency		Loss of P15T (Timmins K23 Bus)		Loss of P13T		Loss of H6T		Loss of H7T		Loss of T3 (Porcupine)	
Monitored Element			Amp	Amp	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint	Summ	Wint
Cct	From	To			(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
T61S	TIMM K23	TIMT61SJ	470	640	14	10.2	0	0	14.3	10.5	14	10.3	13.9	10.2	13.9	10.2
	TIMT61SJ	OGDEN J	470	640	12.8	9.4	0	0	13.3	9.7	12.8	9.4	12.8	9.4	12.7	9.3
	OGDEN J	TIMMWM J	470	640	13	9.6	0	0	13.6	10	13.1	9.6	13	9.6	13	9.5
	TIMMWM J	WESTON L	470	640	2.9	2.1	0	0	3	2.2	2.9	2.1	2.9	2.1	2.9	2.1
	TIMT61SJ	SHINGT61	340	430	7.2	5.7	0	0	6.2	4.9	7.2	5.7	7.2	5.7	7.2	5.7
H7T	TIMM K23	WARKUS J	380	490	45.8	35.5	0	0	37.4	29	77.8	60.4	0	0	47.5	36.8
	WARKUS J	HUNTA	530	610	67.4	58.5	40.7	35.4	51.6	44.8	89.8	78	0	0	68.3	59.4
	WARKUS J	KD CK MI	640	700	33.4	30.5	33.7	30.8	37.9	34.6	33.4	30.6	0	0	33.3	30.5
H6T	TIMM K1	LAFORSTJ	380	490	61	47.3	80	62	0	0	0	0	97.9	75.9	62.6	48.6
	LAFORSTJ	TISDAL J	530	610	53.8	46.7	67.2	58.3	15.9	13.8	0	0	79.8	69.3	54.8	47.6
	TISDAL J	HUNTA	530	610	53.8	46.7	67.1	58.3	15.8	13.8	0	0	79.8	69.3	54.8	47.6
	LAFORSTJ	LAFORST	260	330	27.6	21.7	27.8	21.9	32.3	25.5	0	0	27.6	21.7	27.5	21.7
P15T	PORCUPIN	TIMM K23	890	1030	26	22.5	0	0	64	55.3	27.3	23.6	32.7	28.2	26	22.5
P13T	PORCUPIN	TIMM K1	890	1030	22.2	19.2	41	35.4	0	0	16.7	14.4	34.8	30.1	22.8	19.7

Appendix B: Voltage Assessment Study Results

Table 8. Voltage Decline Study Results

<i>Year 2007, Timmins West Mine NOT in-service</i>													
Monitored Bus	Pre-contingency	Loss of T3 (Porcupine)				Loss of P15T				Loss of P13T			
	(kV)	Pre ULTC	dV (%)	Post ULTC	dV (%)	Pre ULTC	dV (%)	Post ULTC	dV (%)	Pre ULTC	dV (%)	Post ULTC	dV (%)
PORCUPIN 118	127.3	124.5	-2.2	126.4	-0.7	126.7	-0.5	126.7	-0.5	127.5	0.2	127.5	0.2
TIMM K23 118	126.7	123.9	-2.2	125.8	-0.7	0		0		126.4	-0.2	126.4	-0.2
TIMM K1 118	126.7	124	-2.1	125.8	-0.7	125.5	-0.9	125.4	-1.0	0		0	
HUNTA 118	128.6	127.4	-0.9	128.1	-0.4	127.0	-1.2	127	-1.2	128.3	-0.2	128.3	-0.2
SHINGT61 118	126.9	124.1	-2.2	125.9	-0.8	0		0		126.6	-0.2	126.6	-0.2
KD CK MI 118	124.9	122.5	-1.9	124	-0.7	120.0	-3.9	120.2	-3.8	124.5	-0.3	124.5	-0.3
LAFORST 118	126.6	124	-2.1	125.7	-0.7	125.3	-1.0	125.2	-1.1	125.3	-1.0	125.3	-1.0
WARKUS J 118	125.4	123	-1.9	124.6	-0.6	120.6	-3.8	120.8	-3.7	125.0	-0.3	125	-0.3
TISDAL J 118	126.6	124.1	-2.0	125.8	-0.6	125.3	-1.0	125.2	-1.1	125.5	-0.9	125.5	-0.9
SHINGTRE24.9	25.3	24.7	-2.4	25.1	-0.8	0		0		25.3	0.0	25.3	0.0
WESTON B24.9	25.5	24.9	-2.4	25.3	-0.8	0		0		25.4	-0.4	25.4	-0.4
KD CK MI13.8	14.3	14	-2.1	14.2	-0.7	13.7	-4.2	13.9	-2.8	14.3	0.0	14.3	0.0
KD CK MI4.20	4.3	4.2	-2.3	4.3	0	4.2	-2.3	4.2	-2.3	4.3	0.0	4.3	0.0
LAFORST27.6	28	27.7	-1.1	28.9	3.2	28.0	0.0	28.0	0.0	28.0	0.0	28.0	0.0
TIMM QZ 27.6	28.6	28	-2.1	28.4	-1	26.5	-7.5	27.9	-2.3	27.8	-2.7	27.8	-2.7

Table 9. Voltage Decline Study Results

<i>Year 2008, Timmins West Mine CTS IN-service</i>													
Monitored Bus	Pre-contingency	Loss of T3 (Porcupine)				Loss of P15T (Timmins K23 Bus)				Loss of P13T			
	(kV)	Pre ULTC	dV (%)	Post ULTC	dV (%)	Pre ULTC	dV (%)	Post ULTC	dV (%)	Pre ULTC	dV (%)	Post ULTC	dV (%)
PORCUPIN 118	126.7	123.6	-2.4	126.1	-0.5	126.6	-0.1	126.5	-0.2	126.8	0.1	126.8	0.1
TIMM K23 118	125.9	122.8	-2.5	125.3	-0.5	0		0		125.6	-0.2	125.6	-0.2
TIMM K1 118	126.2	123.2	-2.4	125.6	-0.5	125.3	-0.7	125.2	-0.8	0		0	
HUNTA 118	128.4	127	-1.1	128.1	-0.2	127.1	-1.0	127.2	-0.9	128.2	-0.2	128.2	-0.2
SHINGT61 118	126.1	123	-2.5	125.5	-0.5	0		0		125.8	-0.2	125.8	-0.2
TIMMWM J 118	125.2	122.1	-2.5	124.6	-0.5	0		0		124.9	-0.2	124.9	-0.2
KD CK MI 118	124.3	121.6	-2.2	123.7	-0.5	120.3	-3.2	120.4	-3.1	123.9	-0.3	123.9	-0.3
LAFOREST 118	126.1	123.2	-2.3	125.5	-0.5	125.2	-0.7	125.1	-0.8	125.2	-0.7	125.2	-0.7
WARKUS J 118	124.8	122.2	-2.1	124.2	-0.5	120.8	-3.2	121	-3.0	124.4	-0.3	124.4	-0.3
TISDAL J 118	126.1	123.3	-2.2	125.6	-0.4	125.2	-0.7	125.1	-0.8	125.3	-0.6	125.3	-0.6
SHINGTRE24.9	25.9	25.2	-2.7	25.8	-0.4	0		0		25.9	0.0	25.9	0.0
WESTON B24.9	25.6	25	-2.3	25.5	-0.4	0		0		25.6	0.0	25.6	0.0
TIMMWM L4.20	4.2	4.1	-2.4	4.3	2.4	0		0		4.2	0.0	4.2	0.0
KD CK MI13.8	14.3	14	-2.1	14.3	0.0	13.8	-3.5	14	-2.1	14.3	0.0	14.3	0.0
KD CK MI4.20	4.4	4.3	-2.3	4.3	-2	4.2	-4.5	4.2	-4.5	4.3	-2.3	4.3	-2.3
LAFOREST27.6	28.6	27.9	-2.4	28.5	-0.3	28.4	-0.7	28.4	-0.7	28.4	-0.7	28.4	-0.7
TIMM QZ 27.6	28.7	28.0	-2.6	28.6	-0.5	26.4	-8.1	27.8	-3.1	28.0	-2.6	28.0	-2.6

– End of Section –