REPORT

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System Impact Assessment Report

Connection Assessment & Approval Process

Final

Project: Williams Mine 115 kV Line Relocation CAA ID 2009-372
Applicant: Barrick Gold Corporation-Williams Mine

IESO Market Facilitation Department

Date: November 2nd, 2009

System Impact Assessment Report

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 conditional approval or disapproval of the proposed connection under Chapter 4, section 6 of the Market Rules.

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

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

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

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

Hydro One

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

The 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.

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

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

Summary

Barrick Gold Corporation-Williams Mine ("Williams Mine") is to relocate the 115 kV transmission line supplying the Williams Mine in North West zone of the IESO-controlled grid. The proposed new line will be constructed to connect to existing 115 kV tap line supplying power to David Bell Mine.

Williams Mine is presently connected to the 115 kV circuit M2W through a 1.4 km long tap line. The Applicant has proposed to relocate the line by connecting Williams Mine load to a new 115 kV line which will be connected to the existing tap line supplying power to David Bell Mine. This tap is connected to M2W at P209A.The tap line is 2.03 km long and is owned by David Bell Mine. The new line for Williams Mine will be tapped from David Bell Mine tap at 1km from P209A at pole number 10. The Applicant has proposed to construct the 1.24 km of the new line using 211.06 kcmil ACSR conductor.

Findings

This SIA finds that no network additions or modifications are required to satisfy IESO's reliability standards for the incorporation of the Project.

The following conclusions were made.

(1) The incorporation of the Project does not cause any thermal concerns for the transmission system.

(2) With the incorporation of the Project, the pre-contingency and post-contingency system voltages in the area will be within acceptable ranges.

(3) With the incorporation of the Project, the voltage sag during motor starting is expected to be within acceptable limits.

Conclusions and IESO Requirements

Notification of Approval

The proposed relocation of 115 kV line, subject to the requirements specified in this report, is expected to have no material adverse effect on the reliability of the integrated power system.

It is recommended that a *Notification of Conditional Approval for Connection* be issued for the Williams Mine project subject to implementation of the requirements described below under the heading "IESO Requirements".

IESO's Requirements

A. Williams Mine

The IESO has the following requirements:

1. The high voltage connection equipment must be capable of continuously operating in the range between 113 kV and 132 kV (Appendix 4.1, Reference 2 of the Market Rules).

   More specifically, this means:

   - Connection equipment must have a maximum continuous voltage rating of at least 132 kV,
   - Equipment must be able to interrupt rated fault current for voltages up to the maximum continuous rating.

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

   Connection equipment must be designed so that it will be fully operational in all reasonably foreseeable ambient temperature conditions.

3. In accordance with the telemetry requirements for a *wholesale Customers* (Appendix 4.17 of the Market Rules), Williams Mine must continue to provide telemetry data to the IESO. The data is to consist of certain equipment status and MWs and MVARs.

4. The Market Rules (Appendix 4.3) require that the connection applicant have the capability to maintain a power factor (pF) within the range of 0.9 lagging and 0.9 leading as measured at the defined metering point of this facility.

Table of Contents

1. Introduction

Williams Mine is located at approximately 35.5 km from the 115kV Marathon TS in the North West zone of the IESO-controlled grid. The mine load primarily consists of induction and synchronous motors and the peak load of the mine is 31.4 MW. The mine is being supplied from M2W circuit through the 1.4 km long tap line. The Applicant has proposed to relocate this tap line.

The new line will emanate from the existing 115kV tap line supplying power to David Bell Mine. It will be constructed using 211.6 kcmil ACSR and will measure 1.24 km.

The purpose of this System Impact Assessment (SIA) is to examine the effect of the proposed Williams Mine 115 kV line relocation on the reliability of the integrated power system.

In particular, this report assesses the changes in the proposed connection arrangement, thermal capability of lines and voltage declines against the Market Rules standards, and assesses the impact of the proposed facility on the local transmission system.

The report also provides Williams Mine a list of requirements to the proposal to ensure that the new facility, when connected, will not have a material adverse effect on the reliability of the integrated power system.

– End of Section –

2. Proposed Project Details

Williams Mine is being supplied from 115 kV M2W circuit through a1.4km long tap line owned by Williams Mine. Currently the 115 kV line passes through the stock pile of waste rock and removal of line will provide additional space for waste rock and also mitigate the potential safety issues.

The existing 115 kV Williams Mine tap is connected to circuit M2W at P200A. The Applicant has proposed to relocate the line by connecting the Williams Mine load to a new 115 kV line which will be connected to the existing tap line supplying power to David Bell Mine. This tap is connected to M2W at P209A.This tap line has a length of 2.03 km and is owned by David Bell Mine.

The new line for Williams Mine will be tapped from the David Bell Mine tap at a distance of 1km from P209A at pole number 10.

The Applicant has proposed to construct the new line using 211.06 kcmil ACSR conductor and will measure 1.24 km.

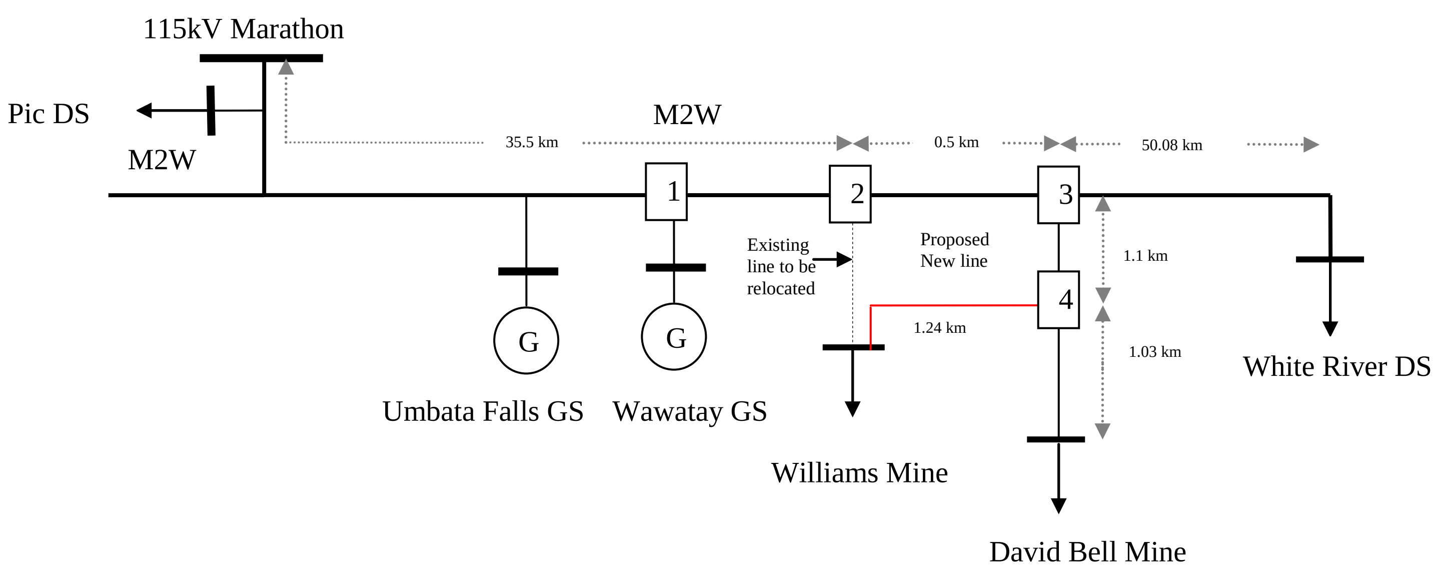

Figure.1

1	Black River Junction
2	Williams Mine Junction
3	Hemlo Mine Junction
4	David Bell Mine Junction

3. SIA Methodology

3.1 Study Assumptions

The following assumptions were made in the IESO studies:

Base Case: Summer 2010 base case was used as a starting point with the following assumptions made based on data provided by the HONI and the Applicant.

Load data

- Peak load at White River DS is 9.1 MVA
- Peak load at David Bell Mine is 5.9 MVA
- Peak load at Williams Mine is 34.8 MVA
- Conductor size for new line is 211.6 kcmil ACSR.

Tap Position

- Williams Mine transformer tap position is set to 0.9911 p.u which corresponds to tap 4 position of the OLTC.

3.2 Study Criteria

To assess the impact of the proposed 115 kV line relocation, technical criteria defined in the IESO Ontario Resource and Transmission Assessment Criteria document were used. This document can be found on the IESO web site at

http://www.ieso.ca/imoweb/pubs/marketAdmin/IMO_REQ_0041_TransmissionAssessmentCriteria.pdf.

For the voltage analysis, after a recognized single or double-element contingency, with all facilities in service pre-contingency, system post-contingency voltage declines (500 kV, 230 kV and 115 kV) must be limited to a 10% voltage change before tap changer action (pre-ULTC) and after tap changer action (post-ULTC). At transformer stations, post-contingency voltage declines (44 kV, 27.6 kV and 13.8 kV) must be limited to a 10% voltage change pre-ULTC and a 5% voltage change post-ULTC.

For the thermal analysis with all transmission elements in service, all circuit loadings must be less than their continuous ratings. Following a contingency the circuit loadings must be less than their short term emergency ratings (STE) if there are post-contingency control actions available to reduce the loadings to within their long term emergency ratings (LTE). Otherwise, following a contingency the loadings must be less than their LTE.

3.3 Study Tools, Data & Models

The Siemens PSS/E software program was used by the IESO to complete the studies.

The relocated line was modeled in PSS/E using data provided by the Applicant.

4. Load Flow Assessment

Load flow studies were carried out to assess whether the proposed 115kV line relocation materially impacts the reliability of the integrated power system. This included examining the voltage performance of the power system and the thermal loading of transmission circuits for pre-contingency and post-contingency conditions.

4.1 Steady State Voltage analysis

The voltage performance of the IESO-controlled grid after the relocation of 115 kV line was evaluated by examining steady state voltage levels with various elements out of service. No abnormality was detected in voltages with various elements out of service. Detailed results are depicted in Table 4.1

Table 4.1: 115 kV Bus Voltages

			All elements I/S		Umbata Falls O/S		Umbata Falls GS O/S Wawatay GS O/S		Wawatay GS O/S Umbata Falls GS I/S		One Marathon Transformer O/S Both GS O/S	
BUS#	NAME	BASKV	V(PU)	V(KV)	V(PU)	V(KV)	V(PU)	V(KV)	V(PU)	V(KV)	V(PU)	V(KV)
9112	MARATHON_TS	220	1.0812	237.86	1.0418	229.19	1.0273	226.01	1.0678	234.91	1.0257	225.66
9340	WAWATAY_CGS	118.05	1.0387	122.62	1.0273	121.28	1.0145	119.77	1.027	121.24	1.0142	119.73
9390	WILLIAMS_MIN	118.05	0.9892	116.78	0.9771	115.34	0.9666	114.11	0.9799	115.68	0.9663	114.07
9677	WILLIAM_M_L1	4.16	0.9605	3.996	0.9477	3.942	0.9366	3.896	0.9507	3.955	0.9362	3.895
9743	DAVID_BELL	4.16	0.9216	3.834	0.9095	3.784	0.8991	3.74	0.9123	3.795	0.8988	3.739
9306	MARATHON_TS	118.05	1.0456	123.43	1.0472	123.62	1.0458	123.45	1.0449	123.35	1.0455	123.42
9364	UMBATA_FALLS	118.05	1.0512	124.1	1.0263	121.15	1.017	120.06	1.0431	123.14	1.0167	120.02
9471	DAVID_BELL	118.05	0.9904	116.92	0.9783	115.49	0.9679	114.26	0.9811	115.82	0.9675	114.22
9678	WILLIAM_M_L2	13.8	0.9677	13.355	0.955	13.179	0.944	13.027	0.958	13.22	0.9436	13.022

Note: Voltage analysis has been performed with non coincident peak load to simulate the worst scenario. The voltages depicted in the results are the lowest possible under very conservative load conditions. If the non coincident peak loads are experienced on circuit M2W, Williams Mine may change the tap position to regulate the voltage on low voltage buses.

4.2 Contingency Analysis

Voltages at 115 kV busses can be impacted adversely by various contingencies, and tests were done to assess the voltage declines when a contingency is suffered in the areas adjoining to Williams Mine.

The voltage performance of the 115 kV transmission system was assessed in accordance with the IESO's Ontario Resource and Transmission Assessment Criteria as described above.

Loads in this study were represented by *Constant MVA load* in immediate post-contingency and post-ULTC states.

Note: In the tables negative sign in percentage change in voltage depicts the decline in voltage whereas positive sign in the percentage change shows rise in voltage based on pre-contingency voltage**.**

Scenario I

With both auto transformers at 230kV /115 kV Marathon TS and Wawatay GS in service but capacitor banks SC29 and SC21 at Marathon TS out of service, if Umbata Falls is lost, the post contingency pre ULTC and post ULTC voltage declines remain below 10 % and minimum 115 kV bus voltages stay above 108 kV as required by Ontario Resource and Transmission Assessment Criteria.

Table 4.2: Loss of Umbata Fall GS

			Pre-contingency		Pre-ULTC		%	Post-ULTC		%
Bus No.	Bus Name	Base kV	V(p.u)	V(kV)	V(p.u)	V(kV)	Change	V(p.u)	V(kV)	Change
9112	MARATHON_TS	220	1.0812	237.86	1.0683	235.04	-1.19	1.0634	233.96	-1.64
9340	WAWATAY_CGS	118.05	1.0387	122.62	1.0088	119.09	-2.88	1.0333	121.98	-0.52
9390	WILLIAMS_MIN	118.05	0.9892	116.78	0.9571	112.99	-3.25	0.9834	116.09	-0.59
9677	WILLIAM_M_L1	4.16	0.9605	3.996	0.9266	3.855	-3.53	0.9544	3.97	-0.65
9743	DAVID_BELL	4.16	0.9216	3.834	0.8897	3.701	-3.47	0.9158	3.81	-0.63
9306	MARATHON_TS	118.05	1.0456	123.43	1.0294	121.52	-1.55	1.0529	124.3	0.70
9364	UMBATA_FALLS	118.05	1.0512	124.1	1.0077	118.96	-4.14	1.0322	121.85	-1.81
9471	DAVID_BELL	118.05	0.9904	116.92	0.9584	113.14	-3.23	0.9847	116.24	-0.58
9678	WILLIAM_M_L2	13.8	0.9677	13.355	0.9341	12.89	-3.48	0.9616	13.271	-0.63

Scenario II

Under the conditions when all the autotransformers at Marathon TS are in service and capacitor banks SC29 and SC21 and Wawatay GS are out of service, if Umbata Falls GS suffers a contingency, the worst pre-ULTC and post-ULTC voltage decline is at the Williams Mine 115 kV bus.

For this contingency, the Marathon 115 kV voltages are above minimum required voltage level of 120 kV and all other surrounding 115 kV bus voltages stay above 108 kV for pre-ULTC and post-ULTC conditions. The voltage declines are less than 10% for pre and post-ULTC. Table 6.2 shows the percentage change in voltages with reference to pre-contingency voltage levels.

Table 4.3: Loss of Umbata Falls GS with Wawatay GS out of service

			Pre-contingency		Pre-ULTC		%	Post-ULTC		%
Bus No.	Bus Name	Base kV	V(p.u)	V(kV)	V(p.u)	V(kV)	Change	V(p.u)	V(p.u)	Change
9112	MARATHON_TS	220	1.0678	234.91	1.0519	231.42	-1.49	1.0479	230.53	-1.86
9340	WAWATAY_CGS	118.05	1.027	121.24	0.9931	117.23	-3.31	1.0193	120.33	-0.75
9390	WILLIAMS_MIN	118.05	0.9799	115.68	0.9436	111.39	-3.71	0.9717	114.71	-0.84
9677	WILLIAM_M_L1	4.16	0.9507	3.955	0.9121	3.795	-4.05	0.942	3.919	-0.91
9743	DAVID_BELL	4.16	0.9123	3.795	0.8762	3.645	-3.95	0.9042	3.761	-0.90
9306	MARATHON_TS	118.05	1.0449	123.35	1.0254	121.04	-1.87	1.0503	123.99	0.52
9364	UMBATA_FALLS	118.05	1.0431	123.14	0.9956	117.53	-4.56	1.0218	120.62	-2.05
9471	DAVID_BELL	118.05	0.9811	115.82	0.9449	111.54	-3.70	0.9729	114.86	-0.83
9678	WILLIAM_M_L2	13.8	0.958	13.22	0.9198	12.693	-3.99	0.9493	13.101	-0.90

Scenario III

Table 6.3 shows the change in voltage as compared to pre-contingency voltage when both Wawatay and Umbata Falls GS are out of service and one of the autotransformers at 230 kV/ 115 kV Marathon TS suffers a contingency. Both capacitor banks at Marathon TS are out of service pre-contingency.

There is no significant effect on the pre and post-ULTC voltage levels.

Table 4.4: Voltages for the loss of one Auto transformer at Marathon TS

			Pre-contingency		Pre-ULTC		%	Post-ULTC		%
Bus No.	Bus Name	Base kV	V(p.u)	V(kV)	V(p.u)	V(kV)	Change	V(p.u)	V(p.u)	Change
9112	MARATHON_TS	220	1.0277	226.09	1.0278	226.11	0.01	1.0258	225.68	-0.18
9340	WAWATAY_CGS	118.05	1.0148	119.8	1.0015	118.23	-1.31	1.0143	119.74	-0.05
9390	WILLIAMS_MIN	118.05	0.9669	114.14	0.9526	112.46	-1.47	0.9664	114.08	-0.05
9677	WILLIAM_M_L1	4.16	0.9369	3.898	0.9218	3.835	-1.62	0.9363	3.895	-0.08
9743	DAVID_BELL	4.16	0.8994	3.742	0.8852	3.683	-1.58	0.8989	3.739	-0.08
9306	MARATHON_TS	118.05	1.046	123.48	1.0334	121.99	-1.21	1.0455	123.43	-0.04
9364	UMBATA_FALLS	118.05	1.0173	120.09	1.004	118.52	-1.31	1.0168	120.03	-0.05
9471	DAVID_BELL	118.05	0.9682	114.29	0.9539	112.61	-1.47	0.9676	114.23	-0.05
9678	WILLIAM_M_L2	13.8	0.9443	13.032	0.9293	12.824	-1.60	0.9437	13.024	-0.06

Scenario IV

For both Umbata Falls and Wawatay GS out of service and capacitor banks SC29 and SC21 in service at Marathon TS, loss of one auto transformer along with the capacitor bank will result in voltage declines at all 115kV buses. The results of post contingency voltage declines are depicted in Table 6.4. The most significant voltage decline is at the 115 kV bus at Williams Mine for the pre-ULTC scenario.

Table 4.5: Umbata Falls GS (Contingency)

			Pre-contingency		Pre-ULTC		%	Post-ULTC		%
Bus No.	Bus Name	Base kV	V(p.u)	V(kV)	V(p.u)	V(kV)	Change	V(p.u)	V(p.u)	Change
9112	MARATHON_TS	220	1.1085	243.86	1.084	238.47	-2.21	1.0829	238.23	-2.31
9340	WAWATAY_CGS	118.05	1.0361	122.31	0.9986	117.88	-3.62	1.0112	119.38	-2.40
9390	WILLIAMS_MIN	118.05	0.9896	116.83	0.9495	112.09	-4.06	0.9631	113.69	-2.69
9677	WILLIAM_M_L1	4.16	0.9609	3.998	0.9185	3.821	-4.43	0.9328	3.881	-2.93
9743	DAVID_BELL	4.16	0.922	3.836	0.8821	3.67	-4.33	0.8956	3.726	-2.87
9306	MARATHON_TS	118.05	1.0663	125.88	1.0306	121.66	-3.35	1.0426	123.08	-2.22
9364	UMBATA_FALLS	118.05	1.0385	122.6	1.0011	118.18	-3.61	1.0137	119.67	-2.39
9471	DAVID_BELL	118.05	0.9909	116.97	0.9508	112.24	-4.04	0.9643	113.84	-2.68
9678	WILLIAM_M_L2	13.8	0.9682	13.361	0.926	12.779	-4.36	0.9403	12.976	-2.88

Scenario V

For both Umbata Falls and Wawatay GS out of service, only one capacitor bank at Marathon TS in service and with both autotransformers in service, loss of an autotransformer will result in loss of a capacitor bank by configuration, removing the reactive power resource, hence the voltage declines will be the worst. Even so, the tests show that voltage declines remain within the required range and the worst voltage decline is at the Williams Mine 4.16 kV bus with pre-ULTC voltage change of 6.47%.

Table 4.6: Loss of One Transformer and Capacitor bank at Marathon TS

			Pre-contingency		Pre-ULTC		%	Post-ULTC		%
Bus No.	Bus Name	BasekV	V(p.u)	V(kV)	V(p.u)	V(kV)	Change	V(p.u)	V(p.u)	Change
9112	MARATHON_TS	220	1.083	238.27	1.0586	232.89	-2.26	1.0537	231.82	-2.71
9340	WAWATAY_CGS	118.05	1.0246	120.96	0.9709	114.61	-5.25	1.0107	119.31	-1.36
9390	WILLIAMS_MIN	118.05	0.9774	115.38	0.9196	108.56	-5.91	0.9625	113.62	-1.53
9677	WILLIAM_M_L1	4.16	0.948	3.944	0.8867	3.689	-6.47	0.9322	3.878	-1.67
9743	DAVID_BELL	4.16	0.9098	3.785	0.8523	3.546	-6.31	0.895	3.723	-1.64
9306	MARATHON_TS	118.05	1.0553	124.58	1.0044	118.57	-4.82	1.0421	123.02	-1.25
9364	UMBATA_FALLS	118.05	1.0271	121.25	0.9735	114.92	-5.22	1.0132	119.6	-1.36
9471	DAVID_BELL	118.05	0.9786	115.53	0.921	108.72	-5.89	0.9637	113.77	-1.52
9678	WILLIAM_M_L2	13.8	0.9553	13.183	0.8945	12.345	-6.36	0.9397	12.967	-1.64

4.3 Thermal Analysis

Thermal analysis was done to identify any thermal limit violations due to relocation of 115kV tap line. Non coincident peak load was used for Williams Mine, David Bell Mine and White River DS to assess the thermal loading of the transmission line.

From the configuration of the line, it is evident that only sections from William Mine Junction to Hemlo Junction and Hemlo Junction to David Bell Mine will have an increase in load due to the proposed change in the connection point of the Williams Mine load. No contingency would impact on the loading on these sections, therefore only the pre-contingency analysis has been conducted.

Hence the analysis has been conducted to estimate the loading in these sections only.

The ratings for the conductors are based on the temperatures and wind speed given below:

From	To	Wind	Ambient Temp	Conductor Temp
Black River Junction	Williams Mine Junction	4 km/hr	30°C	135°C
Williams Mine Junction	Hemlo Mine Junction	15 km/hr	30°C	135°C
Hemlo Mine Junction	David Bell Mine	Provided by H1		60°C
Williams Mine	David Bell Junction	Provided by applicant		
Hemlo Mine Junction	White River	4 km/hr	30°C	82°C

For peak loads at Williams Mine, David Bell Mine and White River DS the line loadings are shown in Table 4.6. The maximum loading is on the section between David Bell Junction and Hemlo Mine Junction.

This line section carries the sum of the loads of Williams Mine and David Bell Mine. At peak load this section is 79% loaded.

Table 4.6: Thermal loading of lines

					CURRENT(MVA)					
	FROM BUS		TO BUS		Before Line relocation			After Line relocation		
BUS#	NAME	BASKV	BUS#	NAME	LOADING	RATING	PERCENT	LOADING	RATING	PERCENT
9339	BLACK_R_JM2W	118.05	9389	WILLIAMS_M_J	51.6	96.7	53.36	51	96.7	52.74
9389	WILLIAMS_M_J	118.05	9418	HEMLO_MINE_J	15.5	100.18	15.47	51	100.18	50.9
9390	WILLIAMS_MIN	118.05	9470	DAVID_BELL_J	New Line			35.8	63.8	56.11
9418	HEMLO_MINE_J	118.05	9470	DAVID_BELL_J	6.2	53.2	11.65	42	53.2	78.94
9418	HEMLO_MINE_J	118.05	9482	WHITE_RIVER	10.4	67.4	15.43	10.2	67.4	15.13

–– End of Section–

5. Motor Starting

The load at Williams Mine consists of synchronous, induction and DC drive motors ranging from 750 to 5250 KW. As per the information provided by the Applicant all the motors are staggered for starting and are started at full voltage, except for the DC drive motor.

Williams Mine has four 2625 KW synchronous motors which are staggered and are started at full voltage. Loadflow tests were performed to predict the voltage dip due to starting of one of the synchronous motors when all other motors are running and David Bell Mine is operating at its peak load.

The largest voltage drop is at Williams Mine, where the 115 kV voltage drops to 114.52 kV from 118.02 kV voltage before start-up. Table 7.1 shows the voltage levels at other 115 kV busses and 230 kV Bus at Marathon TS.

The voltage drops at motor starting are acceptable.

Table 5.1 : Voltage decline due to motor start-up

			Before Motor Start-up		After Motor Start-up	
BUS#	NAME	BASKV	V(PU)	V(KV)	V(PU)	V(KV)
9112	MARATHON_TS	220	1.0834	238.34	1.0757	236.65
9340	WAWATAY_CGS	118.05	1.0448	123.33	1.027	121.24
9390	WILLIAMS_MIN	118.05	0.9998	118.02	0.9701	114.52
9677	WILLIAM_M_L1	4.16	0.9765	4.062	0.9171	3.815
9743	DAVID_BELL	4.16	0.9319	3.877	0.9048	3.764
9306	MARATHON_TS	118.05	1.0488	123.81	1.0373	122.45
9364	UMBATA_FALLS	118.05	1.057	124.78	1.0409	122.87
9471	DAVID_BELL	118.05	1.0008	118.14	0.9718	114.72
9678	WILLIAM_M_L2	13.8	0.9834	13.572	0.9249	12.764

– End of Section–

6. Fault Level Assessment

With Williams Mine's load predominantly consisting of induction and sychronous motors, connected to the same tap line as David Bell Mine , the fault level at David Bell Mine is bound to rise. No test has been done to assess the increase in fault level at David Bell Mine but the Applicant is strongly encouraged to get the fault levels assessed at their load to ensure that equipment at David Bell Mine and Williams Mine are adequate to carry and interrupt the fault currents.

– End of Section–

– End of Report–