

# Engineering Connection Assessment

## P2356 Oyen Wind Power Project

### Connection

Renewable Energy Systems Canada Inc.

**Date:** Nov. 6, 2024

**Version:** V1

**Classification:** Public

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**NOTE:**

The conclusions and recommendations in this report are based on the results presented in *Appendix A: Engineering Connection Assessment: Study Results*, which was prepared by a third party consultant in accordance with the AESO Connection Process.

The AESO has reviewed the *Engineering Connection Assessment: Study Results*, and finds it acceptable for the purpose of assessing the potential impacts of the proposed connection on the performance of the Alberta interconnected electric system.



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## Attachments

Attachment A: Table A-1: Summary of Category B Reliability Criteria Violations, Project Impact and Mitigation Measures- All Scenarios

## Appendix

Appendix A: Engineering Connection Assessment Results

# 1 Introduction

This Alberta Electric System Operator (AESO) Engineering Connection Assessment describes the engineering studies that were completed to assess the impact of the Project (as defined below) on the performance of the Alberta interconnected electric system (AIES). This report also provides the AESO's conclusions and recommendations based on the results of the engineering studies.

An appendix to this Engineering Connection Assessment contains the results of the engineering studies and the scope and methodology used to perform the studies (see Appendix A). This appendix provides details regarding the technical criteria, assumptions, and methods for performing these engineering studies, and the results of the engineering studies.

## 1.1 Project Overview

Renewable Energy Systems Canada Inc. (Market Participant) has submitted a request for system access service to the AESO to connect its proposed Oyen Wind Power Project (Facility)<sup>1</sup> to the AIES. The Facility includes a collector substation, to be designated the Tumbleweed 1043S substation.

The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 250 MW<sup>2</sup> and a Rate DTS, *Demand Transmission Service*, contract capacity of 1 MW; and a request for transmission development (collectively, the Project).

The scheduled in-service date (ISD) for the Project is September 1, 2027.

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<sup>1</sup> Power Plant Application 29377-A001 and Substation Application 29377-A002, RES Oyen Wind LP, Oyen Wind Power Project (October 8, 2024).

<sup>2</sup> The Market Participant has applied for a total capacity of 466 MW to be constructed in two phases. This ECA is for Phase 1 which will have a generation capacity of 250 MW. Phase 2 will have a generation capacity of 216 MW and is proceeding in the AESO Cluster 2 connection process as P2701.

## 2 Assessment Scope

### 2.1 Objectives

The objectives of the AESO Engineering Connection Assessment are as follows:

- Assess the impact of the Project on the performance of the AIES.
- Evaluate Project connection alternatives and identify the AESO's preferred alternative.
- Recommend mitigation measures, if required, to reliably connect the Project to the AIES.
- Identify Project dependencies, including any TFO projects or AESO plans to expand or enhance the transmission system that must be completed prior to connection.

### 2.2 Existing System

Geographically, the Project is located in the AESO planning area of Hanna (Area 42), which is part of the AESO's Central Planning Region. Hanna (Area 42) is surrounded by the planning areas of Red Deer (Area 35), Alliance/Battle River (Area 36), Provost (Area 37), Empress (Area 48), and Sheerness (Area 43).

From a transmission system perspective, Hanna (Area 42) consists of 72 kV, 138/144 kV, and 240 kV transmission systems. Hanna (Area 42) is connected to Red Deer (Area 35) through a 240 kV transmission line; Alliance/Battle River (Area 36) through two 240 kV transmission lines; Provost (Area 37) through a 240 kV transmission line and a 138/144 kV transmission line; Empress (Area 48) through a 138/144 kV line, and the Sheerness area (Area 43) through a 240 kV transmission line and two 144 kV transmission lines.

Existing constraints in the Central planning region are managed in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

### 2.3 Study Area

The Study Area consists of the AESO planning areas of Sheerness (Area 43), Hanna (Area 42), Lloydminster (Area 13), Wainwright (Area 32), Vegreville (Area 56), Provost (Area 37) and Battle River (Area 36), including the tie lines connecting these planning areas to the rest of the AIES. All transmission facilities within the Study Area will be studied and monitored for violations of the Reliability Criteria (defined in Section 3.1 of Appendix – A1: Engineering Connection Assessment Scope).

## 3 Connection Alternatives

### 3.1 Overview

The AESO, in consultation with the TFO in the Study Area and the Market Participant, examined seven transmission alternatives to meet the Market Participant's request for system access service, as detailed in Section 3.2.

### 3.2 Connection Alternatives Examined

Below is a description of the developments associated with the transmission alternatives that were examined for the Project.

#### Alternative 1 – Radial 240 kV connection to Lanfine 959S substation

This alternative includes the following developments:

- Two options exist for Alternative 1:
  - Option 1: Add one 240 kV circuit, approximately 11 km<sup>3</sup> in length, to connect the Facility to the existing Lanfine 959S substation using a radial configuration.
  - Option 2: Add one 240 kV circuit, approximately 11 km<sup>4</sup> in length, to connect the Facility to the existing Lanfine 959S substation using a radial configuration. Approximately 6 km of the new 240 kV circuit would be located on the open side of the existing 240 kV double circuit transmission structures for 9L46.
- Modify the Lanfine 959S substation, including adding one 240 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

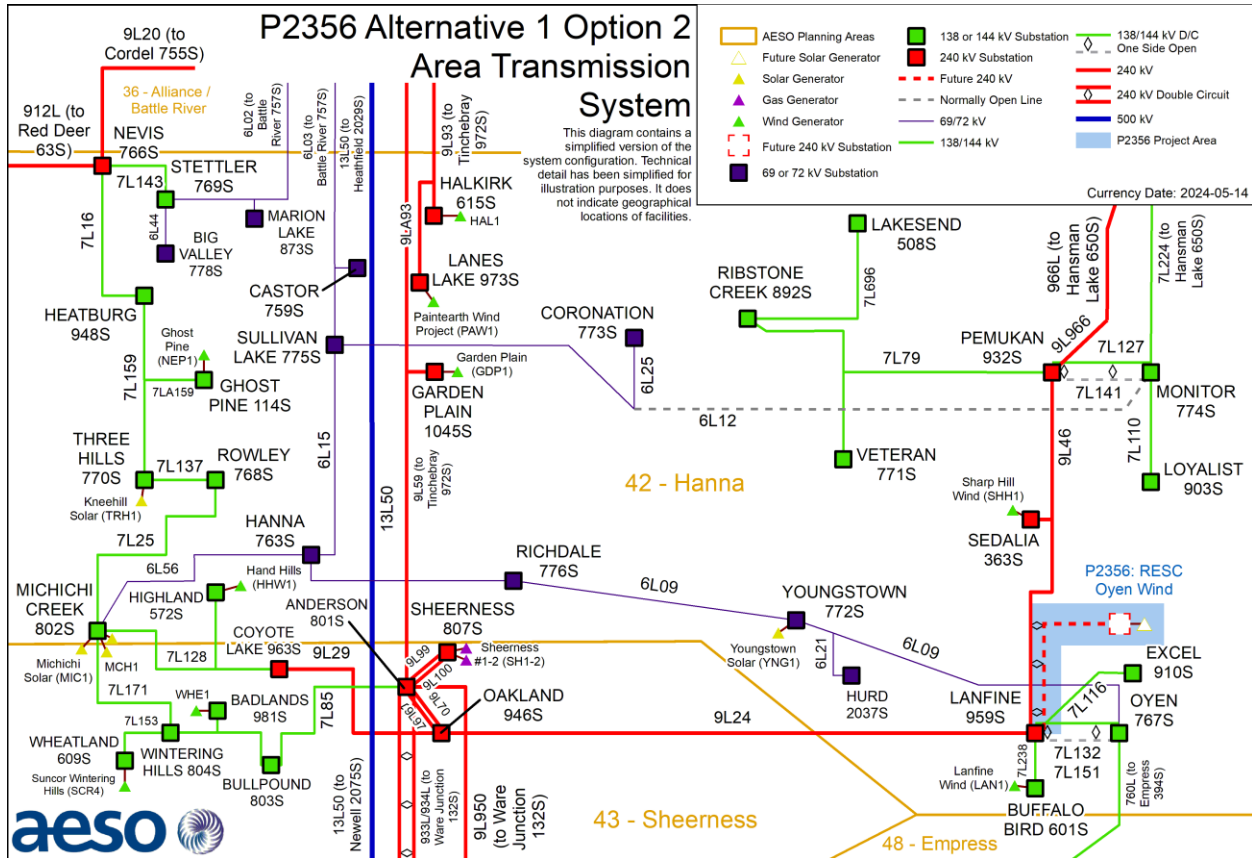
The proposed connection configuration is shown in Figure 3-1.

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<sup>3</sup> Exact line length to be determined by the TFO

<sup>4</sup> Exact line length to be determined by the TFO

Figure 3-1: Connection Alternative 1 Option 2



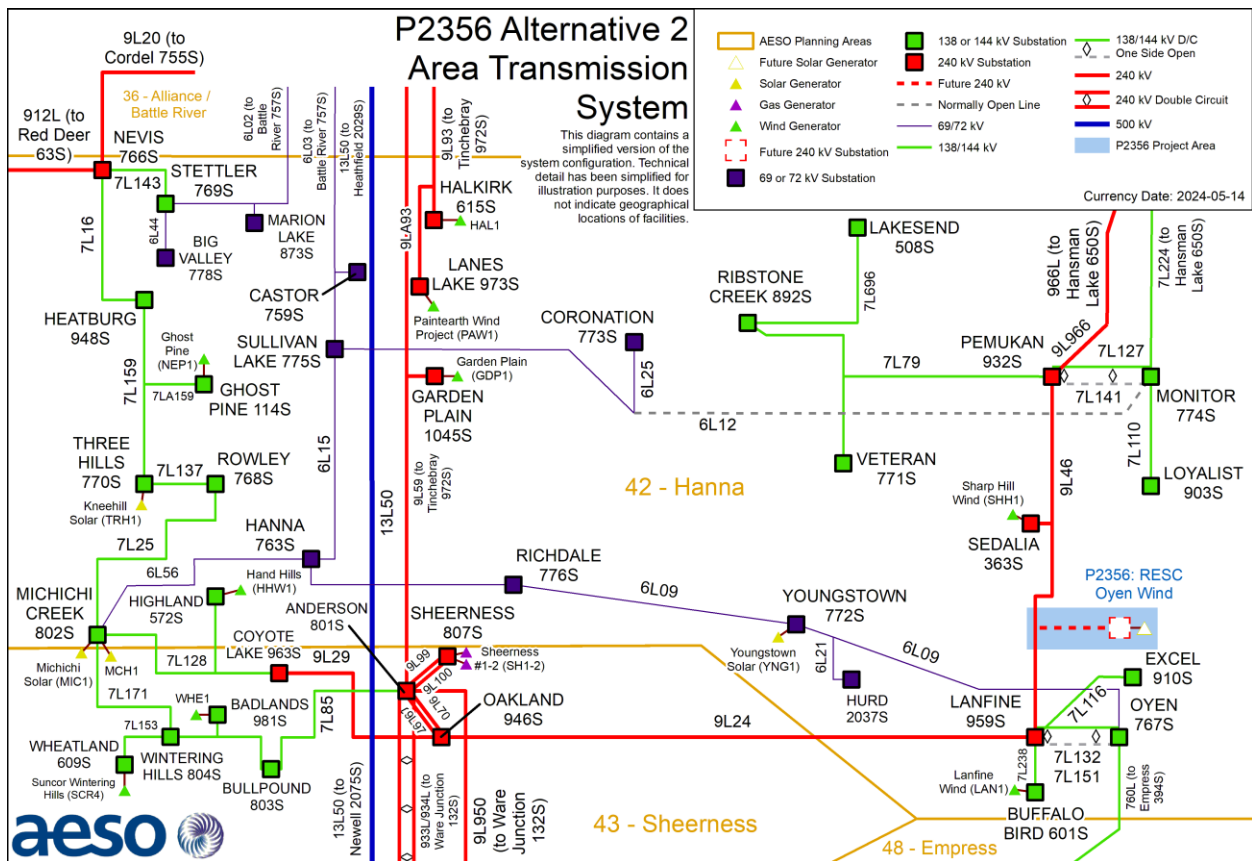
### Alternative 2 – T-Tap connection to the 240 kV Transmission Line 9L46

This alternative includes the following developments:

- Add one 240 kV circuit, approximately 6.5 km<sup>5</sup> in length, to connect the Facility to the existing 240 kV transmission line 9L46 using a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-2.

**Figure 3-2: Connection Alternative 2**



<sup>5</sup> Exact line length to be determined by the TFO

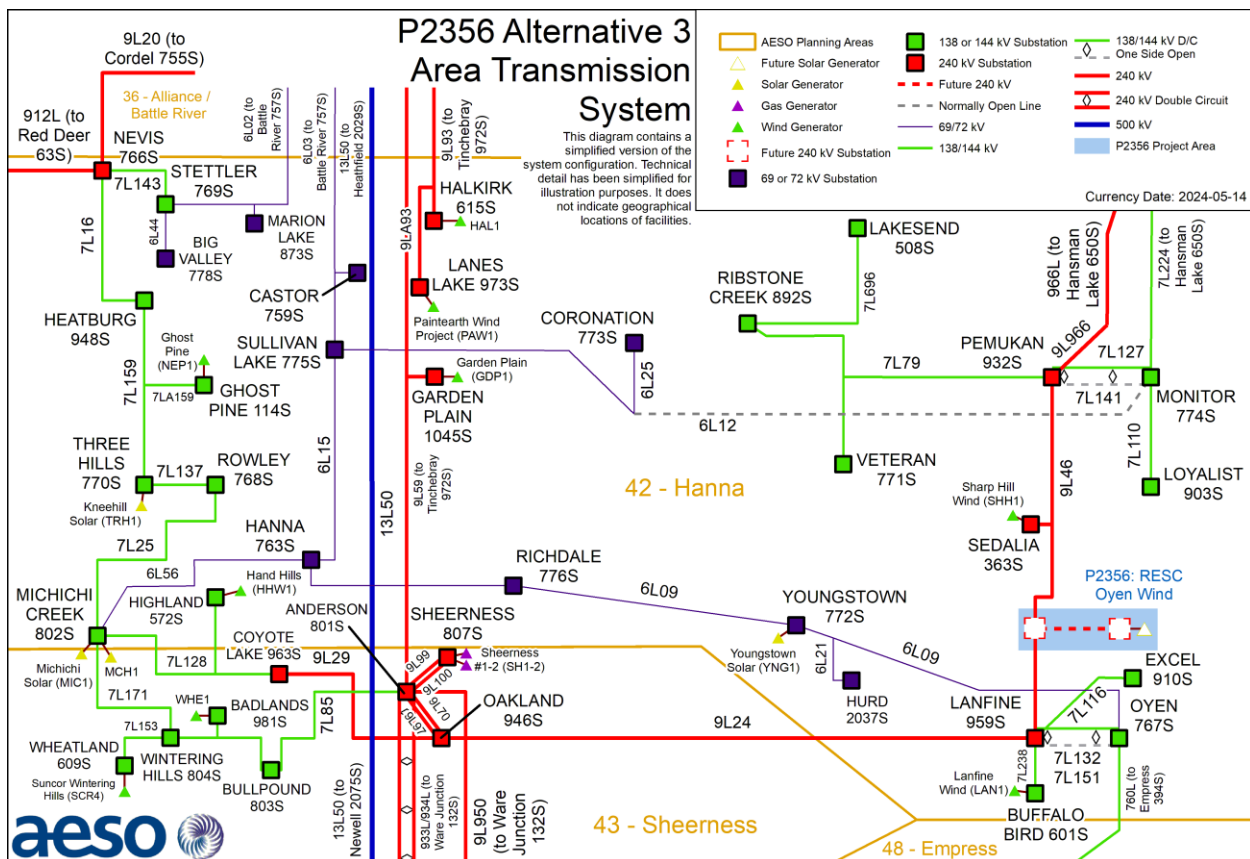
### Alternative 3 – In-and-out connection to the 240 kV Transmission Line 9L46

This alternative includes the following developments:

- Add a 240 kV substation, including three 240 kV circuit breakers to be connected to the existing 240 kV transmission line 9L46 using an in-and-out configuration;
- Add one 240 kV circuit, approximately 6.5 km<sup>6</sup> in length, to connect the Facility to the proposed 240 kV substation; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-3.

Figure 3-3: Connection Alternative 3



<sup>6</sup> Exact line length to be determined by the TFO



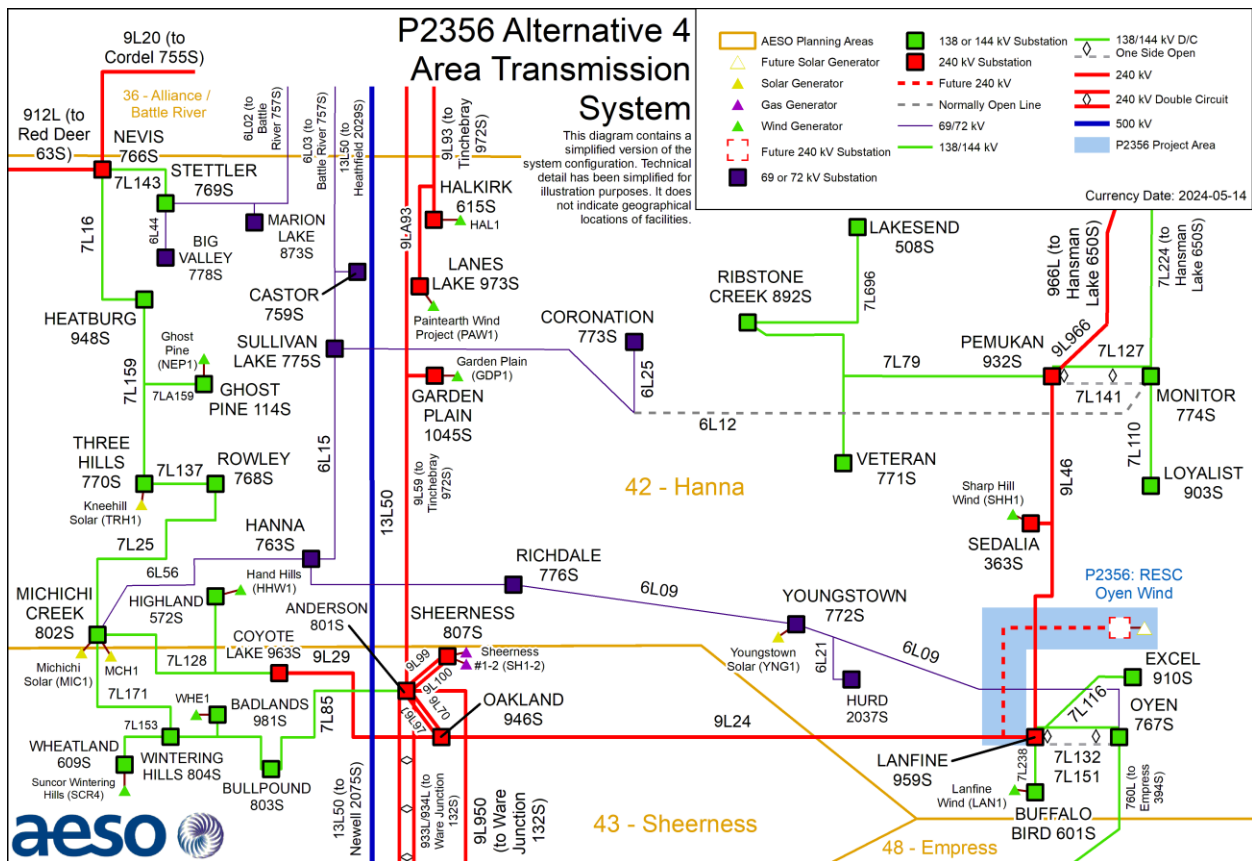
**Alternative 4 – T-Tap connection to the 240 kV Transmission Line 9L24**

This alternative includes the following developments:

- Add one 240 kV circuit, approximately 14.5 km<sup>7</sup> in length, to connect the Facility to the existing 240 kV transmission line 9L24 in a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-4.

**Figure 3-4: Connection Alternative 4**



<sup>7</sup> Exact line length to be determined by the TFO

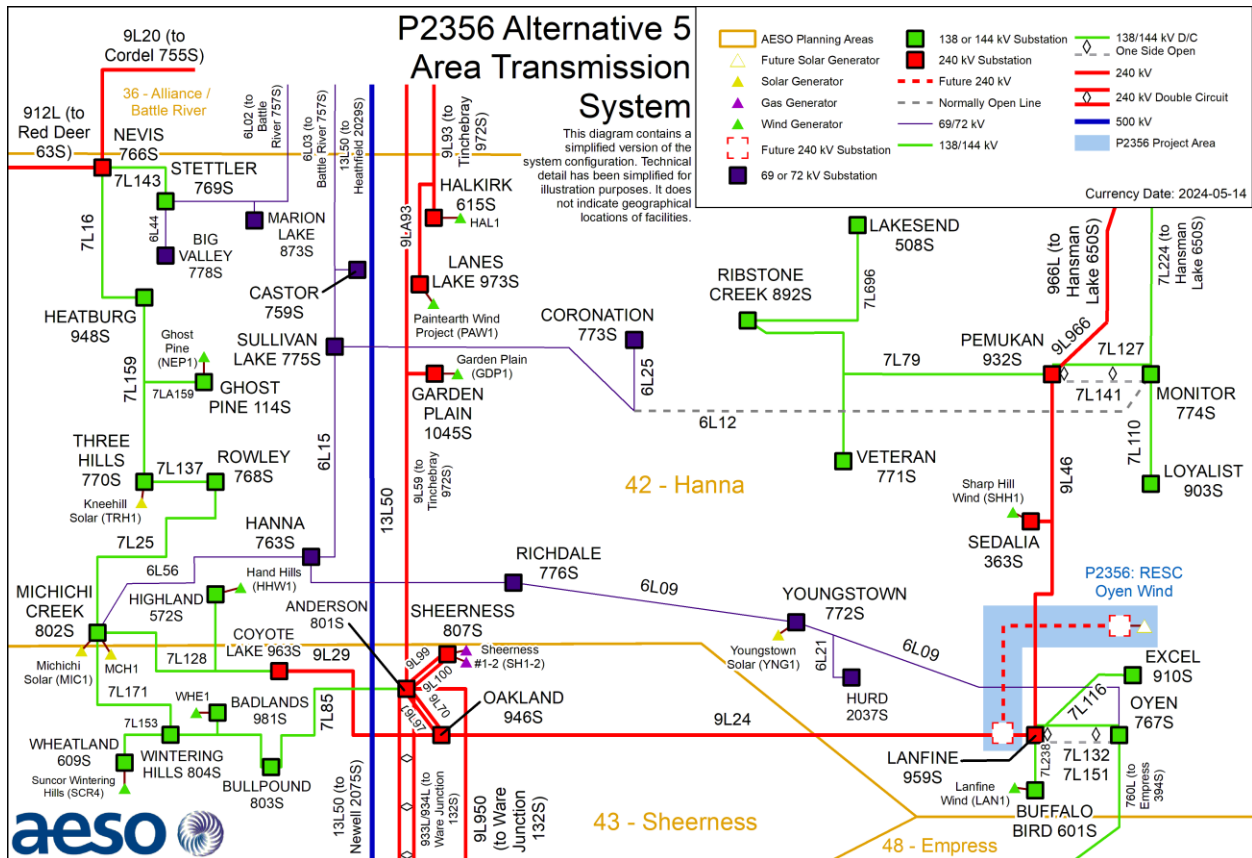
**Alternative 5 – In-and-out connection to the 240 kV Transmission Line 9L24**

This alternative includes the following developments:

- Add a 240 kV substation, including three 240 kV circuit breakers to be connected to the existing 240 kV transmission line 9L24 using an in-an-out configuration; and
- Add one 240 kV circuit, approximately 14.5 km<sup>8</sup> in length, to connect the Facility to the proposed 240 kV substation; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-5.

**Figure 3-5: Connection Alternative 5**



<sup>8</sup> Exact line length to be determined by the TFO

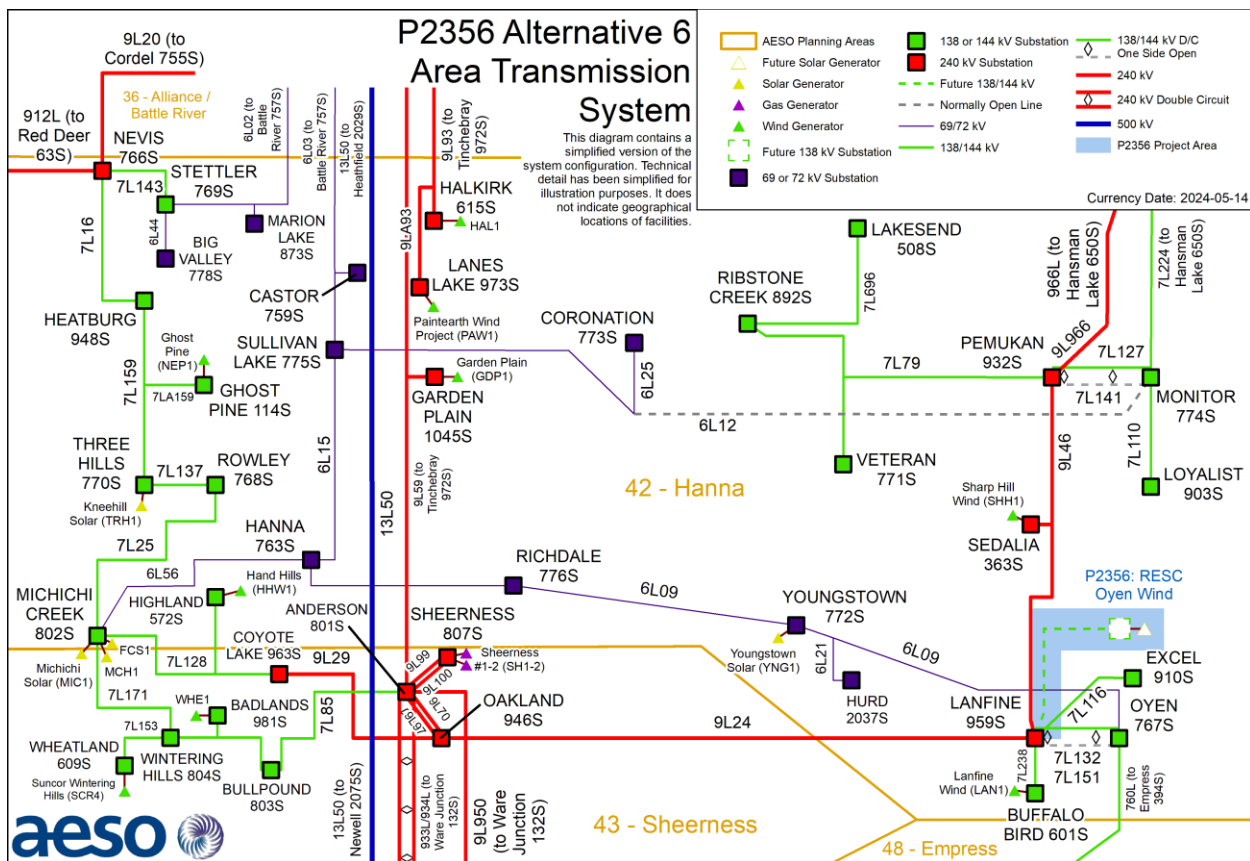
**Alternative 6 – Radial 144 kV connection to Lanfine 959S substation**

This alternative includes the following developments:

- Add one 144 kV circuit, approximately 12 km<sup>9</sup> in length, to connect the Facility to the existing Lanfine 959S substation using a radial configuration;
- Modify the Lanfine 959S substation, including adding one 144 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-6.

**Figure 3-6: Connection Alternative 6**



<sup>9</sup> Exact line length to be determined by the TFO

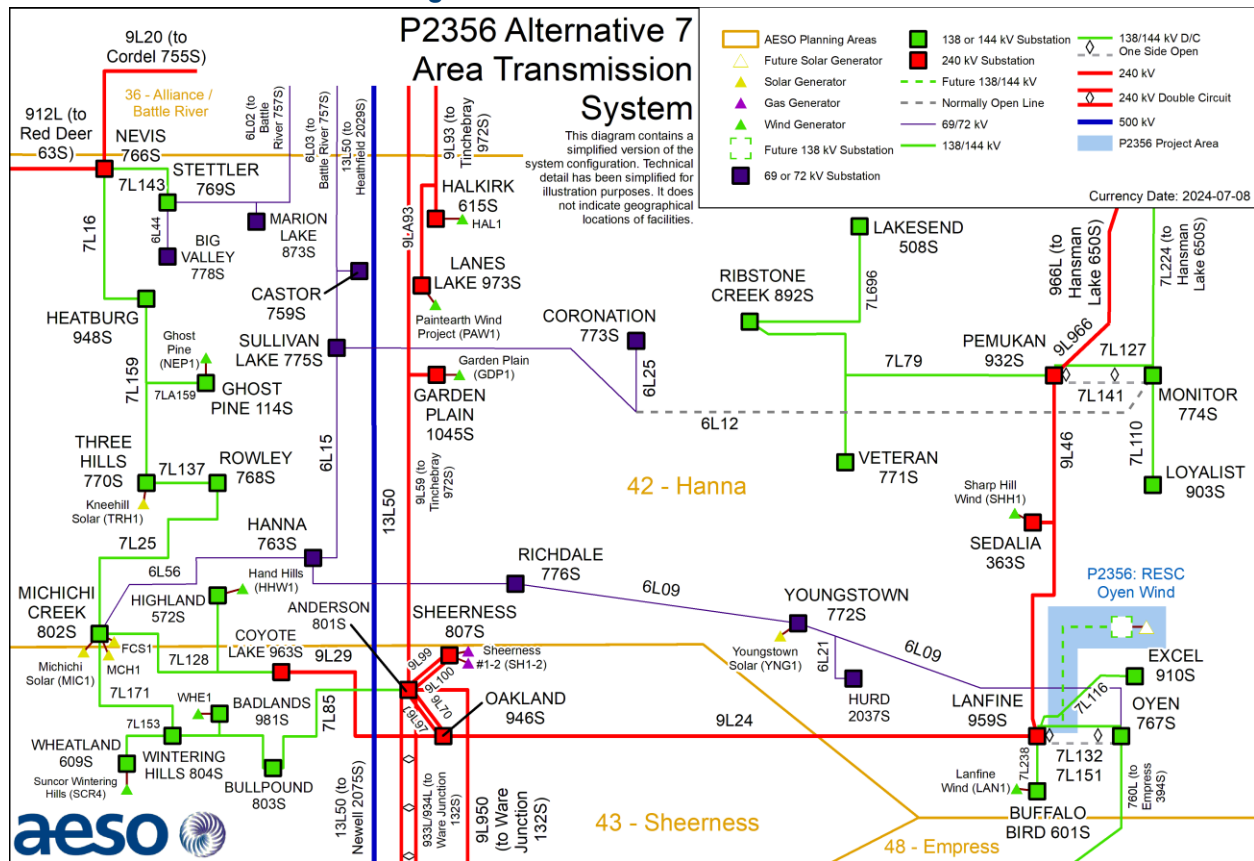
### Alternative 7 – T-Tap connection to 144 kV Transmission Line 7L132

This alternative includes the following developments:

- Add one 144 kV circuit, approximately 11.5 km<sup>10</sup> in length, to connect the Facility to the existing 144 kV transmission line 7L132 using a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 3-7.

**Figure 3-7: Connection Alternative 7**



<sup>10</sup> Exact line length to be determined by the TFO

### **3.3 Connection Alternatives Selected for Further Study**

Alternative 1 Option 2 is considered technically feasible and was selected for further study.

### **3.4 Connection Alternatives Not Selected for Further Study**

The 144 kV connections (Alternatives 6 and 7) were ruled out as these connections would not provide sufficient capacity for the second phase of the Facility.

Alternative 2 is ruled out because there is an existing T-tap connection where an existing generator, Sharp Hill Wind, is connected to the 9L46 line, and the combined amount of generation would exceed the MSSC limit for an N-1 contingency of losing line 9L46.

Alternative 1 Option 1, involves increased transmission development, and hence increased cost and land impact, compared to Alternative 1 Option 2, as Alternative 1 Option 2 uses pre-existing towers for approximately half of the length. Therefore, Alternative 1 Option 1 is ruled out.

Alternatives 3, 4, and 5 involve increased transmission development, compared to Alternative 1 Option 2. As such, Alternatives 1 Option 1, 3, 4, and 5 are ruled out.

## 4 Assessment Approach

### 4.1 Standards, Criteria and Assumptions

A detailed description of the standards, criteria, and assumptions that were used for the connection assessment is provided in Appendix A.

### 4.2 Studies Performed

The scheduled ISD for the Project is September 1, 2027. Therefore, studies were performed using scenarios for 2028 Summer Light (SL), 2028 Summer Peak (SP), and 2028 Winter Peak (WP).

Stage 1 of the approved Central East Transfer-out Transmission (CETO) project, which has a scheduled ISD of June 2026,<sup>11</sup> was included in all studied scenarios reported herein.

Short-circuit studies were performed using the 2033 Winter Peak (WP) scenario.

Table 4-1 lists the study scenarios. Post-Project scenarios reflect the requested Rate STS contract capacity of 450 MW at the 1043 Tumbleweed substation.

**Table 4-1: Connection Study Scenarios**

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
<b>Pre-Project</b>					
1	2028 Summer Peak (2028 SP)	High Generation (HG)	2028 SP Pre-Project	0	0
2	2028 Summer Light (2028 SL)		2028 SL Pre-Project	0	0
3	2028 Winter Peak (2028 WP)		2028 WP Pre-Project	0	0
<b>Post-Project</b>					
4	2028 SP	HG	2028 SP Post -Project	0	250
5	2028 SL		2028 SL Post -Project	0	250
6	2028 WP		2028 WP Post -Project	0	250
7	2033 WP	All study area generation in-service	2033 WP Post-Project- HG	0	250

The AESO Planning Region load forecasts used for the connection studies were based on the AESO's *2023 Long-term Outlook (2023 LTO)*.

#### 4.2.1 Power Flow Studies

The purpose of the power flow studies is to identify and quantify any thermal and voltage criteria violations in the Study Area.

<sup>11</sup> Decision 25469-D01-2021, Alberta Electric System Operator, Needs Identification Document Application, *Central East Transfer-out Transmission Development*.

In addition, power flow studies are also used to identify point of delivery (POD) low voltage bus voltage deviations beyond the limits listed in Table 3-1 of Appendix A – A1: Engineering Connection Assessment Scope.<sup>12</sup>

Power flow studies were performed for the 2028 Summer Light, 2028 Summer Peak, and 2028 Winter Peak pre-Project scenarios, and for 2028 Summer Light, 2028 Summer Peak, and 2028 Winter Peak post-Project scenarios.

#### **4.2.2 Transient Stability Studies**

The purpose of the transient stability studies is to assess the post-Project stability of the transmission system after three-phase to ground faults are applied on select transmission lines in the Study Area.

Transient stability studies were performed for the 2028 Summer Light, 2028 Summer Peak, and 2028 Winter Peak post-Project scenarios.

#### **4.2.3 Short-Circuit Current Level Studies**

The purpose of short-circuit current level studies is to determine the expected system short-circuit current levels in the vicinity of the Project.

Short circuit studies were performed for the 2028 Winter Peak pre-Project scenario and for the 2028 Winter Peak and 2033 Winter Peak post-Project scenarios.

### **4.3 Mitigation Measure Development and Evaluation**

As explained in Appendix A, mitigation measures were developed to address system performance issues that were identified in the post-Project scenarios. Studies performed to assess the effectiveness of mitigation measures are briefly outlined below.

#### **4.3.1 Post-Mitigation Studies**

Power flow, transient stability, and short-circuit current level studies were performed to assess the impact of the Project on the performance of the AIES following implementation of the AESO's proposed mitigation measures.

#### **4.3.2 Constraint Effective Factor Studies**

Constraint effective factor studies were used to determine the generator and load constraint effective factors and to identify the most effective generators or loads to manage thermal criteria violations that were observed under Category B conditions.

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<sup>12</sup> The AESO's desired post-contingency voltage deviations for low voltage busses represent guidelines rather than criteria. A POD bus voltage deviation that exceeds the desired limits shown in Table 3-1 of Attachment A1 does not represent a Reliability Criteria violation. Mitigation measures would not be developed to specifically address POD bus voltage deviations that exceed the desired values in Table 3-1 of Appendix A.

## 5 Interpretation of Results

### 5.1 Results Overview

This section provides an assessment of the impact of the Project on the performance of the AIES. The Reliability Criteria violations observed during the connection assessment studies for Category A, and the proposed mitigation measures are summarized in Table 5-1. Reliability Criteria violations observed during the connection assessment studies for Category B and the proposed mitigation measures are summarized in Attachment A.

- Section 5.2 includes an overview of the pre-Project studies results.
- Section 5.3 includes an overview of the post-Project studies results.
- Section 5.4 includes a description of the proposed mitigation measures to address observed Reliability Criteria violations.

Detailed study results are provided in Appendix A.





**Table 5-1: Summary of Category A Reliability Criteria Violations, Project Impact and Mitigation Measures- All Scenarios**

Scenario	Type of Reliability Criteria Violation Pre-Project	Type of Reliability Criteria Violation Post-Project	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
2028 Summer Peak	None	Thermal - above normal rating	472L (Hughenden 213S to Sunken Lake 221S Tap)	New Violation	None	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	715L (Hansman Lake 650S to 715AL Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	749AL (749AL Tap to ABO Fox Meadows Wind)	Marginally increased violation	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	7L760 (Oyen 767S to Bindloss 914S Tap)	Materially increased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above emergency rating	7L132 (Oyen 767S to Lanfine 959S)	Materially increased violation	Real-time operational practices	Real-time operational practices
2028 Summer Light	None	Thermal - above emergency rating	7L760 (Oyen 767S to Bindloss 914S Tap)	New Violation	None	Real-time operational practices
	None	Thermal - above normal rating	7L132 (Oyen 767S to Lanfine 959S)	New Violation	None	Real-time operational practices

**Notes:**

- Marginally increased (or marginally decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) between 0% and 3% (or -3%).
- Materially increased (or materially decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) above or equal to 3% (or below or equal to -3%)

## 5.2 Pre-Project Study Results

### 5.2.1 Category A Conditions

As shown in Table 5-1, with the inclusion of additional projects planning to connect in the Central Planning Region, the pre-Project power flow studies identified several thermal criteria violations under the Category A condition (i.e. all elements in service) in Summer Peak and Summer Light scenarios.

Category A thermal criteria violations were observed on the 138/144kV transmission lines 715L, 715AL, 749AL, 7L760, and 7L132.

The short-circuit fault levels were found to be within the typical capabilities of the nearby facilities.

### 5.2.2 Category B Conditions

The pre-Project power flow studies identified several thermal violations under Category B conditions (i.e., loss of a single system element); see Attachment A for details.

## 5.3 Post-Project Study Results

### 5.3.1 Category A Conditions

Following the connection of the Project, power flow studies identified a number of thermal criteria violations under the Category A condition. Category A thermal criteria violations observed in the pre-Project scenarios were also observed after the connection of the Project, including violations on the 138/144 kV transmission lines 715L, 715AL, 749AL, 7L760, and 7L132. The violations on 715L, 715AL, and 749AL lines were not changed materially compared to pre-Project conditions, while the violations on 7L760 and 7L132 were materially exacerbated. A new violation on the 138 kV transmission line 472L was observed as well.

A summary of thermal criteria violations observed under N-0 system conditions in the Summer Peak scenarios are shown in Table 5-2 and the Summer Light scenarios are shown in Table 5-3.

**Table 5-2: Thermal Criteria violations under N-0 Condition in the SP scenarios**

Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
			Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
472L (Hughenden 213S to Sunken Lake 221S Tap)	84	92	40.00	47.62	86.52	103.00	55.38
715L (Hansman Lake 650S to 715AL Tap)	98	132	118.38	120.80	116.81	119.20	-1.60
749AL (749AL Tap to ABO Fox Meadows Wind)	121	133	127.96	105.80	129.29	106.90	1.10
715AL (715AL Tap to Cache)	98	108	118.48	120.90	116.91	119.30	-1.60

Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
			Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
Rising Sun MPC Solar)							
7L760 (Oyen 767S to Bindloss 914S Tap)	110	122.7	137.97	125.20	158.90	144.20	19.00
7L132 (Oyen 767S to Lanfine 959S)	112	138	136.33	121.60	159.43	142.20	20.60

**Table 5-3: Thermal Criteria violations under N-0 Condition in the SL scenarios**

Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
			Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
7L760 (Oyen 767S to Bindloss 914S Tap)	110	122.7	105.00	95.28	124.41	112.90	17.62
7L132 (Oyen 767S to Lanfine 959S)	112	138	102.00	92.00	126.47	119.20	27.20

Tables 5-2 and 5-3 indicate that the project has material impacts on N-0 thermal criteria violations in the Study Area following the inclusion of the Project and additional projects planning to connect in the south region, including on transmission lines 472L, 7L760, and 7L132.

Post-Project short-circuit fault levels were not significantly higher than pre-Project levels and were found to be within the typical capabilities of the nearby facilities.

### 5.3.2 Category B Conditions

Post-Project studies identified a number of thermal criteria violations under Category B conditions. Following the connection of the Project, some of the thermal criteria violations observed in the pre-Project scenarios were exacerbated, and new thermal criteria violations were observed.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied.

## 5.4 Mitigation Measures

This section discusses the AESO's proposed mitigation measures to address the system performance issues that were identified in the pre-Project and post-Project scenarios.

### 5.4.1 Pre-Project

The Category A thermal reliability criteria violations observed on the 138/144 kV transmission lines 715L, 715AL, 749AL, 7L760, and 7L132 can be managed by applying Section 302.1 of the ISO rules, *Real-Time Transmission Constraint Management* (TCM Rule) to curtail generation until such a time that system developments are in place to alleviate congestion. If necessary, the AESO will file an application for an "exception" under Section 15(2) of the *Transmission Regulation* (TReg).

Prior to connection of the Project, most of the observed Category B thermal criteria violations can be managed using real-time operational practices (RTOPs). The thermal criteria violations can be mitigated by the existing RASs 134, 200, and 203.

The second stage of the approved CETO project,<sup>13</sup> which has a scheduled ISD of June 2026 and is prior to the Project's scheduled ISD, is expected to mitigate some of the thermal criteria violations involving 240 kV transmission line 9L62 observed under Category B conditions.

The total amount of generation tied to RAS 134 and RAS 201 exceeds the Most Severe Single Contingency (MSSC) limit of 466 MW. Pre-contingency generation curtailment under normal conditions may be required using real-time operational practices to prevent generation curtailment by RAS action above the MSSC limit. The probability of pre-curtailment being required would be dependent on generation profiles and operating conditions.

### 5.4.2 Post-Project

The Category A thermal reliability criteria violations observed on the 138/144 kV transmission lines 472L, 715L, 715AL, 749AL, 7L760, and 7L132 can be managed by applying Section 302.1 of the ISO rules, *Real-Time Transmission Constraint Management* (TCM Rule) to curtail generation until such a time that system developments are in place to alleviate congestion. If necessary, the AESO will file an application for an "exception" under Section 15(2) of the *Transmission Regulation* (TReg). The AESO is developing system plans to address thermal criteria violations on the 138/144 kV system in the Hanna and Sheerness areas.<sup>14</sup>

After connection of the Project, most of the thermal criteria violations observed under Category B conditions can be mitigated by using RTOPs, existing RASs 200 and 203, and modified RASs 134 and 201. One new RAS is required to mitigate the observed new thermal criteria violations under Category B conditions. The new RAS, hereafter referred to as the New 9L24/760L RAS, is required to mitigate thermal criteria violations on the 138/144 kV transmission lines 7L760/760L and 7L132 under certain Category B conditions with the Project included in the RAS logic.

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<sup>13</sup> Decision 25469-D01-2021, Alberta Electric System Operator, Needs Identification Document Application, Central East Transfer-out Transmission Development.

<sup>14</sup> More information about this plan was provided at the Grid Reliability Update Stakeholder Session held on November 23, 2023; session materials are available on the AESO website

The second stage of the approved CETO project,<sup>15</sup> which has a scheduled ISD of June 2026 and is prior to the Project's scheduled ISD, will help mitigate some of the thermal criteria violations involving 240 kV transmission line 9L62 observed under Category B conditions.

The total amount of generation tied to modified RASs 134 and 201 exceeds the MSSC limit of 466 MW. Pre-contingency generation curtailment under normal conditions may be required using real-time operational practices to prevent generation curtailment by RAS action above the MSSC limit. The probability of pre-curtailment being required would be dependent on generation profiles and operating conditions.

### ***5.4.3 Post-Project Mitigation Study Results***

Under Category B conditions, all of the observed Reliability Criteria violations requiring RAS were mitigated. The remaining violations are mitigated by RTOP.

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<sup>15</sup> Decision 25469-D01-2021, Alberta Electric System Operator, Needs Identification Document Application, Central East Transfer-out Transmission Development.

## **6 Project Dependencies**

The Project does not require the completion of any other AESO plans to expand or enhance the transmission system prior to connection.

## 7 Conclusions and Recommendations

Based on the study results, Alternative 1 Option 2 is technically viable. The connection assessment identified pre-Project and post-Project system performance issues. The connection assessment uses credible worst-case conditions to assess the impact of the Facility connecting on the AIES. Category A thermal criteria violations were observed under these credible worst-case load and generation forecast conditions. The probability of Category A thermal criteria violations materializing is highly dependent upon the production profile of the Facility and other generation facilities in the area.

The Category A violations will be mitigated through the use of real-time operational practices, which include applying the TCM Rule to curtail generation as required. The AESO will continue to monitor the pace of generation development and will notify Market Participants if it determines that it is necessary to obtain approval for a Section 15(2) exception. Furthermore, the AESO is developing system plans to address thermal criteria violations on the 138/144 kV system in the Hanna and Sheerness areas.

The thermal criteria violations observed under Category B conditions can be mitigated through the use of existing RASs 200 and 203, modified RASs 134 and 201, the new 9L24/760L RAS, and real-time operational practices, alone or in combination, as appropriate. With the implementation of these mitigation measures, connecting the project with the preferred alternative does not adversely affect the performance of the AIES.

The AESO recommends proceeding with the Project using Alternative 1 Option 2 as the preferred alternative to respond to the Market Participant's request for system access service. Alternative 1 Option 2 involves adding one 240 kV circuit to connect the Facility to the existing Lanfine 959S substation in a radial configuration and modifying the Lanfine 959S substation including adding one 240kV circuit breaker.

The segment of new 240 kV circuit located on the unstrung side of the 9L46 structures should have a rating no less than the rating of the 240 kV transmission line 9L46, to accommodate the ultimate development of a second 240 kV circuit between Lanfine 959S and Pemukan 932S substations. The segment of the new 240 kV circuit connecting the Facility to new segment of line located on the unstrung side of the 9L46 structures should have a minimum line rating of 480 MVA to meet the Market Participant's requested STS contract capacity, the requested STS of the future Facility expansion, and the typical minimum rating used in Alberta for 240 kV transmission lines.

Attachment A:  
Table A-1: Summary of Category B Reliability  
Criteria Violations, Project Impact and  
Mitigation Measures- All Scenarios



Table A-1 - Summary of Category B Reliability Criteria Violations, Project Impact and Mitigation Measures- All Scenarios

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
2028 Summer Peak	Thermal - above emergency rating	Thermal - above emergency rating	748L (Hayter 277S to Killarney Lake 267S)	715L (Hansman Lake 650S to 715AL Tap)	No impact	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	7L42 (Hill 751S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally decreased violation		
	Thermal - above emergency rating	Thermal - above emergency rating	7L16 (Nevis 766S to Heatburg 948S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	Marginally decreased violation	RAS 203	RAS 203
	Thermal - above normal rating	Thermal - above normal rating	7L137 (Three Hills 770S to Rowley 768S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	7L25 (Rowley 768S to Michichi Creek 802S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above emergency rating	9L29 (Oakland 946S to Coyote Lake 963S)	7L159 (Heatburg 948S to 7LA159 Tap)	Materially increased violation	RAS 200	RAS 200
	Thermal - above normal rating	Thermal - above emergency rating		7L16 (Nevis 766S to Heatburg 948S)	Materially increased violation		
	Thermal - above normal rating	Thermal - above normal rating		7L85 (Bullpound 803S to Anderson 801S)	Marginally decreased violation		
	Thermal - above normal rating	Thermal - above normal rating		7L85 (Bullpound 803S to Parker)	Marginally decreased violation		
	Thermal - above normal rating	Thermal - above normal rating		801S T1 (Anderson 801S 240/138 kV Transformer)	Materially decreased violation		
	Thermal - above emergency rating	Thermal - above emergency rating	801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	Materially decreased violation	RAS 203	RAS 203
	Thermal - above normal rating	Thermal - above emergency rating	963S T1 (Coyote Lake 963S Transformer T1)	7L159 (Heatburg 948S to 7LA159 Tap)	Materially increased violation	RAS 200	RAS 200
	Thermal - above normal rating	Thermal - above emergency rating		7L16 (Nevis 766S to Heatburg 948S)	Materially increased violation		
	Thermal - above normal rating	Thermal - above normal rating		7L85 (Bullpound 803S to Anderson 801S)	Marginally decreased violation		
	Thermal - above normal rating	Thermal - above normal rating		7L85 (Bullpound 803S to Parker)	Marginally decreased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		801S T1 (Anderson 801S 240/138 kV Transformer)	Materially decreased violation		
	None	Thermal - above normal rating	9L62 (Tinchey 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	New violation	Real-time operational practices. Long term: CETO Phase II	Real-time operational practices. Long term: CETO Phase II
	Thermal - above normal rating	Thermal - above normal rating		912L (Nevis 766S to Red Deer 63S)	Materially increased violation		
	Thermal - above normal rating	Thermal - above emergency rating		9L20 (Nevis 766S to Cordel 755S)	Materially increased violation		
	None	Thermal - above normal rating		7L132 (Oyen 767S to Lanfine 959S)	Materially increased violation		
	None	Thermal - above normal rating	9L933 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L934 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L950 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	No Impact	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	No Impact		
	Thermal - above normal rating	Thermal - above normal rating	749L (Edgerton 899S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally decreased violation		
	Thermal - above normal rating	Thermal - above normal rating	Edgerton 899S Transformer T0	715L (Hansman Lake 650S to 715AL Tap)	No Impact	Real-time operational practices	Real-time operational practices
Thermal - above normal rating	Thermal - above normal rating	715AL (715AL Tap to Cache Rising Sun MPC Solar)		Marginally decreased violation			
Thermal - above emergency rating	Thermal - above emergency rating	Killarney Lake 267S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	No Impact	Real-time operational practices	Real-time operational practices	
Thermal - above emergency rating	Thermal - above emergency rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally decreased violation			
None	Thermal - above normal rating		472L (Metiskow 648S to 472AL)	New violation			



Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	None	Thermal - above normal rating	1047L (Hansman Lake 650S to Nilrem 574S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L46 (Lanfine 959S to Pemukan 932S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	766S T1 (Nevis 766S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	9L24 (Oakland 946s - Lanfine 959s)	7L760 (Oyen 767S to Bindloss 914S Tap)	Materially increased violation	Real-time operational practices	New 9L24/760L RAS
	Thermal - above normal rating	Thermal - above emergency rating		7L132 (Oyen 767S to Lanfine 959S)	Materially increased violation		
2028 Summer Light	None	Thermal - above normal rating	681L (Hardisty 377S to Tucuman 478S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	966L (Hansman Lake 650S to Pemukan 932S)	7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	9L27 (Paintearth Creek 863S to Cordel 755S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation		
	None	Thermal - above normal rating		7L132 (Oyen 767S to Lanfine 959S)	New violation		
	None	Thermal - above normal rating	9L20 (Nevis 766S to Cordel 755S)	7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	953L (Nilrem 574S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation		
	None	Thermal - above normal rating	912L (Nevis 766S to Red Deer 63S)	7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L62 (Tinchelbray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	New violation	Real-time operational practices. Long term: CETO Phase II	Real-time operational practices. Long term: CETO Phase II
	Thermal - above normal rating	Thermal - above emergency rating		912L (Nevis 766S to Red Deer 63S)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		9L20 (Nevis 766S to Cordel 755S)	Materially increased violation		
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation		
	None	Thermal - above normal rating		7L132 (Oyen 767S to Lanfine 959S)	New violation		
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation		
	None	Thermal - above normal rating	9L933 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L934 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation		
	None	Thermal - above normal rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	9L950 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	New violation	N/A	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating		715L (Hansman Lake 650S to 715AL Tap)	Marginally increased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	749L (Metiskow 648S to Edgerton 899S)	715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating	749L (Edgerton 899S to Lloydminster 716S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	Edgerton 899S Transformer T1	472L (Hughenden 213S to Sunken Lake 221S Tap)	New violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating		704L (Wainwright 51S to Tucuman 478S)	New violation		
	Thermal - above normal rating	Thermal - above normal rating		715L (Hansman Lake 650S to 715AL Tap)	Marginally increased violation		
	Thermal - above normal rating	Thermal - above normal rating		715AL (715AL Tap to Cache Rising Sun MPC Solar)	Marginally increased violation		
	Thermal - above normal rating	Thermal - above normal rating		1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)		
Thermal - above normal rating	Thermal - above emergency rating	1047L (Hansman Lake 650S to Nilrem 574S)	472L (Metiskow 648S to 472AL)	Materially increased violation			
None	Thermal - above normal rating		703L (Hughenden 213S to HRT Express Tap)	New violation			



Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	Thermal - above emergency rating	Thermal - above emergency rating		472L (Hughenden 213S to Sunken Lake 221S Tap)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating	766S T1 (Nevis 766S 240/138 kV Transformer)	7L760 (Oyen 767S to Bindloss 914S Tap)	New violation	N/A	Real-time operational practices
	Thermal - above normal rating	Thermal - above emergency rating	9L24 (Oakland 946s - Lanfine 959s)	472L (Hughenden 213S to Sunken Lake 221S Tap)	Materially increased violation	Real-time operational practices	New 9L24/760L RAS
	Thermal - above emergency rating	Thermal - above emergency rating		7L760 (Oyen 767S to Bindloss 914S Tap)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		7L132 (Oyen 767S to Lanfine 959S)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		7L132 (Oyen 767S to Lanfine 959S)	Materially increased violation		
2028 Winter Peak	None	Thermal - above normal rating	701L (North Hoden 395S to Strome 223S)	9L62 (Tinchelbray 972S to Gaetz 87S)	New violation	N/A	Real-time operational practices. Long term: CETO Phase II
	Thermal - above emergency rating	Thermal - above emergency rating	885L (Metiskow 648S to Hansman Lake 650S)	749AL (749AL Tap to ABO Fox Meadows Wind)	Marginally decreased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating	966L (Hansman Lake 650S to Pemukan 932S)	7L224 (Hansman Lake 650S to Monitor 774S)	New violation	N/A	Modified RAS 201
	None	Thermal - above normal rating		7L127 (Pemukan 932S to Monitor 774S)	New violation		
	None	Thermal - above normal rating	7L42 (Hill 751S to Lloydminster 716S)	703L (Hardisty 377S to HRT Express Tap)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating		704L (Wainwright 51S to Tucuman 478S)	New violation		
	Thermal - above normal rating	Thermal - above normal rating	9L27 (Paintearth Creek 863S to Cordel 755S)	703L (Hardisty 377S to HRT Express Tap)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating		472L (Metiskow 648S to 472AL)	New violation		
	None	Thermal - above normal rating		704L (Wainwright 51S to Tucuman 478S)	New violation		
	Thermal - above emergency rating	Thermal - above emergency rating	9L20 (Nevis 766S to Cordel 755S)	9L62 (Tinchelbray 972S to Gaetz 87S)	Materially increased violation	Real-time operational practices. Long term: CETO Phase II	Real-time operational practices. Long term: CETO Phase II
	Thermal - above normal rating	Thermal - above emergency rating	953L (Nilrem 574S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	Materially increased violation	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	7L171 (Michichi Creek 802S to Wintering Hills 804S)	801S T1 (Anderson 801S 240/138 kV Transformer)	Marginally decreased violation	RAS 200	RAS 200
	None	Thermal - above normal rating	9L80 (Battle River 757S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	912L (Nevis 766S to Red Deer 63S)	174L (Bardo 197S to North Holden 395S)	New violation	Real-time operational practices. Long term: CETO Phase II	Real-time operational practices. Long term: CETO Phase II
	Thermal - above emergency rating	Thermal - above emergency rating		9L62 (Tinchelbray 972S to Gaetz 87S)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating	9L62 (Tinchelbray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	Materially increased violation	RAS 134. Long term: CETO Phase II	Modified RAS 134. Long term: CETO Phase II
	Thermal - above normal rating	Thermal - above emergency rating		701L (North Hoden 395S to Strome 223S)	Materially increased violation		
	None	Thermal - above normal rating		704L (Wainwright 51S to Tucuman 478S)	New violation		
	Thermal - above emergency rating	Thermal - above emergency rating		912L (Nevis 766S to Red Deer 63S)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		9L20 (Nevis 766S to Cordel 755S)	Materially increased violation		
	None	Thermal - above emergency rating	701L (Strome 223S to Battle River 757S)	9L62 (Tinchelbray 972S to Gaetz 87S)	New violation	N/A	Real-time operational practices. Long term: CETO Phase II
	None	Thermal - above normal rating	749L (Metiskow 648S to Edgerton 899S)	704L (Wainwright 51S to Tucuman 478S)	New violation	N/A	Real-time operational practices
	None	Thermal - above normal rating	749L (Edgerton 899S to Lloydminster 716S)	703L (Hardisty 377S to HRT Express Tap)	New violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above emergency rating		704L (Wainwright 51S to Tucuman 478S)	New violation		
	None	Thermal - above normal rating	Edgerton 899S Transformer T1	703L (Hardisty 377S to HRT Express Tap)	New violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above emergency rating		704L (Wainwright 51S to Tucuman 478S)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating	715L (Hansman Lake 650S to Provost 545S)	749AL (749AL Tap to ABO Fox Meadows Wind)	Materially decreased violation	Real-time operational practices	Real-time operational practices
	Thermal - above normal rating	Thermal - above emergency rating	1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)	Materially increased violation	Real-time operational practices	Real-time operational practices
Thermal - above emergency rating	Thermal - above emergency rating	472L (Metiskow 648S to 472AL)		Materially increased violation			
Thermal - above normal rating	Thermal - above emergency rating	703L (Hughenden 213S to HRT Express Tap)		Materially increased violation			
Thermal - above emergency rating	Thermal - above emergency rating	472L (Hughenden 213S to Sunken Lake 221S Tap)		Materially increased violation			
None	Thermal - above normal rating	174L (Bardo 197S to North Holden 395S)		New violation			



Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	Thermal - above emergency rating	Thermal - above emergency rating	766S T1 (Nevis 766S 240/138 kV Transformer)	9L62 (Tinchelbray 972S to Gaetz 87S)	Materially increased violation	Real-time operational practices. Long term: CETO Phase II	Real-time operational practices. Long term: CETO Phase II
	None	Thermal - above normal rating	9L24 (Oakland 946s - Lanfine 959s)	703L (Hardisty 377S to HRT Express Tap)	New violation	N/A	New 9L24/760L RAS
	None	Thermal - above normal rating		472L (Metiskow 648S to 472AL)	New violation		
	None	Thermal - above emergency rating		7L760 (Oyen 767S to Bindloss 914S Tap)	New violation		
	None	Thermal - above emergency rating		7L132 (Oyen 767S to Lanfine 959S)	New violation		

**Notes:**

- Marginally increased (or marginally decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) between 0% and 3% (or -3%).
- Materially increased (or materially decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) above or equal to 3% (or below or equal to -3%).
- New 9L24/760L RAS is a new proposed RAS for P2356 to mitigate overload on on 7L760/760L (Oyen 767S substation to Bindloss 914S) and 7L132 (Oyen 767S substation to 959S Lanfine substation)

# Appendix A

## Engineering Connection Assessment Results




# Engineering Connection Assessment: Study Results

## P2356 Oyen MPC Wind


Renewable Energy Systems

**Date:** October 30, 2024

**Version:** V1D6

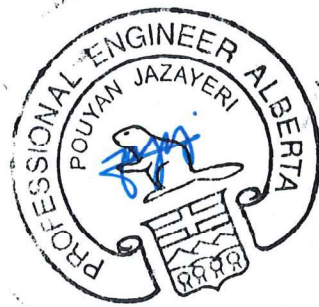
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Reviewed	Yani Jazayeri, P. Eng.	2024-10-30	
Approved	Yani Jazayeri, P. Eng.	2024-10-30	

**PERMIT TO PRACTICE  
HARDLINE ENGINEERING LTD.**

Signature 

Date 2024-10-31 ID#69556

**PERMIT NUMBER: P 14024**  
The Association of Professional  
Engineers and Geoscientists of Alberta



Oct 30, 2024  
Member # 74277



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## Attachments

**Attachment A1 Engineering Connection Assessment: Study Scope**

**Attachment A2 Pre-Project Power Flow Diagrams**

**Attachment A3 Post-Project Power Flow Diagrams**

**Attachment A4 Post-Project Transient Stability Diagrams**

**Attachment A5 Dynamic Data and Assumptions**

**Attachment A6 Post-Ras Power Flow Diagrams**

**Attachment A7 Constraint Effective Factors Table**



# 1 Introduction

This report presents the results of the engineering studies that were completed by Hardline Engineering Ltd. (the Studies Consultant) to assess the impact of the Project (as defined in Attachment A1: AESO Engineering Connection Assessment Scope) on the performance of the Alberta interconnected electric system (AIES). The studies were performed in accordance with Attachment A1: AESO Engineering Connection Assessment: Study Scope, which was prepared by the AESO.

The power system network analysis tool that was used for the studies in this connection assessment was PSS/E version 34.

## 2 Pre-Project Study Results

This section describes the results of the pre-project power flow studies.

### 2.1 Power Flow Studies

Power flow diagrams illustrating the pre-Project power flow studies results for Category A and Category B conditions are provided in Attachment A2.

#### 2.1.1 Scenario 1: 2028 Summer Peak High Wind Generation Pre-Project

##### Category A Condition

Thermal criteria violations were observed under Category A conditions in the 2028 SP pre-project & post-project scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads.

Updated generation dispatch values for Scenario 1 are shown in the table below:

Generator Name	From (MW)	To (MW)
LAN1	137.63	0
P1567	287.71	0
P2424	12.34	0
P2611	312.69	272.69
P2460	106.23	0
<b>Total Curtailed Generation (MW)</b>	583.29	

Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 1 are shown in the Table 2-1 below:

**Table 2-1: Thermal Criteria Violations under Category A Conditions for Scenario 1**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Pre-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
715L (Hansman Lake 650S to 715AL Tap)	98.00	118.38	120.80	97.33	99.32
749AL (749AL Tap to ABO Fox Meadows Wind)	120.90	127.96	105.80	42.36	35.03
715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	118.48	120.90	97.43	99.42
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	137.97	125.20	78.58	71.30
7L132 (Oyen 767S to Lanfine 959S)	112.12	136.33	121.60	80.71	71.99

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Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-2.

**Table 2-2: Thermal Criteria Violations under Category B Conditions for Scenario 1**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
748L (Hayter 277S to Killarney Lake 267S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	142.00	144.90
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	142.19	145.10
7L42 (Hill 751S to Lloydminster 716S)	715L ( Hansman Lake 650S to 715AL Tap)	98.00	132.00	99.76	101.80
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	99.86	101.90
7L16 (Nevis 766S to Heatburg 948S)	7L128 (Coyote Late 963S to 7LA128 Tap)	162.90	180.20	192.05	117.90
7L137 (Three Hills 770S to Rowley 768S)	7L128 (Coyote Late 963S to 7LA128 Tap)	162.90	180.20	164.04	100.70
7L25 (Rowley 768S to Michichi Creek 802S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	165.66	101.70
1041L (Lanfine A959S to Bus542042)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.00	100.00
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.09	100.10
9L29 (Oakland 946S to Coyote Lake 963S)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	121.14	112.90
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	118.56	110.50
	7L85 (Bullpound 803S to Anderson 801S)	139.00	165.80	154.15	110.50
	7L85 (Bullpound 803S to Parker)	138.00	165.80	161.04	116.70
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	167.37	133.90

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801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	201.01	123.40
Hayter 277S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.29	100.30
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.39	100.40
Hill 751S Transformer 2T	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.19	100.20
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.29	100.30
963S T1 (Coyote Lake 963S Transformer T1)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	121.14	112.90
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	118.56	110.50
	7L85 (Bullpound 803S to Anderson 801S)	139.00	165.80	154.15	110.90
	7L85 (Bullpound 803S to Parker)	138.00	165.80	161.18	116.80
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	167.62	134.10
912L (Nevis 766S to Red Deer 63S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	163.22	100.20
962L (Tinchebray 972S to Gaetz 87S)	912L (Nevis 766S to Red Deer 63S)	507.00	608.00	529.81	104.50
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	466.32	108.70
Lloydminster 716S Transformer 1T	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.09	100.10
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.19	100.20
749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	138.67	141.50
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	138.76	141.60
749L (Edgerton 899S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	103.88	106.00
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	103.97	106.10
Edgerton 899S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	104.86	107.10
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	104.95	107.10
Killarney Lake 267S	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	142.19	145.10

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Transformer T1	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	142.39	145.30
766S T1 (Nevis 766S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	172.18	105.70
9L24 (Oakland 946s - Lanfine 959s)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	127.94	116.10
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	134.40	119.90

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### *Voltage Criteria Violations*

No voltage criteria violations were observed under Category B conditions.

### *POD Bus Voltage Deviations*

No POD bus voltage deviations were observed.

## **2.1.2 Scenario 2: 2028 Summer Light High Wind Generation Pre-Project**

### **Category A Condition**

Thermal criteria violations were observed under Category A conditions in the 2028 SL post-Project scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads.

Updated generation dispatch values for Scenario 2 are shown in the below:

Generator Name	From (MW)	To (MW)
LAN1	102.96	5.96
<b>Total Curtailed Generation (MW)</b>	97.00	

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V1D6

Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 1 are shown in the Table 2-3 below:

**Table 2-3: Scenario 2 Loading Details Of Lines Overloaded In Post-Project Scenario**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Pre-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	105.00	95.28	86.40	78.40
7L132 (Oyen 767S to Lanfine 959S)	112.12	102.00	92.00	81.40	72.61

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-4.

**Table 2-4: Thermal Criteria Violations under Category B Conditions for Scenario 2**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
9L27 (Paintearth Creek 863S to Cordel 755S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	84.58	100.70
962L (Tinchebray 972S to Gaetz 87S)	912L (Nevis 766S to Red Deer 63S)	507.00	608.00	555.16	109.50
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	521.66	121.60
749L (Metiskow 648S to Edgerton 899S)	715L ( Hansman Lake 650S to 715AL Tap)	98.00	132.00	102.80	104.90
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	102.90	105.00
Edgerton 899S	715L ( Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.19	100.20

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Transformer T1)	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.19	100.20
1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)	96.00	133.00	100.89	105.10
	472L (Metiskow 648S to 472AL)	121.00	133.00	124.38	102.80
	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	114.49	136.30
9L24 (Oakland 946s - Lanfine 959s)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	90.46	107.70
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	175.32	159.10
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	179.13	159.80

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

## 2.1.3 Scenario 3: 2028 Winter Peak High Wind Generation Pre-Project

### Category A Conditions

No Reliability Criteria violations were observed under Category A conditions.

### Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-5.

**Table 2-5: Thermal Criteria Violations under Category B Conditions for Scenario 3**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
885L (Metiskow 648S to Hansman Lake 650S)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	167.09	112.90

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9L27 (Paintearth Creek 863S to Cordel 755S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	99.55	103.70
	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.59	100.40
9L20 (Nevis 766S to Cordel 755S)	962L (Tinchebray 972S to Gaetz 87S)	831.40	831.40	961.93	115.70
953L (Nilrem 574S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	79.55	100.70
7L171 (Michichi Creek 802S to Wintering Hills 804S)	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	152.13	121.70
Hayter 277S Transformer T1	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.15	100.10
912L (Nevis 766S to Red Deer 63S)	962L (Tinchebray 972S to Gaetz 87S)	831.40	831.40	1030.11	123.90
	9L16 (Tincherbray 972S to Goldeye Tap)	499.00	499.00	518.46	103.90
962L (Tinchebray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	149.00	164.00	165.24	110.90
	701L (North Hoden 395S to Strome 223S)	146.00	161.00	150.96	103.40
	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	149.04	100.70
	912L (Nevis 766S to Red Deer 63S)	624.00	624.00	859.87	137.80
	9L20 (Nevis 766S to Cordel 755S)	540.00	624.00	759.78	140.70
	9L16 (Cordel 755S to Goldeye Tap)	663.00	663.00	505.49	101.30
7L65 (Vergreville 709S to Drury 2007S)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.15	100.10
7L50 (Battle River 757S to Buffalo Creek 526S)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.74	100.50
Edgerton 899S Transformer T1	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	79.11	100.90
715L (Hansman Lake 650S to Provost 545S)	749AL (749AL Tap to ABO Fox Meadows Wind)	143.00	163.00	181.45	122.60
1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	142.18	148.10
	472L (Metiskow 648S to 472AL)	150.00	165.00	186.45	124.30
	703L (Hughenden 213S to HRT Express Tap)	145.00	160.00	147.90	102.00
	472L (Hughenden 213S to Sunken Lake 221S Tap)	125.00	138.00	152.00	121.60
	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.00	100.00



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766S T1 (Nevis 766S 240/138 kV Transformer)	962L (Tinchebray 972S to Gaetz 87S)	831.40	831.40	1025.95	123.40
	9L16 (Tincherbray 972S to Goldeye Tap)	499.00	499.00	505.49	101.30
9L24 (Oakland 946s - Lanfine 959s)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	148.15	100.10

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

## 2.1.4 Sensitivity Scenario 8: 2028 Summer Peak High Wind Generation Pre-Project

### Category A Condition

Thermal criteria violations were observed under Category A conditions in the 2028 SP pre-project & post-project sensitivity scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads.

Updated generation dispatch values for Scenario 8 are shown in the table below:

Generator Name	From (MW)	To (MW)
LAN1	137.63	0
P1567	287.71	0
P2424	12.34	0
P2611	312.69	142.69
P2460	106.23	0
NEP1	76.10	0
HAL1	140.67	0
P1704	190.00	80.00
<b>Total Curtailed Generation (MW)</b>	1040.68	

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Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 8 are shown in the Table 2-6 below:

**Table 2-6: Thermal Criteria Violations under Category A Conditions for Scenario 8**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Pre-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
715L (Hansman Lake 650S to 715AL Tap)	98.00	116.62	119.00	96.94	98.92
749AL (749AL Tap to ABO Fox Meadows Wind)	120.90	129.42	107.00	41.43	34.25
715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	116.62	119.00	97.03	99.01
912L (Nevis 766S to Red Deer 63S)	507.00	719.43	141.90	374.19	73.80
9L20 (Nevis 766S to Cordel 755S)	429.00	637.07	148.50	356.40	83.08
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	153.07	138.90	68.45	62.11
7L132 (Oyen 767S to Lanfine 959S)	112.10	150.80	134.50	70.18	62.59

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

## Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-7.

**Table 2-7: Thermal Criteria Violations under Category B Conditions for Scenario 8**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
748L (Hayter 277S to Killarney Lake 267S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	141.22	144.10
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	141.32	144.20
7L42 (Hill 751S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	99.37	101.40
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	99.47	101.50
9L20 (Nevis 766S to Cordel 755S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	139.03	114.90

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7L137 (Three Hills 770S to Rowley 768S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	163.39	100.30
7L25 (Rowley 768S to Michichi Creek 802S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	164.85	101.20
9L29 (Oakland 946S to Coyote Lake 963S)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.45	102.50
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	143.00	114.40
801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	176.58	108.40
963S T1 (Coyote Lake 963S Transformer T1)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.45	102.50
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	143.25	114.60
912L (Nevis 766S to Red Deer 63S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	150.04	124.00
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	125.66	105.60
749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	137.98	140.80
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	138.08	140.90
749L (Edgerton 899S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	103.49	105.60
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	103.59	105.70
Edgerton 899S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	104.57	106.70
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	104.66	106.80
Killarney Lake 267S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	141.41	144.30
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	141.51	144.40
766S T1 (Nevis 766S 240/138 kV Transformer)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	150.65	124.50
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	126.14	106.00

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as  $MVA (i.e., S = \sqrt{3} \times V_{base} \times I_{actual})$

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

### 3 Post-Project Study Results

This section describes the results of the post-Project power flow studies and transient stability studies.

As described in Section 2 of Attachment A1, the post-Project studies were performed using Alternative 1 Option 2.

#### 3.1 Power Flow Studies

Power flow diagrams illustrating the post-Project power flow studies results for Category A and Category B conditions are included in Attachment A3.

##### 3.1.1 Scenario 4: 2028 Summer Peak High Wind Generation Post-Project

###### Category A Condition

Thermal criteria violations were observed under Category A conditions in the 2028 SP post-Project scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads.

Updated generation dispatch values for Scenario 4 are shown in the table below:

Generator Name	From (MW)	To (MW)
LAN1	137.63	0
P1567	287.71	0
P2424	12.34	0
P2611	312.69	272.69
P2460	106.23	0
<b>Total Curtailed Generation (MW)</b>	583.91	

Thermal criteria violations were observed Category A conditions. Thermal criteria violations under Category A conditions prior to generation curtailment for Scenario 4 and its corresponding pre-Project scenario (Scenario 1) are shown in the Table 3-1 below:

**Table 3-1: Thermal Criteria Violations under Category A Conditions for Scenario 4**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Post-Project Results (Pre-Curtailment)		% Loading Difference (Post-Pre)
			Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	
472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	40.00	47.62	86.52	103.00	55.38
715L (Hansman Lake 650S to 715AL Tap)	98.00	135.00	118.38	120.80	116.81	119.20	-1.60
749AL (749AL Tap to ABO Fox Meadows Wind)	120.95	133.00	127.96	105.80	129.29	106.90	1.10

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715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	118.48	120.90	116.91	119.30	-1.60
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	137.97	125.20	158.90	144.20	19.00
7L132 (Oyen 767S to Lanfine 959S)	112.12	138.00	136.33	121.60	159.43	142.20	20.60

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 4 are shown in the Table 3-2 below:

**Table 3-2: Post-Project Thermal Criteria Violations Under Category A Conditions for Scenario 4**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Post-Project Results (Pre-Curtailment)		Post-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	86.52	103.00	50.51	60.13
715L (Hansman Lake 650S to 715AL Tap)	98.00	116.81	119.20	95.74	97.69
749AL (749AL Tap to ABO Fox Meadows Wind)	120.95	129.29	106.90	43.87	36.27
715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	116.91	119.30	95.84	97.79
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	158.90	144.20	99.34	90.15
7L132 (Oyen 767S to Lanfine 959S)	112.12	159.43	142.20	103.69	92.48

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

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**Category B Conditions**

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-3.

**Table 3-3: Thermal Criteria Violations under Category B Conditions for Scenario 4**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	
748L (Hayter 277S to Killarney Lake 267S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	142.00	144.90	142.00	144.90	0
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	142.20	145.10	142.10	145.00	-0.1
7L42 (Hill 751S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	99.76	101.80	99.67	101.70	-0.1
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	99.86	101.90	99.76	101.80	-0.1
7L16 (Nevis 766S to Heatburg 948S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	192.06	117.90	191.57	117.60	-0.3
7L137 (Three Hills 770S to Rowley 768S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	164.04	100.70	163.71	100.50	-0.2
7L25 (Rowley 768S to Michichi Creek 802S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	165.67	101.70	165.18	101.40	-0.3
9L29 (Oakland 946S to Coyote Lake 963S)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	121.14	112.90	125.76	117.20	4.3
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	118.57	110.50	123.29	114.90	4.4
	7L85 (Bullpound)	139.00	165.80	154.15	110.90	150.26	108.10	-2.8

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	803S to Anderson 801S)							
	7L85 (Bullpound 803S to Parker)	138.00	165.80	161.05	116.70	157.18	113.90	-2.8
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	167.38	133.90	162.63	130.10	-3.8
801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	201.02	123.40	195.15	119.80	-3.6
963S T1 (Coyote Lake 963S Transformer T1)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	121.14	112.90	125.76	117.20	4.3
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	118.57	110.50	123.18	114.80	4.3
	7L85 (Bullpound 803S to Anderson 801S)	139.00	165.80	154.15	110.90	150.40	108.20	-2.7
	7L85 (Bullpound 803S to Parker)	138.00	165.80	161.18	116.80	157.32	114.00	-2.8
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	167.63	134.10	162.88	130.30	-3.8
962L (Tinchebray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	118.56	97.99	132.25	109.30	11.31
	912L (Nevis 766S to Red Deer 63S)	507.00	608.00	529.82	104.50	602.82	118.90	14.4
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	466.32	108.70	529.39	123.40	14.7
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	89.92	80.20	114.34	102.00	21.8

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9L933 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	88.93	79.32	112.66	100.50	21.18
9L934 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	88.93	79.32	112.66	100.50	21.18
9L950 (Anderson 801S to Ware Junction 132S)	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	88.88	79.27	112.55	100.40	21.13
749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	138.67	141.50	138.67	141.50	0
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	138.77	141.60	138.77	141.60	0
749L (Edgerton 899S to Lloydminster 716S) 749L	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	103.88	106.00	103.78	105.90	-0.1
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	103.98	106.10	103.88	106.00	-0.1
Edgerton 899S Transformer T0	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	104.86	107.00	104.86	107.00	0
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	104.96	107.10	104.86	107.00	-0.1
Killarney Lake 267S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	142.20	145.10	142.20	145.10	0
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	142.39	145.30	142.30	145.20	-0.1



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1047L (Hansman Lake 650S to Nilrem 574S)	472L (Metiskow 648S to 472AL)	121.00	133.00	106.54	88.05	127.29	105.20	17.15
	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	133.00	71.78	85.46	92.48	110.10	24.64
9L46 (Lanfine 959S to Pemukan 932S)	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	77.10	68.77	113.78	101.50	32.73
766S T1 (Nevis 766S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	172.19	105.70	170.72	104.80	-0.9
9L24 (Oakland 946s - Lanfine 959s)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	127.94	116.10	180.29	163.60	47.5
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	134.41	119.90	191.69	171.00	51.1

### Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### *Voltage Criteria Violations*

No voltage criteria violations were observed under Category B conditions.

### *POD Bus Voltage Deviations*

No POD bus voltage deviations were observed.

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**3.1.2 Scenario 5: 2028 Summer Light High Wind Generation Post-Project**

**Category A Condition**

Thermal criteria violations were observed under Category A conditions in the 2028 SL post-Project scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads. Updated generation dispatch values for Scenario 5 are shown in the table below:

Generator Name	From (MW)	To (MW)
LAN1	102.96	5.96
<b>Total Curtailed Generation (MW)</b>	97.00	

Thermal criteria violations were observed Category A conditions. Thermal criteria violations under Category A conditions prior to generation curtailment for Scenario 5 and its corresponding pre-Project scenario (Scenario 2) are shown in the Table 3-4 below:

**Table 3-4: Thermal Criteria Violations under Category A Conditions for Scenario 5**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Post-Project Results (Pre-Curtailment)		% Loading Difference (Post-Pre)
			Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	105.00	95.28	124.41	112.90	17.62
7L132 (Oyen 767S to Lanfine 959S)	112.12	138.00	102.00	92.00	126.47	119.20	27.20

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ )<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

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Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 5 are shown in the Table 3-5 below:

**Table 3-5: Post-Project Thermal Criteria Violations under Category A Conditions for Scenario 5**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Post-Project Results (Pre-Curtailment)		Post-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	124.41	112.90	107.07	97.16
7L132 (Oyen 767S to Lanfine 959S)	112.12	126.47	119.20	104.82	93.49

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Category B Condition

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-6.

**Table 3-6: Thermal Criteria Violations under Category B Conditions for Scenario 5**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	
681L (Hardisty 377S to Tucuman 478S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	133.00	77.49	92.25	84.42	100.50	8.25
966L (Hansman Lake 650S to Pemukan 932S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	85.85	77.90	110.97	100.70	22.80
9L27 (Paintearth Creek 863S to Cordel 755S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	133.00	84.59	100.70	95.84	114.10	13.40
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	92.33	83.79	113.84	103.30	19.51

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	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	89.02	79.40	112.55	100.40	21.00
9L20 (Nevis 766S to Cordel 755S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	90.85	82.44	111.85	101.50	19.06
953L (Nilrem 574S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	75.00	83.00	74.28	99.05	85.58	114.10	15.05
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	91.82	83.32	113.29	102.80	19.48
912L (Nevis 766S to Red Deer 63S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	91.87	83.36	113.18	102.70	19.34
962L (Tincebray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	109.07	90.14	121.97	100.80	10.66
	912L (Nevis 766S to Red Deer 63S)	507.00	608.00	555.17	109.50	622.60	122.80	13.30
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	521.66	121.60	582.58	135.80	14.20
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	95.79	86.93	117.69	106.80	19.87
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	91.35	81.48	115.24	102.80	21.32
9L933 (Anderson 801S to Ware Junction 132S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	94.24	85.51	115.38	104.70	19.19
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	89.87	80.16	112.88	100.70	20.54

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9L934 (Anderson 801S to Ware Junction 132S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	94.24	85.51	115.38	104.70	19.19
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	89.87	80.16	112.88	100.70	20.54
9L950 (Anderson 801S to Ware Junction 132S)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	94.18	85.47	115.27	104.60	19.13
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	89.82	80.11	112.88	100.70	20.59
749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	102.80	104.90	103.00	105.10	0.20
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	102.90	105.00	103.10	105.20	0.20
749L (Edgerton 899S to Lloydminster 716S)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	77.86	92.69	87.61	104.30	11.61
Edgerton 899S Transformer T1	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	79.06	94.12	88.79	105.70	11.58
	704L (Wainwright 51S to Tucuman 478S)	75.00	83.00	65.98	87.97	75.60	100.80	12.83
	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	98.20	100.20	98.29	100.30	0.10
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	98.20	100.20	98.39	100.40	0.20

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1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)	96.00	133.00	100.90	105.10	119.14	124.10	19.00
	472L (Metiskow 648S to 472AL)	121.00	133.00	124.39	102.80	143.39	118.50	15.70
	703L (Hughenden 213S to HRT Express Tap)	121.00	133.00	103.68	85.69	121.97	100.80	15.11
	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	114.49	136.30	133.14	158.50	22.20
766S T1 (Nevis 766S 240/138 kV Transformer)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	91.95	83.44	113.29	102.80	19.36
9L24 (Oakland 946s - Lanfine 959s)	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	90.47	107.70	106.18	126.40	18.70
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	175.33	159.10	225.14	204.30	45.20
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	179.14	159.80	233.39	208.20	48.40

### Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

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**3.1.3 Scenario 6: 2028 Winter Peak High Wind Generation Post-Project**

**Category A Condition**

No Reliability Criteria violations were observed under Category A conditions.

**Category B Condition**

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-7.

**Table 3-7: Thermal Criteria Violations under Category B Conditions for Scenario 6**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	
701L (North Hoden 395S to Strome 223S)	962L (Tincebray 972S to Gaetz 87S)	831.40	831.40	767.65	92.33	832.23	100.10	7.77
885L (Metiskow 648S to Hansman Lake 650S)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	167.09	112.90	166.50	112.50	-0.40
966L (Hansman Lake 650S to Pemukan 932S)	7L224 (Hansman Lake 650S to Monitor 774S)	143.80	163.90	111.45	77.50	156.45	108.80	31.30
	7L127 (Pemukan 932S to Monitor 774S)	182.10	243.40	135.27	74.29	185.56	101.90	27.61
7L42 (Hill 751S to Lloydminster 716S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	87.58	91.23	98.40	102.50	11.27
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	72.01	91.15	81.84	103.60	12.45
9L27 (Paintearth Creek 863S to Cordel 755S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	99.55	103.70	112.51	117.20	13.50
	472L (Metiskow 648S to 472AL)	150.00	165.00	141.45	94.30	154.80	103.20	8.90
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	68.55	86.77	79.16	100.20	13.43
9L20 (Nevis 766S to Cordel 755S)	962L (Tincebray 972S to Gaetz 87S)	831.40	831.40	961.93	115.70	1040.08	125.10	9.40
953L (Nilrem 574S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	79.55	100.70	92.51	117.10	16.40
7L171 (Michichi Creek 802S to Wintering Hills 804S)	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	152.13	121.70	151.63	121.30	-0.40

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9L80 (Battle River 757S to Cordel 755S)	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	69.19	87.59	79.16	100.20	12.61
912L (Nevis 766S to Red Deer 63S)	174L (Bardo 197S to North Holden 395S)	149.00	164.00	137.71	92.42	149.60	100.40	7.98
	962L (Tinchebray 972S to Gaetz 87S)	831.40	831.40	1030.11	123.90	1117.40	134.40	10.50
962L (Tinchebray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	149.00	164.00	165.24	110.90	179.25	120.30	9.40
	701L (North Hoden 395S to Strome 223S)	146.00	161.00	150.96	103.40	168.48	115.40	12.00
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	76.02	96.23	86.82	109.90	13.67
	912L (Nevis 766S to Red Deer 63S)	624.00	624.00	859.87	137.80	933.50	149.60	11.80
	9L20 (Nevis 766S to Cordel 755S)	540.00	624.00	759.78	140.70	824.04	152.60	11.90
701L (Strome 223S to Battle River 757S)	962L (Tinchebray 972S to Gaetz 87S)	831.40	831.40	772.22	92.88	836.39	100.60	7.72
749L (Metiskow 648S to Edgerton 899S)	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	74.44	94.22	83.74	106.00	11.78
749L (Edgerton 899S to Lloydminster 716S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	93.22	97.11	103.97	108.30	11.19
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	78.13	98.90	87.61	110.90	12.00
Edgerton 899S Transformer T1	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	94.71	98.66	105.41	109.80	11.14
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	79.71	100.90	89.19	112.90	12.00
715L (Hansman Lake 650S to Provost 545S)	749AL (749AL Tap to ABO Fox Meadows Wind)	148.00	163.00	181.45	122.60	174.05	117.60	-5.00
1047L (Hansman Lake 650S to Nilrem 574S)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	142.18	148.10	163.49	170.30	22.20
	472L (Metiskow 648S to 472AL)	150.00	165.00	186.45	124.30	208.20	138.80	14.50
	703L (Hughenden 213S to HRT Express Tap)	145.00	160.00	147.90	102.00	169.22	116.70	14.70
	472L (Hughenden 213S to Sunken Lake 221S Tap)	125.00	138.00	152.00	121.60	173.25	138.60	17.00
	174L (Bardo 197S to North Holden 395S)	149.00	164.00	137.87	92.53	149.75	100.50	7.97



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766S T1 (Nevis 766S 240/138 kV Transformer)	962L (Tincheybray 972S to Gaetz 87S)	831.40	831.40	1025.95	123.40	1113.25	133.90	10.50
9L24 (Oakland 946s - Lanfine 959s)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	93.42	97.31	111.17	115.80	18.49
	472L (Metiskow 648S to 472AL)	150.00	165.00	134.69	89.80	153.00	102.00	12.20
	7L760 (Oyen 767S to Bindloss 914S Tap)	146.60	167.70	121.50	82.88	174.60	119.10	36.22
	7L132 (Oyen 767S to Lanfine 959S)	140.90	171.50	136.49	96.88	194.86	138.30	41.42

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

## 3.1.4 Sensitivity Scenario 9: 2028 Summer Peak High Wind Generation Post-Project

### Category A Condition

Thermal criteria violations were observed under Category A conditions in the 2028 SP post-Project sensitivity scenario. Hence, Category A curtailments were conducted prior to the Category B studies. The most effective generators were scaled down to mitigate overloads.

Updated generation dispatch values for Scenario 9 are shown in the table below:

Generator Name	From (MW)	To (MW)
LAN1	137.63	0
P1567	287.71	0
P2424	12.34	0
P2611	312.69	142.69
P2460	106.23	0
NEP1	76.10	0
HAL1	140.67	0
P1704	190.00	80.00
<b>Total Curtailed Generation (MW)</b>	1040.68	

Thermal criteria violations were observed Category A conditions. Thermal criteria violations under Category A conditions prior to generation curtailment for Scenario 9 and its corresponding pre-Project scenario (Scenario 8) are shown in the Table 3-8 below:

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**Table 3-8: Thermal Criteria Violations under Category A Conditions for Scenario 9**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results (Pre-Curtailment)		Post-Project Results (Pre-Curtailment)		% Loading Difference (Post-Pre)
			Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	
715L (Hansman Lake 650S to 715AL Tap)	98.00	135.00	116.62	119.00	114.76	117.10	-1.90
749AL (749AL Tap to ABO Fox Meadows Wind)	120.95	133.00	129.42	107.00	130.87	108.20	1.20
715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	116.62	119.00	114.86	117.20	-1.80
912L (Nevis 766S to Red Deer 63S)	507.00	608.00	719.43	141.90	794.47	156.70	14.80
9L20 (Nevis 766S to Cordel 755S)	429.00	624.00	637.07	148.50	702.70	163.80	15.30
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	153.07	138.90	176.21	159.90	21.00
7L132 (Oyen 767S to Lanfine 959S)	112.12	138.00	150.80	134.50	176.03	157.00	22.50

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

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Thermal criteria violations under Category A conditions prior to and after generation curtailment for Scenario 9 are shown in the Table 3-9 below:

**Table 3-9: Post-Project Thermal Criteria Violations under Category A Conditions for Scenario 9**

Violation Location Details	Seasonal Continuous Rating (MVA) <sup>a</sup>	Post-Project Results (Pre-Curtailment)		Post-Project Results (Post-Curtailment)	
		Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
174L (Bardo 197S to North Holden 395S)	85.10	91.40	107.40	63.61	74.74
715L (Hansman Lake 650S to 715AL Tap)	98.00	114.76	117.10	95.54	97.49
749AL (749AL Tap to ABO Fox Meadows Wind)	120.95	130.87	108.20	43.97	36.35
715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	114.86	117.20	95.64	97.59
912L (Nevis 766S to Red Deer 63S)	507.00	794.47	156.70	445.92	87.95
9L20 (Nevis 766S to Cordel 755S)	429.00	702.70	163.80	419.51	97.79
7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	176.21	159.90	90.74	82.34
7L132 (Oyen 767S to Lanfine 959S)	112.12	176.03	157.00	94.55	84.33

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as MVA (i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{\text{base}} \times I_{\text{actual}}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

## Category B Condition

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-10.

**Table 3-10: Thermal Criteria Violations under Category B Conditions for Scenario 9**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA) <sup>a</sup>	Emergency Rating (MVA) <sup>a</sup>	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	Observed Power Flow (MVA) <sup>b</sup>	% Loading <sup>c</sup>	
701L (North Hoden 395S to Strome 223S)	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	102.19	93.50	113.89	104.20	10.70
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	368.33	85.86	435.01	101.40	15.54

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748L (Hayter 277S to Killamey Lake 267S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	141.22	144.10	141.90	144.80	0.70
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	141.31	144.20	142.00	144.90	0.70
7L42 (Hill 751S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	99.37	101.40	99.66	101.70	0.30
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	99.47	101.50	99.76	101.80	0.30
9L20 (Nevis 766S to Cordel 755S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	139.02	114.90	159.59	131.90	17.00
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	113.52	95.40	136.73	114.90	19.50
	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	121.36	85.59	144.63	102.00	16.41
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	125.69	88.64	148.61	104.80	16.16
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	99.25	90.80	109.52	100.20	9.40
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	85.59	76.34	112.88	100.70	24.36
7L137 (Three Hills 770S to Rowley 768S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	163.39	100.30	165.02	101.30	1.00
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	366.95	85.54	431.15	100.50	14.96
7L25 (Rowley 768S to Michichi Creek 802S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	164.85	101.20	166.48	102.20	1.00
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	367.95	85.77	432.00	100.70	14.93
9L29 (Oakland 946S to Coyote Lake 963S)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.45	102.50	141.73	102.70	0.20
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	143.00	114.40	145.75	116.60	2.20
801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	176.58	108.40	174.14	106.90	-1.50
174L (North Holden 395S to Bardo 197S)	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	373.35	87.03	438.87	102.30	15.27

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963S T1 (Coyote Lake 963S Transformer T1)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.45	102.50	141.73	102.70	0.20
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	143.25	114.60	146.00	116.80	2.20
912L (Nevis 766S to Red Deer 63S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	150.04	124.00	173.03	143.00	19.00
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	125.66	105.60	151.73	127.50	21.90
	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	133.50	94.15	159.67	112.60	18.45
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	126.34	89.10	150.02	105.80	16.70
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	102.24	93.54	113.23	103.60	10.06
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	86.04	78.07	112.07	101.70	23.63
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	86.09	76.78	113.78	101.50	24.72
Battle River Transformer T2	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	365.63	85.23	429.86	100.20	14.97
701L (Strome 223S to Battle River 757S)	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	104.52	95.63	116.19	106.30	10.67
	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	372.07	86.73	438.87	102.30	15.57
749L (Metiskow 648S to Edgerton 899S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	137.98	140.80	138.57	141.40	0.60
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	138.08	140.90	138.67	141.50	0.60
749L (Edgerton 899S to Lloydminster 716S)	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	103.49	105.60	103.78	105.90	0.30
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	103.59	105.70	103.88	106.00	0.30
Edgerton 899S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	104.57	106.70	104.76	106.90	0.20
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	104.66	106.80	104.86	107.00	0.20

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Killarney Lake 267S Transformer T1	715L (Hansman Lake 650S to 715AL Tap)	98.00	132.00	141.41	144.30	142.10	145.00	0.70
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	98.00	108.00	141.51	144.40	142.20	145.10	0.70
766S T1 (Nevis 766S 240/138 kV Transformer)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	150.65	124.50	173.64	143.50	19.00
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	126.14	106.00	152.20	127.90	21.90
	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	133.97	94.48	160.09	112.90	18.42
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	130.00	91.68	153.85	108.50	16.82
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	102.77	94.03	113.78	104.10	10.07
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	86.52	78.52	112.62	102.20	23.68
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	87.27	77.84	115.01	102.60	24.76
9L24 (Oakland 946s - Lanfine 959s)	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	361.37	84.24	438.87	102.30	18.06
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	101.85	92.43	157.92	143.30	50.87
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	106.51	94.99	167.59	149.50	54.51
7L92 (Vegreville 709S to Whitby Lake 819S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	107.62	88.94	124.63	103.00	14.06

Notes:

<sup>a</sup> The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.

<sup>b</sup> Power flow (MVA) is current expressed as  $MVA$  (i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ )

<sup>c</sup> Reported as a percentage of the power flow (in MVA, i.e.,  $S = \sqrt{3} \times V_{base} \times I_{actual}$ ) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed

## 3.2 Transient Stability Studies

### 3.2.1 Transient stability studies were completed for Scenario 4.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied, as shown in Table 3-11. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A5.

**Table 3-11: Transient Stability Study Results under Category B Conditions for Scenario 4**

Studied Contingency	Fault Description and Location	Results
9L24 (Oakland 946S - Lanfine 959S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Lanfine 959S	Stable
9L29 (Oakland 946S - Coyote Lake 963S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Coyote Lake 963S	Stable
9L46 (Lanfine 959S - Pemukan 932S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Pemukan 932S	Stable
9L59 (Anderson 801S - Tinchebray 972S)	3-phase fault at Anderson 801S	Stable
	3-phase fault at Tinchebray 972S	Stable
9L966 (Pemukan 932S - Hansman Lake 650S)	3-phase fault at Pemukan 932S	Stable
	3-phase fault at Hansman Lake 650S	Stable
760L (Oyen 767S - Amoco Empress 163S)	3-phase fault at Oyen 767S	Stable
	3-phase fault at Amoco Empress 163S	Stable
7L132 (Lanfine 959S - Oyen 767S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Oyen 767S	Stable
7L116 (Lanfine 959S - Excel 910S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Excel 910S	Stable
9L20 (Cordel 755S - Nevis 766S)	3-phase fault at Cordel 755S	Stable
	3-phase fault at Nevis 766S	Stable
9L62 (Tinchebray 972S - Gaetz 87S)	3-phase fault at Tinchebray 972S	Stable
	3-phase fault at Gaetz 87S	Stable
912L/9L912 (Red Deer 63S - Nevis 766S)	3-phase fault at Red Deer 63S	Stable
	3-phase fault at Nevis 766S	Stable

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### 3.2.2 Transient stability studies were completed for Scenario 5.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied, as shown in Table 3-. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A5.

**Table 3-12: Transient Stability Study Results under Category B Conditions for Scenario 5**

Studied Contingency	Fault Description and Location	Results
9L24 (Oakland 946S - Lanfine 959S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Lanfine 959S	Stable
9L29 (Oakland 946S - Coyote Lake 963S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Coyote Lake 963S	Stable
9L46 (Lanfine 959S - Pemukan 932S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Pemukan 932S	Stable
9L59 (Anderson 801S - Tinchebray 972S)	3-phase fault at Anderson 801S	Stable
	3-phase fault at Tinchebray 972S	Stable
9L966 (Pemukan 932S - Hansman Lake 650S)	3-phase fault at Pemukan 932S	Stable
	3-phase fault at Hansman Lake 650S	Stable
760L (Oyen 767S - Amoco Empress 163S)	3-phase fault at Oyen 767S	Stable
	3-phase fault at Amoco Empress 163S	Stable
7L132 (Lanfine 959S - Oyen 767S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Oyen 767S	Stable
7L116 (Lanfine 959S - Excel 910S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Excel 910S	Stable
9L20 (Cordel 755S - Nevis 766S)	3-phase fault at Cordel 755S	Stable
	3-phase fault at Nevis 766S	Stable
9L62 (Tinchebray 972S - Gaetz 87S)	3-phase fault at Tinchebray 972S	Stable
	3-phase fault at Gaetz 87S	Stable
912L/9L912 (Red Deer 63S - Nevis 766S)	3-phase fault at Red Deer 63S	Stable
	3-phase fault at Nevis 766S	Stable



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### 3.2.3 Transient stability studies were completed for Scenario 6.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied, as shown in Table 3-. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A5.

**Table 3-13: Transient Stability Study Results under Category B Conditions for Scenario 6**

Studied Contingency	Fault Description and Location	Results
9L24 (Oakland 946S - Lanfine 959S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Lanfine 959S	Stable
9L29 (Oakland 946S - Coyote Lake 963S)	3-phase fault at Oakland 946S	Stable
	3-phase fault at Coyote Lake 963S	Stable
9L46 (Lanfine 959S - Pemukan 932S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Pemukan 932S	Stable
9L59 (Anderson 801S - Tinchebray 972S)	3-phase fault at Anderson 801S	Stable
	3-phase fault at Tinchebray 972S	Stable
9L966 (Pemukan 932S - Hansman Lake 650S)	3-phase fault at Pemukan 932S	Stable
	3-phase fault at Hansman Lake 650S	Stable
760L (Oyen 767S - Amoco Empress 163S)	3-phase fault at Oyen 767S	Stable
	3-phase fault at Amoco Empress 163S	Stable
7L132 (Lanfine 959S - Oyen 767S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Oyen 767S	Stable
7L116 (Lanfine 959S - Excel 910S)	3-phase fault at Lanfine 959S	Stable
	3-phase fault at Excel 910S	Stable
9L20 (Cordel 755S - Nevis 766S)	3-phase fault at Cordel 755S	Stable
	3-phase fault at Nevis 766S	Stable
9L62 (Tinchebray 972S - Gaetz 87S)	3-phase fault at Tinchebray 972S	Stable
	3-phase fault at Gaetz 87S	Stable
912L/9L912 (Red Deer 63S - Nevis 766S)	3-phase fault at Red Deer 63S	Stable
	3-phase fault at Nevis 766S	Stable

## 4 Short Circuit Studies

### 4.1 Pre-Project Results

#### 4.1.1 Scenario 3: 2028 Winter Peak High Wind Generation Pre-Project

Pre-Project short-circuit current levels for Scenario 3 are provided in Table 4-1<sup>1</sup>.

**Table 4-1: Pre-Project Short-Circuit Current Levels for Scenario 3**

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3- $\Phi$ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1- $\Phi$ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Excel 910S	138.00	148.70	6.22	0.013358+ j0.076087	7.82	0.008291+ j0.025596
Hansman Lake 650S	240.00	259.20	6.56	0.009670+ j0.039797	7.71	0.003005+ j0.019399
	138.00	142.10	8.91	0.013170+ j0.048234	9.67	0.004096+ j0.034419
Monitor 774S	138.00	151.30	6.45	0.018052+ j0.071970	7.43	0.006095+ j0.040138
Lanfine 959S	240.00	260.90	6.45	0.007515+ j0.042574	7.22	0.005950+ j0.025000
	138.00	148.80	7.11	0.010823+ j0.066728	10.48	-0.00015- j0.000657
Oakland 946S	240.00	260.90	13.61	0.003061+ j0.020621	14.06	0.003560+ j0.017239
Oyen 767S	138.00	148.60	6.00	0.016814+ j0.078270	6.46	0.017613+ j0.057534
Pemukan 932S	240.00	257.70	5.76	0.010044+ j0.045781	5.94	0.006419+ j0.037571
	138.00	151.60	6.55	0.017193+ j0.071076	7.79	0.003865+ j0.033827
Ware Junction 132S	240.00	254.70	14.74	0.003554+ j0.019140	14.70	0.003093+ j0.017488

<sup>1</sup> Short-circuit current studies were based on modeling information provided to the AESO by third parties. The authenticity of the modeling information has not been validated. Fault levels could change as a result of system developments, new customer connections, or additional generation in the area. It is recommended that these changes be monitored and fault levels reviewed to ensure that the fault levels are within equipment operating limits. The information provided in this study should not be used as the sole source of information for electrical equipment specifications or for the design of safety-grounding systems.

## 4.2 Post-Project Results

### 4.2.1 Scenario 6: 2028 Winter Peak High Wind Generation Post-Project

Post-Project short-circuit current levels for Scenario 6 are provided in Table 4-2.

**Table 4-2: Post-Project Short-Circuit Current Levels for Scenario 6**

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3- $\Phi$ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1- $\Phi$ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Excel 910S	138.00	148.90	6.23	0.013403+ j0.076185	7.84	0.008292+ j0.025598
Hansman Lake 650S	240.00	259.20	6.54	0.009722+ j0.039923	7.69	0.003005+ j0.019394
Hansman Lake 650S	138.00	142.30	8.91	0.013166+ j0.048245	9.67	0.004096+ j0.034402
Monitor 774S	138.00	151.50	6.45	0.018093+ j0.072048	7.44	0.006096+ j0.040138
Lanfine 959S	240.00	260.90	6.44	0.007565+ j0.042699	7.22	0.005969+ j0.025036
Lanfine 959S	138.00	149.00	7.13	0.010868+ j0.066826	10.50	-0.00015- j0.000654
Oakland 946S	240.00	259.70	13.58	0.003067+ j0.020615	14.03	0.003560+ j0.017239
Oyen 767S	138.00	148.80	6.02	0.016858+ j0.078360	6.48	0.017613+ j0.057536
Pemukan 932S	240.00	257.50	5.75	0.010087+ j0.045874	5.93	0.006420+ j0.037571
Pemukan 932S	138.00	151.80	6.56	0.017234+ j0.071156	7.80	0.003865+ j0.033827
Ware Junction 132S	240.00	253.20	14.70	0.003564+ j0.019134	14.66	0.003093+ j0.017488
Tumbleweed 1043S	240.00	262.20	5.73	0.009961+ j0.048010	5.95	0.012419+ j0.037947

### 4.2.2 Scenario 7: 2033 Winter Peak High Wind Generation Post-Project

Post-Project short-circuit current levels for Scenario 7 are provided in Table 4-3.

**Table 4-3: Post-Project Short-Circuit Current Levels for Scenario 7**

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3- $\Phi$ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1- $\Phi$ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Excel 910S	138.00	143.10	5.84	0.013045+ j0.074929	7.32	0.008303+ j0.025602
Hansman Lake 650S	240.00	256.80	6.01	0.011325+ j0.041911	7.19	0.002991+ j0.019240
Hansman Lake 650S	138.00	142.20	7.93	0.016017+ j0.052701	8.94	0.004088+ j0.033921
Monitor 774S	138.00	149.90	6.03	0.019578+ j0.074042	7.01	0.006110+ j0.040056

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Lanfine 959S	240.00	257.00	5.98	0.007804+ j0.043386	6.72	0.006133+ j0.025071
Lanfine 959S	138.00	143.30	6.69	0.010497+ j0.065591	9.86	-0.00014-j0.000650
Oakland 946S	240.00	259.30	12.94	0.002778+ j0.020501	13.50	0.003484+ j0.016867
Oyen 767S	138.00	143.40	5.61	0.016469+ j0.077577	6.02	0.017841+ j0.057823
Pemukan 932S	240.00	253.50	5.33	0.011121+ j0.047150	5.56	0.006455+ j0.037415
Pemukan 932S	138.00	150.10	6.13	0.018691+ j0.073095	7.35	0.003881+ j0.033750
Ware Junction 132S	240.00	260.00	14.13	0.003095+ j0.019034	14.16	0.003133+ j0.017601
Tumbleweed 1043S	240.00	258.10	5.32	0.010202+ j0.048699	5.55	0.012585+ j0.037984

## 5 Mitigation Measure Development and Evaluation

The Studies Consultant, in consultation with the AESO, developed mitigation measures to address the system performance issues that were identified in the post-Project scenarios. Existing remedial action schemes (RASs) are described in Section 1.2.2 of Attachment A1.

### 5.1 Pre-Project

Pre-Project mitigation measures are summarized in .

**Table 5-1: Pre-Project Mitigation Measures**

Mitigation Measure	Location of Observed Violation	Contingency
Existing RAS 134	174L (Bardo 197S to North Holden 395S)	766S T1 (Nevis 766S 240/138 kV Transformer)
	174L (Bardo 197S to North Holden 395S)	912L (Nevis 766S to Red Deer 63S)
	174L (Bardo 197S to North Holden 395S)	962L (Tinchebray 972S to Gaetz 87S)
	912L (Nevis 766S to Red Deer 63S)	
	9L20 (Nevis 766S to Cordel 755S)	
		174L (Bardo 197S to North Holden 395S) <sup>a</sup>
Existing RAS 200	801S T1 (Anderson 801S 240/138 kV Transformer)	7L171 (Michichi Creek 802S to Wintering Hills 804S)
	801S T1 (Anderson 801S 240/138 kV Transformer)	963S T1 (Coyote Lake 963S Transformer T1)
	801S T1 (Anderson 801S 240/138 kV Transformer)	9L29 (Oakland 946S to Coyote Lake 963S)
Existing RAS 203	7L128 (Coyote Lake 963S to 7LA128 Tap)	7L16 (Nevis 766S to Heatburg 948S)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	801S T1 (Anderson 801S 240/138 kV Transformer)
RTOP	472L (Hughenden 213S to Sunken Lake 221S Tap)	1047L (Hansman Lake 650S to Nilrem 574S)
	472L (Metiskow 648S to 472AL)	
	703L (Hardisty 377S to HRT Express Tap)	
	703L (Hughenden 213S to HRT Express Tap)	
	749AL (749AL Tap to ABO Fox Meadows Wind)	715L (Hansman Lake 650S to Provost 545S)
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	748L (Hayter 277S to Killarney Lake 267S)
	715L (Hansman Lake 650S to 715AL Tap)	
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	749L (Edgerton 899S to Lloydminster 716S)
	715L (Hansman Lake 650S to 715AL Tap)	
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	749L (Metiskow 648S to Edgerton 899S)
	715L (Hansman Lake 650S to 715AL Tap)	
	701L (North Hoden 395S to Strome 223S) <sup>a</sup>	766S T1 (Nevis 766S 240/138 kV Transformer)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	
	962L (Tinchebray 972S to Gaetz 87S)	
		7L128 (Coyote Lake 963S to 7LA128 Tap)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	7L25 (Rowley 768S to Michichi Creek 802S)

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715AL (715AL Tap to Cache Rising Sun MPC Solar)	7L42 (Hill 751S to Lloydminster 716S)
715L (Hansman Lake 650S to 715AL Tap)	
749AL (749AL Tap to ABO Fox Meadows Wind)	885L (Metiskow 648S to Hansman Lake 650S)
701L (North Hoden 395S to Strome 223S) <sup>a</sup>	912L (Nevis 766S to Red Deer 63S)
962L (Tinchebray 972S to Gaetz 87S)	
704L (Wainwright 51S to Tucuman 478S)	953L (Nilren 574S to Cordel 755S)
701L (North Hoden 395S to Strome 223S)	962L (Tinchebray 972S to Gaetz 87S)
7L159 (Heatburg 948S to 7LA159 Tap)	963S T1 (Coyote Lake 963S Transformer T1)
7L16 (Nevis 766S to Heatburg 948S)	
7L85 (Bullpound 803S to Anderson 801S)	
7L85 (Bullpound 803S to Parker)	
962L (Tinchebray 972S to Gaetz 87S)	9L20 (Nevis 766S to Cordel 755S)
472L (Hughenden 213S to Sunken Lake 221S Tap)	9L24 (Oakland 946s - Lanfine 959s)
472L (Hughenden 213S to Sunken Lake 221S Tap)	9L27 (Paintearth Creek 863S to Cordel 755S)
703L (Hardisty 377S to HRT Express Tap)	
7L159 (Heatburg 948S to 7LA159 Tap)	9L29 (Oakland 946S to Coyote Lake 963S)
7L16 (Nevis 766S to Heatburg 948S)	
7L85 (Bullpound 803S to Anderson 801S)	
7L85 (Bullpound 803S to Parker)	
704L (Wainwright 51S to Tucuman 478S)	Edgerton 899S Transformer T1
715AL (715AL Tap to Cache Rising Sun MPC Solar)	
715L (Hansman Lake 650S to 715AL Tap)	
715AL (715AL Tap to Cache Rising Sun MPC Solar)	Killarney Lake 267S Transformer T1
715L (Hansman Lake 650S to 715AL Tap)	

Notes:

<sup>a</sup> Refers to violations that only occurred in sensitivity scenarios.

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## 5.2 Post-Project

Post-Project mitigation measures are summarized in Table 5-2.

**Table 5-2: Post-Project Mitigation Measures**

Mitigation Measure	Location of Observed Violation	Contingency
Modified RAS 134 <sup>a</sup>	174L (Bardo 197S to North Holden 395S)	962L (Tinchebray 972S to Gaetz 87S)
	701L (North Hoden 395S to Strome 223S)	
	704L (Wainwright 51S to Tucuman 478S)	
	912L (Nevis 766S to Red Deer 63S)	
	9L20 (Nevis 766S to Cordel 755S)	
	174L (Bardo 197S to North Holden 395S) <sup>b</sup>	9L20 (Nevis 766S to Cordel 755S)
	701L (North Hoden 395S to Strome 223S) <sup>b</sup>	
	701L (Strome 223S to 7LA701 Tap) <sup>b</sup>	
	7L701L (Battle River 757S to 7LA701 Tap) <sup>b</sup>	
	7L65 (Vegreville 709S to 7LA65) <sup>b</sup>	
	7L132 (Oyen 767S to Lanfine 959S) <sup>b</sup>	912L (Nevis 766S to Red Deer 63S)
	174L (Bardo 197S to North Holden 395S) <sup>b</sup>	
	701L (North Hoden 395S to Strome 223S) <sup>b</sup>	
	701L (Strome 223S to 7LA701 Tap) <sup>b</sup>	
	7L701L (Battle River 757S to 7LA701 Tap) <sup>b</sup>	
7L65 (Vegreville 709S to 7LA65) <sup>b</sup>		
7L760 (Oyen 767S to Bindloss 914S Tap) <sup>b</sup>		
7L132 (Oyen 767S to Lanfine 959S) <sup>b</sup>	766S T1 (Nevis 766S 240/138 kV Transformer)	
174L (Bardo 197S to North Holden 395S) <sup>b</sup>		
701L (North Hoden 395S to Strome 223S) <sup>b</sup>		
701L (Strome 223S to 7LA701 Tap) <sup>b</sup>		
7L701L (Battle River 757S to 7LA701 Tap) <sup>b</sup>		
7L65 (Vegreville 709S to 7LA65) <sup>b</sup>		
7L760 (Oyen 767S to Bindloss 914S Tap) <sup>b</sup>		
7L132 (Oyen 767S to Lanfine 959S) <sup>b</sup>	9L29 (Oakland 946S to Coyote Lake 963S)	
Existing RAS 200		7L159 (Heatburg 948S to 7LA159 Tap)
		7L16 (Nevis 766S to Heatburg 948S)
		7L85 (Bullpound 803S to Anderson 801S)
	7L85 (Bullpound 803S to Parker)	

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	801S T1 (Anderson 801S 240/138 kV Transformer)	
	7L159 (Heatburg 948S to 7LA159 Tap)	963S T1 (Coyote Lake 963S Transformer T1)
	7L16 (Nevis 766S to Heatburg 948S)	
	7L85 (Bullpound 803S to Anderson 801S)	
	7L85 (Bullpound 803S to Parker)	
	801S T1 (Anderson 801S 240/138 kV Transformer)	
	801S T1 (Anderson 801S 240/138 kV Transformer)	
Modified RAS 201 <sup>a</sup>	7L224 (Hansman Lake 650S to Monitor 774S)	966L (Hansman Lake 650S to Pemukan 932S)
	7L127 (Pemukan 932S to Monitor 774S)	
Existing RAS 203	7L128 (Coyote Lake 963S to 7LA128 Tap)	7L16 (Nevis 766S to Heatburg 948S)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	801S T1 (Anderson 801S 240/138 kV Transformer)
New RAS 9L24/760L <sup>c</sup>	703L (Hardisty 377S to HRT Express Tap)	9L24 (Oakland 946s - Lanfine 959s) <sup>d</sup>
	472L (Metiskow 648S to 472AL)	
	7L760 (Oyen 767S to Bindloss 914S Tap)	
	7L132 (Oyen 767S to Lanfine 959S)	
	472L (Hughenden 213S to Sunken Lake 221S Tap)	
	9L20 (Nevis 766S to Cordel 755S) <sup>b</sup>	
RTOP	9L20 (Nevis 766S to Cordel 755S)	174L (North Holden 395S to Bardo 197S)
	962L (Tinchebray 972S to Gaetz 87S)	701 (North Hoden 395S to Strome 223S)
	7L65 (Vegreville 709S to 7LA65) <sup>b</sup>	
	9L20 (Nevis 766S to Cordell 755S) <sup>b</sup>	
	962L (Tinchebray 972S to Gaetz 87S)	701L (Strome 223S to Battle River 757S)
	7L65 (Vegreville 709S to 7LA65) <sup>b</sup>	
	9L20 (Nevis 766S to Cordell 755S) <sup>b</sup>	
	749AL (749AL Tap to ABO Fox Meadows Wind)	715L (Hansman Lake 650S to Provost 545S)
	715L (Hansman Lake 650S to 715AL Tap)	748L (Hayter 277S to Killarney Lake 267S)
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	
	715L (Hansman Lake 650S to 715AL Tap)	7L42 (Hill 751S to Lloydminster 716S)
	715AL (715AL Tap to Cache Rising Sun MPC Solar)	
	703 (Hardisty 377S to HRT Express Tap)	
	704L (Wainwright 51S to Tucuman 478S)	
	174L (Bardo 197S to North Holden 395S) <sup>b</sup>	7L92 (Vegreville 709S to Whitby Lake 819S)
	9L20 (Nevis 766S to Cordell 755S) <sup>b</sup>	7L137 (Three Hills 770S to Rowley 768S)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	
	9L20 (Nevis 766S to Cordell 755S) <sup>b</sup>	7L25 (Rowley 768S to Michichi Creek 802S)
	7L128 (Coyote Lake 963S to 7LA128 Tap)	
	749AL (749AL Tap to ABO Fox Meadows Wind)	885L (Metiskow 648S to Hansman Lake 650S)



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7L132 (Oyen 767S to Lanfine 959S)	962L (Tinchebray 972S to Gaetz 87S)
7L760 (Oyen 767S to Bindloss 914S Tap)	
704L (Wainwright 51S to Tucuman 478S)	9L80 (Battle River 757S to Cordel 755S)
7L132 (Oyen 767S to Lanfine 959S)	9L933 (Anderson 801S to Ware Junction 132S)
7L760 (Oyen 767S to Bindloss 914S Tap)	
7L132 (Oyen 767S to Lanfine 959S)	9L934 (Anderson 801S to Ware Junction 132S)
7L760 (Oyen 767S to Bindloss 914S Tap)	
7L132 (Oyen 767S to Lanfine 959S)	9L950 (Anderson 801S to Ware Junction 132S)
7L760 (Oyen 767S to Bindloss 914S Tap)	
715L (Hansman Lake 650S to 715AL Tap)	749L (Metiskow 648S to Edgerton 899S)
715AL (715AL Tap to Cache Rising Sun MPC Solar)	
715L (Hansman Lake 650S to 715AL Tap)	749L (Edgerton 899S to Lloydminster 716S)
715AL (715AL Tap to Cache Rising Sun MPC Solar)	
703L (Hardisty 377S to HRT Express Tap)	
704L (Wainwright 51S to Tucuman 478S)	
472L (Hughenden 213S to Sunken Lake 221S Tap)	
715L (Hansman Lake 650S to 715AL Tap)	Edgerton 899S Transformer T1
715AL (715AL Tap to Cache Rising Sun MPC Solar)	
703L (Hardisty 377S to HRT Express Tap)	
704L (Wainwright 51S to Tucuman 478S)	
472L (Hughenden 213S to Sunken Lake 221S Tap)	
715L (Hansman Lake 650S to 715AL Tap)	Killarney Lake 267S Transformer T1
715AL (715AL Tap to Cache Rising Sun MPC Solar)	
9L20 (Nevis 766S to Cordel 755S) <sup>b</sup>	Battle River Transformer T2
472L (Metiskow 648S to 472AL)	
472L (Hughenden 213S to Sunken Lake 221S Tap)	1047L (Hansman Lake 650S to Nilrem 574S)
703L (Hardisty 377S to HRT Express Tap)	
703L (Hughenden 213S to HRT Express Tap)	
7L132 (Oyen 767S to Lanfine 959S)	9L46 (Lanfine 959S to Pemukan 932S)
7L128 (Coyote Lake 963S to 7LA128 Tap)	766S T1 (Nevis 766S 240/138 kV Transformer)
174L (Bardo 197S to North Holden 395S)	
7L760 (Oyen 767S to Bindloss 914S Tap)	
962L (Tinchebray 972S to Gaetz 87S)	
472L (Hughenden 213S to Sunken Lake 221S Tap)	681L (Hardisty 377S to Tucuman 478S)
7L760 (Oyen 767S to Bindloss 914S Tap)	966L (Hansman Lake 650S to Pemukan 932S)
472L (Hughenden 213S to Sunken Lake 221S Tap)	
7L760 (Oyen 767S to Bindloss 914S Tap)	
7L132 (Oyen 767S to Lanfine 959S)	

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	472L (Metiskow 648S to 472AL)	9L27 (Paintearth Creek 863S to Cordel 755S)
	703L (Hardisty 377S to HRT Express Tap)	
	704L (Wainwright 51S to Tucuman 478S)	
	7L760 (Oyen 767S to Bindloss 914S Tap)	9L20 (Nevis 766S to Cordel 755S)
	962L (Tinchebray 972S to Gaetz 87S)	
	704L (Wainwright 51S to Tucuman 478S)	953L (Nilrem 574S to Cordel 755S)
	7L760 (Oyen 767S to Bindloss 914S Tap)	
	7L760 (Oyen 767S to Bindloss 914S Tap)	912L (Nevis 766S to Red Deer 63S)
	174L (Bardo 197S to North Holden 395S)	
	962L (Tinchebray 972S to Gaetz 87S)	

Notes:

<sup>a</sup> "Modified" refers to adding the Project to the logic of the existing RAS 134, RAS 201

<sup>b</sup> Refers to violations that only occurred in sensitivity scenarios.

<sup>c</sup> "New" refers to adding Project to the logic on New RAS9L24/760L

<sup>d</sup> Real time operation measure includes curtailment.

### 5.3 Evaluation of Mitigation Measures

This section describes the results of the power flow studies that were performed to assess the impact of the Project on the performance of the AIES following the implementation of proposed mitigation measures.

The post-mitigation measures studies were performed under Category B conditions for Scenarios 4, 5, 6 & 9 using Alternative 1 Option 2 and the RASs described in the previous section.

The post-mitigation power flow diagrams for selected Category B conditions are provided in Attachment 6. Post-Ras power flow diagrams present only those post-Project contingencies that result in thermal criteria violations that require RAS mitigation. Post-Project contingencies that result in thermal criteria violations that can be mitigated by real-time operational practices, or TFO capital maintenance projects were not studied.

#### 5.3.1 Scenario 4: Post-Project 2028 High Wind Summer Peak

##### Category B Conditions

Thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in **Error! Reference source not found.**

**Table 5-3: Post-RAS Power Flow Study Results For Scenario 4**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
7L16 (Nevis 766S to Heatburg 948S)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	191.57	117.60	101.13	62.08

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9L29 (Oakland 946S to Coyote Lake 963S)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	125.76	117.20	52.20	48.65
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	123.29	114.90	49.80	46.41
	7L85 (Bullpound 803S to Anderson 801S)	139.00	165.80	150.26	108.10	24.05	17.30
	7L85 (Bullpound 803S to Parker)	138.00	165.80	157.18	113.90	30.61	22.18
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	162.63	130.10	22.93	18.34
801S T1 (Anderson 801S 240/138 kV Transformer)	7L128 (Coyote Lake 963S to 7LA128 Tap)	162.90	180.20	195.15	119.80	104.26	64.00
963S T1 (Coyote Lake 963S)	7L159 (Heatburg 948S to 7LA159 Tap)	107.30	123.60	125.76	117.20	52.21	48.66
	7L16 (Nevis 766S to Heatburg 948S)	107.30	119.80	123.18	114.80	49.81	46.42
	7L85 (Bullpound 803S to Anderson 801S)	139.00	165.80	150.40	108.20	24.12	17.35
	7L85 (Bullpound 803S to Parker)	138.00	165.80	157.32	114.00	30.65	22.21
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	162.88	130.30	23.01	18.41
9L24 (Oakland 946s - Lanfine 959s)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	180.29	163.60	125.30	113.70 <sup>a</sup>
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	191.69	171.00	131.61	117.40 <sup>a</sup>

Notes:

<sup>a</sup>Overloads remaining after RAS action are mitigated by real-time operational practices, including pre-contingency curtailment.

### 5.3.2 Scenario 5: Post-Project 2028 High Wind Summer Light

#### Category B Conditions

The thermal and voltage criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in **Error! Reference source not found.**

**Table 5-4: Post-RAS Power Flow Study Results for Scenario 5**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
	472L (Hughenden 213S to Sunken Lake 221S Tap)	84.00	92.00	106.18	126.40	88.03	104.80 <sup>a</sup>

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9L24 (Oakland 946s - Lanfine 959s)	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	225.14	204.30	170.48	154.70 <sup>a</sup>
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	233.39	208.20	173.64	154.90 <sup>a</sup>

Notes:

<sup>a</sup>Overloads remaining after RAS action are mitigated by real-time operational practices, including pre-contingency curtailment.

### 5.3.3 Scenario 6: Post-Project 2028 High Wind Winter Peak

#### Category B Conditions

The thermal and voltage criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in **Error! Reference source not found.**

After RAS actions were complete, real-time operational practices are required to fully alleviate certain thermal criteria violations observed on 240kV transmission line 912L (Nevis 766S to Red Deer 63S) & 9L20 (Nevis 766S to Cordel 755S).

**Table 5-5: Post-RAS Power Flow Study Results for Scenario 6**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
966L (Hansman Lake 650S to Pemukan 932S)	7L224 (Hansman Lake 650S to Monitor 774S)	143.80	163.90	156.45	108.80	59.10	41.10
	7L127 (Pemukan 932S to Monitor 774S)	182.10	243.40	185.56	101.90	53.36	29.30
7L171 (Michichi Creek 802S to Wintering Hills 804S)	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	151.63	121.30	78.15	62.52
962L (Tinchebray 972S to Gaetz 87S)	174L (Bardo 197S to North Holden 395S)	149.00	164.00	179.25	120.30	142.80	95.84
	701L (North Hoden 395S to Strome 223S)	146.00	161.00	168.48	115.40	130.58	89.44
	704L (Wainwright 51S to Tucuman 478S)	79.00	87.00	86.82	109.90	70.08	88.71
	912L (Nevis 766S to Red Deer 63S)	624.00	624.00	933.50	149.60	676.60	108.43 <sup>a</sup>
	9L20 (Nevis 766S to Cordel 755S)	540.00	624.00	824.04	152.60	608.20	112.63 <sup>a</sup>
9L24 (Oakland 946s - Lanfine 959s)	703L (Hardisty 377S to HRT Express Tap)	96.00	143.00	111.17	115.80	84.38	87.90
	472L (Metiskow 648S to 472AL)	150.00	165.00	153.00	102.00	124.80	83.20
	7L760 (Oyen 767S to Bindloss 914S Tap)	146.60	167.70	174.60	119.10	133.55	91.10

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	7L132 (Oyen 767S to Lanfine 959S)	140.90	171.50	194.86	138.30	85.53	60.70
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### Notes:

<sup>a</sup>Overloads remaining after RAS action are mitigated by real-time operational practices, including pre-contingency curtailment.

## 5.3.4 Sensitivity Scenario 9: Post-Project 2028 High Wind Summer Peak

### Category B Conditions

The thermal and voltage criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in **Error! Reference source not found.**

After RAS actions were complete, real-time operational practices are required to fully alleviate certain thermal criteria violations observed on 138kV transmission line 174L (Bardo 197S to North Holden 395S) & 701L (North Hoden 395S to Strome 223S).

**Table 5-6: Post-RAS Power Flow Study Results for Scenario 9**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
9L20 (Nevis 766S to Cordel 755S)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	159.60	131.90	144.73	119.61 <sup>a</sup>
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	136.73	114.90	121.24	101.88 <sup>a</sup>
	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	144.64	102.00	129.12	91.06
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	148.61	104.80	132.41	93.38
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	109.52	100.20	104.01	95.16
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	112.88	100.70	106.23	94.76
9L29 (Oakland 946S to Coyote Lake 963S)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.73	102.70	14.20	10.29
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	145.75	116.60	6.60	5.28
963S T1 (Coyote Lake 963S Transformer T1)	7L85 (Bullpound 803S to Parker)	138.00	165.80	141.73	102.70	14.28	10.35
	801S T1 (Anderson 801S 240/138 kV Transformer)	125.00	125.00	146.00	116.80	6.79	5.43
	174L (Bardo 197S to North Holden 395S)	121.00	133.00	173.03	143.00	109.37	90.39
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	151.73	127.50	87.47	73.50

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912L (Nevis 766S to Red Deer 63S)	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	159.67	112.60	95.25	67.17
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	150.02	105.80	91.89	64.80
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	113.23	103.60	88.00	80.51
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	112.07	101.70	65.88	59.78
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	113.78	101.50	69.77	62.24
766S T1 (Nevis 766S 240/138 kV Transformer)	174L (Bardo 197S to North Holden 395S)	121.00	133.00	173.64	143.50	110.50	91.32
	701L (North Hoden 395S to Strome 223S)	119.00	131.00	152.20	127.90	88.21	74.13
	701L (Strome 223S to 7LA701 Tap)	141.80	169.00	160.09	112.90	96.01	67.71
	7L701L (Battle River 757S to 7LA701 Tap)	141.80	160.00	153.85	108.50	97.70	68.90
	7L65 (Vegreville 709S to 7LA65)	109.30	121.70	113.78	104.10	88.85	81.29
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	112.62	102.20	66.66	60.49
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	115.01	102.60	71.69	63.95
9L24 (Oakland 946s - Lanfine 959s)	9L20 (Nevis 766S to Cordel 755S)	429.00	501.00	438.87	102.30	380.52	88.70
	7L760 (Oyen 767S to Bindloss 914S Tap)	110.20	122.70	157.92	143.30	100.50	91.20
	7L132 (Oyen 767S to Lanfine 959S)	112.10	138.00	167.59	149.50	105.15	93.80

### Notes:

<sup>a</sup>Overloads remaining after RAS action are mitigated by real-time operational practices, including pre-contingency curtailment.

## 5.4 Constraint Effective Factor Studies

Constraint effective factor studies were conducted for all post-Project scenarios. The constraint effective factors were calculated for all Category A & B conditions when the loadings of the monitored transmission elements in the Study Area exceeded 100% (i.e., for all of the contingencies that resulted in thermal criteria violations). The results of the constraint effective factor studies are provided in Attachment A7.

# Attachment A1

## Engineering Connection Assessment: Study Scope

# Study Scope


## P2356 Oyen MPC Wind

Renewable Energy Systems Canada Inc.

**Date:** Oct. 15, 2024

**Version:** V3

**Classification:** Public

Company Name	Name and Credentials	Date	Signature
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## Attachments

Attachment A: Transmission Planning Criteria – Basis and Assumptions

# 1 Introduction

This Study Scope provides an overview of the engineering studies to be completed by Hardline Engineering Ltd. (the Studies Consultant) to assess the impact of the Project (as defined in section 1.1) on the performance of the Alberta interconnected electric system (AIES). Technical criteria, assumptions and methods for performing these engineering studies are provided in this document.

## 1.1 Project Overview

Project overview is provided in Table 1-1.

**Table 1-1: Project Overview**

Market Participant	Type of Project	In-service Date (ISD)
Renewable Energy Systems Canada Inc.	Connection	Sept. 1, 2027

Load and generation components of the Project are listed in Table 1-2.

**Table 1-2: Project Load and Generation Details**

Project Component		Description
Generation	Generation type	Wind
	Existing Rate STS, <i>Supply Transmission Service</i> , contract capacity	0 MW
	Requested Rate STS	250 MW
	Number and size of generating units	Not Available
	Maximum authorized real power (MARP)	250 MW
	Maximum capability (MC)	250 MW
	Reactive power capability	0.95 pf absorbing
		0.9 pf producing
Future generation expansion plans	Plan to increase generation to 400 MW in the future.	
Load	Existing Rate DTS, <i>Demand Transmission Service</i> , contract capacity	0 MW
	Requested Rate DTS	1 MW
	Type	Station service
	Motors (number and size)	None
	Power factor	0.9 pf

Project Component		Description
	Future load expansion plans	No

**Note:**

MARP and MC are defined in the AESO's *Consolidated Authoritative Document Glossary*, which can be found on the AESO's website.

## 1.2 Existing System Overview

### 1.2.1 Study Area

Geographically, the Project is located in the AESO planning area of Hanna, Area 42.

The Study Area consists of the AESO planning areas of Sheerness (Area 43), Hanna (Area 42), Lloydminster (Area 13), Wainwright (Area 32), Vegreville (Area 56), Provost (Area 37), Battle River (Area 36), including the tie lines connecting these planning areas to the rest of the AIES.

The existing transmission system in the Study Area is shown in Figure 1-1.

### 1.2.2 Existing Constraints

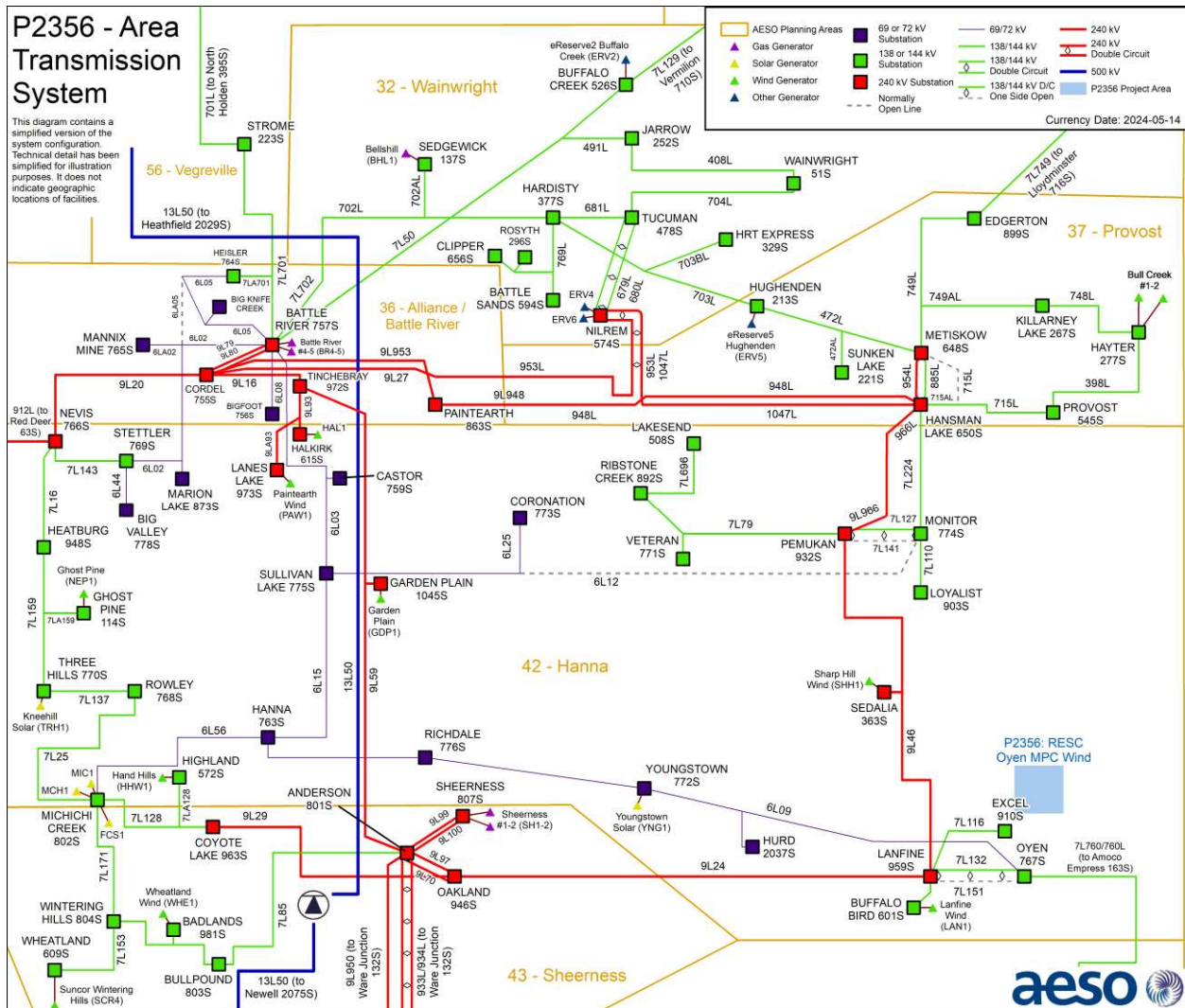
Existing constraints in the Study Area are managed in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management (TCM Rule)*.

There are a number of constraints in the Study Area that are mitigated by existing remedial action schemes (RASs) and/or other protection schemes.

The following existing RASs and/or other protection schemes are used to manage constraints in the area:

- RAS 134 Logic #1      174L and 701L Overload Mitigation Scheme at North Holden
- RAS 134 Logic #2      7L50 Overload Mitigation Scheme at Buffalo Creek substation
- RAS 134 Logic #3      Nevis 766S 901T transformer Overload Mitigation Scheme
- RAS 151              223S Strome Low Voltage Mitigation
- RAS 159              936S Norberg Under Voltage Mitigation
- RAS 199              7L159 Overload Mitigation Scheme at Heatburg 948S
- RAS 200              801T Overload Mitigation Scheme at Anderson 801S
- RAS 201              7L224 Overload Mitigation Scheme at Monitor 774S
- RAS 202              7L171 Overload Mitigation Scheme at Wintering Hills 804S
- RAS 203              7L128 Overload Mitigation Scheme at Michichi Creek 802S or Coyote Lake 963S

**Figure 1-1: Transmission System in the Study Area**



## 2 Connection Alternative to be Studied

The following alternative is to be studied:

### 2.1 Alternative 1 Option 2 – 240kV connection to the Lanfine 959S Substation

This alternative included the following developments:

- Add one 240 kV transmission circuit, approximately 6.5km in length<sup>1</sup>, and then string approximately 6.2km<sup>2</sup> of the same conductor as 9L46 onto the existing unused side of the double circuit structures of 9L46, to connect the Facility to Lanfine 959S Substation.
- Modify the existing Lanfine 959S substation, including adding one 240 kV circuit breaker and
- Add or modify associated equipment as required for the above transmission developments.

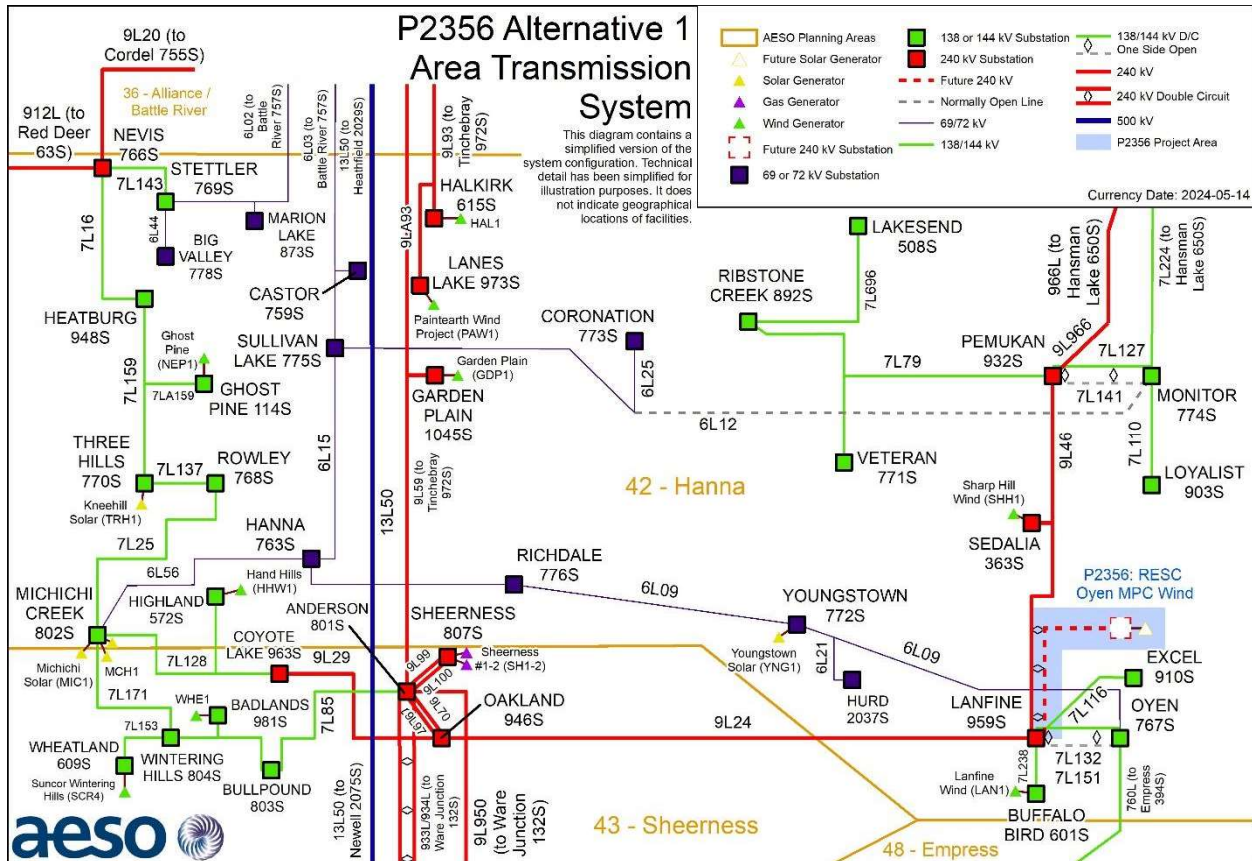
The proposed connection configuration is shown in Figure 2-1

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<sup>1</sup> The exact line length to be determined by the TFO.

<sup>2</sup> The exact line length to be determined by the TFO.

Figure 2-1: Connection Alternative 1 Option 2





## 3 Criteria, Standards and Requirements

### 3.1 AESO Reliability Criteria

The Transmission Planning (TPL) Standards, which are included in the Alberta Reliability Standards, and *Transmission Planning Criteria – Basis and Assumptions* (see Attachment A), (collectively, the Reliability Criteria) will be applied to evaluate system performance under Category A system conditions (i.e., all elements in-service) and following Category B contingencies (i.e., single element outage), prior to and following the studied alternatives. Below is a summary of Category A and Category B system conditions.

**Category A**, often referred to as the N-0 condition, represents a normal system with no contingencies and all facilities in service. Under this condition, the system must be able to supply all firm load and firm transfers to other areas. All equipment must operate within its applicable rating, voltages must be within their applicable range, and the system must be stable with no cascading outages.

**Category B** events, often referred to as an N-1 or N-G-1 with the most critical generator out of service, result in the loss of any single specified system element under specified fault conditions with normal clearing. These elements are a generator, a transmission circuit, a transformer, or a single pole of a DC transmission line. The acceptable impact on the system is the same as Category A. Planned or controlled interruptions of electric supply to radial customers or some local network customers, connected to or supplied by the faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) transmission service electric power transfers.

The TPL standards, TPL-001-AB-0 and TPL-002-AB1-0 have referenced Applicable Ratings when specifying the required system performance under Category A and Category B events. For the purpose of applying the TPL standards to the studies documented in this report, Applicable Ratings are defined as follows:

- Normal thermal rating of the line's loading limits for each season;
- The highest specified loading limits for transformers;
- For Category A conditions: Voltage range under normal operating condition per AESO Information Document #2010-007RS, *General Operating Practices – Voltage Control* (ID #2010-007RS). For the busses not listed in ID #2010-007RS, Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions* applies;
- For Category B and Category C5 conditions: The extreme voltage range values per Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions*; and
- Desired post-contingency voltage deviation limits for three defined post-event timeframes as provided in Table 3-1.



**Table 3-1: Post-Contingency Voltage Deviation Guidelines for Low Voltage Busses**

Parameter and reference point	Time Period		
	Post Transient (up to 30 sec)	Post Auto Control (30 sec to 5 min)	Post Manual Control (Steady State)
Voltage deviation from steady state at point of delivery (POD) low voltage bus.	±10%	±7%	±5%

### 3.2 ISO Rules and Information Documents

ID #2010-007RS will be used to establish system normal (i.e., pre-contingency) voltage profiles for the Study Area.

The TCM Rule will be followed to set up the study scenarios and assess the impact of the Project. In addition, due regard will be given to the following:

- The AESO’s *Connection Study Requirements*;
- Section 502.1 of the ISO rules, *Aggregated Generating Facilities Technical Requirements*;
- Section 502.16 of the ISO rules, *Aggregated Generating Facilities Operating Requirements*;

## 4 Scenarios and Assumptions

### 4.1 Scenarios

The following section describes the scenarios to be studied and the assumptions to be used in the studies. Connection scenarios must be studied as outlined in Table 4-1.

**Table 4-1: Connection Study Scenarios**

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
<b>Pre-Project</b>					
1	2028 Summer Peak (2028 SP)	High Generation (HG)	2028 SP Pre-Project	0	0
2	2028 Summer Light (2028 SL)		2028 SL Pre-Project	0	0
3	2028 Winter Peak (2028 WP)		2028 WP Pre-Project	0	0
<b>Post-Project</b>					
4	2028 SP	HG	2028 SP Post -Project	0	250
5	2028 SL		2028 SL Post -Project	0	250
6	2028 WP		2028 WP Post -Project	0	250
7	2033 WP	All study area generation in-service	2033 WP Post-Project- HG	0	250
<b>Pre-Project – Sensitivity – Without CETO (ph1)</b>					
8	2028 SP	HG	2028 SP Pre-Project	0	0
<b>Post-Project – Sensitivity – Without CETO (ph1)</b>					
9	2028 SP	HG	2028 SP Post -Project	0	250

### 4.2 Assumptions

#### 4.2.1 System Project Assumptions

Table 4-2 lists the system transmission projects that will be included in the studies.

**Table 4-2: Planned System Transmission Projects that may be Included in the Studies**

AESO Project No.	Project Name/Description	Scheduled ISD	AUC NID Decision No.
CETO (ph1) <sup>1</sup>	Central East Transfer-out Transmission Development	2026	25469-D01-2021

<sup>1</sup>The CETO Transmission Development phase 1 is considered in the study. Phase 1 includes one 240-kilovolt (kV) circuit between the Tinchebray 972S and Gaetz 875 substations.

### 4.2.2 Load Assumptions

Load forecast to be used for the studies is shown in Table 4-3 and is a forecast for the AESO Central Cluster based on the AESO's 2023 Long-term Outlook (2023 LTO).

**Table 4-3: Forecast Load in Central Cluster**

AESO Planning Region Name	Forecast Peak Load by Year/Season (MW)		
	2028 SP	2028 SL	2028 WP
Central Planning Region <sup>1</sup>	1,848	1,736	2,081
AIES	11,106	9,709	11,534

**Note:**

<sup>1</sup> The Central Region comprises the following AESO planning areas: Lloydminster (Area 13), Cold Lake (Area 28), Hinton/Edson (Area 29), Drayton Valley (Area 30), Wainwright (Area 32), Abraham Lake (Area 34), Red Deer (Area 35), Alliance/Battle River (Area 36), Provost (Area 37), Caroline (Area 38), Didsbury (Area 39), Hanna (Area 42) and Vegreville (Area 56).

### 4.2.3 Generation Assumptions

The generation forecast to be used for the studies is based on the 2023 LTO with modifications to incorporate the latest forecast intelligence. The generation assumptions for the studies will assume high Central generation dispatch for STS studies.

The existing generation (excluding wind and solar) dispatch conditions for the study scenarios are described in Table 4-4.

**Table 4-4: Existing Generation (excluding Wind and Solar) Dispatch Conditions**

Facility Name	Unit No.	Bus No.	MC (MW)	AESO Planning Area No.	Unit Net Generation <sup>a</sup> (MW) by Scenario		
					2028 SP	2028 SL	2028 WP
Battle River #4 (BR4)	4	1496	155	36	31	31	31
Battle River #5 (BR5)	G5	1497	385	36	94.8	94.8	94.8
Sheerness #1 (SH1)	G1	1482	400	43	140	140	140
Sheerness #2 (SH2)	G2	1487	390	43	140	140	140

**Notes:**

<sup>a</sup> "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.

The wind and solar generation facilities will be dispatched to yield the credible worst-case generation dispatches for the Central Cluster. Pre- and post-Project dispatch levels for the existing and planned<sup>3</sup> wind and solar generation facilities for the Southeast Cluster are shown in Table 4-5 and Table 4-6.

**Table 4-5: Dispatch Conditions for Existing and Planned Wind Generation Facilities**

Project Name	AESO Planning Area No.	Bus No.	MC (MW)	2028 SP	2028 SL	2028 WP
Fortis Bull Creek Phases 1 and 2 (BUL1 & BUL2)	37	550003	29	10	2.9	10.2
		550004		11	5	13.7
Garden Plain (GDP1)	42	565002	130	130	85.3	130
Ghost Pine (NEP1)	42	2621	82	15	3.6	14.8
		2622		15	3.6	14.8
		2623		11	2.7	11.1
		2624		15	3.6	14.8
		2625		19	4.5	18.5
Grizzly Bear Creek (GRZ1)	13	67308	152	45	29.9	45
Halkirk (HAL1)	42	66435	150	69	53.9	70.2
		67435		72	56.1	73
Hand Hills (HHW1)	42	560045	145	115	57.1	92
Lanfine Wind (LAN1)	42	60996	151	138	103	145
EDPR Sharp Hills Wind Farm	42	60831	248.4	196	121.5	195.6
		60832		92	57.2	92.1
Paintearth Wind Power / Paintearth Wind Power Phase 2	42	61418	99	99	99	99
		62418	99	91	46.9	91
Lone Pine MPC Wind	42	561103	466	212	158.9	233
		561104		212	158.9	233
Capital Power Halkirk 2 Wind	36	60467	150	141	110	143.2
ABO Fox Meadows Wind	37	560039	150	106	47	128.5
CP Rolling Hills MPC Wind	37	560235	190	135	59.5	162.7
BluEarth Prairie Yarrow MPC Wind	37	560273	222	53	23.5	64.2

**Notes:**

<sup>a</sup> "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.

<sup>3</sup> Planned generation refers to the projects which met have met the AESO's project inclusion criteria.

**Table 4-6: Dispatch Conditions for Existing and Planned Solar Generation Facilities**

Project Name	AESO Planning Area No.	Bus No.	MC (MW)	2028 SP	2028 SL	2028 WP
Empress Solar Park (EMP1)	39	4366	21	18	17.7	9.7
		4266		13	12.8	7
Innisfail (INF1)	39	557120	22	8	7.7	6.2
Kneehill Solar (TRH1)	42	19433	25	0	0	0
		552433				
Michichi Creek (MCH1)	42	557448	13.5	11	0	5.9
Michichi Solar (MIC1)	42	554448	25	25	25	10.9
Youngstown Solar (YNG1)	42	19476	6	5	4.8	2.6
ATCO Michichi DER Solar	42	552448	75	19	22	16.4
		553448		22	22	16.4
		552450		16	11.3	0
ATCO Vilna 777S DER Solar	56	19357	5	0	0	0
RESC Big Sky Solar	56	560051	140	0	0	60.2
ATCO Oyen 767S DER Solar	42	19474	15	12	12.1	6.5
FortisAlberta Metiskow 648S DER Solar	37	557074	22.5	11	18.4	8.7
Phoenix MPC Solar	35	560362	299	72	119.7	56.6
		560365		72	119.7	56.6
Cache Rising Sun MPC Solar	37	562046	125	98	97.7	53.7
Kneehill MPC Solar	42	560106	450	176	175.9	96.7
		560103		176	175.9	96.7
Dolcy Solar Battery	37	567158	200	32	53.4	25.2
		567157		32	53.4	25.2
		567156		32	53.4	25.2
Eastervale Solar Battery	37	564092	300	48	80.1	37.9
		563092		48	80.1	37.9
		562092		48	80.1	37.9
Fortis Aura Provost DER Solar	37	4086	22.5	11	18	8.5
UK Solar East MPC	42	561042	401	156	156.8	89.1
		562042		156	156.8	89.1
Sundre 575S DER Solar	38	4107	14.6	12	12.1	6.5
Mannix MPC Solar Battery	36	566011	59	0	0	0
Harvest Sky MPC Solar Battery	42	566013	15	0	0	0
		566014		0	0	0

Springbrook MPC Solar	35	568204	300	73	120.1	56.8
		568207		73	120.1	56.8
FortisAlberta Killarney Lake 267S DER Solar/Battery Storage	37	4219	22.5	11	18	8.5
FortisAlberta Joffre 535S DER Solar 1	35	2886	25	0	0	0
FortisAlberta Joffre 535S DER Solar 2	35	2383	22	0	0	0
Fortis Moon Lake DER Solar	30	4028	18.4	9	14.7	7

**Notes:**

<sup>a</sup> “Unit Net Generation” refers to gross generating unit output (MW) less unit service load.

#### 4.2.4 Intertie Flow Assumptions

The intertie flow assumptions for the Alberta-British Columbia (AB-BC), Alberta-Saskatchewan (AB-SK), and Alberta-Montana (MATL) interties are shown in Table 4-7.

**Table 4-7: Intertie Flows for all Study Scenarios**

Scenario Name	Import (-) / Export (+) (MW) by Intertie		
	AB-BC	AB-SK	MATL
2028 SL	+868	0	+186
2028 SP	+851	+150	+186
2028 WP	+1091	+150	+186

#### 4.2.5 HVDC Power Order Assumptions

The Western Alberta Transmission Line (WATL) and the Eastern Alberta Transmission Line (EATL) are high-voltage direct current (HVDC) transmission lines. The HVDC power order assumptions for the studies will be set to minimize losses for the pre-Project and post-Project study scenarios.

#### 4.2.6 Protection Fault Clearing Times

The transient stability studies will be performed using the actual fault clearing times for the selected contingencies, as provided by the TFO and as shown in Table 4-8. Only those contingencies shown in Table 4-8 will be studied for transient stability studies. If the TFO did not specify the fault clearing times (e.g. for new transmission lines) for a selected contingency, then the studies for that contingency will be performed using the standard fault clearing times that are specified in Table 2-3 of the AESO’s *Transmission Planning Criteria – Basis and Assumptions*.

**Table 4-8: Protection Fault Clearing Times**

Contingency (System Element Lost)	Fault Location	Clearing Times (Cycles)	
		Near End	Far End
9L24 Oakland 946S to Lanfine 959S	Oakland 946S	5	6
9L24 Oakland 946S to Lanfine 959S	Lanfine 959S	5	6
9L29 Oakland 946S to Coyote Lake 963S	Oakland 946S	5	6
9L29 Oakland 946S to Coyote Lake 963S	Coyote Lake 963S	5	6
9L46 Lanfine 959S to Pemukan 932S	Lanfine 959S	5	6
9L46 Lanfine 959S to Pemukan 932S	Pemukan 932S	5	6
9L59 From Anderson 801S to Tinchebray 972S	Anderson 801S	5	6
9L59 From Anderson 801S to Tinchebray 972S	Tinchebray 972S	5	6
9L966 From Pemukan 932S to Hansman Lake 650S	Pemukan 932S	5	6
9L966 From Pemukan 932S to Hansman Lake 650S	Hansman Lake 650S	5	6
760L From Oyen 767S to Amoco Empress 163S	Oyen 767S	6	7
760L From Oyen 767S to Amoco Empress 163S	Amoco Empress 163S	6	8
7L132 From Lanfine 959S to Oyen 767S	Lanfine 959S	6	8
7L132 From Lanfine 959S to Oyen 767S	Oyen 767S	6	8
7L116 From Lanfine 959S to Excel 910S	Lanfine 959S	6	N/A
7L116 From Lanfine 959S to Excel 910S	Excel 910S	N/A	24
9L20 (Cordel 755S – Nevis 766S)	Cordel 755S	5	6
9L20 (Cordel 755S – Nevis 766S)	Nevis 766S	5	6
9L62 (Tinchebray 972S to Gaetz 87S)	Gaetz 87S	5	6
9L62 (Tinchebray 972S to Gaetz 87S)	Tinchebray 972S	5	6
912L/9L912 (Red Deer 63S – Nevis 766S)	Red Deer 63S	5	6
912L/9L912 (Red Deer 63S – Nevis 766S)	Nevis 766S	5	6

#### 4.2.7 Project Dynamic Data

Dynamic data for the Project can be found in Attachment A7.

#### 4.2.8 Voltage Profile Assumption

ID #2010-007RS will be used to establish system normal (i.e., pre-contingency) voltage profiles for key area busses prior to commencing any studies. Table 2-1 of the *Transmission Planning Criteria – Basis and Assumptions* applies for the busses not included in ID #2010-007RS. These voltages will be used to set the voltage profile for the study base cases prior to the power flow studies.

## 5 Study Methodology

The studies to be performed for this connection assessment are identified in Table 5-1.

**Table 5-1: Summary of the Studies to be Performed**

Scenario No. and Name		Power Flow		Voltage Stability		Transient Stability		Motor Starting		Short Circuit
		Category		Category		Category		Category		Category A
		A	B	A	B	A	B	A	B	
<b>Pre-Project</b>										
1	2028 SP	X	X			X*	X*			
2	2028 SL	X	X			X*	X*			
3	2028 WP	X	X			X*	X*			X
<b>Post-Project</b>										
4	2028 SP	X	X			X	X			
5	2028 SL	X	X			X	X			
6	2028 WP	X	X			X	X			X
7	2033 WP									X
<b>Pre-Project-Sensitivity</b>										
8	2028 SP	X	X							
<b>Post-Project-Sensitivity</b>										
9	2028 SP	X	X							

\* Pre-project transient stability and voltage stability studies will be Only required if post-project studies identify potential performance issues.

For the engineering studies, all transmission facilities 69 kV and above, within the Study Area and the transmission lines connecting these planning areas to neighbouring planning areas will be studied and monitored to assess the impact of the Project on the performance of the AIES, including any violations of the Reliability Criteria (as defined in Section 3.1).

### 5.1 Study Case Validation

The study will be conducted on the AIES system model using the AESO's planning base cases. The seasonal light/peak scenarios will be studied as required. The base cases will be modified by the AESO to include the corresponding load and generation forecast information. The resulting cases, or seed cases, along with the project IDEVs, will be provided by the AESO to the Studies Consultant. These cases are provided in PSS/E v34 and/or v33 format. Upon request, the AESO can provide RAW and SEQ files. Software used by the Studies Consultant must be able to read and write these file types. Manual adjustments may be required to ensure full alignment with the details outlined in this Study Scope, as



described in the process outlined below. The AESO will provide guidance to the Studies Consultant with regard to the setup of the study cases should any questions arise.

The expected process for the creation of acceptable study cases is as follows:

1. The AESO provides seed cases and the appropriate incremental IDEVs to use and any other applicable information required to the Studies Consultant.
2. The Studies Consultant applies the identified IDEVs to the seed cases to create the study cases. The Studies Consultant verifies and makes adjustments as required to ensure the study cases represent the assumptions outlined within the Study Scope.
3. Upon creating the study cases, all the study cases are forwarded to the AESO for approval.
4. The Studies Consultant proceeds with the required engineering studies only after the study cases are approved by the AESO.

## 5.2 Power Flow Studies

Power flow studies will be performed to identify thermal and voltage criteria violations as per the Reliability Criteria, and any deviations from the limits listed in Table 3-1.

For information purposes, the Studies Consultant must also provide, as a separate file, a list of any transmission elements where the thermal loading exceeds 95% of the element's normal rating under Category A and Category B conditions.

For the Category B power flow studies, the transformer taps and switched shunt reactive compensating devices such as shunt capacitors and reactors will be locked and continuous shunt devices will be enabled.

Voltage deviations at point-of-delivery (POD) low voltage busses will also be assessed for both the pre-Project and post-Project networks by first locking all tap changers and area shunt reactive compensating devices to identify any post-transient voltage deviations above 10%. Second, tap changers will be allowed to move while shunt reactive compensating devices remained locked to determine if any voltage deviations above 7% would occur in the area. Third, all the taps and shunt reactive compensating devices will be allowed to adjust, and voltage deviations above 5% will be reported.

The scenarios to be studied are shown in Table 5-1.

### 5.2.1 Contingencies to be Studied

Power flow studies will be performed for the Category A and all Category B conditions in the Study Area.

## 5.3 Transient Stability Studies

Genesee unit 3 in Wabamun (Area 40) will be used as the reference for the studies.

The report presenting the results of the transient stability studies must provide response plots for several variables, including rotor angle as applicable, and active and reactive power output for the generating units in the study area. The results report must also provide the 500 kV, 240 kV and 138 kV bus voltage levels for substations near the point of connection. Other busses will be monitored and will be reported as determined by the results. The results report must also provide the key branch active and reactive power flow surrounding the Facility.

Transient stability studies will be performed for the post-Project scenarios as shown in Table 5-1. If any transient stability issues are observed, transient stability analysis will be performed for the corresponding pre-Project scenarios.

### **5.3.1 Contingencies to be Studied**

Transient stability studies will be performed for the contingencies shown in Table 4-8.

## **5.4 Short-Circuit Current Level Studies**

A maximum fault level must be provided for the substations in the vicinity of the Project assuming normal system operation with all transmission elements in service and generation dispatched. Three-phase faults and single line-to-ground faults will be simulated. Polar coordinates and per-unit values will be used for reporting the results.

Winter peak scenarios will be used for the short-circuit studies because winter peak scenarios generally produce higher short-circuit current levels than summer peak scenarios.

Estimated maximum three-phase faults and single line-to-ground short-circuit current levels will be reported for the following substations:

- Excel 910S
- Hansman Lake 650S
- Monitor 774S
- Lanfine 959S
- Oakland 946S
- Oyen 767S
- Pemukan 932S
- Ware Junction 132S
- P2356 Facility

Further sensitivity studies, in consultation with the TFO, may be required if the primary short-circuit analysis indicates a potential to exceed or approach the existing fault rating of the transmission facilities.

The scenarios to be studied are as shown in Table 5-1.

## 6 Mitigation Measures

### 6.1 Development

Mitigation measures may be required if the post-Project study results identify system performance issues. Mitigation measures for the Project may involve modifying or adding real-time operational practices and/or remedial action schemes (RASs).

The Studies Consultant must notify the AESO of any system performance issues in a timely manner, following which the AESO Studies Engineer may instruct the Studies Consultant as follows:

- Develop tables showing the constraint effective factors<sup>4</sup> for generation or load based on thermal criteria violations that are observed.
- Collaborate with the AESO to propose changes, if any, to the connection alternatives that could remove the requirement for a RAS.
- Collaborate with the AESO to study modifications to existing and/or planned RASs, proposed by the AESO, to ensure the coordination of existing protection schemes with the addition of any proposed protection schemes.
- Collaborate with the AESO to identify and study new RASs, if any, that may be required to ensure system reliability is maintained after connecting the Project to the AES.

The AESO Studies Engineer will work closely with the Studies Consultant and guide the development and/or modifications of the proposed mitigation measures to ensure system reliability, security and compliance with AESO ID #2018-018T, *Provision of System Access Service and the Connection Process*.

### 6.2 Evaluation

#### 6.2.1 Post-Mitigation Studies

Studies to evaluate the effectiveness of mitigation measures, if required, will be performed in accordance with the technical criteria, assumptions, and methods provided in this Study Scope and in accordance with further instructions from the AESO.

#### 6.2.2 Constraint Effective Factor Studies

Constraint effective factor analysis are used to determine the generator- and load- constraint effective factors and to identify the most effective generators or loads to manage the thermal criteria violations, if any, that are observed under Category B conditions.

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<sup>4</sup> Constraint effective factor studies are performed to determine the generator- and load- constraint effective factors. Constraint effective factors are used to estimate the ability of generators and loads to manage transmission constraints. A generator's or load's constraint effective factor is defined as the change in power flow over a specific transmission line following a change in the generator's energy production or in the load's energy consumption. The greater the constraint effective factor, the more effective a generator or load can be in managing a thermal criteria violation on the specific transmission line.

## 7 Changes to Study Assumptions

This study will utilize the AESO's planning base cases, which are based on the AESO's current corporate forecast (2021 LTO) with modifications to incorporate the latest forecast intelligence. Sensitivity studies or restudy may be required in the event of revisions to the AESO's corporate forecast, forecast intelligence, or other study assumptions. Additional engineering studies may also be required to assess new connection alternatives, changes to project ISD, or delays in proposed system developments. Any additional or revised study requirements shall be captured in a signed Study Scope Amendment document.

# Attachment A: Transmission Planning Criteria – Basis and Assumptions

# Transmission Planning Criteria – Basis and Assumptions

**Date:** July 9, 2019

**Version:** V1.2

## 1. Introduction

This document presents the reliability standards, criteria, and assumptions to be used as the basis for planning the Alberta Transmission System. The criteria, standards and assumptions identified in this document supersede those previously established.

## 2. Transmission Reliability Standards and Criteria<sup>1</sup>

The AESO applies the following Alberta Reliability Standards to ensure that the transmission system is planned to meet applicable performance requirements under a defined set of system conditions and contingencies. A brief description of each of these standards is given below:

### 1. TPL-001-AB-0: System Performance Under Normal Conditions

Category A represents a normal system condition with all elements in service (N-0). All equipment must be within its applicable rating, voltages must be within their applicable ratings and the system must be stable with no cascading outages. Under Category A, electric supply to load cannot be interrupted and generating units cannot be removed from service.

### 2. TPL-002-AB1-0: System Performance Following Loss of a Single BES Element

Category B events result in the loss of any single element (N-1) under specified fault conditions with normal clearing. The specified elements are a generating unit, a transmission circuit, a transformer or a single pole of a direct current transmission line. The acceptable impact on the system is the same as Category A with the exception that radial customers or some local network customers, including loads or generating units, are allowed to be disconnected from the system if they are connected through the faulted element. The loss of opportunity load or opportunity interchanges is allowed. No cascading can occur.

### 3. TPL-003-AB-0: System Performance Following Loss of Two or More BES Elements

Category C events result in the loss of two or more bulk electric system elements (sequential, N-1-1 or concurrent, N-2) under specified fault conditions and include both normal and delayed fault clearing. All of the system limits for Category A and B events apply with the exception that planned and controlled loss of firm load, firm transfers and/or generation is acceptable provided there is no cascading.

### 4. TPL-004-AB-0: System Performance Following Extreme BES Events

Category D represents a wide variety of extreme, rare and unpredictable events, which may result in the loss of load and generation in widespread areas. The system may not be able to reach a new stable steady state, which means a blackout is a possible outcome. The AESO needs to evaluate these events, at its discretion, for risks and consequences prior to creating mitigation plans.

### 5. FAC-014-AB1-2: Establishing and Communicating System Operating Limits

The AESO is required to establish system operating limits where a contingency is not mitigated through construction of transmission facilities

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<sup>1</sup> A complete description of the *Alberta Reliability Standards* can be found on the AESO's website: <https://www.aeso.ca/rules-standards-and-tariff/alberta-reliability-standards/>

## 2.1 Thermal Loading Criteria

The AESO Thermal Loading Criteria require that the continuous thermal rating of any transmission element is not exceeded under normal and post-contingency operating conditions. Thermal limits are assumed to be 100% of the respective normal summer and winter ratings. Emergency limits are not considered in the planning evaluations.

## 2.2 Voltage Range and Voltage Stability Criteria

The normal minimum and maximum voltage limits as specified in the following table are used to identify Category A system voltage violations, while the extreme minimum and maximum limits are used to identify Category B and C system violations. Table 2-1 presents the acceptable steady state and contingency state voltage ranges for the AIES. Table 2-2 provides voltage stability criteria used to test the system performance.

**Table 2-1: Acceptable Range of Steady State Voltage (kV)**

Nominal Voltage	Extreme Minimum	Normal Minimum	Normal Maximum	Extreme Maximum
500	475	500	525	550
240	216	234	252	264
260 (Northeast & Northwest)*	234	247	266	275
144	130	137	151	155
138	124	135	145	150
72	65	68.5	75.5	79
69	62	65.5	72.5	76

**Table 2-2: Voltage Stability Criteria**

Performance Level	Disturbance (1)(2)(3)(4) Initiated by: Fault or No Fault DC Disturbance	MW Margin (P-V method) (5)(6)(7)	MVAr Margin (V-Q method) (6)(7)
A	Any element such as: One Generator One Circuit One Transformer One Reactive Power Source One DC Monopole	$\geq 5\%$	Worst Case Scenario(8)
B	Bus Section	$\geq 5\%$	50% of Margin Requirement in Level A
C	Any combination of two elements such as: A Line and a Generator A Line and a Reactive Power Source Two Generators Two Circuits Two Transformers Two Reactive Power Sources DC Bipole	$\geq 2.5\%$	50% of Margin Requirement in Level A
D	Any combination of three or more elements such as: Three or More Circuits on ROW Entire Substation Entire Plant Including Switchyard	$> 0$	$> 0$



### 2.3 Transient Stability Analysis Assumptions

Standard fault clearing times as shown in Table 2-3 are used for the new facilities or when the actual clearing times are not available for the existing facilities. Double line-to-ground faults are applied for the Category C5 events with normal clearing times. Single line-to-ground faults are applied for Category C6 to C9 events with delayed clearing times as depicted in Table 2-4 and Table 2-5.

**Table 2-3: Fault Clearing Times**

Nominal (kV)	Near End (Cycles)	Far End (Cycles)
500	4	5
240	5	6
144/138 with telecommunications	6	8
144/138 without telecommunications	6	30

**Table 2-4: Stuck Breaker Clearing Times for Lines**

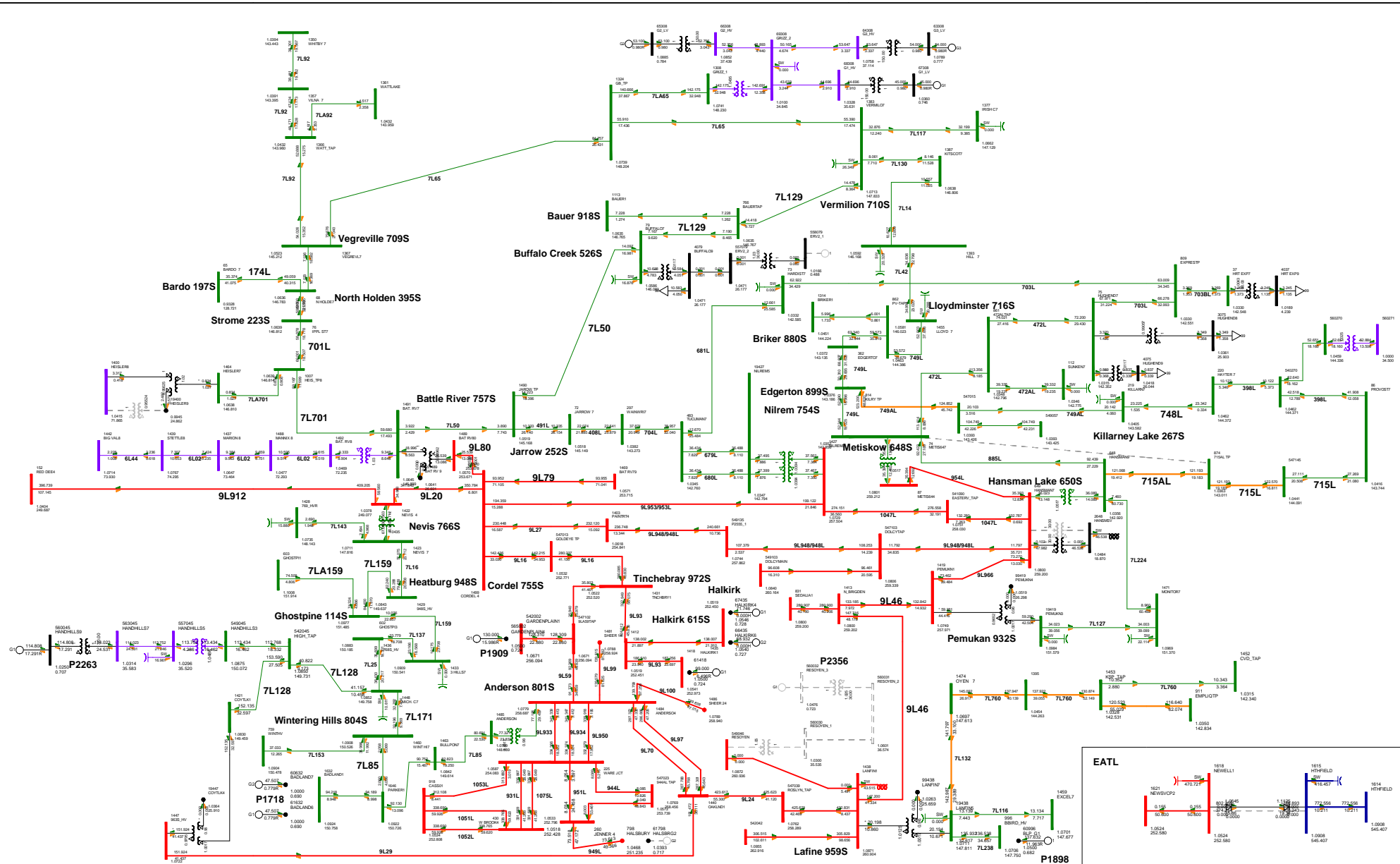
Voltage (kV)	Fault Clearing Times (Cycles)		
	Near End	Far End	2 <sup>nd</sup> Ckt (C5 and C7 only)
138/144	15	24	24
240	12	6	14
500	9	5	11

**Table 2-5: Stuck Breaker Clearing Times for Transformers**

Voltage (kV)	Fault Location	Fault Clearing Times (Cycles)		
		High Side	Low Side	2 <sup>nd</sup> Ckt (breaker fail)
240/138	240 kV side	12	6	14
	138 kV side	5	15	24
500/240	500 kV side	9	5	11
	240 kV side	4	12	14

# Attachment A2

## Pre-Project Power Flow Diagrams



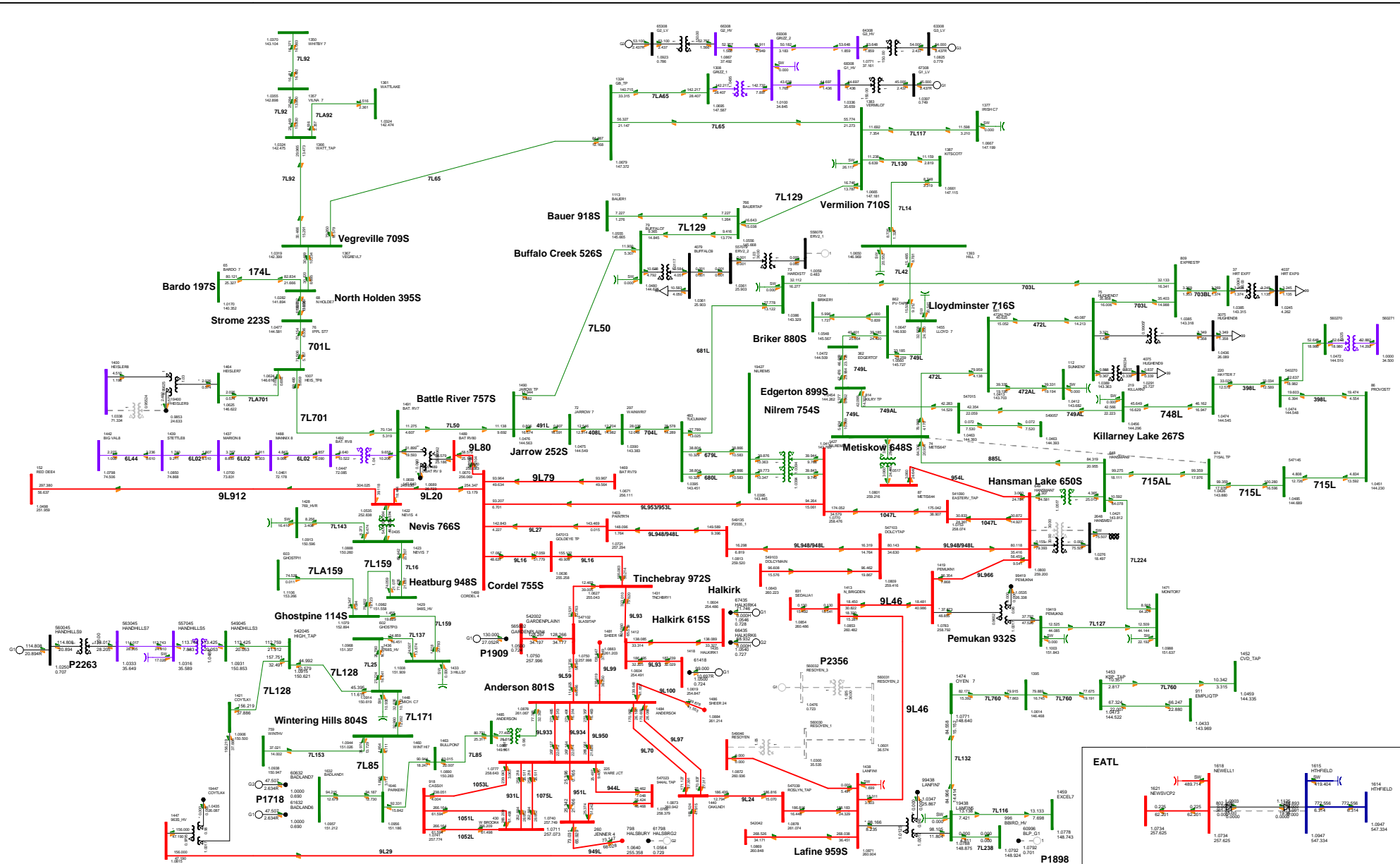
**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/Max  
 102.5/100.0  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

**FIGURE A2.1-0-N-0: NORMAL OPERATION**  
 2028 SUMMER PEAK (PRE-CONNECTION), PRE-CURTAILMENT  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.430 MW  
 EATL: -808.112 MW

BC Import: -850.981 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



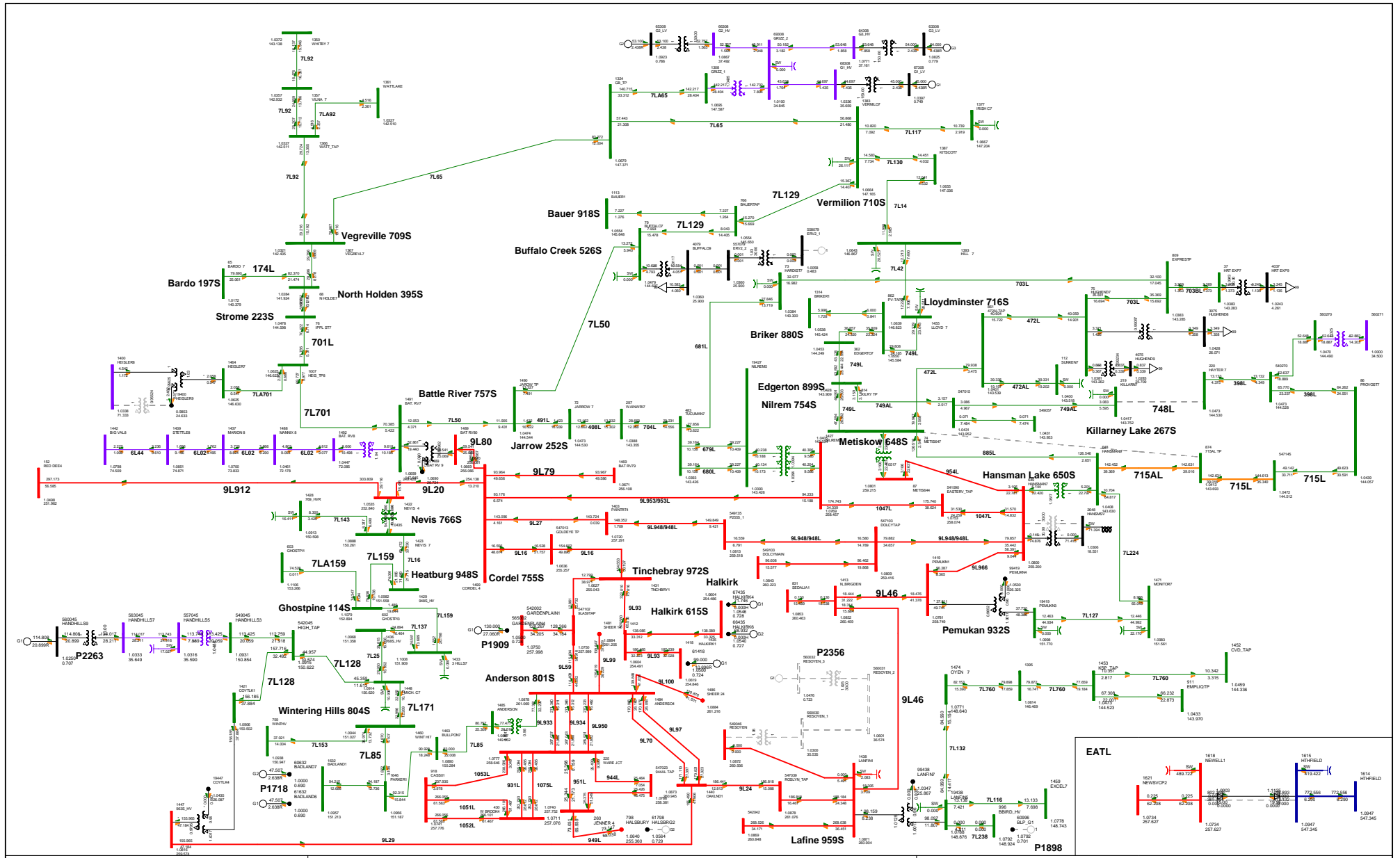
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (V) @  
 Equipment (MVA) @  
 102.5kV @  
 W: +0.000+34.500-88.000+138.000+190.000+800.000

**FIGURE A2.1-1-N-0: NORMAL OPERATION**  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.252 MW

BC Import: -425.238 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



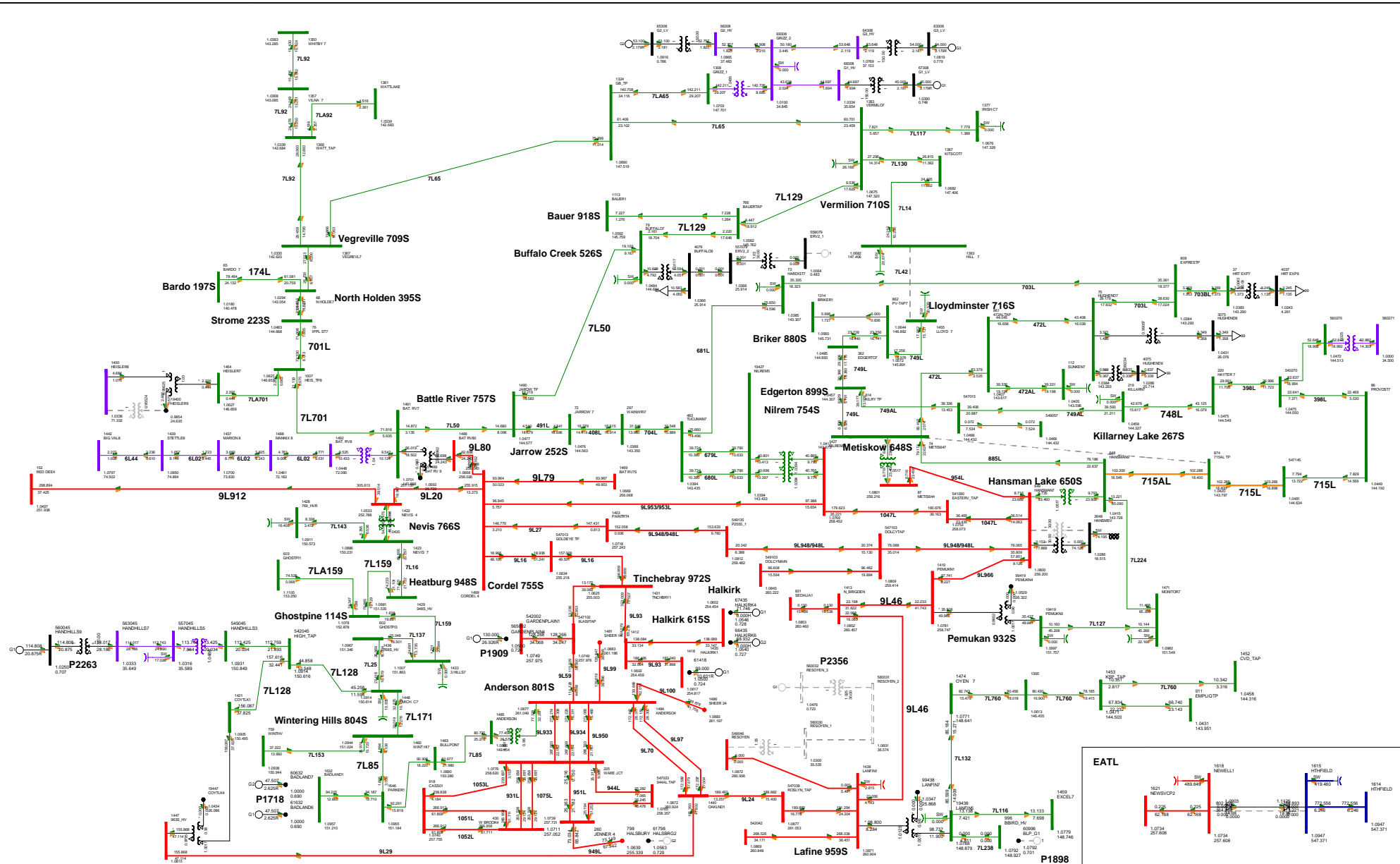
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 138  
 Branch Voltage (kV) = 138  
 Equipment Rating (MVA) = 1000  
 W: +10.00+34.500+88.000+138.000+240.000+500.000

FIGURE A2.1-2 748L (HAYTER 277S TO KILLARNEY LAKE 267S)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW
EATL: -808.252 MW

BC Import: -423.163 MW
Sask Import: -150.000 MW
MATL Import: -182.825 MW



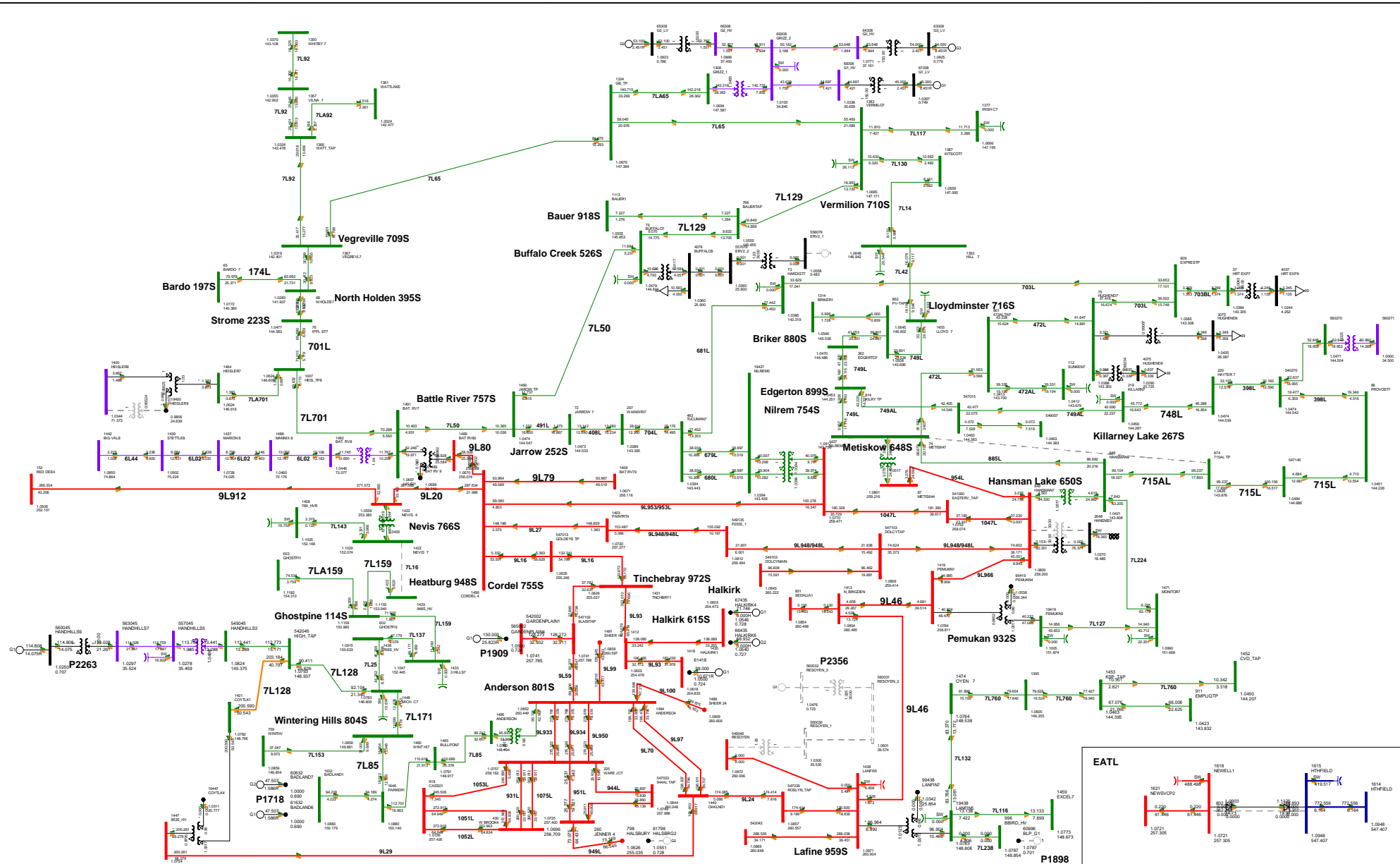
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100  
 W: +0.000+34.500-88.000+138.000+190.000+300.000

**FIGURE A2-1-3 7L42 (HILL 751S TO LLOYDMINSTER 716S)  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.251 MW

BC Import: -425.732 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



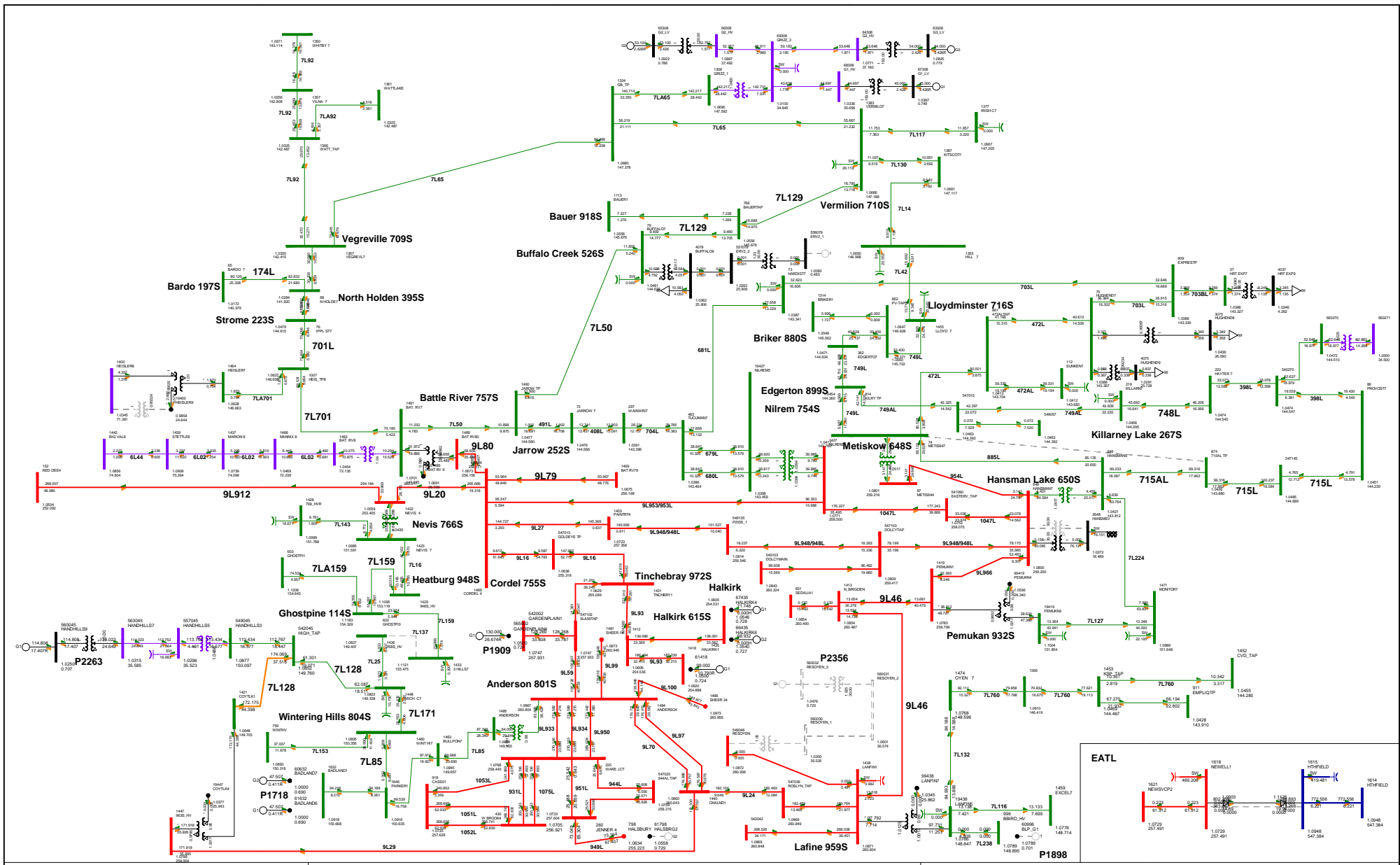
**P2356 Oyen MPC Wind**

Bus Voltage (V) @ 2025 SUMMER PEAK (PRE-CONNECTION)  
 Branch: MW  
 Equipment: MW/MVar  
 102.76 kV @ A  
 W: +0.000+34.500-88.000+138.000+240.000+400.000

**FIGURE A2.1-4 7L16 (NEVIS 766S TO HEATBURG 948S)**  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.242 MW

BC Import: -420.375 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Breaker (V/90)  
 Equipment (MVA/MW)  
 102.5kV/90kVA  
 W: +0.000+54.500=-88.000+138.000+240.000+500.000

FIGURE A2.1-5 T1.137 (THREE HILLS 770S TO ROWLEY 768S)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.248 MW

BC Import: -425.955 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



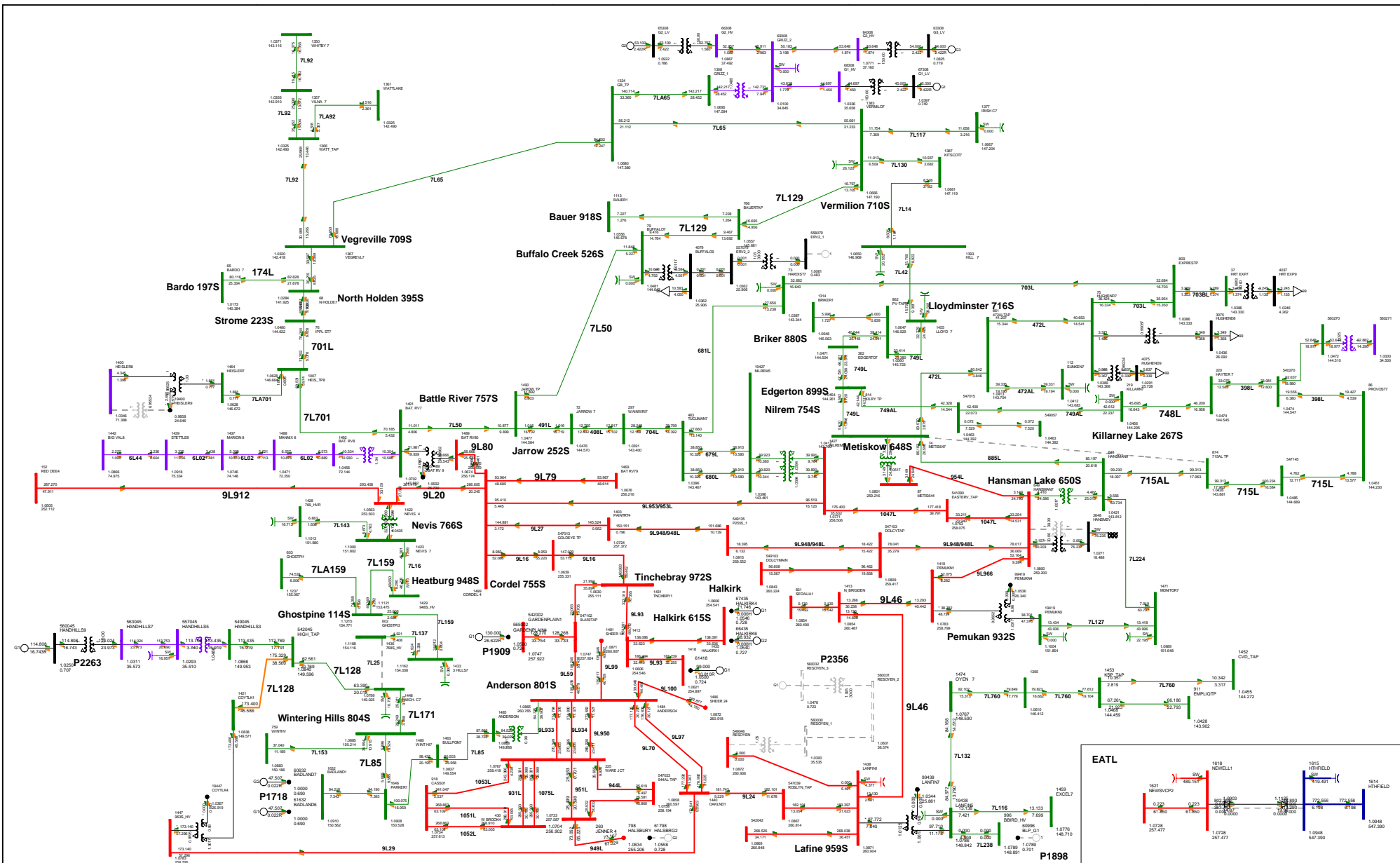


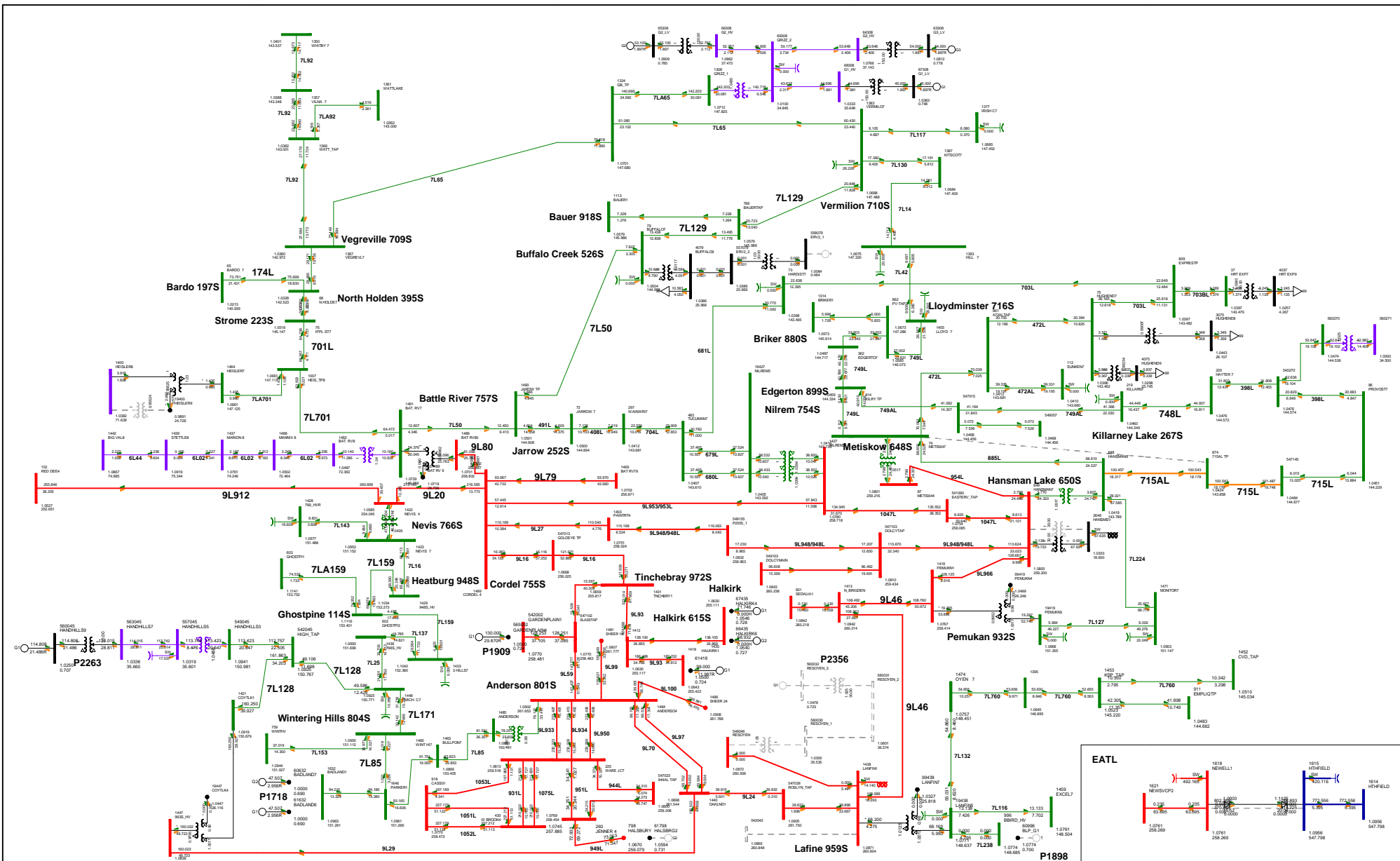
FIGURE A2.1-4 7L25 (ROWLEY 766S TO MICHICI CREEK 802S)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (kV) = 115  
 Branch W/F = 100  
 Equipment W/F = 100  
 W = 0.000 + 54.500 + 88.000 + 138.000 + 240.000 = 500.000

WATL: -2.433 MW  
 EATL: -808.247 MW

BC Import: -425.883 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



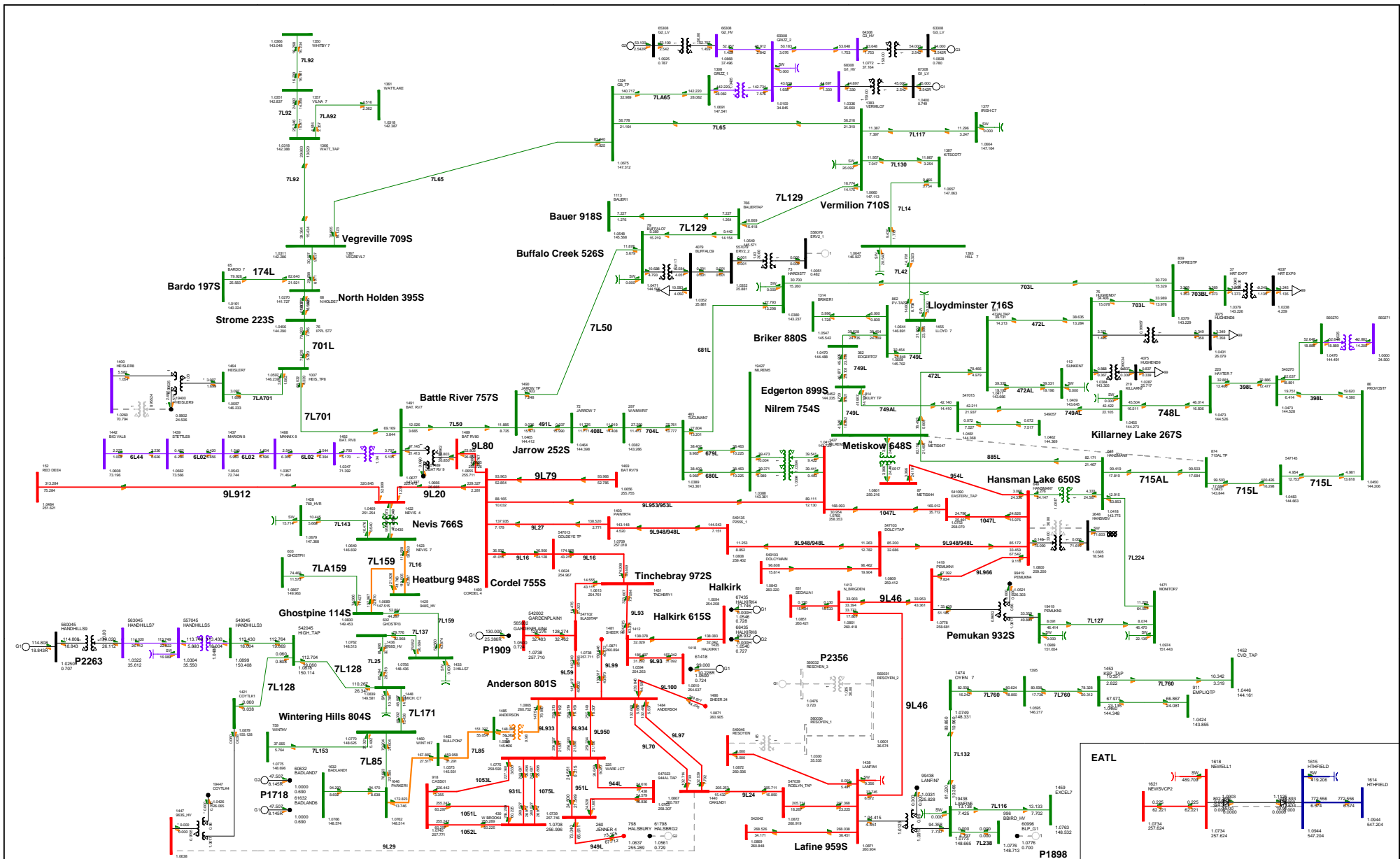
**P2356 Oyen MPC Wind**

Bus Voltage (kV) 115  
 Breaker (kV) 170  
 Equipment (MVA) 100  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+290.000

**FIGURE A2.1-7 1041L (LANFIRE A859S TO BUS542042)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.271 MW

BC Import: -190.025 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



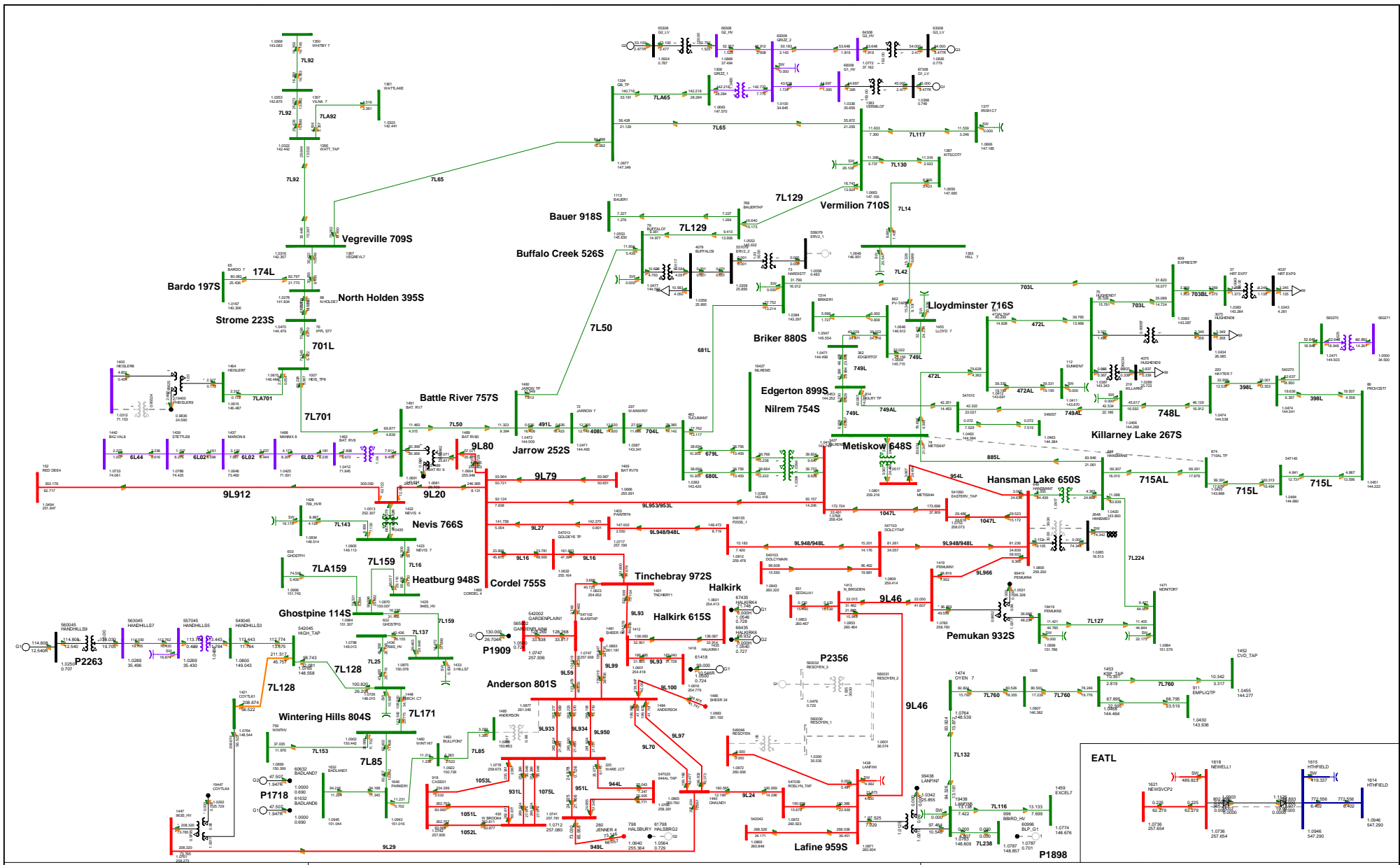
**P2356 Oyen MPC Wind**

Bus: Voltage (V/Hz)  
 Break: MVA  
 Equipment: MVA/MW  
 102.5kV/80kA  
 W: +0.000+54.500-88.009 +138.000 +240.000 +500.000

FIGURE A2.1-8 9L29 (OAKLAND 946S TO COYOTE LAKE 963S)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.252 MW

BC Import: -397.736 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+290.000

**FIGURE A2.1-9 801S T1 (ANDERSON 801S 240/138 KV TRANSFORMER)**  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.253 MW

BC Import: -416.741 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW

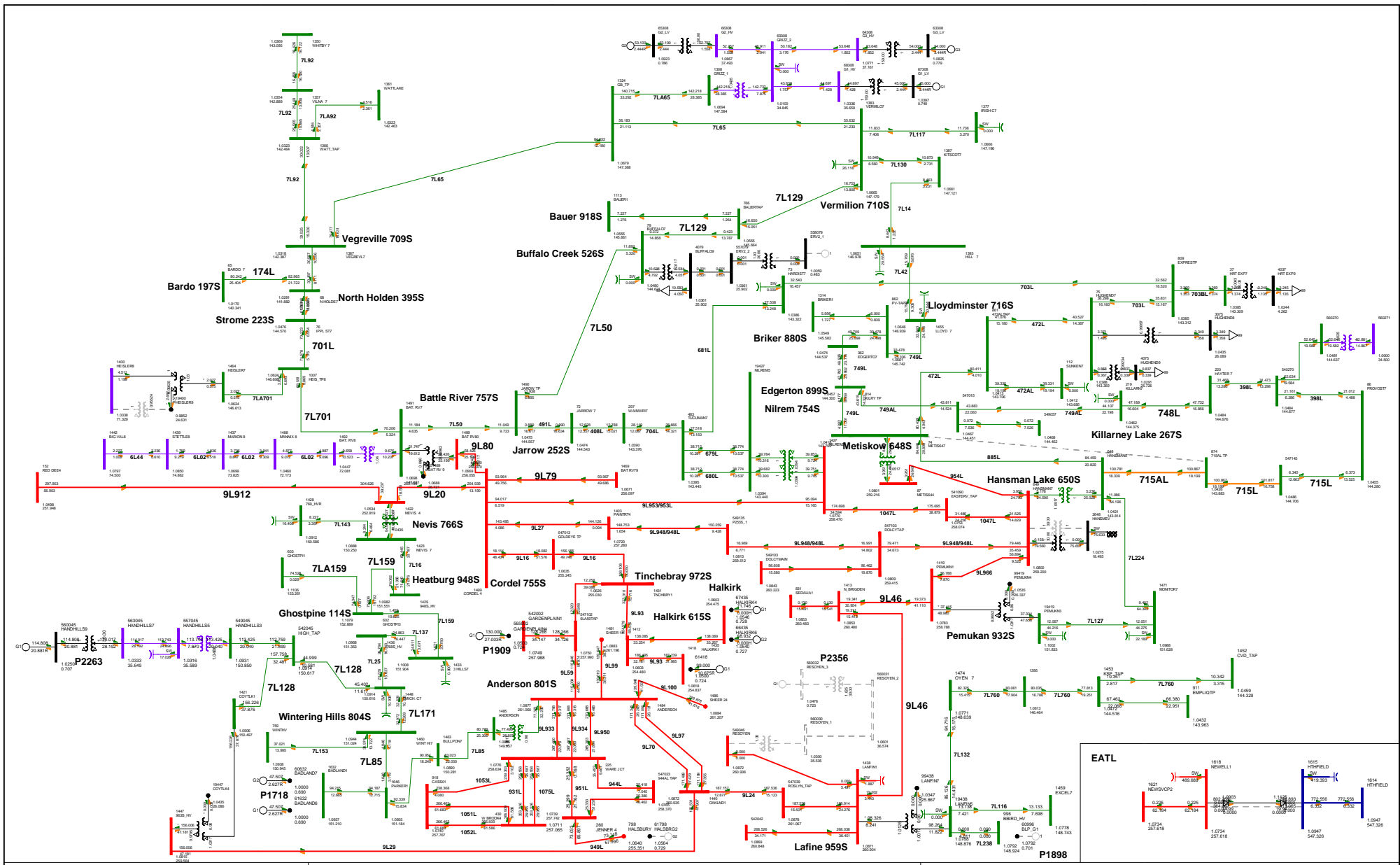


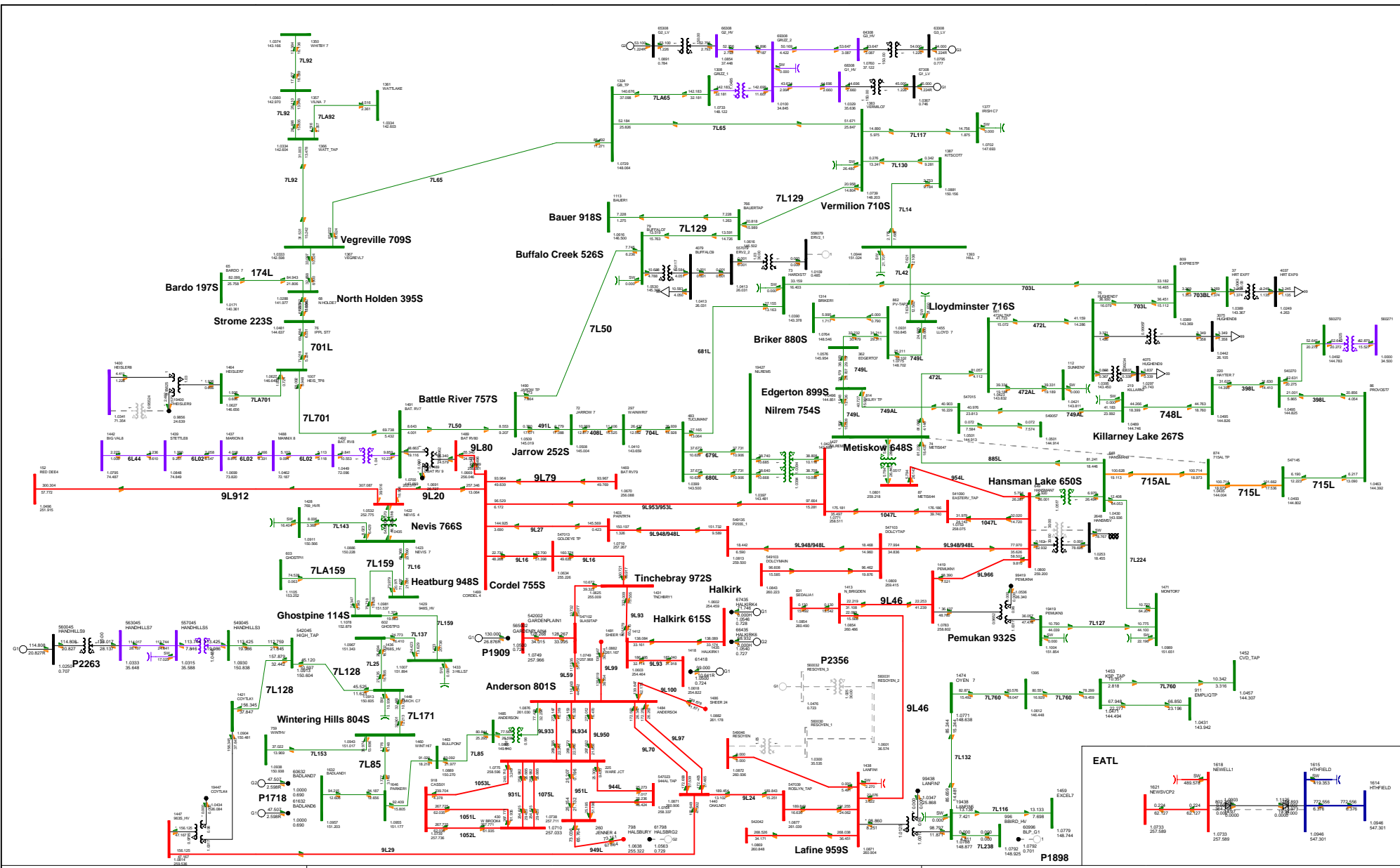
FIGURE A2.1-10 HAYTER 277S TRANSFORMER T1  
2028 SUMMER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (kV) 115  
Branch W/F 100  
Equipment MVA/MW 100/20000  
W: +0.000+34.500-88.000+138.000+240.000+500.000

WATL: -2.433 MW  
EATL: -808.252 MW

BC Import: -427.748 MW  
Sask Import: -150.000 MW  
MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

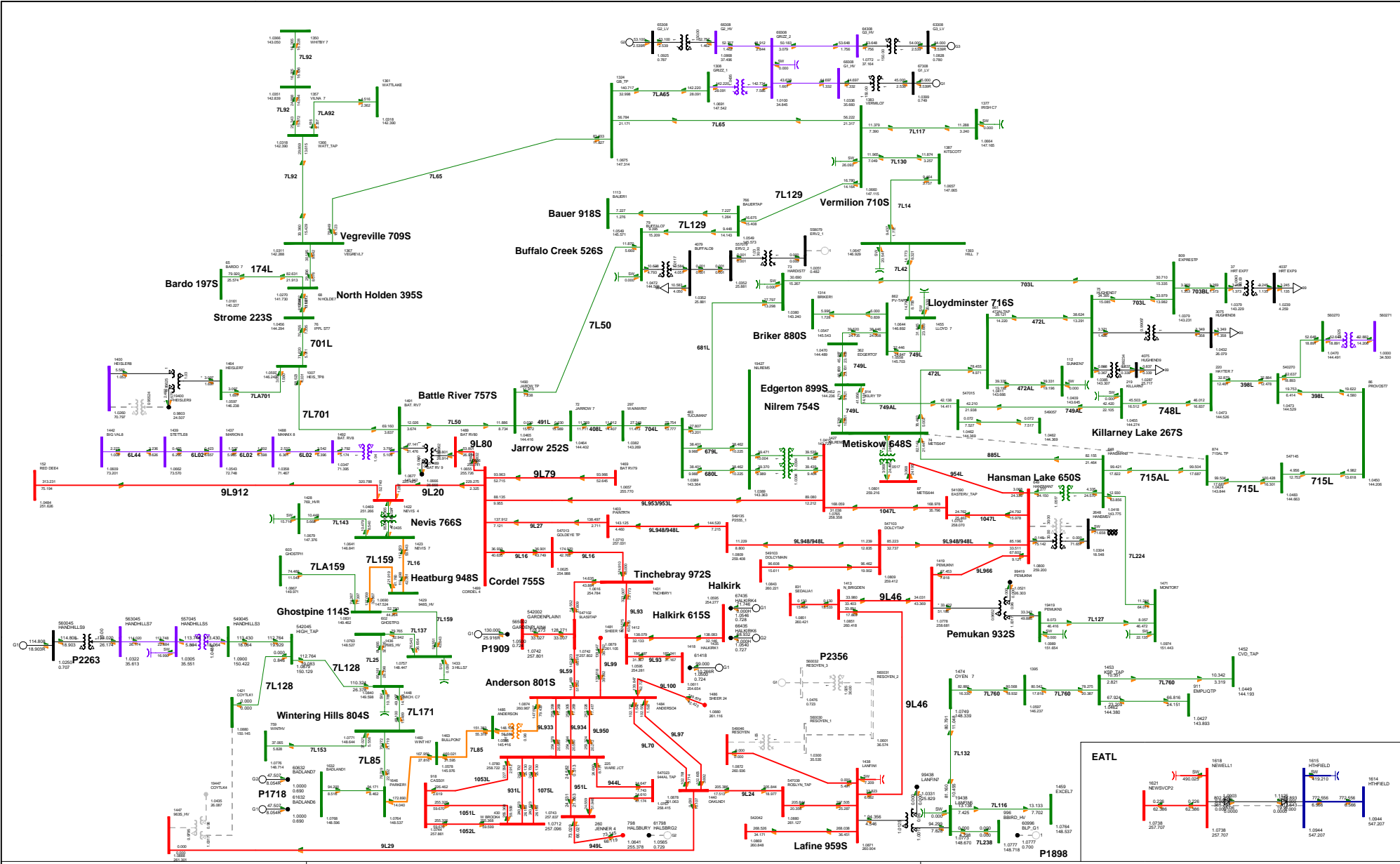
Bus Voltage (kV) 230  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500-88.000+138.000+240.000+300.000

**FIGURE A2-1-11 HILL 751S TRANSFORMER 2T  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23 SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.251 MW

BC Import: -441.975 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW





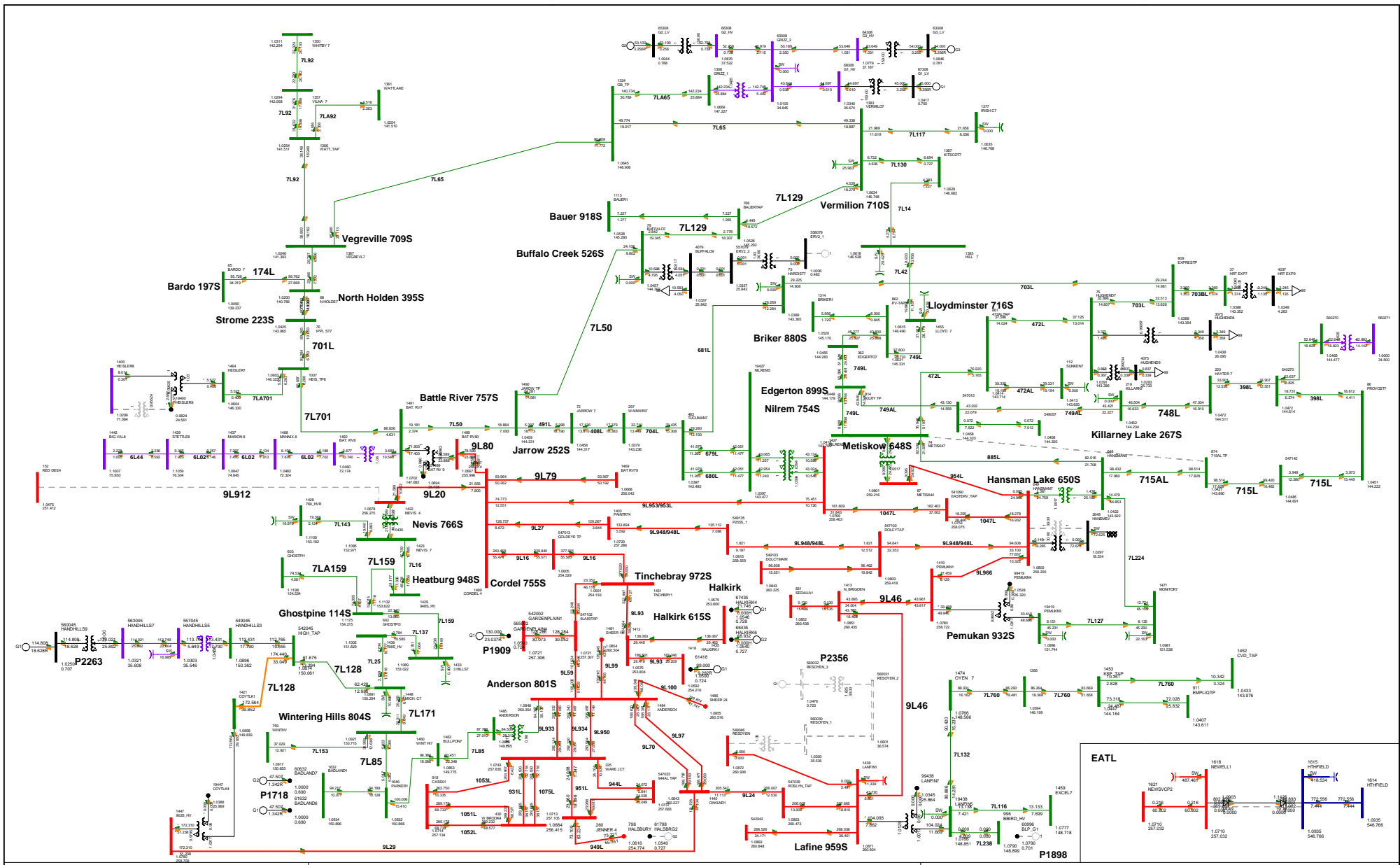
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Base MVA = 100  
 Equipment MVA/MW = 100/20/100  
 W = +0.000 + j4.500 - j8.000 + j38.000 + j240.000 + j900.000

**FIGURE A2-1-12 963S T1 (COYOTE LAKE 963S TRANSFORMER T1)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.254 MW

BC Import: -397.802 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

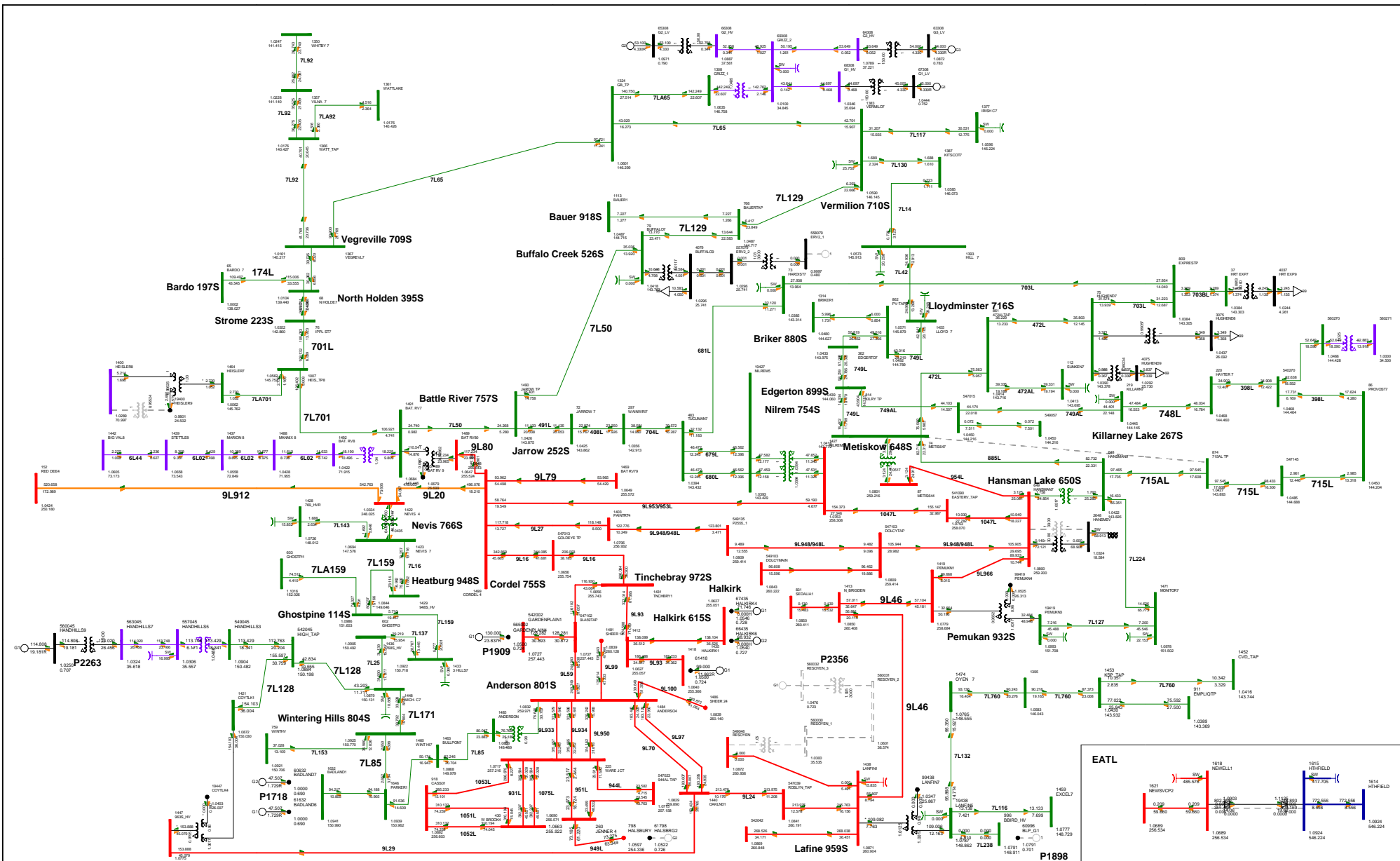
Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 MW = 0.0004 \* kVA - 88.009 + 138.000 + 240.000 = 930.000

**FIGURE A2.1-1.3 912L (NEVIS 766S TO RED DEER 63S)**  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.234 MW

BC Import: -407.777 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW





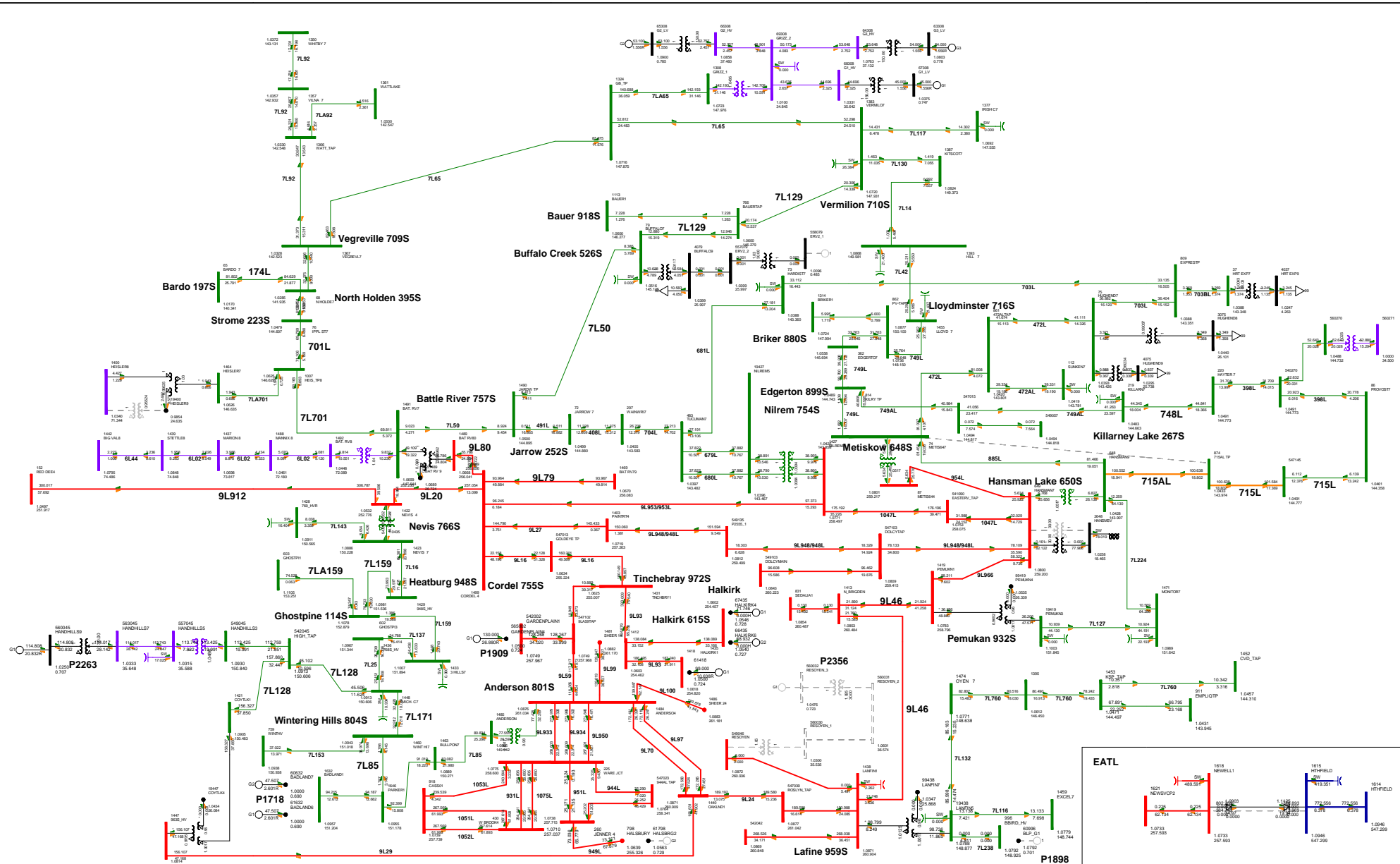
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Base MVA = 100  
 Equipment MVA/MW = 100/2000  
 W = +0.000+34.500-88.000+138.000+240.000+500.000

FIGURE A2.1-14 962L (TINCHEBRAY 972S TO GAETZ 87S)  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.219 MW

BC Import: -377.256 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



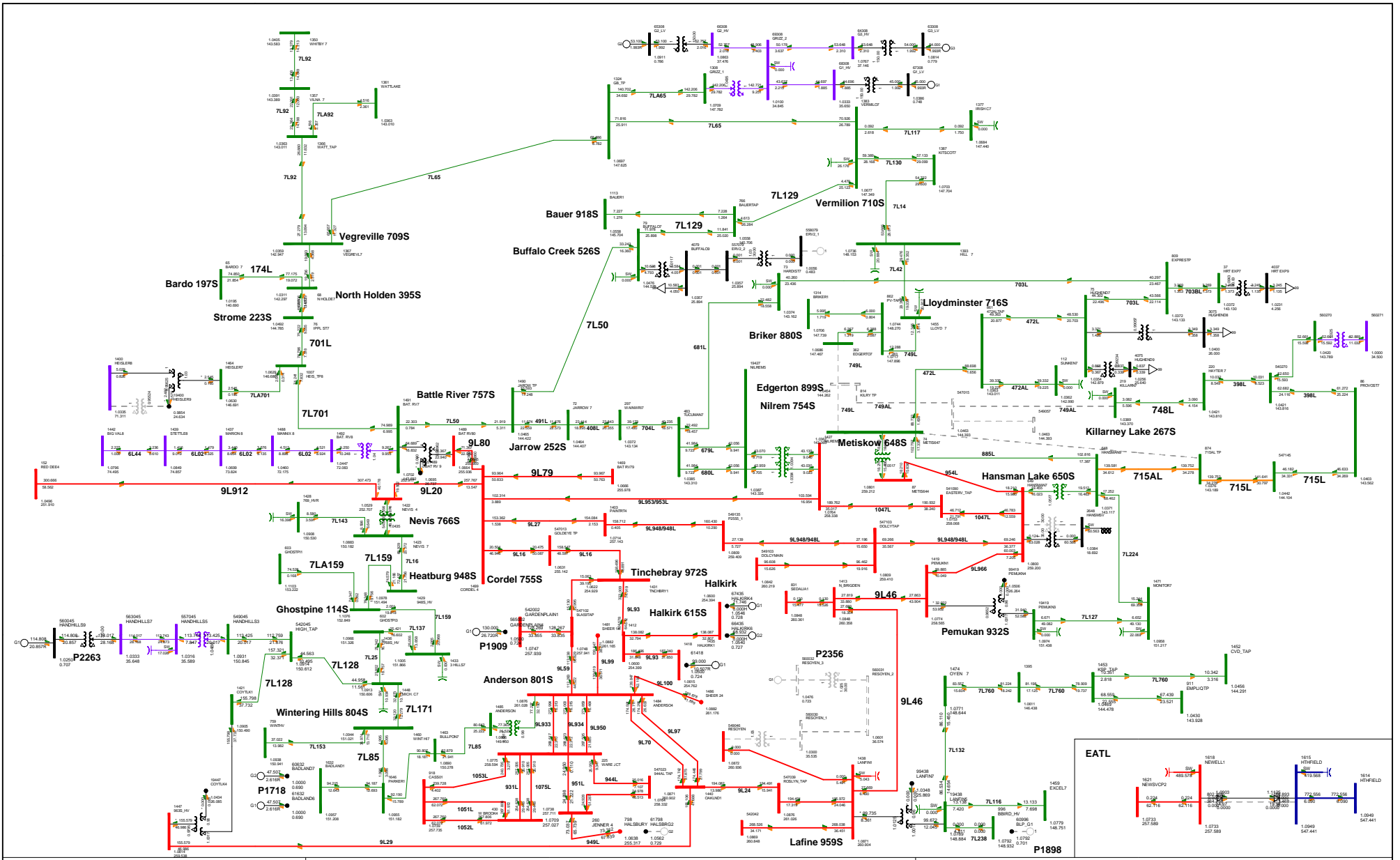
**P2356 Oyen MPC Wind**

Bus Voltage (V) @ 115.000  
 Branch W/F 115.000  
 Equipment W/F @ 115.000  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+290.000

**FIGURE A2.1-15 LLOYDMINSTER 716S TRANSFORMER 1T**  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.251 MW

BC Import: -440.063 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



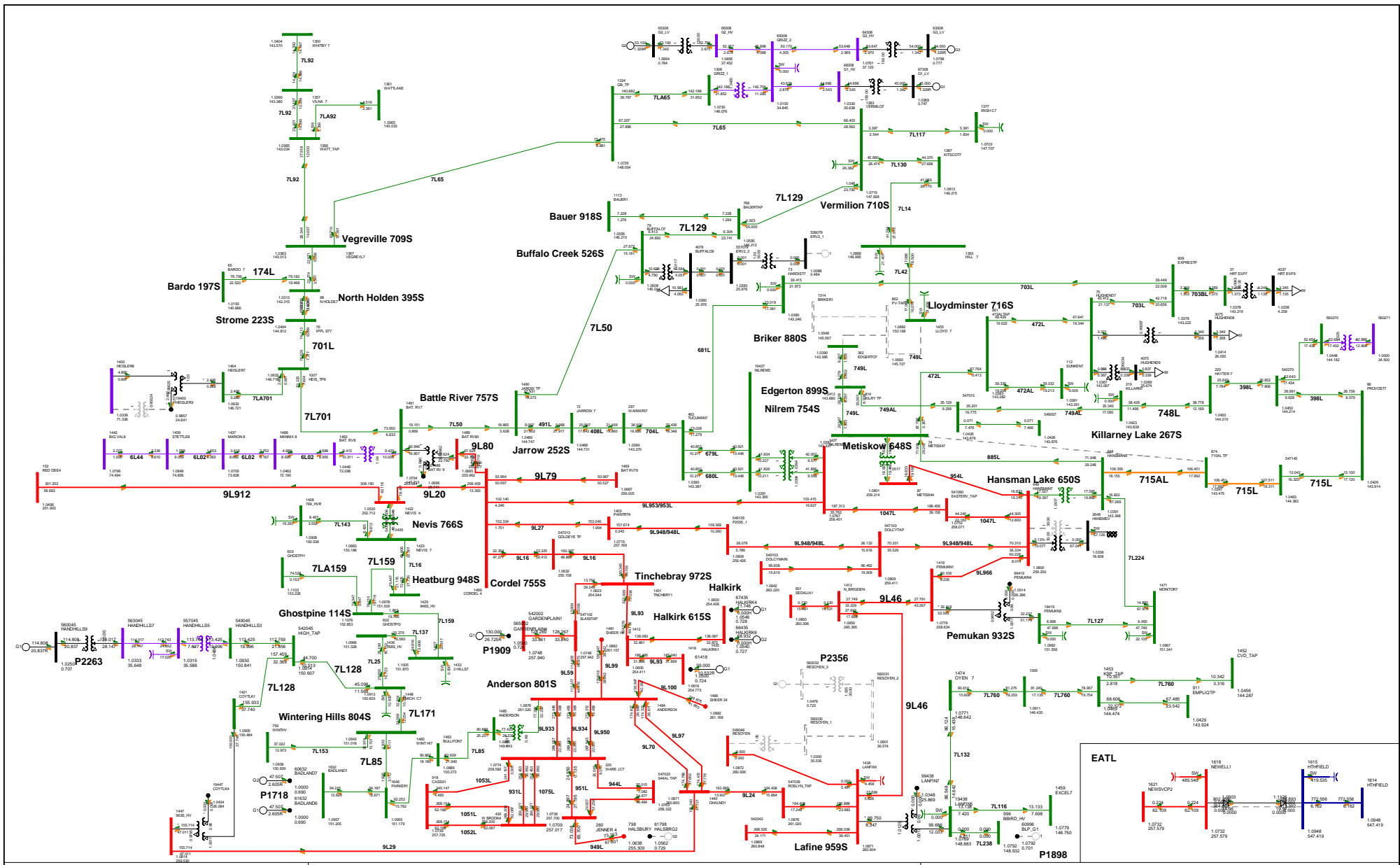
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 W: +0.000+34.500-88.000-138.000+240.000+500.000

**FIGURE A2-1-16 749L (METISKOW 648S TO EDGERTON 899S)  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.251 MW

BC Import: -421.012 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



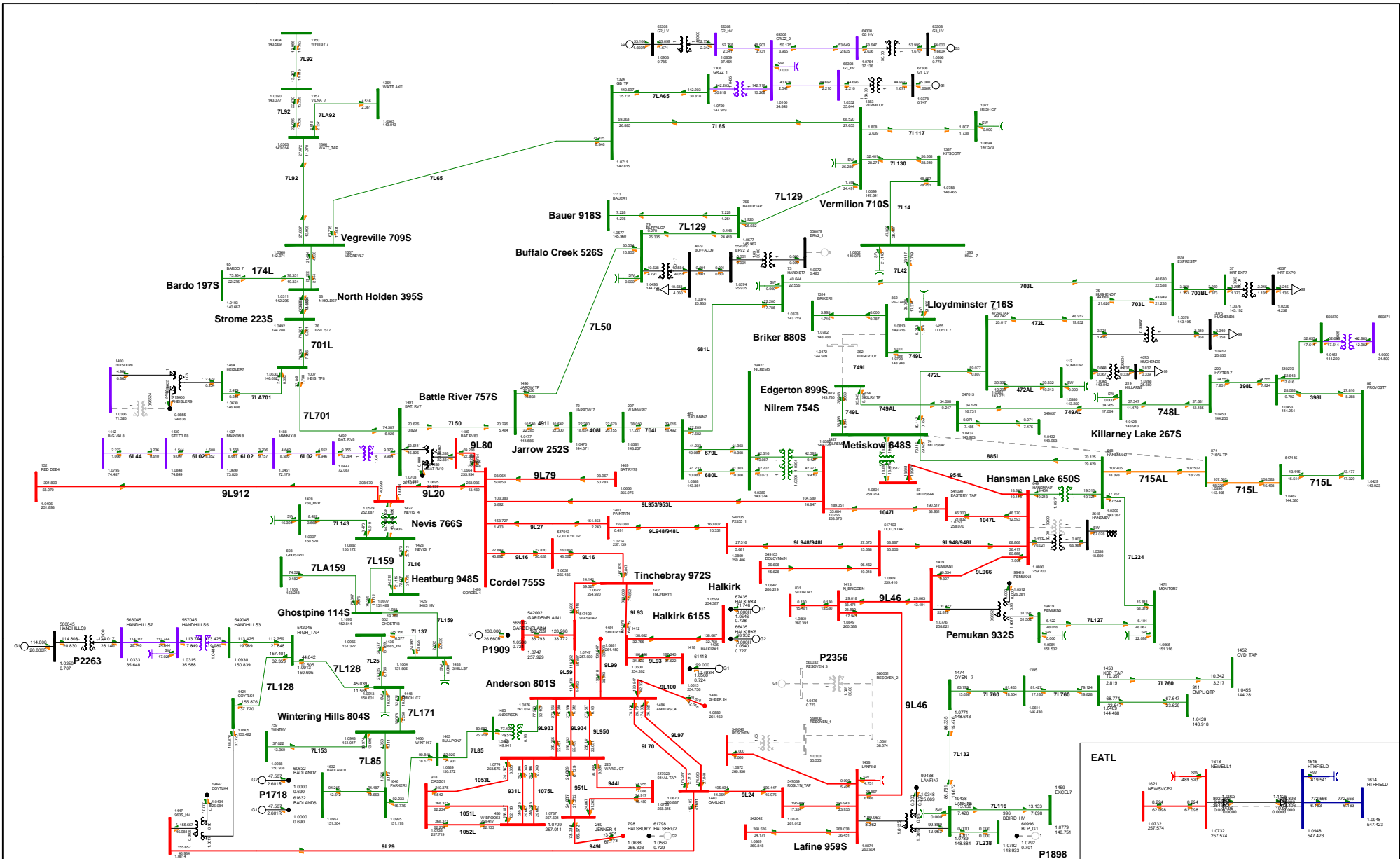
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Base MVA = 100  
 Equipment MVA/MW = 100/1000  
 W = +0.000 + 34.500 - 0.000 + 138.000 + 240.000 = 500.000

**FIGURE A2-1-17 749L (EDGERTON 899S TO LLOYDMINSTER 716S)**  
 2028 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23 SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.250 MW

BC Import: -429.243 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 MW = 0.0004 + 34.500 \* (MW - 138.000) + 0.0001 \* (MW - 138.000)<sup>2</sup>

**FIGURE A2.1-18 EDGERTON 899S TRANSFORMER T1**  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.250 MW

BC Import: -428.579 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW

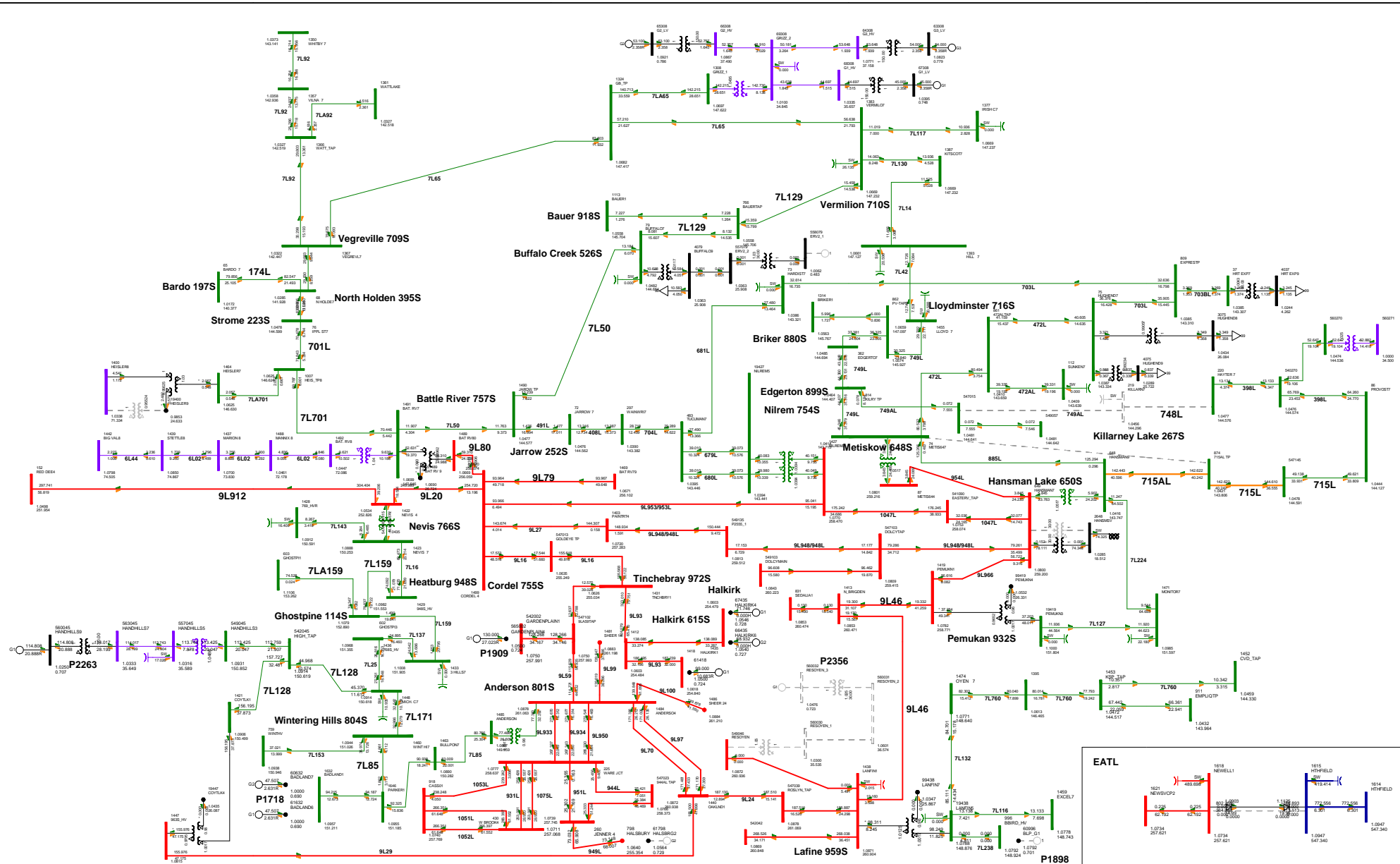


FIGURE A2-1-19 KILLARNEY LAKE 267S TRANSFORMER T1  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

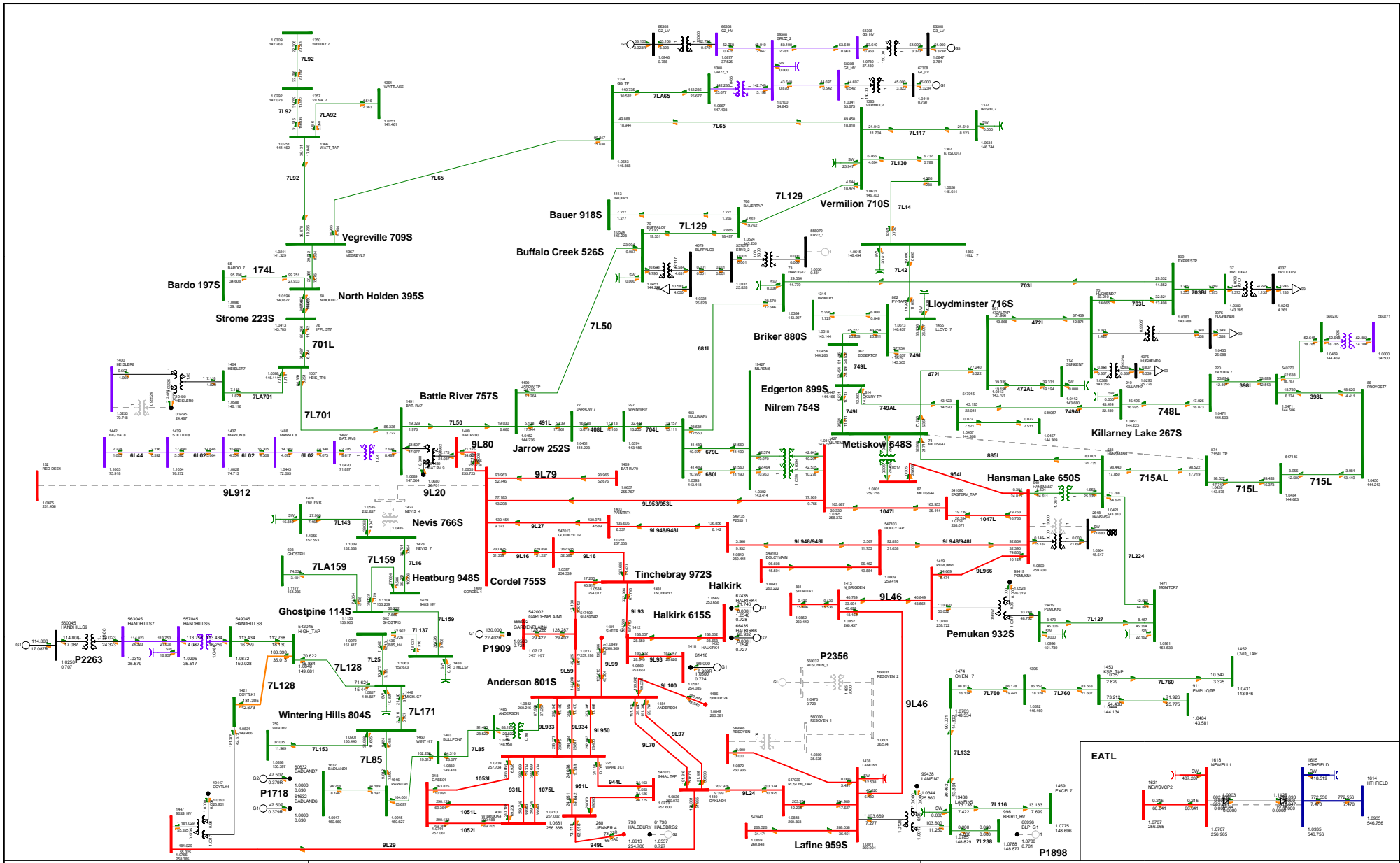
**P2356 Oyen MPC Wind**

Bus Voltage (V) @ 100.000  
 Branch W/F @ 100.000  
 Equipment W/F @ 100.000  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

WATL: -2.433 MW  
 EATL: -808.252 MW

BC Import: -425.757 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW





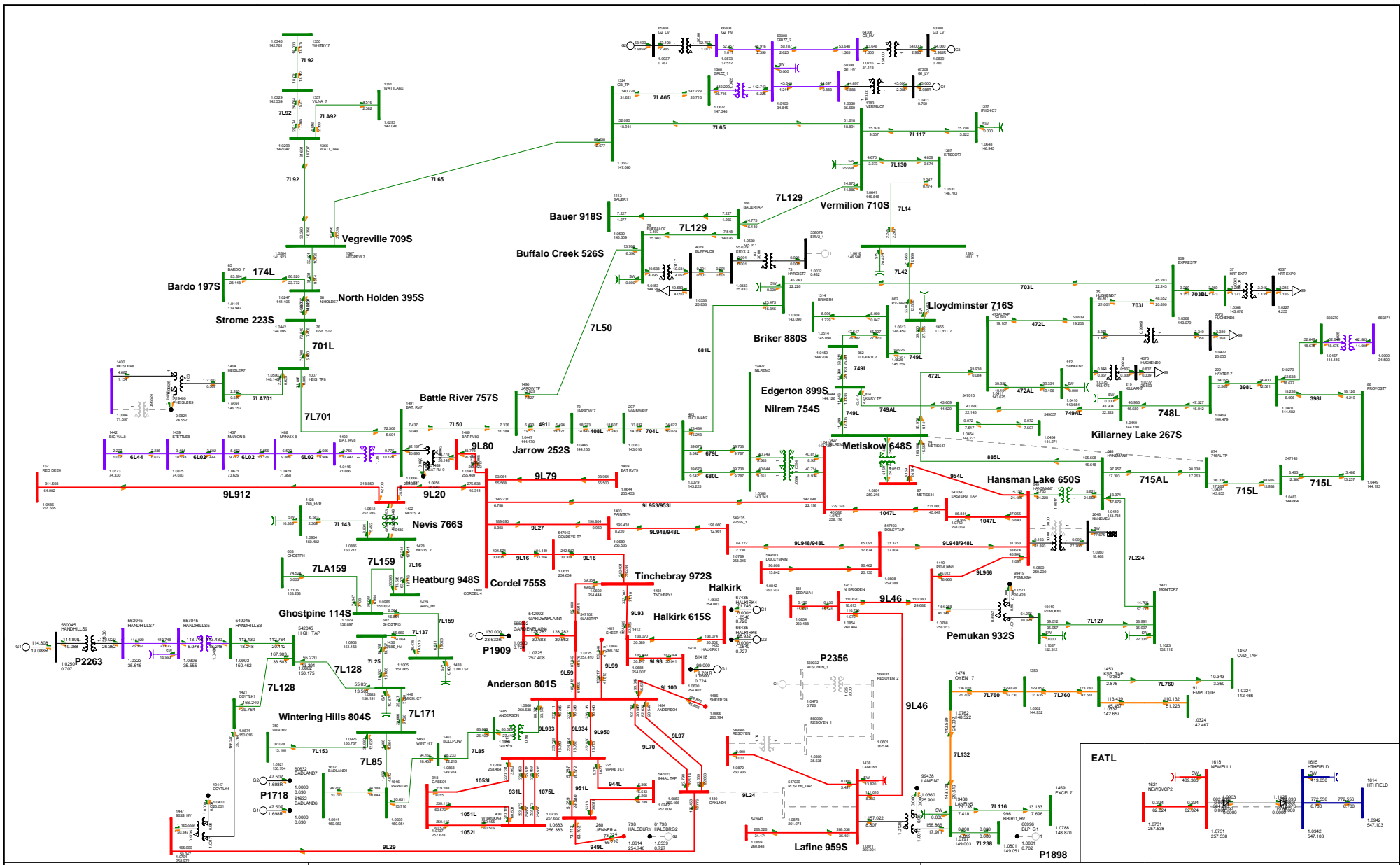
**P2356 Oyen MPC Wind**

Bus Voltage (kV) 138  
 Breaker (kV) 170  
 Equipment (kV) 170  
 W: +0.000+34.500+138.000+240.000+300.000

FIGURE A2.1-20 T66S T1 (NEVIS 766S 240/138 KV TRANSFORMER)  
 2023 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.232 MW

BC Import: -407.419 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW



**P2356 Oyen MPC Wind**

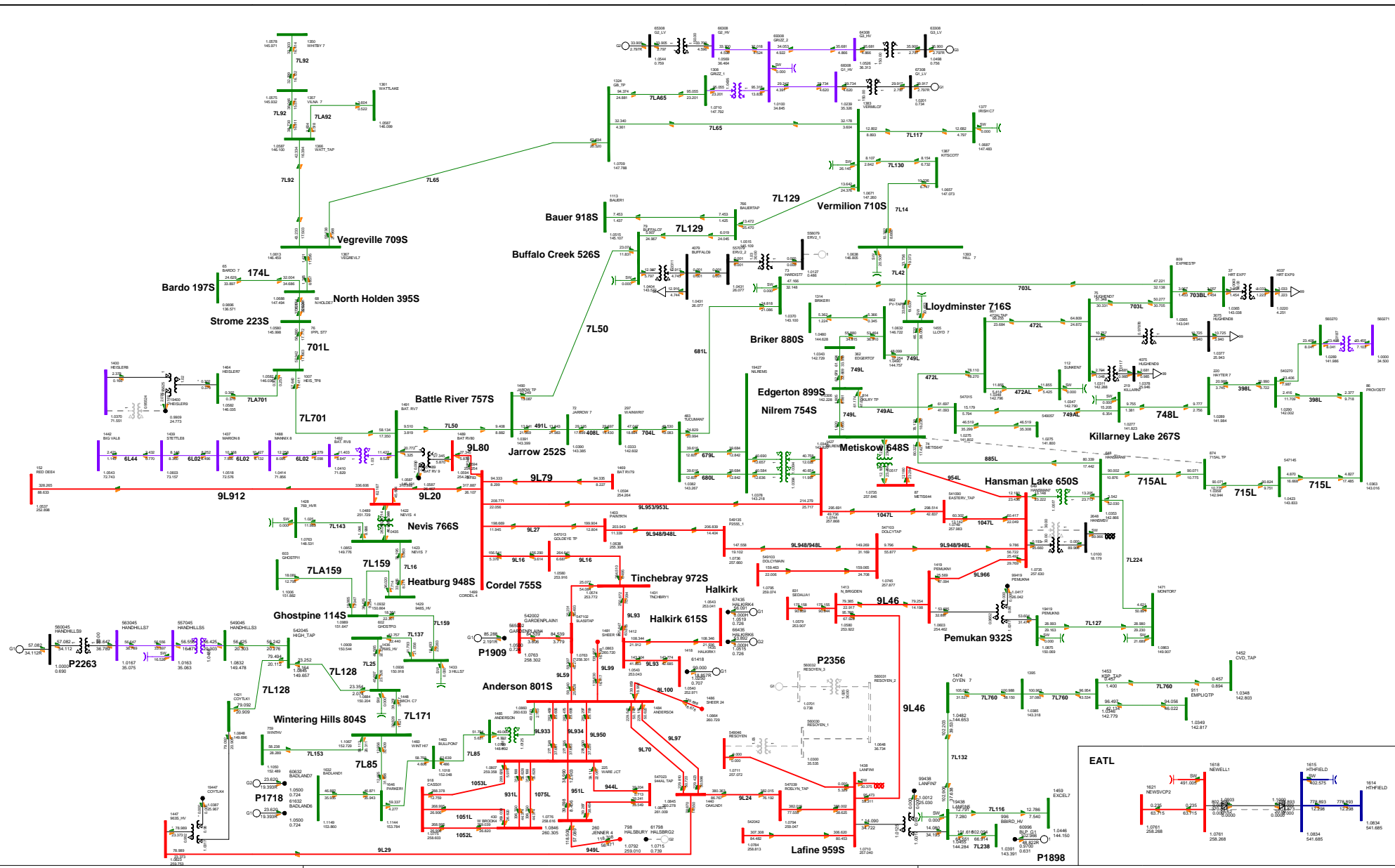
Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 100.00 kV @ 100.00 MVA  
 MW = 0.0000 + 34.5000 + 138.0000 + 340.0000 + 900.0000

**FIGURE A2.1-2.1 9L24 (OAKLAND 946S - LANFINE 959S)**  
 2025 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.249 MW

BC Import: -407.881 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.825 MW





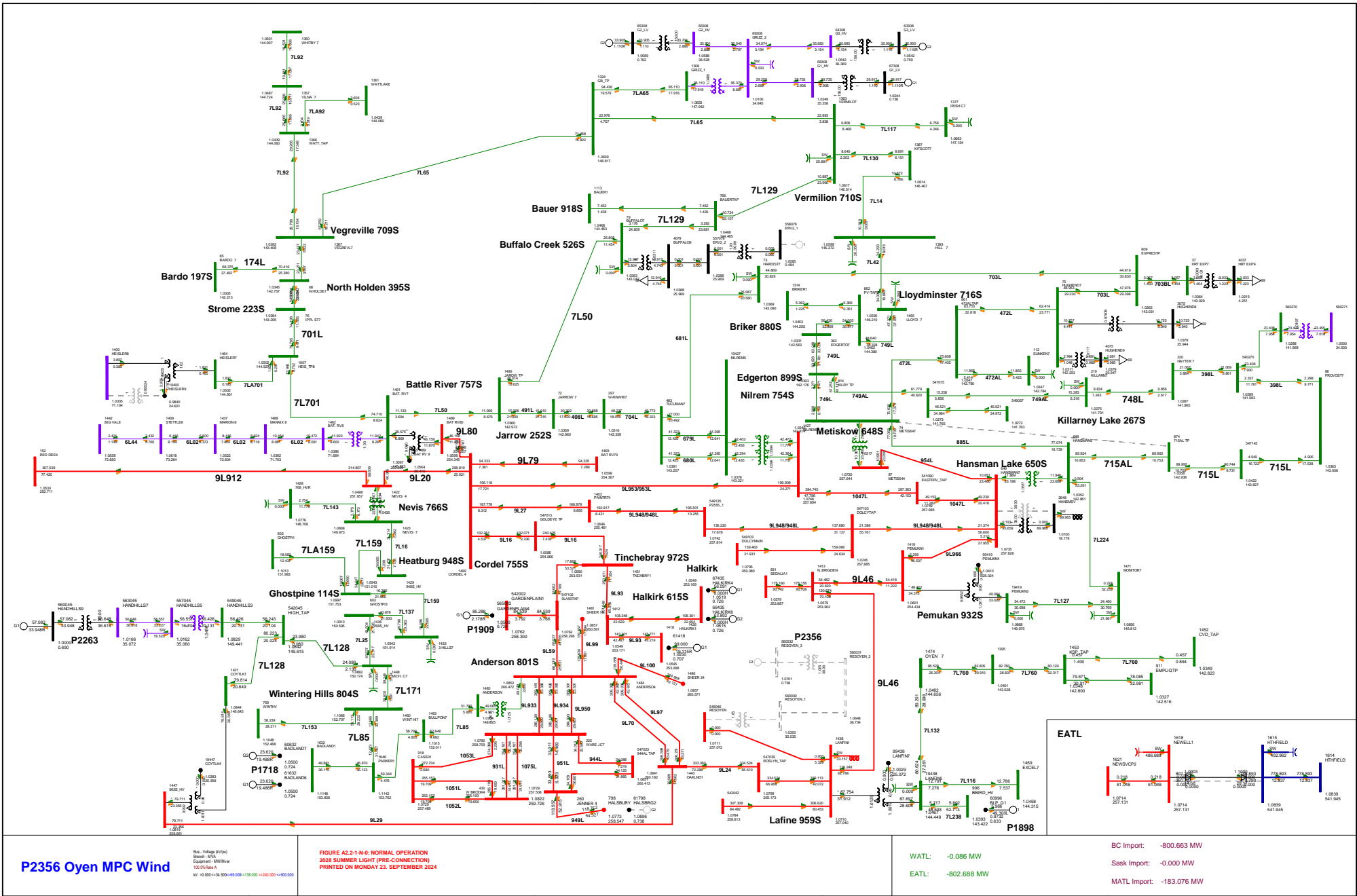
**P2356 Oyen MPC Wind**

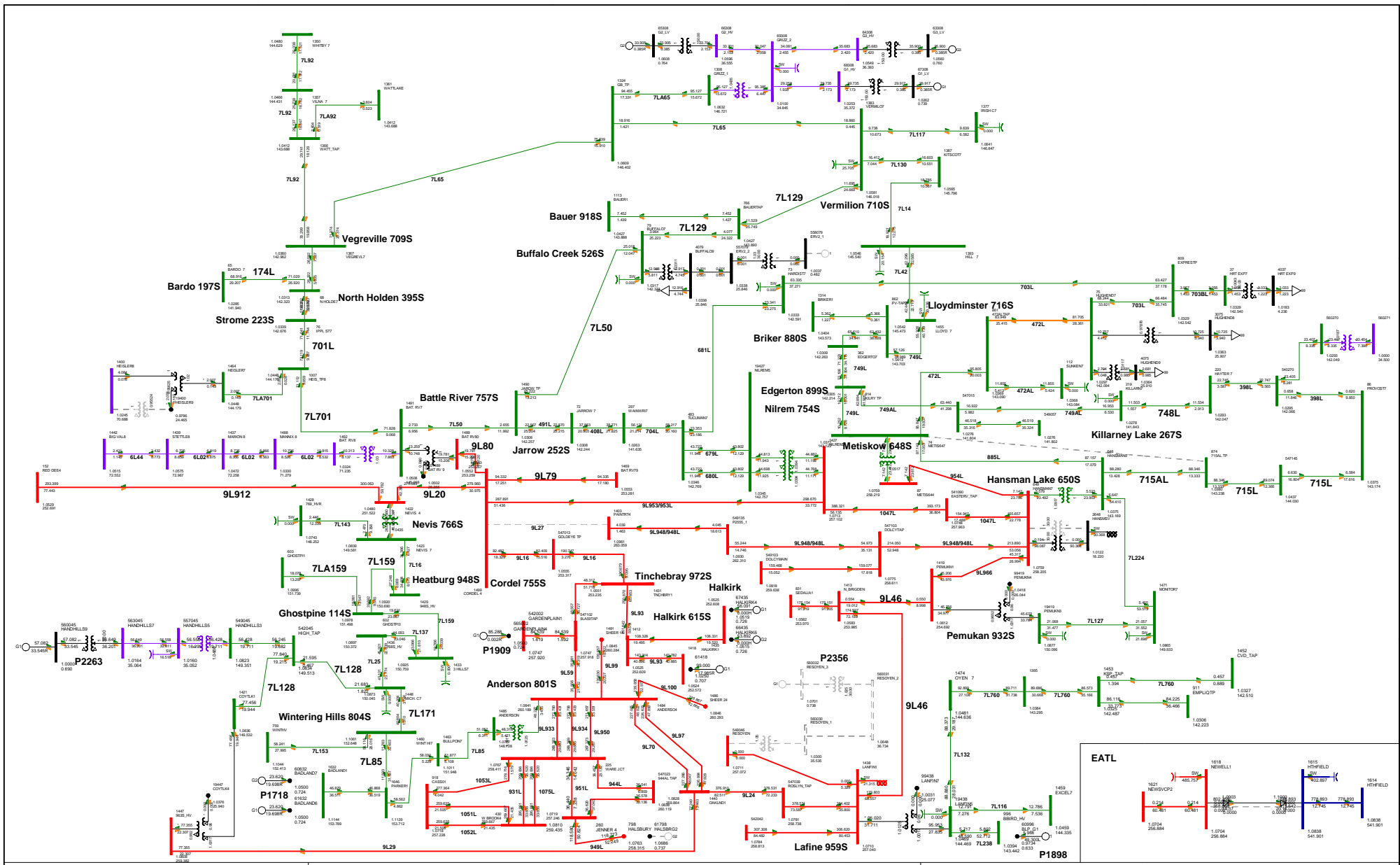
Bus Voltage (V) @  
 Breaker (kV)  
 Equipment (MVA) @  
 102.5kV Bus  
 W: +0.000+34.500-88.000-138.000+240.000+500.000

**FIGURE A2.2-0-4: NORMAL OPERATION**  
 2025 SUMMER LIGHT (PRE-CONNECTION), PRE-CURTALMENT  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.723 MW

BC Import: -868.018 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.076 MW





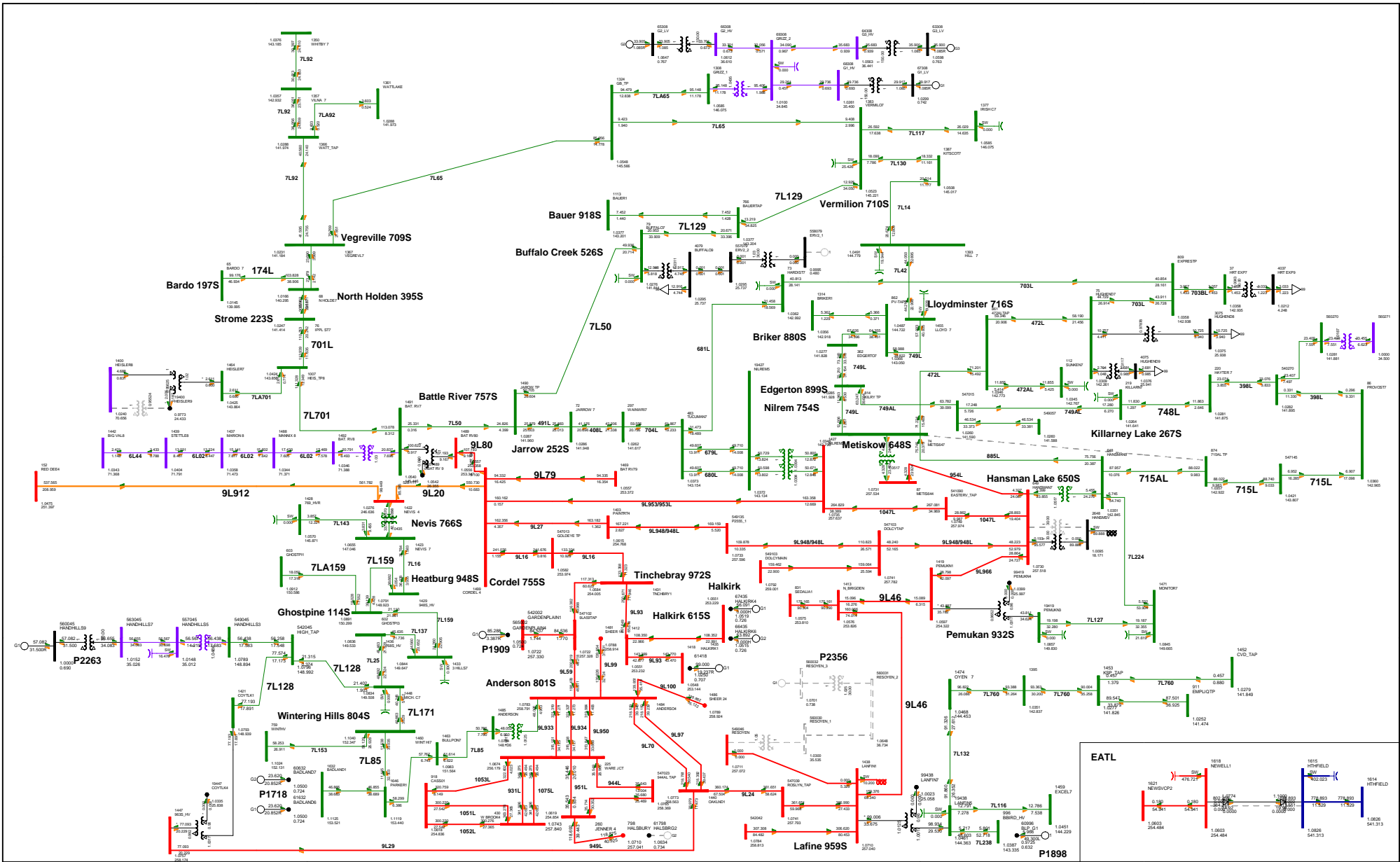
**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Breaker (MVA)  
 Equipment (MVA/MW)  
 102.5kV/50kVA  
 W: +0.000+54.500-89.009-138.000+240.000+500.000

**FIGURE A2.2-2 9L27 (PAINTEARTH CREEK 863S TO CORDEL 755S)**  
 2025 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.680 MW

BC Import: -787.878 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW



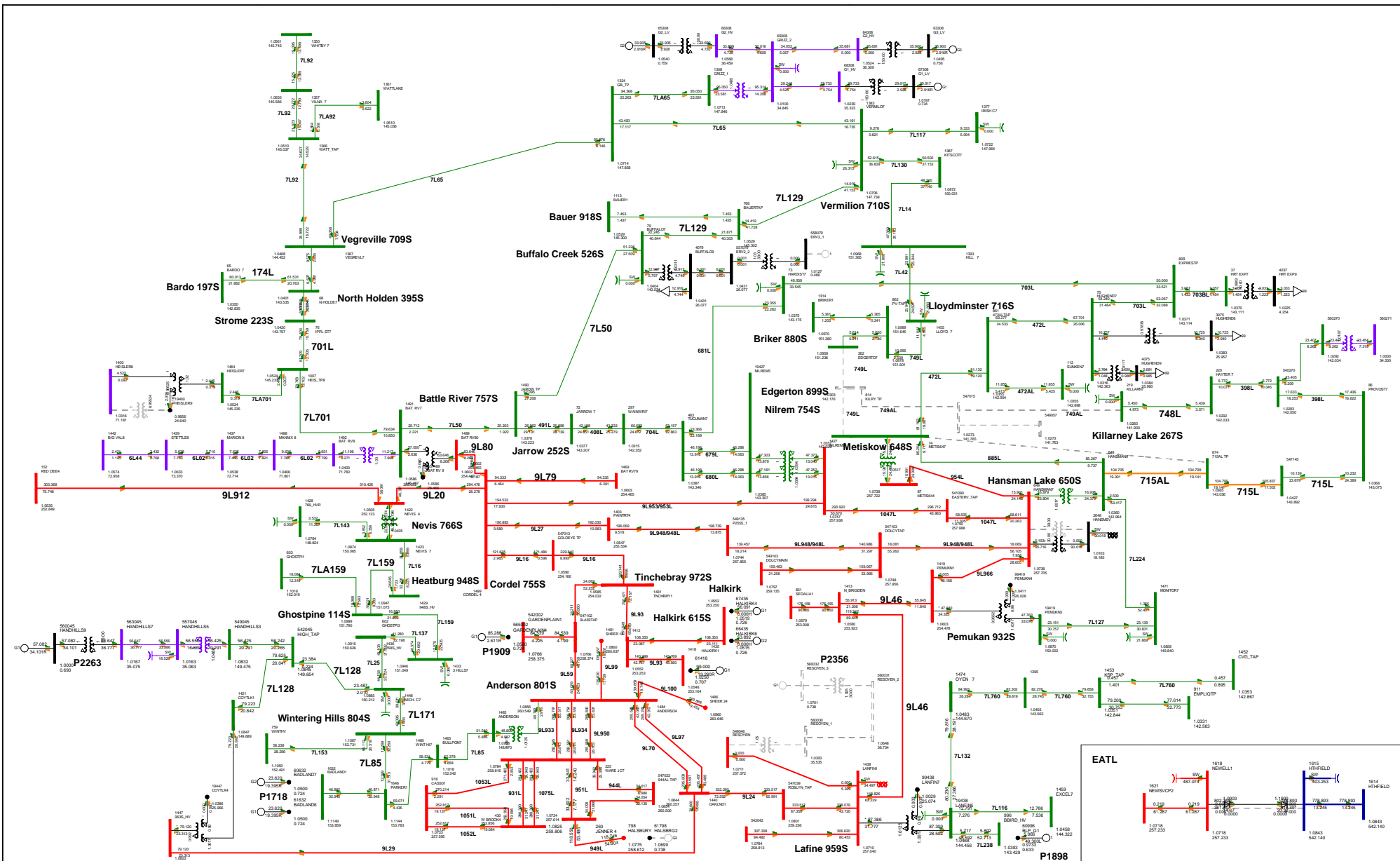
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100  
 W: +0.000+0.400-0.000-0.000-0.000+0.000

**FIGURE A2-2-3 962L (TINCHEY 72S TO GAETZ 87S)**  
 2025 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.612 MW

BC Import: -746.055 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW



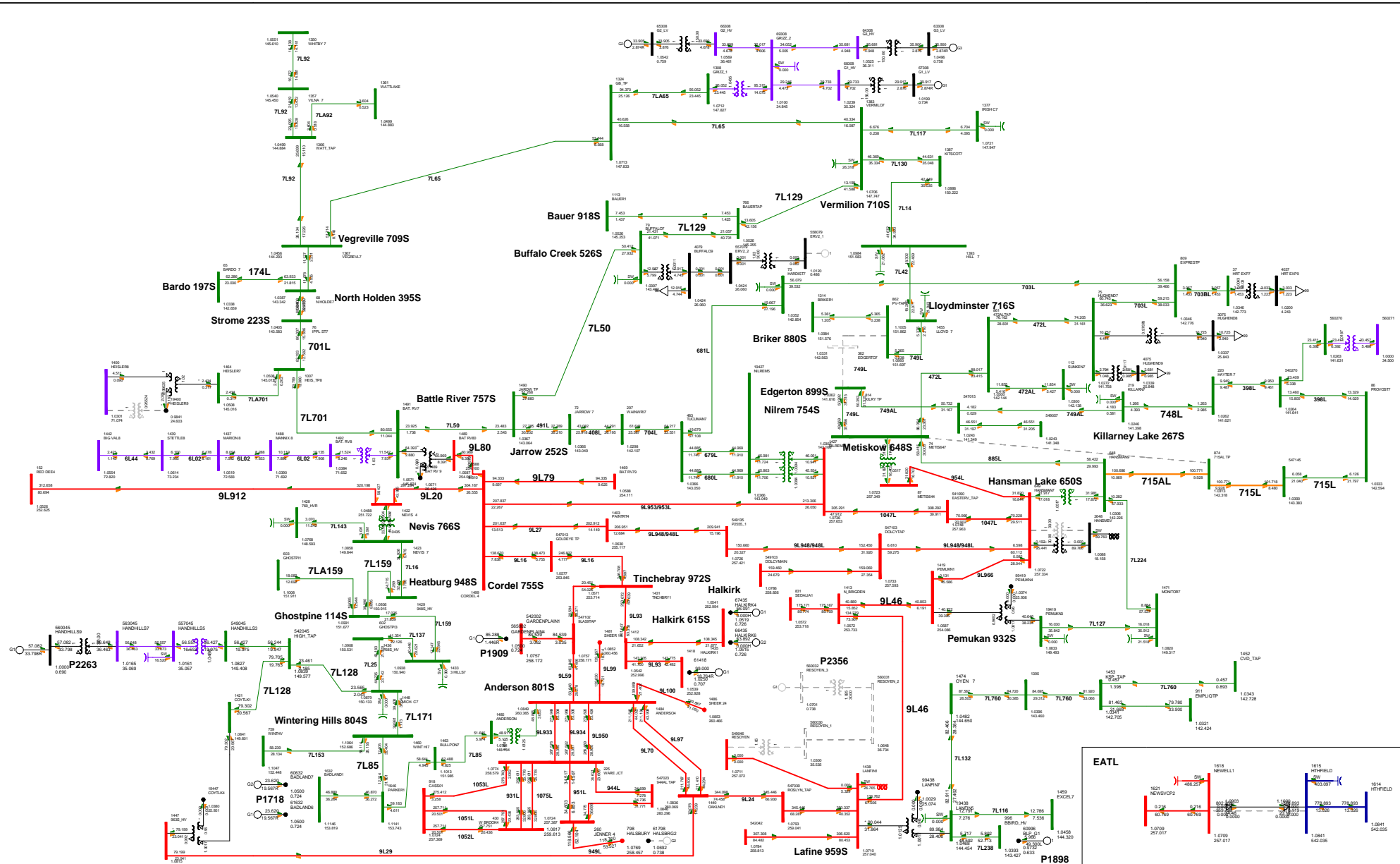
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

**FIGURE A2.2-4 749L (METISKOW 648S TO EDGERTON 899S)  
 2028 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.691 MW

BC Import: -760.418 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW



**P2356 Oyen MPC Wind**

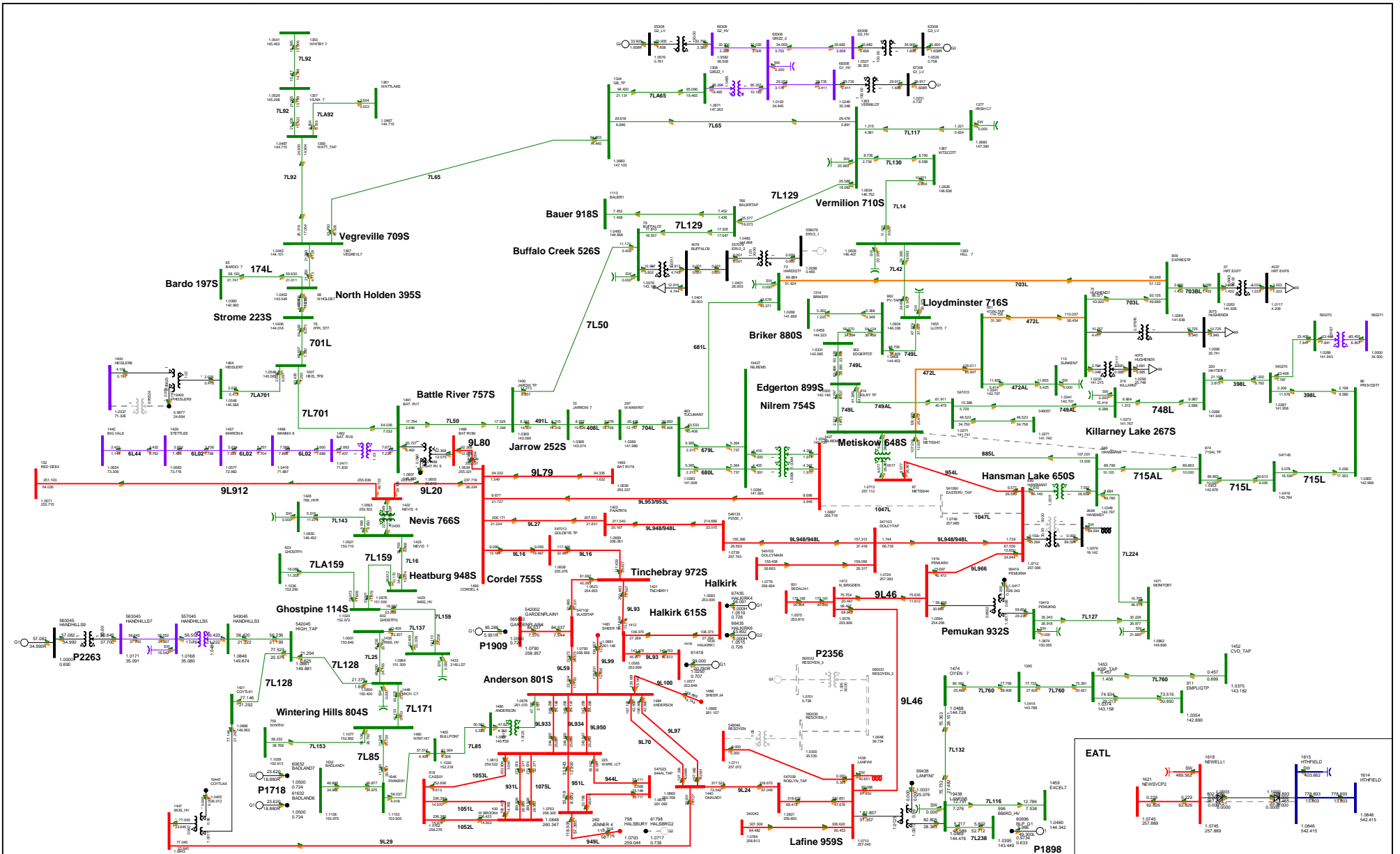
Bus Voltage (V) 10  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500+89.000+138.000+190.000+240.000+300.000

**FIGURE A2.2-5 EDGERTON 899S TRANSFORMER T1**  
 2028 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.685 MW

BC Import: -801.067 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW





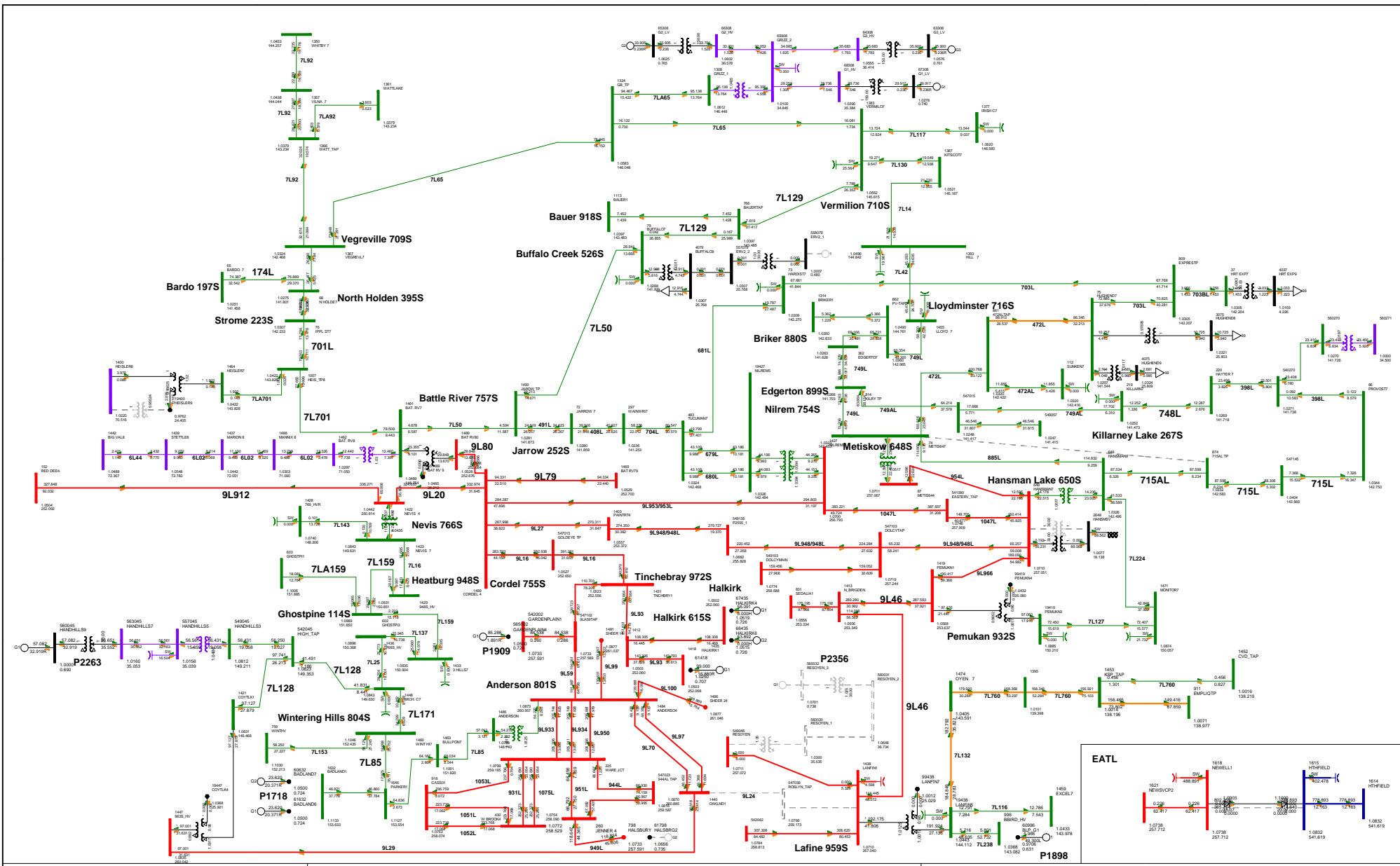
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100  
 W: +0.000+0.400-0.800-1.200+0.200+0.000+0.000

**FIGURE A2.2-4 1047L (HANSMAN LAKE 650S TO NILREM 574S)  
 2025 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.711 MW

BC Import: -599.799 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 W: +0.000+54.500=-89.009 +138.000 +240.000 =930.000

**FIGURE A2.2-7 9L24 (OAKLAND 946S - LANFINE 959S)  
 2028 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024**

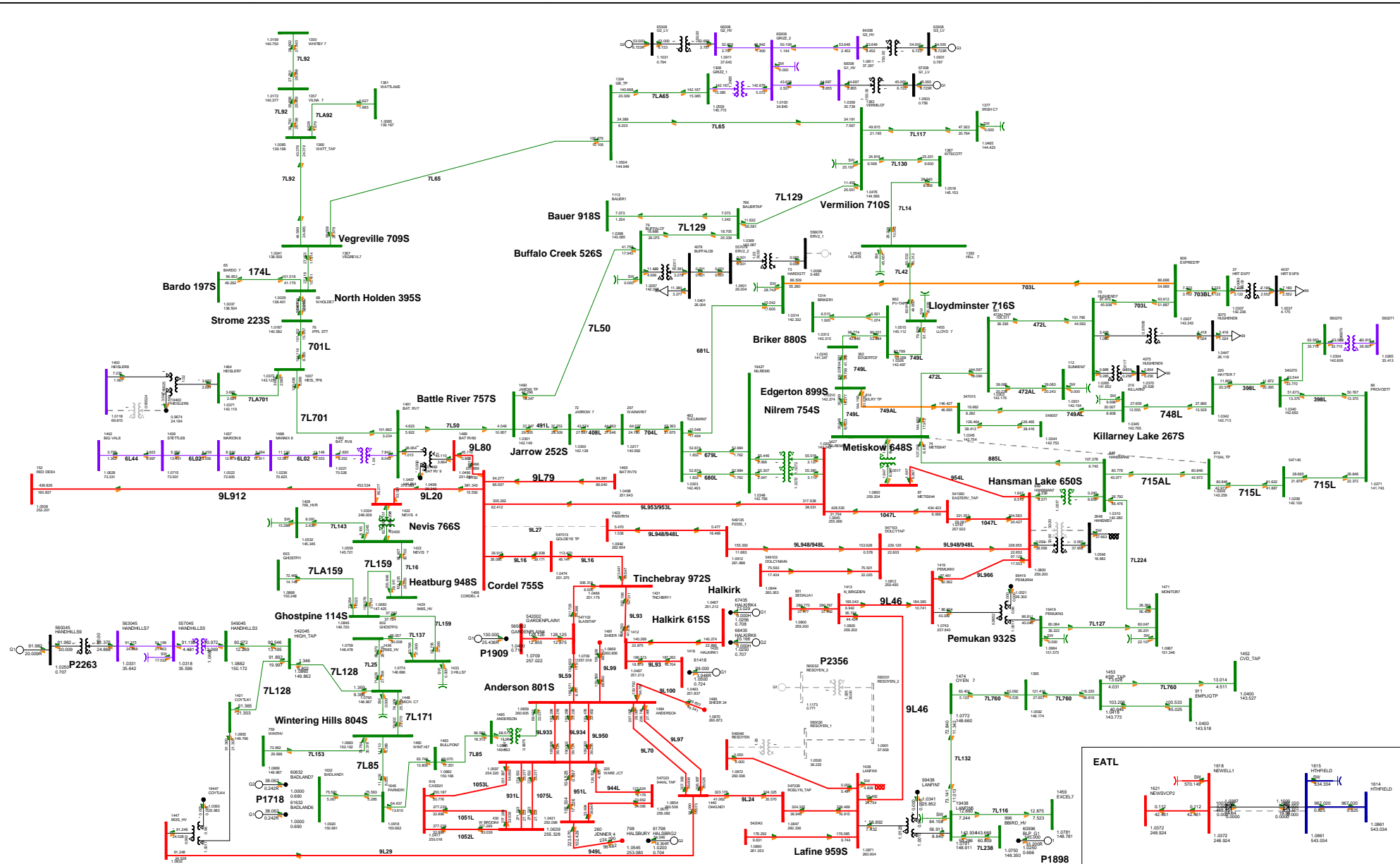
WATL: -0.086 MW  
 EATL: -802.705 MW

BC Import: -751.628 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.076 MW







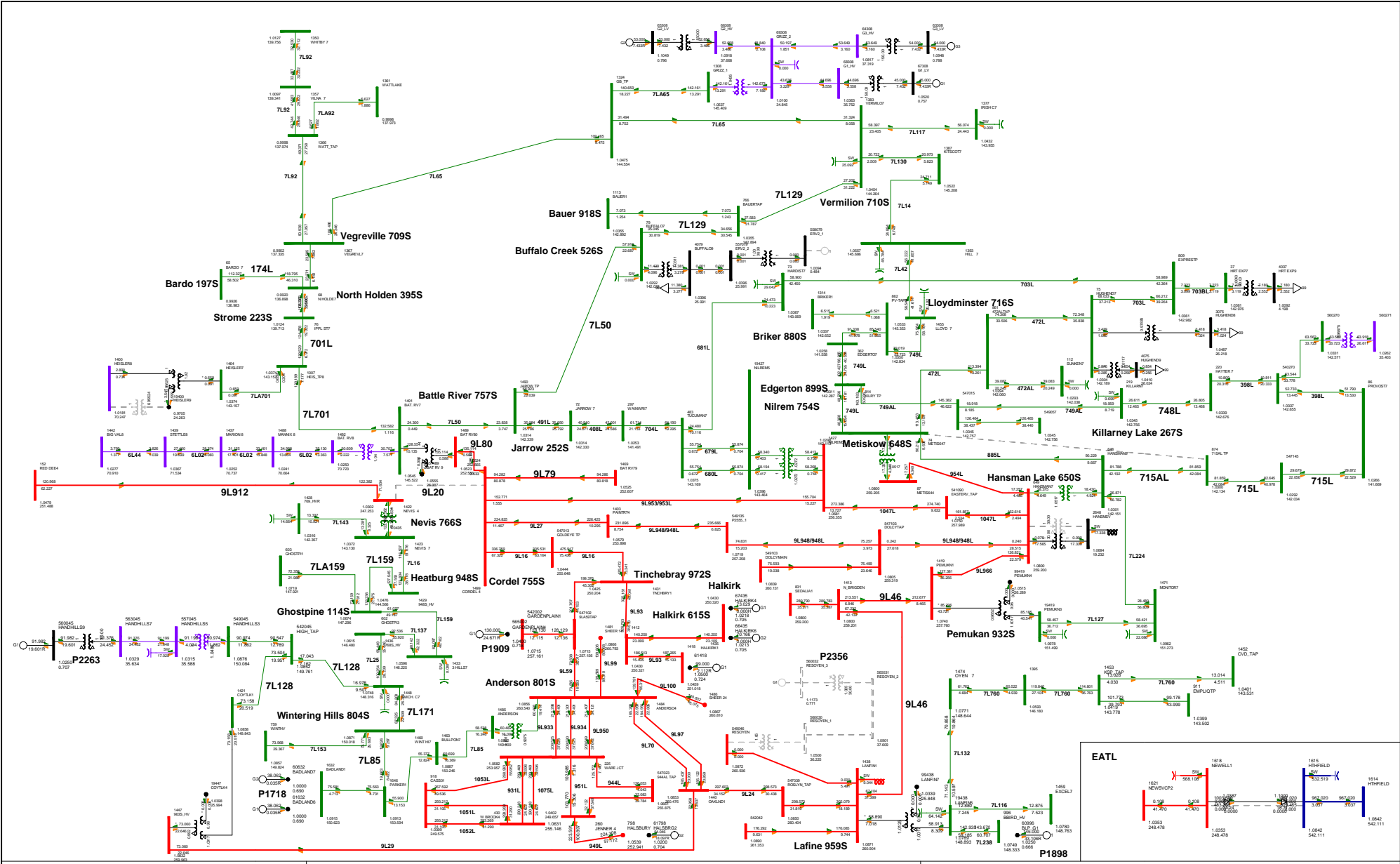


**P2356 Oyen MPC Wind**

FIGURE A2.3-3 9L27 (PAINTEARTH CREEK 863S TO CORDEL 755S)  
 2028 WINTER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.744 MW

BC Import: -1083.078 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.712 MW

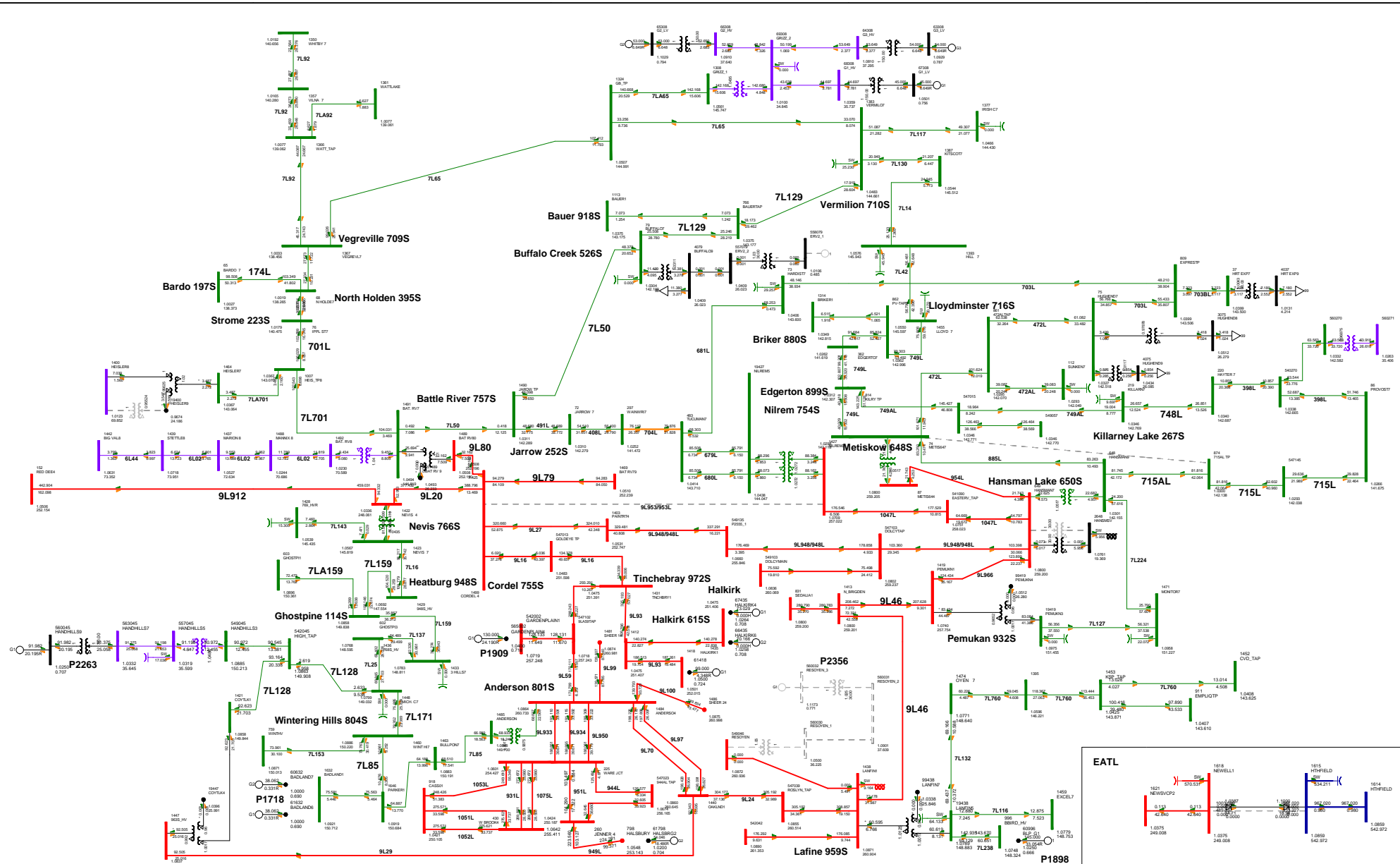


**P2356 Oyen MPC Wind**

**FIGURE A2.3-4 9L20 (NEVIS 766S TO CORDEL 755S)  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -150.145 MW  
EATL: -1003.735 MW

BC Import: -1064.178 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW

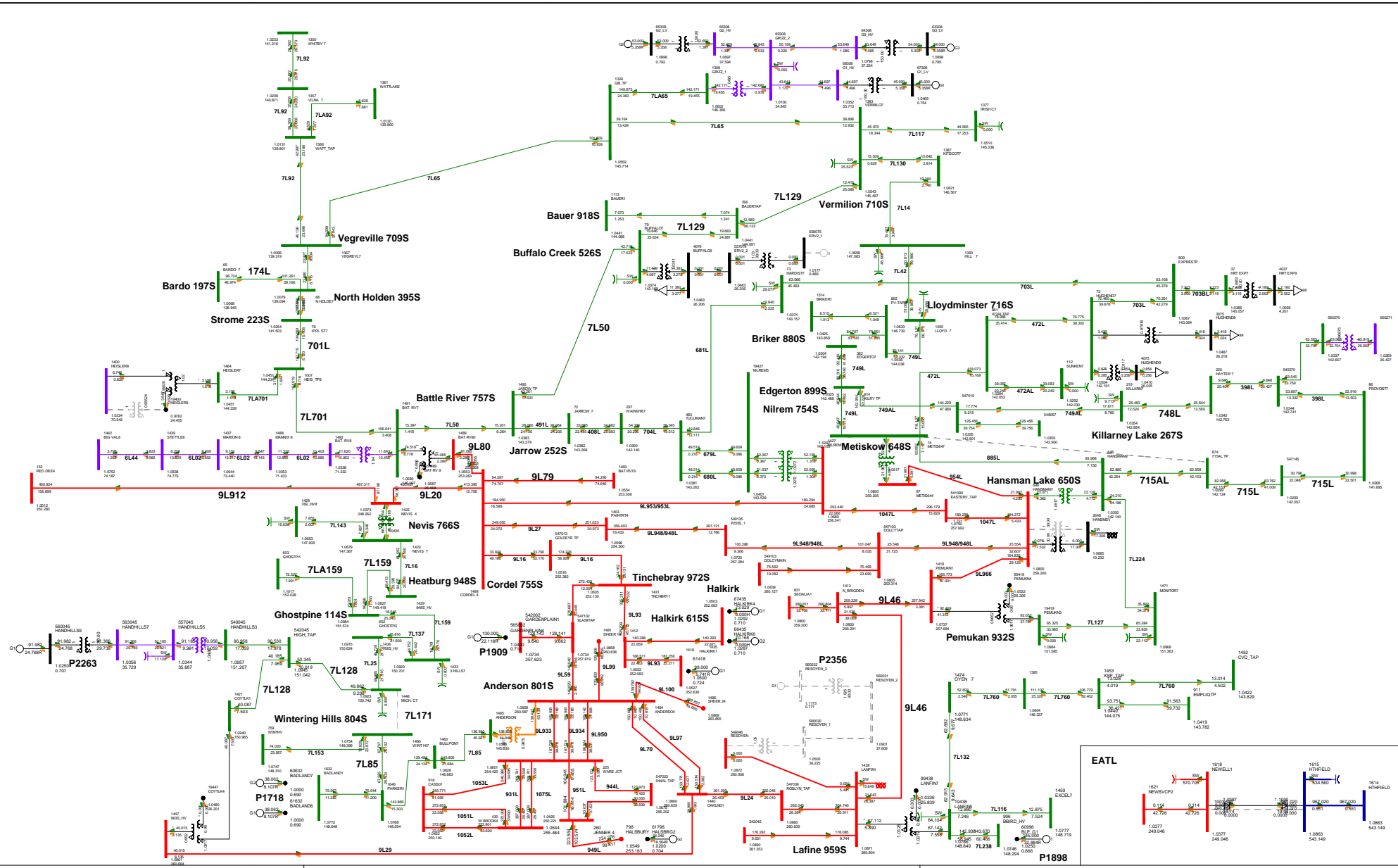


P2356 Oyen MPC Wind

FIGURE A2.3-5 953L (NILREN 574S TO CORDEL 755S)  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.746 MW

BC Import: -1093.911 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW



P2356 Oyen MPC Wind

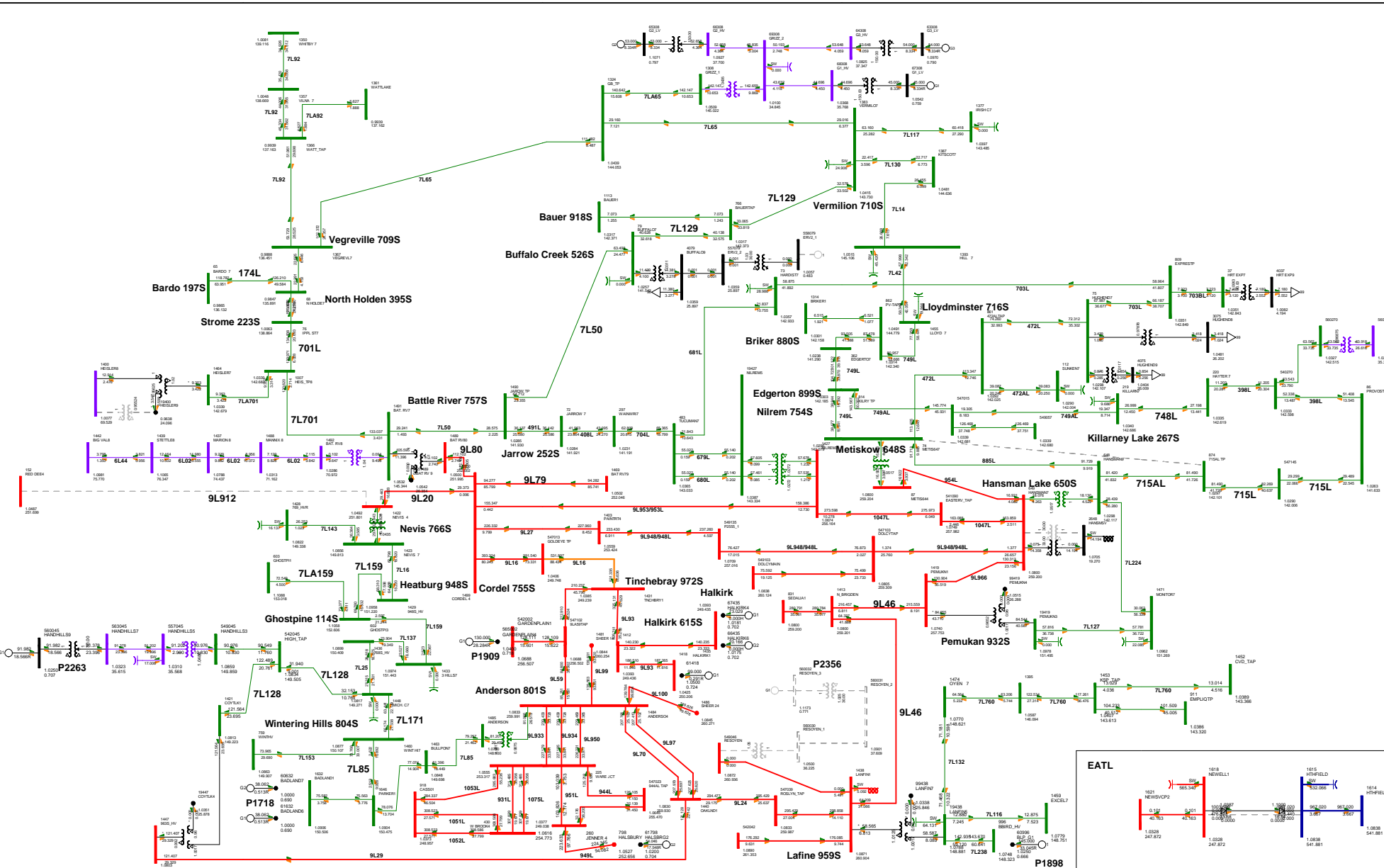
FIGURE A2.3-4 7L171 (MICHIGI CREEK 802S TO WINTERING HILLS 804S)  
 2028 WINTER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.747 MW

BC Import: -1103.903 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.712 MW







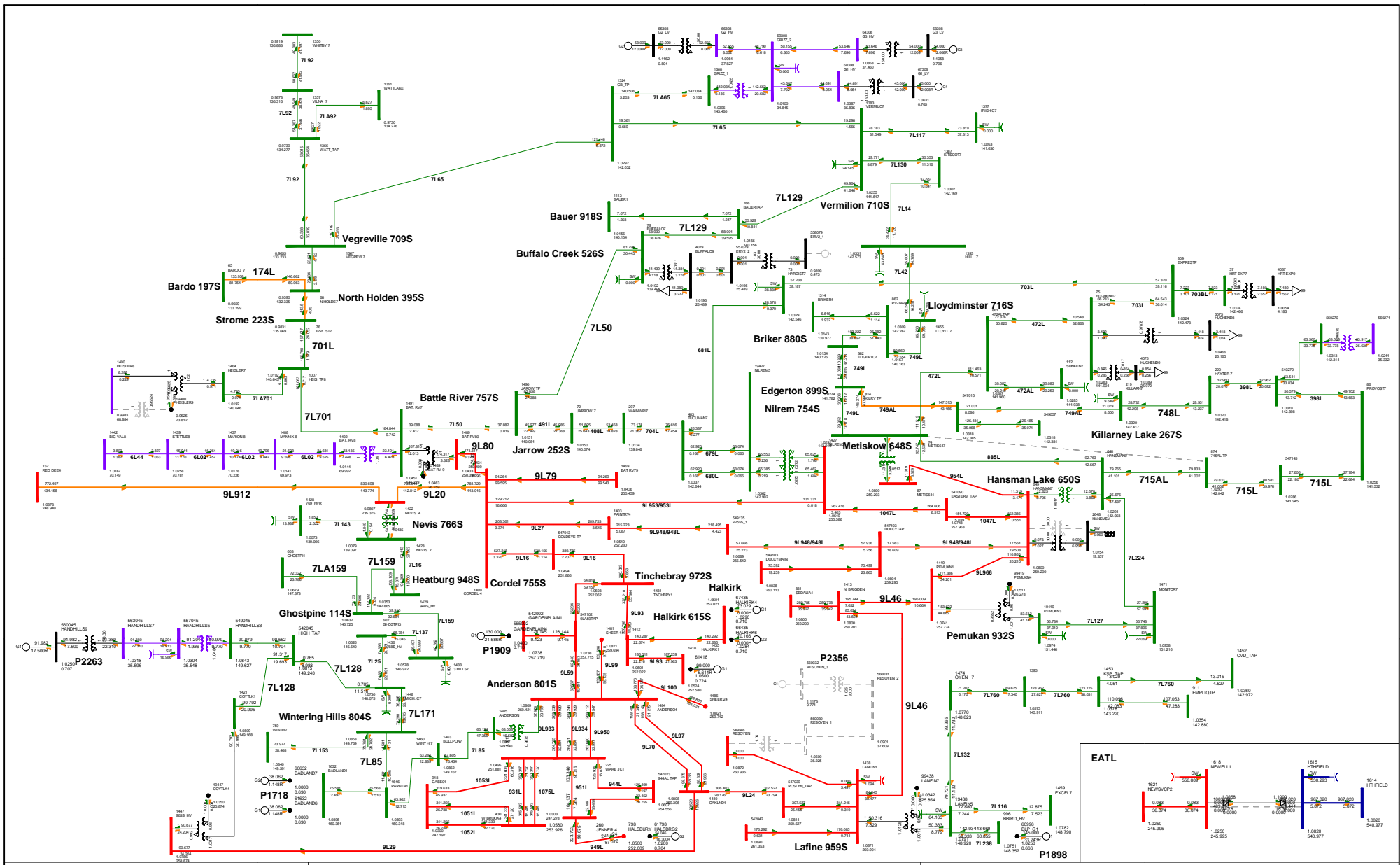
**P2356 Oyen MPC Wind**

**FIGURE A2.3-8 912L (NEVIS 766S TO RED DEER 63S)  
2024 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -150.145 MW  
EATL: -1003.722 MW

BC Import: -1055.924 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW



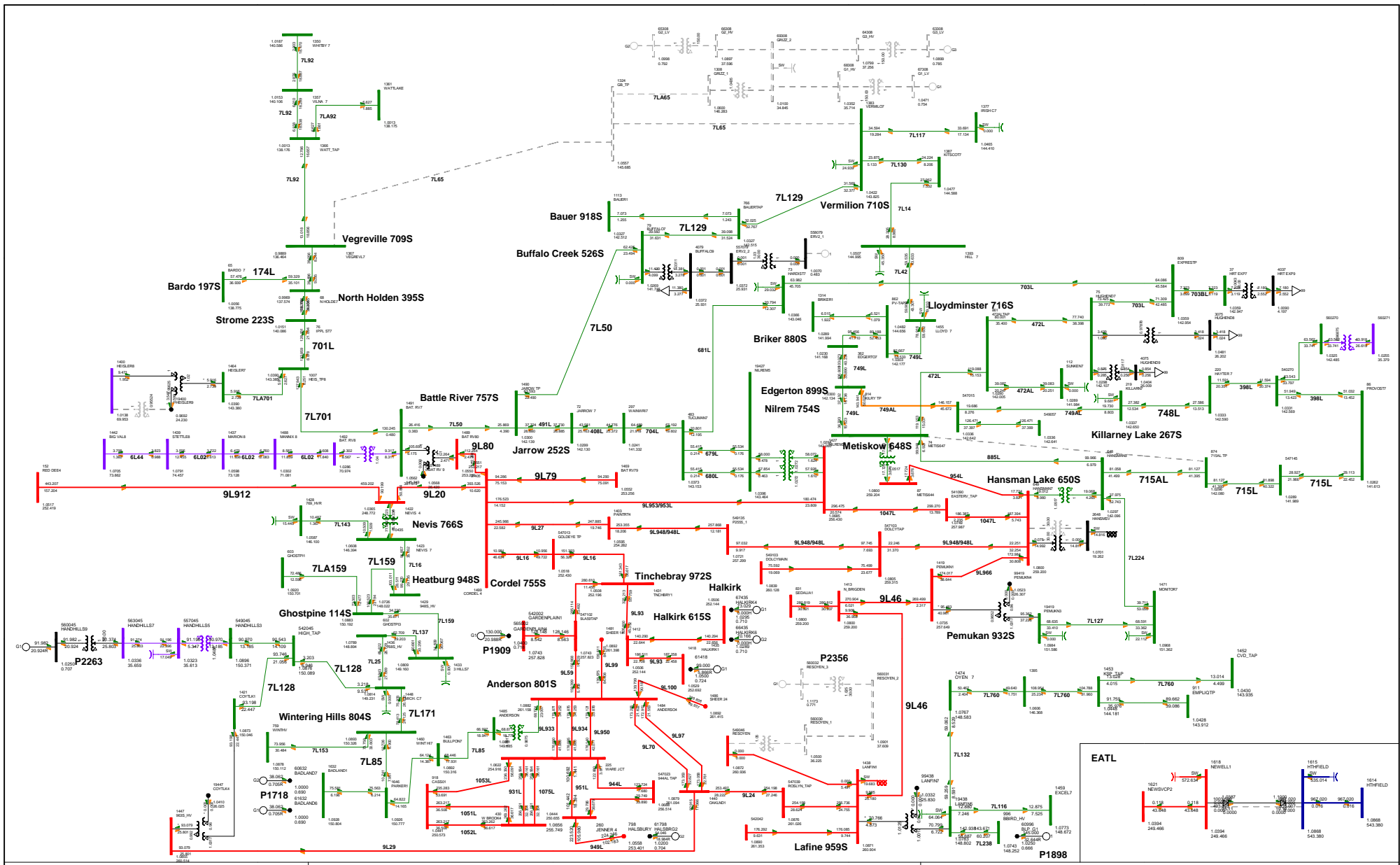


P2356 Oyen MPC Wind

FIGURE A2.3-9 963L (TINCHEY 72S TO GAETZ 87S)  
2023 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.686 MW

BC Import: -967.595 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW

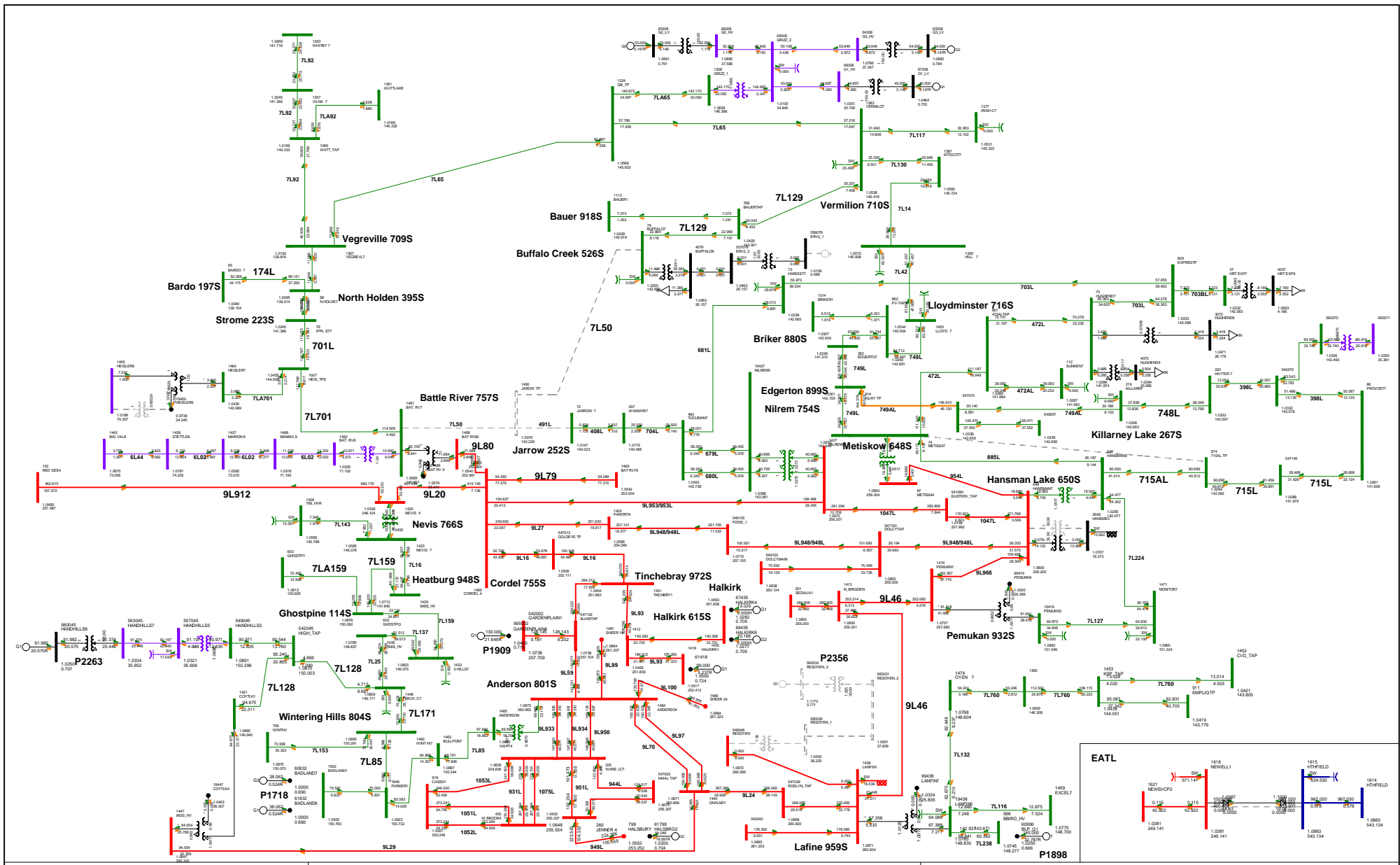


P2356 Oyen MPC Wind

FIGURE A2.3-10 7L65 (VERGREVILLE 709S TO DRURY 2007S)  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.756 MW

BC Import: -982.562 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW

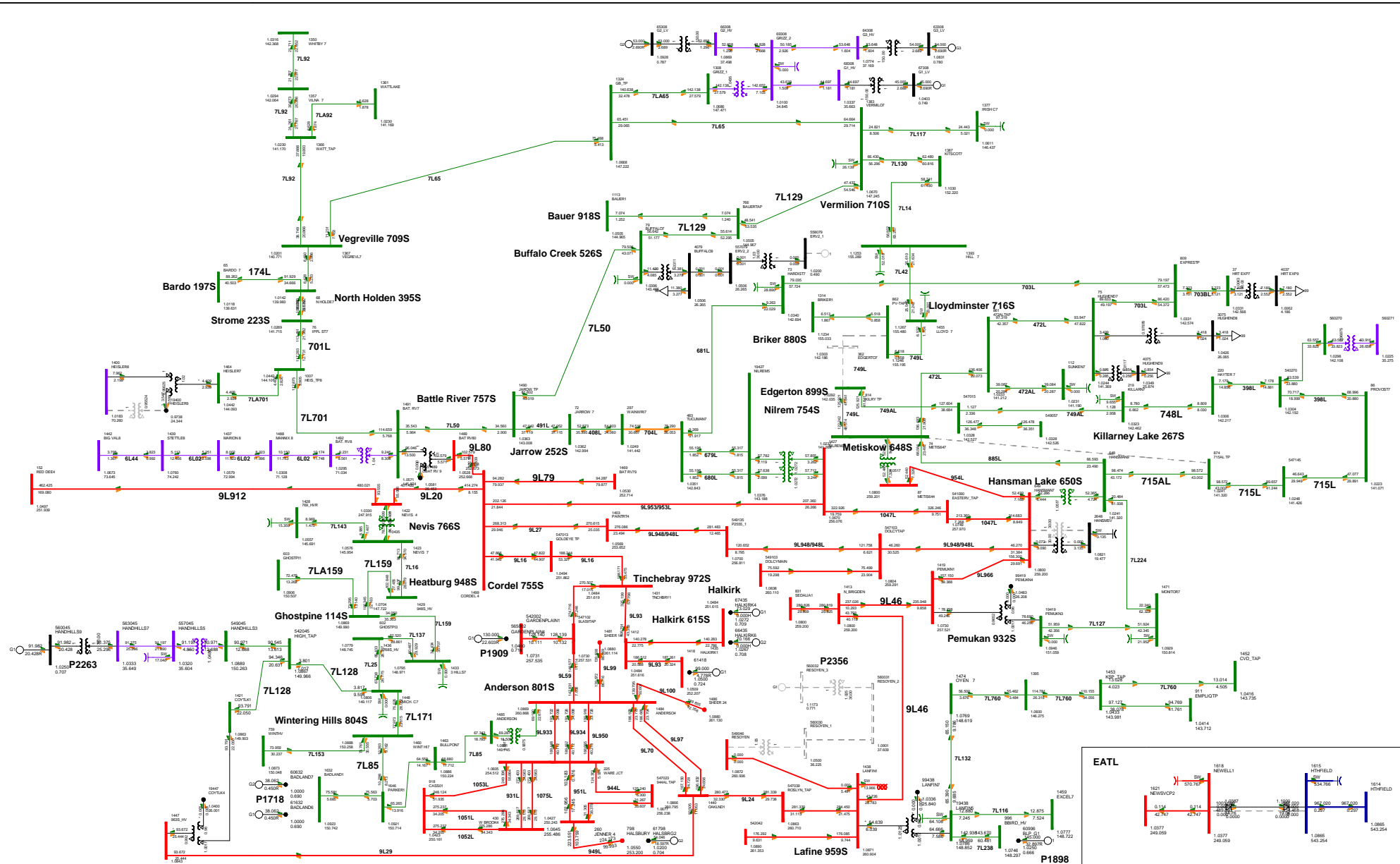


P2356 Oyen MPC Wind

FIGURE A2.3-11 7L50 (BATTLE RIVER 757S TO BUFFALO CREEK 526S)  
 2028 WINTER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.749 MW

BC Import: -1106.403 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.712 MW

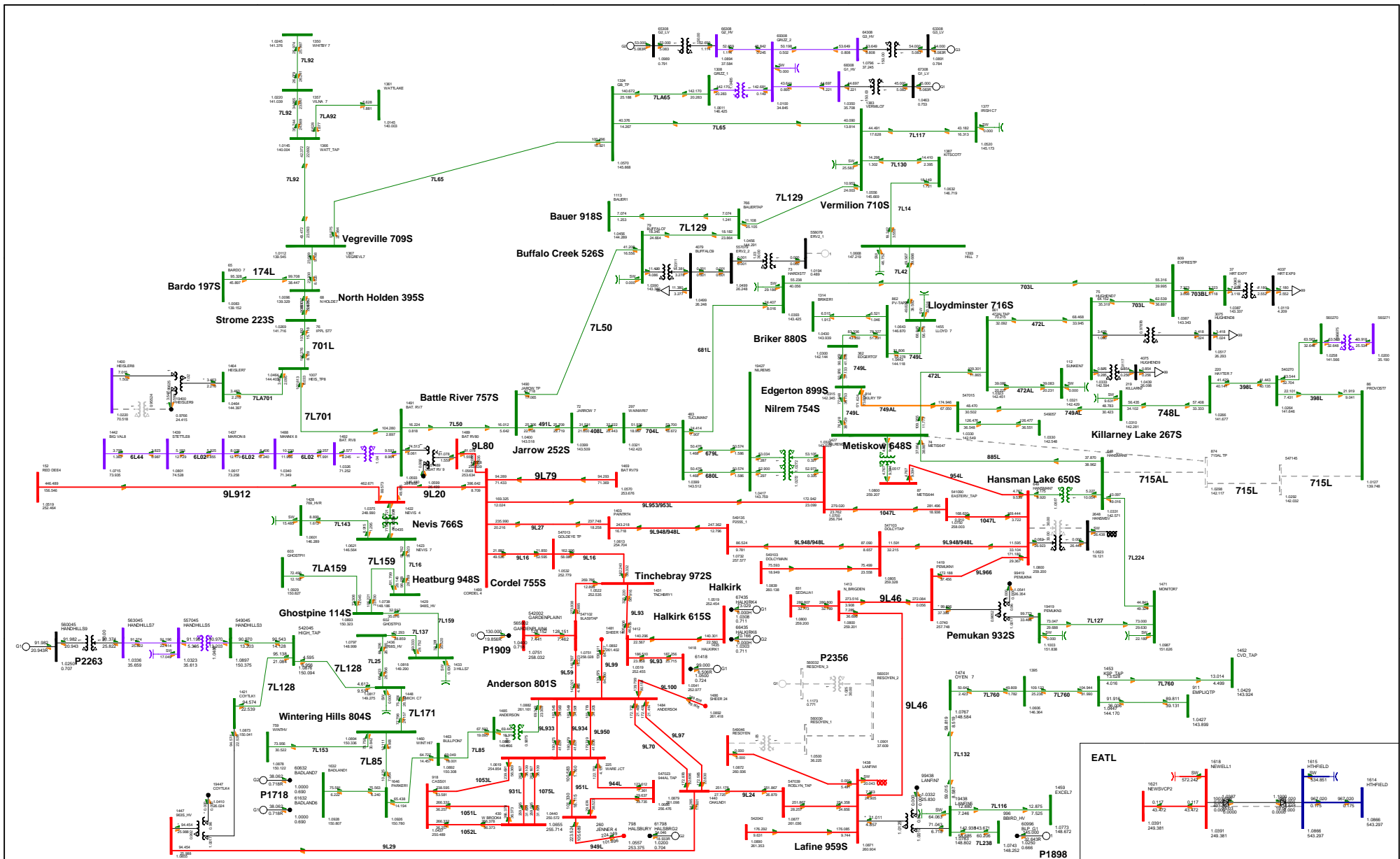


P2356 Oyen MPC Wind

FIGURE A2.3-12 EDGERTON 899S TRANSFORMER T1  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.747 MW

BC Import: -1102.488 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW

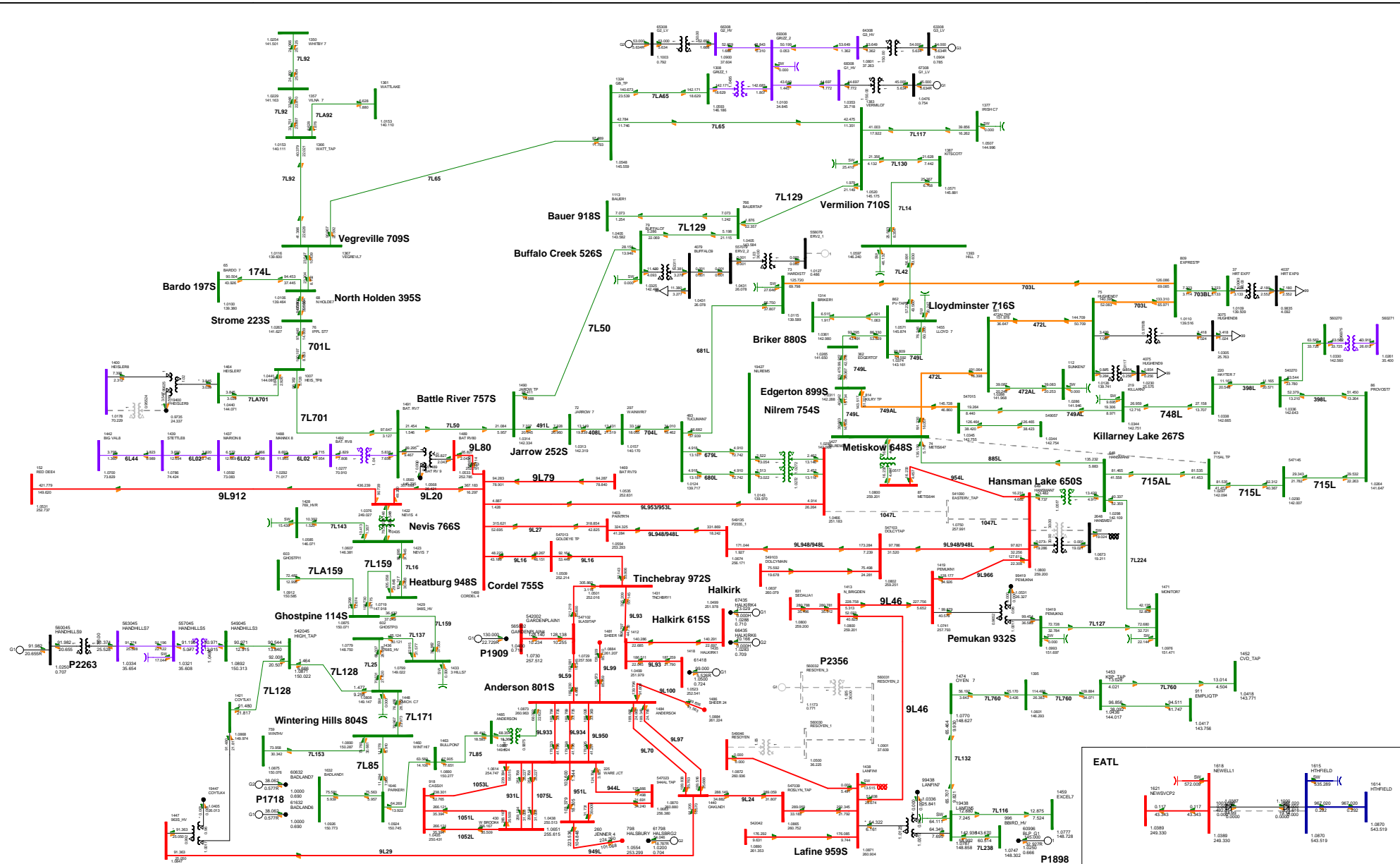


P2356 Oyen MPC Wind

FIGURE A2.3-13 715L (HANSMAN LAKE 650S TO PROVOST 545S)  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.754 MW

BC Import: -1066.562 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW



**P2356 Oyen MPC Wind**

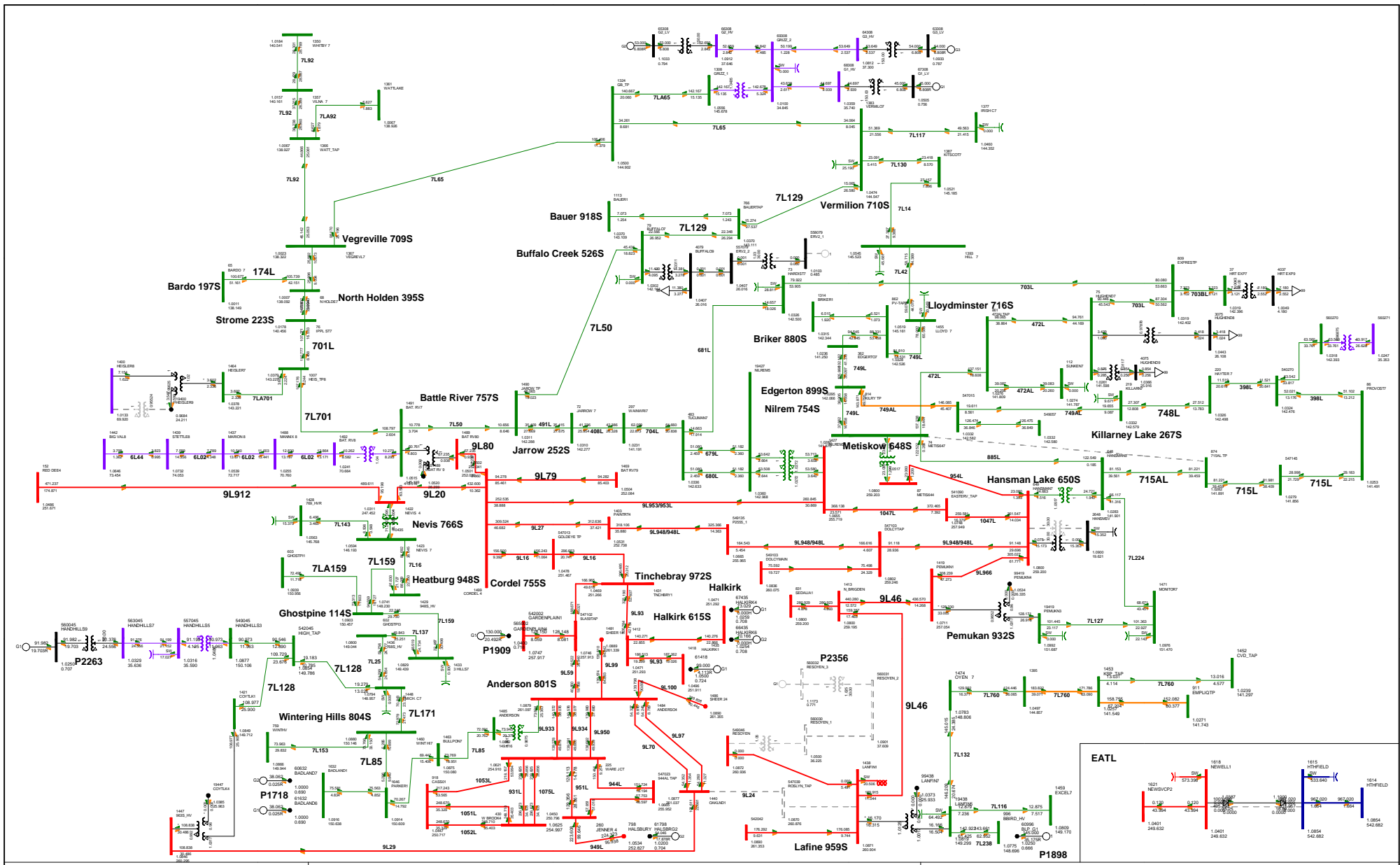
FIGURE A2.3-14 1047L (HANSMAN LAKE 650S TO NILREM 574S)  
 2028 WINTER PEAK (PRE-CONNECTION)  
 PRINTED ON MONDAY 23 SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.753 MW

BC Import: -1004.933 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.712 MW







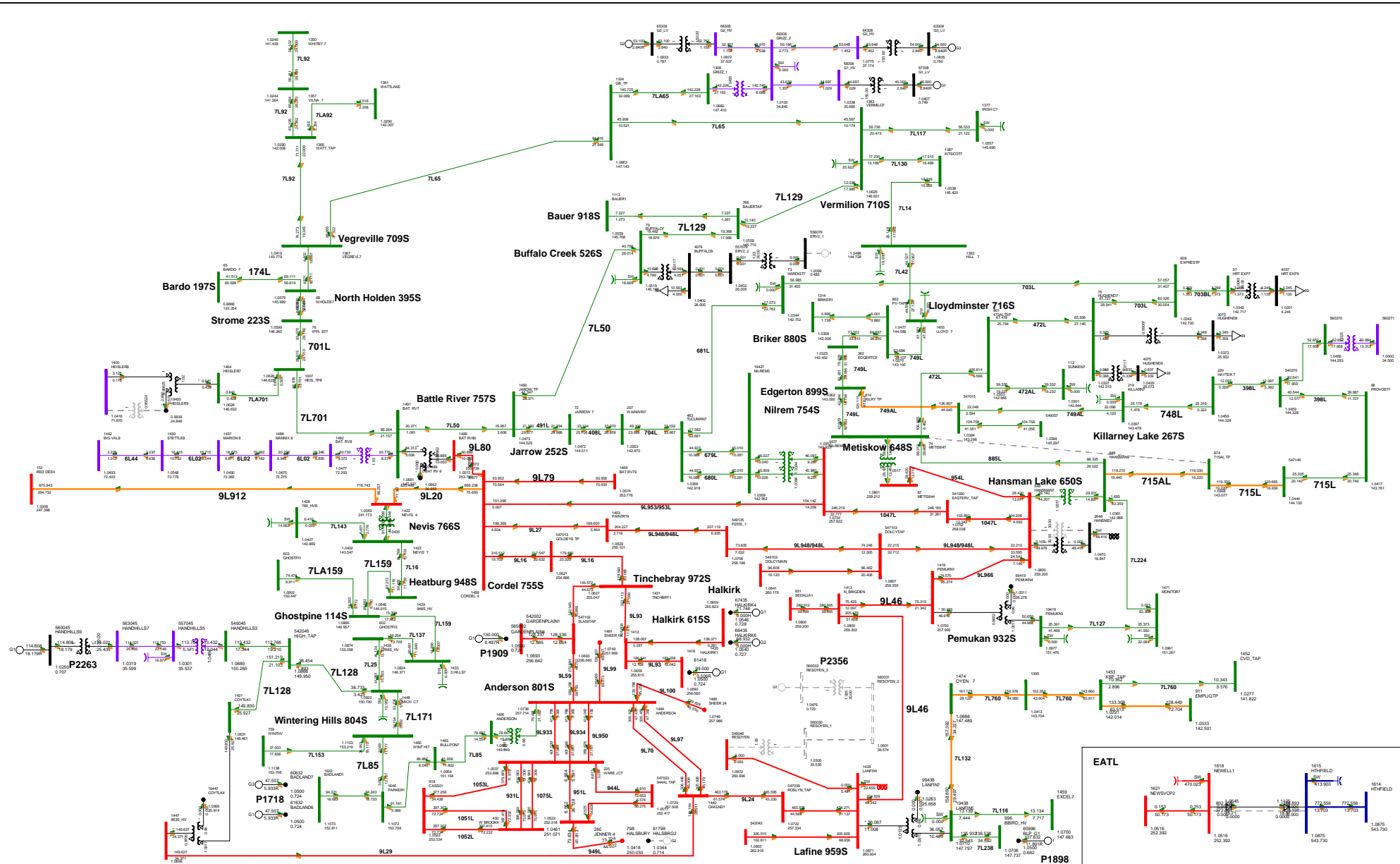
**P2356 Oyen MPC Wind**

FIGURE A2.3-16 SL24 (OAKLAND 946S - LANFNE 959S)  
2028 WINTER PEAK (PRE-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.760 MW

BC Import: -1075.613 MW  
Sask Import: -151.000 MW  
MATL Import: -182.712 MW





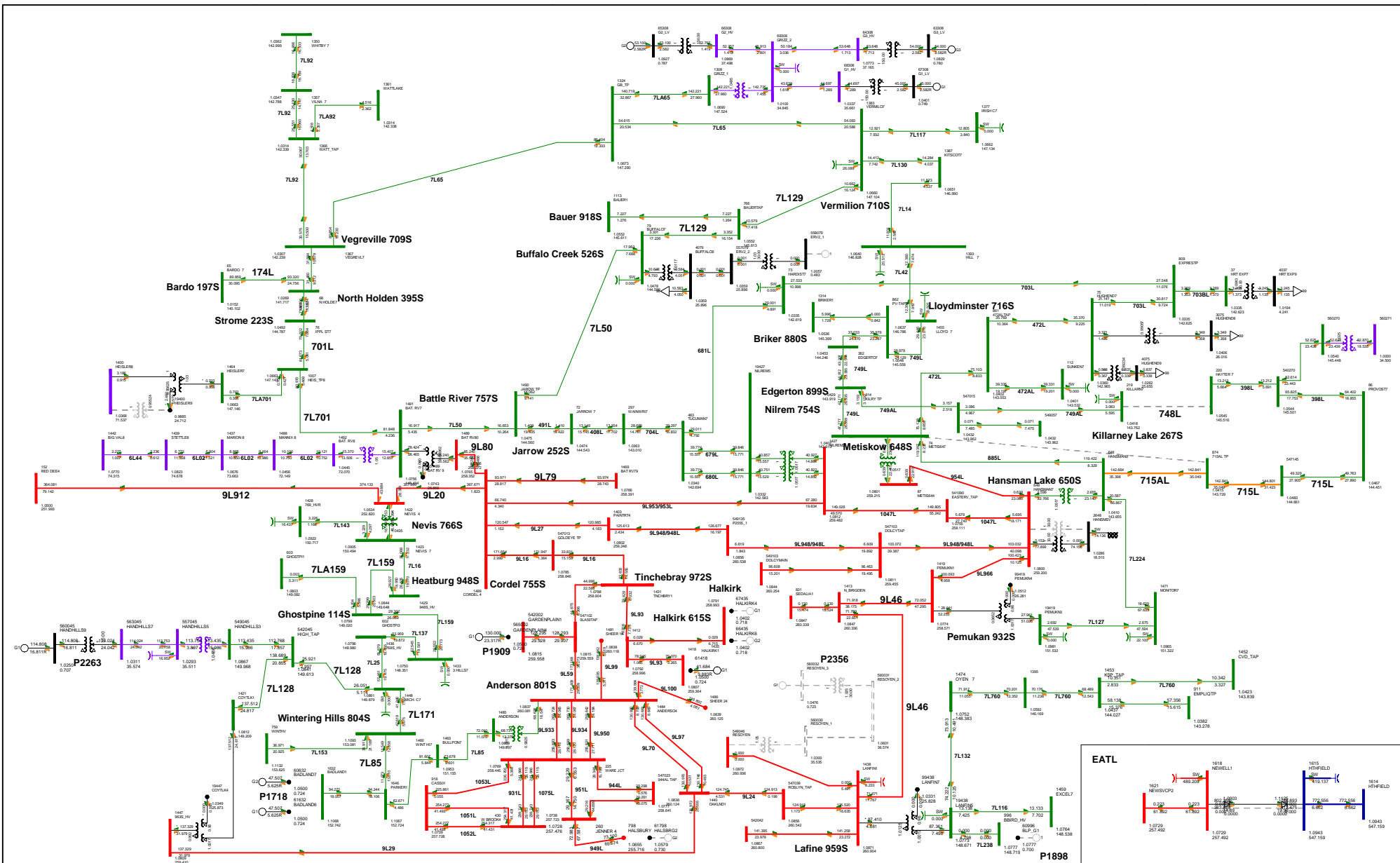
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 138  
 Breaker (kV) = 170  
 Equipment (kV) = 170  
 W = +0.000 + j4.500 - j8.000 + j38.000 + j240.000 + j900.000

**FIGURE A2.4-0-N-4: NORMAL OPERATION**  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH), PRE-CURTAILMENT  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.430 MW	BC Import: -867.272 MW
EATL: -808.107 MW	Sask Import: -150.000 MW
	MATL Import: -182.776 MW





**P2356 Oyen MPC Wind**

Bus Voltage (V) 90  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500-88.000+138.000+240.000+390.000

**FIGURE A2-4-2 748L (HAYTER 277S TO KILLARNEY LAKE 267S)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.248 MW

BC Import: -100.183 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW

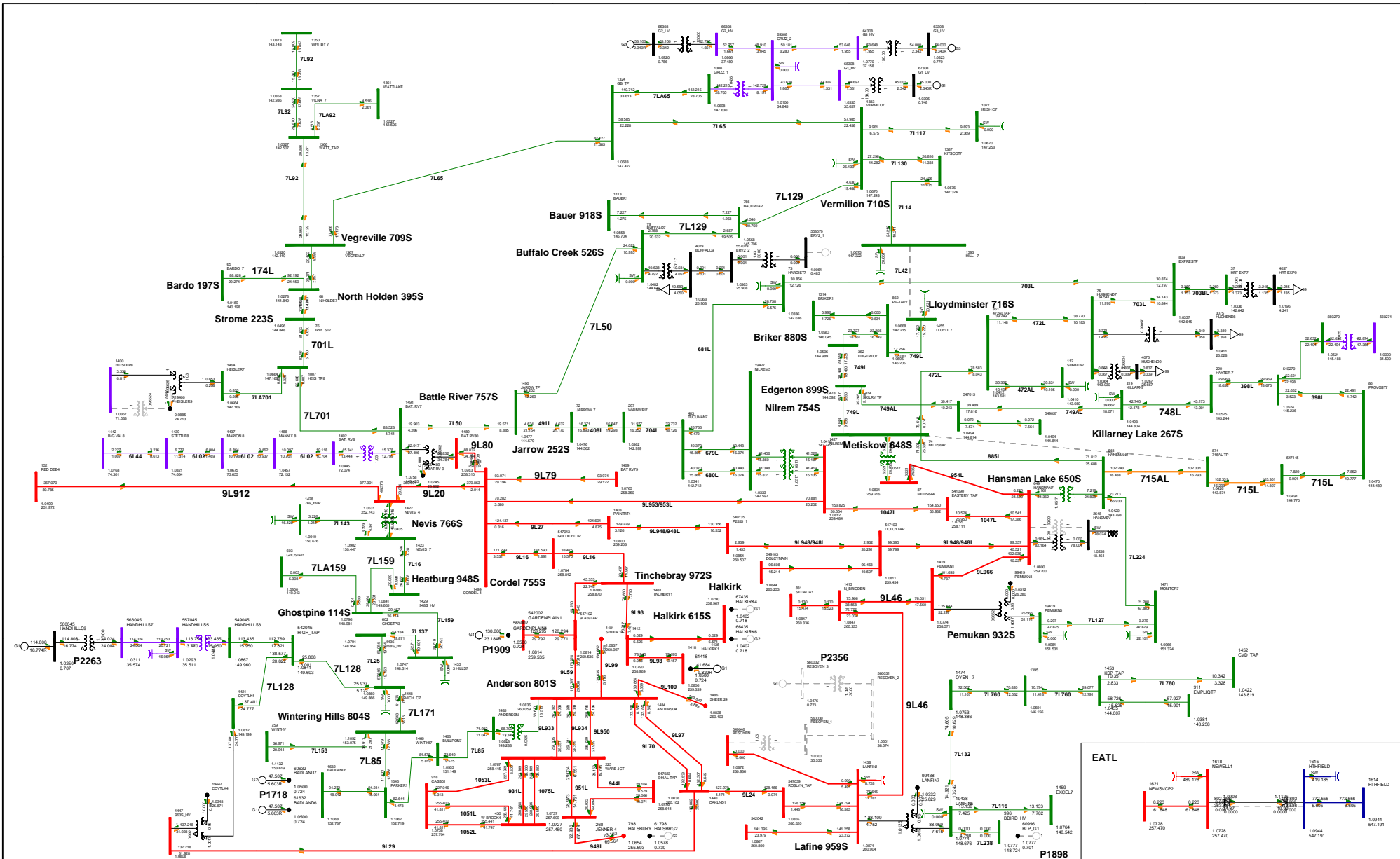


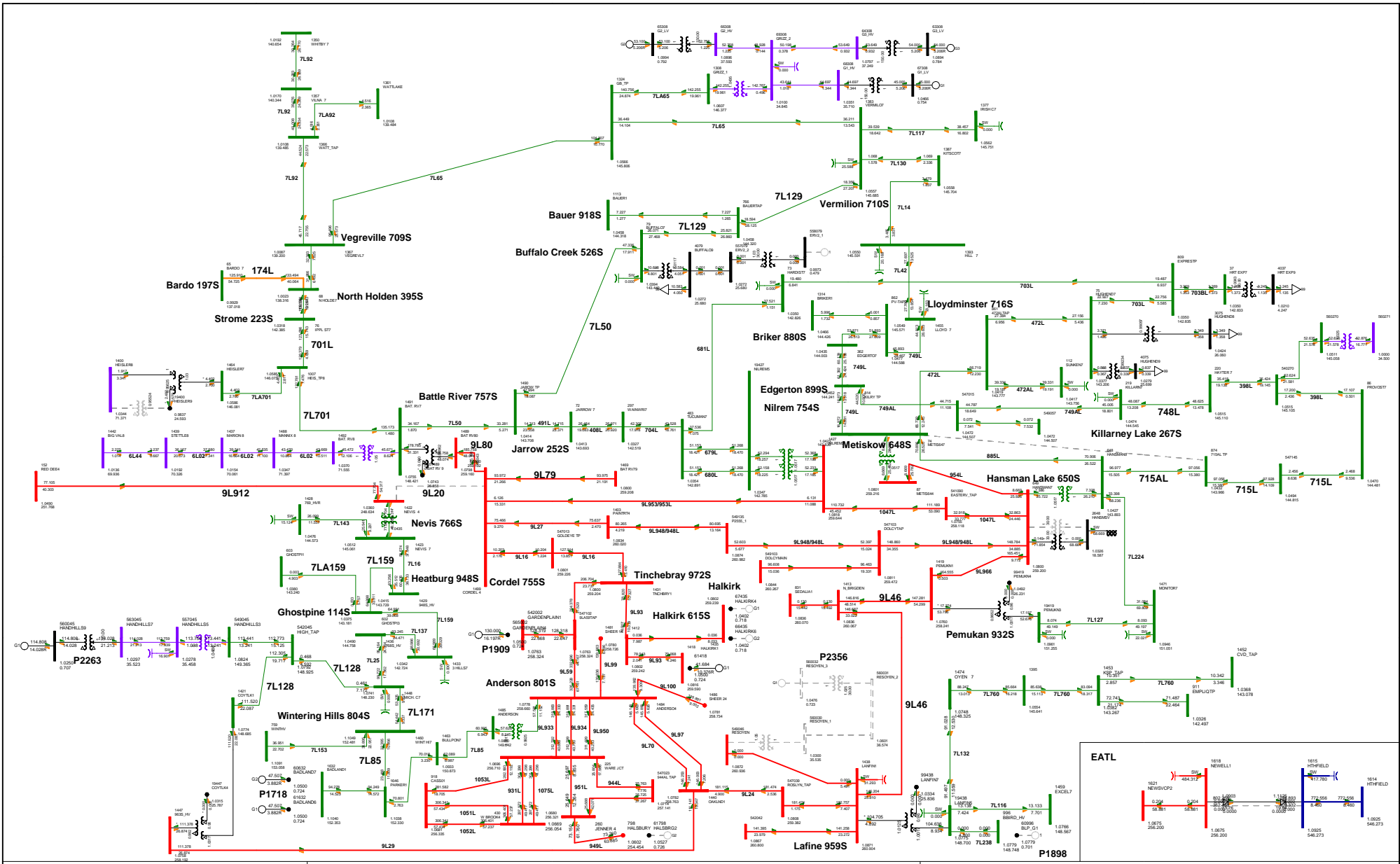
FIGURE A2-4-3 7L42 (HILL 751S TO LLOYDMINSTER 716S)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV BusA  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

WATL: -2.433 MW  
 EATL: -808.247 MW

BC Import: -102.676 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



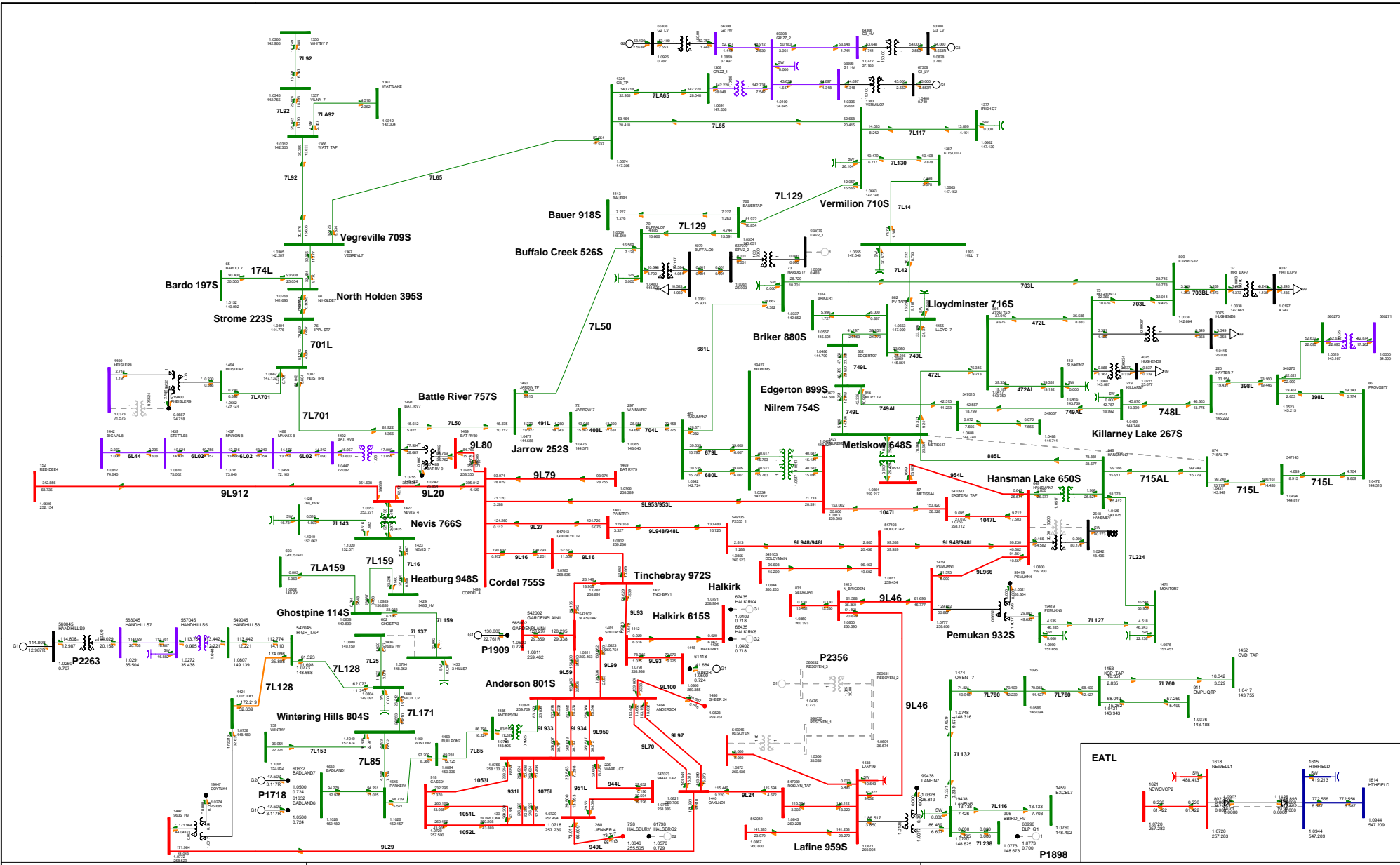
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/Mvar  
 102.50kVA  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

**FIGURE A2.4-4 9L20 (NEVIS 766S TO CORDEL 755S)**  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.210 MW

BC Import: -55.003 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) 90  
 Branch (V) 90  
 Equipment (MVA) 100  
 W: +0.000+54.500-88.000-138.000+240.000+500.000

**FIGURE A2-4-5 7L137 (THREE HILLS 770S TO ROWLEY 768S)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.241 MW

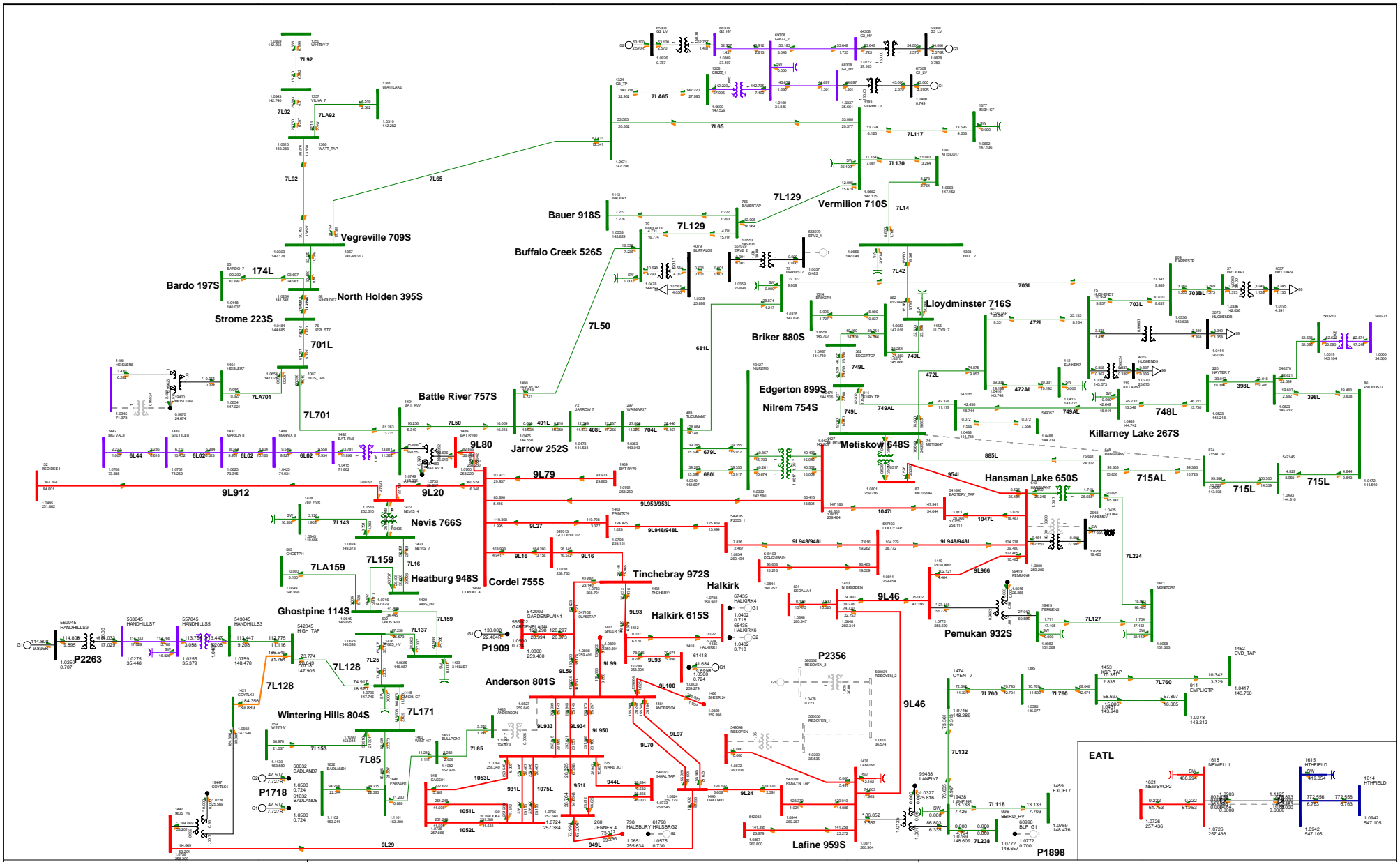
BC Import: -100.704 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW











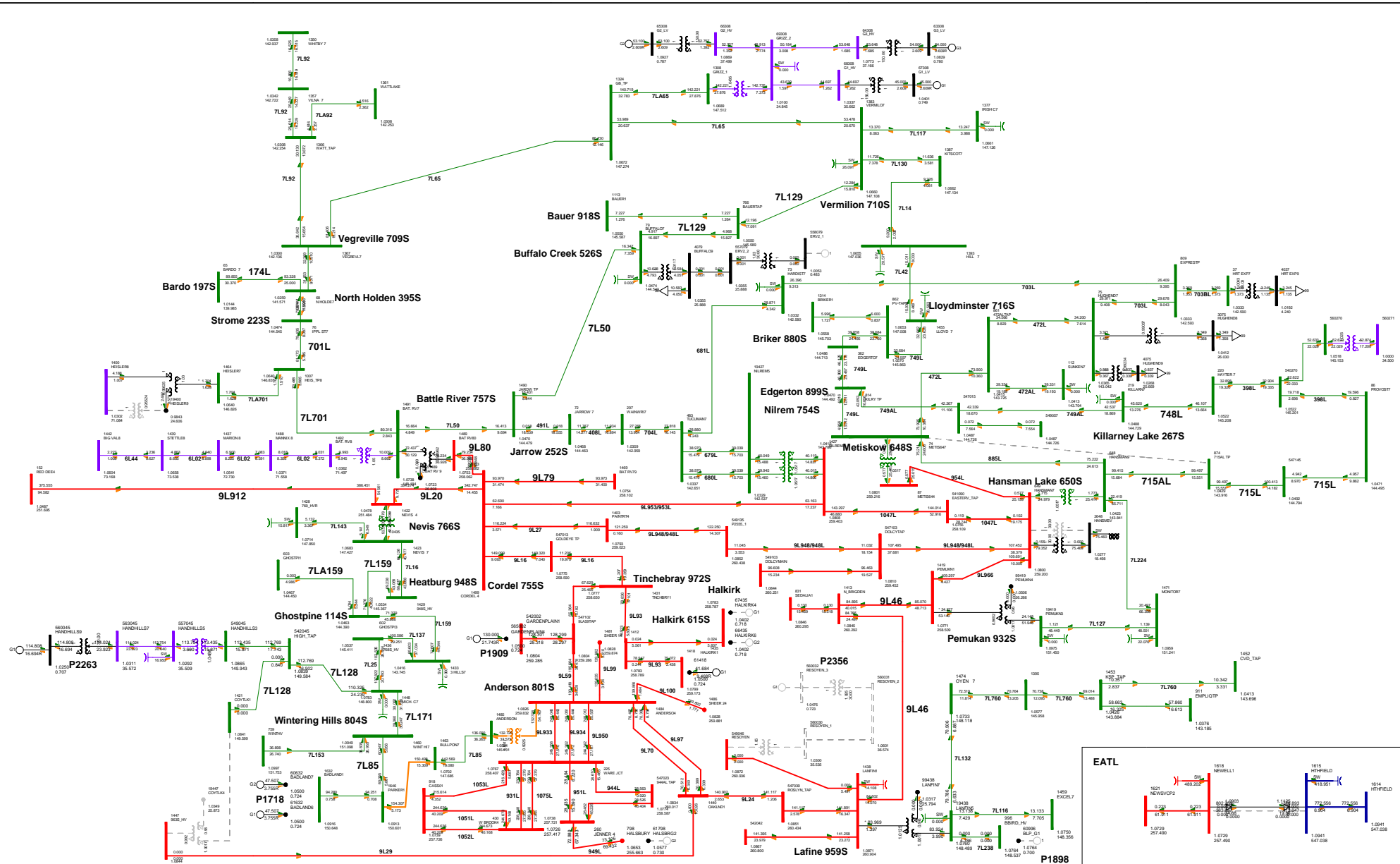
**P2356 Oyen MPC Wind**

**FIGURE A2.4-8 801S T1 (ANDERSON 801S 240/138 KV TRANSFORMER)  
2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
PRINTED ON MONDAY 23. SEPTEMBER 2024**

WATL: -2.433 MW  
EATL: -808.246 MW

BC Import: -95.041 MW  
Sask Import: -150.000 MW  
MATL Import: -182.776 MW

Bus: Voltage (V) @  
Branch: MW  
Equipment: MVA/Mvar  
102.25: Ratio A  
KV: +0.000-34.500-69.000-138.000-240.000-600.000



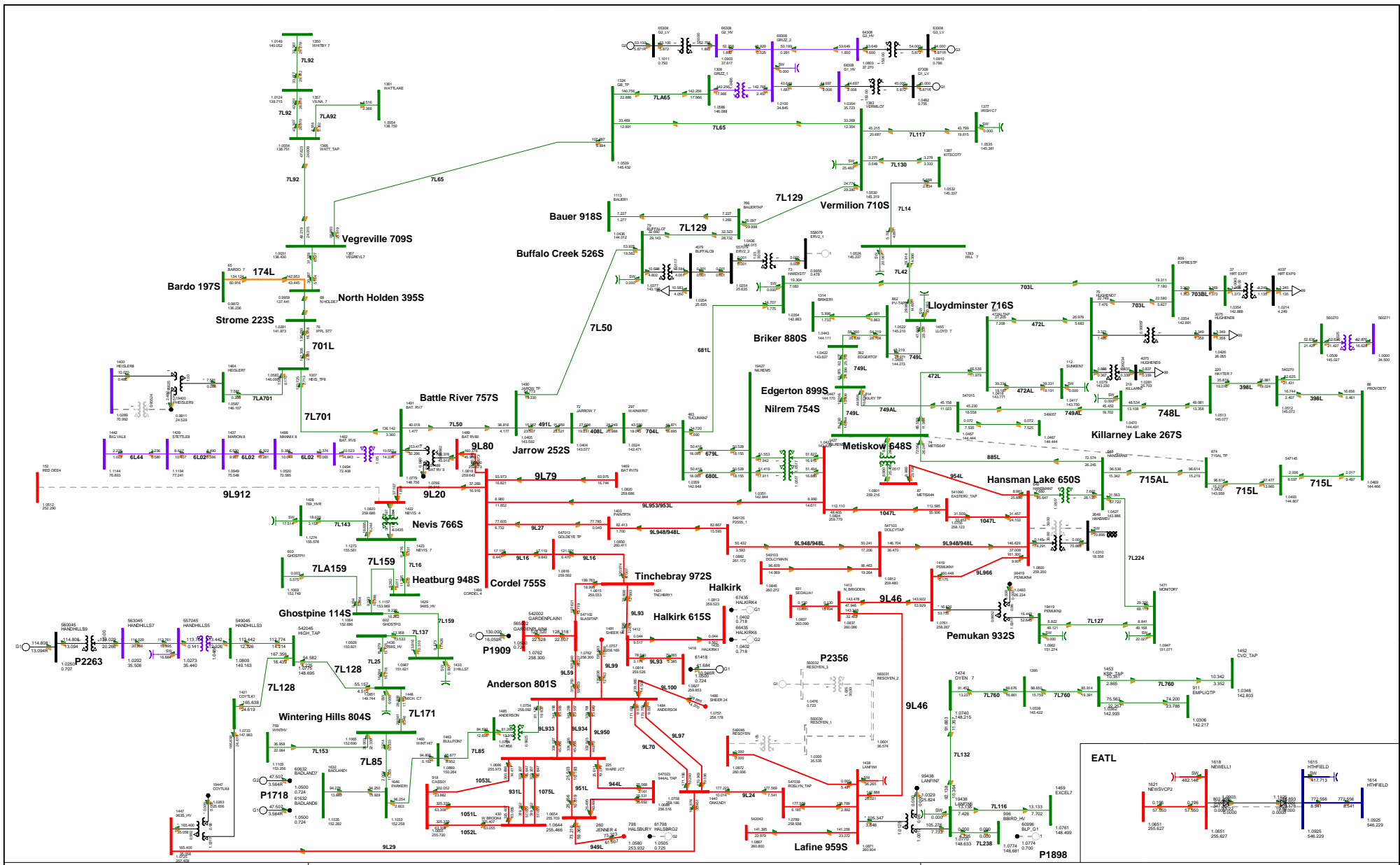
**P2356 Oyen MPC Wind**

Bus Voltage (kV) 115  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+290.000

**FIGURE A2-4-9 963S T1 (COYOTE LAKE 963S TRANSFORMER T1)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.248 MW

BC Import: -80.040 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



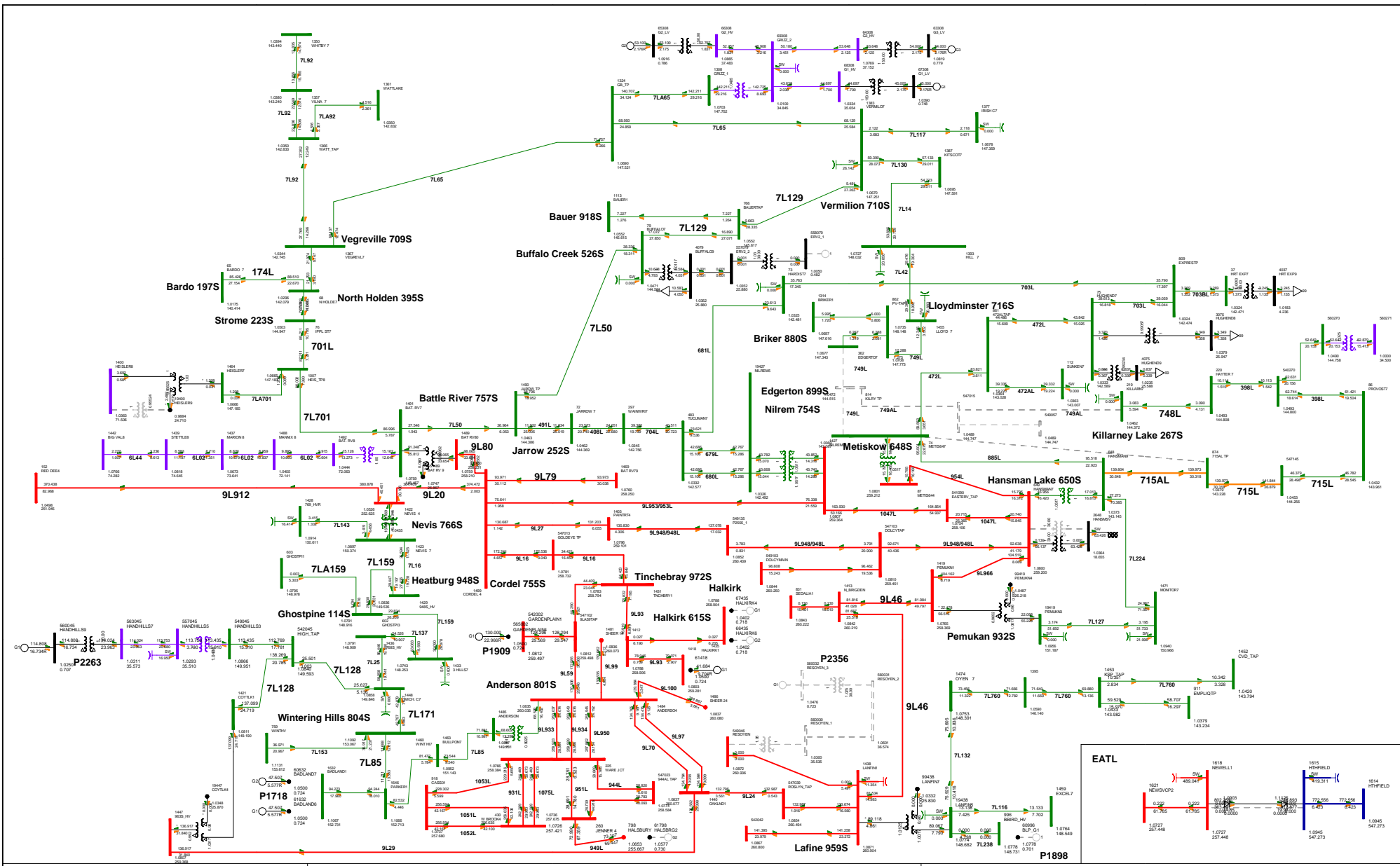
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Branch Voltage (kV) = 115  
 Equipment = 115/115/115  
 W = 10,000 + 34,500 + 88,000 + 138,000 + 240,000 + 500,000

**FIGURE A2-4-10 912L (NEVIS 766S TO RED DEER 63S)**  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.193 MW

BC Import: -53.791 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



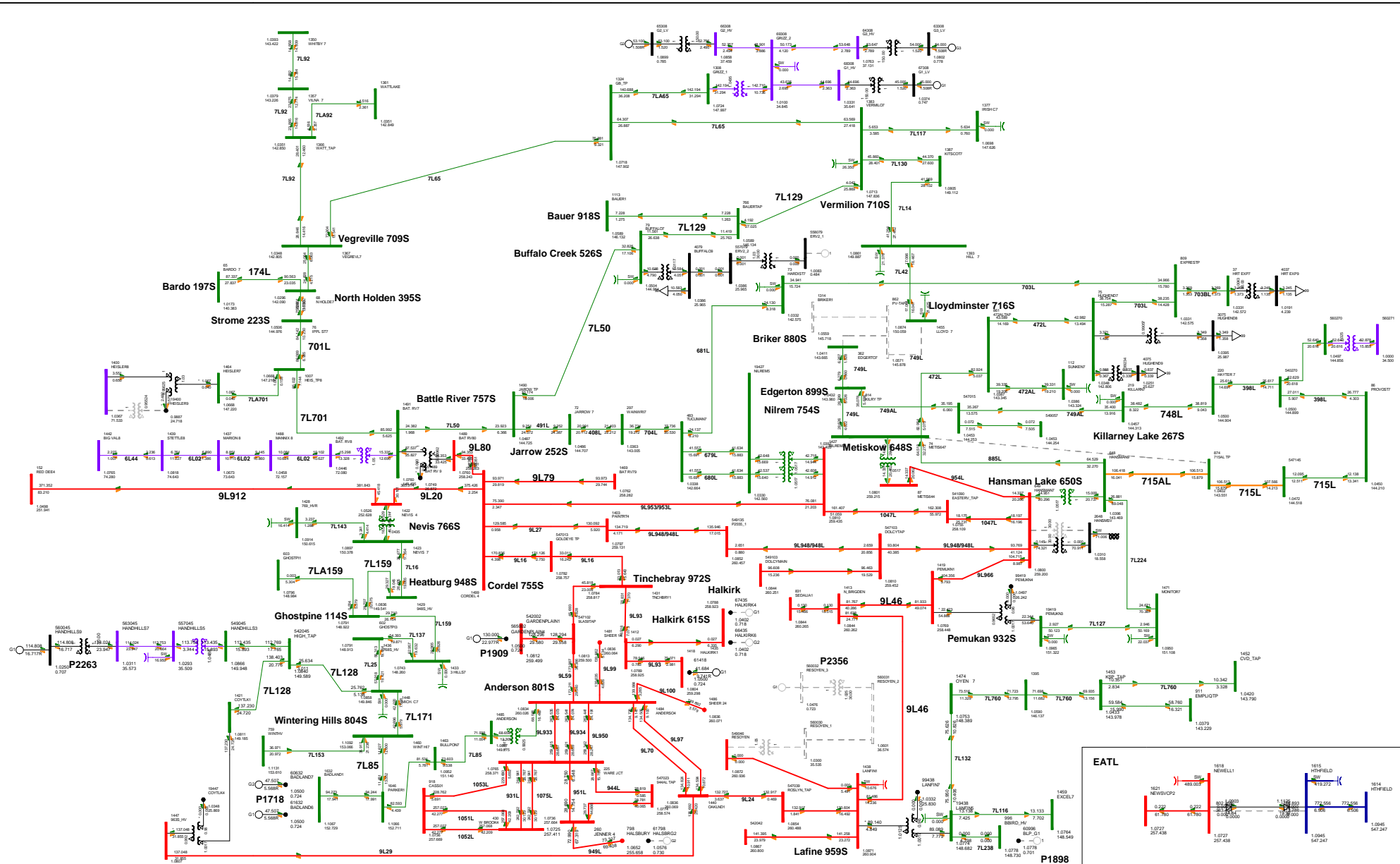
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Base MVA = 100  
 Equipment MVA = 100  
 W = +0.000 + j4.500 - j8.000 + j38.000 + j240.000 + j900.000

**FIGURE A2-4-11 749L (METISKOW 648S TO EDGERTON 899S)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23 SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.246 MW

BC Import: -97.975 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



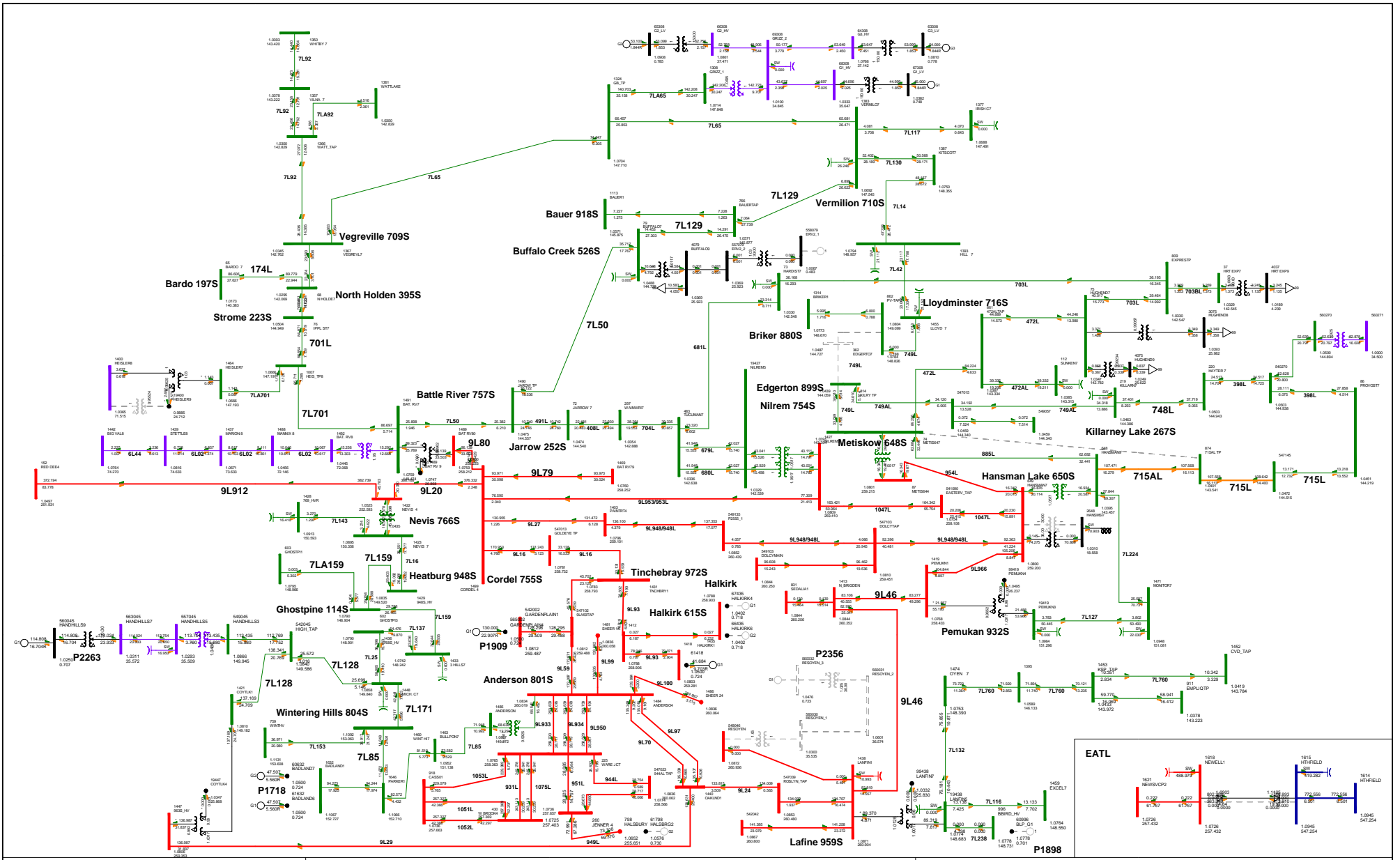
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Breaker (kV) = 170  
 Equipment (MVA) = 100  
 100.000+14.500+18.000+130.000+240.000+490.000

**FIGURE A2-4-12 749L (EDGERTON 899S TO LLOYDMINSTER 716S)  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23 SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.246 MW

BC Import: -106.191 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/Mvar  
 102.5kV/50MVA  
 W: +0.000+54.500-89.000+138.000+240.000+500.000

**FIGURE A2.4-13 EDGERTON 899S TRANSFORMER T1**  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.246 MW

BC Import: -105.511 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW



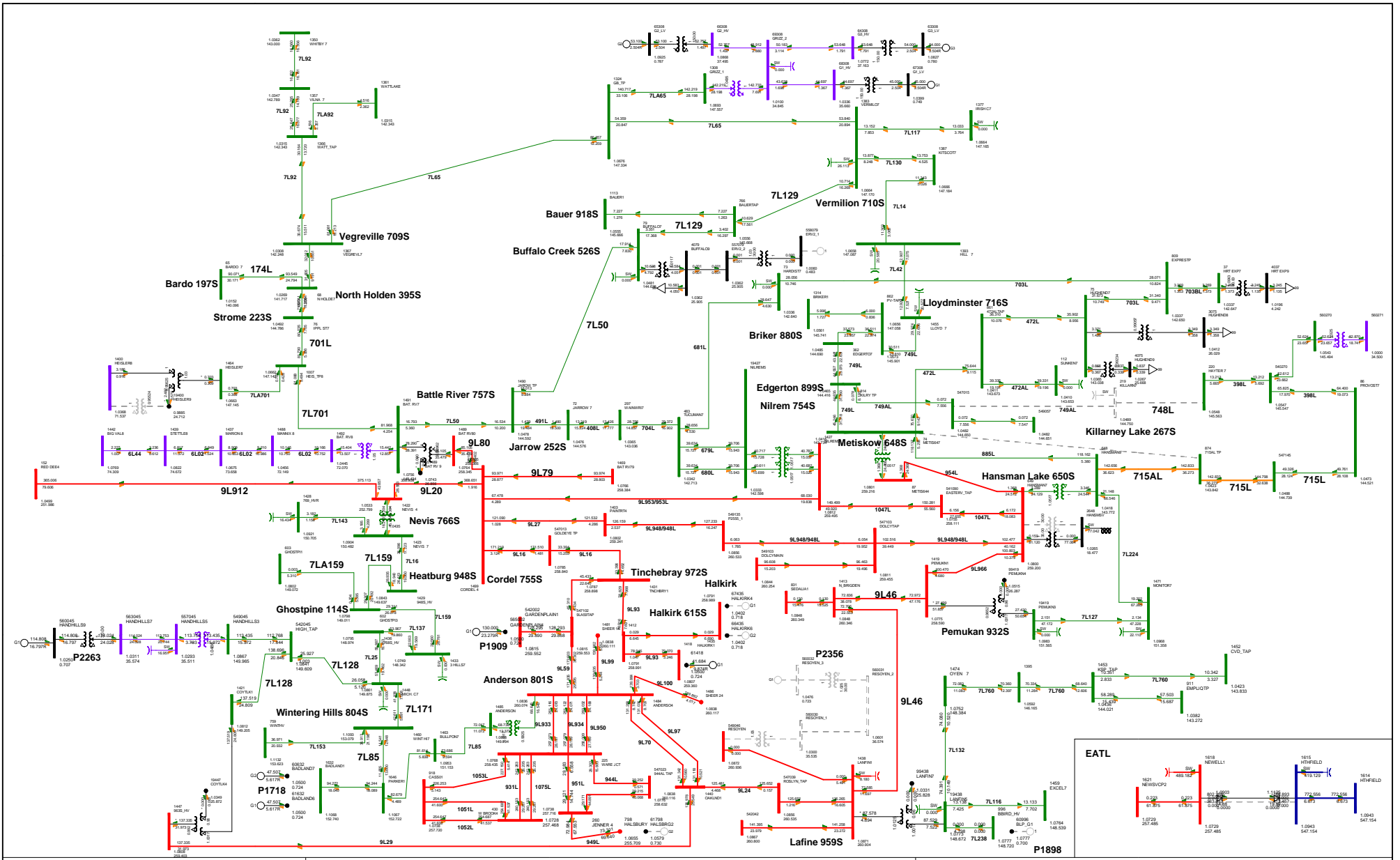


FIGURE A2-4-14 KILLARNEY LAKE 267S TRANSFORMER T1  
 2028 SUMMER PEAK (PRE-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV Bus A  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

WATL: -2.433 MW  
 EATL: -808.247 MW

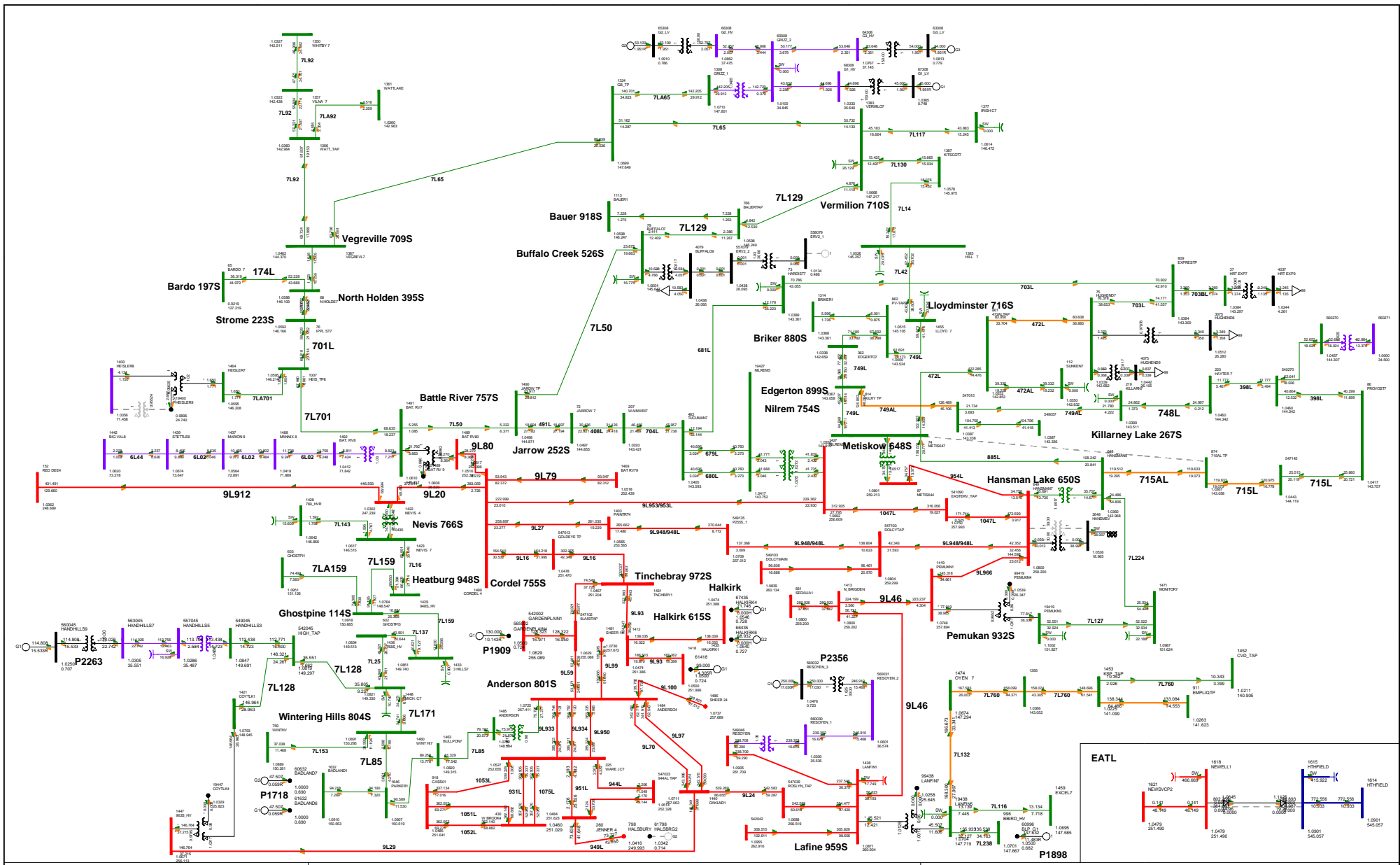
BC Import: -102.783 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.776 MW





# Attachment A3

## Post-Project Power Flow Diagrams



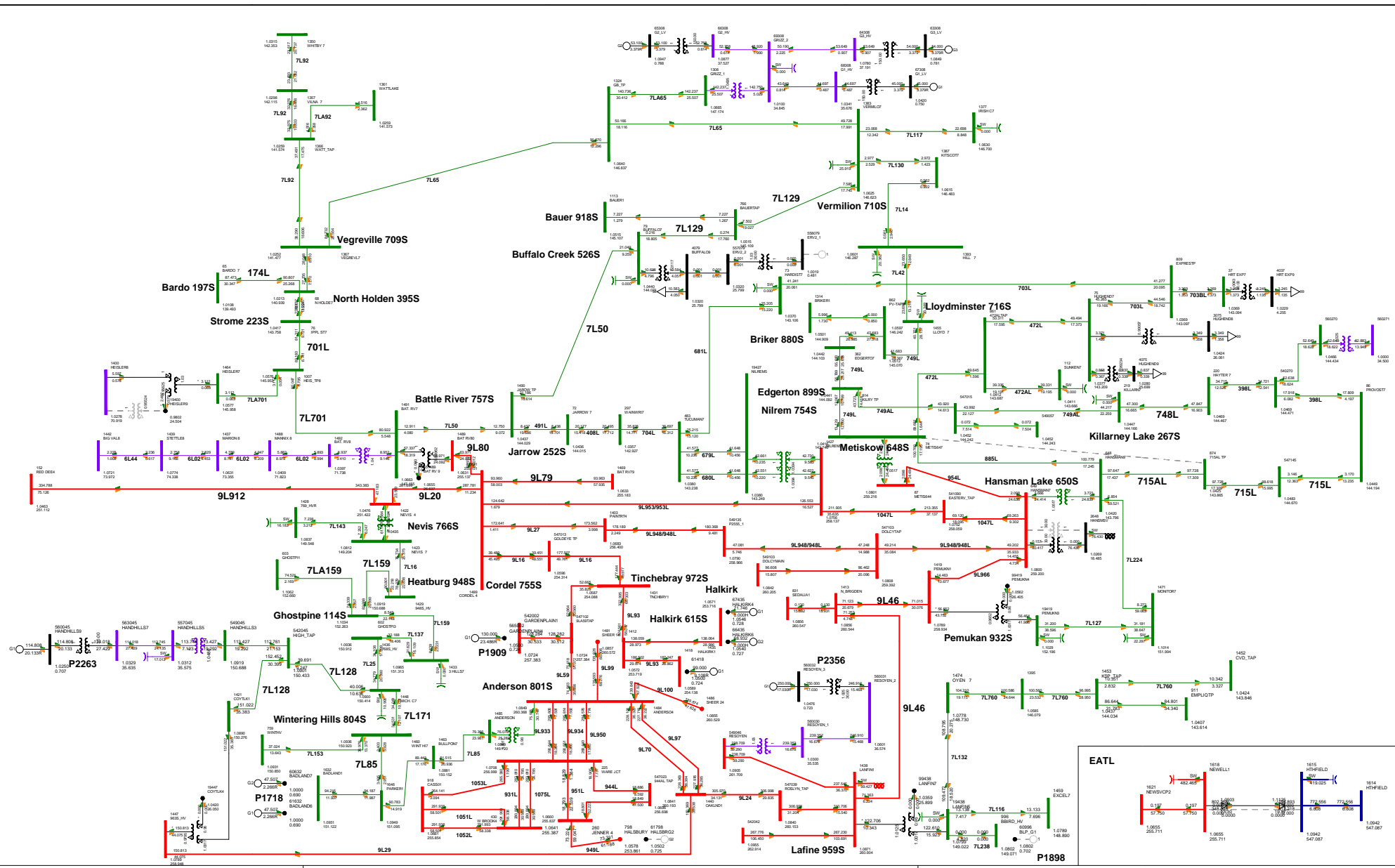
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (V) @  
 Equipment (V) @  
 102.5kV @  
 W: +0.000+34.500-88.000+138.000+240.000+400.000

**FIGURE A3.1-0-N-0: NORMAL OPERATION**  
 2025 SUMMER PEAK (POST-CONNECTION), PRE-CURTAILMENT  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.430 MW  
 EATL: -808.085 MW

BC Import: -851.004 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Breaker (MVA)  
 Equipment (MVA/MW)  
 102.5kV/50MVA  
 W: +0.000+54.500-88.000+138.000+240.000+500.000

**FIGURE A3.1-1-N-0: NORMAL OPERATION**  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.195 MW

BC Import: -444.967 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW

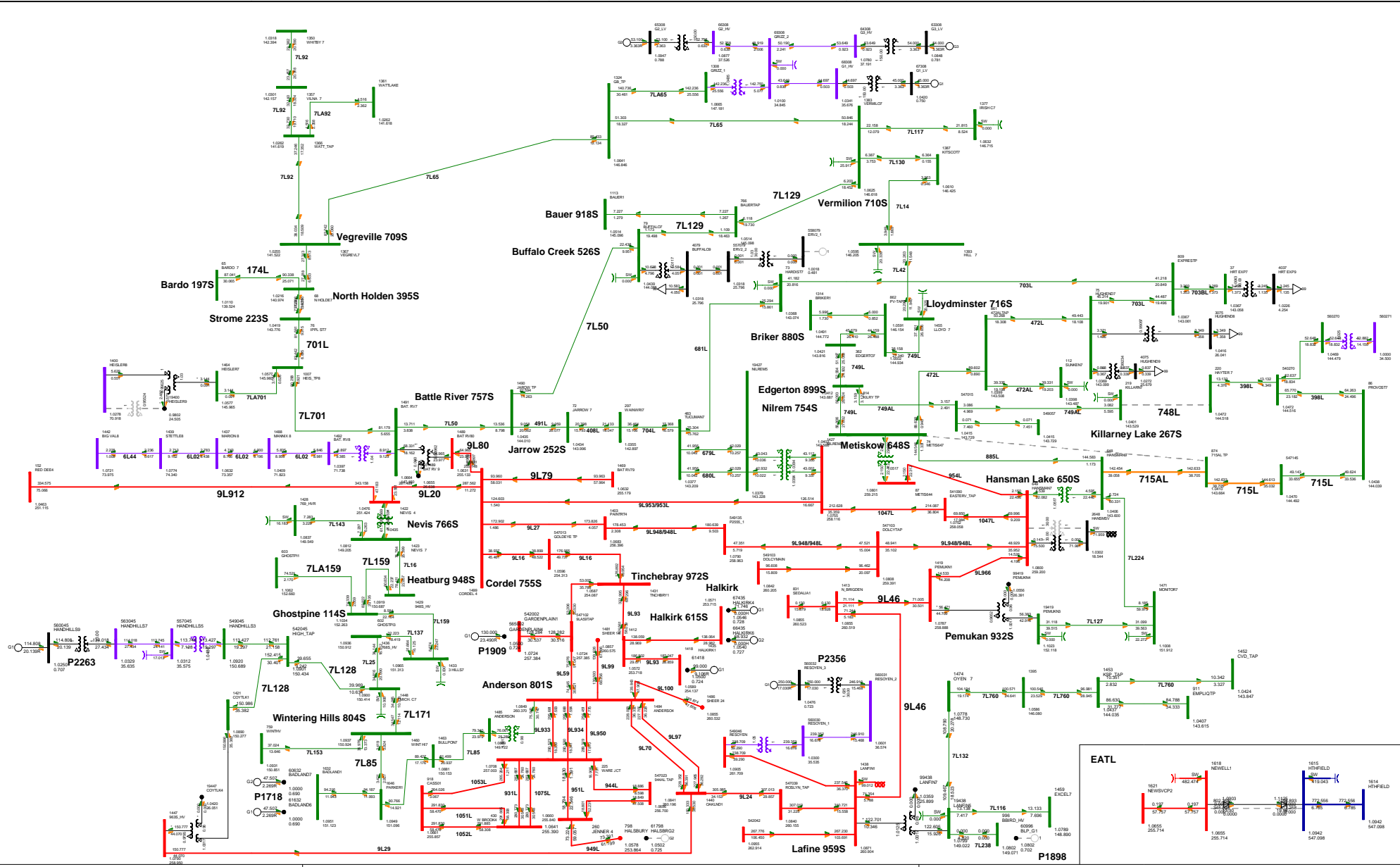
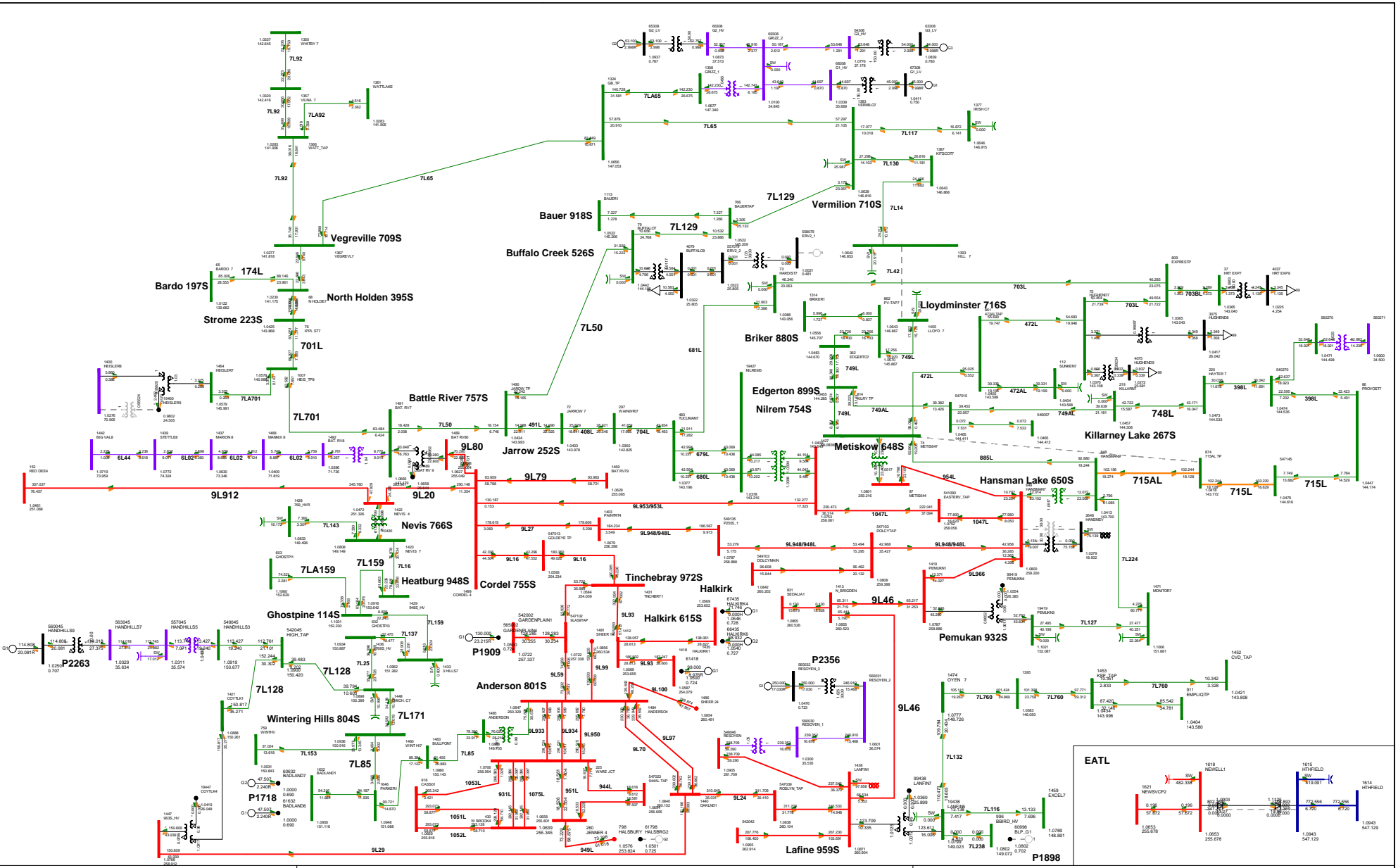


FIGURE A3.1-2 748L (HAYTER 277S TO KILLARNEY LAKE 267S)  
 2025 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Branch (V) @  
 Equipment / MVA/Year  
 102.76/10.0/1  
 W: +0.000+34.500=-138.000+1340.000=-930.000

WATL: -2.433 MW	BC Import: -442.874 MW
EATL: -808.196 MW	Sask Import: -150.000 MW
	MATL Import: -182.800 MW



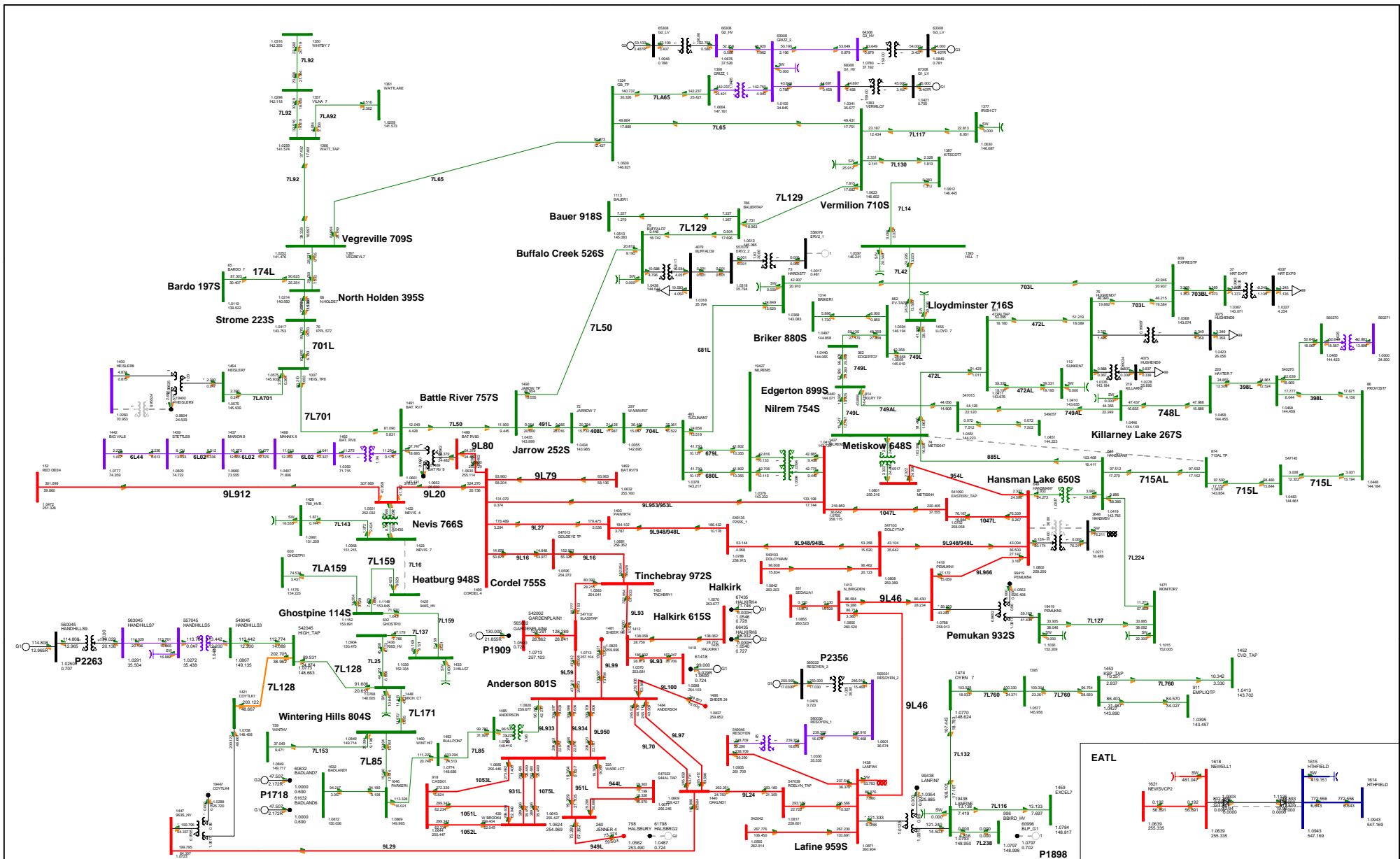
**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Breaker (V) 69  
 Equipment (MVA) 100  
 100.000+54.500+138.000+138.000+900.000

**FIGURE A3.1-3 7L42 (HILL 715S TO LLOYDMINSTER 716S)  
 2025 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.195 MW

BC Import: -445.625 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



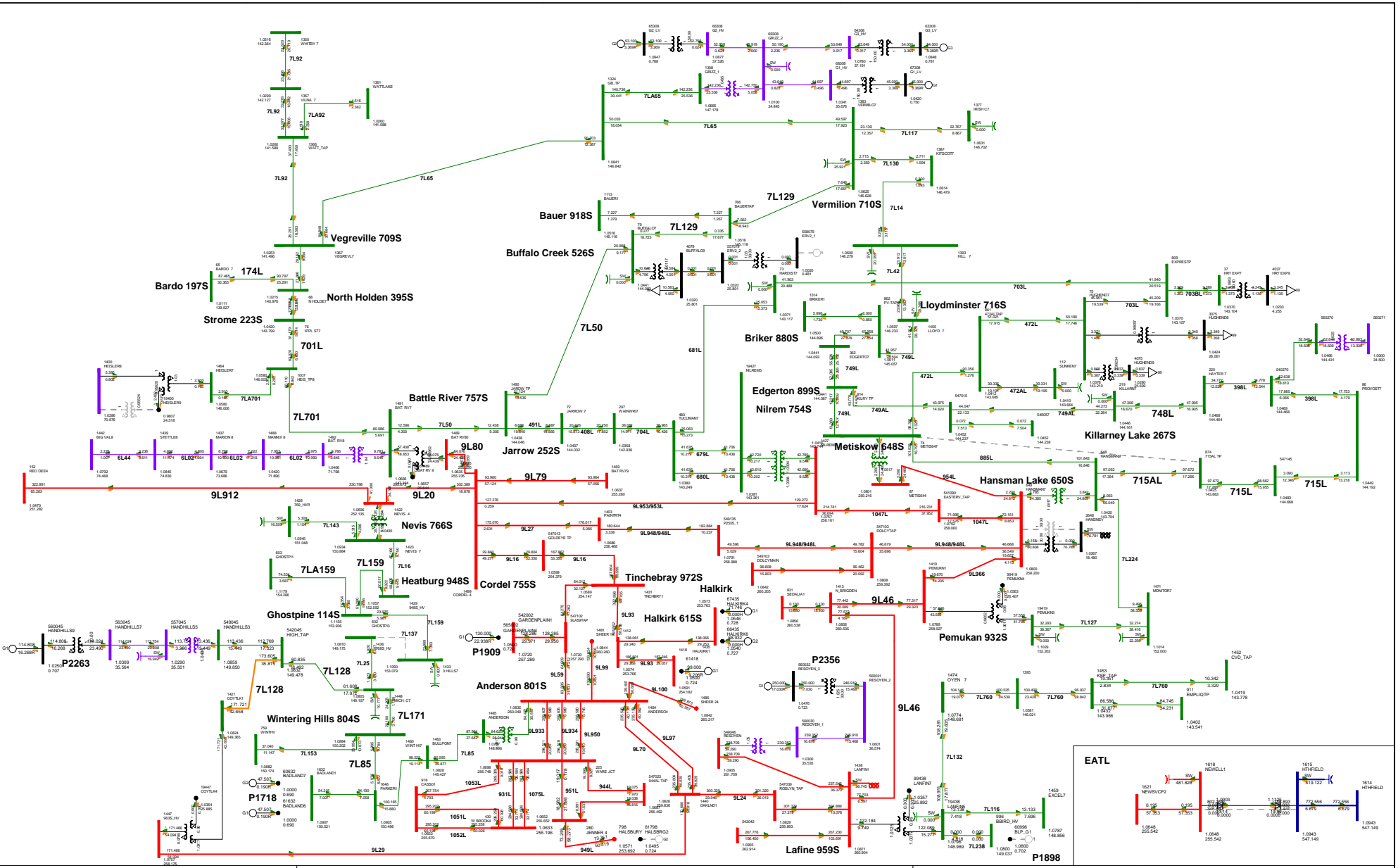
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Breaker (kV) = 115  
 Equipment (MVA) = 100  
 100.000000  
 W: +0.000000+0.000000+0.000000+0.000000

**FIGURE A3.1-4 7L16 (NEVIS 766S TO HEATBURG 948S)  
 2025 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.185 MW

BC Import: -439.564 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

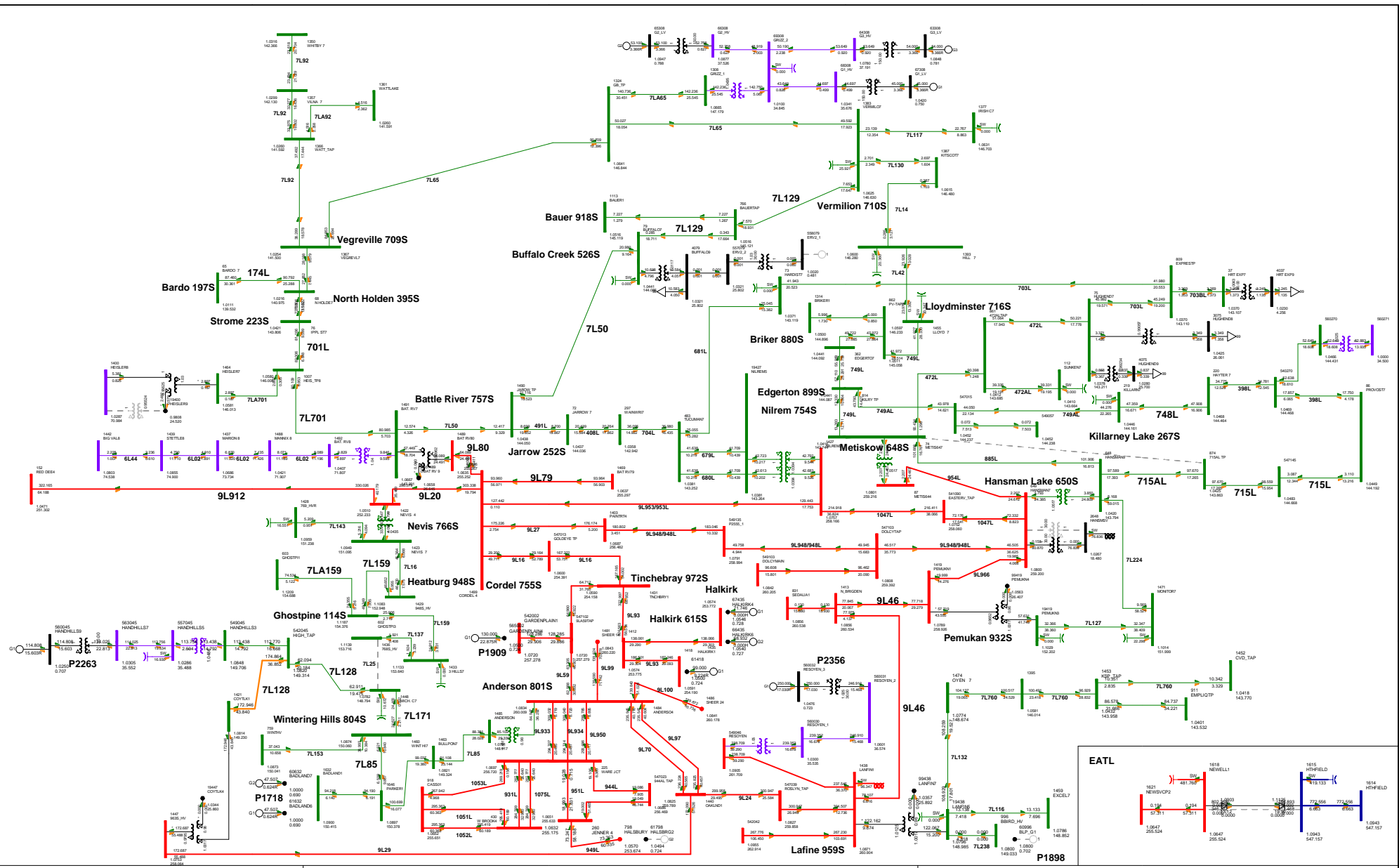
Bus Voltage (V) @ 2028 Summer Peak  
 Base MVA  
 Equipment MVA/MW  
 102.5kV Bus A  
 W: +0.000+0.400-0.000+0.000+0.000+0.000

**FIGURE A3.1-5 7L137 (THREE HILLS 770S TO ROWLEY 788S)**  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.191 MW

BC Import: -445.854 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW





**P2356 Oyen MPC Wind**

Bus Voltage (V) 10  
 Base MVA 100  
 Equipment MVA/MW 100/20000  
 W: +0.000+34.500=-138.000+240.000=930.000

**FIGURE A3.1-4 7L25 (ROWLEY 768S TO MICHIGI CREEK 802S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

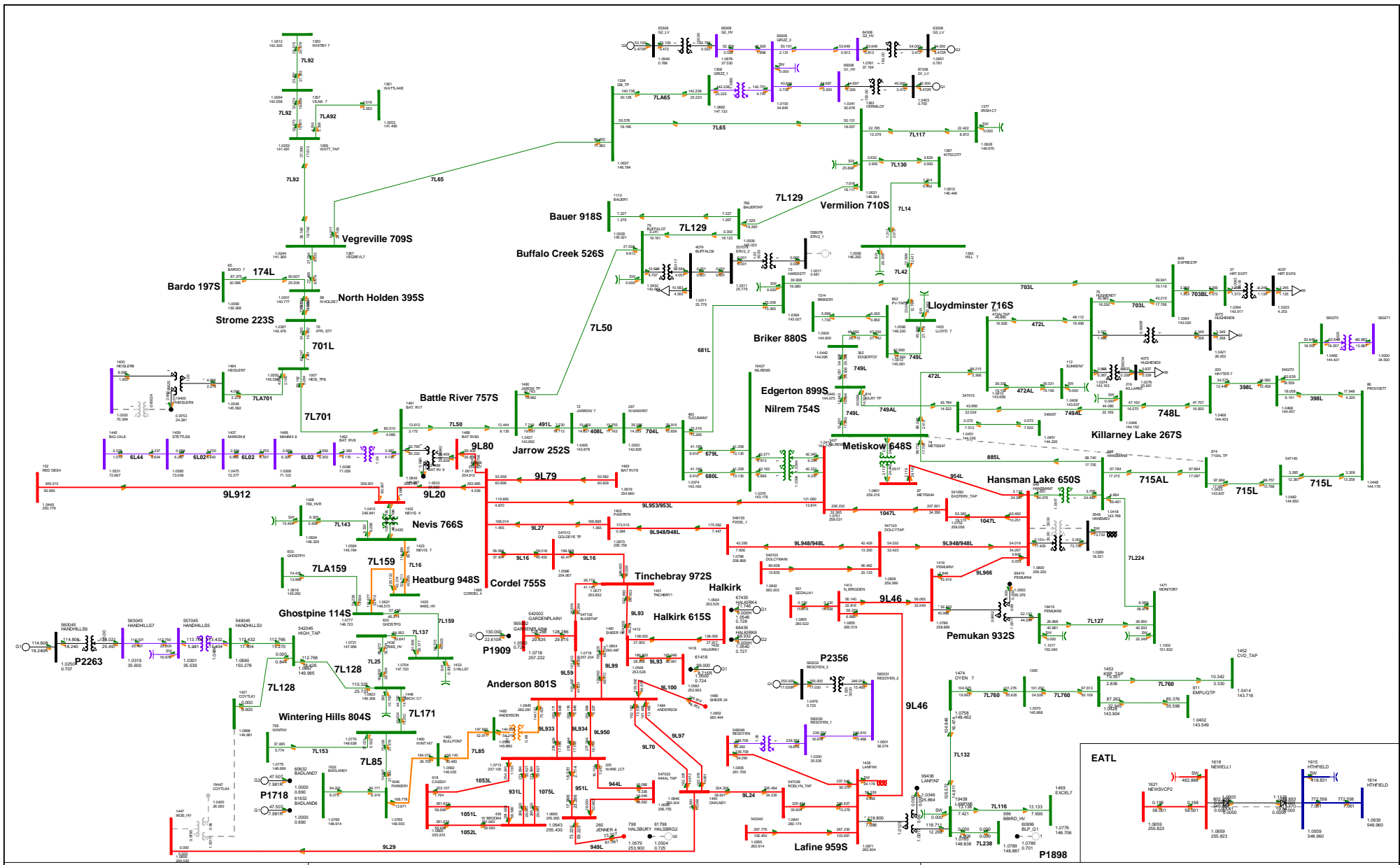
WATL: -2.433 MW  
 EATL: -808.190 MW

BC Import: -445.754 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW









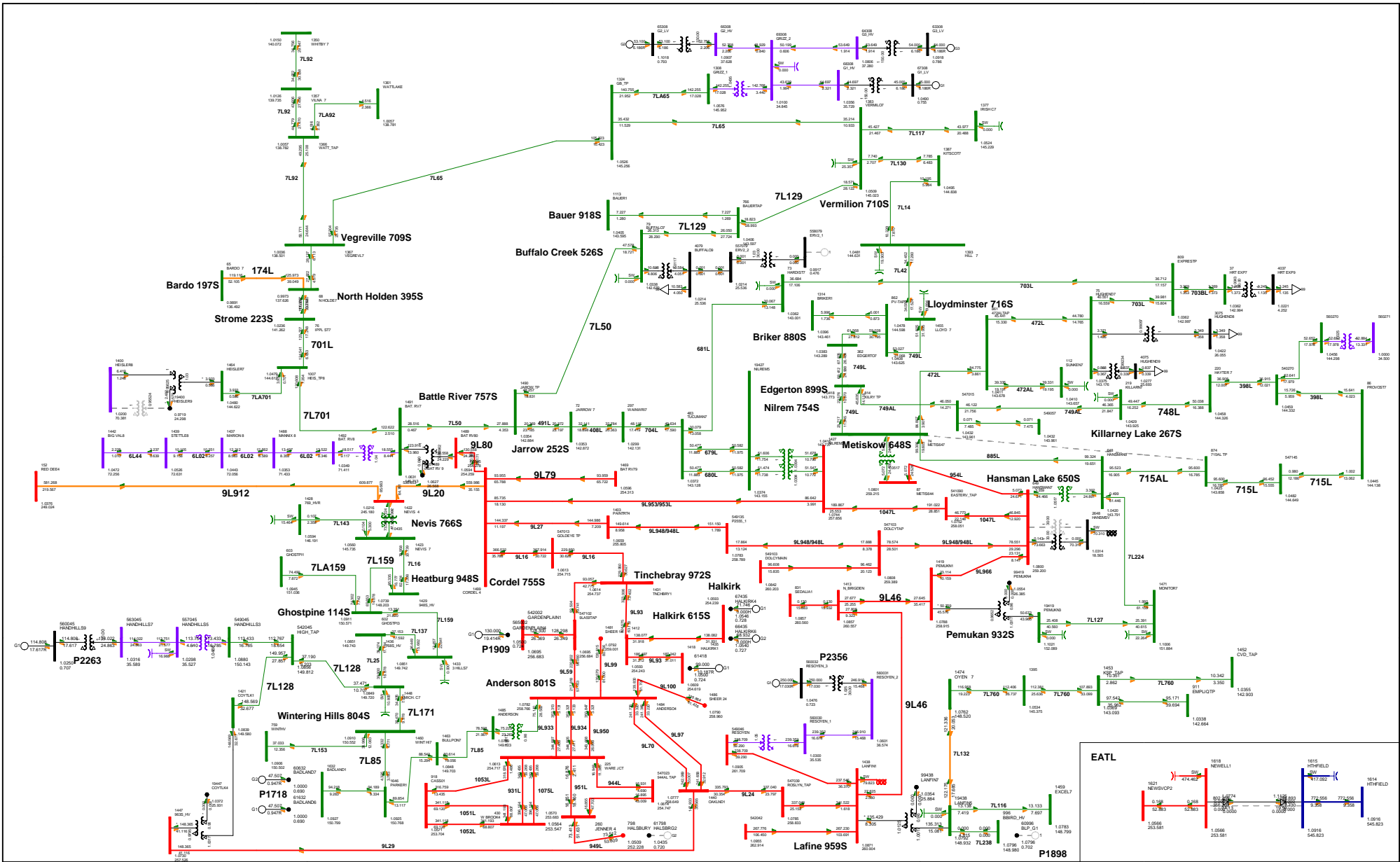
**P2356 Oyen MPC Wind**

Bus Voltage (kV) = 115  
 Breaker (MVA) = 100  
 Equipment (MVA) = 100  
 100.000+54.500+88.000+138.000+240.000+500.000

**FIGURE A3.1-9 963S T1 (COYOTE LAKE 963S TRANSFORMER T1)**  
 2023 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.199 MW

BC Import: -418.902 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



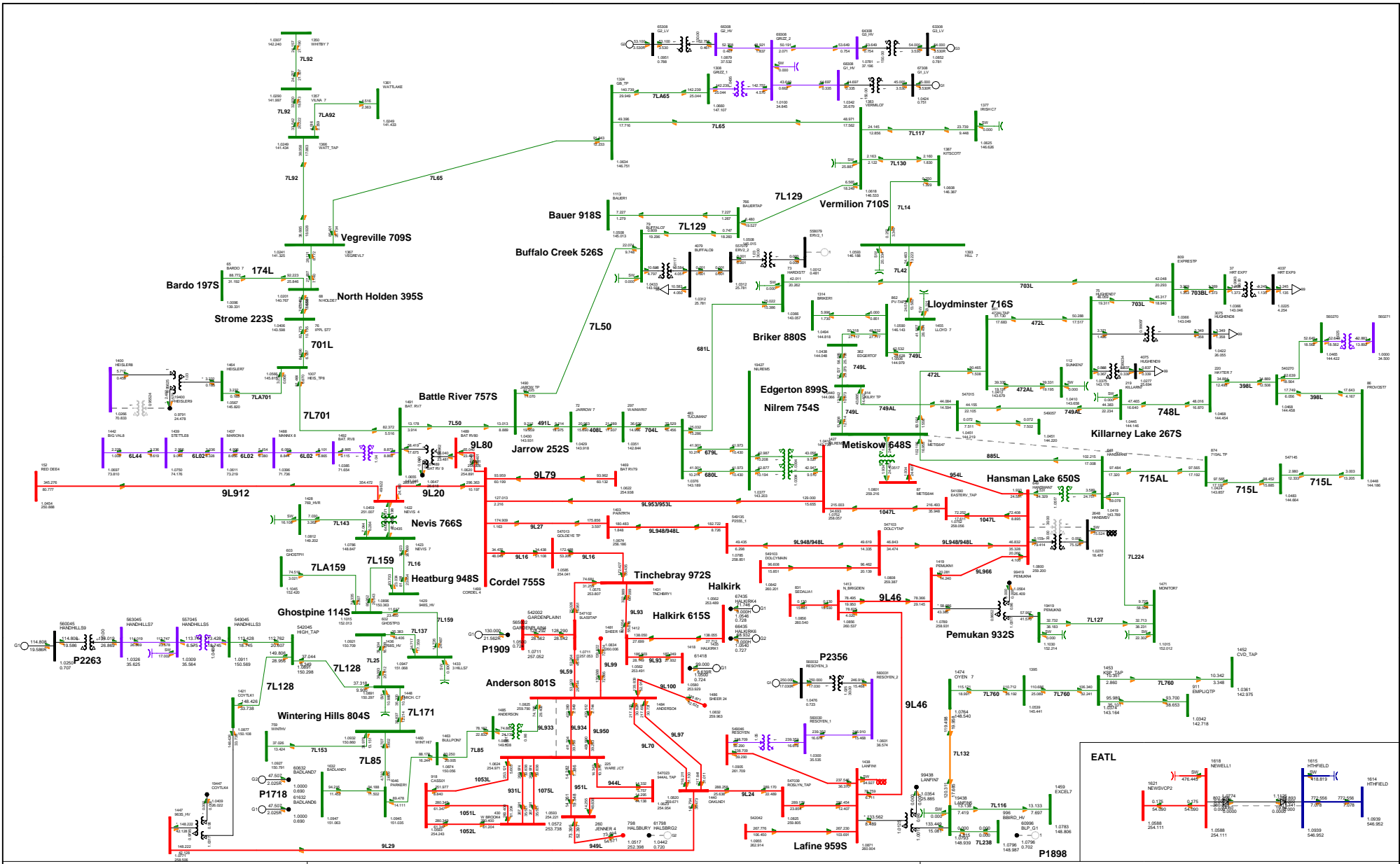
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/100MVA  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+300.000

**FIGURE A3.1-10 962L (TINCHEBRAY 922S TO GAETZ 87S)**  
 2025 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.137 MW

BC Import: -380.451 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



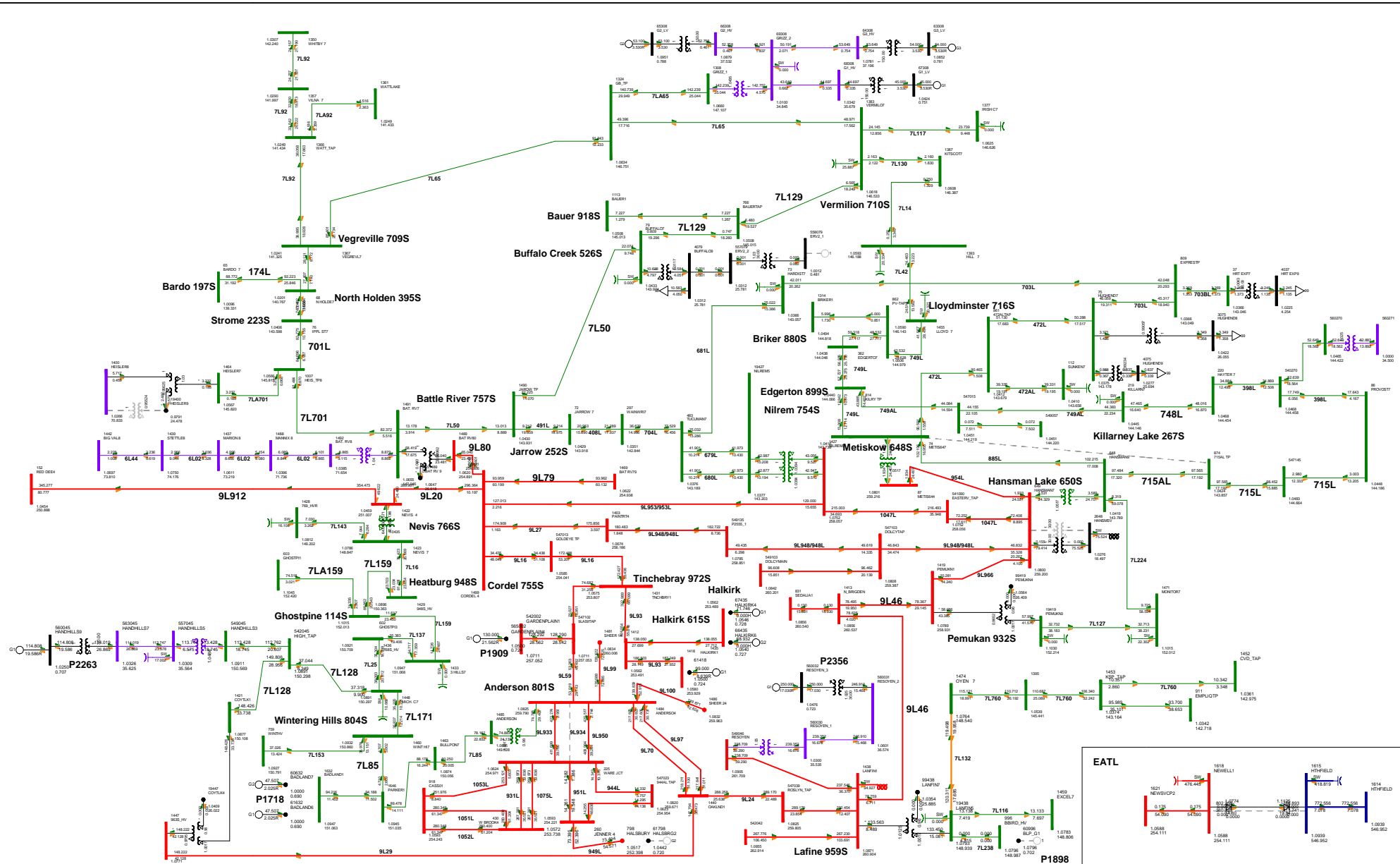
P2356 Oyen MPC Wind

Bus Voltage (kV) 500  
 Breaker (kV) 500  
 Equipment (MVA) 100.00/100.00  
 W: +0.000+0.400-0.000-0.000-0.000+0.000+0.000

FIGURE A3.1-11 9L933 (ANDERSON 801S TO WARE JUNCTION 132S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.151 MW

BC Import: -435.180 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+54.500-88.000+138.000+240.000+500.000

**FIGURE A3.1-12 9L934 (ANDERSON 801S TO WARE JUNCTION 132S)**  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.151 MW

BC Import: -435.180 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



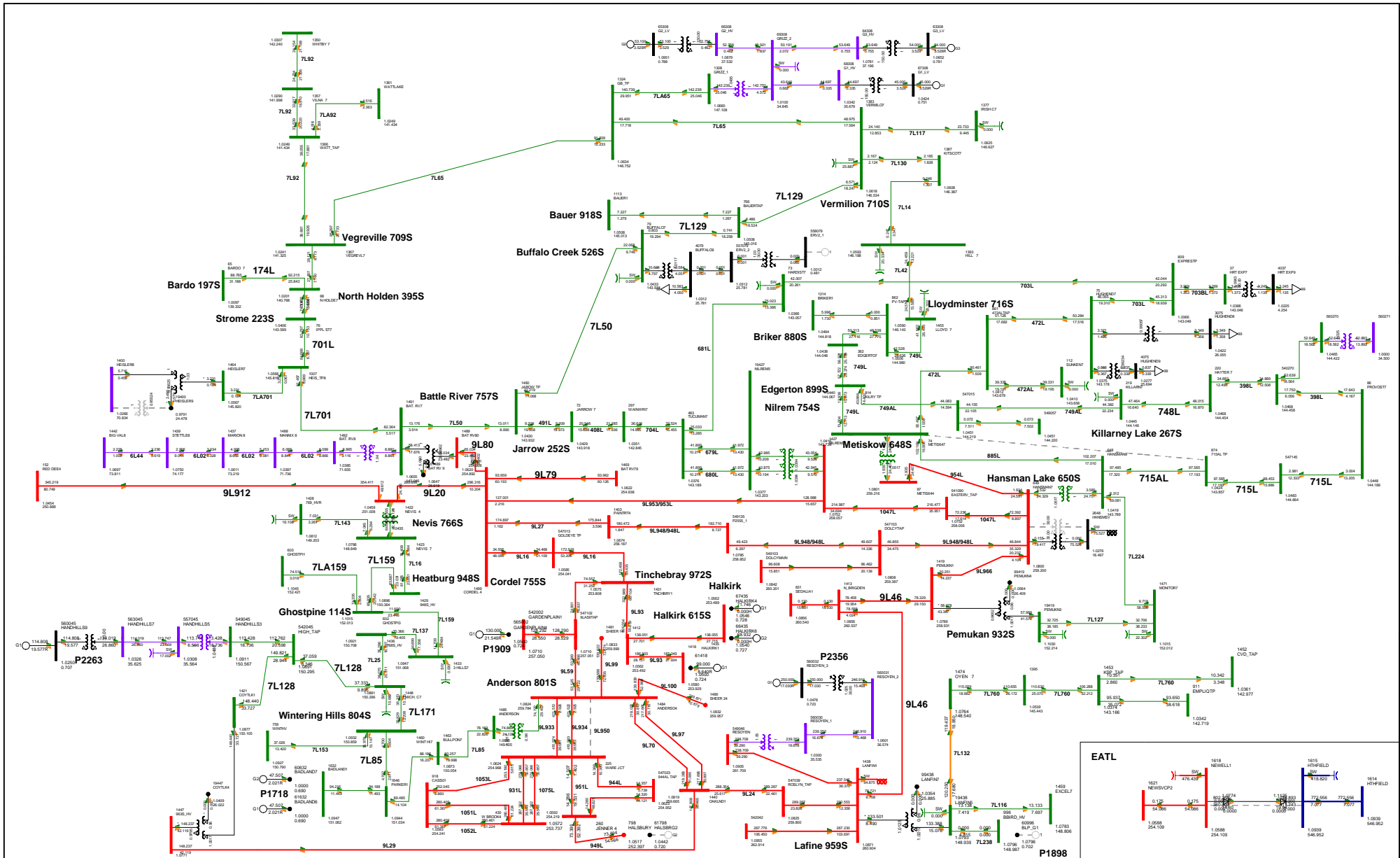


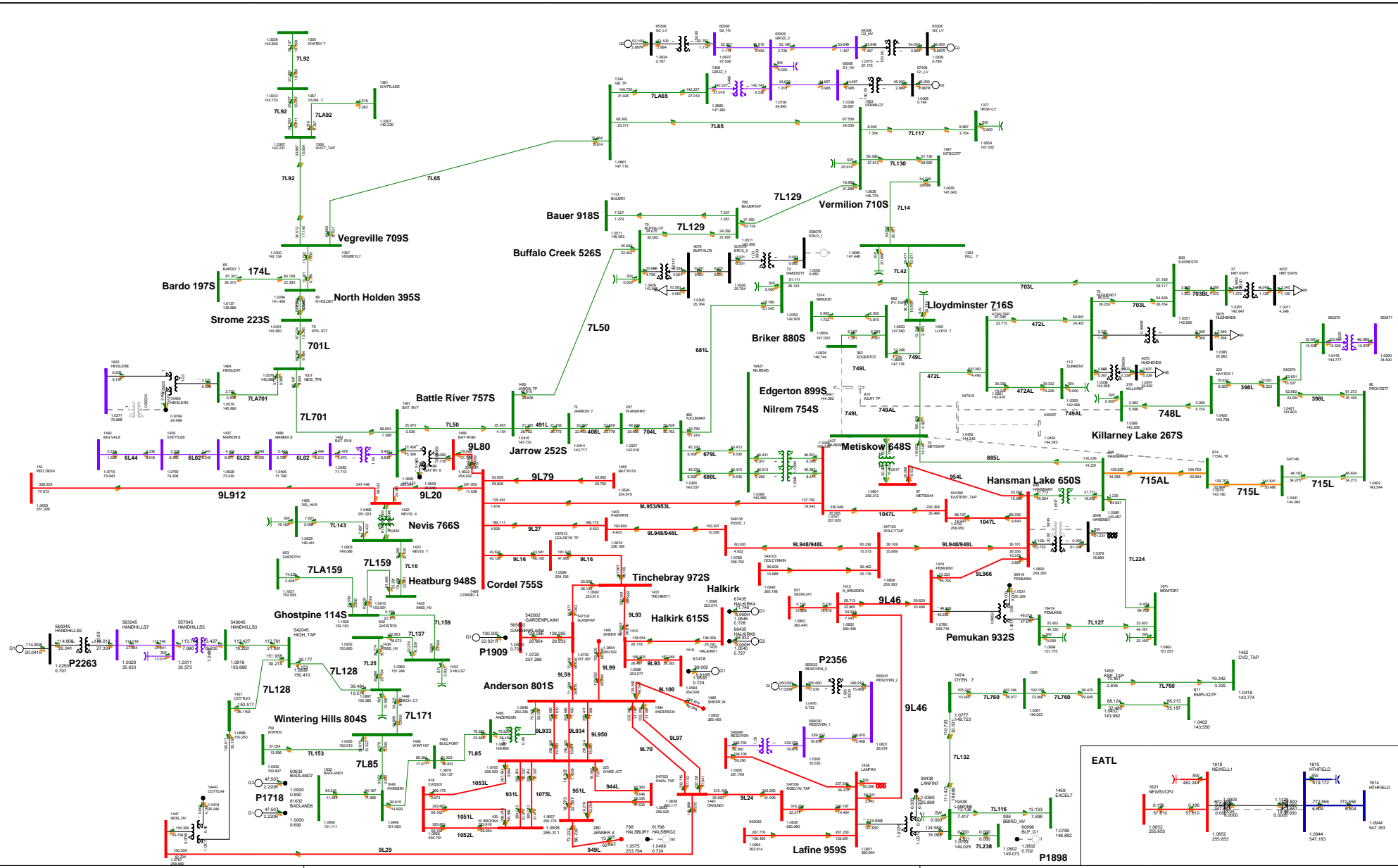
FIGURE A3.1-13 9L550 (ANDERSON 801S TO WARE JUNCTION 132S)  
2028 SUMMER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V/90)  
Breaker (V/90)  
Equipment (V/90)  
W: +0.000+34.500=-138.000+340.000=+90.000

WATL: -2.433 MW  
EATL: -808.151 MW

BC Import: -435.227 MW  
Sask Import: -150.000 MW  
MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

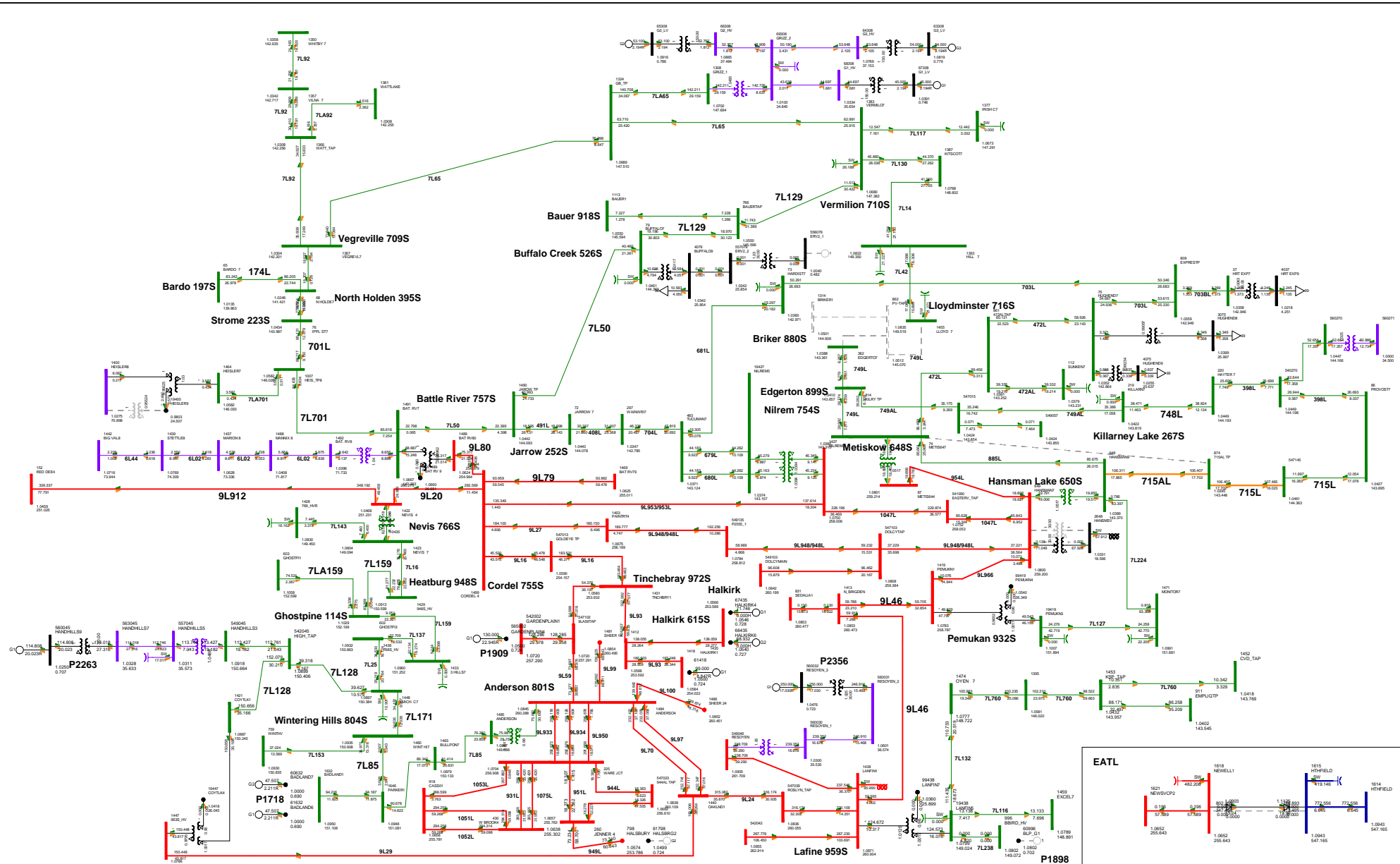
Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/100MVA  
 W: +0.000+34.500-88.000+138.000+240.000+400.000

**FIGURE A3.1-14 749L (METISKOW 648S TO EDGERTON 899S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.194 MW

BC Import: -440.174 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW





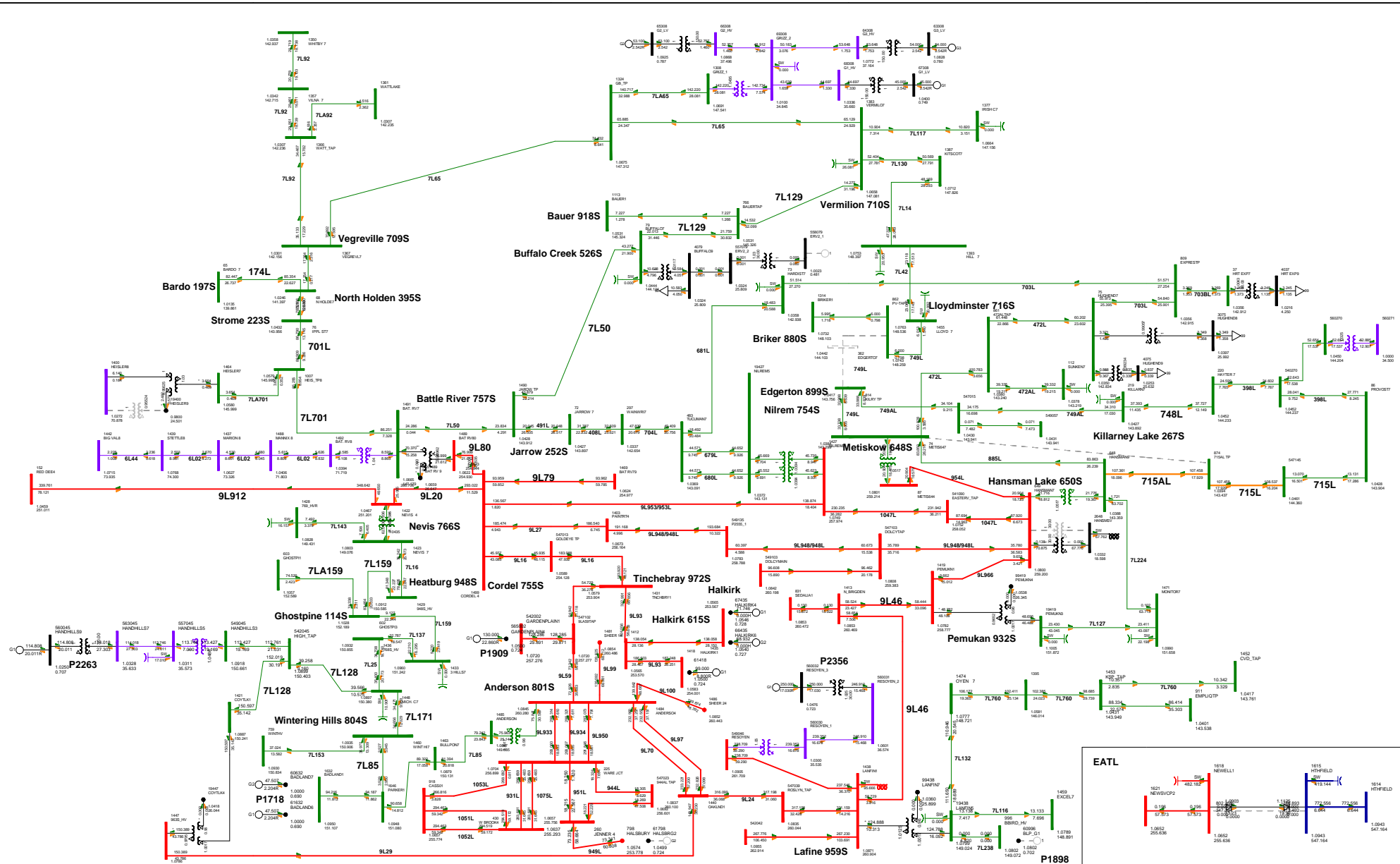
**P2356 Oyen MPC Wind**

Bus Voltage (V) 90  
 Base MVA 100  
 Equipment MVA/MVA 100/50/25/12.5  
 W: +0.000+54.500=-138.000+340.000 =+50.000

**FIGURE A3.1-15 749L (EDGERTON 899S TO LLOYDMINSTER 716S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.194 MW

BC Import: -448.542 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100.0  
 W: +0.000+54.500-88.000+138.000+240.000+500.000

**FIGURE A3.1-16 EDGERTON 899S TRANSFORMER T1**  
 2023 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.193 MW

BC Import: -447.707 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW

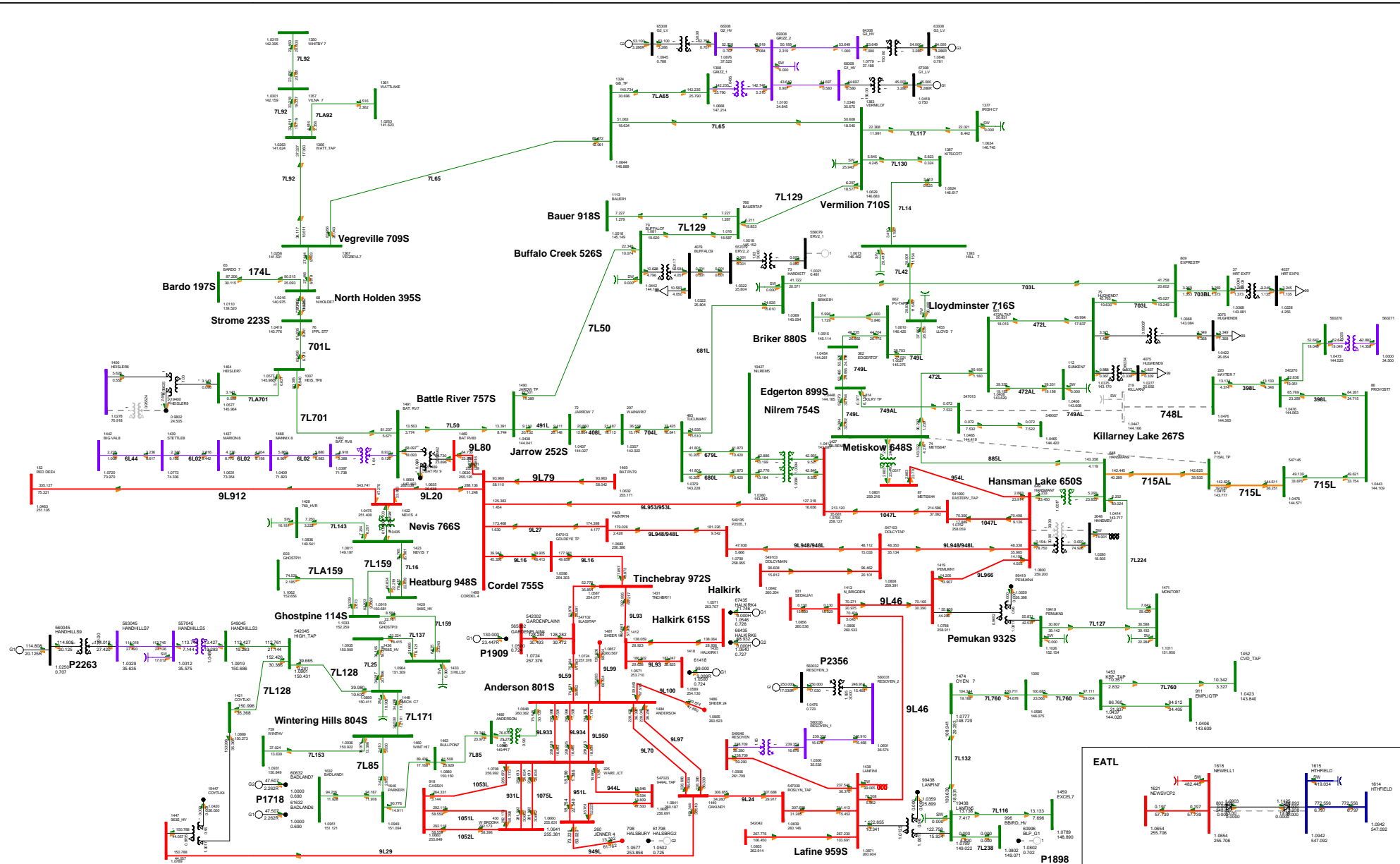


FIGURE A3.1-17 KILLARNEY LAKE 267S TRANSFORMER T1  
 2025 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

**P2356 Oyen MPC Wind**  
 Bus Voltage (V) @ 110.000  
 Branch W/F 0.000  
 Equipment W/M/M/kvar 102.76/MVA  
 W: +0.000+34.500+89.000+138.000+240.000+500.000

WATL: -2.433 MW  
 EATL: -808.195 MW

BC Import: -445.404 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW

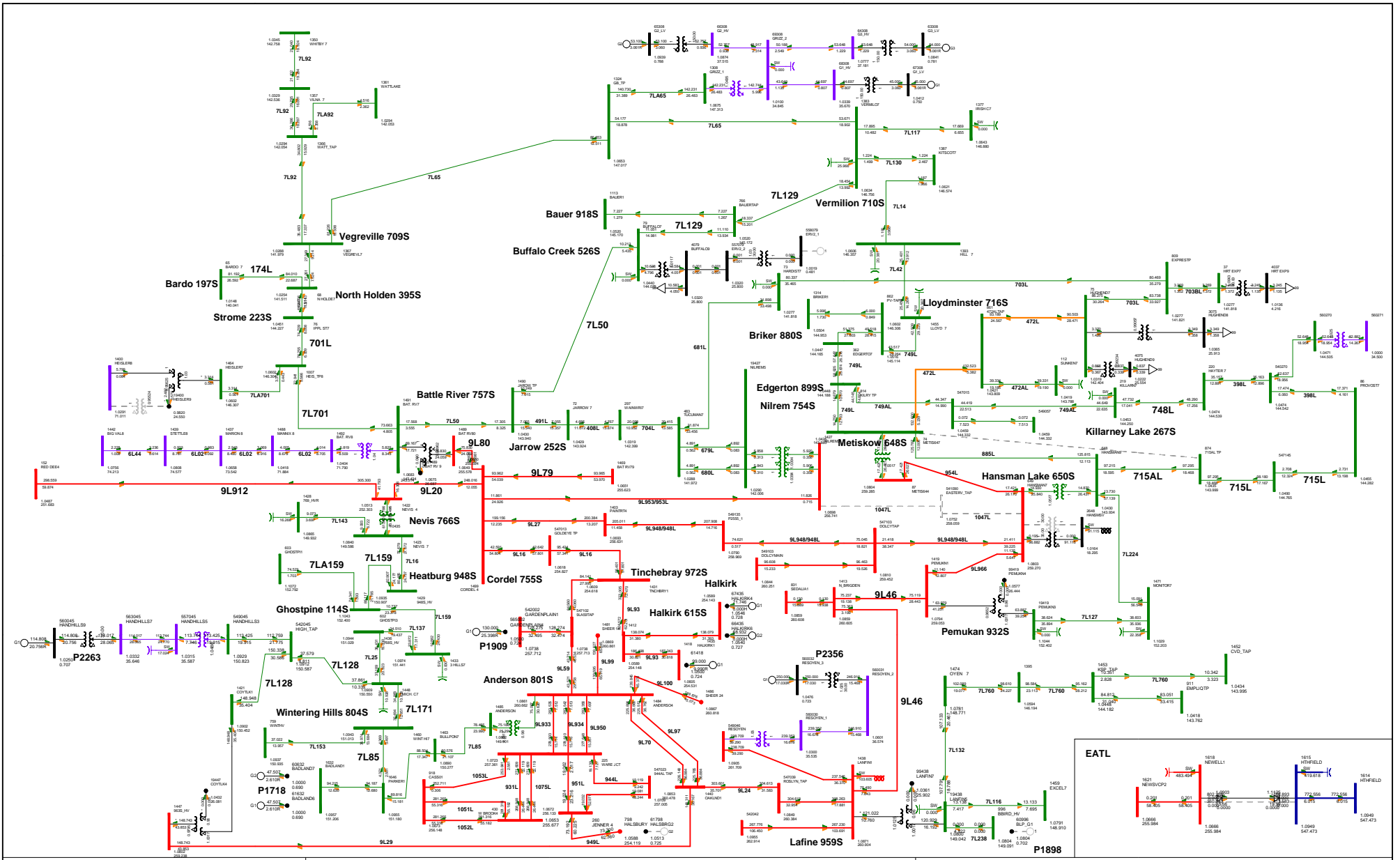


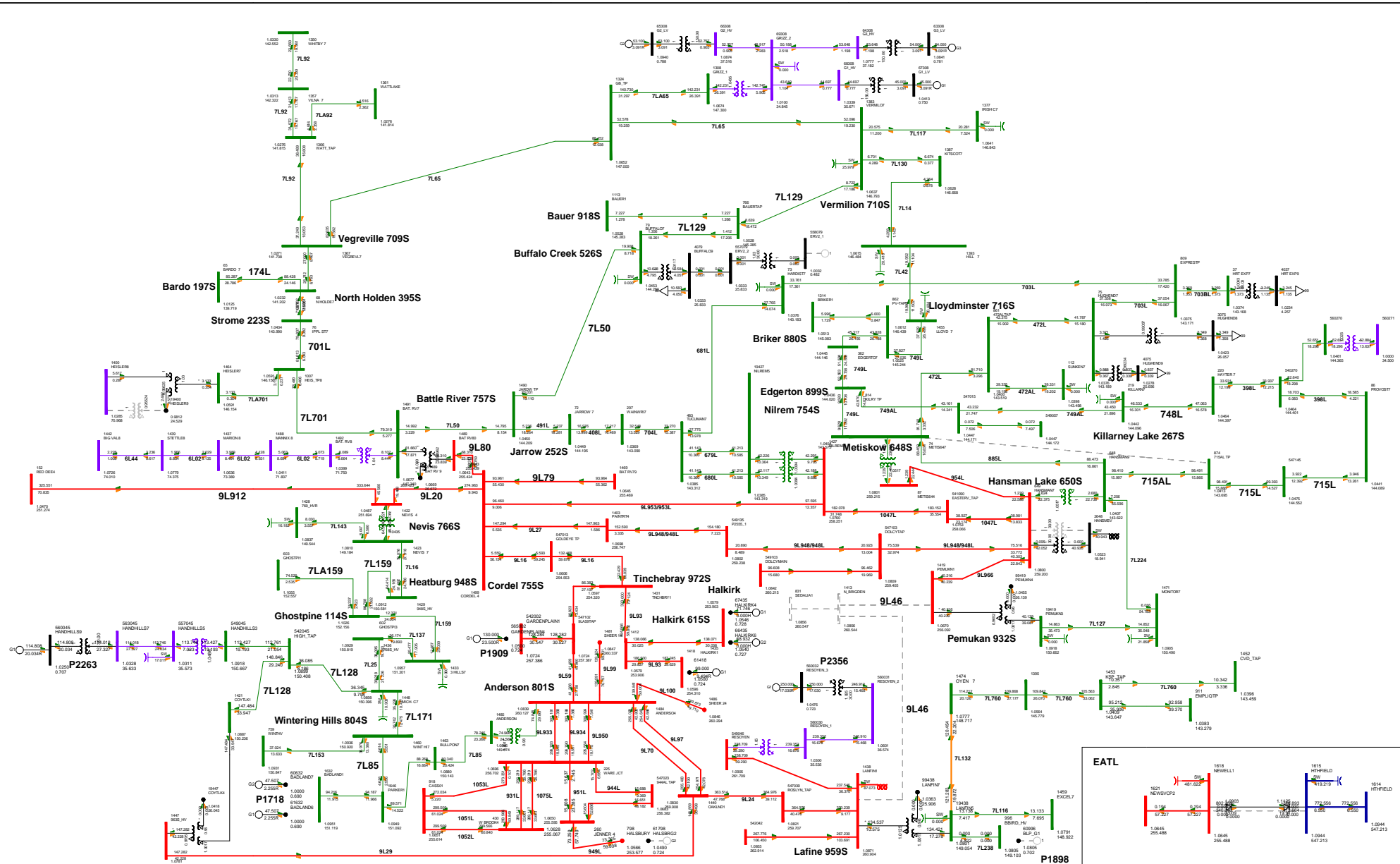
FIGURE A3.1-18 1047L (HANSMAN LAKE 650S TO NILREM 574S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Base: 110 kV  
 Equipment: 110/115 kV  
 102.5% V @ 110 kV  
 W: +0.000 +34.500 -88.000 +138.000 +240.000 +500.000

WATL: -2.433 MW  
 EATL: -808.203 MW

BC Import: -319.046 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



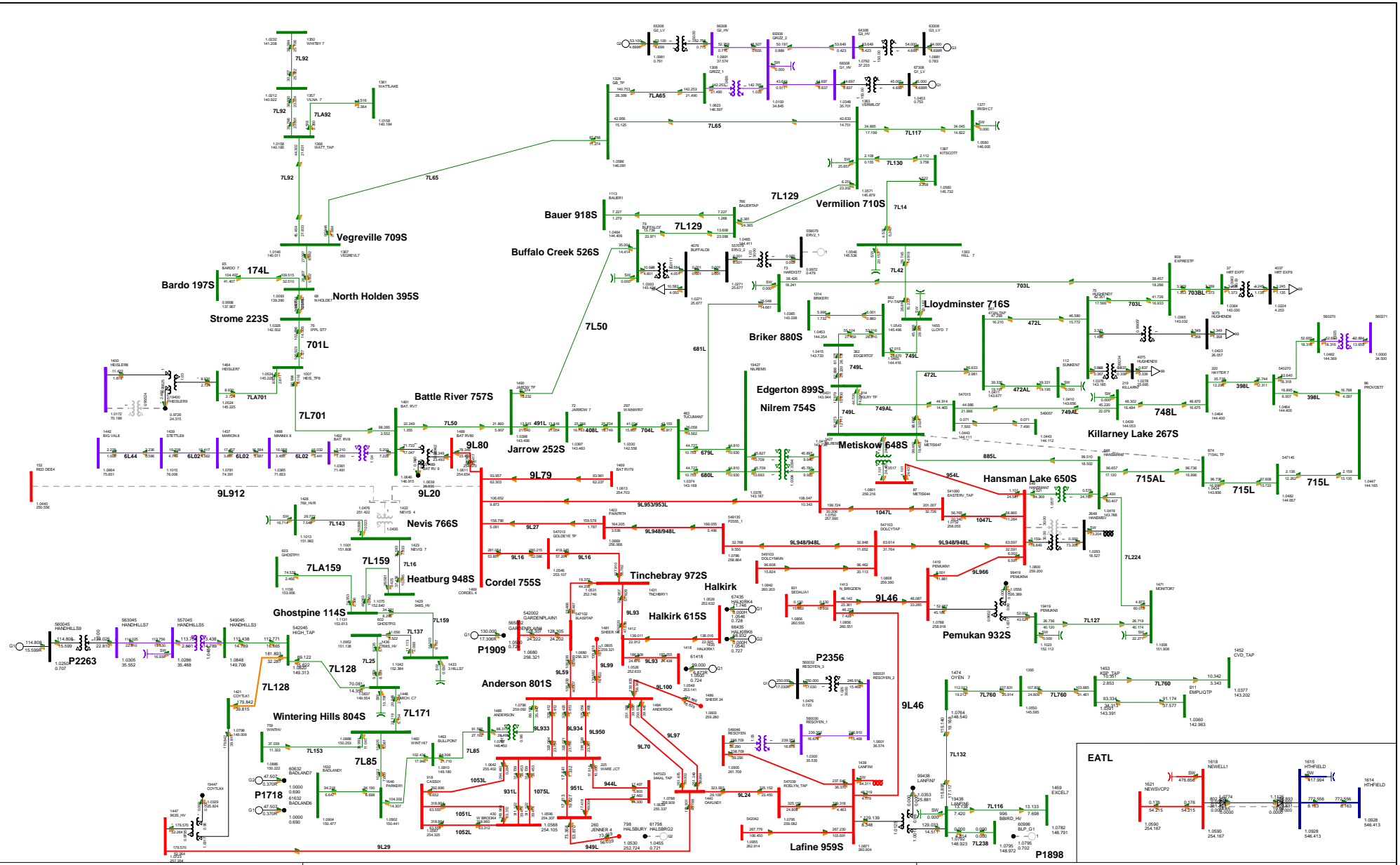
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MW  
 Equipment MVA/Mvar  
 102.5kV/50MVA  
 W: +0.000+54.500-88.000+138.000+240.000+500.000

**FIGURE A3.1-19 9L46 (LANFNE 959S TO PEMUKAN 932S)  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.189 MW

BC Import: -445.635 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



P2356 Oyen MPC Wind

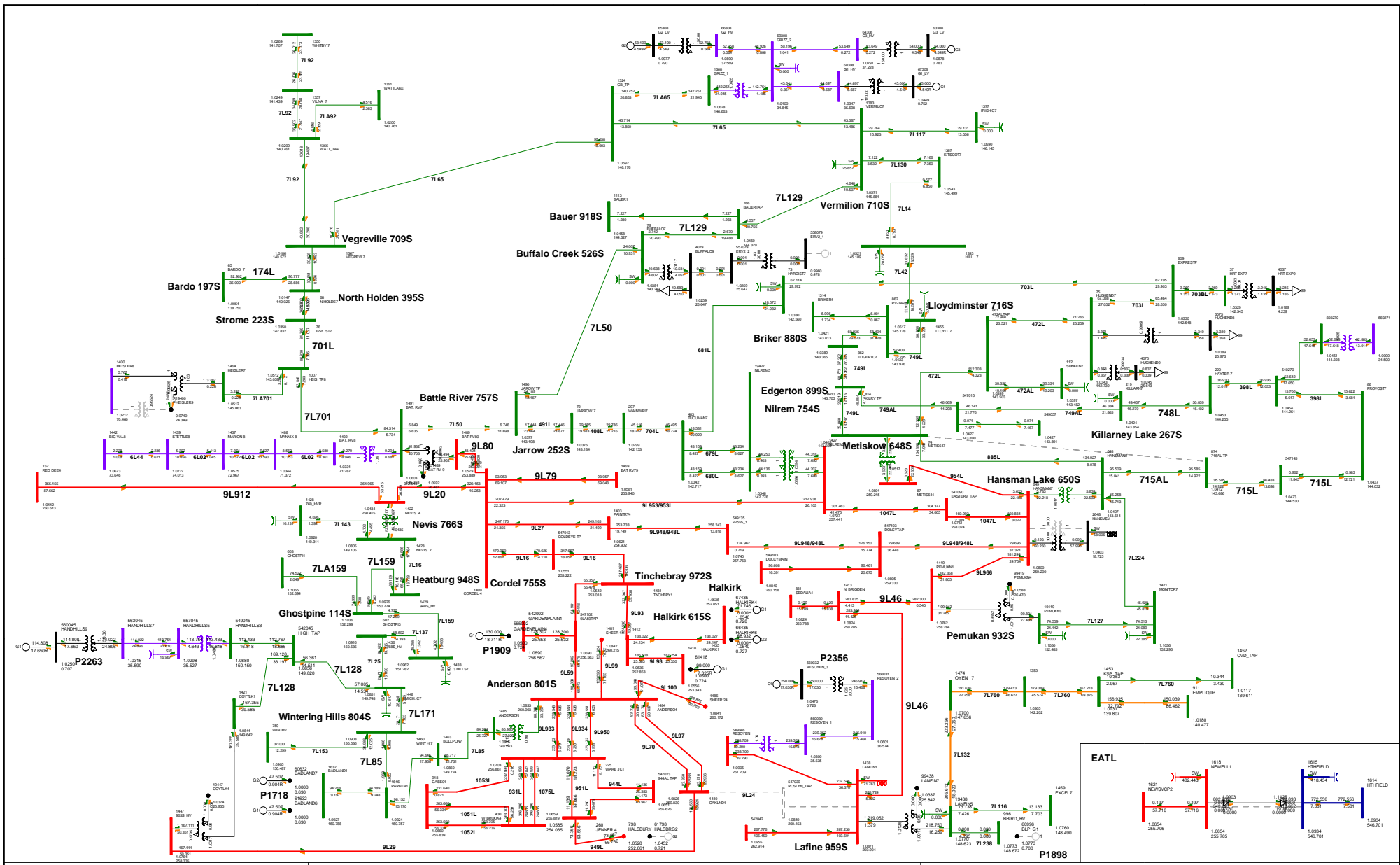
Bus Voltage (V) @  
Base MW  
Equipment - MW/Mvar  
10.000/30.000  
W: +0.000/+4.500=-0.000/+38.000/+90.000

FIGURE A3.1-20 766S T1 (NEVIS 766S 240/138 KV TRANSFORMER)  
2028 SUMMER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
EATL: -808.153 MW

BC Import: -420.718 MW  
Sask Import: -150.000 MW  
MATL Import: -182.800 MW





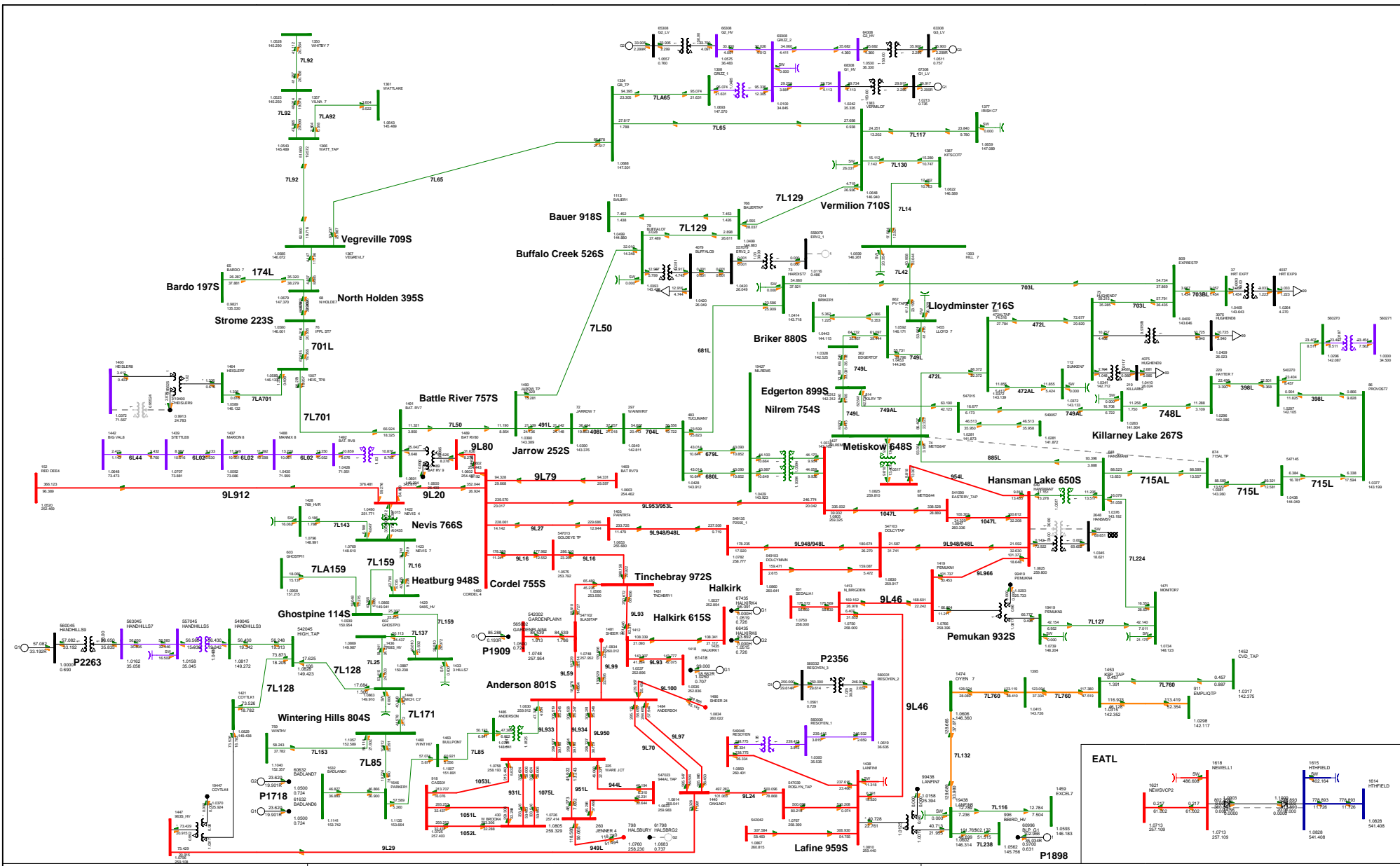
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100MVA  
 W: +0.000+34.500-88.000+138.000+240.000+500.000

**FIGURE A3.1-21 9L24 (OAKLAND 946S - LANFIRE 959S)**  
 2028 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.195 MW

BC Import: -403.606 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

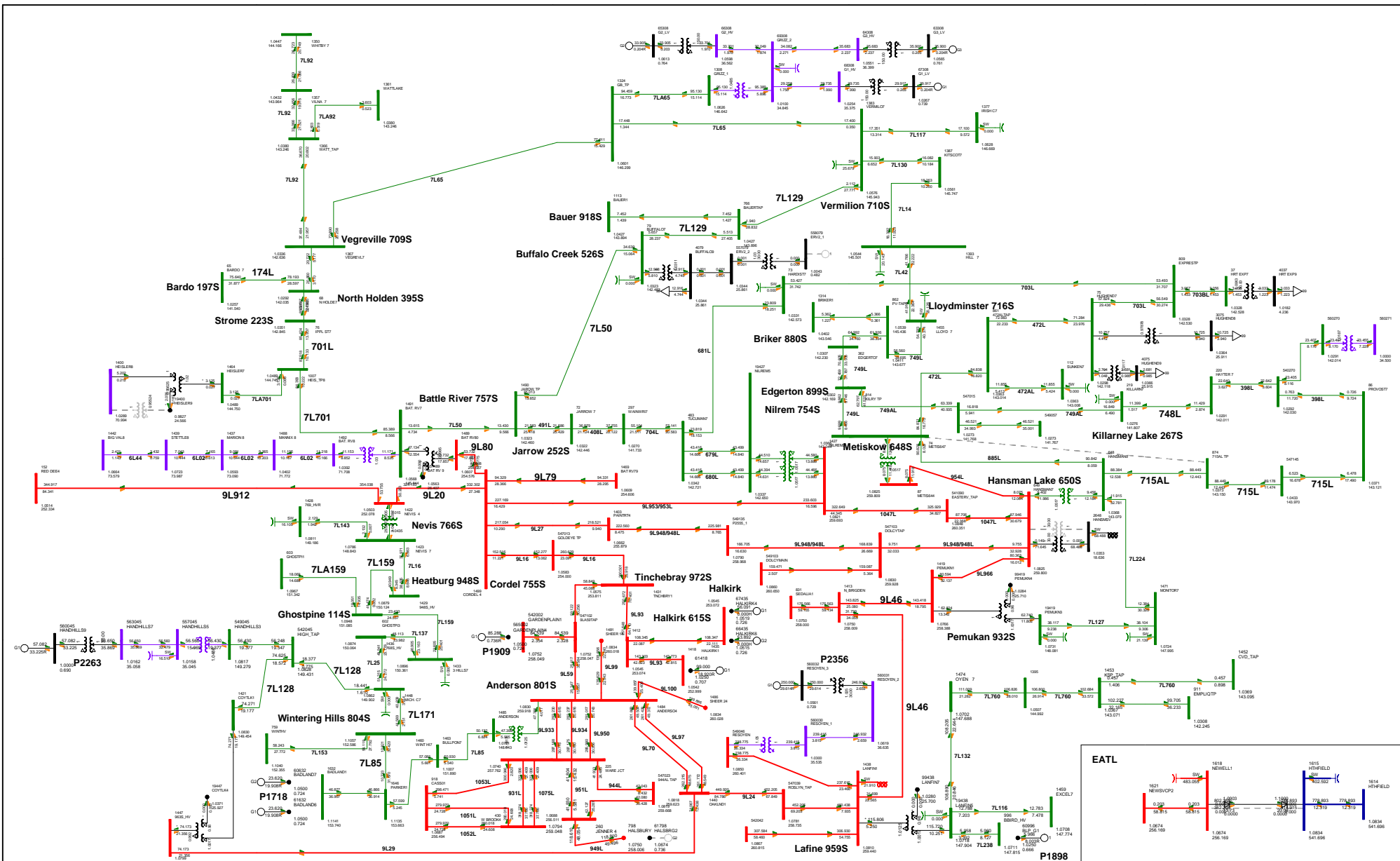
Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 MW = 0.0004 \* kVA - 0.0009 \* MW @ 100.000 = 0.0000

**FIGURE A3.2-0-N-0: NORMAL OPERATION**  
 2028 SUMMER LIGHT (POST-CONNECTION), PRE-CURTAILMENT  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.687 MW

BC Import: -868.006 MW  
 Sask Import: -0.000 MW  
 MATL Import: -183.024 MW





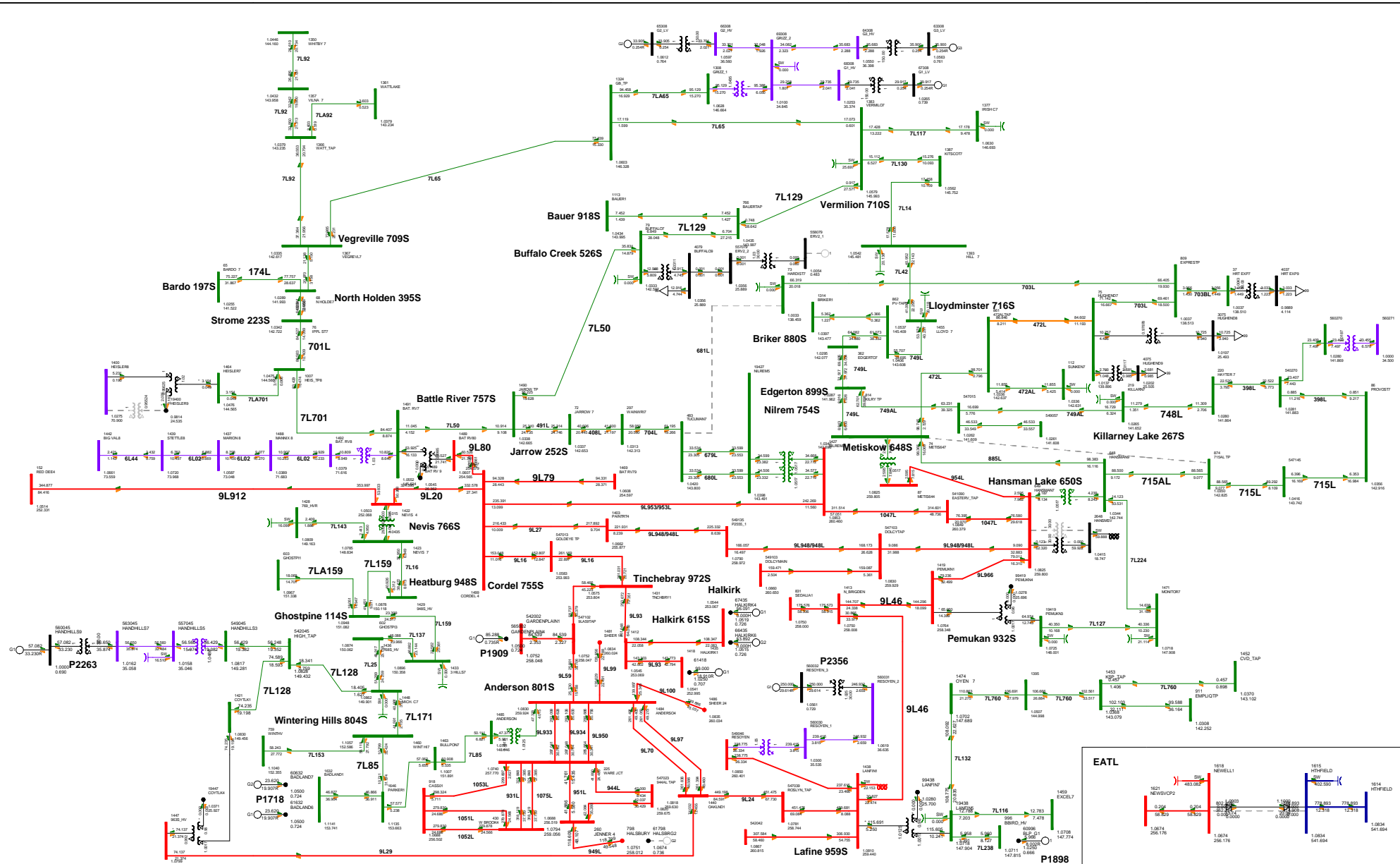
**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500+89.000+138.000+194.000+260.000

**FIGURE A3.2.1-N-0: NORMAL OPERATION**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.660 MW

BC Import: -805.556 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



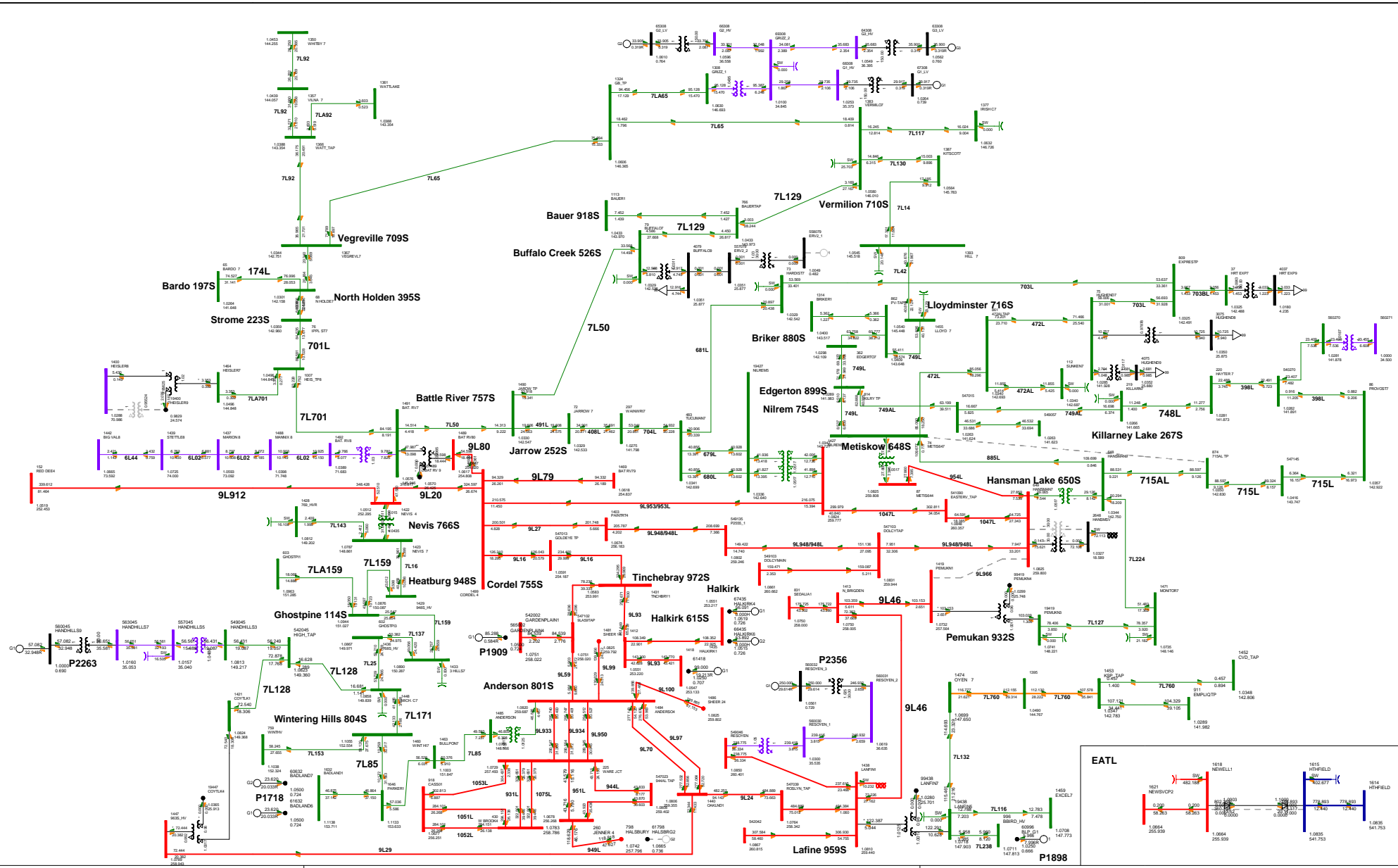
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100  
 W: +0.000+34.500-138.000+240.000+500.000

**FIGURE A3.2-2 681L (HARDISTY 377S TO TUCUMAN 478S)  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.660 MW

BC Import: -804.795 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



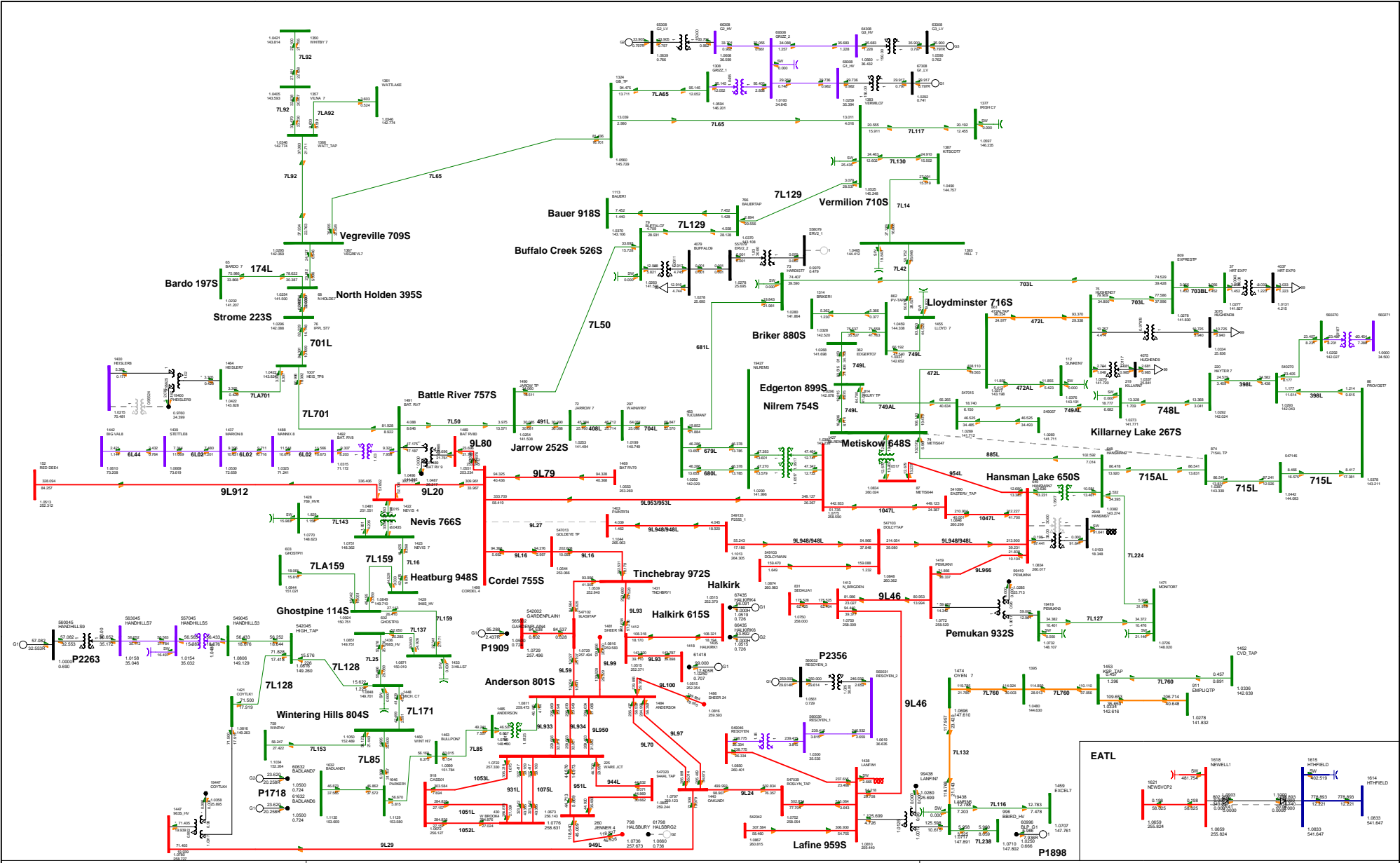
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MW @  
 Equipment / MVA @  
 102.5kV @ 100.0kV @  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

**FIGURE A3.2-3 966L (HANSMAN LAKE 650S TO PEMUKAN 932S)**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.653 MW

BC Import: -805.179 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/MW  
 102.5/100kVA  
 W: +0.000+54.500-118.000+340.000+900.000

**FIGURE A3.2.4 9L27 (PAINTEARTH CREEK 863S TO CORDEL 755S)**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.650 MW

BC Import: -788.004 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW

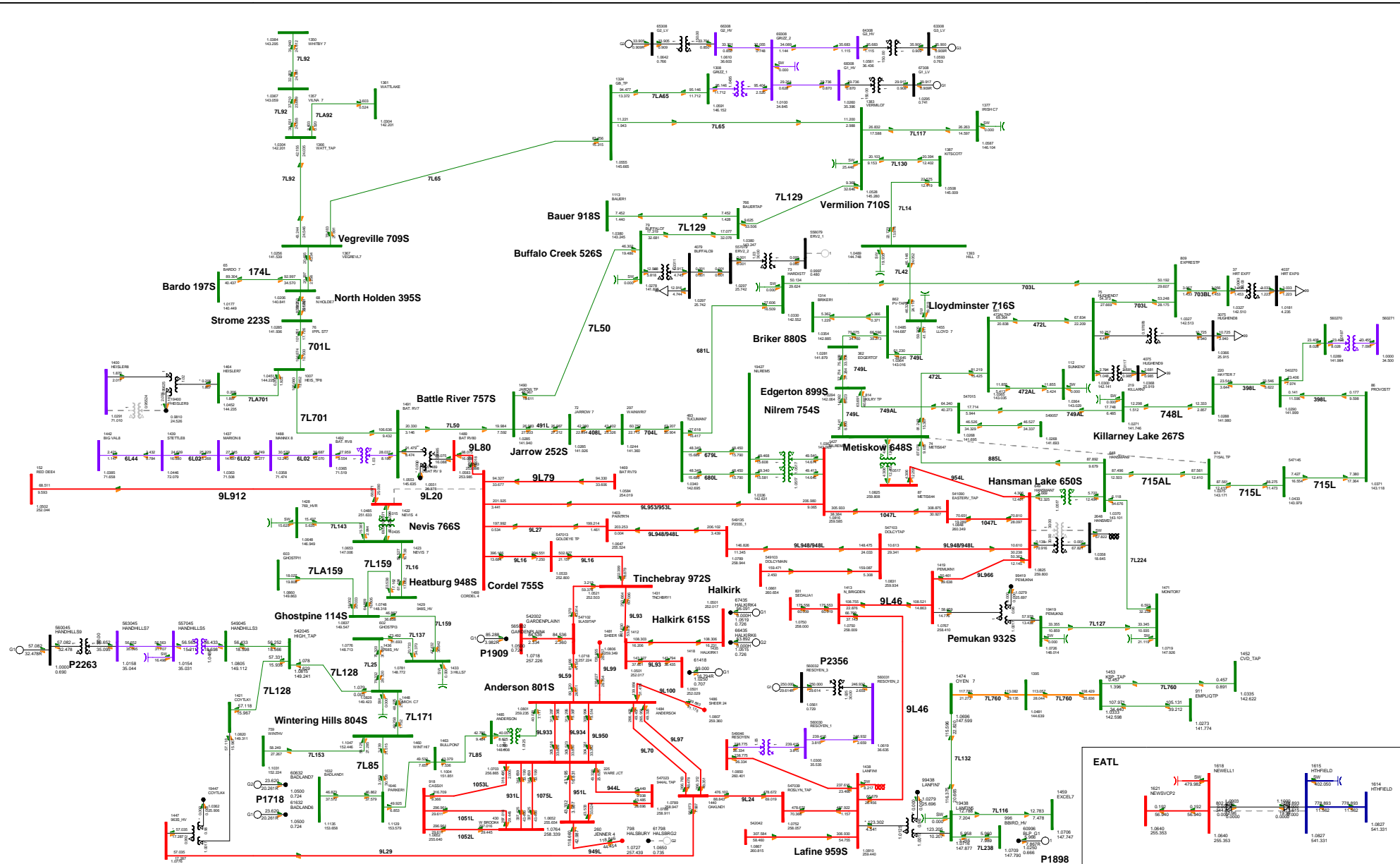


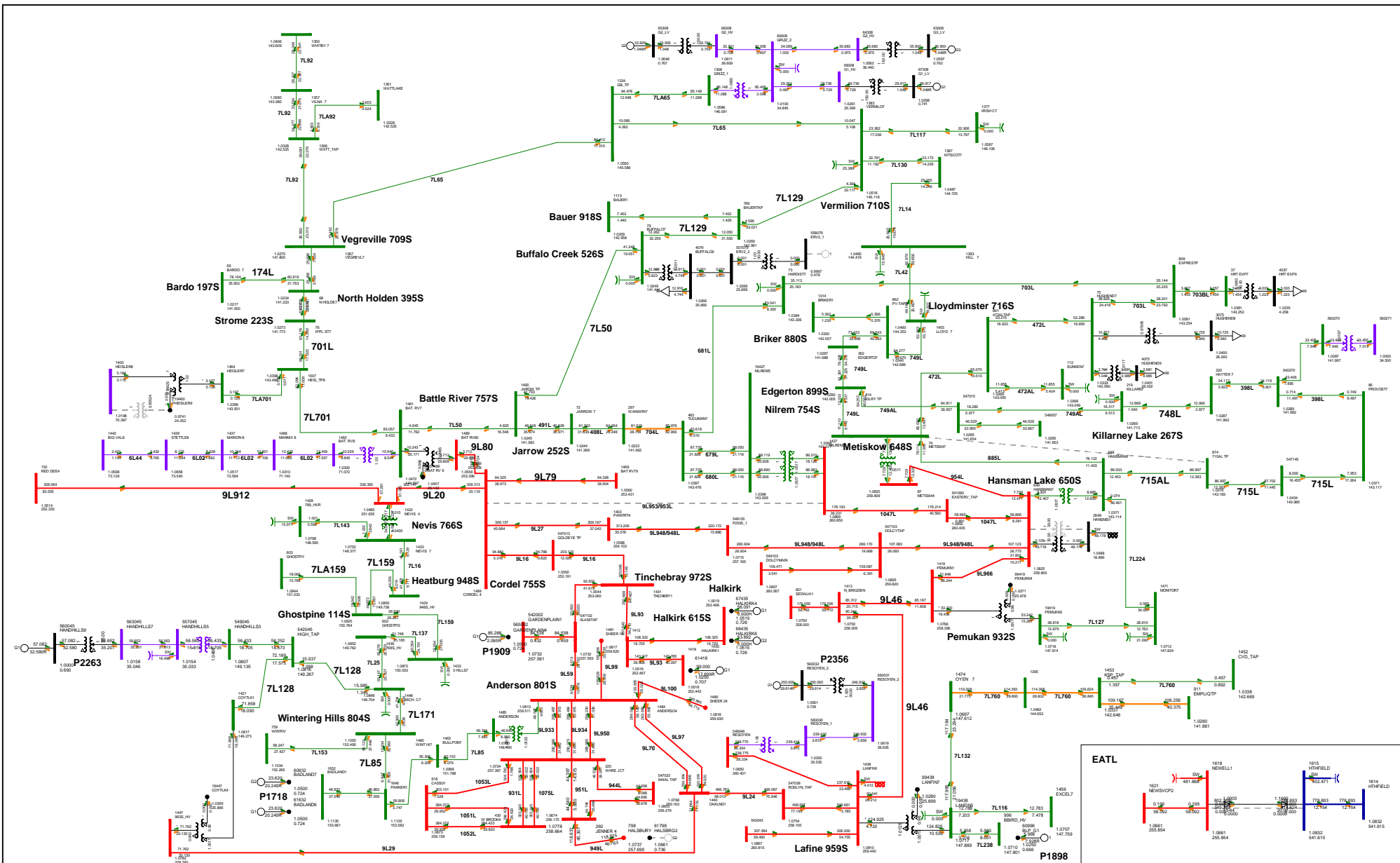
FIGURE A3.2-5 9L20 (NEVIS 766S TO CORDEL 755S)  
 2025 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+34.500+89.000+133.000+176.000+219.000

WATL: -0.086 MW  
 EATL: -802.636 MW

BC Import: -780.577 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

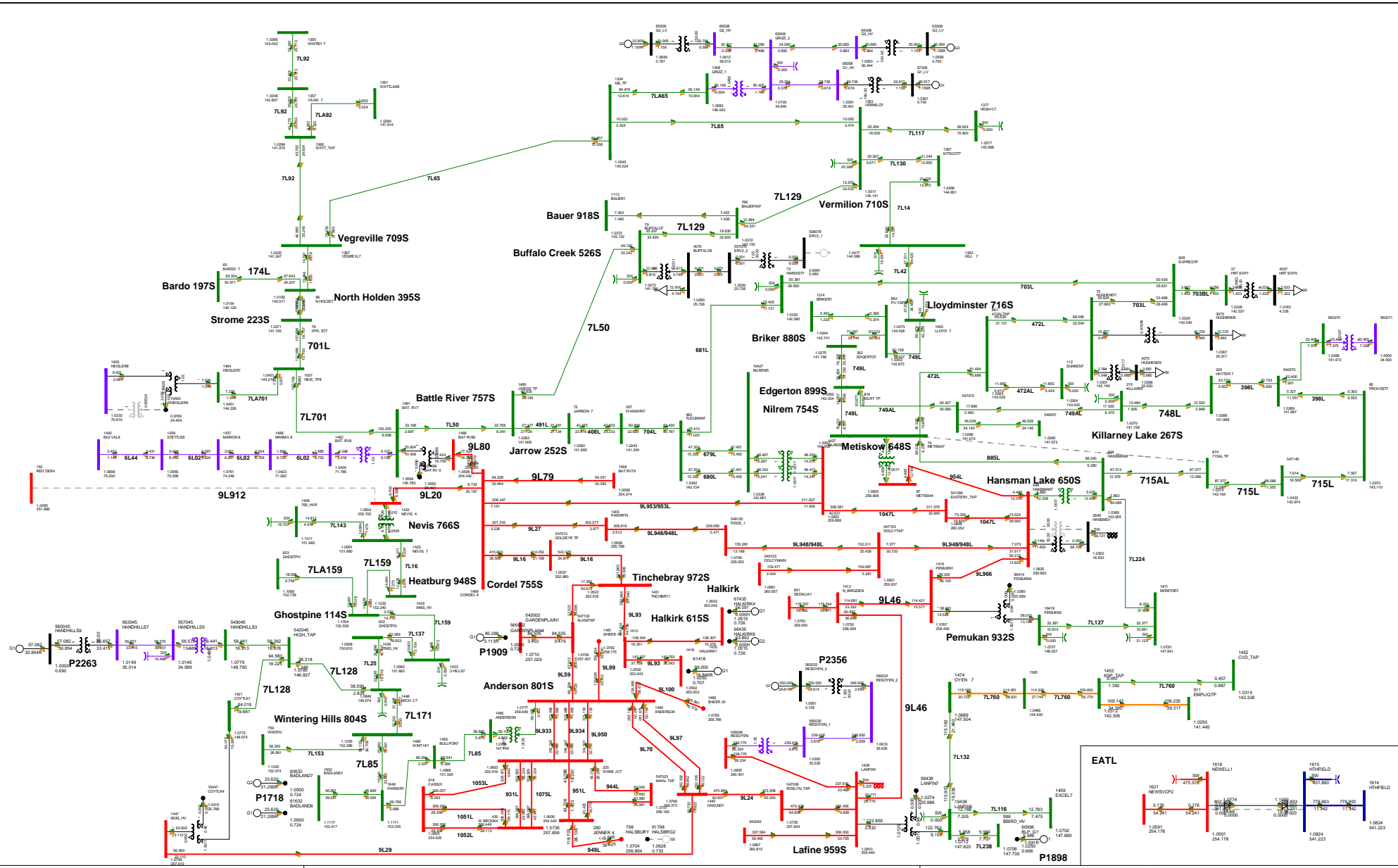
Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100.0  
 W: +0.000+34.500=-89.009 =+138.000 =+240.000 =+500.000

**FIGURE A3.2-4 953L (NILREN 574S TO CORDEL 755S)**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.651 MW

BC Import: -790.714 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW





**P2356 Oyen MPC Wind**

Bus Voltage (kV) 100  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 100.000+34.500+138.000+240.000+500.000

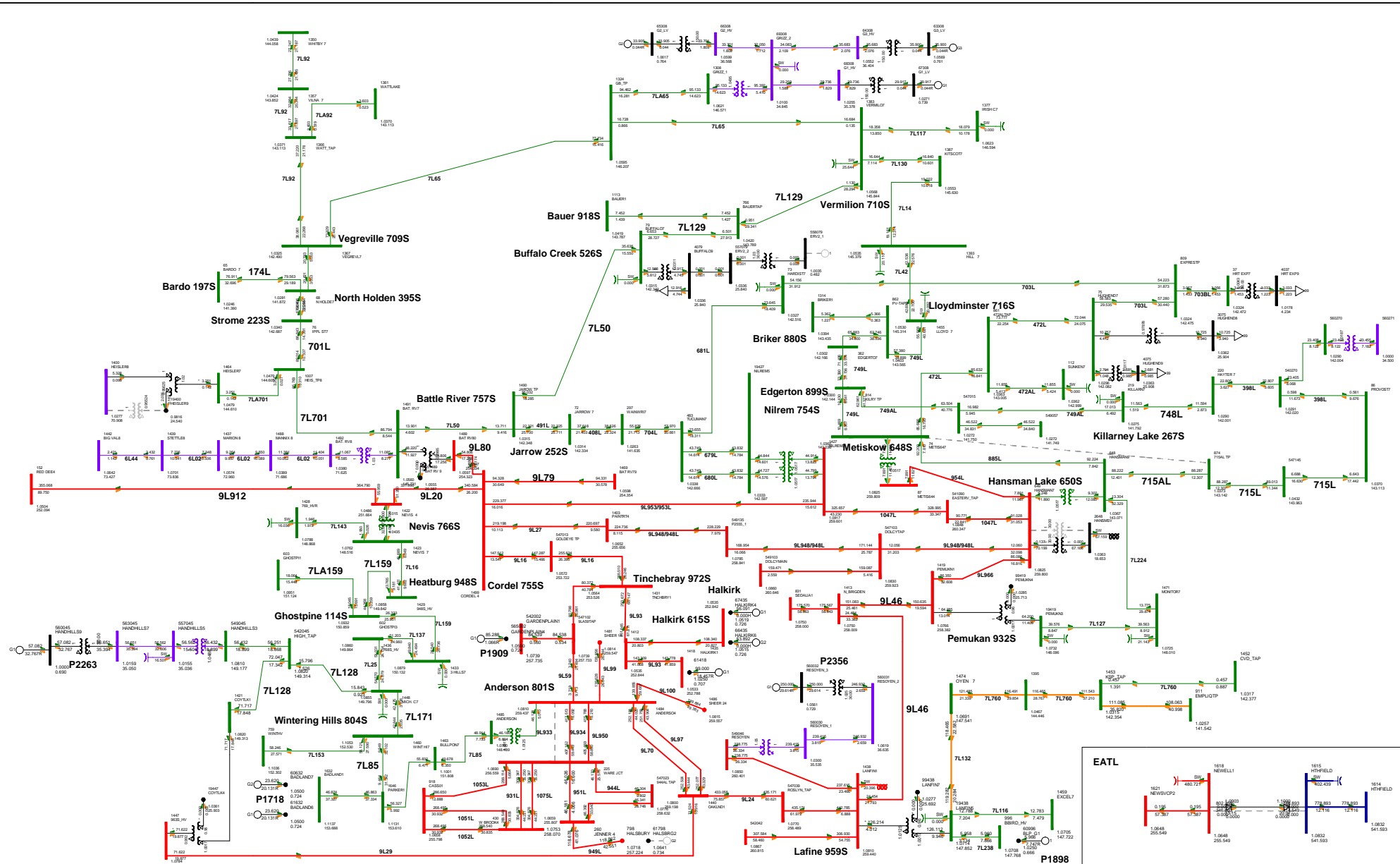
**FIGURE A3.2-7 912L (NEVIS 766S TO RED DEER 63S)  
 2025 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.604 MW

BC Import: -779.272 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW







**P2356 Oyen MPC Wind**

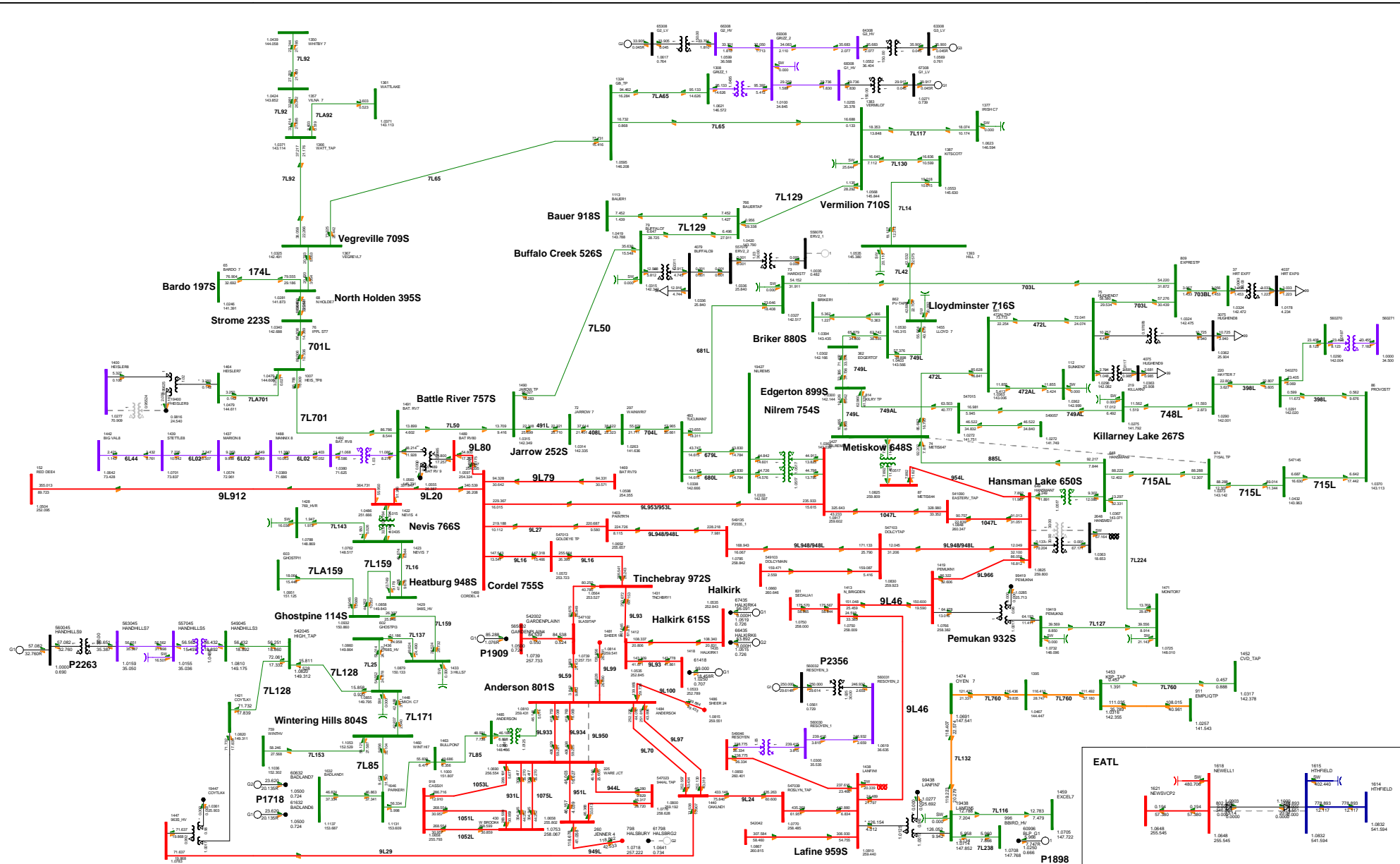
Bus Voltage (V) 90  
 Branch W/F 100  
 Equipment W/F 100  
 W: +0.000+34.500+89.000+138.000+240.000+500.000

**FIGURE A3.2-9 9L933 (ANDERSON 801S TO WARE JUNCTION 132S)**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.642 MW

BC Import: -796.290 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW





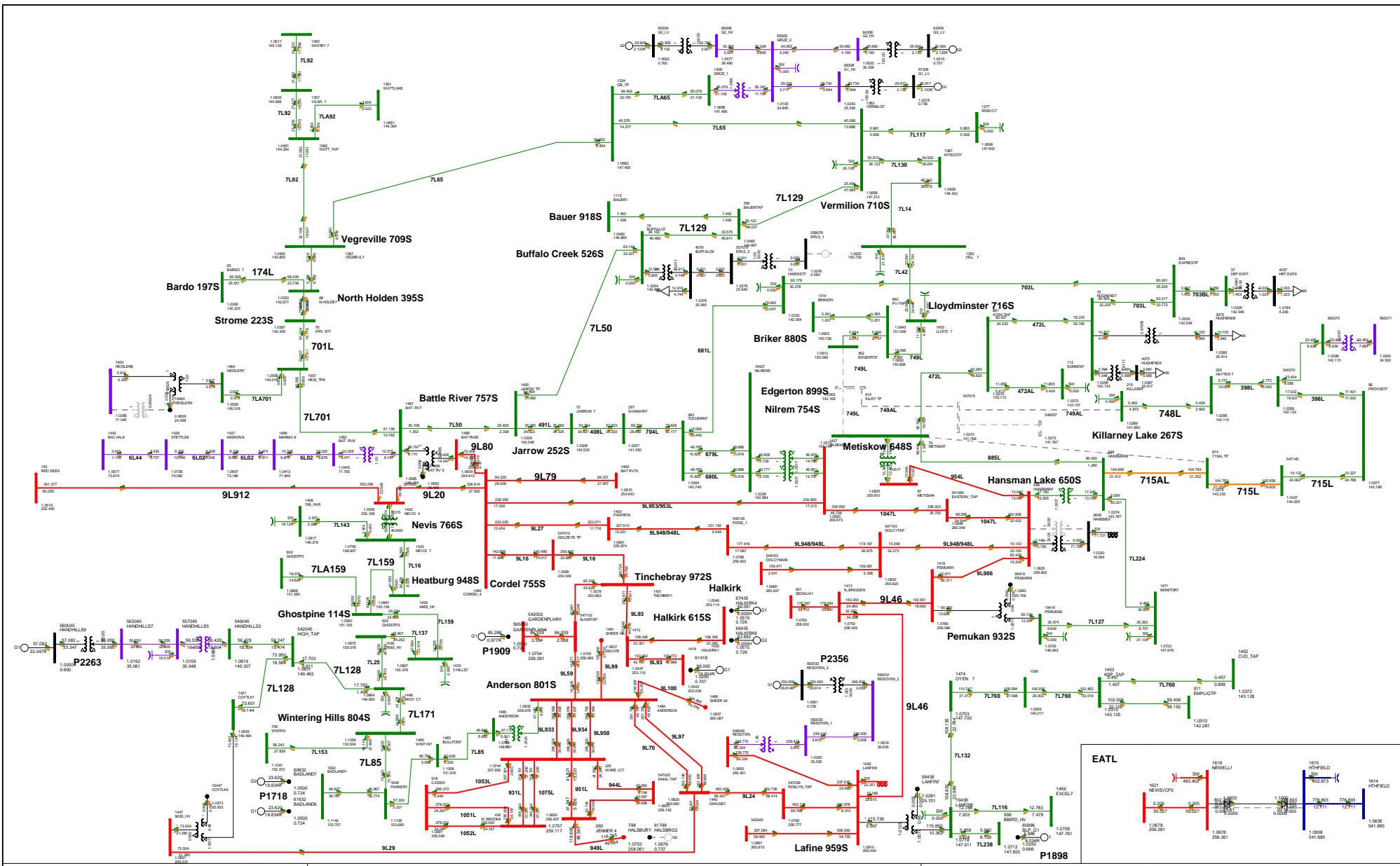
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 W: +0.000+54.500=-138.000+240.000=+500.000

**FIGURE A3-2.1-11.950 (ANDERSON 801S TO WARE JUNCTION 132S) 2028 SUMMER LIGHT (POST-CONNECTION) PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.642 MW

BC Import: -796.332 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 W: +0.000+34.500=-138.000+240.000+800.000

**FIGURE A3.2-12 749L (METISKOW 648S TO EDGERTON 899S)  
 2025 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.662 MW

BC Import: -765.588 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW

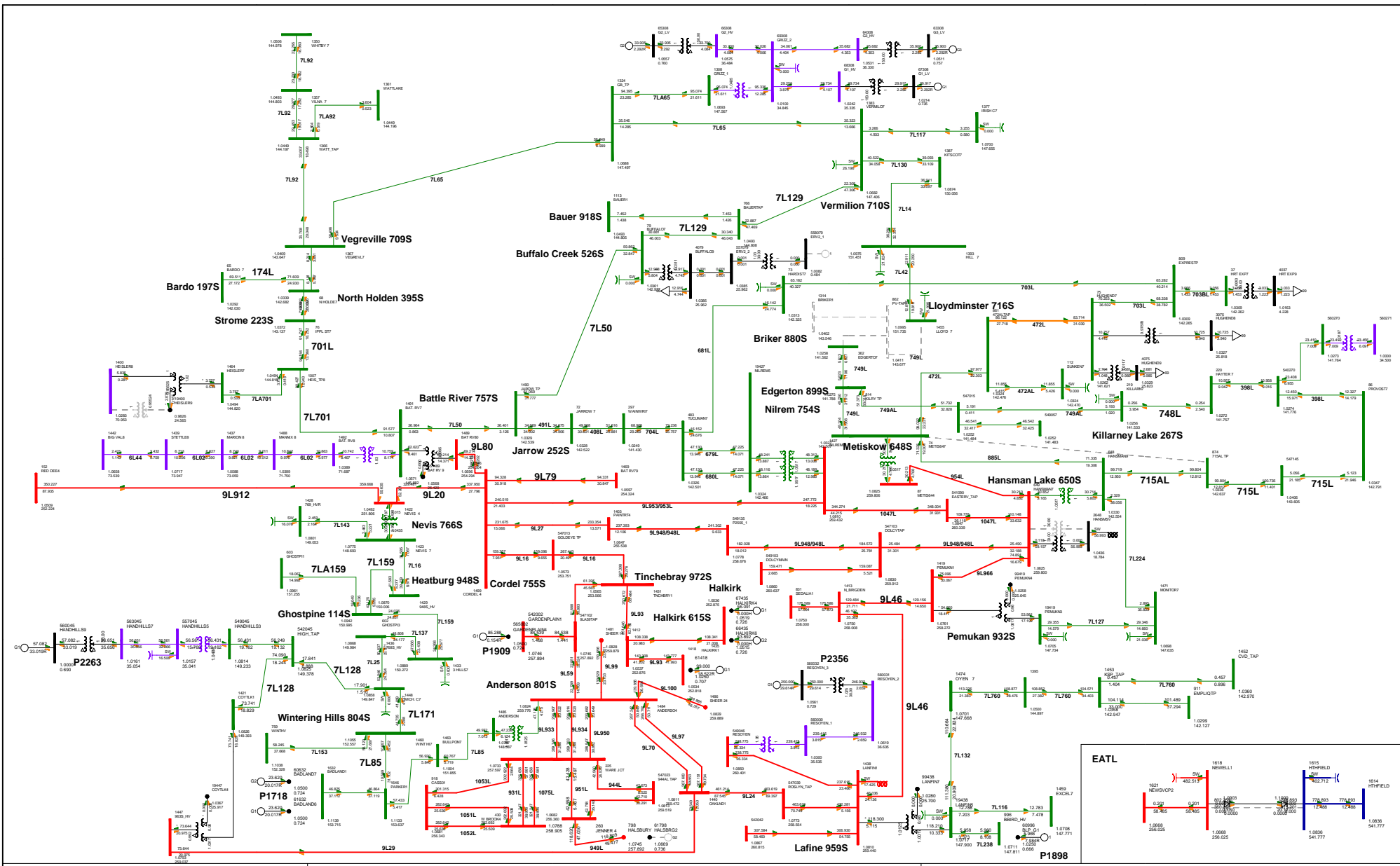


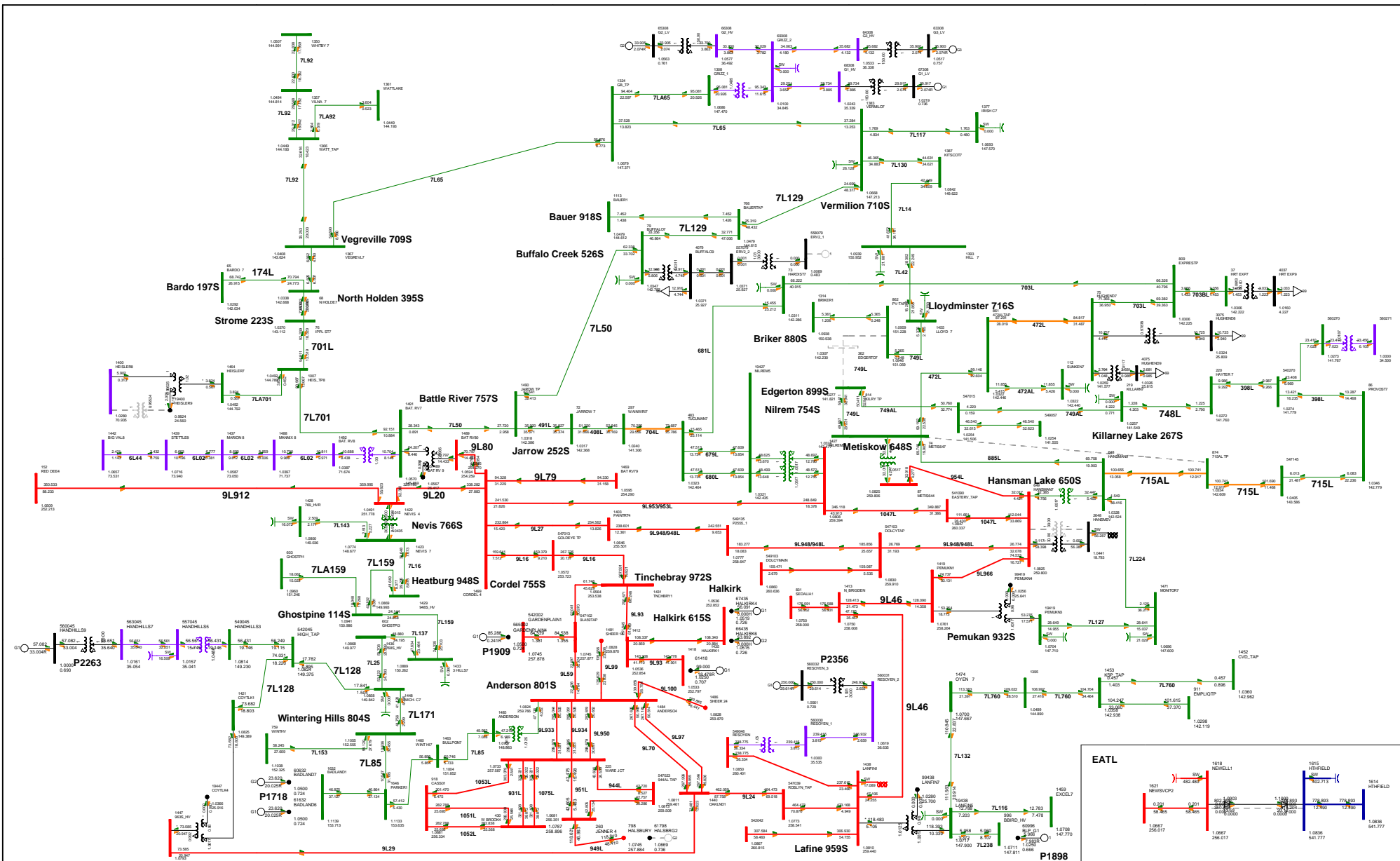
FIGURE A3.2-13 749L (EDGERTON 899S TO LLOYDMINSTER 716S)  
 2025 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) (kV)  
 Base MVA  
 Equipment MVA/MW  
 102.5kV Bus A  
 W: +0.000+0.400-0.800-1.200+0.200+0.000

WATL: -0.086 MW  
 EATL: -802.656 MW

BC Import: -806.415 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 W: +0.000+54.500=-18.000+340.000=900.000

**FIGURE A3.2-14 EDGERTON 899S TRANSFORMER T1**  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -0.086 MW  
 EATL: -802.655 MW

BC Import: -805.298 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



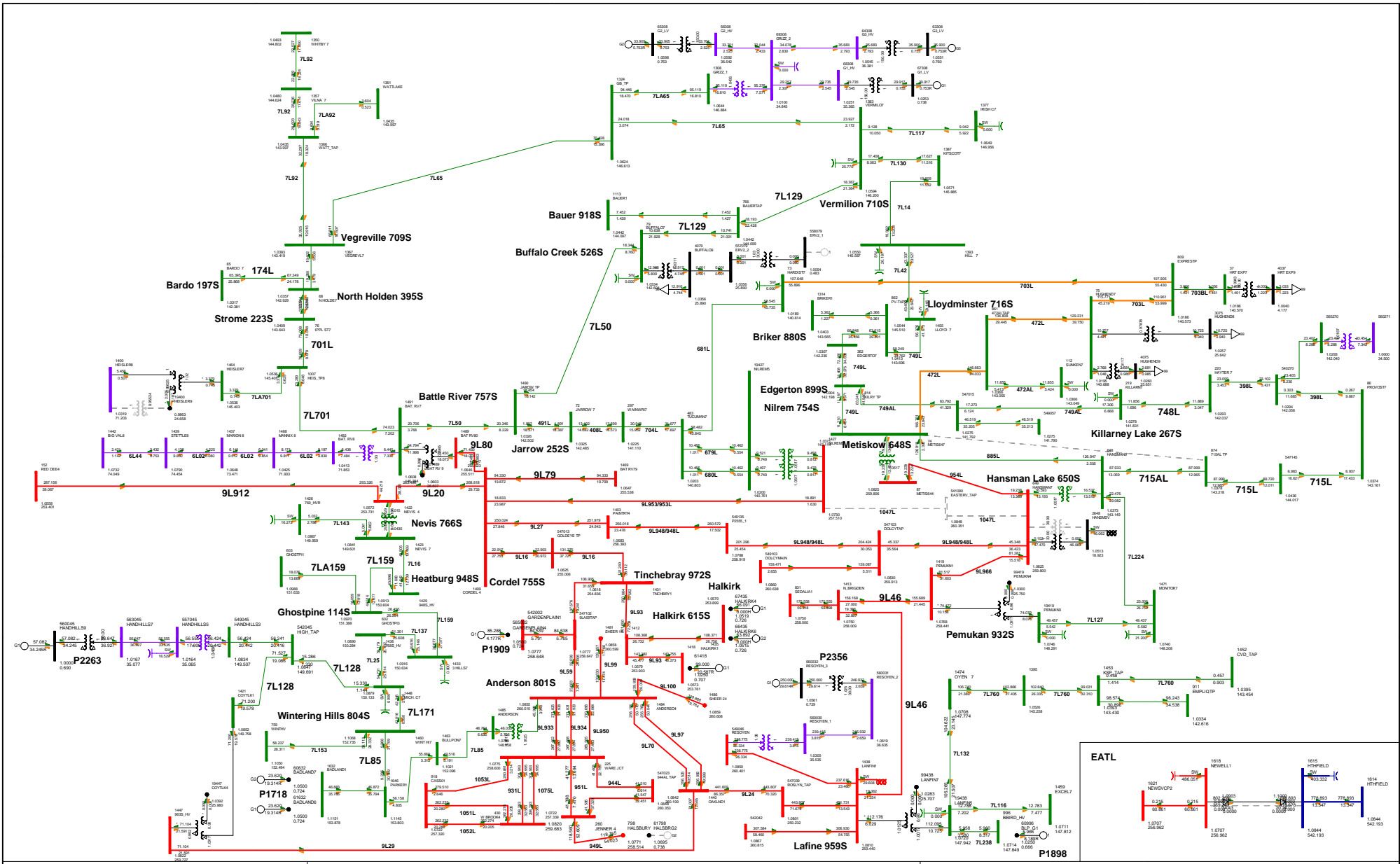


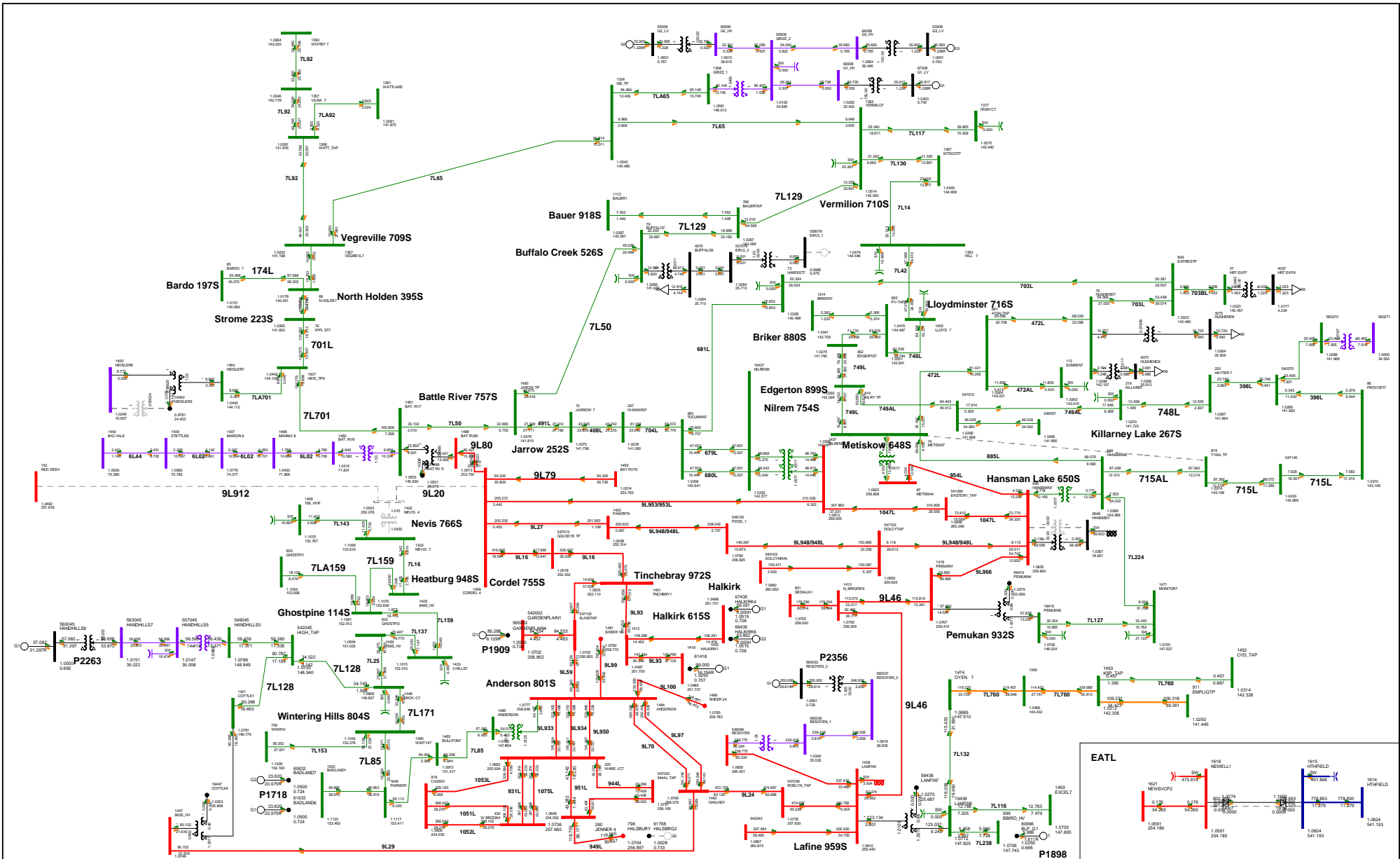
FIGURE A3-2.15-1047L (HANSMAN LAKE 650S TO NILREM 574S)  
 2025 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA @  
 102.5kV @ 100MVA  
 W: +0.000+54.500-89.000+138.000+240.000+500.000

WATL: -0.086 MW  
 EATL: -802.683 MW

BC Import: -606.010 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

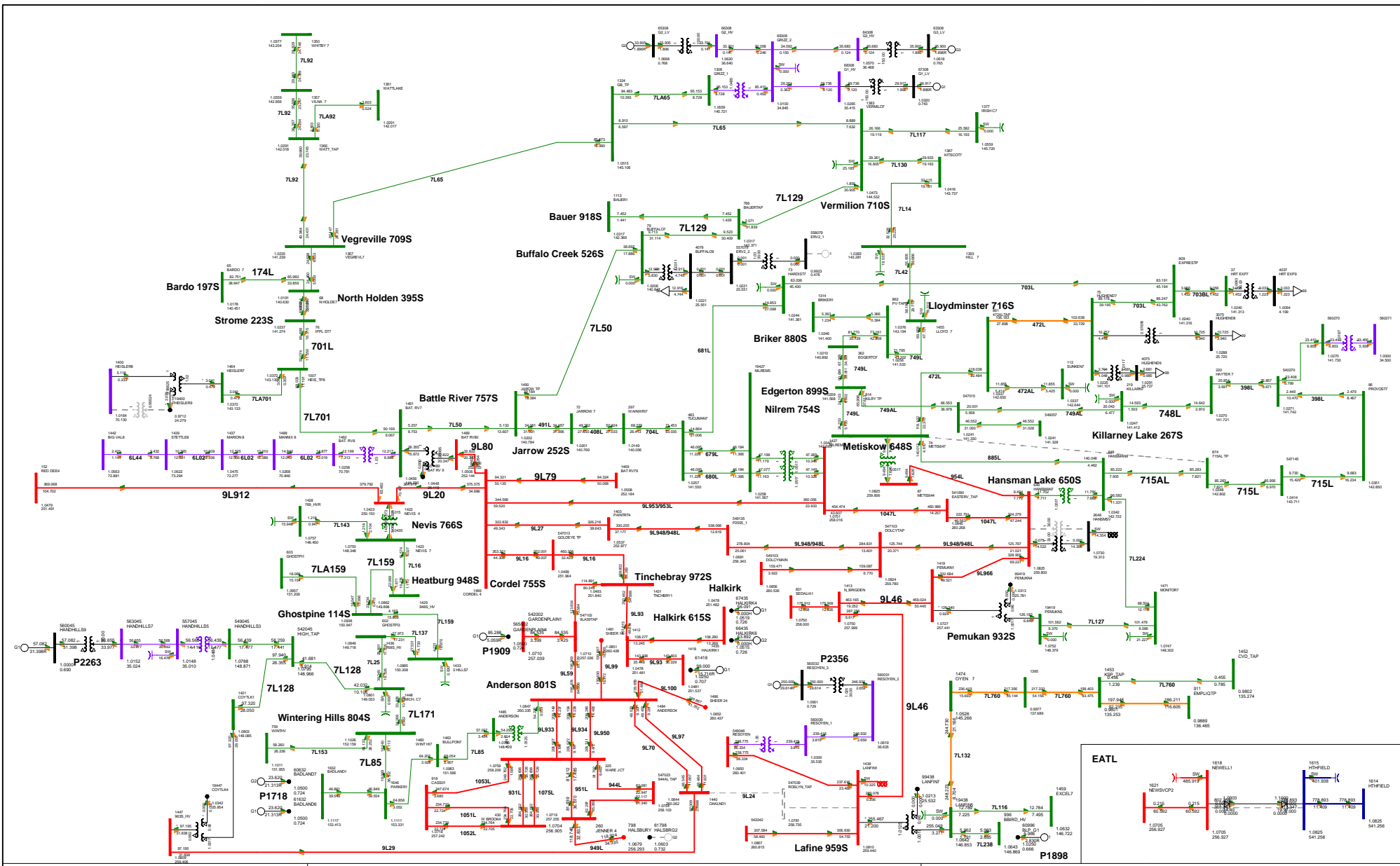
Bus Voltage (V) @  
 Base MW @  
 Equipment MW/MVA @  
 102.5kV @  
 W: +0.000+34.500=-88.000+138.000+340.000+800.000

**FIGURE A3.2-16 766S T1 (NEVIS 766S 240/138 KV TRANSFORMER)  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.604 MW

BC Import: -778.743 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW





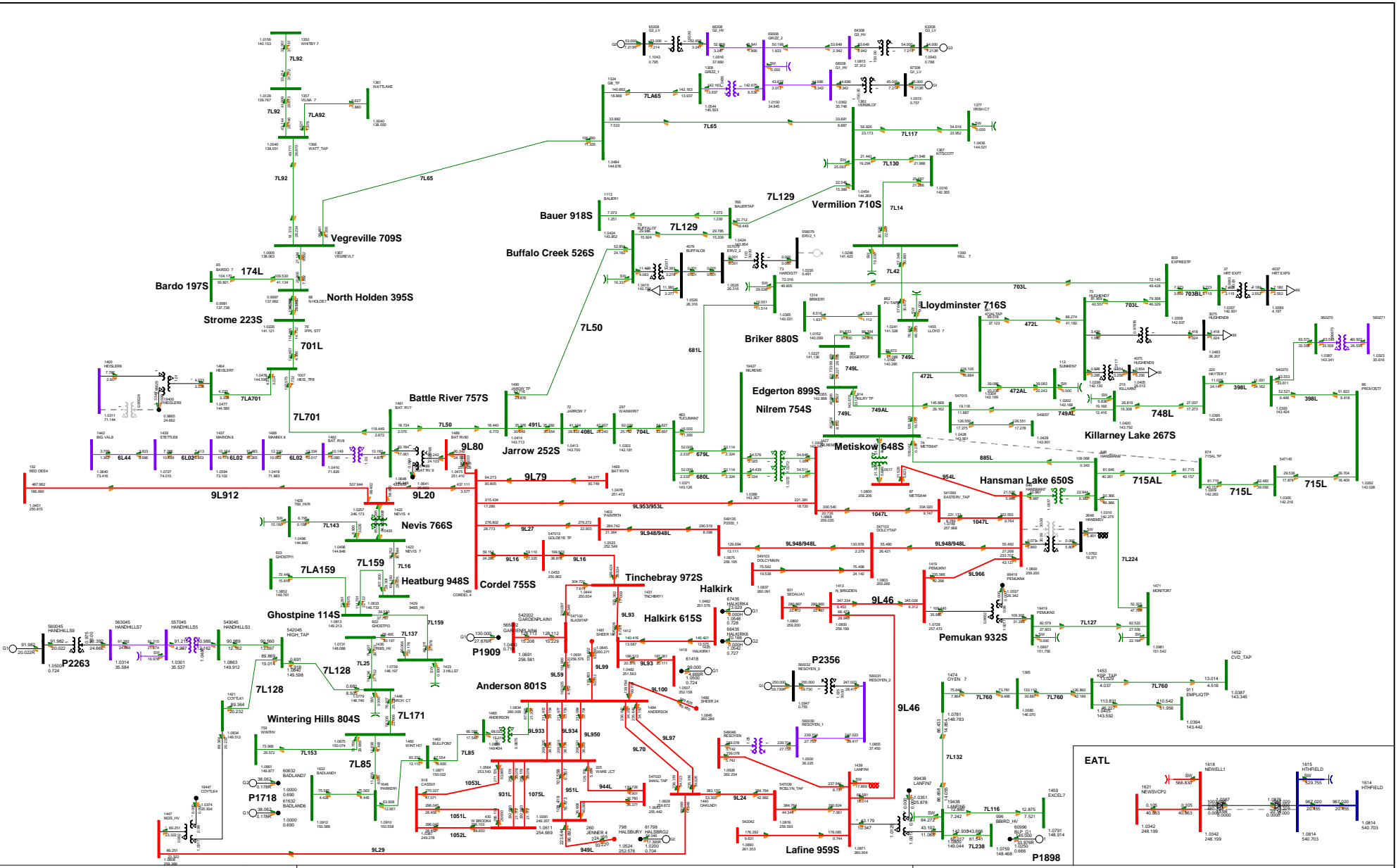
**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Base MVA 100  
 Equipment MVA 100  
 W: +0.000+34.500-89.000+138.000+240.000+500.000

**FIGURE A3.2-17 9L24 (OAKLAND 946S - LANFINE 959S)  
 2028 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -0.086 MW  
 EATL: -802.682 MW

BC Import: -723.101 MW  
 Sask Import: 0.000 MW  
 MATL Import: -183.024 MW



**P2356 Oyen MPC Wind**

**FIGURE A3.3-1-N-4: NORMAL OPERATION**  
 2024 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.729 MW

BC Import: -1109.102 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW



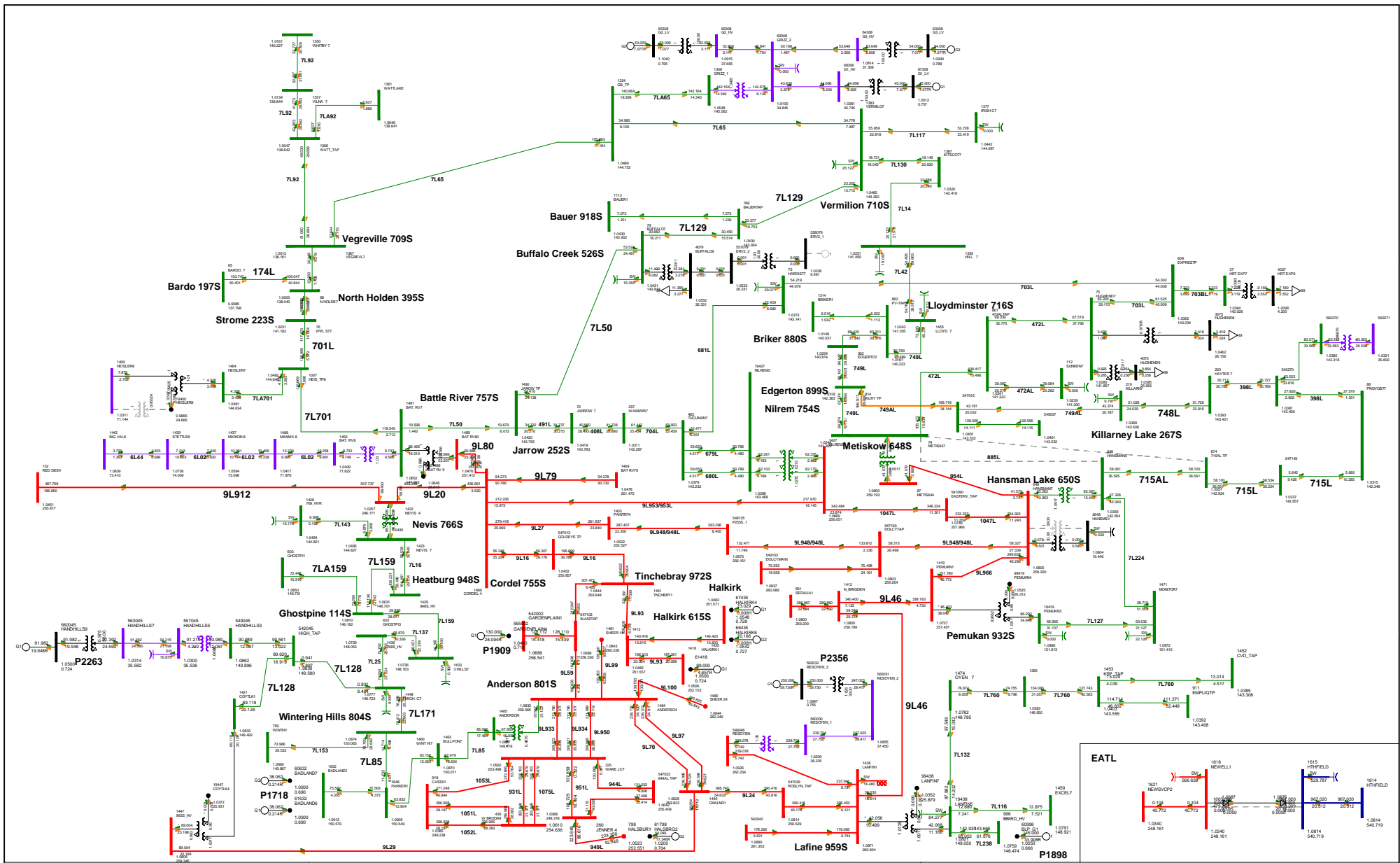
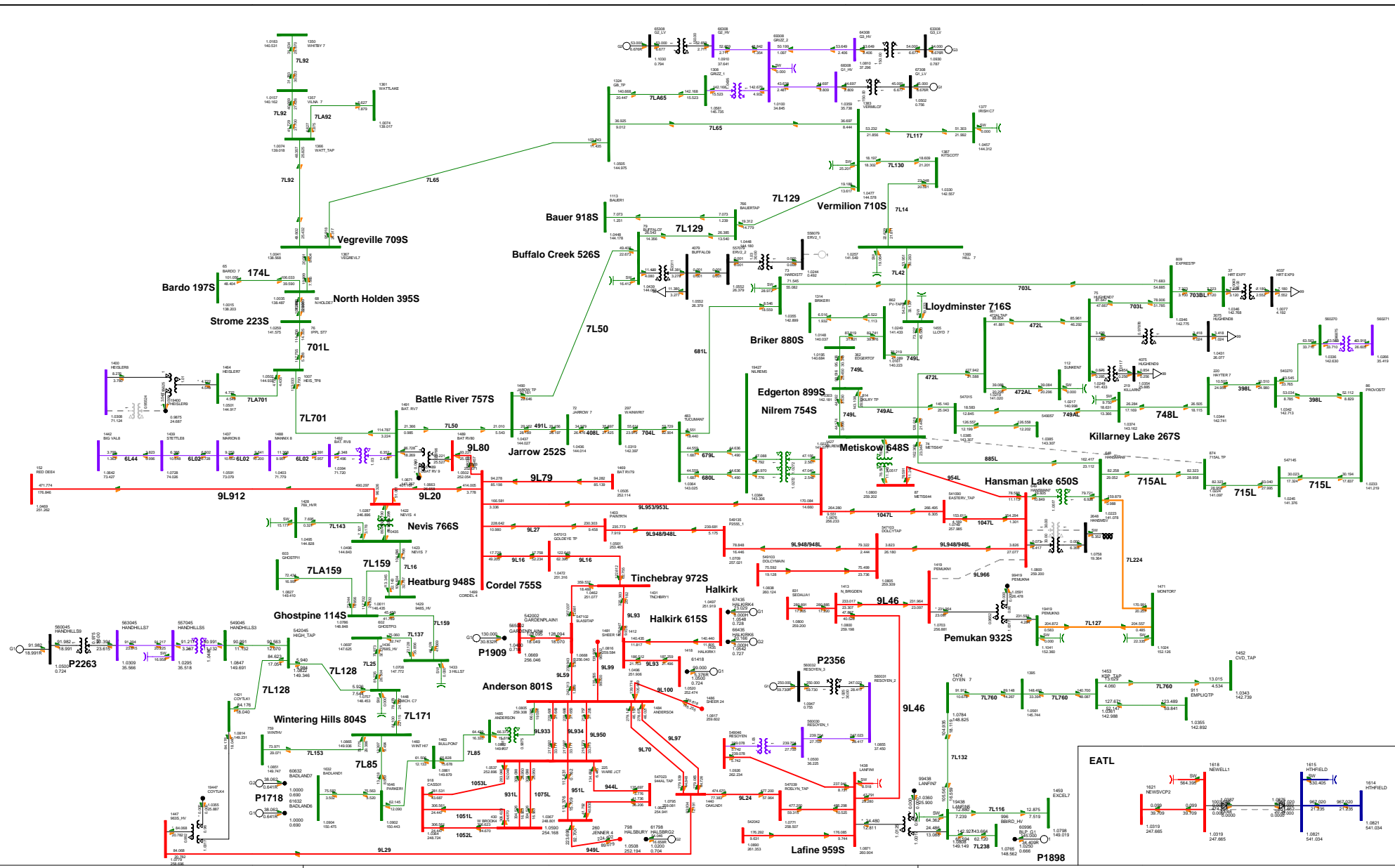


FIGURE A3.3-3 885L (METISKOW 648S TO HANSMAN LAKE 650S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

P2356 Oyen MPC Wind

WATL: -150.145 MW  
EATL: -1003.728 MW

BC Import: -1109.992 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW

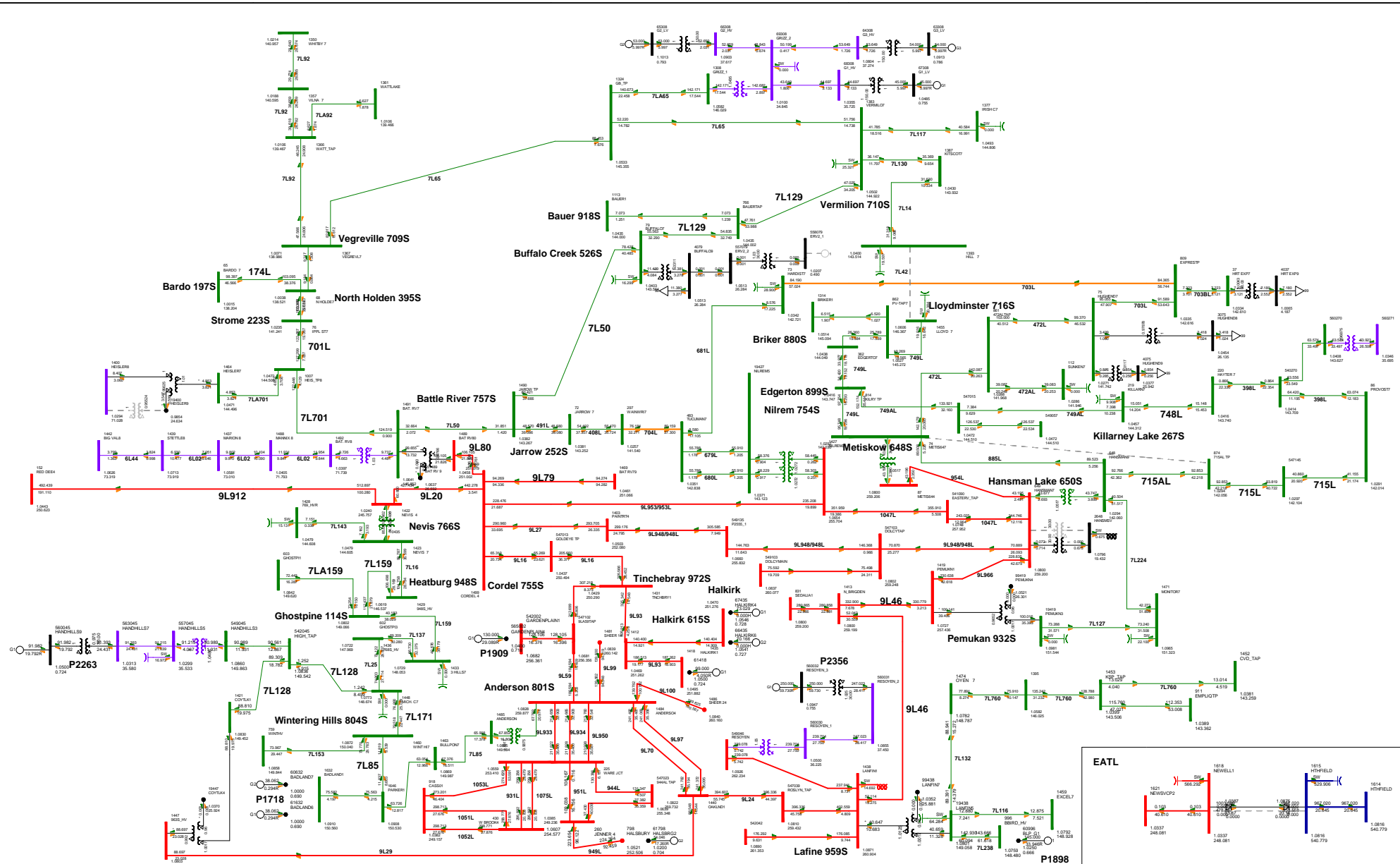


P2356 Oyen MPC Wind

FIGURE A3.3-4 966L (HANSMAN LAKE 650S TO PEMUKAN 932S)  
 2024 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.718 MW

BC Import: -1098.633 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW



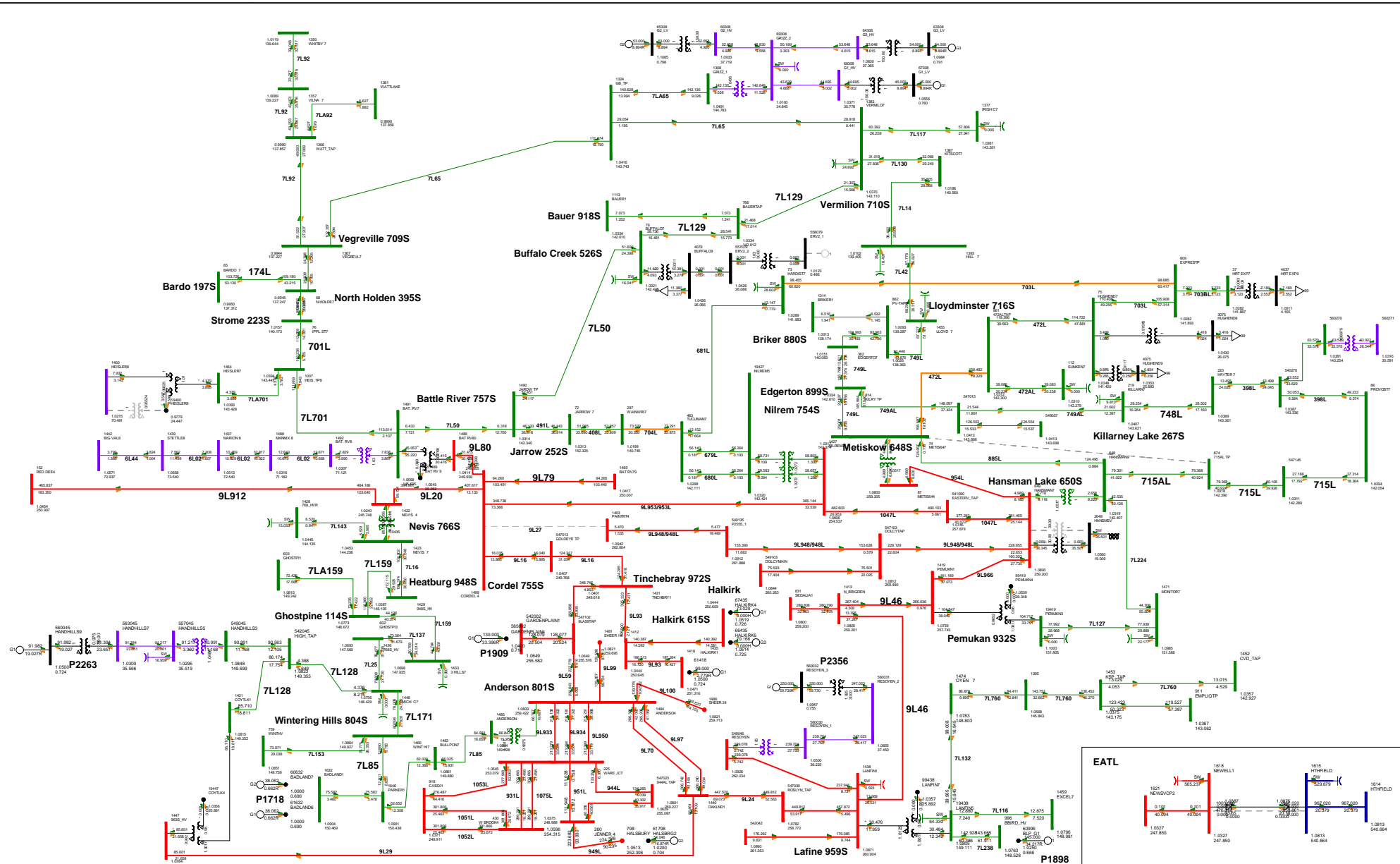
P2356 Oyen MPC Wind

FIGURE A3.3-5 7L42 (HILL 715S TO LLOYDMINSTER 716S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.727 MW

BC Import: -1108.068 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW



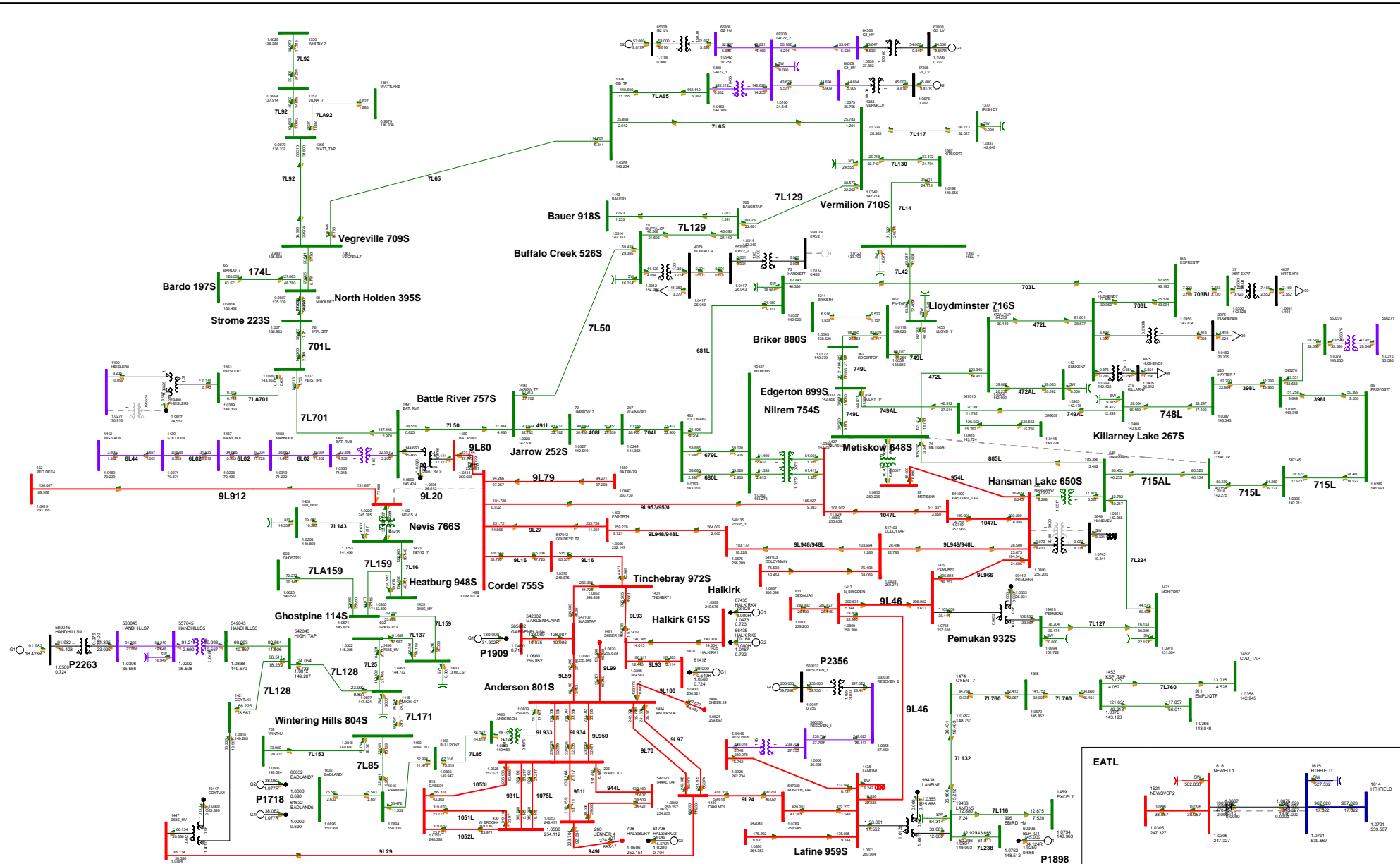


**P2356 Oyen MPC Wind**

FIGURE A3.3-4 9L27 (PAINTEARTH CREEK 83S TO CORDEL 755S)  
 2024 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.722 MW

BC Import: -1080.056 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW



P2356 Oyen MPC Wind

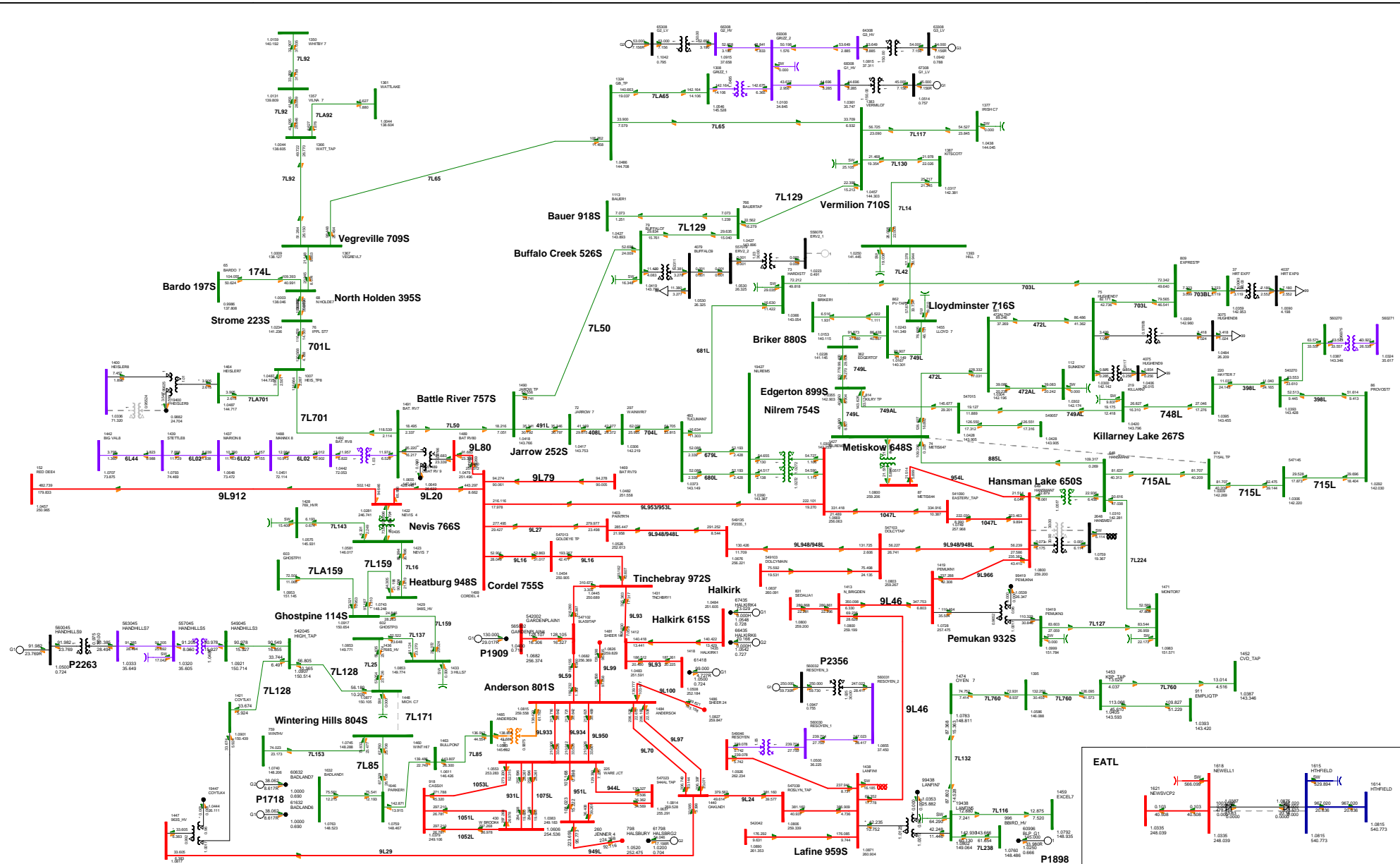
FIGURE A3.3-7 9L20 (NEVIS 766S TO CORDEL 755S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.711 MW

BC Import: -1058.371 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW





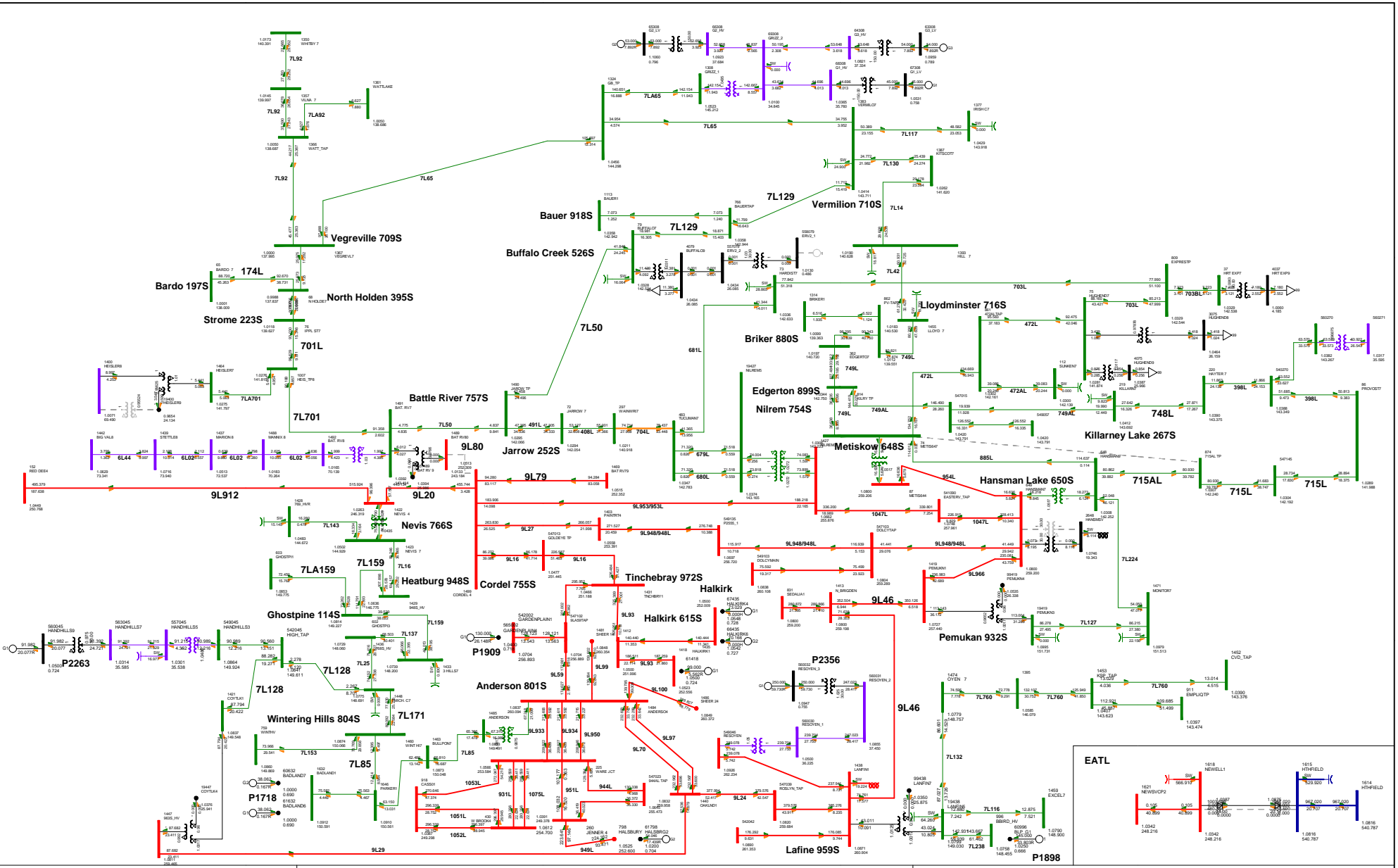


P2356 Oyen MPC Wind

FIGURE A3.3-9 7L171 (MICHIGAN CREEK 802S TO WINTERING HILLS 804S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.726 MW

BC Import: -1107.204 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW

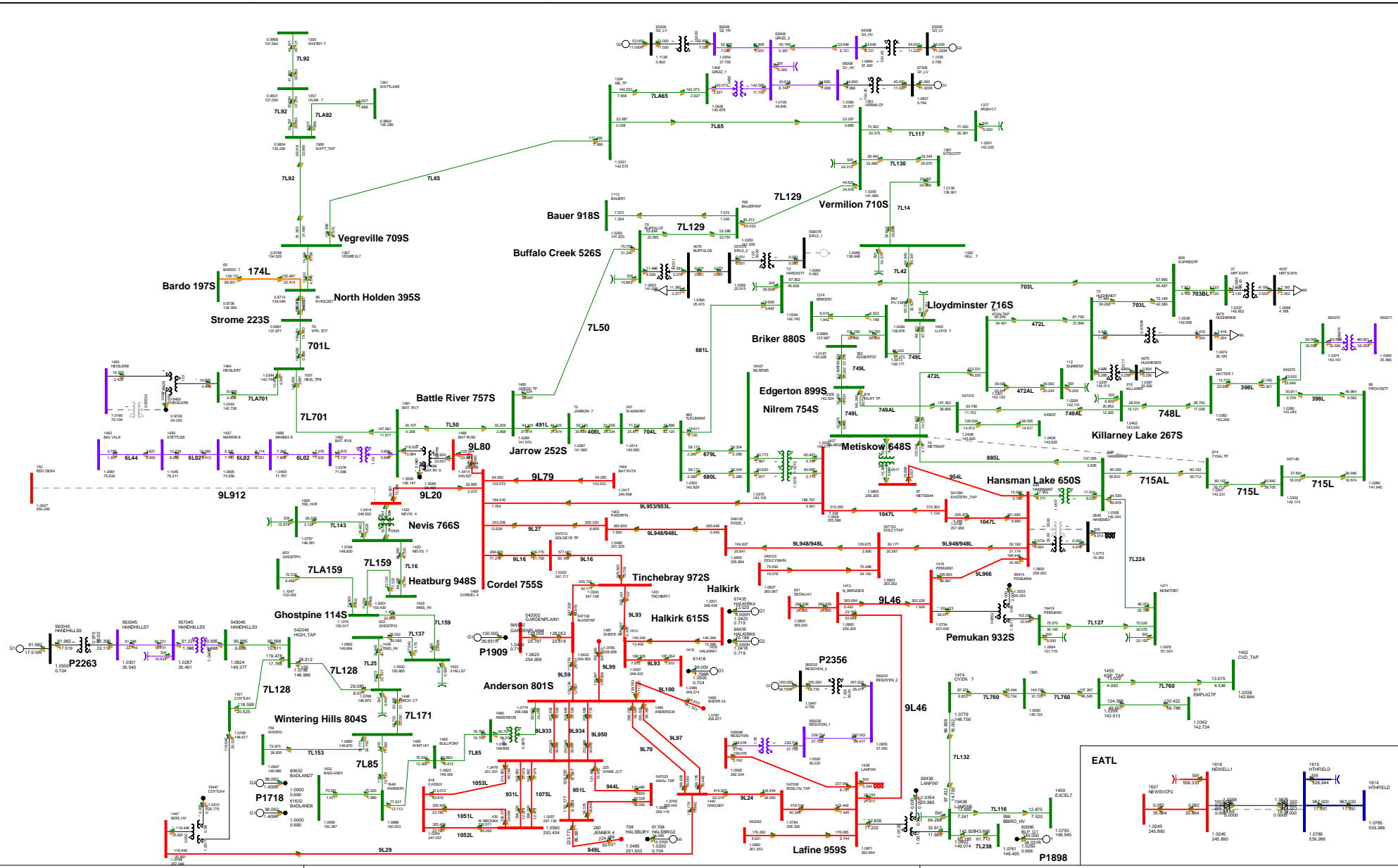


**P2356 Oyen MPC Wind**

**FIGURE A3.3-10 9L80 (BATTLE RIVER 757S TO CORDEL 755S)**  
 2028 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.730 MW

BC Import: -1108.139 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW

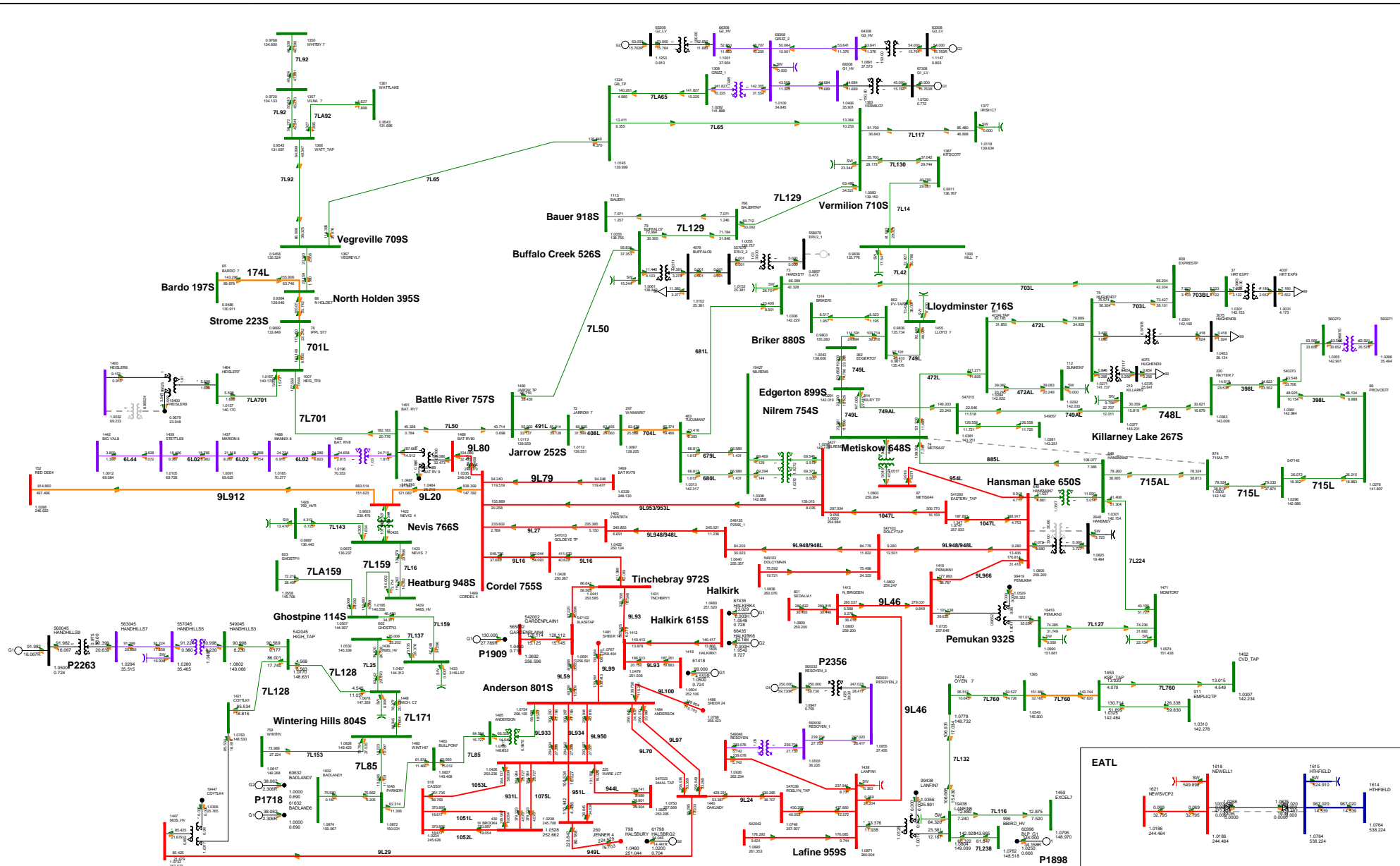


P2356 Oyen MPC Wind

FIGURE A3.3-11 912L (NEVIS 766S TO RED DEER 63S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23 SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.684 MW

BC Import: -1046.527 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW



P2356 Oyen MPC Wind

FIGURE A3.3-12 962L (TINCHEBRAY 922S TO GAETZ 875)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.659 MW

BC Import: -939.649 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW

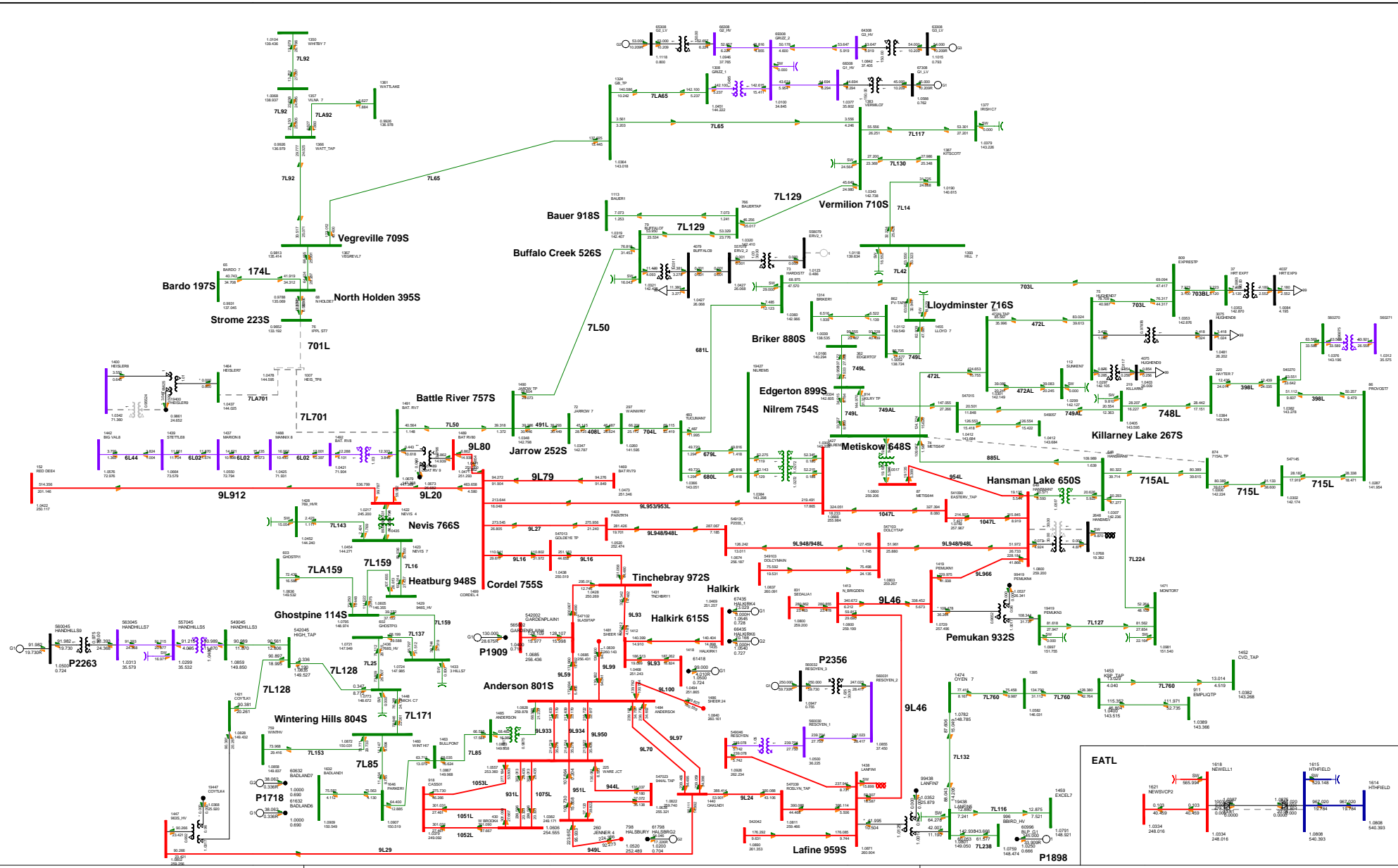


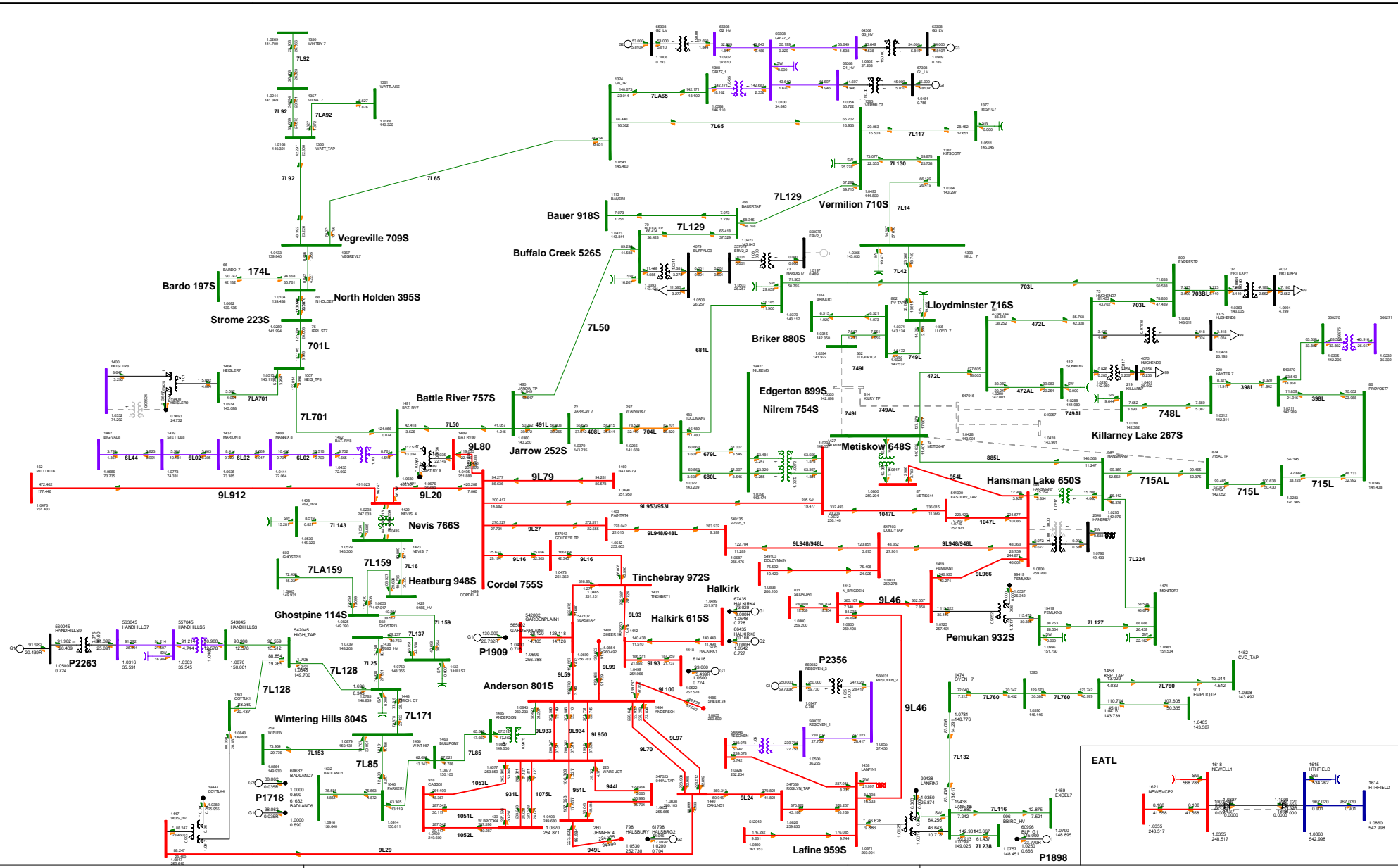
FIGURE A3.3-13 701L (STROME 223S TO BATTLE RIVER 757S)  
 2024 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

P2356 Oyen MPC Wind

WATL: -150.145 MW  
 EATL: -1003.725 MW

BC Import: -1101.763 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW



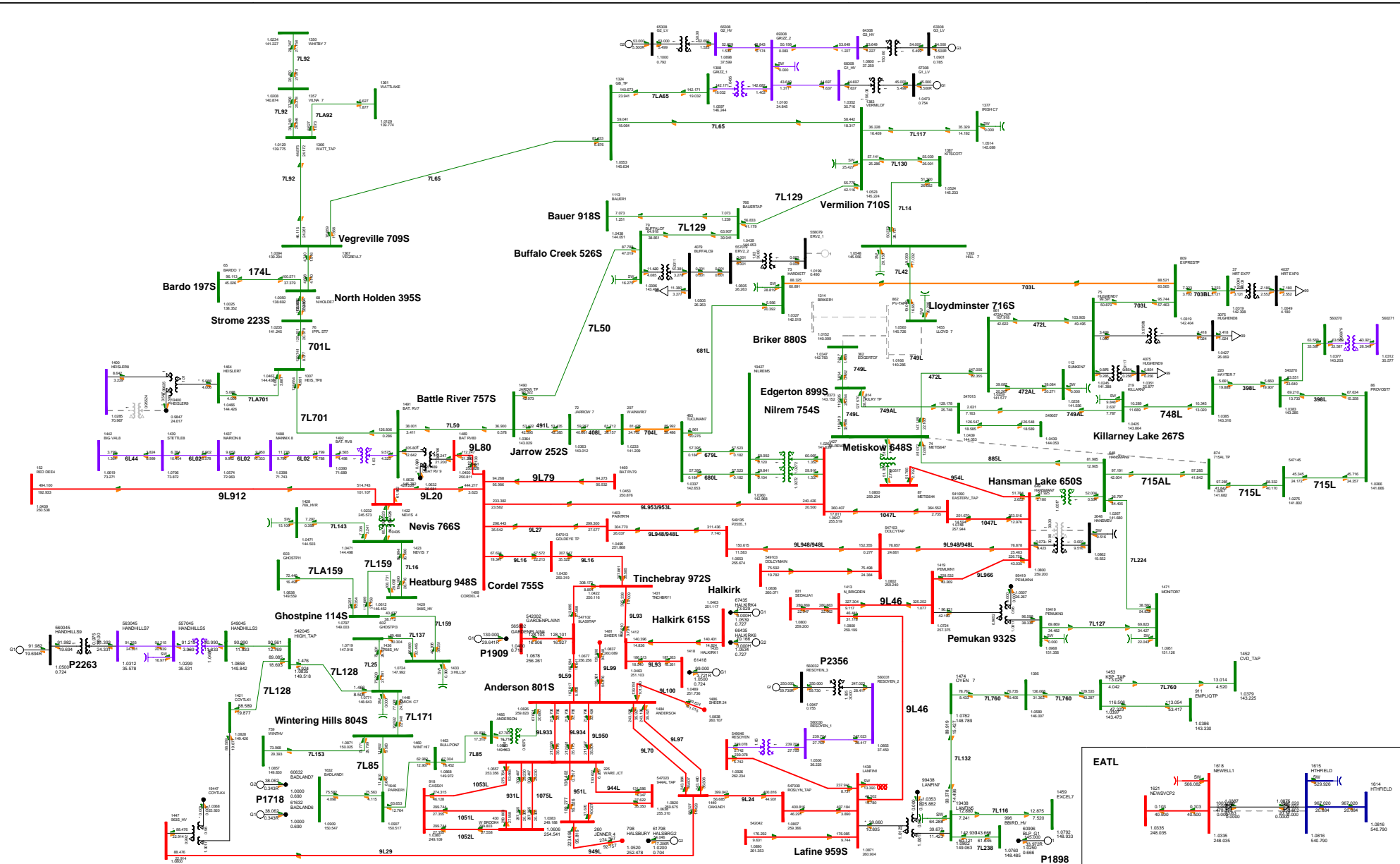


**P2356 Oyen MPC Wind**

FIGURE A3.3-14 749L (METISKOW 648S TO EDGERTON 899S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.736 MW

BC Import: -1013.996 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW



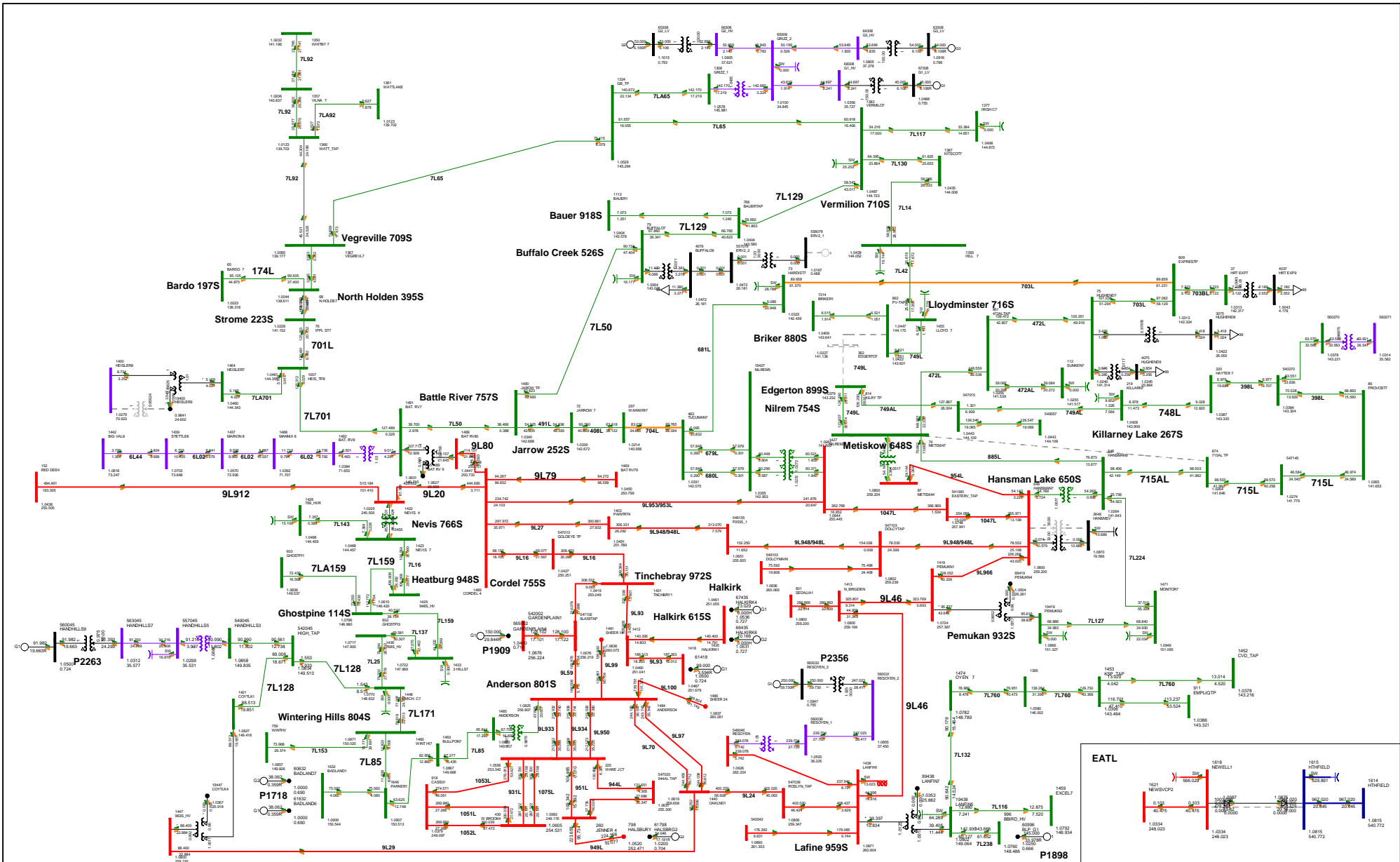
P2356 Oyen MPC Wind

FIGURE A3.3-15 748L (EDGERTON 899S TO LLOYDMINSTER 716S)  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.726 MW

BC Import: -1107.419 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW



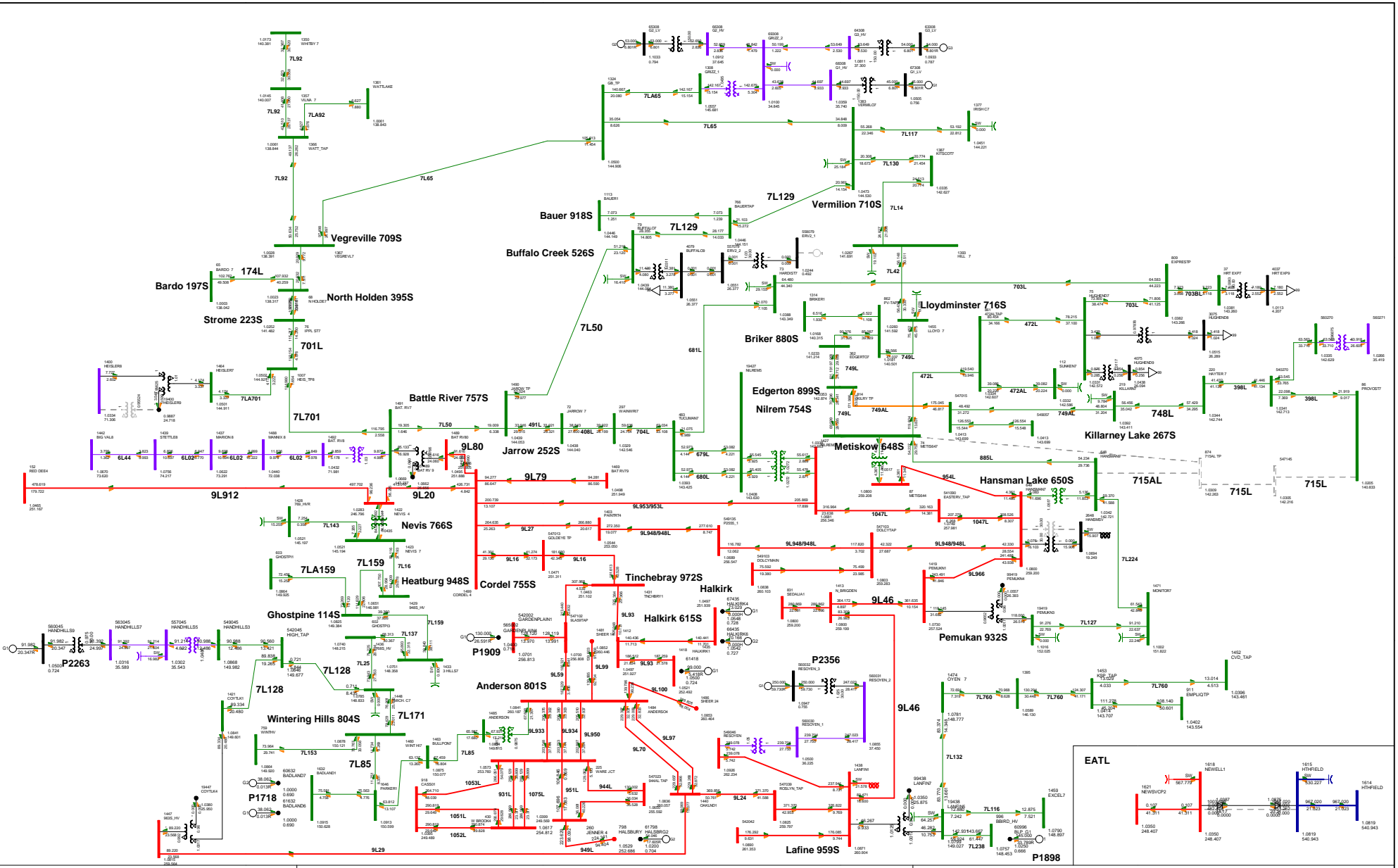


P2356 Oyen MPC Wind

FIGURE A3.3-16 EDGERTON 899S TRANSFORMER T1  
2024 WINTER PEAK (POST-CONNECTION)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
EATL: -1003.726 MW

BC Import: -1105.979 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW

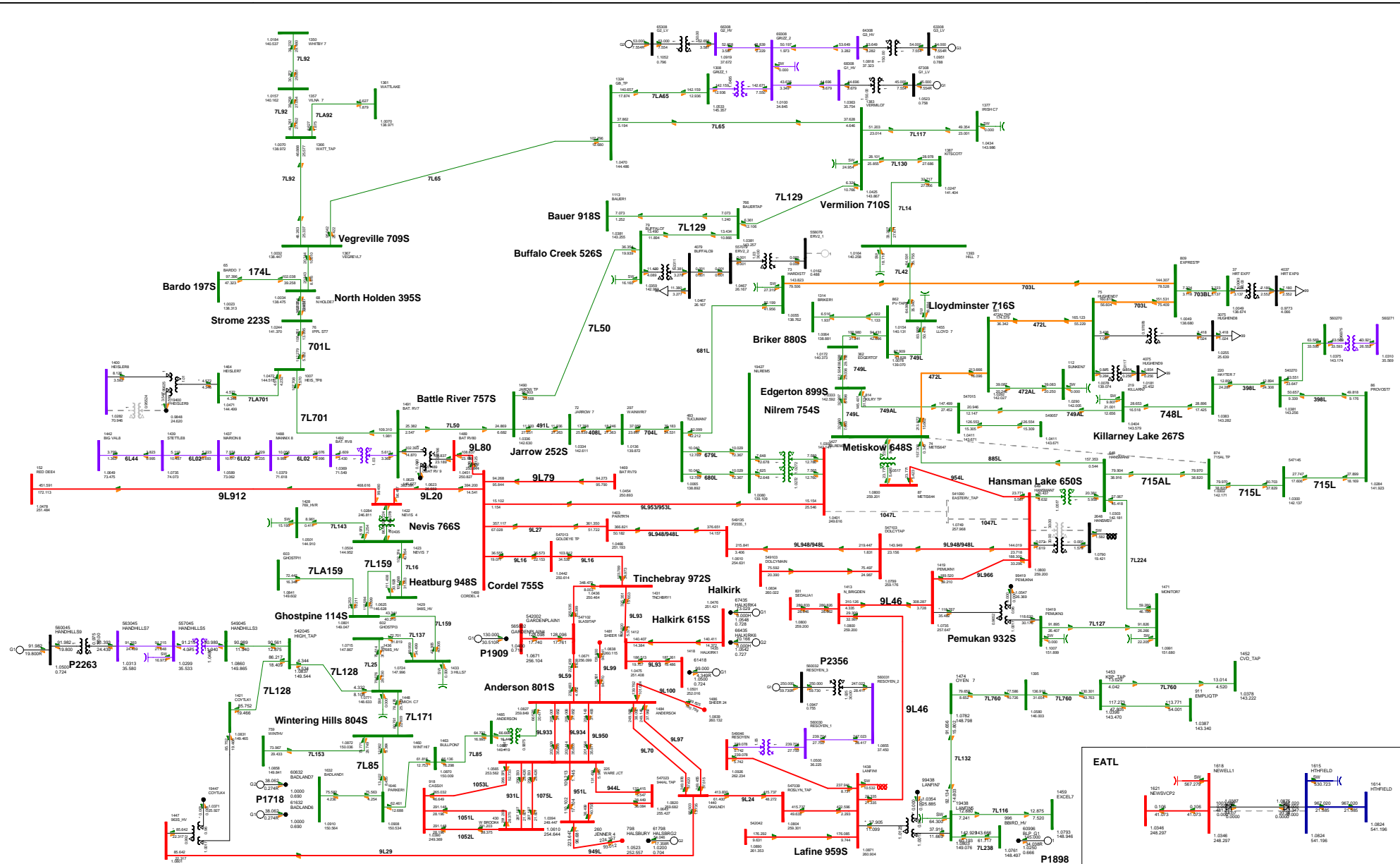


**P2356 Oyen MPC Wind**

FIGURE A3.3-17 715L (HANSMAN LAKE 650S TO PROVOST 545S)  
 2028 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.733 MW

BC Import: -1071.528 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW

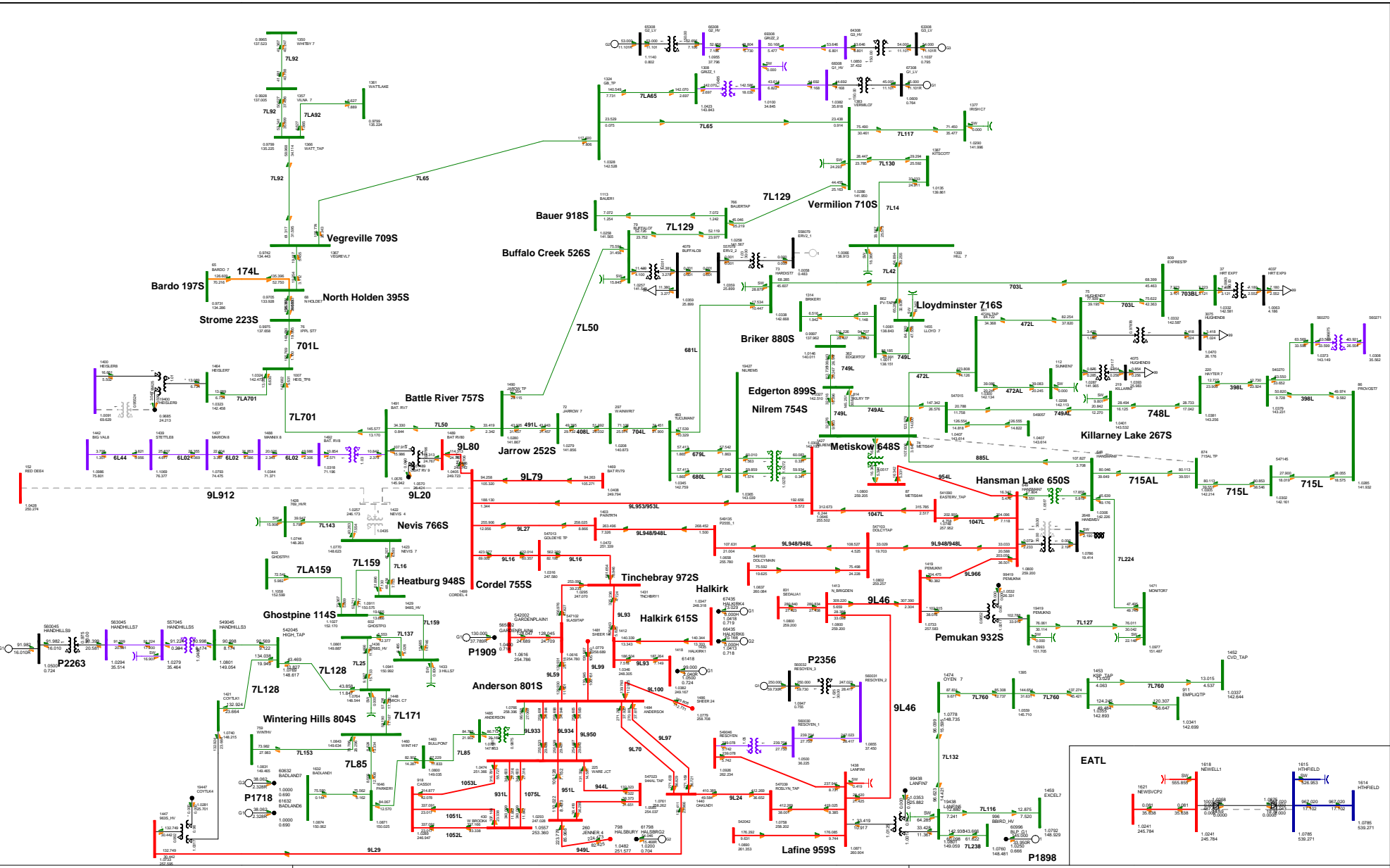


P2356 Oyen MPC Wind

FIGURE A3.3-18 1047L (HANSMAN LAKE 650S TO NILREM 574S)  
 2028 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.731 MW

BC Import: -1005.720 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW

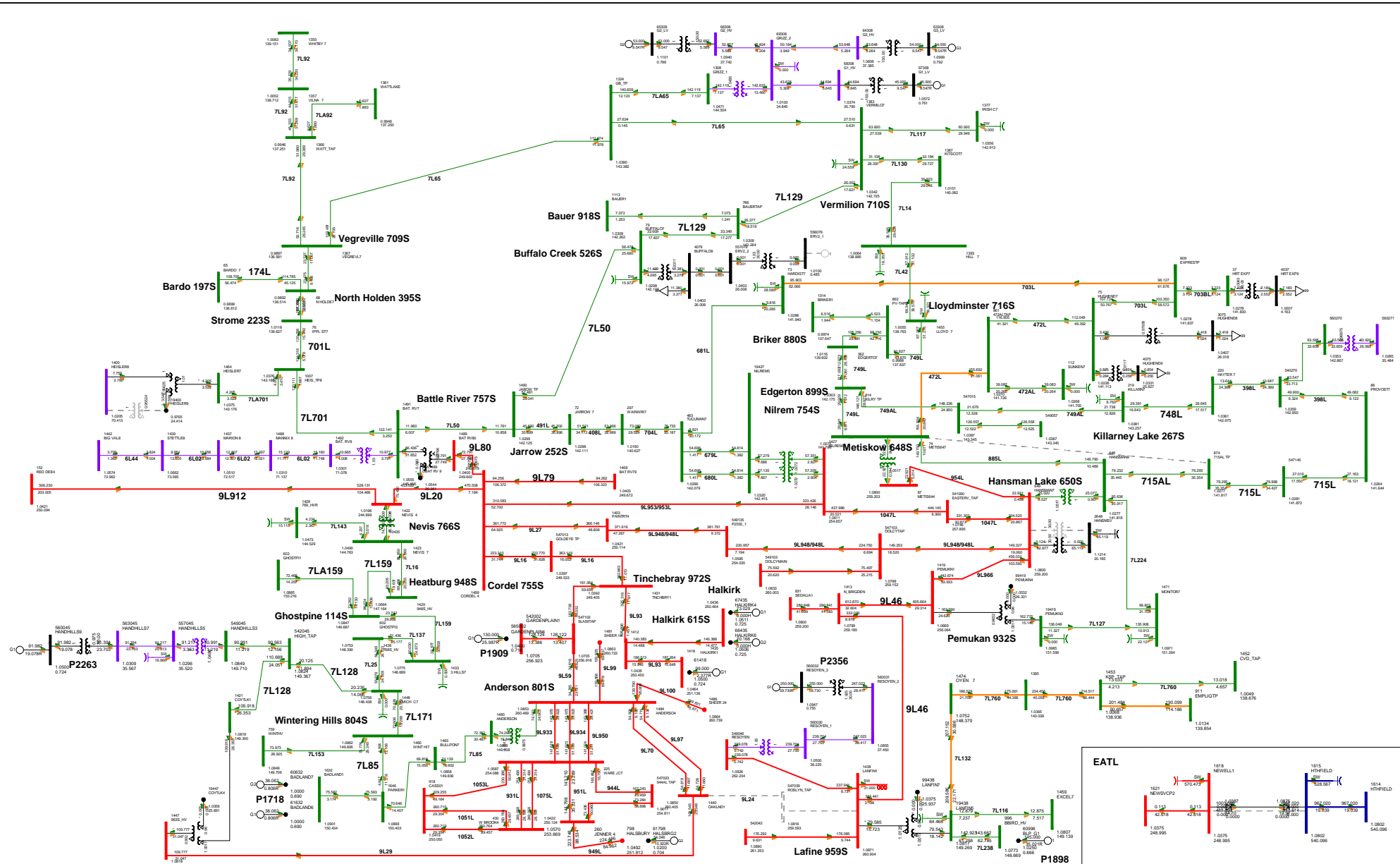


**P2356 Oyen MPC Wind**

FIGURE A3.3-19 766S T1 (NEVIS 766S 240/138 KV TRANSFORMER)  
 2024 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.682 MW

BC Import: -1046.326 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW

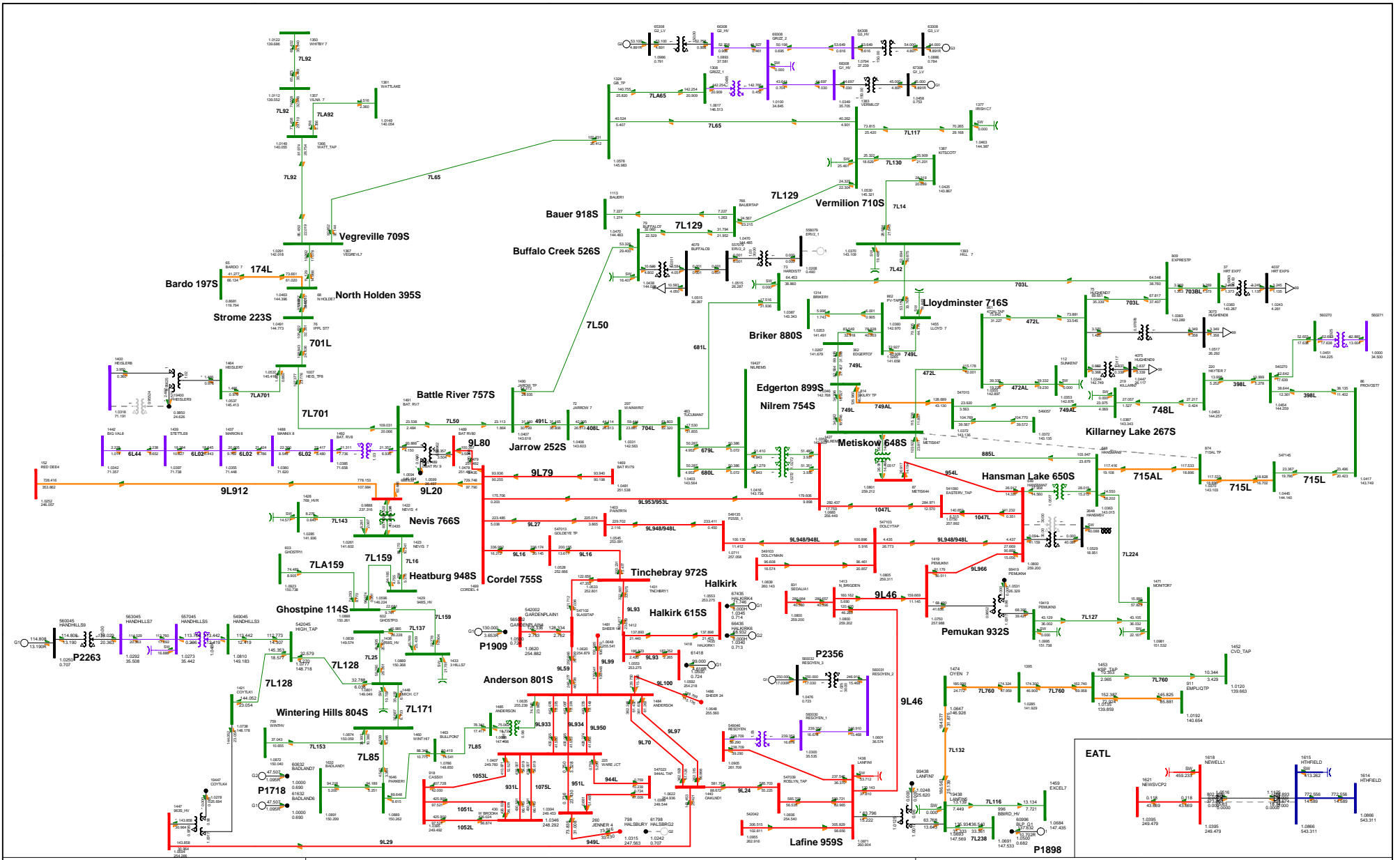


P2356 Oyen MPC Wind

FIGURE A3.3-20 9L24 (OAKLAND 946S - LANFNE 959S)  
 2025 WINTER PEAK (POST-CONNECTION)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

WATL: -150.145 MW  
 EATL: -1003.746 MW

BC Import: -1051.709 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW



**P2356 Oyen MPC Wind**

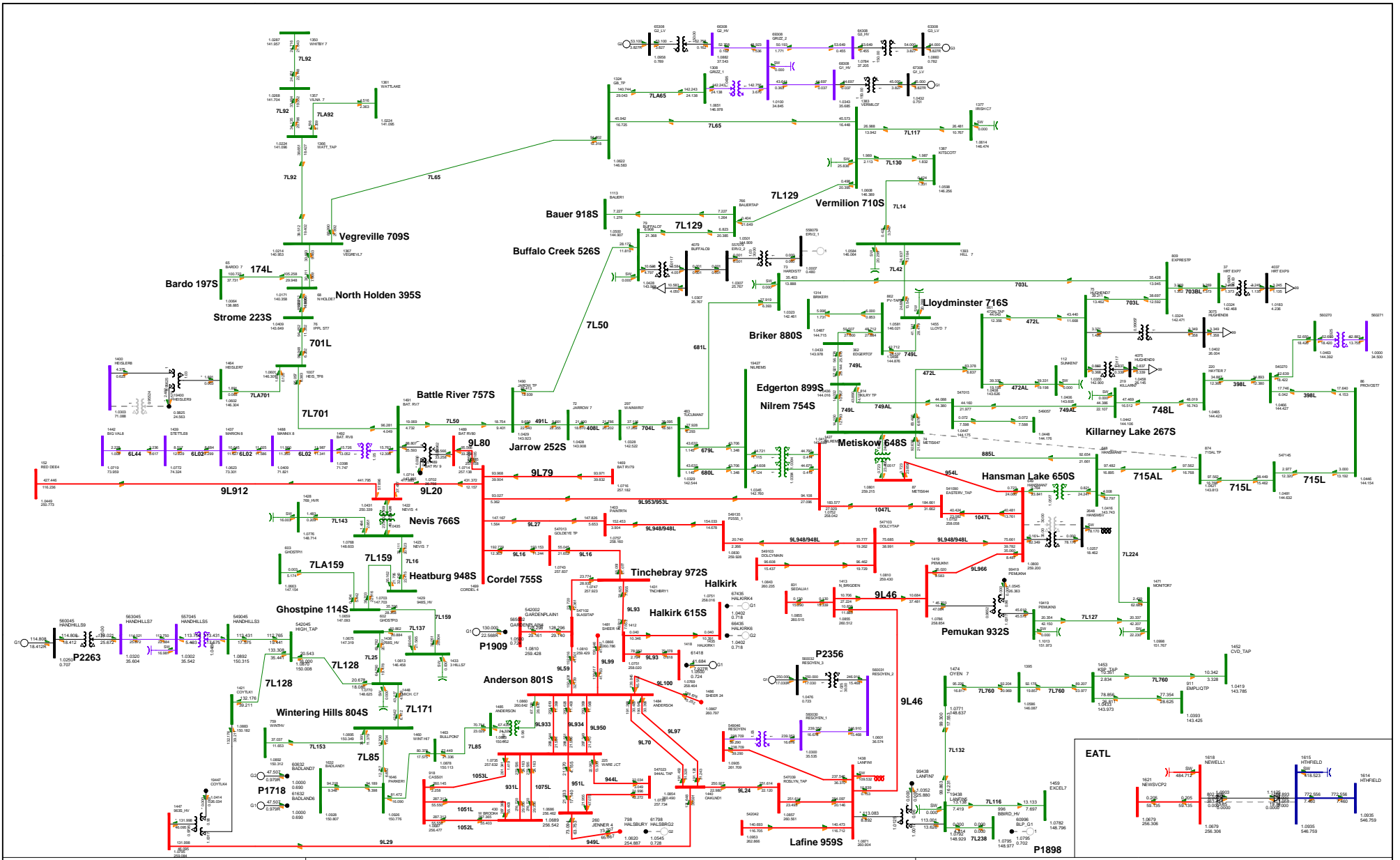
Bus Voltage (V) @  
 Base: 110V  
 Equipment: 110V/110V  
 102.76V/102.76V  
 W: +0.000+34.500-88.000+138.000+240.000+390.000

**FIGURE A3.4-0-N-0: NORMAL OPERATION**  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1), PRE-CURTAILMENT  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.430 MW  
 EATL: -808.038 MW

BC Import: -865.220 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW





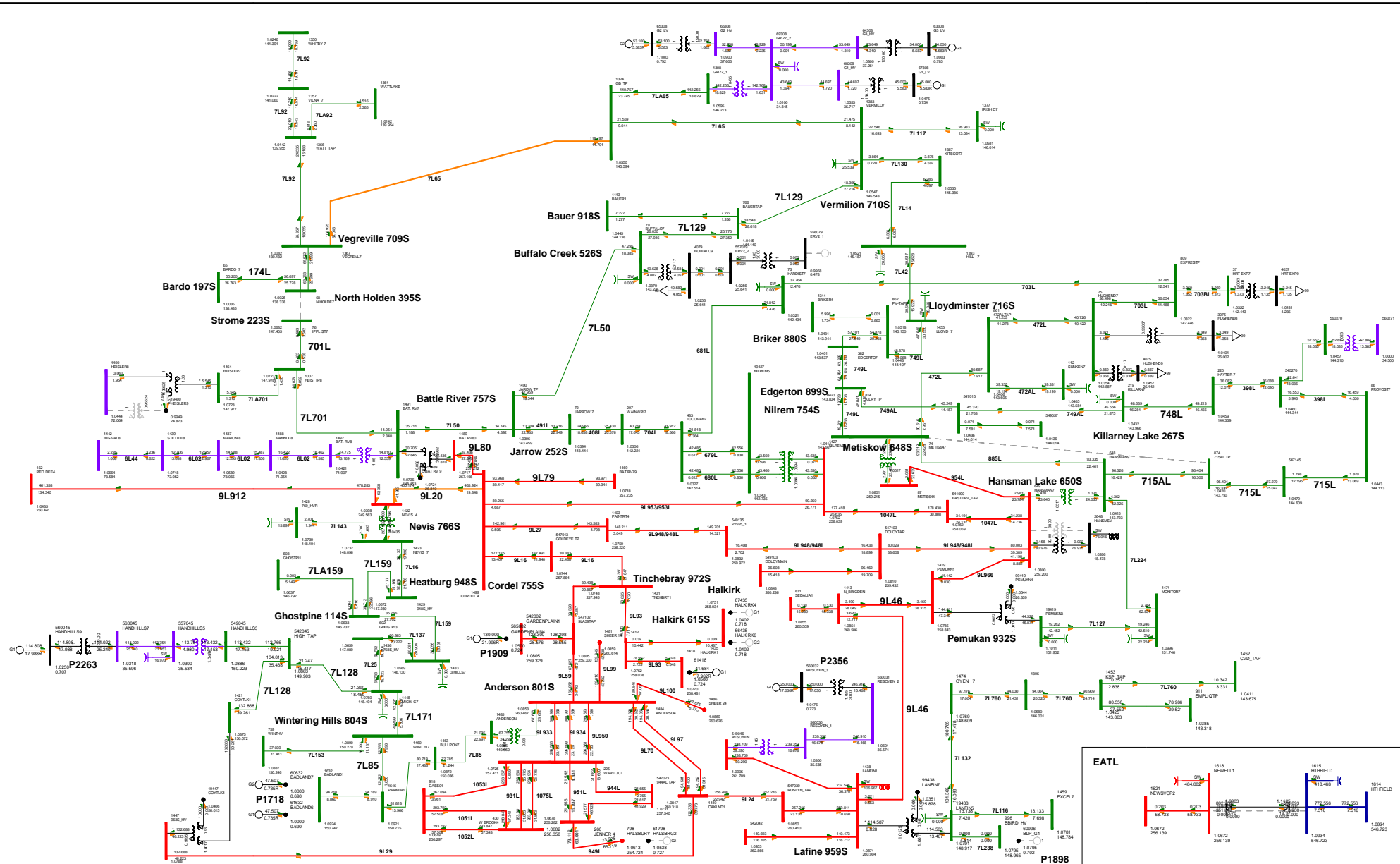
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV @ 100 MVA  
 W: +0.000+0.400-0.000-0.000+0.000+0.000

**FIGURE A3.4-1-N-0: NORMAL OPERATION**  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.213 MW

BC Import: -140.893 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



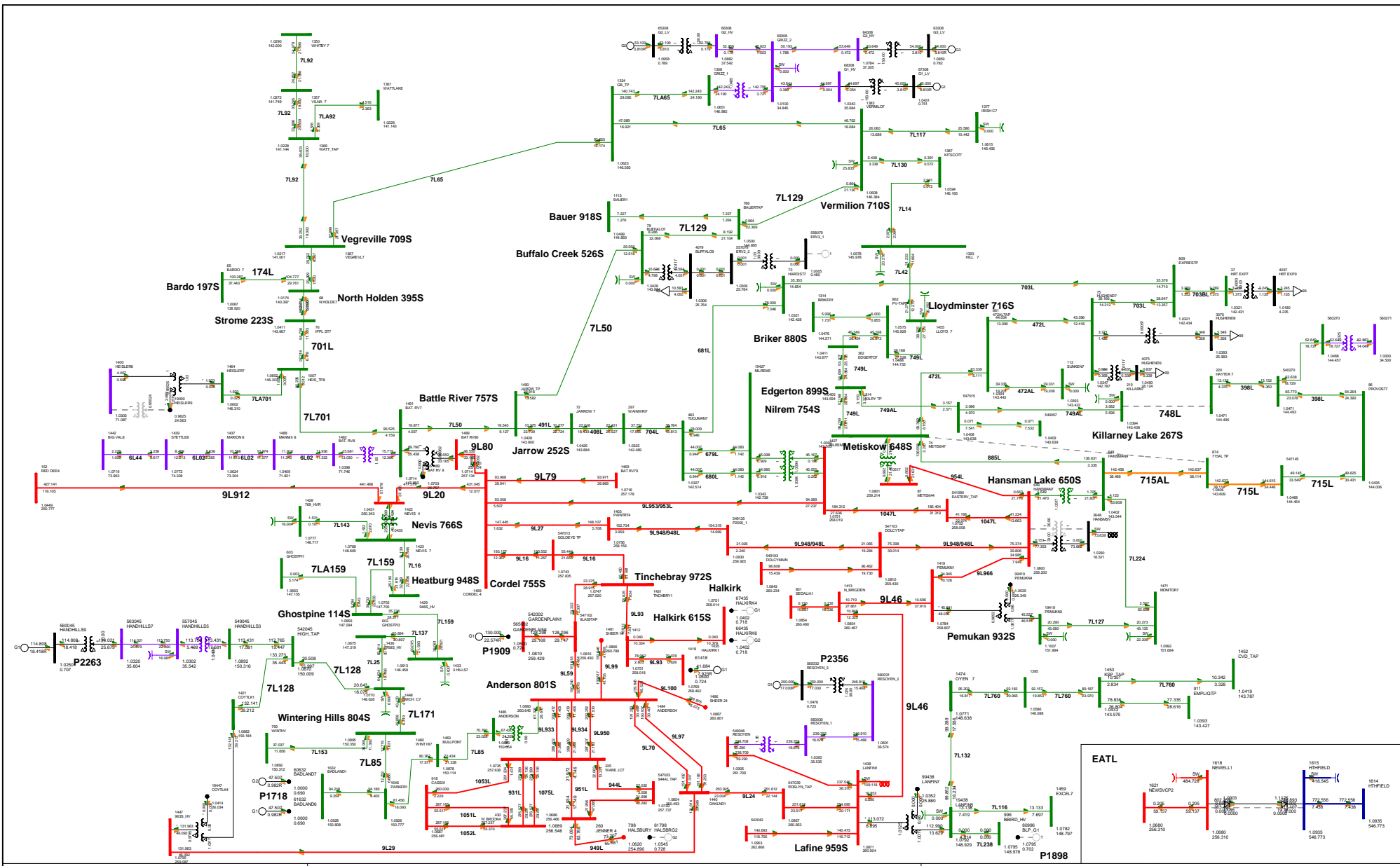
**P2356 Oyen MPC Wind**

Bus Voltage (V) @ 10000  
 Breaker (MVA)  
 Equipment (MVA) @ 10000  
 W: +0.000+34.500-138.000+340.000+900.000

**FIGURE A3.4-2 701L (NORTH HOLDEN 395S TO STROME 223S)**  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW	BC Import: -137.663 MW
EATL: -808.208 MW	Sask Import: -150.000 MW
	MATL Import: -182.738 MW





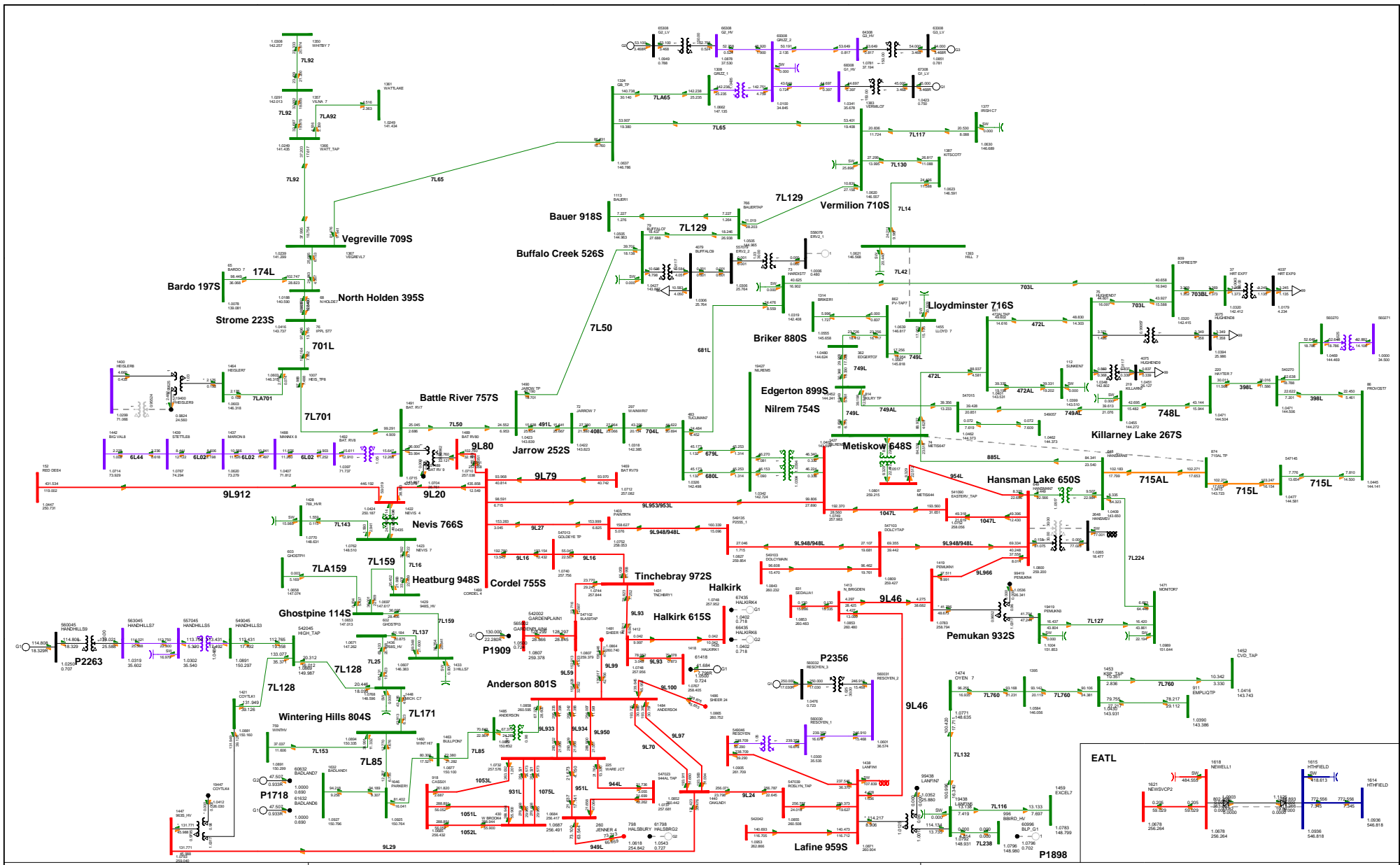
**P2356 Oyen MPC Wind**

Bus Voltage (V) 90  
 Breaker (MVA)  
 Equipment (MVA) 100  
 100.76 MVA  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

**FIGURE A3-4-3 748L (HAYTER 277S TO KILLARNEY LAKE 267S)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.213 MW

BC Import: -138.805 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/Mvar  
 102.5kV/50MVA  
 W: +0.000+54.500-89.000+138.000+240.000+500.000

**FIGURE A3.4-4 7L42 (HILL 715S TO LLOYDMINSTER 716S)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.211 MW

BC Import: -141.514 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

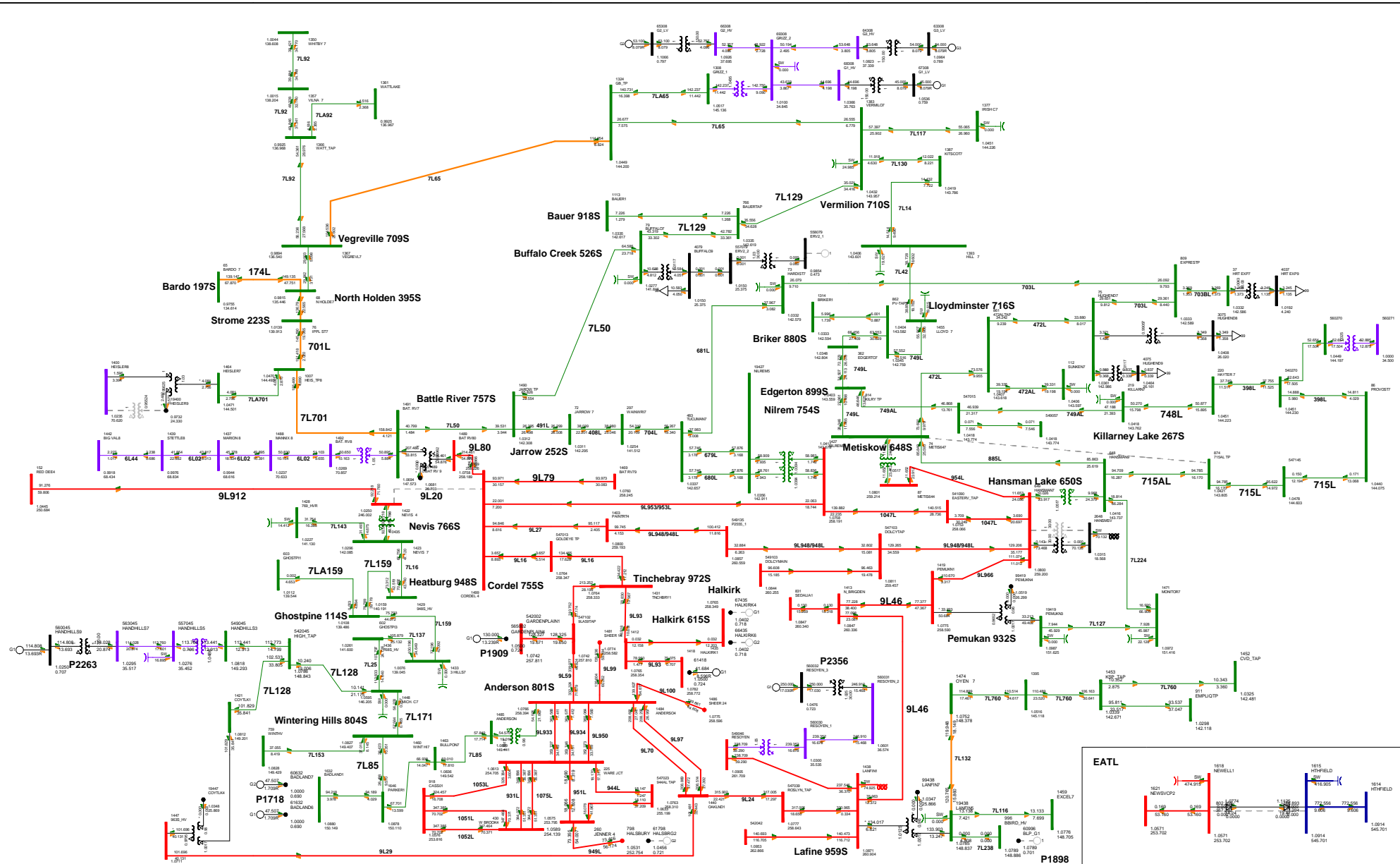


FIGURE A3-4-5 9L20 (NEVIS 766S TO CORDEL 755S)  
 2023 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Base MVA 100  
 Equipment MVA/MW 100/50/50  
 W: +0.000+54.500+138.000+340.000+930.000

WATL: -2.433 MW  
 EATL: -808.140 MW

BC Import: -72.076 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

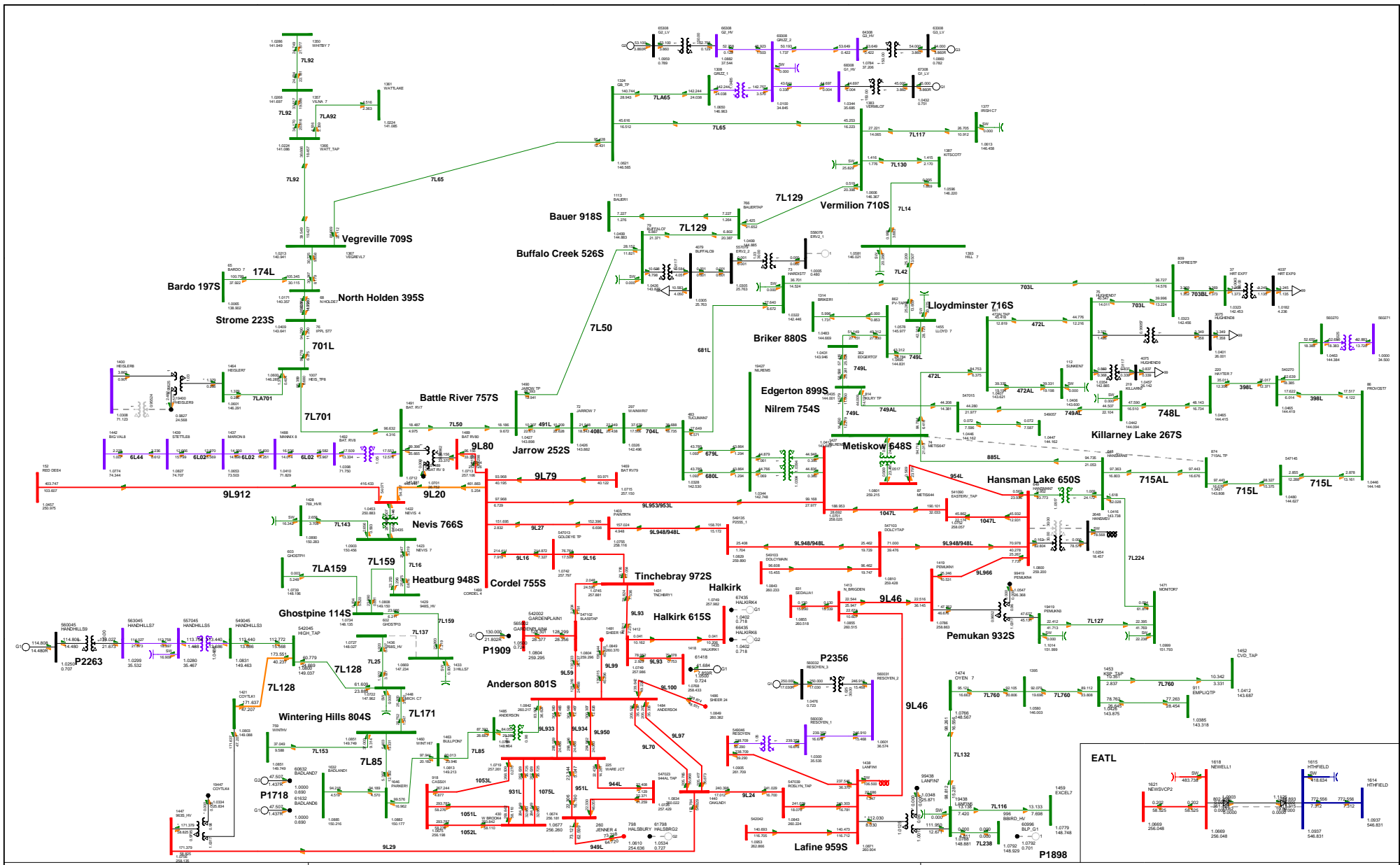


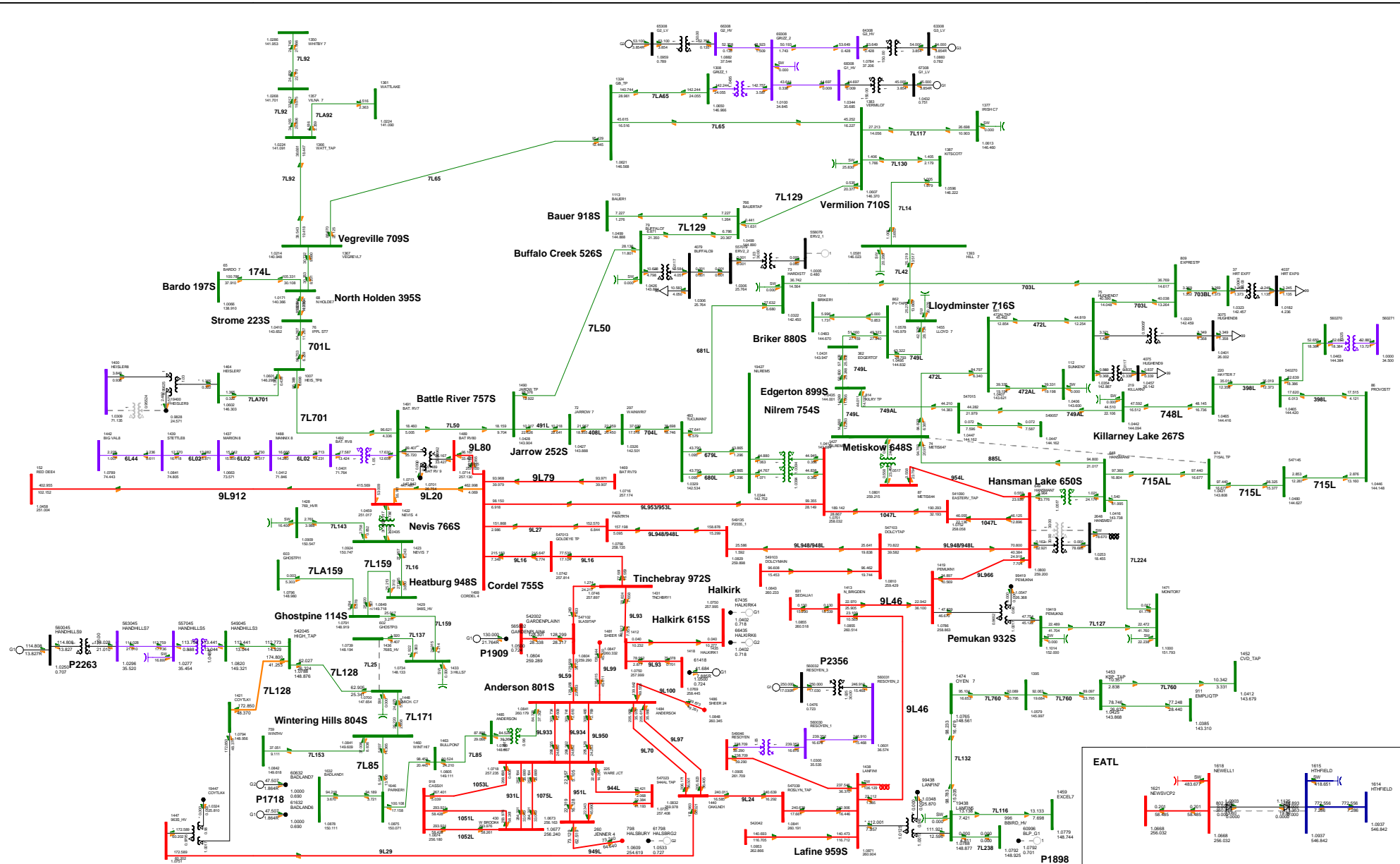
FIGURE A3.4-4 T1137 (THREE HILLS 770S TO ROWLEY 768S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Branch (V) @  
 Equipment (MVA) @  
 102.5kV @ 102.5kV @  
 W: +0.000+0.400-0.000 = +0.000  
 S: +0.000+0.400-0.000 = +0.000

WATL: -2.433 MW  
 EATL: -808.205 MW

BC Import: -139.156 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

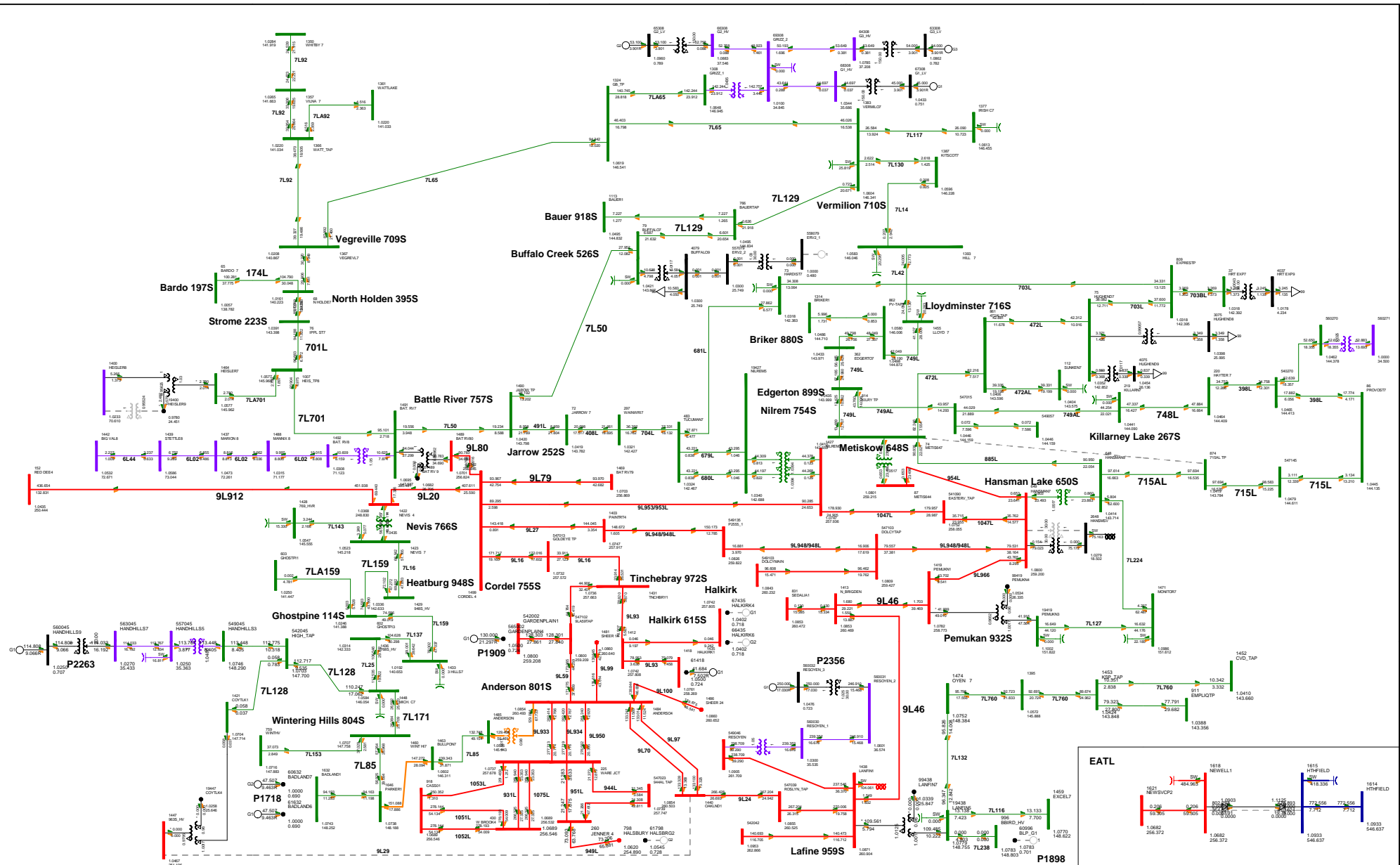


**P2356 Oyen MPC Wind**

Bus Voltage (V) = 110.00  
 Breaker (V) = 110.00  
 Equipment (V) = 110.00  
 W = 10.000 + 34.500 - 138.000 + 240.000 = 900.000

**FIGURE A3-4-7 7L25 (ROWLEY 766S TO MICHICI CREEK 802S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW	BC Import: -138.818 MW
EATL: -808.205 MW	Sask Import: -150.000 MW
	MATL Import: -182.738 MW



P2356 Oyen MPC Wind

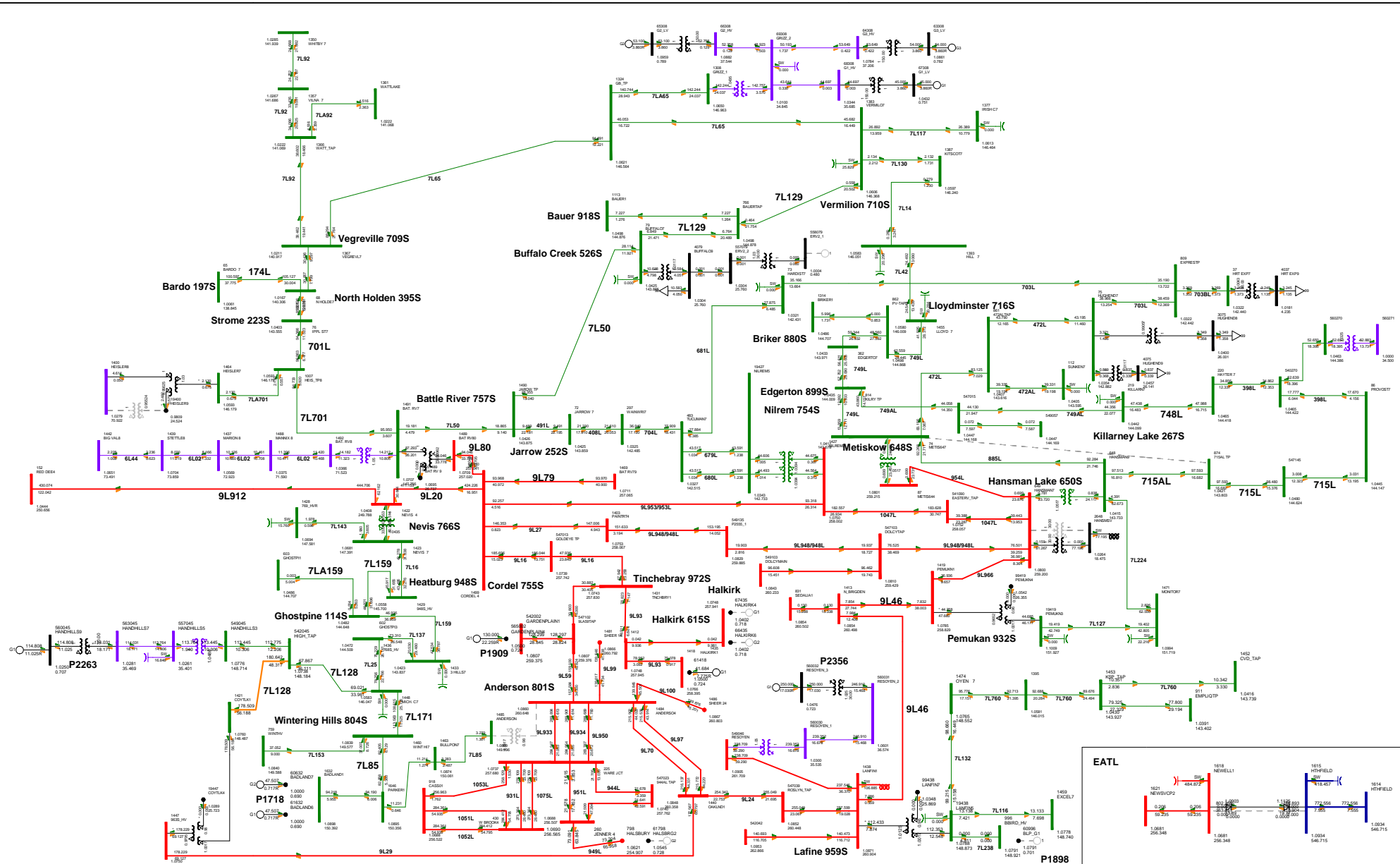
Bus Voltage (V) =  
Branch MW =  
Equipment / MVA =  
102.5% Fault A =  
KV = 10.00-14.50-18.00-23.00-34.50-50.00-69.00

FIGURE A3.4-8 9L29 (OKLAND 946S TO COYOTE LAKE 963S)  
2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
EATL: -808.214 MW

BC Import: -119.155 MW  
Sask Import: -150.000 MW  
MATL Import: -182.738 MW





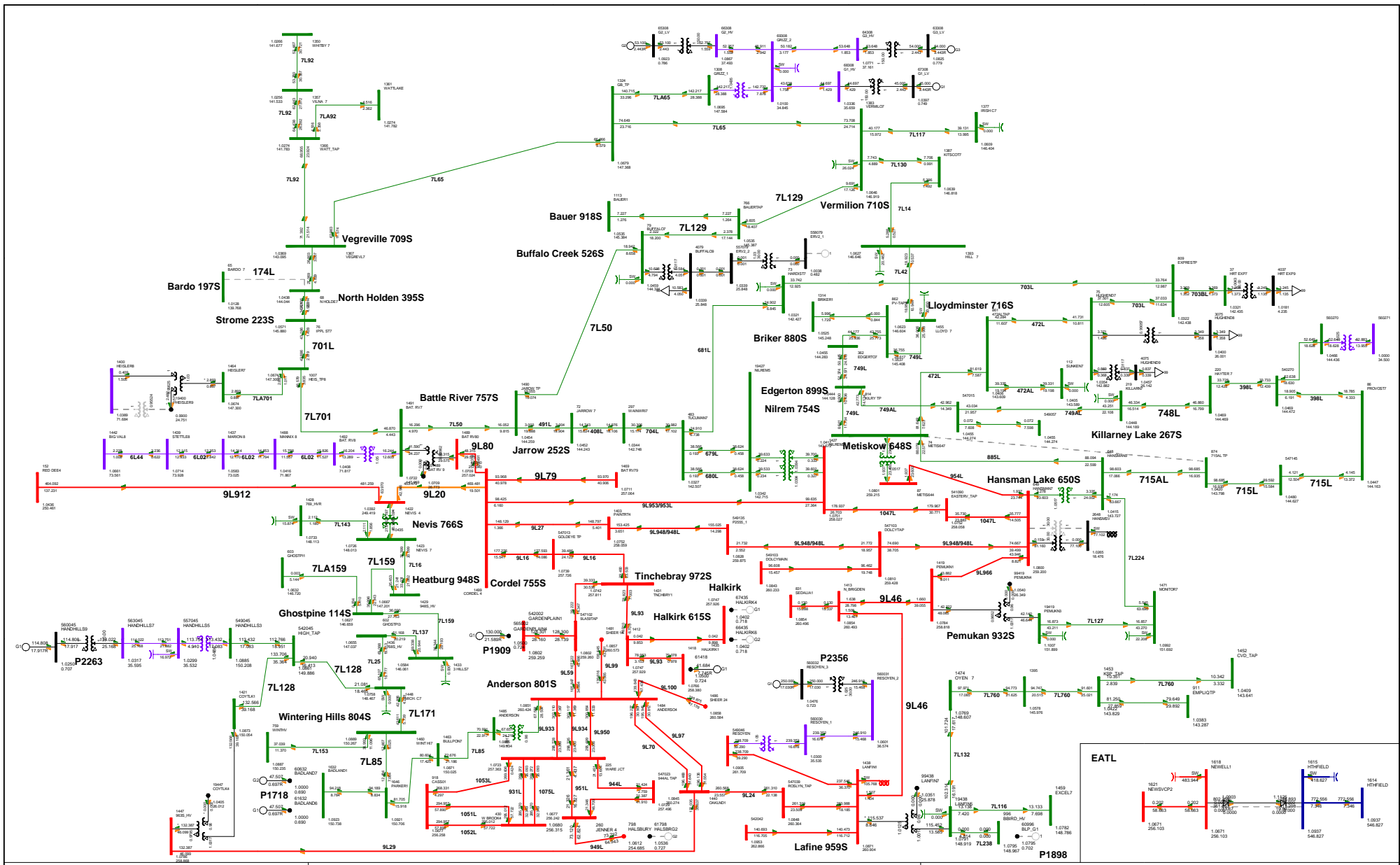
**P2356 Oyen MPC Wind**

Bus Voltage (V) = 240  
 Breaker (V) = 240  
 Equipment (V) = 240  
 102.76 kV = 102.76 kV  
 W = +0.000 + 0.000 - 0.000 = 0.000 + 0.000 + 0.000 = 0.000

**FIGURE A3.4-9 801S T1 (ANDERSON 801S 240/138 KV TRANSFORMER)**  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.214 MW

BC Import: -133.610 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



**P2356 Oyen MPC Wind**

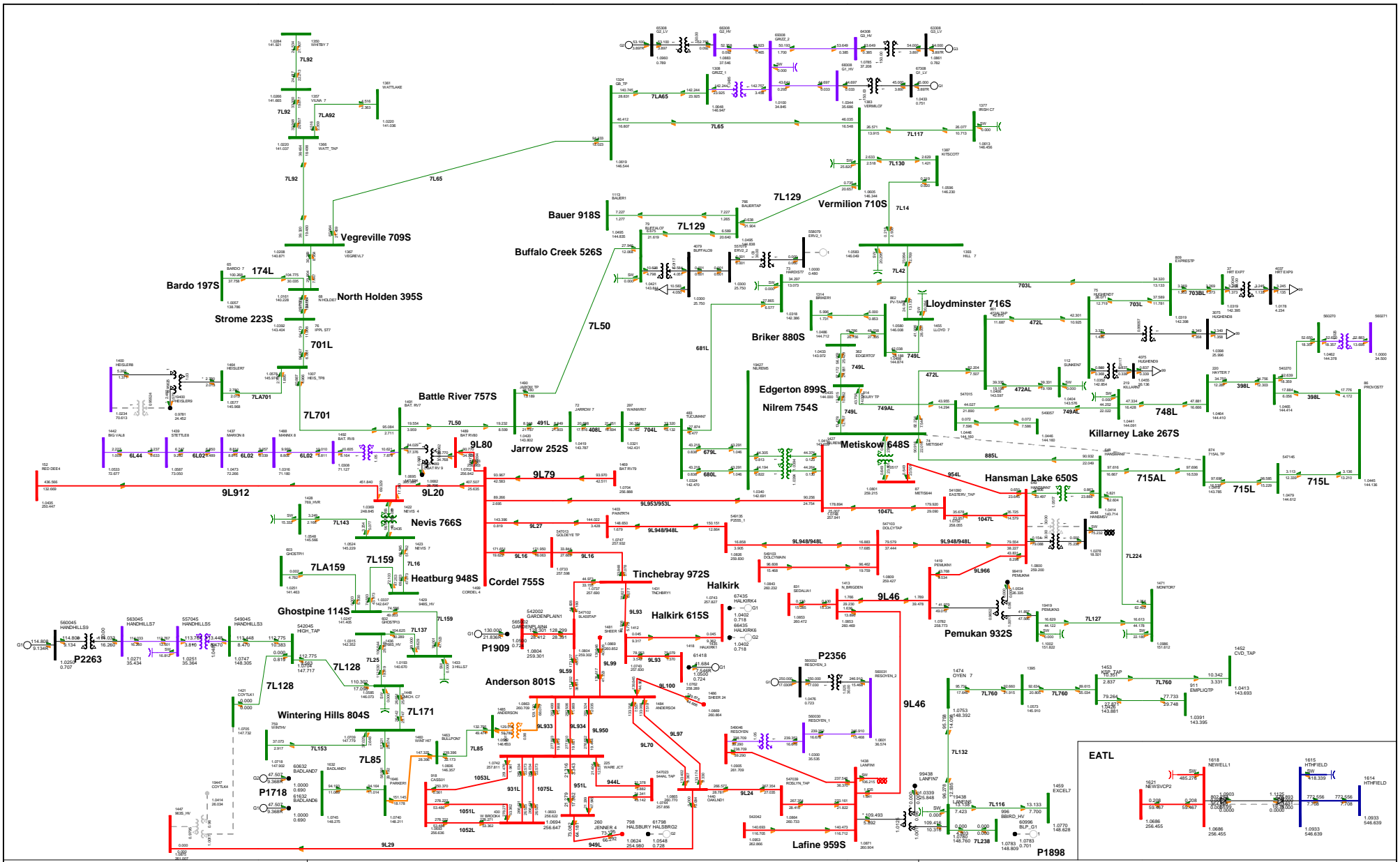
Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

**FIGURE A3.4-10 174L (NORTH HOLDEN 395S TO BARDO 197S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.207 MW

BC Import: -139.232 MW  
 Sask Import: -150.000 MW  
 Matl Import: -182.738 MW





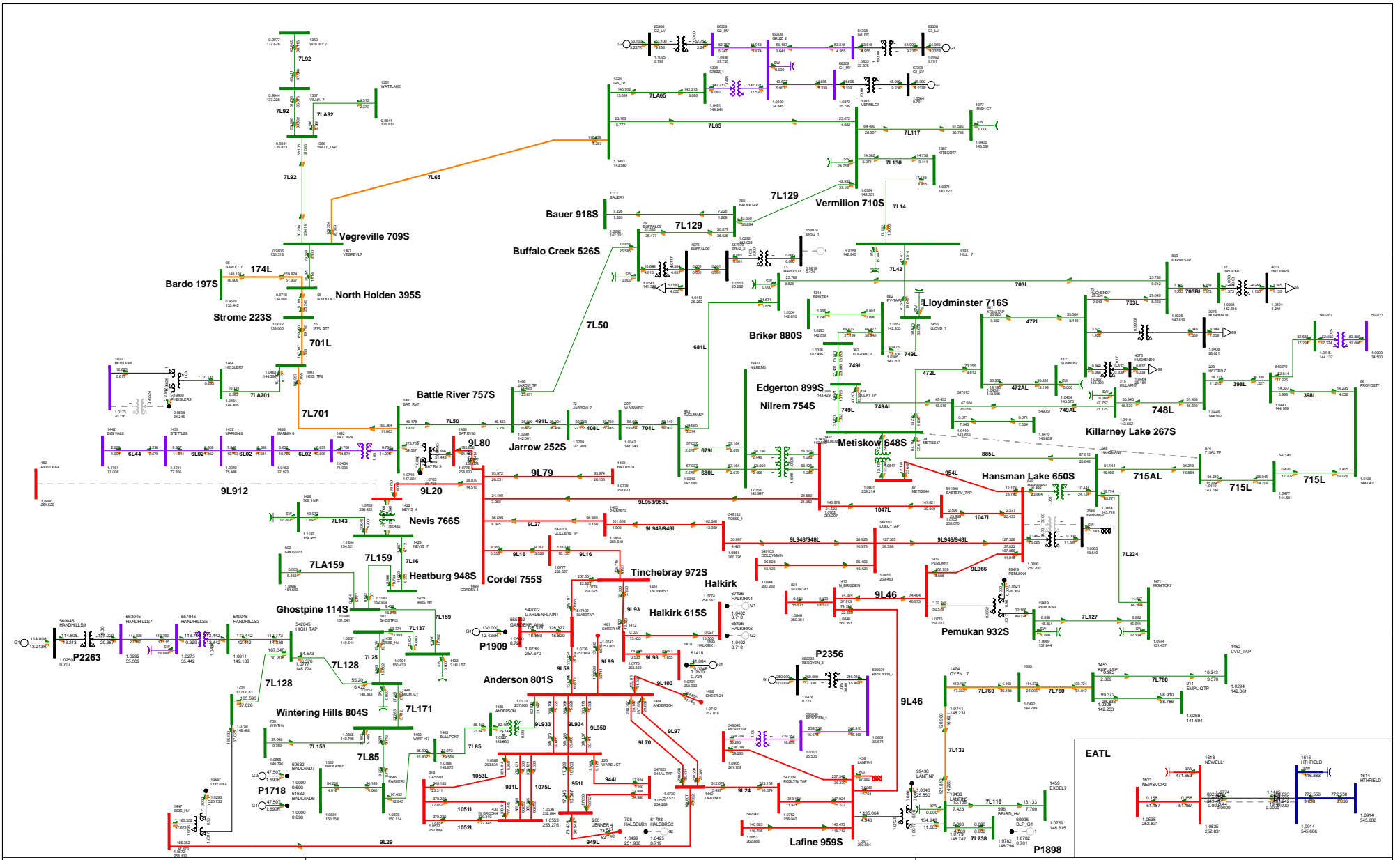
**P2356 Oyen MPC Wind**

FIGURE A3-4-11 963S T1 (COYOTE LAKE 963S TRANSFORMER T1)  
2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PHI)  
PRINTED ON MONDAY 23. SEPTEMBER 2024

Bus: Voltage (V) @  
Branch: MW  
Equipment: MVA/Mvar  
102.5% Peak A  
KV: 10.000=34.500=69.000=138.000=240.000=500.000

WATL: -2.433 MW  
EATL: -808.217 MW

BC Import: -119.241 MW  
Sask Import: -150.000 MW  
MATL Import: -182.738 MW



**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW @  
 102.5kV @ 100 MVA  
 W: +0.000+0.400-0.000-0.000  
 S: +0.000+0.000-0.000-0.000

**FIGURE A3.4-12 912L (NEVIS 766S TO RED DEER 63S)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.118 MW

BC Import: -68.272 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

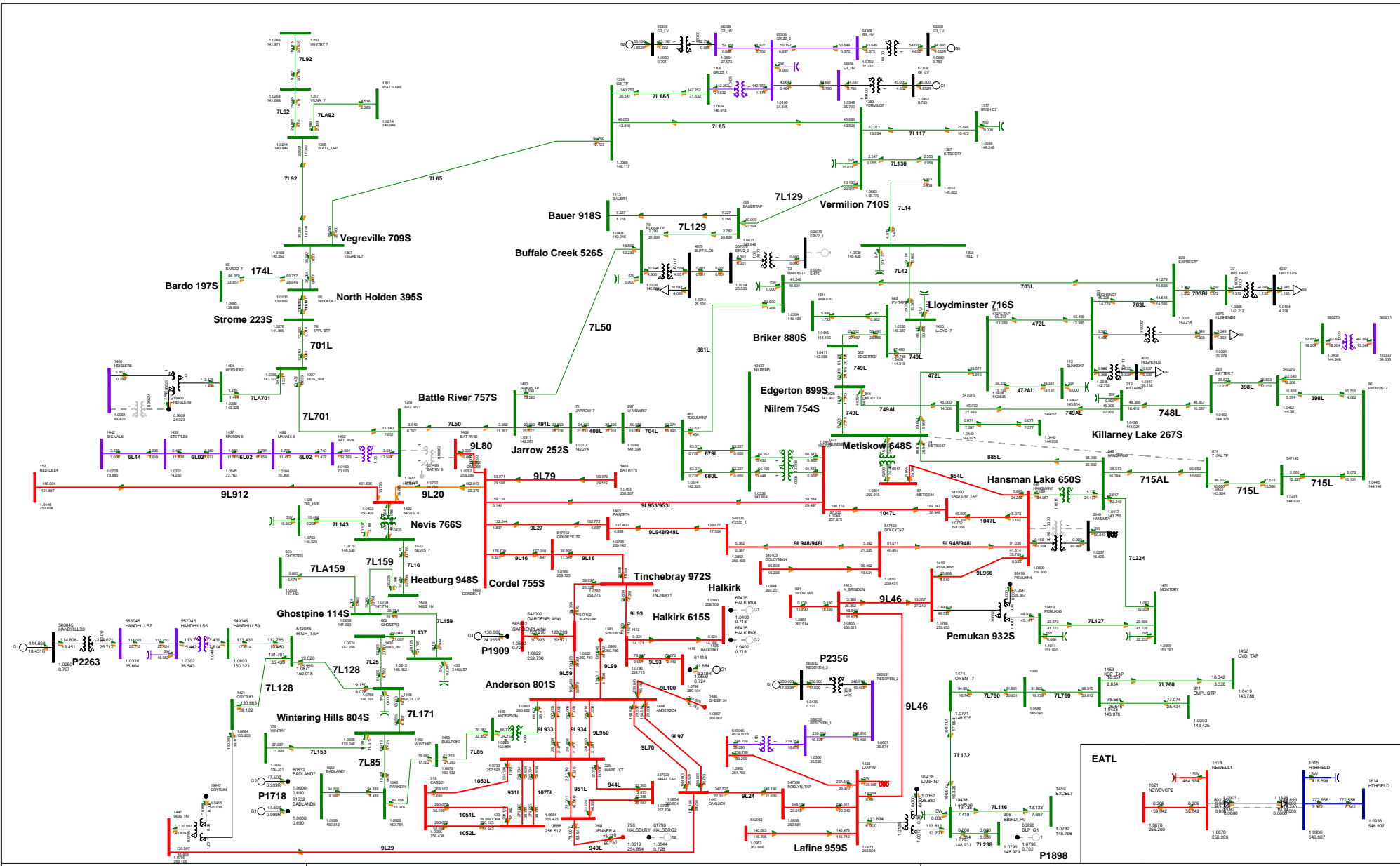


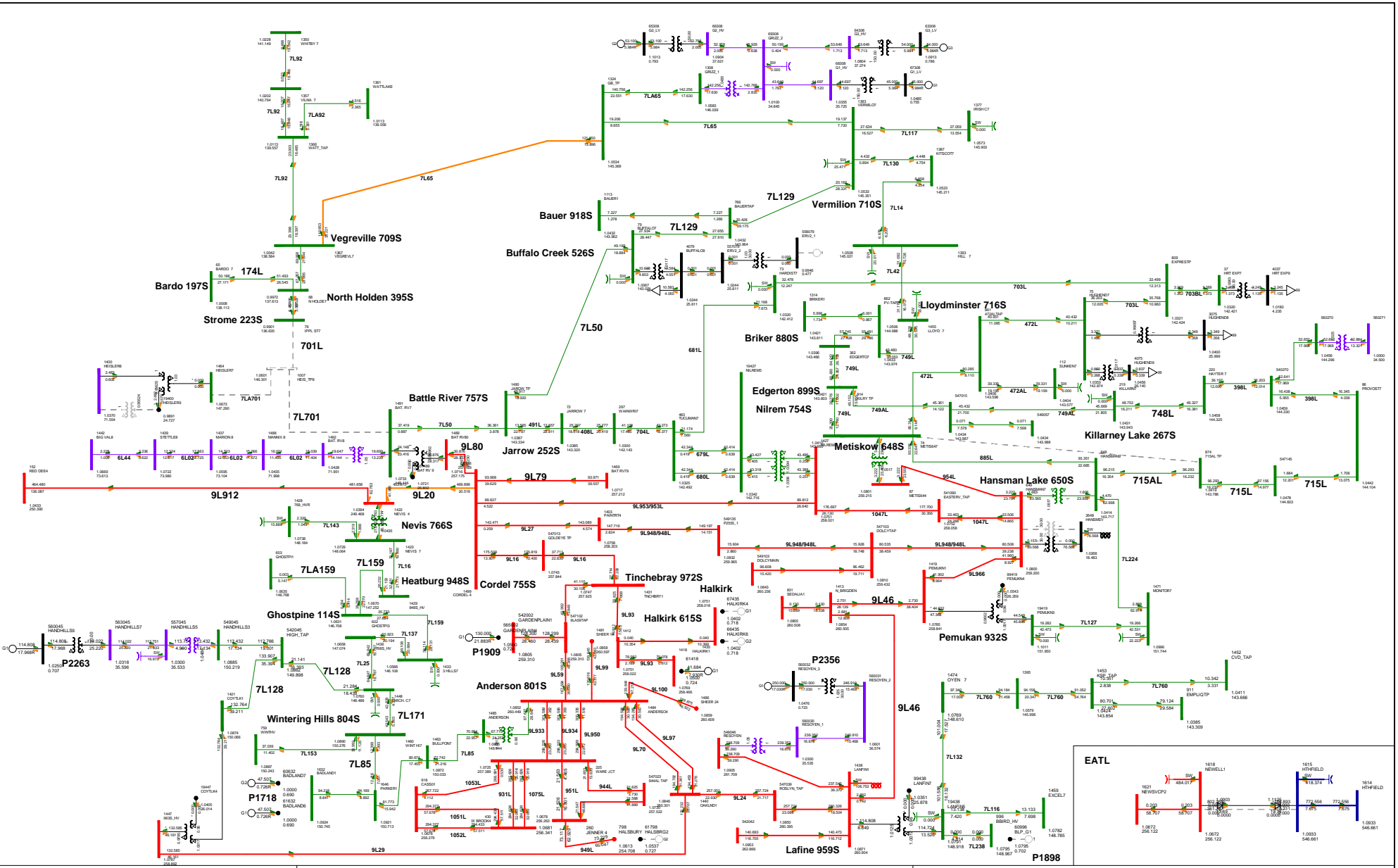
FIGURE A3-4-13 BATTLE RIVER TRANSFORMER T2  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

P2356 Oyen MPC Wind

Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/Mvar  
 102.50/100kVA  
 W: +0.000+54.500-89.009 +138.000 +240.000 +400.000

WATL: -2.433 MW  
 EATL: -808.212 MW

BC Import: -145.333 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



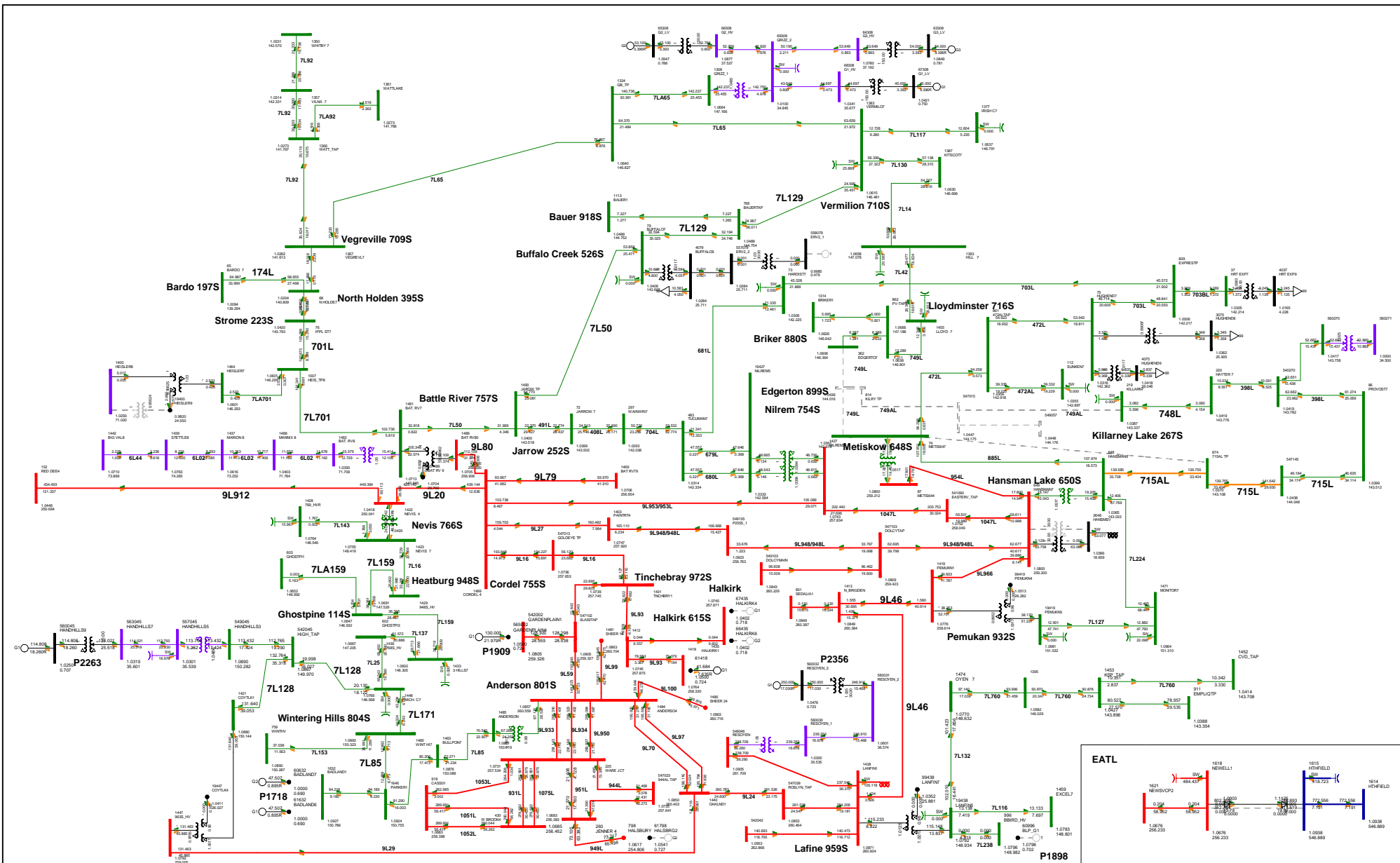
**P2356 Oyen MPC Wind**

Bus Voltage (kV) 115  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+0.400-0.000-0.000+0.000+0.000+0.000

**FIGURE A3.4-14 70/1L (STROME 223S TO BATTLE RIVER 757S)**  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.207 MW

BC Import: -136.078 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



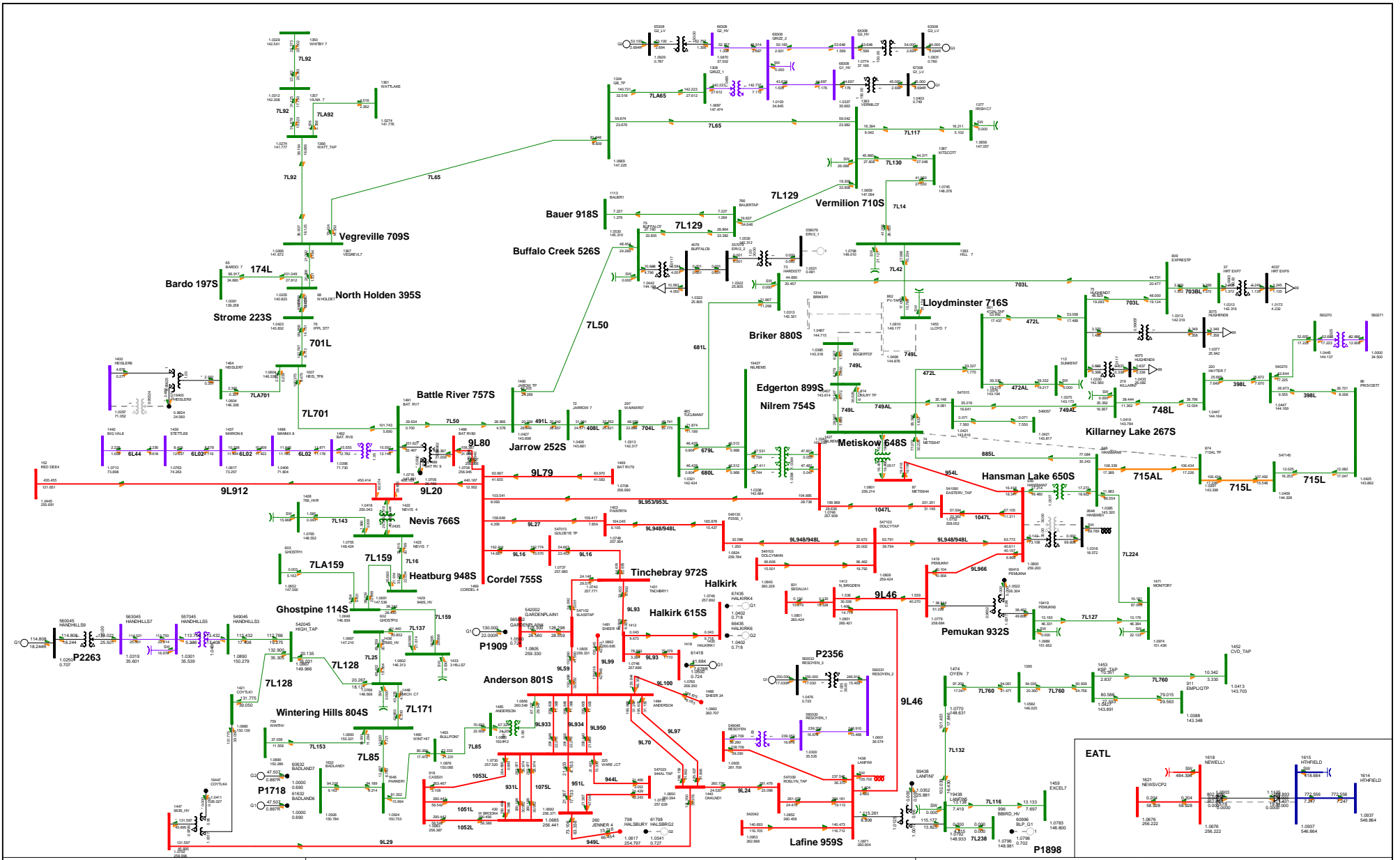
**P2356 Oyen MPC Wind**

Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/Mvar  
 100.76V @ 100 MVA  
 W: +0.000+34.500-88.000-138.000+240.000+300.000

**FIGURE A3.4-15 749L (METISKOW 648S TO EDGERTON 899S)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.210 MW

BC Import: -135.936 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



**P2356 Oyen MPC Wind**

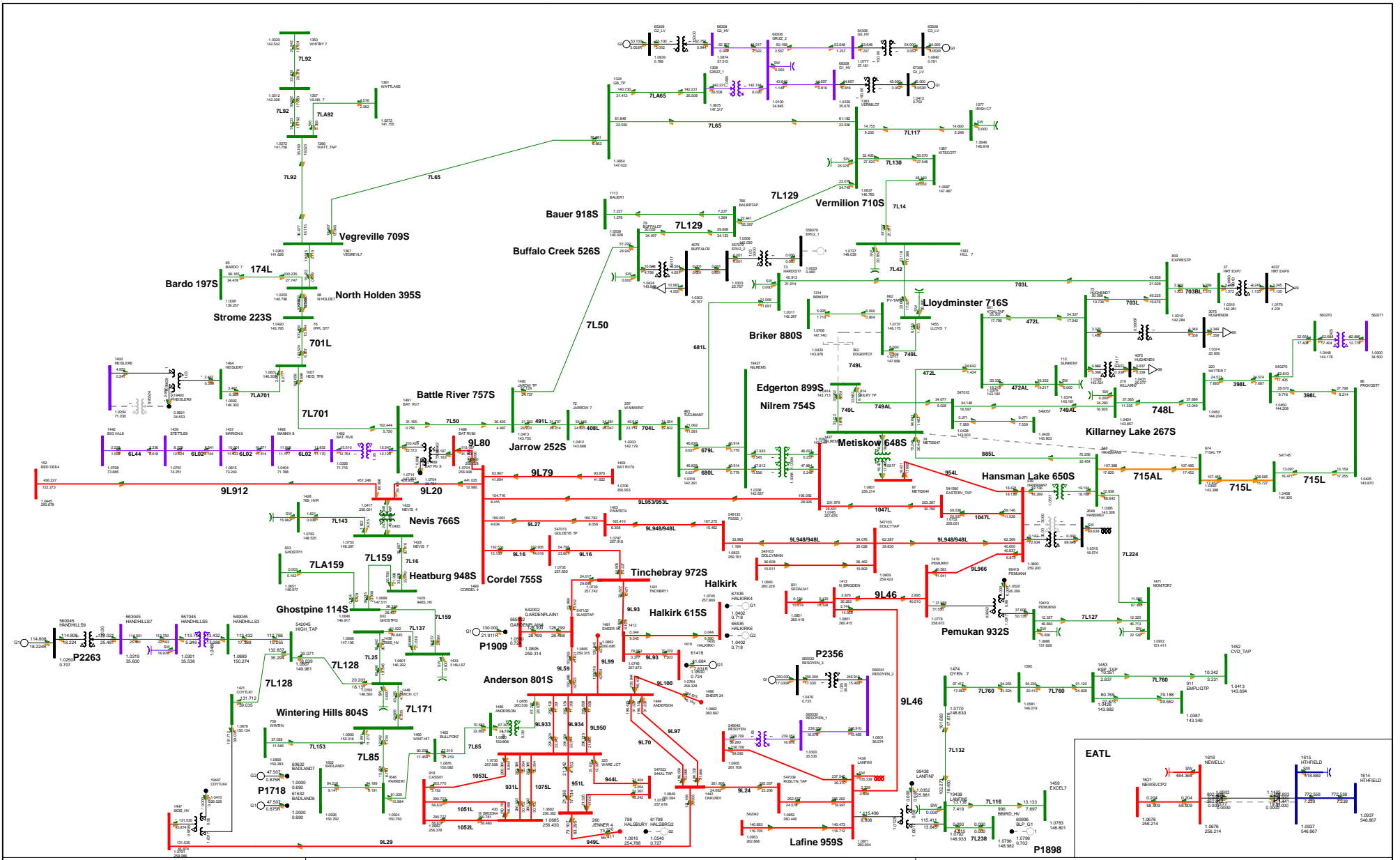
Bus Voltage (V) @  
 Base MVA  
 Equipment MVA/MW  
 102.5kV/50MVA  
 W: +0.000+54.500-88.000-138.000+240.000 =+0.000

**FIGURE A3-4-16 749L (EDGERTON 899S TO LLOYDMINSTER 716S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.210 MW

BC Import: -144.317 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW





**P2356 Oyen MPC Wind**

Bus Voltage (V) 90  
 Breaker (MVA) 100  
 Equipment (MVA) 100  
 W: +0.000+0.400-0.000+0.000+0.000+0.000

**FIGURE A3-4-17 EDGERTON 899S TRANSFORMER T1**  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.210 MW

BC Import: -143.442 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

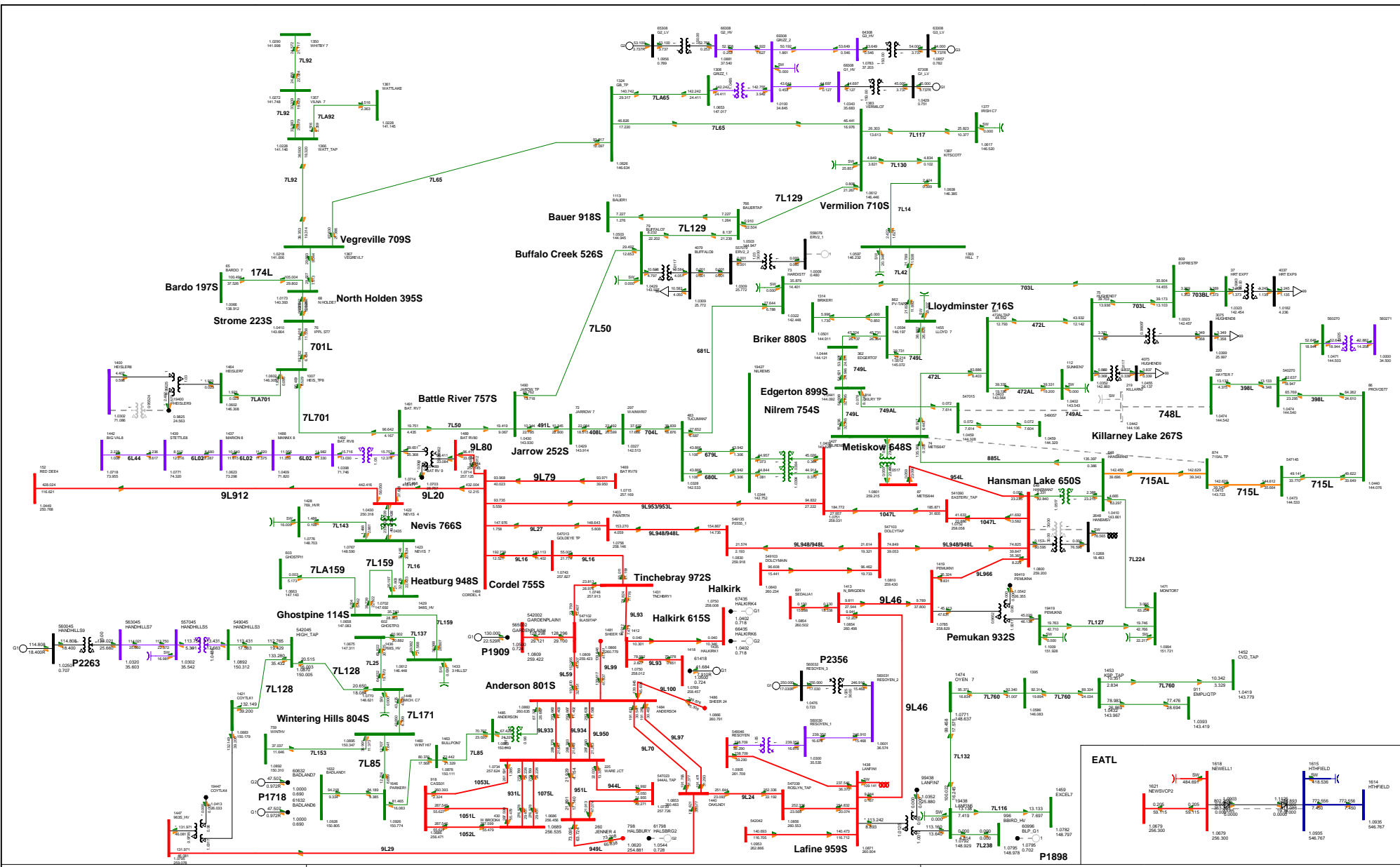


FIGURE A3-4-18 KILLARNEY LAKE 267S TRANSFORMER T1  
 2023 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

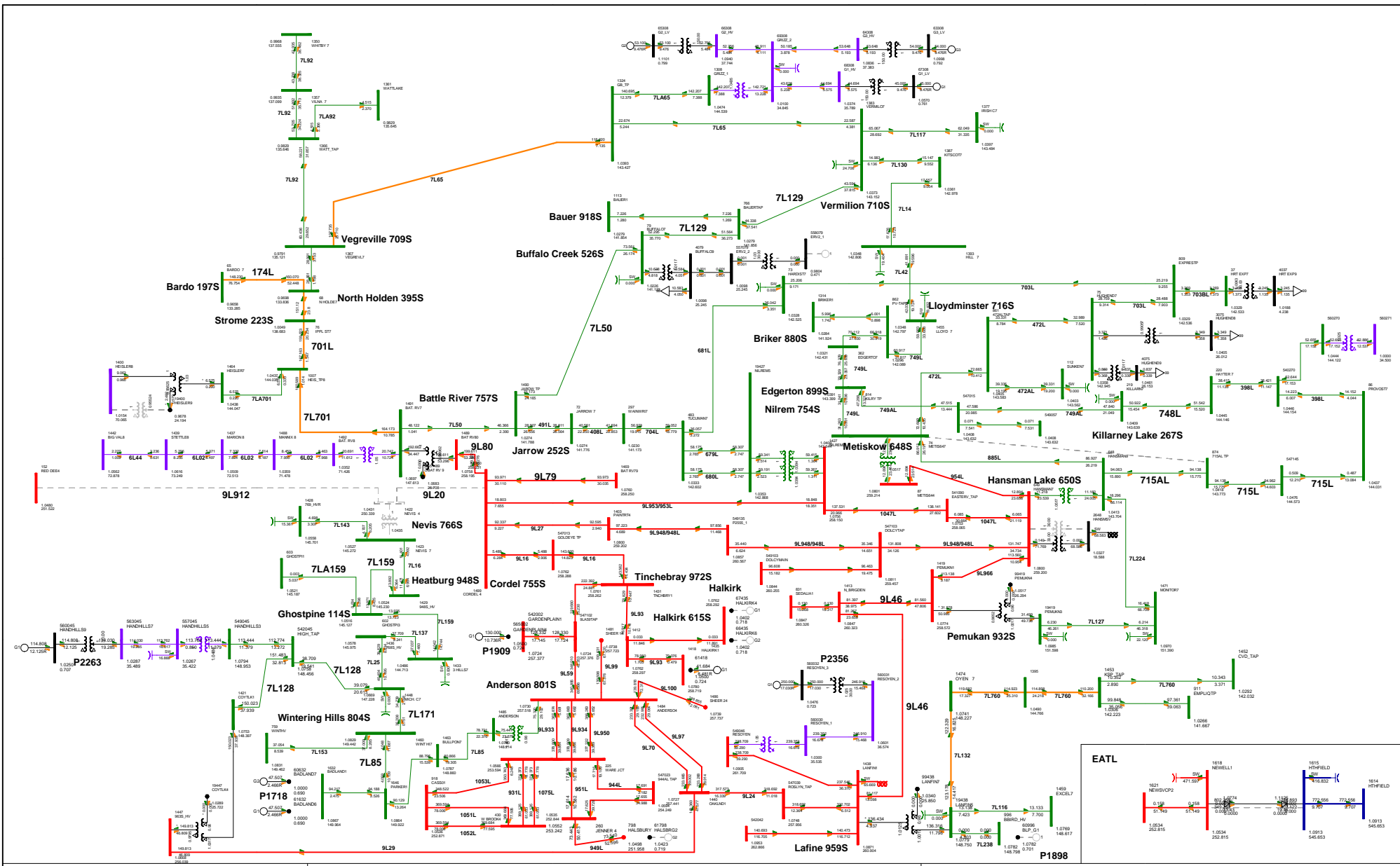
P2356 Oyen MPC Wind

Bus Voltage (V) @  
 Breaker (MVA)  
 Equipment (MVA) @  
 102.5kV @ 100.0  
 W: +0.000+34.500=-138.000+1240.000+900.000

WATL: -2.433 MW  
 EATL: -808.212 MW

BC Import: -141.314 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW





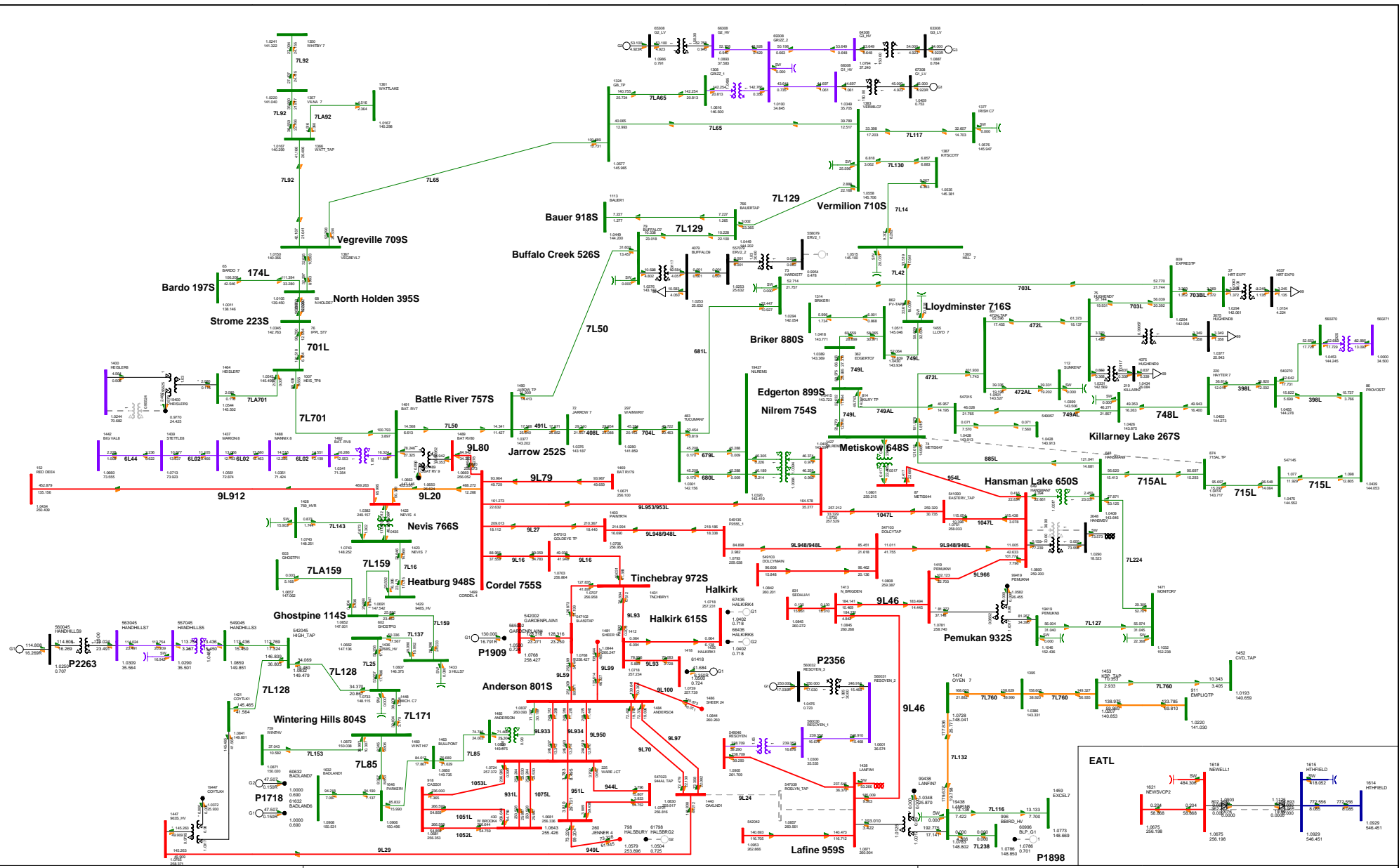
**P2356 Oyen MPC Wind**

Bus Voltage (V/Hz)  
 Base MVA  
 Equipment MVA/Hz  
 102.5/0.954  
 W: +0.000+34.500-88.009-138.000+240.000+500.000

**FIGURE A3.4-19 766S T1 (NEVIS 766S 240/138 KV TRANSFORMER)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024**

WATL: -2.433 MW  
 EATL: -808.117 MW

BC Import: -66.787 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



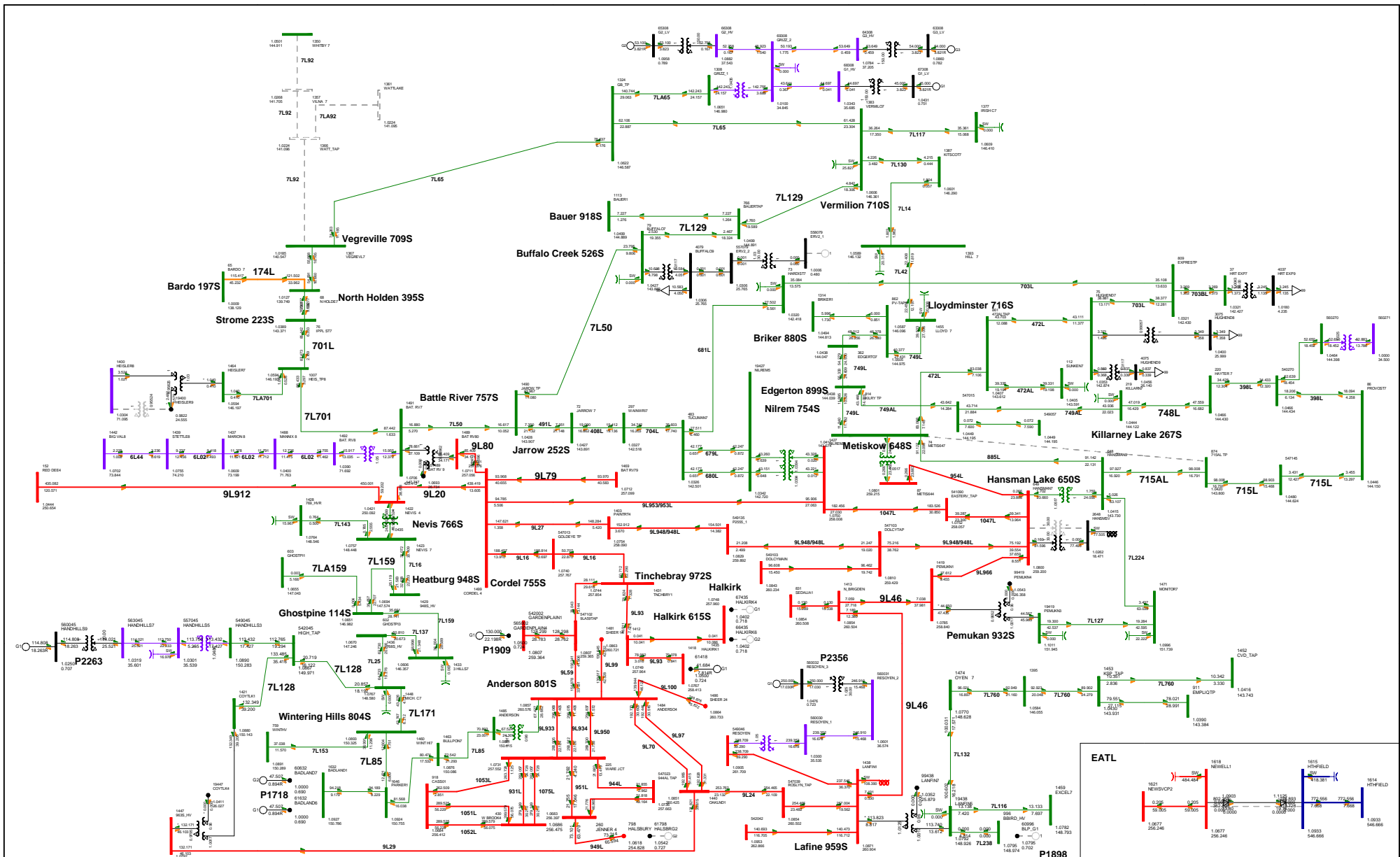
**P2356 Oyen MPC Wind**

Bus Voltage (V) 600  
 Base MVA 100  
 Equipment MVA/MW 100/20000  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

**FIGURE A3.4-20 9L24 (OAKLAND 946S - LANFIRE 959S)**  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23, SEPTEMBER 2024

WATL: -2.433 MW  
 EATL: -808.209 MW

BC Import: -110.016 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



**P2356 Open MPC Wind**

Bus: Voltage (110kV)  
 Bus#: -141A  
 Equipment: 6000kvar  
 10: PU:Rm A  
 W: 42.000+34.300+89.000+118.000+246.000+500.000

FIGURE AS-4-21 TL3S (VEGREVILLE T89S TO WHITNEY LAKE 819S)  
 2023 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1)  
 PRINTED ON MONDAY 23. SEPTEMBER 2024

GATL: -2.433 MW  
 EATL: -808.211 MW

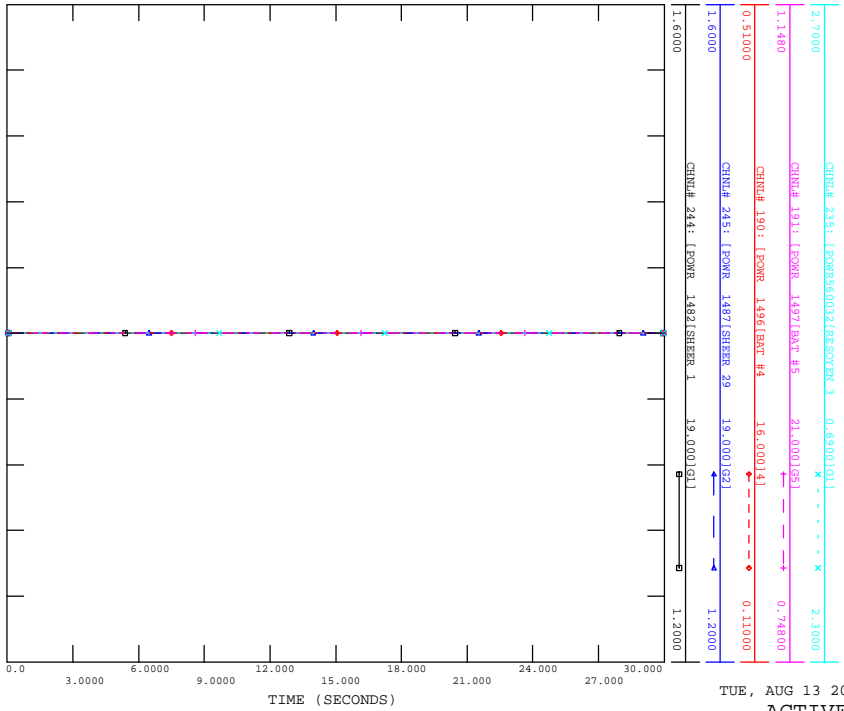
BC Import: -151.966 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

# Attachment A4

## Post-Project Transient Stability Diagrams

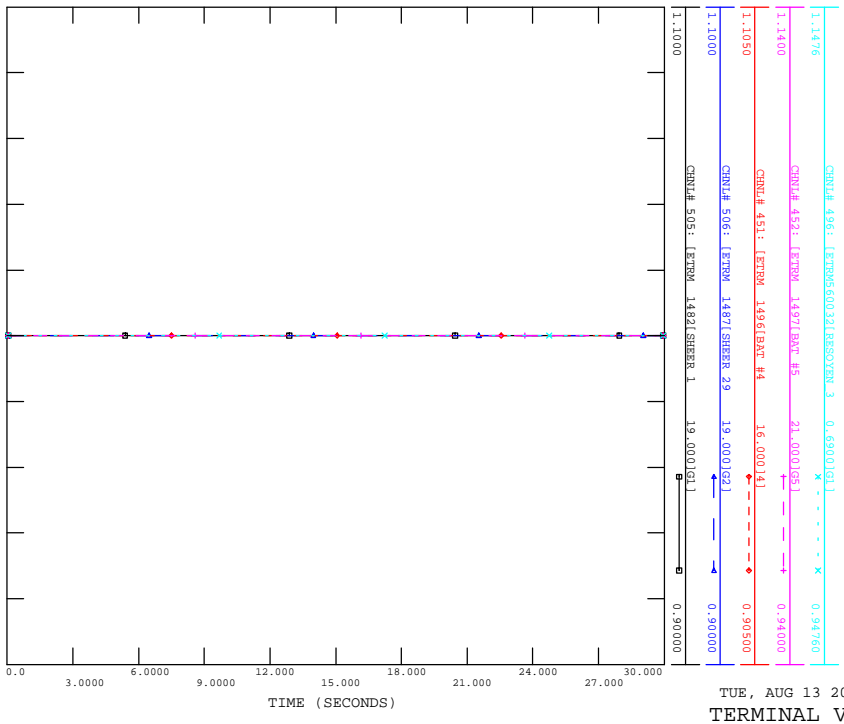
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CONTINGENCY -SCN4\_2028SP\_00\_NOPFAULT

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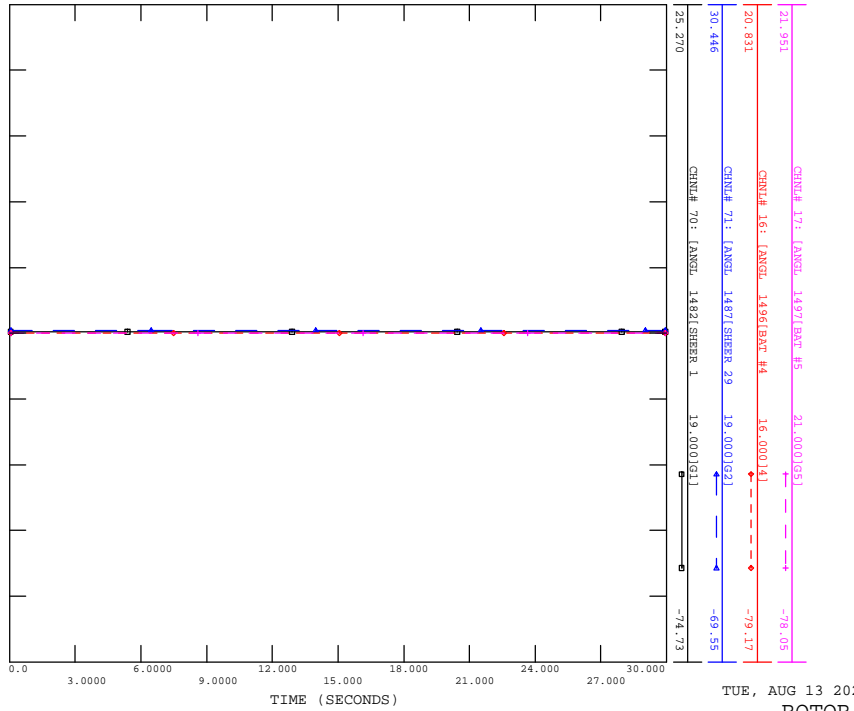
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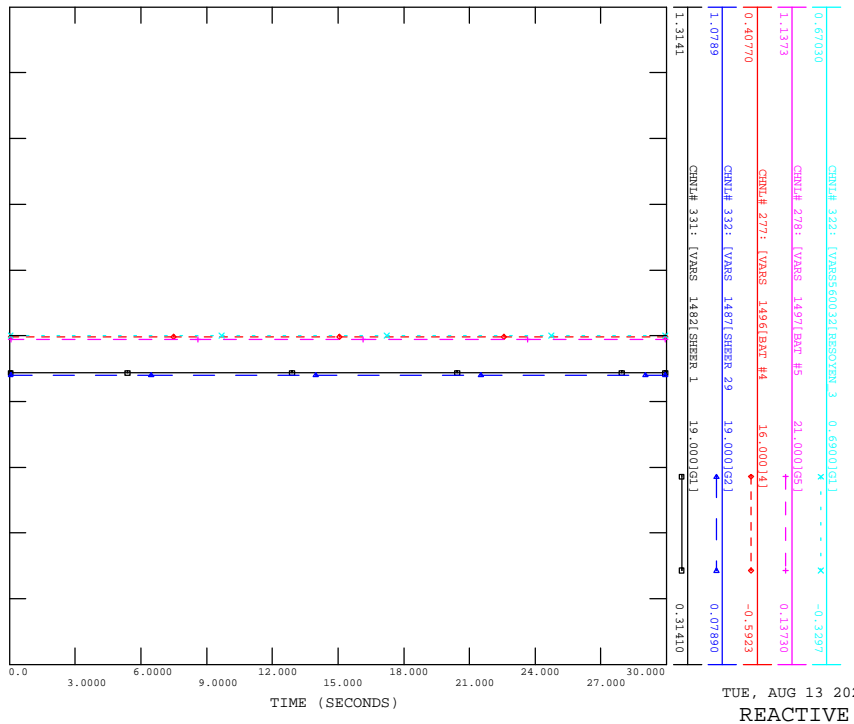
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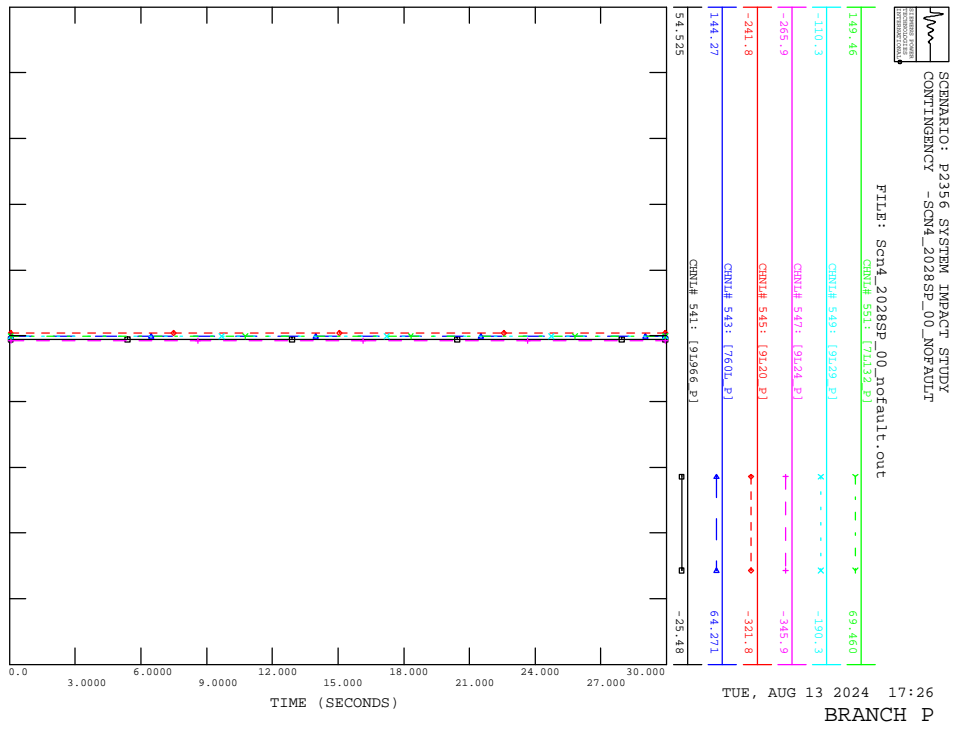
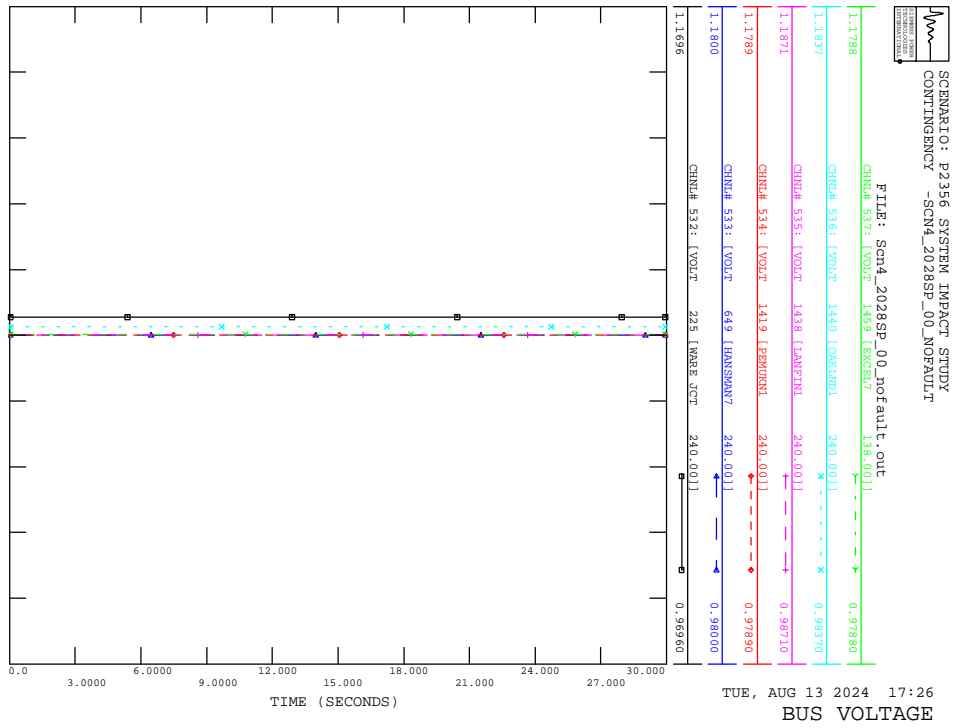
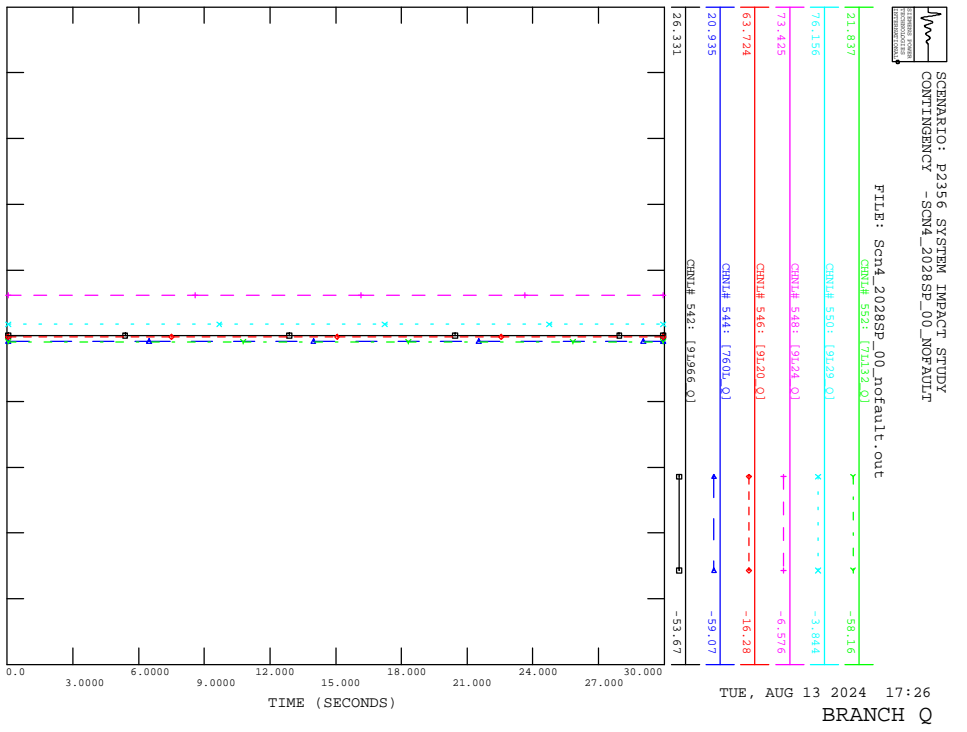
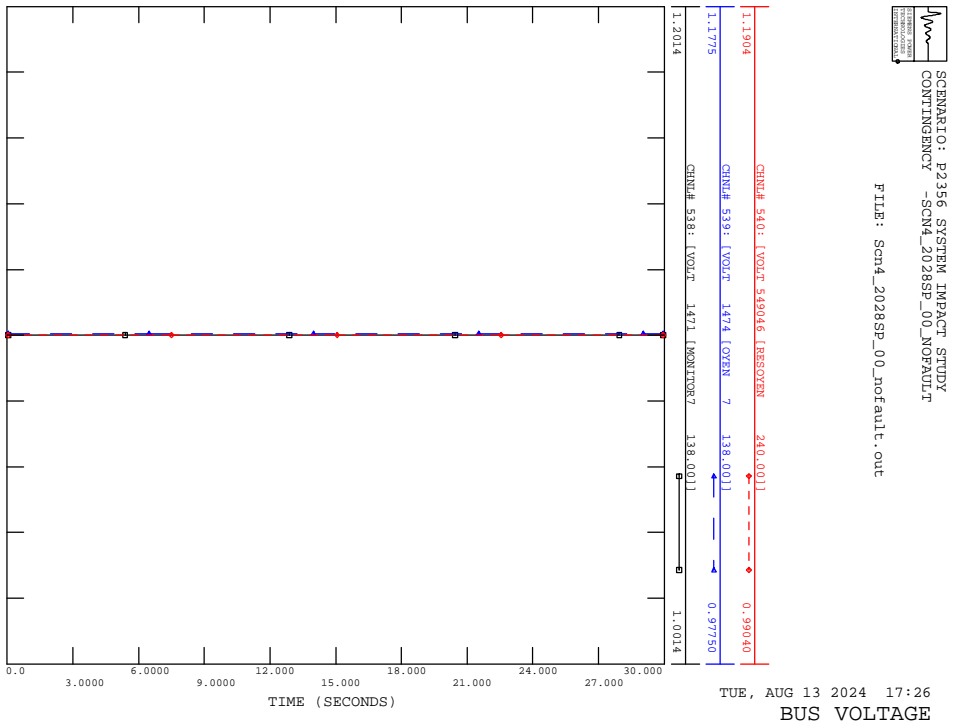
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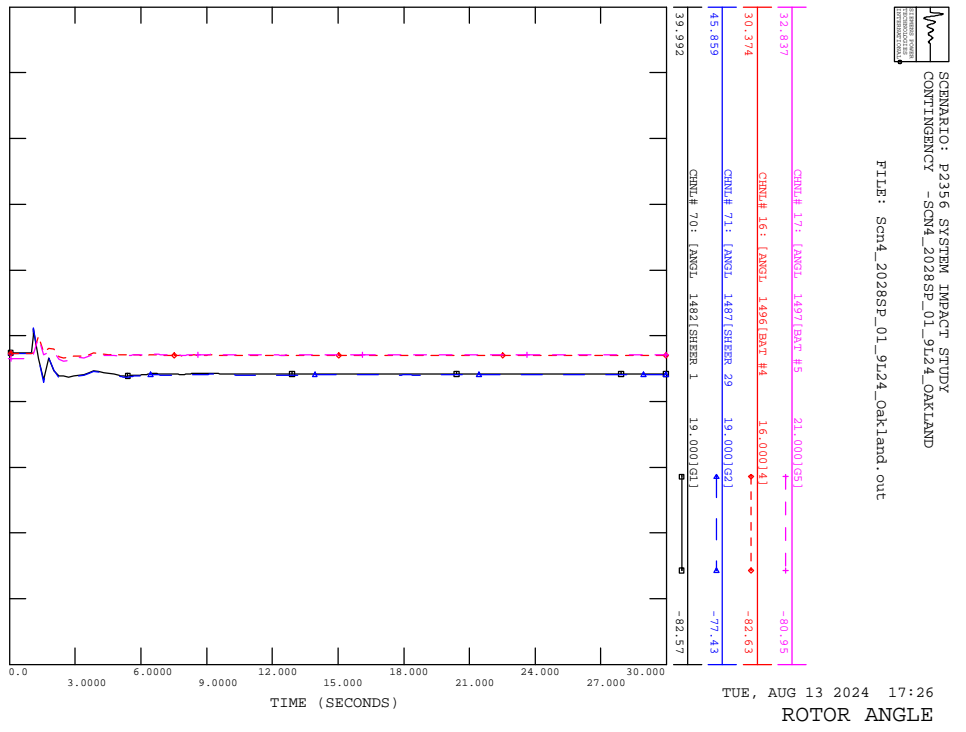
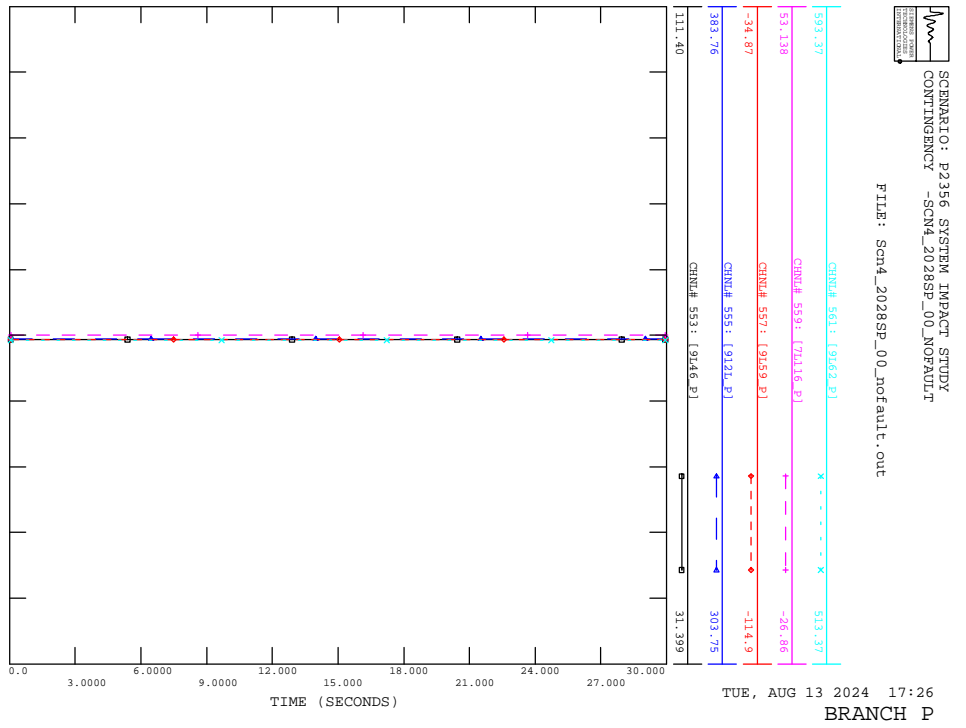
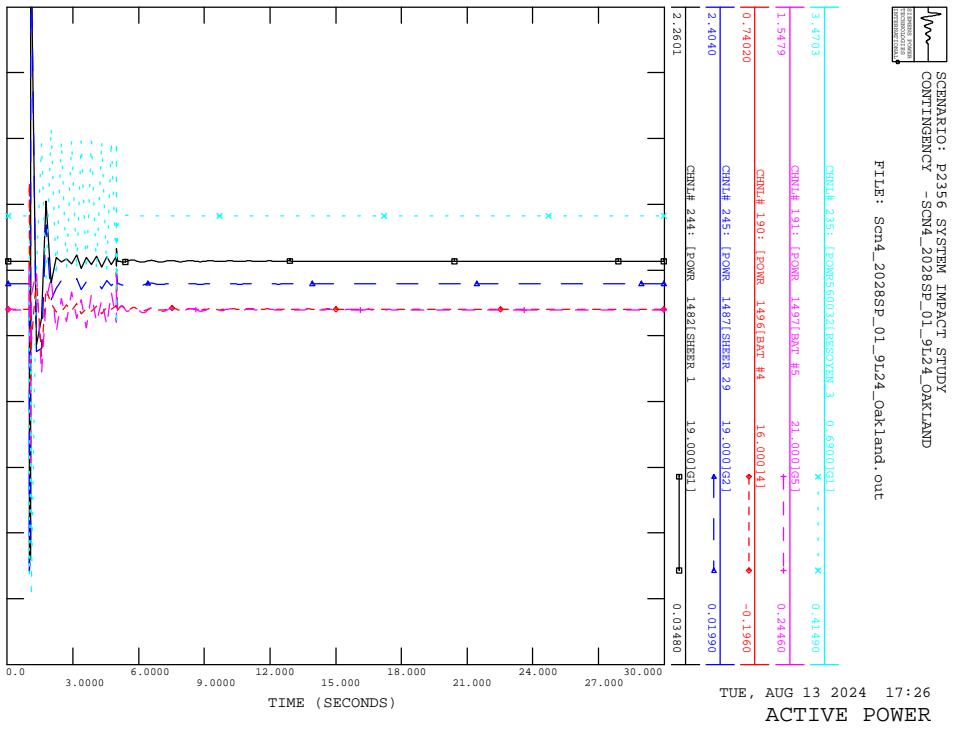
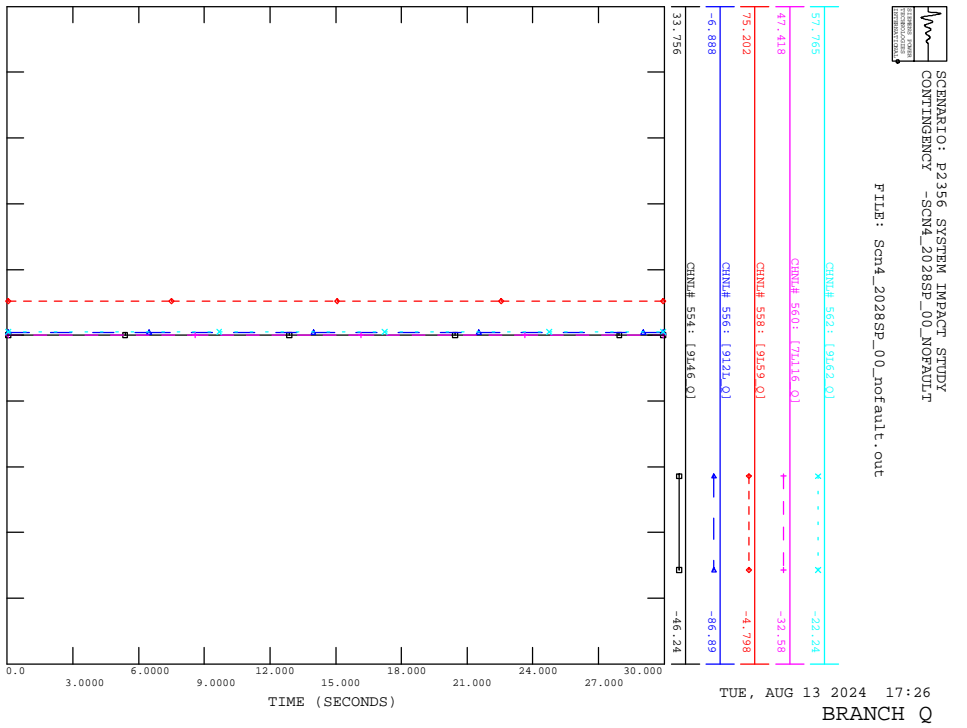


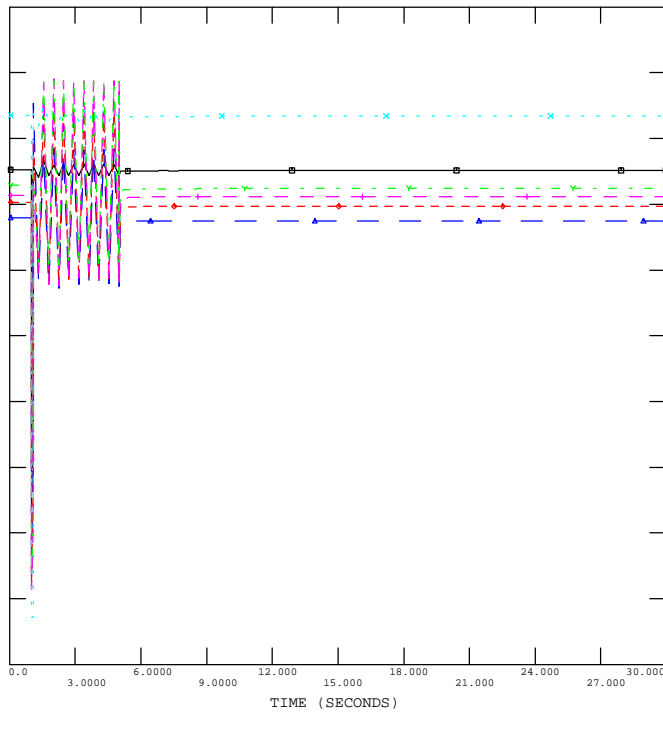
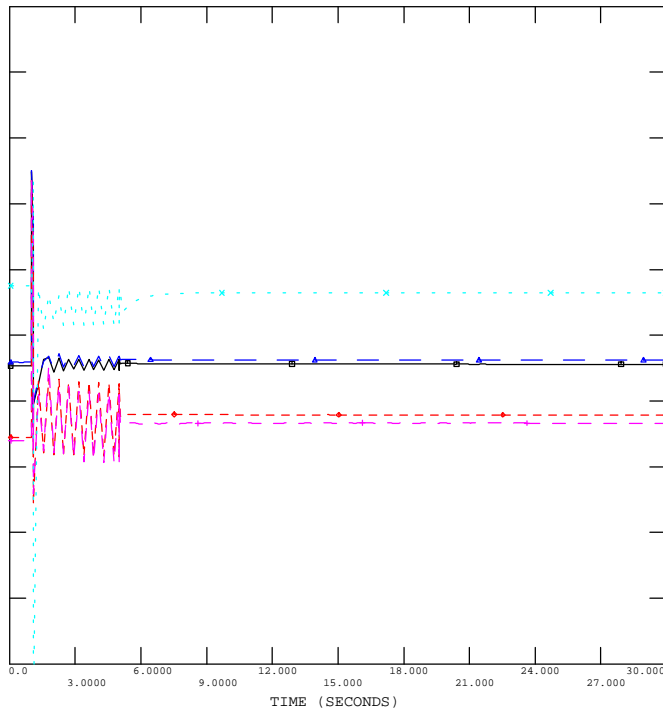
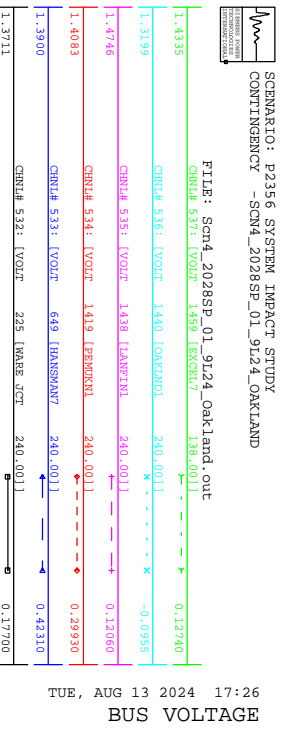
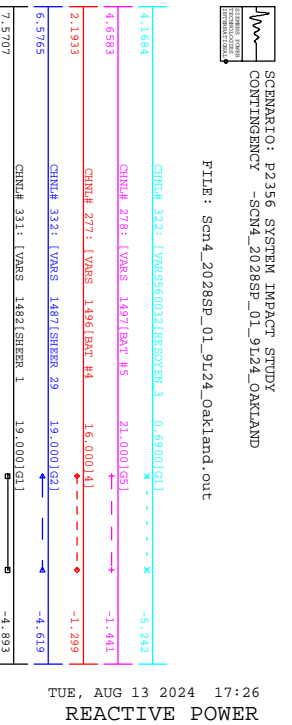
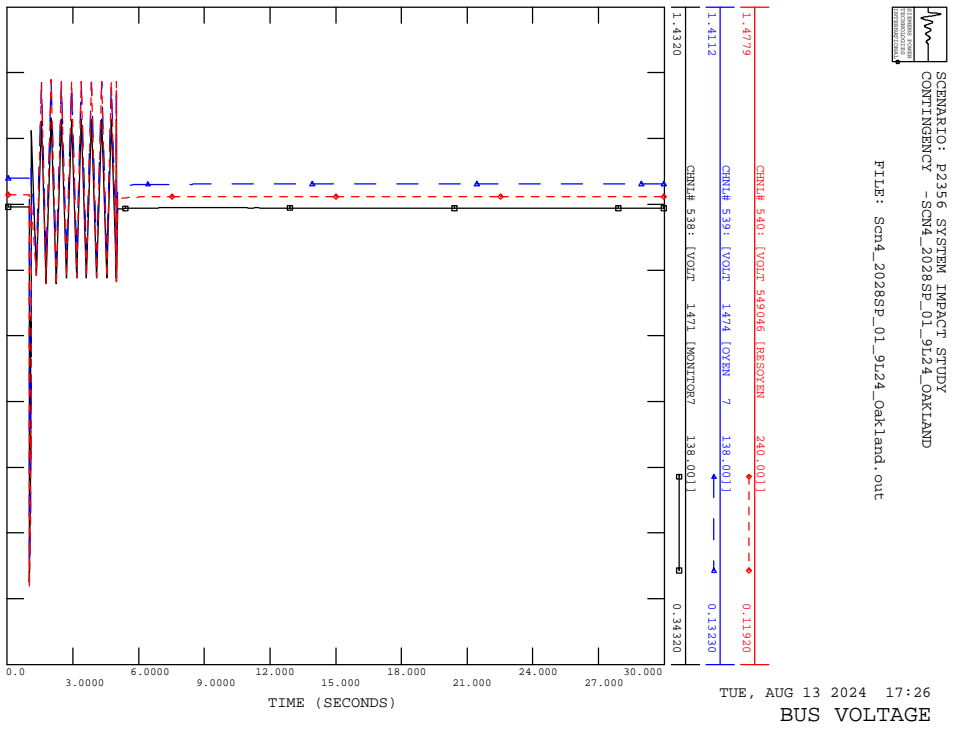
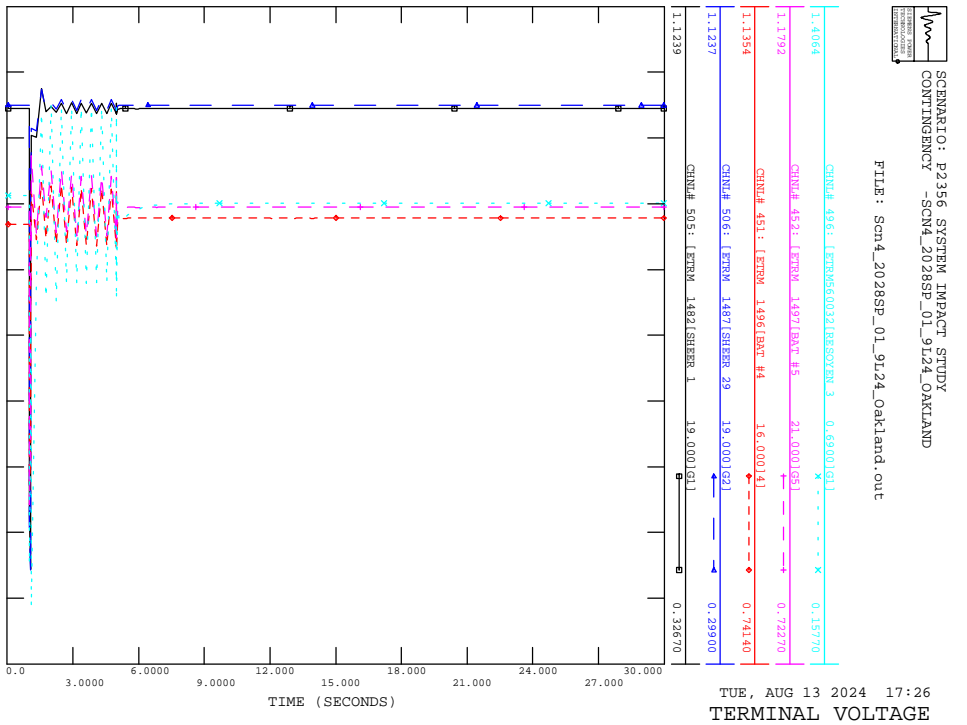
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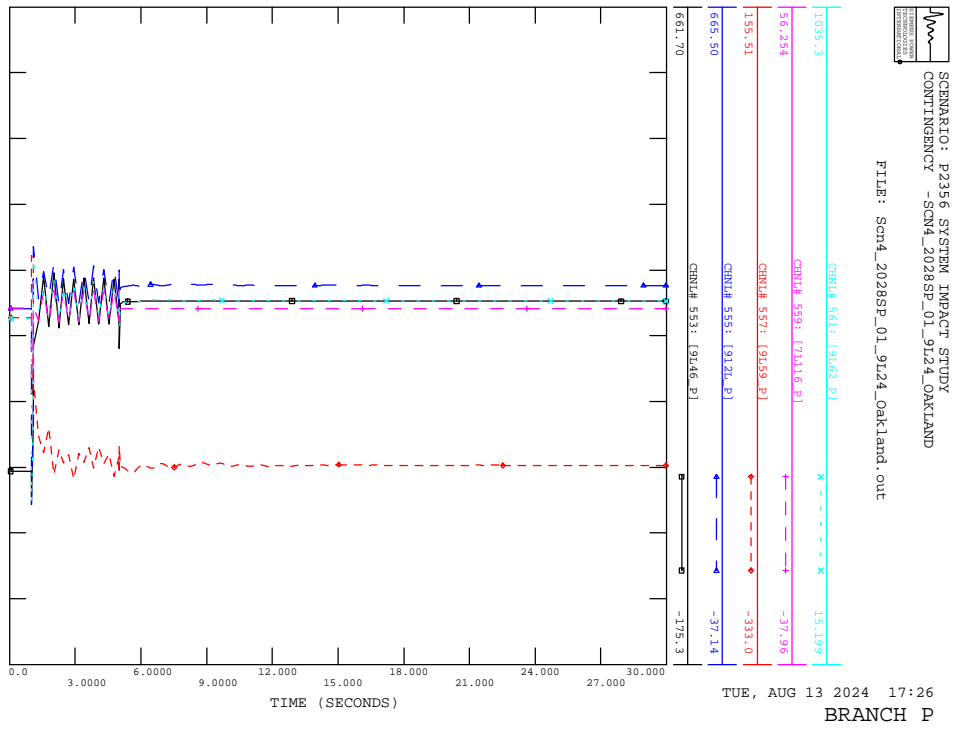
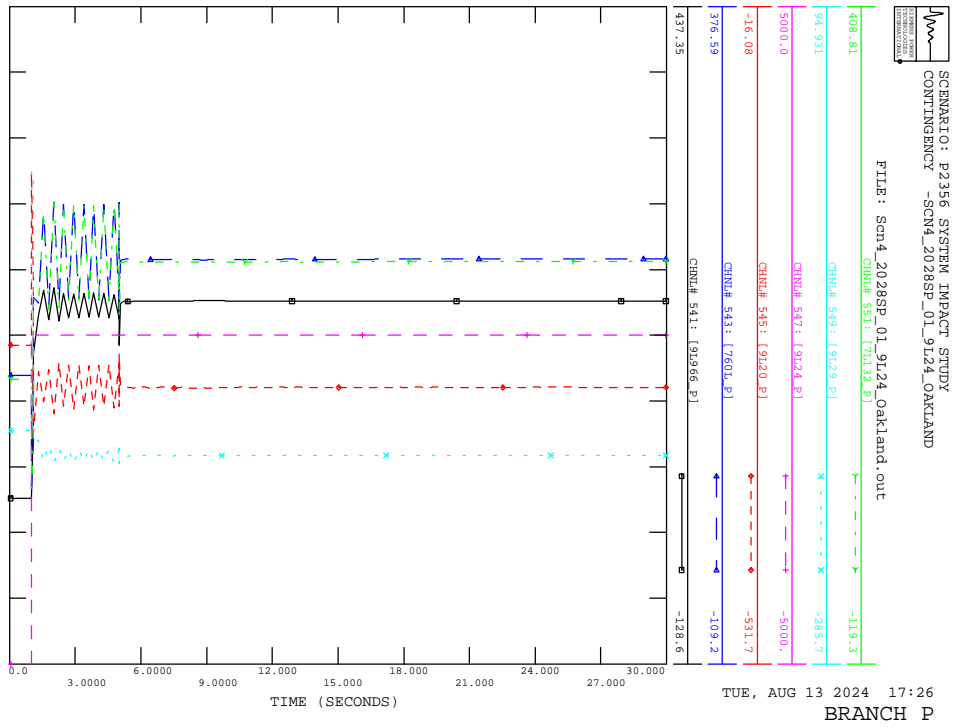
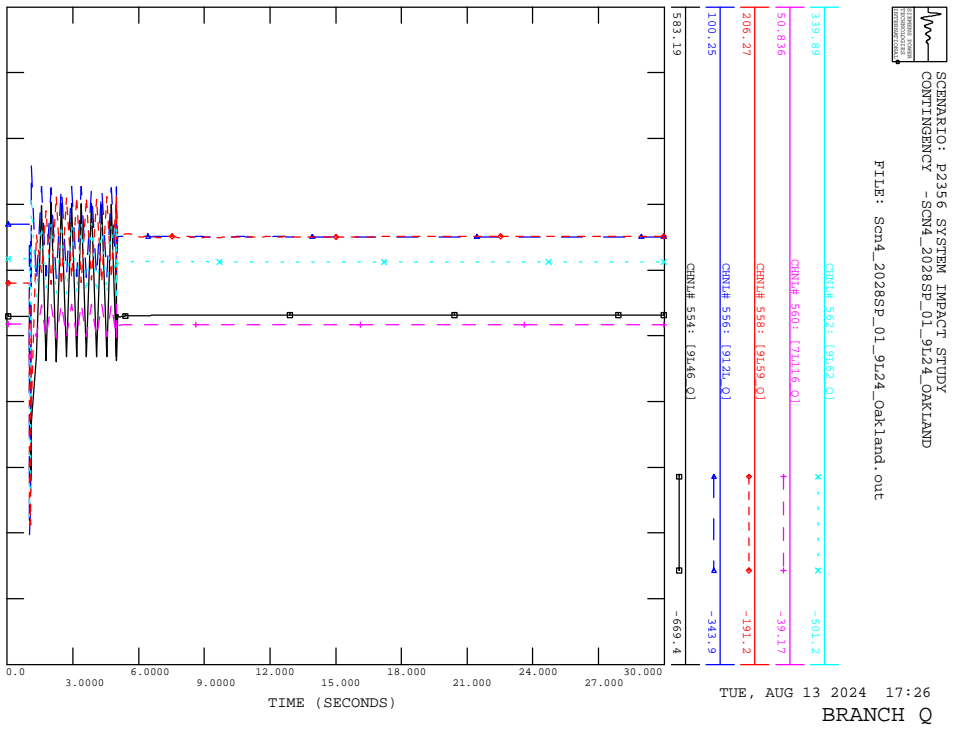
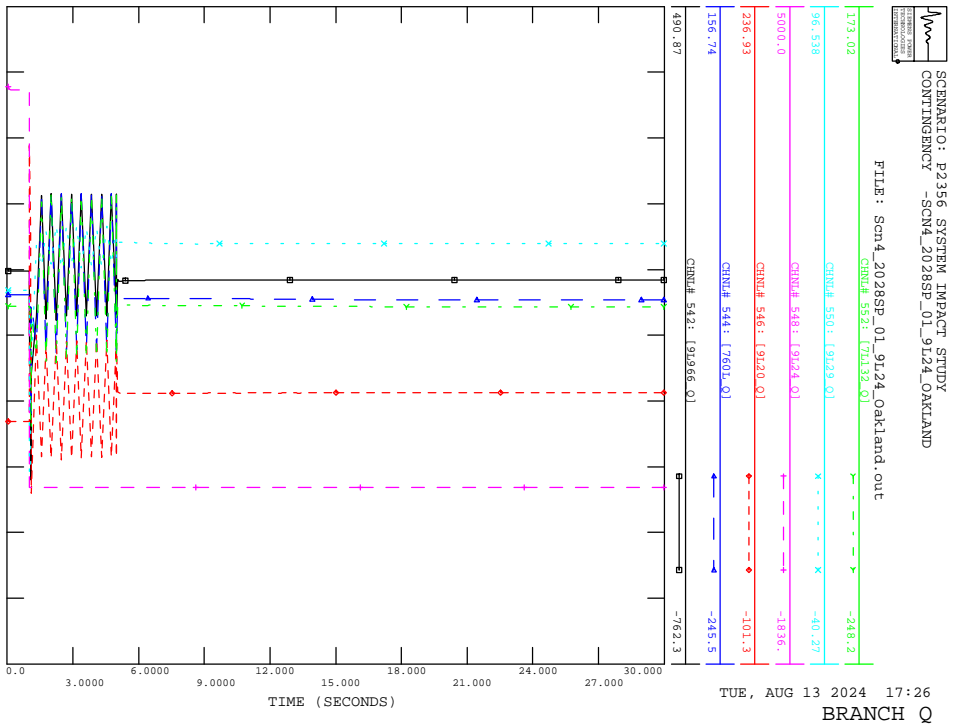






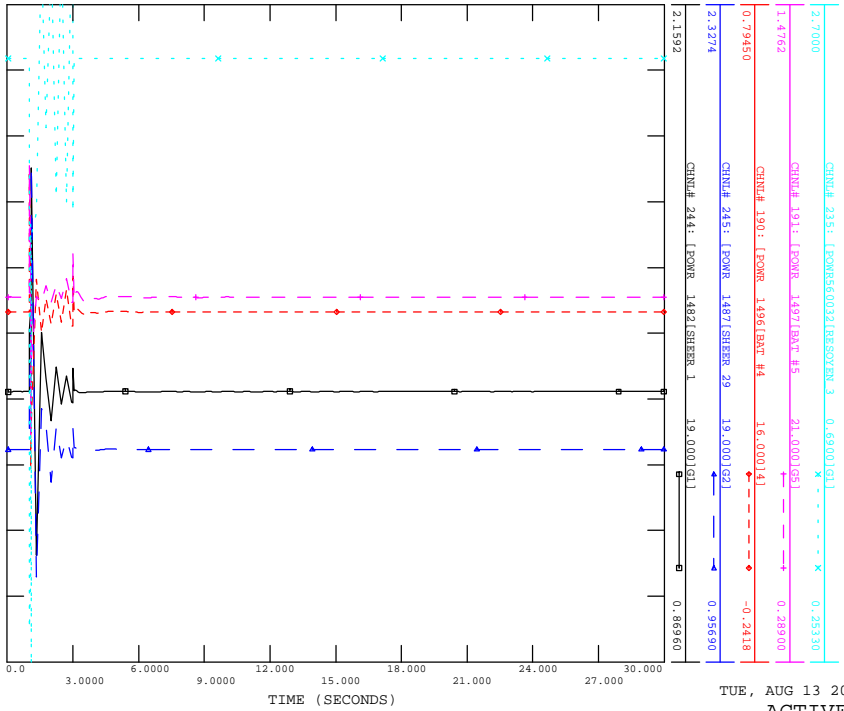






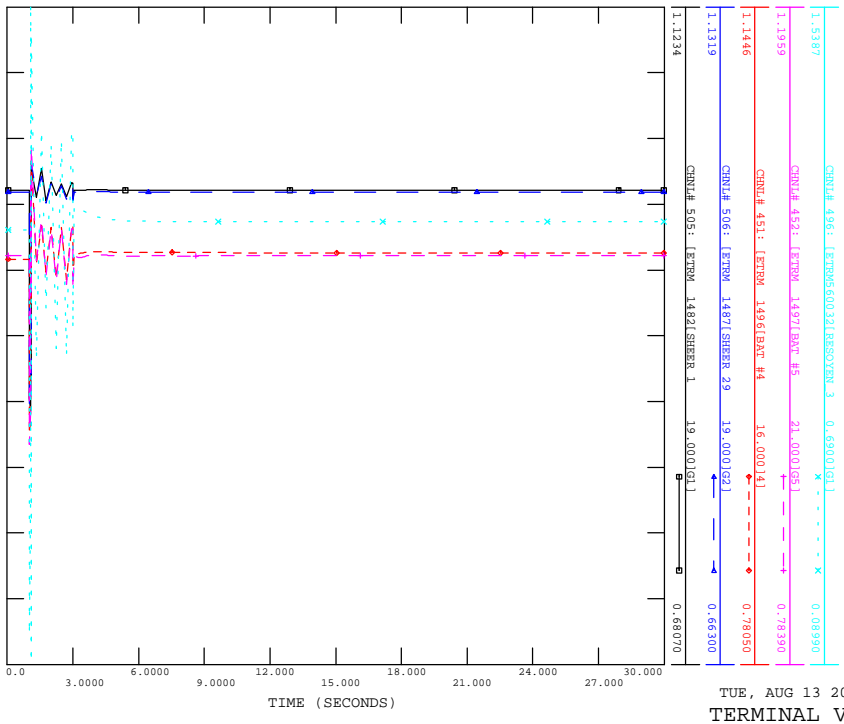
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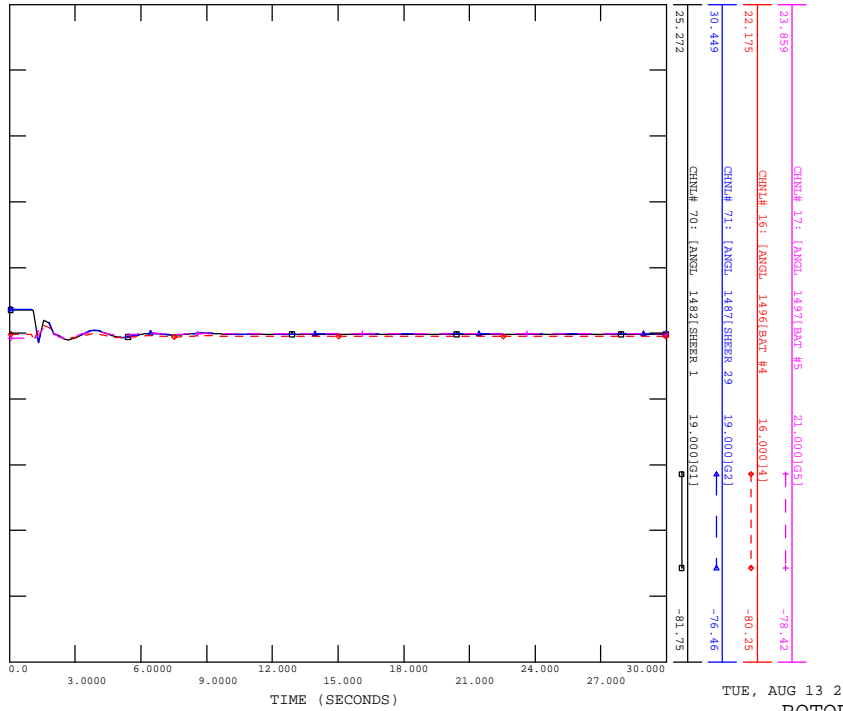
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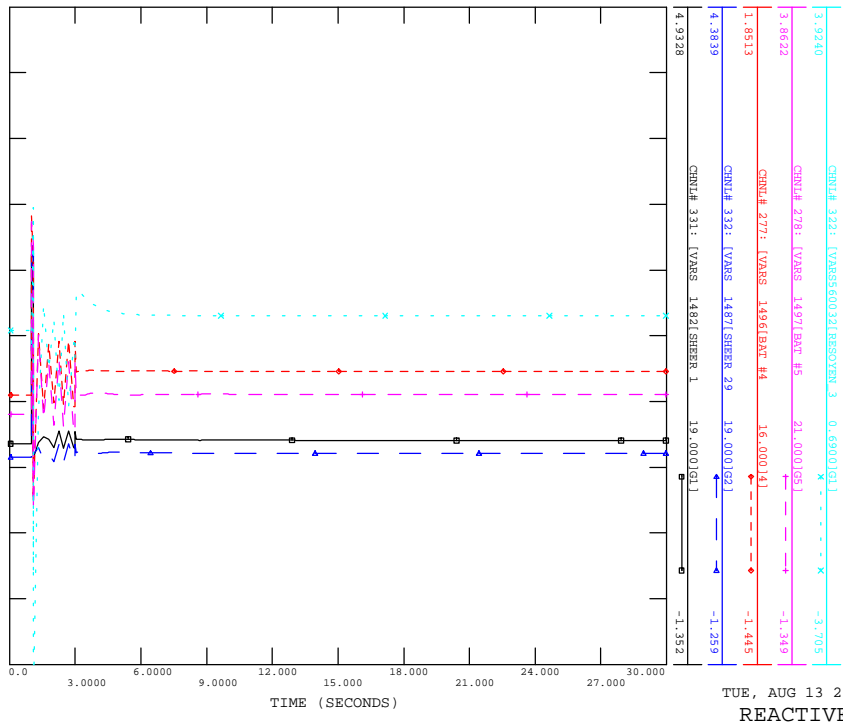
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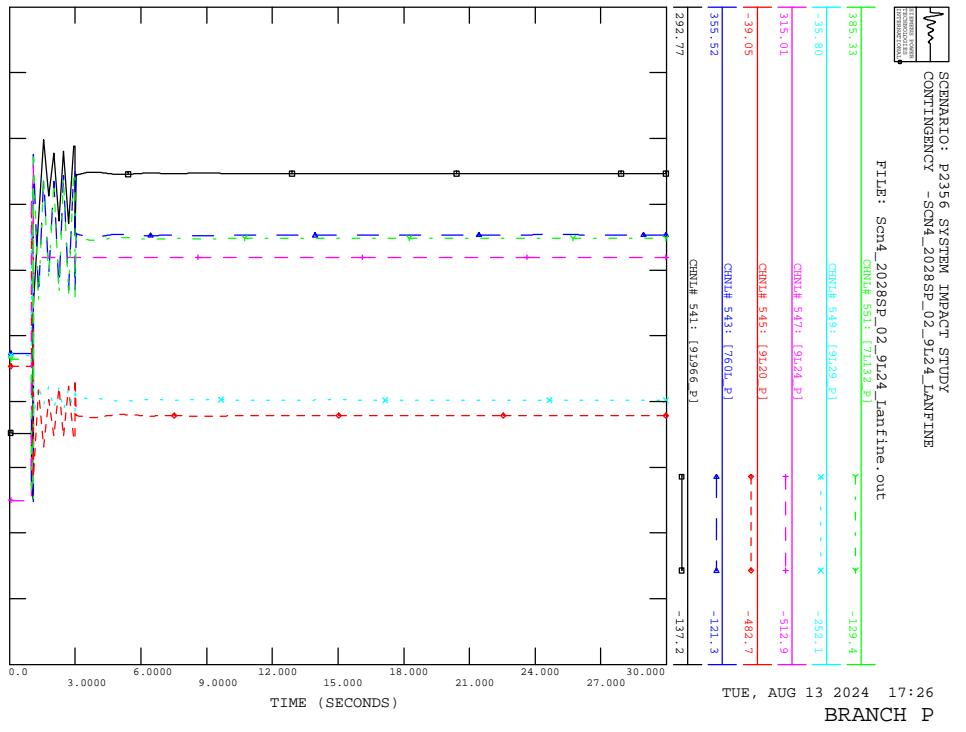
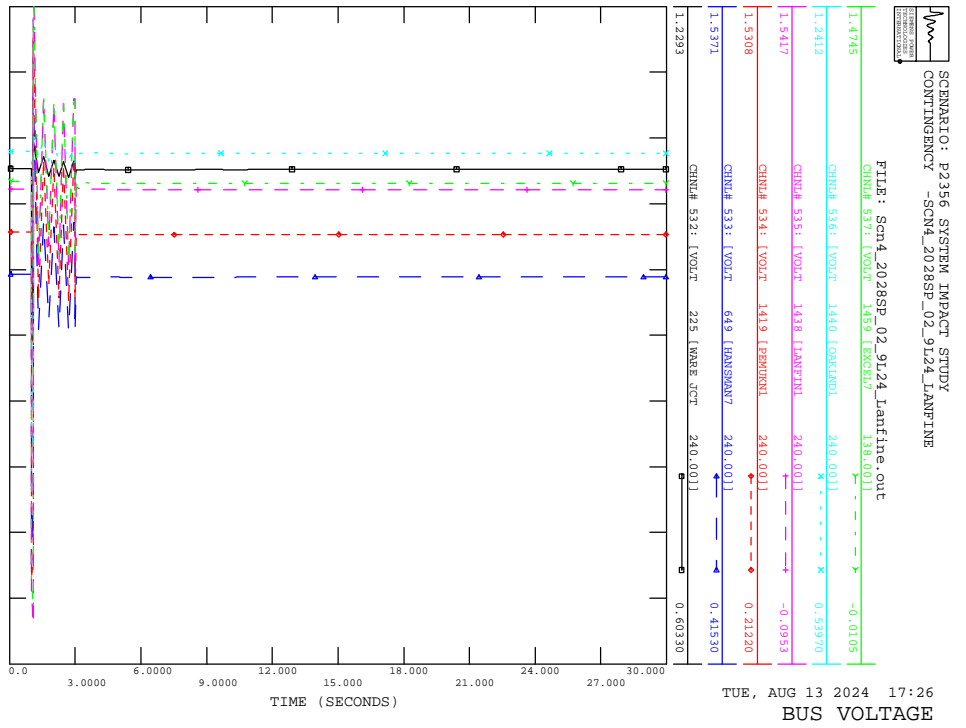
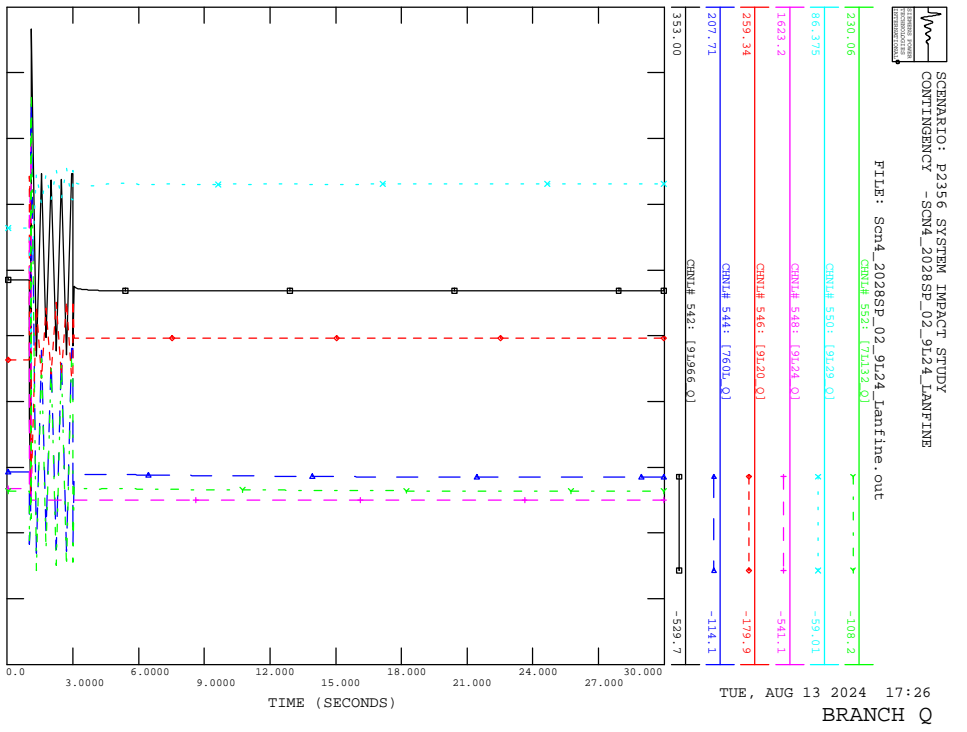
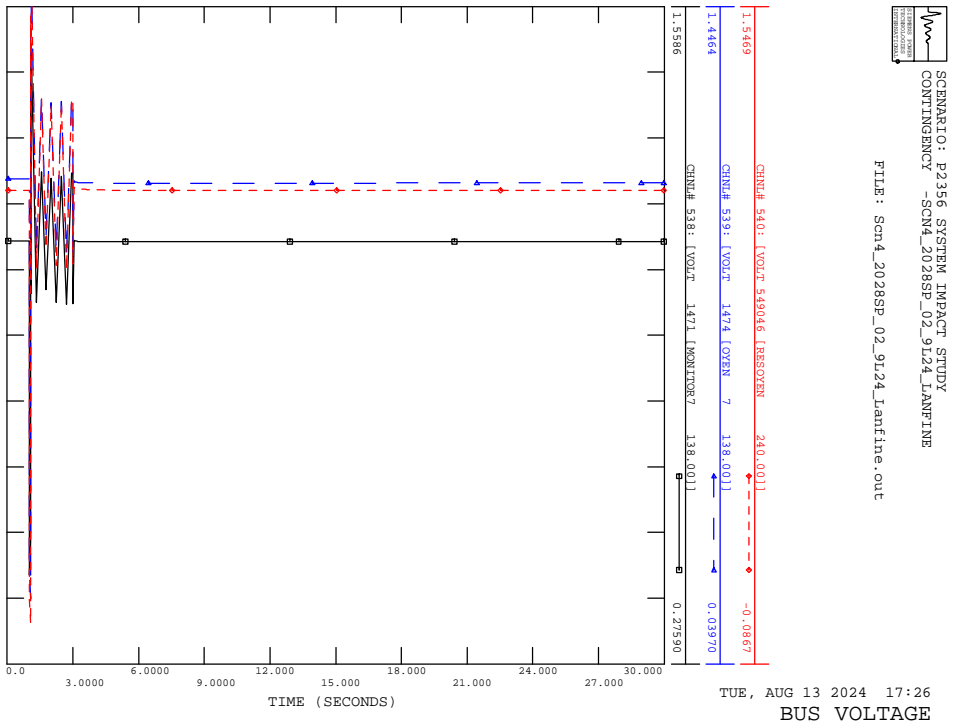
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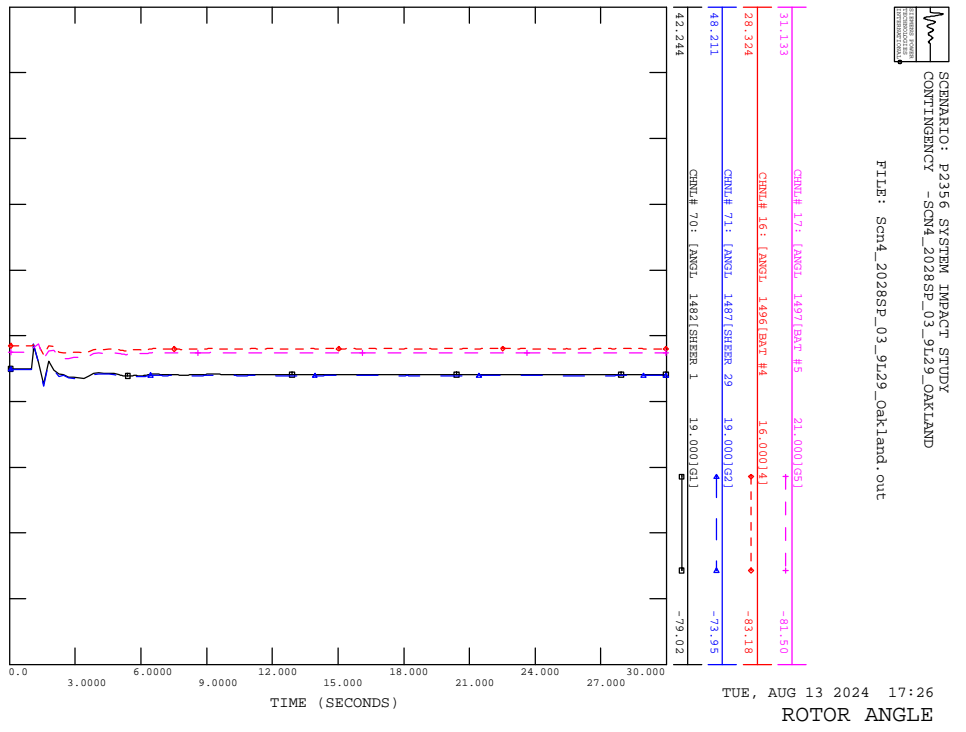
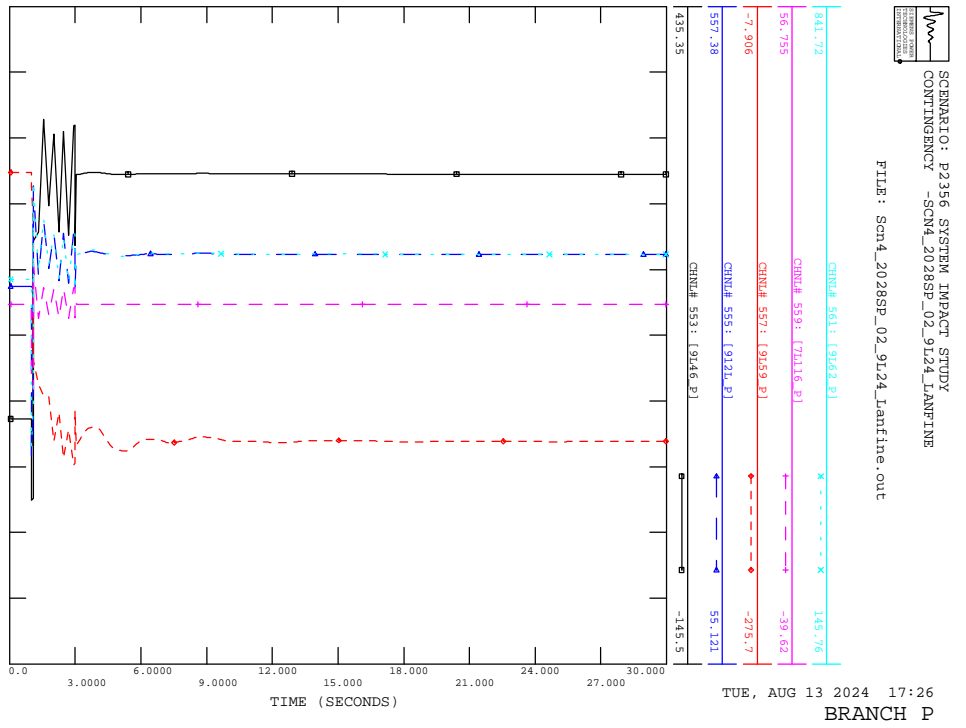
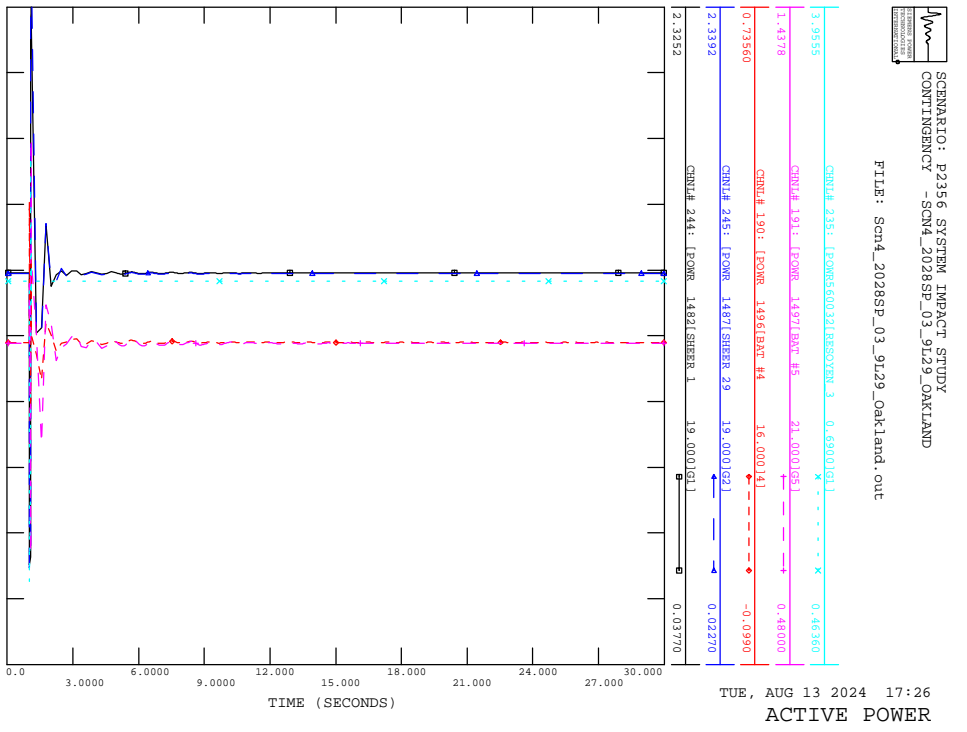
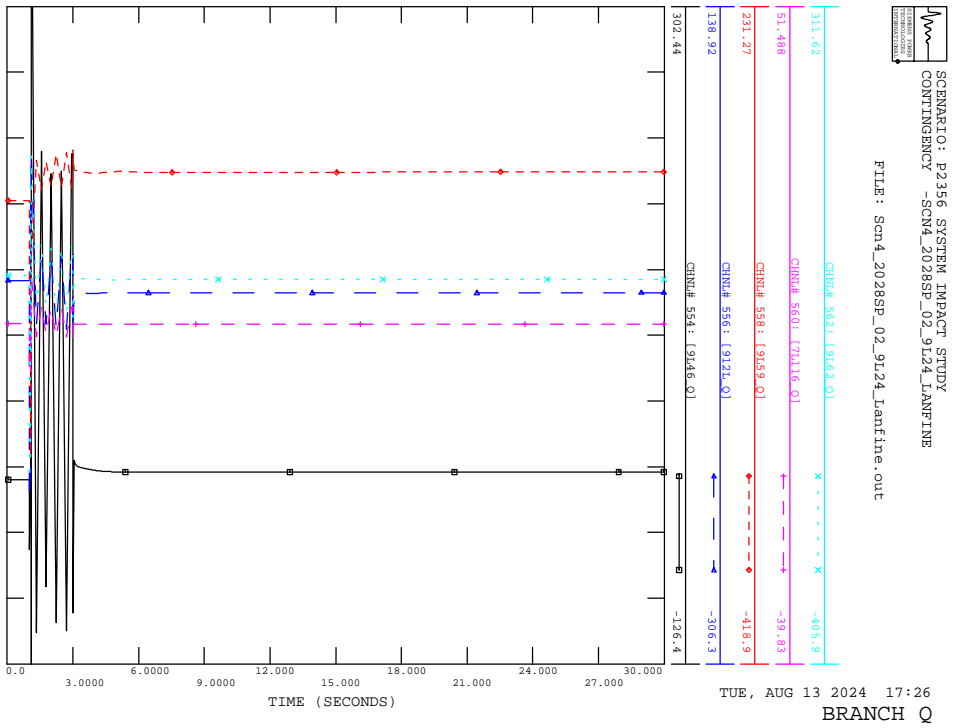


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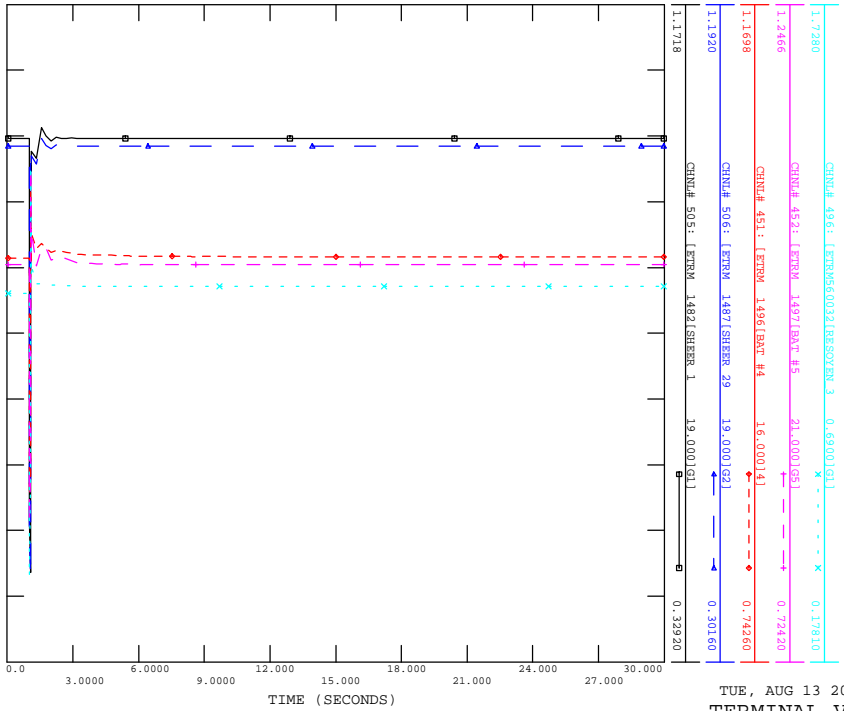






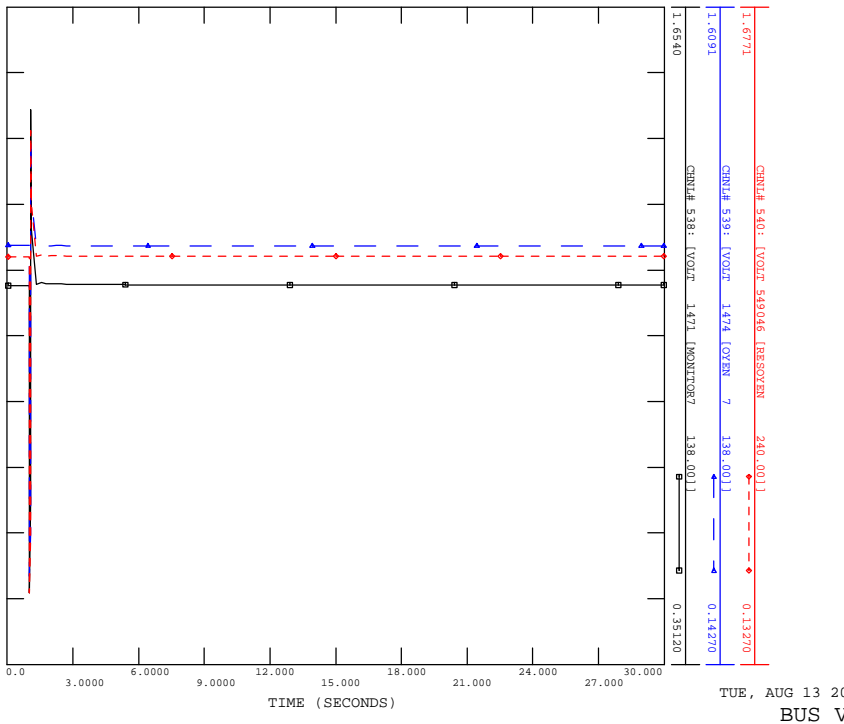
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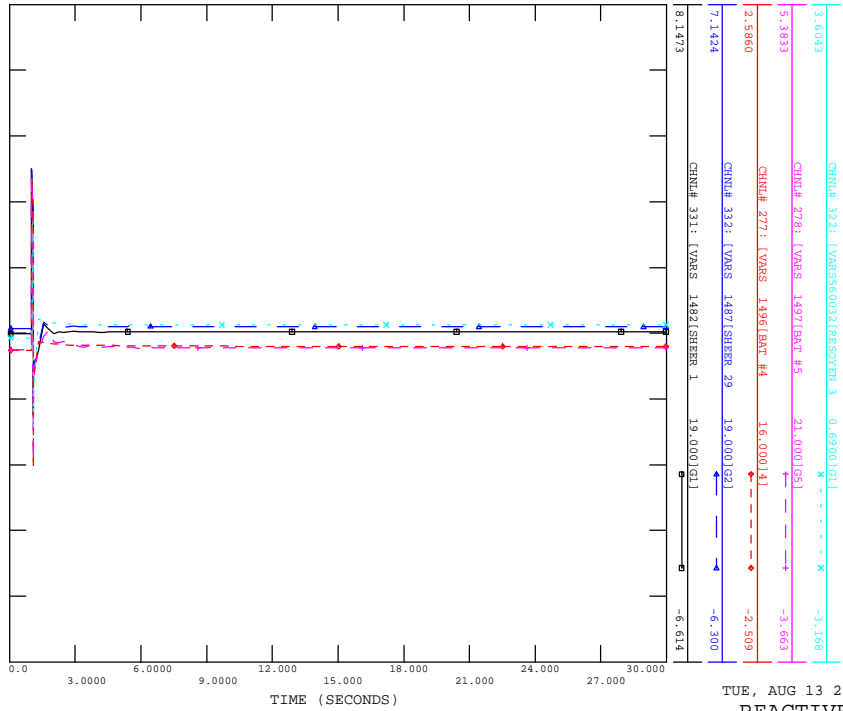
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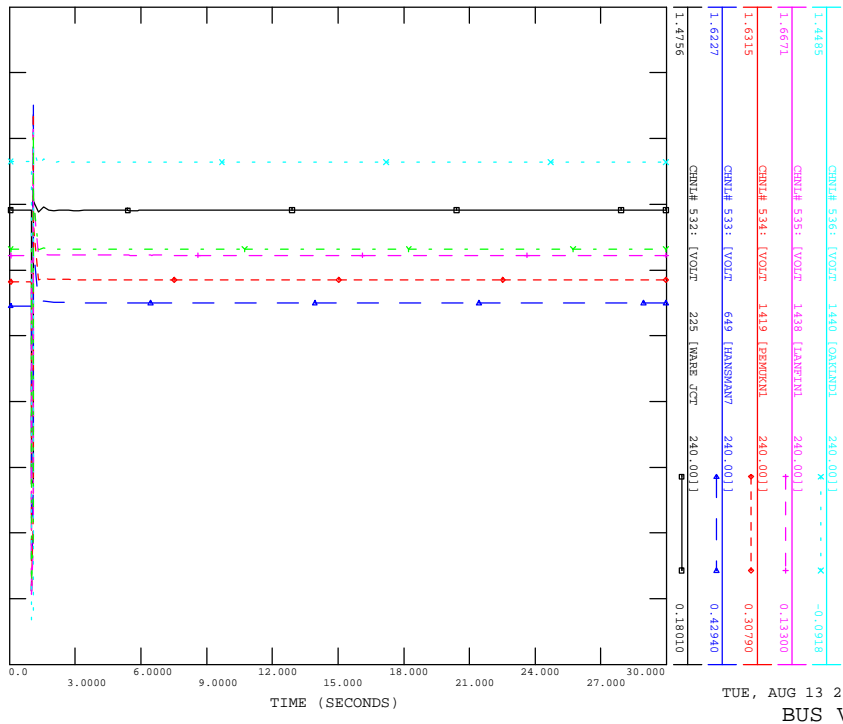
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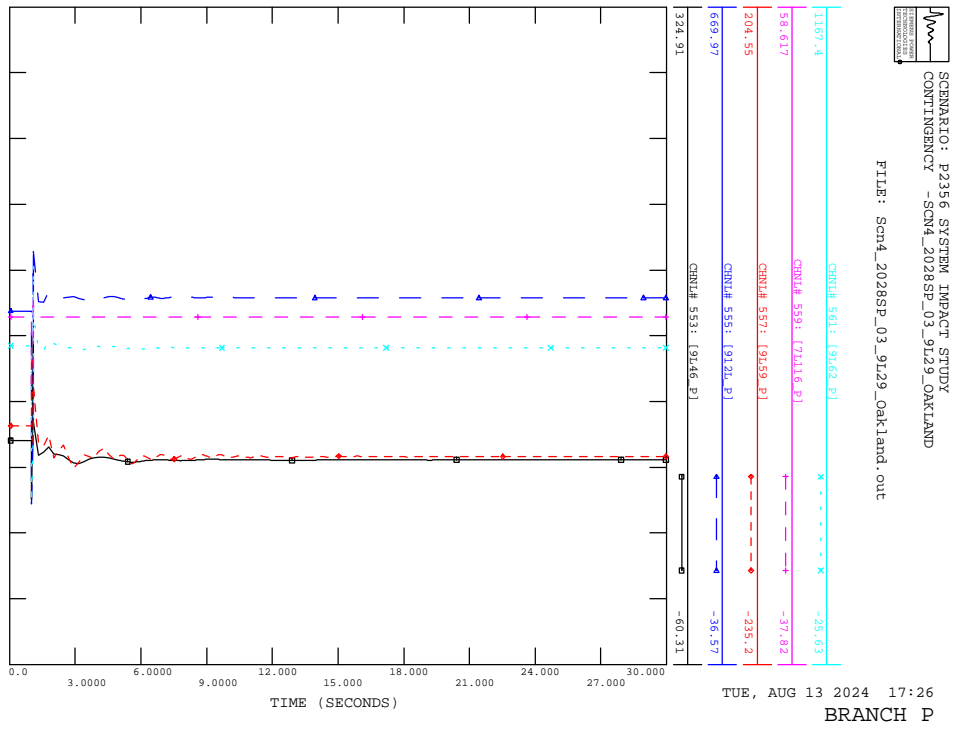
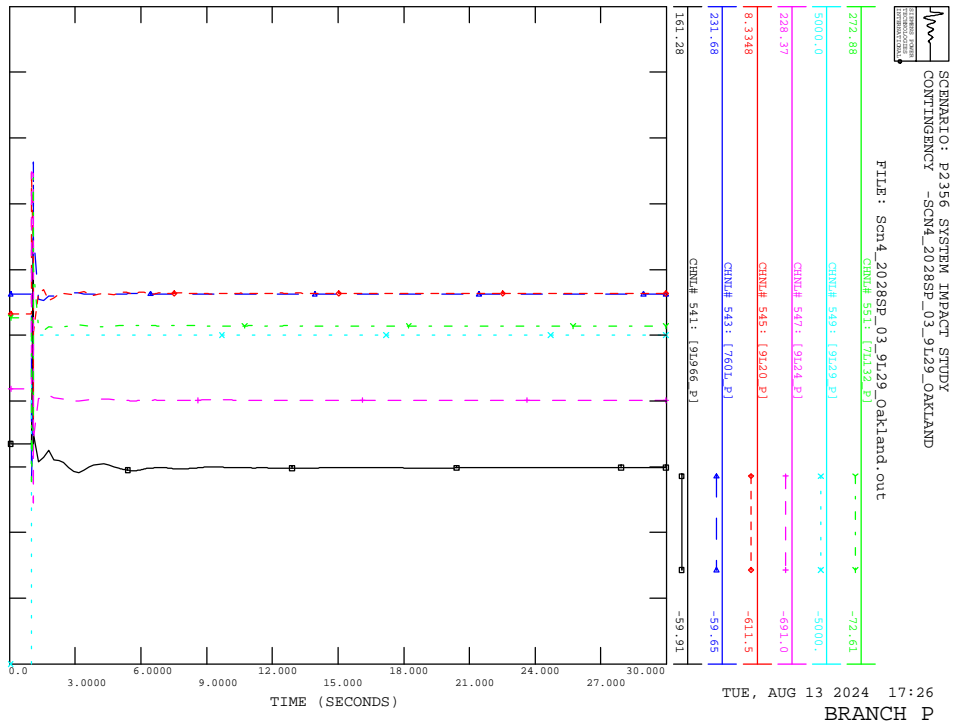
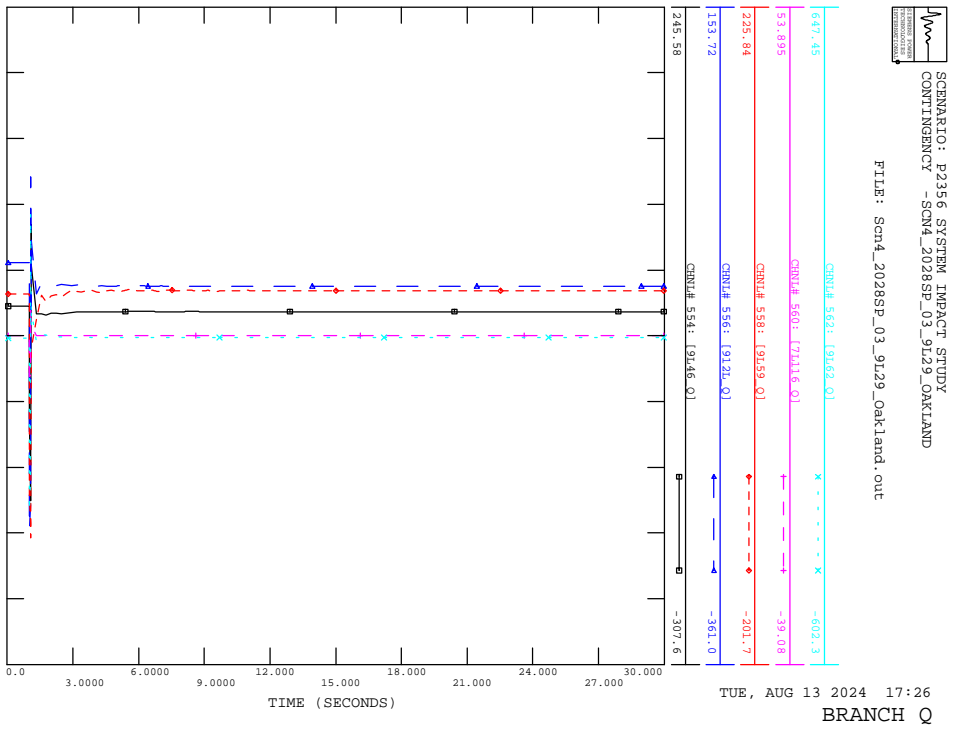
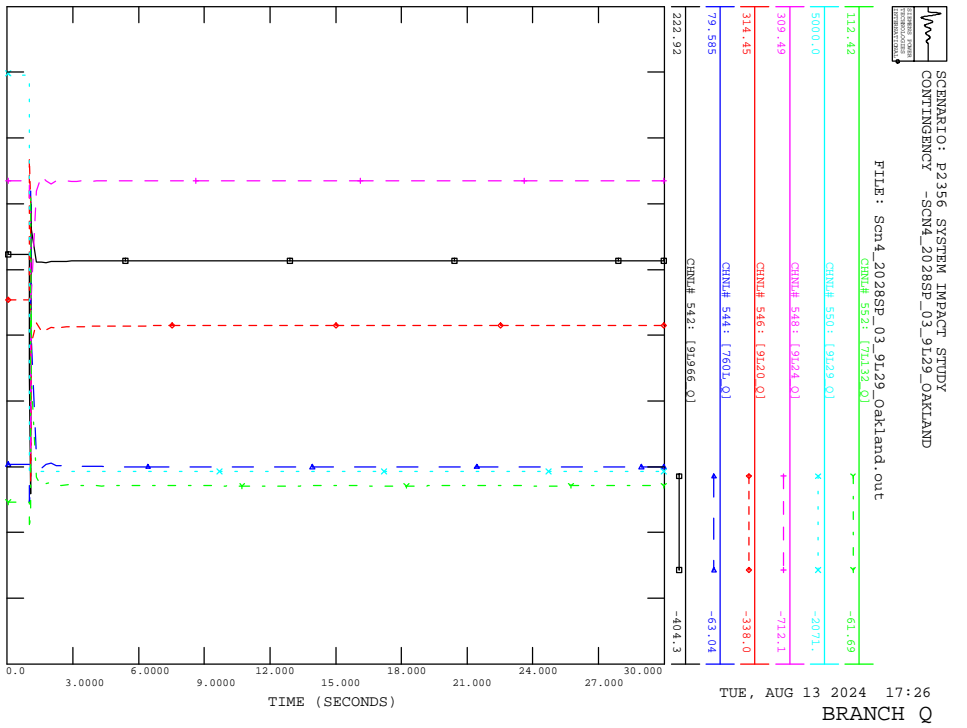
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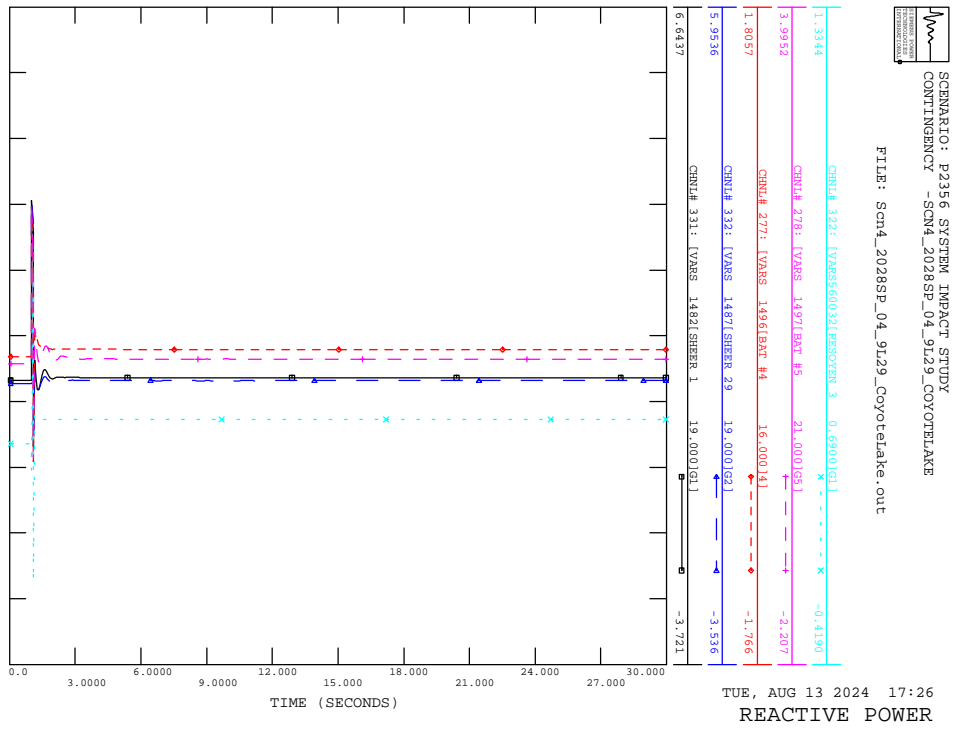
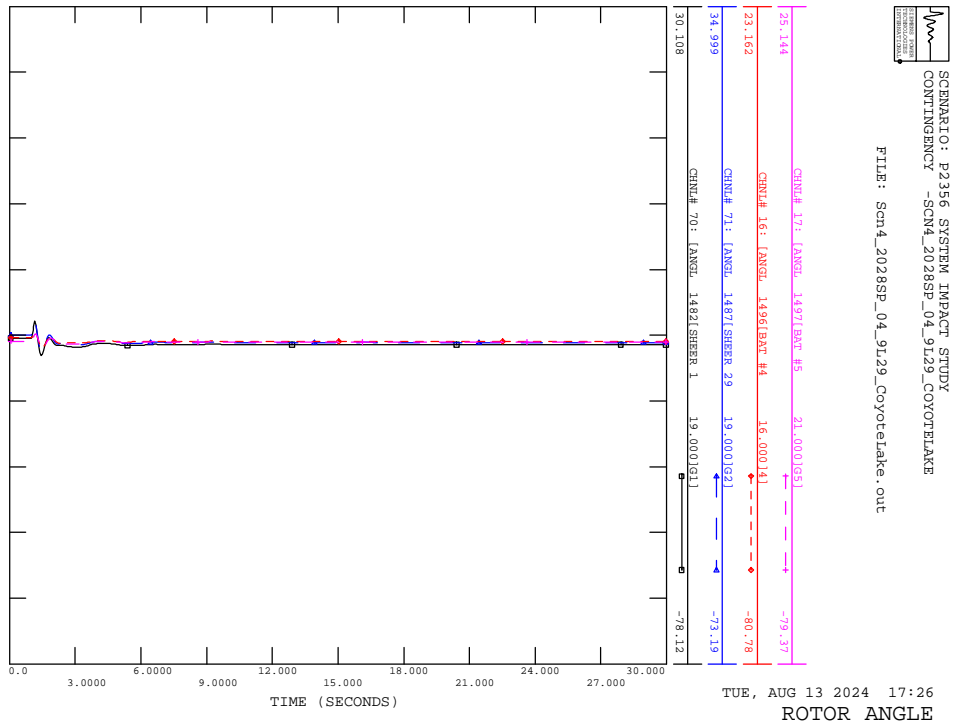
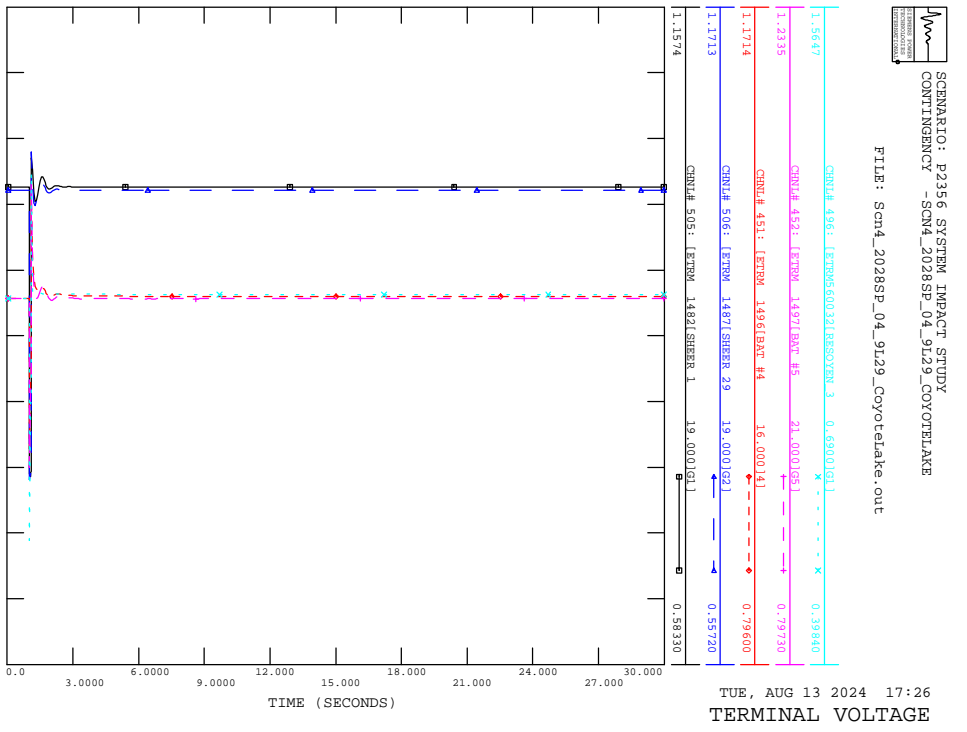
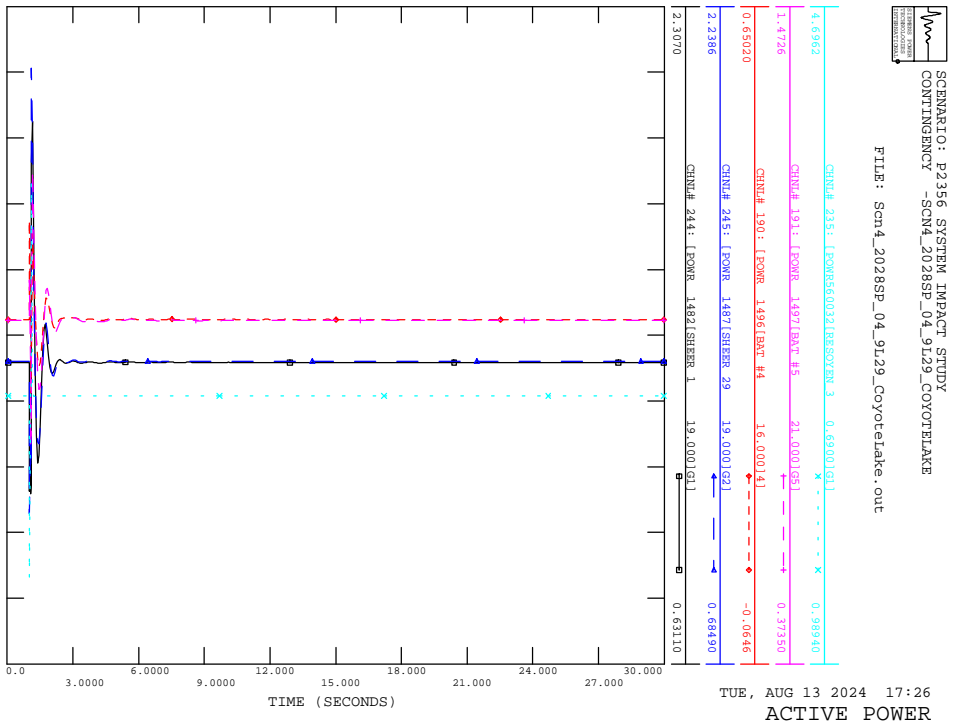


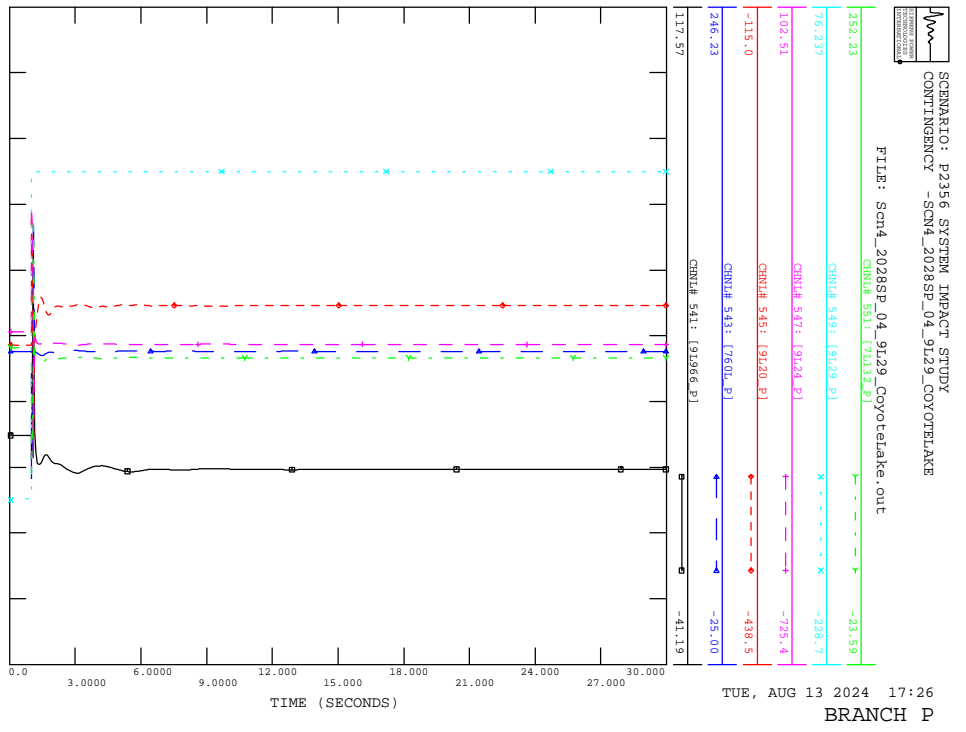
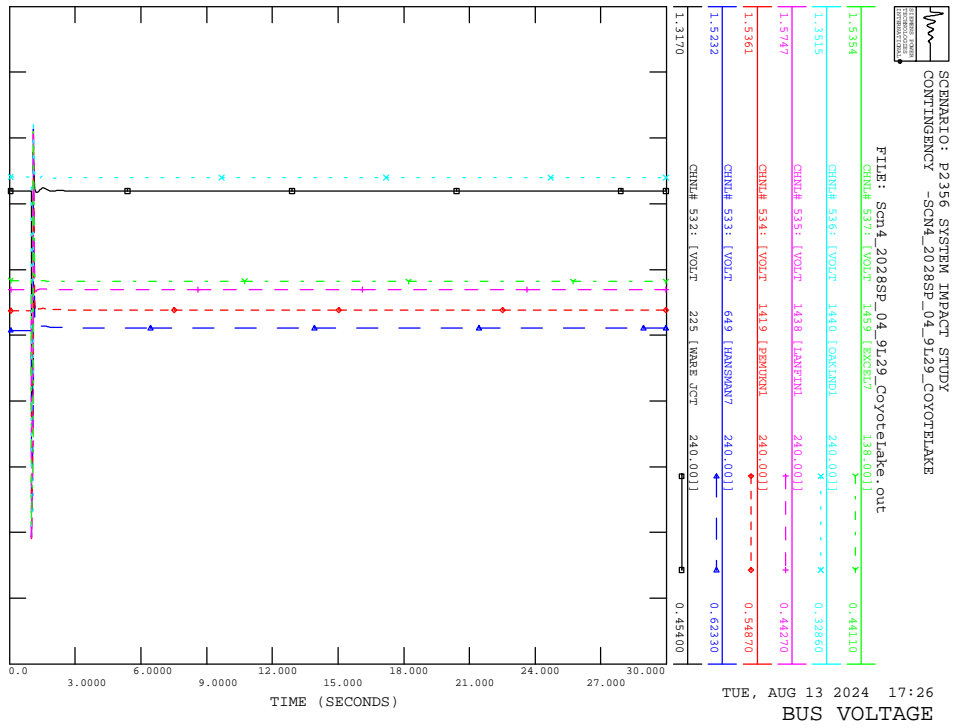
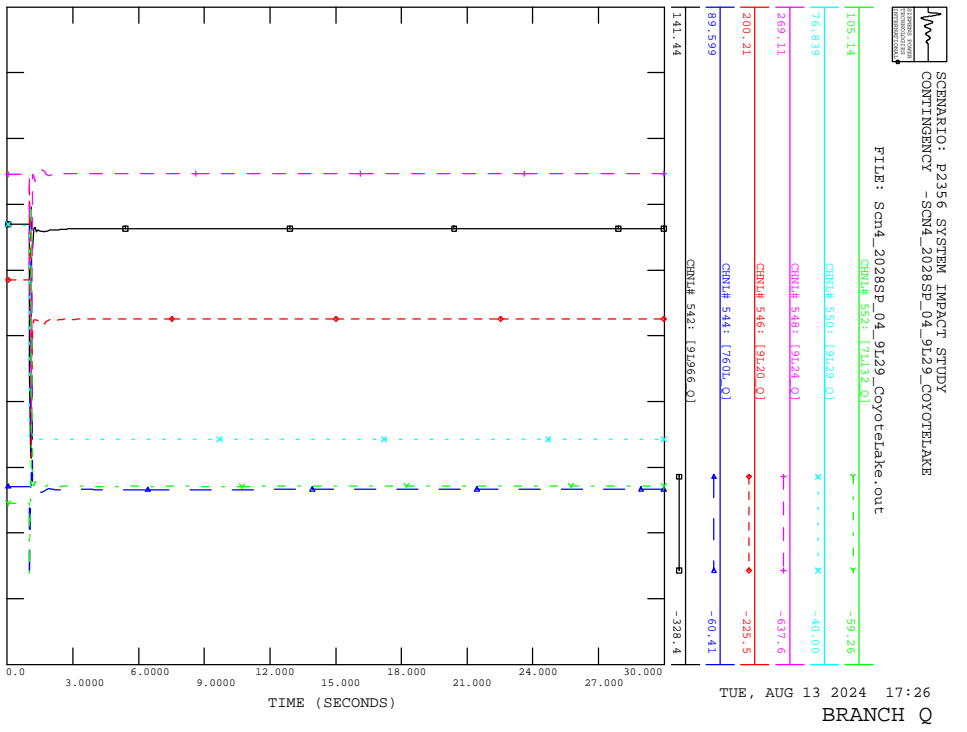
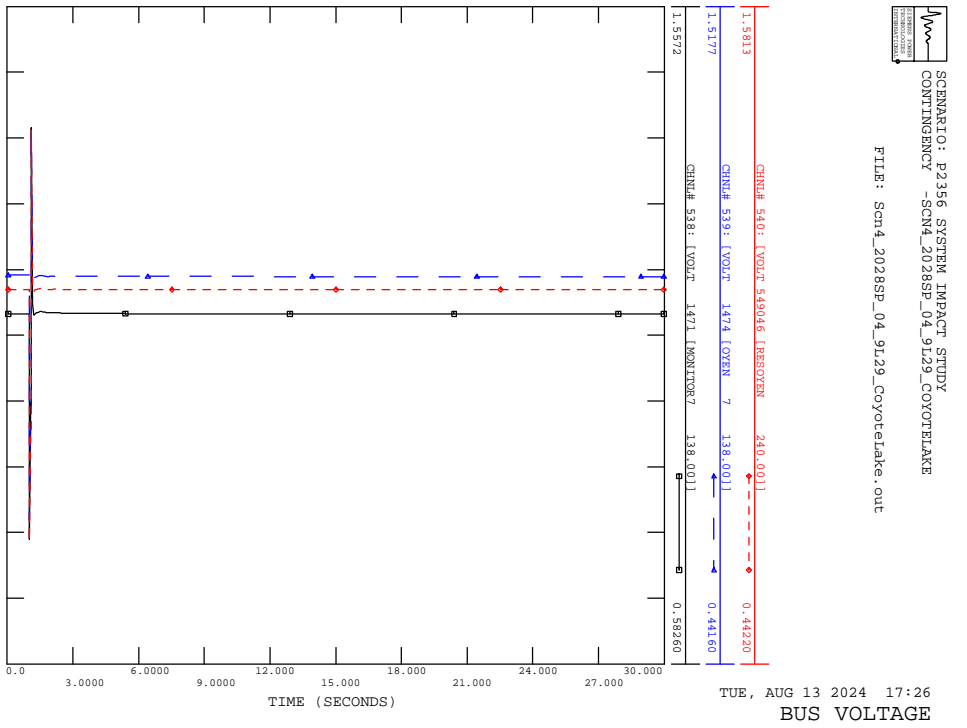
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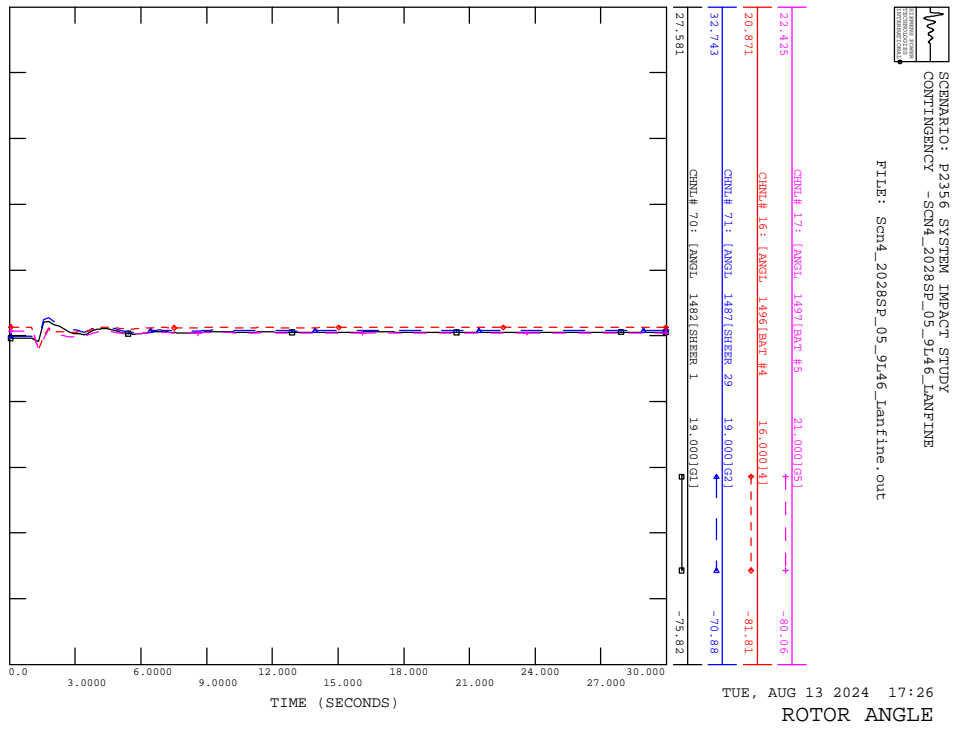
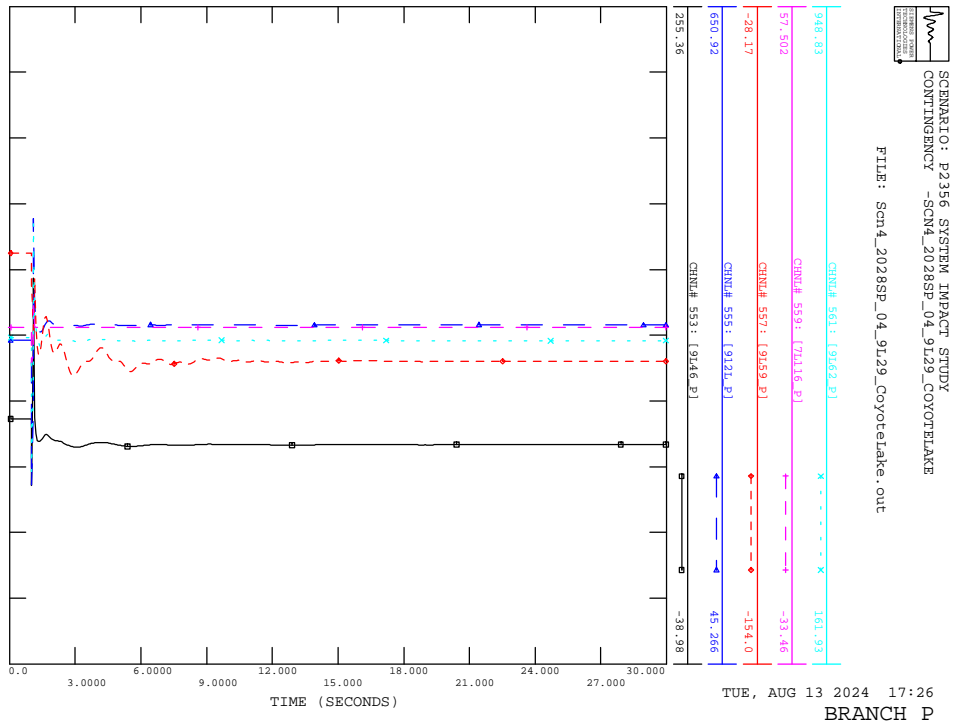
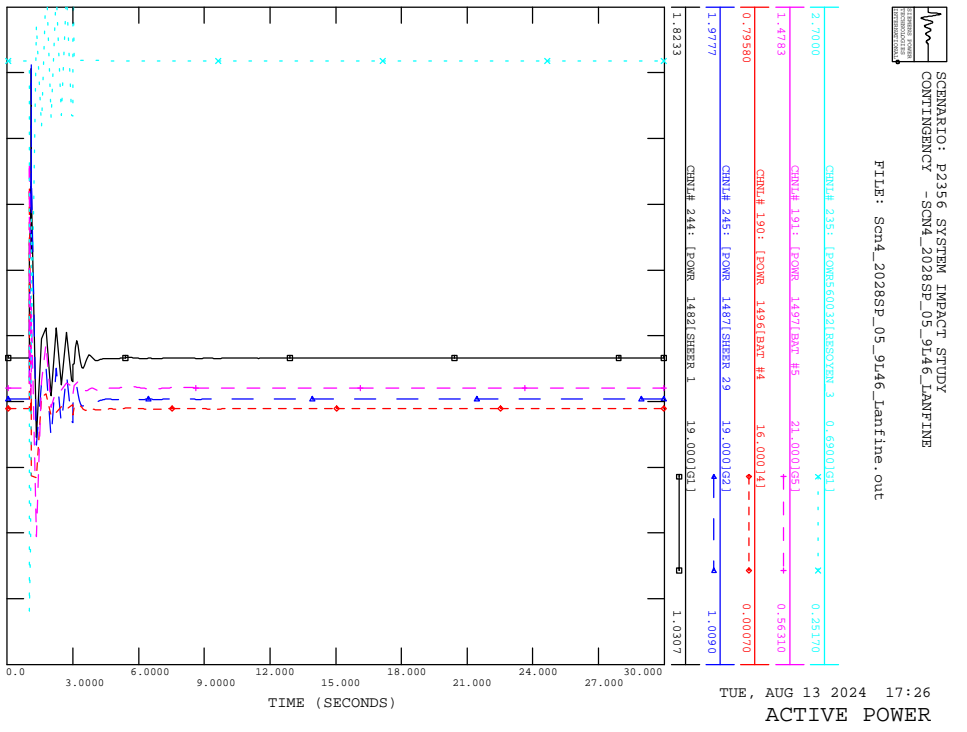
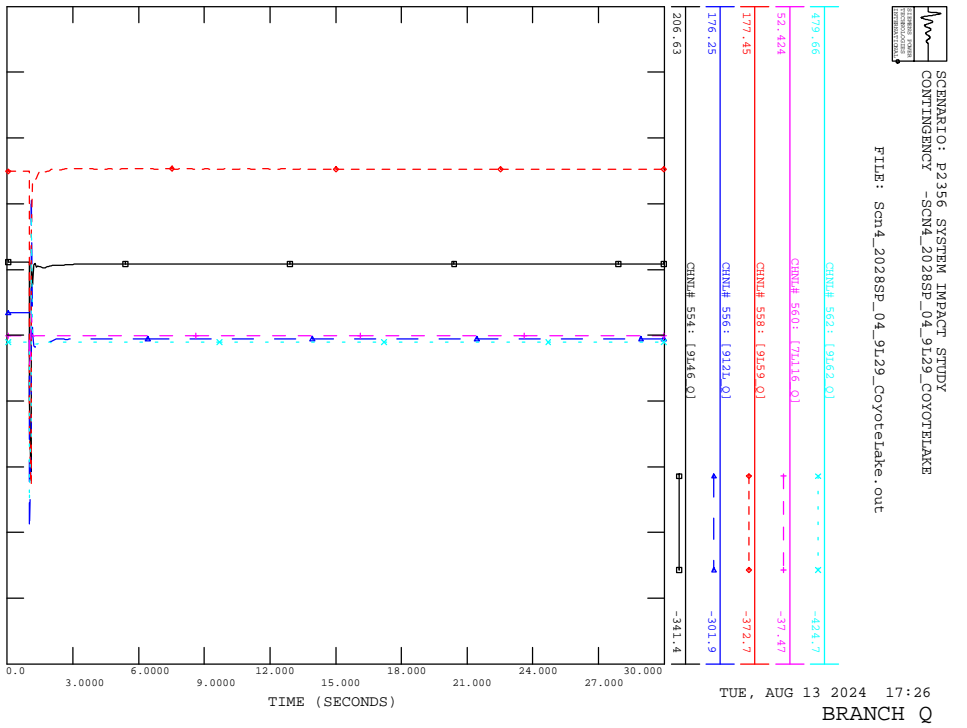


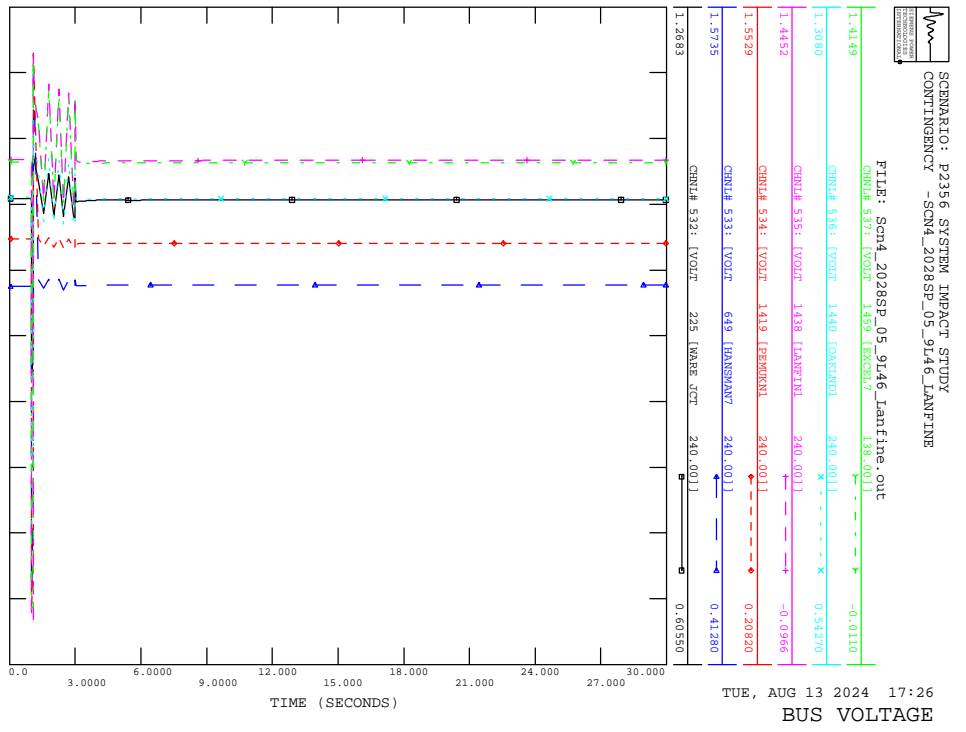
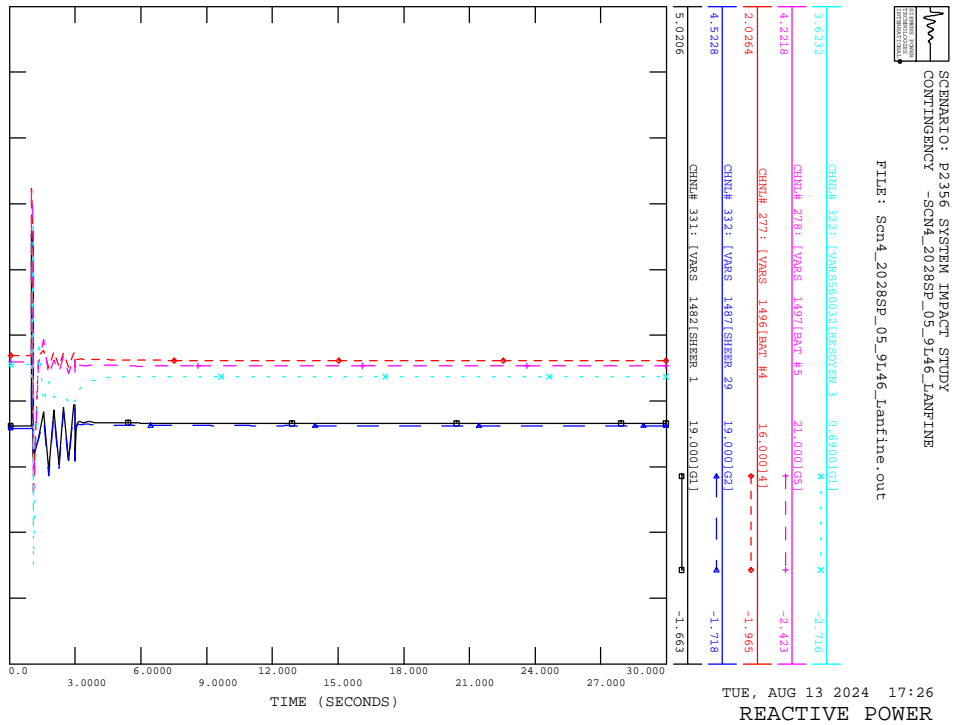
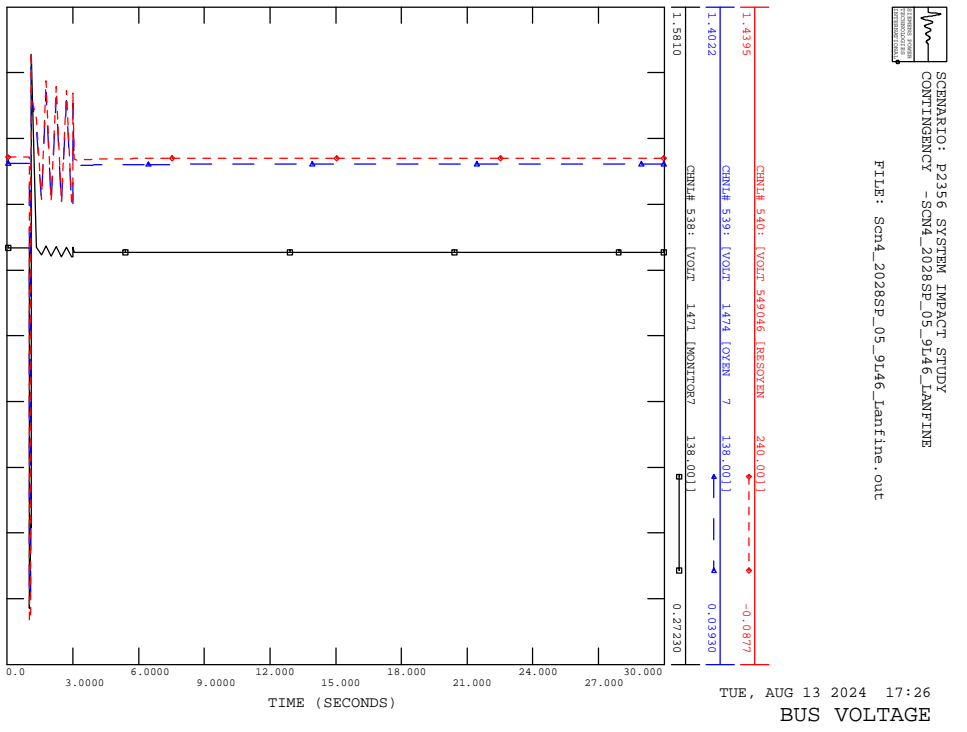
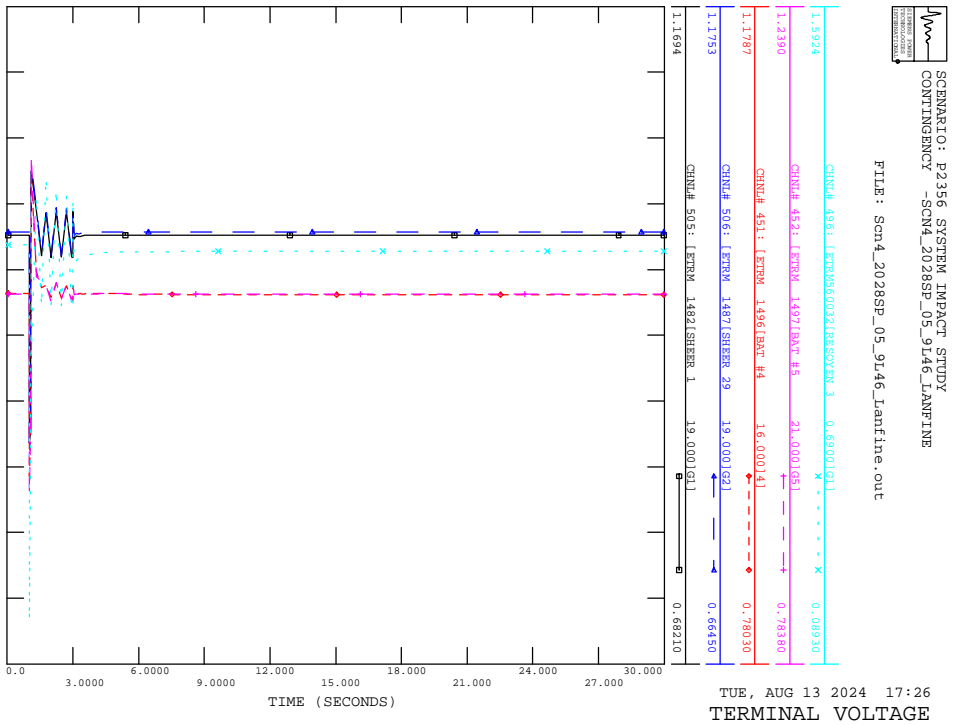


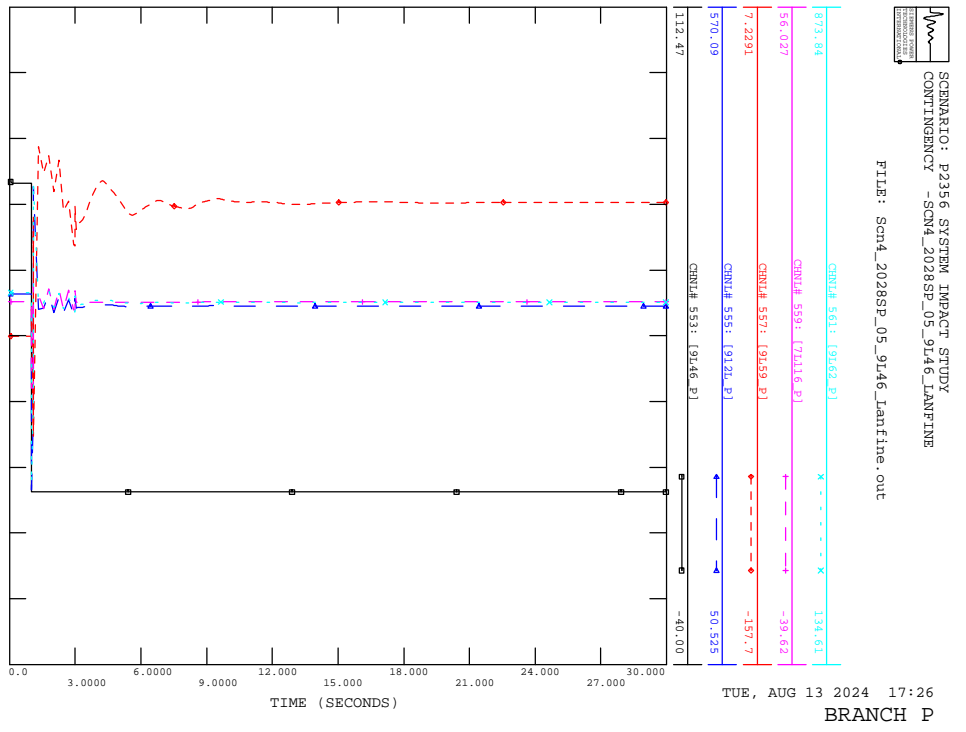
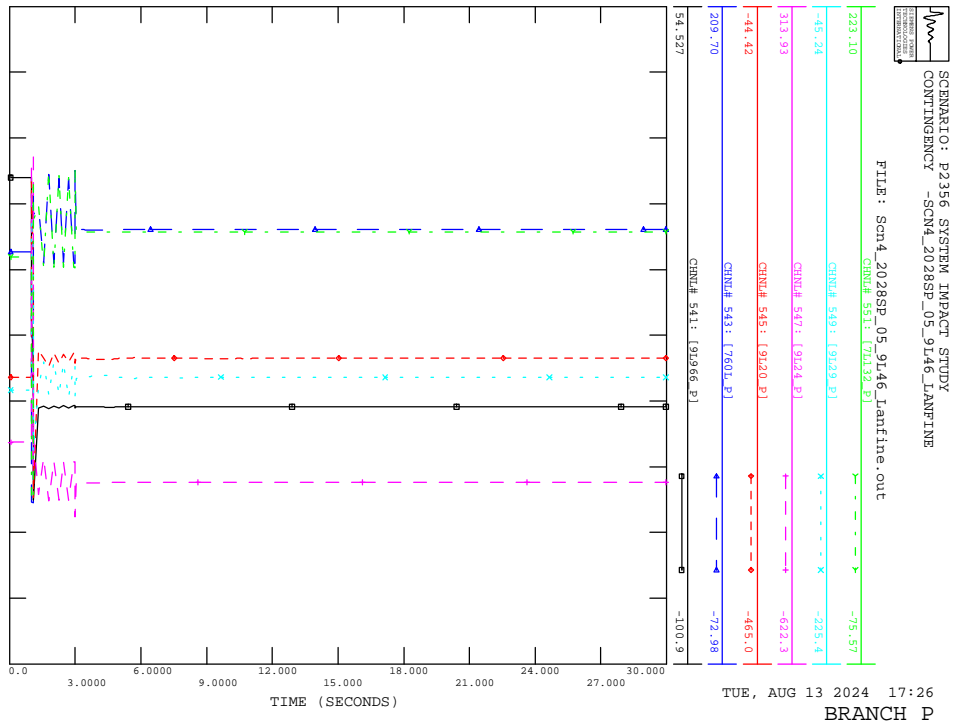
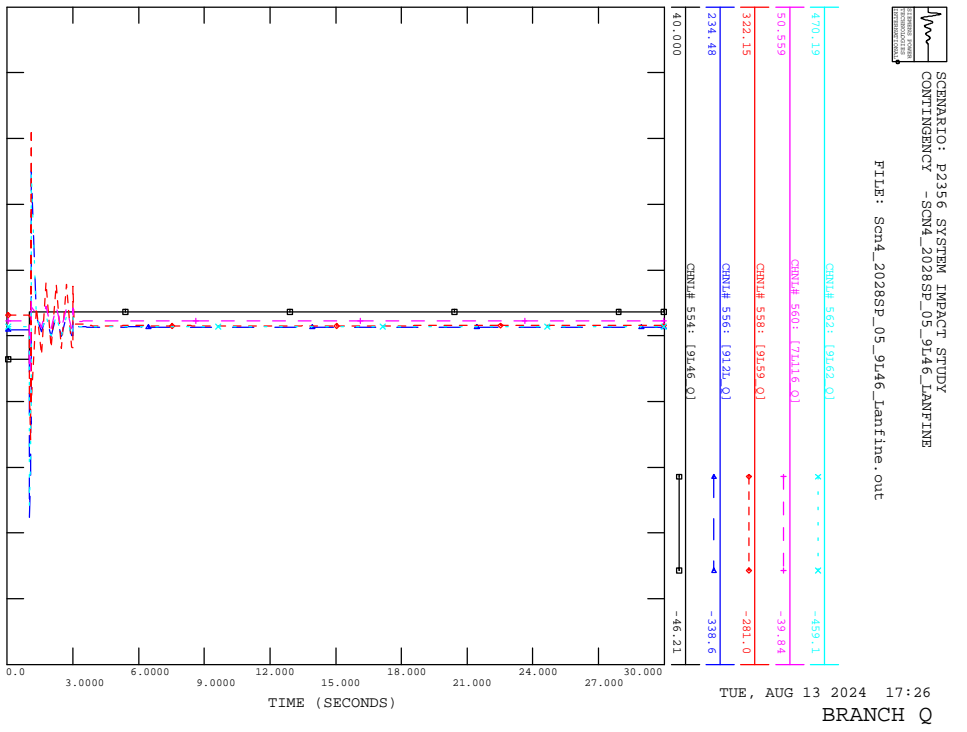
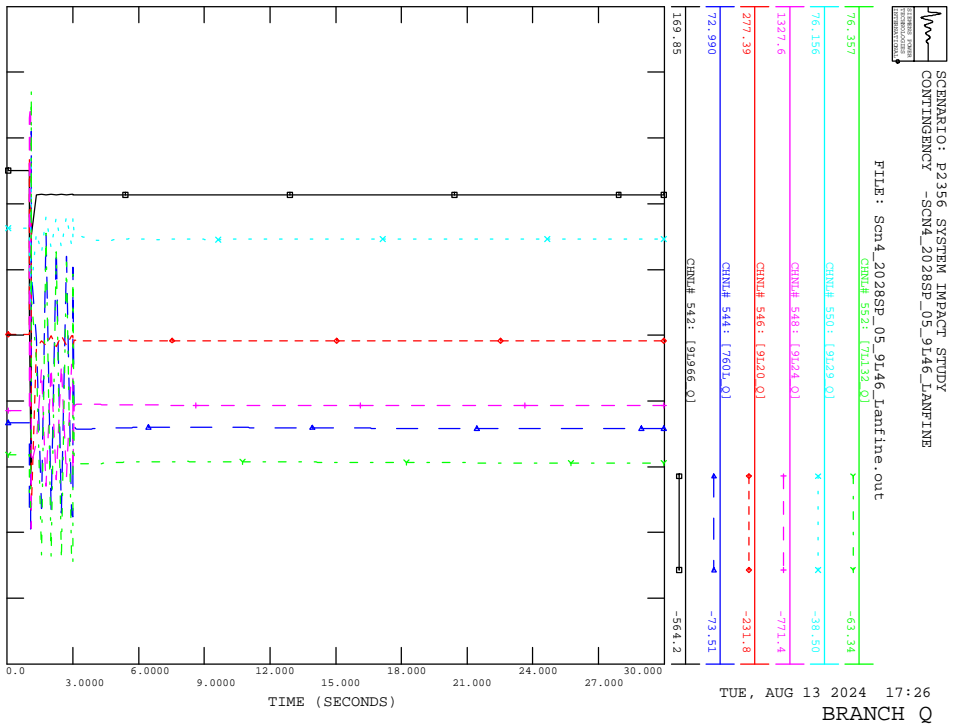


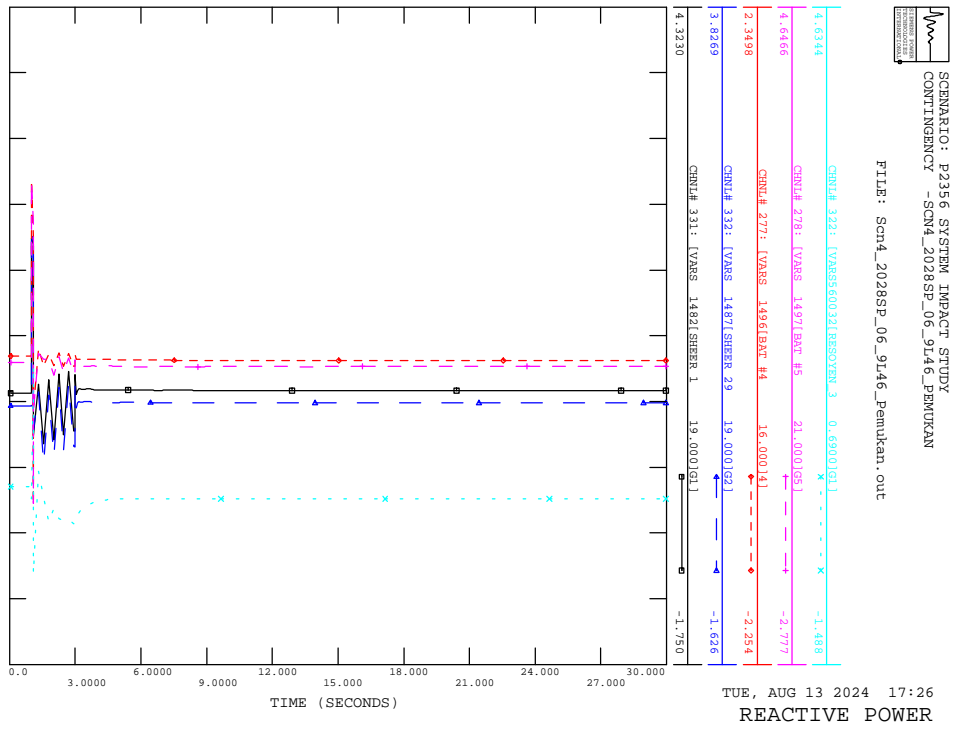
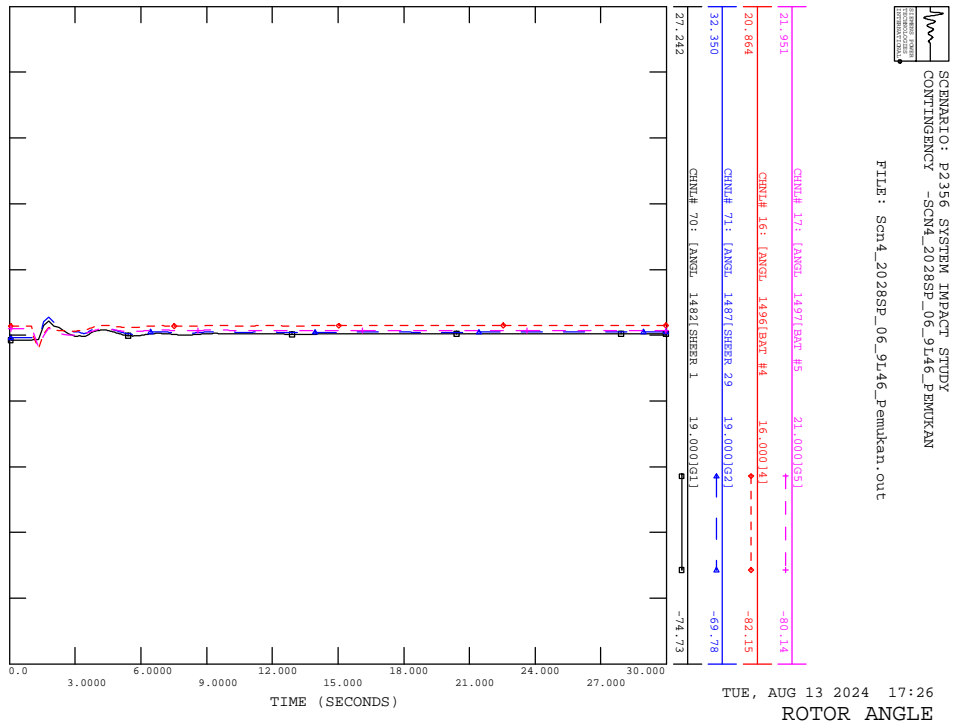
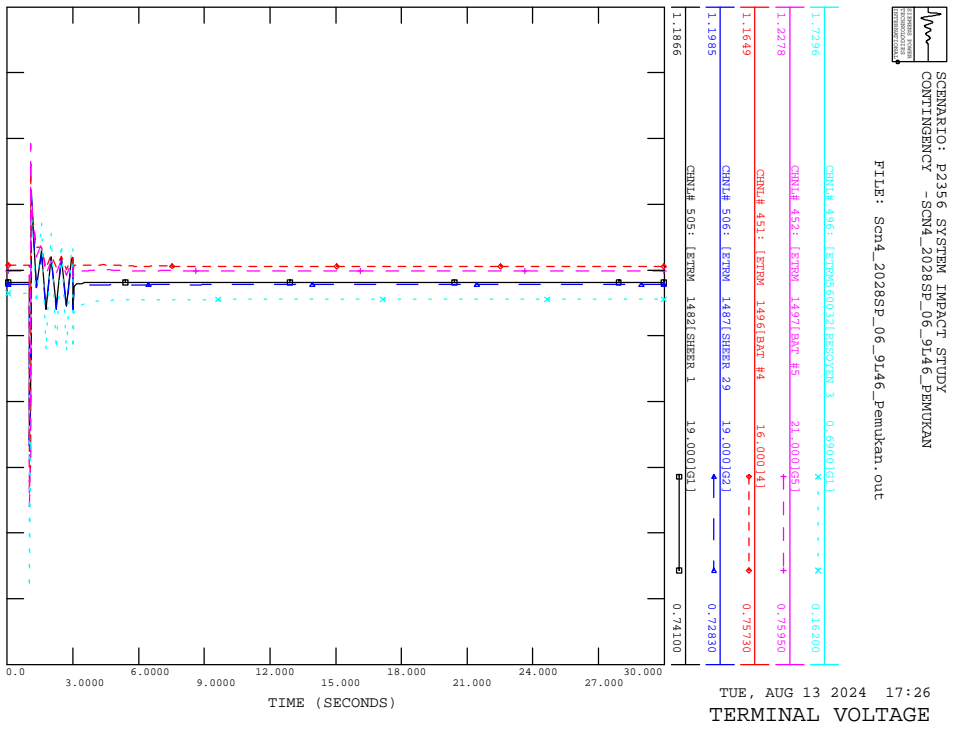
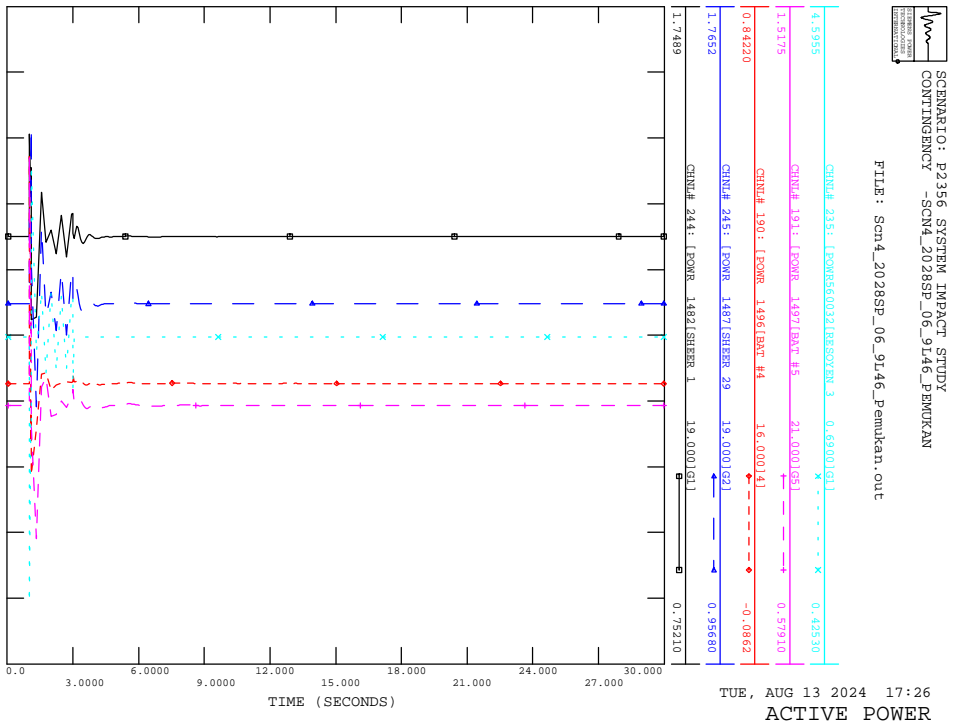


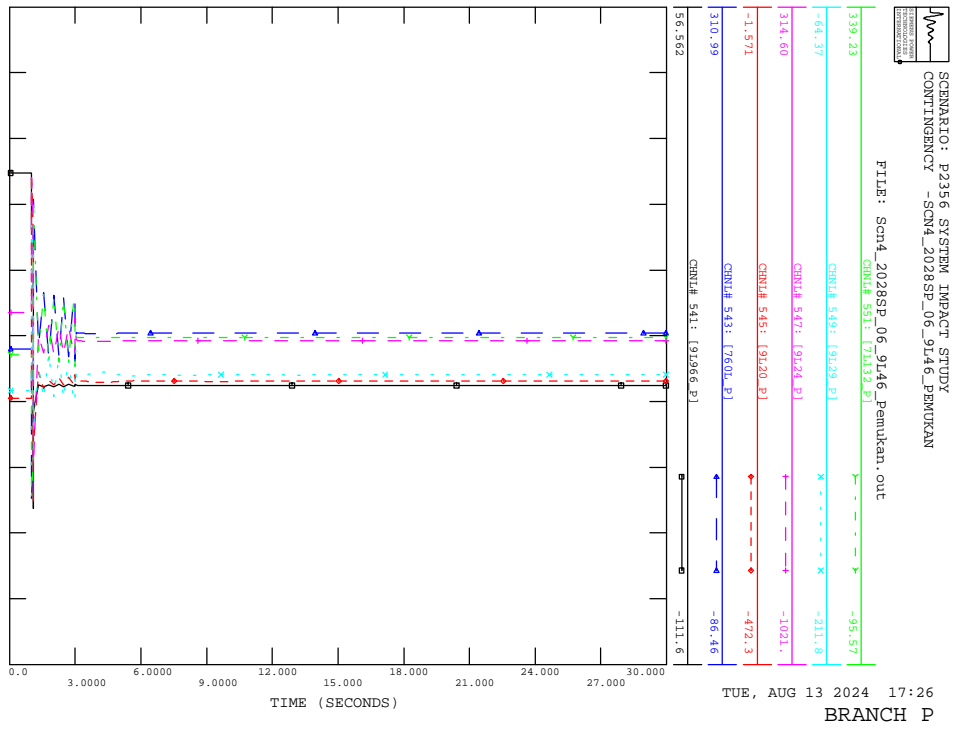
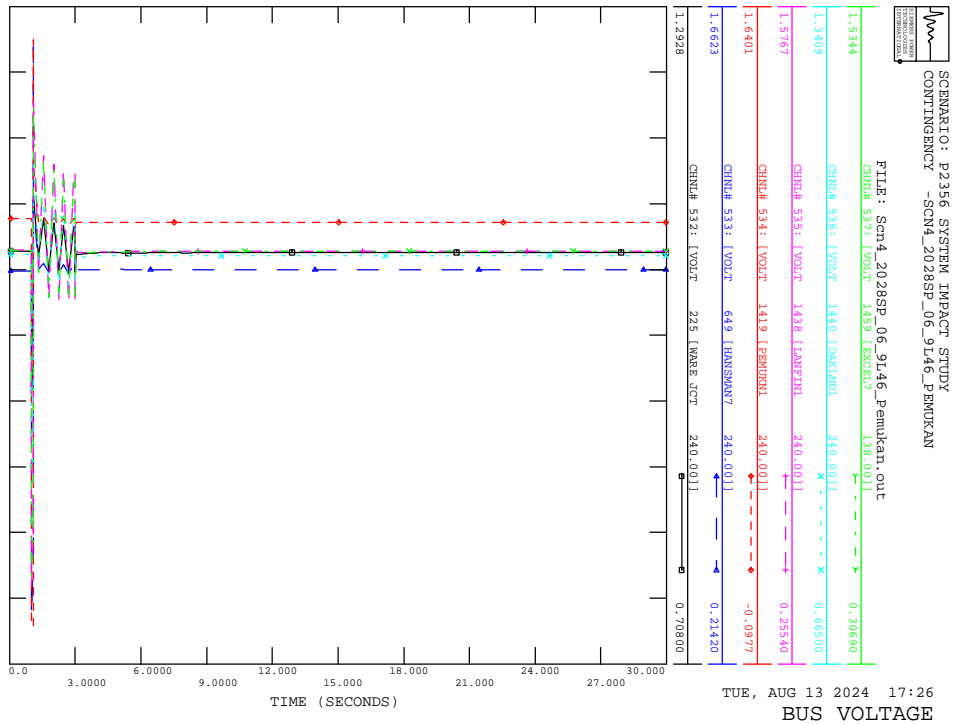
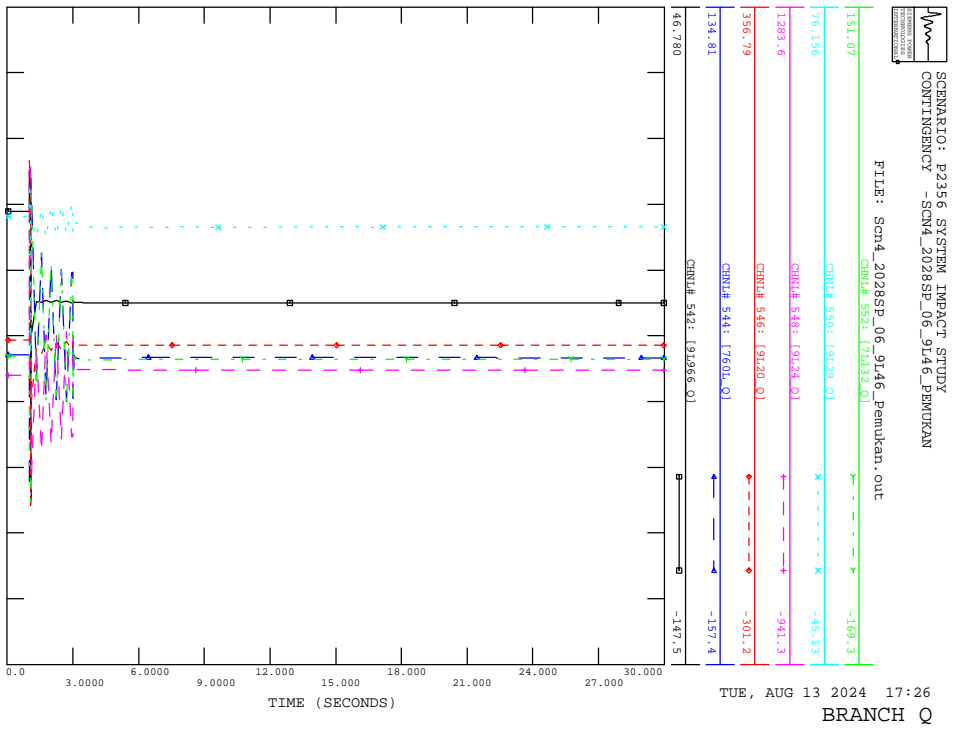
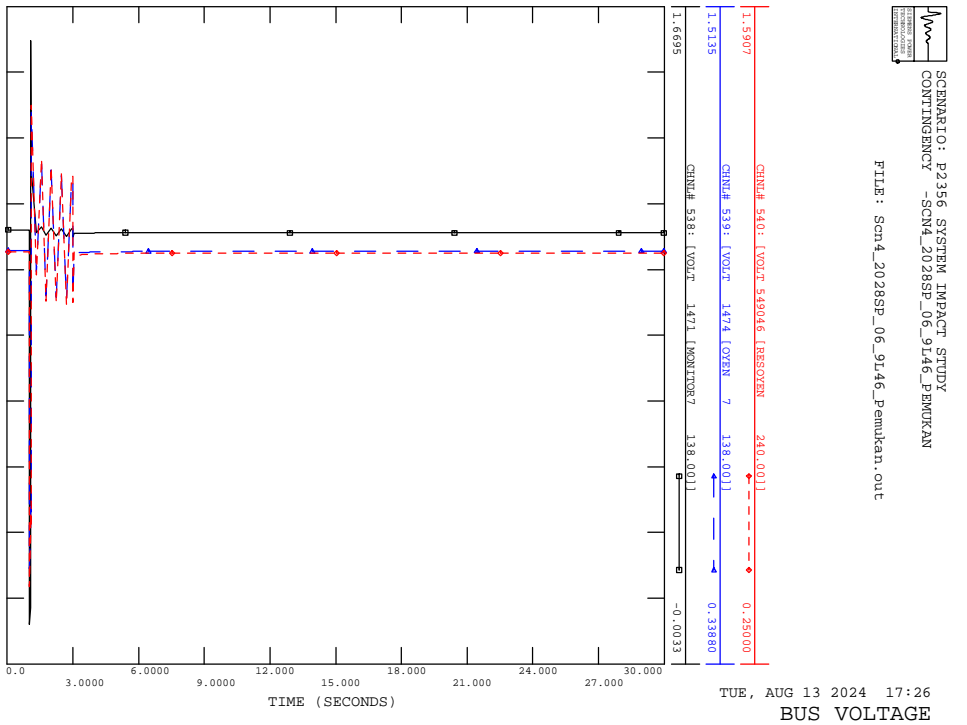


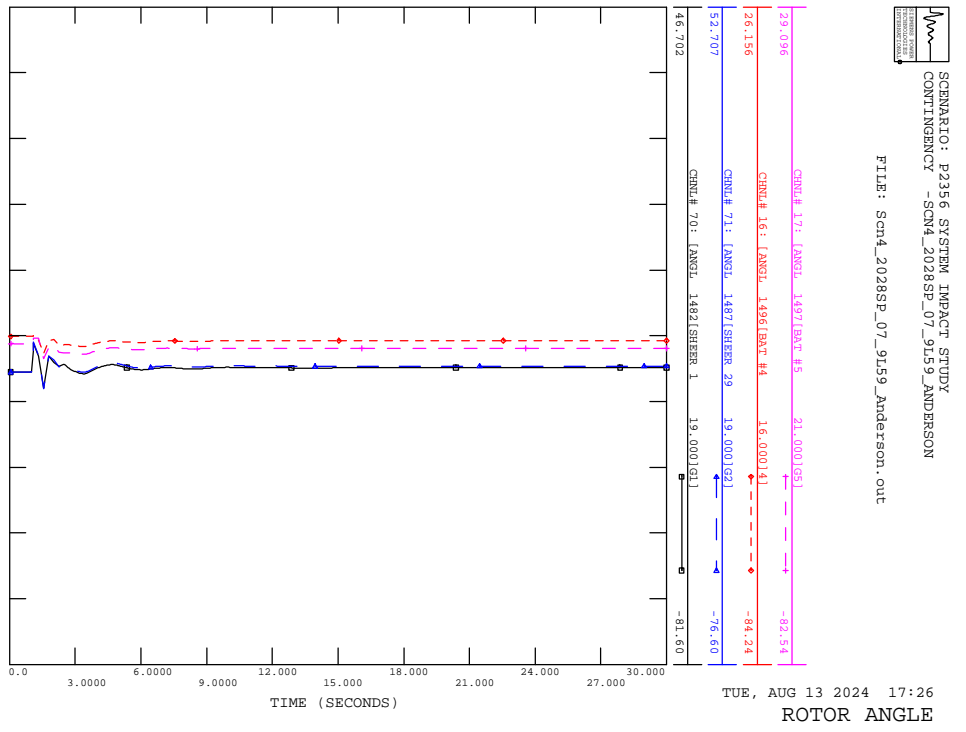
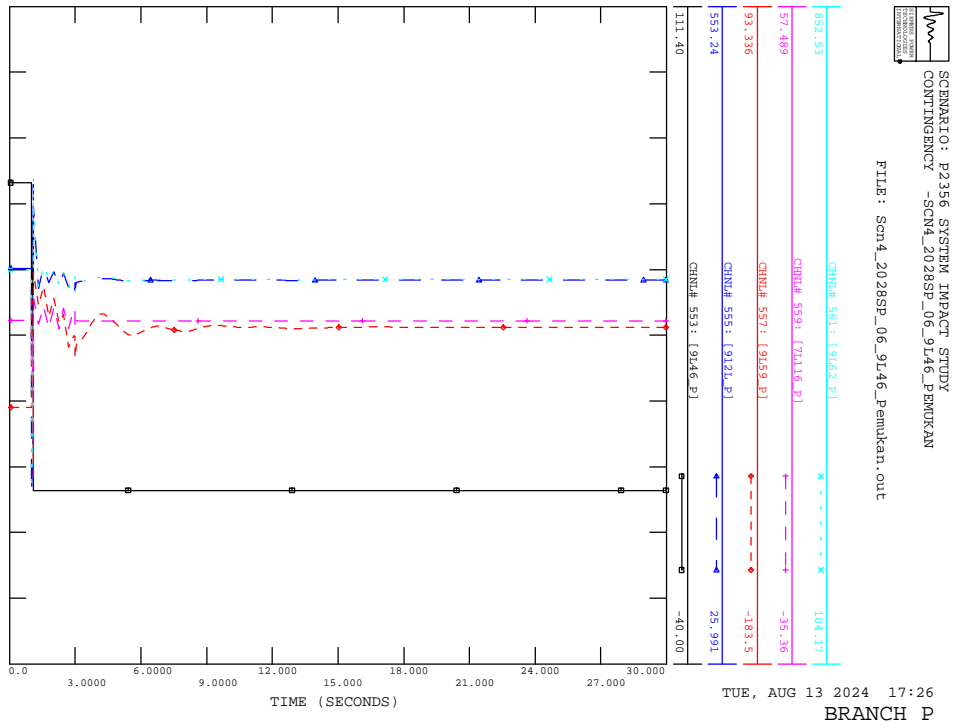
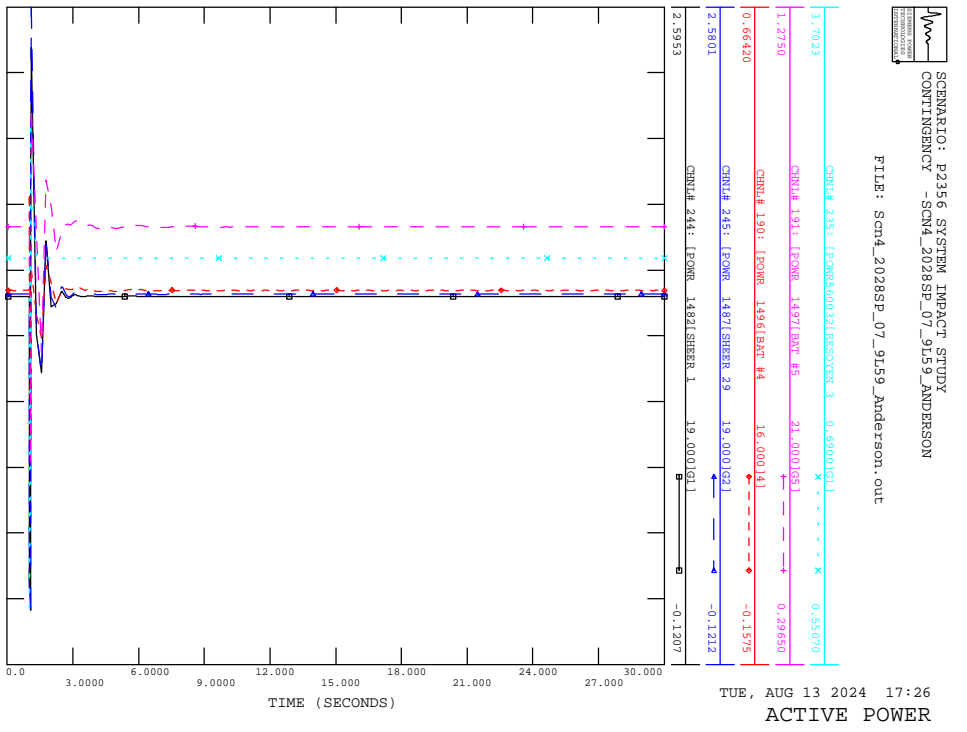
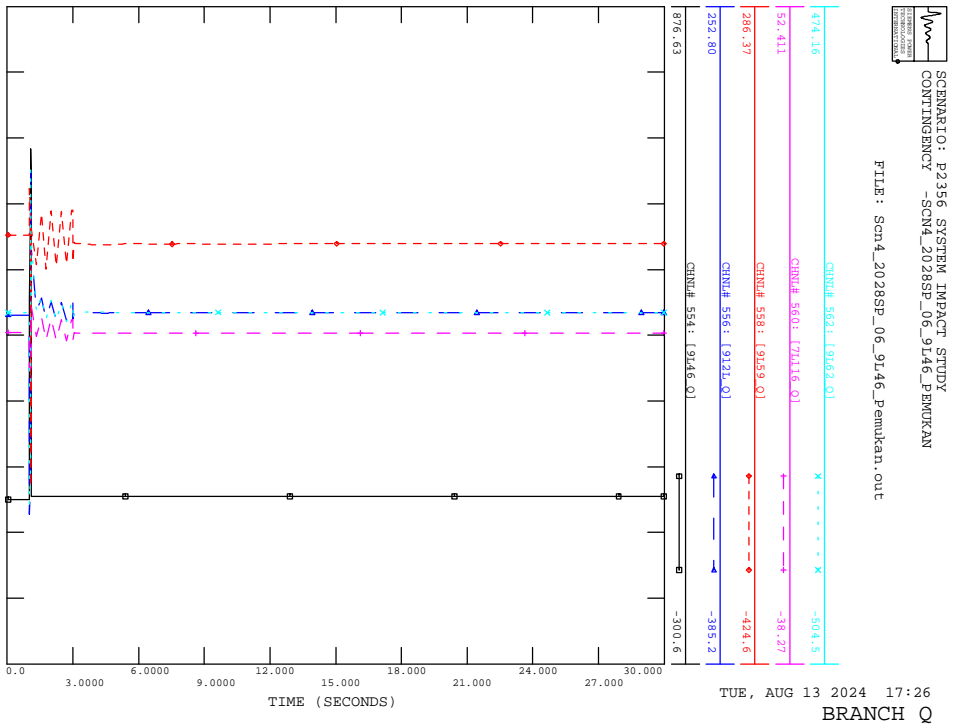


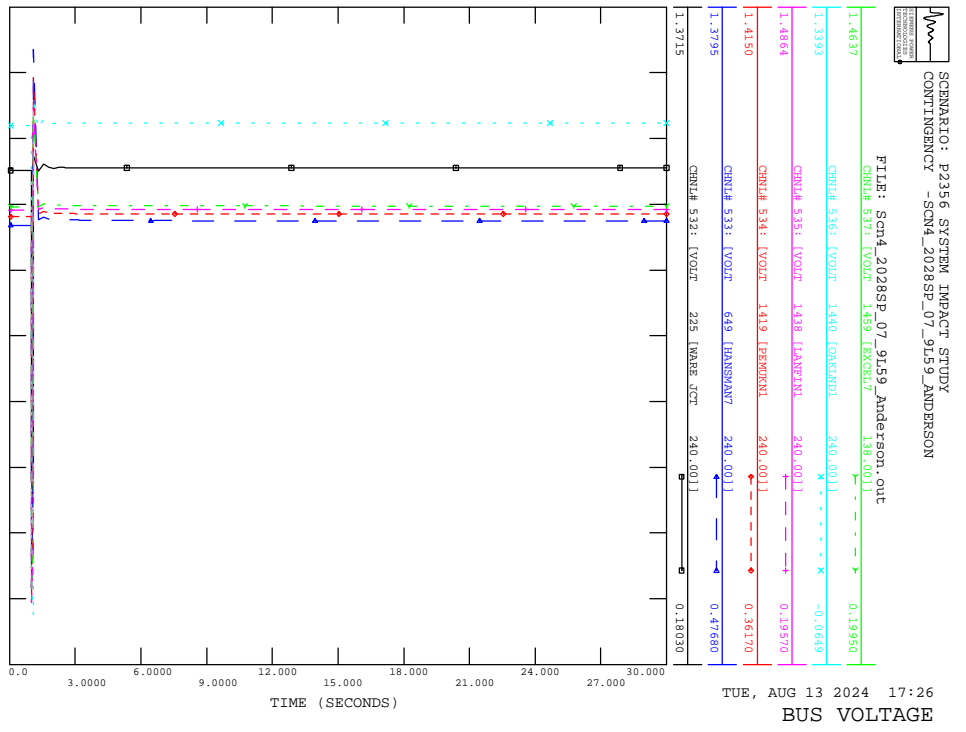
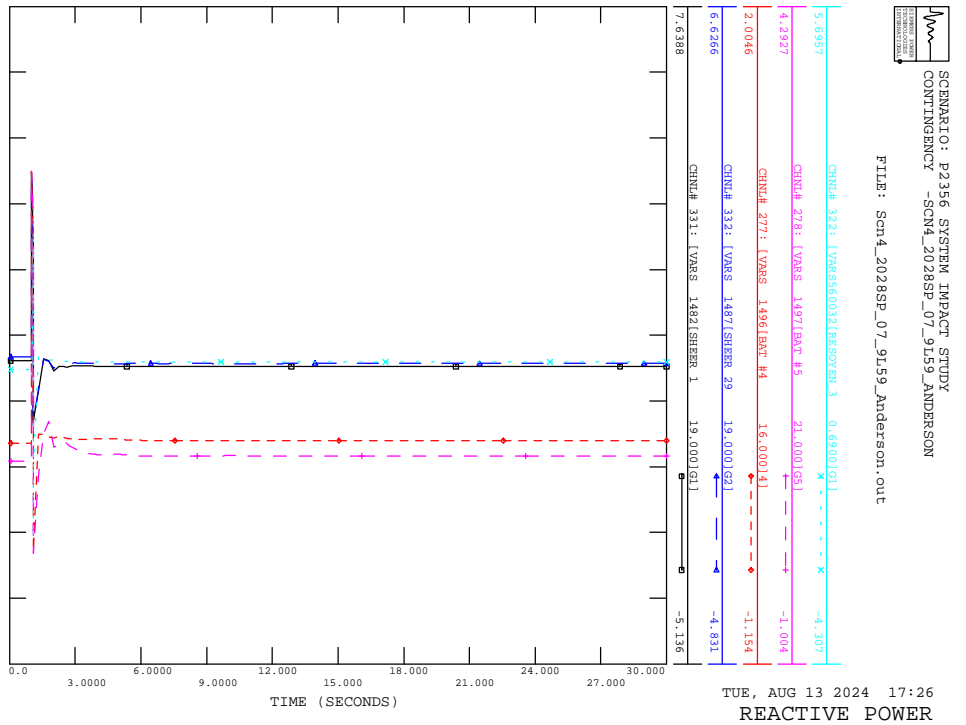
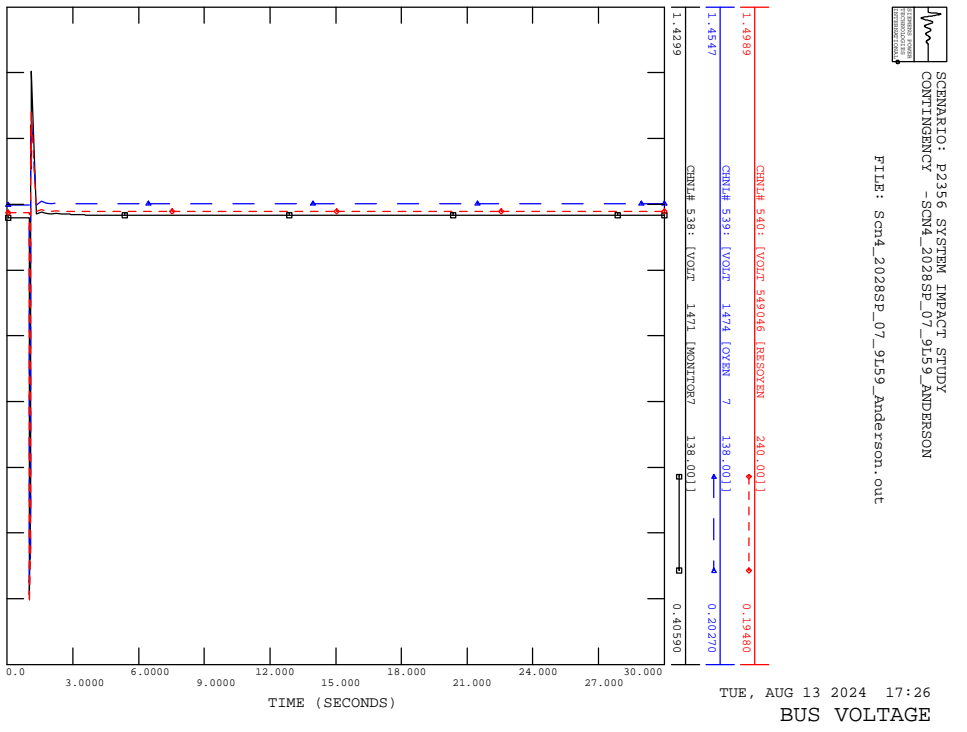
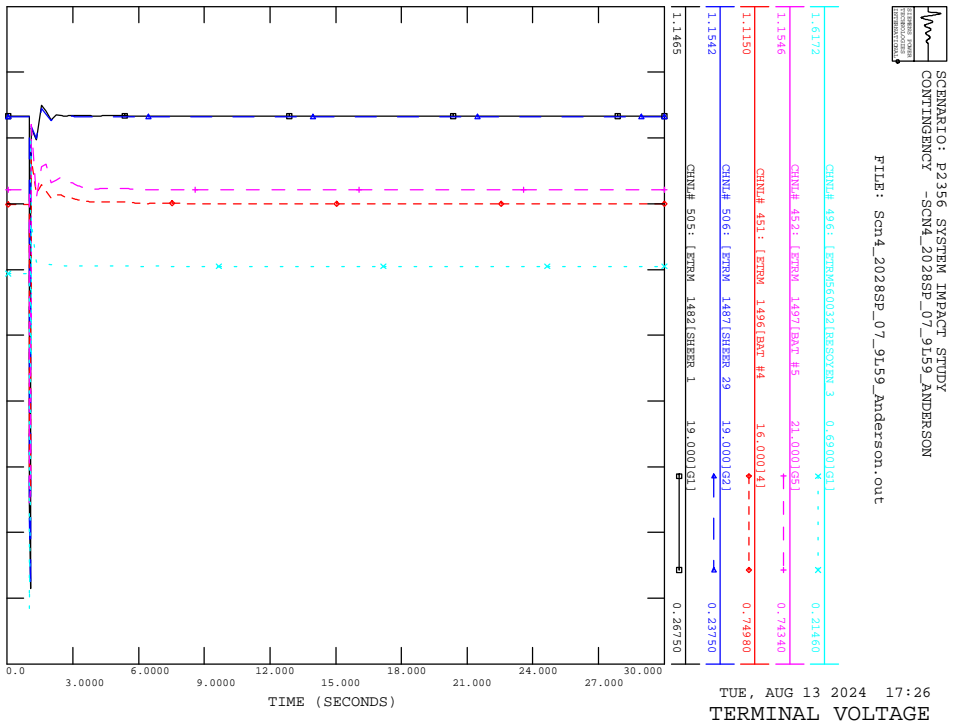


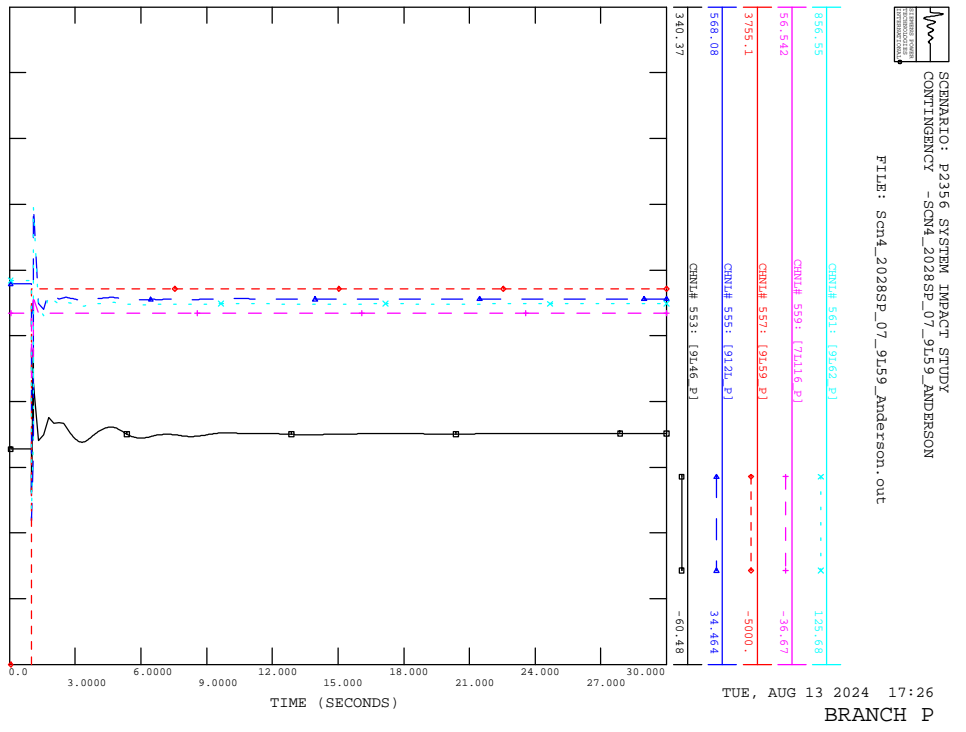
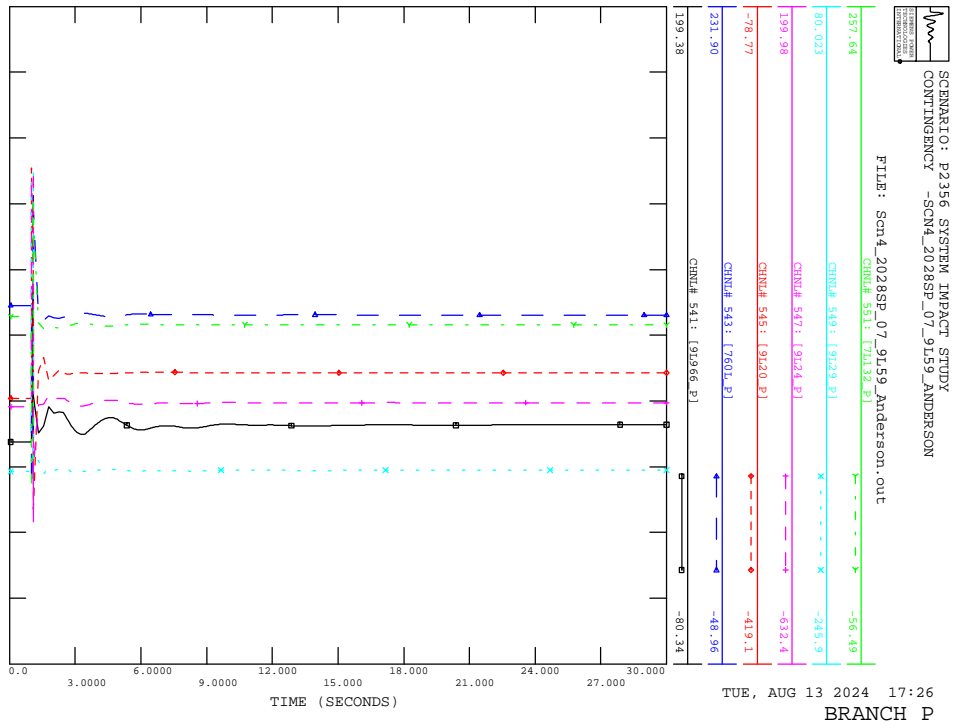
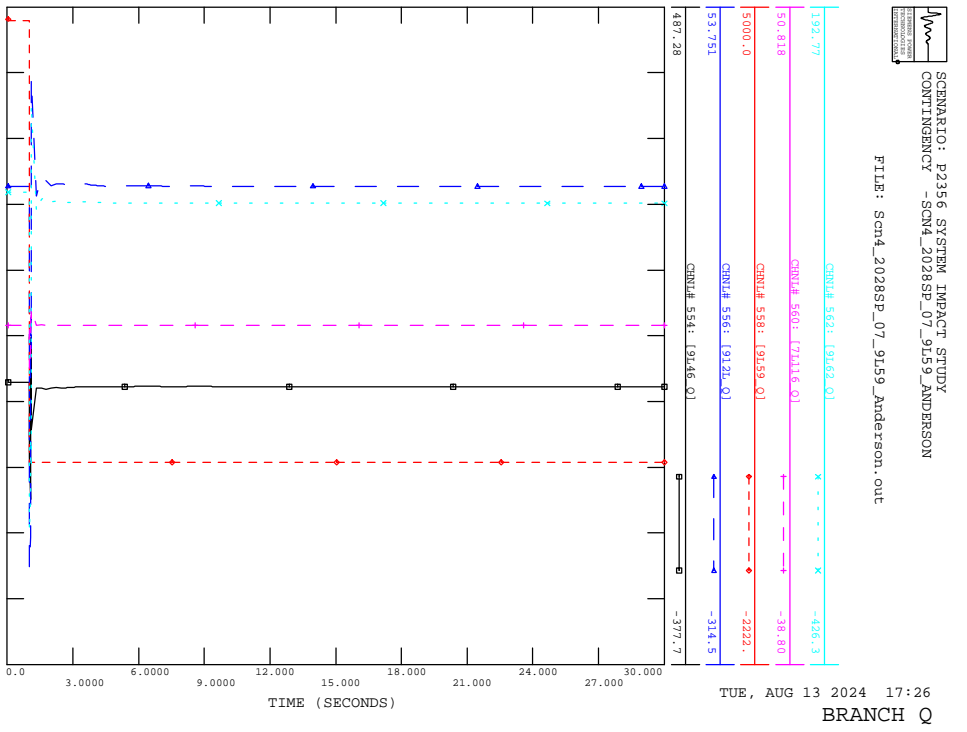
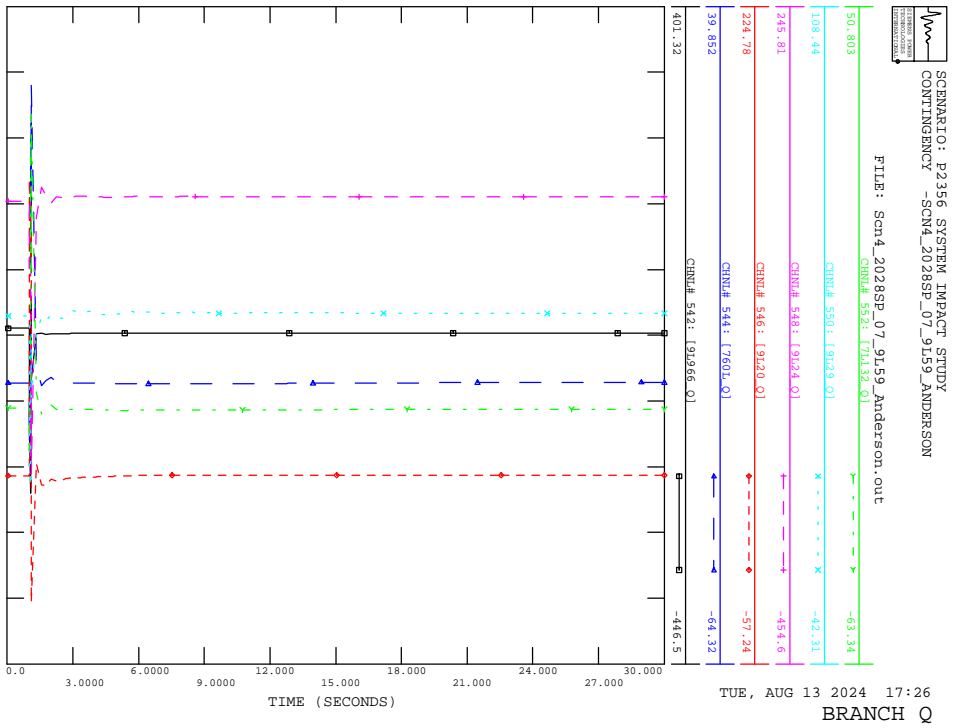




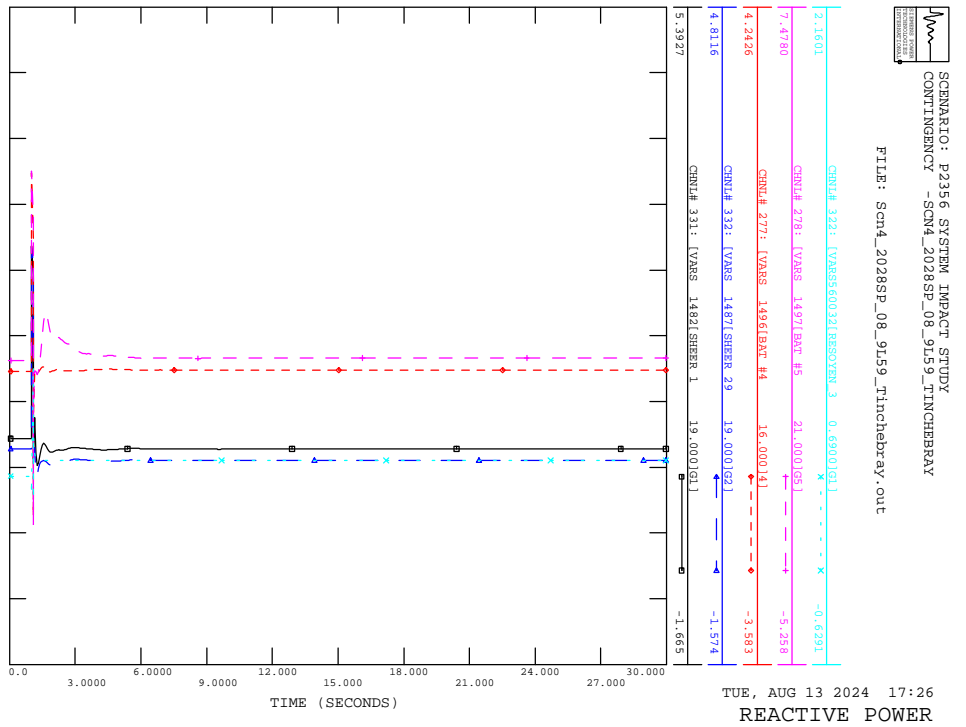
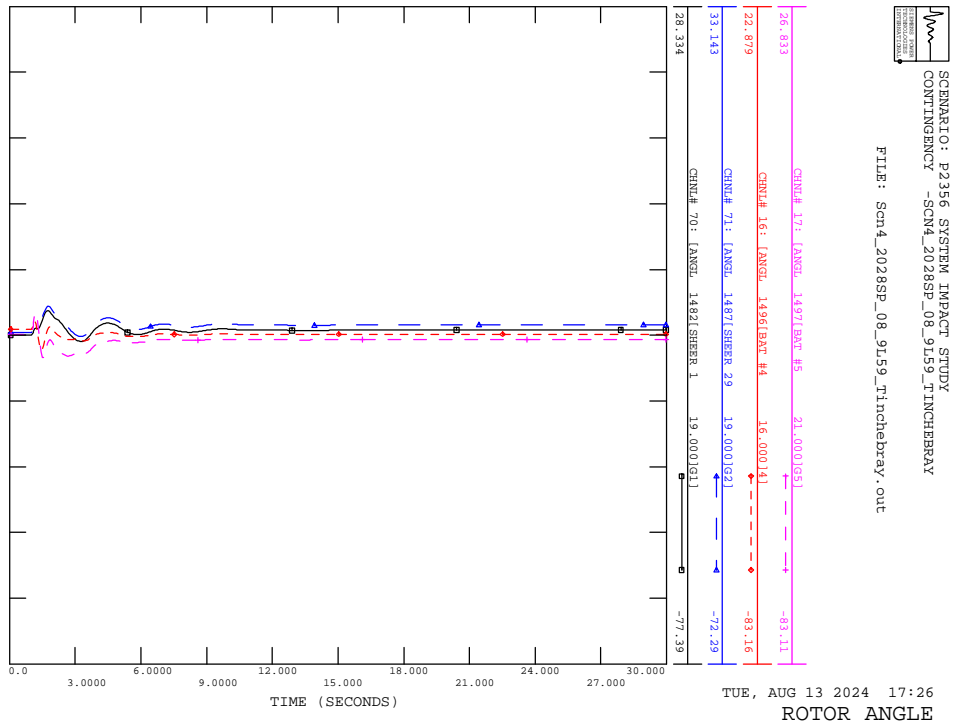
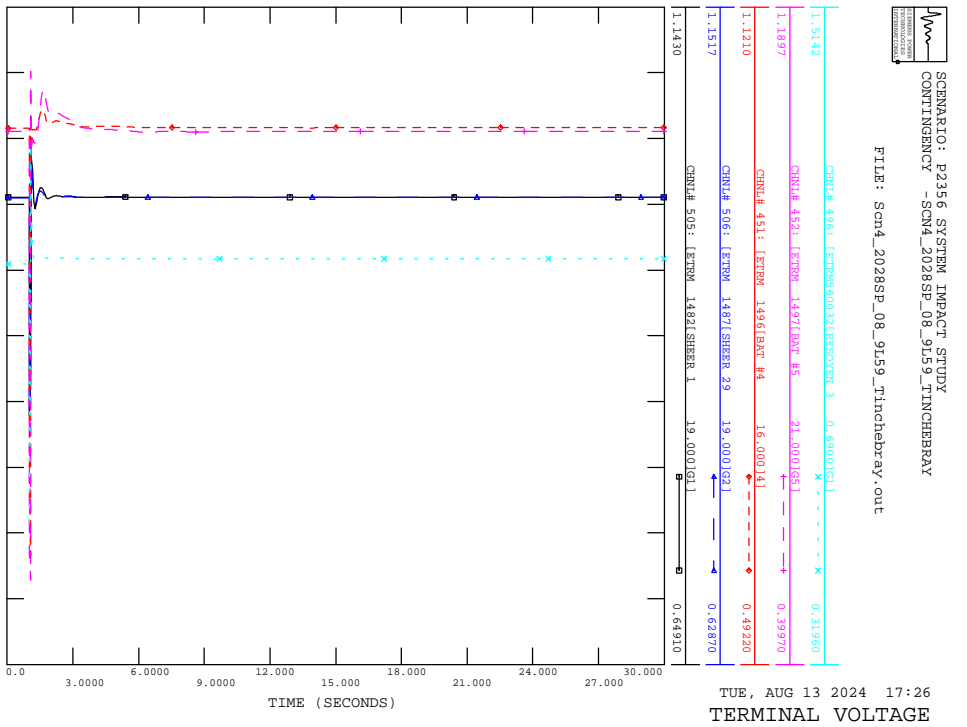
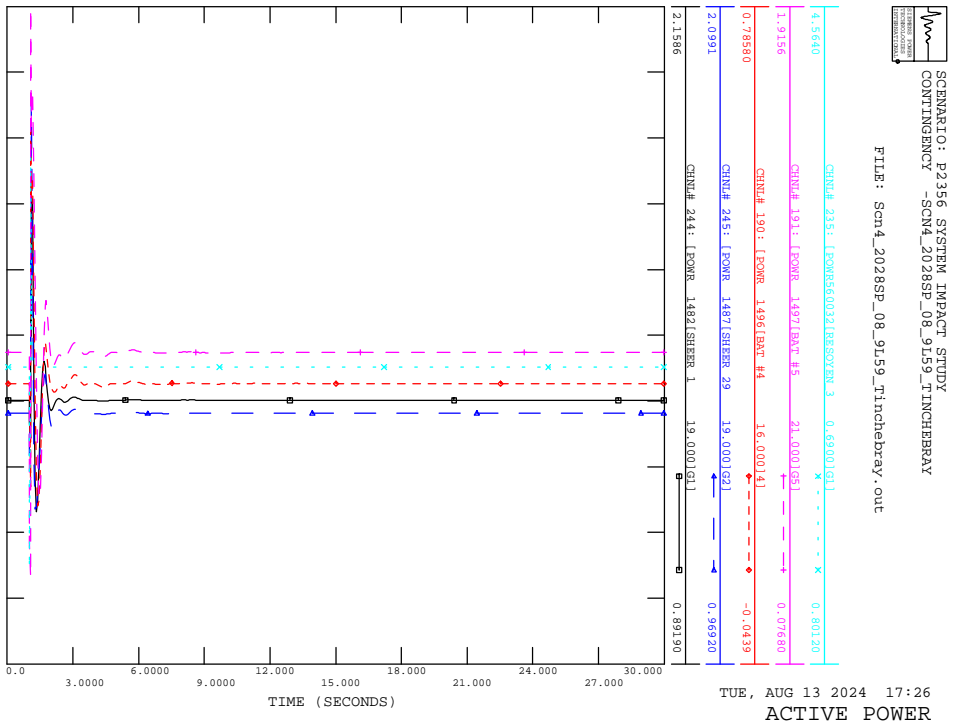


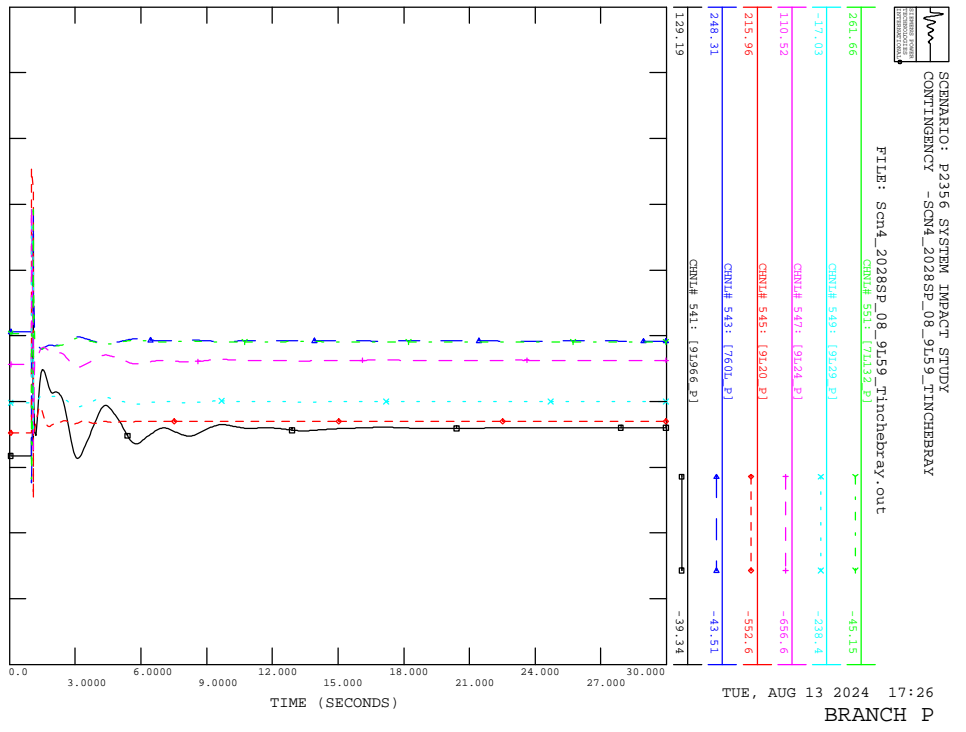
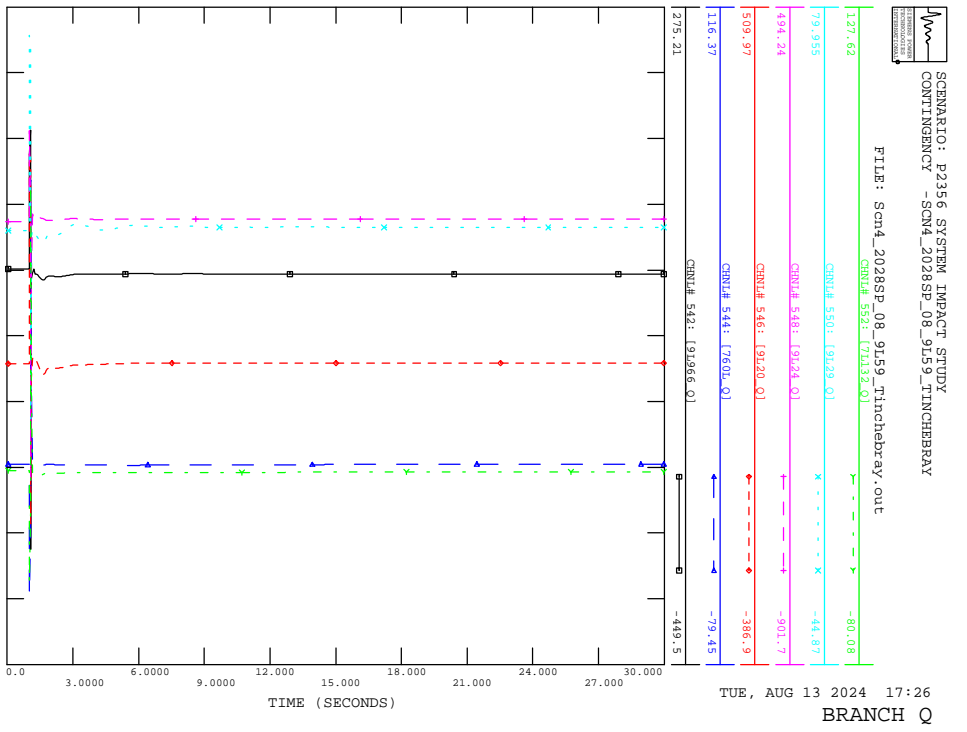
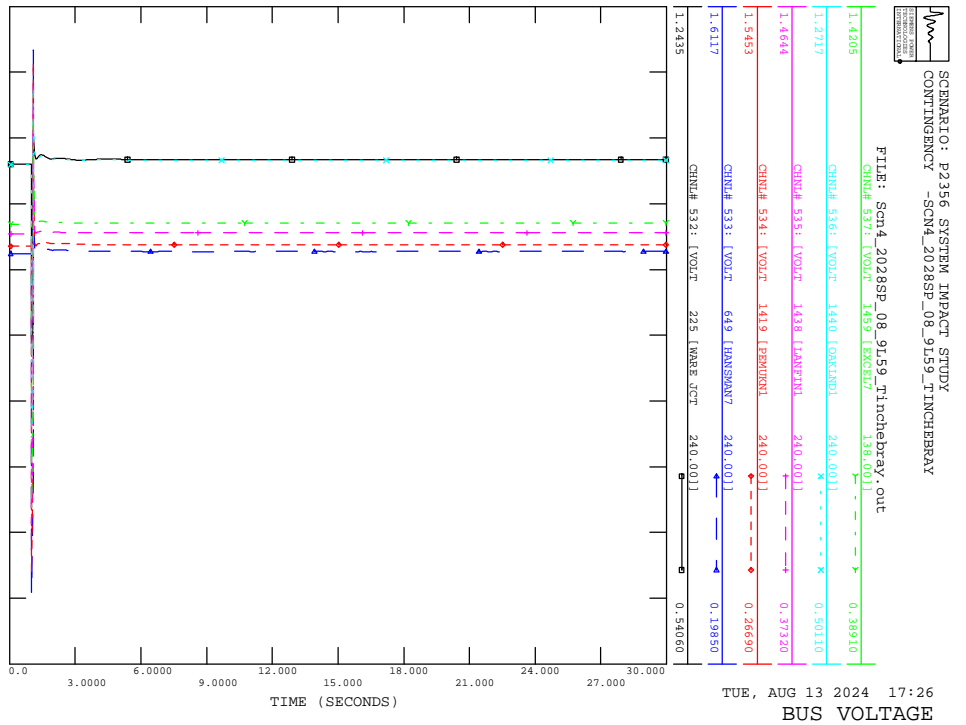
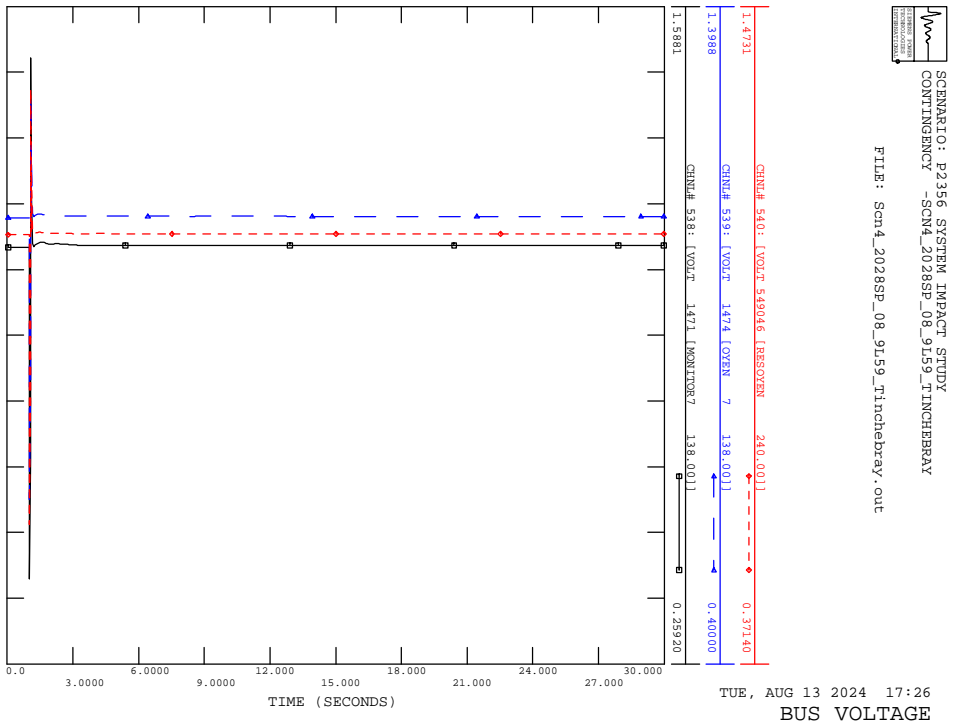




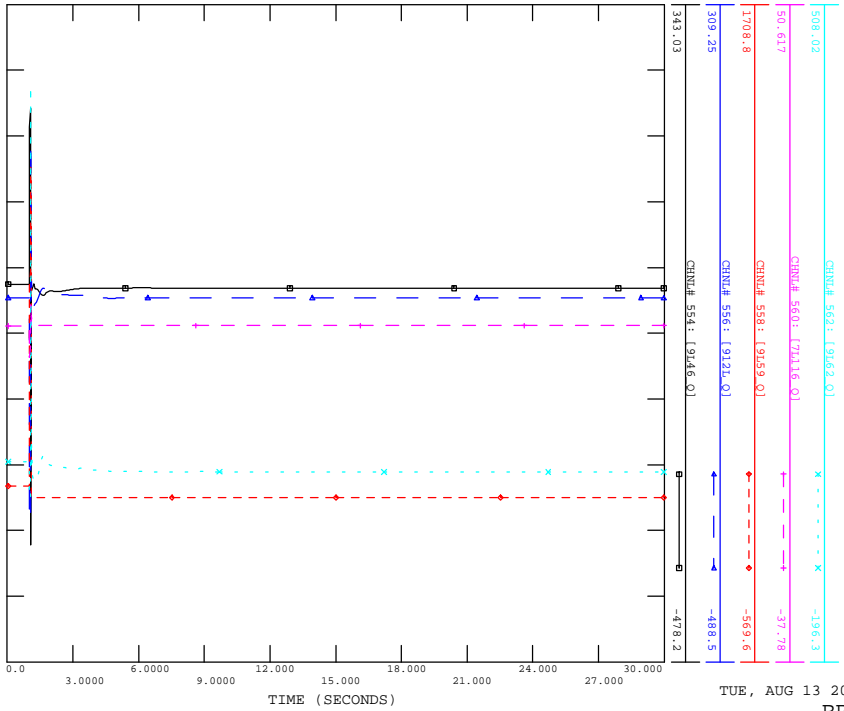






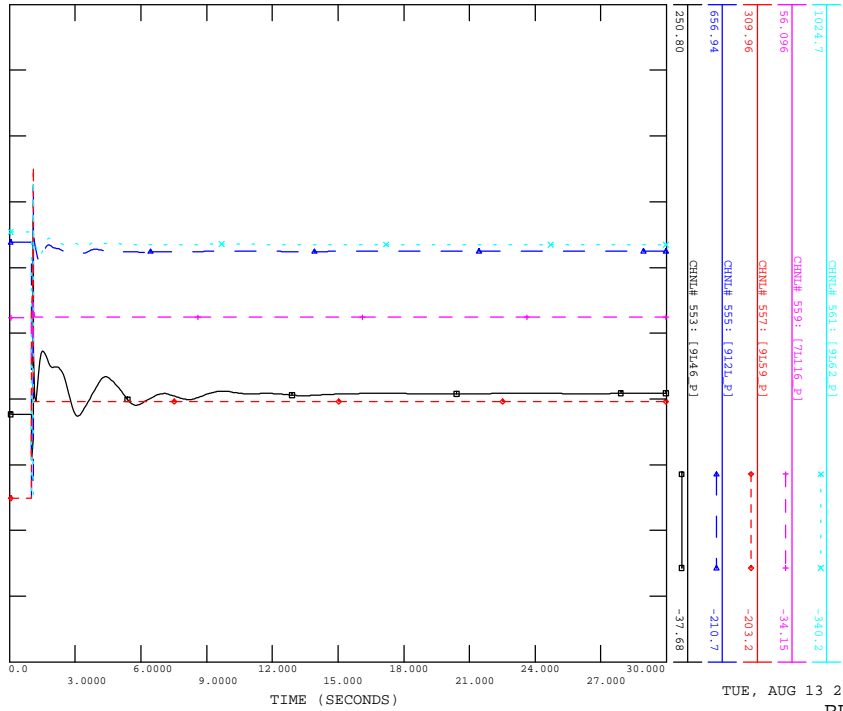


SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_08\_9L59\_TINCHERRAY  
FILE: Scn4\_2028SP\_08\_9L59\_Tinchebray.out



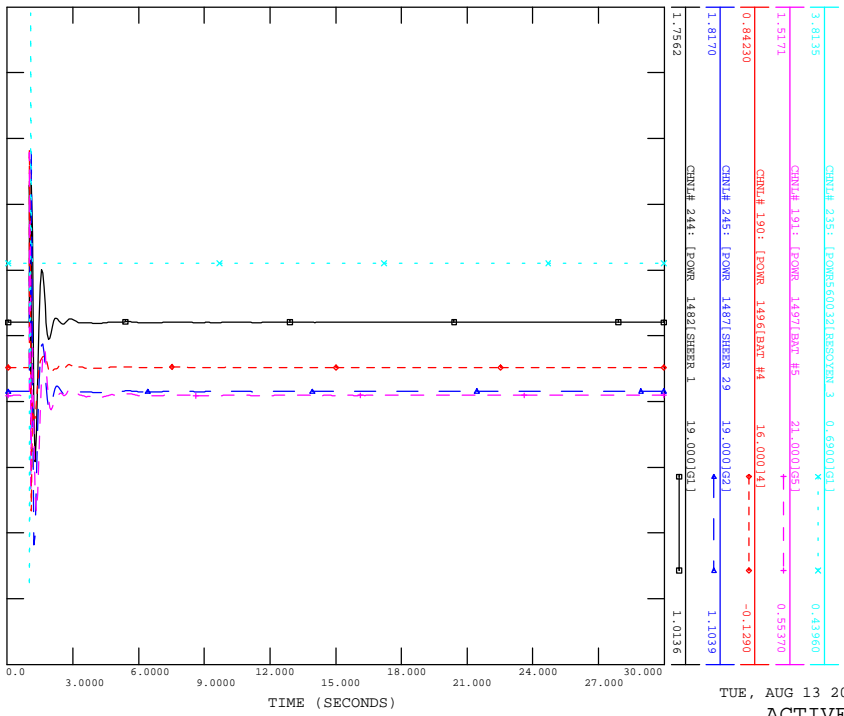
TUE, AUG 13 2024 17:26  
BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
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FILE: Scn4\_2028SP\_08\_9L59\_Tinchebray.out



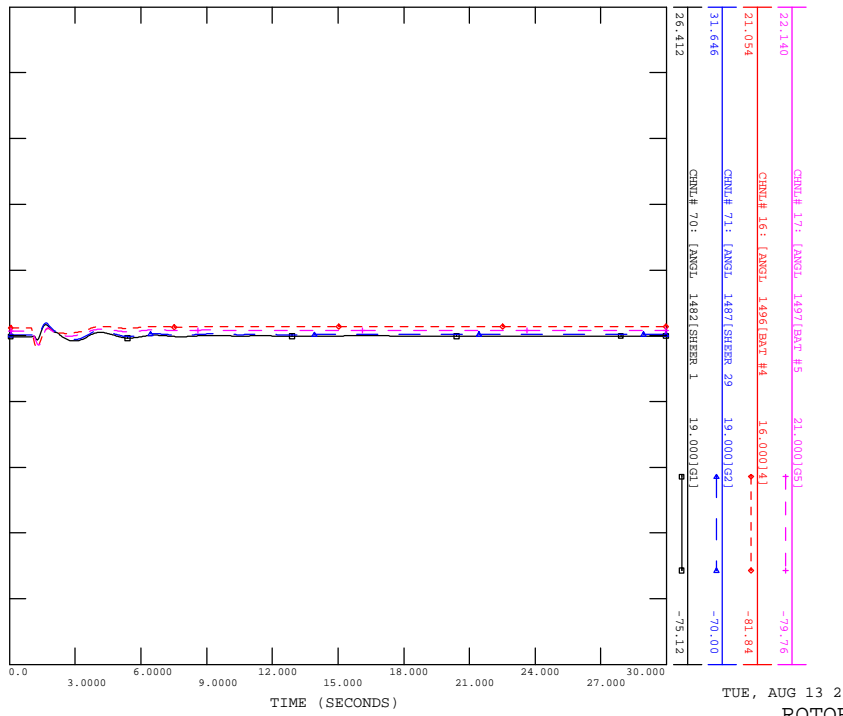
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BRANCH P

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_09\_9L666\_PEMUKAN  
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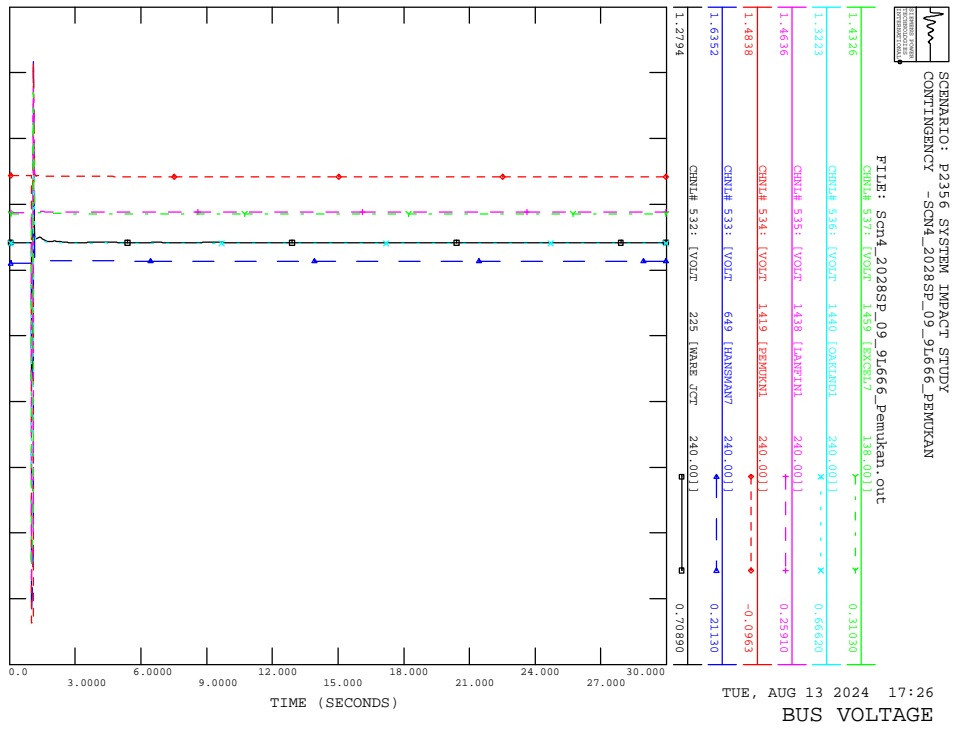
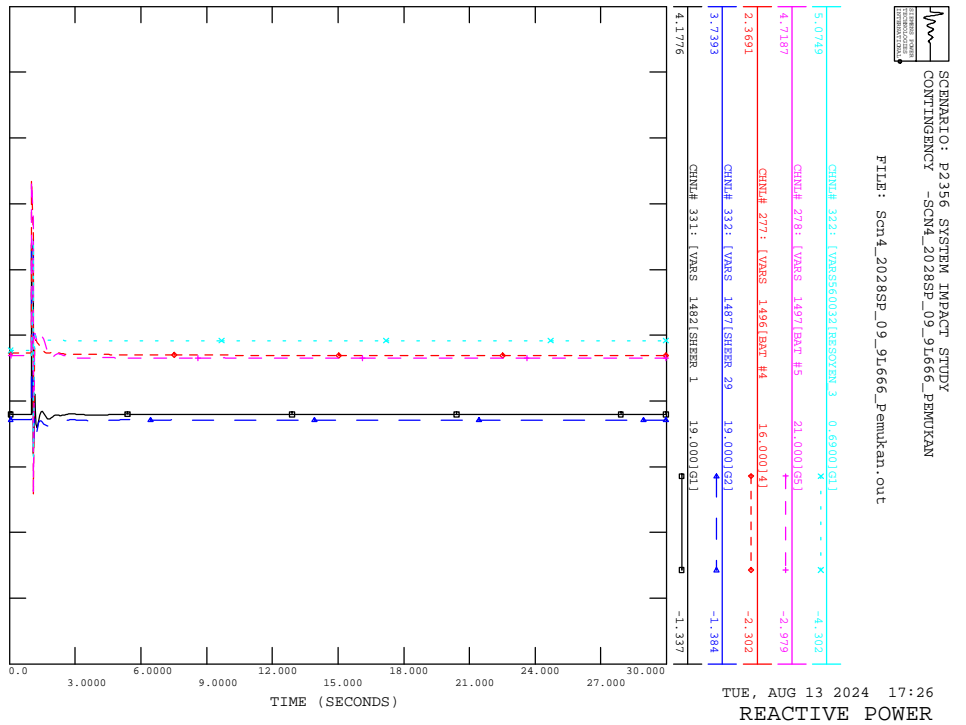
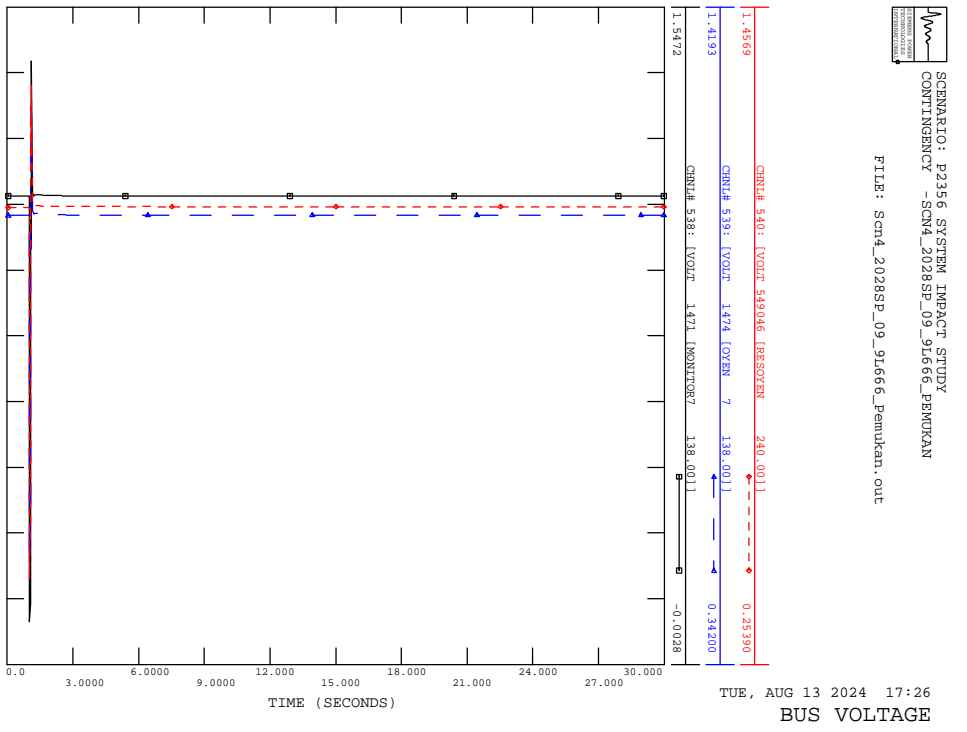
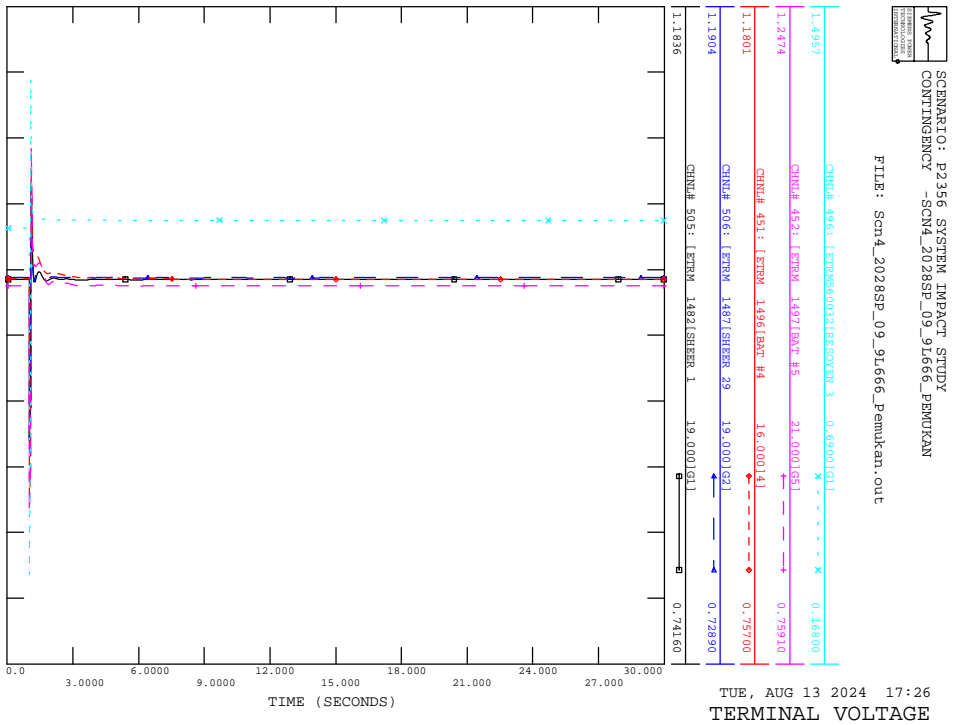


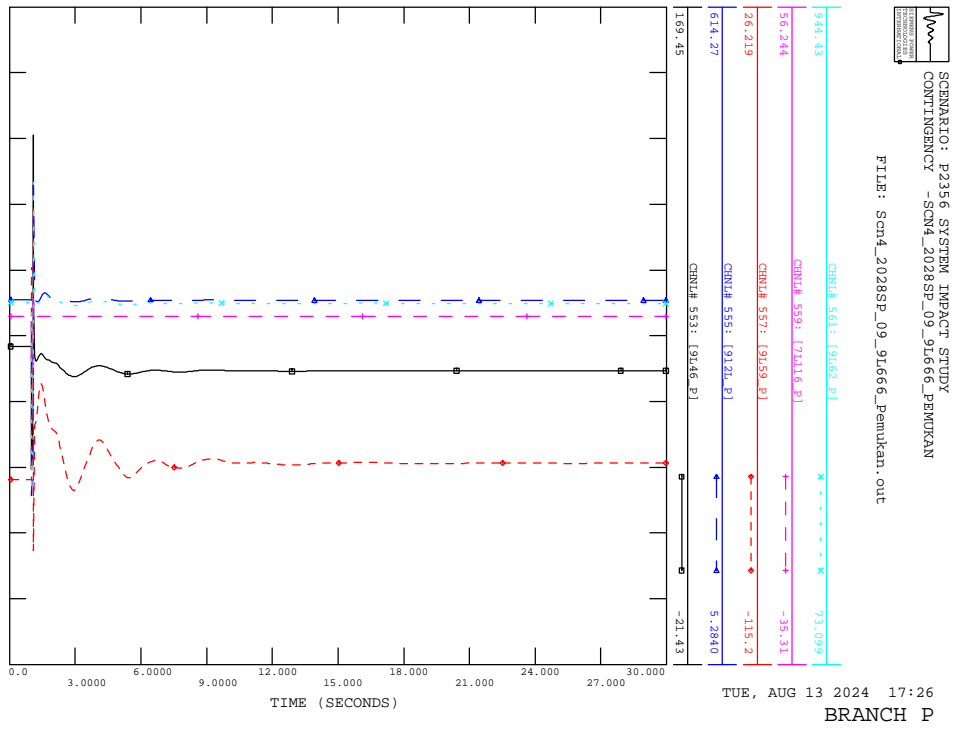
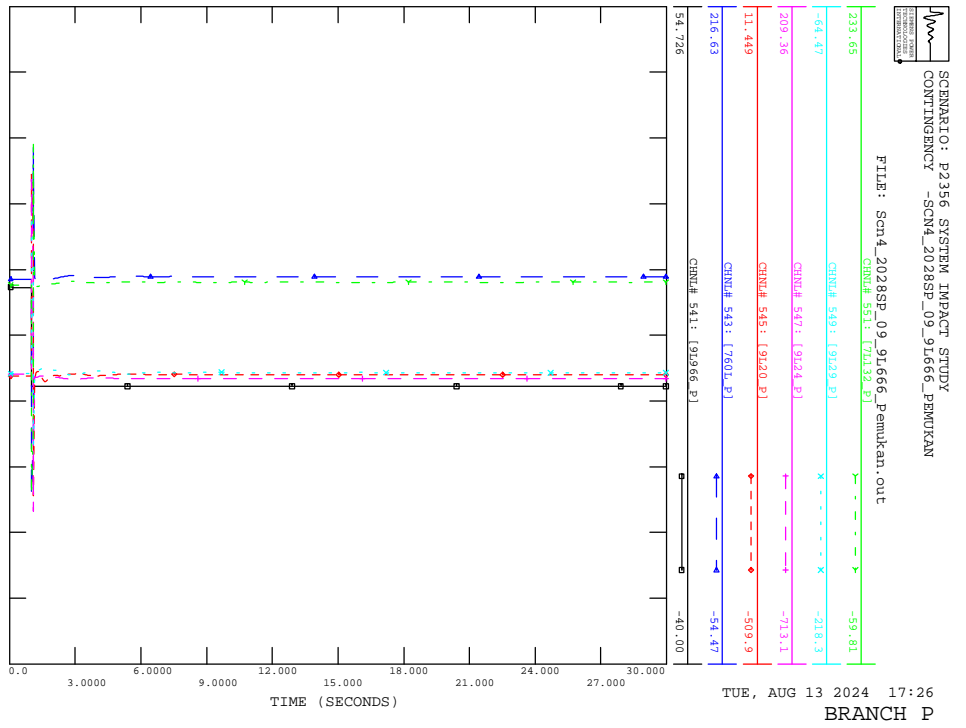
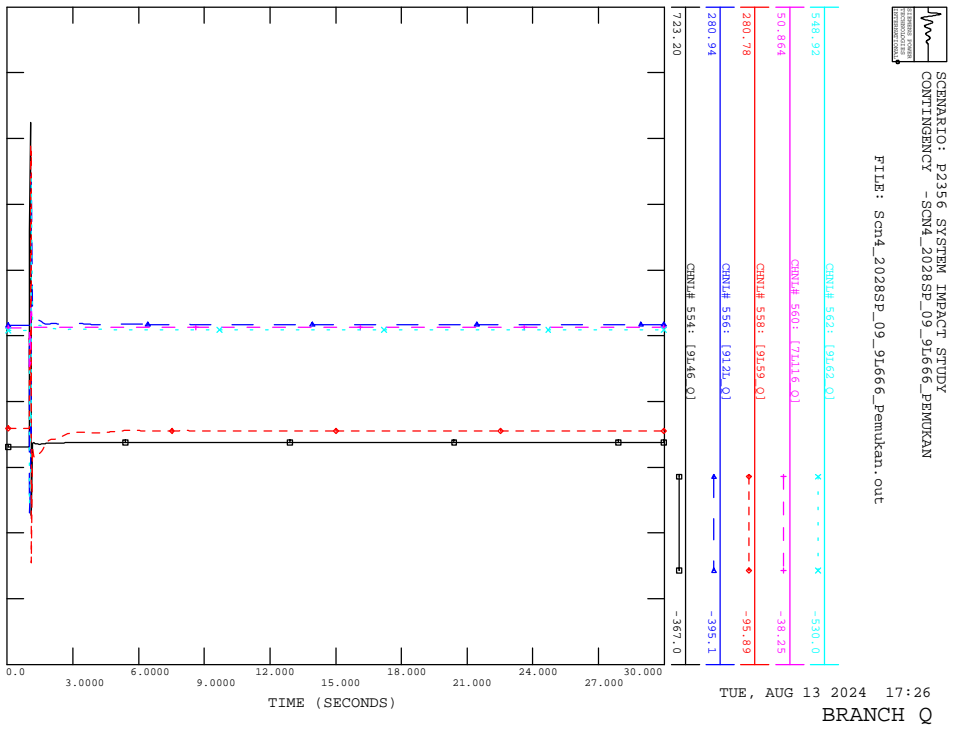
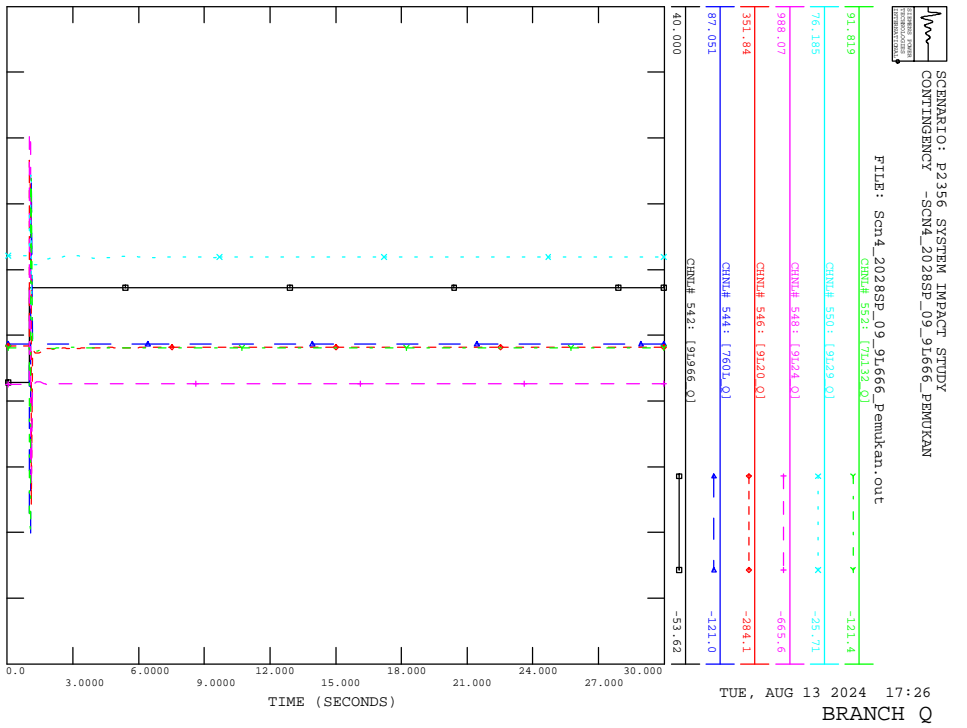
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ACTIVE POWER

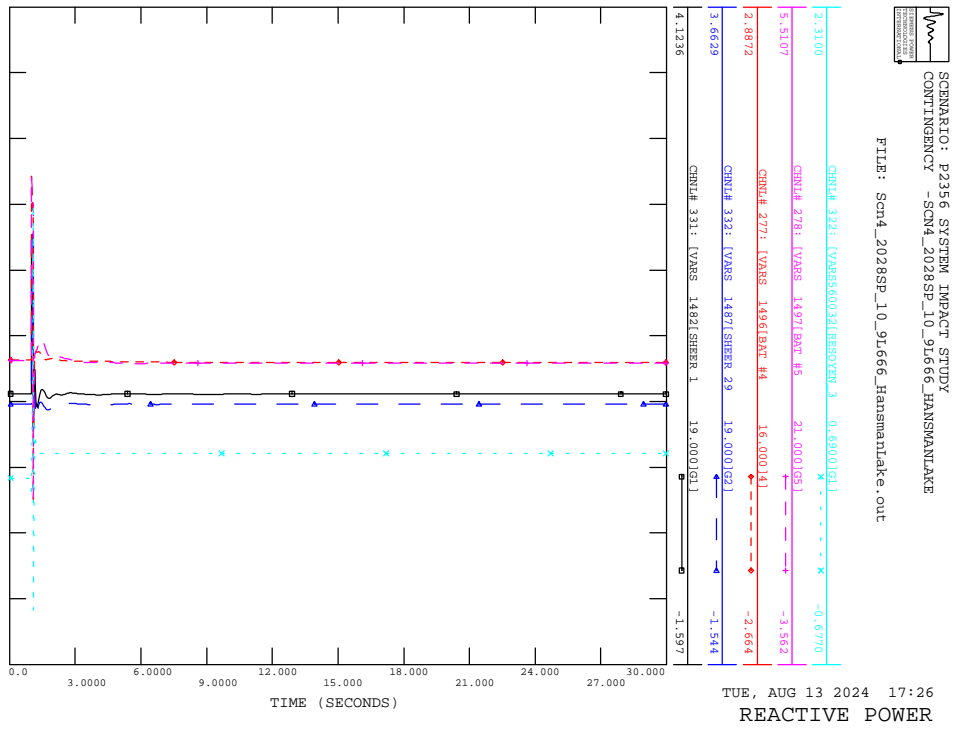
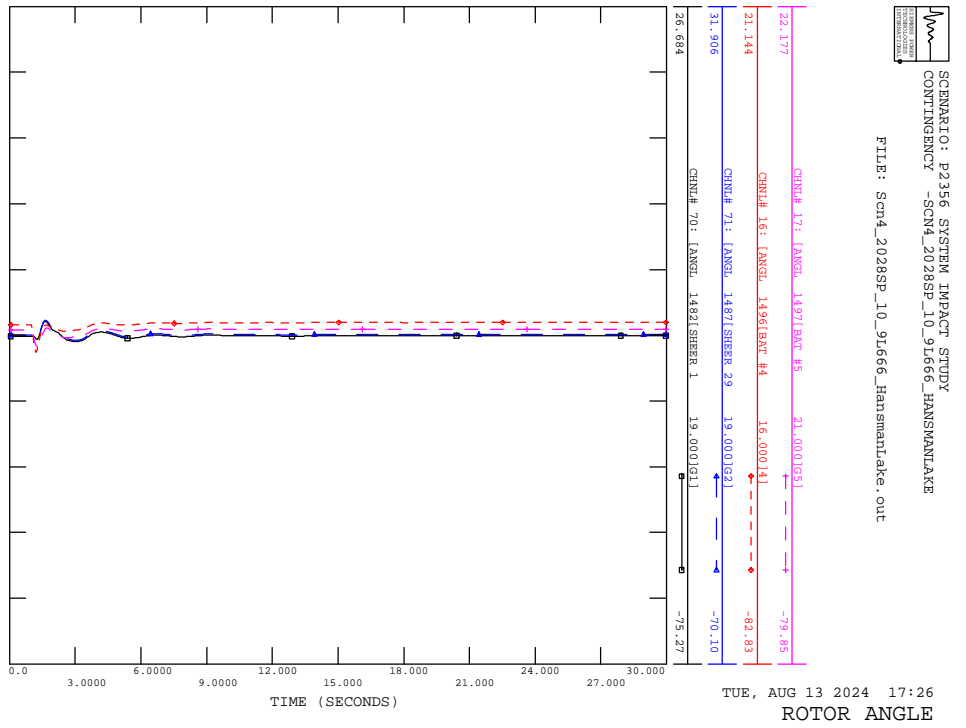
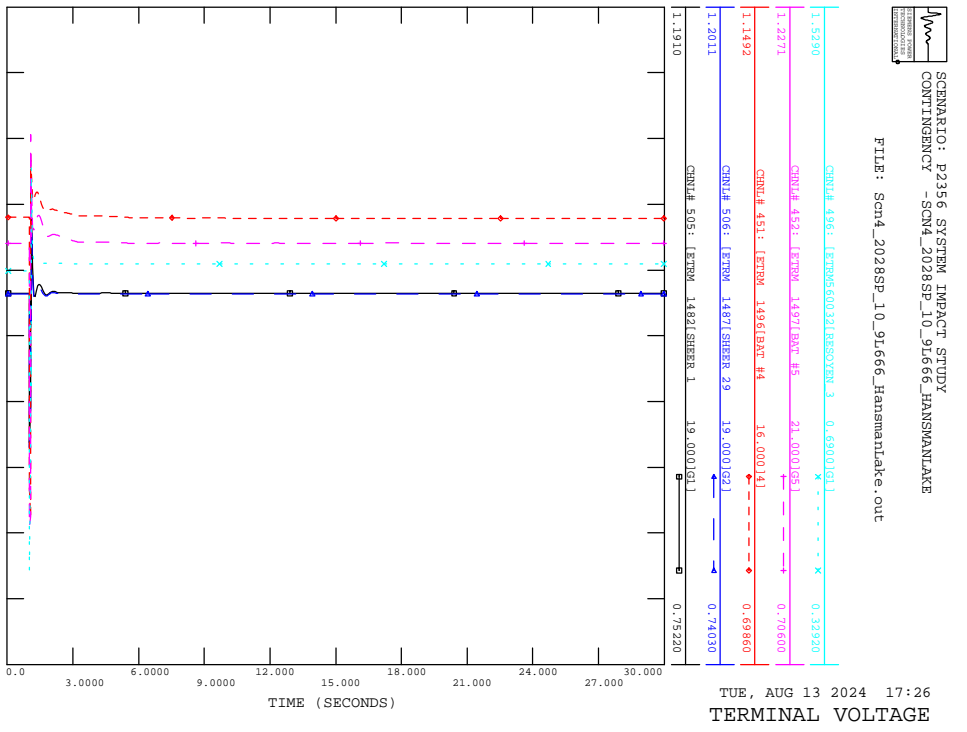
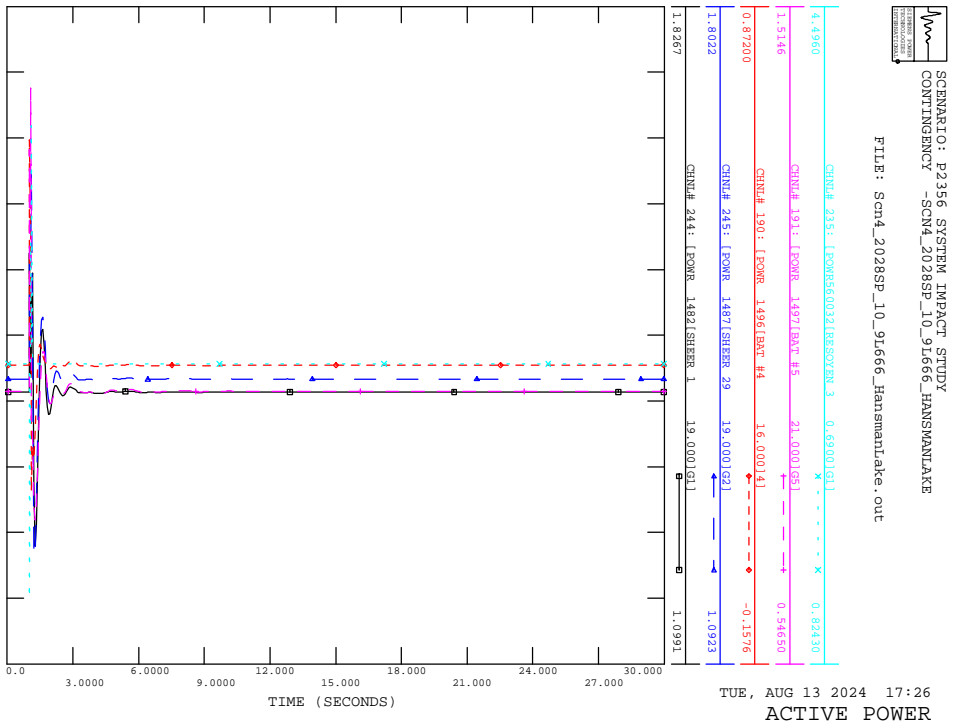
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FILE: Scn4\_2028SP\_09\_9L666\_Pemukan.out

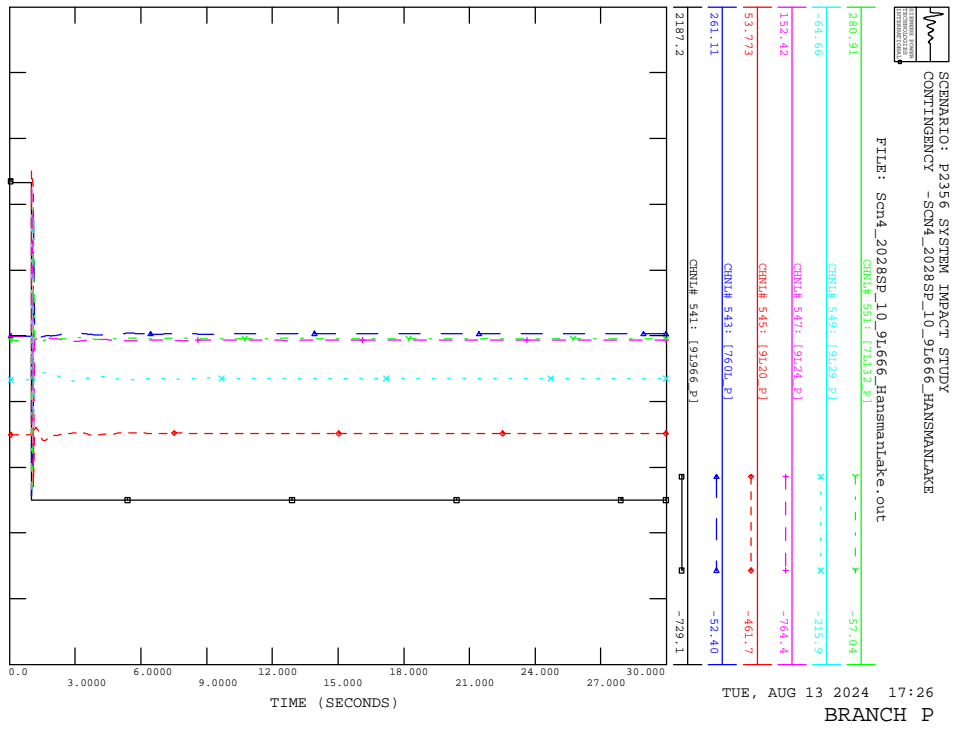
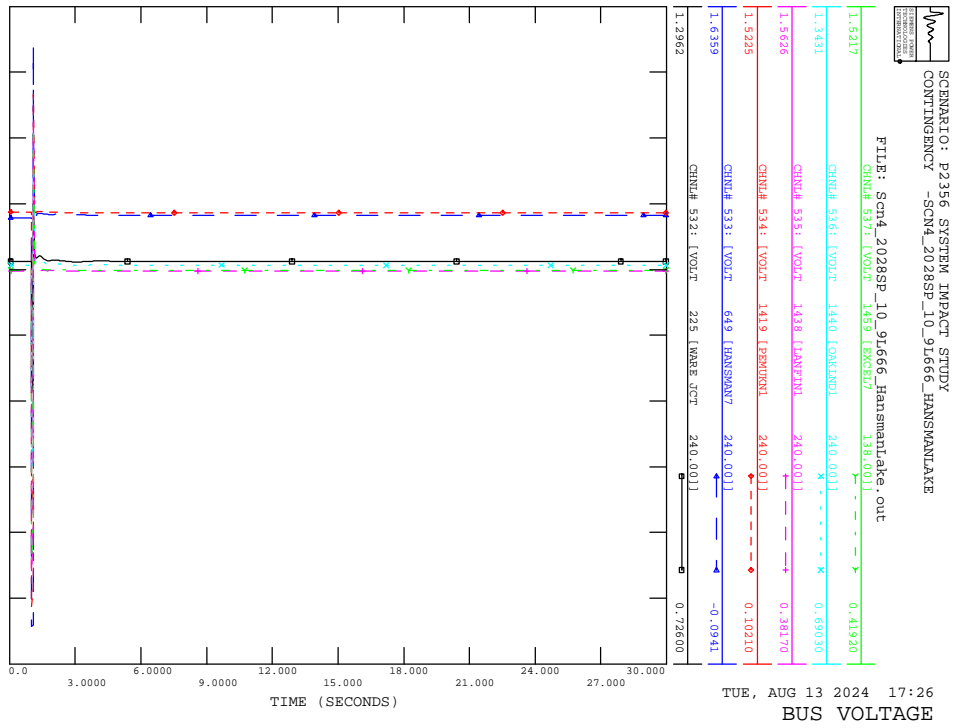
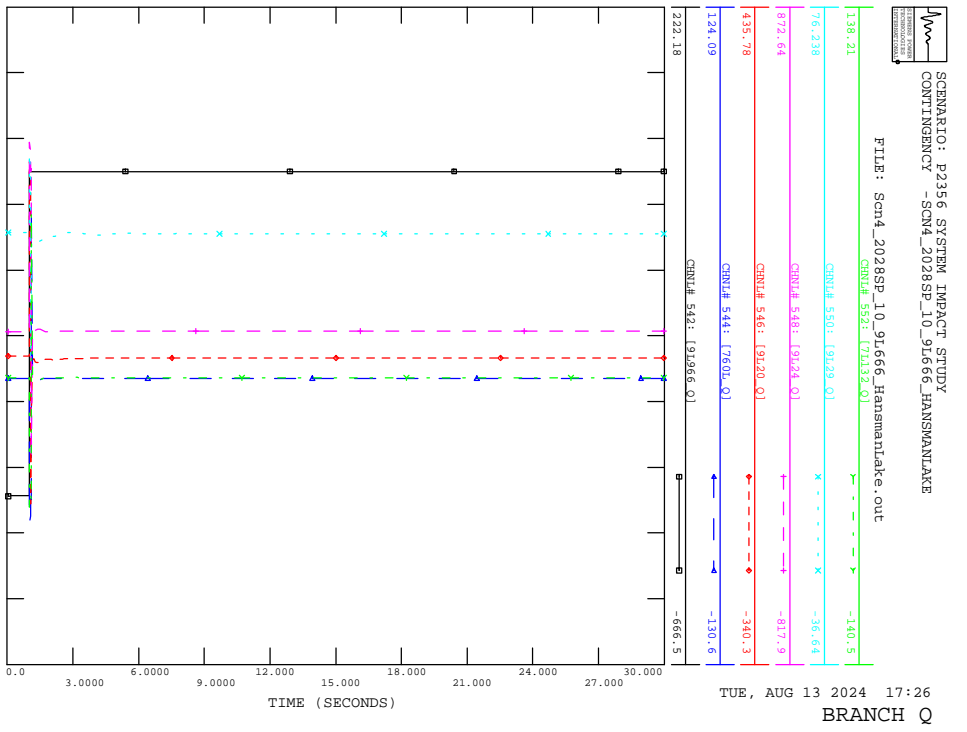
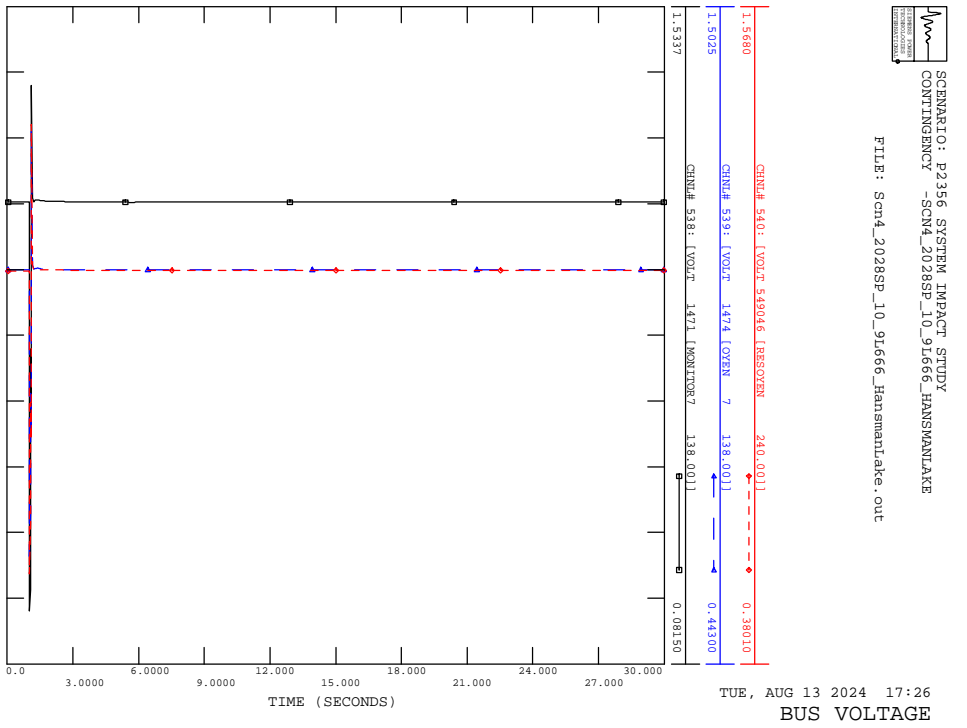


TUE, AUG 13 2024 17:26  
ROTOR ANGLE

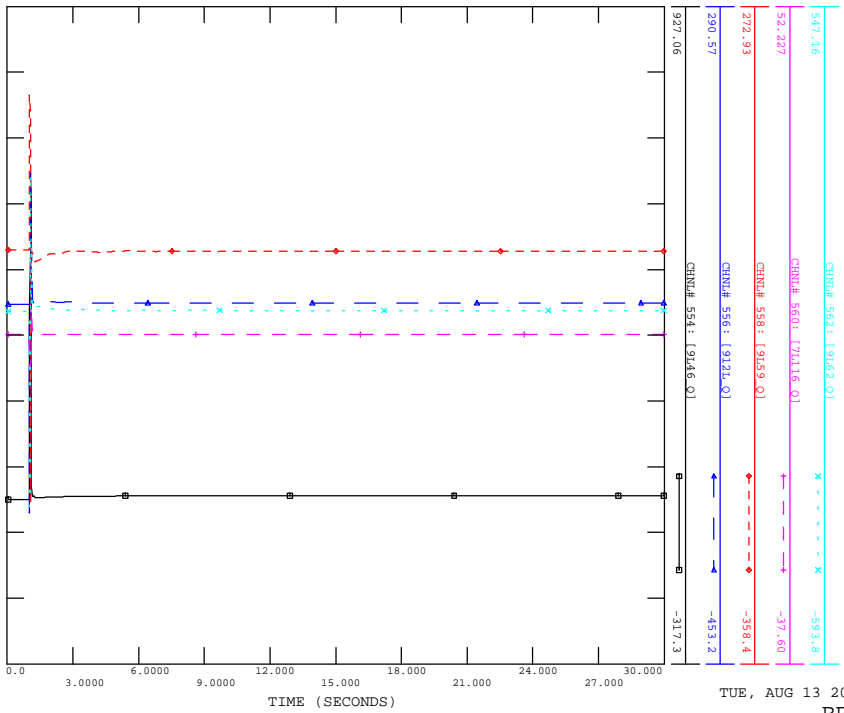






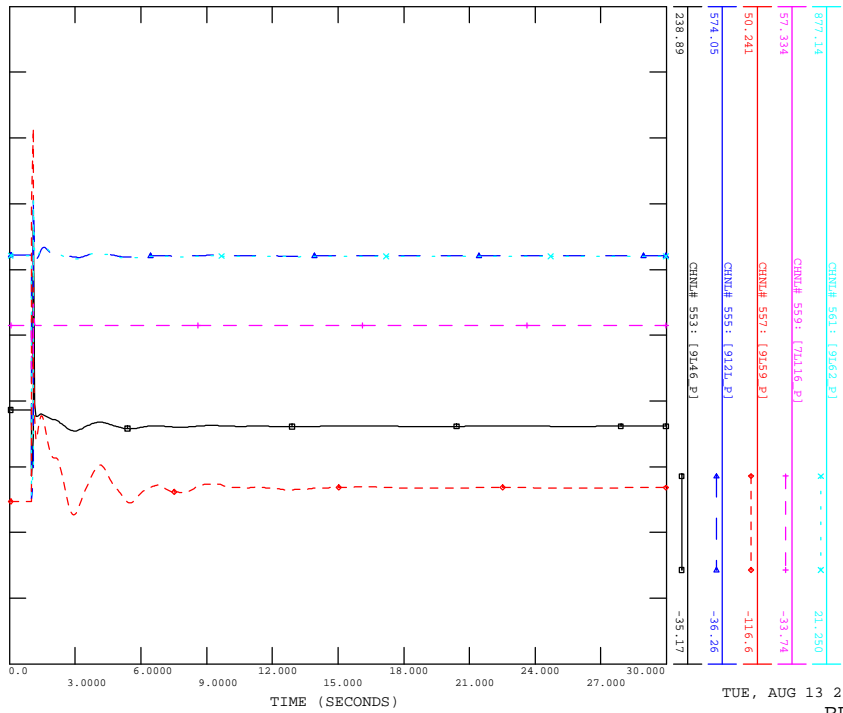


SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_10\_91666\_HANSMANLAKE  
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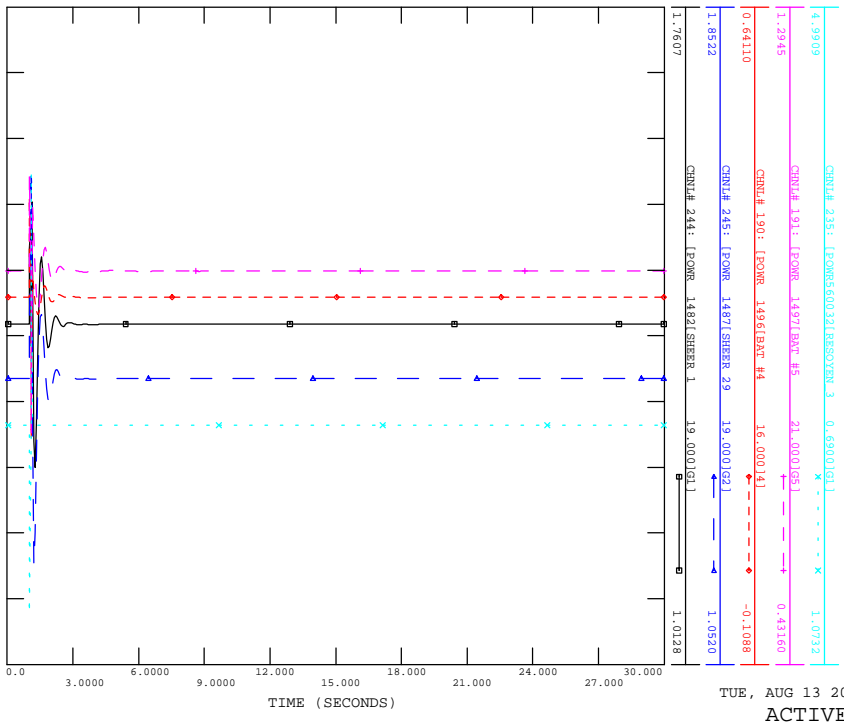
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BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
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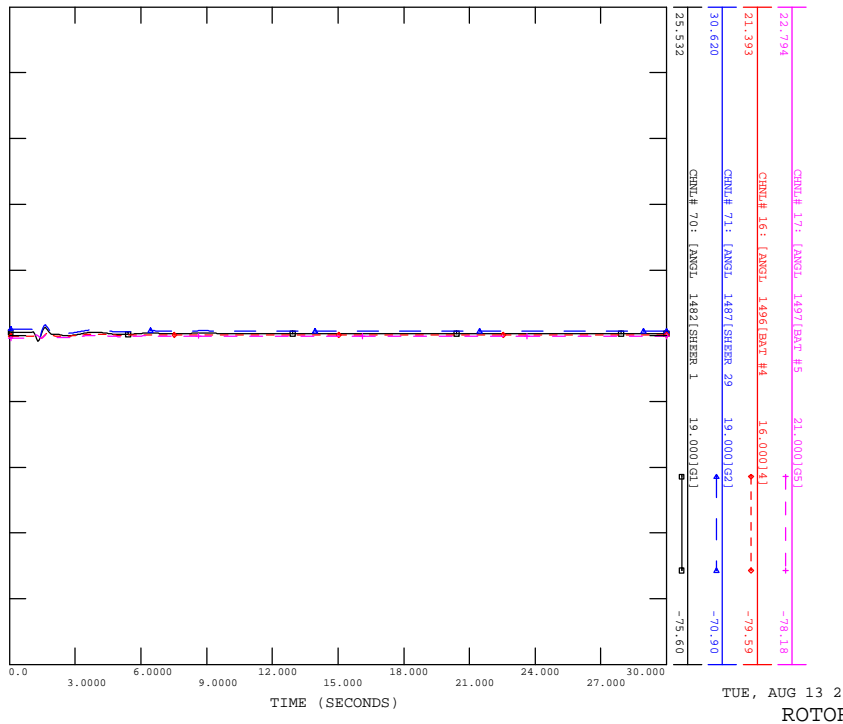
TUE, AUG 13 2024 17:26  
BRANCH P

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_11\_760L\_OYEN  
FILE: Scn4\_2028SP\_11\_760L\_Oyen.out



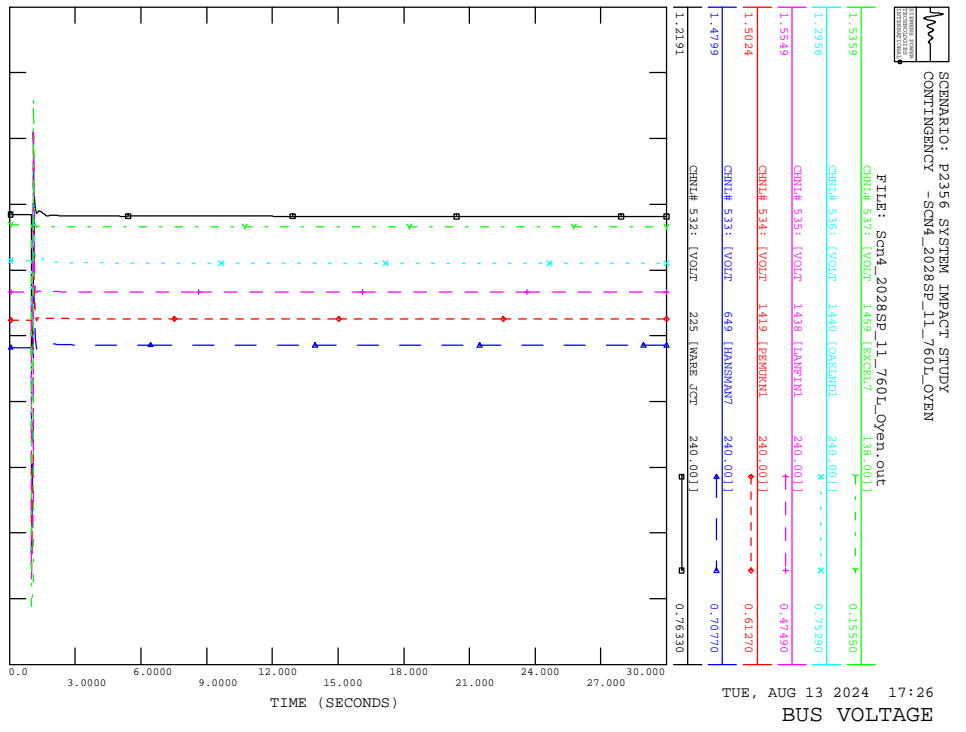
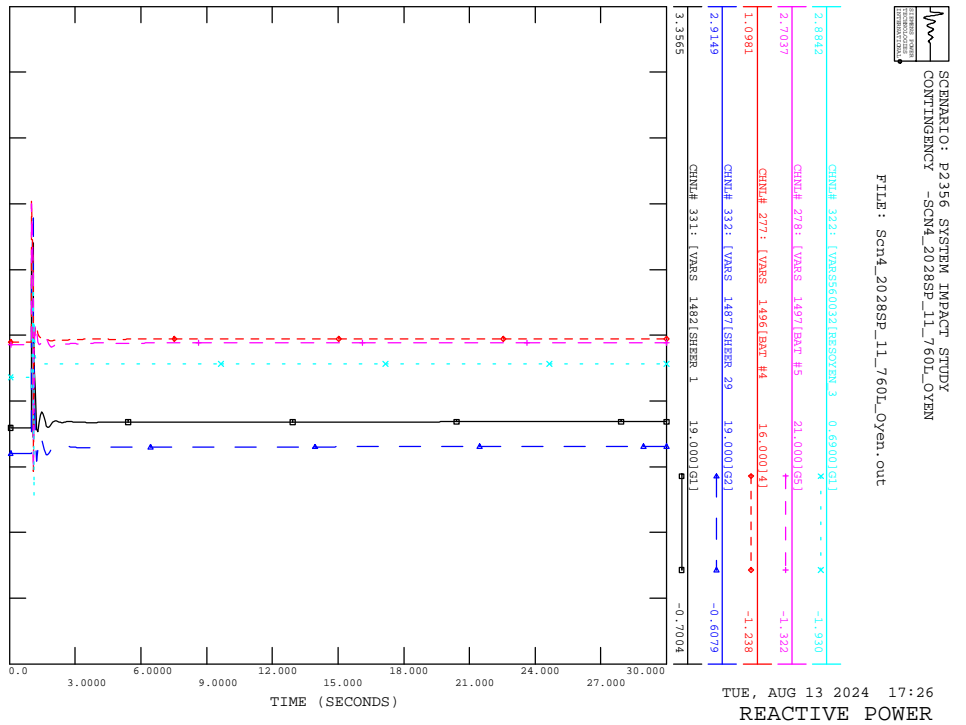
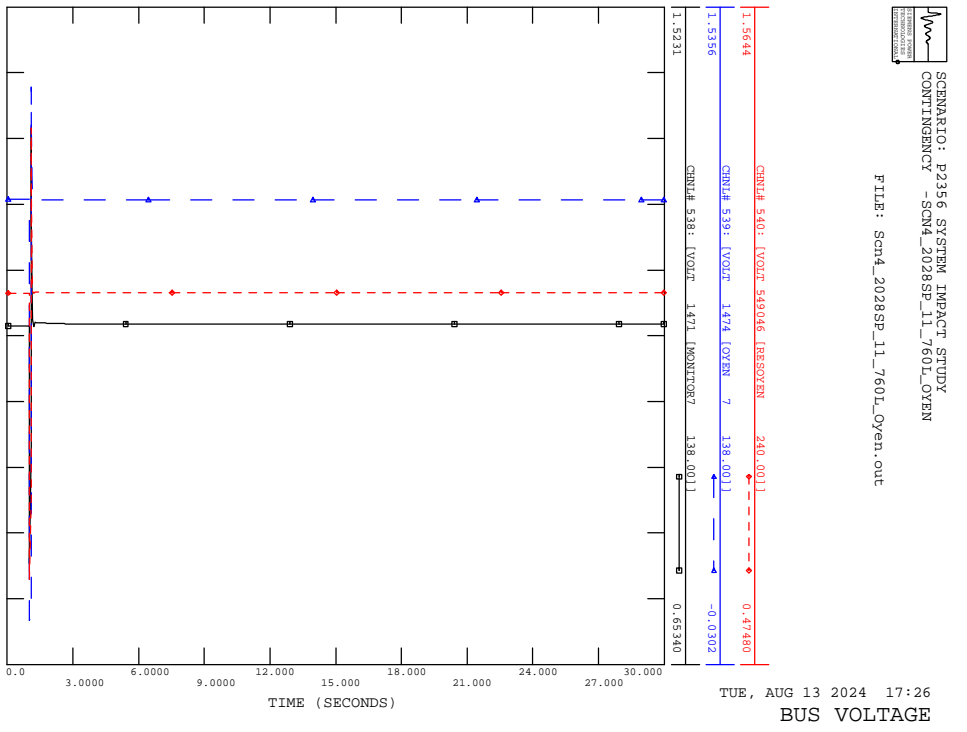
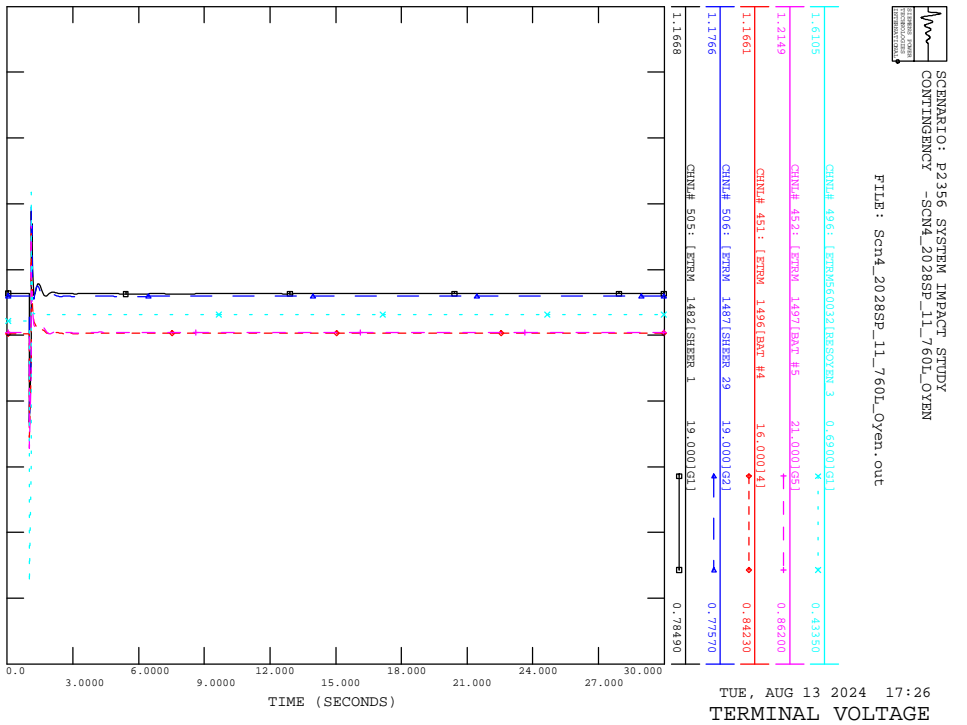
TUE, AUG 13 2024 17:26  
ACTIVE POWER

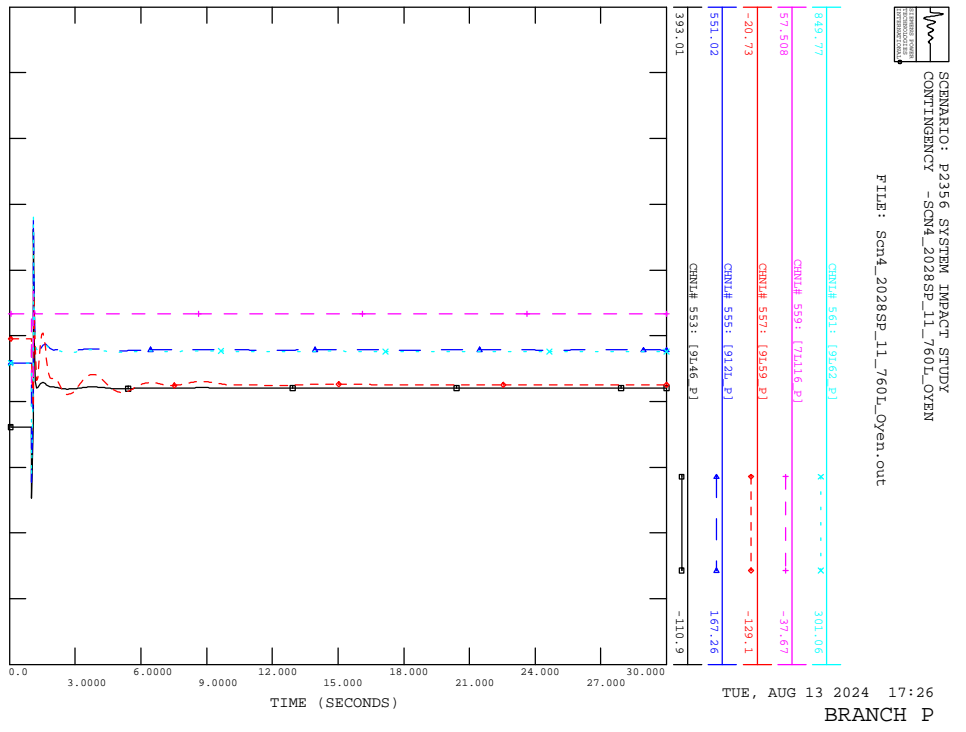
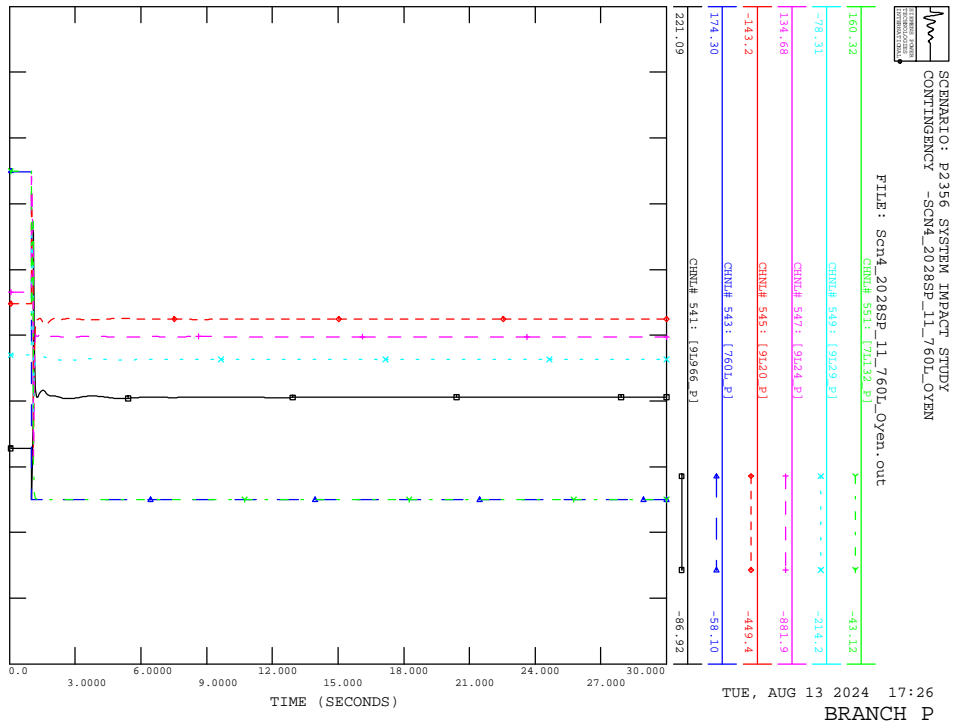
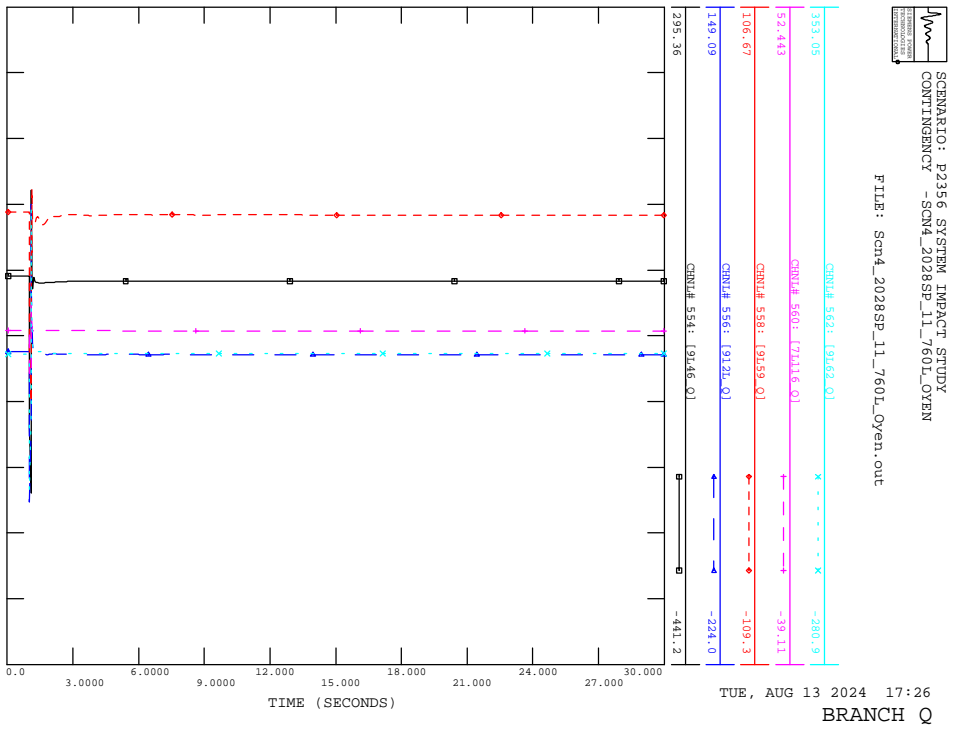
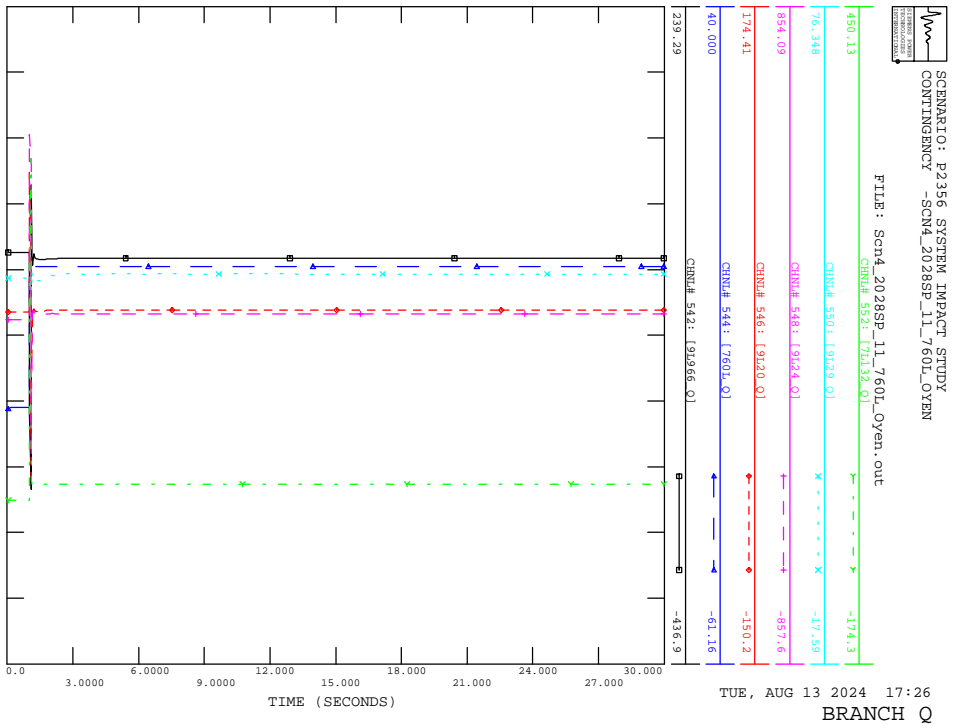
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_11\_760L\_OYEN  
FILE: Scn4\_2028SP\_11\_760L\_Oyen.out

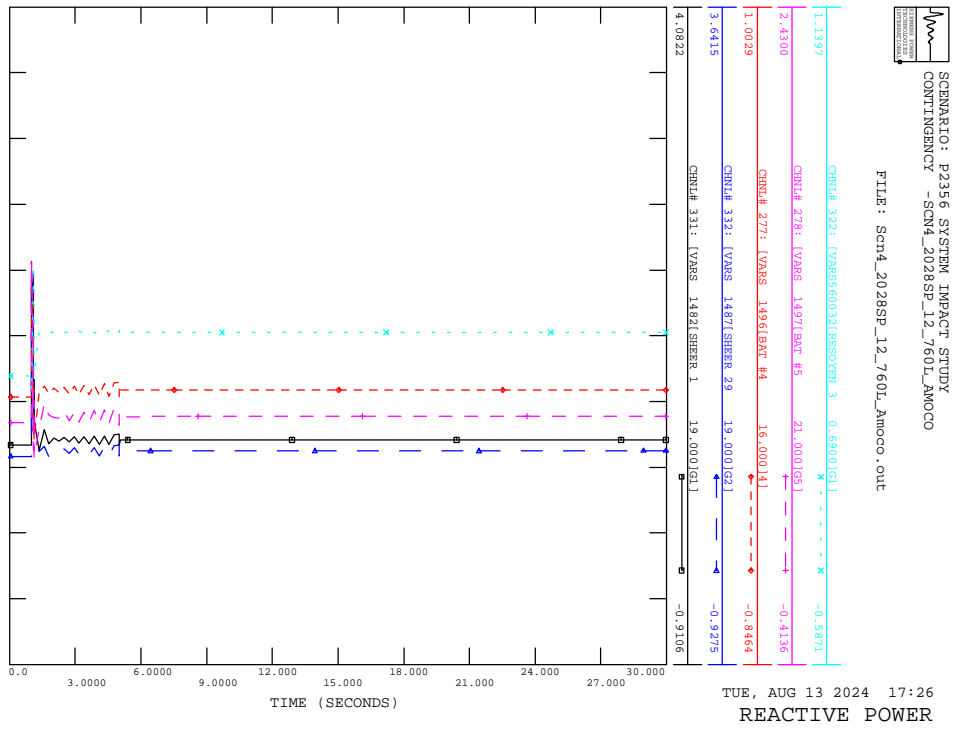
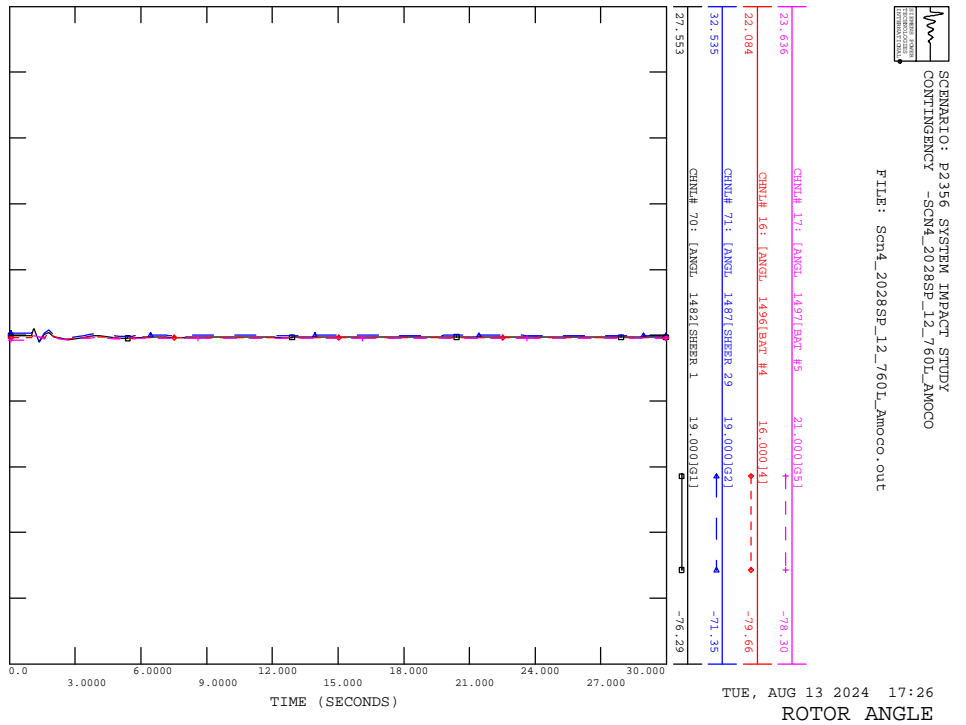
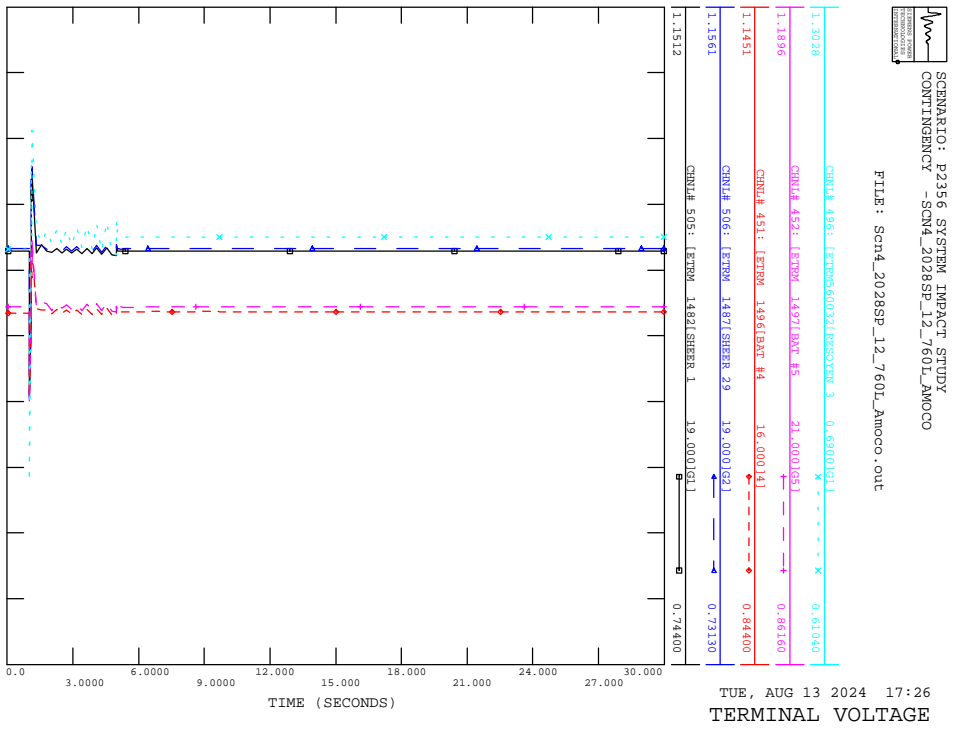
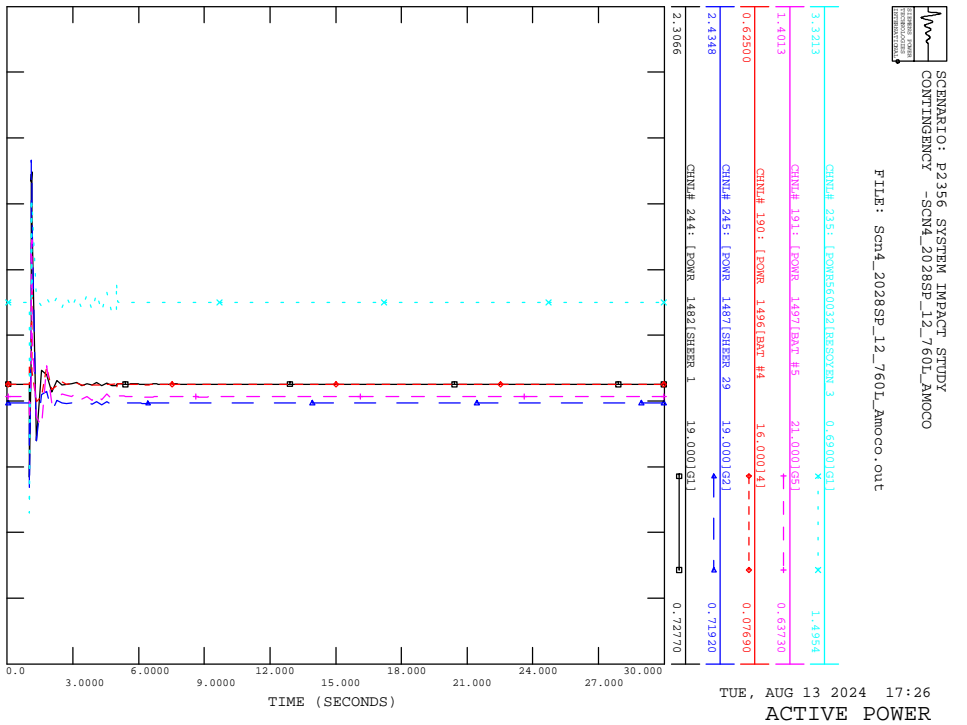


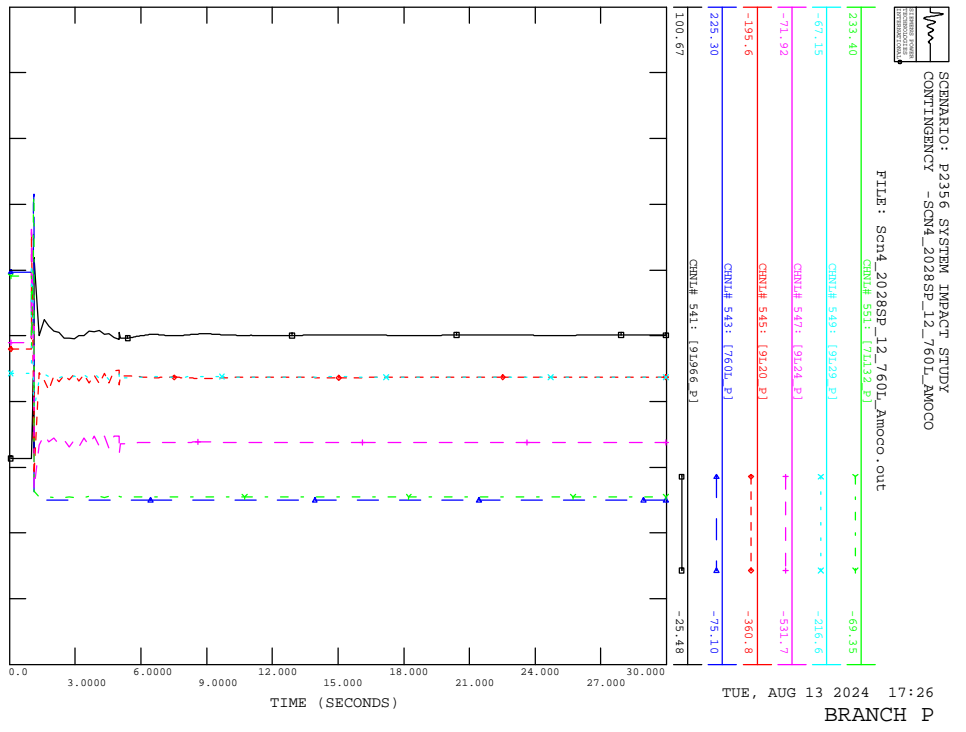
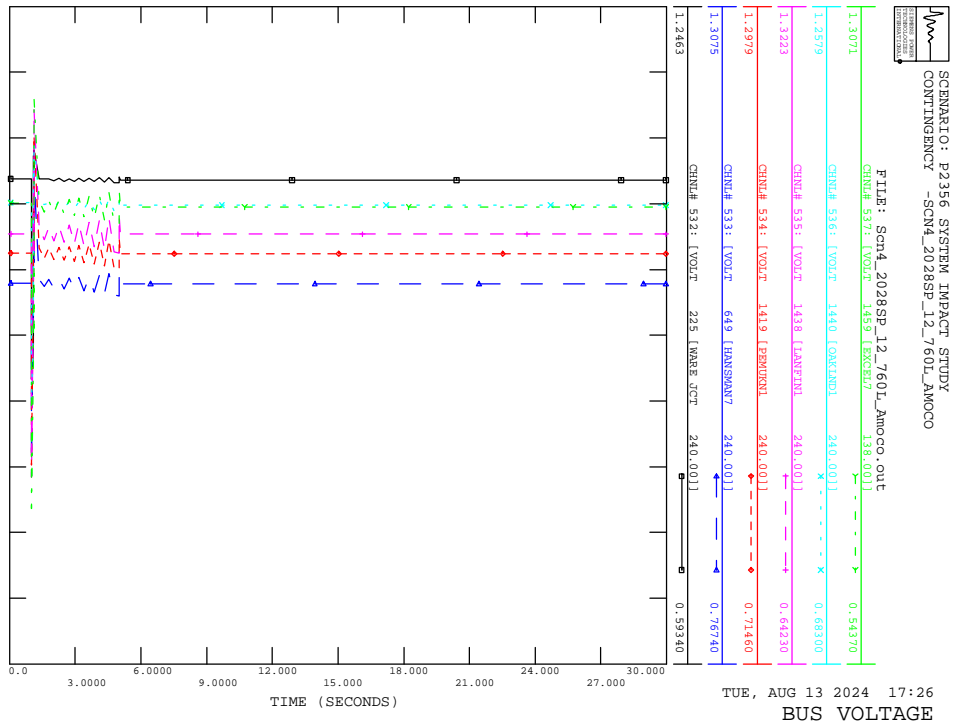
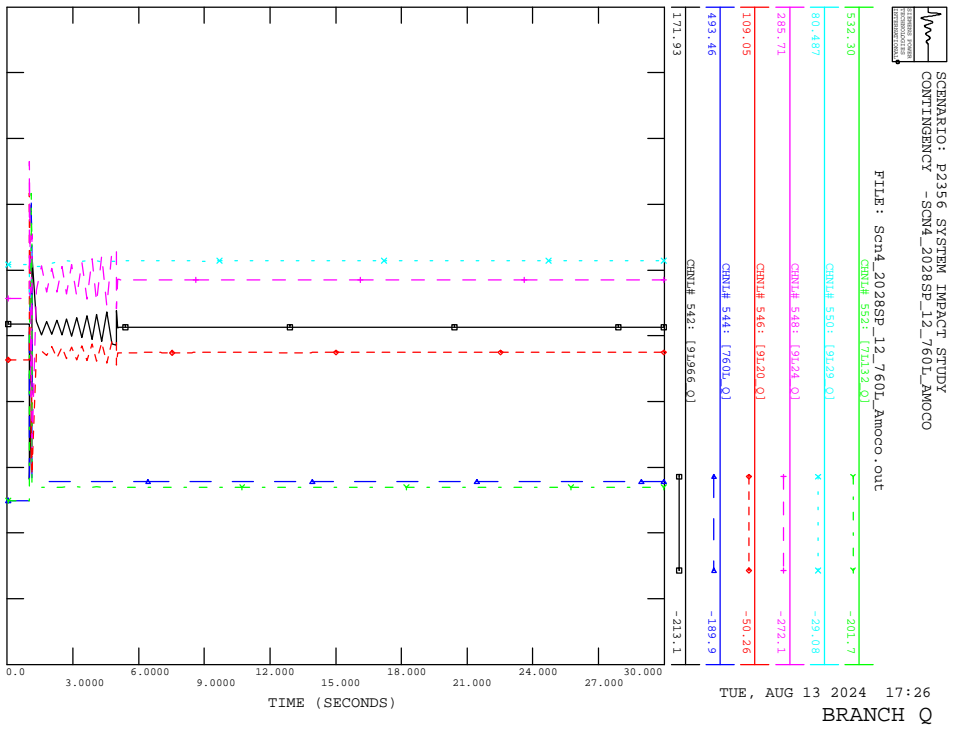
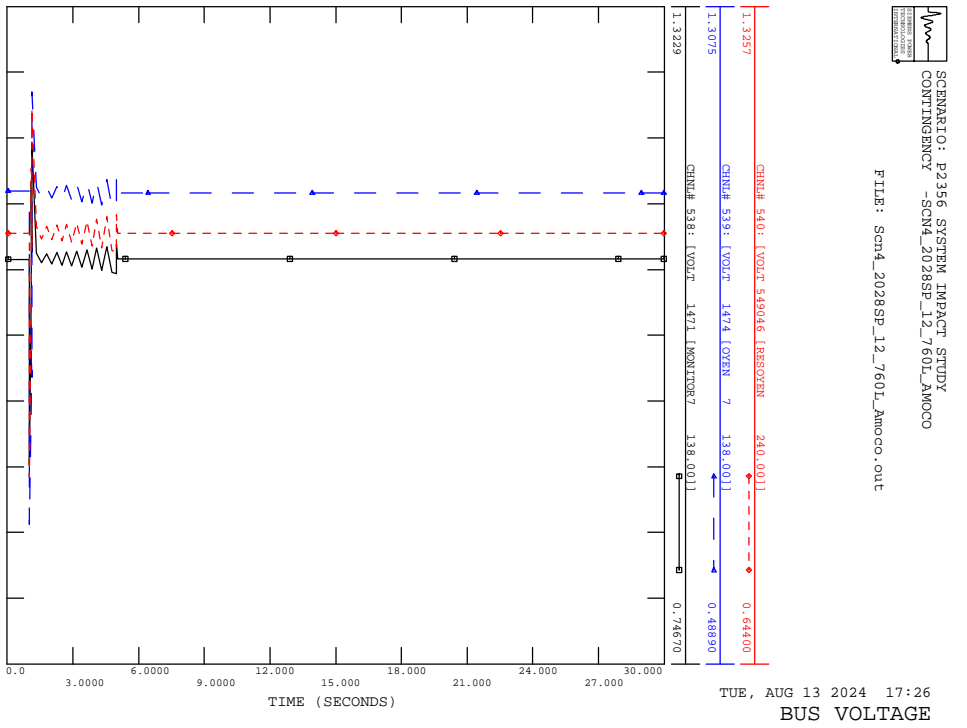
TUE, AUG 13 2024 17:26  
ROTOR ANGLE

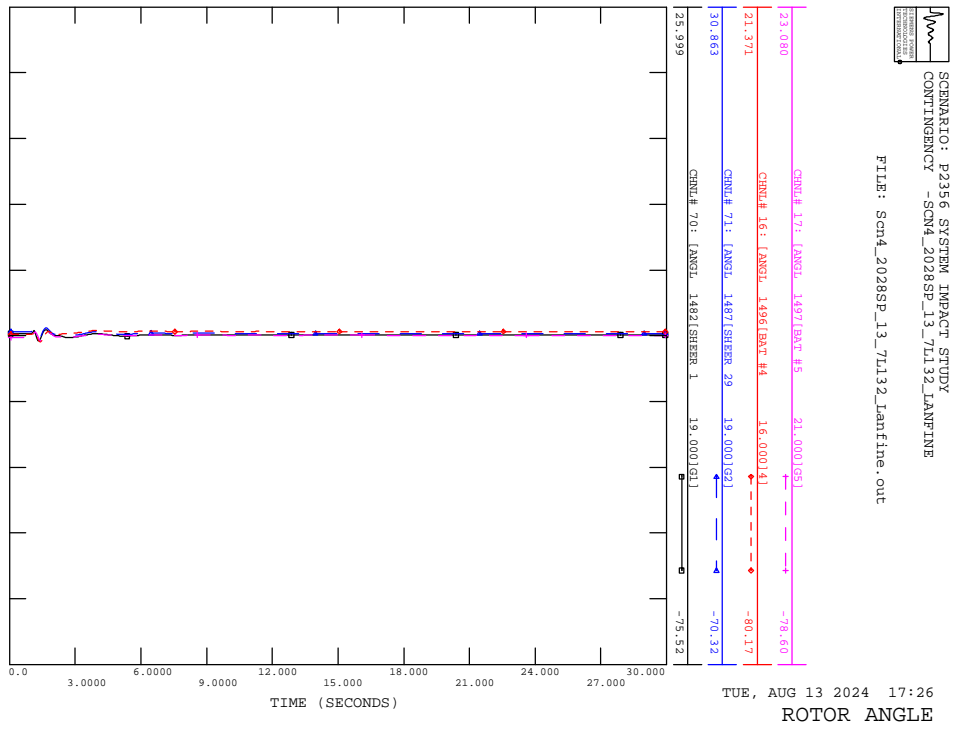
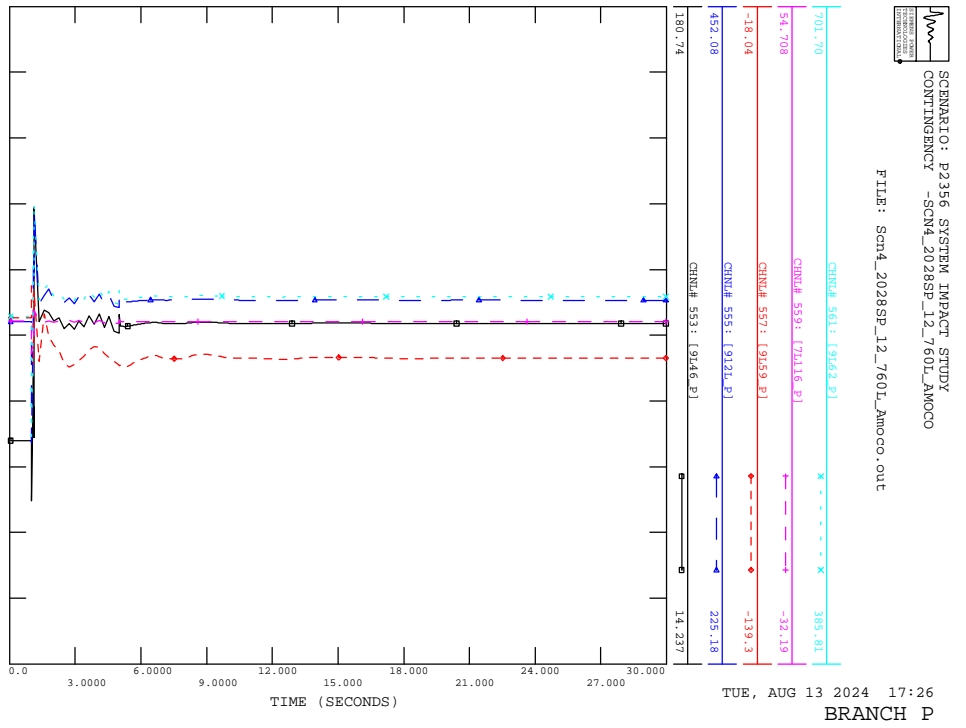
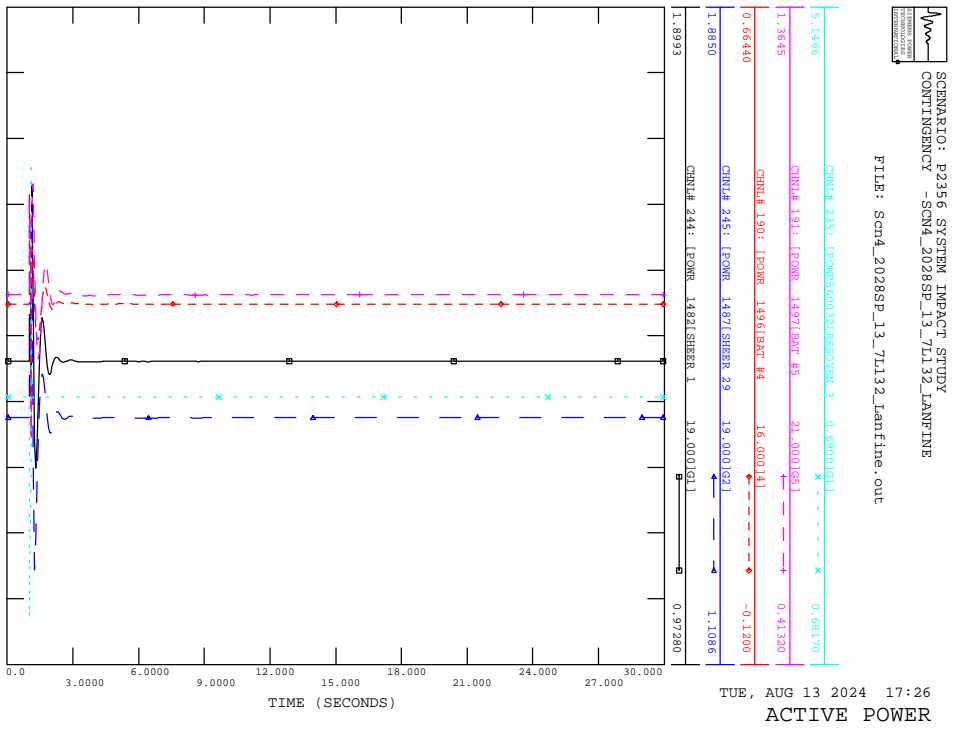
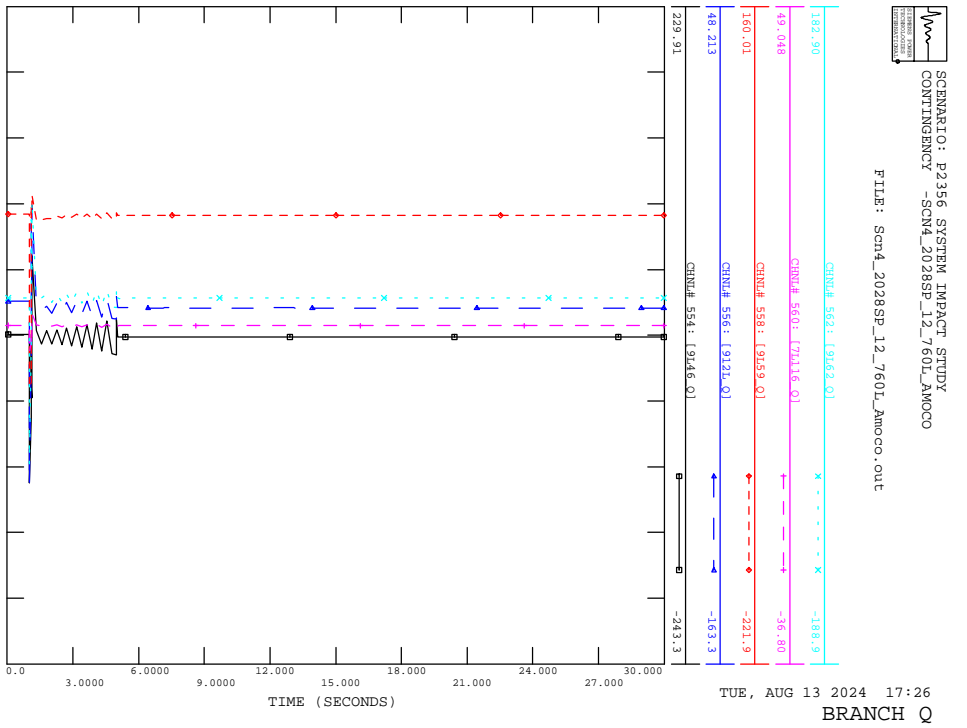


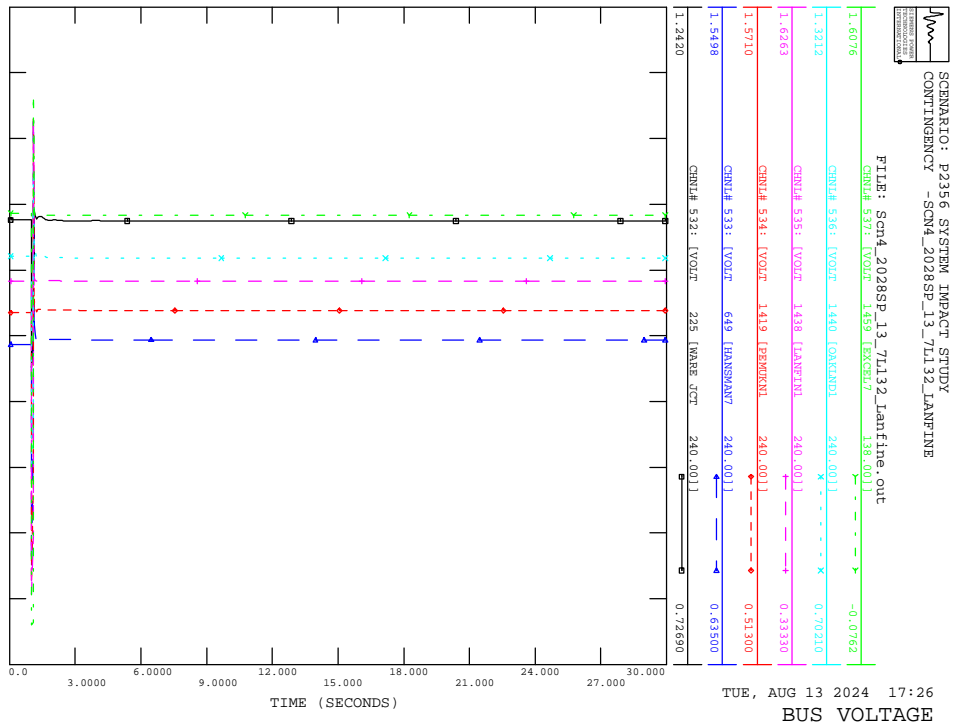
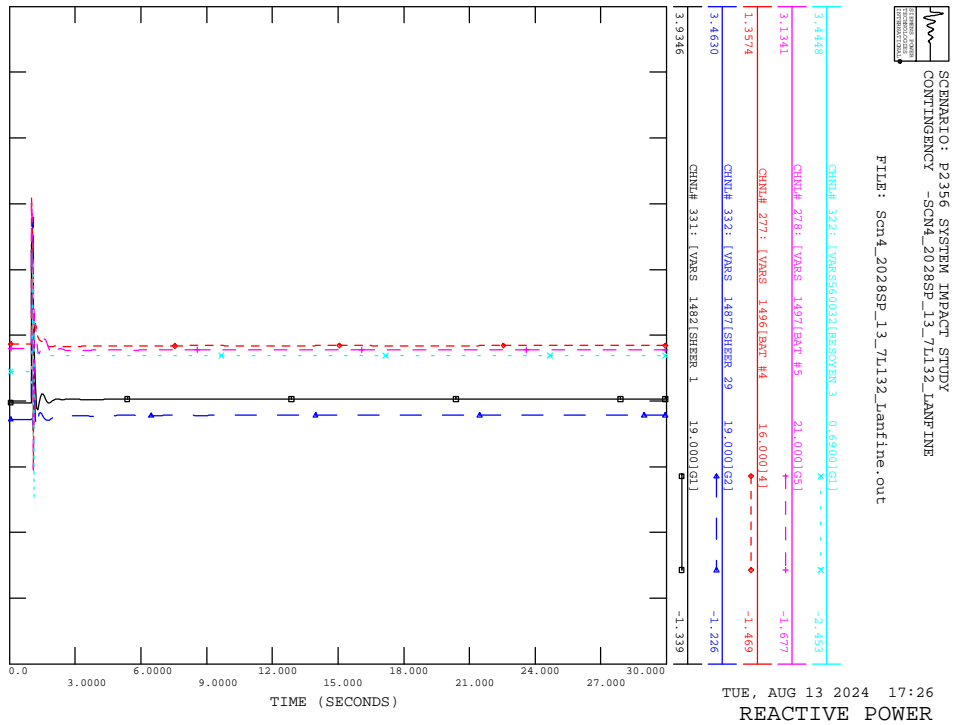
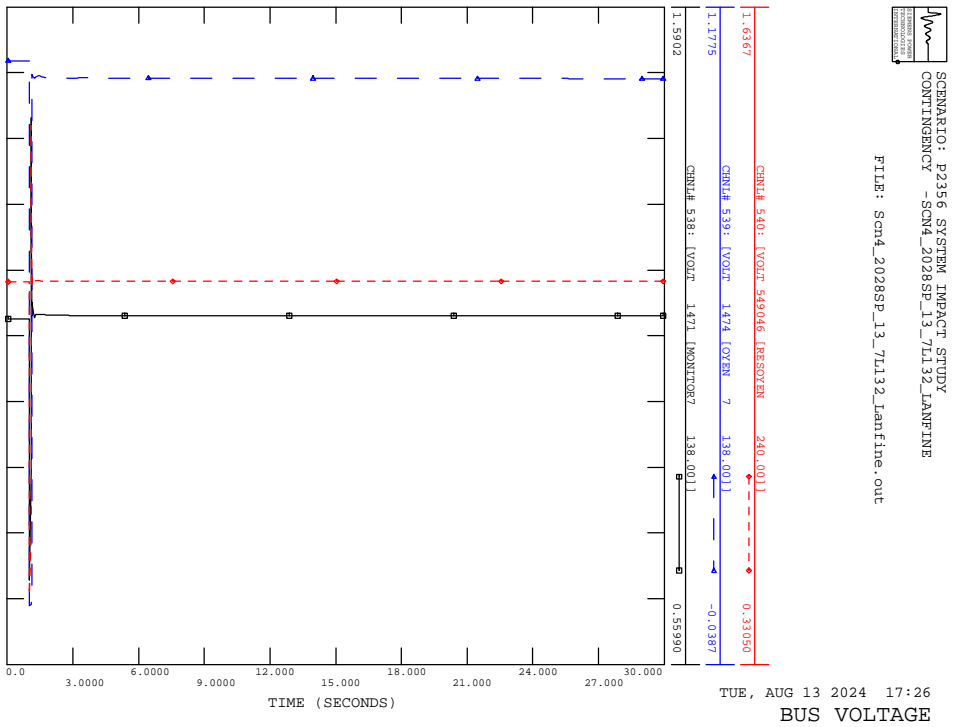
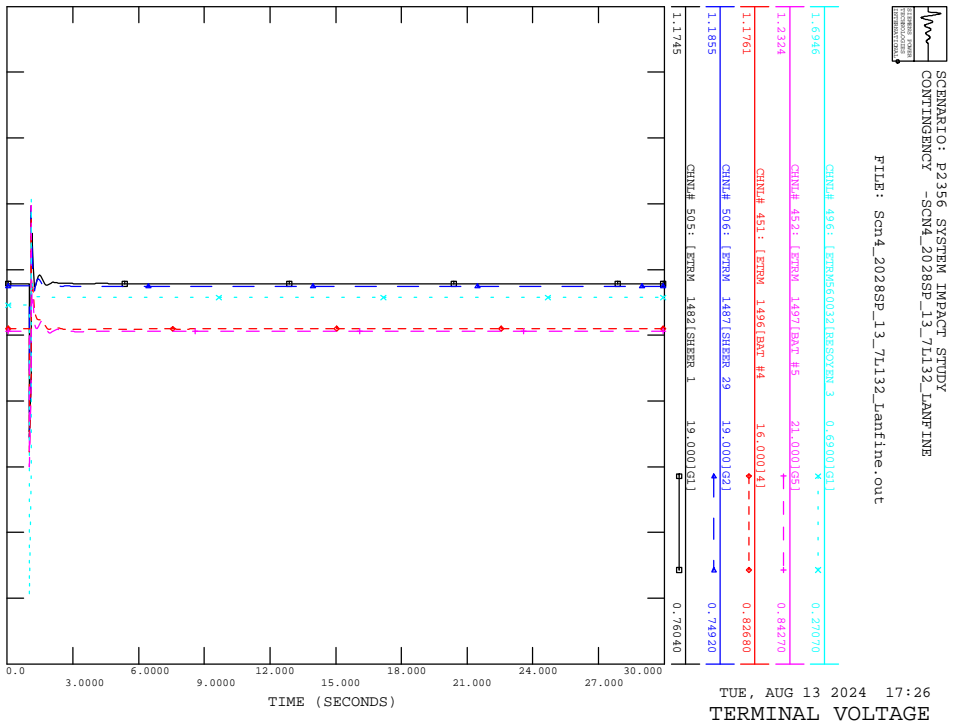


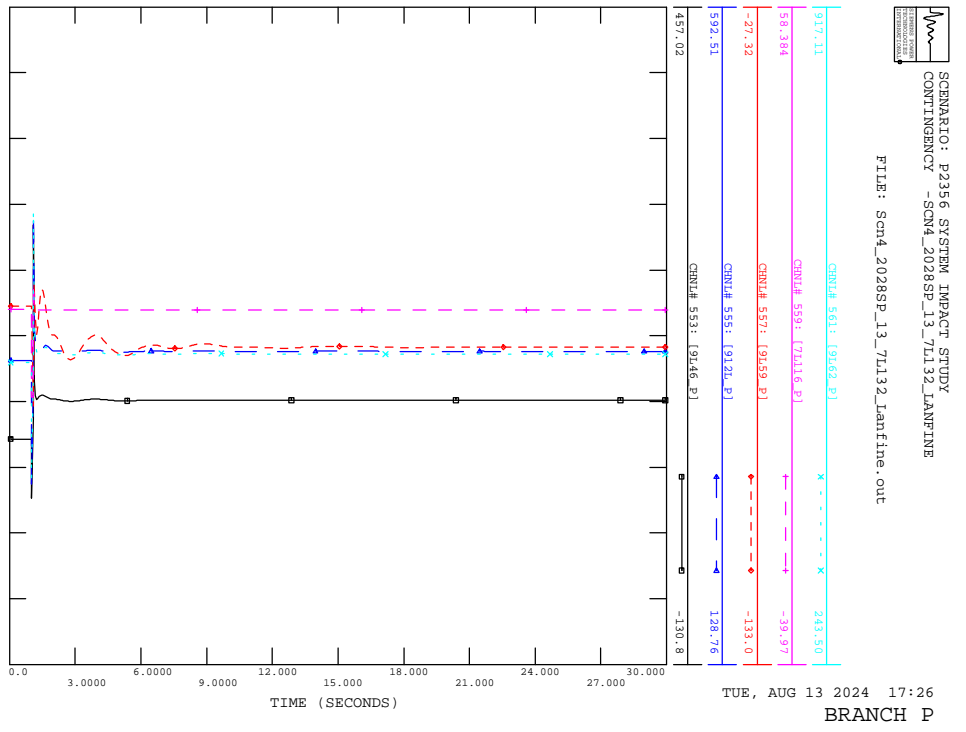
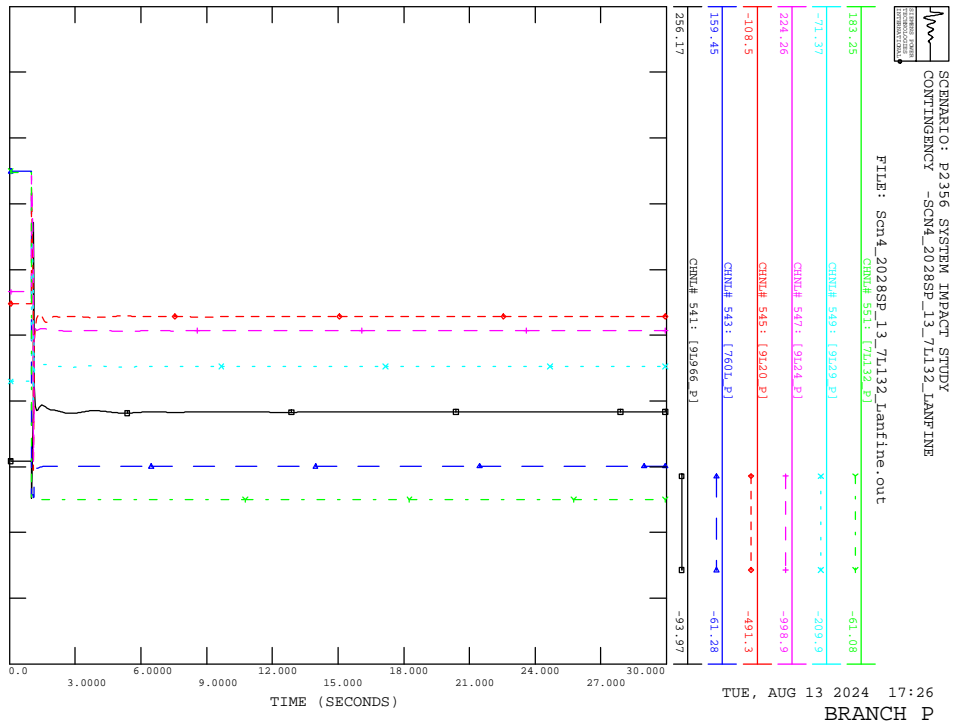
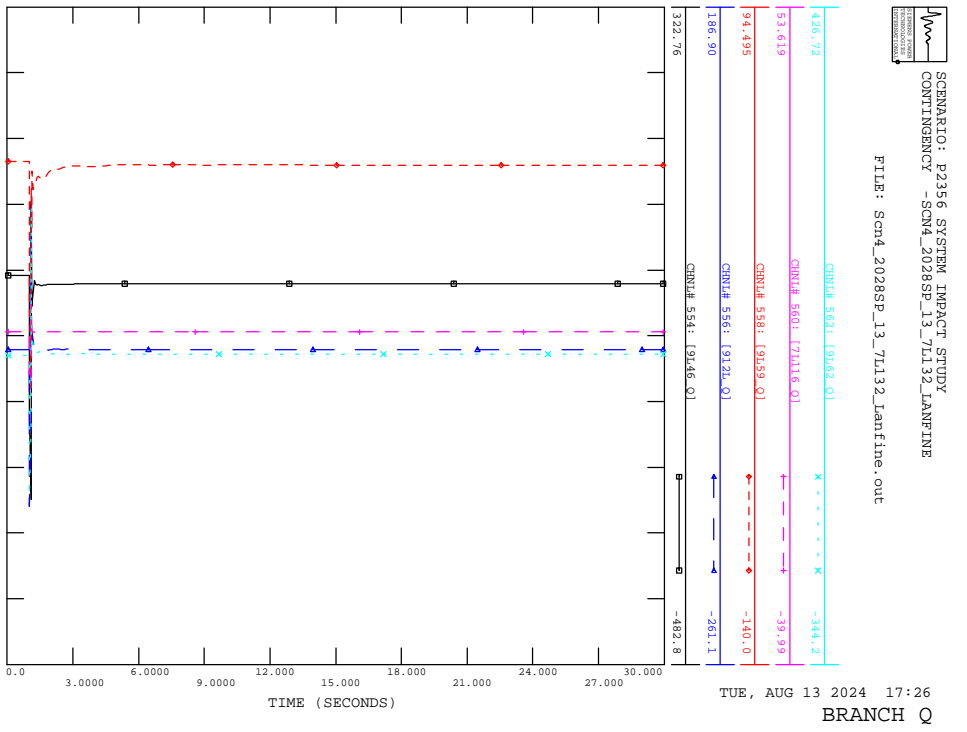
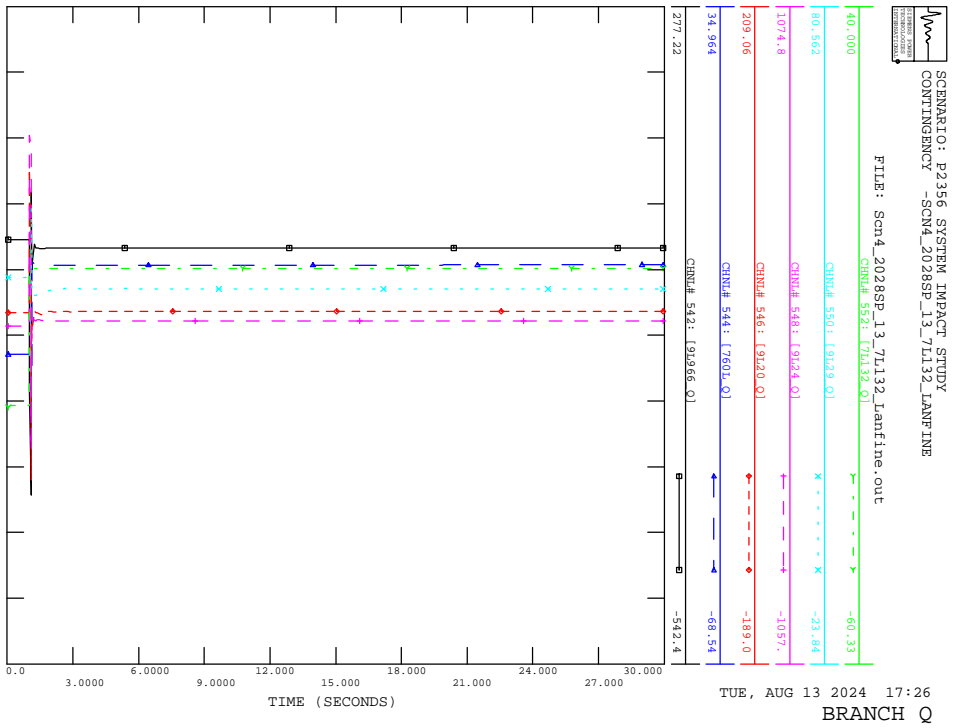


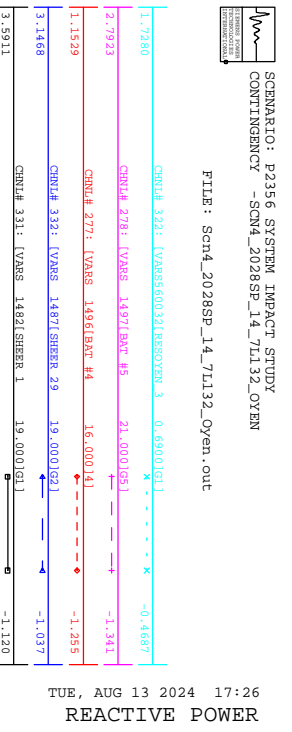
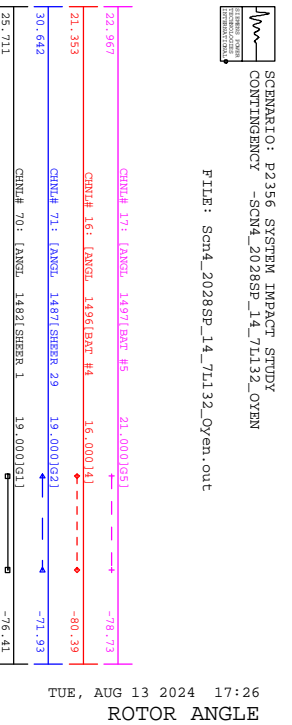
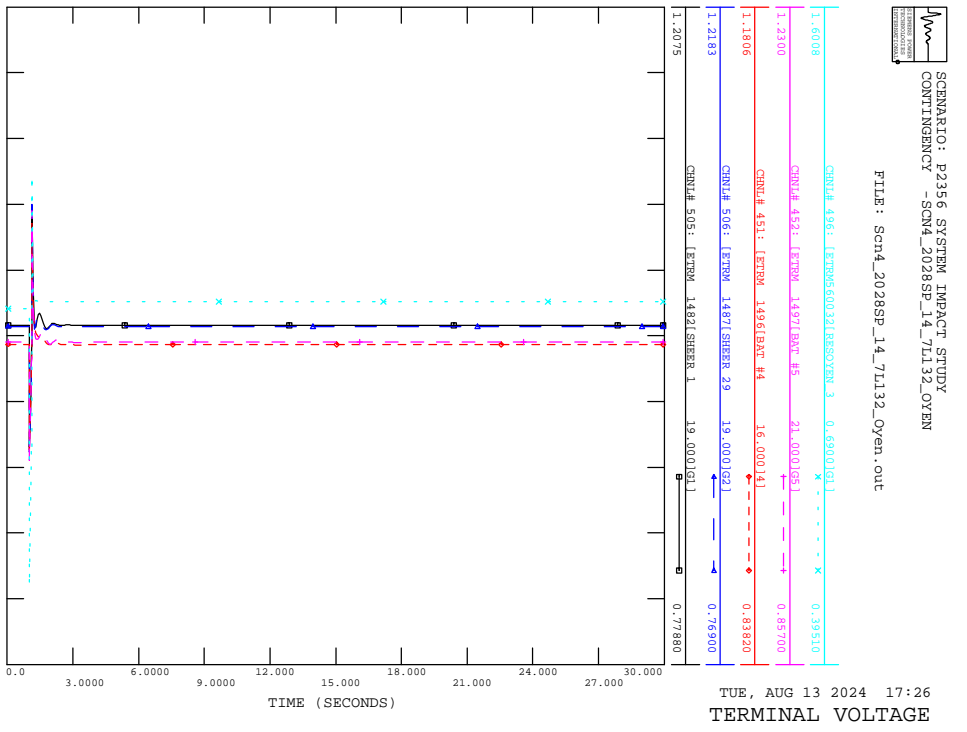
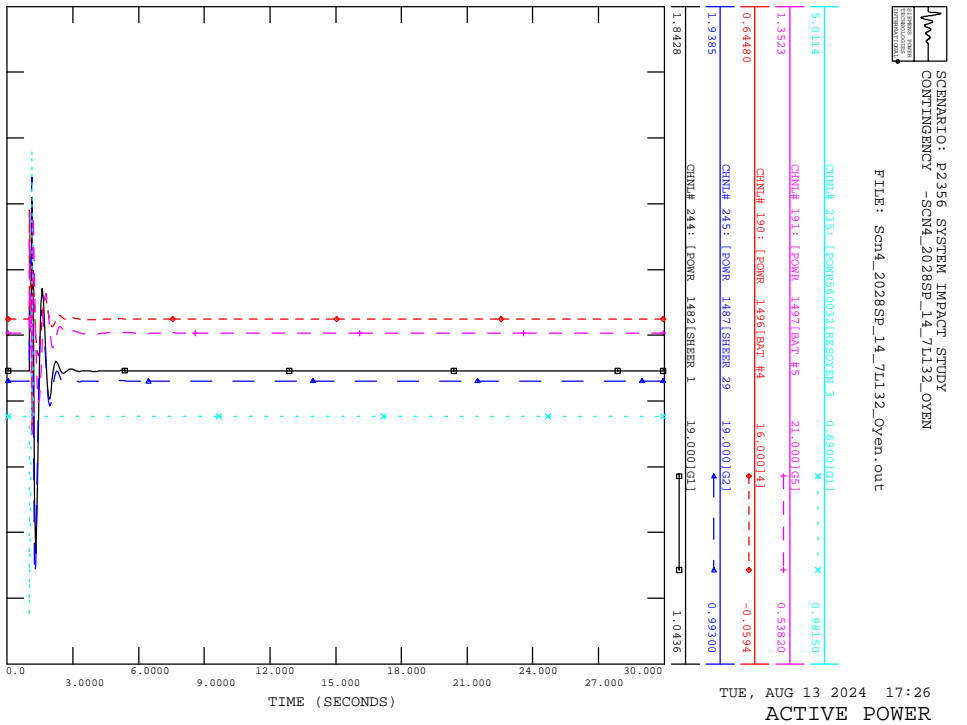




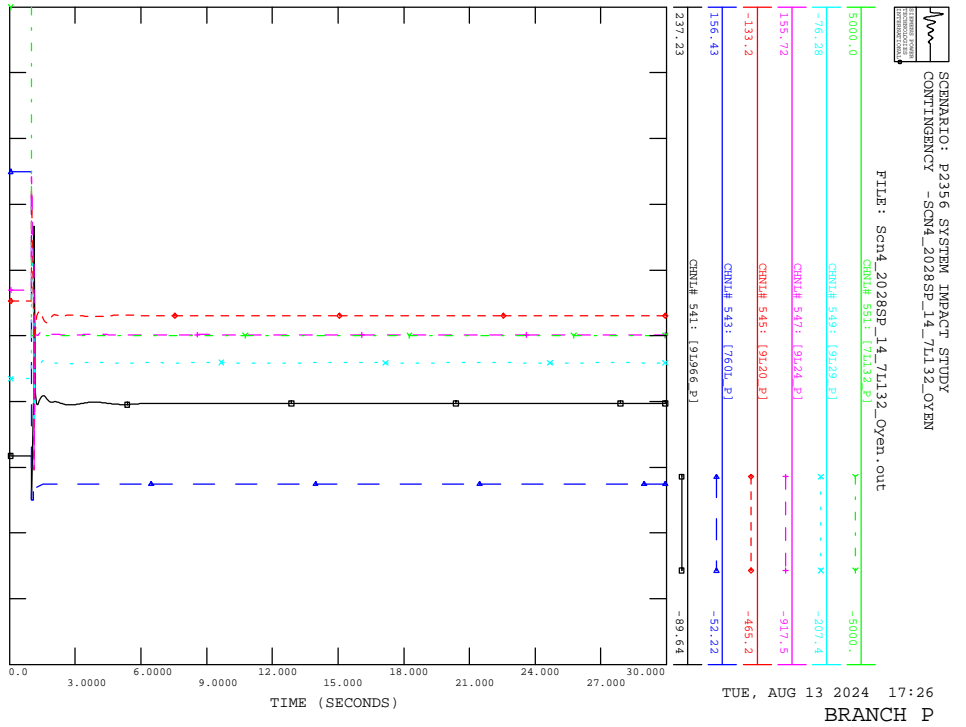
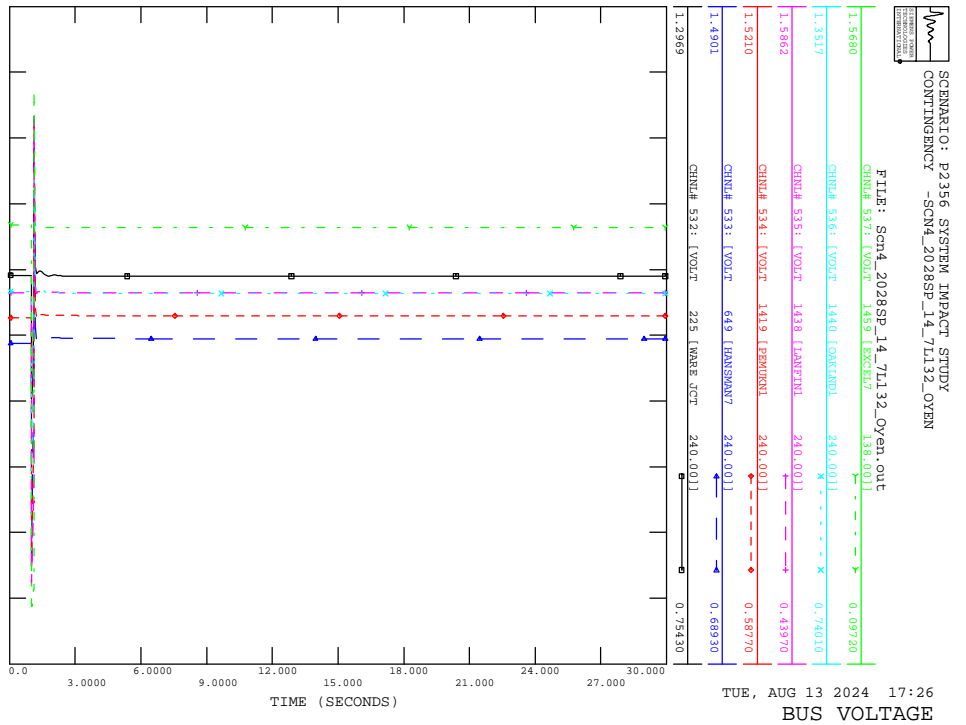
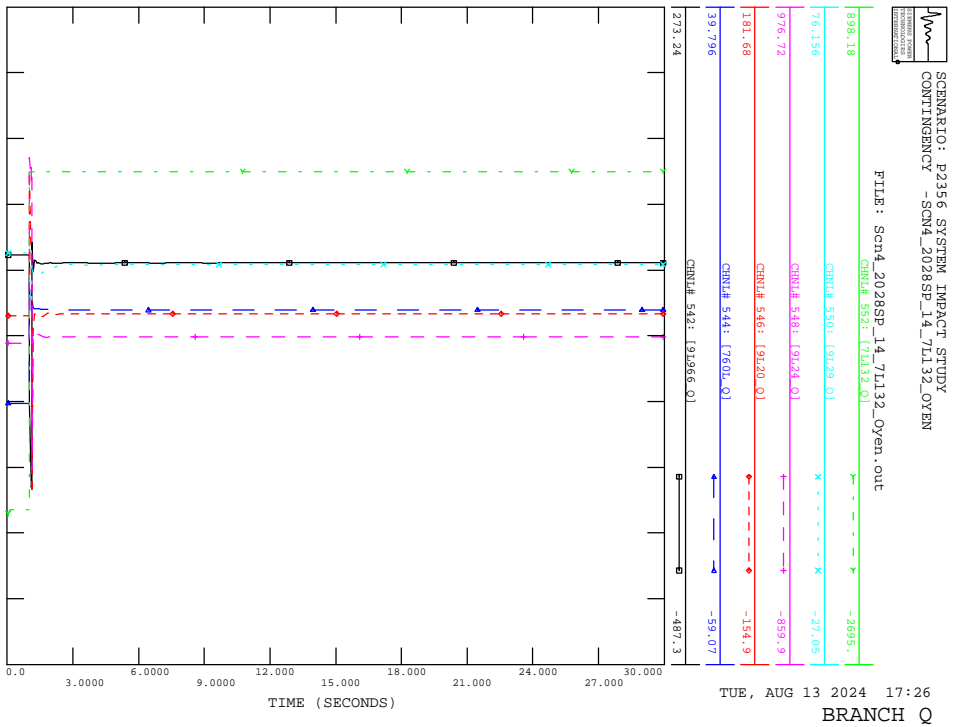
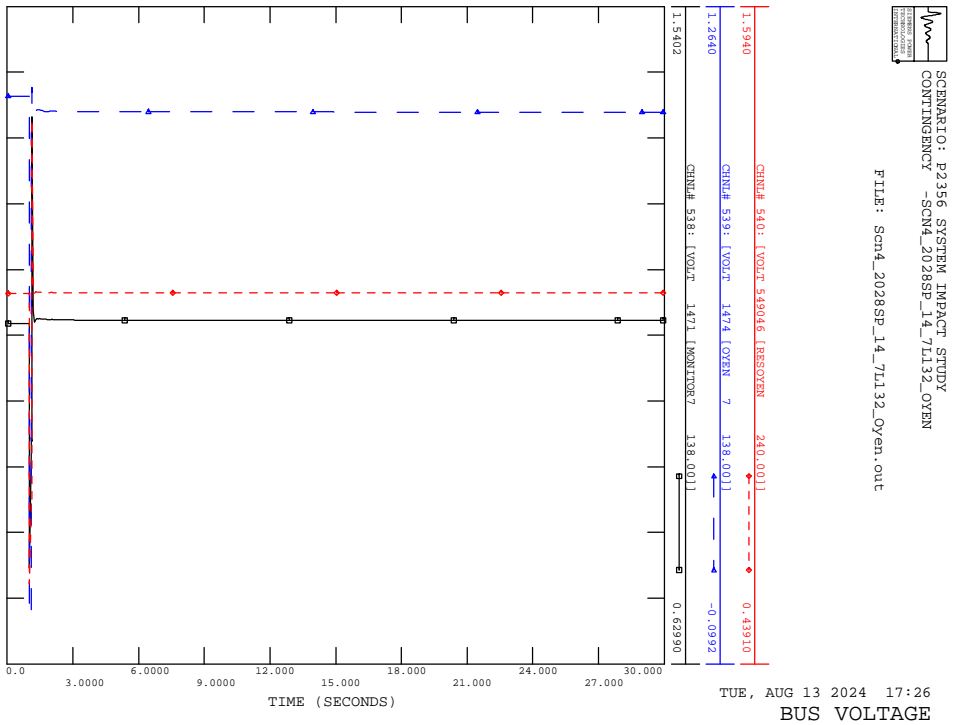


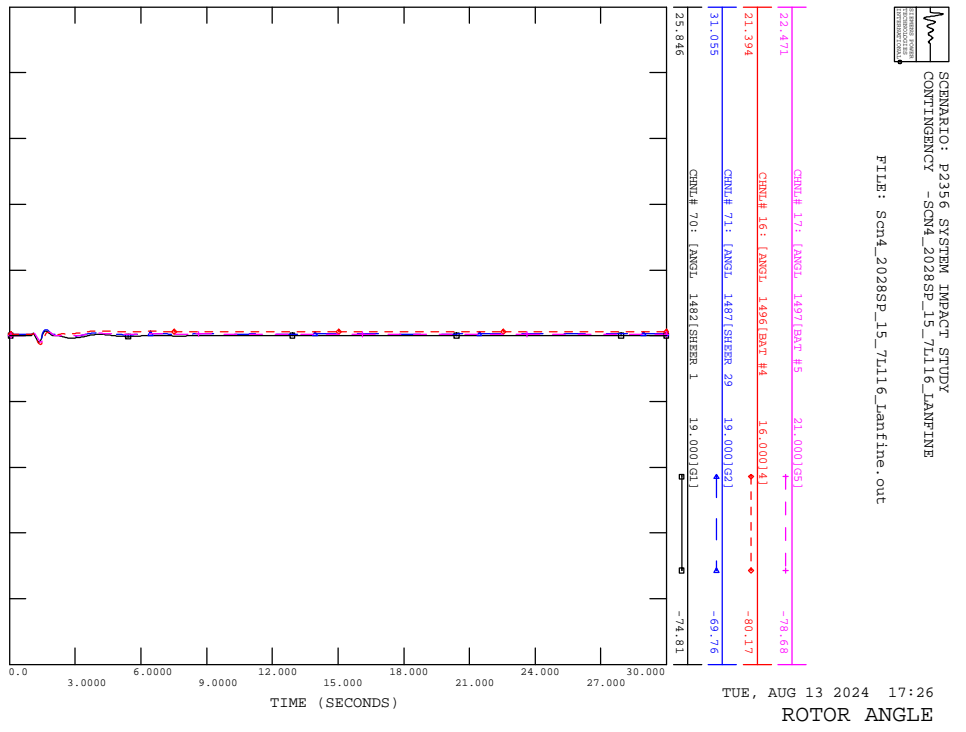
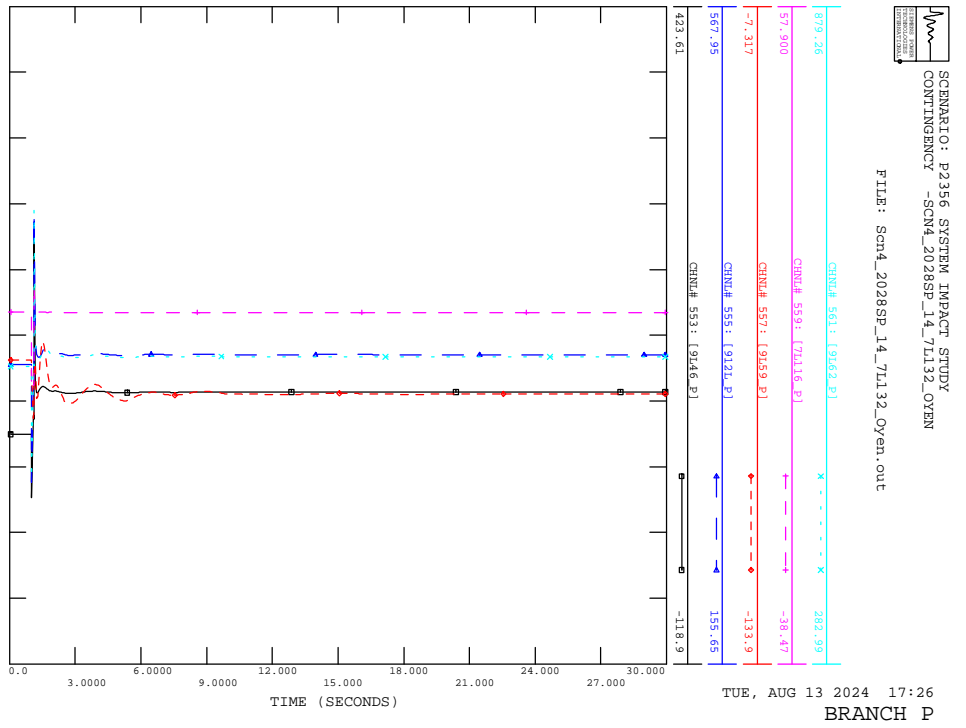
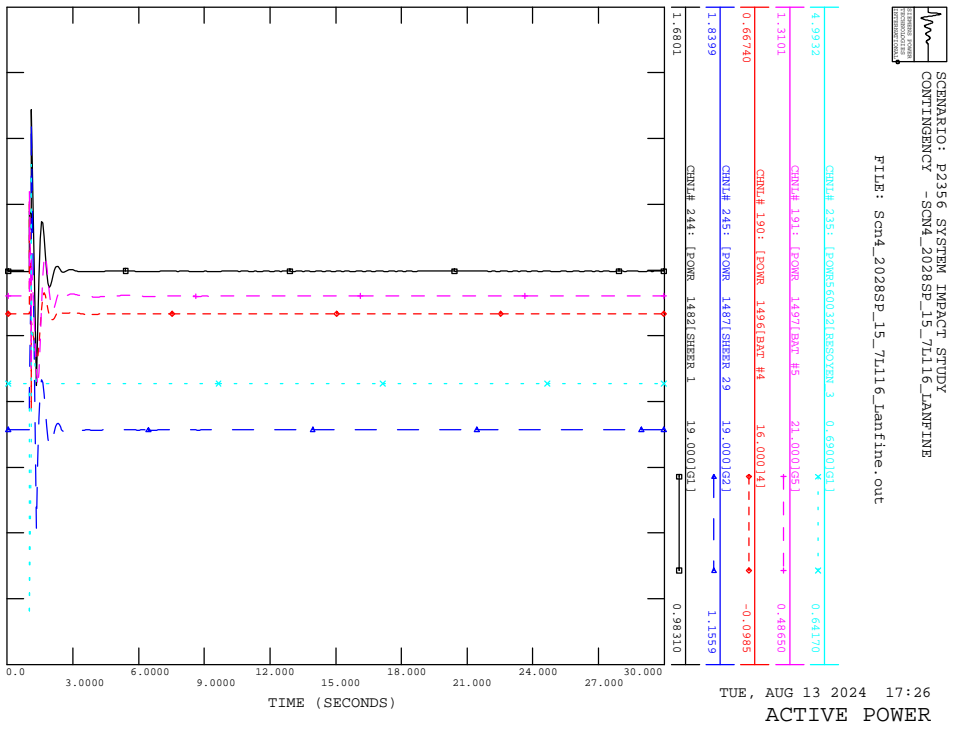
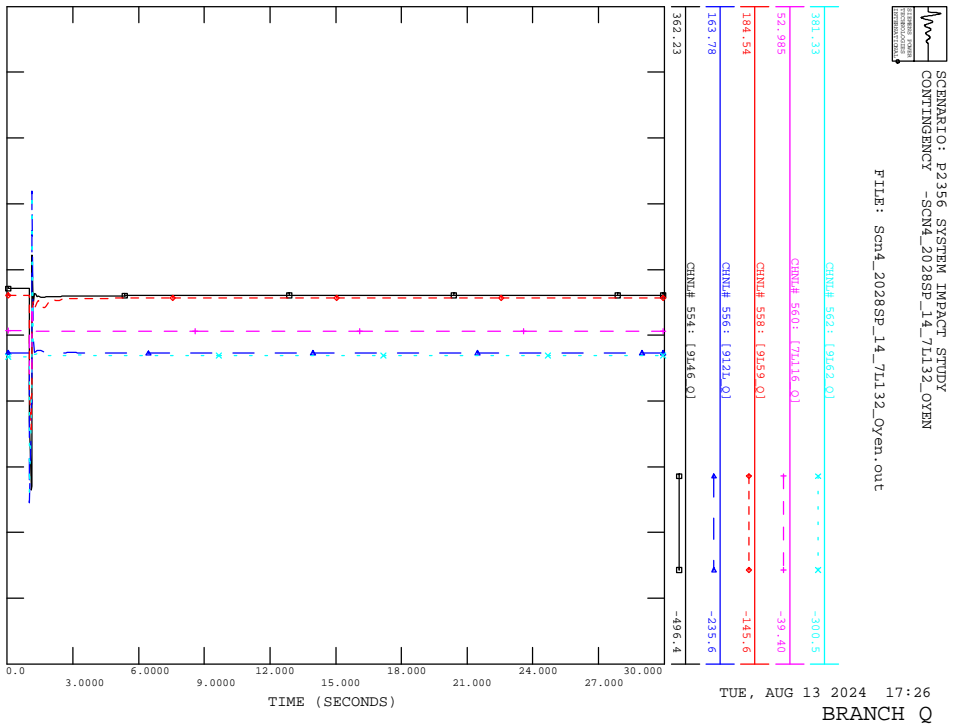


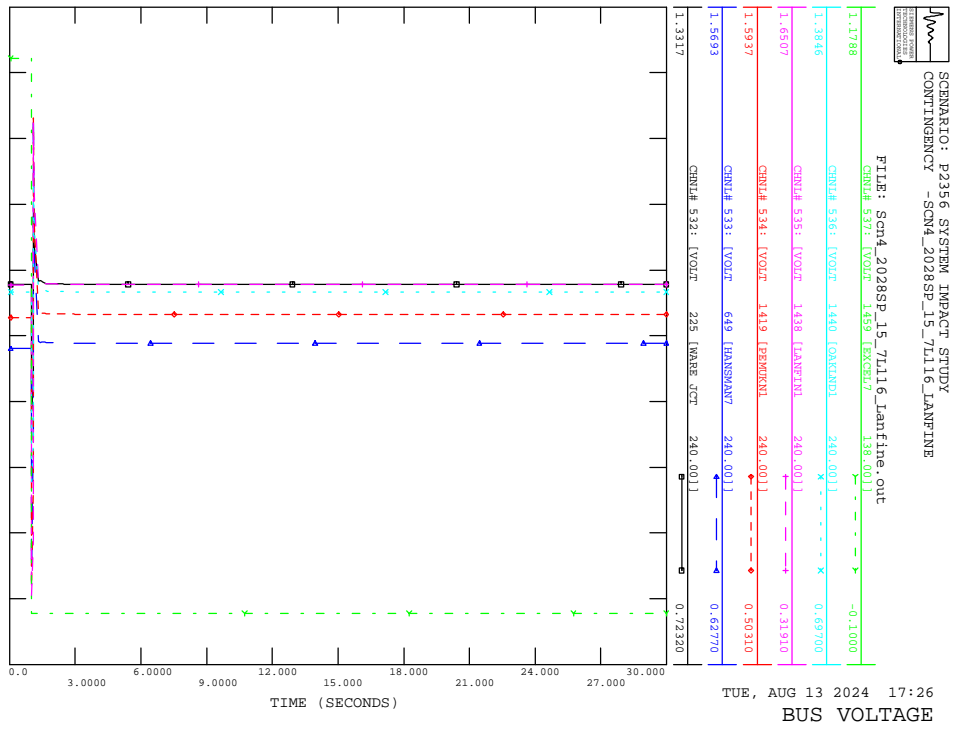
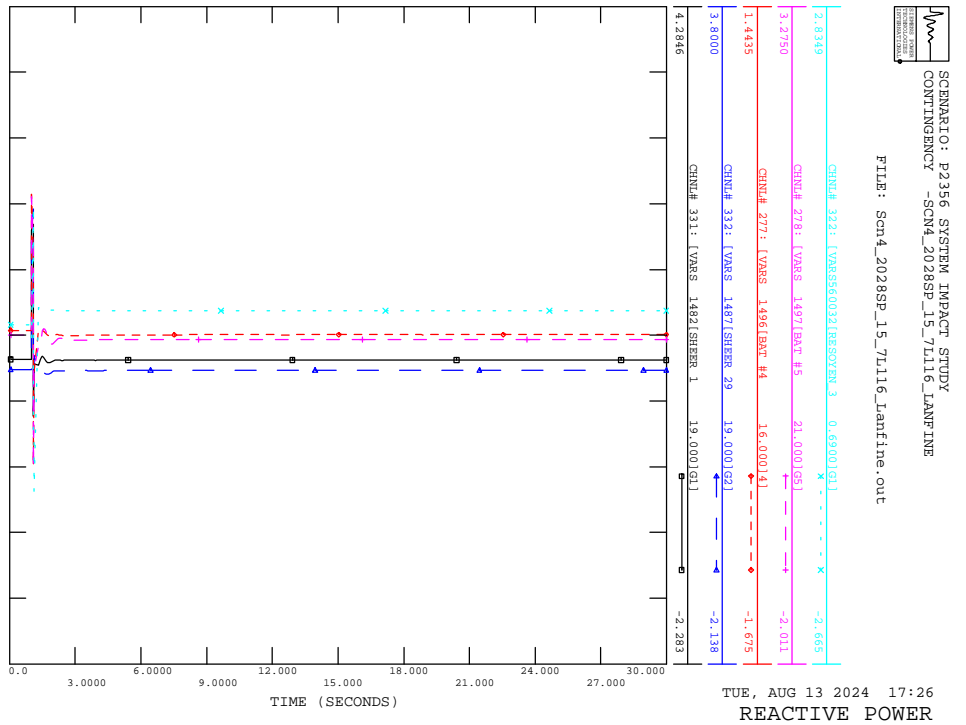
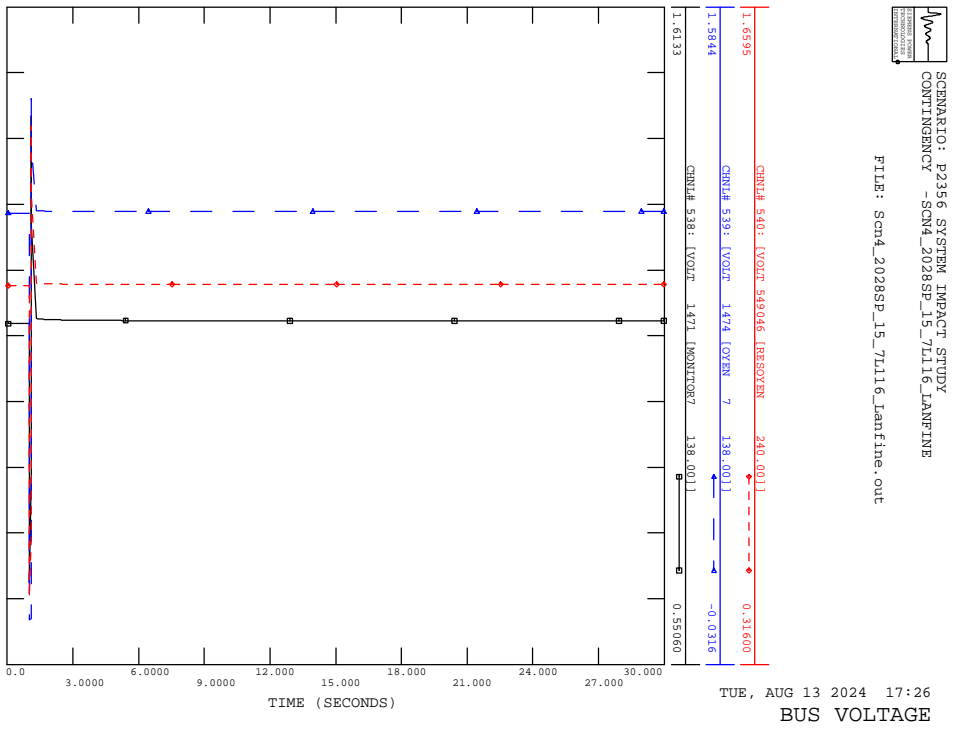
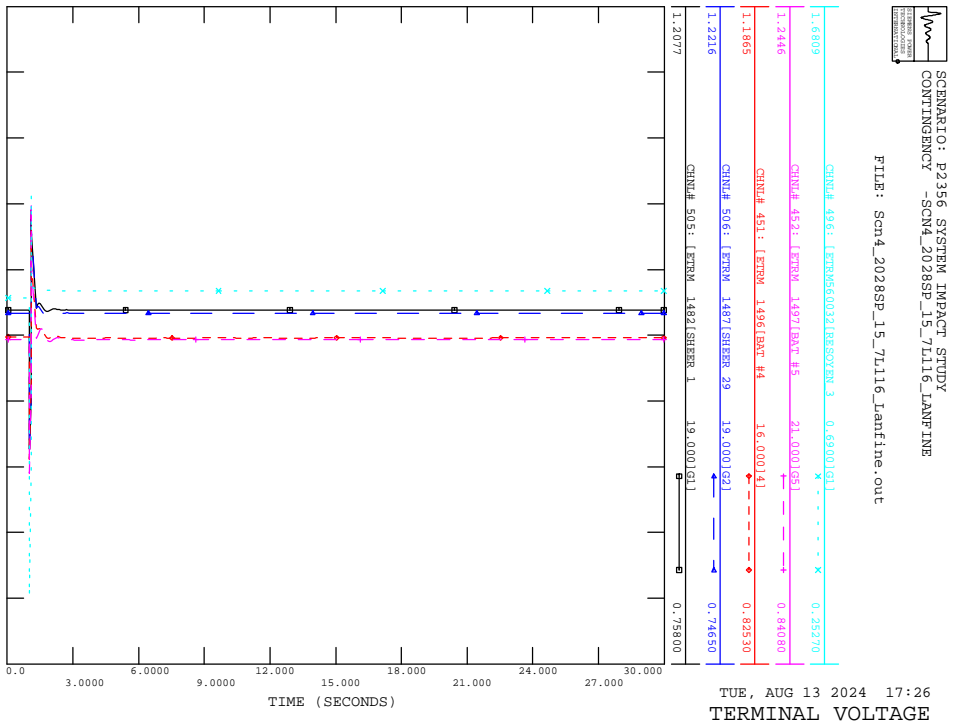


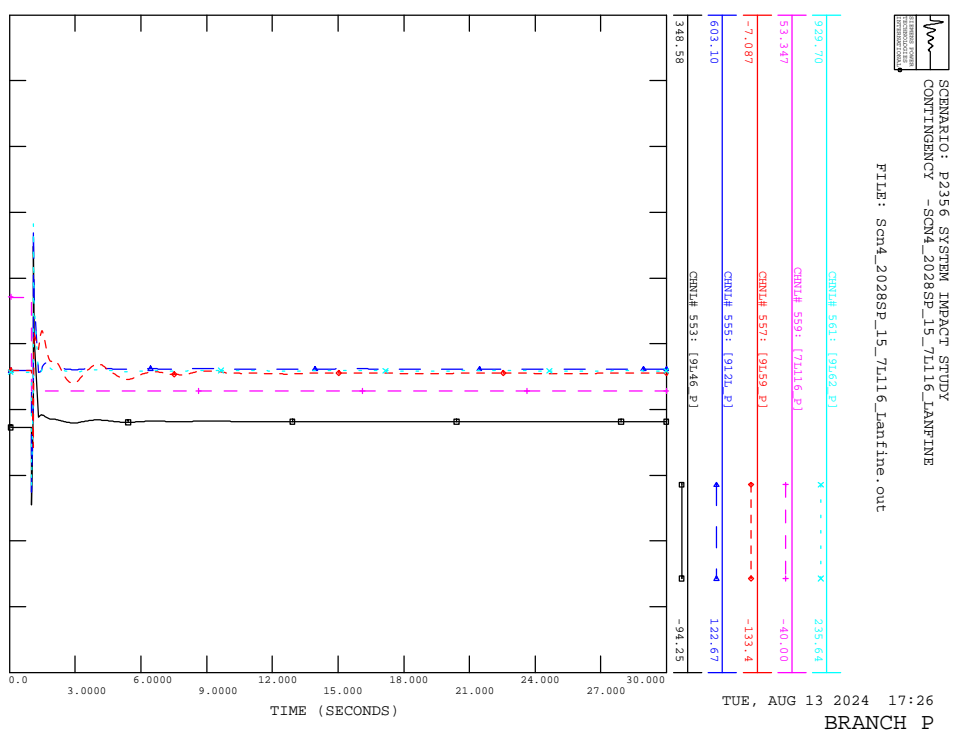
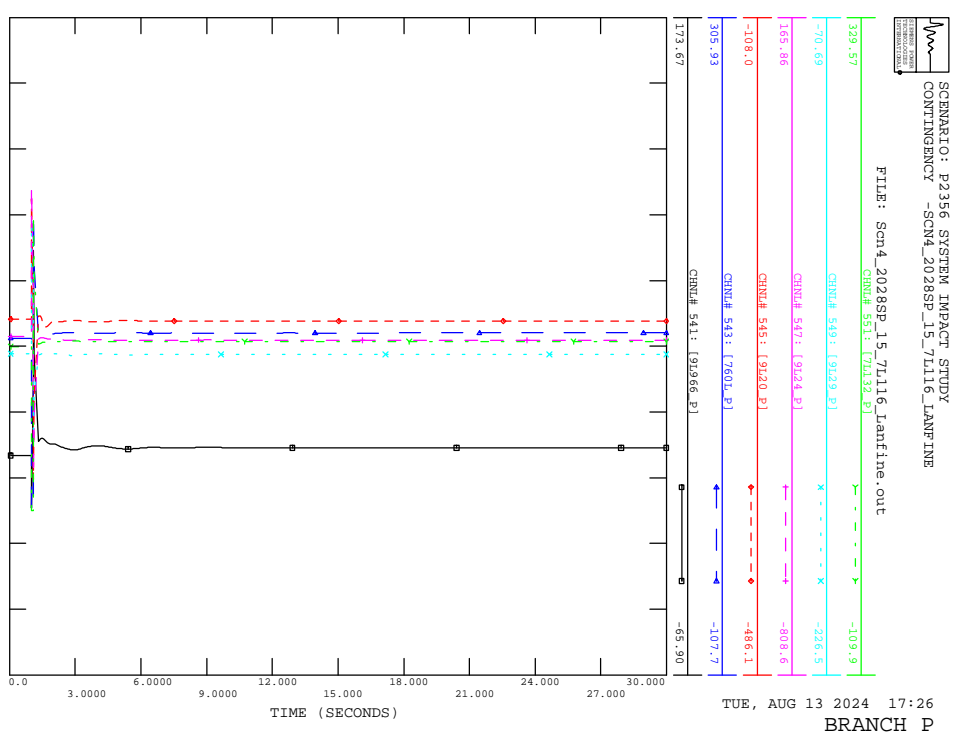
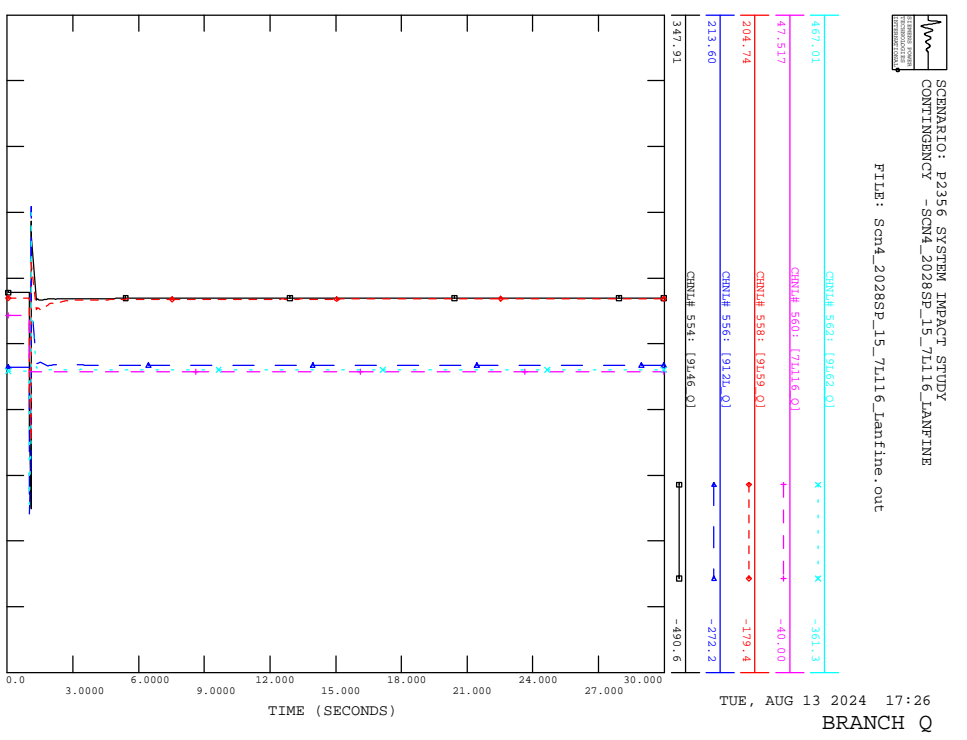
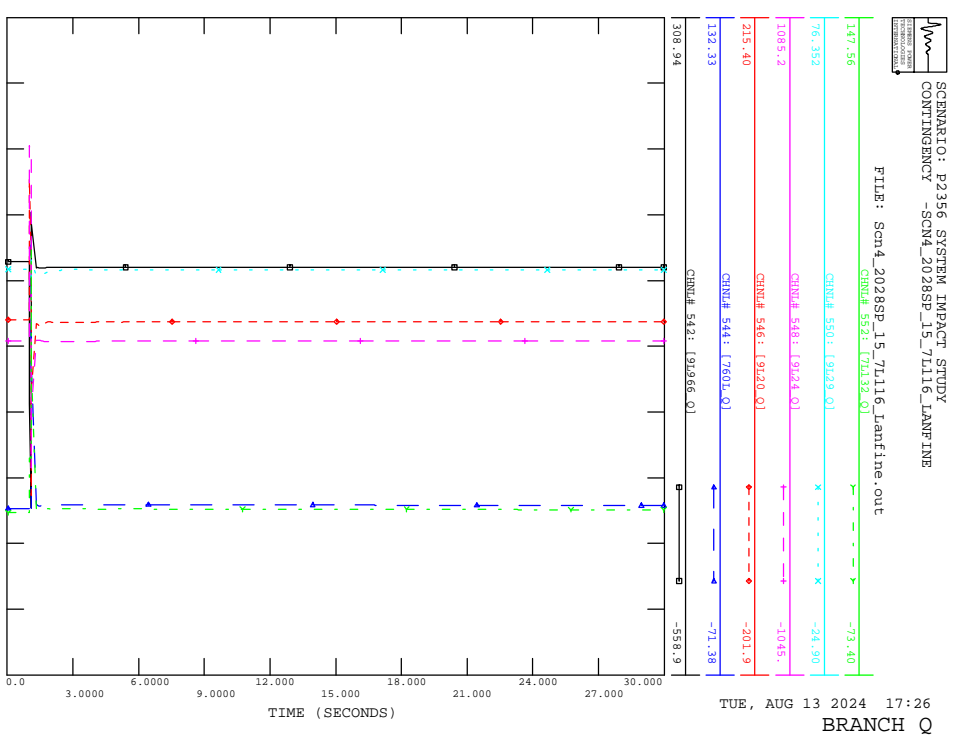


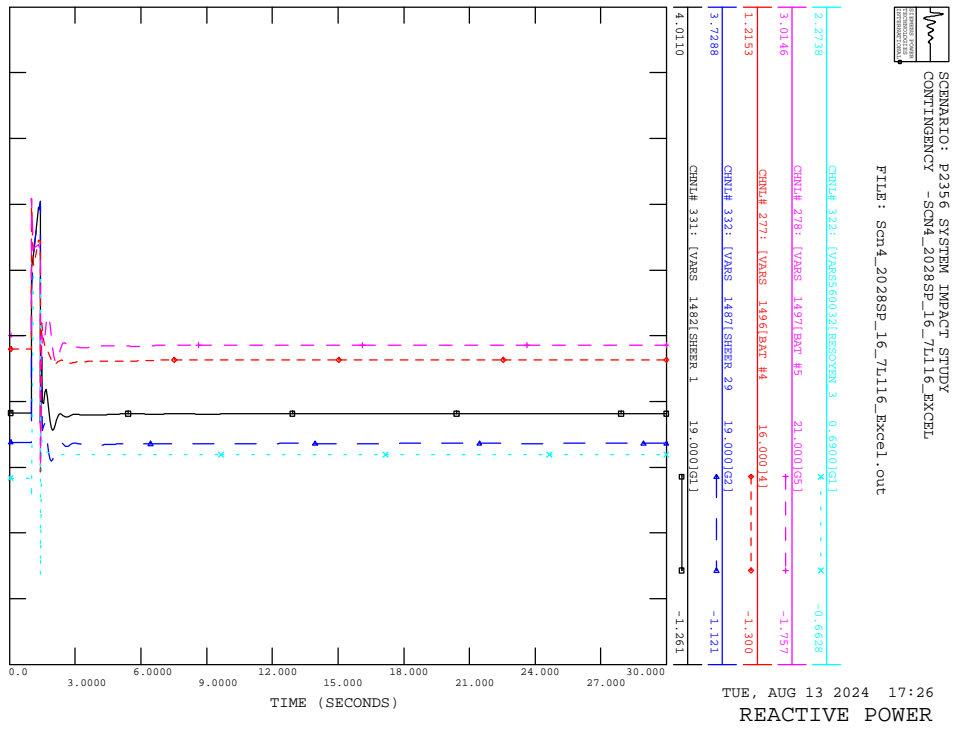
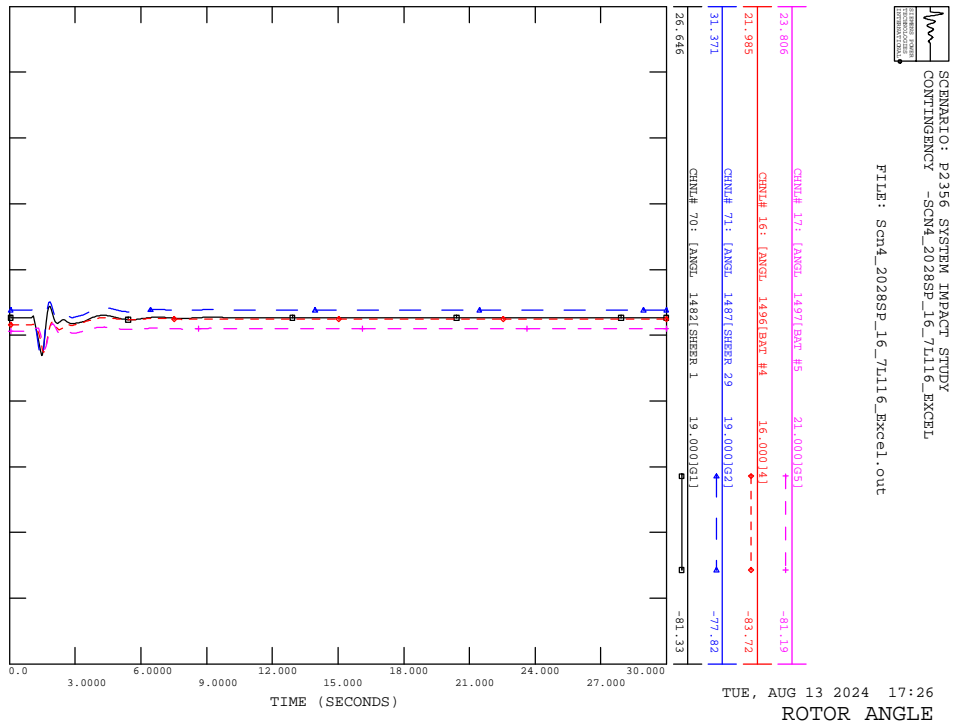
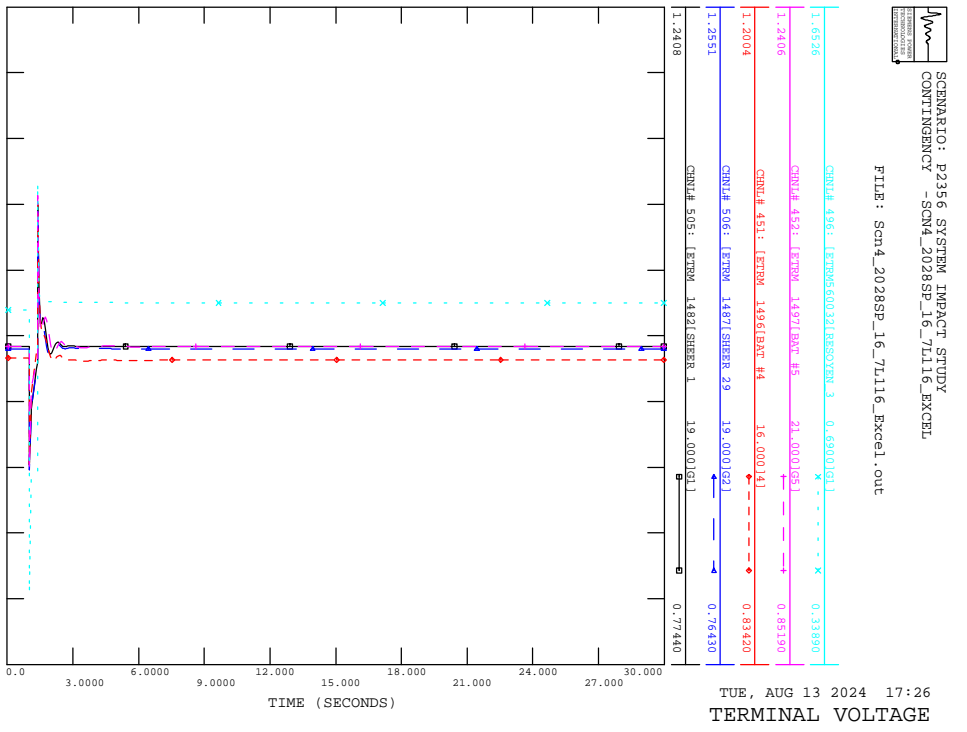
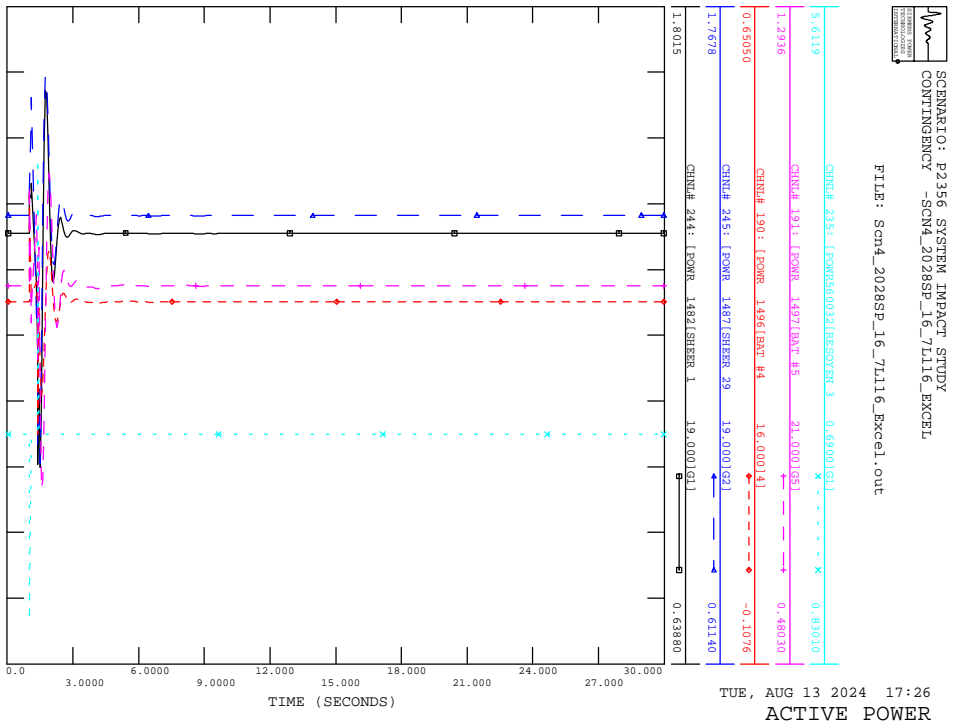






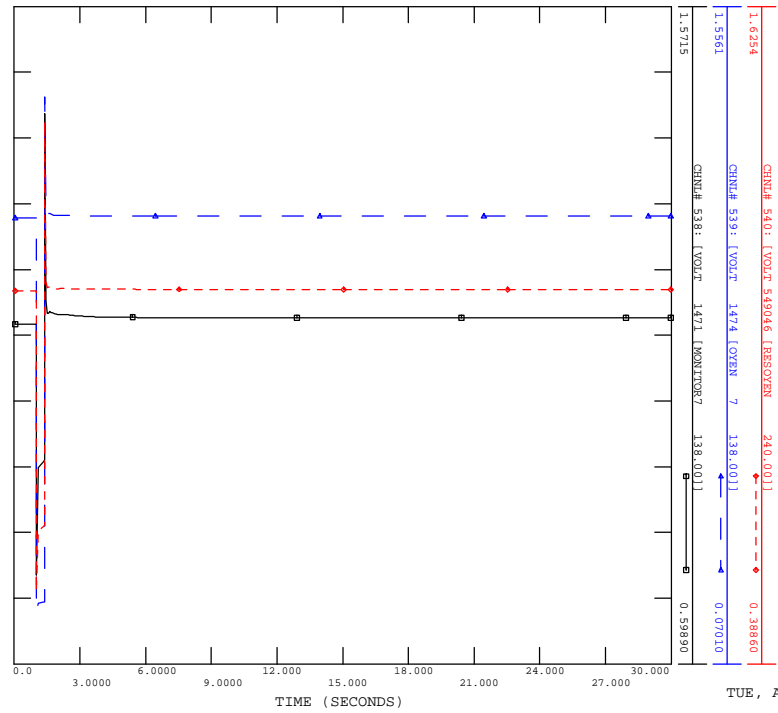






SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_16\_7L116\_EXCEL

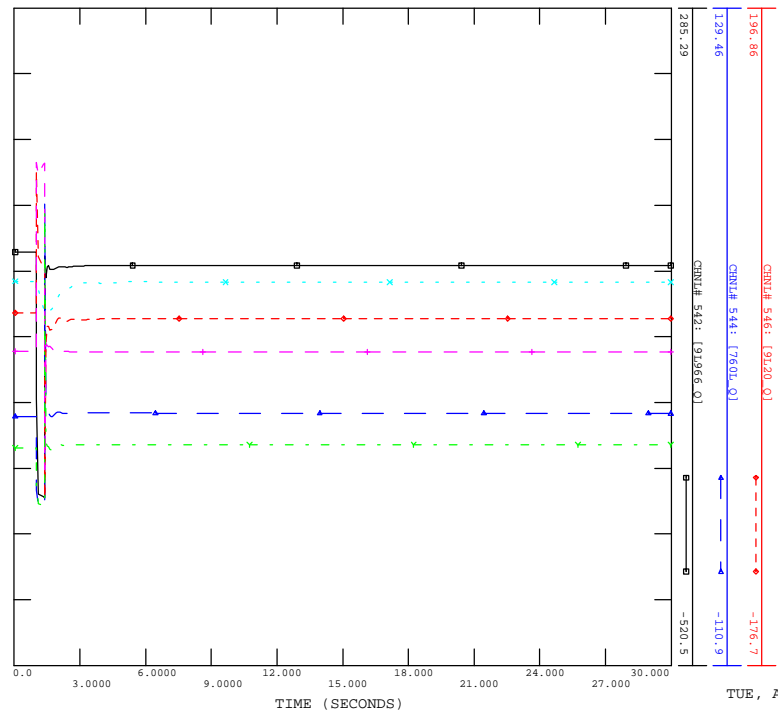
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TUE, AUG 13 2024 17:26  
BUS VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_16\_7L116\_EXCEL

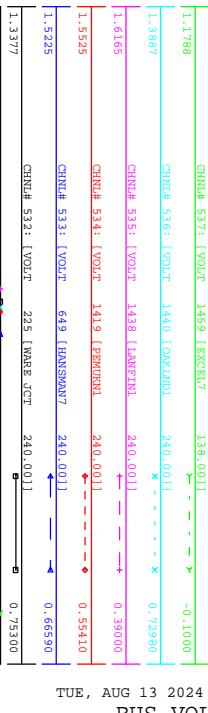
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TUE, AUG 13 2024 17:26  
BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_16\_7L116\_EXCEL

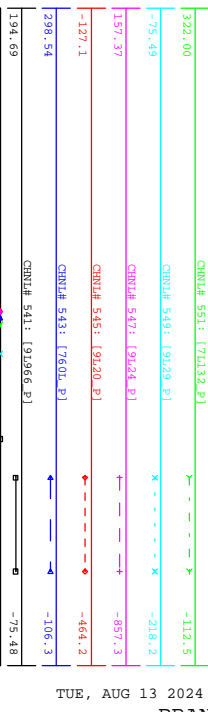
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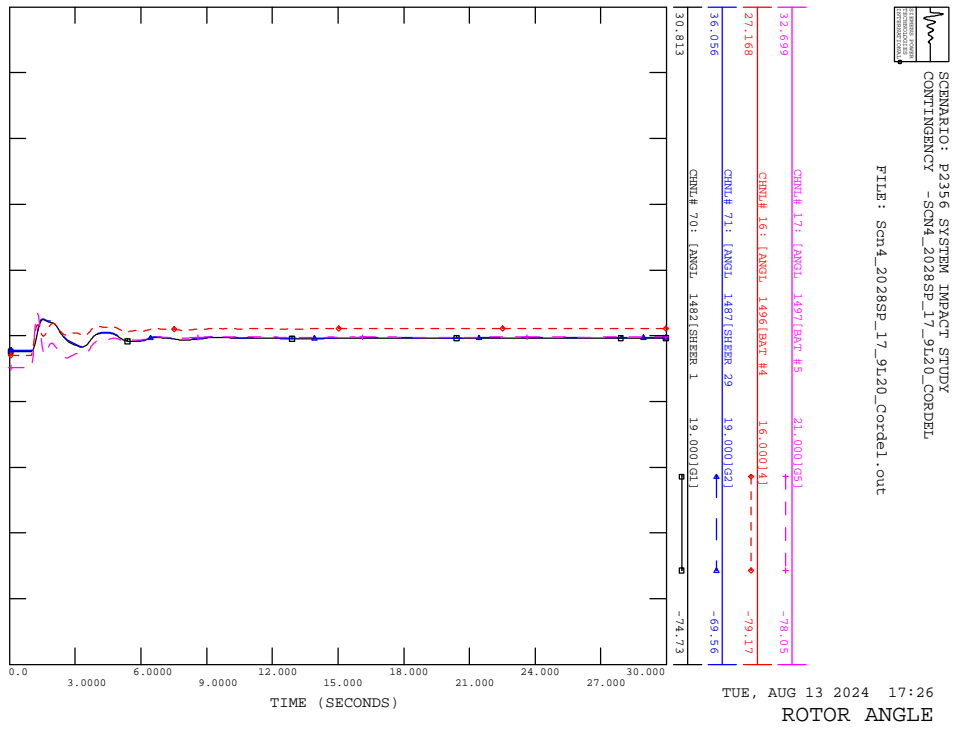
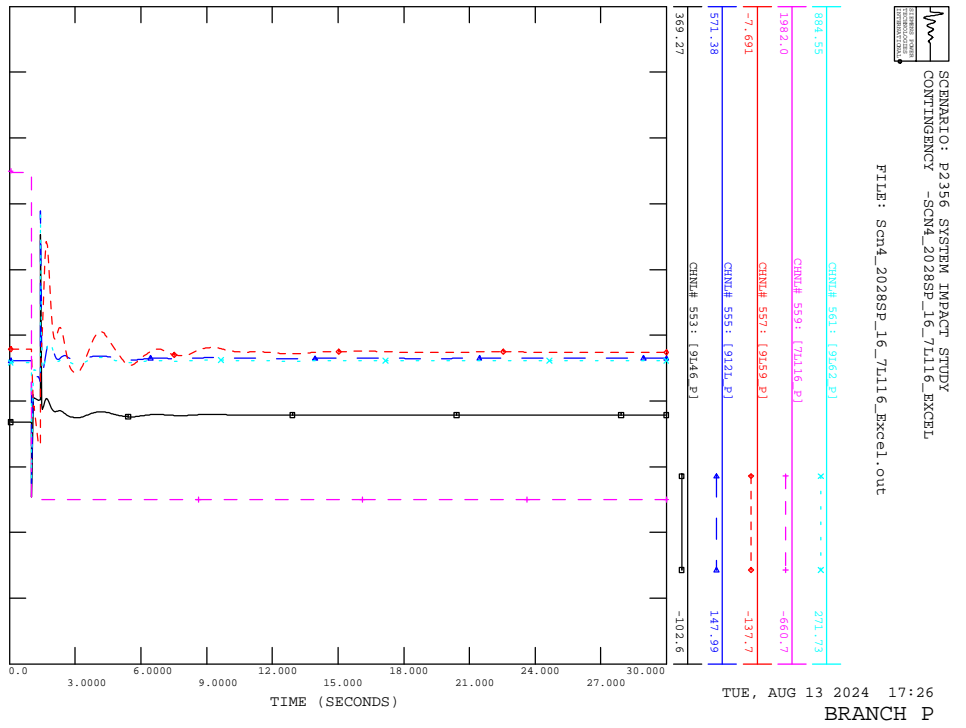
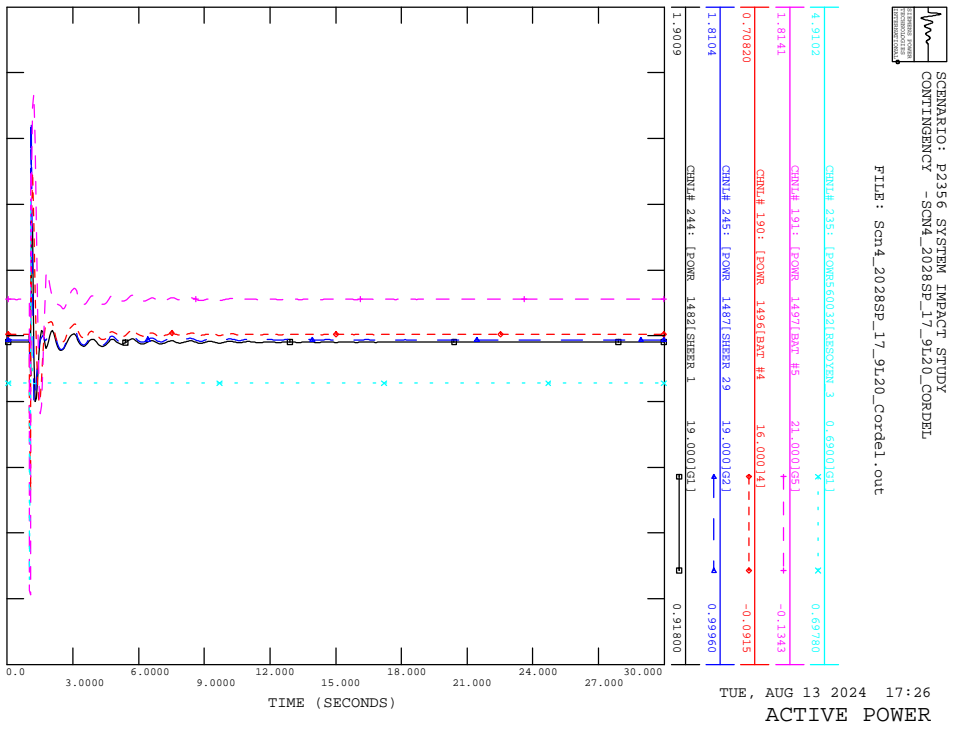
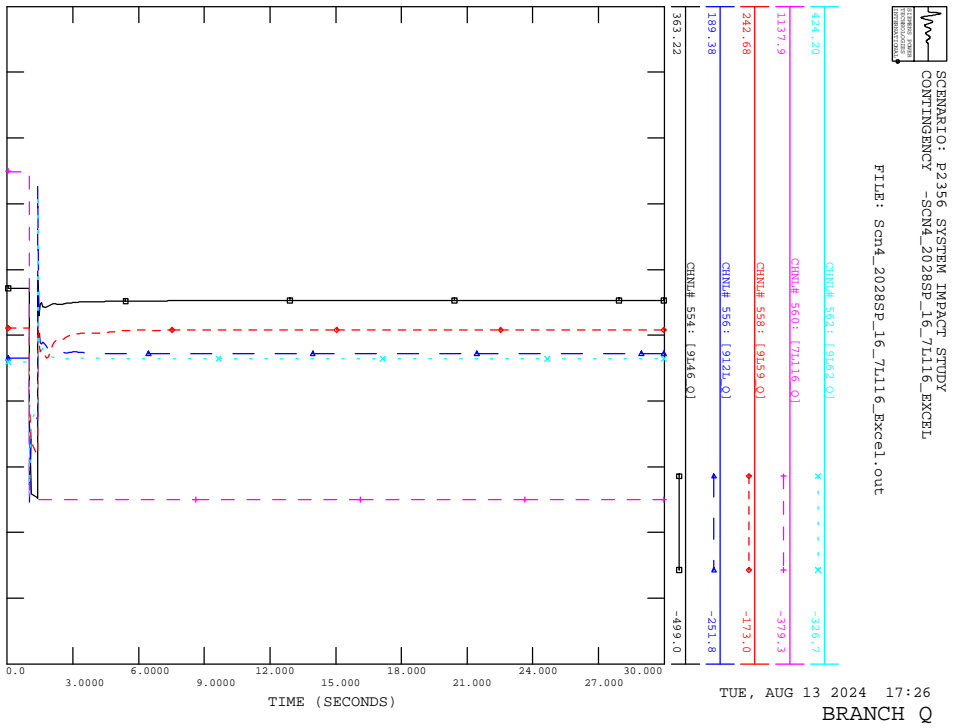
TUE, AUG 13 2024 17:26  
BUS VOLTAGE

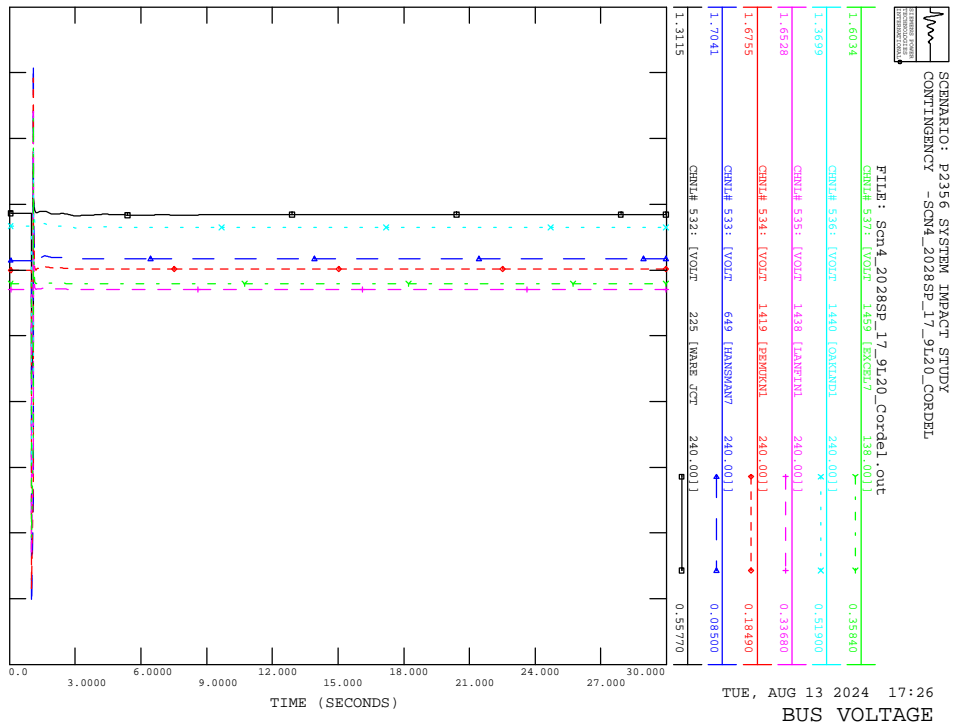
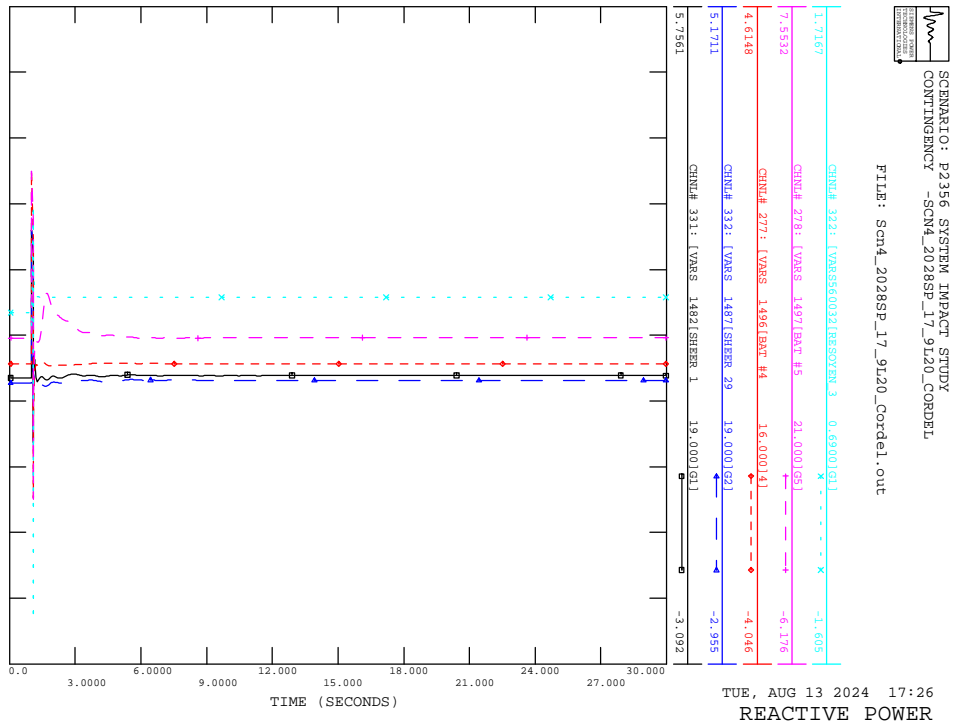
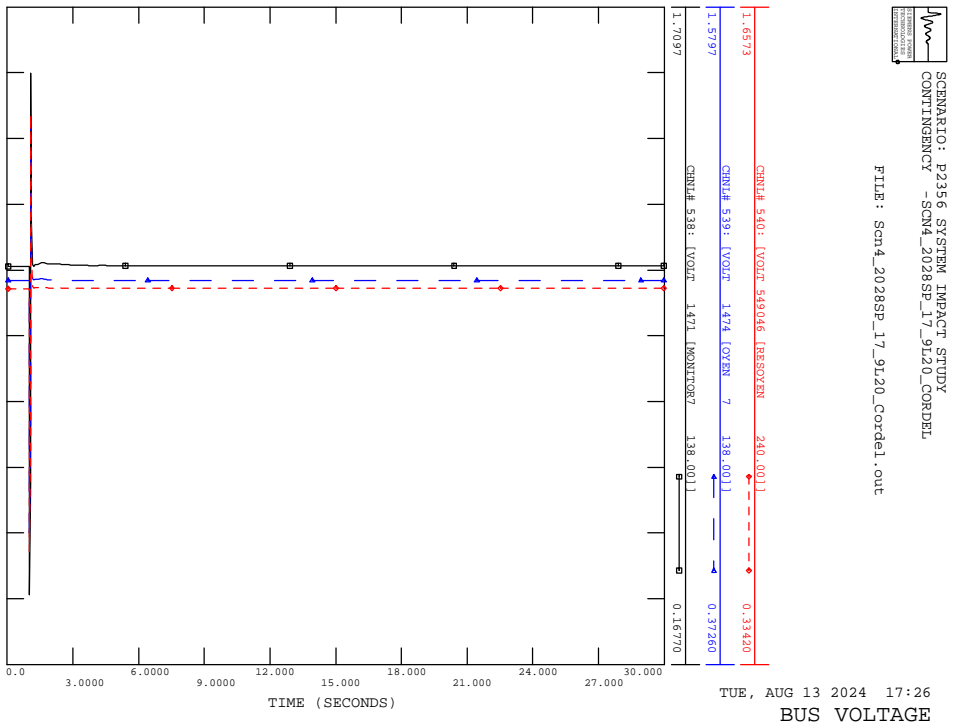
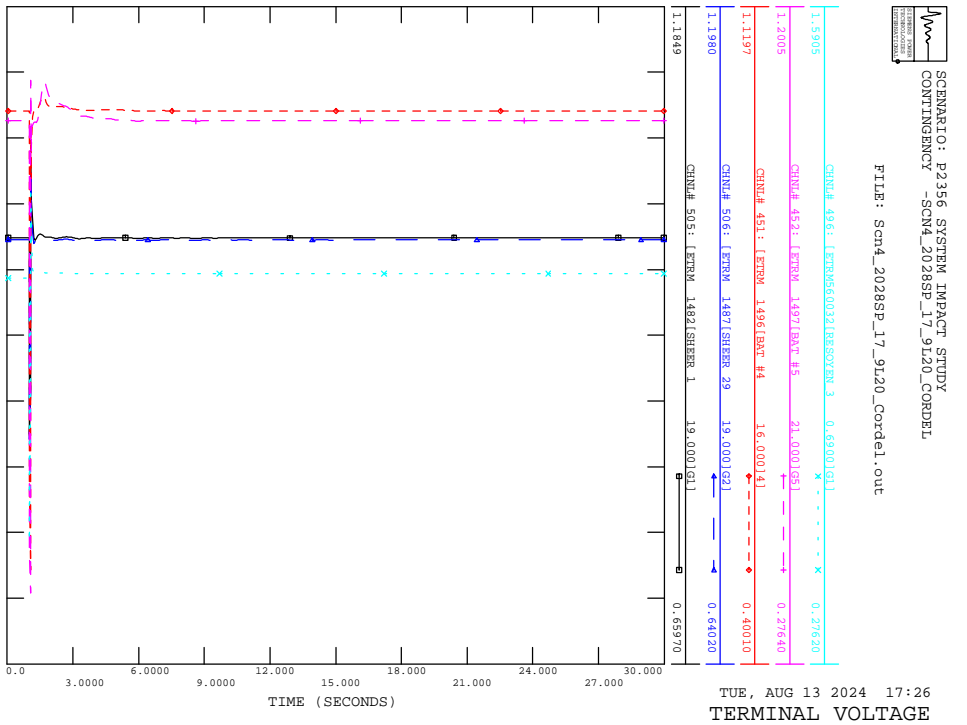
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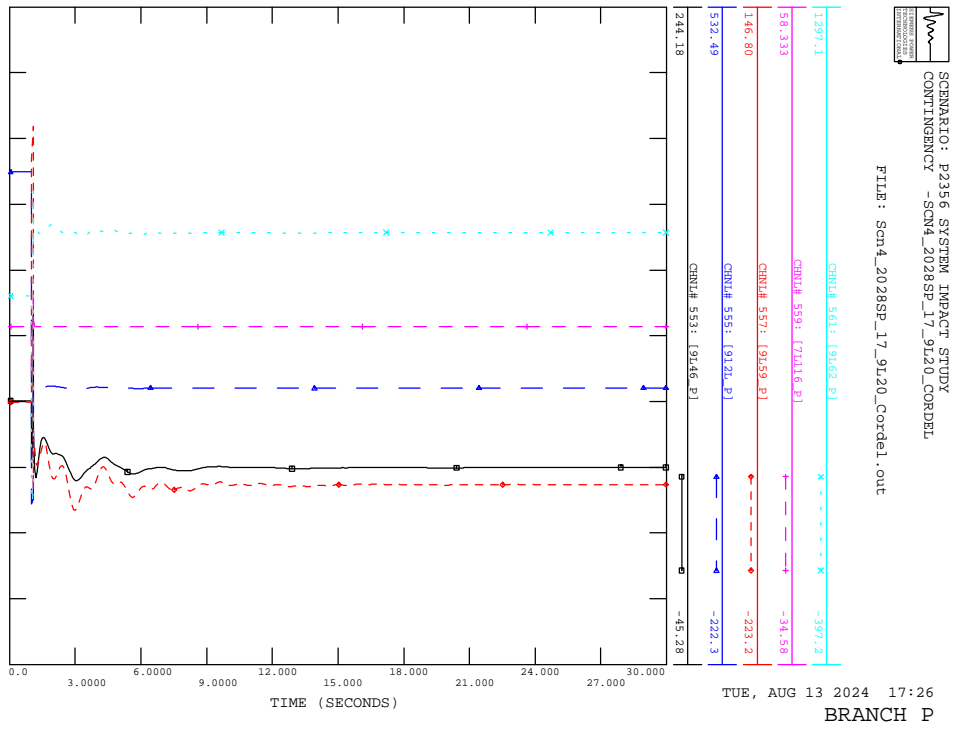
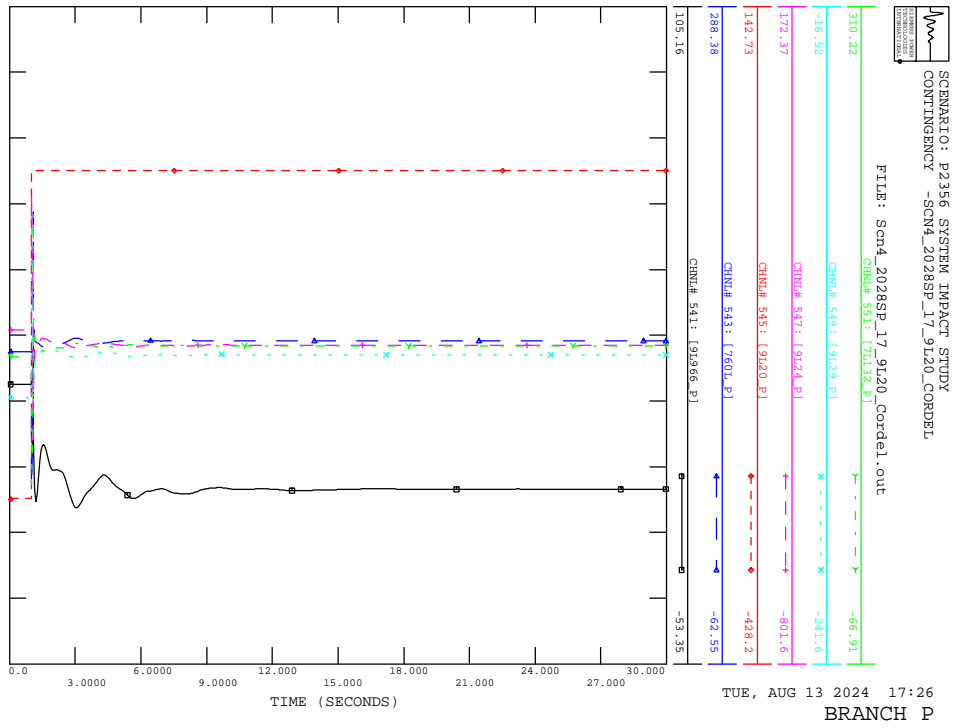
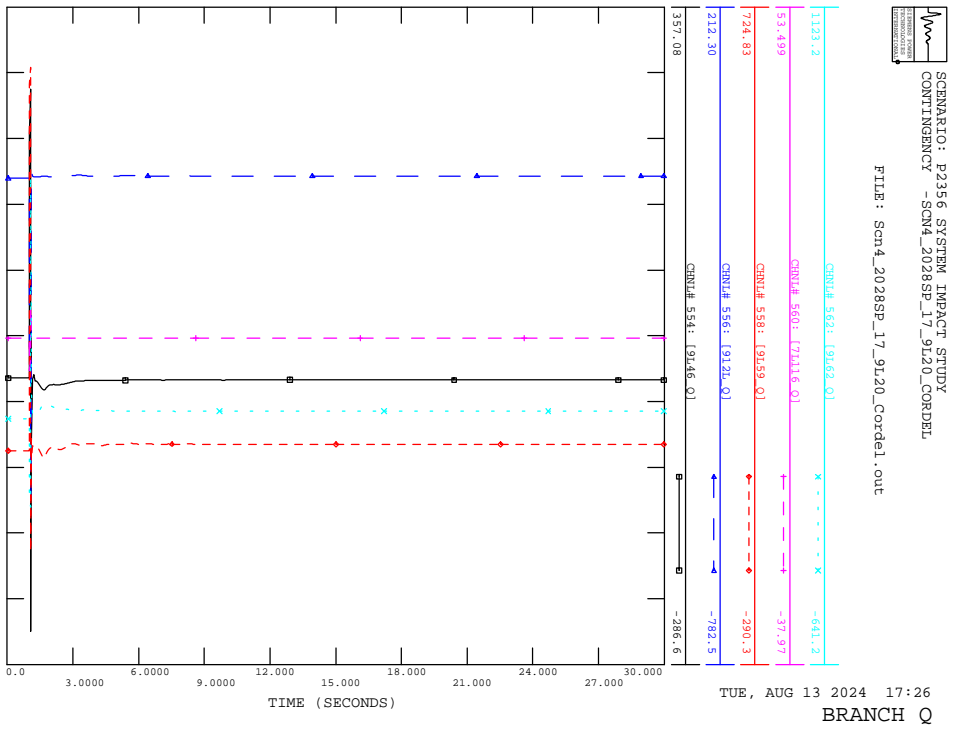
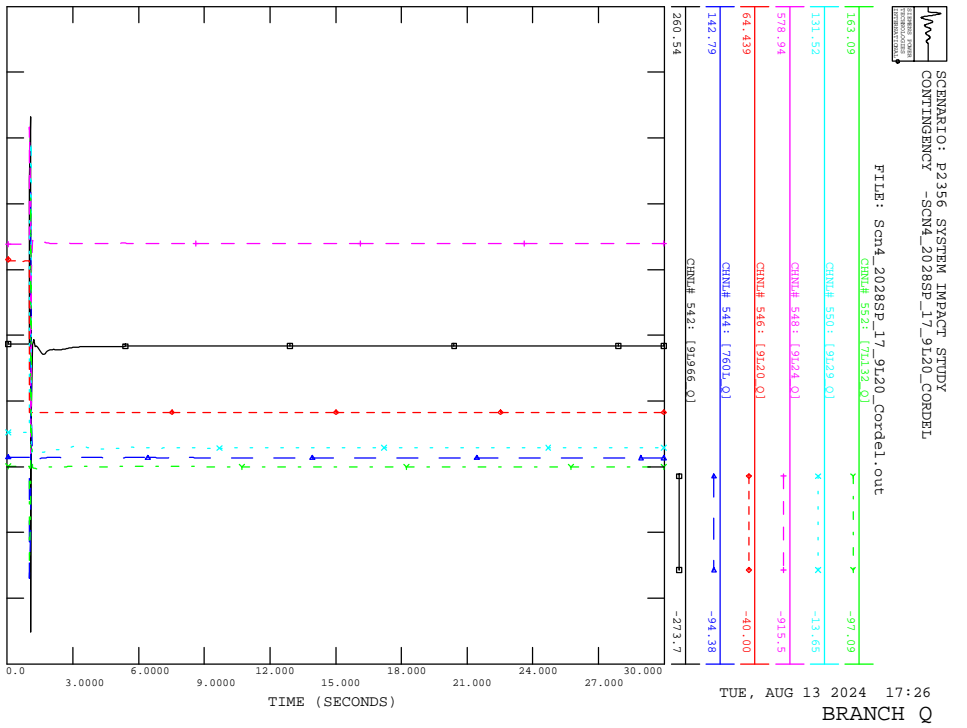


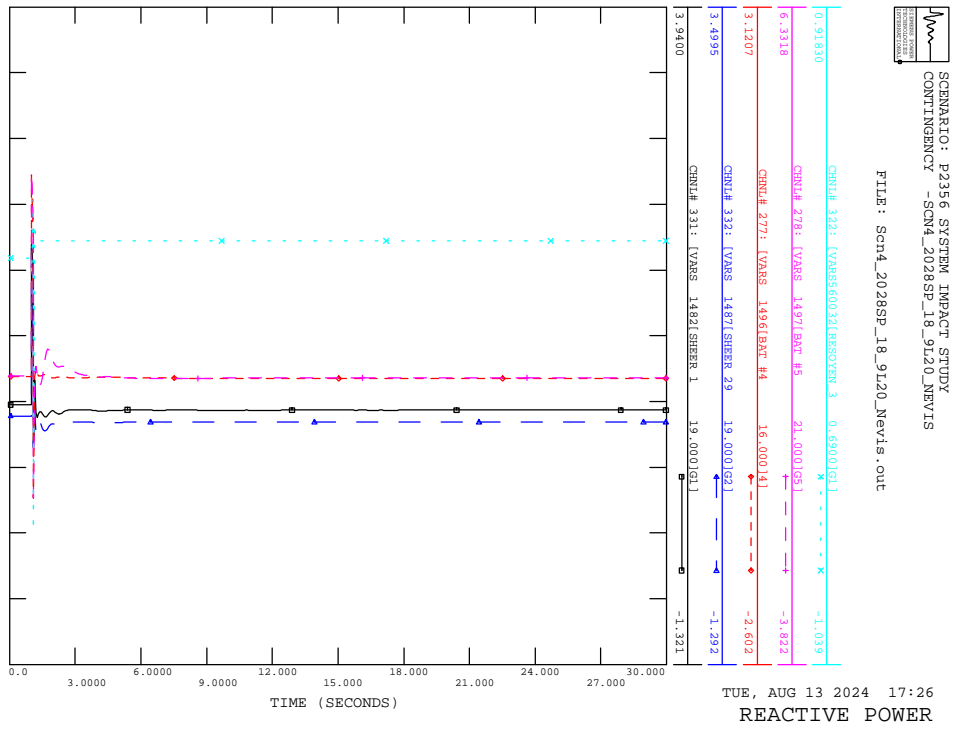
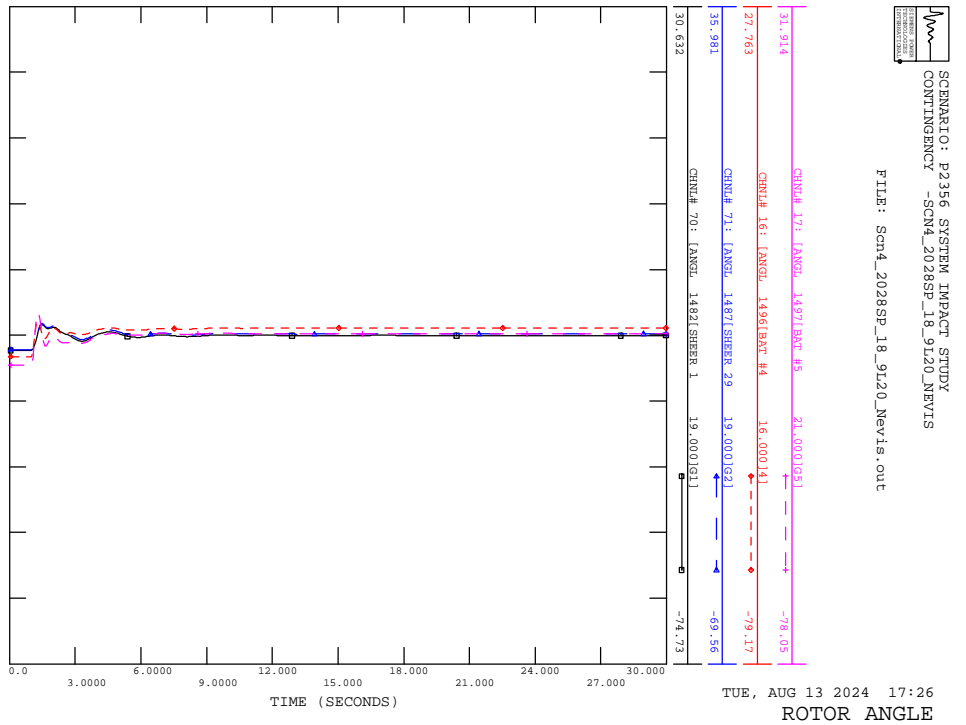
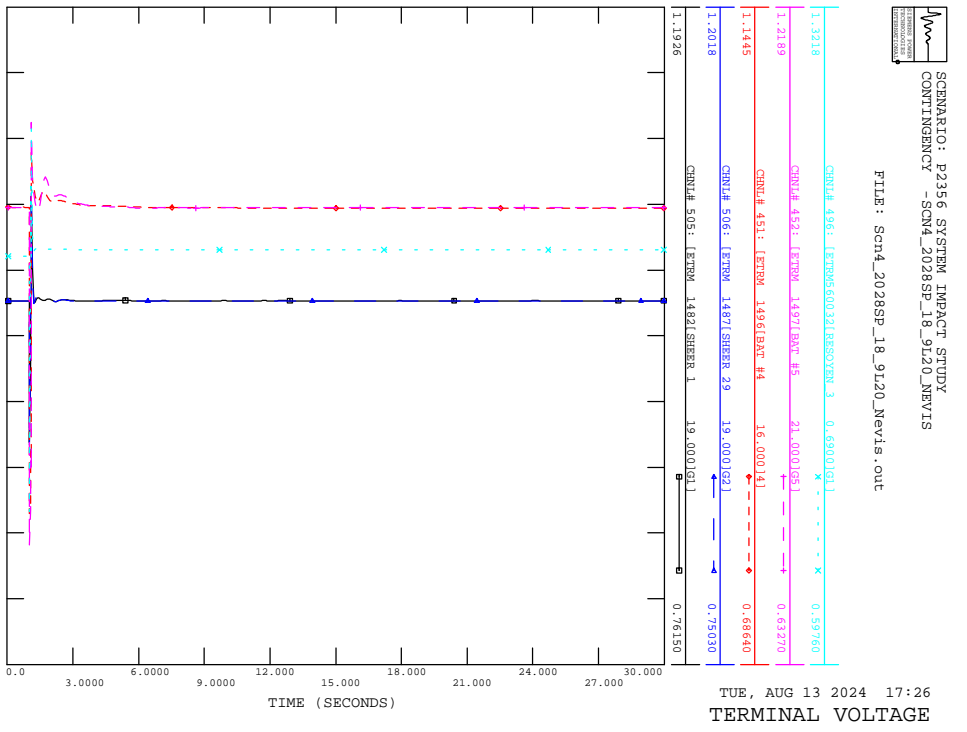
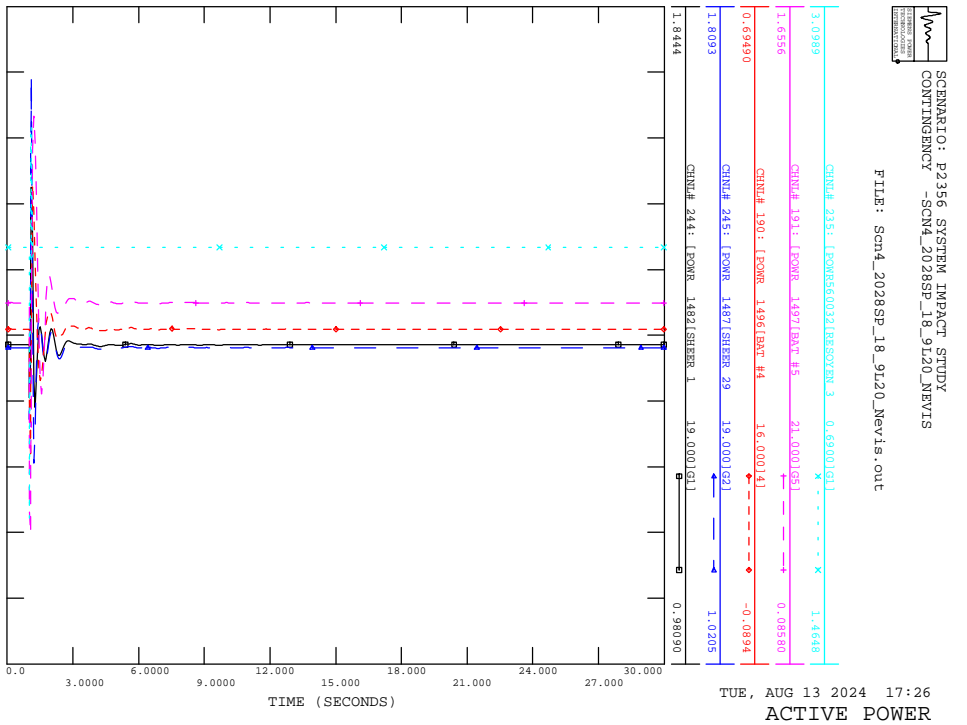
TUE, AUG 13 2024 17:26  
BRANCH P

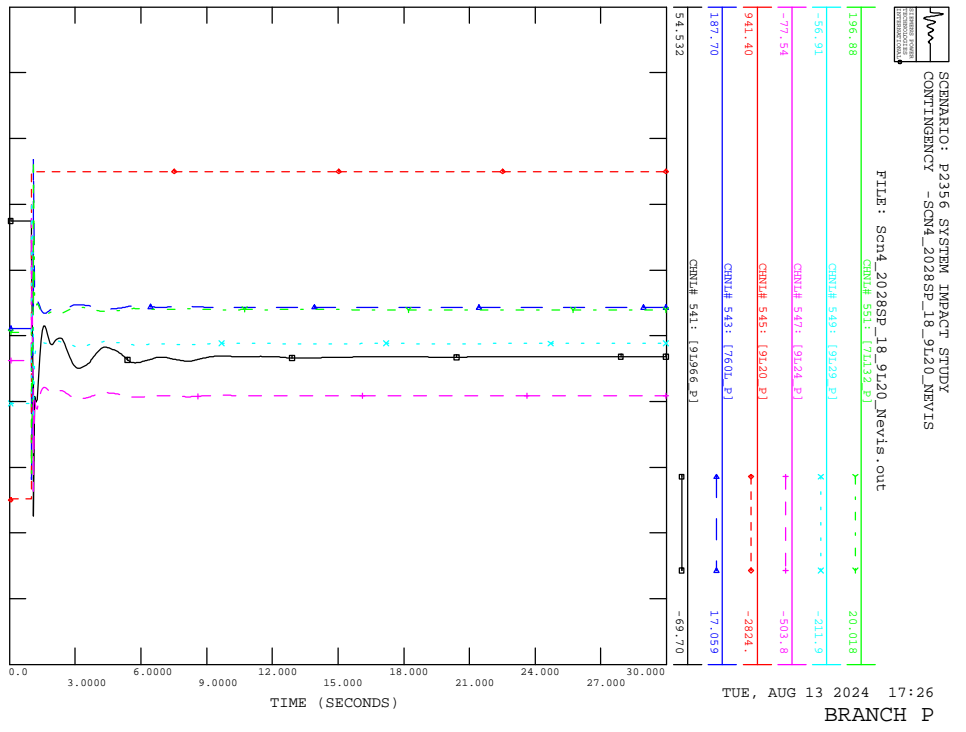
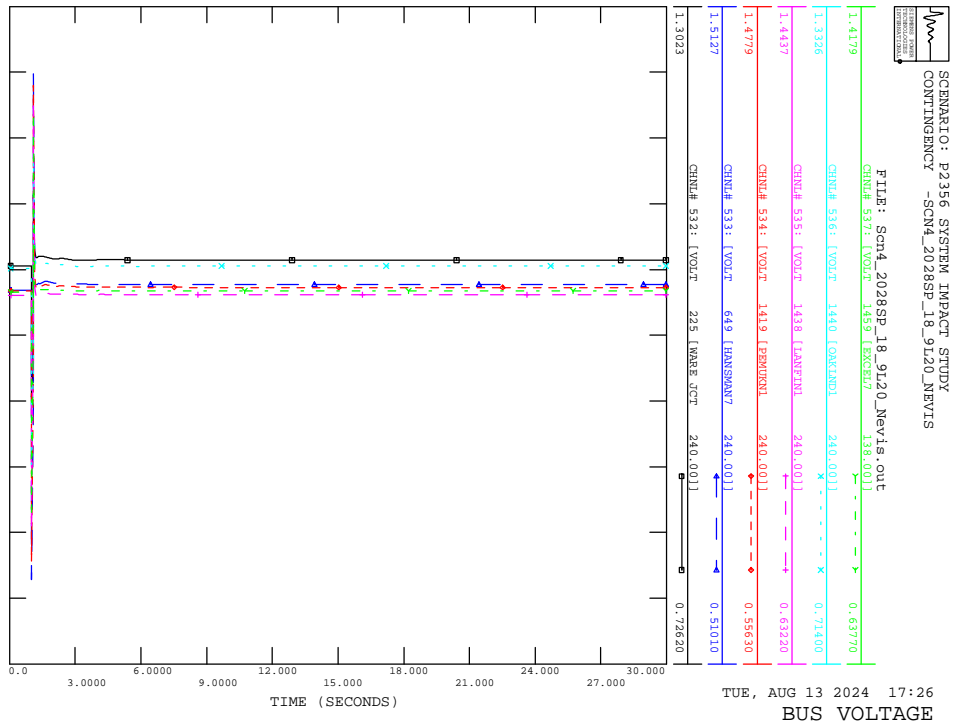
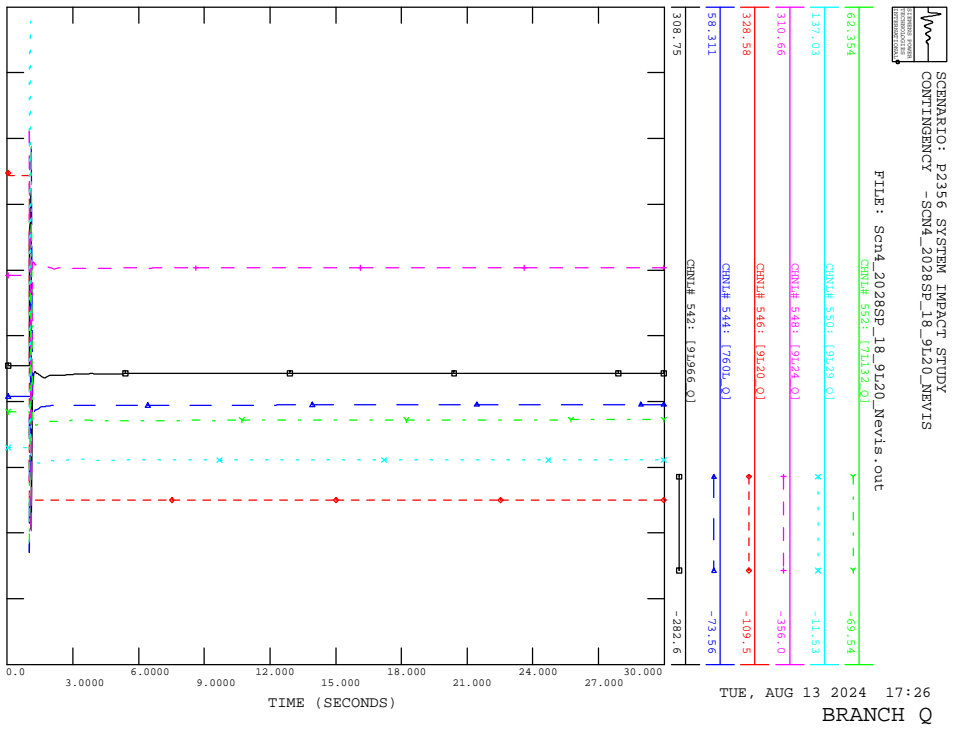
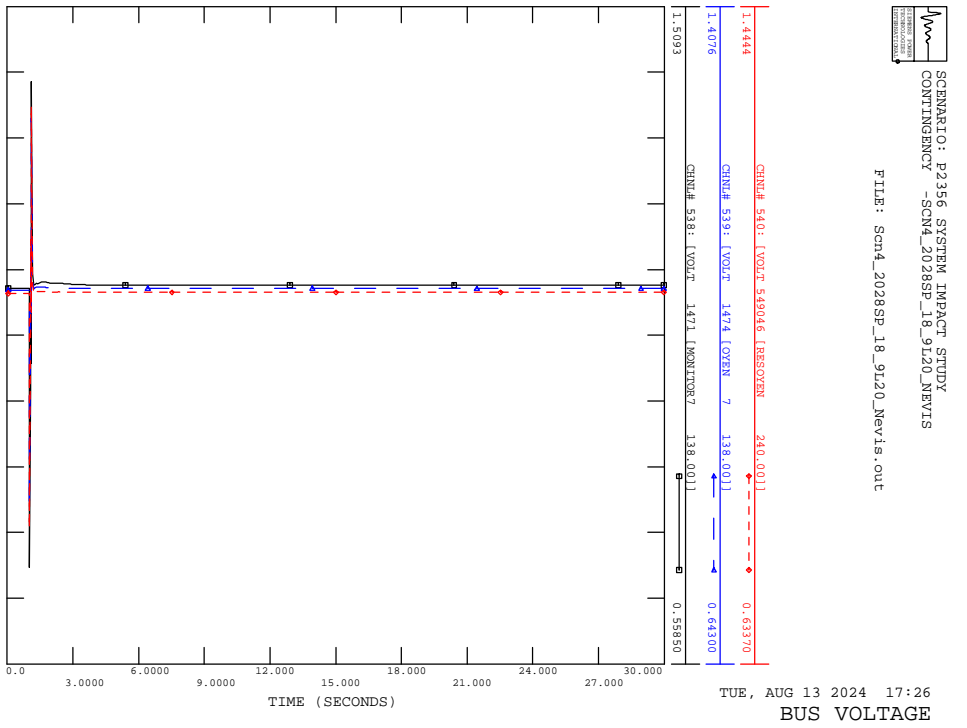






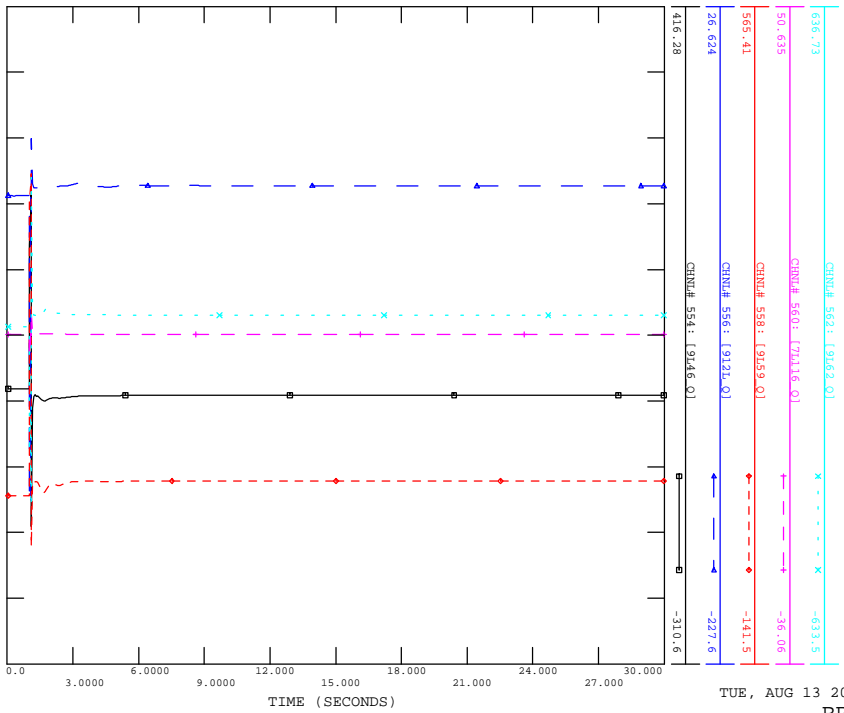






SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_18\_9120\_NEVIS

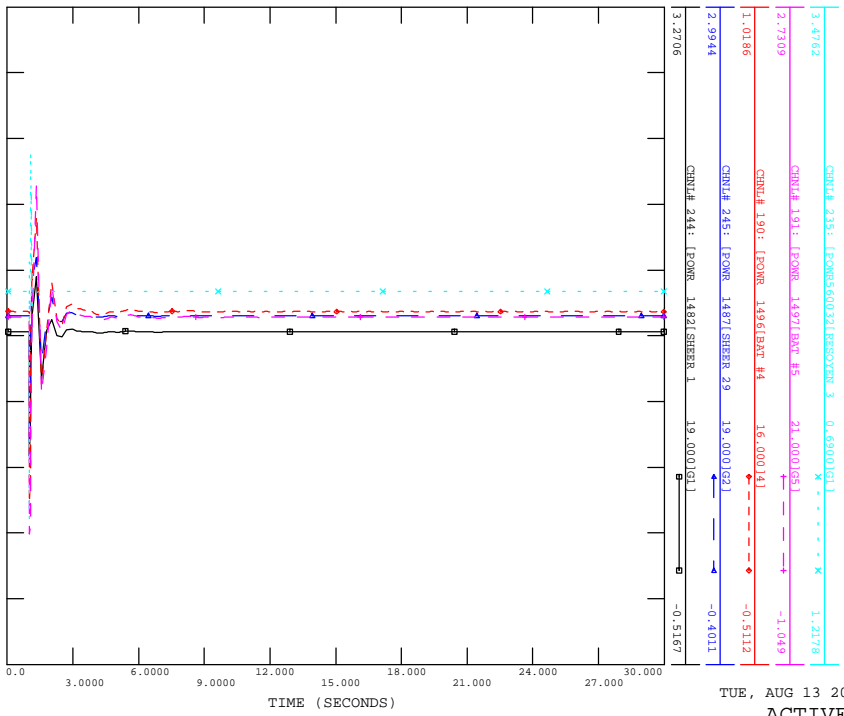
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TUE, AUG 13 2024 17:26  
BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GABTZ

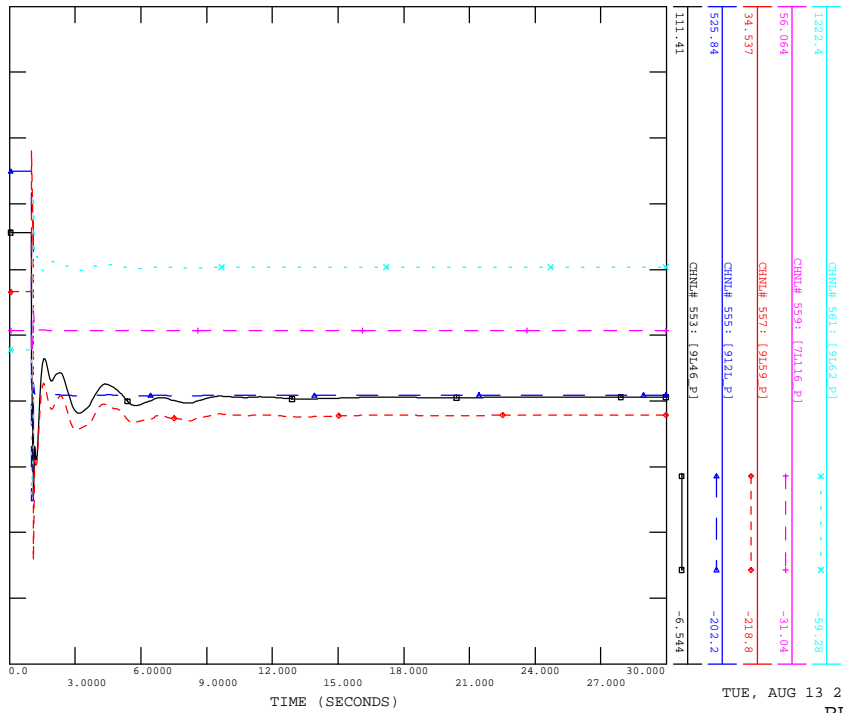
FILE: scn4\_2028sp\_19\_9162\_Gaetz.out



TUE, AUG 13 2024 17:26  
ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_18\_9120\_NEVIS

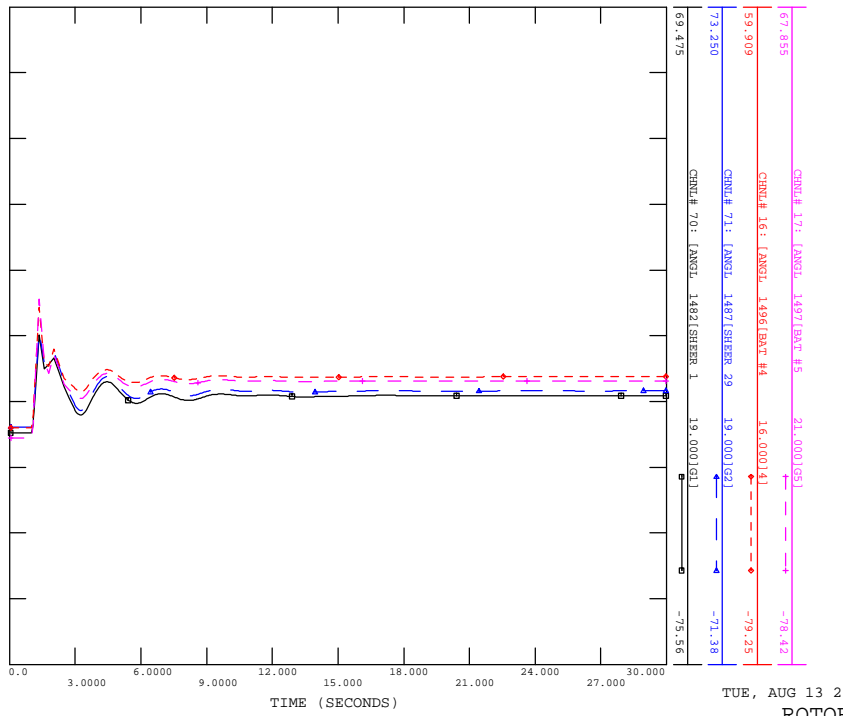
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TUE, AUG 13 2024 17:26  
BRANCH P

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GABTZ

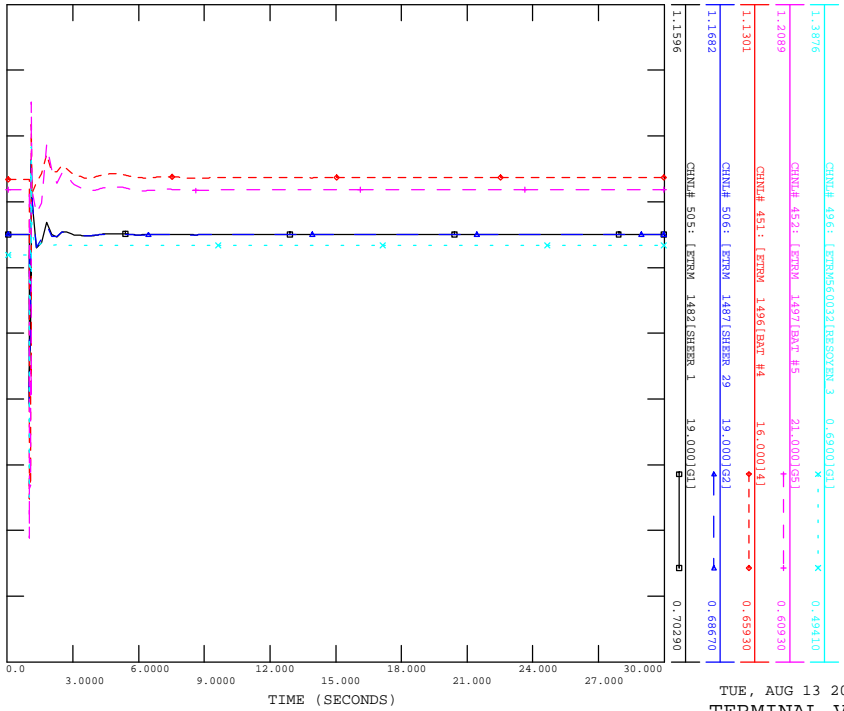
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TUE, AUG 13 2024 17:26  
ROTOR ANGLE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GAETZ

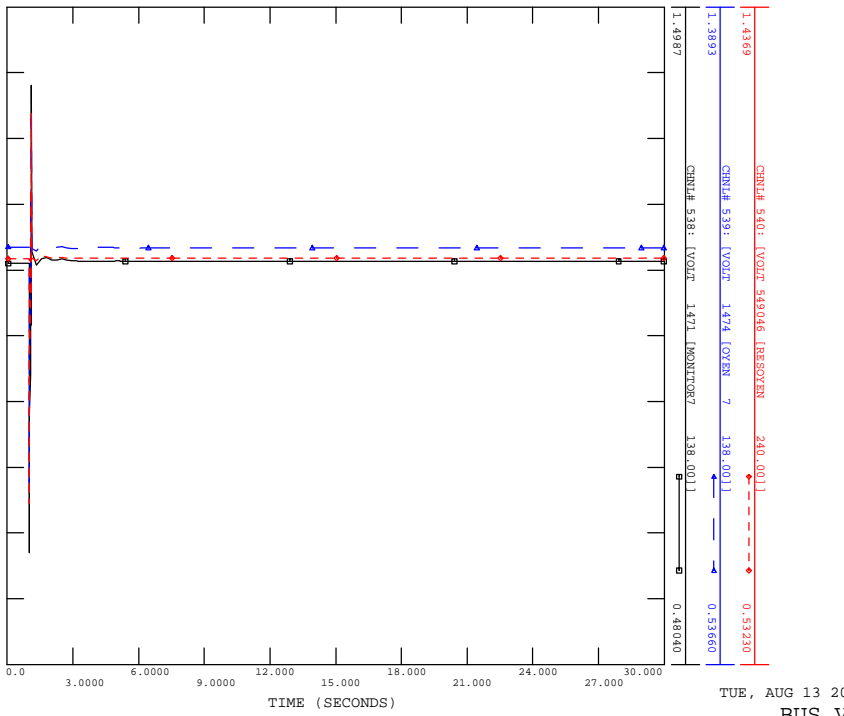
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TUE, AUG 13 2024 17:26  
TERMINAL VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GAETZ

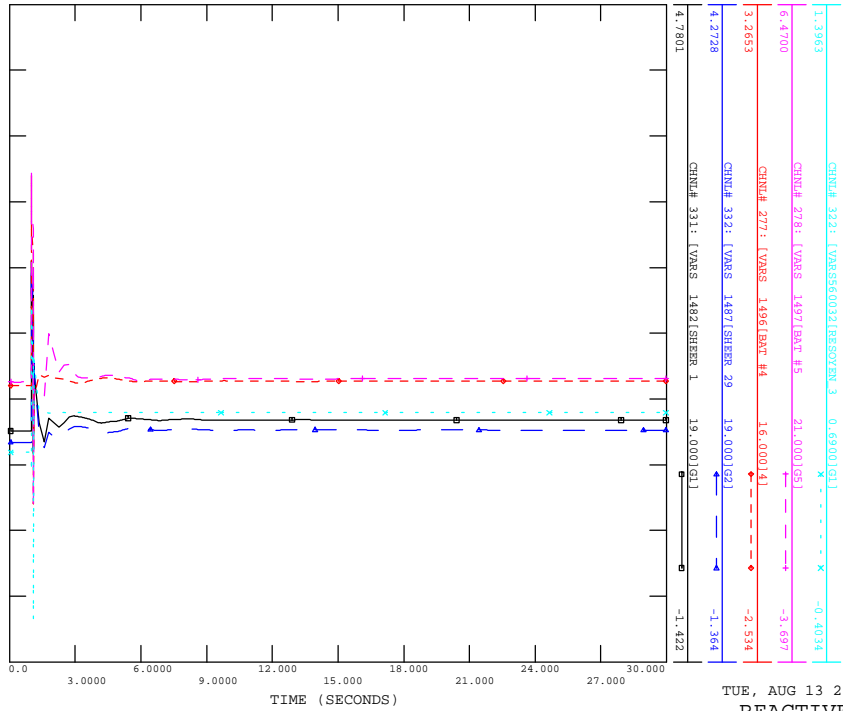
FILE: Scn4\_2028sp\_19\_9162\_Gaetz.out



TUE, AUG 13 2024 17:26  
BUS VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GAETZ

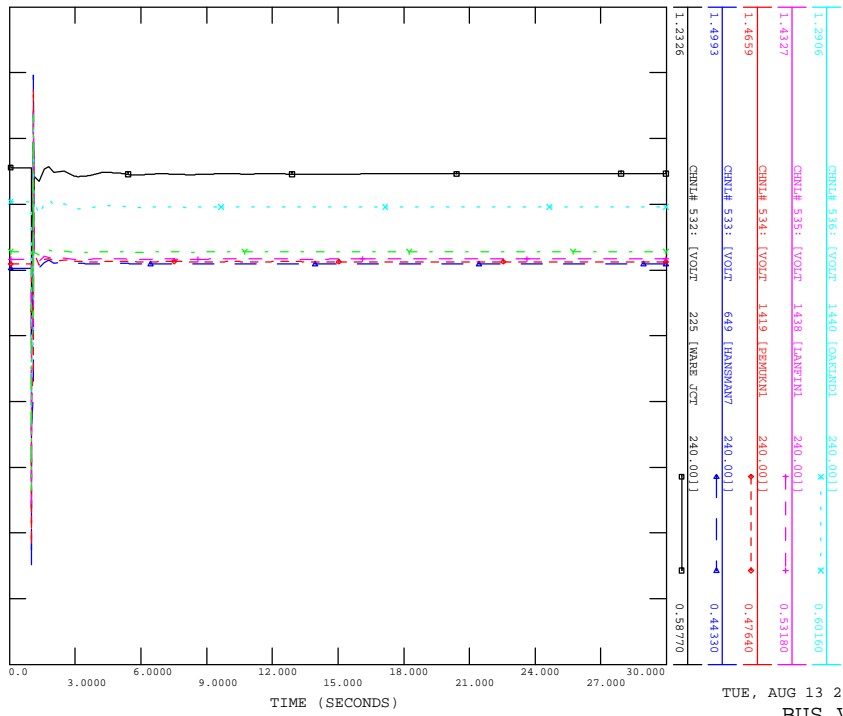
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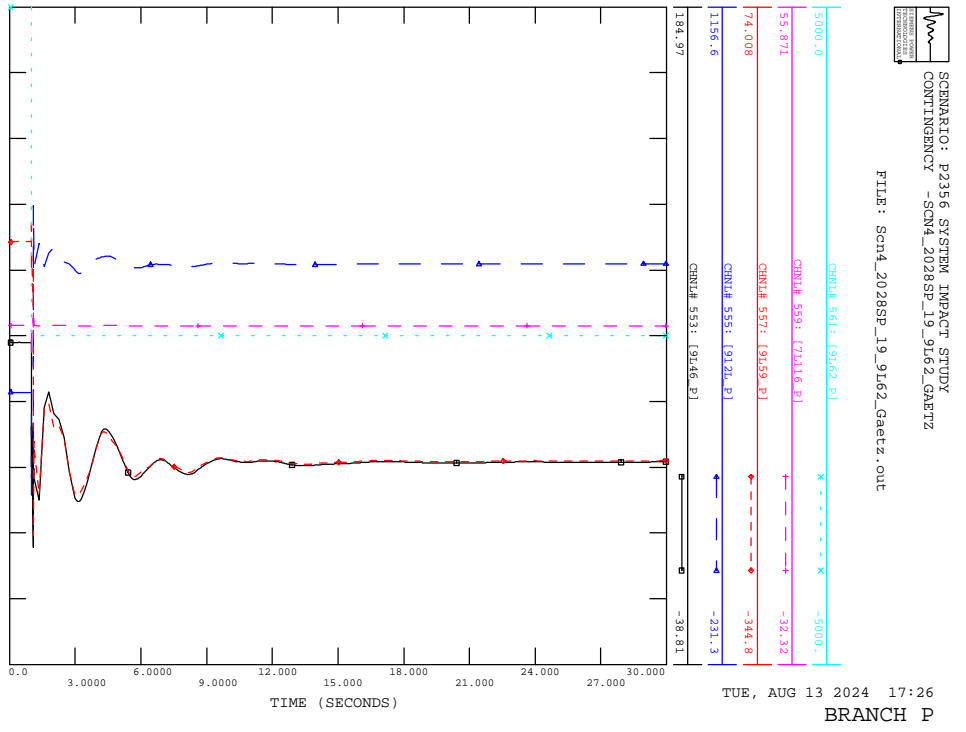
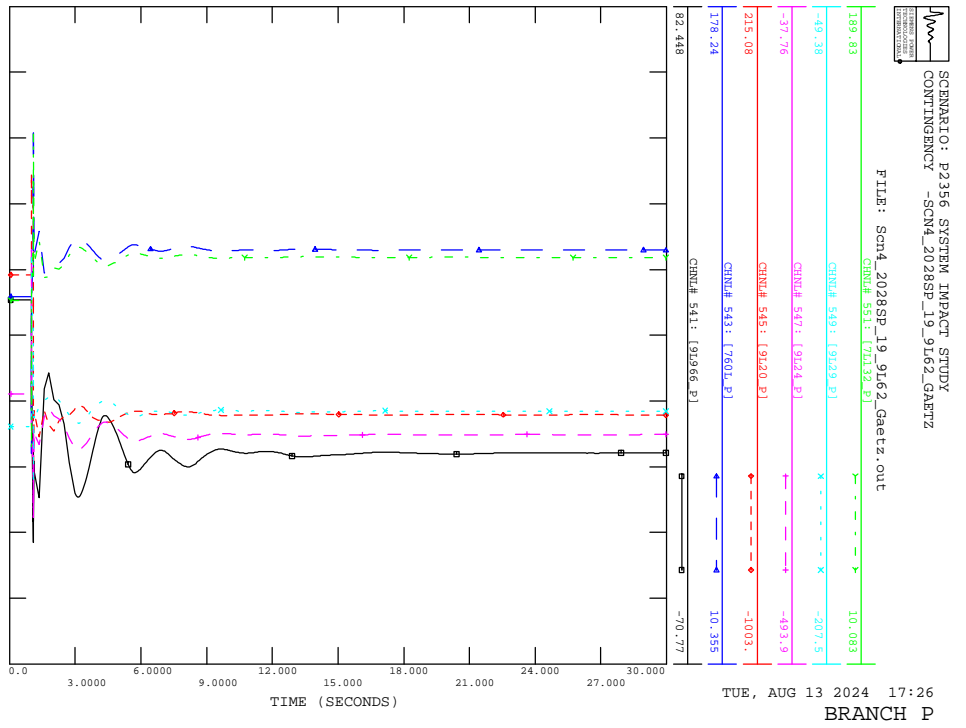
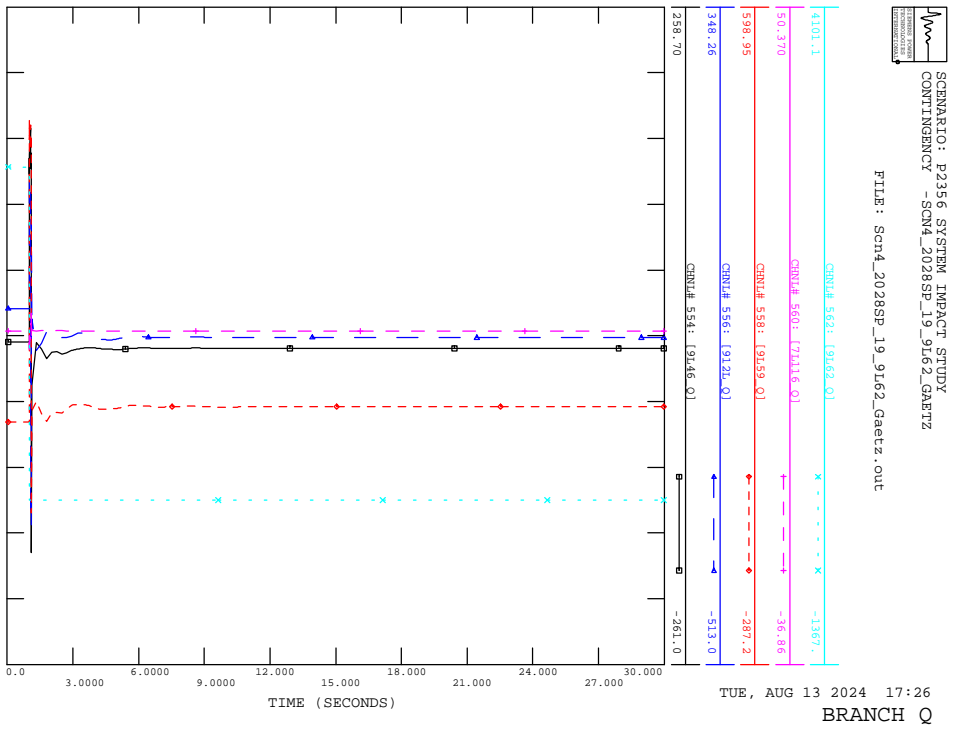
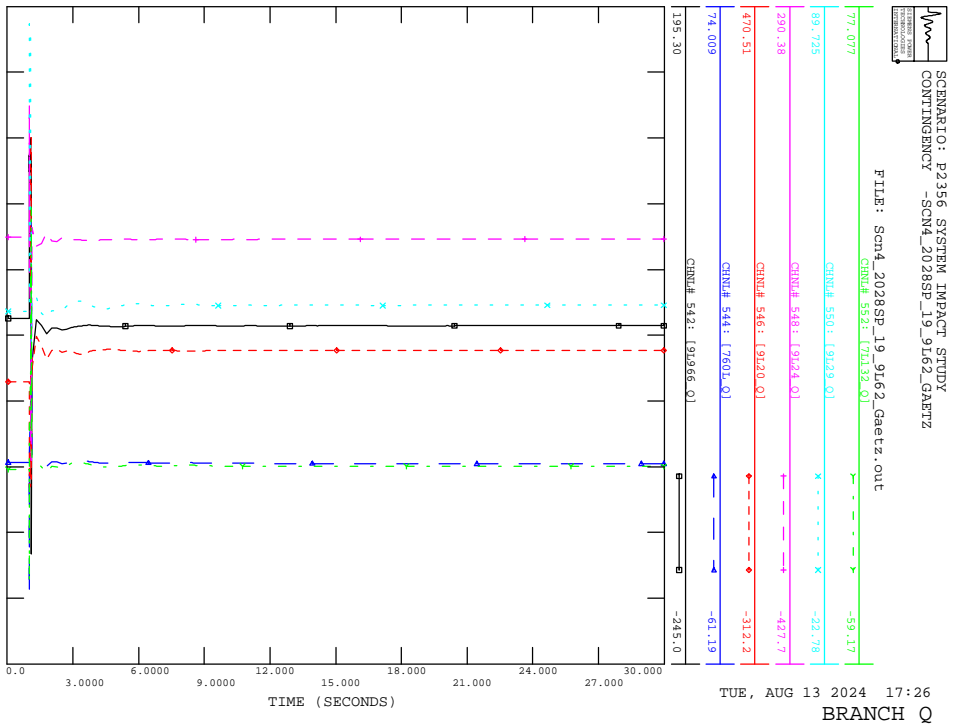
TUE, AUG 13 2024 17:26  
REACTIVE POWER

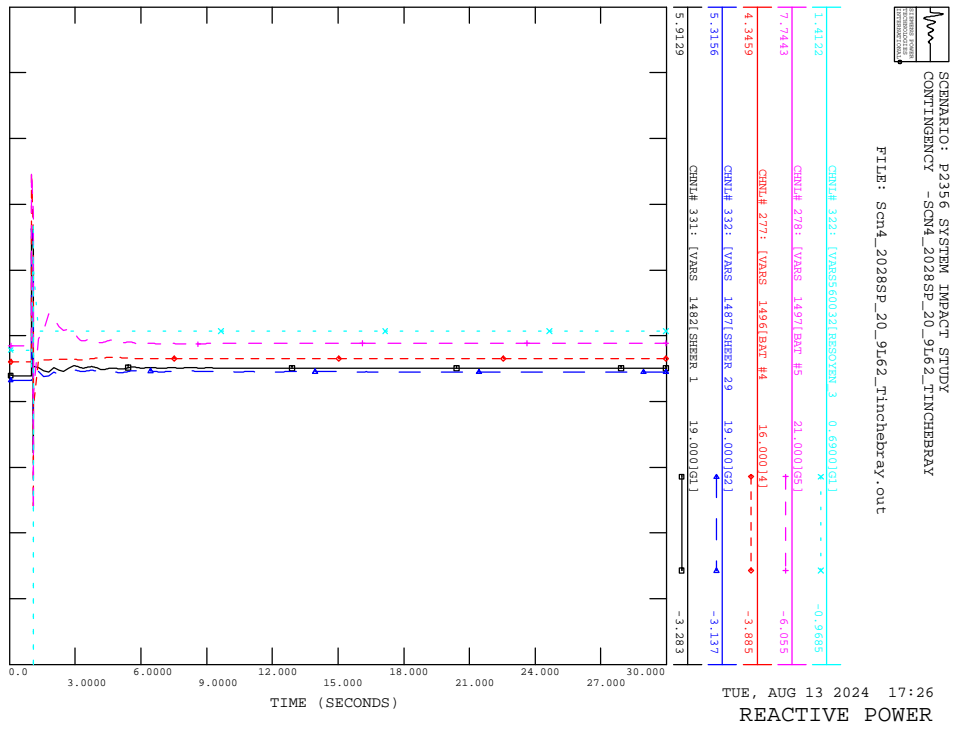
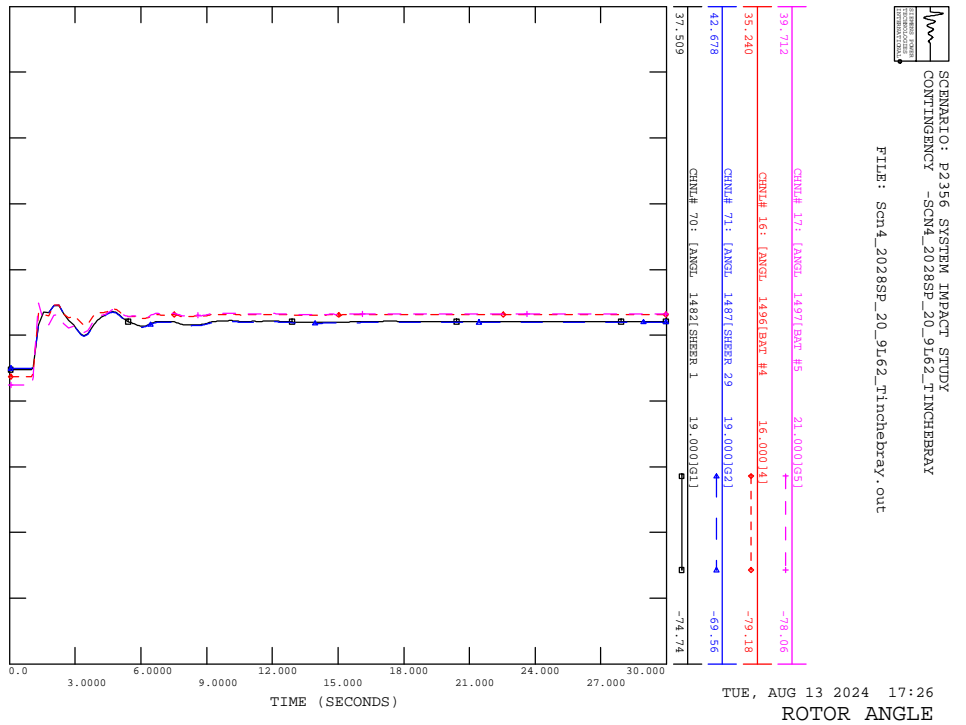
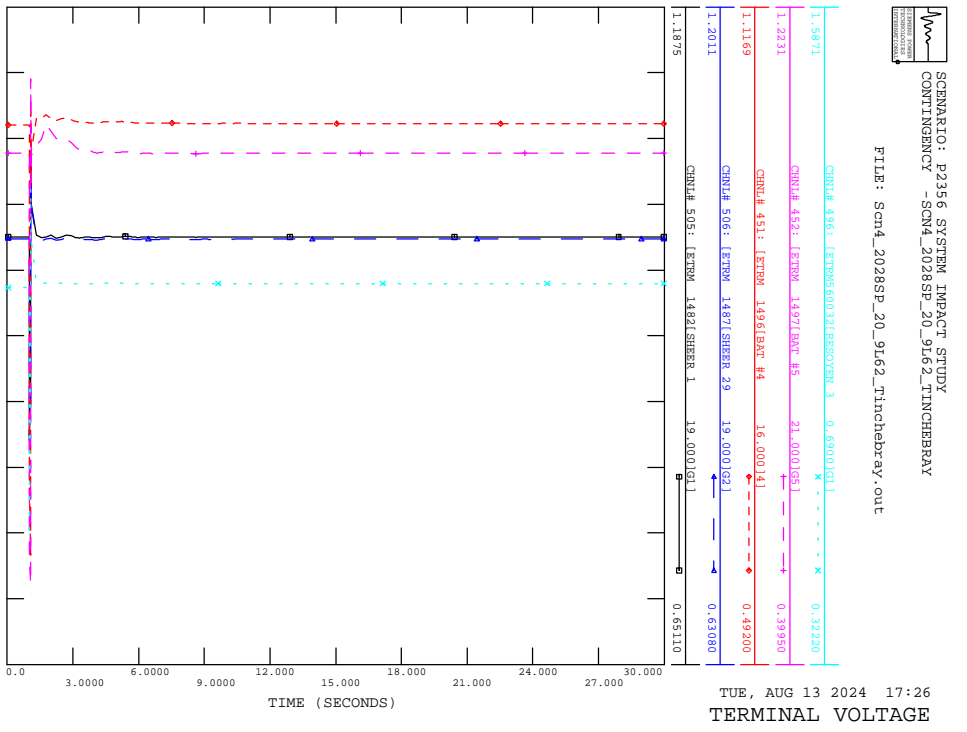
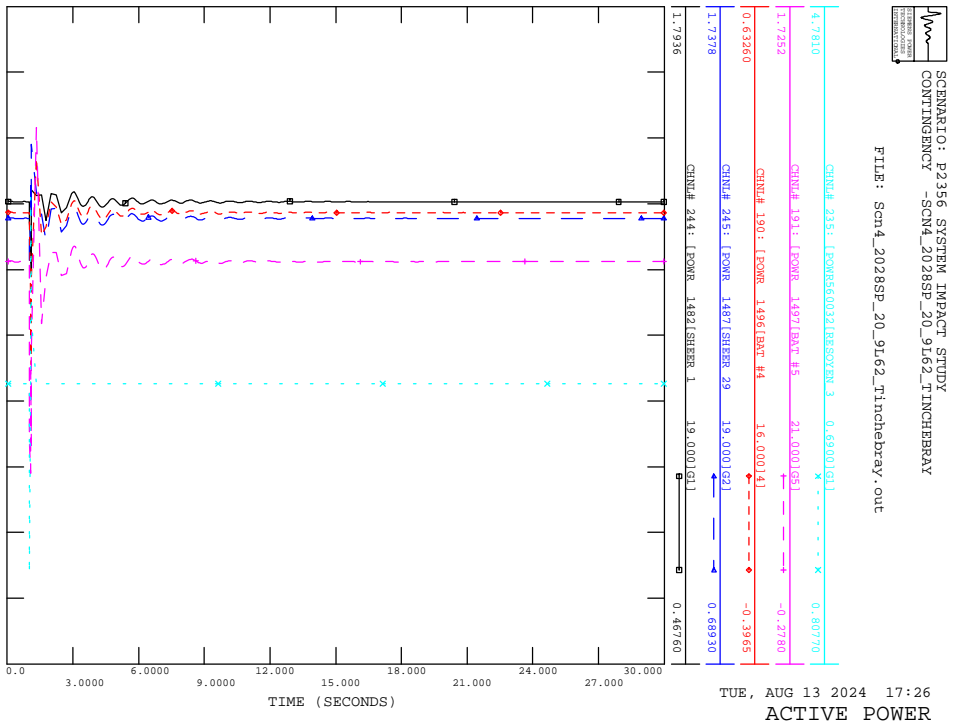
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_19\_9162\_GAETZ

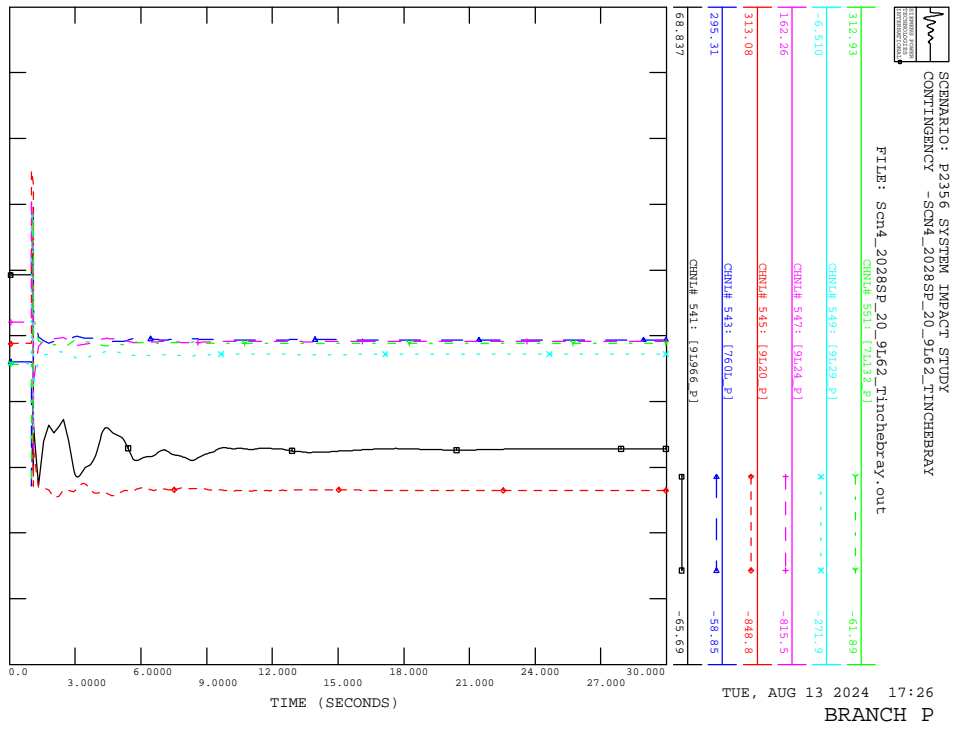
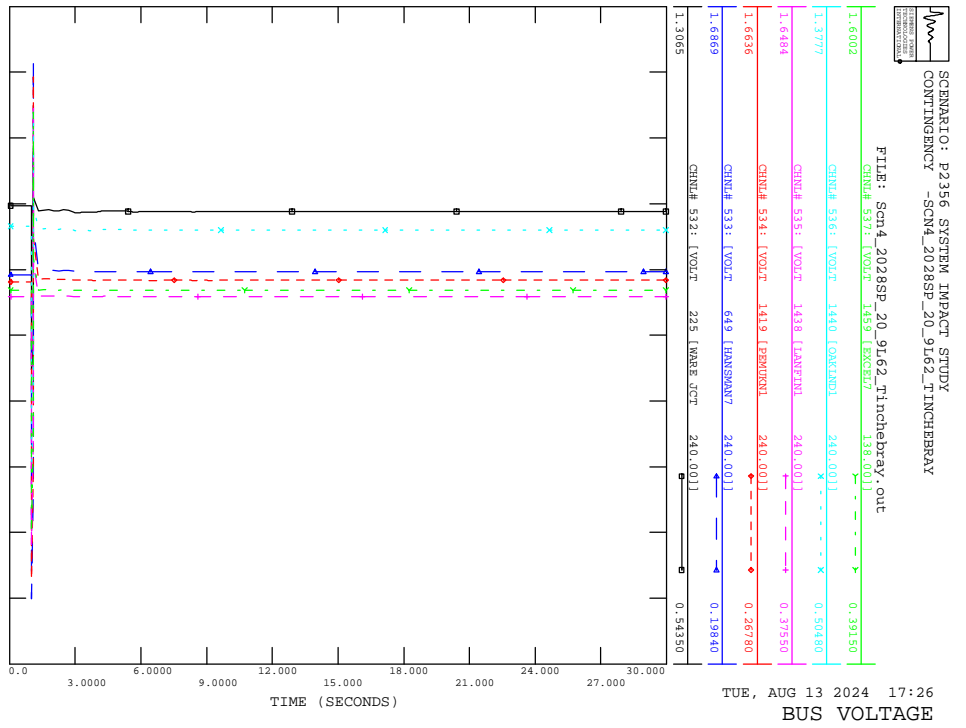
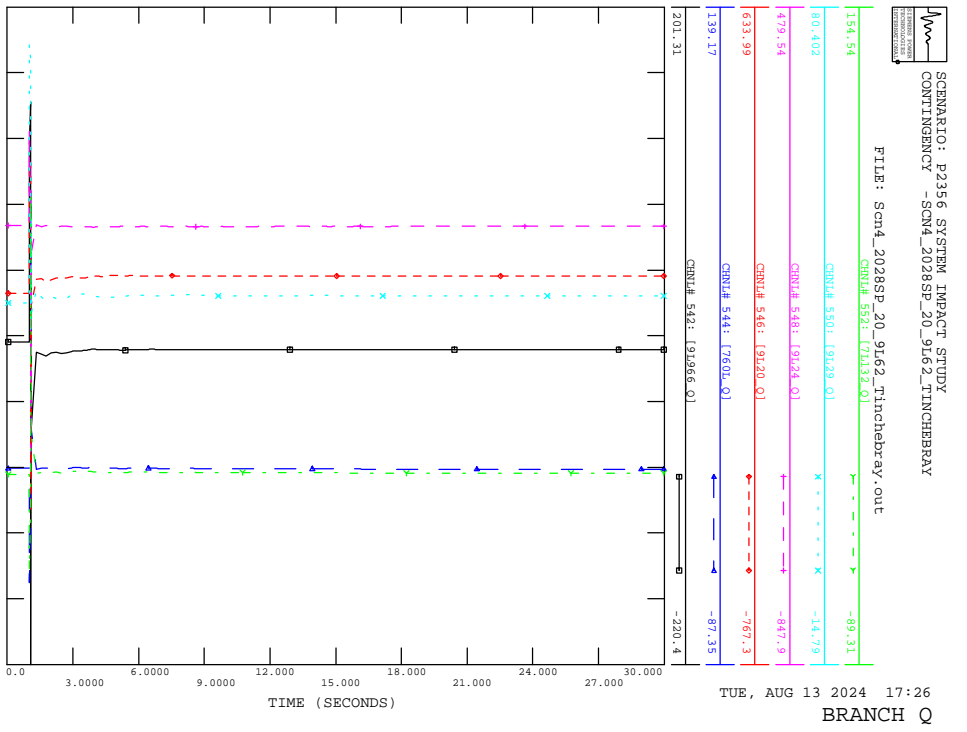
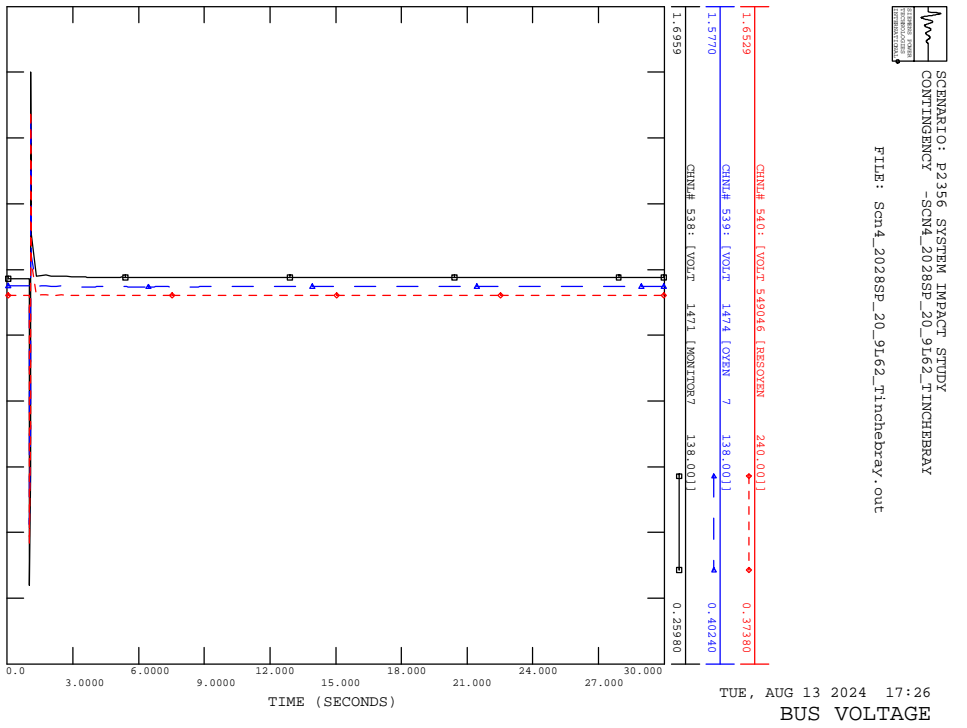
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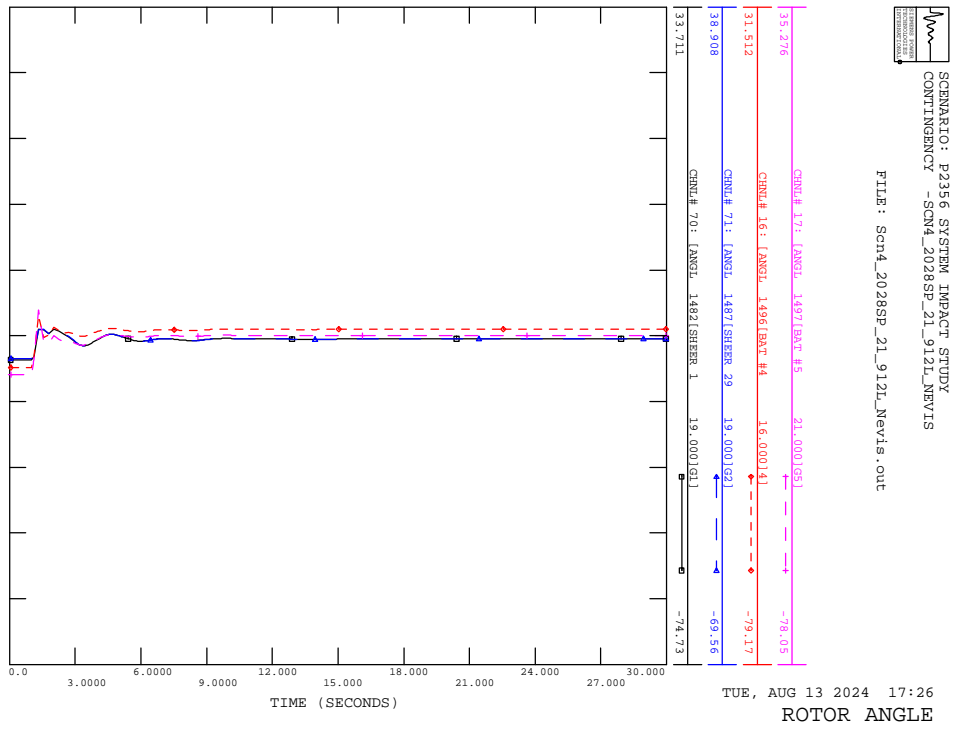
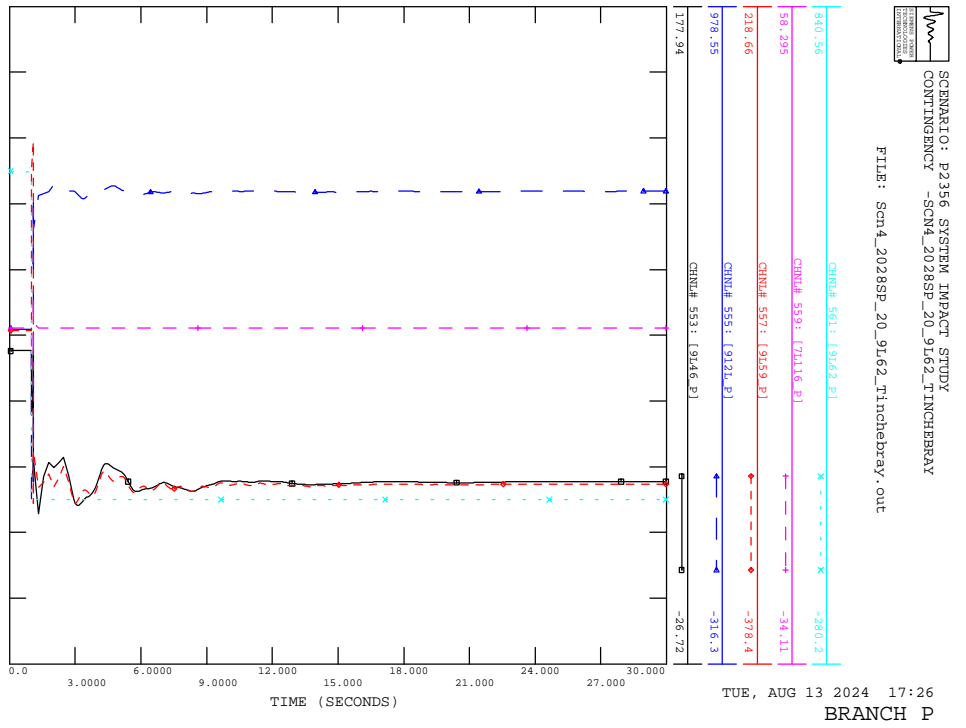
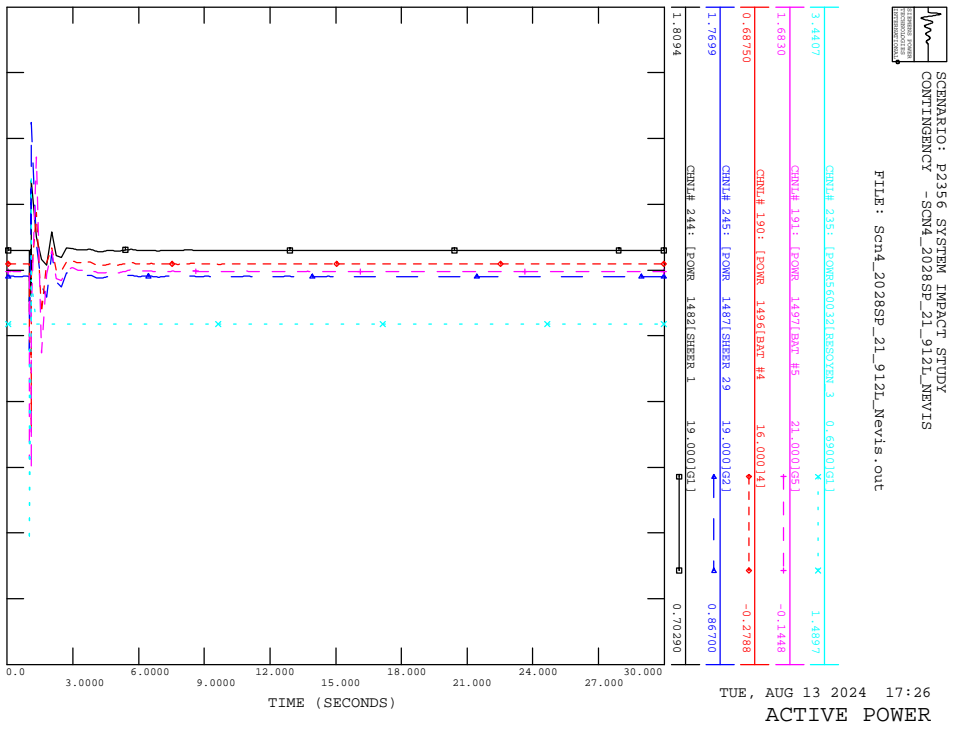
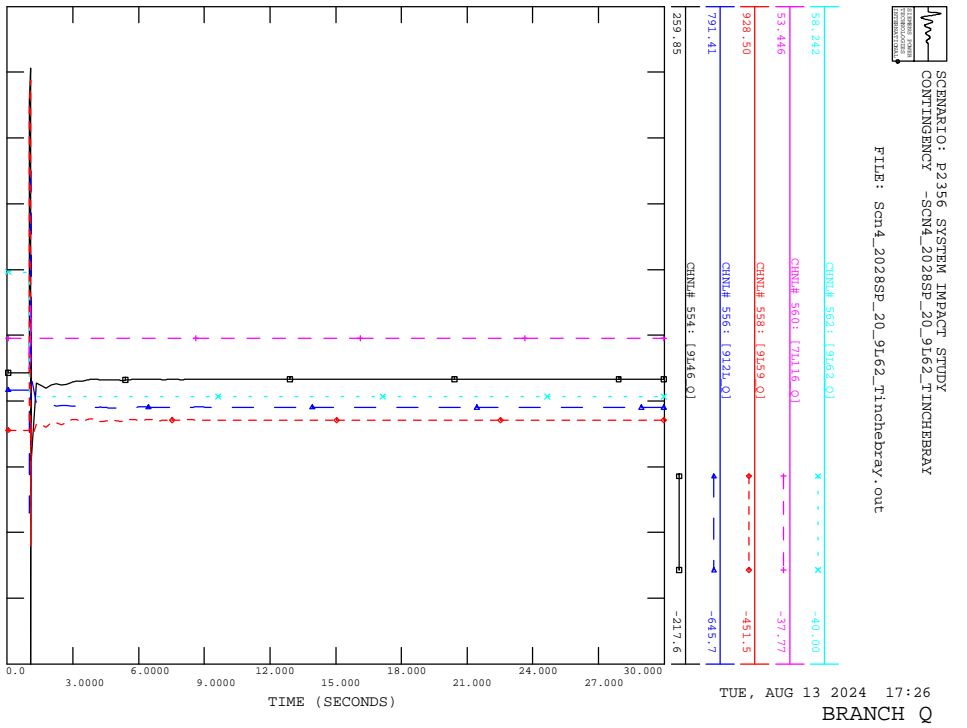
TUE, AUG 13 2024 17:26  
BUS VOLTAGE

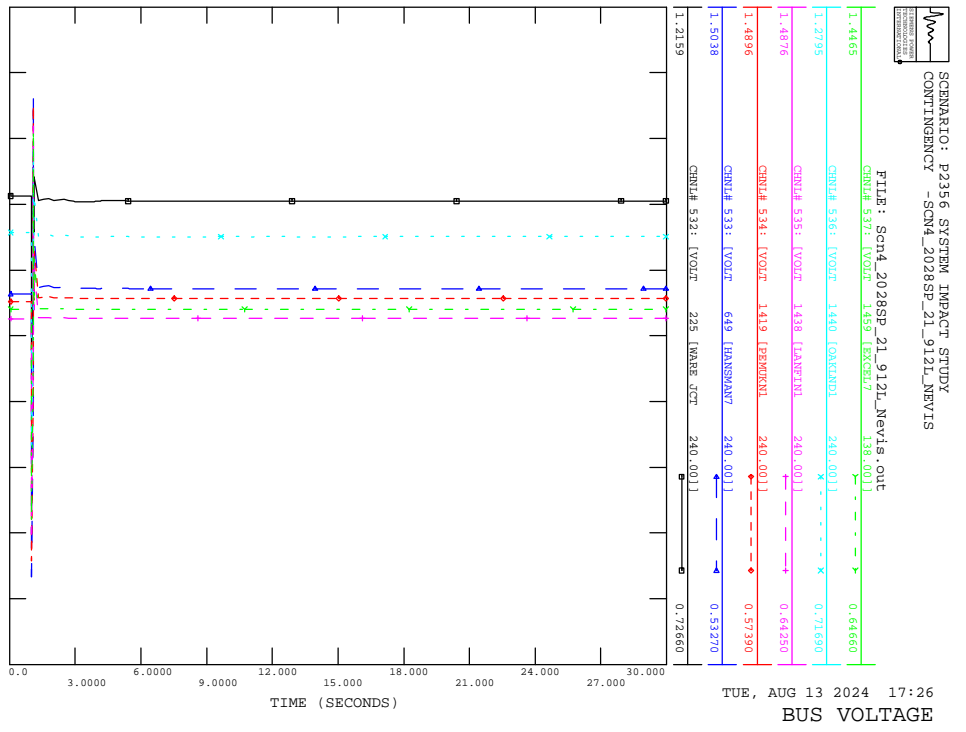
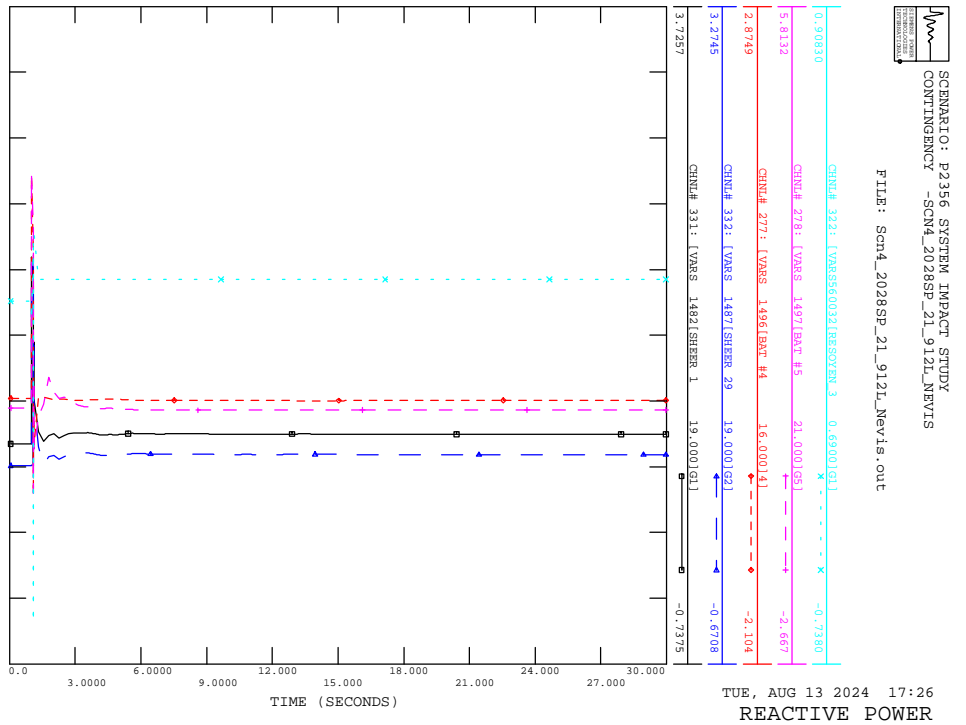
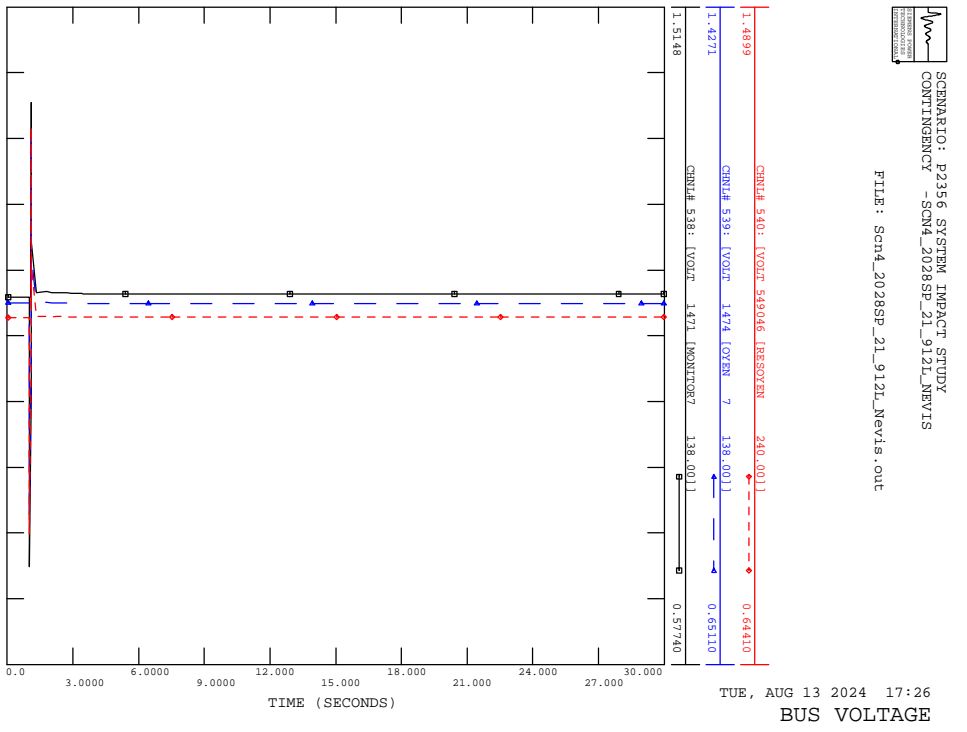
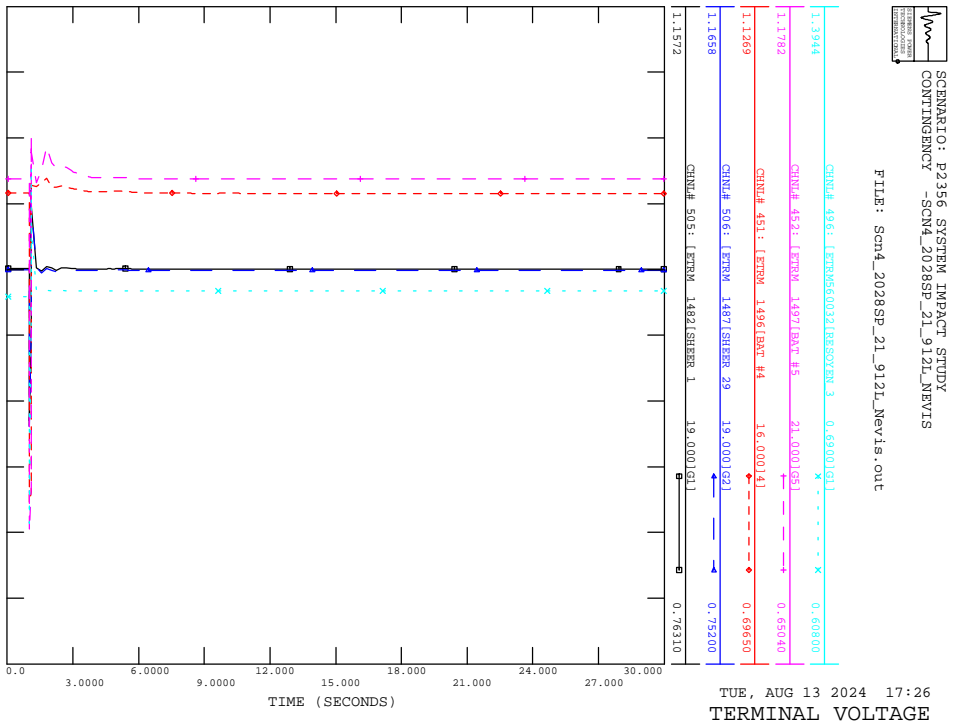


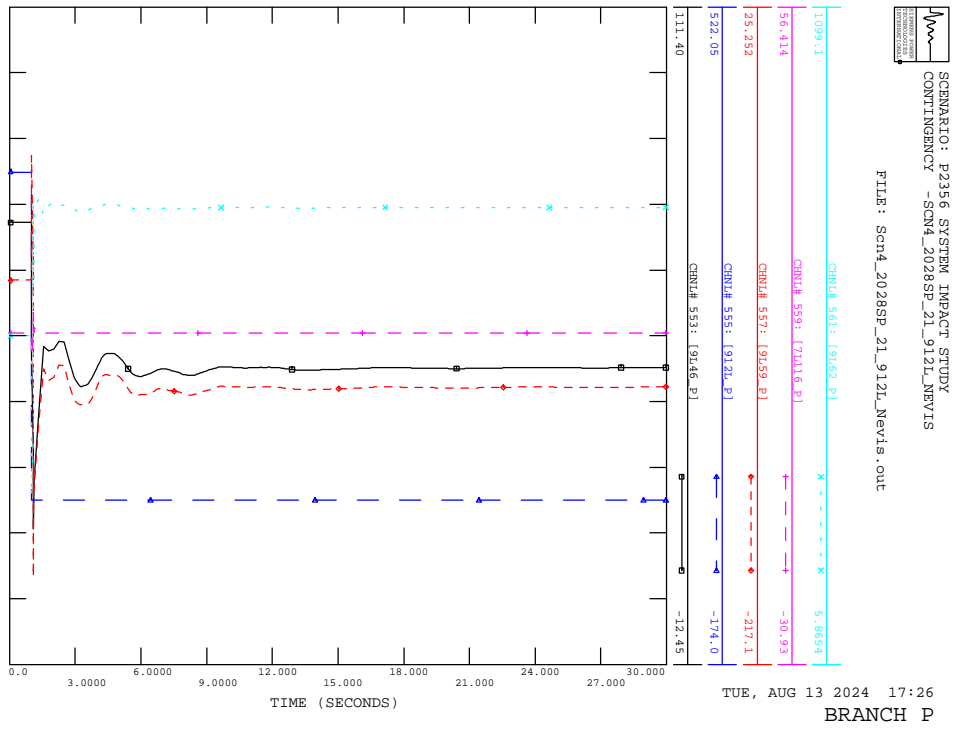
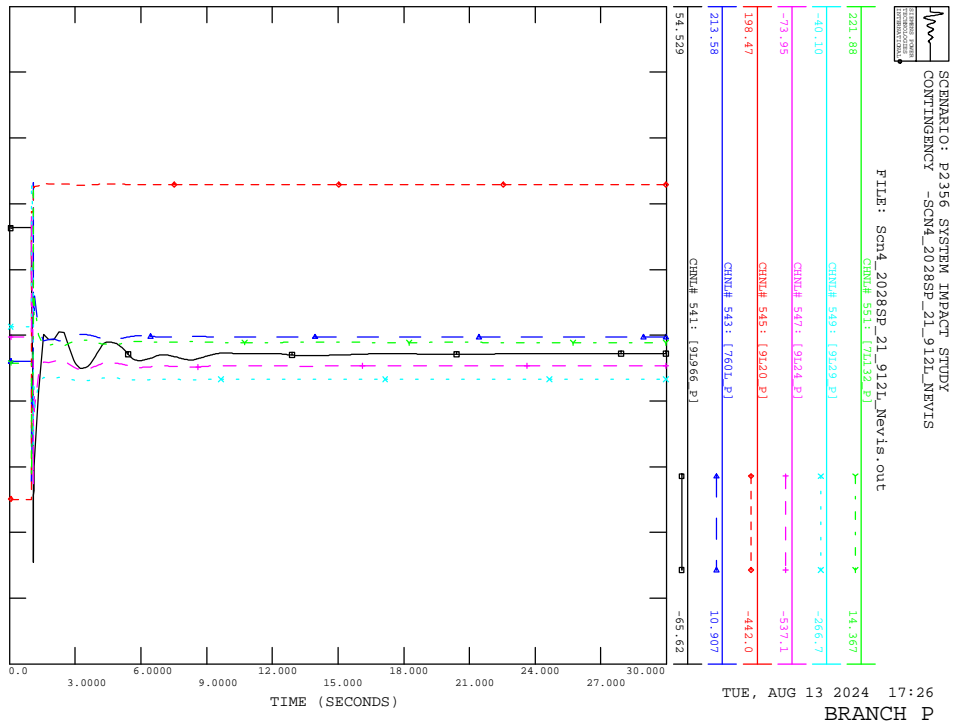
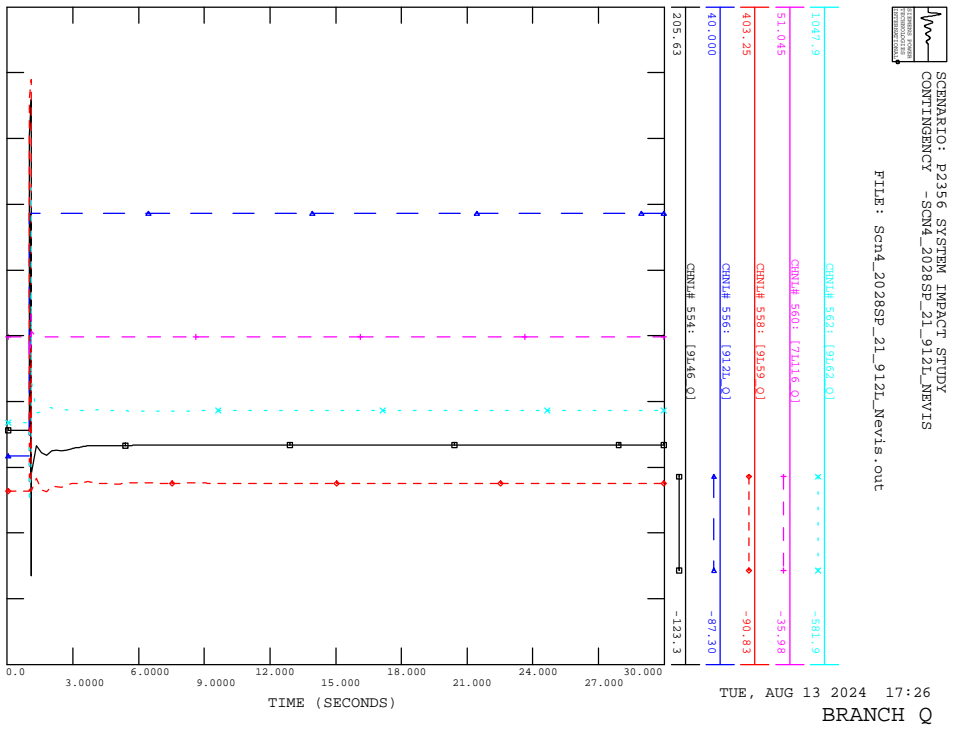
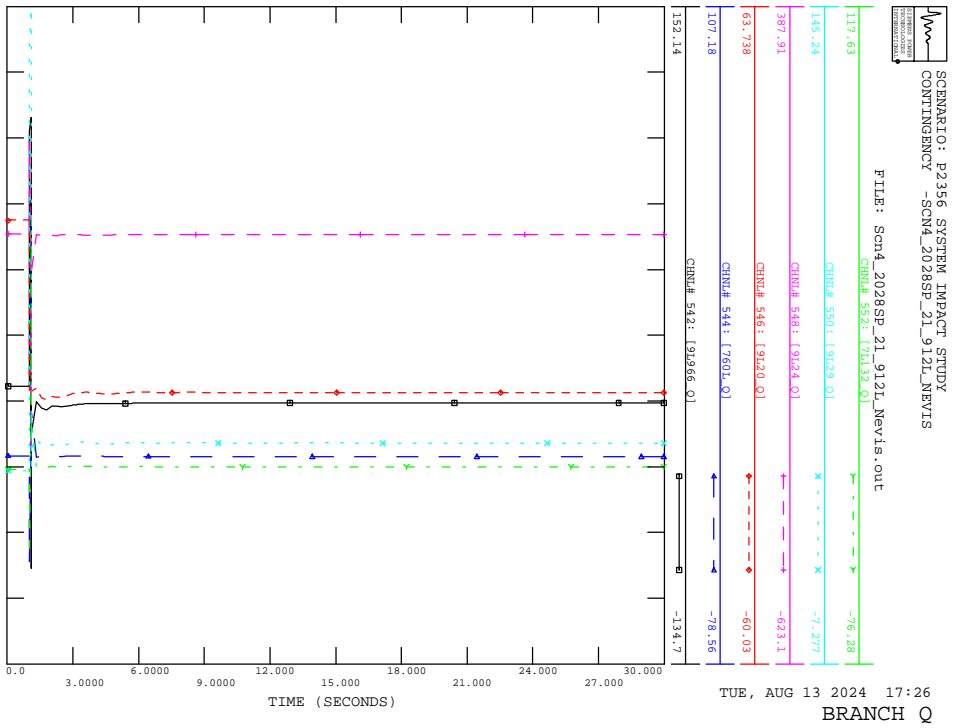






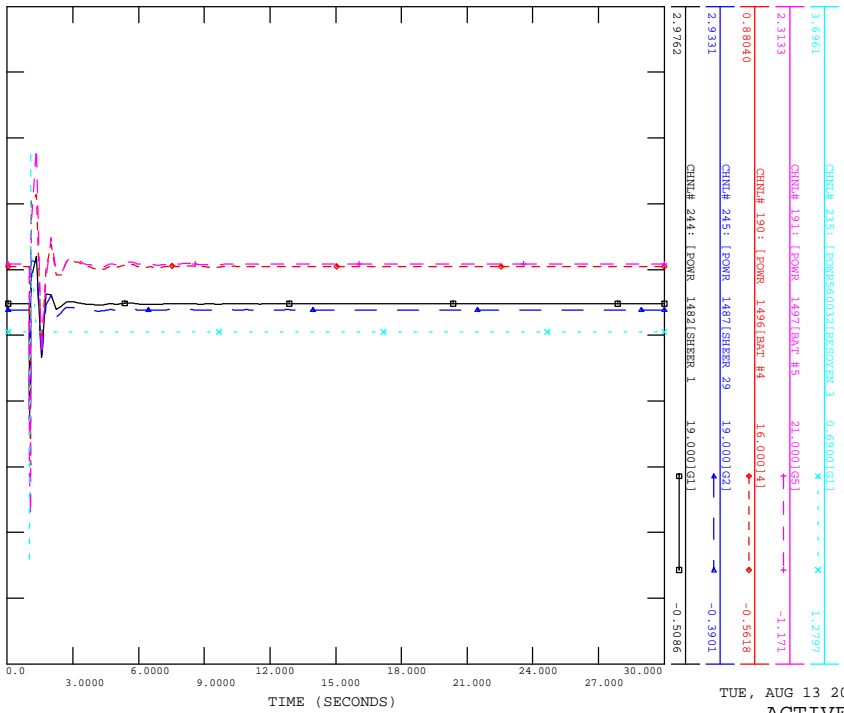






SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

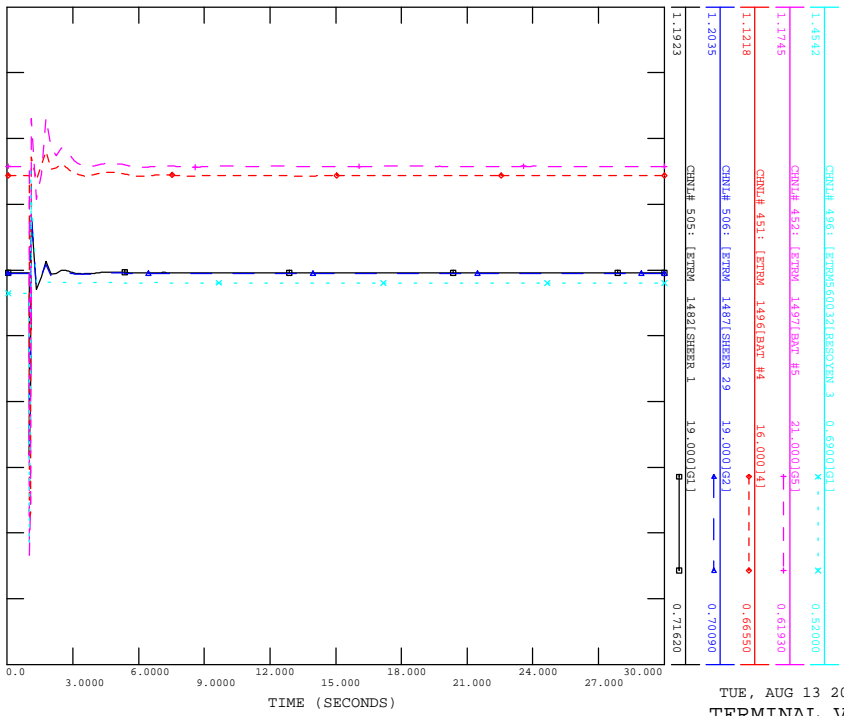
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

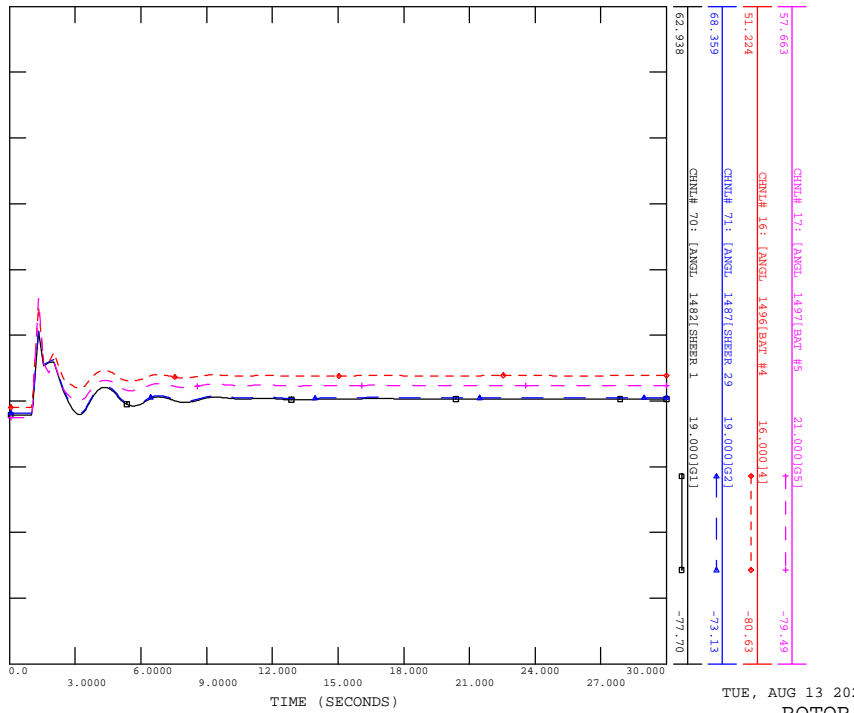
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
TERMINAL VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

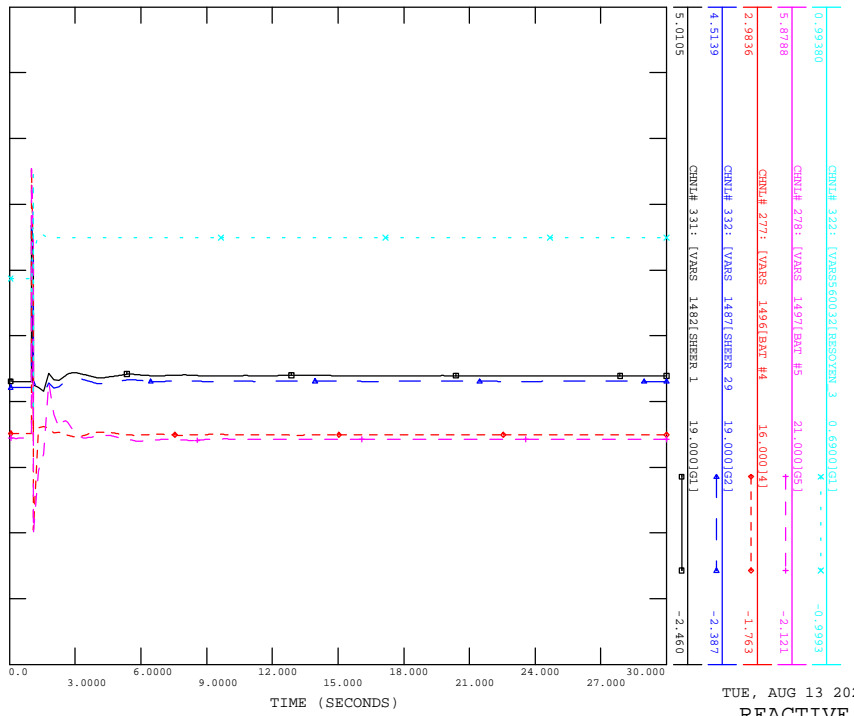
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
ROTOR ANGLE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

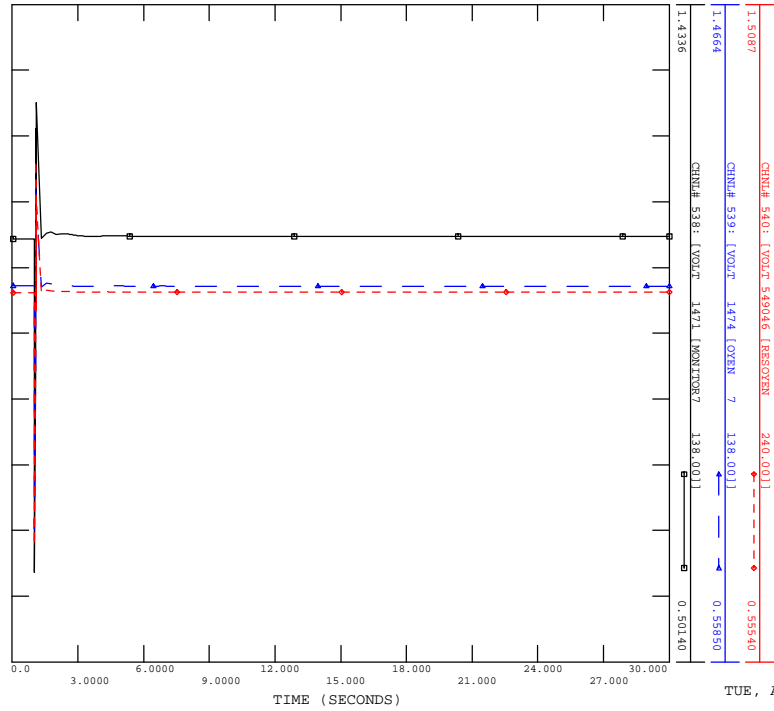
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
REACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

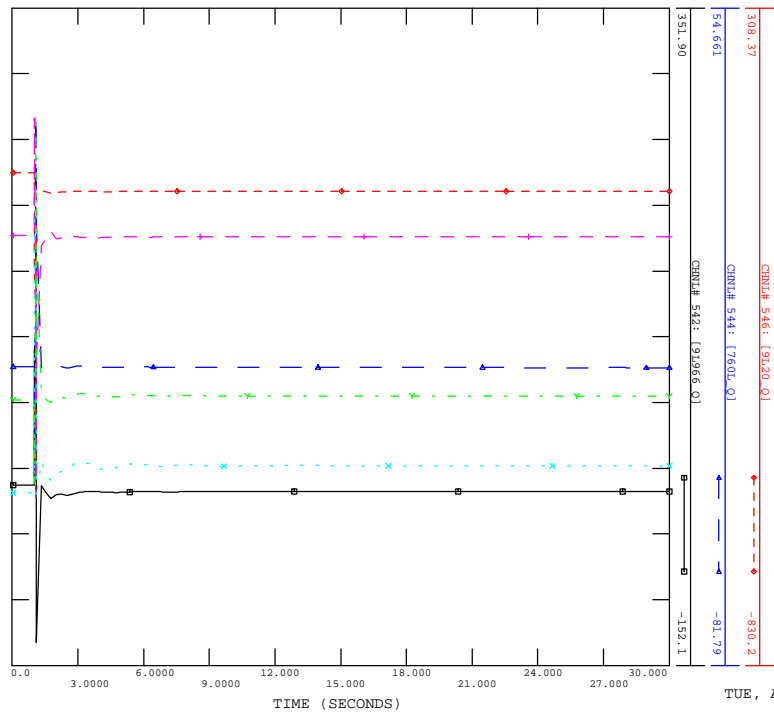
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
BUS VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

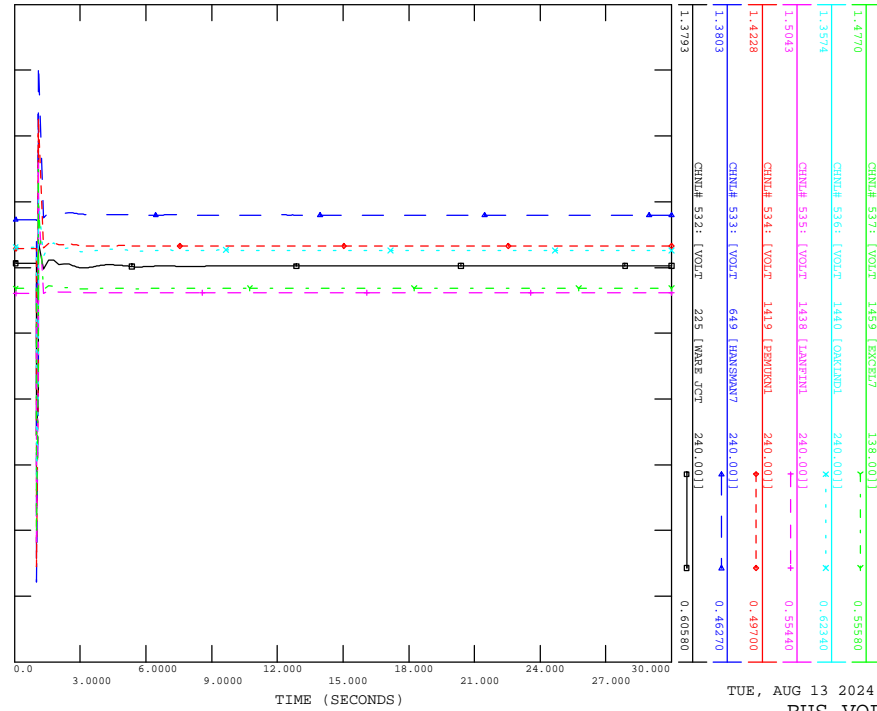
FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



TUE, AUG 13 2024 17:26  
BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

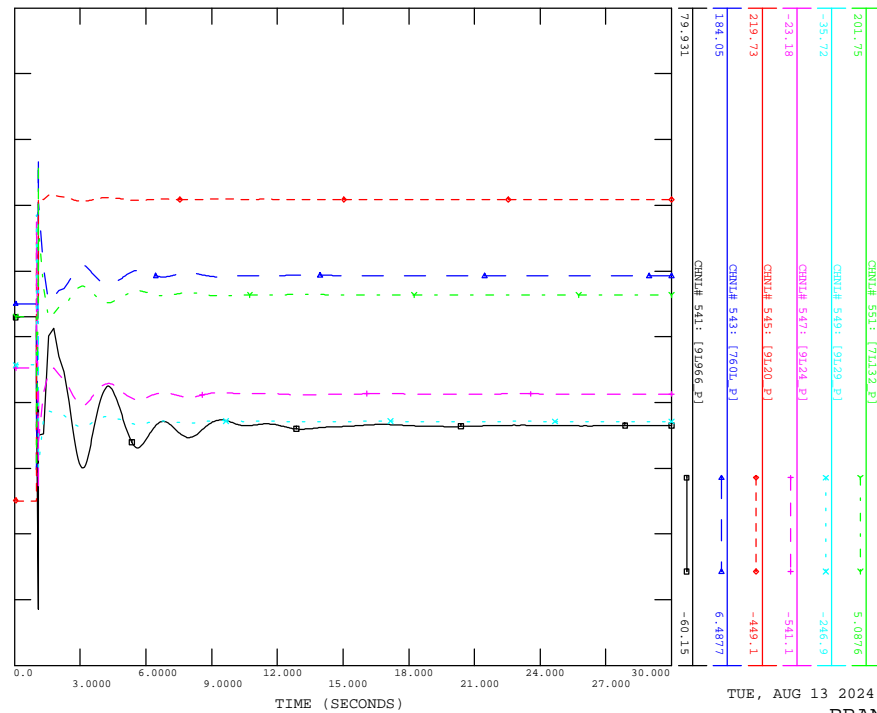
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TUE, AUG 13 2024 17:26  
BUS VOLTAGE

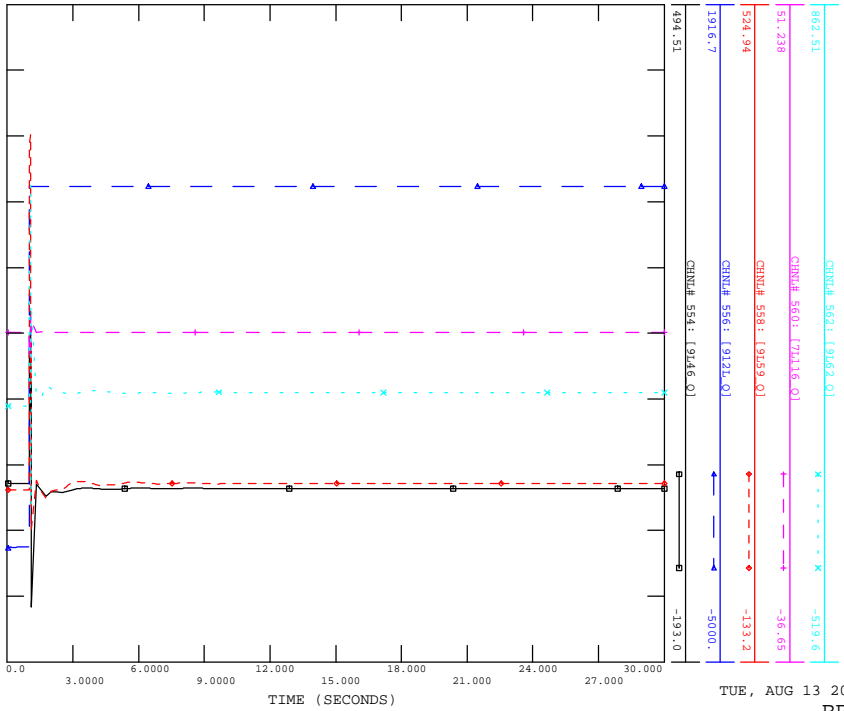
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER

FILE: Scn4\_2028SP\_22\_912L\_RedDeer.out



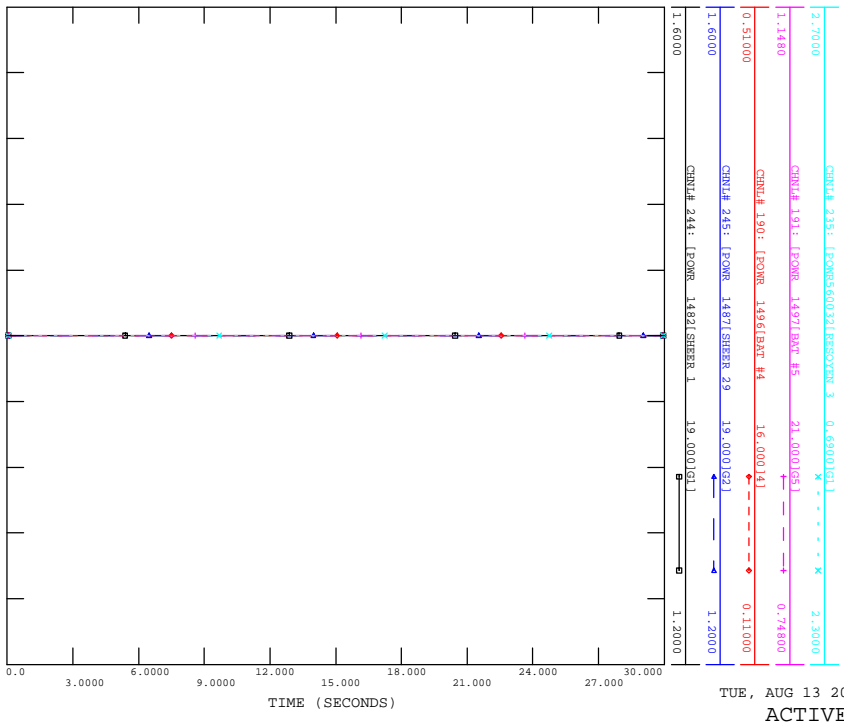
TUE, AUG 13 2024 17:26  
BRANCH P

SCENARIO: P2356 SYSTEM IMPACT STUDY  
 CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER  
 FILE: scn4\_2028SP\_22\_912L\_RedDeer.out



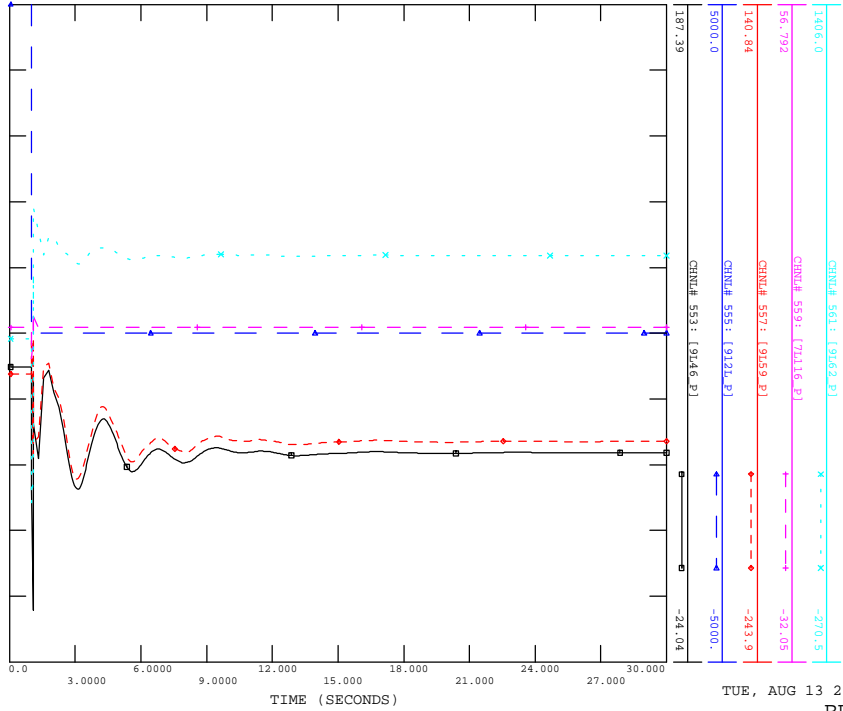
TUE, AUG 13 2024 17:26  
 BRANCH Q

SCENARIO: P2356 SYSTEM IMPACT STUDY  
 CONTINGENCY -SCN5\_2028SL\_00\_NOFAULT  
 FILE: scn5\_2028SL\_00\_noFault.out



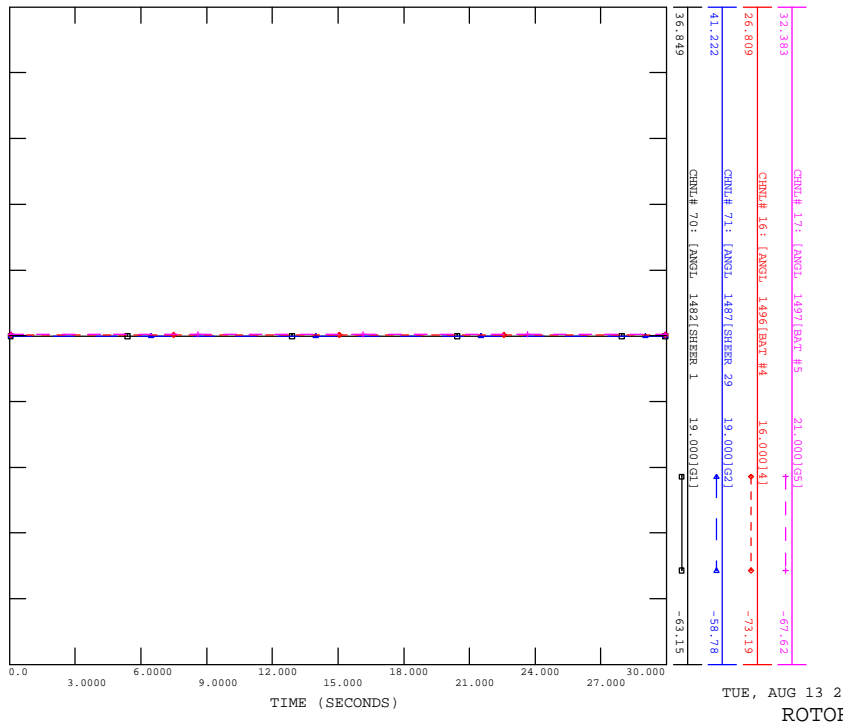
TUE, AUG 13 2024 17:26  
 ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
 CONTINGENCY -SCN4\_2028SP\_22\_912L\_REDDER  
 FILE: scn4\_2028SP\_22\_912L\_RedDeer.out

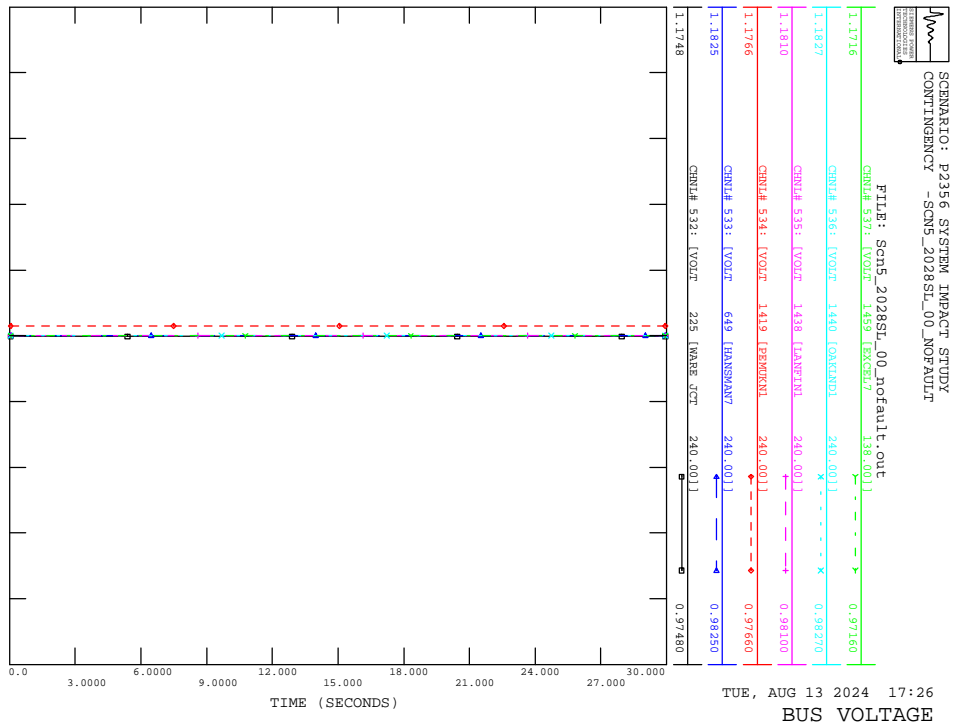
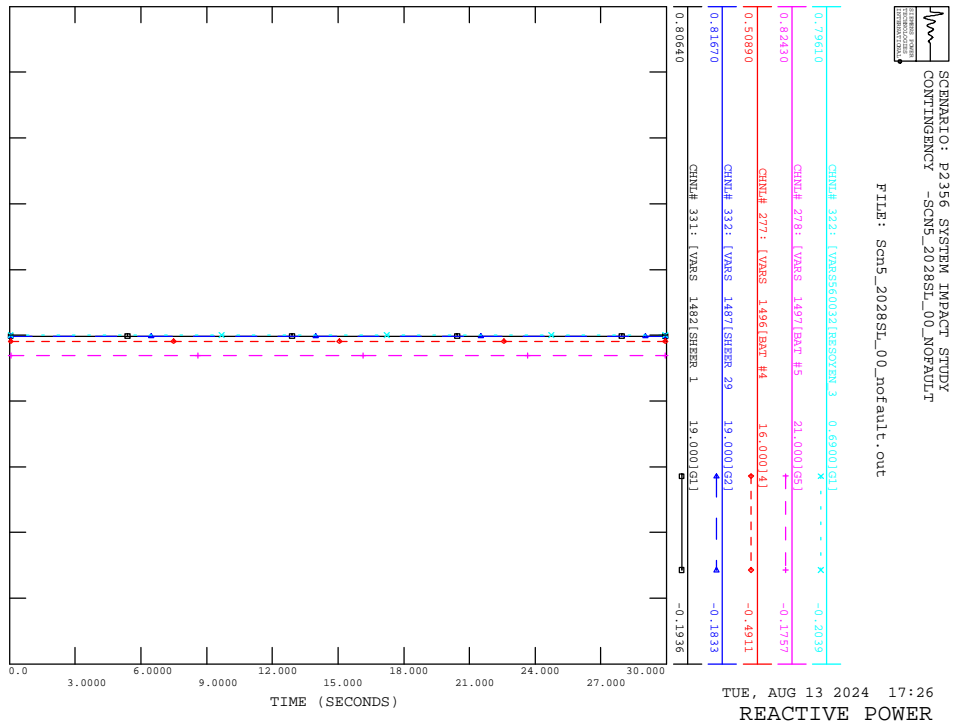
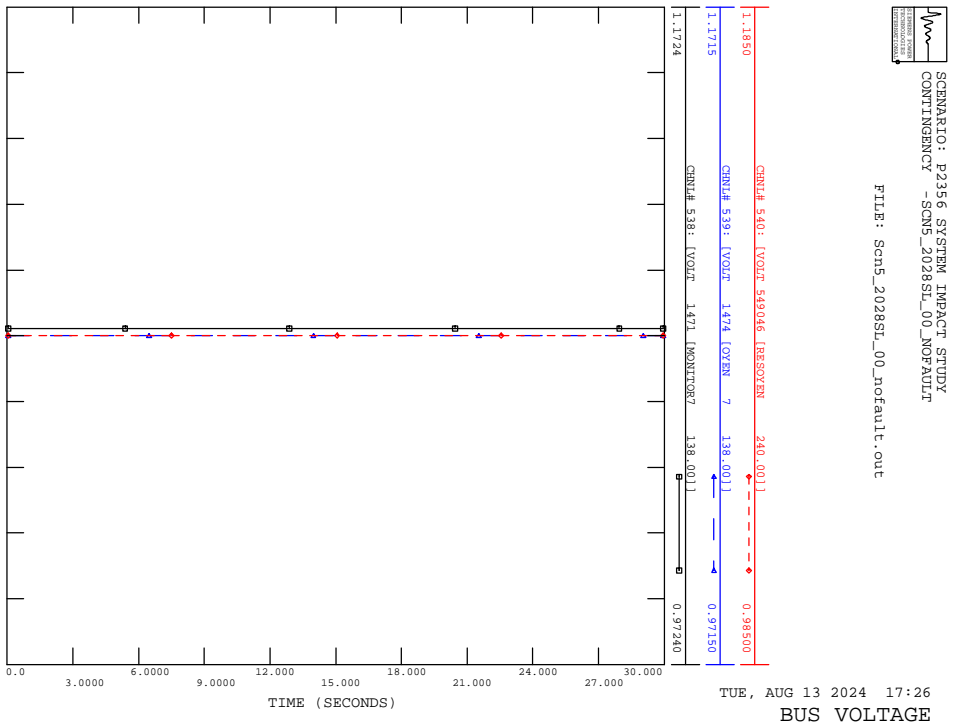
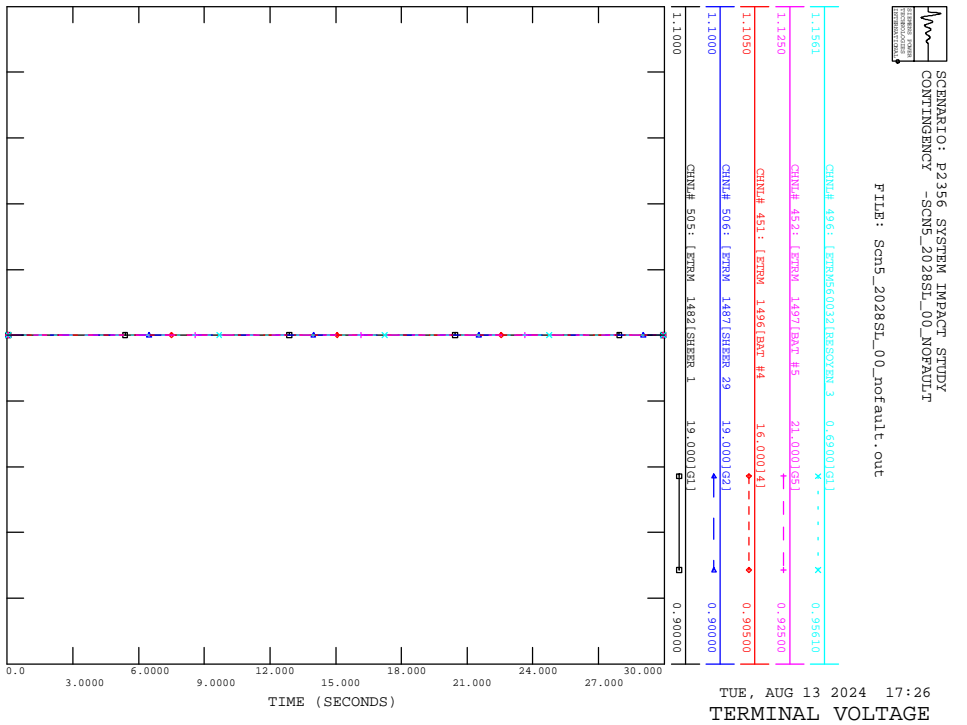


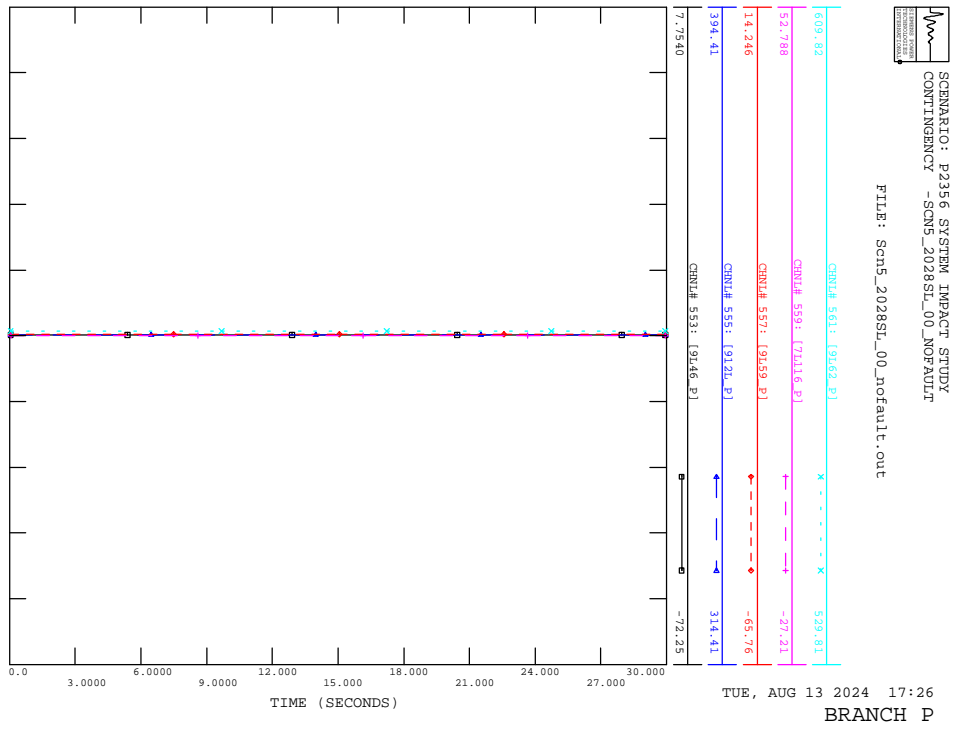
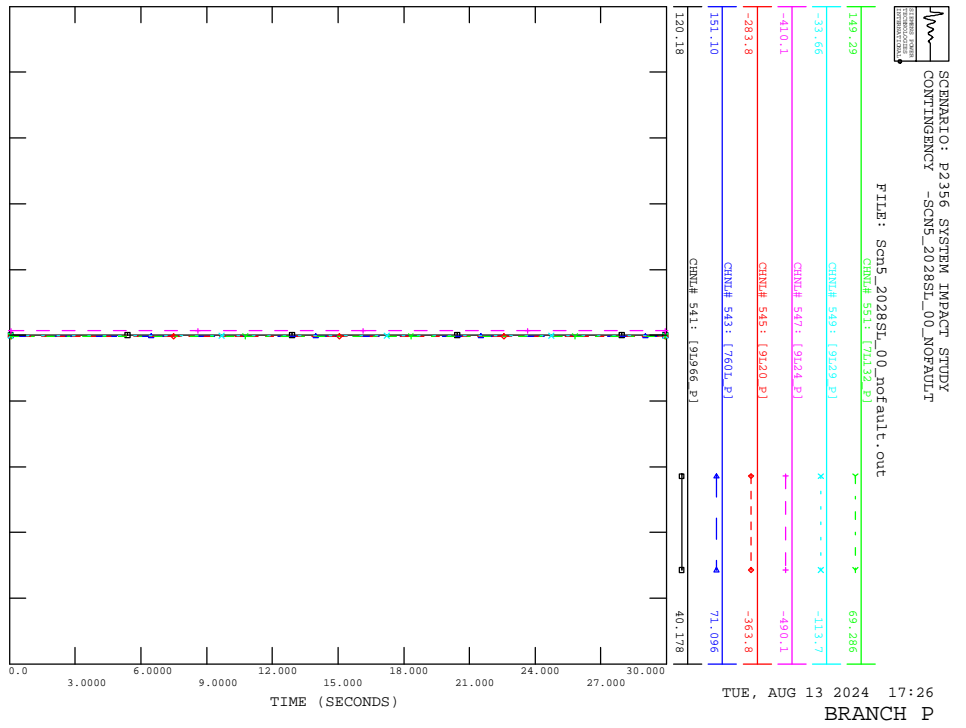
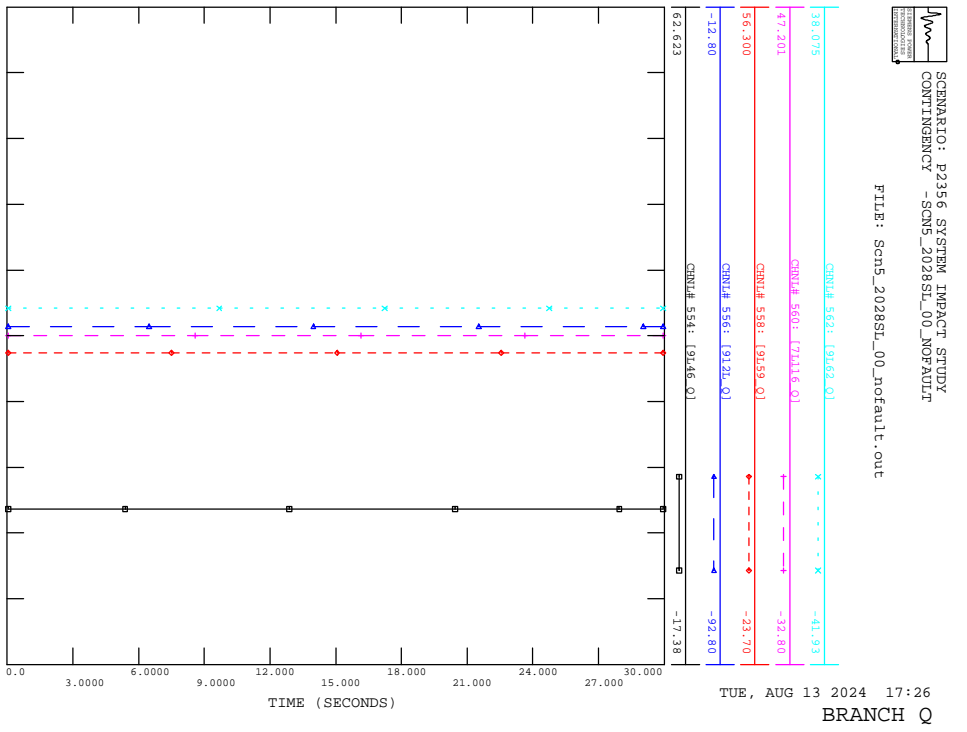
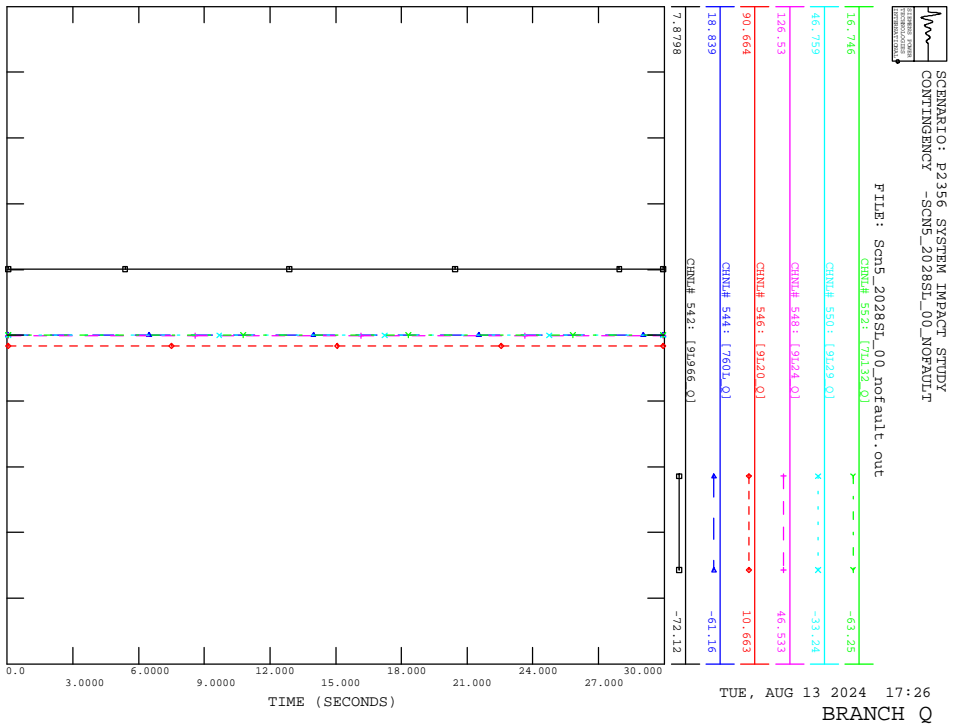
TUE, AUG 13 2024 17:26  
 BRANCH P

SCENARIO: P2356 SYSTEM IMPACT STUDY  
 CONTINGENCY -SCN5\_2028SL\_00\_NOFAULT  
 FILE: scn5\_2028SL\_00\_noFault.out



TUE, AUG 13 2024 17:26  
 ROTOR ANGLE

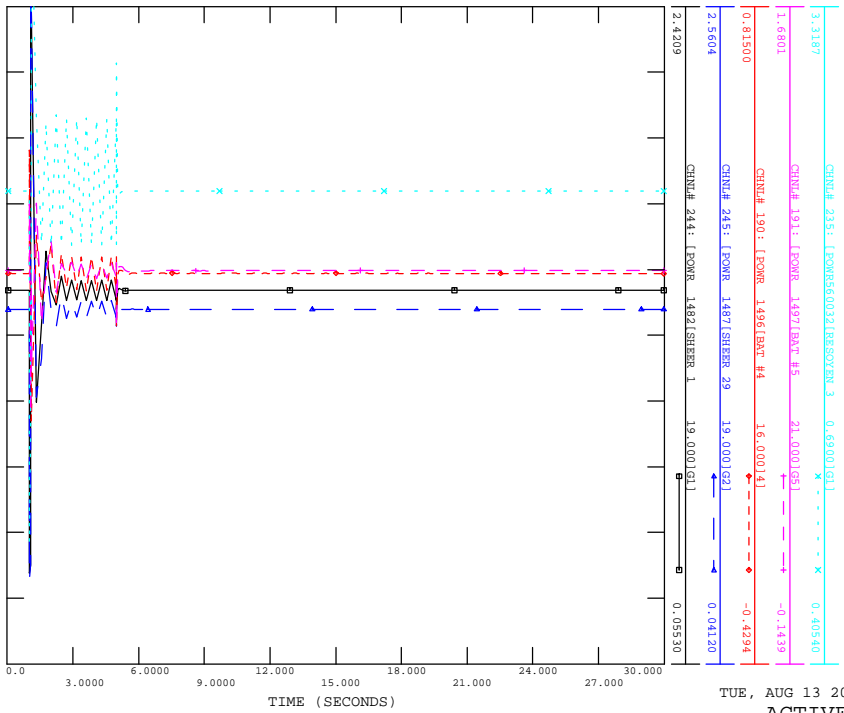






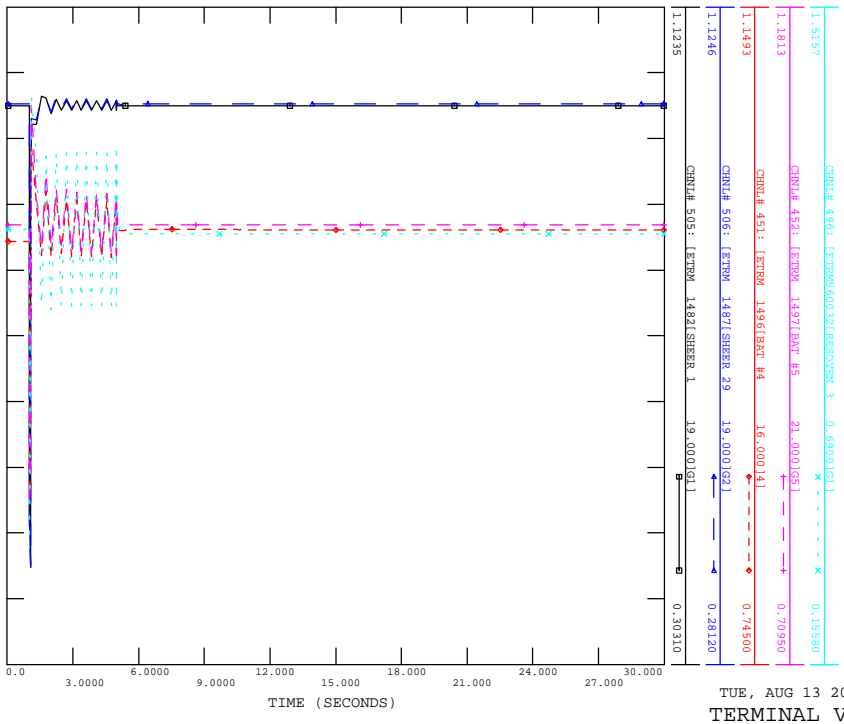
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_01\_9L24\_OAKLAND

FILE: scn5\_2028sl\_01\_9l24\_oakland.out



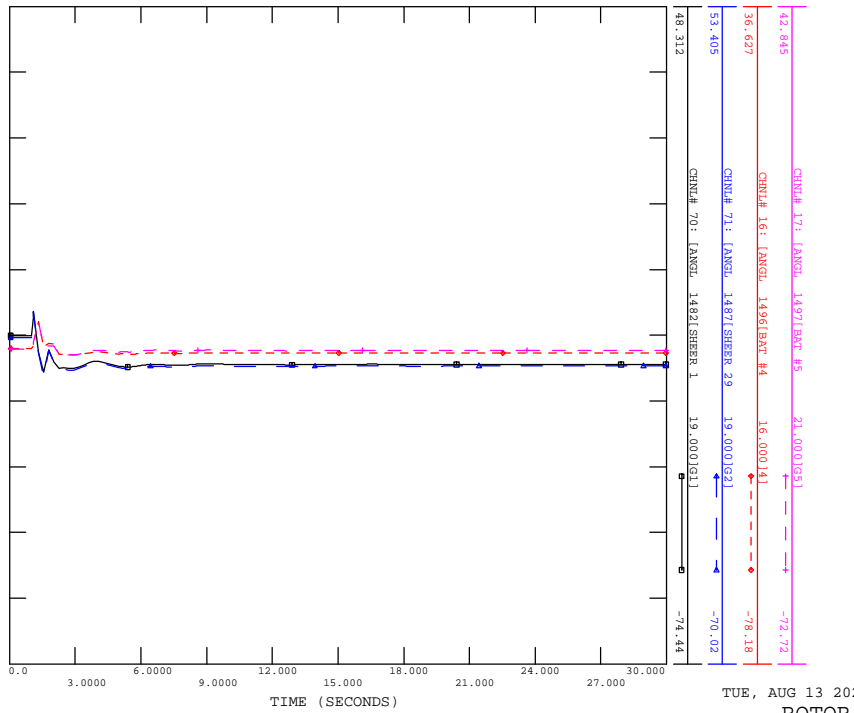
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_01\_9L24\_OAKLAND

FILE: scn5\_2028sl\_01\_9l24\_oakland.out



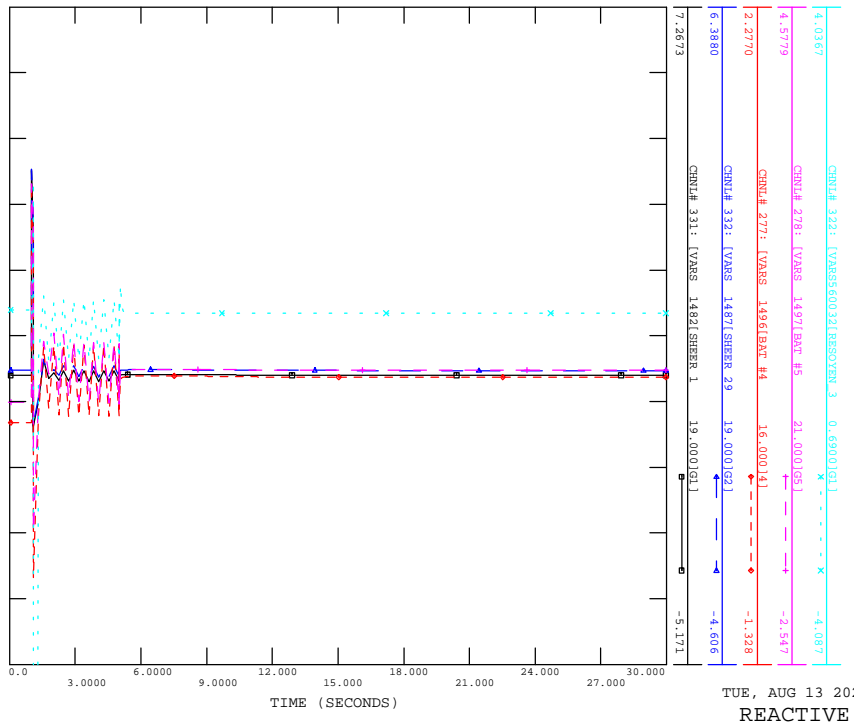
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CONTINGENCY -SCN5\_2028SL\_01\_9L24\_OAKLAND

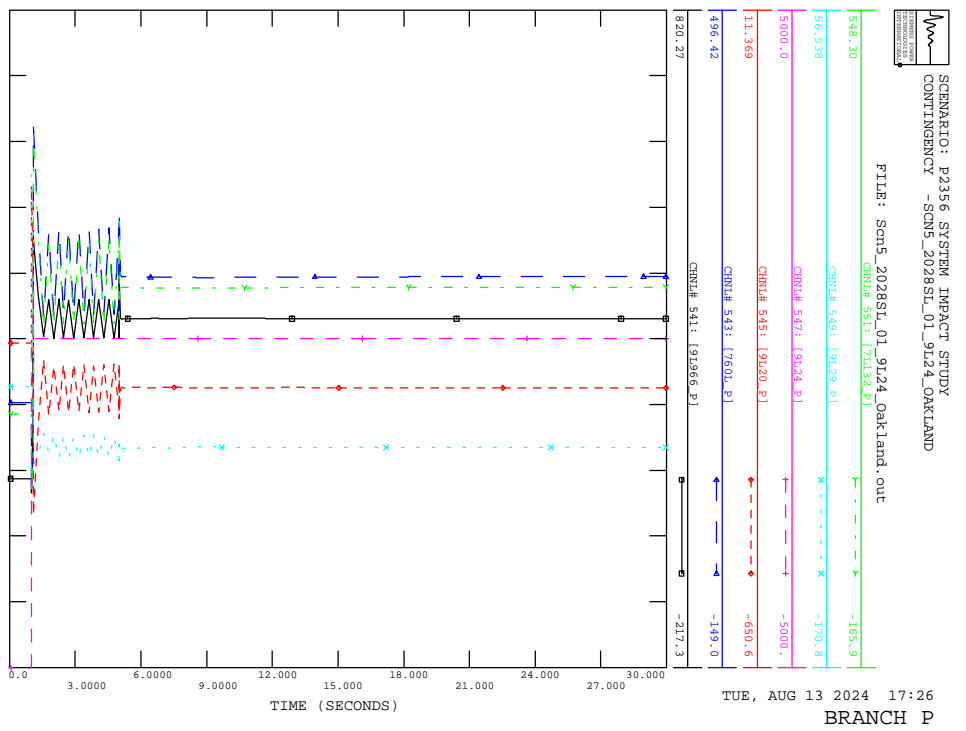
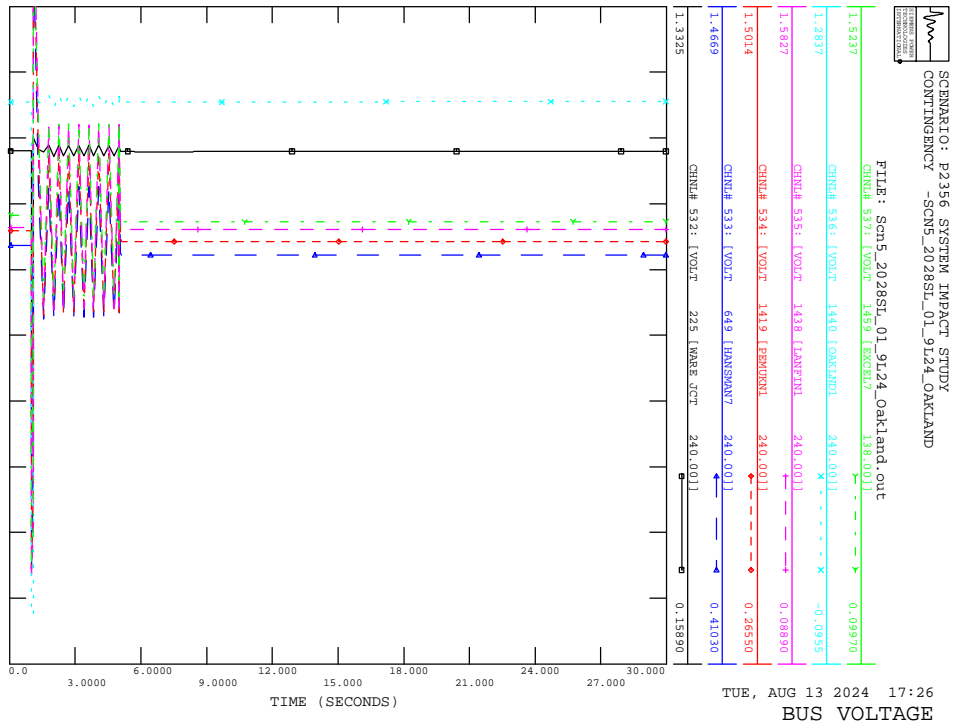
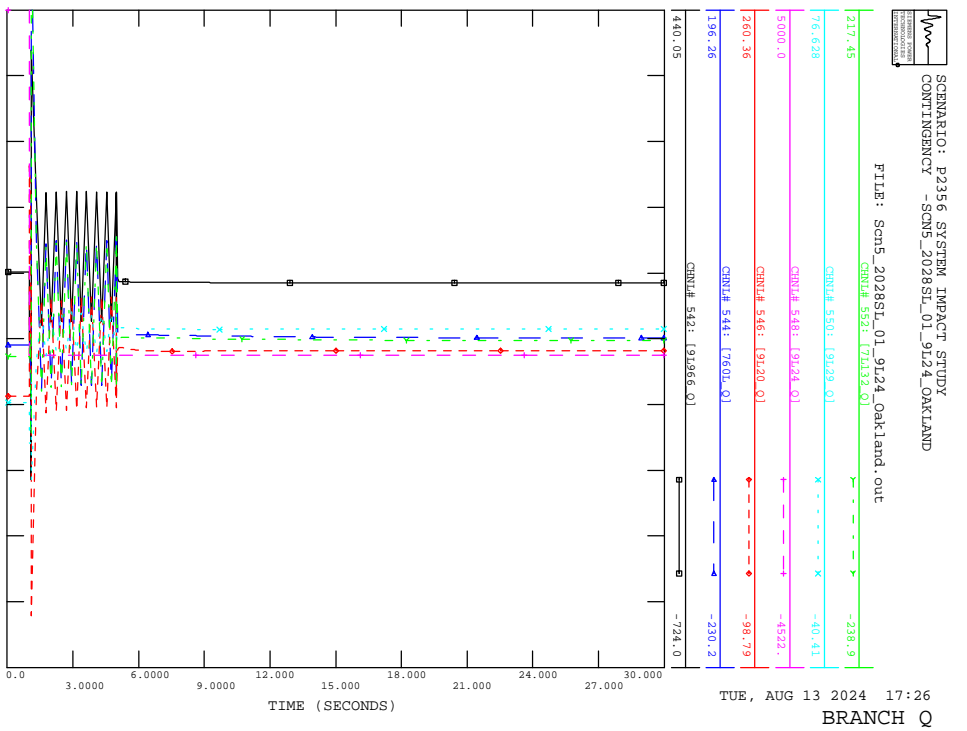
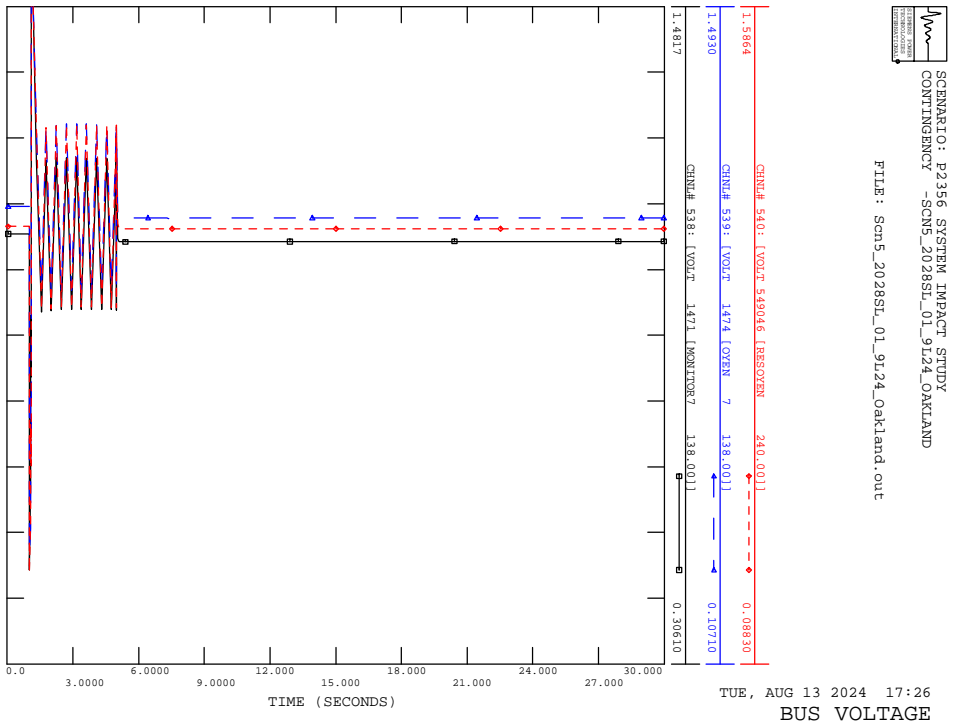
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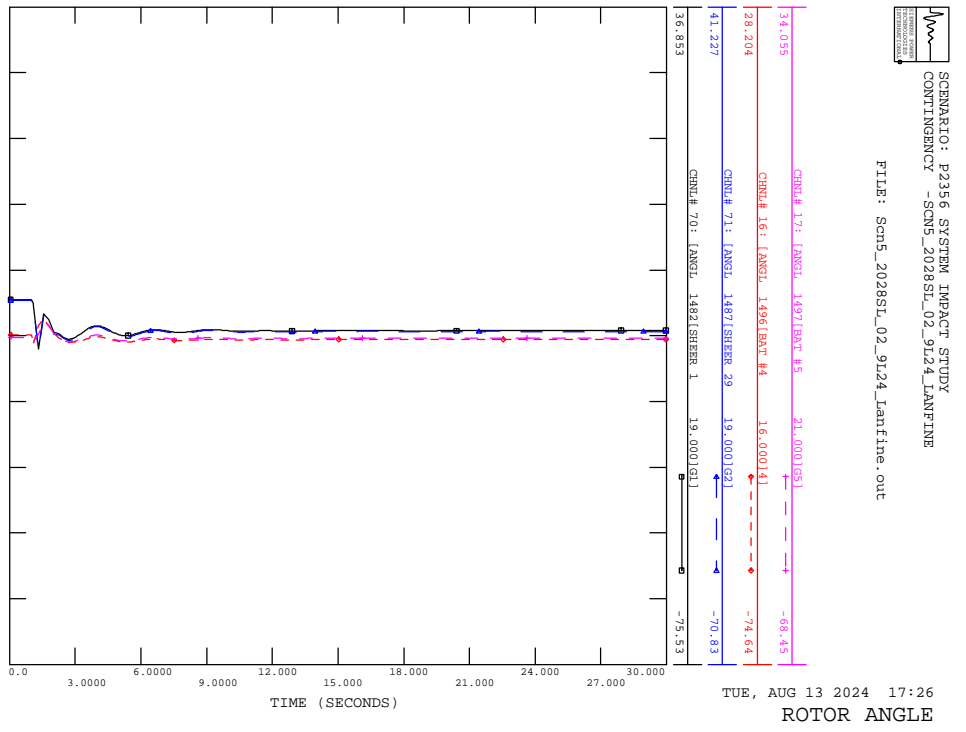
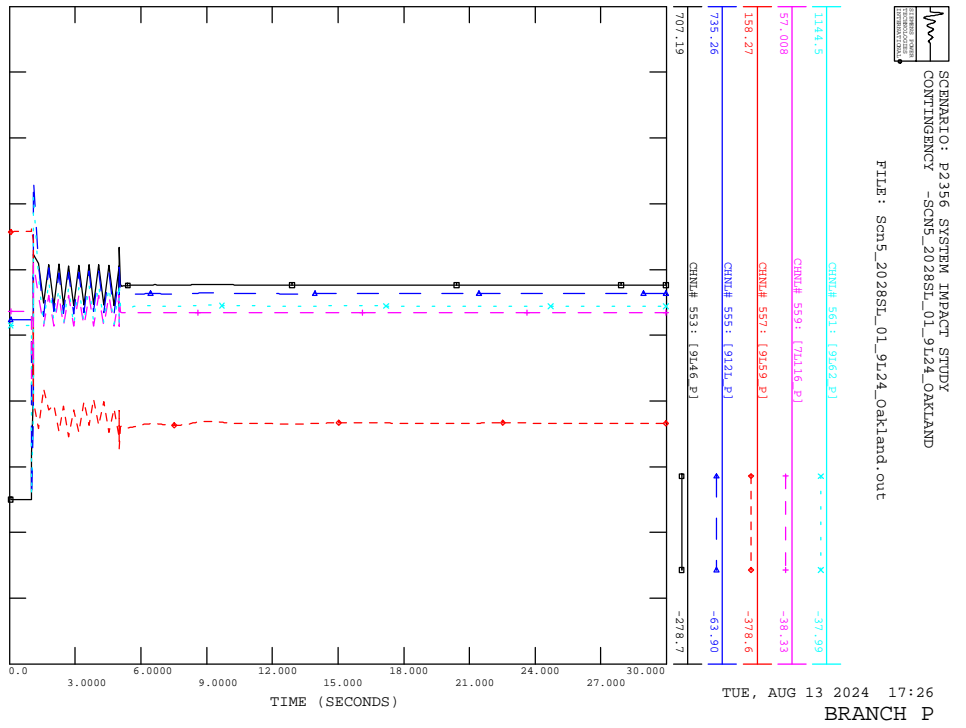
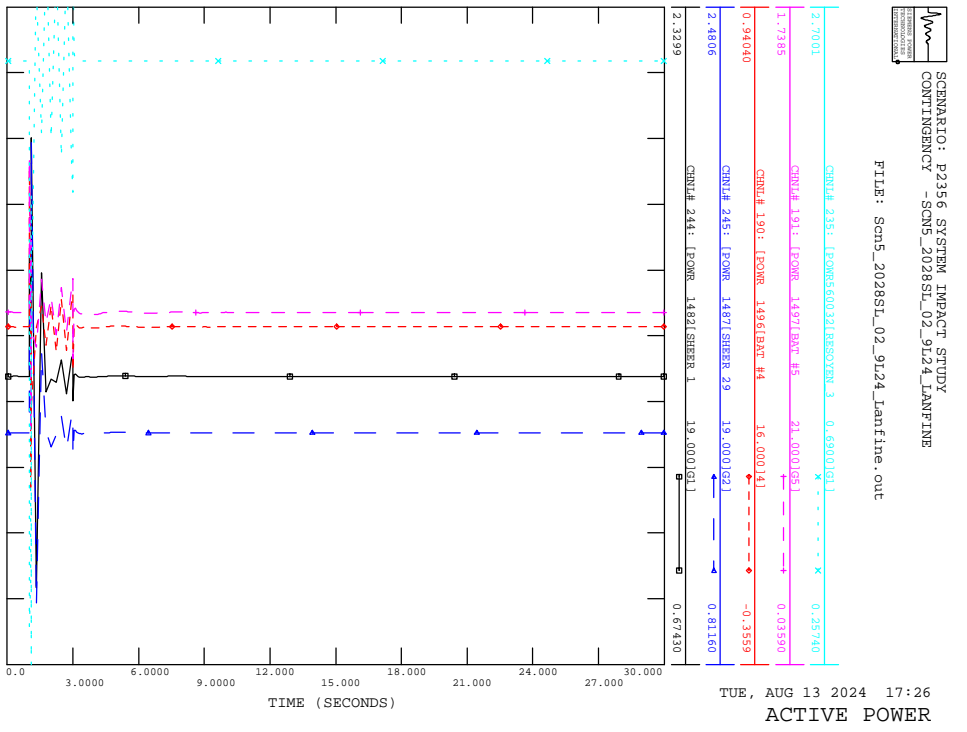
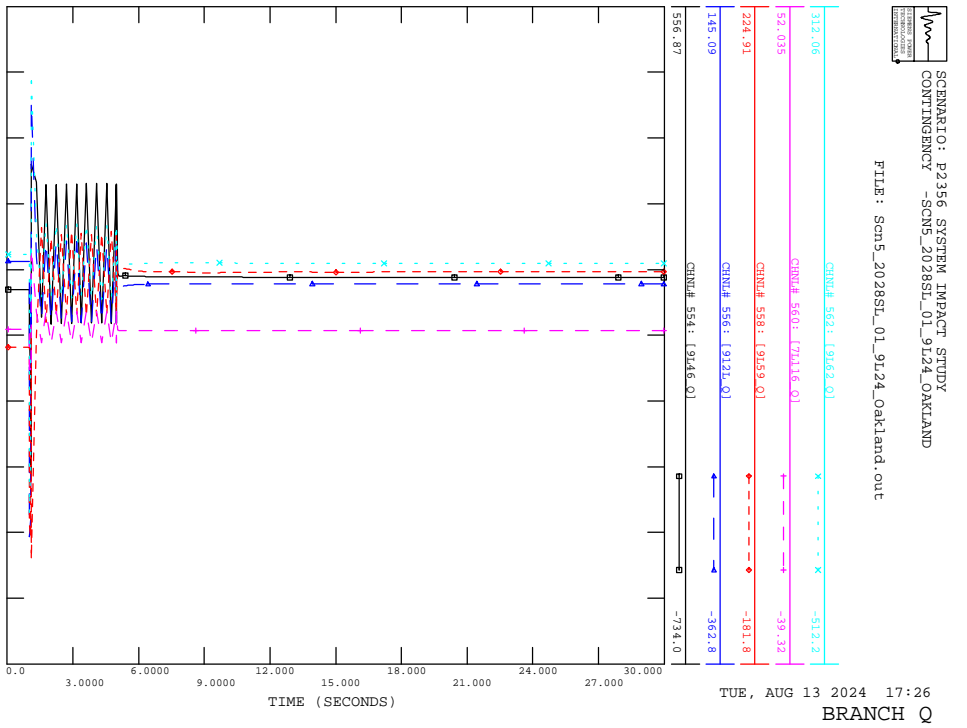


SCENARIO: P2356 SYSTEM IMPACT STUDY  
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FILE: scn5\_2028sl\_01\_9l24\_oakland.out

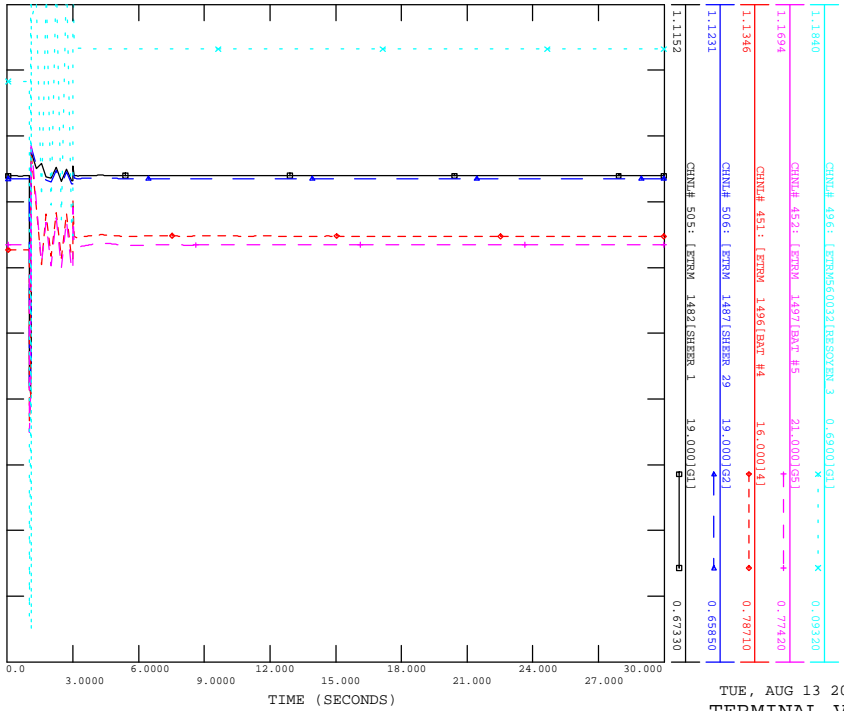






SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_02\_9L24\_LANFLINE

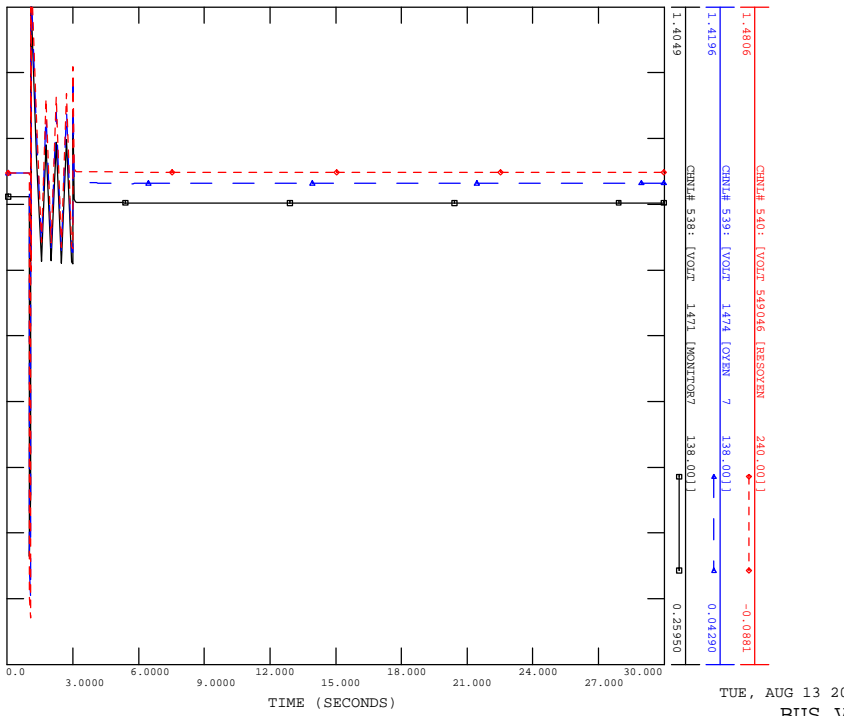
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TUE, AUG 13 2024 17:26  
TERMINAL VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_02\_9L24\_LANFLINE

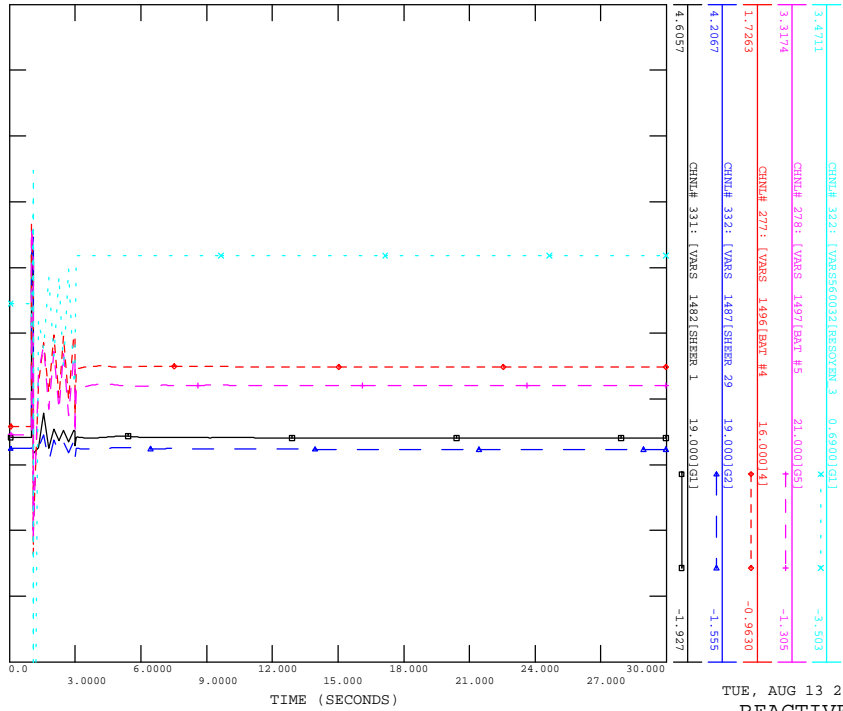
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TUE, AUG 13 2024 17:26  
BUS VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_02\_9L24\_LANFLINE

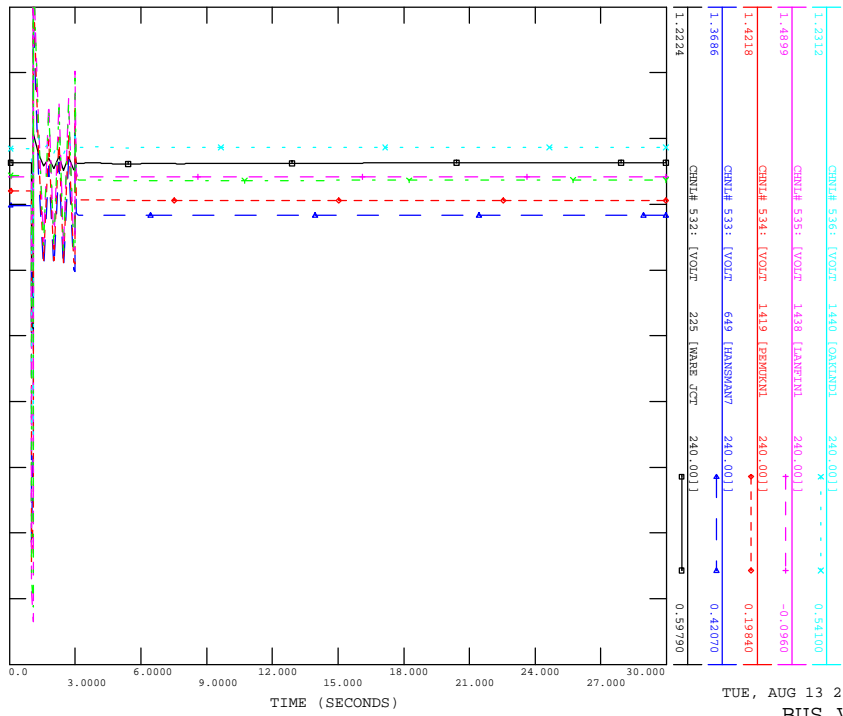
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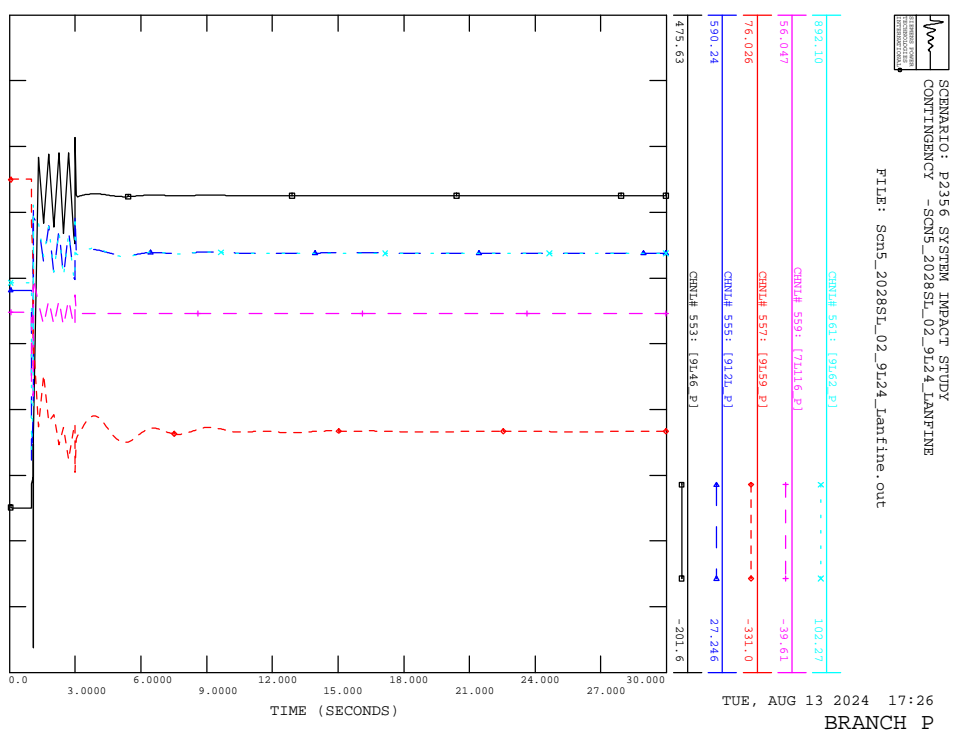
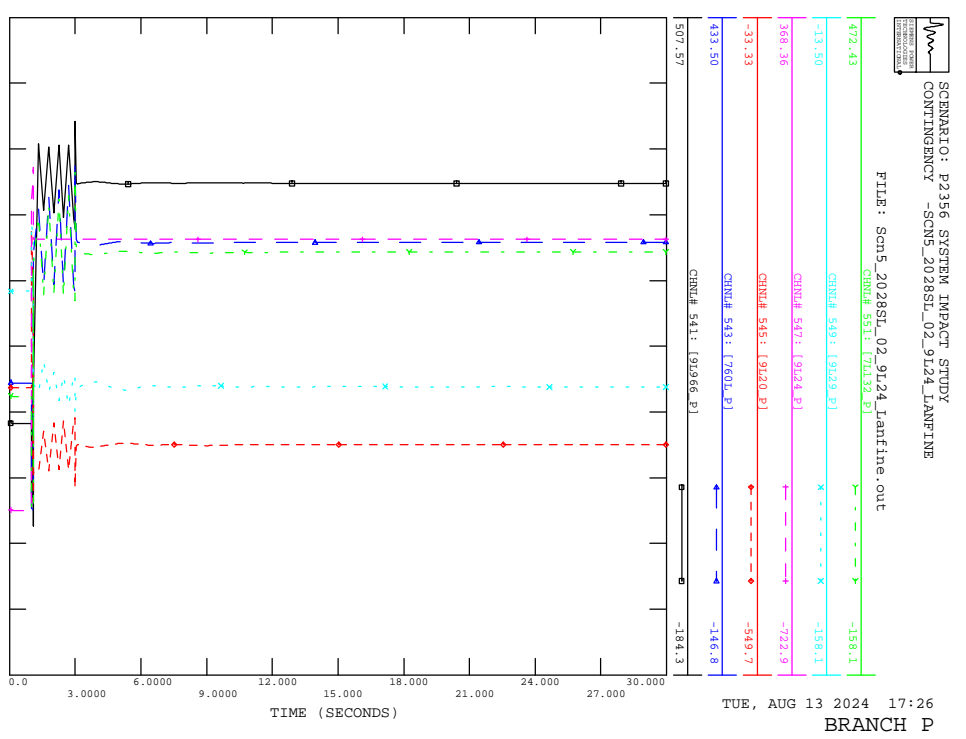
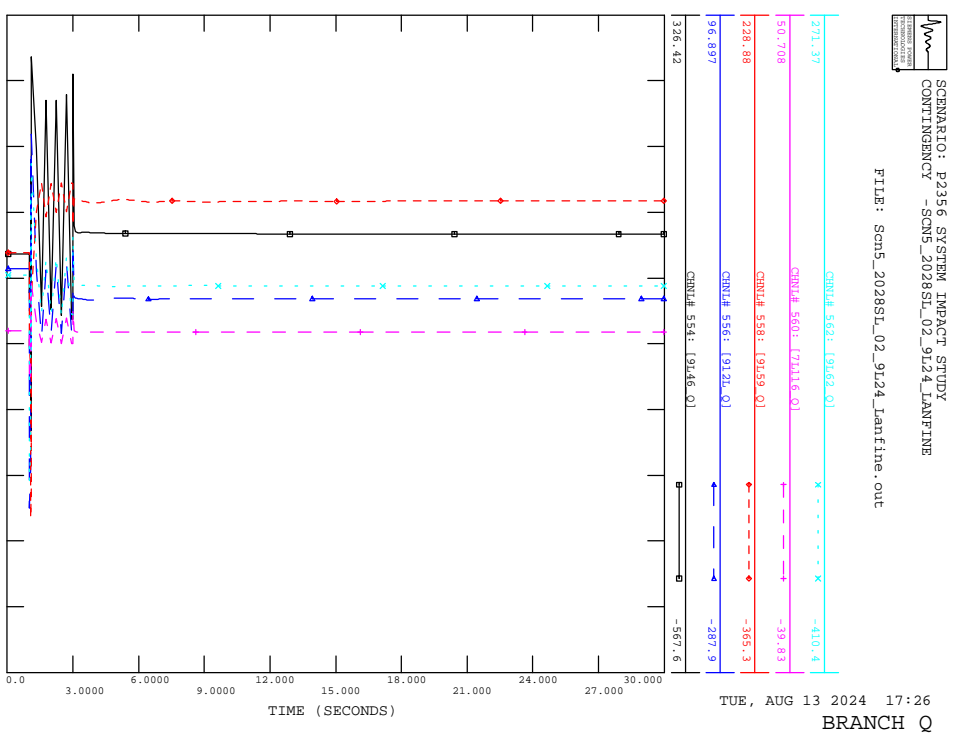
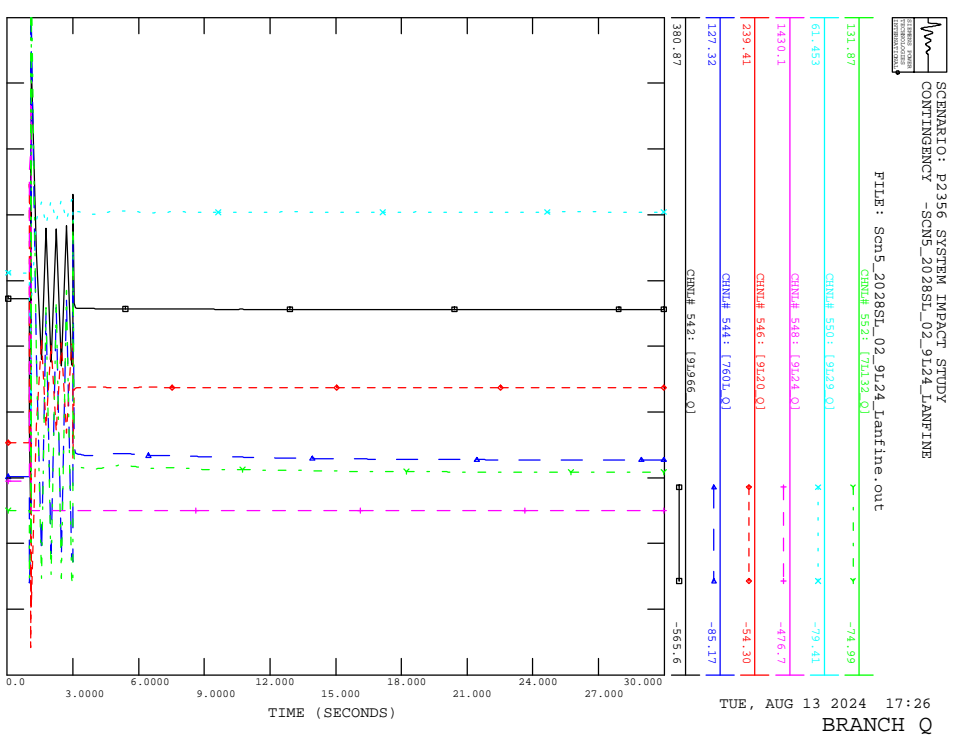
TUE, AUG 13 2024 17:26  
REACTIVE POWER

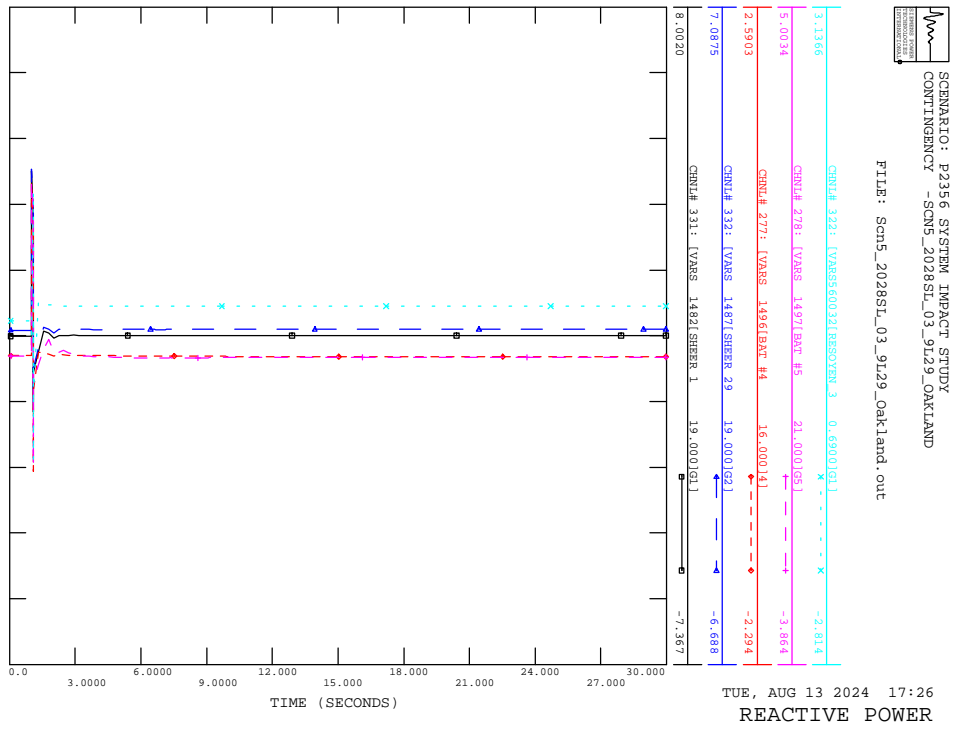
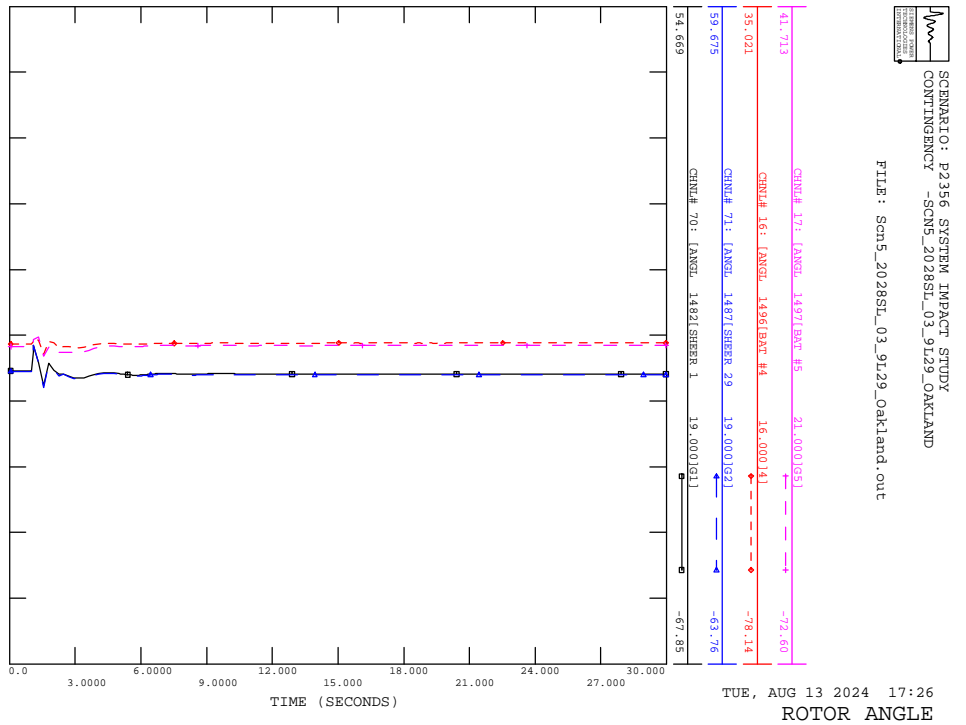
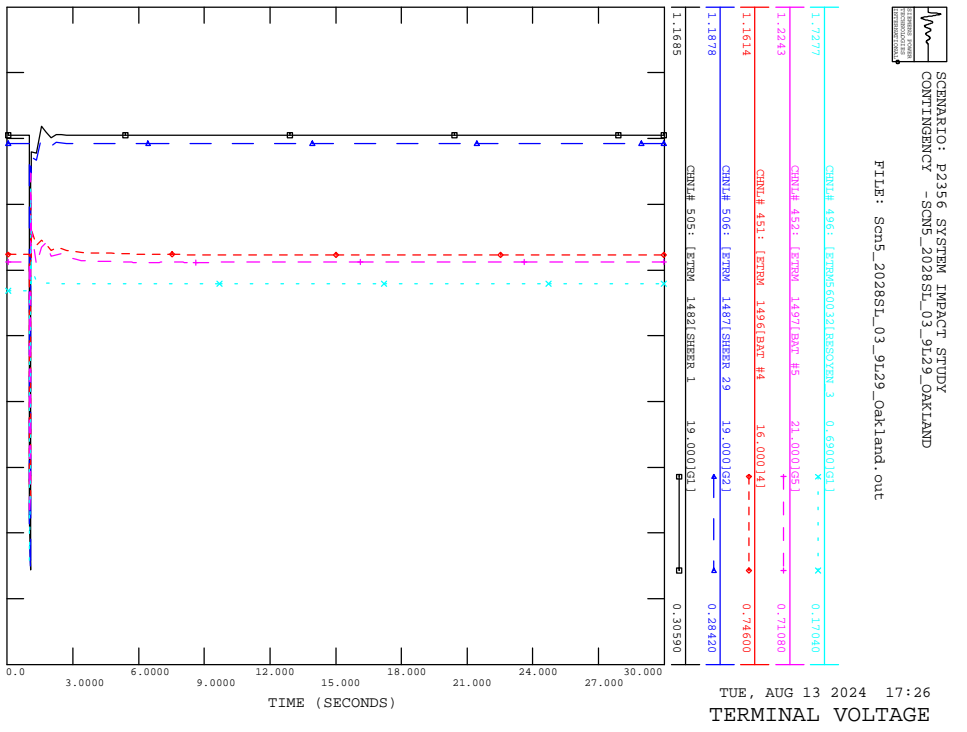
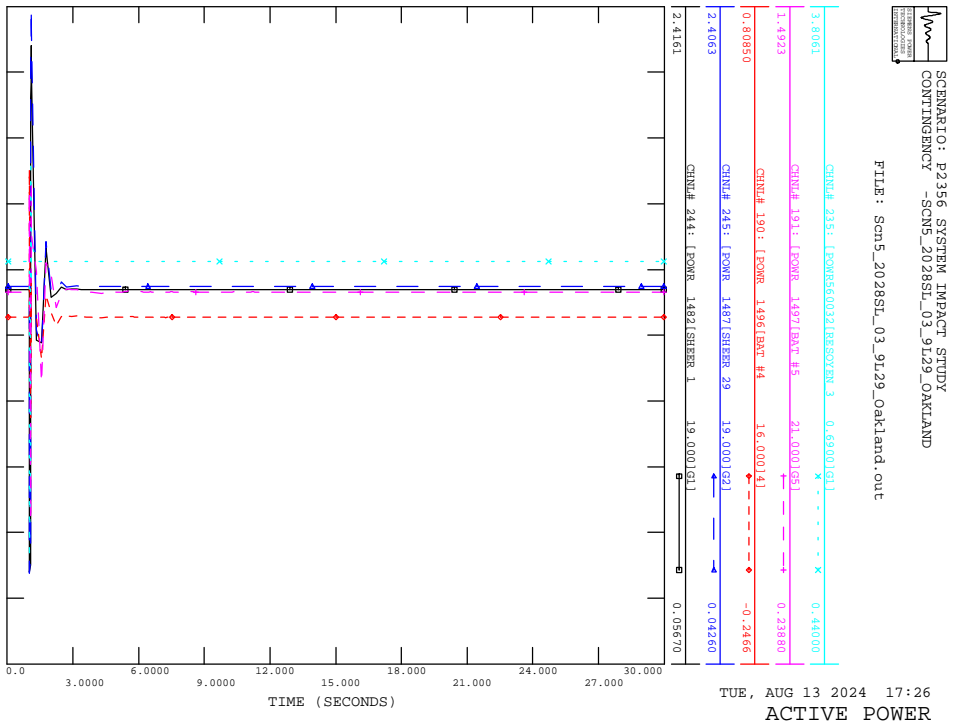
SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_02\_9L24\_LANFLINE

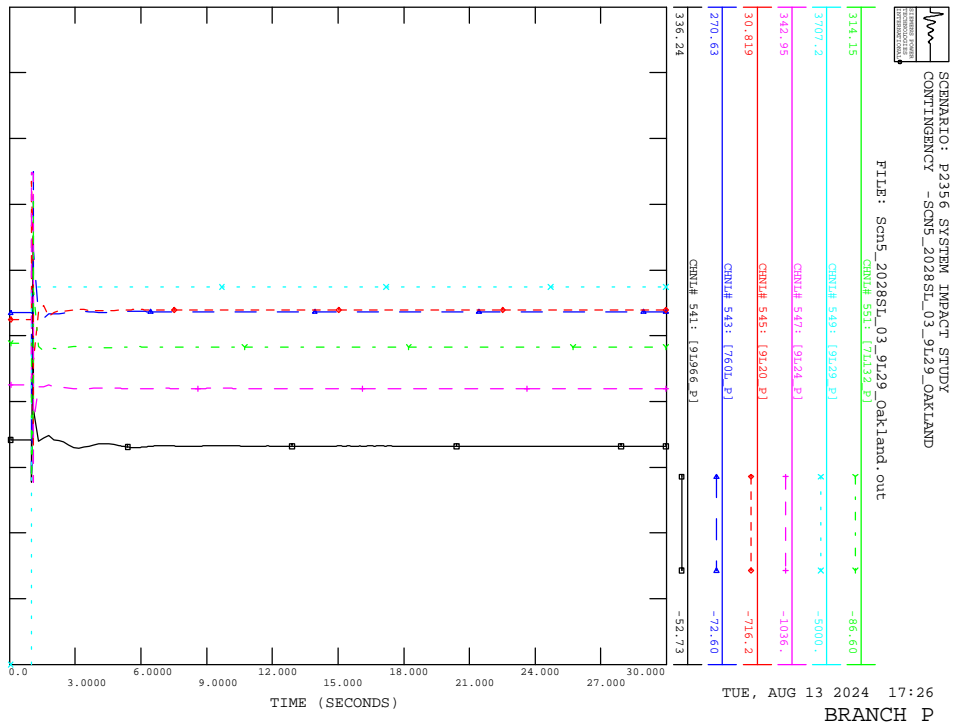
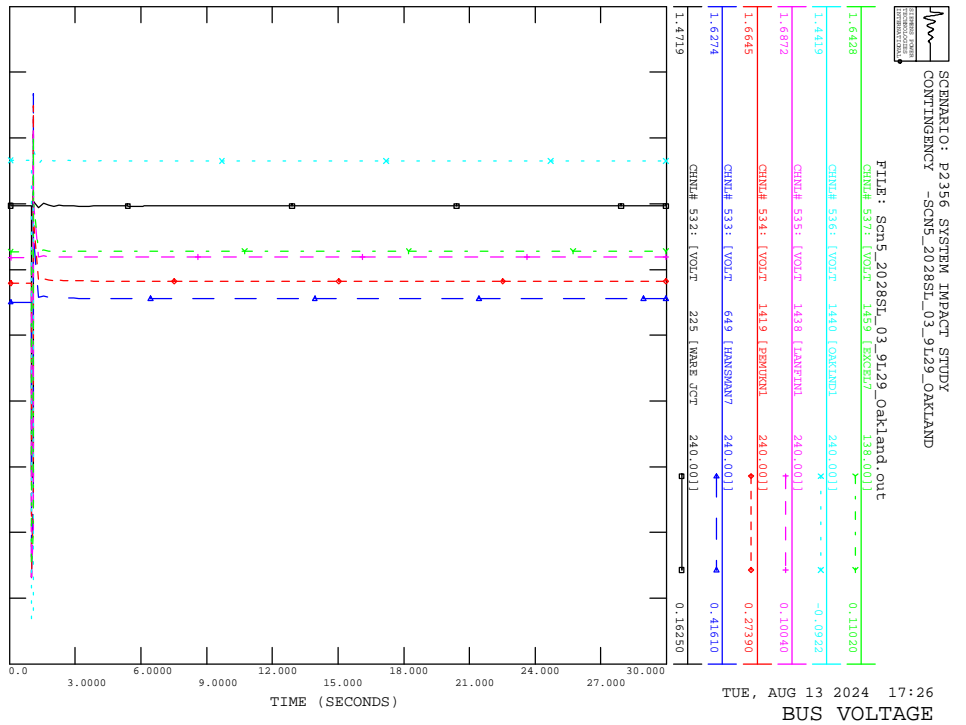
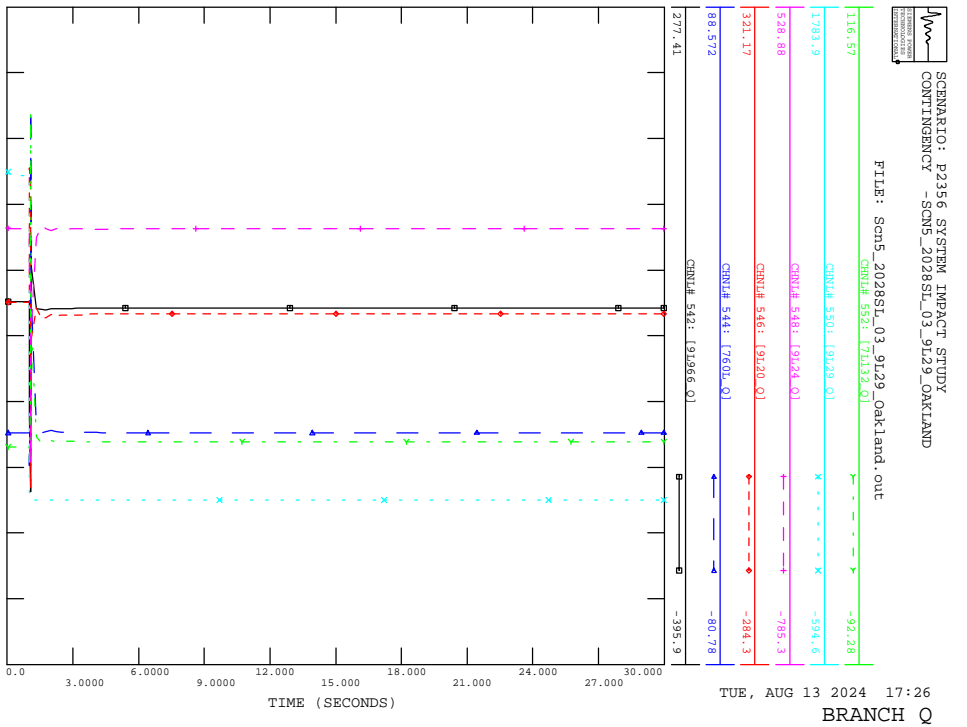
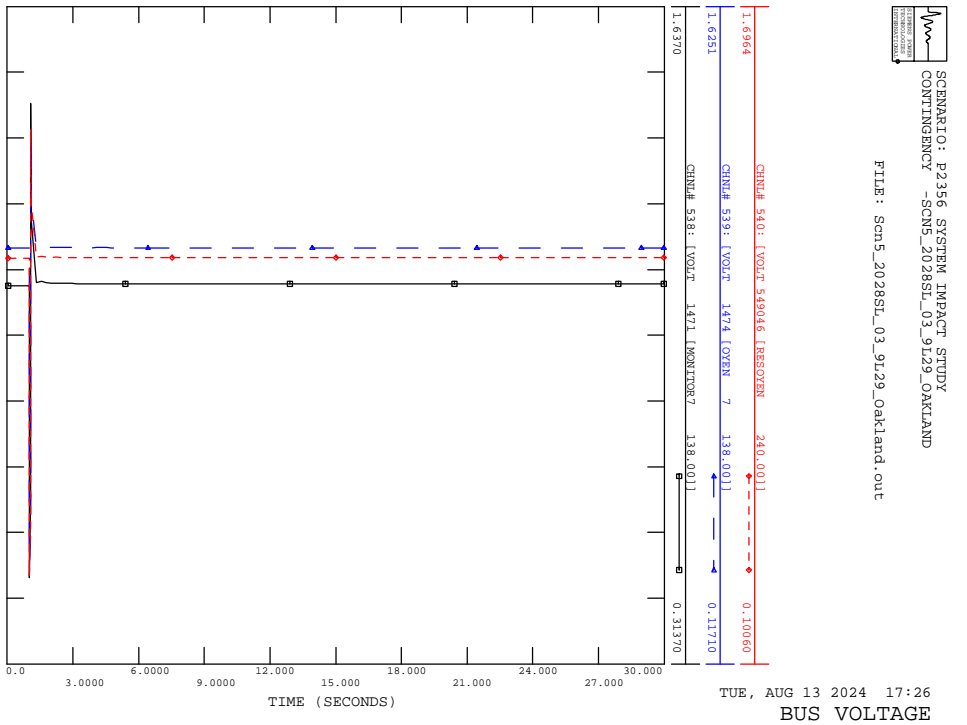
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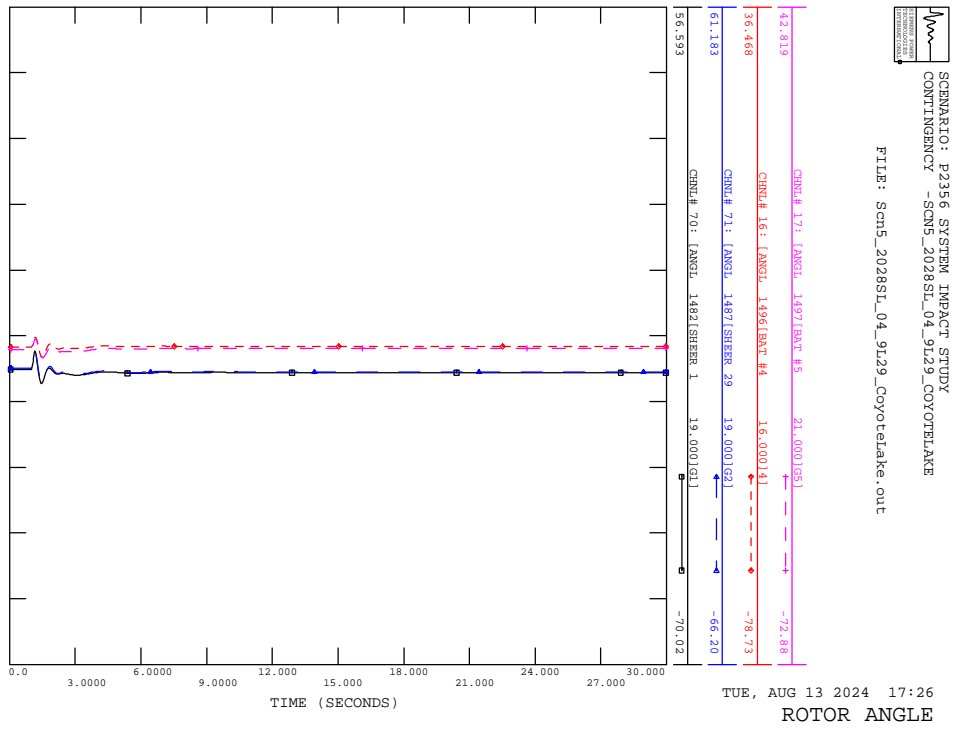
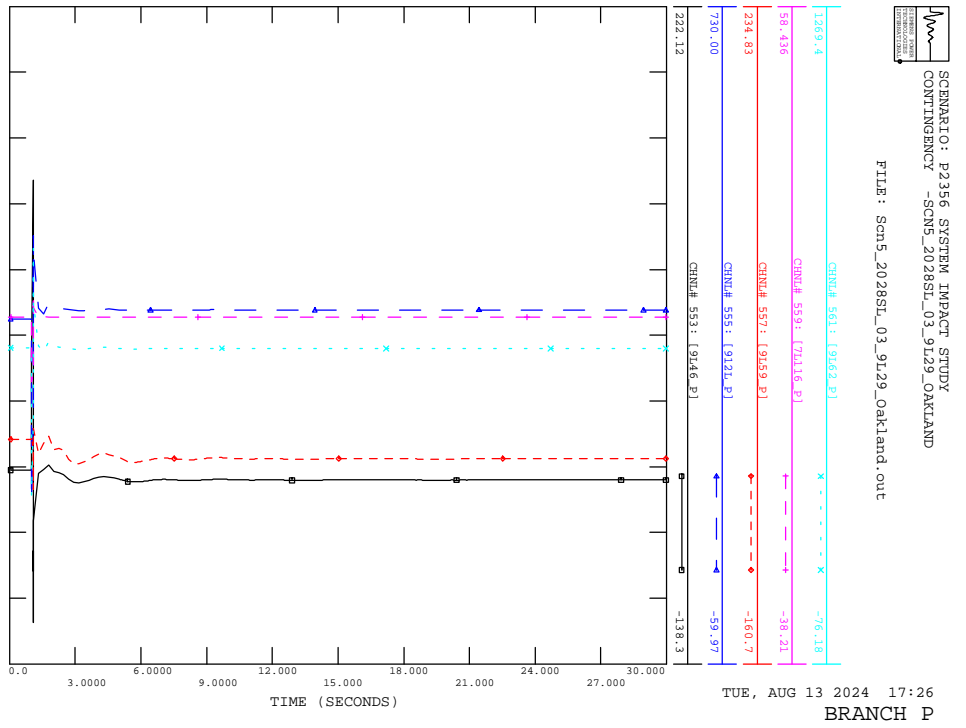
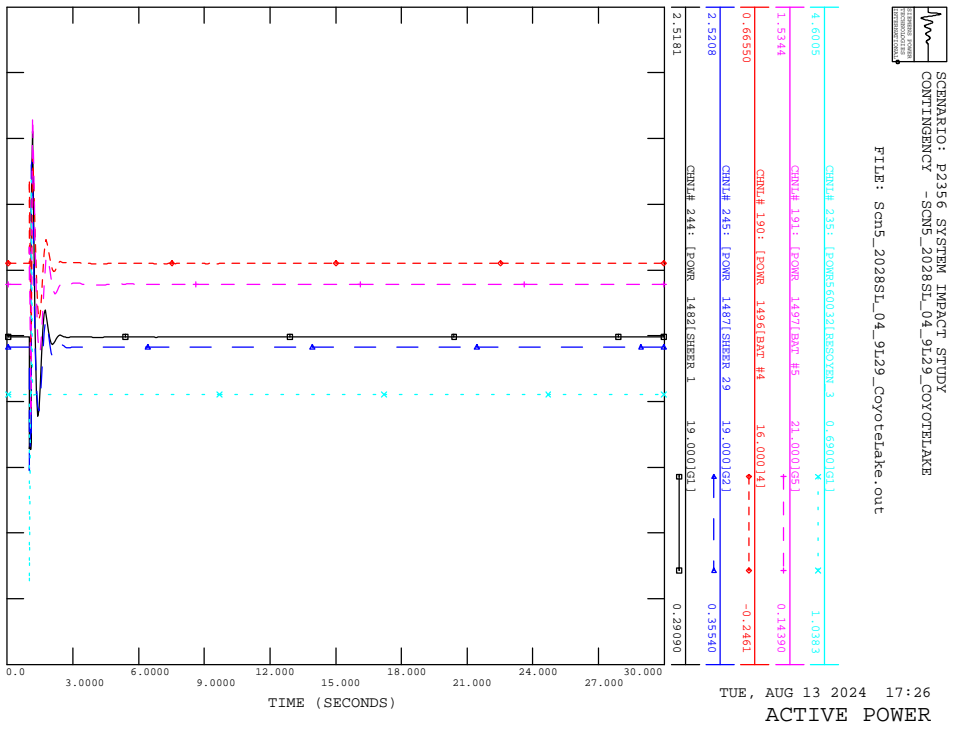
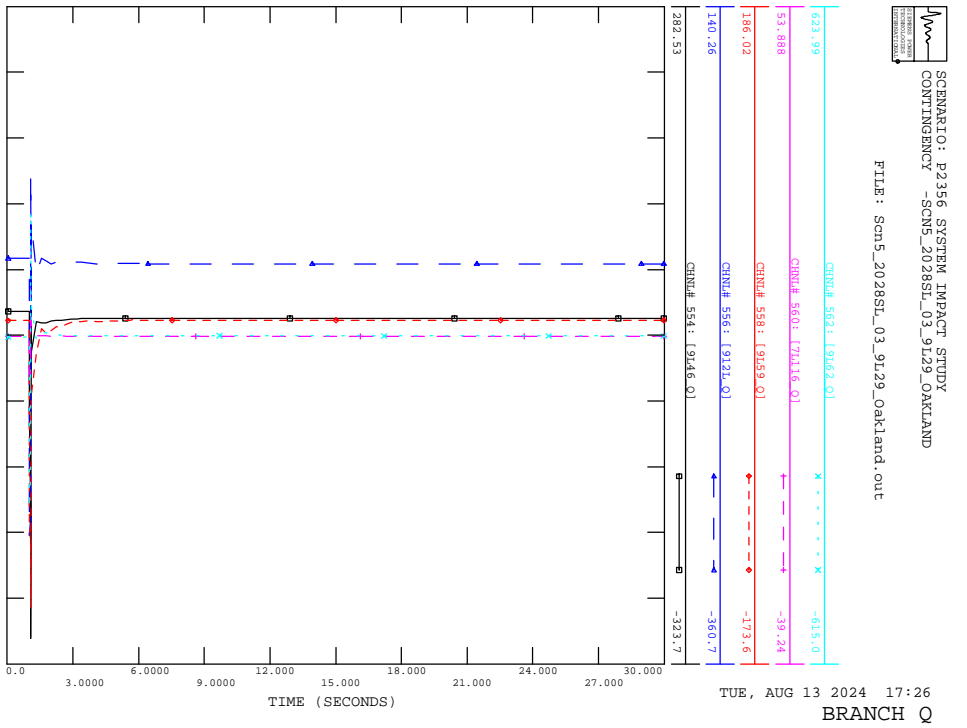


TUE, AUG 13 2024 17:26  
BUS VOLTAGE

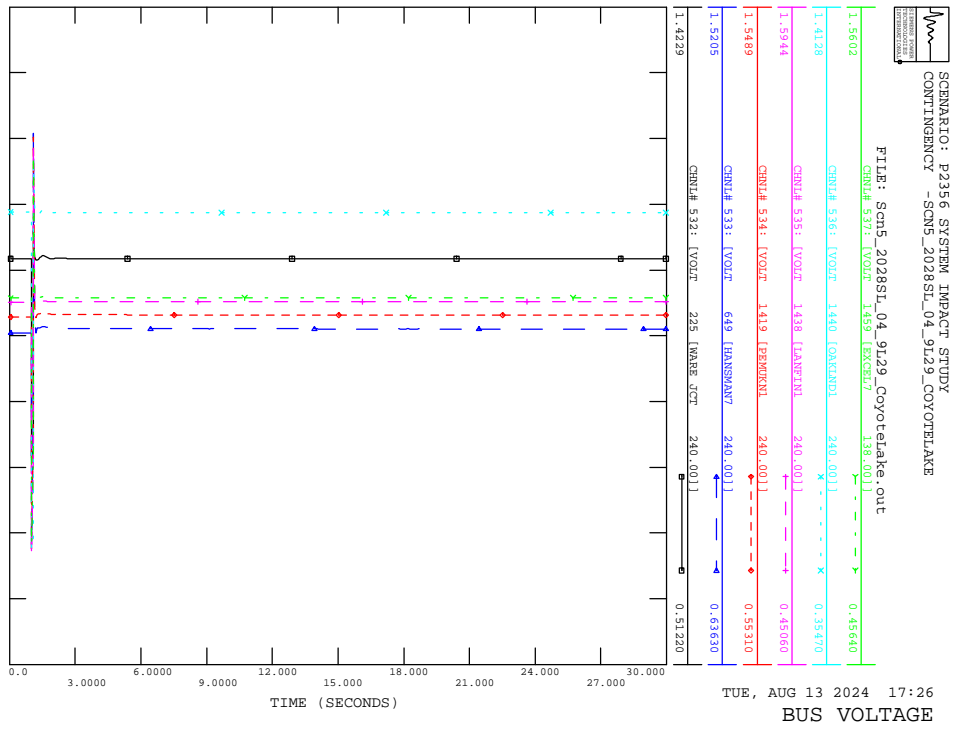
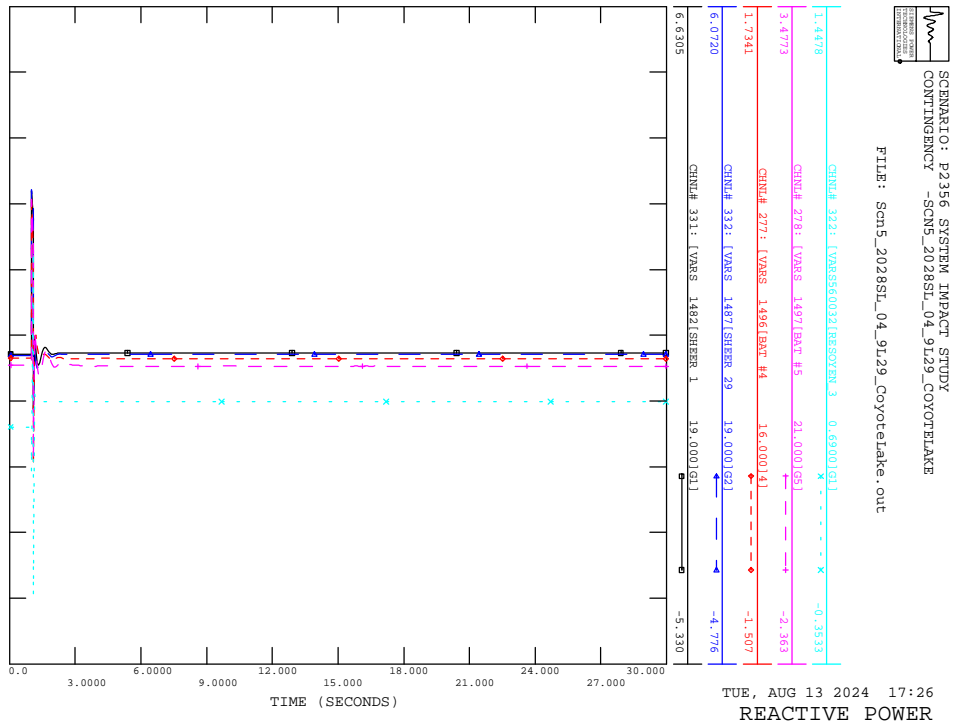
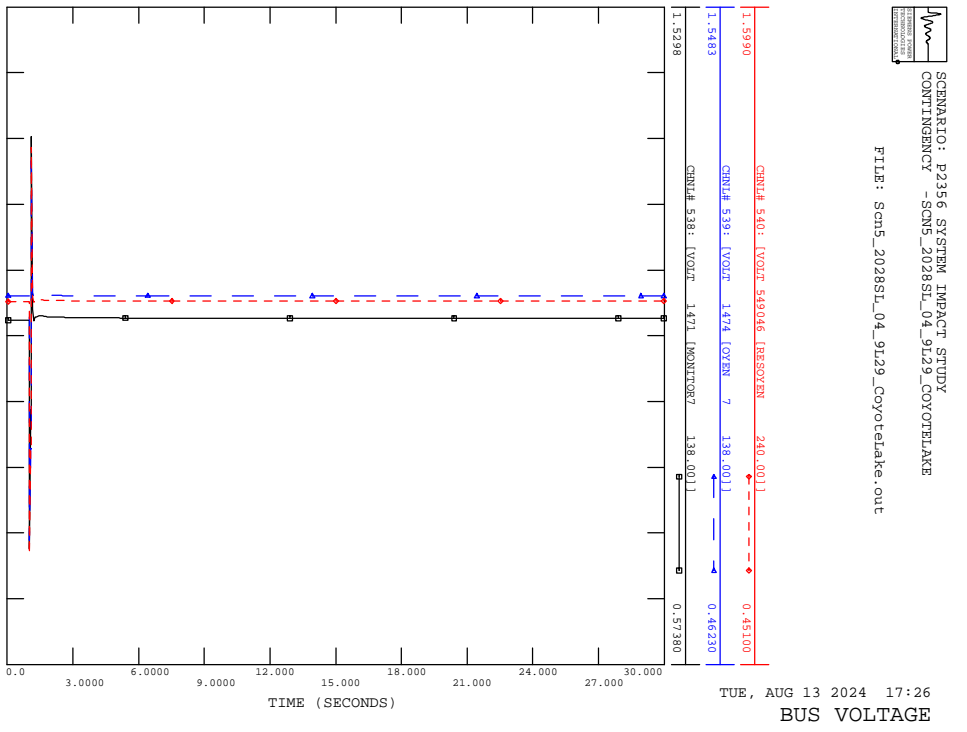
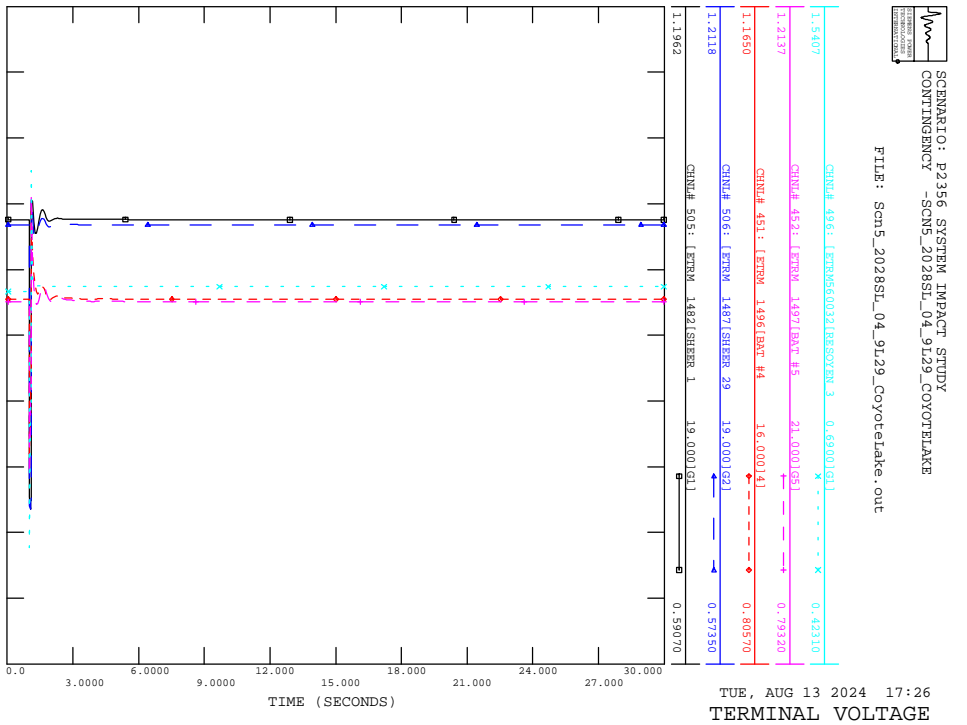


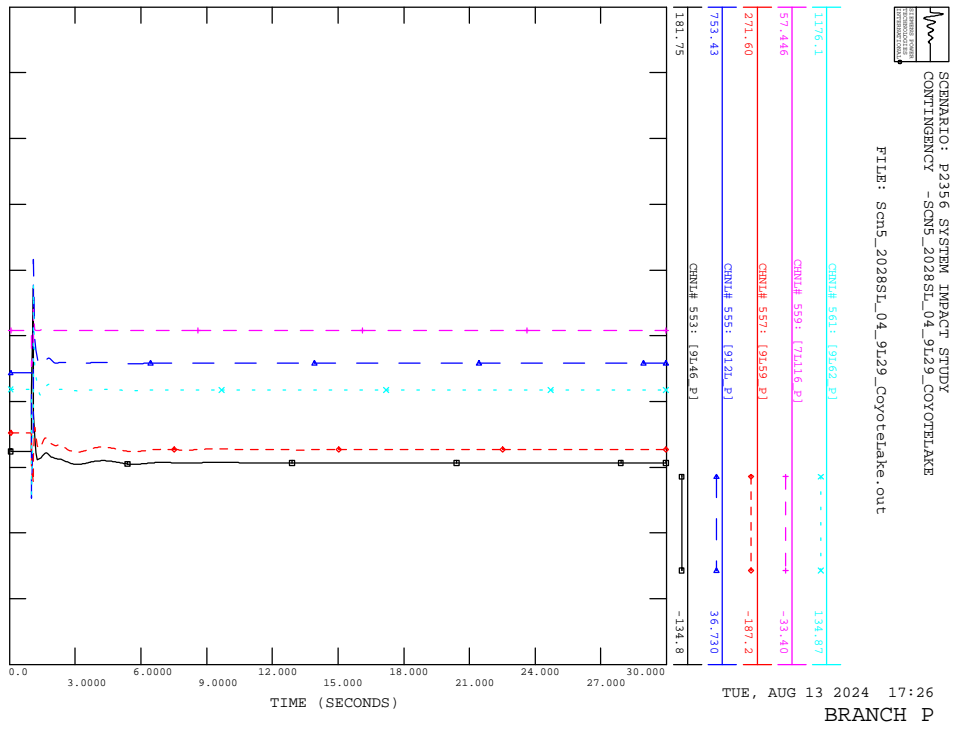
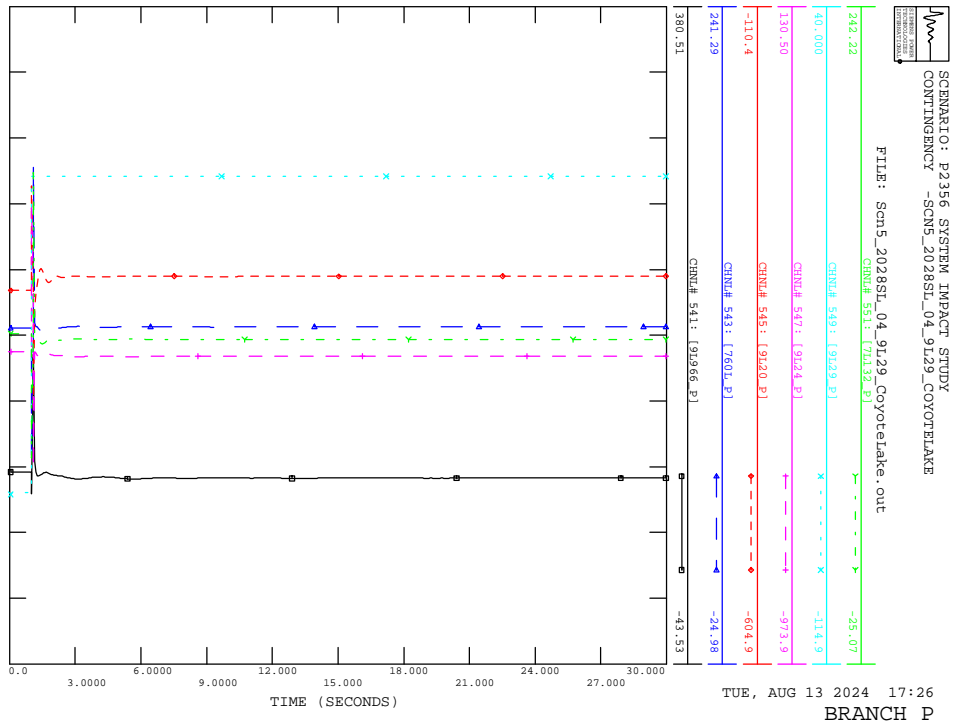
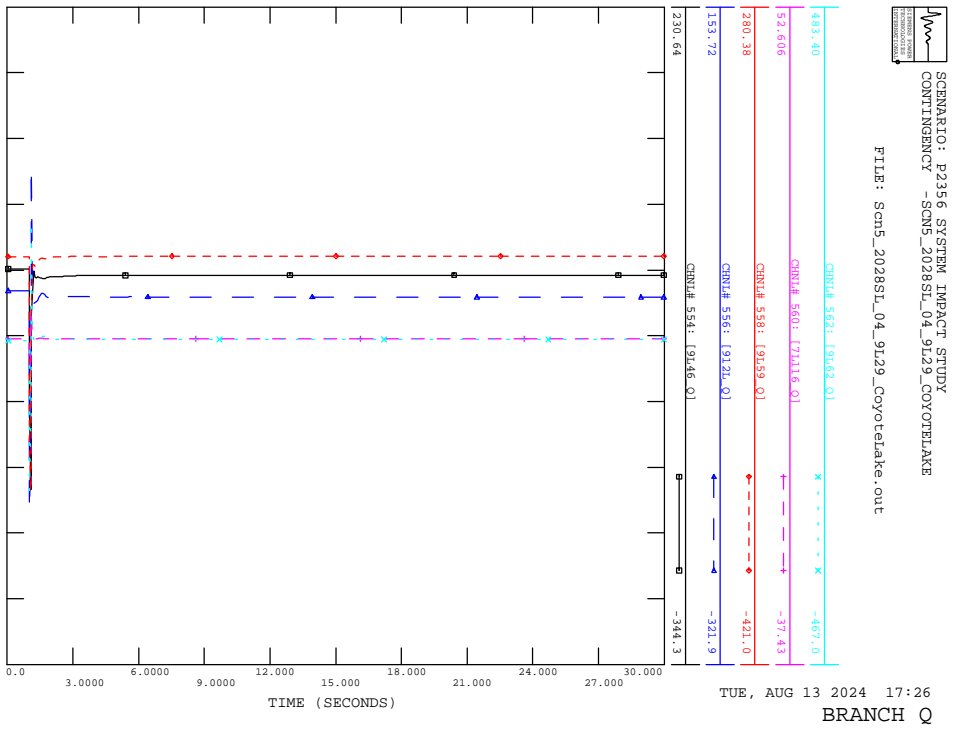
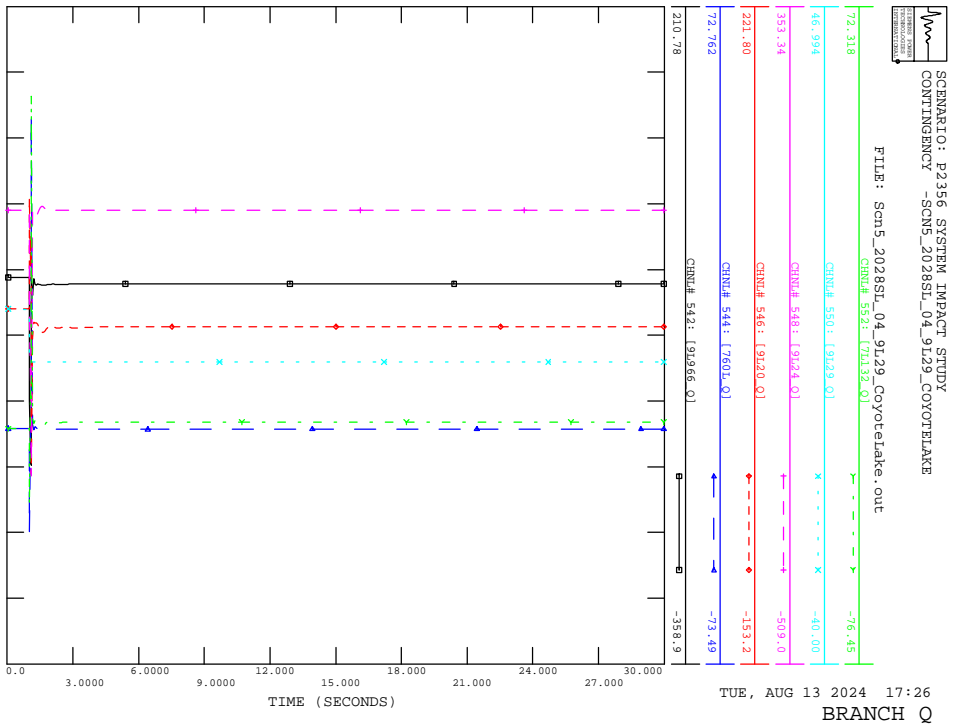






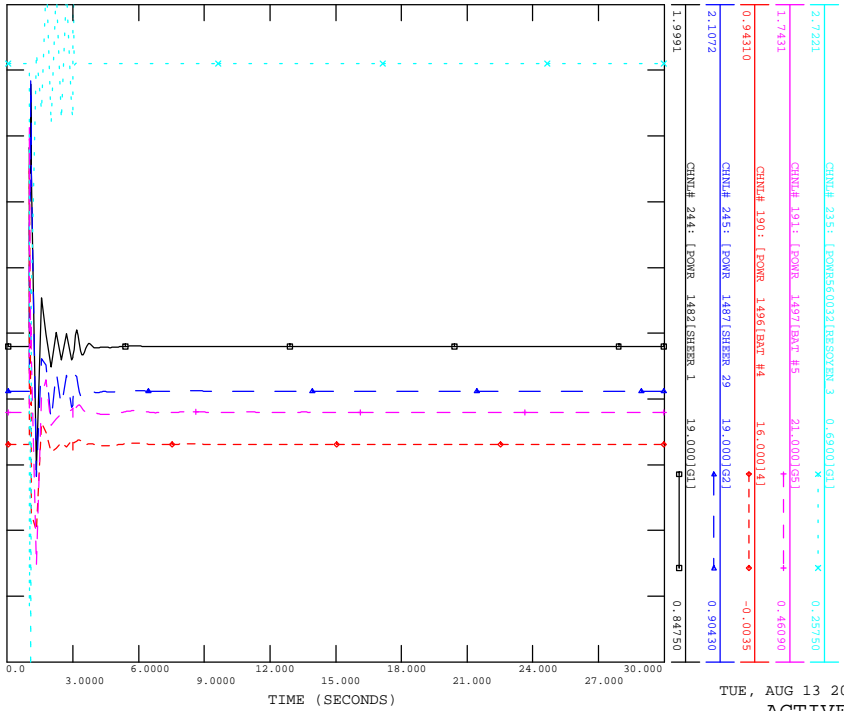






SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_05\_9L46\_LANFLINE

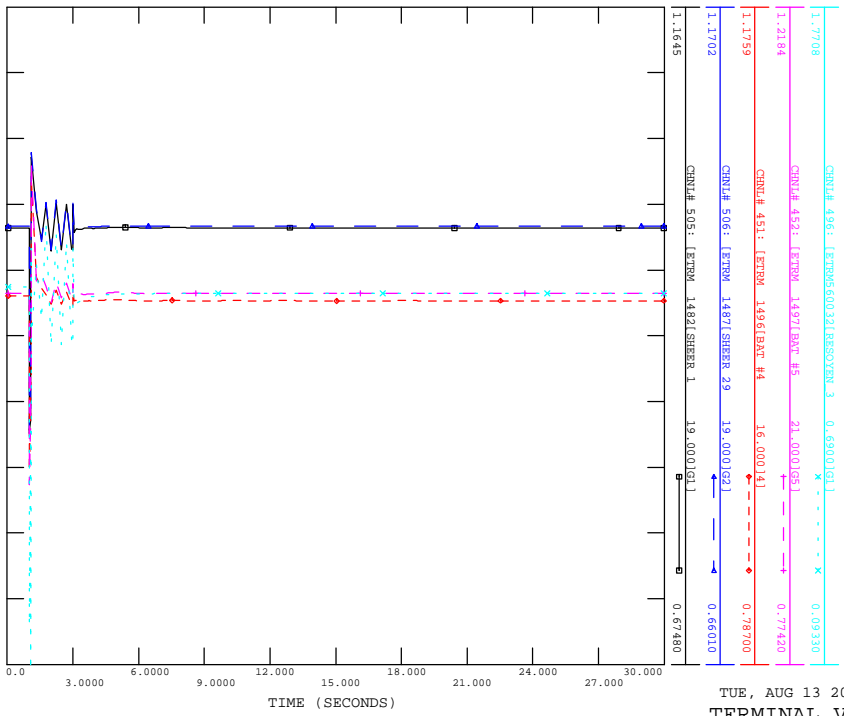
FILE: Scn5\_2028SL\_05\_9L46\_Lanflineline.out



TUE, AUG 13 2024 17:26  
ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_05\_9L46\_LANFLINE

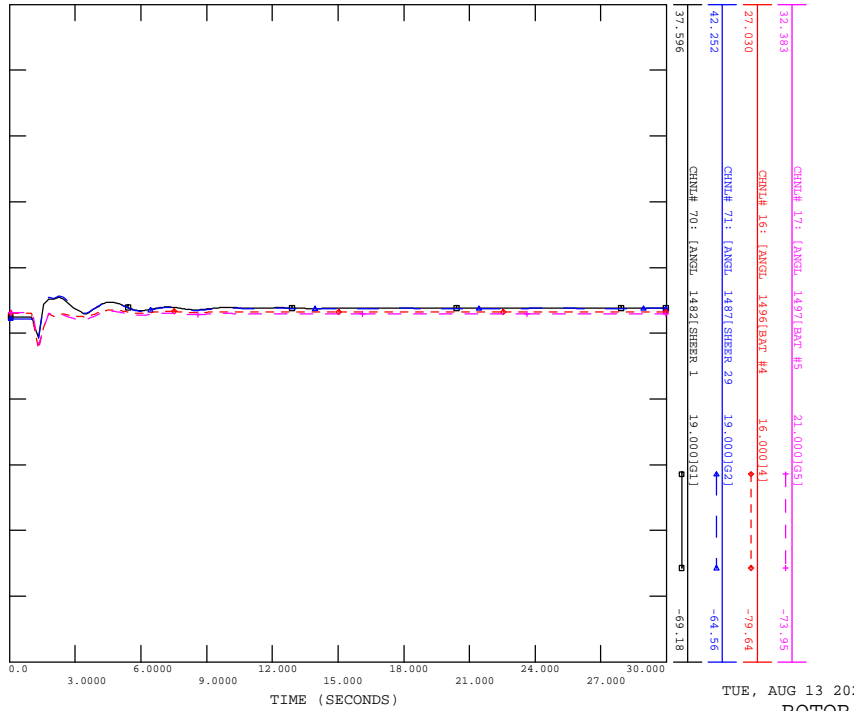
FILE: Scn5\_2028SL\_05\_9L46\_Lanflineline.out



TUE, AUG 13 2024 17:26  
TERMINAL VOLTAGE

SCENARIO: P2356 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN5\_2028SL\_05\_9L46\_LANFLINE

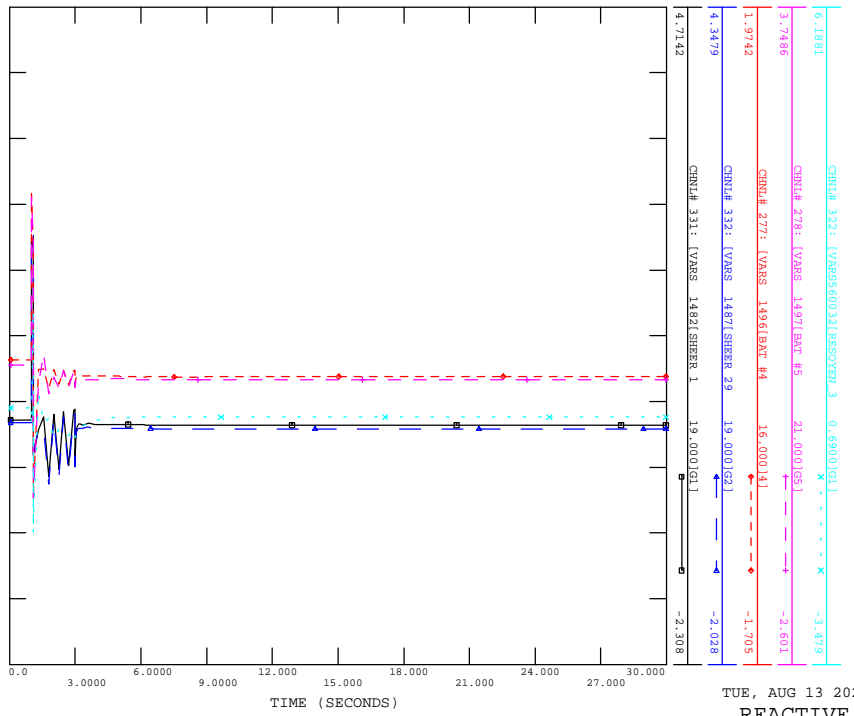
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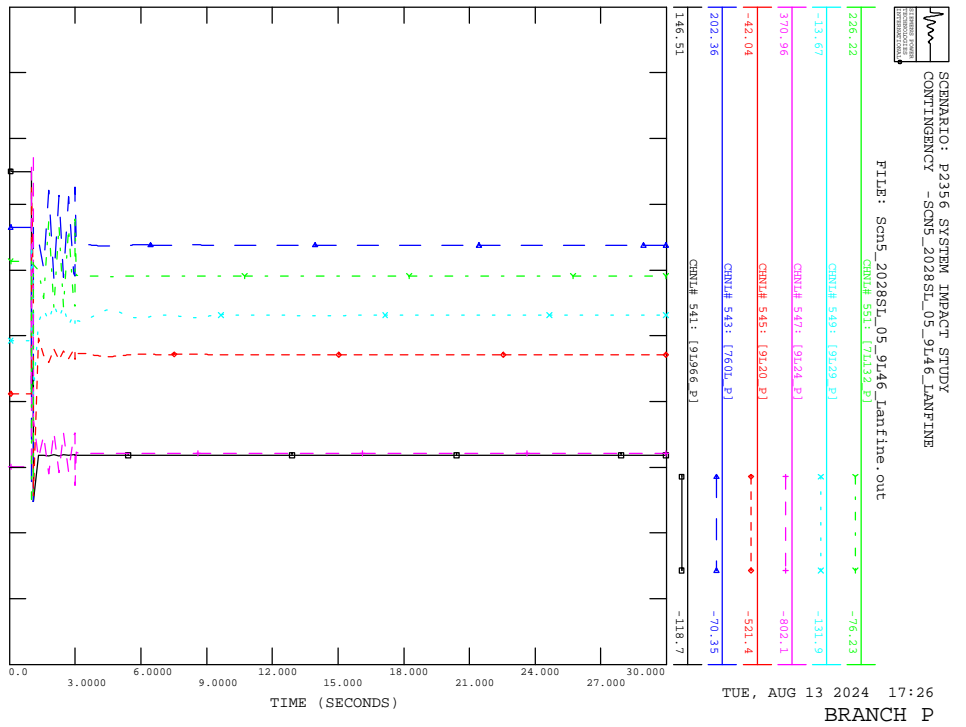
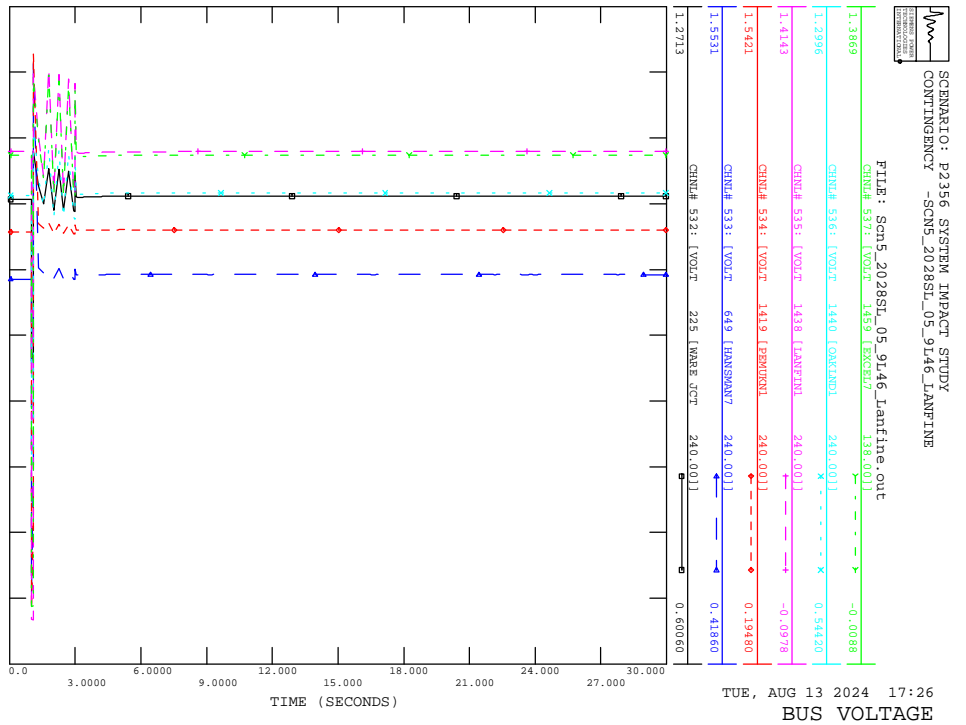
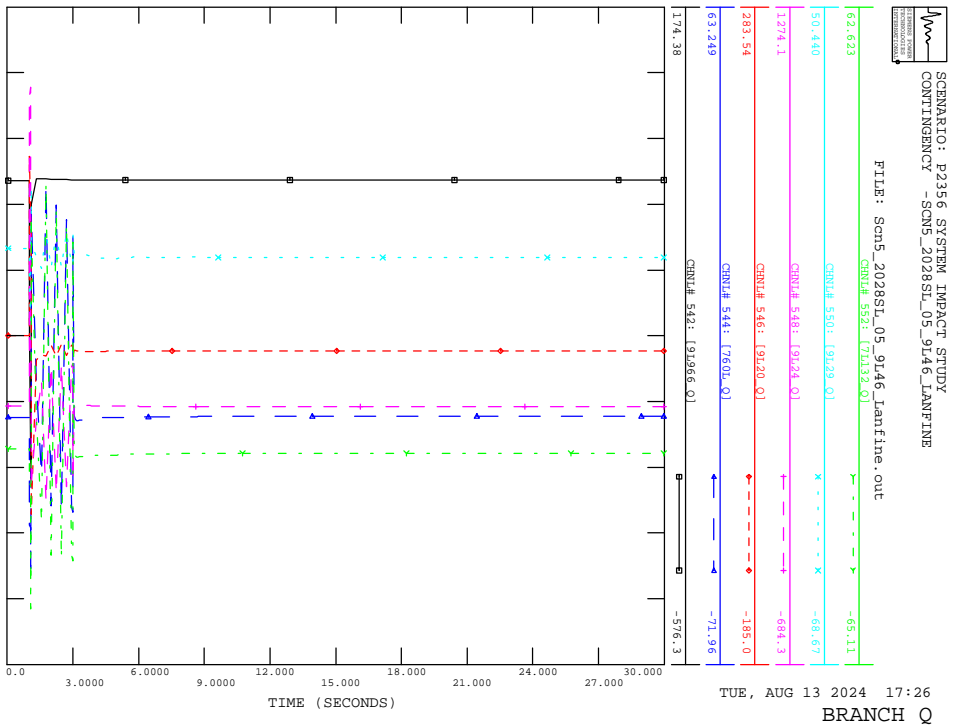
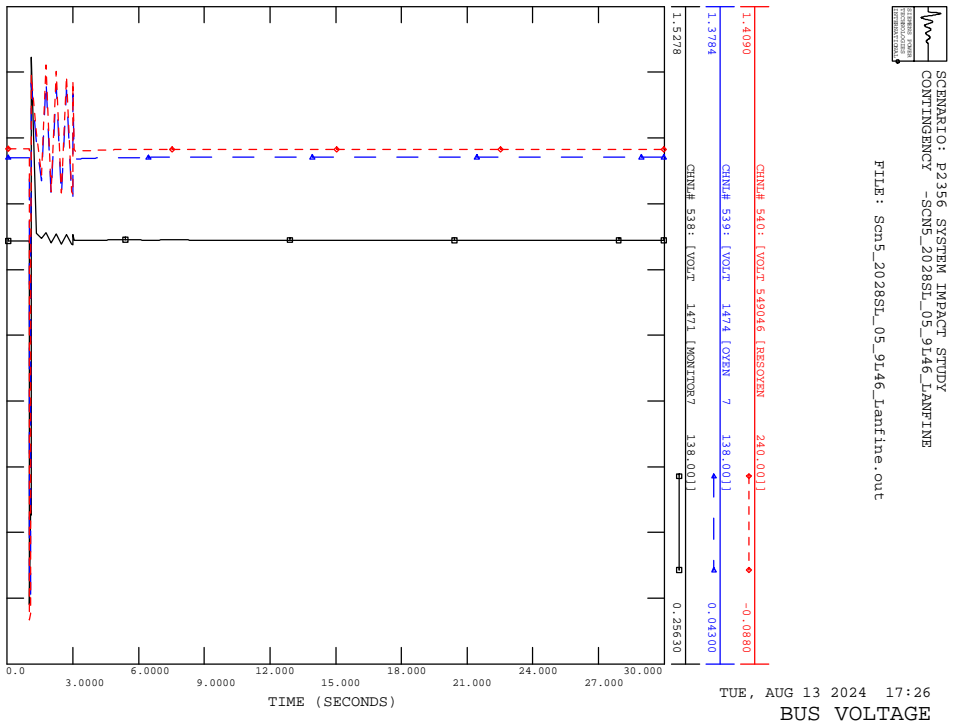
TUE, AUG 13 2024 17:26  
ROTOR ANGLE

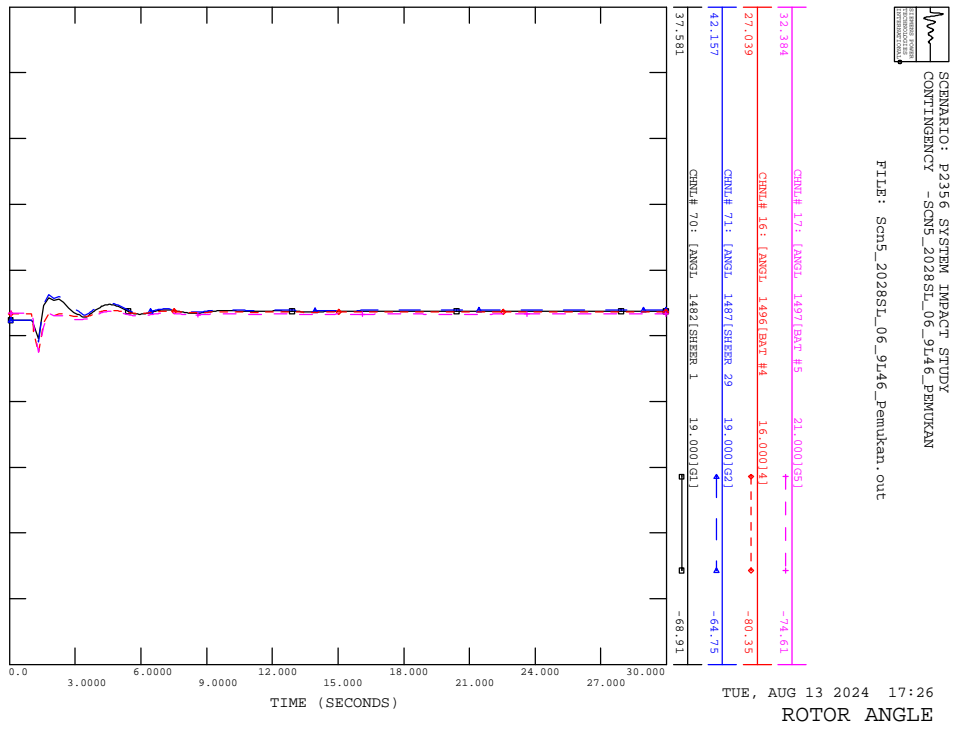
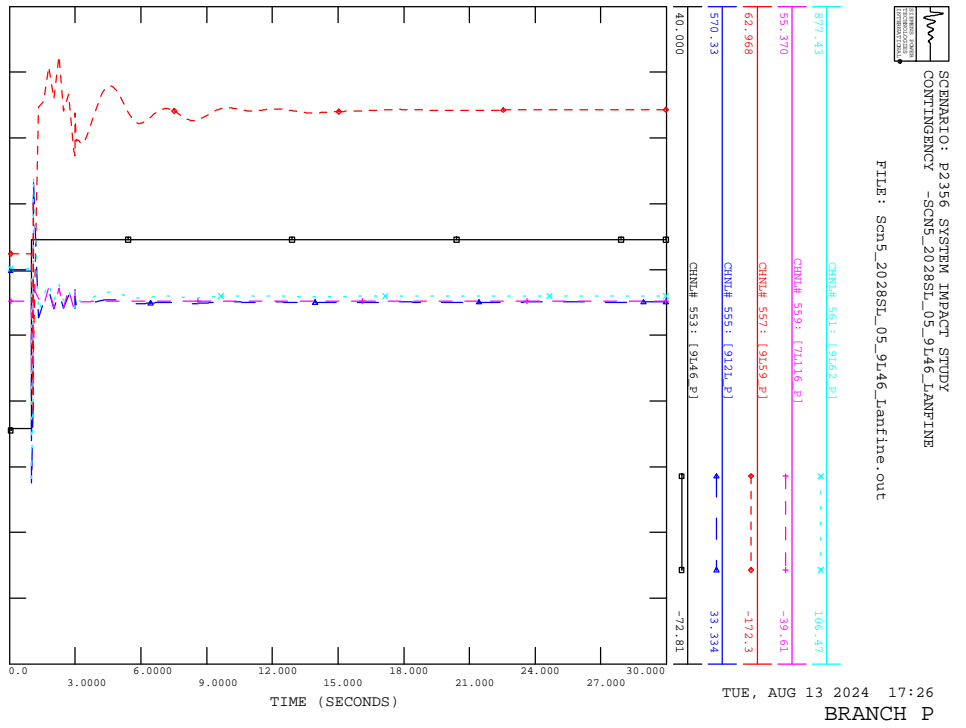
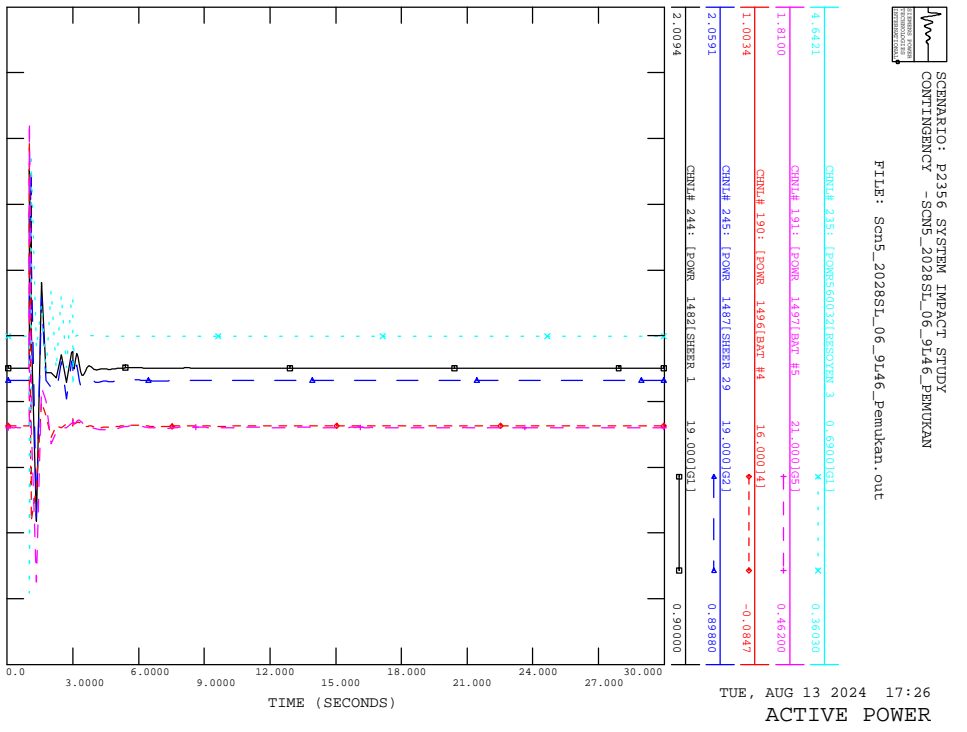
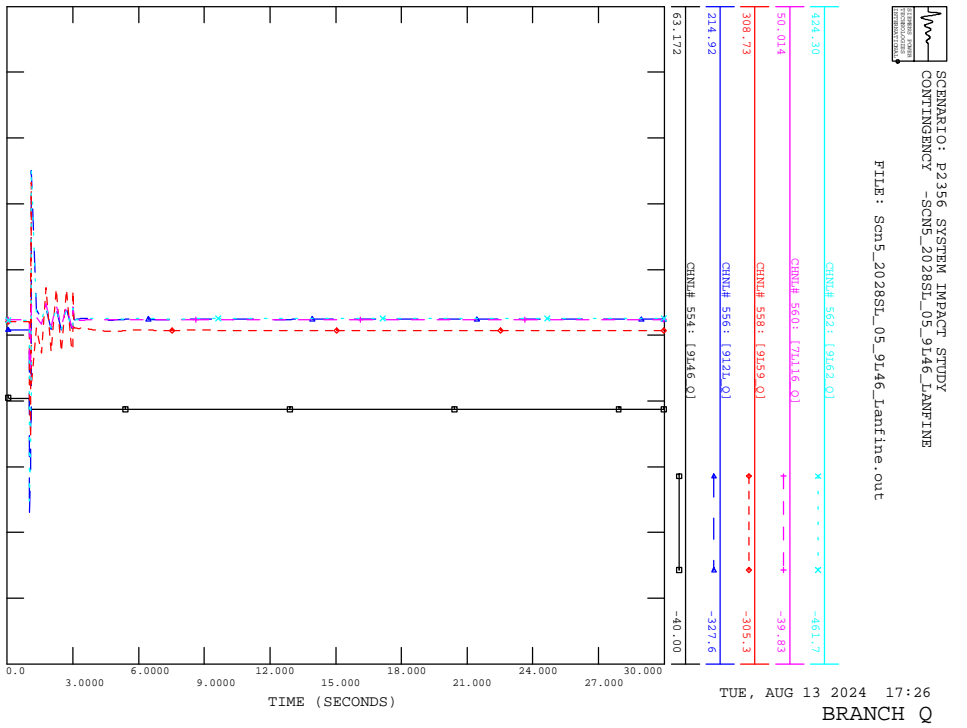
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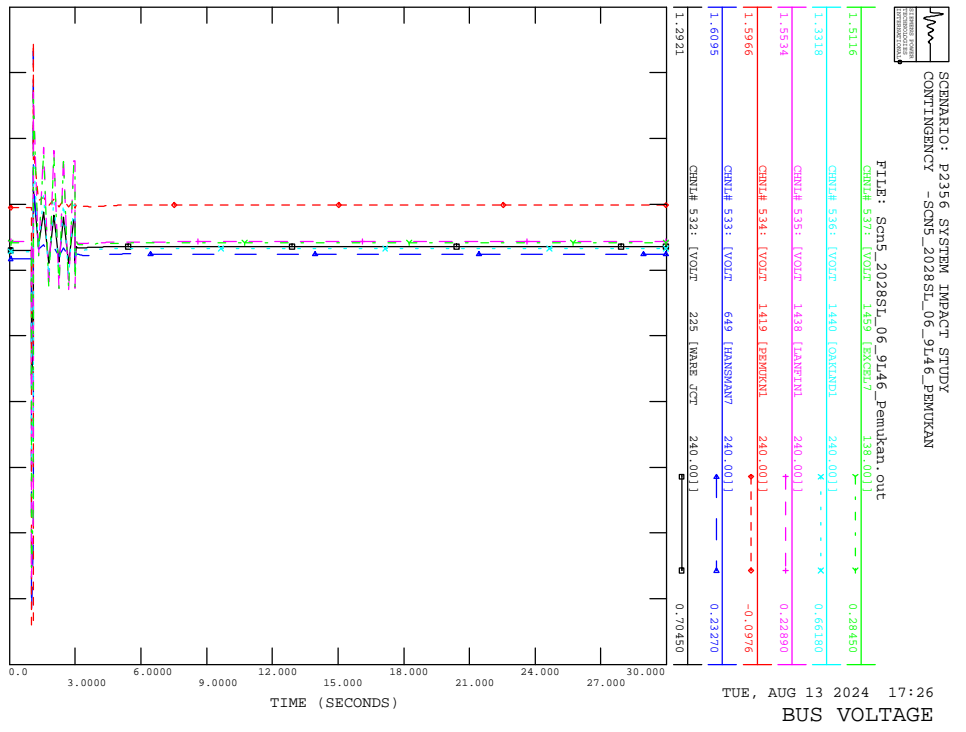
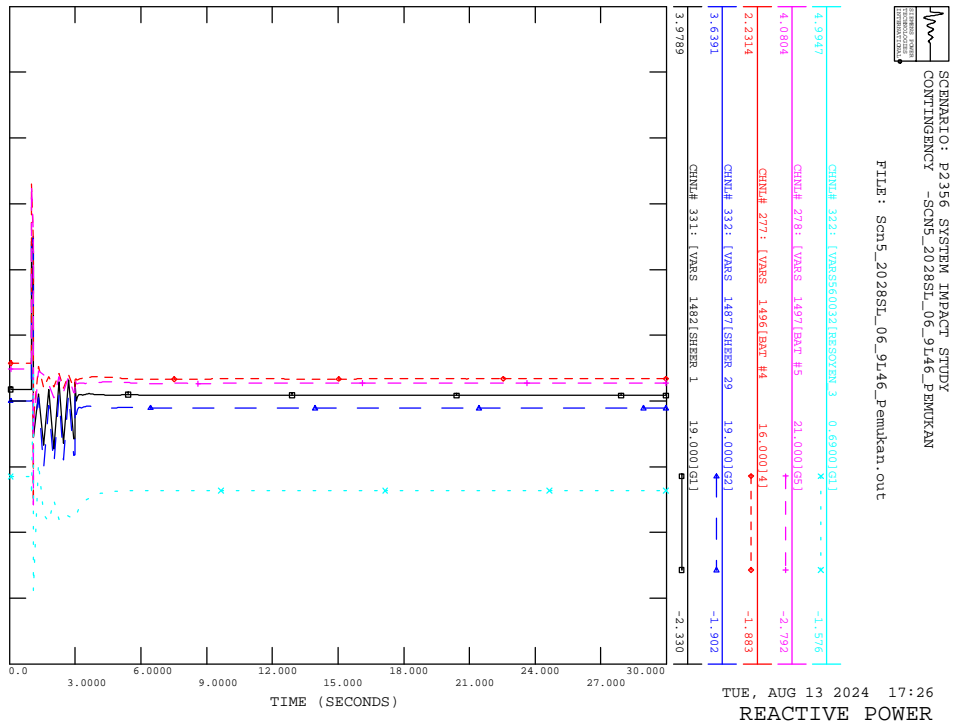
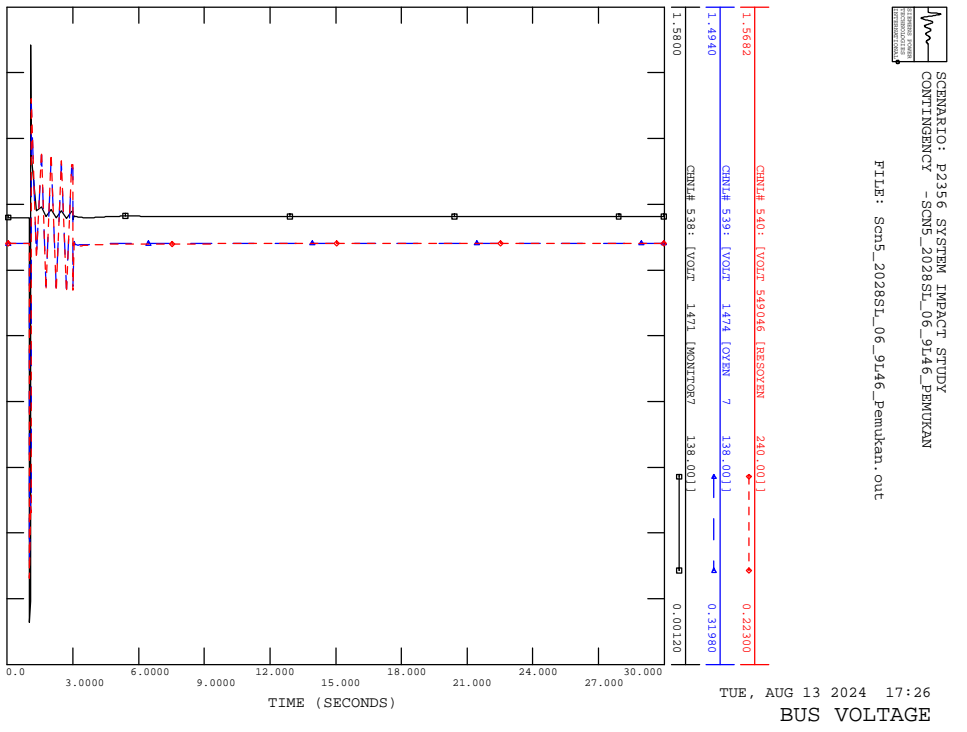
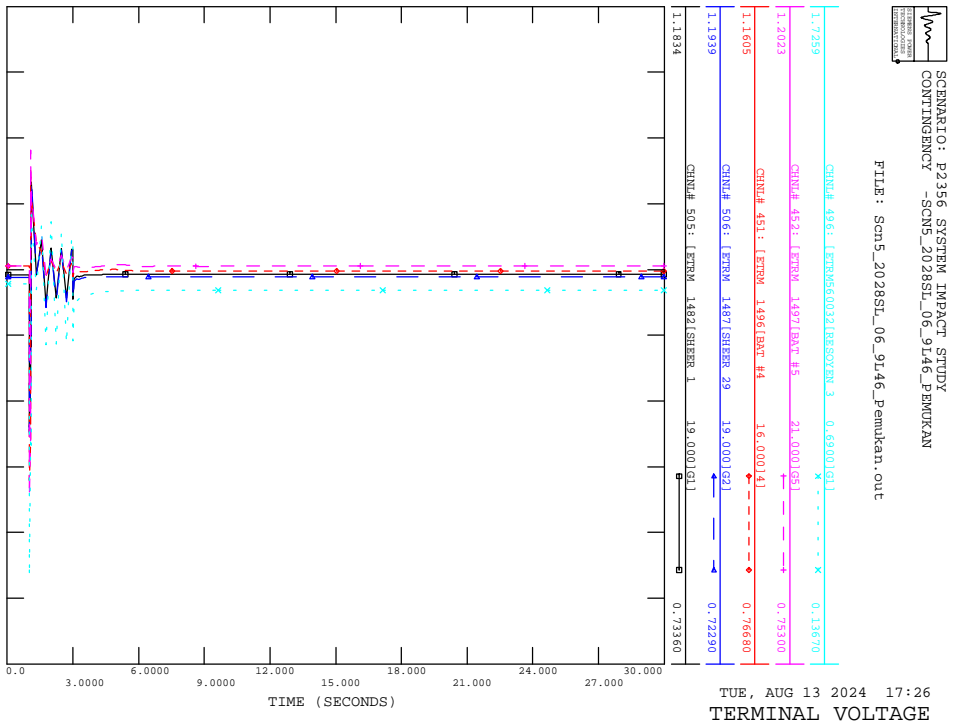
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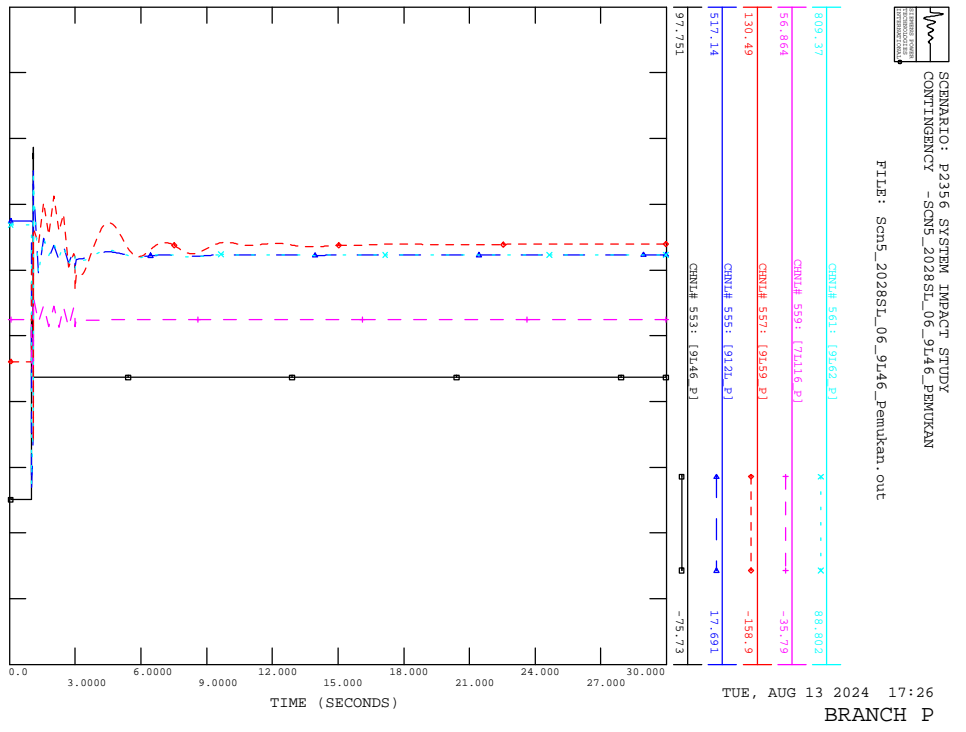
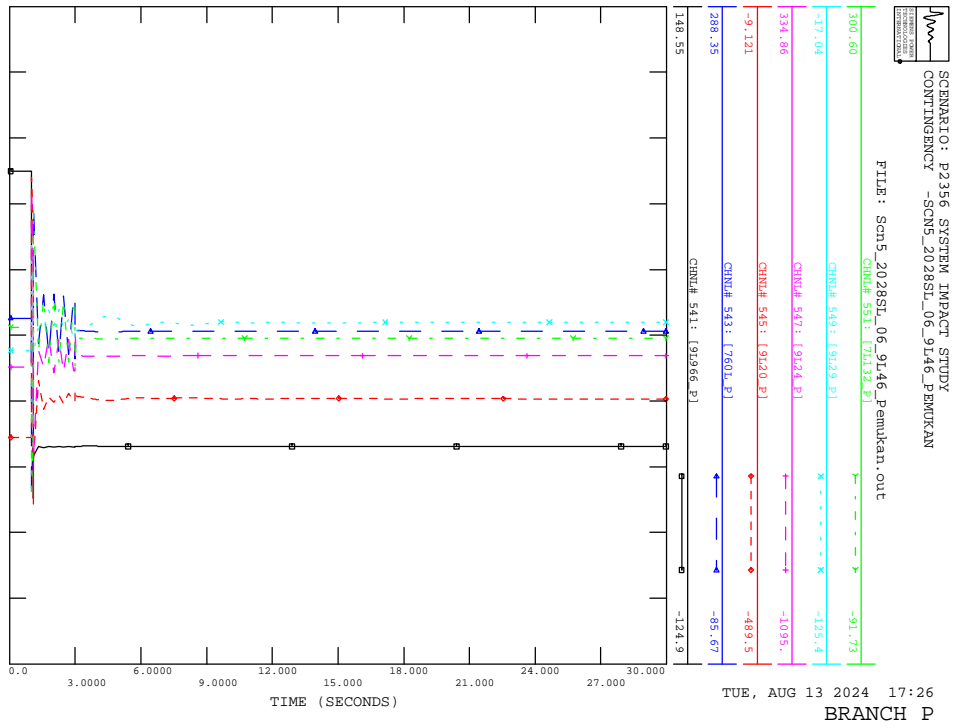
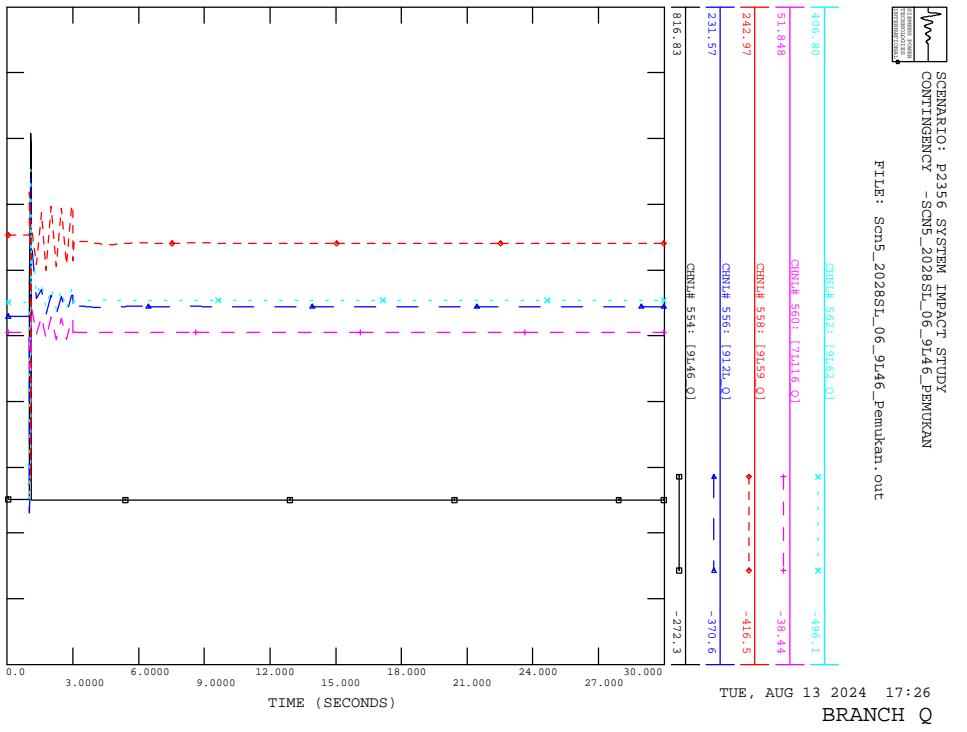
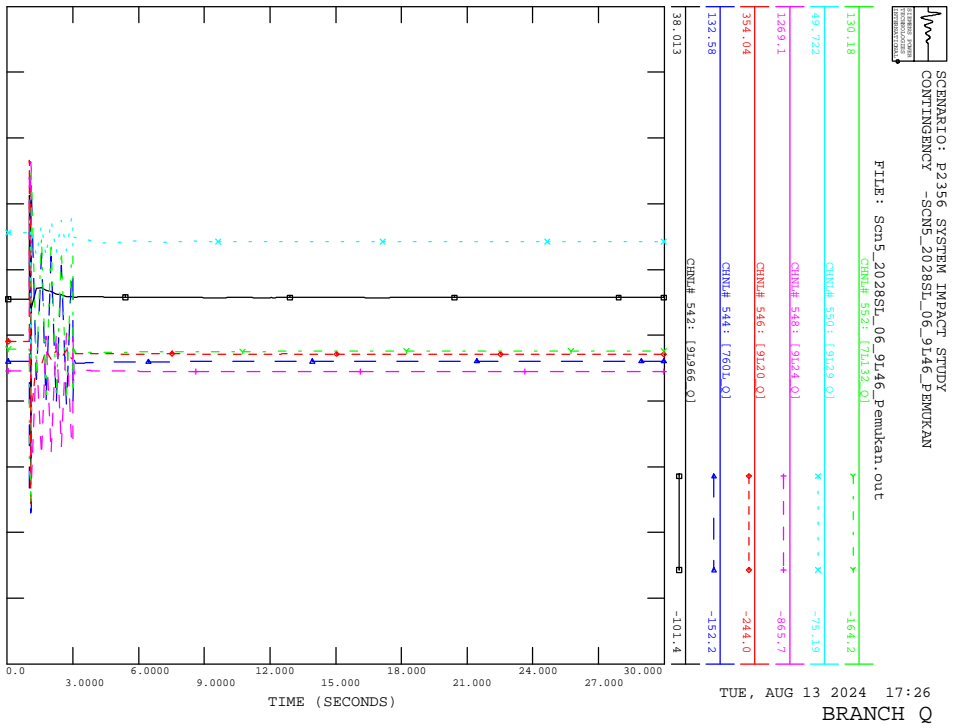


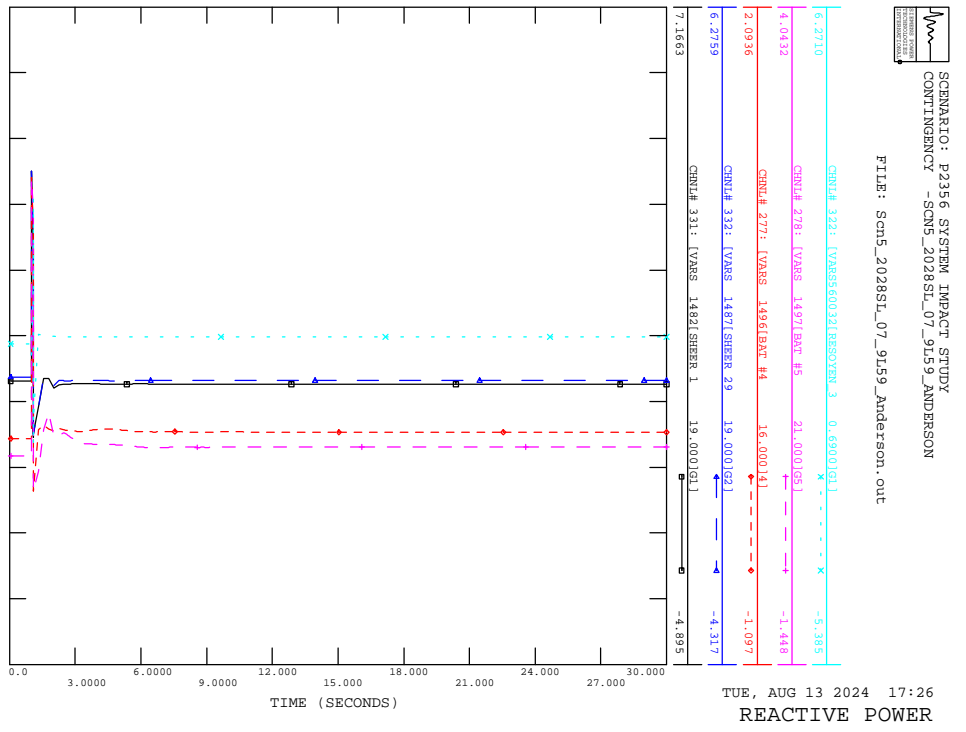
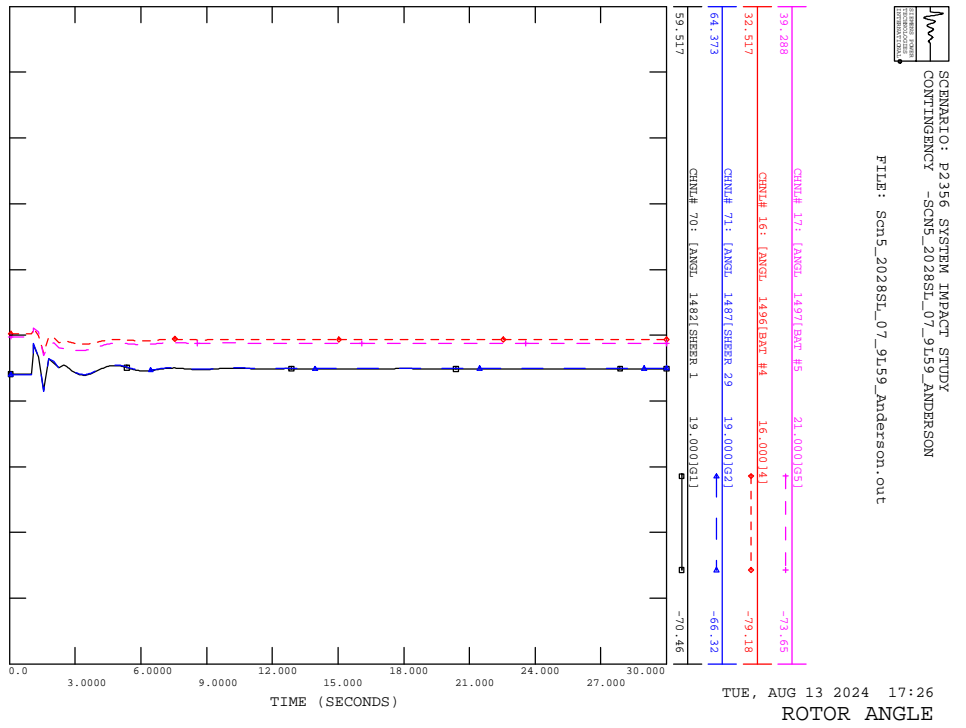
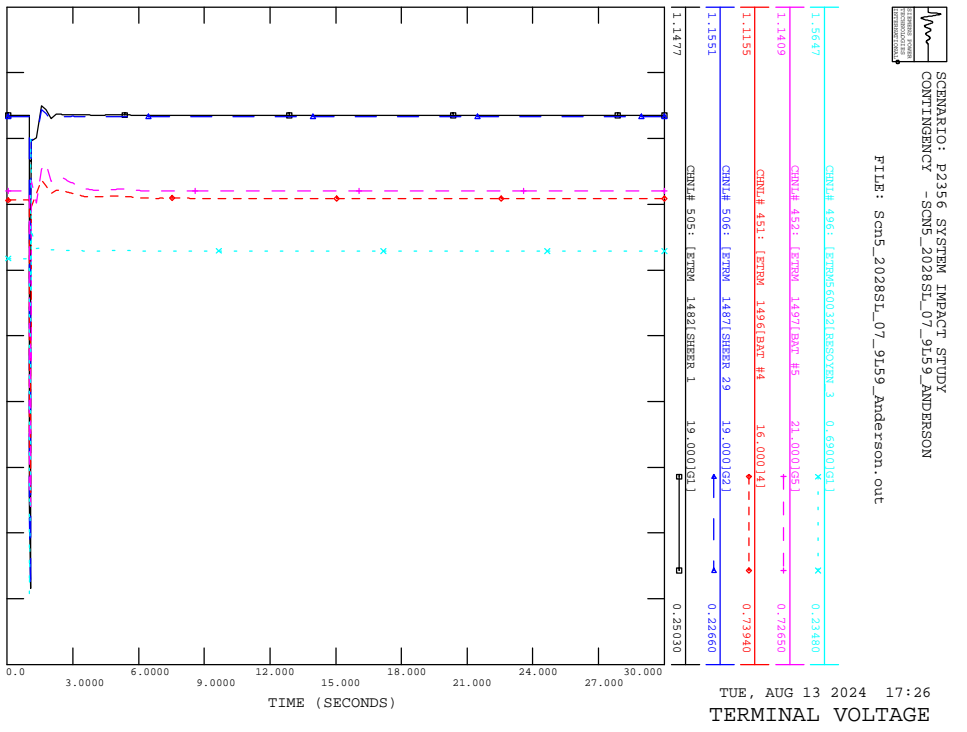
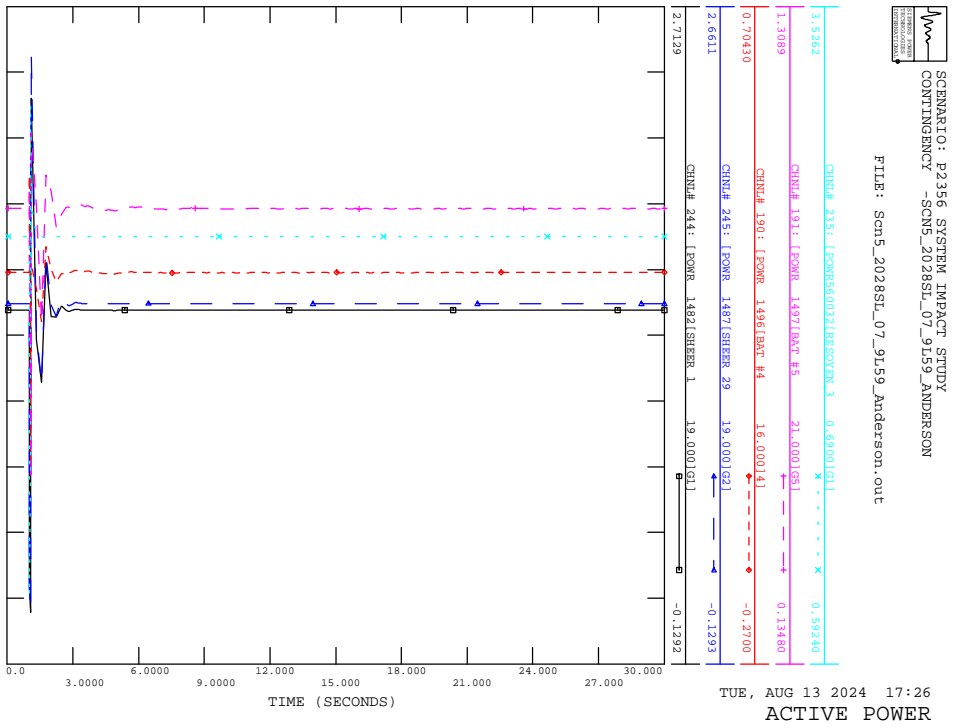
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REACTIVE POWER



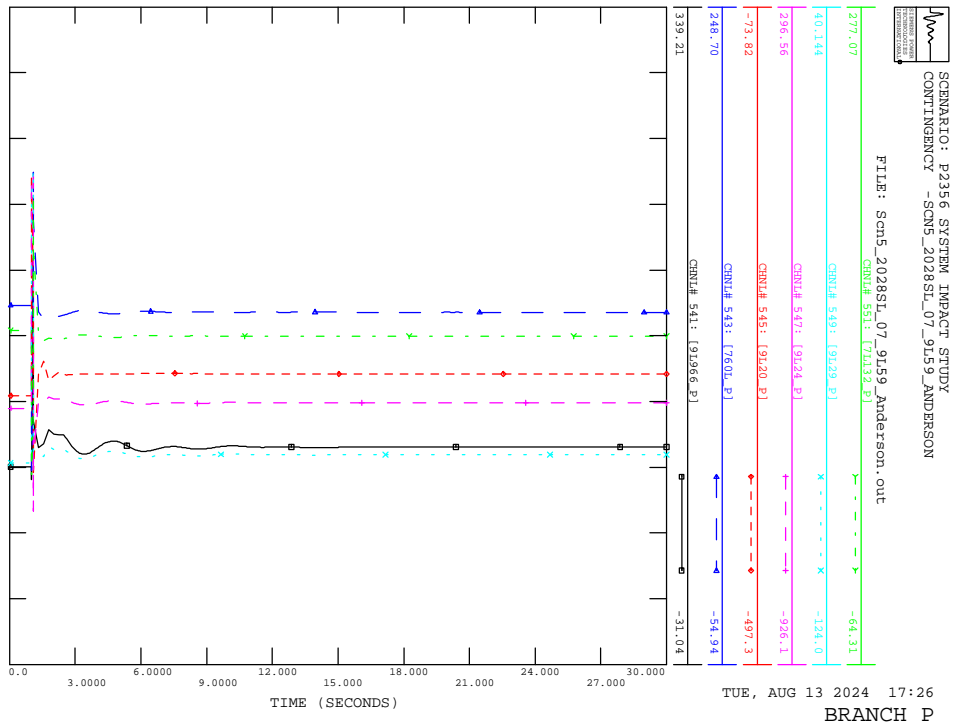
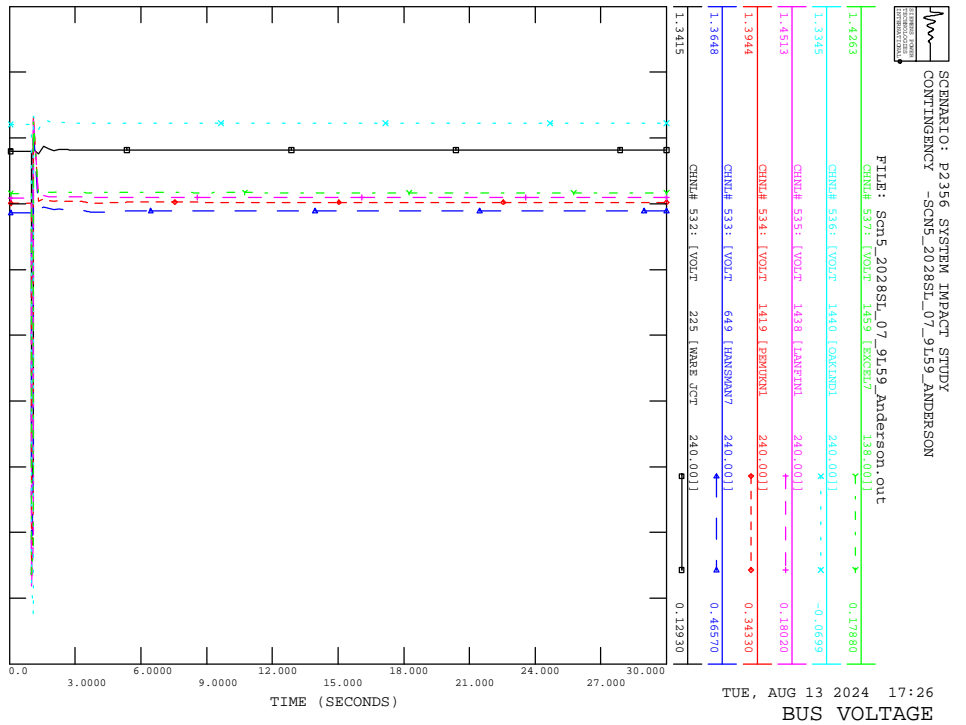
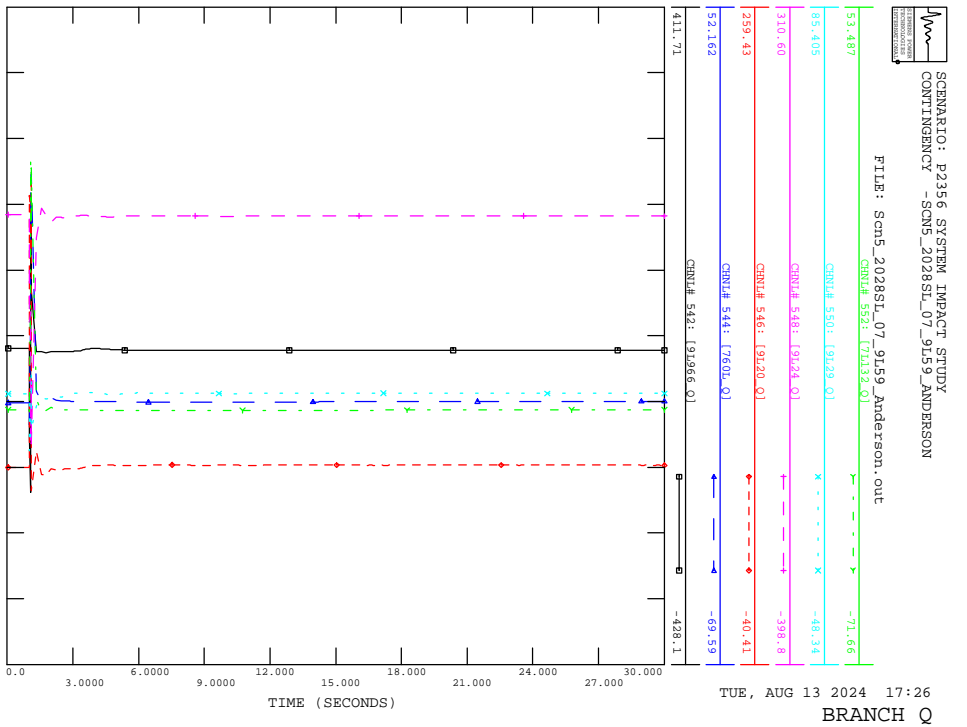
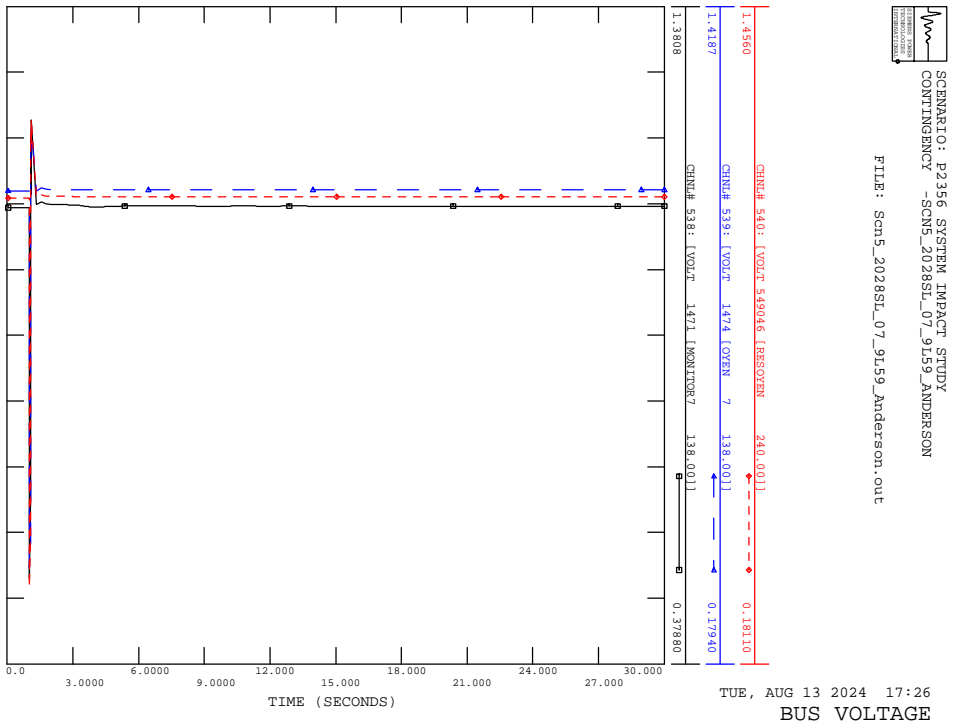


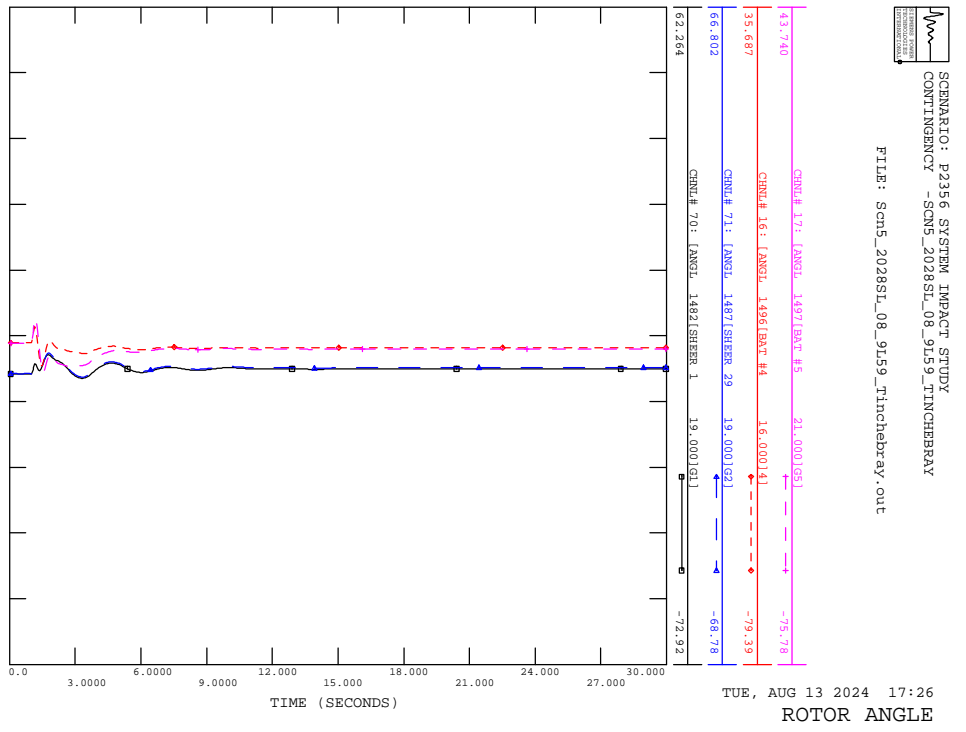
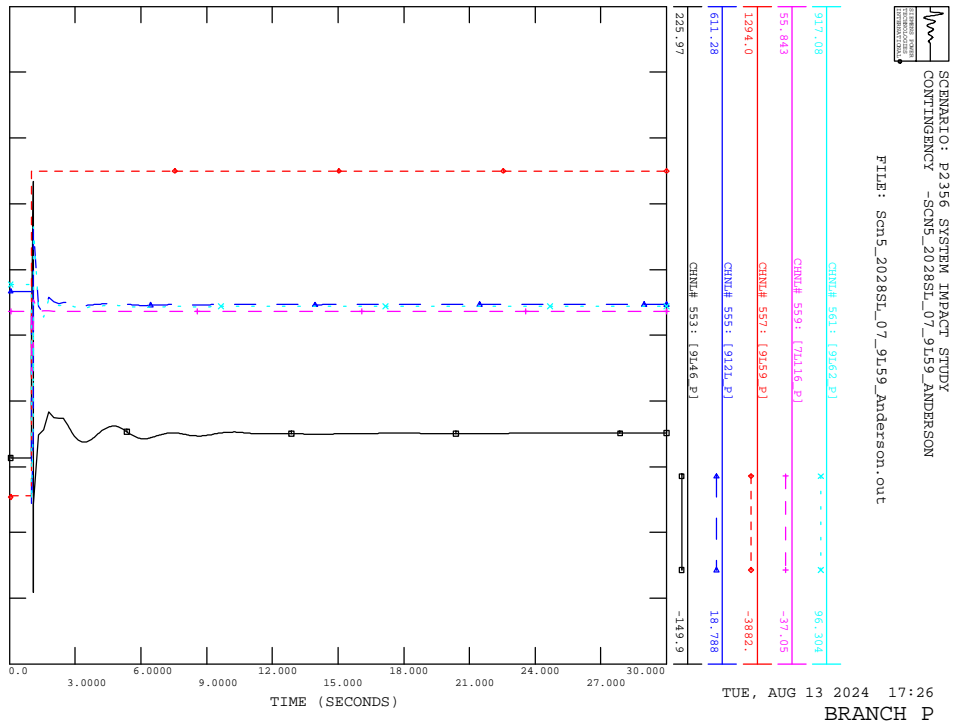
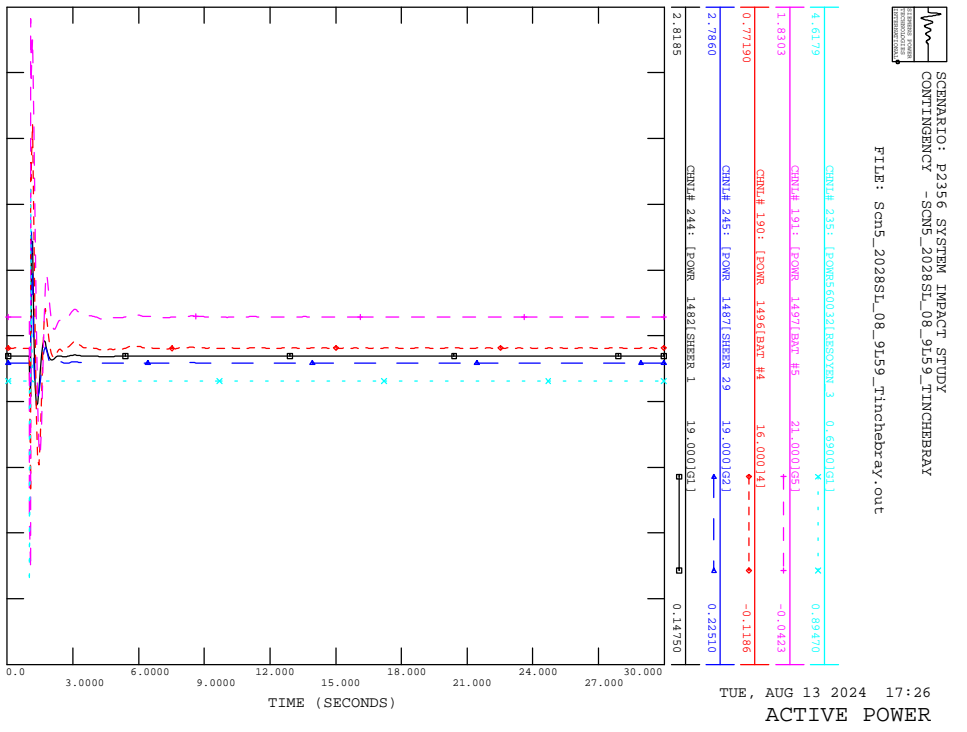
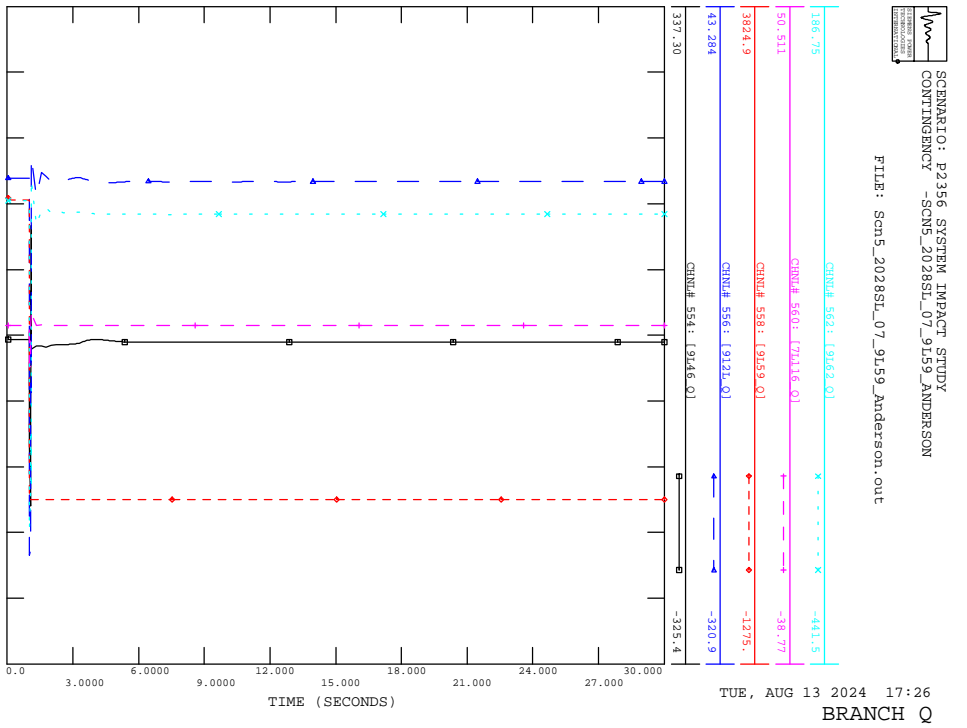


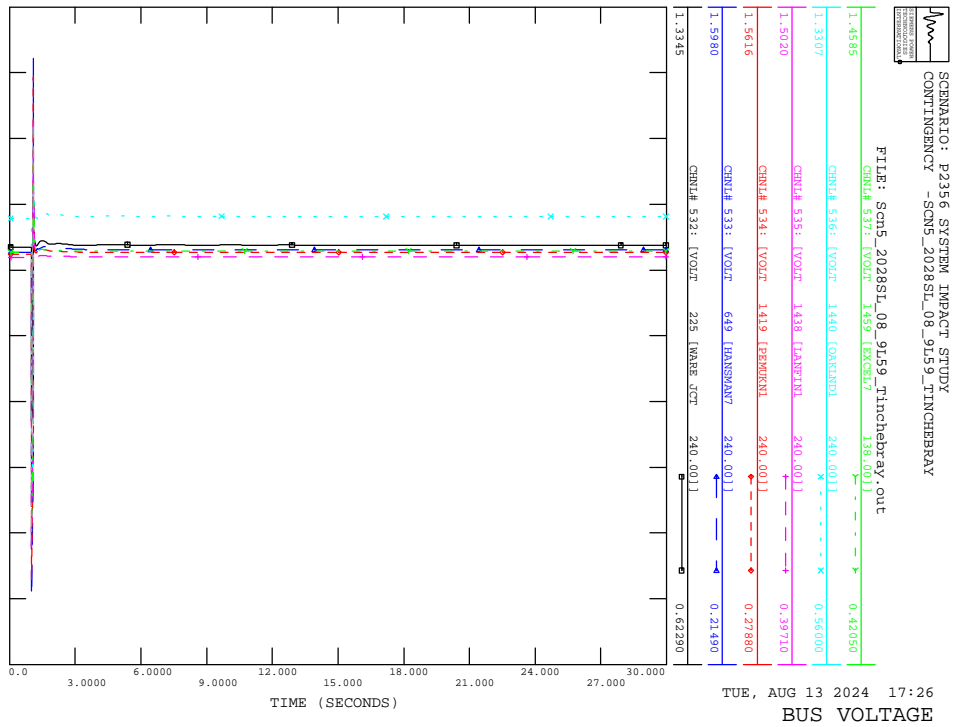
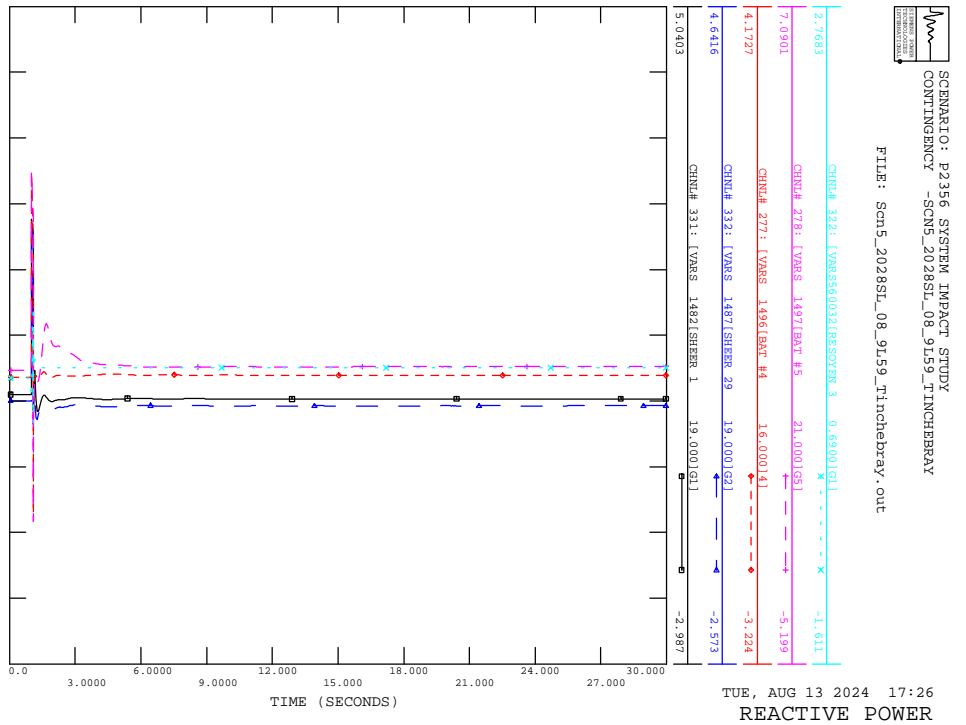
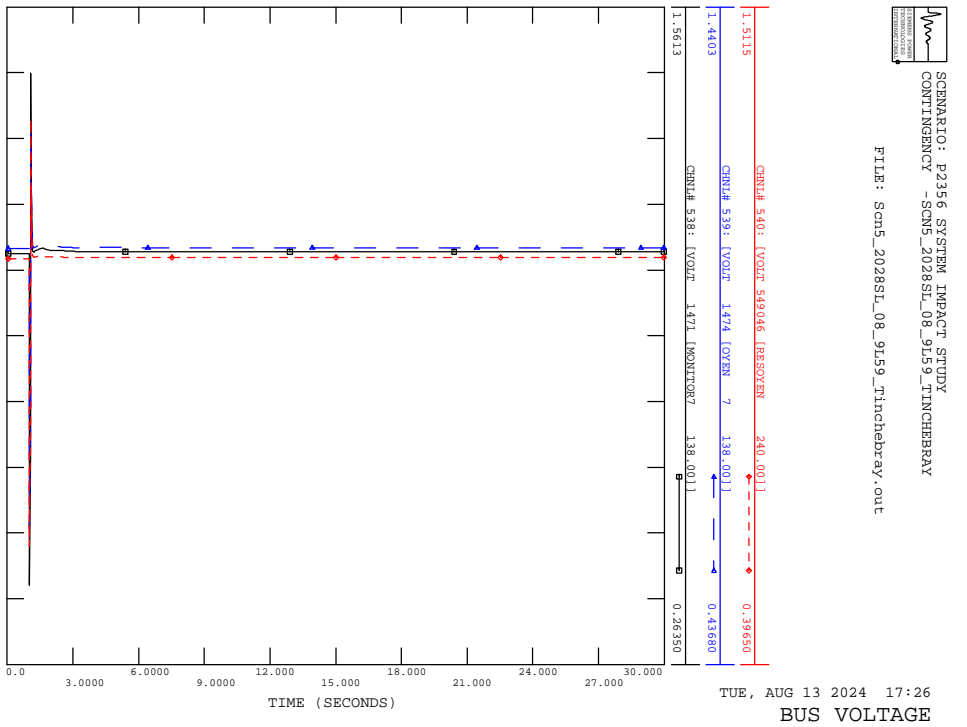
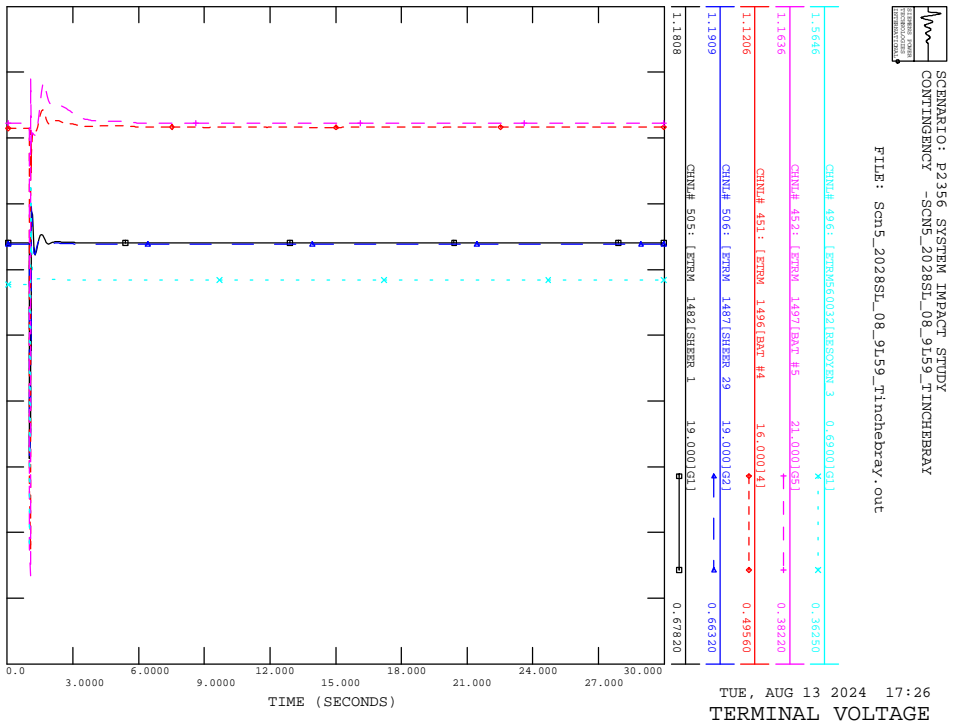


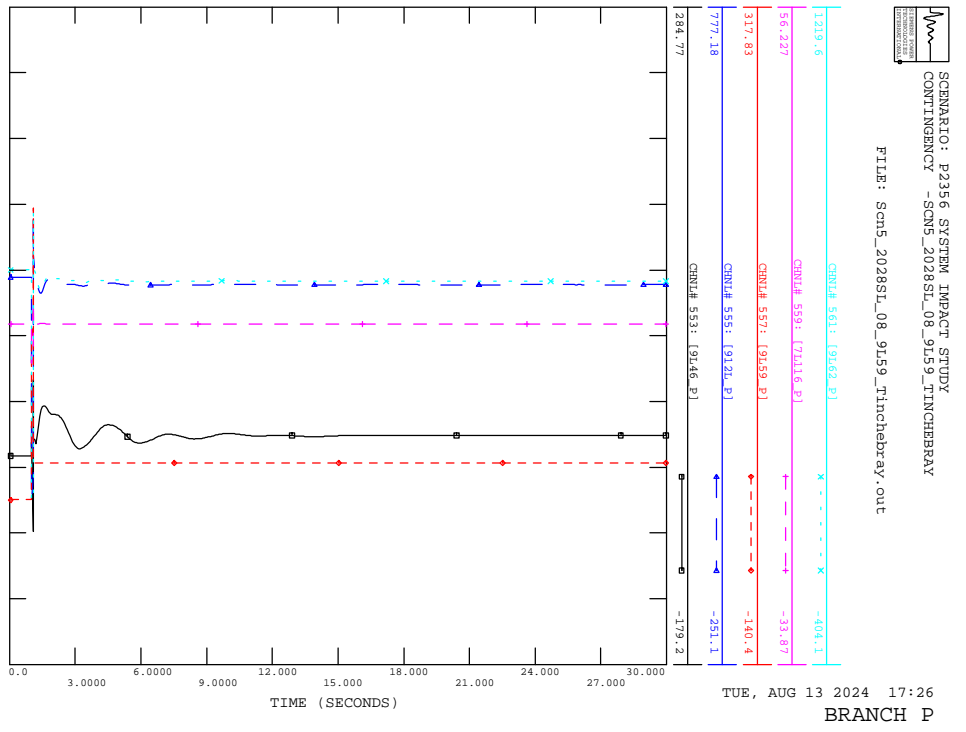
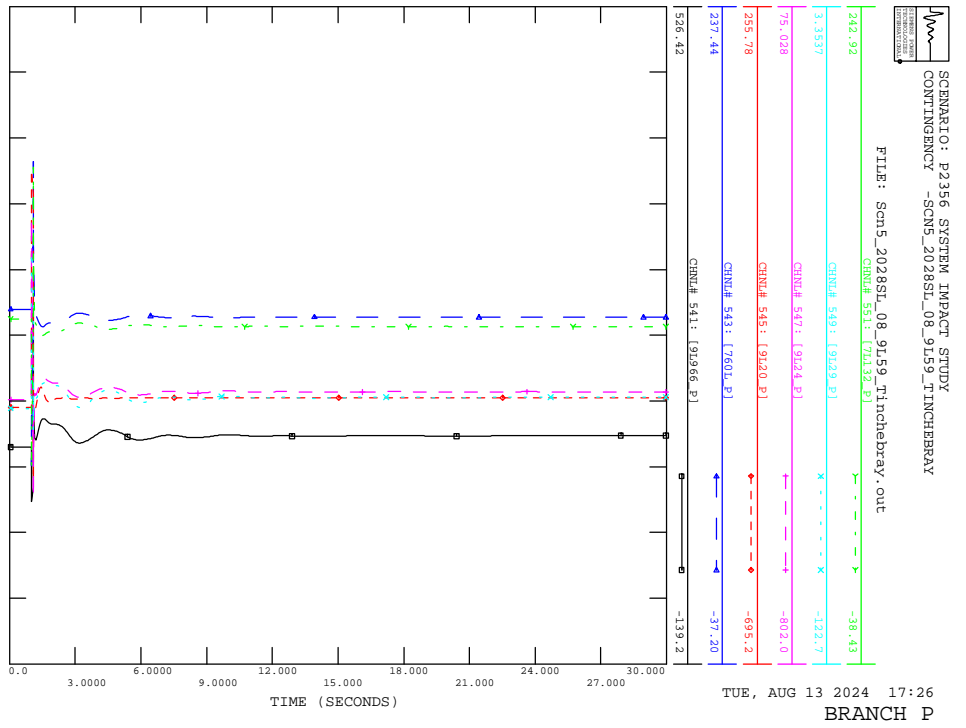
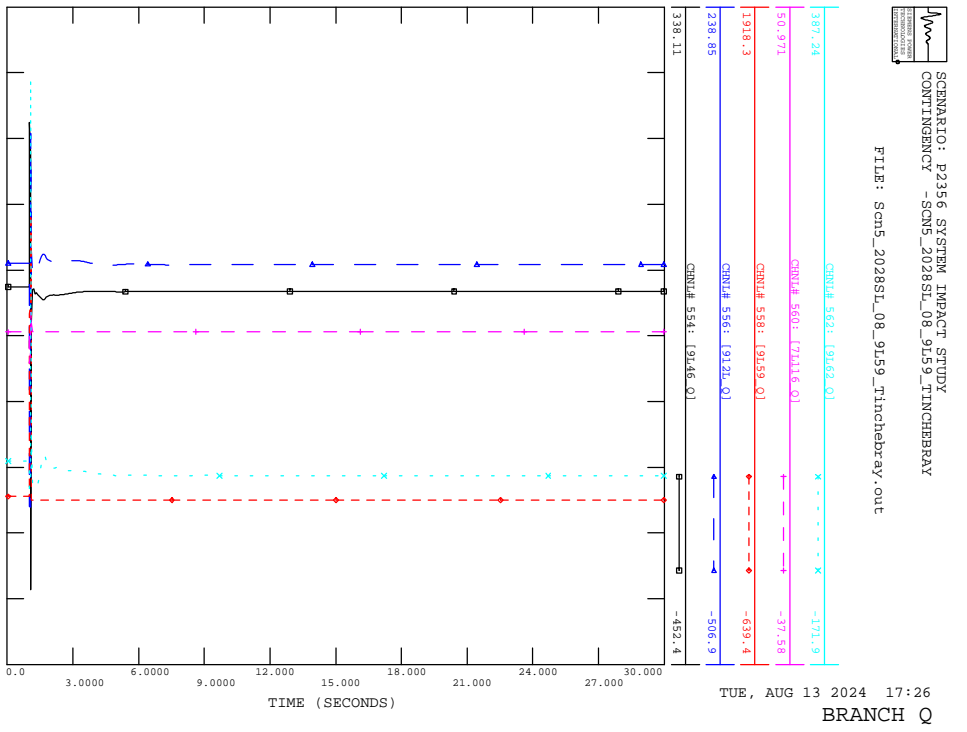
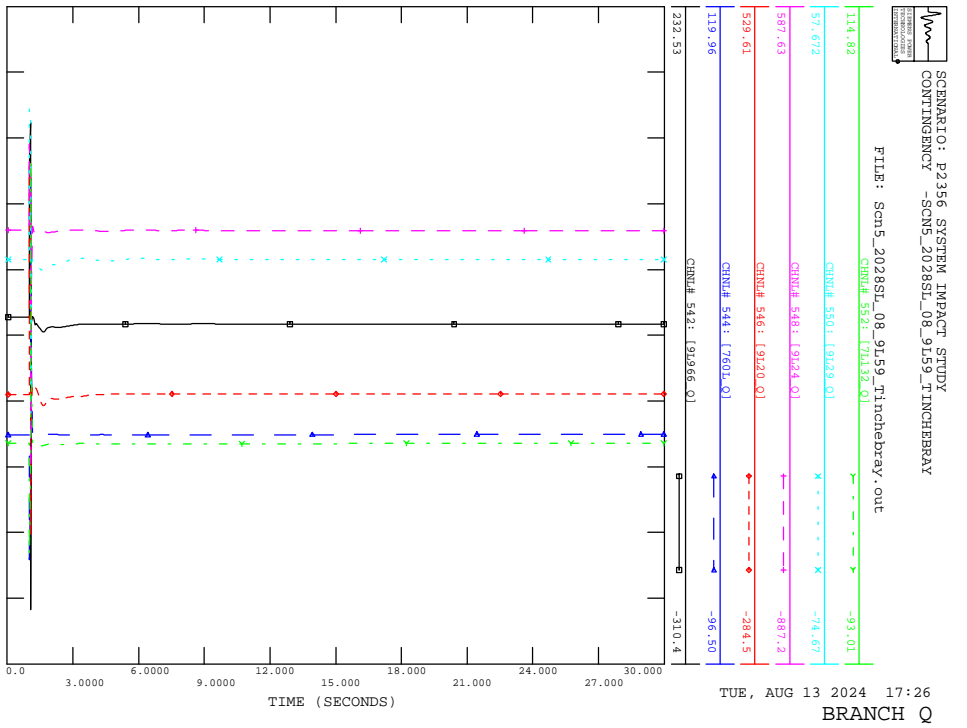


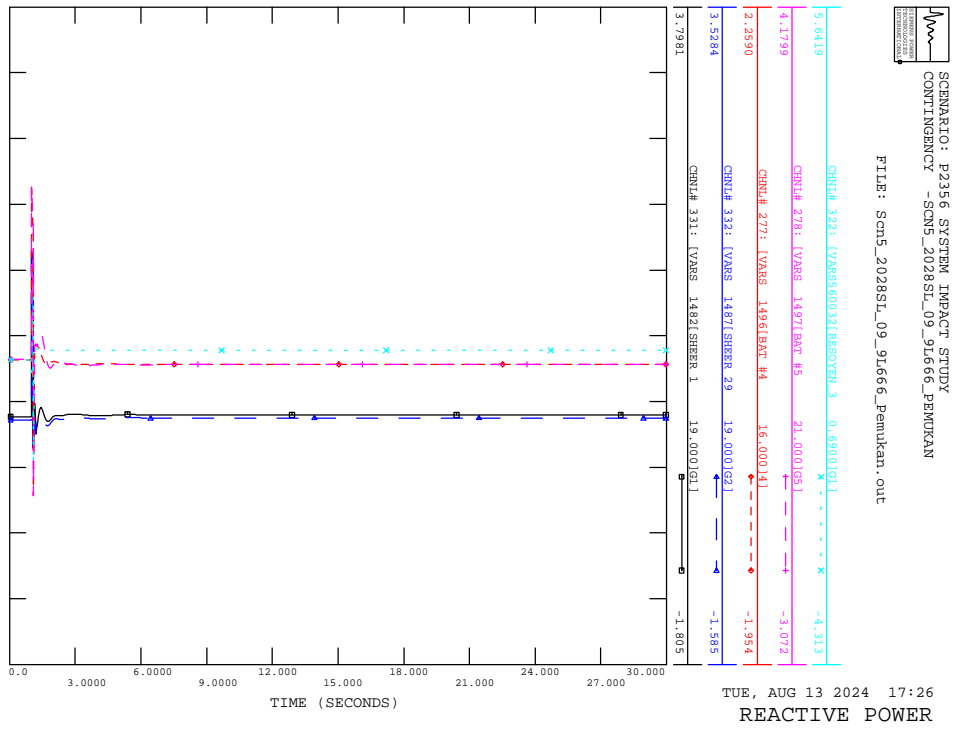
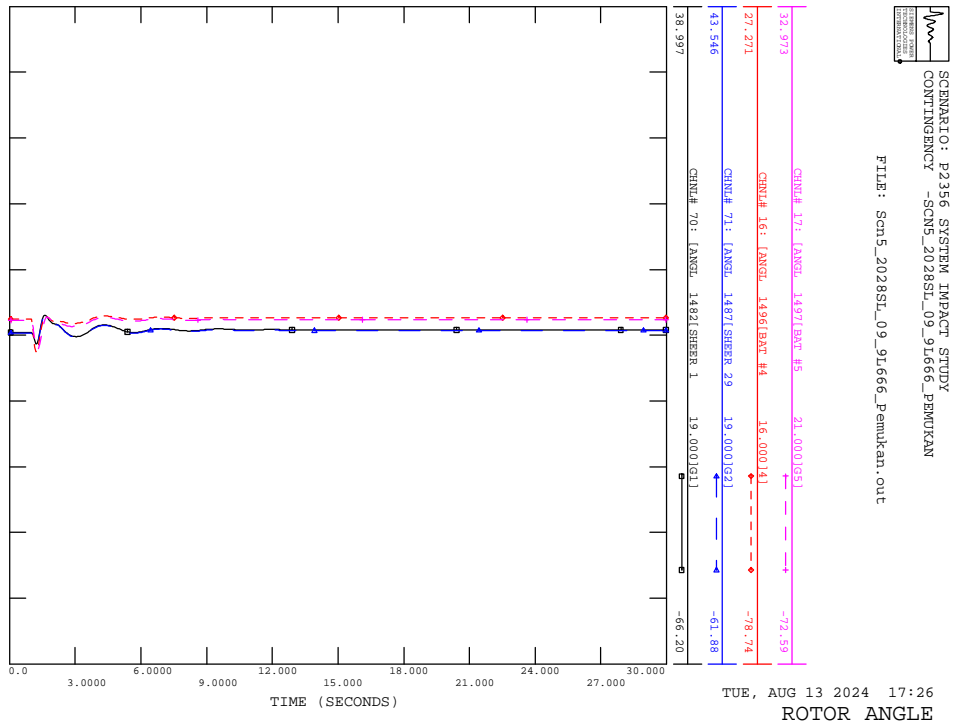
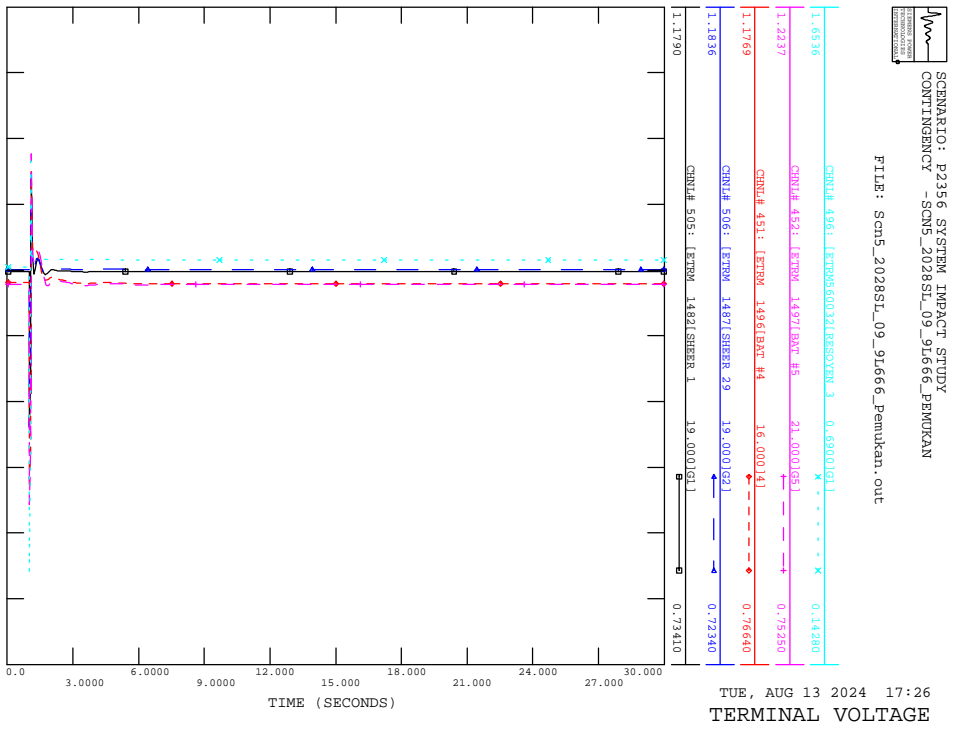
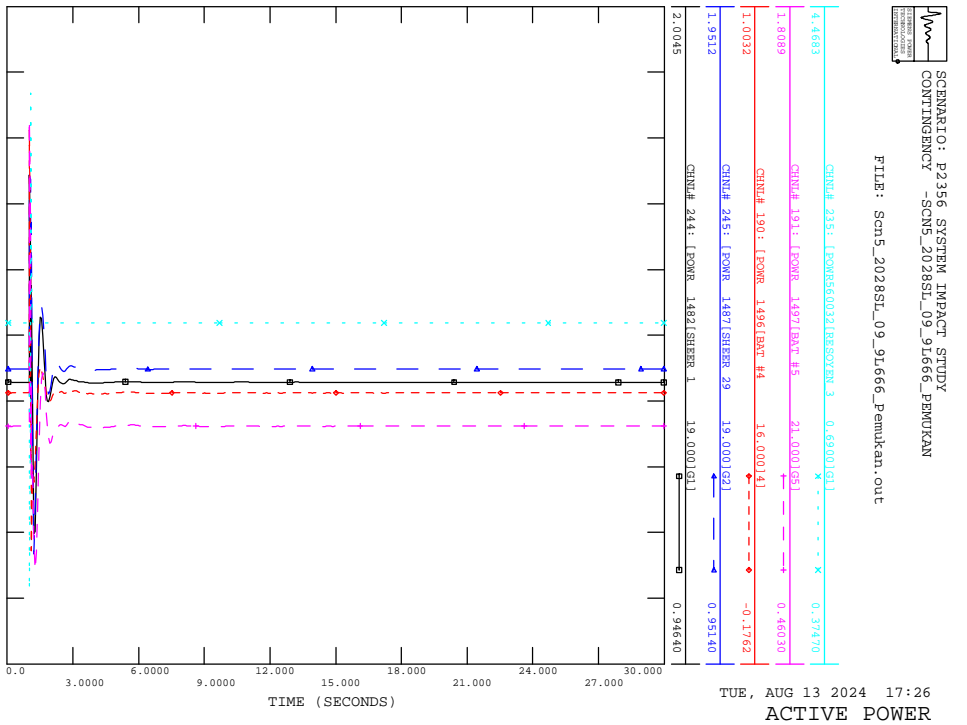


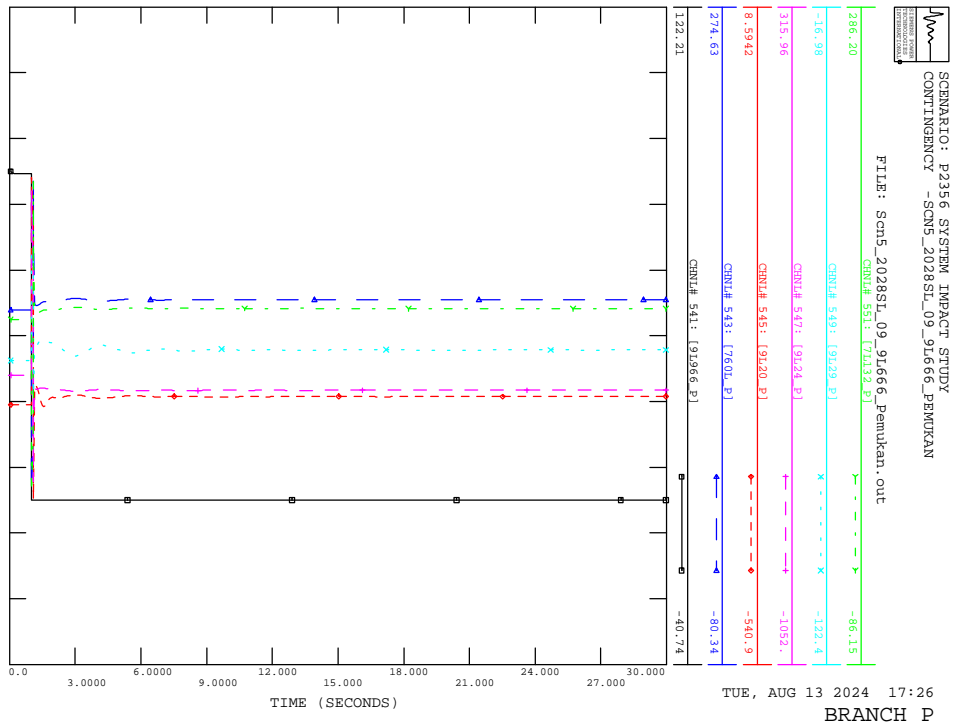
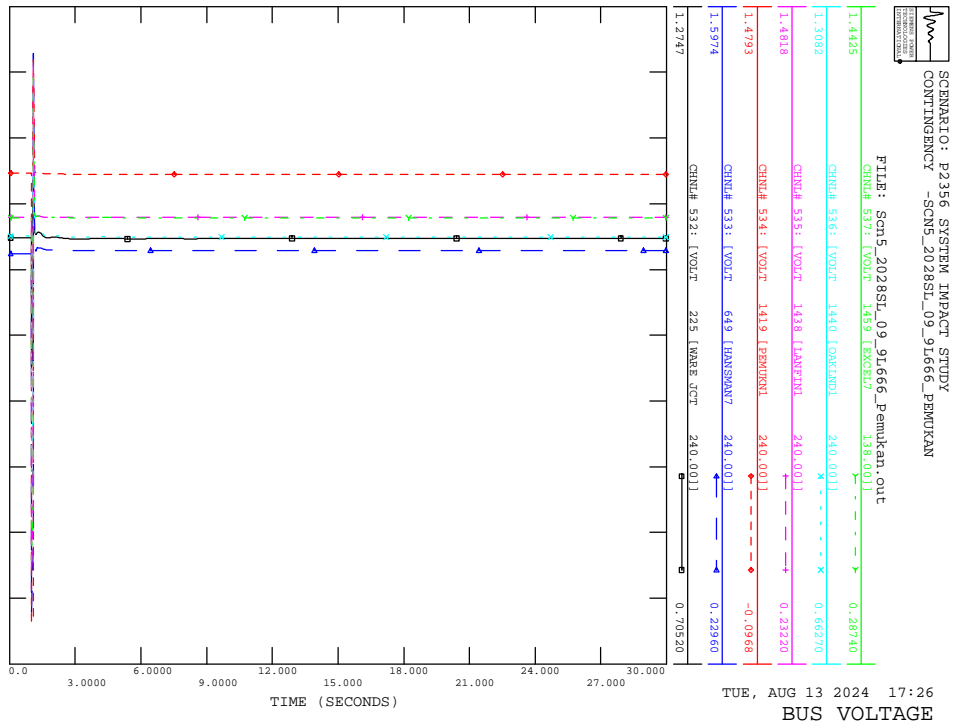
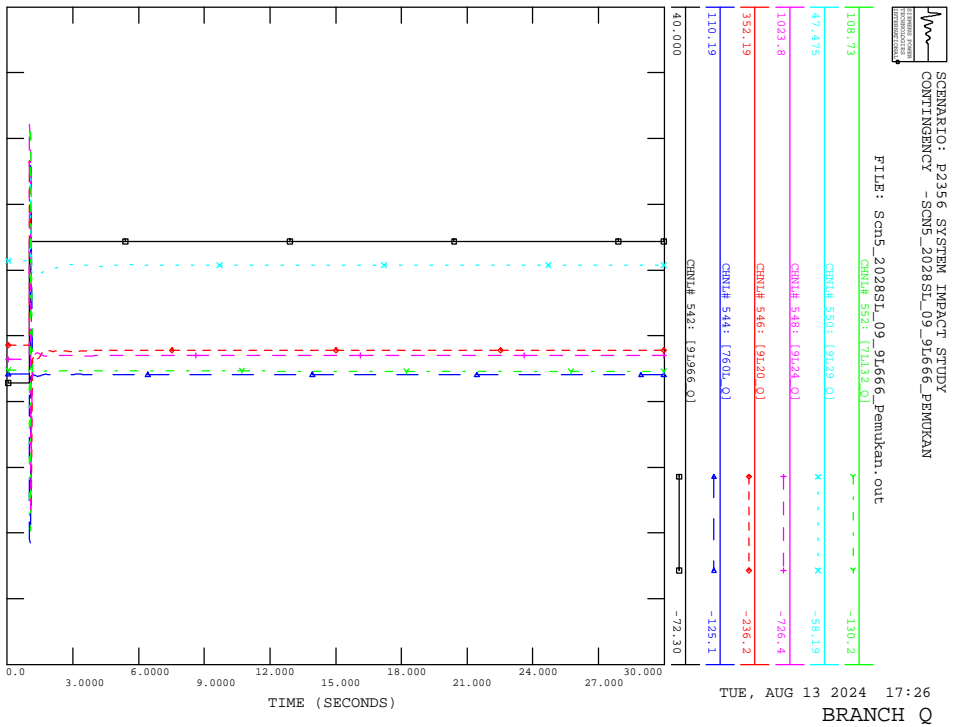
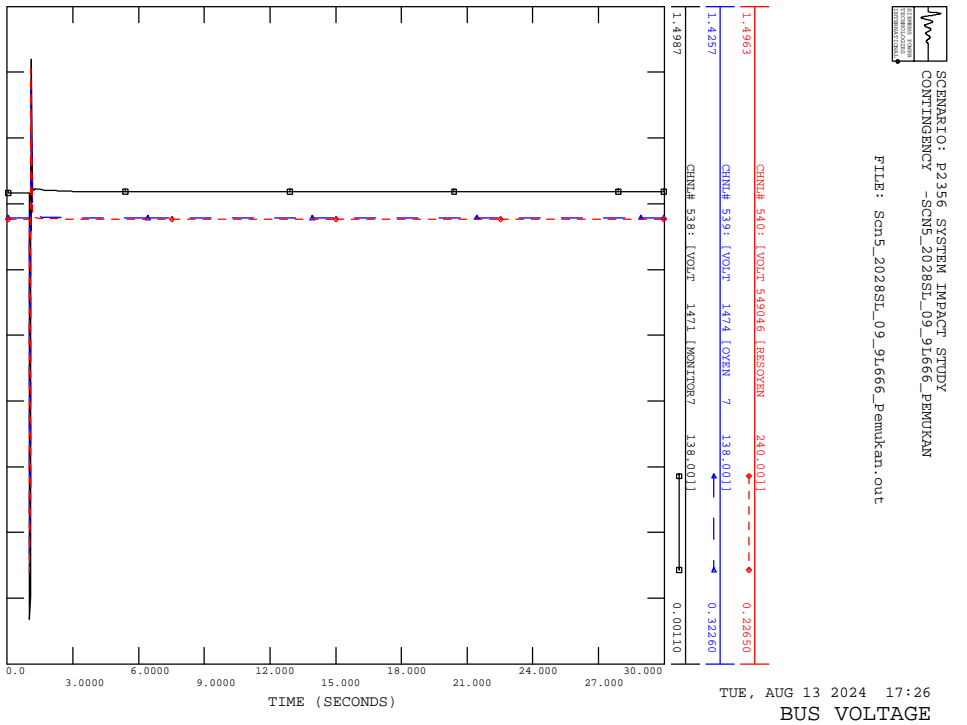


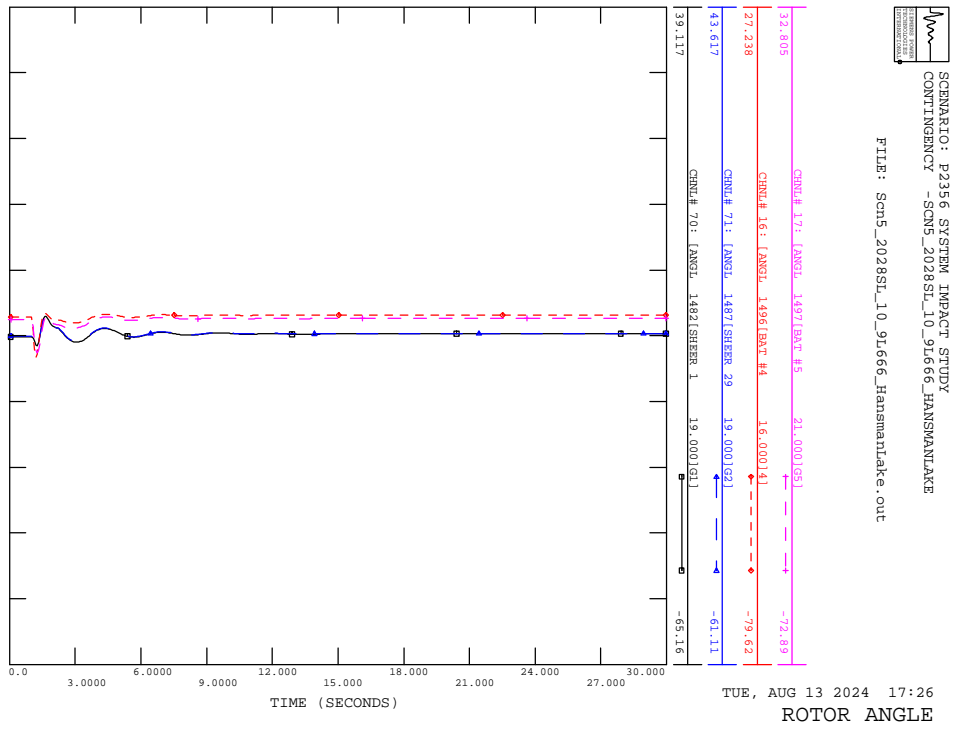
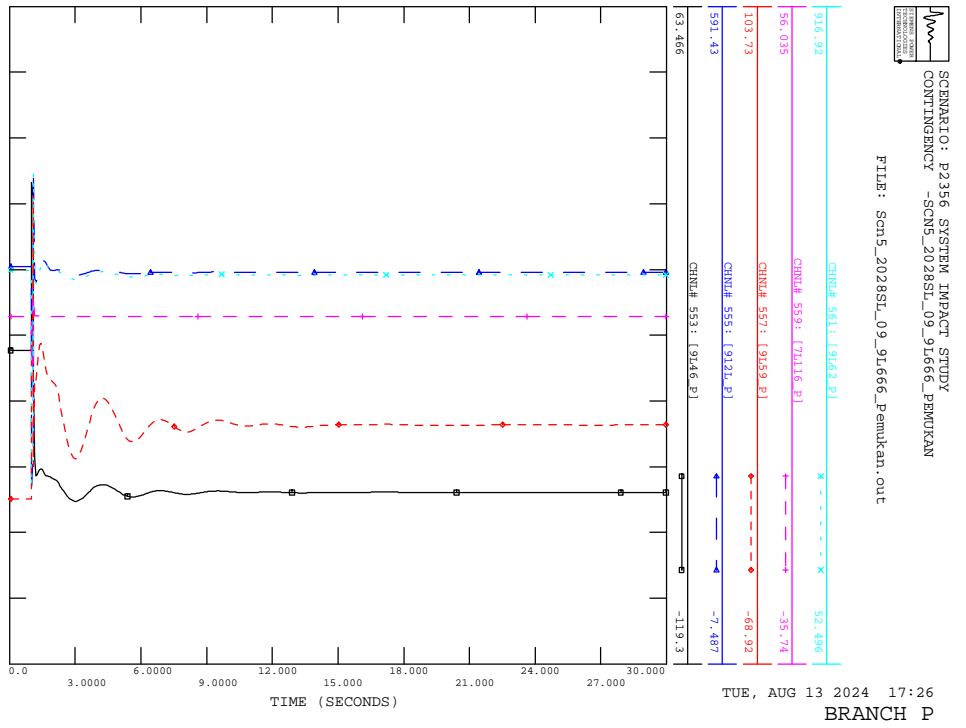
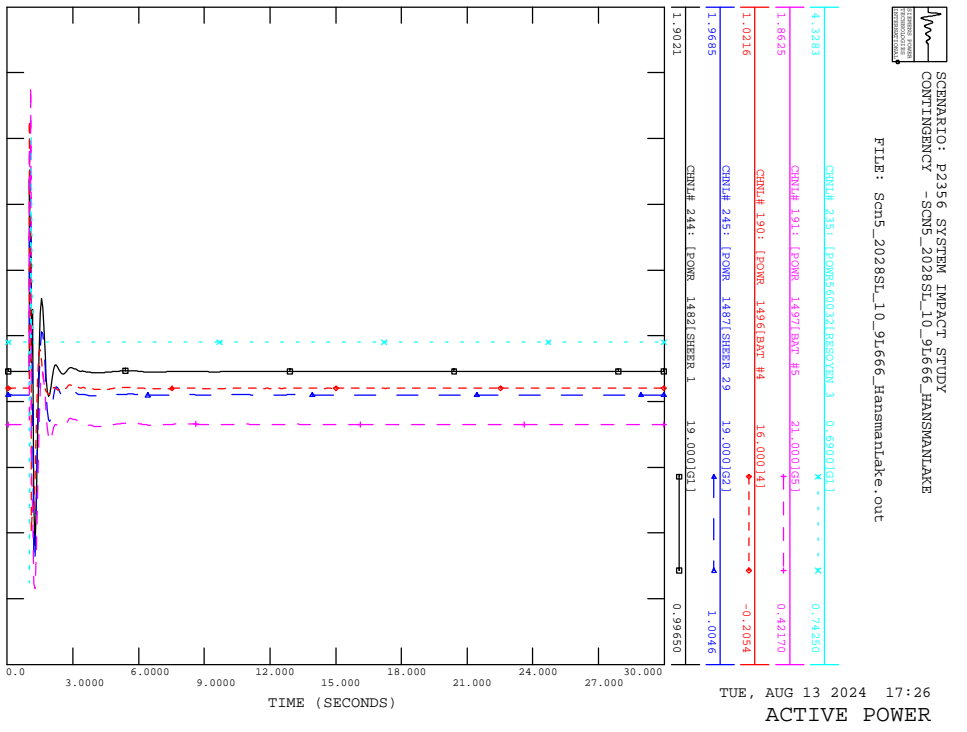
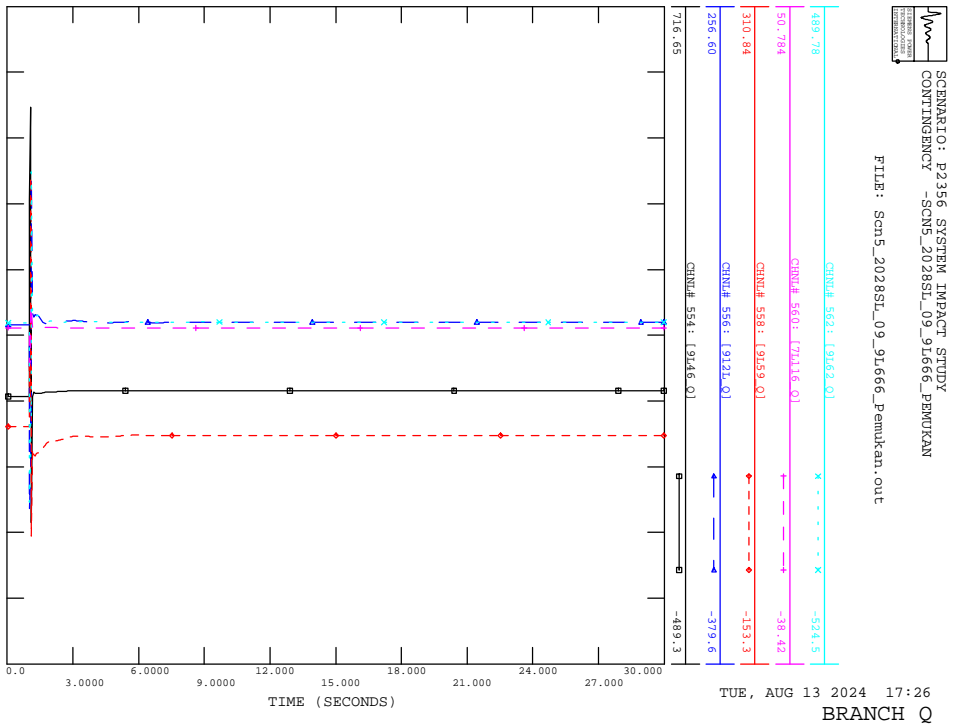


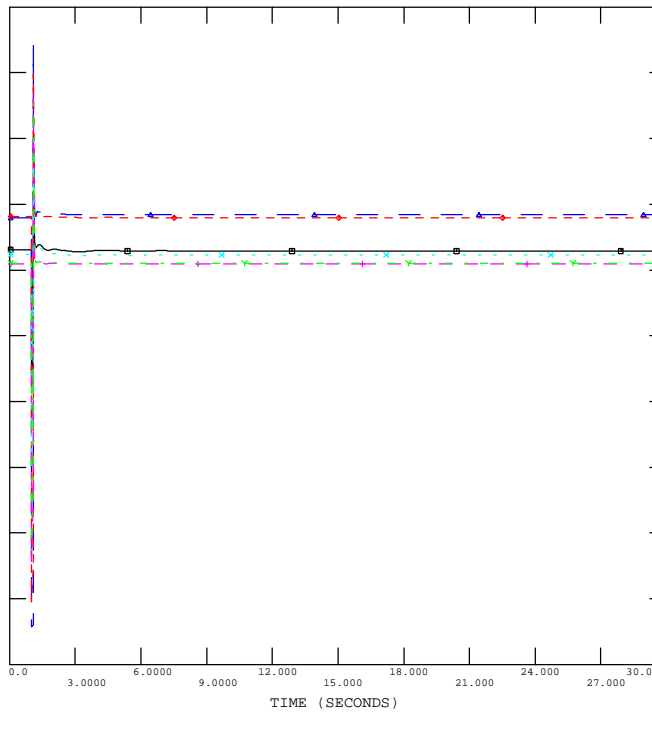
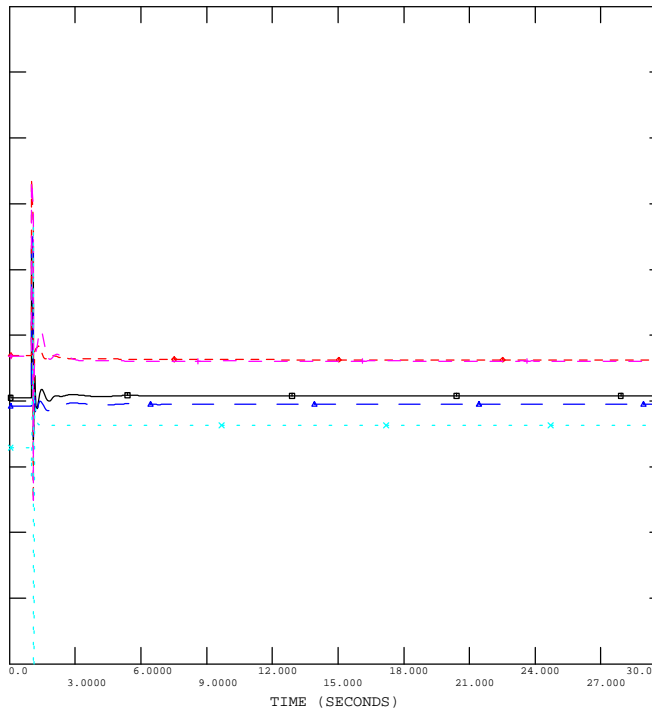
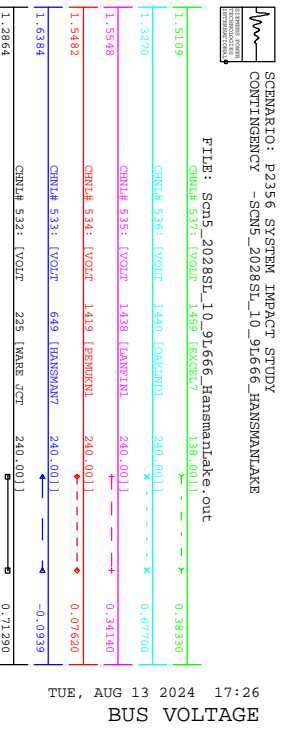
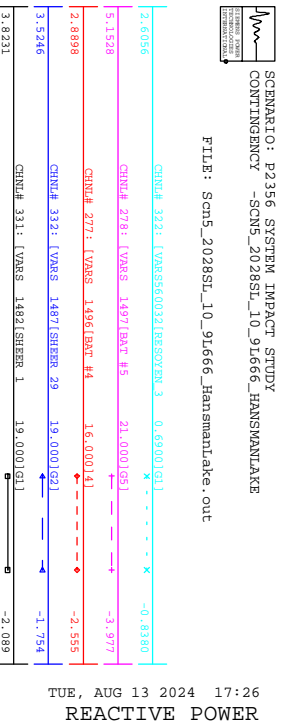
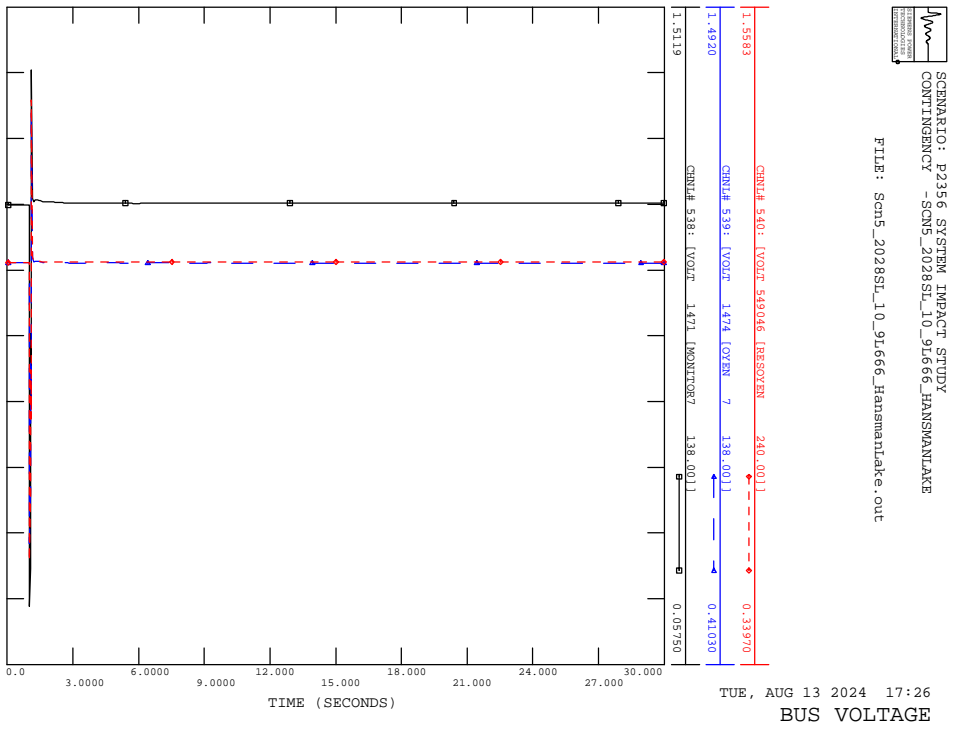
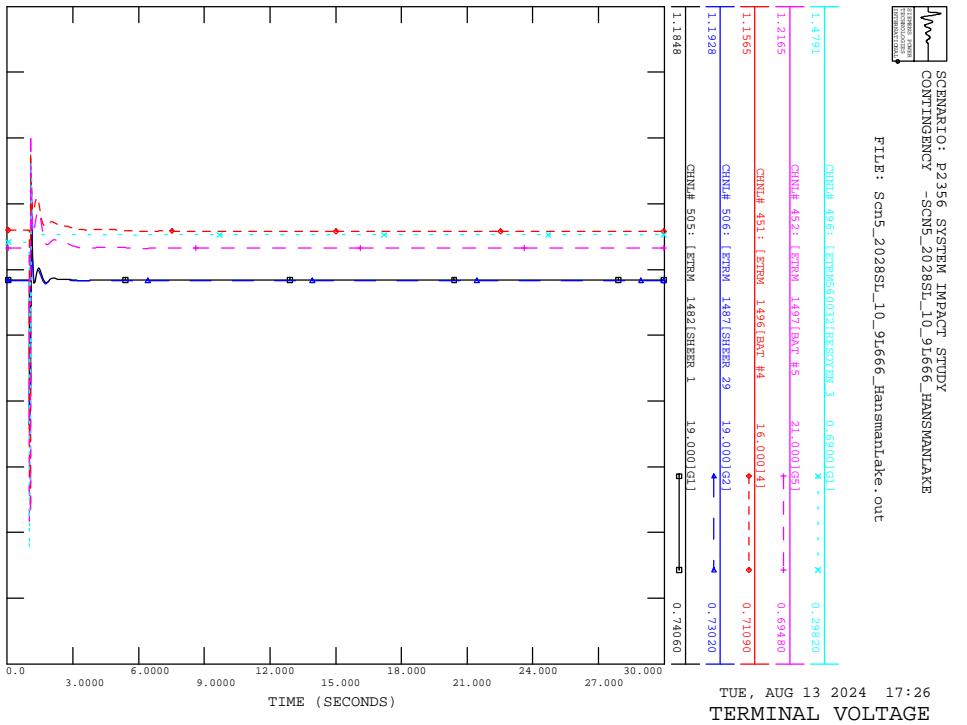




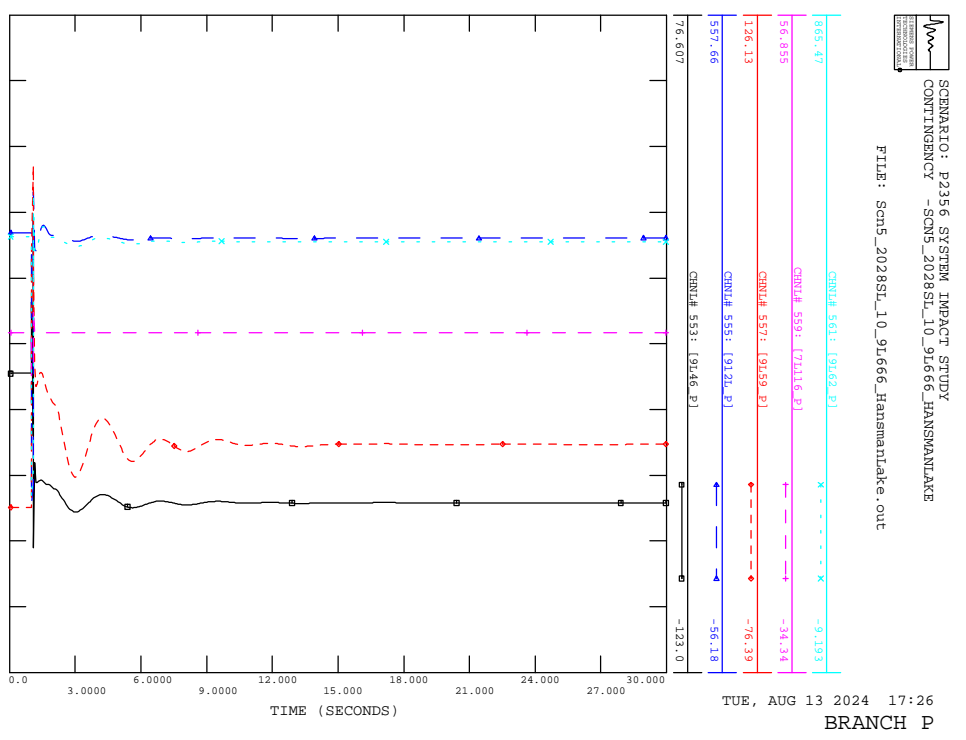
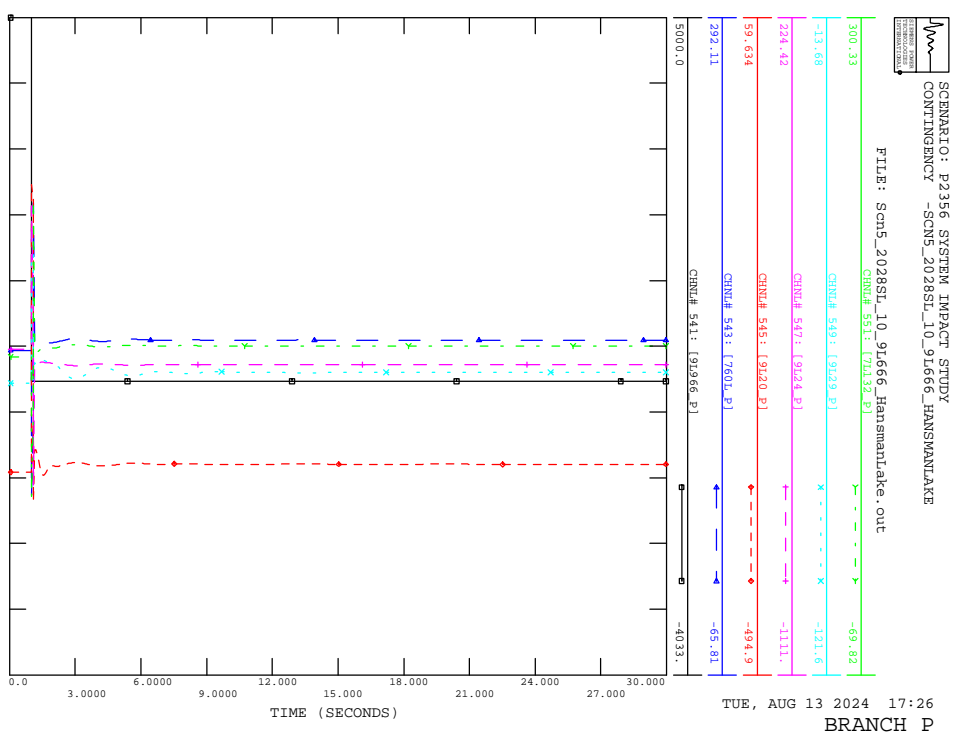
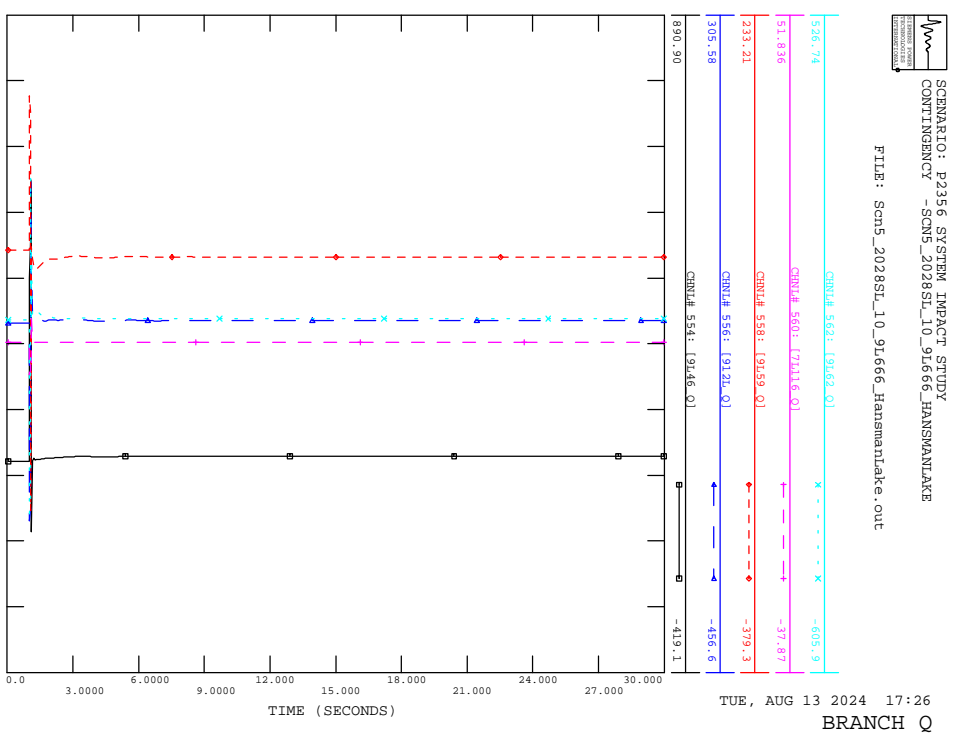
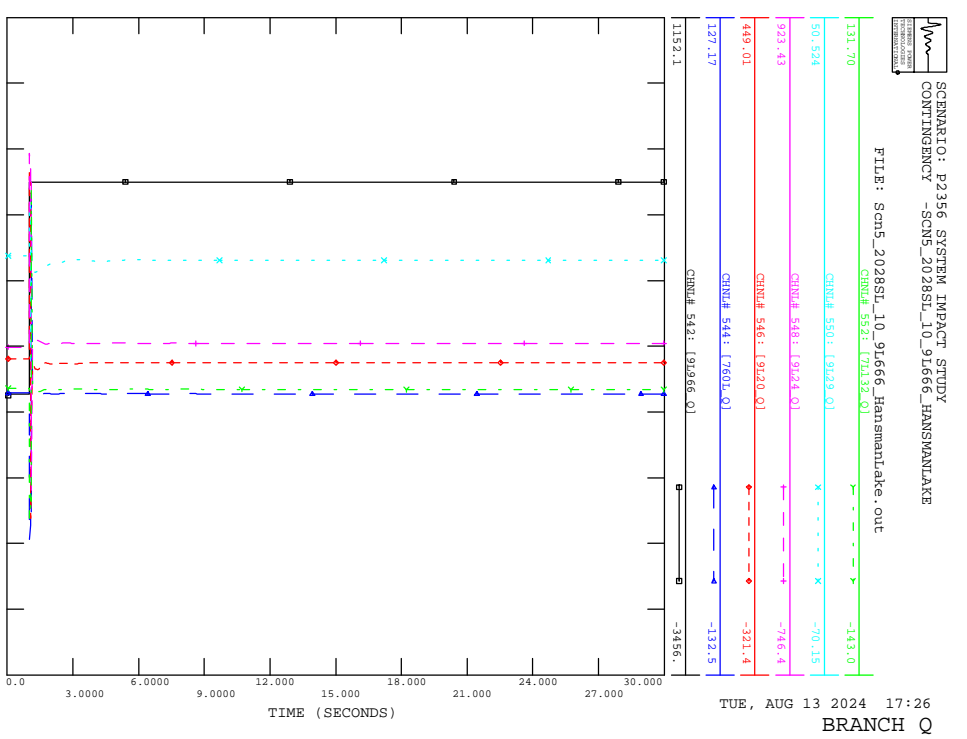






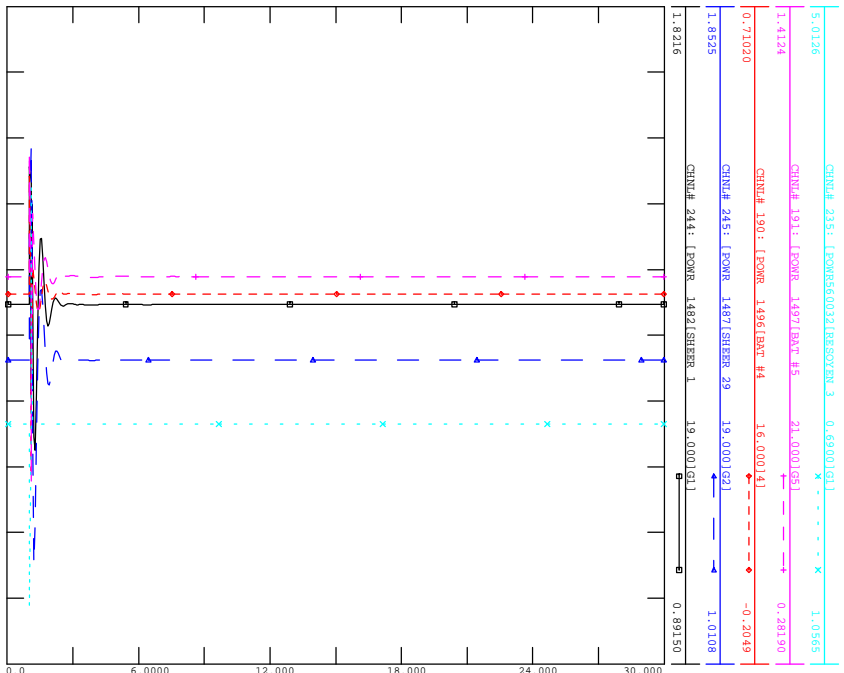






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CONTINGENCY -SCN5\_2028SL\_11\_760L\_OYEN

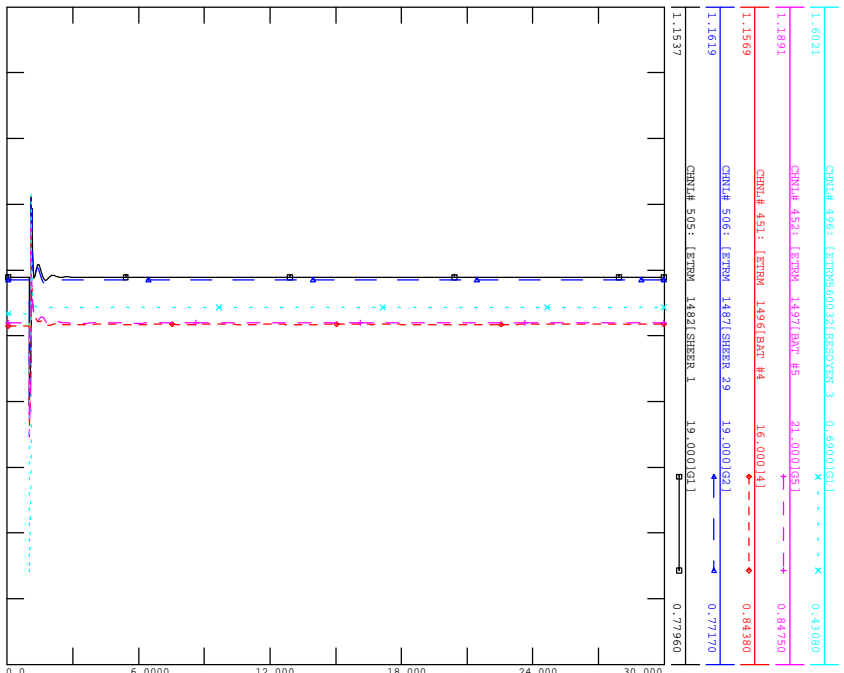
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ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
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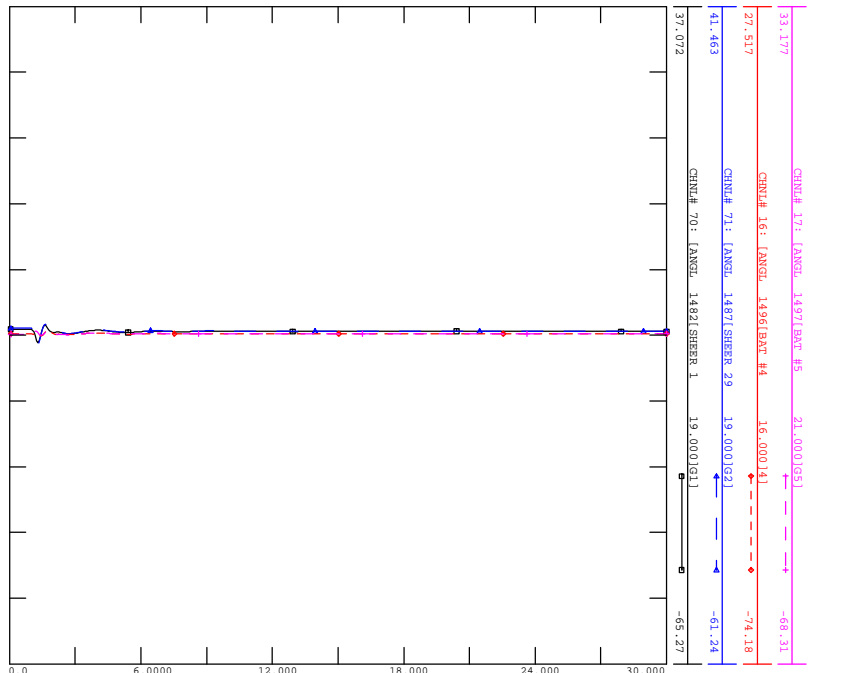
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TERMINAL VOLTAGE

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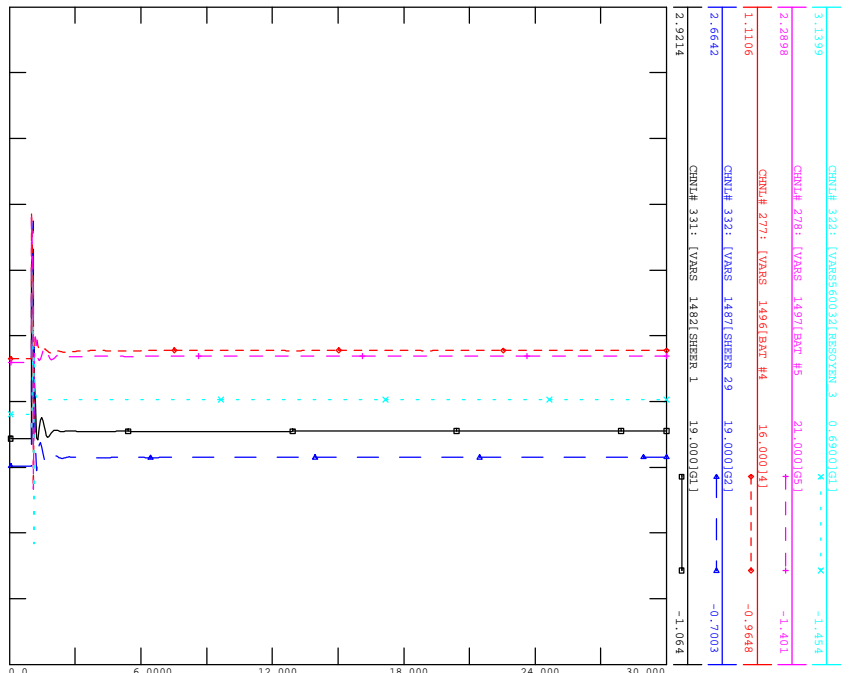
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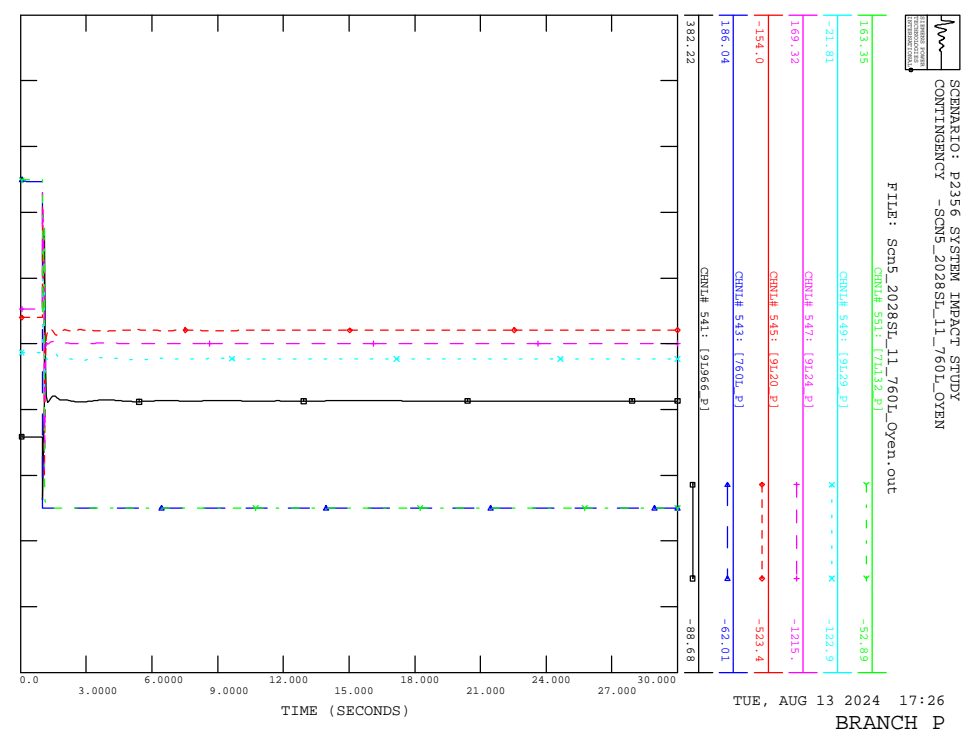
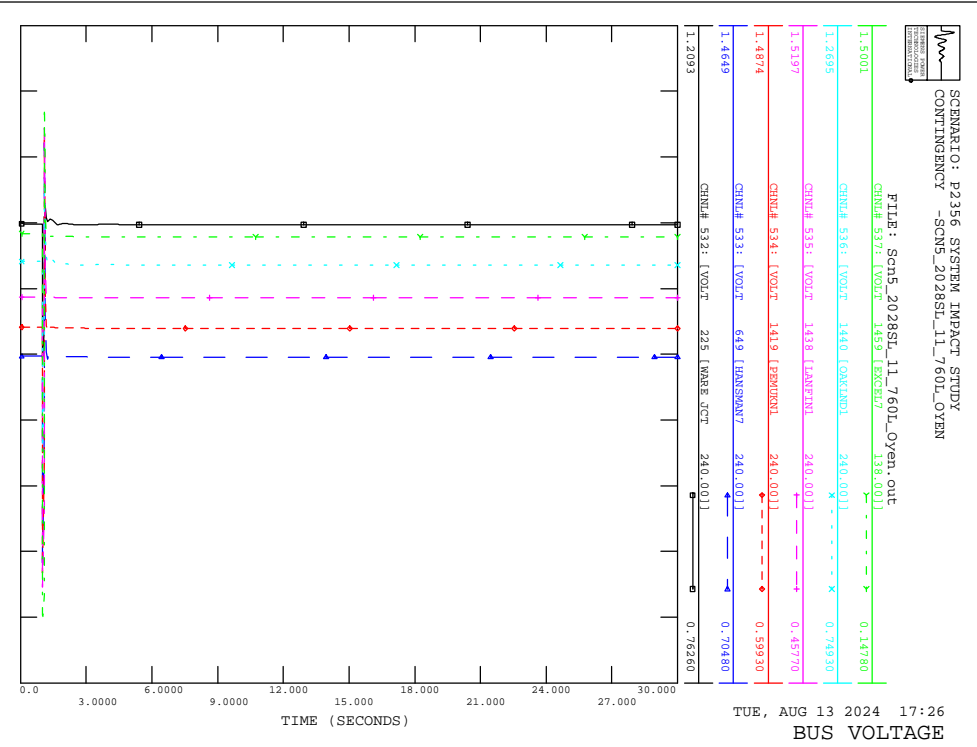
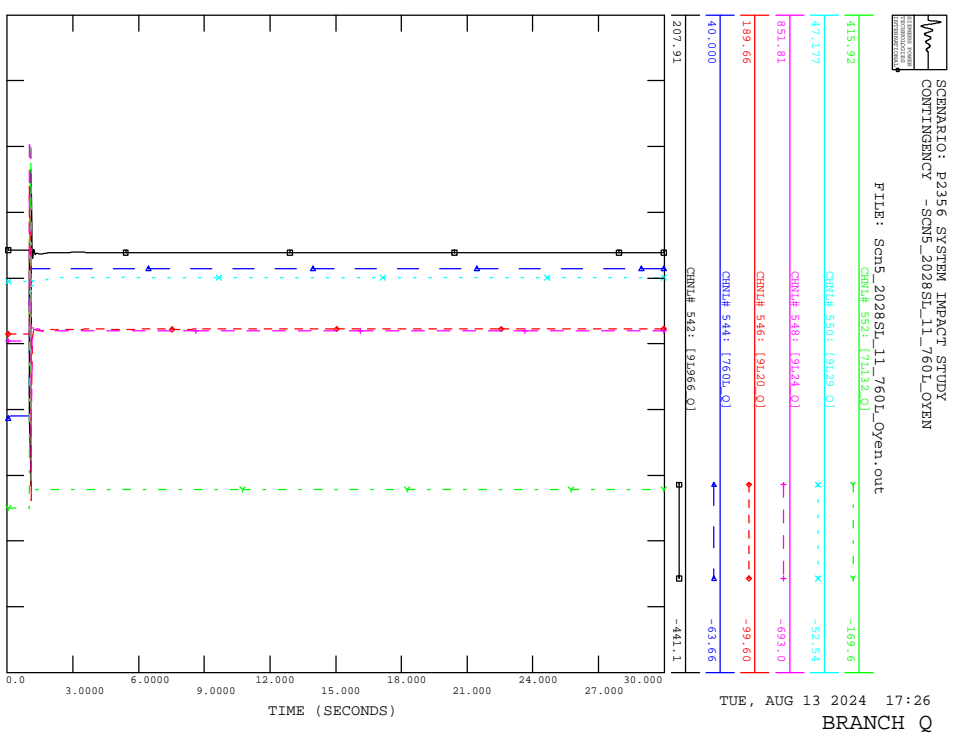
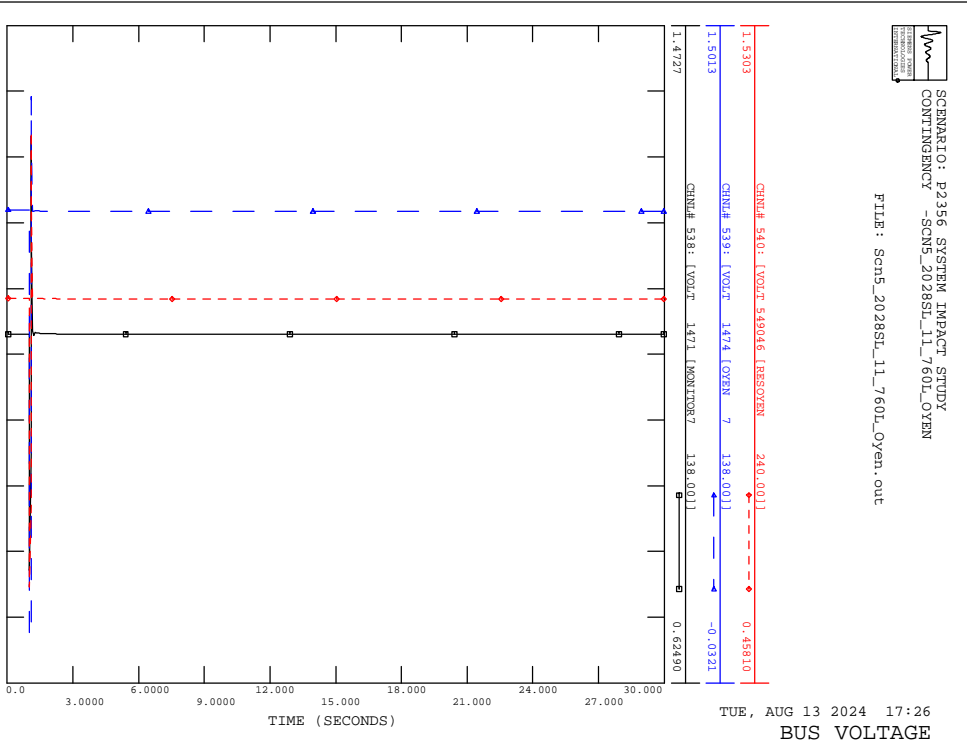
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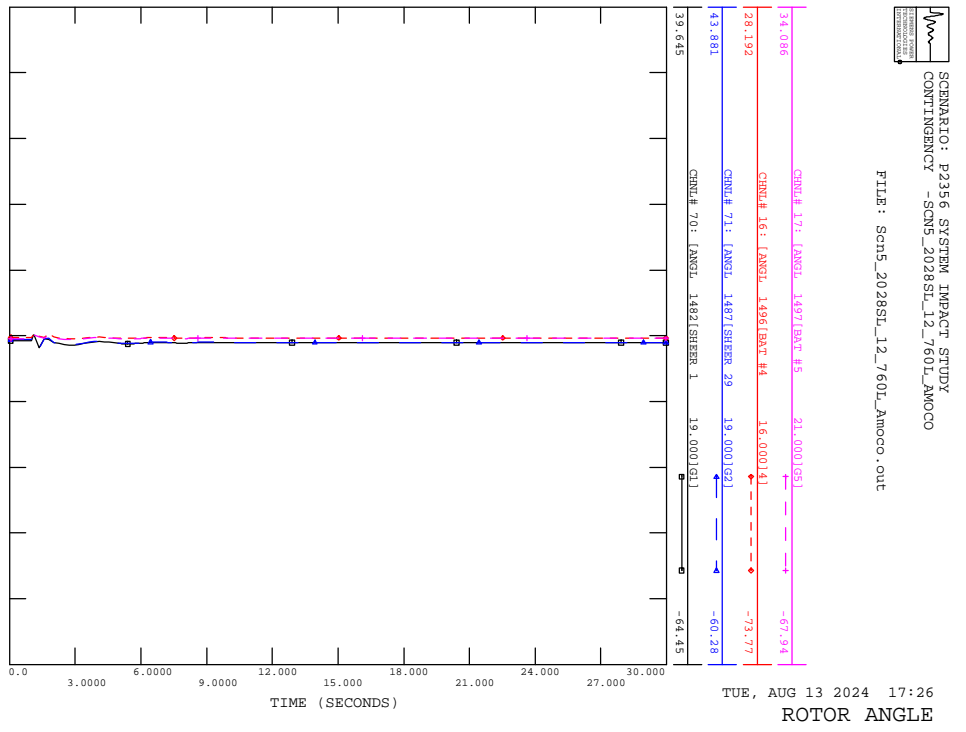
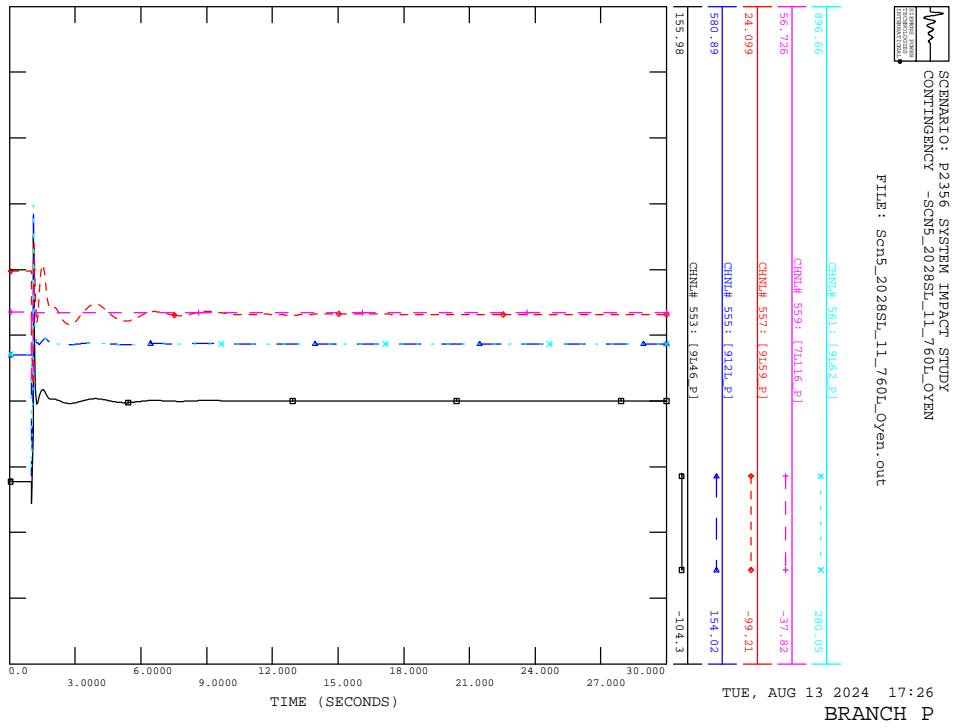
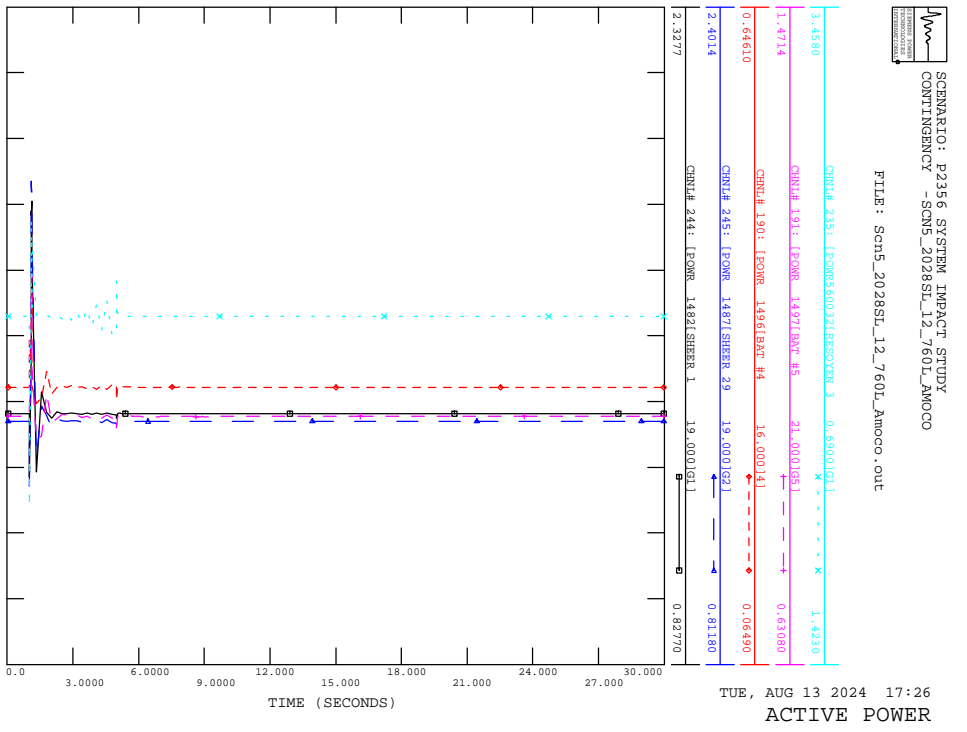
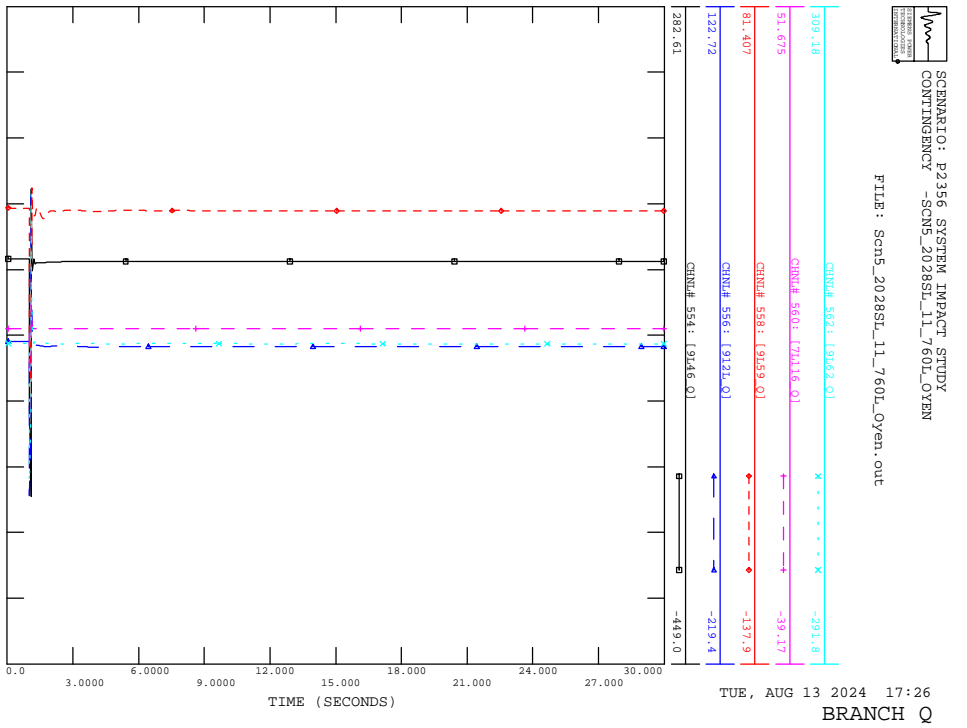
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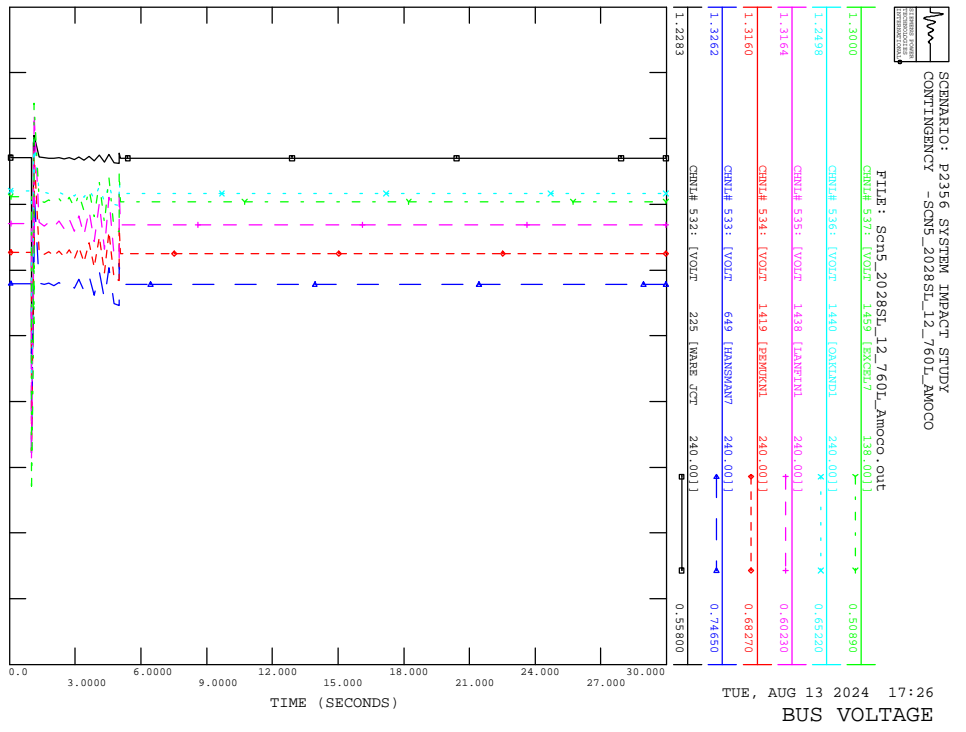
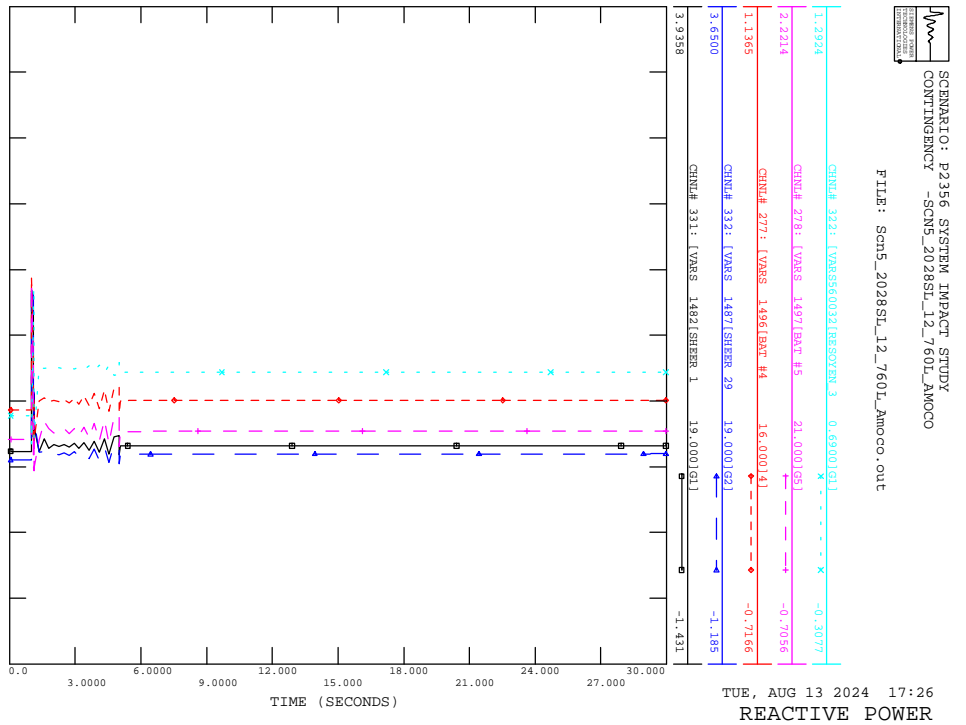
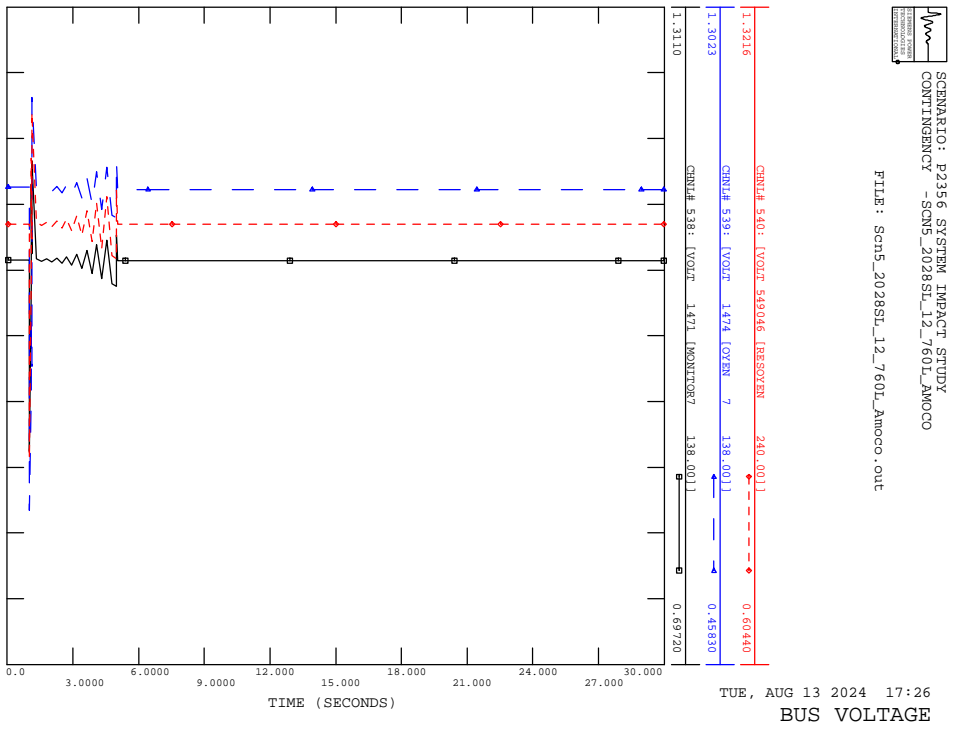
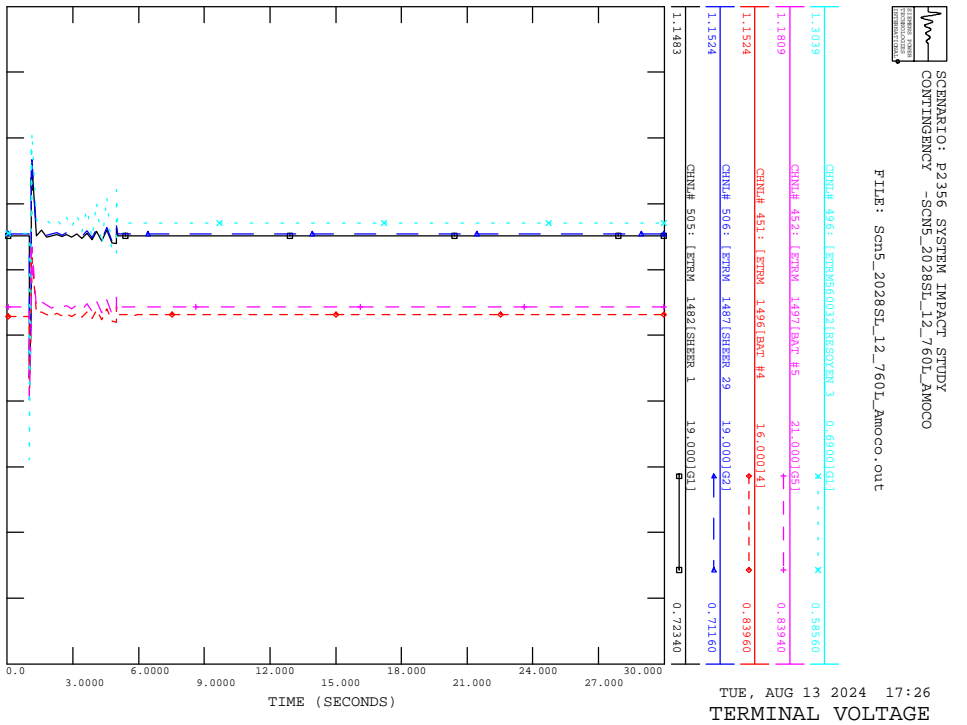
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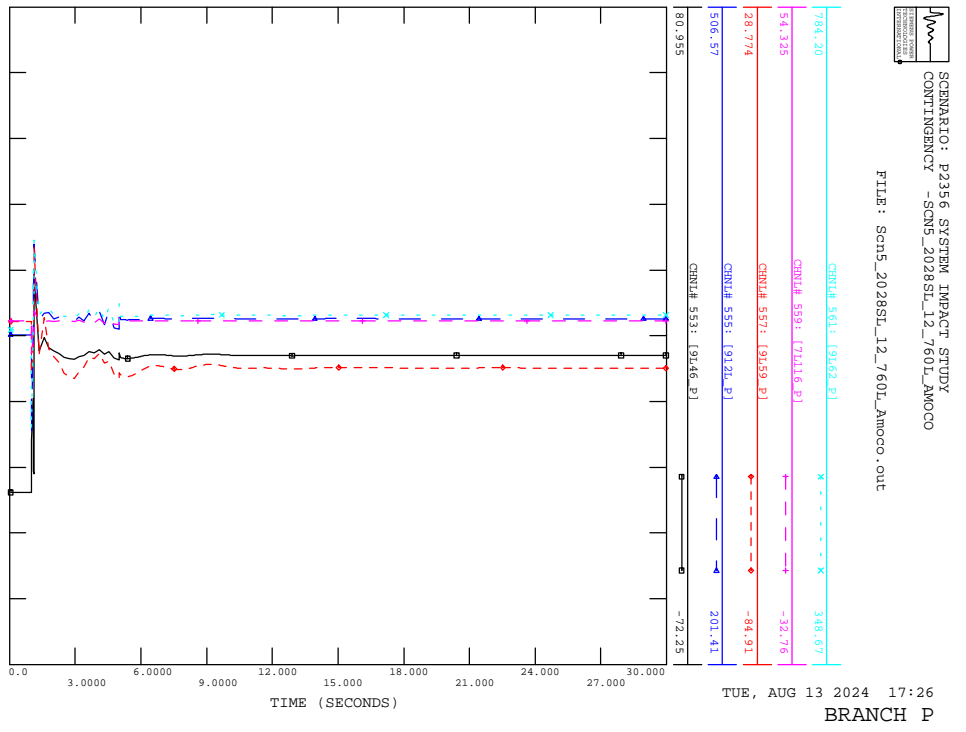
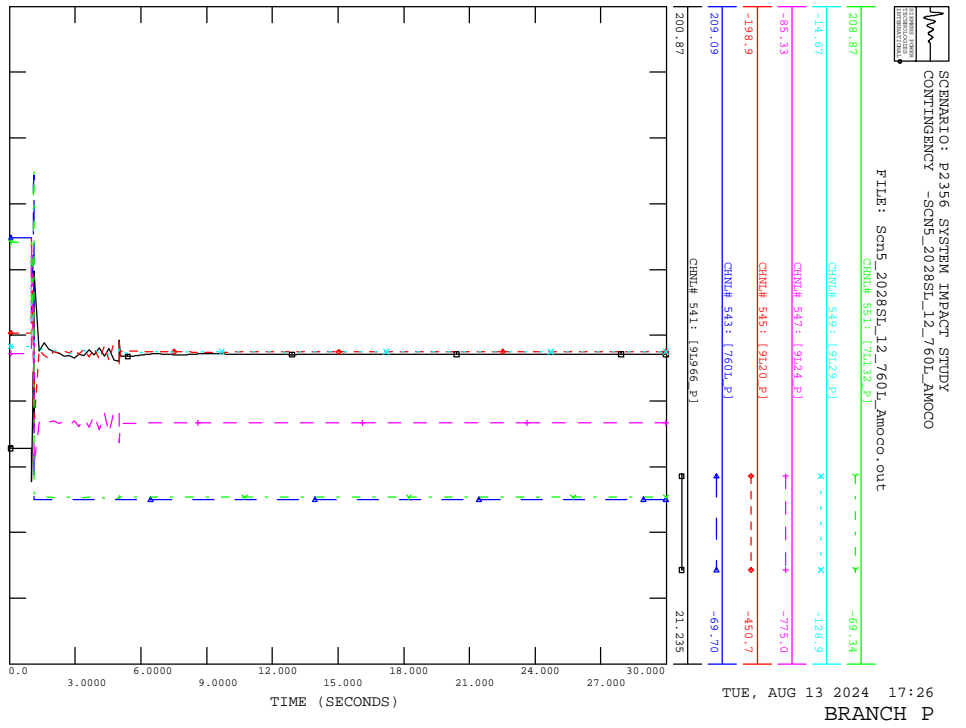
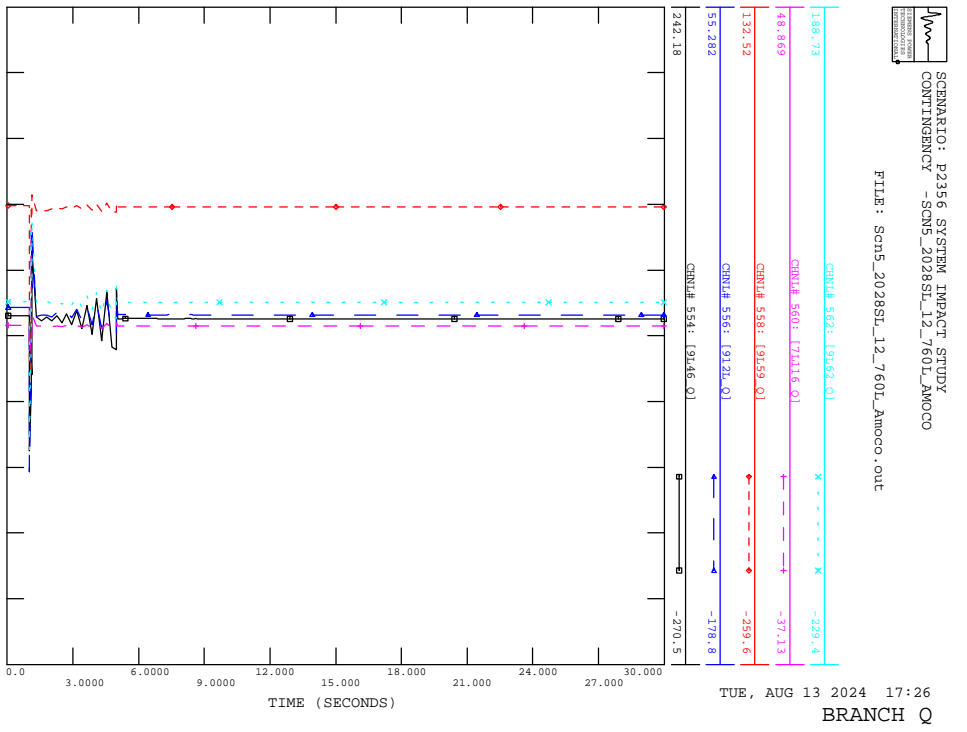
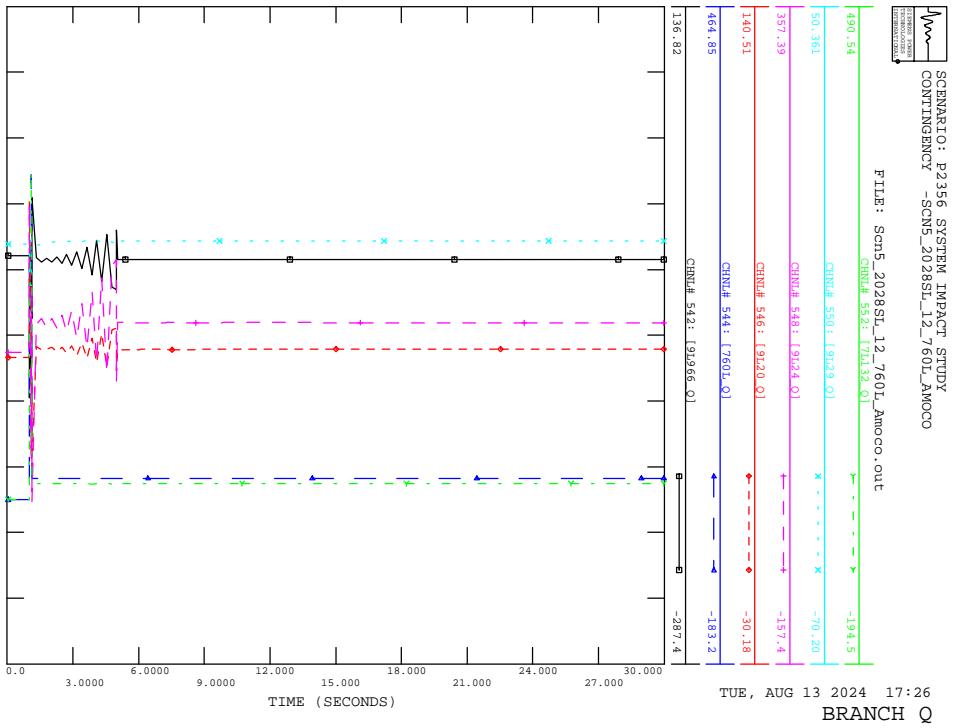


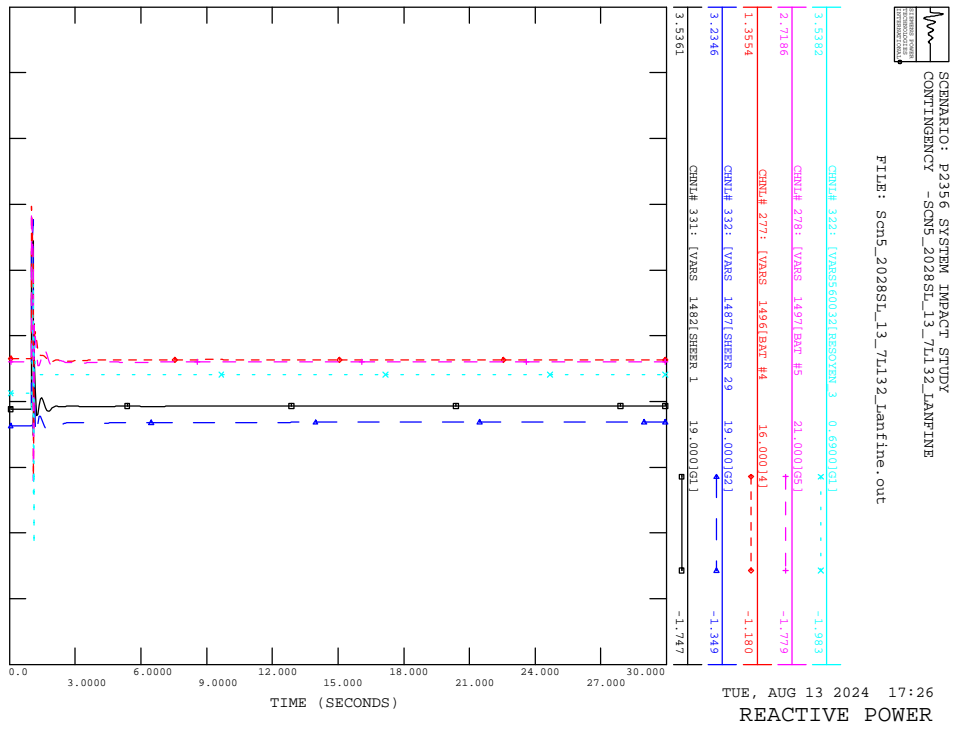
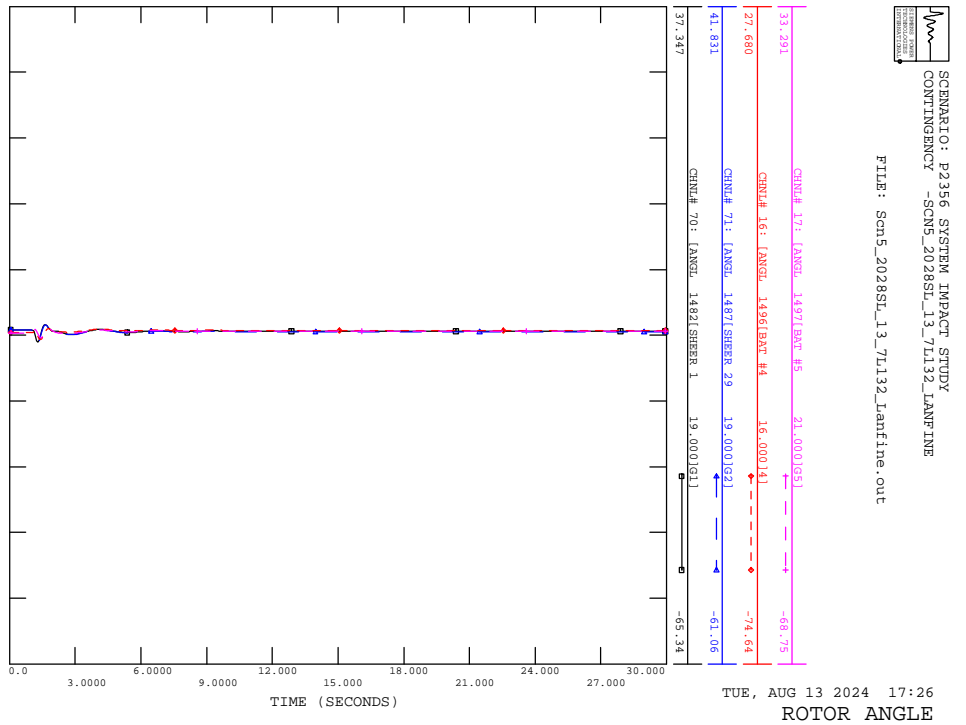
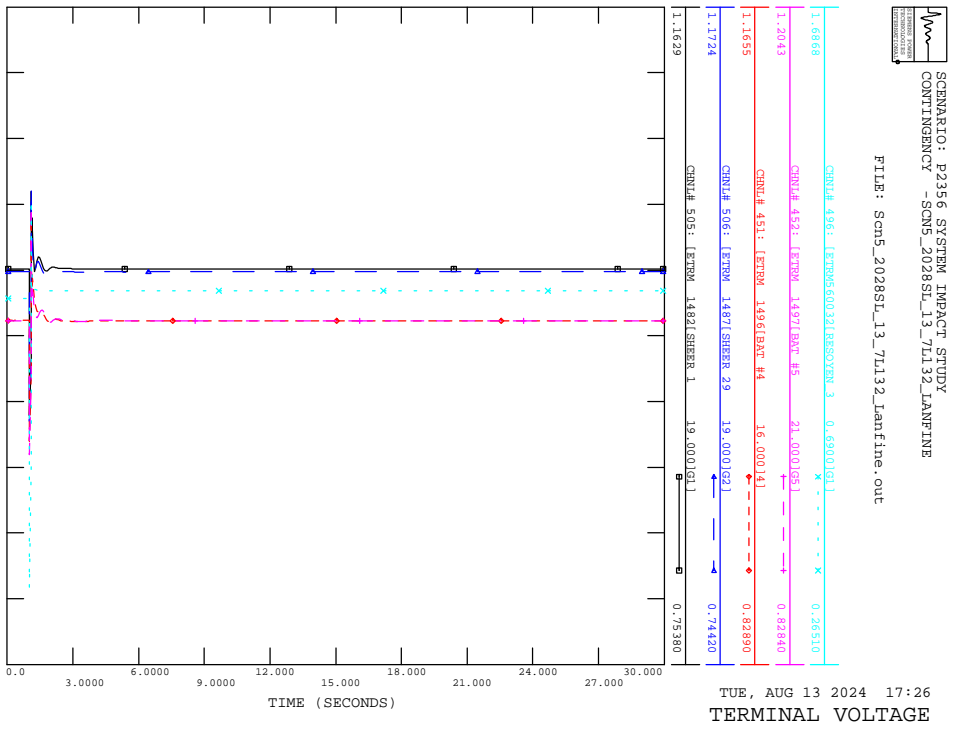
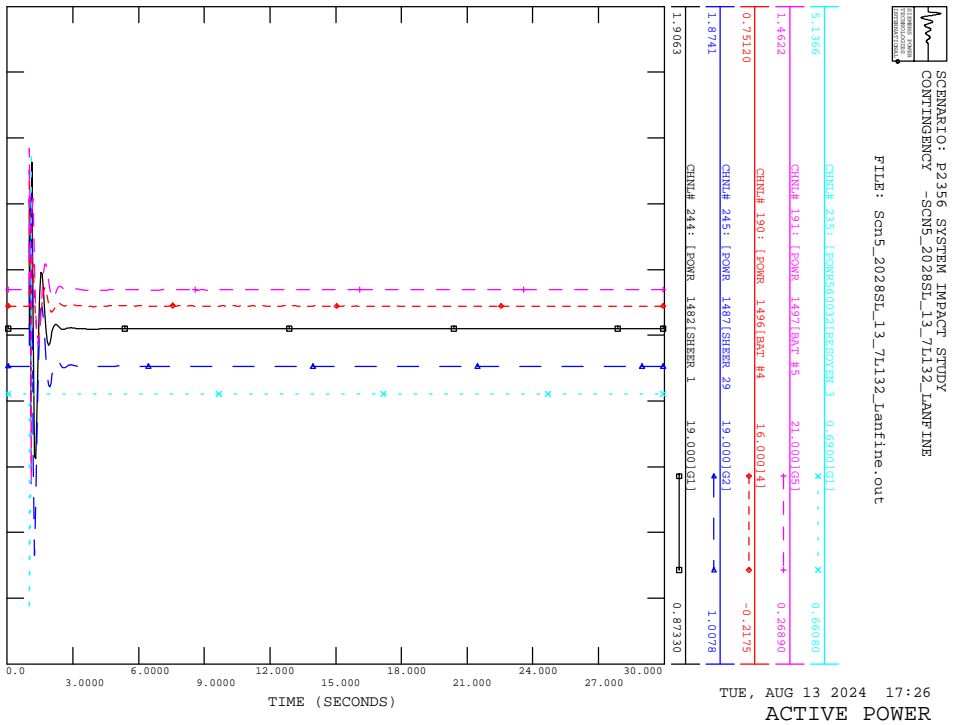
TUE, AUG 13 2024 17:26  
REACTIVE POWER

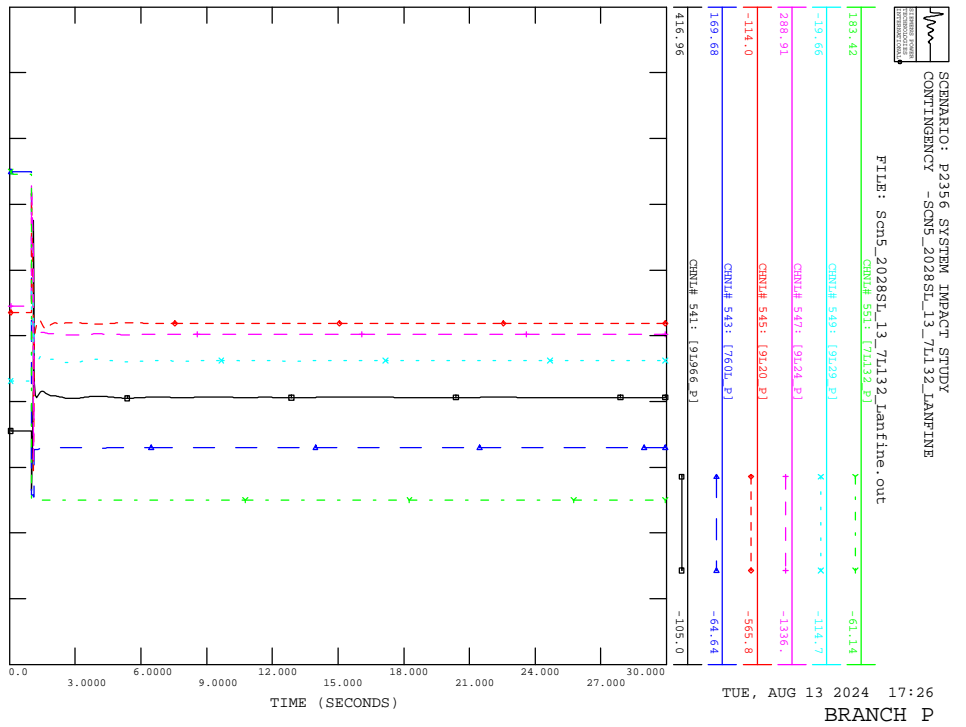
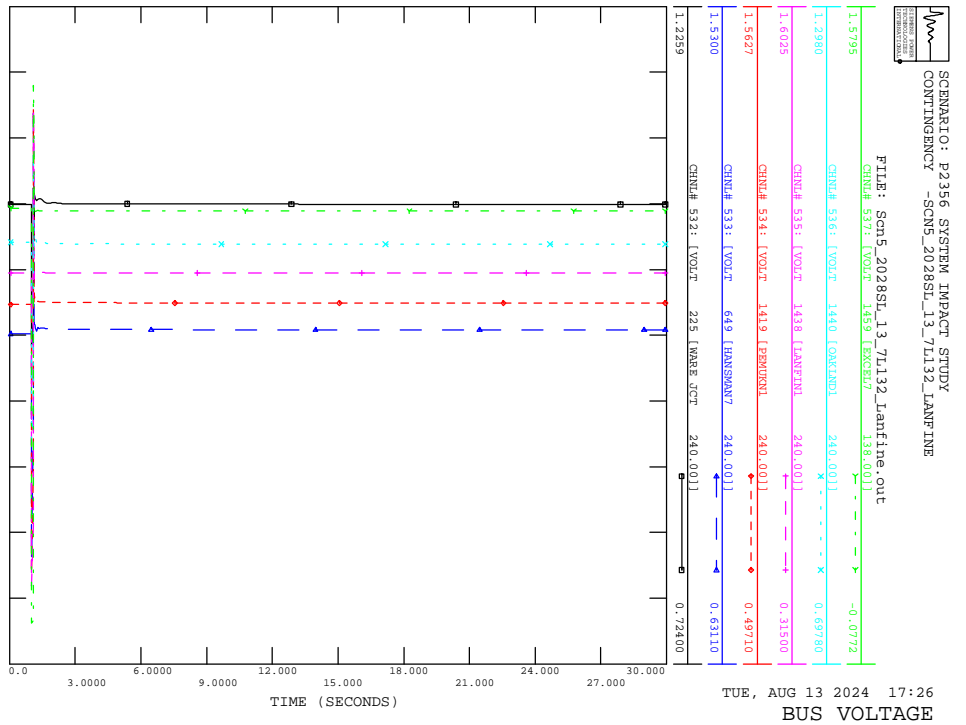
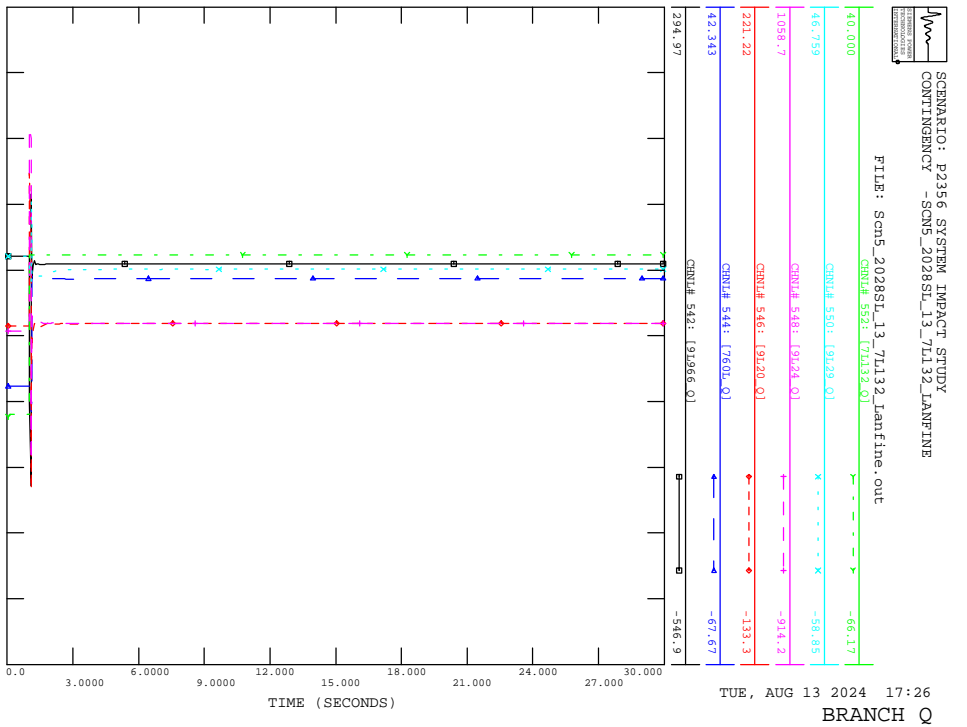
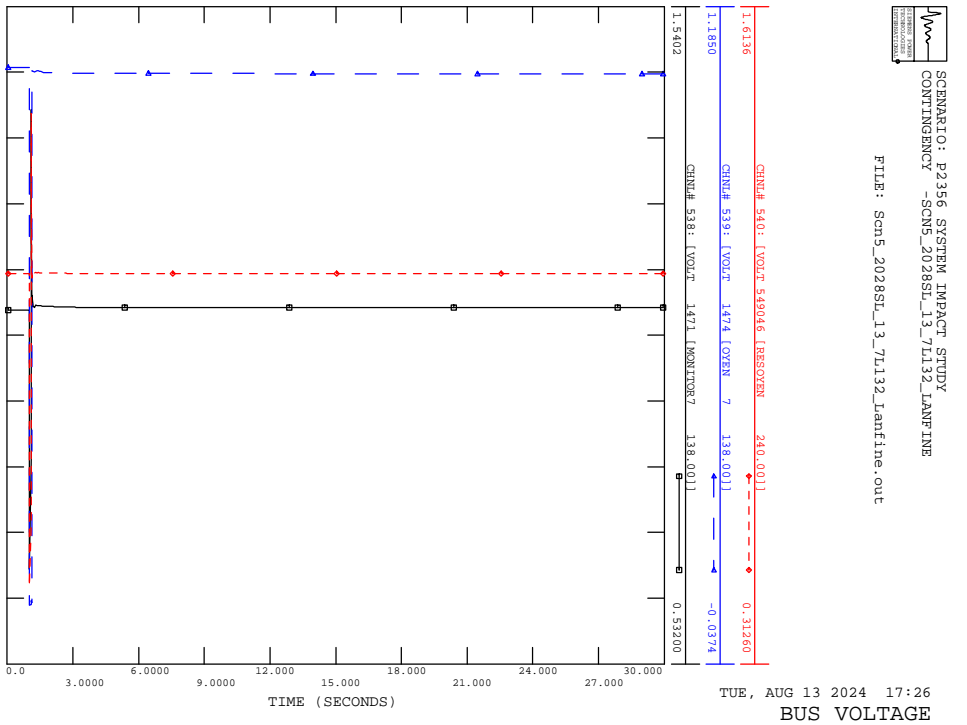




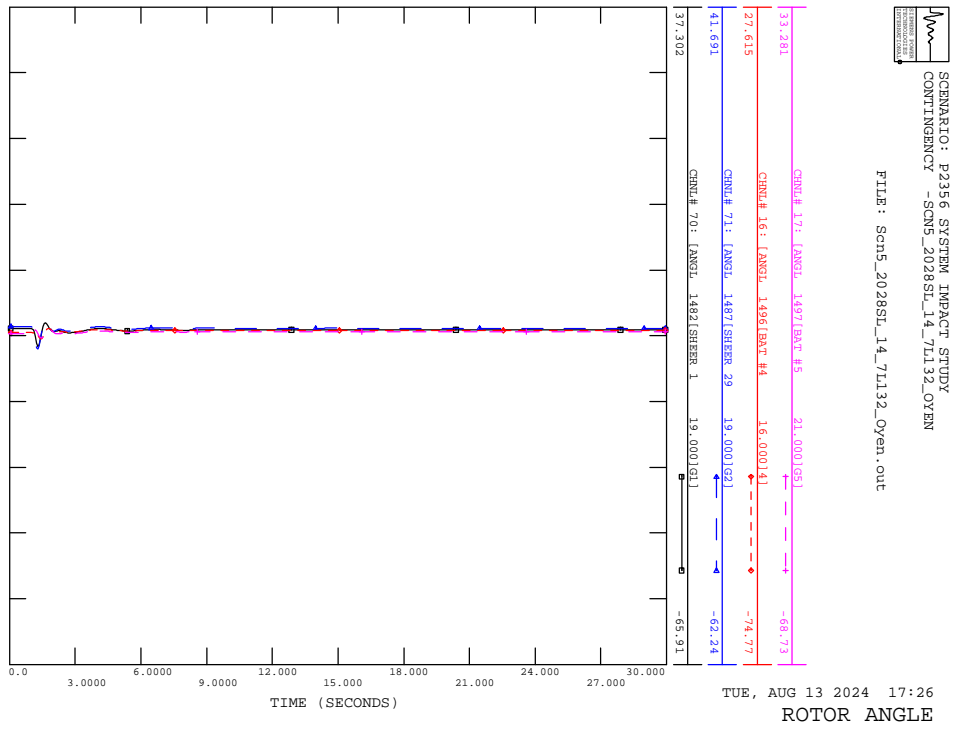
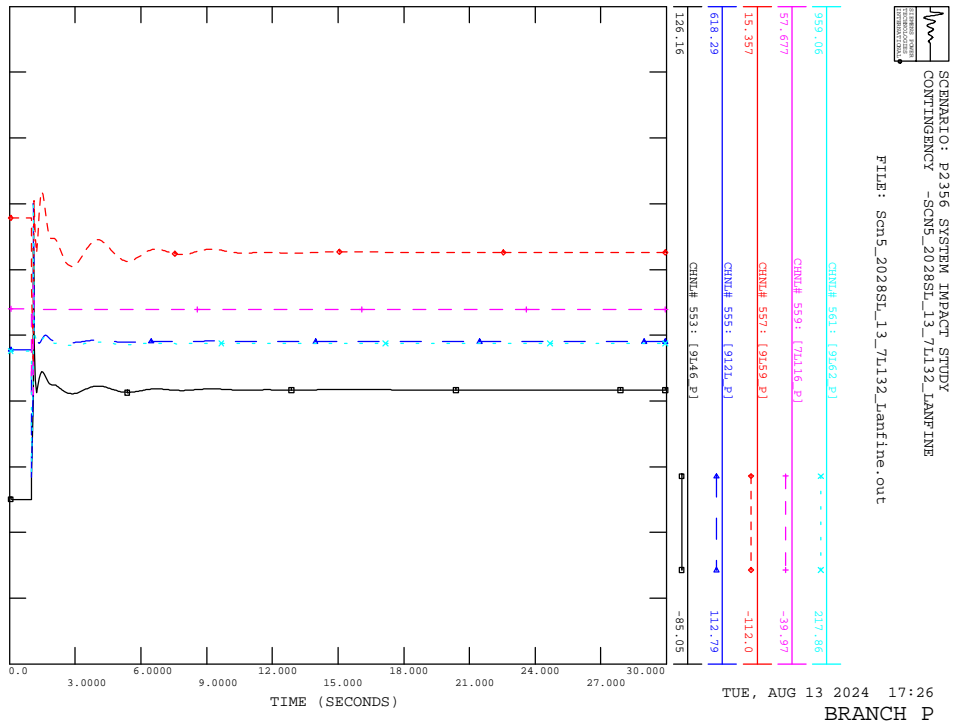
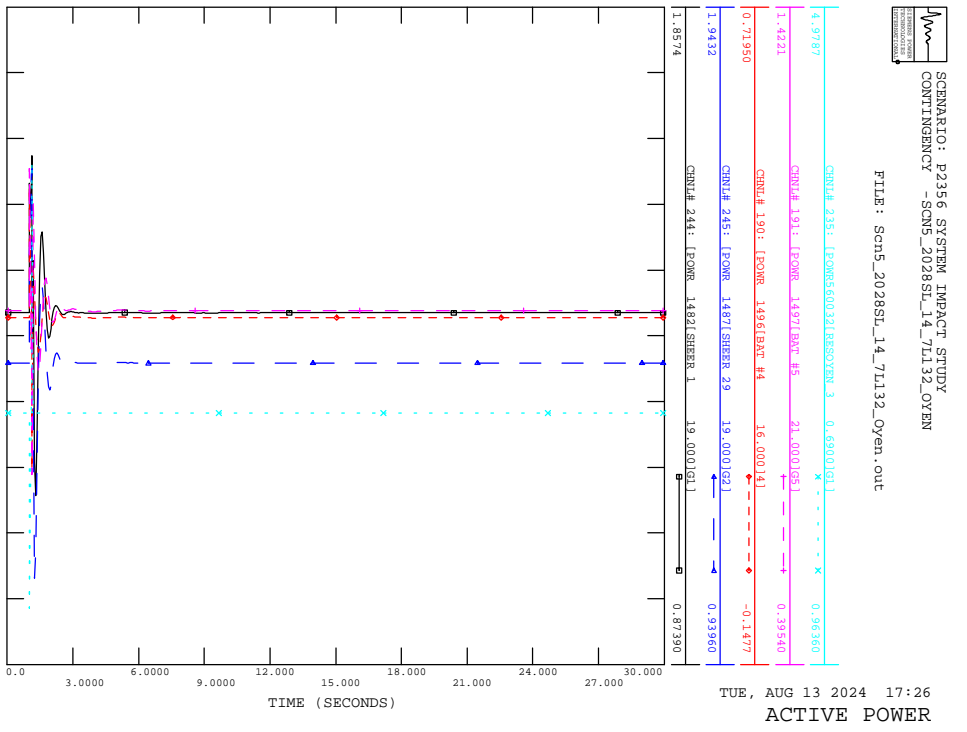
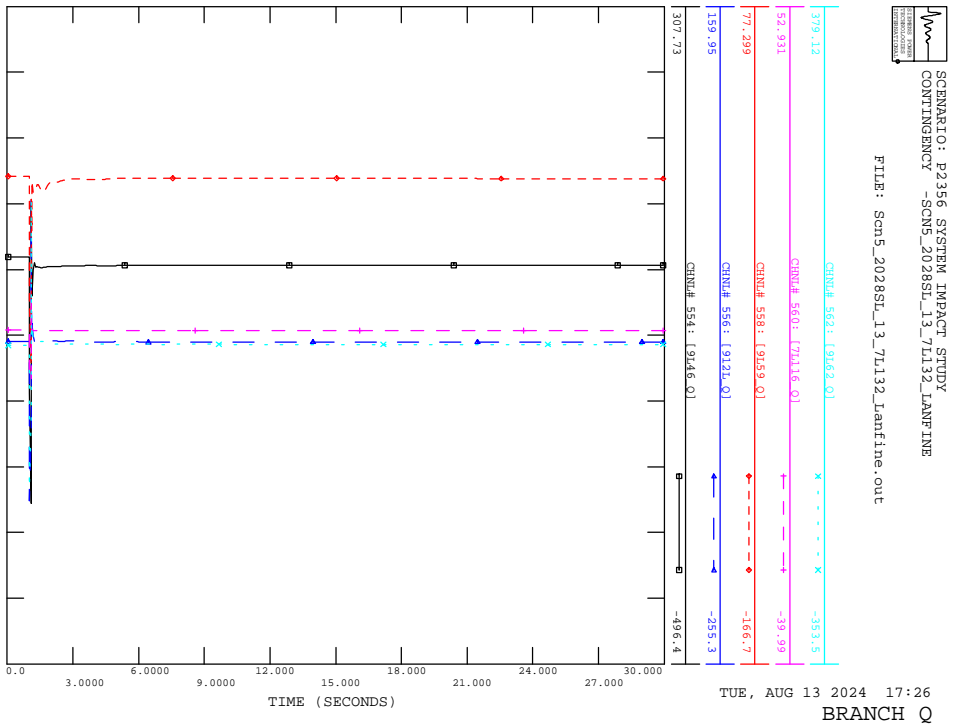


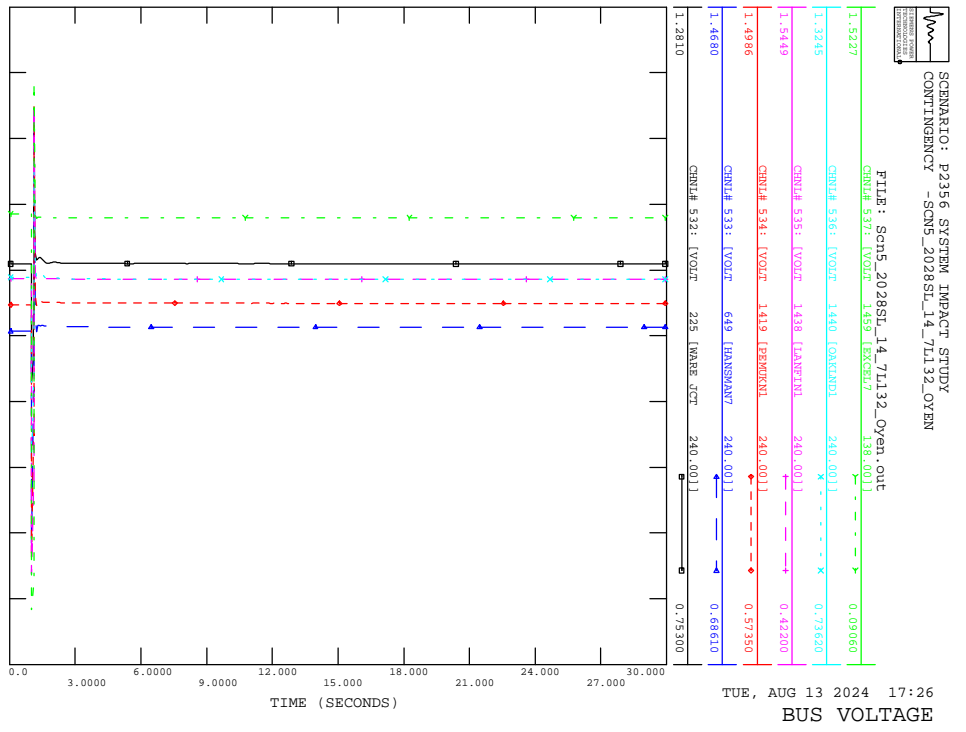
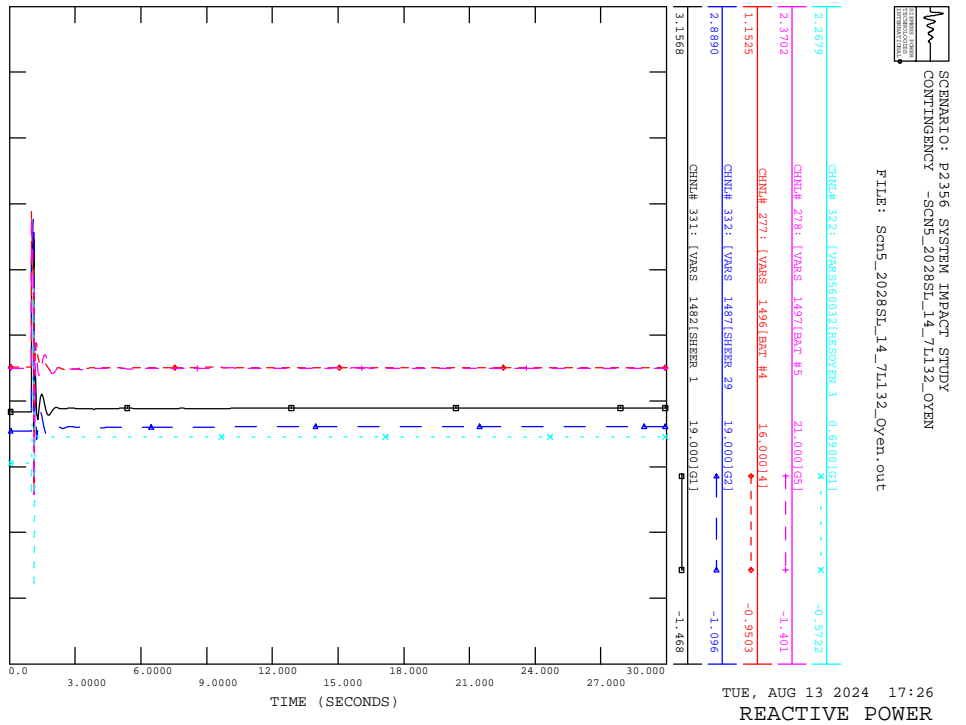
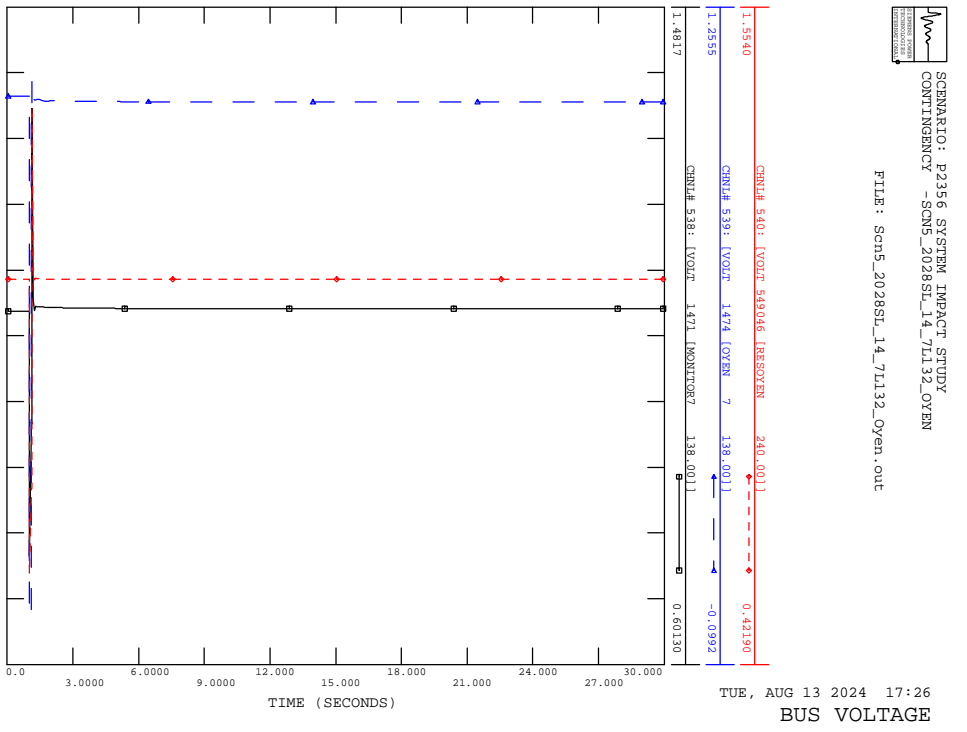
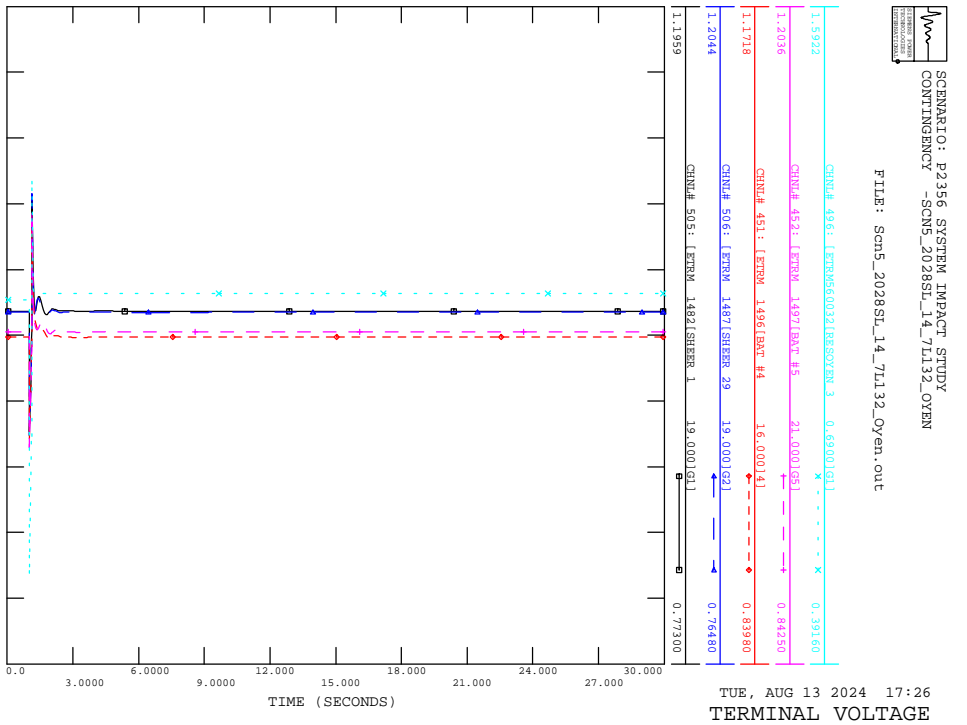


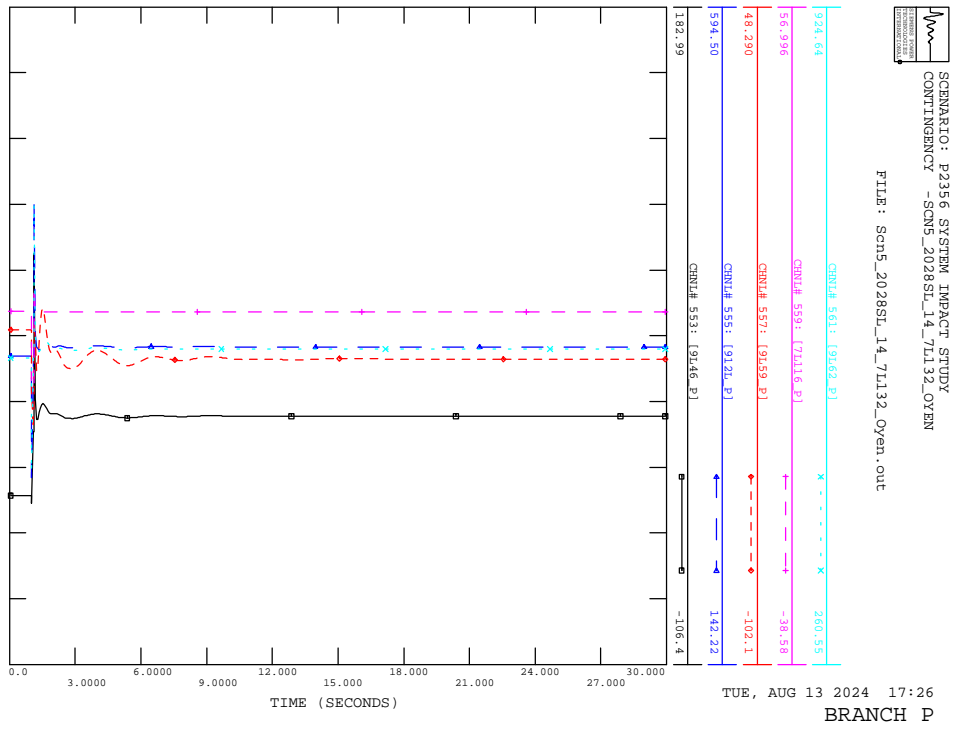
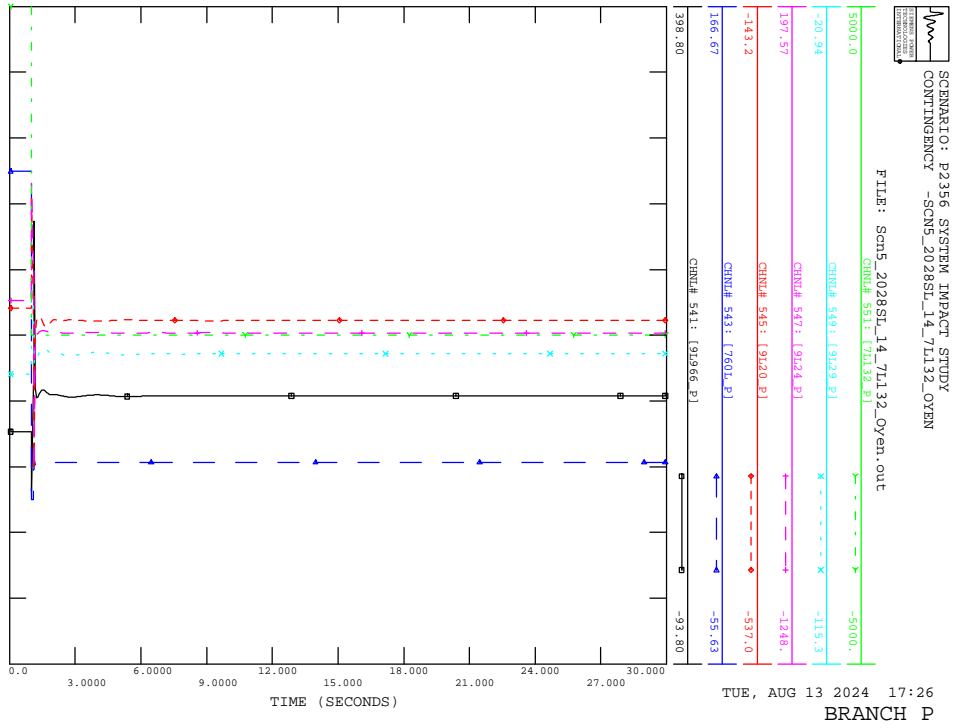
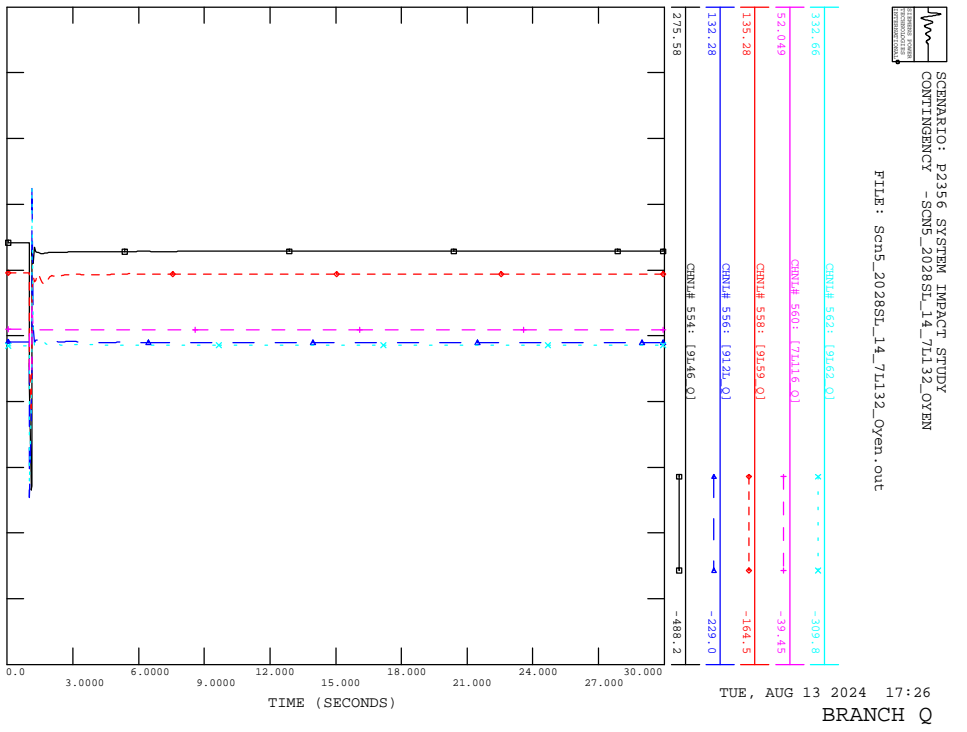
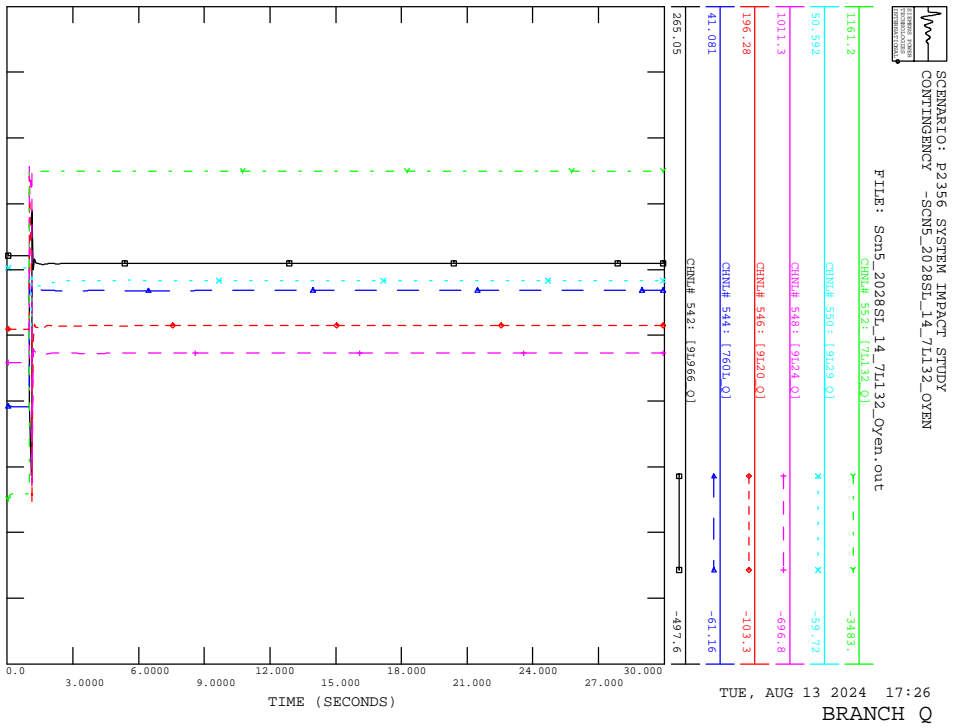


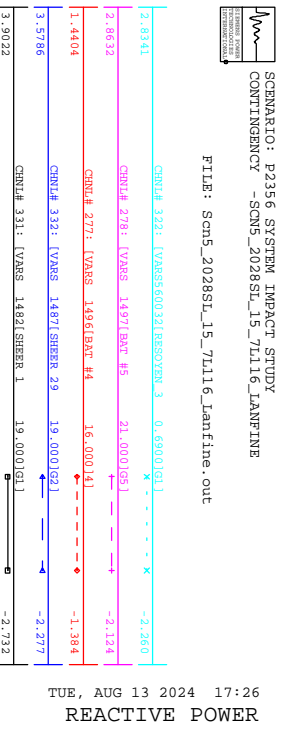
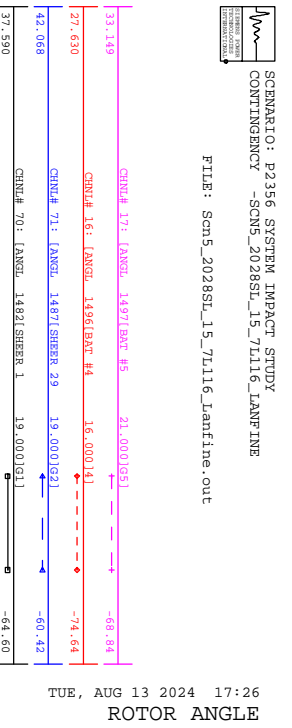
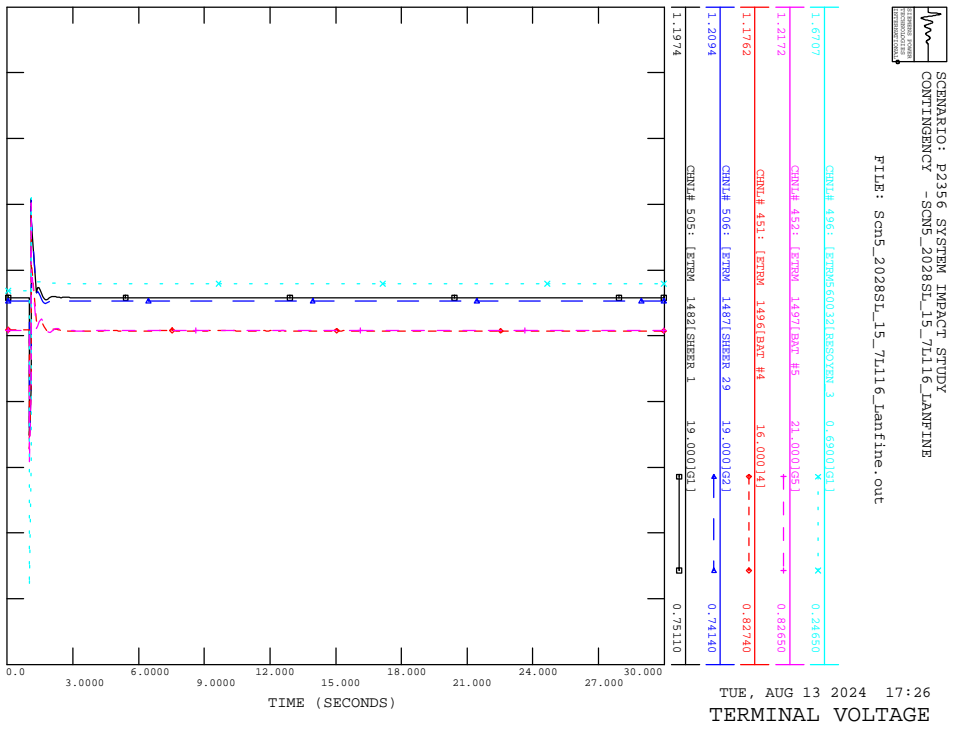
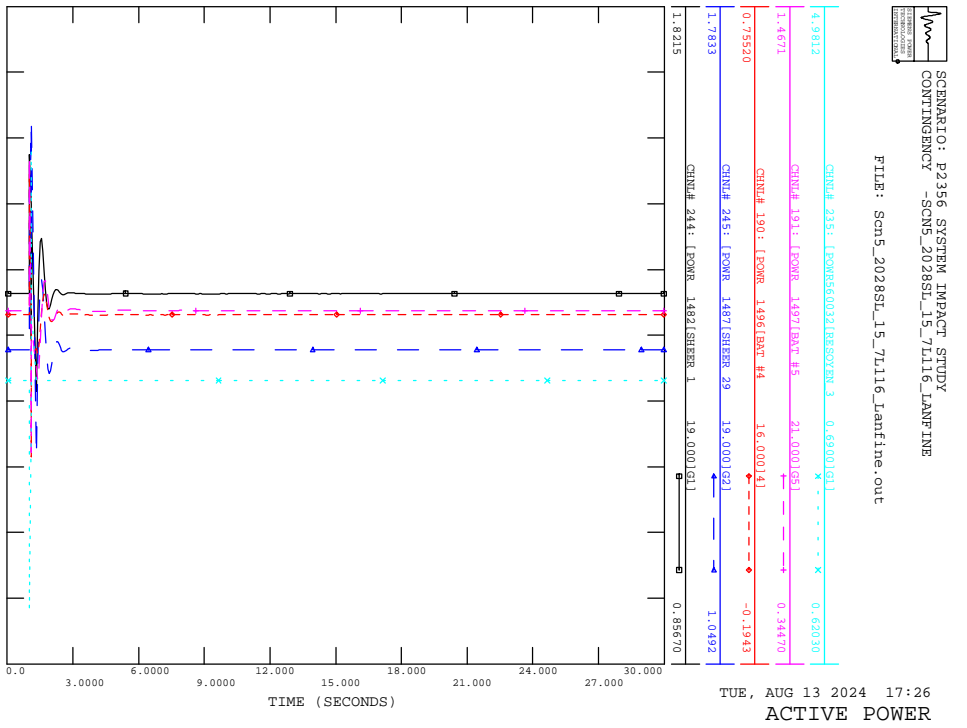


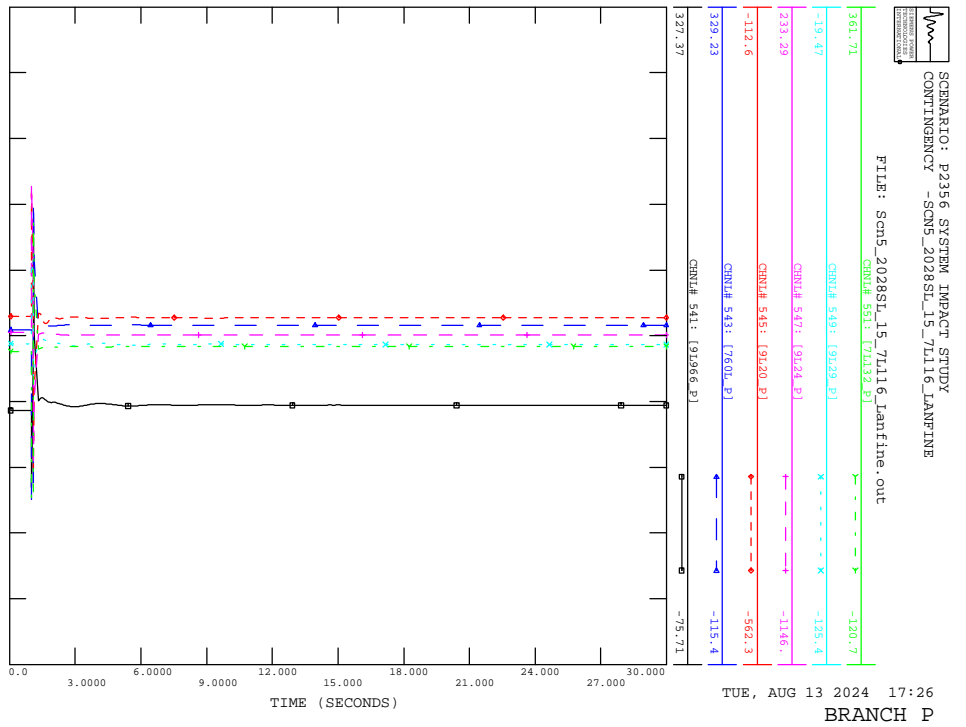
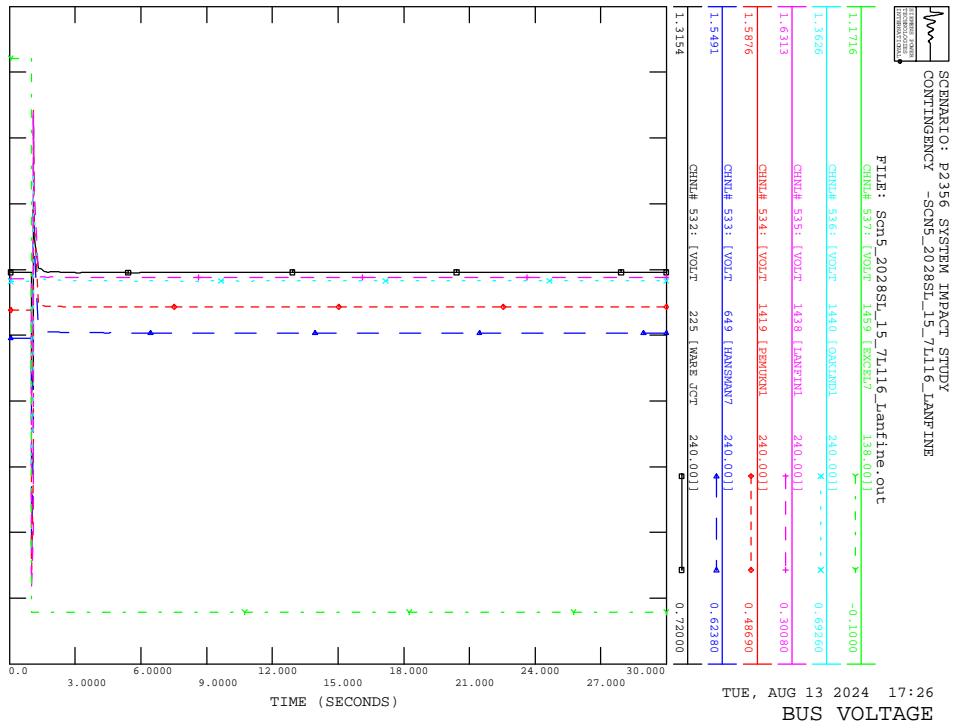
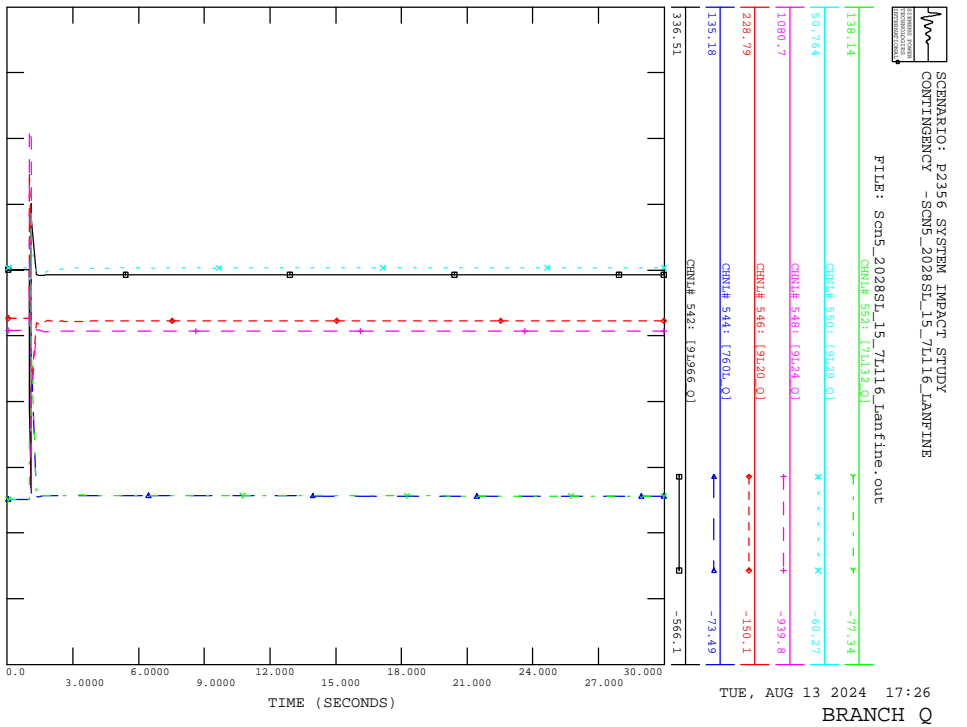
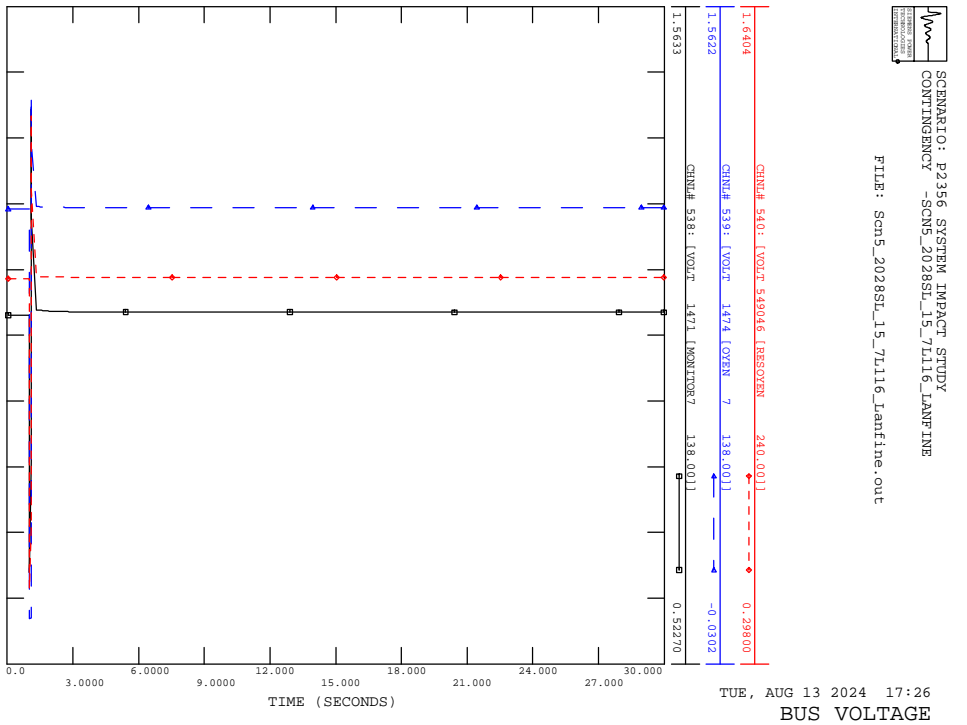


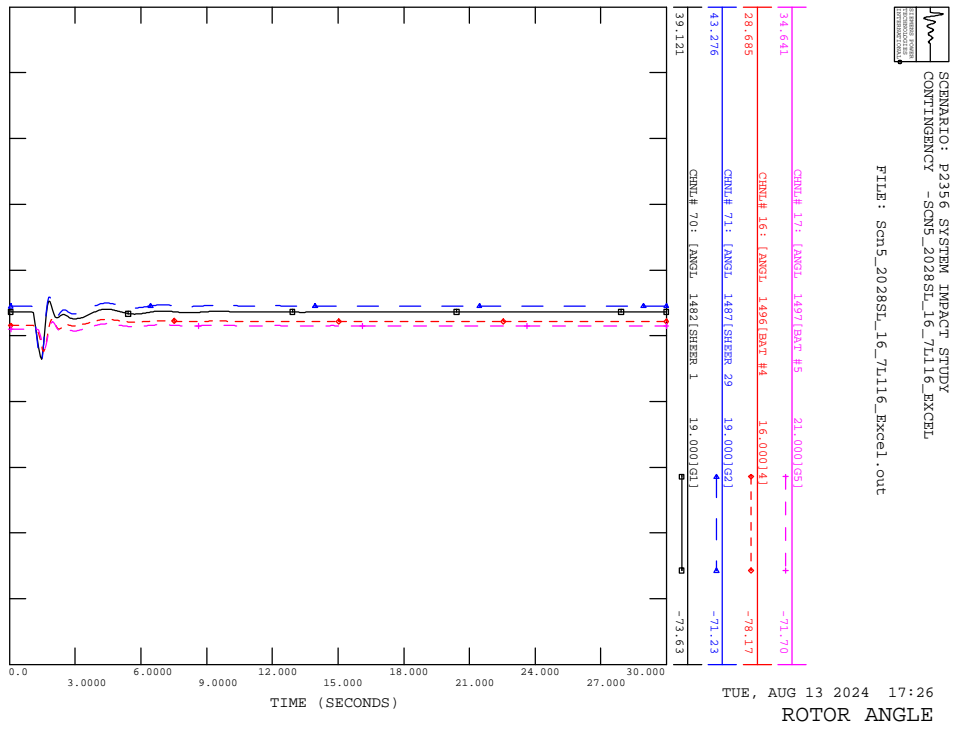
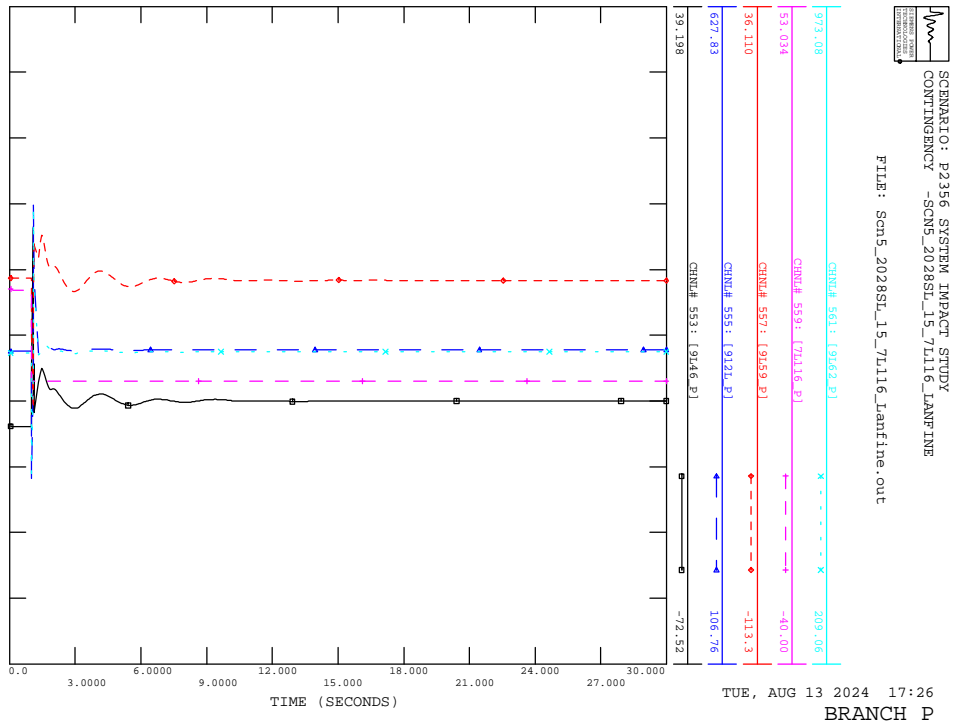
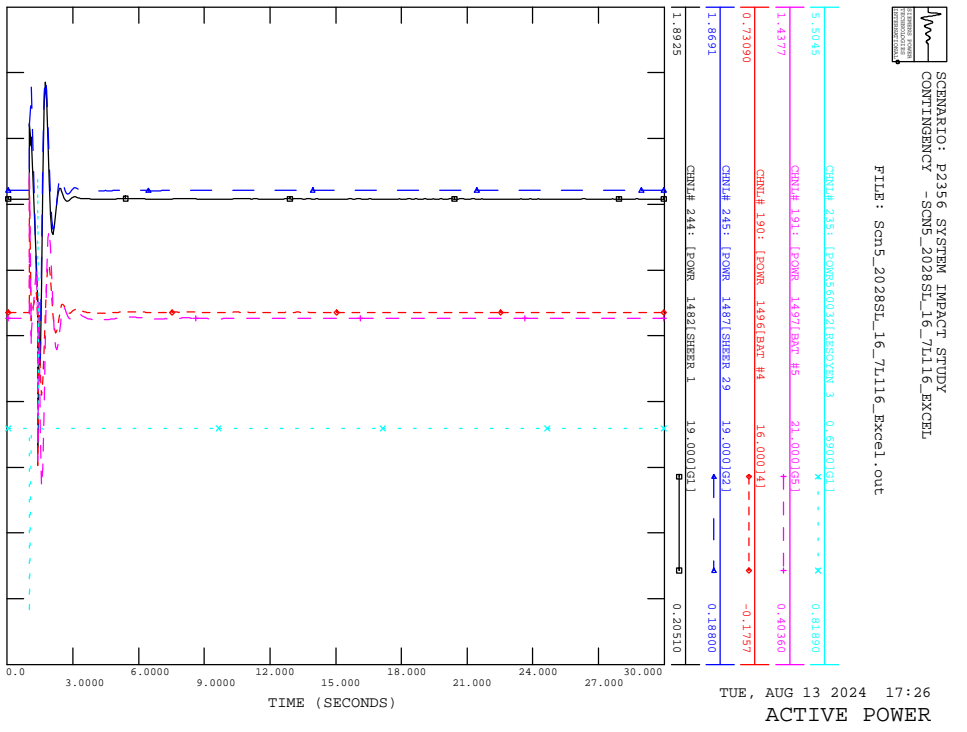
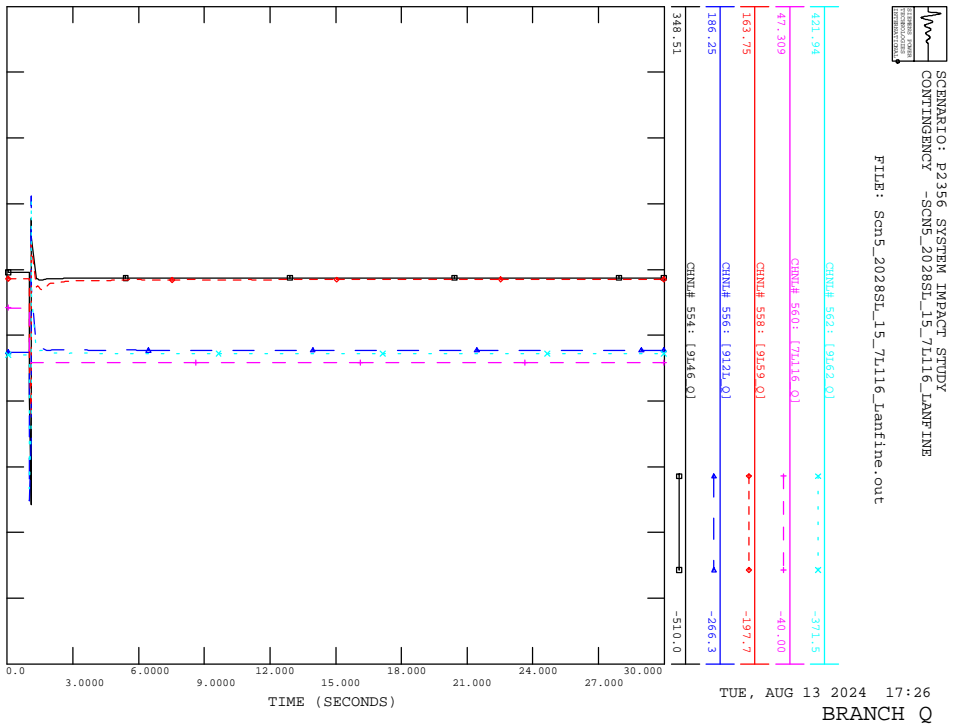


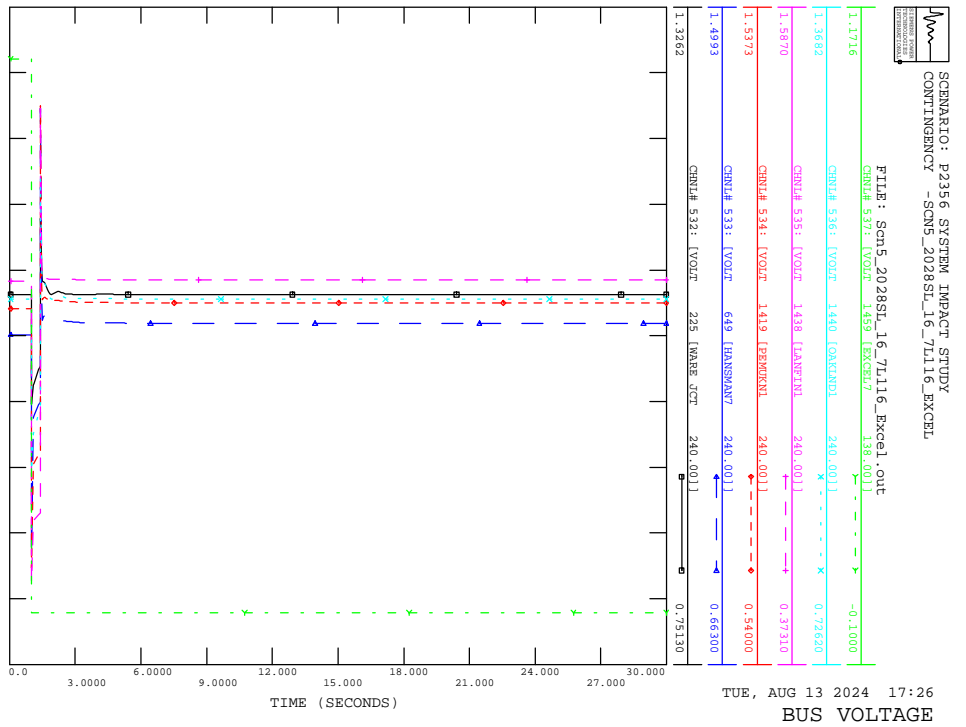
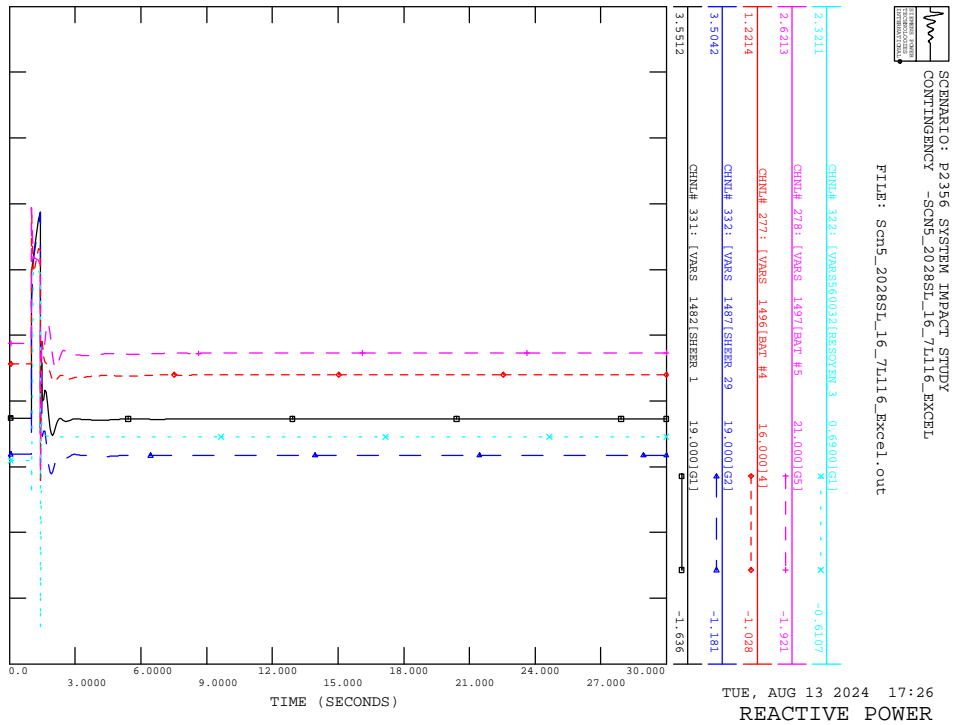
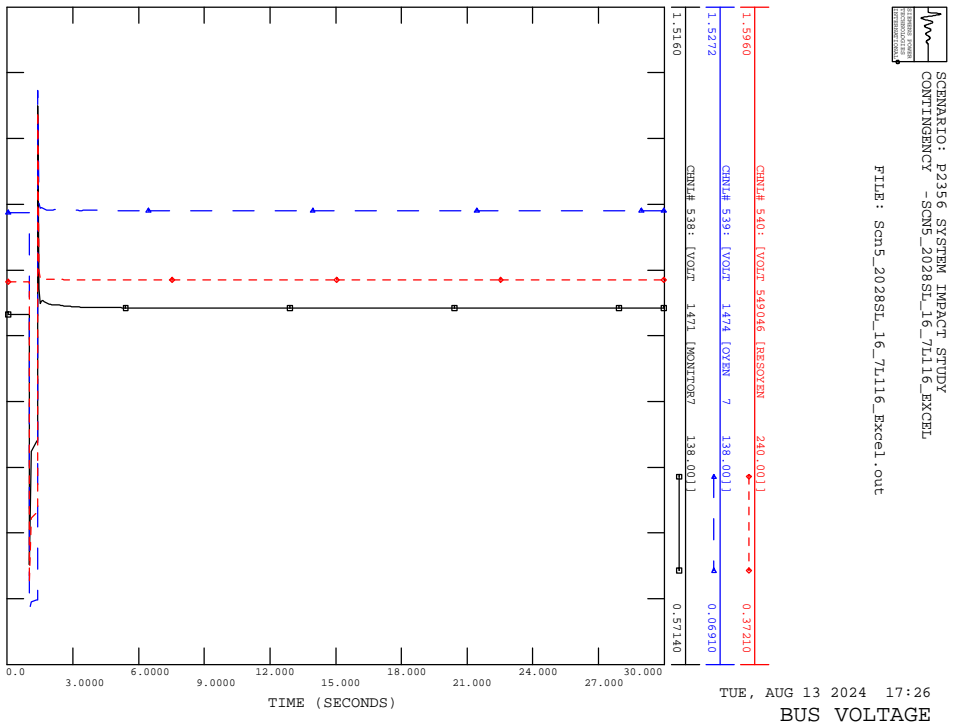
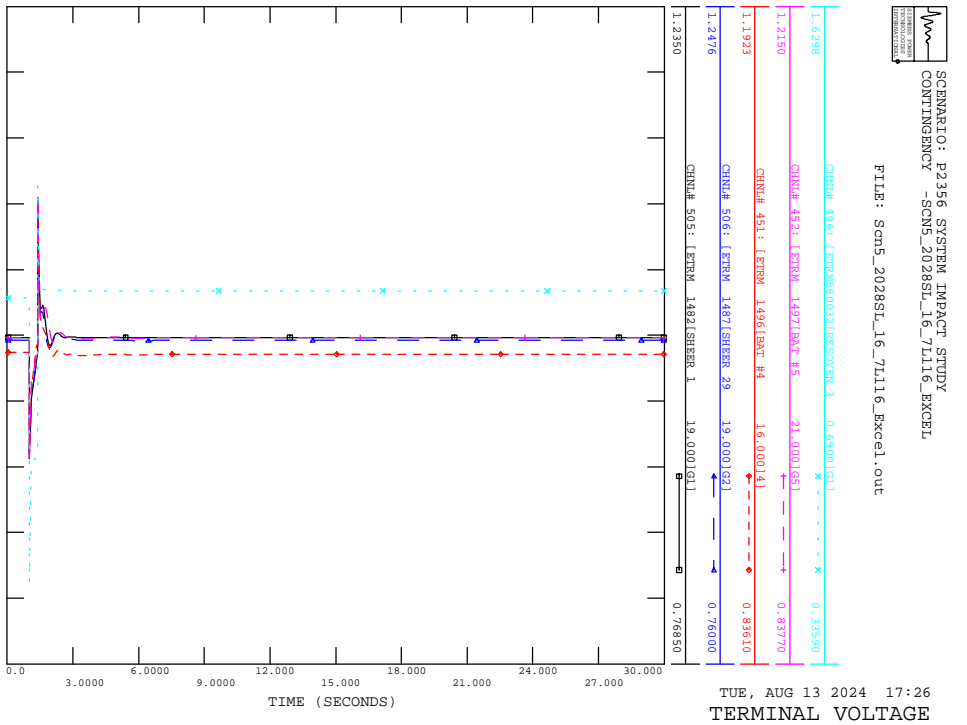


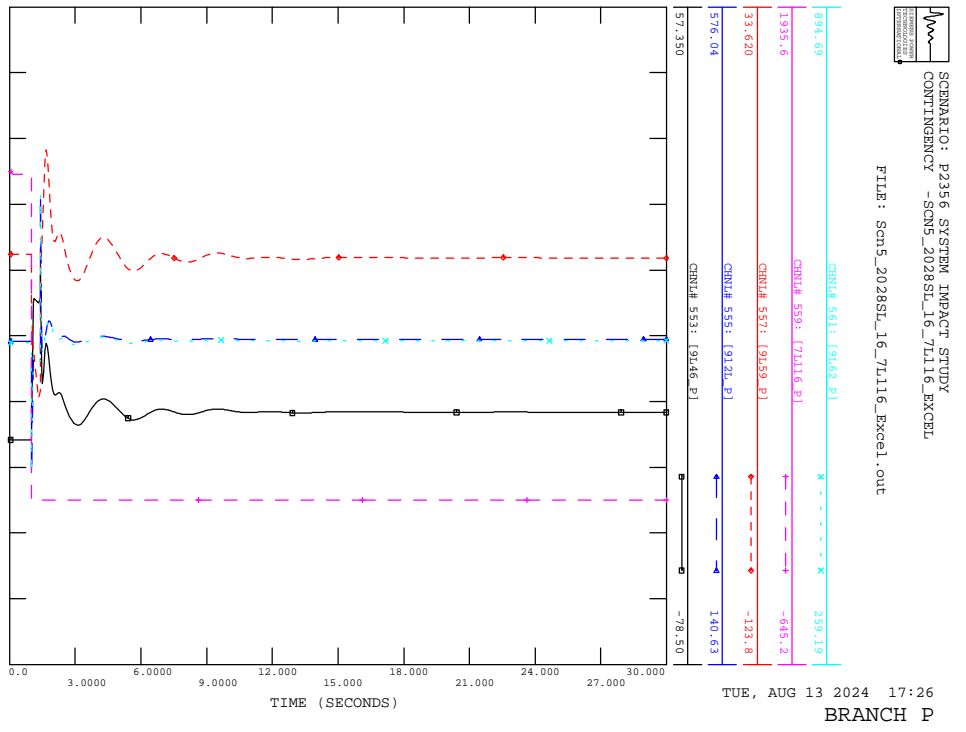
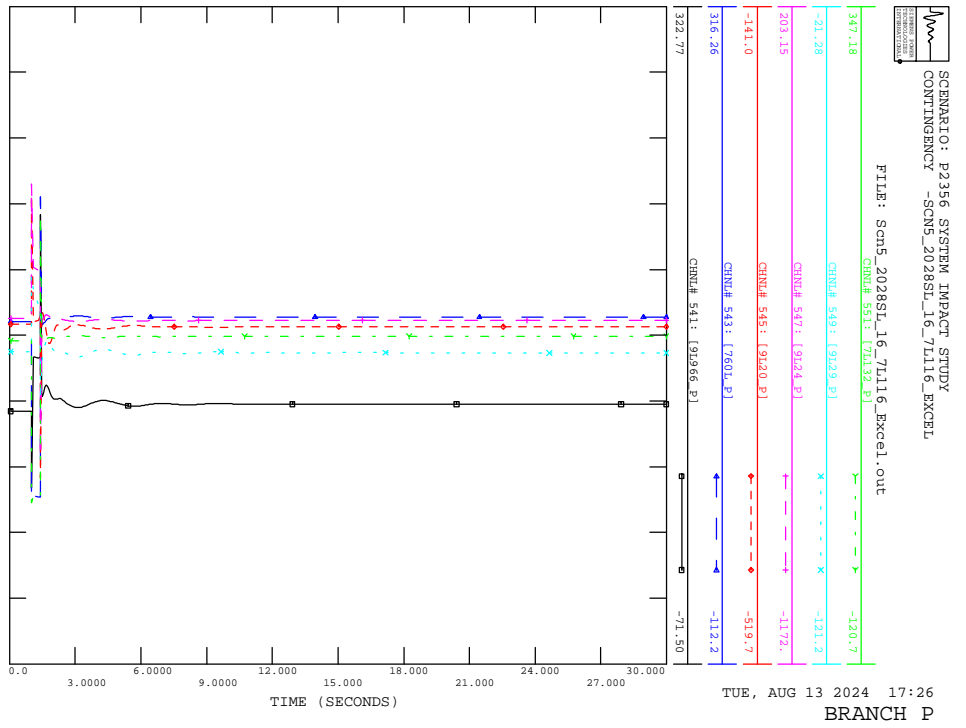
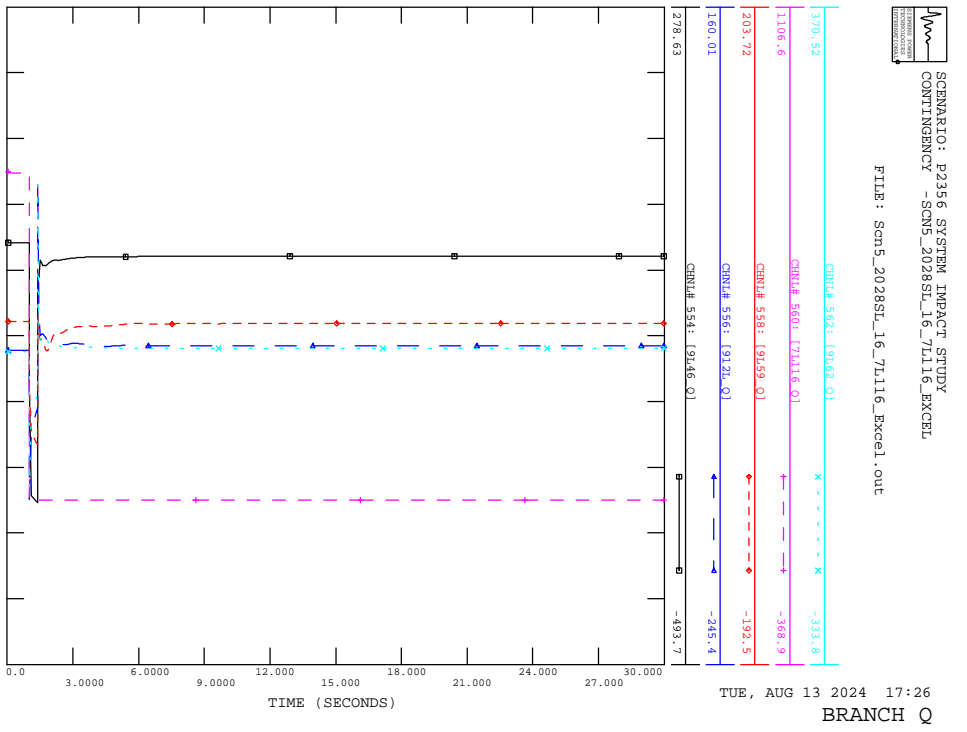
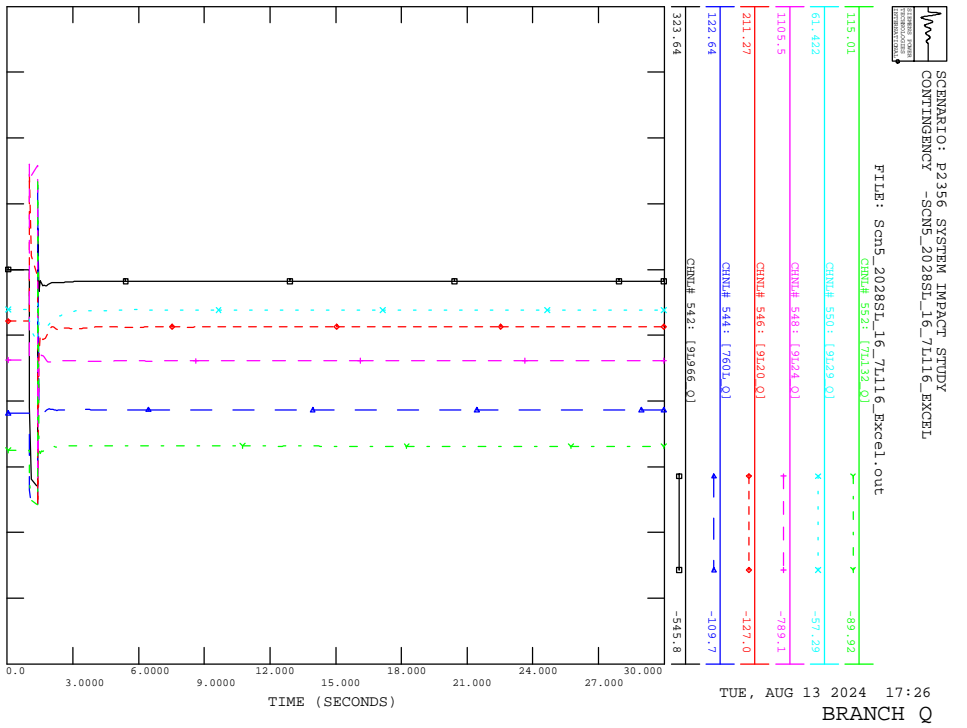




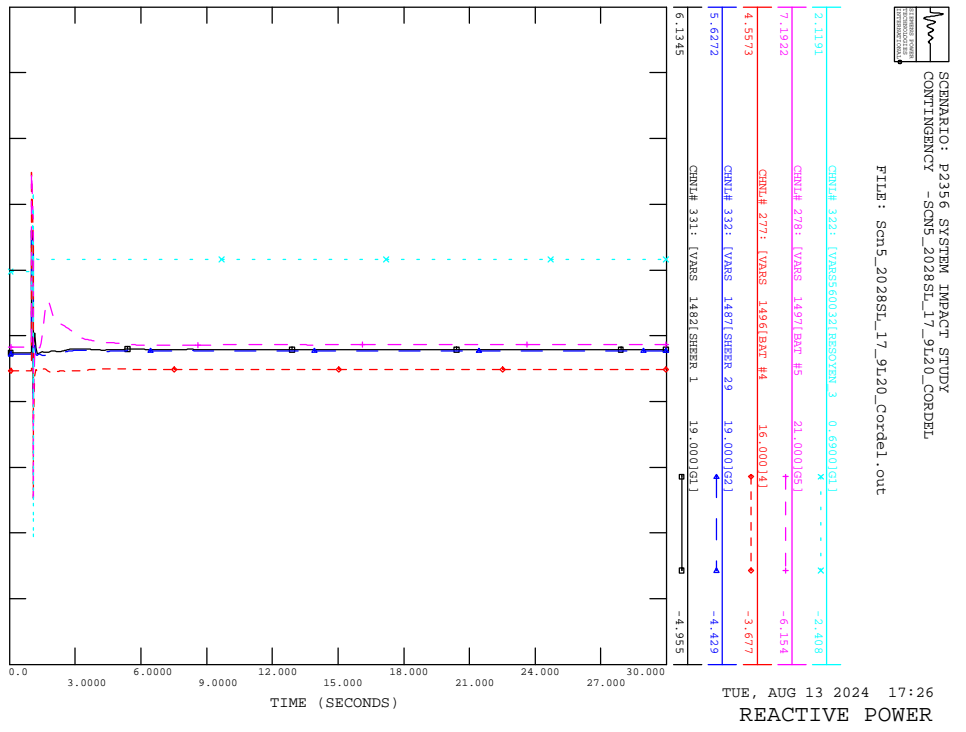
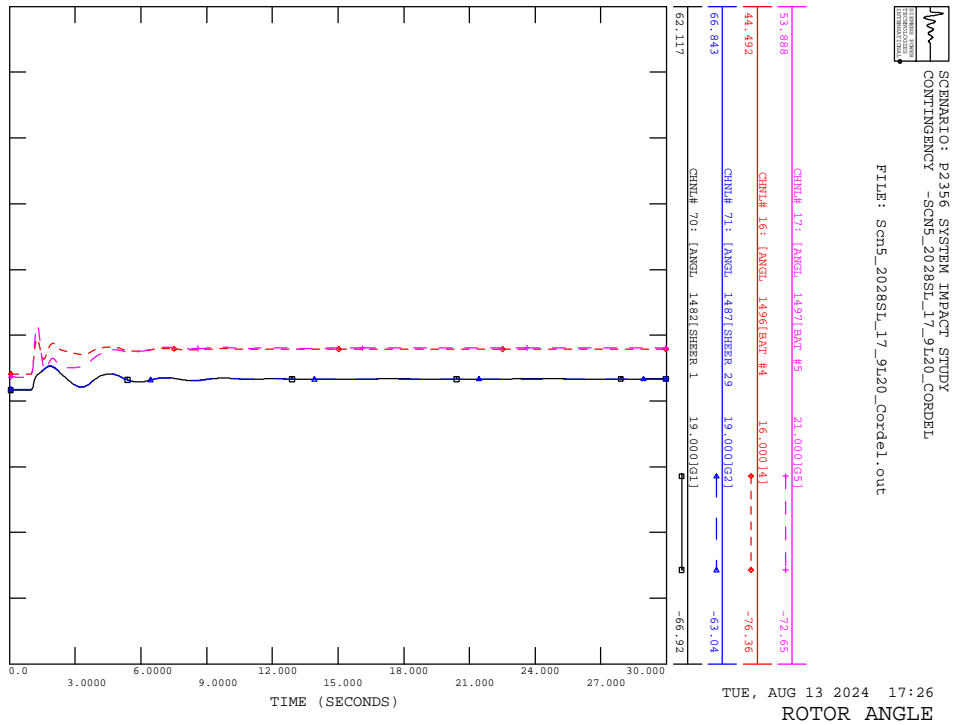
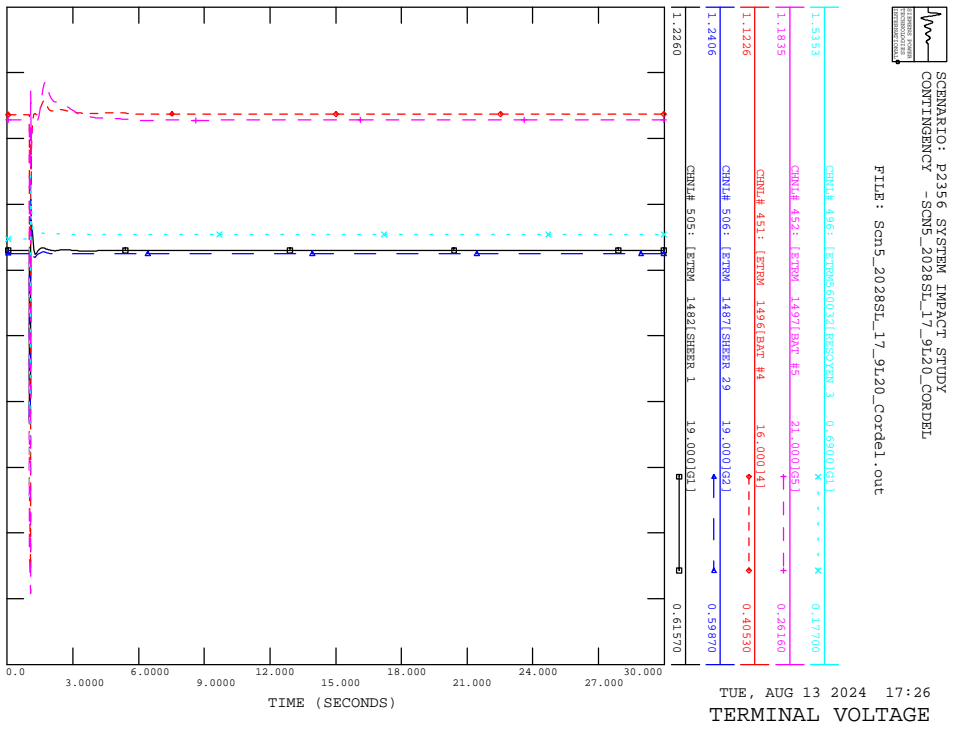
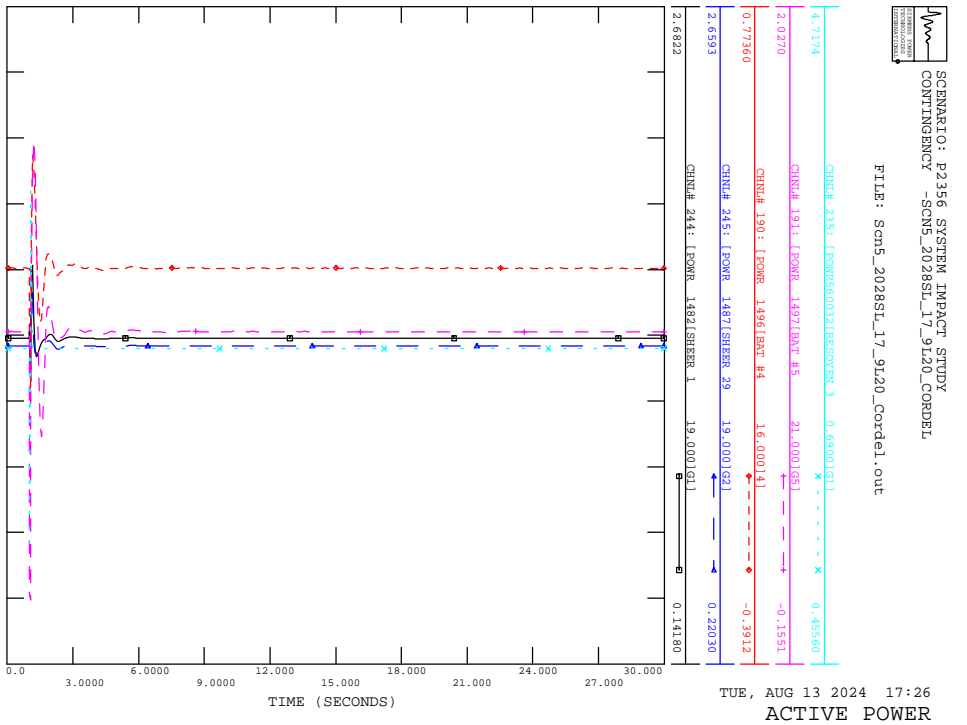


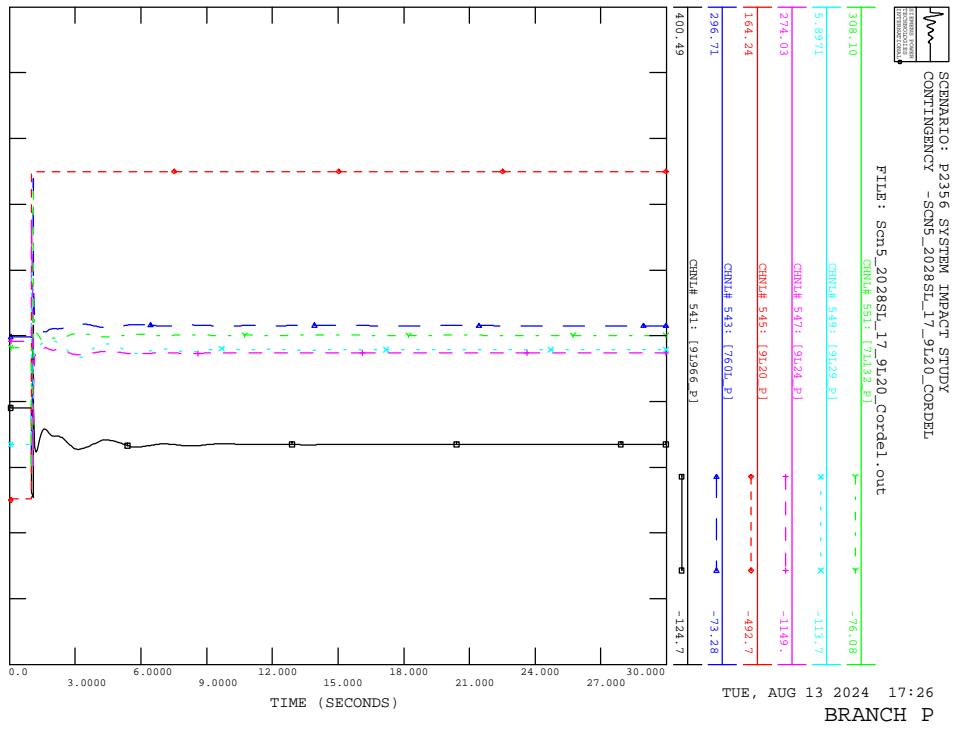
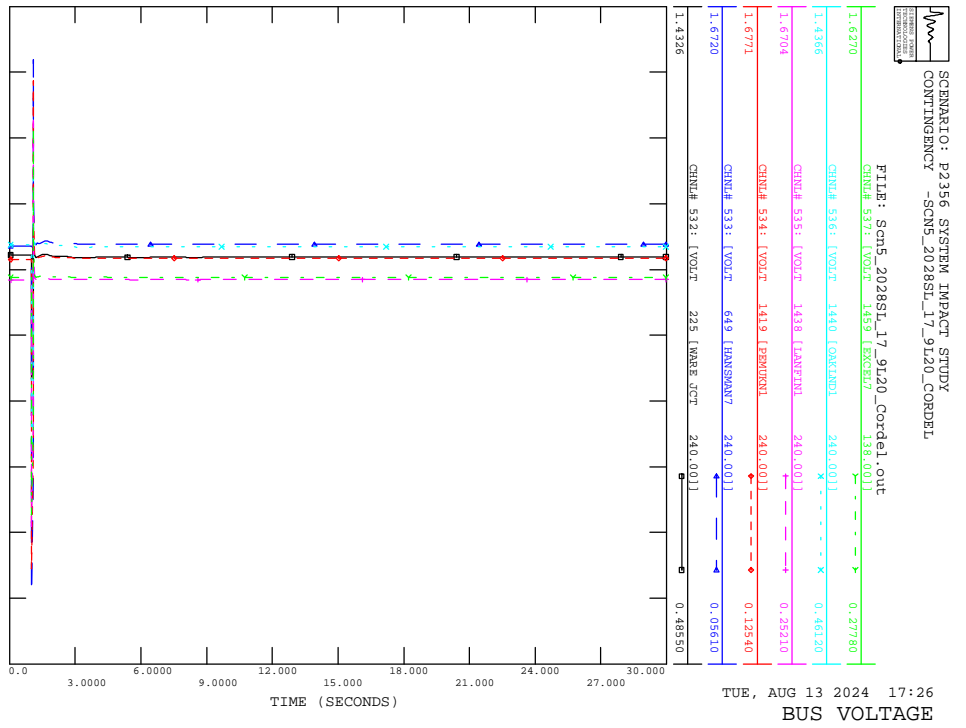
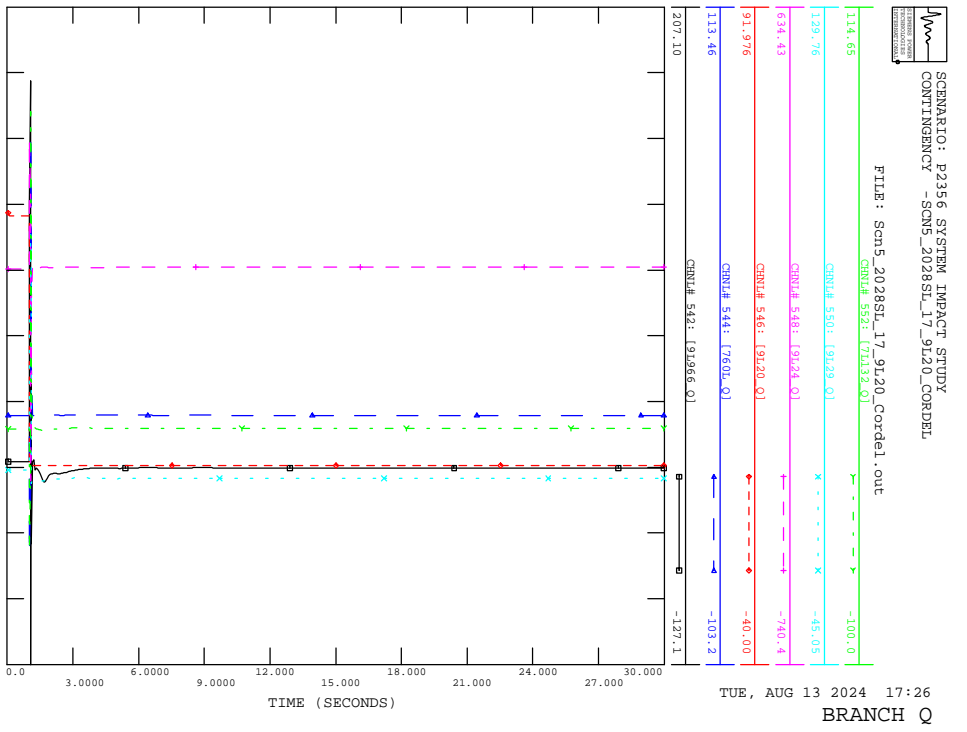
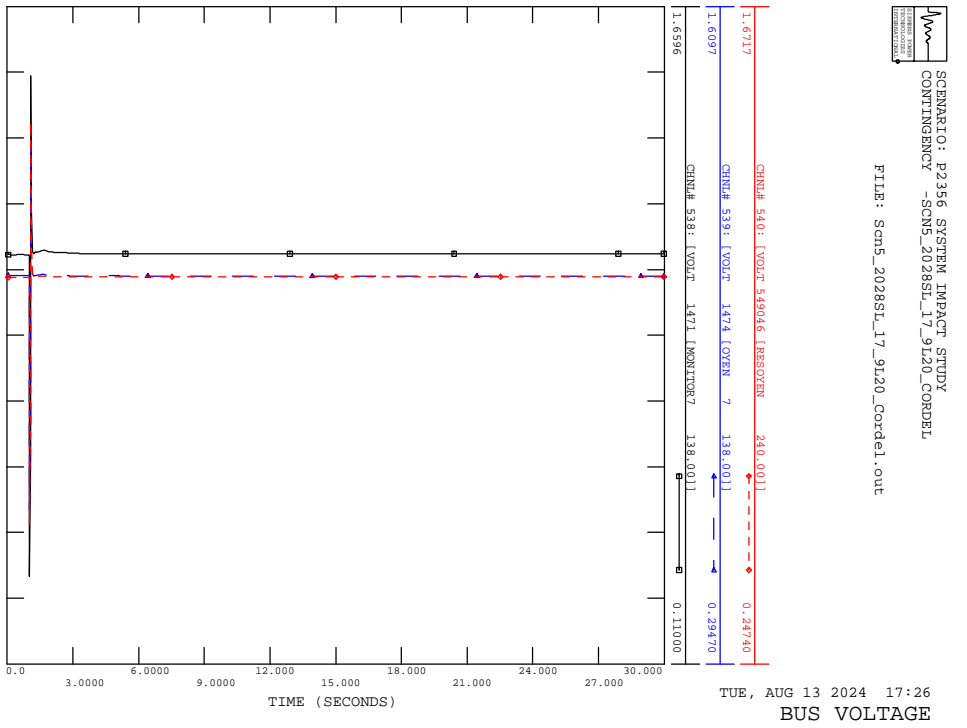


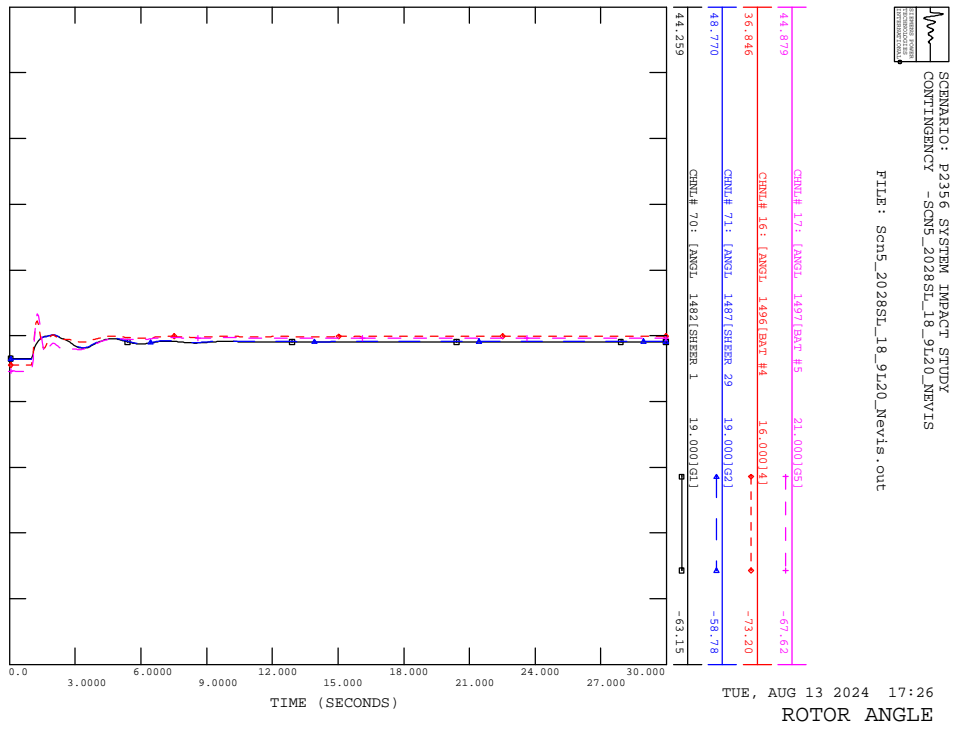
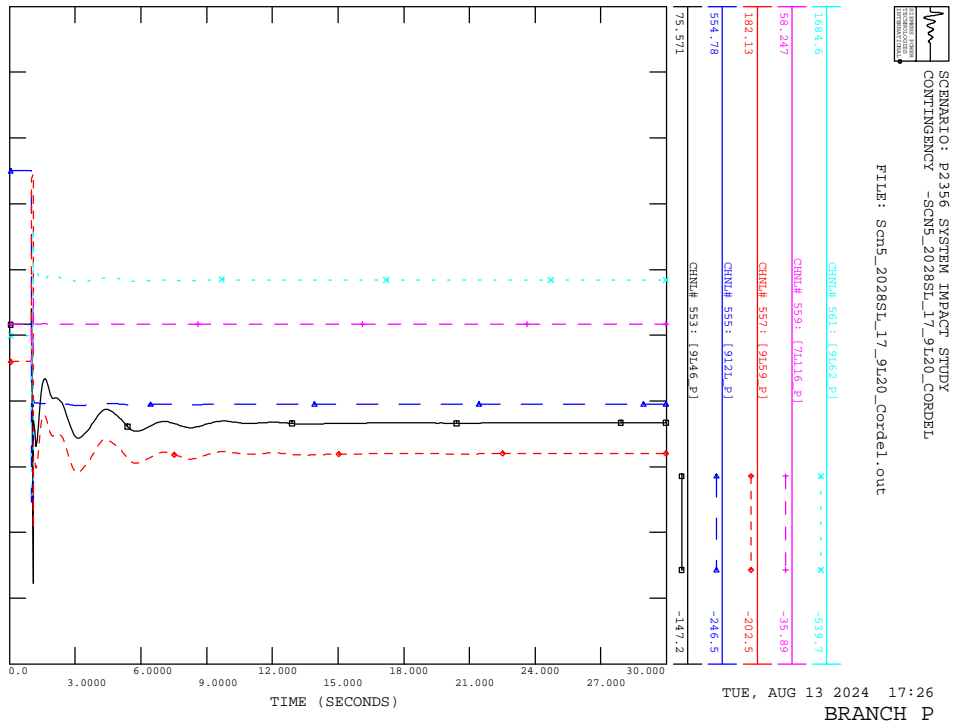
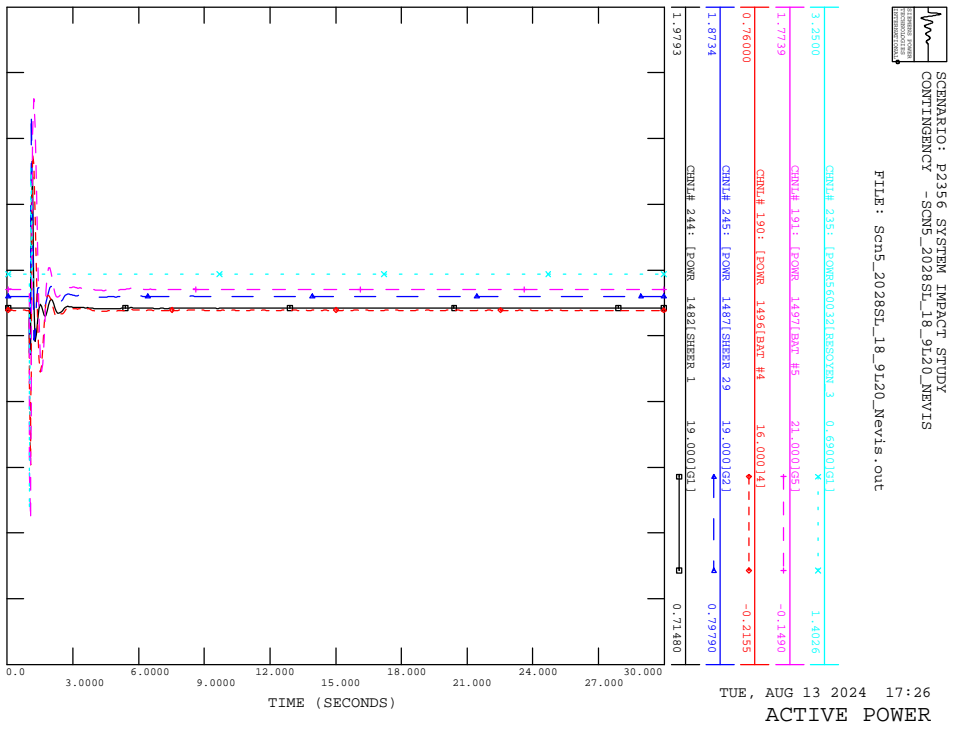
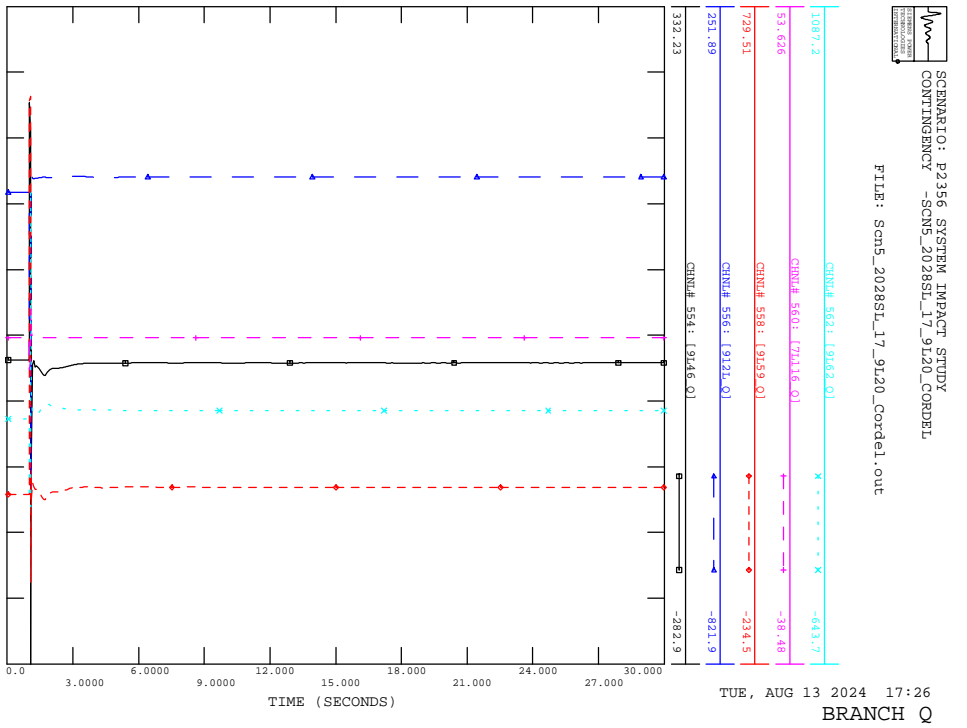


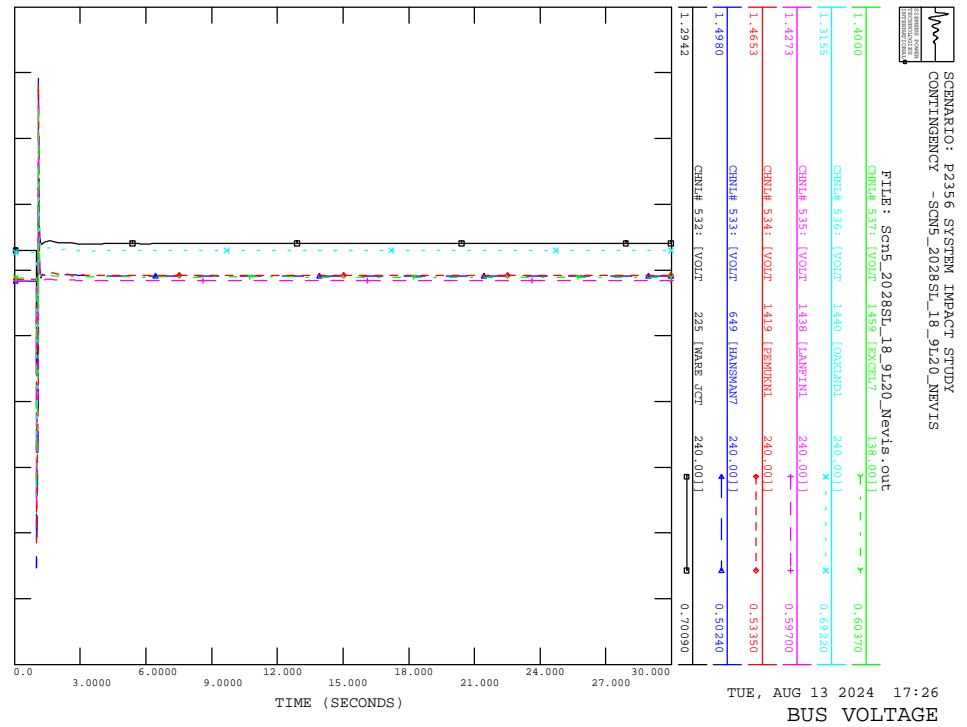
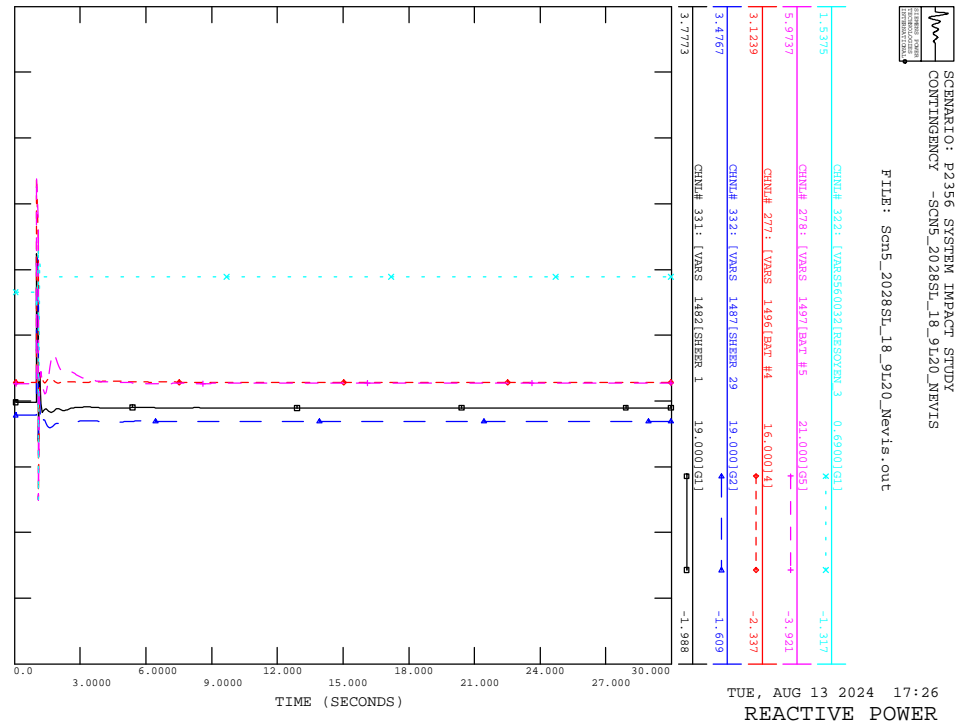
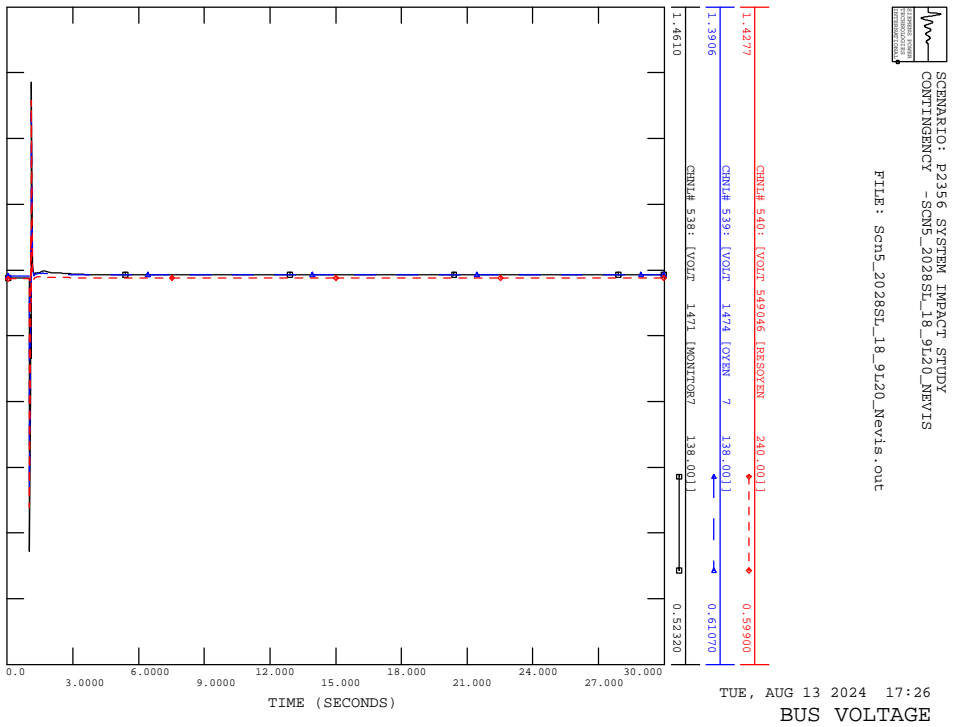
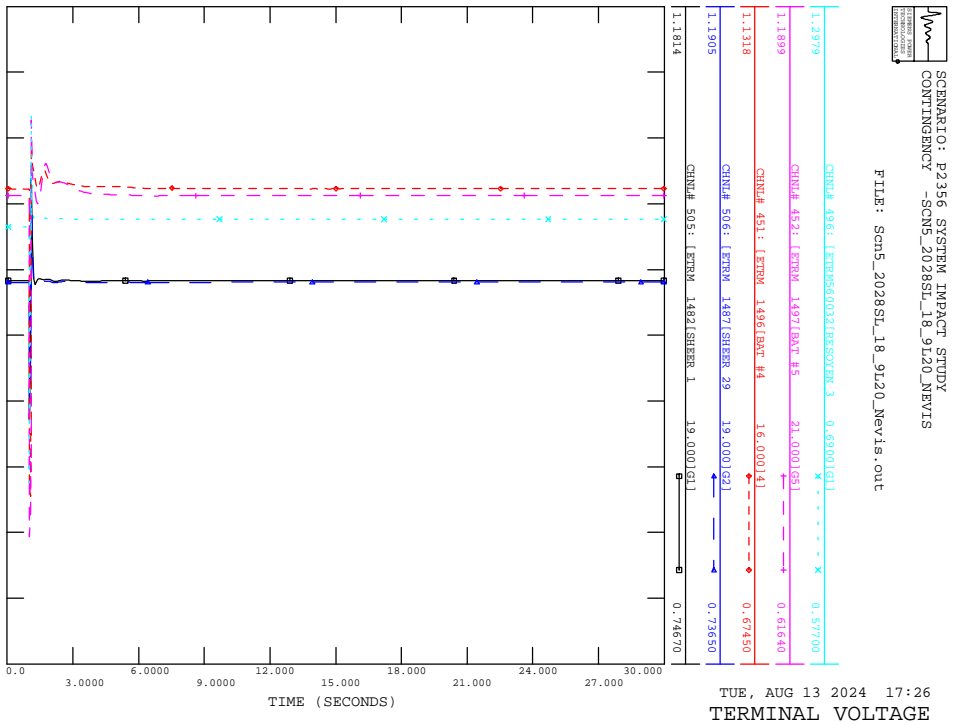


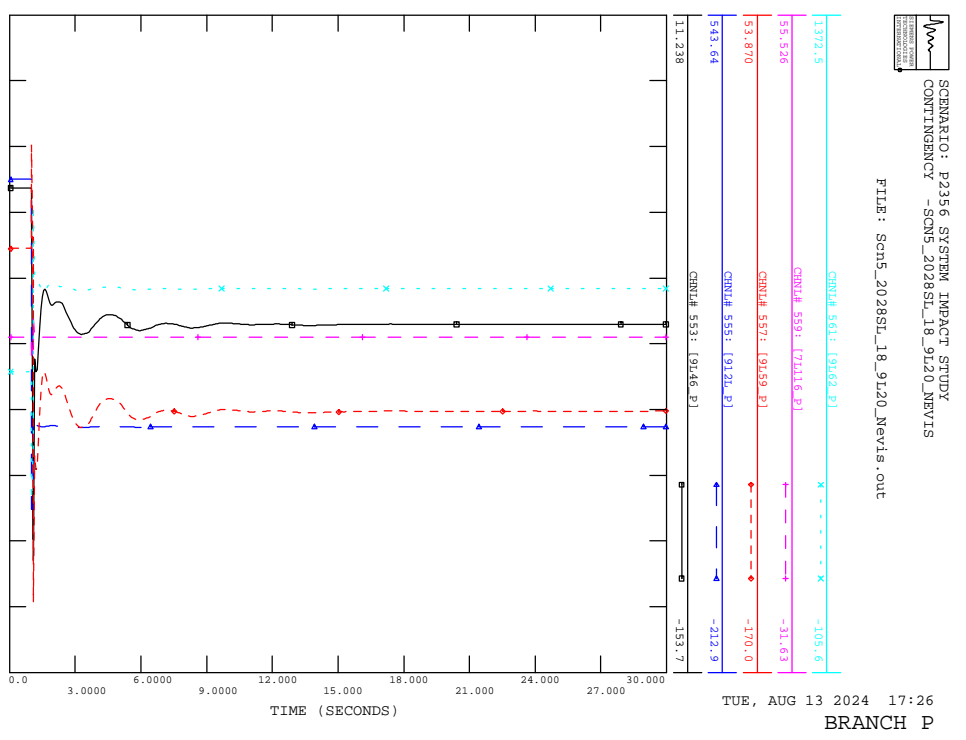
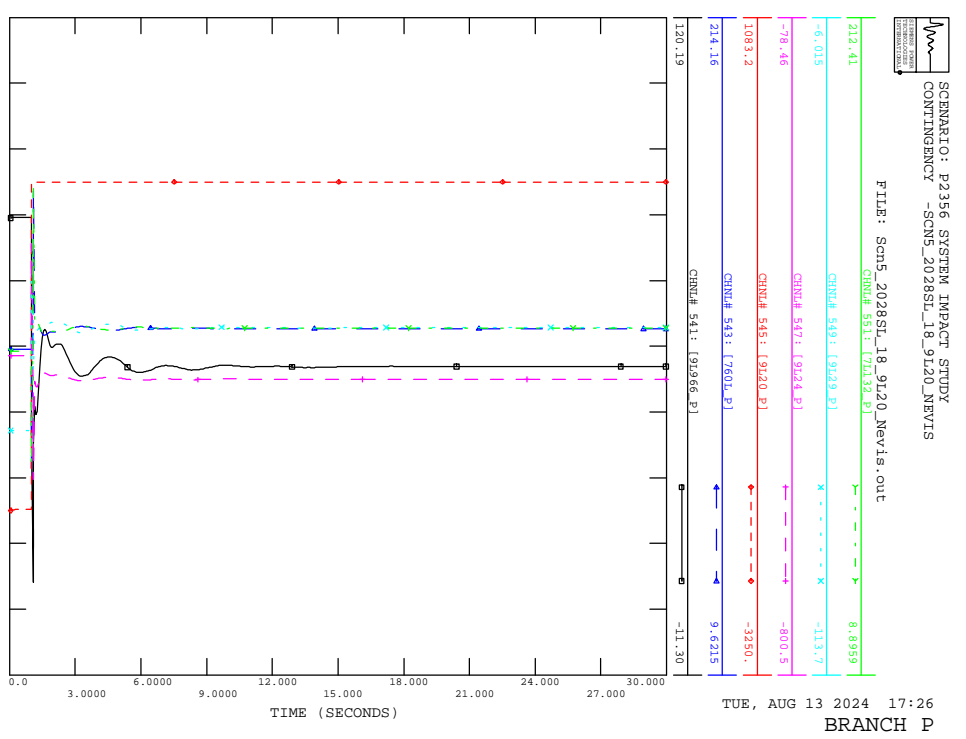
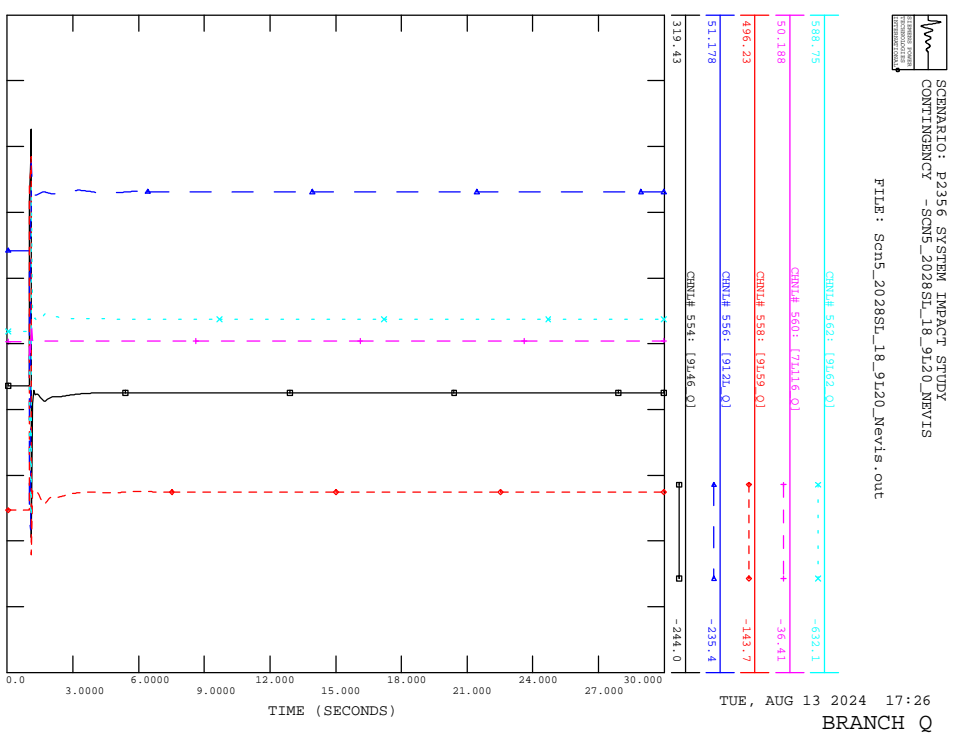
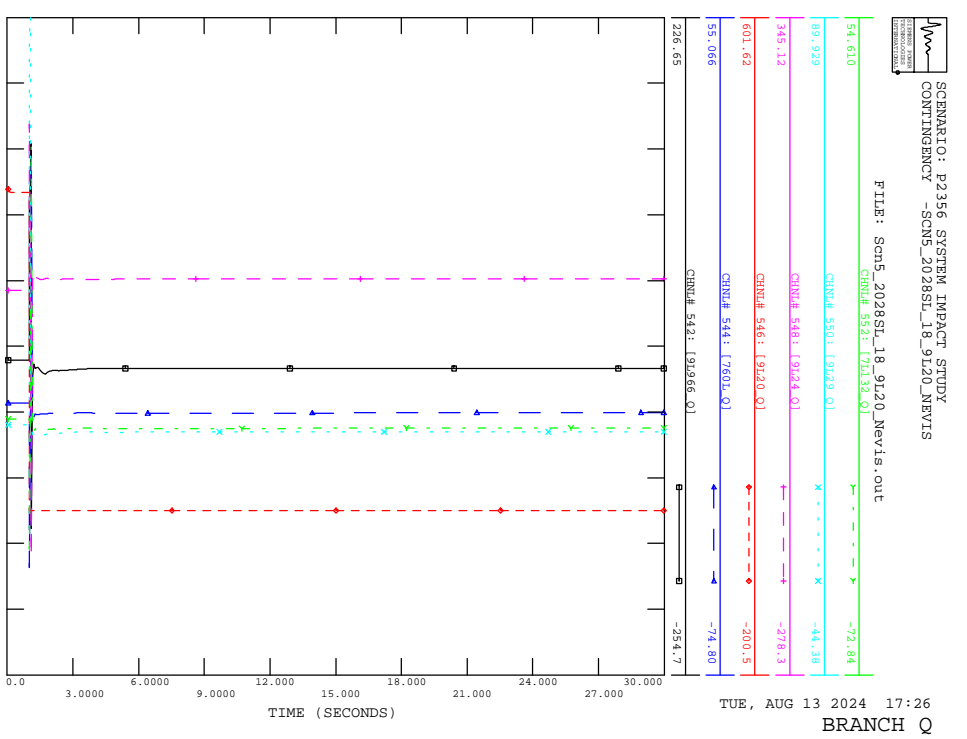


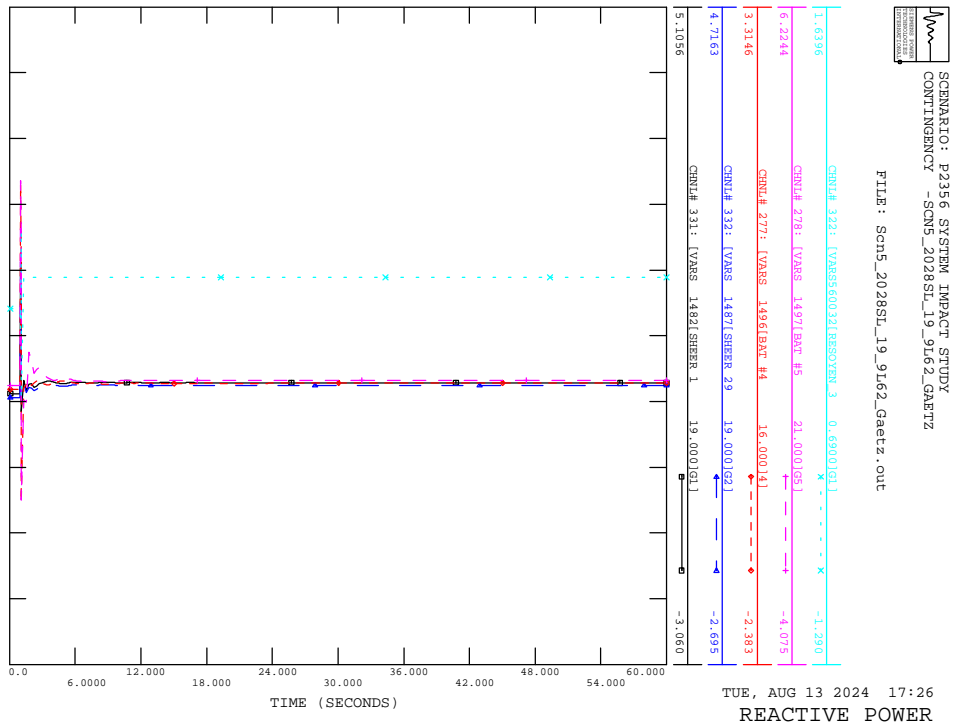
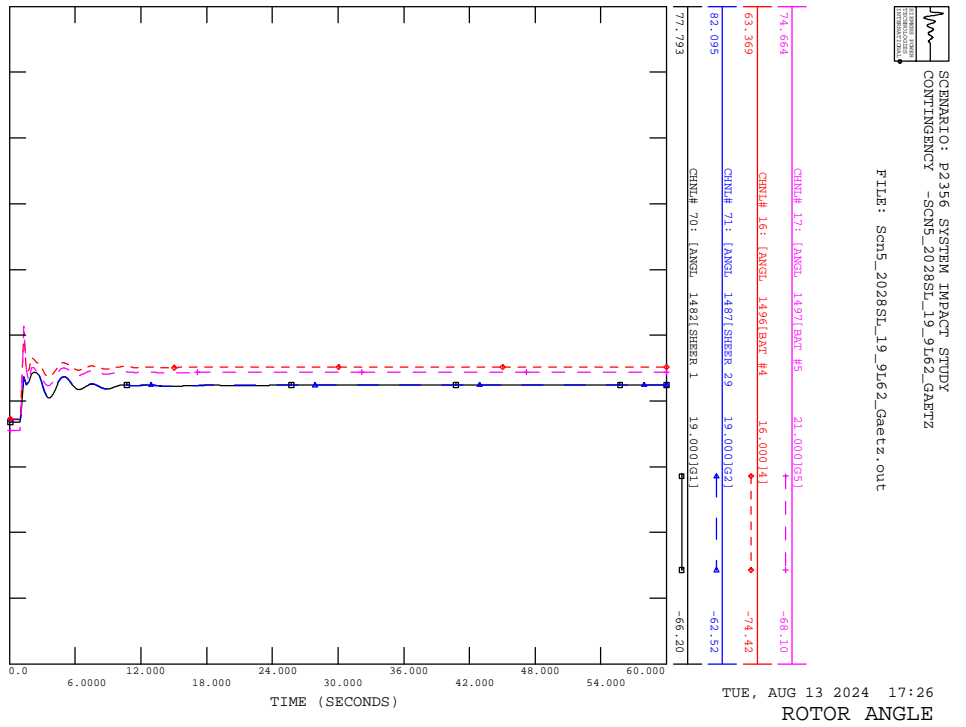
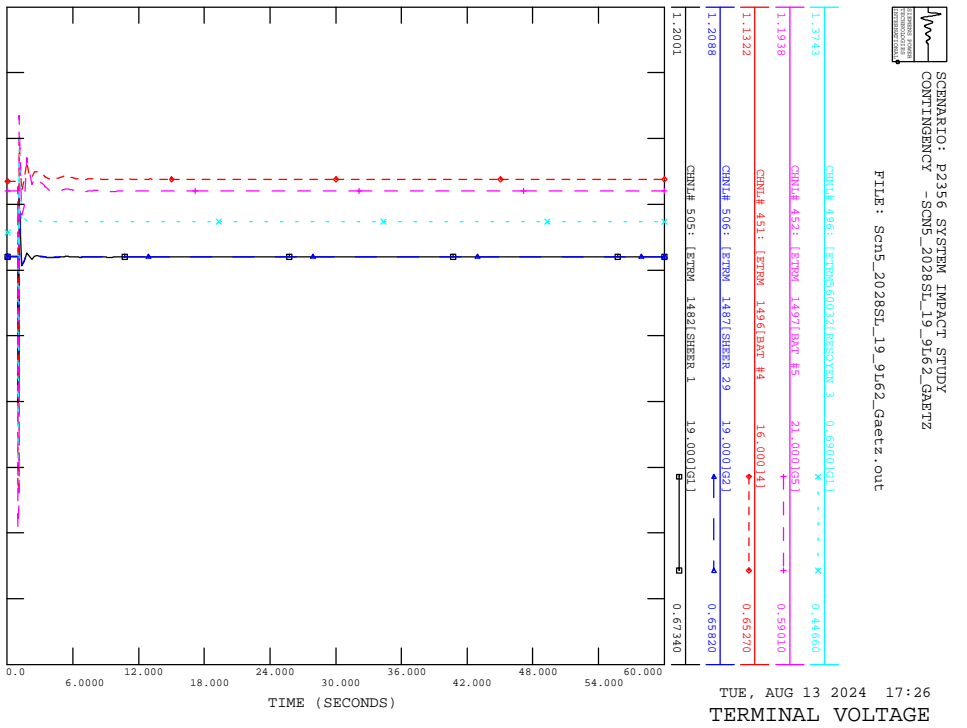
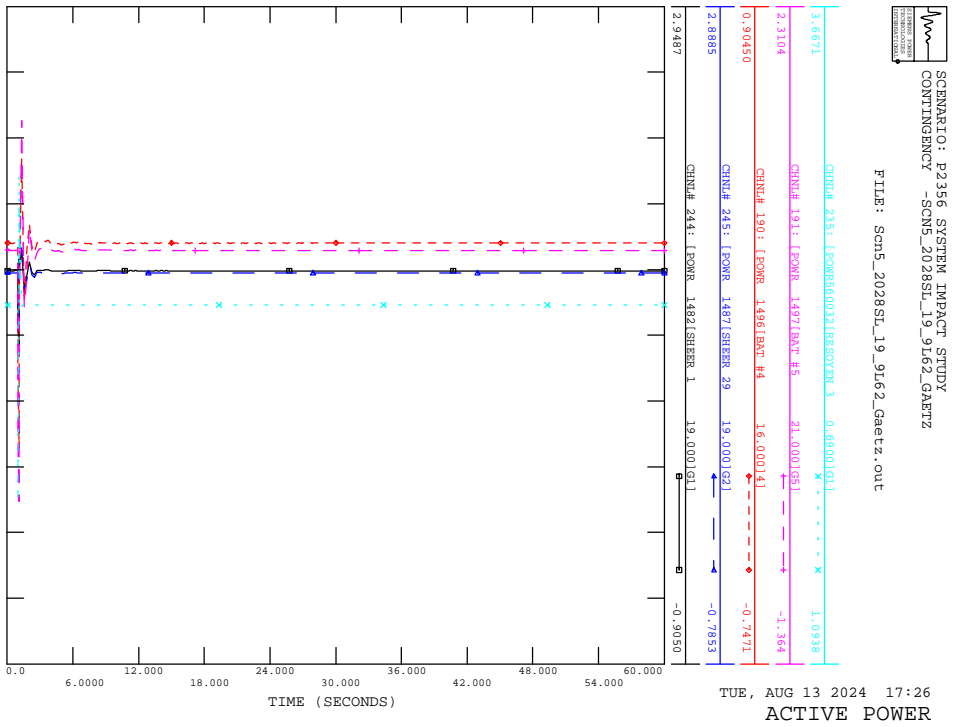


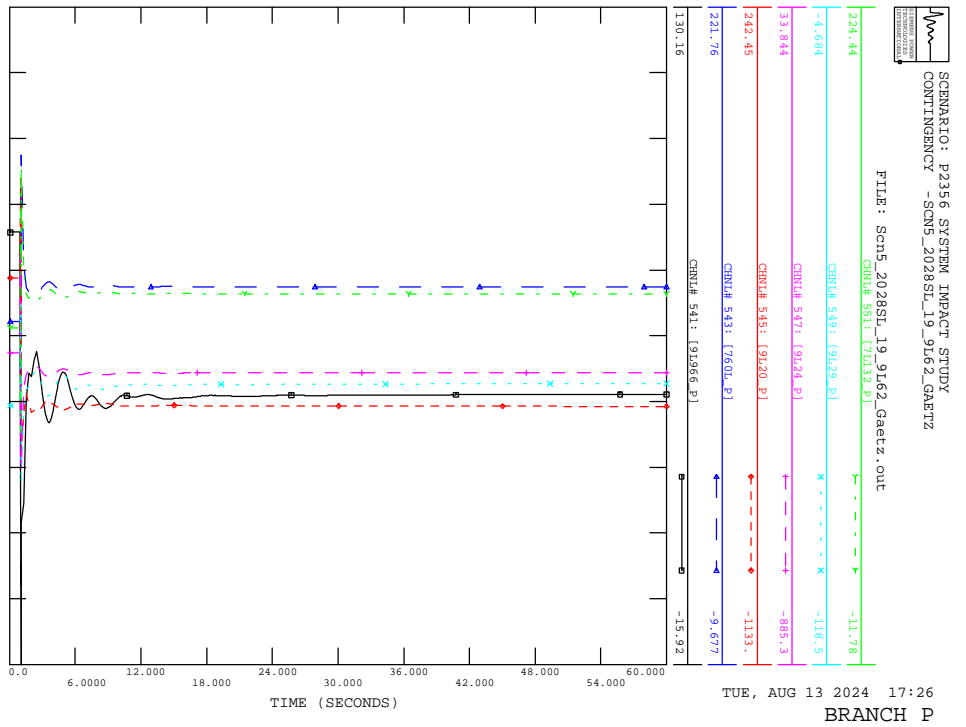
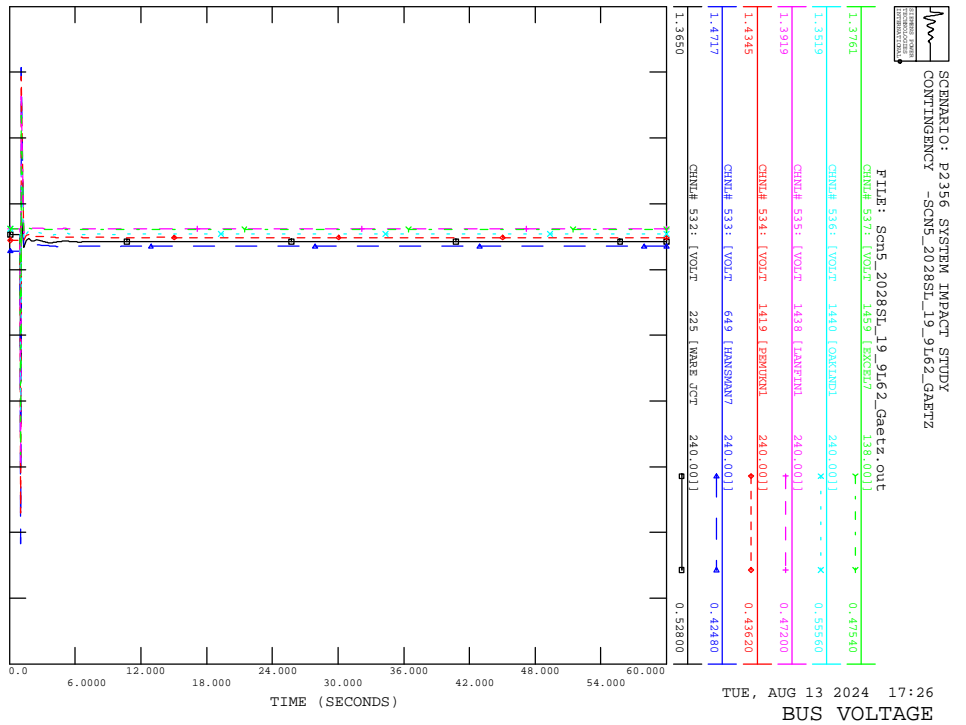
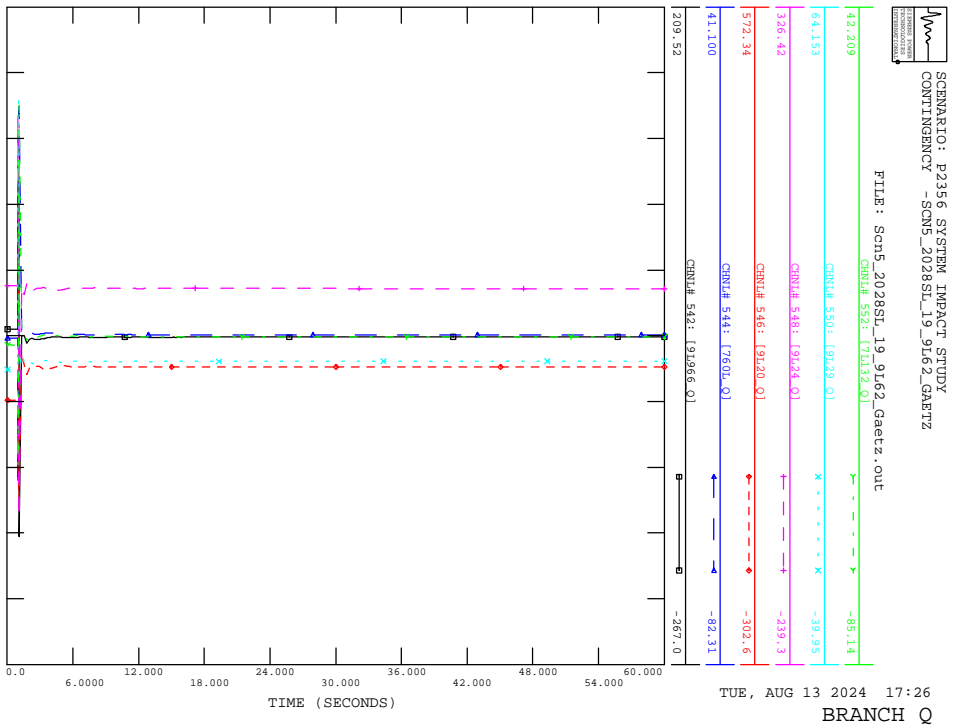
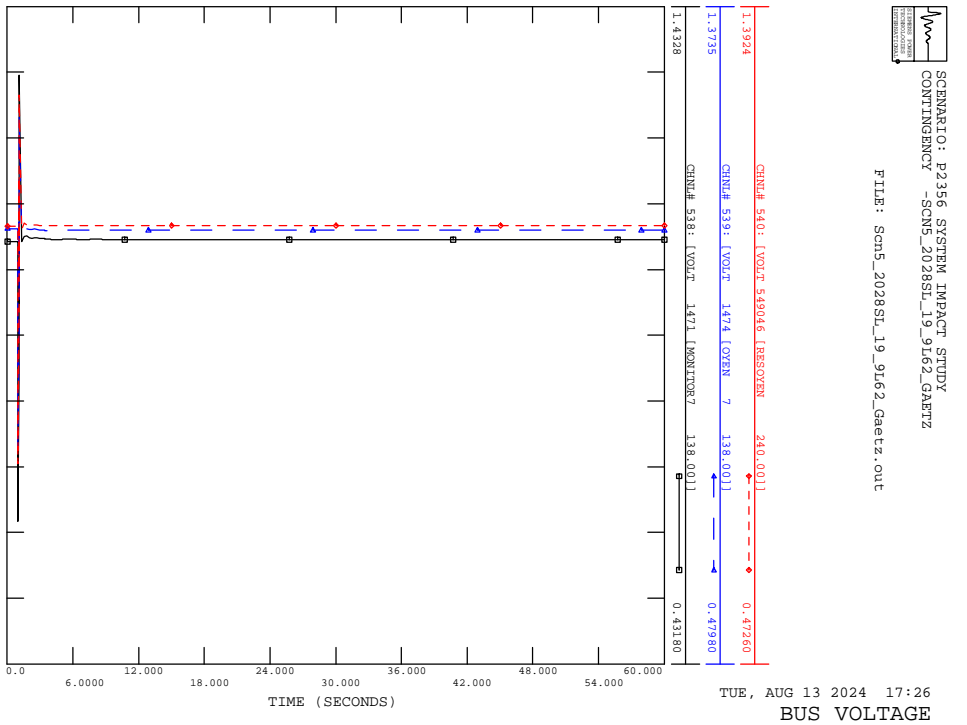


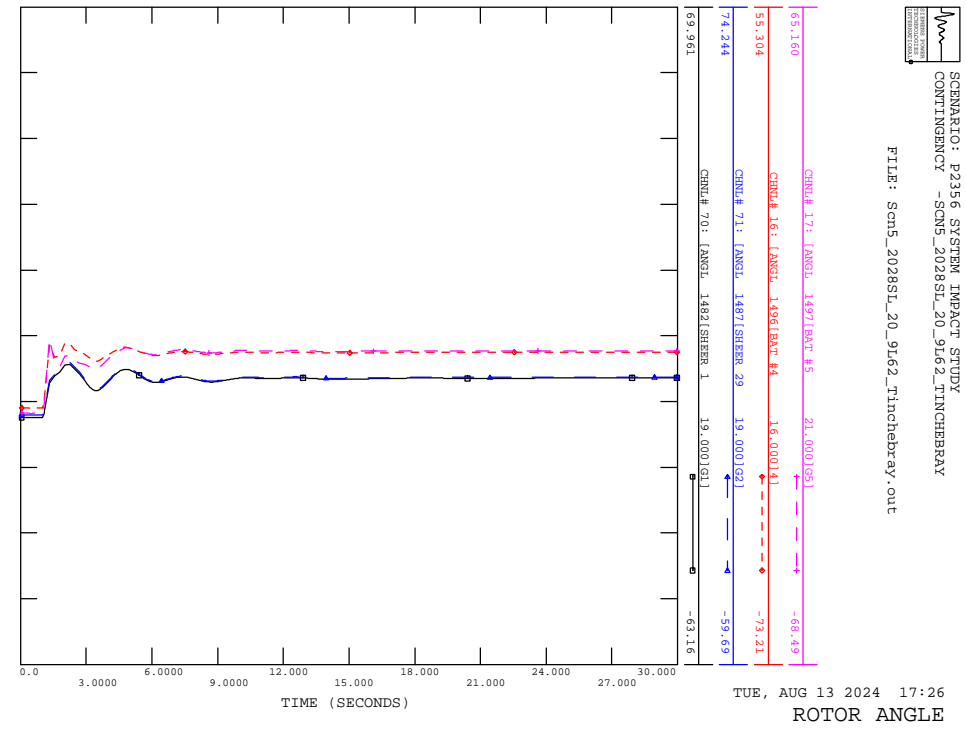
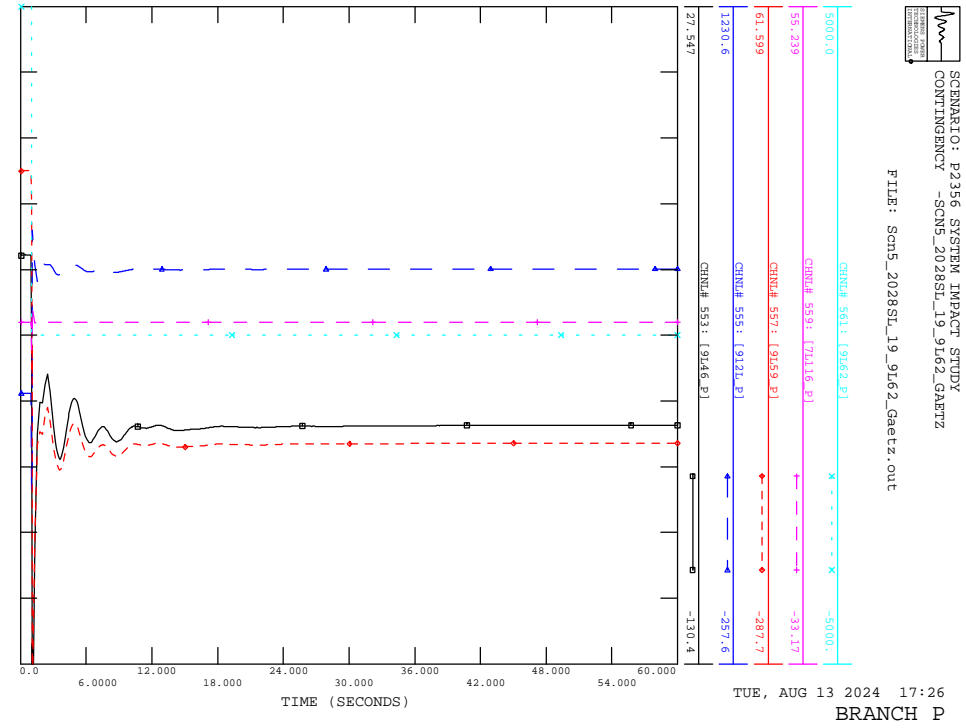
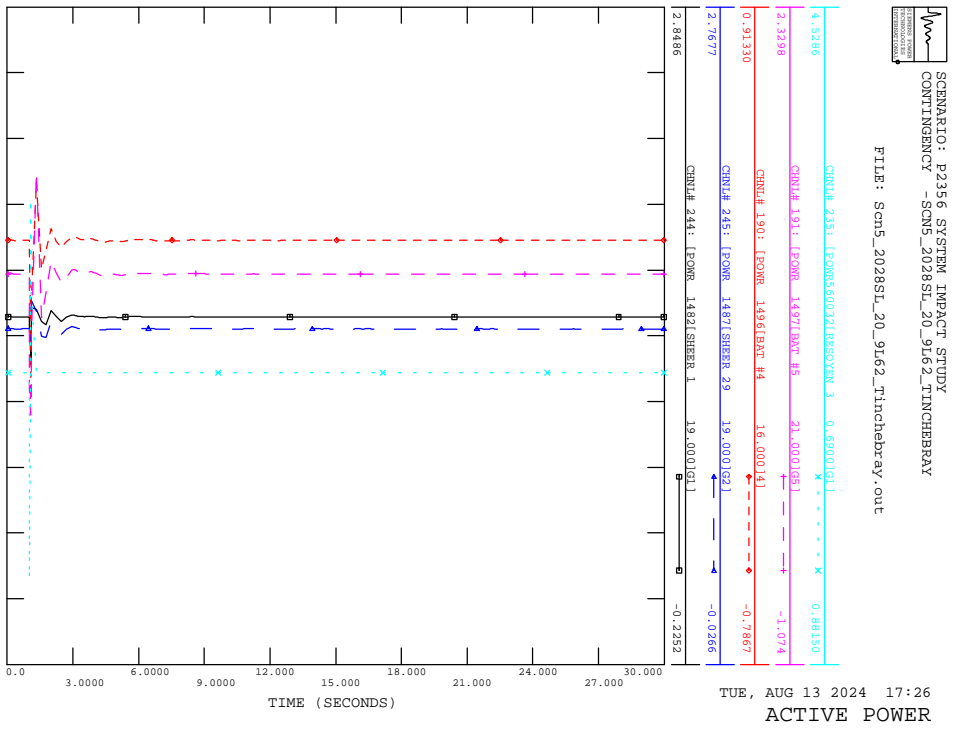
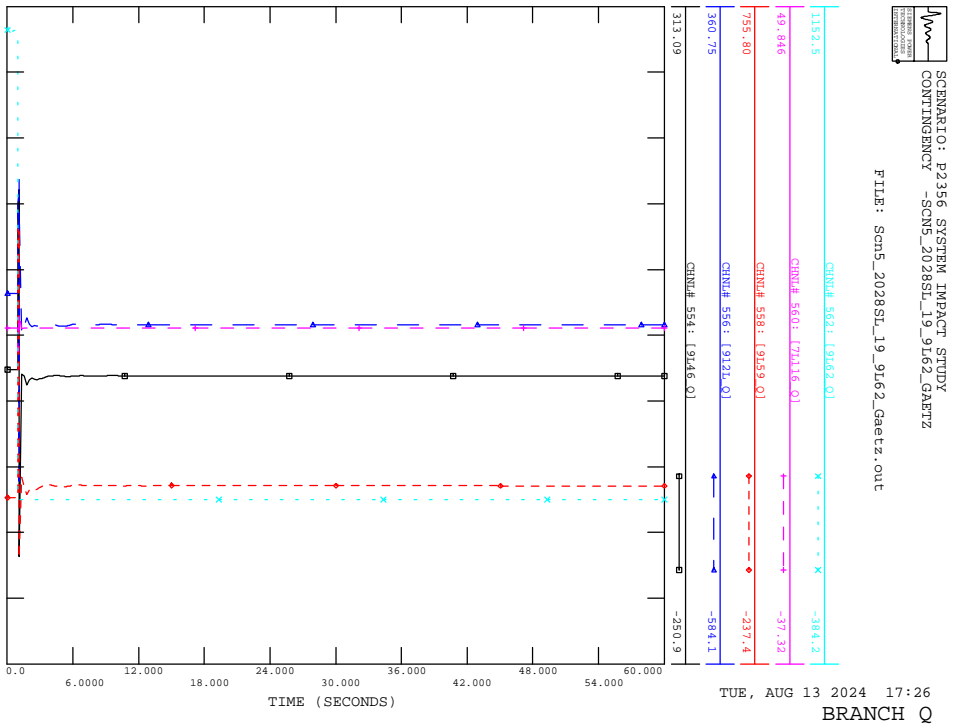




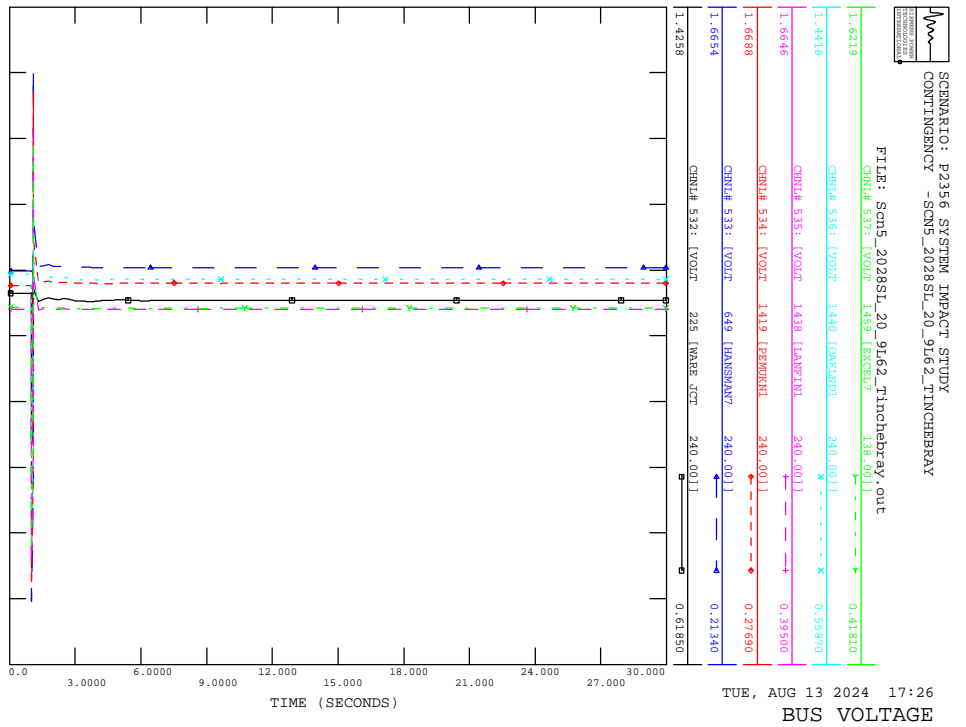
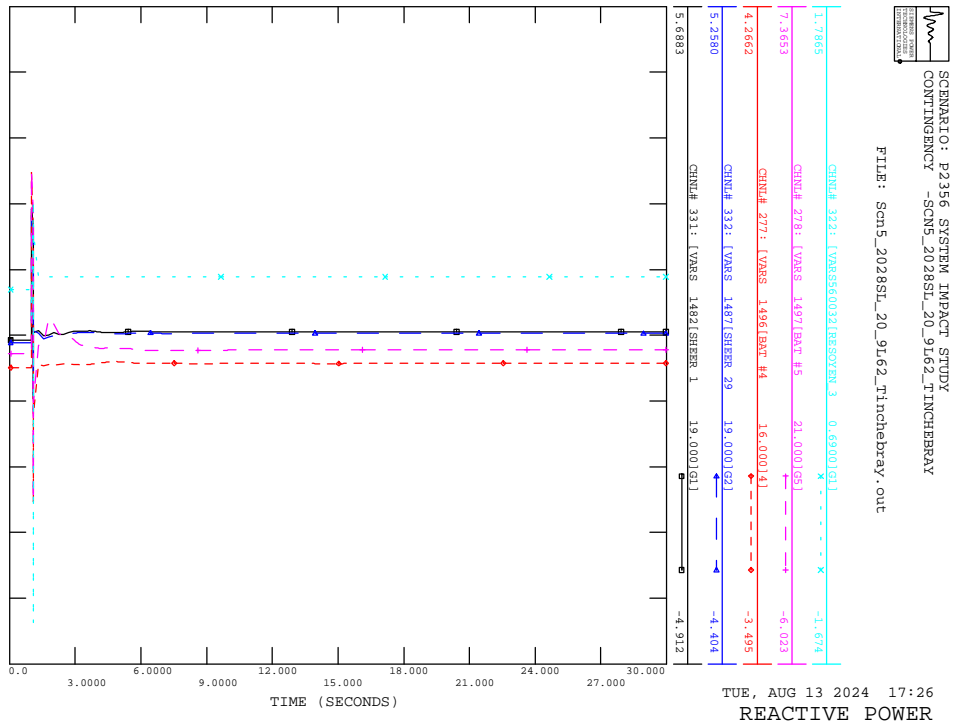
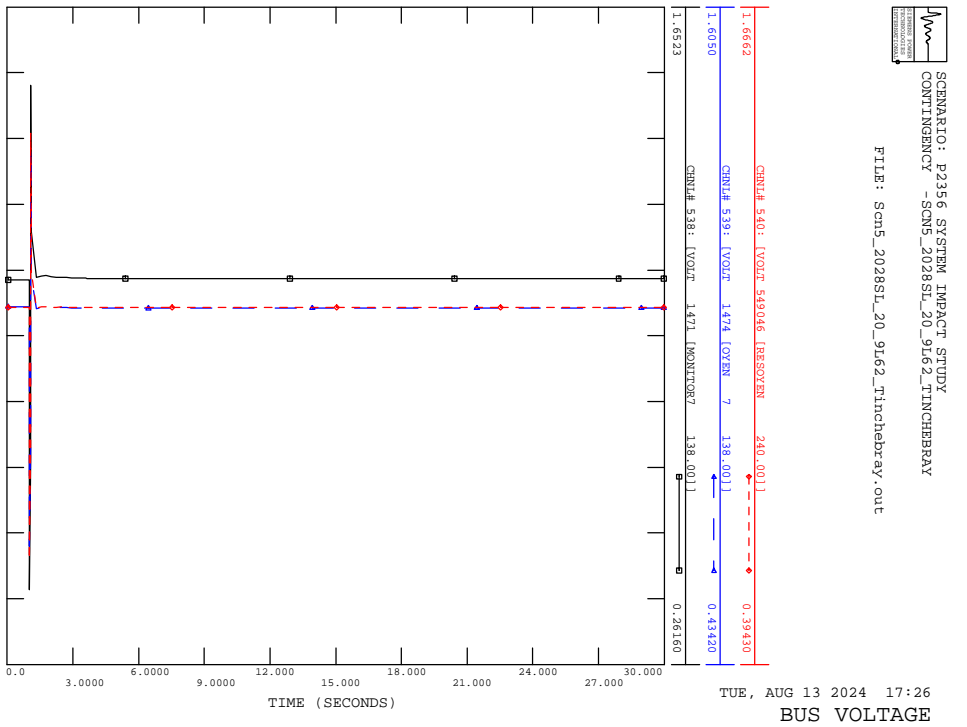
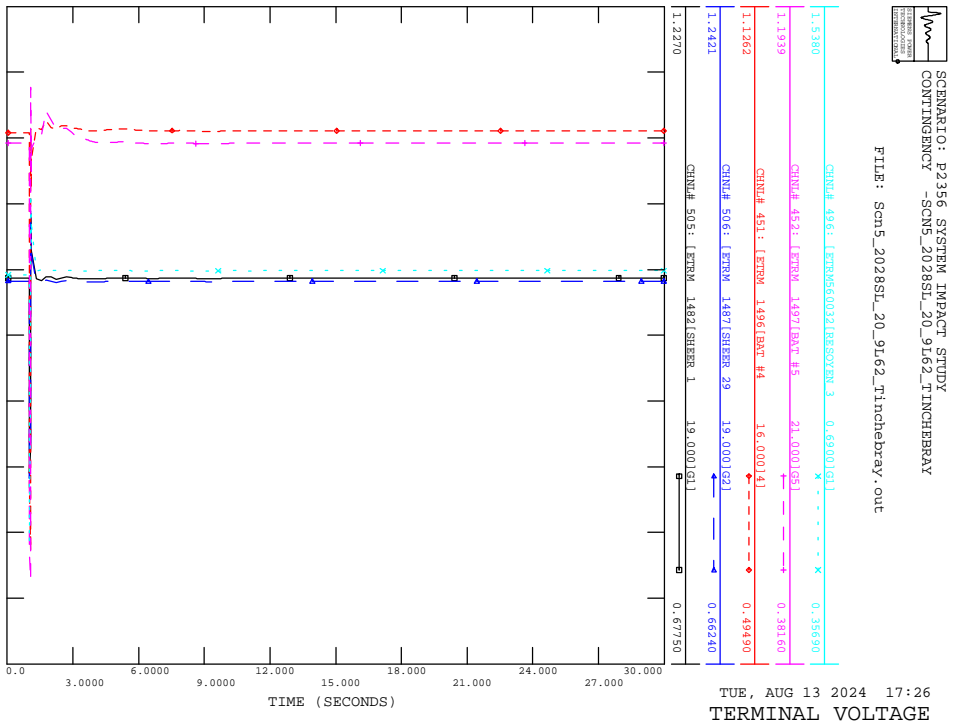


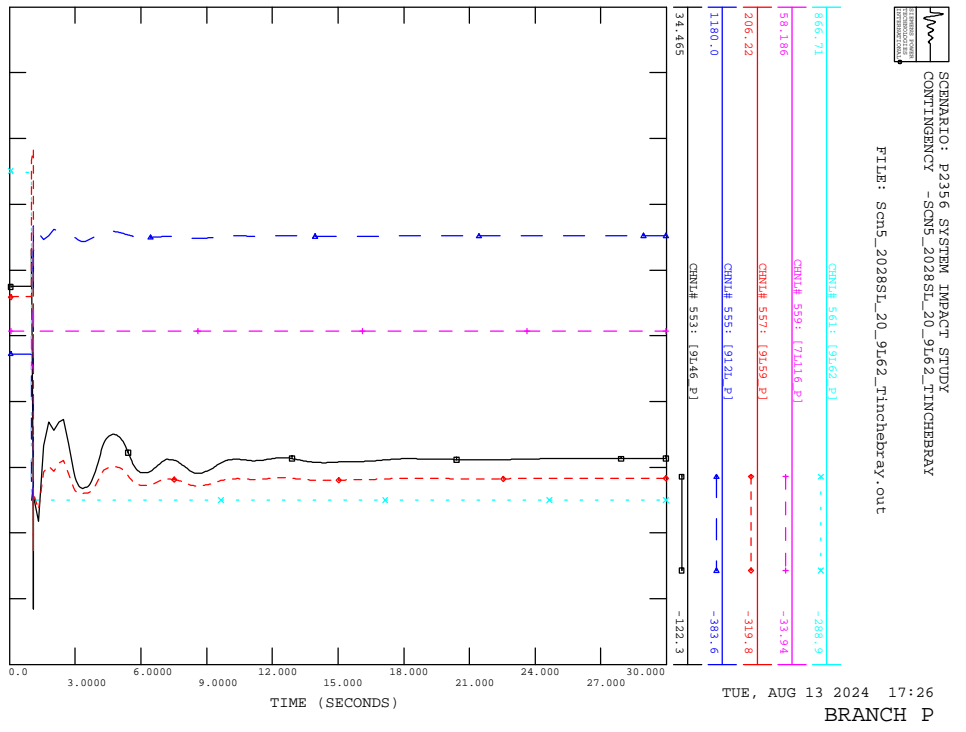
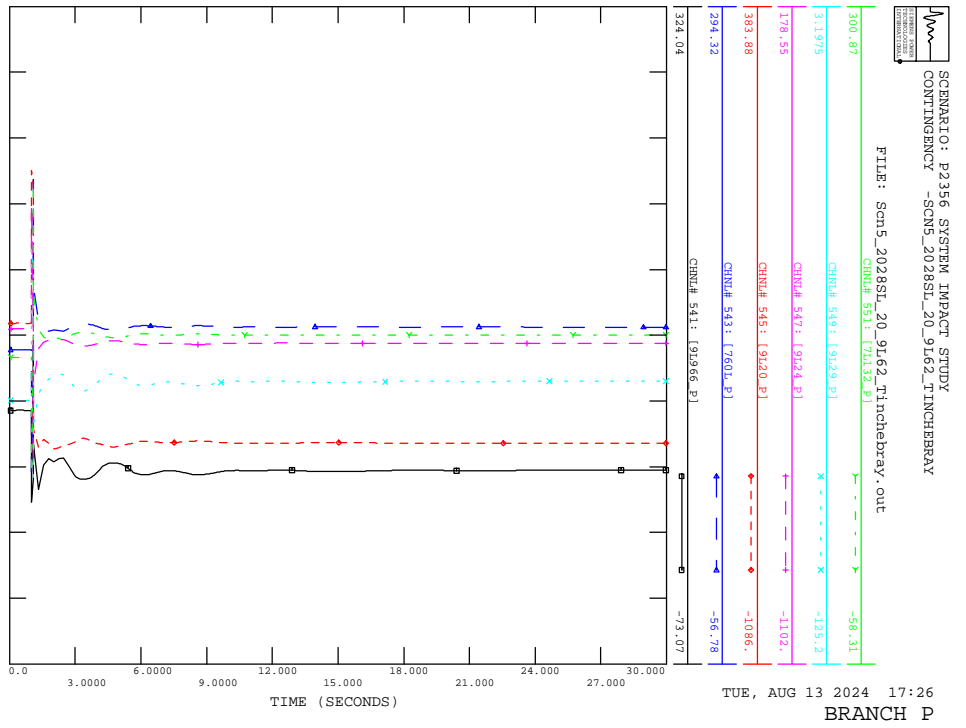
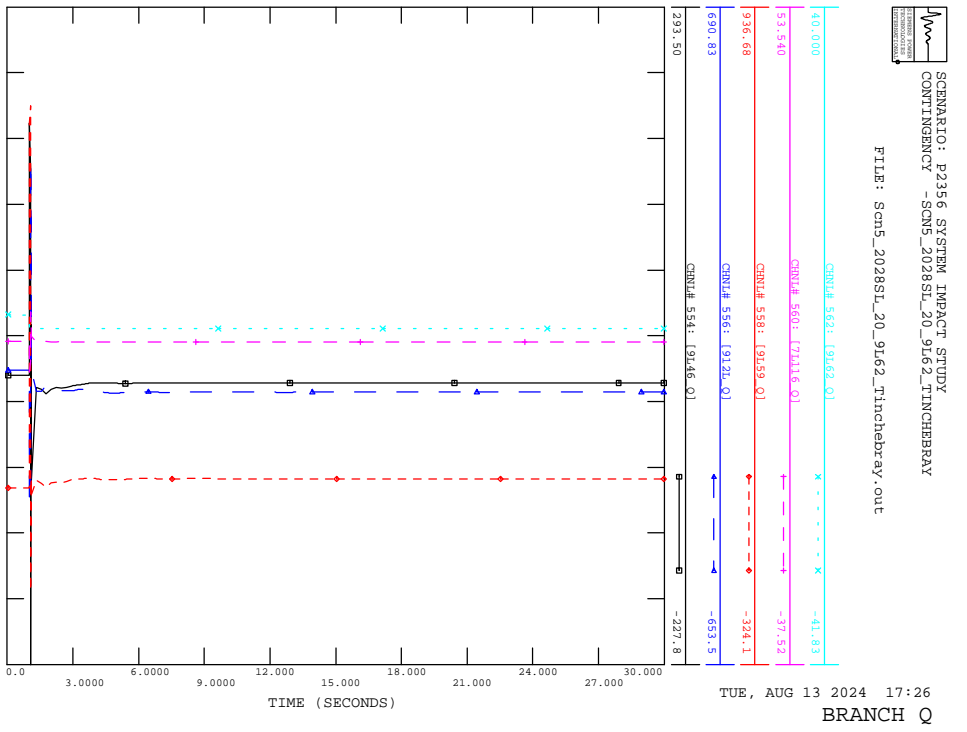
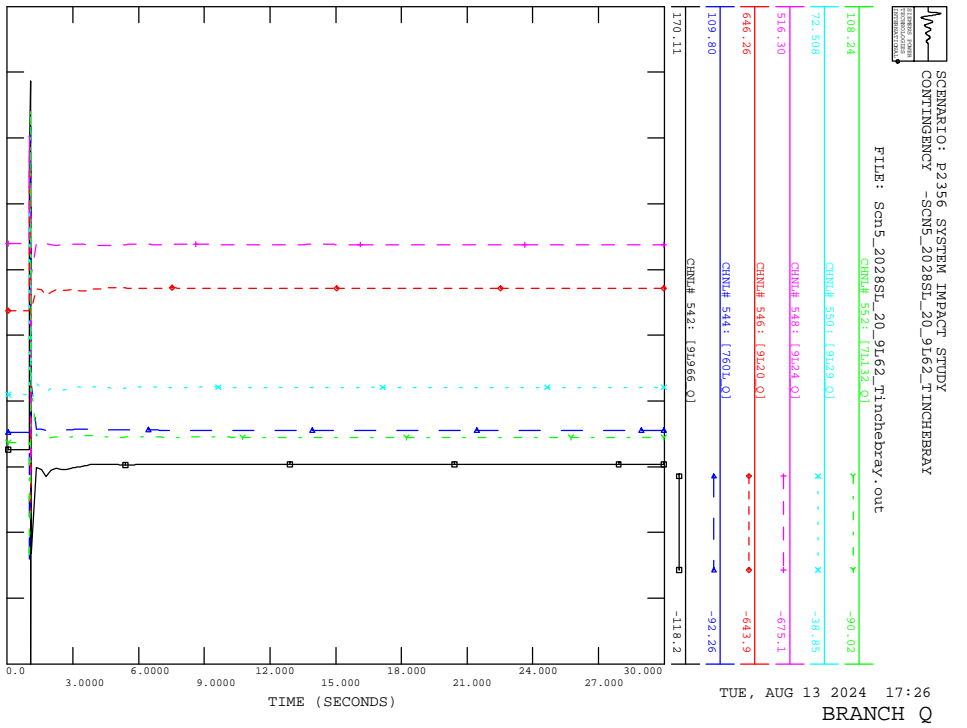


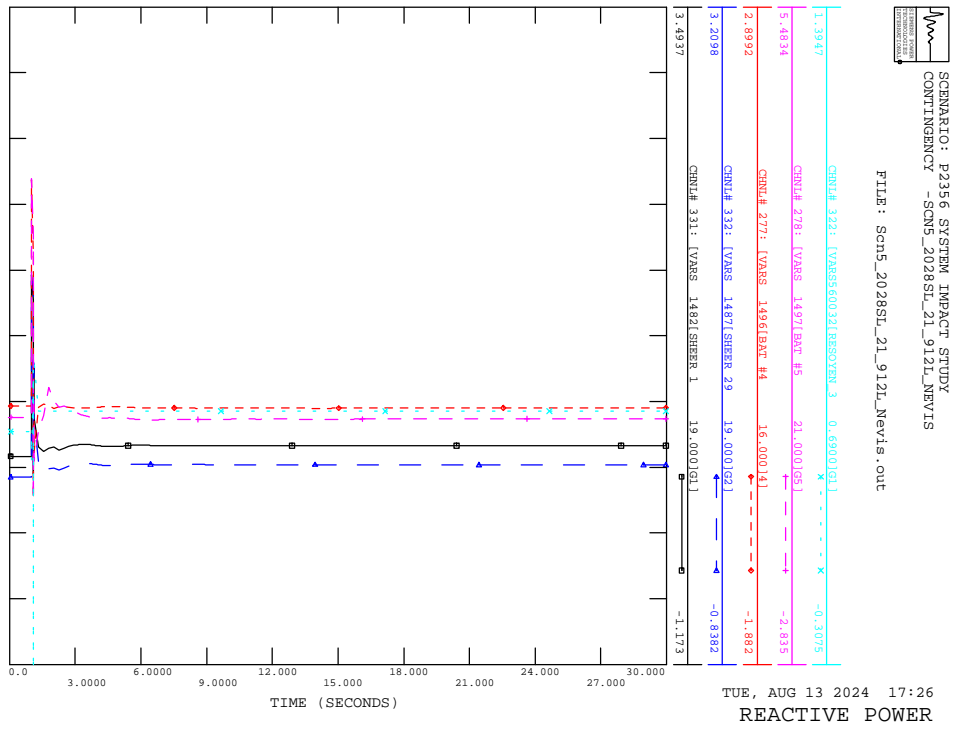
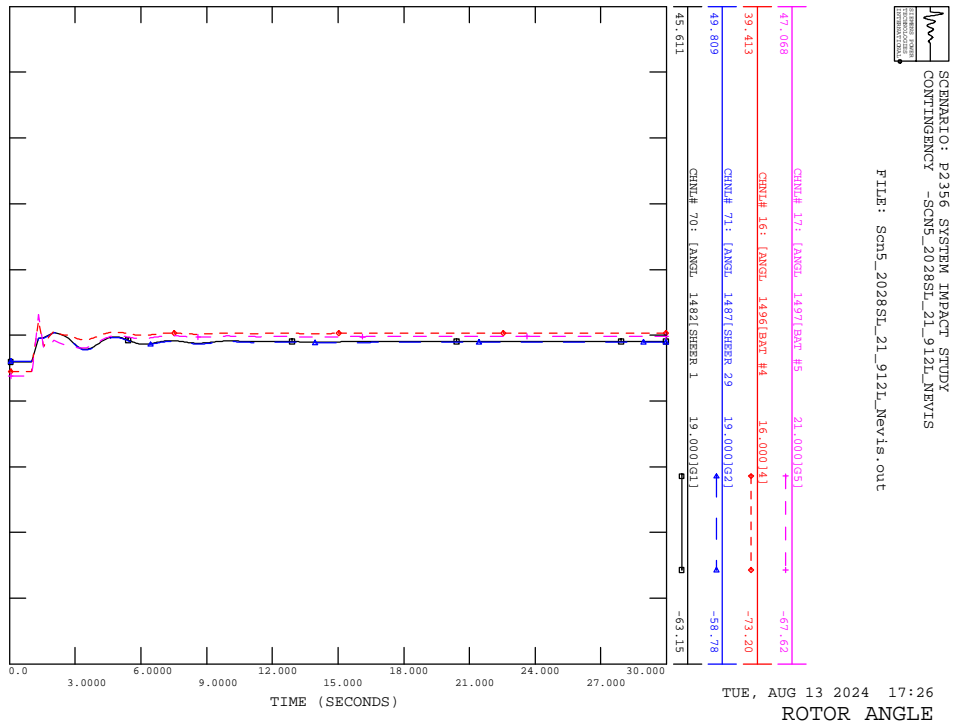
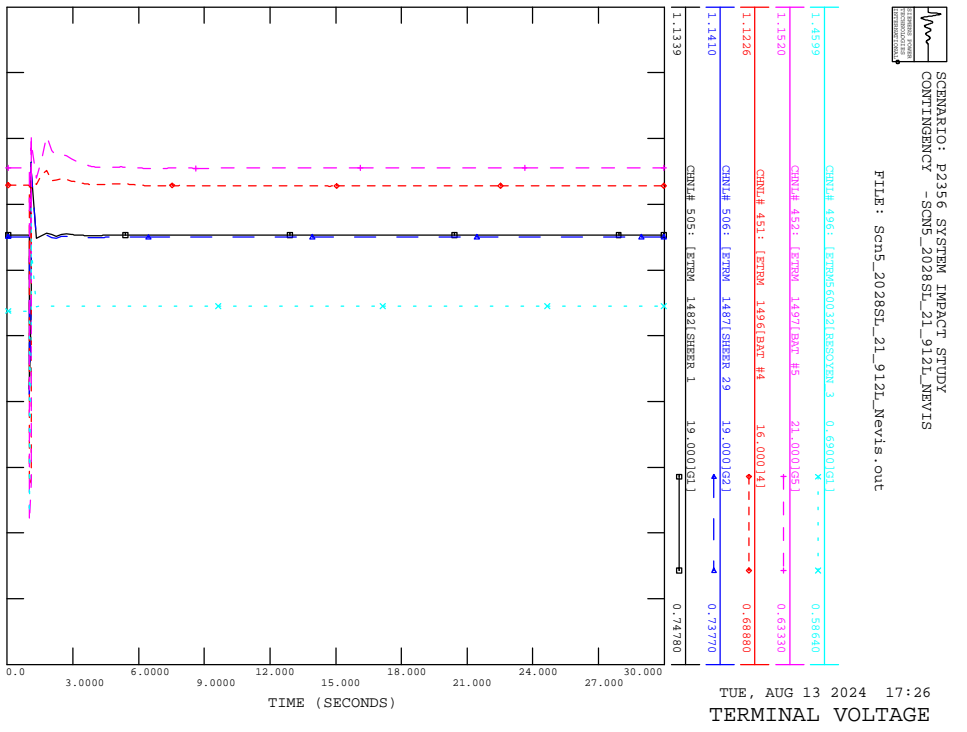
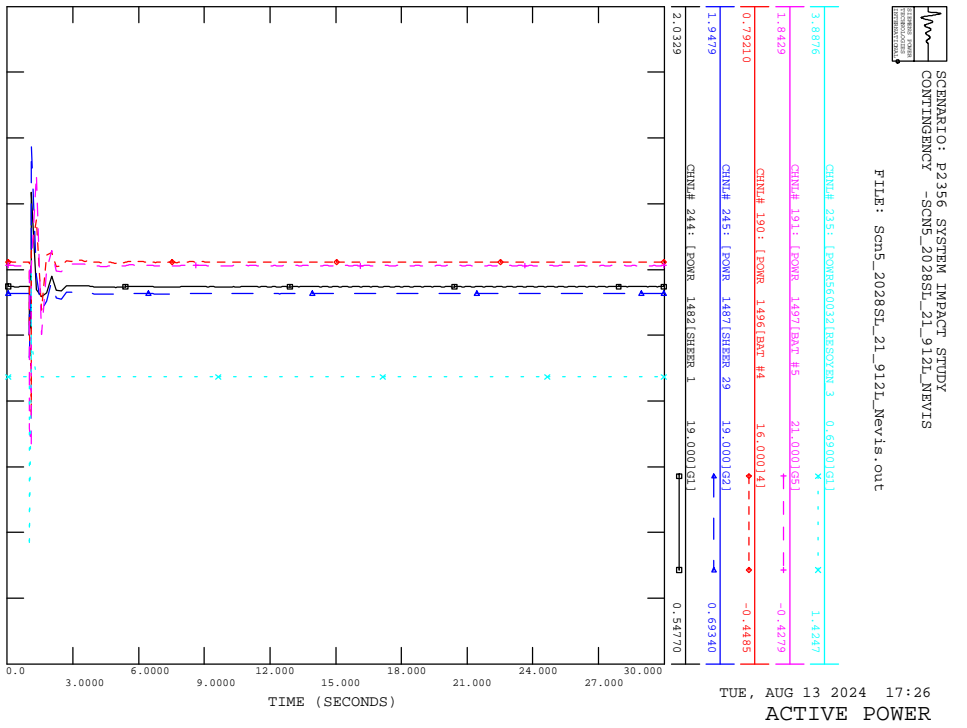


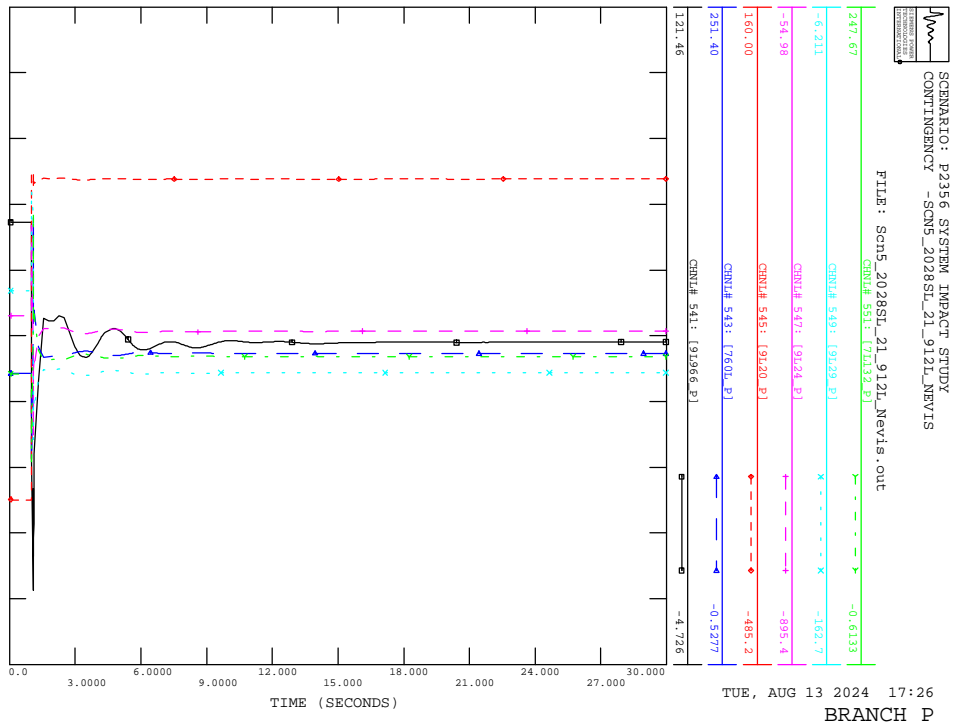
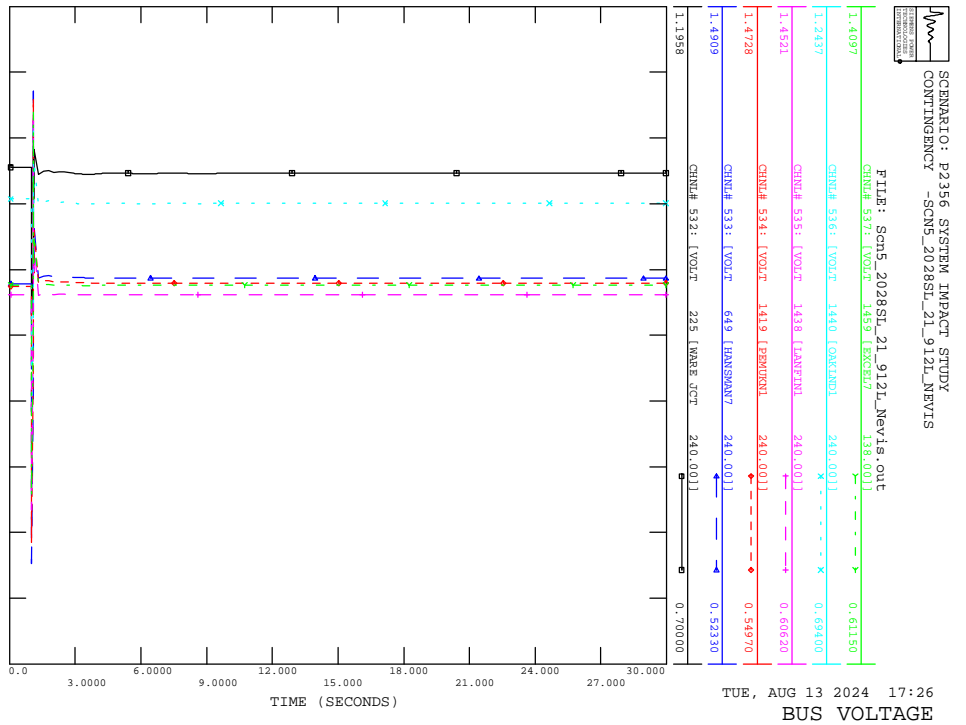
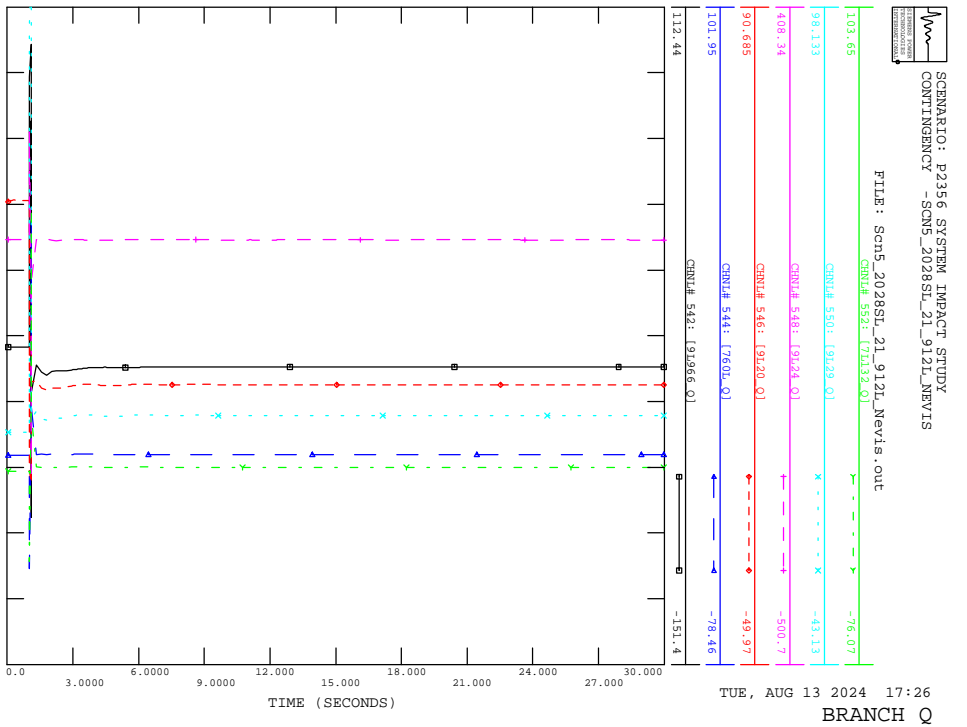
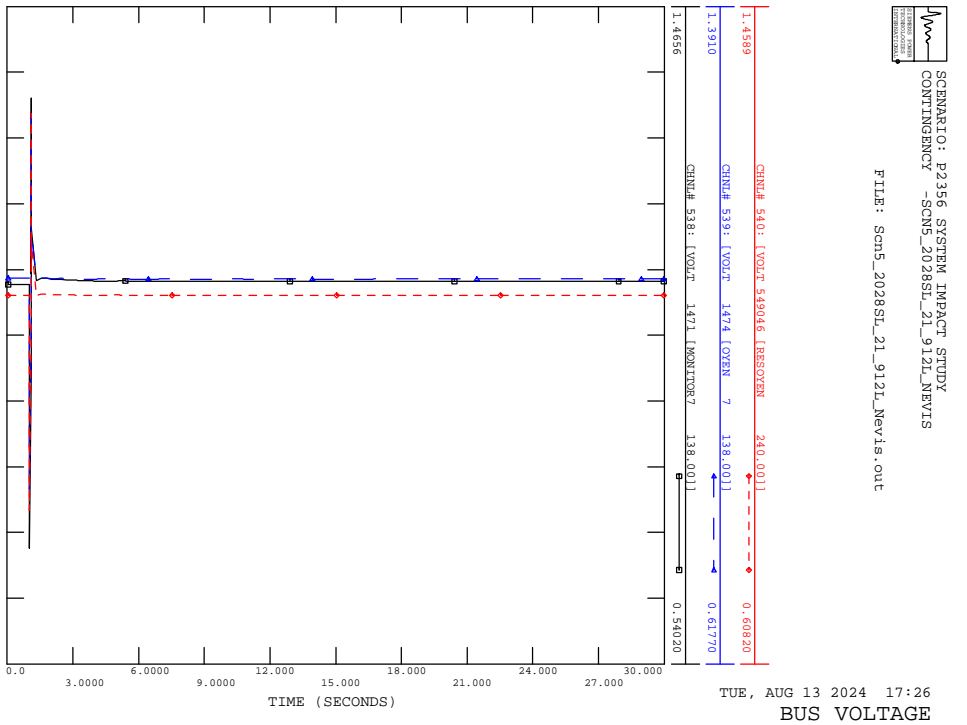


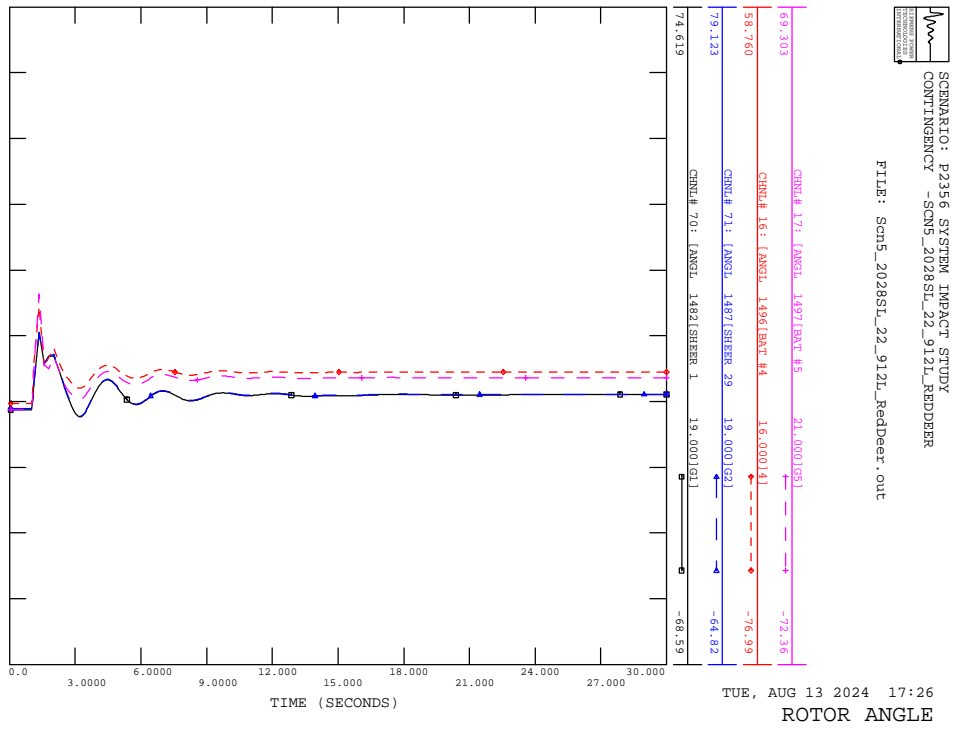
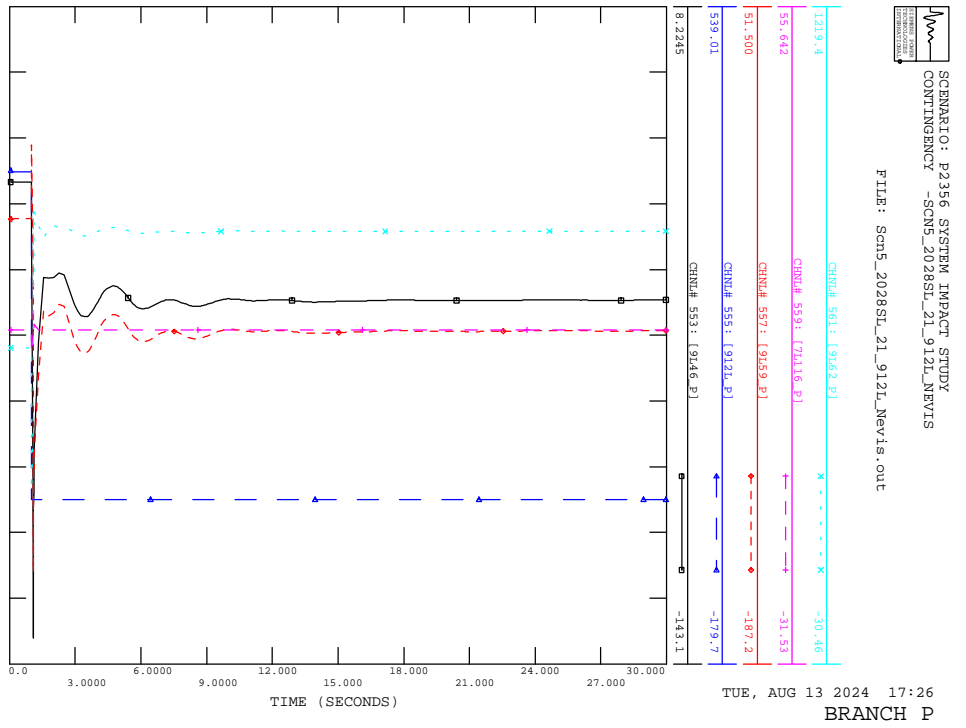
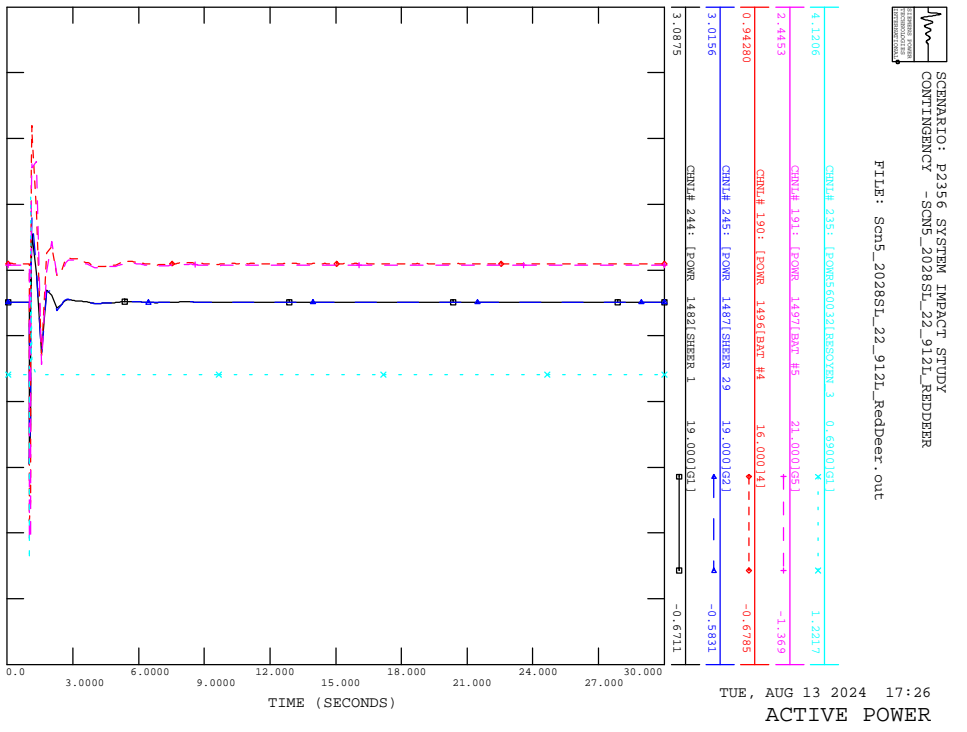
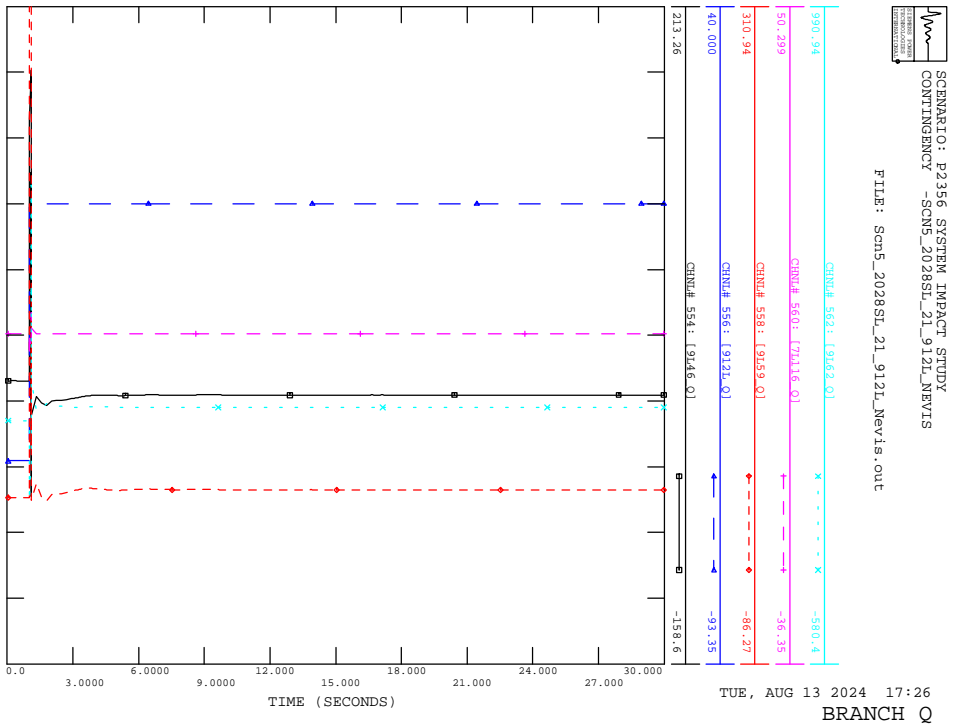


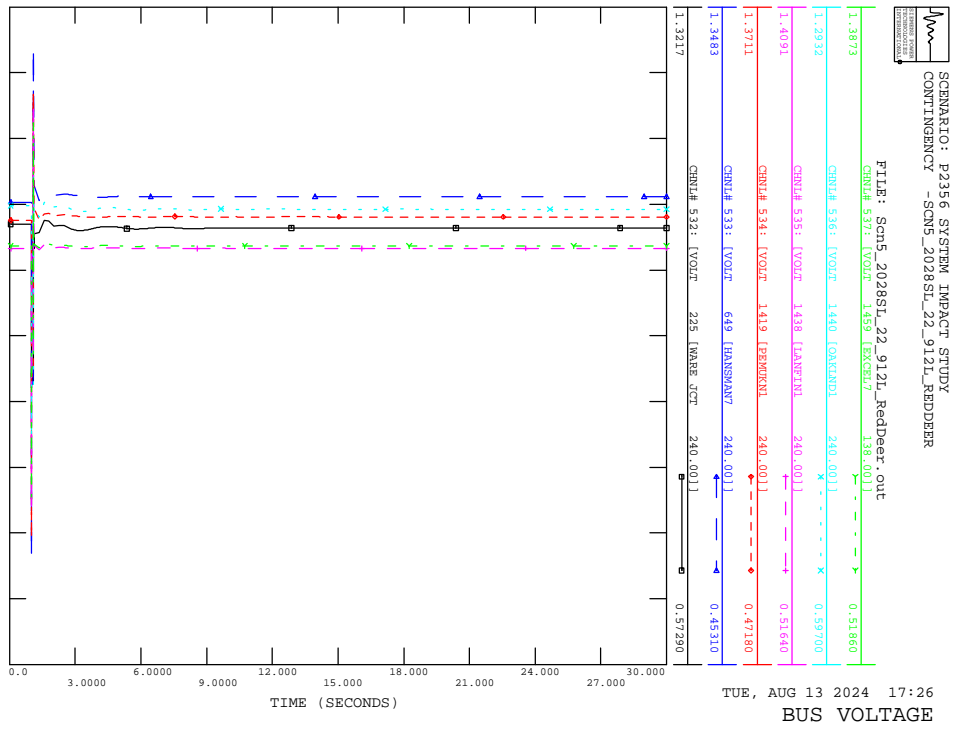
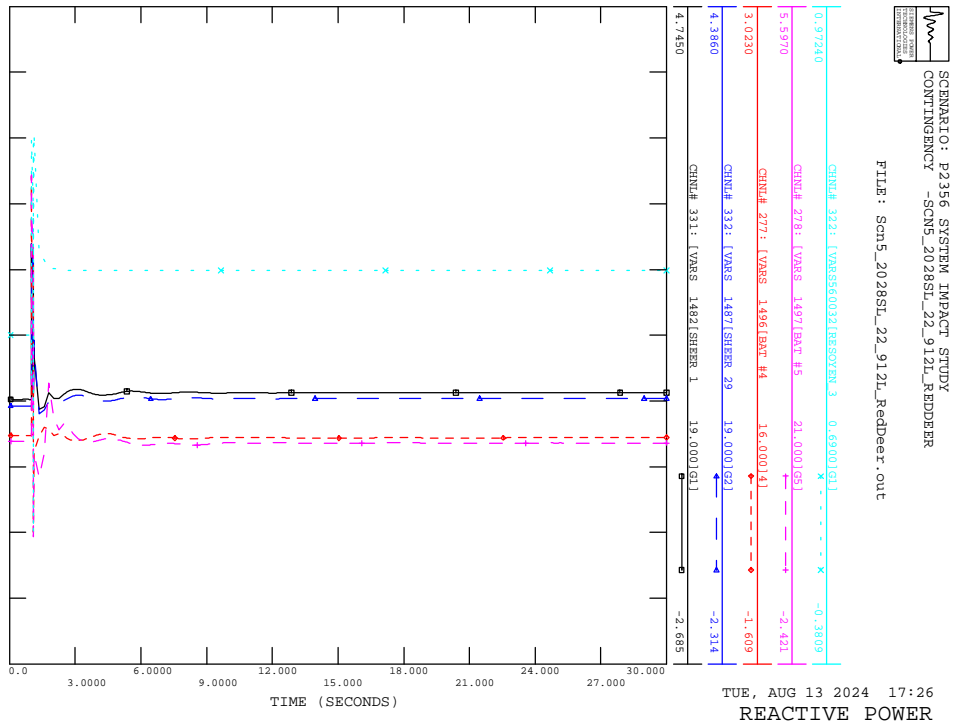
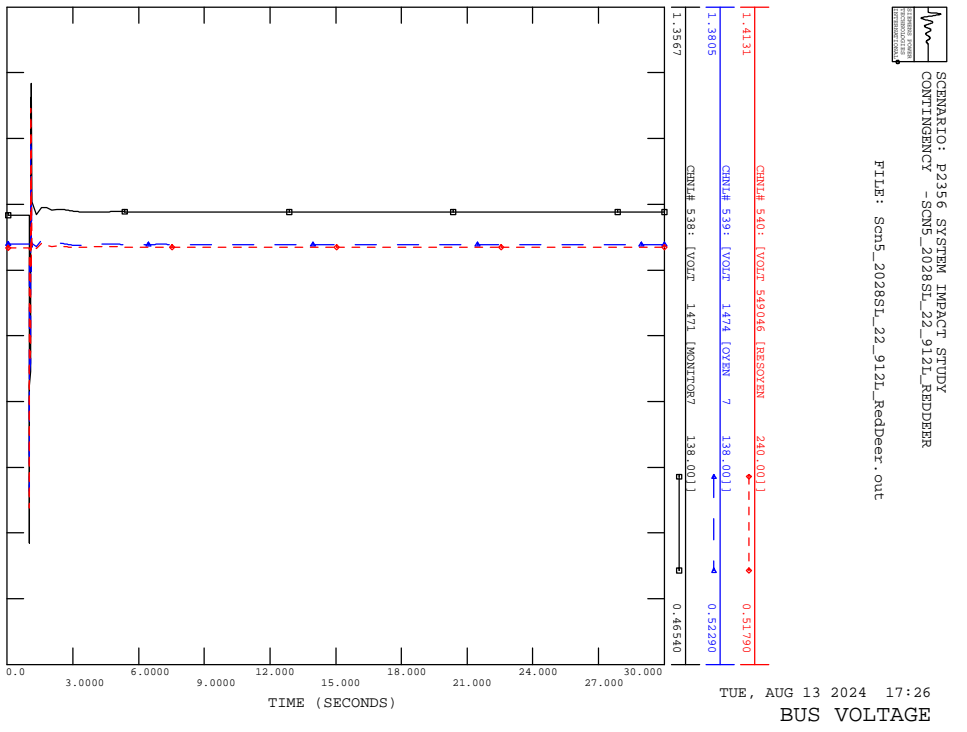
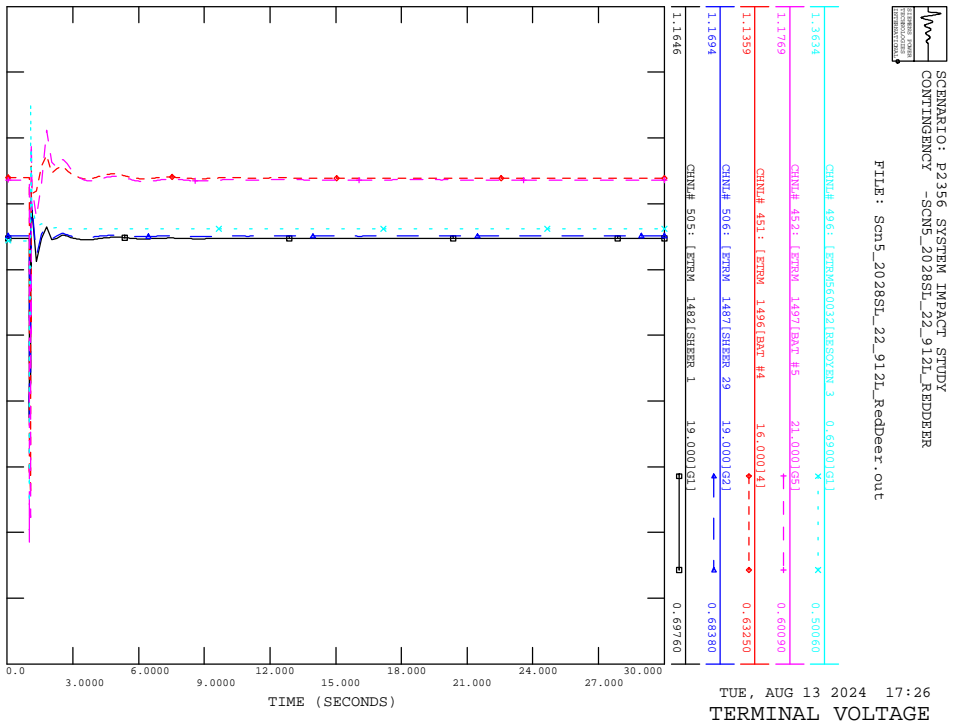


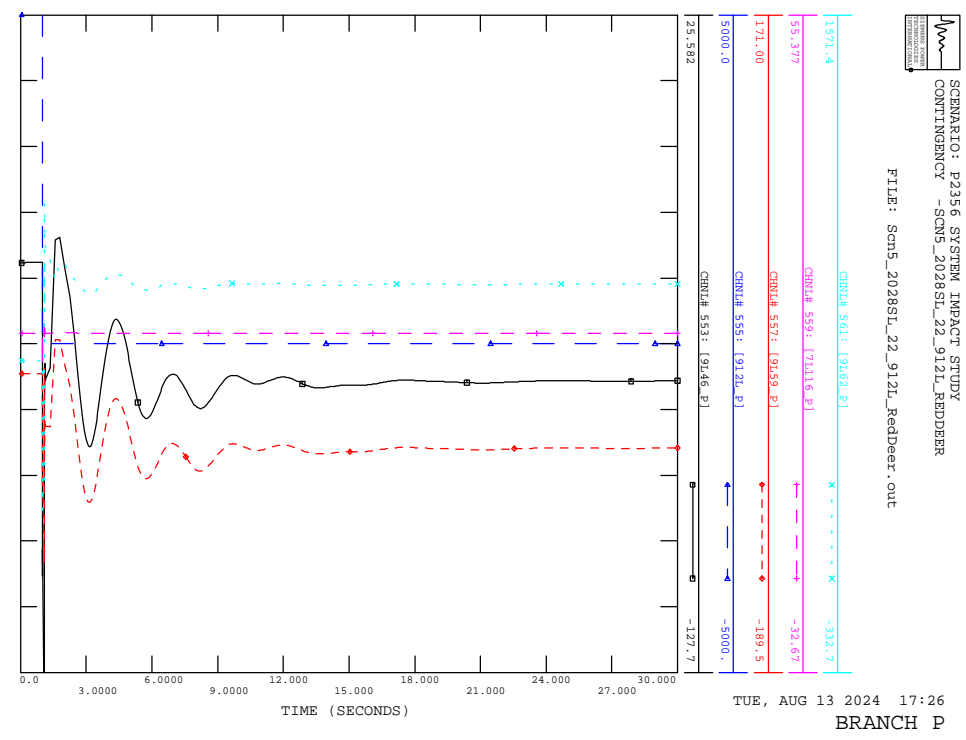
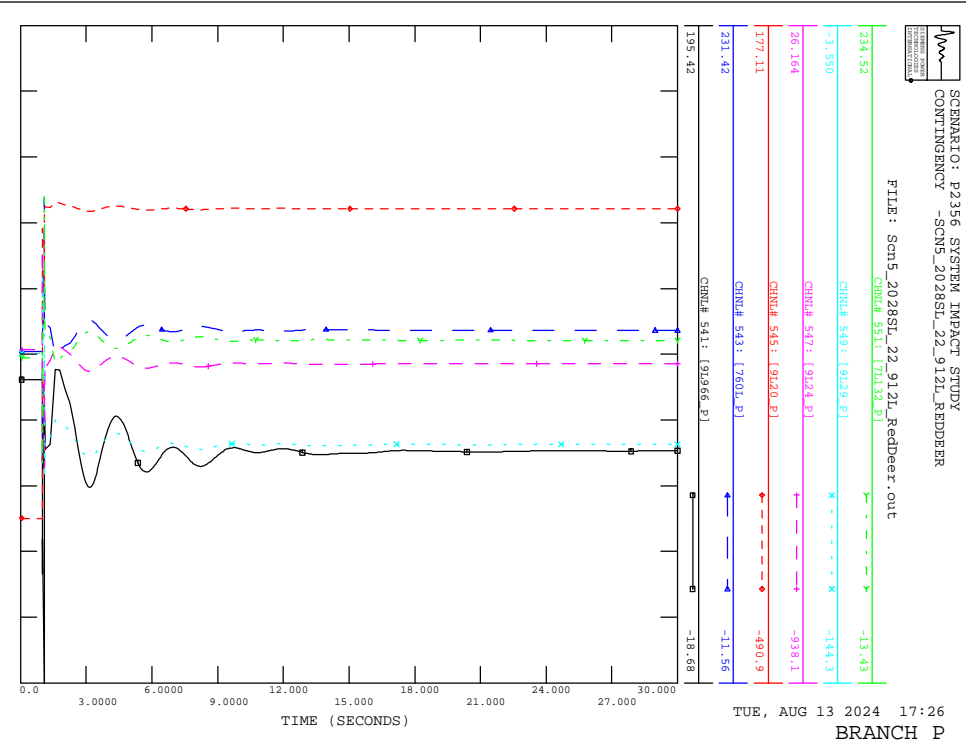
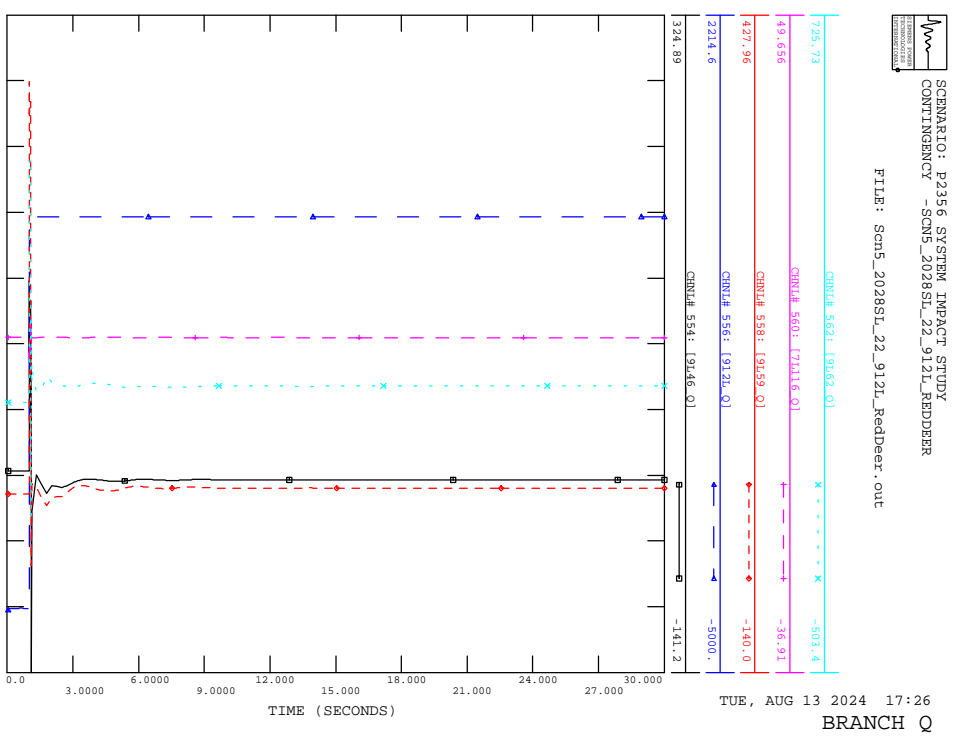
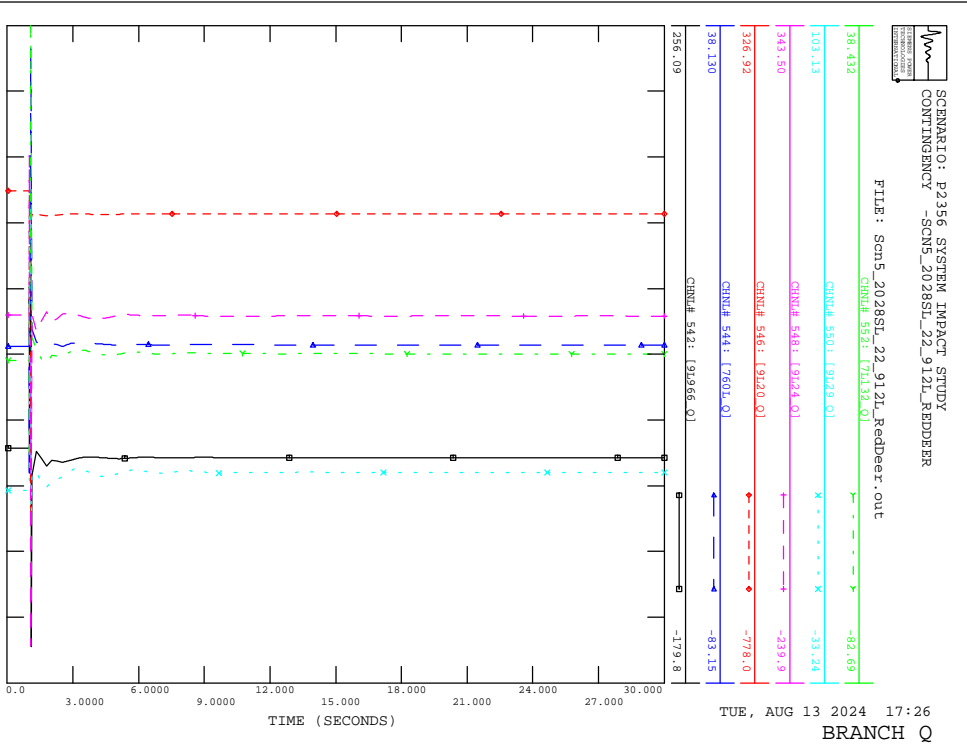


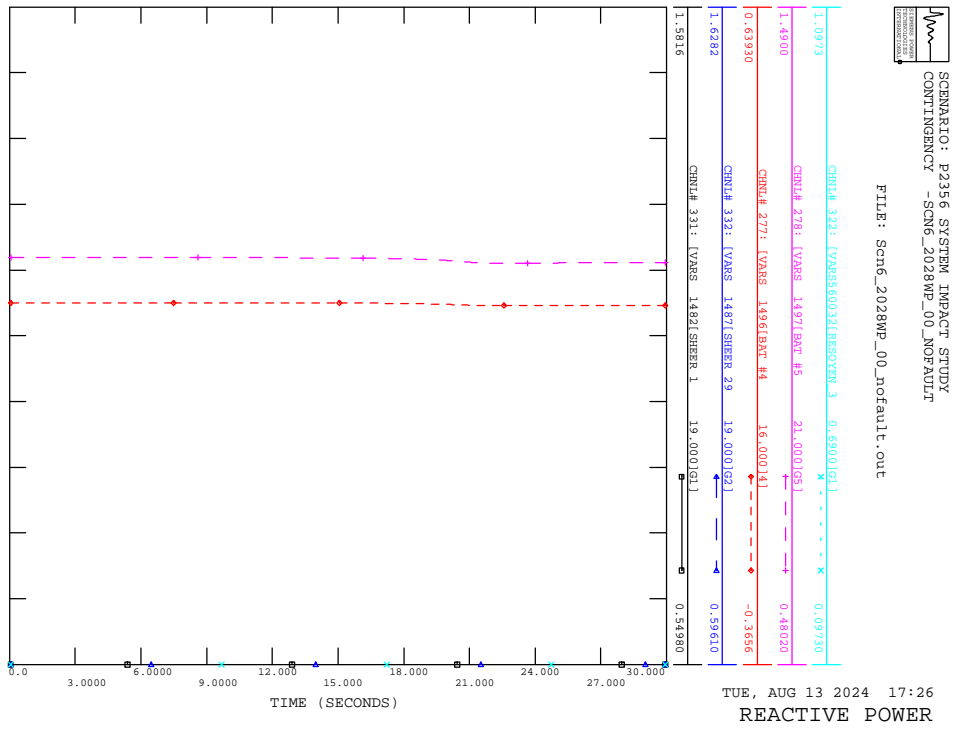
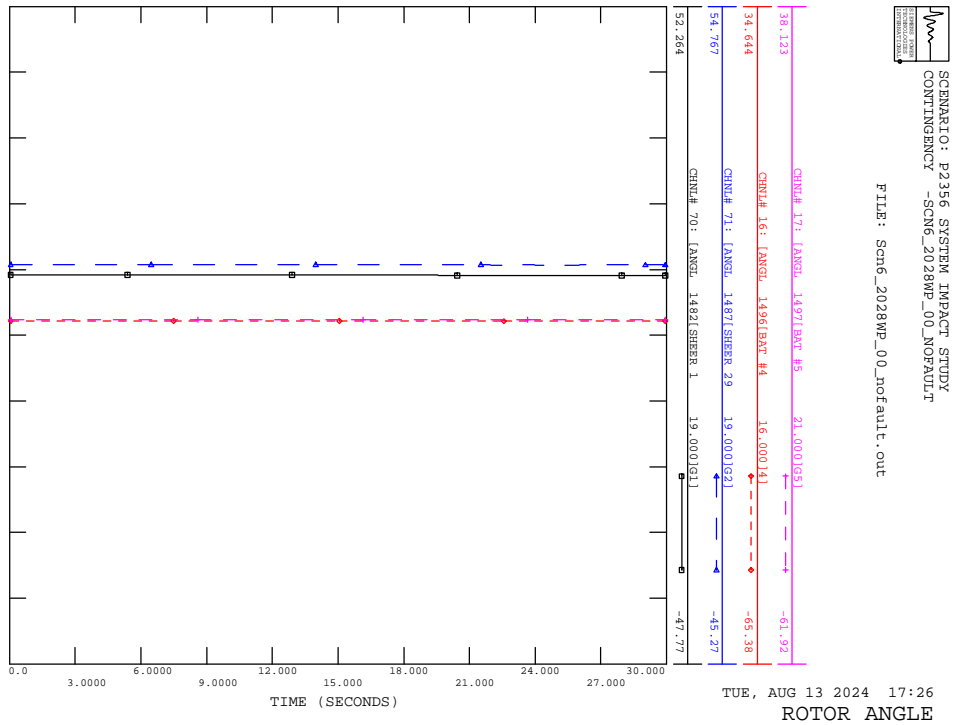
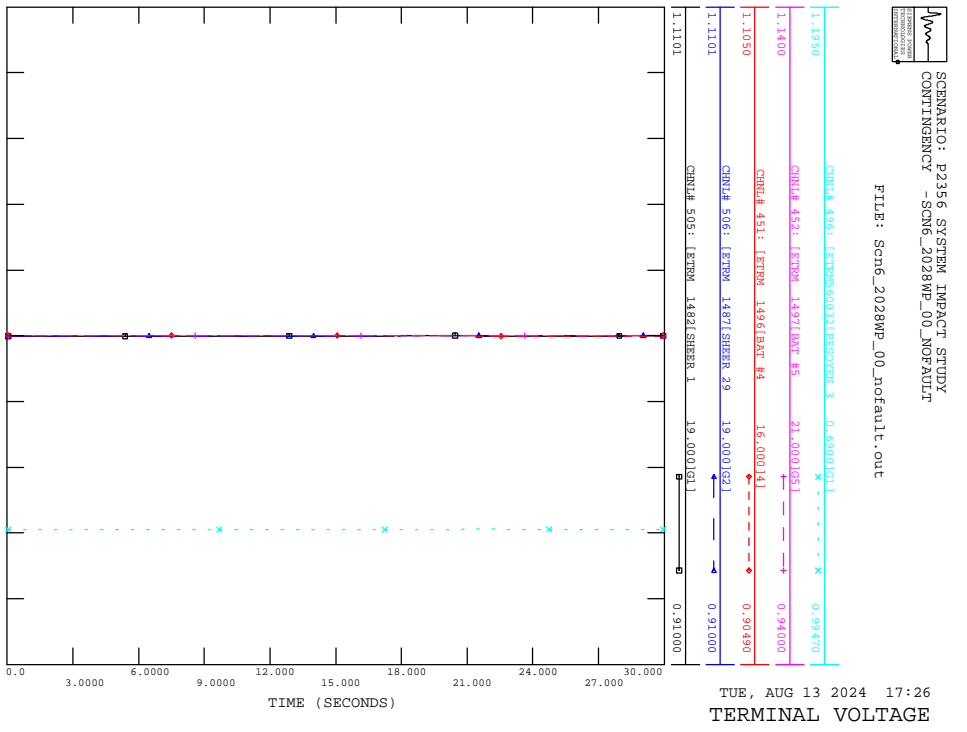
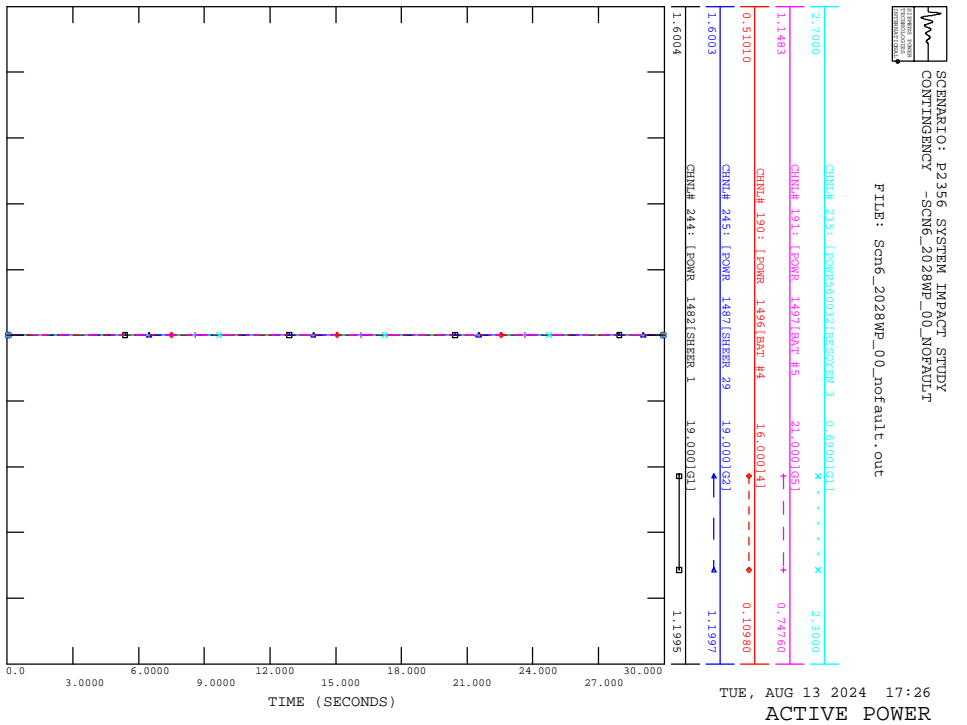




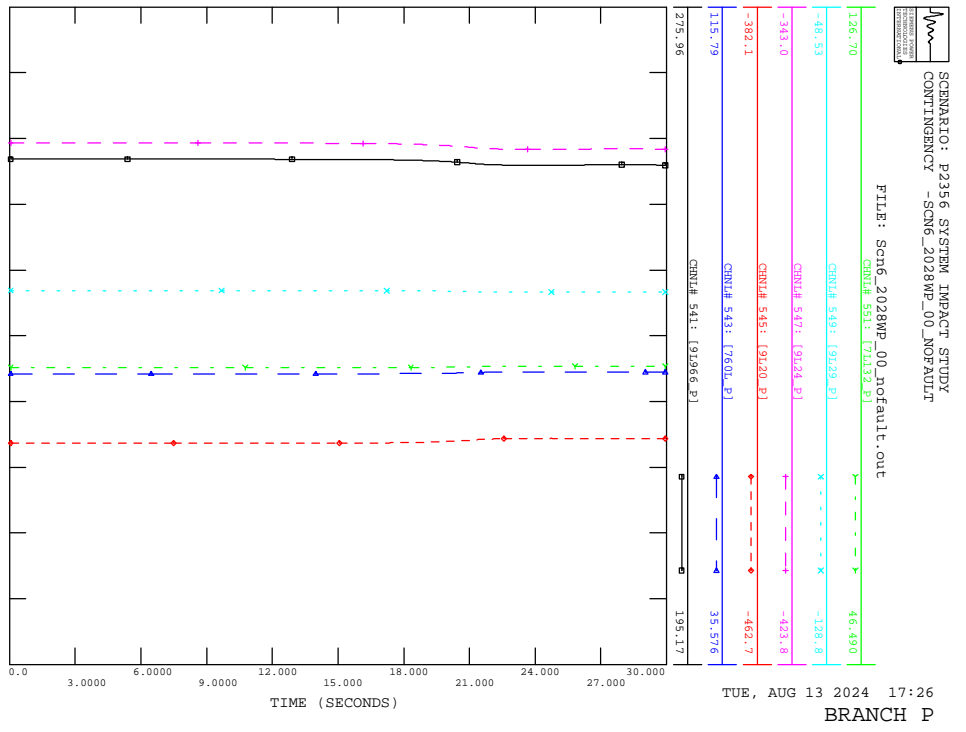
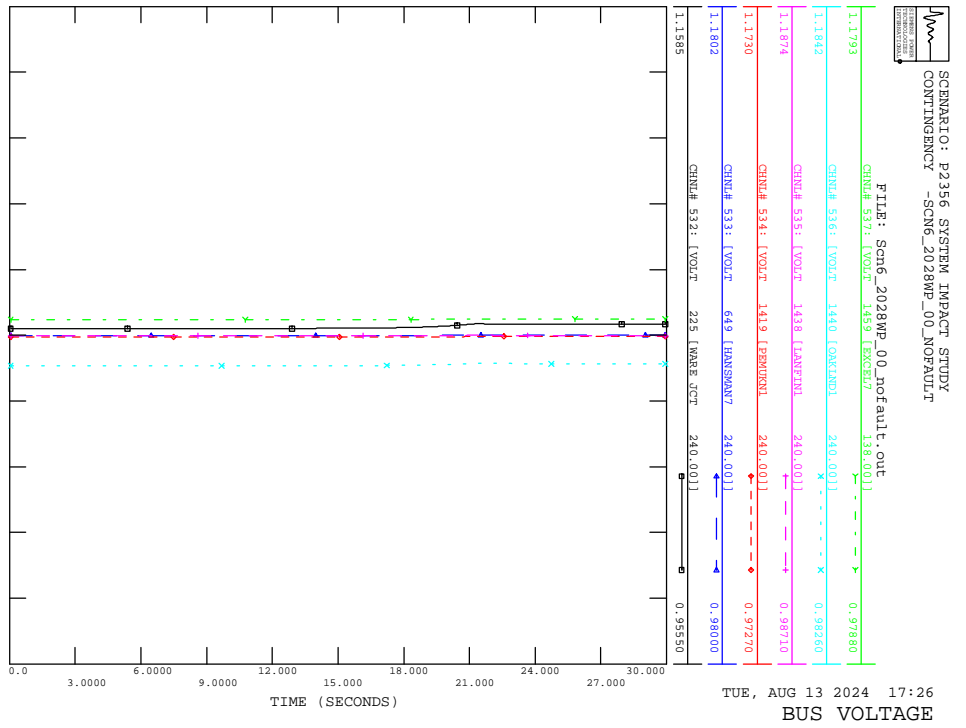
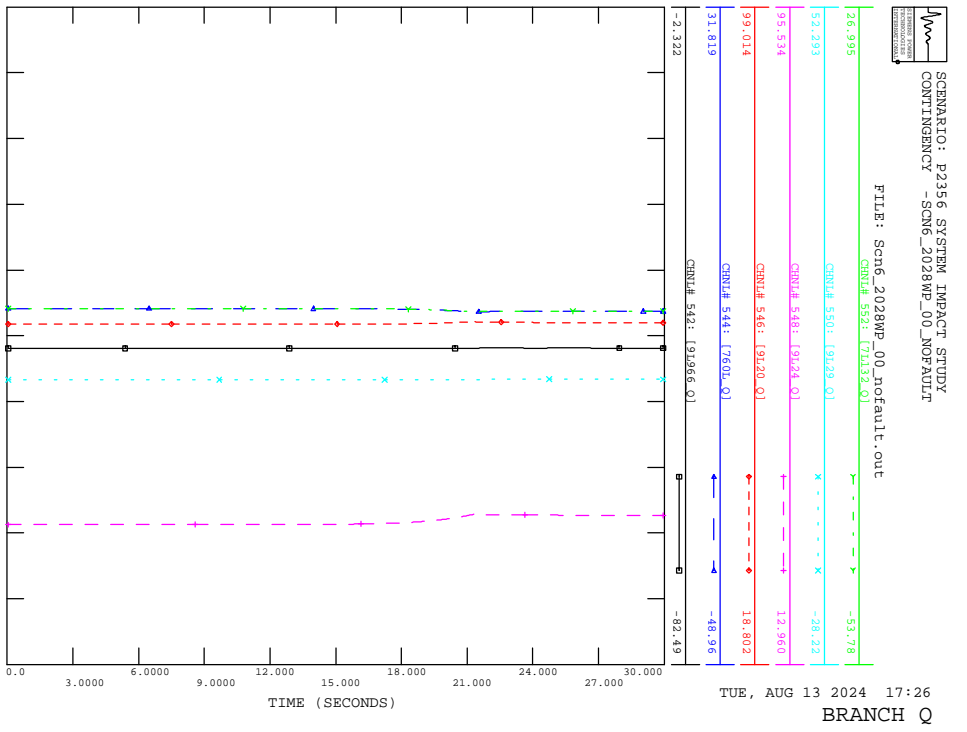
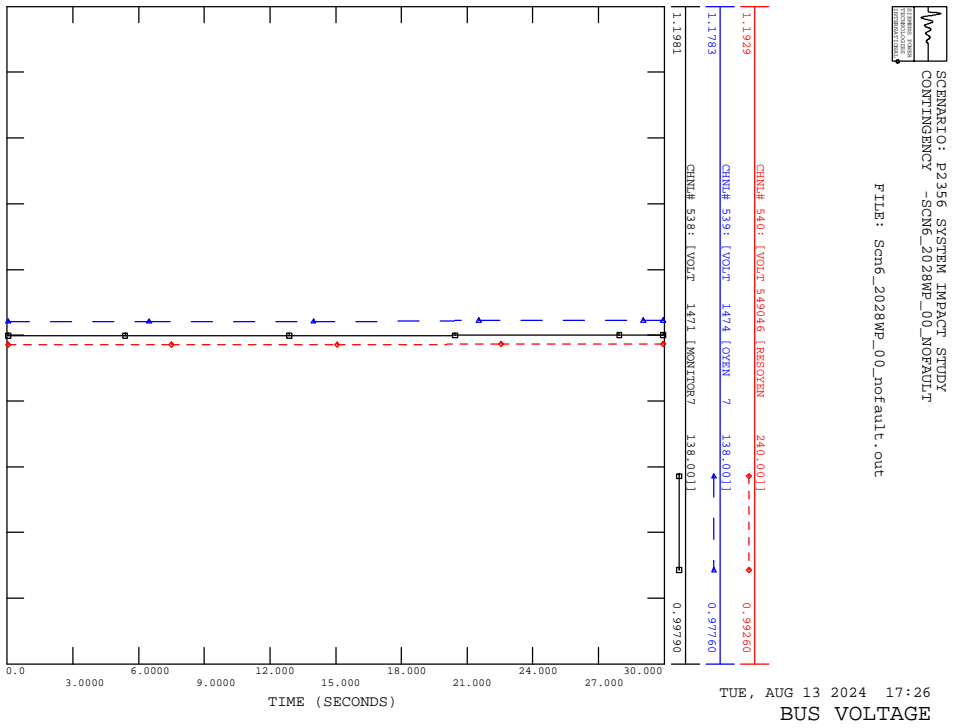


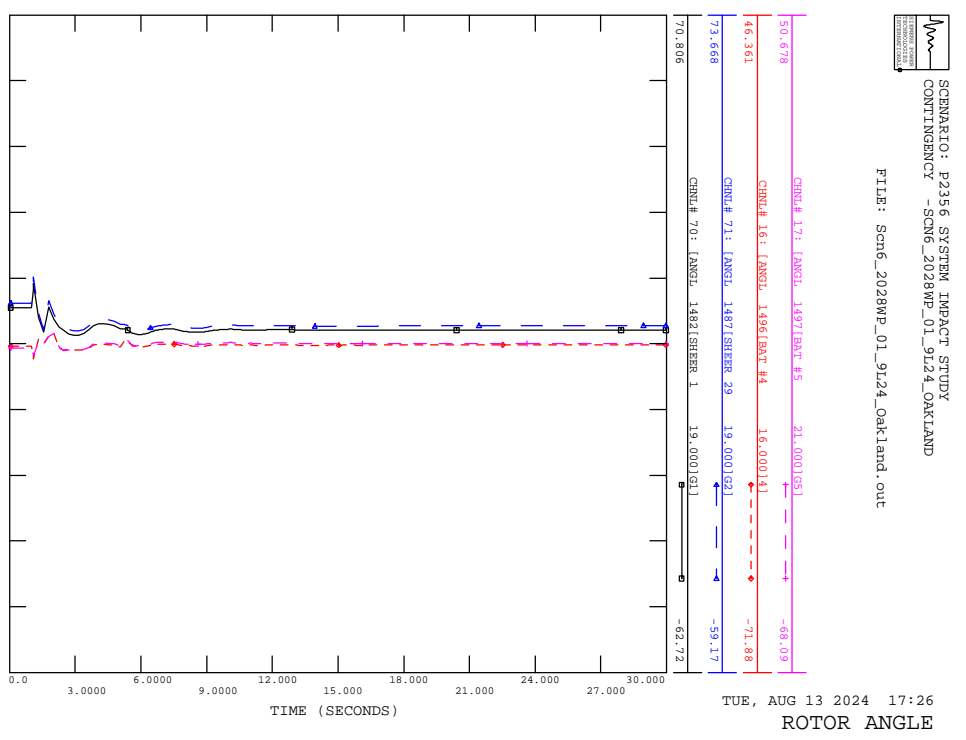
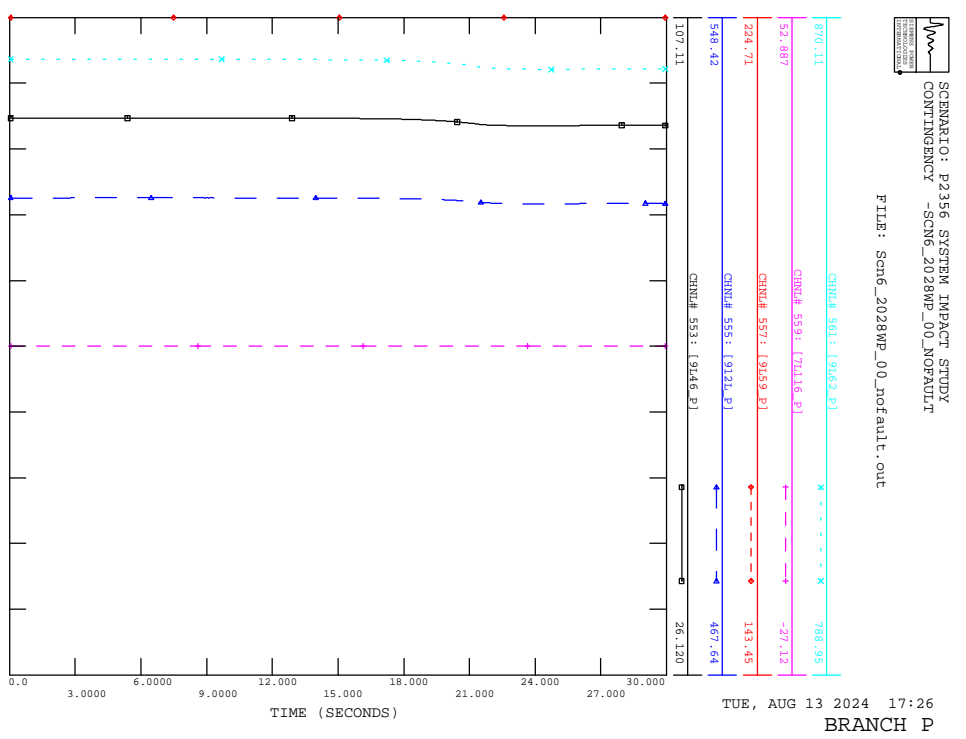
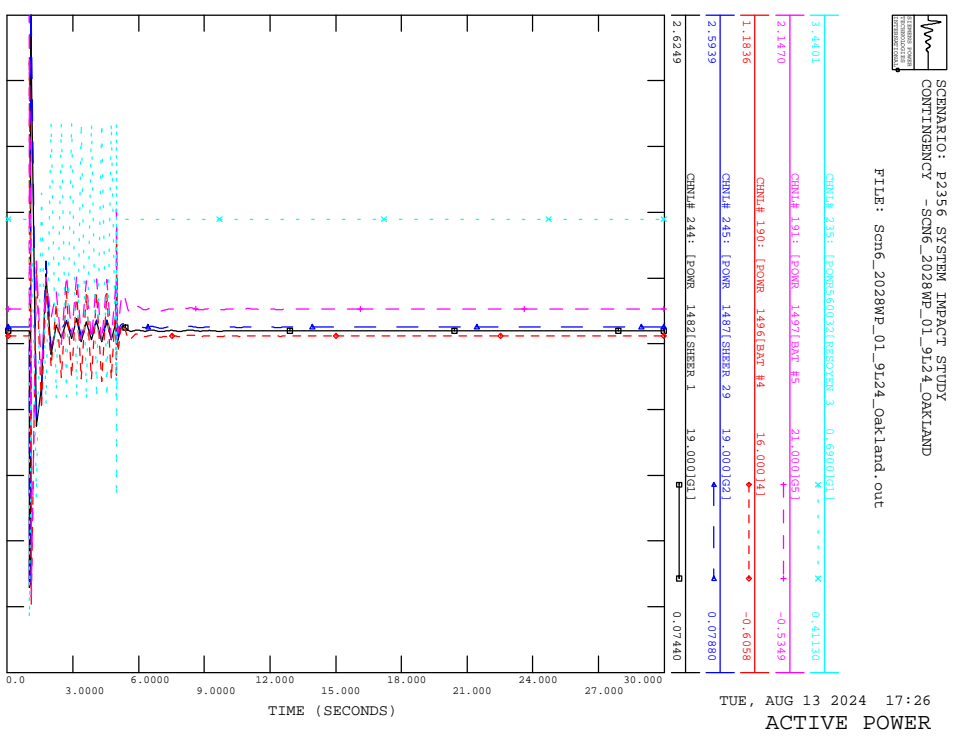
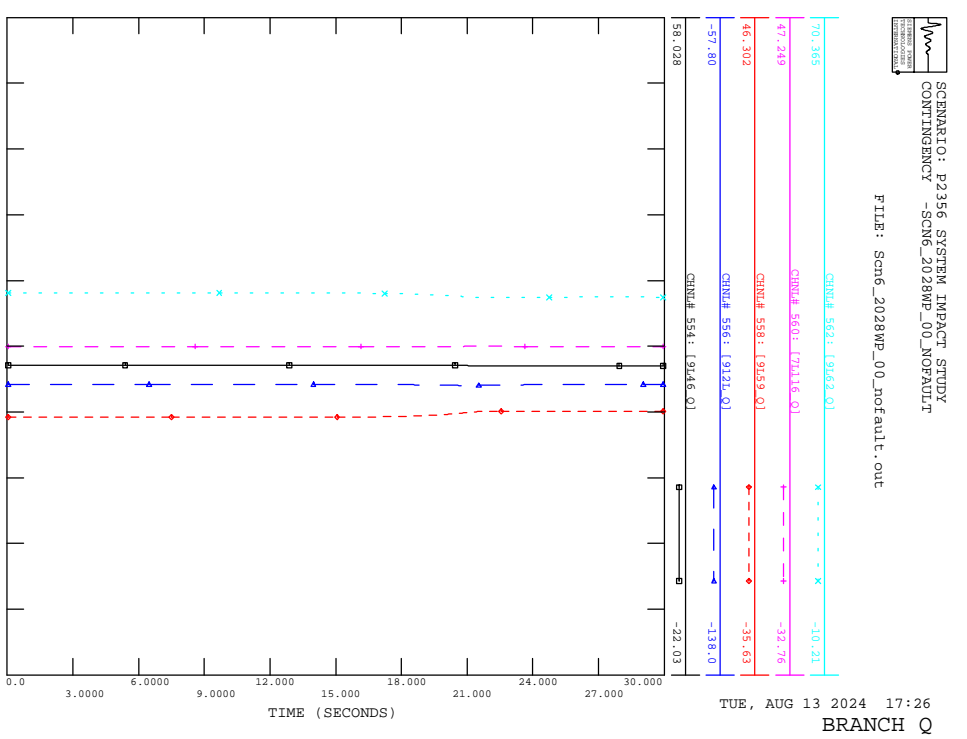


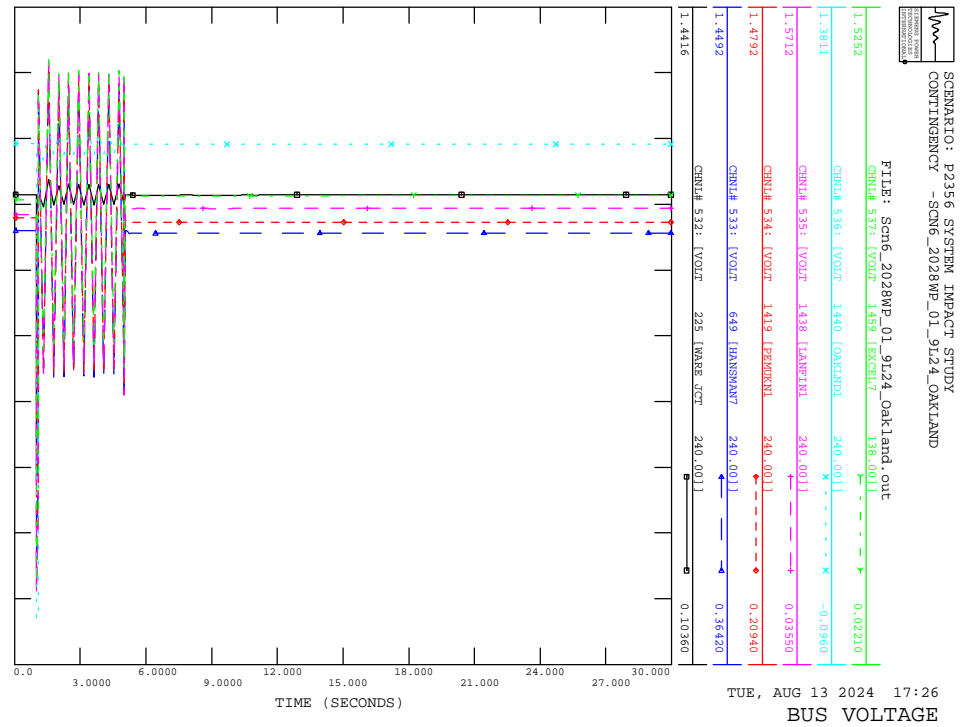
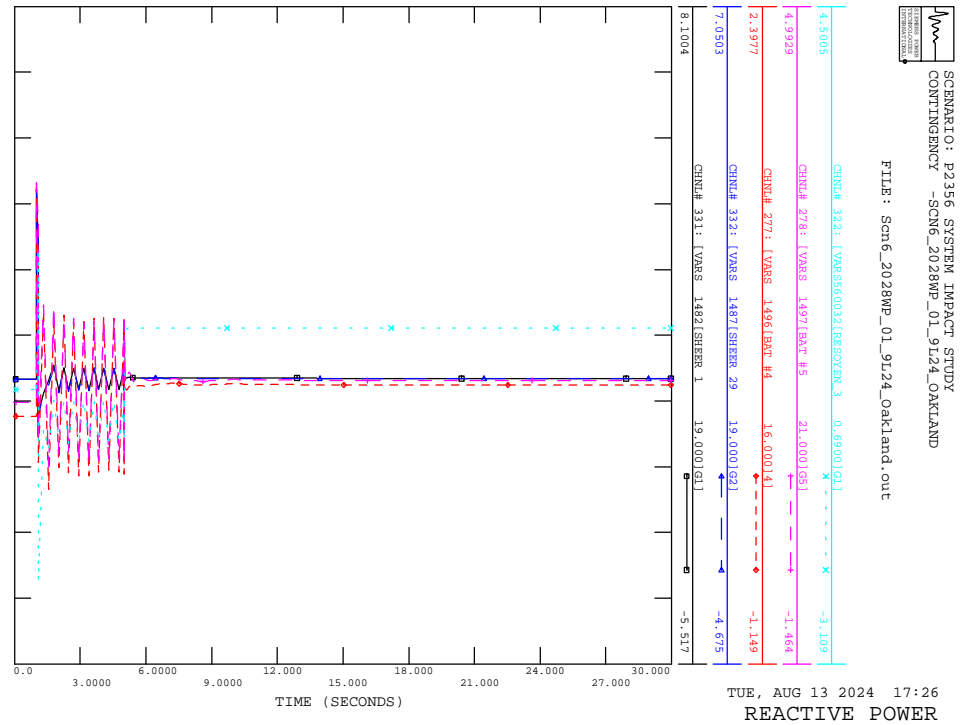
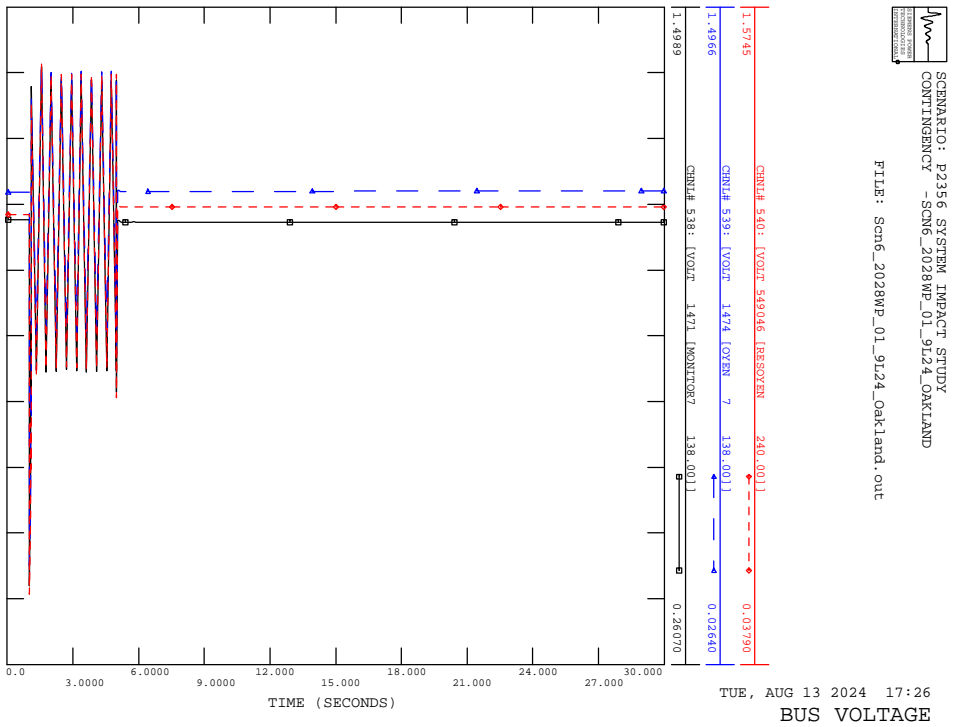
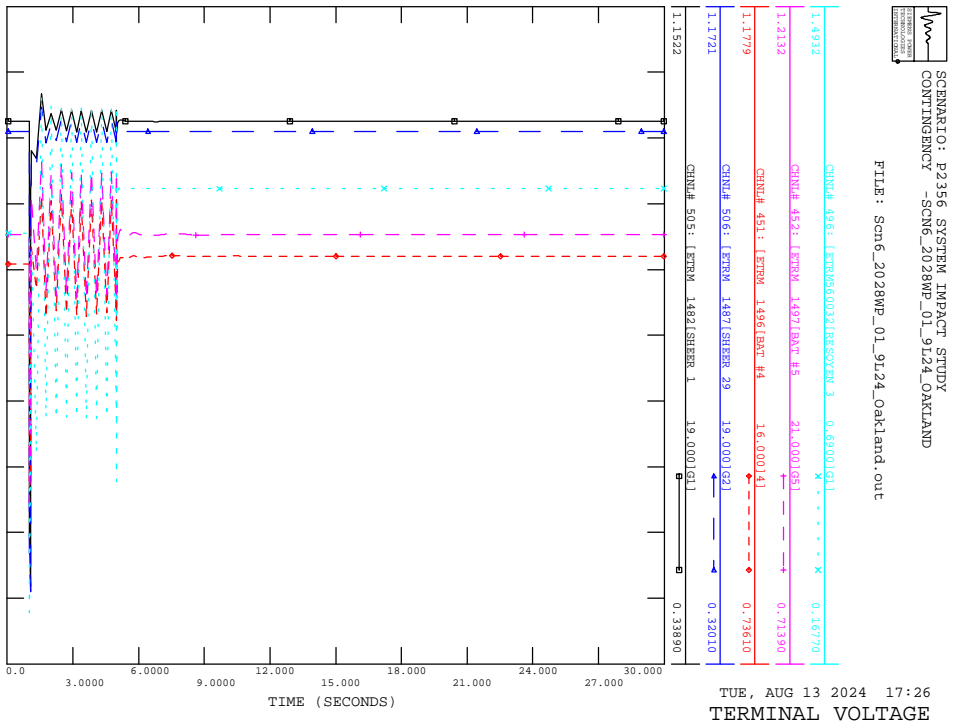


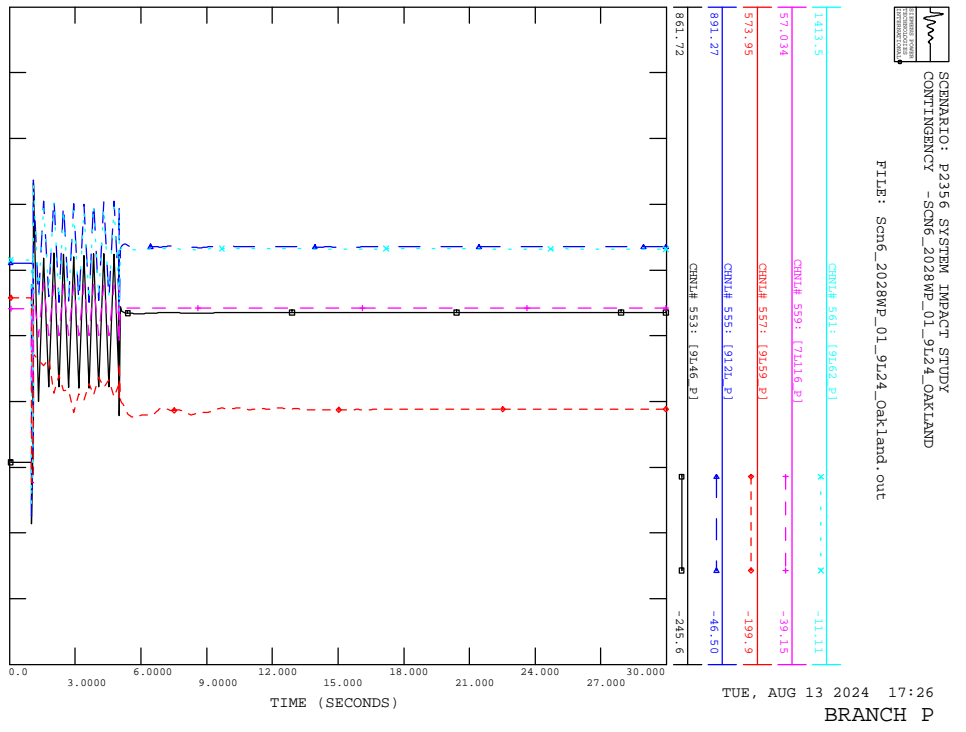
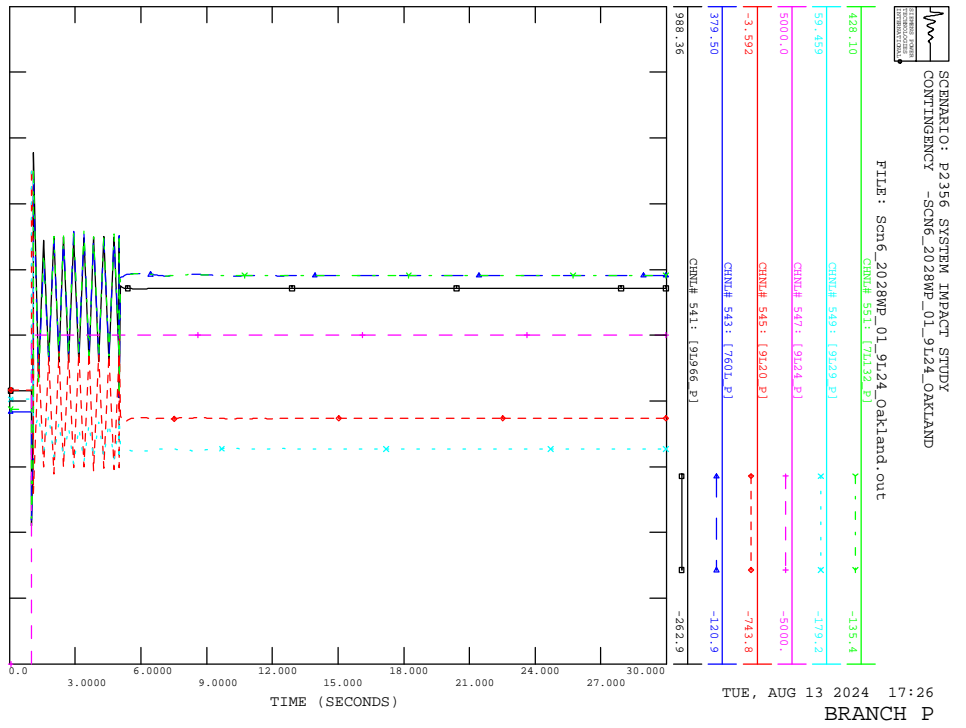
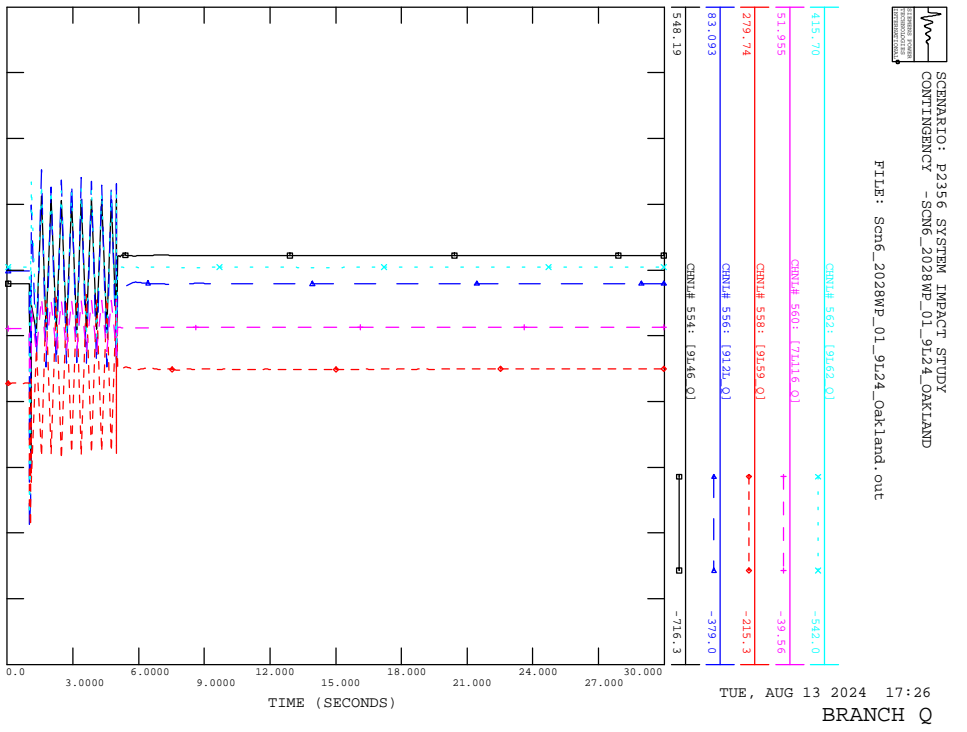
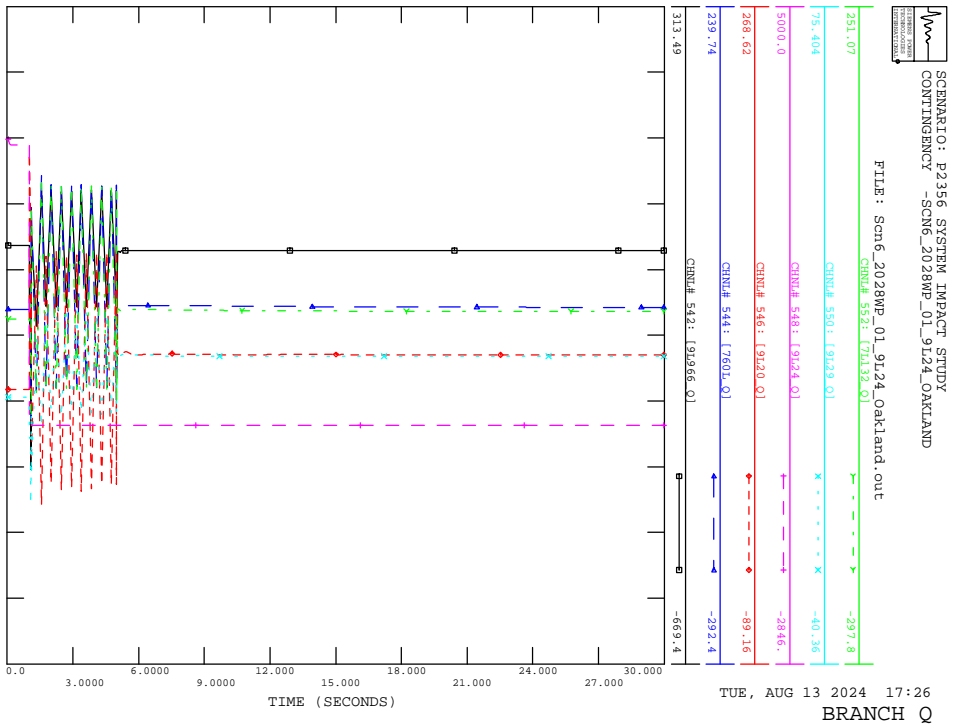


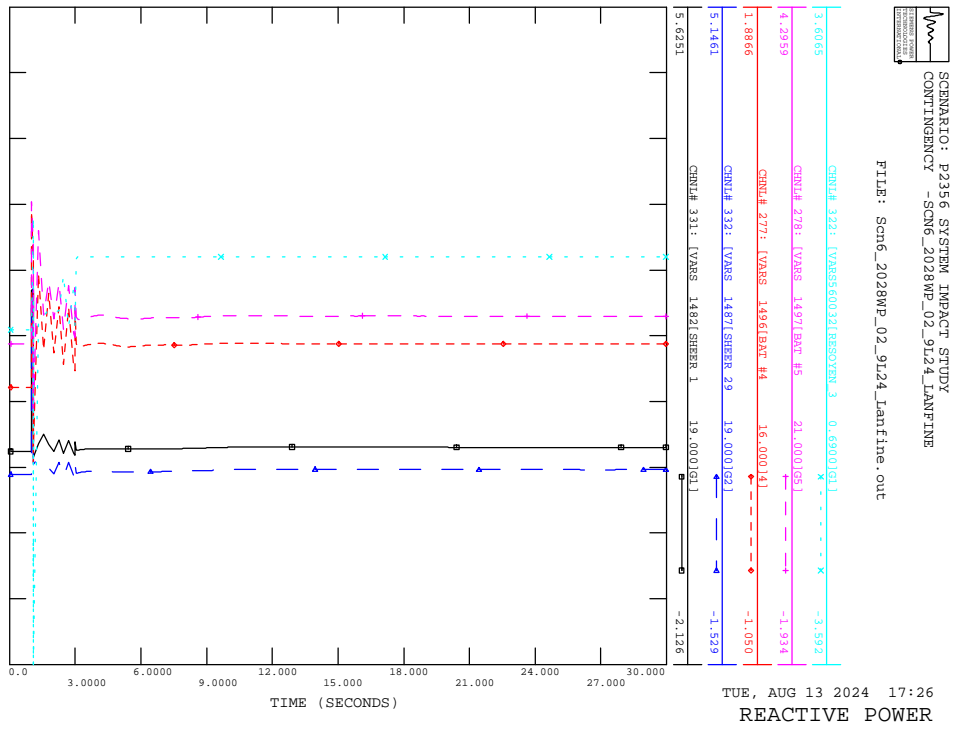
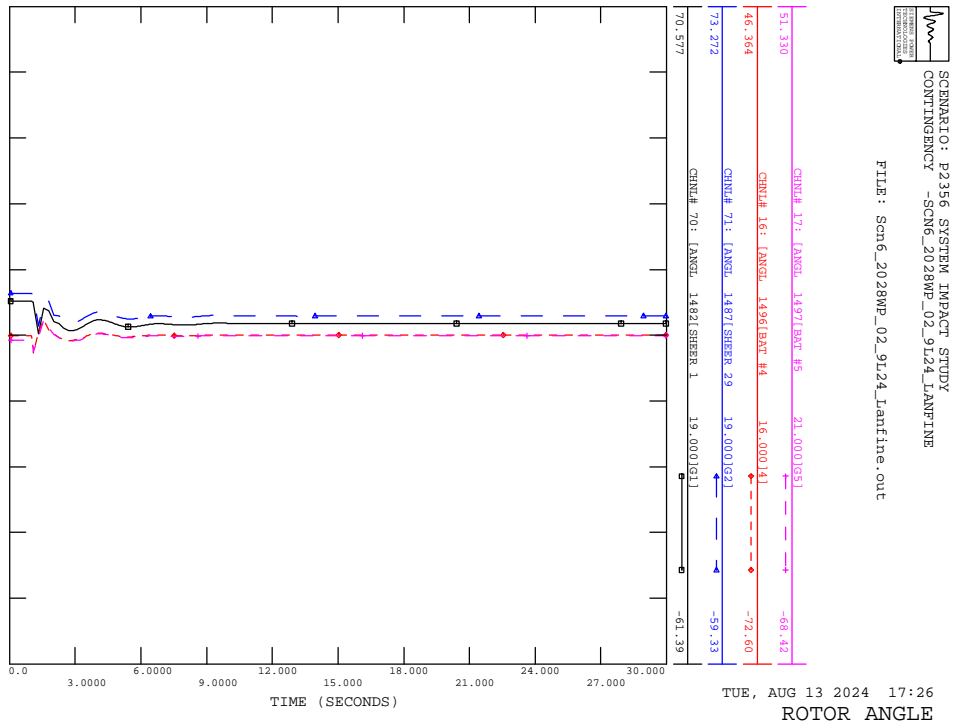
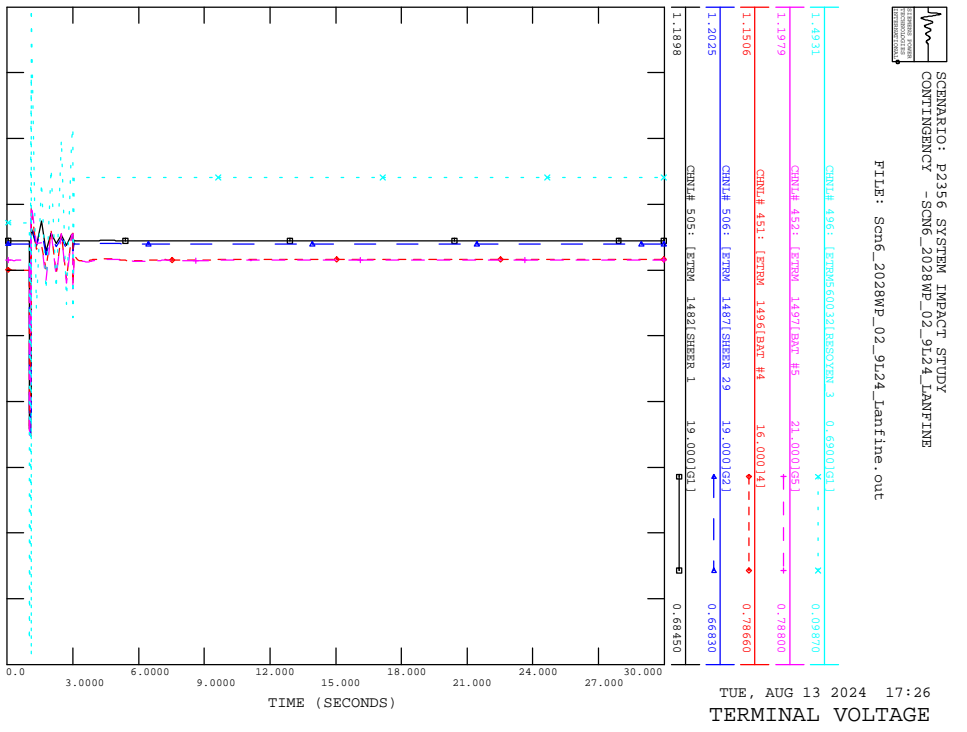
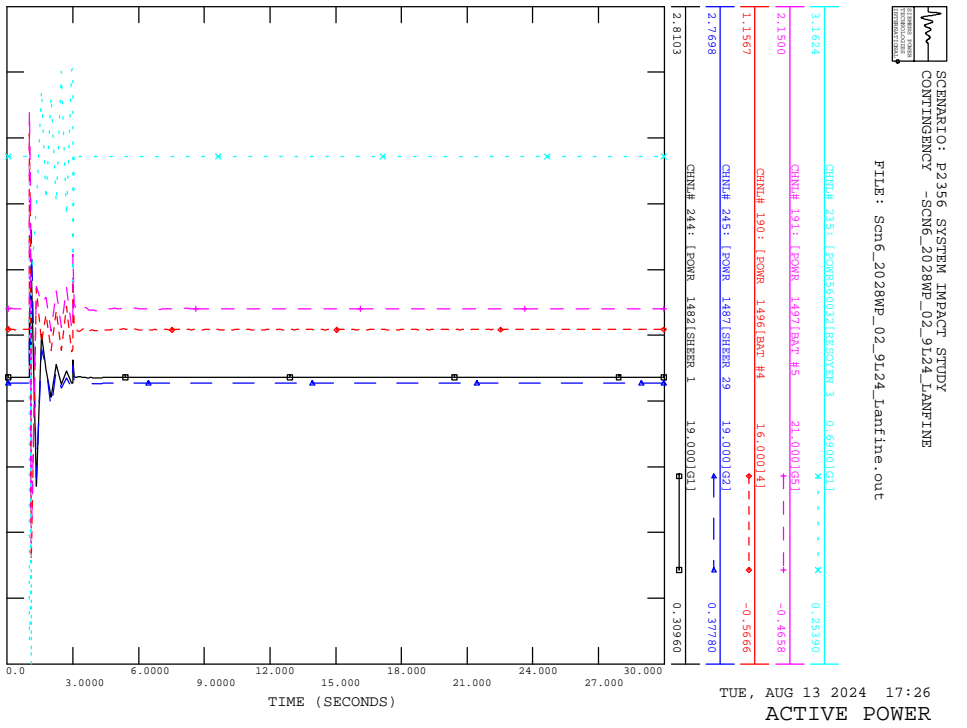


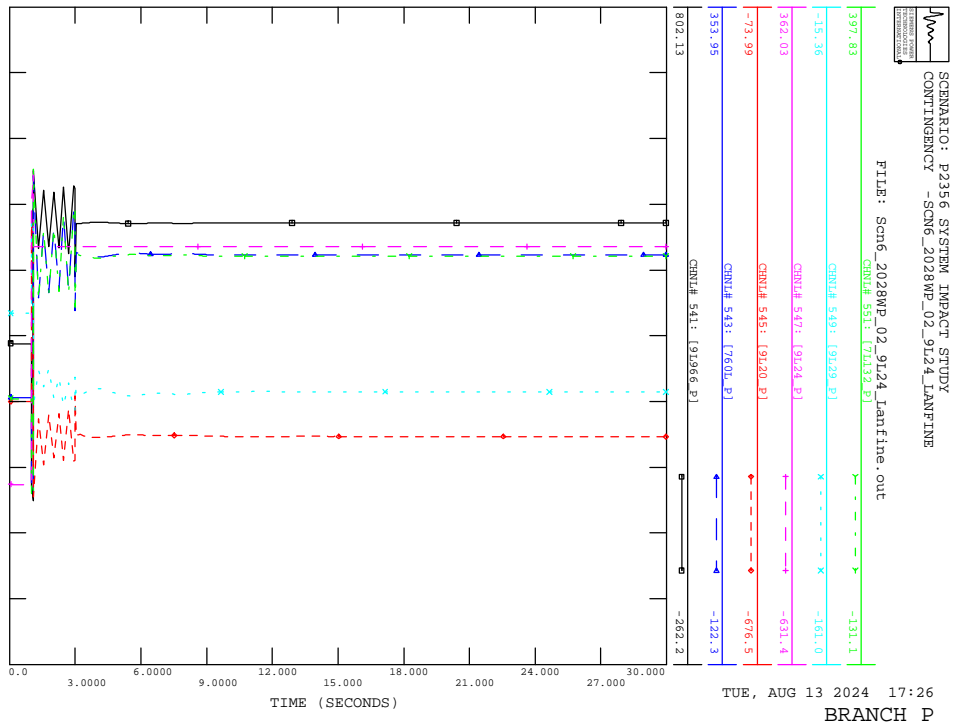
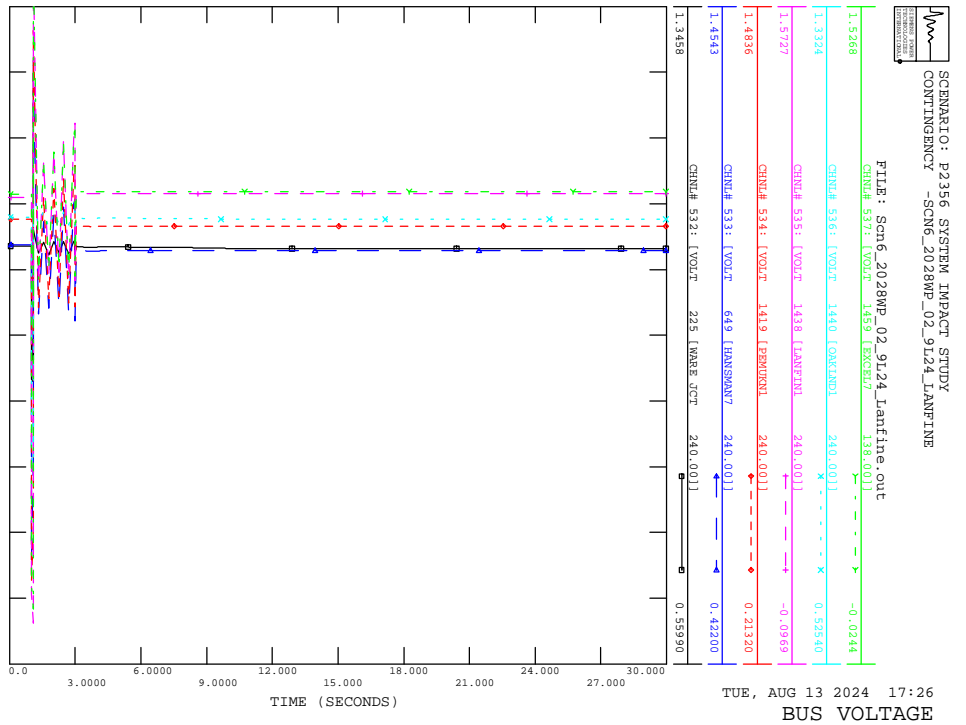
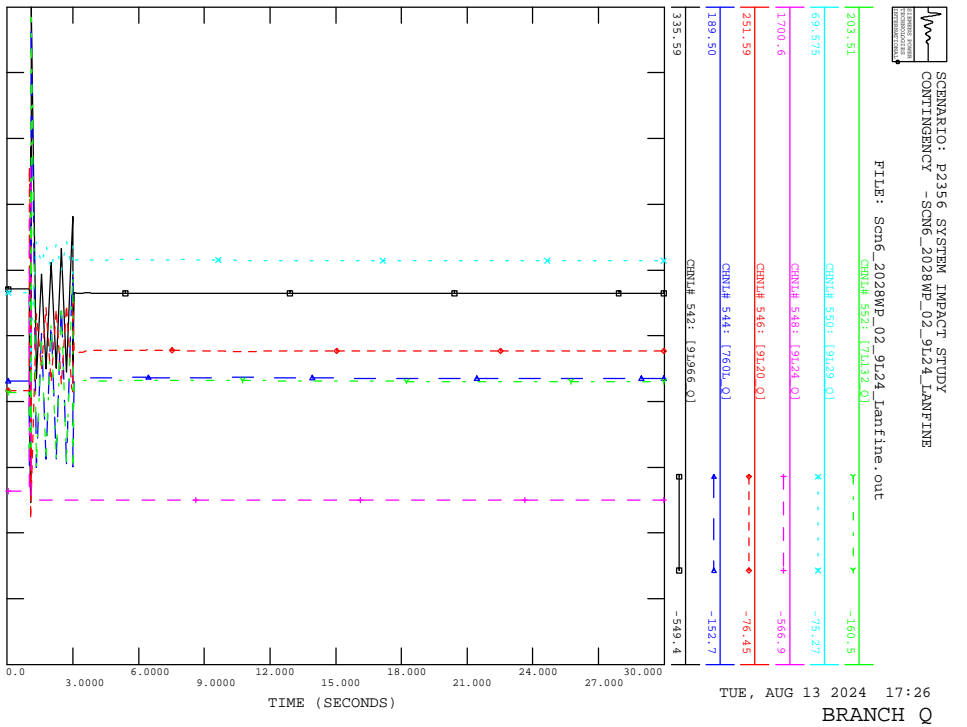
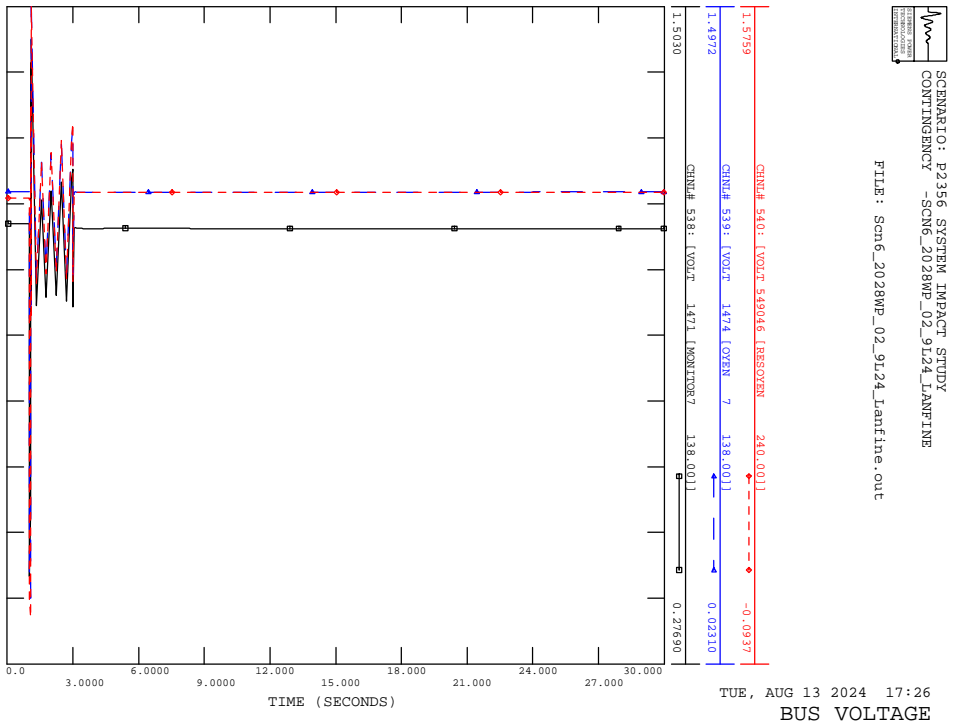


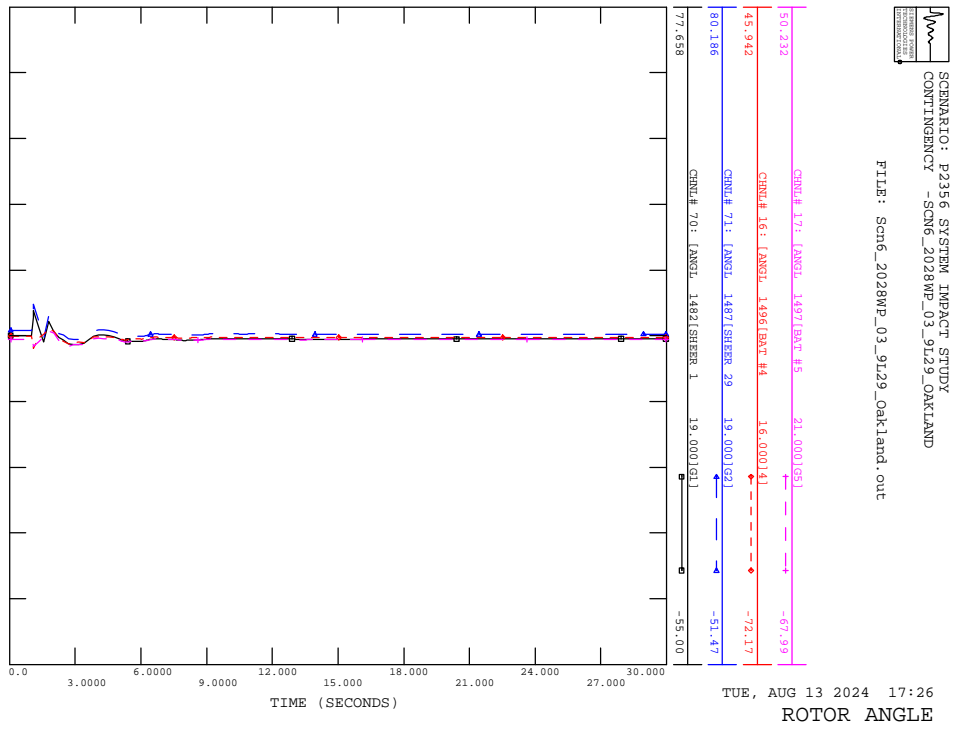
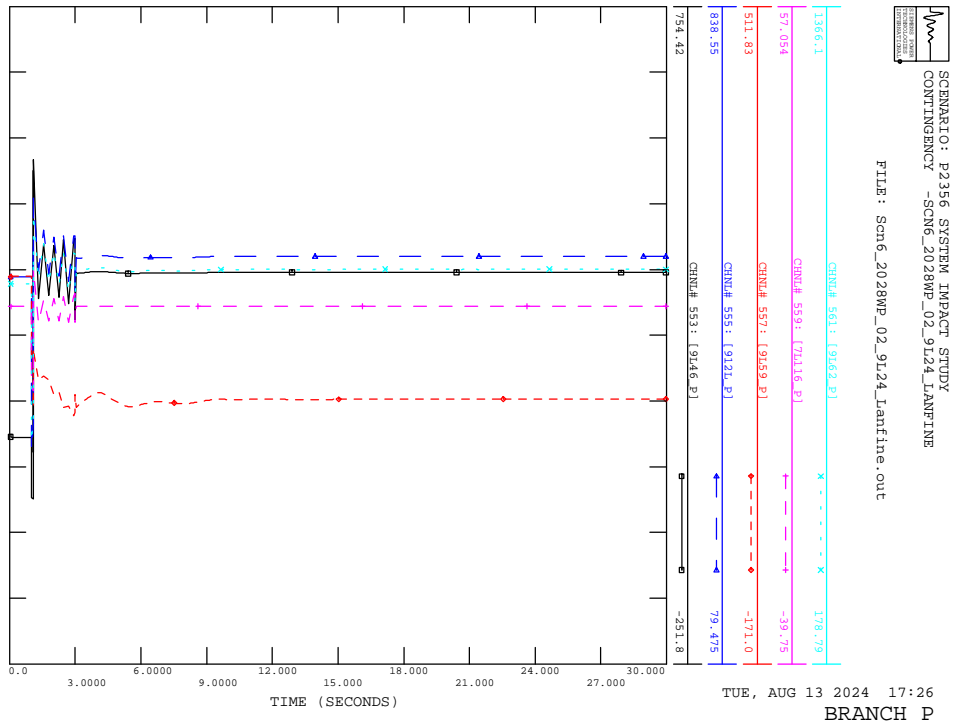
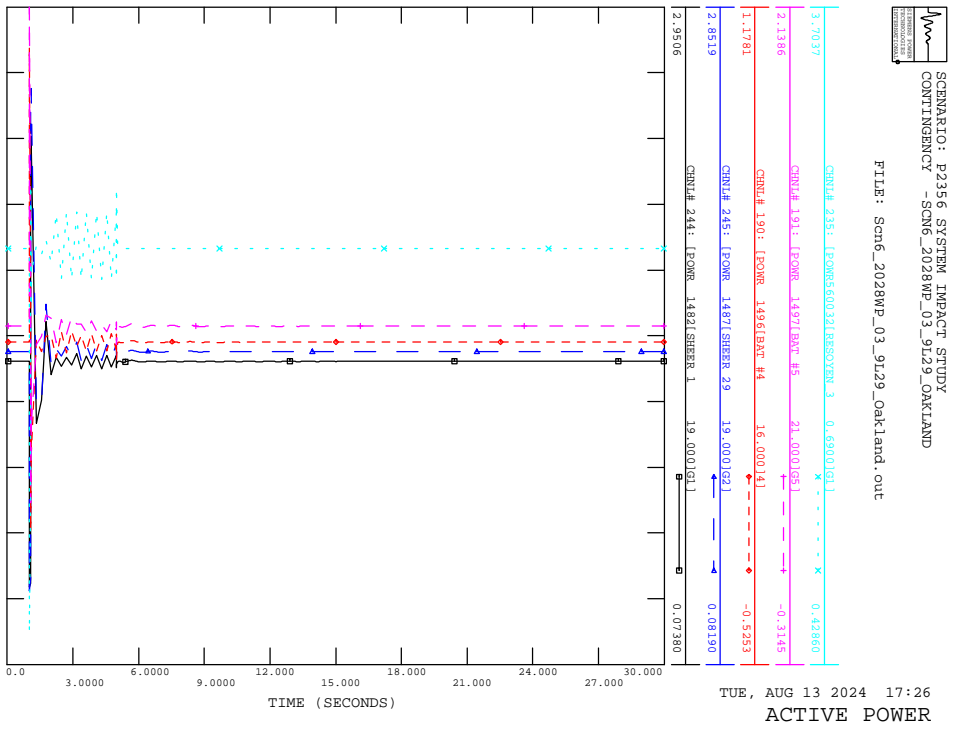
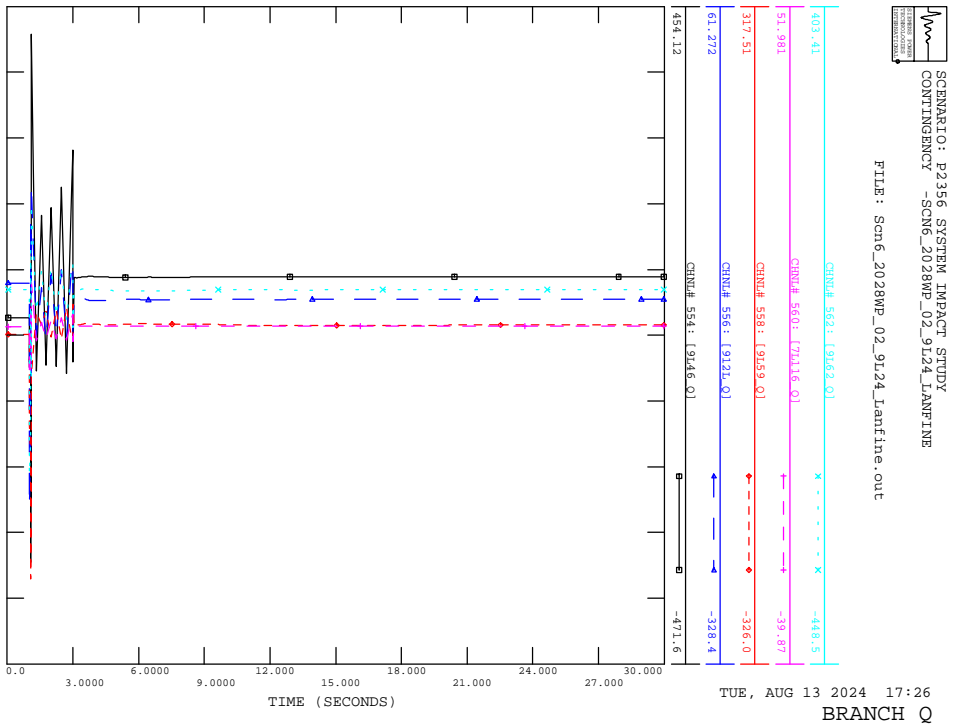


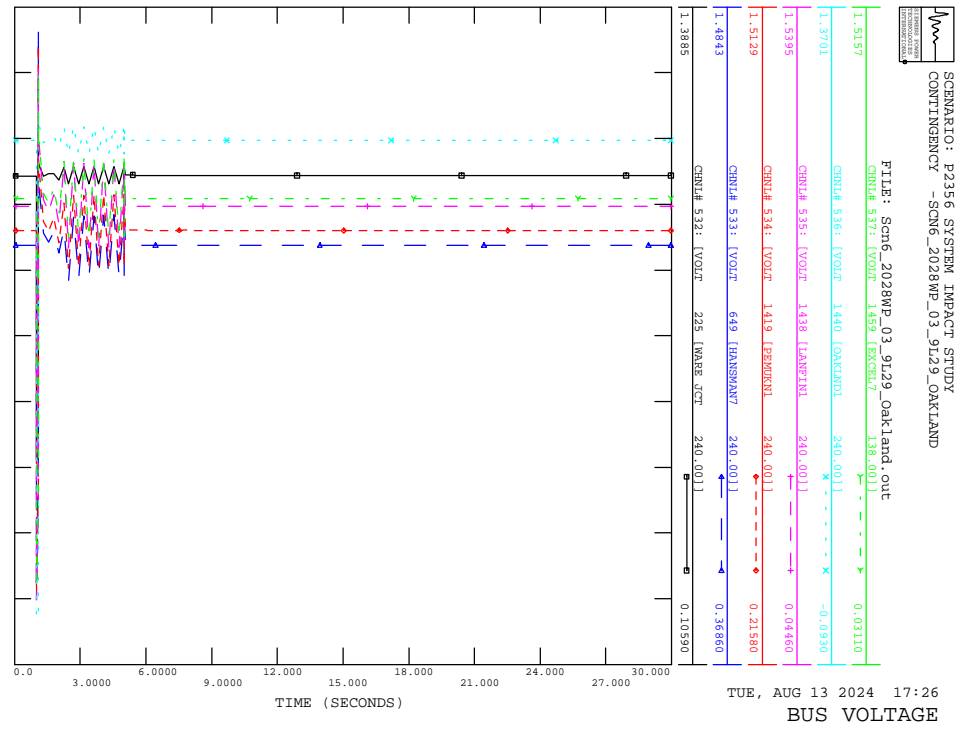
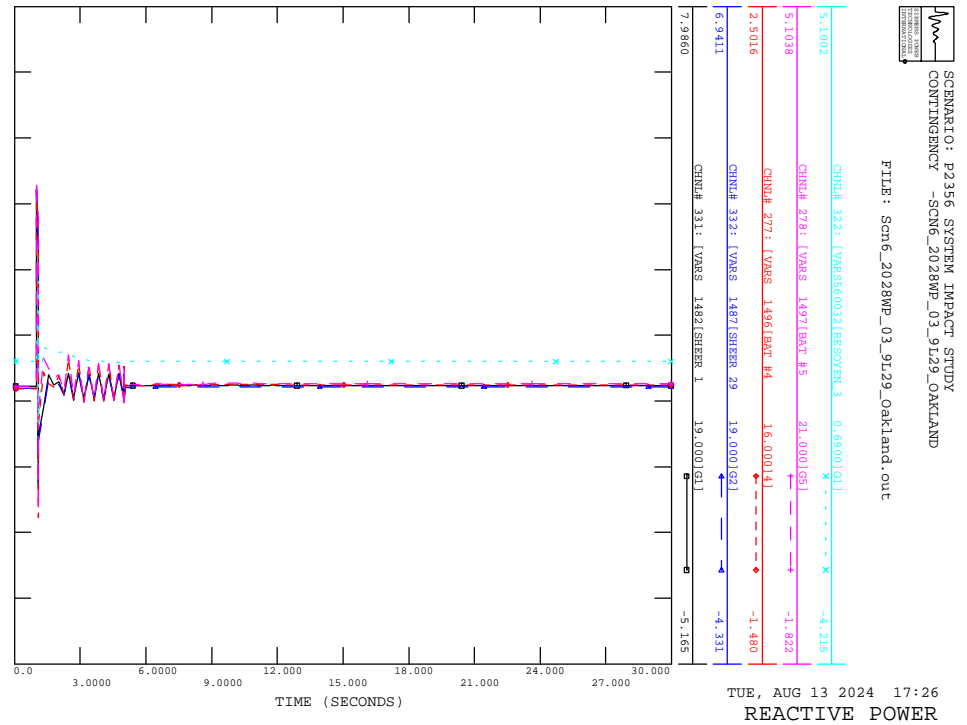
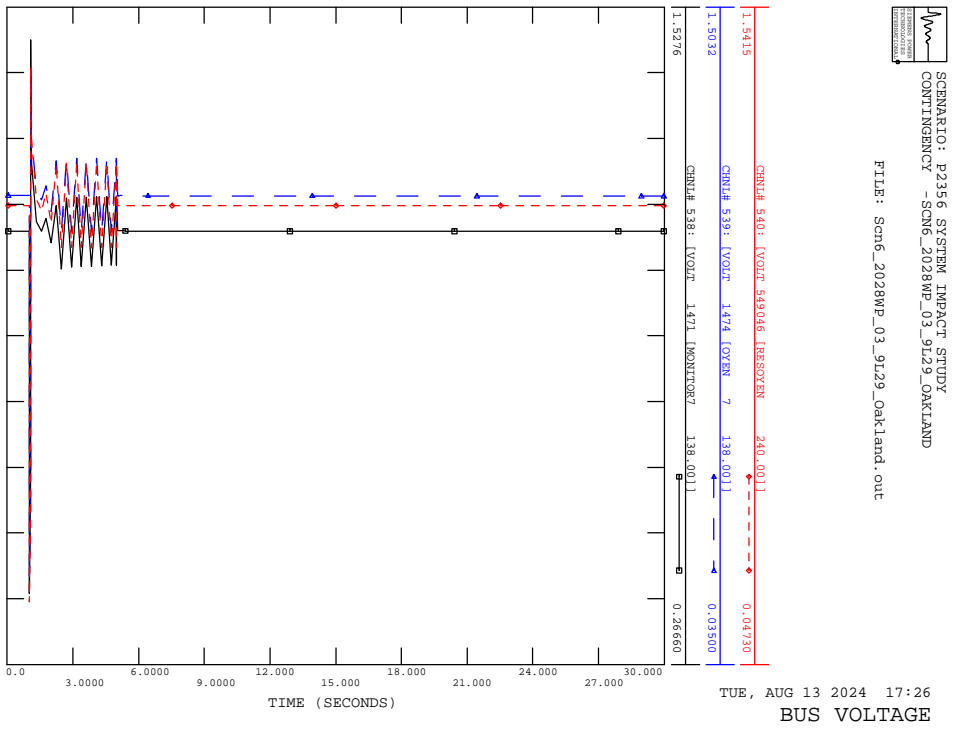
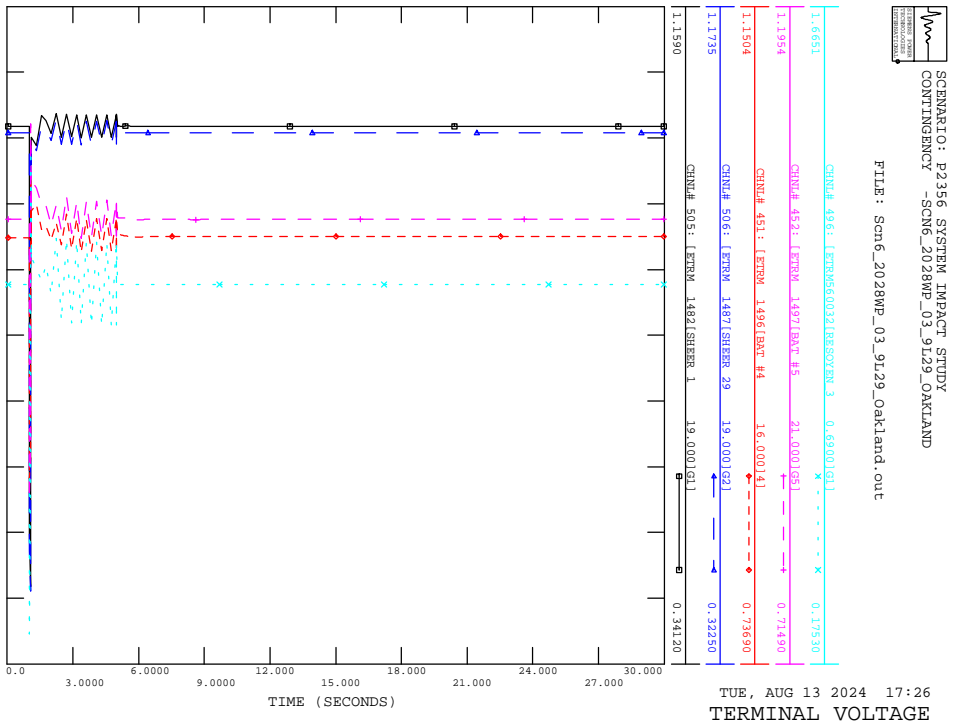




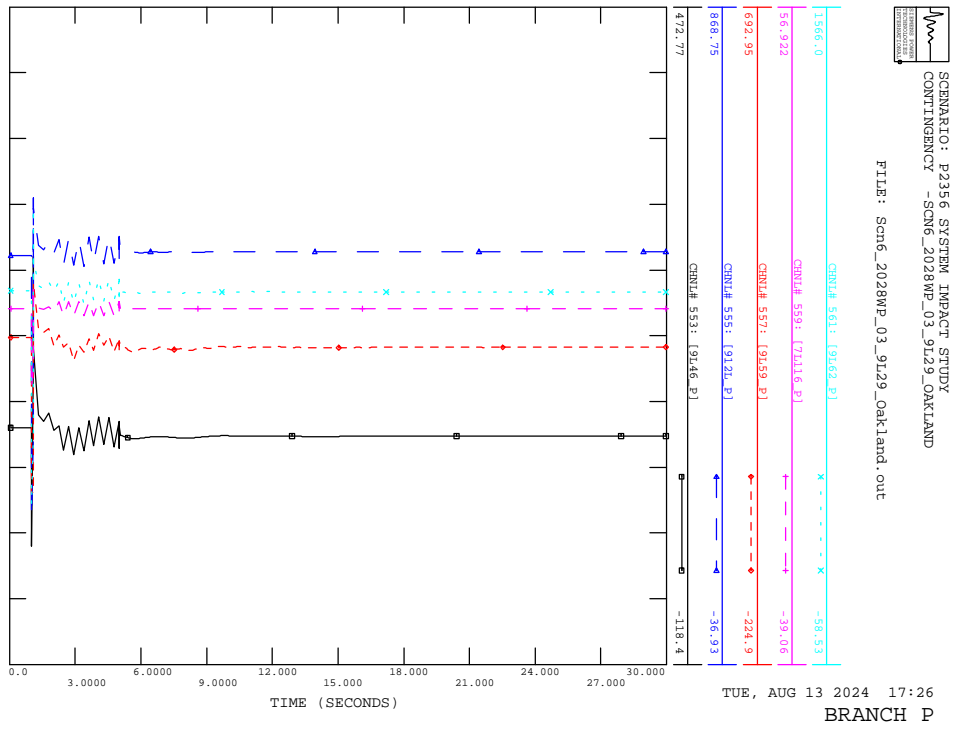
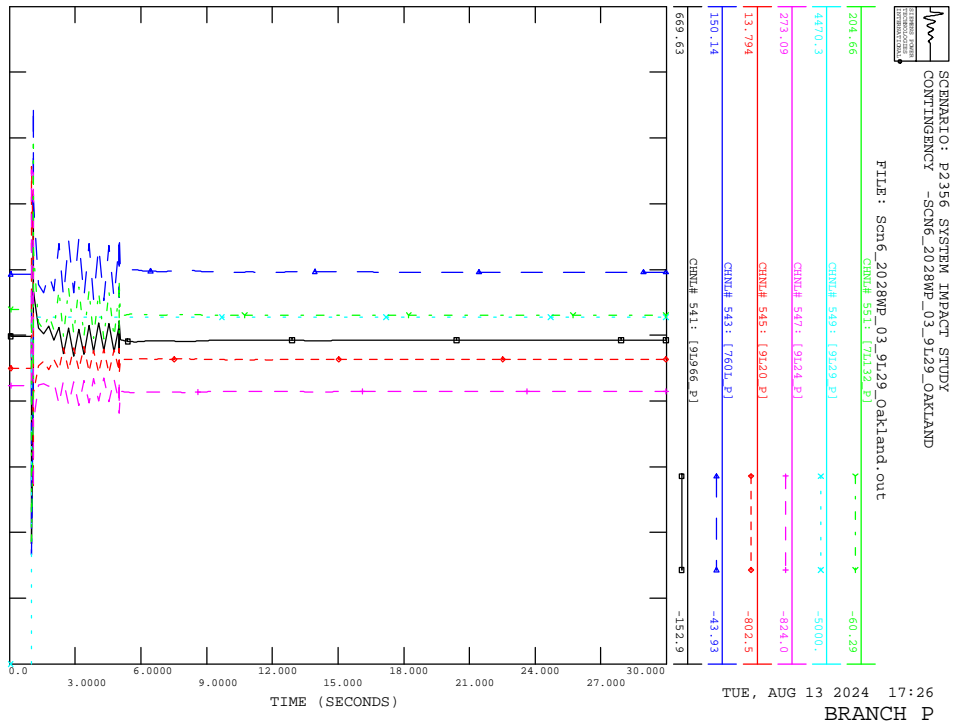
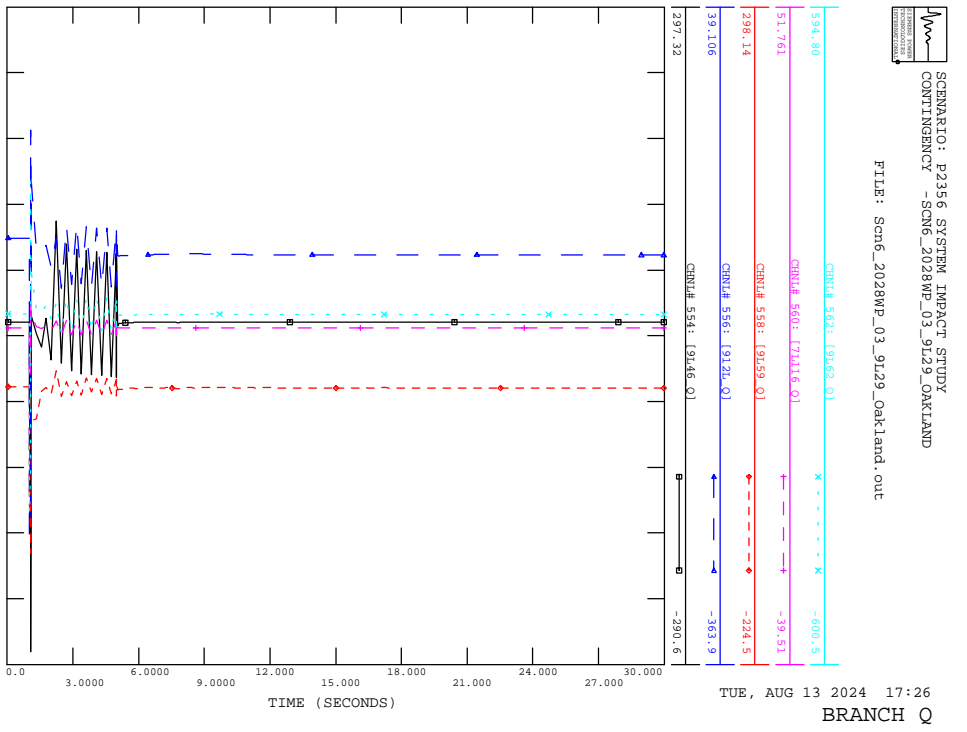
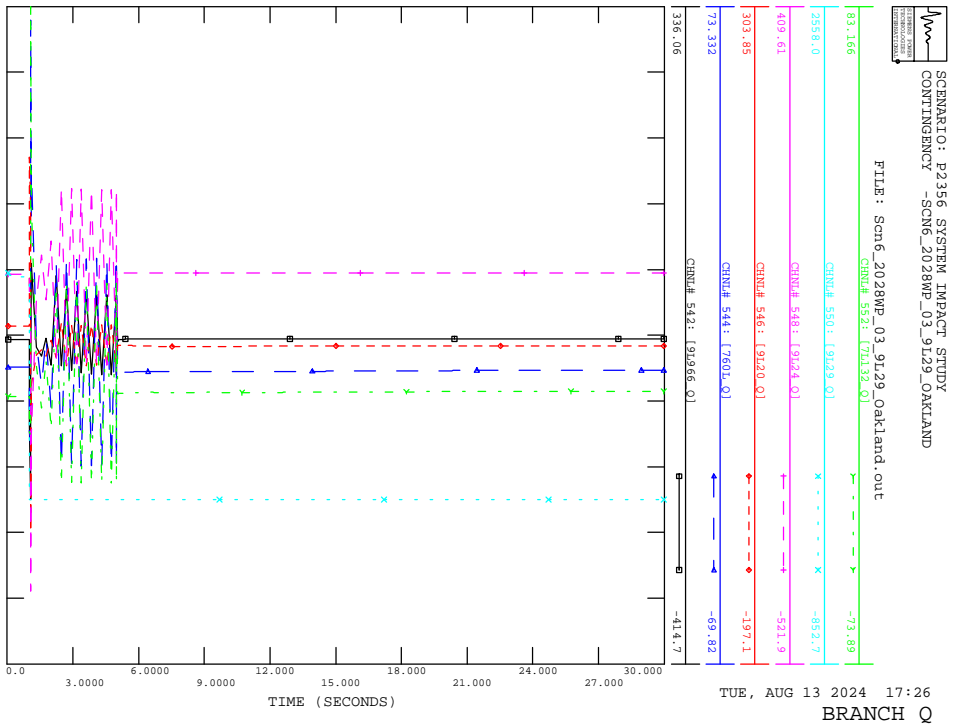


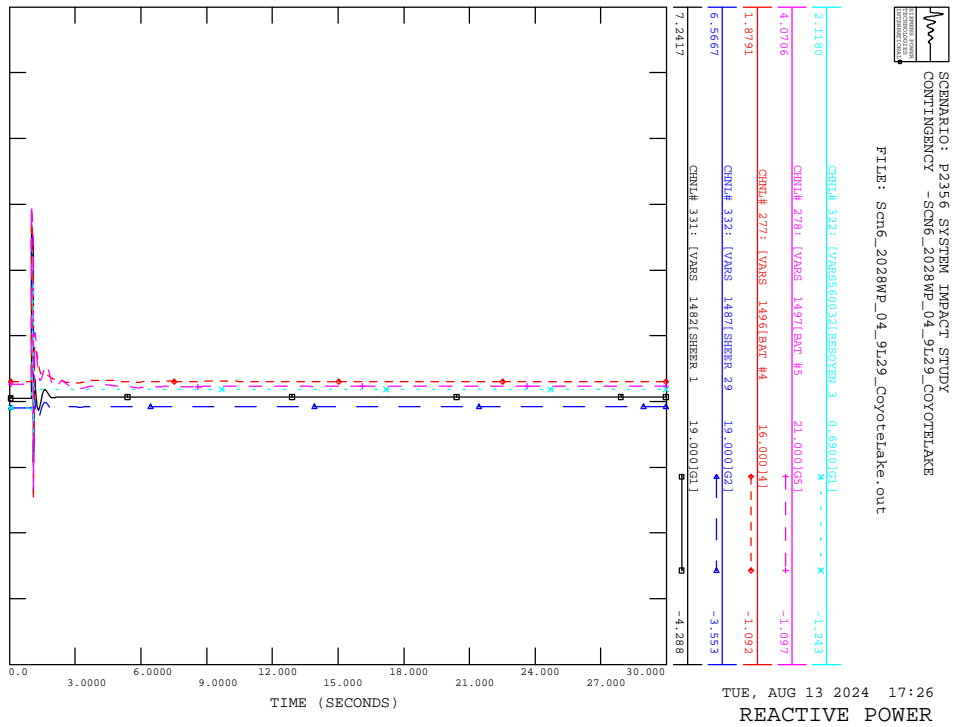
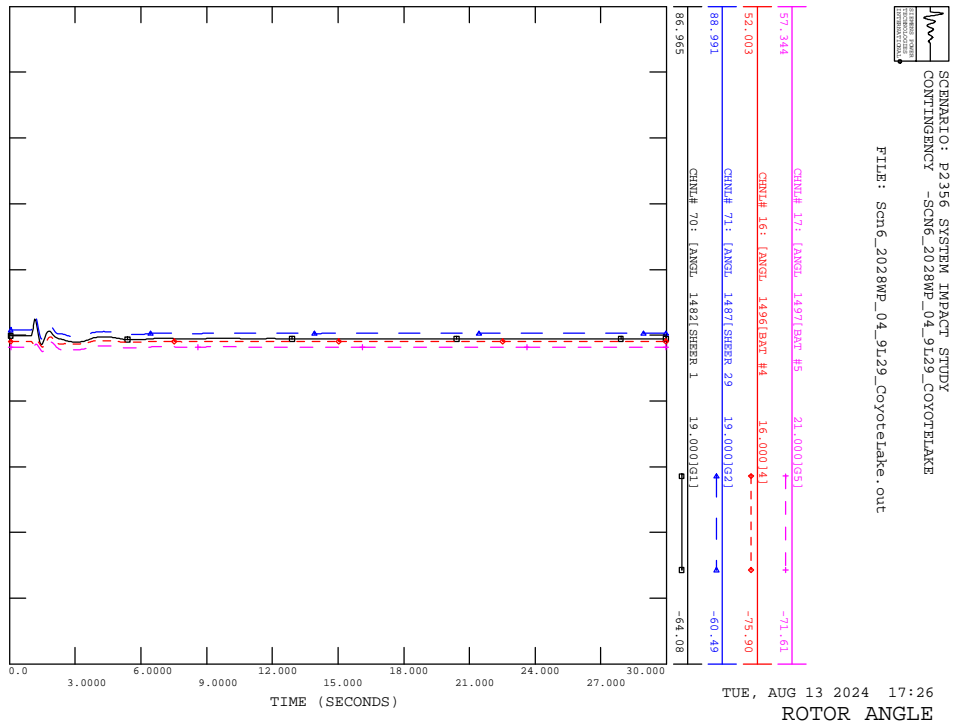
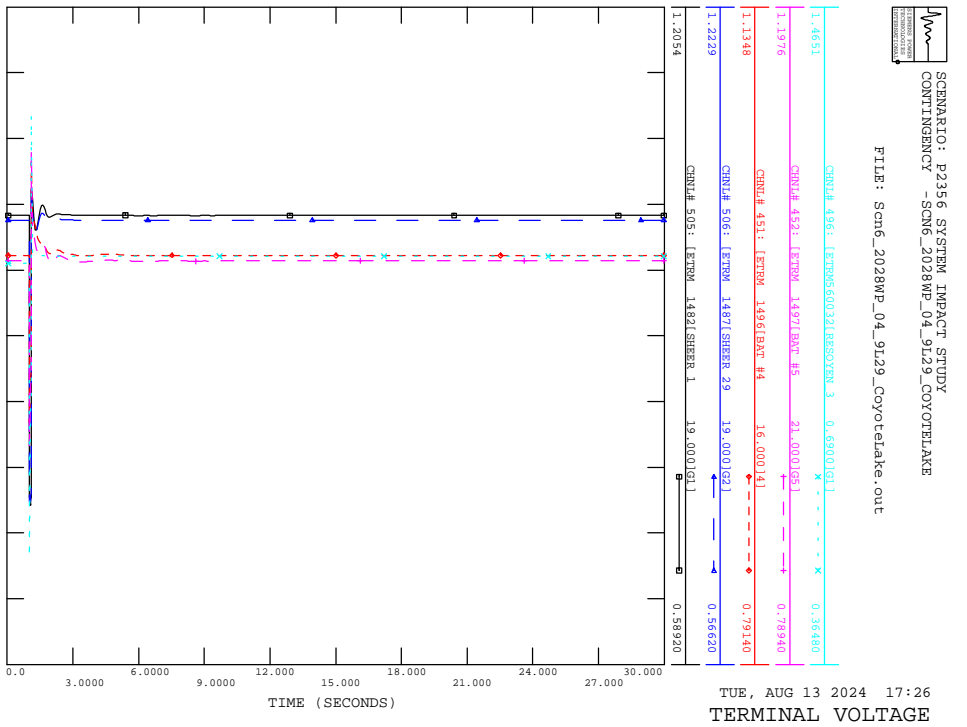
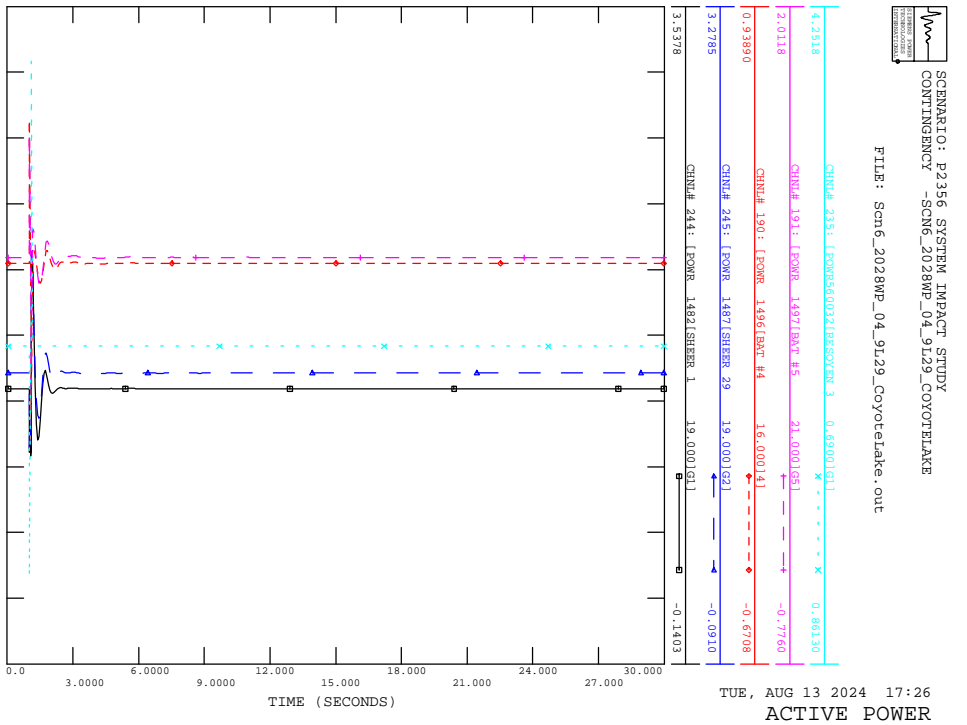


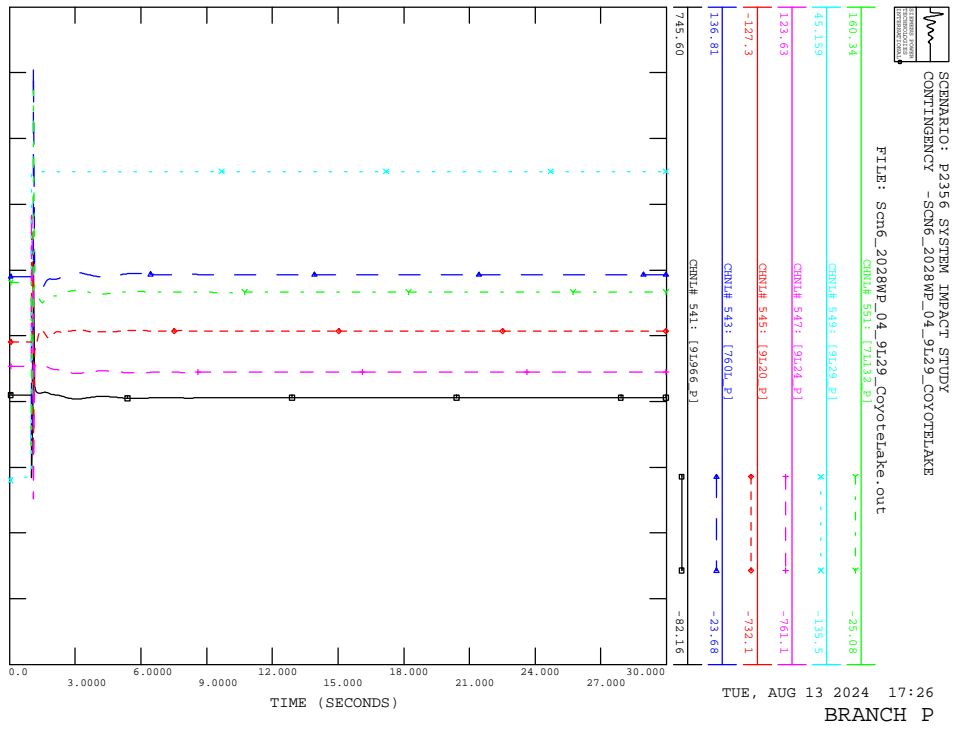
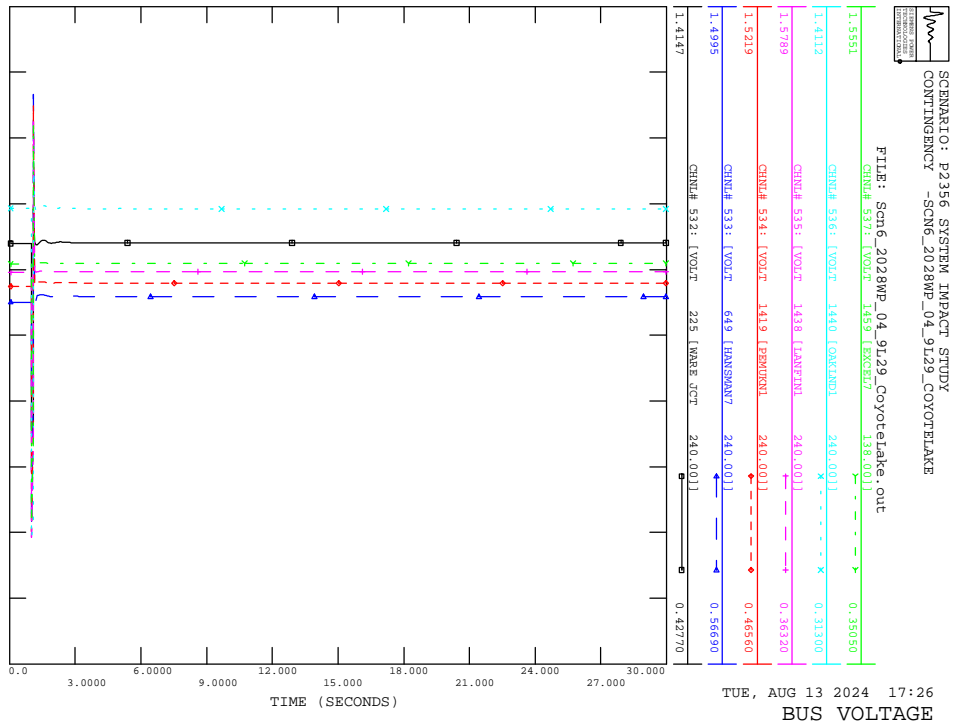
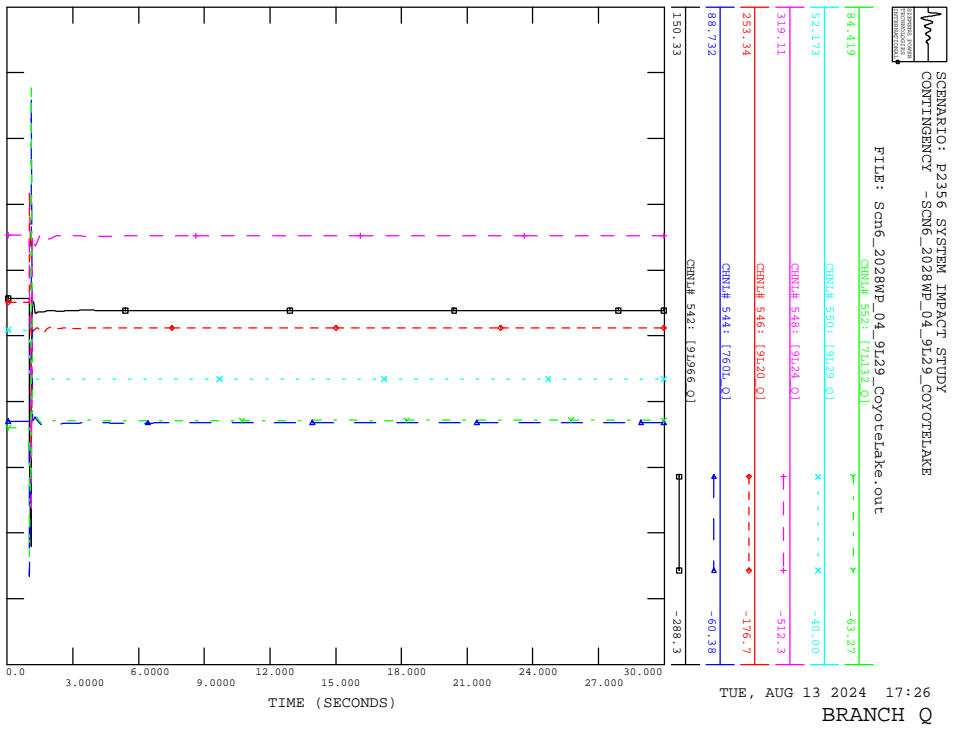
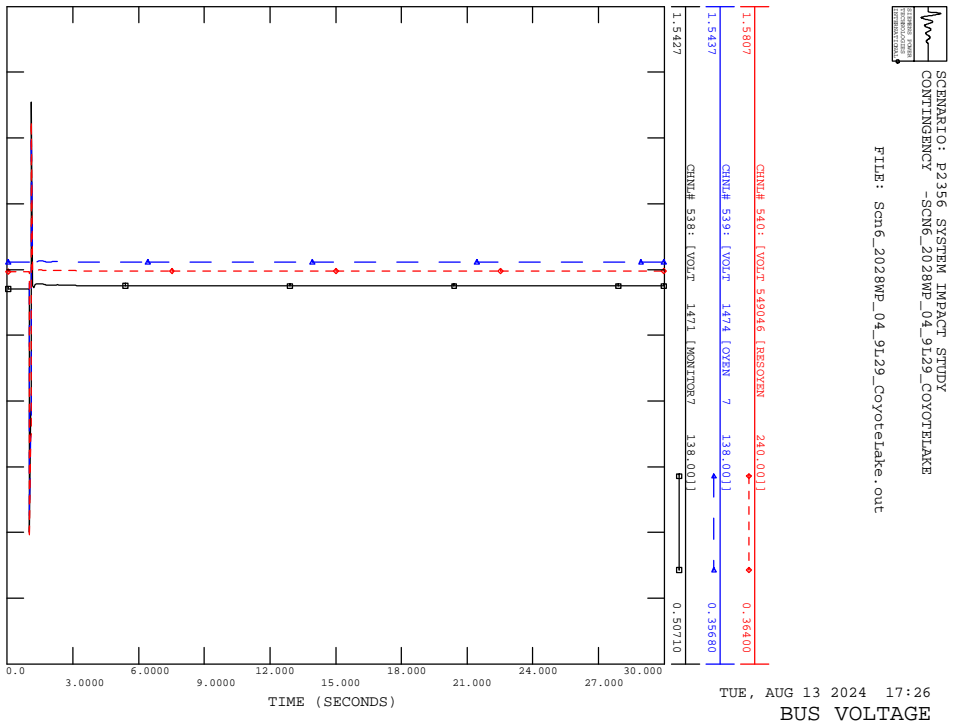


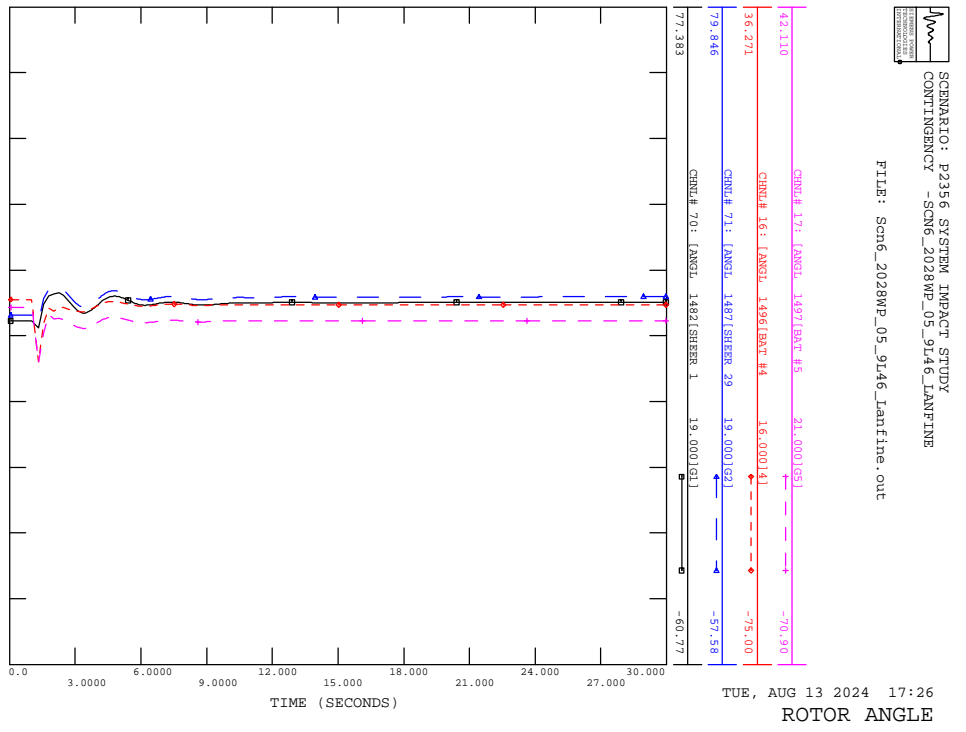
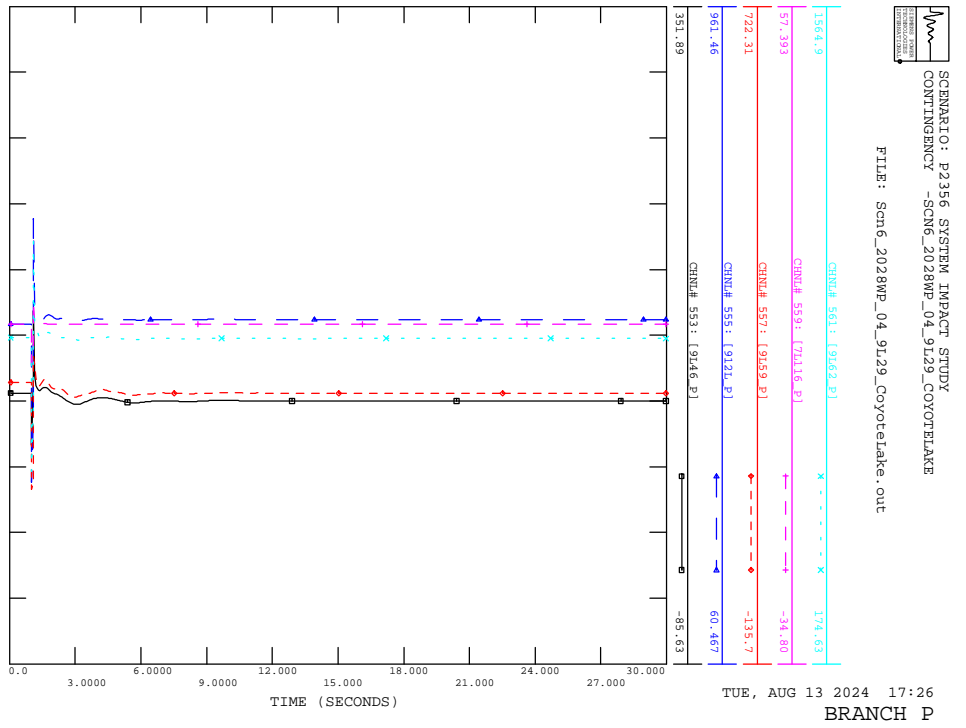
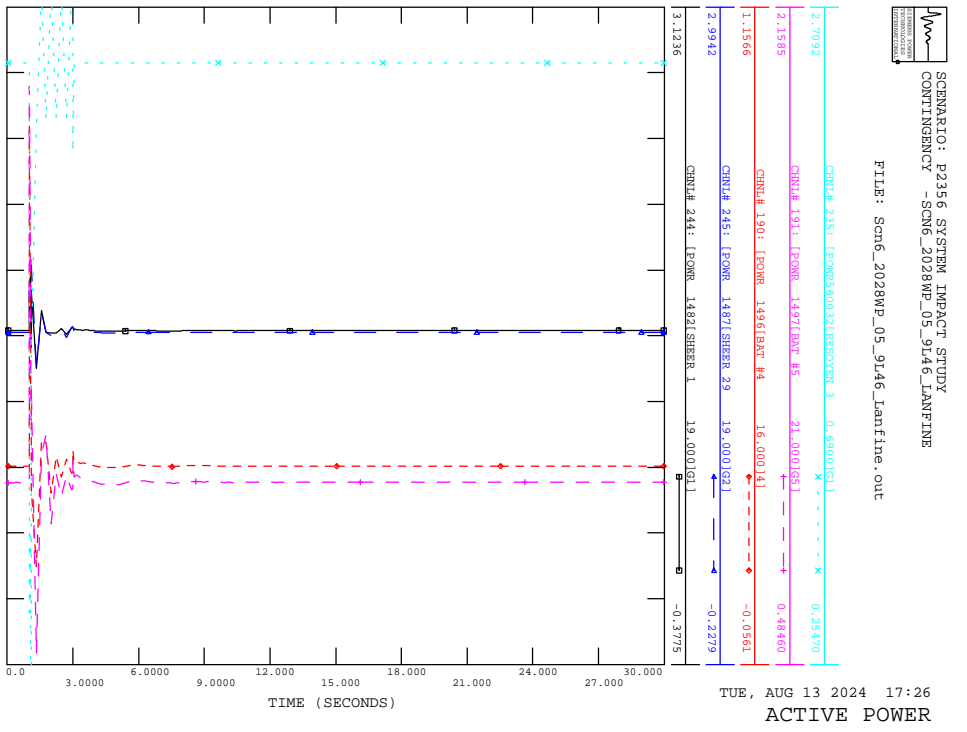
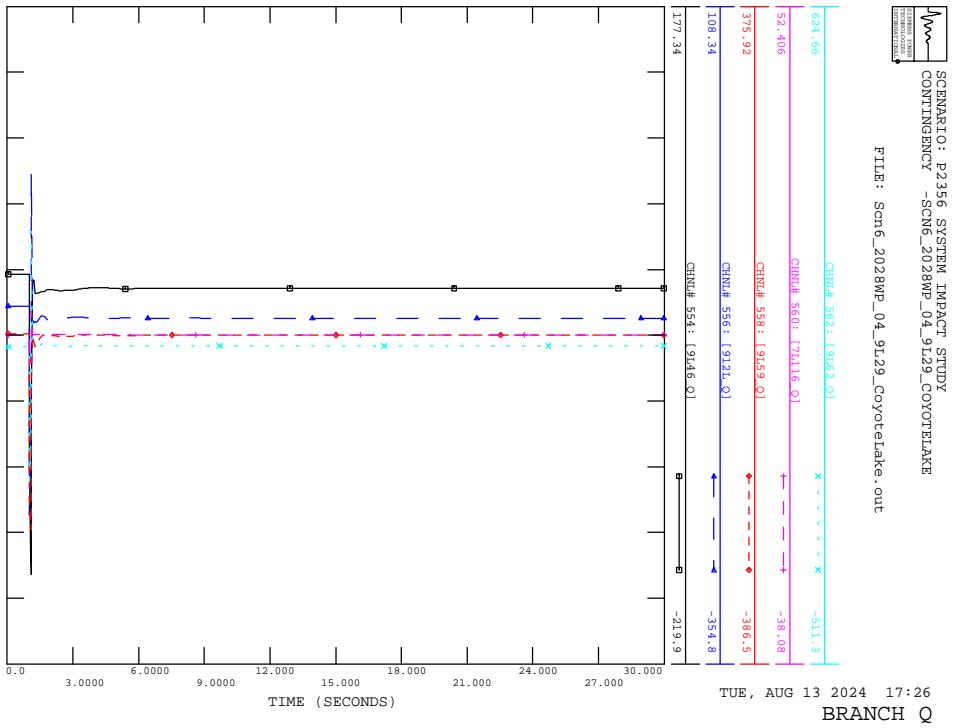


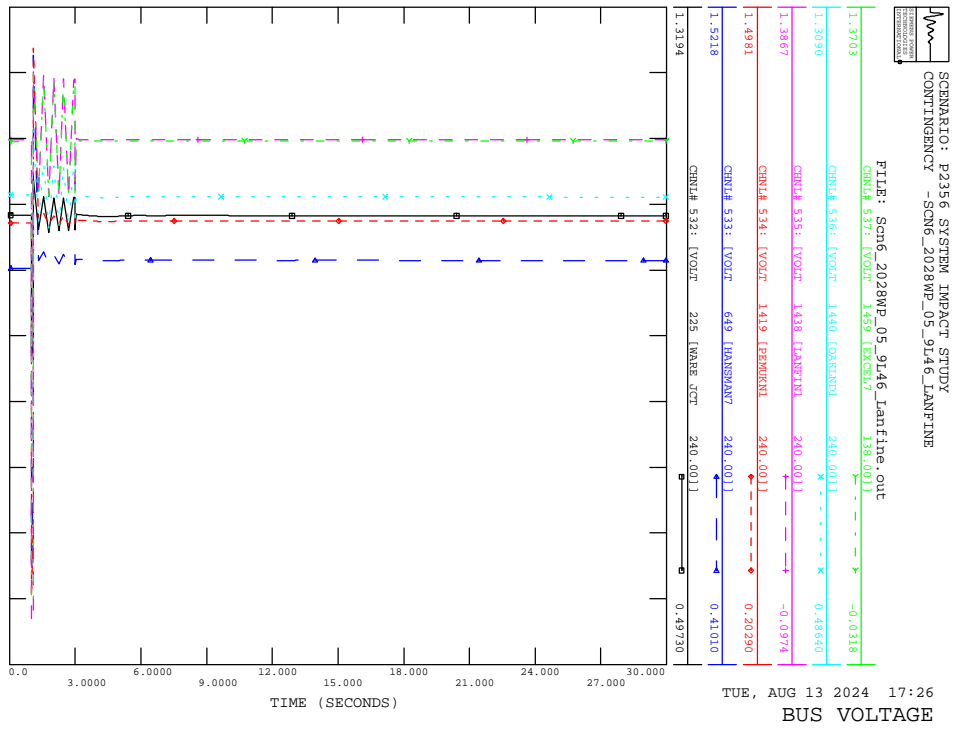
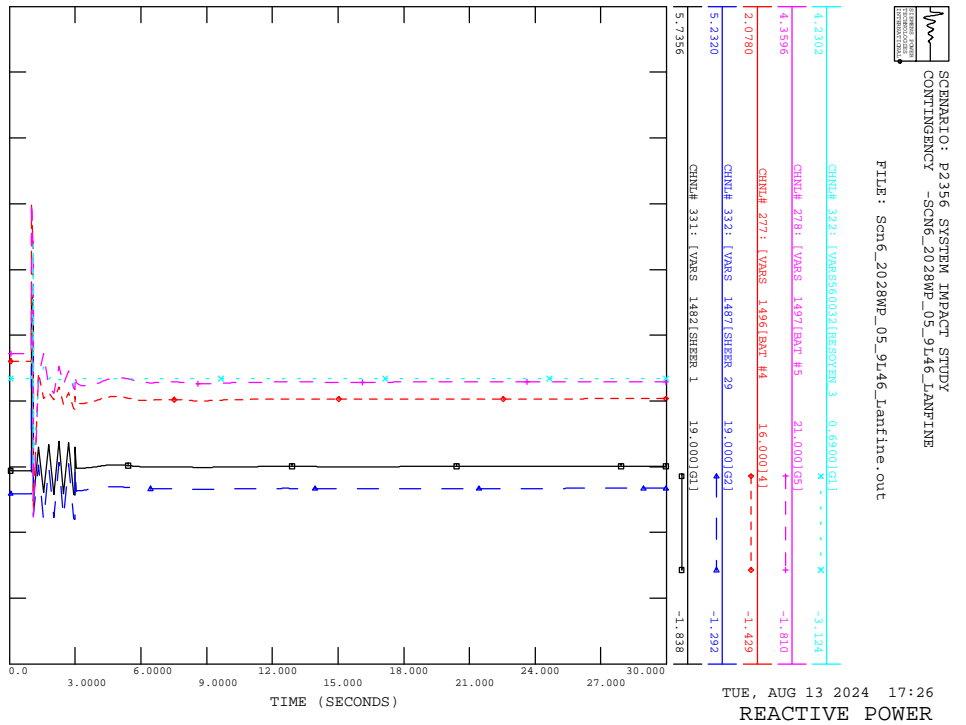
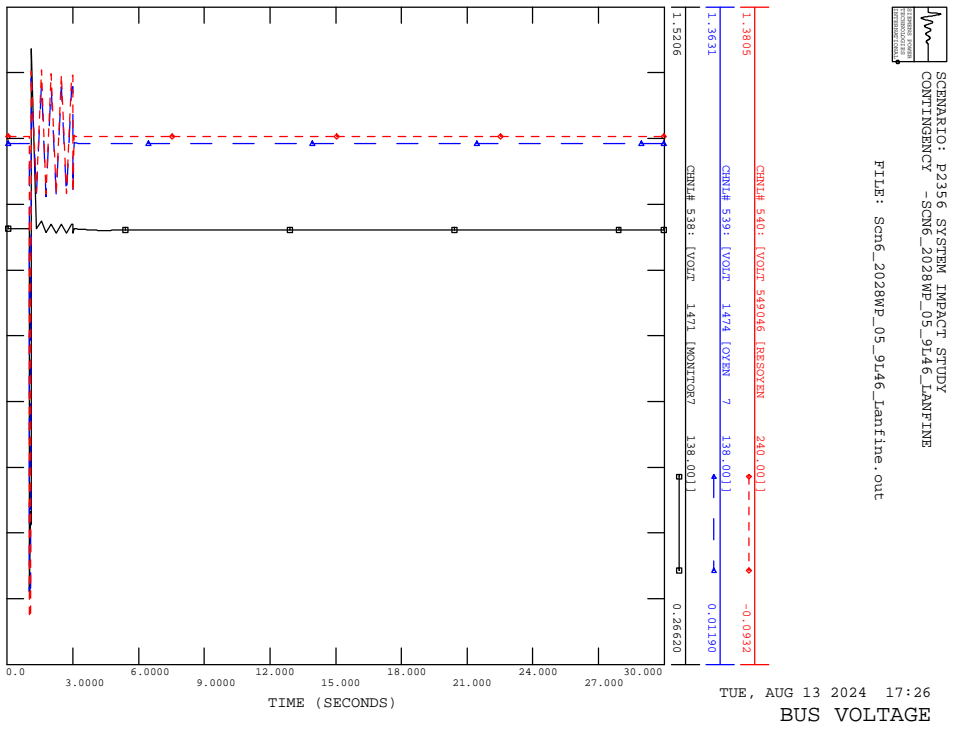
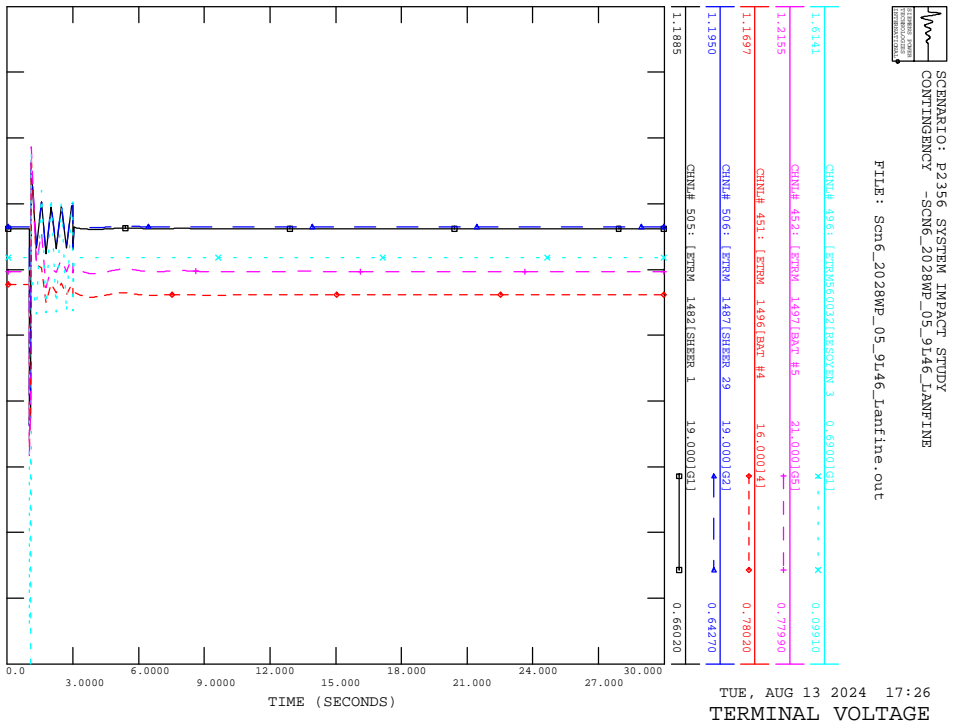


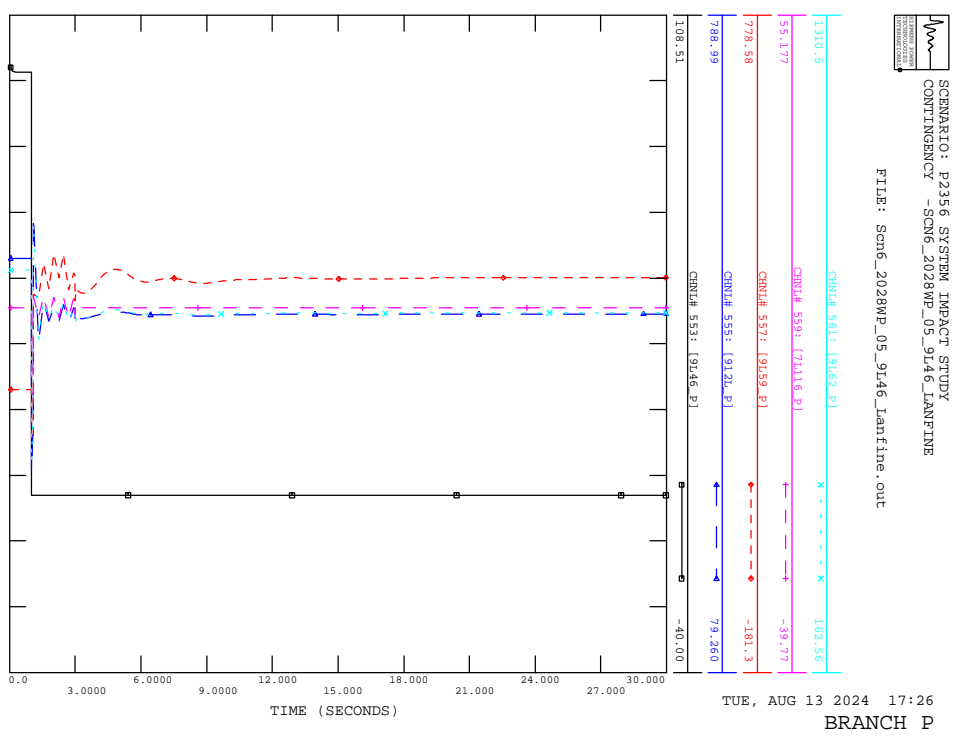
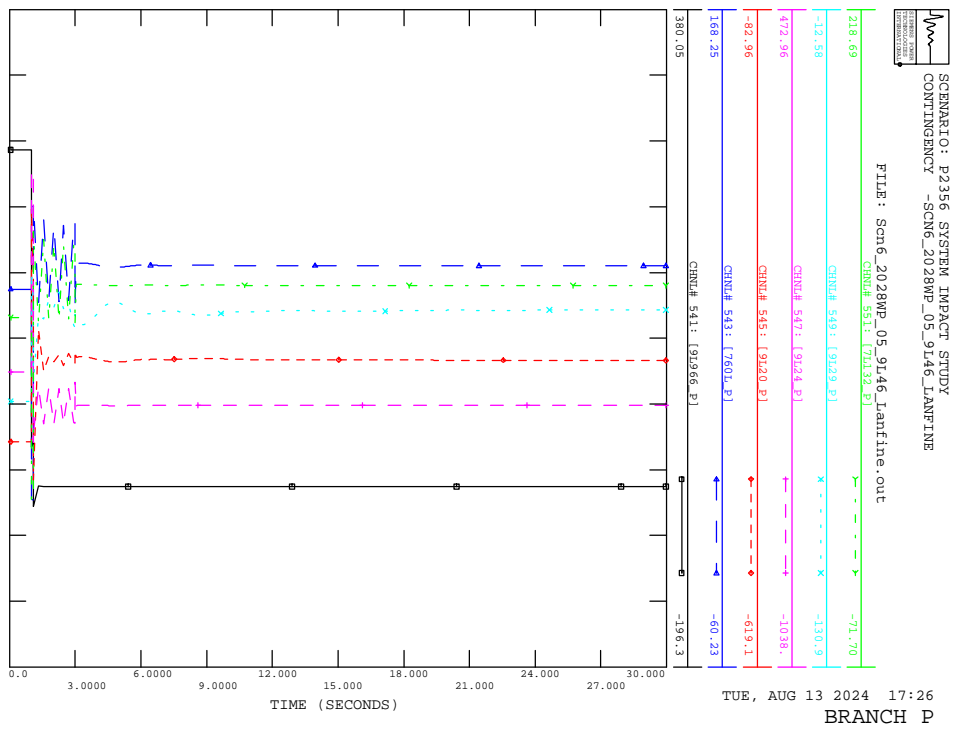
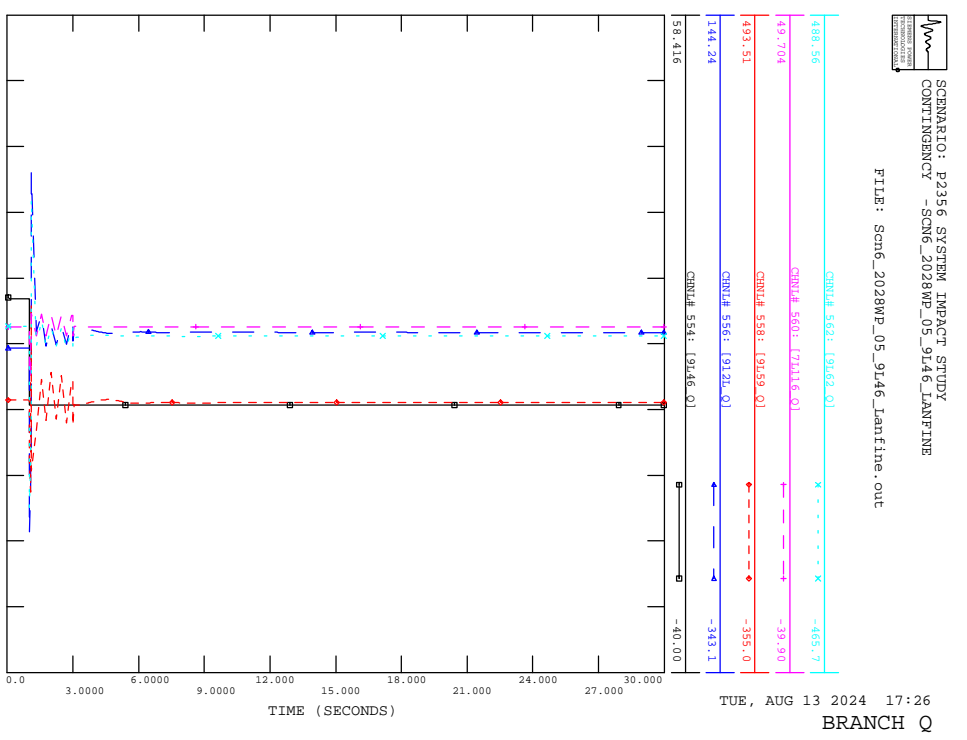
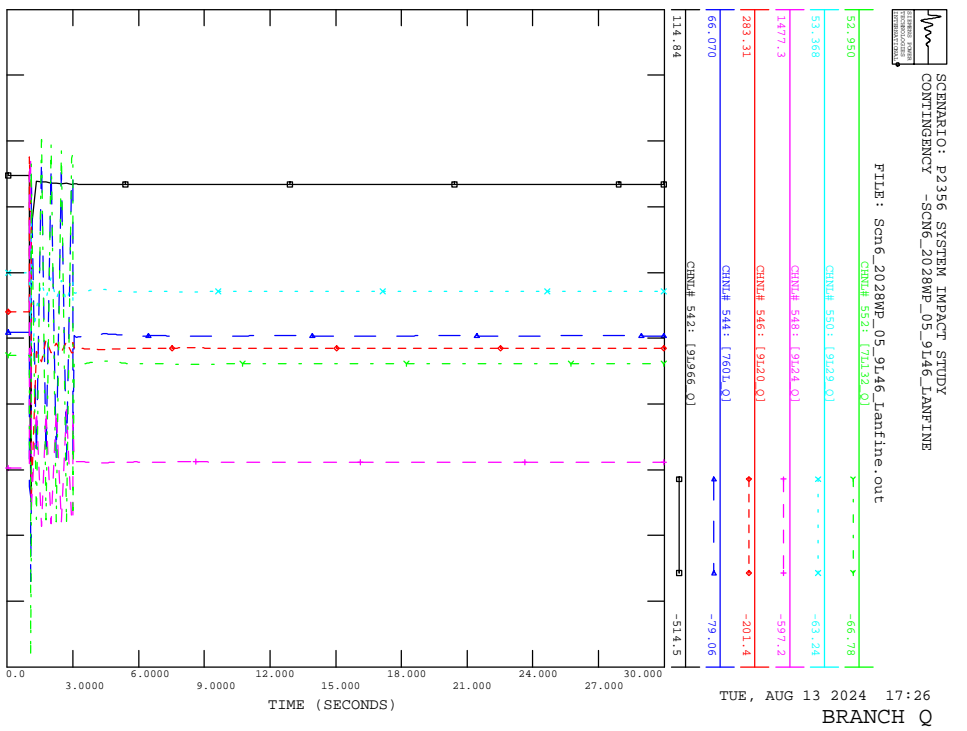


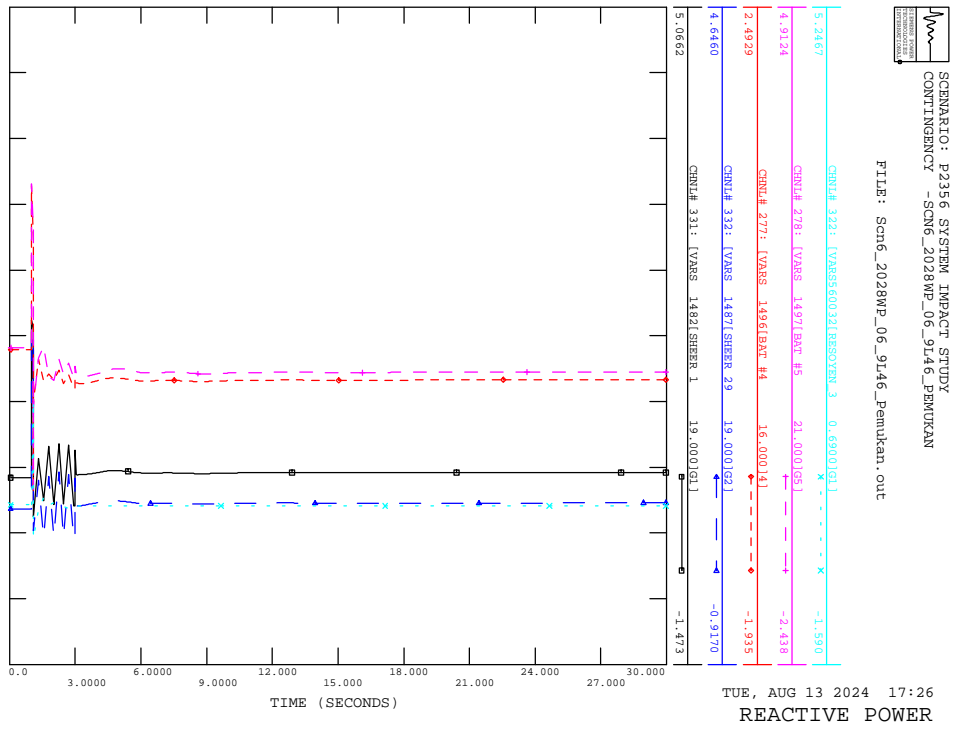
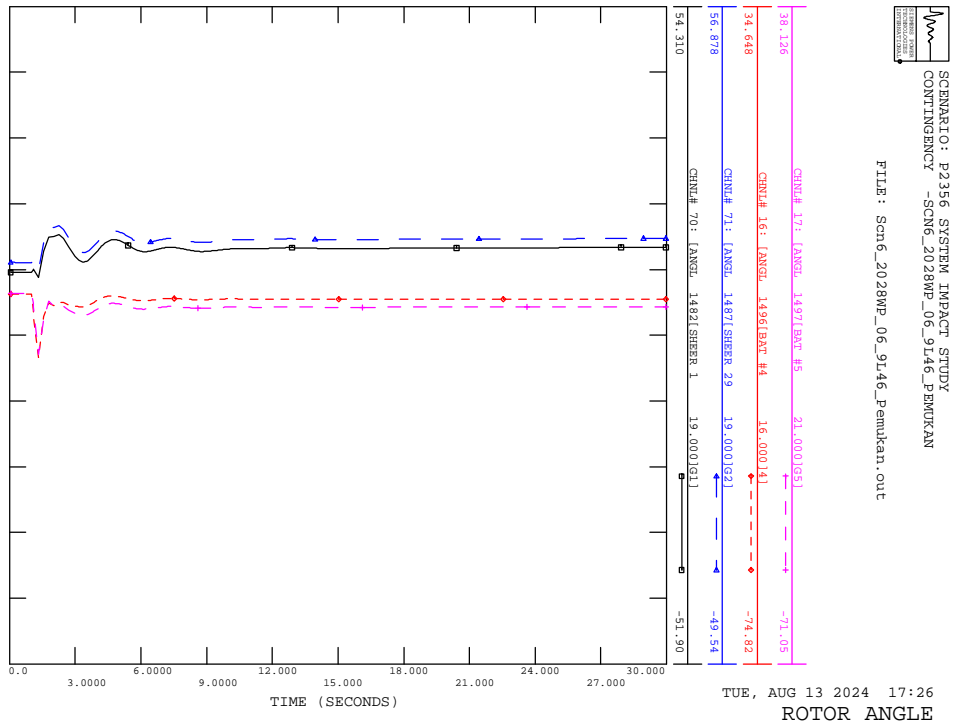
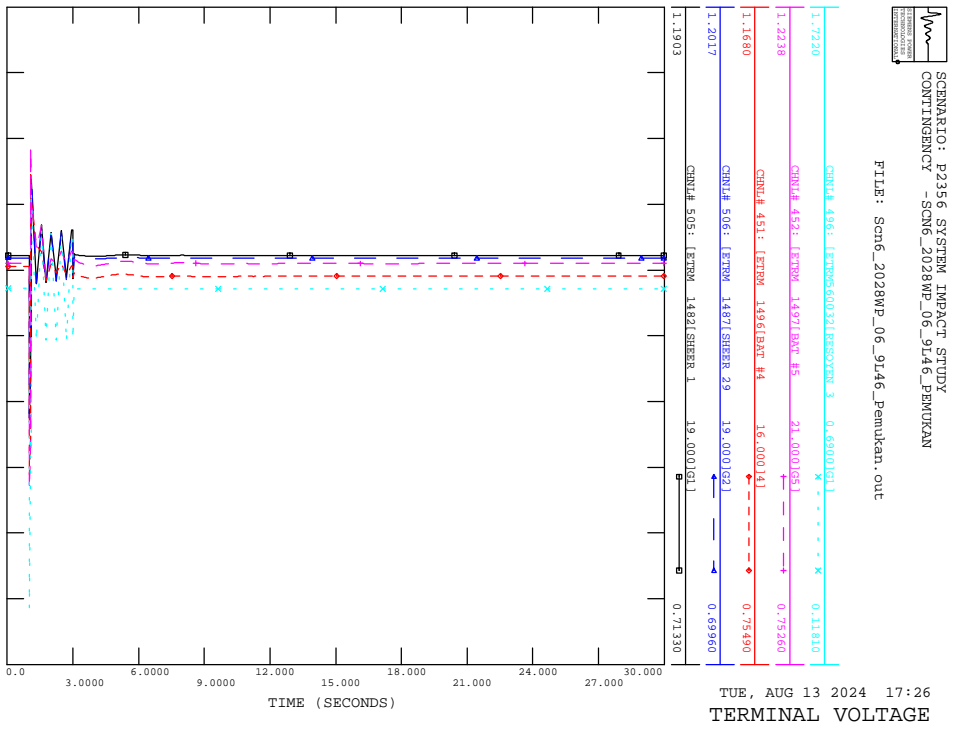
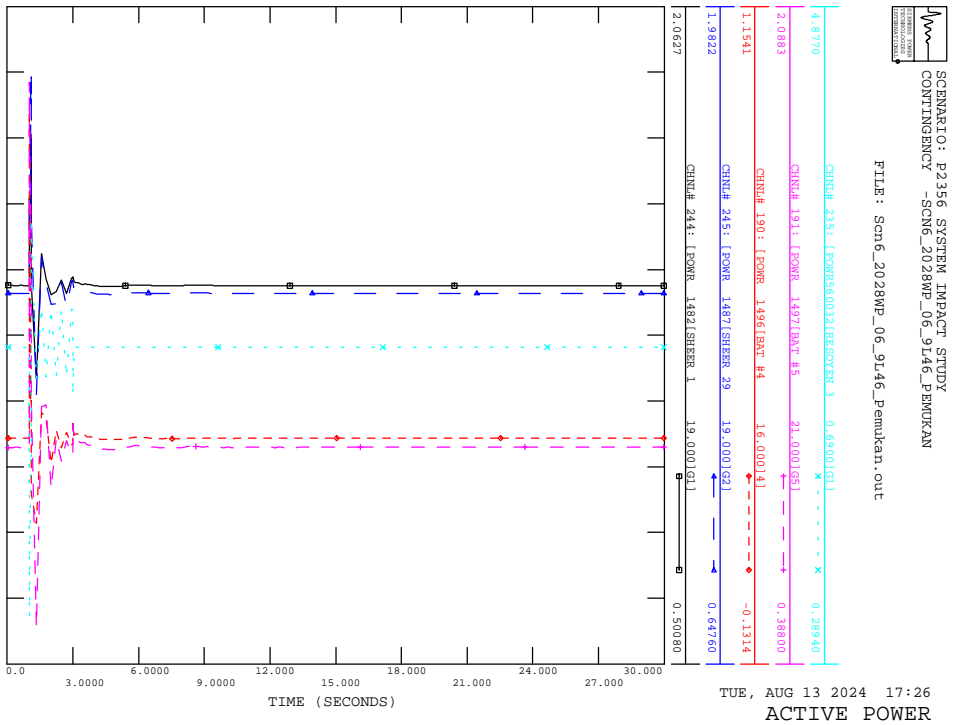


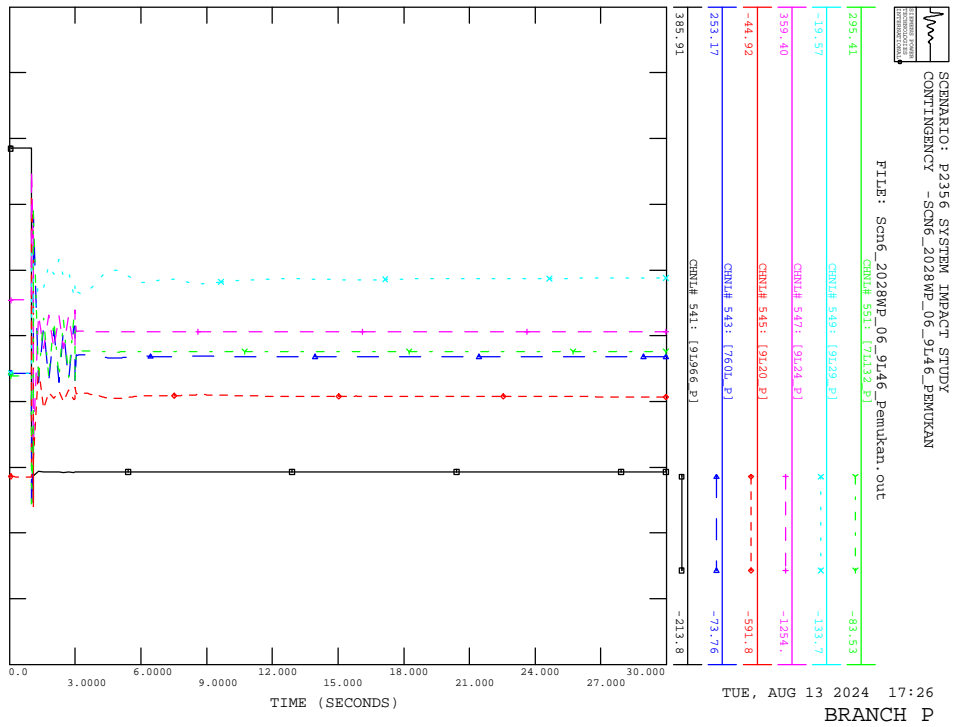
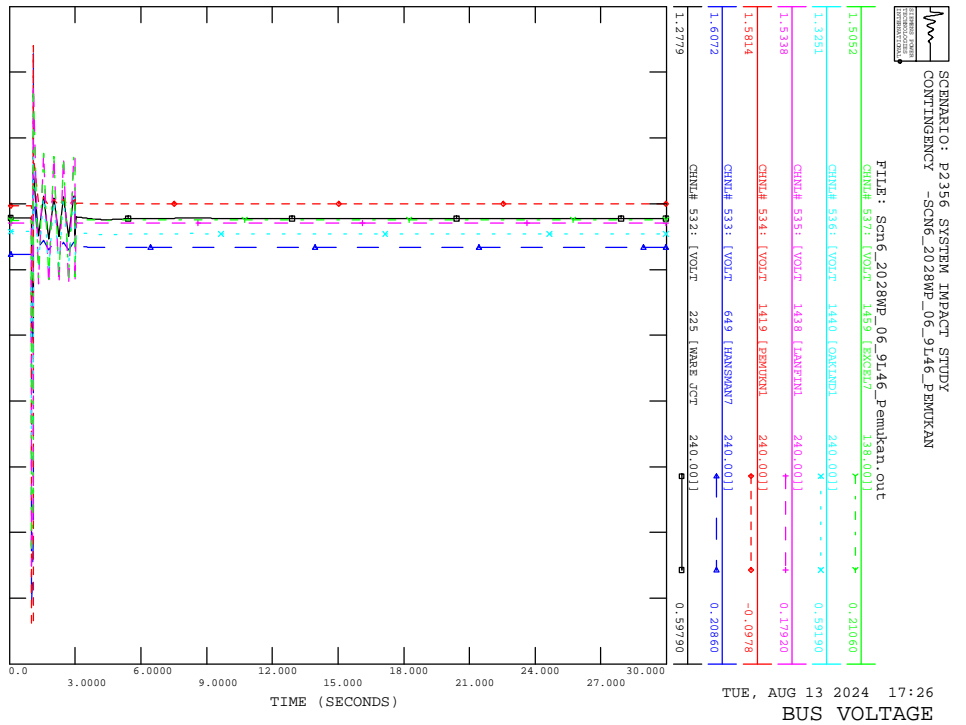
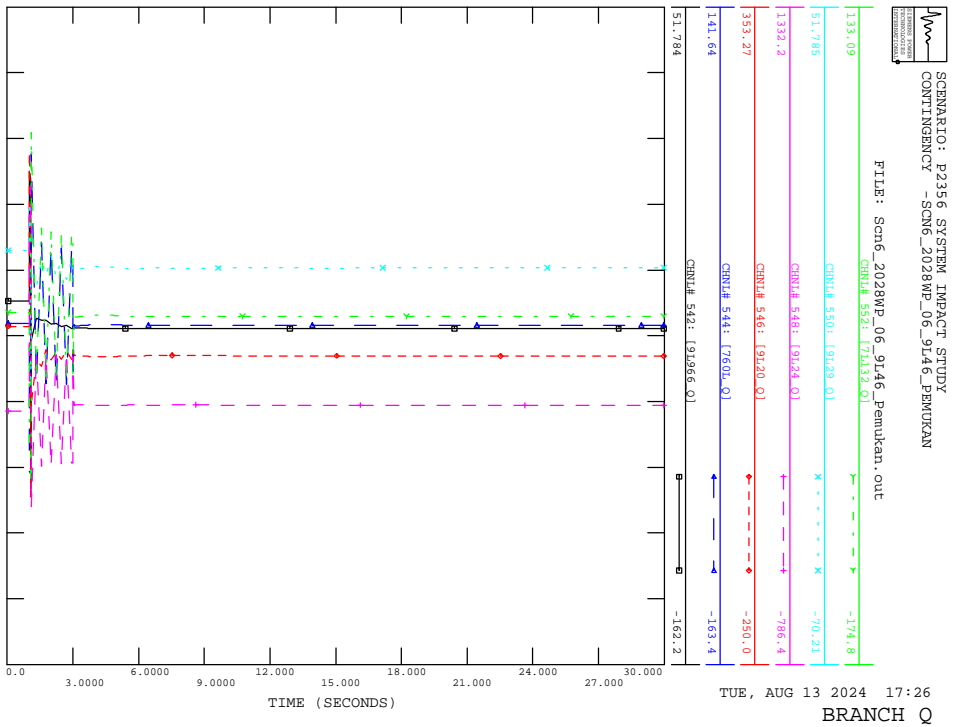
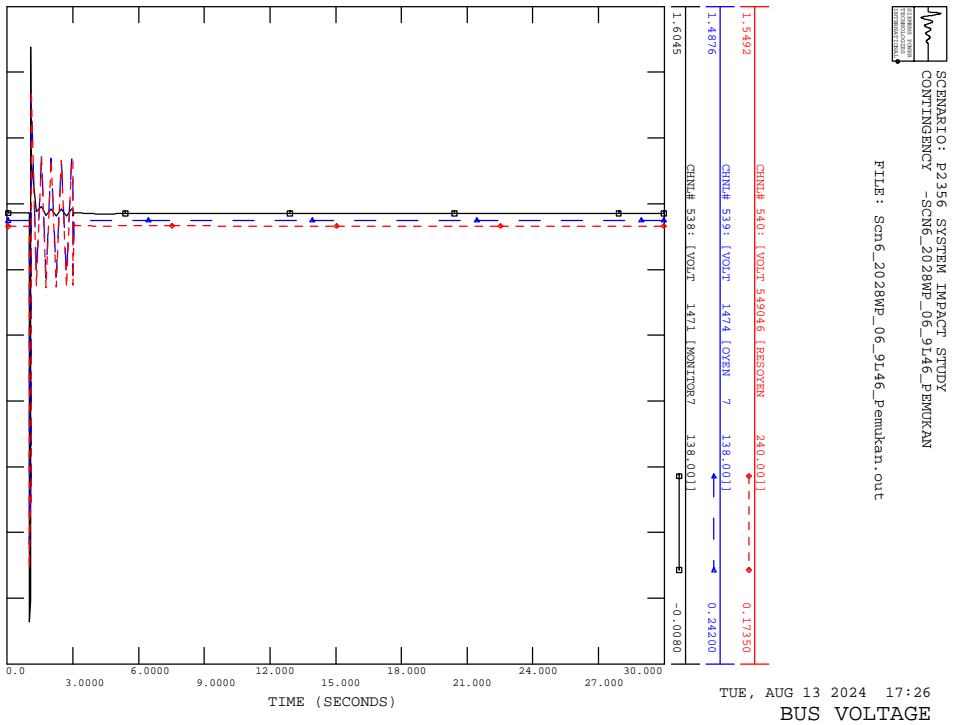




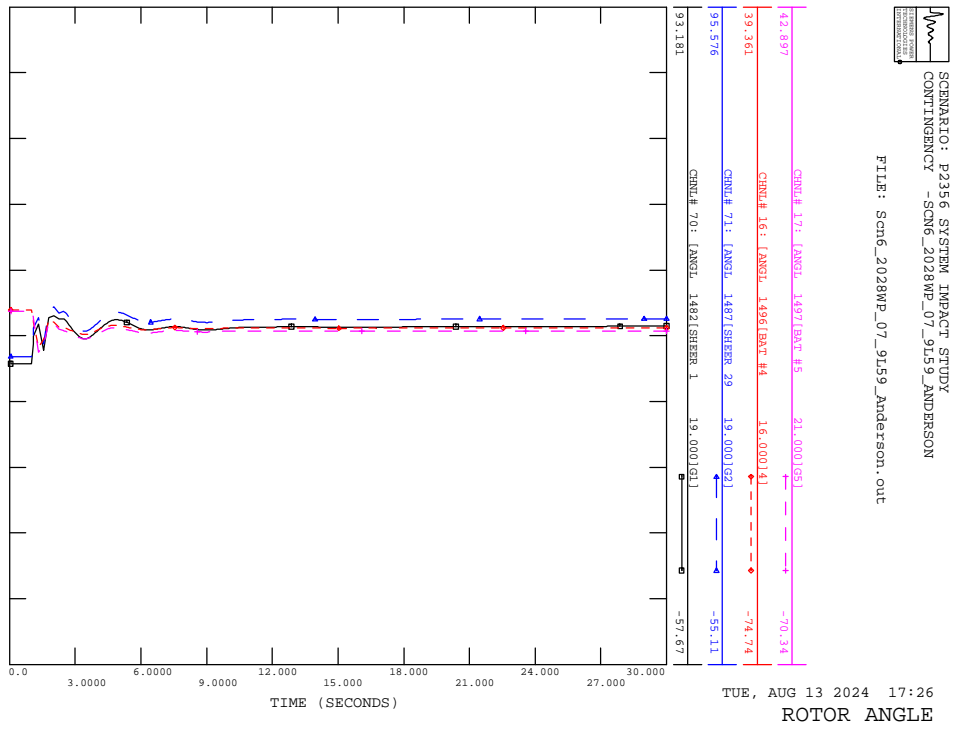
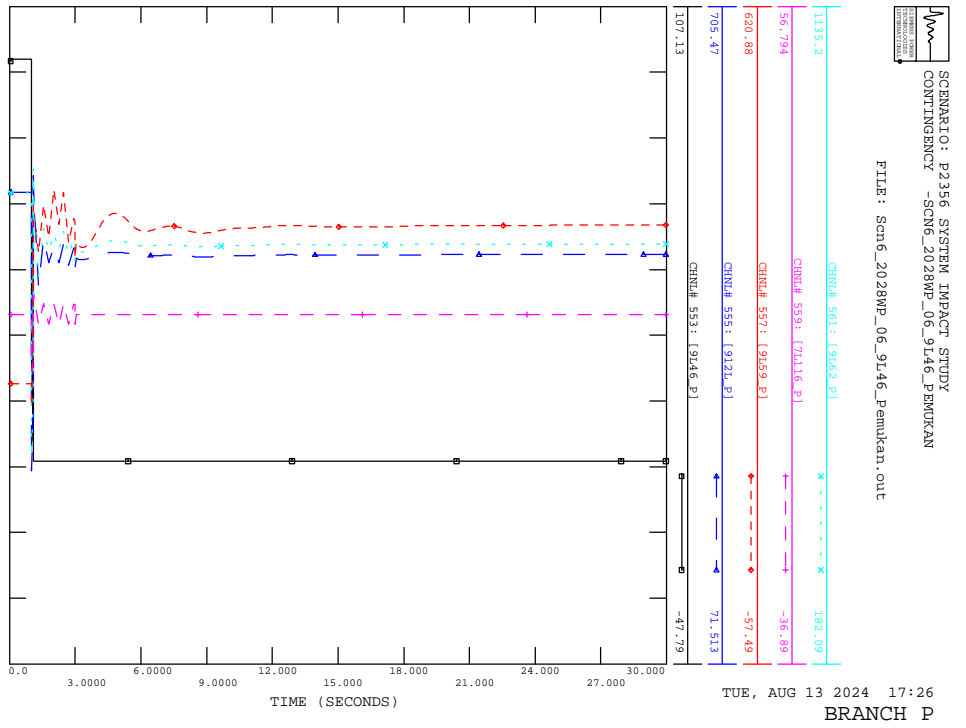
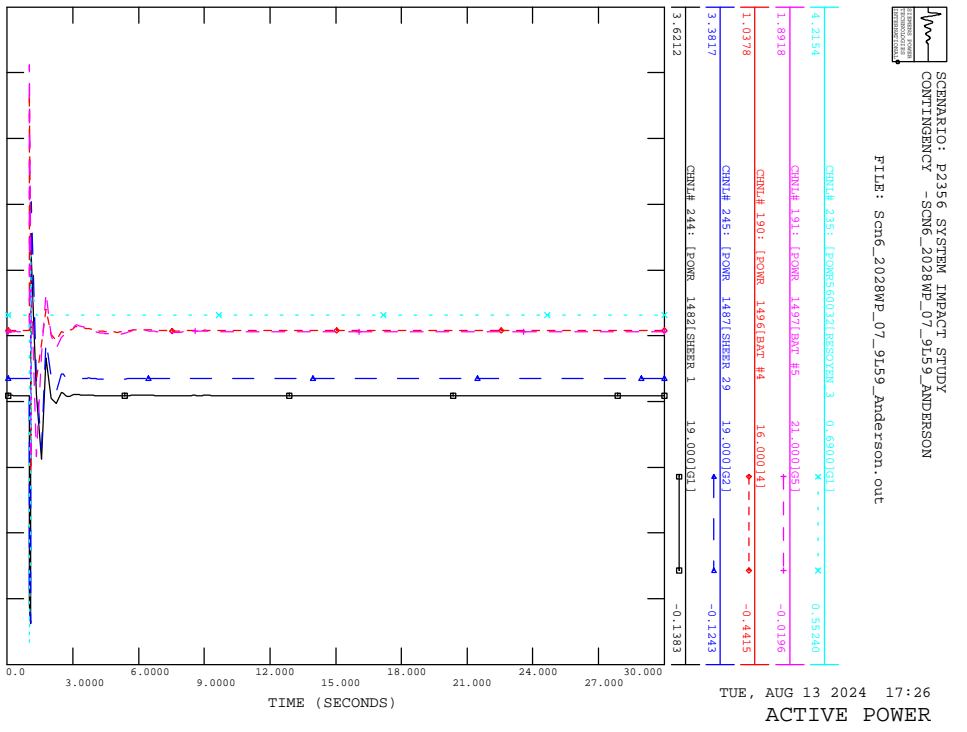
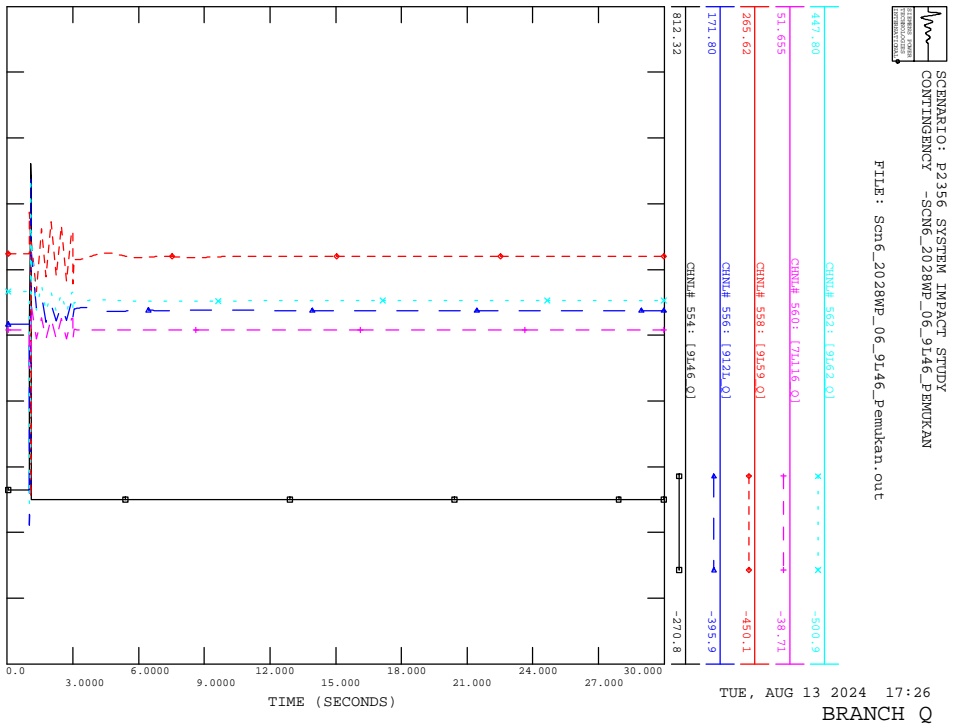


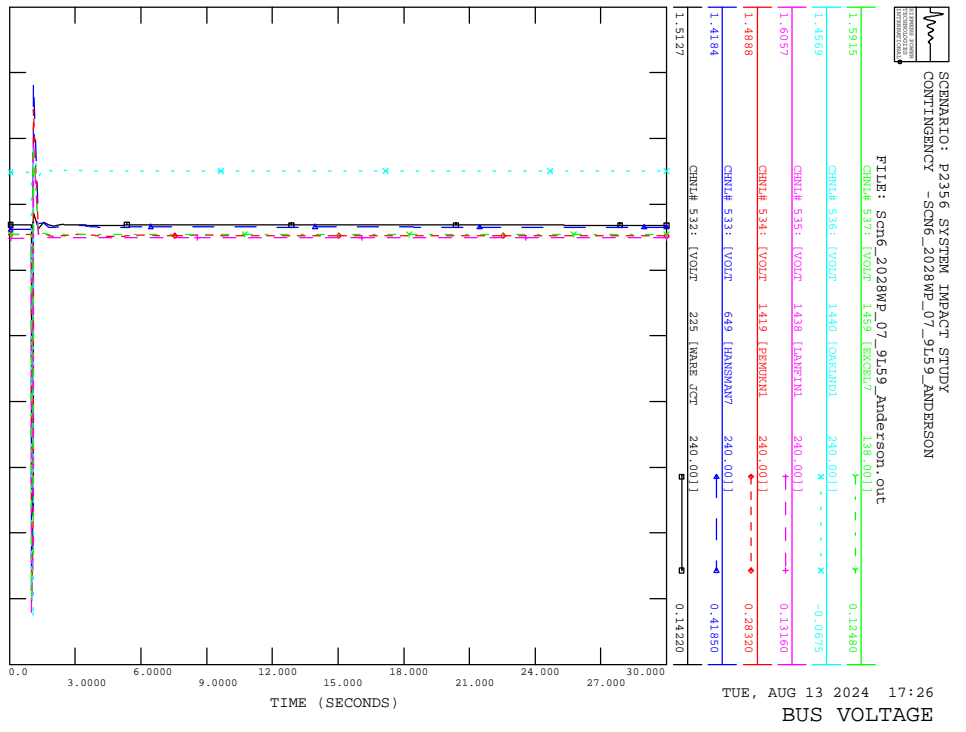
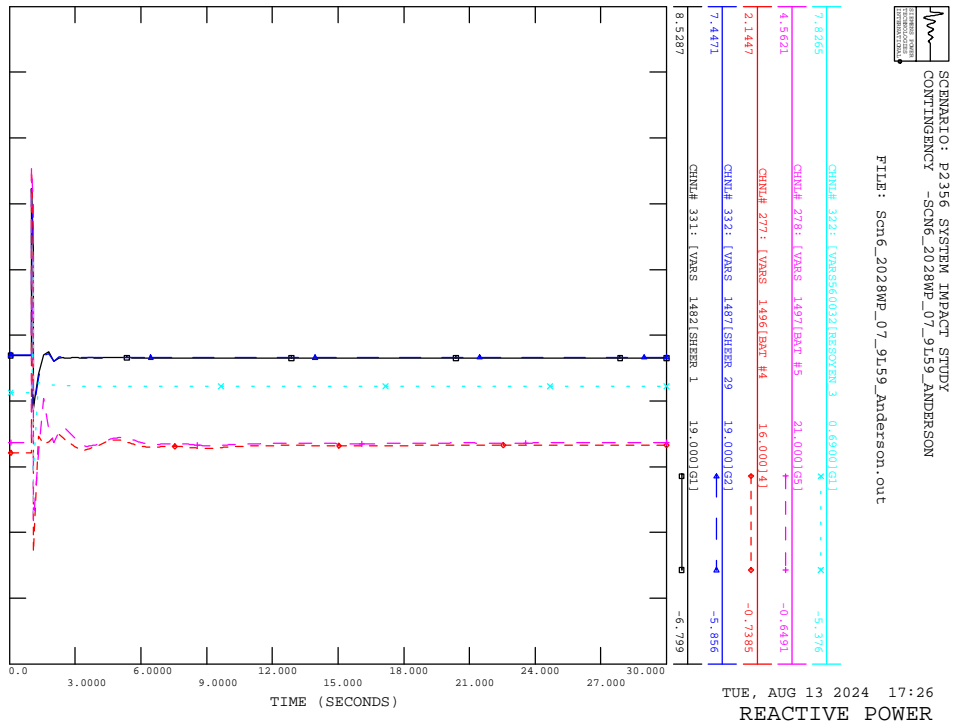
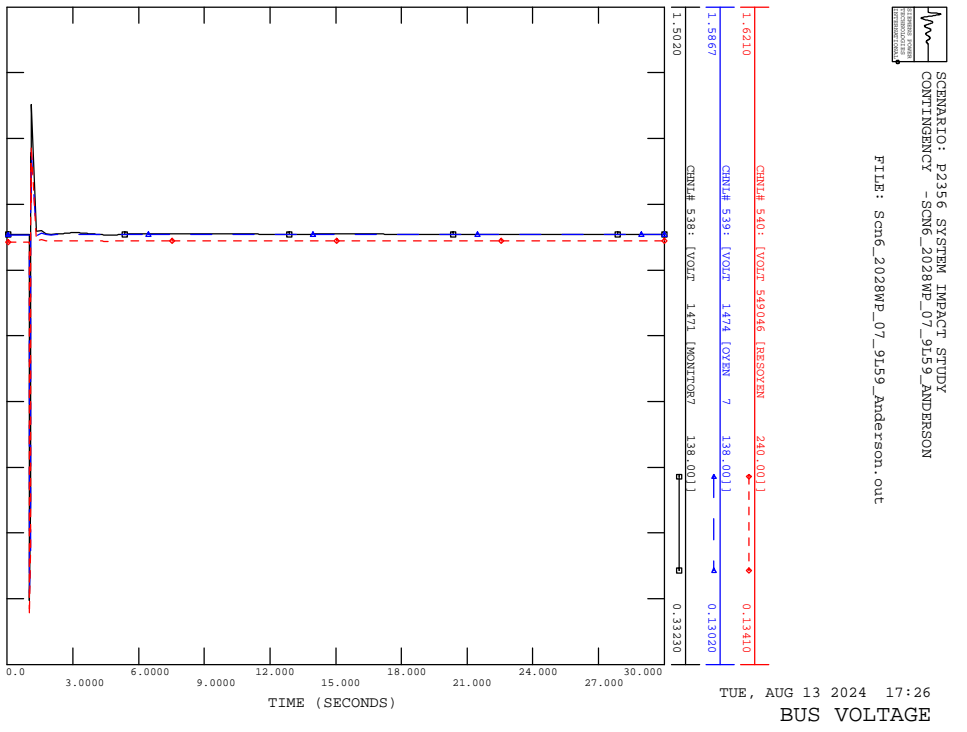
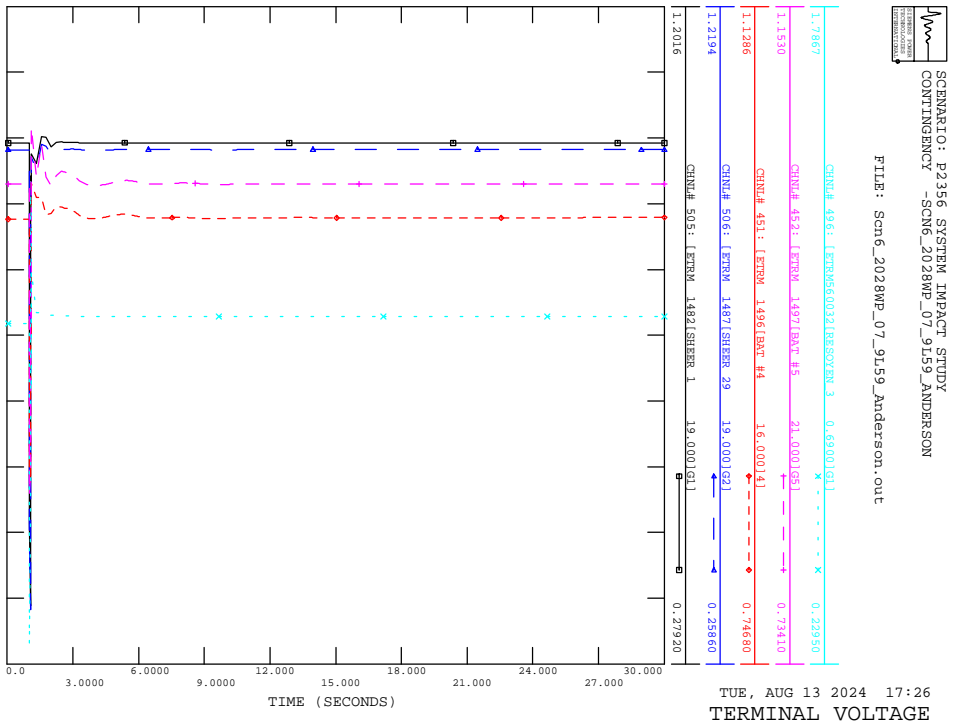


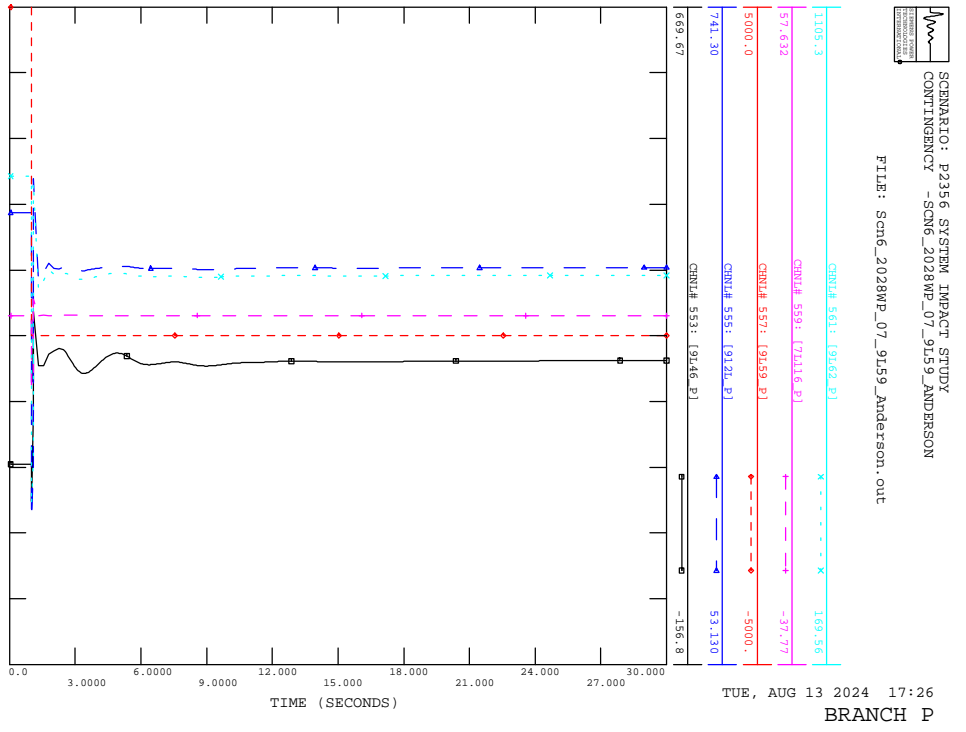
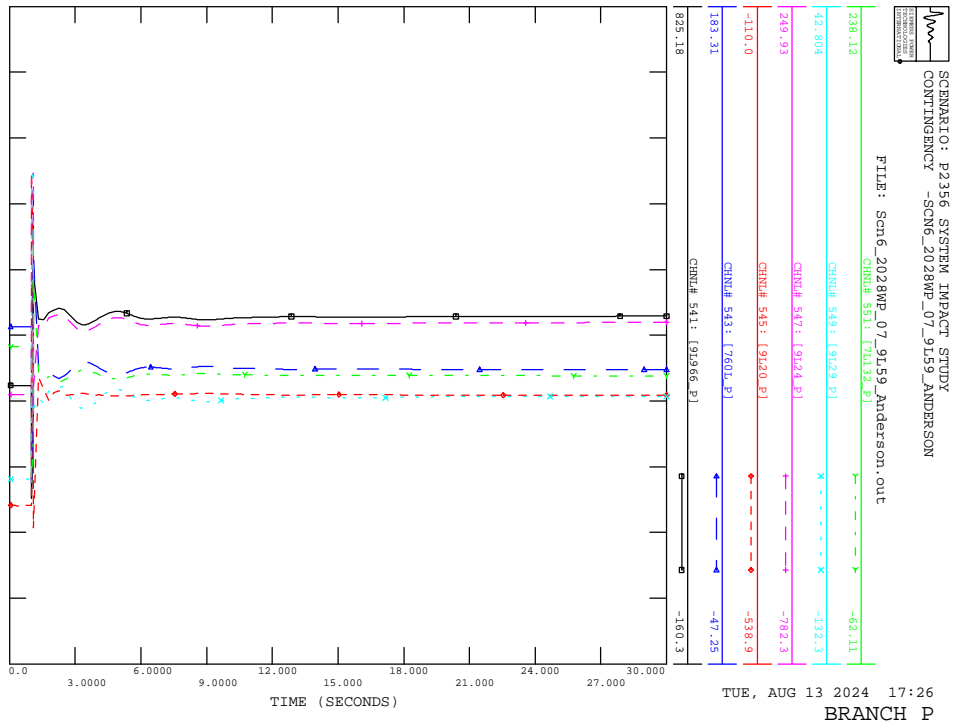
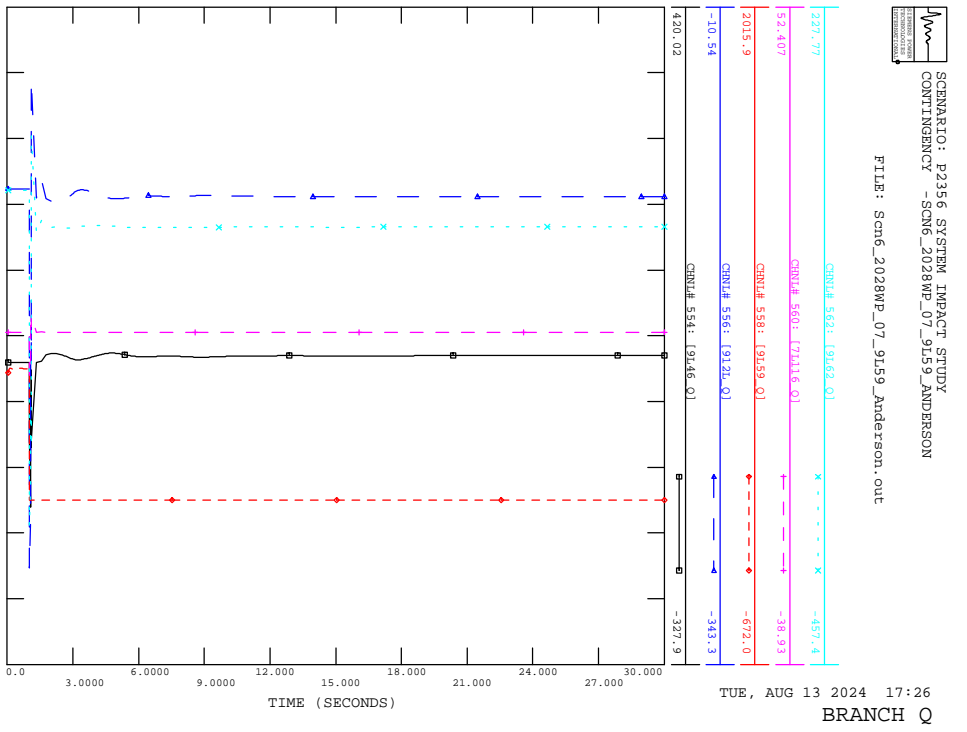
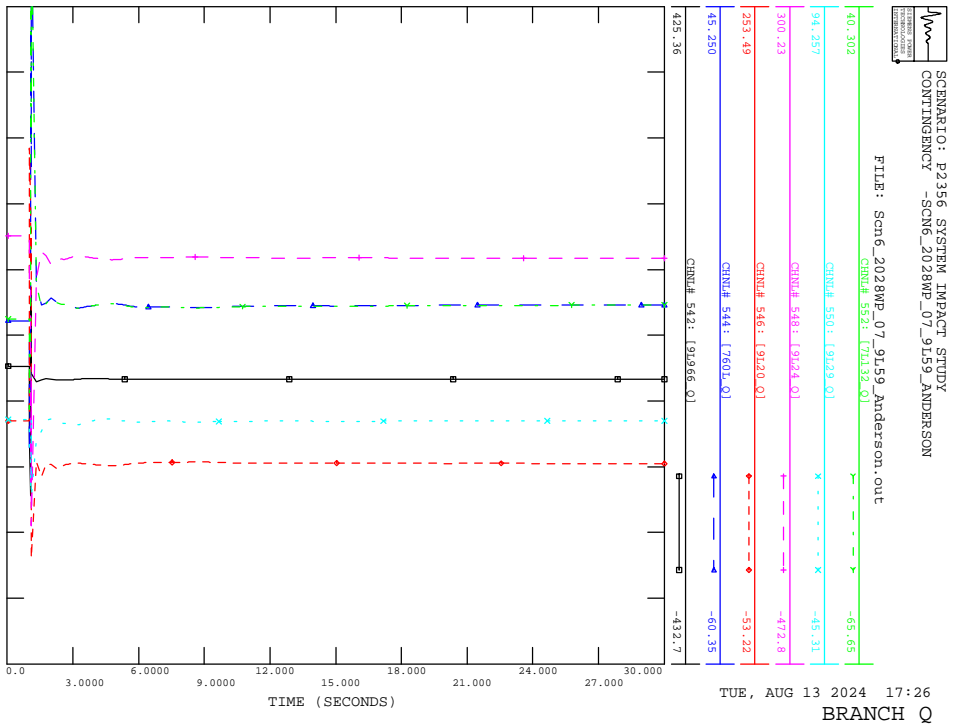


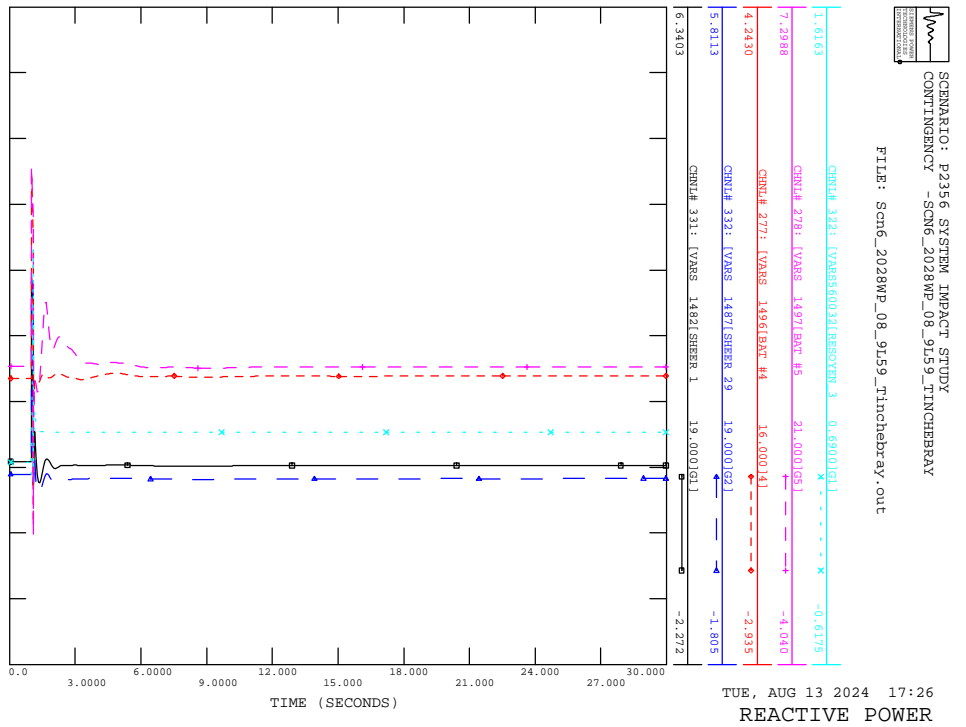
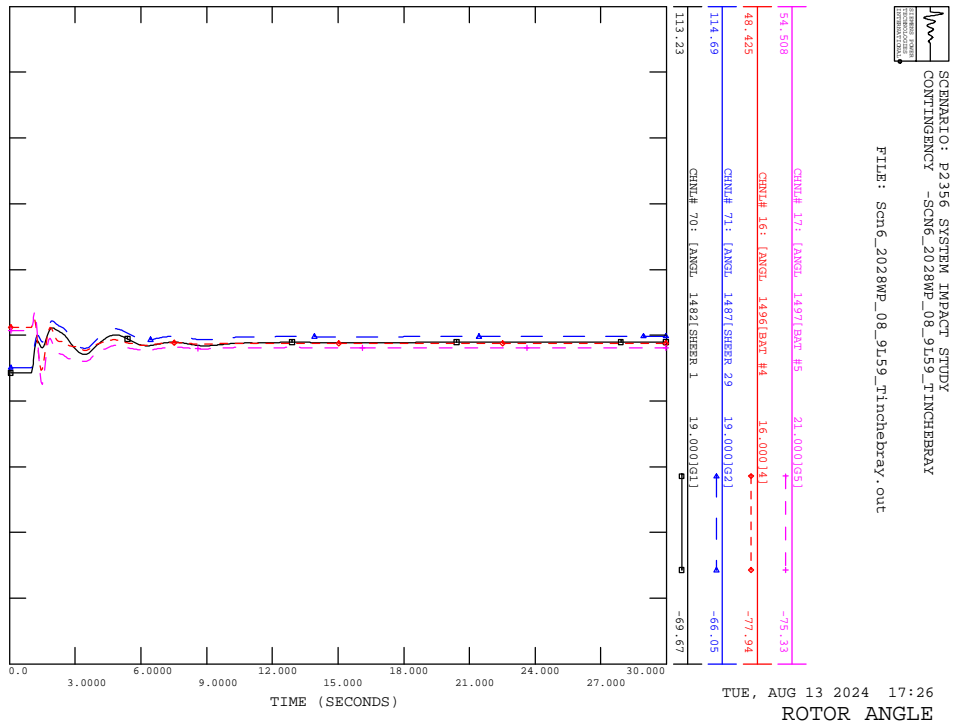
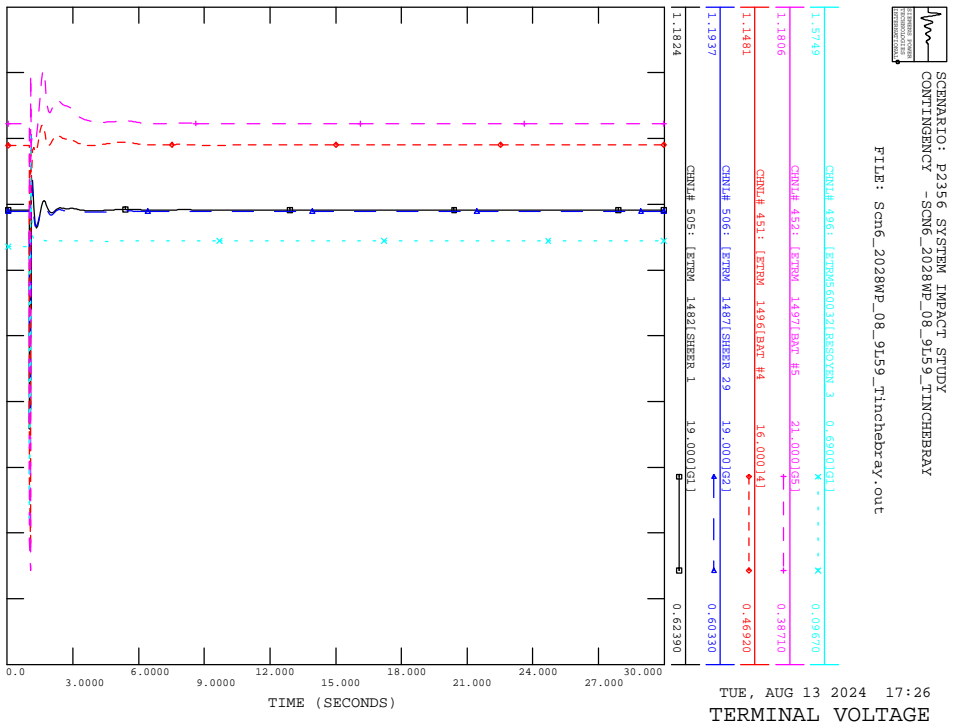
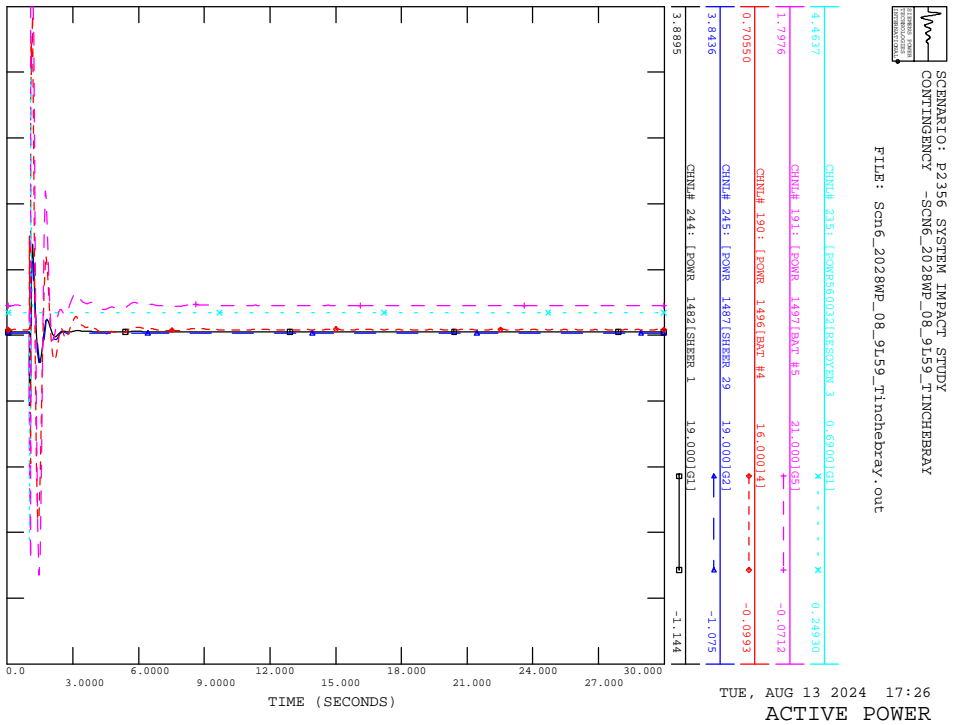


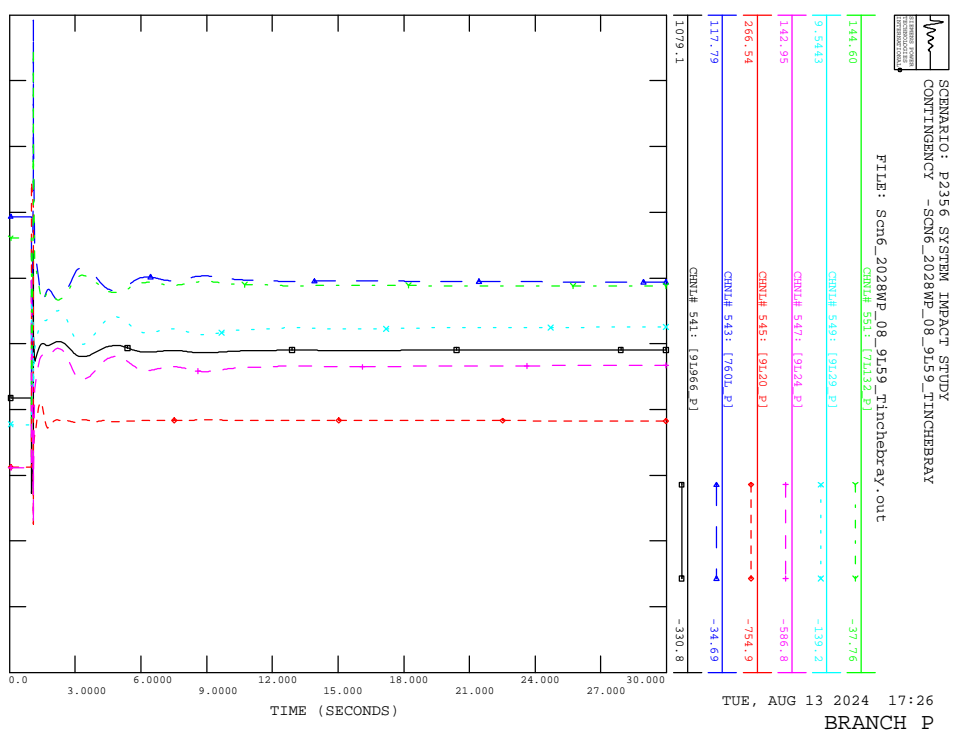
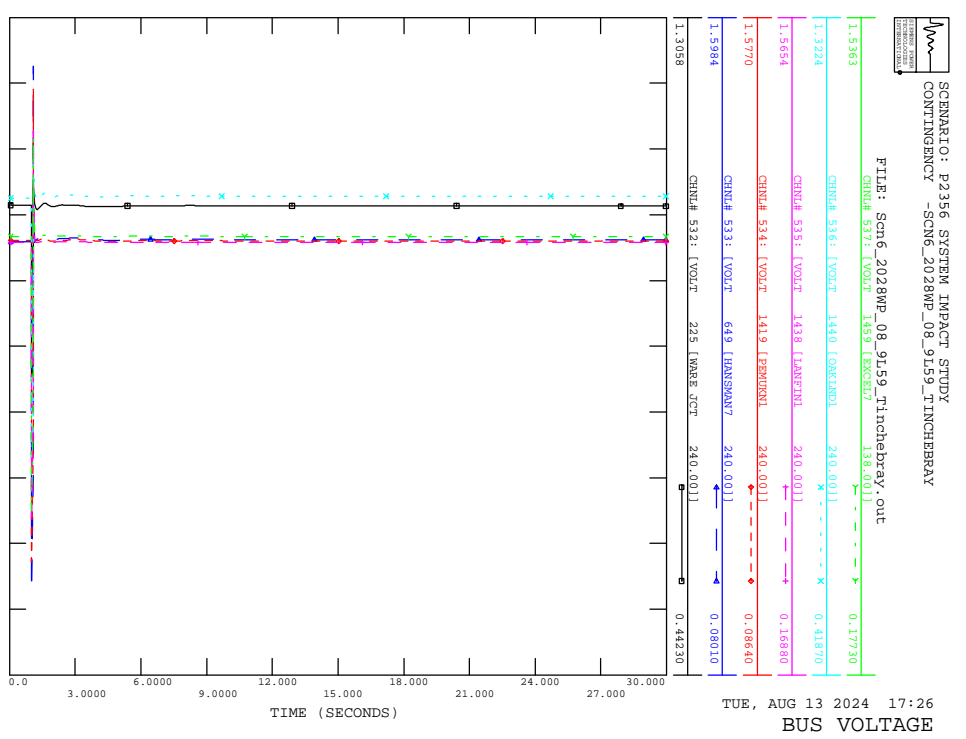
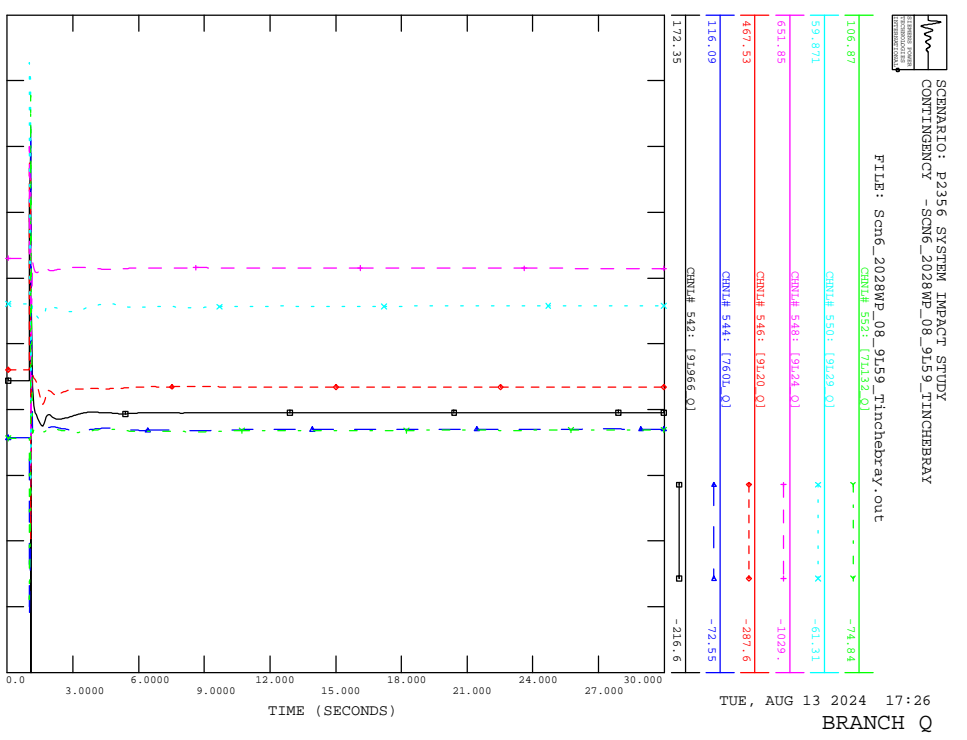
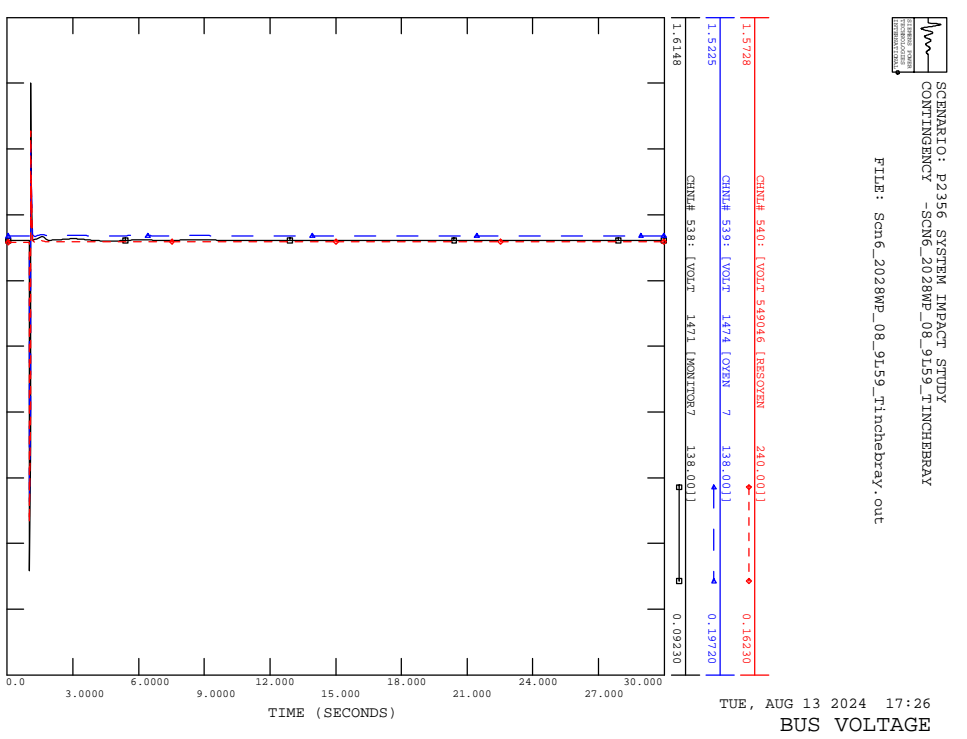






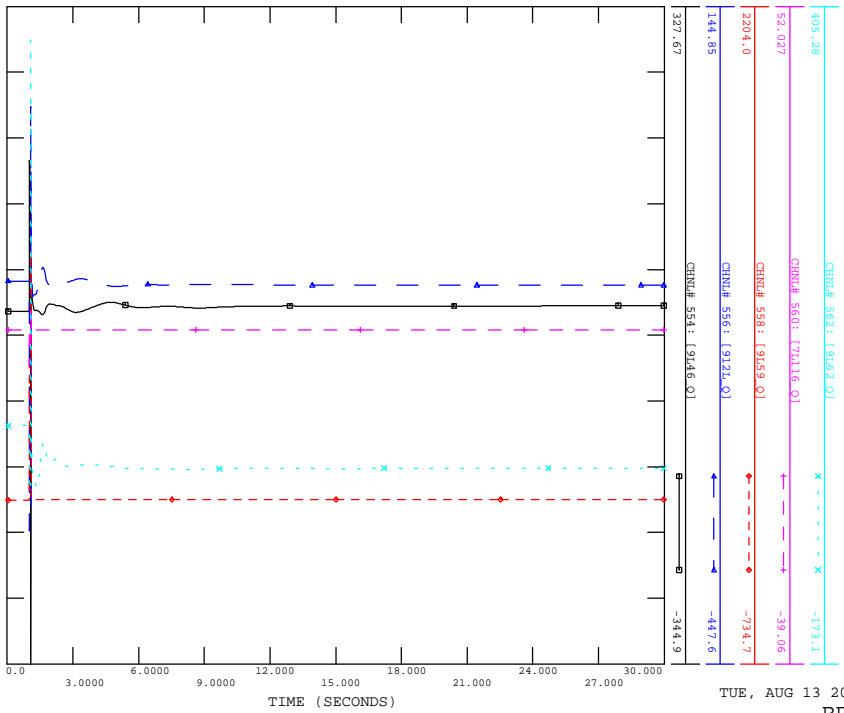






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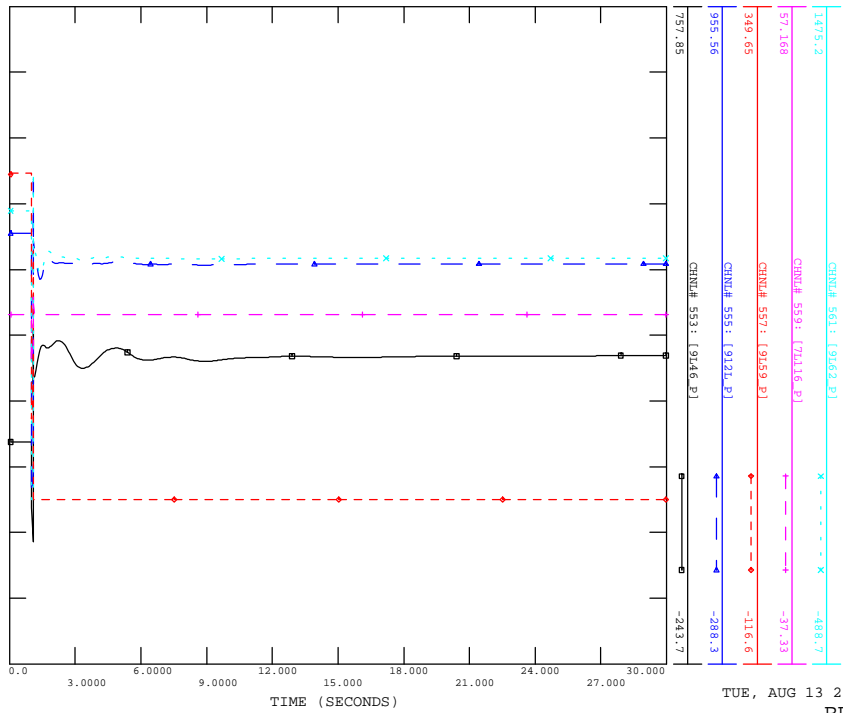
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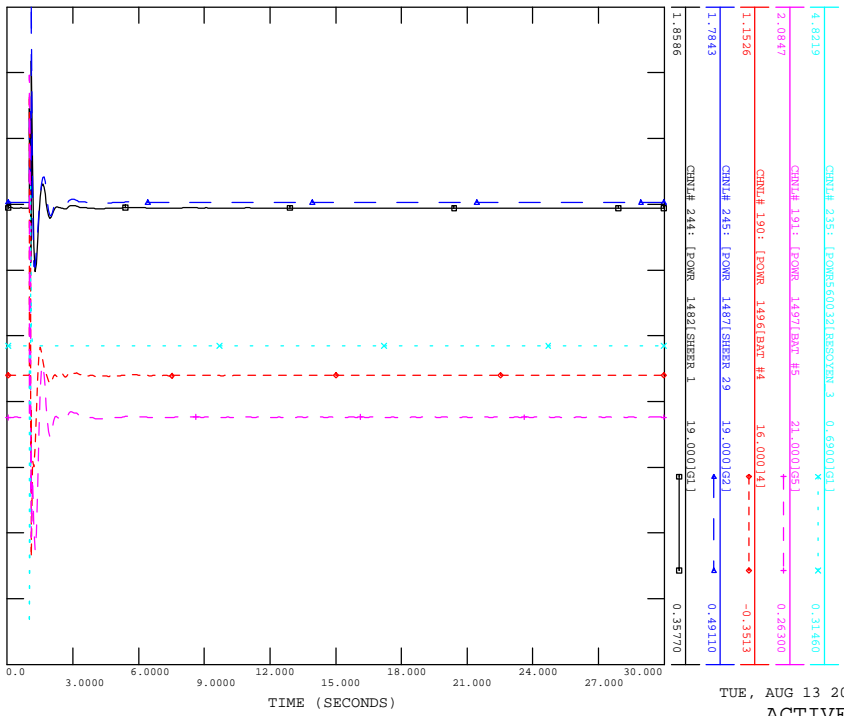
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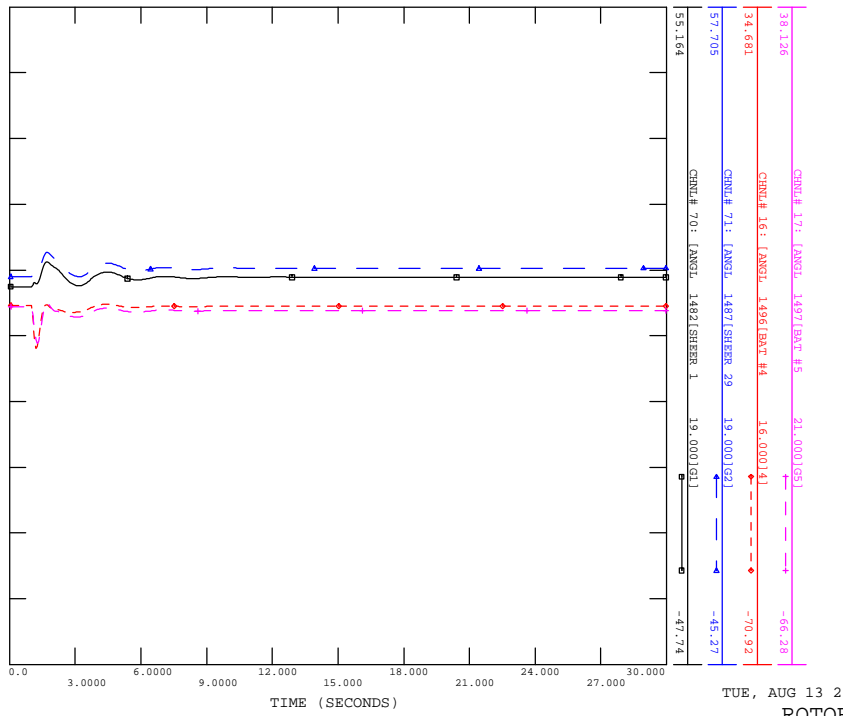
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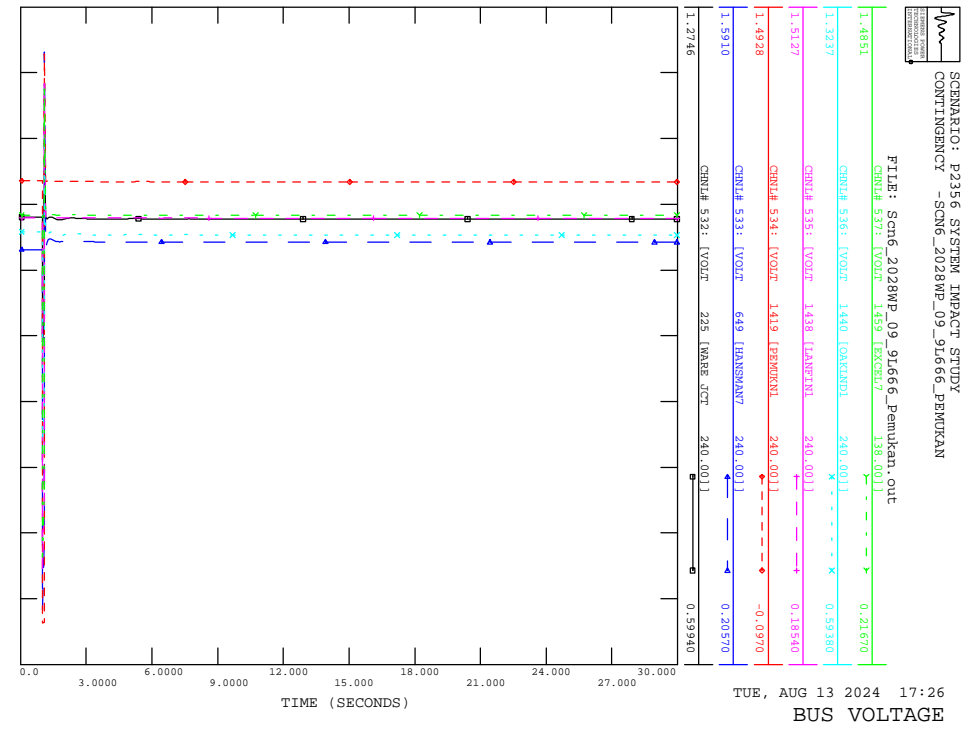
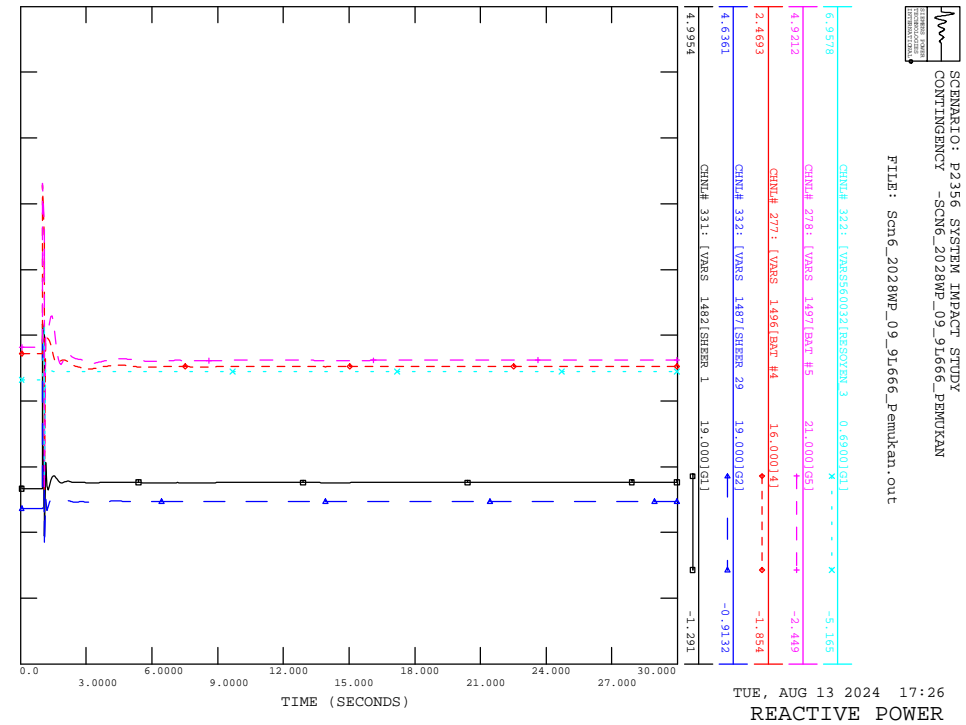
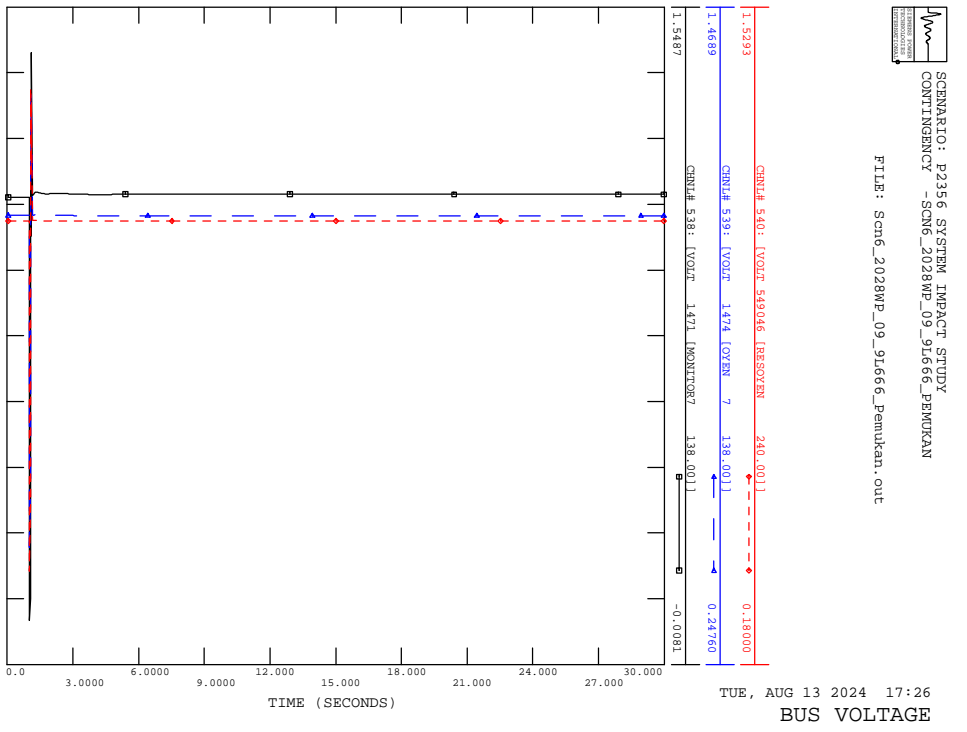
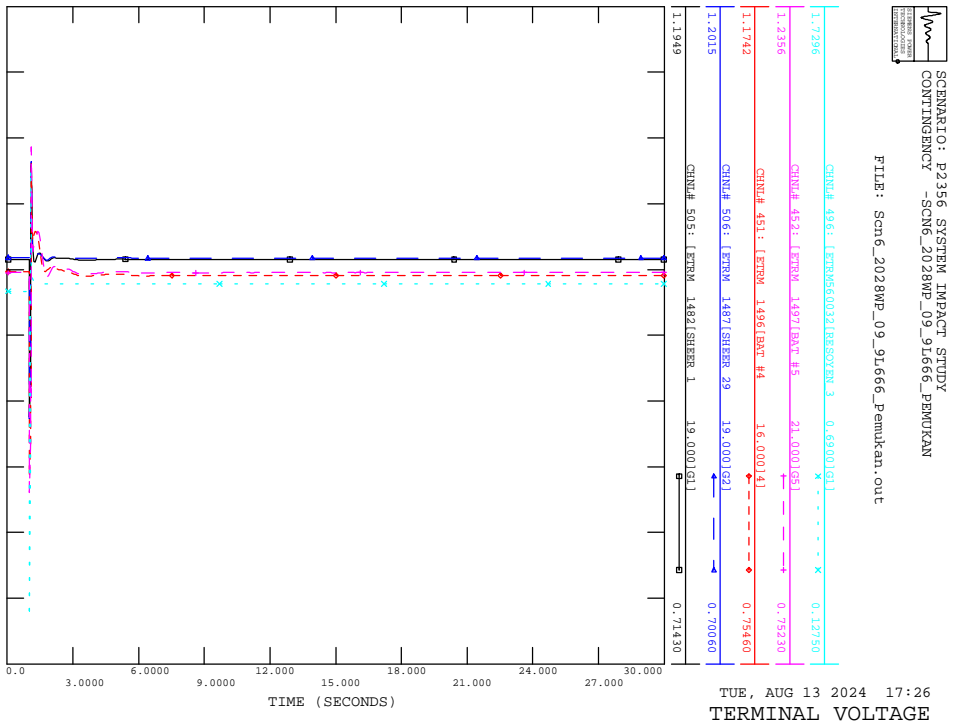
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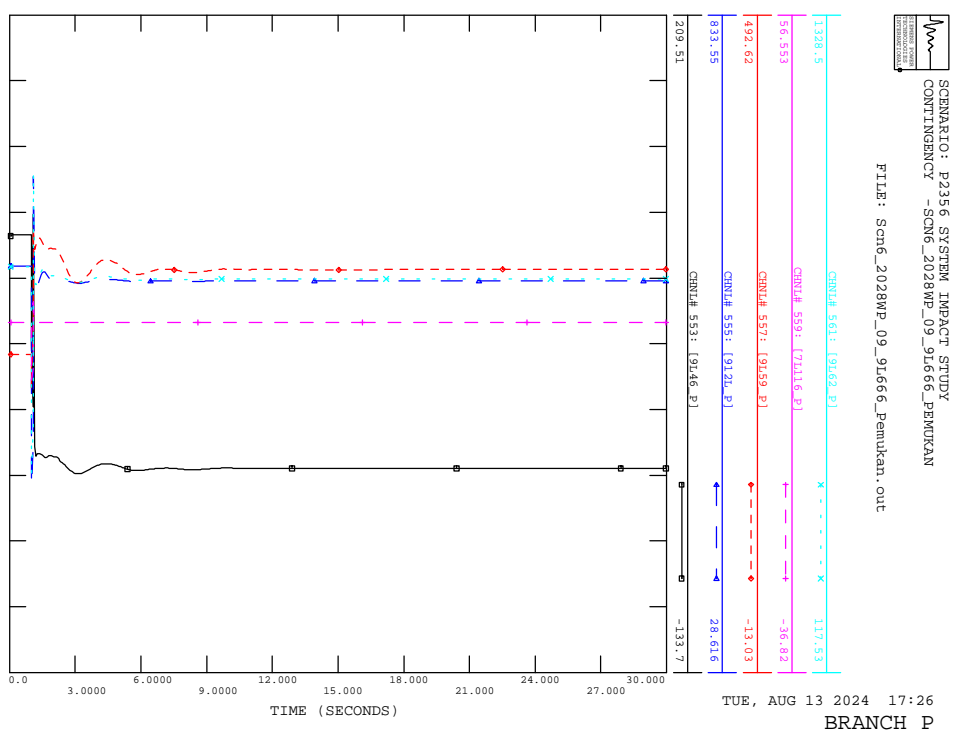
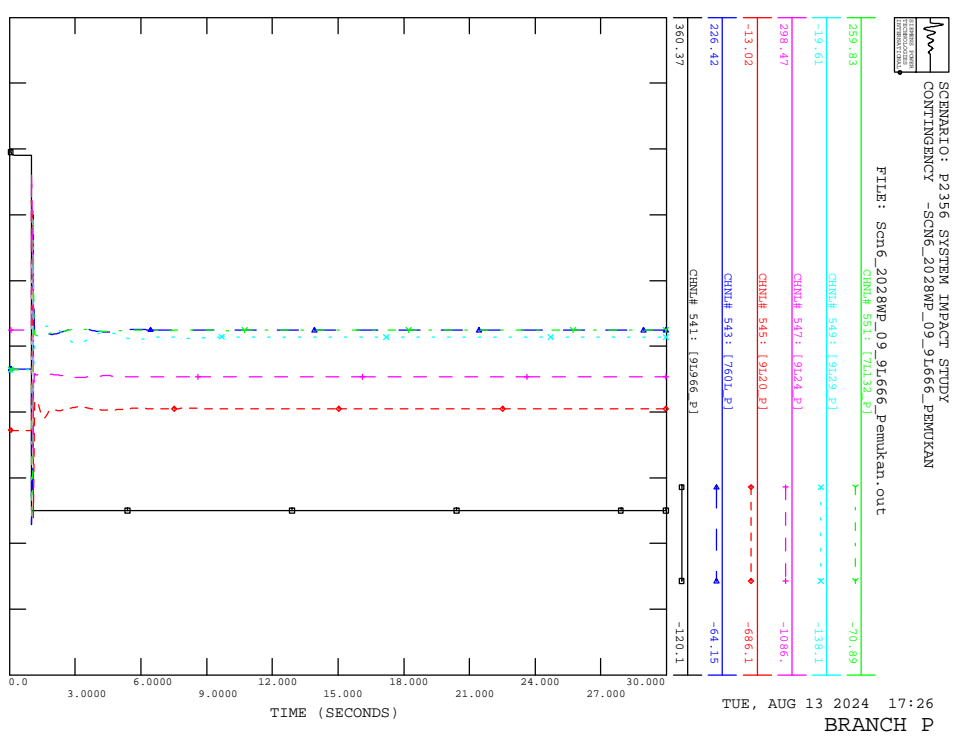
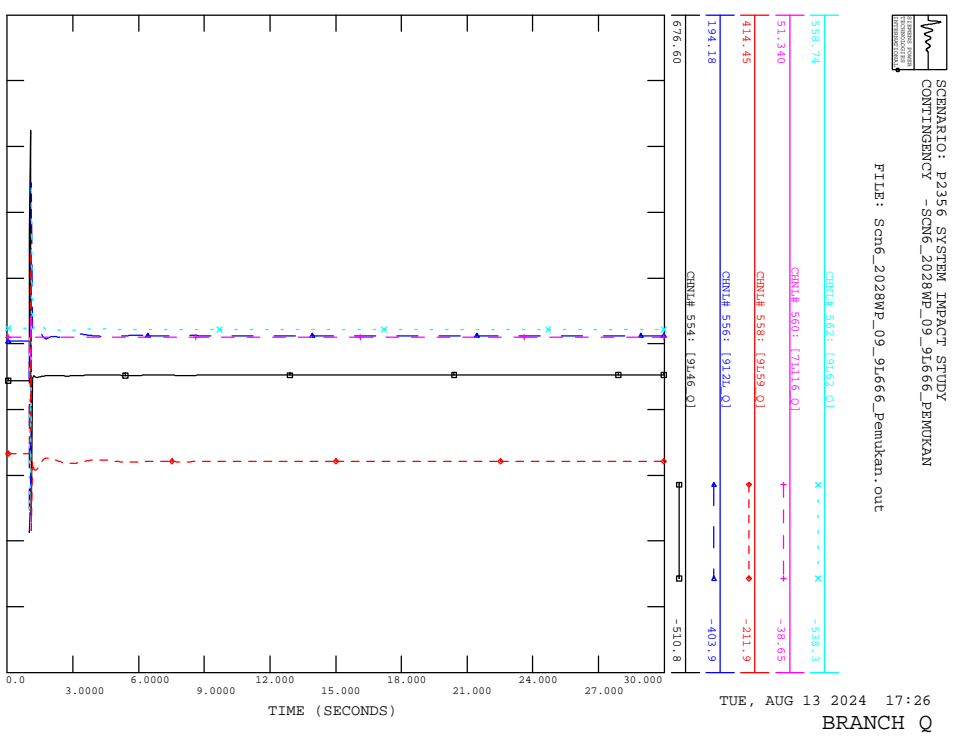
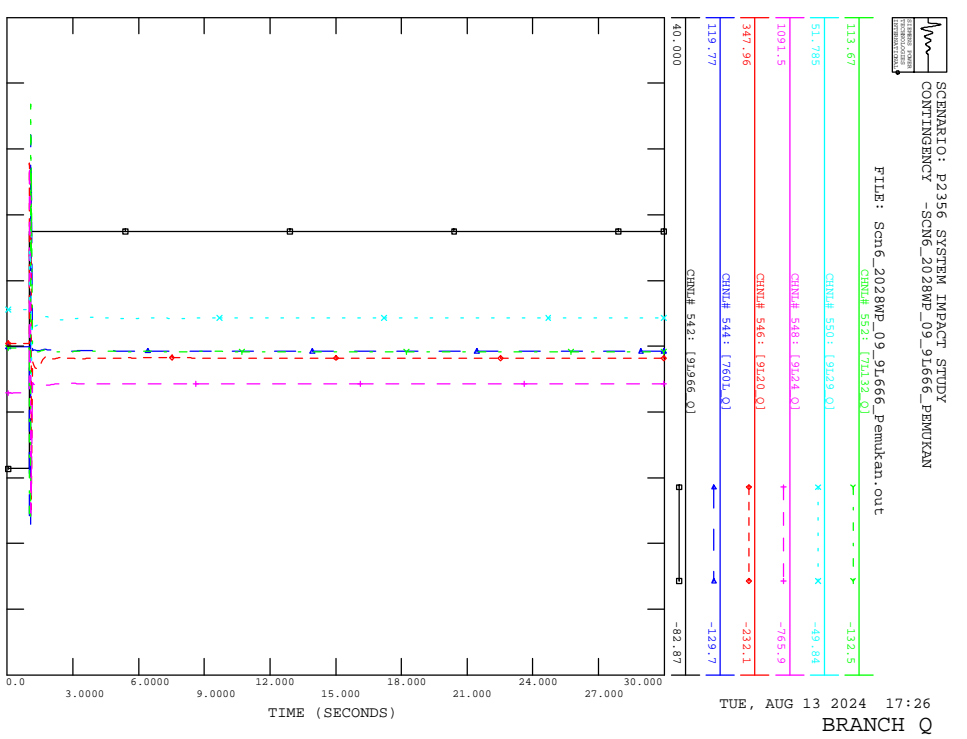
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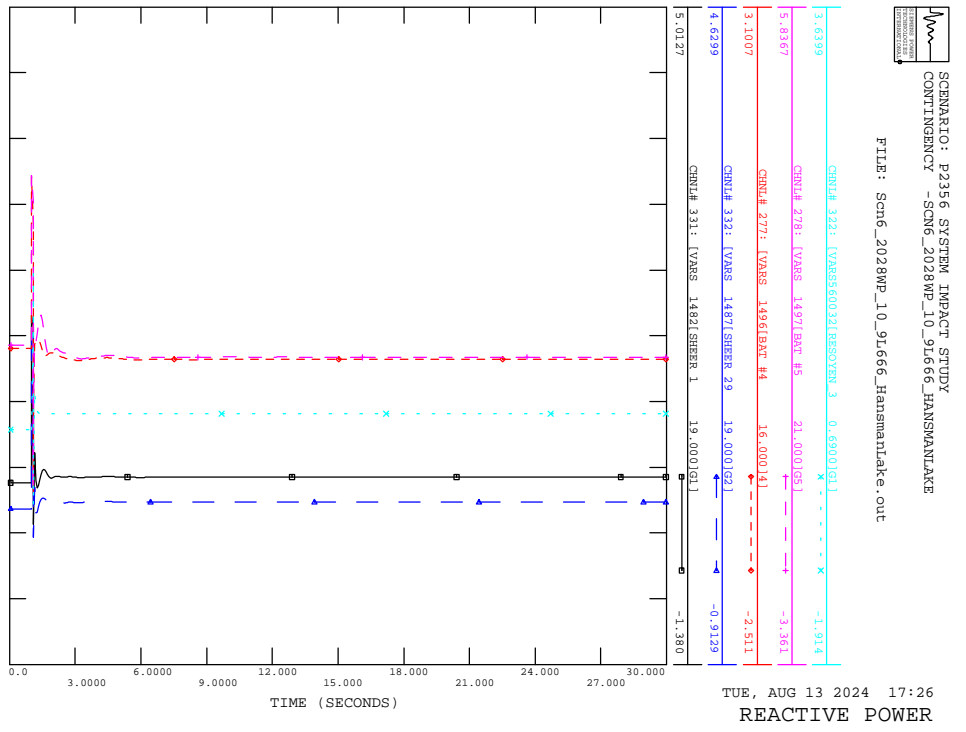
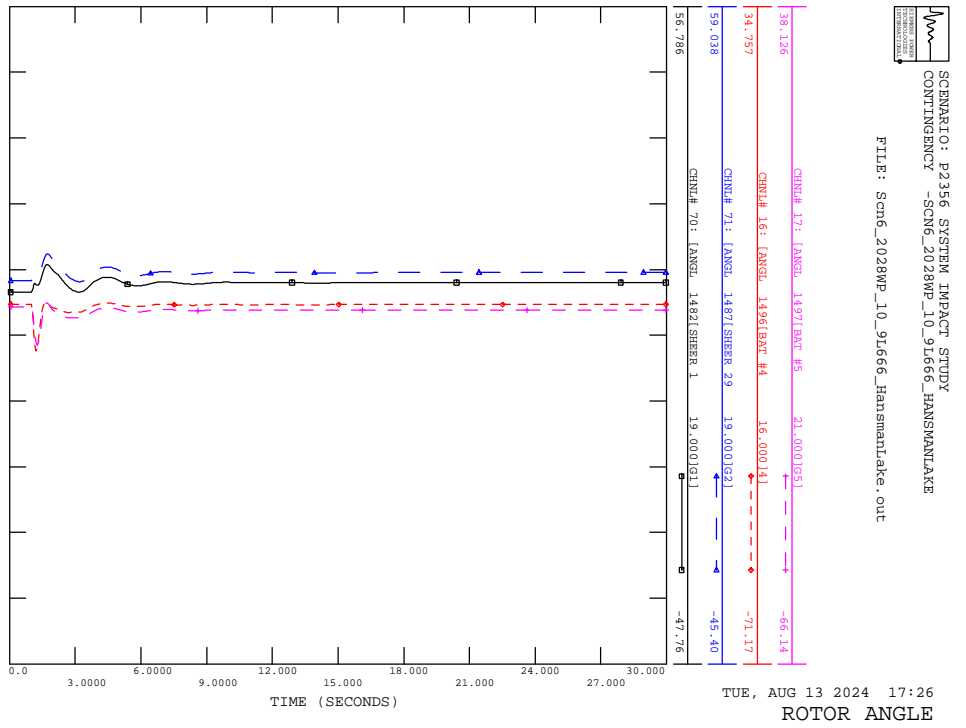
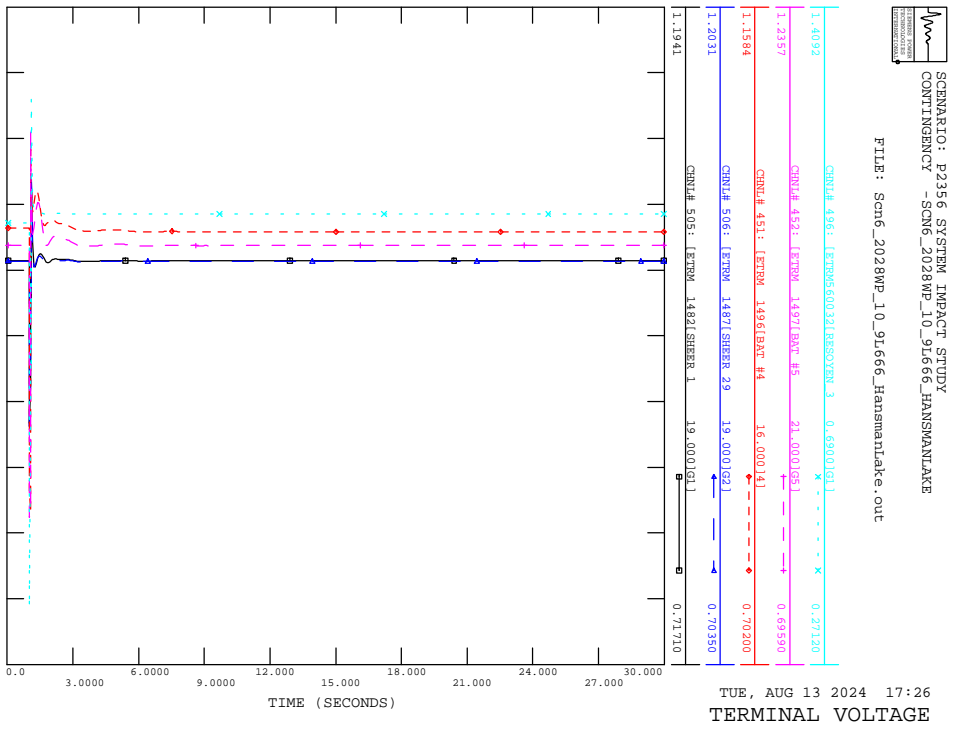
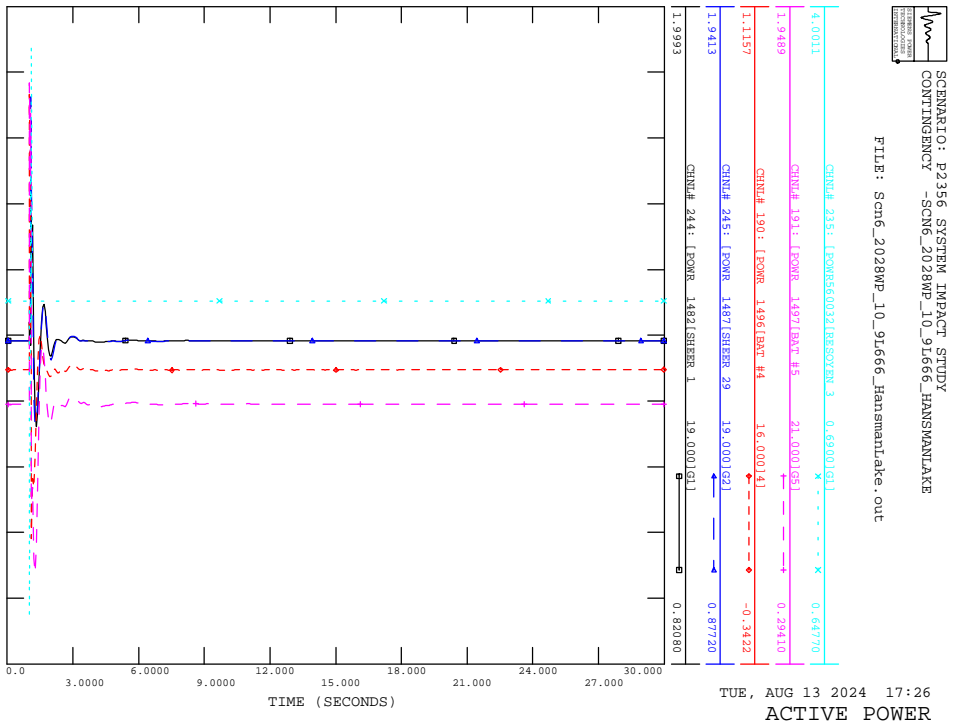


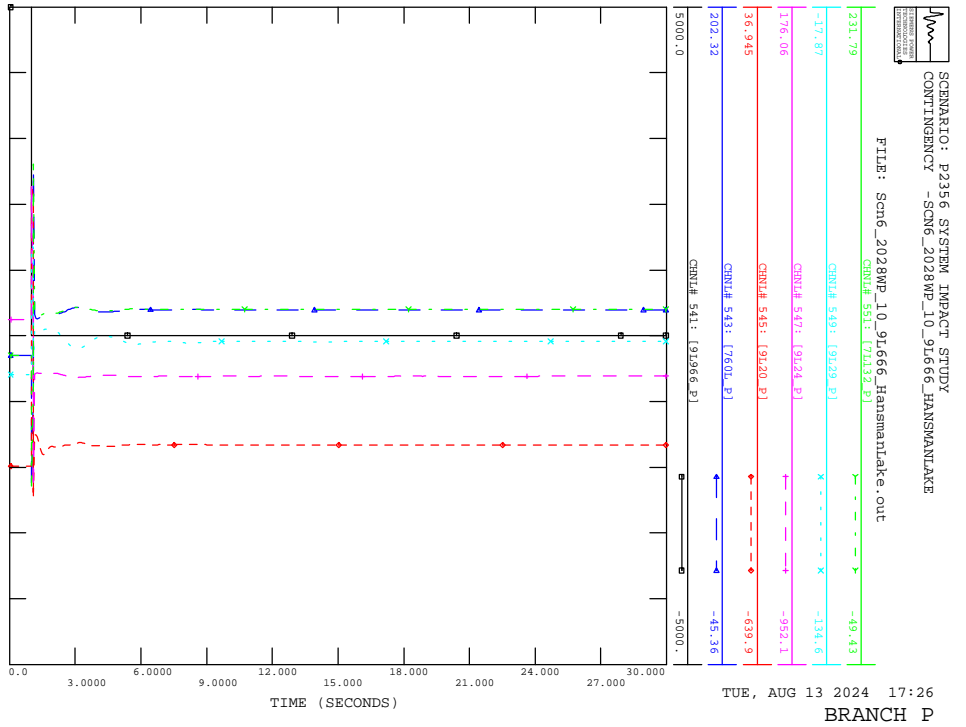
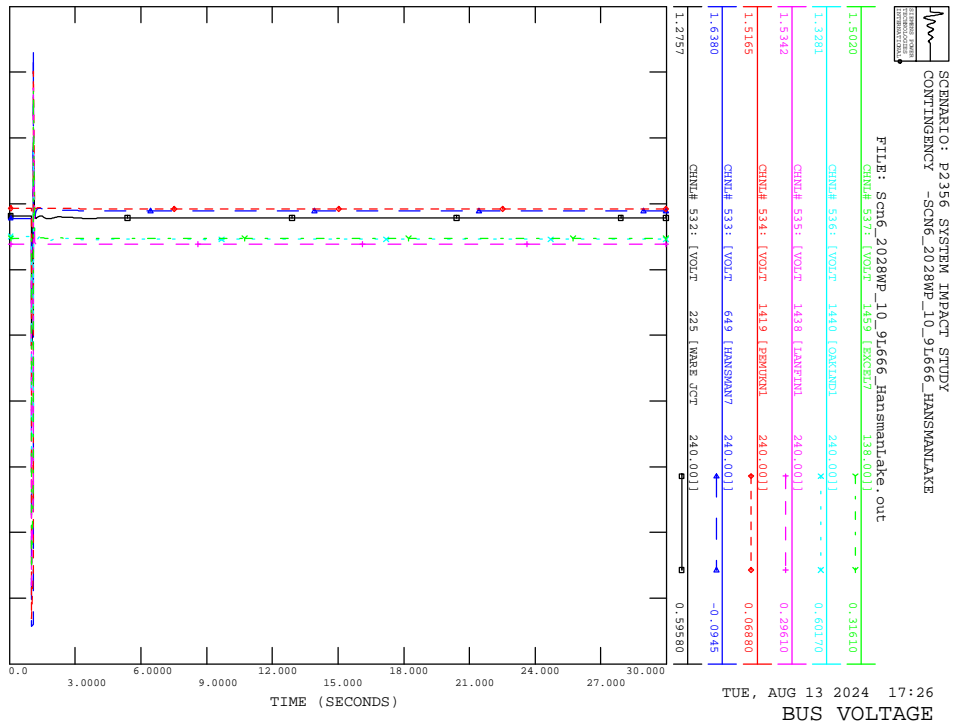
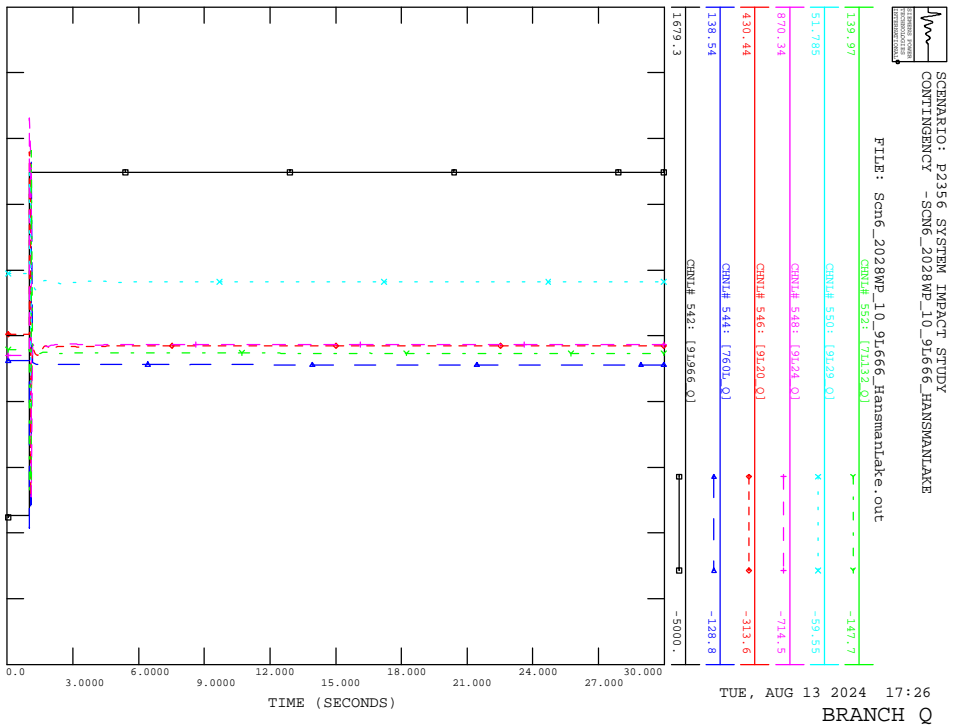
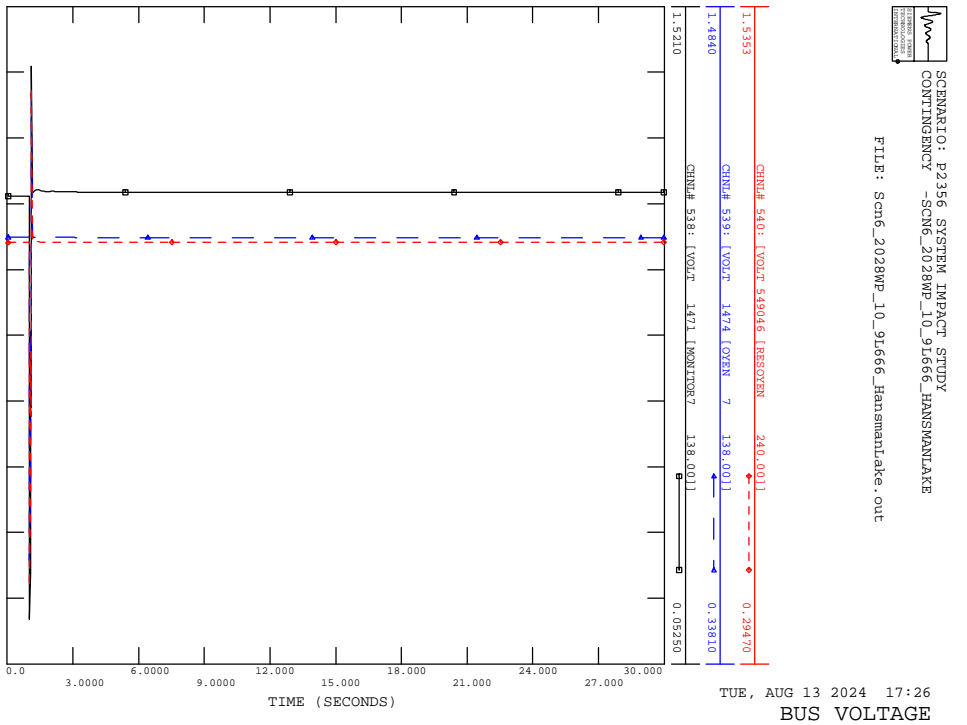
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ROTOR ANGLE

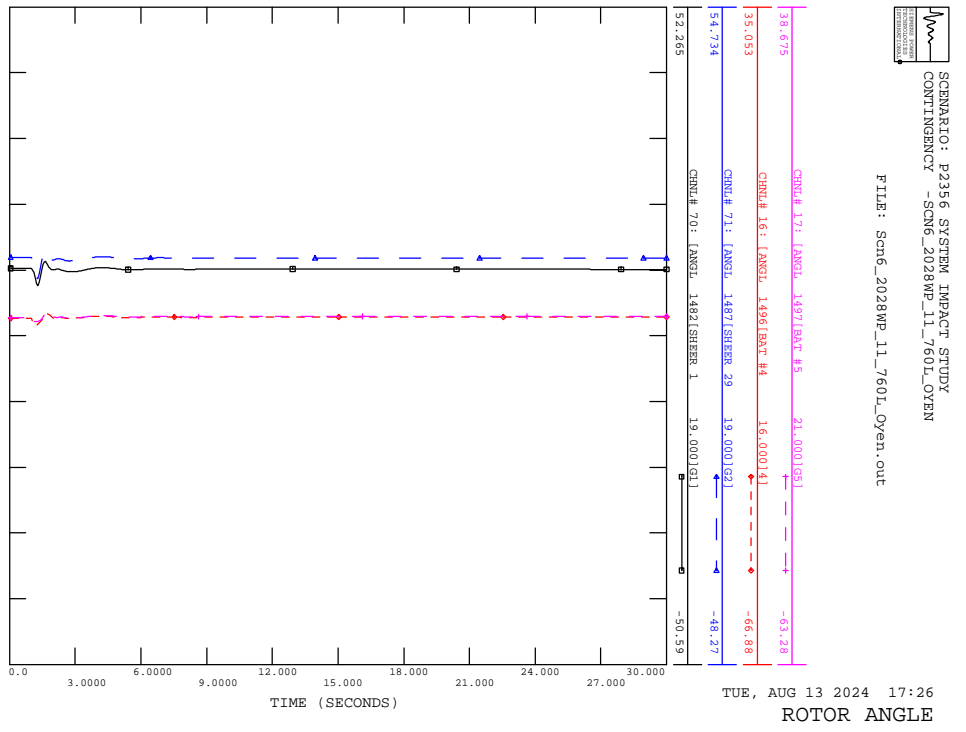
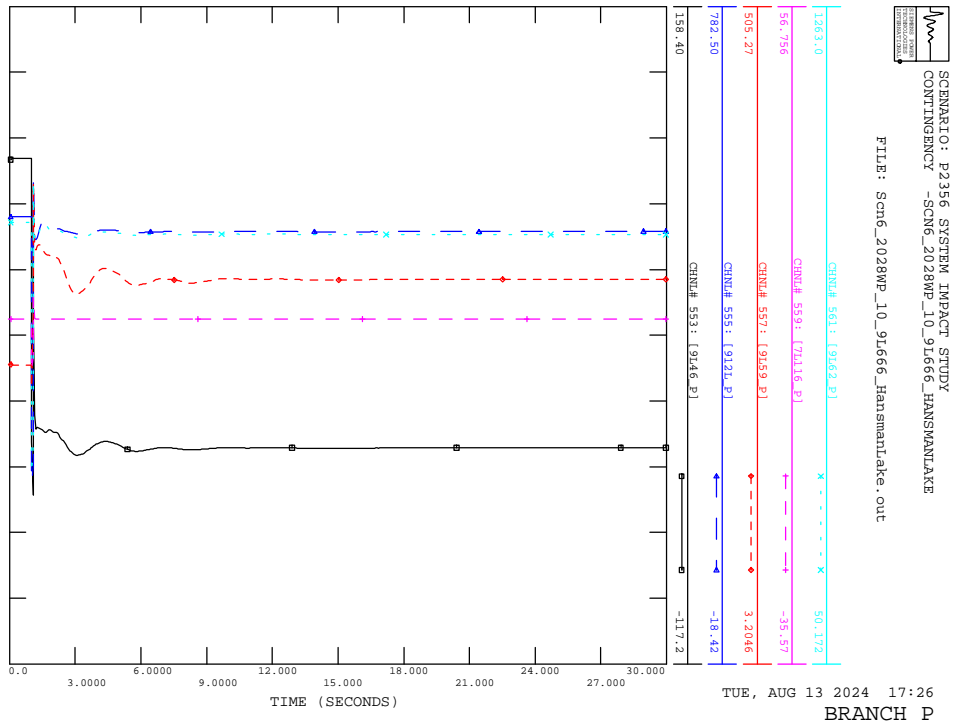
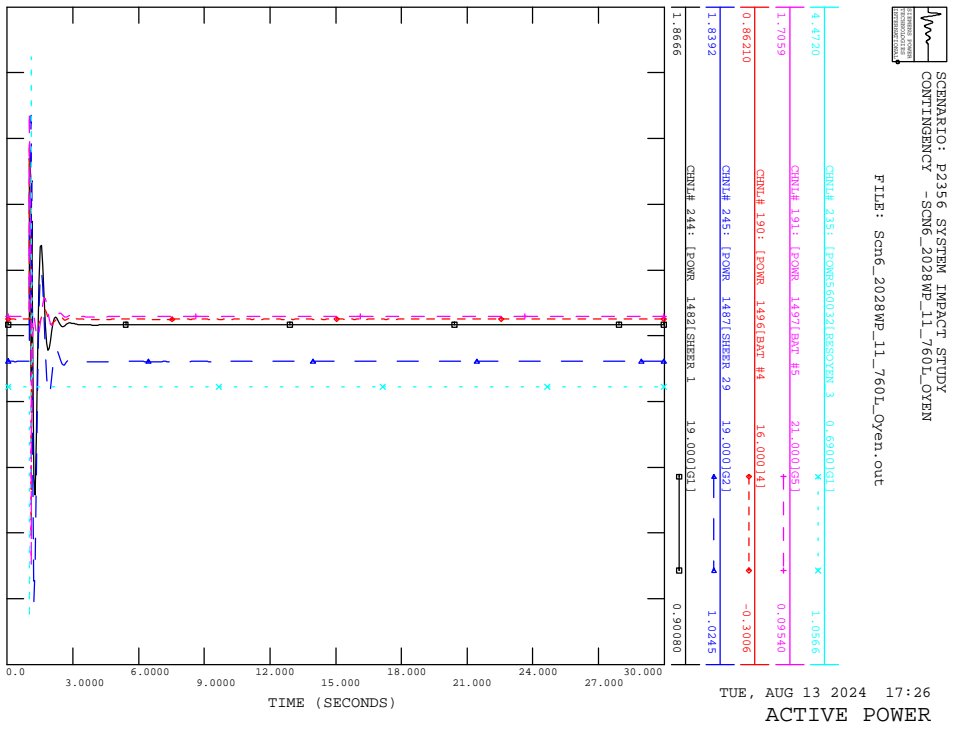
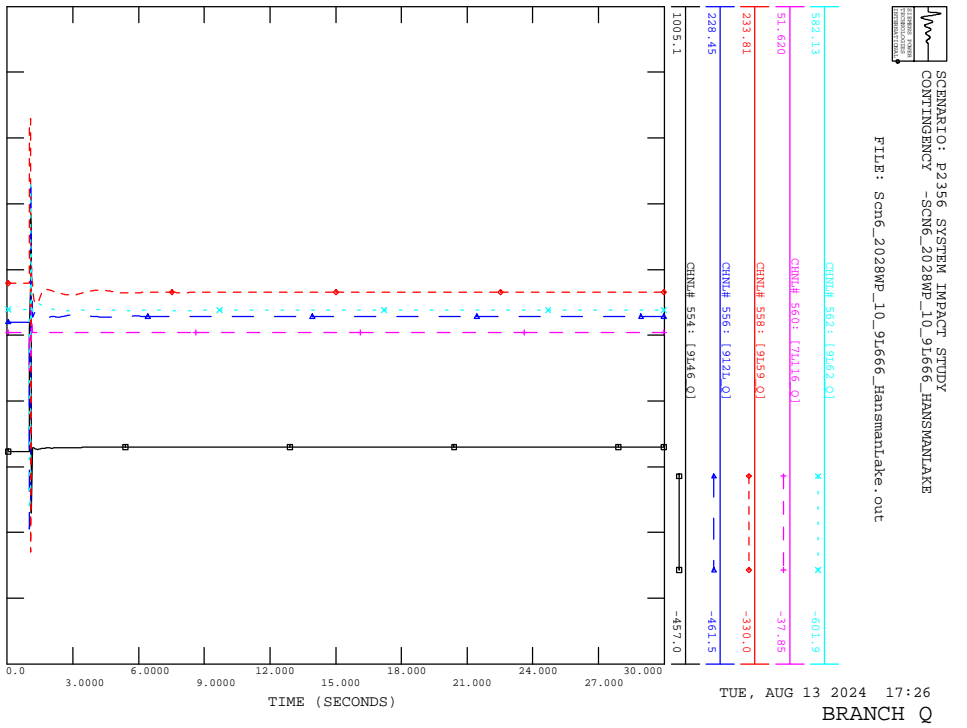


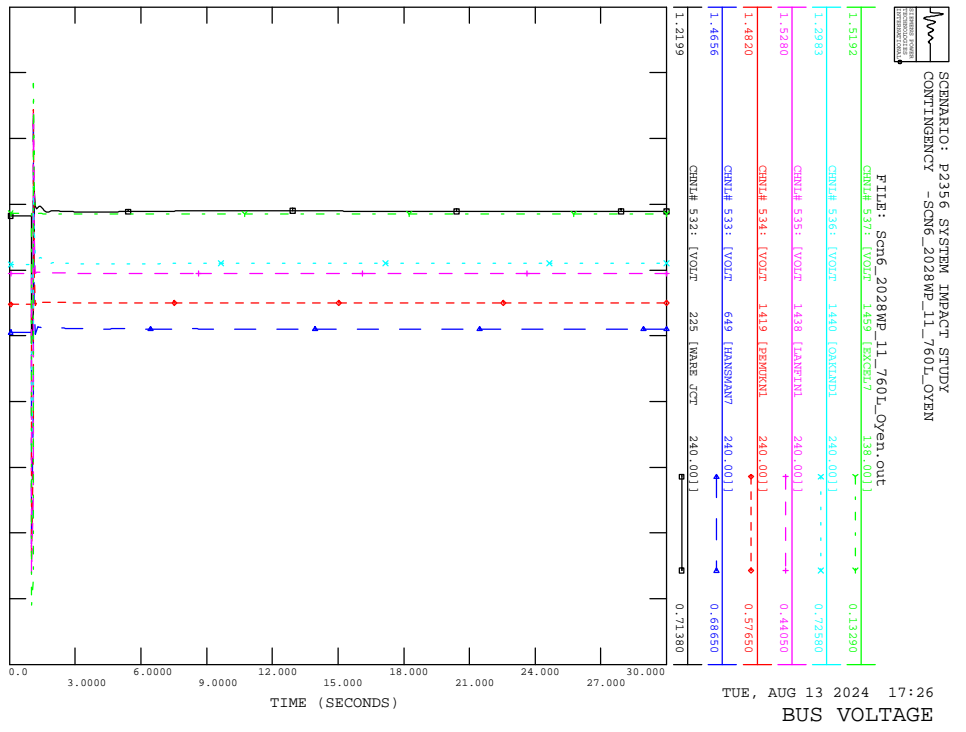
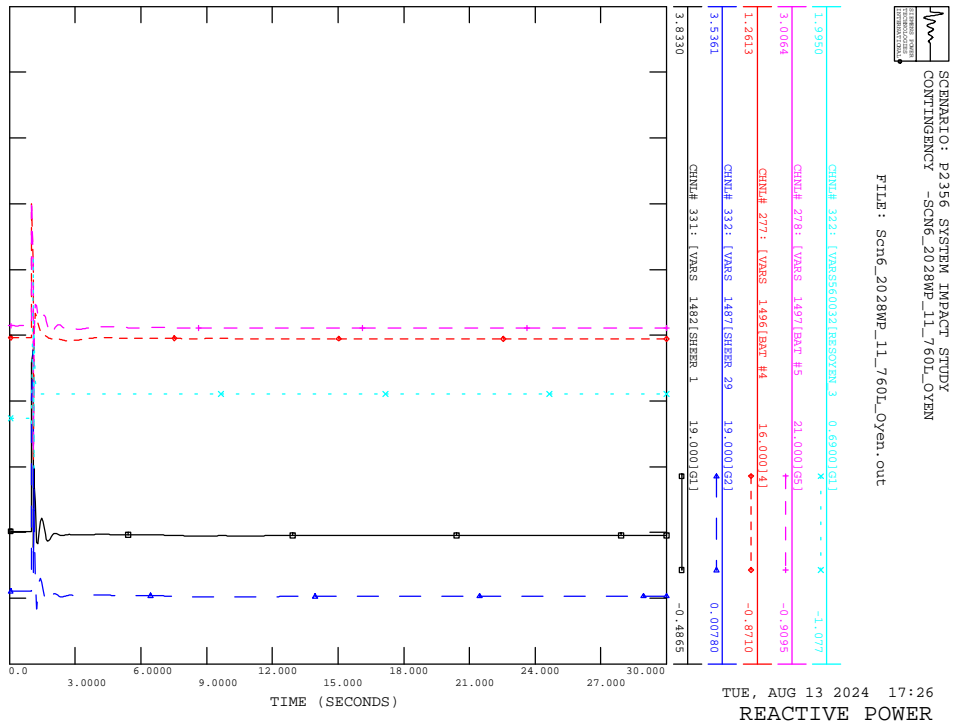
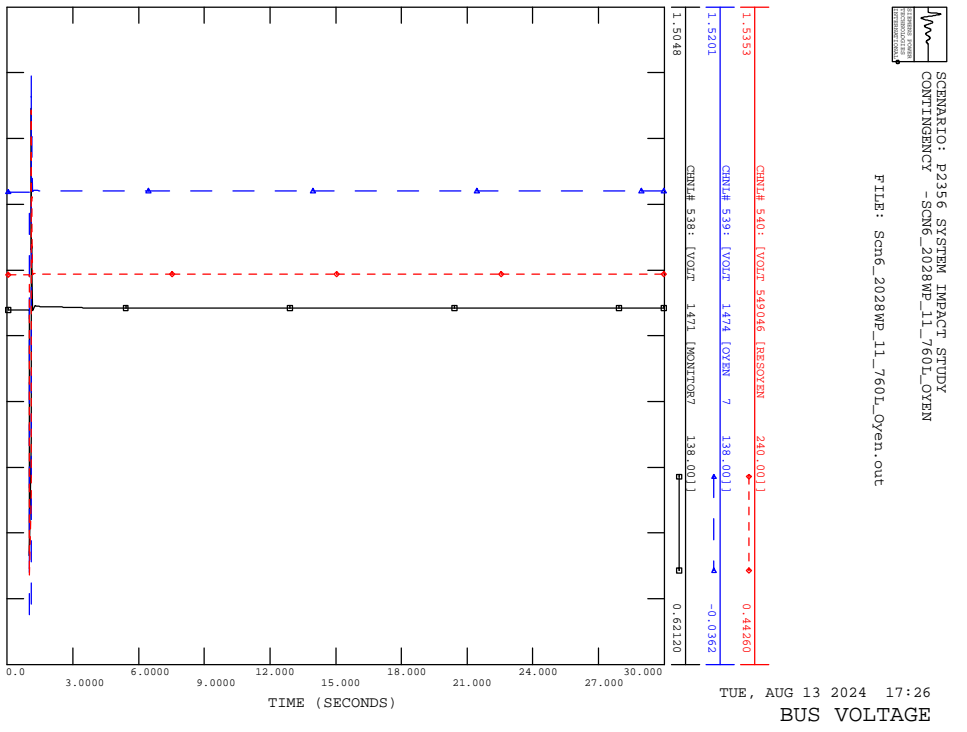
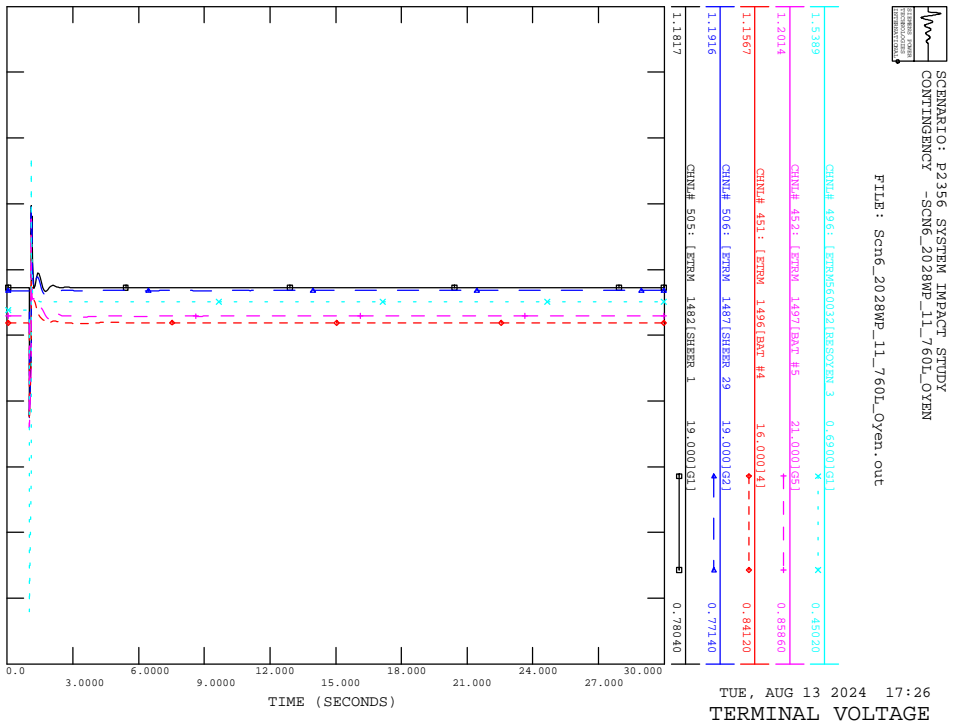


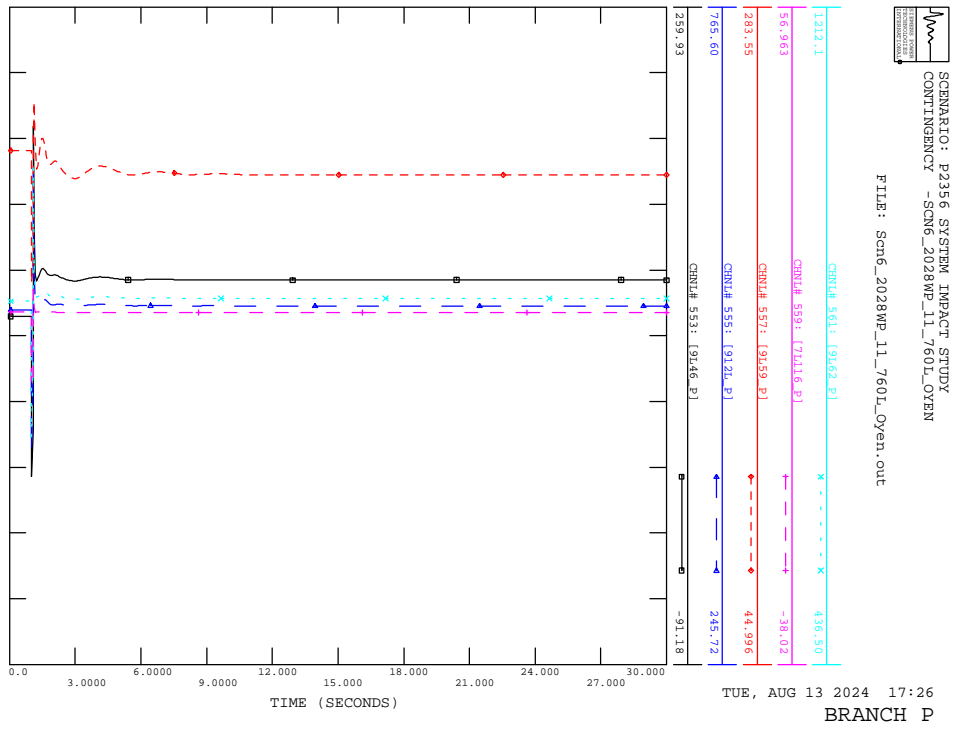
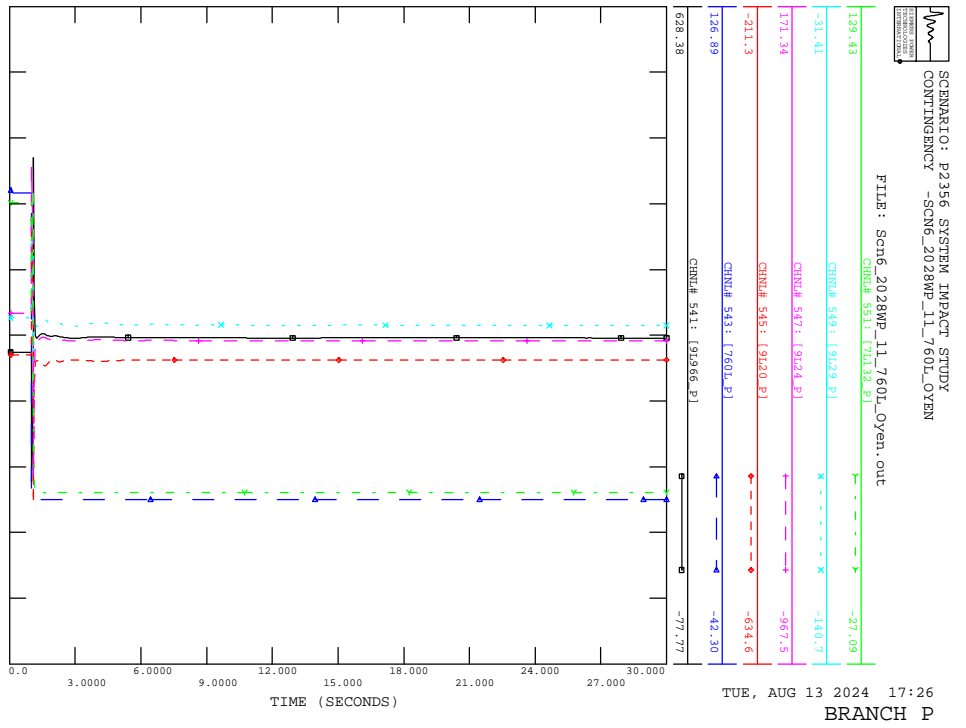
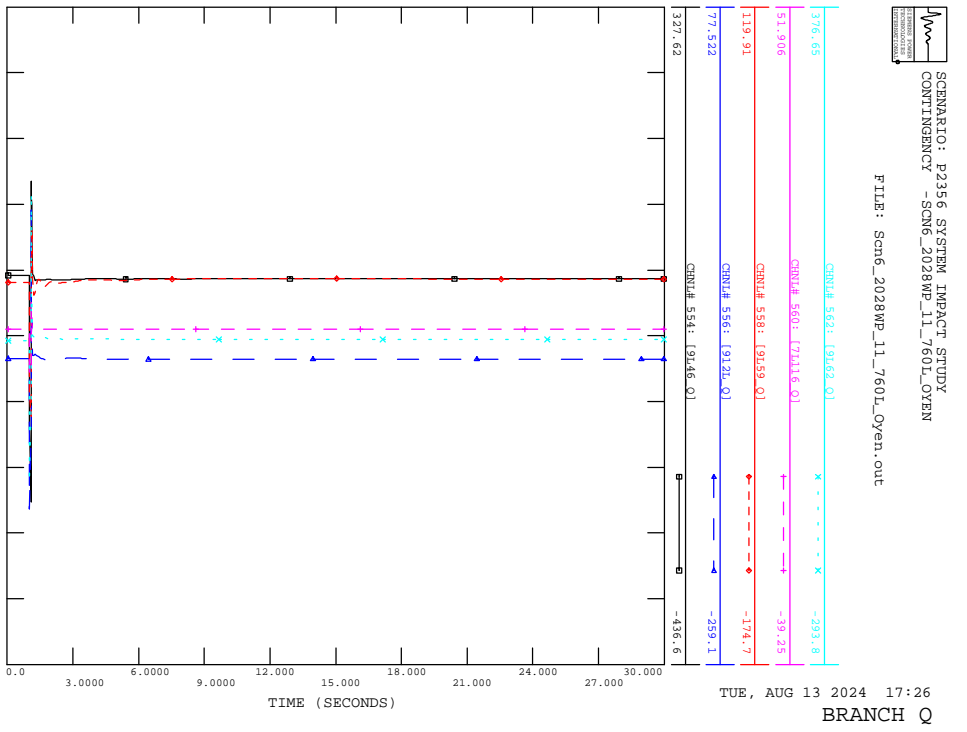
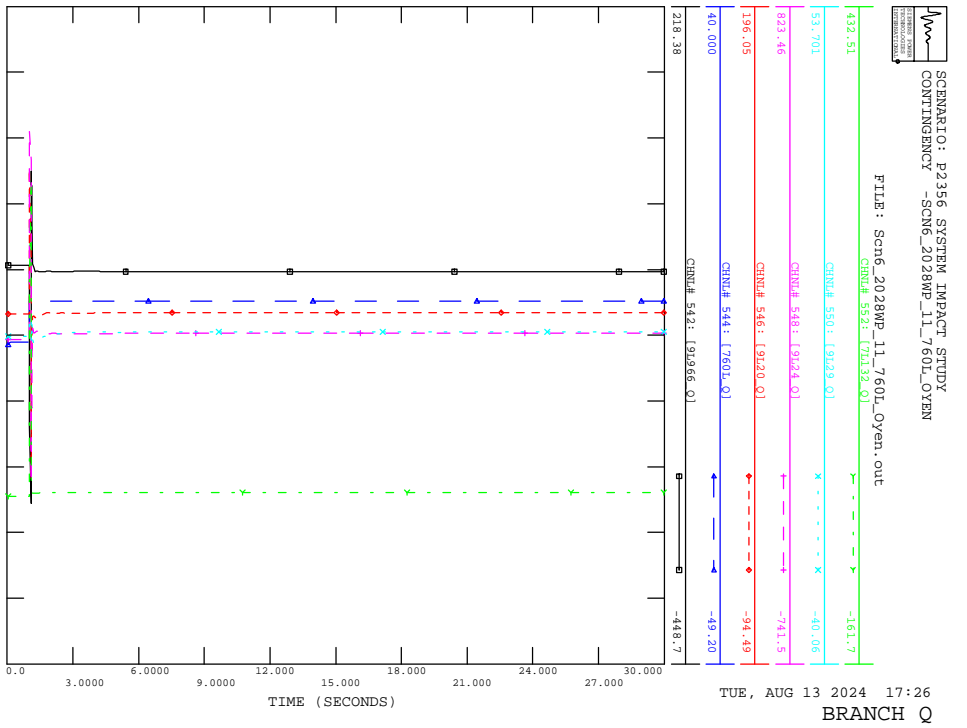


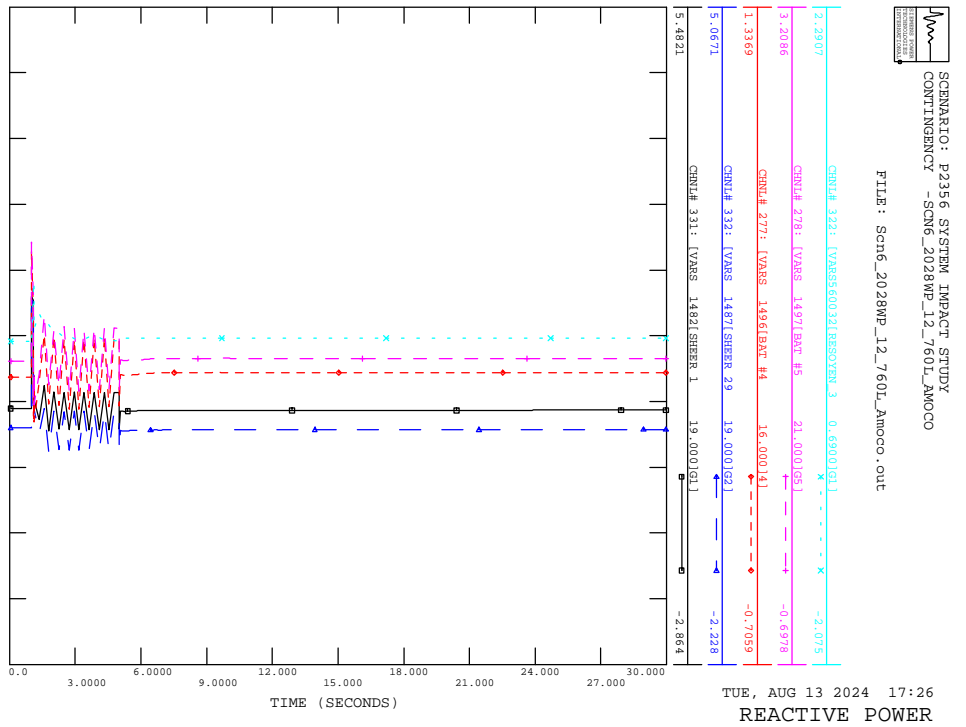
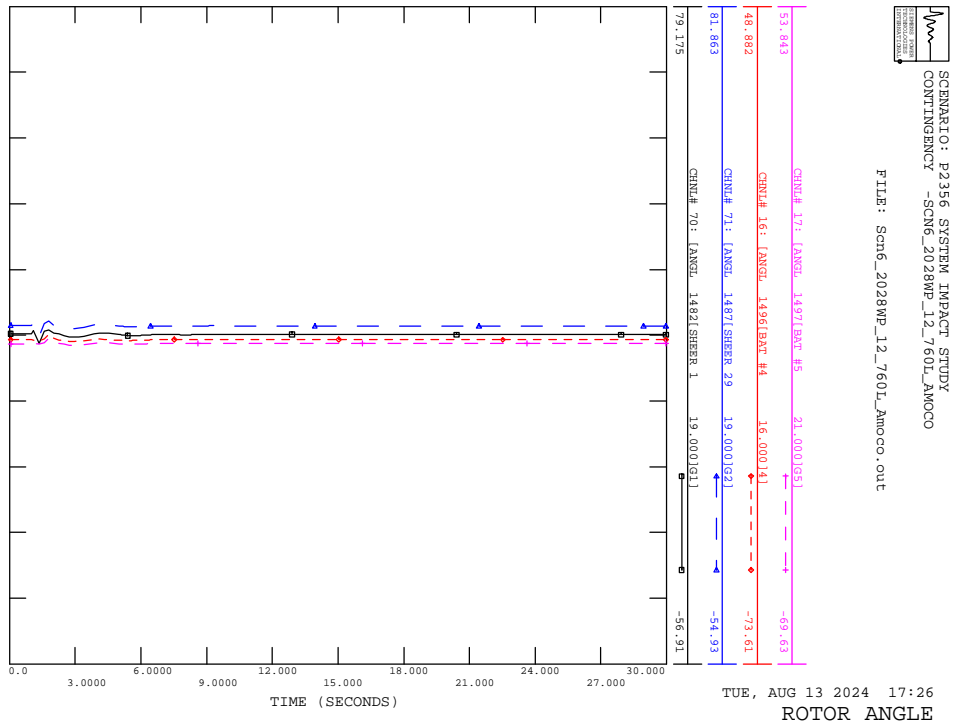
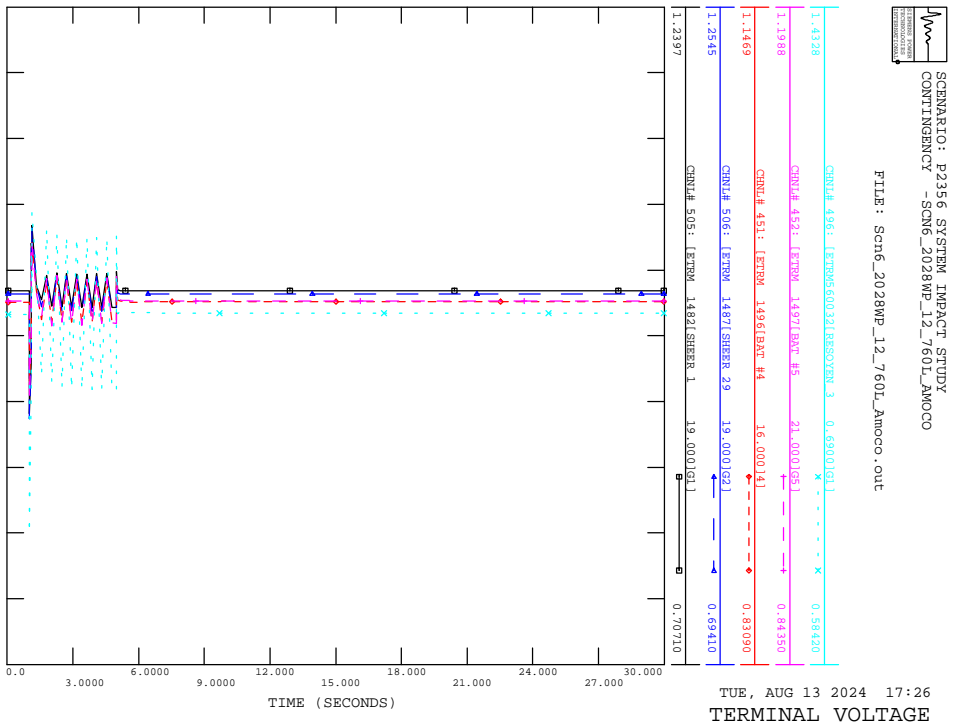
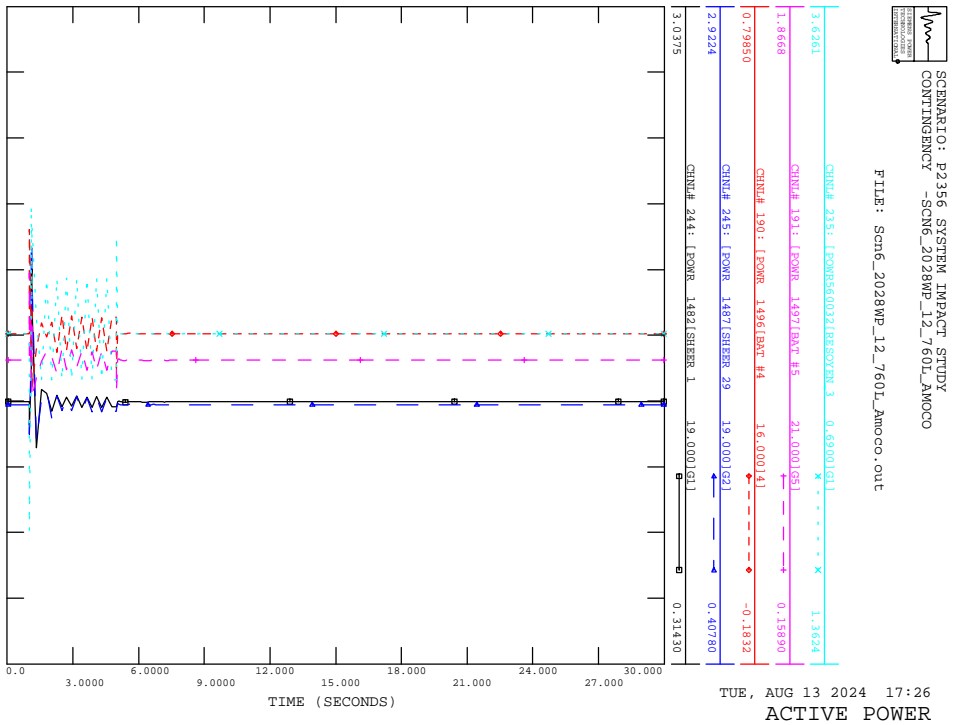


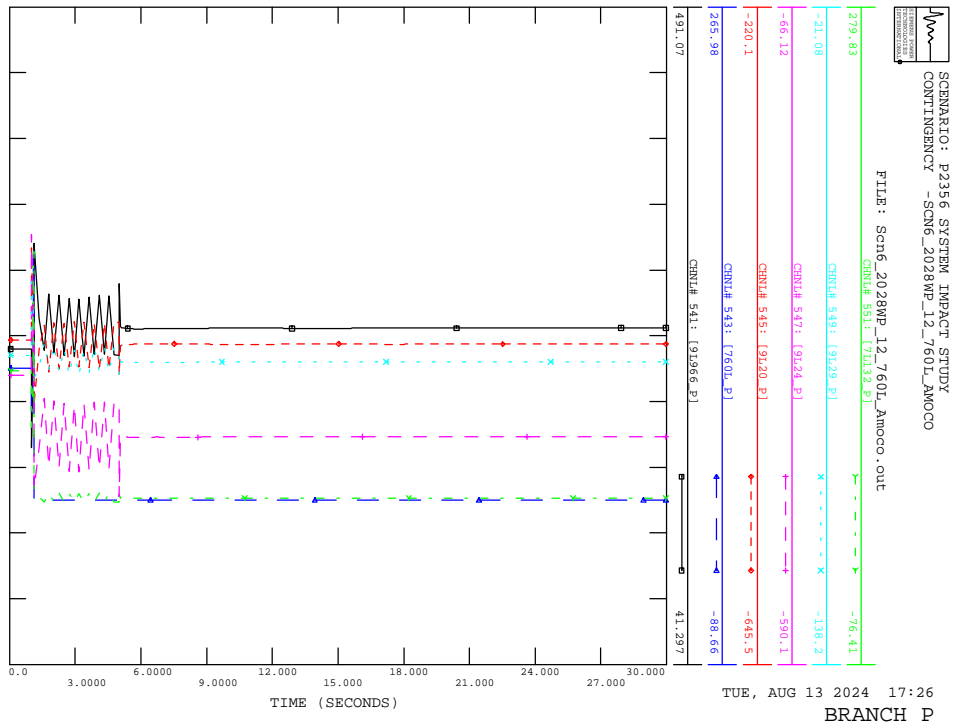
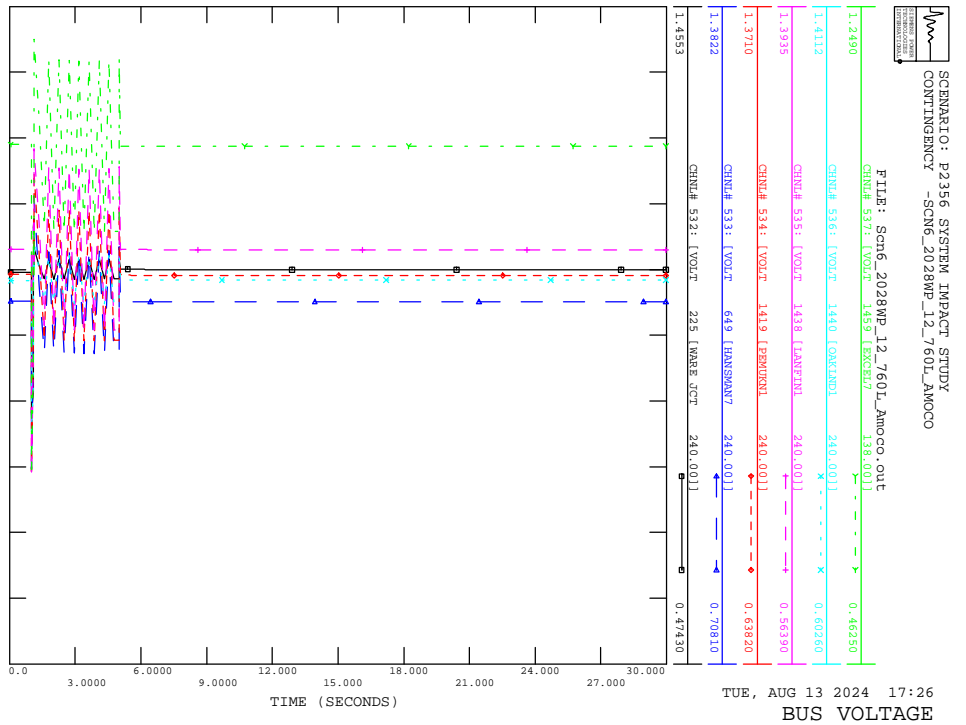
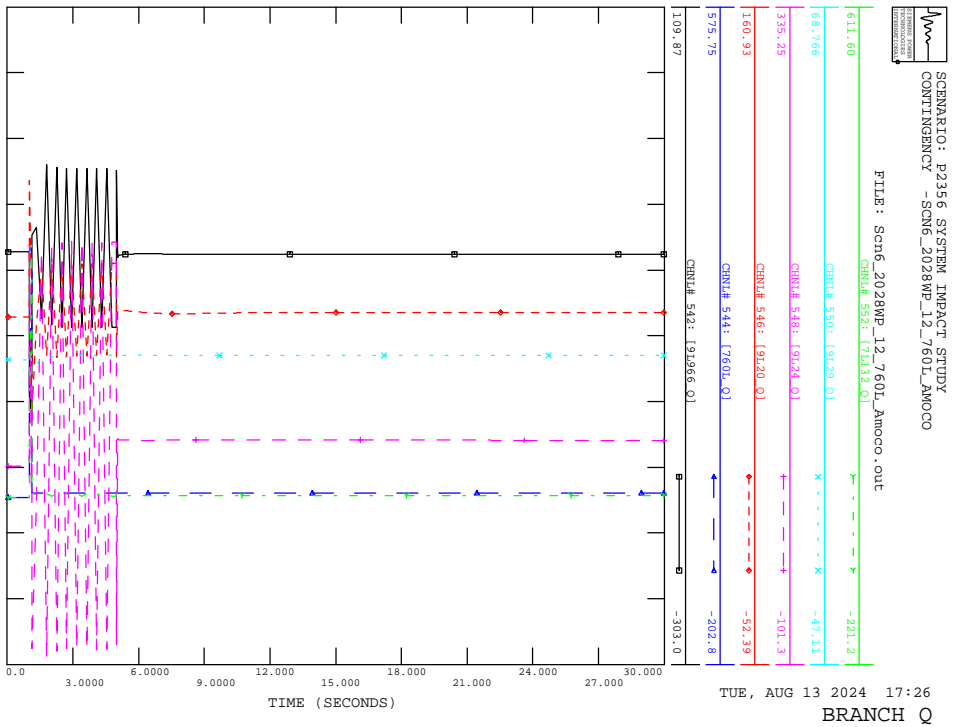
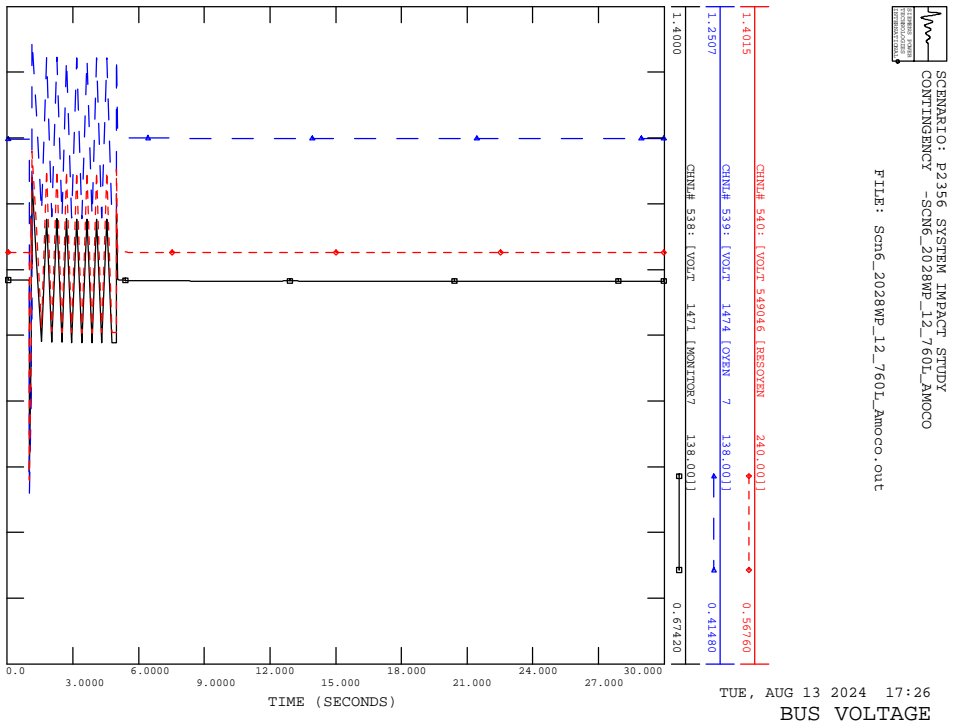


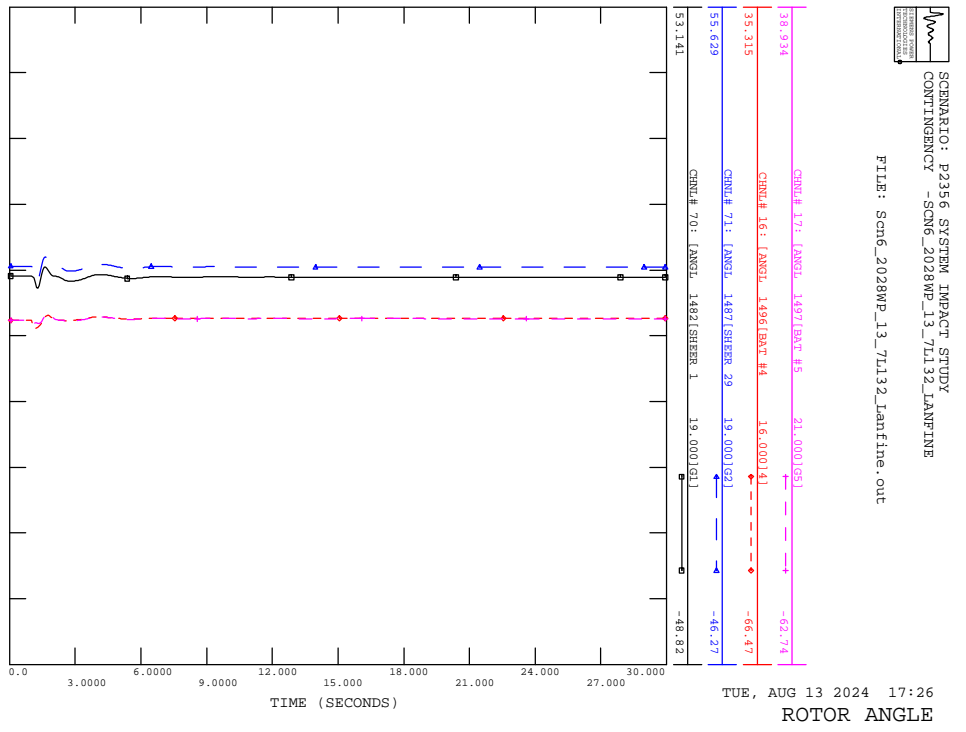
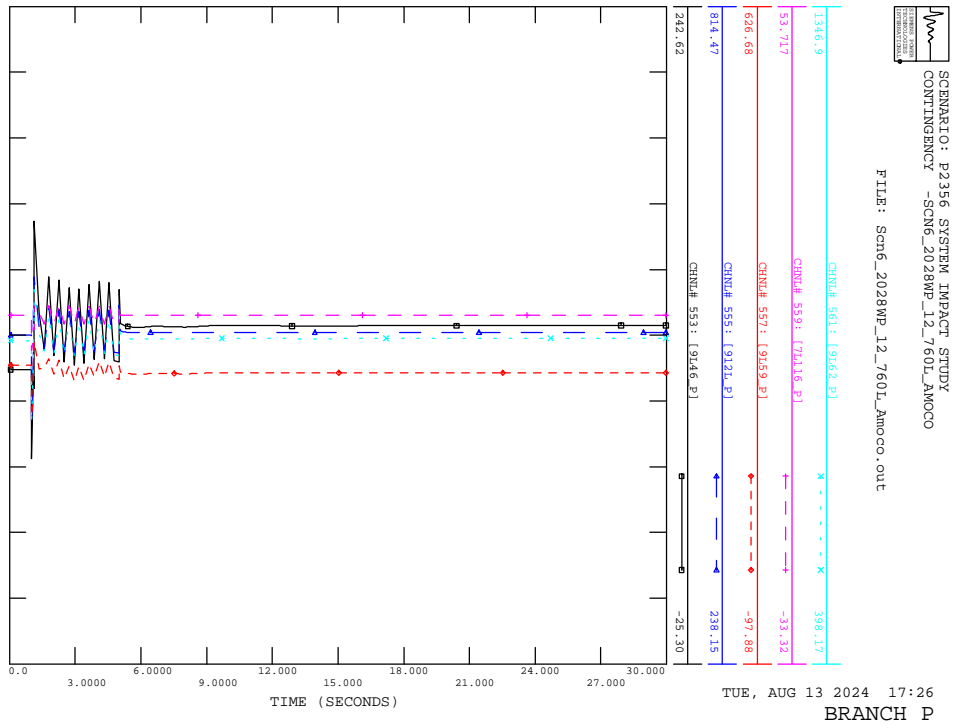
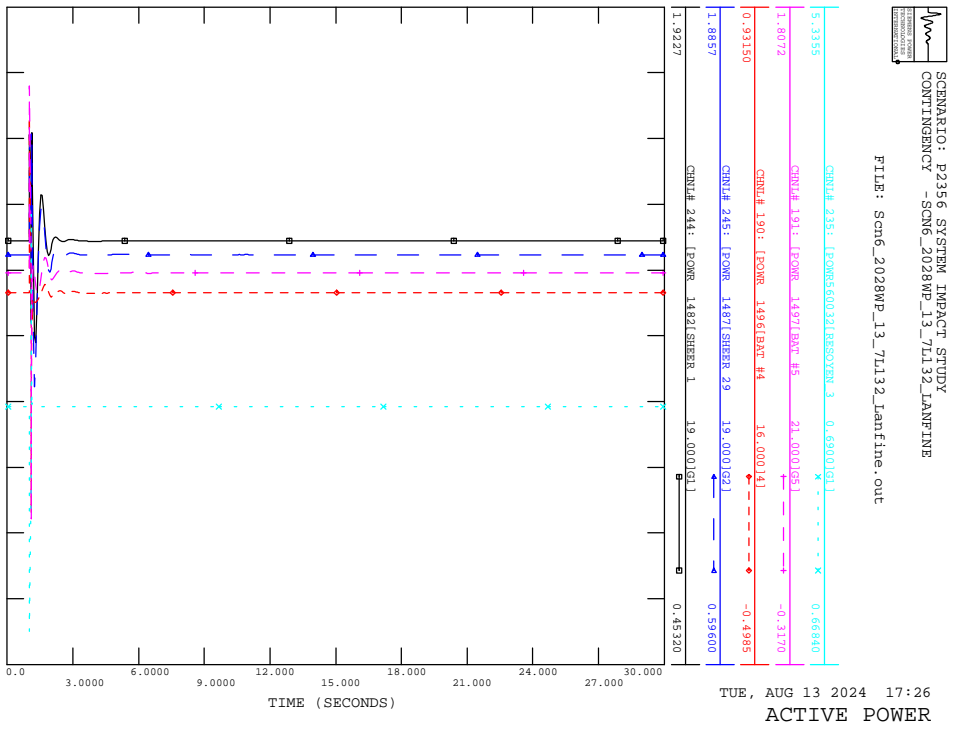
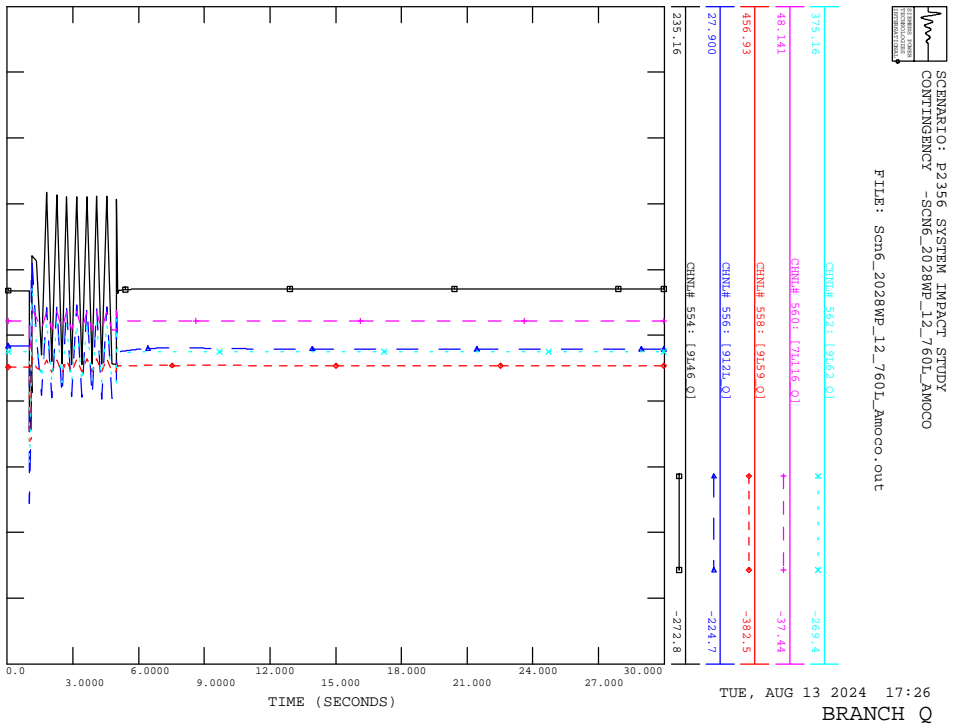




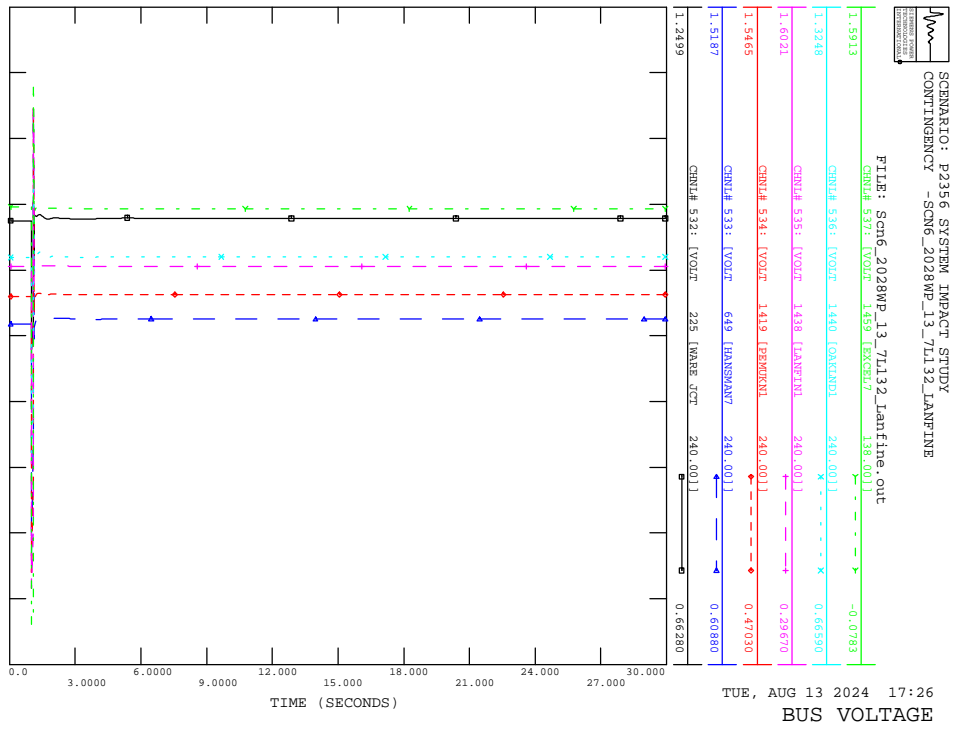
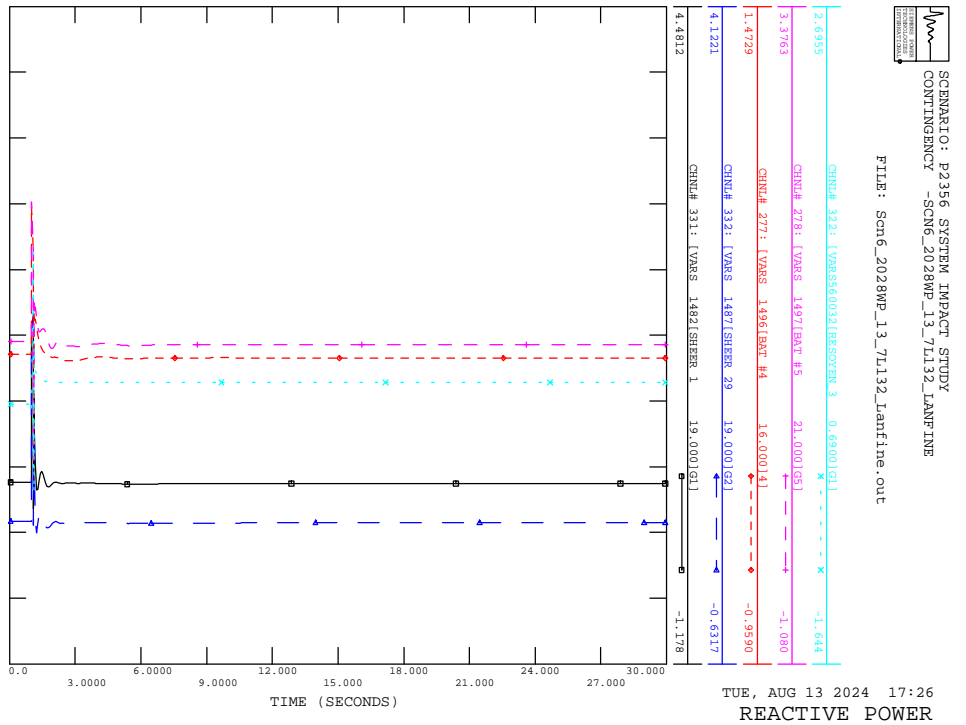
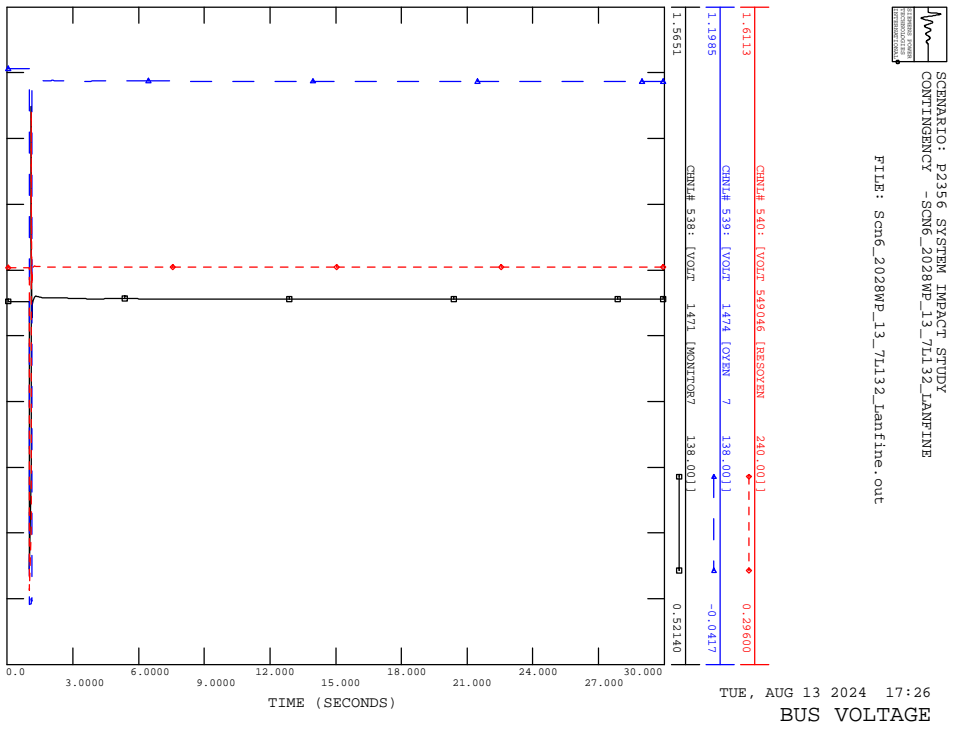
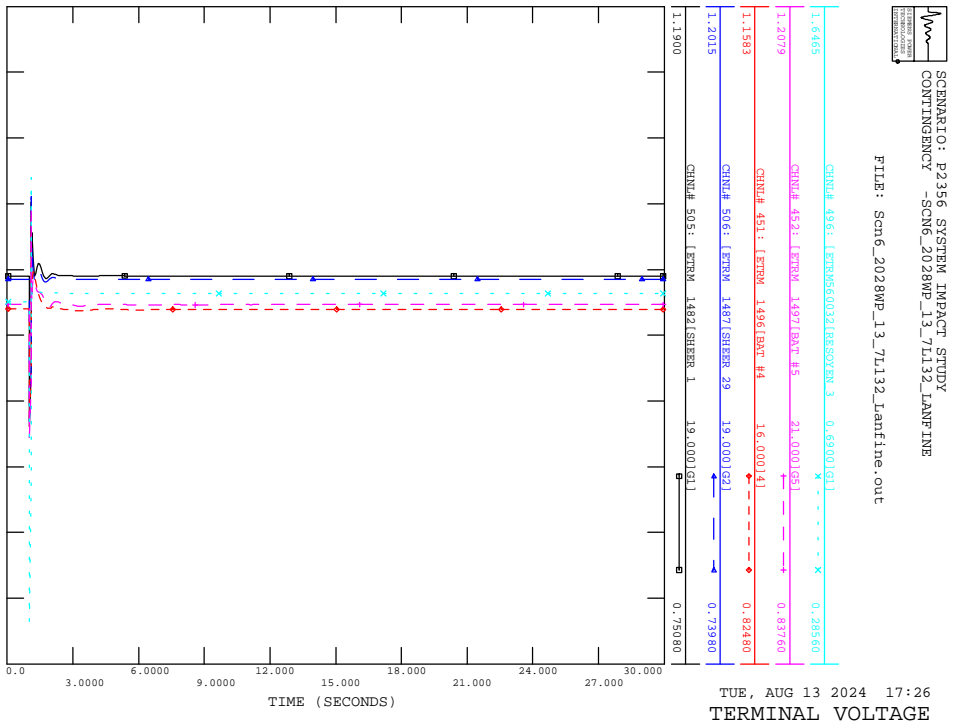


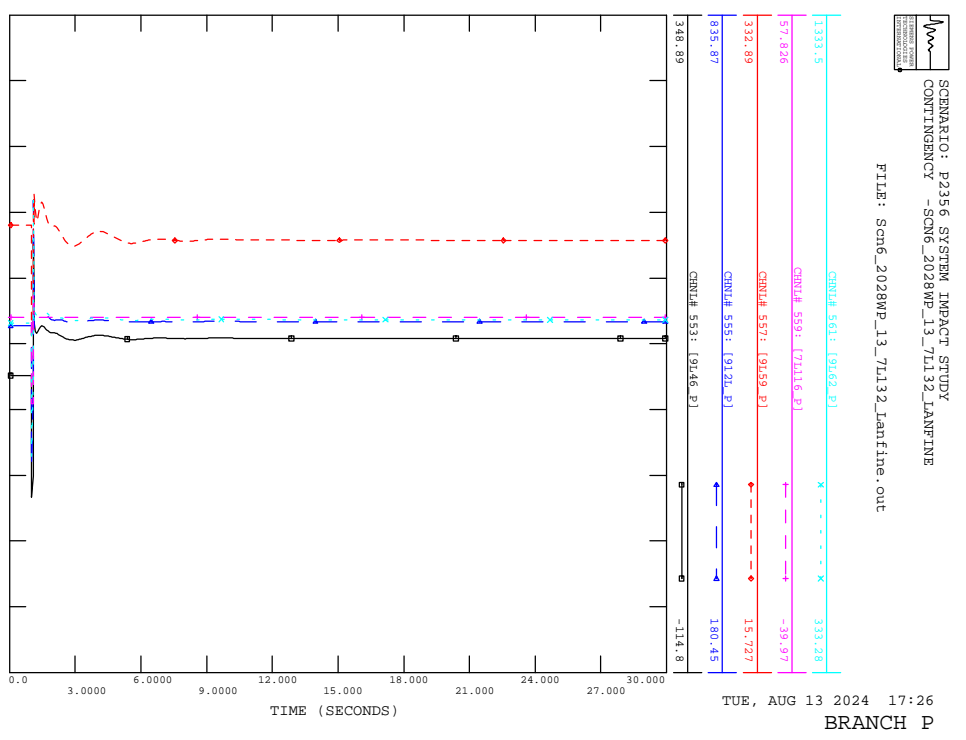
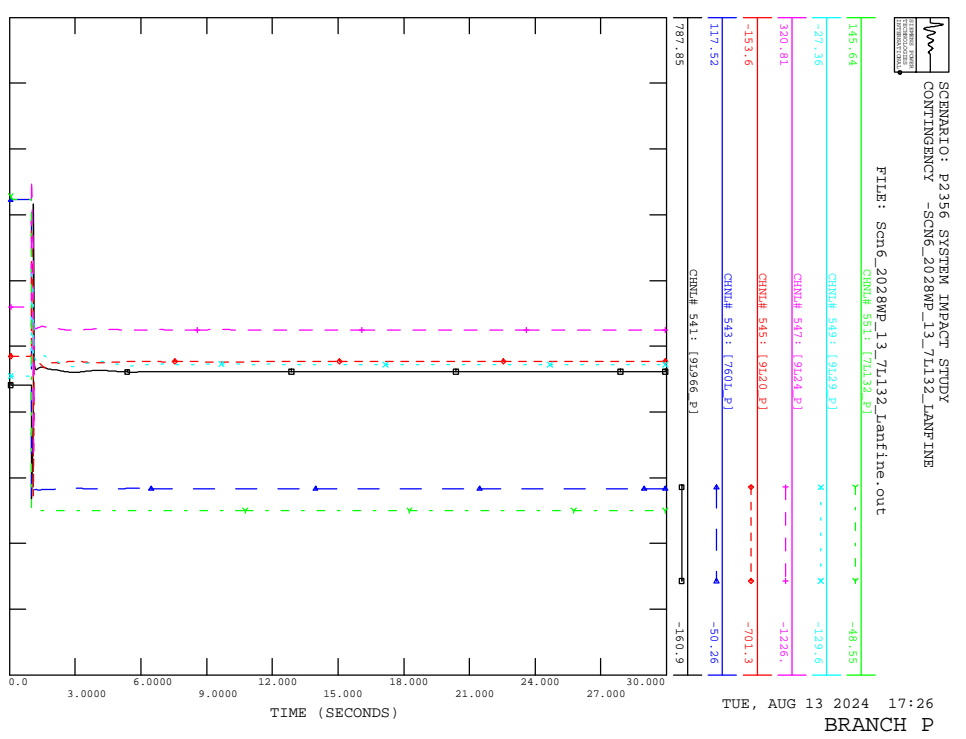
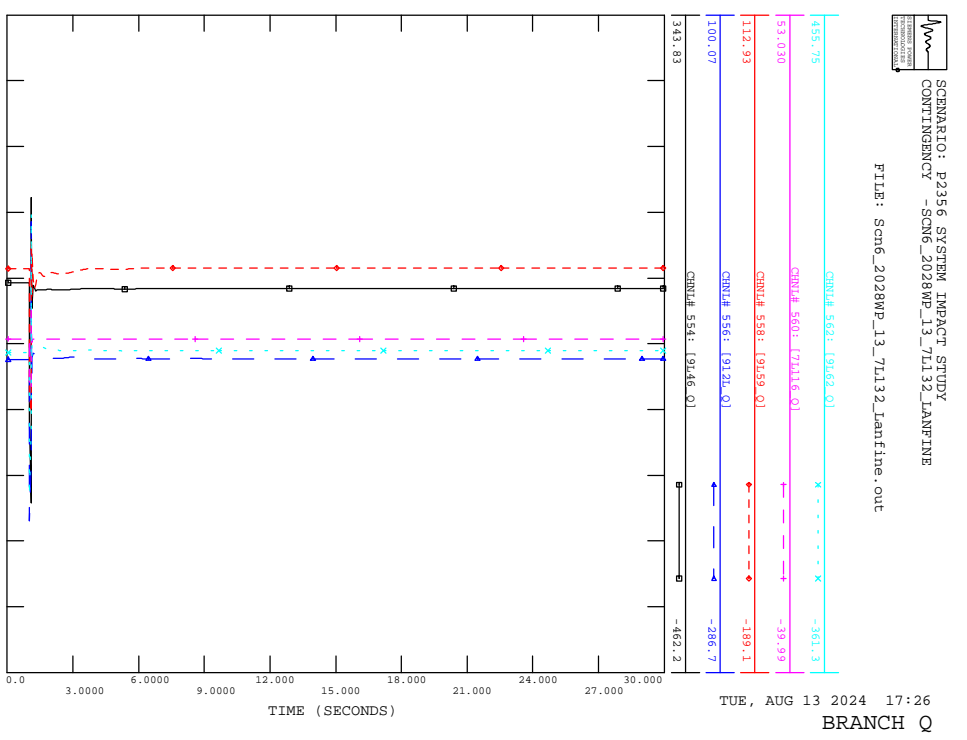
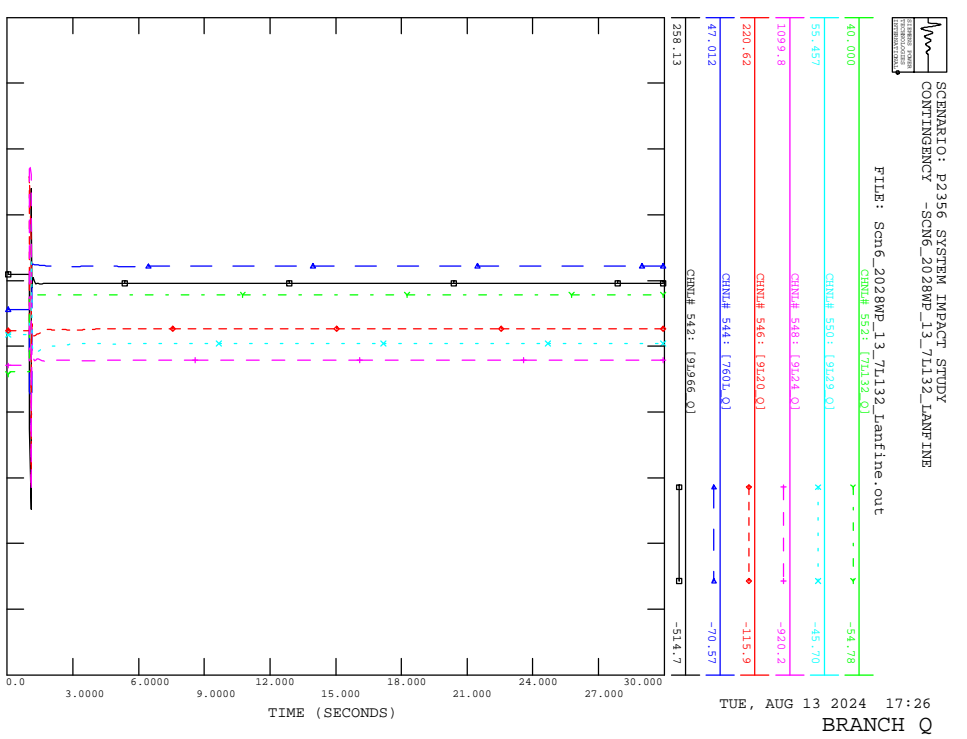


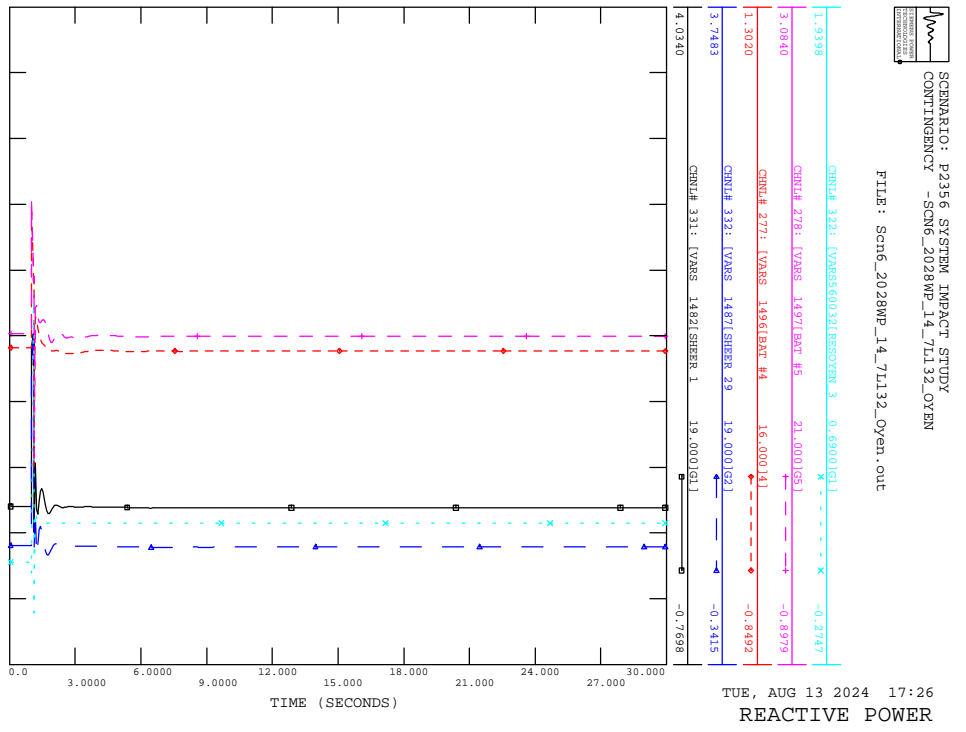
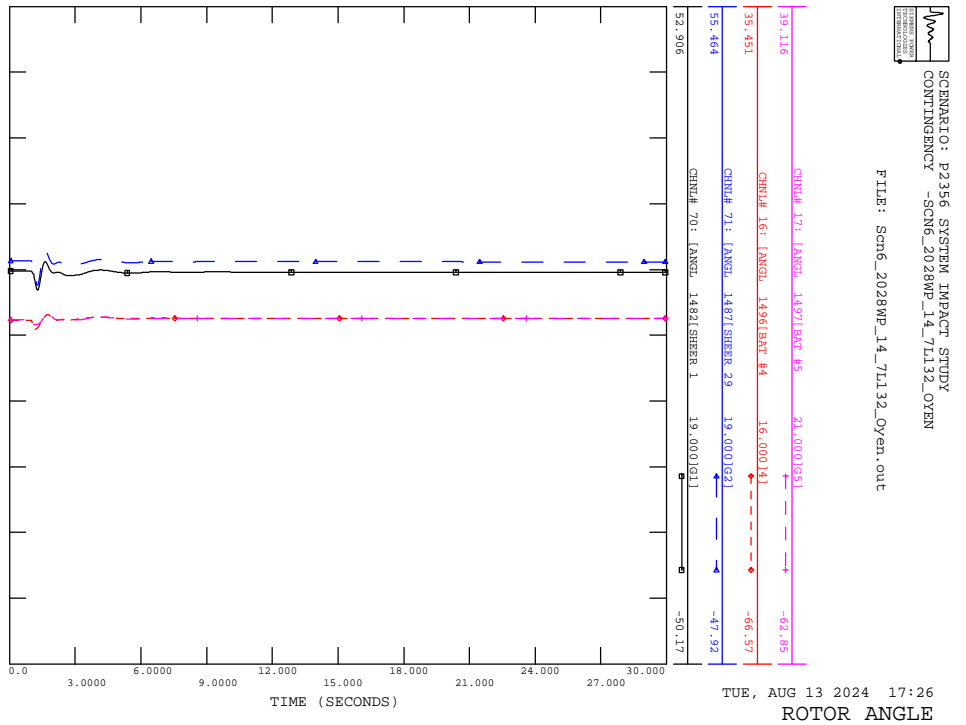
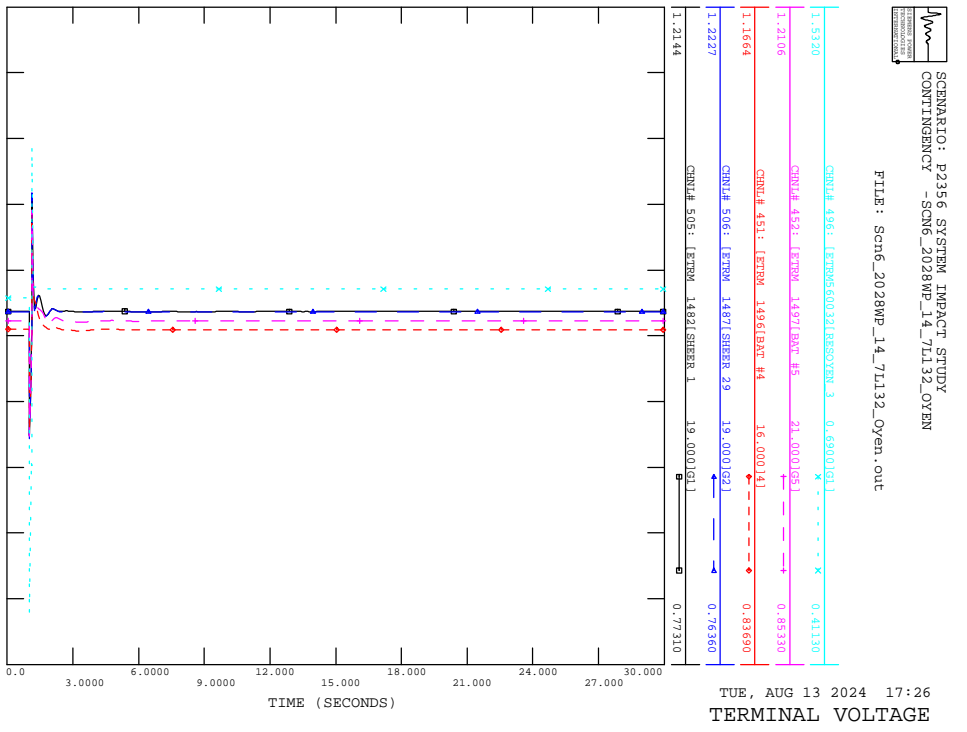
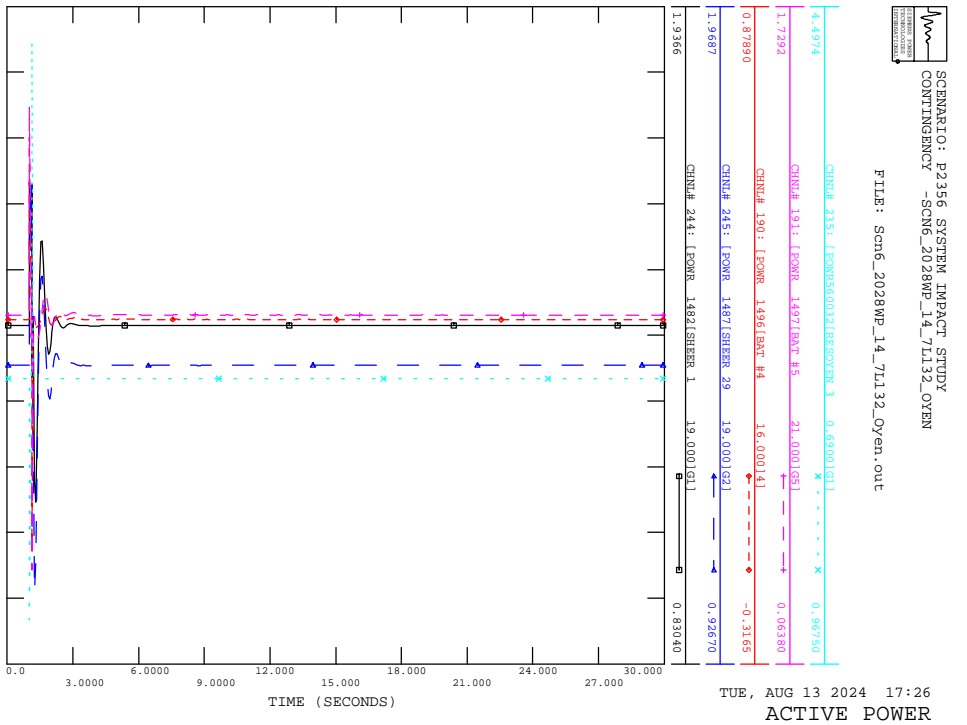


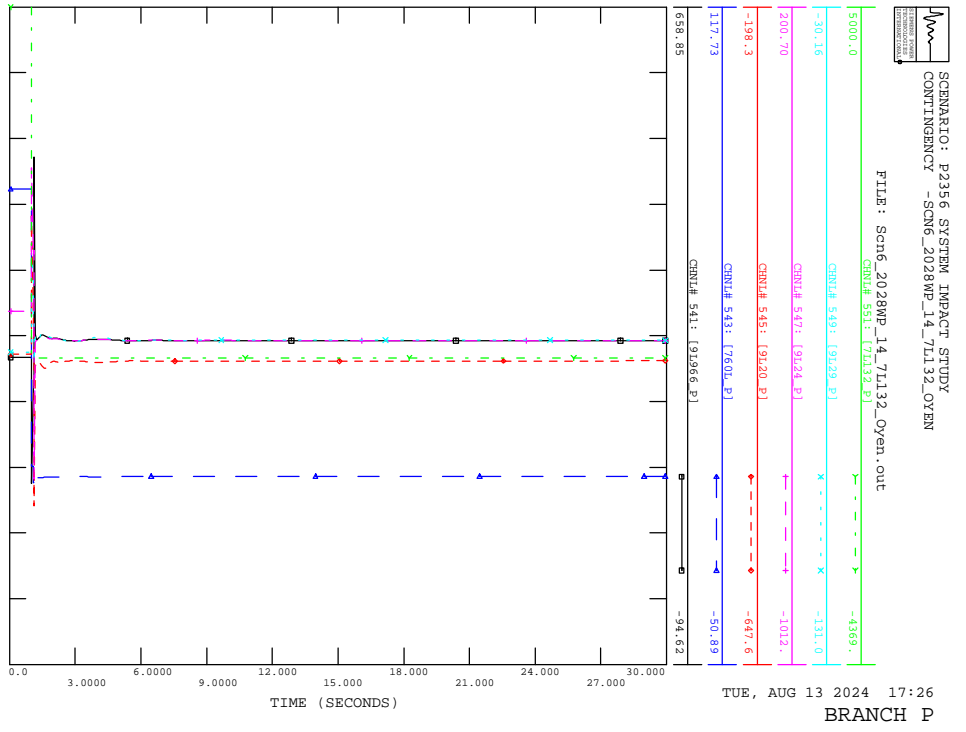
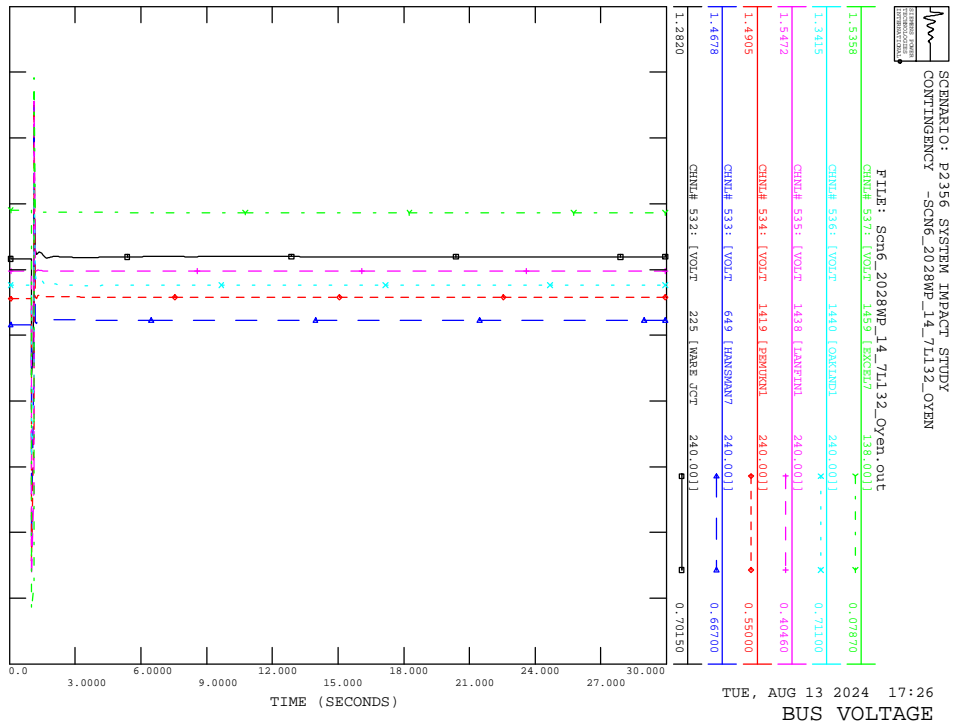
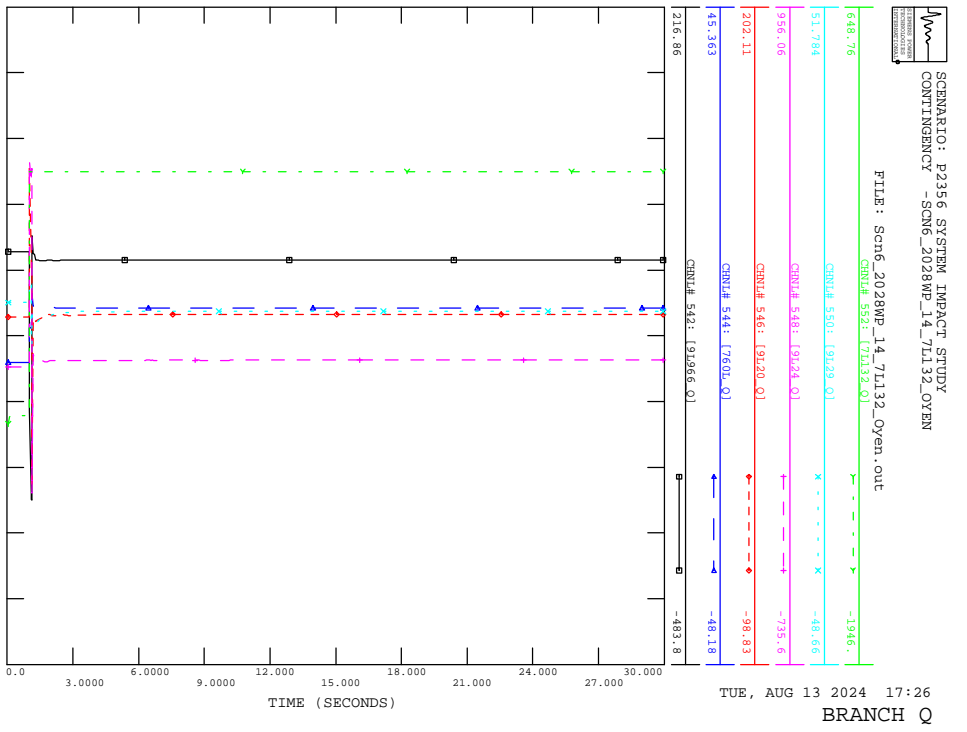
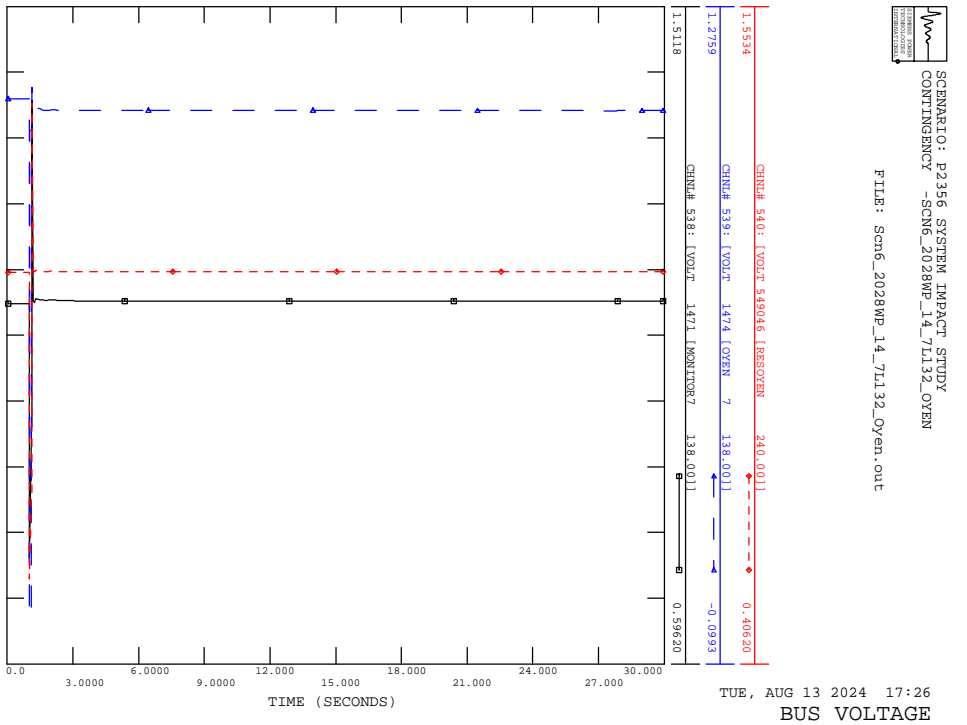


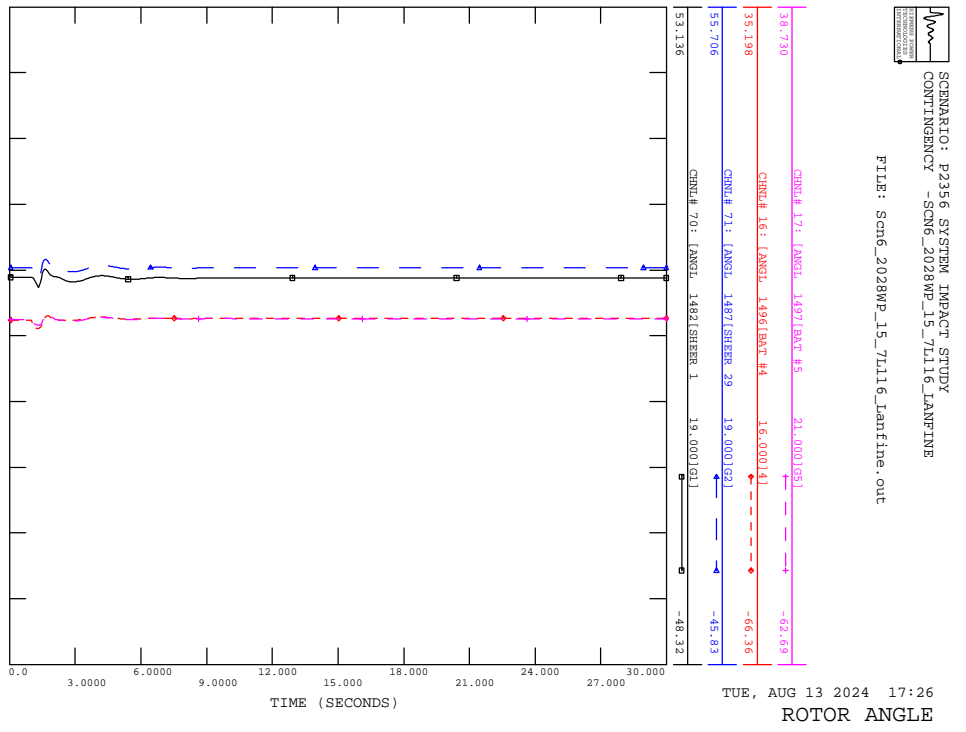
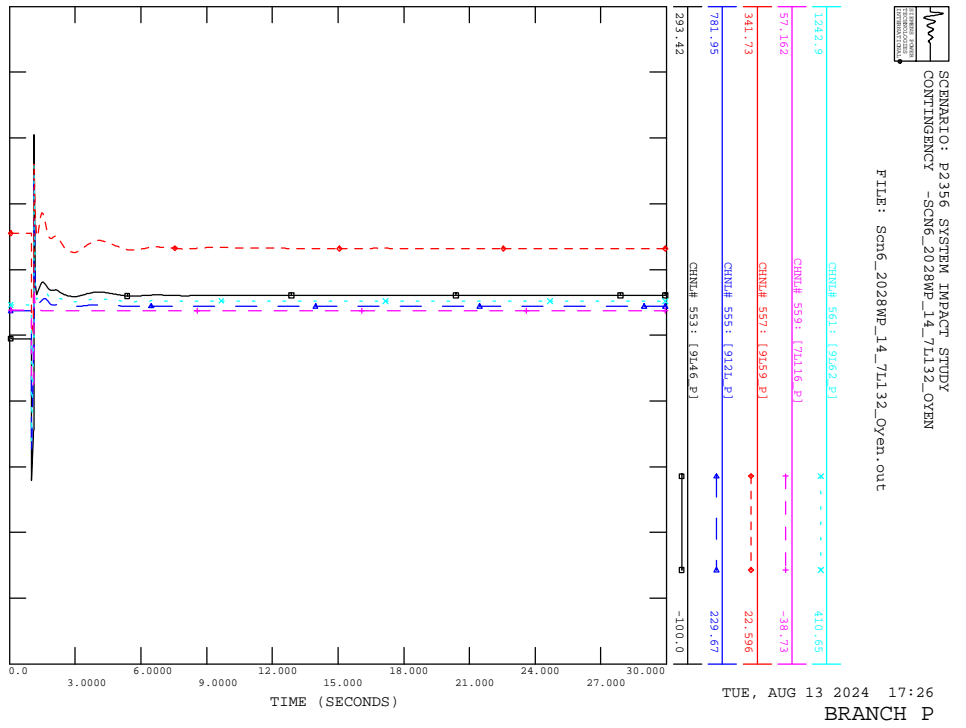
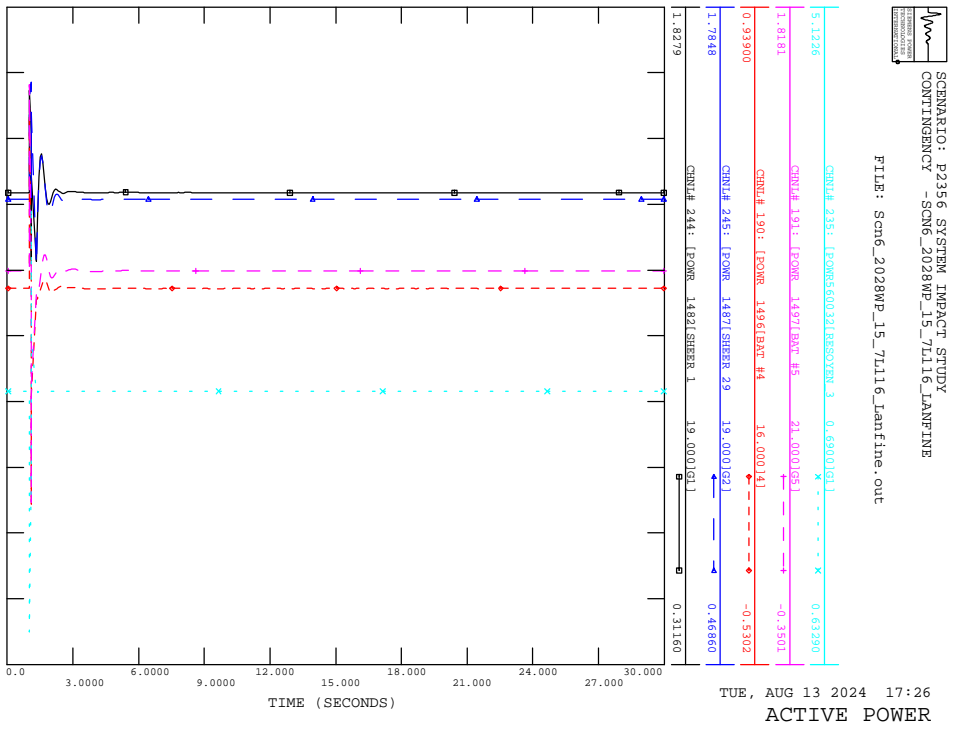
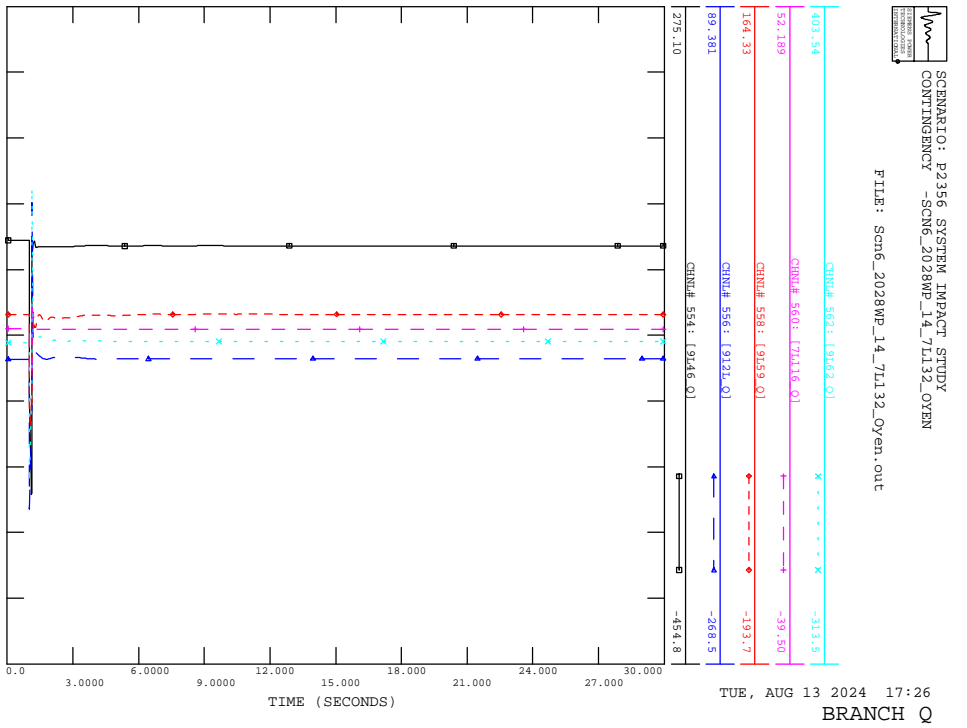


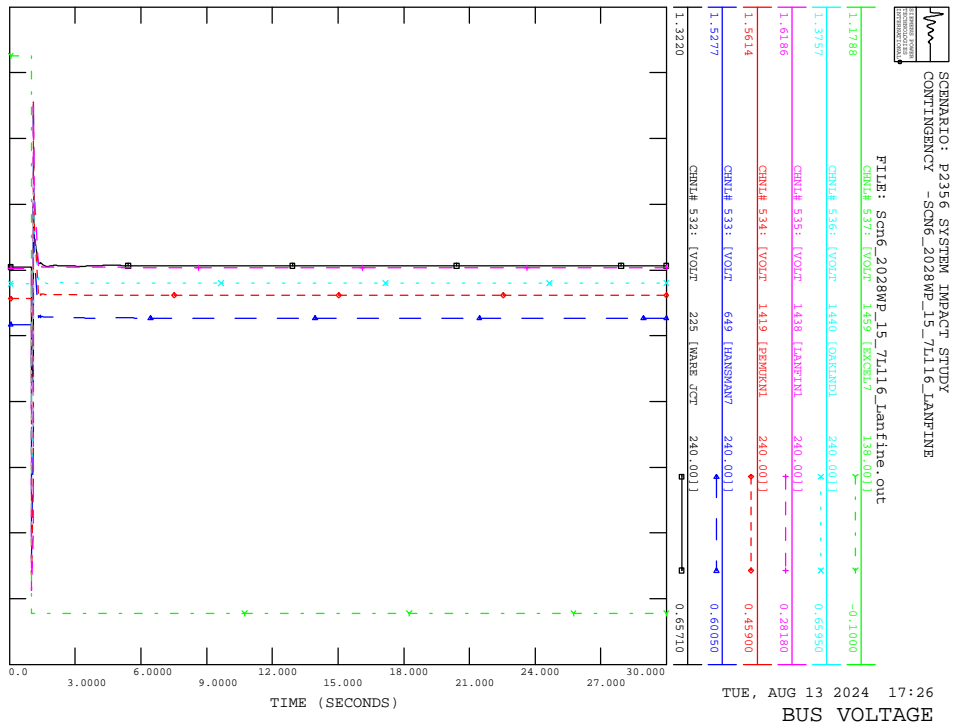
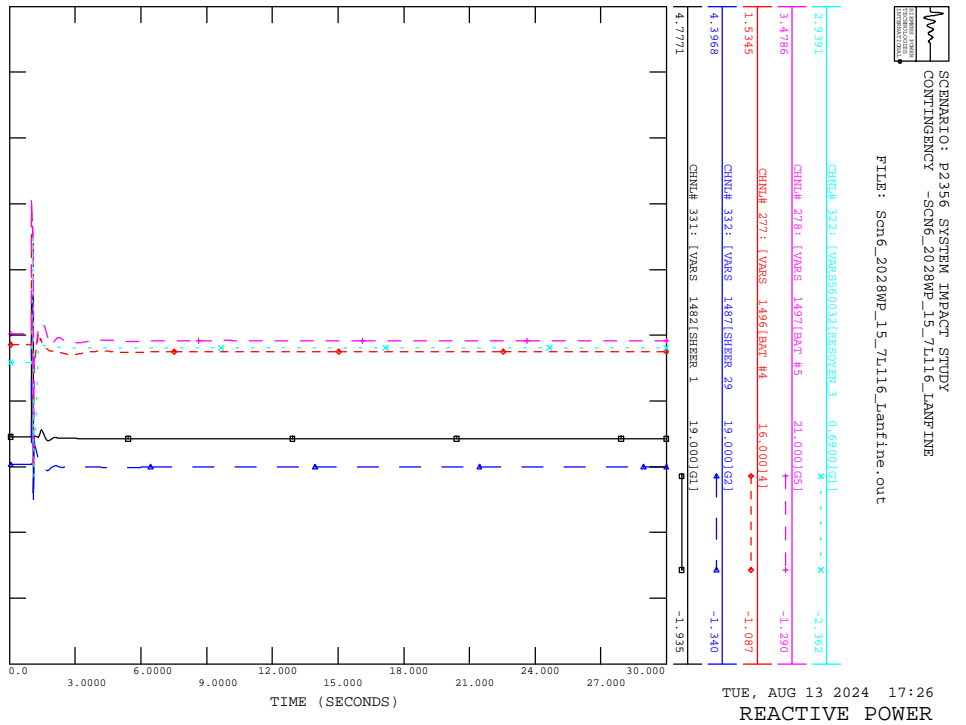
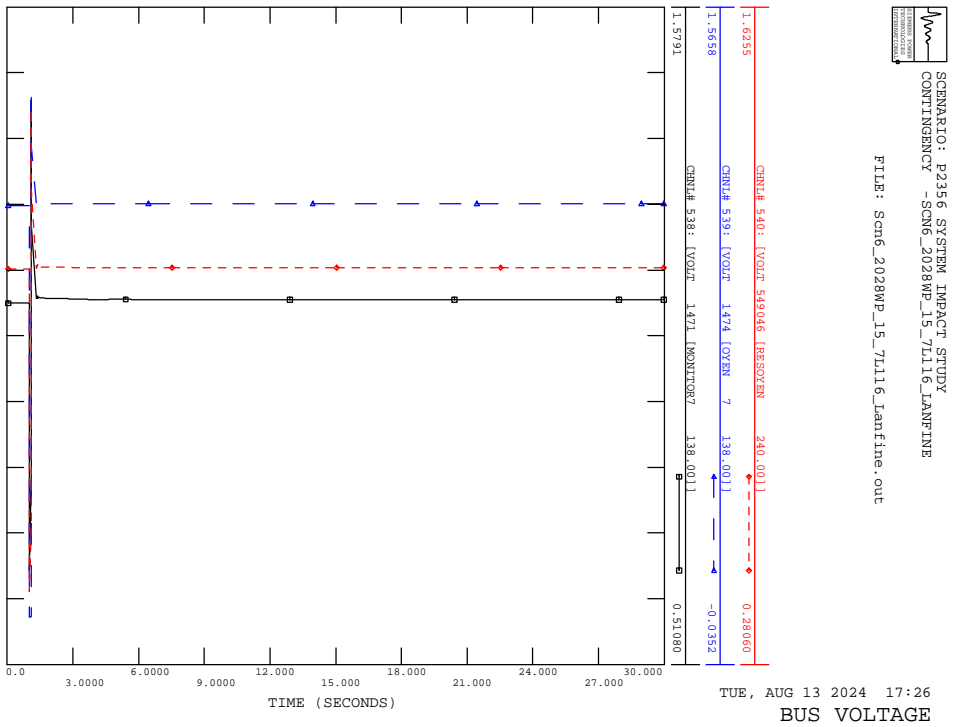
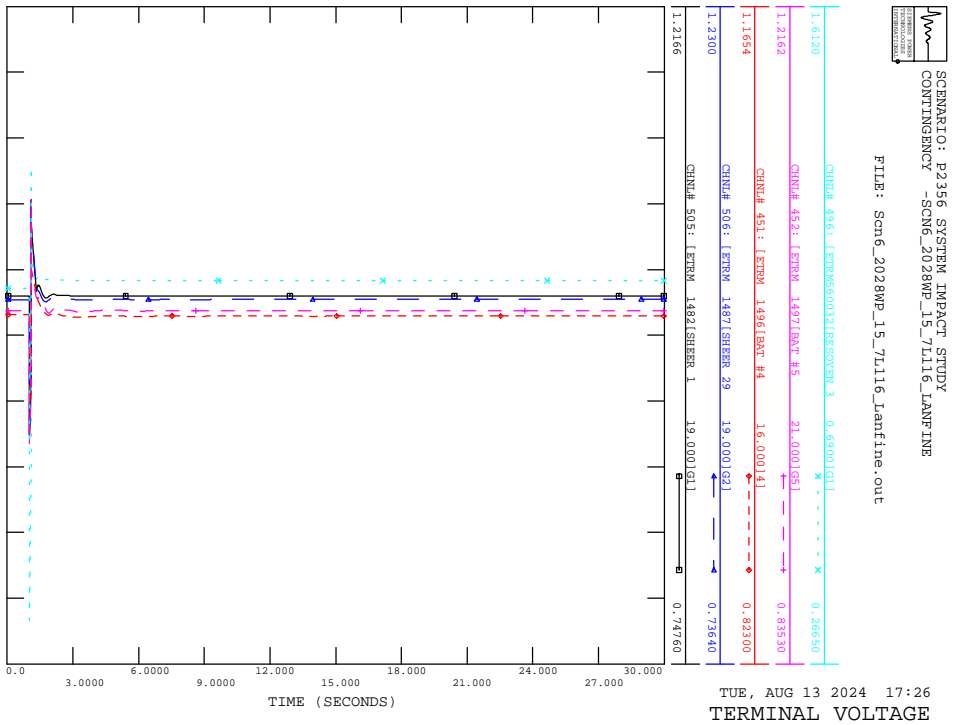


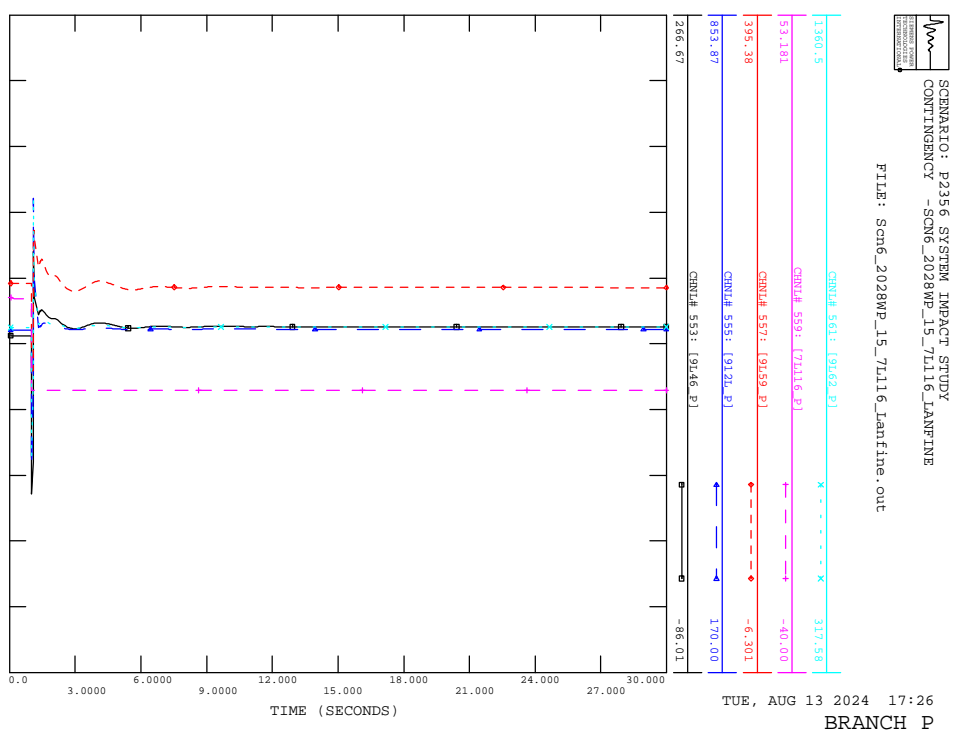
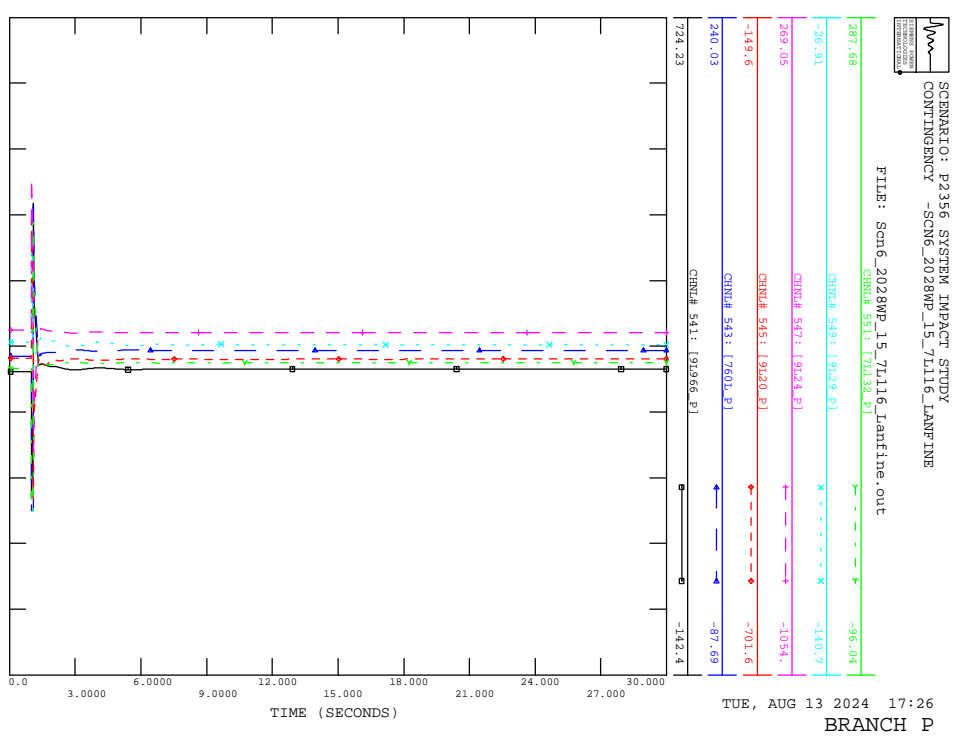
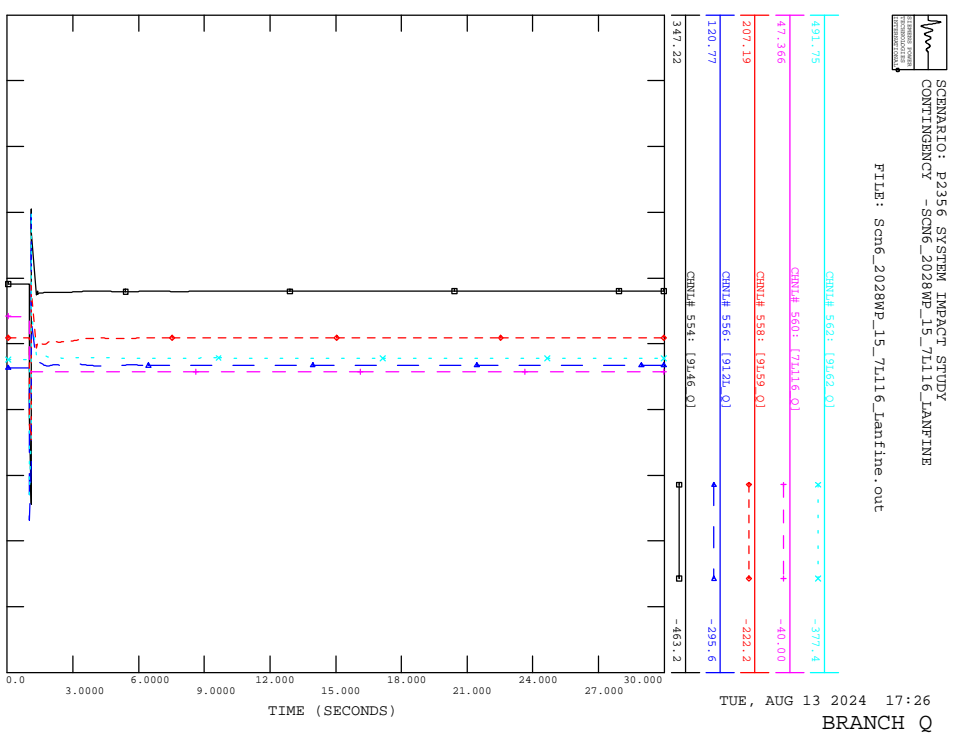
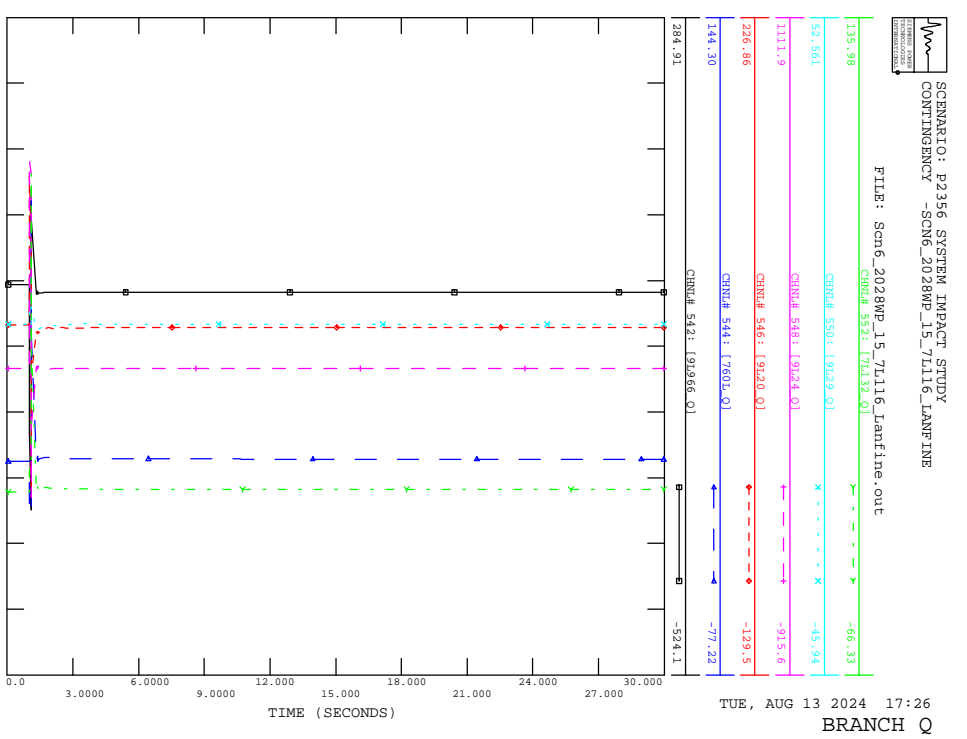






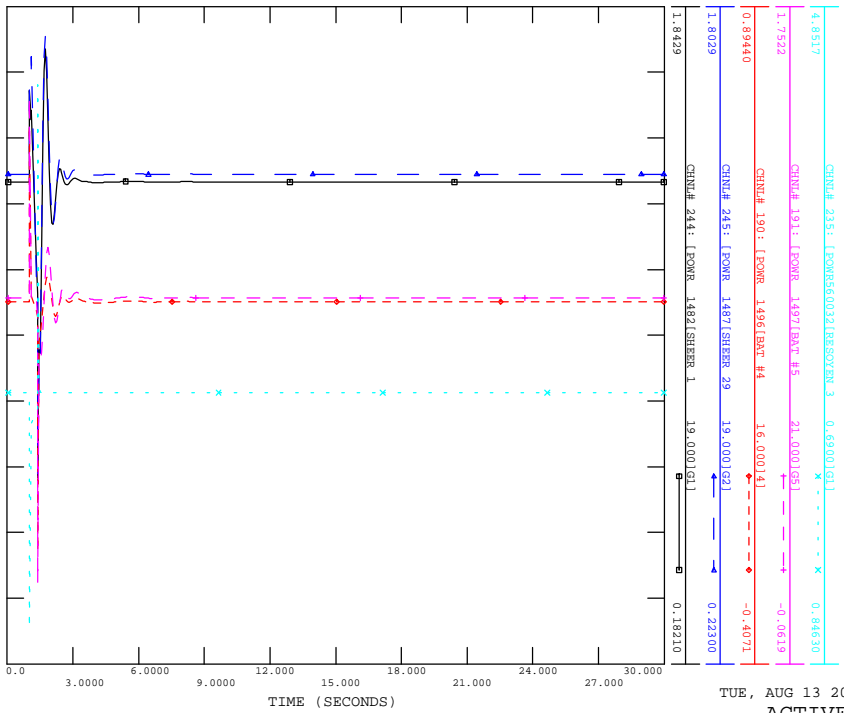






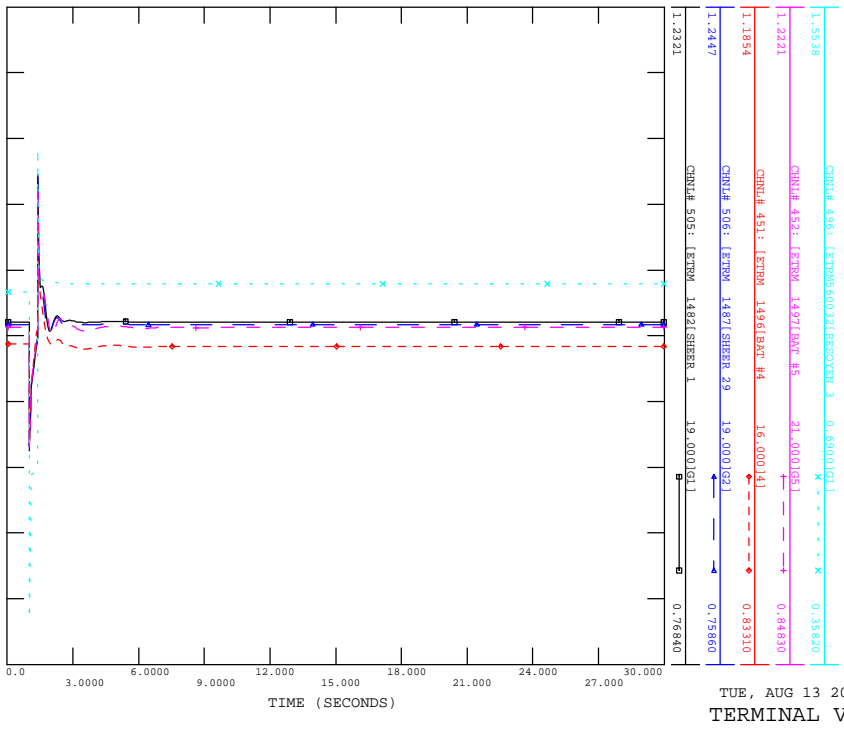
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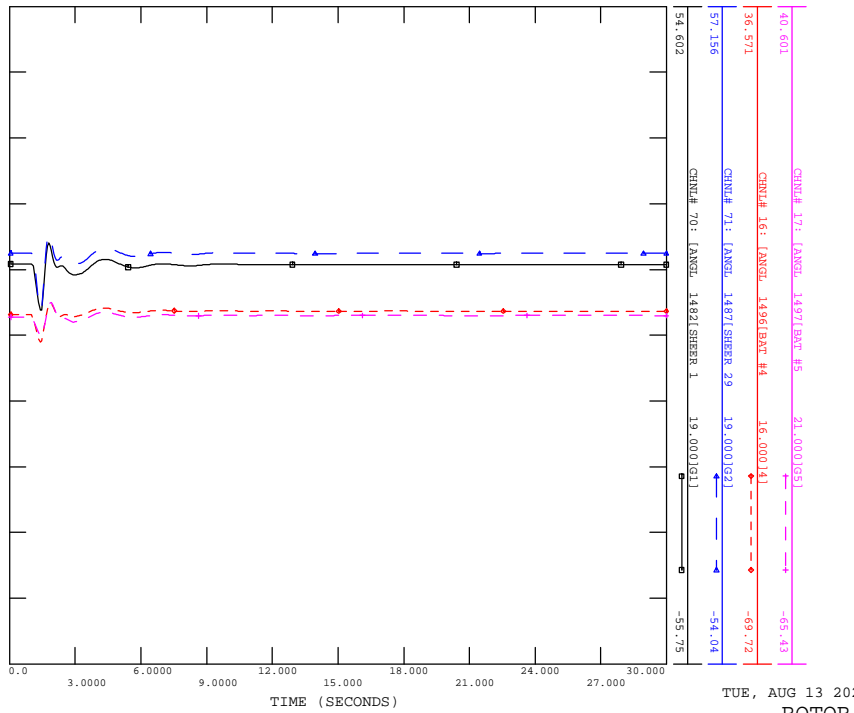
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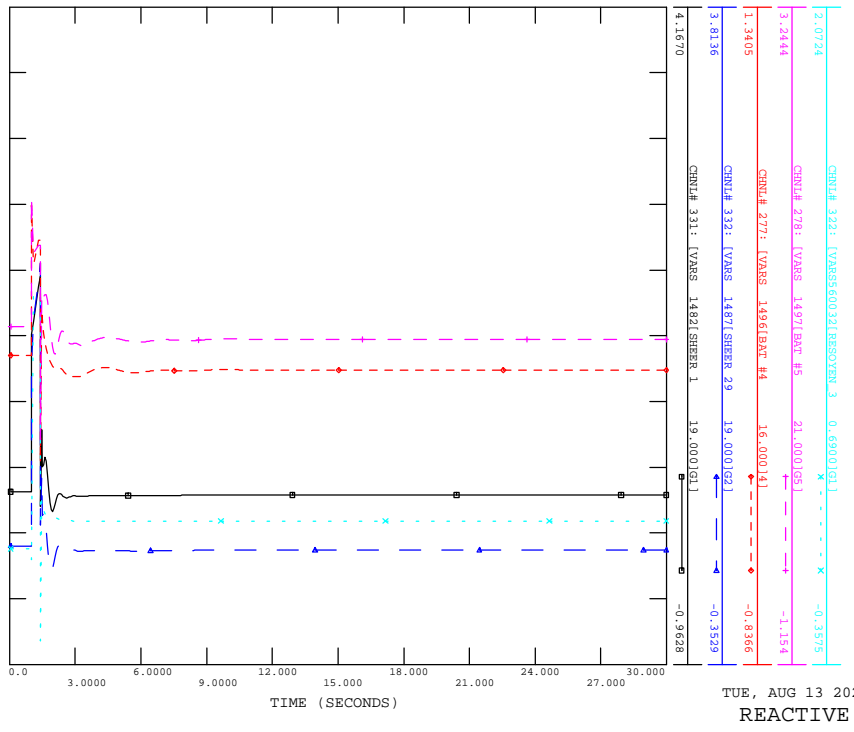
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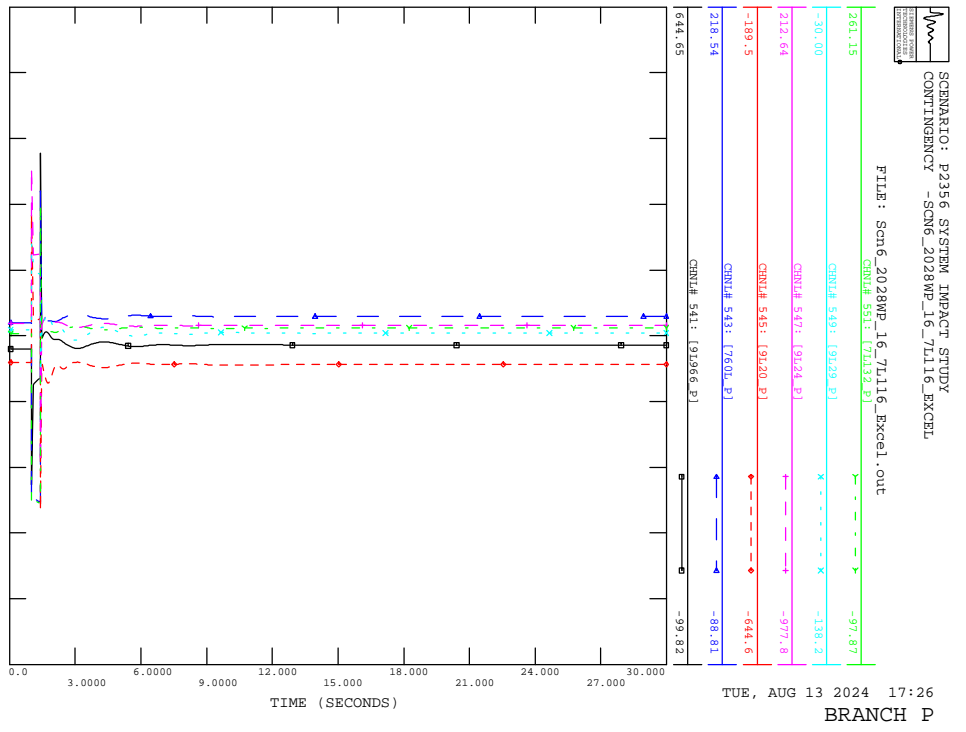
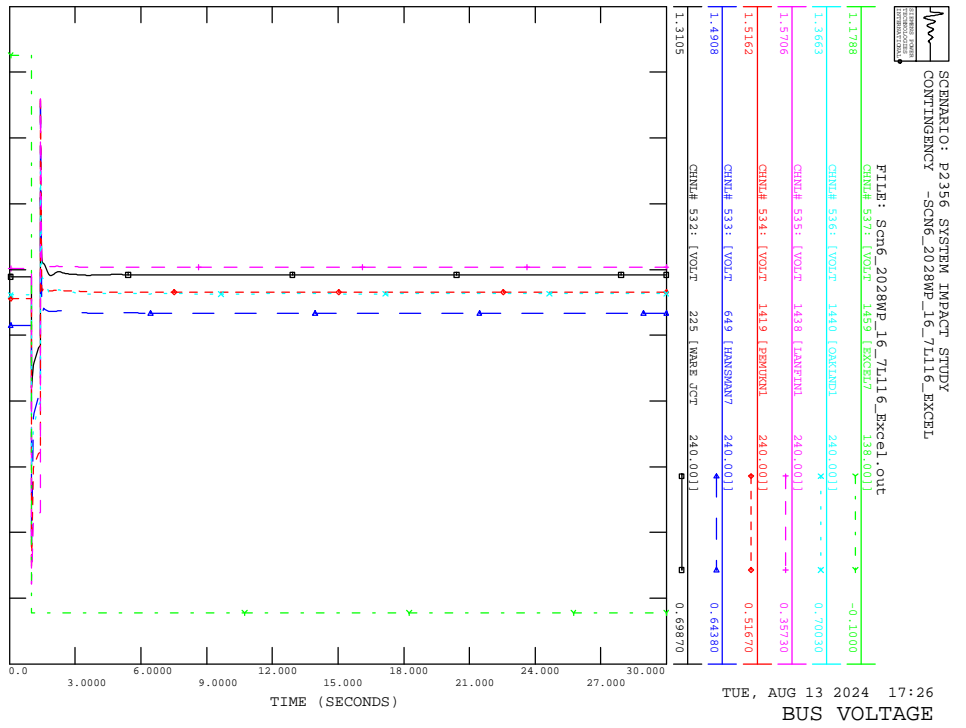
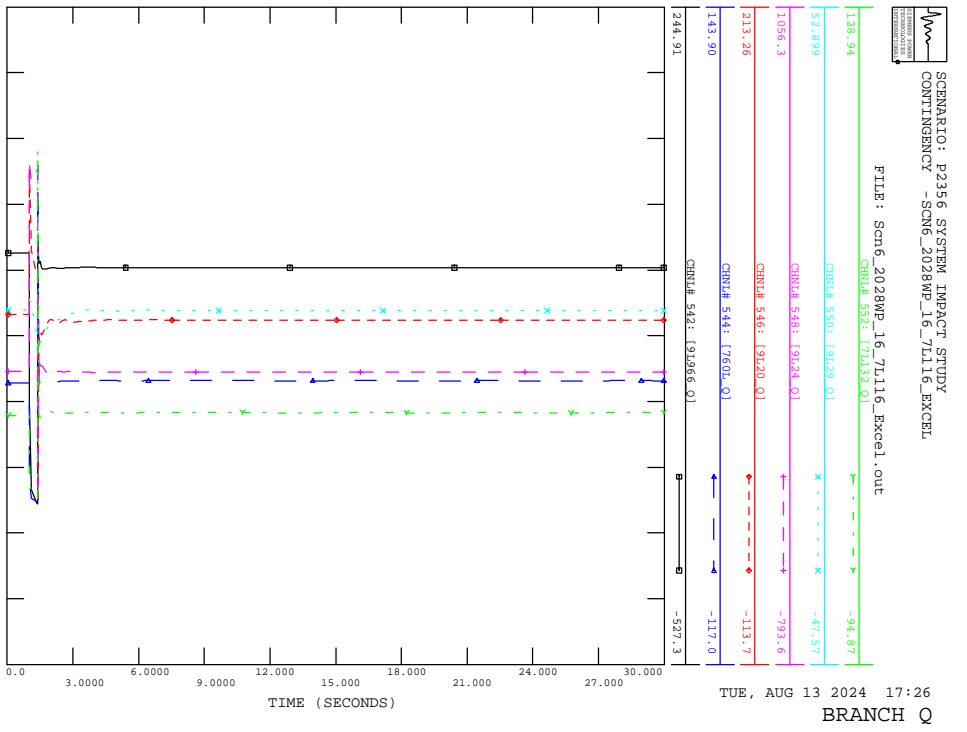
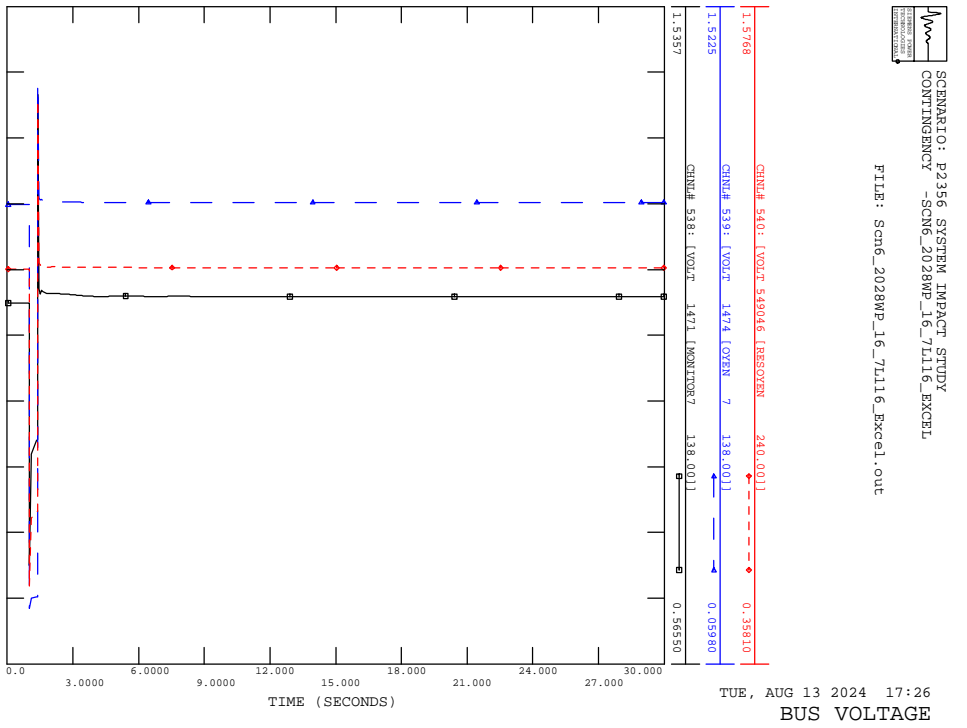


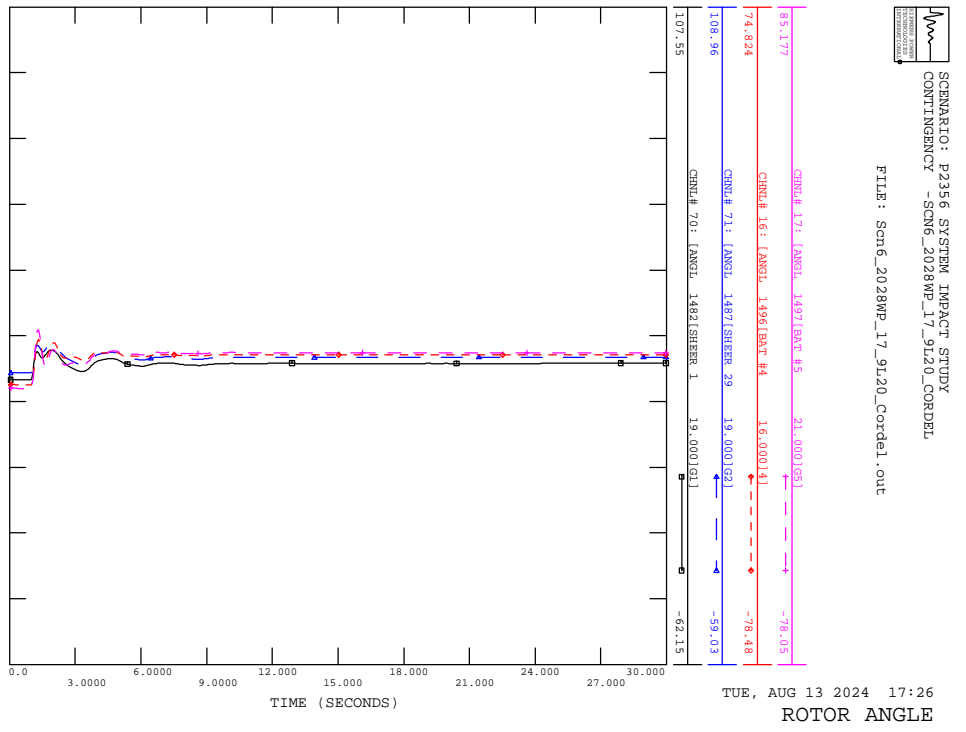
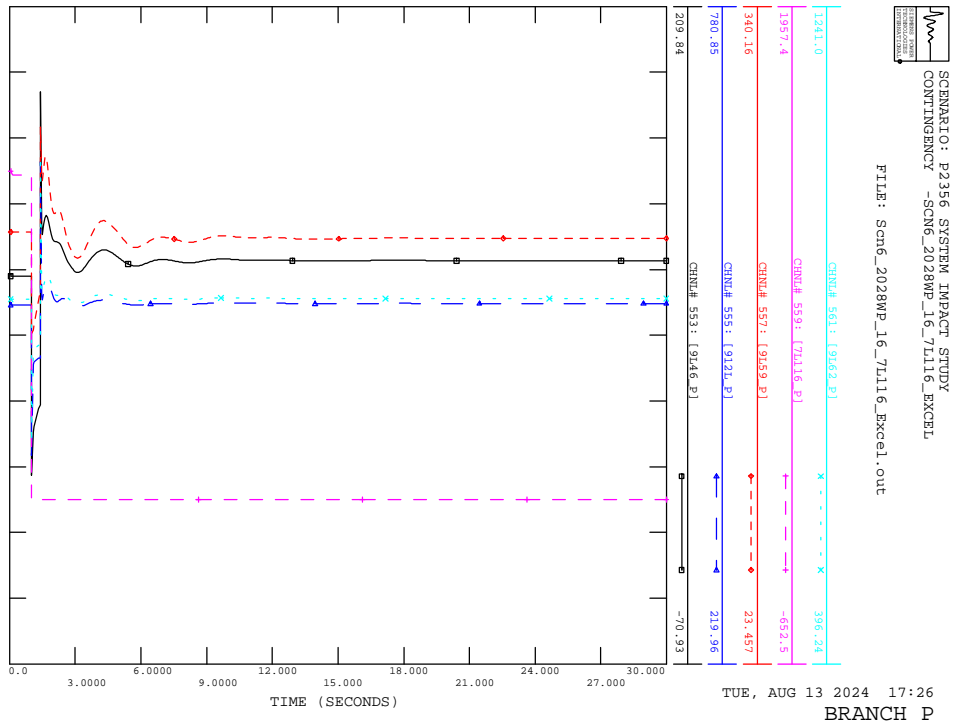
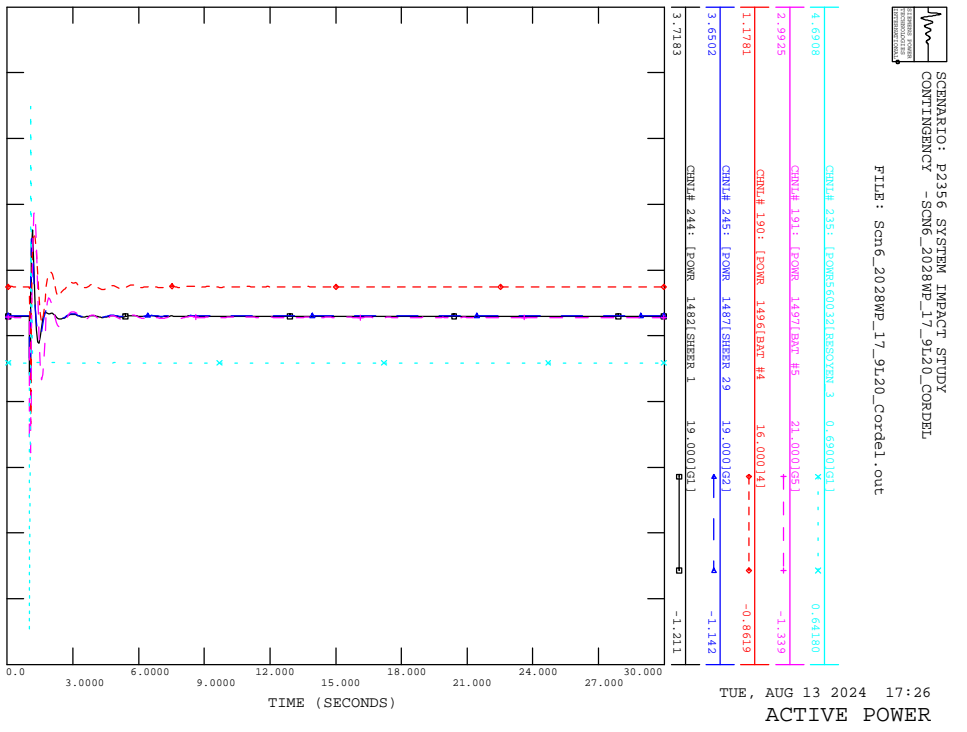
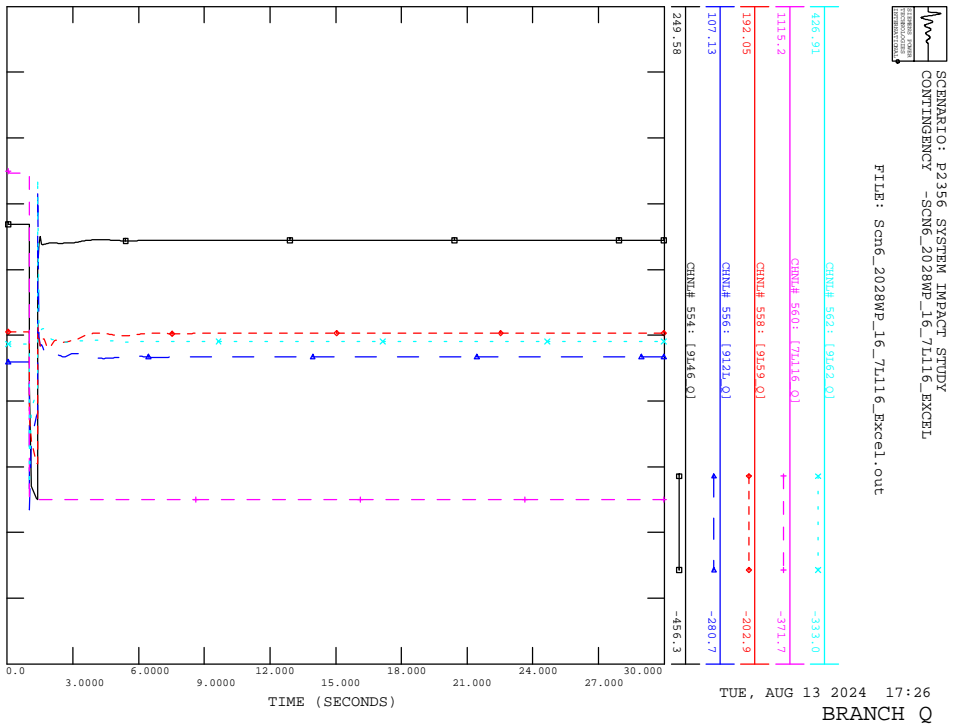
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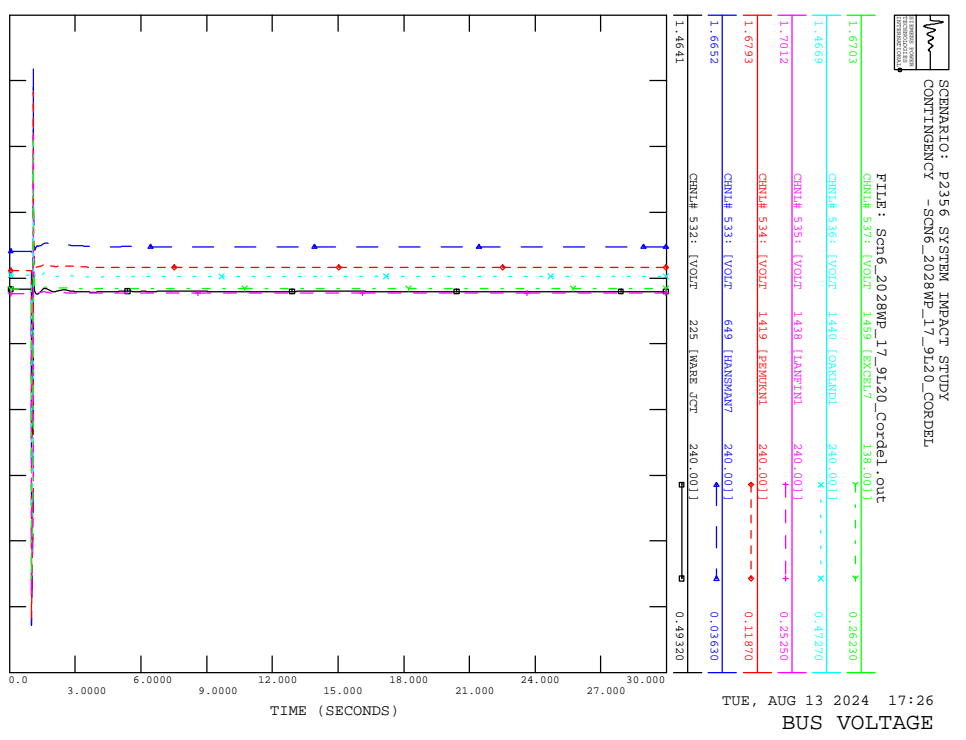
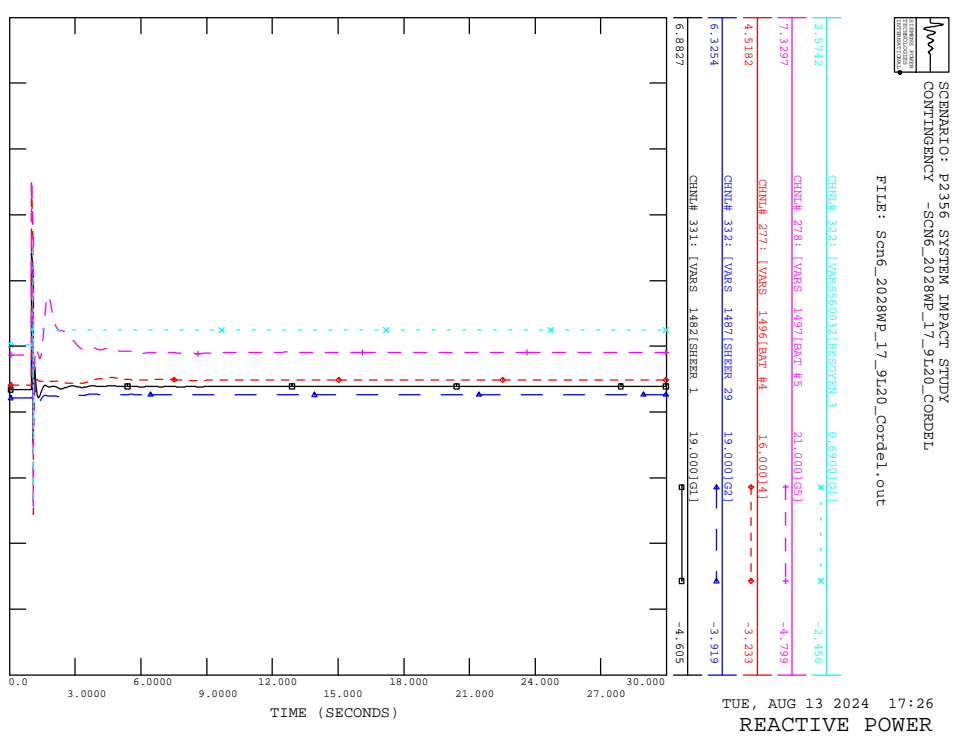
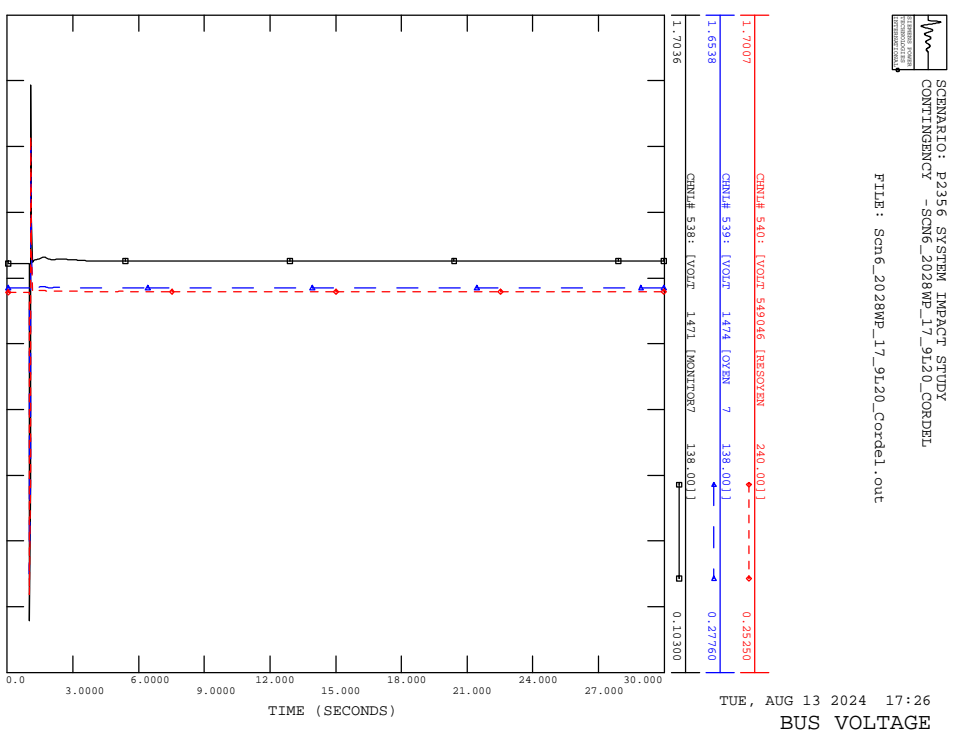
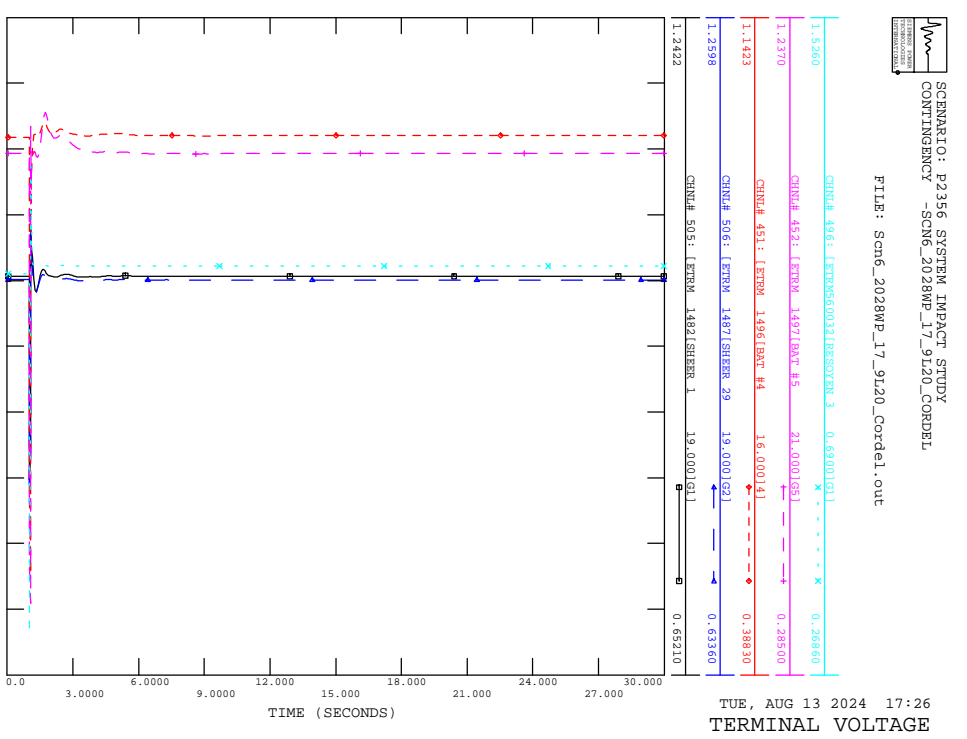
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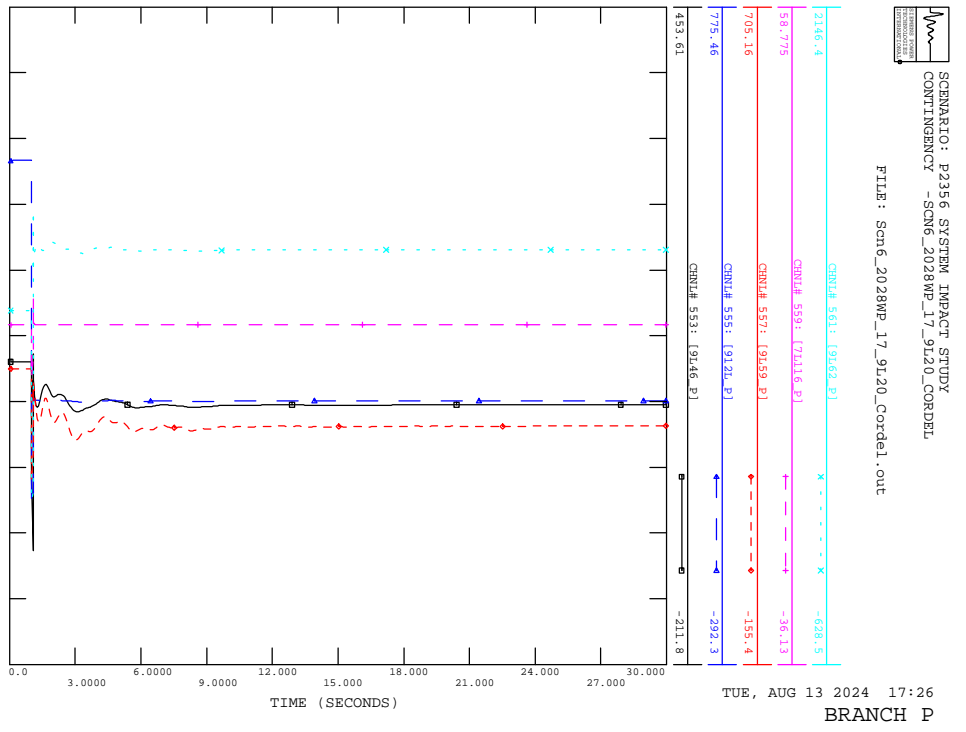
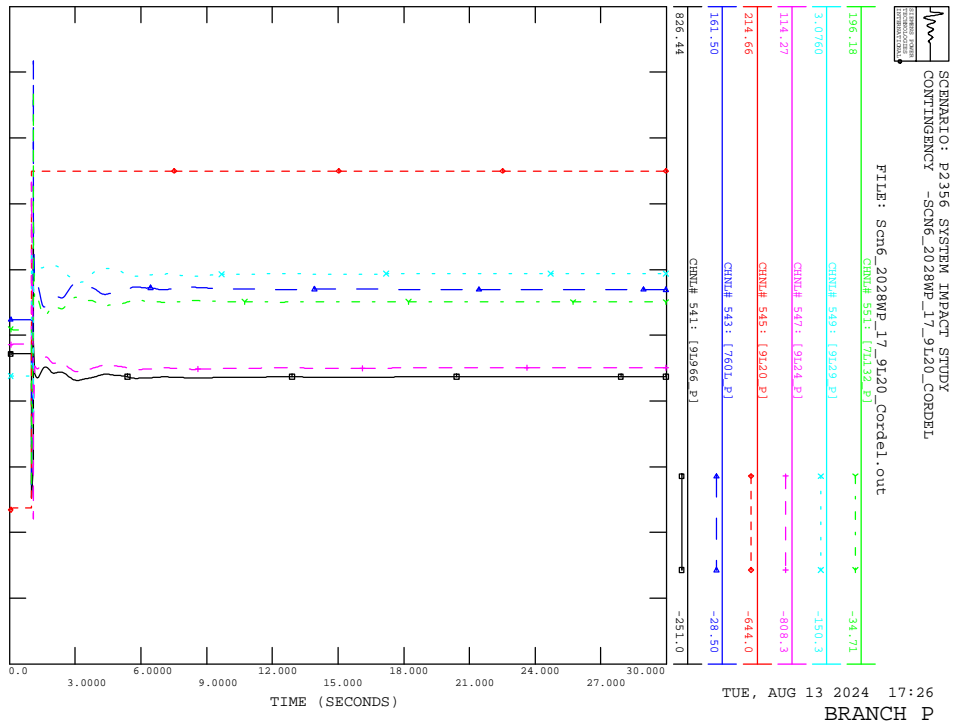
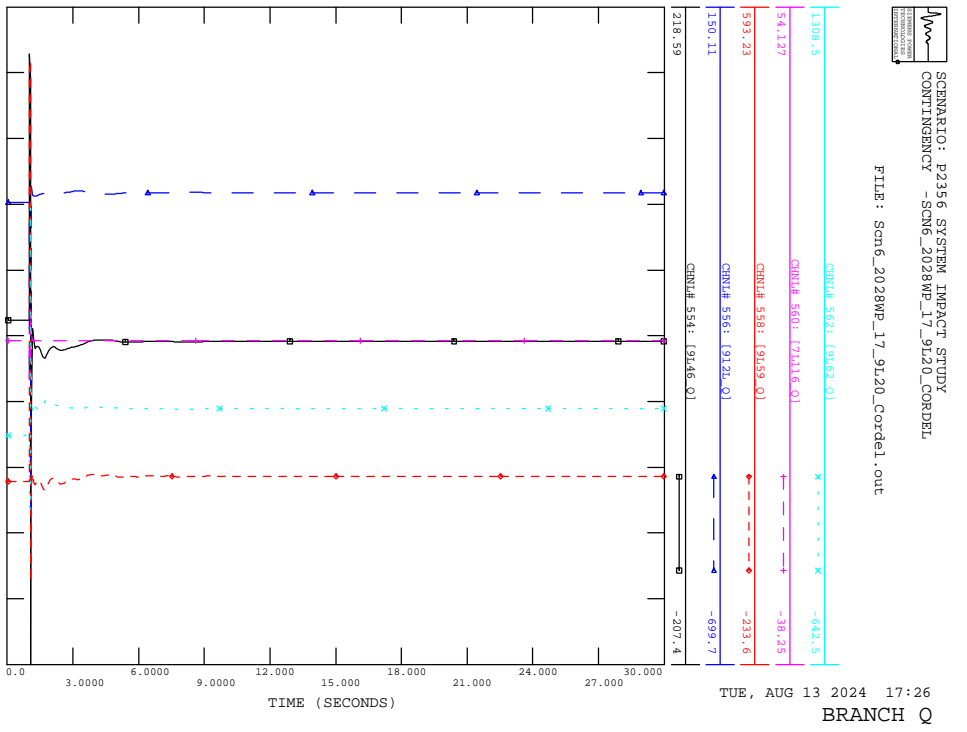
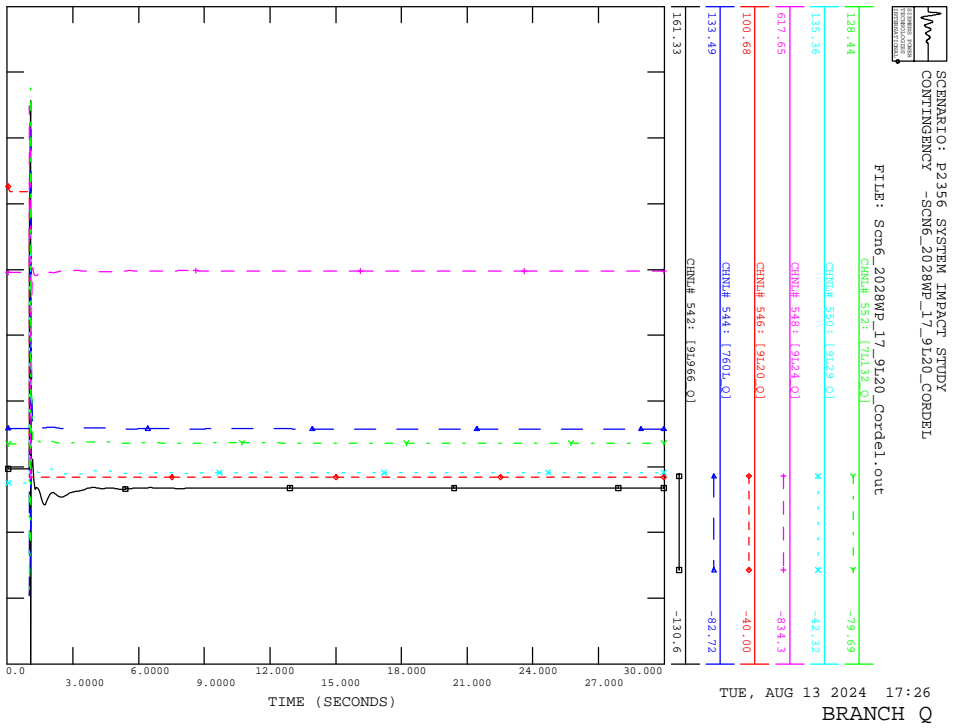






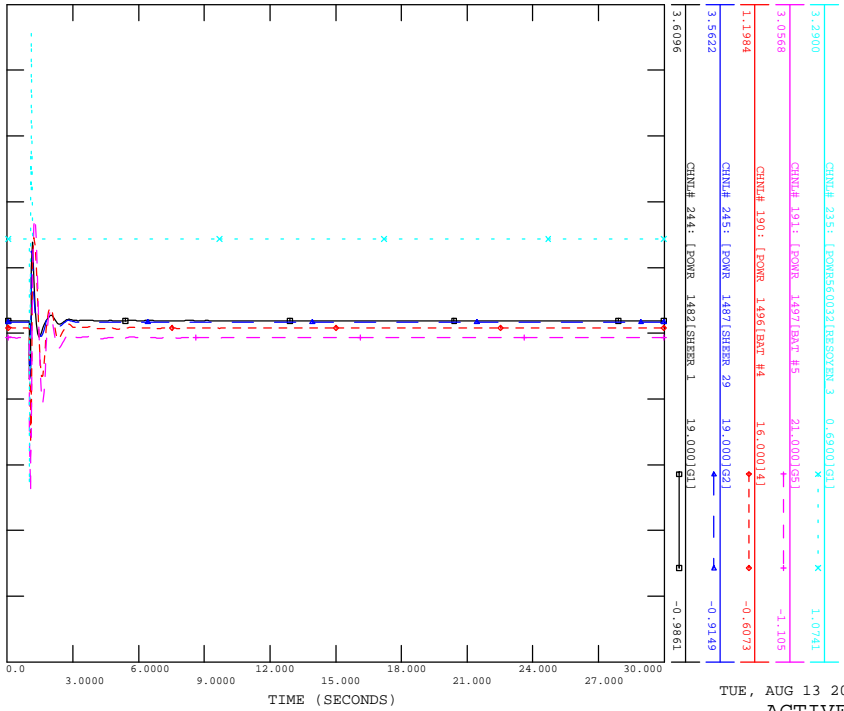






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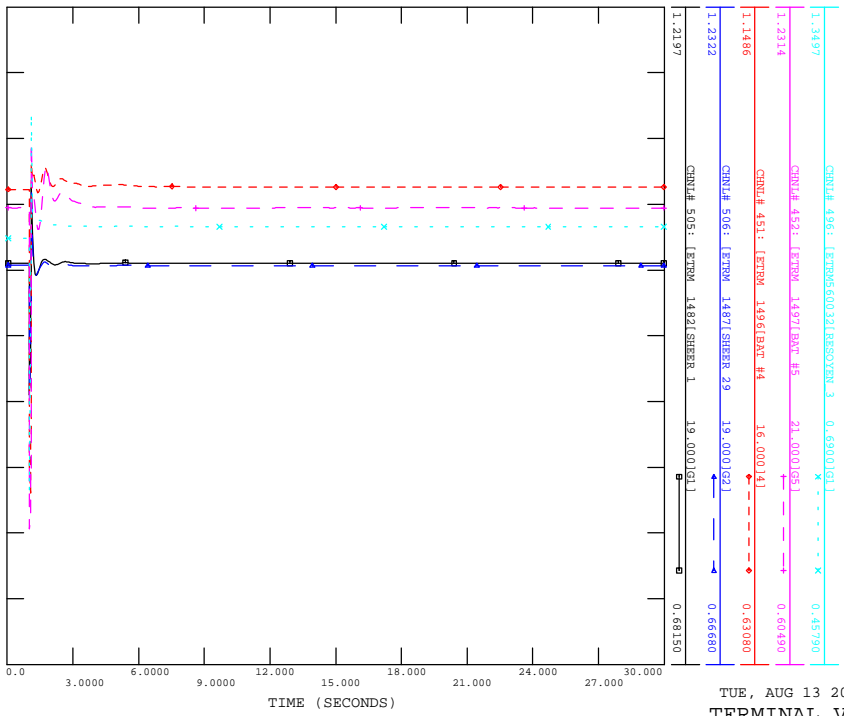
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ACTIVE POWER

SCENARIO: P2356 SYSTEM IMPACT STUDY  
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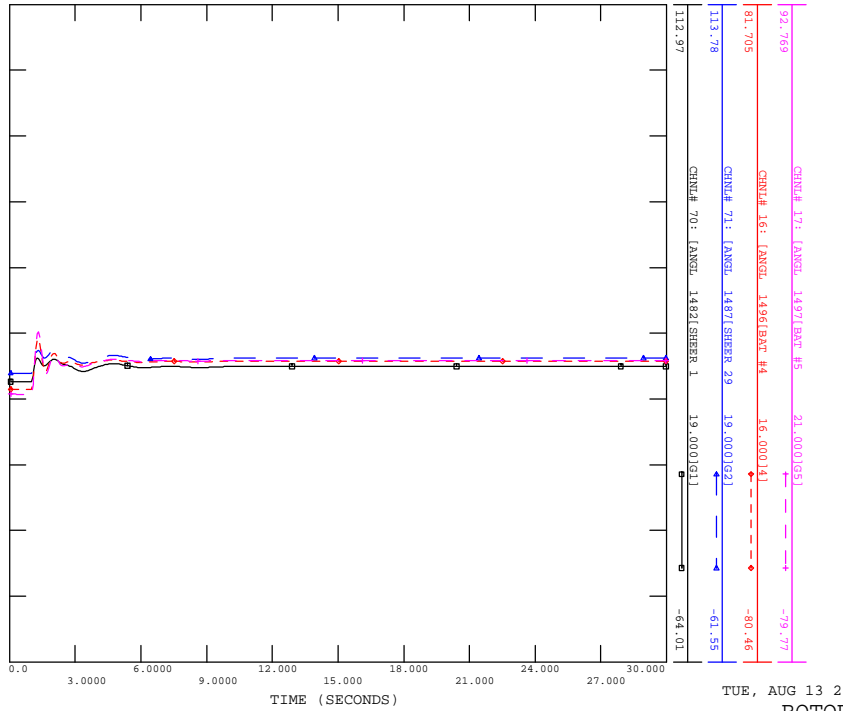
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TERMINAL VOLTAGE

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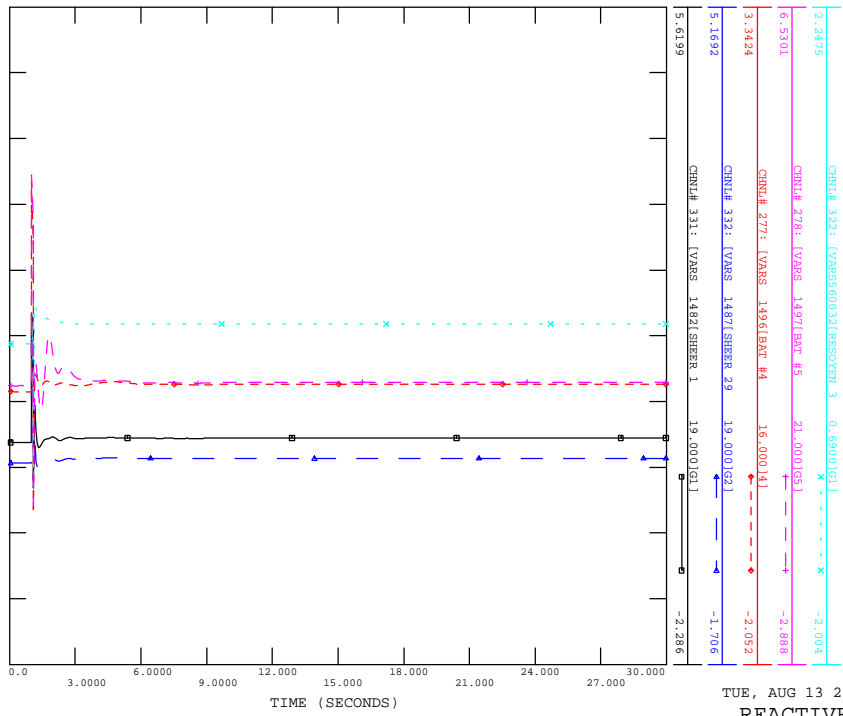
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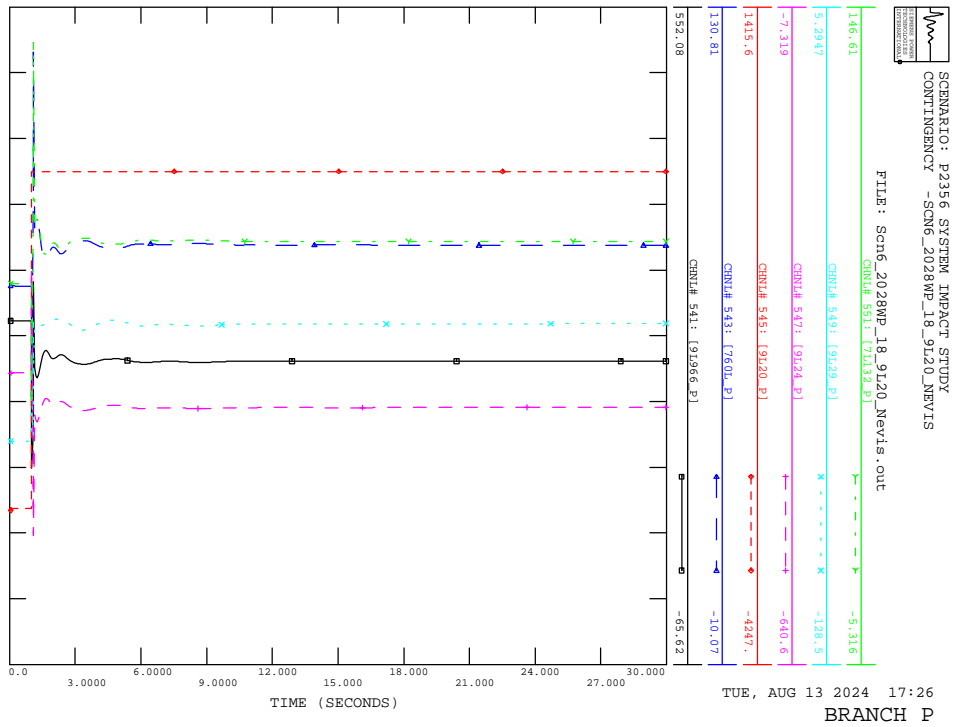
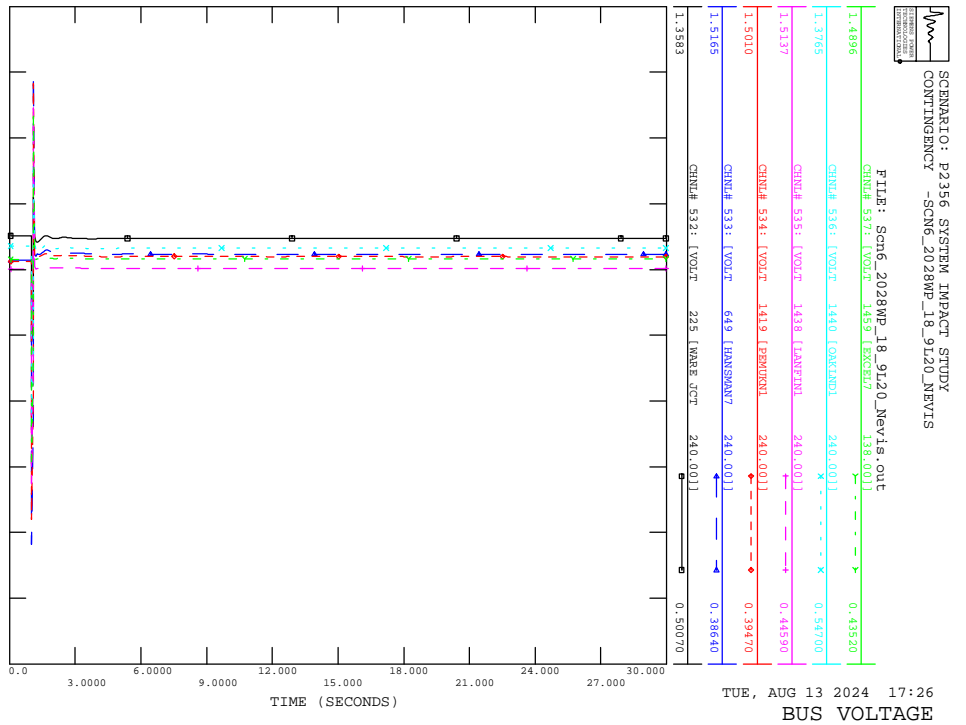
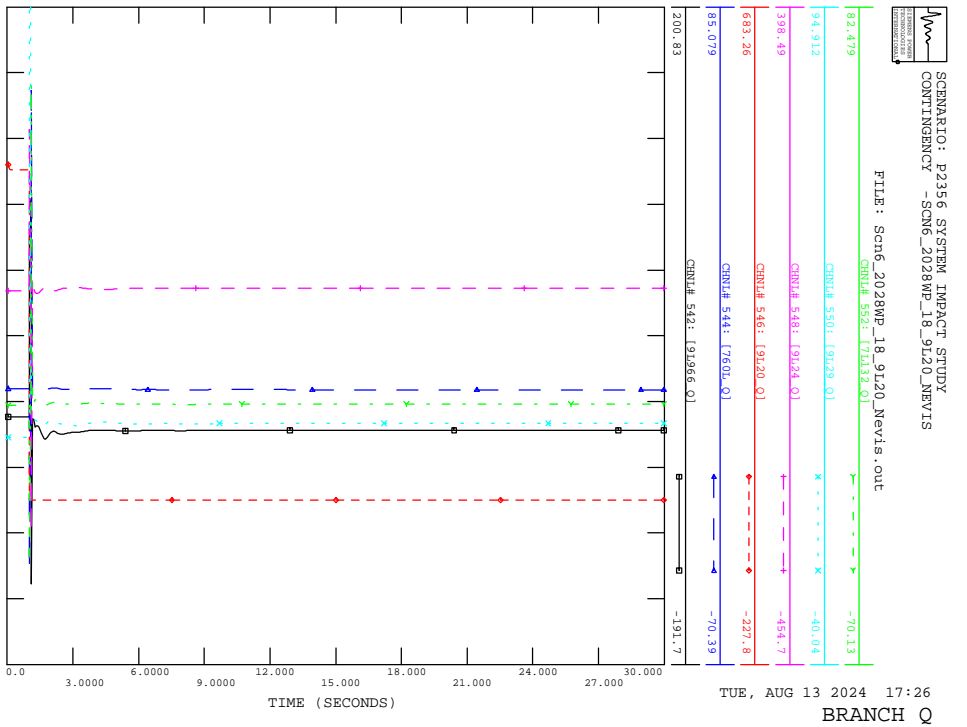
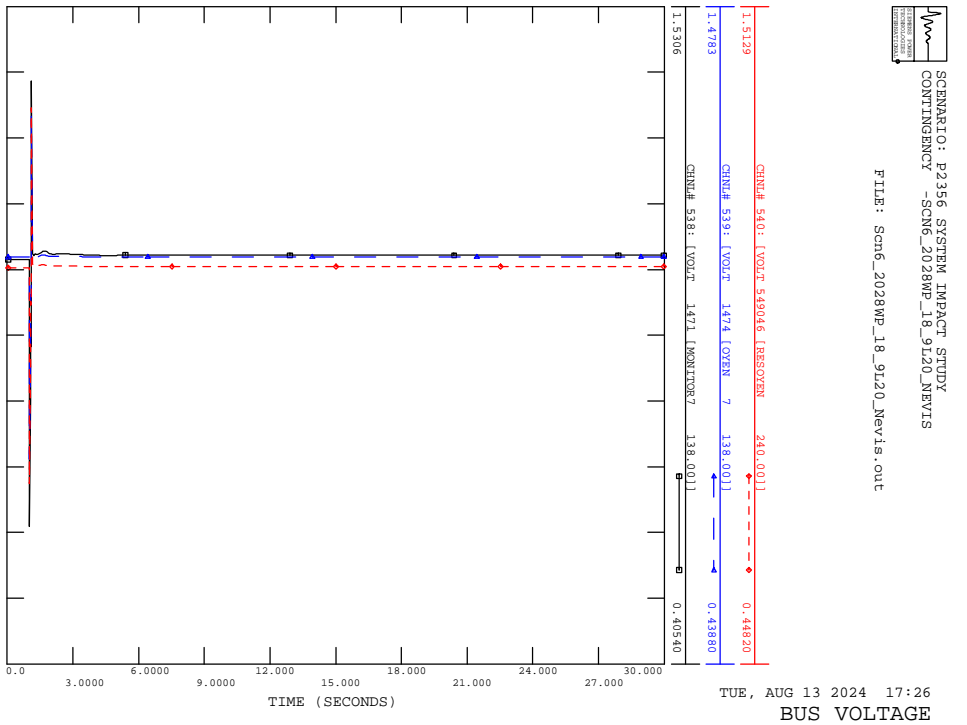
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ROTOR ANGLE

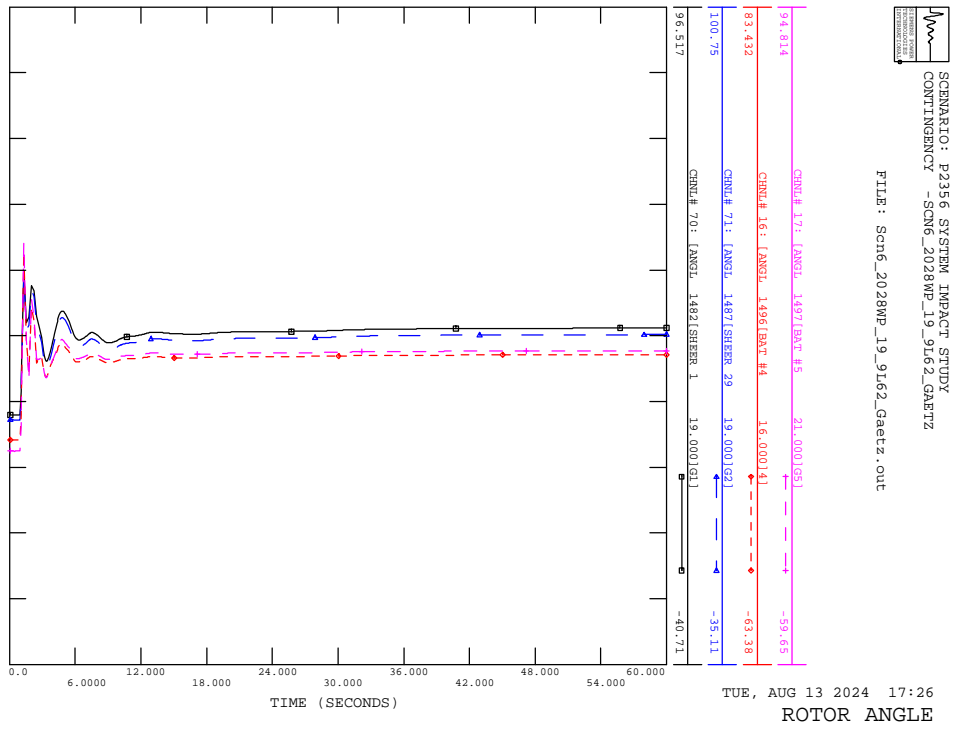
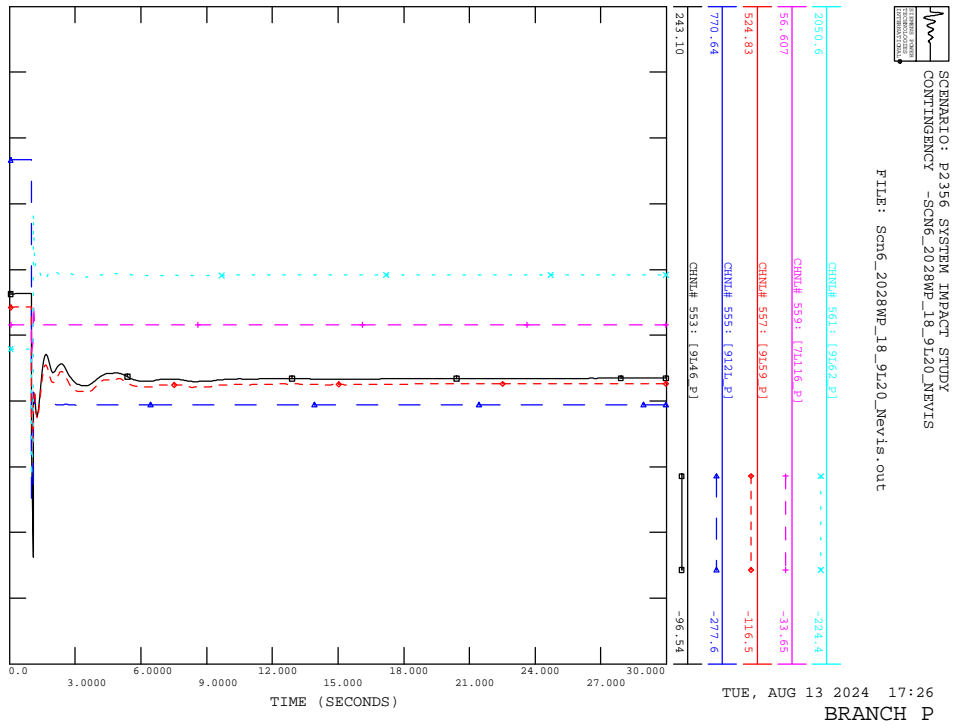
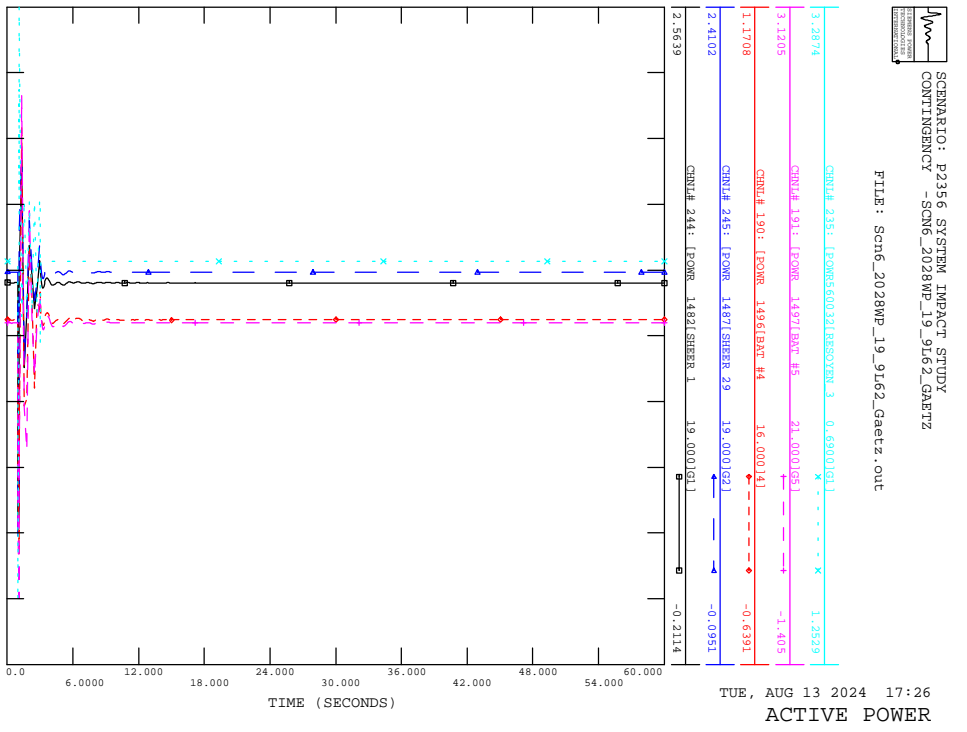
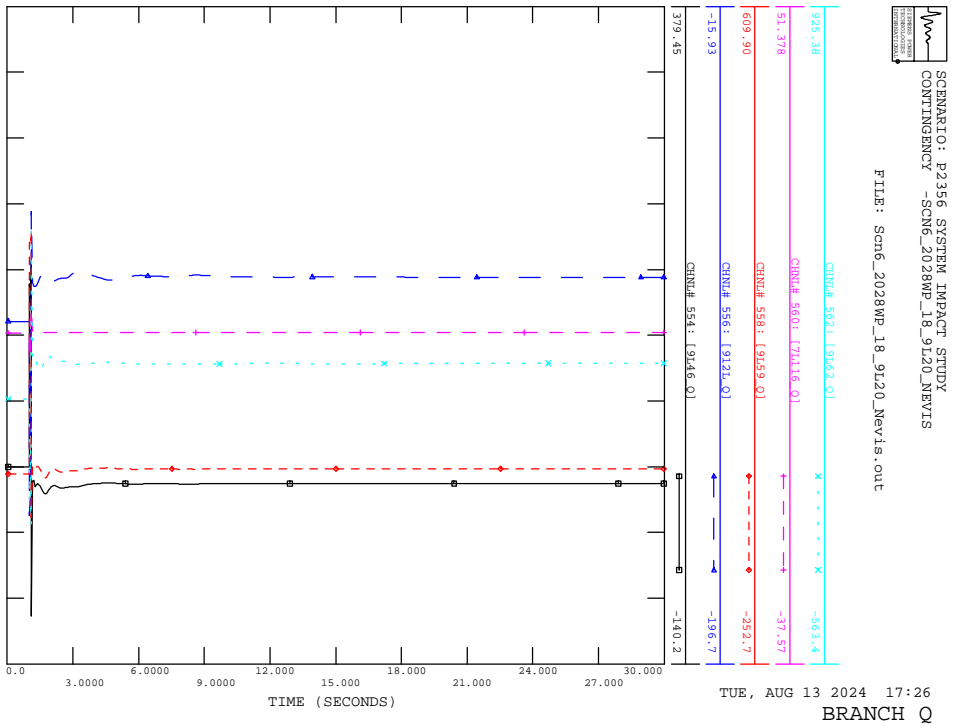
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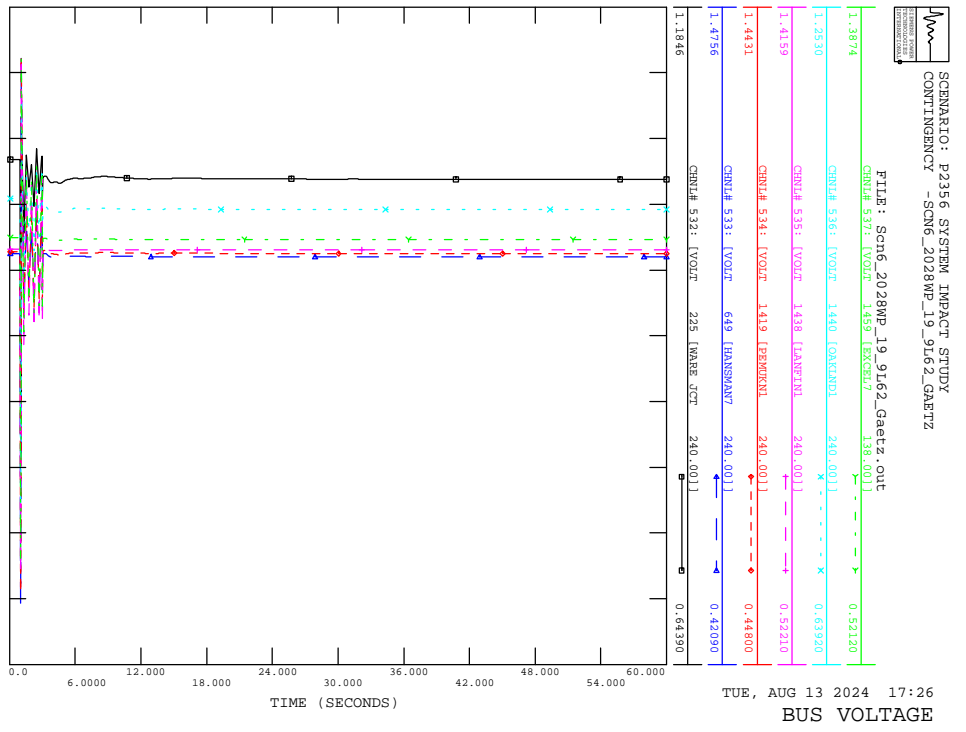
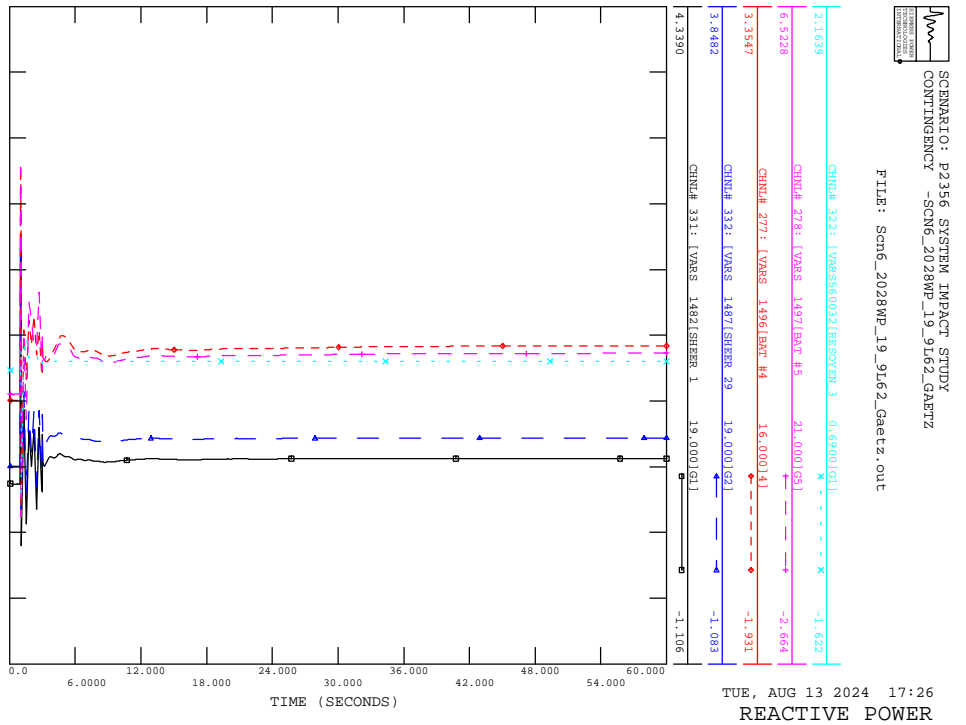
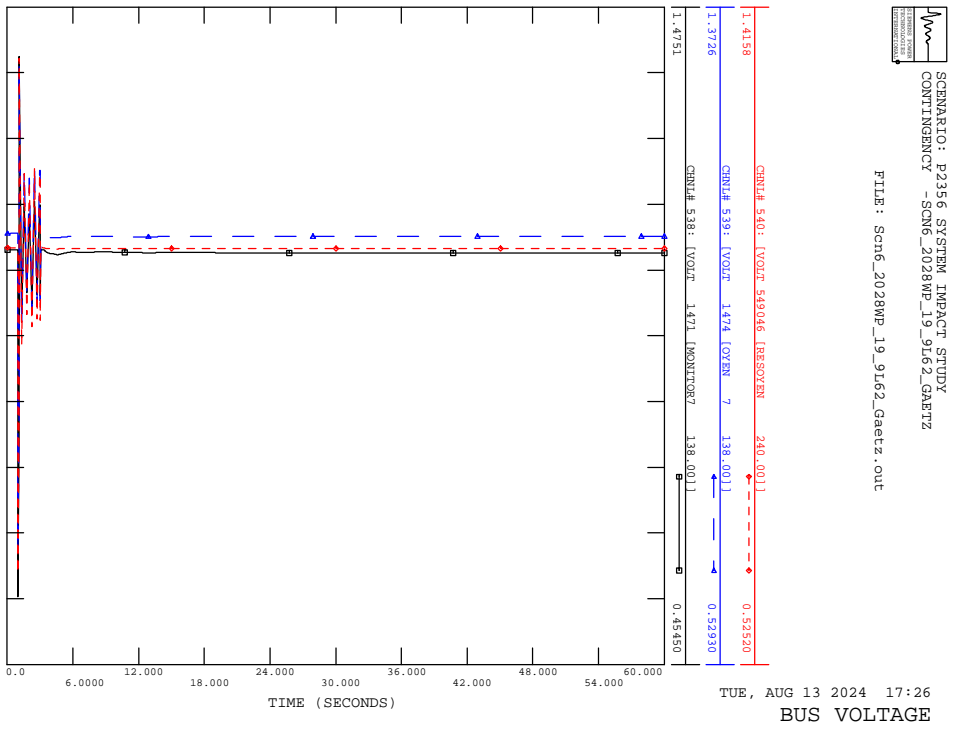
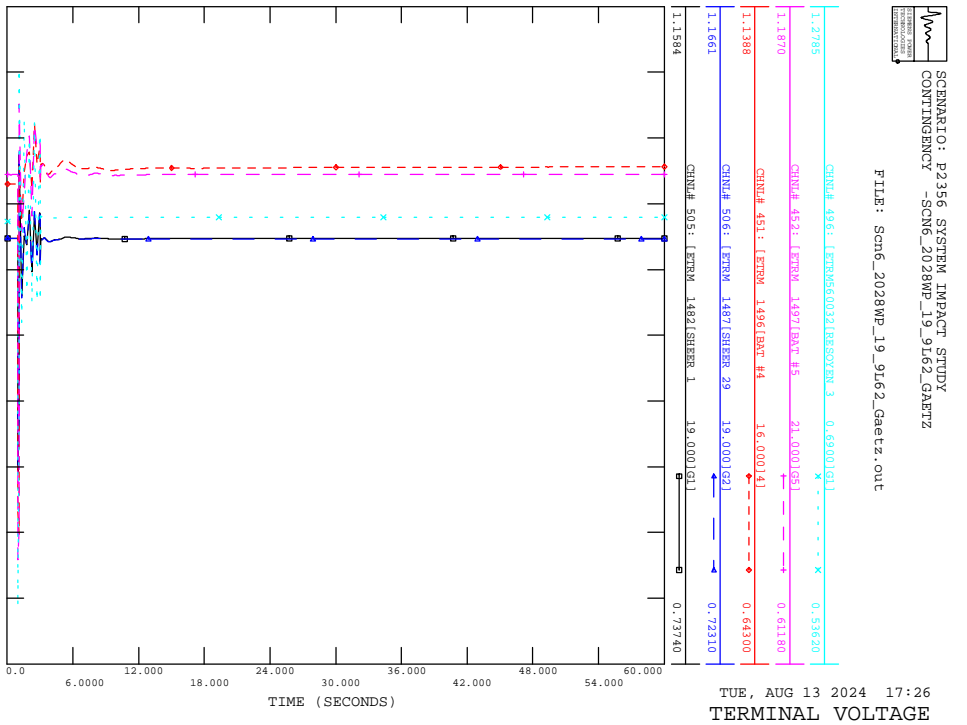
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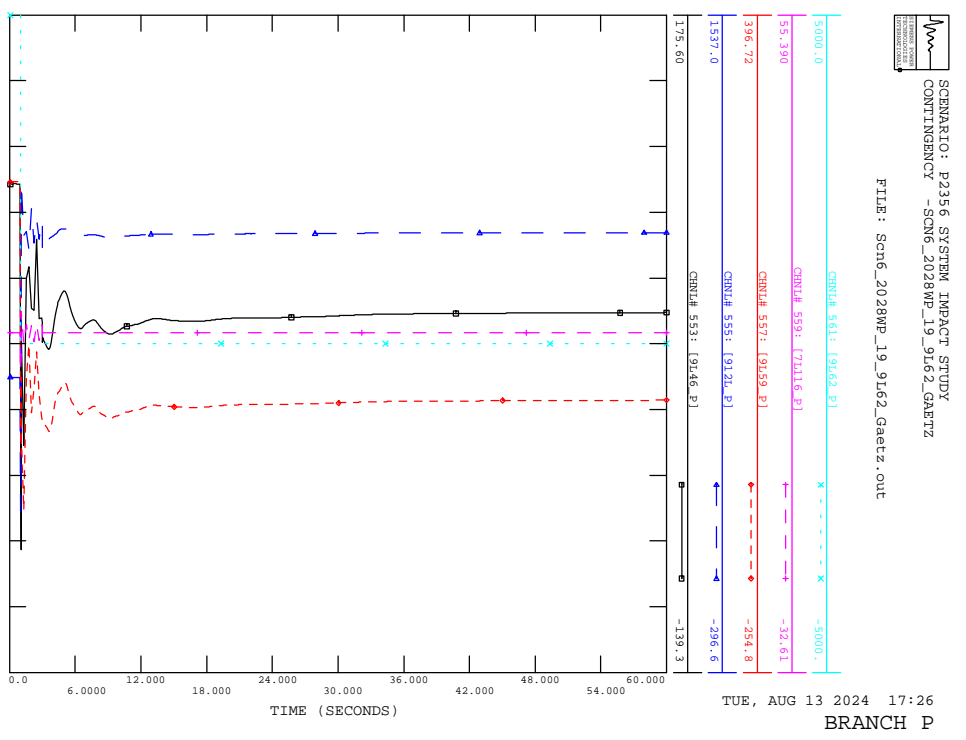
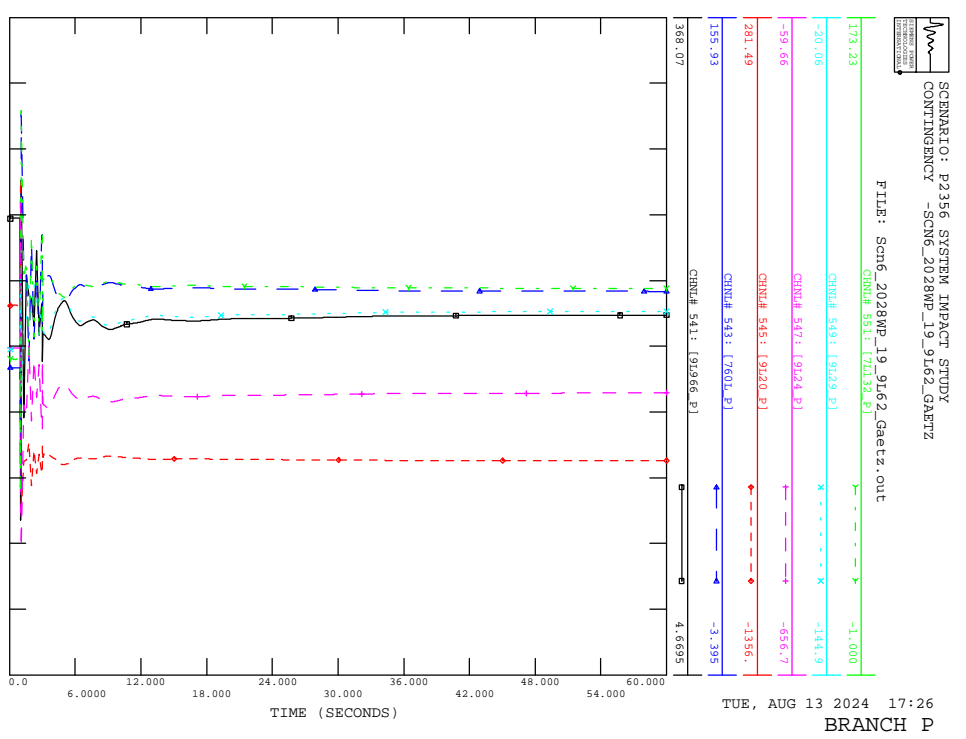
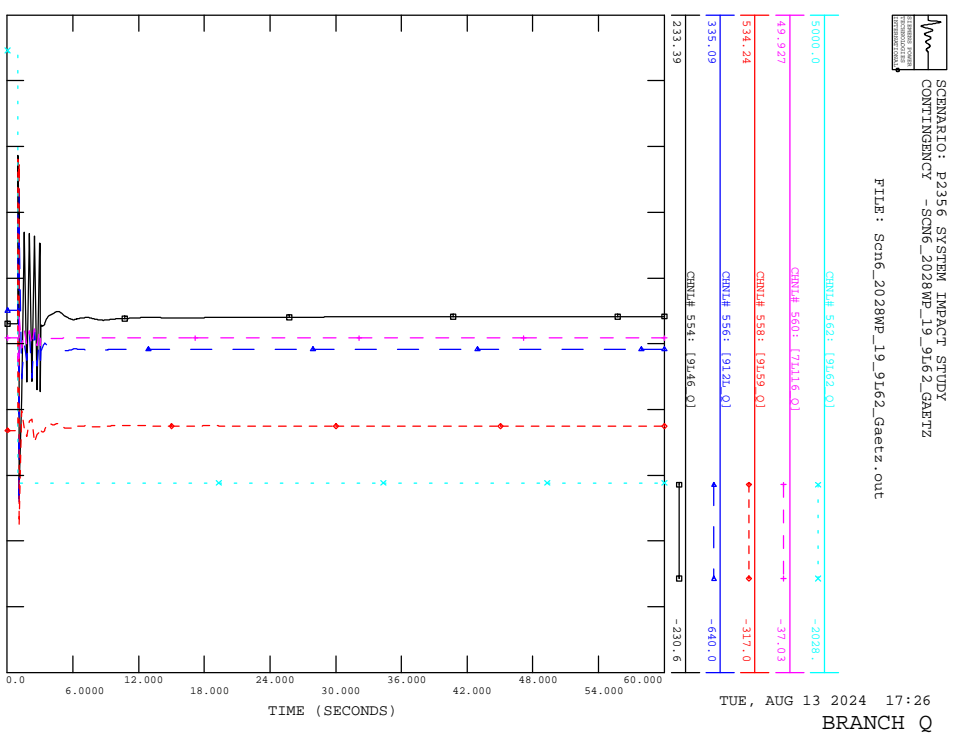
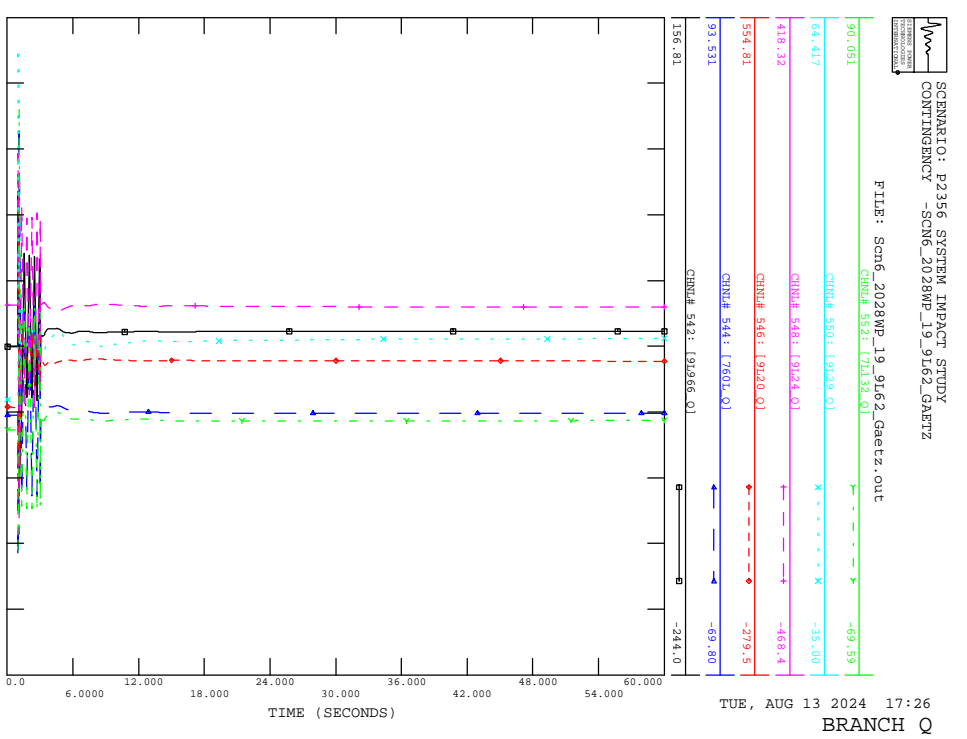
TUE, AUG 13 2024 17:26  
REACTIVE POWER

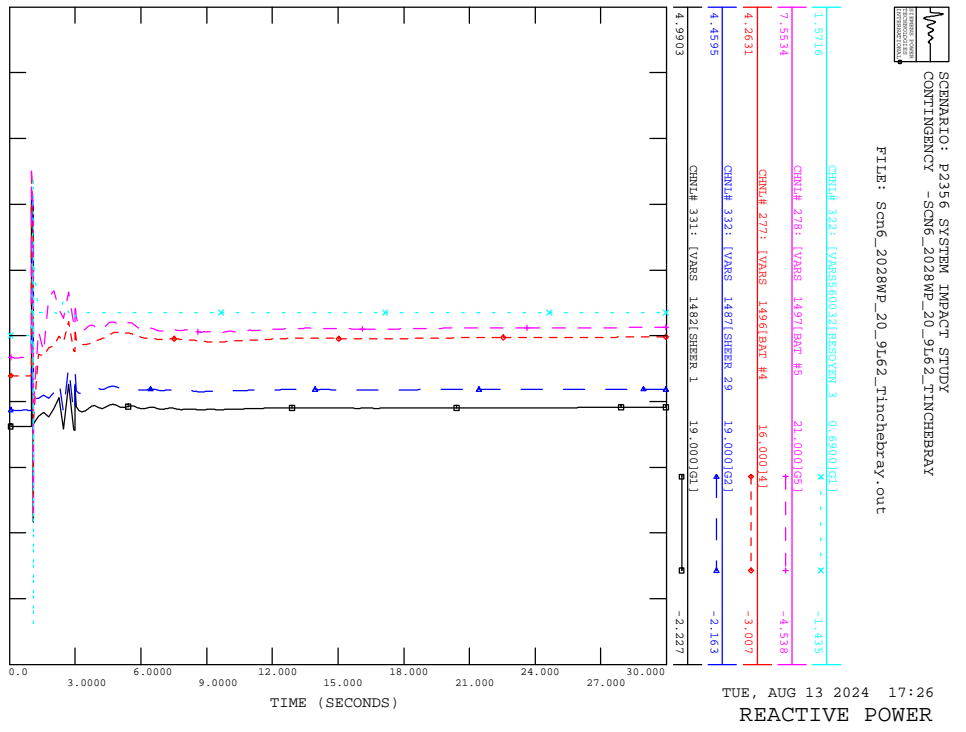
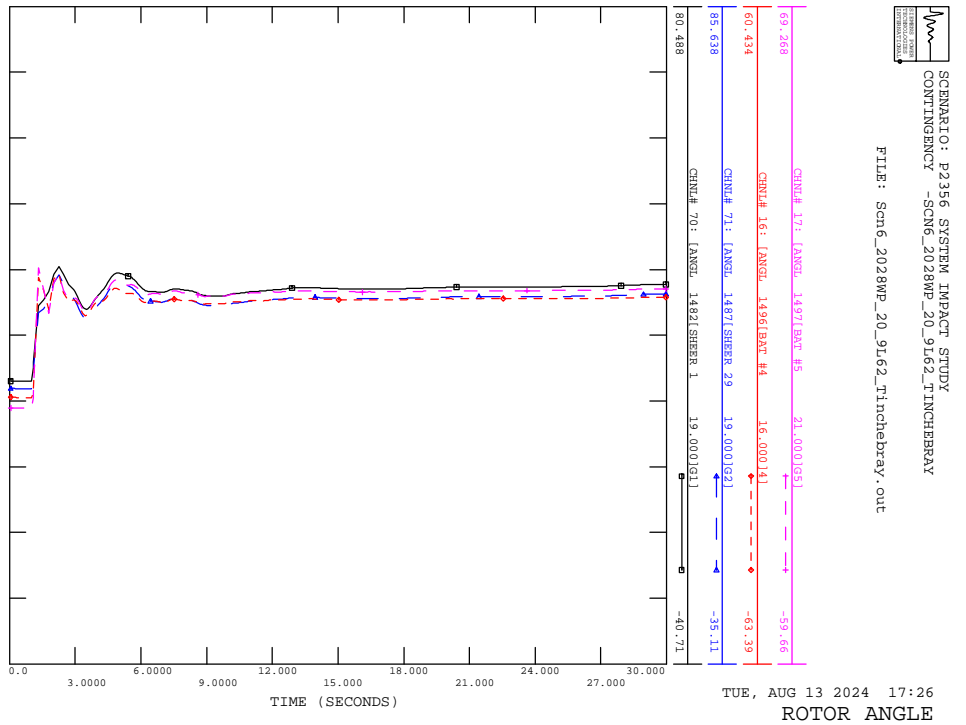
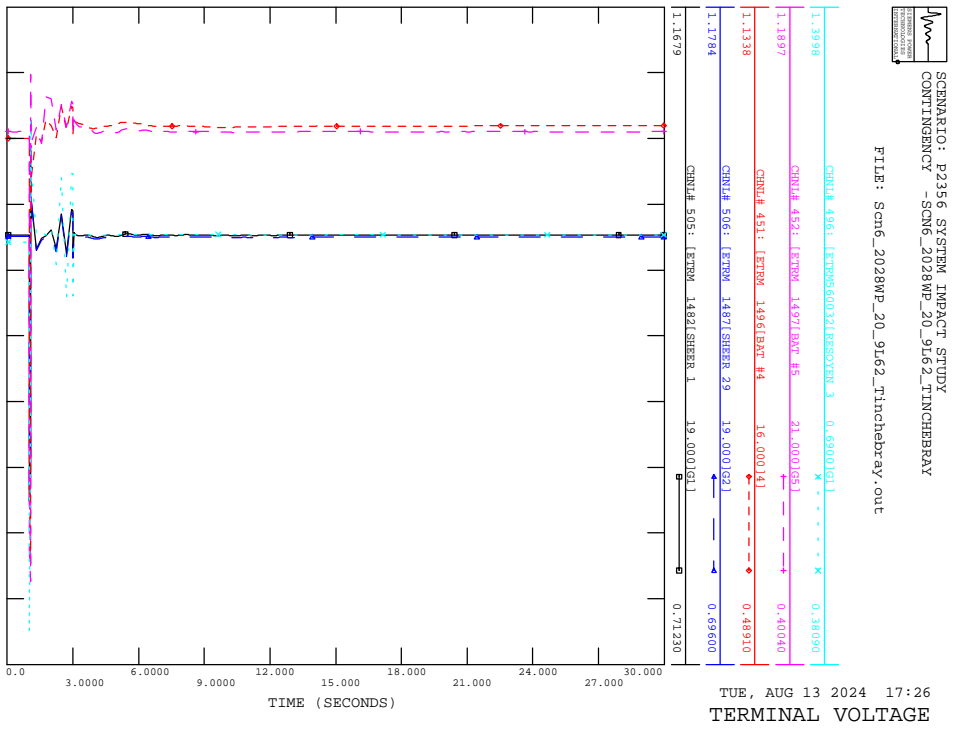
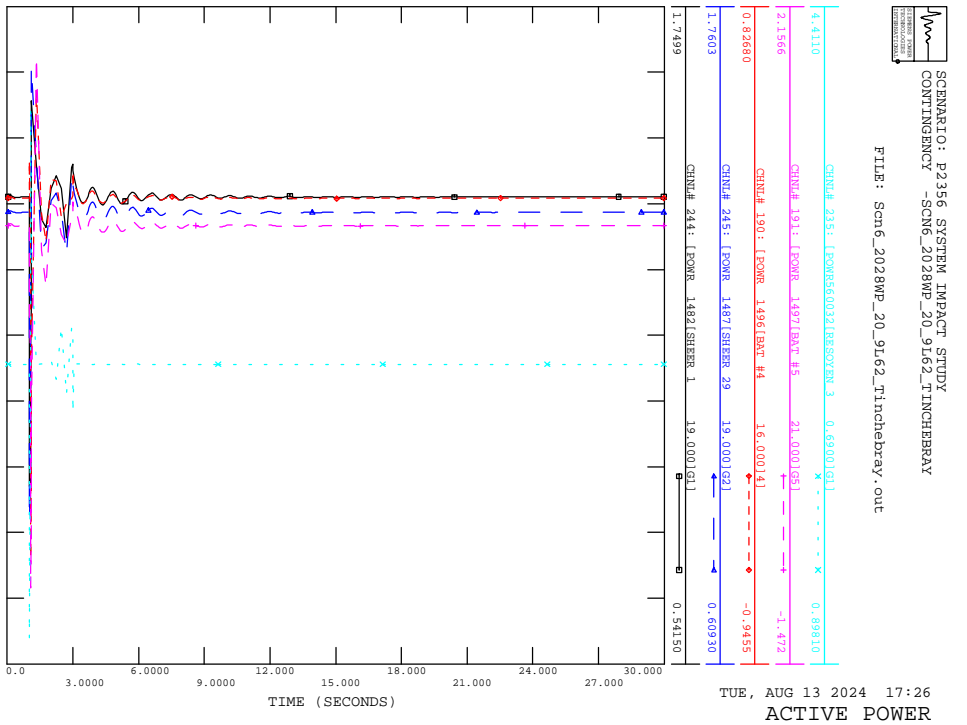


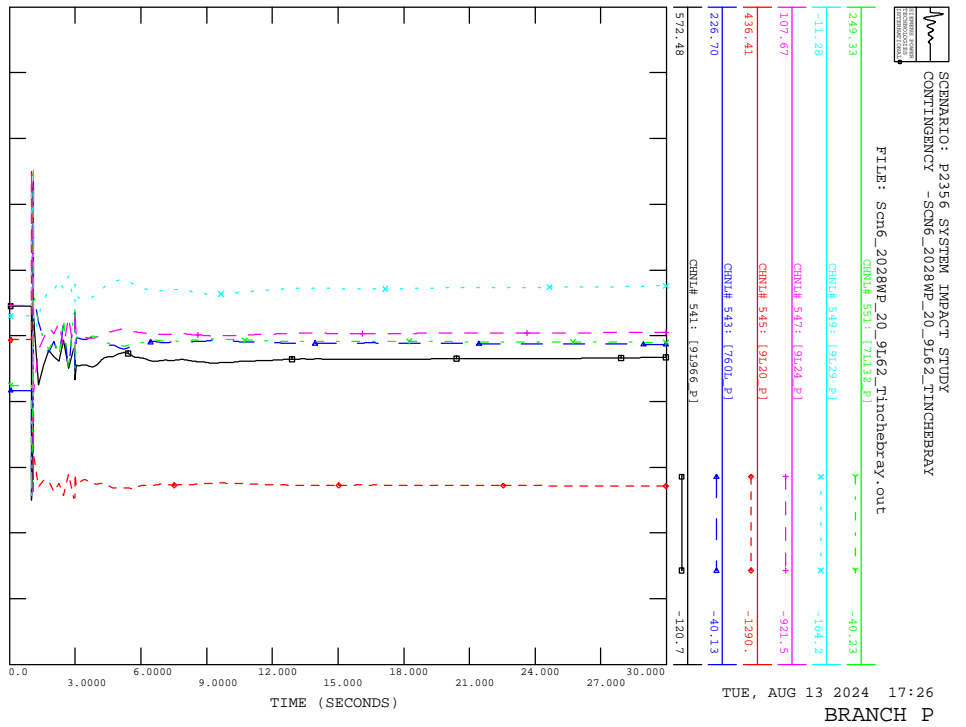
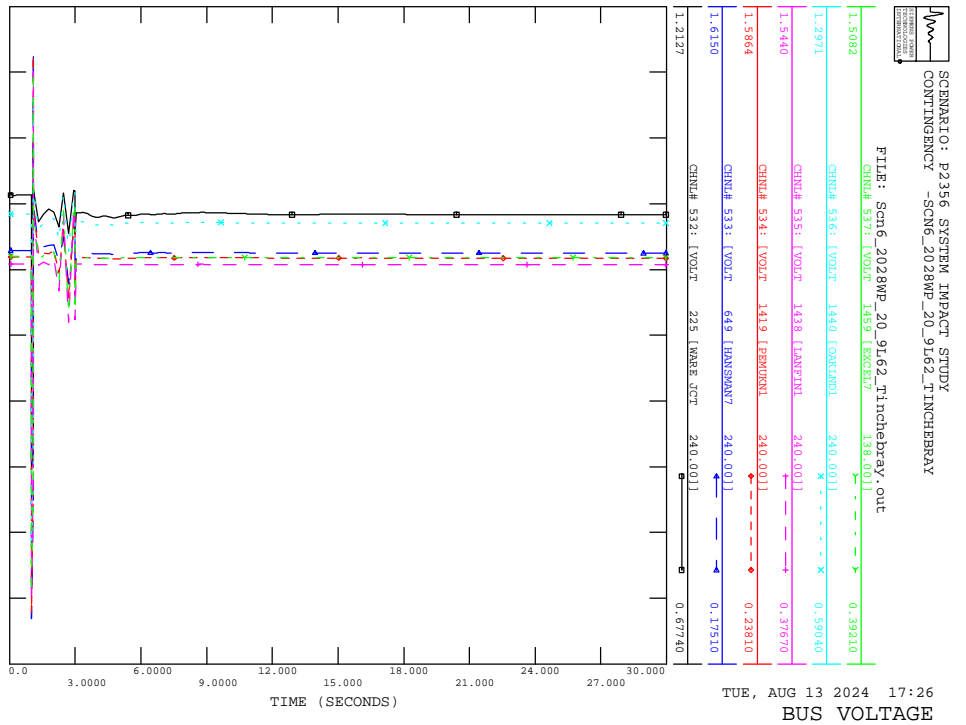
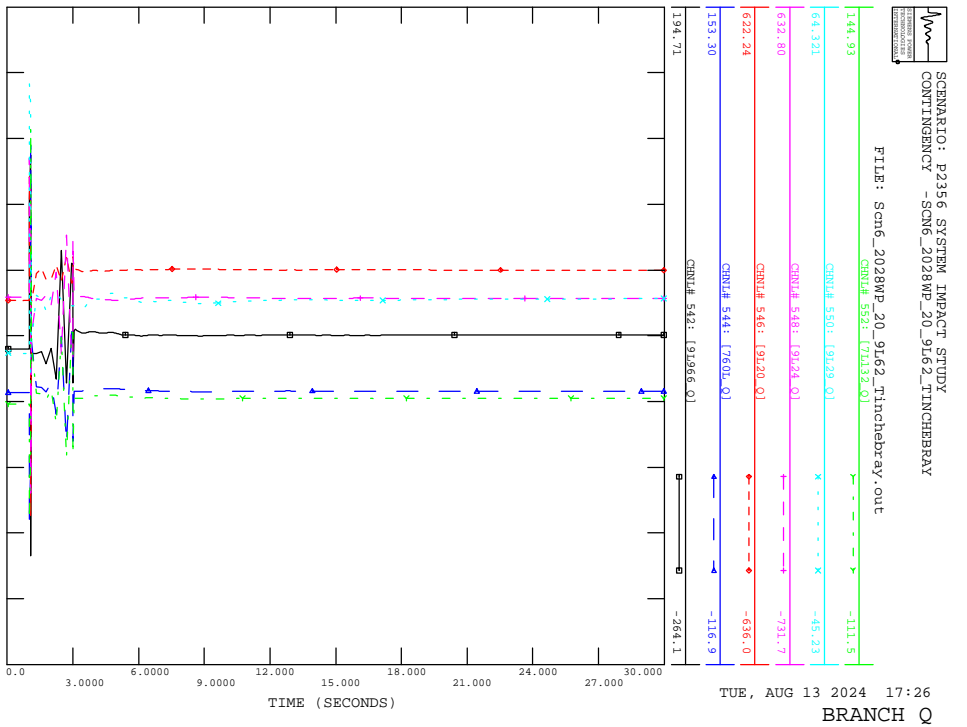
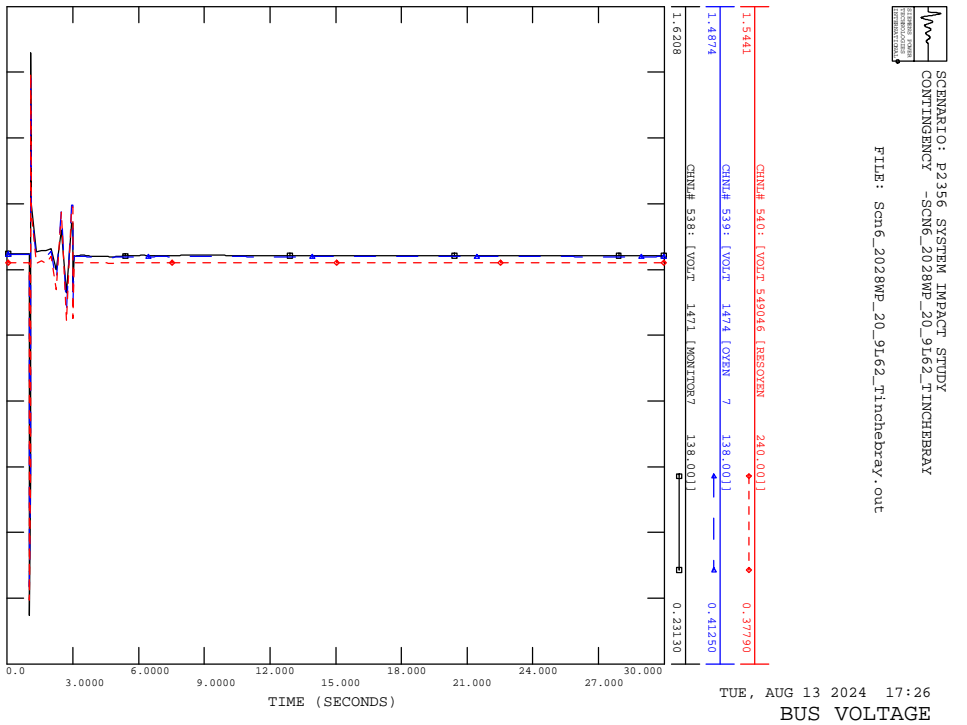


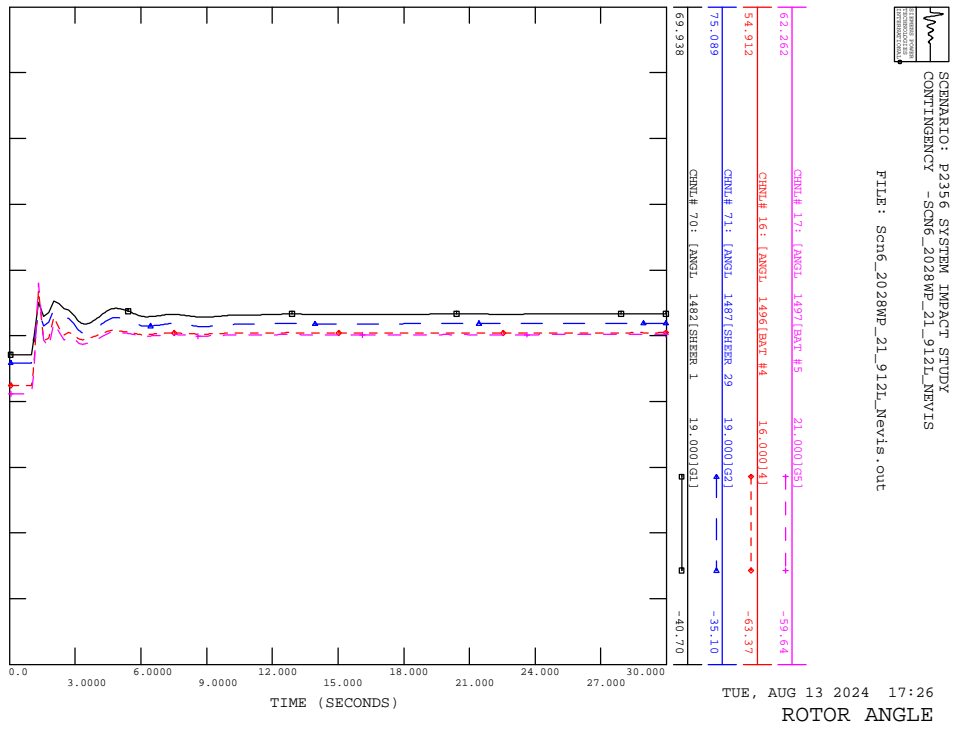
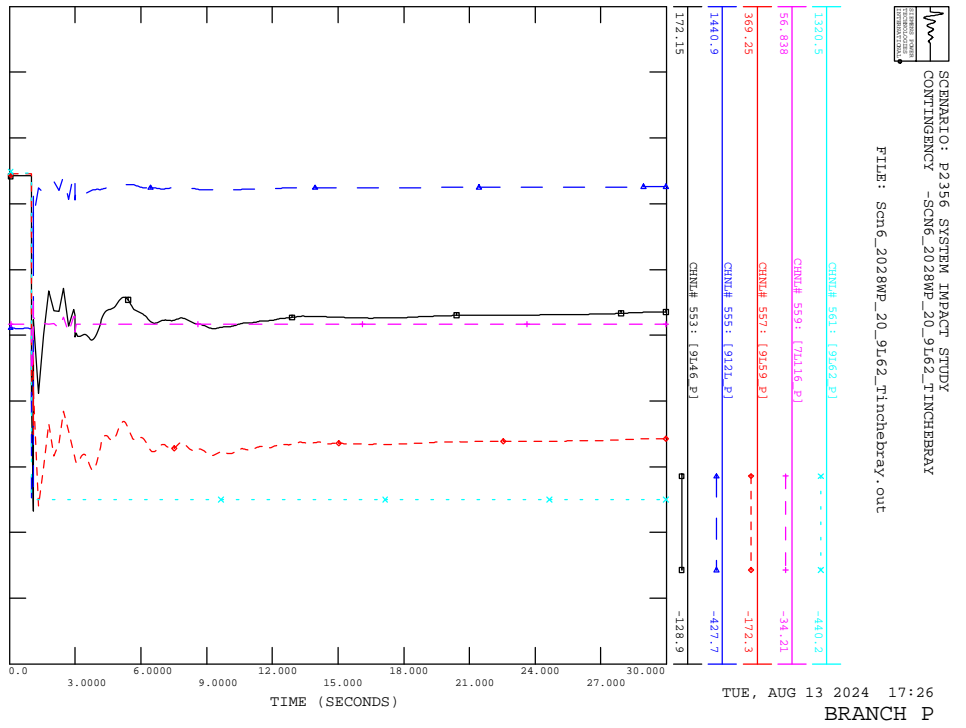
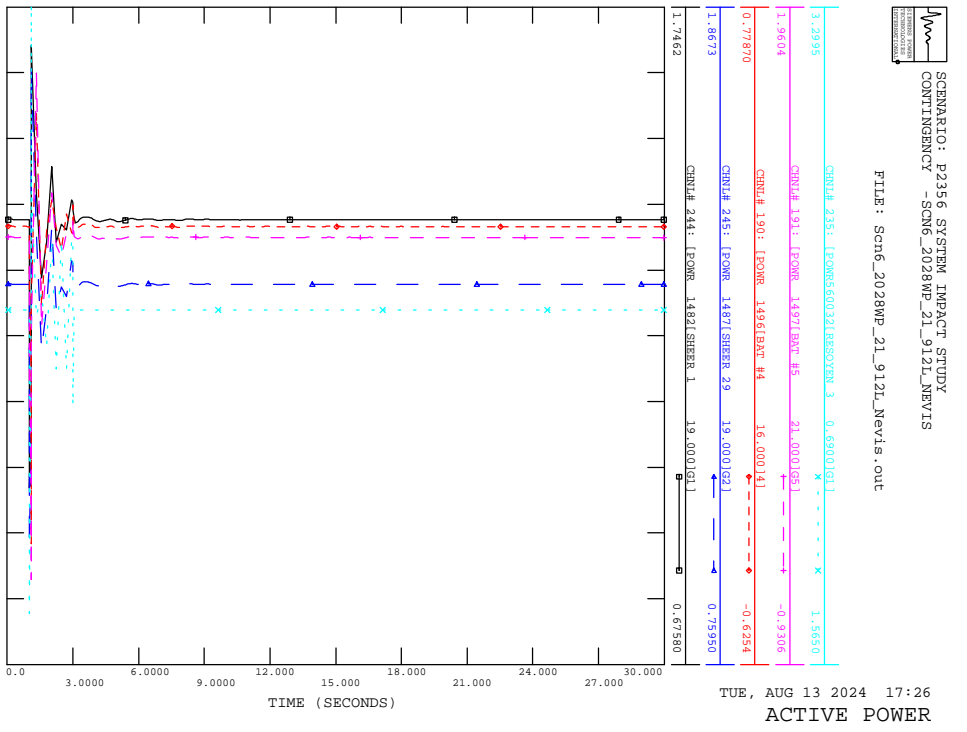
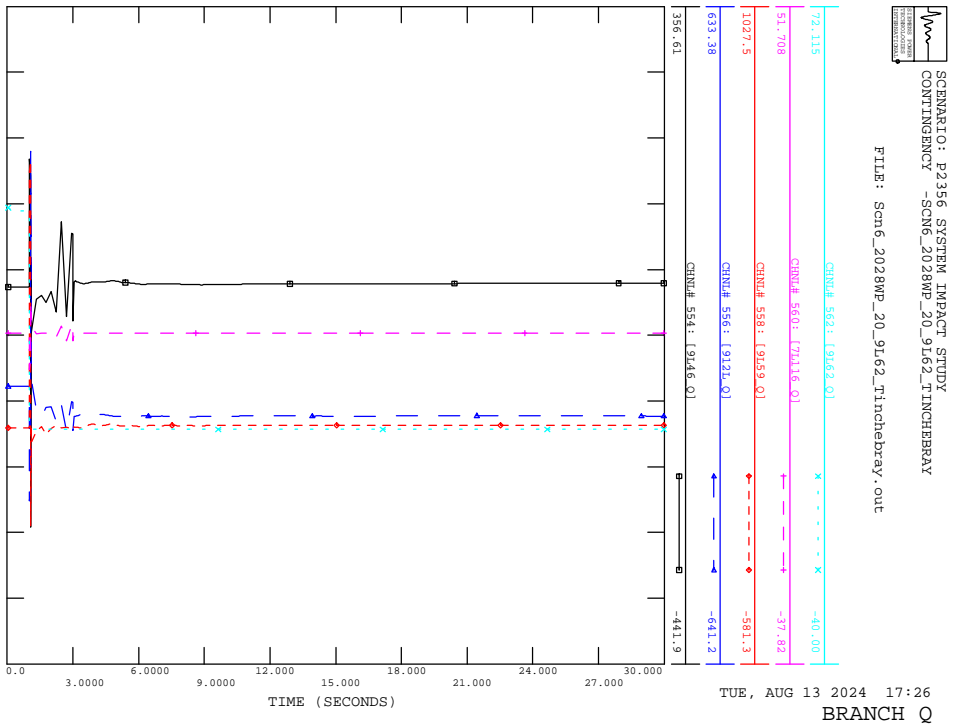




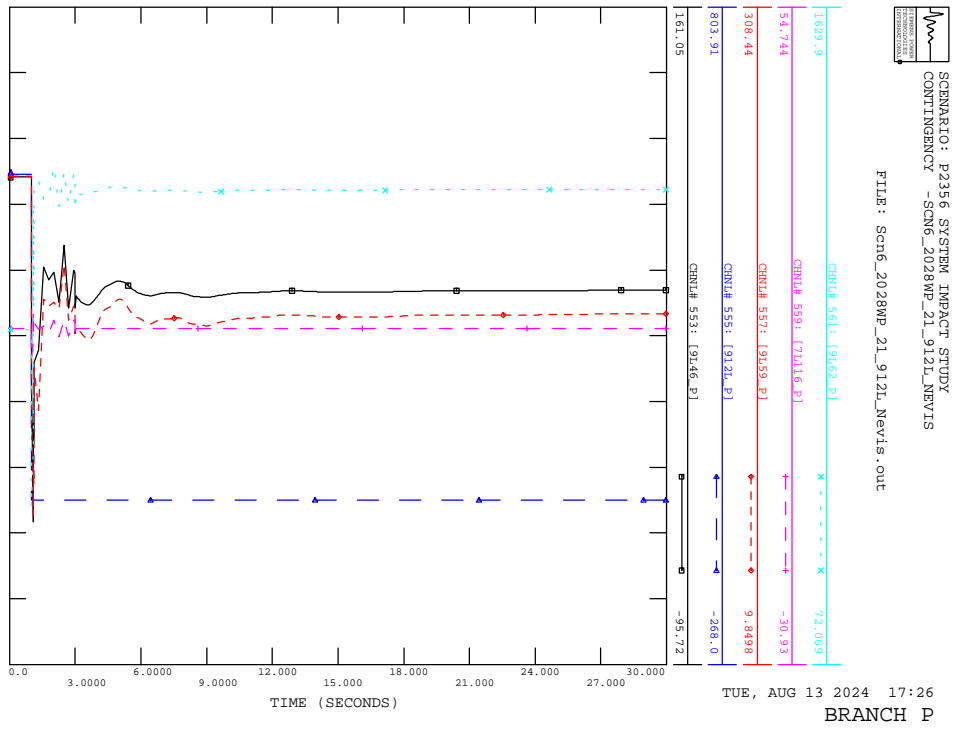
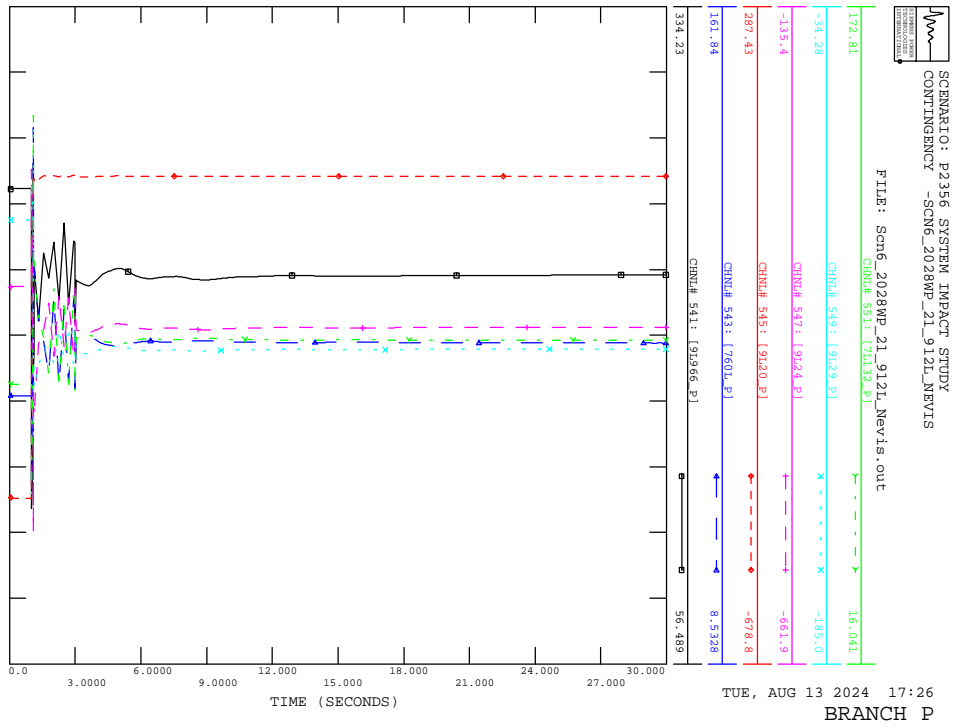
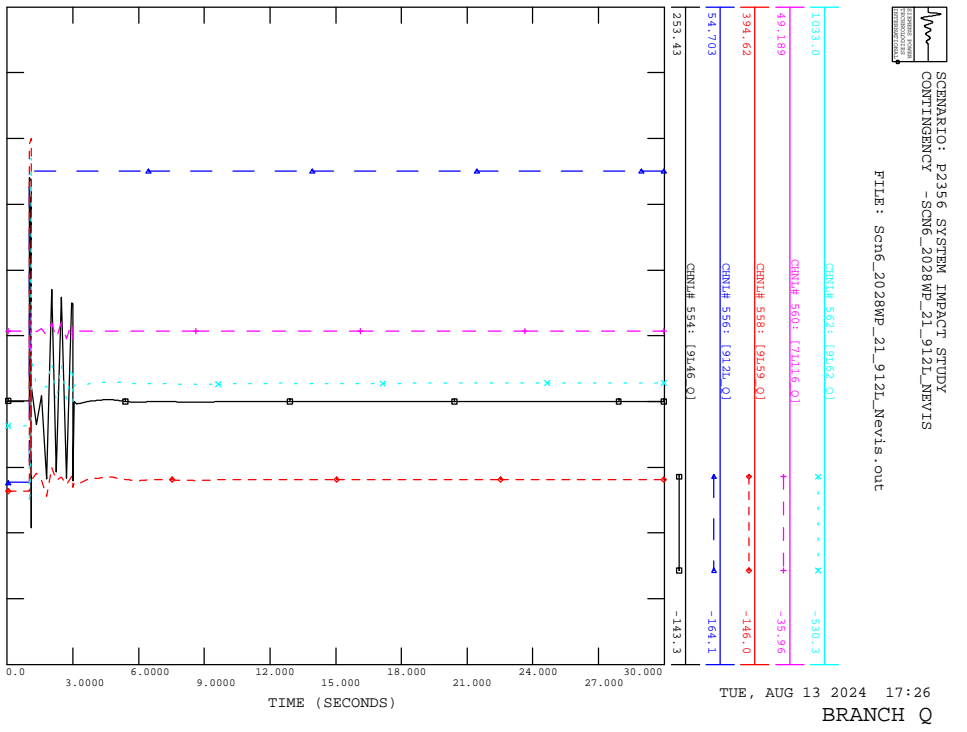
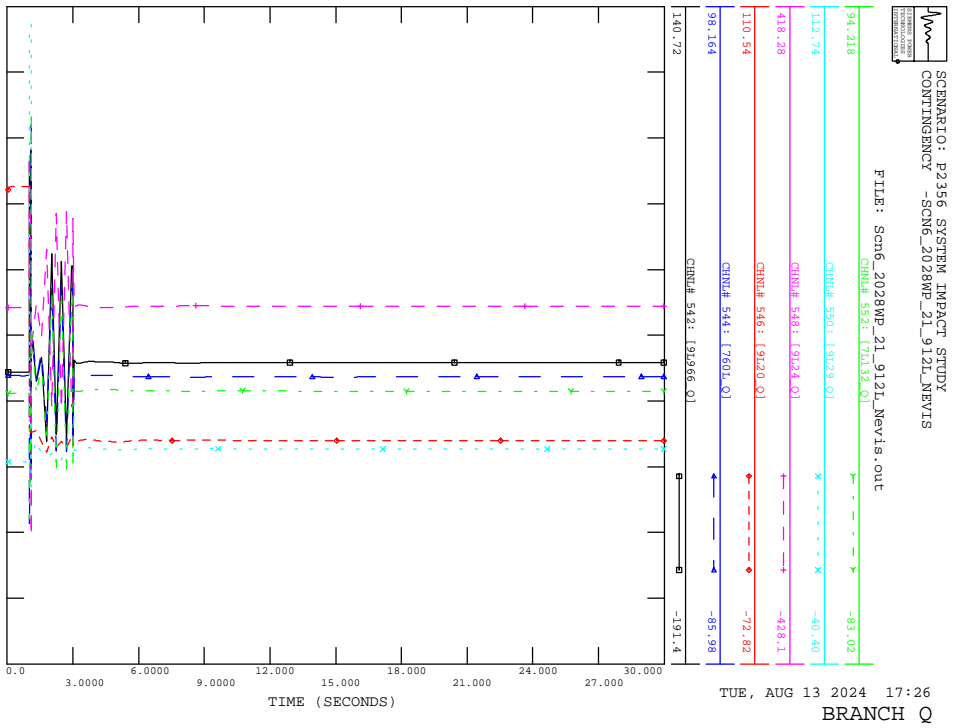


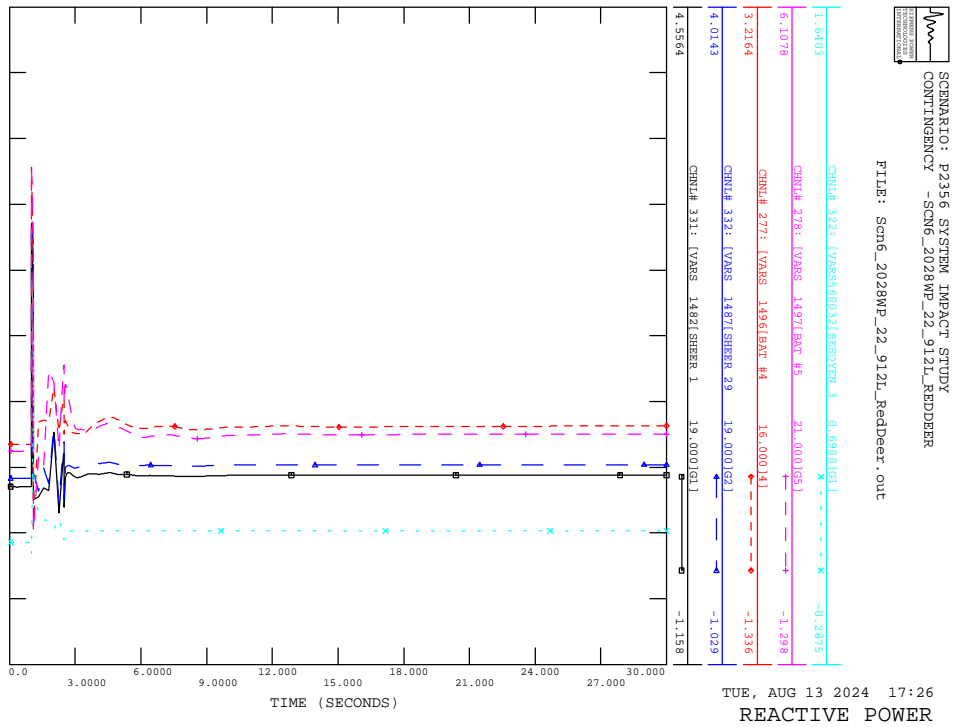
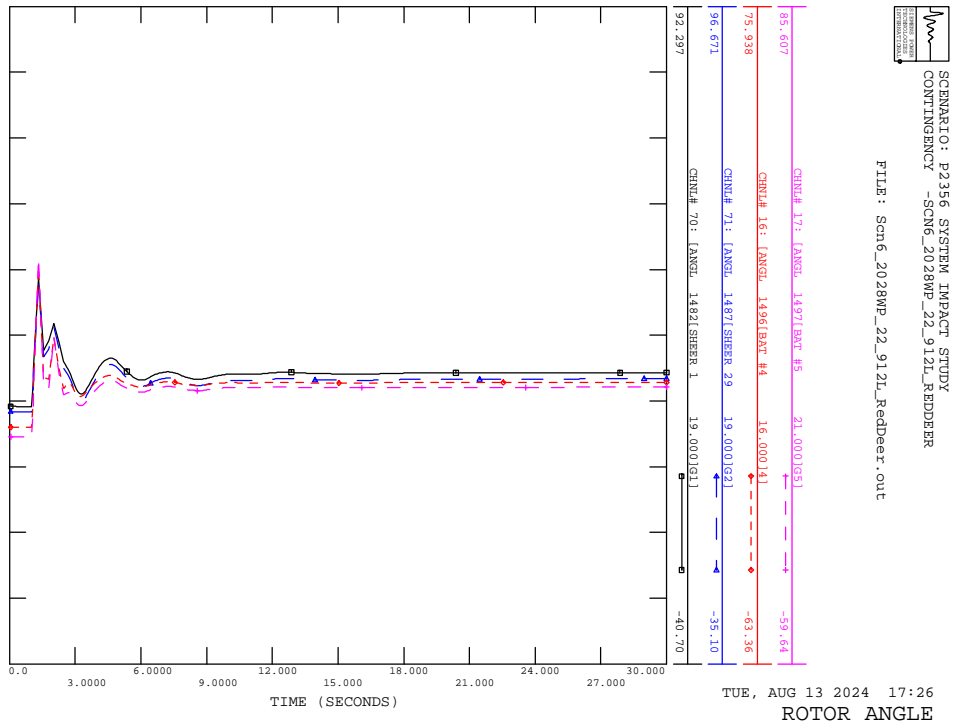
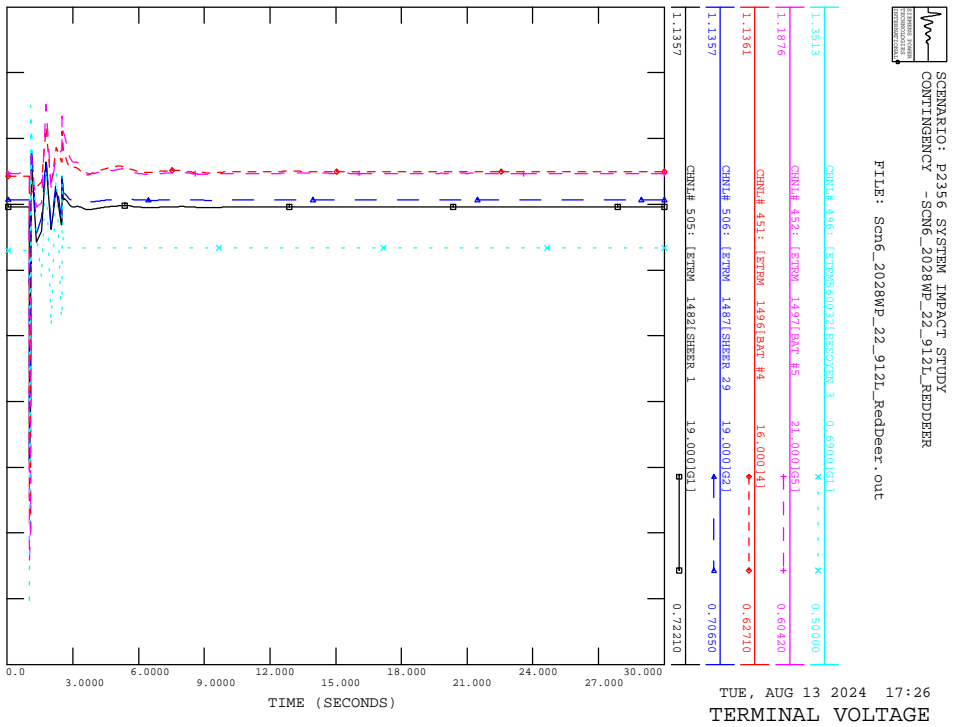
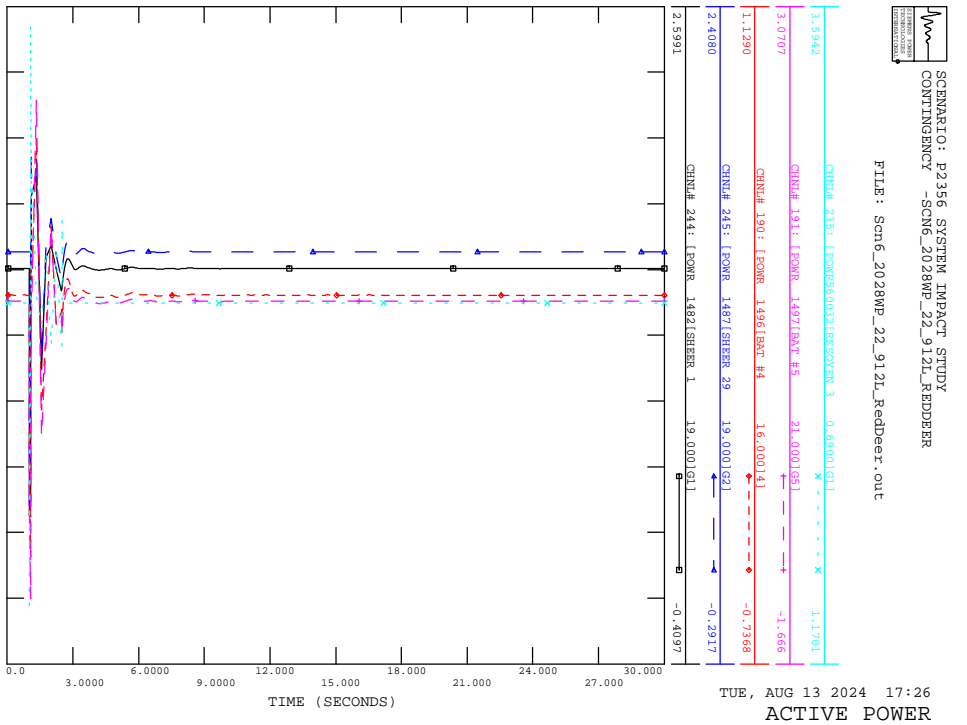


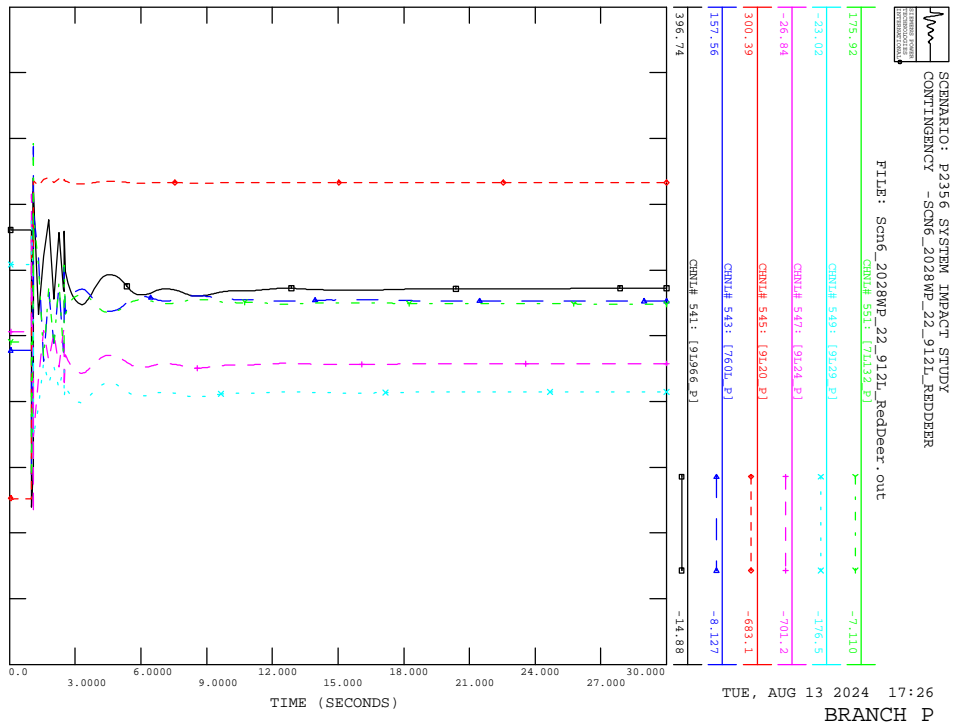
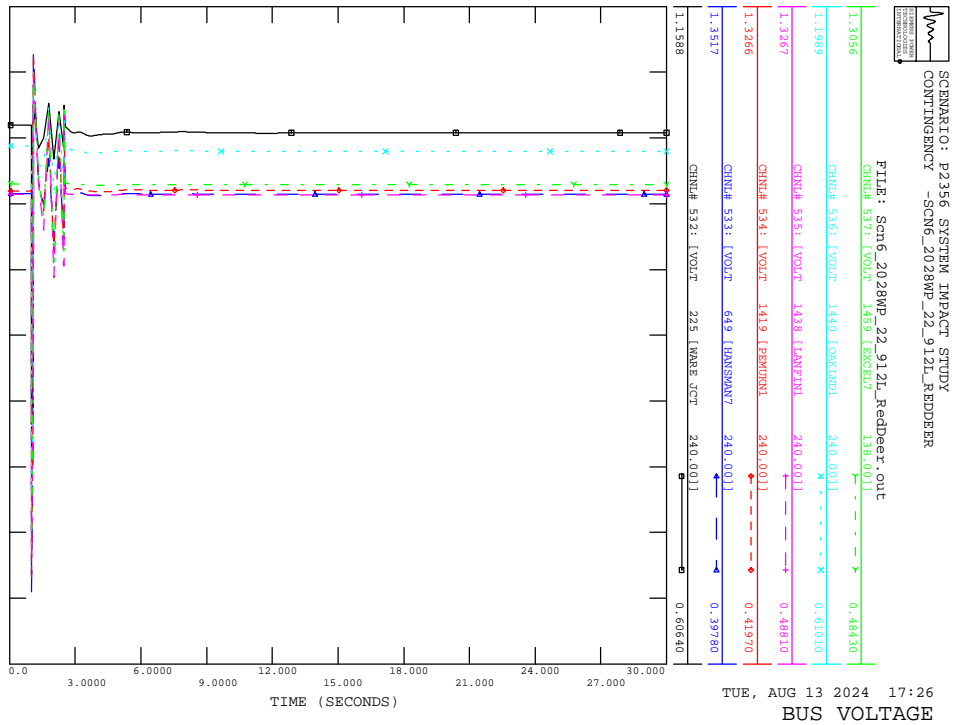
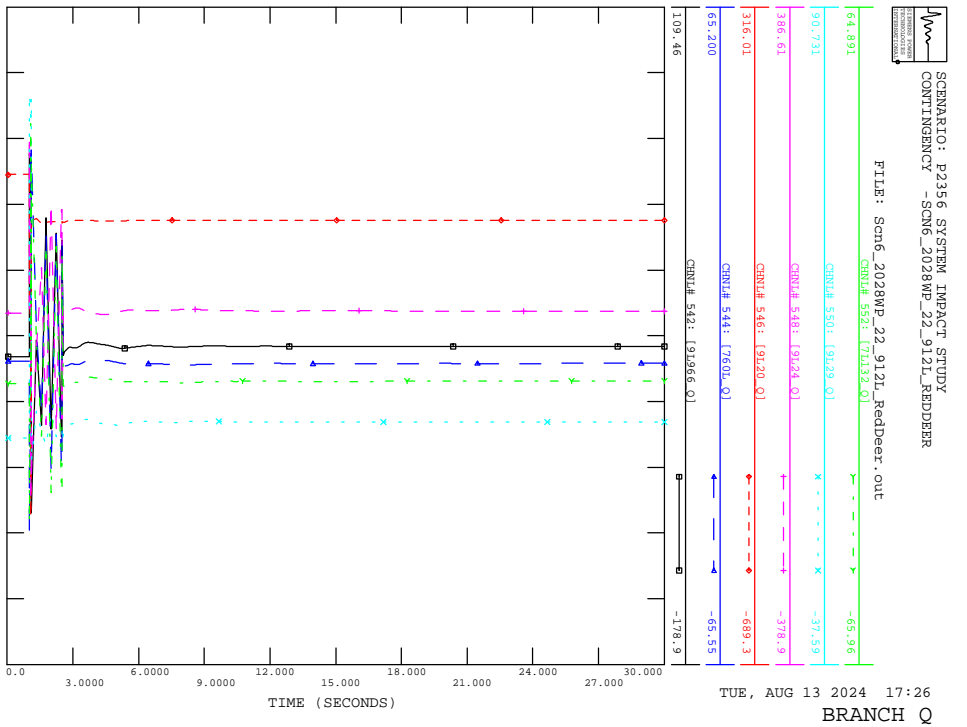
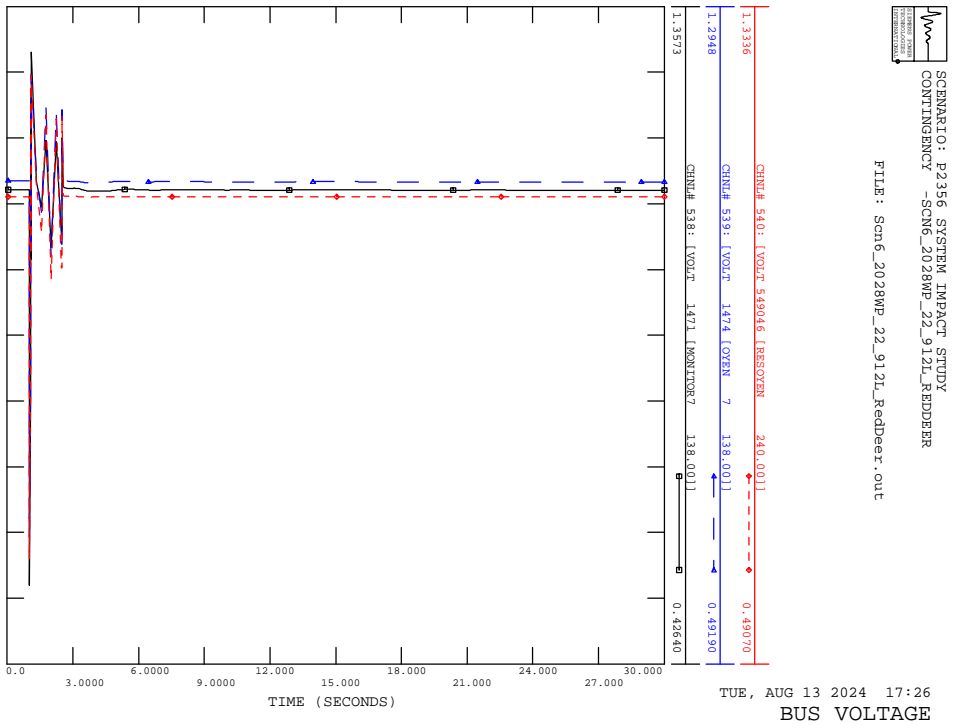






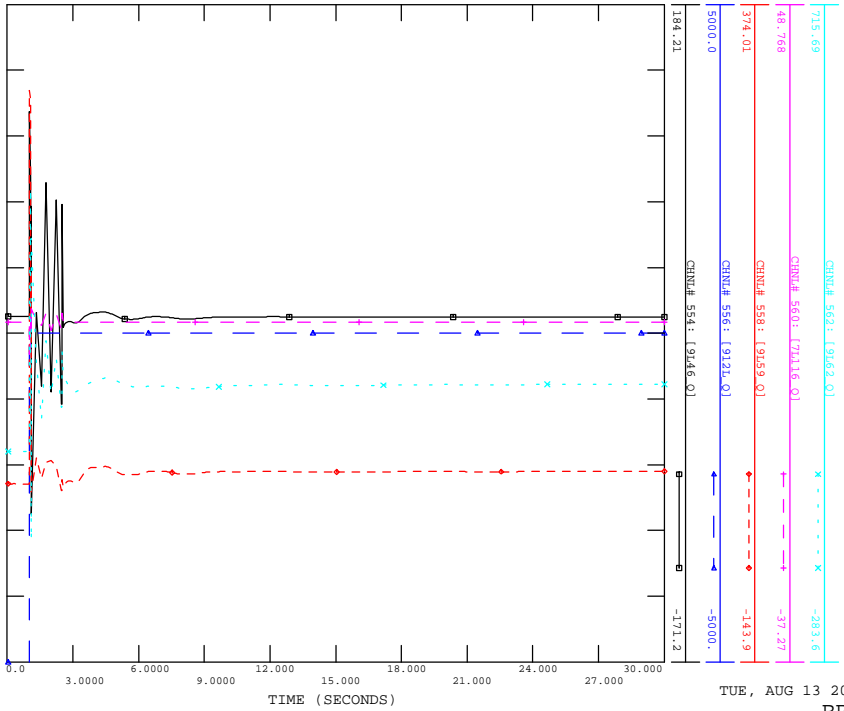




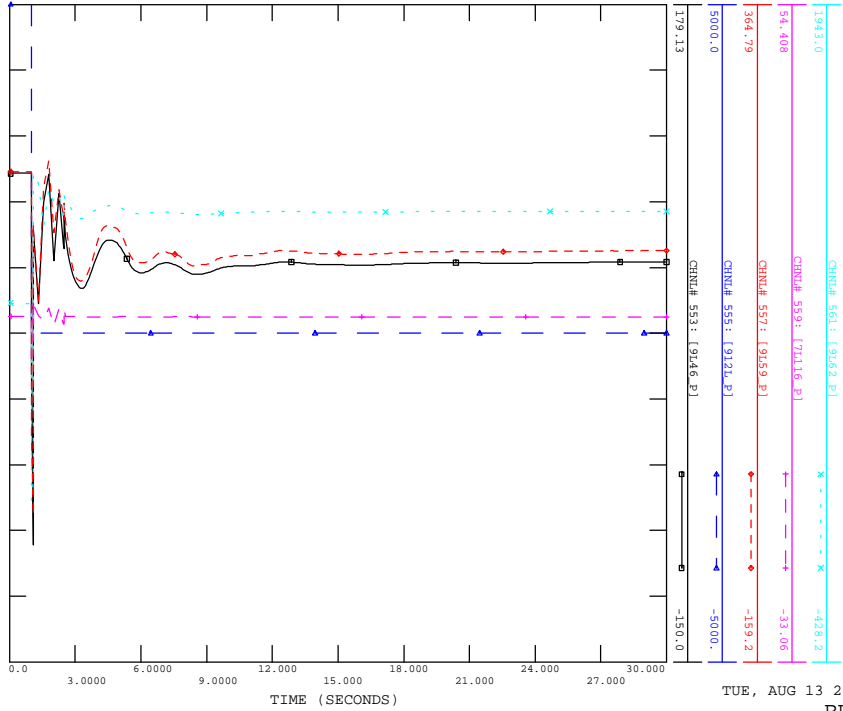




FILE: scn6\_2028WP\_22\_912L\_RedDeer.out



FILE: scn6\_2028WP\_22\_912L\_RedDeer.out



# Attachment A5

## Dynamic Data and Assumptions

/

/ P2356- Stage 3 Project Data Update Package

/

560032 'USRMDL' G1 'REGCAU1' 101 1 1 14 3 4

1

0.02 10.0 0.15 0.06 1.22 1.15 0.2 -999.0 -1.3 0.03 2.0 106.15 -106.2 0.5 / G1 - Generator-Converter

560032 'USRMDL' G1 'REECAU1' 102 0 6 45 6 9

0 0 0 0 0 0

0.9 1.1 0.0 -0.1 0.1 1.98 1.0 -1.0 0.0 0.0 0.6 0.0 0.05 0.5 -0.5 1.1 0.9

0.0 3.0 18.0 5.0 0.0 0.05 106.2 -10.62 1.05 0.05 1.44 0.01 0.01 0.27 0.07

0.27 0.15 1.0 0.3507 1.0 0.08 0.12 0.1 0.39 0.5 0.39 0.79 1.44 / G1 - Electrical Control

560032 'USRMDL' G1 'REPCAU1' 107 0 7 27 7 9

560030 0 0 0 0 0 0

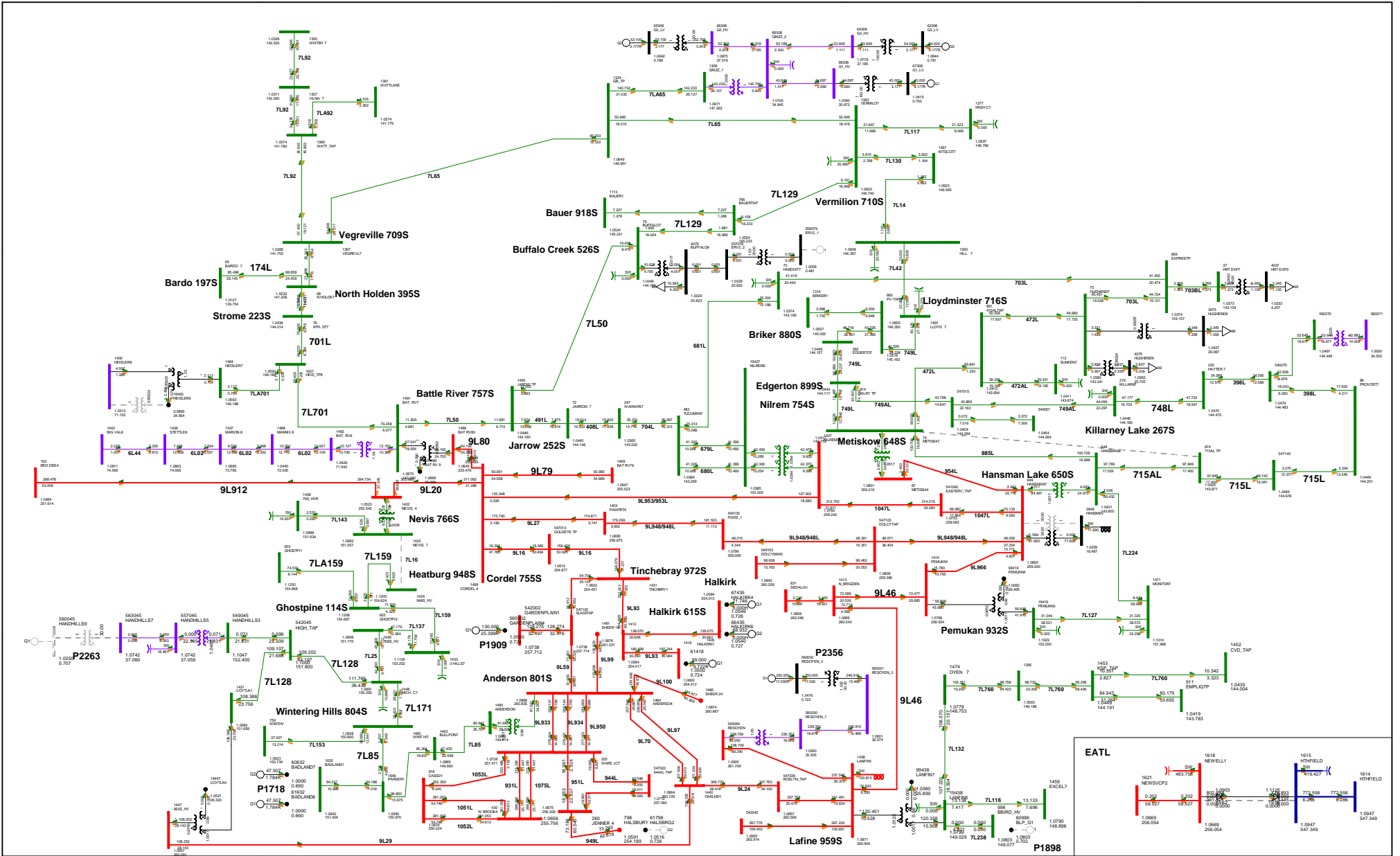
0.03 1.0 6.6667 0.0 0.0 0.85 0.0 0.0 0.05 999.0 -999.0 -0.01 0.01 0.6 -0.6

0.4 2.6667 0.03 0.0 0.0 999.0 -999.0 1.1 0.0 0.10 0.0 0.0 / G1 - Plant Control

/

# Attachment A6

## Post-Ras Power Flow Diagrams

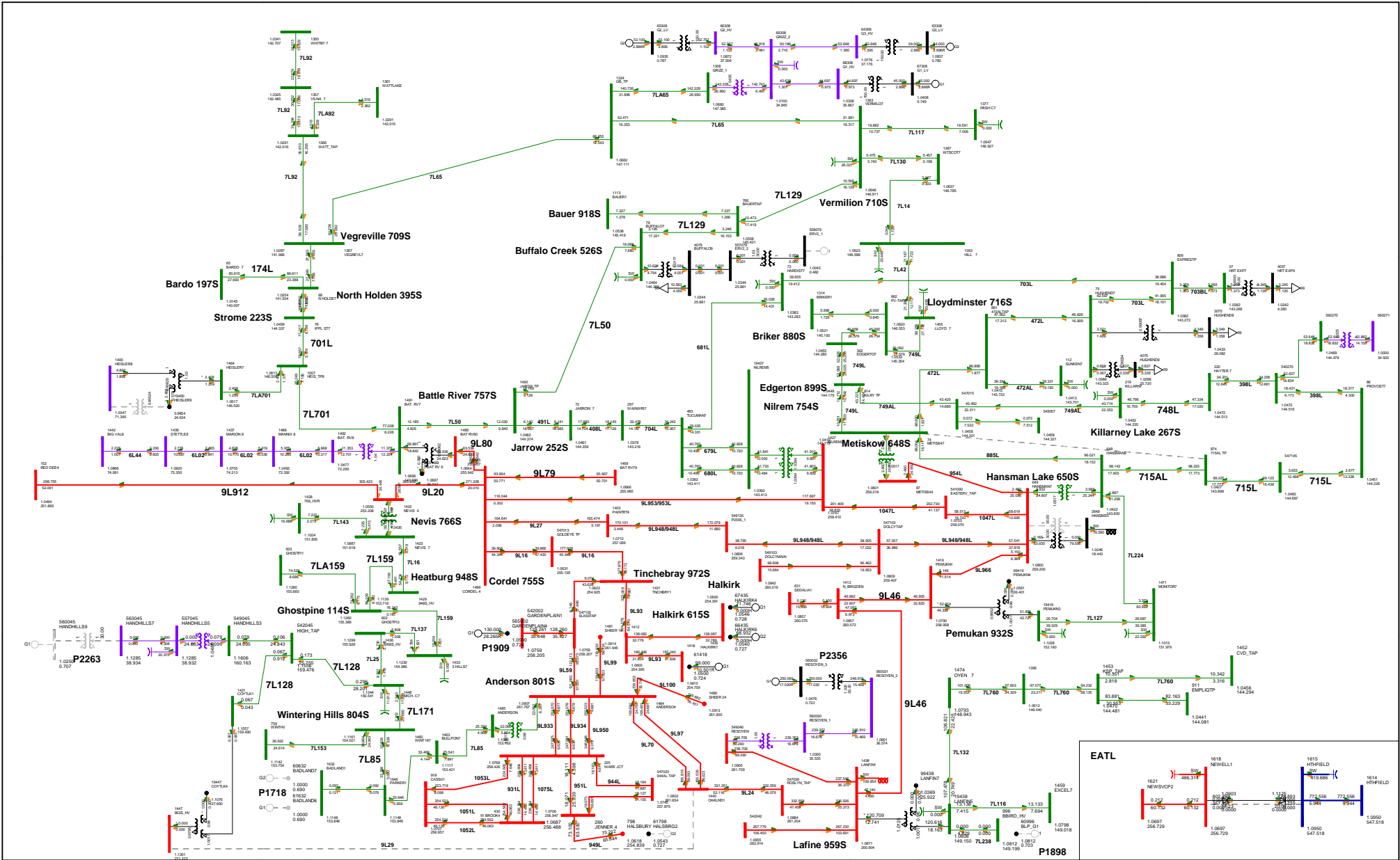


**P2356 Oyen MPC Wind**

**FIGURE A6-1-1 N-1: 7L16 (NEVIS 766S TO HEATBURG 948S)  
2028 SUMMER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
EATL: -808.205 MW

BC Import: -345.318 MW  
Sask Import: -150.000 MW  
MATL Import: -182.800 MW

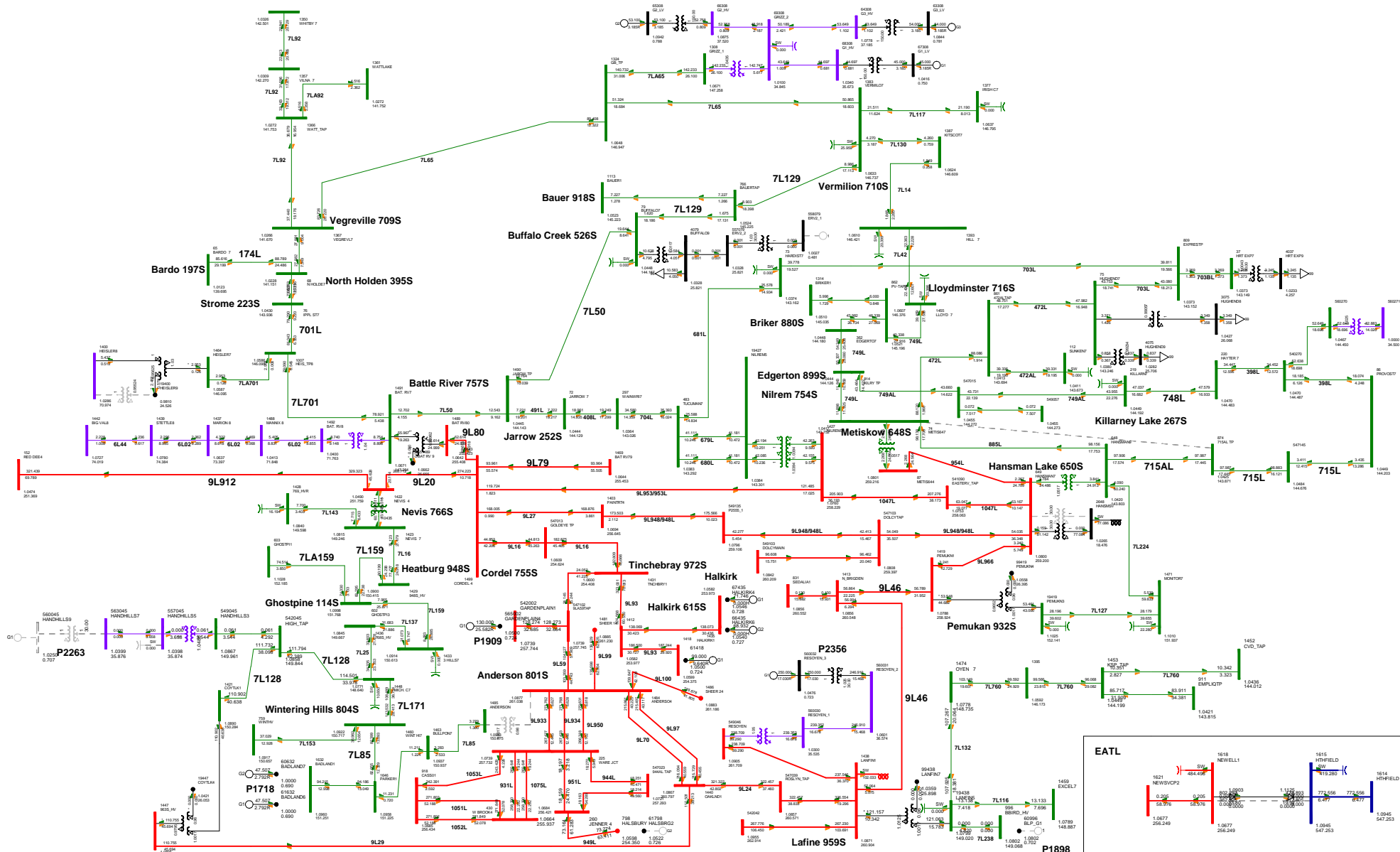


**P2356 Oyen MPC Wind**

**FIGURE A6.1-2 N-1: 9L29 (JAKLAND 946S TO COYOTE LAKE 963S)  
2028 SUMMER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
EATL: -808.225 MW

BC Import: -240.816 MW  
Sask Import: -150.000 MW  
MATL Import: -182.800 MW

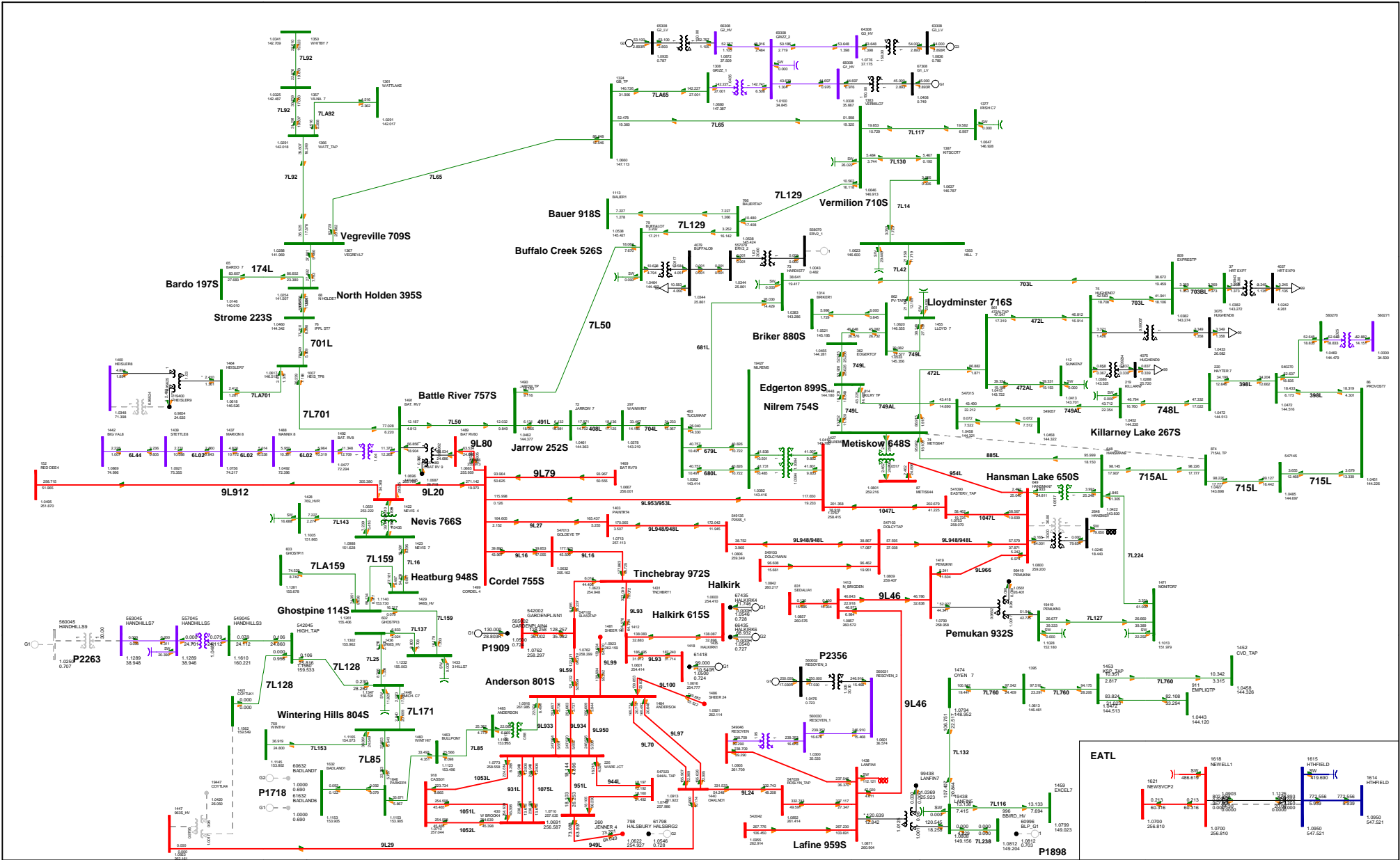


**P2356 Oyen MPC Wind**

**FIGURE A6.1-3 N-1: 801ST1 (ANDERSON 801S 240/138 KV T1)  
2028 SUMMER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
EATL: -808.211 MW

BC Import: -343.124 MW  
Sask Import: -150.000 MW  
MATL Import: -182.800 MW



**P2356 Oyen MPC Wind**

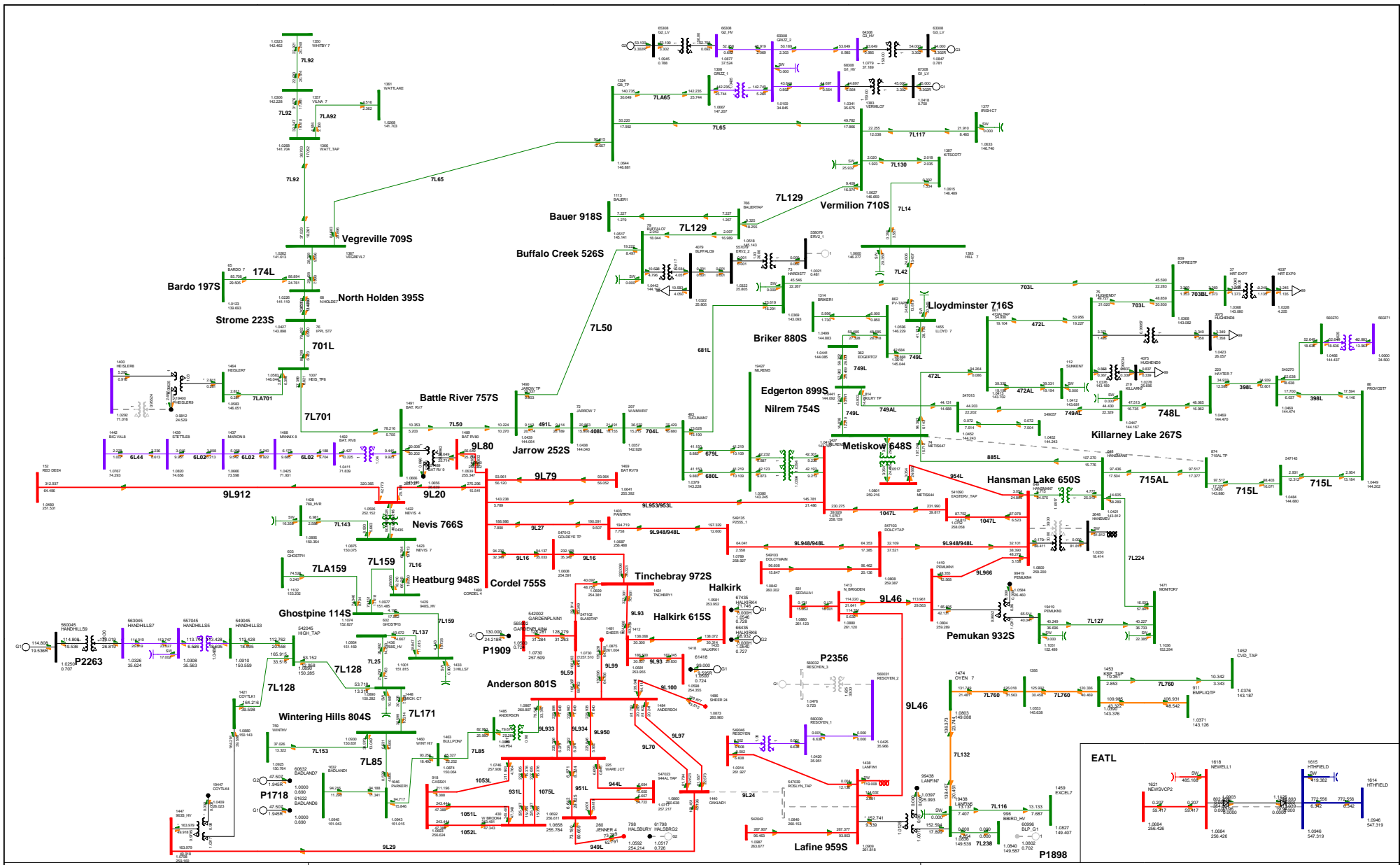
Bus - Voltage (kV)  
 Branch - MVA  
 Capacity - MW/Mvar  
 100.0% base  
 MVA - 40.000-34.500-49.000-130.000-144.000-550.000

**FIGURE A6.1-4-N-1: 963ST1 (COYOTE LAKE 963S TRANSFORMER T1)  
 2028 SUMMER PEAK (POST-CONNECTION), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
 EATL: -808.227 MW

BC Import: -240.885 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW





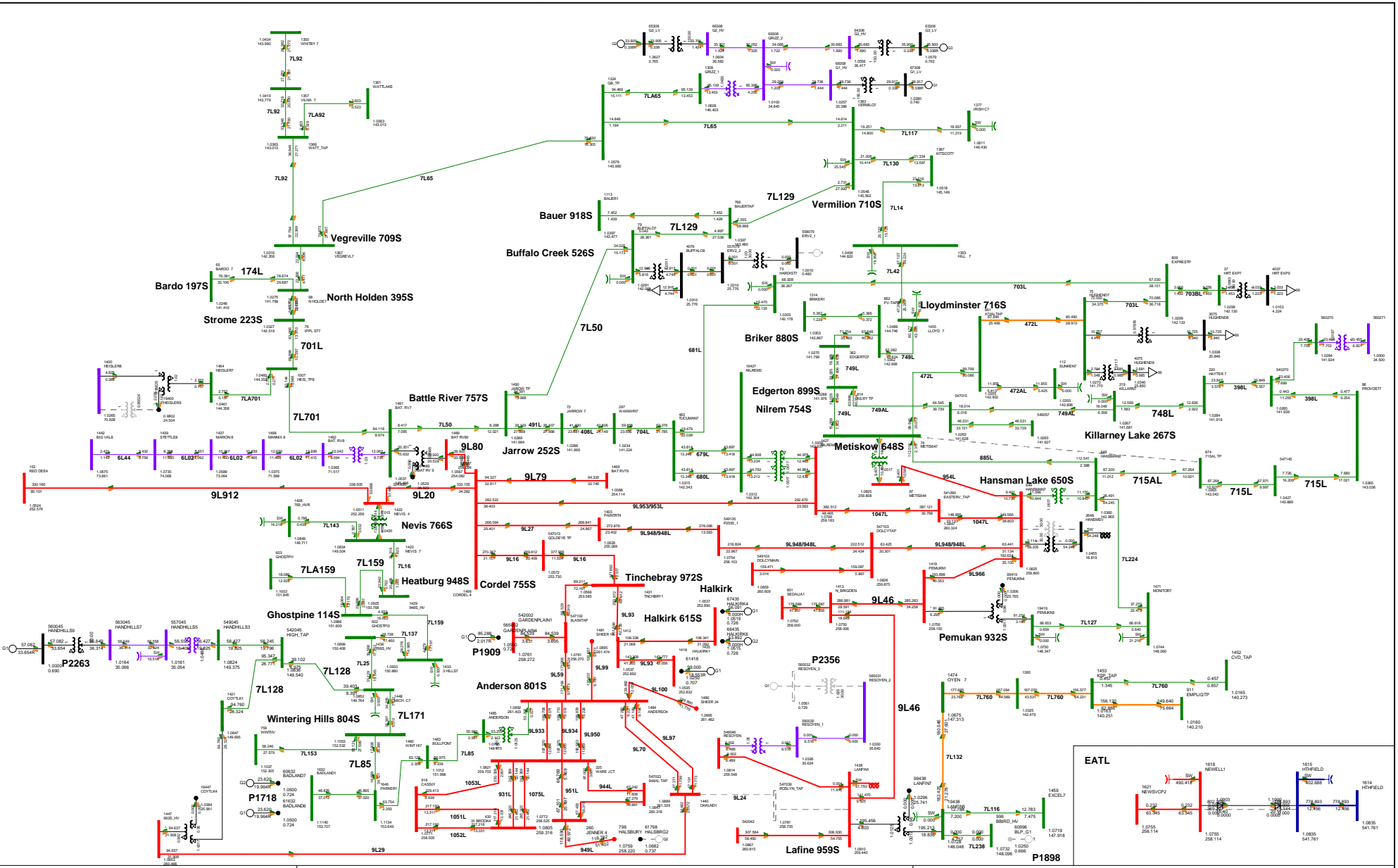
**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/MVA  
 102.5/100.0  
 W: +0.000+34.500+88.000+138.000+240.000+500.000

**FIGURE A6.1-5 N-1: 9L24 (DANKLAND 948S - LANFINE 959S)**  
 2028 SUMMER PEAK (POST-CONNECTION), WITH RAS  
 PRINTED ON WEDNESDAY 02 OCTOBER 2024

WATL: -2.433 MW  
 EATL: -808.216 MW

BC Import: -229.719 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.800 MW

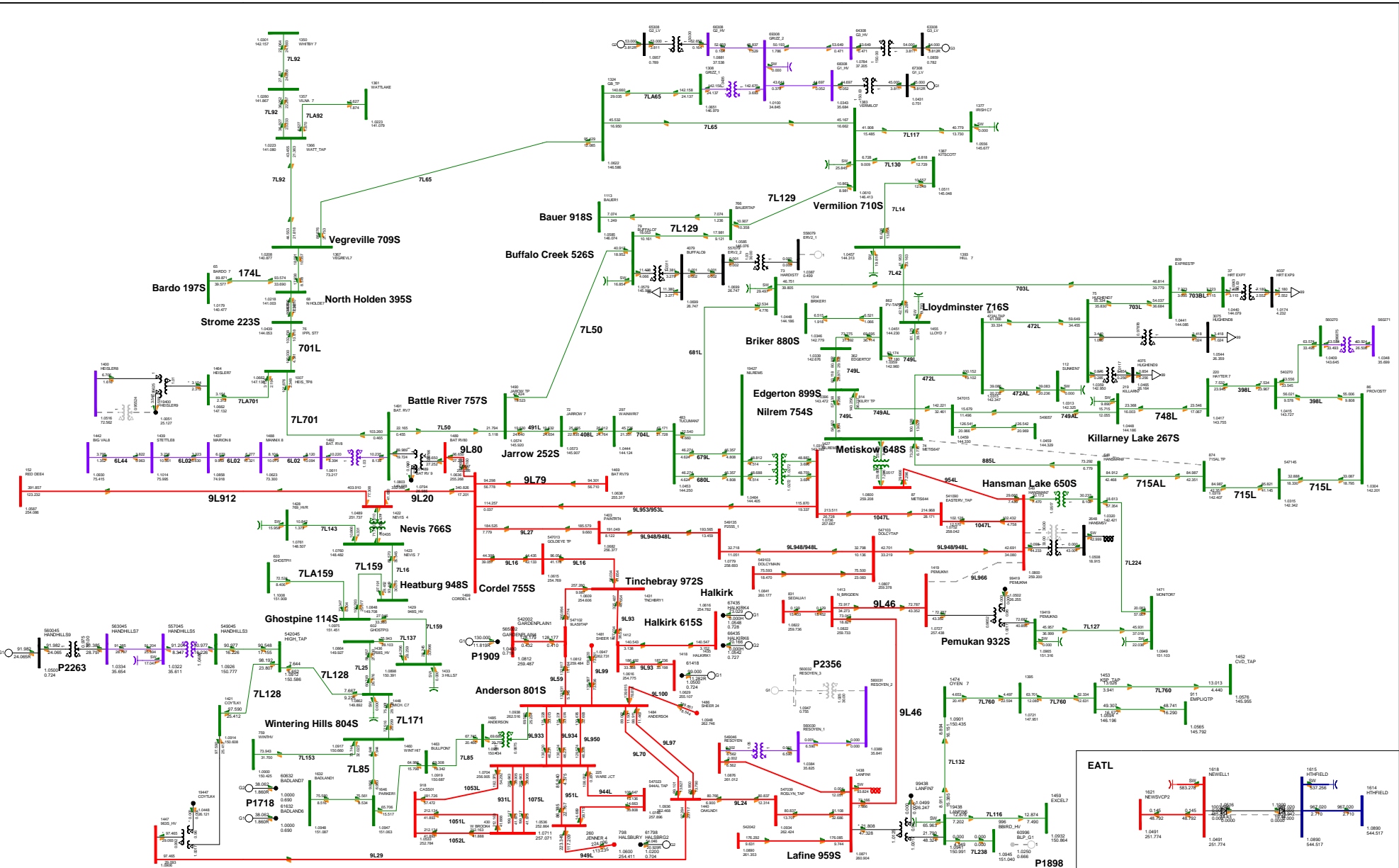


**P2356 Oyen MPC Wind**

Bus Voltage (V) 69  
 Base MVA 100  
 Equipment MVA/MW 100/30/30  
 W: +0.000+34.500+88.000+138.000+190.000+240.000+290.000

**FIGURE A6.2-1 N-1: 9L24 (DANKLAND 946S - LANFINE 959S)  
 2025 SUMMER LIGHT (POST-CONNECTION), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -0.086 MW	BC Import: -569.249 MW
EATL: -802.718 MW	Sask Import: 0.000 MW
	MATL Import: -183.024 MW

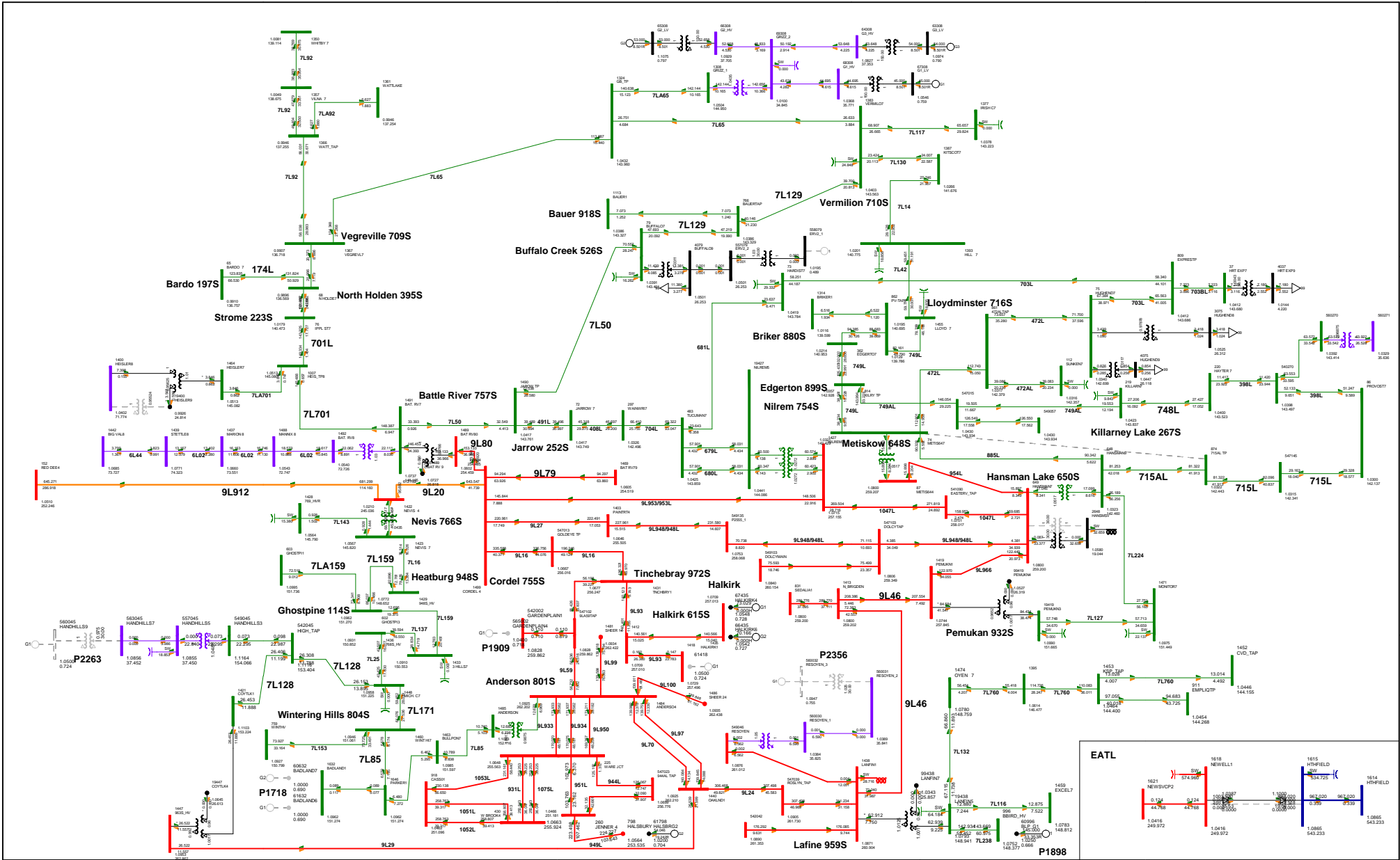


**P2356 Oyen MPC Wind**

**FIGURE A6.3-1 N-1: 966L (HANSMAN LAKE 650S TO PEMUKAN 932S)  
 2028 WINTER PEAK (POST-CONNECTION), WITH RAS  
 PRINTED ON WEDNESDAY 02 OCTOBER 2024**

WATL: -150.146 MW  
 EATL: -1003.810 MW

BC Import: -619.768 MW  
 Sask Import: -151.000 MW  
 MATL Import: -182.679 MW

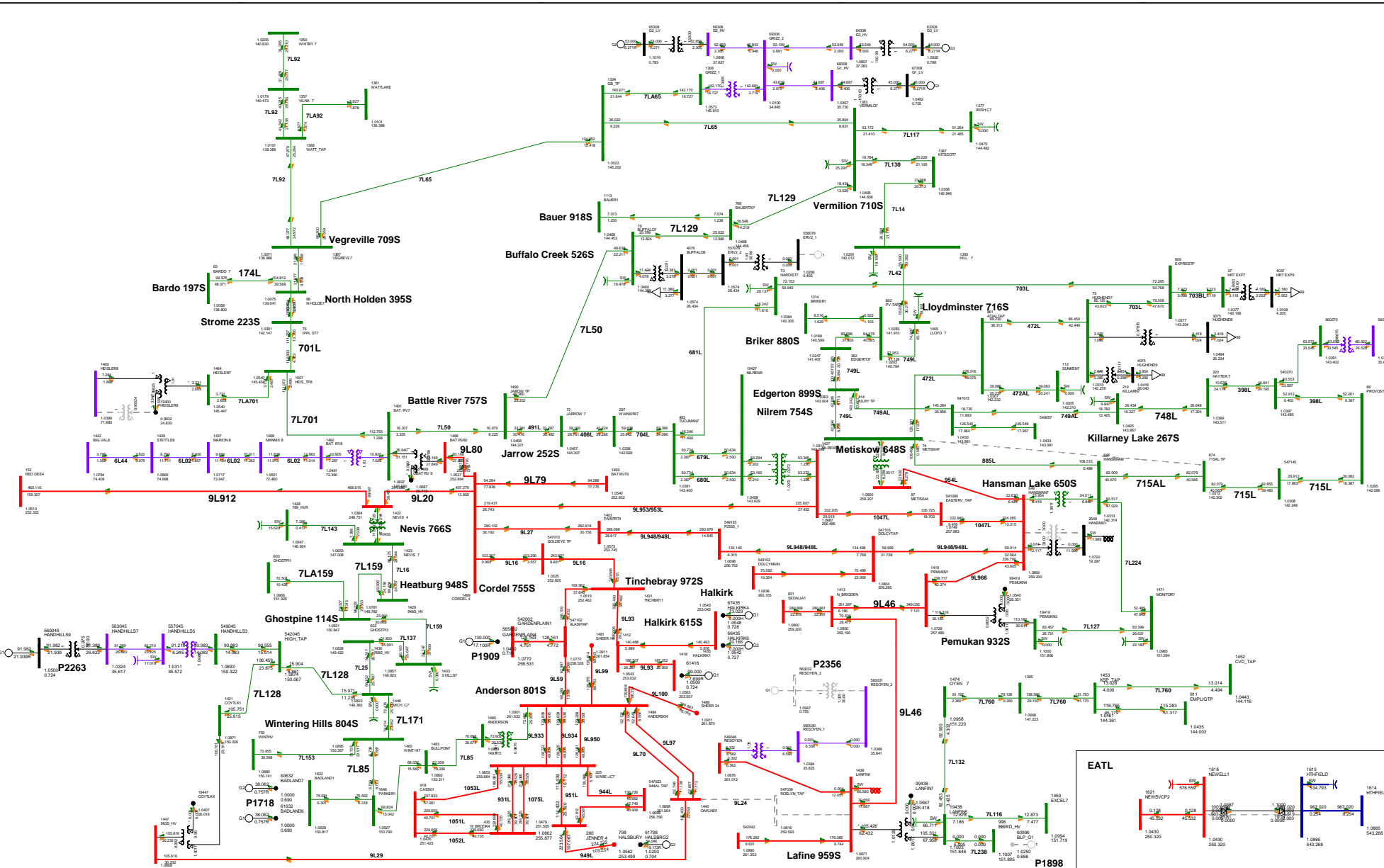


P2356 Oyen MPC Wind

FIGURE A6.3-2-N-1-962L (TINCCHREAY 972S TO GAETZ 97S)  
2028 WINTER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02, OCTOBER 2024

WATL: -150.145 MW  
EATL: -1003.768 MW

BC Import: -428.589 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW

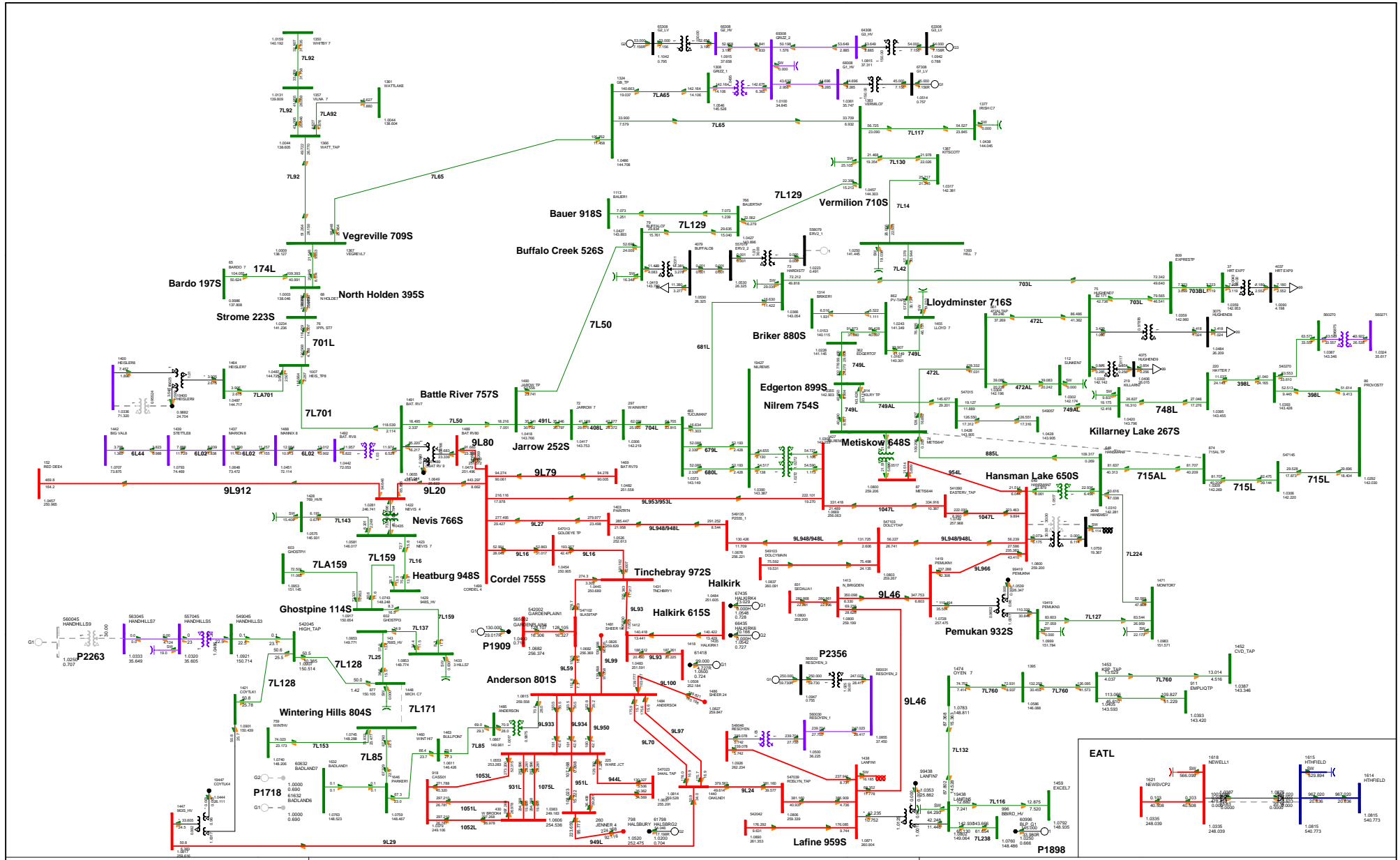


**P2356 Oyen MPC Wind**

**FIGURE A6.3-3 N-1: 9L24 (OAKLAND 946S - LANFINE 959S)  
2028 WINTER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02 OCTOBER 2024**

WATL: -150.145 MW  
EATL: -1003.775 MW

BC Import: -820.435 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW



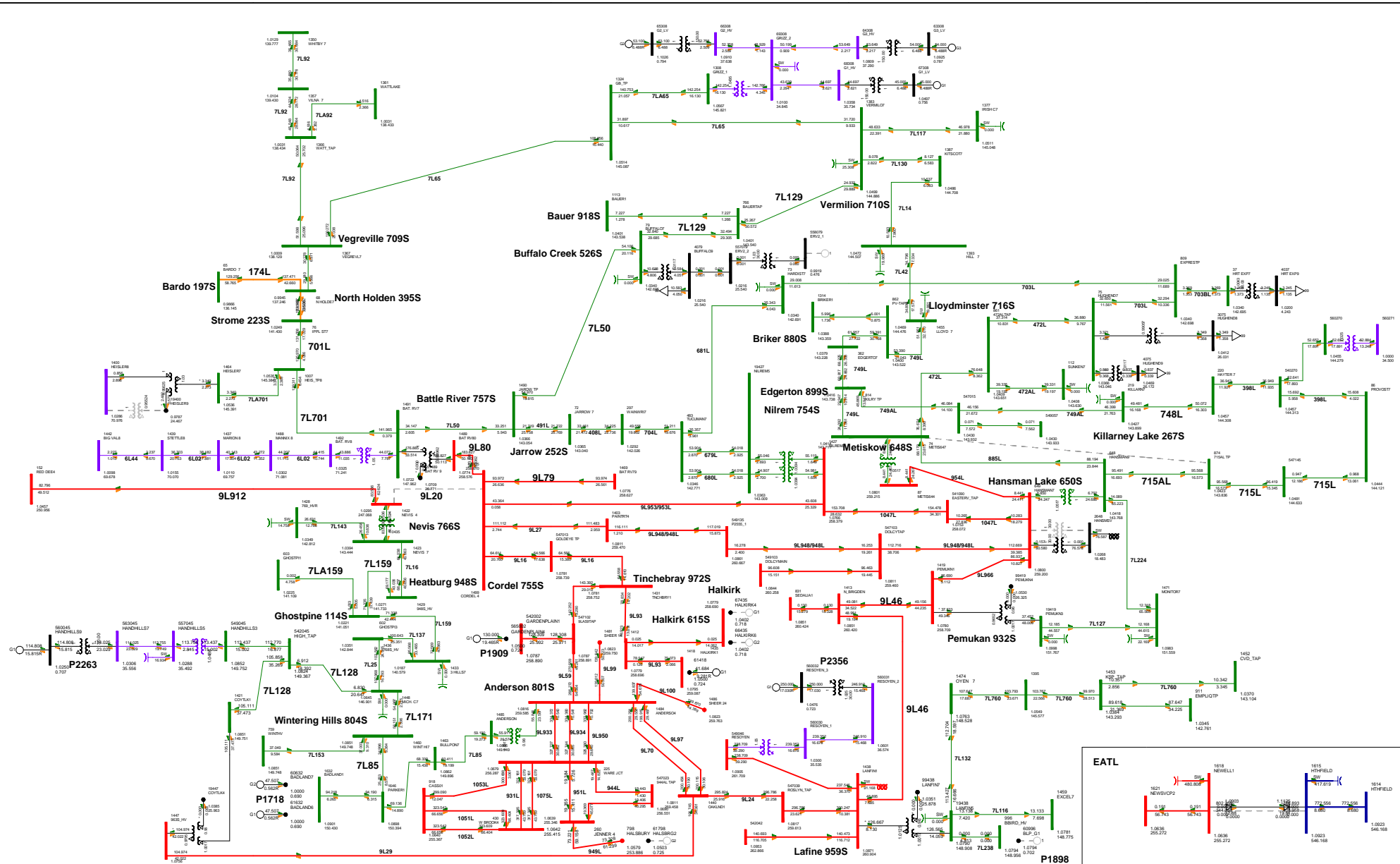
**P2356 Oyen MPC Wind**

**FIGURE A6.3-4 7L171 (MICHIGI CREEK 802S TO WINTERING HILLS 804S)  
2024 WINTER PEAK (POST-CONNECTION), WITH RAS  
PRINTED ON WEDNESDAY 02 OCTOBER 2024**

WATL: -150.145 MW  
EATL: -1003.726 MW

BC Import: -961.3 MW  
Sask Import: -151.000 MW  
MATL Import: -182.679 MW





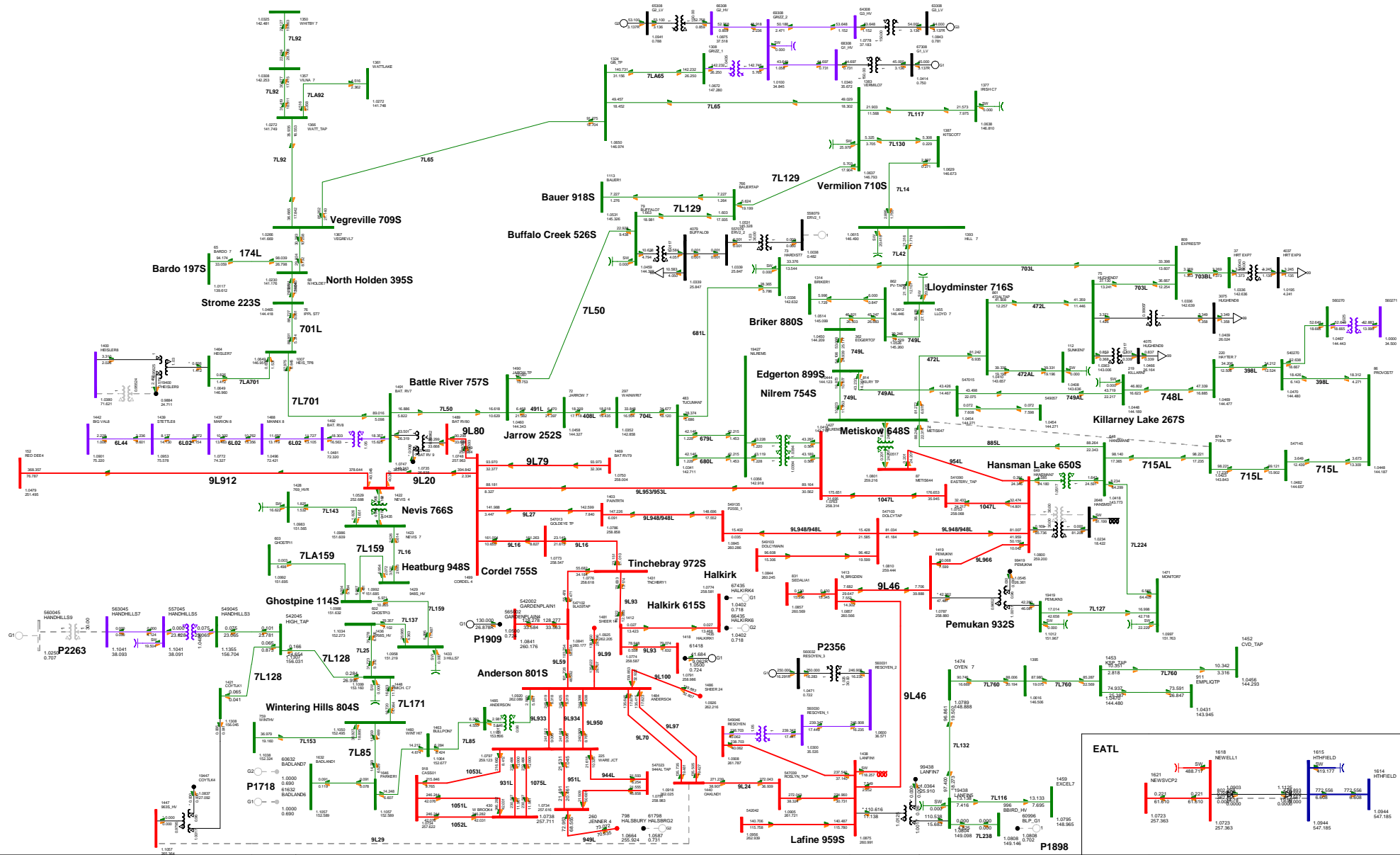
**P2356 Oyen MPC Wind**

Bus Voltage (V) @ 230  
 Branch W/F @ 230  
 Equipment W/F @ 230  
 Loss W/F @ 230  
 W: +0.000+34.500-89.000+138.000+240.000+800.000

**FIGURE A6-4.1 N-1: (NEVIS 766S TO CORDEL 755S)  
 2025 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
 EATL: -808.183 MW

BC Import: 29.430 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



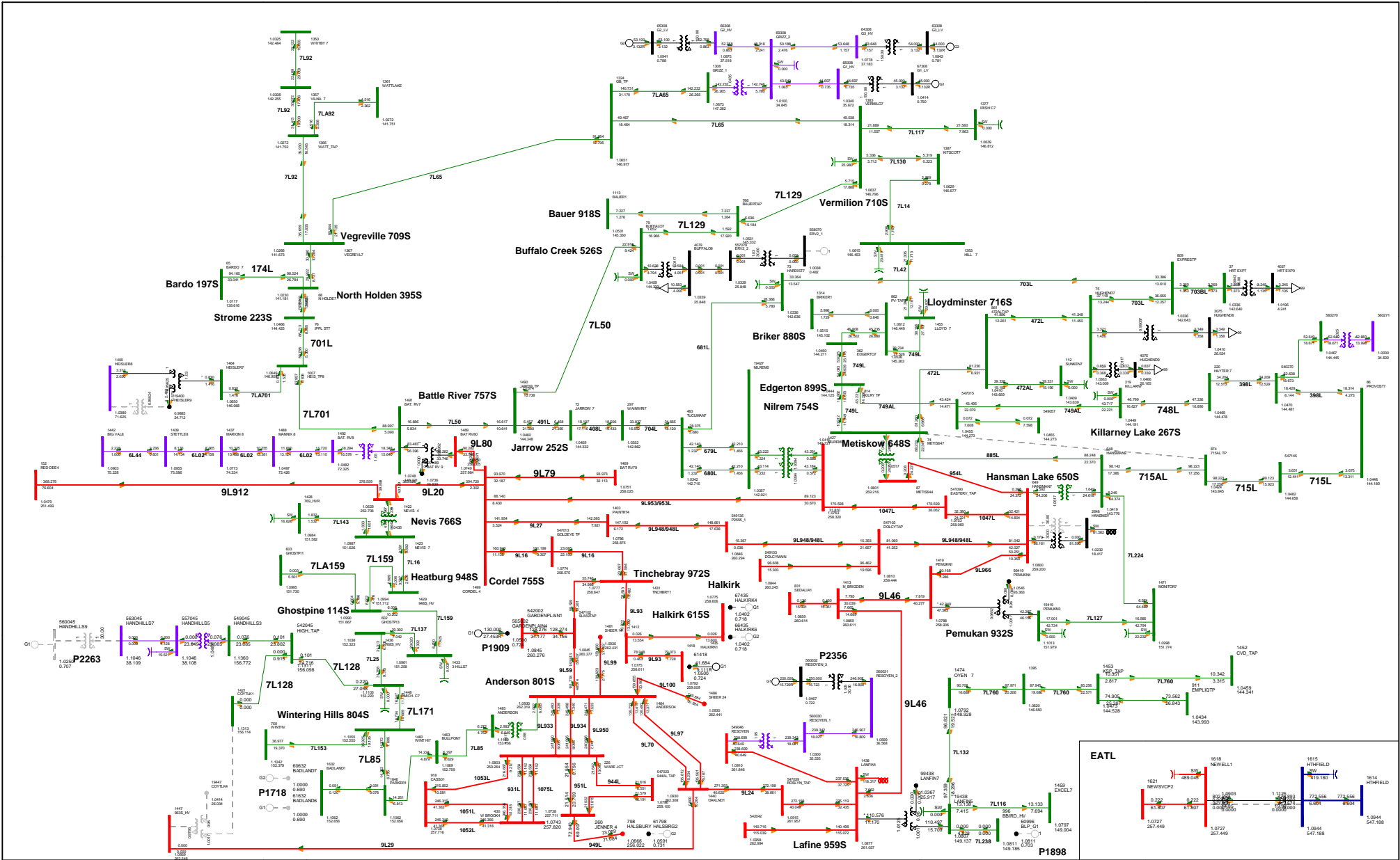
**P2356 Oyen MPC Wind**

FIGURE A6.4-2 N-1: 9L29 (JAKLAND 946S TO COYOTE LAKE 963S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024

WATL: -2.433 MW  
 EATL: -808.244 MW

BC Import:	63.571 MW
Sask Import:	-150.000 MW
MATL Import:	-182.738 MW





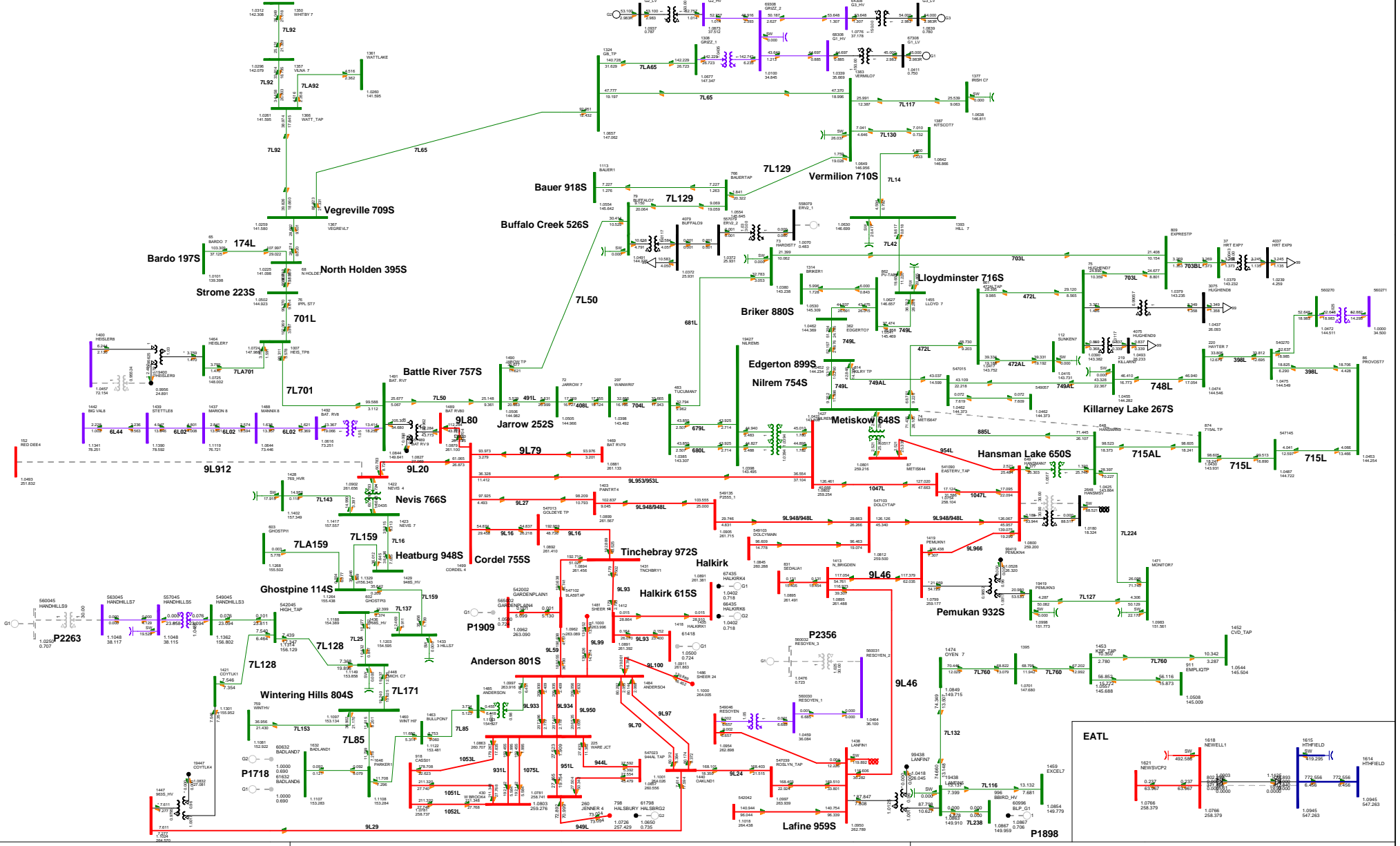
**P2356 Oyen MPC Wind**

FIGURE A6.4-3 N-1: 963ST1 (COYOTE LAKE 963S TRANSFORMER T1)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024

WATL: -2.433 MW  
 EATL: -808.246 MW

BC Import: 63.496 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

Bus - Voltage (kV)  
 Branch - kVA  
 Equipment - MVA  
 100.0% base A  
 W - 4000-34.599-49.008-133.000-144.000-550.000



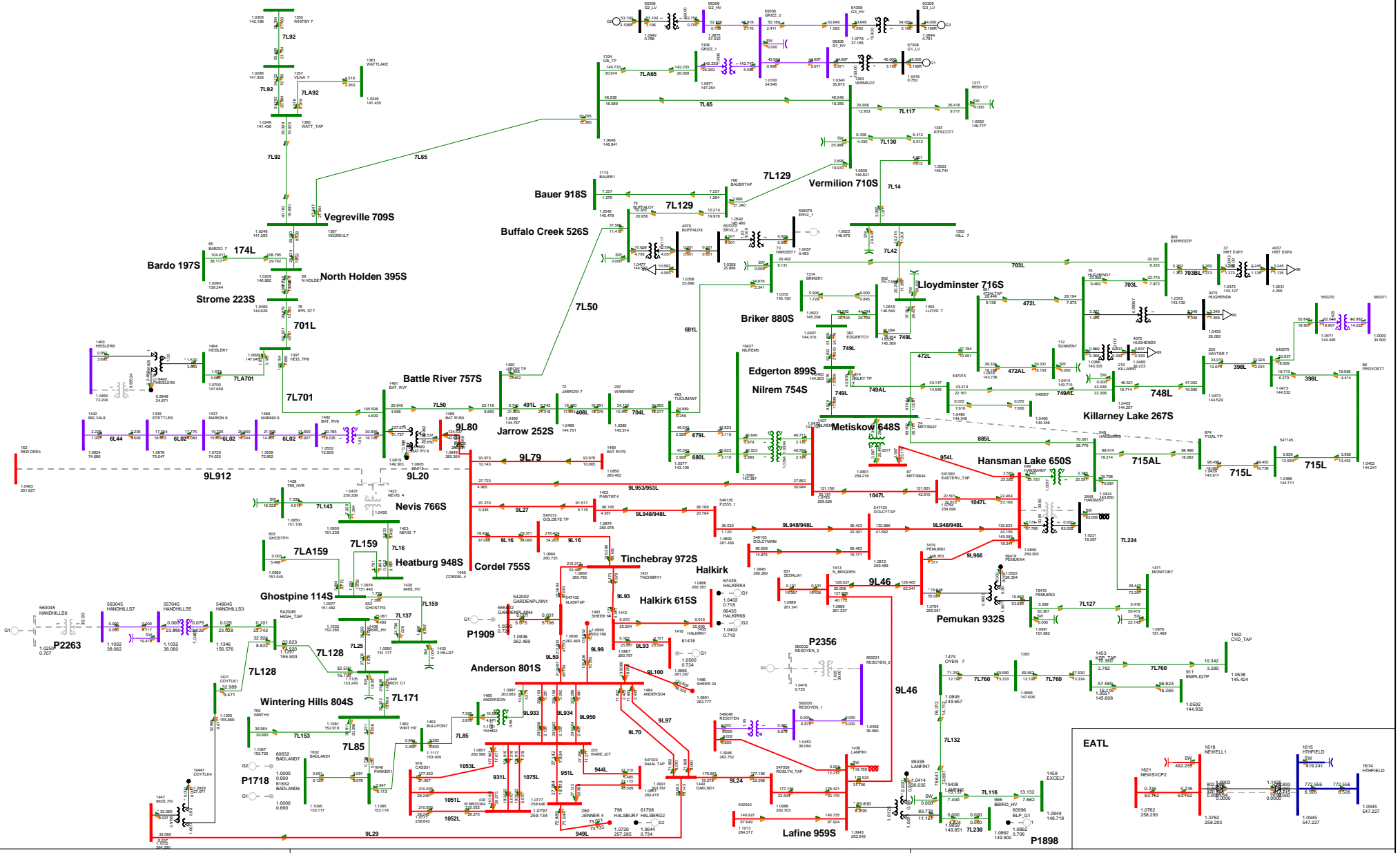
**P2356 Oyen MPC Wind**

Bu - Voltage (kV)  
 Branch - MW  
 Equipment - MVA  
 102.0V-500.0  
 IV - 0.000-0.000-0.000-1.000-0.000-0.000-0.000

**FIGURE A6.4-4 N-1: 912L (NEVIS 766S TO RED DEER 63S)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024**

WATL: -2.433 MW  
 EATL: -808.275 MW

BC Import: 531.348 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW



**P2356 Oyen MPC Wind**

FIGURE A6.4-5 N-1: 766ST1 (NEVIS 766S 240/138 KV T1)  
 2028 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH), WITH RAS  
 PRINTED ON WEDNESDAY 02. OCTOBER 2024

WATL: -2.433 MW  
 EATL: -808.272 MW

BC Import: 534.019 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

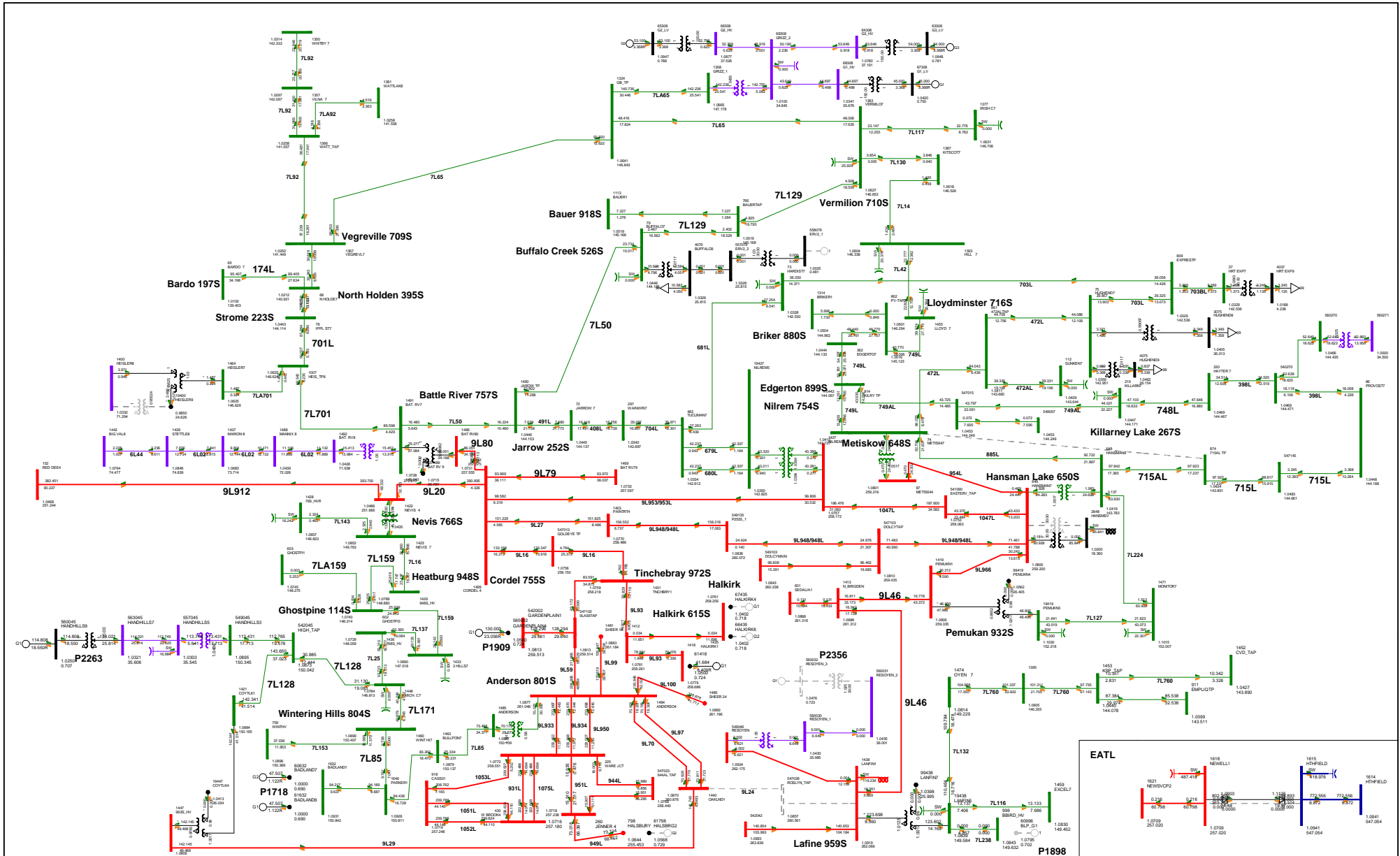


FIGURE A6.4-4 N-1: 9L24 (DAKLAND 948S - LANFINE 959S)  
 2023 SUMMER PEAK (POST-CONNECTION) - WITHOUT CETO (PH1), WITH RAS  
 PRINTED ON WEDNESDAY 02 OCTOBER 2024

**P2356 Oyen MPC Wind**

Bus Voltage (V/90)  
 Base MVA  
 Equipment MVA/Mvar  
 102.76 kV/90 MVA  
 W: +0.000+54.500-88.000+138.000+240.000+800.000

WATL: -2.433 MW  
 EATL: -808.234 MW

BC Import: 68.375 MW  
 Sask Import: -150.000 MW  
 MATL Import: -182.738 MW

# Attachment A7

## Constraint Effective Factors Table





15.16 (Home 265) to (Home 266)	15.17 (Home 266) to (Home 267)	15.18 (Home 267) to (Home 268)	15.19 (Home 268) to (Home 269)	15.20 (Home 269) to (Home 270)	15.21 (Home 270) to (Home 271)	15.22 (Home 271) to (Home 272)	15.23 (Home 272) to (Home 273)	15.24 (Home 273) to (Home 274)	15.25 (Home 274) to (Home 275)	15.26 (Home 275) to (Home 276)	15.27 (Home 276) to (Home 277)	15.28 (Home 277) to (Home 278)	15.29 (Home 278) to (Home 279)	15.30 (Home 279) to (Home 280)	15.31 (Home 280) to (Home 281)	15.32 (Home 281) to (Home 282)	15.33 (Home 282) to (Home 283)	15.34 (Home 283) to (Home 284)	15.35 (Home 284) to (Home 285)	15.36 (Home 285) to (Home 286)	15.37 (Home 286) to (Home 287)	15.38 (Home 287) to (Home 288)	15.39 (Home 288) to (Home 289)	15.40 (Home 289) to (Home 290)	15.41 (Home 290) to (Home 291)	15.42 (Home 291) to (Home 292)	15.43 (Home 292) to (Home 293)	15.44 (Home 293) to (Home 294)	15.45 (Home 294) to (Home 295)	15.46 (Home 295) to (Home 296)	15.47 (Home 296) to (Home 297)	15.48 (Home 297) to (Home 298)	15.49 (Home 298) to (Home 299)	15.50 (Home 299) to (Home 300)															
15.51 (Home 300) to (Home 301)	15.52 (Home 301) to (Home 302)	15.53 (Home 302) to (Home 303)	15.54 (Home 303) to (Home 304)	15.55 (Home 304) to (Home 305)	15.56 (Home 305) to (Home 306)	15.57 (Home 306) to (Home 307)	15.58 (Home 307) to (Home 308)	15.59 (Home 308) to (Home 309)	15.60 (Home 309) to (Home 310)	15.61 (Home 310) to (Home 311)	15.62 (Home 311) to (Home 312)	15.63 (Home 312) to (Home 313)	15.64 (Home 313) to (Home 314)	15.65 (Home 314) to (Home 315)	15.66 (Home 315) to (Home 316)	15.67 (Home 316) to (Home 317)	15.68 (Home 317) to (Home 318)	15.69 (Home 318) to (Home 319)	15.70 (Home 319) to (Home 320)	15.71 (Home 320) to (Home 321)	15.72 (Home 321) to (Home 322)	15.73 (Home 322) to (Home 323)	15.74 (Home 323) to (Home 324)	15.75 (Home 324) to (Home 325)	15.76 (Home 325) to (Home 326)	15.77 (Home 326) to (Home 327)	15.78 (Home 327) to (Home 328)	15.79 (Home 328) to (Home 329)	15.80 (Home 329) to (Home 330)	15.81 (Home 330) to (Home 331)	15.82 (Home 331) to (Home 332)	15.83 (Home 332) to (Home 333)	15.84 (Home 333) to (Home 334)	15.85 (Home 334) to (Home 335)	15.86 (Home 335) to (Home 336)	15.87 (Home 336) to (Home 337)	15.88 (Home 337) to (Home 338)	15.89 (Home 338) to (Home 339)	15.90 (Home 339) to (Home 340)	15.91 (Home 340) to (Home 341)	15.92 (Home 341) to (Home 342)	15.93 (Home 342) to (Home 343)	15.94 (Home 343) to (Home 344)	15.95 (Home 344) to (Home 345)	15.96 (Home 345) to (Home 346)	15.97 (Home 346) to (Home 347)	15.98 (Home 347) to (Home 348)	15.99 (Home 348) to (Home 349)	16.00 (Home 349) to (Home 350)