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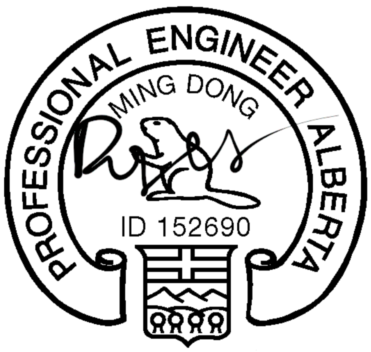

2025-12-15

Cluster 2 Congestion Assessment

Southeast Cluster [SE-02]

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1. Introduction

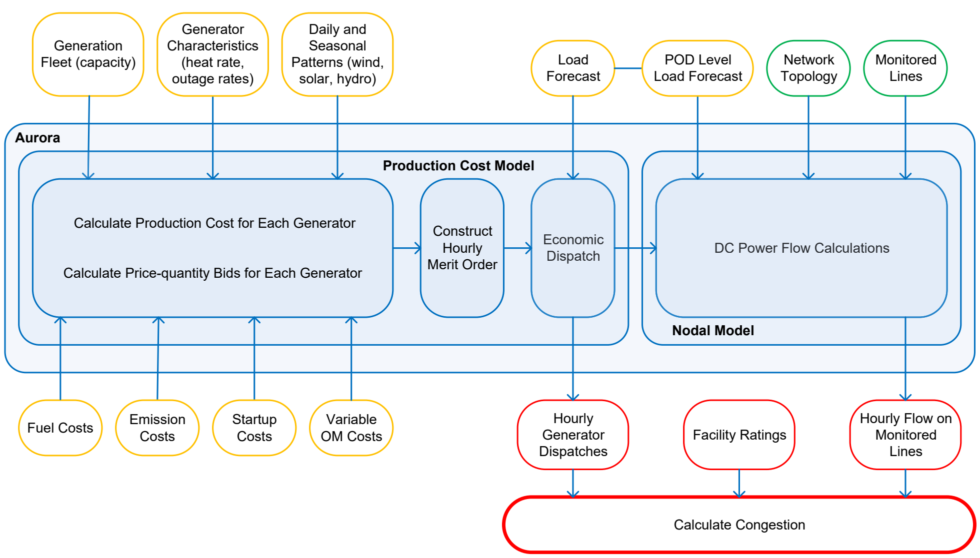
This report documents the Congestion Assessment for the projects in the Southeast cluster region.

Congestion occurs when the transmission system cannot accommodate all in-merit generation, because the resulting power flows would contravene reliability standards and/or ISO rules.[1] This Congestion Assessment forecasts congestion that may occur in the cluster region under three scenarios.

2. Method

The congestion assessment combines a production cost model with a transmission system network model. The production cost model simulates the hourly energy market economic dispatches required to supply the forecasted hourly demand. Then, the transmission system network model calculates the hourly power flows on each transmission facility that result from the hourly energy market dispatches and demand. Finally, congestion is calculated by comparing the hourly power flows on each transmission facility with its respective facility rating. Figure 1 illustrates the inputs and processes involved in the congestion assessment.

Figure 1 - Congestion Assessment Process



The Congestion Assessment forecasts the potential congestion resulting from thermal violations of normal facility ratings under the Category A condition. Generation is dispatched as if the transmission system had no constraints and then the resulting power flows are compared to their respective facility ratings to identify congestion.

The assessment does not forecast the potential congestion caused by curtailment to prepare for contingencies, most severe single contingency limits, or congestion

[1] The reliability standards and ISO rules are available on the AESO website.

associated with voltage or transient stability criteria violations. These items could increase the risk of congestion. In addition, supply surplus can also impact a generating unit's ability to provide energy to the market. Supply surplus creates an unbalanced supply-demand situation where generation may be curtailed due to excess supply offered to the market rather than transmission constraints.

3. Assumptions

The Congestion Assessment forecasts congestion that may occur in the cluster region for the following assumptions.

3.1 Study Period

The Congestion Assessment studied all 8760 hours in the study year of 2029 to forecast congestion.

The Congestion Assessment assumes any modelled generating unit or transmission system project are in service prior to January 1st, 2029. Thus, every modelled generating unit and transmission system project were simulated as in-service for all of calendar year 2029.

3.2 Scenarios

The Congestion Assessment forecasts congestion that may occur in the cluster region within three scenarios:

i) **Post-PIC**: assumes projects that have met the project inclusion criteria[2] (PIC) across the entire province are energized;

ii) **Pre-cluster**: assumes post-PIC plus all Connection Assessment (CA) modelled projects[3] within the cluster region are energized; and

iii) **Post-cluster**: assumes pre-cluster plus Cluster 2 projects within the cluster region are energized.

Projects were included in the different scenarios as per the *AESO Connection Project List*[4] from August 2025. The scenarios are reiterated in Table 1.

[2] The definition of project inclusion criteria is available in the Connection Project List Guide on the AESO website.

[3] For the purpose of this assessment, CA Modelled projects are the non-Cluster 2 projects which are included in the assessment. The definition of CA modelled projects is available in the Connection Project List Guide on the AESO website.

[4] The AESO Connection Project List is available on the AESO website.

Table 1 – Projects Included in each Scenario

	In-flight Projects[5]		Cluster Projects[6]
Scenario	Projects that have met PIC across the province	CA Modelled Projects in the cluster region	Cluster Projects in the cluster region
Post-PIC	Yes	No	No
Pre-Cluster	Yes	Yes	No
Post-Cluster	Yes	Yes	Yes

[5] CA Modelled projects located outside the geographic region may be considered part of that region for cluster assessment if they have a significant impact on its system.

[6] Cluster projects located outside the geographic region may be considered part of that region for cluster assessment if they have a significant impact on its system.

3.3 Generation and Demand

Generation

Table 2 provides the generation capacities modelled in each scenario. The post-PIC scenario includes all existing generators and those that have met the AESO's inclusion criteria. However, the pre-cluster and post-cluster scenarios only add generating units to the cluster region.

Table 2 – Assumed Installed Generation Capacity

Technology	Post-PIC (MW)	Pre-Cluster (MW)	Post-Cluster (MW)
Wind[7]	6,257	0	+1,016
Solar[8]	5,255	+615	+1,380
Energy Storage[9]	286	+180	+941
Thermal	14,448	0	0
Hydro	894	0	0
Other	509	0	0
Additions		+795	+3,337
Total	27,649	28,444	31,781

Wind generating units were dispatched following forecasted hourly wind profiles which account for varying weather patterns and geographic locations.

Solar generating units were dispatched following forecasted hourly solar profiles which account for varying solar irradiance, weather patterns, geographic locations, and solar panel characteristics.

Energy storage assets were divided into three groups:

1. Storage assets co-located with generating units. These storage units were modelled to only charge from their respective co-located generating units and discharge based on pool price.
2. Storage assets that are assumed to provide ancillary services. These storage generating units were modelled to not dispatch in the energy market.
3. Storage assets that are assumed to provide energy market dispatches. These storage generating units were modelled to optimize charging and discharging based on pool price arbitrage.

[7] This includes wind generating units with hybrid storage. The storage, which charges from the wind generating unit, is not included in the total generation capacity.

[8] This includes solar generating units with hybrid storage. The storage, which charges from the solar generating unit, is not included in the total generation capacity.

[9] This includes the storage component of hybrid generating units with either wind and energy storage or solar and energy storage.

Each remaining generating unit was dispatched using production cost modelling which accounts for the costs and characteristics of its technology type.

In the event of supply surplus, partial volume dispatches of $0 offers were assigned pro-rata to the generating units according to Section 202.5 of the ISO Rules, *Supply Surplus*.[10]

Demand

Demand was modelled at each point of delivery following the *2024 Long Term Outlook*.[11]

In addition, two large data center loads from Phase 1 of the Large Load Integration program have been added to the base demand.[12] Their total size is 1200MW.

Table 3 – Large Data Center Loads

Project Name	Contract Size (MW)
P2936 GLDC Load	970
P3083 Keephills Data Centre Phase I	230

3.4 Transmission Topology

The transmission system topology was modelled as per the existing transmission system with the following additions:

1. Connection projects were included using the AESO-preferred connection alternative.
2. *Central East Transfer-Out Transmission Development*[13] (CETO) Stage 2 was included.

All of the above transmission system topology additions were assumed in-service before January 1st, 2029.

The existing facility ratings, provided by the legal owners of transmission facilities, were assumed in the transmission system model, except for the facility ratings that will be modified by any of the above additions.

Congestion is reported for transmission facilities in the cluster region that operate at 69 kV and above. Transformers are only reported if both sides of a transformer's voltage are at 69 kV and above.

4. Results

The Congestion Assessment forecasts the potential congestion resulting from thermal violations of normal facility ratings under the Category A condition. The Assessment does not forecast the

[10] *ISO Rule 202.5 – Supply Surplus* is available on the AESO website.
[11] The *2024 LTO* is available on the AESO website.
[12] Phase-1 Large Load Integration program information is available on the AESO website.
[13] AUC Decision 25469-D01-2021

potential congestion caused by pre-contingency curtailment, most severe single contingency limits, or congestion associated with voltage or transient stability criteria violations.

The Congestion Assessment provides forecasted congestion frequency and congested energy on lines within the cluster region.

> *Note: The total amount of congested energy in a region is not the sum of all of the congested energy on the transmission facilities. This is because when a generating unit is curtailed, it may affect flows on multiple lines with different effectiveness. For example, 1,000 MWh of curtailed energy at a specific generator may prevent overloads on two transmission facilities that report 1,000 MWh and 500 MWh of congested energy. In this hypothetical example, taking 1,000 MWh of action at a generator leads to 1,500 MWh of Congested Energy relief on transmission facilities.*

The Congestion Assessment does not consider which generating units would be curtailed; all real-time curtailments are subject to Section 302.1 of the ISO Rules, *Real Time Transmission Constraint Management.*[14]

The results are provided in the following sections for the three scenarios (as defined in Section 3.2): post-PIC, pre-cluster, and post-cluster.

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[14] *ISO Rule 302.1 – Real Time Transmission Constraint Management* is available on the AESO website.

4.1 Post-PIC Scenario

Figure 2 illustrates the forecasted congestion frequency and Figure 3 illustrates the forecasted congested energy. The results are provided in tabular format in Attachment A.

In the post-PIC scenario, material congestion is observed on 138 kV transmission lines 172L (83S Taber-172EL Tap), 760L (394S Empress-163S Amoco Empress), 7L171 (802S Michichi Creek-804S Wintering Hills), and 880L (523S Bullshead-321S Al Rothbauer) as well as 240kV/138 kV transformers 244ST1 (244S Bowmanton) and 244ST2 (244S Bowmanton). Material congestion is also observed on 240 kV lines 924L (356S Milo-924AL Tap), 927L (356S Milo-927AL Tap), 1074L (244S Bowmanton-1074CL Tap), 9L59 (9LA59 Tap-9LB59 Tap) and the Cassils-Bowmanton-Whitla (CBW) Path.

Figure 2 – Post-PIC Congestion Frequency Heatmap

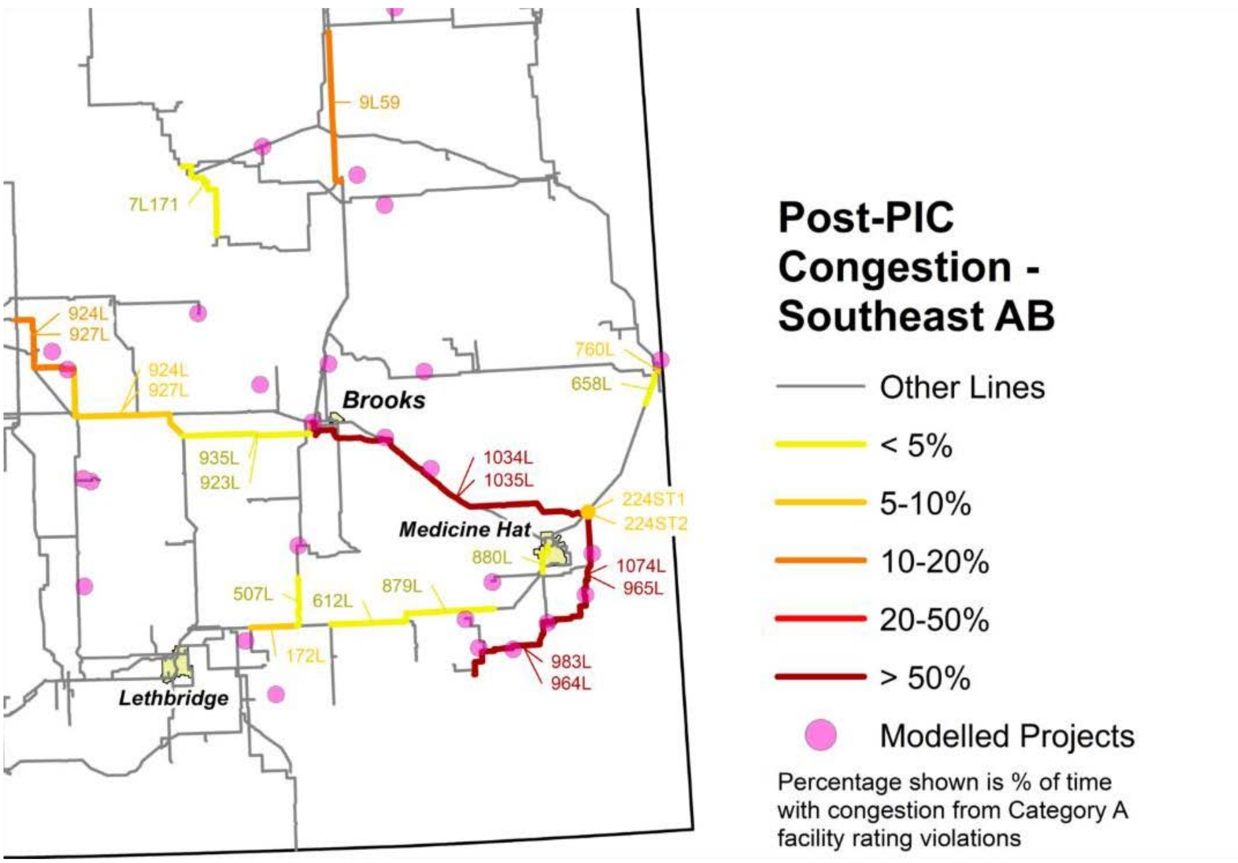
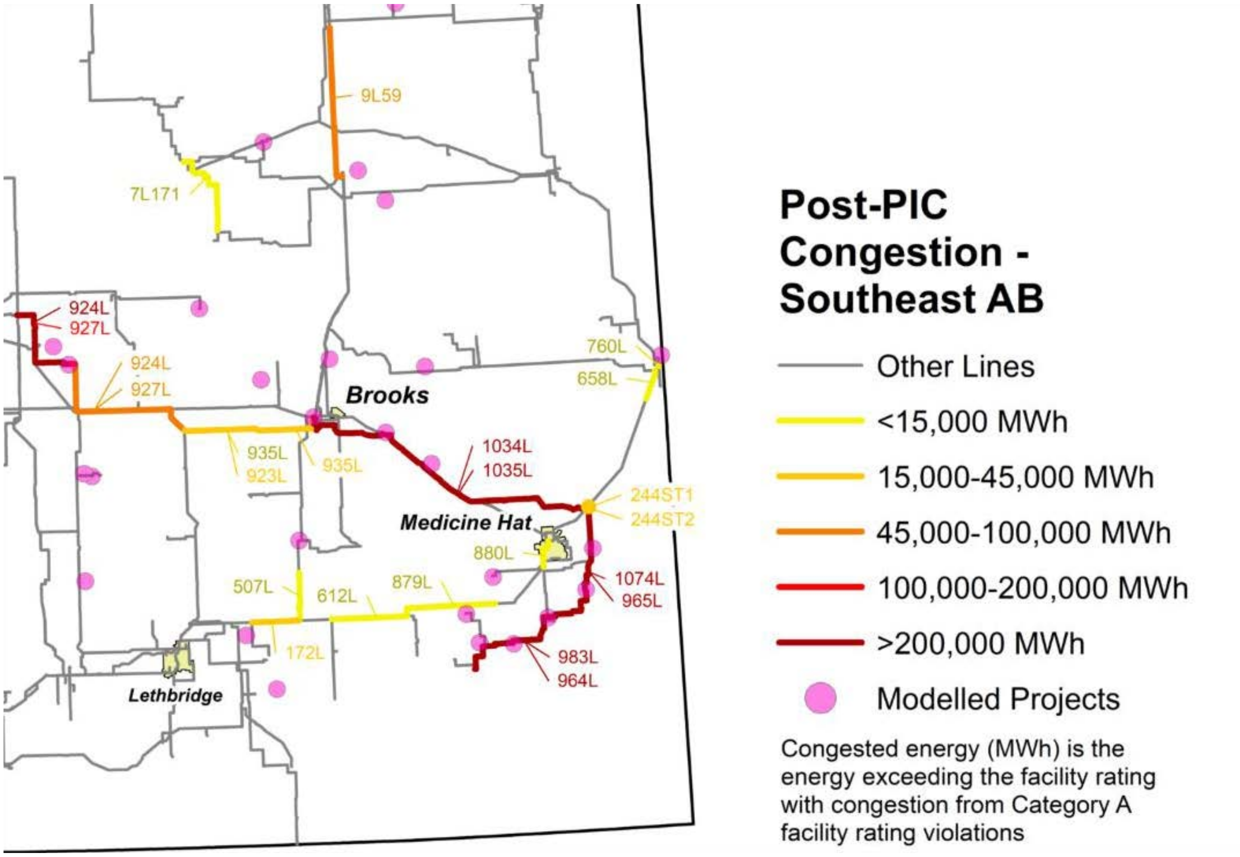


Figure 3 – Post-PIC Congested Energy Heatmap



4.2 Pre-Cluster Scenario

Figure 4 illustrates the forecasted congestion frequency and Figure 5 illustrates the forecasted congested energy. The results are provided in tabular format in Attachment A.

In the pre-cluster scenario, relative to the post-PIC scenario, material congestion increase is observed on 138 kV transmission lines 172L (83S Taber-172EL Tap). Material congestion increase is also observed on 240 kV lines 924L (356S Milo-924AL Tap), 927L (356S Milo-927AL Tap), 935L (356S Milo-935BL Tap), 935L (935AL Tap-935BL Tap) and 9L59 (9LA59 Tap-9LB59 Tap).

Figure 4 – Pre-Cluster Congestion Frequency Heatmap

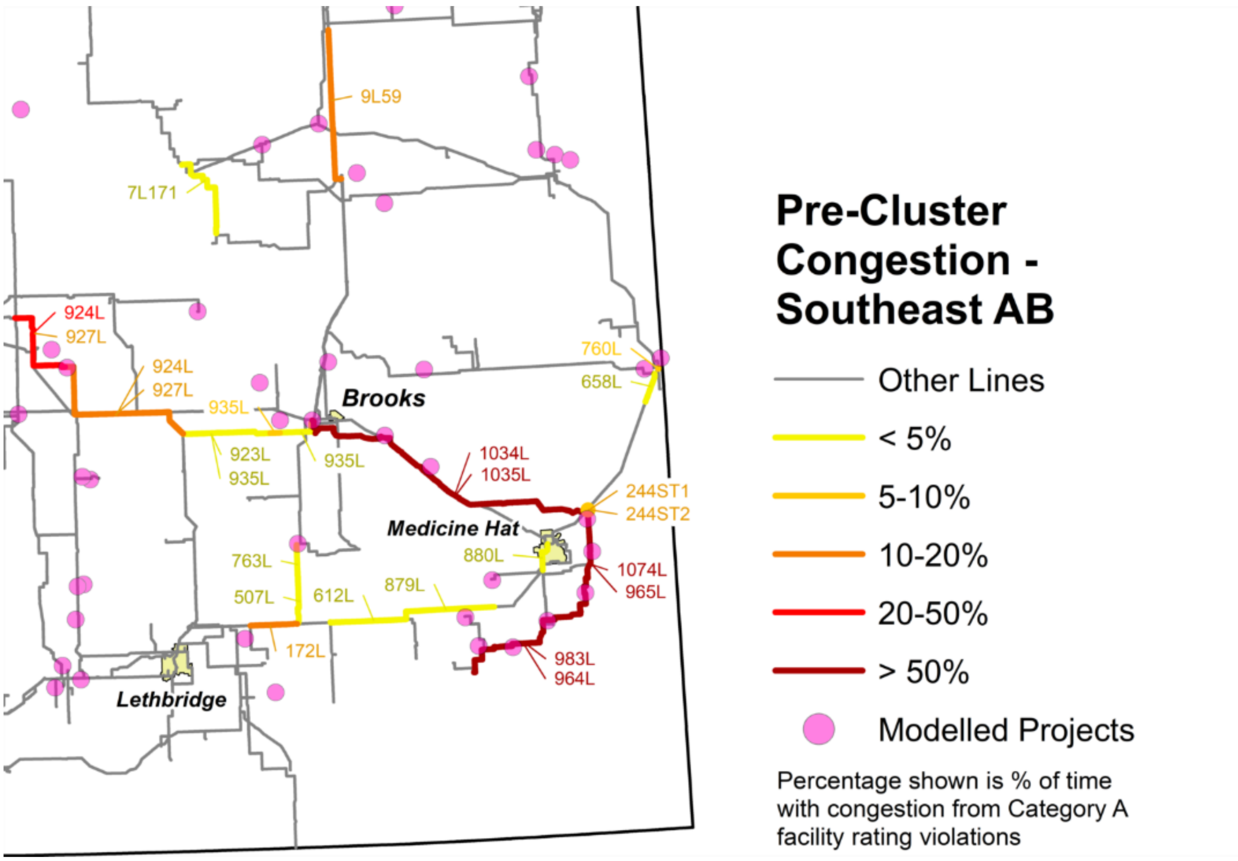
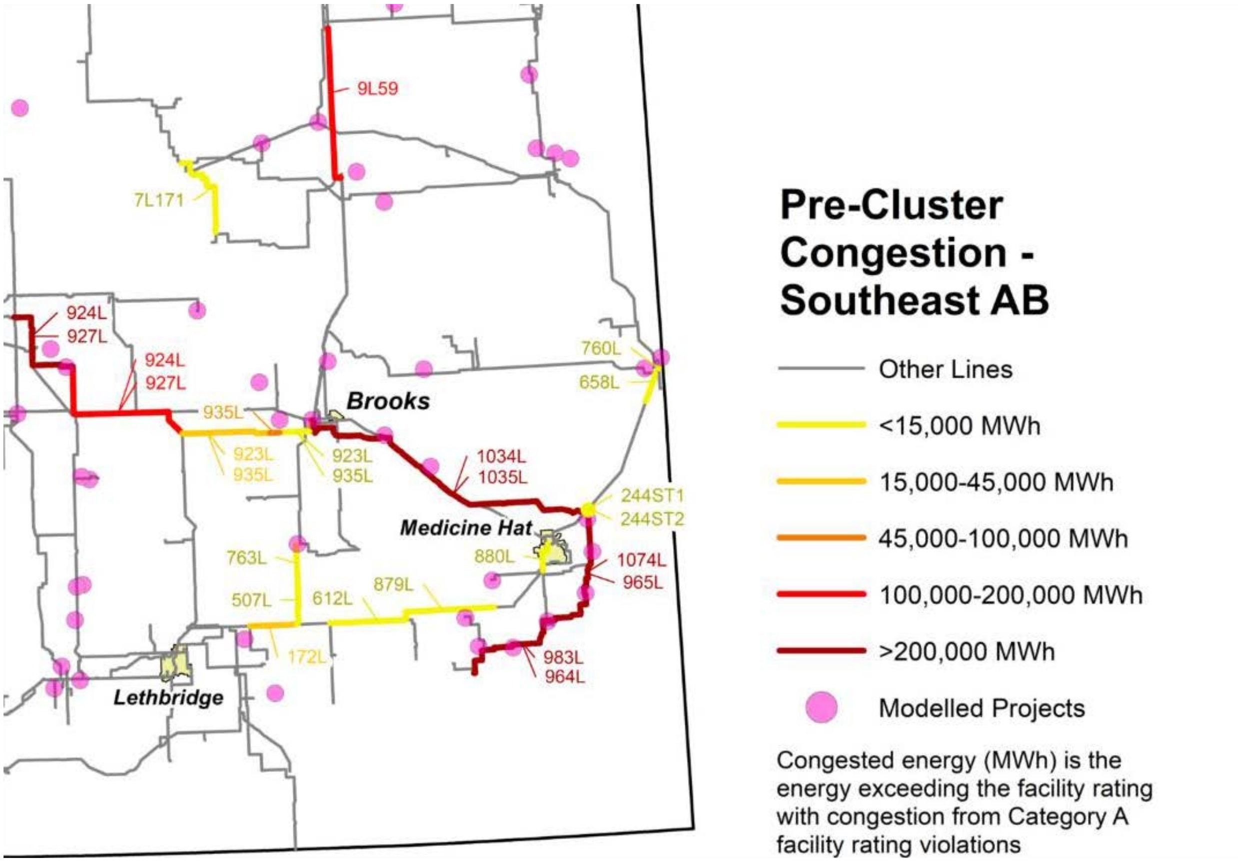


Figure 5 – Pre-Cluster Congested Energy Heatmap



4.3 Post-Cluster Scenario

Figure 6 illustrates the forecasted congestion frequency and Figure 7 illustrates the forecasted congested energy. The results are provided in tabular format in Attachment A.

In the post-cluster scenario, relative to the pre-PIC scenario, material congestion increase is observed on 138 kV transmission lines 172L (83S Taber-172EL Tap), 507L (83S Taber-257S Hull), 763L (763AL Tap-257S Hull), 831L (121S Brooks-831AL Tap) and 831L (831AL Tap-831BL Tap). Material congestion increase is also observed on 240 kV lines 923L (2075S Newell-923AL Tap), 923L (356S Milo- 923AL Tap), 924L (356S Milo-924AL Tap), 927L (356S Milo-927AL Tap), 935L (356S Milo-935BL Tap), 1074L (244S Bowmanton-1074CL Tap), 9L59 (9LA59 Tap-9LB59 Tap) and the CBW Path.

Some transmission facilities experienced decreased congestion, as detailed in Attachment A.

Figure 6 – Post-Cluster Congestion Frequency Heatmap

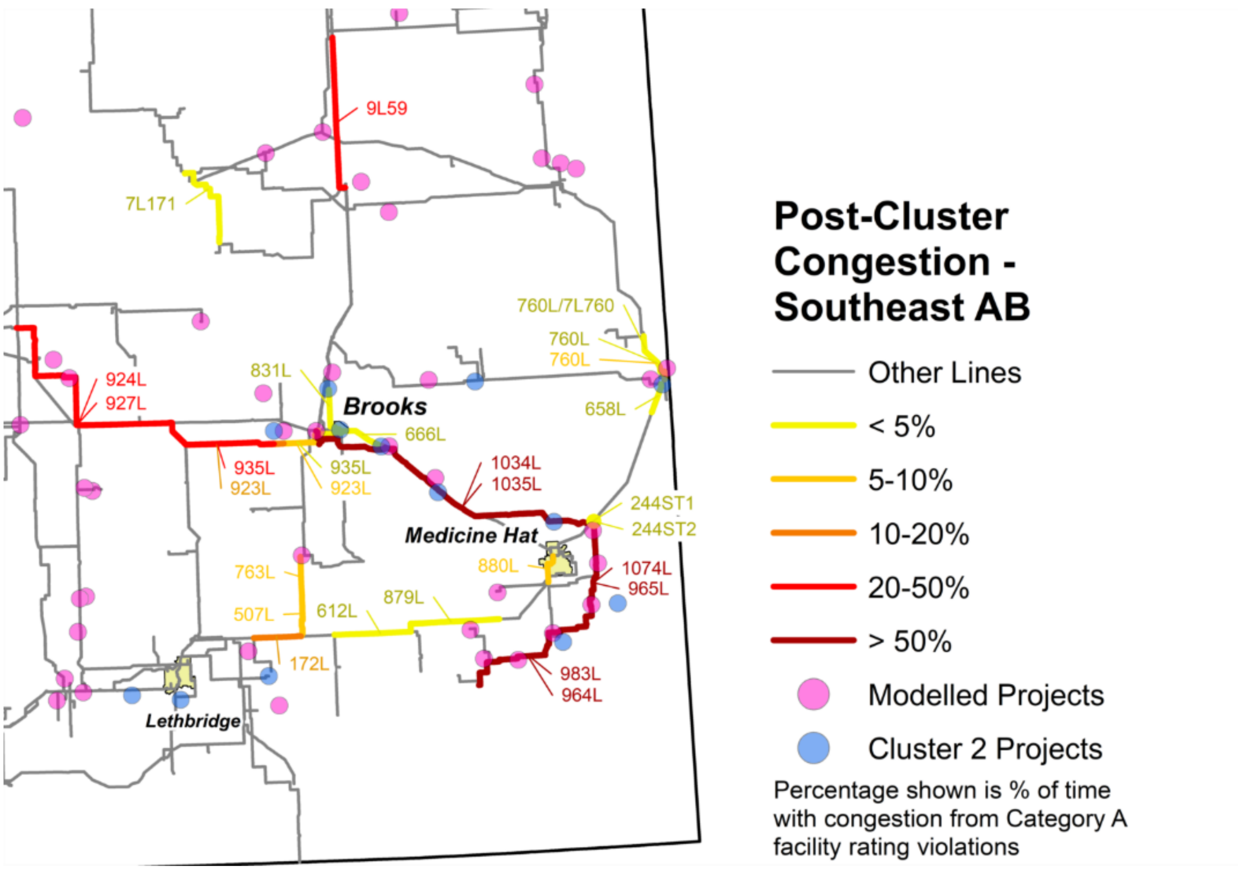
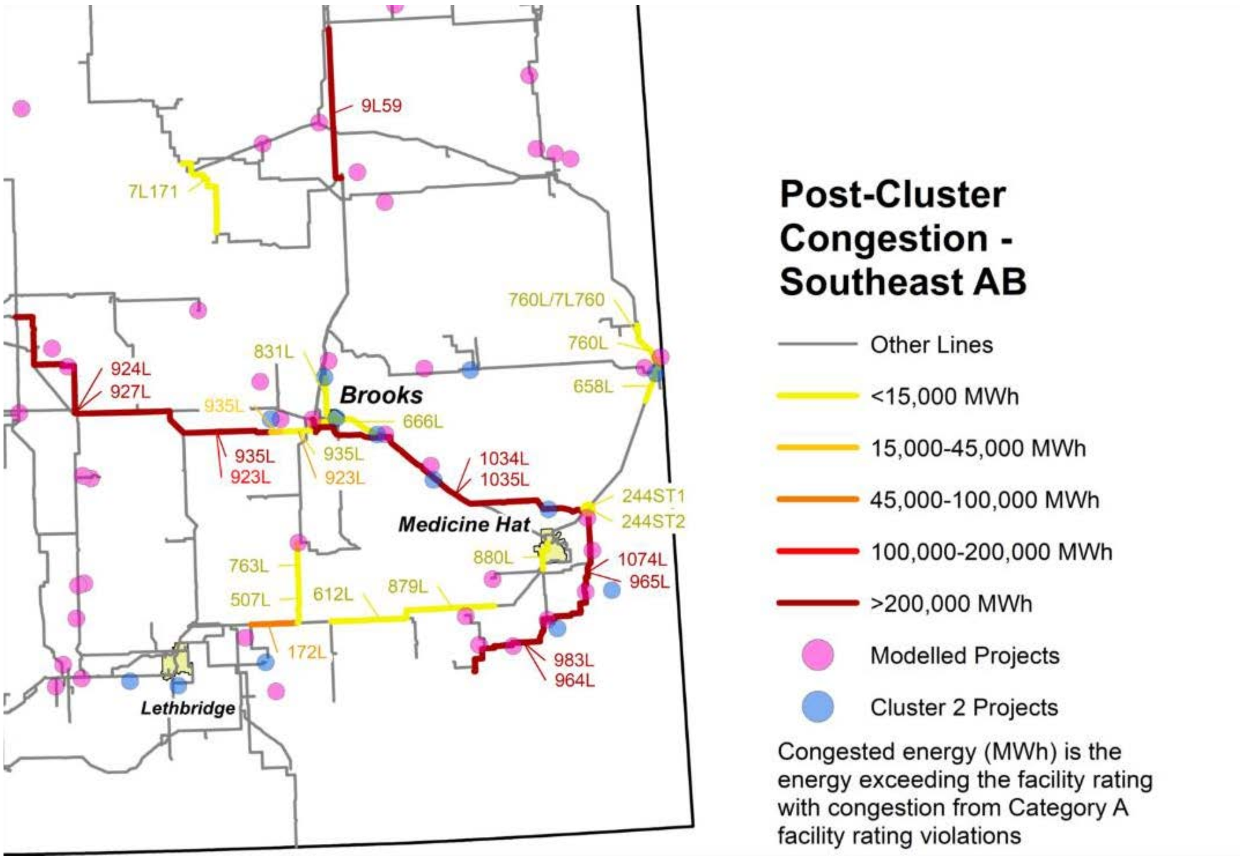


Figure 7 – Post-Cluster Congested Energy Heatmap



5. Conclusions

The Congestion Assessment forecasts the congestion for three scenarios: post-PIC, pre-cluster, and post-cluster.

- Congestion is forecasted in the post-PIC scenario, most notably on the CBW Path, 240 kV lines 924L, 927L and 9L59.
- The addition of in-flight and cluster projects would increase congestion on many transmission facilities and introduce new congestion risks across the Cluster Region.

Attachment A

Table A1 – Congestion Assessment Detailed Results

Transmission Line	Post-PIC		Pre-Cluster		Post-Cluster	
	Frequency (%)	Energy (MWh)	Frequency (%)	Energy (MWh)	Frequency (%)	Energy (MWh)
Cassils-Bowmanton-Whitla Path[15]	61	3,266,700	60	3,180,000	72	5,864,100
172L (83S Taber-172EL Tap)	9	22,000	13	38,000	16	58,000
244ST1 (244S Bowmanton)	9	17,000	9	14,000	3	4,200
244ST2 (244S Bowmanton)	9	17,000	9	14,000	3	4,200
507L (83S Taber-257S Hull)	1	560	2	1,500	7	9,700
612L (336S Fincastle-368S Burdett)	2	2,300	3	3,600	3	2,300
658L (562S Cypress-658AL Tap)	2	1,700	1	1,100	2	2,100
666L (498S Tilley-28S West Brooks)					1	430
760L (163S Amoco Empress-760AL Tap)					1	870
760L (394S Empress-163S Amoco Empress)	8	13,000	9	14,000	9	13,000
760L/7L760 (760AL Tap-7LA760 Tap)					1	1,400
763L (763AL Tap-257S Hull)			1	750	5	6,600
7L171 (802S Michichi Creek-804S Wintering Hills)	3	2,400	3	2,500	4	4,600
7L50 (526S Buffalo Creek-491L Tap)					2	1,400
831L (121S Brooks-831AL Tap)					4	1,700
831L (831AL Tap-831BL Tap)					5	2,100
879L (368S Burdett-879AL Tap)	1	520	1	660	1	780
880L (523S Bullshead-321S Al Rothbauer)	4	6,800	4	7,400	6	9,300
923L (2075S Newell-923AL Tap)	2	18,000	2	10,000	8	72,000
923L (356S Milo- 923AL Tap)	2	16,000	4	38,000	16	170,000
924L (356S Milo-924AL Tap)	10	97,000	13	150,000	30	470,000

[15] The Cassils-Bowmanton-Whitla Path consists of 240kV transmission lines 1034L (244S Bowmanton - 324S Cassils), 1035L(Bowmanton 244S-Newell 2075S), 1074L(234S Elkwater – 244S Bowmanton), 964L(251S Whitla-326S Murray Lake), 965L(244S Bowmanton-326S Murray Lake) and 983L(264S Elkwater-251S Whitla). The path's limit 850MW was determined through operational studies.

927L (356S Milo-927AL Tap)	9	87,000	12	130,000	28	440,000
935L (324S Cassils-935AL Tap)	2	17,000	1	7,500	2	13,000
935L (356S Milo-935BL Tap)	2	15,000	5	43,000	22	380,000
935L (935AL Tap-935BL Tap)	2	16,000	5	46,000	4	35,000
9L59 (801S Anderson-9LA59 Tap)	11	86,000	17	150,000	28	430,000