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CONNECTION ASSESSMENT & APPROVAL PROCESS

PRELIMINARY ASSESSMENT REPORT - 3rd Addendum

*Victor Mine Project: Review of the Supply Capability to the Victor Mine
under various system operating conditions*

Applicant: De Beers Canada Exploration Inc.

CAA ID No. 2002-086

Transmission Assessments & Performance Department

FINAL Version

Date: 4th September 2007

Preliminary Assessment Report: 3rd Addendum

Review of the Supply Capability to the Victor Mine

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 proposed change in the connection applicant's connection to the IESO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether the IESO should revise its notice of approval of the proposed connection under Chapter 4, section 6 of the Market Rules.

The IESO assumes no responsibility for the accuracy or completeness of the information provided by Hydro One Networks Inc. that was used in this assessment. Furthermore, should changes occur to this information, or if additional information should become available after approval has been granted, then the connection approval would be subject to further consideration. 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 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.

Hydro One

Special Notes and Limitations of Study Results

The results reported in this Addendum to the Preliminary Assessment are based on the information available to Hydro One, at the time of the study, suitable for an assessment of the impact of the new transmission facilities on the system.

PRELIMINARY ASSESSMENT REPORT: 3rd Addendum

For the Victor Mine Project: A review of the supply capability to the Mine under various operating conditions

1. Conclusions and Recommendations

This Addendum summarises the results of the analysis to review the maximum load that could be supplied at the Victor Mine under various operating conditions during the interim period while the new transmission facilities between Otter Rapids GS and Kashechewan S/S are being completed.

While the original Preliminary Assessment and the subsequent Addenda assumed a peak load of 29.7MW at Moosonee and the Five Nations communities corresponding to the forecast value for 2020, this Addendum has used a value of 20.4MW. This corresponds to the peak loads that were recorded during the winter of 2006/2007 of approximately 12.5MW at Moosonee and 5.5MW at the Five Nations communities, together with nominal increases to allow for future growth during the review period as well as a possible change in the status of the Kashechewan community.

The results from the analysis have been summarised in the following Table.

This shows that with the peak loads that are expected to occur during the review period, the maximum load that could be supplied at the mine would need to be restricted to **10MW** until at least one of the new lines is placed in-service.

Once either of the new lines becomes available, it would then be possible to supply the specified maximum load of **20MW** at the mine, conditional on the number of SVCs that are available at the mine.

Maximum Load that could be supplied at the Victor Mine			
		<i>No. of SVCs</i>	<i>Maximum Load that could be supplied</i>
<i>With the 'Present' Peak Load of 20.4MW at Moosonee & the Five Nations Communities</i>			
1.	With only the existing transmission facilities	2 or 3	10MW
2.	With only the Otter Rapids to Moosonee line	2 or 3	Specified Maximum Load of 20MW
3.	With only the Moosonee to Kashechewan line	2	19MW
		3	Specified Maximum Load of 20MW
4.	With both the Otter Rapids to Moosonee & the Moosonee to Kashechewan line	2 or 3	Specified Maximum Load of 20MW
<i>With the Forecast Peak Load for 2020 of 29.7MW at Moosonee & the Five Nations Communities</i>			
5.	With both the Otter Rapids to Moosonee & the Moosonee to Kashechewan line	2 or 3	Specified Maximum Load of 20MW

The Table also shows the results of a study with the loads at Moosonee and the Five Nations communities increased to the levels forecast for 2020. This study has confirmed that with both new lines in-service, the system would be capable of supplying the specified maximum load of 20MW at the Victor Mine with only two of the SVCs in-service.

2. Introduction

Diagram 1 shows the arrangement that has been adopted by De Beers Canada Exploration Inc. for the supply to the Victor Mine and for which a Notification of Approval to Connect has been issued by the IESO.

All of the new transmission facilities identified in Diagram 1 are presently under construction although their actual completion is expected to be staged. De Beers Canada Exploration Inc. has therefore requested the IESO to quantify the capability of the existing transmission facilities to supply the Mine, both with and without the new facilities in-service under different scenarios for the staged completion of these new facilities.

3. Load Forecast

In the analysis performed for the earlier Assessments, the estimated loads that were assumed at Moosonee and the Five Nations communities had been extracted from the SNC-Lavalin Inc. Report dated September 1997, and were as summarised in the following Table:

Forecast Loads					
<i>Location</i>		<i>2006</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>
Moosonee	<i>Power Factor: 0.975</i>	14.4MW 3.3MVA _r	15.0MW 3.4MVA _r	15.8MW 3.6MVA _r	16.6MW 3.8MVA _r
Fort Albany		1.9MW 0.4MVA _r	2.3MW 0.5MVA _r	2.8MW 0.6MVA _r	3.5MW 0.8MVA _r
Kashechewan		2.2MW 0.5MVA _r	2.8MW 0.6MVA _r	3.5MW 0.8MVA _r	4.4MW 1.0MVA _r
Attawapiskat		2.6MW 0.6MVA _r	3.2MW 0.7MVA _r	4.1MW 0.9MVA _r	5.2MW 1.2MVA _r
<i>Total</i>		<i>21.1MW 4.8MVA_r</i>	<i>23.3MW 5.3MVA_r</i>	<i>26.2MW 6.0MVA_r</i>	<i>29.7MW 6.8MVA_r</i>

However, during the past year, following the temporary relocation of some of the residents from Kashechewan, the peak flows on circuits C6R & M3K, as recorded at Abitibi Canyon GS & Moosonee DS, were 23MW and 8MW, respectively. These flows included a 2MW supply to the Victor Mine.

For this particular flow distribution and after allowing for the transmission system losses incurred over the existing facilities north of Abitibi Canyon GS, the present peak load at Moosonee DS would therefore be approximately 12.5MW. Similarly the peak loads at Fort Albany, Kashechewan & Attawapiskat would total approximately 5.5MW.

Even after discounting the unique situation at Kashechewan, it is apparent that the peak loads at Moosonee and the other Five Nations Communities have not developed as fast as had been forecast in the earlier SNC-Lavalin Report.

It was therefore decided that the assessment of the supply capability to the Victor Mine during the *interim* period while the new transmission facilities are completed and placed in-service would use the loads as summarised in the following Table. These loads have been increased beyond the peak values that were recorded during the past year to provide some margin to accommodate limited growth during the review period as well as a possible change in the status of the Kashechewan community:

<i>'Present' Peak Loads (based on those recorded during the winter 2006/2007 year)</i>			
<i>Location</i>	<i>Power Factor</i>	<i>Peak Demand</i>	
Moosonee	0.975	14.4MW	3.283MVA _r
Fort Albany		2.2MW	0.502MVA _r
Kashechewan		1.2MW	0.274MVA _r
Attawapiskat		2.6MW	0.600MVA _r
<i>Moosonee & the Five Nations Communities: Sub-total</i>		20.4MW	4.659MVA _r
Victor Mine	0.900	2.0MW	0.969MVA _r
<i>Total</i>		22.4MW	5.628MVA _r

In addition, the assessment has reviewed the supply capability to the Victor Mine once all of the new transmission facilities are in-service and with the loads at their forecast levels for 2020.

It has also been assumed that the maximum load to be supplied at the Victor Mine remains at the same level of 20MW as was assumed in the analysis supporting the contents of the 1st and 2nd Addenda, dated 12th December 2004 and 7th June 2005, respectively.

4. Study Criteria

Load Flow Analysis

- A constant-MVA representation was used for all system loads.
- All under-load tap-changers (ULTCs) that are under automatic control were allowed to move.
- All switched shunt devices that are under automatic control were allowed to move. In addition, switching of both the existing and the future shunt reactors that are to be installed on the 115kV system north of Abitibi Canyon GS were assumed to respond as follows:
 - switching into-service at a voltage of 137.0kV
 - switching out-of-service at a voltage of 126.7kV

Power-Voltage (PV) Analysis

- A constant-MVA representation was used for all system loads
- For each of the system arrangements that were studied, the *pre-contingency condition* was used as the reference. All ULTCs and switch shunts that are under automatic control were allowed to move prior to starting the PV analysis.
- To compensate for the simulated increases in the load at the Victor Mine, the output of one of the 230kV-connected generating units on the Mattagami River was increased accordingly.
- In accordance with the IESO's criteria, the limiting transfer for voltage stability would correspond to a value 10% less than the voltage instability point (or knee) of the PV curve.
- After discussions with both Hydro One and the Five Nations representative, it was agreed that a voltage of at least 121kV should be maintained at Moosonee DS and at each of the Five Nations S/Ss.

Any reduction in the minimum voltage at which each of these substations is to be operated would require a change in the transformer tap-changer positions. This would be expected to compromise the ability of the Five Nations system to operate securely under light load conditions when high voltages are routinely experienced.

5. Study Results

The analysis examined the performance of the system with both two and three SVCs in-service at Victor Mine.

PV-Analysis

The results from the PV-Analysis have been summarised in the following Table:

<i>Pre-Contingency PV-Analysis</i>					
<i>System Condition</i>		<i>Diagram No.</i>	<i>No. of SVCs in-service</i>	<i>Analytical Limit</i>	<i>Voltage In-stability Limit (after 10% margin)</i>
<i>With the 'Present' Peak Loads</i>					
<i>i.</i>	Existing Transmission Facilities	2	2	16MW	14.4MW
		3	3	16MW	14.4MW
<i>ii.</i>	<i>plus</i> Otter Rapids to Moosonee line	6	2	23MW	20.7MW
		7	3	26MW	23.4MW
<i>iii.</i>	<i>plus</i> Moosonee to Kashechewan line	8	2	22MW	19.8MW
		9	3	24MW	21.6MW
<i>iv.</i>	<i>plus</i> Otter Rapids to Moosonee line & Moosonee to Kashechewan line	10	2	31MW	27.9MW
		11	3	35MW	31.5MW
<i>With the Forecast Peak Loads for 2020</i>					
<i>v.</i>	<i>plus</i> Existing Transmission Facilities <i>plus</i> Otter Rapids to Moosonee line & Moosonee to Kashechewan line	12	2	29MW	26.1MW
		13	3	31MW	27.9MW

6. Review of the Results

6.1 With the 'Present' Peak Loads

Existing System Arrangement

For the existing system arrangement with the loads at their 'Present' peak values, the PV-curves shown in Diagrams 2 & 3, for the two and three SVC conditions, respectively, indicate that the analysis for both studies terminated at the same load of 16MW at the Victor Mine. Comparing the two Diagrams shows that while the third SVC at the Victor mine is able to maintain the voltage at the mine at a constant value until the analysis terminated, it has only a minimal effect on the voltage performance at Moosonee DS.

After allowing for the required 10% margin, the maximum load that could therefore be supplied at the Mine with the existing facilities and with a combined load of 20.4MW at Moosonee and the Five Nations communities, would be 14.4MW.

Diagram 4 shows the results of the load flow analysis with a load of 14.4MW and with only two of the three SVCs at the Victor Mine in-service. The voltages shown are very close to those corresponding to a load of 14.4MW in Diagram 2 and while they are significantly lower than the levels at which the FNEI System is presently being operated, they would be above the Market Rule minimum of 113kV.

The system losses are shown to total 14.8MW to supply a combined load of 34.8MW from the system north of Abitibi Canyon GS/Pinard TS. The losses would therefore represent approximately 43% of the combined load, which is excessive.

However, reference to Diagrams 2 & 3 shows that the maximum load at the Victor Mine would need to be limited to **10MW**, with either two or three SVCs in-service, to ensure that the voltage at Moosonee DS would remain above the 121kV threshold.

The results of the load flow study with the load of 10MW at the Victor Mine are summarised in Diagram 5.

This shows that with all of the shunt reactors out-of-service, the two SVCs at the Victor Mine would be delivering a combined output of 8.8MVAR, of which 4.8MVAR would be absorbed by the 10MW load at the mine and a further 0.5MVAR would be accounted for by the losses of the local transformers.

The transmission losses are shown to total 8.2MW to supply a combined load of 30.4MW. This would be equivalent to 27% of the load, and while still excessive, would be a significant improvement on the 43% recorded for a load of 14.4MW at the mine.

With the new Otter Rapids to Moosonee line

The results from the PV-analysis for the condition with only the new 115kV line in-service between Otter Rapids GS and Moosonee SS are summarised in Diagram 6 (with two SVCs in-service) and Diagram 7 (with all three SVCs in-service at the Victor Mine).

The changes that are shown to occur in the voltage profile in each of these Diagrams reflect the automatic switching of the shunt-reactors at Moosonee SS and the Five Nations' TSs.

The corresponding voltage-stability limits are shown as 20MW and 23MW, for the condition with two or three SVCs in-service at the Victor Mine, respectively.

Consequently, with the total load at Moosonee and the Five Nations communities at their 'present' peak value of 20.4MW, the new line between Otter Rapids GS and Moosonee SS would allow the full peak load of **20MW** at the Victor Mine to be supplied.

With the new Moosonee to Kashechewan line

Diagrams 8 & 9 show the results from the PV-analysis for the same loading condition but with only the new line between Moosonee SS and Kashechewan S/S in-service.

The corresponding voltage-stability limits are shown as 19MW and 21MW, for the condition with two or three SVCs in-service at the Victor Mine, respectively.

This would mean that whenever the total load at Moosonee and the Five Nations communities is at their 'present' peak value of 20.4MW, the maximum load that could be supplied to the mine would need to be restricted to **19MW** when only two of the three SVCs are in-service. When all three SVCs are in-service the full peak load of **20MW** at the Victor Mine could be supplied.

With both the Otter Rapids to Moosonee line and the Moosonee to Kashechewan line

The PV-analysis for the condition with both new 115kV lines in-service has been summarised in Diagrams 10 & 11 with two and three SVCs in-service at the Victor Mine, respectively.

The corresponding voltage-stability limits are shown as 27MW with two SVCs in-service, and 31MW with three SVCs in-service at the Victor Mine, respectively.

Therefore, with both new lines in-service, there would be no restrictions on supplying the full **20MW** at the Victor Mine.

6.2 With the forecast peak loads for 2020

With both the Otter Rapids to Moosonee line and the Moosonee to Kashechewan line

Diagrams 12 & 13 show the results of the PV-analysis for the condition with all of the new transmission facilities in-service and with either two or three SVCs in-service at the Victor Mine, respectively.

From Diagram 12, with the loads at the levels forecast for 2020, the maximum load that could be supplied at the mine with two SVCs in-service while respecting the voltage-stability criteria would be approximately 24MW. This would increase to approximately 27MW with all three SVCs in-service as shown in Diagram 13.

Although the limiting values would be beyond the 20MW requirement of the Victor Mine, it is interesting to note that for the same system configuration with all new transmission facilities in-service the expected increase of 9.3MW in the combined load at Moosonee and the Five Nations communities from the 'present' 20.4MW to the '2020 load forecast' of 29.7MW would result in a 3.6MW decrease in the load that could be supplied at the Victor Mine.

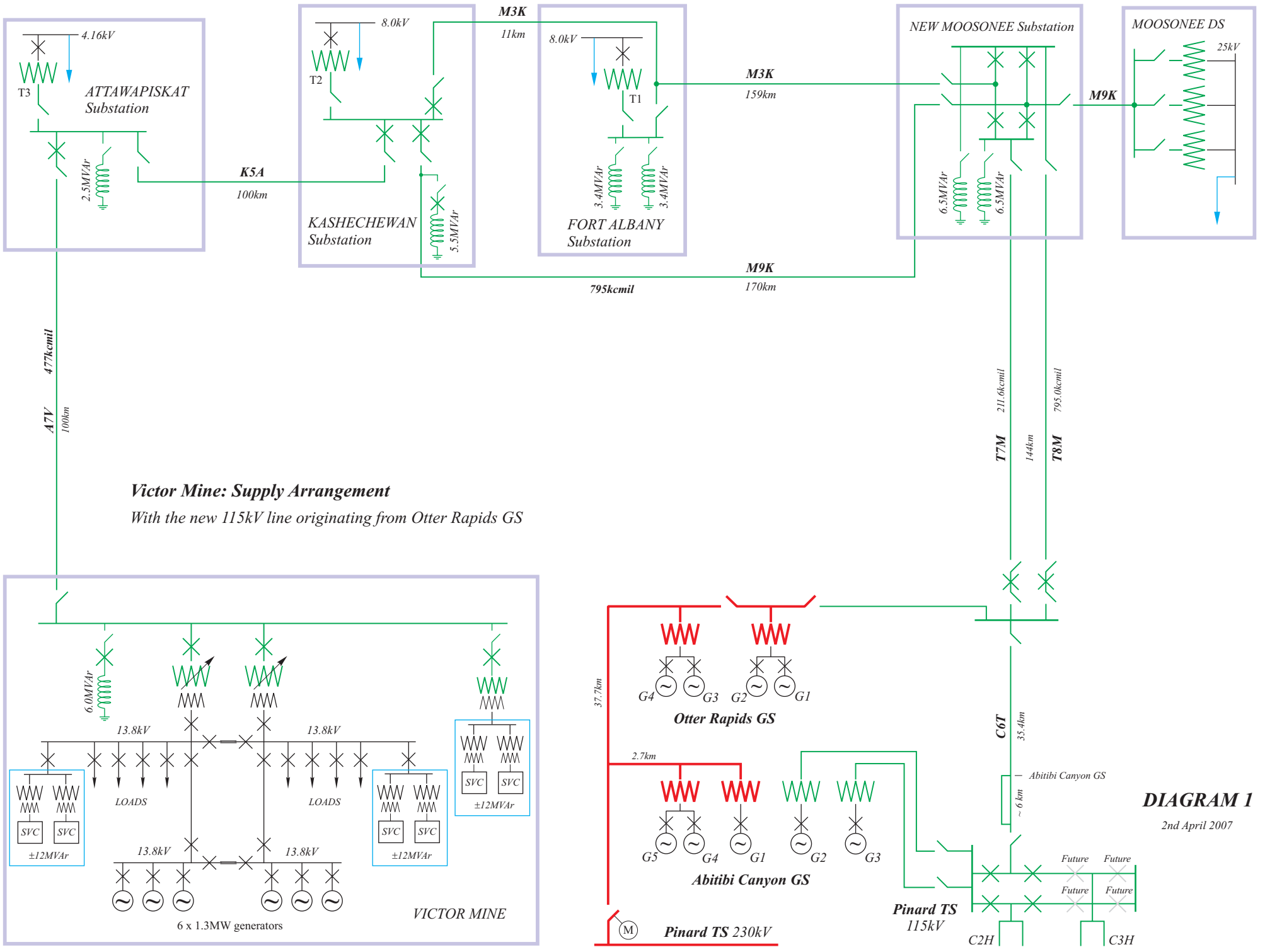
- i.e. from 27.9MW (Diagram 10) to 24.3MW (Diagram 12) with two SVCs in-service,
- or
- from 31.5MW (Diagram 11) to 27.9MW (Diagram 13) with all three SVCs in-service.

These results therefore confirm the recommendations made in the 1st Addendum to the original Preliminary Assessment Report that the installation of two SVCs at the Victor Mine rated at +12MVAR/-15MVAR together with the additional transmission facilities between Otter Rapids GS/Pinard TS and Kashechewan S/S via Moosonee SS would be capable of supplying a load of at least 20MW at the Victor Mine with the loads at Moosonee and the Five Nations communities at their forecast levels for 2020.

7. Summary of the Supply Capability to the Victor Mine

The following Table summarises the maximum load that could be supplied at the Victor Mine for the various system and loading conditions that were examined:

<i>Maximum Load that could be supplied at the Victor Mine</i>			
		<i>No. of SVCs</i>	<i>Maximum Load that could be supplied</i>
<i>With the 'Present' Peak Load of 20.4MW at Moosonee & the Five Nations Communities</i>			
1.	With the existing transmission facilities	2 or 3	10MW
2.	With only the Otter Rapids to Moosonee line	2 or 3	The specified Maximum Load of 20MW
3.	With only the Moosonee to Kashechewan line	2	19MW
		3	The specified Maximum Load of 20MW
4.	With both the Otter Rapids to Moosonee & the Moosonee to Kashechewan line	2 or 3	The specified Maximum Load of 20MW
<i>With the Forecast Peak Load for 2020 of 29.7MW at Moosonee & the Five Nations Communities</i>			
5.	With both the Otter Rapids to Moosonee & the Moosonee to Kashechewan line	2 or 3	The specified Maximum Load of 20MW

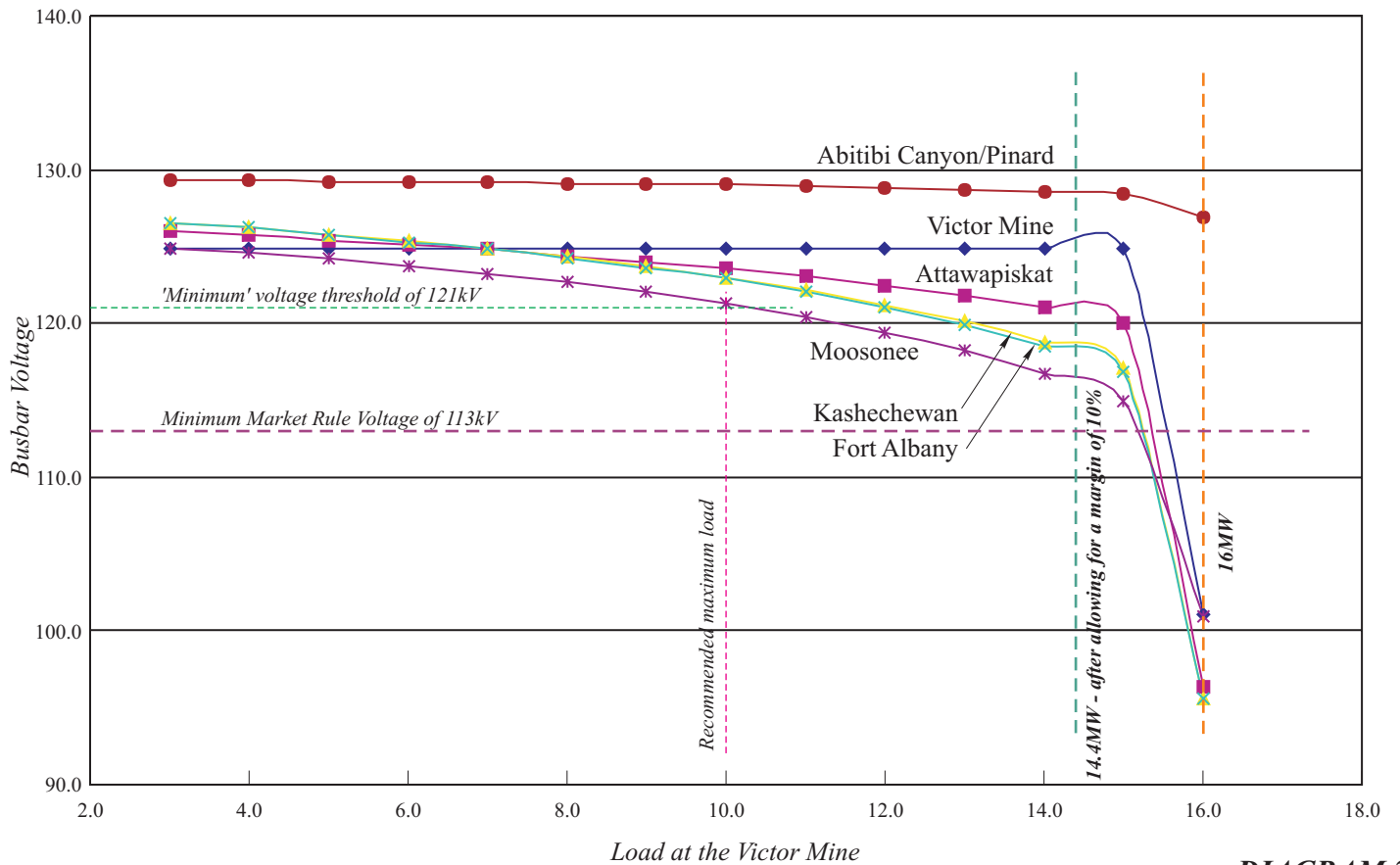
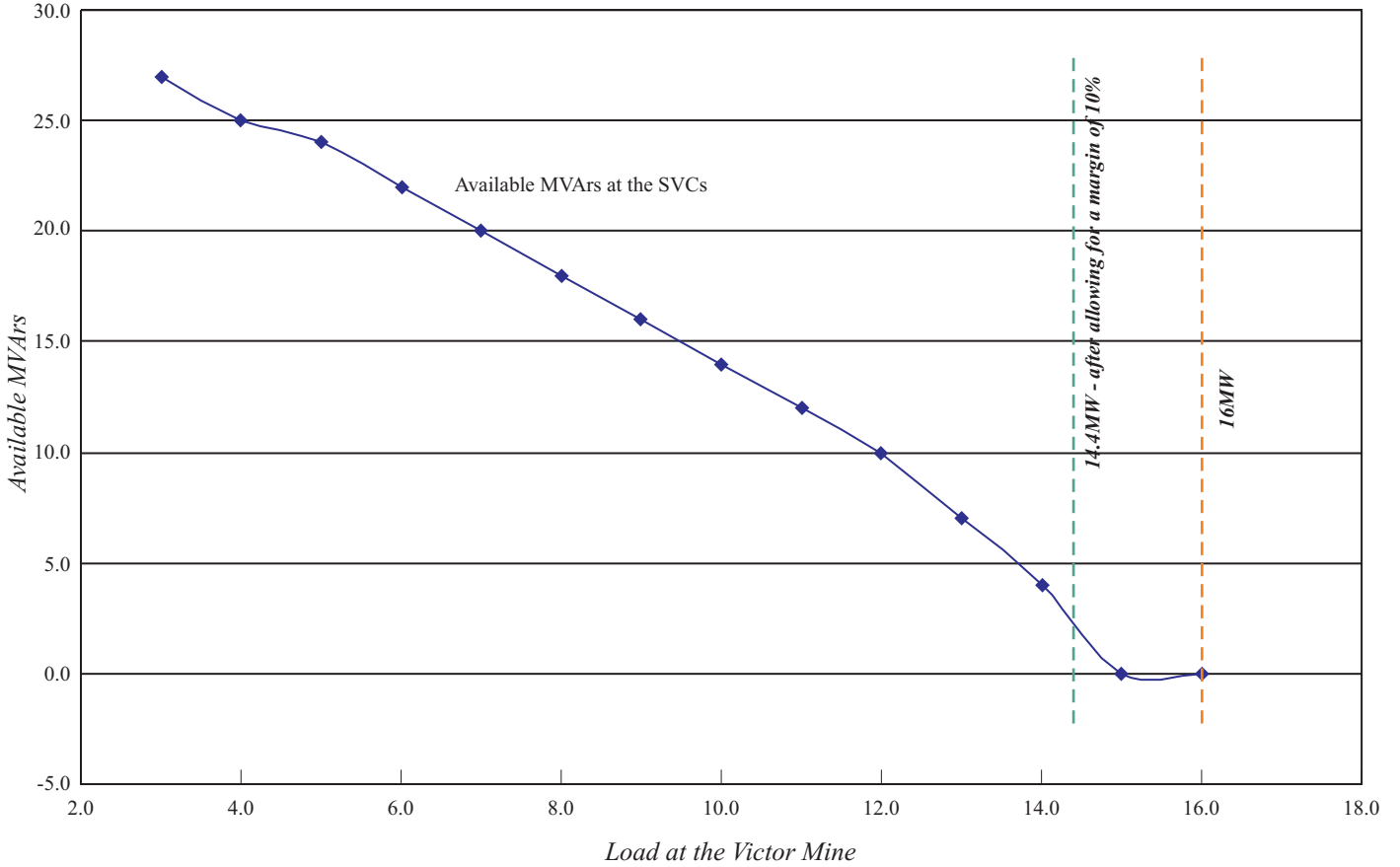


Victor Mine: Supply Arrangement
 With the new 115kV line originating from Otter Rapids GS

DIAGRAM 1
 2nd April 2007

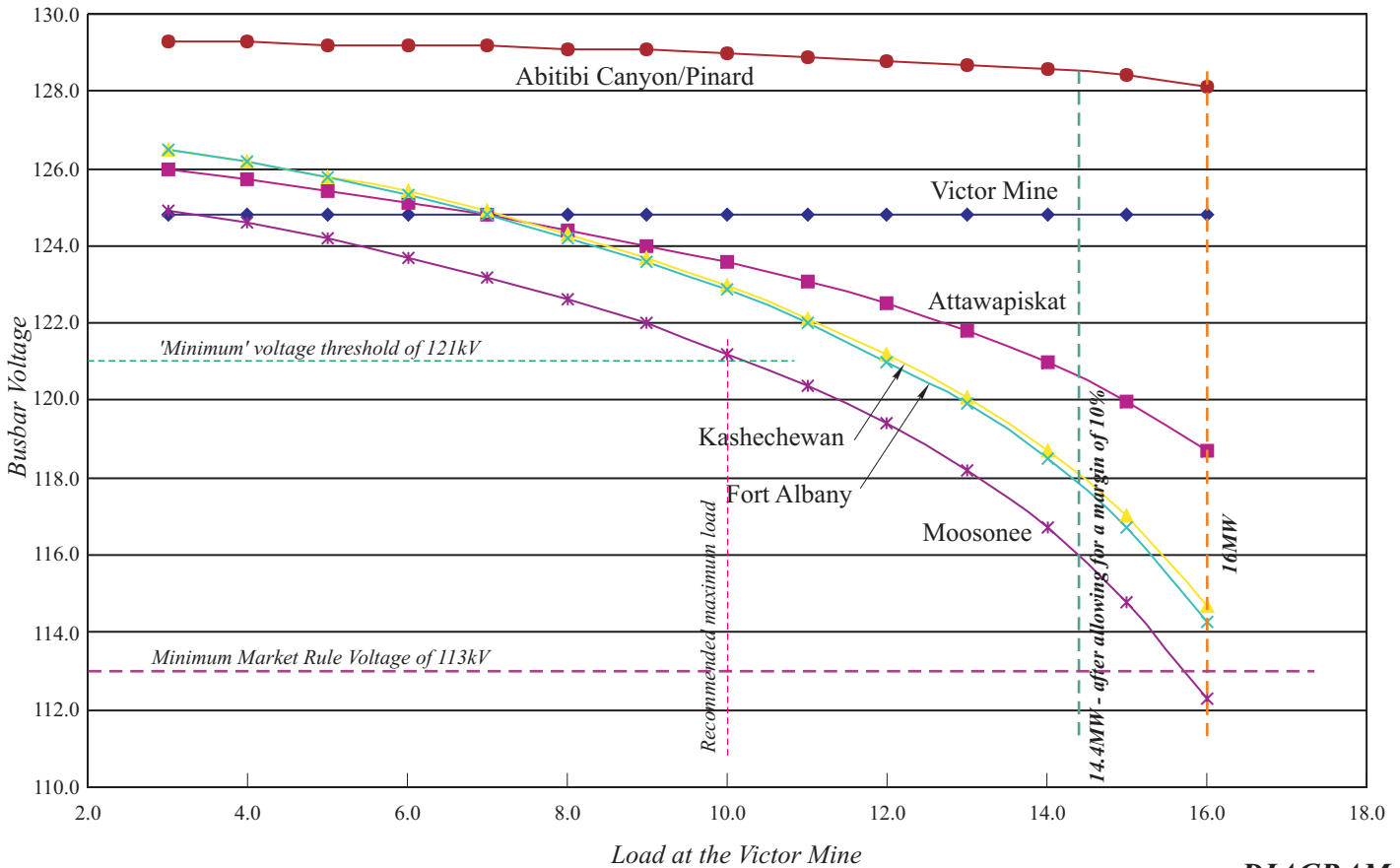
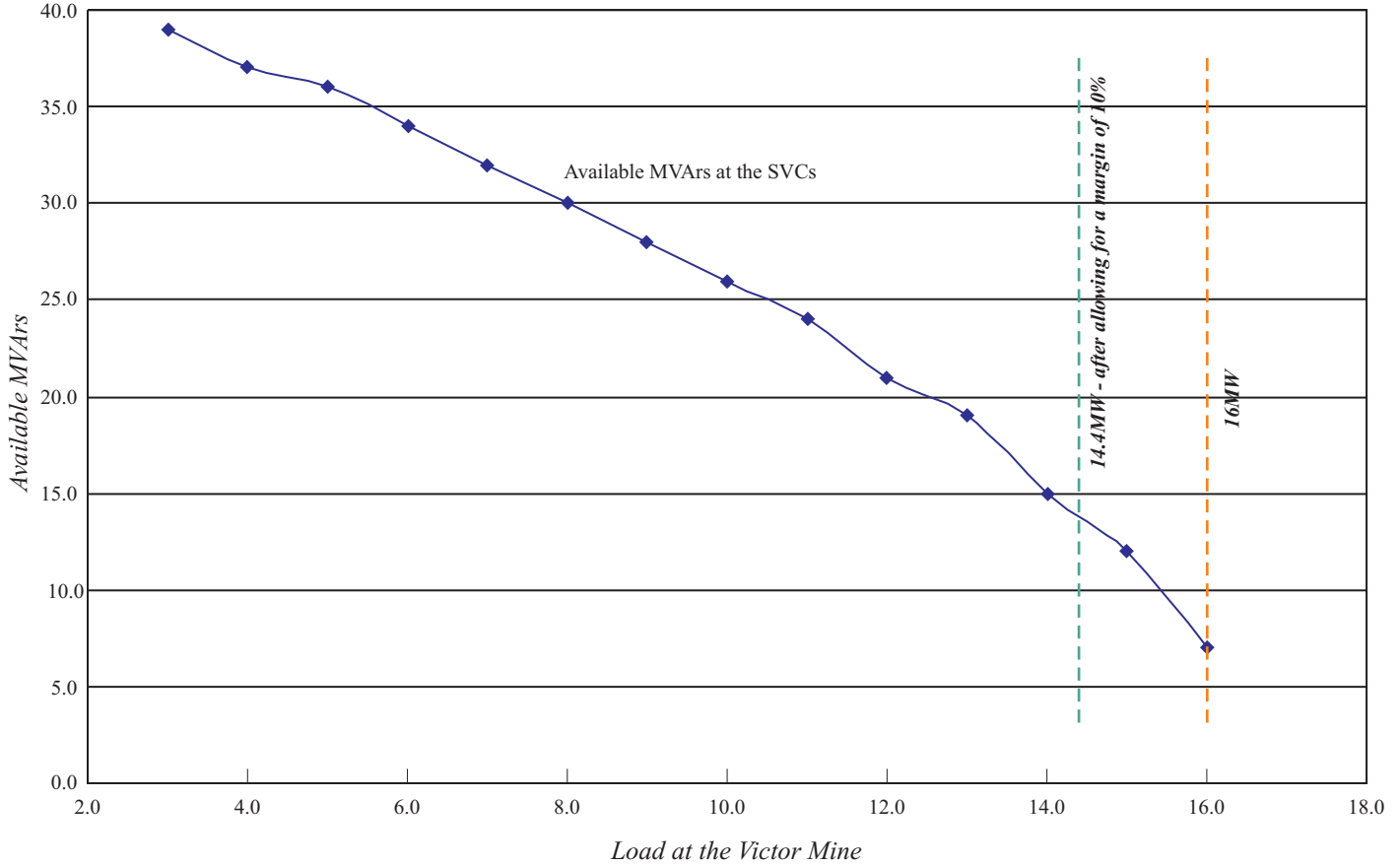
PV-Analysis with the existing transmission facilities in-service: Present Peak Loads

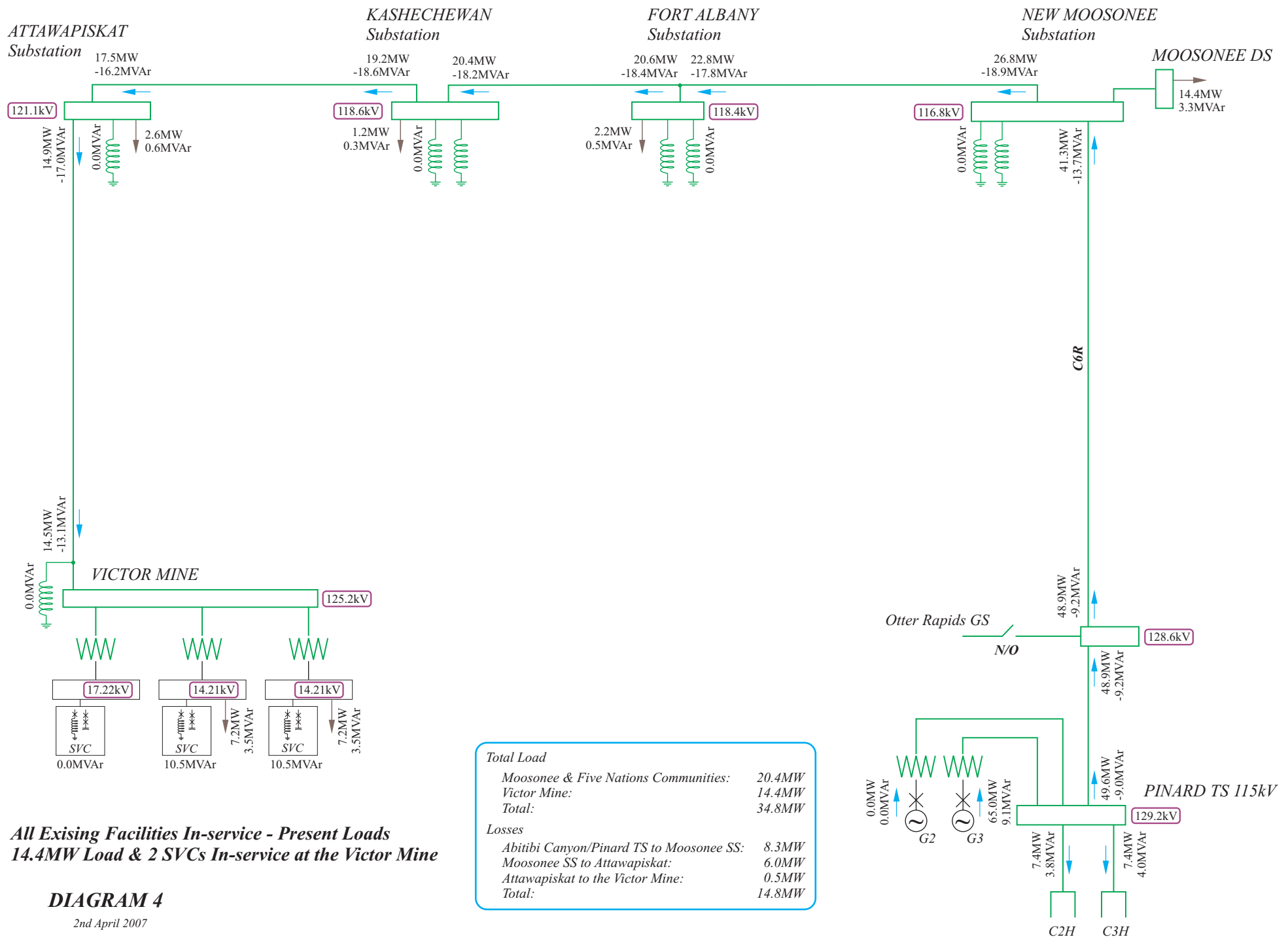
With two SVCs in-service at the Victor Mine



PV-Analysis with the existing transmission facilities in-service: Present Peak Loads

With three SVCs in-service at the Victor Mine





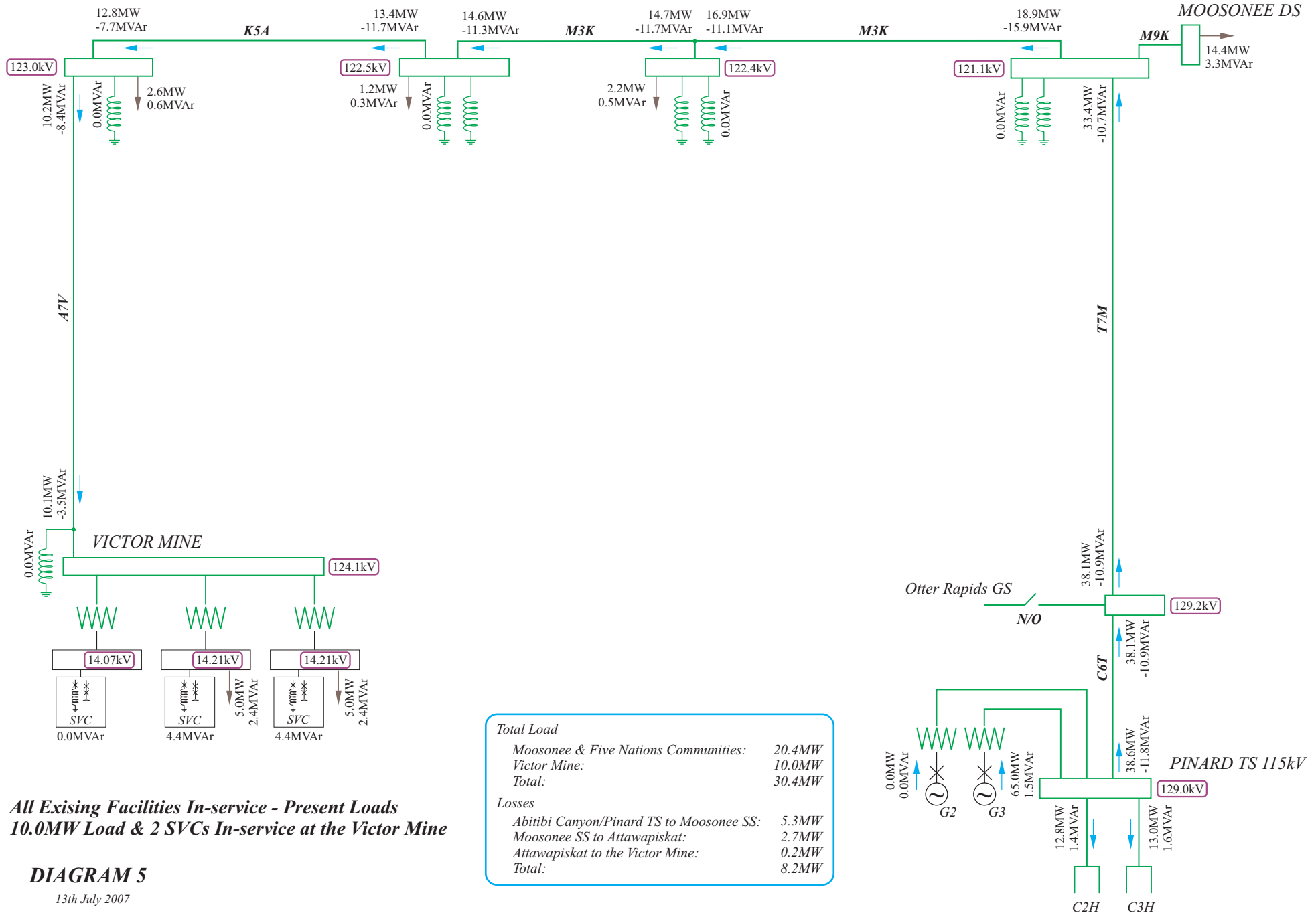
**ATTAWAPISKAT
Substation**

**KASHECHEWAN
Substation**

**FORT ALBANY
Substation**

**NEW MOOSONEE
Substation**

MOOSONEE DS



Total Load	
Moosonee & Five Nations Communities:	20.4MW
Victor Mine:	10.0MW
Total:	30.4MW
Losses	
Abitibi Canyon/Pinard TS to Moosonee SS:	5.3MW
Moosonee SS to Attawapiskat:	2.7MW
Attawapiskat to the Victor Mine:	0.2MW
Total:	8.2MW

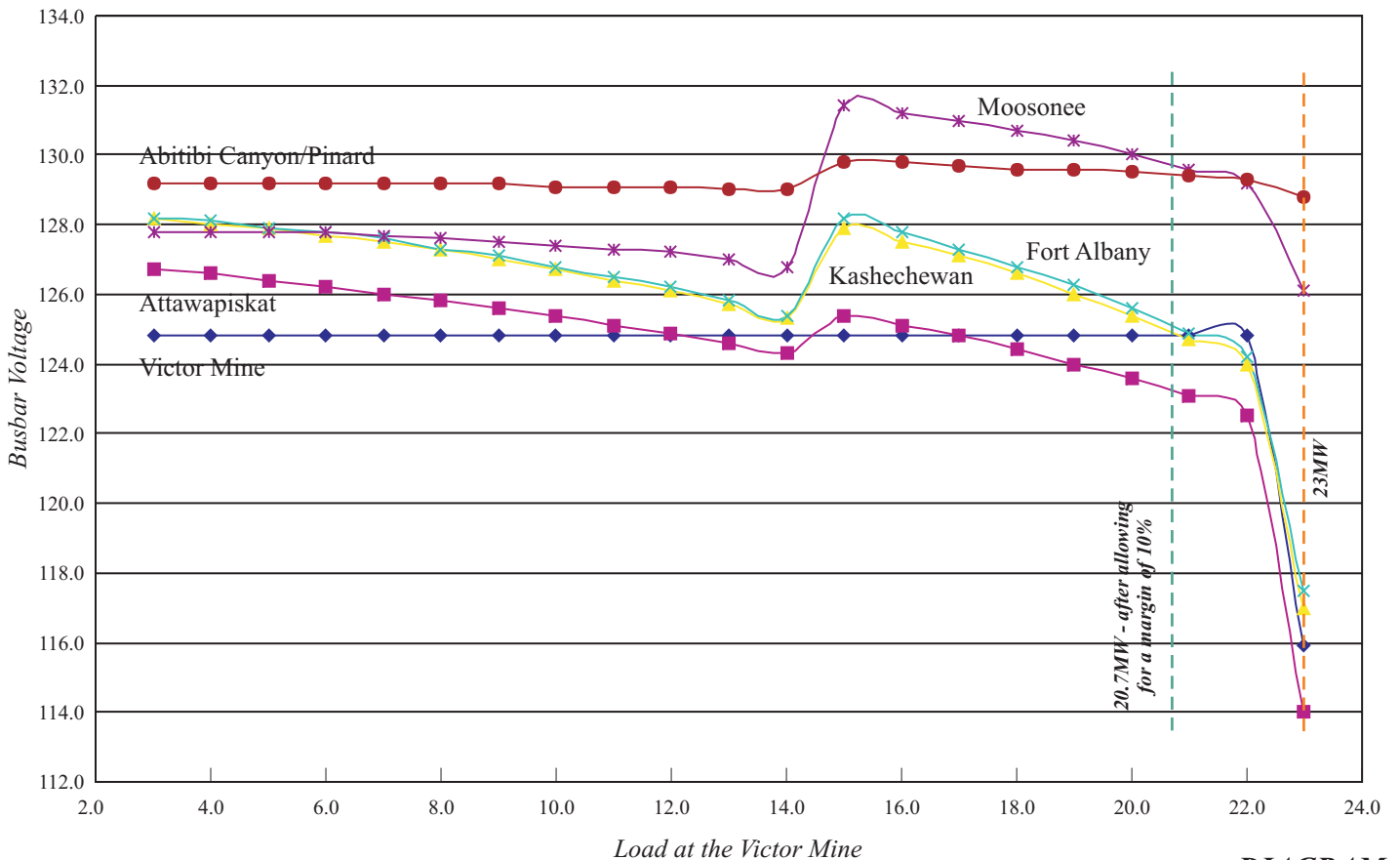
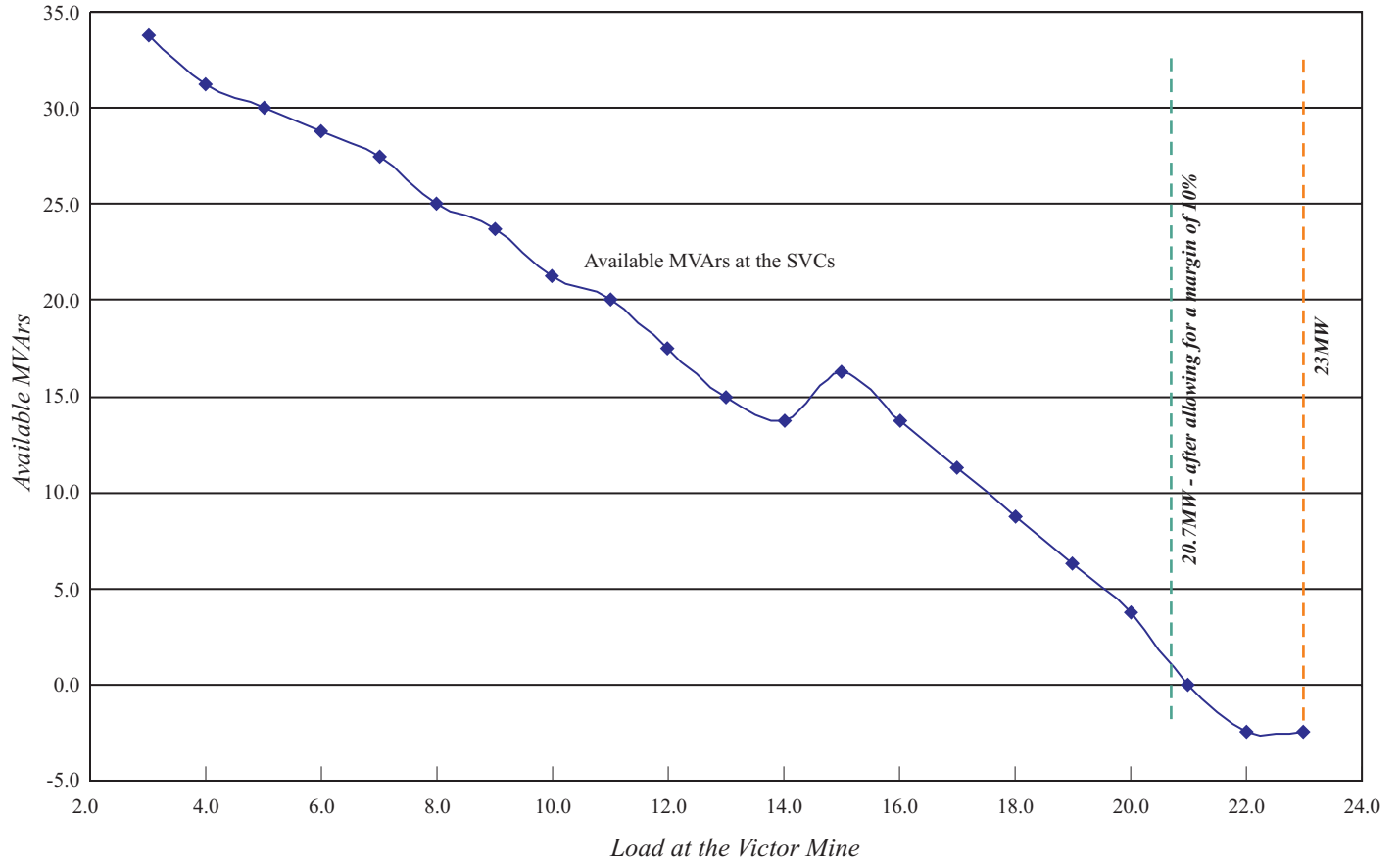
**All Existing Facilities In-service - Present Loads
10.0MW Load & 2 SVCs In-service at the Victor Mine**

DIAGRAM 5

13th July 2007

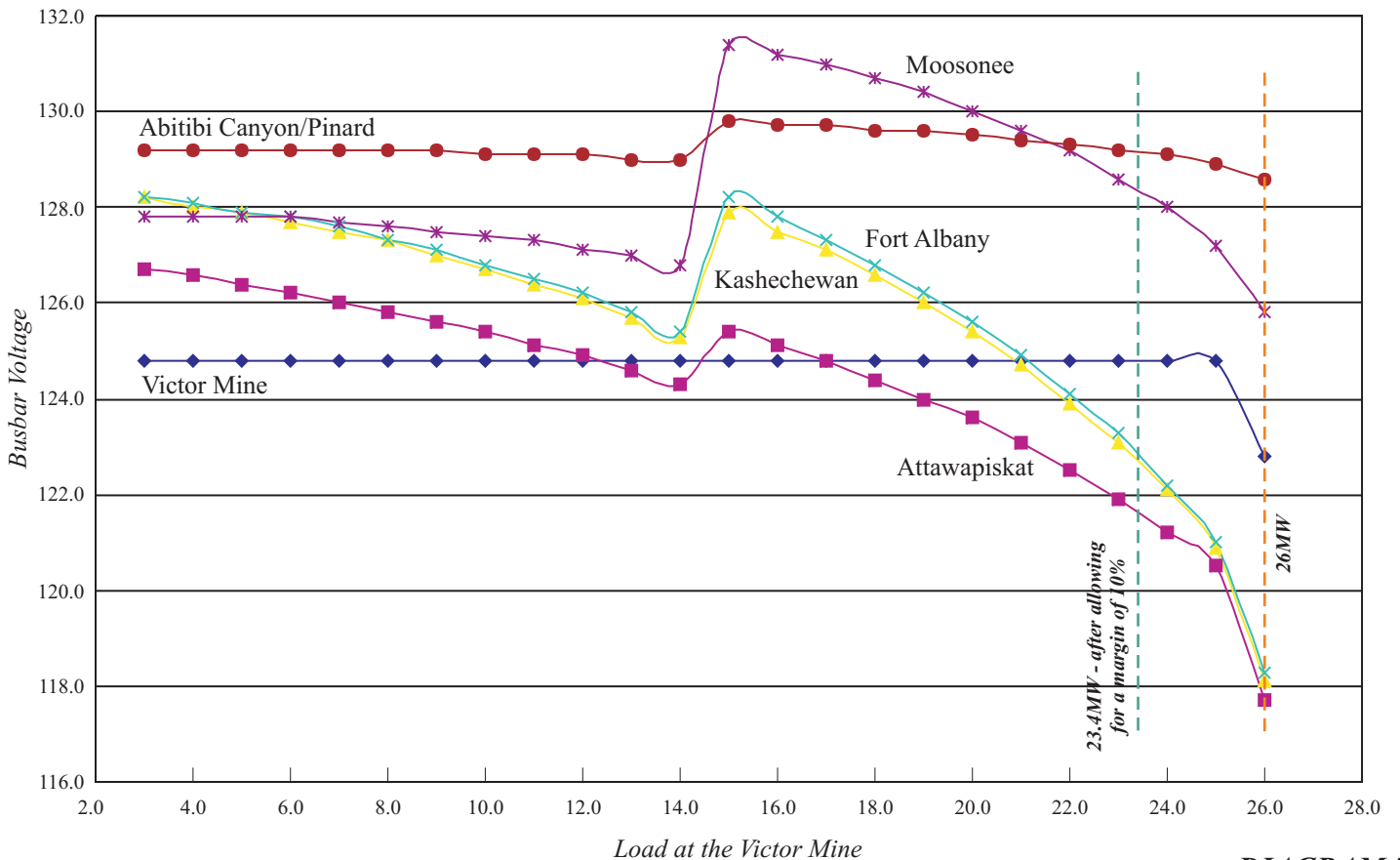
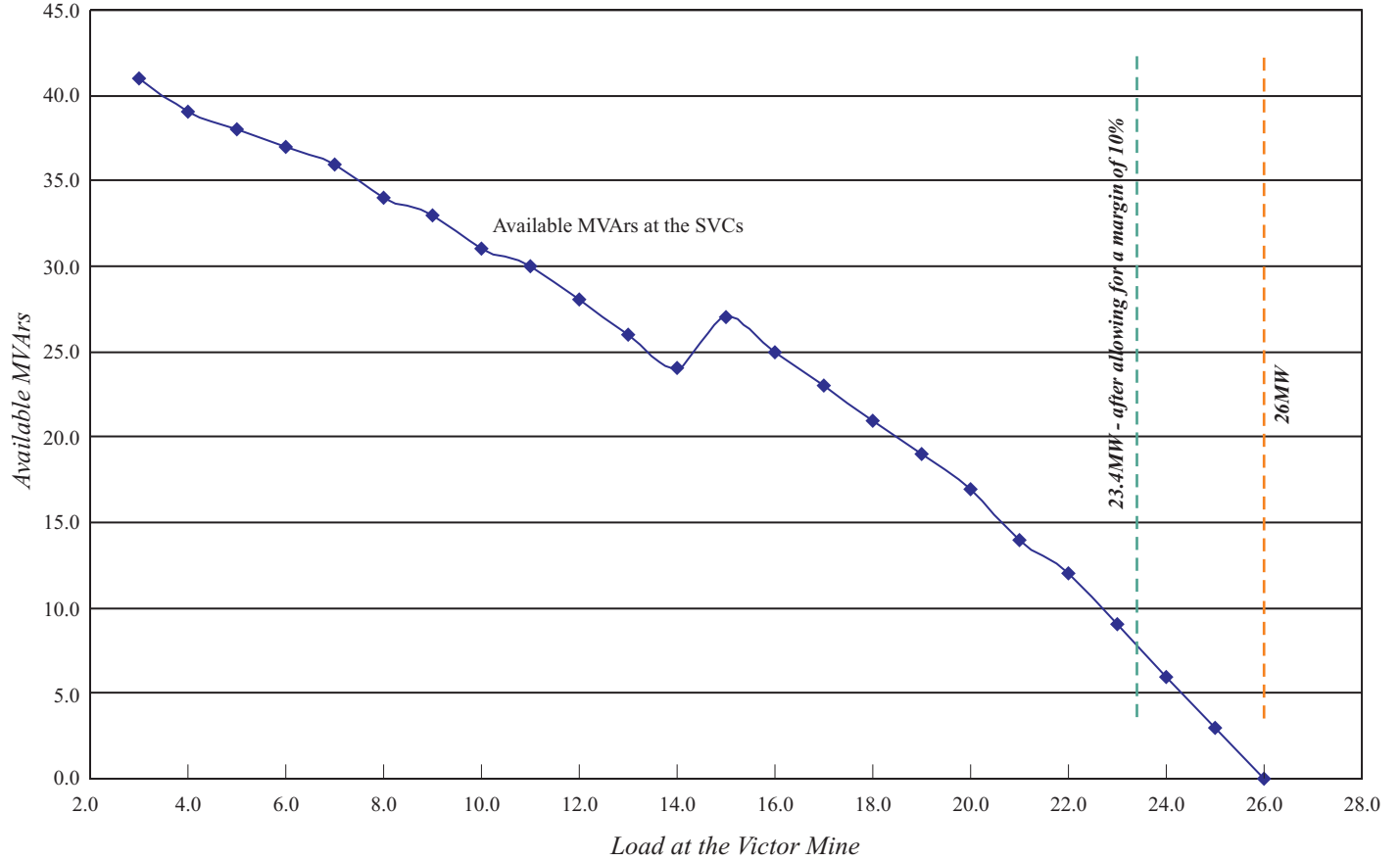
PV-Analysis with the new OxM circuit in-service: Present Peak Loads

With two SVCs in-service at the Victor Mine



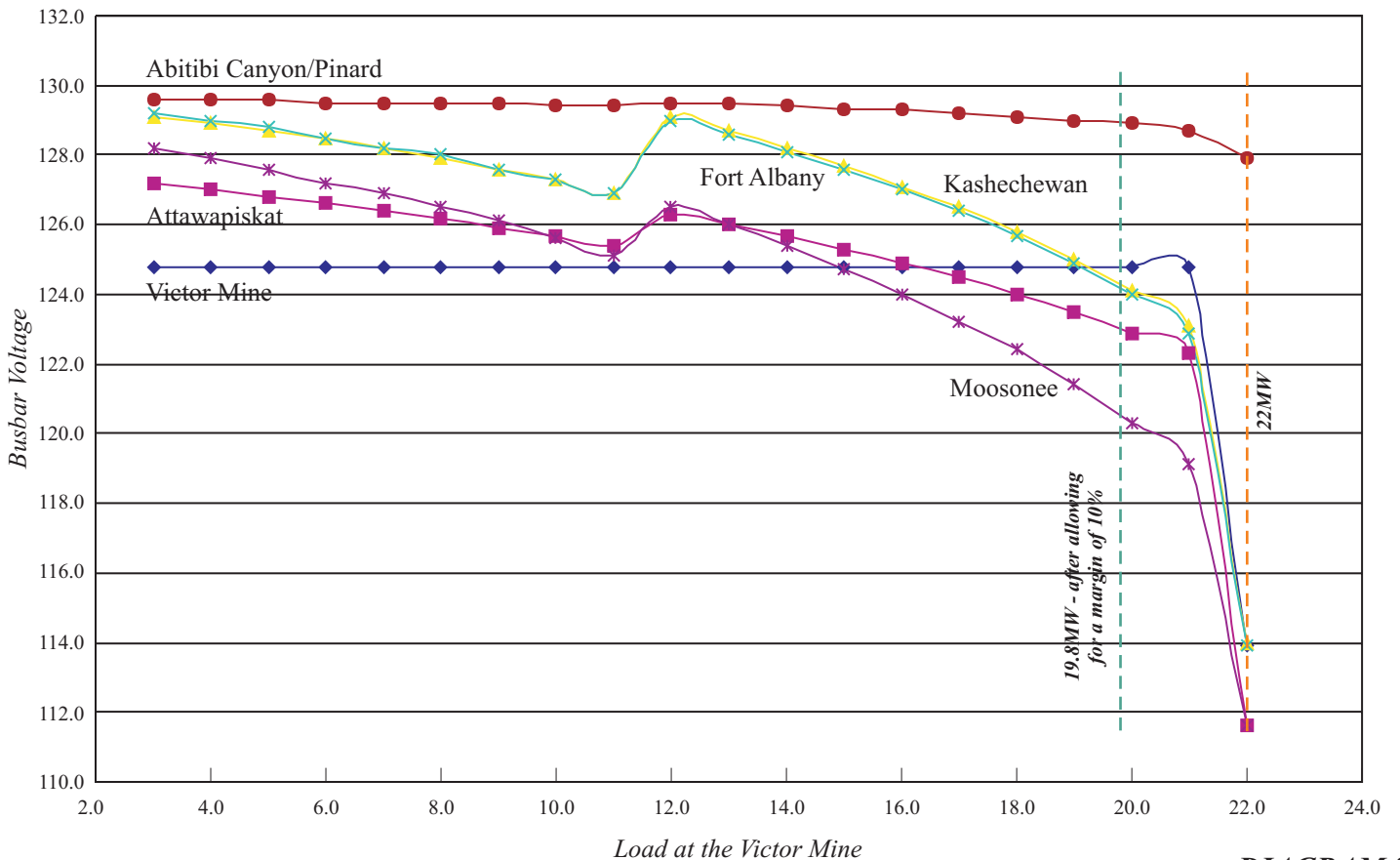
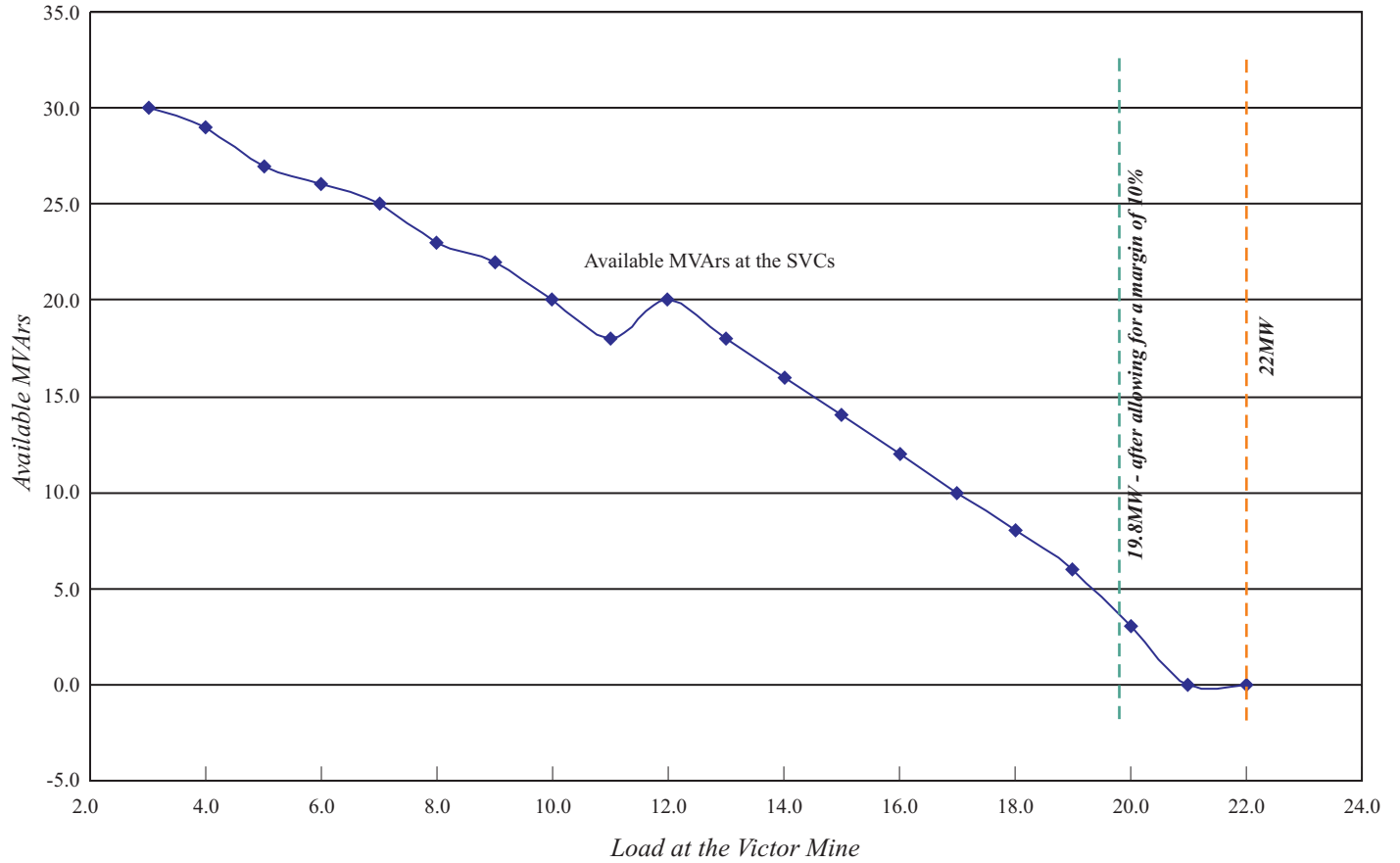
PV-Analysis with the new OxM circuit in-service: Present Peak Loads

With three SVCs in-service at the Victor Mine



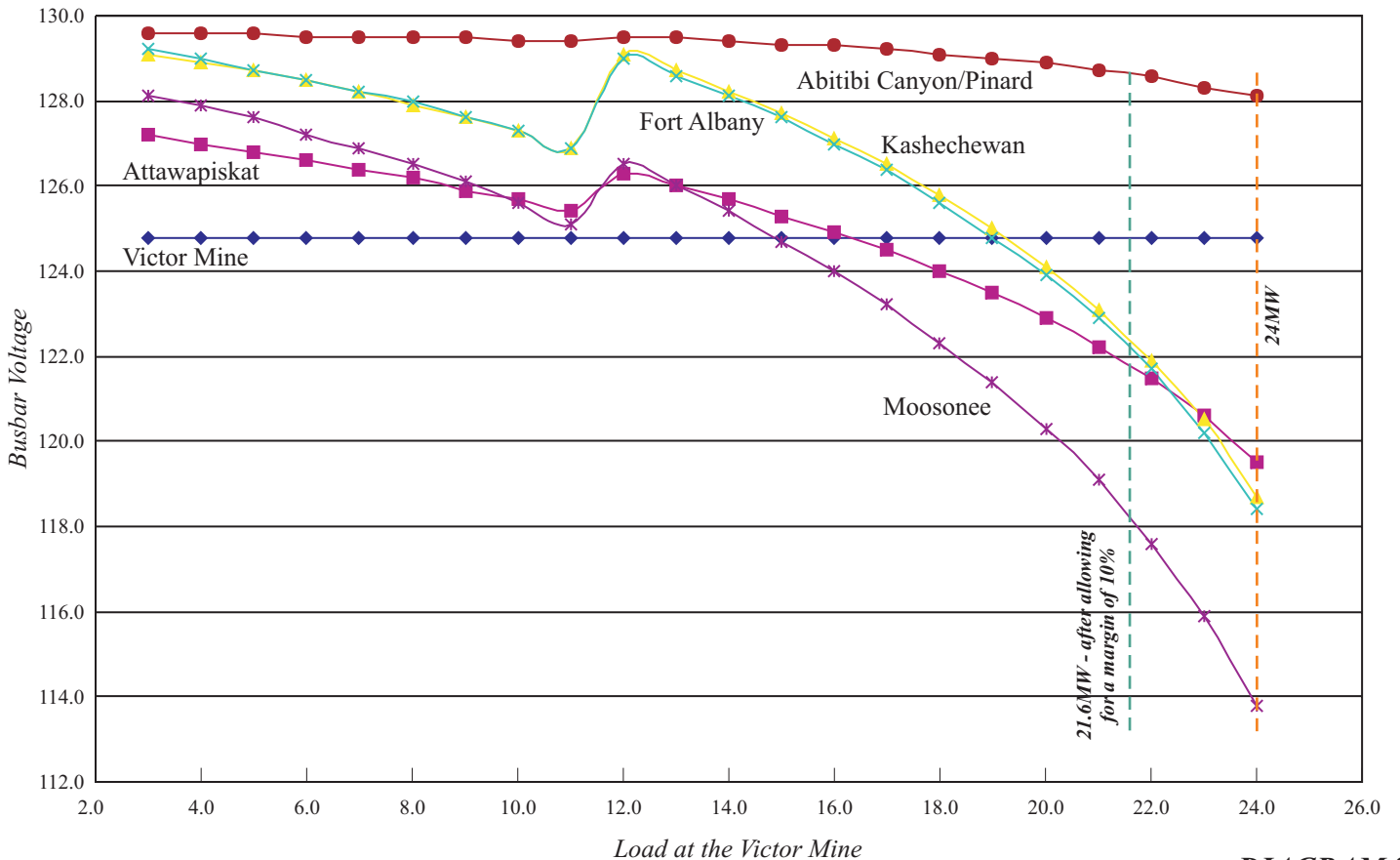
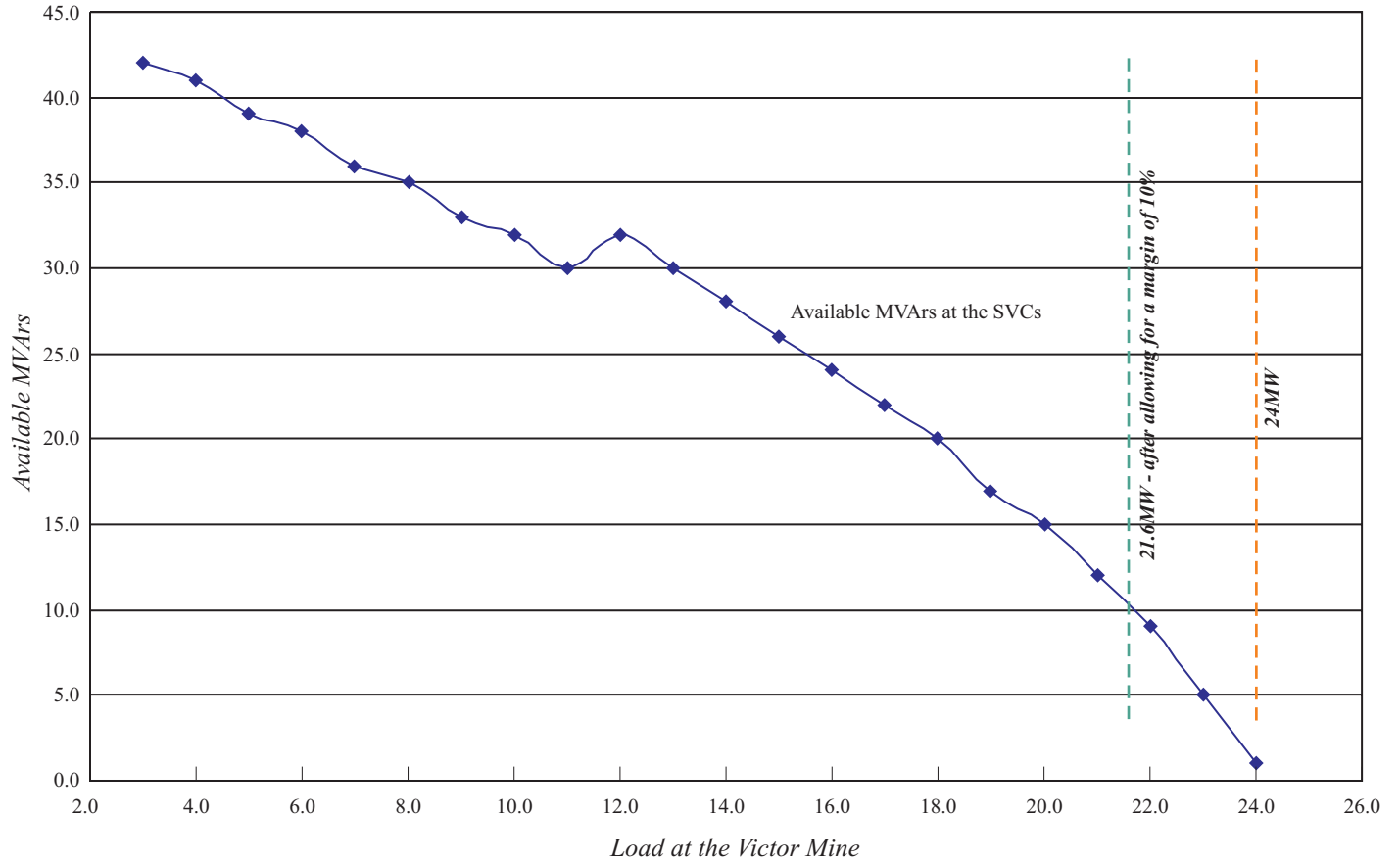
PV-Analysis with the new MxK circuit in-service: Present Peak Loads

With two SVCs in-service at the Victor Mine



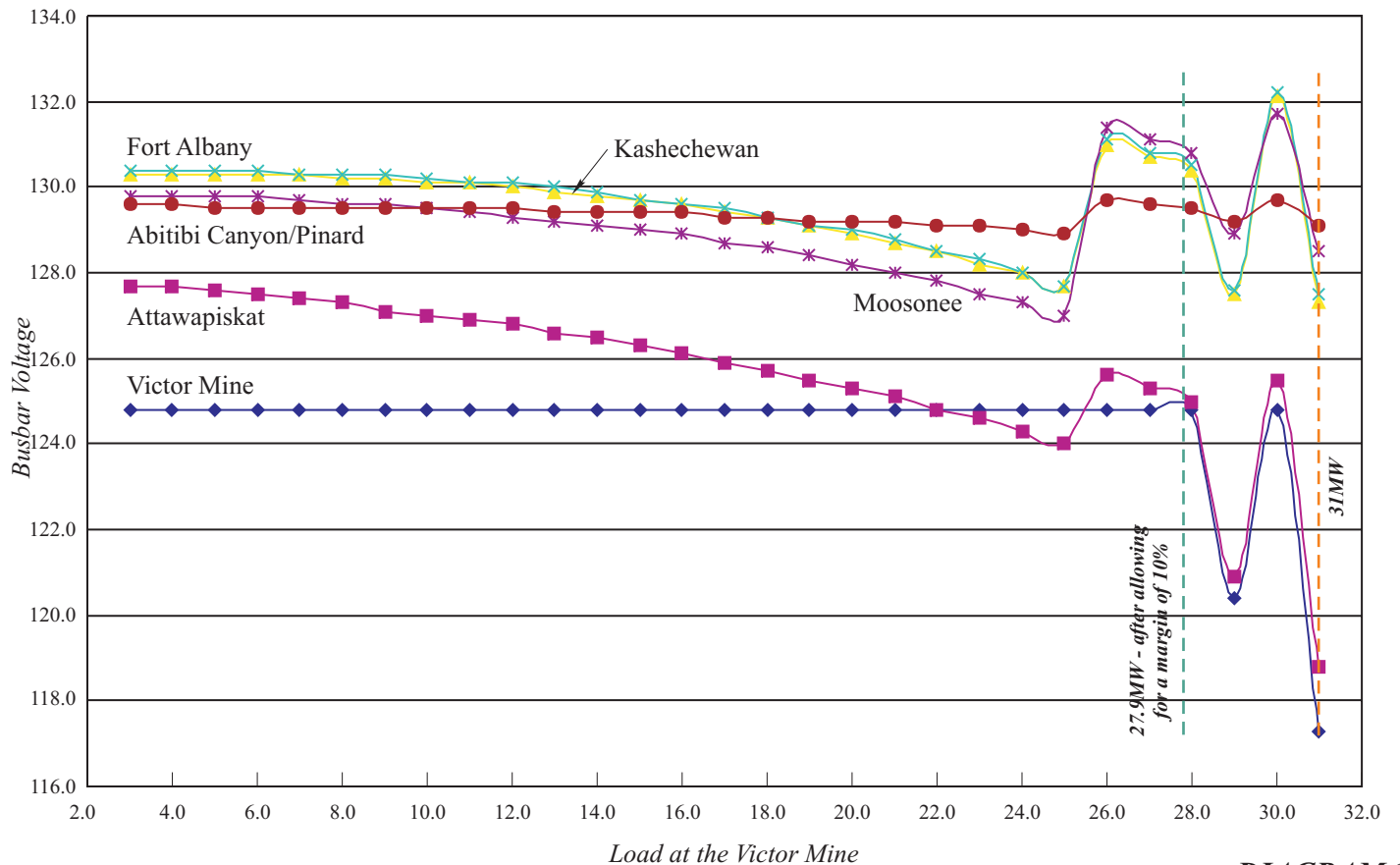
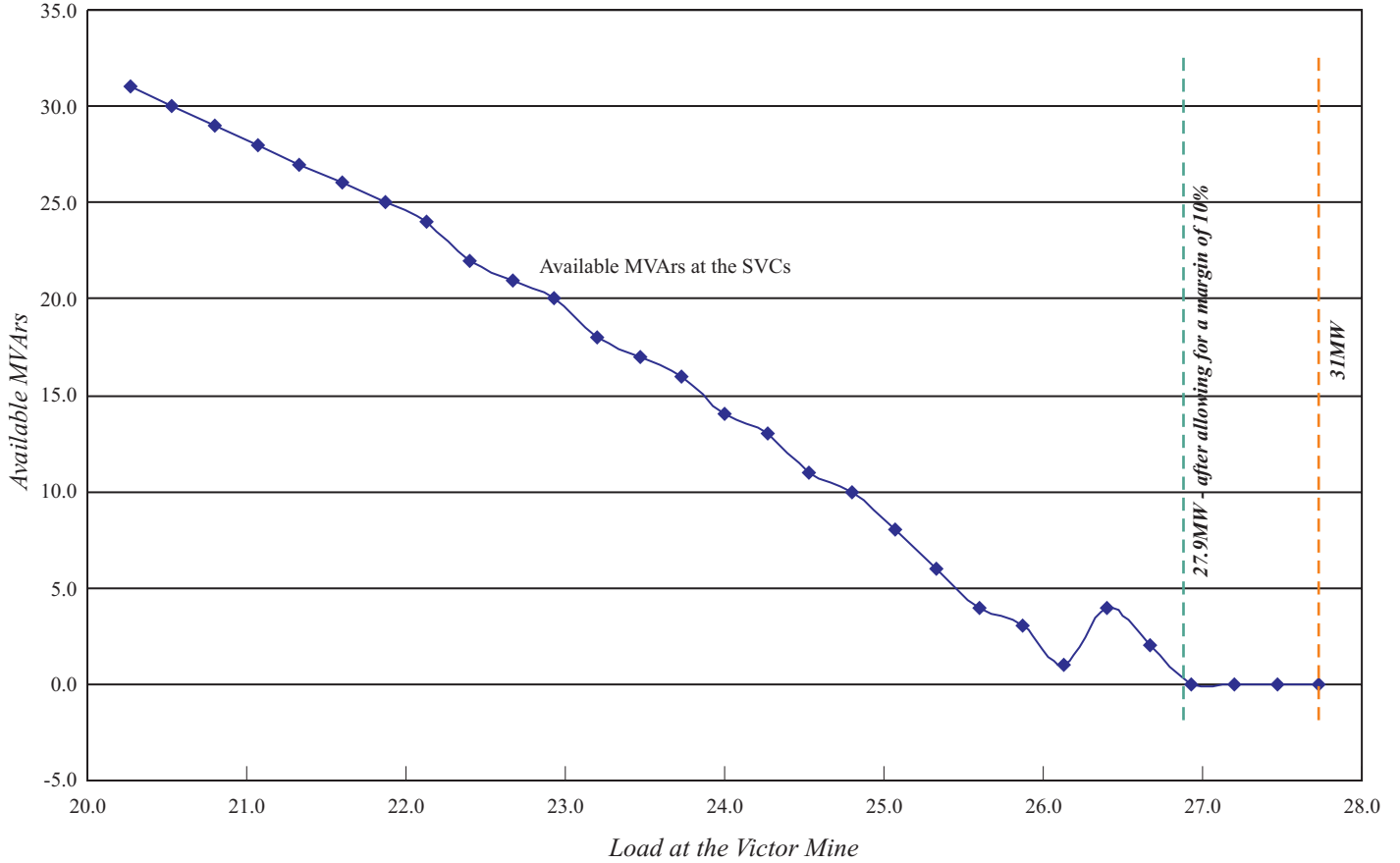
PV-Analysis with the new MxK circuit in-service: Present Peak Loads

With three SVCs in-service at the Victor Mine



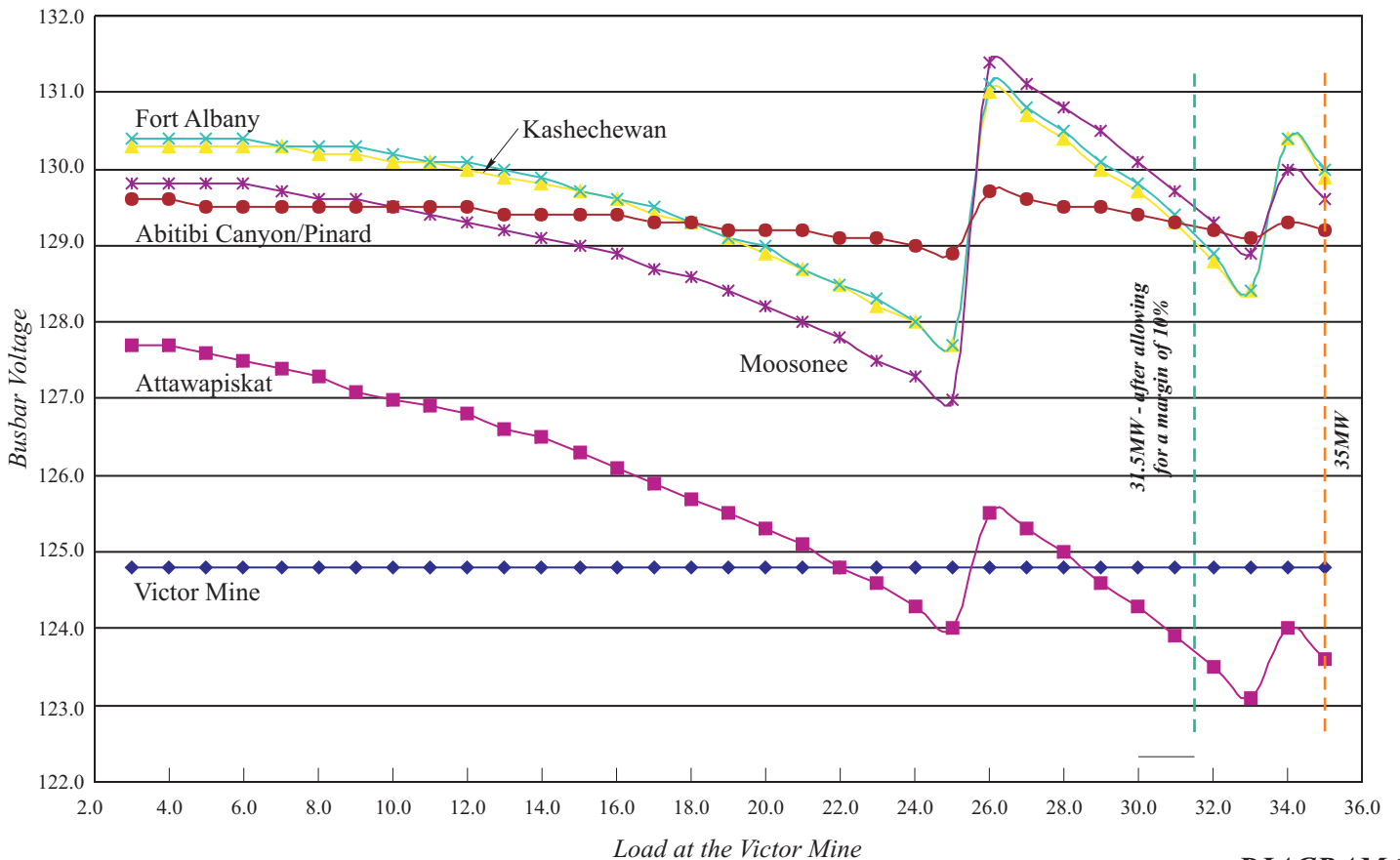
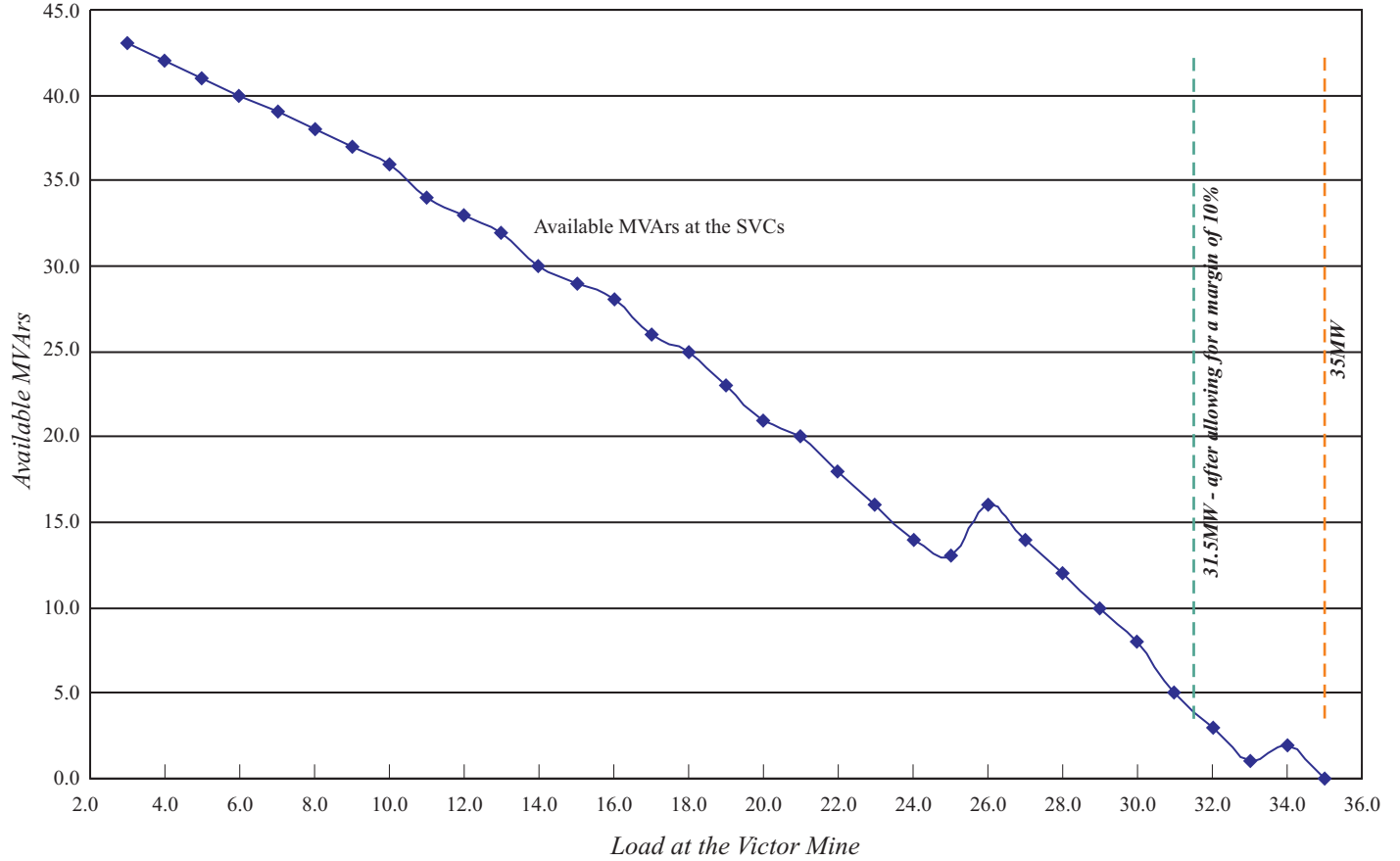
PV-Analysis with the new OxM & MxK circuits in-service: Present Peak Loads

With two SVCs in-service at the Victor Mine



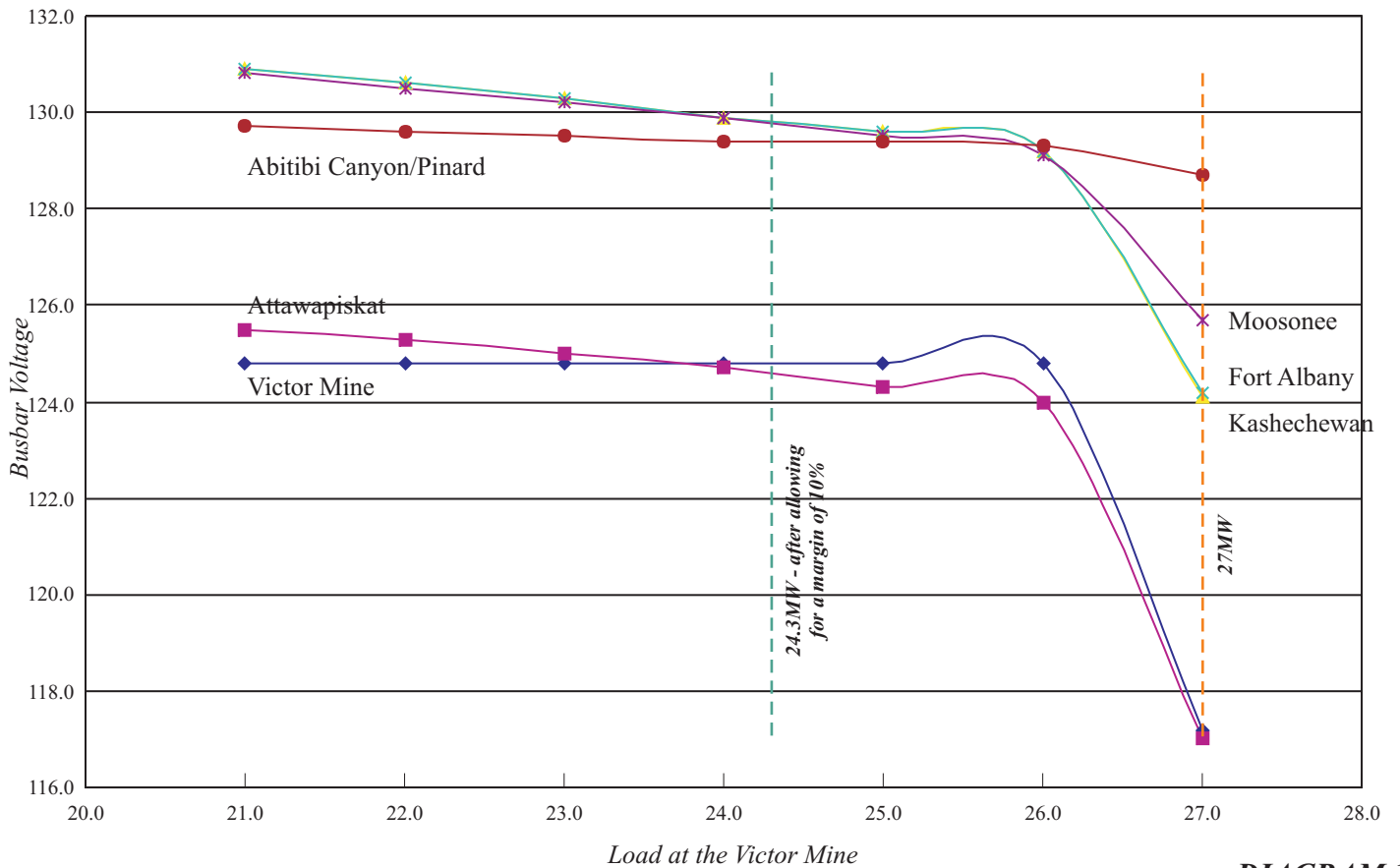
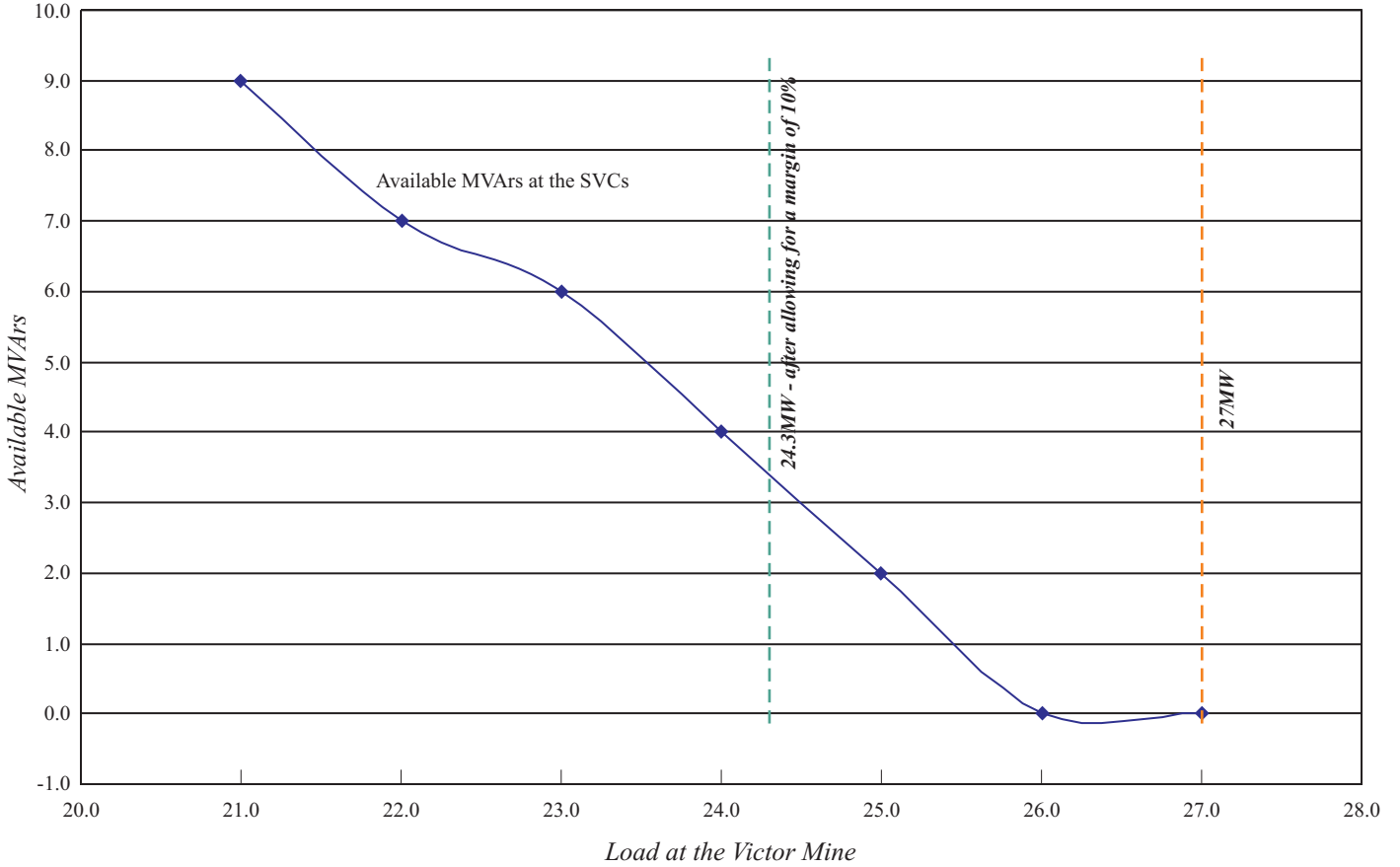
PV-Analysis with the new OxM & MxK circuits in-service: Present Peak Loads

With three SVCs in-service at the Victor Mine



PV-Analysis with all transmission facilities in-service: 2020 Peak Loads

With two SVCs in-service at the Victor Mine



PV-Analysis with all transmission facilities in-service: 2020 Peak Loads

With three SVCs in-service at the Victor Mine

