Engineering Connection Assessment

P2614 Fort Saskatchewan Path2Zero Expansion Connection

Dow Chemical Canada ULC

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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
Appendix B: High-level Desktop Environment and Land Use Analysis

1 Introduction

This 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 are the results of the engineering studies and the scope and methodology used to perform the studies (see Appendix A). These attachments provide details regarding the technical criteria, assumptions, and methods for performing these engineering studies, and the results of the engineering studies.

1.1 Project Overview

Dow Chemical Canada ULC (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its proposed Fort Saskatchewan Path2Zero Expansion (Facility) to the AIES. The Facility includes a substation, to be designated the Main Site BLK 80 1199S 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 0 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 231 MW; and a request for transmission development (collectively, the Project).

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

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 Fort Saskatchewan (Area 33).

The Study Area consists of the AESO planning areas of Fort Saskatchewan (Area 33), Edmonton (Area 60), and Athabasca (Area 27), including the tie lines connecting these planning areas to the rest of the AIES.

From a transmission system perspective, Fort Saskatchewan consists primarily of a 240 kV and 500 kV transmission system. Fort Saskatchewan is connected to Edmonton, Athabasca and Cold Lake (Area 28) via 240 kV transmission lines as well as one 138 kV transmission line connecting to Vegreville (Area 56).

Existing constraints in the Northeast 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 for the Project consists of the AESO Planning areas of Fort Saskatchewan (Area 33), Edmonton (Area 60) and Athabasca (Area 27), 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 A – A1: Engineering Connection Assessment Scope).

3 Connection Alternatives

3.1 Overview

The AESO, in consultation with the TFO in the Study Area and the MP, examined 7 transmission alternatives to meet the MP's request for system access service, as detailed in Section 3.2.[1] 138 kV transmission alternatives were not considered due to the size of the Project. The Market Participant has indicated that its operations cannot tolerate interruption in grid power supply, and it has therefore requested that alternatives provide two single circuit connections to the AIES to meet its operational reliability requirements (see Appendix B for a fulsome description of the Markt Particpants requested level of reliability).

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 – In-and-Out connection to the 240 kV transmission lines 997L and 942L

This alternative included the following developments:

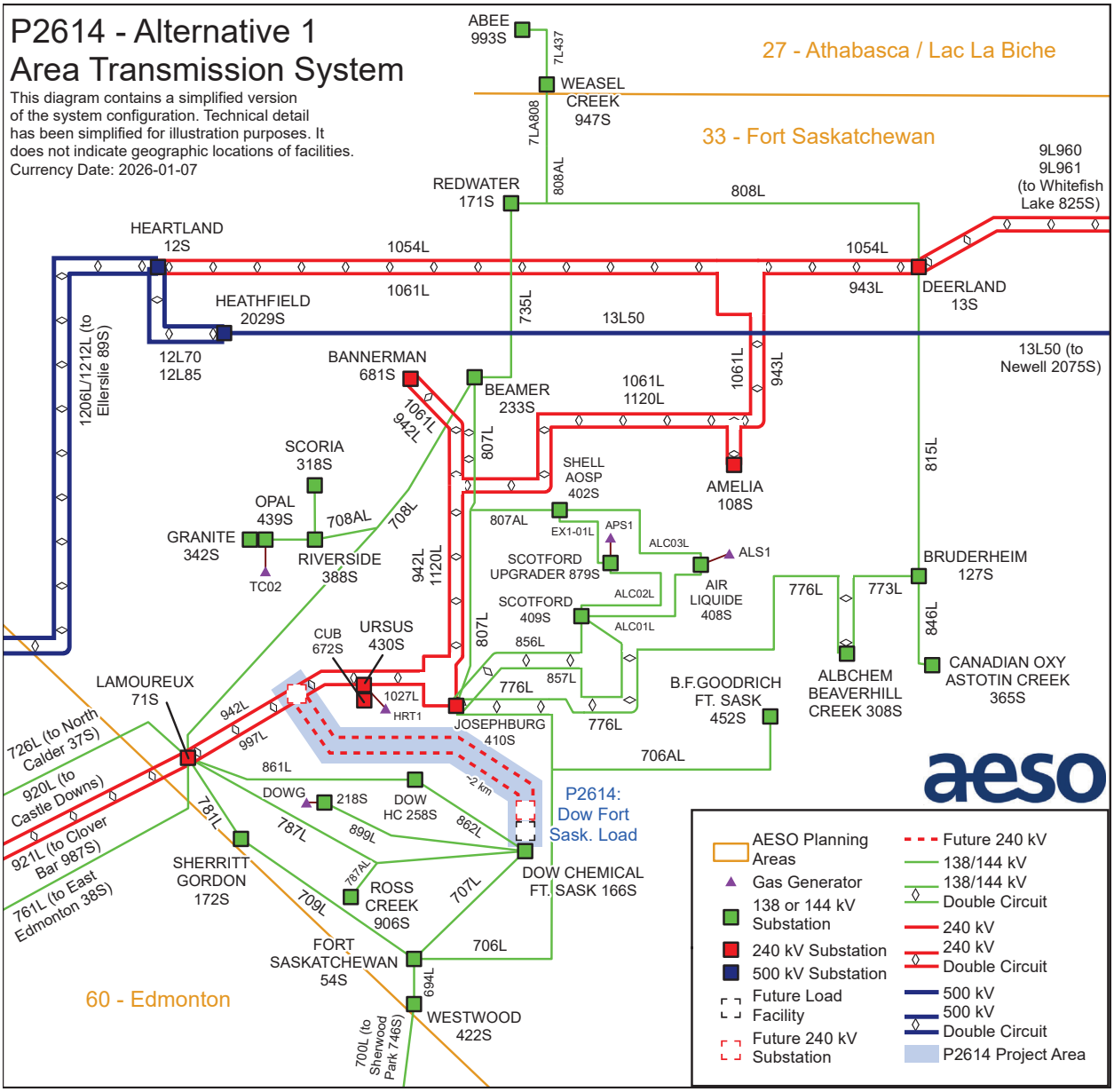
- Add a 240 kV switching substation, including six 240 kV circuit breakers, connected to the existing 240 kV transmission transmission lines 997L and 942L using an in-and-out configuration[2];
- Add two 240 kV single circuits, each approximately 2 km in length[3], to connect the Facility to the new 240 kV switching substation; and
- Add or modify associated equipment as required for the above transmission developments.

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

[2] Exact location of the new substation and new circuit length will be determined by the TFO.

[3] Exact line length to be determined by the TFO.

Figure 3-1: Connection Alternative 1



Alternative 2 – Radial 240 kV connection to Lamoureux 71S substation

This alternative included the following developments:

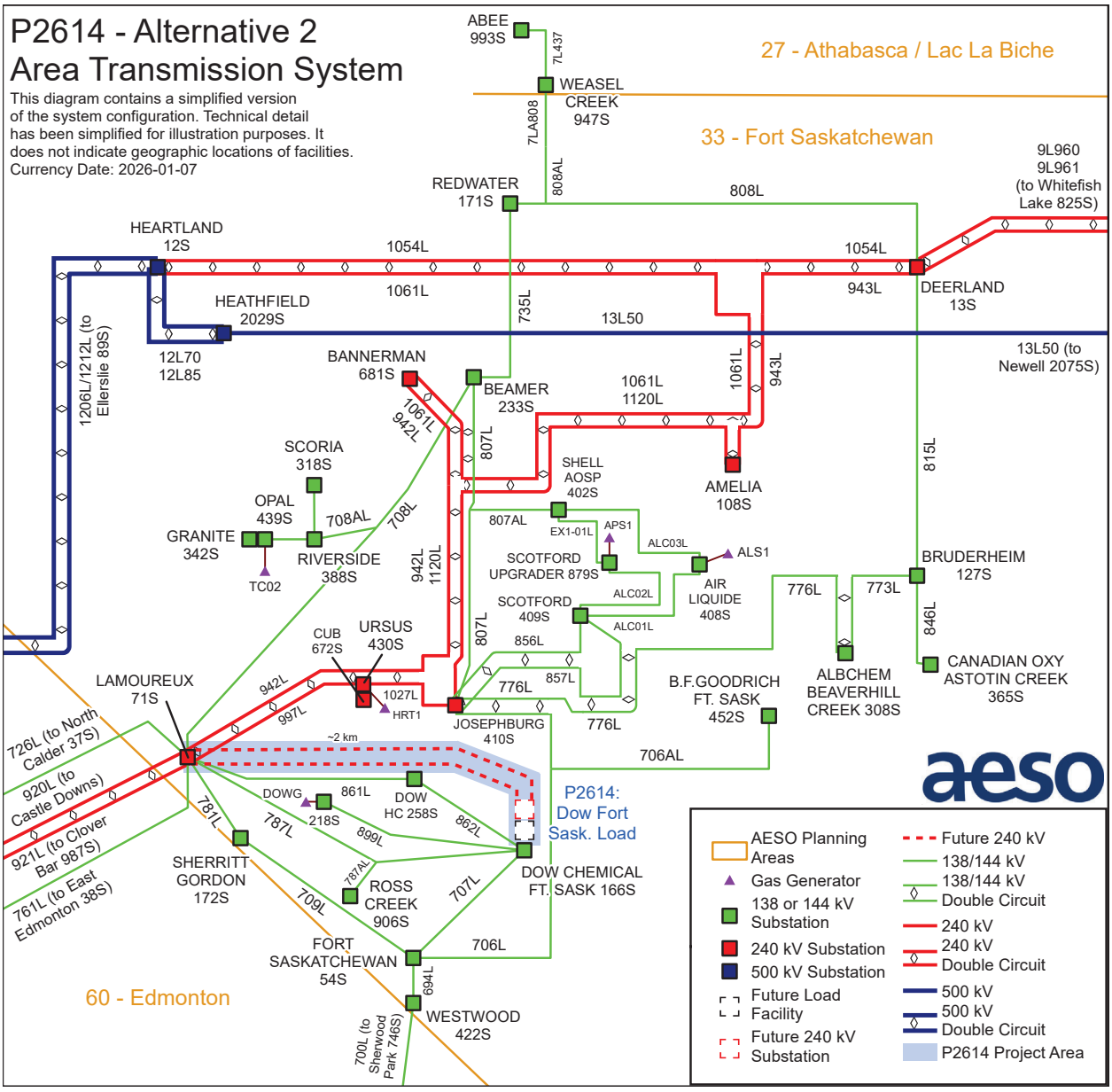
- Add two 240 kV single circuits, each approximately 2 km in length,[4] to connect the Facility to the existing Lamoureux 71S substation using a radial configuration;

[4] Exact line length to be determined by the TFO.

- Modify Lamoureux substation by expanding the 240 kV buswork and adding four 240 kV circuit breakers; 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



Alternative 3a – In-and-out connection to 240 kV transmission line 997L (two circuits)

This alternative included the following developments:

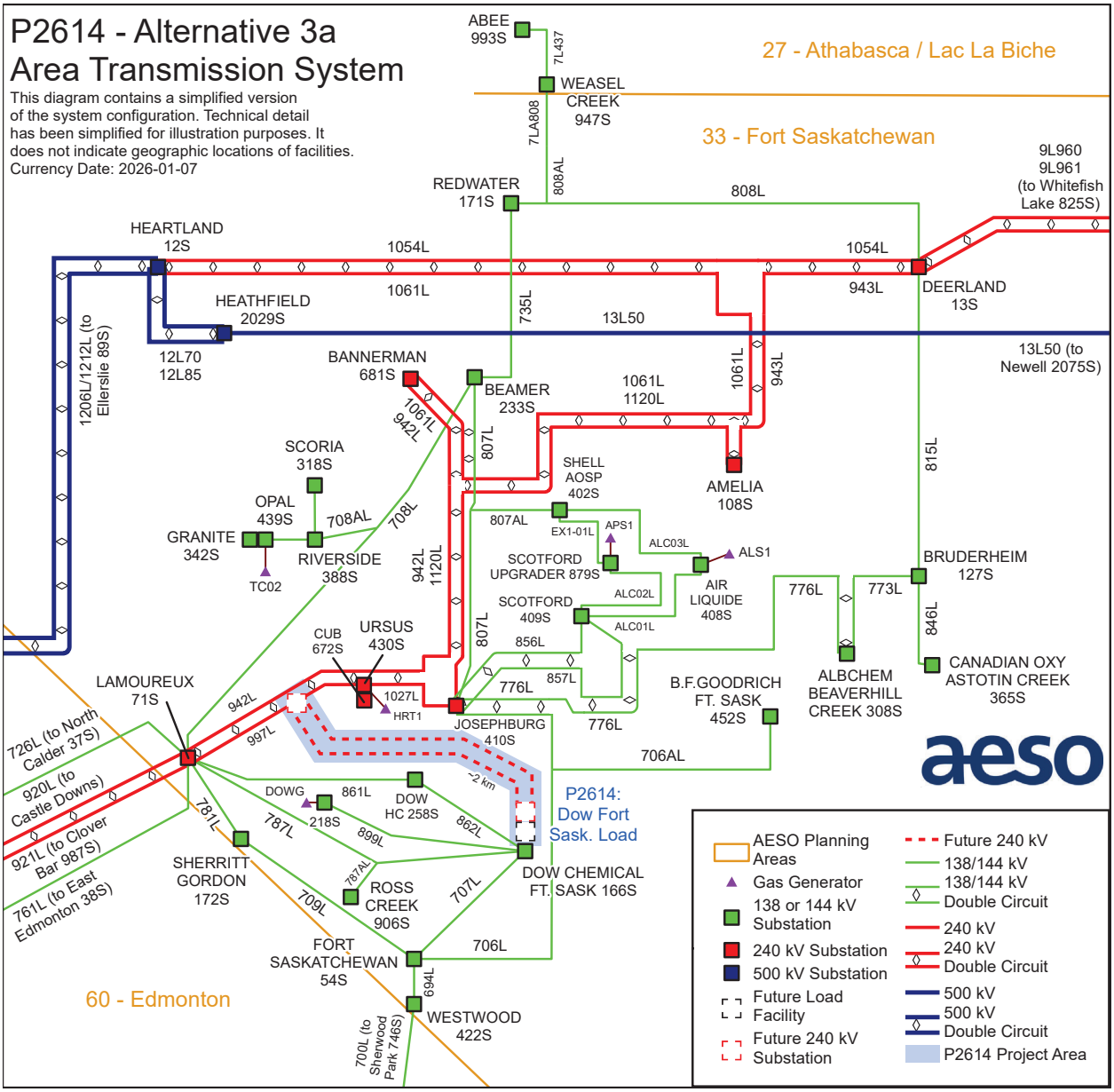
- Add a 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission transmission line 997L using an in-and-out configuration[5];
- Add two 240 kV single circuits, each approximately 2 km in length[6], to connect the Facility to the new 240 kV switching substation; and
- Add or modify associated equipment as required for the above transmission developments.

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

[5] Exact location of the new substation and new circuit length will be determined by the TFO.

[6] Exact line length to be determined by the TFO.

Figure 3-3: Connection Alternative 3a



Alternative 3b – In-and-out connection to 240 kV transmission line 997L (one circuit)

This alternative included the following developments:

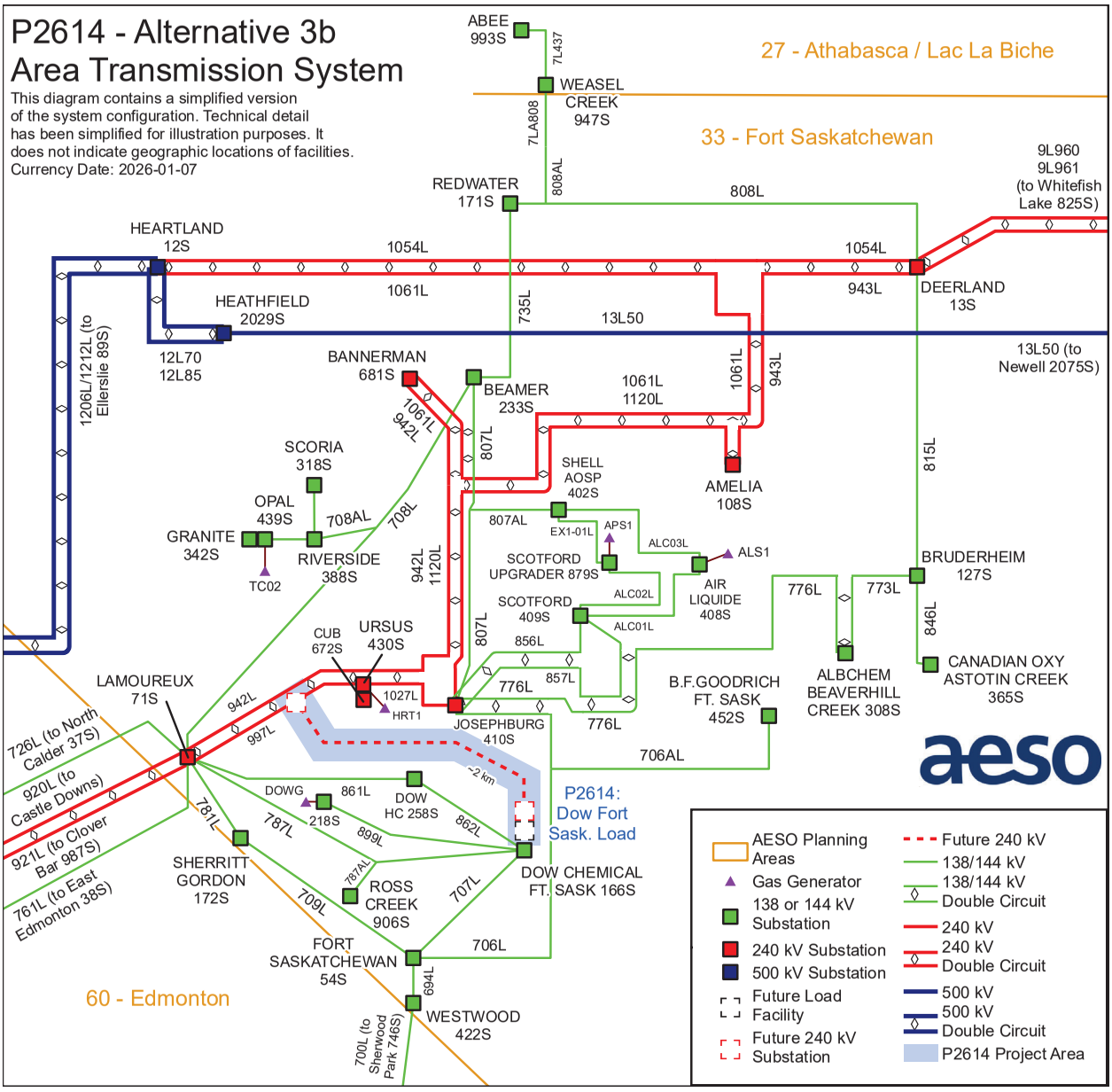
- Add a 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission transmission line 997L using an in-and-out configuration[7];

[7] Exact location of the new substation and new circuit length will be determined by the TFO.

- Add one 240 kV circuit, approximately 2 km in length[8], to connect the Facility to the new 240 kV switching substation; 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 3b



Alternative 4a – In-and-out connection to 240 kV transmission line 942L (two circuits)

This alternative included the following developments:

[8] Exact line length to be determined by the TFO.

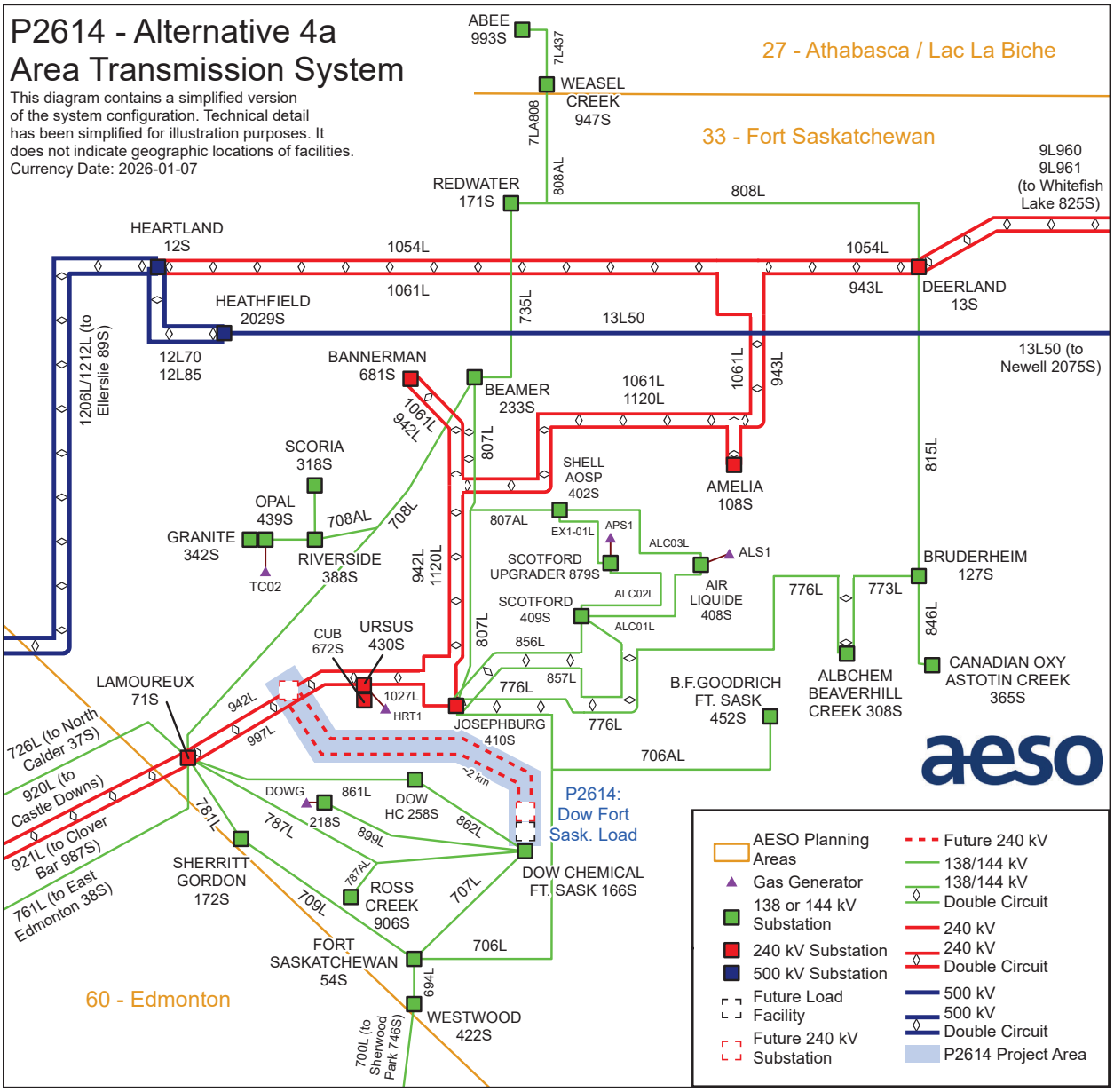
- Add a 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission transmission line 942L using an in-and-out configuration[9] , which would require crossing the 240 kV transmission line 997L;
- Add two 240 kV single circuits, each approximately 2 km in length[10], to connect the Facility to the new 240 kV switching substation; and
- Add or modify associated equipment as required for the above transmission developments.

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

[9] Exact location of the new substation and new circuit length will be determined by the TFO.

[10] Exact line length to be determined by the TFO.

Figure 3-5: Connection Alternative 4a



Alternative 4b – In-and-out connection to 240 kV transmission line 942L (one circuit)

This alternative included the following developments:

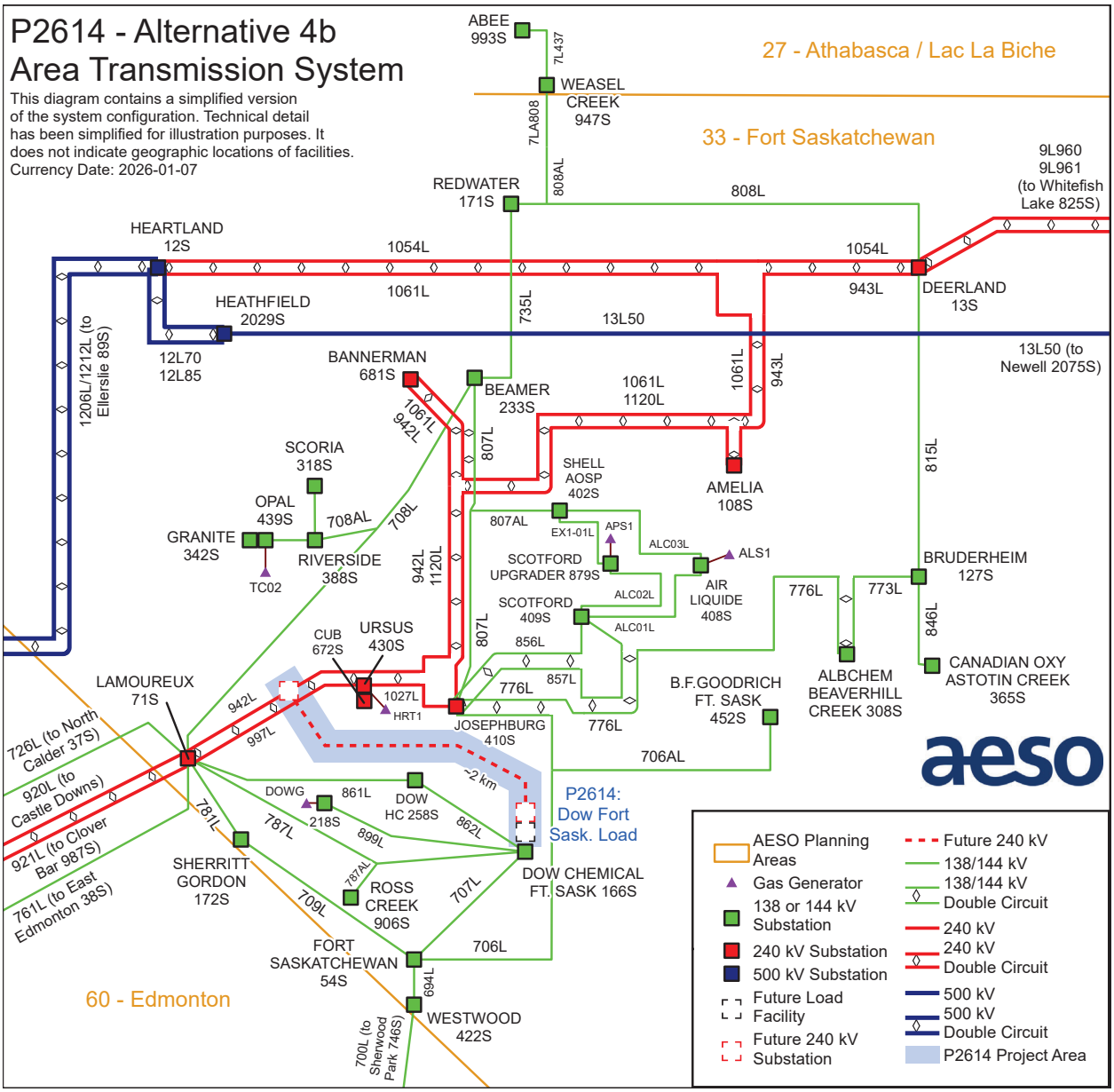
- Add a 240 kV switching substation, including three 240 kV circuit breakers, connected to the existing 240 kV transmission transmission line 942L using an in-and-out configuration[11], which would require crossing the 240 kV transmission line 997L;

[11] Exact location of the new substation and new circuit length will be determined by the TFO.

- Add one 240 kV circuit, approximately 2 km in length[12], to connect the Facility to the new 240 kV switching substation; 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 4b



[12] Exact line length to be determined by the TFO.

Alternative 5 – Radial 240 kV connection to Ursus 430S substation

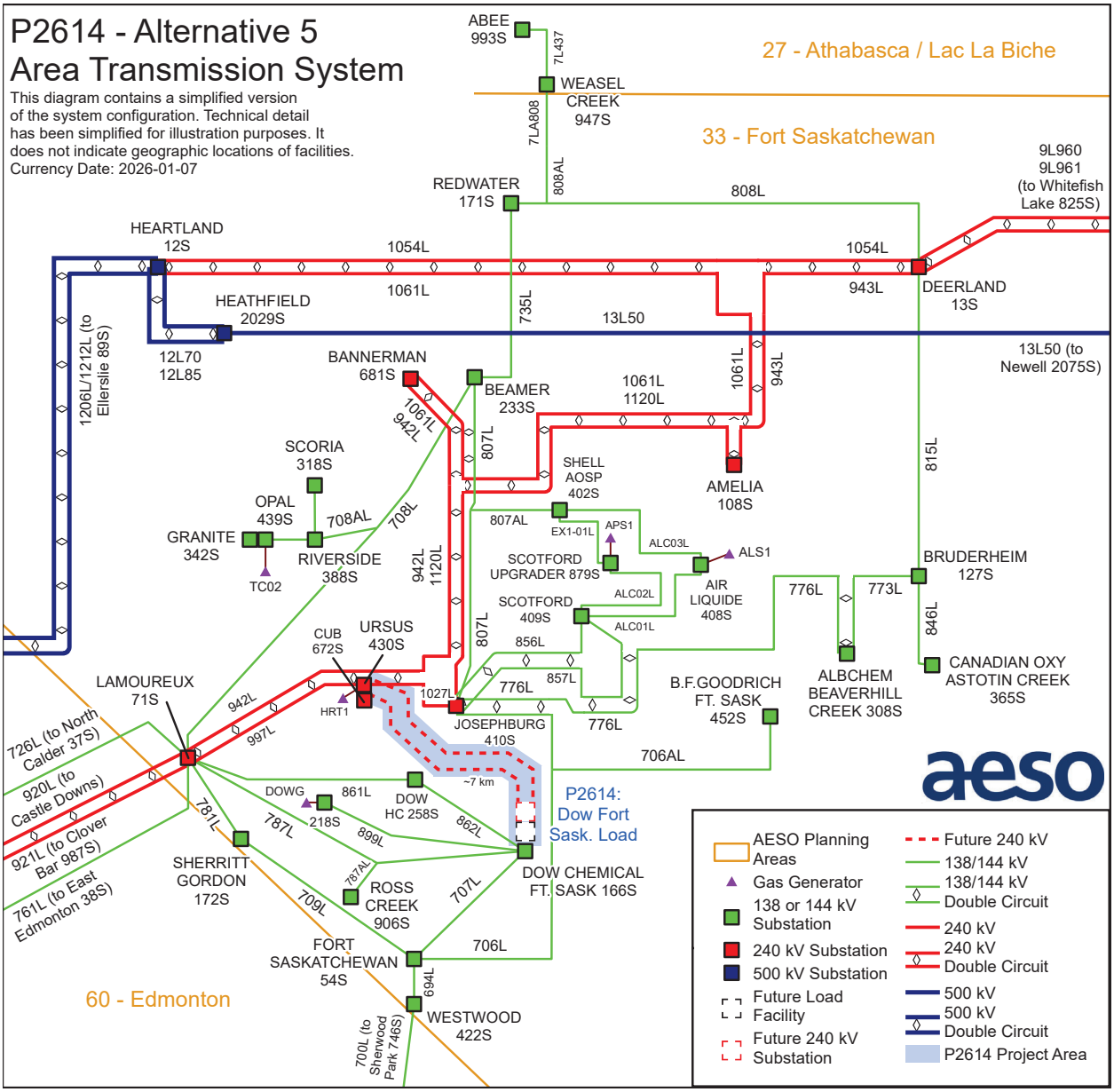
This alternative included the following developments:

- Add two 240 kV single circuits, each at least 7 km in length,[13] to connect the Facility to the existing Ursus 430S substation using a radial configuration;
- Modify Ursus 430S substation by expanding the 240 kV bus work, expanding the existing fenceline and adding four 240 kV circuit breakers; and
- Add or modify associated equipment as required for the above transmission developments.

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

[13] Exact line length to be determined by the TFO.

Figure 3-7: Connection Alternative 5



3.3 Connection Alternatives Selected for Further Study

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

3.4 Connection Alternatives Not Selected for Further Study

Alternative 1 involves increased transmission development, resulting from a new switching substation with six 240 kV circuit breakers and hence increased cost compared with Alternative 2. Additionally, the TFO's

desktop Environmental and Land Use (ELU) assessment[14] has identified that additional land is required for an associated switching station which is anticipated to result in greater land impacts and new right-of-way requirements compared to Alternative 2. The ELU assessment also identified that Alternative 1 would require additional line-crossings compared to Alternative 2. Therefore, Alternative 1 was not selected for further studies.

Alternatives 3a and 3b involve increased transmission development, resulting from a new switching substation. The TFO's desktop ELU assessment has identified that additional land is required for an associated switching station which is anticipated to result in greater land impacts and new right-of-way requirements compared to Alternative 2. Alternatives 3a and 3b would require additional line-crossings compared to Alternative 2, resulting in increased transmission development, and hence increased cost. Additionally, connecting the Project to only 997L would have a high likelihood of resulting in unbalanced power flow on 997L/942L 240 kV double circuit, which would result in non optimal utilization of the system. Therefore, Alternatives 3a and 3b were ruled out.

Alternatives 4a and 4b involve increased transmission development, resulting from a new switching substation. The TFO's desktop ELU assessment has identified that additional land is required for an associated switching station which is anticipated to result in greater land impacts and new right-of-way requirements compared to Alternative 2. Alternatives 4a and 4b would require additional line-crossings compared to Alternative 2, resulting in increased transmission development, and hence increased cost. Additionally, connecting the Project to only 942L would have a high likelihood of resulting in unbalanced power flow on 997L/942L 240 kV double circuit, which would result in non optimal utilization of the system. Therefore Alternatives 4a and 4b were ruled out.

In addition, Alternatives 3b and 4b do not meet the Market Participant's requested level of reliability and are ruled out.

Alternatives 1, 2, 3a, 3b, 4a, and 4b would all require crossing the North Saskatchewan River.

As confirmed by TFO's desktop ELU assessment, Alternative 5 involves increased transmission development, resulting from a longer and more complex route through the Dow industrial complex and one additonal transmission line crossing, and hence increased cost compared with Alternative 2. The preferred alternative and Alternative 5 both require similar substation equipment additions. Although the impact to environmental features, residences and non-industrial land is lesser for Alternative 5, and Alternative 5 avoids crossing the North Saskatchewan River, the ELU assessment has identified that Alternative 5 will likely require expansion of Ursus 430S impacting land use in the area. Therefore, because of the longer line length and the requirement for substatation expansion, Alternative 5 was not selected for further studies.

[14] See Appendix B

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

At the time of the study, the scheduled ISD for the Project was August 15, 2026. After completion of the studies, the ISD of the Project was changed to September 1, 2027. The AESO determined that the ISD change would not have material impact on the connection alternative, the mitigation measures and the conclusions for the scenario studies conducted. Short-circuit studies were performed using the 2025 Winter Peak Pre-Project and Post-Project as well as the 2031 Winter Peak Post-Project scenarios.

Table 4-1 lists the study scenarios. Post-Project scenarios reflect the requested DTS contract capacity of 231 MW at the Main Site BLK 80 1199S substation.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Facility Net-to-Grid Import (MW)	Facility Net-to-Grid Export (MW)
Pre-Project					
1	2025 Summer Peak (SP)	Low Northeast generation	2025 SP Pre-Project	0	0
2	2025 Winter Peak (WP)		2025 WP Pre-Project	0	0
Post-Project					
3	2025 SP	Low Northeast generation	2025 SP Post-Project	231	0
4	2025 WP		2025 WP Post-Project	231	0
5	2031 WP	All study area generation in-service	2031 WP Post-Project	231	0

The AESO Planning Region load forecasts used for the connection studies were based on the *2021 Long-Term Outlook* (2021 LTO). While the AESO has updated its regional forecasts since the connection studies were performed, the use of the current AESO forecast, the *2024 Long-Term Outlook* would not materially alter the connection study results or affect the conclusions and recommendations in this report.

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.

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.[15]

Power flow studies were performed for 2025 Summer Peak and 2025 Winter Peak pre-Project and post-Project scenarios.

4.2.2 Voltage Stability Studies

The purpose of the voltage stability studies is to determine the ability of the transmission system to maintain voltage stability at the busses in the Study Area.

Voltage stability studies were performed for 2025 Summer Peak and 2025 Winter Peak post-Project scenarios listed in Table 4-1 above.

4.2.3 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 2025 Summer Peak and 2025 Winter Peak post-Project scenarios listed in Table 4-1 above.

4.2.4 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 2025 Winter Peak pre-Project scenario and for 2025 Winter Peak and 2031 Winter Peak post-Project scenarios listed in Table 4-1 above.

4.2.5 Motor Starting Studies

The purpose of the motor starting studies is to evaluate the potential impact of motor starting on the performance of the surrounding transmission system. The study identifies the mitigation measures required to avoid any negative system impact associated with motor starting.

Motor starting studies were performed for 2025 Summer Peak and 2025 Winter Peak post-Project scenarios scenarios listed in Table 4-1 above.

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.

[15] 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 Appendix A - Engineering Connection Assessment Scope 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.

4.3.1 Post-Mitigation Studies

No additional studies were required 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.

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, 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.
- Section 5.5 includes an overview of the post-mitigation studies results.

Detailed study results are provided in Appendix A.

5.2 Pre-Project Study Results

5.2.1 Category A Conditions

No Reliability Criteria violations were observed under the Category A conditions (i.e., all elements in service) for any of the pre-Project scenarios.

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 thermal criteria violations under Category B conditions (i.e., loss of a single system element); see Attachment A Table A-1: Summary of Category B Reliability Criteria Violations, Project Impact and Mitigation Measures.

5.3 Post-Project Study Results

5.3.1 Category A Conditions

No Reliability Criteria violations were observed under Category A conditions for any post-Project scenarios. Post-Project short-circuit fault levels were not significantly higher than pre-Project levels.

The long term short circuit levels were found to be within the designed capabilities of the nearby facilities.

Category B Conditions

Post-Project power flow studies identified thermal criteria violations under Category B conditions. Following the connection of the Project, most of the thermal criteria violations observed in the pre-Project scenarios were marginally reduced and one thermal criteria violation was marginally exacerbated. One new thermal criteria violation was observed on 908L (Ellerslie 89S – Petrolia), however the pre-Project loading of this transmission line was already over 99%, and the effectiveness of the Project is low (less than 3%).

Voltage stability studies showed that voltage stability margin was met for all studied conditions.

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

Motor starting studies did not show any issues, and the voltage drop at the connection point to the system was acceptable.

5.4 Mitigation Measures

Both before and after the connection of the Project, all of the observed Category B thermal criteria violations can be managed by using real-time operational practices.

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 2 is technically viable. The connection assessment identified post-Project system performance issues which were not significantly impacted by the connection of the Project. All of the thermal criteria violations observed under Category B conditions can be mitigated through real-time operational practices.

The AESO recommends proceeding with the Project using Alternative 2 as the preferred alternative to respond to the Market Participant's request for system access service. Alternative 2 involves adding two 240 kV circuits to connect the Facility to the existing Lamoureux 71S substation using a radial configuration, and modifying Lamoureux 71S substation including adding four 240 kV circuit breakers and upgrading the 240 kV buswork. The new 240 kV circuits connecting the Facility to Lamoureux 71S substation should each have a minimum thermal rating of 480 MVA to meet the Market Participant's requested DTS, including the DTS increase associated with P3085.

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

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					
2025 Summer Peak	Thermal - below emergency	Thermal - below emergency	1056L (Ellerslie 89S - Argyll Transfer Station)	908L (Ellerslie 89S - Petrolia)	New violation	Real-time operational practices (RTOP)	RTOP
	Thermal - below emergency	Thermal - below emergency	72CH9 (Hardisty - Cloverbar)	72CH11 (Hardisty - Cloverbar)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CH11 (Hardisty - Cloverbar)	72CH9 (Hardisty - Cloverbar)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	240BA2 (Bellamy - Argyll Transfer Station)	908L (Ellerslie 89S - Petrolia)	Materially increased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CK12 (Cloverbar - Kennedale)	72CK13 (Cloverbar - Kennedale)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CK13 (Cloverbar - Kennedale)	72CK12 (Cloverbar - Kennedale)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72RG1 (Rossdale – Garneau)	72RG7 (Rossdale – Garneau)	Marginally increased	RTOP	RTOP
2025 Winter Peak	Thermal - below emergency	Thermal - below emergency	72CH9 (Hardisty - Cloverbar)	72CH11 (Hardisty - Cloverbar)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CH11 (Hardisty - Cloverbar)	72CH9 (Hardisty - Cloverbar)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CK12 (Cloverbar - Kennedale)	72CK13 (Cloverbar - Kennedale)	Marginally decreased	RTOP	RTOP
	Thermal - below emergency	Thermal - below emergency	72CK13 (Cloverbar - Kennedale)	72CK12 (Cloverbar - Kennedale)	Marginally decreased	RTOP	RTOP

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%).

Appendix A: Engineering Connection Assessment Results

Engineering Connection Assessment: Study Results

P2614 Dow Fort Sask. MPC Load

Dow Chemical Canada ULC

Date: **January 28, 2026**

Version: R2

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1 Introduction

This report presents the results of the engineering studies that were completed by Power Grid Specialists Corp. (the Studies Consultant) to assess the impact of the Project (as defined in Attachment A1: Engineering Connection Assessment: Study Scope) on the performance of the Alberta Interconnected Electric System (AIES). The studies were performed in accordance with Attachment A1: 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 33.

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: 2025 Summer Peak Low Gen Pre-Project*

Category A condition

No Reliability Criteria violations were observed under the Category A condition.

Category B conditions

Thermal Criteria Violations

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-1.

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

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Observed Power Flow (MVA)	% Loading
72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	46.51	121.45
72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	46.5	121.41
240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	383	460	383.76	100.2
72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	46	57.5	56.33	122.47
72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	46	57.5	56.34	122.48
P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)	P1649 CKT 11 (GARNEAU Bus 535 - P1649 Bus 580006)	57.5	134.2	65.48	113.87

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No Voltage Deviations violations were observed under Category B conditions.

2.1.2 *Scenario 2: 2025 Winter Peak Low Gen Pre-Project*

Category A condition

No Reliability Criteria violations were observed under the Category A condition.

Category B conditions

Thermal Criteria Violations

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 2

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Observed Power Flow (MVA)	% Loading
72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.5	55.08	143.8
72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.5	55.06	143.75
72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	57.2	110.7	56.87	105.91
72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	57.2	110.7	56.88	105.92

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No Voltage Deviations violations were observed under Category B conditions.

3 Post-Project Study Results

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

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 3: 2025 Summer Peak Low Gen Post-Project*

Category A condition

No Reliability Criteria violations were observed under Category A conditions.

Category B conditions

Thermal Criteria Violations

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-1.

Table 3-1: Thermal Criteria Violations under Category B Conditions for Scenario 3

Contingency (System Element Lost)	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	
1056L (Ellerslie 89S Bus 128 - Argyll Transfer Station ARGYLL Bus 518)	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	383	460	380.49	99.34	396.11	103.42	4.08
72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	46.51	121.45	46.13	120.43	-1.02
72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	46.5	121.41	46.11	120.4	-1.02
240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	383	460	383.76	100.2	399.08	104.2	4
72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	46	57.5	56.33	122.47	55.85	121.42	-1.05
72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	46	57.5	56.34	122.48	55.86	121.43	-1.05
P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)	P1649 CKT 11 (GARNEAU Bus 535 - P1649 Bus 580006)	57.5	134.2	65.48	113.87	65.96	114.72	0.84

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed under Category B conditions.

3.1.2 *Scenario 4: 2025 Winter Peak Low Gen Post-Project*

Category A condition

No Reliability Criteria violations were observed under Category A conditions.

Category B conditions

Thermal Criteria Violations

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-2.

Table 3-2: Thermal Criteria Violations under Category B Conditions for Scenario 4

Contingency (System Element Lost)	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	
72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	55.08	143.8	54.96	143.49	-0.32
72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	38.3	76.7	55.06	143.75	54.93	143.43	-0.32
72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	53.7	65.2	56.87	105.91	56.74	105.67	-0.24
72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	53.7	65.2	56.88	105.92	56.75	105.68	-0.24

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed under Category B conditions.

3.2 Voltage Stability Studies

3.2.1 *Scenario 3: 2025 Summer Peak Low Gen Post-Project*

Voltage stability analysis was performed for the 2025 SP Low Gen post-project scenario. No voltage stability criteria violations were observed. The reference load level for the study area (AESO Planning Areas 33) is 1047.2 MW, which includes the project load. The minimum incremental load transfer for the Category B contingencies is 5.0% of the reference load (or 52.36 MW = 0.05 x 1047.2 MW) to meet the voltage stability criteria. Table 3-3 provides the voltage stability results under the Category A condition and for the five worst contingencies under Category B conditions. The voltage stability P-V plots can be found in Attachment A4.

Table 3-3: Voltage Stability Results for the 2025 SP Scenario 3

Contingency (System Element Lost)	From	To	Maximum Incremental Transfer (MW)	Meets Criteria?
N-0 Base Case	System Normal		800	YES
942L	Lamoureux 71S	Bannerman 681S	800	YES
921L	Lamoureux 71S	CloverBar 987S	800	YES
920L	North Calder 37S	Castle Downs 557S	800	YES
T1	Heartland 12S Transformer 500/240 kV		800	YES
1061L	Heartland 12S	Bannerman 681S	800	YES

3.2.2 *Scenario 4: 2025 Winter Peak Low Gen Post-Project*

Voltage stability analysis was performed for the 2025 WP Low Gen post-project scenario. No voltage stability criteria violations were observed. The reference load level for the study area (AESO Planning Areas 33) is 1135.2 MW, which includes the project load. The minimum incremental load transfer for the Category B contingencies is 5.0% of the reference load (or 56.76 MW = 0.05 x 1135.2 MW) to meet the voltage stability criteria. Table 3-4 provides the voltage stability results under the Category A condition and for the five worst contingencies under Category B conditions. The voltage stability P-V plots can be found in Attachment A4.

Table 3-4: Voltage Stability Results for the 2025 WP Scenario 4

Contingency (System Element Lost)	From	To	Maximum Incremental Transfer (MW)	Meets Criteria?
N-0 Base Case	System Normal		850	YES
943L	Deerland 13S	Amelia 108S	850	YES
921L	Lamoureux 71S	CloverBar 987S	850	YES
920L	North Calder 37S	Castle Downs 557S	850	YES
T1	Heartland 12S Transformer 500/240 kV		850	YES
1061L	Heartland 12S	Bannerman 681S	850	YES

3.3 Transient Stability Studies

Transient stability studies were completed for Scenarios 3 and 4 post-Project.

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 3-5 and

Table 3-6.

The post-Project transient stability plots are provided in Attachment A5. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A7

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

Category	Line Element	Substation Terminals		Faulted End	Performance
A	Flat start				Stable
B	1054L	Deerland 13S	Heartland 12S	13S	Stable
				12S	Stable
B	12L70	Heartland 12S	Heathfield 2029S	12S	Stable
				2029S	Stable
B	12L85	Heartland 12S	Heathfield 2029S	12S	Stable
				2029S	Stable
B	1206L	Ellerslie 89S	Heartland 12S	12S	Stable
B	1212L	Ellerslie 89S	Heartland 12S	12S	Stable
B	1350L	EATL (Heathfield 2029S)	EATL (NEWELL 2075S)	2029S	Stable
B	943L	Deerland 135S	Amelia 108S	13S	Stable
				108S	Stable
B	1120L	Josephburg 410S	Amelia 108S	410S	Stable
				108S	Stable
B	997L	Lamoureux 71S	Ursus 430S	71S	Stable
				430S	Stable
B	1061L	Heartland 12S	Bannerman 681S	12S	Stable
				681S	Stable
B	9L960	Deerland 13S	Whitefish Lake 825S	13S	Stable
				825S	Stable

Table 3-6: Transient Stability Study Results under Category B Conditions for Scenario 4

Category	Line Element	Substation Terminals	Faulted End	Performance

A	Flat start				Stable
B	1054L	Deerland 13S	Heartland 12S	13S	Stable
				12S	Stable
B	12L70	Heartland 12S	Heathfield 2029S	12S	Stable
				2029S	Stable
B	12L85	Heartland 12S	Heathfield 2029S	12S	Stable
				2029S	Stable
B	1206L	Ellerslie 89S	Heartland 12S	12S	Stable
B	1212L	Ellerslie 89S	Heartland 12S	12S	Stable
B	1350L	EATL (Heathfield 2029S)	EATL (NEWELL 2075S)	2029S	Stable
B	943L	Deerland 135S	Amelia 108S	13S	Stable
				108S	Stable
B	1120L	Josephburg 410S	Amelia 108S	410S	Stable
				108S	Stable
B	997L	Lamoureux 71S	Ursus 430S	71S	Stable
				430S	Stable
B	1061L	Heartland 12S	Bannerman 681S	12S	Stable
				681S	Stable
B	9L960	Deerland 13S	Whitefish Lake 825S	13S	Stable
				825S	Stable

3.4 Motor Starting Studies

Motor starting studies were conducted under system normal and worst-case Category B contingencies (determined based on power flow analysis) in the 2025 SP and 2025 WP post-Project scenarios using preliminary motor information that was provided by Dow Chemicals. Table 3-7 and Table 3-8 show the summary of the motor starting performance.

3.4.1 *Scenario 3: 2025 Summer Peak Low Gen Post-Project*

Table 3-7: Motor Starting Performance for Scenario 3

Contingencies / Substation		Category A (N-0)	Category B (N-1) Heartland 12S Transformer	Category B (N-1) 921L (Lamoureux 17S to Clover Bar 987S)	Category B (N-1) L1 (Lamoureux 17S to Dow Sub A)
Dow Sub A PROJECT SUB	**Nominal Bus Voltage (kV)**	240	240	240	240

	Before Motor Start (kV)	241.92	239.40	240.43	240.48
	After Motor Start (kV)	237.49	234.68	235.19	235.17
	Voltage Dip (kV)	4.43	4.72	5.24	5.31
	% Voltage Dip	1.83	1.97	2.18	2.21
Lamoureux 17S	**Nominal Bus Voltage (kV)**	240	240	240	240
	Before Motor Start (kV)	243.26	240.74	241.78	243.07
	After Motor Start (kV)	239.76	236.97	237.49	239.65
	Voltage Dip (kV)	3.50	3.78	4.29	3.42
	% Voltage Dip	1.44	1.57	1.77	1.41

3.4.2 *Scenario 4: 2025 Winter Peak Low Gen Post-Project*

Table 3-8: Motor Starting Performance for Scenario 4

Substation \ **Contingencies**		**Category A (N-0)**	**Category B (N-1) Heartland 12S Transformer**	**Category B (N-1) 921L (Lamoureux 17S to Clover Bar 987S)**	**Category B (N-1) L1 (Lamoureux 17S to Dow Sub A)**
Dow Sub A PROJECT SUB	**Nominal Bus Voltage (kV)**	240	240	240	240
	Before Motor Start (kV)	240.84	236.83	238.72	239.36
	After Motor Start (kV)	236.47	232.22	233.56	234.14
	Voltage Dip (kV)	4.37	4.61	5.16	5.22
	% Voltage Dip	1.81	1.95	2.16	2.18

Lamoureux 17S	**Nominal Bus Voltage (kV)**	240	240	240	240
	Before Motor Start (kV)	242.16	238.19	240.02	242.04
	After Motor Start (kV)	238.79	234.51	235.82	238.65
	Voltage Dip (kV)	3.37	3.67	4.20	3.39
	% Voltage Dip	1.39	1.54	1.75	1.40

The motor starting results show that the voltage drop caused by “across-the-line” motor starting at the proposed Dow Sub A 240kV bus is below 5% under both normal and contingency conditions. The simulation results suggest that the impact on the voltage due to the “across-the-line” starting of one motor is acceptable. The motor voltage results plots are provided in Attachment A6 .

4 Short-Circuit Studies

4.1 Pre-Project Results

Pre-Project short-circuit current levels are provided in Table 4-1.[1]

Table 4-1: Short-Circuit Current Levels for the 2025 WP Low Gen Pre-Project Scenario 2

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Lamoureux 71S	240	246.67	21.2	0.00214+j0.01150	18.5	0.00244+j0.01679
	138	140.55	29.0	0.00288+j0.01447	27.0	0.00244+j0.01802
Deerland 13S	138	142.20	12.9	0.00638+j0.03285	10.9	0.00619+j0.05160
Heartland 12S	500	544.75	10.3	0.00132+j0.01233	7.5	0.00569+j0.02559
	240	251.90	15.5	0.00197+j0.01625	12.1	0.00546+j0.03012
Josephburg 410S	240	245.69	18.3	0.00230+j0.01335	16.3	0.00223+j0.01838
	138	140.32	27.0	0.00309+j0.01550	25.0	0.00234+j0.01968
Bannerman 681S	240	248.02	13.5	0.00273+j0.01826	10.3	0.00621+j0.03552
Amelia 108S	240	247.68	14.9	0.00255+j0.01658	11.7	0.00463+j0.02994
Whitefish Lake 825S	240	260.35	9.2	0.00542+j0.02799	6.0	0.01615+j0.07120

4.2 Post-Project Results

4.2.1 *Scenario 4: 2025 Winter Peak Low Gen Post-Project*

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

[1] 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.

Table 4-2: Short-Circuit Current Levels for the 2025 WP Low Gen Pre-Project Scenario 4

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Lamoureux 71S	240	242.33	22.0	0.00227+j0.01086	18.7	0.00246+j0.01682
	138	140.14	29.3	0.00296+j0.01427	27.0	0.00248+j0.01821
Deerland 13S	138	141.89	12.9	0.00648+j0.03275	10.9	0.00628+j0.05198
Heartland 12S	500	536.15	10.3	0.00132+j0.01208	7.5	0.00569+j0.02556
	240	247.75	15.6	0.00200+j0.01591	12.0	0.00546+j0.03009
Josephburg 410S	240	241.42	18.7	0.00236+j0.01281	16.5	0.00220+j0.01817
	138	140.28	27.2	0.00320+j0.01539	24.9	0.00239+j0.01996
Bannerman 681S	240	243.70	13.7	0.00281+j0.01775	10.3	0.00621+j0.03551
Amelia 108S	240	243.46	15.0	0.00261+j0.01611	11.7	0.00461+j0.02977
Whitefish Lake 825S	240	257.14	9.1	0.00541+j0.02780	6.0	0.01613+j0.07115
Dow Substation 999001	240	241.44	18.0	0.00257+j0.01324	14.0	0.00422+j0.02483

4.2.2 *Scenario 5: 2031 Winter Peak Low Gen Post Project*

Post-Project short-circuit current levels for scenario 5 are provided in Table 4-3.

Table 4-3: Short-Circuit Current Levels for the 2031 WP Low Gen Pre-Project Scenario 5

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Lamoureux 71S	240	243.53	22.2	0.00228+j0.01084	19.0	0.00238+j0.01650
	138	139.84	29.6	0.00292+j0.01409	27.4	0.00240+j0.01786
Deerland 13S	138	141.66	13.2	0.00622+j0.03211	11.3	0.00520+j0.04867
Heartland 12S	500	536.45	9.8	0.00148+j0.01272	7.6	0.00472+j0.02359
	240	248.86	15.8	0.00201+j0.01585	12.5	0.00469+j0.02818
Josephburg 410S	240	243.60	19.0	0.00232+j0.01273	16.8	0.00213+j0.01780
	138	140.07	27.7	0.00305+j0.01509	25.6	0.00227+j0.01928
Bannerman 681S	240	244.97	13.8	0.00282+j0.01773	10.5	0.00592+j0.03459
Amelia 108S	240	245.47	15.5	0.00250+j0.01578	12.2	0.00428+j0.02839
Whitefish Lake 825S	240	256.99	9.4	0.00511+j0.02698	6.1	0.01605+j0.07053
Dow Substation 999001	240	242.62	18.2	0.00258+j0.01322	14.2	0.00414+j0.02451

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. All violations that were observed were confirmed to be able to be mitigated through real time operational practices.

5.1 Pre-Project

Pre-Project mitigation measures are summarized in Table 5-1.

Table 5-1: Pre-Project Mitigation Measures

Mitigation Measure	Location of Observed Violation	Contingency
Real time operational practices	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)
	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
	P1649 CKT 11 (GARNEAU Bus 535 - P1649 Bus 580006)	P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)

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
Real time operational practices	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	1056L (Ellerslie 89S Bus 128 - Argyll Transfer Station ARGYLL Bus 518)
	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
	908L (Ellerslie 89S Bus 128 - PETROLIA Bus 521)	240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)
	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)

	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
	P1649 CKT 11 (GARNEAU Bus 535 - P1649 Bus 580006)	P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)

5.3 Evaluation of Mitigation Measures

All of the pre-Project and post-Project thermal criteria violations can be resolved with the use of real time operational practices.

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 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 A8.

Attachment A1
Engineering Connection Assessment: Study Scope

Engineering Connection Assessment: Study Scope

P2614 Dow Fort Sask. Load

Dow Chemical Canada ULC

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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 Power Grid Specialists Corp (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

Dow Chemical Canada ULC (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its proposed Dow Fort Sask. Load facility (Facility) to the AIES.

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 0 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 231 MW; and a request for transmission development (collectively, the Project).

The Project in-service date (ISD) used for the purpose of the studies is August 15, 2026. Following the completion of the studies, a change proposal was submitted to amend the ISD to September 1, 2027.

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

Table 1-1: Project Load and Generation Details

Project Component		Description
Load	Existing Rate DTS, *Demand Transmission Service,* contract capacity	246 MW at Dow Chemical Fort Sask. 166S No existing contract at new facility
	Requested Rate DTS	A decrease to 72 MW at Dow Chemical Fort Sask. 166S 231 MW at new facility
	Type	Industrial
	Motors (number and size)	2 x FVNR motors (40 MW each)
	Power factor	0.9 pf
	Future load expansion plans	N/A
Generation	Generation type	Wasteheat
	Existing Rate STS, *Supply Transmission Service,* contract capacity	No existing contract at new facility
	Requested Rate STS	0 MW
	Number and size of generating units	2 x 30 MW condensing steam turbine generators
	Maximum authorized real power (MARP)	120 MW
	Maximum capability (MC)	60 MW (limited due to steam process requirements)
	Reactive power capability	19.7 MVAr (0.95 pf absorbing)

Project Component		Description
		29.1 MVAr (0.9 pf producing)
	Future generation expansion plans	N/A

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 Fort Saskatchewan (Area 33).

The Study Area consists of the AESO planning areas of 33 (Fort Saskatchewan), 60 (Edmonton), and 27 (Athabasca), 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

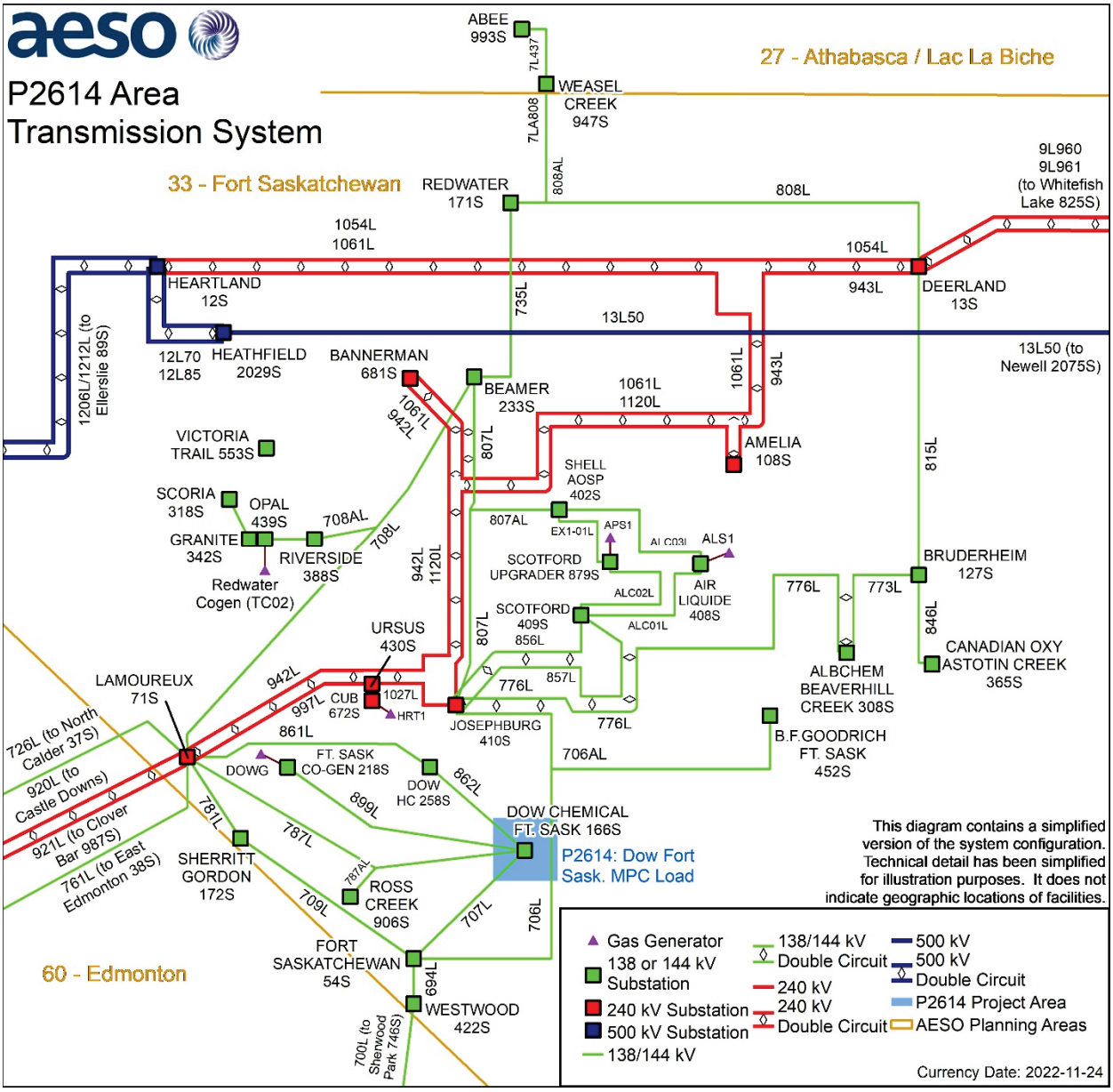
Existing constraints in the Study Area are managed in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

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:

- APS 159: 936S Norberg Under Voltage Mitigation
- APS 120: Alpac Load Trip Scheme

Figure 1-1: Transmission System in the Study Area



2 Connection Alternative to be Studied

The following alternative will be studied:

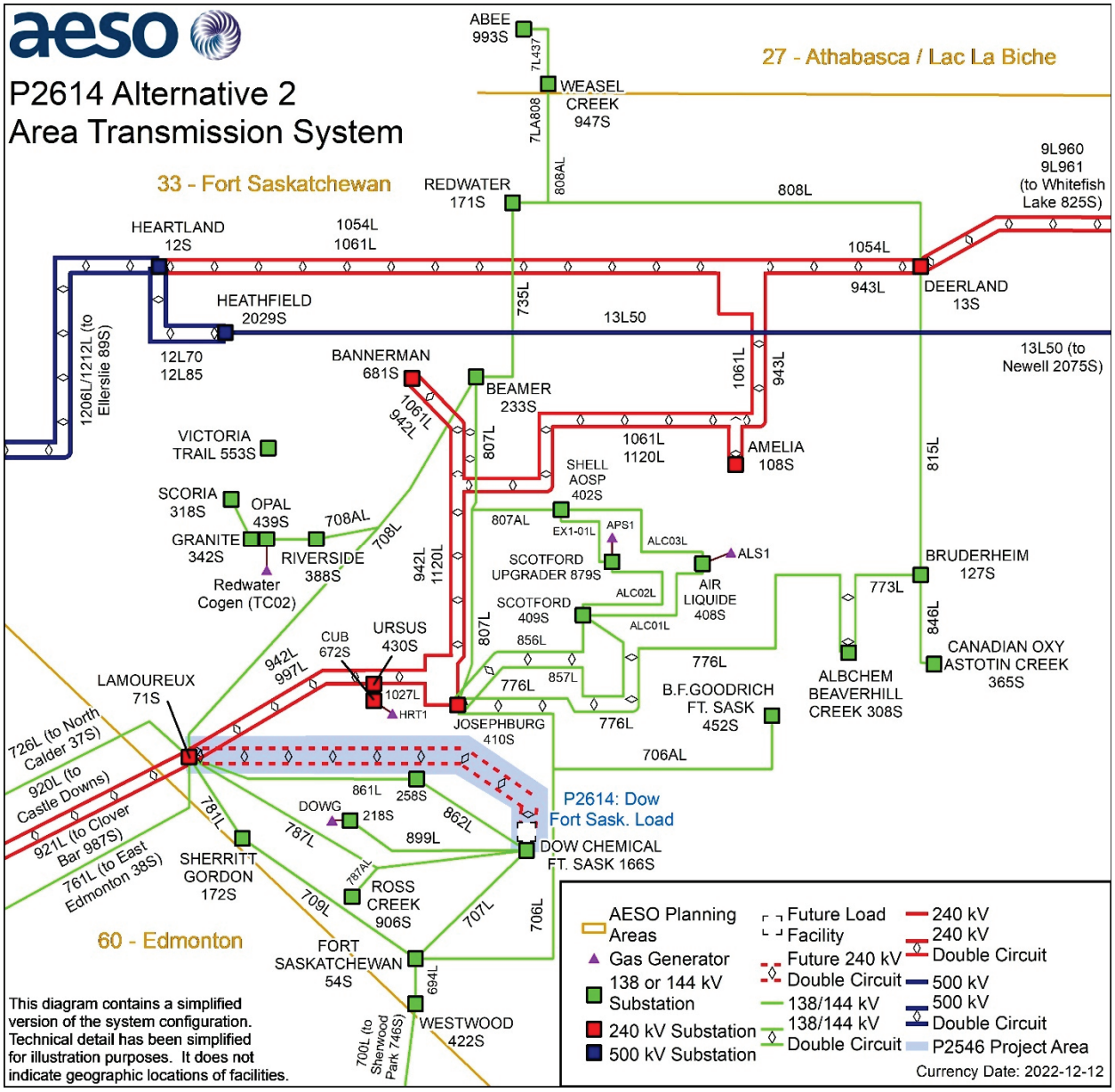
2.1 Alternative 2 – Double 240 kV Radial to Lamoureux 71S

This alternative included the following developments:

- Add two 240 kV circuits, approximately 2 km each, to connect the Facility to the existing Lamoureux 71S substation
- Upgrade/expand Lamoureux substation by extending the 240 kV buswork and adding (4) 240 kV circuit breakers
- Add or modify associated equipment as required for the above transmission developments.

The proposed connection configuration is shown in Figure 2-1.

Figure 2-1: Connection Alternative 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, TPL-002-AB1-0, have referenced Applicable Ratings when specifying the required system performance under Category A, 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 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 502.7 of the ISO rules, *Load Facility Technical Requirements*;
- Section 502.5 of the ISO rules *Generating Unit Technical Requirements*;
- Section 502.6 of the ISO rules *Generating Unit 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.

At the time the studies were performed, the ISD of the Project was August 15, 2026. After the completion of the studies, a change proposal was submitted to amend the ISD to September 1, 2027, to align with the construction timelines for the project.

When the change proposal was submitted, the AESO reviewed the differences between the original forecast and updated 2027 forecast for the Northeast region and noted that the differences would not have a significant impact on the study results. Therefore, the AESO determined that a restudy was not required.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Facility Net-to-Grid Import (MW)	Facility Net-to-Grid Export (MW)
Pre-Project					
1	2025 SP	Low Northeast generation	2025 SP Pre-Project DTS	0	0
2	2025 WP		2025 WP Pre-Project DTS	0	0
Post-Project					
3	2025 SP	Low Northeast generation	2025 SP Post-Project DTS	231	0
4	2025 WP		2025 WP Post-Project DTS	231	0
5	2031 WP	All study area generation in-service	2031 WP Post-Project	231	0

4.2 Assumptions

4.2.1 System Project Assumptions

The pre-Project and post-Project connection assessment will not include any system transmission projects because there are no planned system transmission developments in the Study Area that are expected to be in service before the scheduled Project ISD.

4.2.2 Connection Project Assumptions

Table 4-2 summarizes the connection projects in the Study Area that should be included in the studies.

Table 4-2: Planned Connection Projects Included in the Studies

AESO Project Name/No.	AESO Planning Area No.	Generation (MW)	Load (MW)	Scheduled ISD
P1649 EPCOR Garneau Area Upgrade	60-Edmonton	0	0	Apr 8, 2022
P2289 Heartland Scotford Change	33-Fort Saskatchewan	0	0	Mar 22, 2023
P2381 Capital Power Genesee Unit 3 Change	40-Wabamun	0	0	Nov 2, 2022
P2383 CP Genesee Unit 6 Gas	40-Wabamun	430	0	Dec 22, 2023
P2389 CP Genesee Unit 1 Repower ST	40-Wabamun	-100	0	Dec 22, 2023
P2392 Nutrien Redwater Cogen	33-Fort Saskatchewan	0	0	Aug 30, 2023
P2409 CP Genesee Unit 7 Gas	40-Wabamun	430	3	Dec 22, 2023
P2410 CP Genesee 2 Repower ST	40-Wabamun	-100	0	Jan 15, 2024
P2440 EDTI Meadowlark Modification	60-Edmonton	0	0	Feb 28, 2023
P2532 Shell ALS1 Modification	33-Fort Saskatchewan	0	0	Apr 30, 2023
P1982 EDTI DG Solar BTF	60-Edmonton	0	0	Aug 8, 2022
P2485 Fortis Wabamun 2739S & Carvel 432S Contract Change	40-Wabamun	0	0	Nov 1, 2022
P2550 CP Genesee GN2 Modification	40-Wabamun	20	0	Oct 1, 2022

4.2.3 Load Assumptions

The load forecast to be used for the studies is shown in Table 4-3 and is a forecast for the AESO Northeast Planning Region peak based on the *AESO 2021 Long-term Outlook* (2021 LTO[1] with modifications to incorporate the latest forecast intelligence. For the post-Project studies, when the Study Area loads are modified to align with the regional load forecast, the active power to reactive power ratio in the base case scenarios shall be maintained.

[1] The [e.g., 2017 LTO] is available on the AESO website.

Table 4-3: Forecast Load (at AESO Northeast Planning Region Peak)

AESO Planning Region Name	Forecast Peak Load by Year/Season (MW)	
	2025 SP	2025 WP
Northeast Planning Region[1]	3,257	3,528

Note:
[1] The Northeast Region comprises the following AESO planning areas: 33, 27, 25

IDEV files contain non-motor loads in zones 34, 36, and 351. These loads are not accounted for in the forecasted peak loads shown above and should not be considered when scaling load. The AESO engineer will provide guidance to load scaling procedures as required.

4.2.4 Generation Assumptions

The generation forecast to be used for the studies is based on the 2021 LTO with modifications to incorporate the latest forecast intelligence. The generation assumptions for the studies will assume high Northeast generation for the STS study scenarios and low Northeast generation for the DTS study scenarios. Additional studies may be required in the event of changes to the AESO's corporate forecast.

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

Air Liquide Scotford #1 was determined to be the critical generator and shall be modelled as being offline to simulate the N-G condition in the DTS study scenarios.

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[a] (MW) by Scenario	
					2025 SP	2025 WP
Dow Hydrocarbon (DOWG)	GT	2031	95	33	149	167
	ST	2030	45.5	33		
	G1	54	99.5	33		
	G2	454	99.5	33		
Redwater Cogen (TC02)	1	3050	46	33	52	83
	G1	5793	46	33		
ATCO Scotford Upgrader (APS1)	GT	4185	99.4	33	129.3	144
	ST	7185	95.7	33		
Air Liquide Scotford #1 (ALS1)	G1	627	96	33	N-G	N-G

Facility Name	Unit No.	Bus No.	MC (MW)	AESO Planning Area No.	Unit Net Generation[a] (MW) by Scenario	
					2025 SP	2025 WP
Suncor Cogeneration Facility	1, 2	2867, 2868	806	25	559	709
Genesee 1/6	1, 6	491, 2525	466	40	403	435
Genesee 2/7	2, 7	492, 3525	466	40	403	435

Notes:
[a] "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.
[b] "N-G" indicates the critical generating unit that is assumed by the AESO to be offline to test the N-G contingency condition
[c] "Not in merit" means that the generating unit has operating blocks whose prices are above the system marginal price.

4.2.5 Intertie Flow Assumptions

The Alberta-British Columbia (AB-BC), Alberta-Saskatchewan (AB-SK), and Alberta-Montana (MATL) intertie points are deemed to be too far away from the Study Area to have any material impact on the connection assessment. Therefore, intertie flow values shall be set to the AESO planning base case values and will not be adjusted for the studies.

4.2.6 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.

For the 2031 WP scenario, the HVDC power order should be as per the AESO base cases and will not be adjusted.

The reactive power limits of the MVAr exchanges between the HVDC terminals (WATL and EATL) and the connected alternating current (AC) transmission systems are shown in Table 4-5. These limits must be maintained when performing the studies.

Table 4-5: HVDC to Adjacent AC System MVAr Exchange Limits

HVDC Facility	North Terminal Reactive Power Limit (MVAr)	South Terminal Reactive Power Limit (MVAr)
EATL	-85 to 75	-35 to 35
WATL	-75 to 75	-35 to 35

4.2.7 Transmission Facility Ratings

The legal owner of transmission facilities (TFO) provided the thermal ratings assumptions for the existing transmission lines in the Study Area. Table 4-6 shows the normal ratings and emergency ratings for the key transmission lines in the Study Area, which will be used to perform the engineering studies.

Table 4-6: Thermal Rating Assumptions for Key Transmission Lines in the Study Area

Line ID	Line Description	Voltage Class (kV)	Normal Rating (MVA)		Emergency Rating (MVA)	
			Summer	Winter	Summer	Winter
1206L	HEARTLAND 12S - ELLERSLIE 89S	500	2598CT	2598CT	3464@	3464@
1212L	HEARTLAND 12S - ELLERSLIE 89S	500	2598CT	2598CT	3464@	3464@
12L70	HEARTLAND 12S - HEATHFIELD 2029S	500	3464@	3464@	3464@	3464@
12L85	HEARTLAND 12S - HEATHFIELD 2029S	500	3464@	3464@	3464@	3464@
920L	EP 920L J511 - LAMOUREUX 71S	240	419	499CT	503	620
921L	LAMOUREUX 71S - CLOVER BAR 987S	240	417	499CT	500	620
942L	LAMOUREUX 71S - BANNERMAN 681S	240	499CT	499CT	654@	748CT
943L	AMELIA 108S - DEERLAND 13S	240	457CT	457CT	654@	686CT
997L	LAMOUREUX 71S - URSUS 430S	240	594@	624CT	654@	773@
1027L	URSUS 430s – JOSEPHBURG 410S	240	499CT	499CT	654@	748CT
1054L	HEARTLAND 12S - DEERLAND 13S	240	594@	624CT	654@	773@
1061L	BANNERMAN 681S - HEARTLAND 12S	240	628	706	754	847
1120L	JOSEPHBURG 410S - AMELIA 108S	240	594@	706	654@	773@
9L960	DEERLAND 13S – WHITEFISH LAKE 825S	240	457CT	457CT	624	624
9L961	DEERLAND 13S – WHITEFISH LAKE 825S	240	457CT	457CT	624	686CT
706L	JOSEPHBURG 410S - JCT. 706AL	138	119	146	131	161
706L	JCT. 706AL - FORT SASKATCHEWAN 54S	138	92	117	101	129
708L	LAMOUREUX 71S - JCT. 708AL	138	121	148	133	163
708L	JCT. 708AL - BEAMER 233S	138	121	148	133	163
708AL	JCT. 708L - RIVERSIDE 388S	138	123	150	135	165
726L	LAMOUREUX 71S - NORTH CALDER 37S	138	169	191CT	186	228
735L	BEAMER 233S - REDWATER 171S	138	96CT	94	125	103
761L	EAST EDMONTON 38S - LAMOUREUX 71S	138	100	135	110	149
776L	JOSEPHBURG 410S - ALBCHEM BEAVERHILL CREEK 308S	138	140	140	154	154
781L	LAMOUREUX 71S - SHERRITT 172S	138	143@	172@	172@	186@
787L	DOW CHEMICAL FORT SASK. 166S - JCT. 787AL	138	172	207@	189	224@

Line ID	Line Description	Voltage Class (kV)	Normal Rating (MVA)		Emergency Rating (MVA)	
			Summer	Winter	Summer	Winter
787L	JCT. 787AL - LAMOUREUX 71S	138	172	212	189	233
807L	BEAMER 233S - JCT. 807AL	138	85	90	94	99
807L	JCT. 807AL - JOSEPHBURG 410S	138	175	217	193	239
807AL	JCT. 807L – EXPANSION ONE 402S	138	175	217	193	239
808L	REDWATER 171S - JCT. 808AL	138	98	114	108	125
808L	JCT. 808AL - DEERLAND 13S	138	98	114	108	125
815L	BRUDERHEIM 127S - DEERLAND 13S	138	167@	163	184@	179
856L	JOSEPHBURG 410S - SHELL SCOTFORD 409S	138	229@	275@	252@	287CT
857L	JOSEPHBURG 410S - SHELL SCOTFORD 409S	138	246	287CT	271	330
861L	LAMOUREUX 71S - DOW HYDROCARBONS 258S	138	172	212	189	233

Note:
"CT" indicates that the transmission line is limited by current transformer.

"@" indicates that the transmission line rating is limited by other terminal equipment.

The TFOs provided the details of the substation transformers in the Study Area. The key transformers in the Study Area are shown in Table 4-7.

Table 4-7: Summary of Key Transformer Ratings in the Study Area

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	Transformer Rating (MVA)
Josephburg 410S	T1	250/144	336
	T2	250/144	336
Lamoureux 71S	T1	245/144	448
	T2	245/144	400
Deerland 13S	T2	245/144	300
Heartland 12S	T1	525/252	1200
North Calder 37S	T6	245/144	448
East Edmonton 38S	T1	245/144	400
	T4	245/144	400
Ellerslie 89S	T1	525/252	1200
	T2	525/252	1200
Saunders Lake 289S	T1	245/144	400
	T2	245/144	400

The TFOs provided the details of the shunt elements in the Study Area. The key shunt elements in the Study Area are shown in Table 4-8.

Table 4-8: Summary of Key Shunt Elements in the Study Area

Substation Name and Number	Voltage Class (kV)	Capacitors		Reactors	
		Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)	Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)
Fort Saskatchewan 54S	138	1	48.91	-	-
Lamoureux 71S	138	2	97.82	-	-
Bruderheim 127S	138	1	45	-	-
Boyle 56S	138	1	14.95	-	-
Lac La Biche 157S	138	1	10.8	-	-
Waupisoo 405S	138	2	36.13	-	-
Winefred 818S	138	3	42.07	-	-
Bonnyville 700S	138	2	40.74	-	-
Bourque 970S	138	3	50	-	-
Whitefish Lake 825S	240	1	100	-	-
Acheson 305S	138	1	24.46	-	-
East Edmonton 38S	138	2	97.82	-	-
Jasper 805S	240	1	105.31	-	-
Leduc 325S	138	1	27	-	-
Nisku 149S	138	1	30	-	-

4.2.8 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 4-9. Only those contingencies shown in Table 4-9 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 4-9: Protection Fault Clearing Times

Contingency (System Element Lost)	Fault Location	Clearing Times (Cycles)	
		Near End	Far End
1054L (Heartland 12S – Deerland 13S)	Heartland 12S	5	6

1054L (Heartland 12S – Deerland 13S)	Deerland 13S	5	6
12L70 (Heartland 12S – Heathfield 2029S)	Heartland 12S	5.5	5.5
12L70 (Heartland 12S – Heathfield 2029S)	Heathfield 2029S	3.5	5.5
12L85 (Heartland 12S – Heathfield 2029S)	Heartland 12S	5.5	5.5
12L85 (Heartland 12S – Heathfield 2029S)	Heathfield 2029S	3.5	5.5
1206L (Heartland 12S – Ellerslie 89S)	Heartland 12S	4	5
1212L (Heartland 12S – Ellerslie 89S)	Heartland 12S	4	5
13L50 EATL	Heathfield 2029S	1	1
943L (Amelia 108S – Deerland 13S)	Amelia 108S	4	6
943L (Amelia 108S – Deerland 13S)	Deerland 13S	5	5
1120L (Amelia 108S – Josephburg 410S)	Amelia 108S	5	6
1120L (Amelia 108S – Josephburg 410S)	Josephburg 410S	5	6
997L (Josephburg 410S – Lamoureux 71S)	Josephburg 410S	6.5	6.5
997L (Josephburg 410S – Lamoureux 71S)	Lamoureux 71S	6.5	6.5
1061L (Heartland 12S – Bannerman 681S)	Heartland 12S	4	5
1061L (Heartland 12S – Bannerman 681S)	Bannerman 681S	4	5
9L960 (Deerland 13S – Whitefish lake 825S)	Deerland 13S	5	6
9L960 (Deerland 13S – Whitefish lake 825S)	Whitefish lake 825S	5	6

4.2.9 Project Dynamic Data

Dynamic data for the Project will be based on the Stage 1 Project Data Update Package (PDUP-1).

4.2.10 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	
Pre-Project										
1	2025 SP Pre Project DTS	X	X	X*	X*	X*	X*			
2	2025 WP Pre Project DTS	X	X	X*	X*	X*	X*			X
Post-Project										
3	2025 SP Pre Project DTS	X	X	X	X	X	X	X	X	
4	2025 WP Pre Project DTS	X	X	X	X	X	X	X	X	X
5	2031 WP Post-Project									X

*Only required if post-Project stability issues are observed

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 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.

5.1.1 Contingencies to be Studied

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

5.2 Voltage Stability Studies

The objective of the voltage stability studies is to determine the ability of the transmission system to maintain voltage stability margin at all busses under Category A and Category B conditions. The power-voltage (PV) curve is a representation of voltage change as a result of increased power transfer between two systems. The incremental transfers will be reported at the collapse point.

Voltage stability studies will be performed for the post-Project scenarios. For load connection projects, the load level modeled in post-Project scenarios is the same as, or higher than, in pre-Project scenarios. Therefore, voltage stability studies for pre-Project scenarios will only be performed if post-Project scenarios show voltage stability criteria violations.

Voltage stability studies will be performed according to the Western Electricity Coordinating Council (WECC) Voltage Stability Assessment Methodology. WECC voltage stability criteria states, for load areas, post-transient voltage stability margin is required for the area modeled at a minimum of 105% of the reference load level for Category A conditions and for Category B conditions. For this standard, the reference load level is the maximum established planned load.

Typically, voltage stability studies are carried out assuming the worst case scenarios in terms of loading. In this connection assessment, the voltage stability studies will be performed by increasing load in Fort Saskatchewan (Area 33) and increasing generation in Wabamun (Area 40) and Edmonton (Area 60).

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

5.2.1 Contingencies to be Studied

Voltage stability studies will be performed for all Category B contingencies in the Study Area. The Category A condition and the five contingencies with the smallest stability margin will be presented in the results.

5.3 Transient Stability Studies

The Genesee 3 unit 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, and active and reactive power output for the following units.

- Dow Hydrocarbon (DOWG)
- Redwater Cogen (TC02)
- ATCO Scotford Upgrader (APS1)

- Air Liquide Scotford #1 (ALS1)

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 4-9

5.4 Motor Starting Studies

The analysis may consider the starting of one motor, with its variable frequency driver (VFD) out of service, while the other motors will be running at full load. If multiple motors may start simultaneously, the number of motors, size of motors, and probability of starting them simultaneously should be provided. The following assumptions will used in conducting the motor starting studies:

- The transient voltage dip at the 138 kV POD bus should not exceed 5% when starting a single motor.
- The motors will not start simultaneously. Only one motor will be allowed to start in VFD bypass mode while the other motors are running at full load.

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

5.4.1 Contingencies to be Studied

Motor starting studies will be performed for the worst case contingencies identified in the voltage stability and power flow studies.

5.5 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:

- Main 240 kV bus at the Facility (post-Project only)
- Deerland 13S 138kV
- Amelia 108S 240 kV

- Josephburg 410S 240kV
- Josephburg 410S 138kV
- Whitefish Lake 825S 240kV
- Heartland 12S 500kV
- Heartland 12S 240kV
- Lamoureux 71S 240kV
- Lamoureux 71S 138kV
- Bannerman 681S 240kV

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[2] 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 AIES.

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.

[2] 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 2021 Long-Term Outlook 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

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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[1]

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

[1] 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 of 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	≥5%	Worst Case Scenario(8)
B	Bus Section	≥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	≥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	2nd Ckt (C5 and C7 only)
138/144	15	24	24
240	12	6	14
500	9	5	11

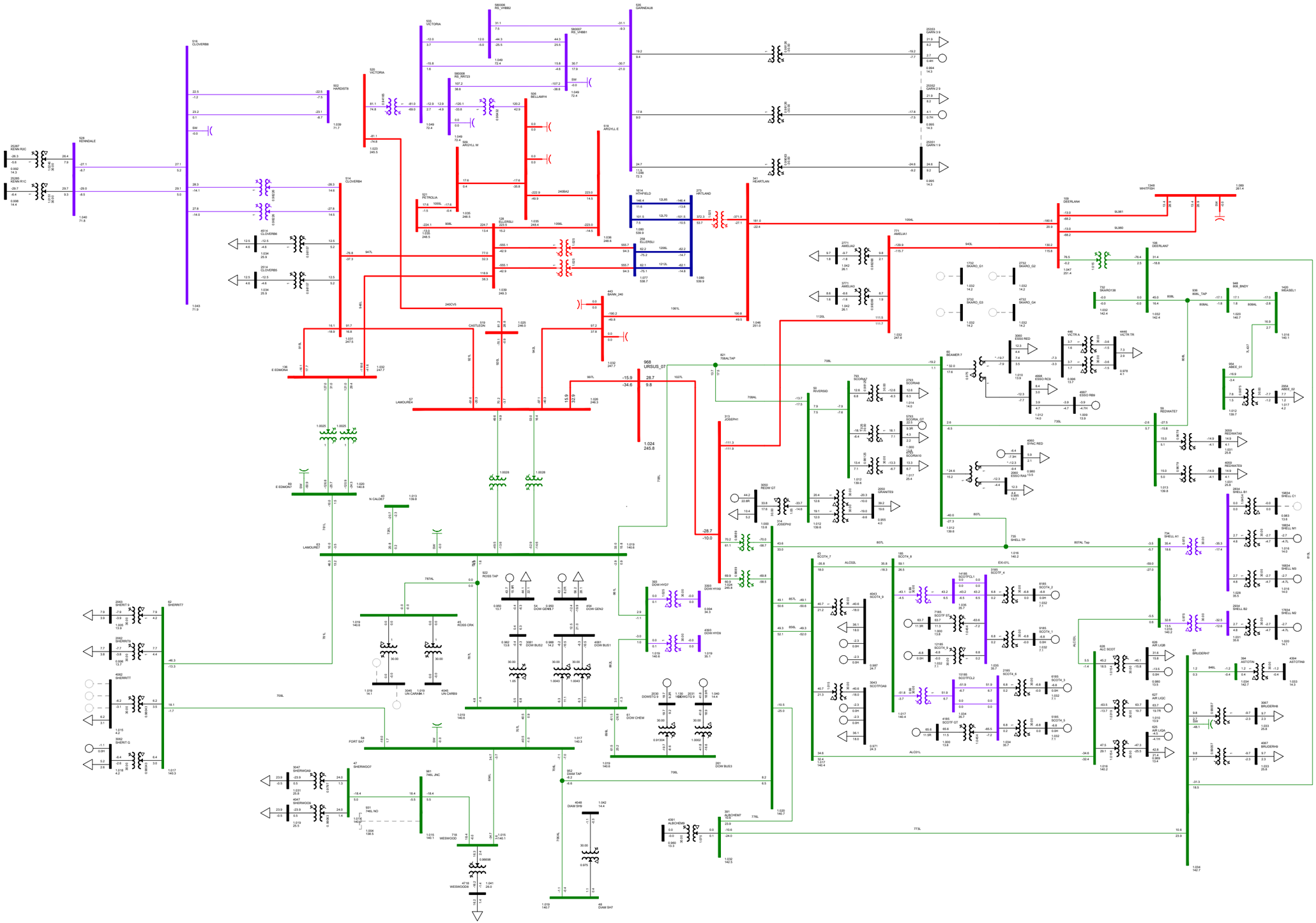
Table 2-5: Stuck Breaker Clearing Times for Transformers

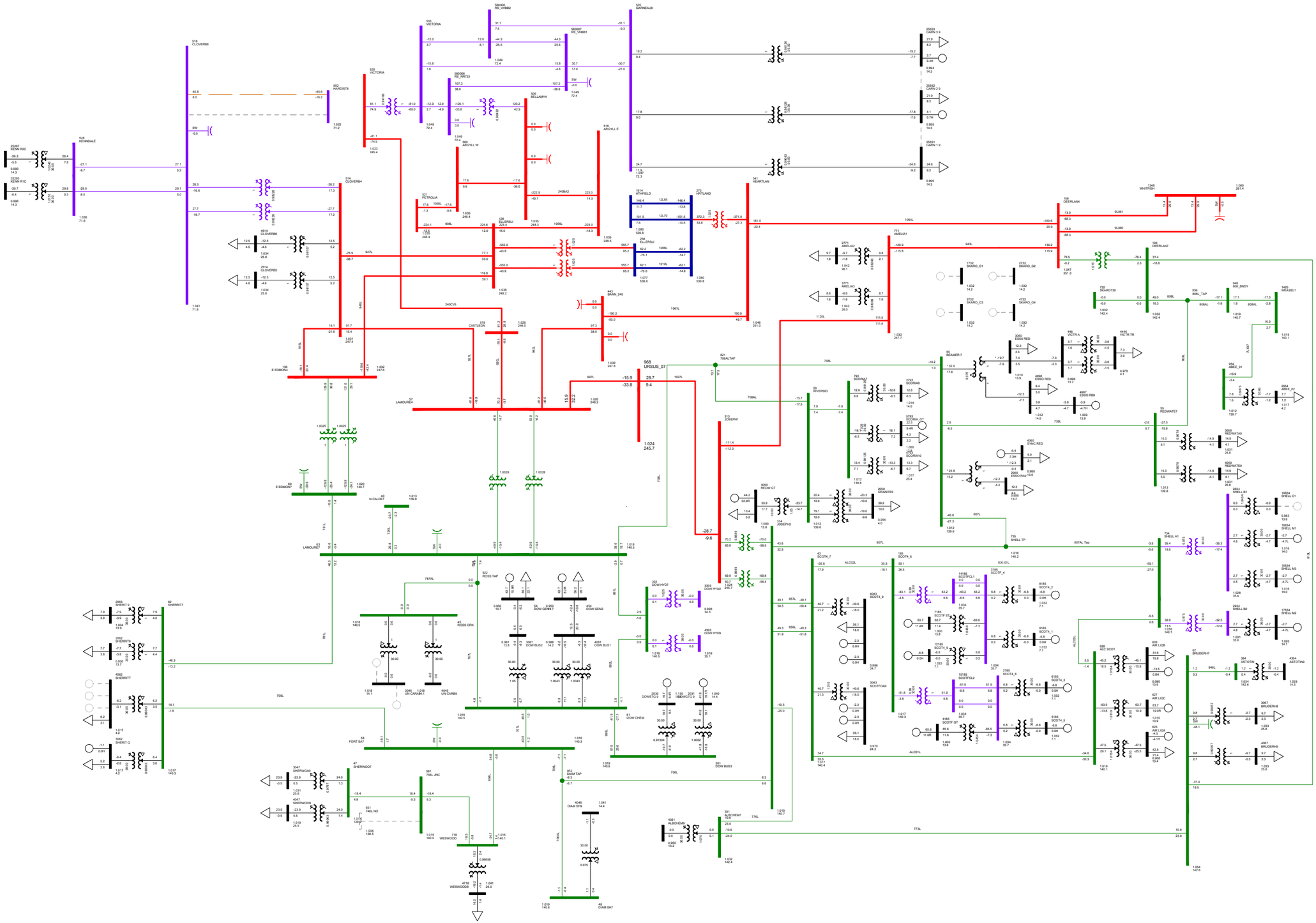
Voltage (kV)	Fault Location	Fault Clearing Times (Cycles)		
		High Side	Low Side	2nd Ckt (breaker fail)
240/138	240 kV side	12	6	14
	138 kV side	5	15	24
500/240	500 kV side	9	5	11
	240 kV side	4	12	14

Attachment A2
Pre-Project Power Flow Diagrams

Table A2-1: List of 2025 Summer Peak Pre-Project Load Flow Diagrams

Figure	Category	Contingency
A2-1 SP Pre - 1	A (N-0)	System Normal
A2-1 SP Pre - 2	B (N-1)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A2-1 SP Pre - 3	B (N-1)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A2-1 SP Pre - 4	B (N-1)	240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)
A2-1 SP Pre - 5	B (N-1)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A2-1 SP Pre - 6	B (N-1)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A2-1 SP Pre - 7	B (N-1)	P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)


516 CLOVERB8
502 HARDISTB
526 KENDALE
25287 KENN 81C
25286 KENN R1C
514 CLOVERB4
4014 CLOVERB6
2014 CLOVERB5
520 VICTORIA
533 VICTORIA
580008 RS_VHBB2
580007 RS_VHBB1
580008 RS_SRY23
506 BELLAMY4
509 ARGYLL W
518 ARGYLL E
521 PETROLIA
528 EILERSLI
240BA2
1614 HTHFIELD
273 HETLAND
241 HEARTLAN
535 GARNEAUB
25353 GARN 2.9
25352 GARN 2.9
25351 GARN 1.9
443 BANN_240
240GV5
CASTLEDN
510
136 E EDMON4
57 LAMOUR4
968 URSUS_07
28.7
9.8
1.024
245.8
821 708ALTAP
313 JOSEPH1
314 JOSEPH2
50 RIVERSID
793 SCORA7
2793 SCORA6
5793 SCORA_G2
2223
1000 SCORA1S
3050 REDW GT
3050 GRANITES
4361 ALBCHEM5
391 ALBCHEM7
361
776L
773L
707AL
708AL
709L
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716L
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3062 SHERIT G
62 SHERRIT7
3047 SHERWOA3
4047 SHERWOG3
47 SHERWOO7
931 746L NO
961 746L JNC
718 WESWOOD
4718 WESWOOD6
68 FORT SA7
952 DIAM TAP
4048 DIAM SH9
46 DIAM SH7
DOW CHEM
281 DOW BUS3
DOW GEN3 7
DOW GEN2
DOW BUS2
DOW BUS1
DOW HYD7
DOW HYA9
DOW HYD9
3045 UN CARA4 T
4045 UN CARB9
1732 SKARO_G1
2732 SKARO_G2
3732 SKARO_G3
4732 SKARO_G4
271 AMELIA1
2771 AMELIA2
3771 AMELIA3
WHITFISH
100 DEERLAN4
100 DEERLAN7
732 SKARO138
936 808L_TAP
808AL
808BAL
948 808_BNDY
1420 WEASEL1
954 ABEE_01
2954 ABEE_02
3059 REDWATA9
4059 REDWATE9
59 REDWATE7
60 BEAMER 7
3060 ESSO RED
4960 ESSO RC9
4960 SYNC RED
3960 ESSO RA9
4960 ESSO RB9
446 VICTR A
4446 VICTR TR
734 SHELL A1
734 SHELL B1
2934 SHELL B2
16834 SHELL C1
16834 SHELL M1
17834 SHELL M2
828 ALC LIQB
827 AIR LIQC
820 AIR LIQA
829 ALC SCOT
87 BRUDERH7
3967 BRUDERH9
4067 BRUDERH9
43 SCOTA_7
185 SCOTA_8
4043 SCOTA_9
3043 SCOTOA9
3185 SCOTF_4
9185 SCOTA_2
9185 SCOTA_1
9185 SCOTA_3
9185 SCOTA_5
14185 SCOTFCL1
7185 SCOTF ST
12185 SCOTA_9
15185 SCOTFCL2
4185 SCOTF GT
2185 SCOTA_6
6185 SCOTA_3
ALOS2L
ALOS1L
EXI-01L
807AL Tap
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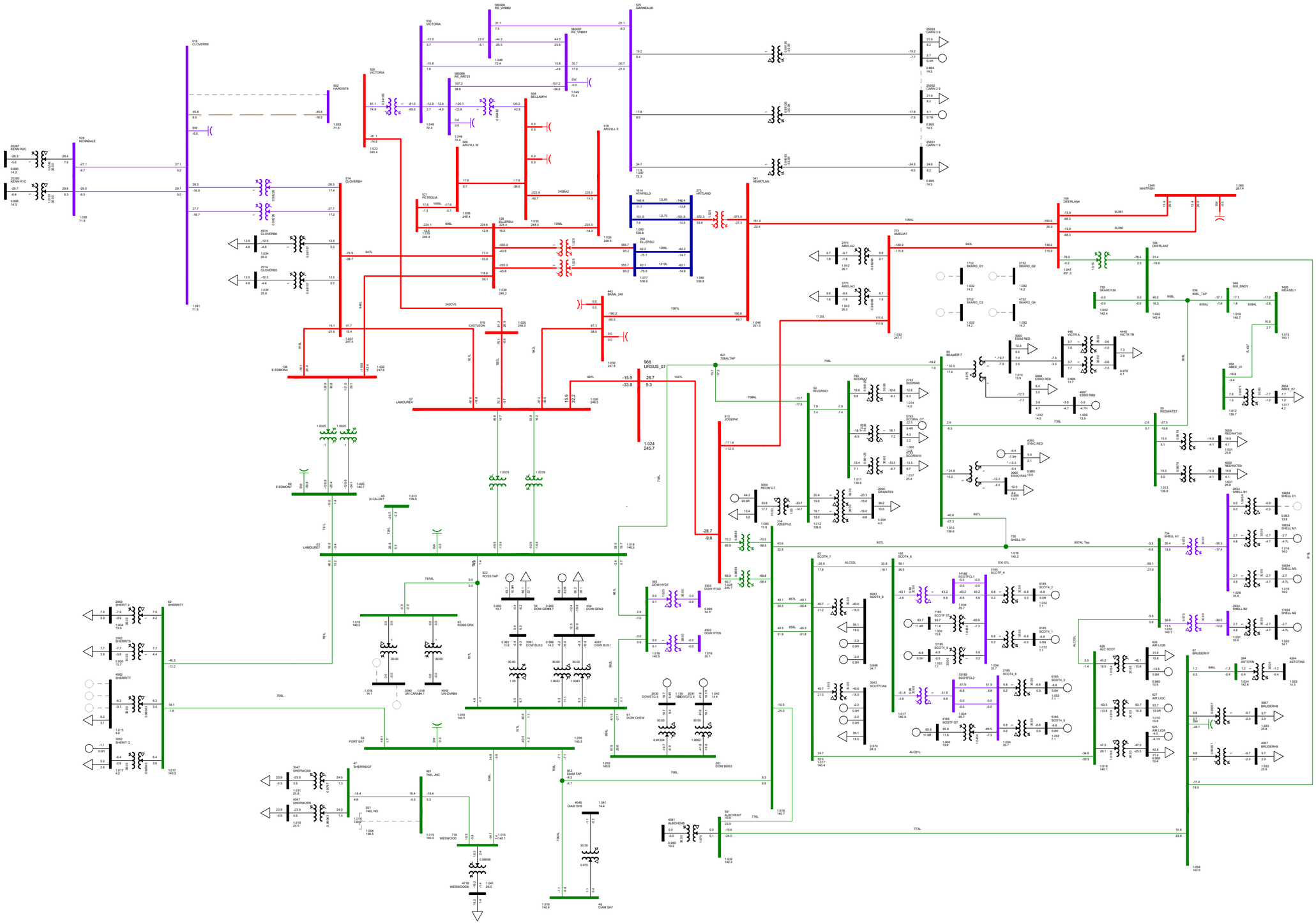


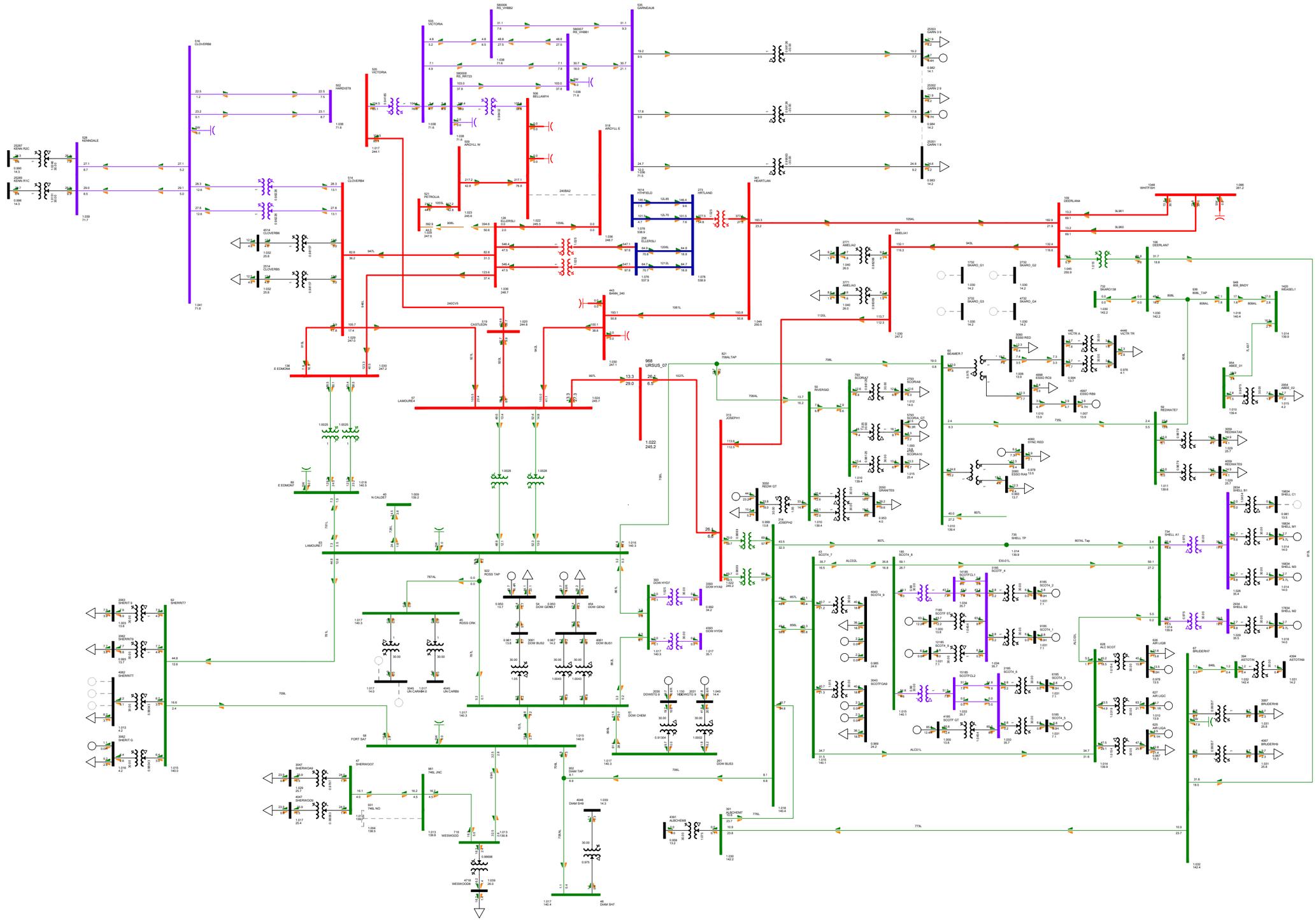
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72CH9 CONTINGENCY
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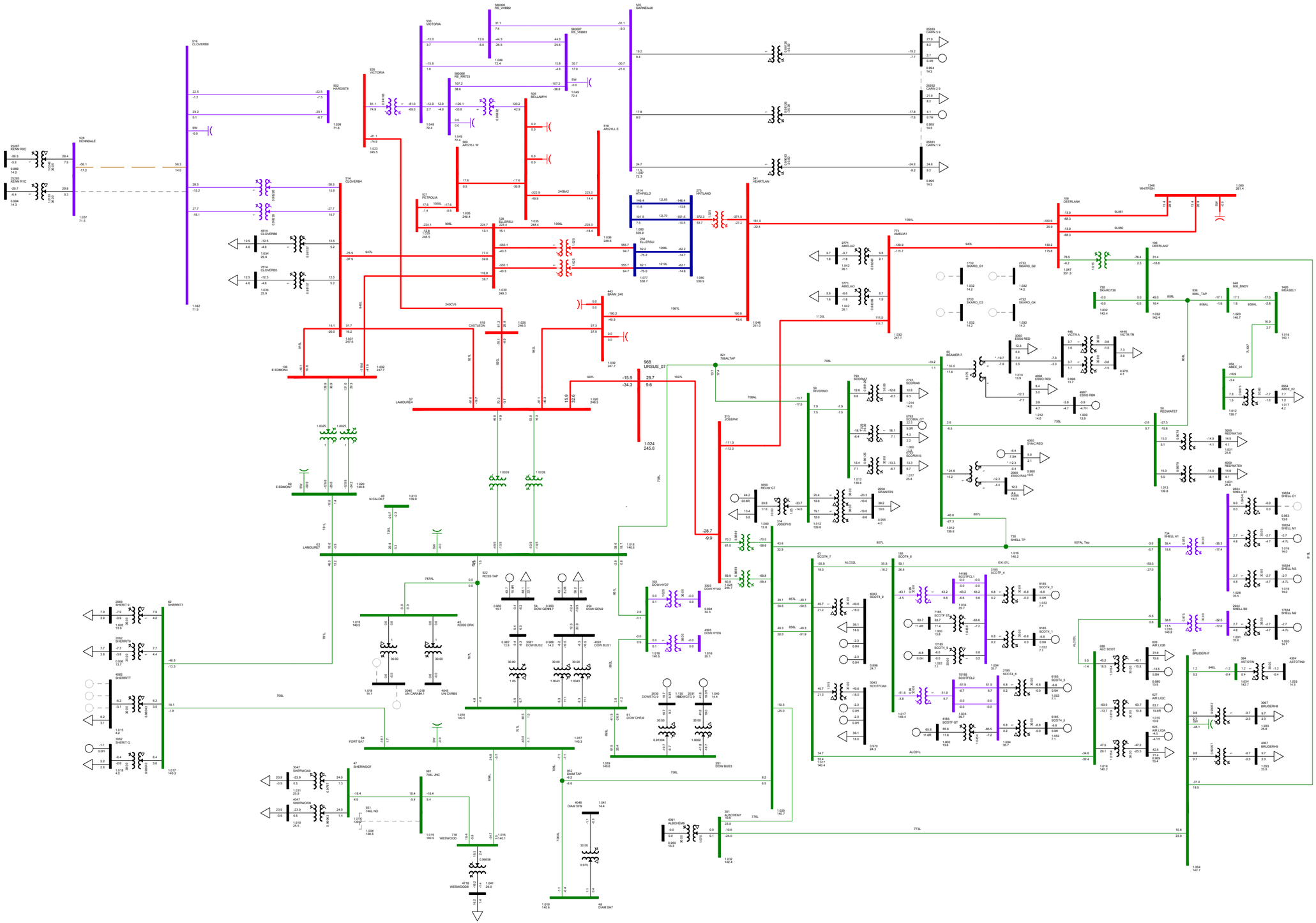
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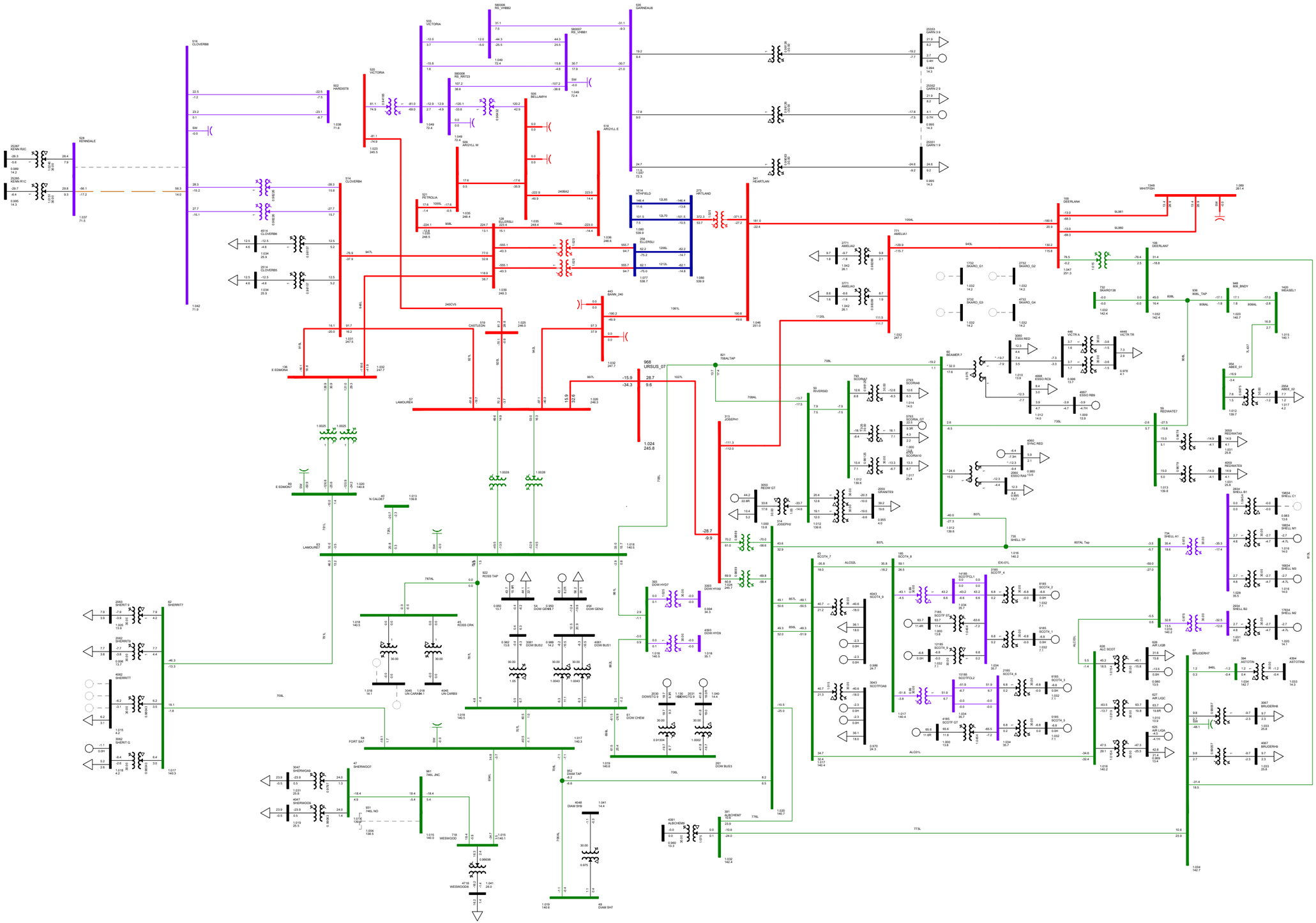
Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000


516 CLOVERB8
526 KEANDALE
502 HARDISTB
533 VICTORIA
580008 RS_VHB82
580007 RS_VHB81
535 GARNEAUB
520 VICTORIA
580008 RS_SRY23
506 BELLAMY4
518 ARGYLL E
509 ARGYLL W
521 PETROLIA
128 ELLERSLI
514 CLOVERB4
4014 CLOVERB6
2014 CLOVERB5
241 HEARTLAN
1614 HTHFIELD
273 HETLAND
2771 AMELIA2
2731 AMELIA3
731 AMELIA1
720 DEERLAN4
100 DEERLAN7
1345 WHITFISH
732 SKARO138
1732 SKARO_G1
2732 SKARO_G2
3732 SKARO_G3
4732 SKARO_G4
3060 ESSO RED
4446 VICTR A
4446 VICTR TR
4958 ESSO RC9
4957 ESSO RB9
4060 SYNC RED
2060 ESSO RA9
60 BEAMER 7
59 REDWATE7
3059 REDWATA9
4058 REDWATE9
954 ABEE_01
2954 ABEE_02
948 808_SINDY
808AL
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2014 CLOVERB5
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SHERWOO7
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DIAM SH7
DIAM TAP
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746L NO
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WESWOOD6
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DOW BUS3
DOW BUS2
DOW BUS1
DOW GEN3
DOW GEN2
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DOW HYD7
DOW HYD9
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UN CARB3
UN CARA4
UN CARA3
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ALBCHEM9
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SHELL A7
SHELL B1
SHELL B2
SHELL C1
SHELL M1
SHELL M2
SHELL M3
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ASTOTIN9
BRUDERH
BRUDERH6
BRUDERH7
BRUDERH9
ALC SCOT
AIR LIQB
AIR LIQC
AIR LIQA
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SCOTFOA3
2025 SP SC1
72CK13 CONTINGENCY
MON, NOV 17 2025 16:32
A2 - 1 SP Pre - 6
Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A
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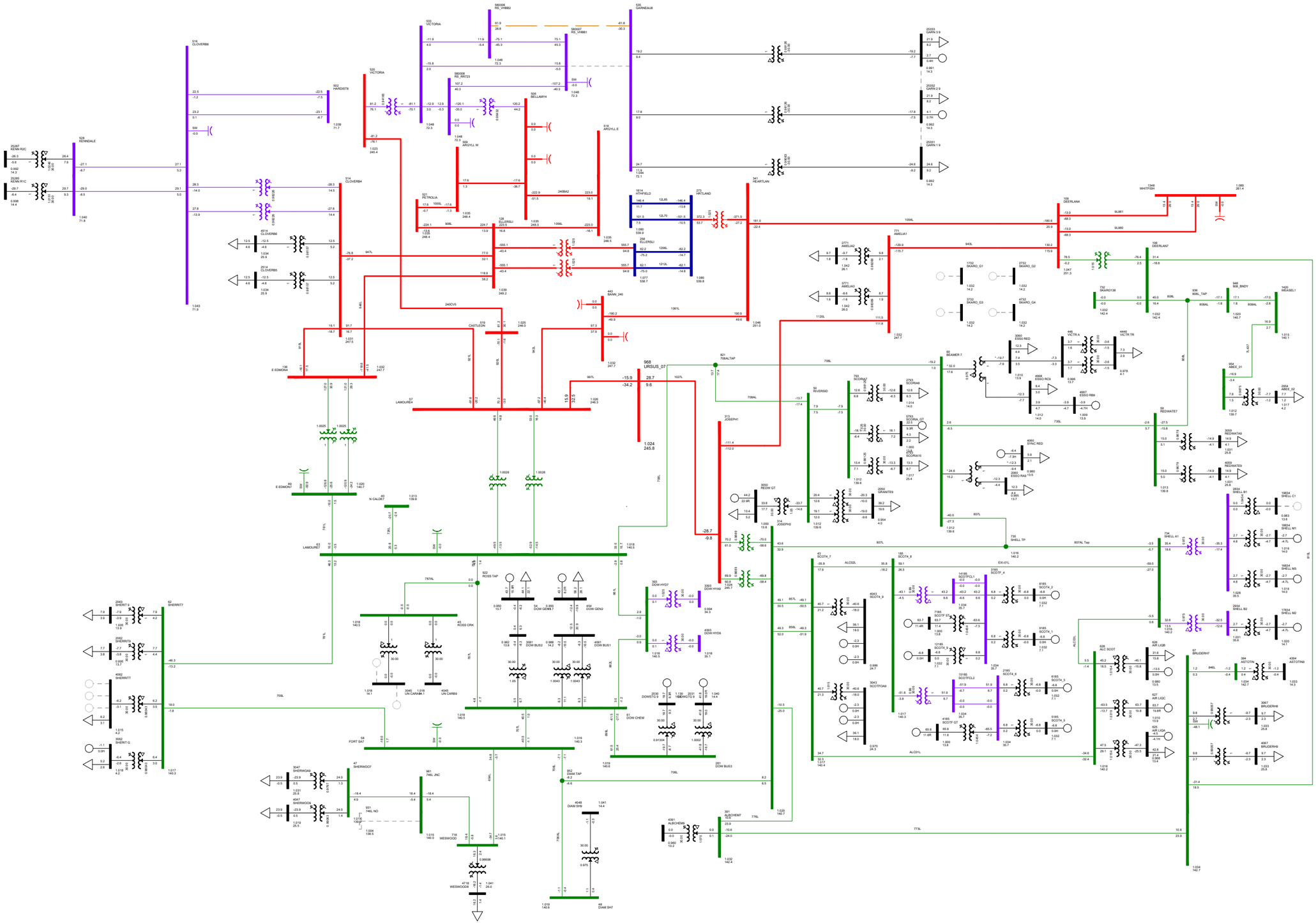
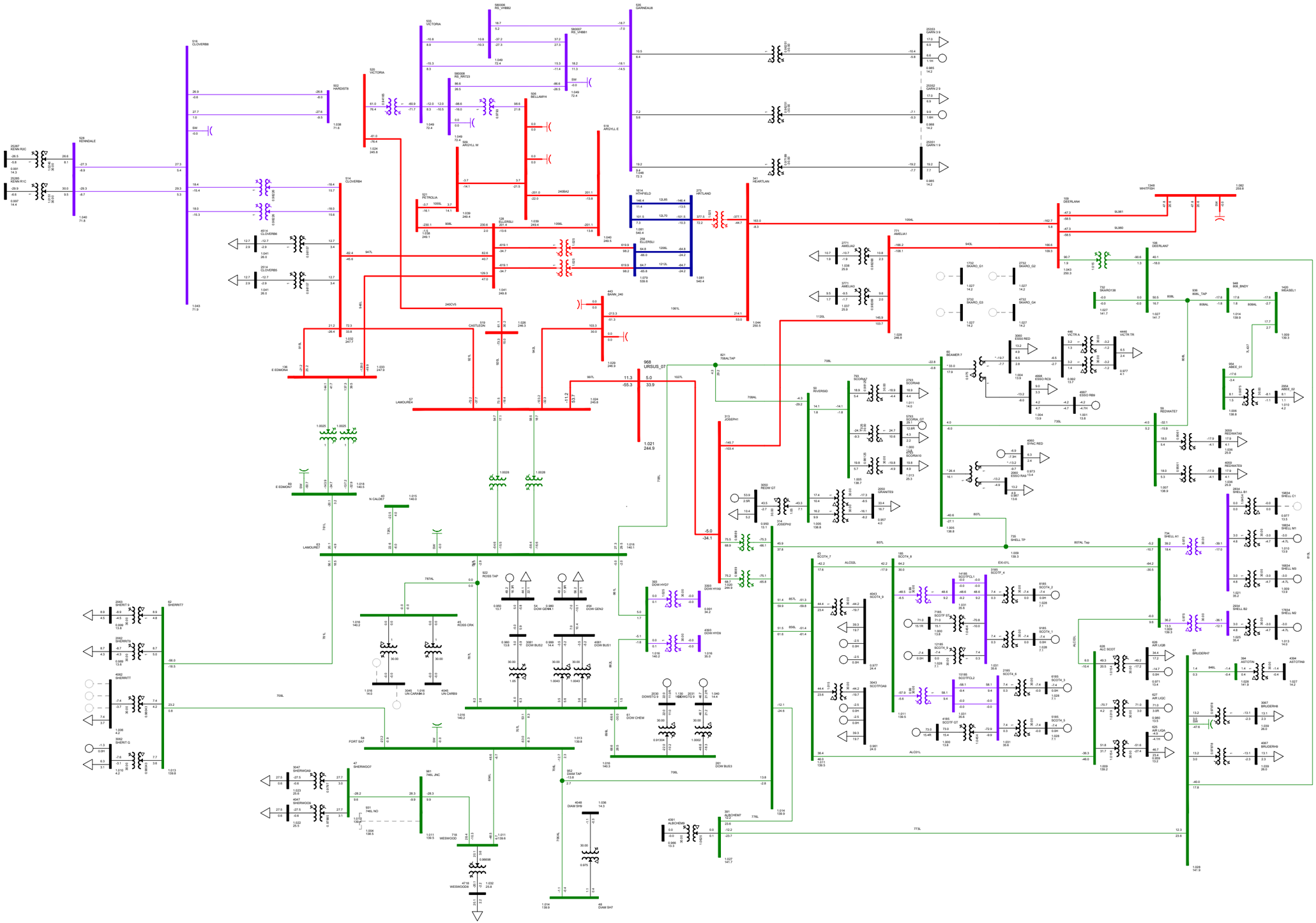
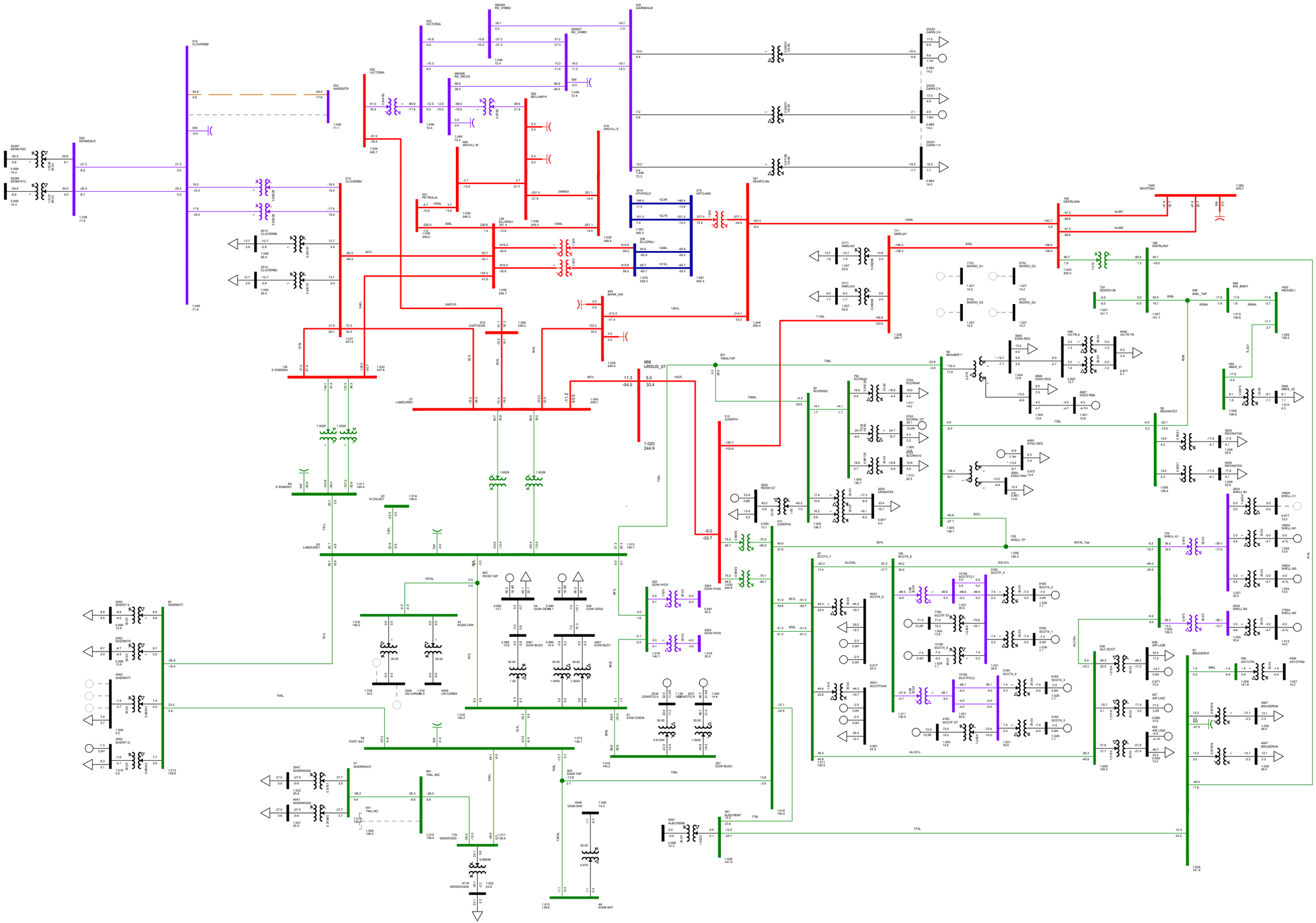
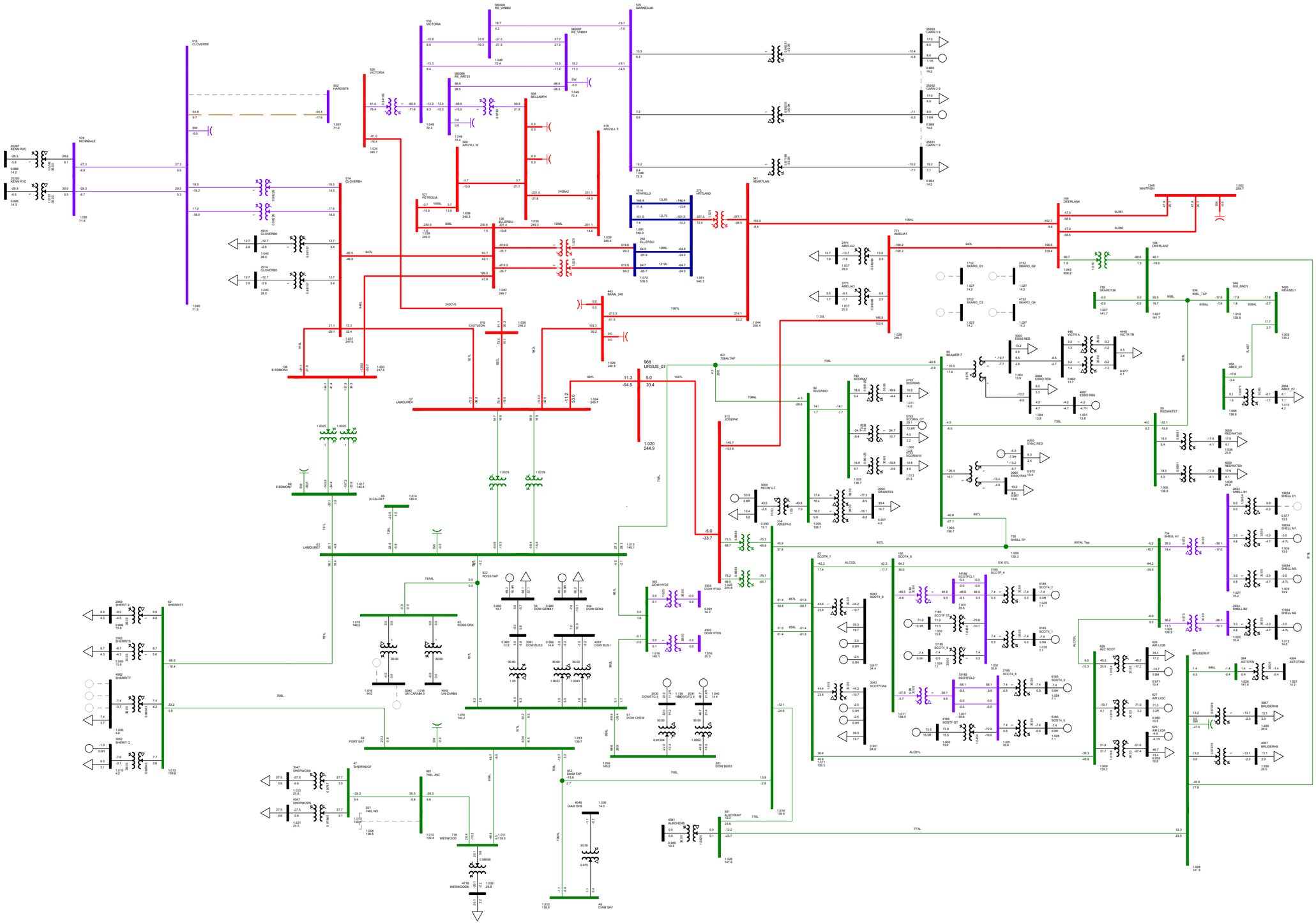

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514 CLOVERB4
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2014 CLOVERB5
128 ELLERSLI
240BA2
1614 HTHFIELD
273 HETLAND
241 HEARTLAN
443 BANN_240
240CV5
519 CASTLEDN
57 LAMOUR4
136 E EDMON4
40 N CALDE7
42 E EDMON7
63 LAMOUR7
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45 ROSS CRK
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46 DIAM SH7
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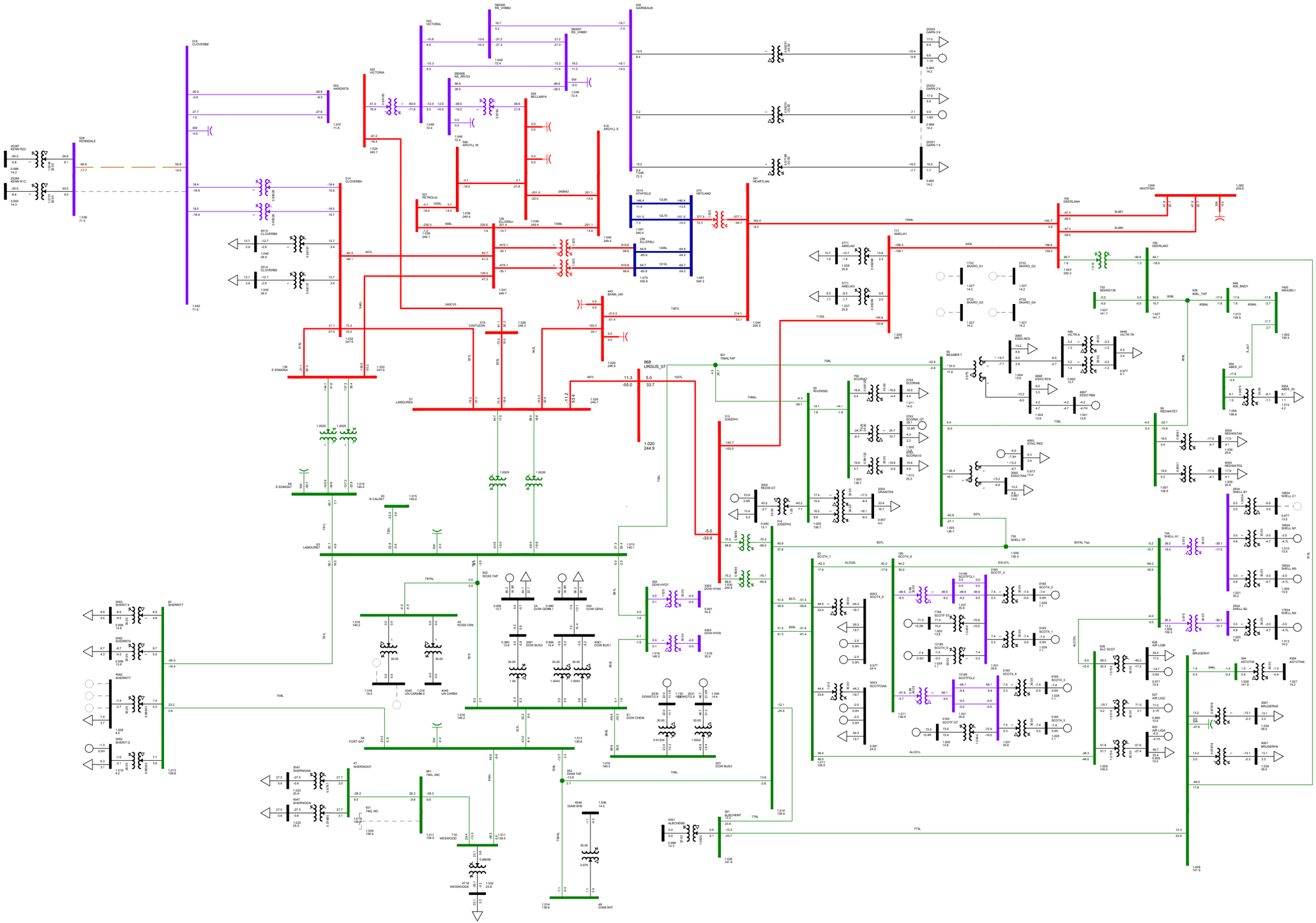
Table A2-2: List of 2025 Winter Peak Pre-Project Load Flow Diagrams

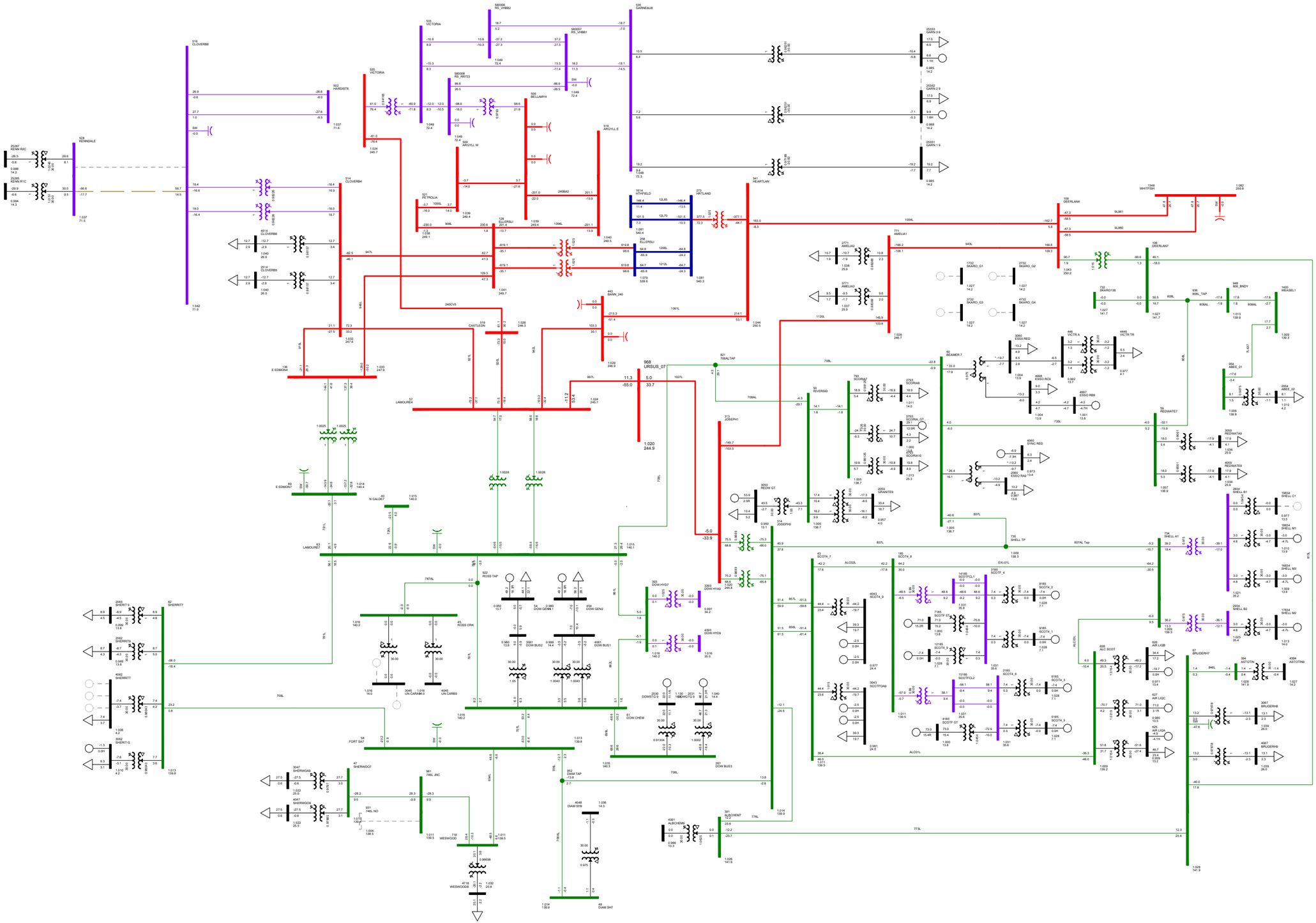
Figure	Category	Contingency
A2-2 WP Pre - 1	A (N-0)	System Normal
A2-2 WP Pre - 2	B (N-1)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A2-2 WP Pre - 3	B (N-1)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A2-2 WP Pre - 4	B (N-1)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A2-2 WP Pre - 5	B (N-1)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)


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URSUS_07
11.3
-55.3
5.0
33.9
1.021
244.9
1027L
709L
708AL
708ALTAP
821
-5.0
-34.1
709L
313
JOSEPH1
-145.7
-103.4
314
JOSEPH2
-75.2
69.7
1.020
244.9
-75.3
-66.1
45.9
37.8
-12.1
-24.6
1.014
139.9
776L
773L
391
ALKCHEM7
23.6
-12.2
-23.7
1.027
141.7
4391
ALKCHEM5
0.998
13.3
0.0
-0.1
1.0002
391
DOW BUS3
1.016
140.3
13.8
-2.8
952
DIAM TAP
2.7
-13.8
1.036
14.3
4048
DIAM SH9
30.00
0.975
1.1
1.4
46
DIAM SH7
1.014
139.9
709L
DOW CHEM
87
1.016
140.2
-12.1
-24.6
2030
DOWSTG 2
1.130
1.016
140.2
2031
DOWSTG 9
1.130
1.040
144.4
391
DOW BUS3
DOW HYD7
0.0
0.1
-0.0
-0.0
0.991
34.2
393
DOW HYD9
0.0
0.1
-0.0
-0.0
0.991
34.2
4353
DOW HYD9
1.016
140.2
1.016
36.0
-5.1
-11.8
DOW BUS2
0.960
13.8
3061
DOW BUS2
0.999
14.4
-3.5
-3.2
4061
DOW BUS1
1.004
144.5
1.004
144.5
30.00
30.00
30.00
30.00
DOW GEN1
0.960
13.7
54
DOW GEN1
-7.6
-10.1
-7.6
-10.4
454
DOW GEN2
1.016
140.2
1.016
14.0
3045
UN CARA#4.0
1.016
140.2
4045
UN CARB9
30.00
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-0.0
-0.0
-0.0
-0.0
1.016
140.2
70.7L
1.013
139.8
1.011
139.5
718
WESWOOD
29.4
-10.3
-48.5
1.011
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0.99598
20.1
-3.8
20.1
-3.2
4718
WESWOOD6
-28.1
-3.2
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-3.2
1.032
25.8
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-2.1
-2.1
1.036
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-2.1
-2.1
1.036
14.3
-2.1
-2.1


516 CLOVERB8
502 HARDISTB
520 VICTORIA
533 VICTORIA
580008 RS_VHBB2
580007 RS_VHBB1
580008 RS_SKY23
535 GARNEAUB
25353 GARN 2.9
25352 GARN 2.9
25351 GARN 1.9
506 BELLAMY4
509 ARGYLL W
518 ARGYLL E
521 PETROLIA
528 KEANDALE
25287 KEWN 1GC
25286 KEWN R1C
514 CLOVERB4
4014 CLOVERB6
2014 CLOVERB5
128 ELLERSLI
1614 HTHFIELD
273 HETLAND
241 DEARTLAN
2771 AMELIA2
3771 AMELIA3
251 AMELIA1
720 DEERLAN4
100 DEERLAN7
1345 WHITFISH
732 SKARO138
1732 SKARO_G1
2732 SKARO_G2
3732 SKARO_G3
4732 SKARO_G4
3060 ESSO RED
4660 SYNC RED
4660 ESSO RC9
4662 ESSO RB9
4660 ESSO RA9
4446 VICTR A
4446 VICTR TR
60 BEAMER 7
59 REDWATE7
3059 REDWATA9
4658 REDWATE8
954 ABEE_01
2954 ABEE_02
948 808_SINDY
1420 WEASEL1
936 808L_TAP
808AL
808AL
808BL
1345
1.082
259.7
968 URSUS_07
1.020 244.9
313 JOSEPH1
314 JOSEPH2
50 RIVERSID
793 SCORIA7
2793 SCORIA8
5793 SCORIA_G2
1000 SCORIA15
3050 REDW GT
3050 GRANITES
3053 HYA9
4353 DOW HYD9
369 DOW HYD7
DOW BUS1
DOW BUS2
DOW GEN8.1
DOW GEN2
DOW CHEM
DOW BUS3
DOWSTG 2
DOWSTG 9
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1.130
922 ROSS TAP
45 ROSS CRK
UN CARB9
UN CARB8
UN CARA4
UN CARA5
68 FORT SAT
787AL
709L
707L
709AL
708L
708AL
708AL Tap
807L
807AL
806AL
806BL
773L
776L
796L
796AL
1120L
1054L
1061L
1027L
1106L
1099L
1095L
1059L
943L
947L
909L
249CV5
240BA2
821 708ALTAP
443 BANN_240
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57 LAMOURE4
136 E EDMON4
42 E EDMON7
40 N CALDE7
63 LAMOUR27
47 SHERWOO7
3047 SHERWOA9
4047 SHERWOG9
961 746L JNC
931 746L NO
718 WESWOOD
4718 WESWOOD9
952 DIAM TAP
4048 DIAM SH9
46 DIAM SH7
62 SHERRIT7
2053 SHERIT A
2052 SHERRITB
4052 SHERRTT
3052 SHERIT G
391 ALKCHEM7
4391 ALKCHEM9
43 SCOTA_7
185 SCOTA_8
4043 SCOTA_9
3043 SCOTOA9
14185 SCOTFCL1
3185 SCOTF_4
7185 SCOTF ST
12185 SCOTA_9
15185 SCOTFCL2
3185 SCOTA_6
4185 SCOTF GT
9185 SCOTA_2
9185 SCOTA_1
6185 SCOTA_3
6185 SCOTA_5
734 SHELL A1
735 SHELL TP
736 SHELL B1
16834 SHELL C1
16834 SHELL M1
16834 SHELL M3
2934 SHELL B2
17834 SHELL M2
628 ALC SCOT
628 AIR LIQB
627 AIR LIQC
629 AIR LIQA
87 BRUDERH7
3967 BRUDERH8
4067 BRUDERH9
394 ASTOTIN
4394 ASTOTIN9
EXI-01L
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ALC41L
ALC42L


516 CLOVERB8
502 HARDISTB
528 KENDALE
25287 KENN 82C
25286 KENN R1C
514 CLOVERB4
4014 CLOVERB5
2014 CLOVERB5
520 VICTORIA
533 VICTORIA
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580007 RS_VHBB1
580008 RS_RR123
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25352 GARN 2 8
25351 GARN 1 9
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509 ARGYLL W
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521 RETROLIA
128 ELLERSLI
1614 HTHFIELD
273 HETLAND
241 DEARTLAN
2771 AMELIA2
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720 DEERLAN4
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2025 WP SC2
72CH11 CONTINGENCY
MON, NOV 17 2025 16:33
A2 - 2 WP Pre - 3
Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B
kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

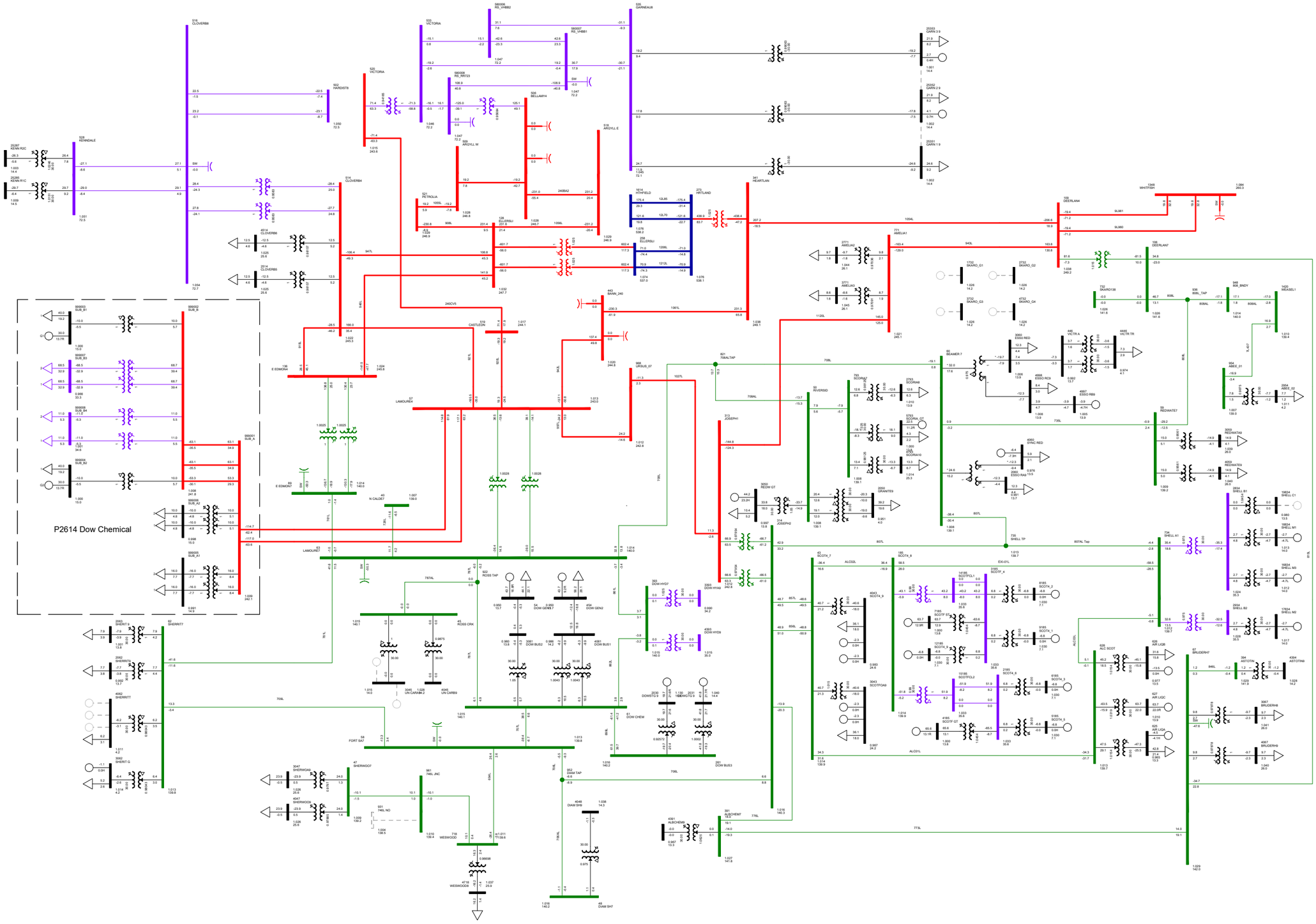

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516 CLOVERB8
502 HARDISTB
528 KENDALE
25287 KENN R2C
25286 KENN R1C
514 CLOVERB4
4014 CLOVERB6
2014 CLOVERB5
520 VICTORIA
533 VICTORIA
580036 RS_VHBB2
580007 RS_VHBB1
580008 RS_SKY23
535 GARNEAUB
506 BELLAMY4
509 ARGYLL W
518 ARGYLL E
521 PETROLIA
528 ELLERSLI
1614 HTHFIELD
273 HIETLAND
241 DEARTLAN
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25352 GARN 2 8
25351 GARN 1 9
2771 AMELIA2
3771 AMELIA3
271 AMELIA1
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2732 SKARO_G2
3732 SKARO_G3
4732 SKARO_G4
700 DEERLAN4
706 DEERLAN7
1345 WHITFISH
732 SKARO138
936 809L_TAP
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808BAL
948 808_BNDY
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4660 SYNC RED
4668 ESSO RC9
4667 ESSO RB9
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3060 ESSO RED
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4667 ESSO RB9
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4446 VICTR TR
60 BEAMER 7
59 REDWATE7
3059 REDWATA9
4658 REDWATE8
954 ABEE_01
2954 ABEE_02
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Attachment A3
Post-Project Power Flow Diagrams

Table A3-1: List of 2025 Summer Peak Post-Project Load Flow Diagrams

Figure	Category	Contingency
A3-1 SP Post - 1	A (N-0)	System Normal
A3-1 SP Post - 2	B (N-1)	1056L (Ellerslie 89S Bus 128 - Argyll Transfer Station ARGYLL Bus 518)
A3-1 SP Post - 3	B (N-1)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A3-1 SP Post - 4	B (N-1)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A3-1 SP Post - 5	B (N-1)	240BA2 (BELLAMY Bus 506 - Argyll Transfer Station ARGYLL Bus 518)
A3-1 SP Post - 6	B (N-1)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A3-1 SP Post - 7	B (N-1)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A3-1 SP Post - 8	B (N-1)	P1649 CKT71 (GARNEAU Bus 535 - P1649 Bus 580007)

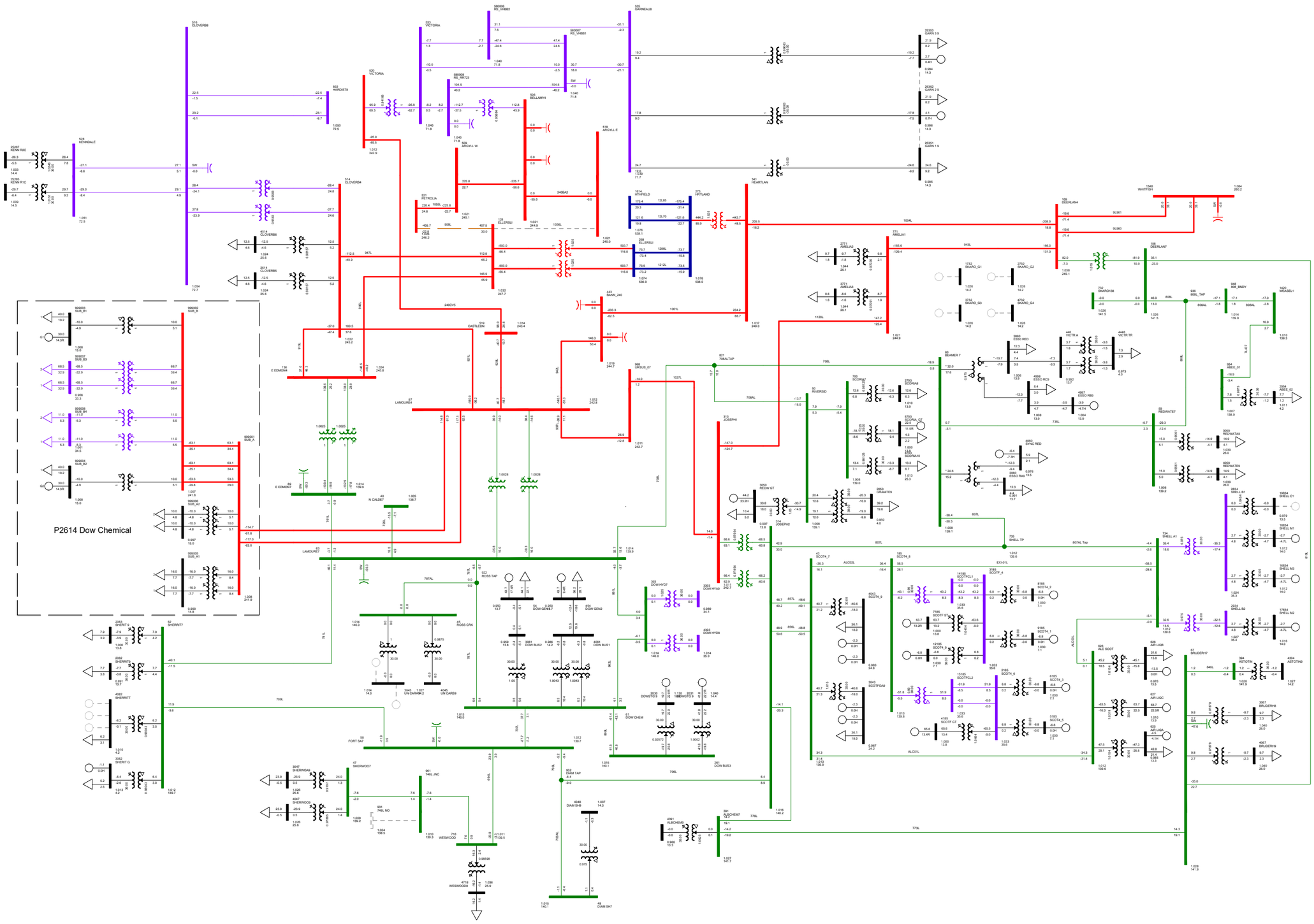


2025 SP SC3 ALT2
N-0, SYSTEM NORMAL
MON, NOV 17 2025 16:33

A3 - 1 SP Post - 1

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000



2025 SP SC3 ALT2
1056L CONTINGENCY
MON, NOV 17 2025 16:33

A3 - 1 SP Post - 2

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

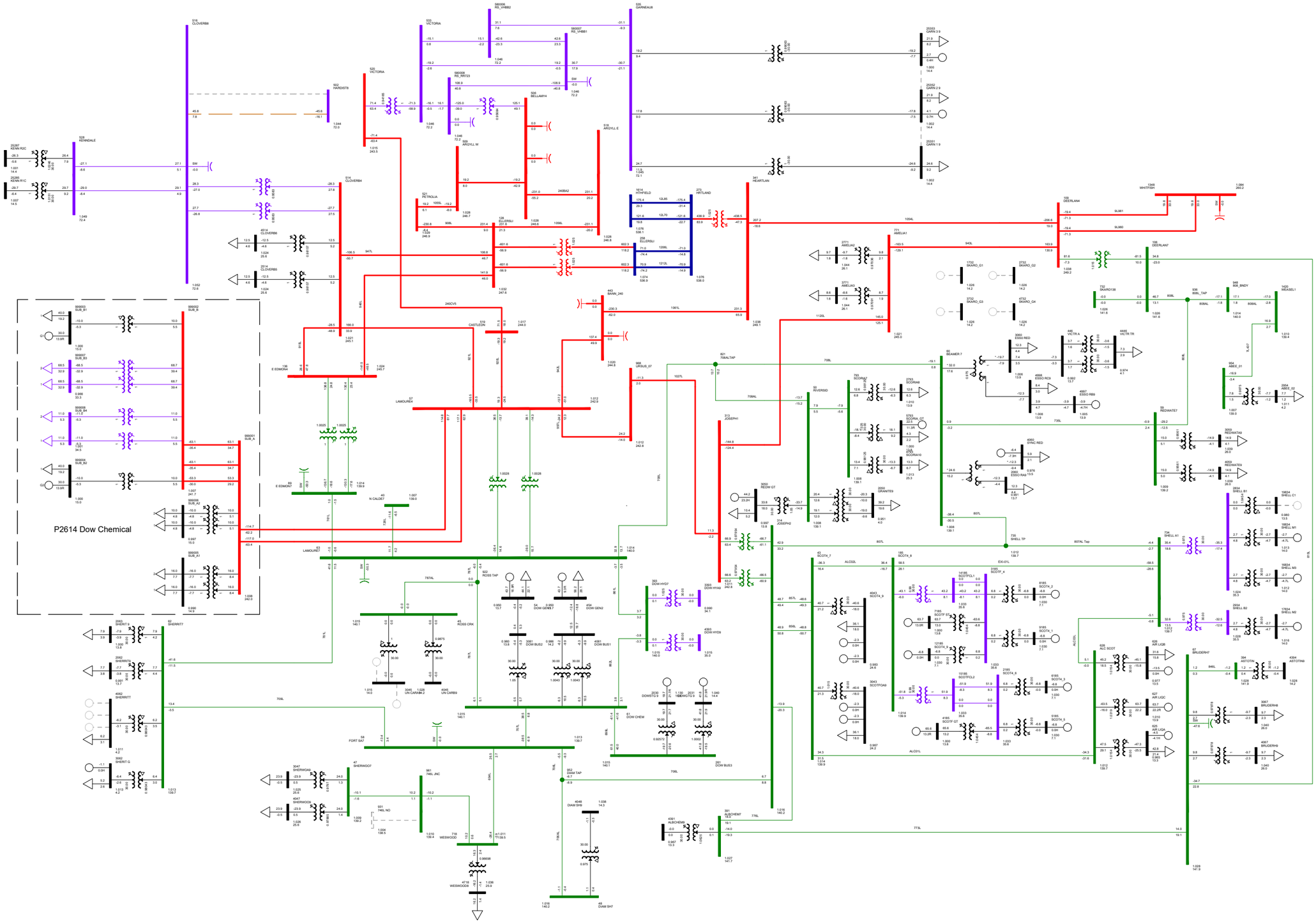
P2614 Dow Chemical

2025 SP SC3 ALT2
72CH9 CONTINGENCY
MON, NOV 17 2025 16:33

A3 - 1 SP Post - 3

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

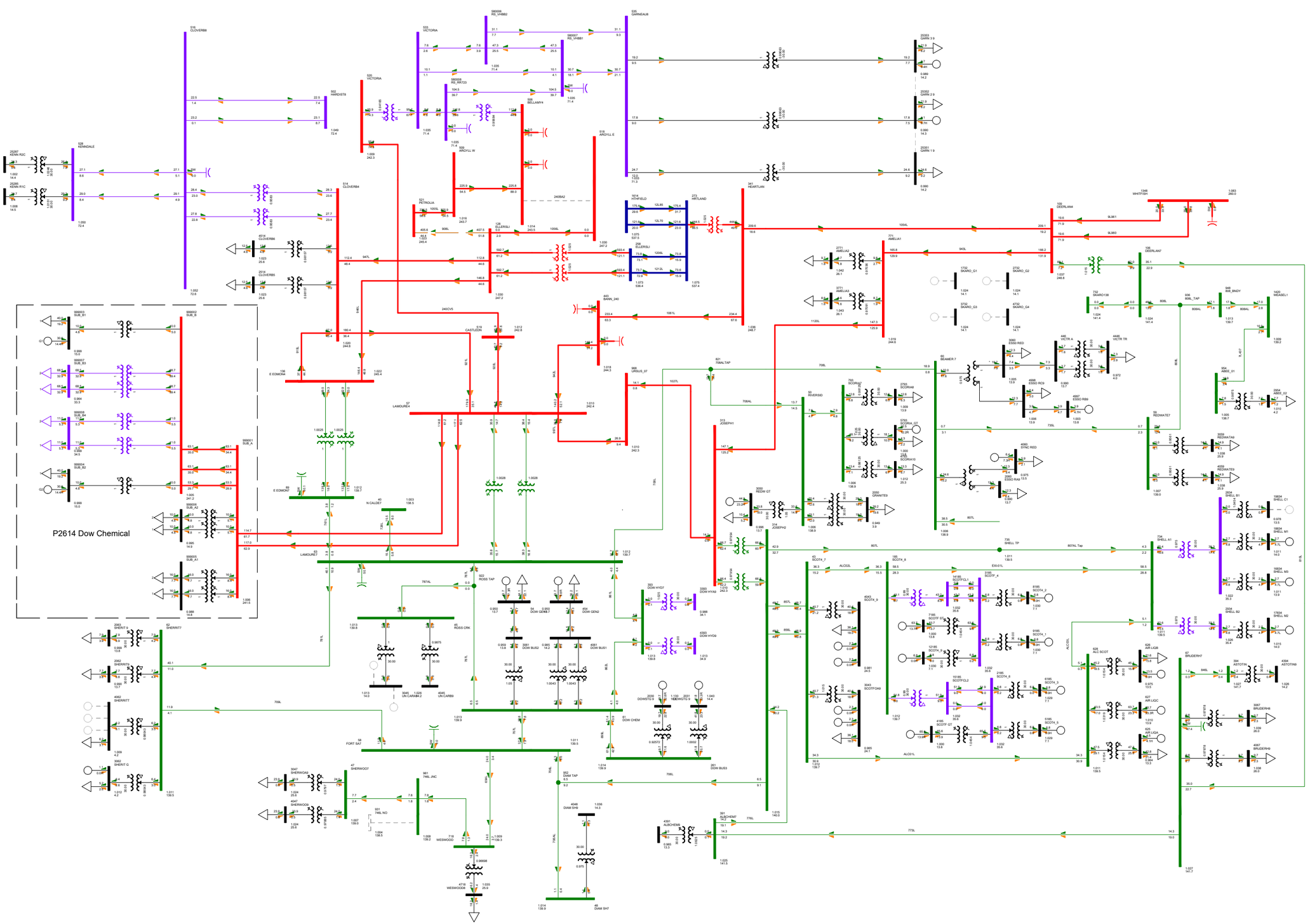


2025 SP SC3 ALT2
72CH11 CONTINGENCY
MON, NOV 17 2025 16:33

A3 - 1 SP Post - 4

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

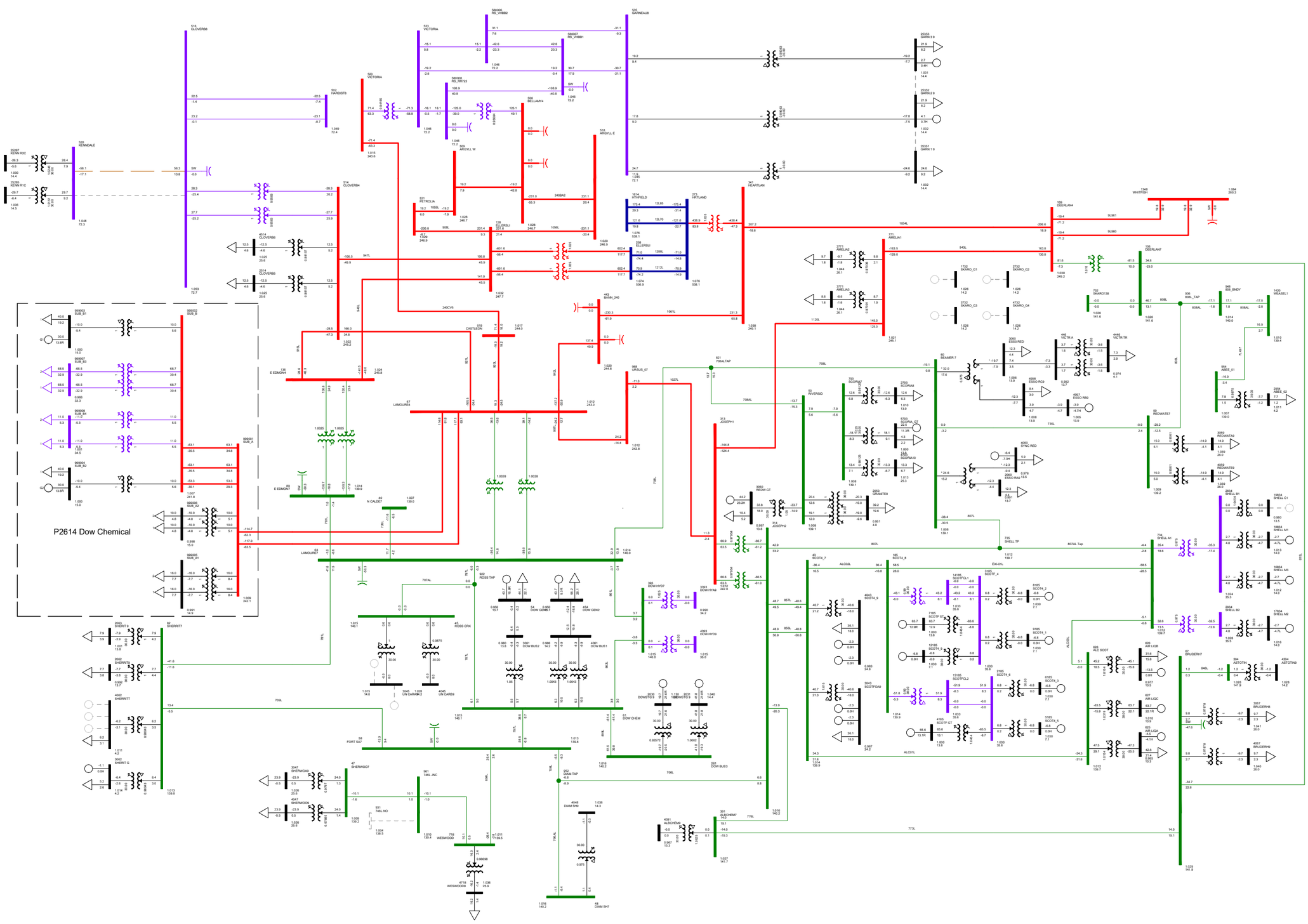


2025 SP SC3 ALT2
240BA2 CONTINGENCY
MON, NOV 17 2025 17:41

A3 - 1 SP Post - 5

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000<=69.000 <=138.000 <=240.000 <=500.000>500.000

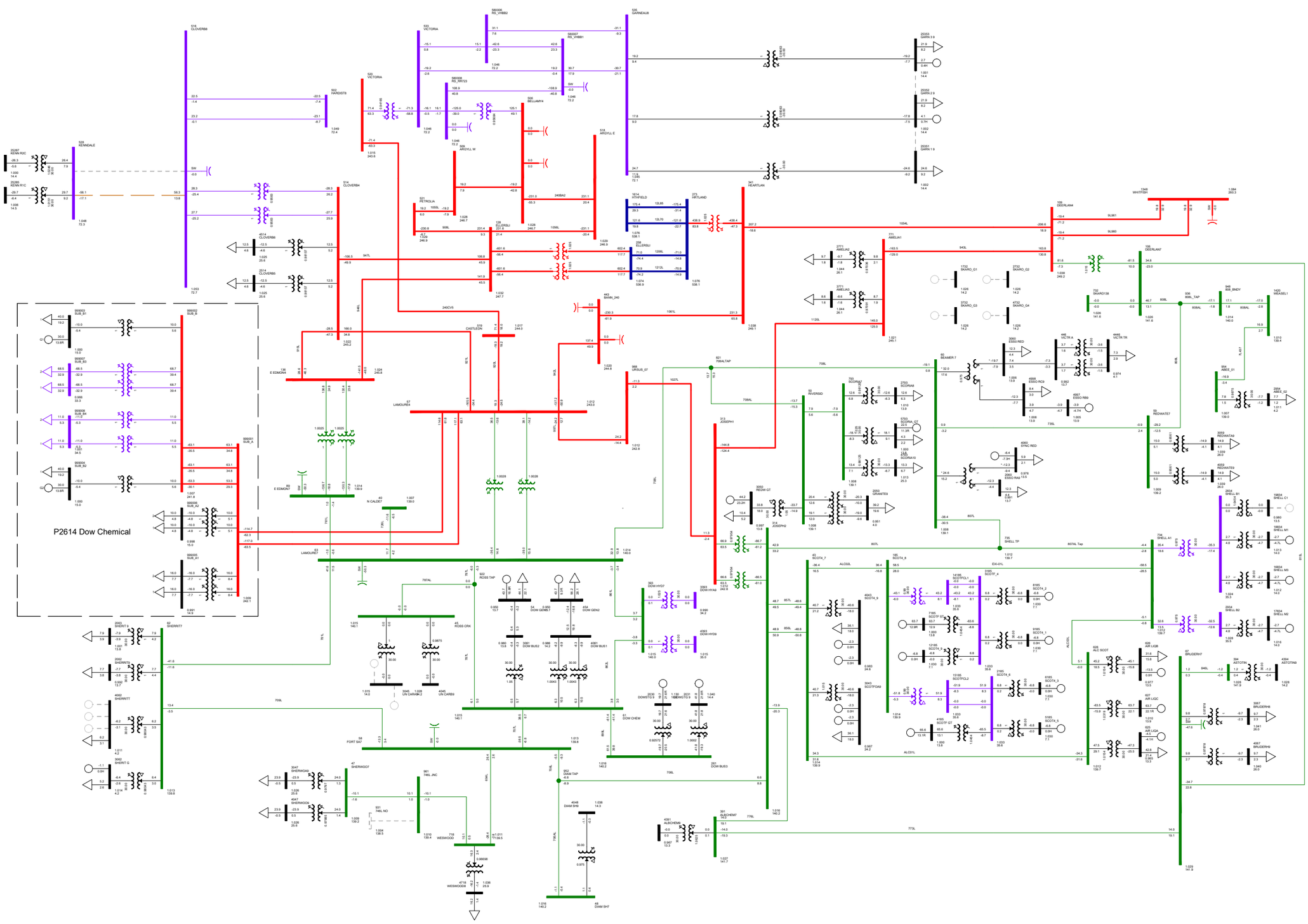


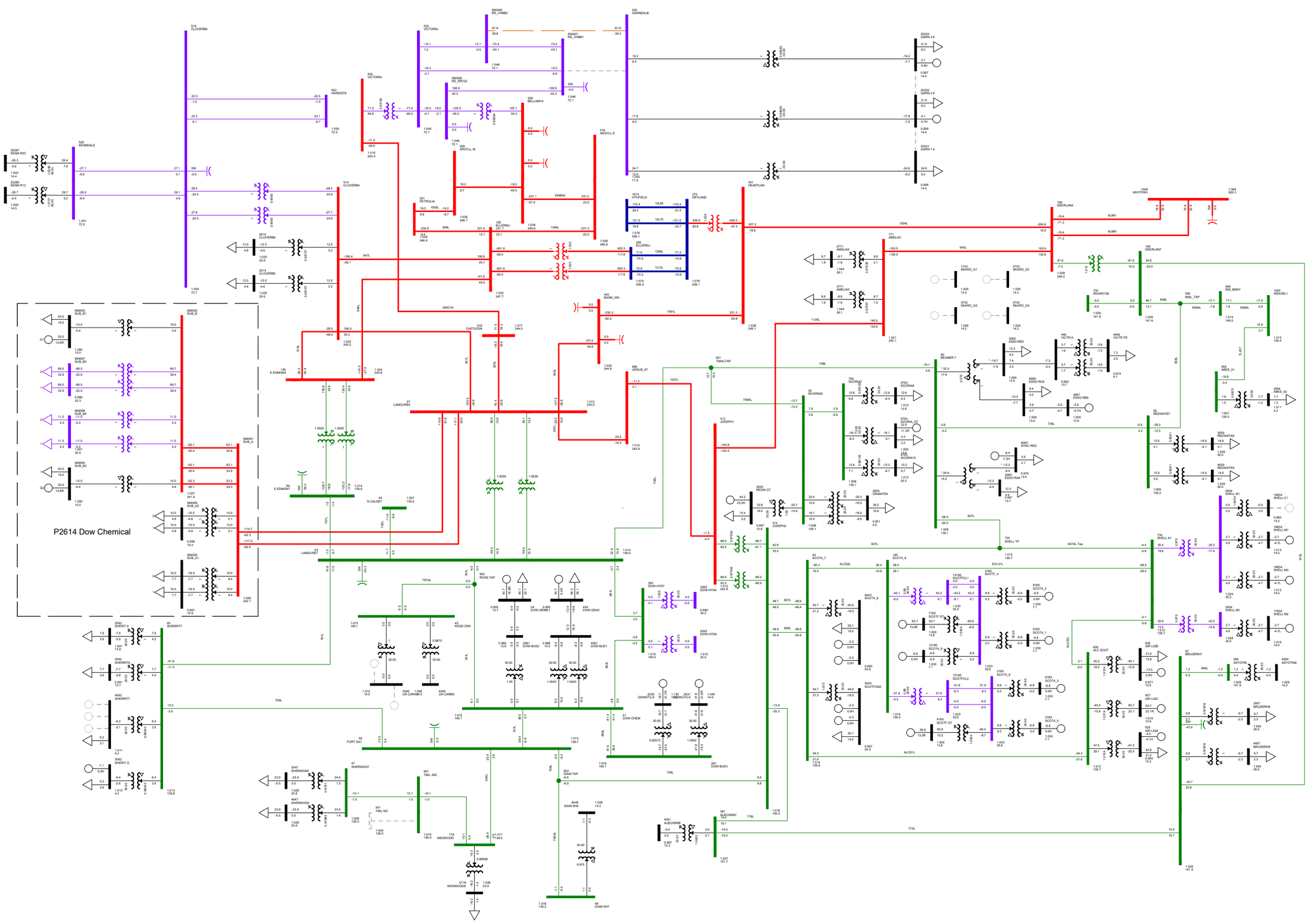
2025 SP SC3 ALT2
72CK12 CONTINGENCY
MON, NOV 17 2025 16:33

A3 - 1 SP Post - 6

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000


P2614 Dow Chemical
516 CLOVERB8
502 HARDISTB
520 VICTORIA
533 VICTORIA
580006 RS_VHBB2
580007 RS_VHBB1
580008 RS_SRY23
535 GARNEAUB
506 BELLAMY4
518 ARGYLL E
509 ARGYLL W
521 PETROLIA
528 KEINDALE
25287 KEWN 1GC
25286 KEWN R1C
514 CLOVERB4
4014 CLOVERB6
2014 CLOVERB5
128 ELLERSLI
1614 HTHFIELD
273 HETLAND
241 HEARTLAN
443 BANN_240
968 URSUS_07
821 706ALTAP
313 JOSEPH1
50 REVERSID
793 SCORIA7
2793 SCORIA8
5793 SCORIA_G7
1000 (1/4) SCORIA15
3050 REDW GT
3050 GRANITES
25353 GARN 2.9
25352 GARN 2.9
25351 GARN 1.9
520 DEERLAN4
520 DEERLAN7
1345 WHITFISH
1084
251 AMELIA1
2771 AMELIA2
3771 AMELIA3
732 SKARO138
1732 SKARO_G1
2732 SKARO_G2
3732 SKARO_G3
4732 SKARO_G4
3060 ESSO RED
4958 ESSO RC9
4957 ESSO RB9
4060 SYNC RED
2060 ESSO RA9
4446 VICTR A
4446 VICTR TR
60 BEAMER 7
59 REDWATE7
3059 REDWATA9
4059 REDWATE9
954 ABEE_01
2954 ABEE_02
948 808_BNDY
1420 WEASEL1
808AL
808AL_TAP
808L
809L
936
1345
1084
999903 SUB_B1
999902 SUB_B
999907 SUB_B3
999908 SUB_B4
999904 SUB_B2
999905 SUB_A
999906 SUB_A2
999909 SUB_A3
62 SHERRIT7
2083 SHERIT 6
2082 SHERRIT8
4082 SHERRIT
3062 SHERIT G
47 SHERWOO7
3047 SHERWOA9
4047 SHERWOO9
58 FORT SA7
136 E EDMON4
48 E EDMON7
40 N CALDE7
57 LAMOUR4
63 LAMOUR7
45 ROSS CRK
3045 UN CARAB-2
4045 UN CARB9
61 DOW CHEM
201 DOW BUS3
4081 DOW BUS1
3081 DOW BUS2
363 DOW HY07
3363 DOW HY-2
4363 DOW HY09
454 DOW GEN2
54 DOW GEN8.7
510 CASTLEON
922 ROSS TAP
952 DIAM TAP
4048 DIAM SH9
48 DIAM SH7
961 746L JNC
331 746L NO
718 WESWOOD
4718 WESWOOD8
391 ALBCHEM7
4391 ALBCHEM9
707AL
707L
708AL
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847L



2025 SP SC3 ALT2
P1649 CKT71 CONTINGENCY
MON, NOV 17 2025 16:33

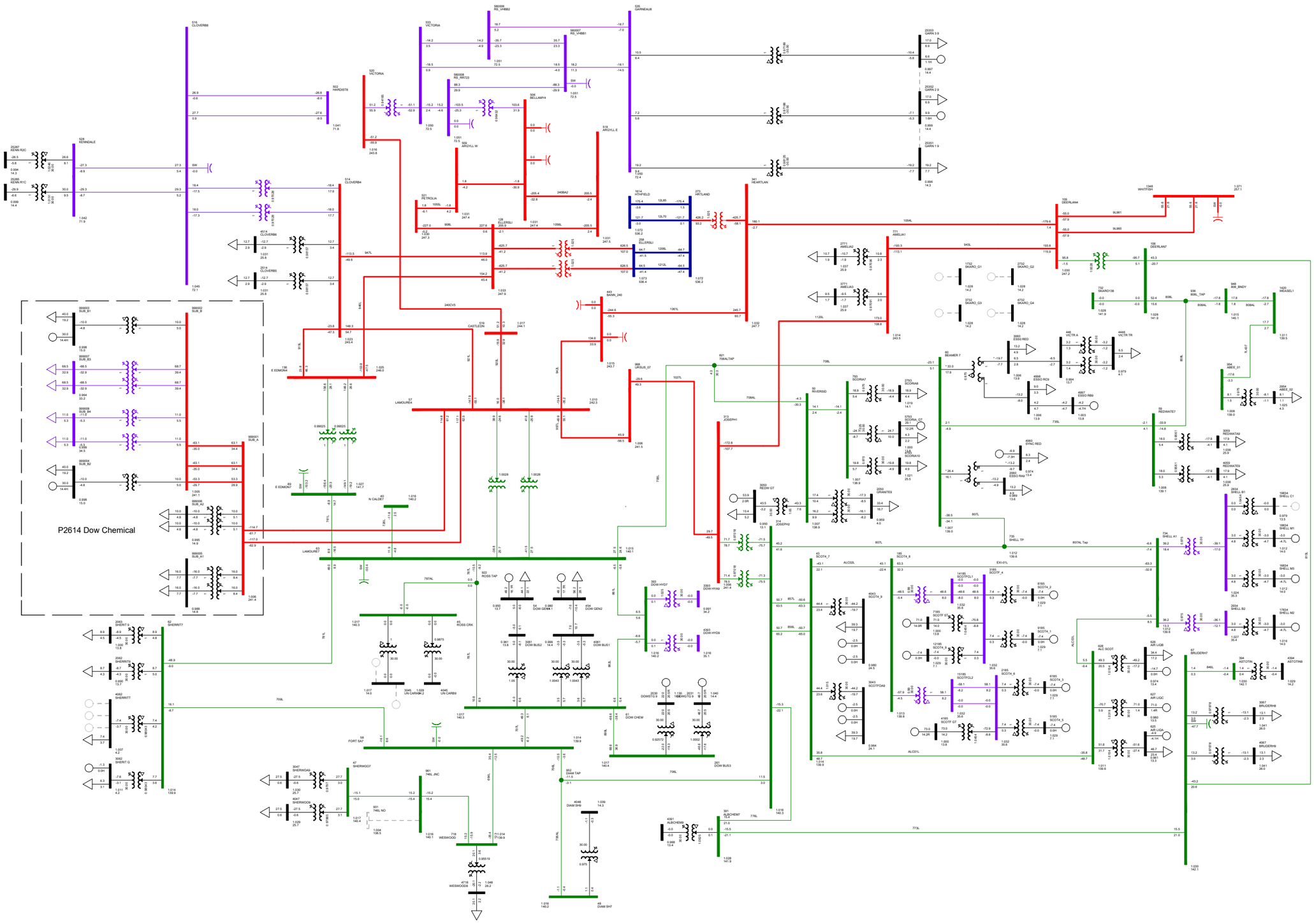
A3 - 1 SP Post - 8

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

Table A3-2: List of 2025 Winter Peak Post-Project Load Flow Diagrams

Figure	Category	Contingency
A3-2 WP Post - 1	A (N-0)	System Normal
A3-2 WP Post - 2	B (N-1)	72CH9 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A3-2 WP Post - 3	B (N-1)	72CH11 (HARDISTY Bus 502 - CLOVERBAR Bus 516)
A3-2 WP Post - 4	B (N-1)	72CK12 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)
A3-2 WP Post - 5	B (N-1)	72CK13 (CLOVERBAR Bus 516 - KENNEDALE Bus 528)

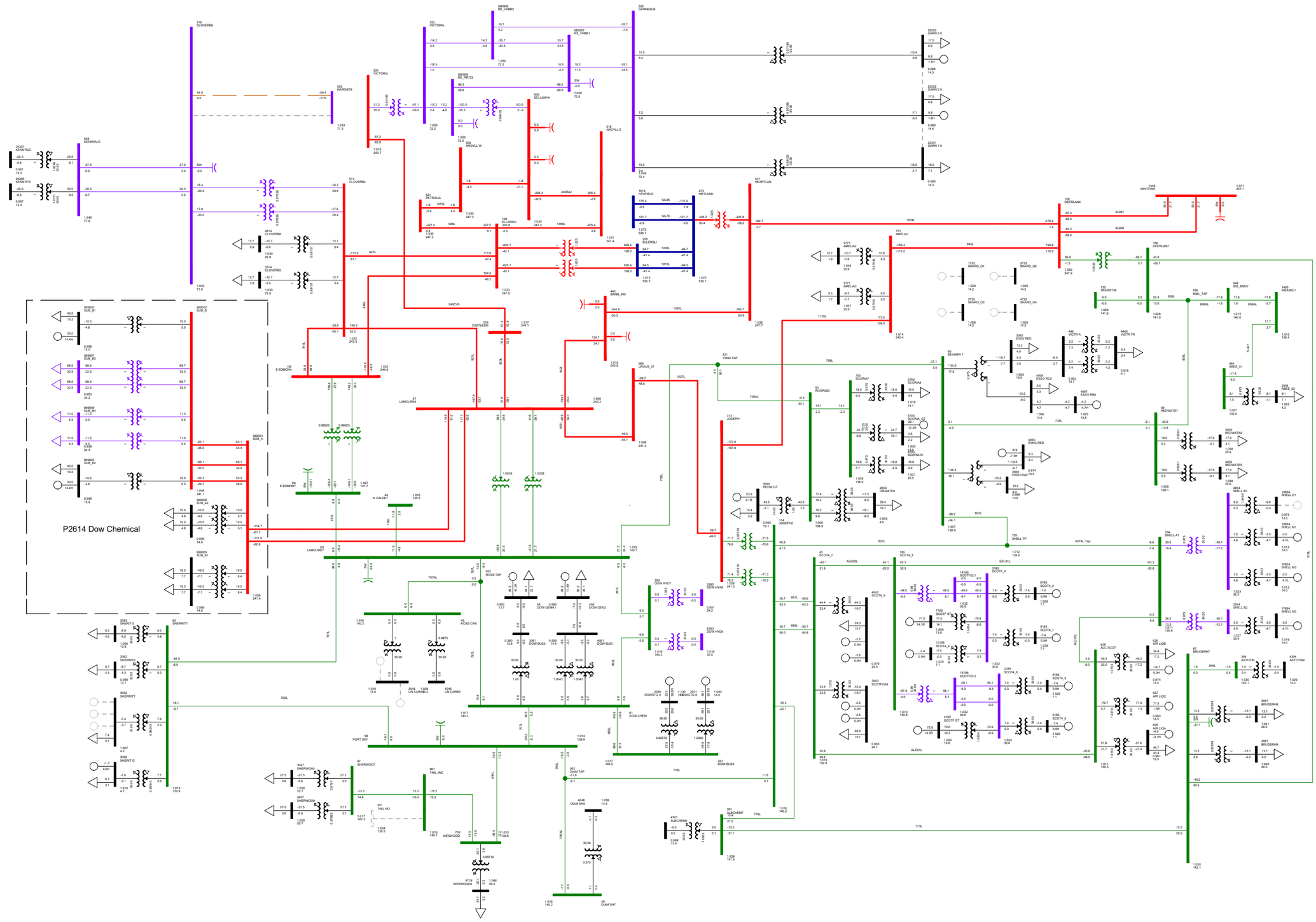


2025 WP SC4 ALT2
N-0, SYSTEM NORMAL
MON, NOV 17 2025 16:34

A3 - 2 WP Post - 1

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

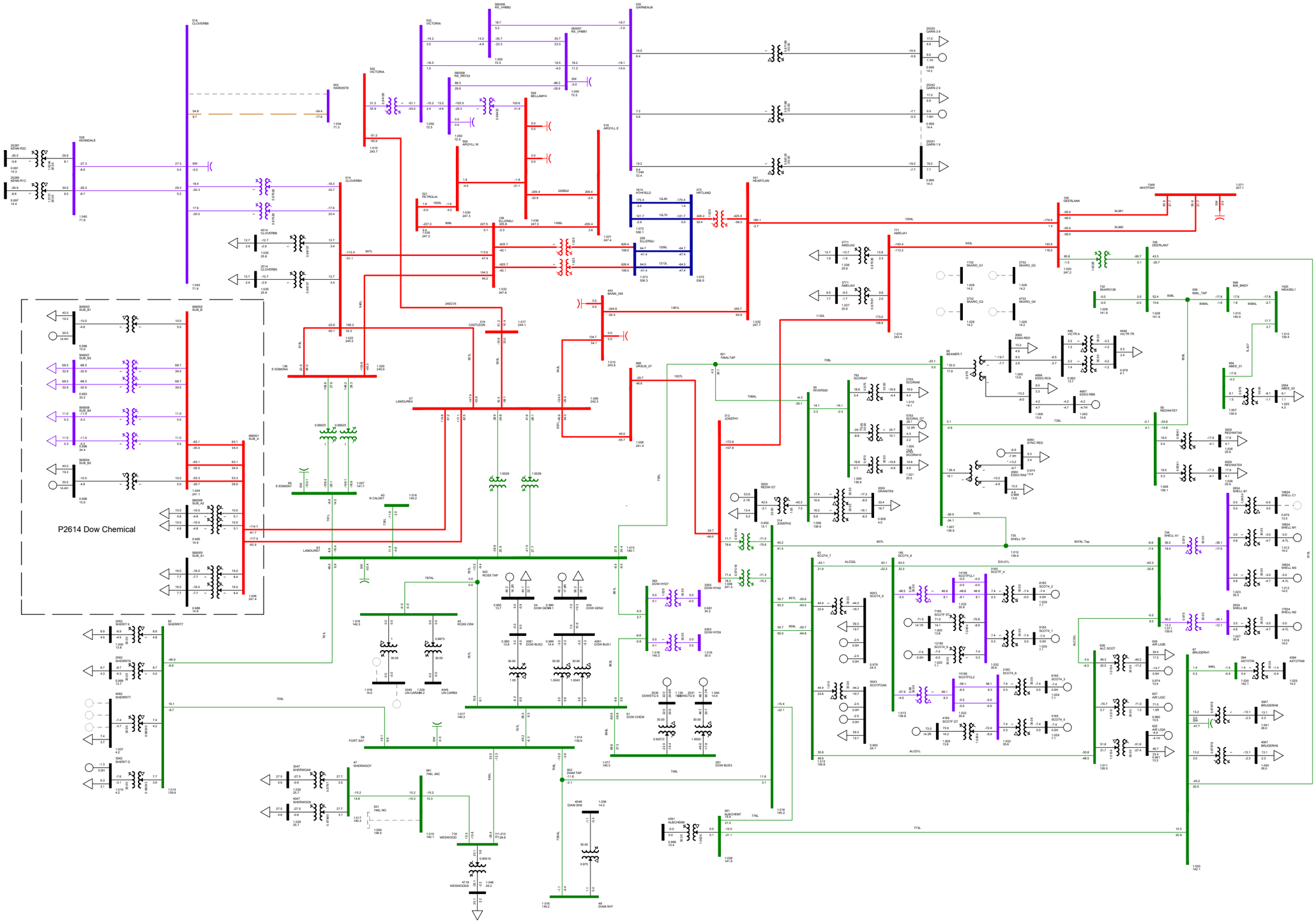


2025 WP SC4 ALT2
72CH9 CONTINGENCY
MON, NOV 17 2025 16:34

A3 - 2 WP Post - 2

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

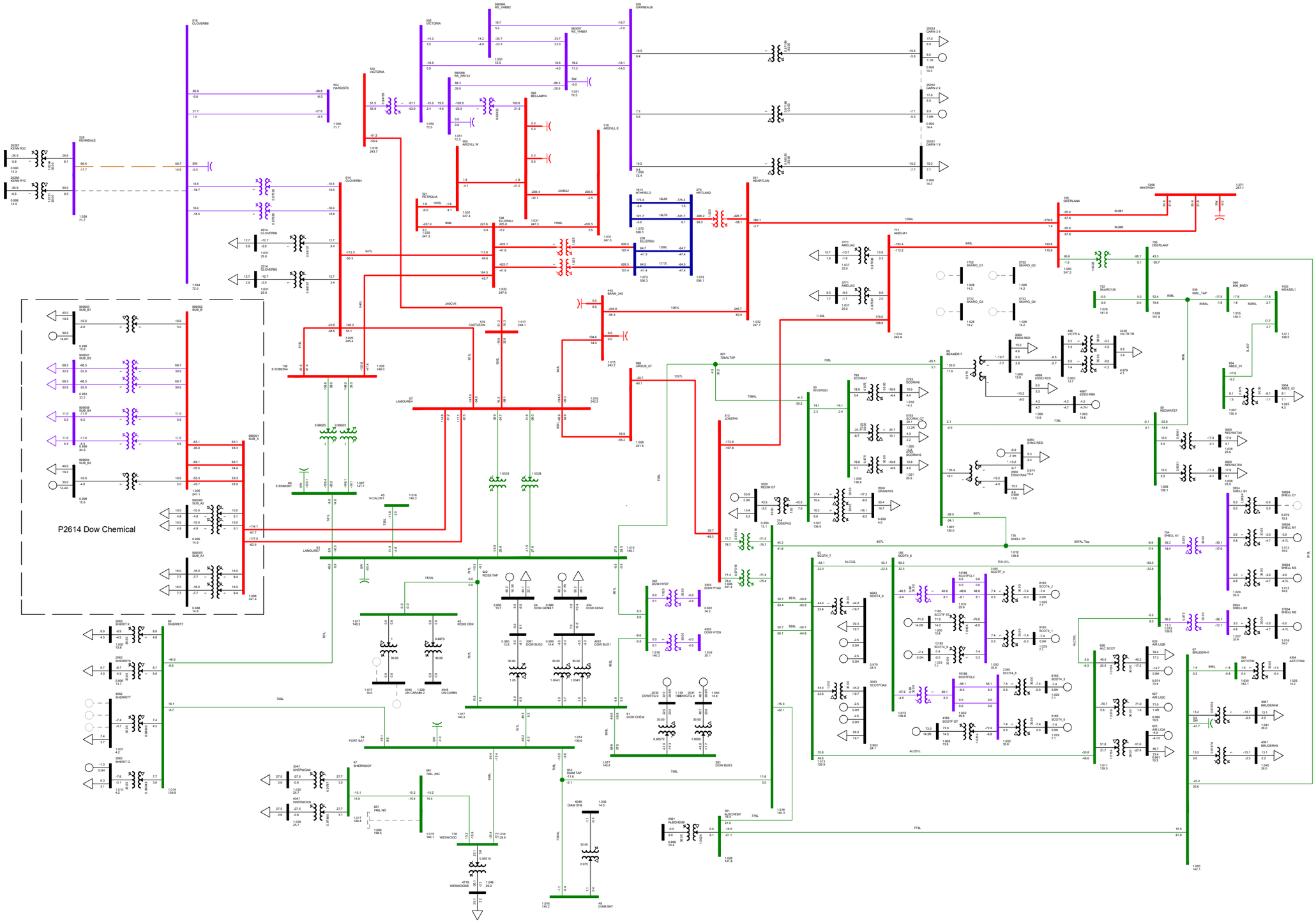


2025 WP SC4 ALT2
72CH11 CONTINGENCY
MON, NOV 17 2025 16:34

A3 - 2 WP Post - 3

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

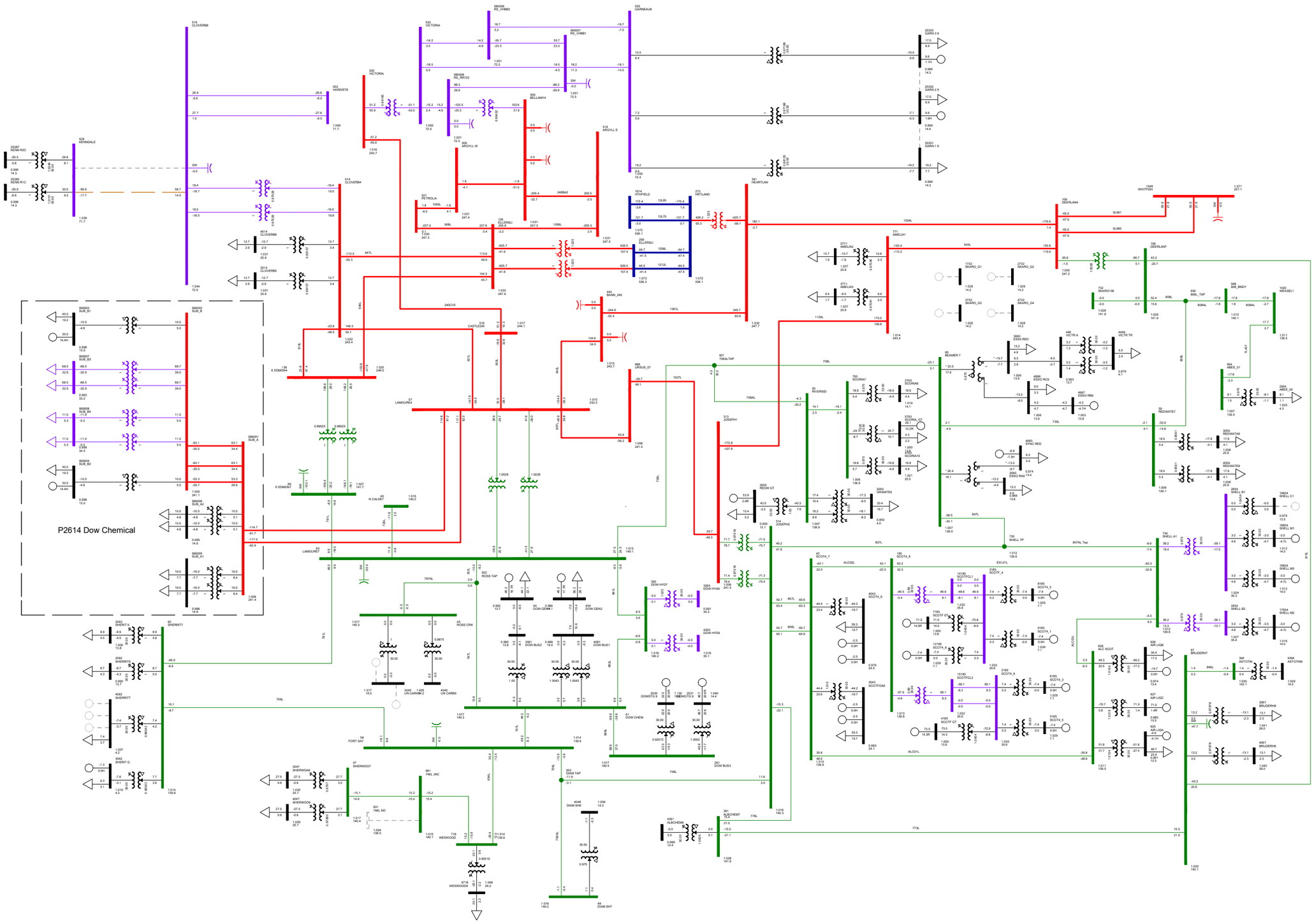


2025 WP SC4 ALT2
72CK12 CONTINGENCY
MON, NOV 17 2025 16:34

A3 - 2 WP Post - 4

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000



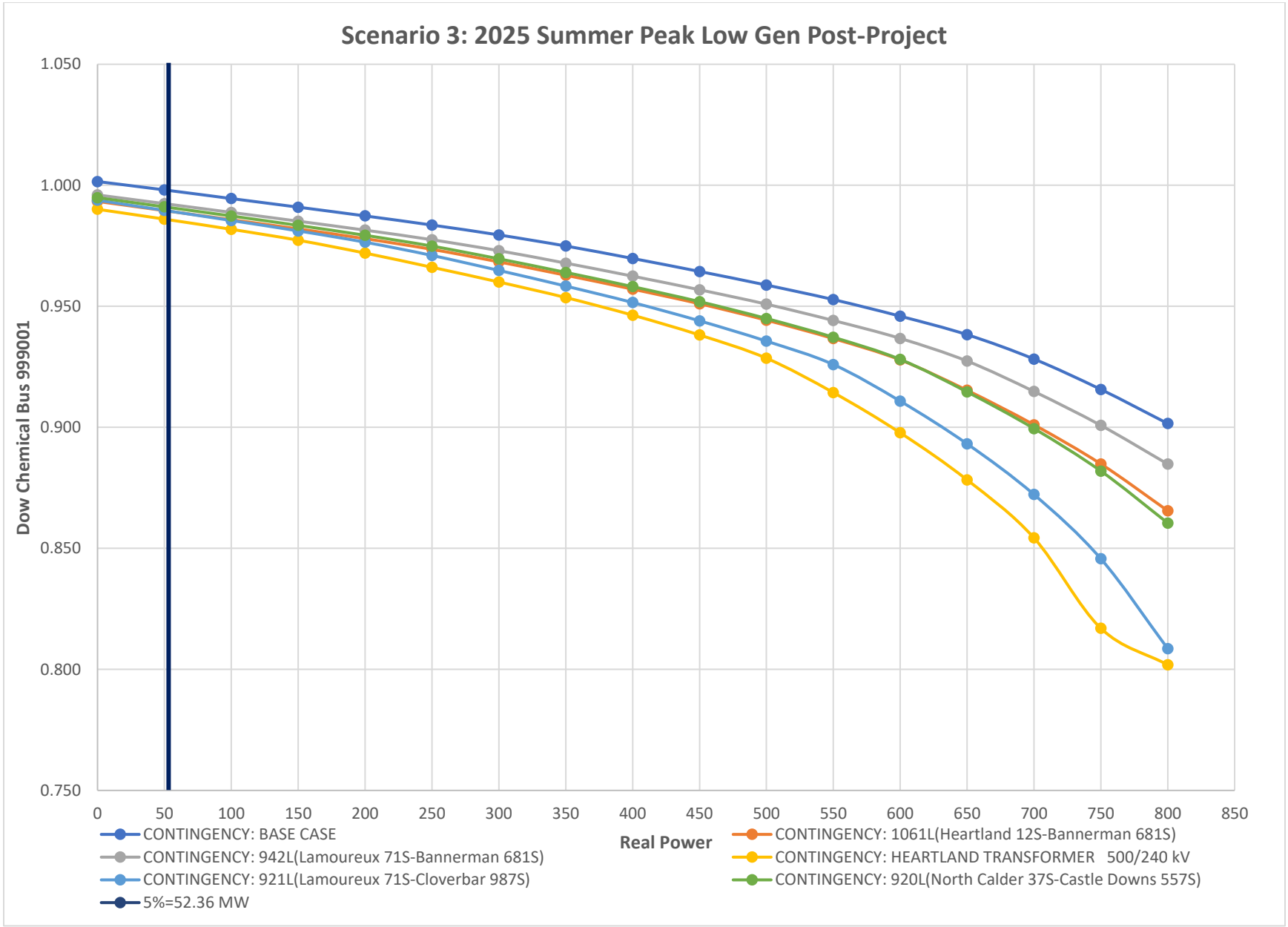
2025 WP SC4 ALT2
72CK13 CONTINGENCY
MON, NOV 17 2025 16:34

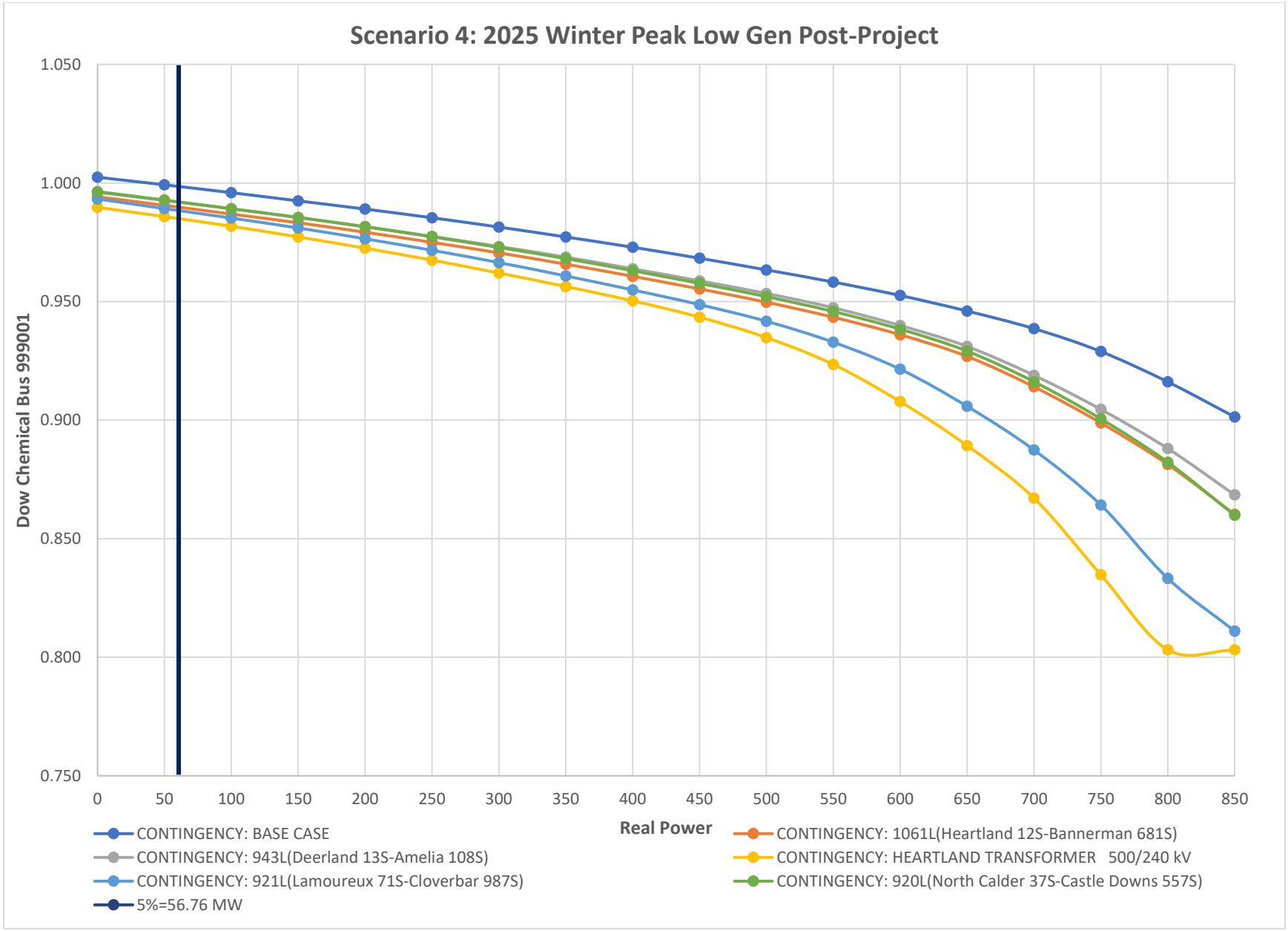
A3 - 2 WP Post - 5

Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate B

kV: <=25.000 <=69.000 <=138.000 <=240.000 <=500.000 >500.000

Attachment A4
Post-Project Voltage Stability Diagrams


Scenario 3: 2025 Summer Peak Low Gen Post-Project
Dow Chemical Bus 999001
1.050
1.000
0.950
0.900
0.850
0.800
0.750
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
Real Power
CONTINGENCY: BASE CASE
CONTINGENCY: 942L(Lamoureux 71S-Bannerman 681S)
CONTINGENCY: 921L(Lamoureux 71S-Cloverbar 987S)
5%=52.36 MW
CONTINGENCY: 1061L(Heartland 12S-Bannerman 681S)
CONTINGENCY: HEARTLAND TRANSFORMER 500/240 kV
CONTINGENCY: 920L(North Calder 37S-Castle Downs 557S)


Scenario 4: 2025 Winter Peak Low Gen Post-Project
Dow Chemical Bus 999001
1.050
1.000
0.950
0.900
0.850
0.800
0.750
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
Real Power
CONTINGENCY: BASE CASE
CONTINGENCY: 1061L(Heartland 12S-Bannerman 681S)
CONTINGENCY: 943L(Deerland 13S-Amelia 108S)
CONTINGENCY: HEARTLAND TRANSFORMER 500/240 kV
CONTINGENCY: 921L(Lamoureux 71S-Cloverbar 987S)
CONTINGENCY: 920L(North Calder 37S-Castle Downs 557S)
5%=56.76 MW

Attachment A5
Post-Project Transient Stability Diagrams

Scenario 3

Summer Peak Post Project

Transient Response Plot Key

Table Summer Peak Post Project Figure Reference:

Scenario	Plots	Figure #
Summer Peak Post Project	Angles Plots	A-SC3-1 to A-SC3-20
	Power Plots	B-SC3-1 to B-SC3-20
	Var Plots	C-SC3-1 to C-SC3-20
	Bus Voltage Plots	D-SC3-1 to D-SC3-20
	Branchflow MW Plots	E-SC3-1 to E-SC3-20
	Branchflow MVar Plots	F-SC3-1 to F-SC3-20

Table Summer Peak Post Project Figures:

Category	Line Element	Substation Terminals		Faulted End	Figure Reference
A	Flat start			n/a	A-SC3-1 B-SC3-1 C-SC3-1 D-SC3-1 E-SC3-1 F-SC3-1
B	1054L	Deerland 13S	Heartland 12S	13S	A-SC3-2 B-SC3-2 C-SC3-2 D-SC3-2 E-SC3-2 F-SC3-2
				12S	A-SC3-3 B-SC3-3 C-SC3-3 D-SC3-3 E-SC3-3 F-SC3-3
B	12L70	Heartland 12S	Heathfield 2029S	12S	A-SC3-4 B-SC3-4 C-SC3-4 D-SC3-4 E-SC3-4 F-SC3-4
				2029S	A-SC3-5 B-SC3-5 C-SC3-5 D-SC3-5 E-SC3-5 F-SC3-5
B	12L85	Heartland 12S	Heathfield 2029S	12S	A-SC3-6 B-SC3-6 C-SC3-6 D-SC3-6 E-SC3-6 F-SC3-6
				2029S	A-SC3-7 B-SC3-7 C-SC3-7 D-SC3-7 E-SC3-7 F-SC3-7
B	1206L	Ellerslie 89S	Heartland 12S	12S	A-SC3-8 B-SC3-8 C-SC3-8 D-SC3-8 E-SC3-8 F-SC3-8
B	1212L	Ellerslie 89S	Heartland 12S	12S	A-SC3-9 B-SC3-9 C-SC3-9 D-SC3-9

					E-SC3-9 F-SC3-9
B	1350L	EATL (Heathfield 2029S)	EATL (NEWELL 2075S)	2029S	A-SC3-10 B-SC3-10 C-SC3-10 D-SC3-10 E-SC3-10 F-SC3-10
B	943L	Deerland 135S	Amelia 108S	13S	A-SC3-11 B-SC3-11 C-SC3-11 D-SC3-11 E-SC3-11 F-SC3-11
				108S	A-SC3-12 B-SC3-12 C-SC3-12 D-SC3-12 E-SC3-12 F-SC3-12
B	1120L	Josephburg 410S	Amelia 108S	410S	A-SC3-13 B-SC3-13 C-SC3-13 D-SC3-13 E-SC3-13 F-SC3-13
				108S	A-SC3-14 B-SC3-14 C-SC3-14 D-SC3-14 E-SC3-14 F-SC3-14
B	997L	Lamoureux 71S	Ursus 430S	71S	A-SC3-15 B-SC3-15 C-SC3-15 D-SC3-15 E-SC3-15 F-SC3-15
				430S	A-SC3-16 B-SC3-16 C-SC3-16 D-SC3-16 E-SC3-16 F-SC3-16
B	1061L	Heartland 12S	Bannerman 681S	12S	A-SC3-17 B-SC3-17 C-SC3-17 D-SC3-17 E-SC3-17 F-SC3-17
				681S	A-SC3-18 B-SC3-18 C-SC3-18 D-SC3-18 E-SC3-18 F-SC3-18
B	9L960	Deerland 13S	Whitefish Lake 825S	13S	A-SC3-19 B-SC3-19

					C-SC3-19 D-SC3-19 E-SC3-19 F-SC3-19
				825S	A-SC3-20 B-SC3-20 C-SC3-20 D-SC3-20 E-SC3-20 F-SC3-20

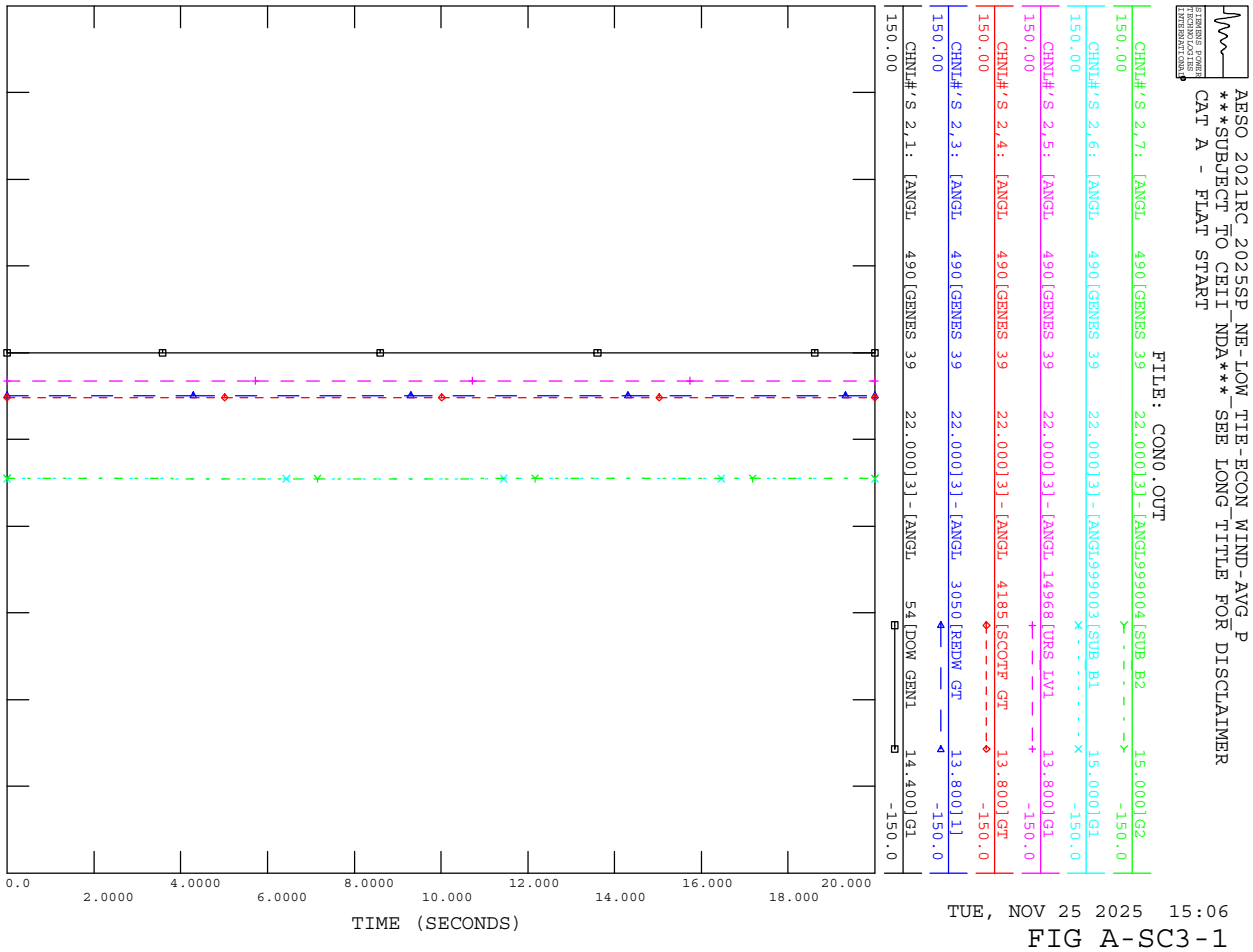


FIG A-SC3-1

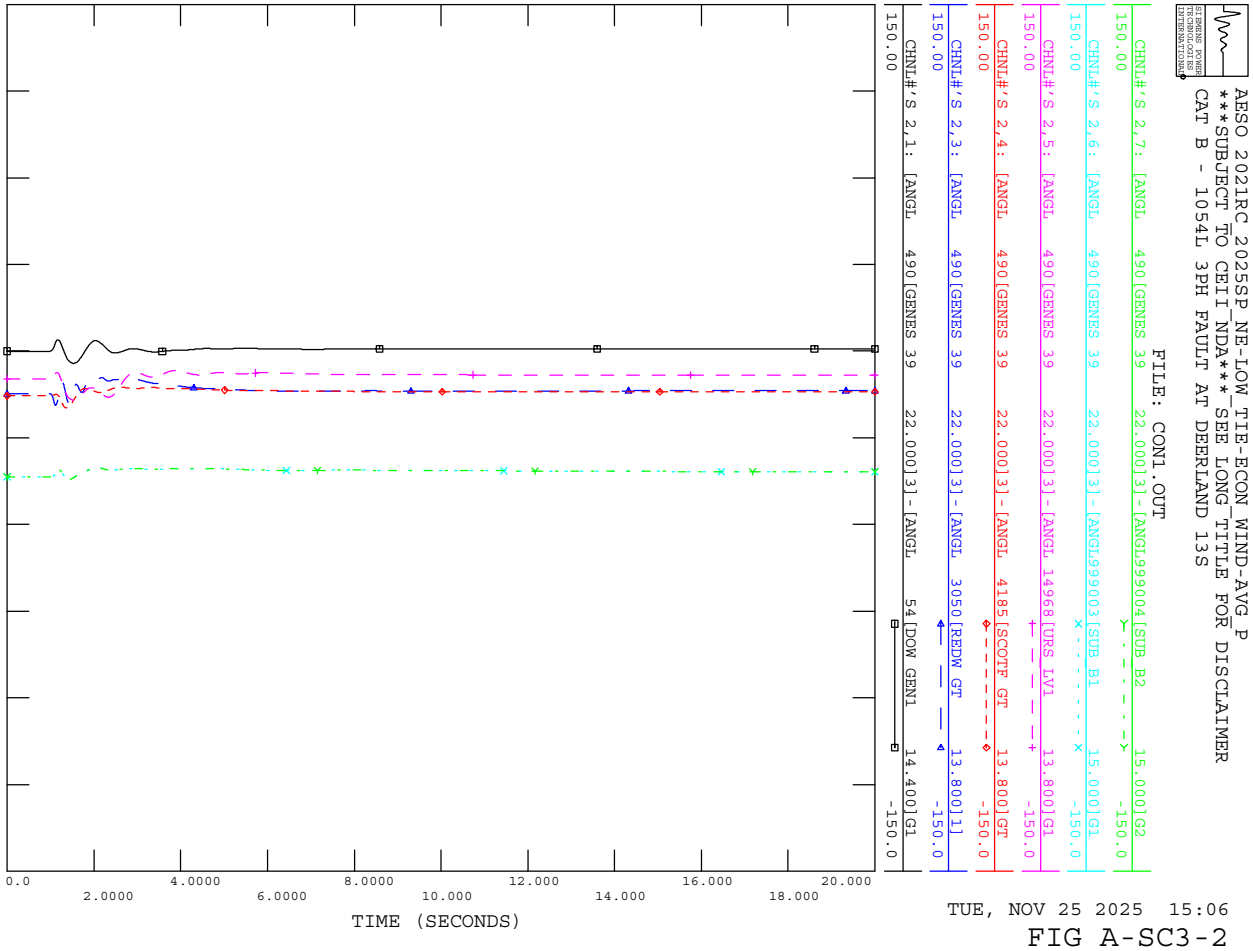


FIG A-SC3-2

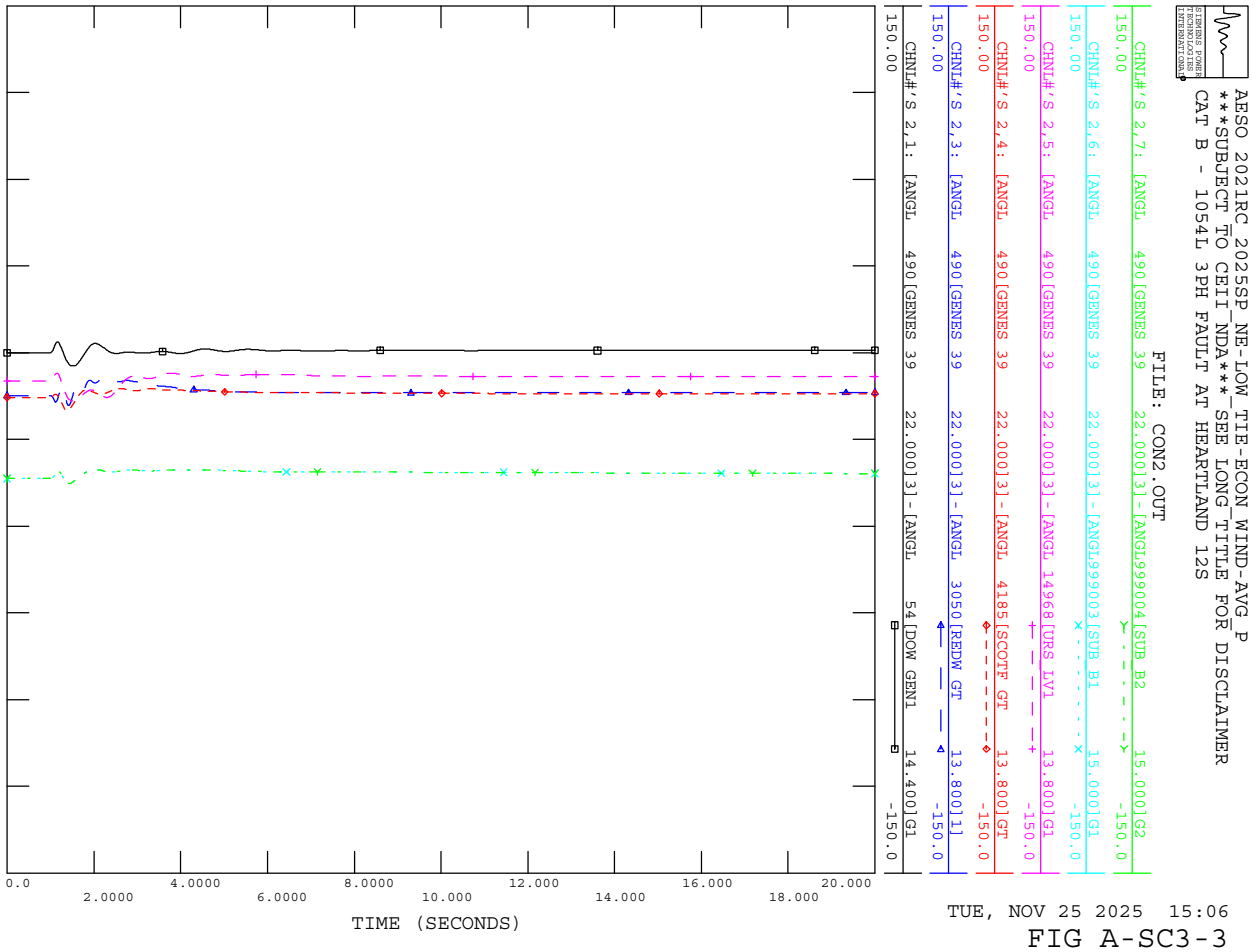


FIG A-SC3-3

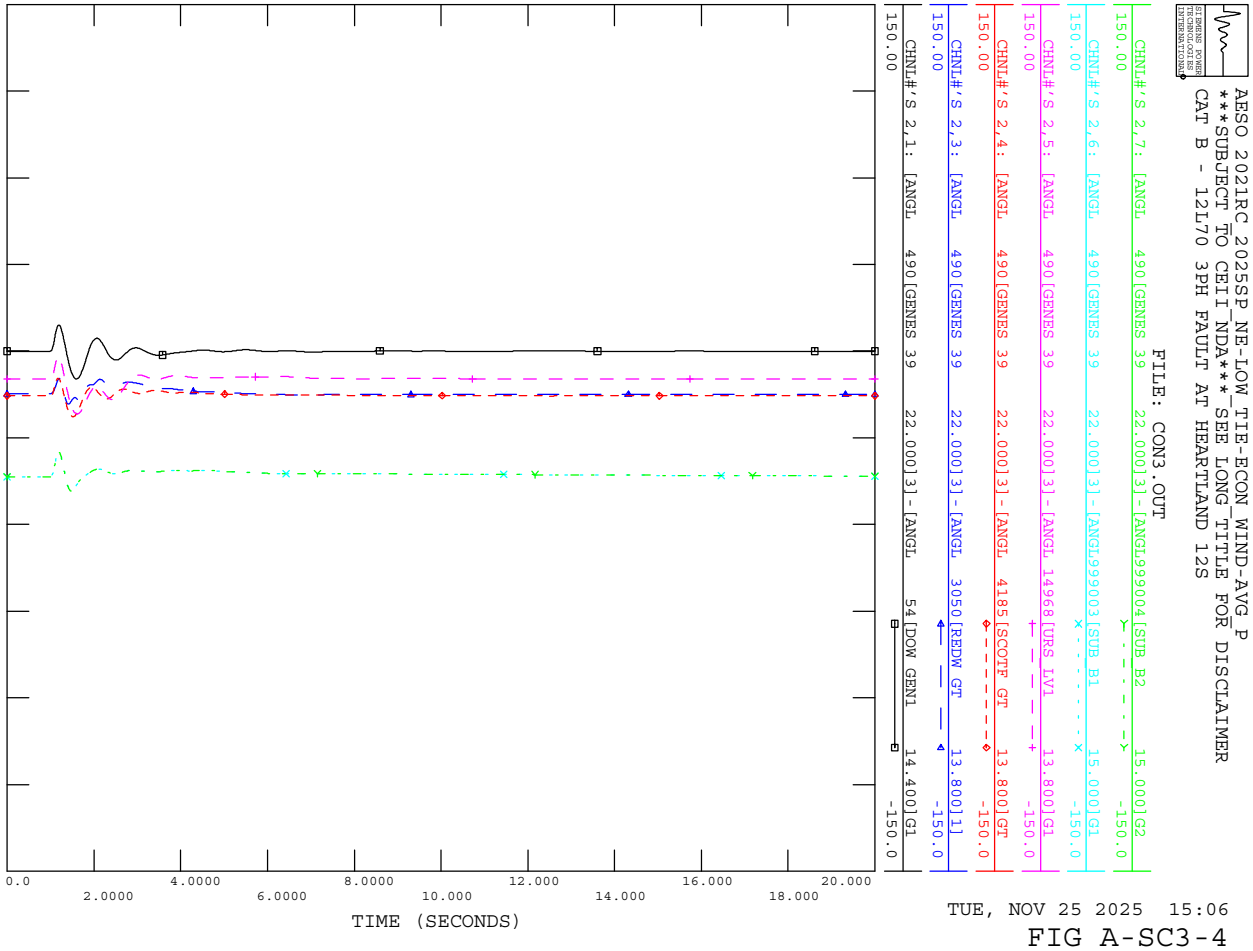


FIG A-SC3-4

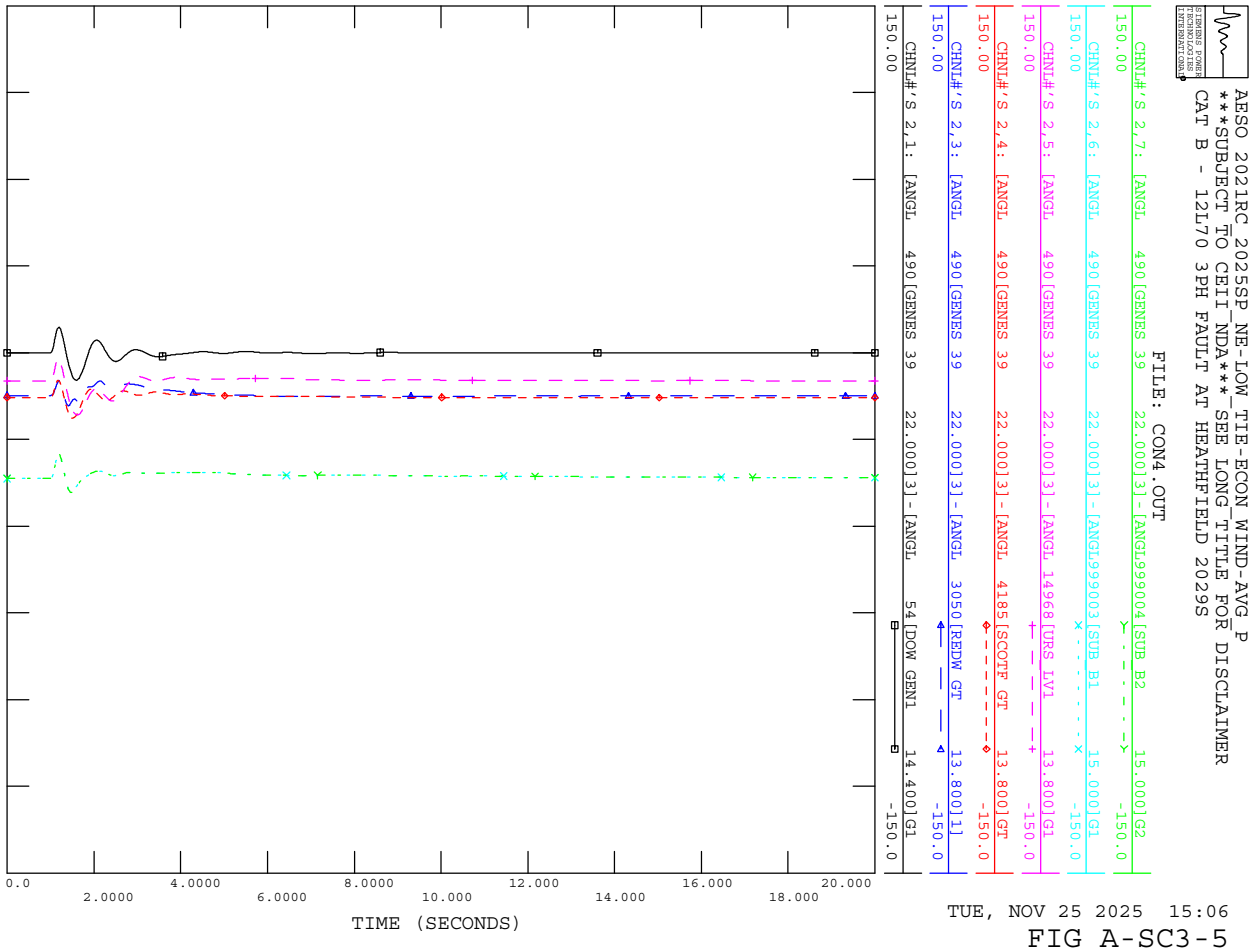


FIG A-SC3-5

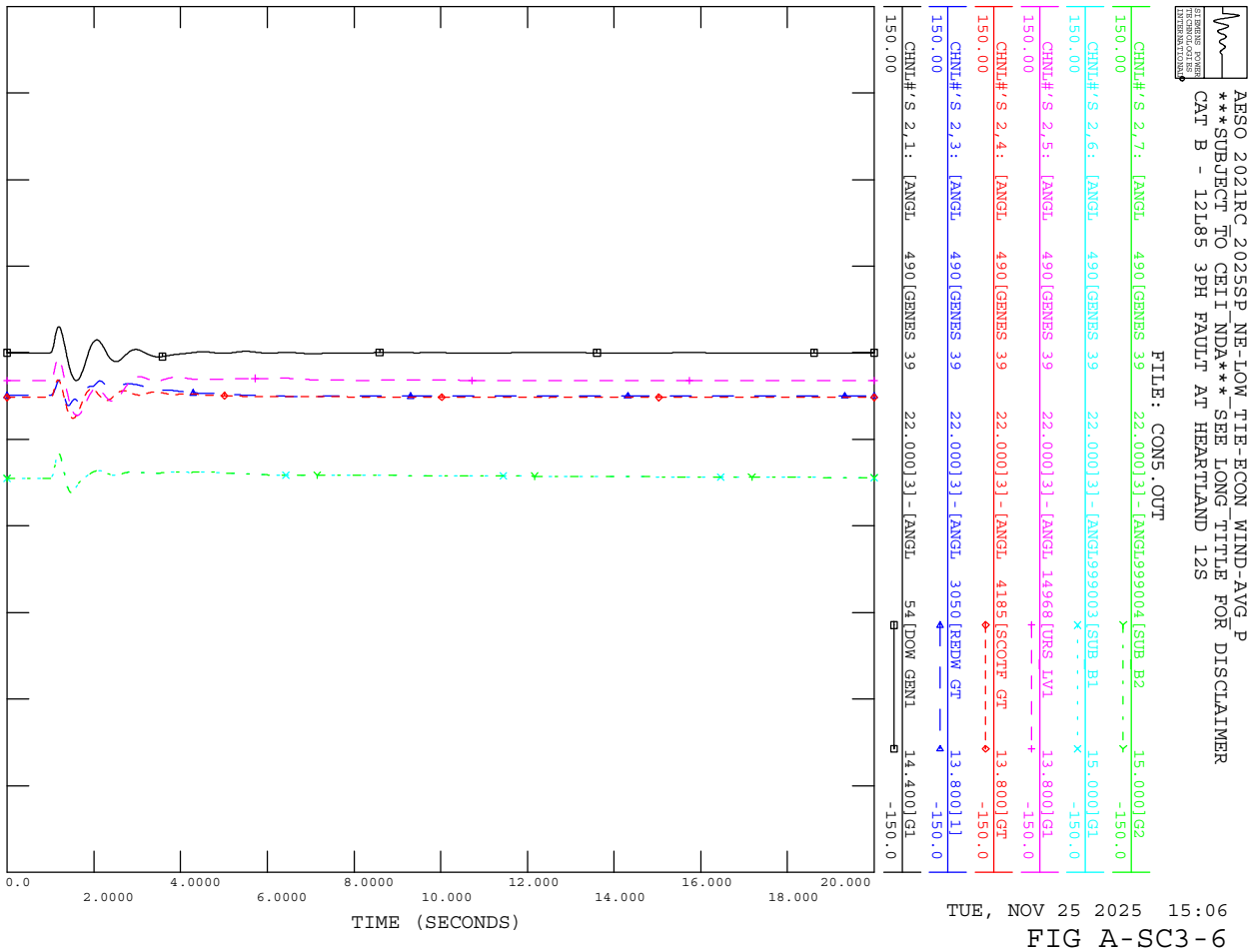


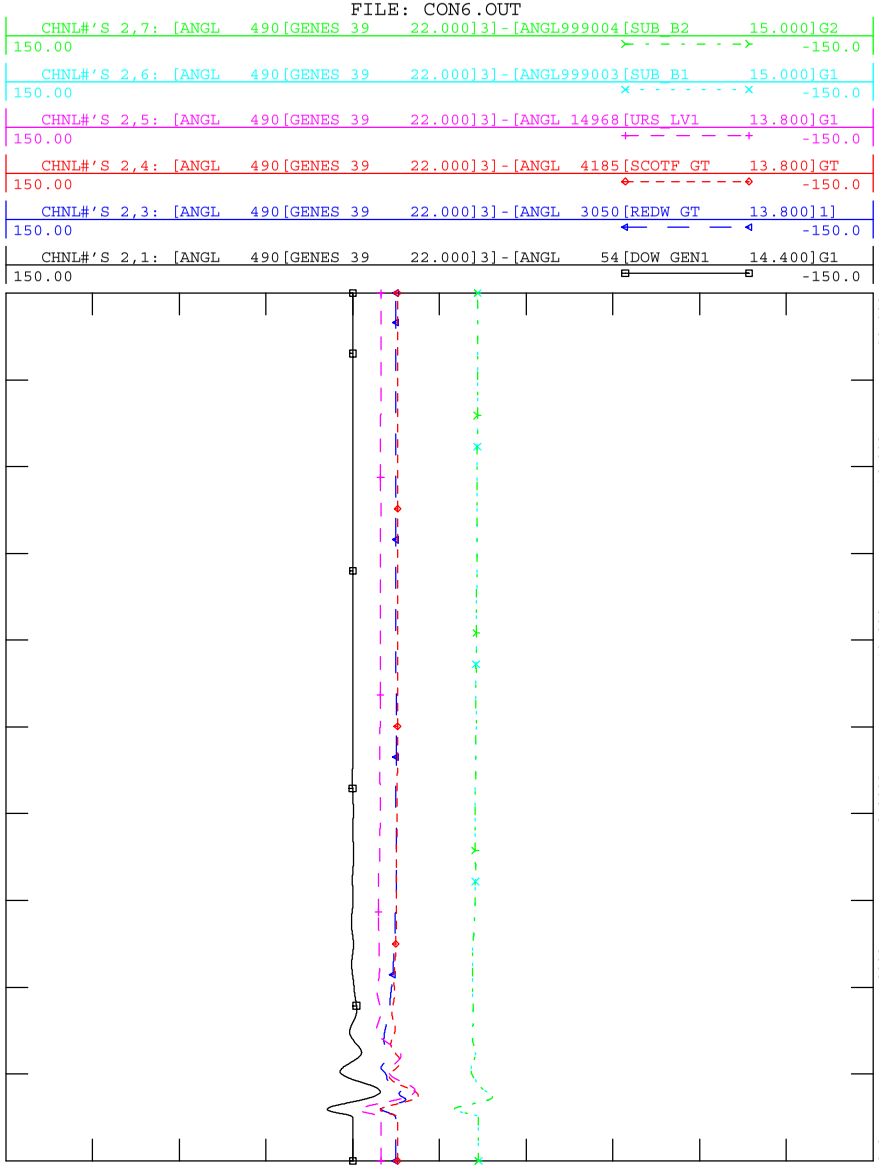
FIG A-SC3-6

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEATHFIELD 2029S

FILE: CON6.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-7

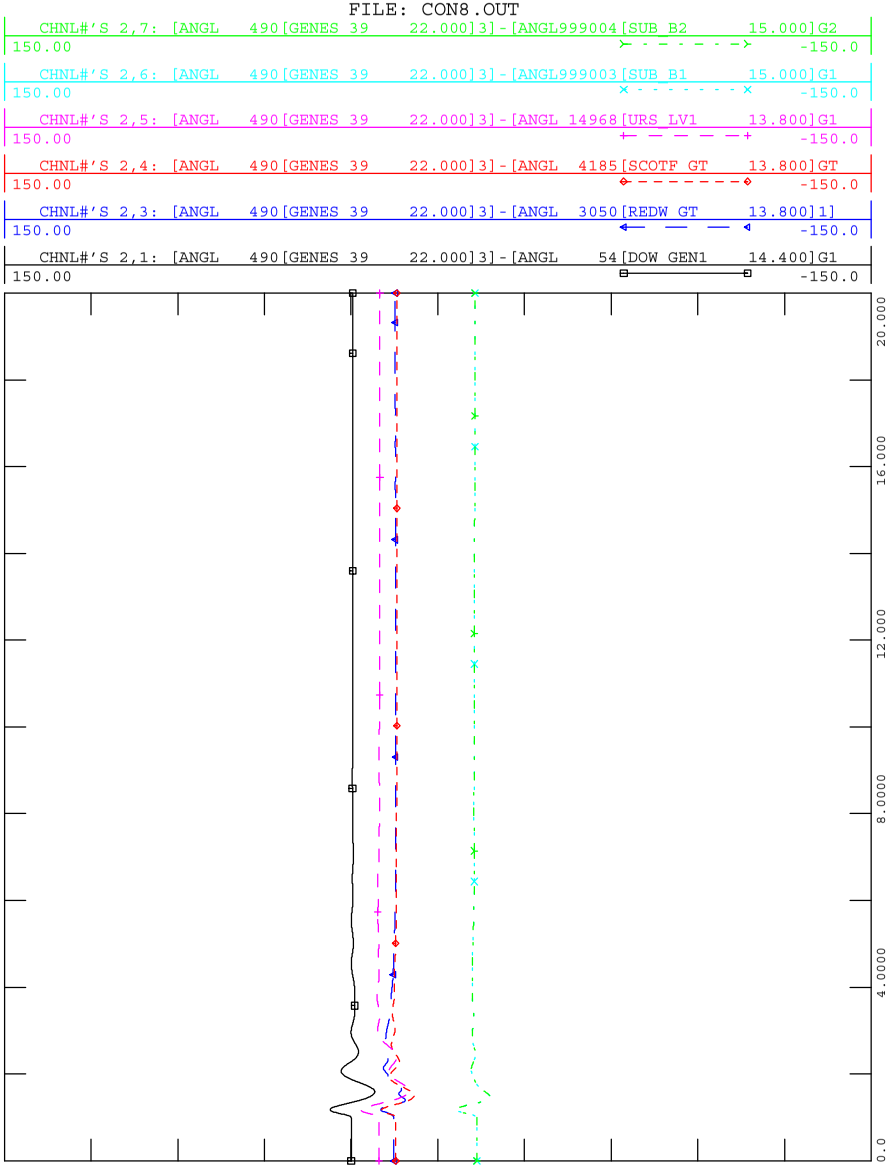


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1206L 3PH FAULT AT HEARTLAND 12S

FILE: CON8.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-8



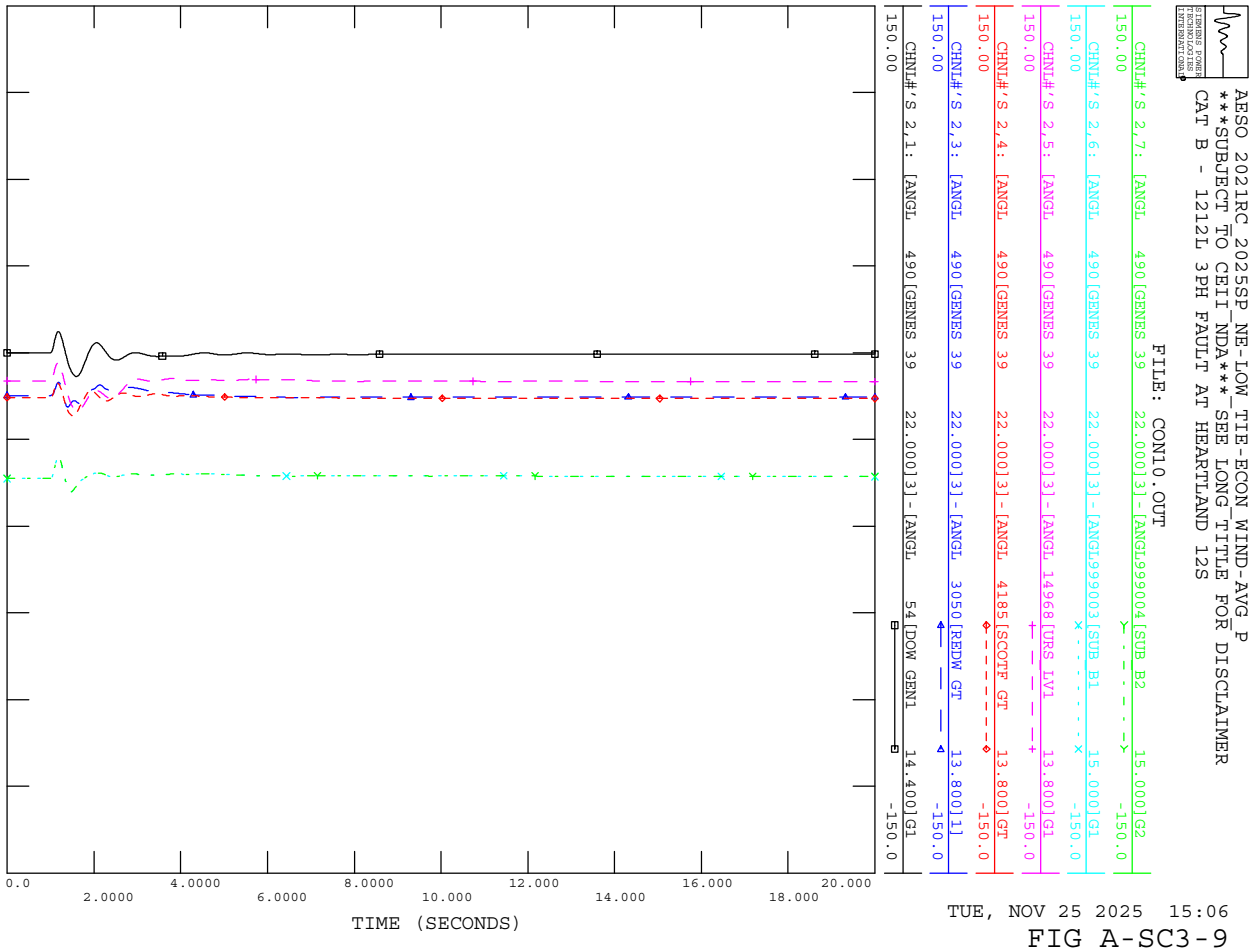


FIG A-SC3-9

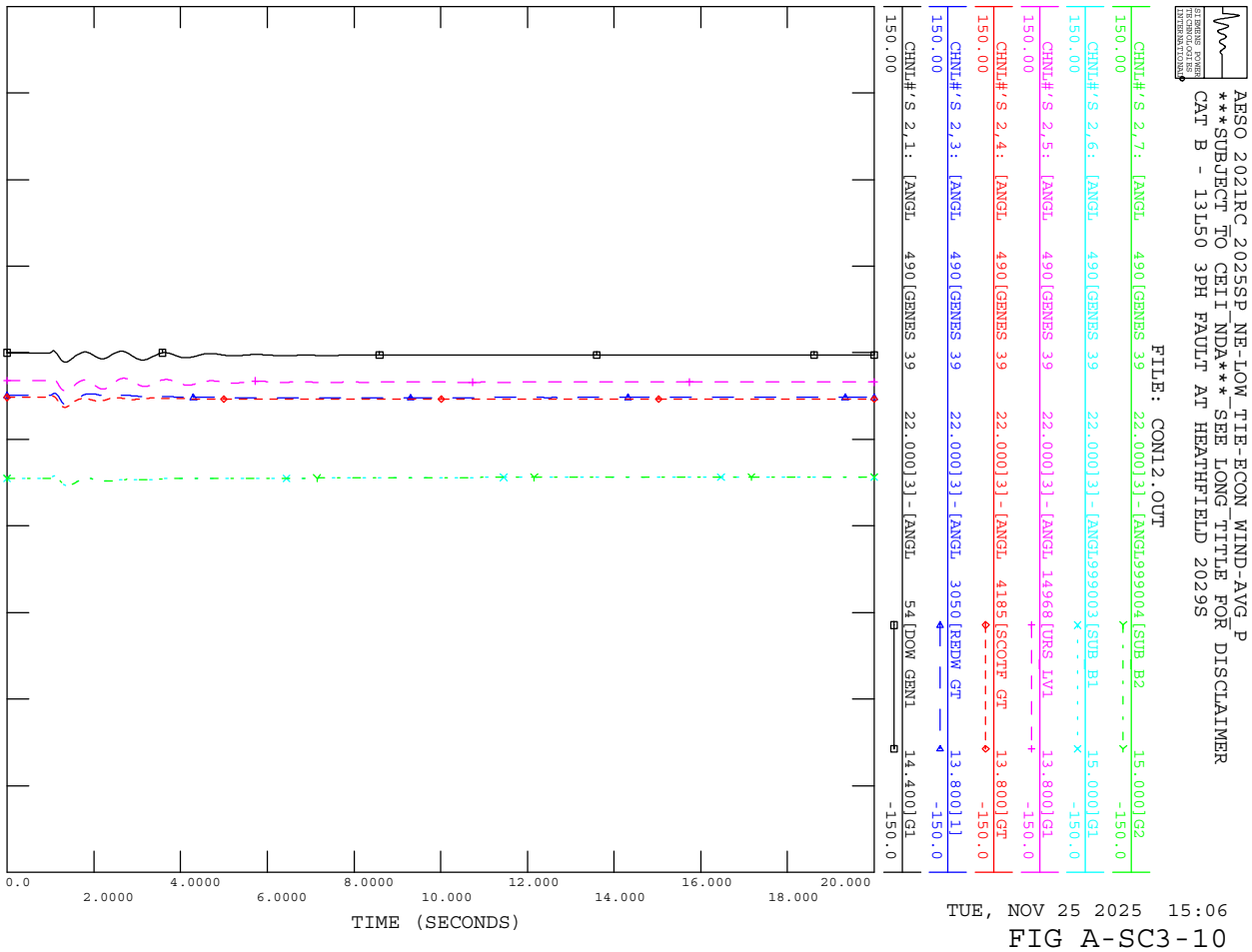


FIG A-SC3-10

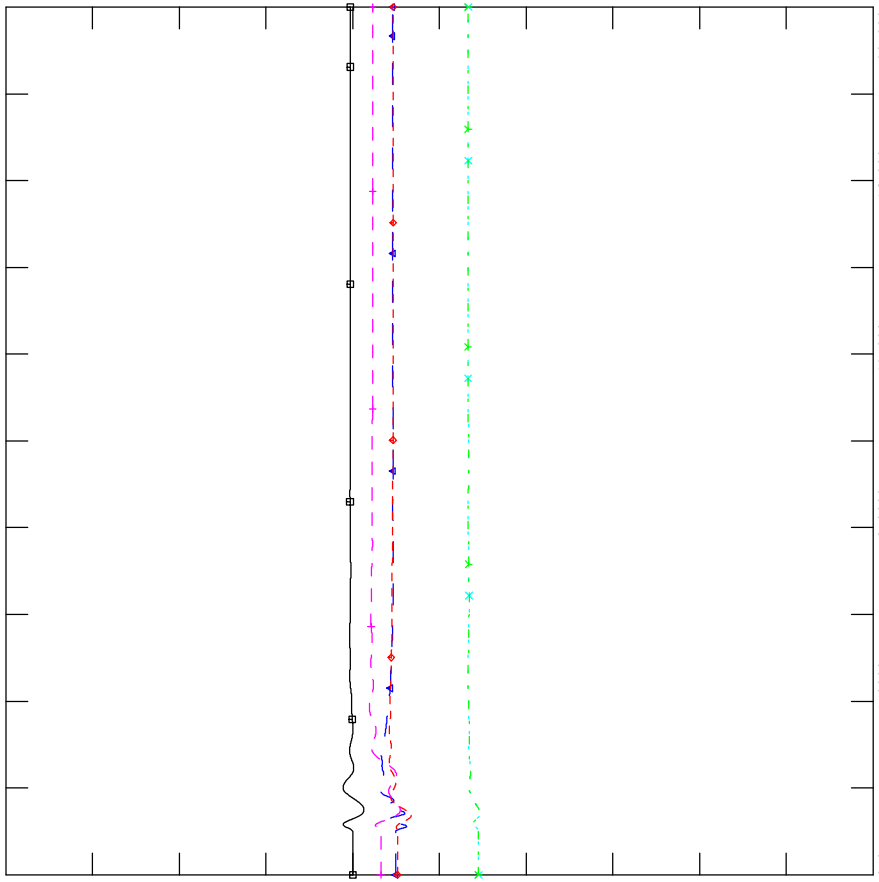
AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT DEERLAND 13S

FILE: CON13.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-11

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0



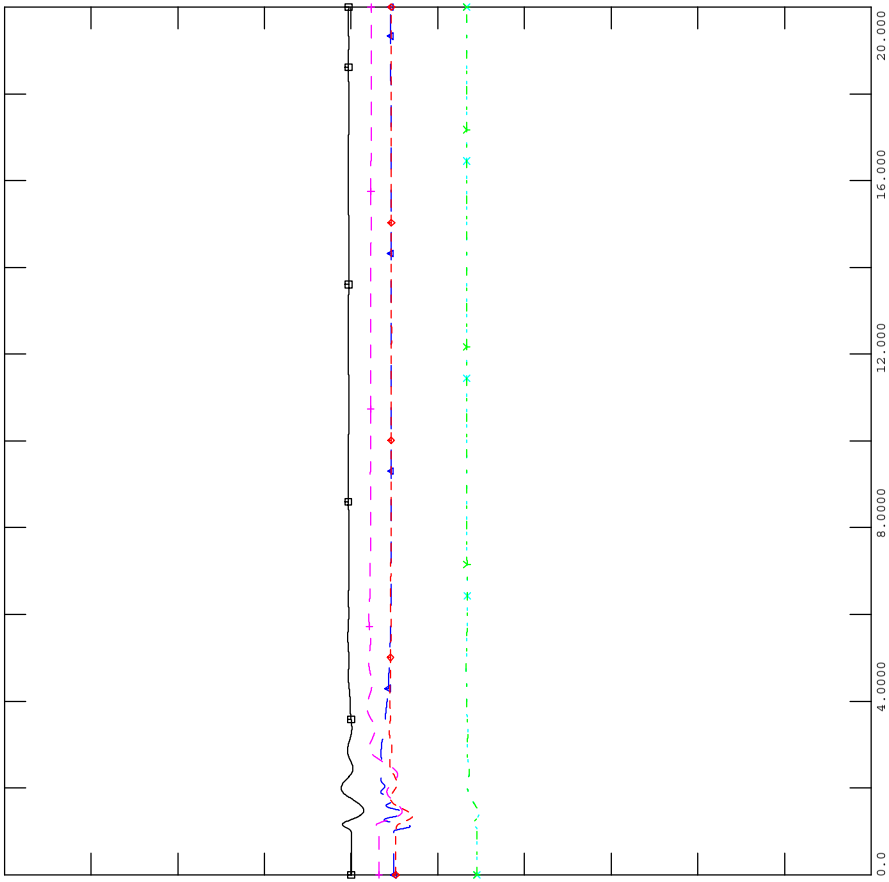
AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:06

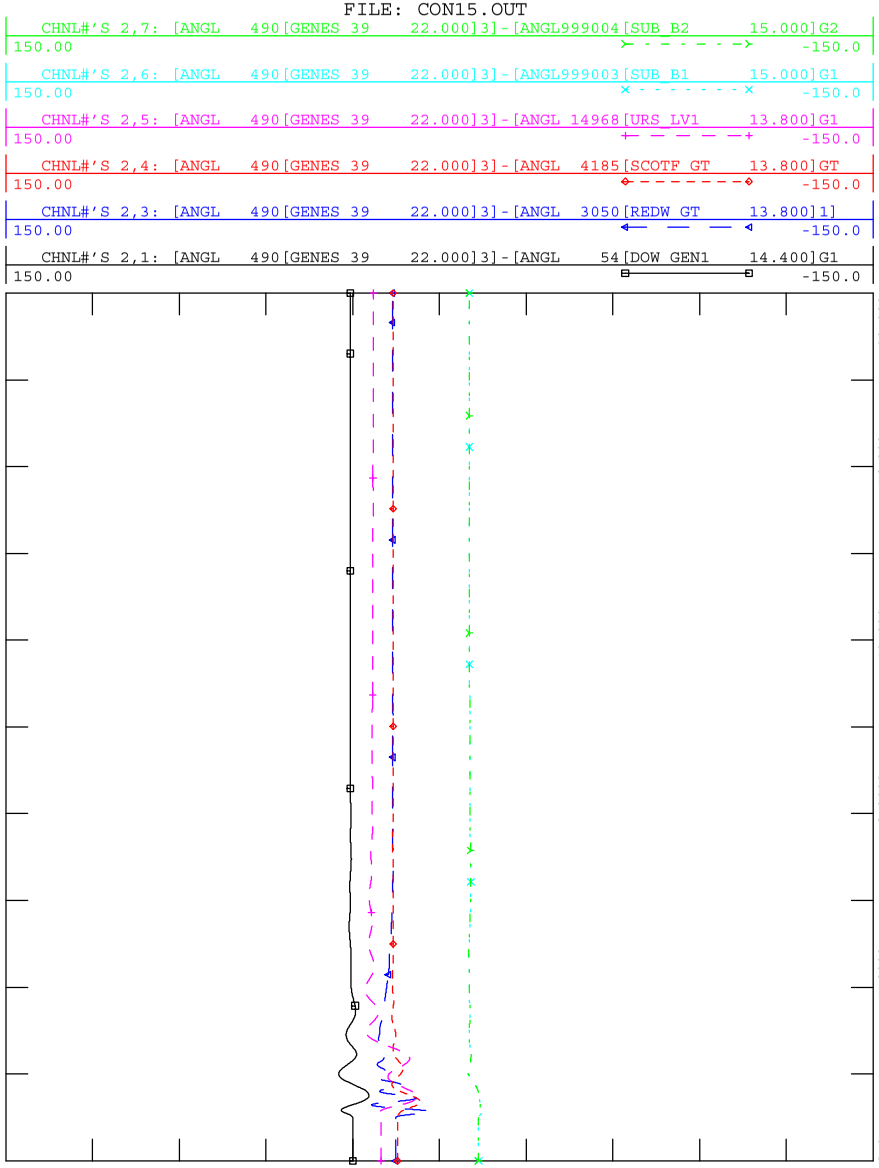
FIG A-SC3-12

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0



AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
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CAT B - 1120L 3PH FAULT AT JOSEPHBURG 410S

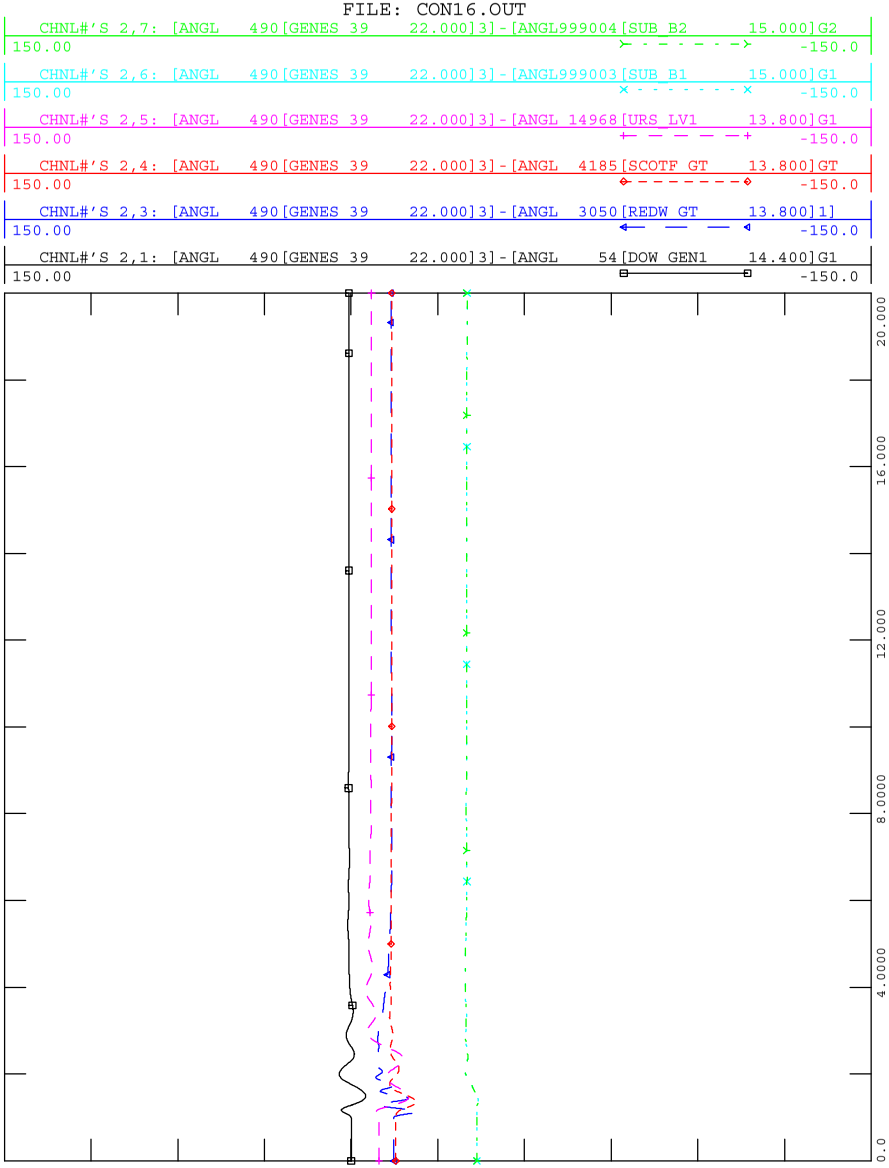
FILE: CON15.OUT



TUE, NOV 25 2025 15:06
FIG A-SC3-13

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1120L 3PH FAULT AT AMELIA 108S

FILE: CON16.OUT



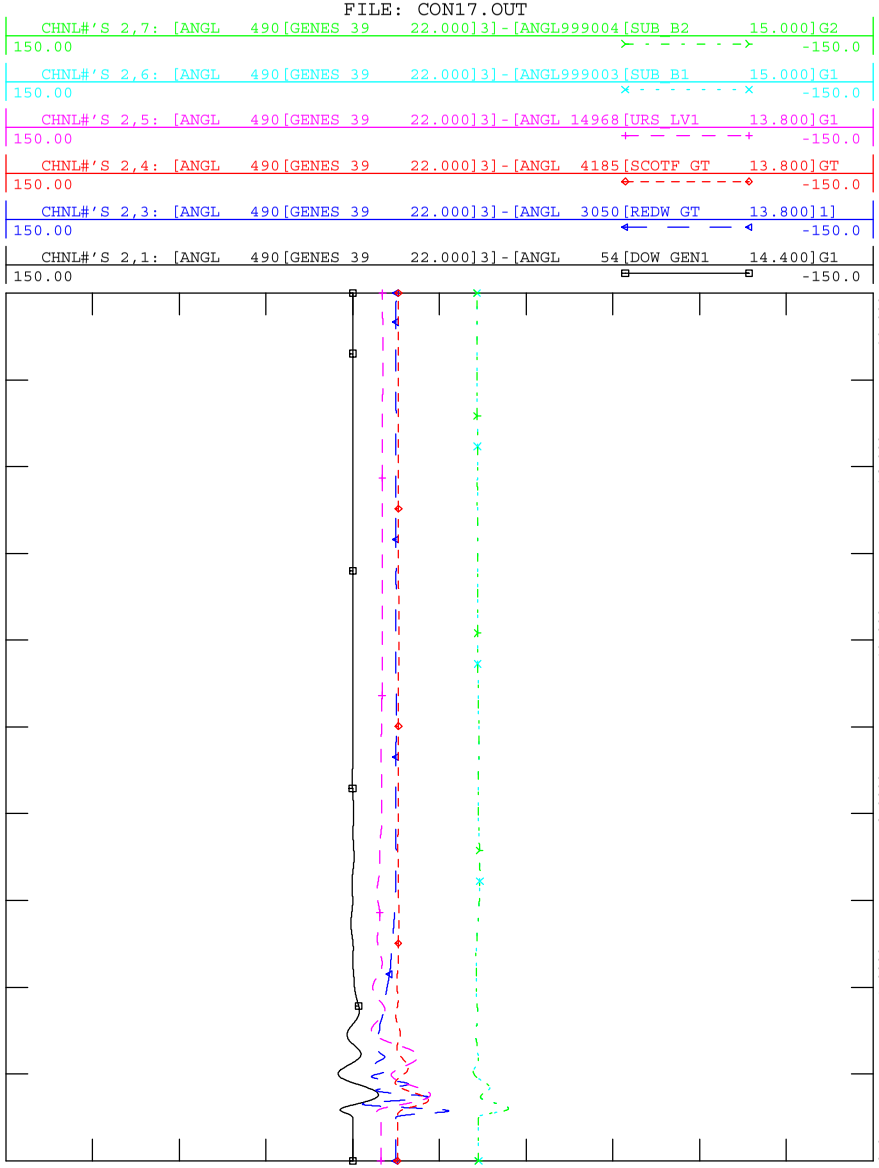
TUE, NOV 25 2025 15:06
FIG A-SC3-14

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT LAMOUREUX 71S

FILE: CON17.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-15

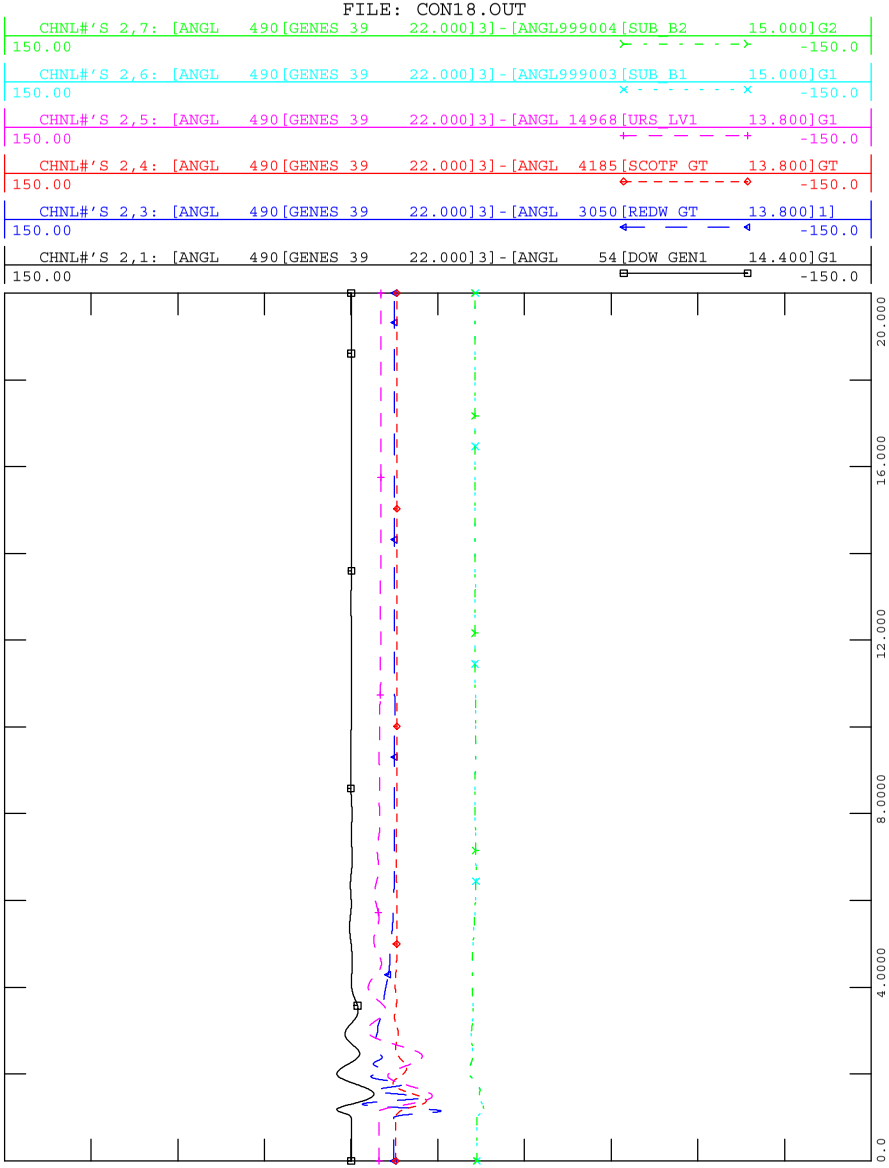


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT

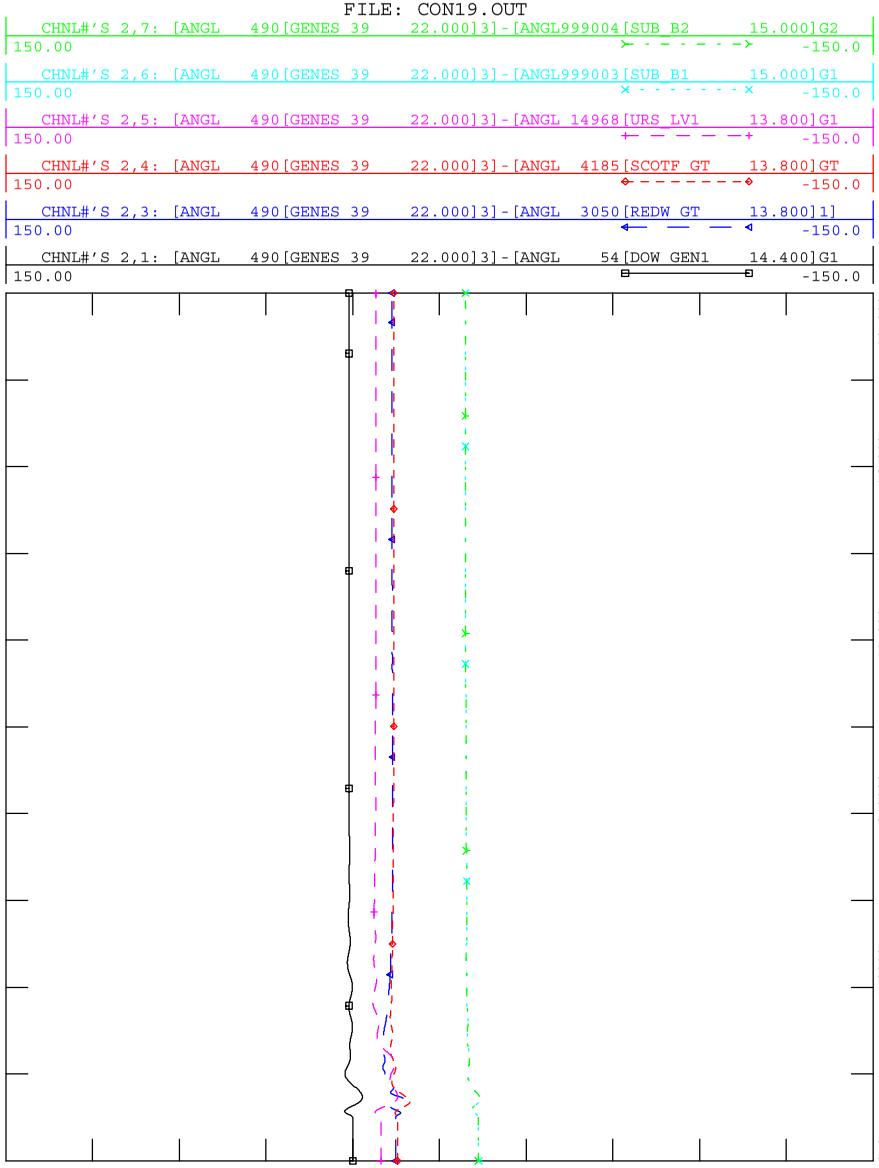
TUE, NOV 25 2025 15:06

FIG A-SC3-16



AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

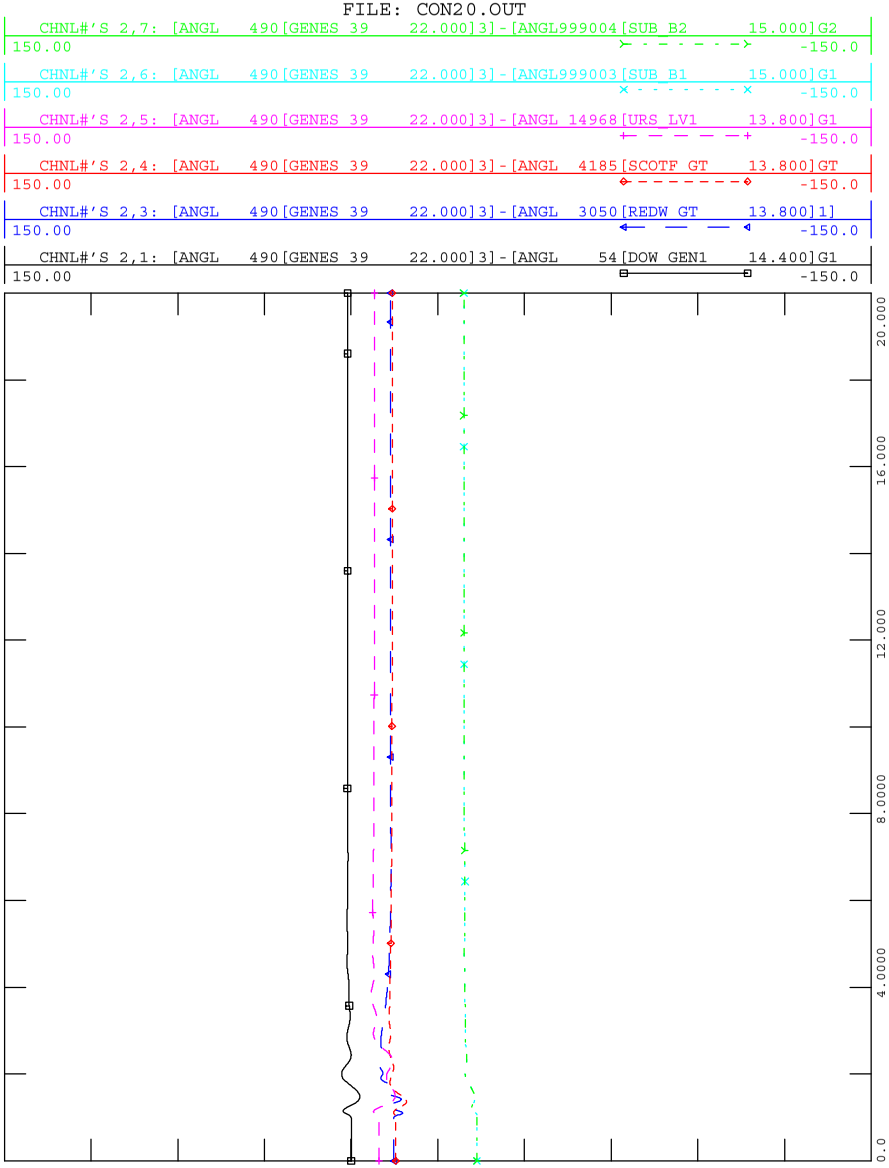
FILE: CON19.OUT



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FIG A-SC3-17

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT BANNERMAN 681S

FILE: CON20.OUT



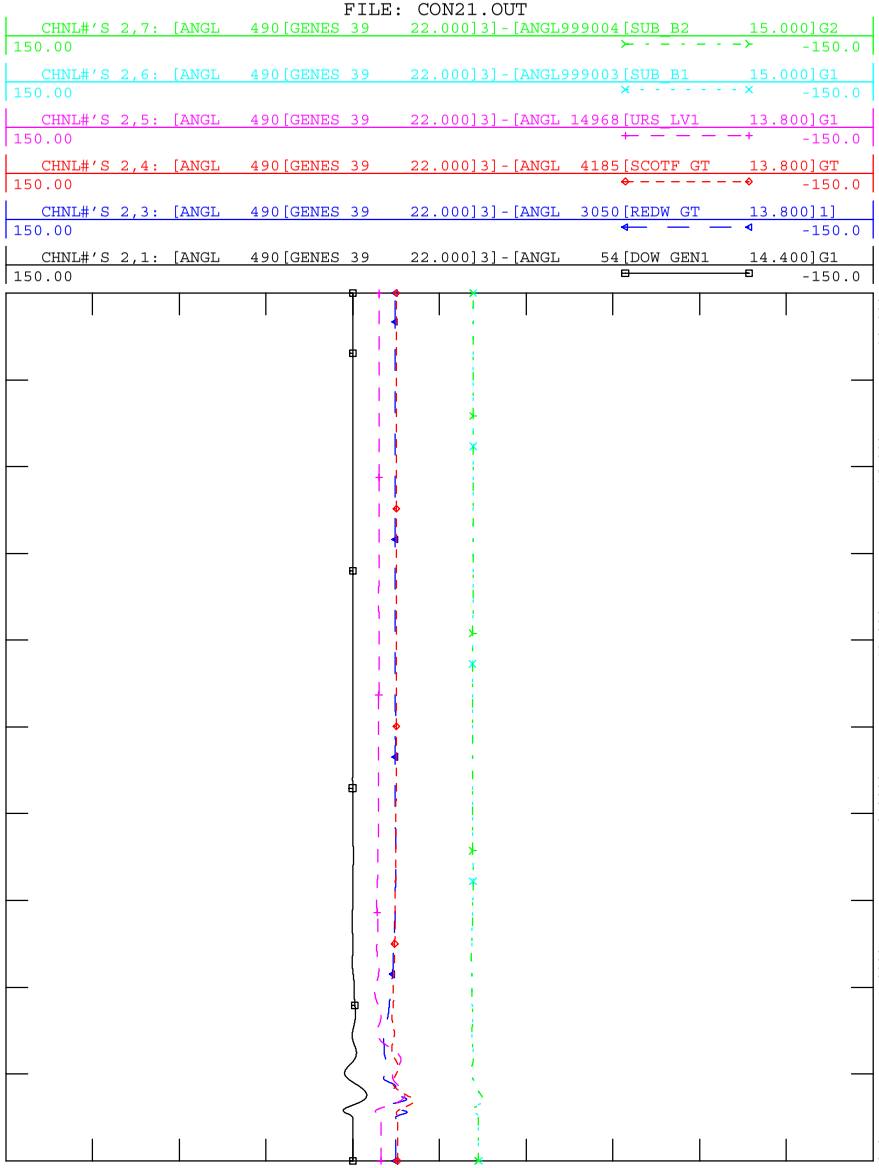
TUE, NOV 25 2025 15:06
FIG A-SC3-18

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT DEERLAND 13S

FILE: CON21.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-19

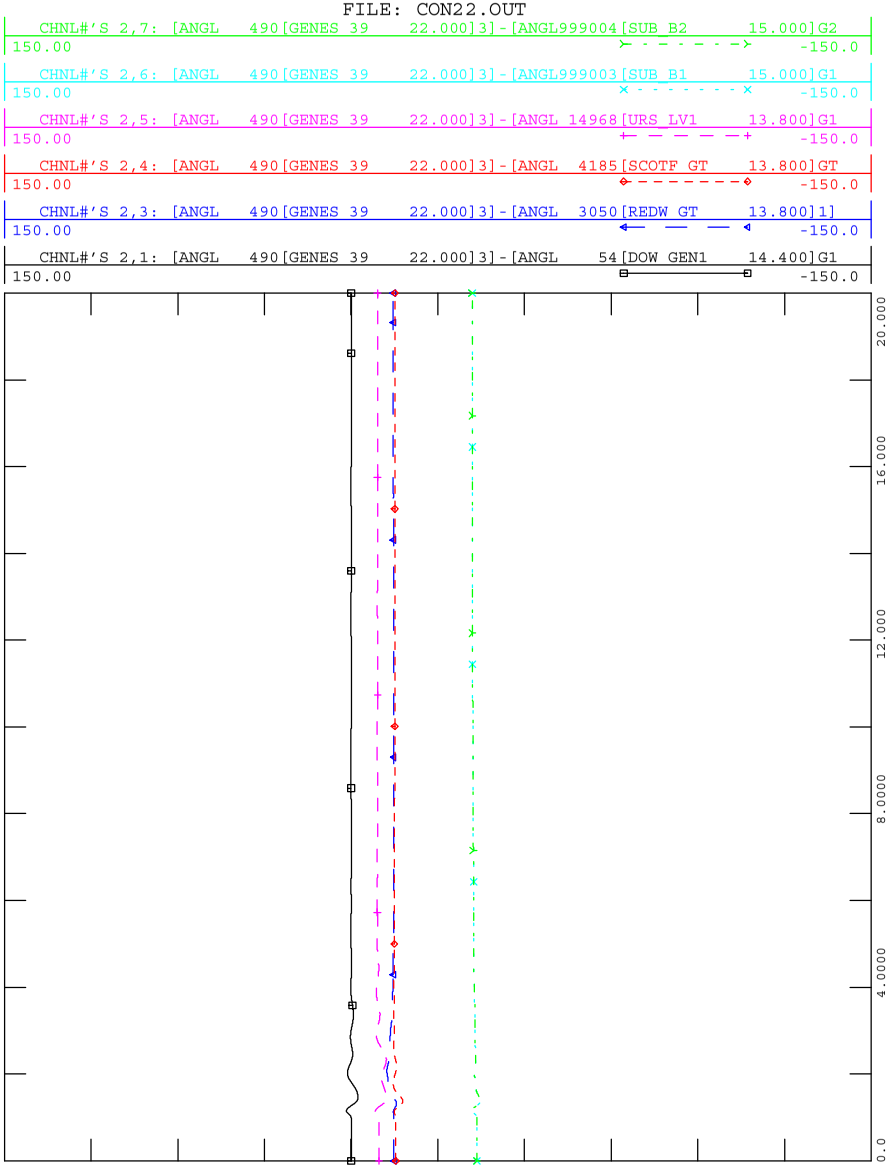


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

TUE, NOV 25 2025 15:06

FIG A-SC3-20



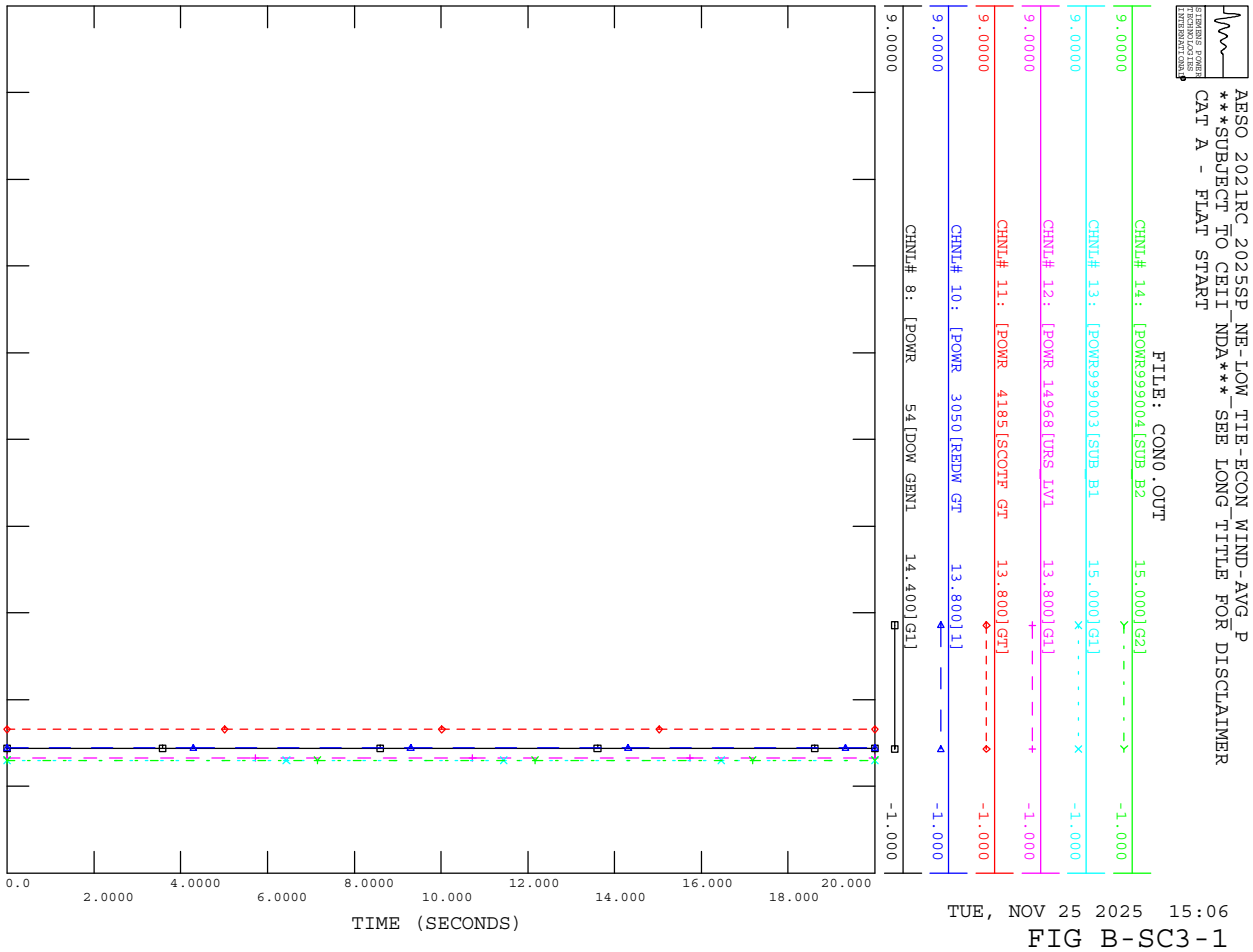


FIG B-SC3-1

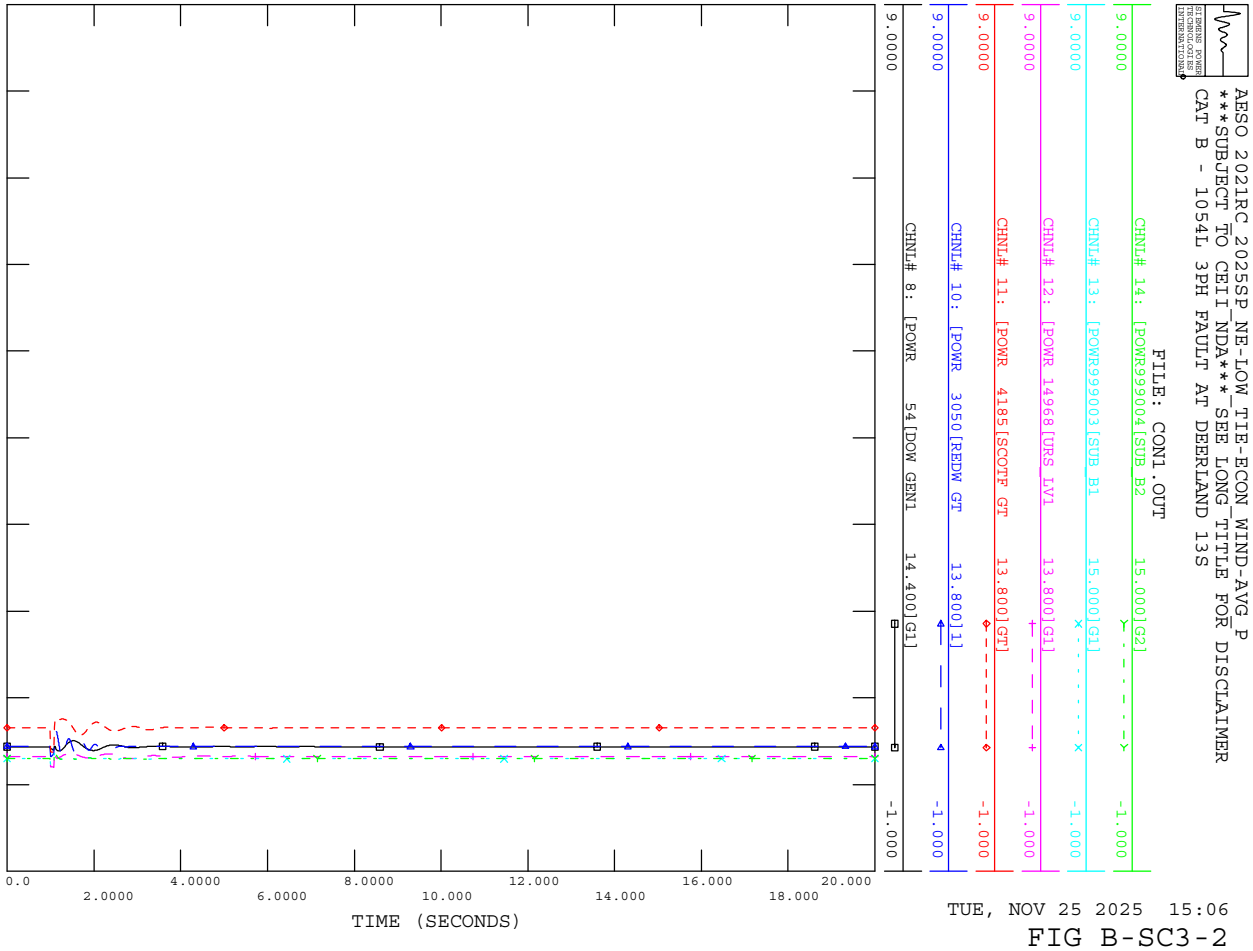


FIG B-SC3-2

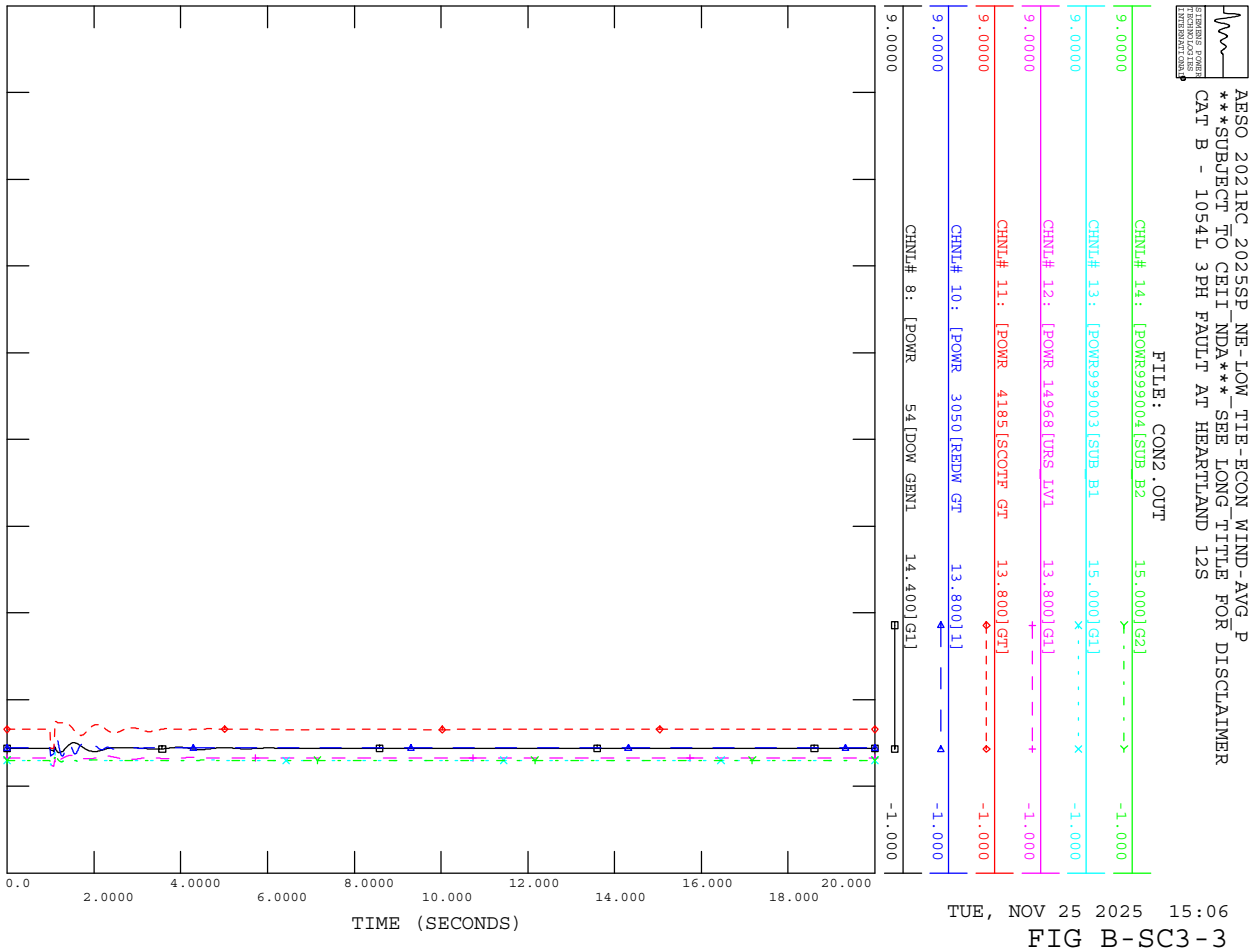


FIG B-SC3-3

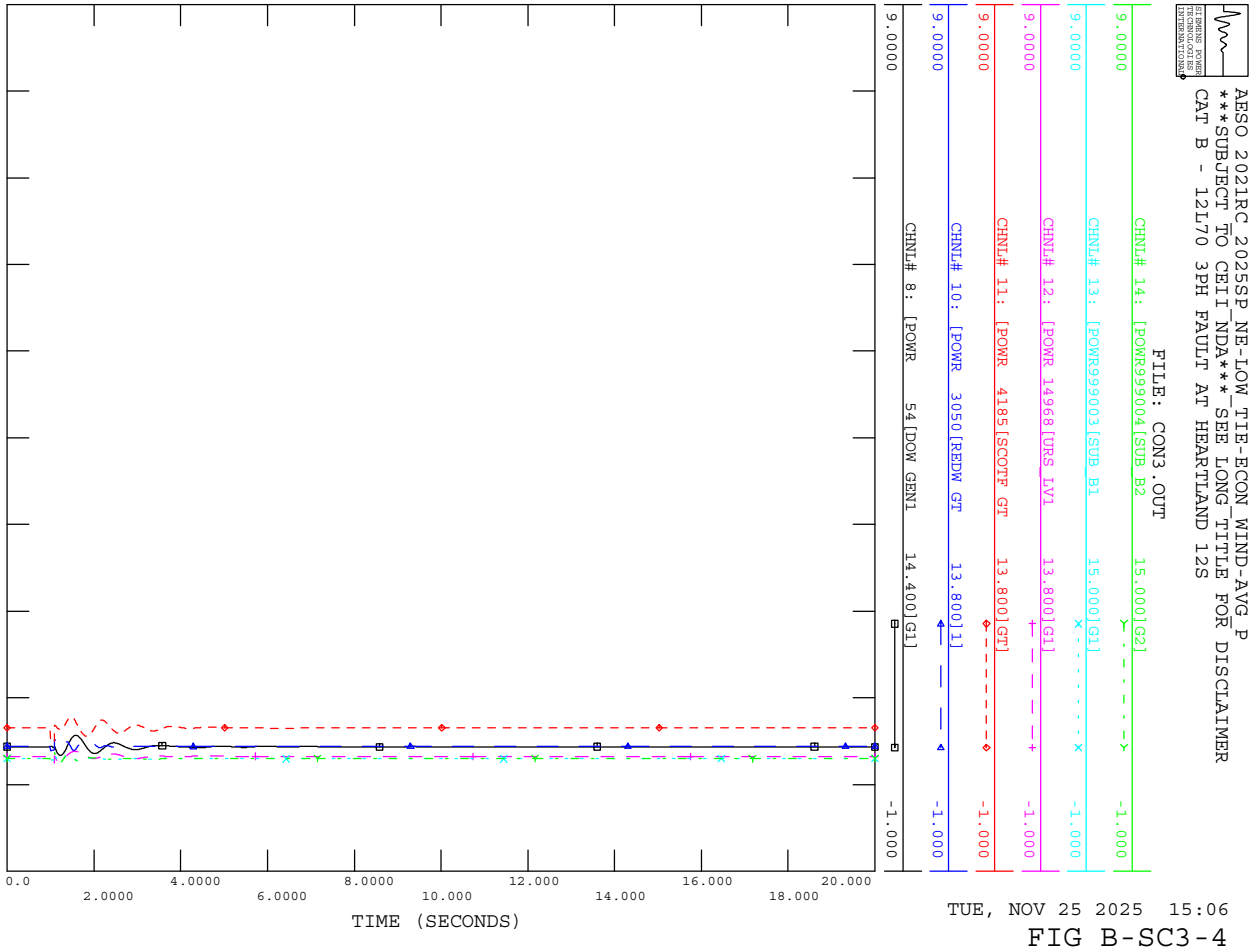


FIG B-SC3-4

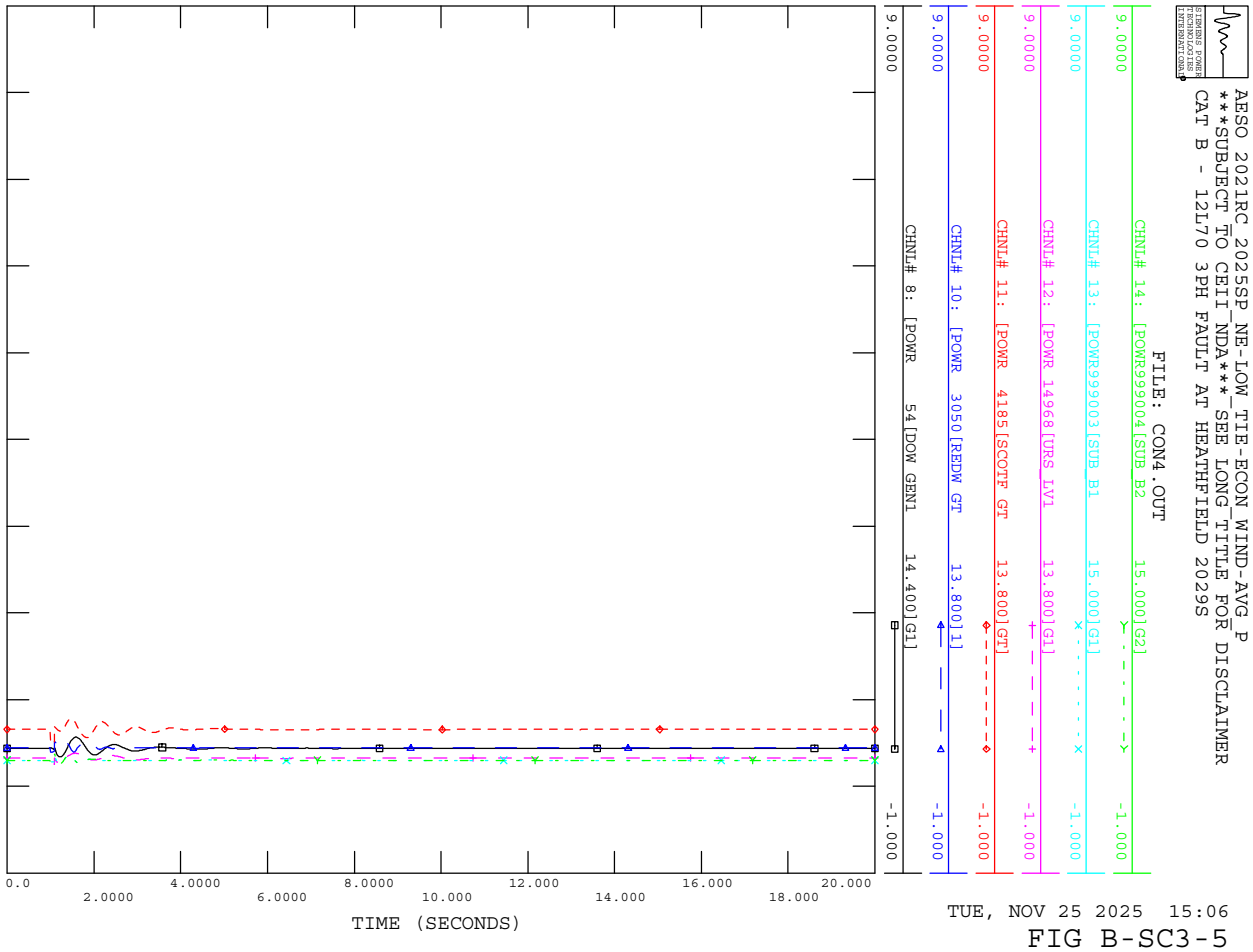


FIG B-SC3-5

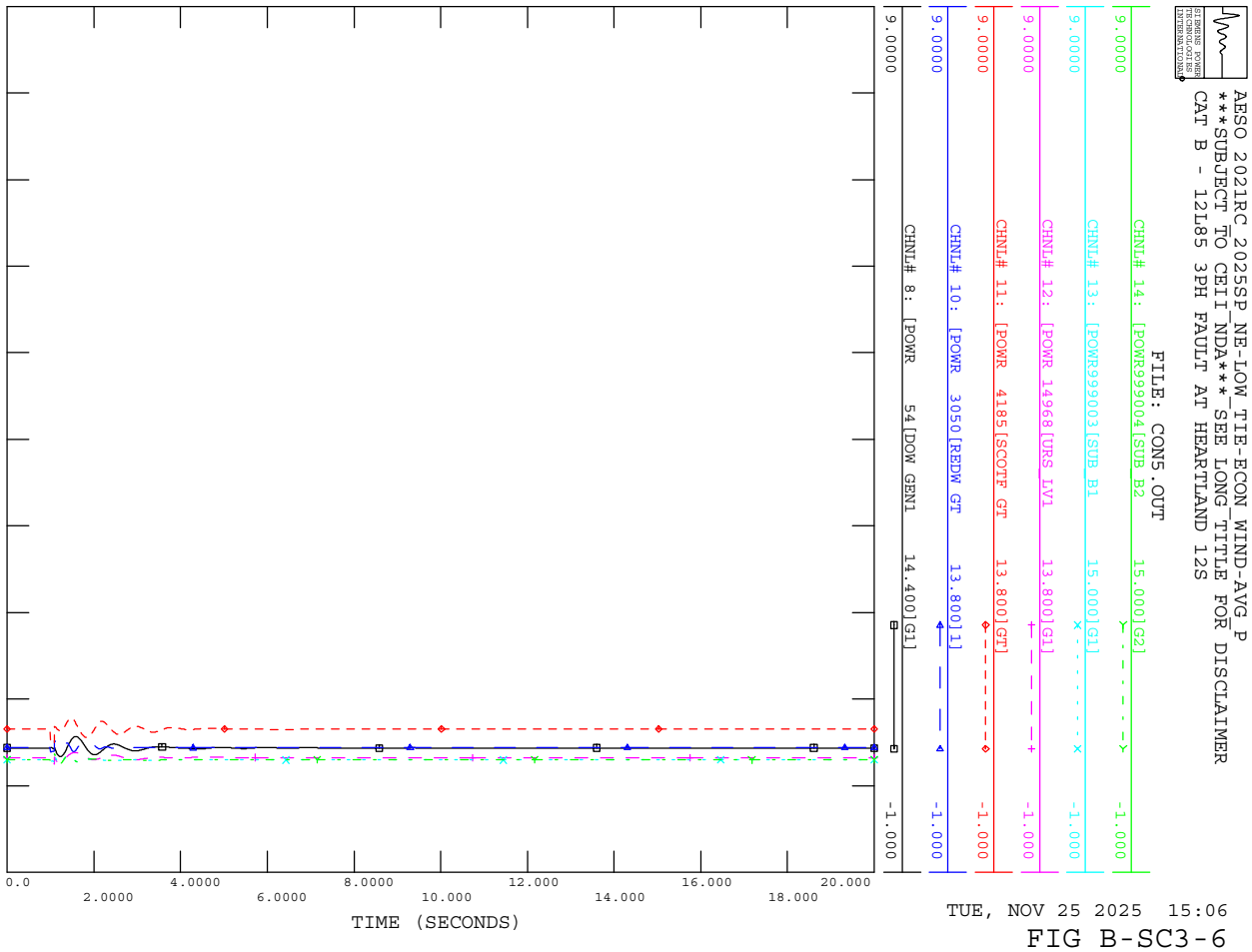


FIG B-SC3-6

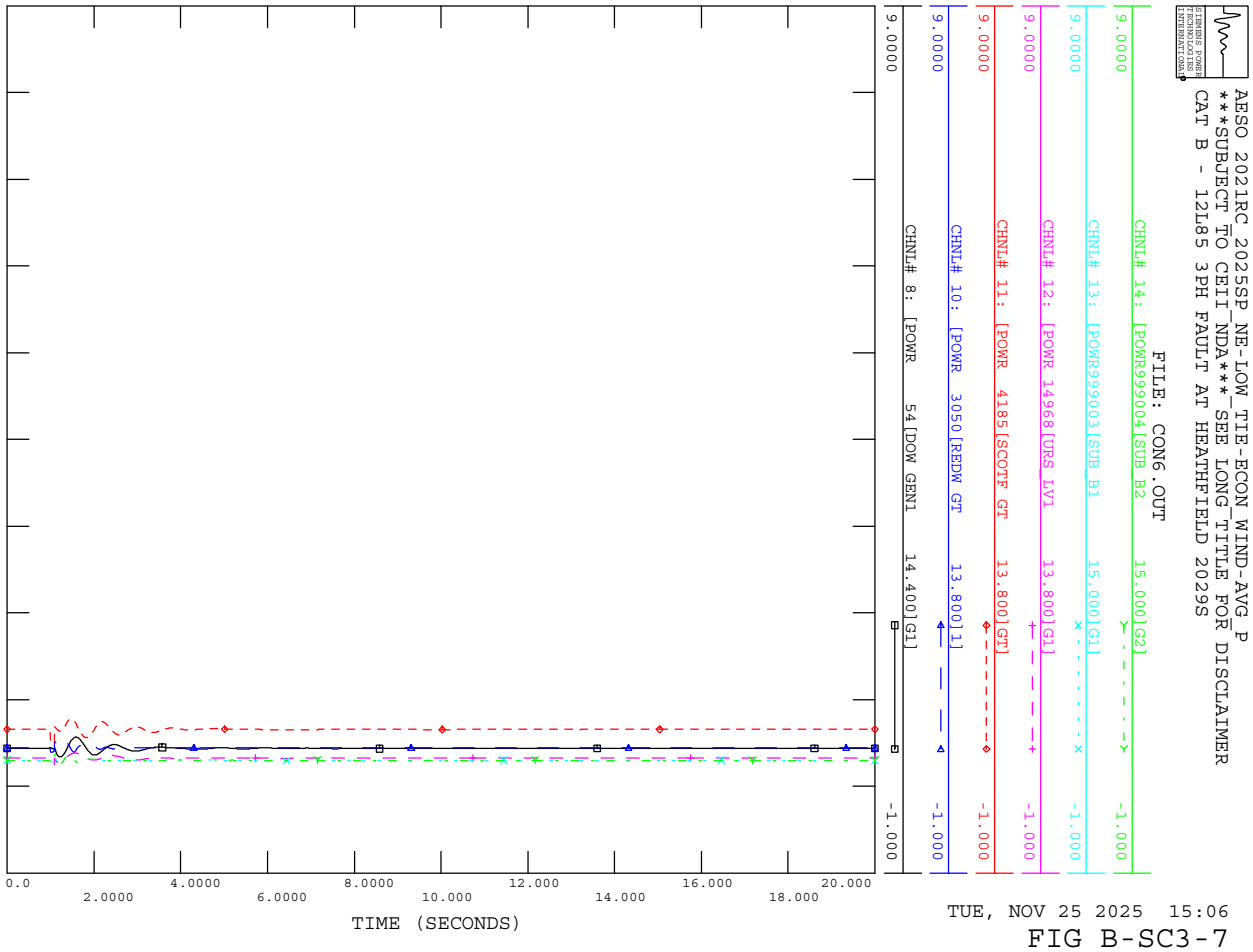


FIG B-SC3-7

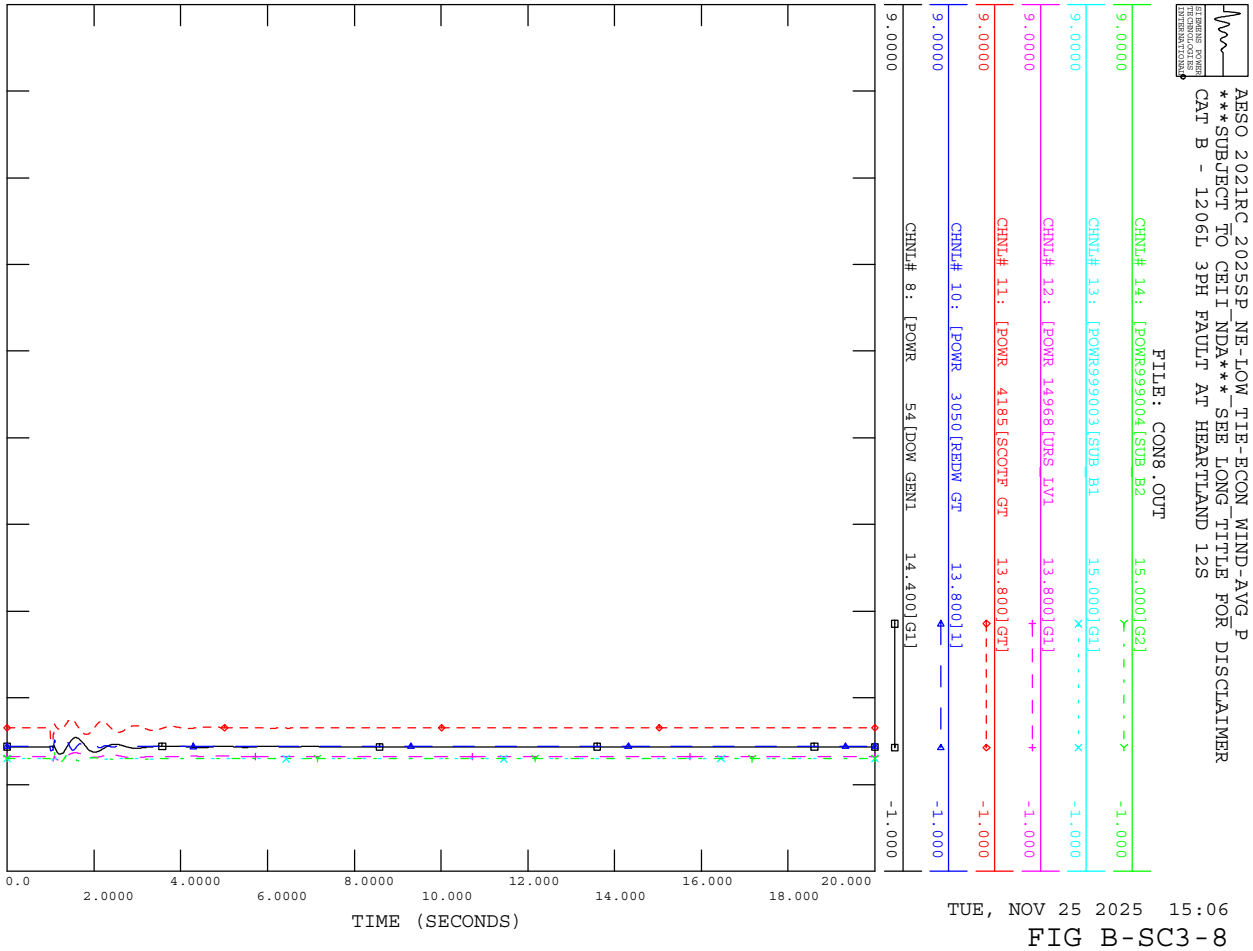


FIG B-SC3-8

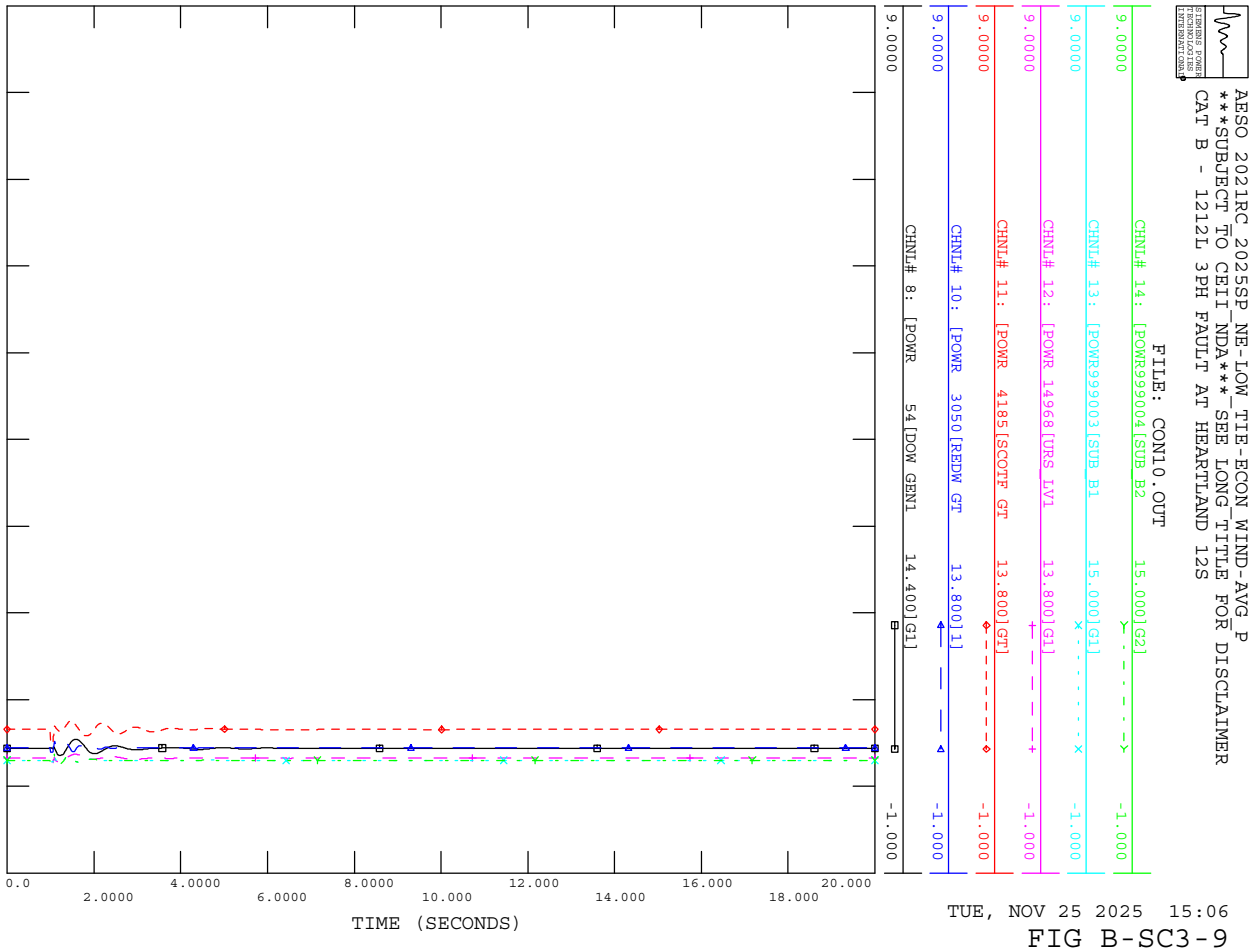


FIG B-SC3-9

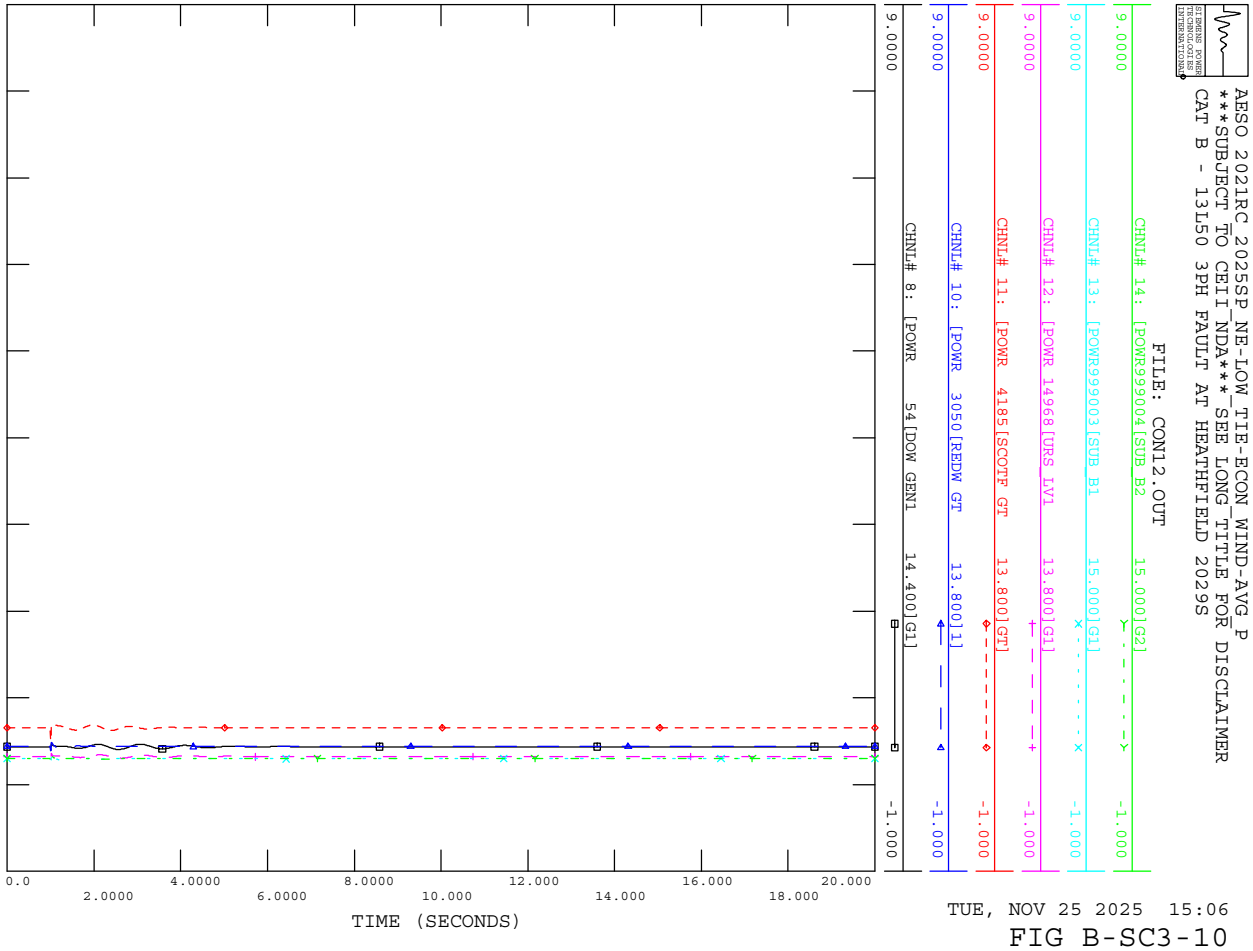


FIG B-SC3-10

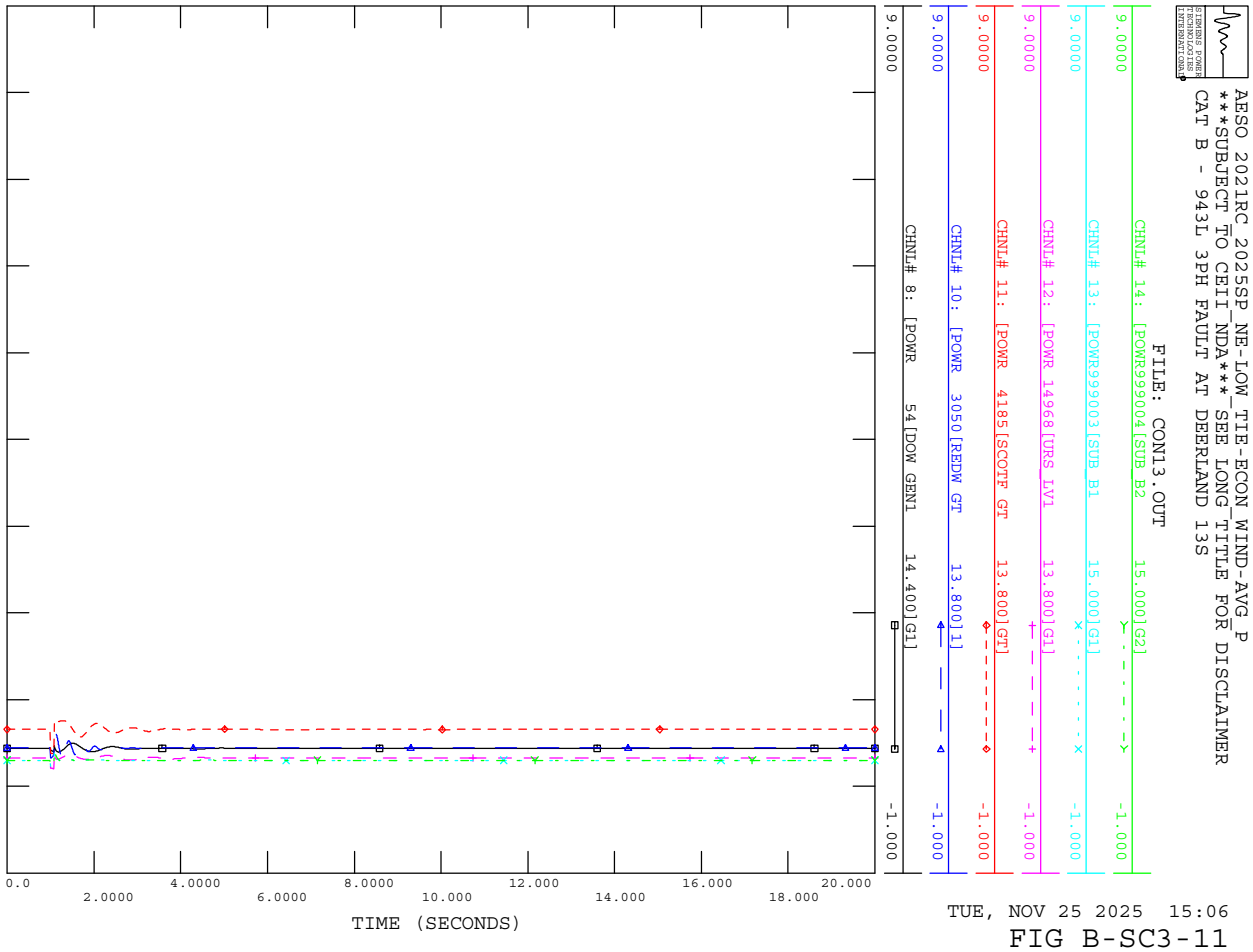


FIG B-SC3-11

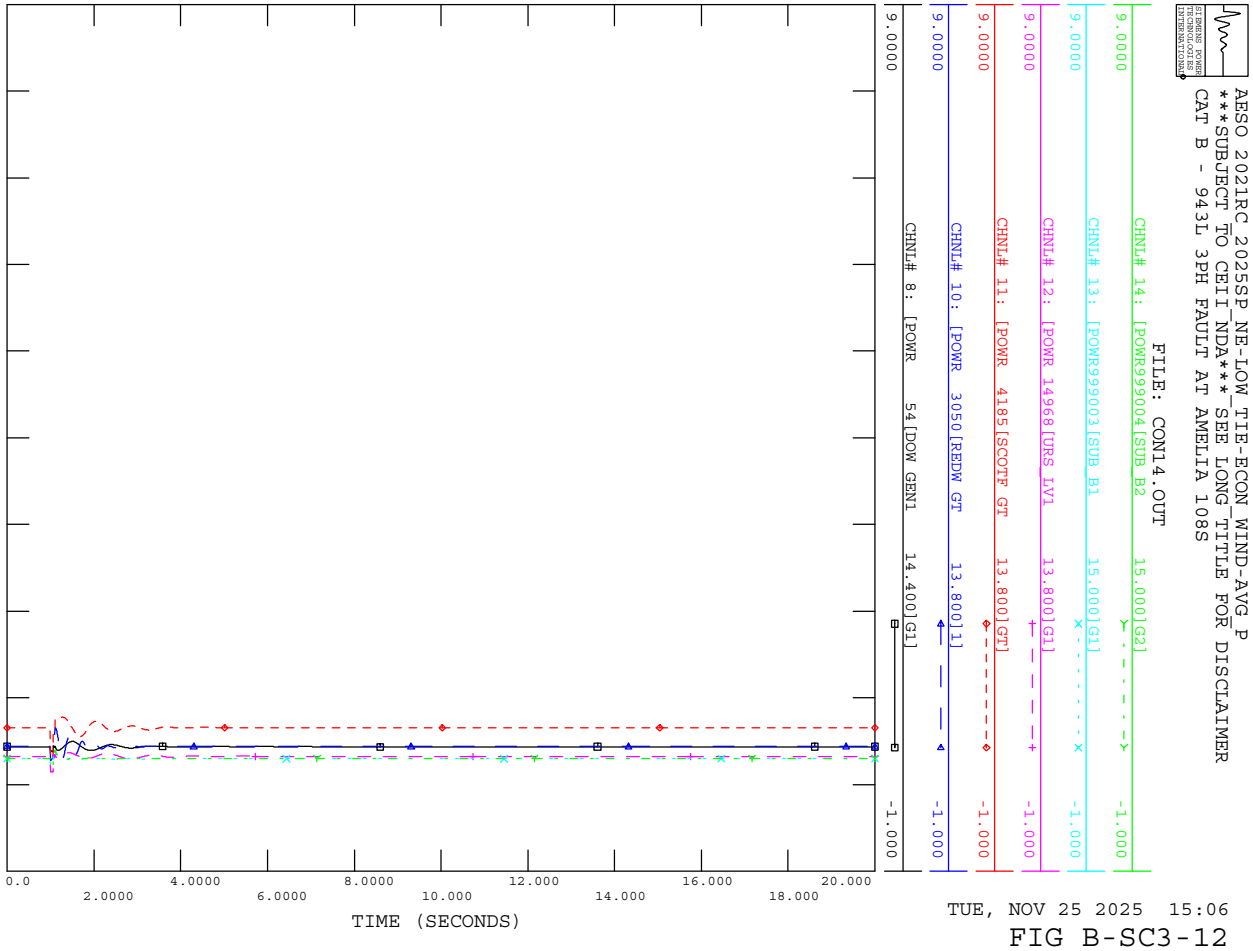


FIG B-SC3-12

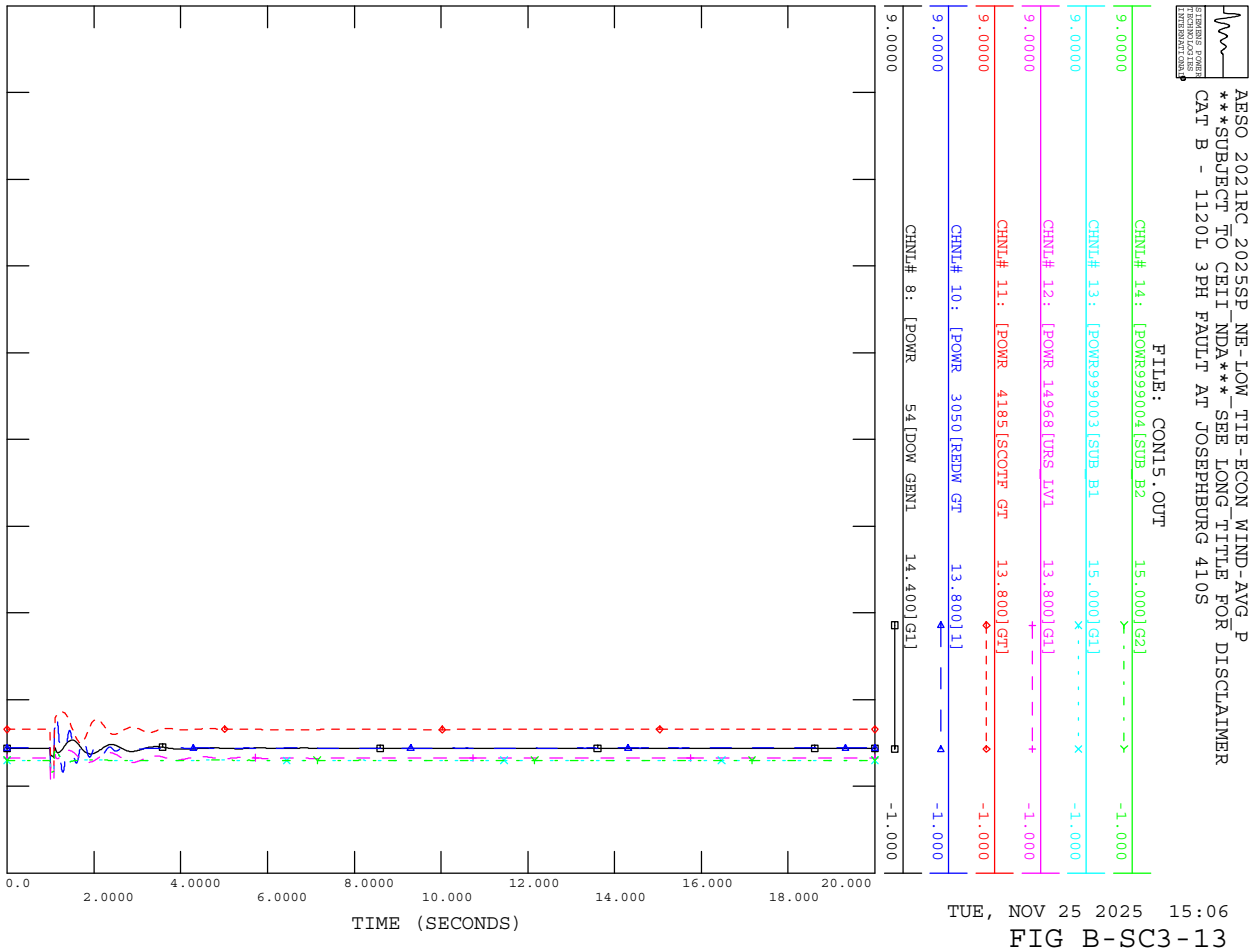


FIG B-SC3-13

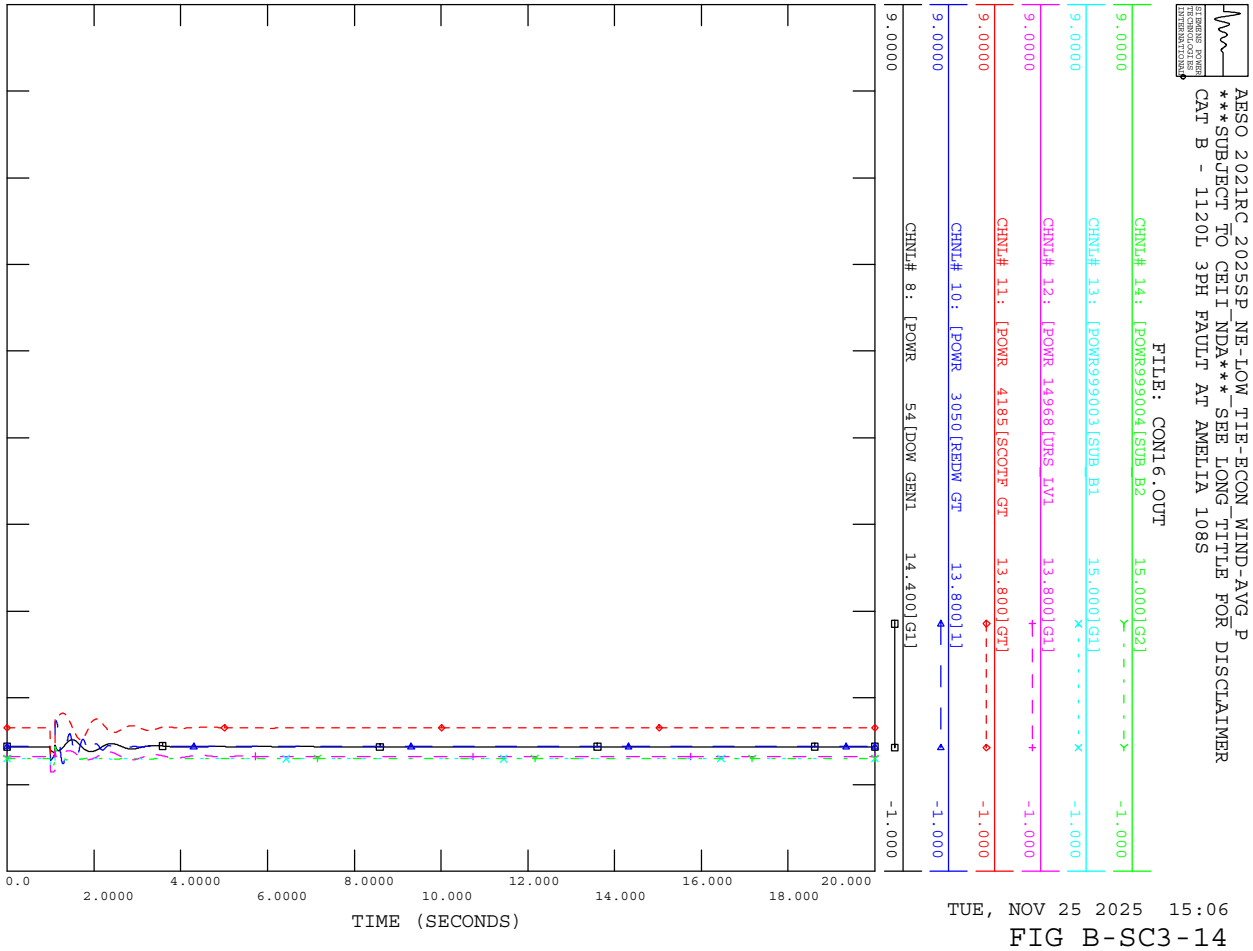
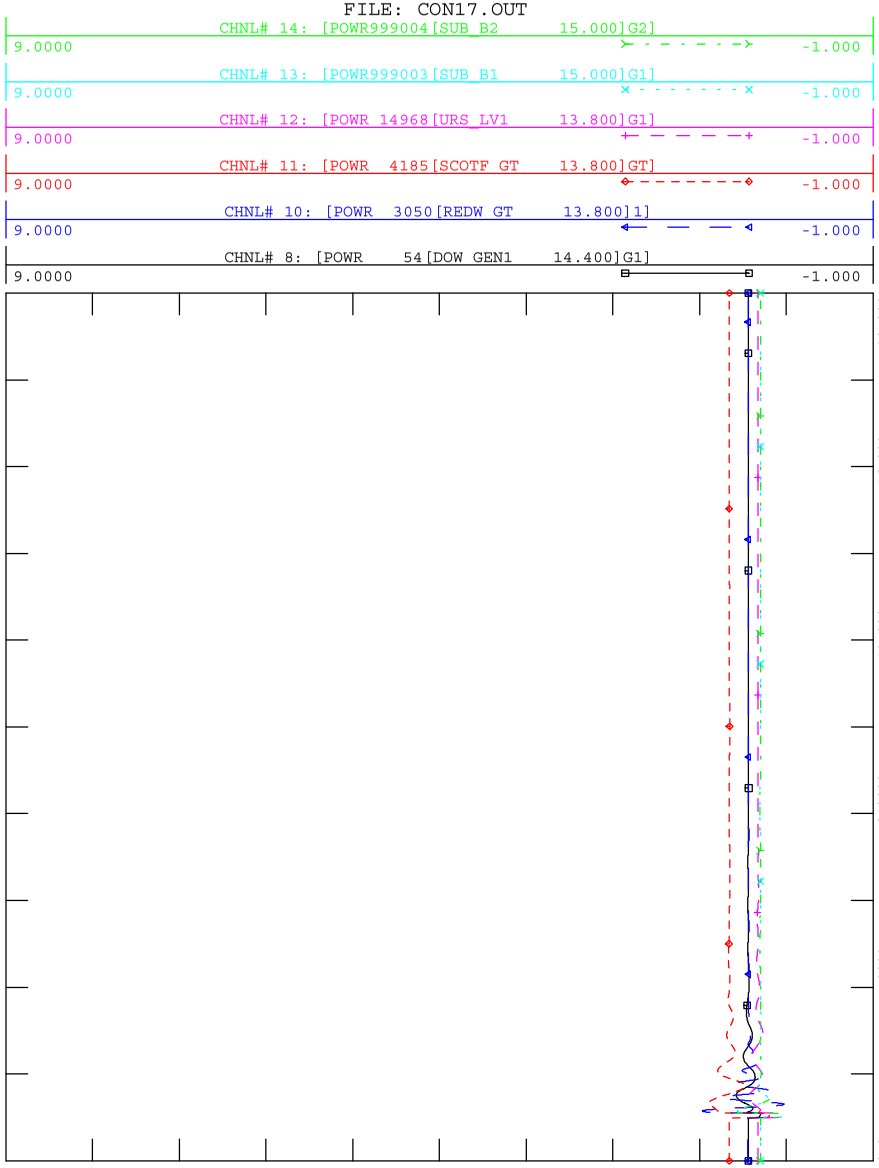


FIG B-SC3-14

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT LAMOUREUX 71S

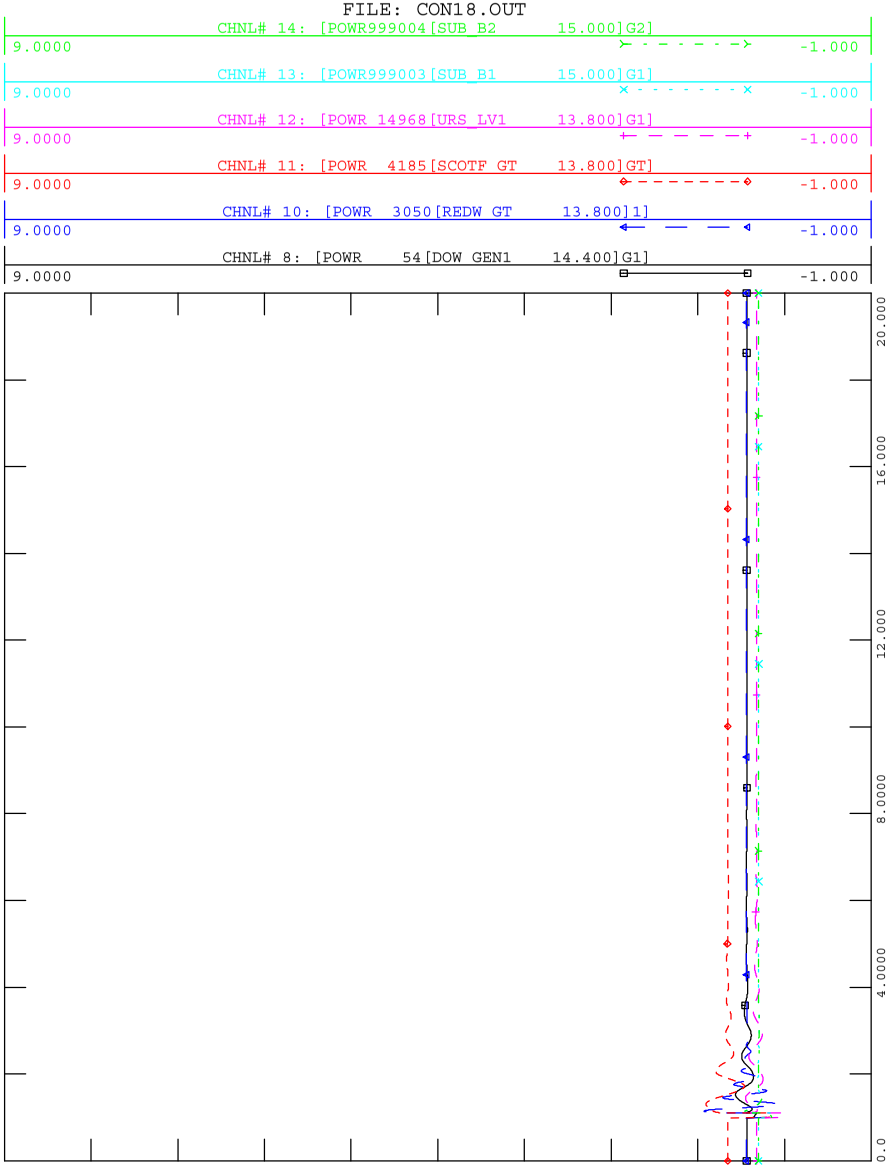
FILE: CON17.OUT



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FIG B-SC3-15

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT



TUE, NOV 25 2025 15:06
FIG B-SC3-16

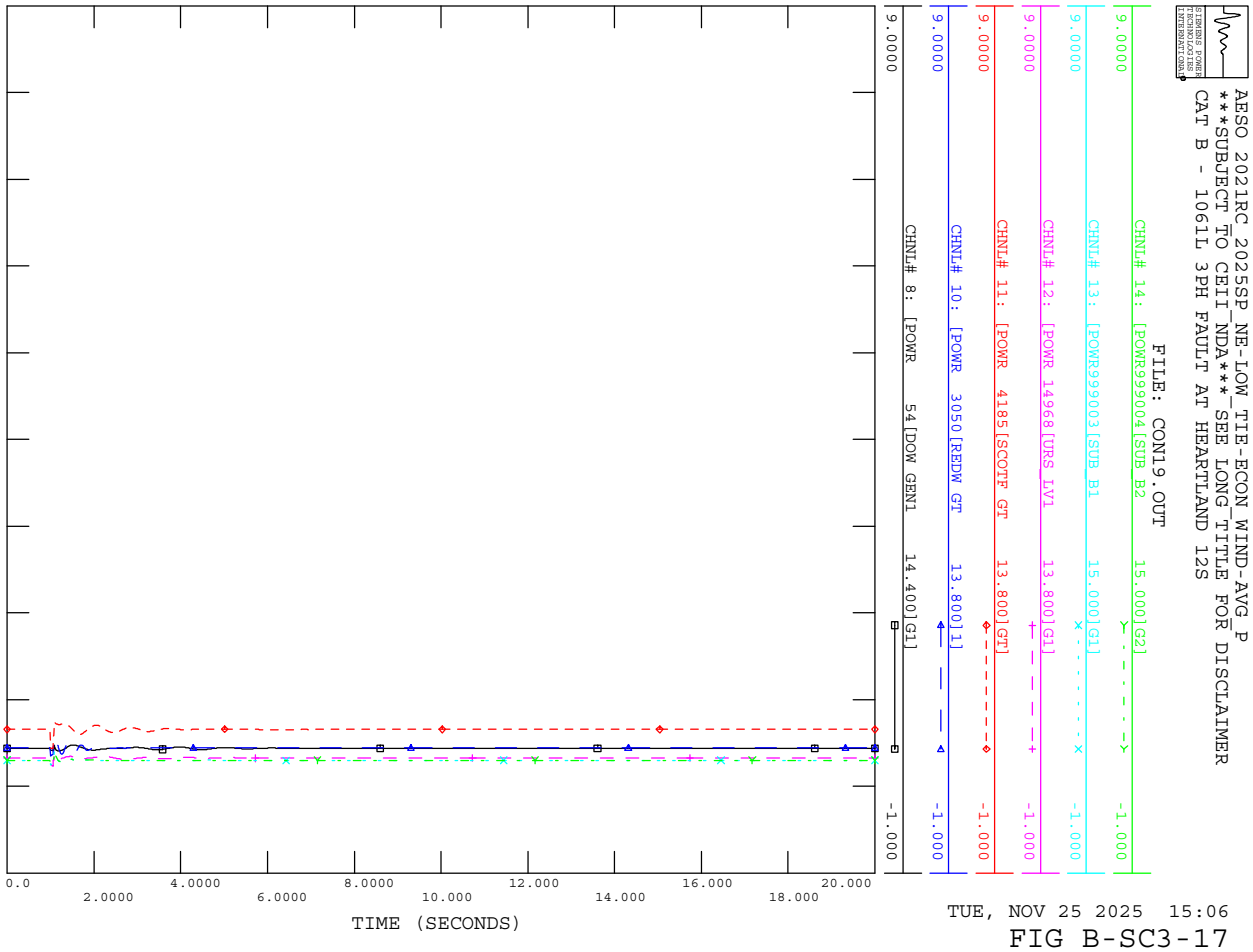


FIG B-SC3-17

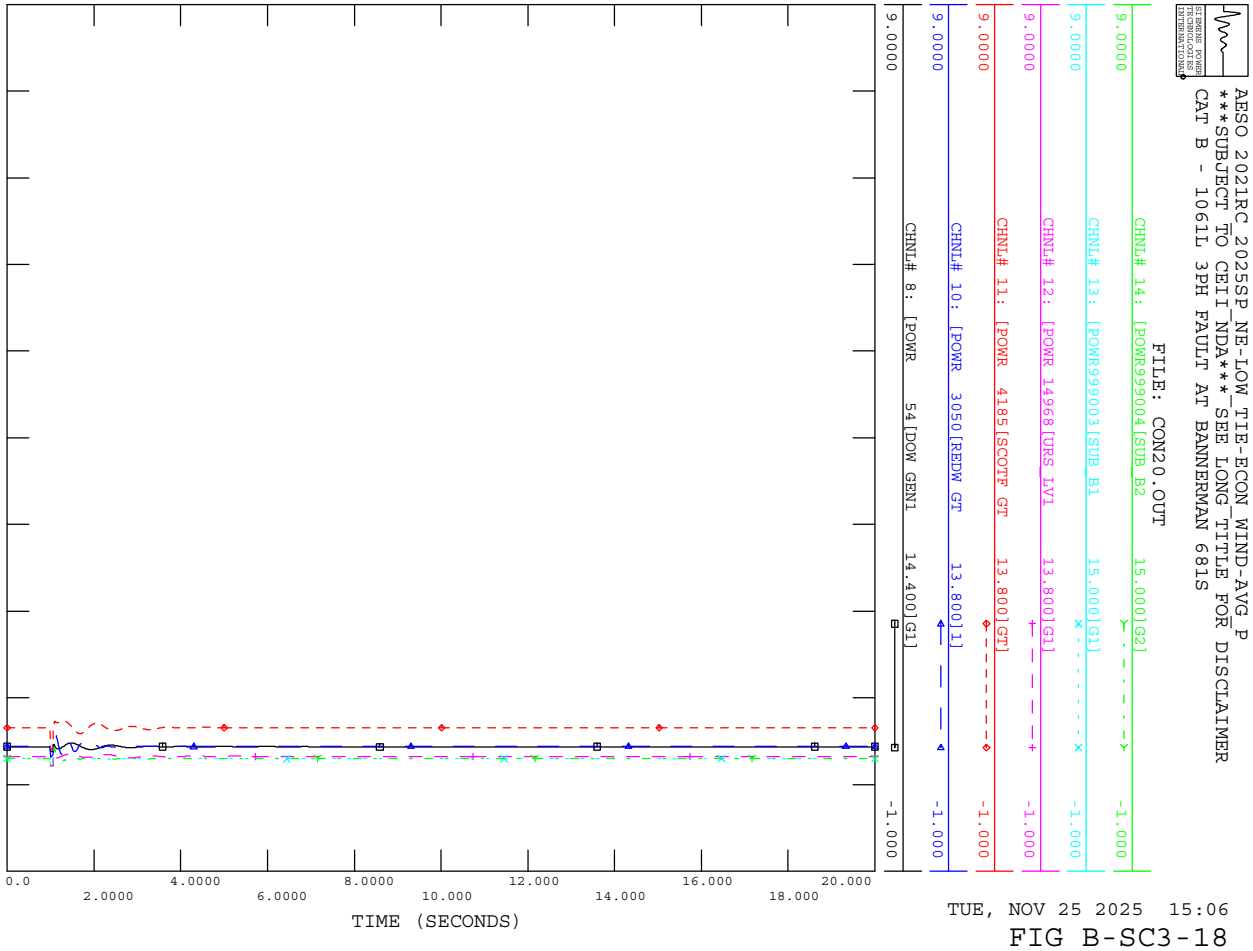
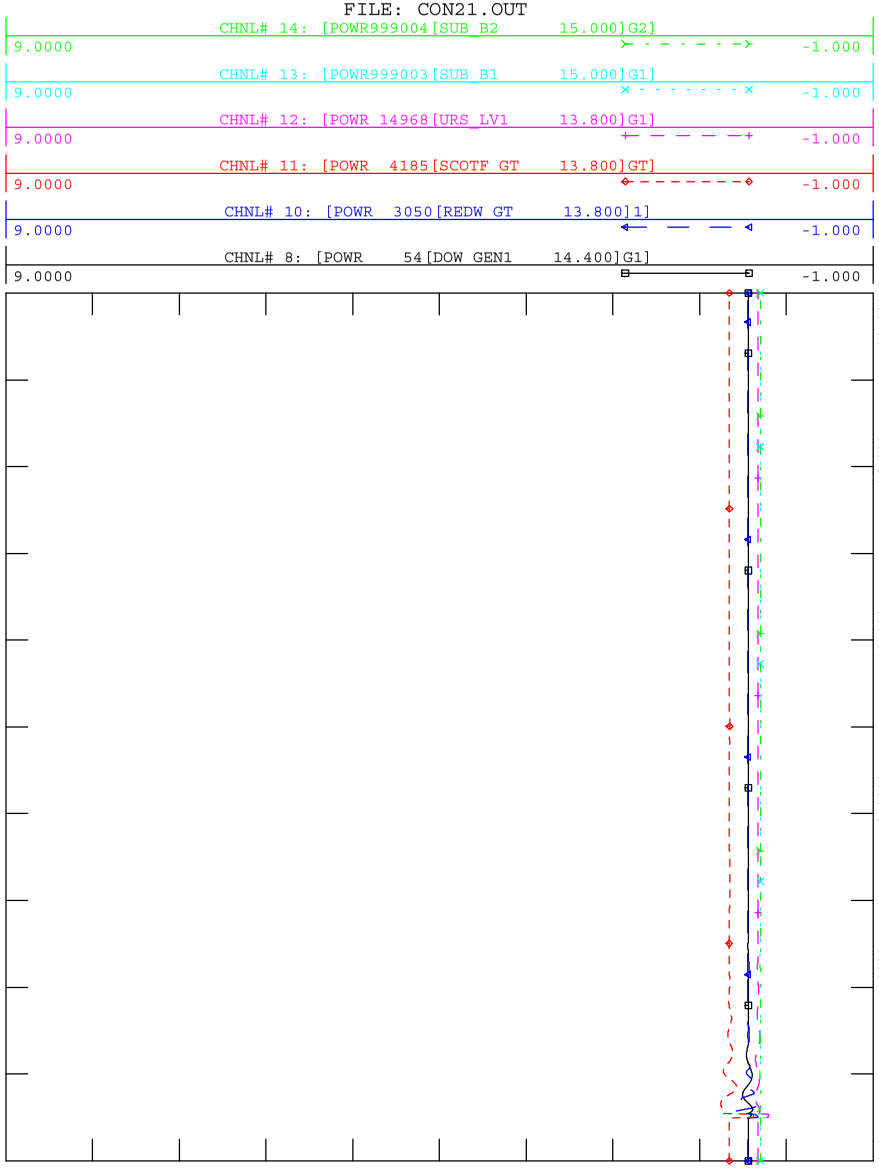


FIG B-SC3-18

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT DEERLAND 13S

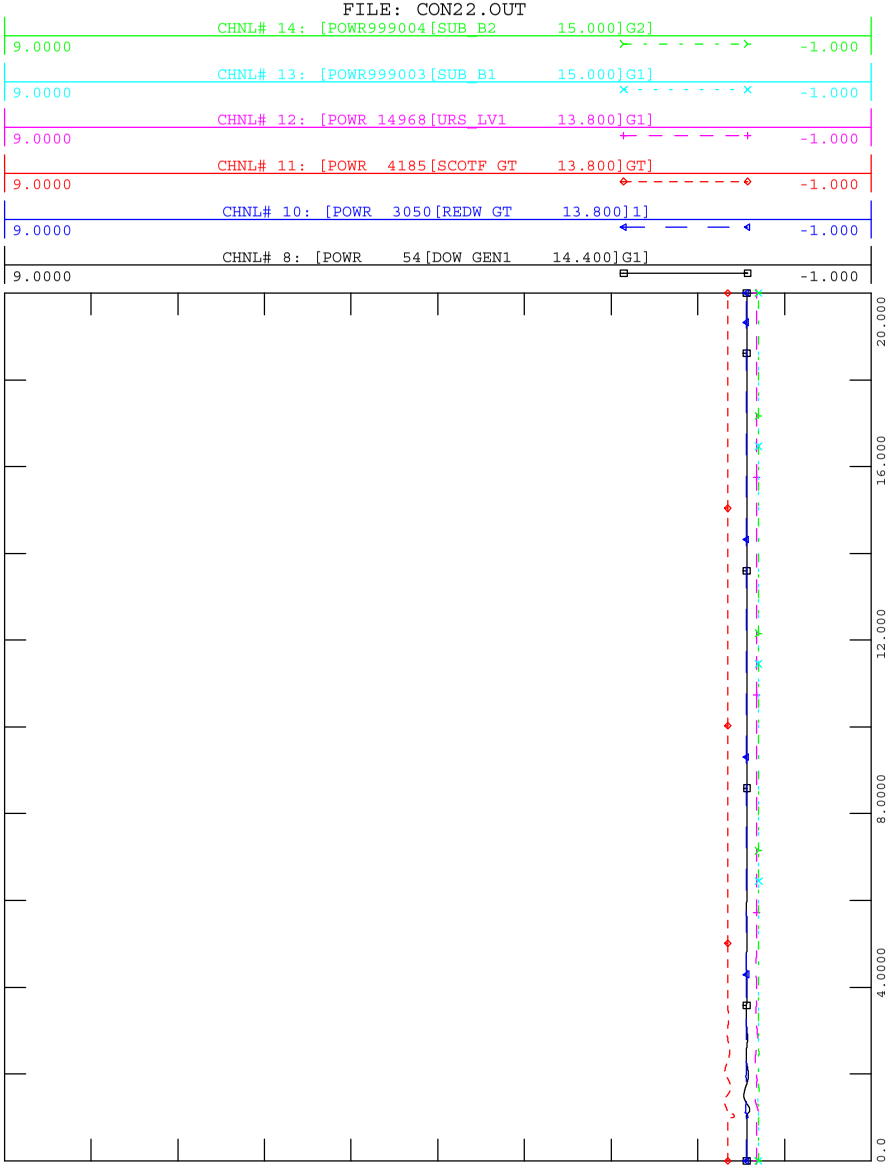
FILE: CON21.OUT



TUE, NOV 25 2025 15:06
FIG B-SC3-19

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT



TUE, NOV 25 2025 15:06
FIG B-SC3-20

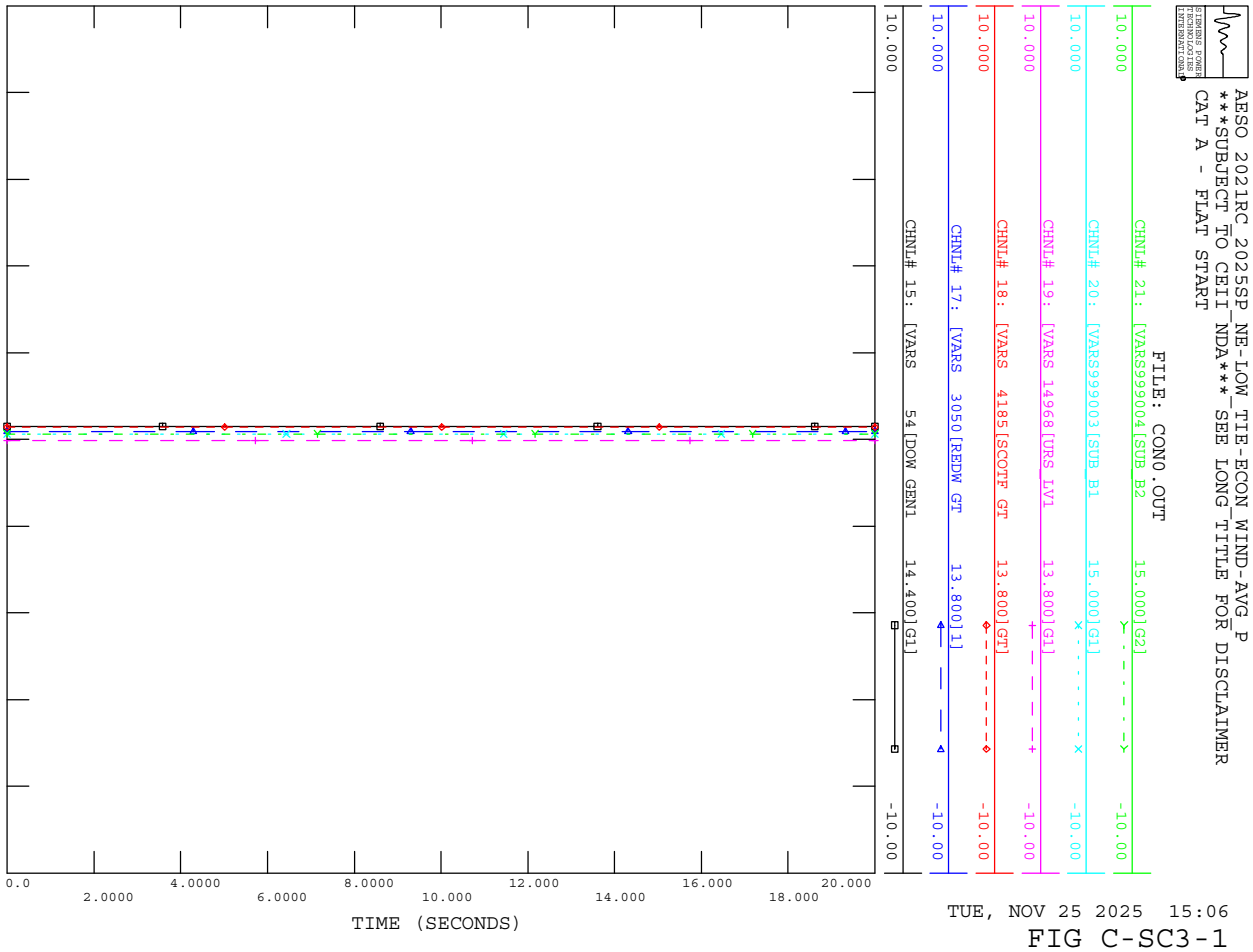


FIG C-SC3-1

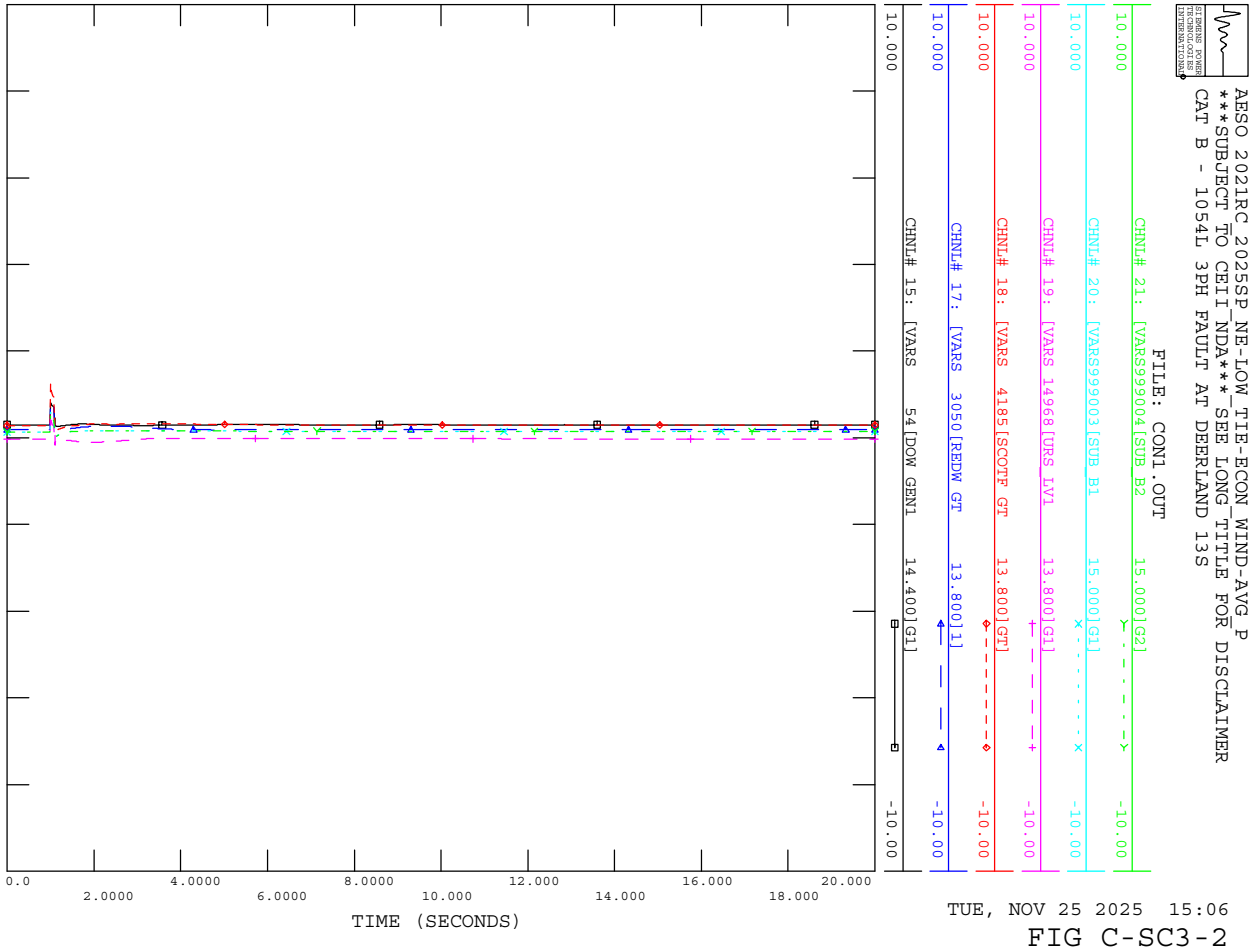
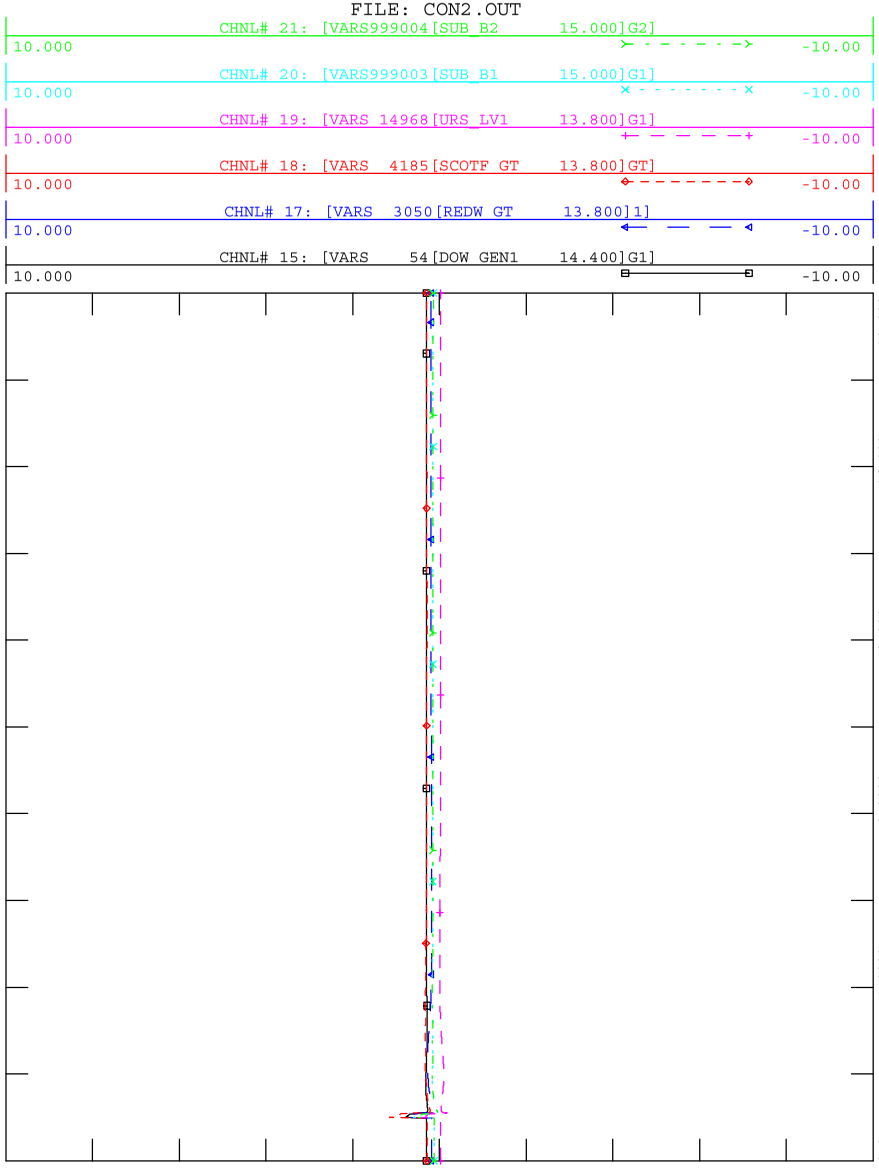


FIG C-SC3-2

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1054L 3PH FAULT AT HEARTLAND 12S

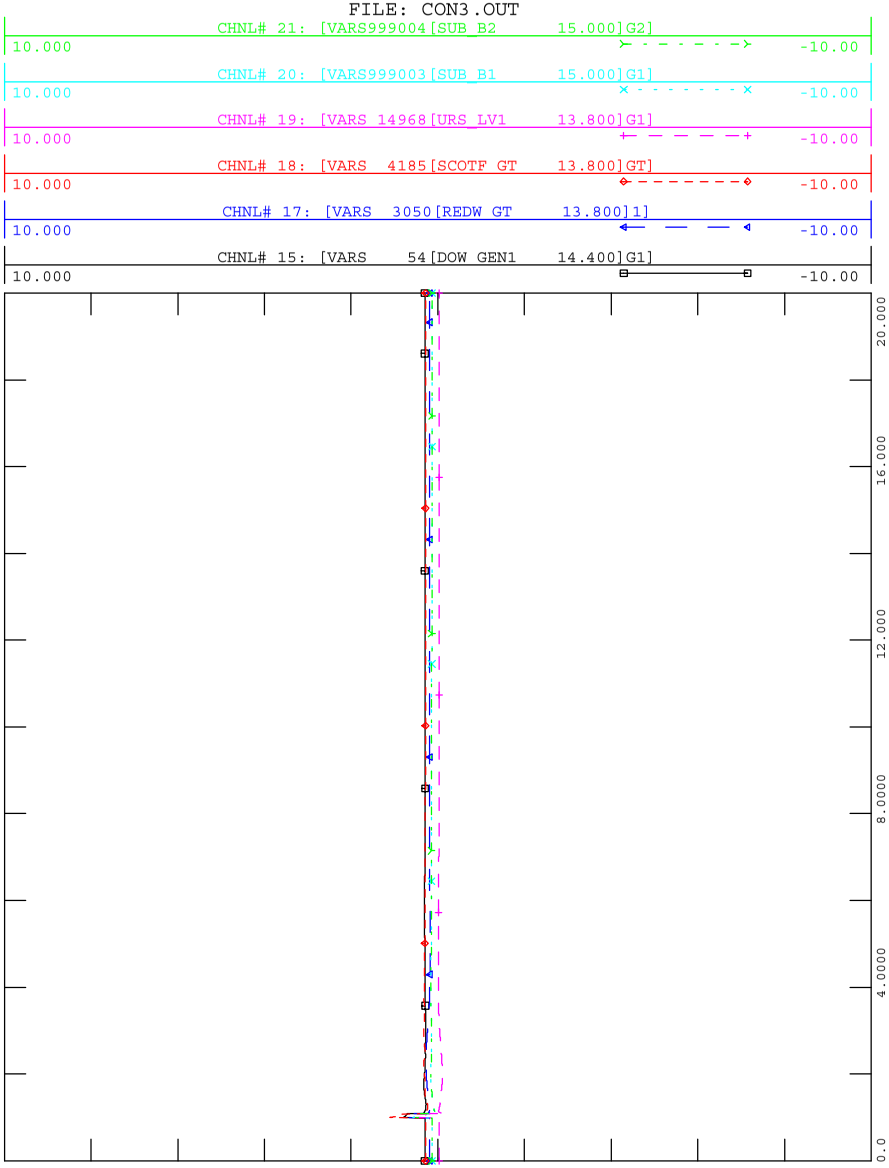
FILE: CON2.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-3

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEARTLAND 12S

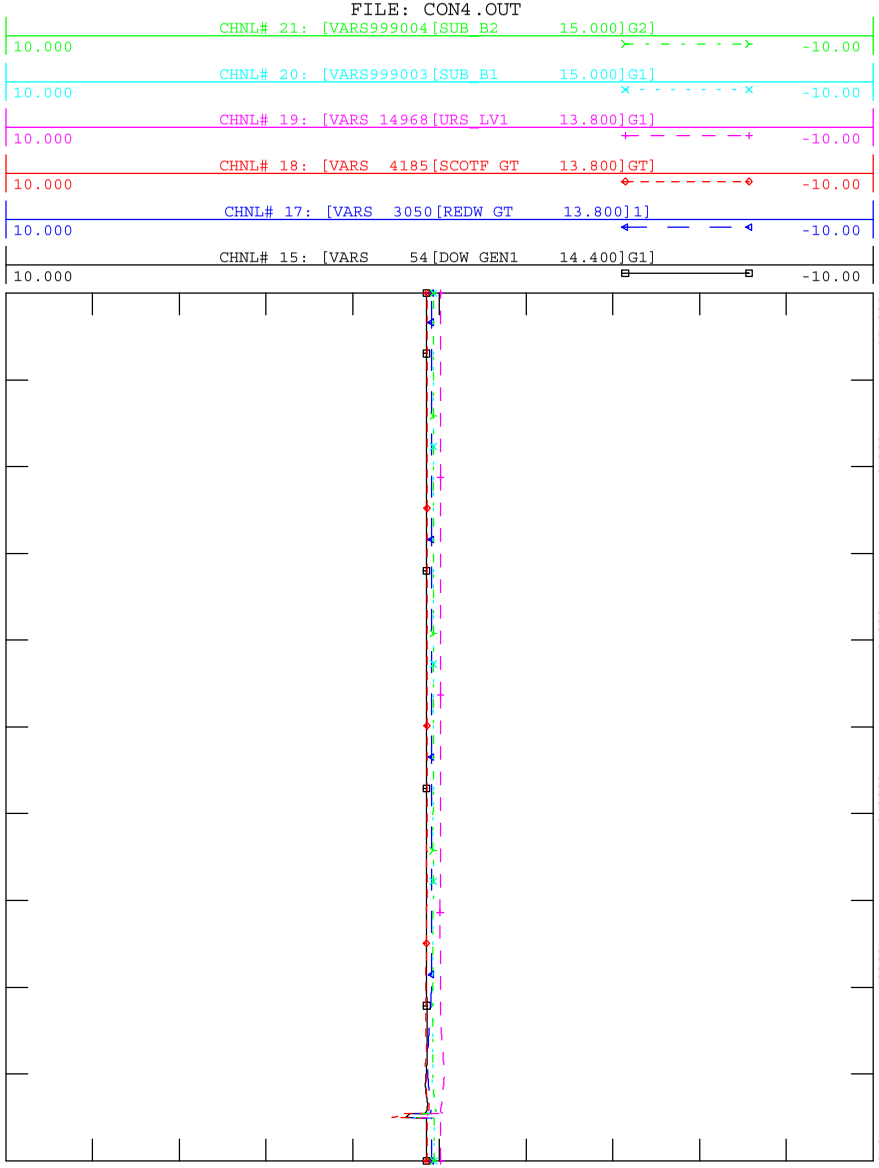
FILE: CON3.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-4

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

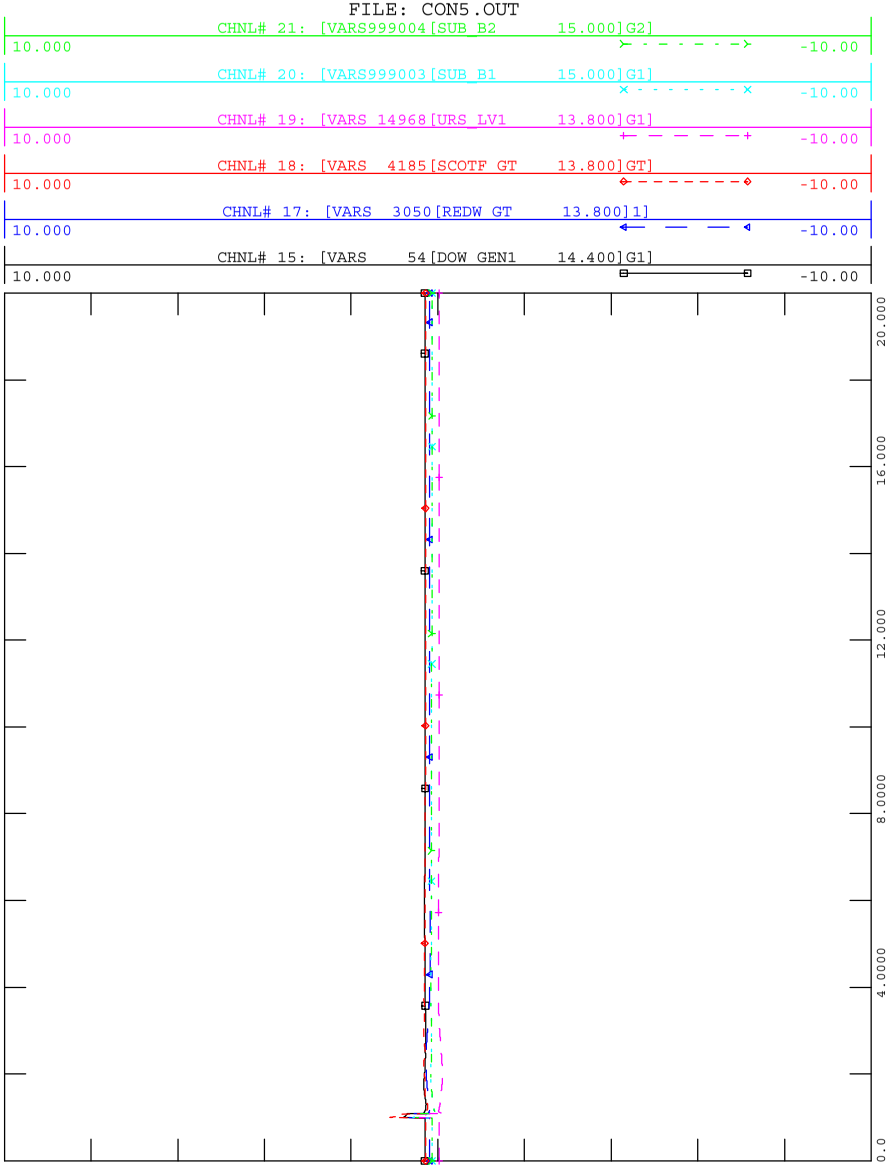
FILE: CON4.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-5

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

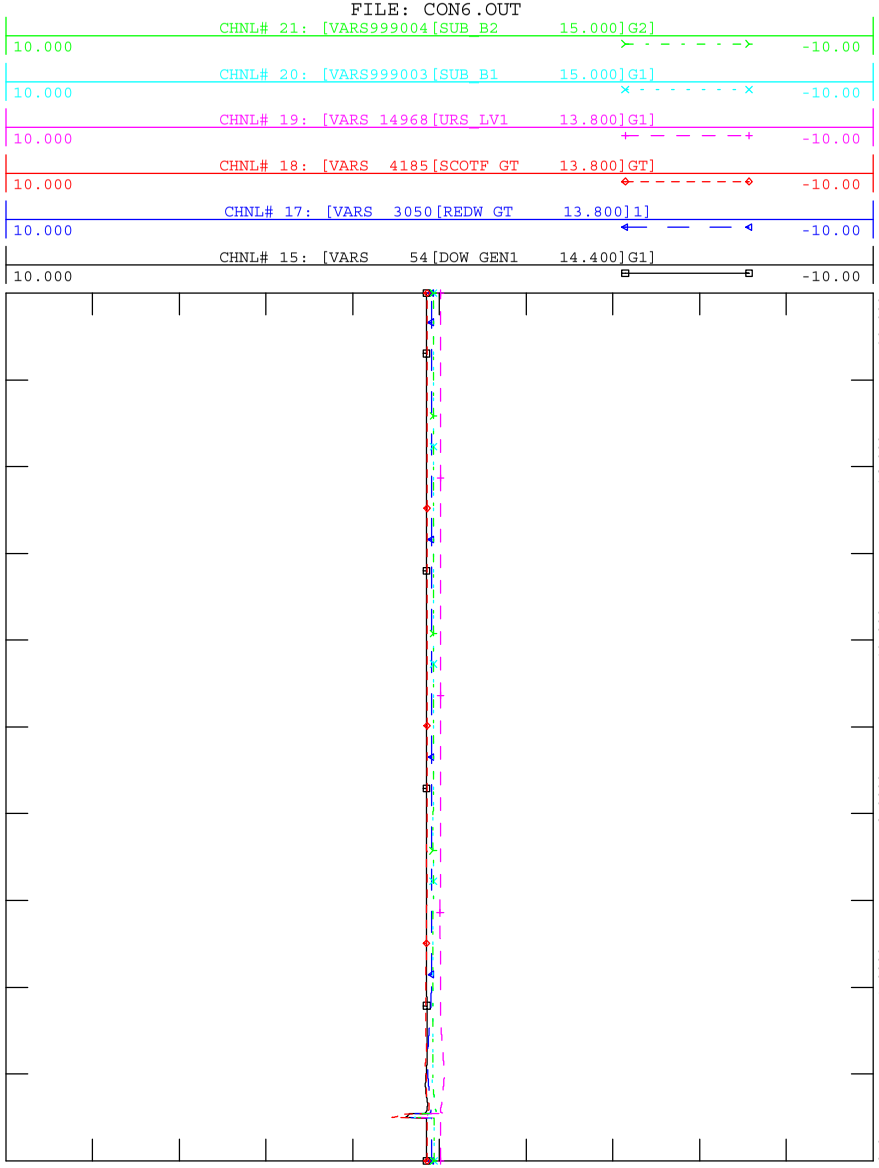
FILE: CON5.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-6

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEATHFIELD 2029S

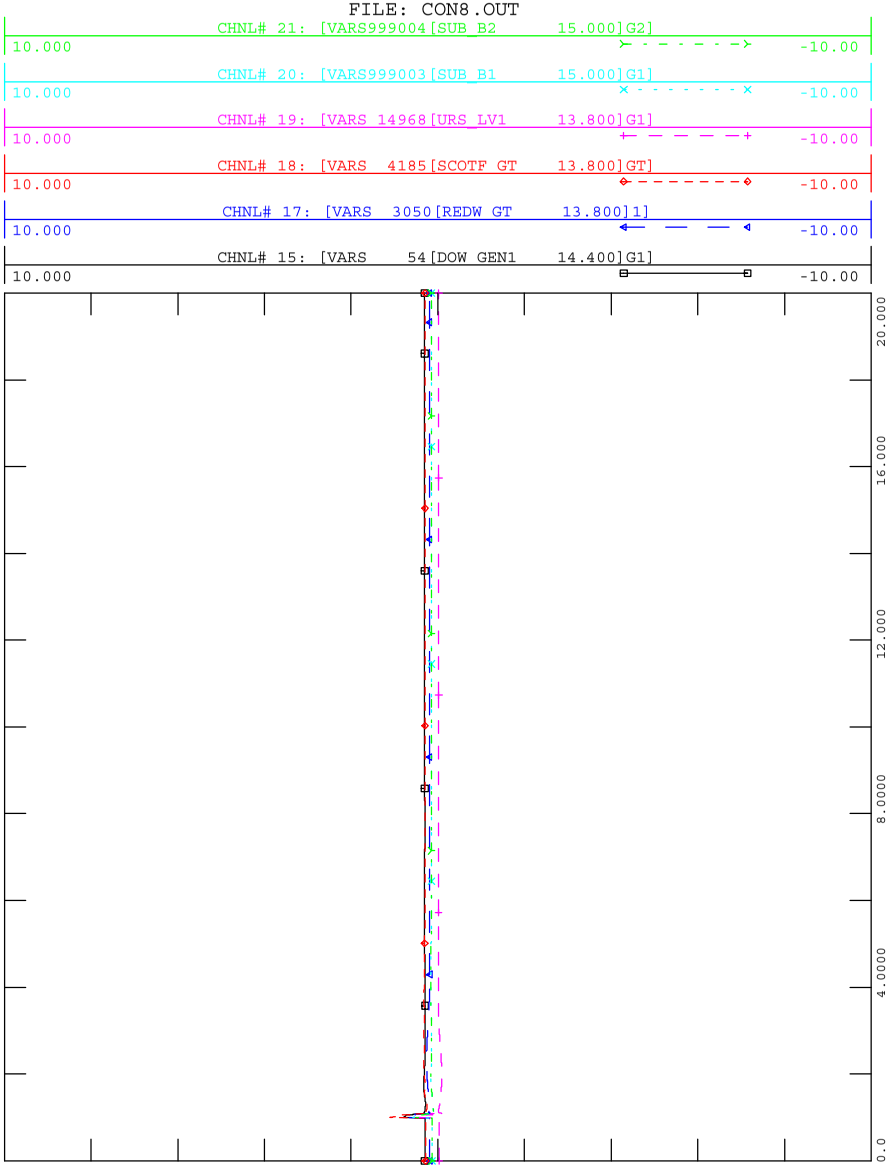
FILE: CON6.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-7

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1206L 3PH FAULT AT HEARTLAND 12S

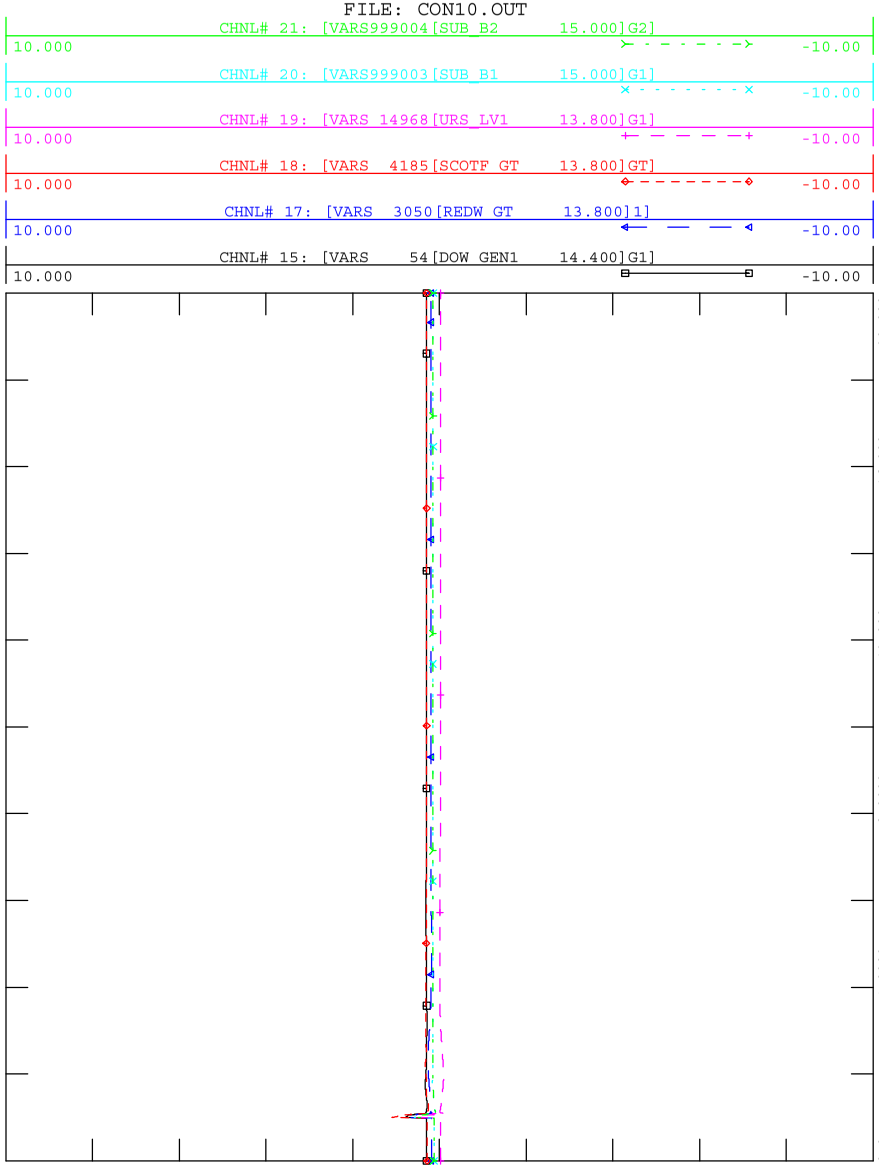
FILE: CON8.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-8

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1212L 3PH FAULT AT HEARTLAND 12S

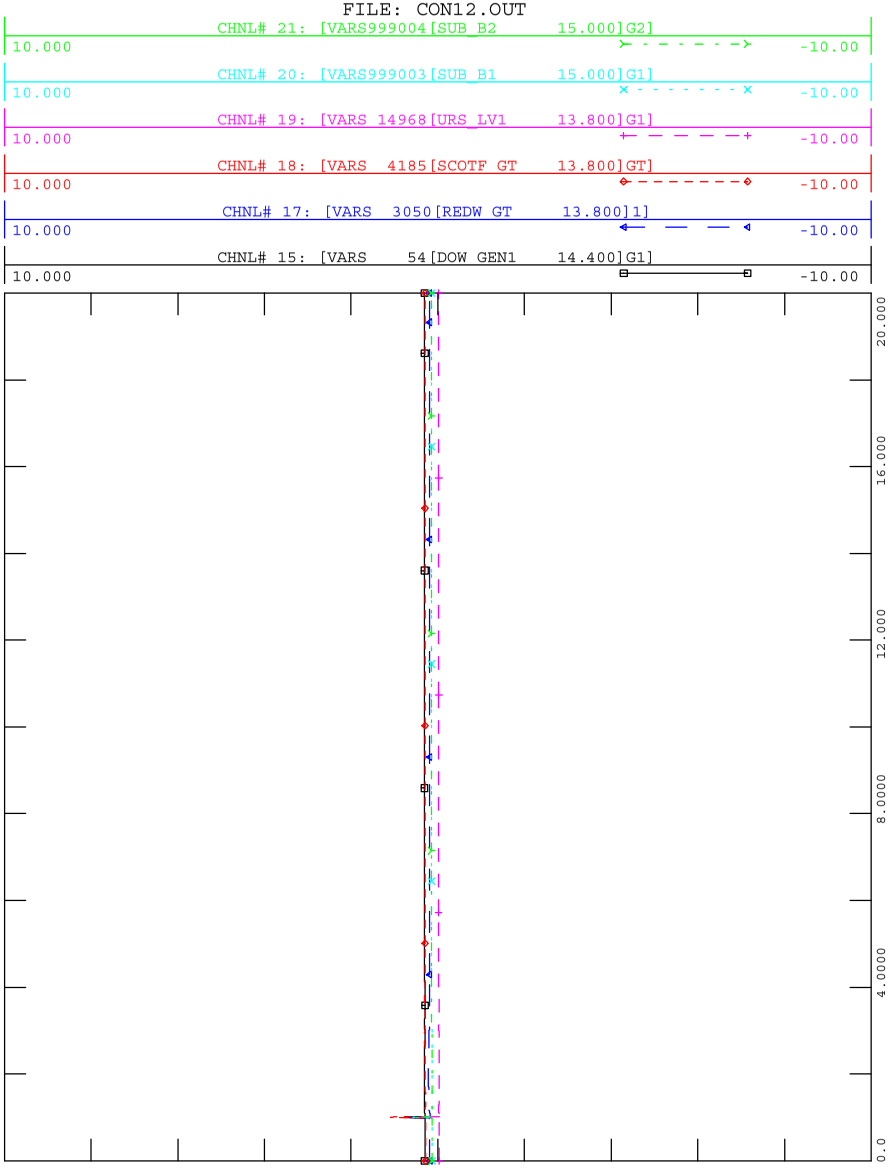
FILE: CON10.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-9

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT



TUE, NOV 25 2025 15:06
FIG C-SC3-10

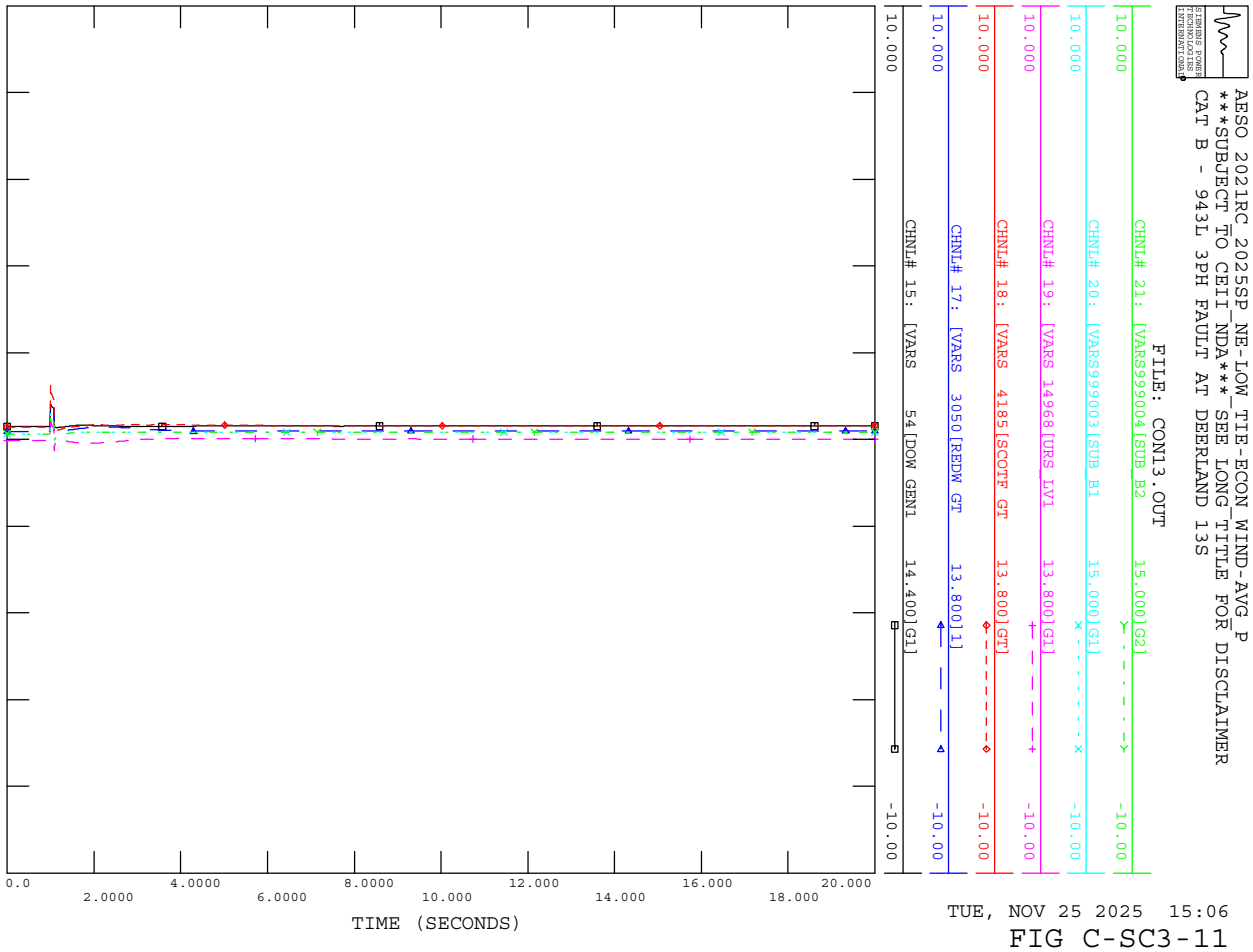


FIG C-SC3-11

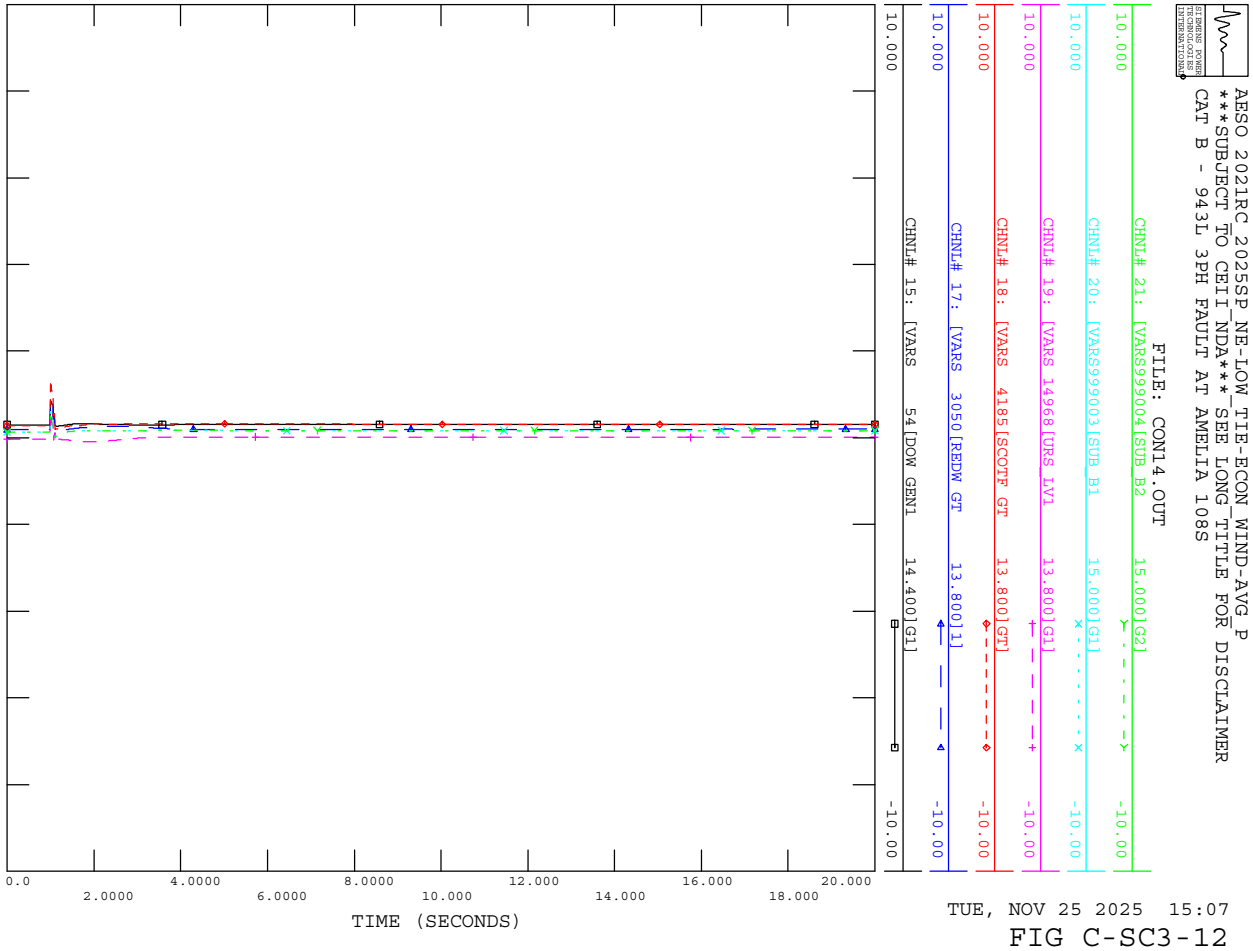


FIG C-SC3-12

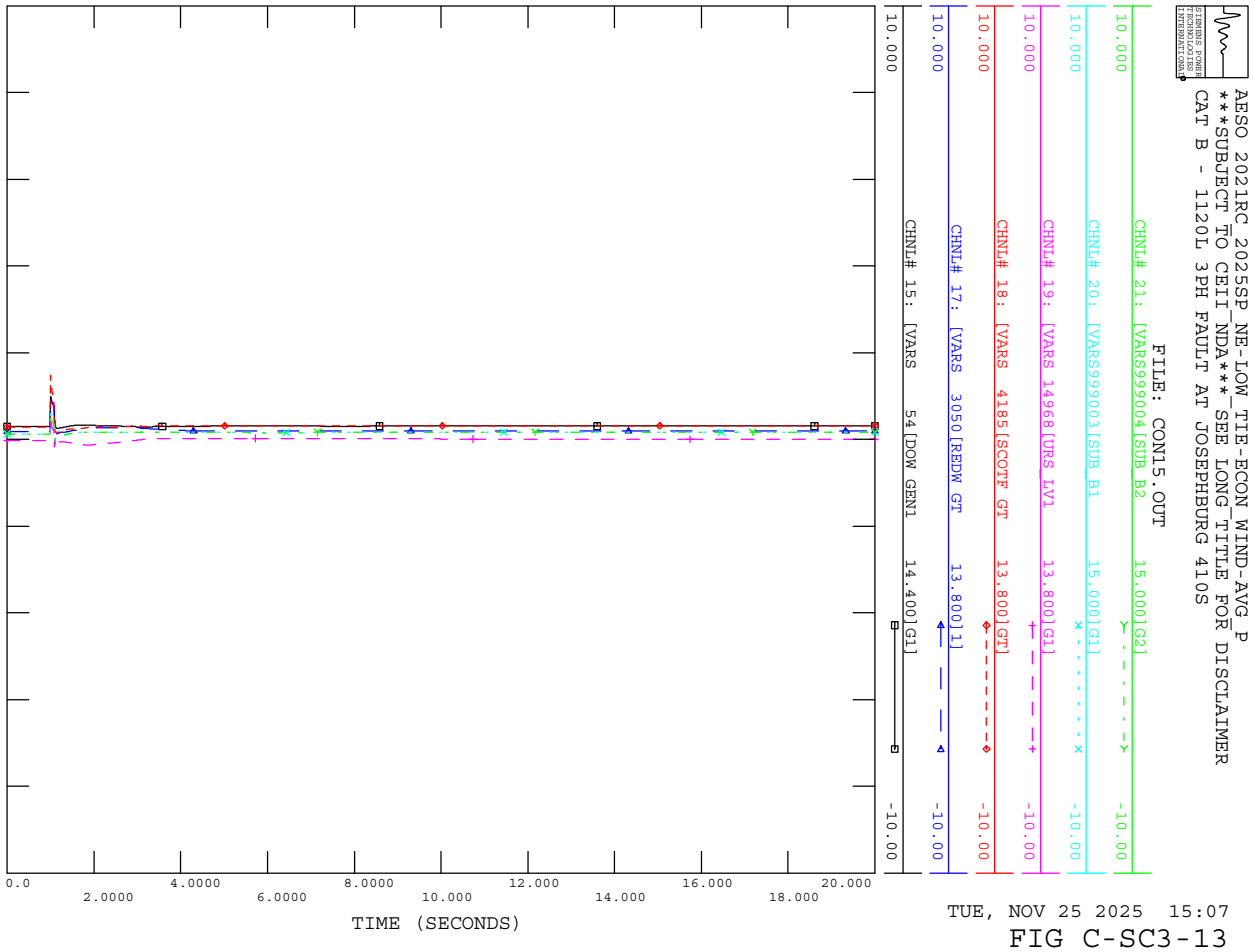


FIG C-SC3-13

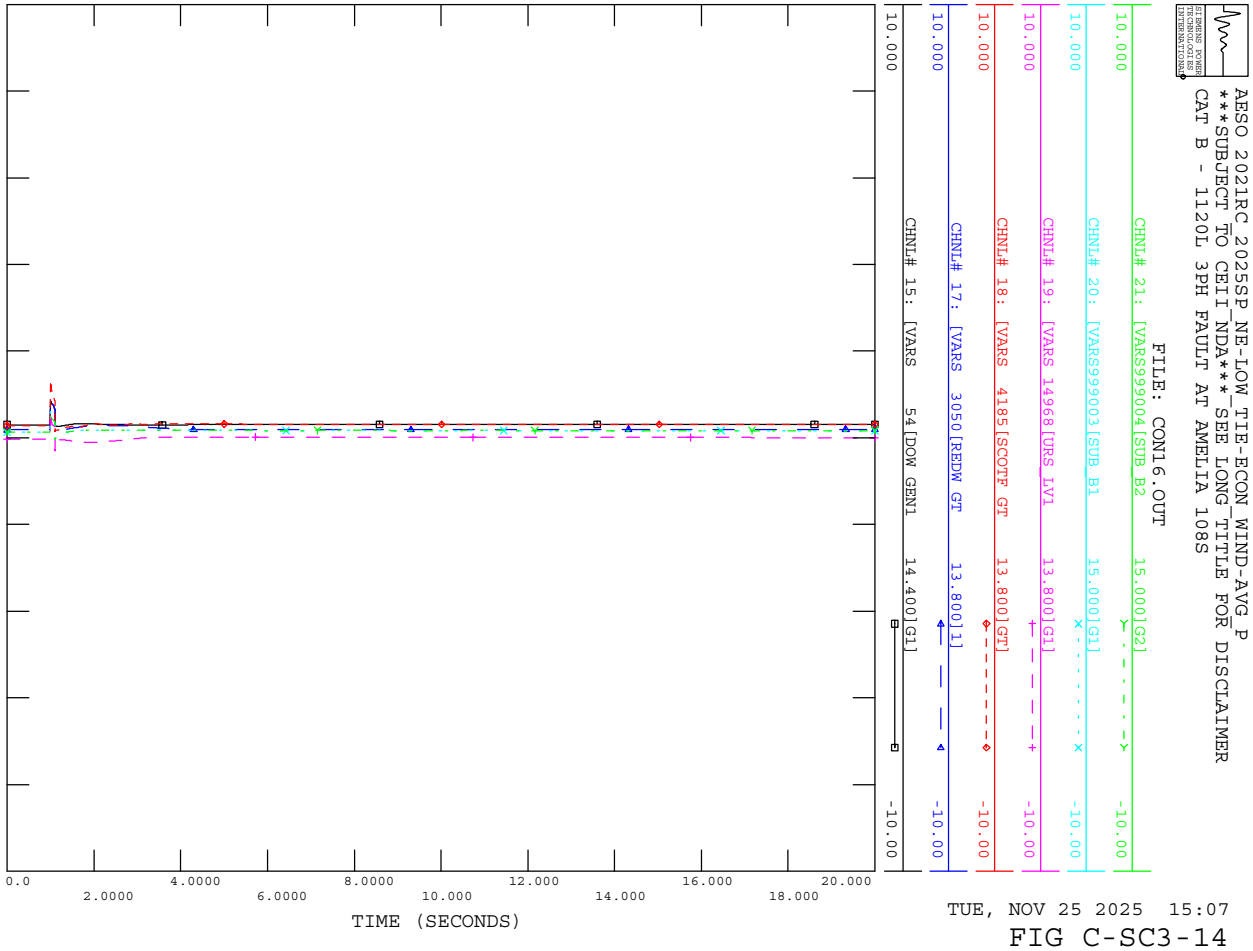
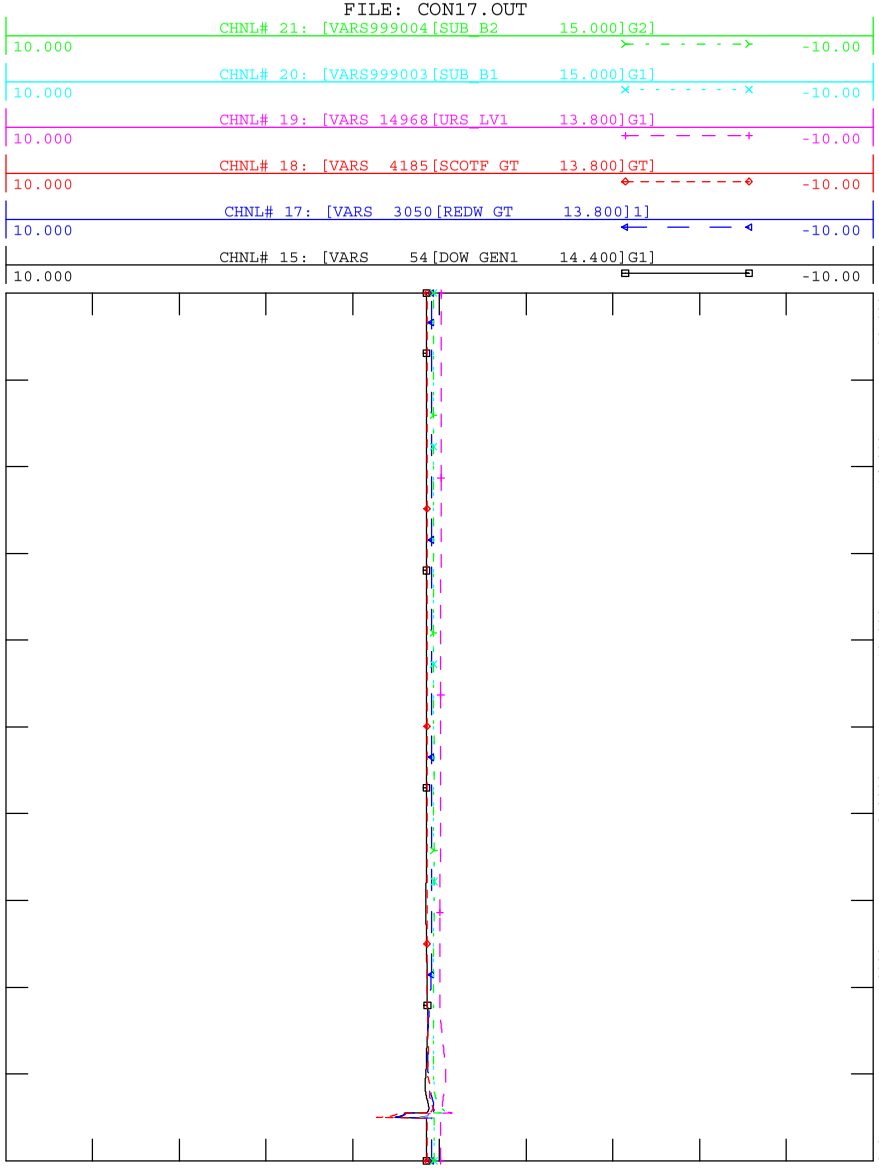


FIG C-SC3-14

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT LAMOUREUX 71S

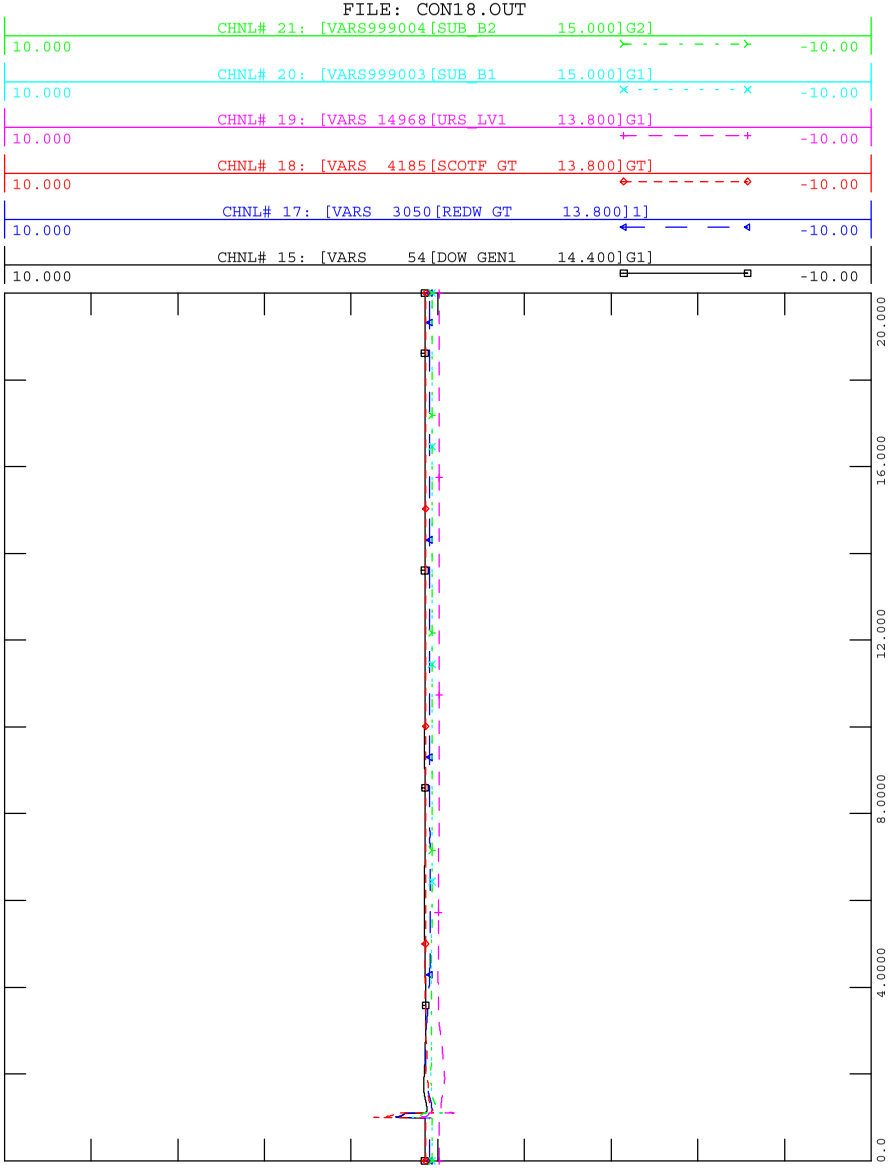
FILE: CON17.OUT



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FIG C-SC3-15

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT



TUE, NOV 25 2025 15:07
FIG C-SC3-16

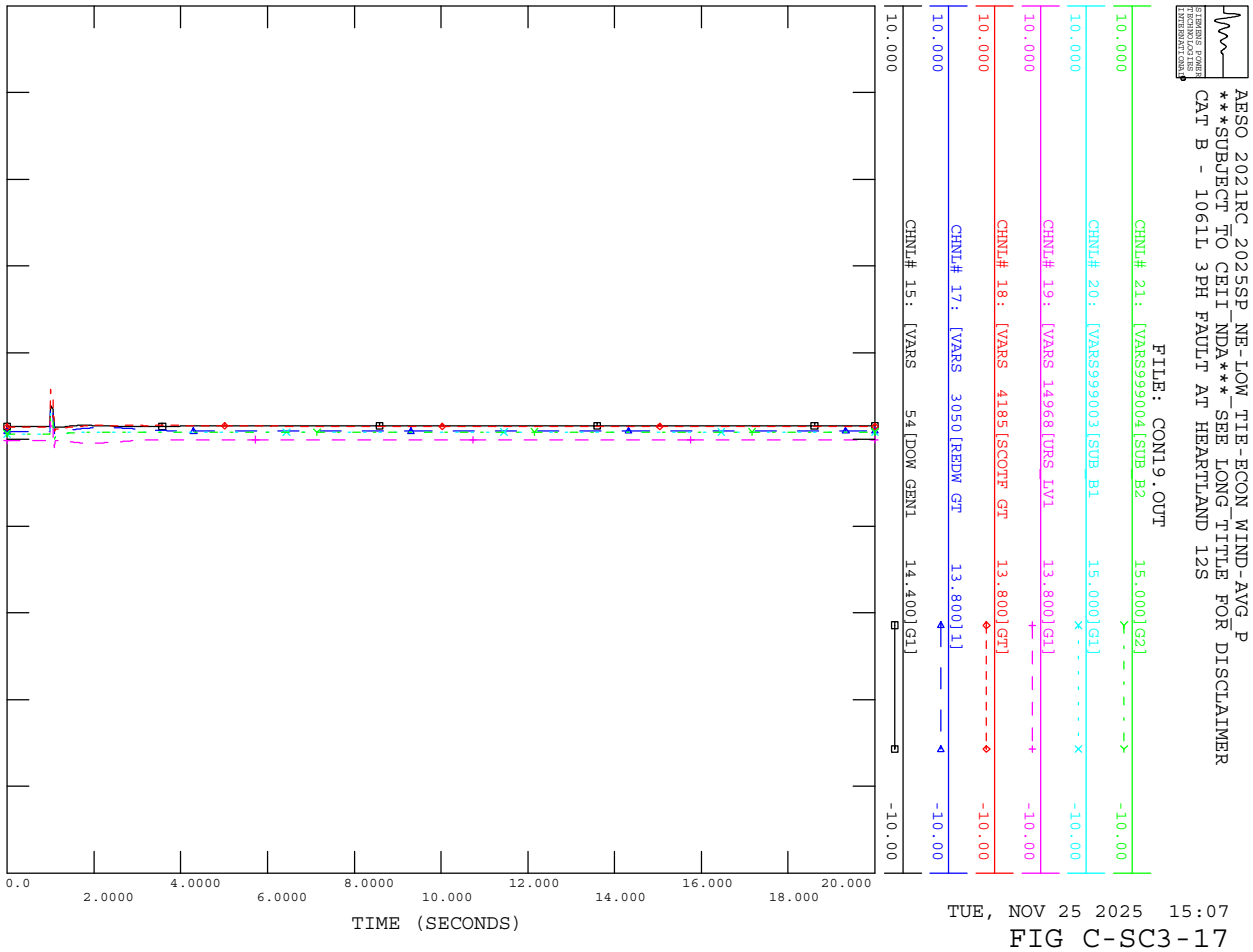


FIG C-SC3-17

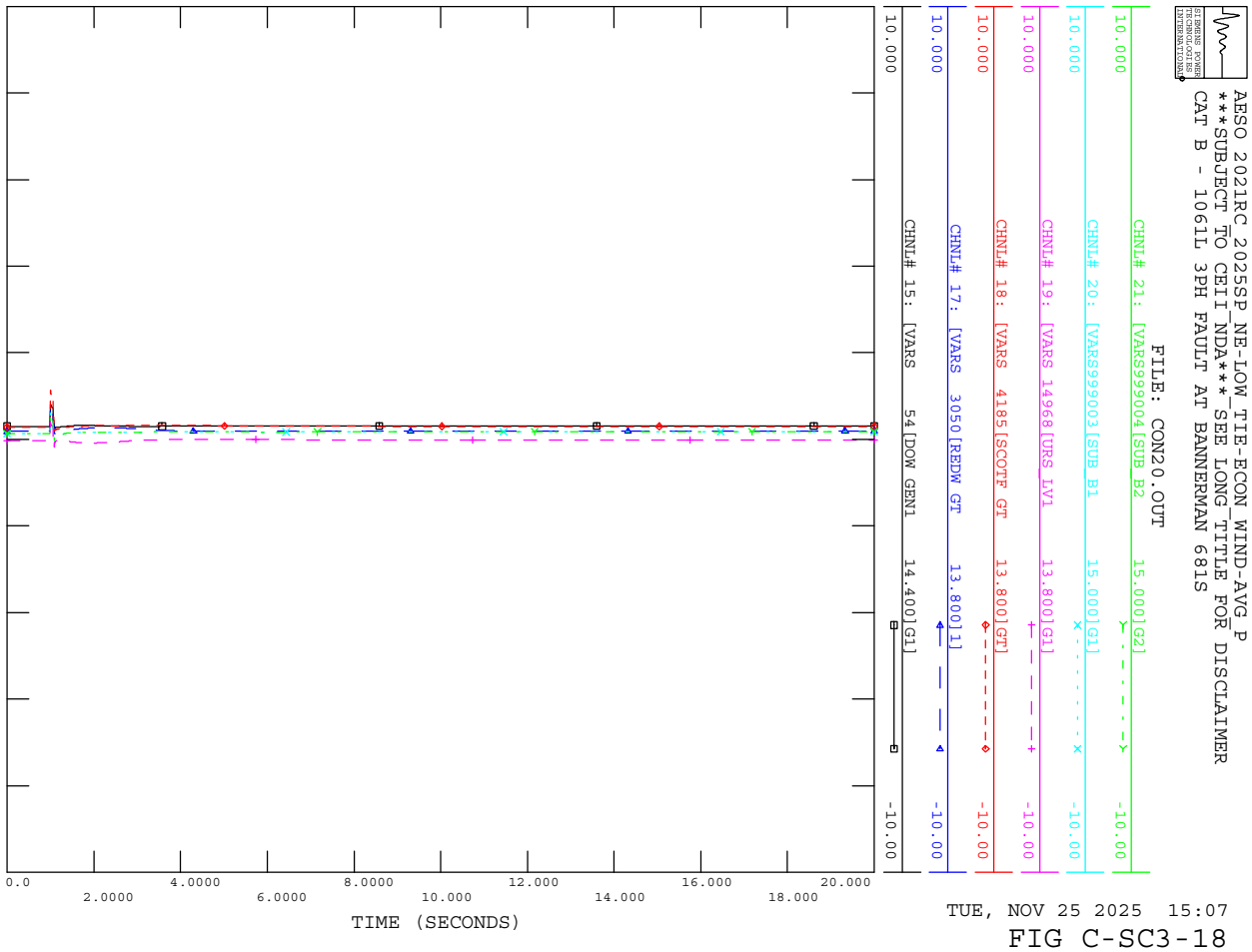


FIG C-SC3-18

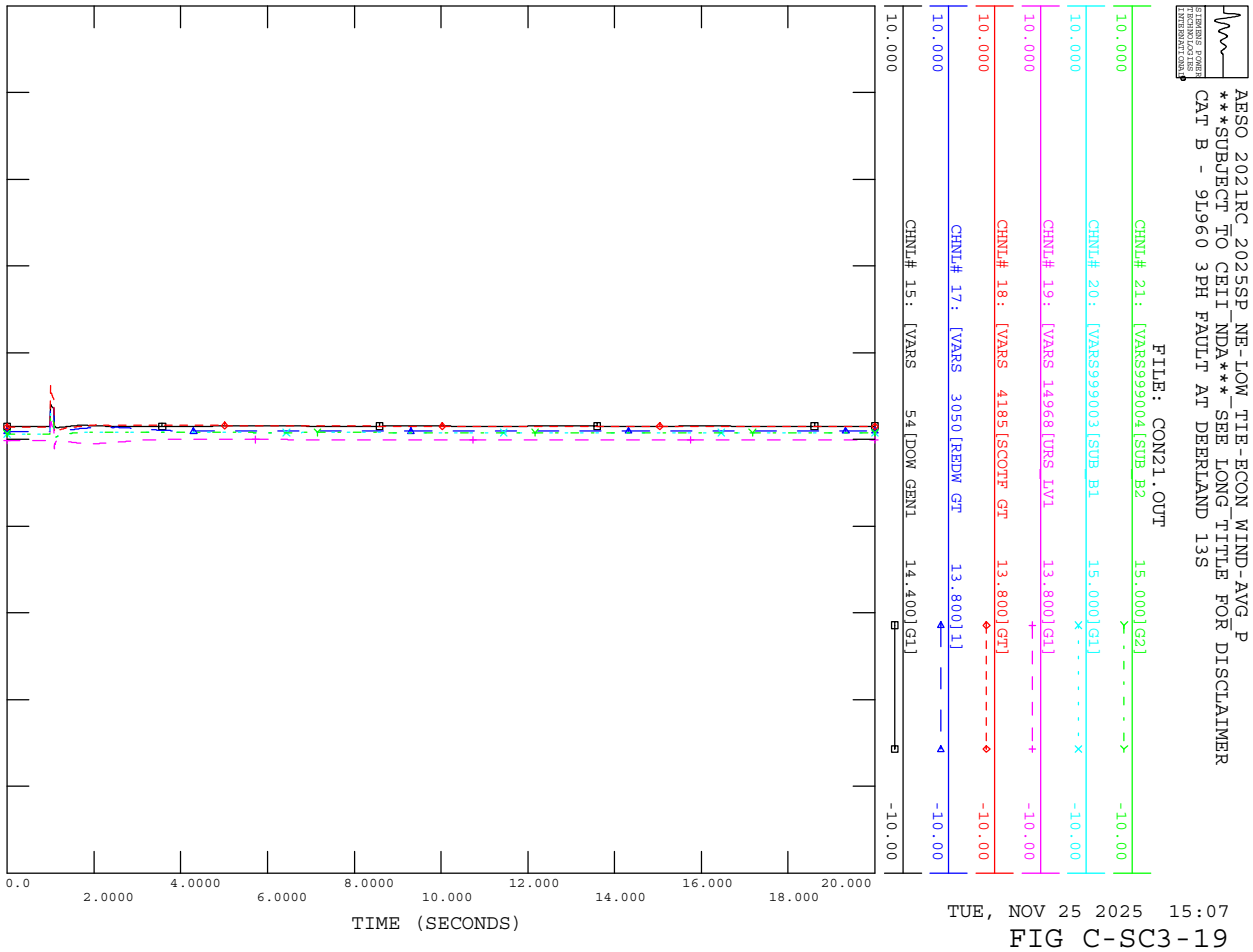


FIG C-SC3-19

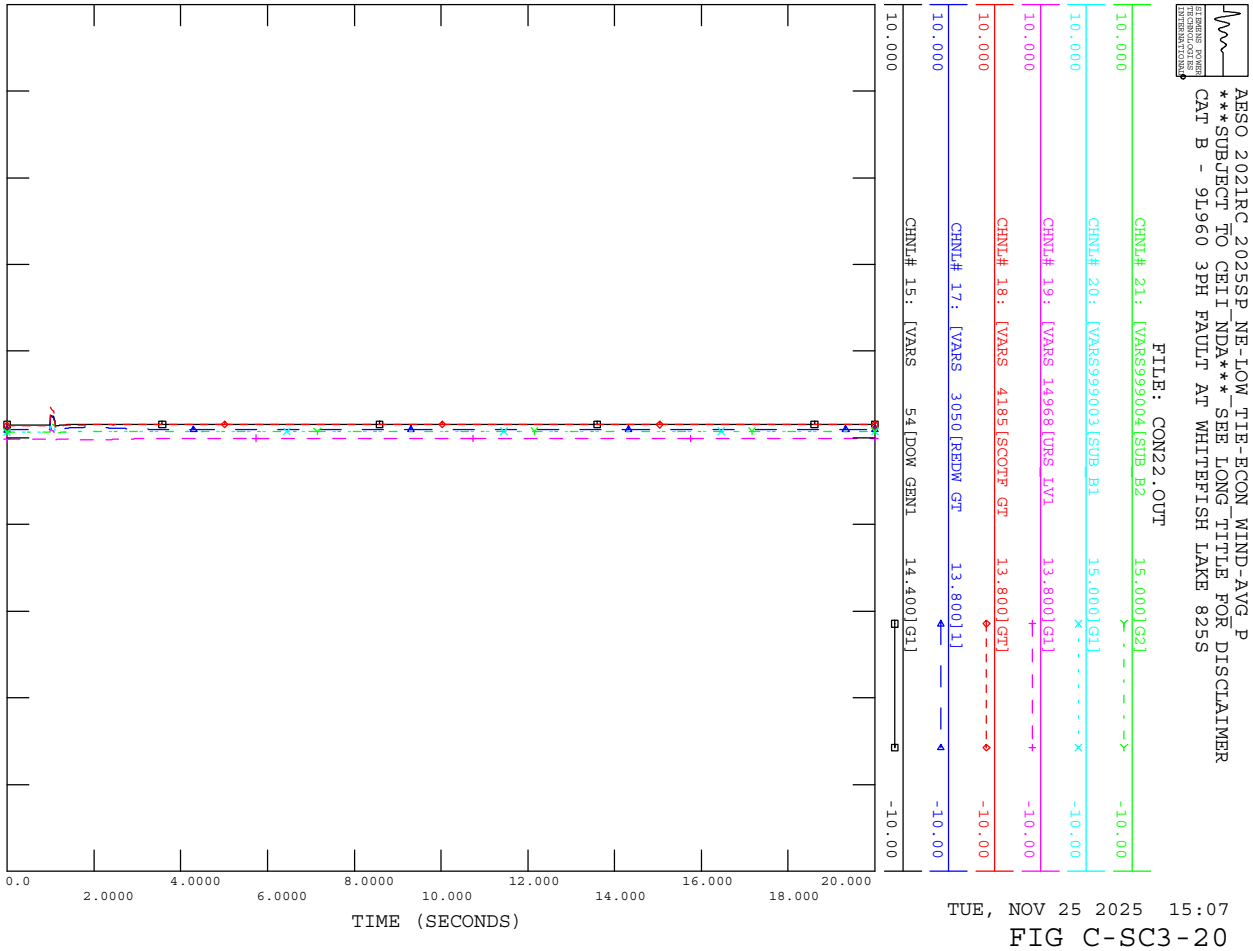


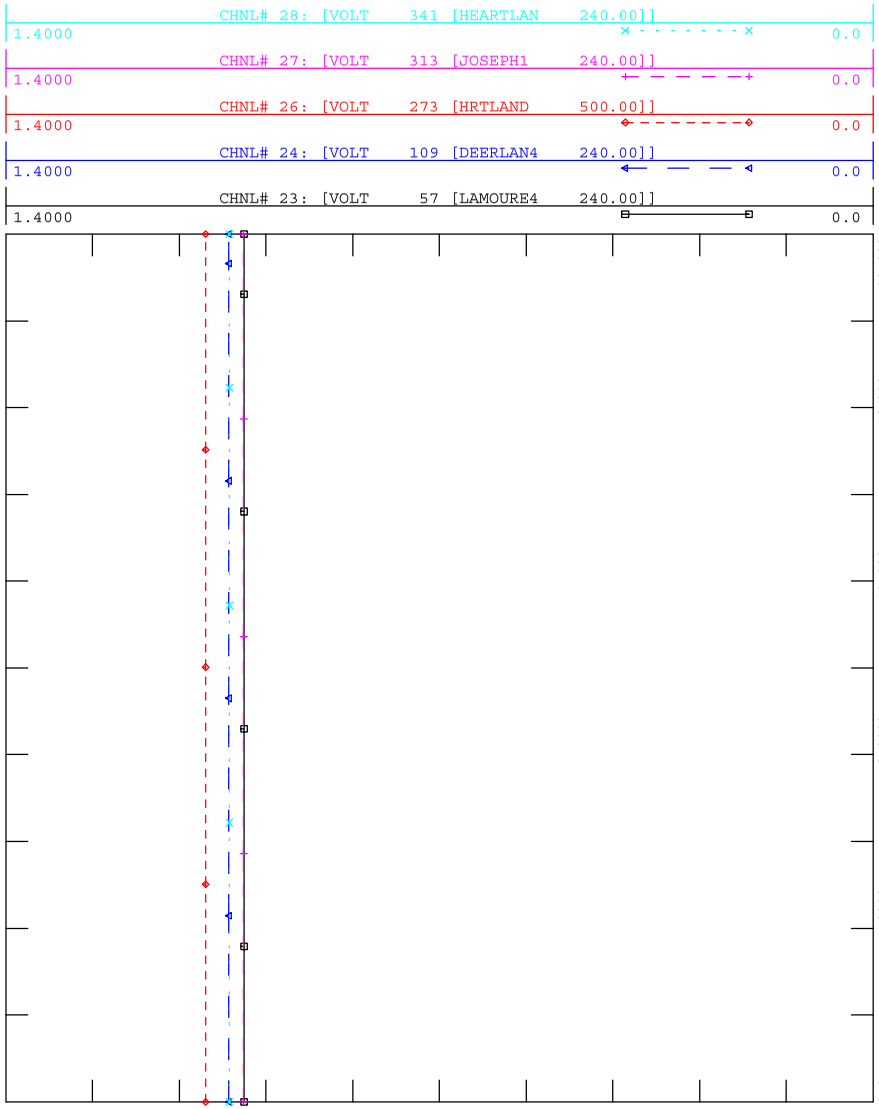
FIG C-SC3-20

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT A - FLAT START

FILE: CON0.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-1

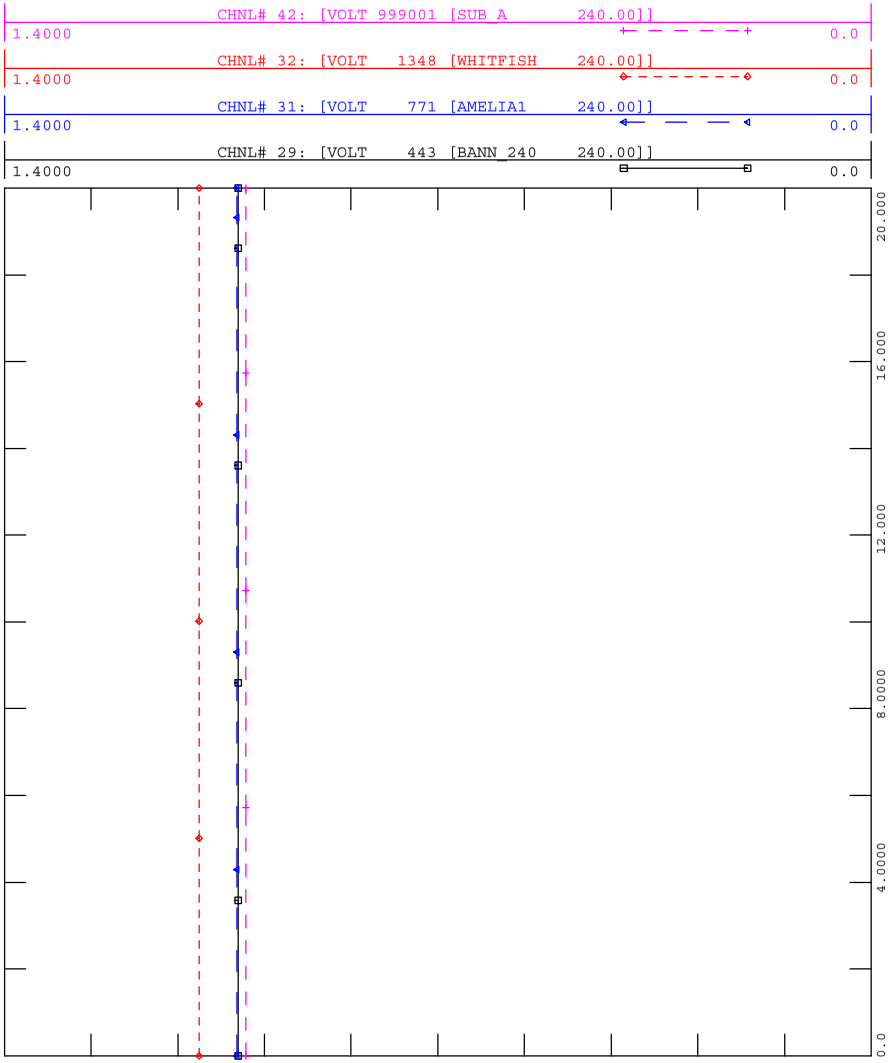


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT A - FLAT START

FILE: CON0.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-1

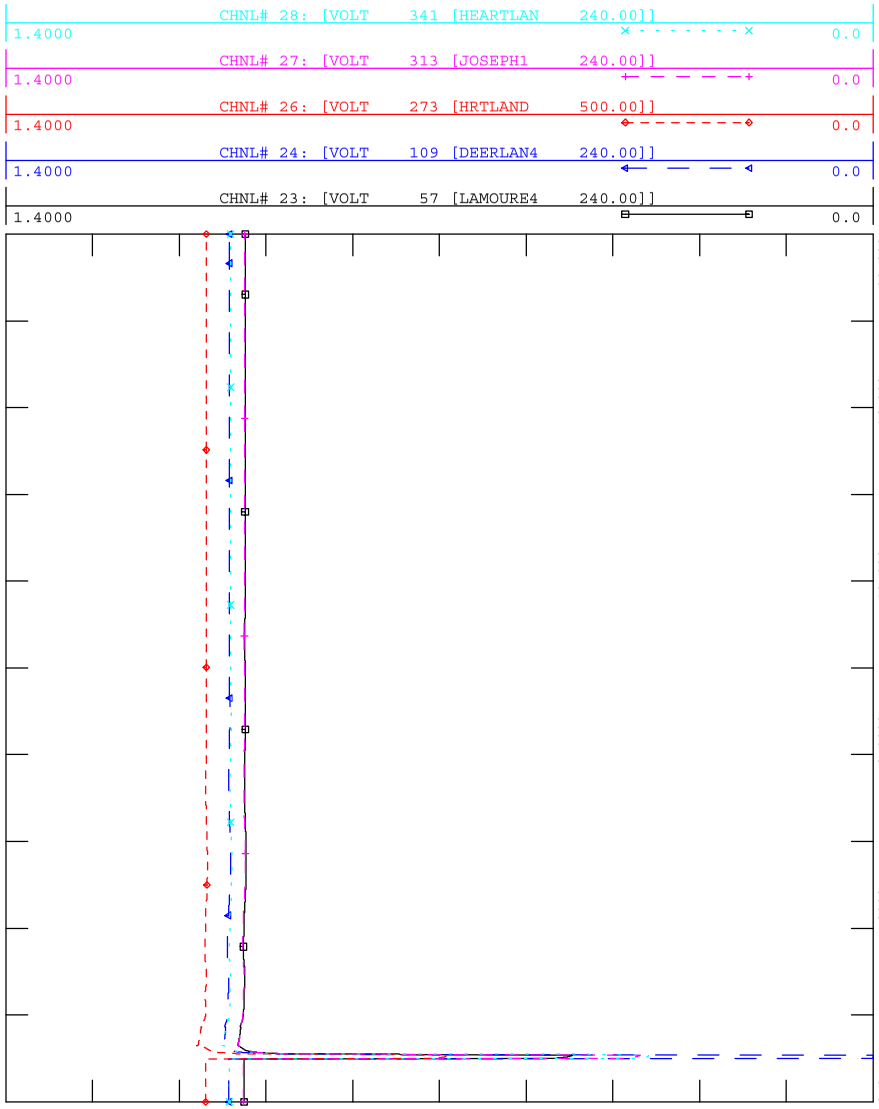


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1054L 3PH FAULT AT DEERLAND 13S

FILE: CON1.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-2

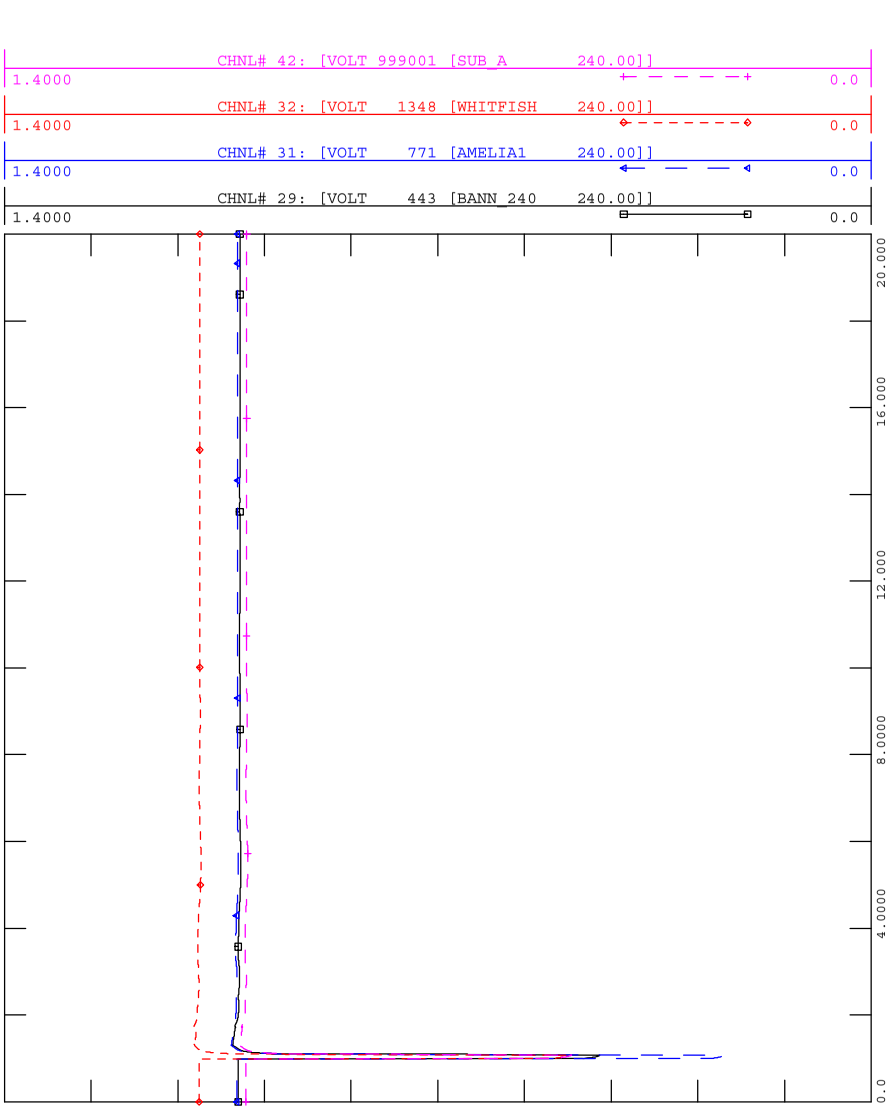


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1054L 3PH FAULT AT DEERLAND 13S

FILE: CON1.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-2



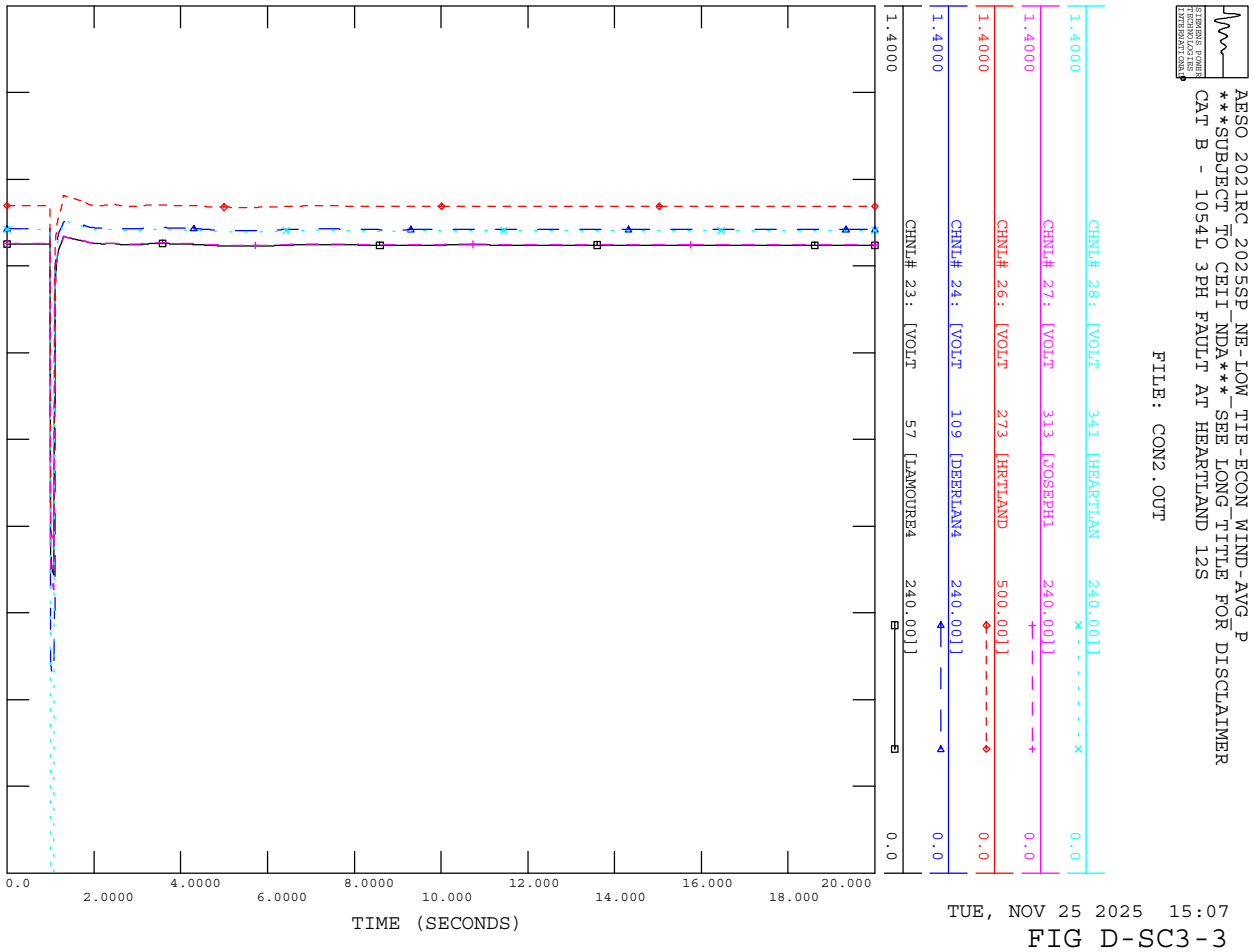


FIG D-SC3-3

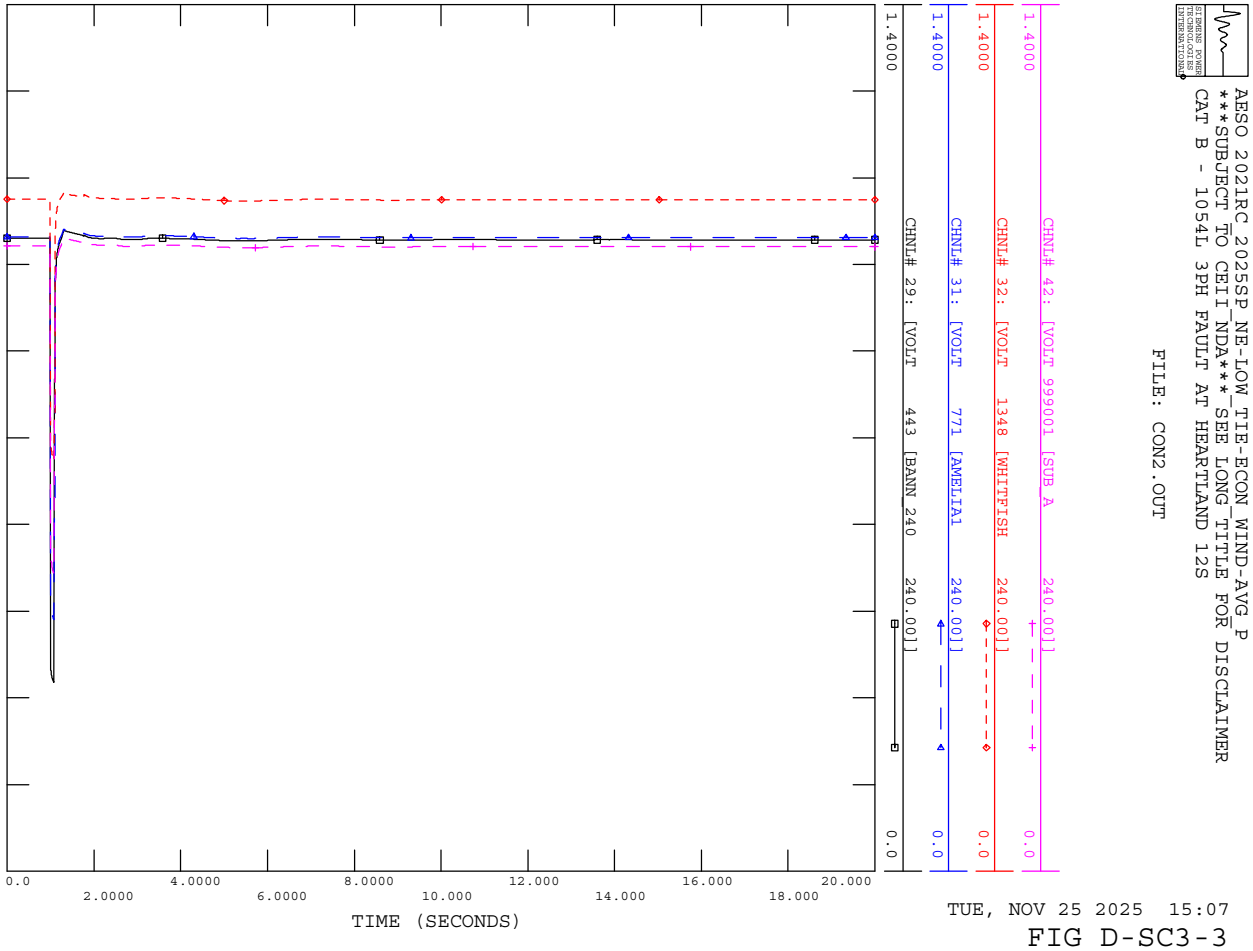


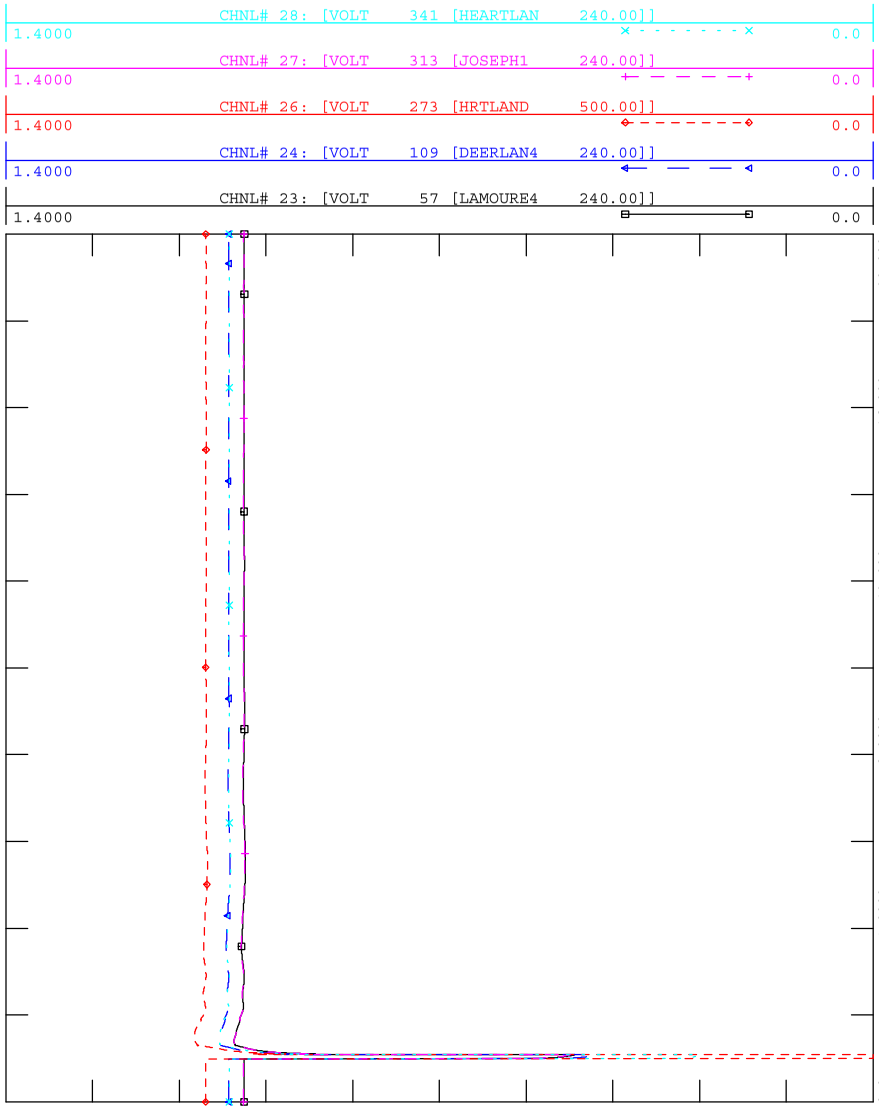
FIG D-SC3-3

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEARTLAND 12S

FILE: CON3.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-4

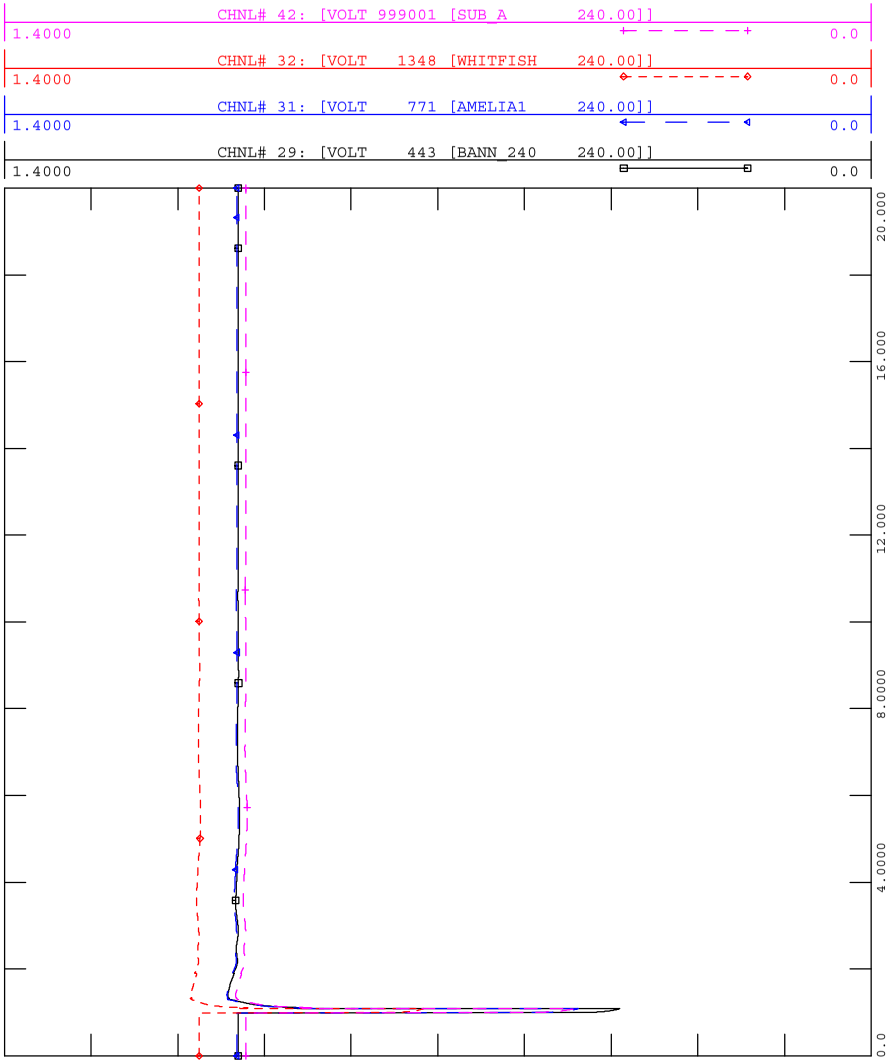


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEARTLAND 12S

FILE: CON3.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-4

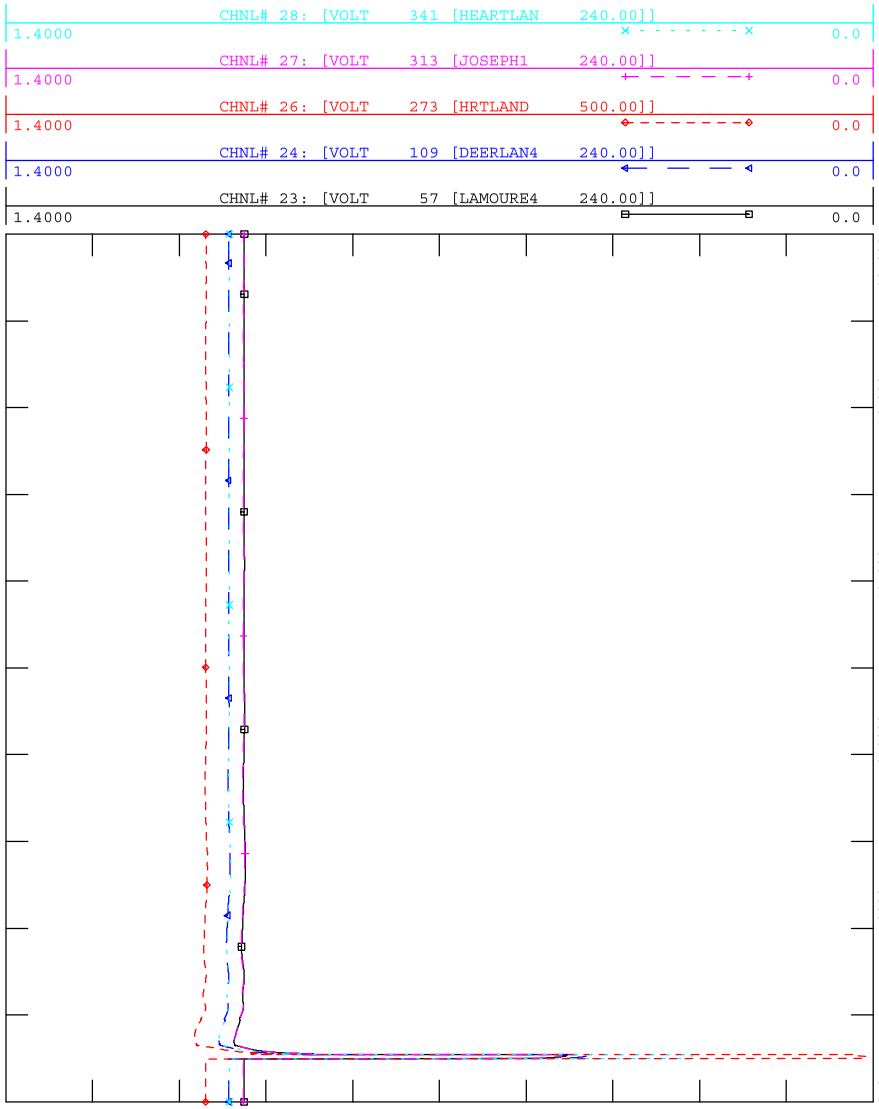


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

FILE: CON4.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-5

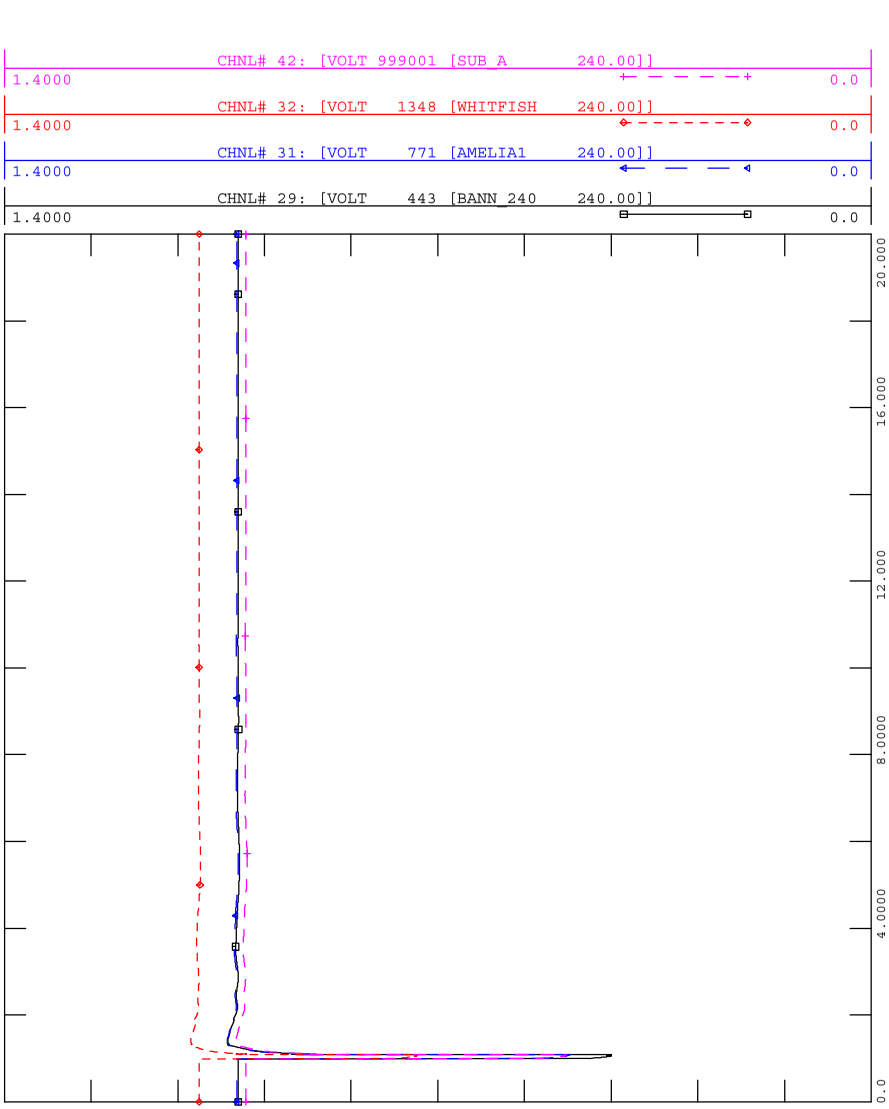


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

FILE: CON4.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-5

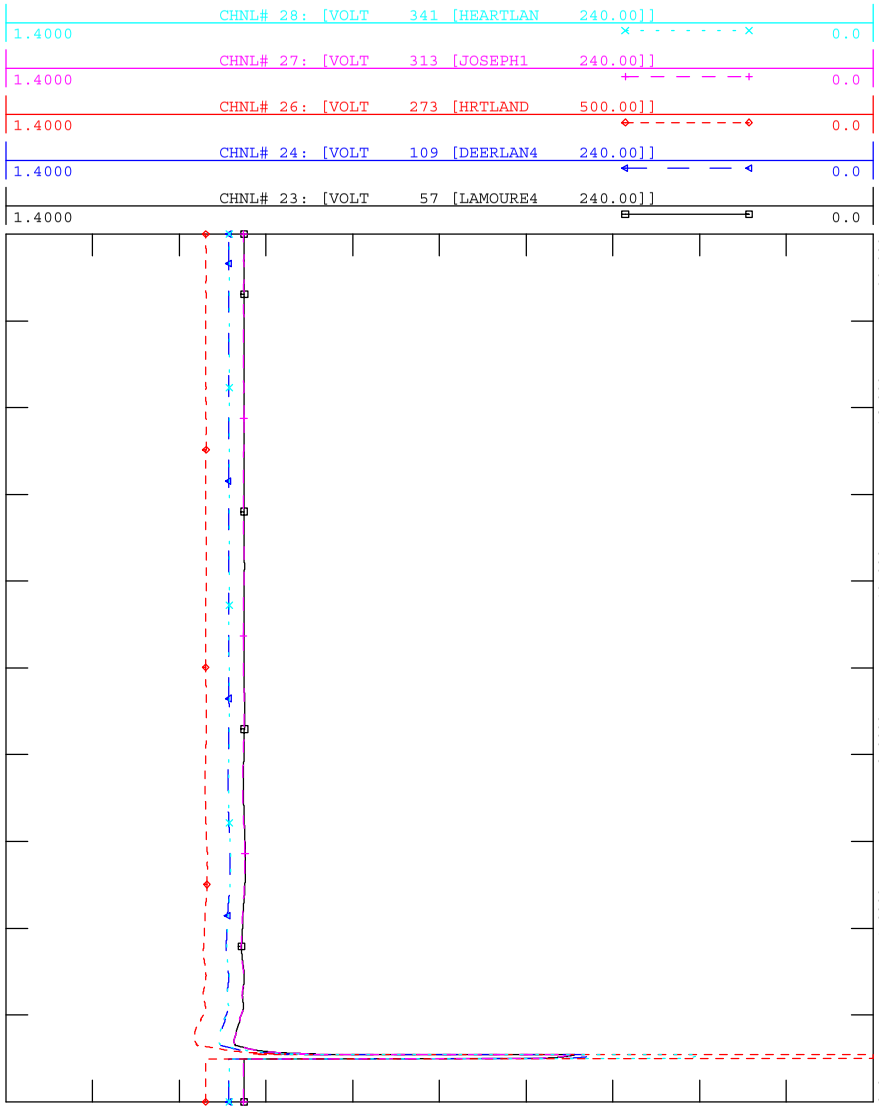


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

FILE: CON5.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-6

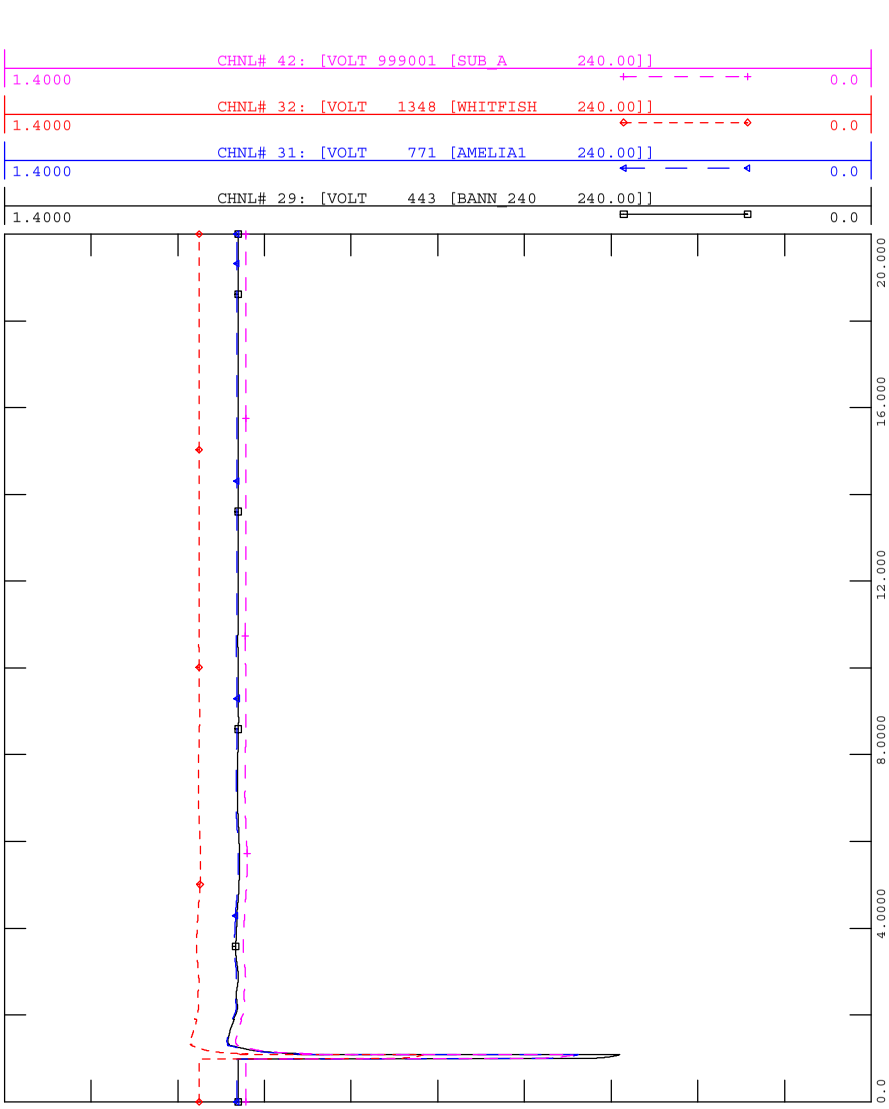


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

FILE: CON5.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-6



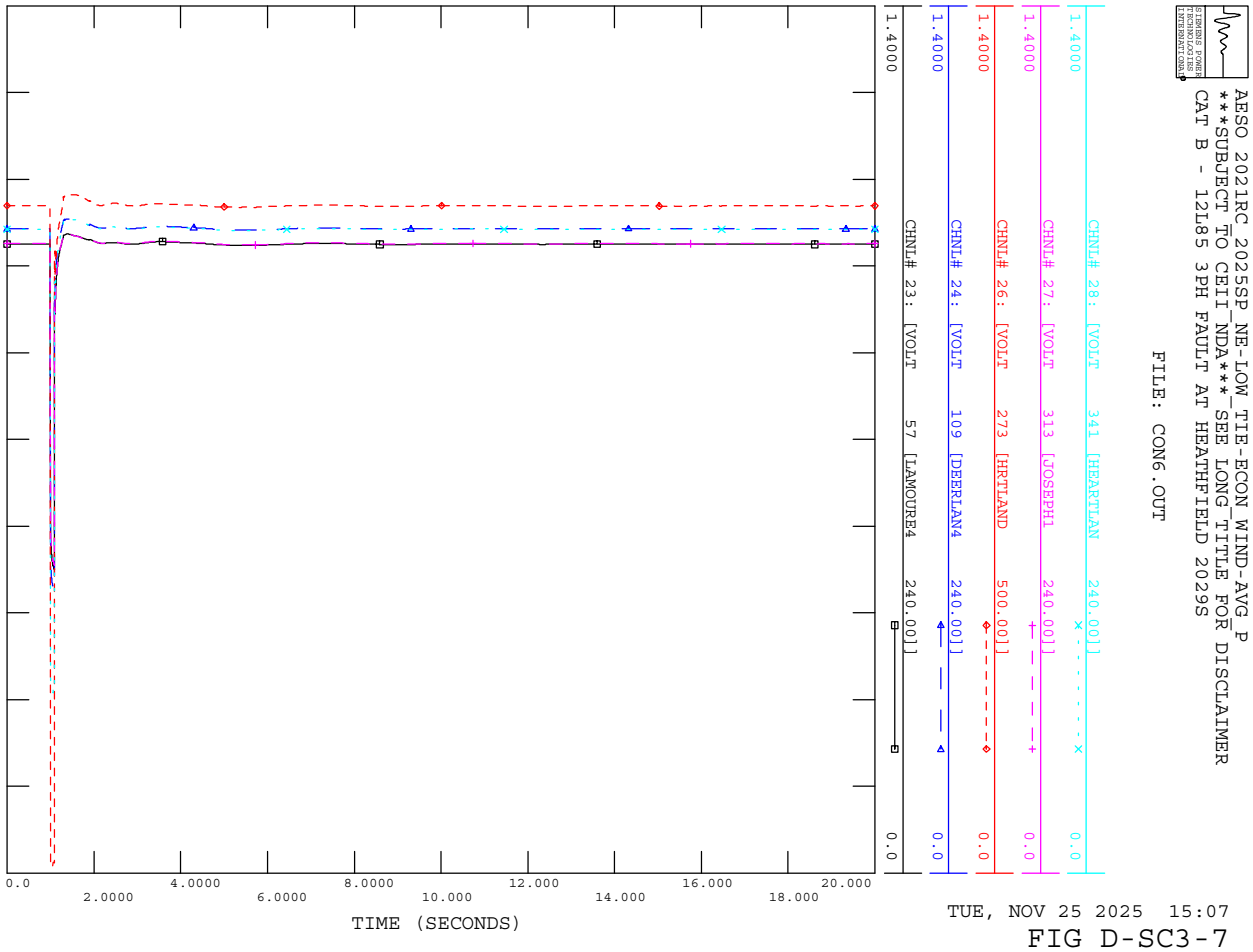


FIG D-SC3-7

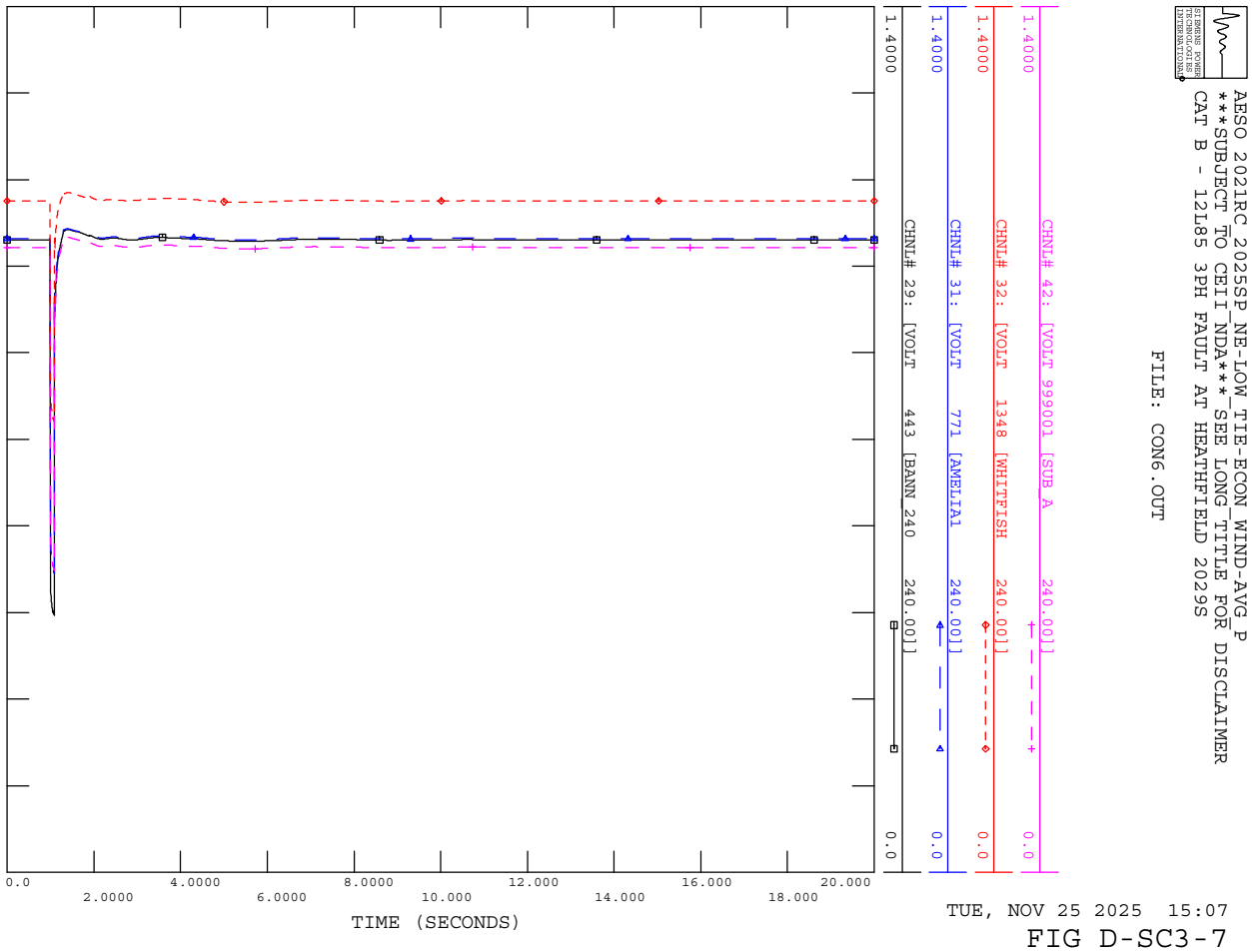
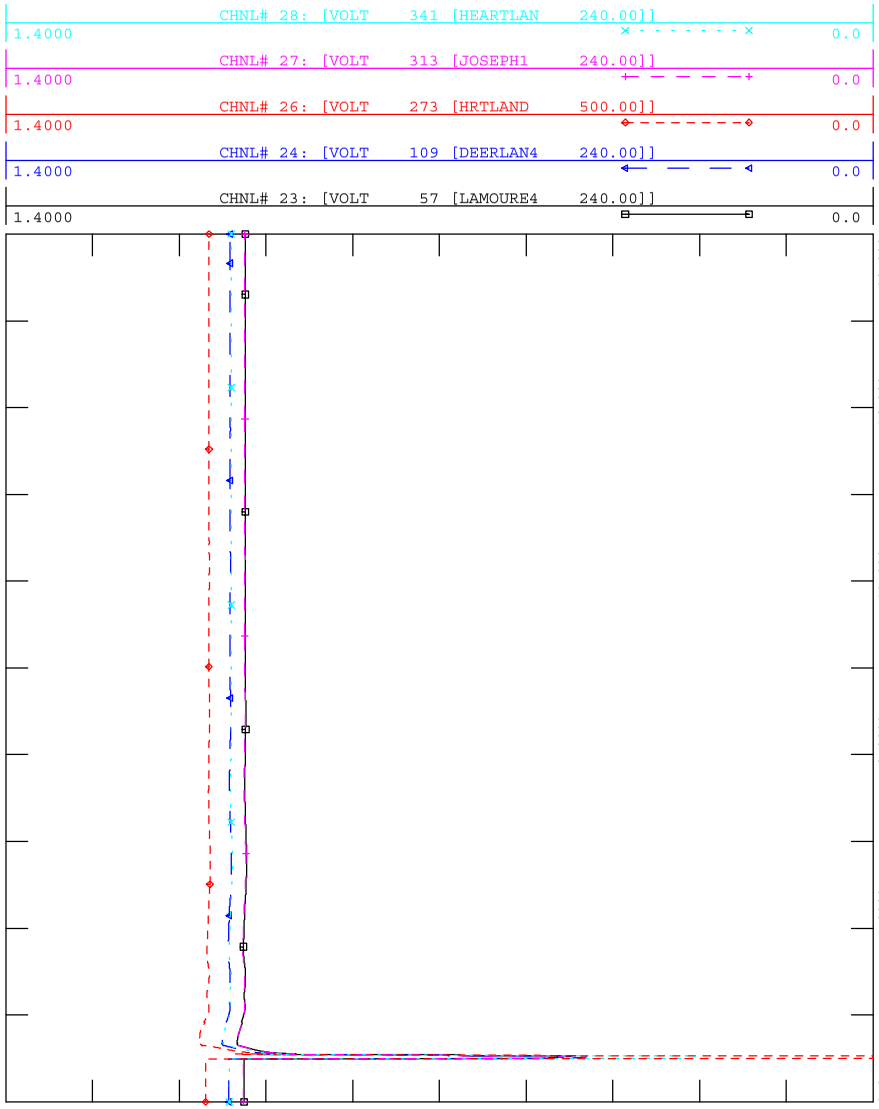


FIG D-SC3-7

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1206L 3PH FAULT AT HEARTLAND 12S

FILE: CON8.OUT

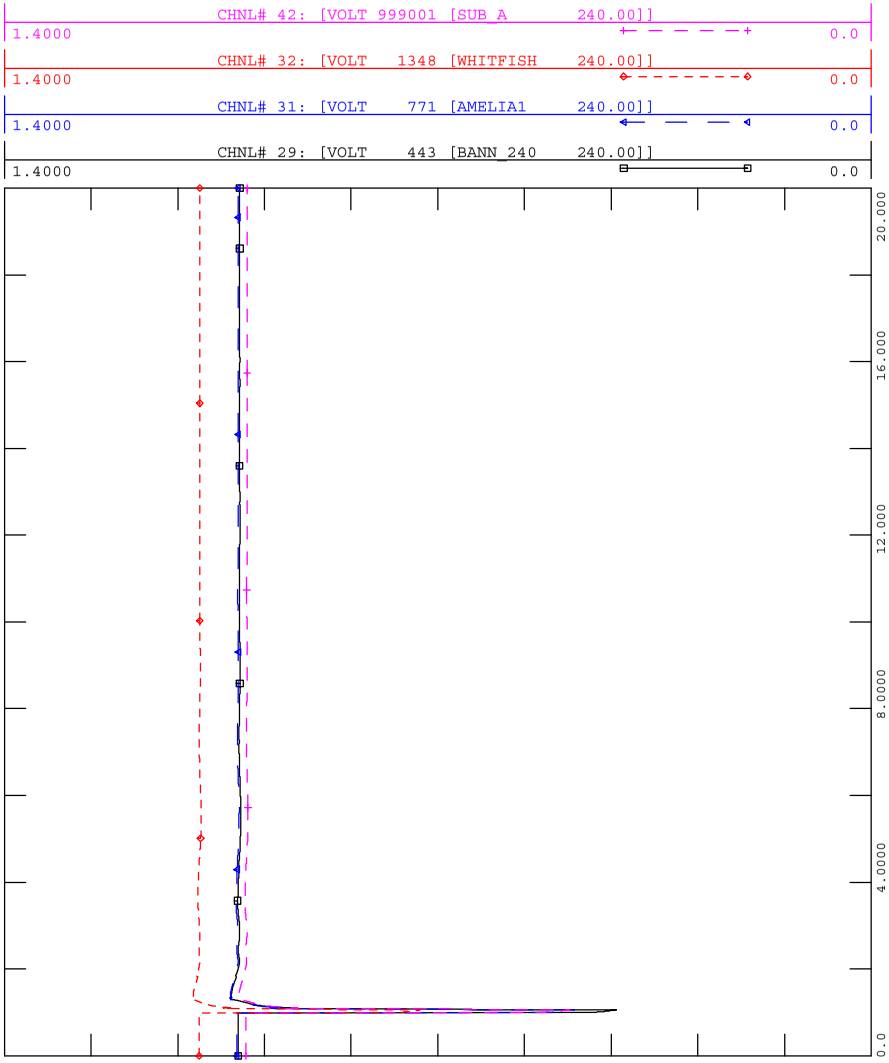


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FIG D-SC3-8

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1206L 3PH FAULT AT HEARTLAND 12S

FILE: CON8.OUT



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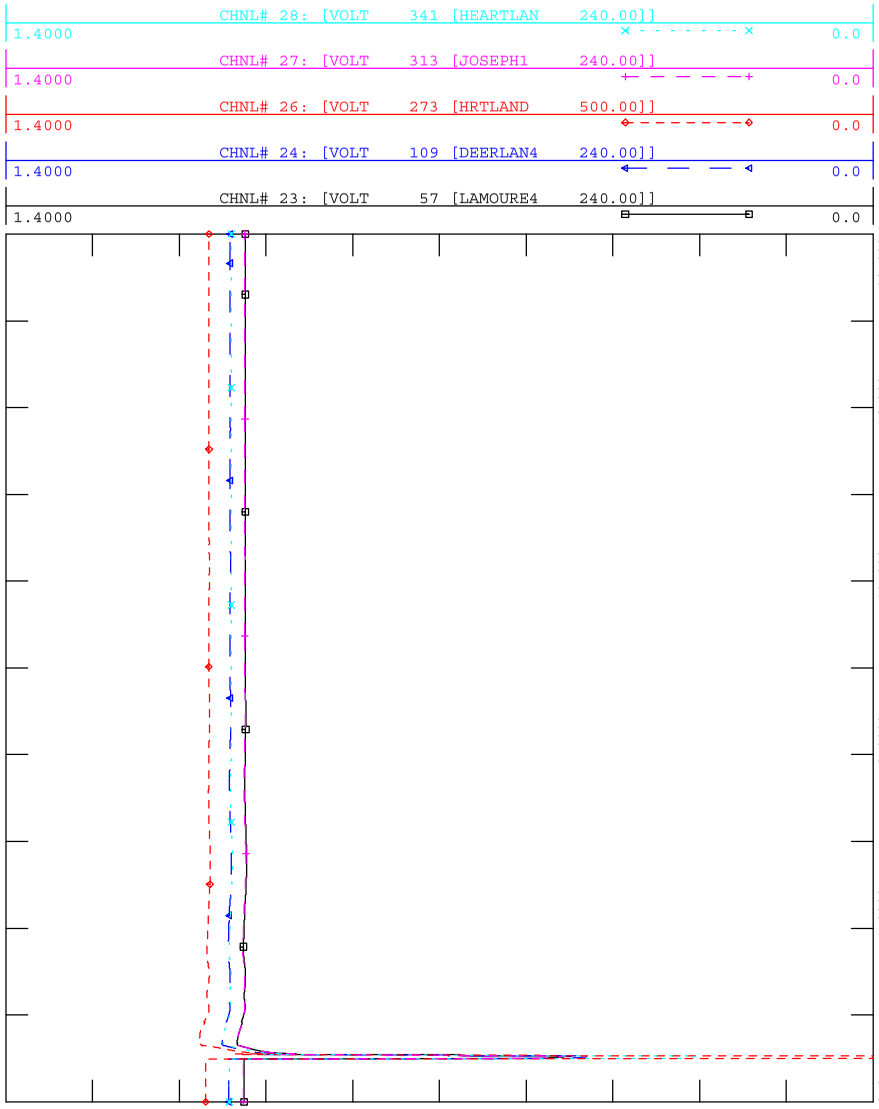
FIG D-SC3-8

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1212L 3PH FAULT AT HEARTLAND 12S

FILE: CON10.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-9

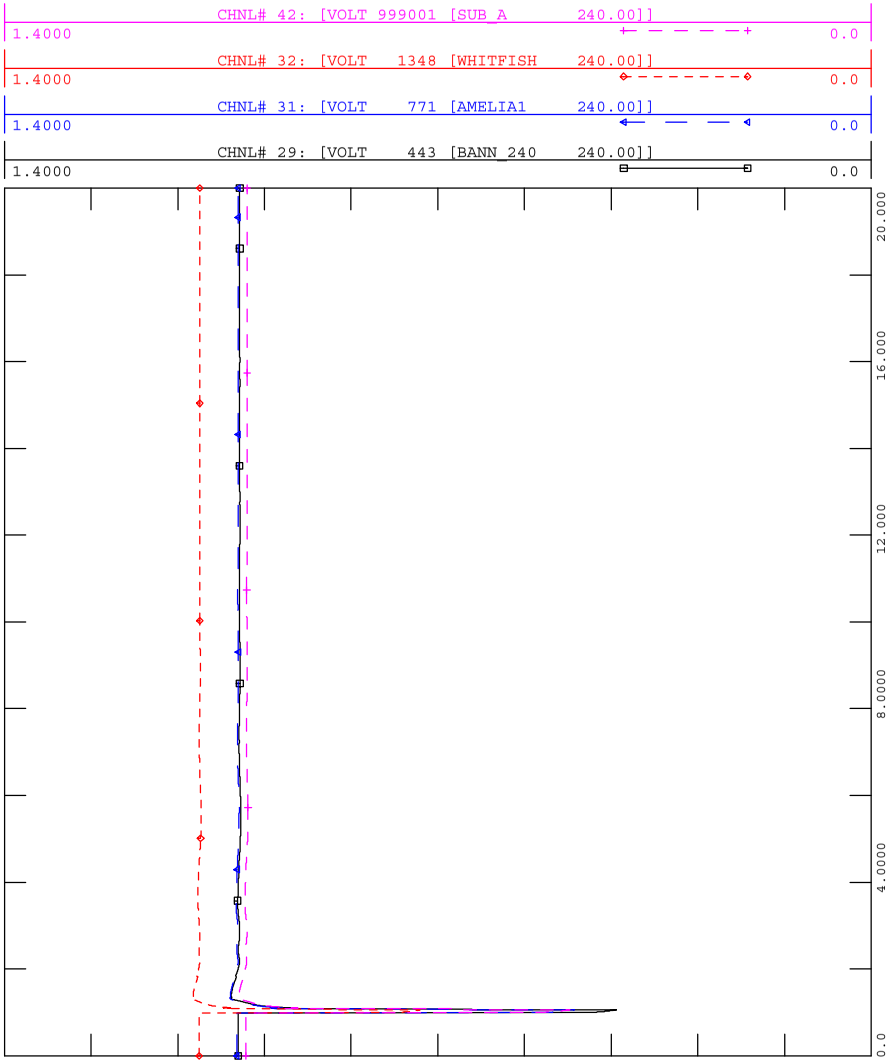


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1212L 3PH FAULT AT HEARTLAND 12S

FILE: CON10.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-9

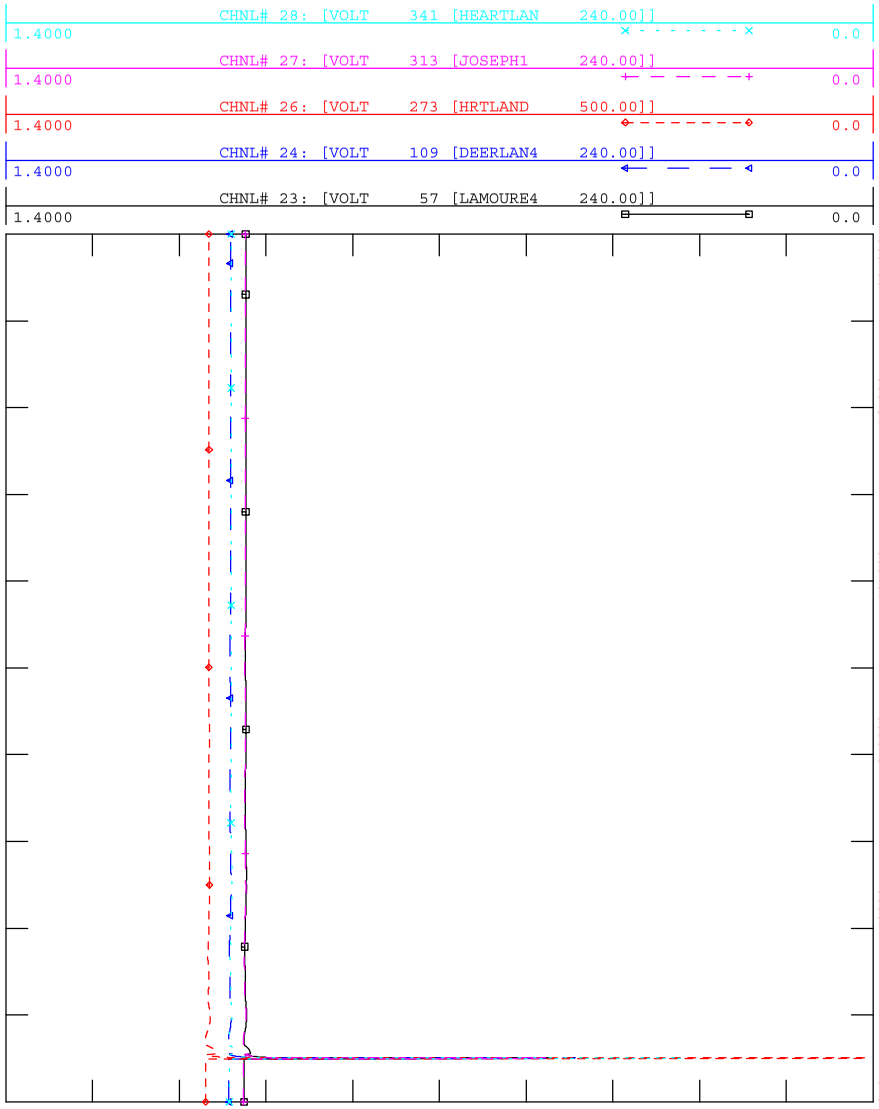


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-10

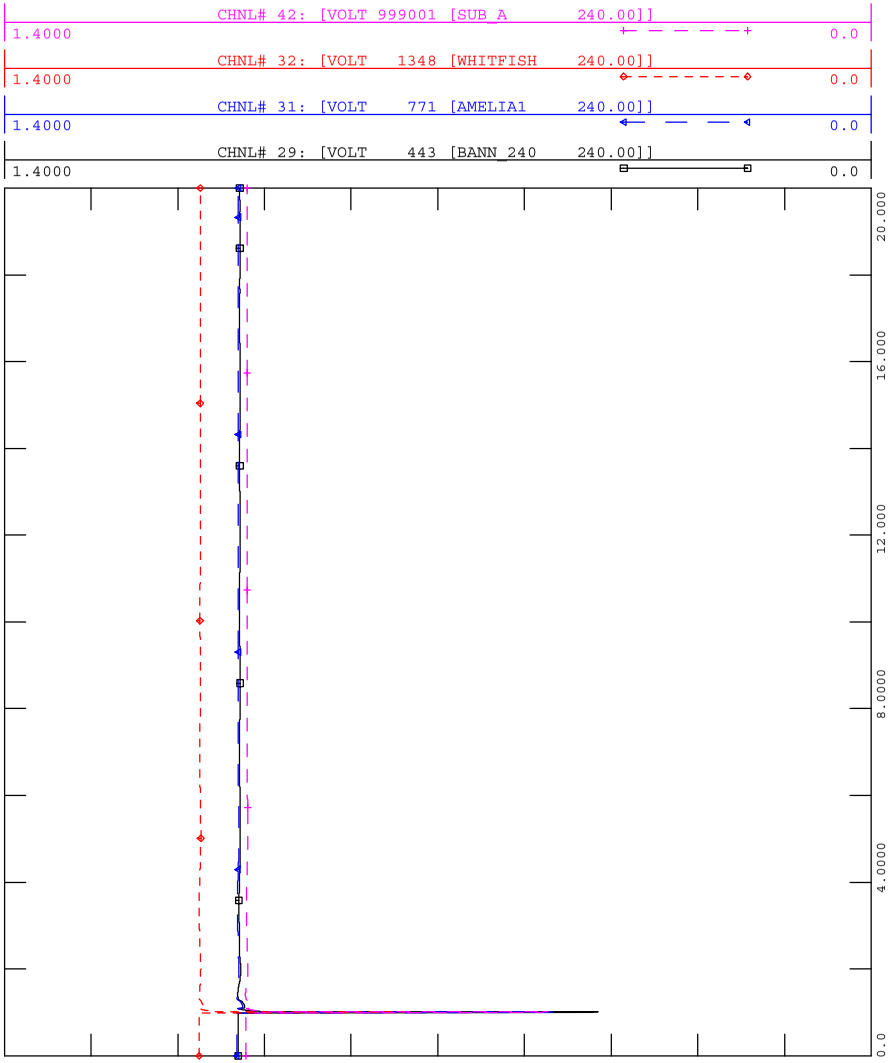


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-10

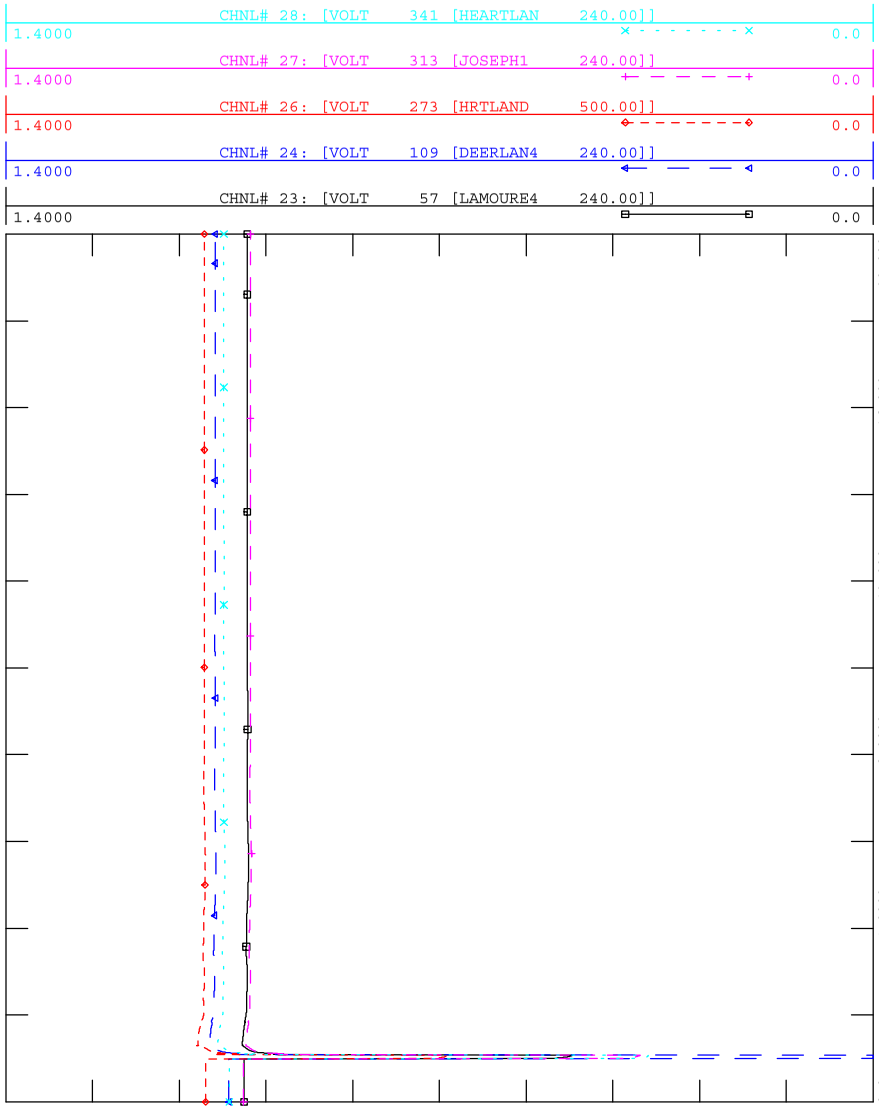


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT DEERLAND 13S

FILE: CON13.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-11

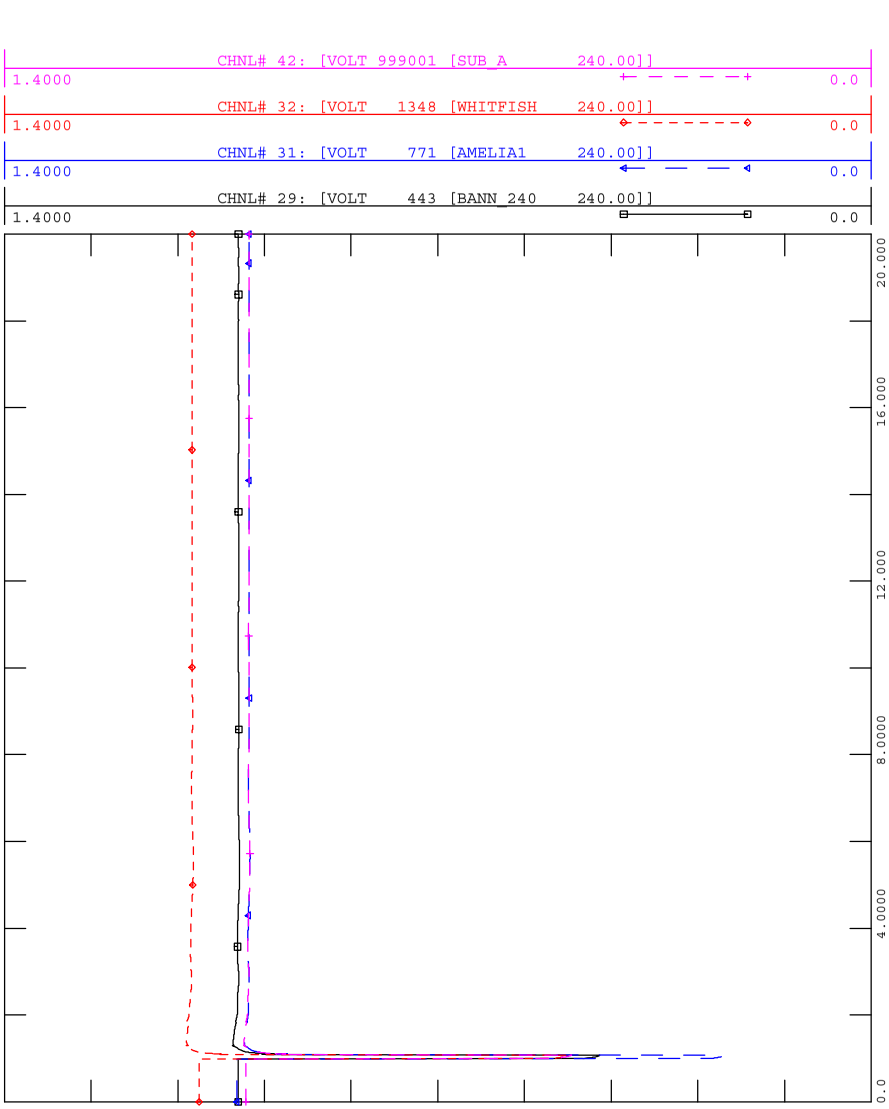


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT DEERLAND 13S

FILE: CON13.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-11

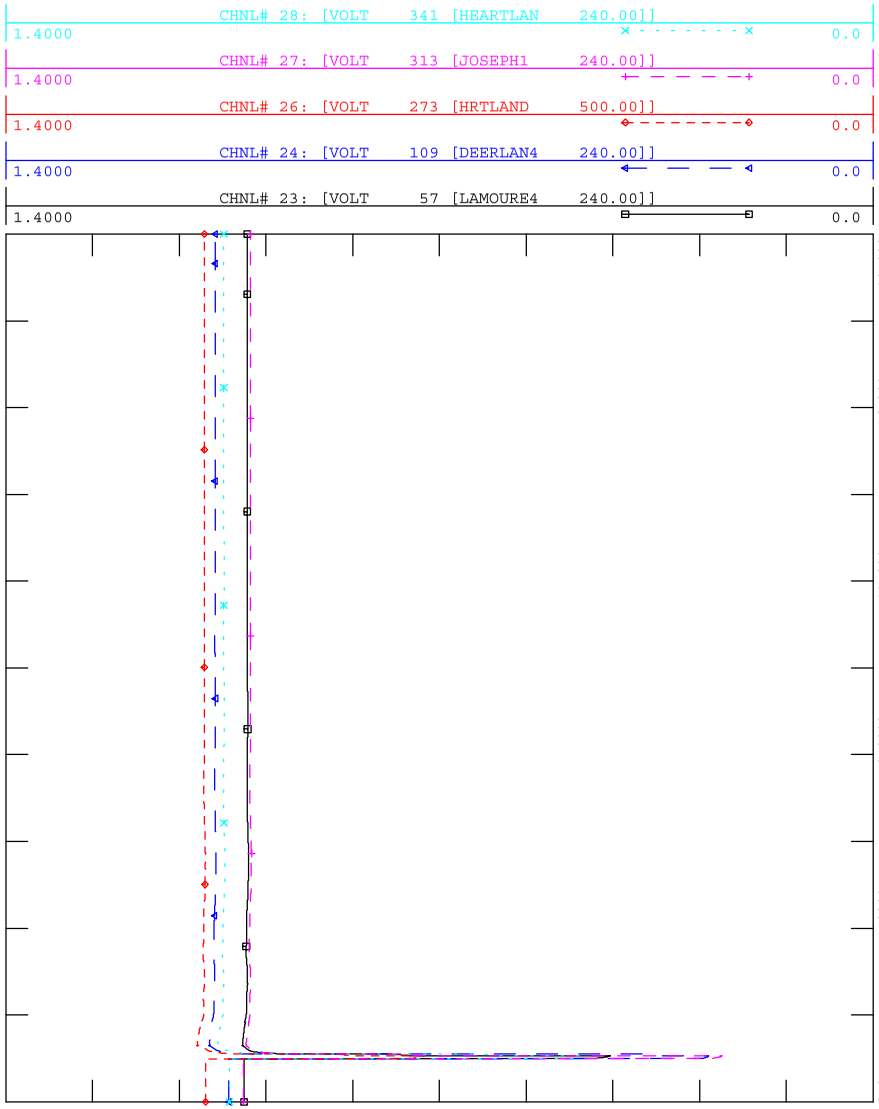


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-12

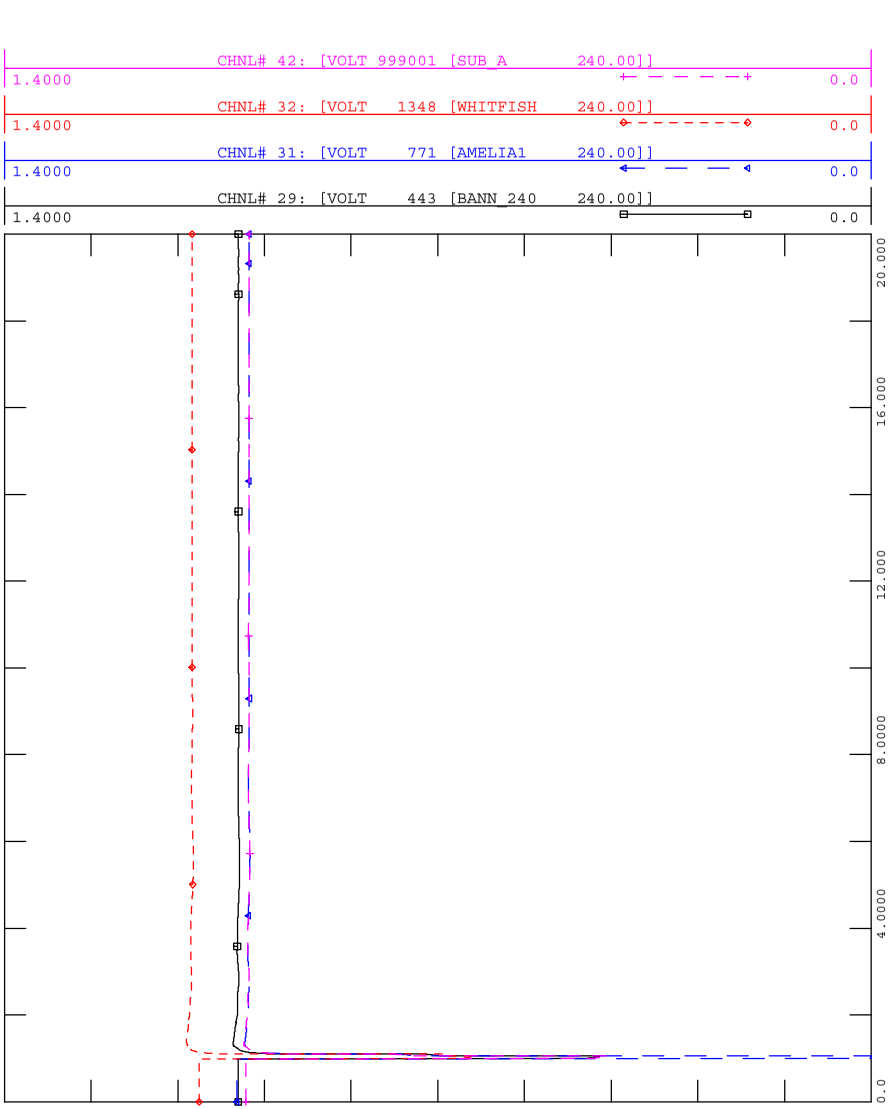


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-12

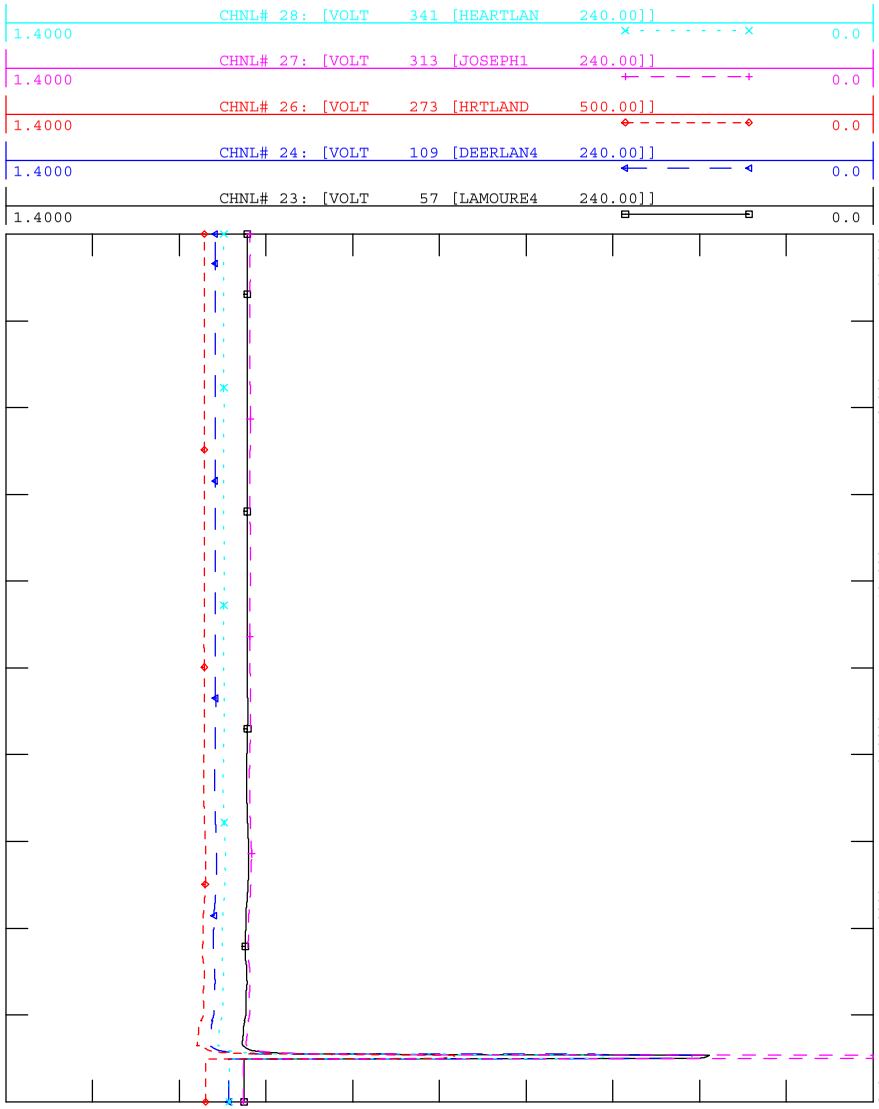


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1120L 3PH FAULT AT JOSEPHBURG 410S

FILE: CON15.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-13

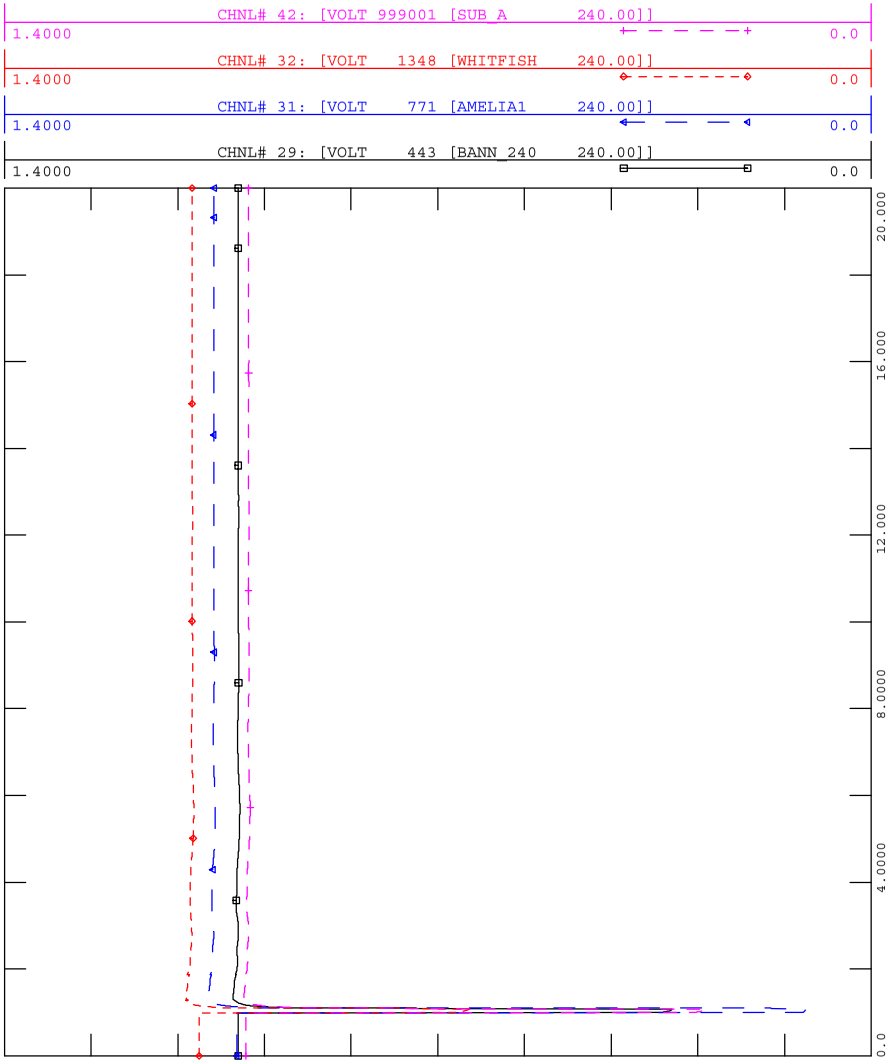


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1120L 3PH FAULT AT JOSEPHBURG 410S

FILE: CON15.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-13



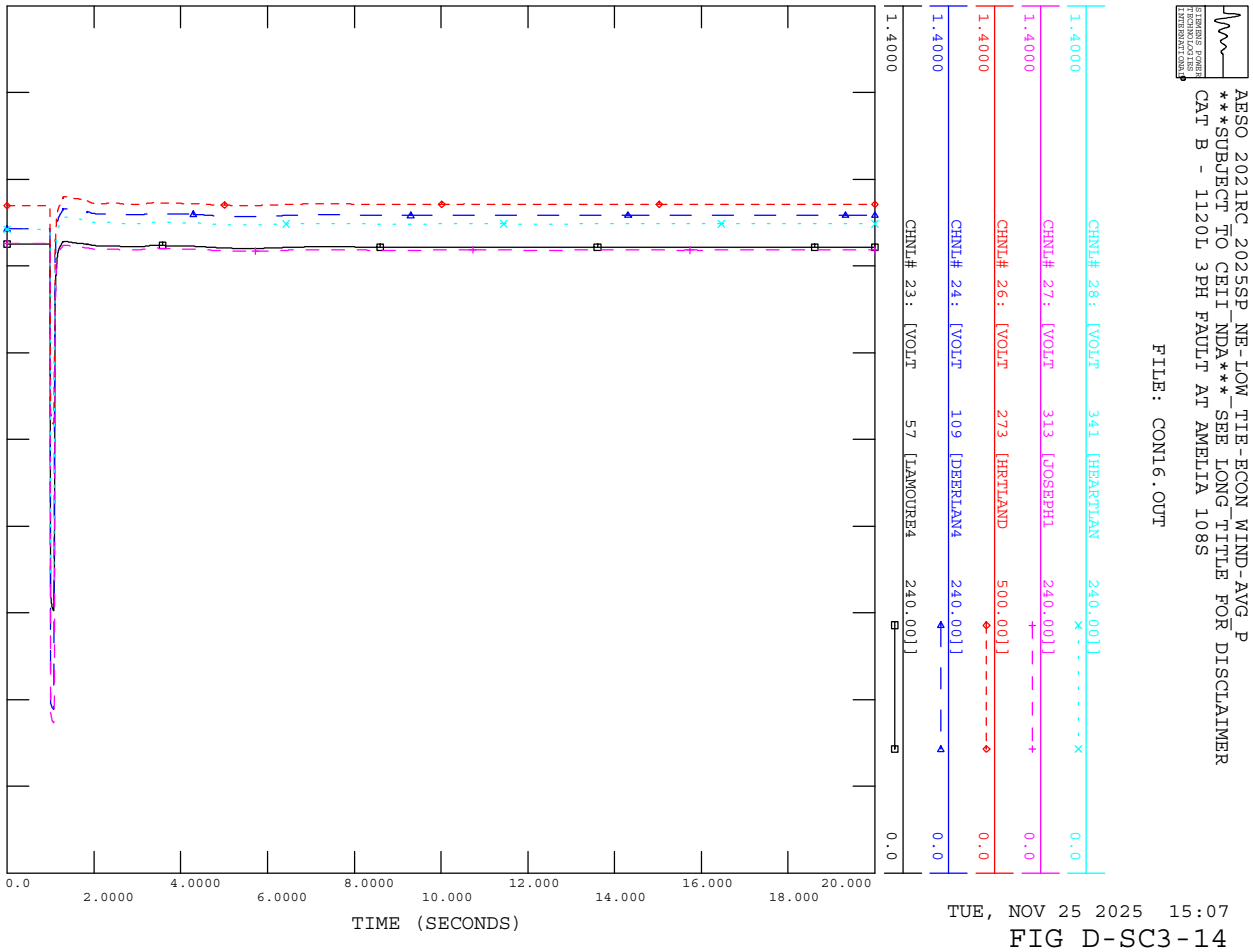


FIG D-SC3-14

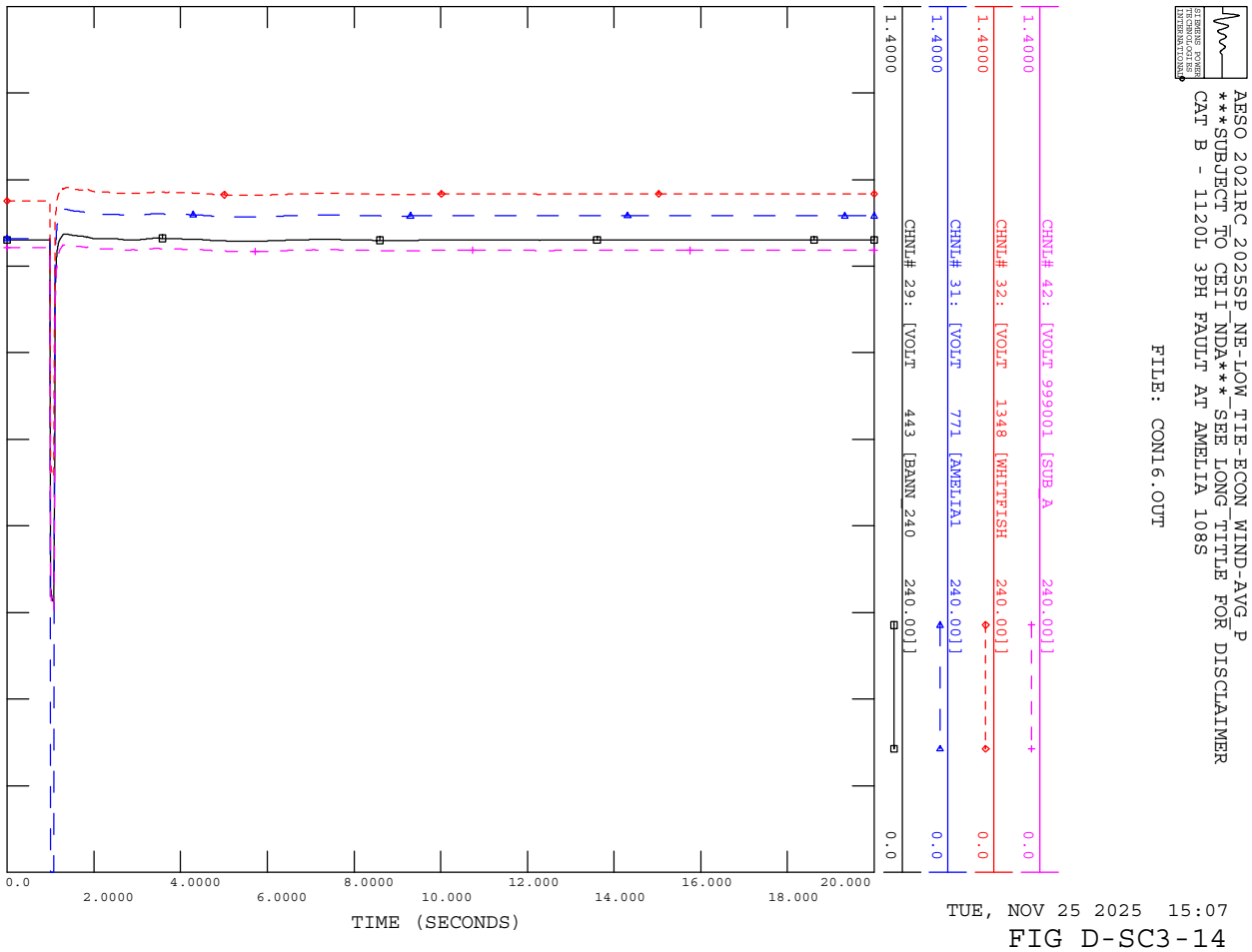


FIG D-SC3-14

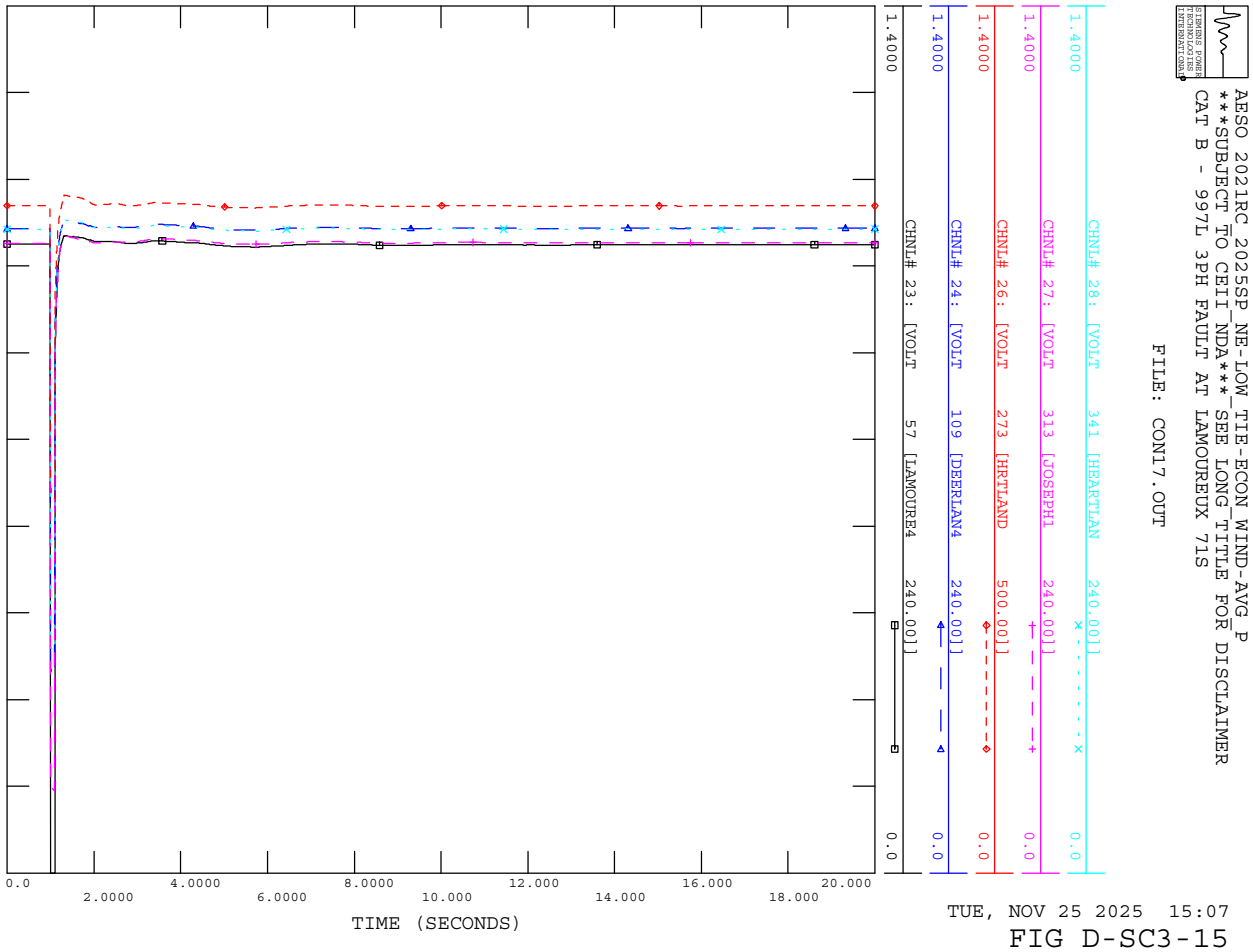


FIG D-SC3-15

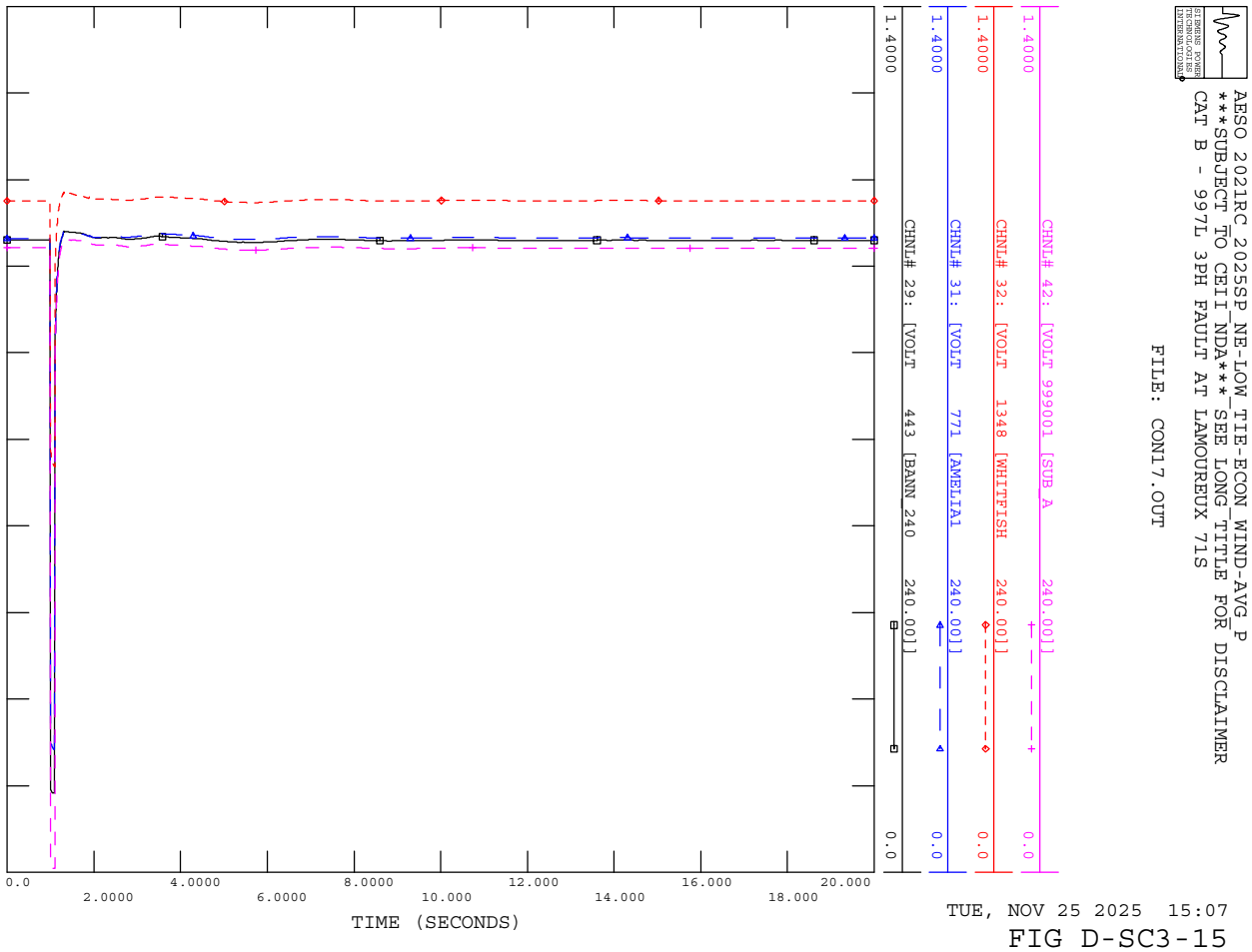


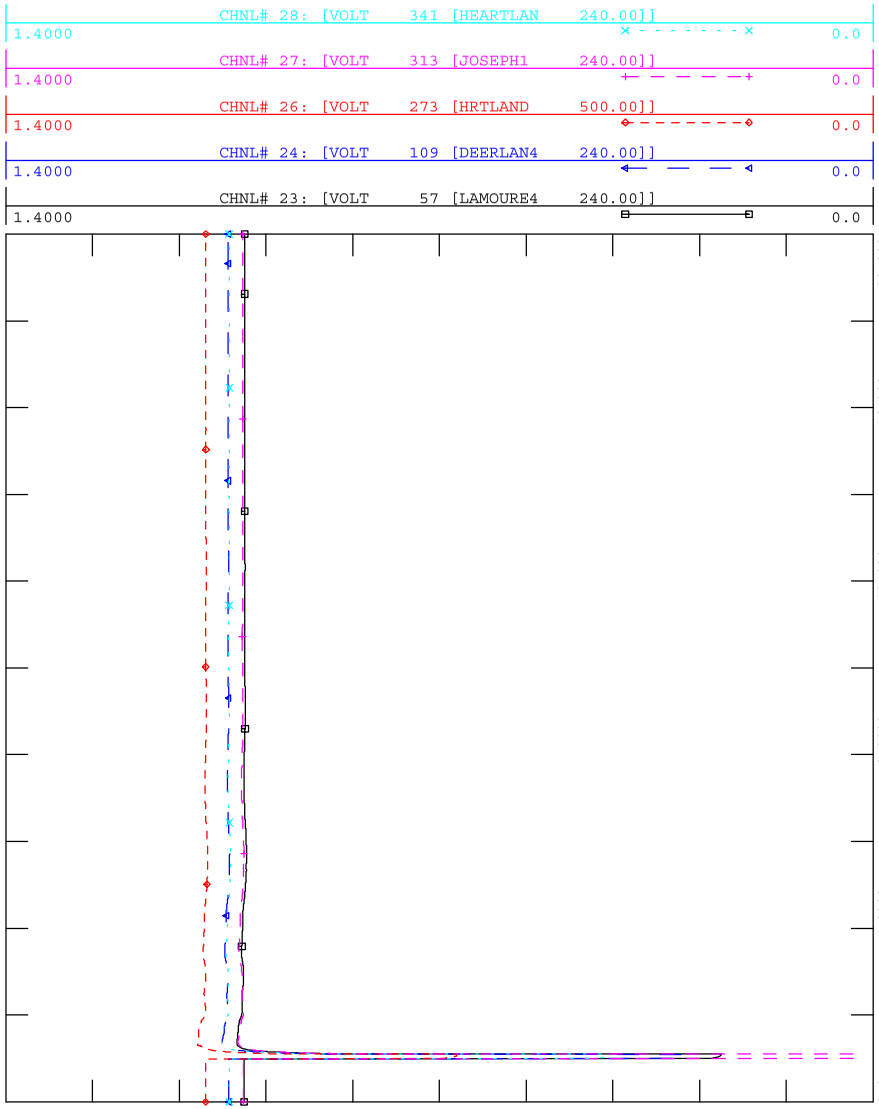
FIG D-SC3-15

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-16

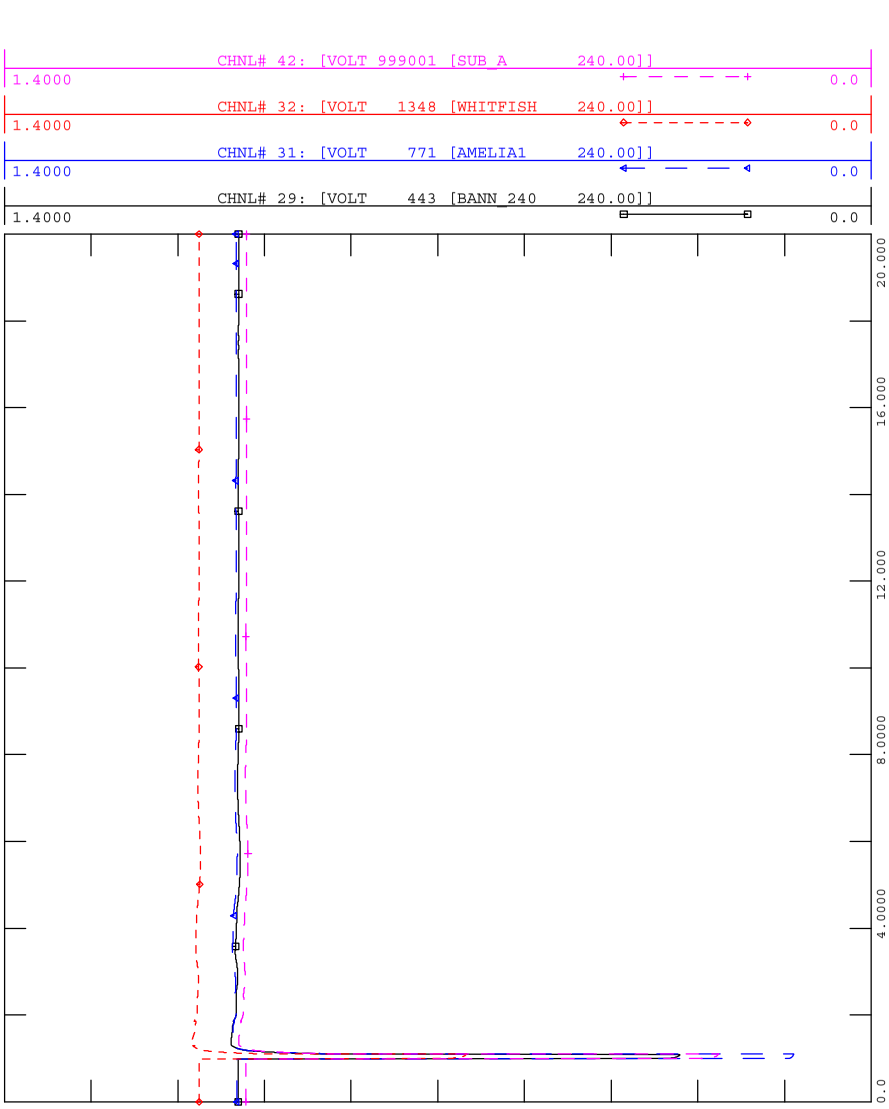


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-16

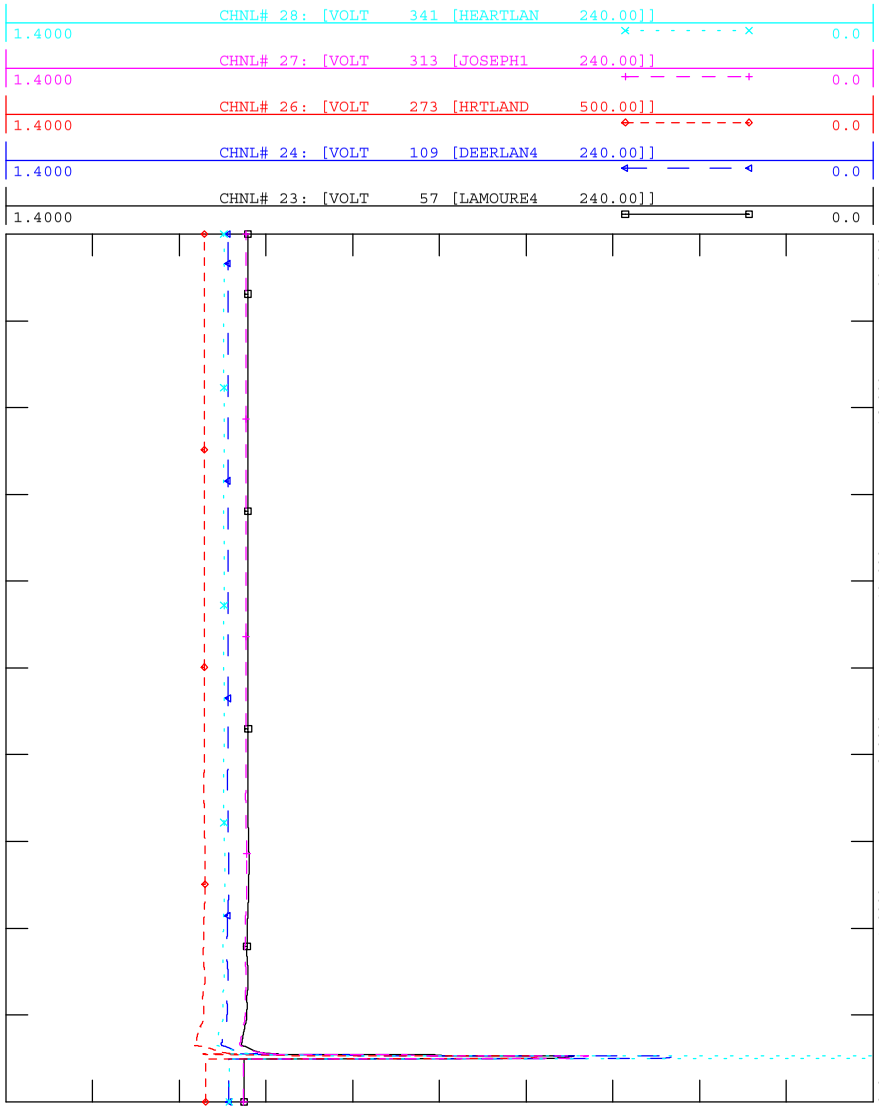


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

FILE: CON19.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-17

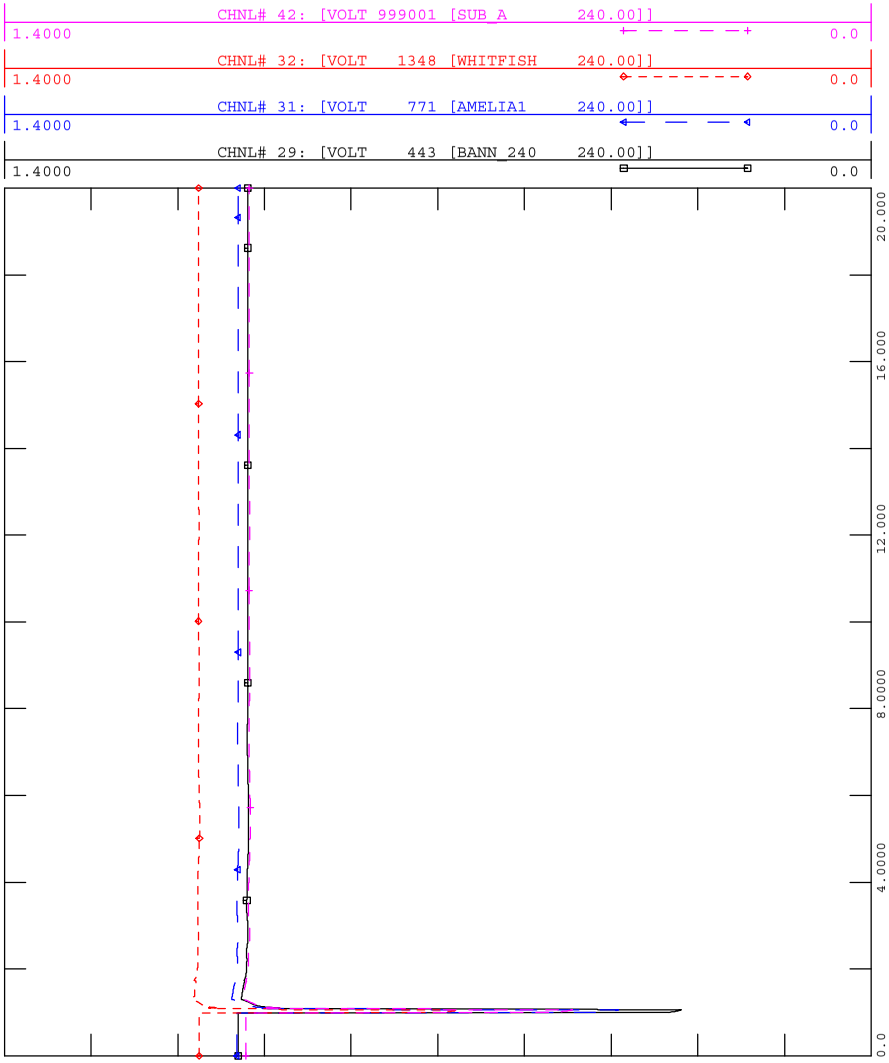


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

FILE: CON19.OUT

TUE, NOV 25 2025 15:07

FIG D-SC3-17



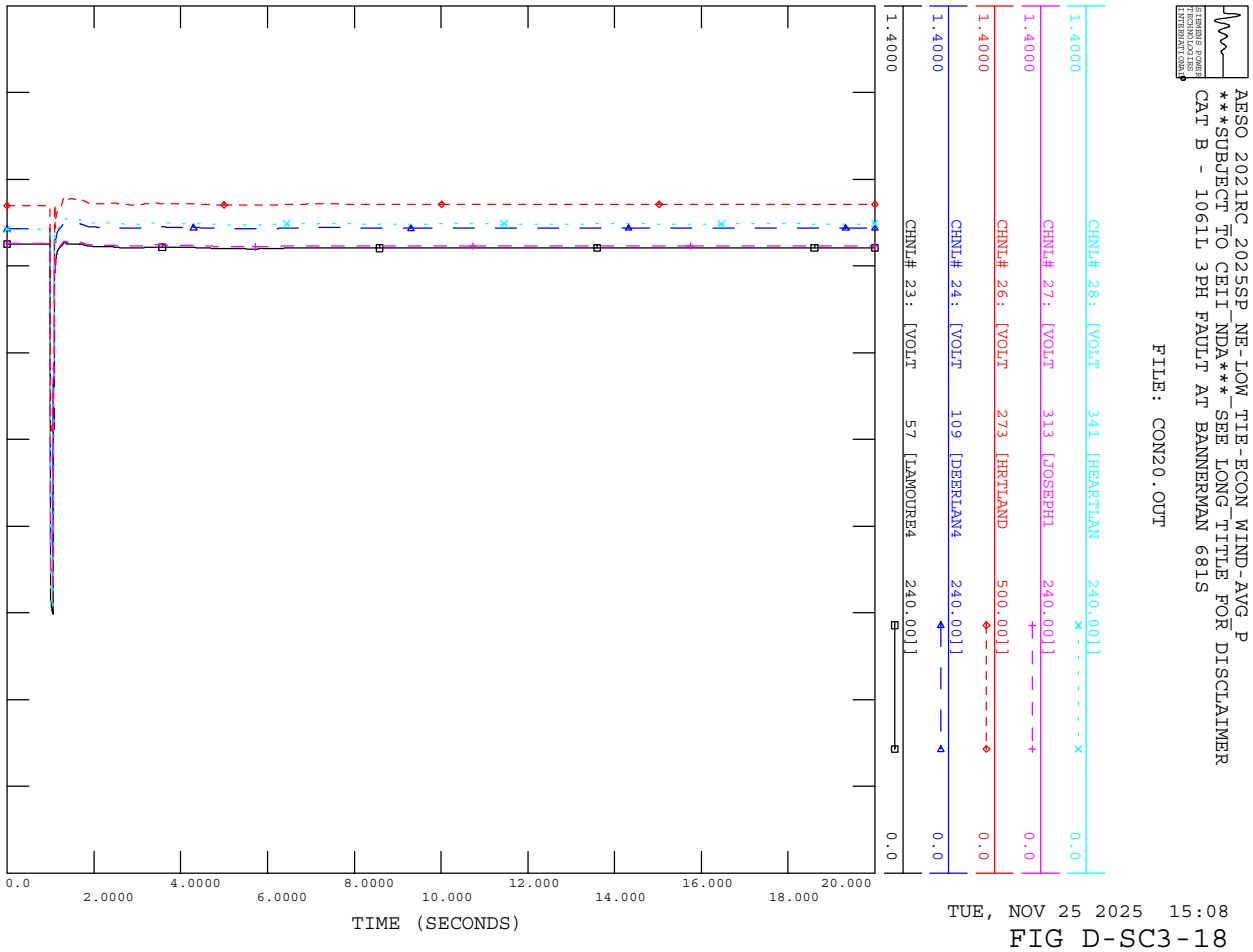


FIG D-SC3-18

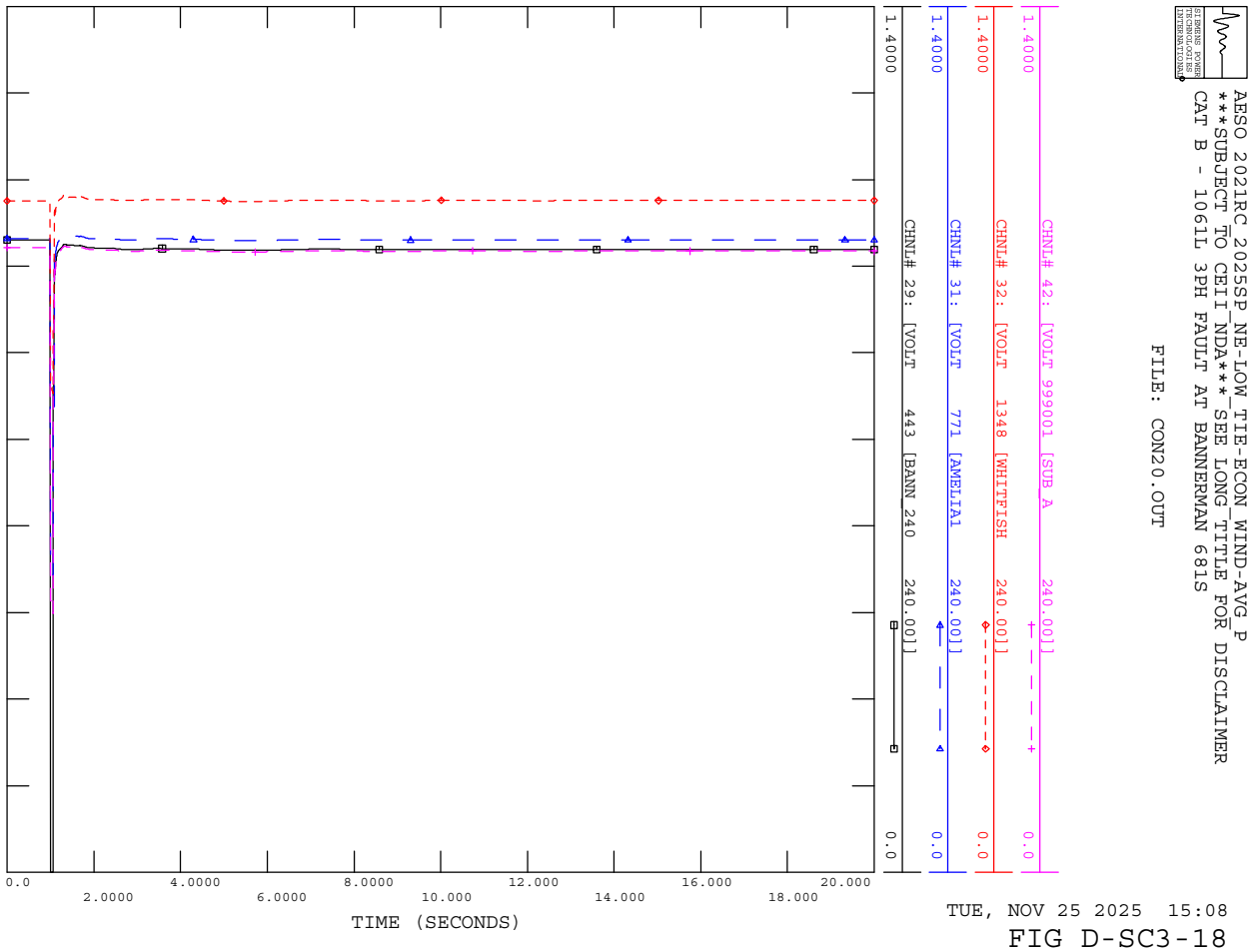


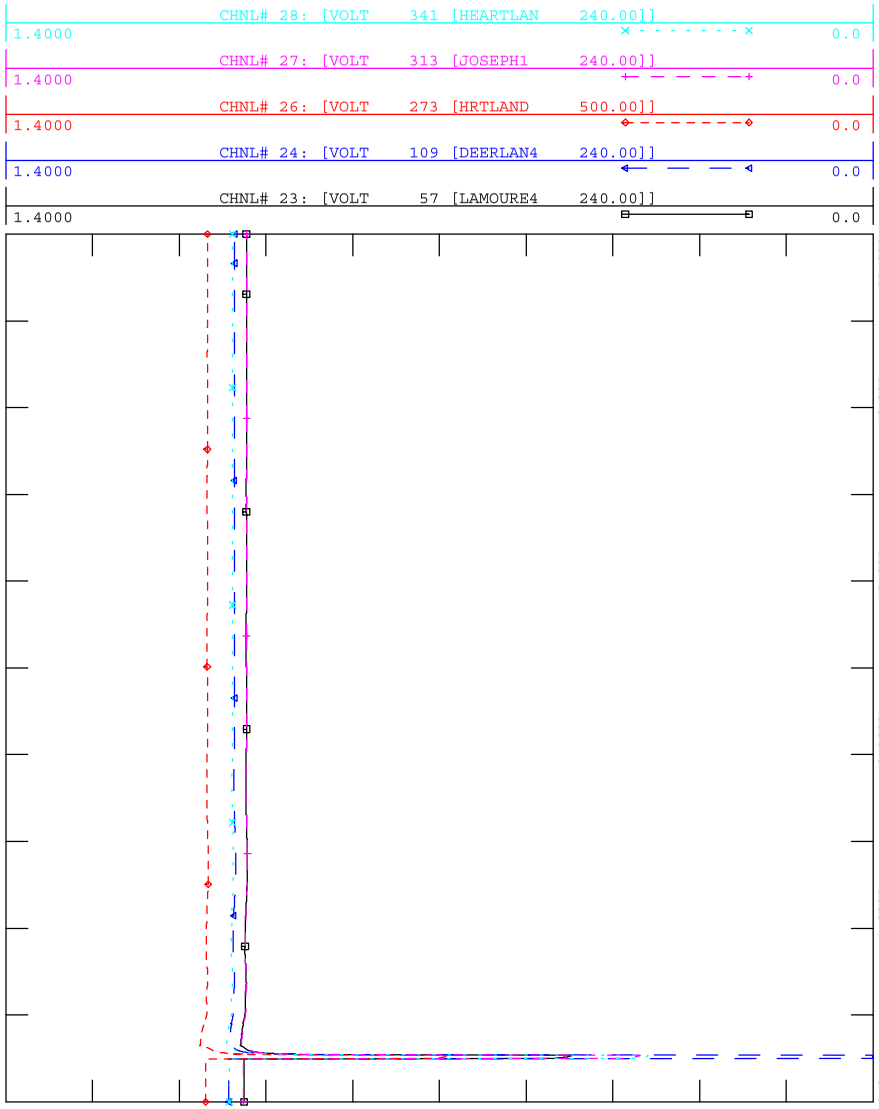
FIG D-SC3-18

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT DEERLAND 13S

FILE: CON21.OUT

TUE, NOV 25 2025 15:08

FIG D-SC3-19

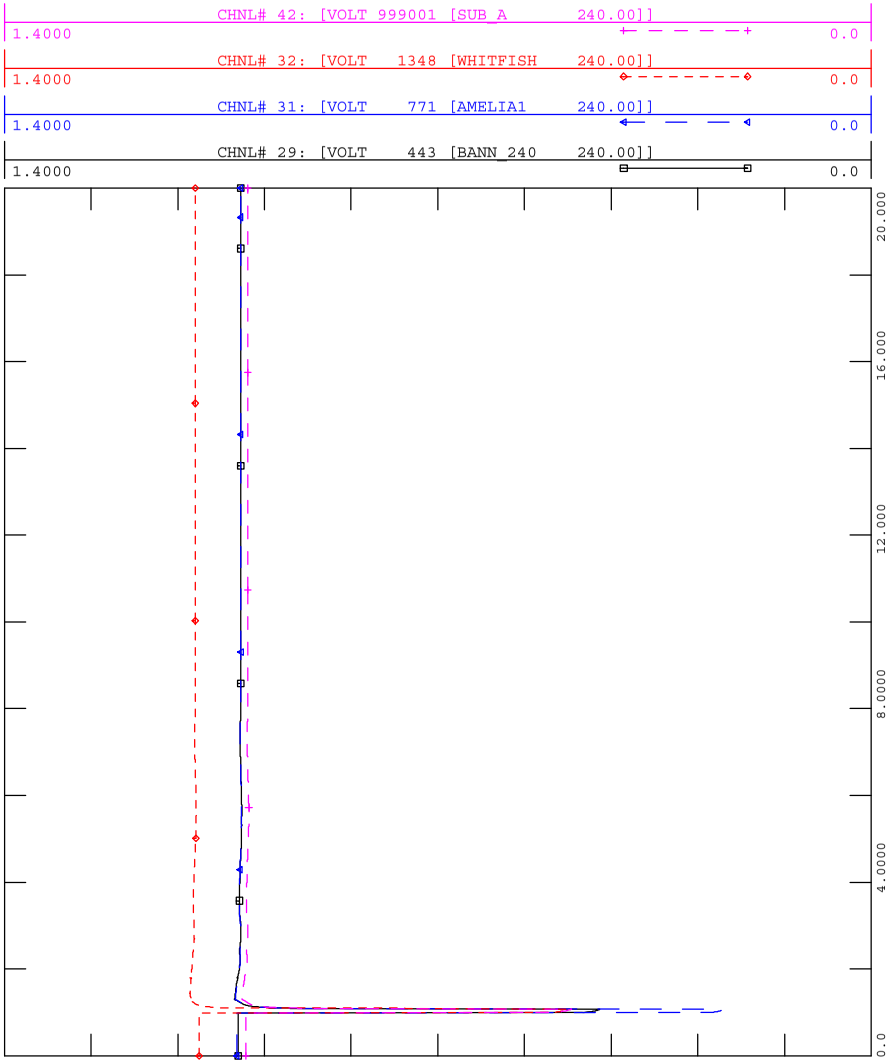


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT DEERLAND 13S

FILE: CON21.OUT

TUE, NOV 25 2025 15:08

FIG D-SC3-19

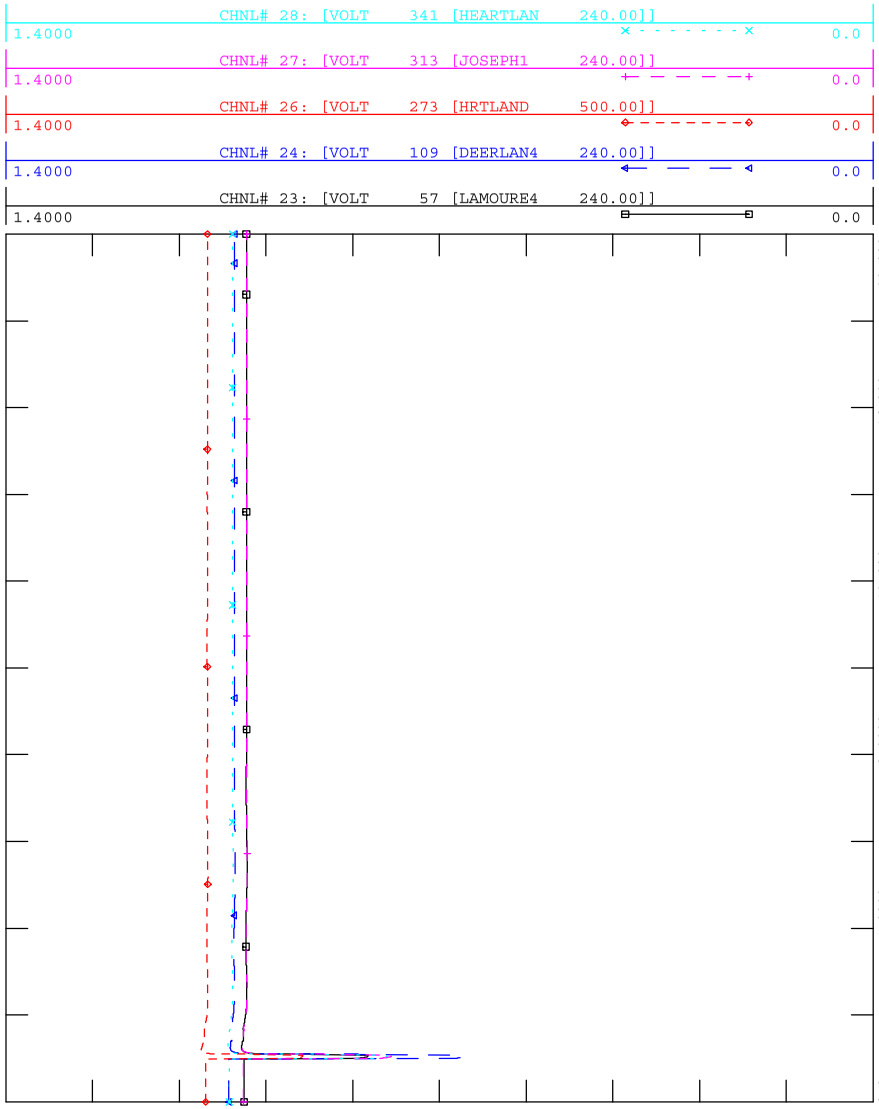


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

TUE, NOV 25 2025 15:08

FIG D-SC3-20

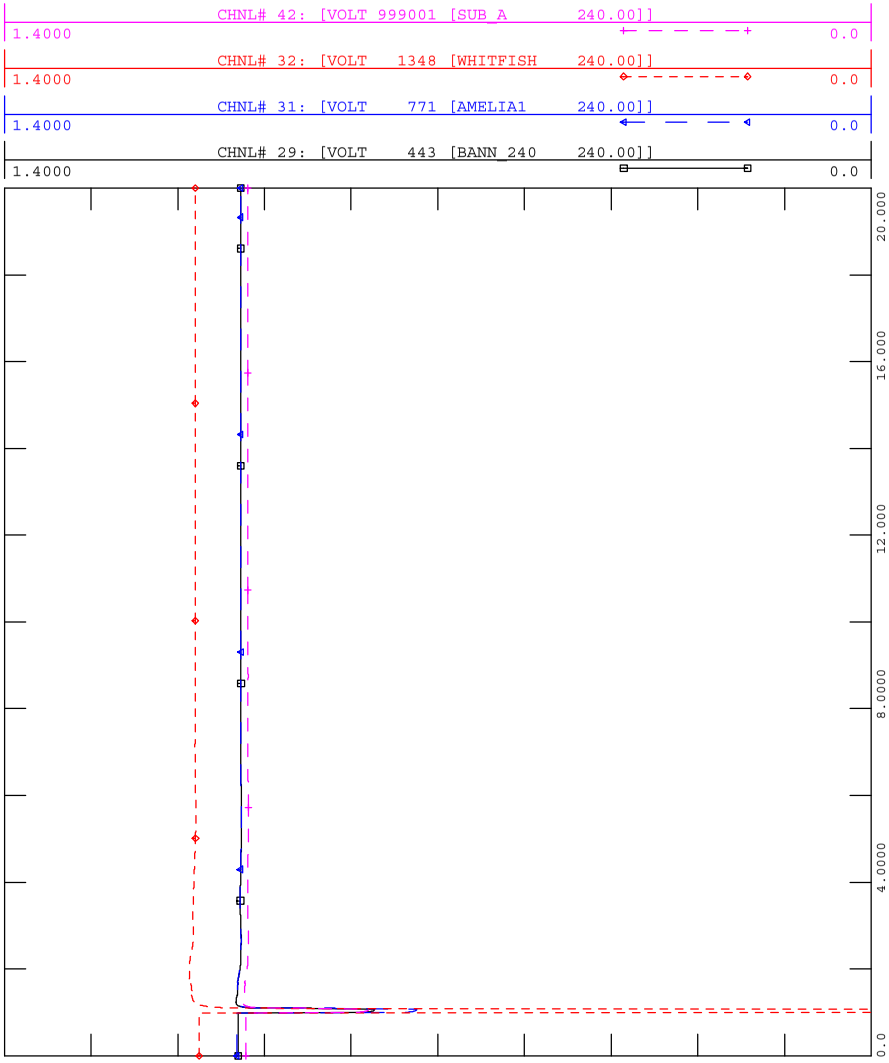


AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

TUE, NOV 25 2025 15:08

FIG D-SC3-20



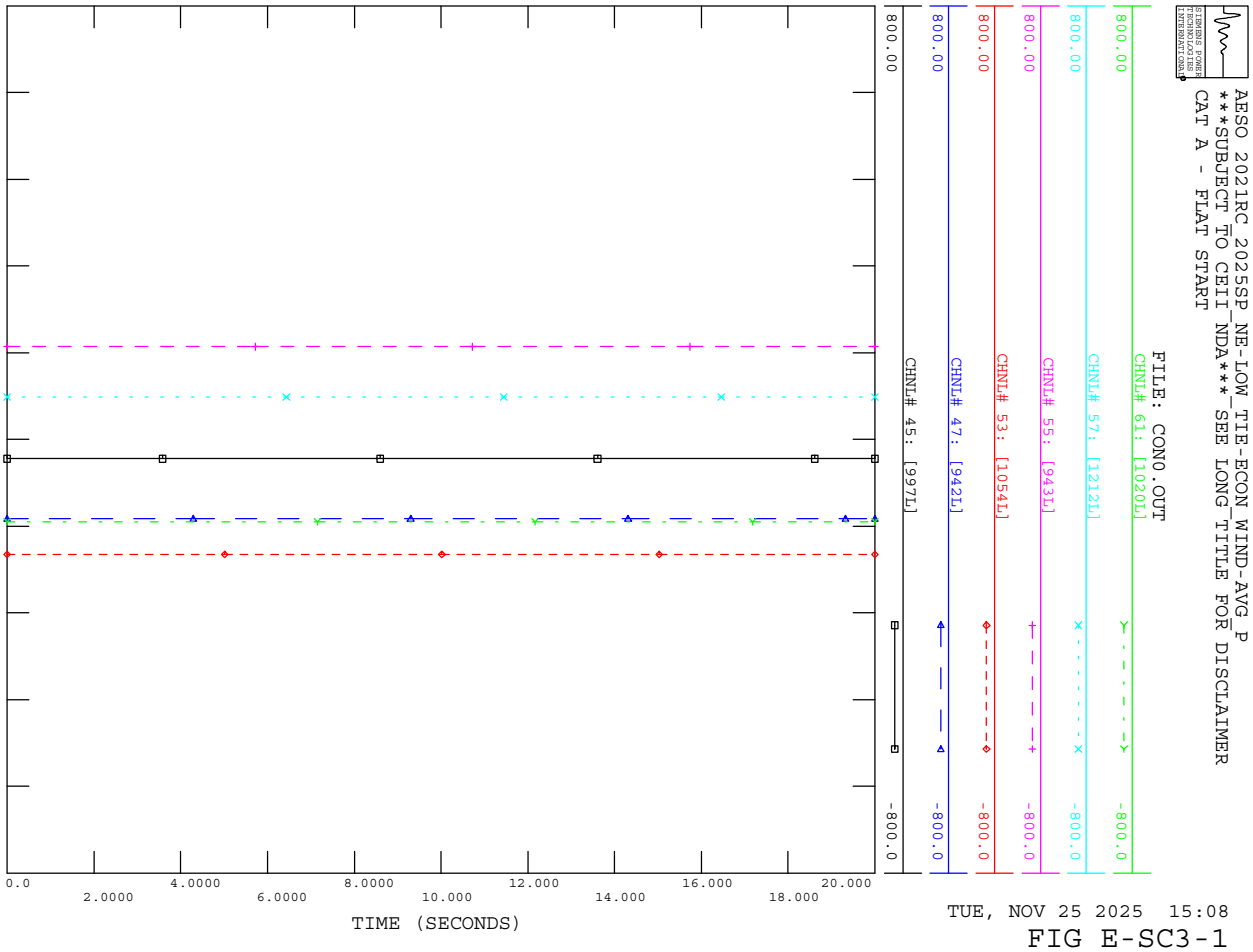


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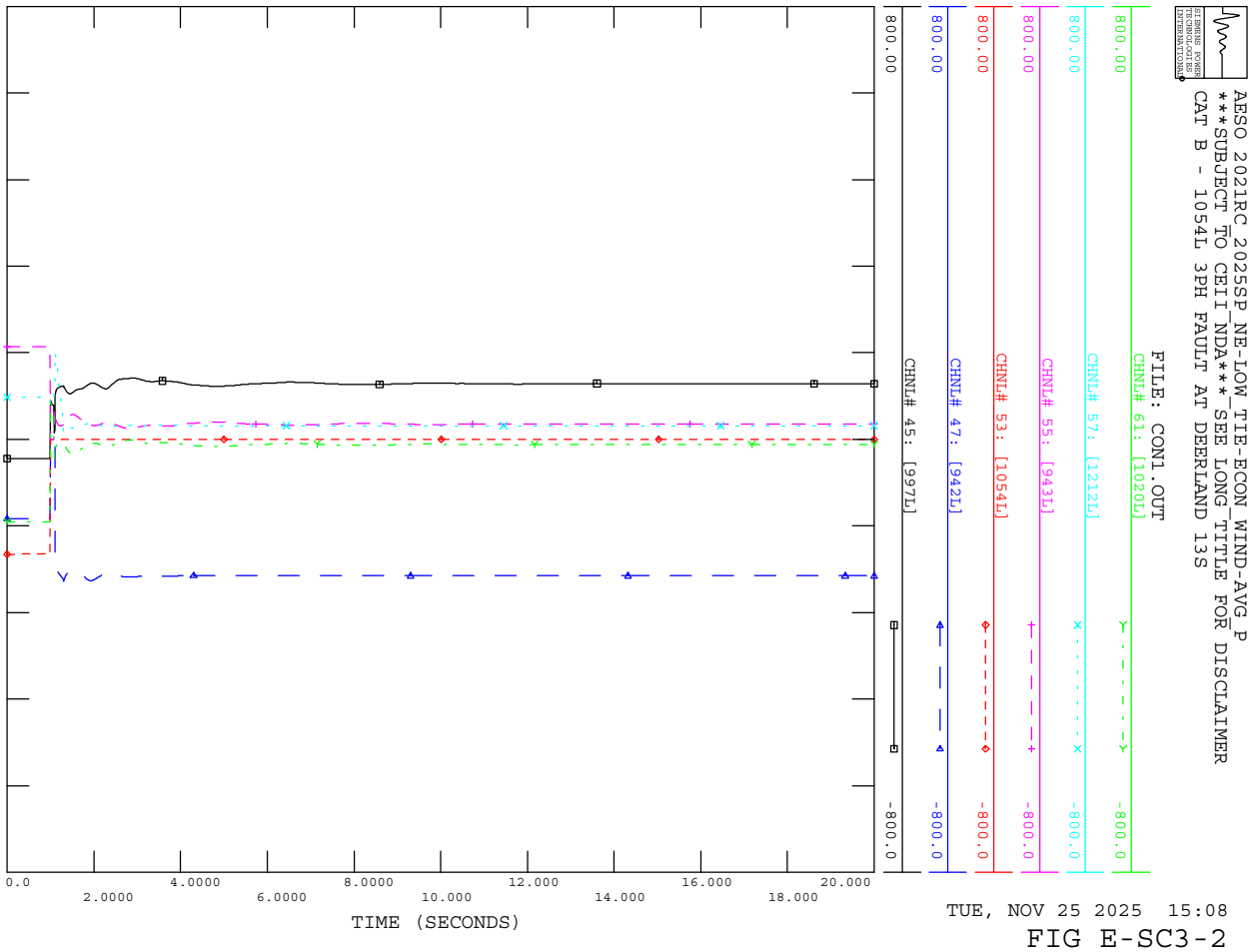


FIG E-SC3-2

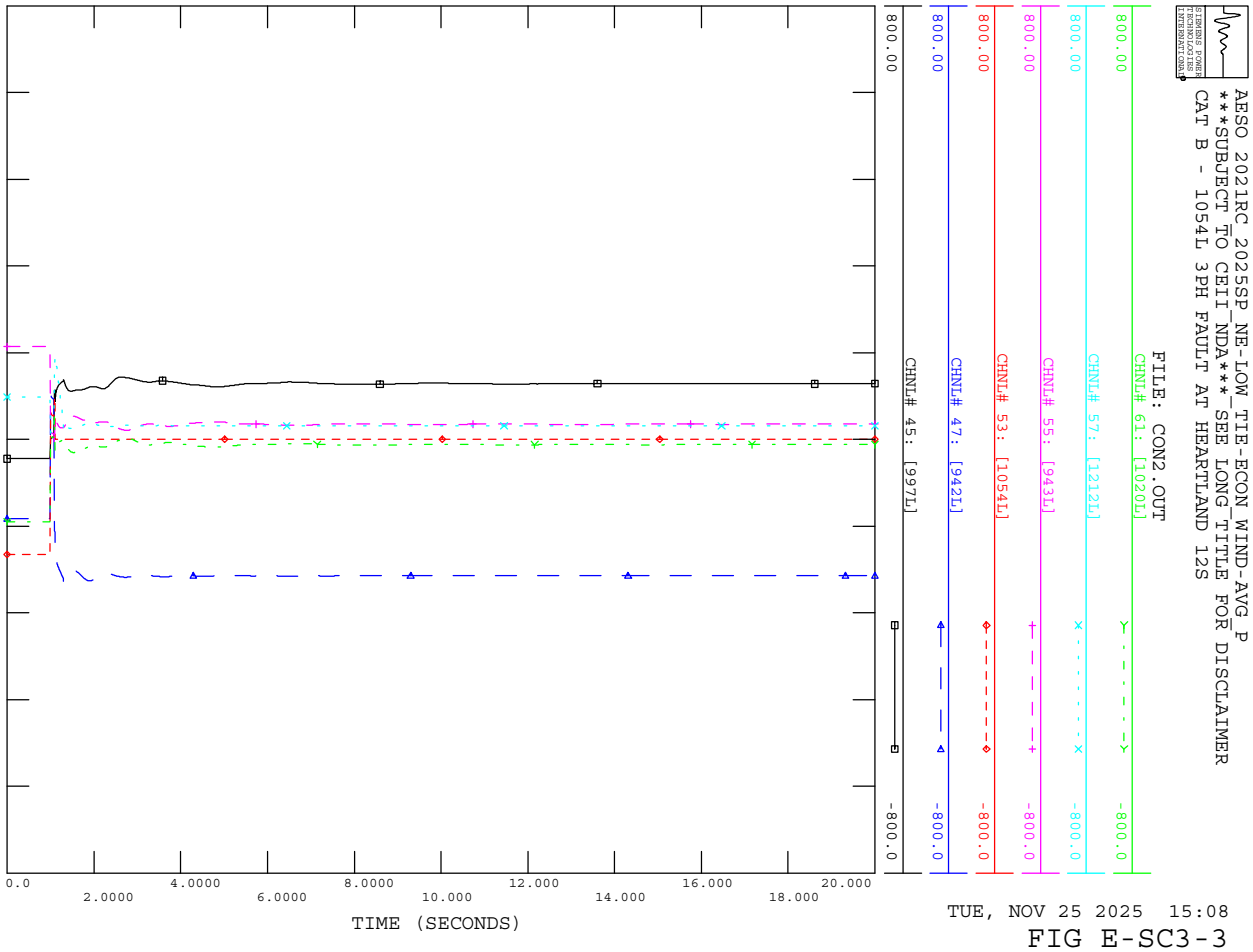


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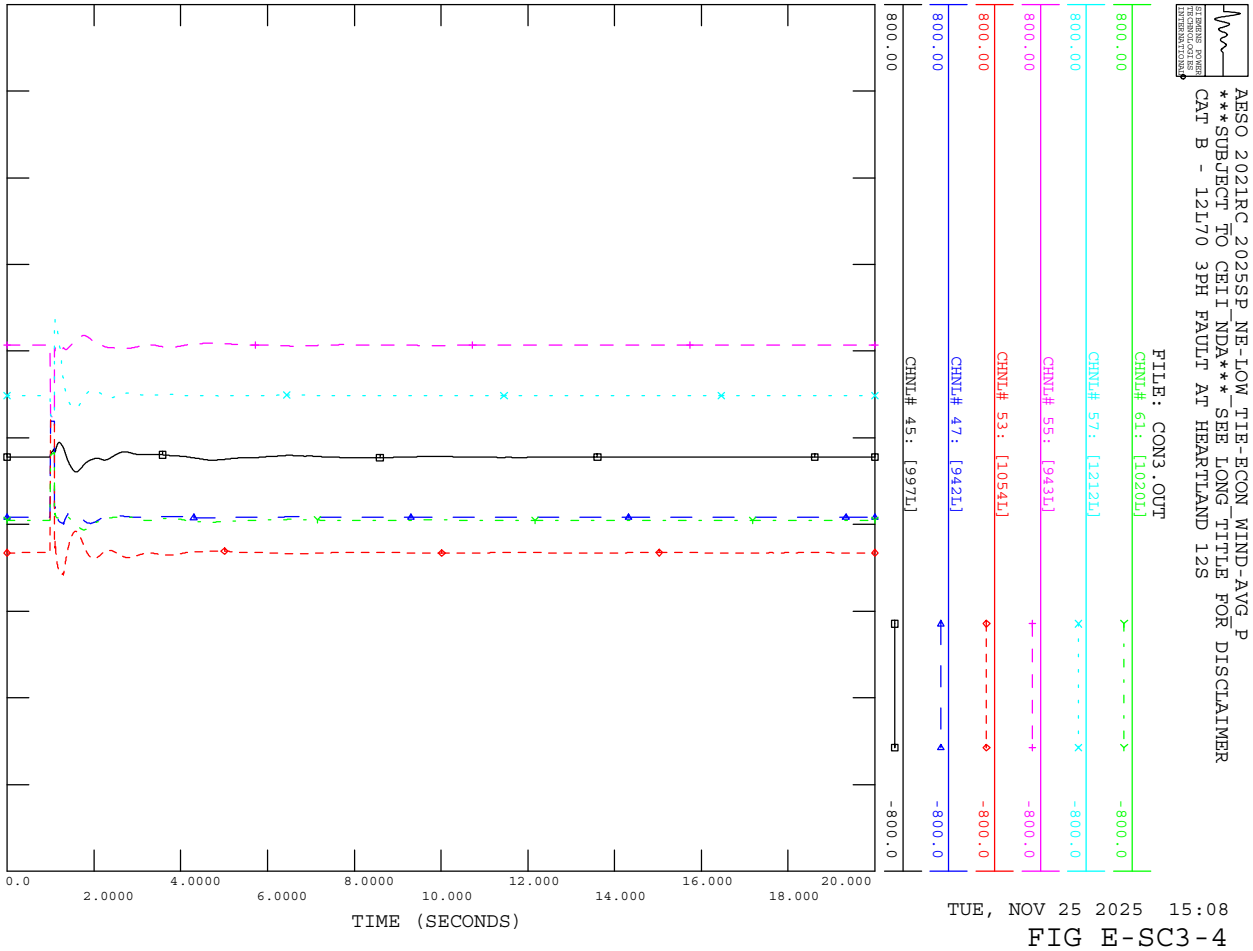


FIG E-SC3-4

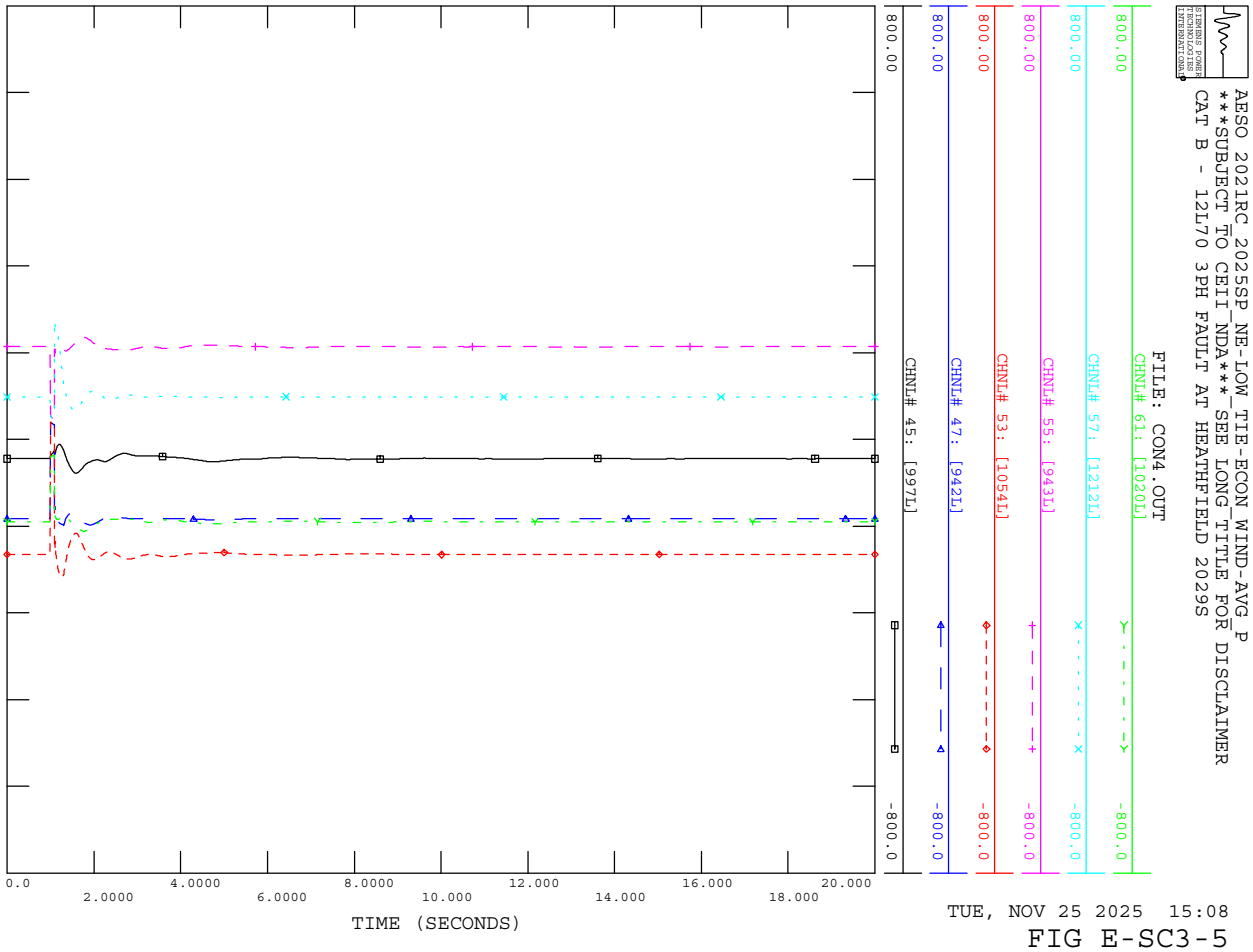


FIG E-SC3-5

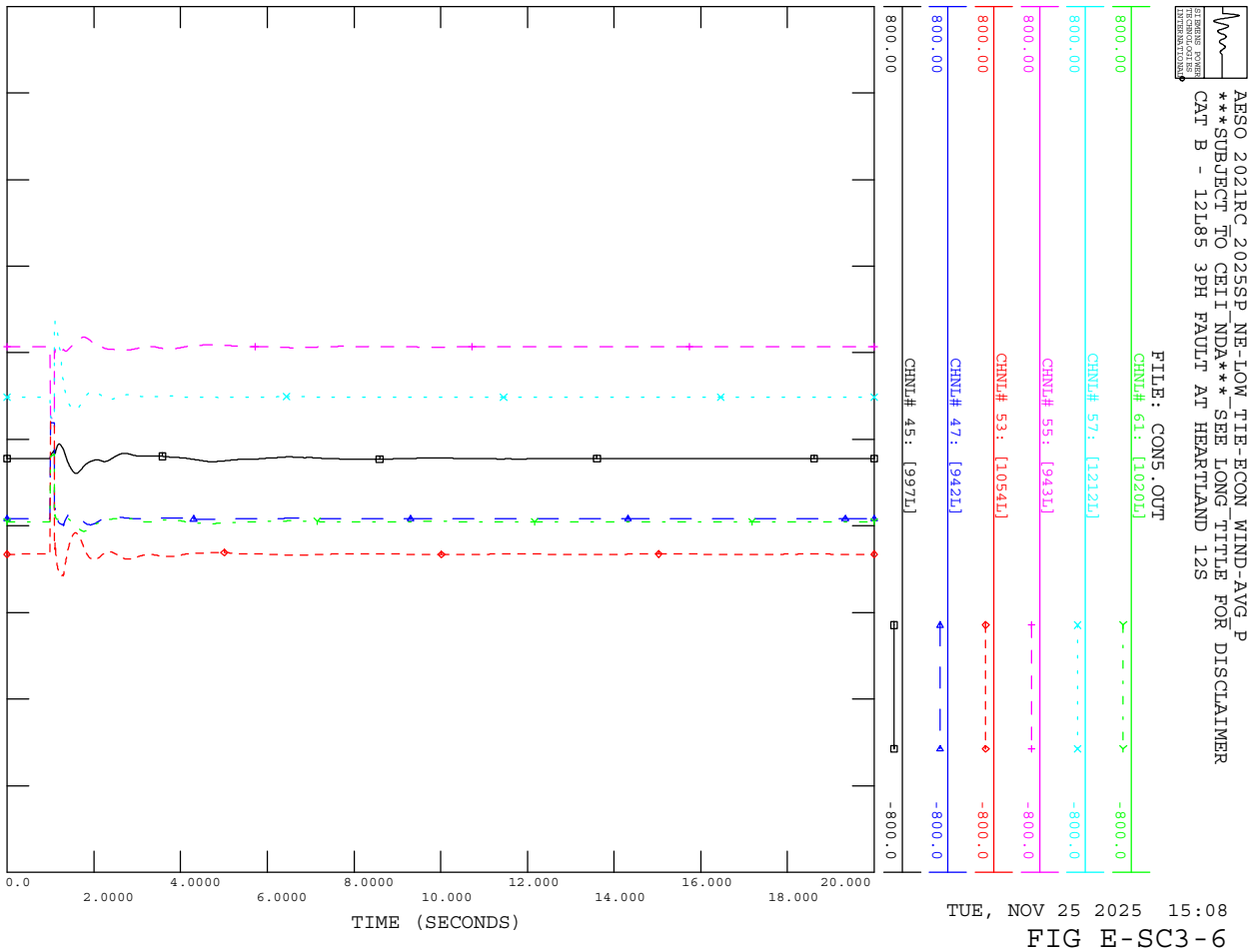


FIG E-SC3-6

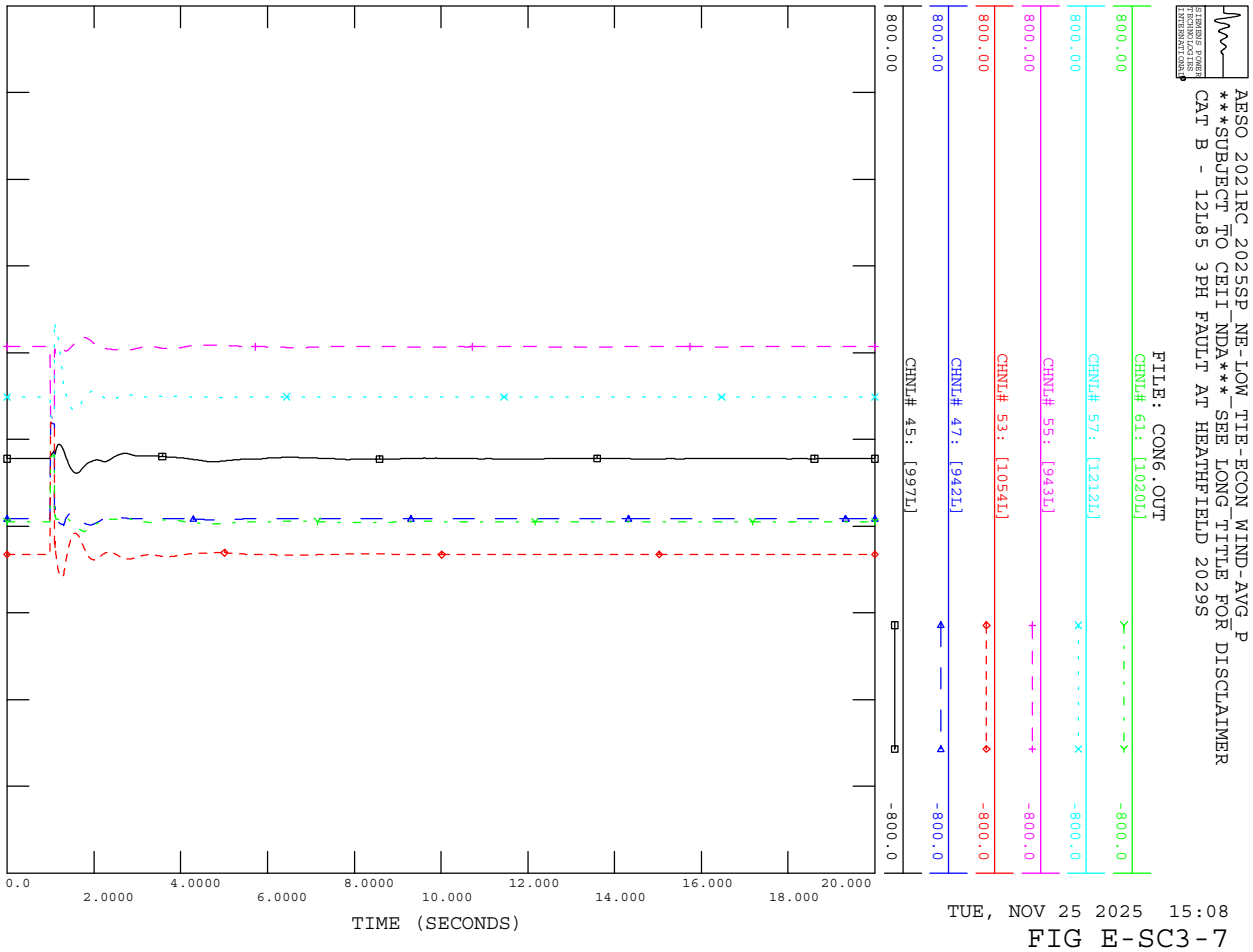


FIG E-SC3-7

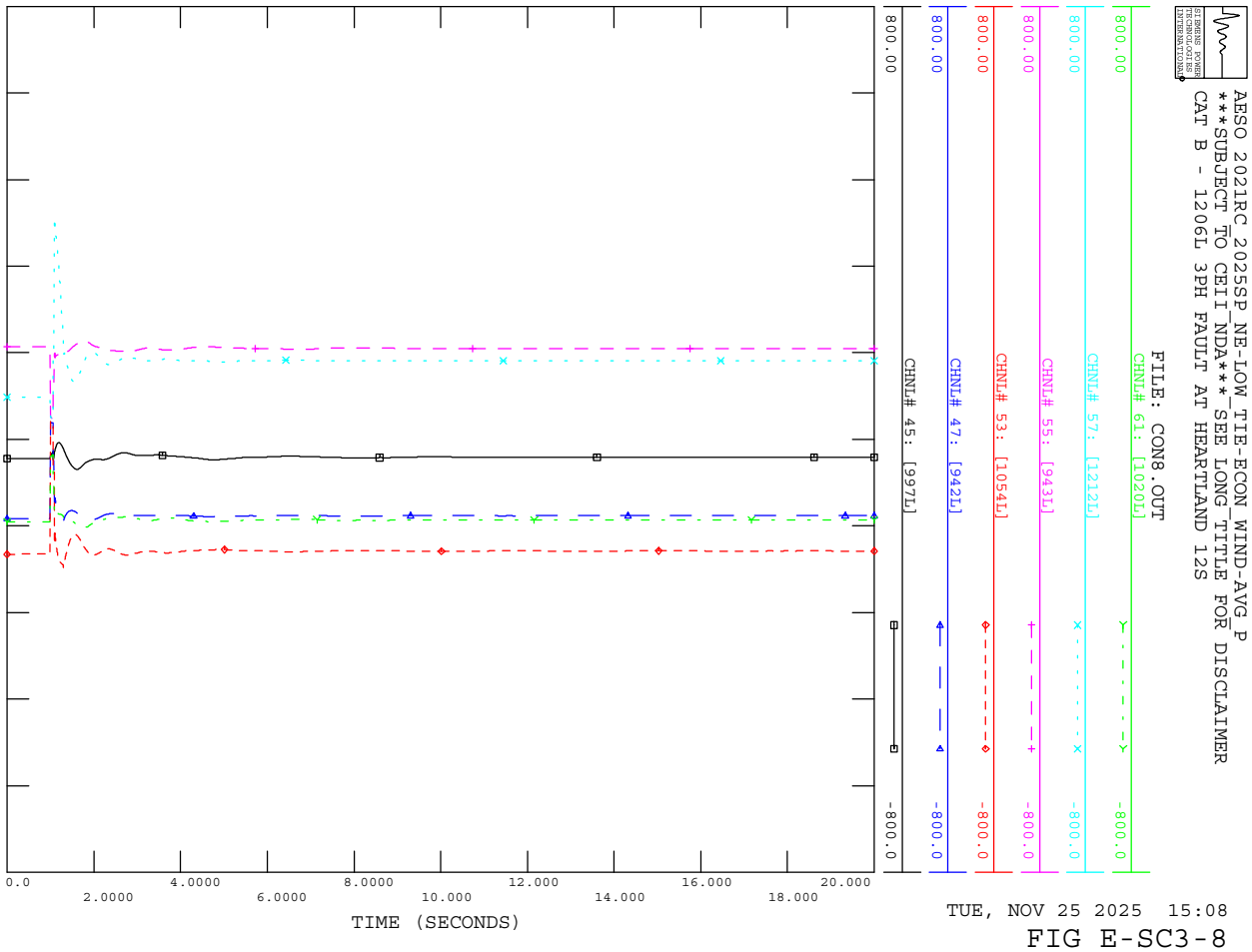


FIG E-SC3-8

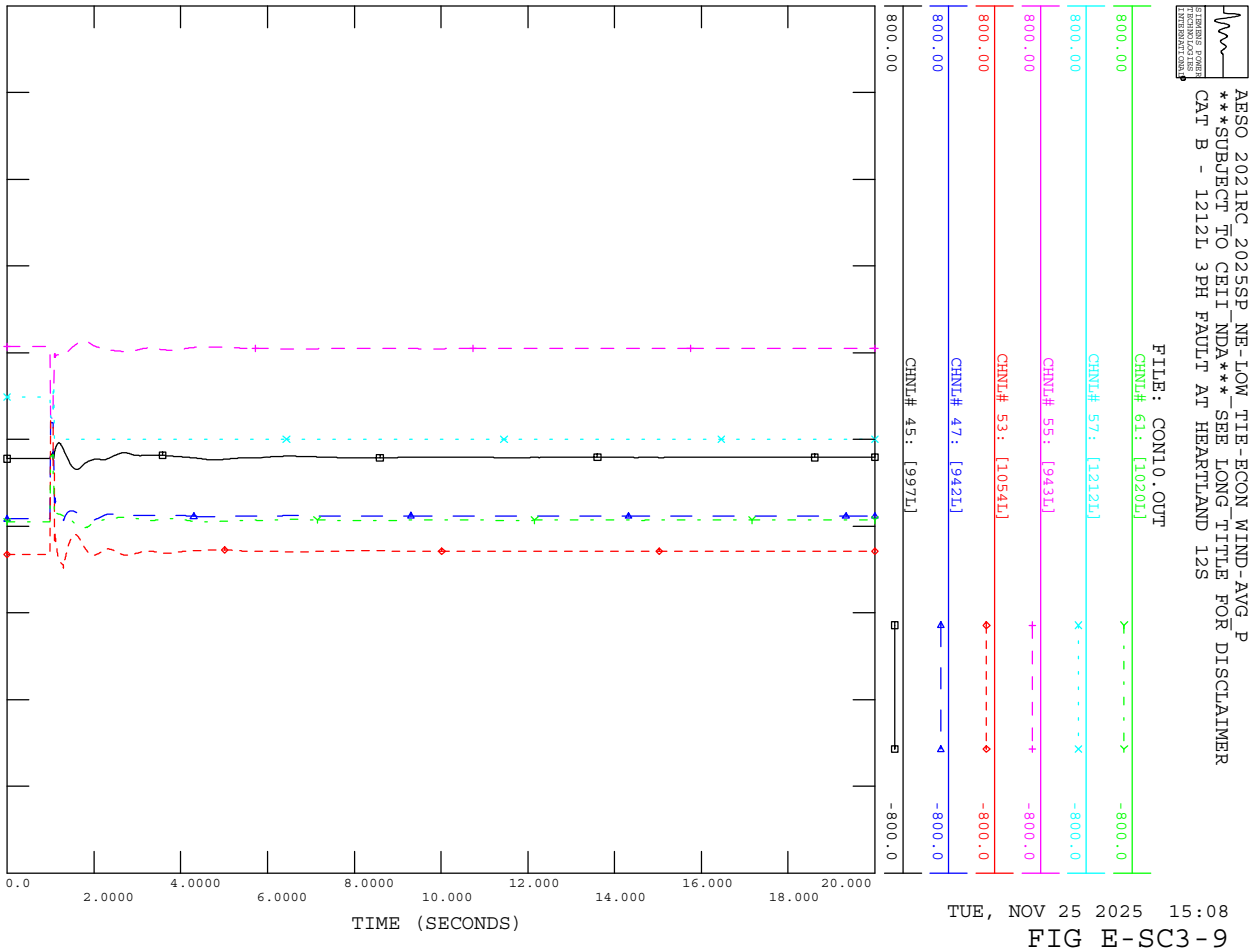


FIG E-SC3-9

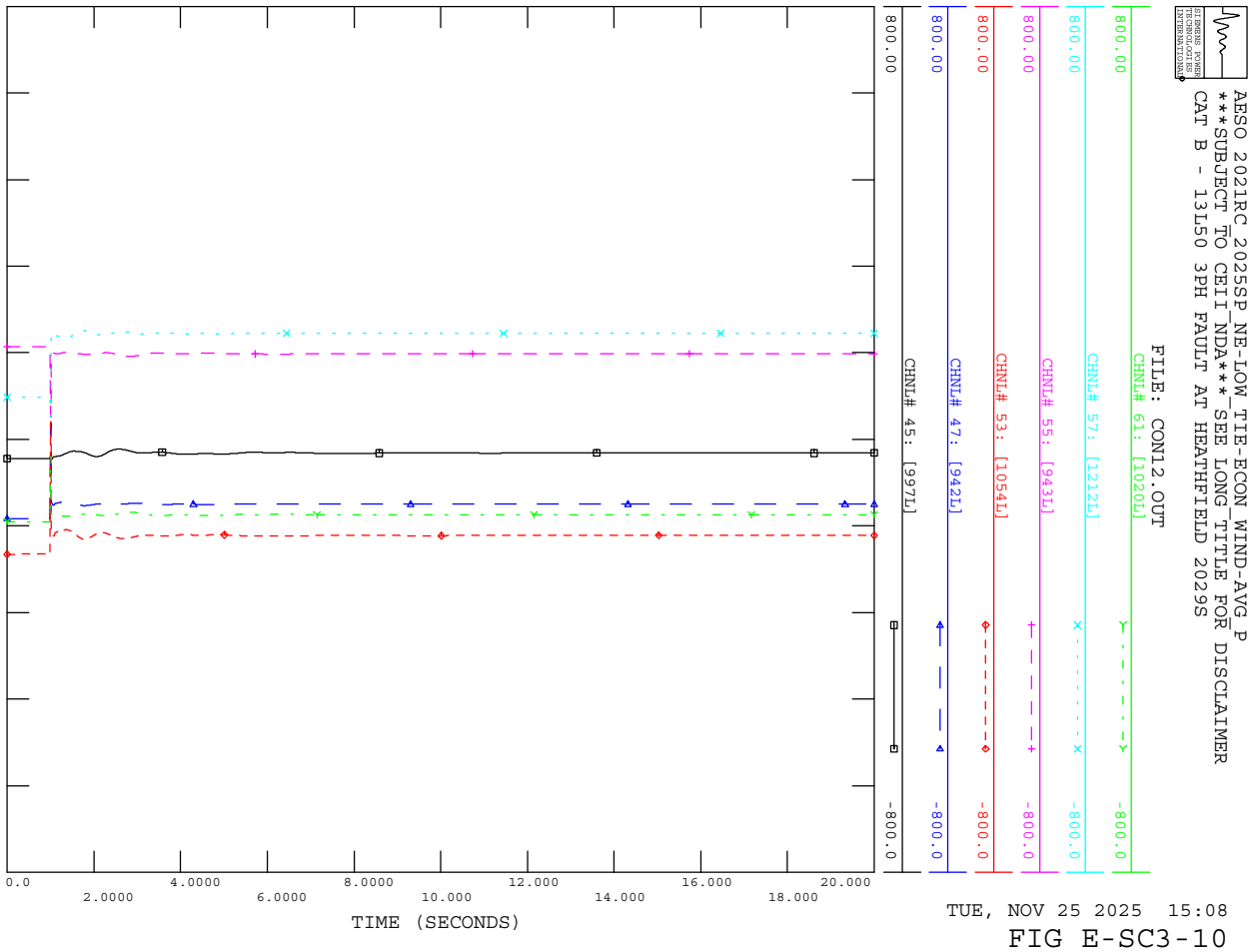


FIG E-SC3-10

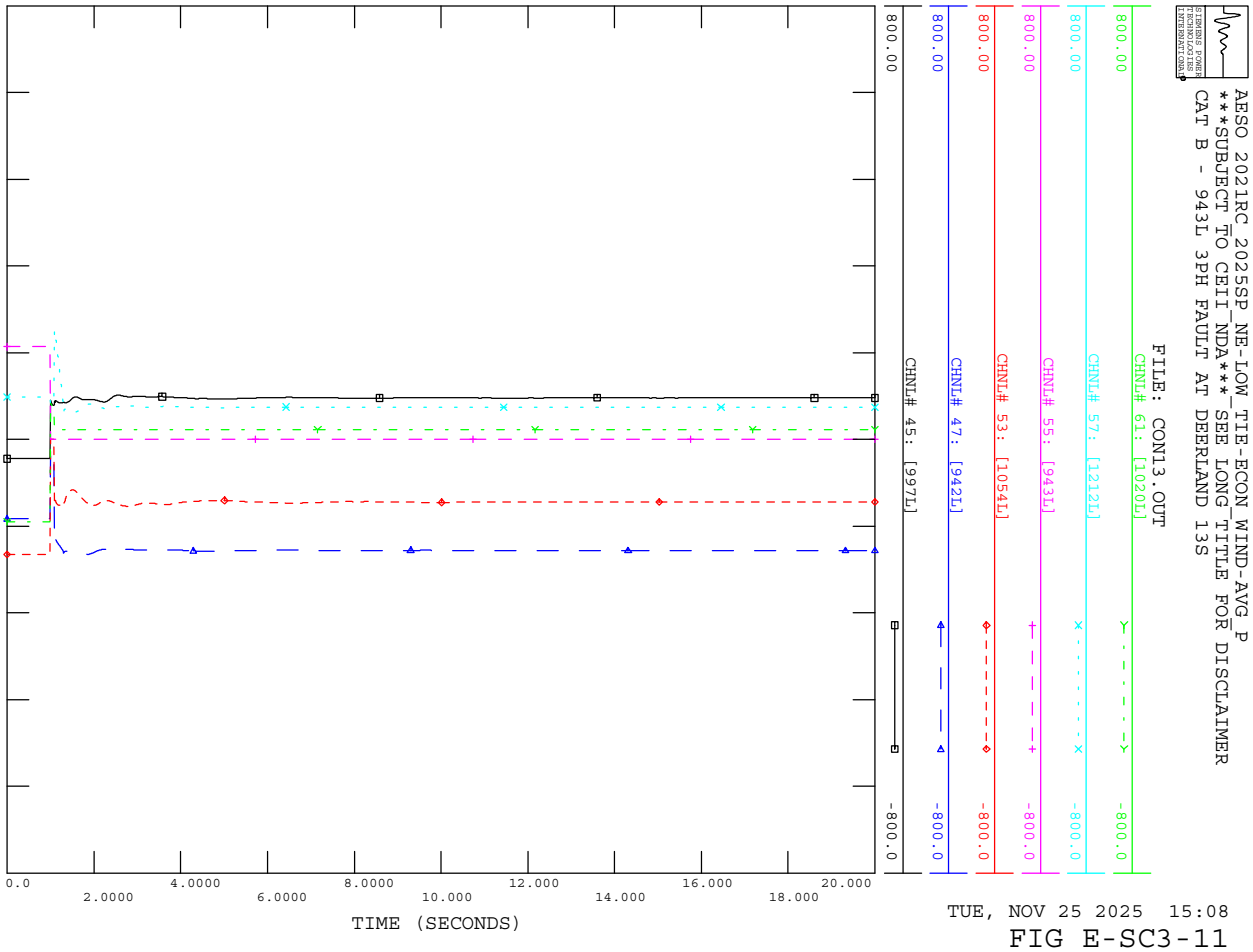


FIG E-SC3-11

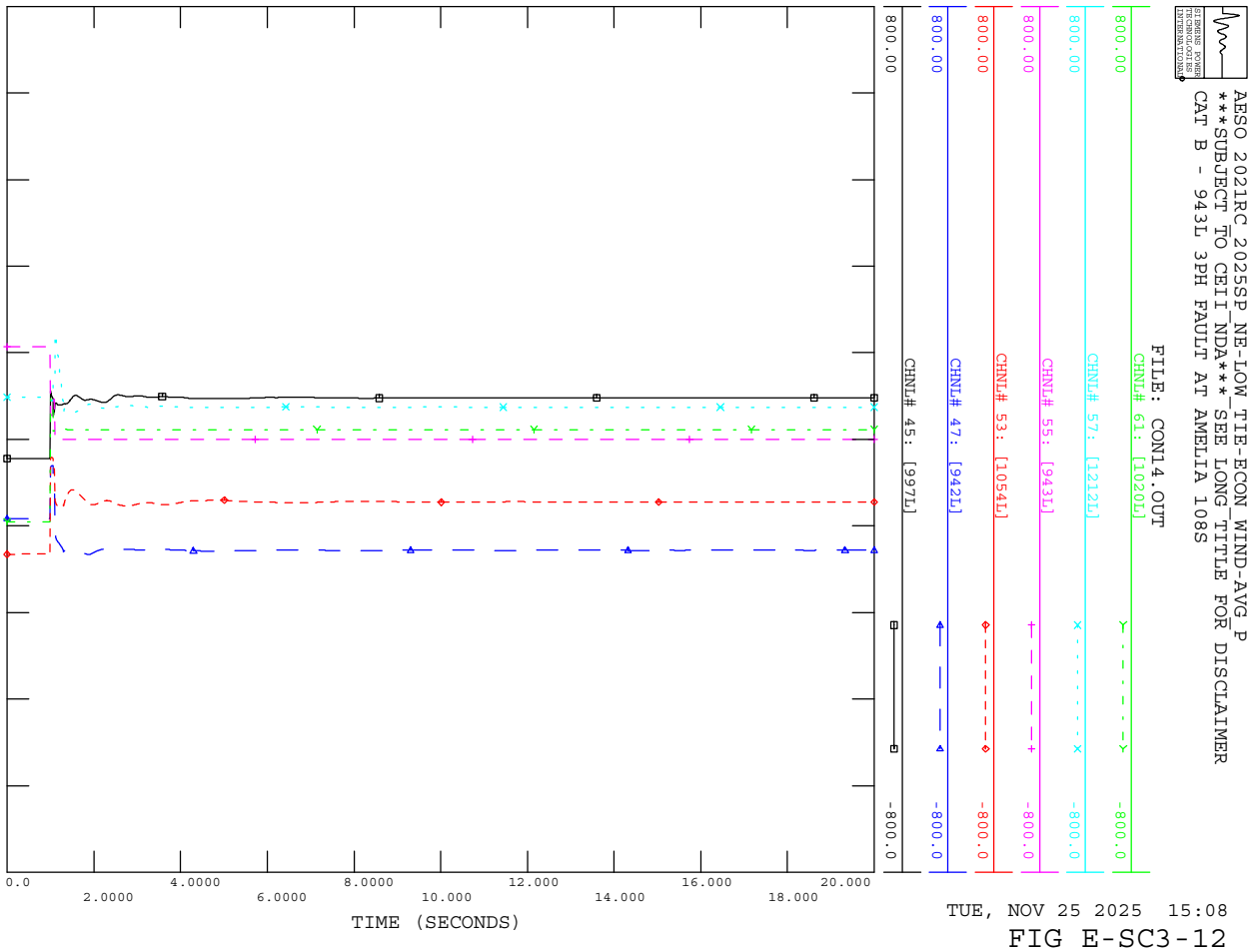


FIG E-SC3-12

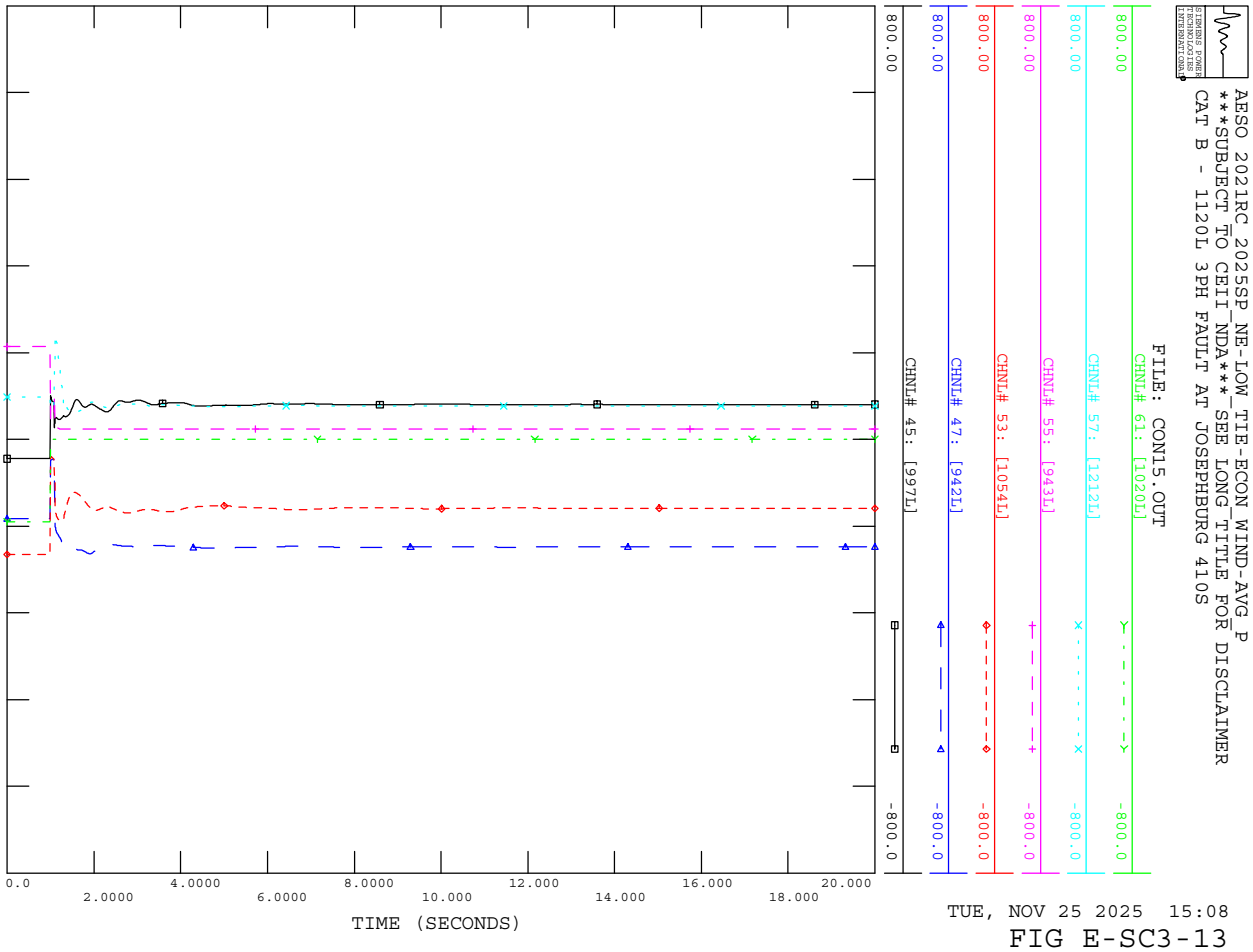


FIG E-SC3-13

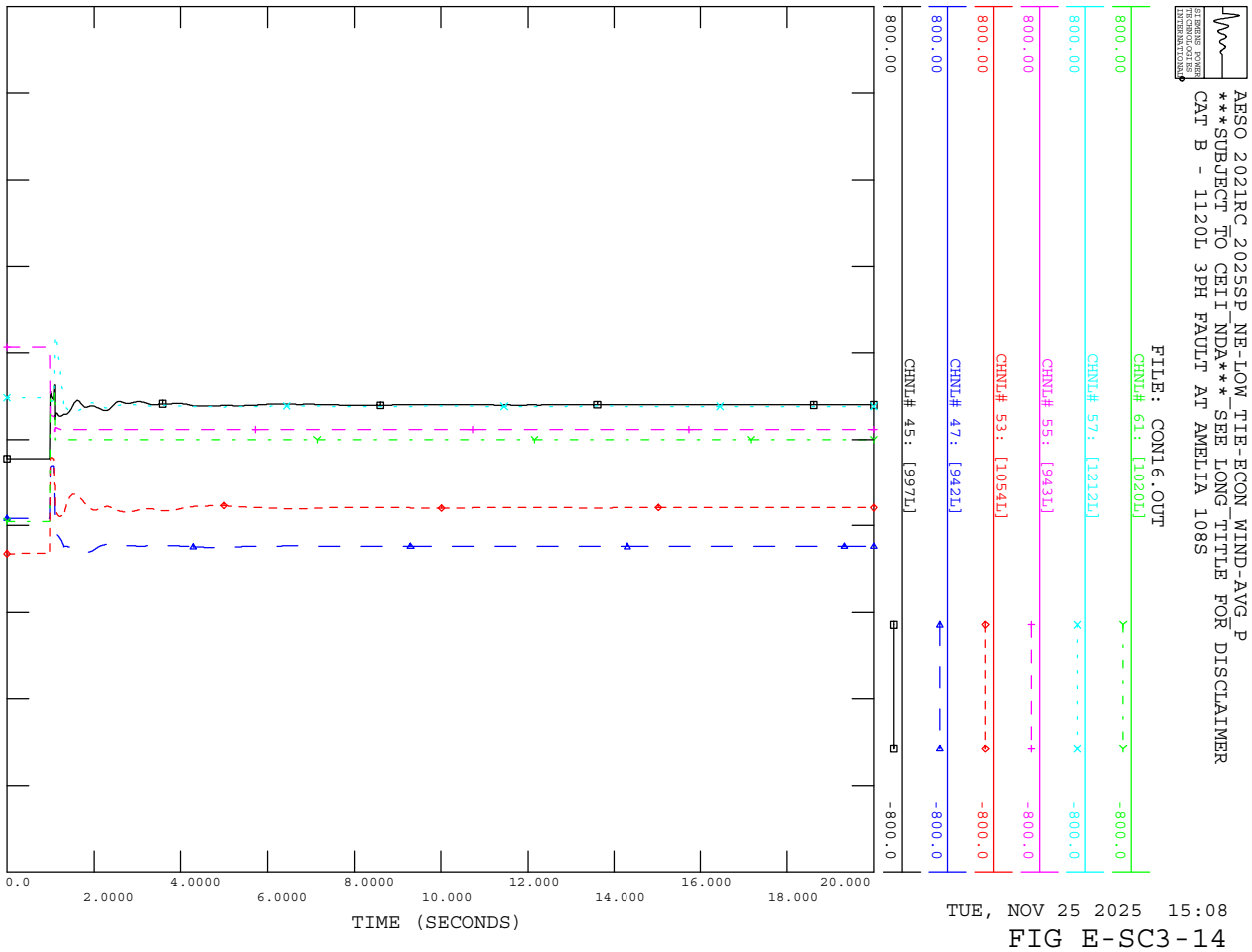


FIG E-SC3-14

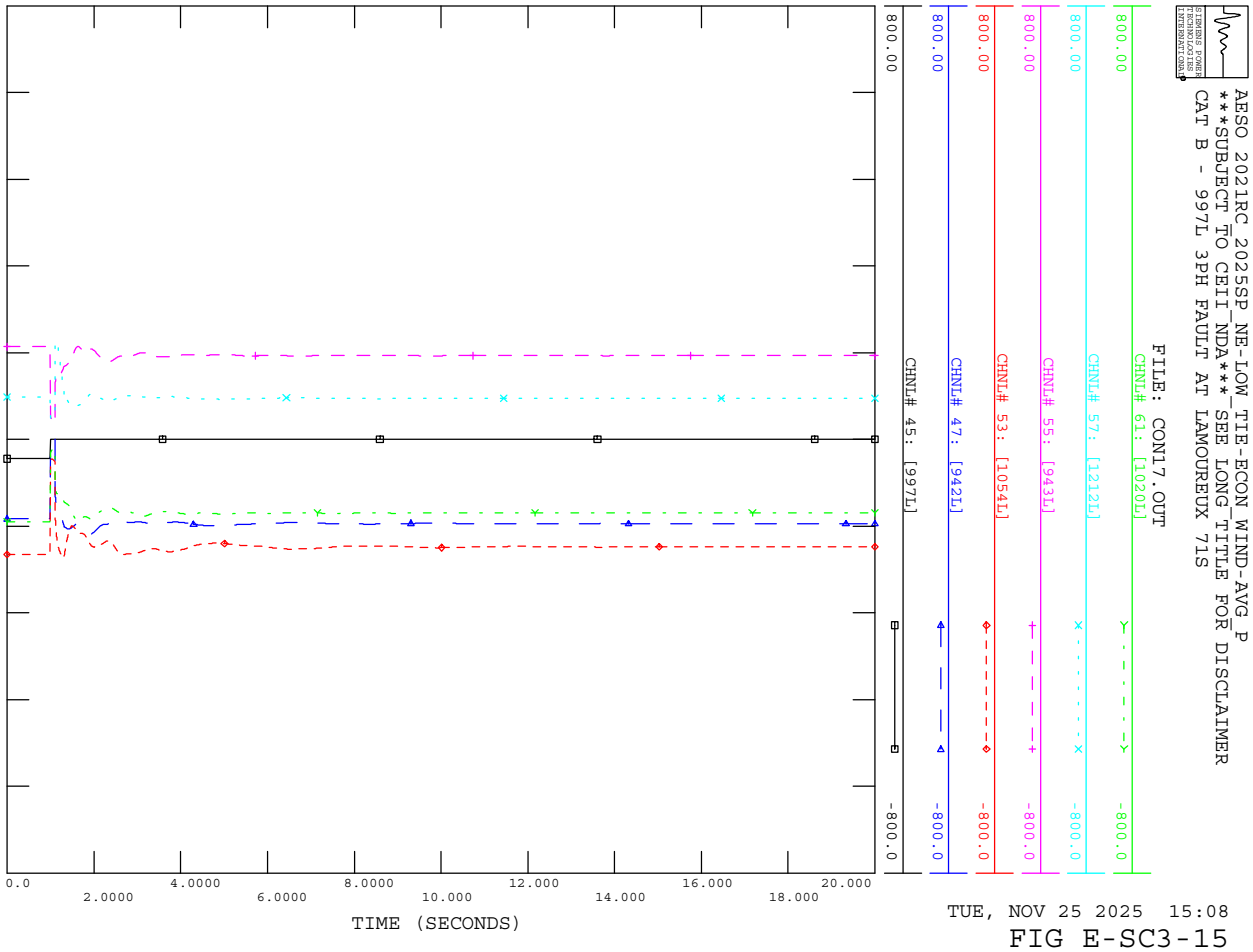


FIG E-SC3-15

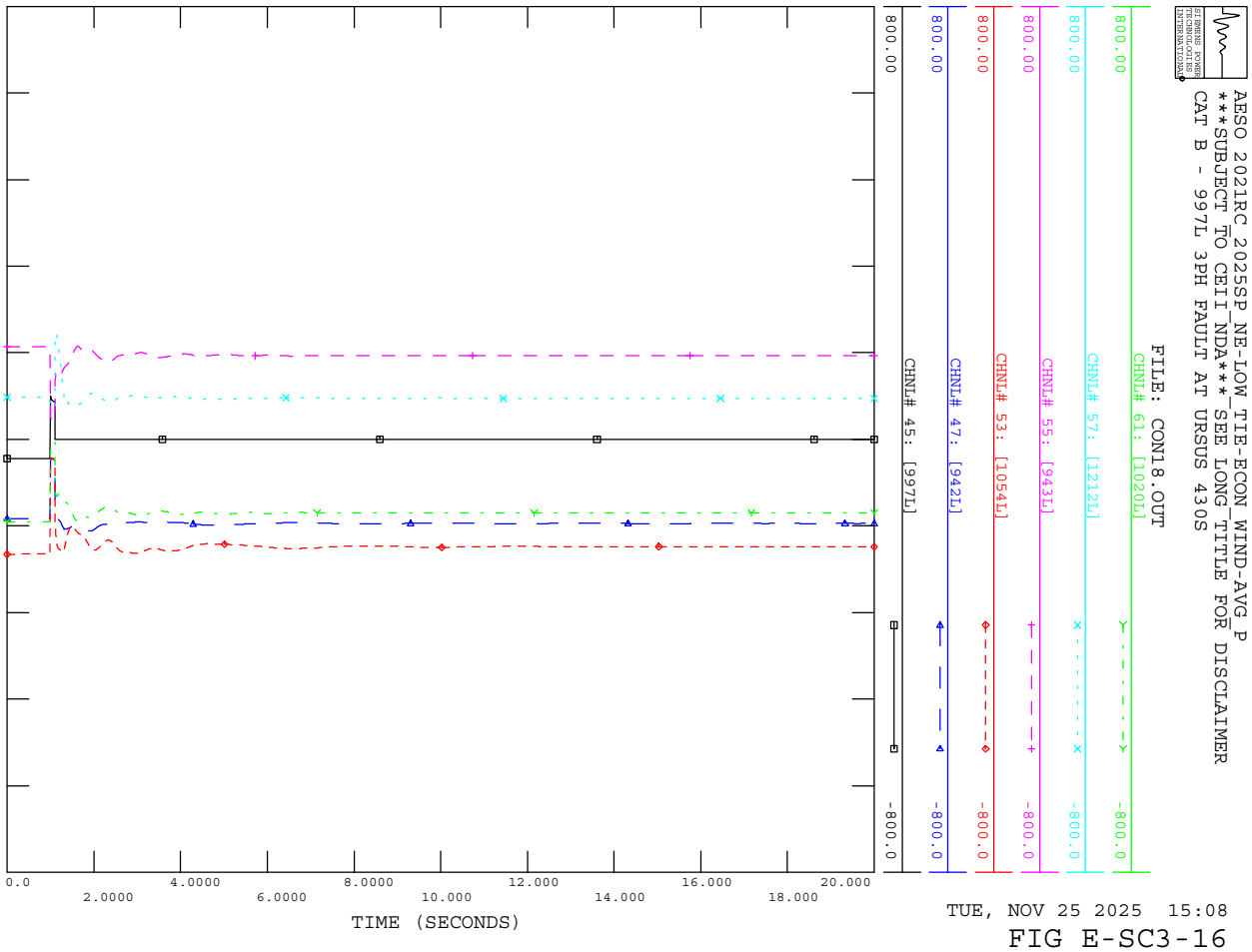


FIG E-SC3-16

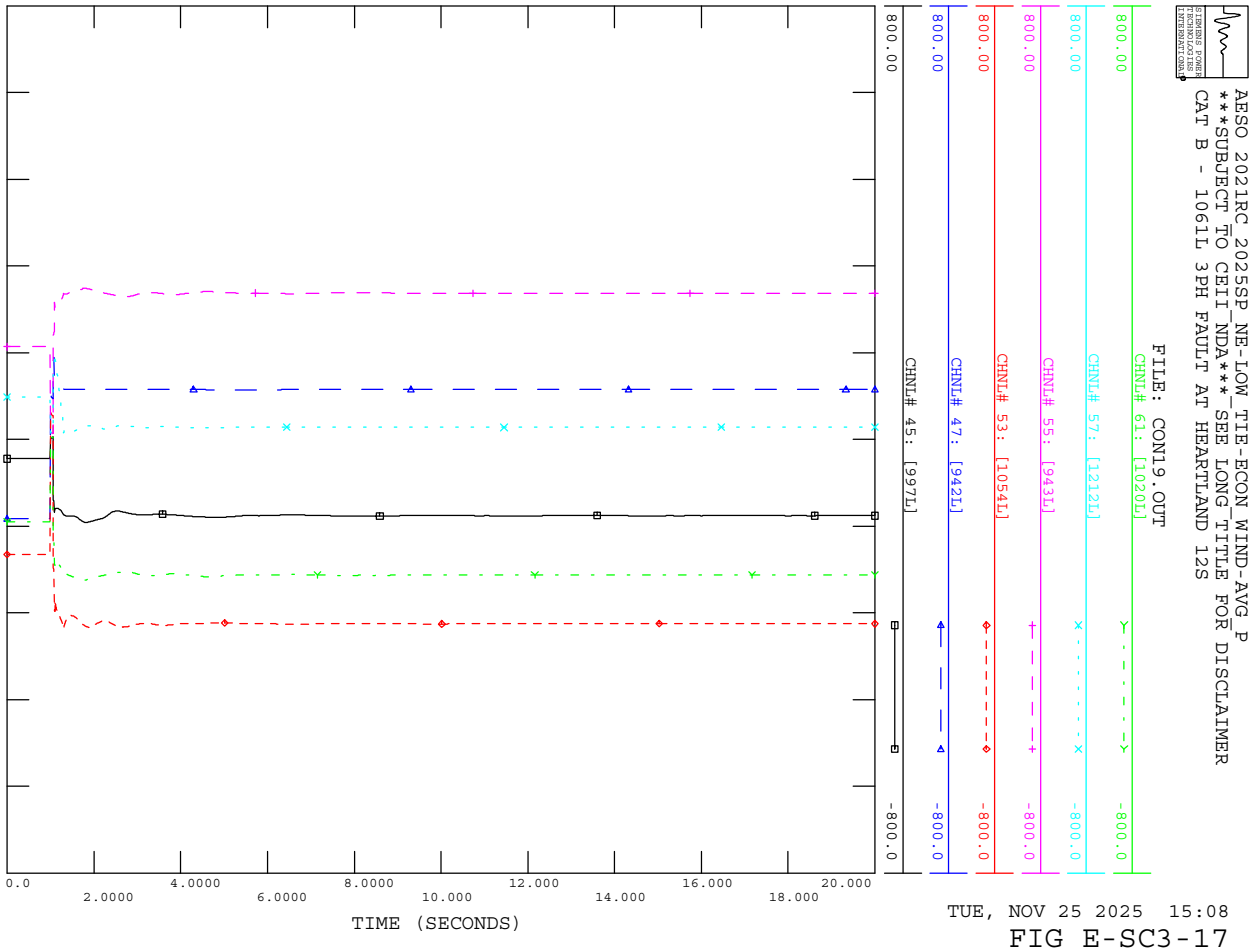


FIG E-SC3-17

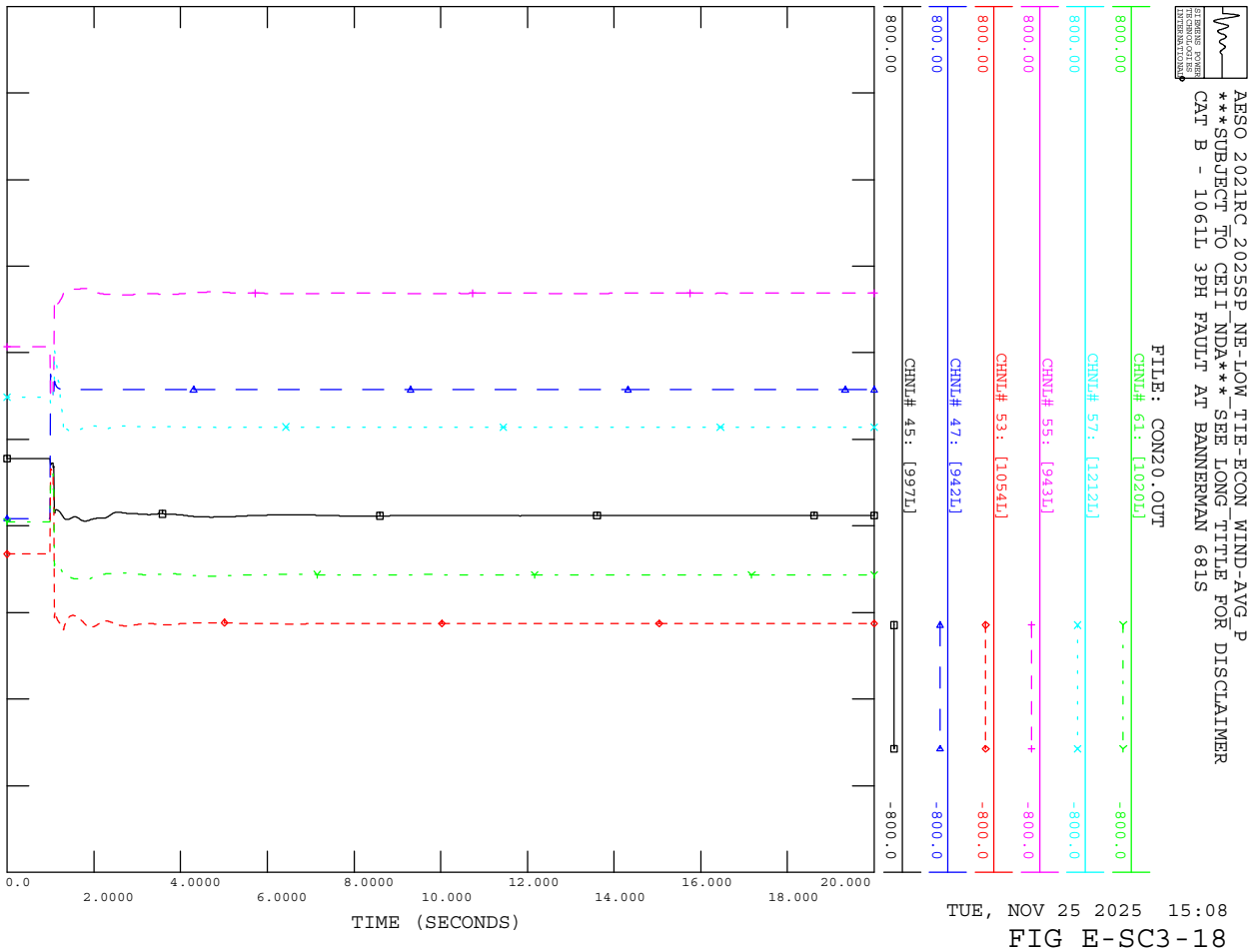


FIG E-SC3-18

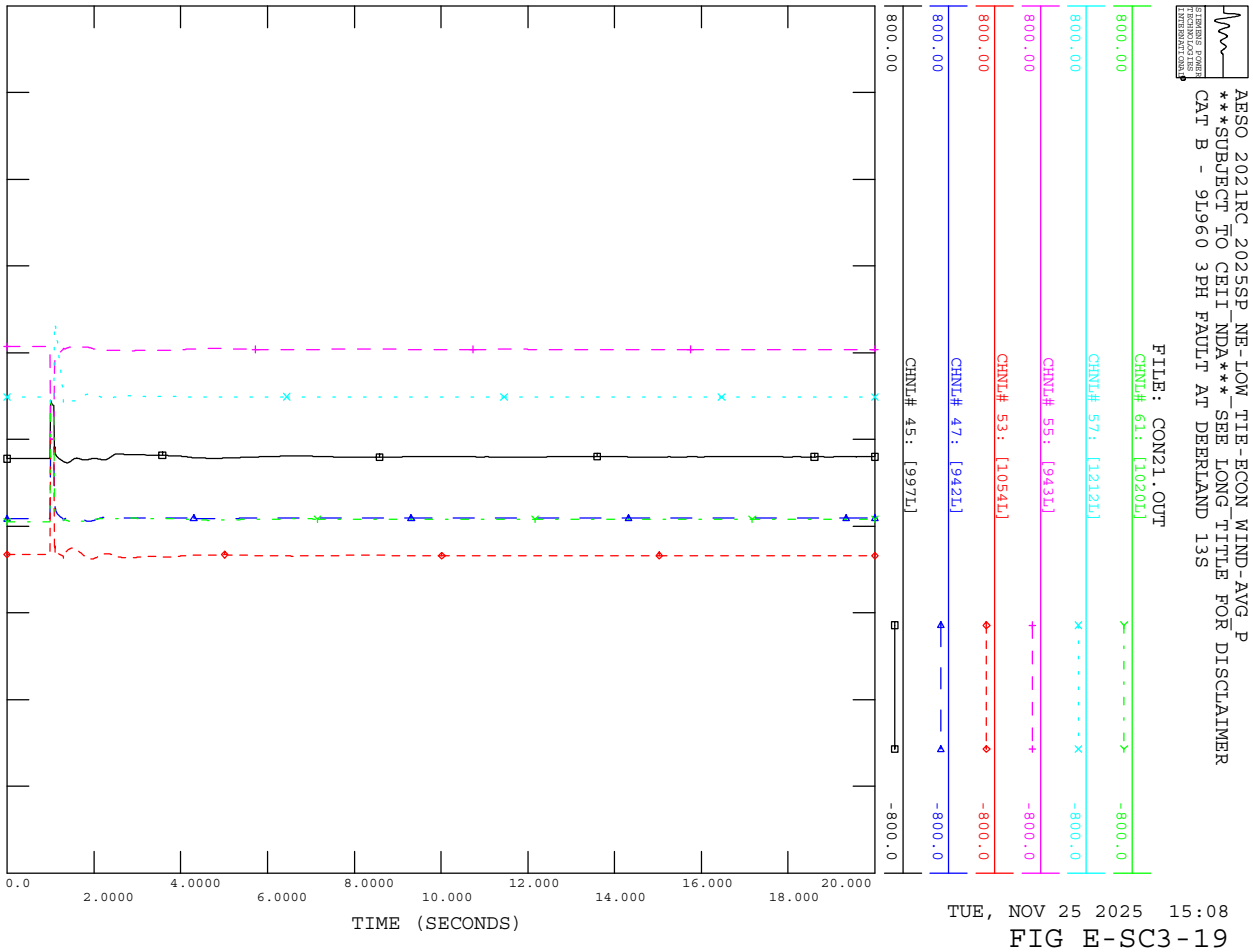


FIG E-SC3-19

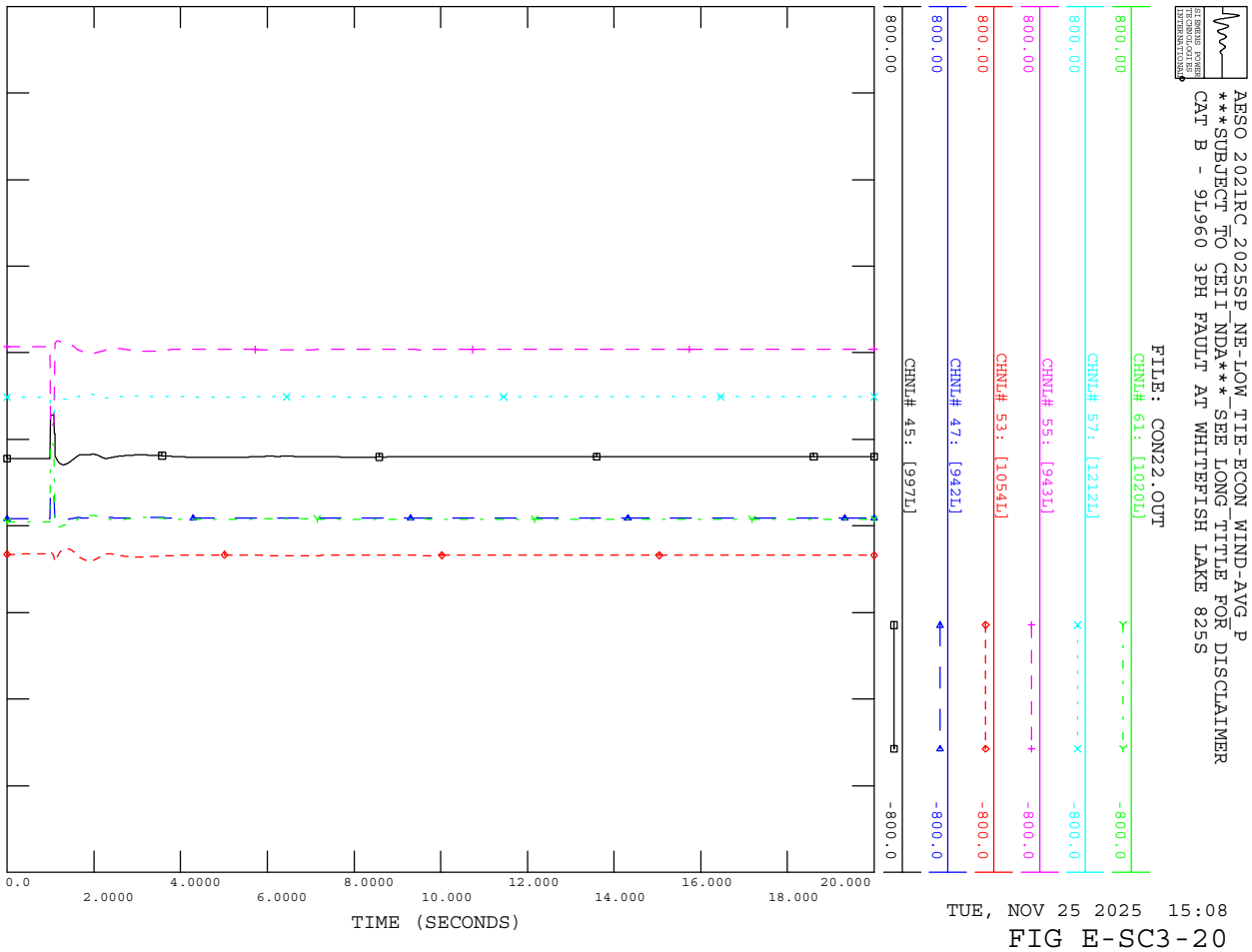


FIG E-SC3-20

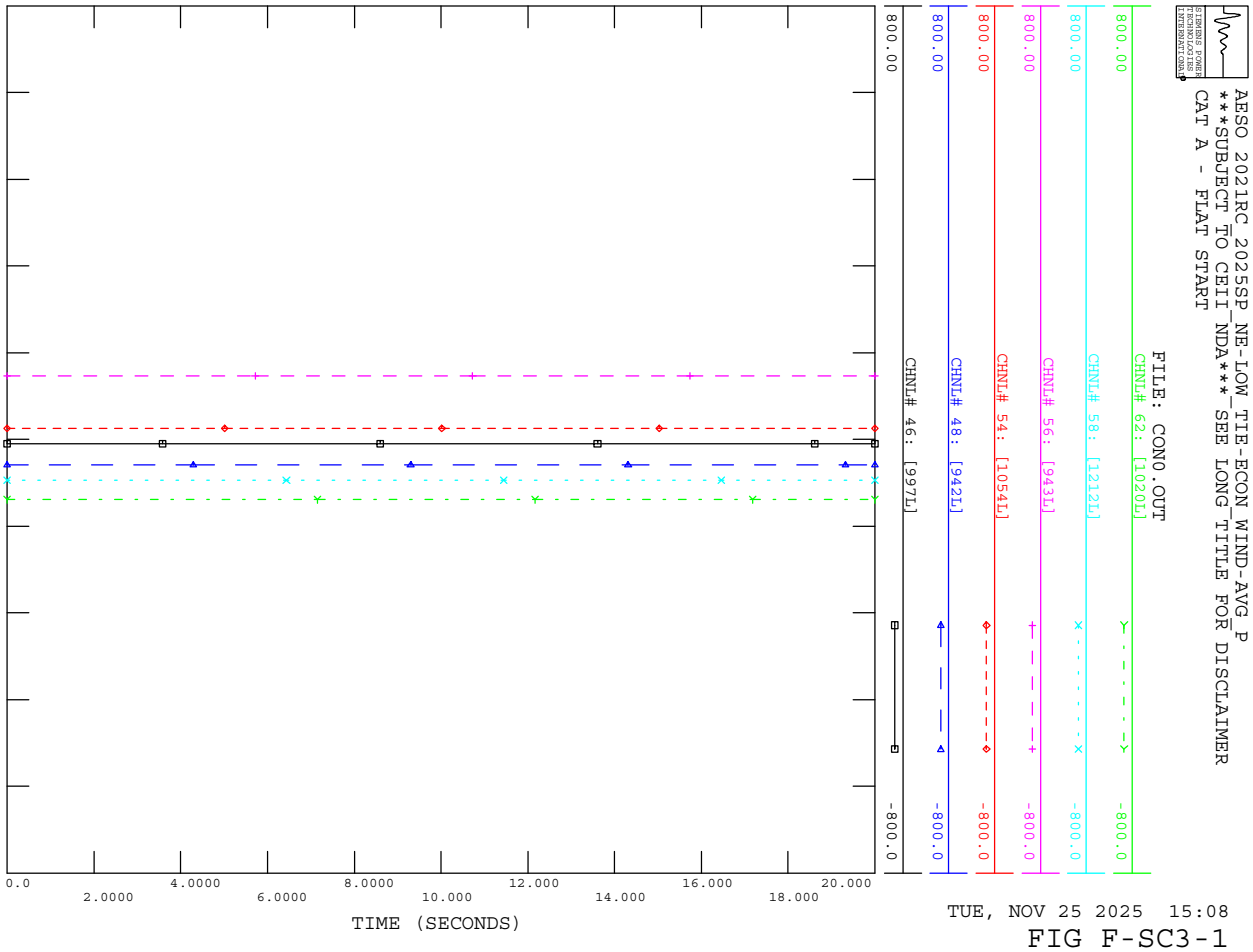


FIG F-SC3-1

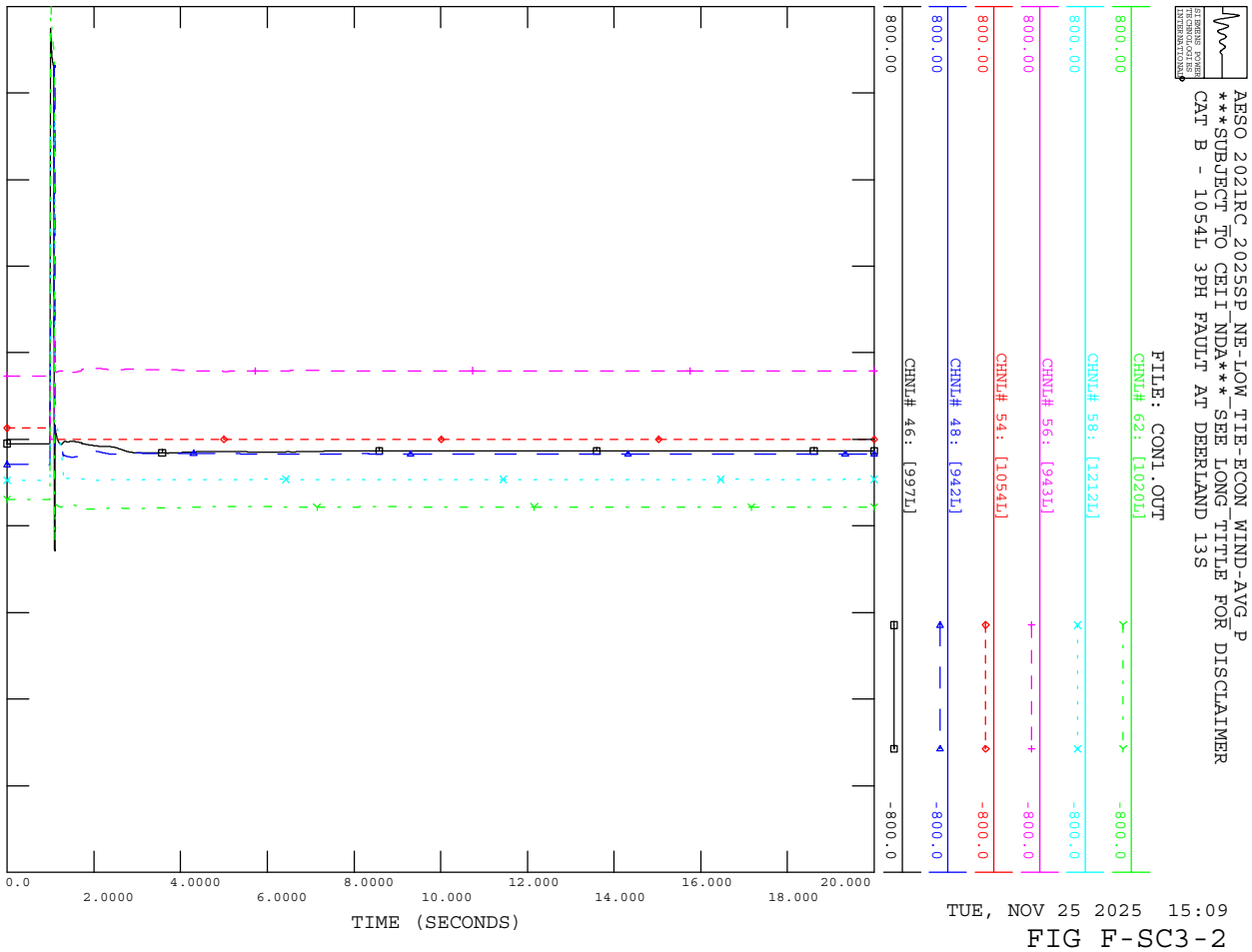


FIG F-SC3-2

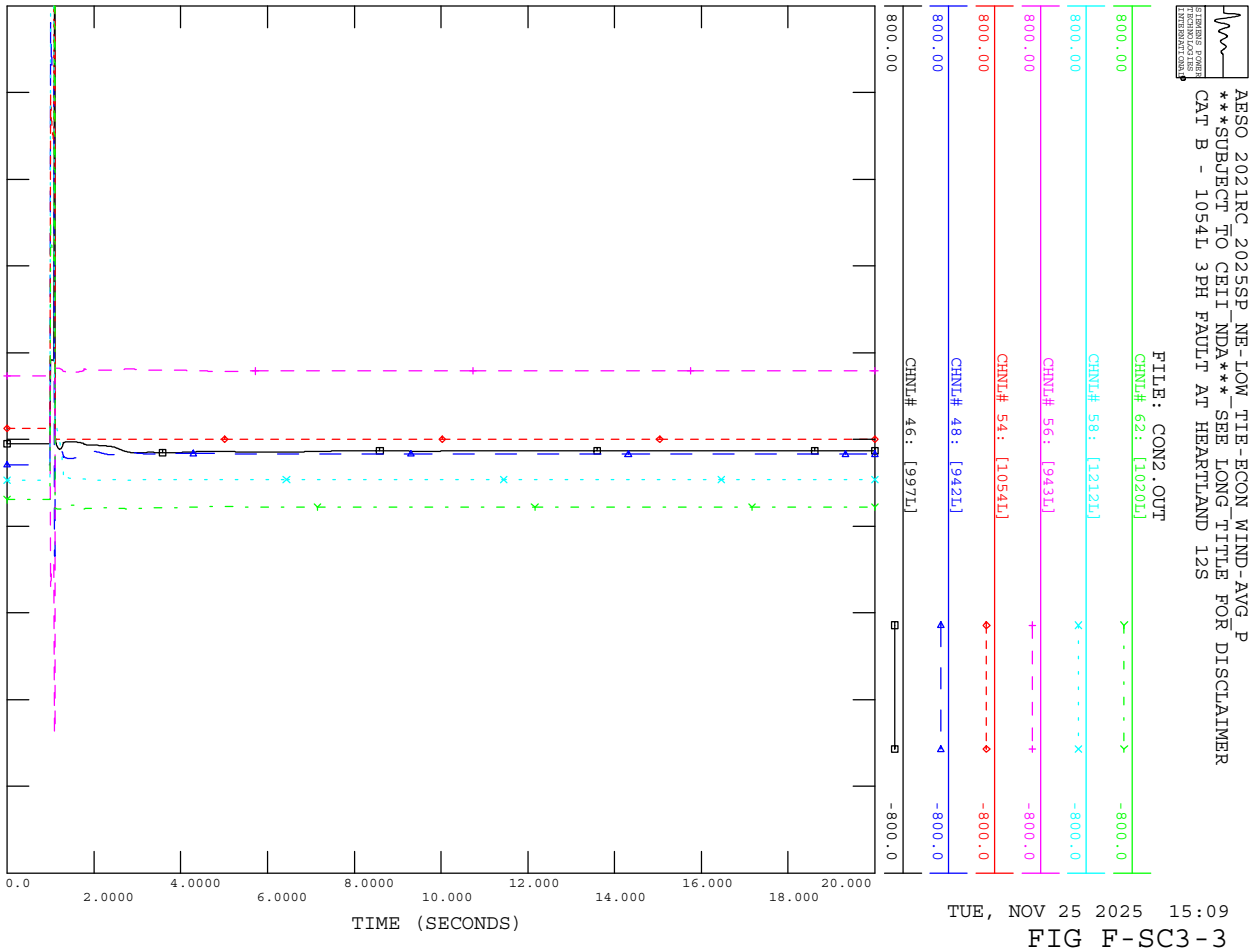


FIG F-SC3-3

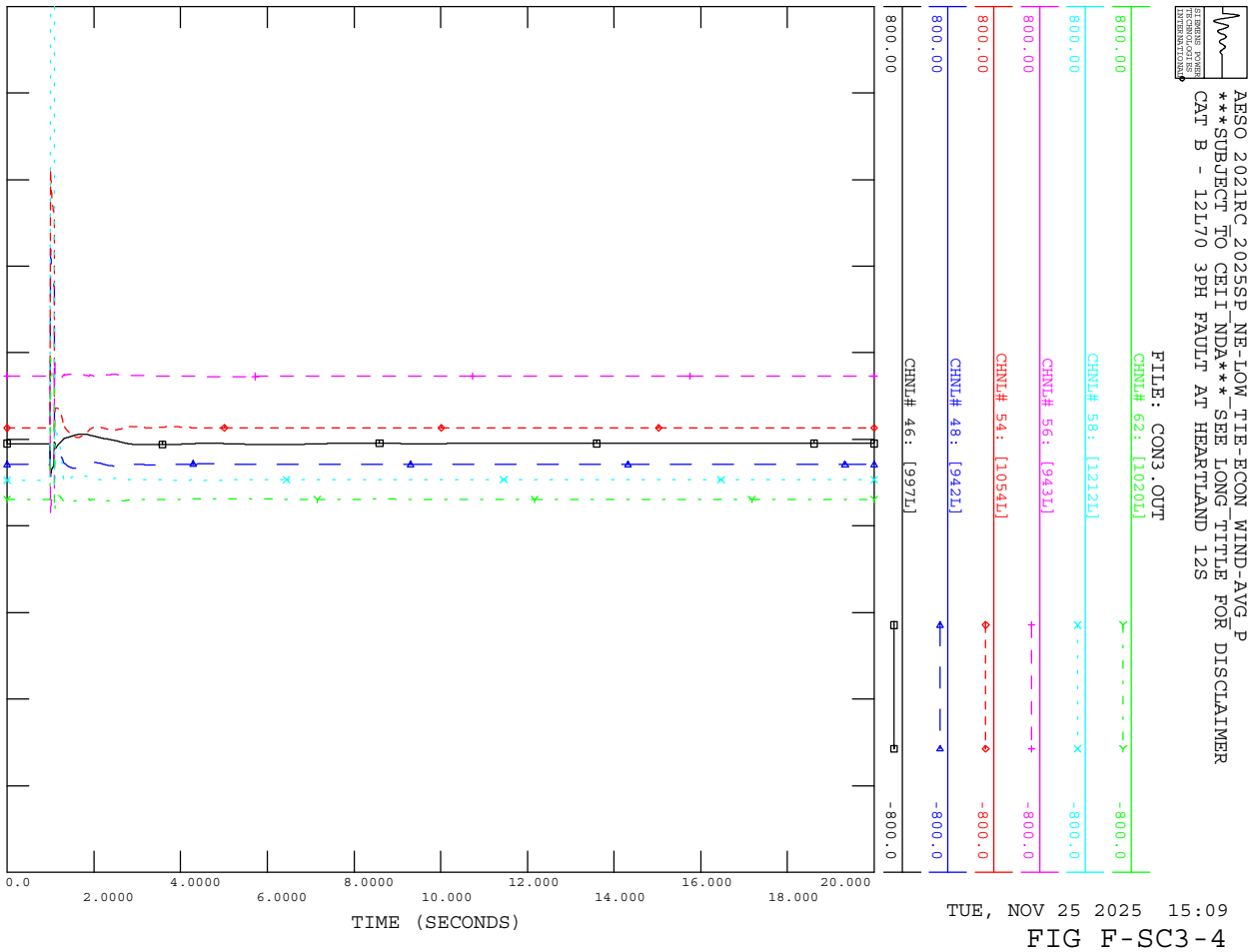


FIG F-SC3-4

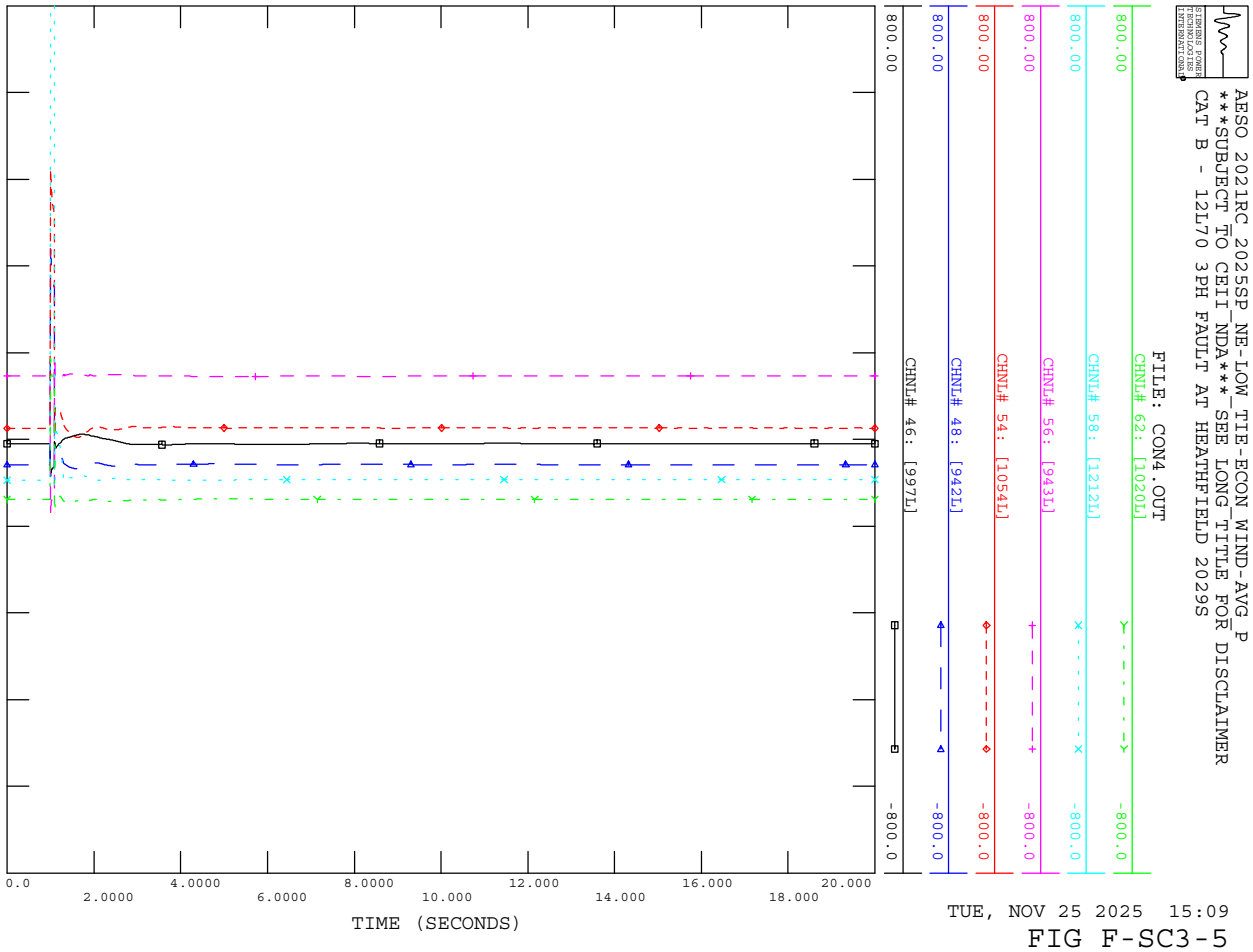


FIG F-SC3-5

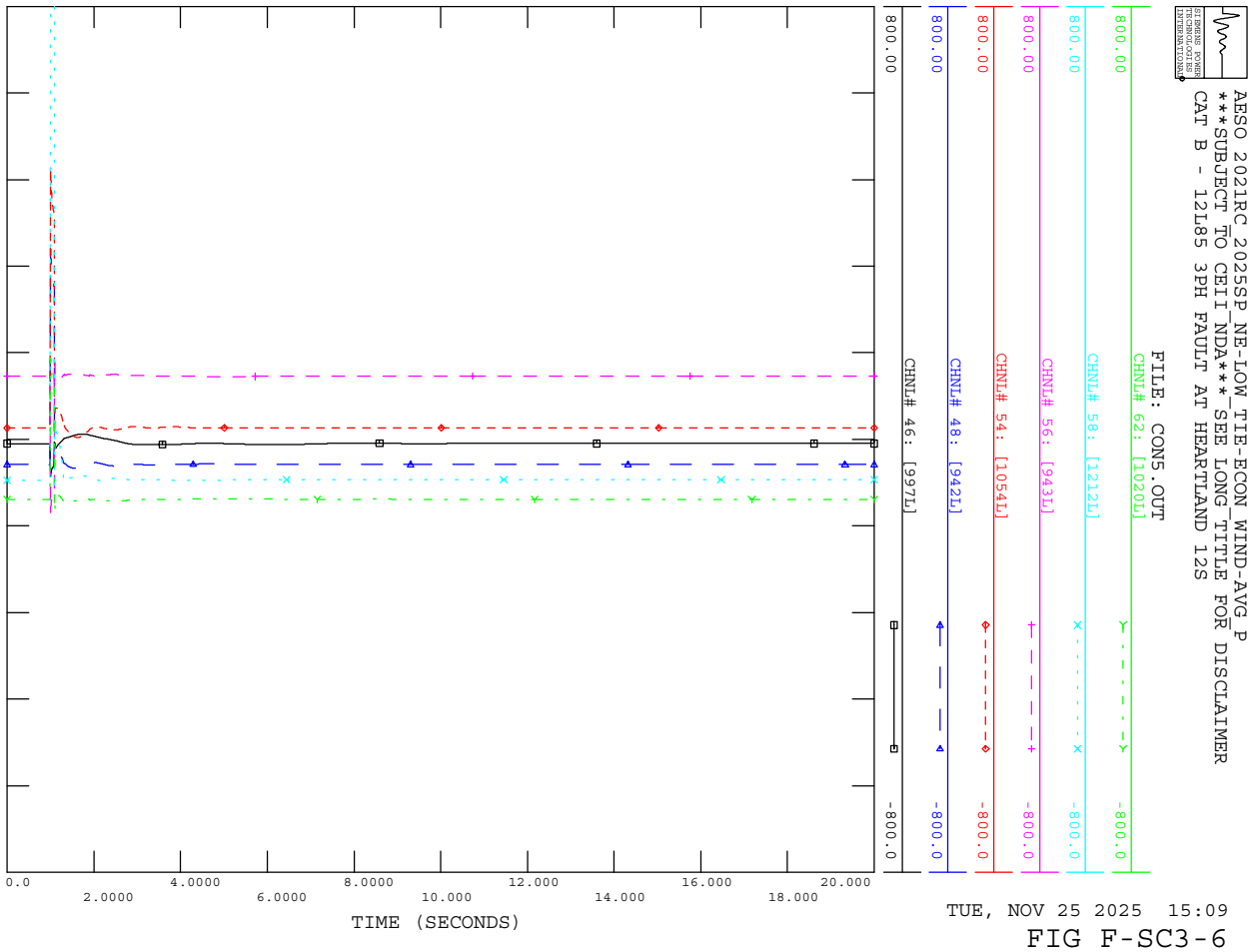


FIG F-SC3-6

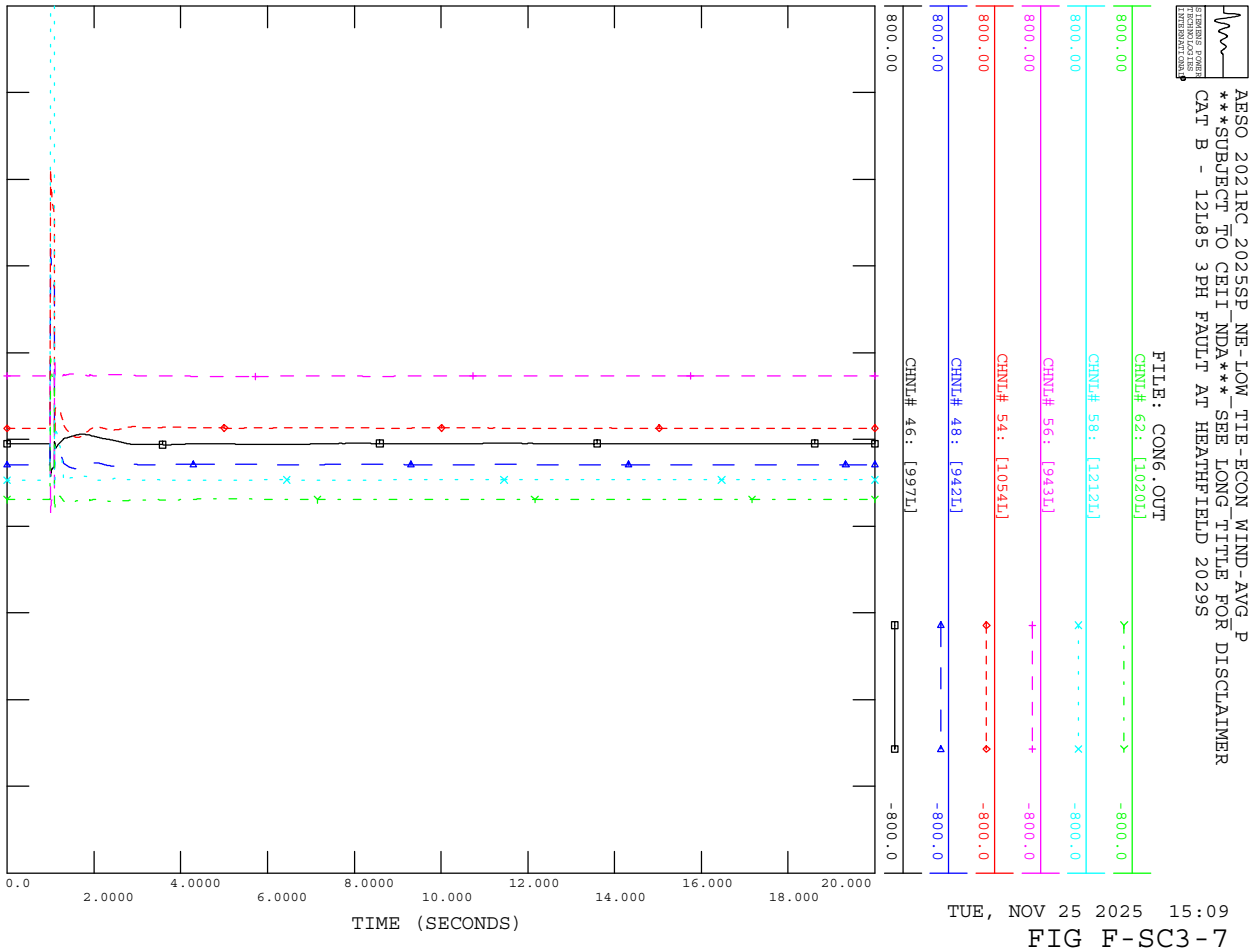


FIG F-SC3-7

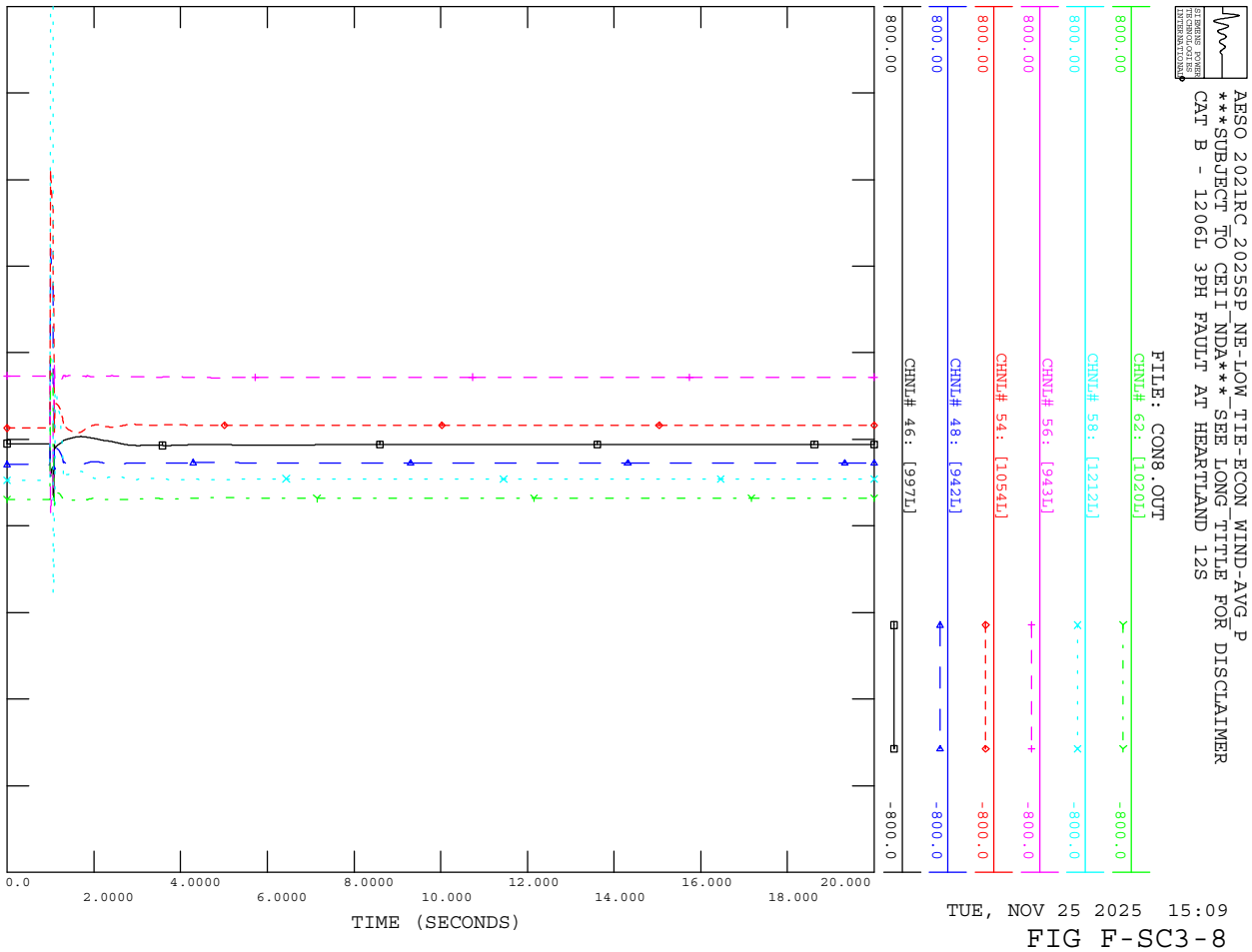


FIG F-SC3-8

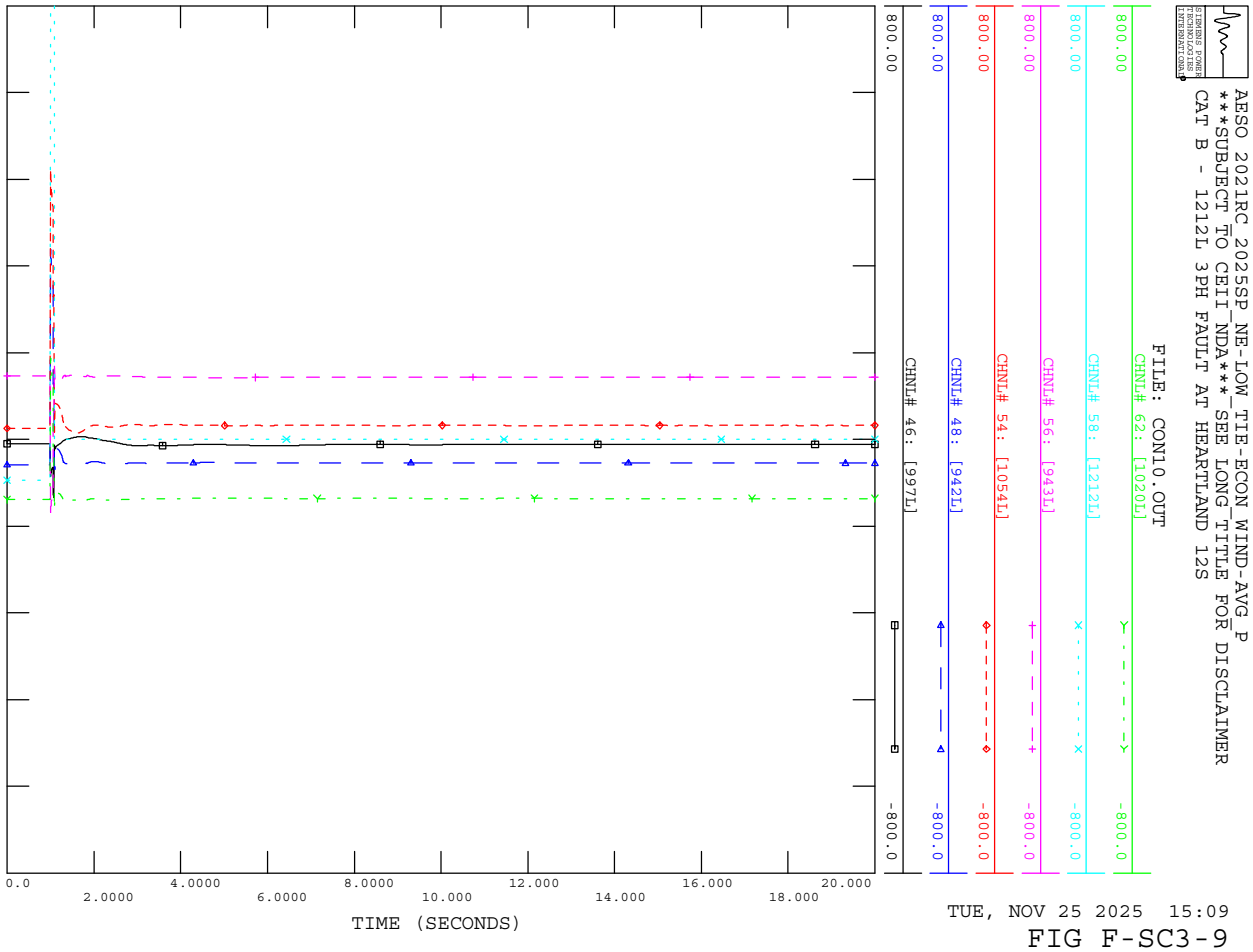


FIG F-SC3-9

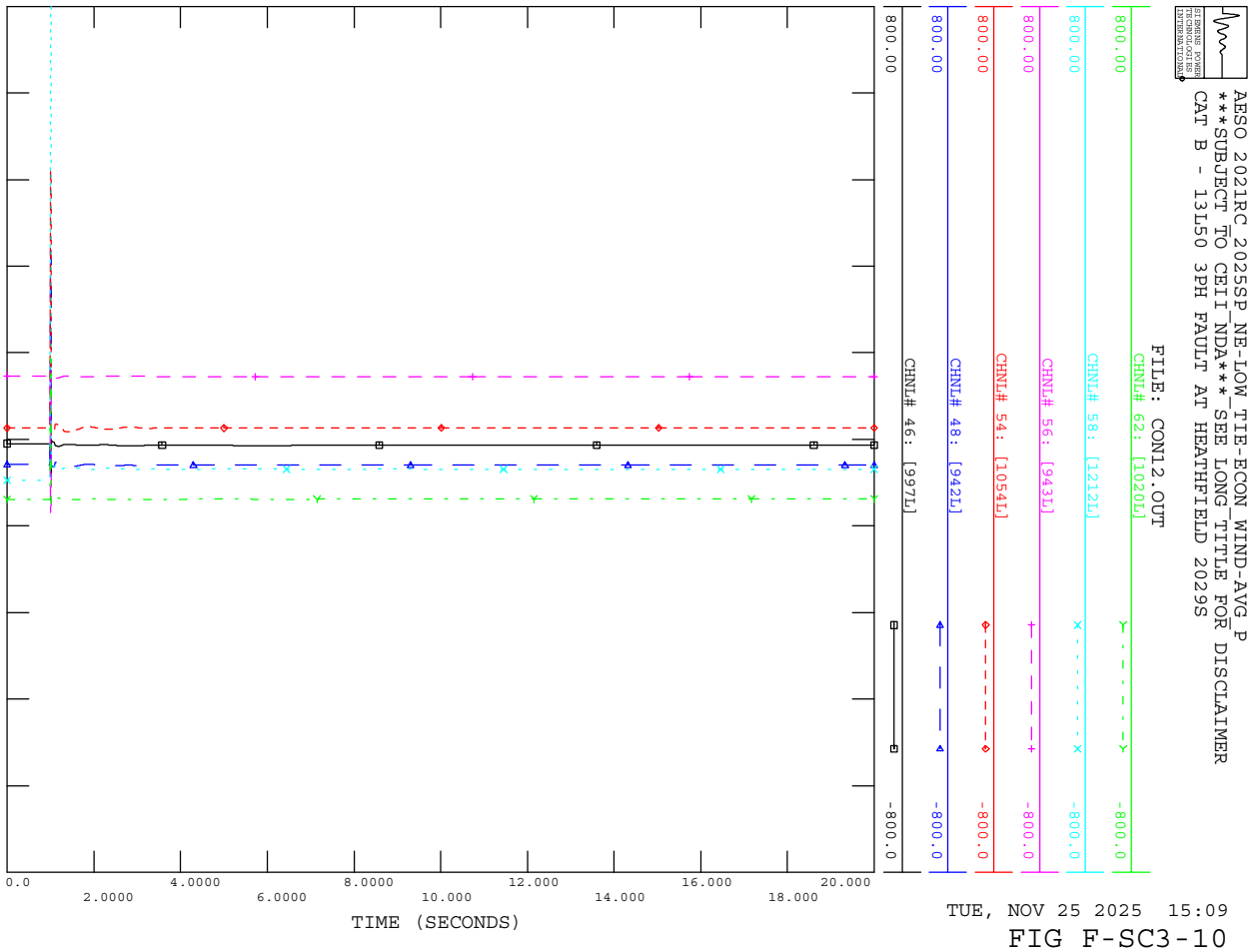


FIG F-SC3-10

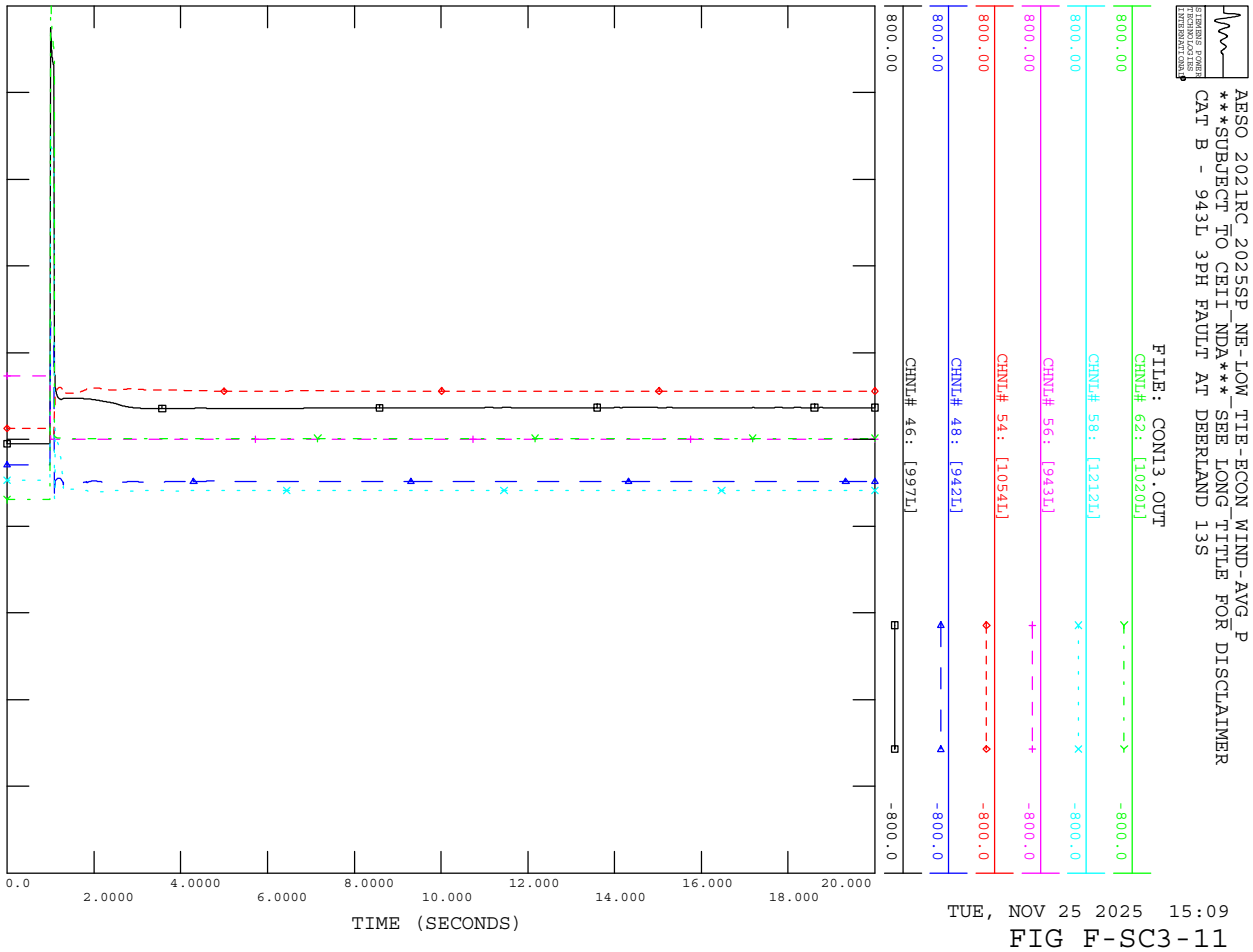


FIG F-SC3-11

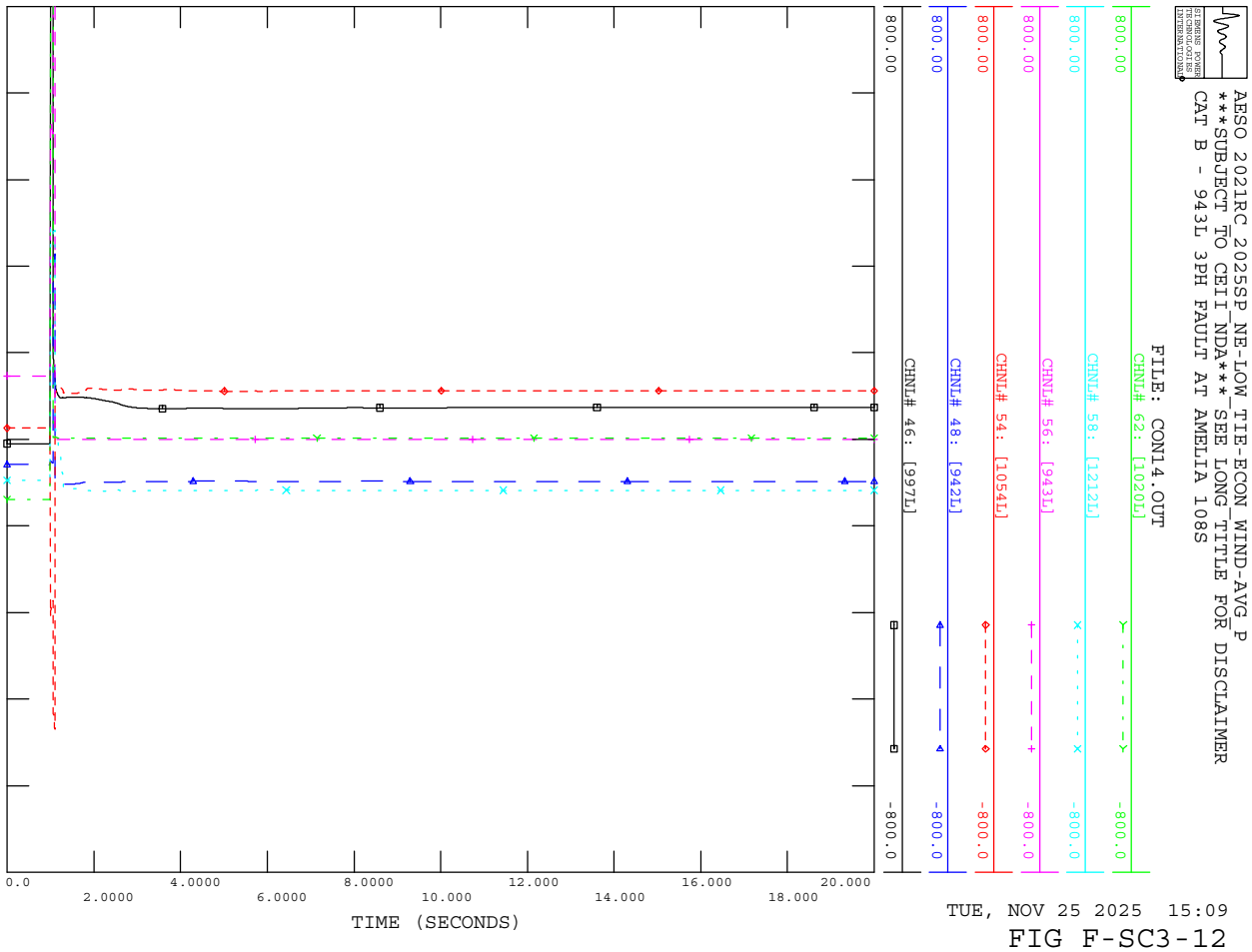


FIG F-SC3-12

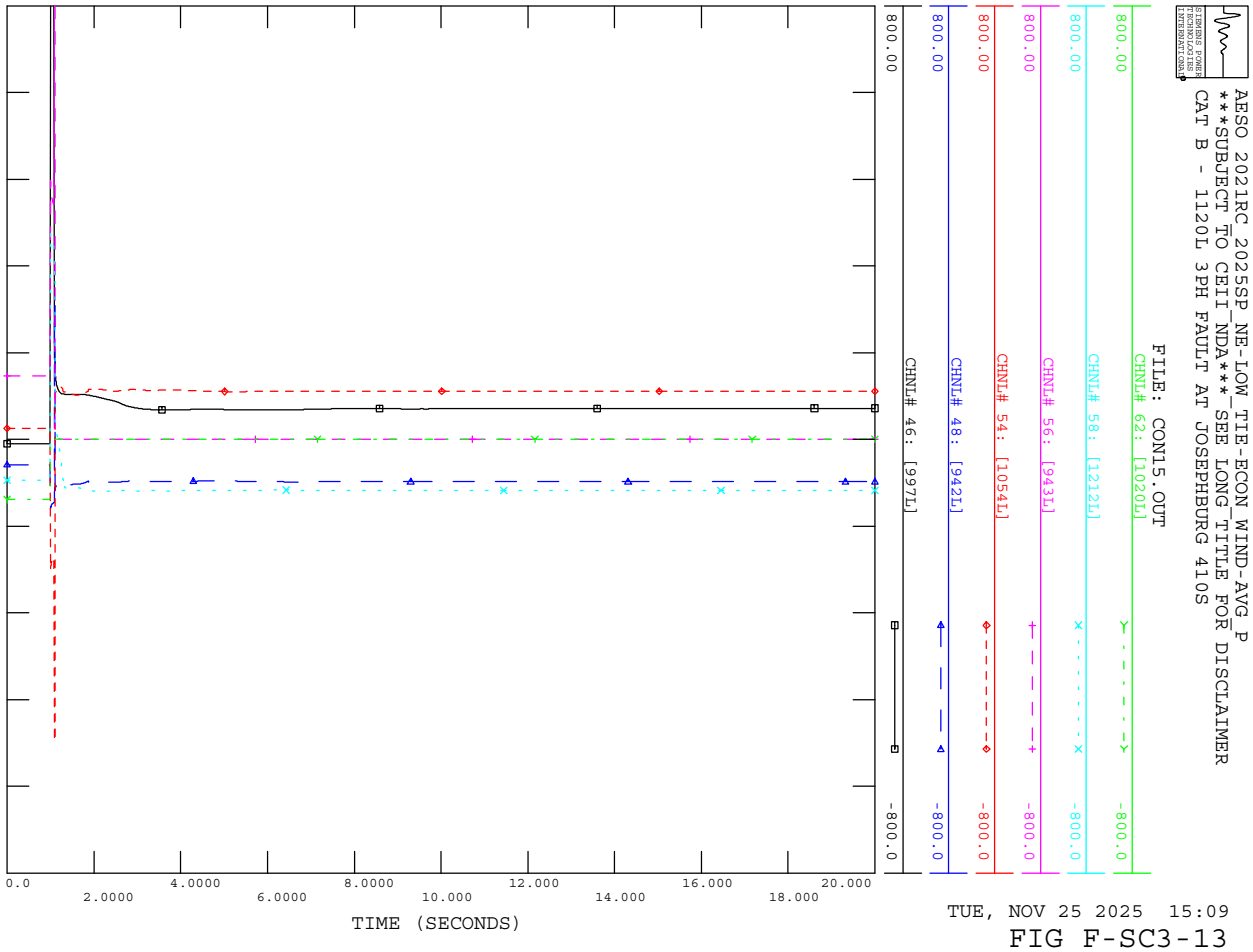


FIG F-SC3-13

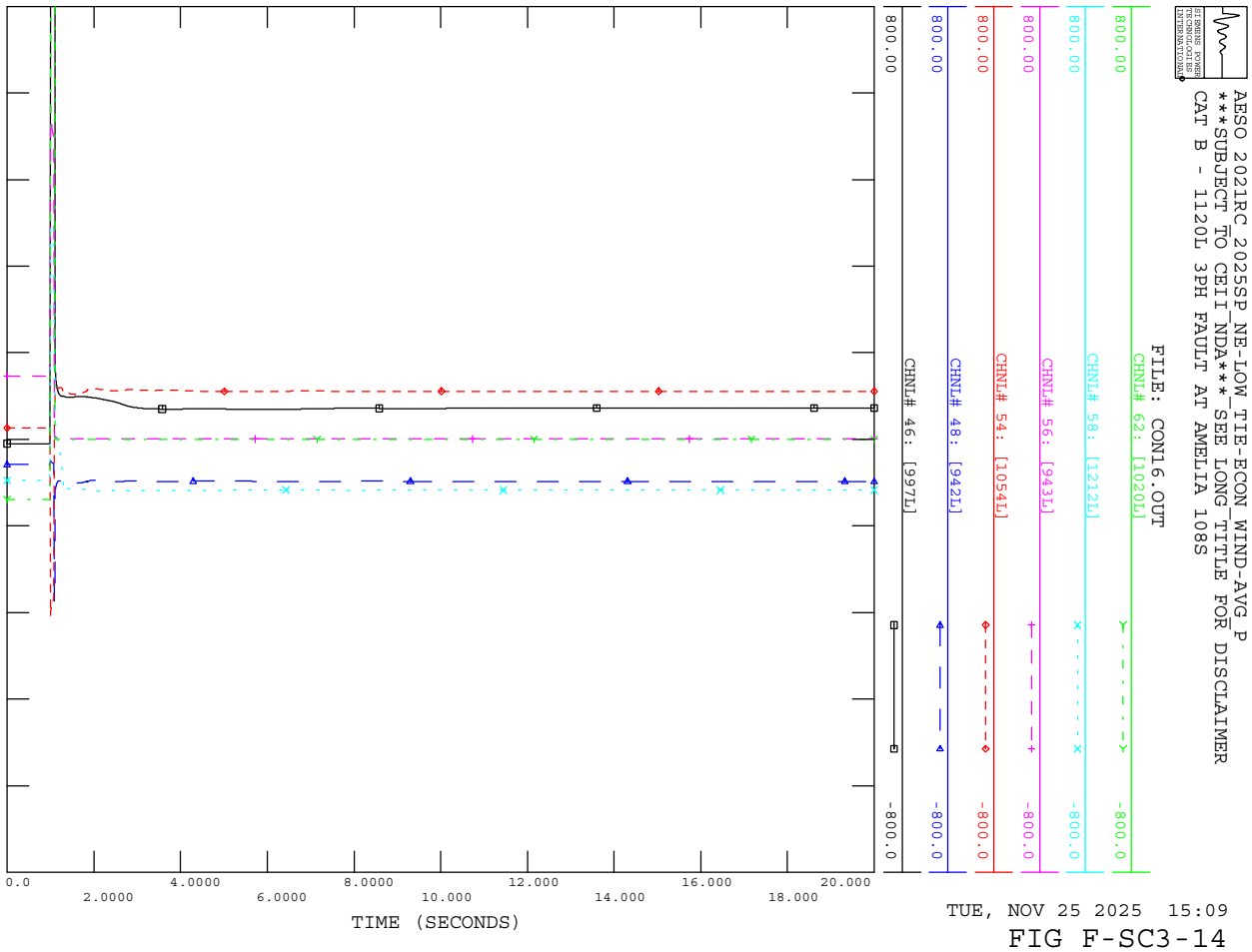


FIG F-SC3-14

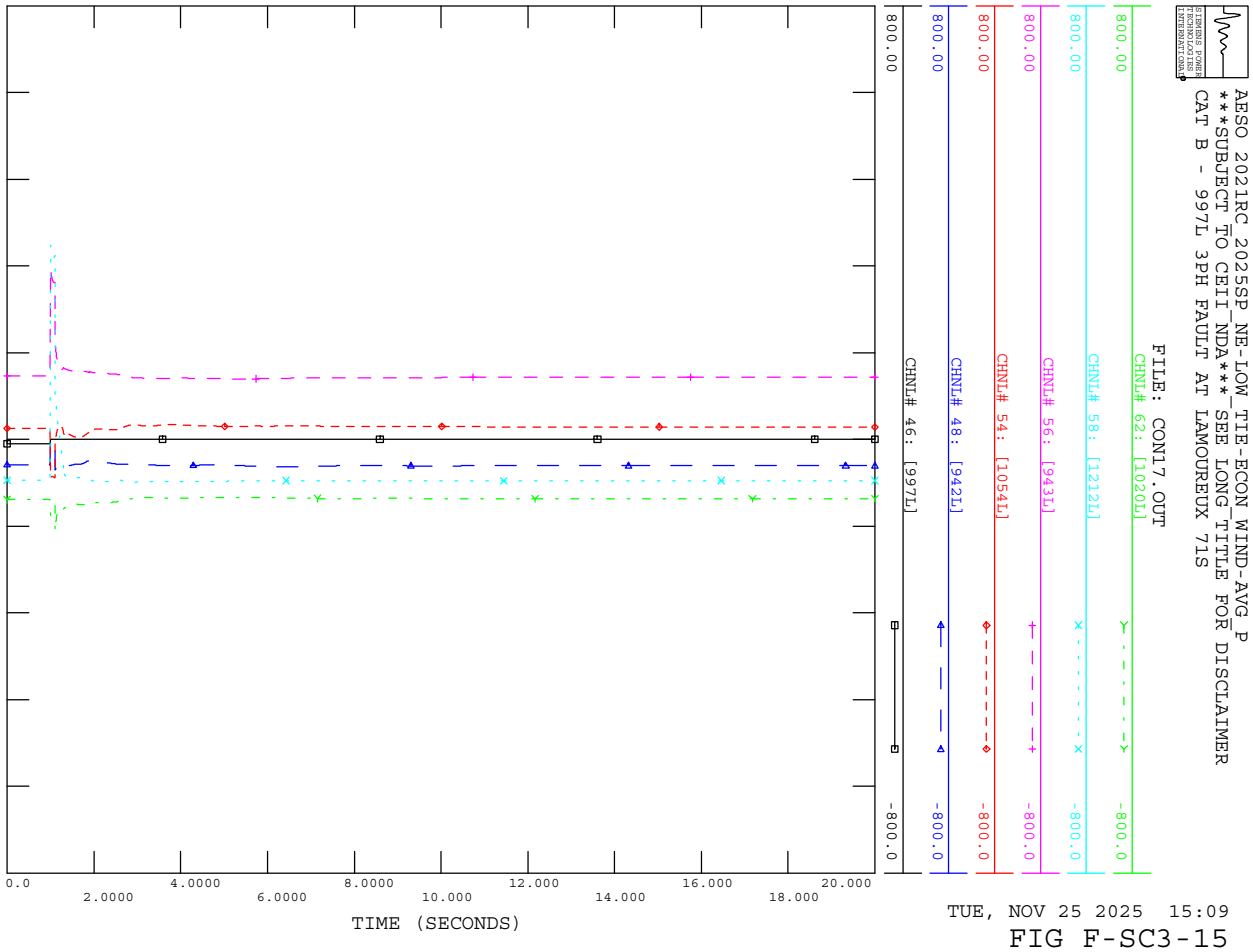


FIG F-SC3-15

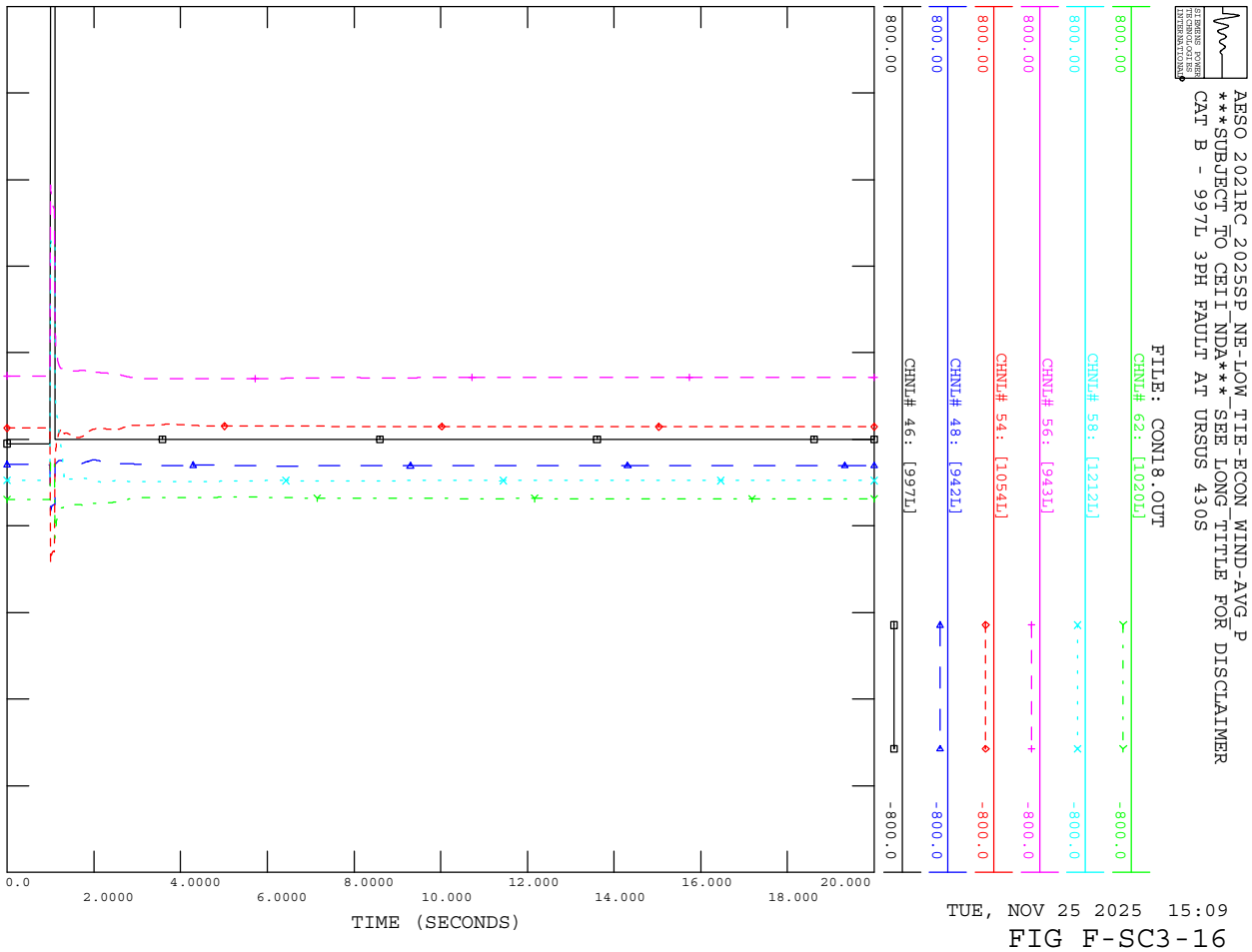


FIG F-SC3-16

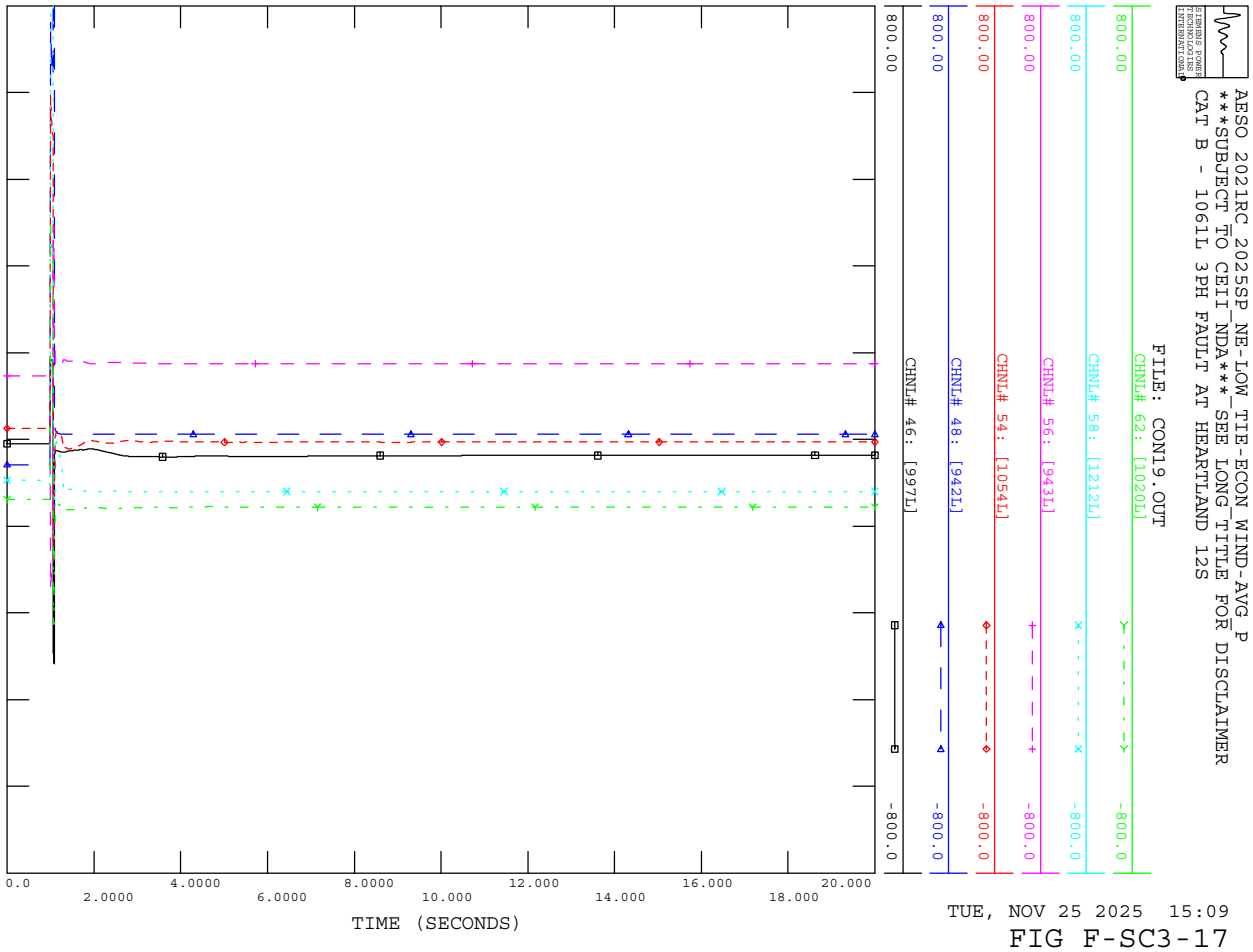


FIG F-SC3-17

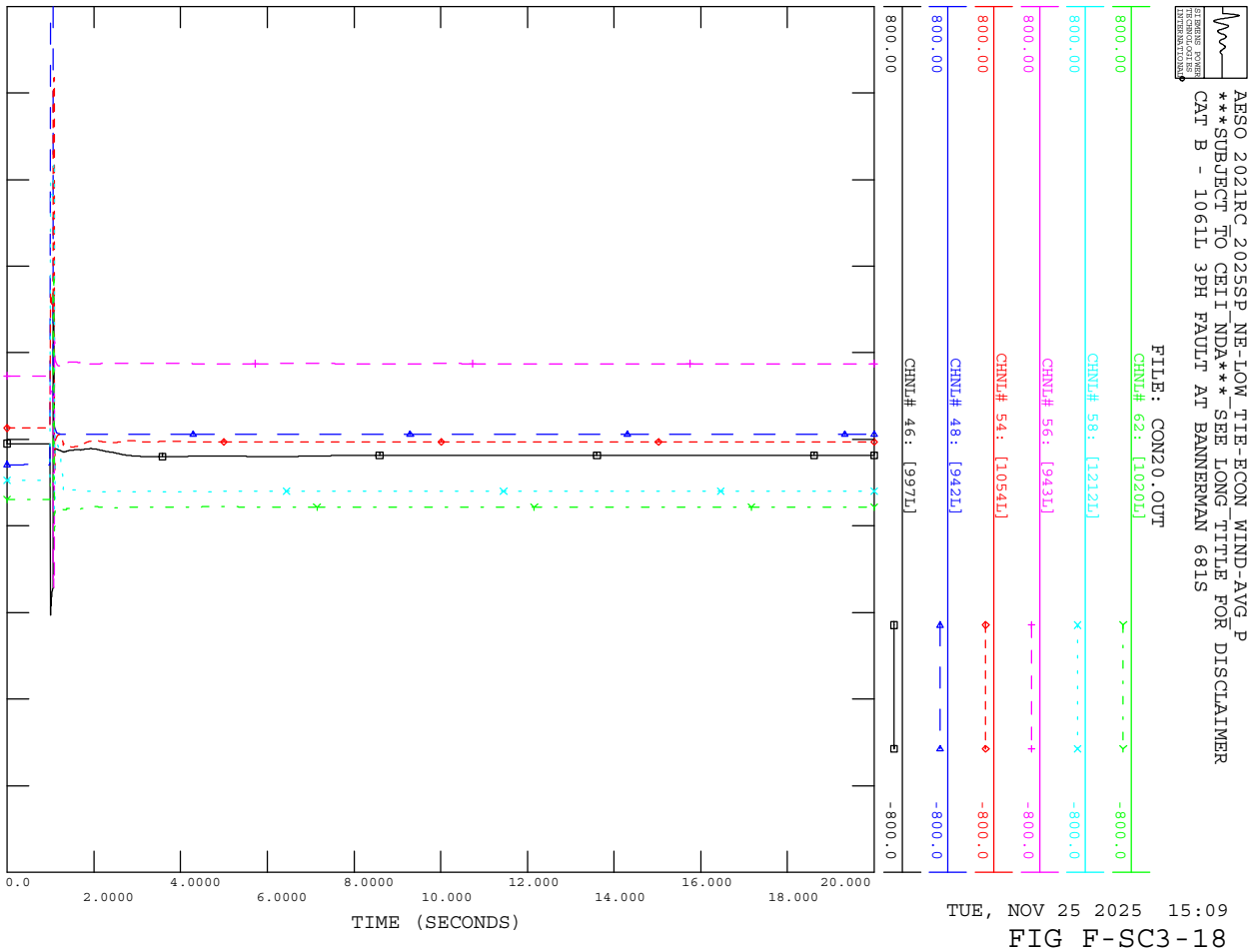


FIG F-SC3-18

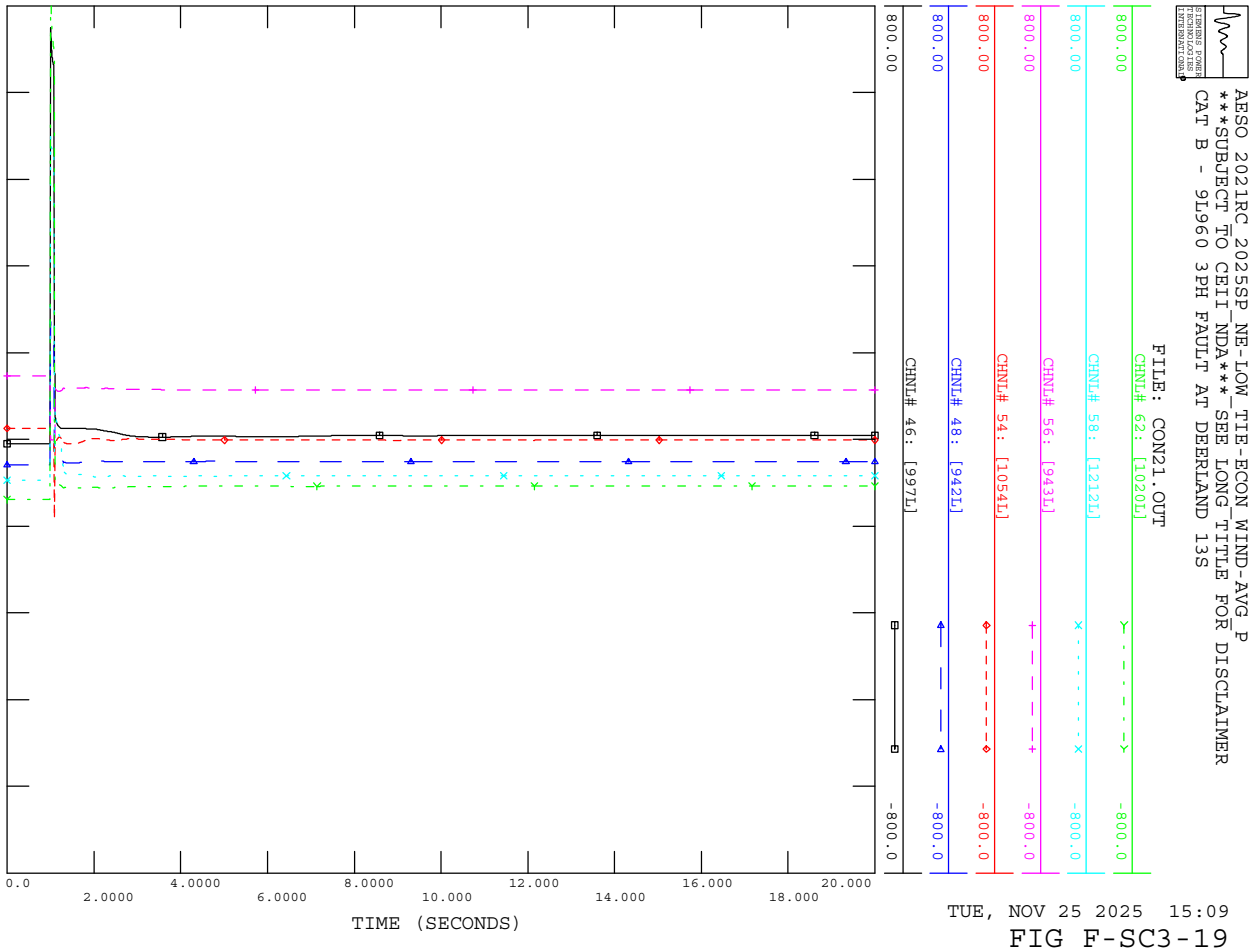


FIG F-SC3-19

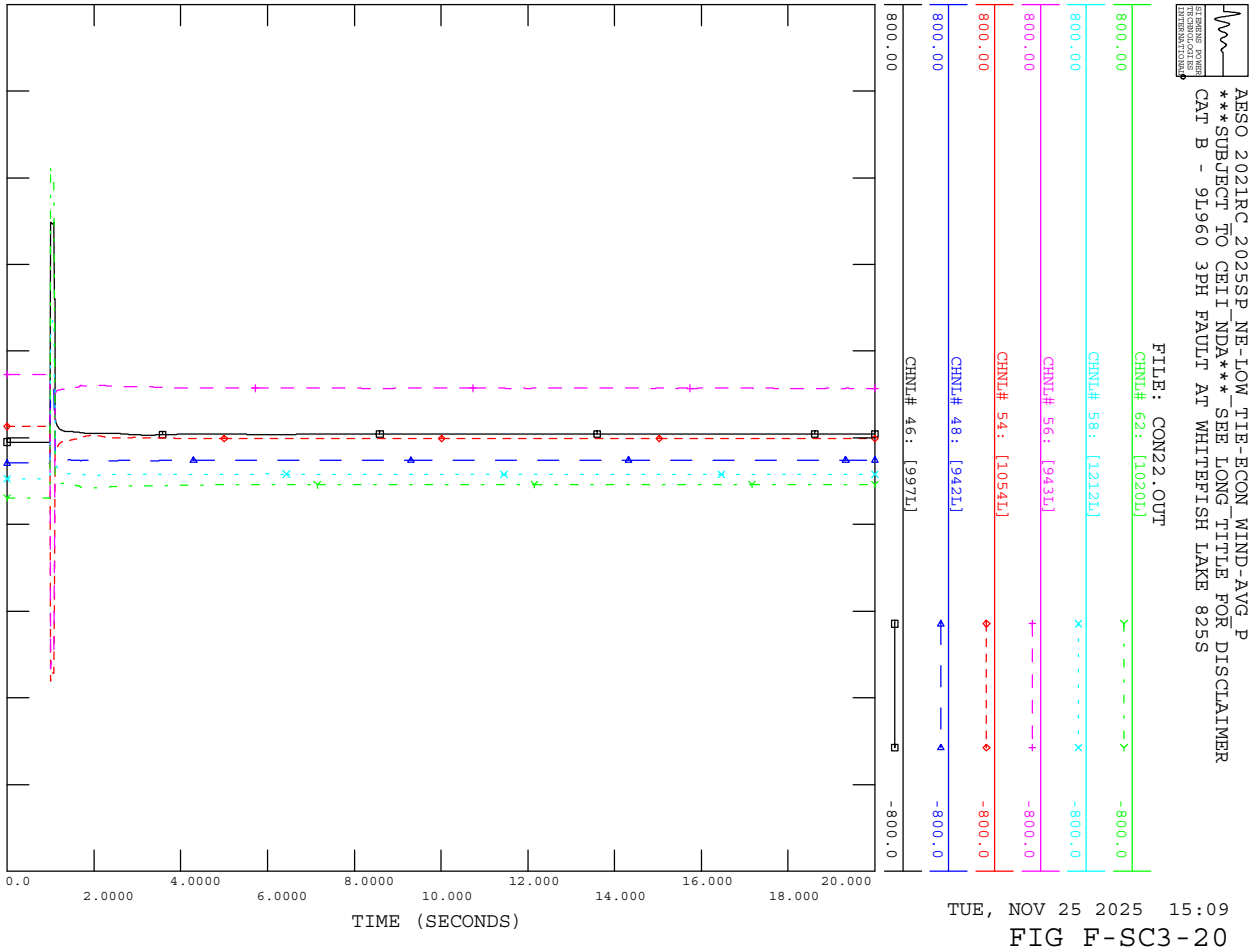


FIG F-SC3-20

Scenario 4

Winter Peak Post Project

Transient Response Plot Key

Table Winter Peak Post Project Figure Reference:

Scenario	Plots	Figure #
Winter Peak Post Project	Angles Plots	A-SC4-1 to A-SC4-20
	Power Plots	B-SC4-1 to B-SC4-20
	Var Plots	C-SC4-1 to C-SC4-20
	Bus Voltage Plots	D-SC4-1 to D-SC4-20
	Branchflow MW Plots	E-SC4-1 to E-SC4-20
	Branchflow MVar Plots	F-SC4-1 to F-SC4-20

Table Winter Peak Post Project Figures:

Category	Line Element	Substation Terminals		Faulted End	Figure Reference
A	Flat start			n/a	A-SC4-1 B-SC4-1 C-SC4-1 D-SC4-1 E-SC4-1 F-SC4-1
B	1054L	Deerland 13S	Heartland 12S	13S	A-SC4-2 B-SC4-2 C-SC4-2 D-SC4-2 E-SC4-2 F-SC4-2
				12S	A-SC4-3 B-SC4-3 C-SC4-3 D-SC4-3 E-SC4-3 F-SC4-3
B	12L70	Heartland 12S	Heathfield 2029S	12S	A-SC4-4 B-SC4-4 C-SC4-4 D-SC4-4 E-SC4-4 F-SC4-4
				2029S	A-SC4-5 B-SC4-5 C-SC4-5 D-SC4-5 E-SC4-5 F-SC4-5
B	12L85	Heartland 12S	Heathfield 2029S	12S	A-SC4-6 B-SC4-6 C-SC4-6 D-SC4-6 E-SC4-6 F-SC4-6
				2029S	A-SC4-7 B-SC4-7 C-SC4-7 D-SC4-7 E-SC4-7 F-SC4-7
B	1206L	Ellerslie 89S	Heartland 12S	12S	A-SC4-8 B-SC4-8 C-SC4-8 D-SC4-8 E-SC4-8 F-SC4-8
B	1212L	Ellerslie 89S	Heartland 12S	12S	A-SC4-9 B-SC4-9 C-SC4-9 D-SC4-9

					E-SC4-9 F-SC4-9
B	1350L	EATL (Heathfield 2029S)	EATL (NEWELL 2075S)	2029S	A-SC4-10 B-SC4-10 C-SC4-10 D-SC4-10 E-SC4-10 F-SC4-10
B	943L	Deerland 135S	Amelia 108S	13S	A-SC4-11 B-SC4-11 C-SC4-11 D-SC4-11 E-SC4-11 F-SC4-11
				108S	A-SC4-12 B-SC4-12 C-SC4-12 D-SC4-12 E-SC4-12 F-SC4-12
B	1120L	Josephburg 410S	Amelia 108S	410S	A-SC4-13 B-SC4-13 C-SC4-13 D-SC4-13 E-SC4-13 F-SC4-13
				108S	A-SC4-14 B-SC4-14 C-SC4-14 D-SC4-14 E-SC4-14 F-SC4-14
B	997L	Lamoureux 71S	Ursus 430S	71S	A-SC4-15 B-SC4-15 C-SC4-15 D-SC4-15 E-SC4-15 F-SC4-15
				430S	A-SC4-16 B-SC4-16 C-SC4-16 D-SC4-16 E-SC4-16 F-SC4-16
B	1061L	Heartland 12S	Bannerman 681S	12S	A-SC4-17 B-SC4-17 C-SC4-17 D-SC4-17 E-SC4-17 F-SC4-17
				681S	A-SC4-18 B-SC4-18 C-SC4-18 D-SC4-18 E-SC4-18 F-SC4-18
B	9L960	Deerland 13S	Whitefish Lake 825S	13S	A-SC4-19

					B-SC4-19 C-SC4-19 D-SC4-19 E-SC4-19 F-SC4-19
				825S	A-SC4-20 B-SC4-20 C-SC4-20 D-SC4-20 E-SC4-20 F-SC4-20

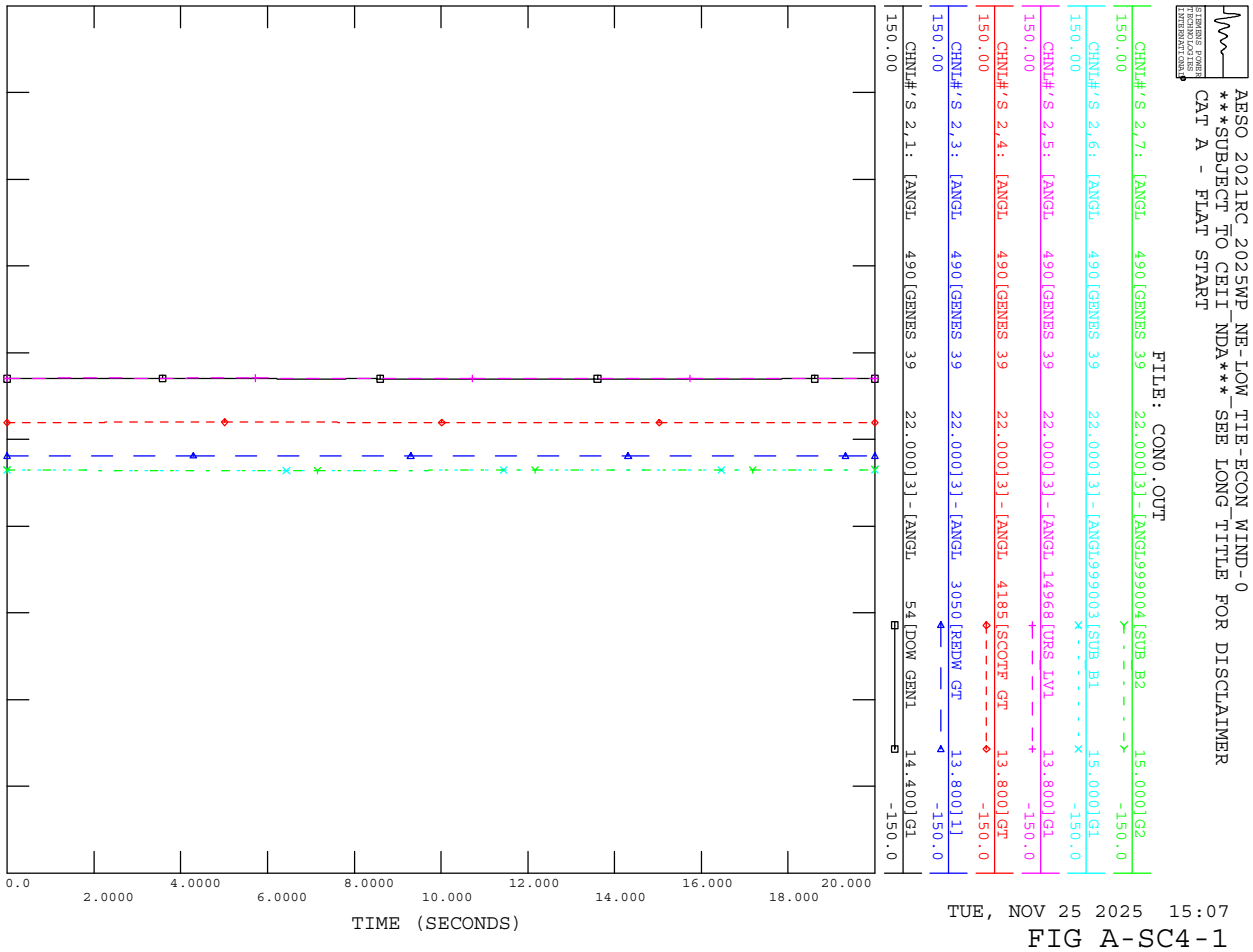


FIG A-SC4-1

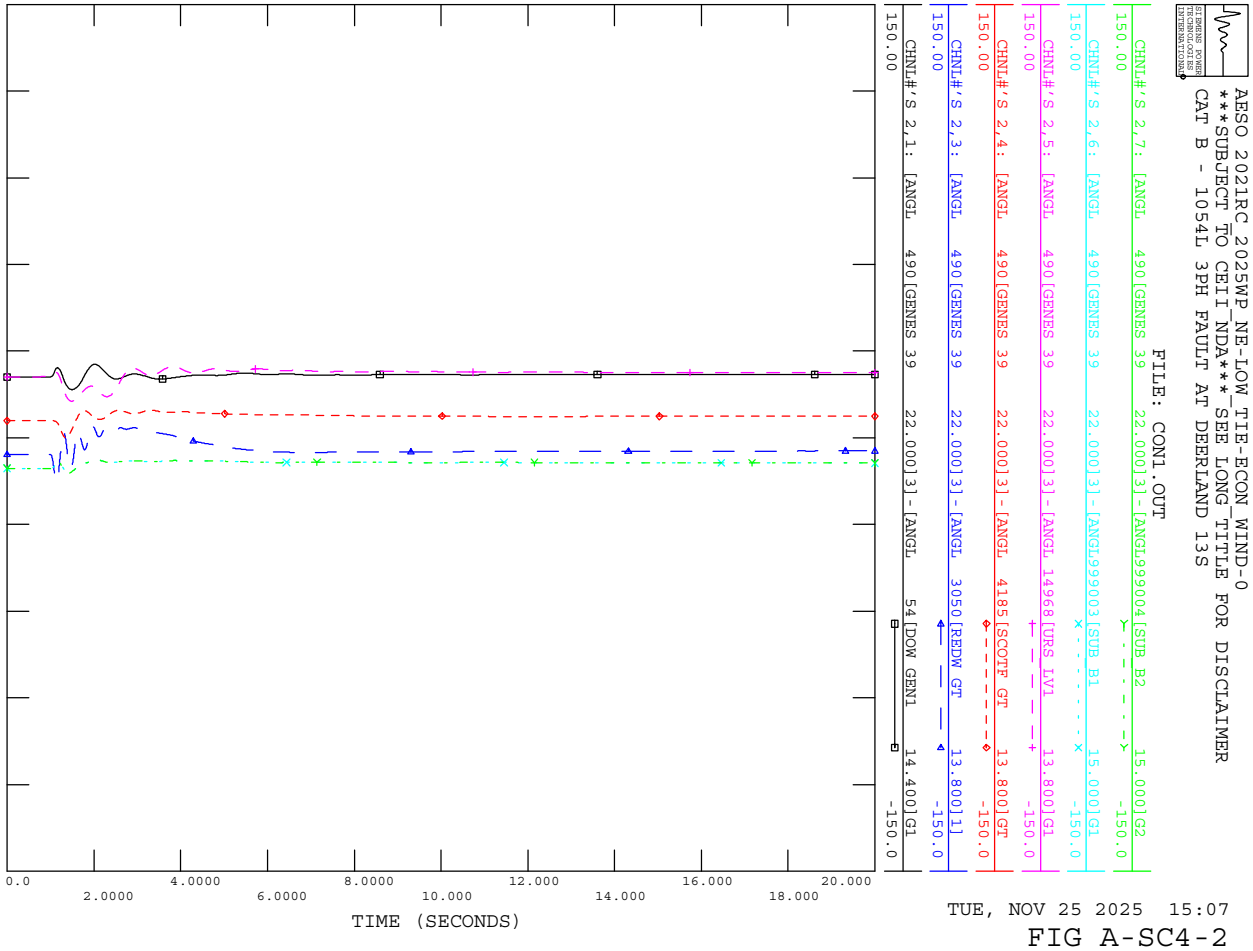


FIG A-SC4-2

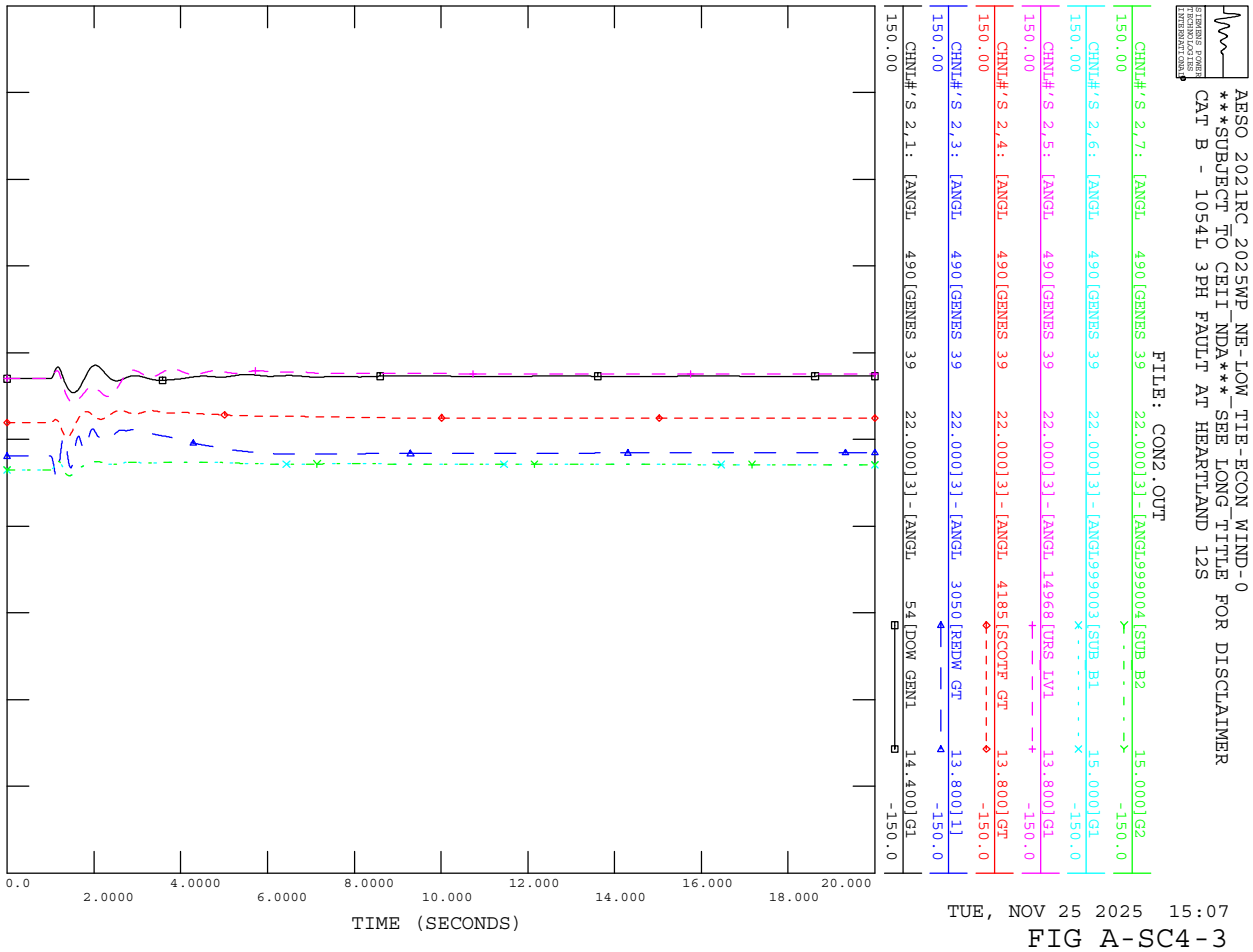


FIG A-SC4-3

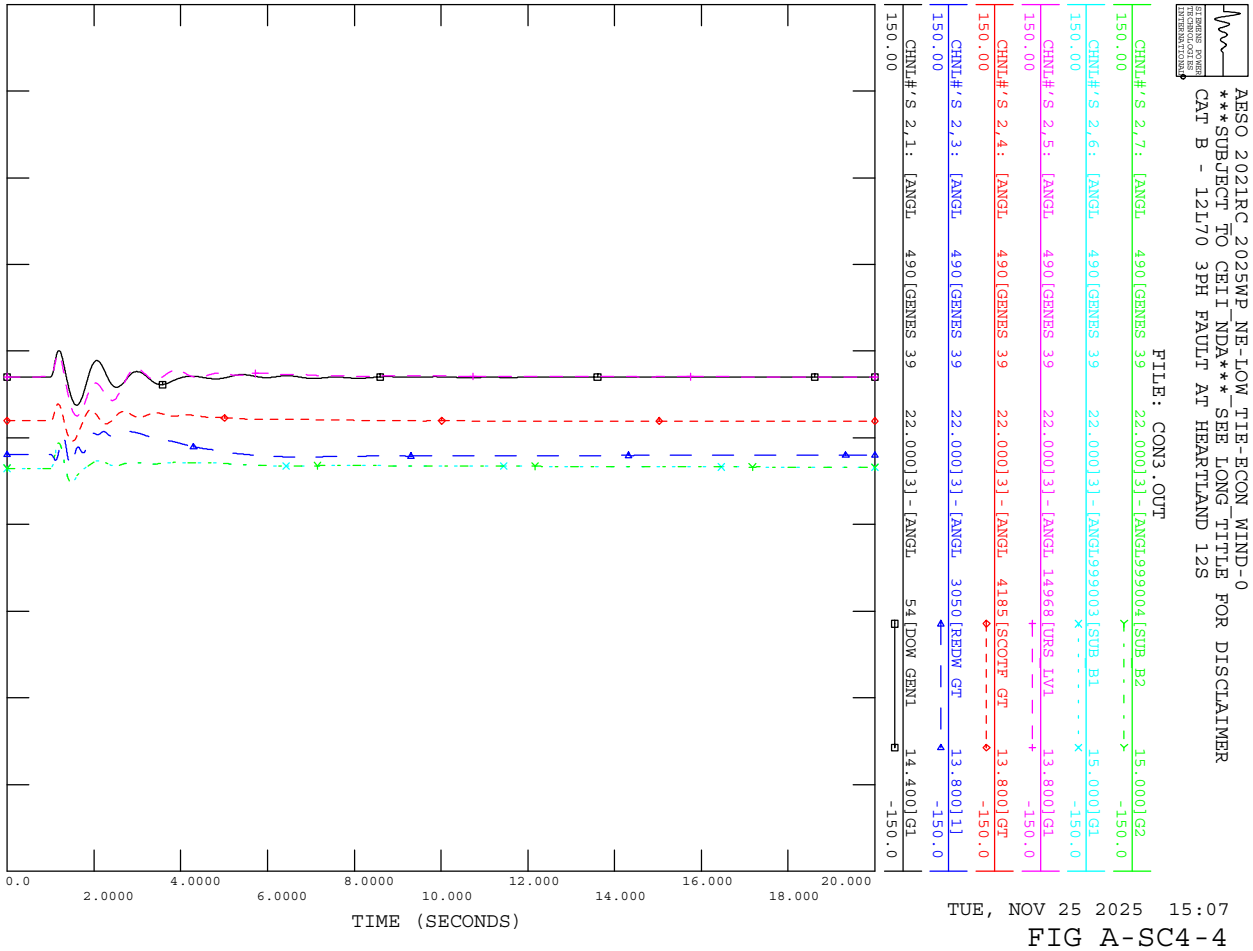


FIG A-SC4-4

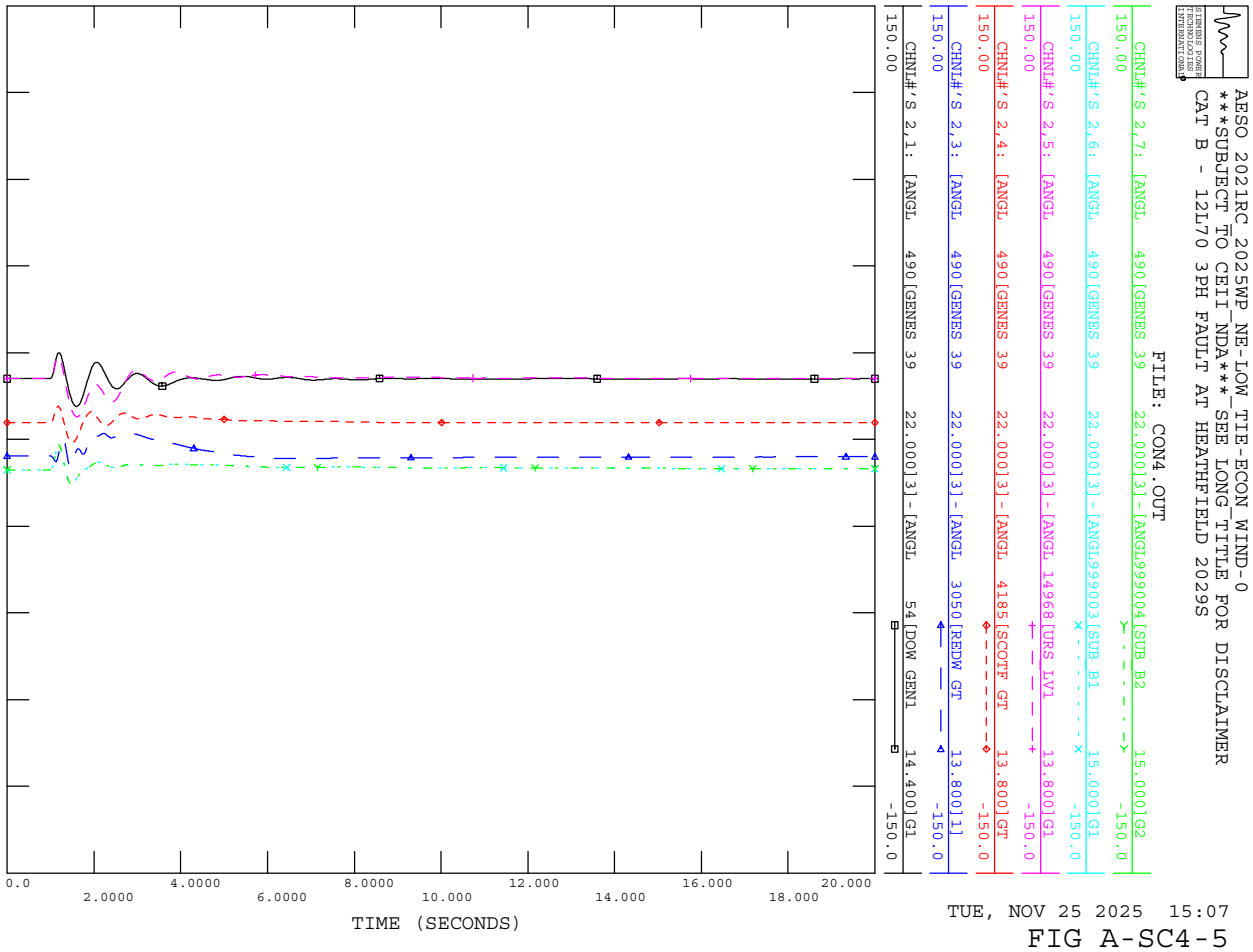


FIG A-SC4-5

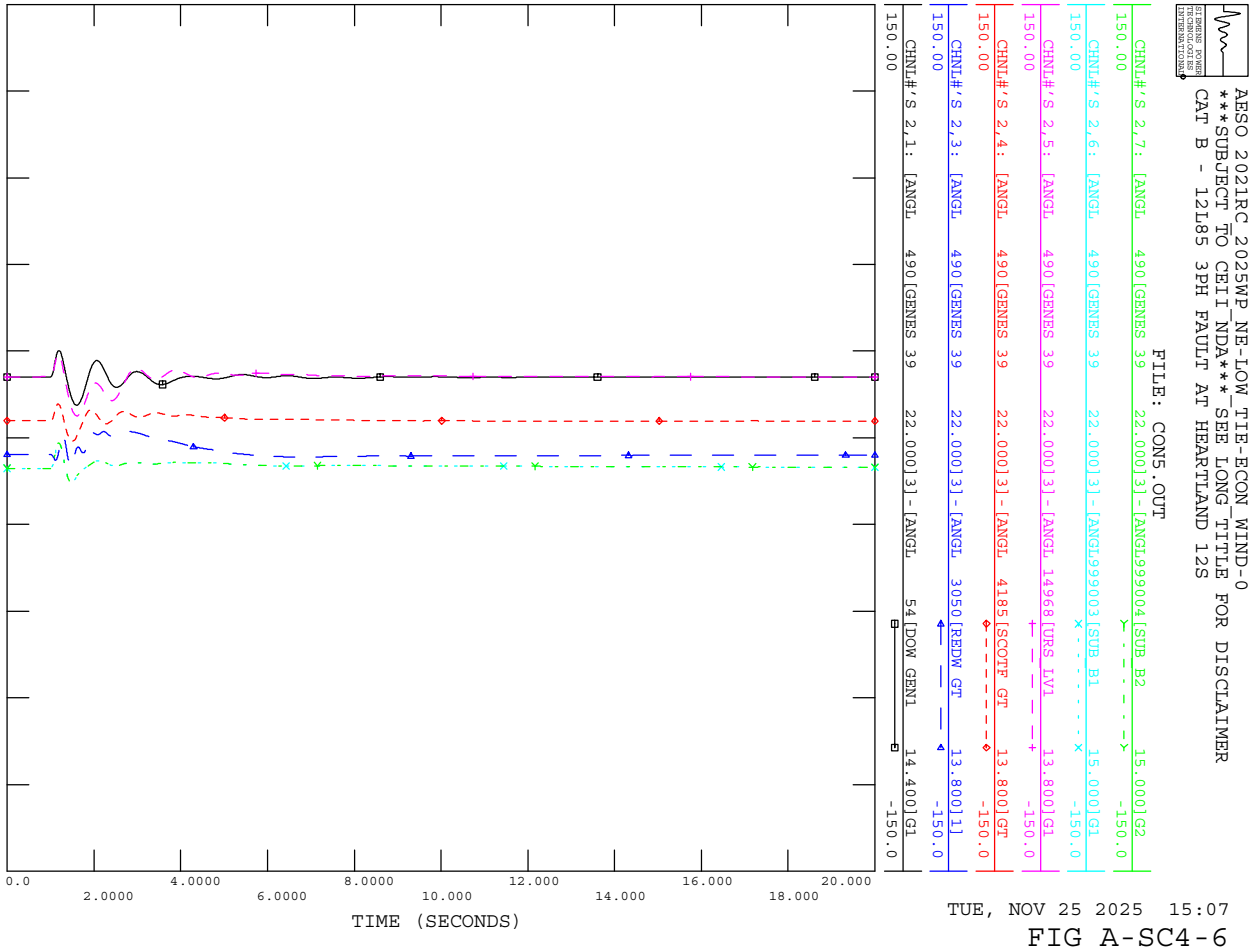


FIG A-SC4-6

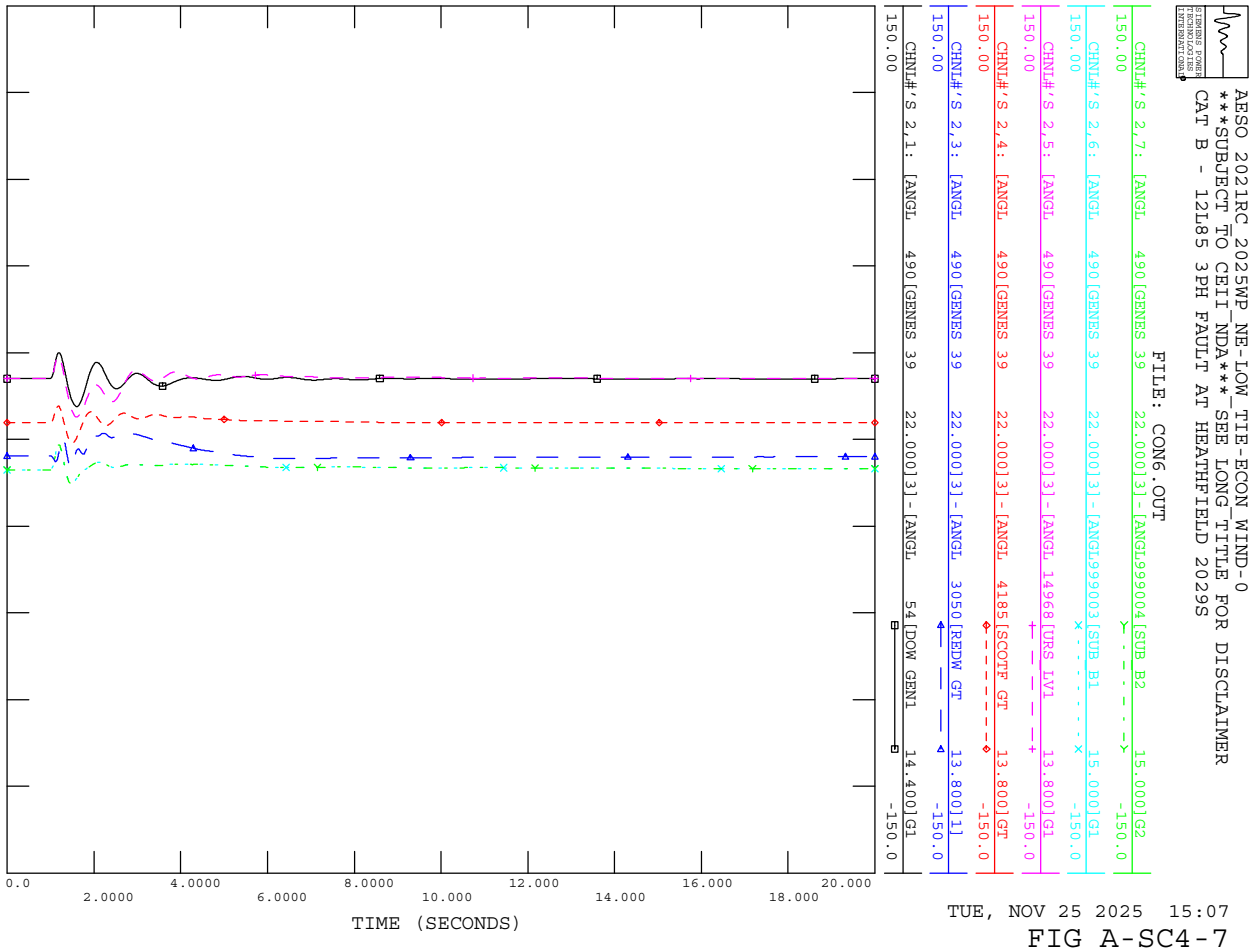


FIG A-SC4-7

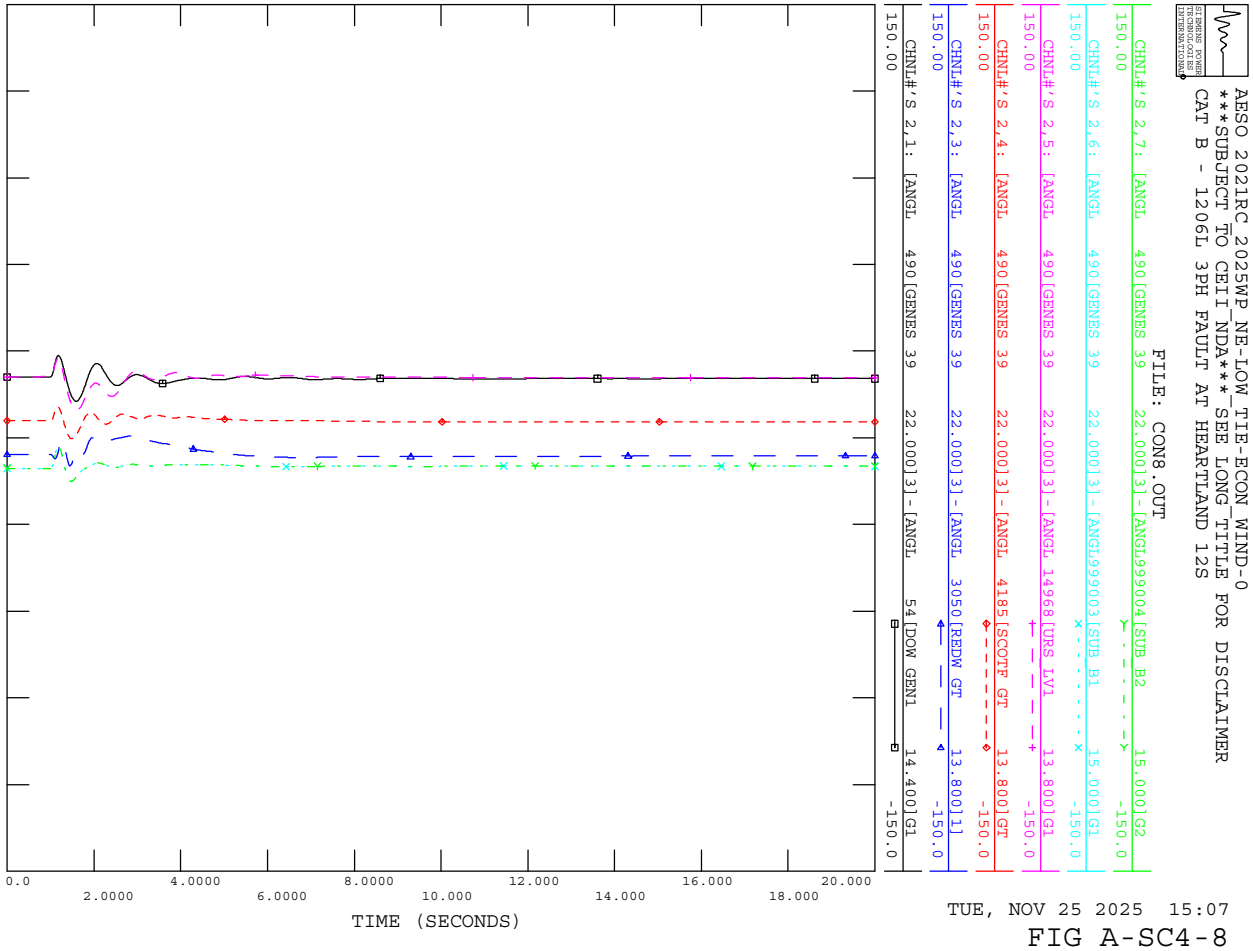
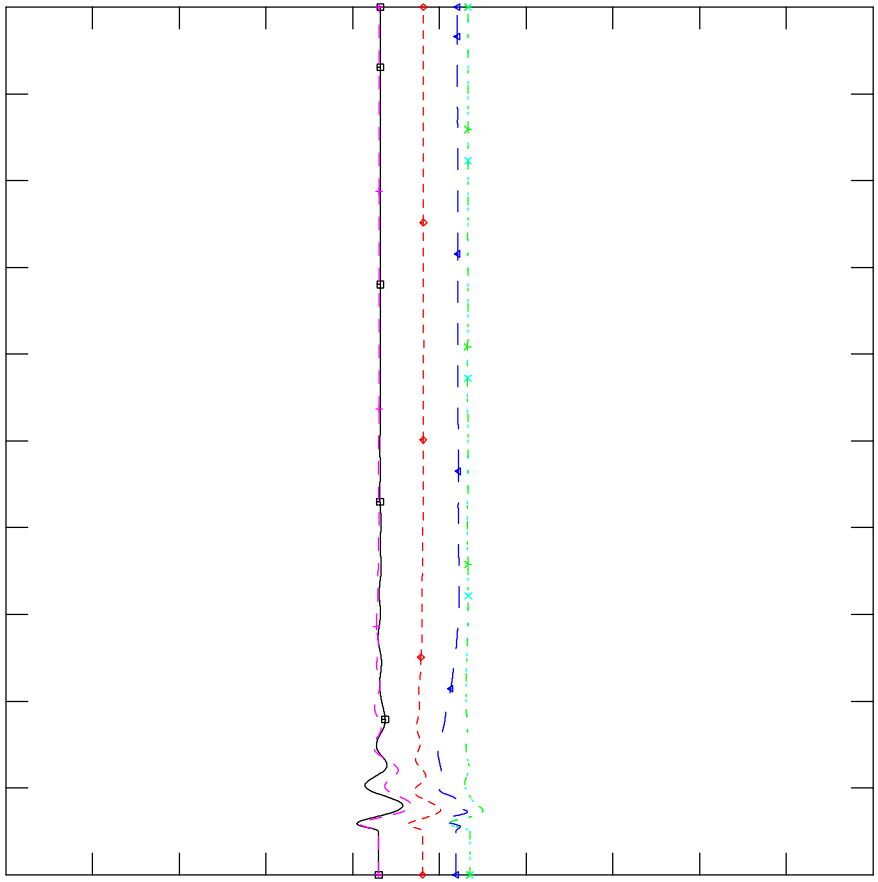


FIG A-SC4-8

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1212L 3PH FAULT AT HEARTLAND 12S

FILE: CON10.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0

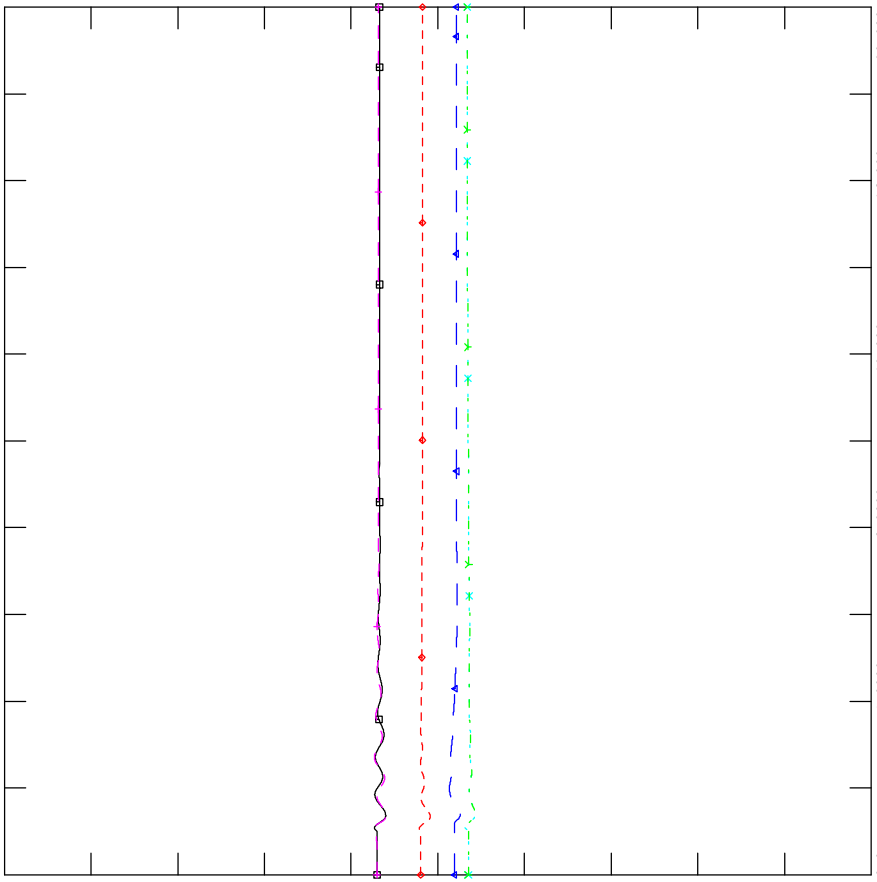


TUE, NOV 25 2025 15:07
FIG A-SC4-9

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0



TUE, NOV 25 2025 15:07
FIG A-SC4-10

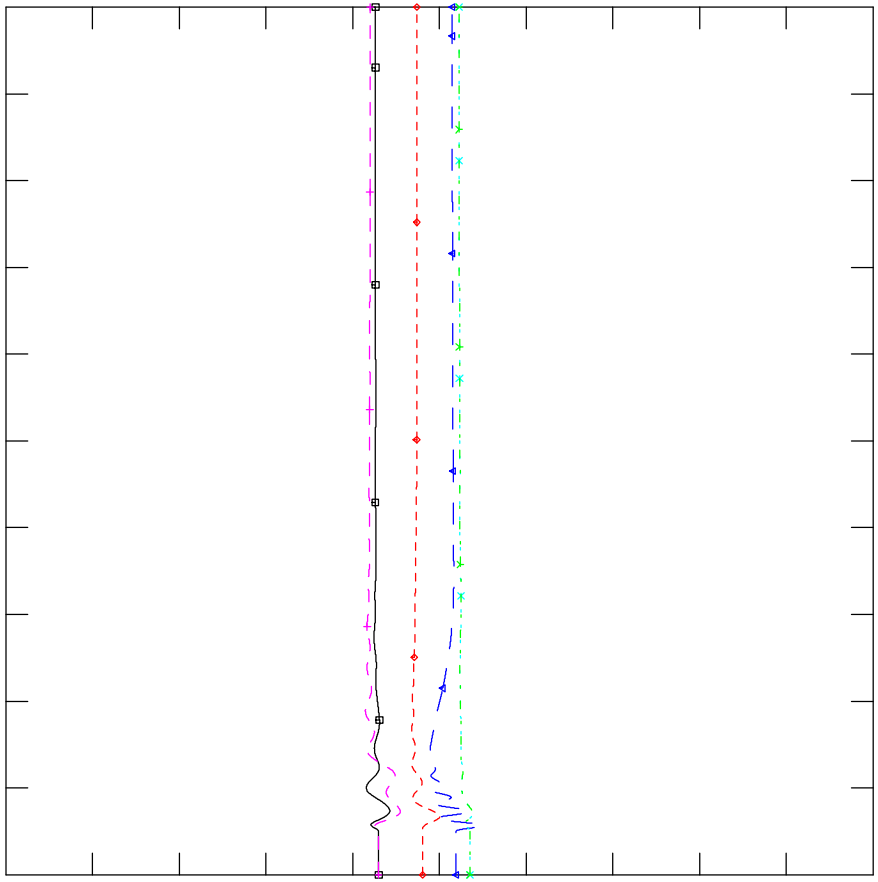
AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT DEERLAND 13S

FILE: CON13.OUT

TUE, NOV 25 2025 15:07

FIG A-SC4-11

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB_B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB_B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS_LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF_GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW_GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW_GEN1 14.400]G1
150.00 -150.0



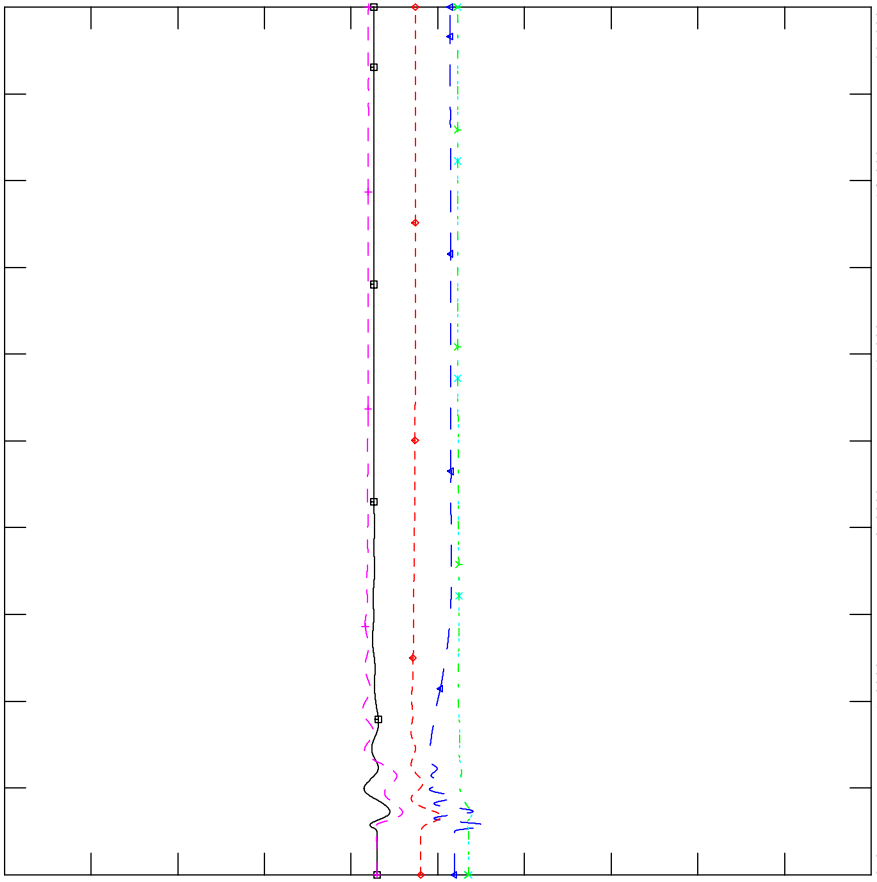
AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:07

FIG A-SC4-12

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB_B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB_B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS_LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF_GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW_GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW_GEN1 14.400]G1
150.00 -150.0



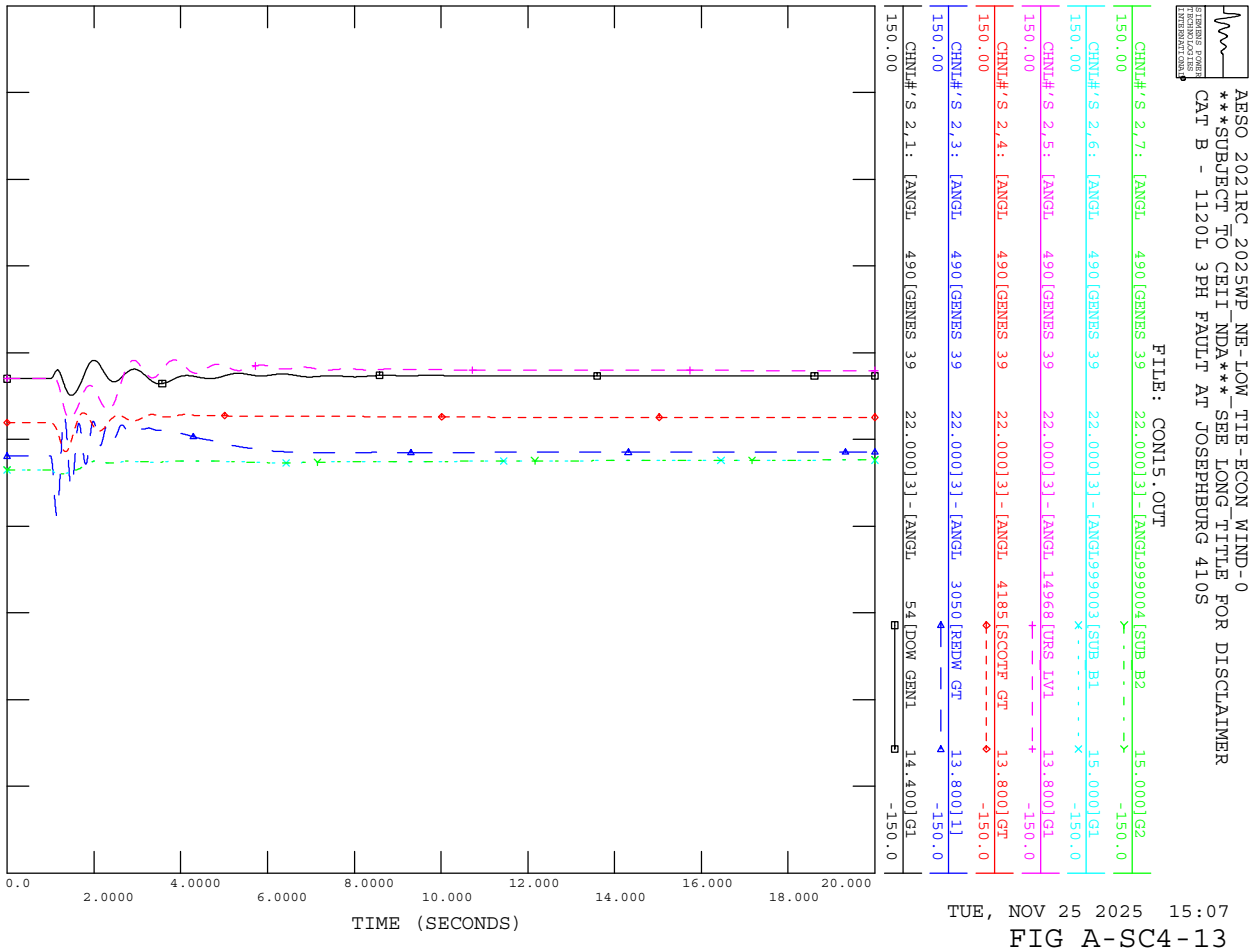


FIG A-SC4-13

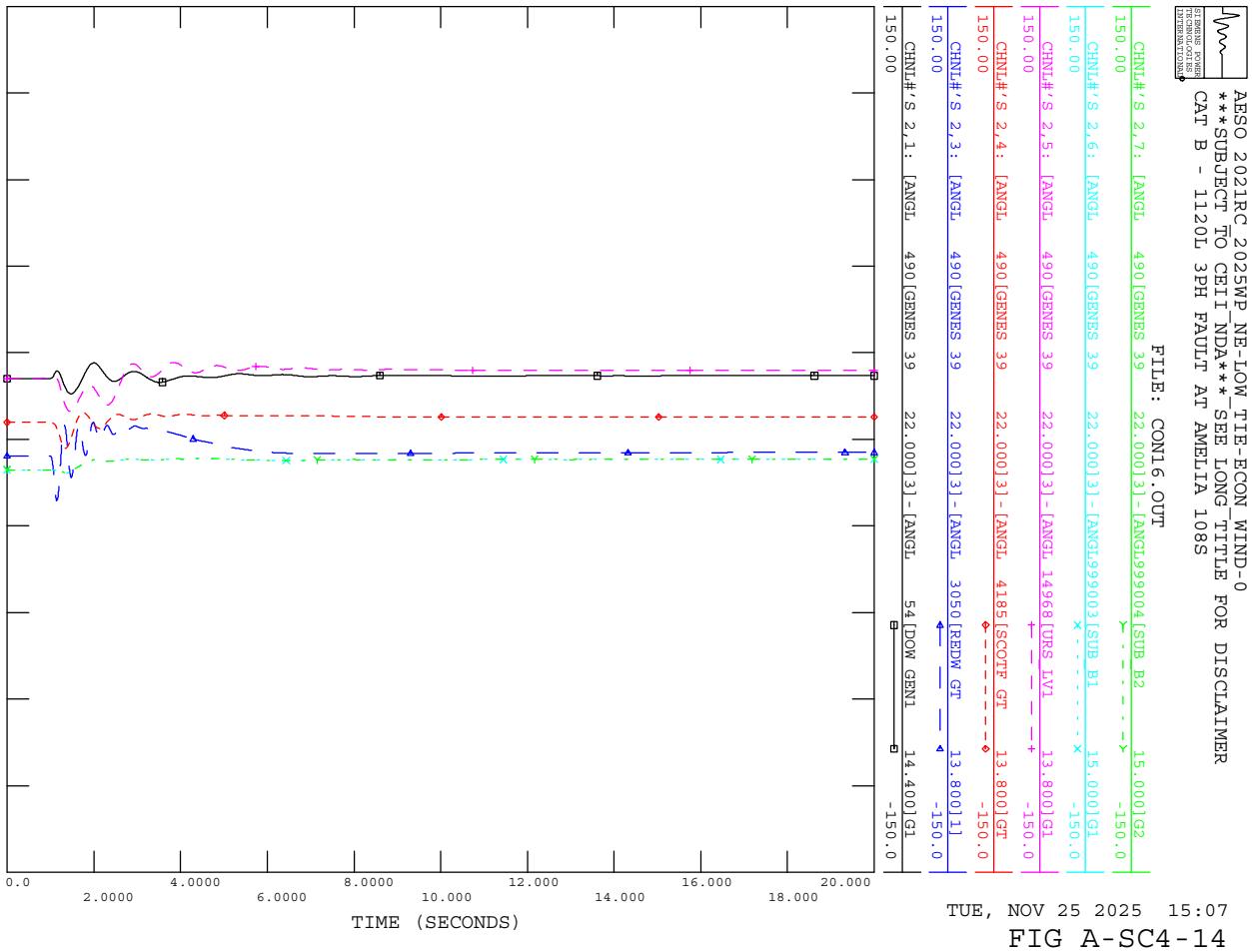


FIG A-SC4-14

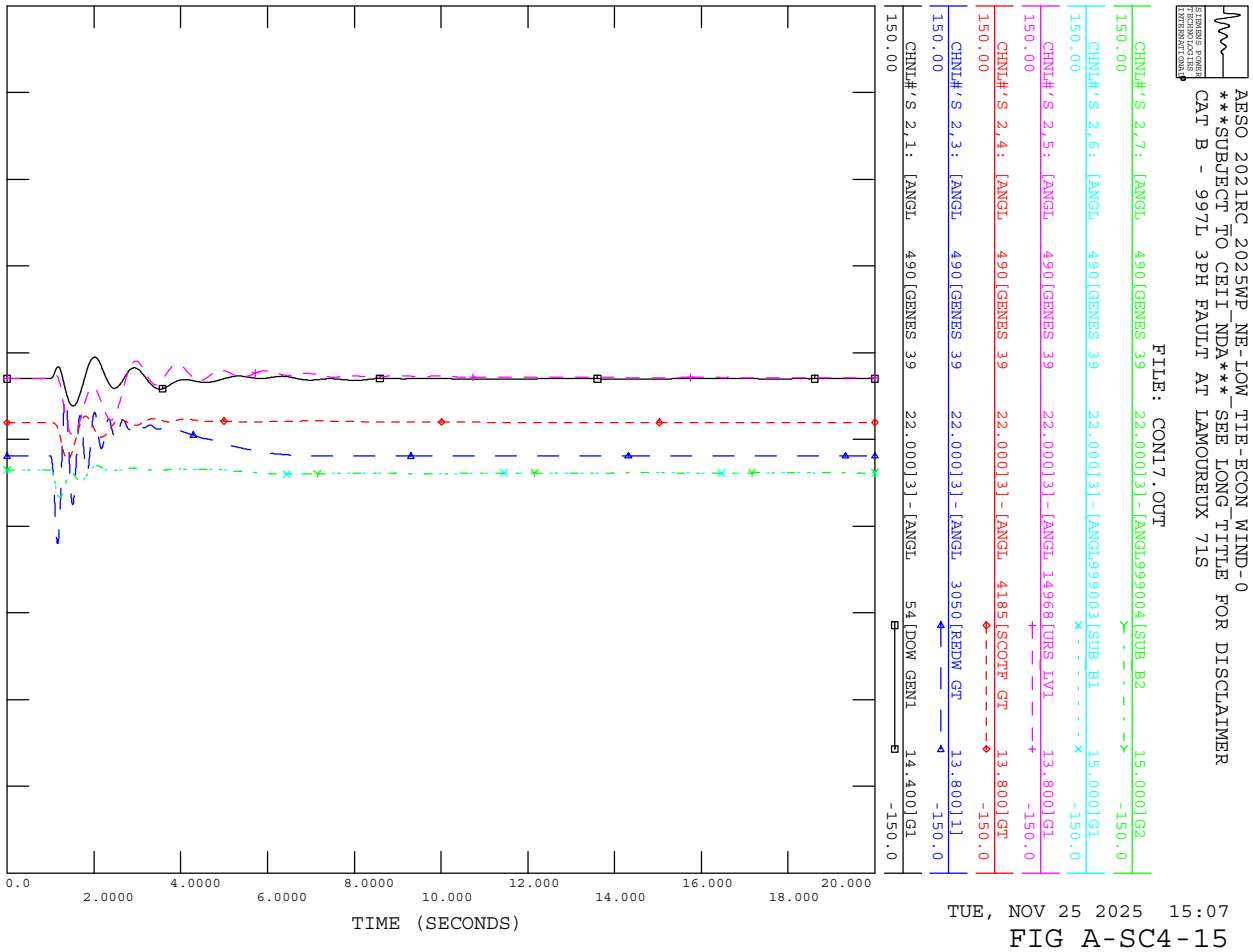


FIG A-SC4-15

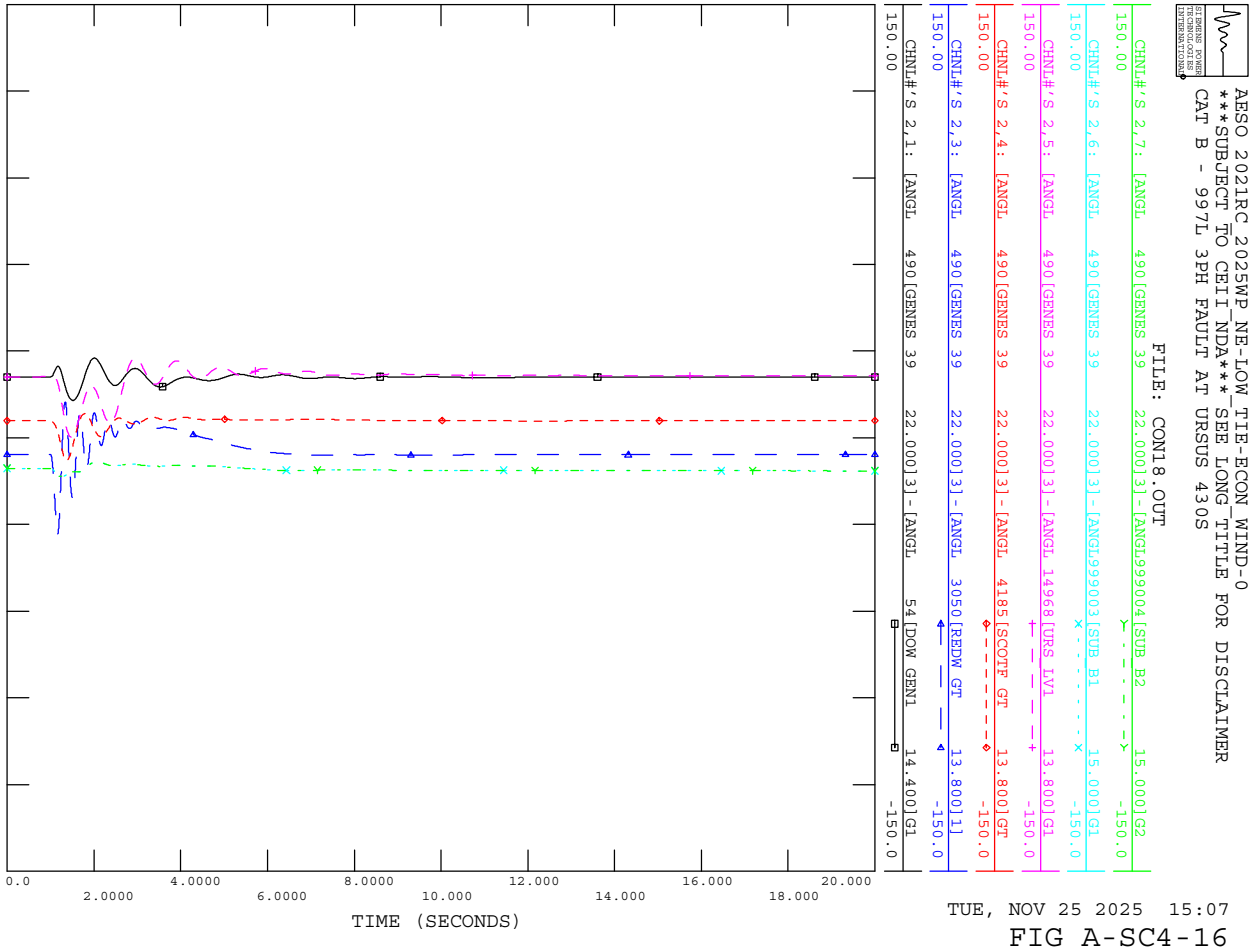
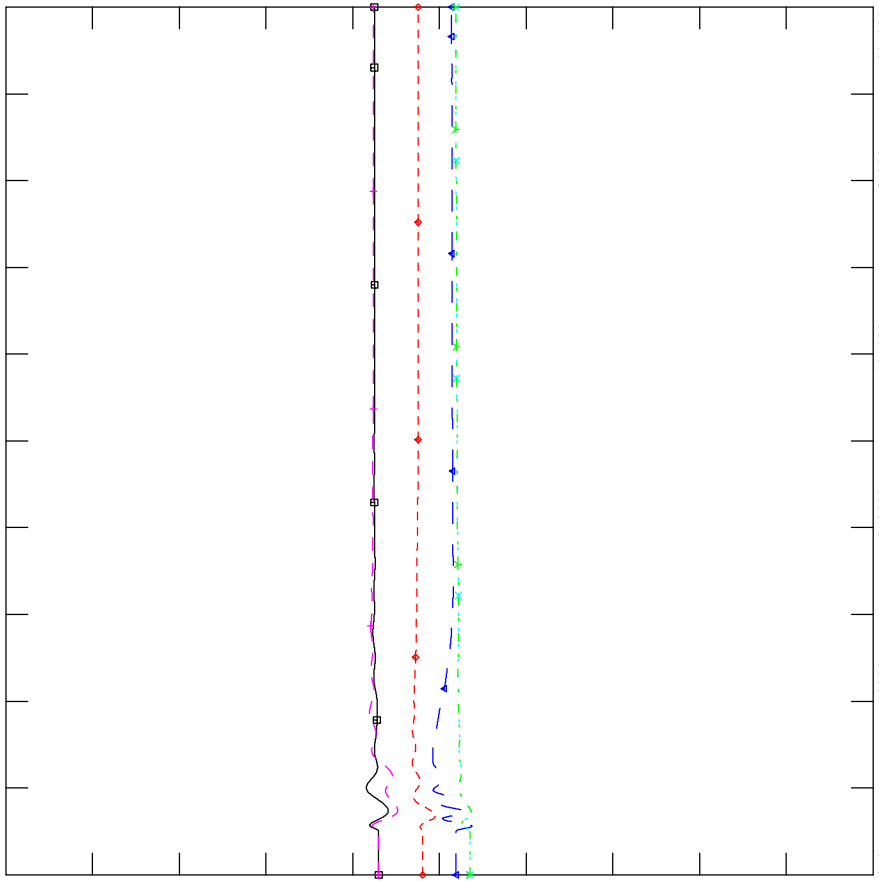


FIG A-SC4-16

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

FILE: CON19.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0

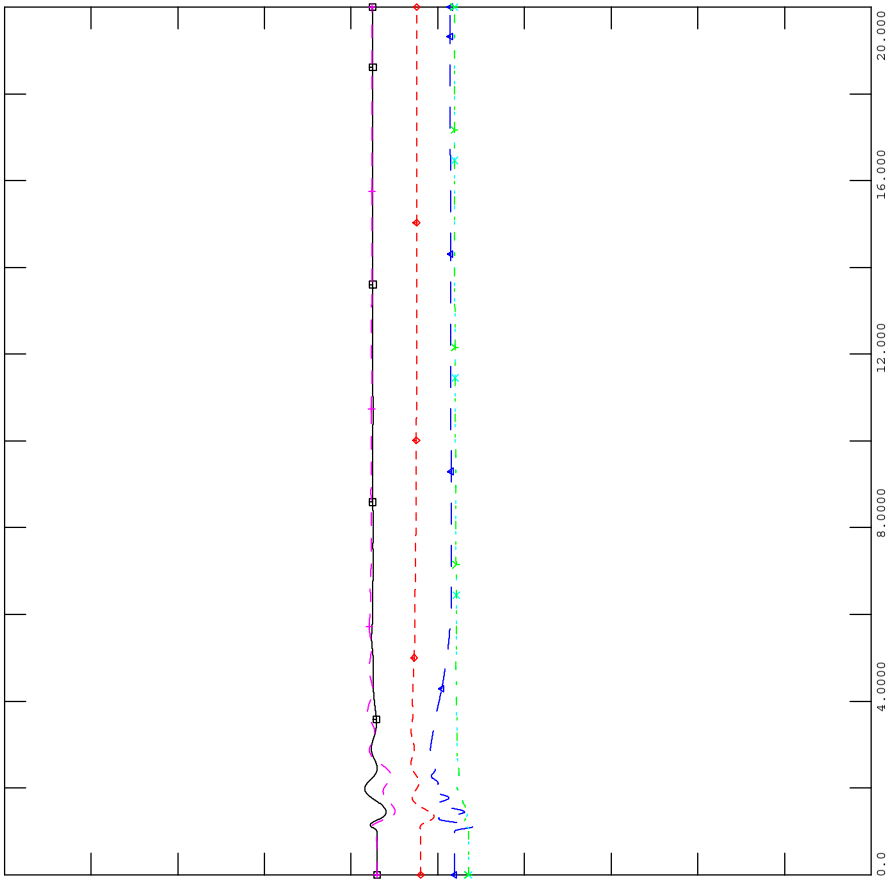


TUE, NOV 25 2025 15:07
FIG A-SC4-17

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT BANNERMAN 681S

FILE: CON20.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0

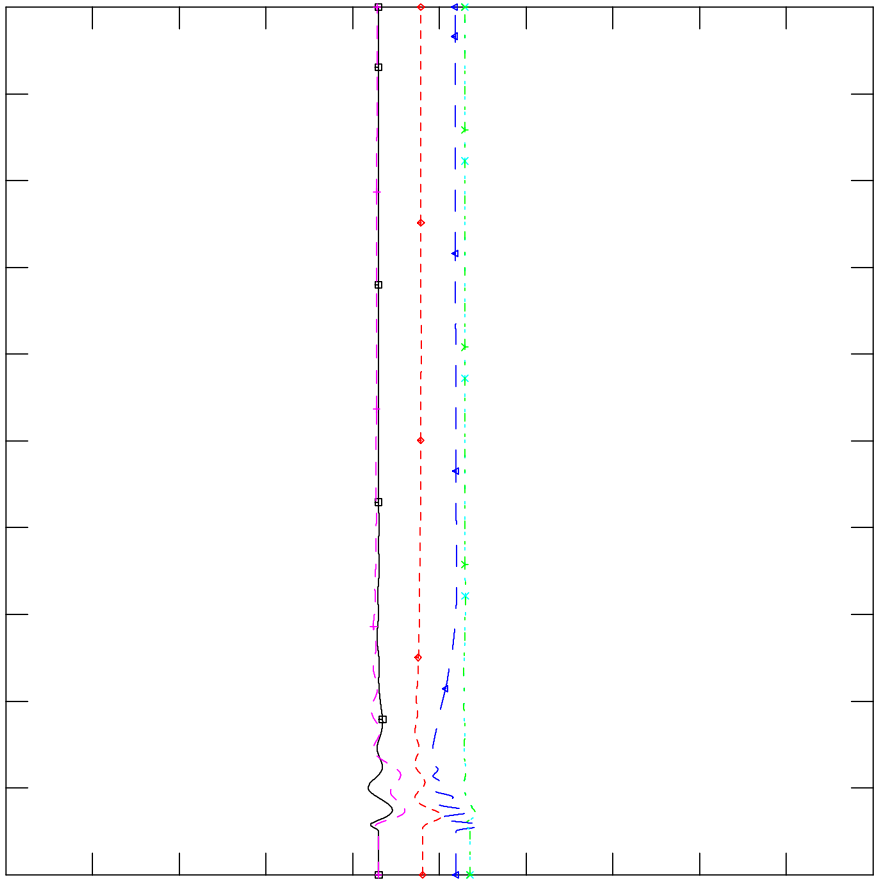


TUE, NOV 25 2025 15:07
FIG A-SC4-18

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT DEERLAND 13S

FILE: CON21.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0

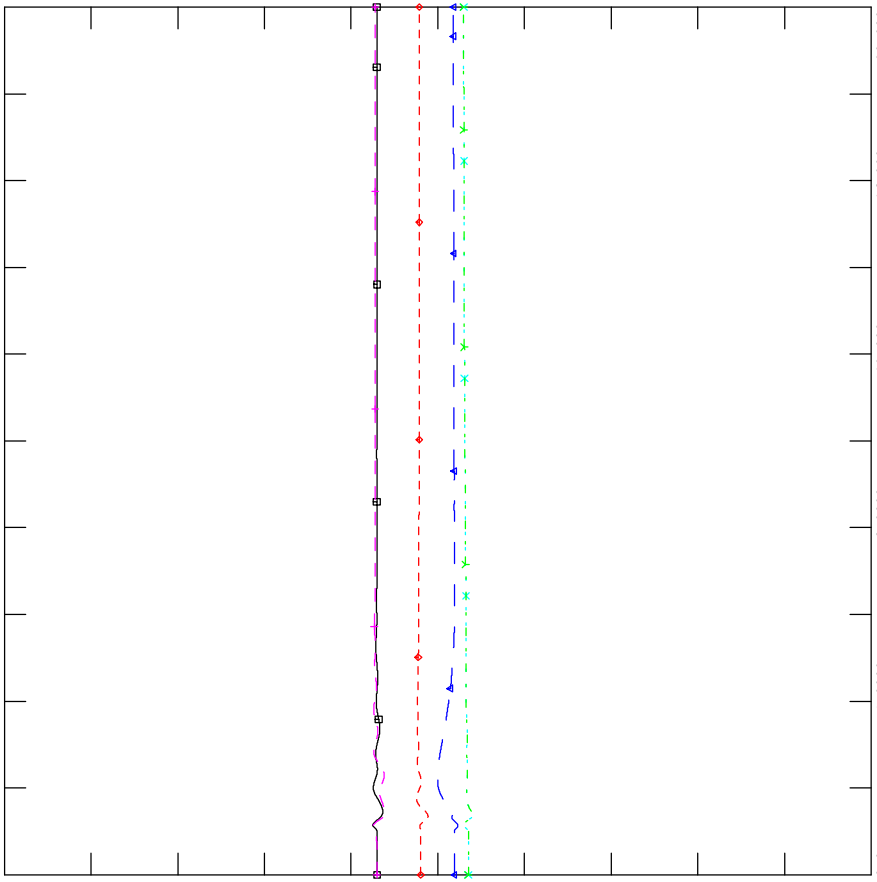


TUE, NOV 25 2025 15:07
FIG A-SC4-19

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

CHNL#'S 2,7: [ANGL 490[GENES 39 22.000]3]-[ANGL999004[SUB B2 15.000]G2
150.00 -150.0
CHNL#'S 2,6: [ANGL 490[GENES 39 22.000]3]-[ANGL999003[SUB B1 15.000]G1
150.00 -150.0
CHNL#'S 2,5: [ANGL 490[GENES 39 22.000]3]-[ANGL 14968[URS LV1 13.800]G1
150.00 -150.0
CHNL#'S 2,4: [ANGL 490[GENES 39 22.000]3]-[ANGL 4185[SCOTF GT 13.800]GT
150.00 -150.0
CHNL#'S 2,3: [ANGL 490[GENES 39 22.000]3]-[ANGL 3050[REDW GT 13.800]1]
150.00 -150.0
CHNL#'S 2,1: [ANGL 490[GENES 39 22.000]3]-[ANGL 54[DOW GEN1 14.400]G1
150.00 -150.0



TUE, NOV 25 2025 15:07
FIG A-SC4-20

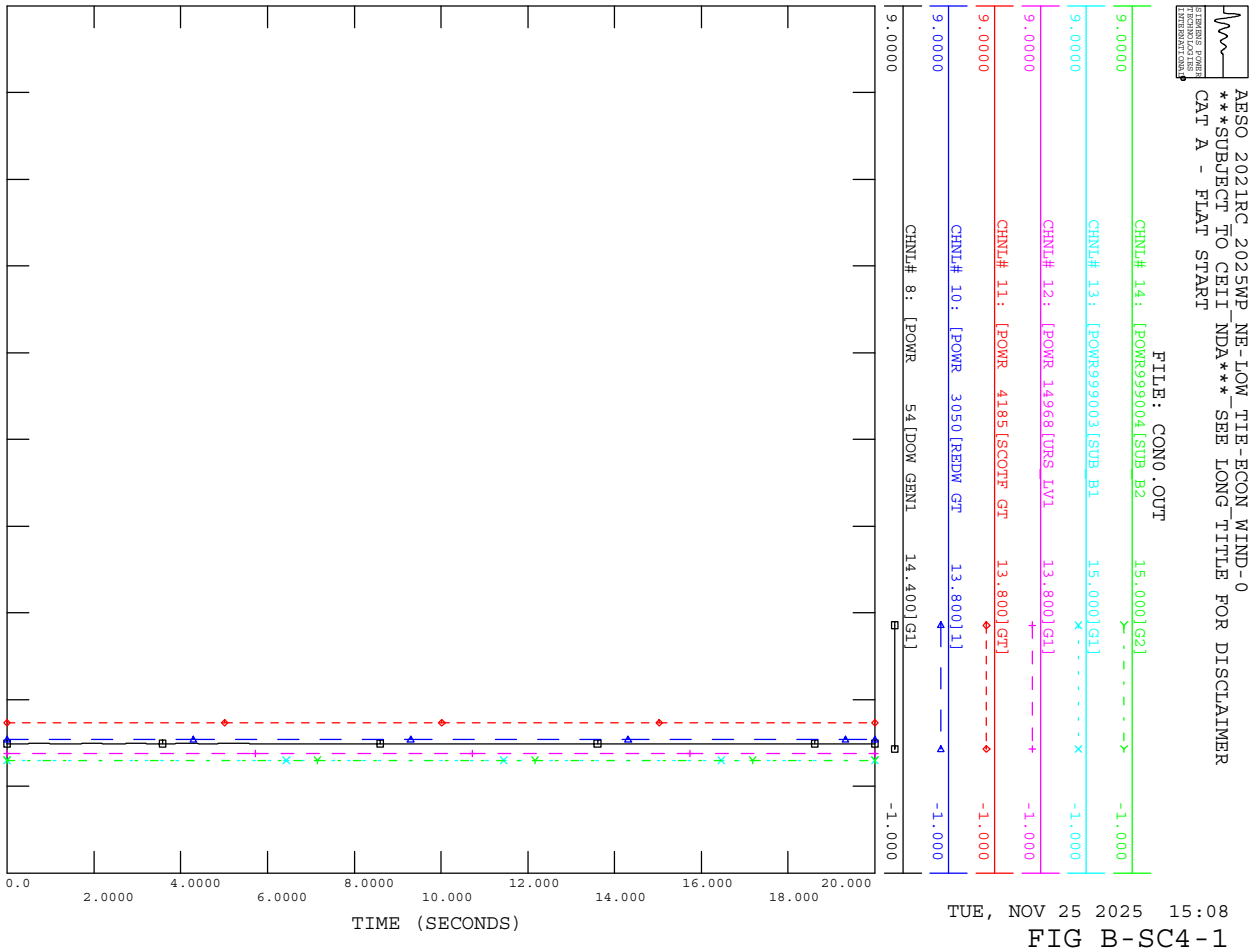


FIG B-SC4-1

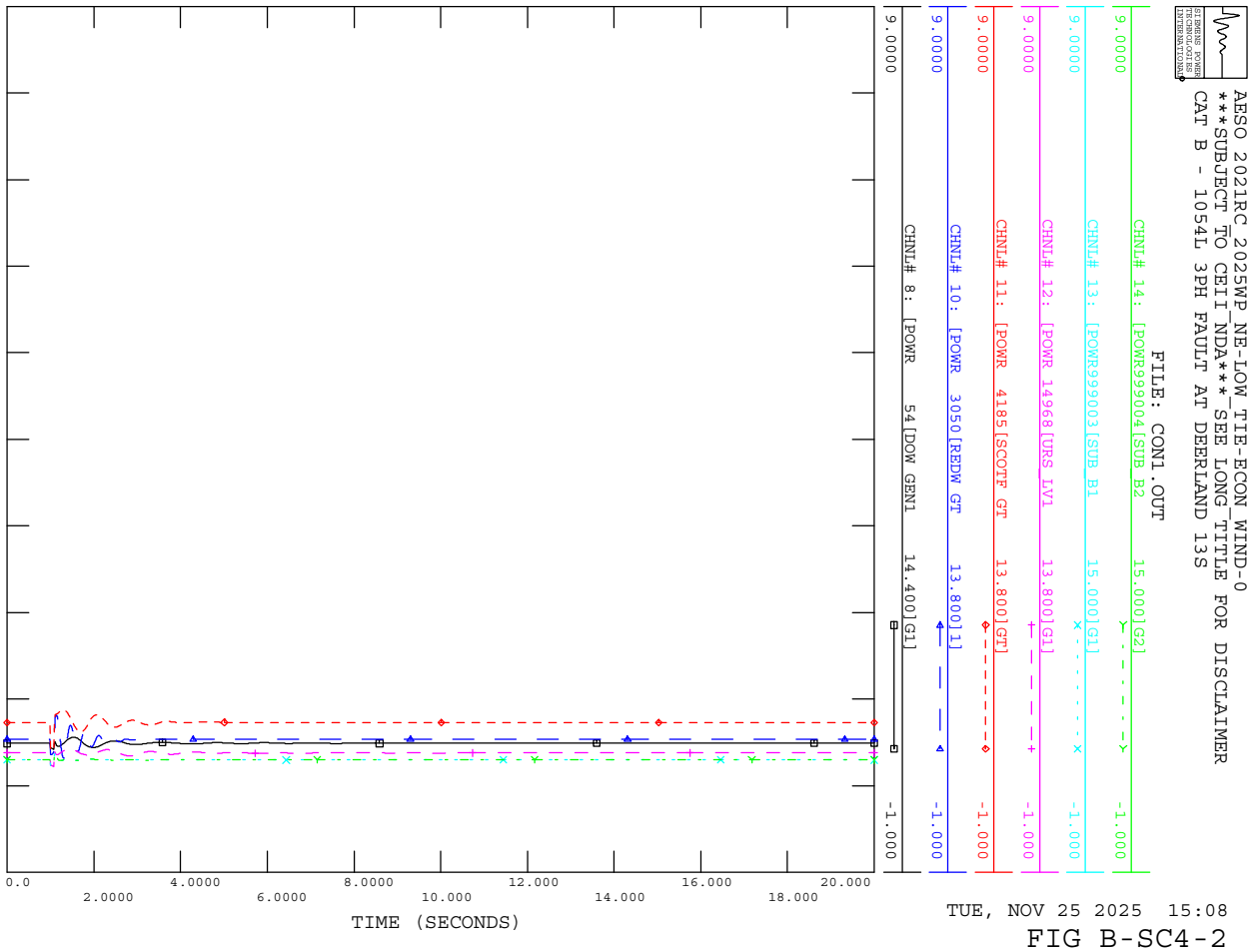


FIG B-SC4-2

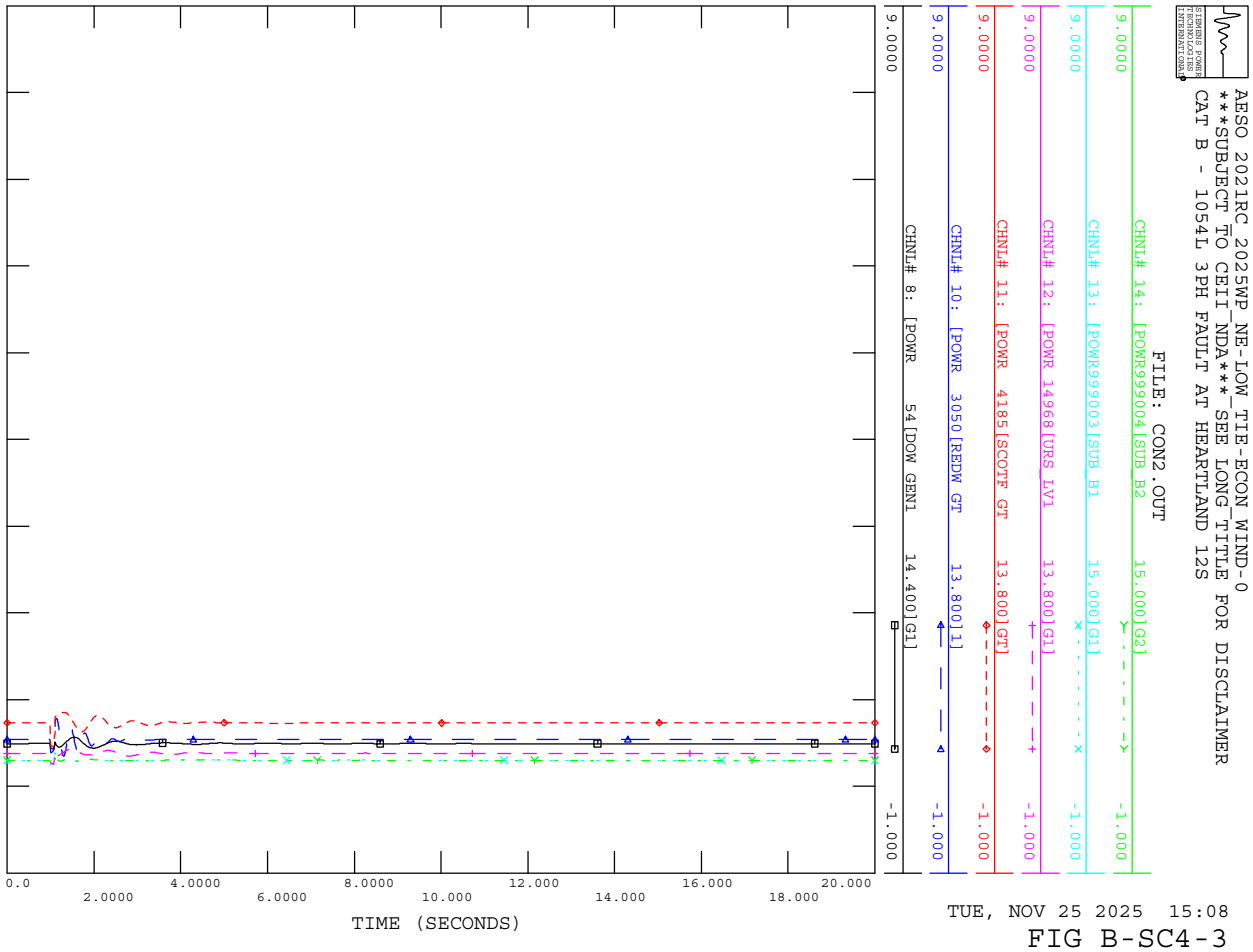


FIG B-SC4-3

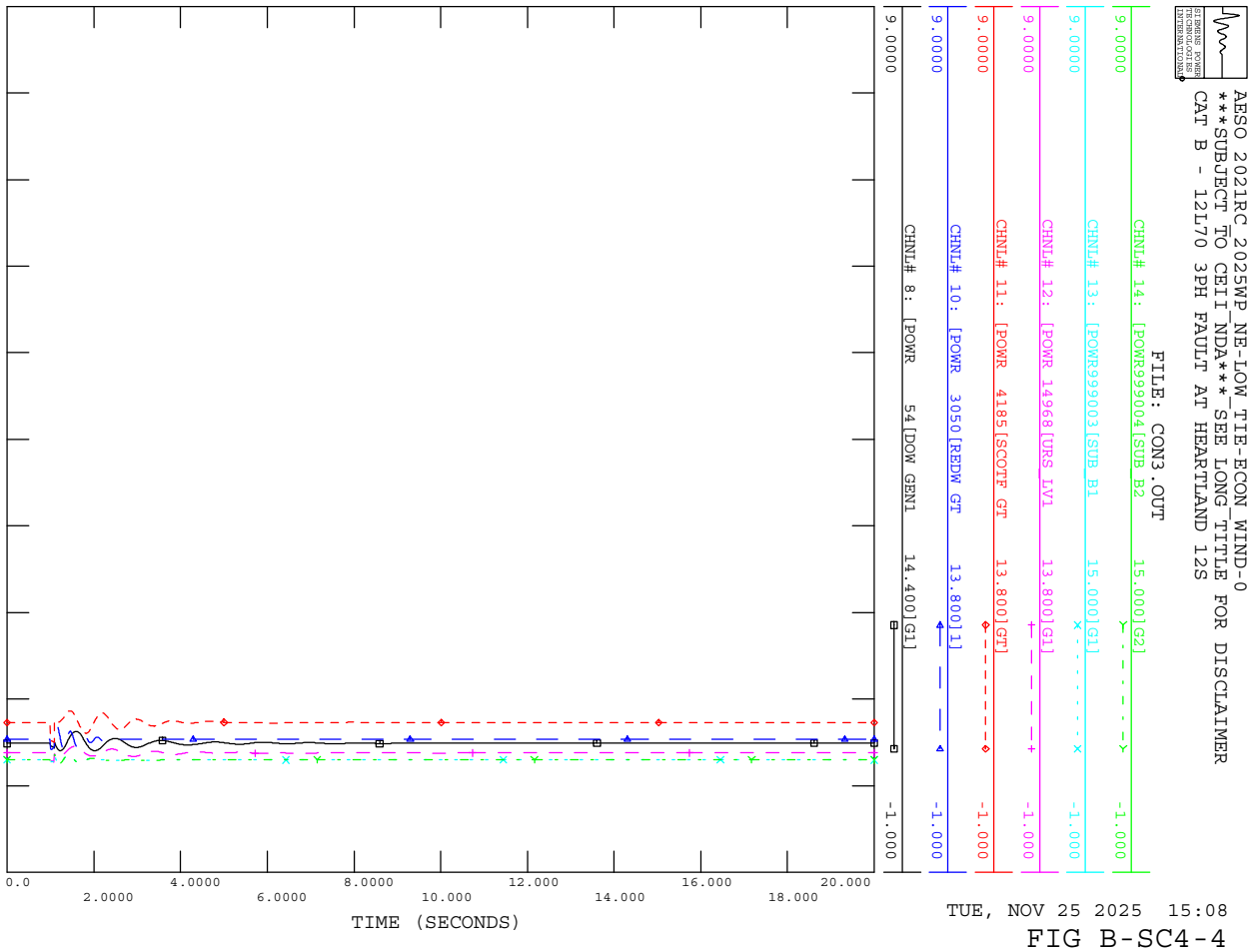


FIG B-SC4-4

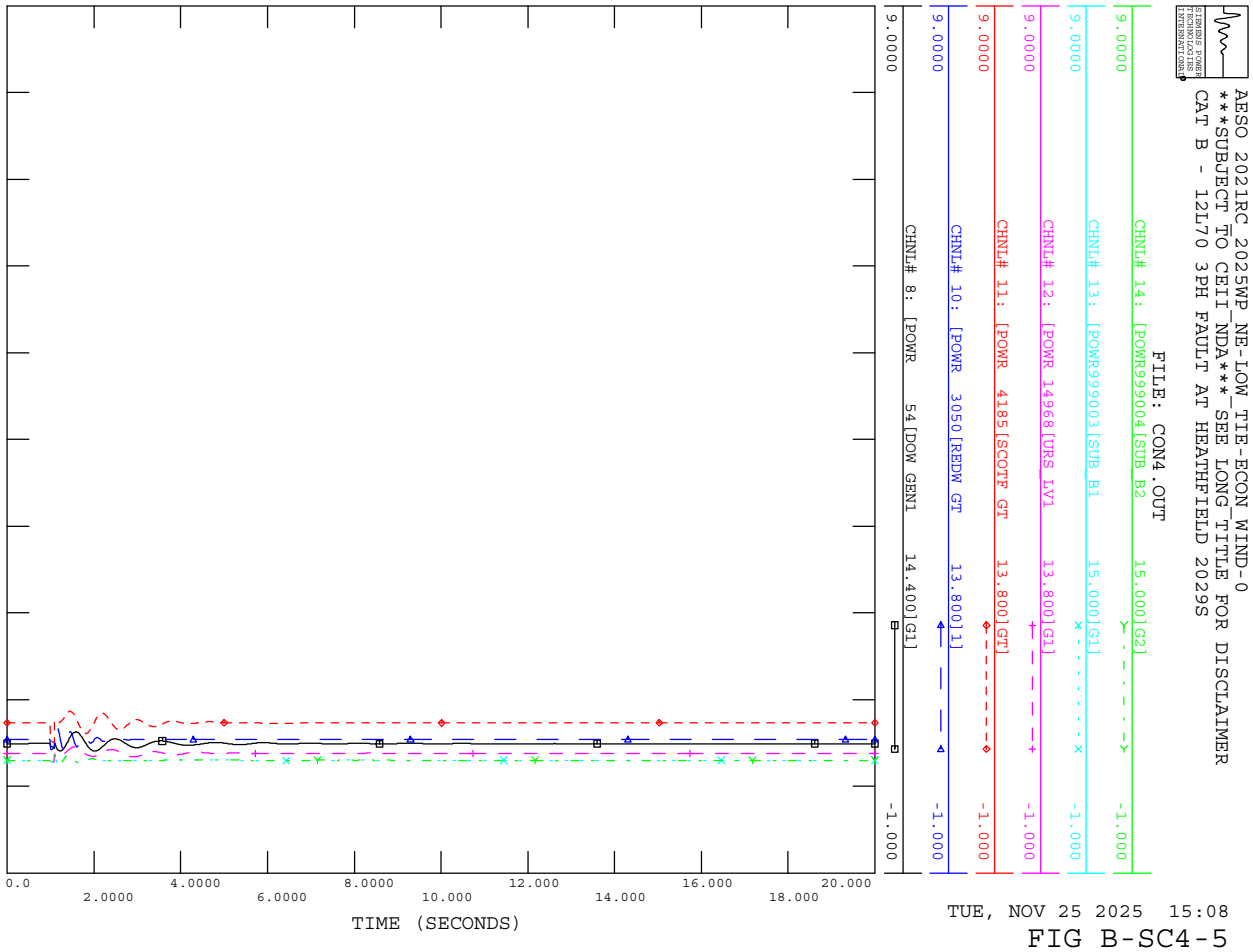


FIG B-SC4-5

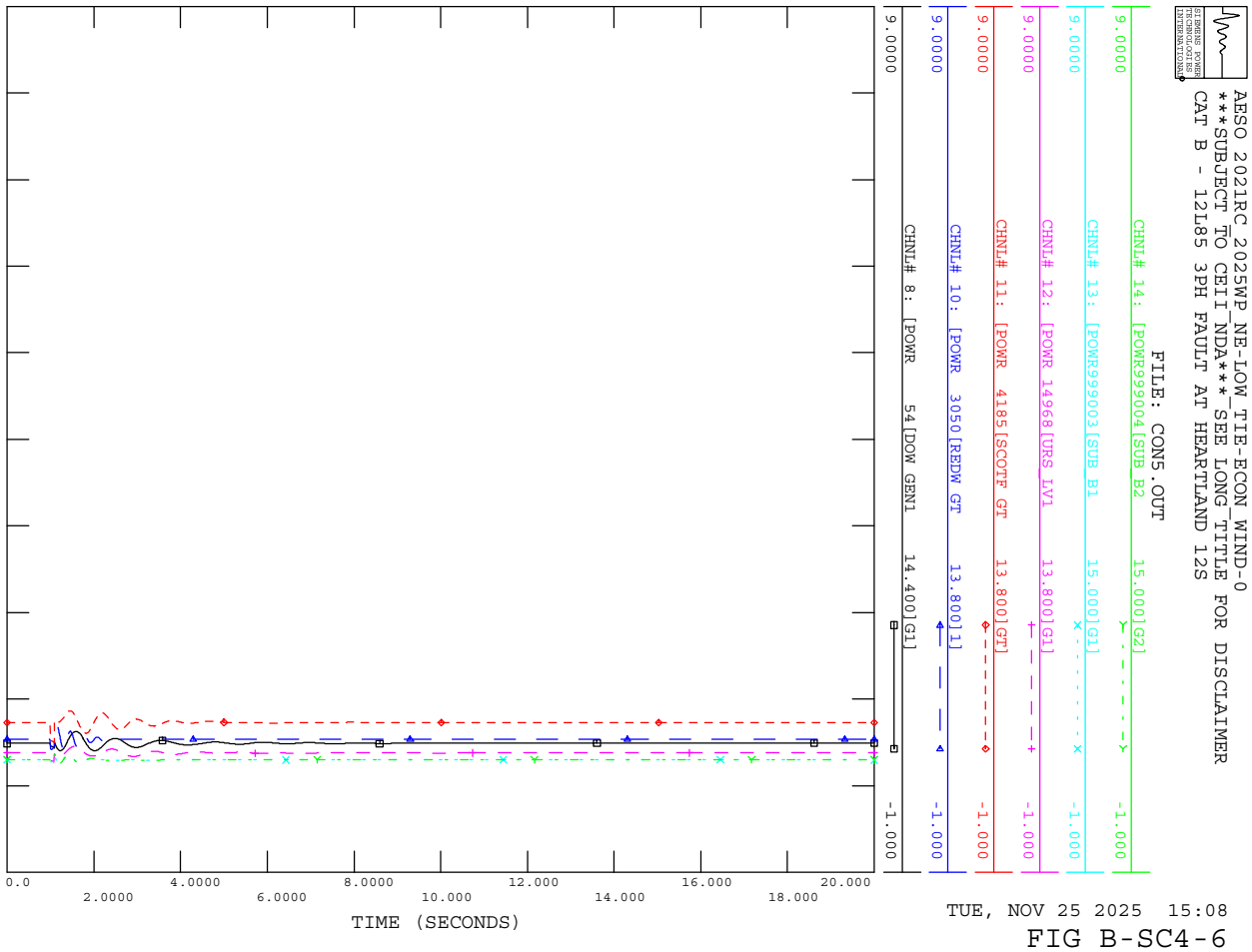


FIG B-SC4-6

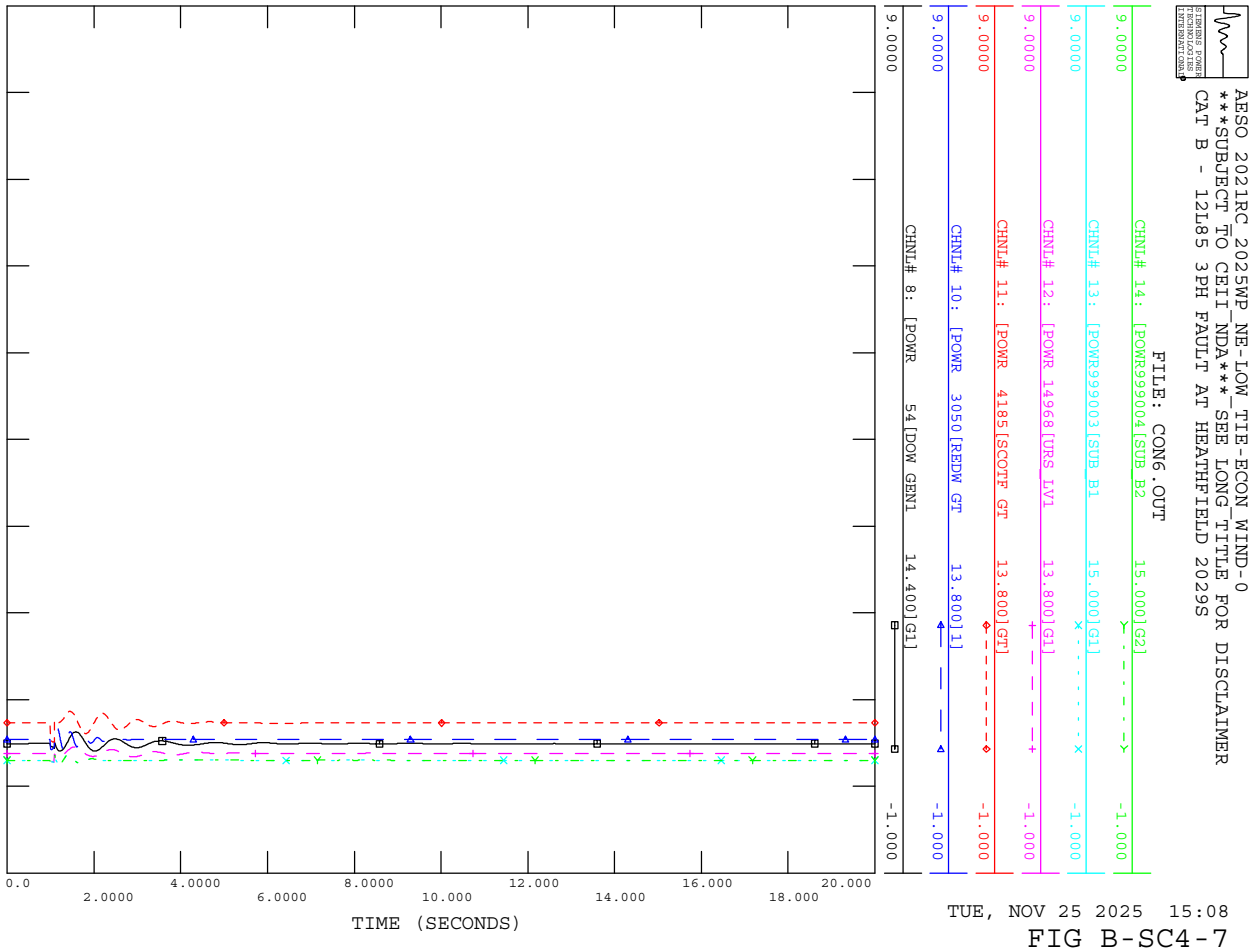


FIG B-SC4-7

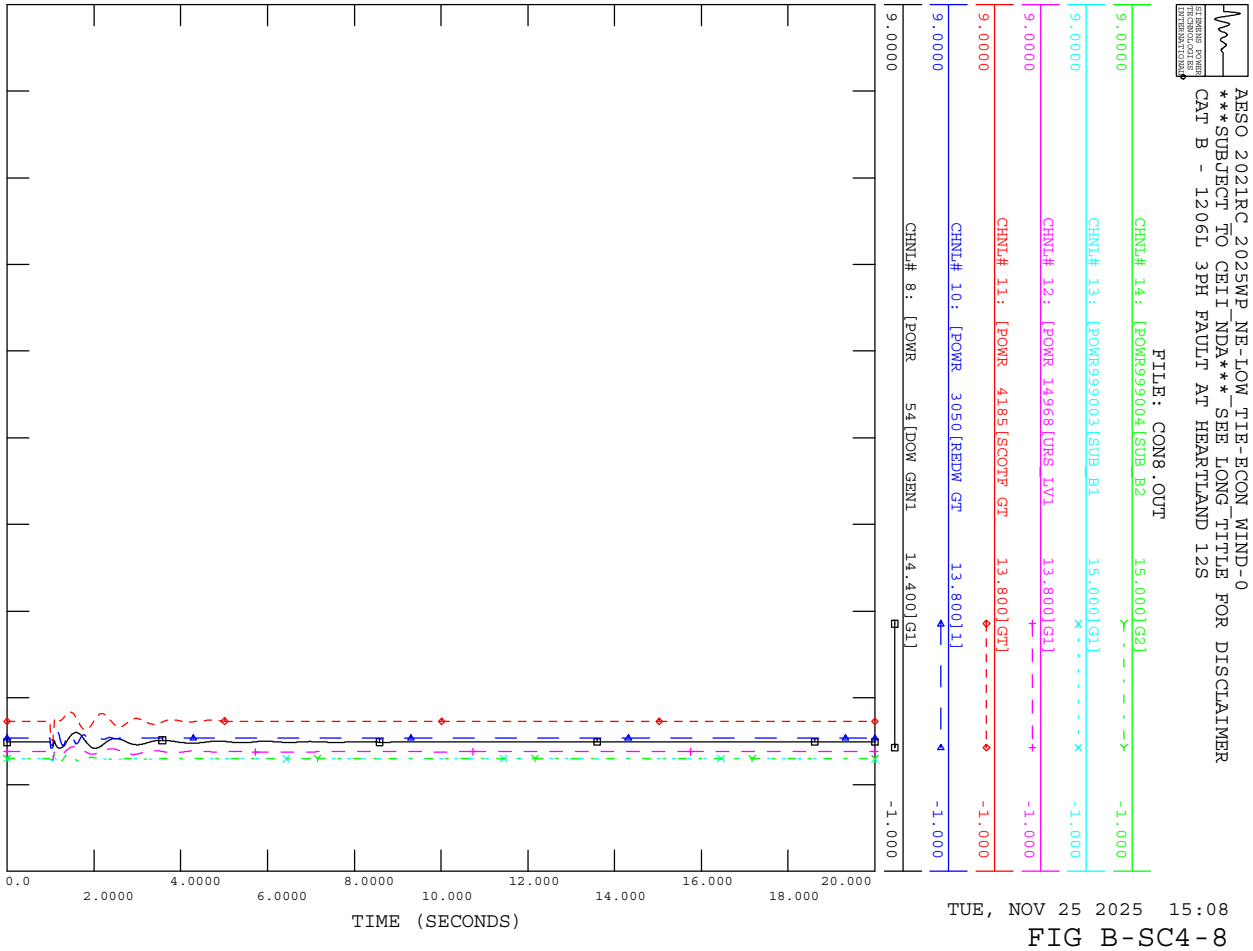


FIG B-SC4-8

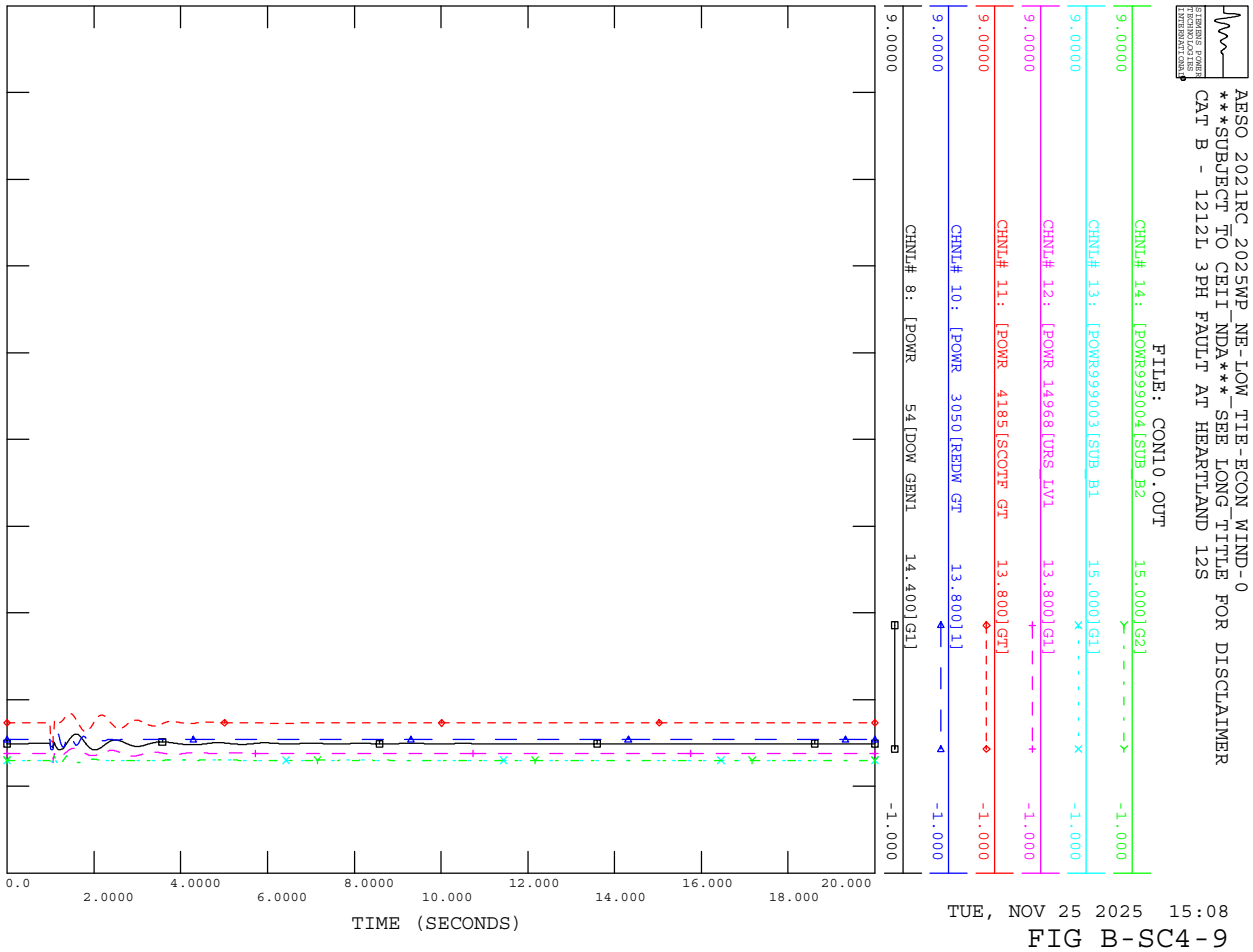


FIG B-SC4-9

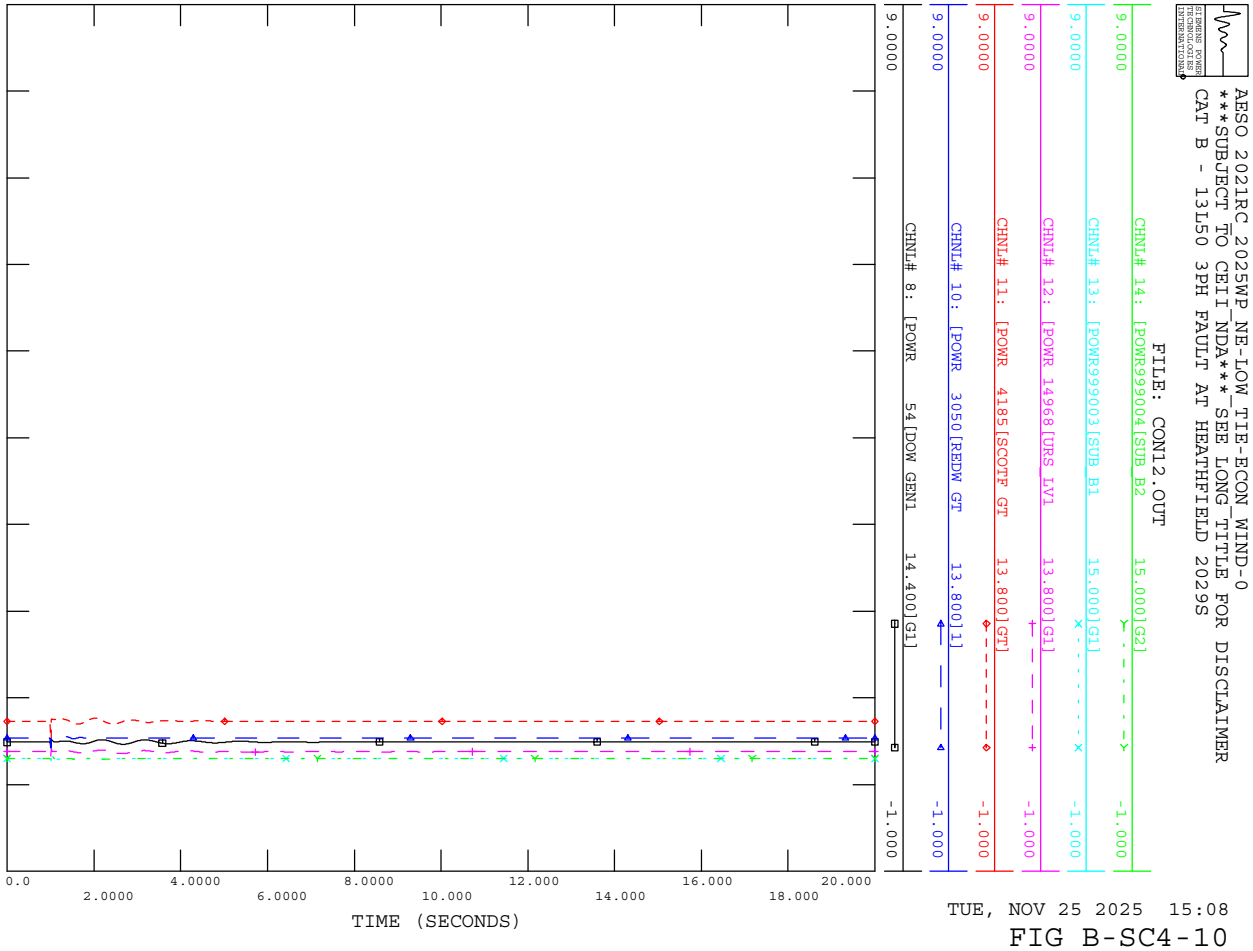


FIG B-SC4-10

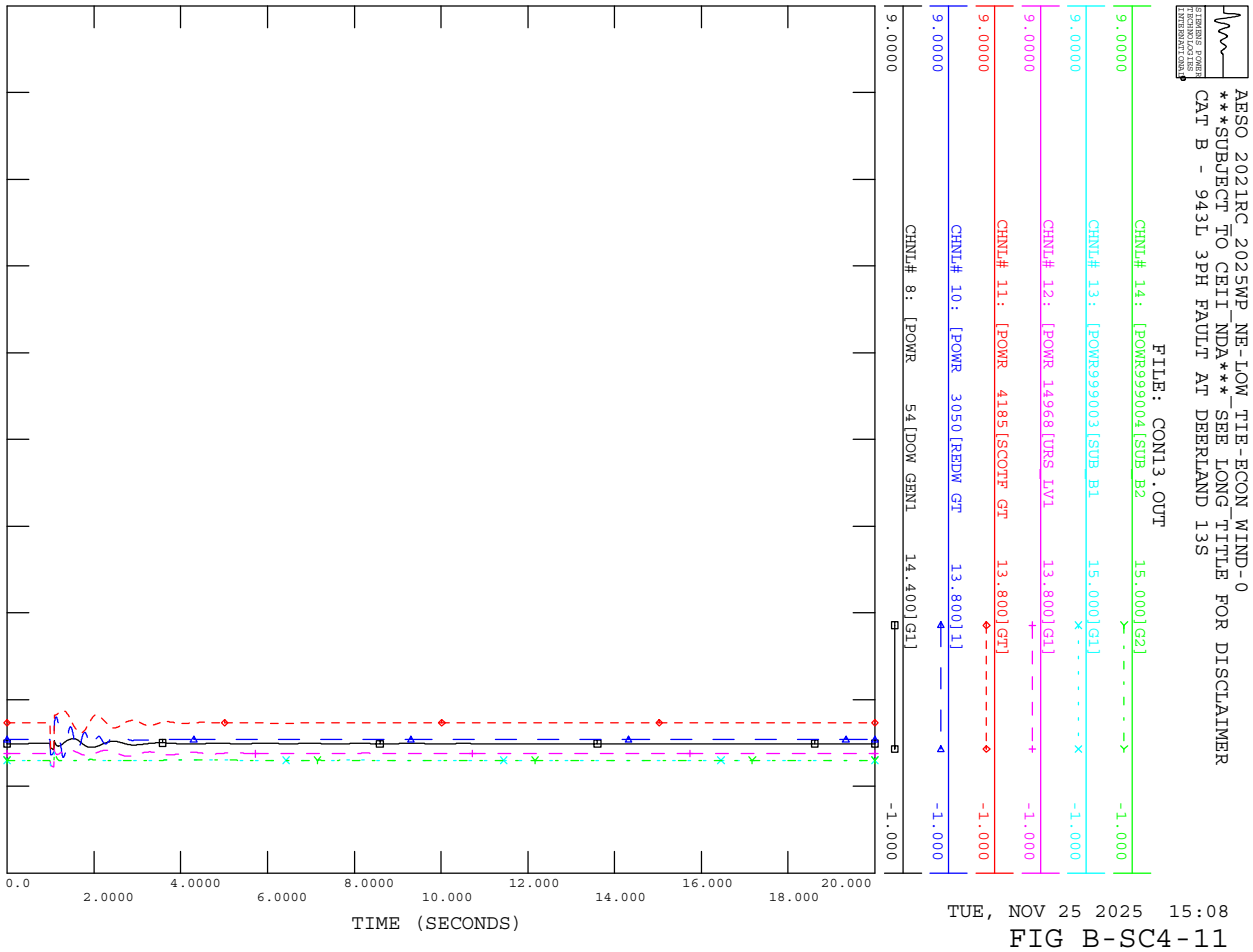


FIG B-SC4-11

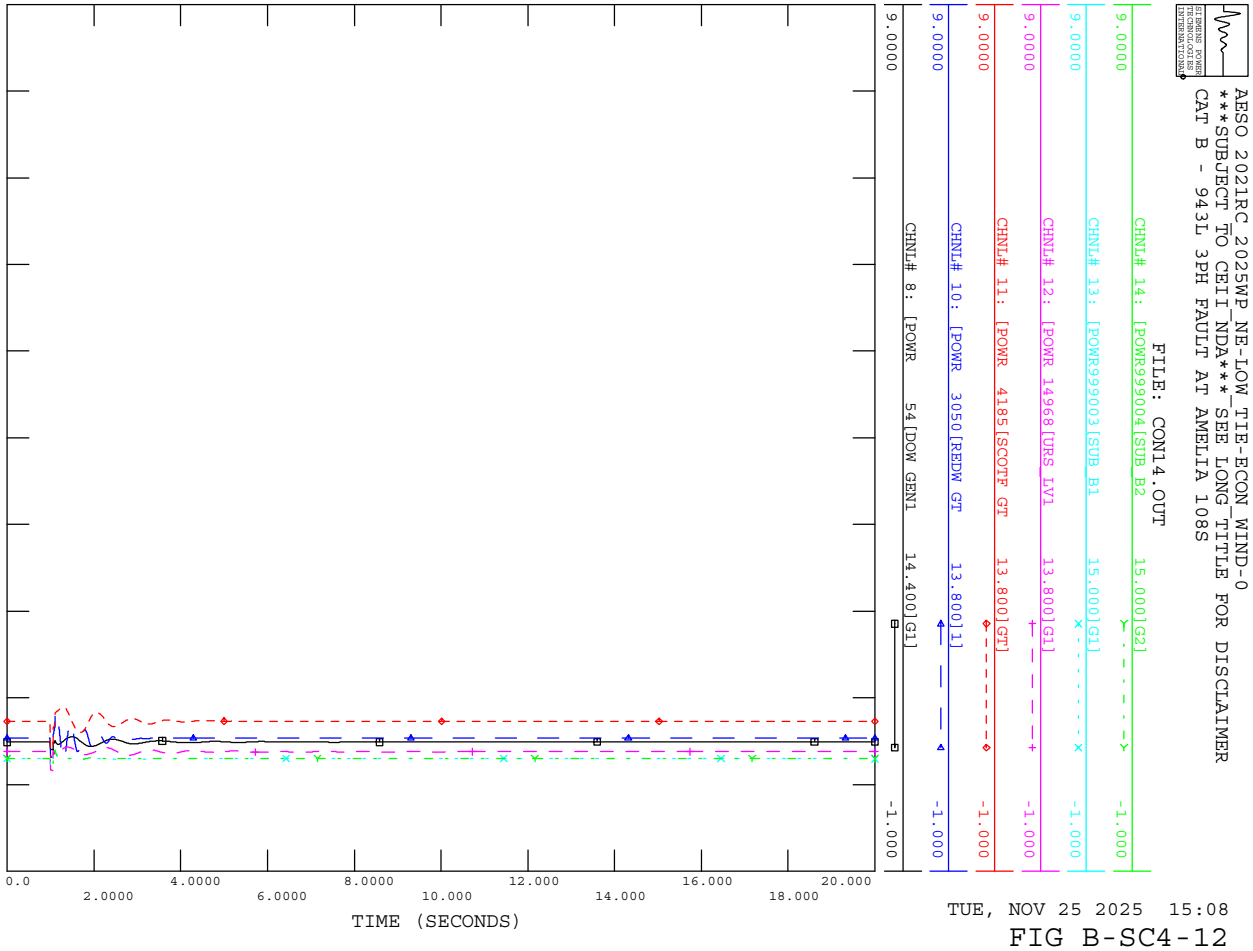


FIG B-SC4-12

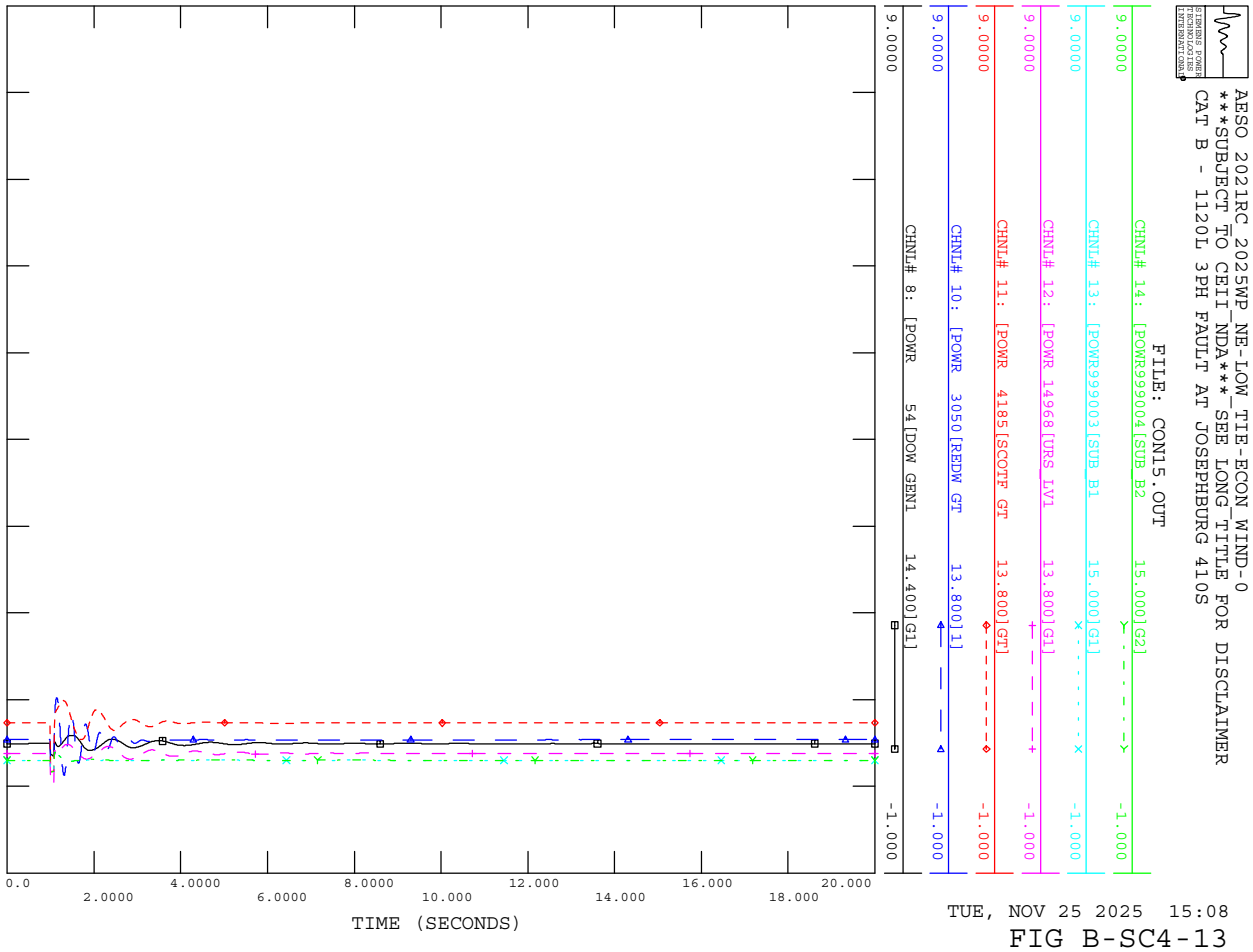


FIG B-SC4-13

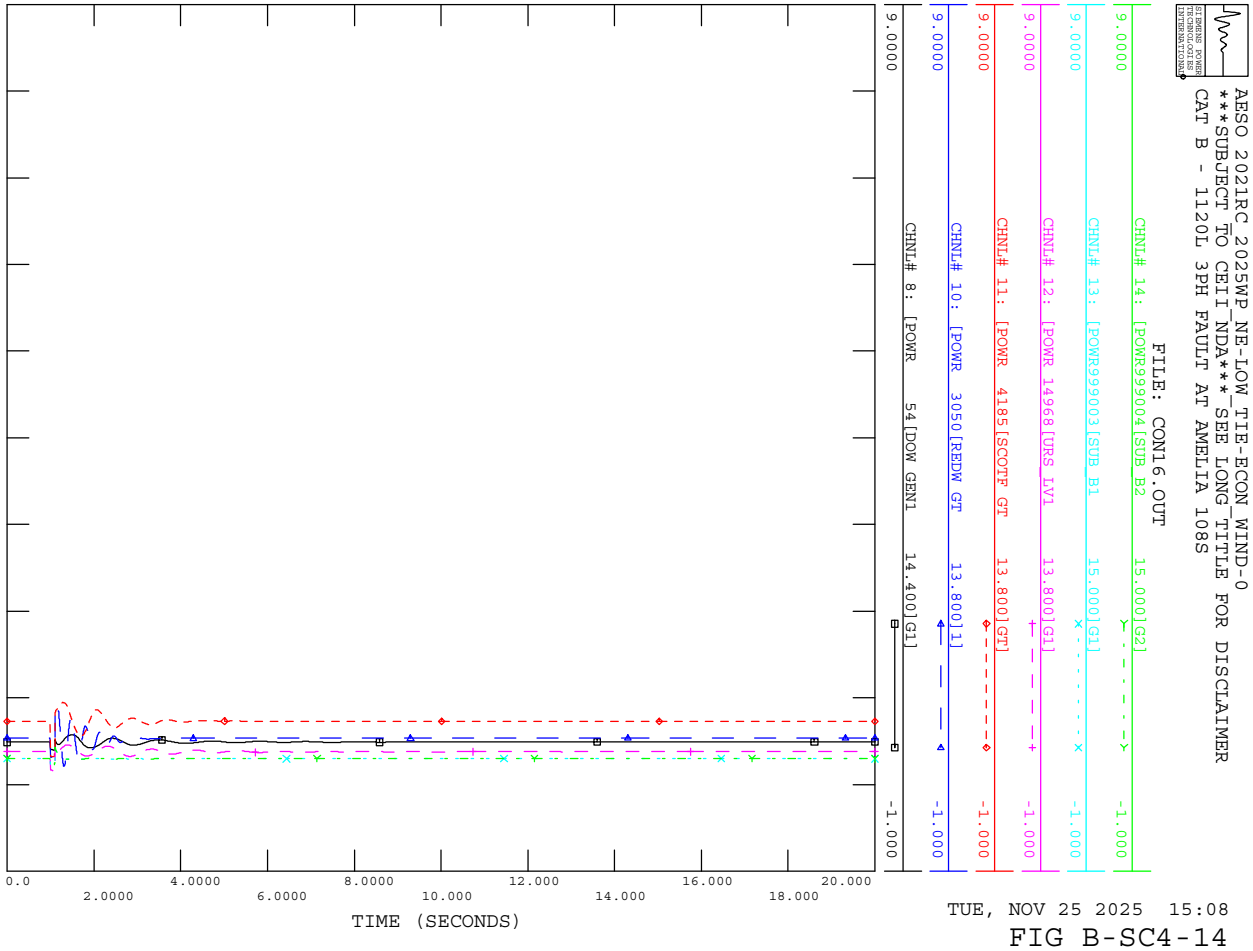


FIG B-SC4-14

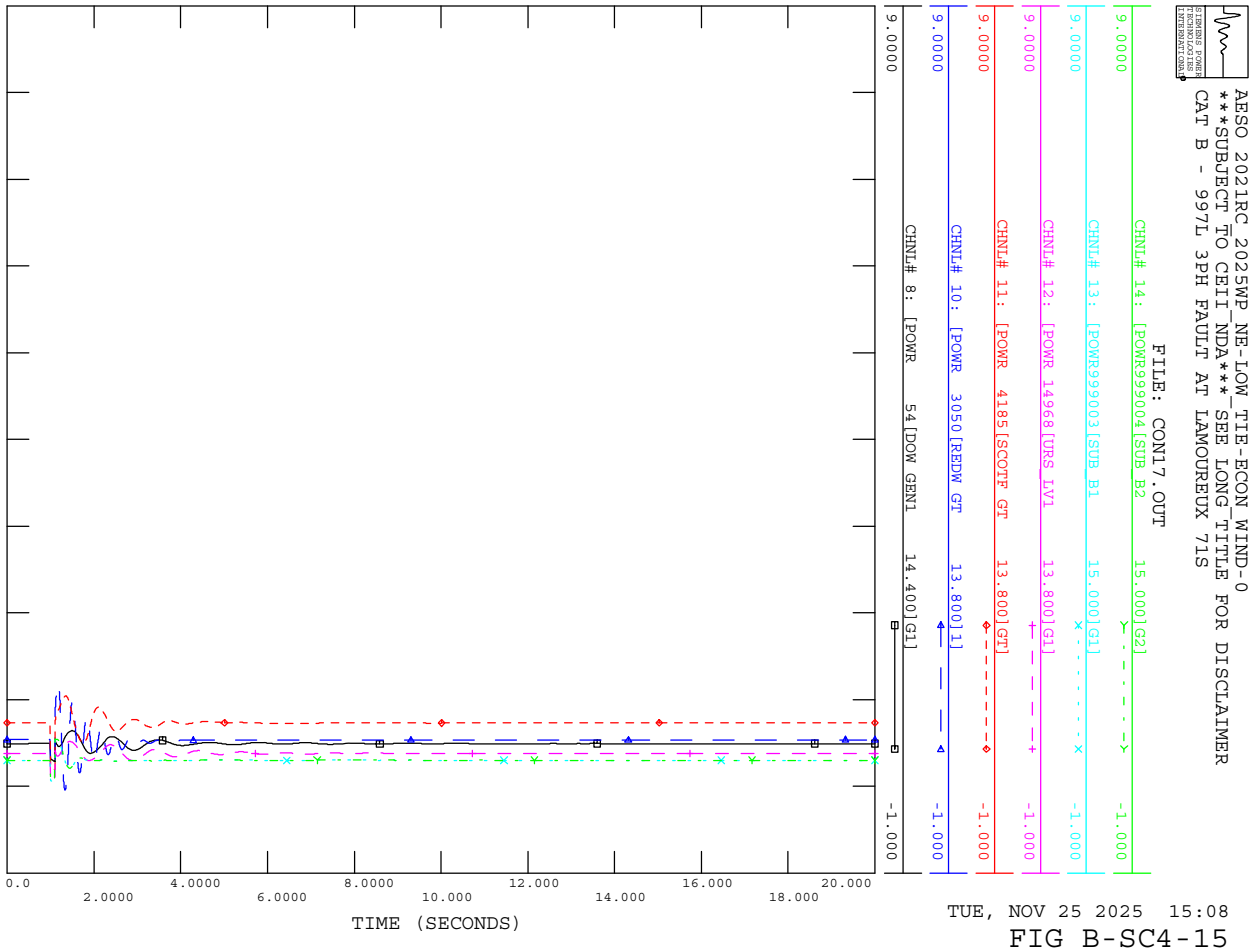


FIG B-SC4-15

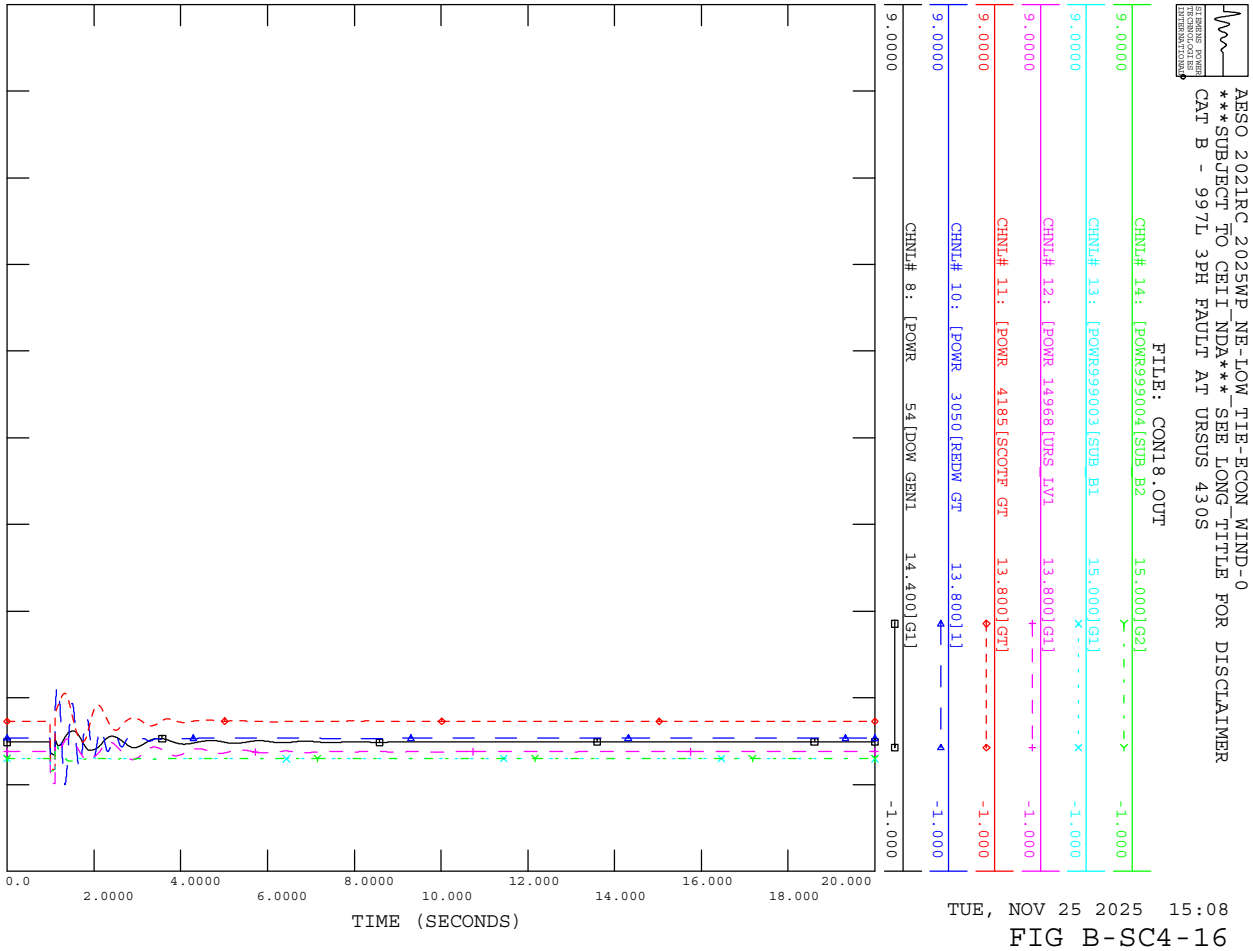


FIG B-SC4-16

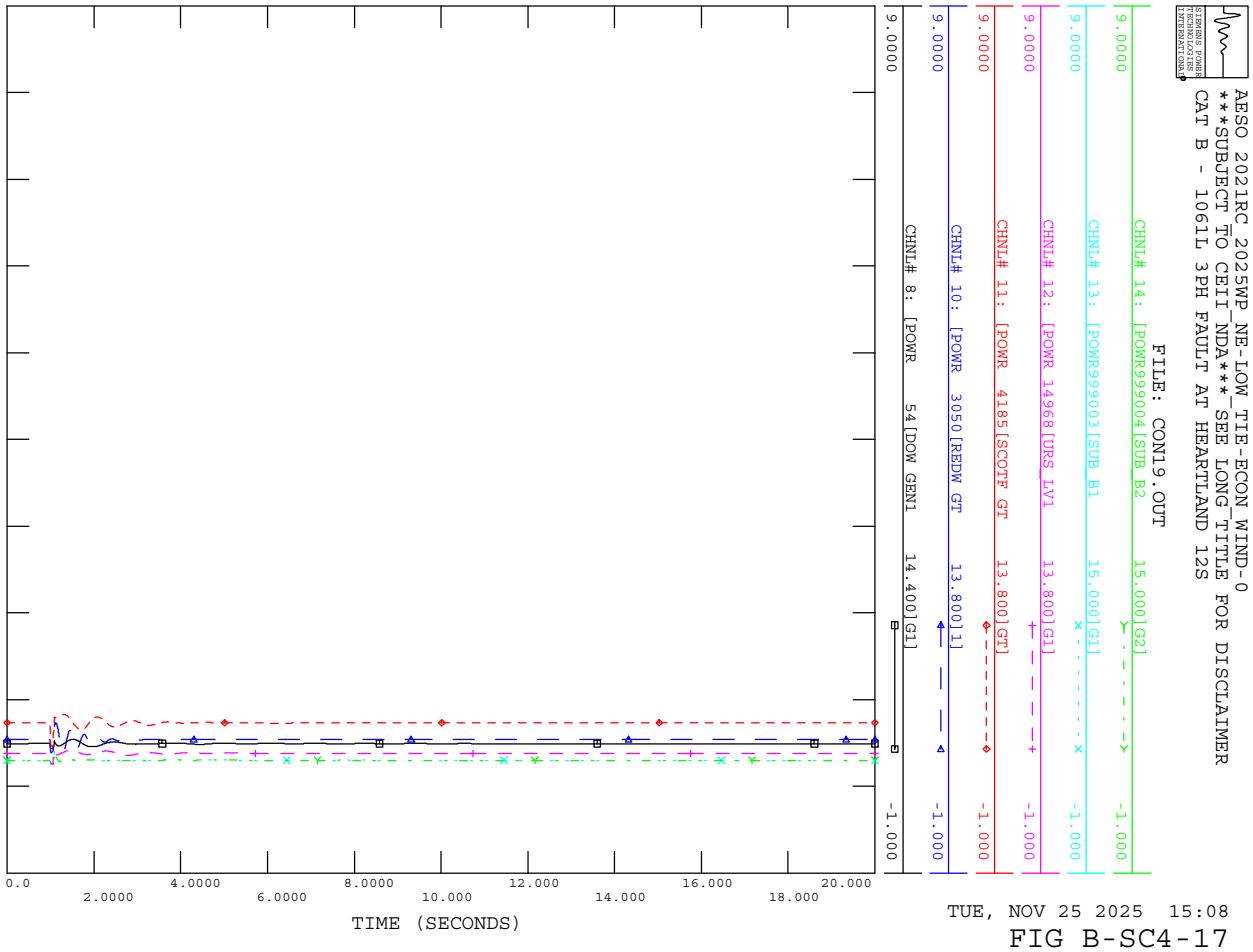


FIG B-SC4-17

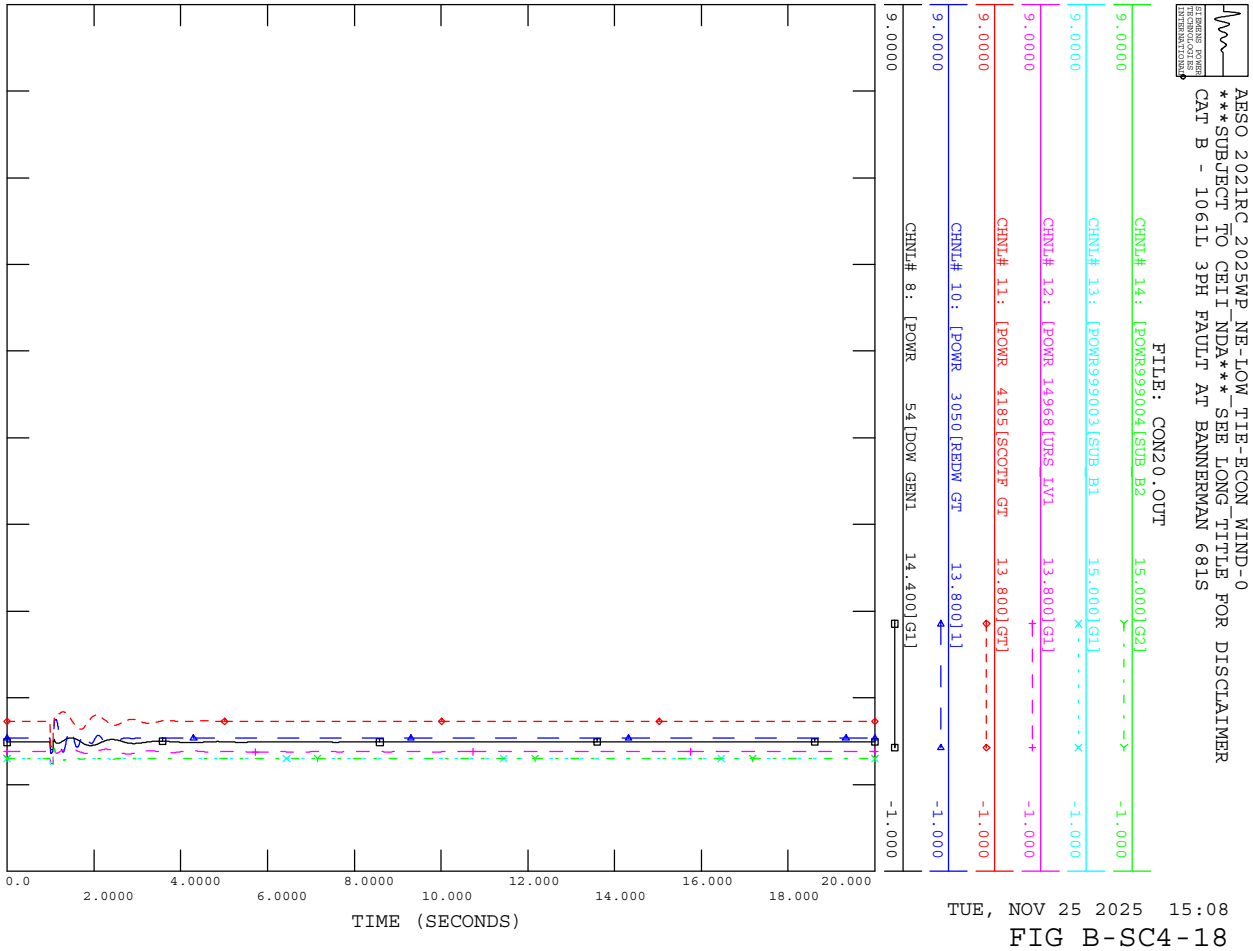


FIG B-SC4-18

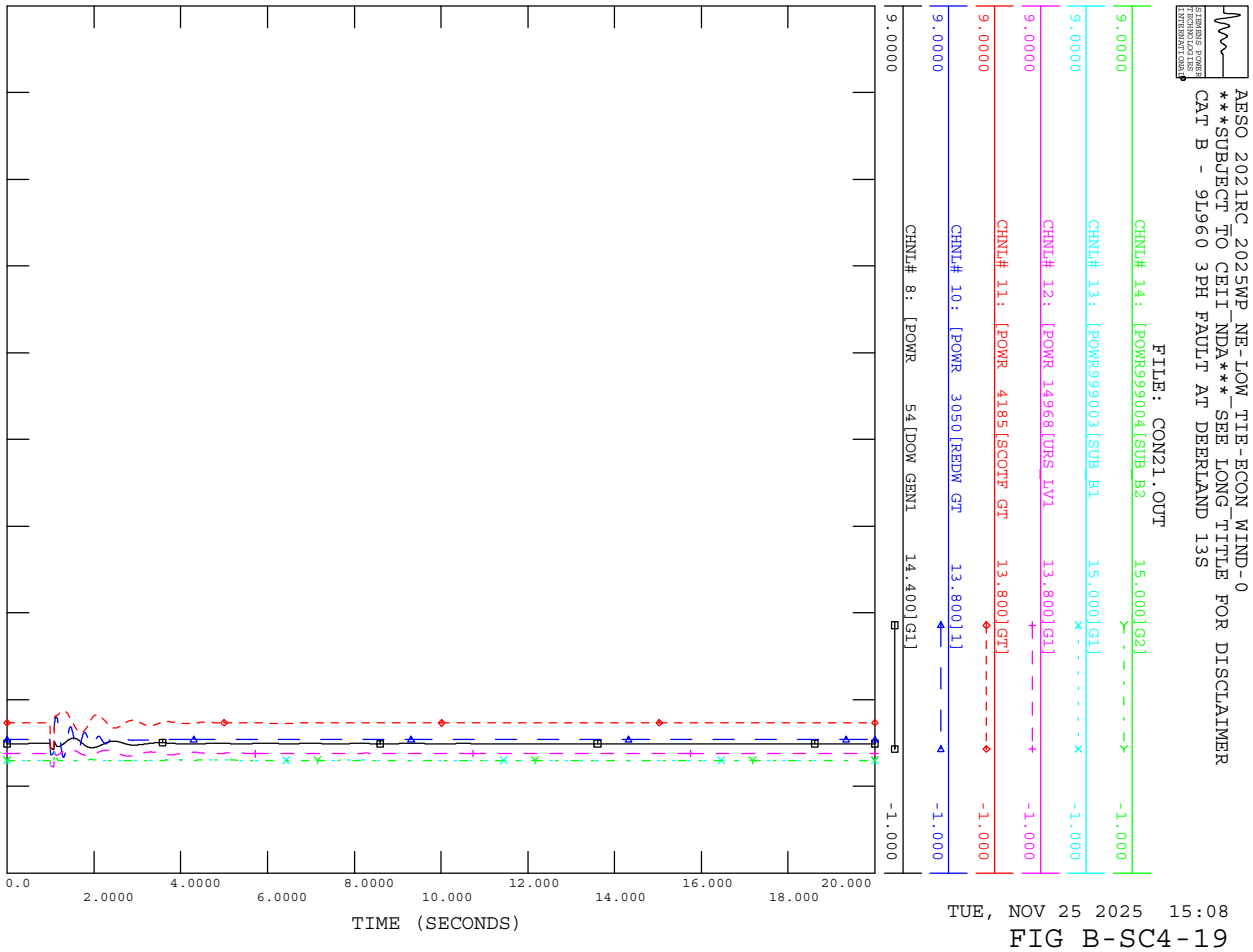


FIG B-SC4-19

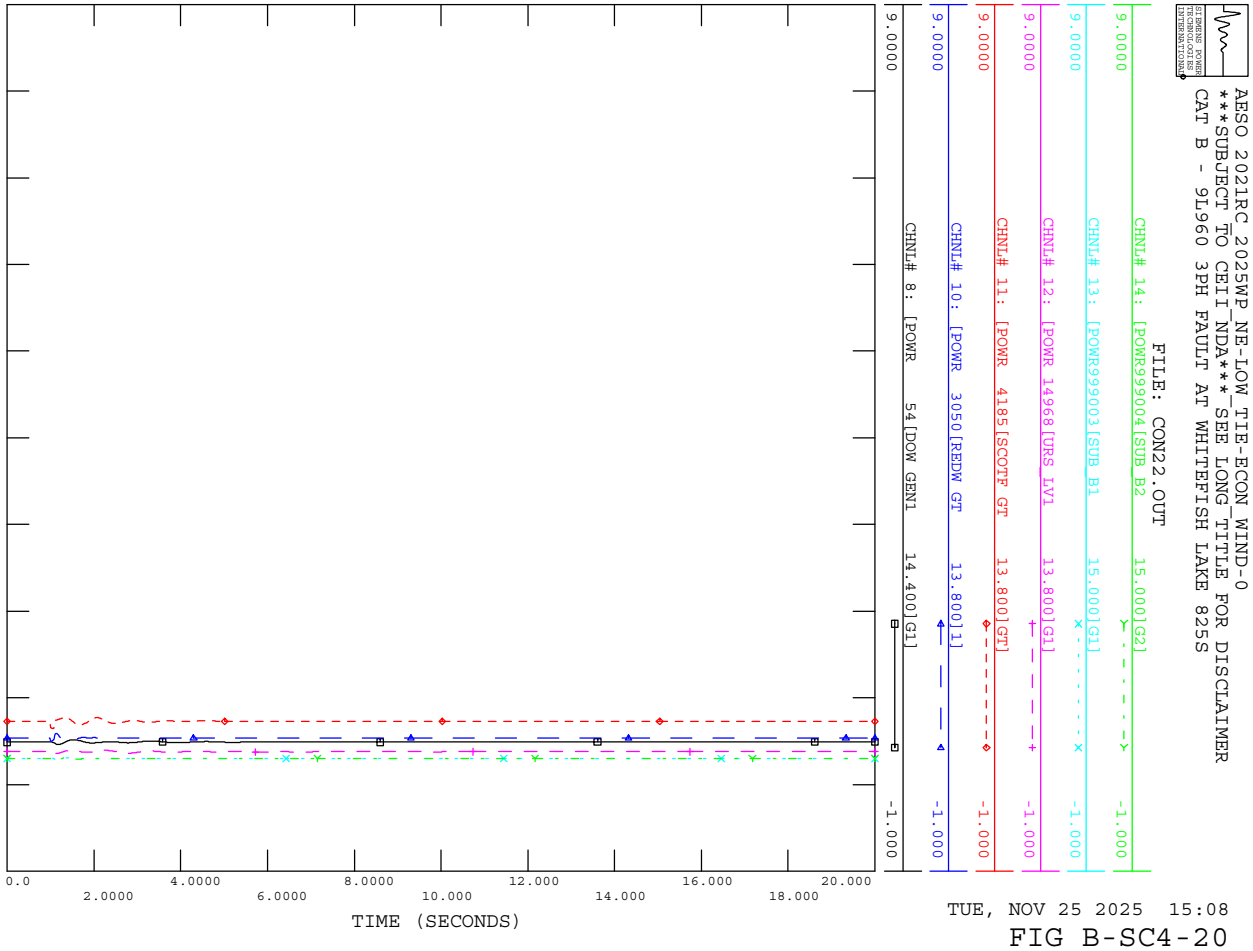


FIG B-SC4-20

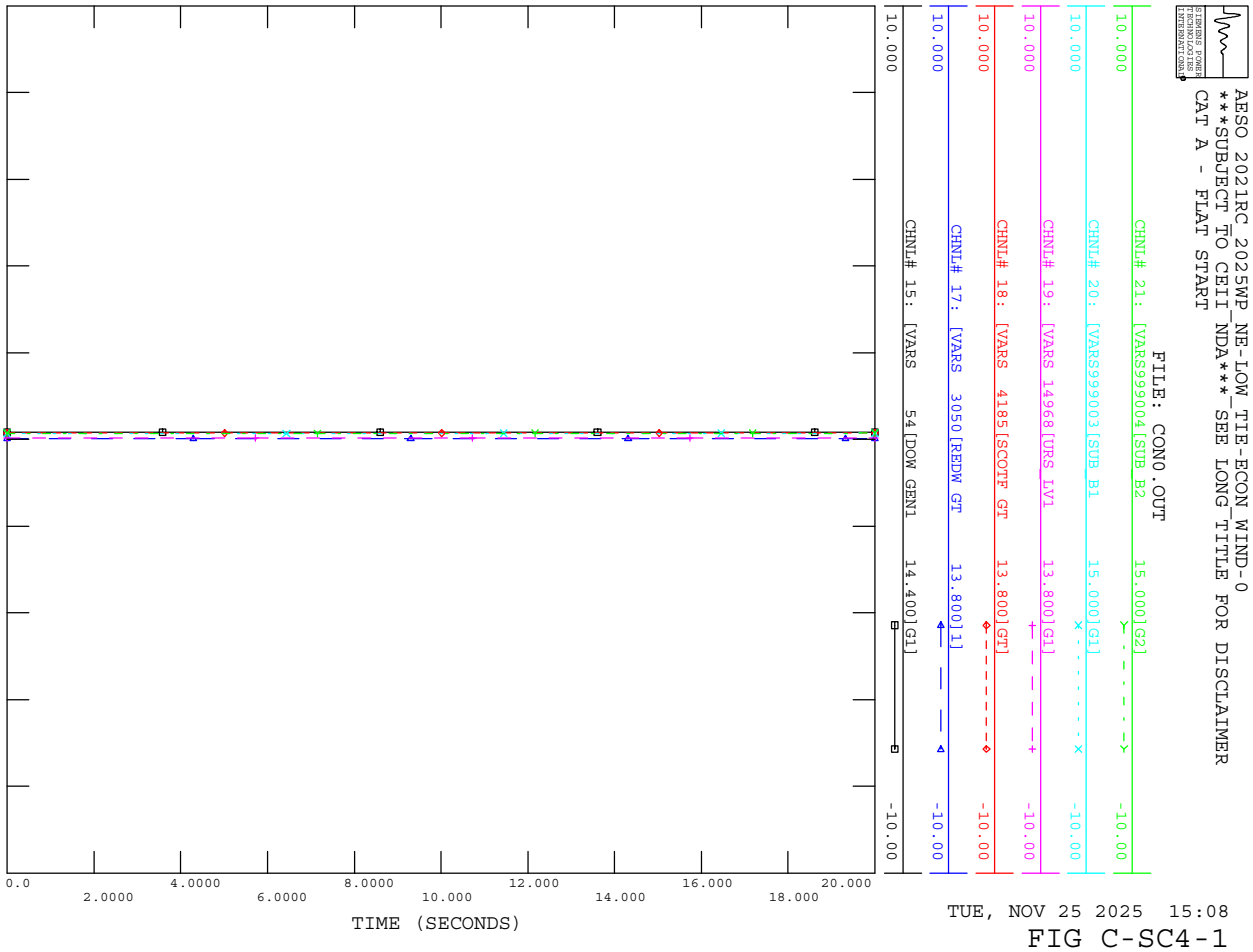


FIG C-SC4-1

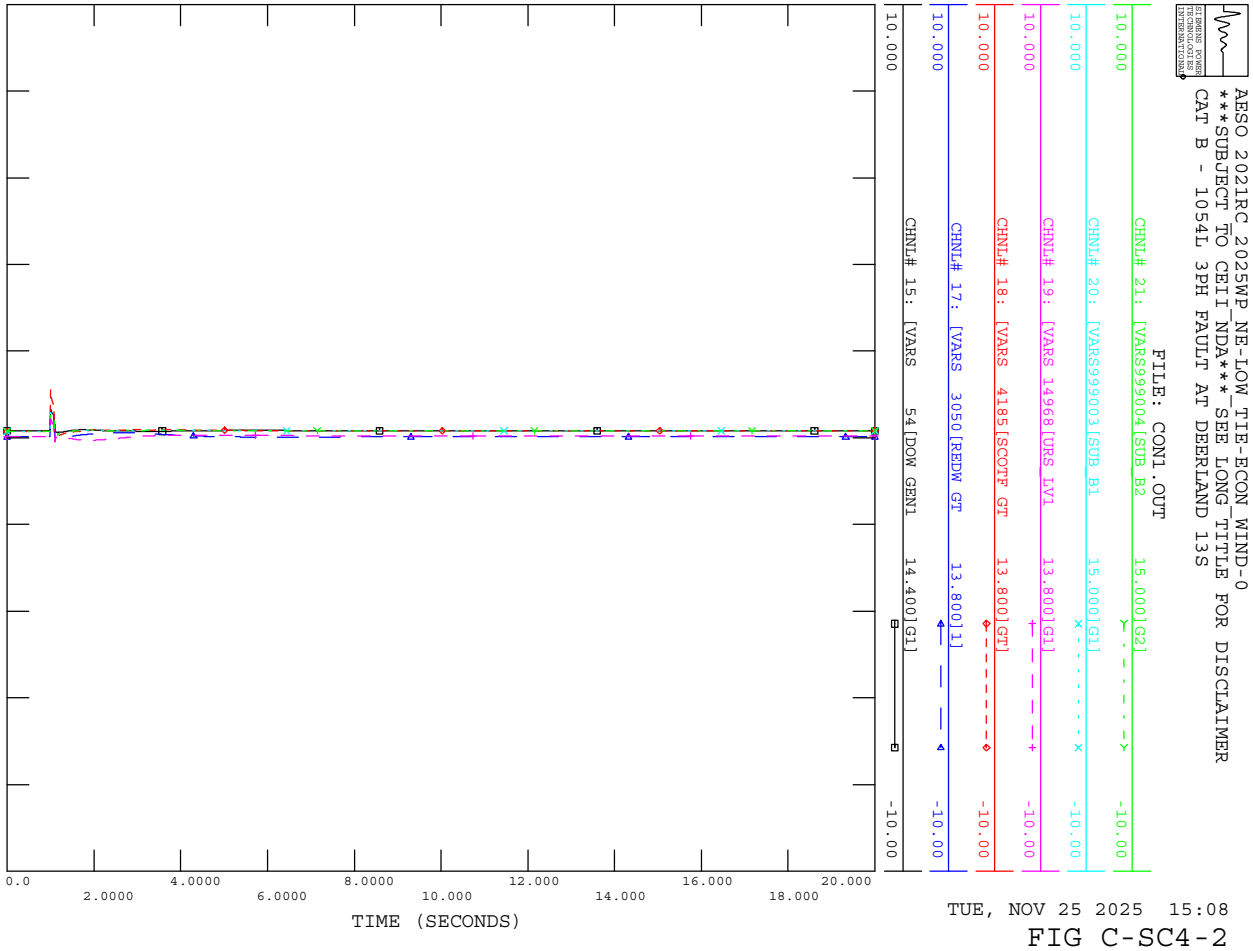


FIG C-SC4-2

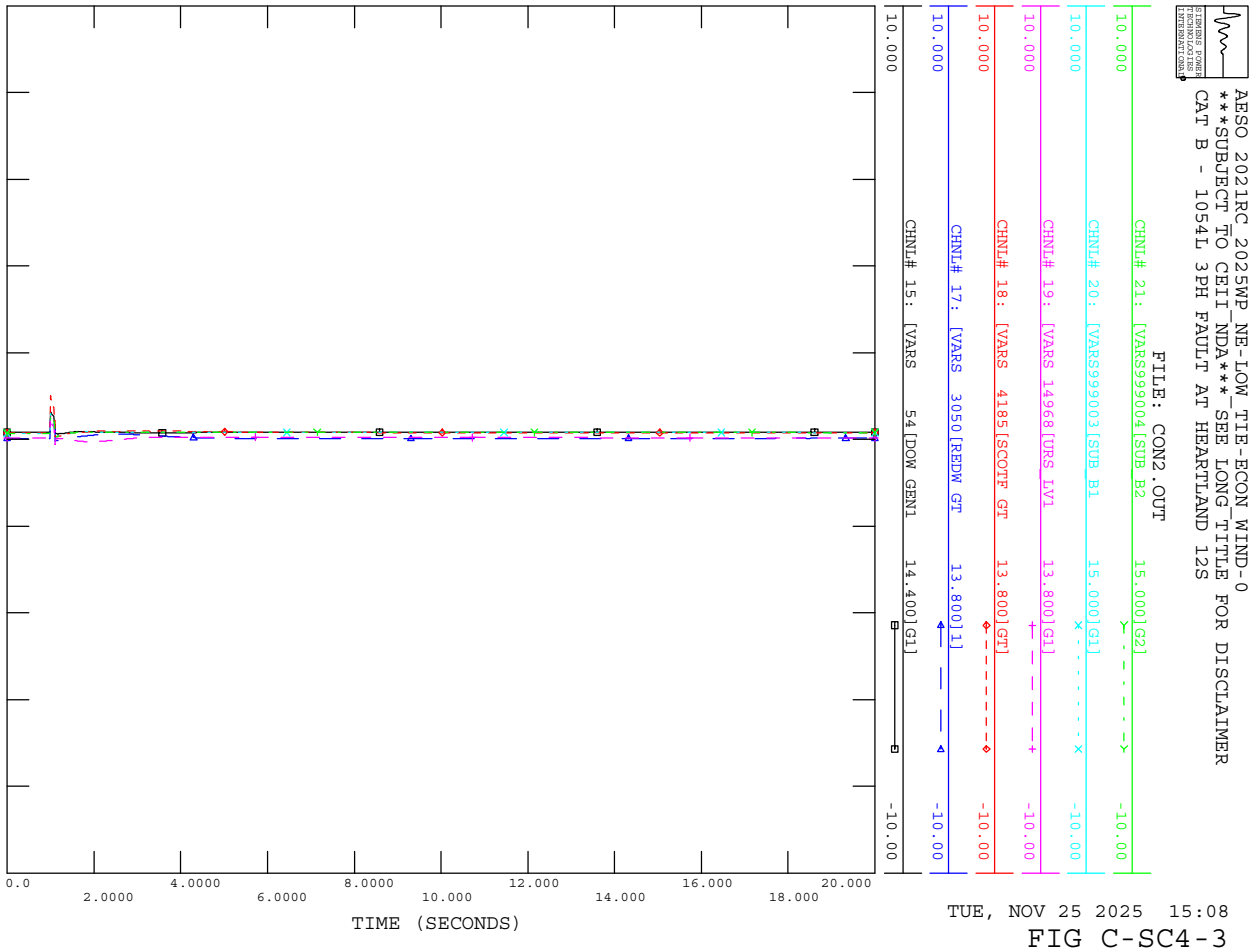


FIG C-SC4-3

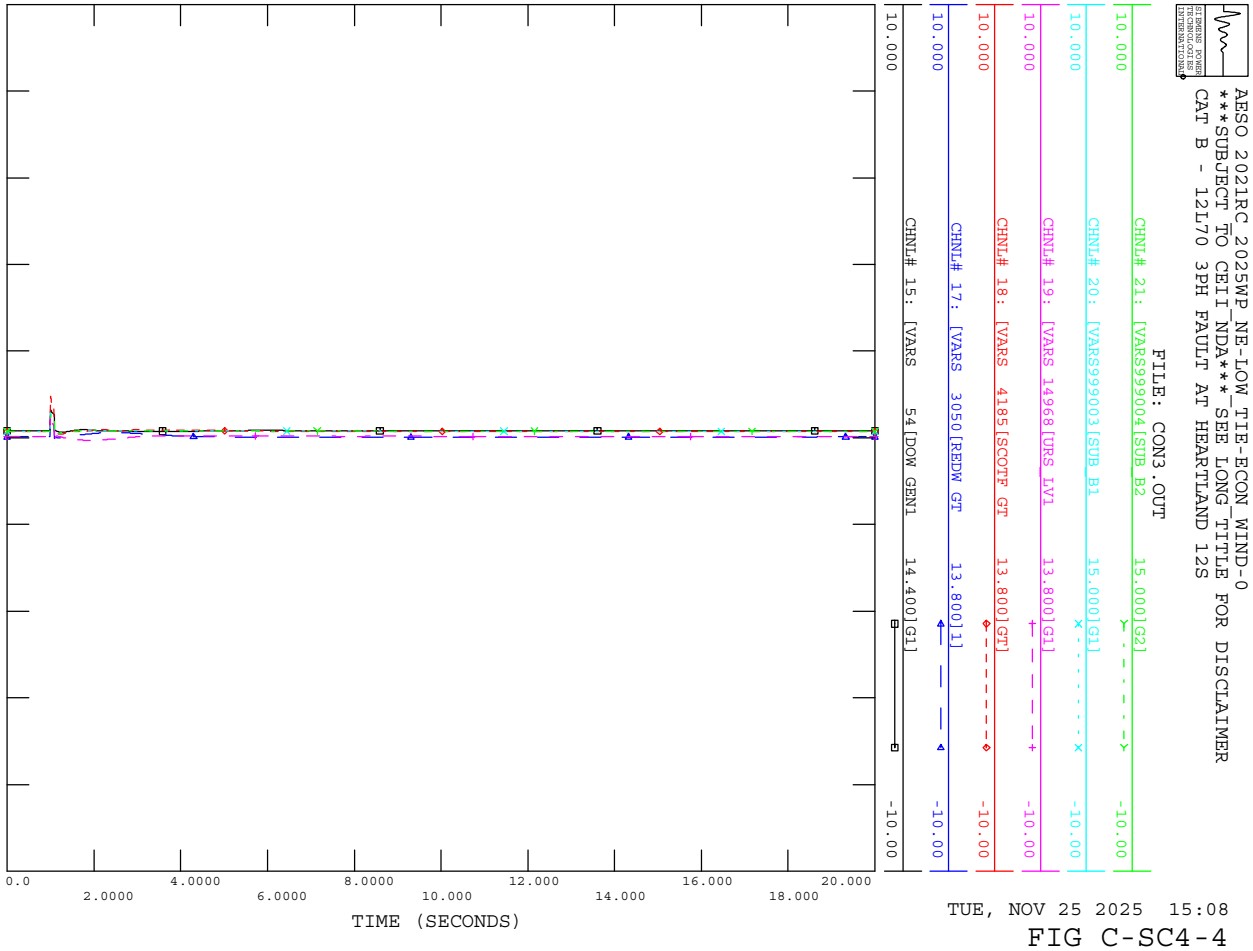
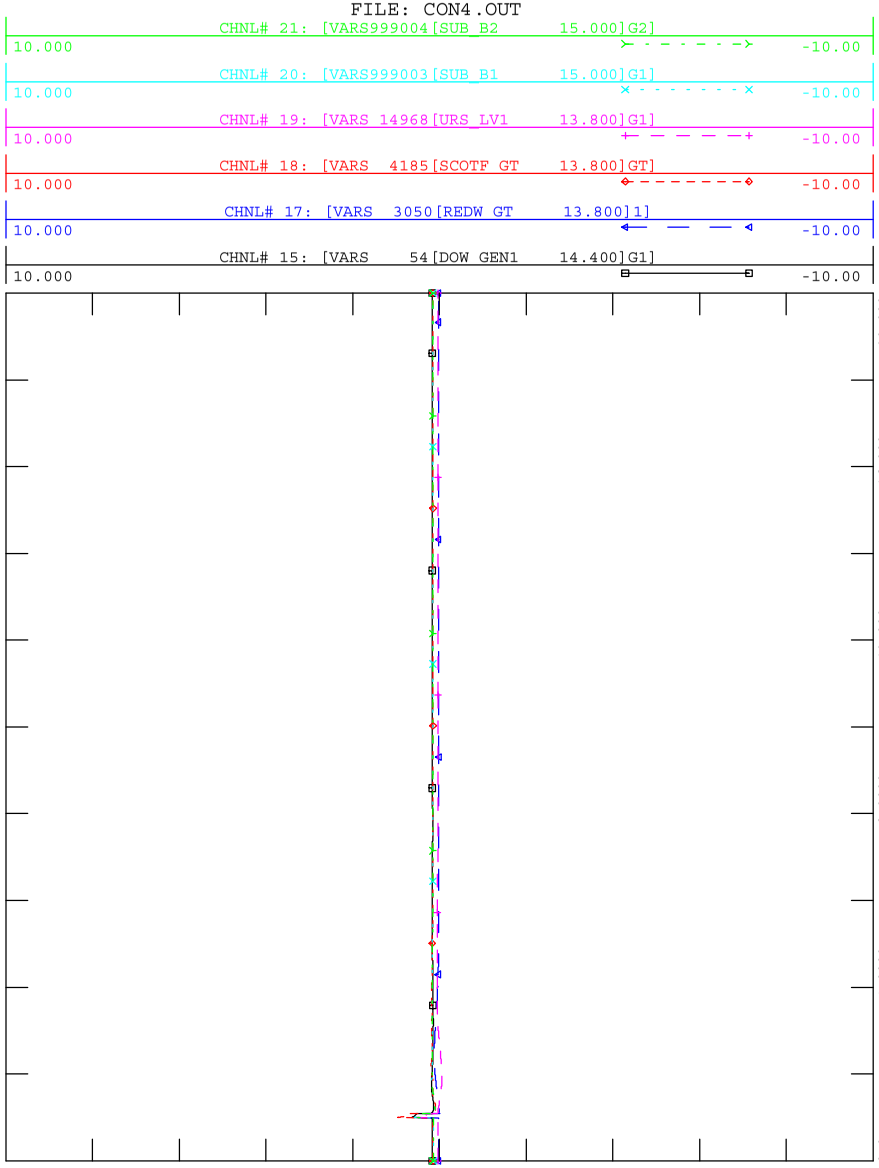


FIG C-SC4-4

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
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CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

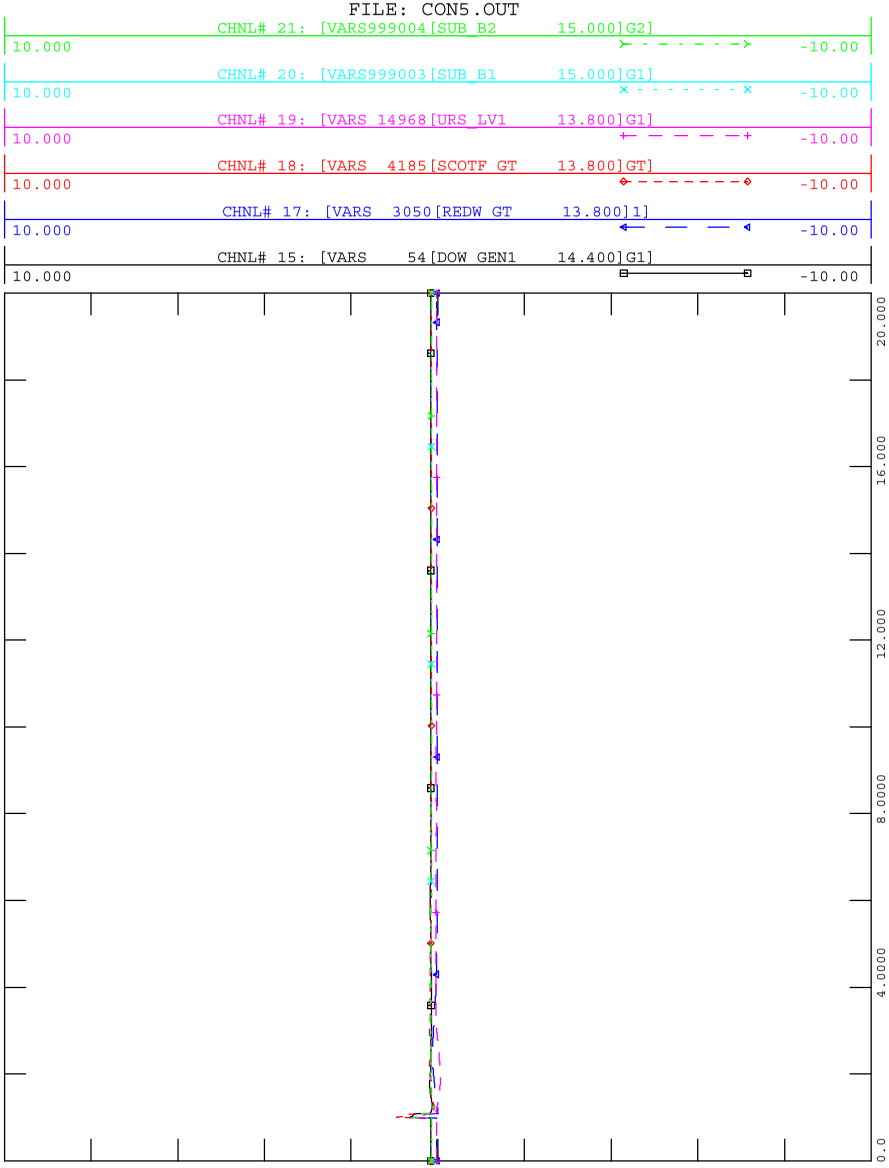
FILE: CON4.OUT



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FIG C-SC4-5

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

FILE: CON5.OUT



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FIG C-SC4-6

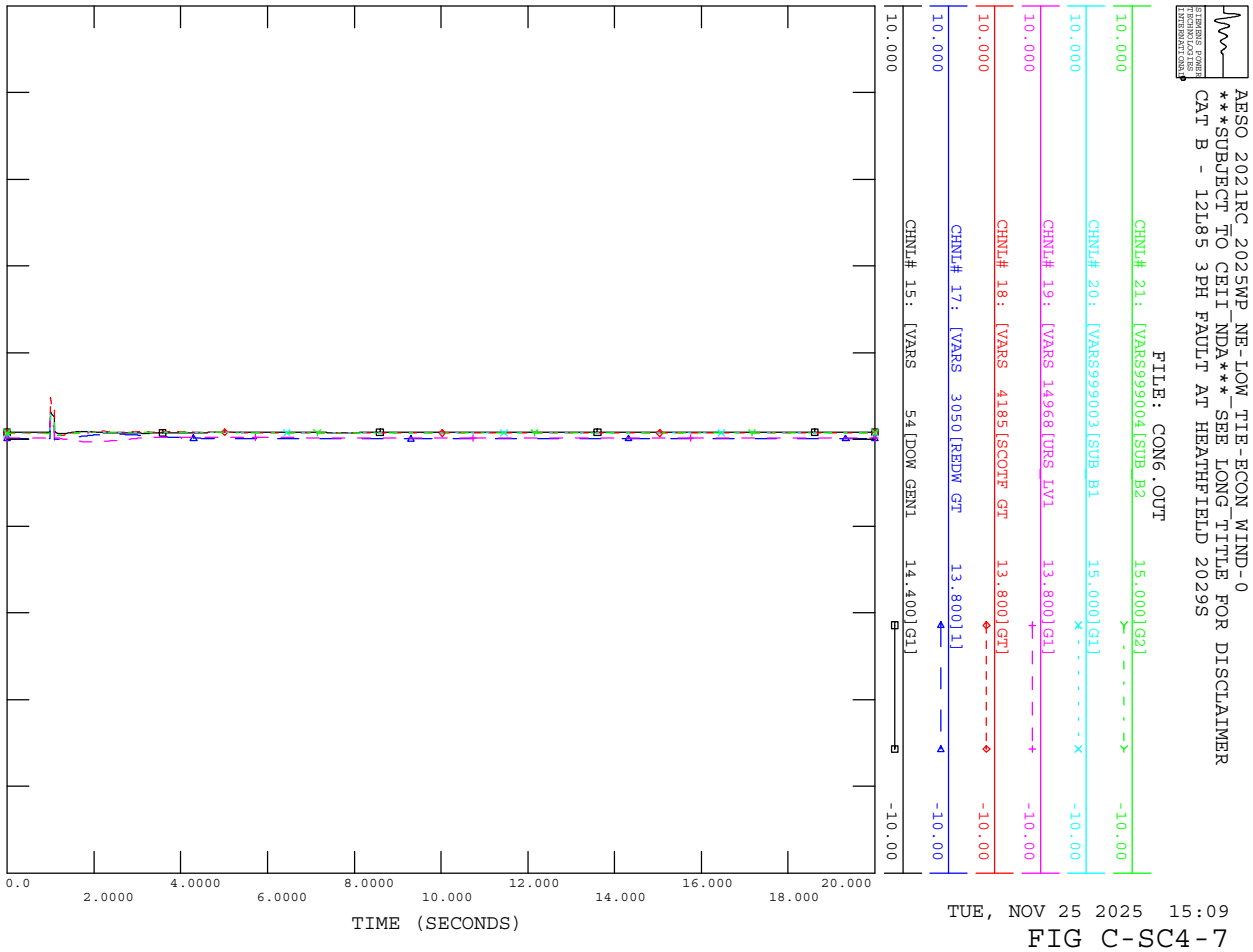


FIG C-SC4-7

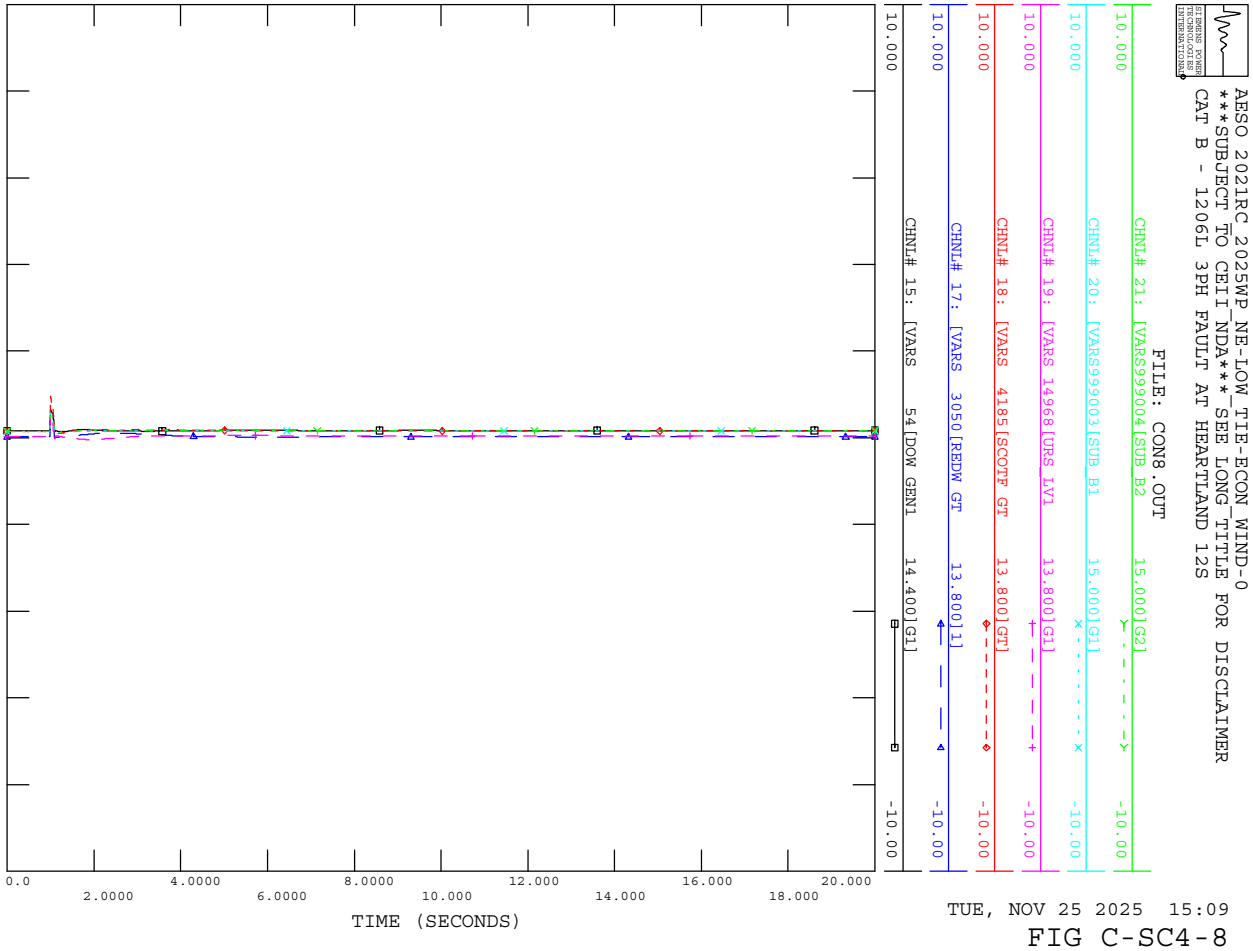


FIG C-SC4-8

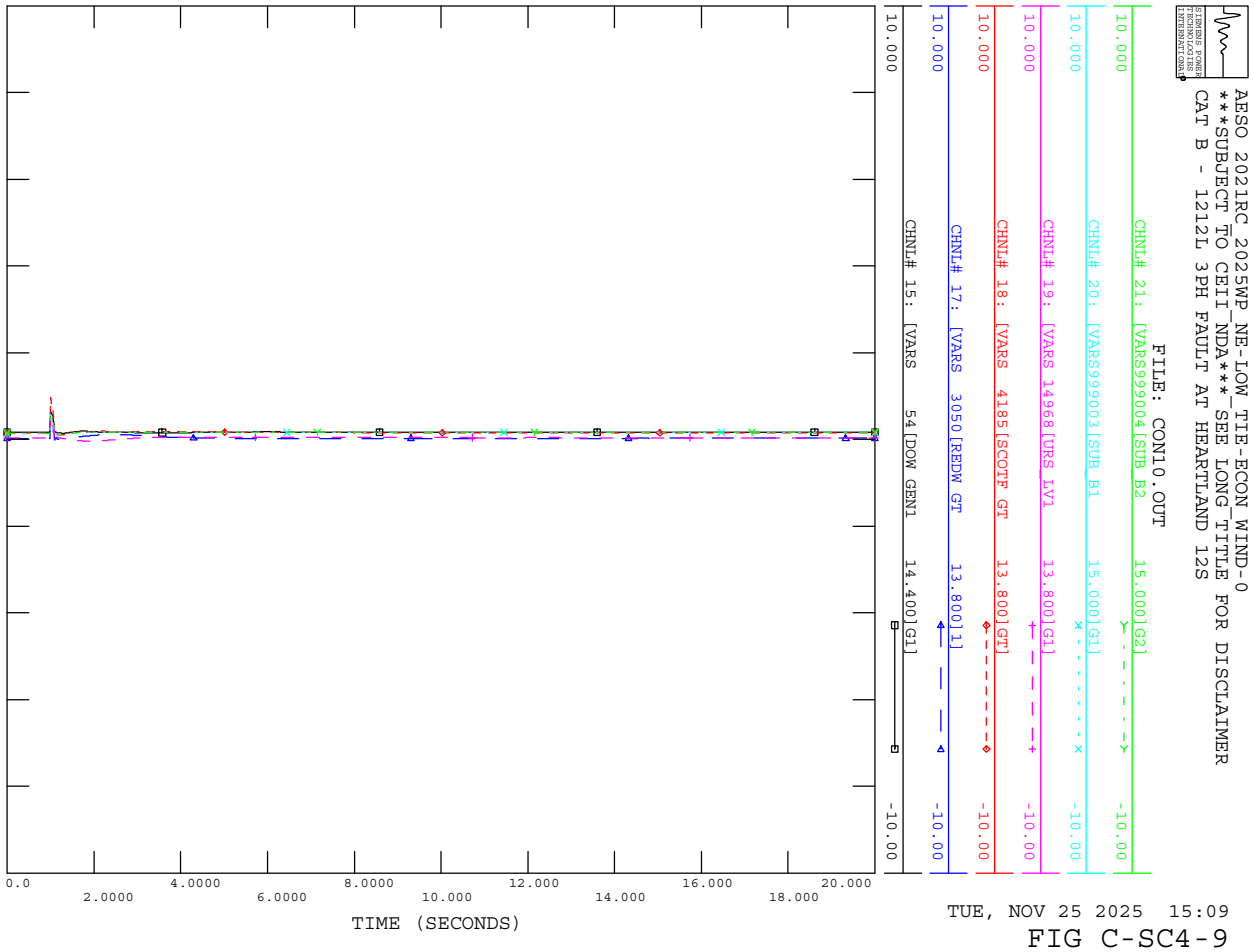


FIG C-SC4-9

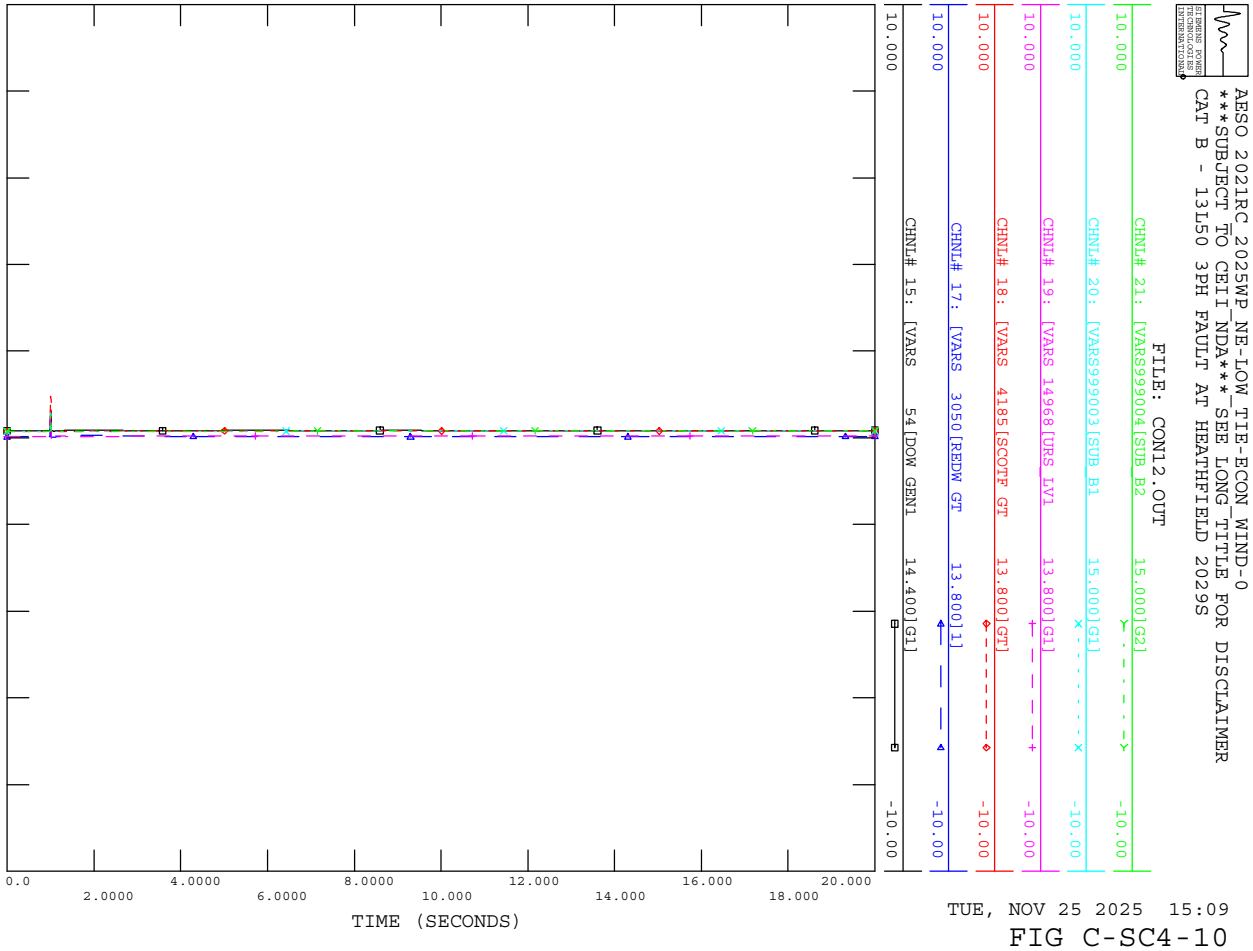


FIG C-SC4-10

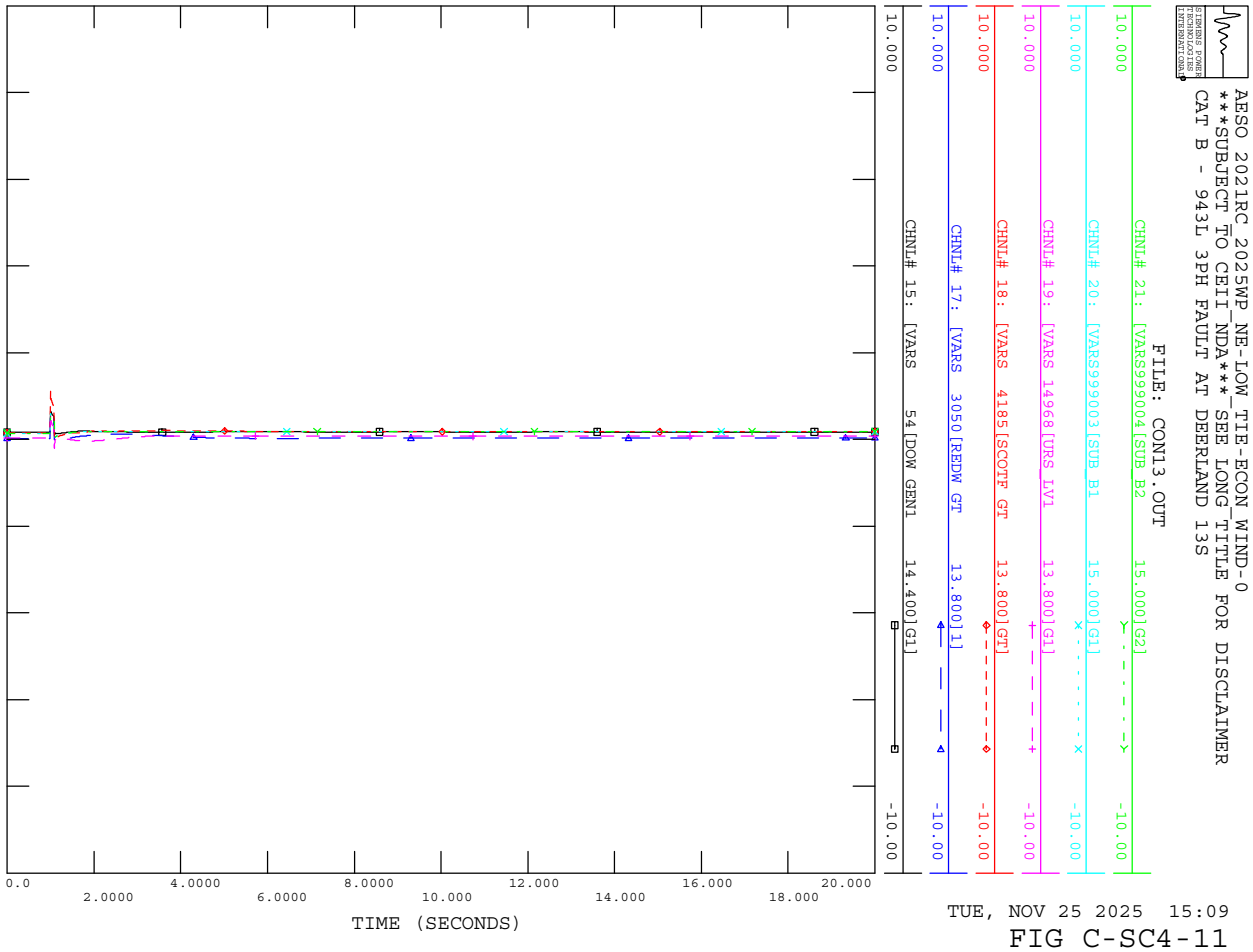


FIG C-SC4-11

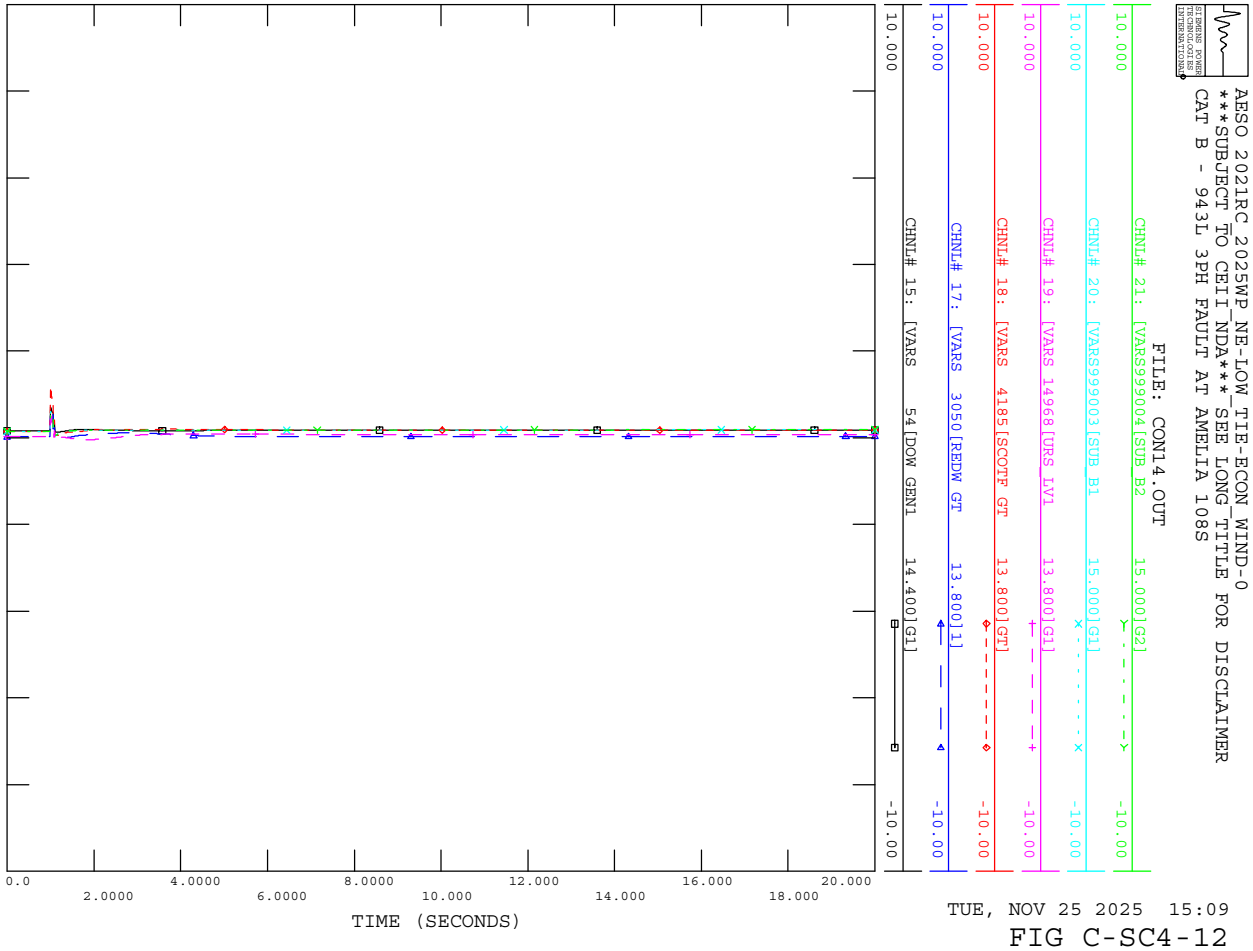


FIG C-SC4-12

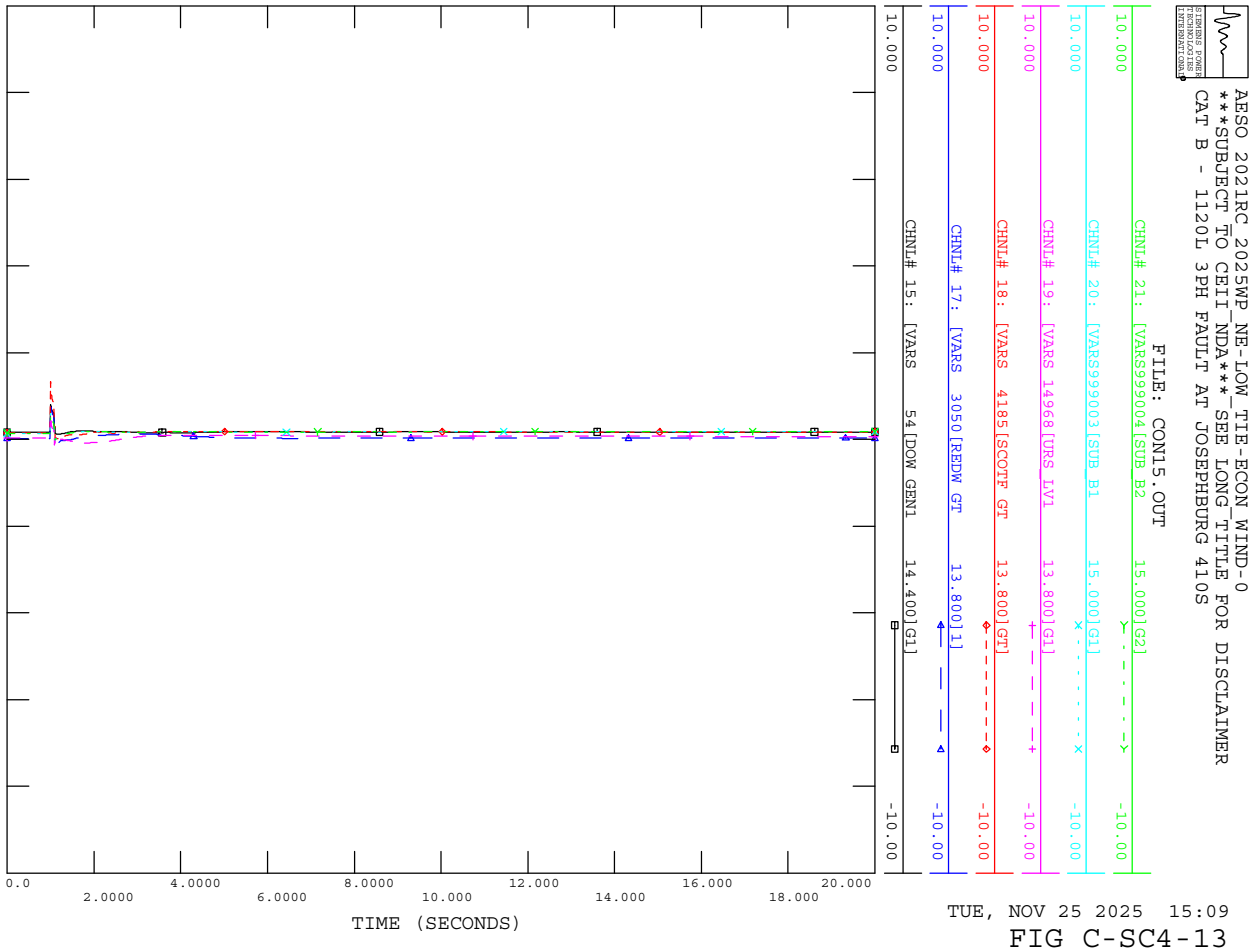


FIG C-SC4-13

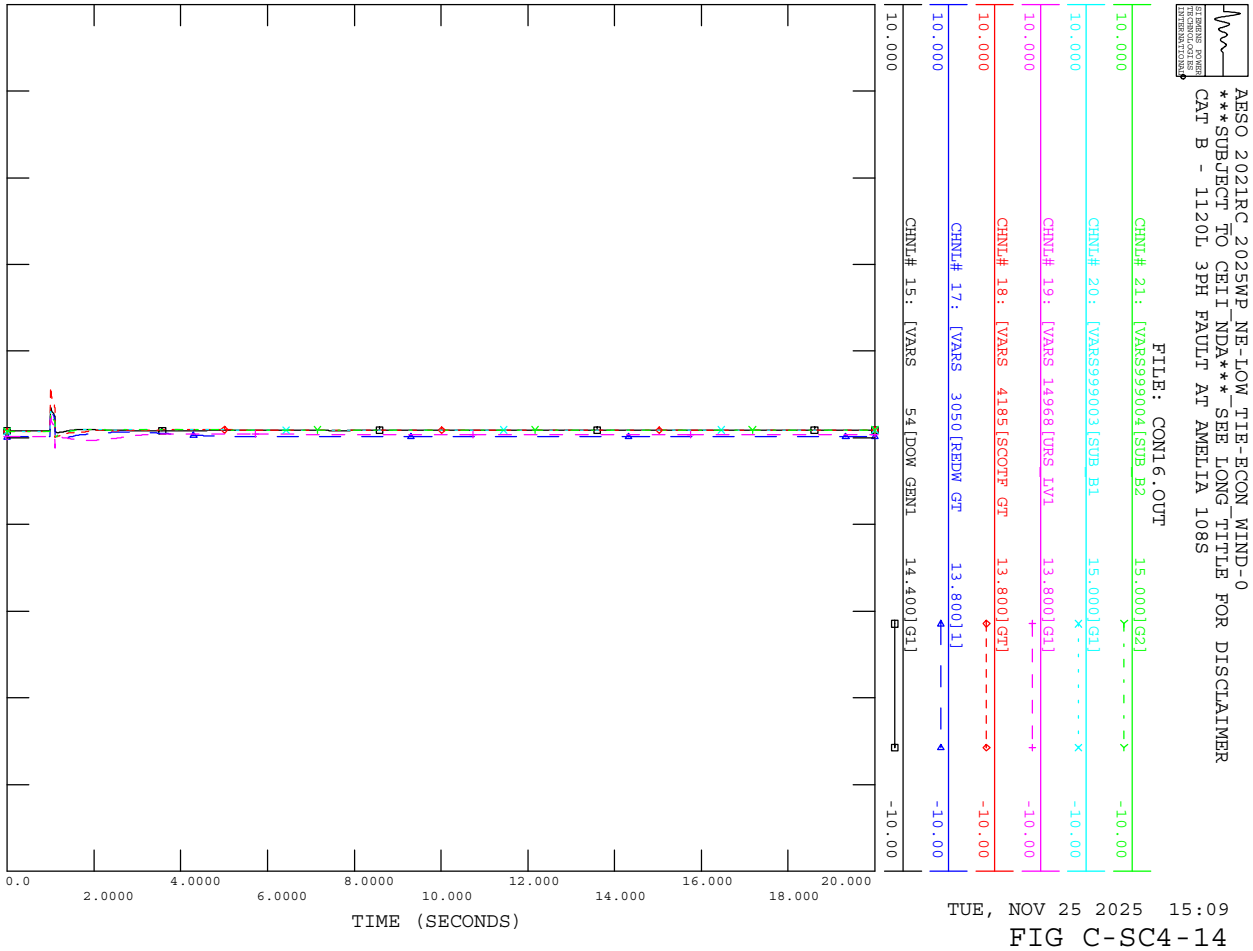
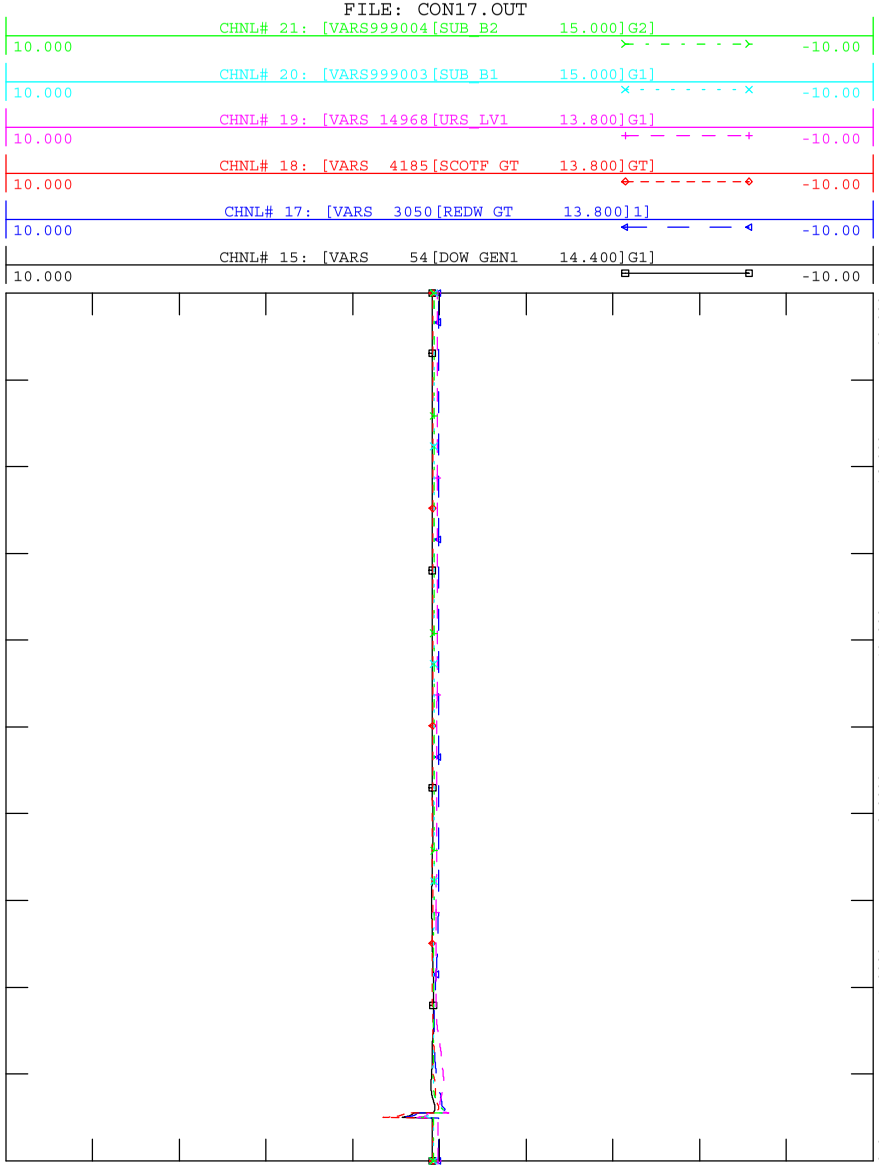


FIG C-SC4-14

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT LAMOUREUX 71S

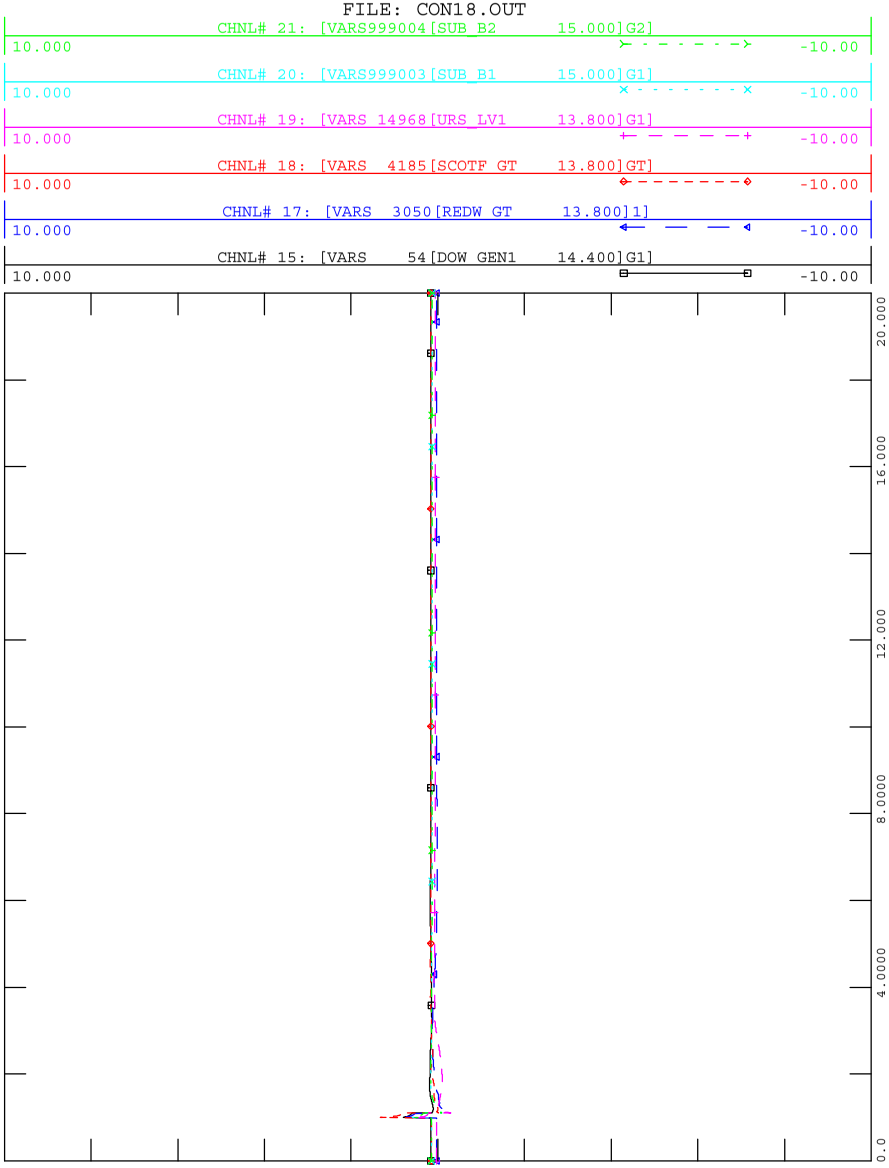
FILE: CON17.OUT



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FIG C-SC4-15

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 997L 3PH FAULT AT URSUS 430S

FILE: CON18.OUT



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FIG C-SC4-16

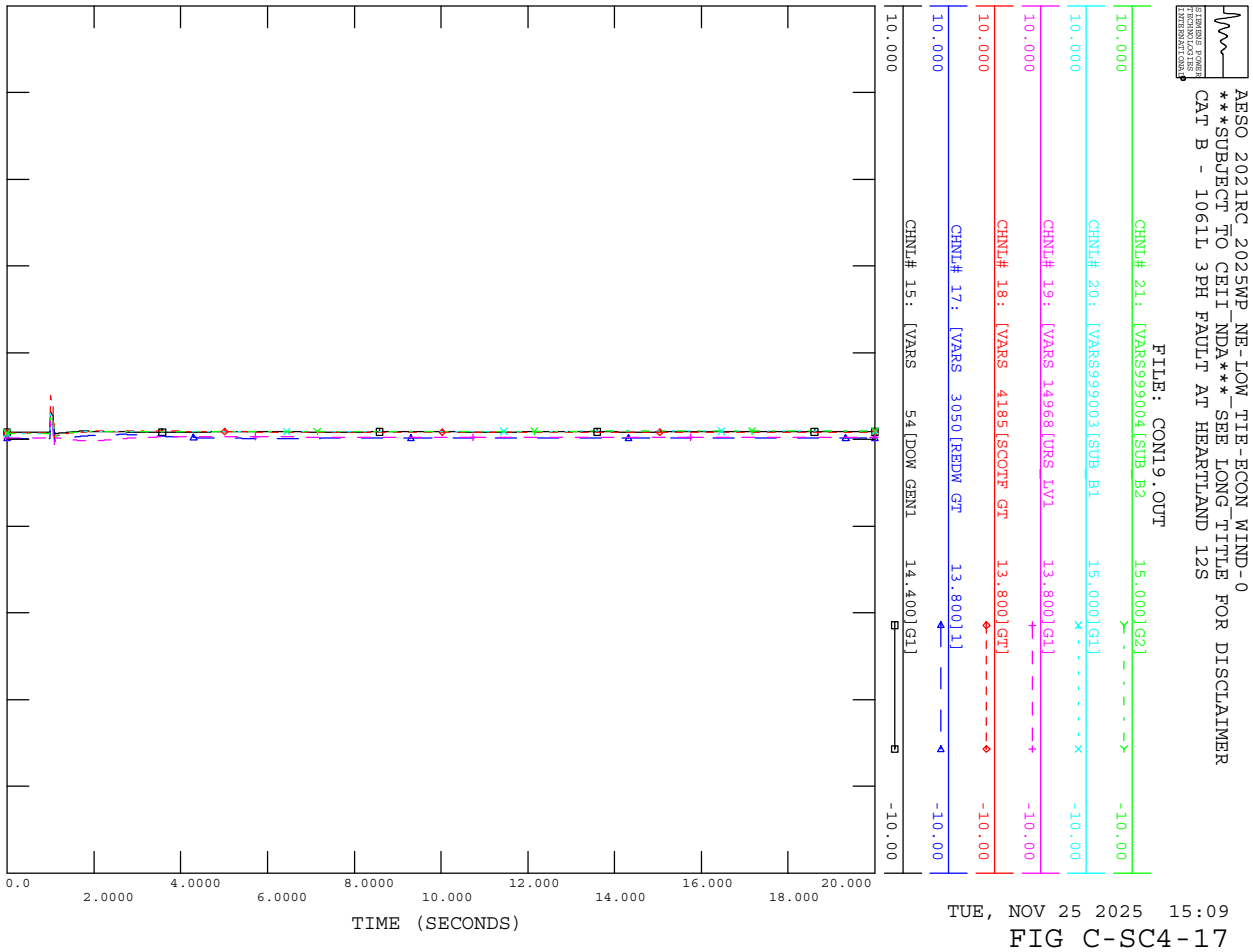


FIG C-SC4-17

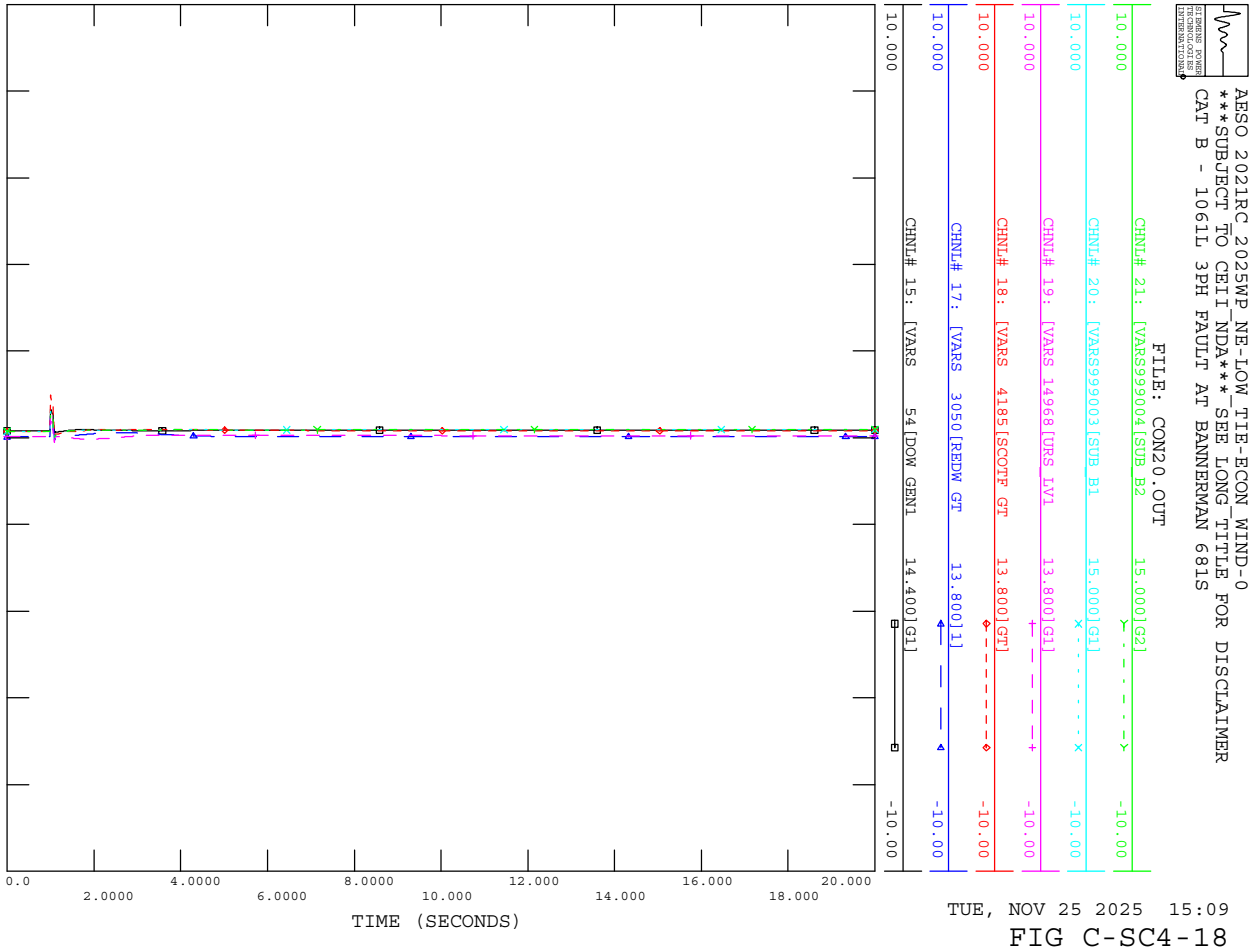


FIG C-SC4-18

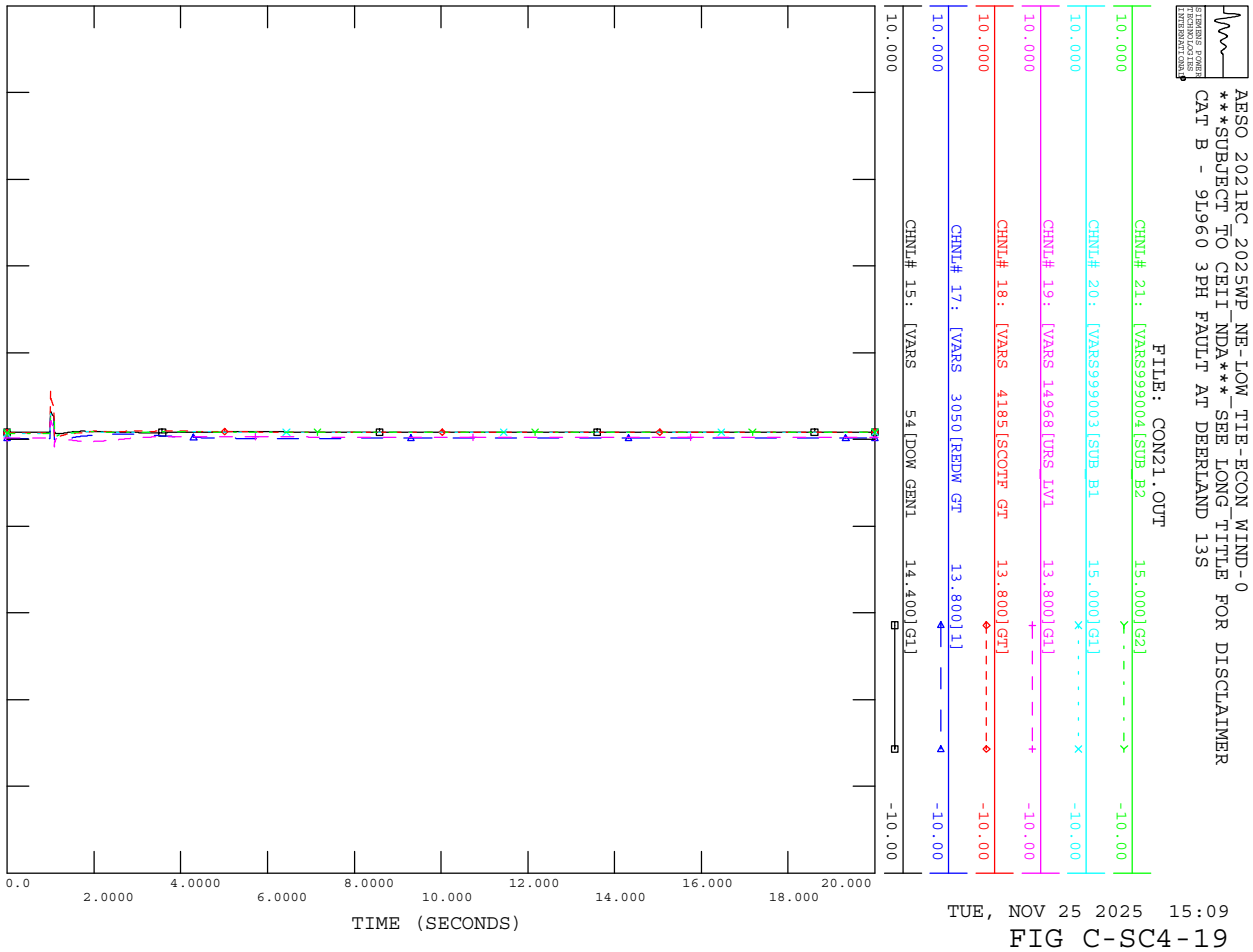


FIG C-SC4-19

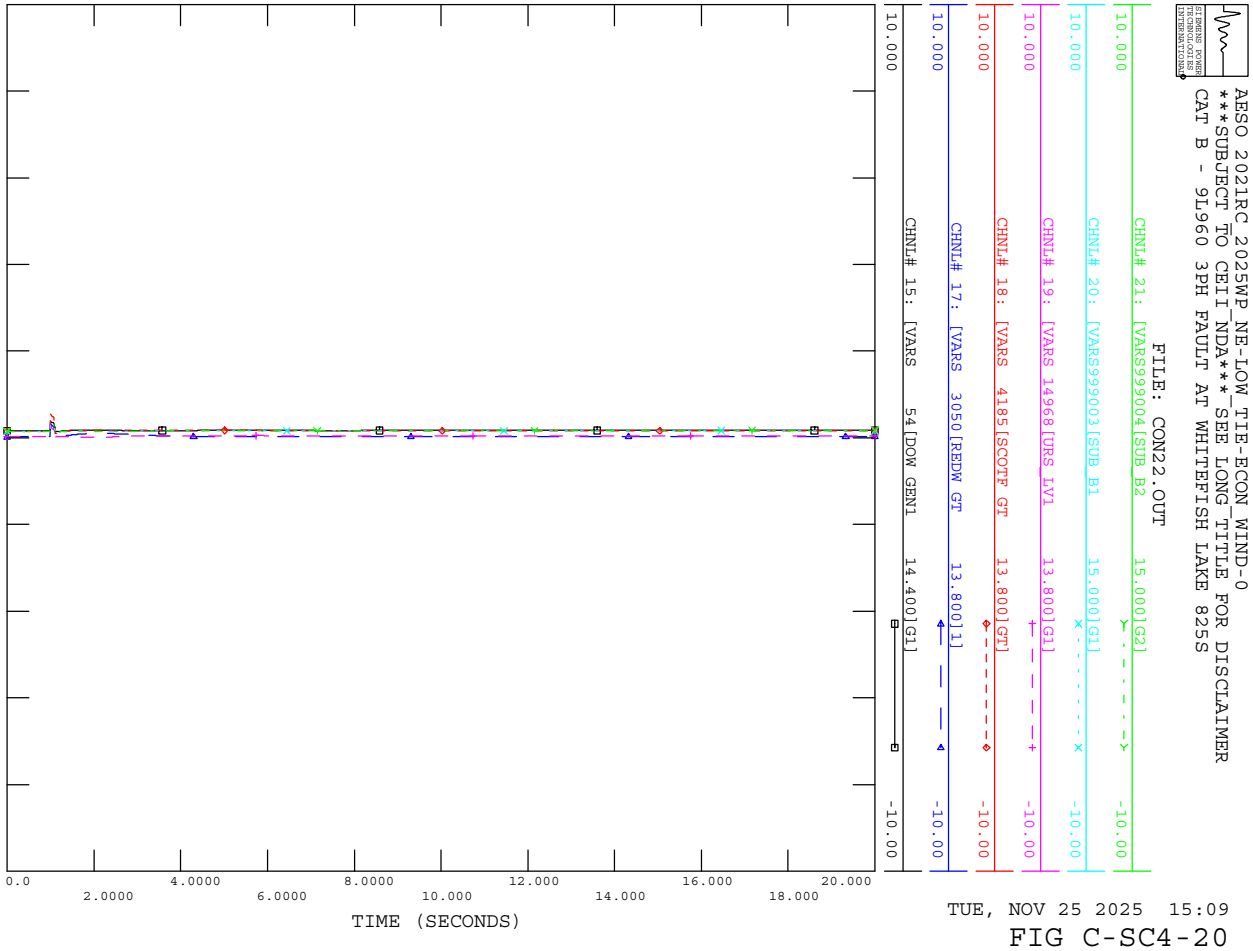


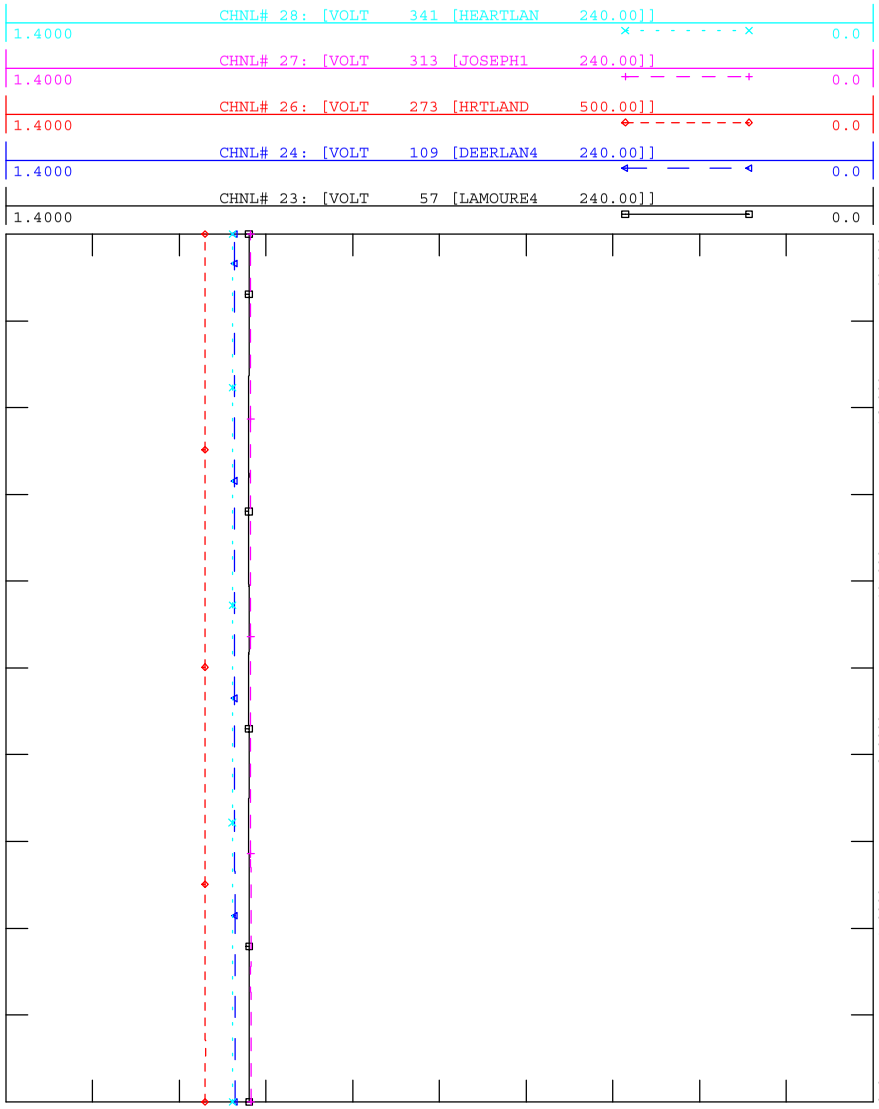
FIG C-SC4-20

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT A - FLAT START

FILE: CON0.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-1

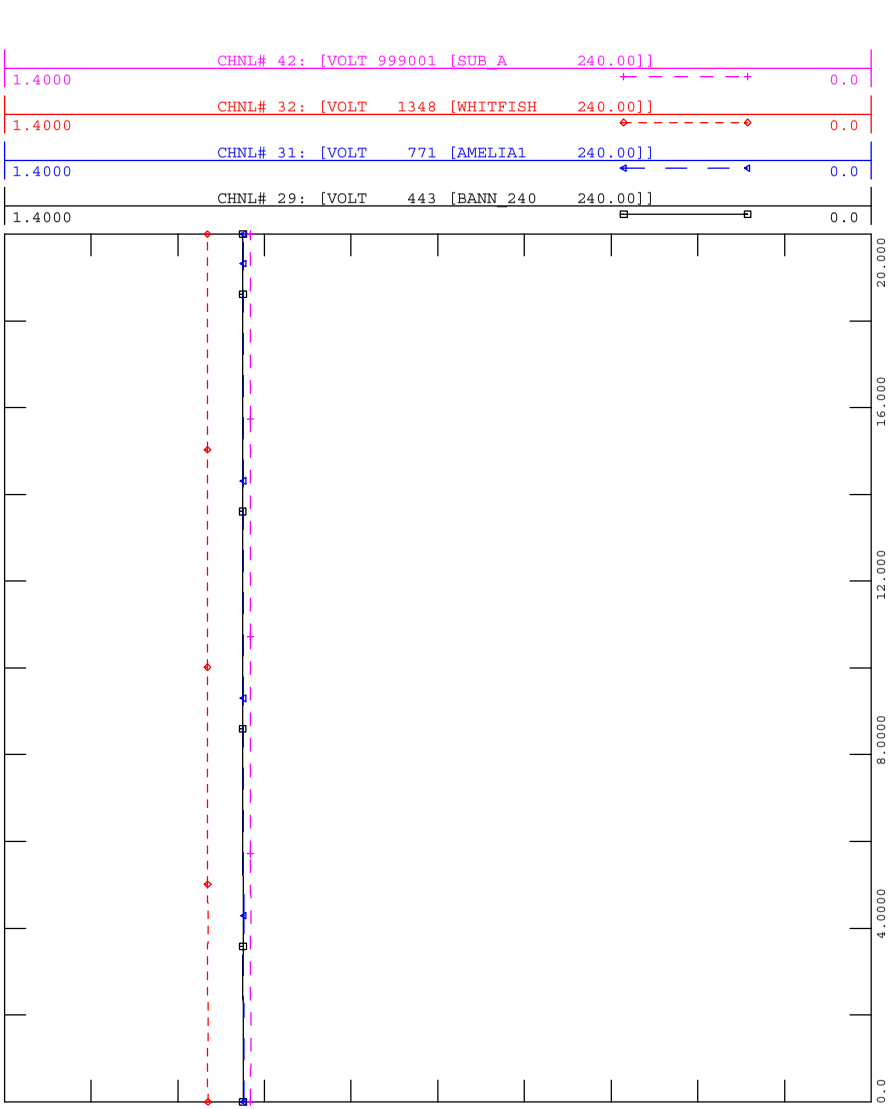


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT A - FLAT START

FILE: CON0.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-1



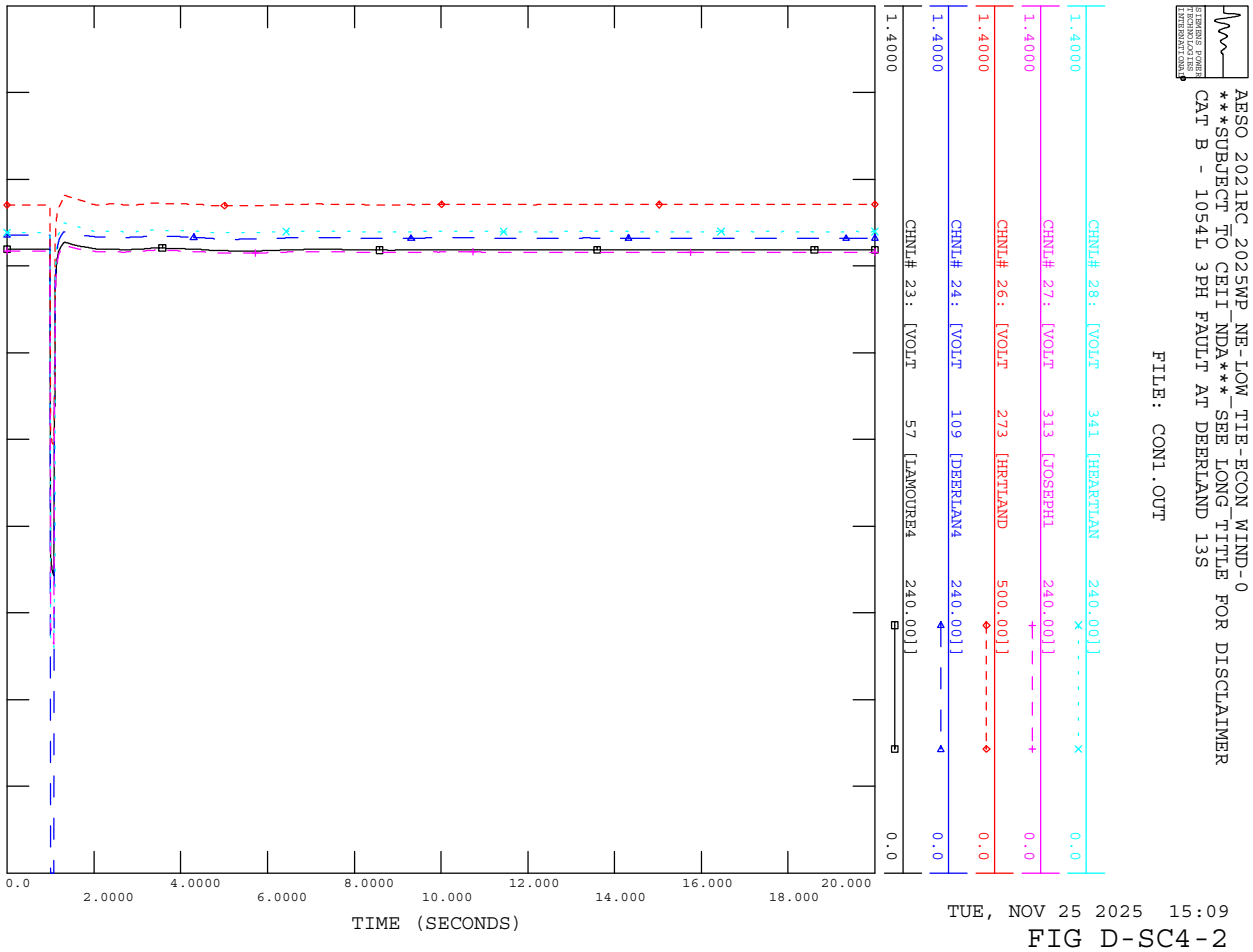


FIG D-SC4-2

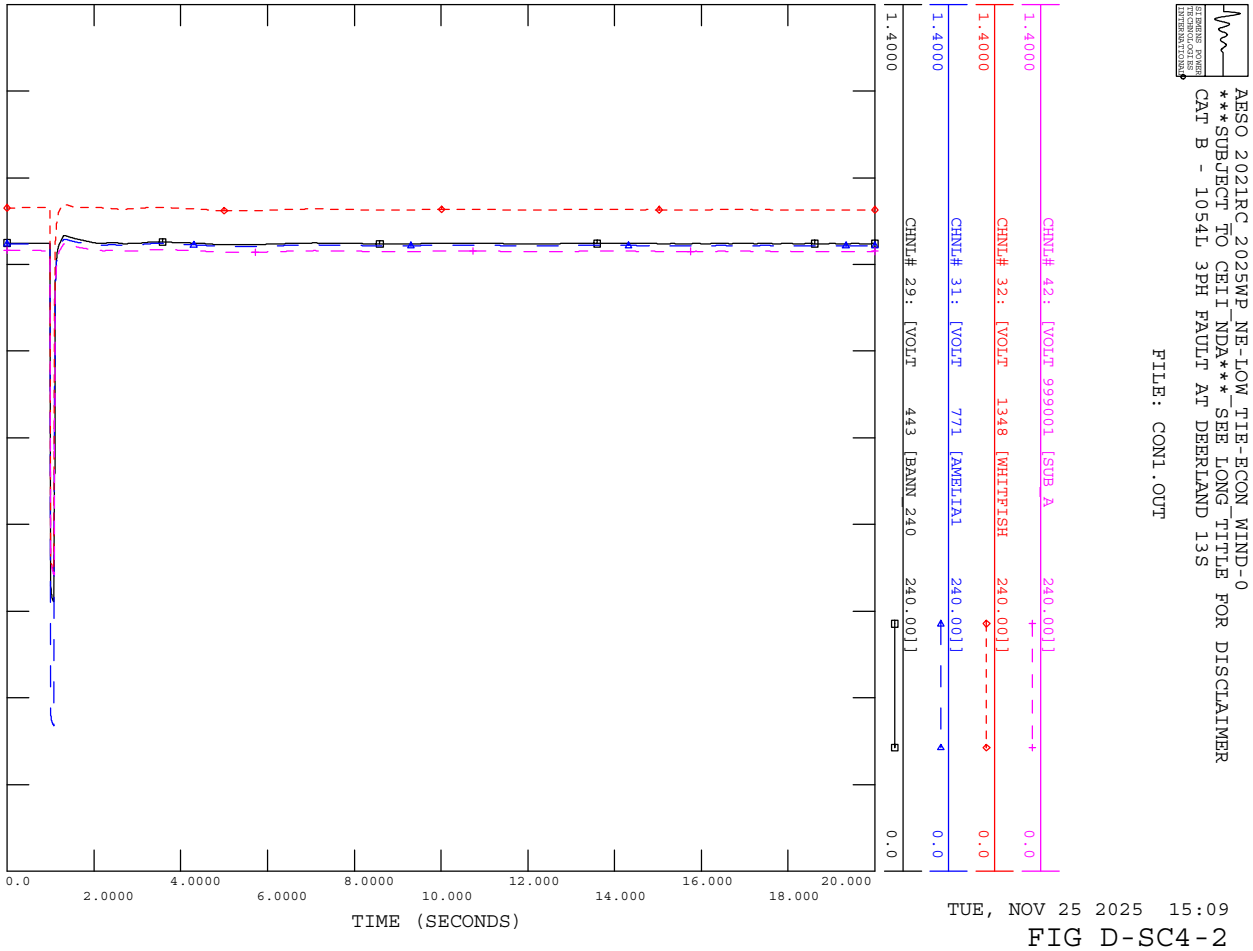


FIG D-SC4-2

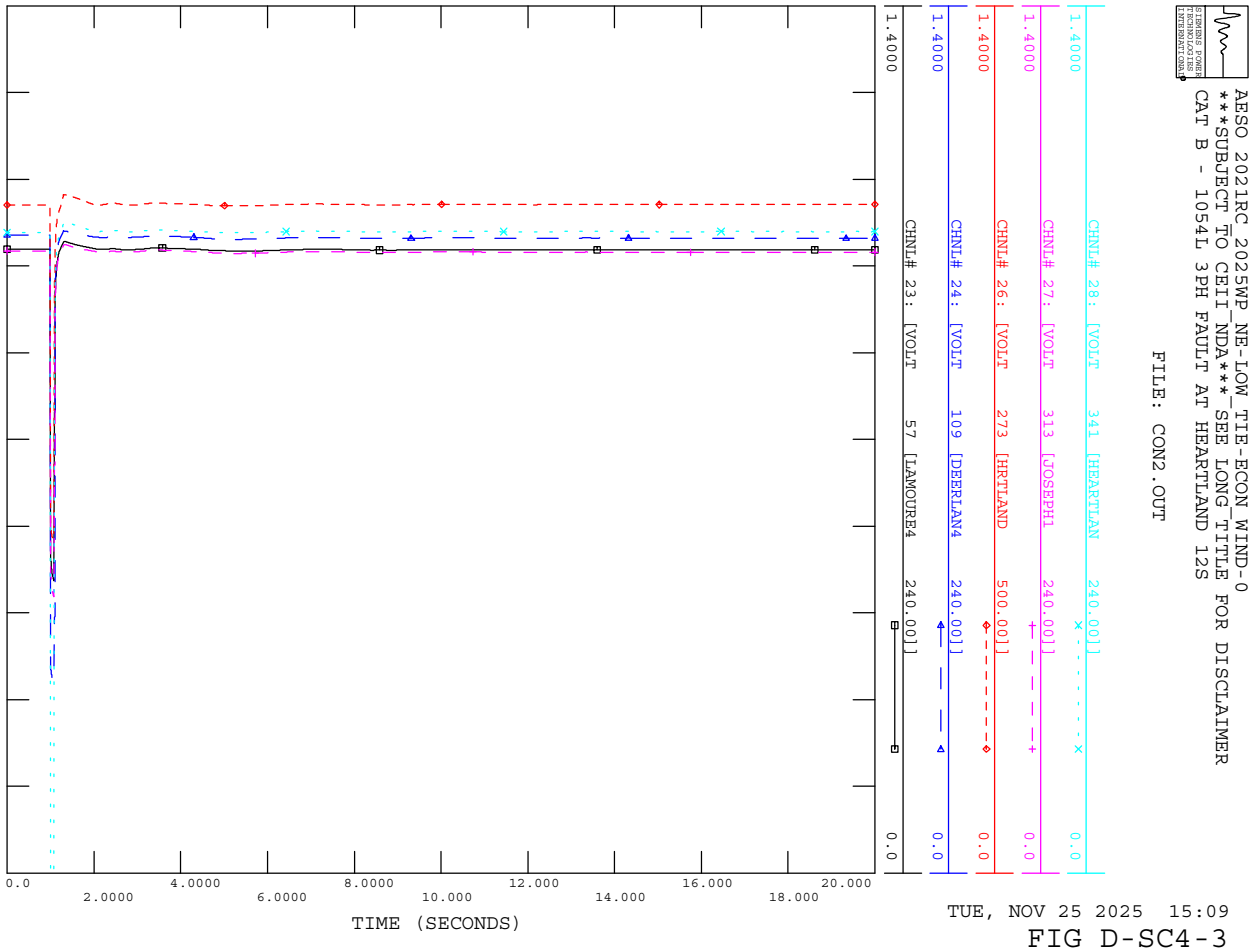


FIG D-SC4-3

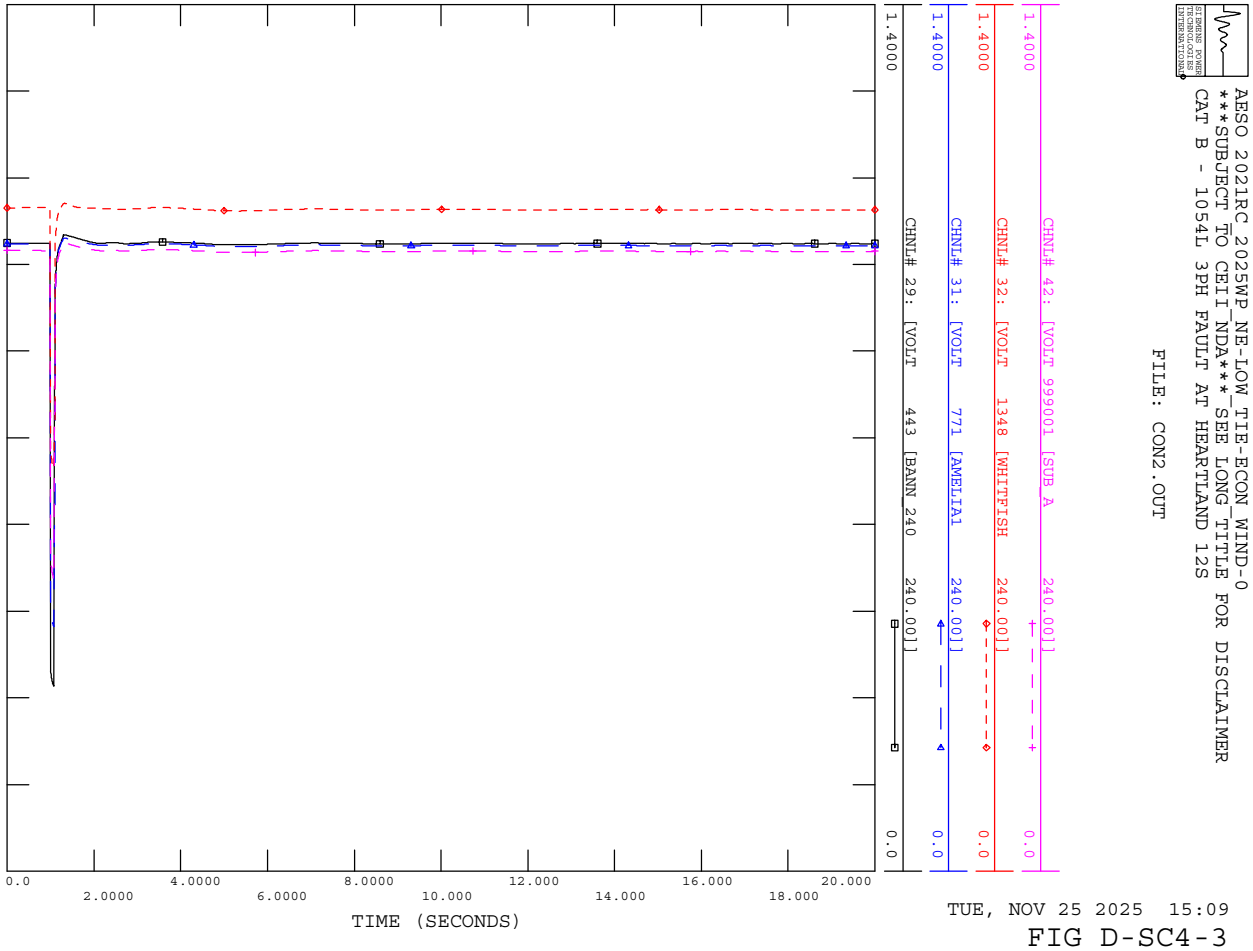


FIG D-SC4-3

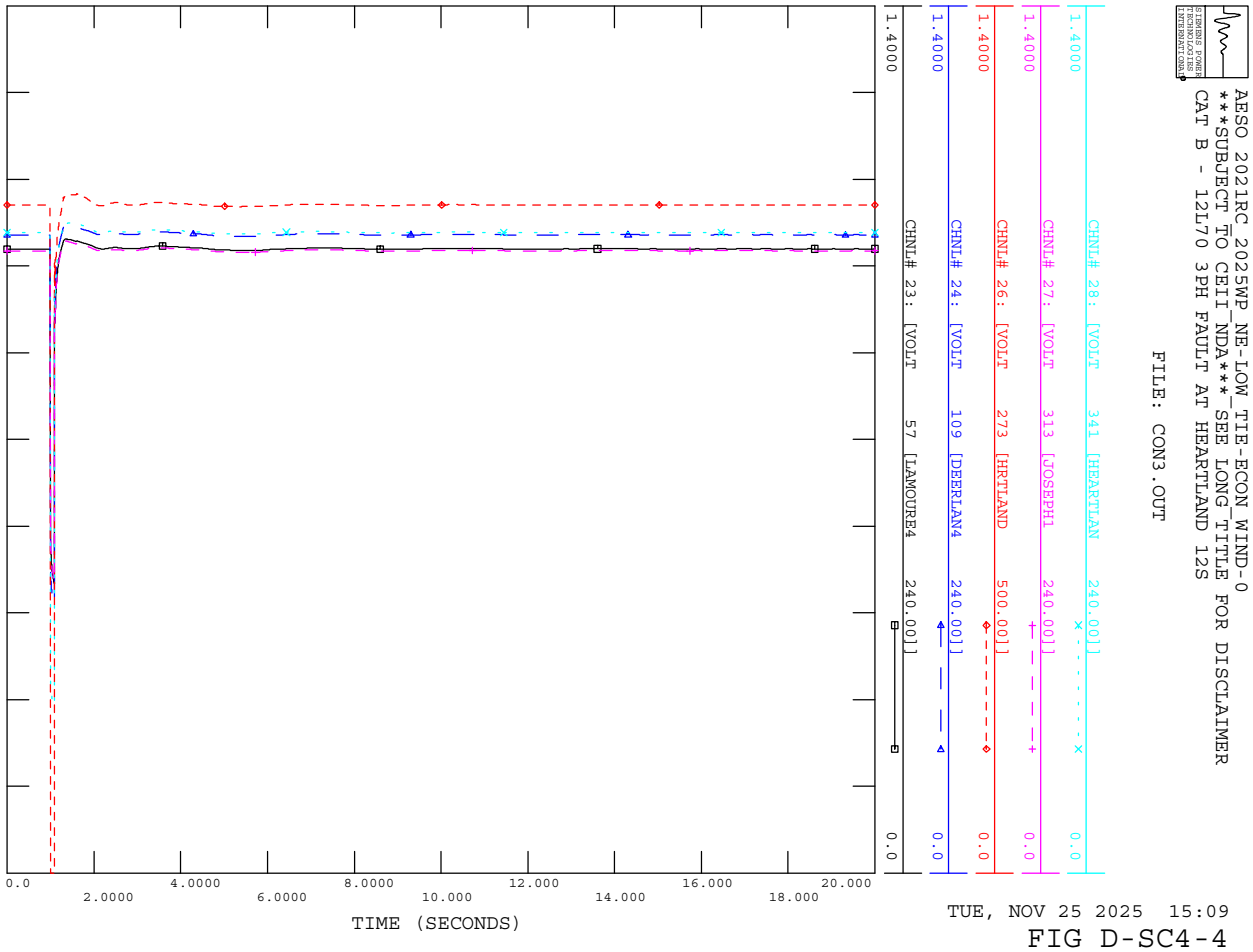


FIG D-SC4-4

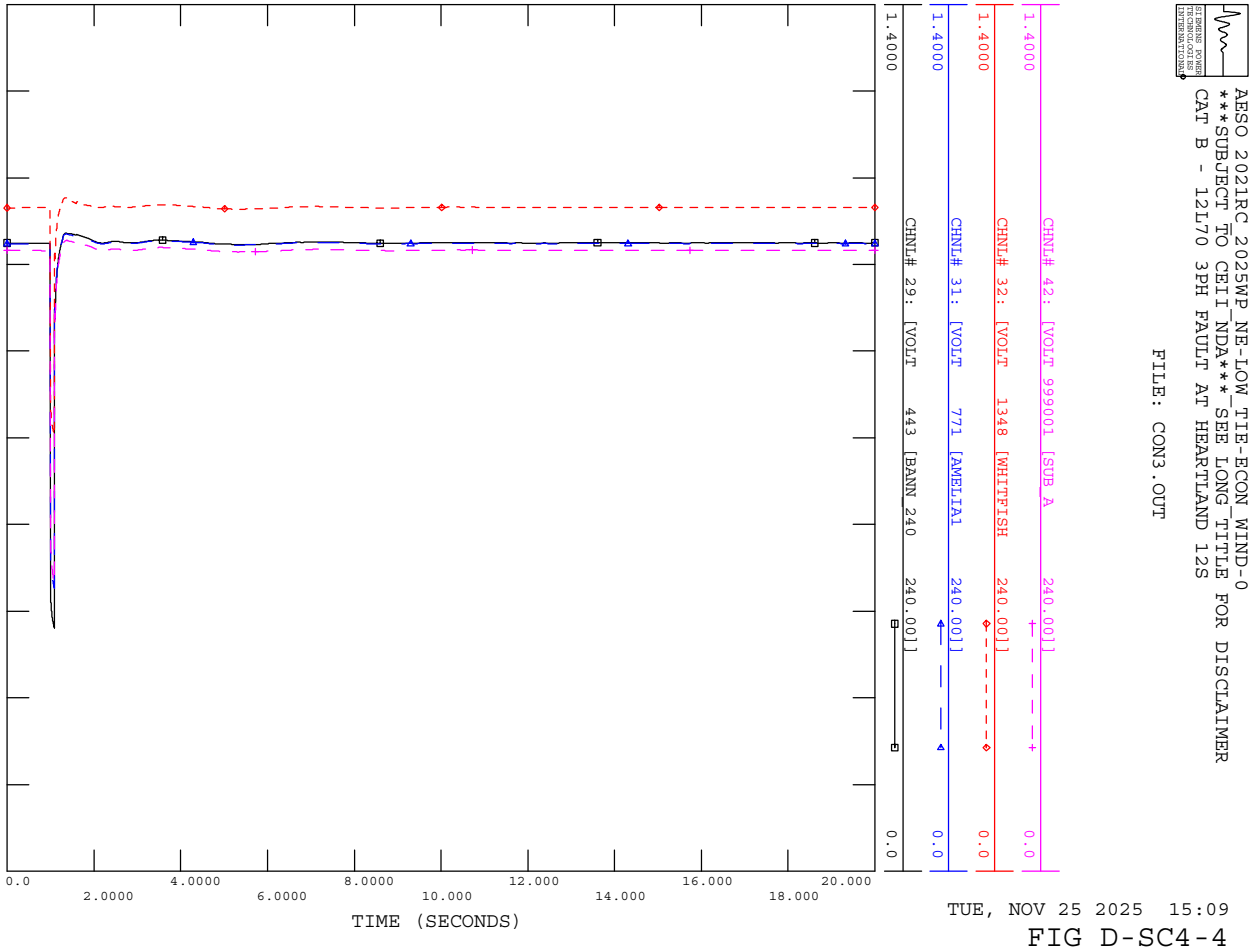


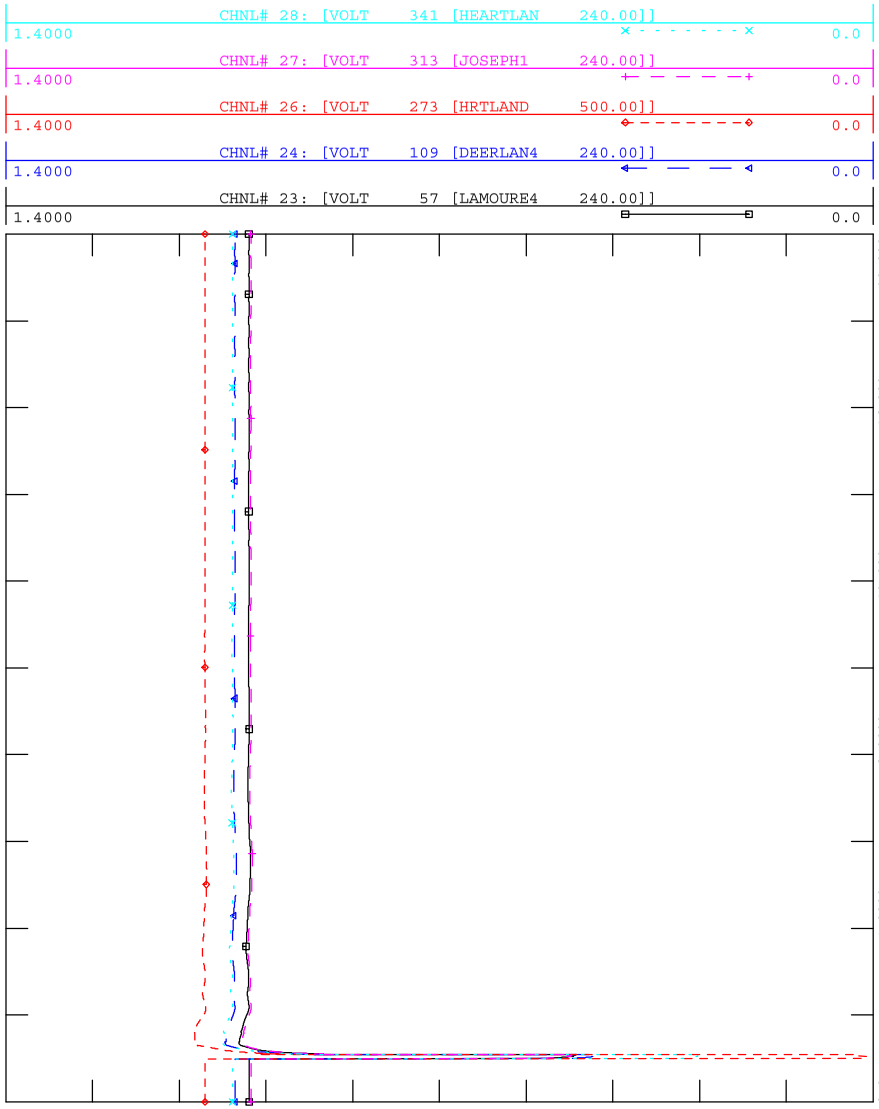
FIG D-SC4-4

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

FILE: CON4.OUT

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FIG D-SC4-5

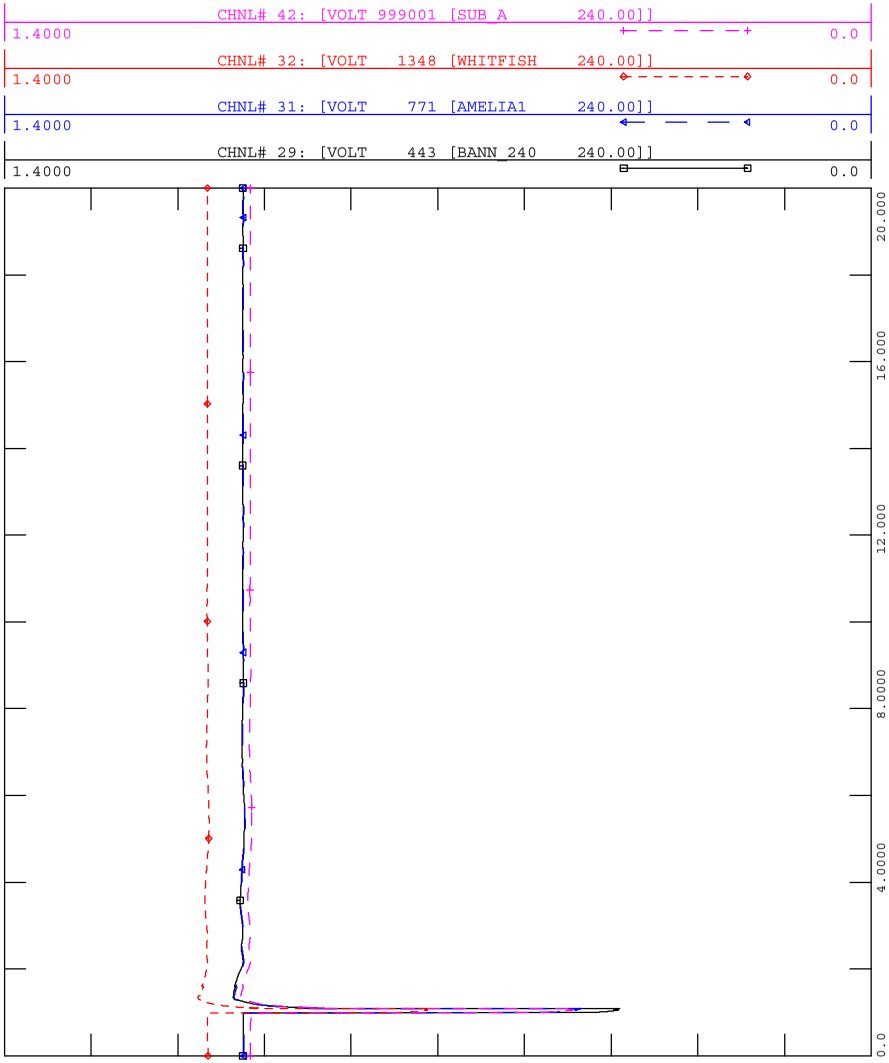


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L70 3PH FAULT AT HEATHFIELD 2029S

FILE: CON4.OUT

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FIG D-SC4-5

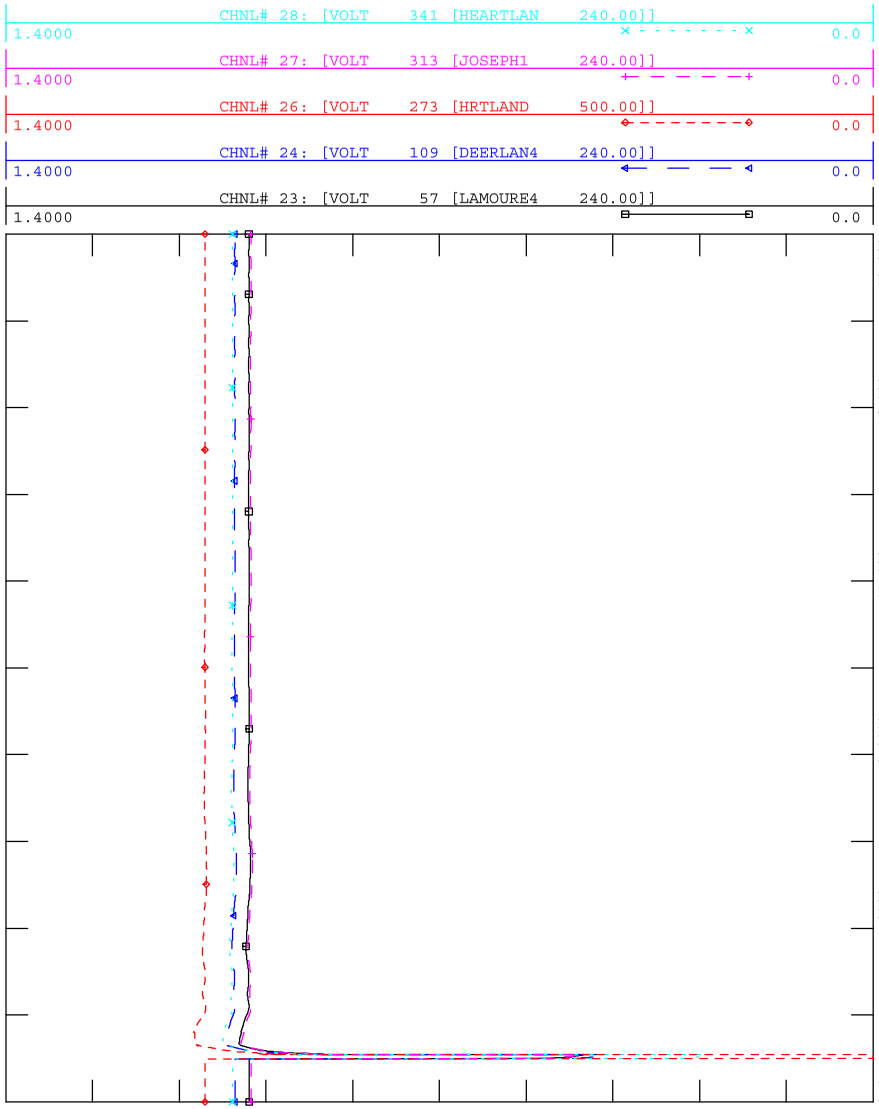


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

FILE: CON5.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-6

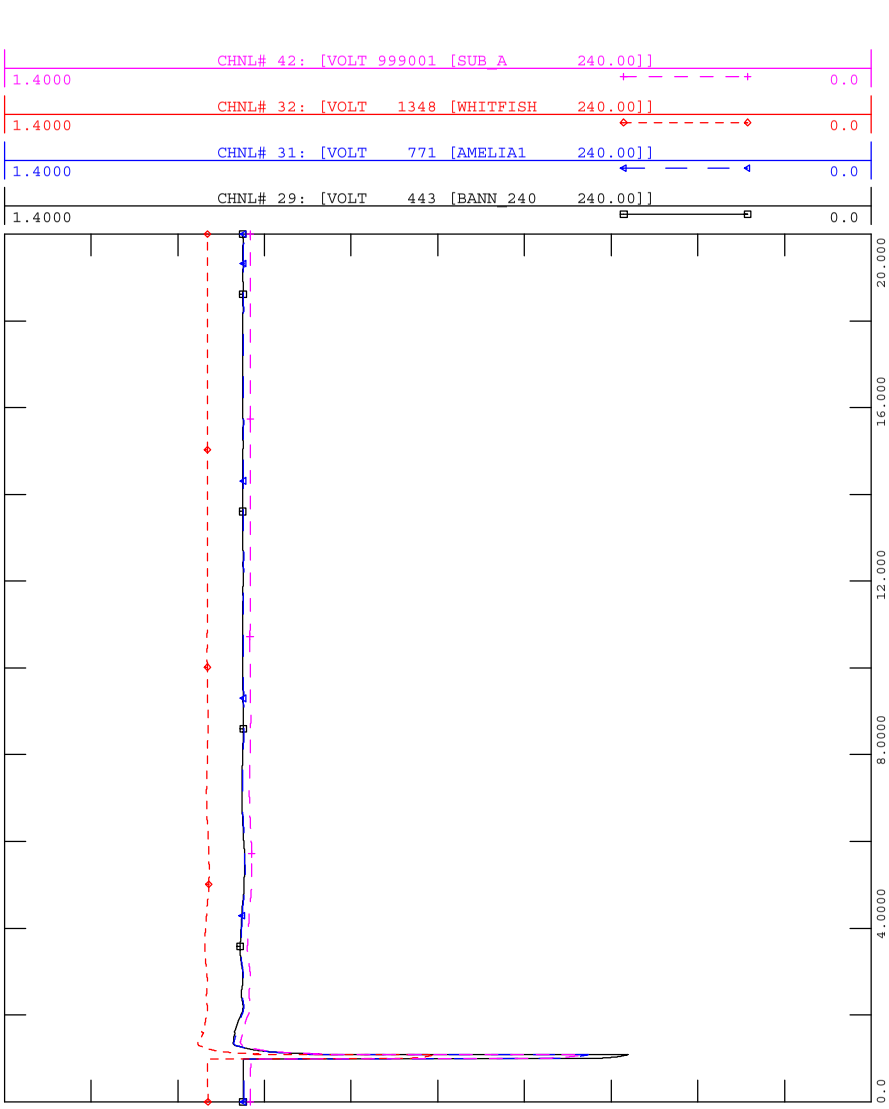


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 12L85 3PH FAULT AT HEARTLAND 12S

FILE: CON5.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-6



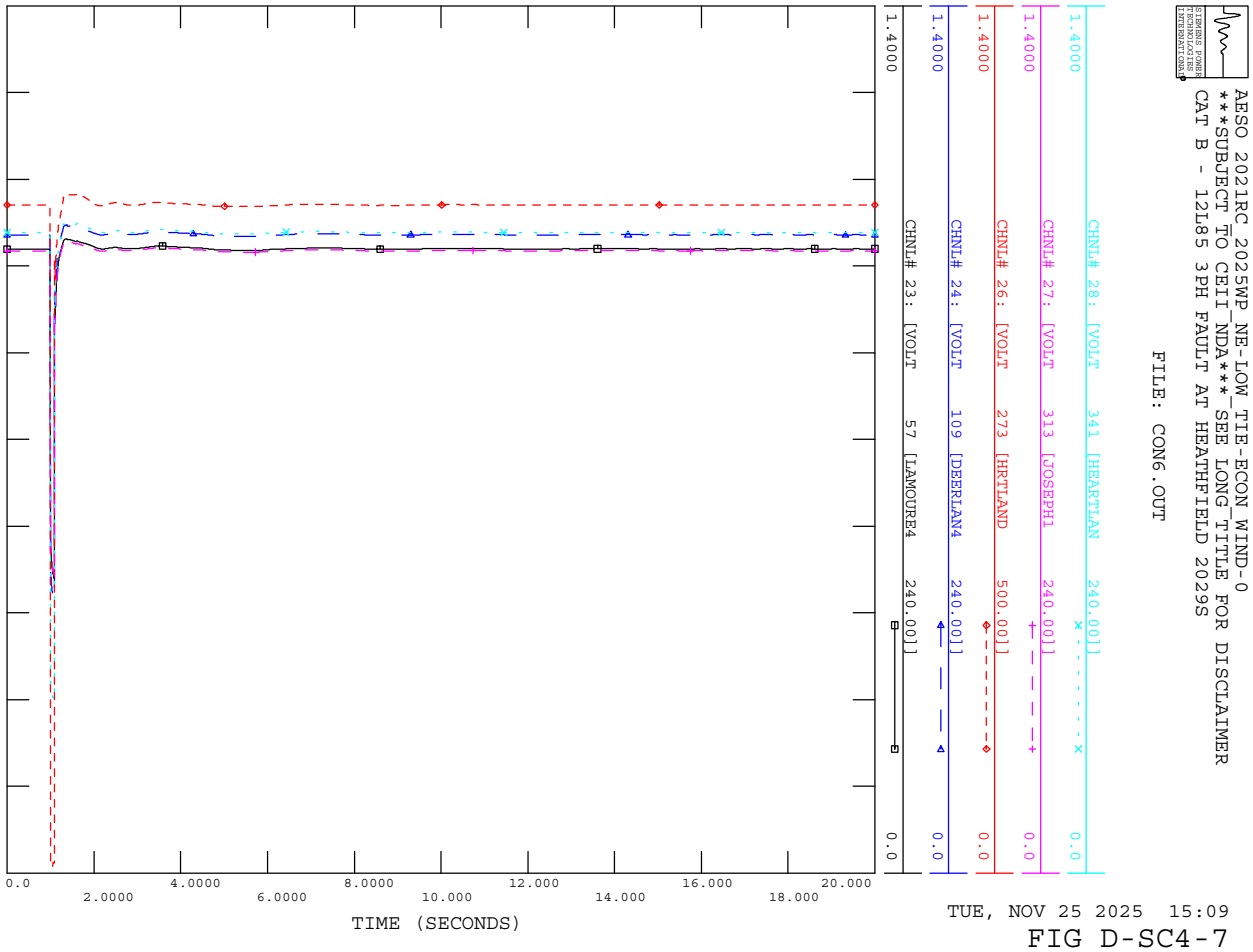


FIG D-SC4-7

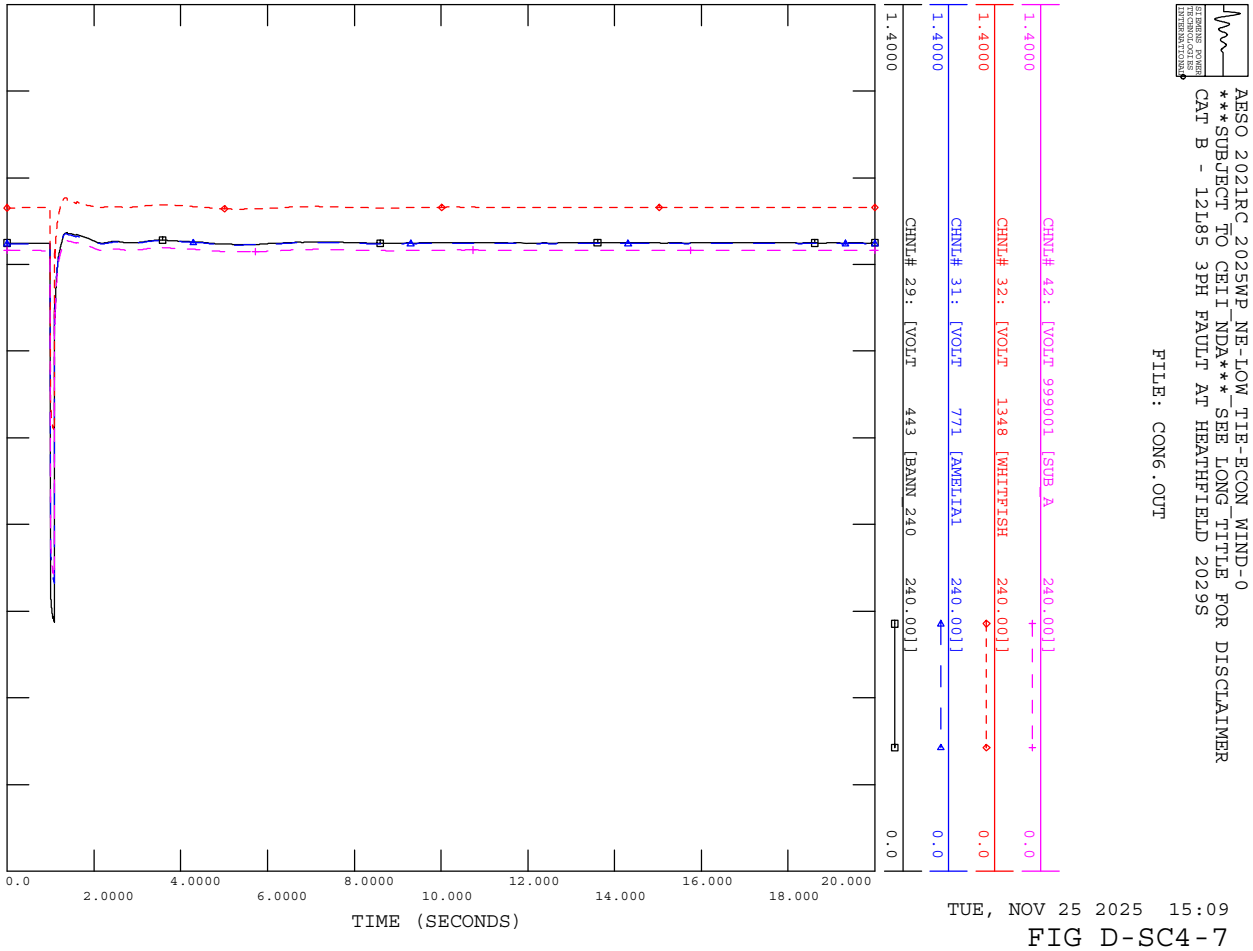


FIG D-SC4-7

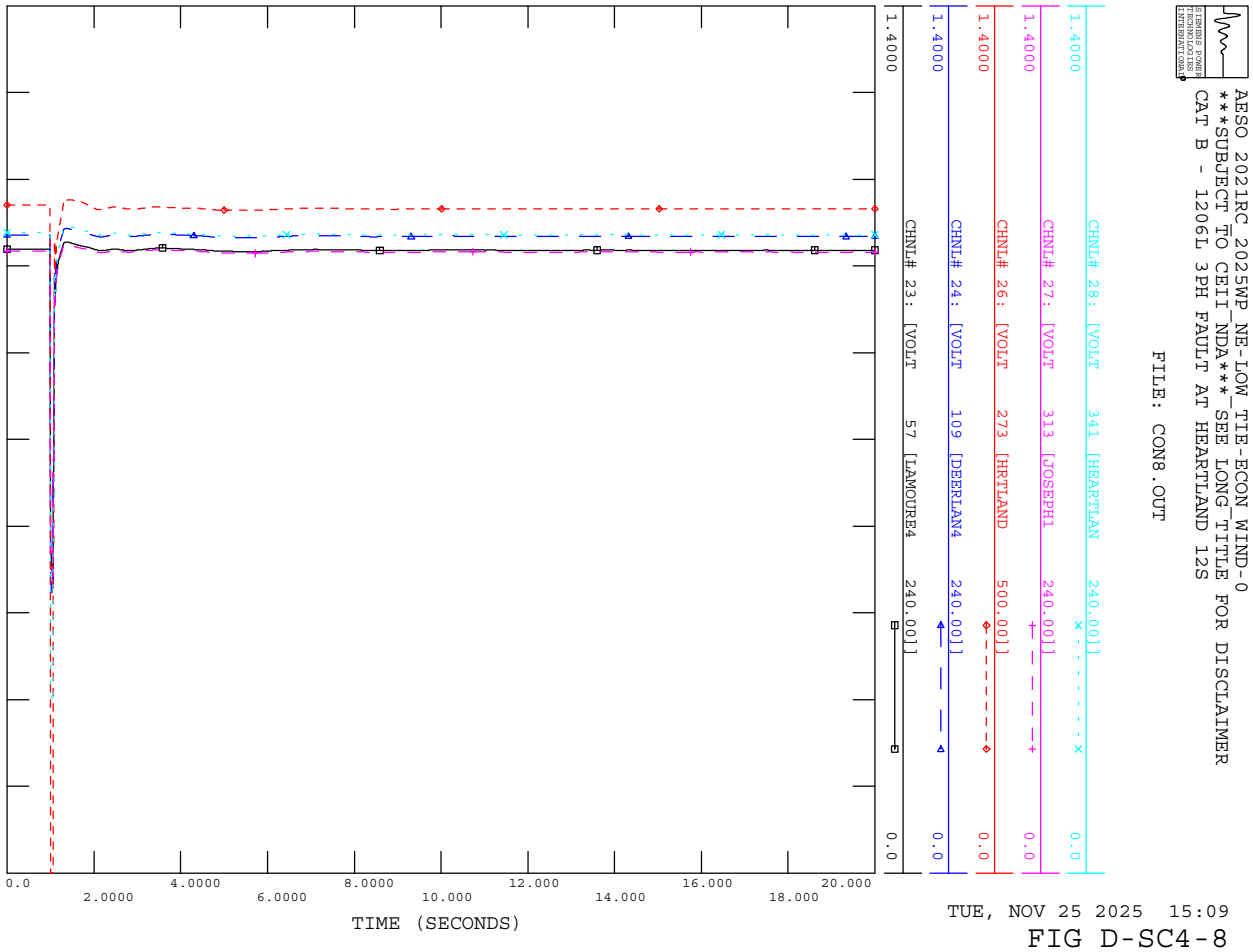


FIG D-SC4-8

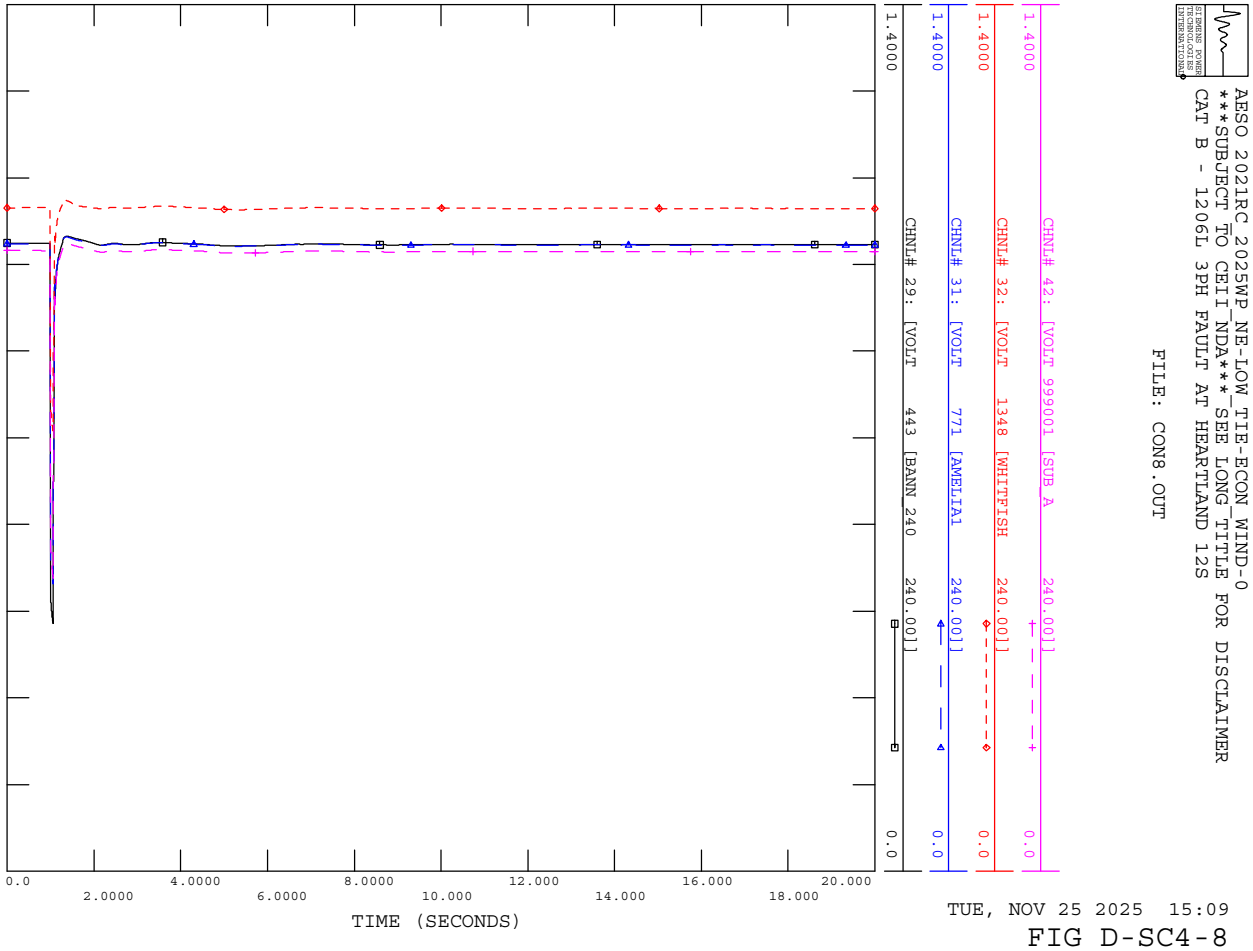


FIG D-SC4-8

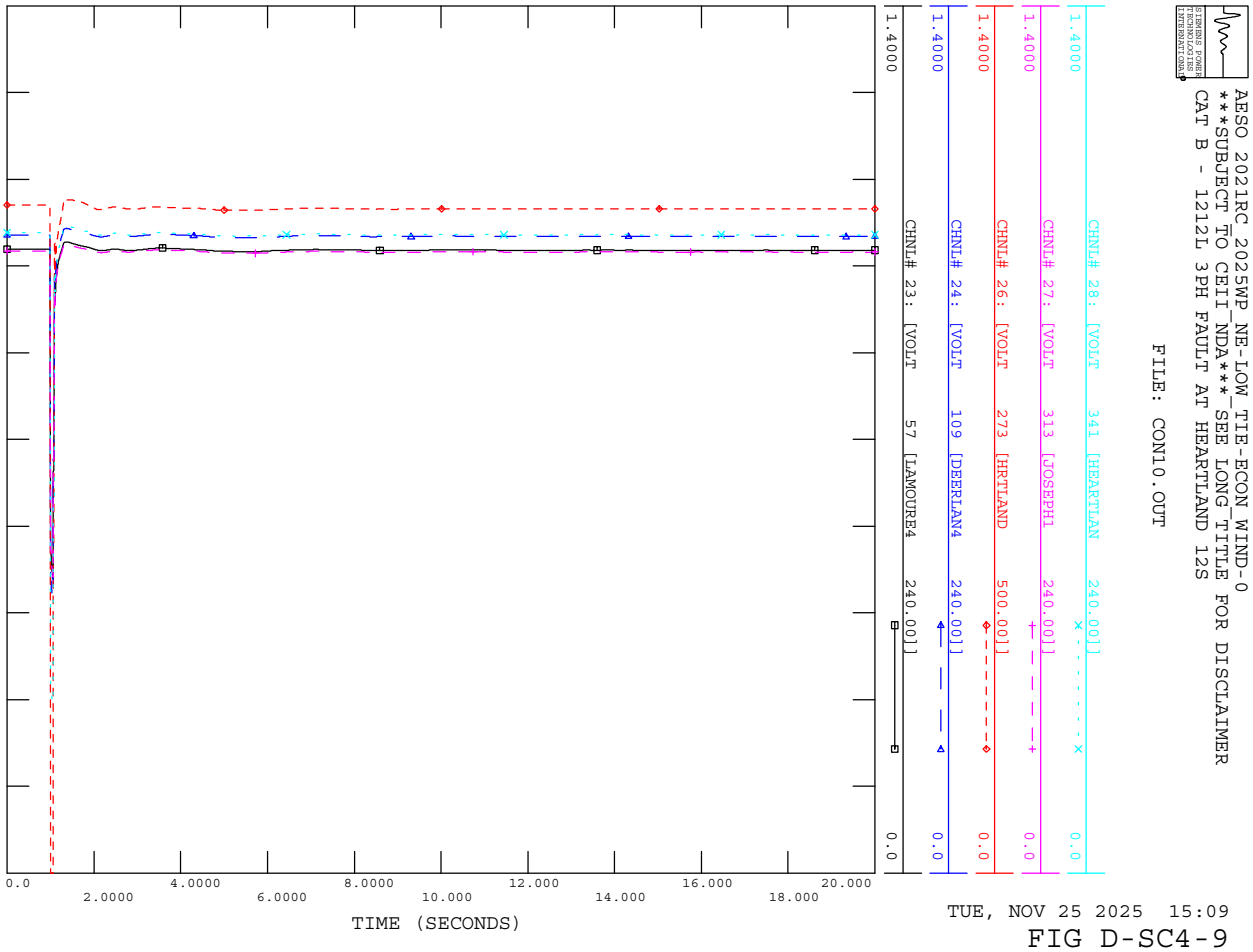


FIG D-SC4-9

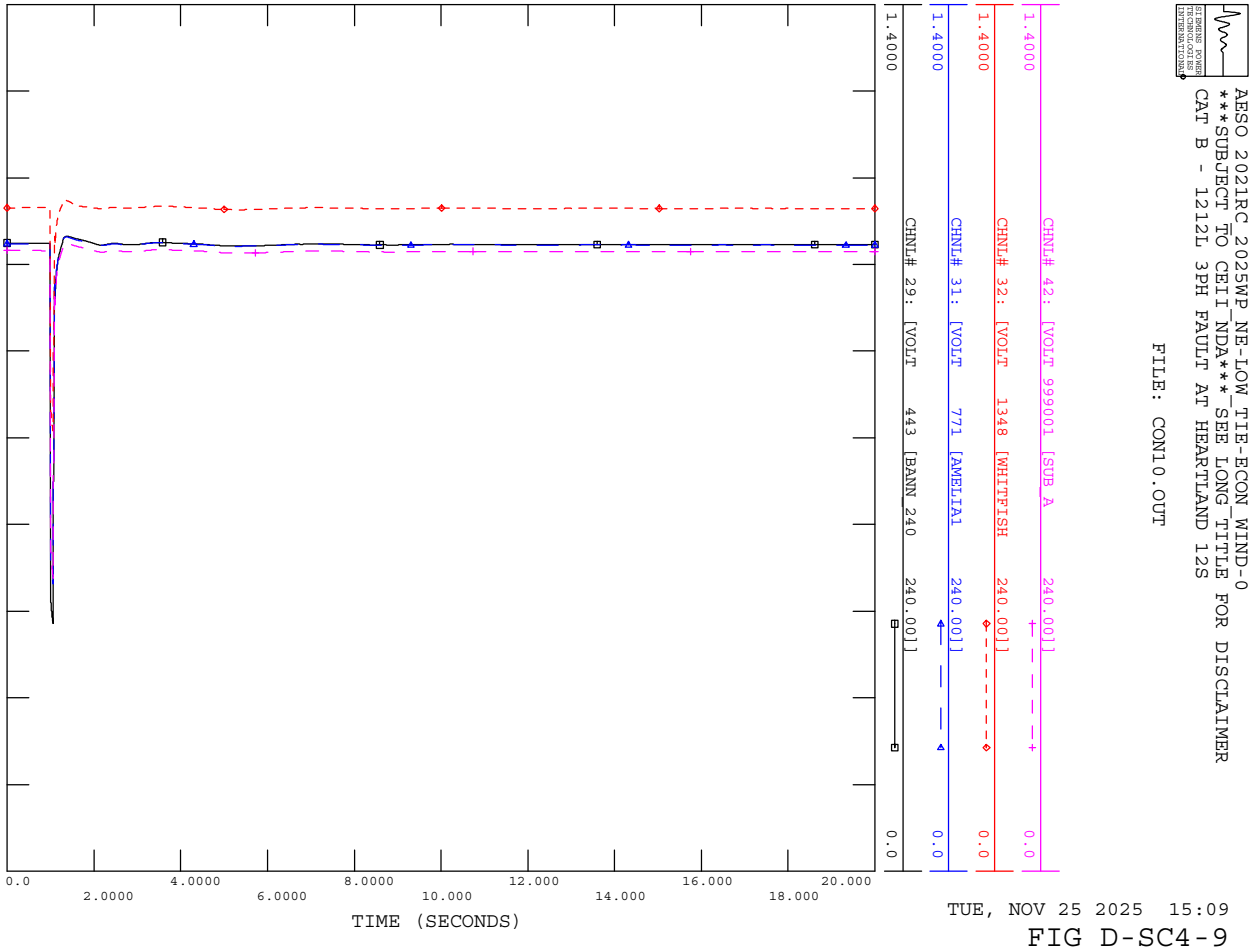


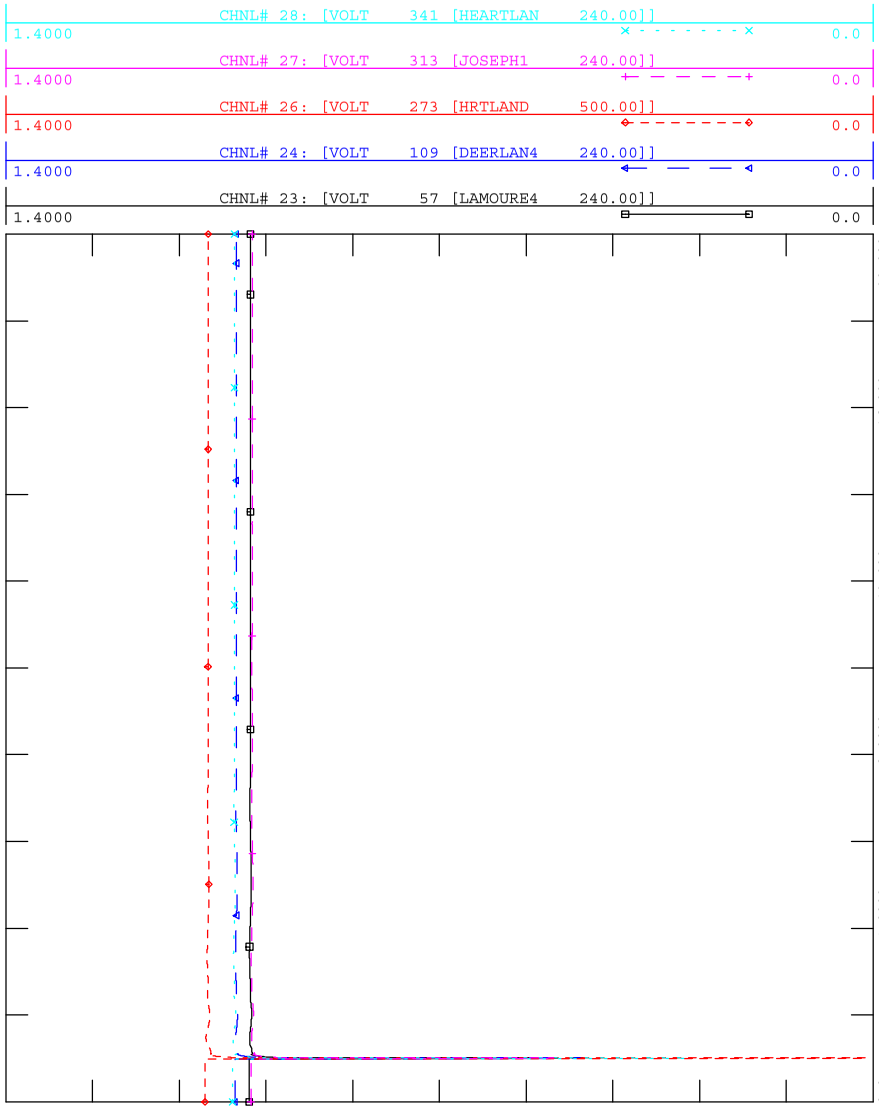
FIG D-SC4-9

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-10

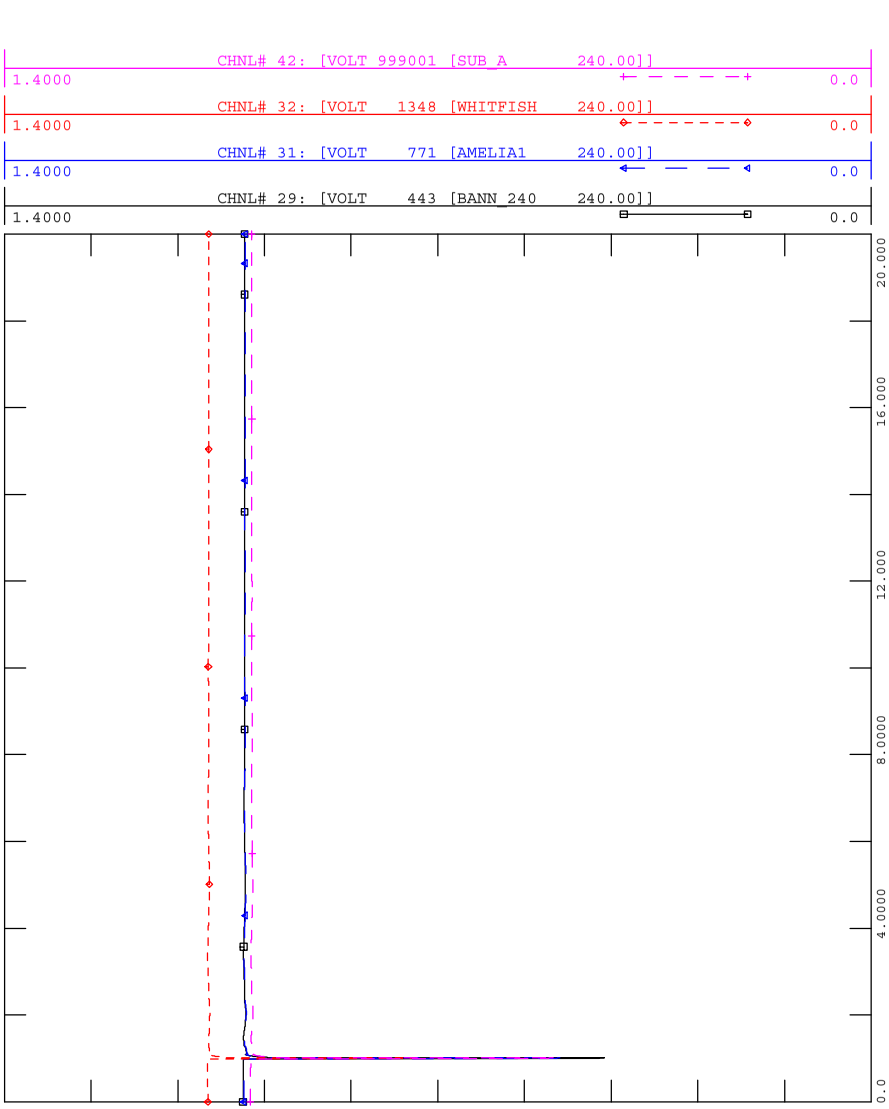


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 13L50 3PH FAULT AT HEATHFIELD 2029S

FILE: CON12.OUT

TUE, NOV 25 2025 15:09

FIG D-SC4-10



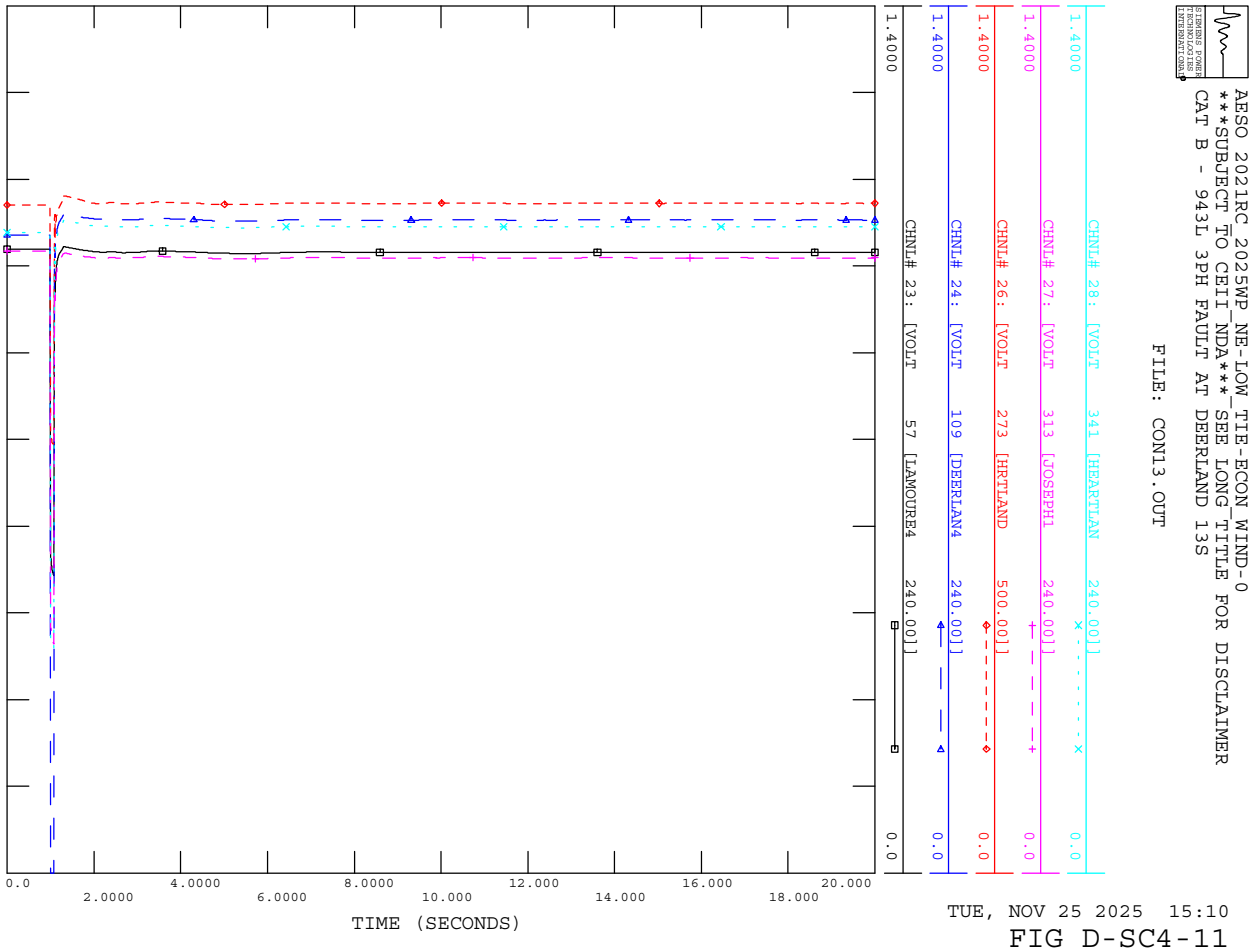


FIG D-SC4-11

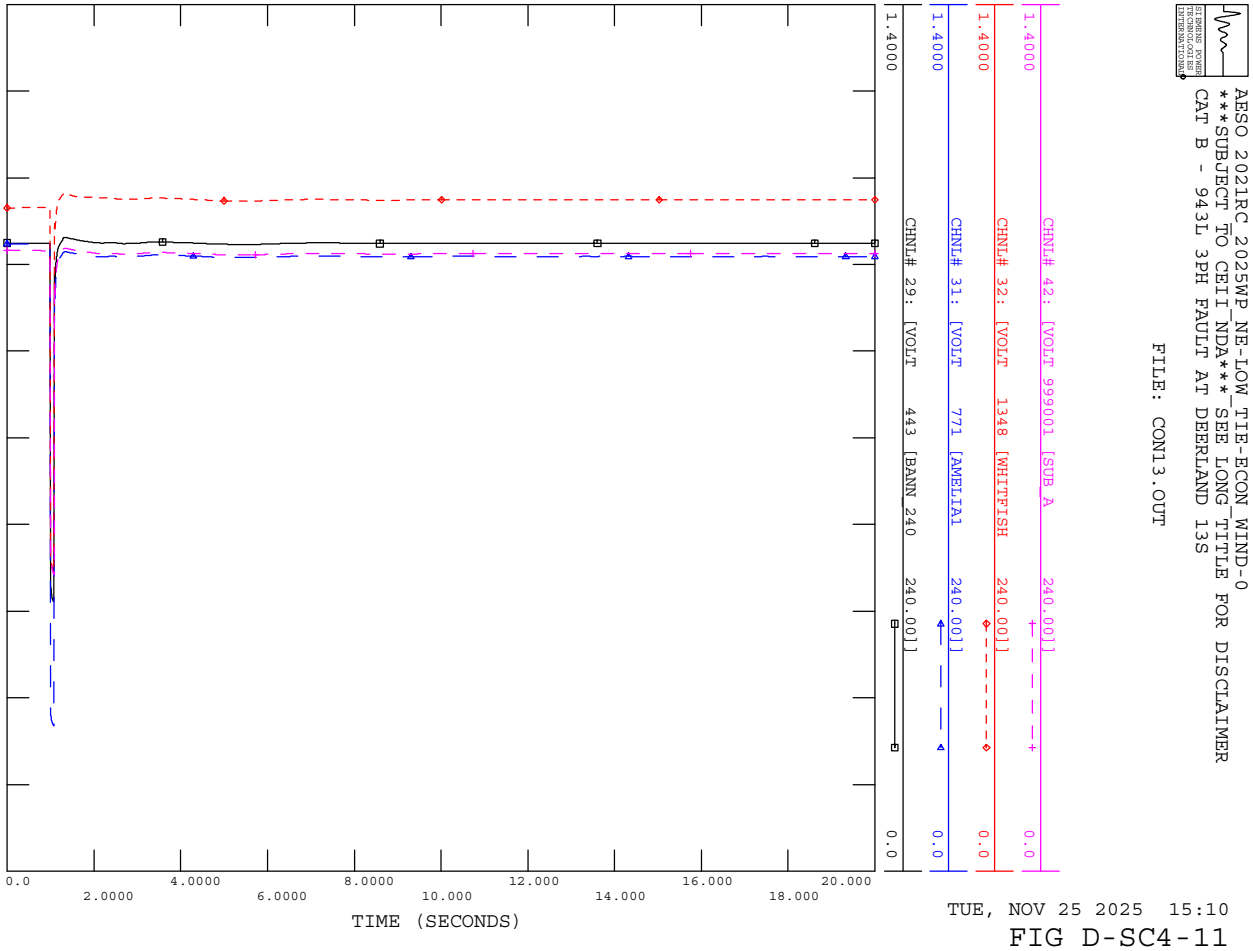


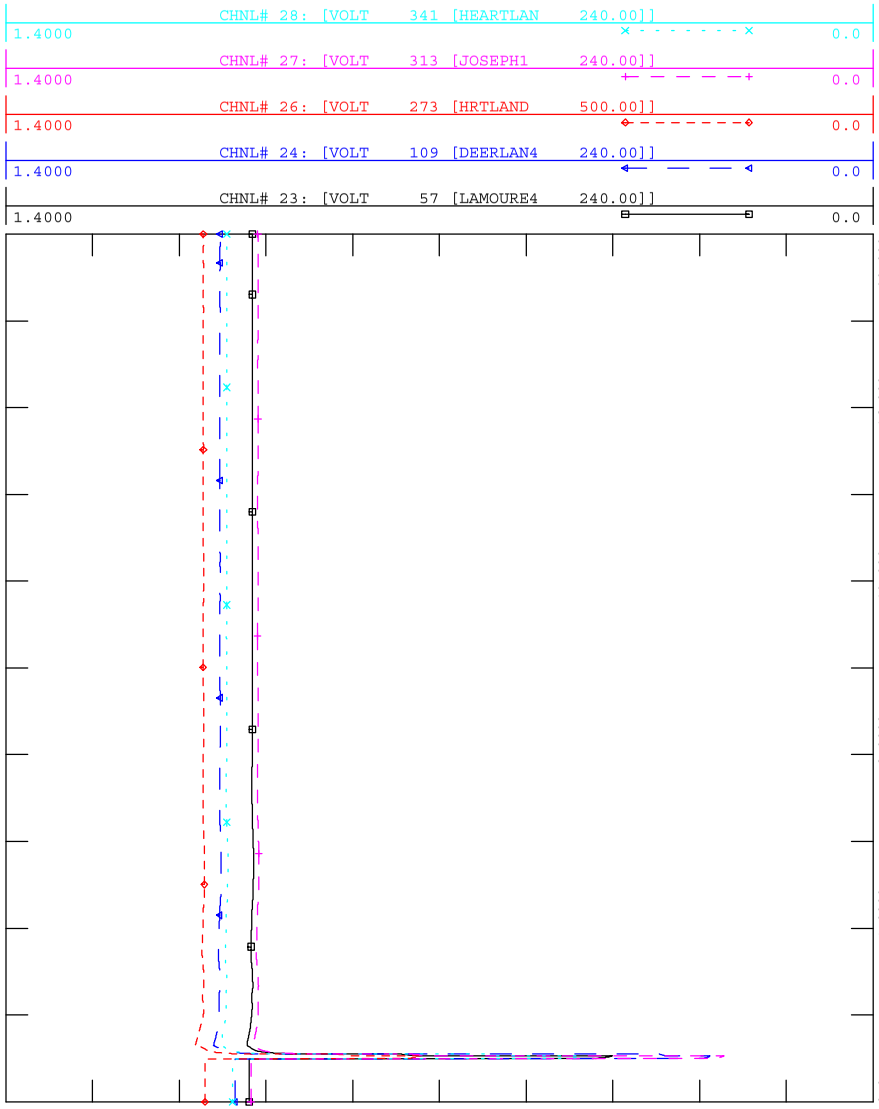
FIG D-SC4-11

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:10

FIG D-SC4-12

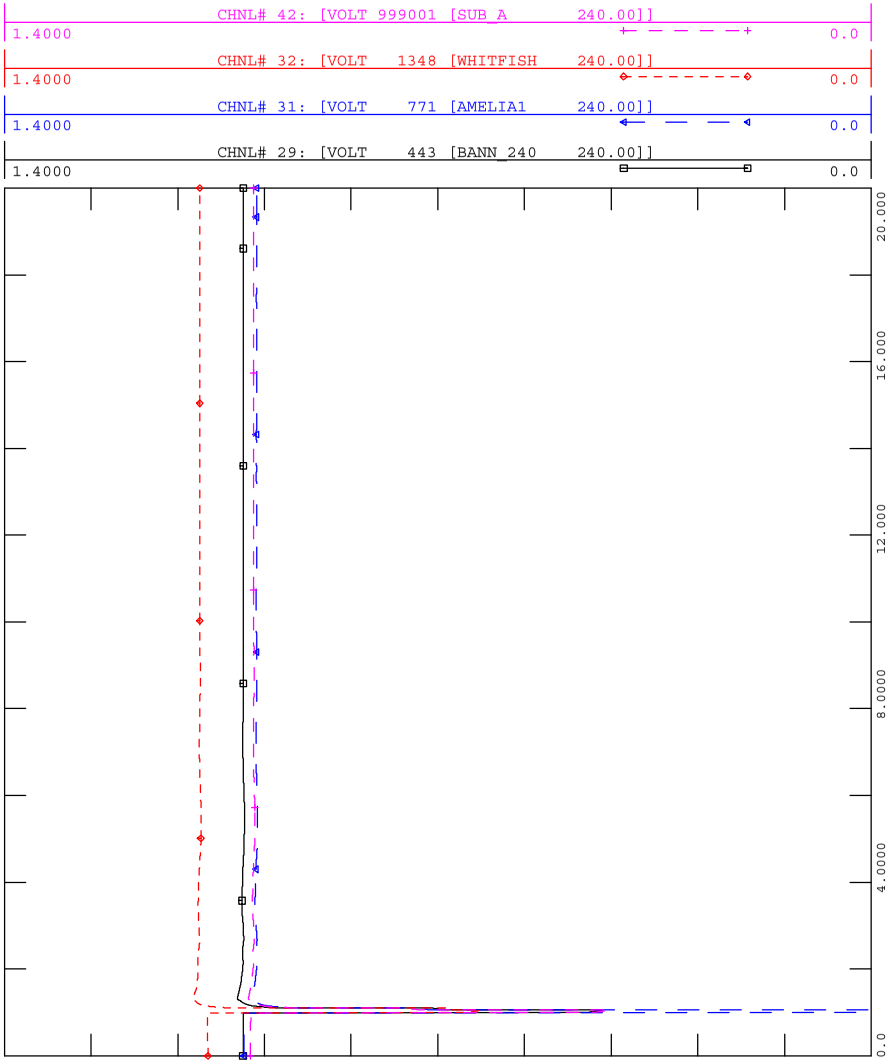


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 943L 3PH FAULT AT AMELIA 108S

FILE: CON14.OUT

TUE, NOV 25 2025 15:10

FIG D-SC4-12



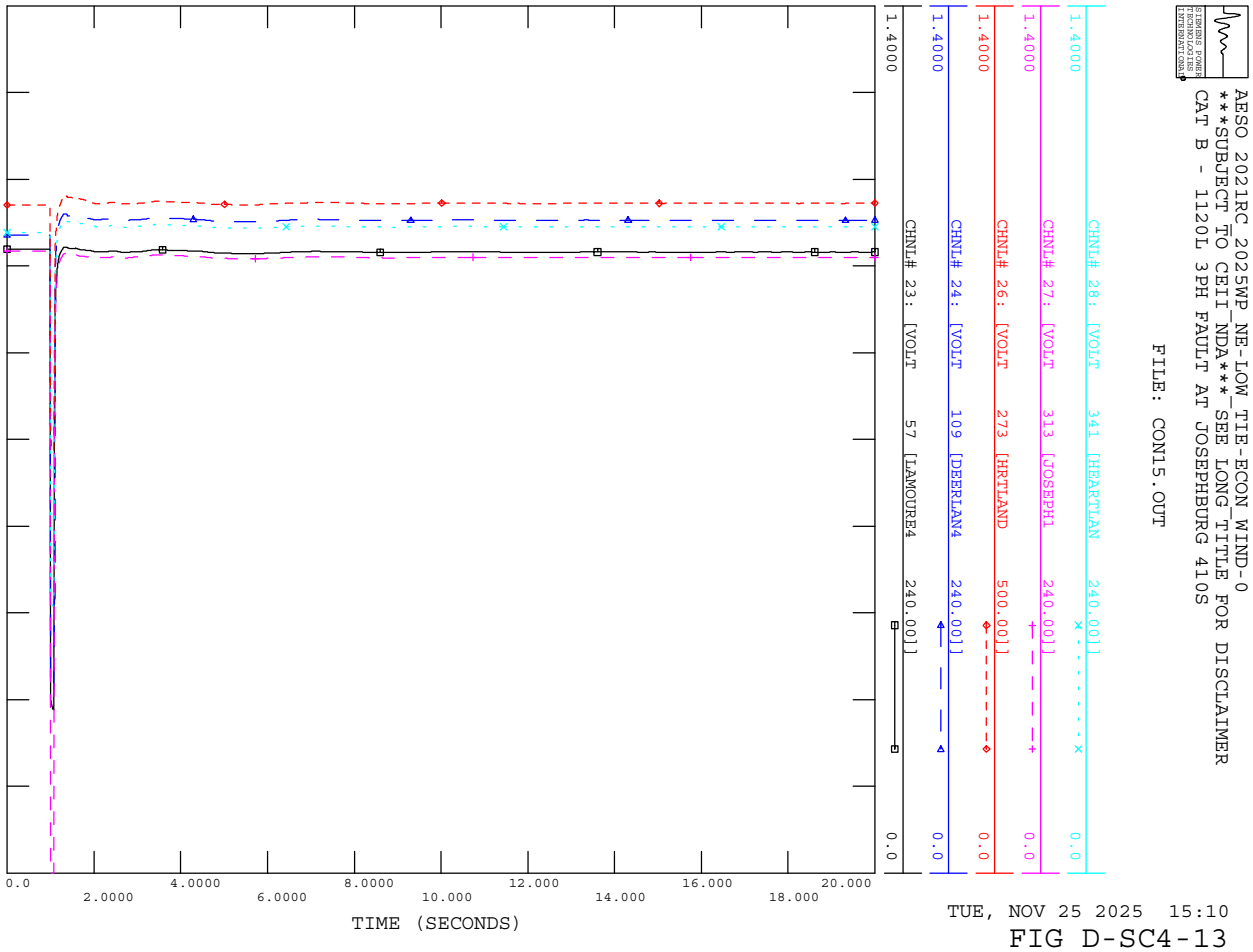


FIG D-SC4-13

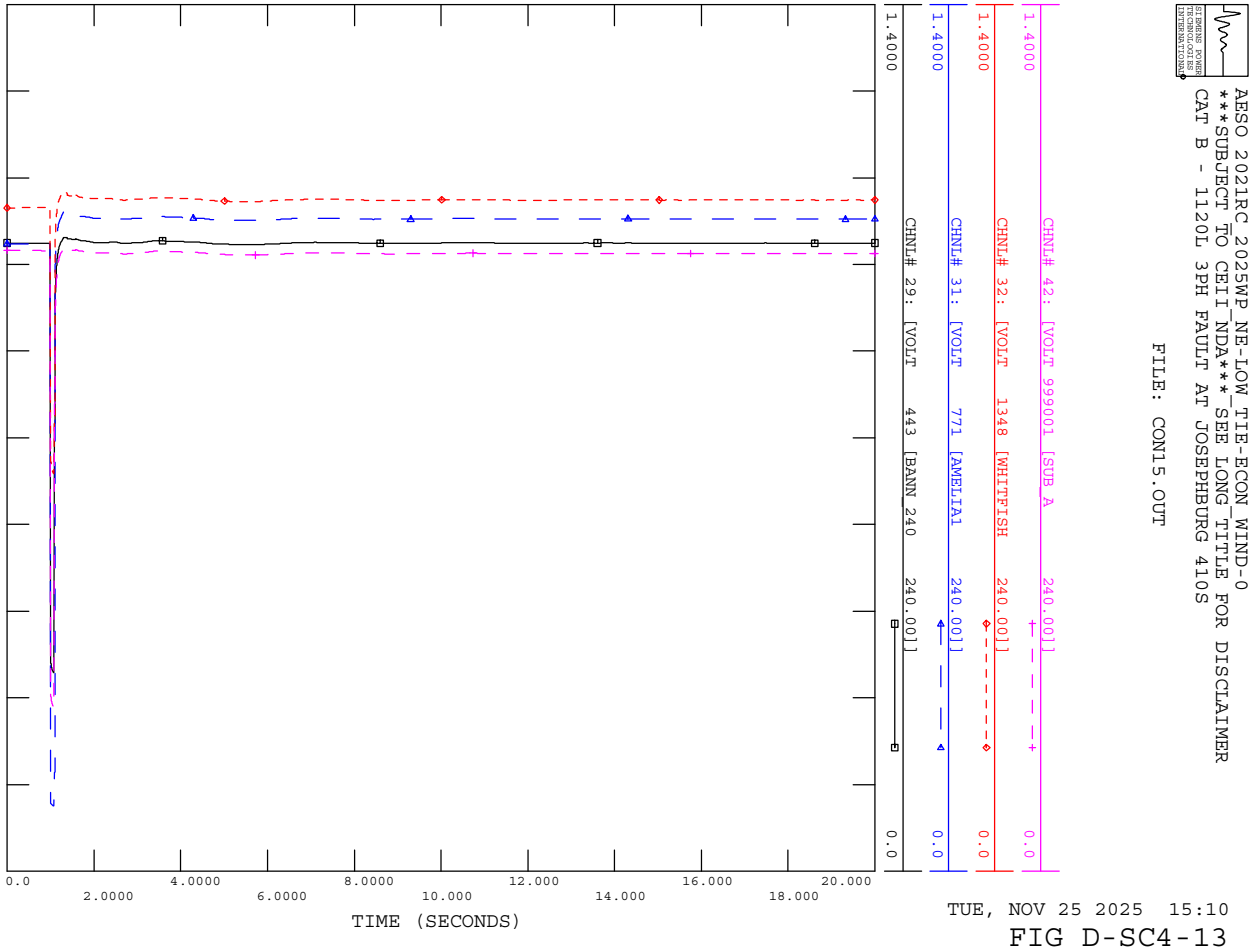


FIG D-SC4-13

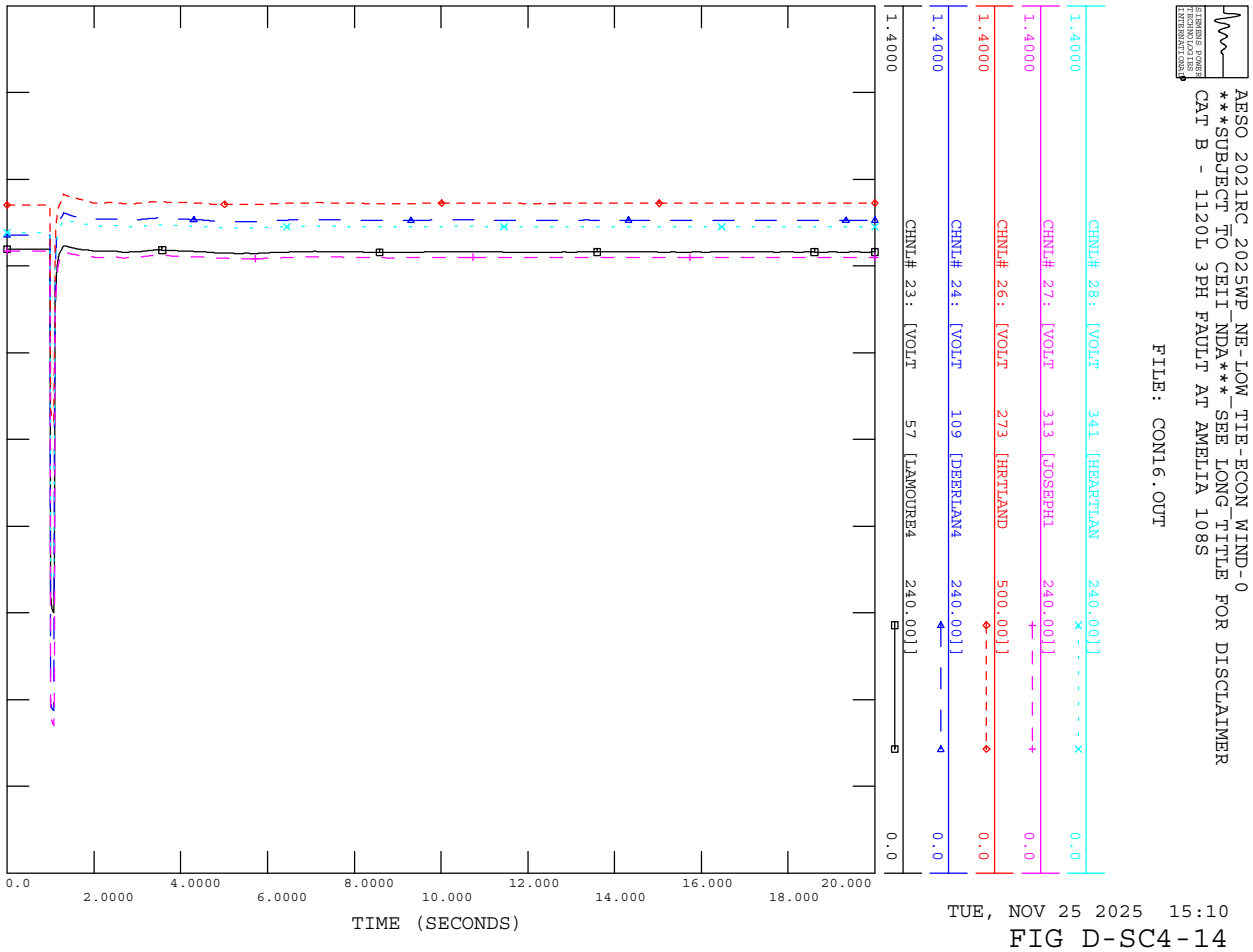


FIG D-SC4-14

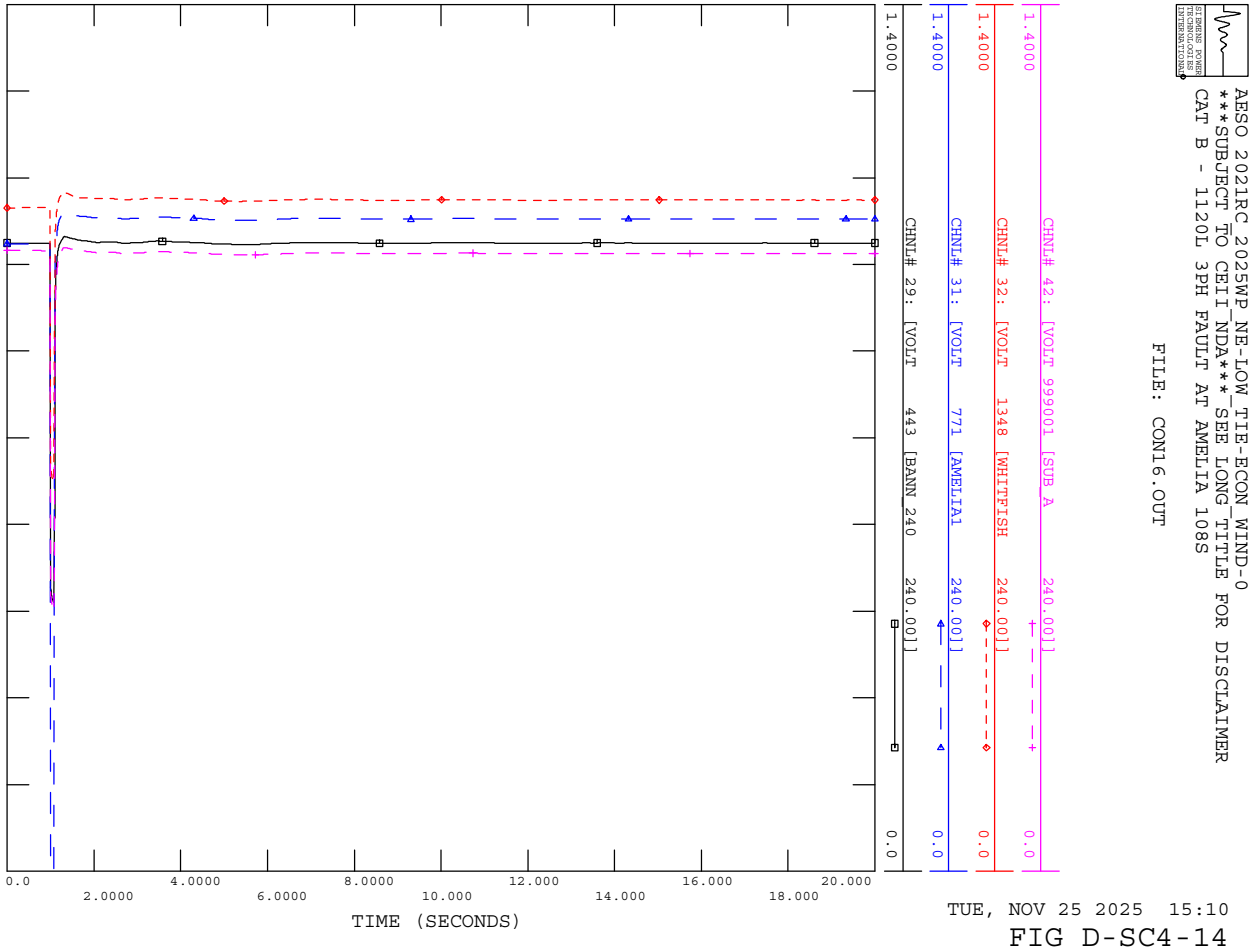


FIG D-SC4-14

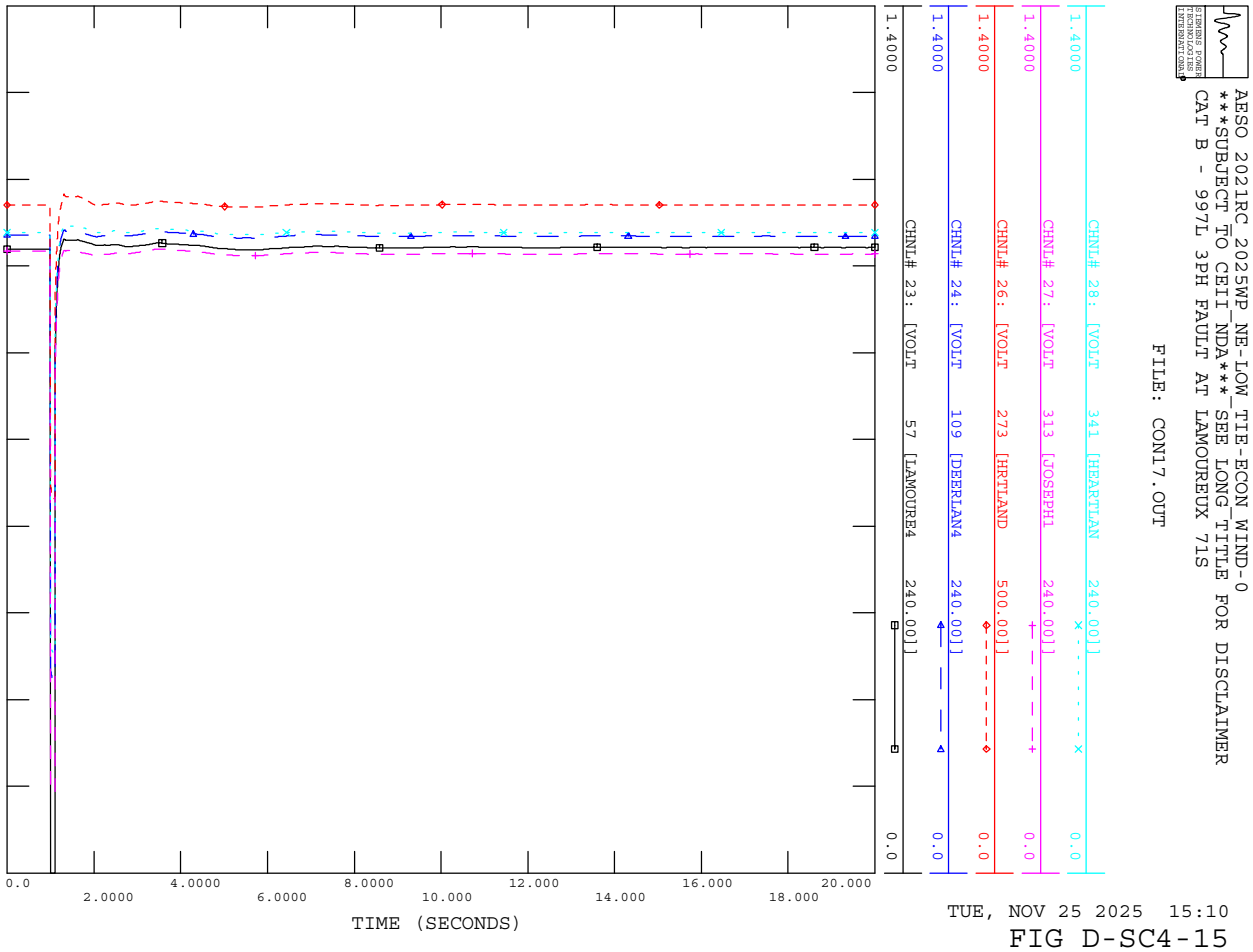


FIG D-SC4-15

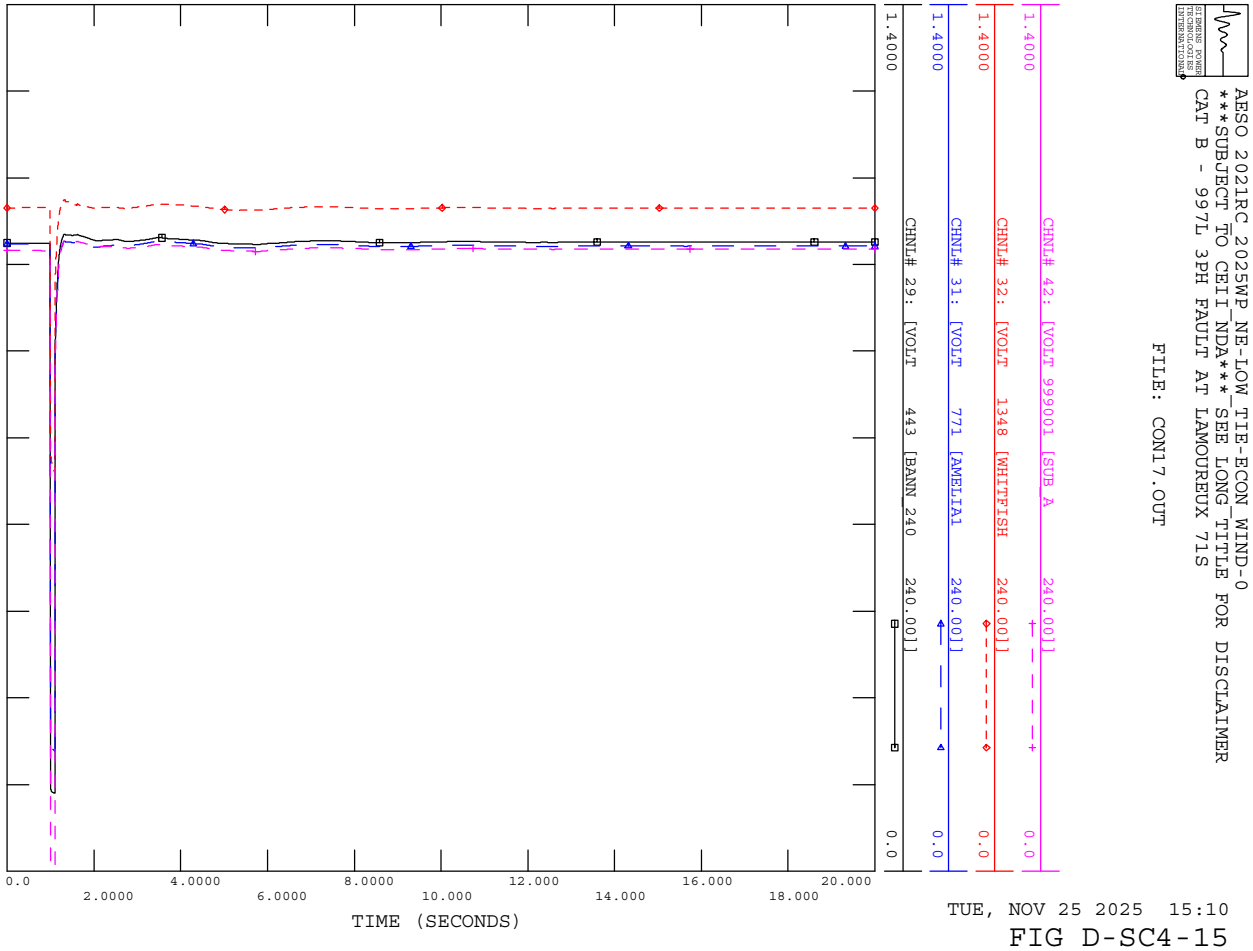


FIG D-SC4-15

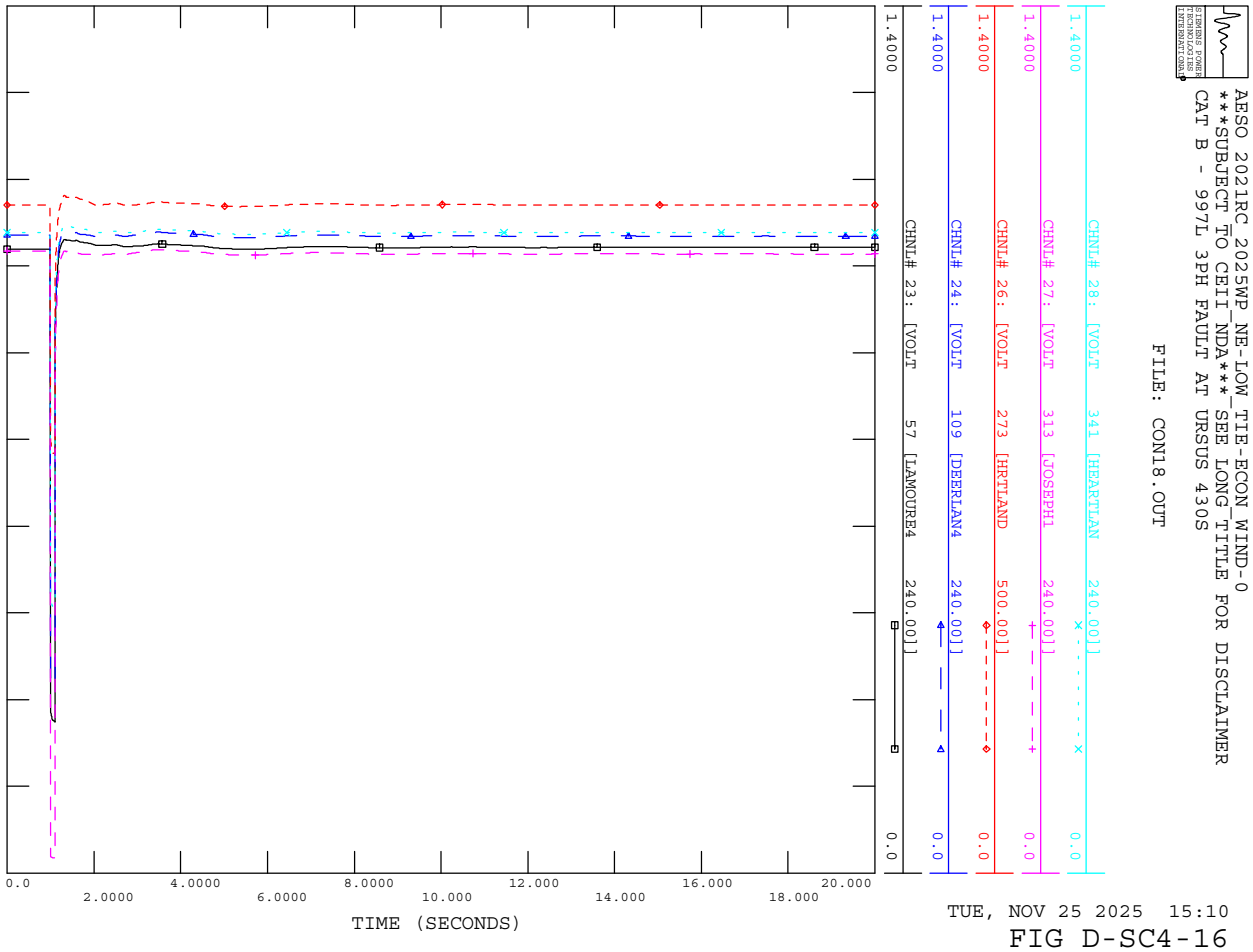


FIG D-SC4-16

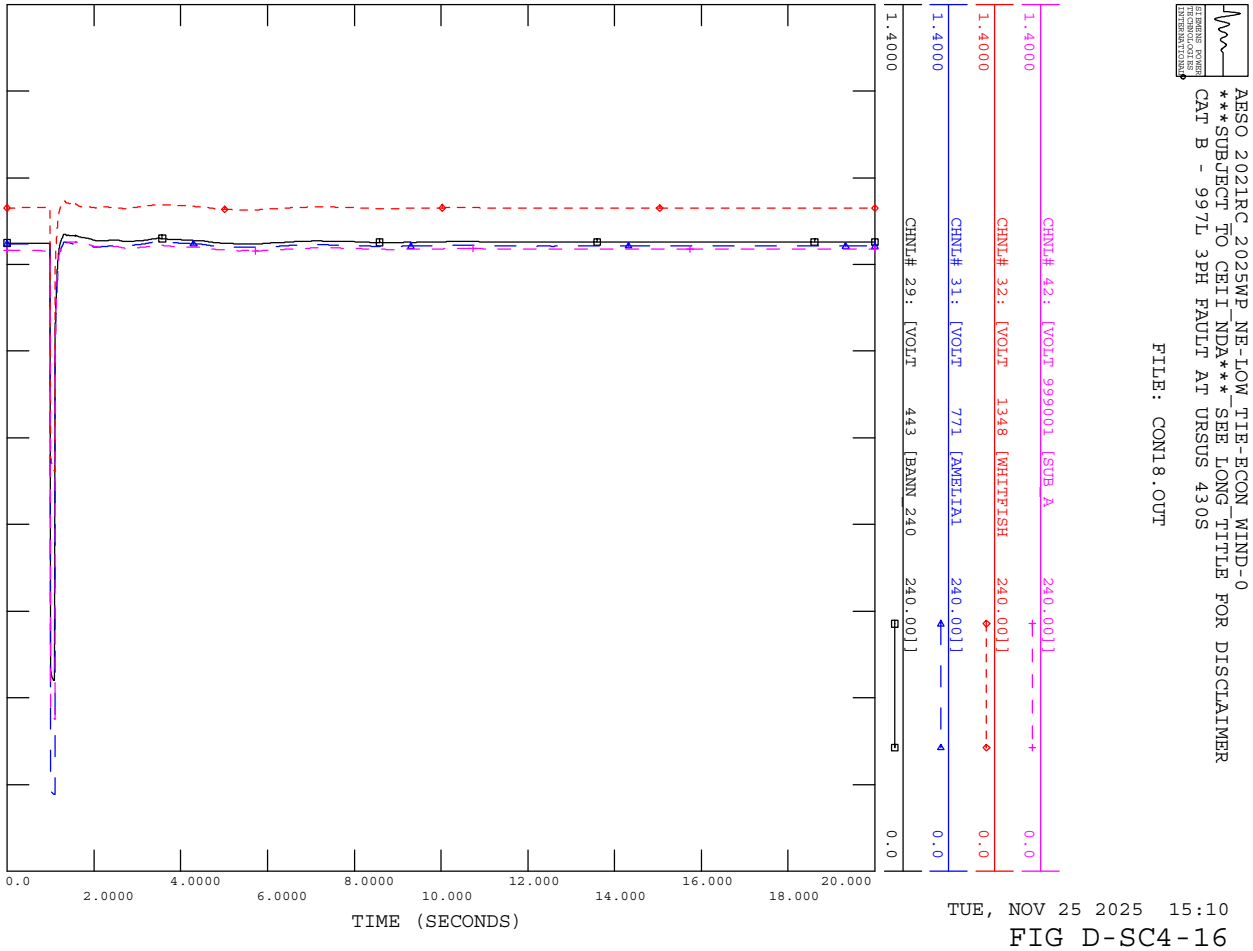


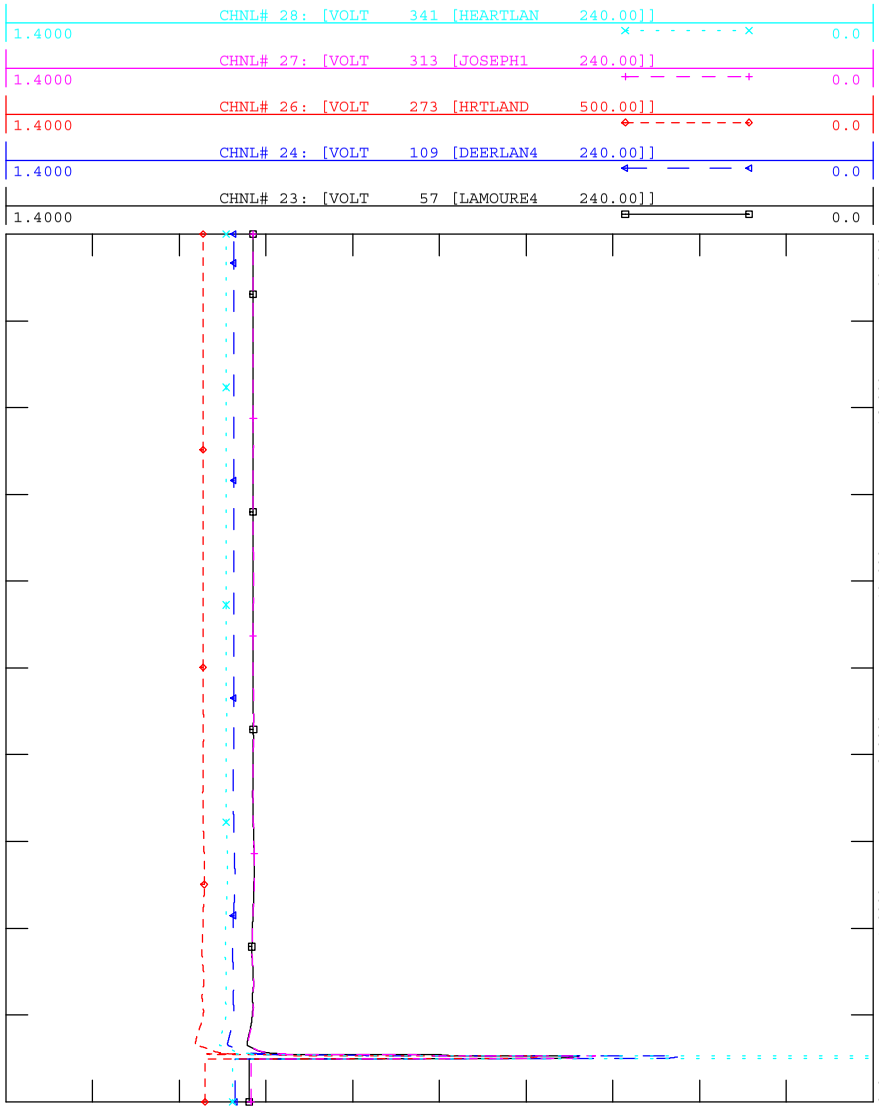
FIG D-SC4-16

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

FILE: CON19.OUT

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FIG D-SC4-17

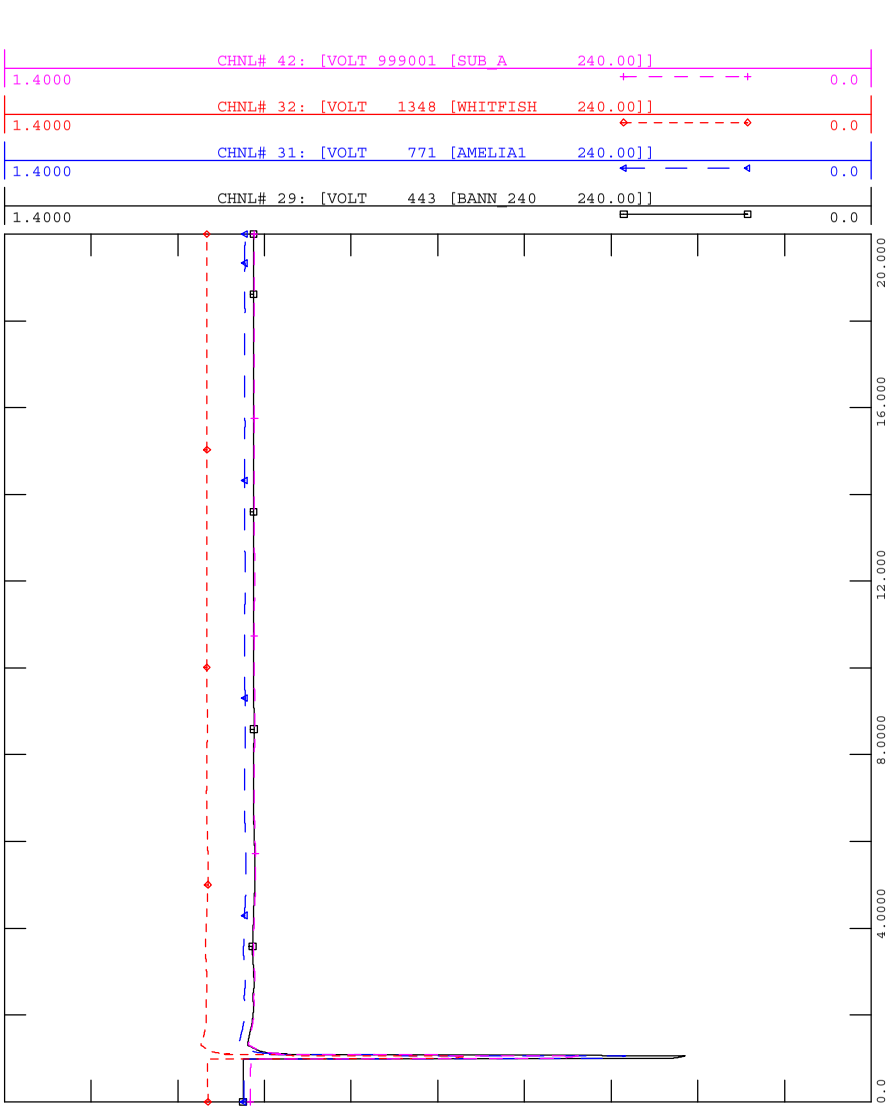


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 1061L 3PH FAULT AT HEARTLAND 12S

FILE: CON19.OUT

TUE, NOV 25 2025 15:10

FIG D-SC4-17



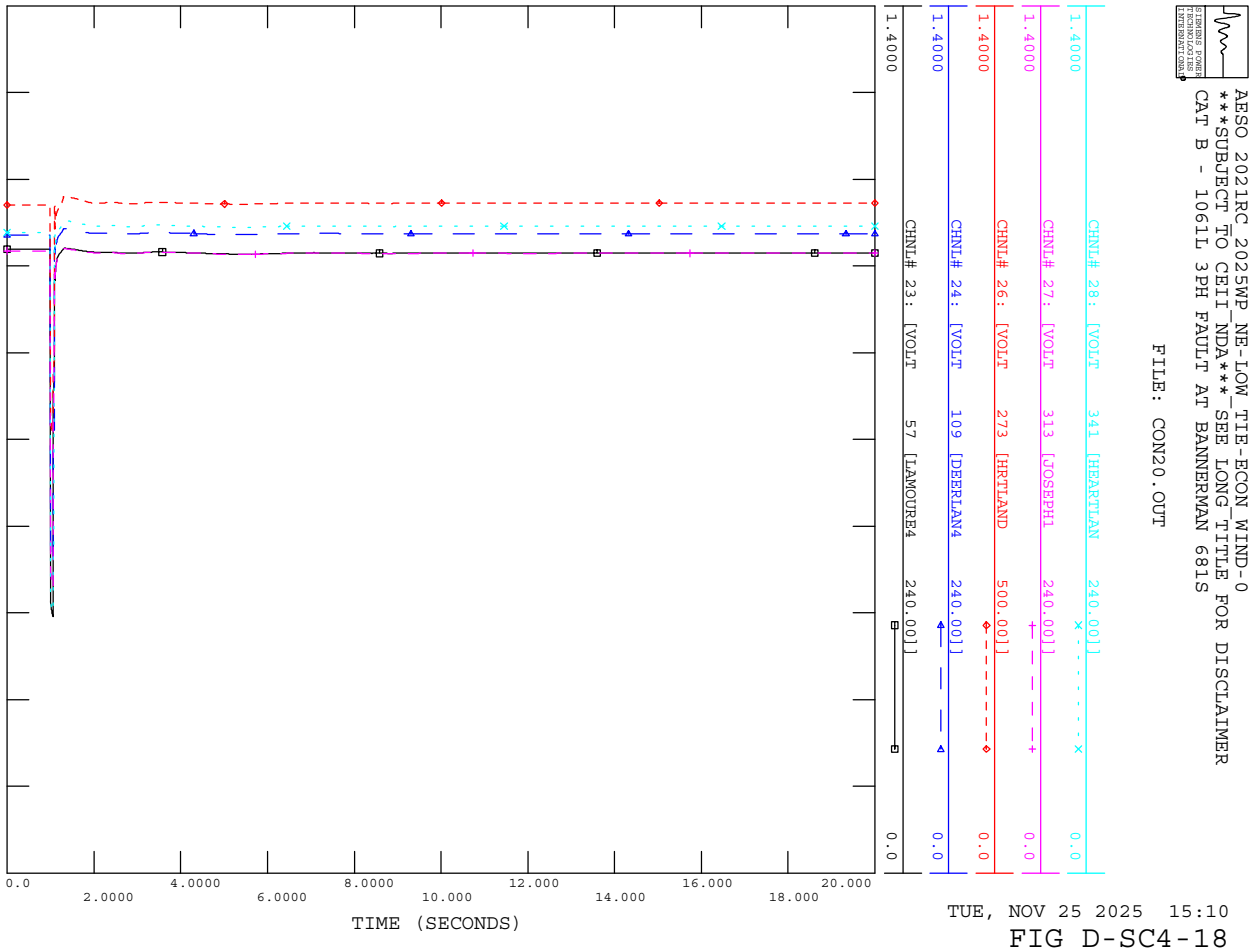


FIG D-SC4-18

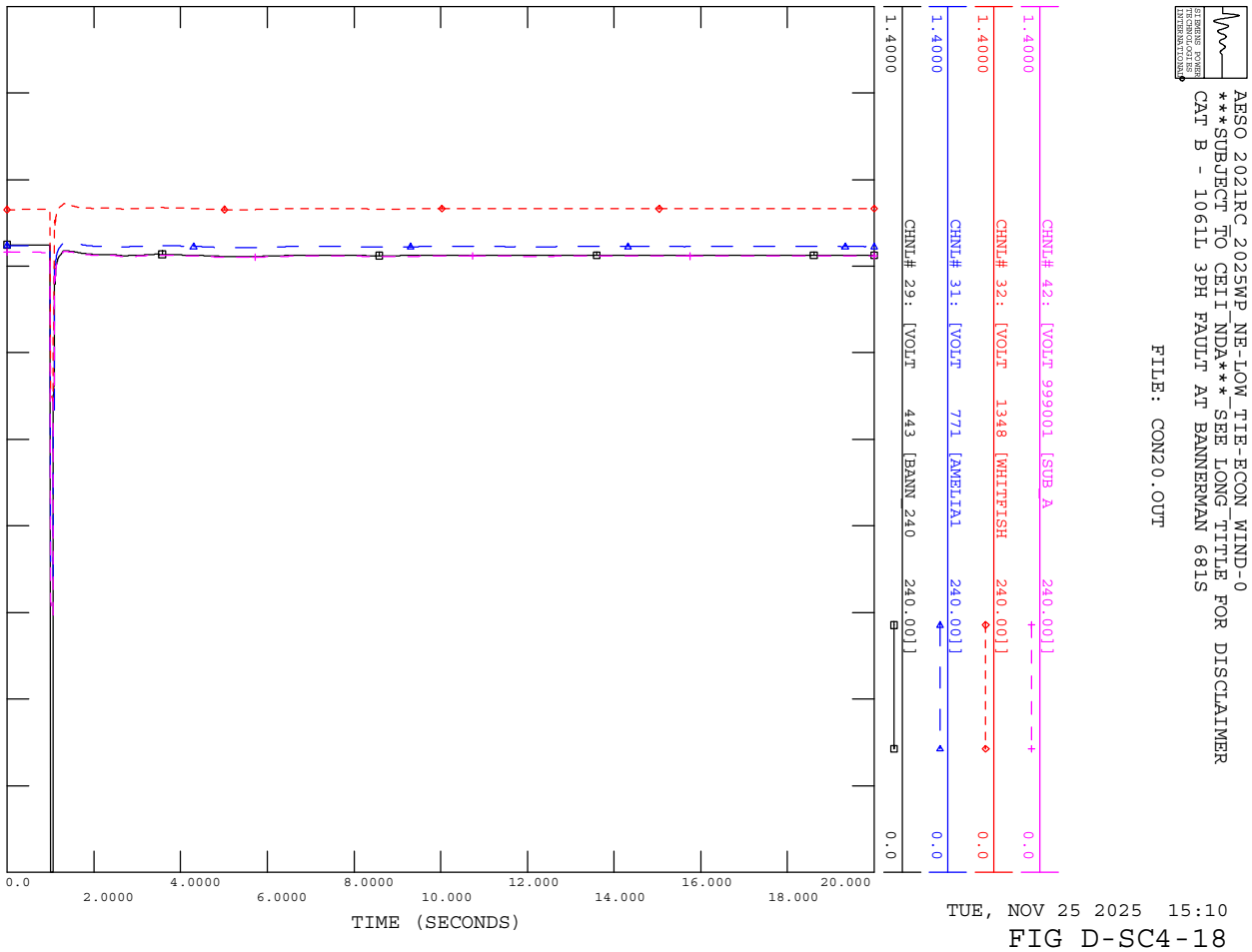


FIG D-SC4-18

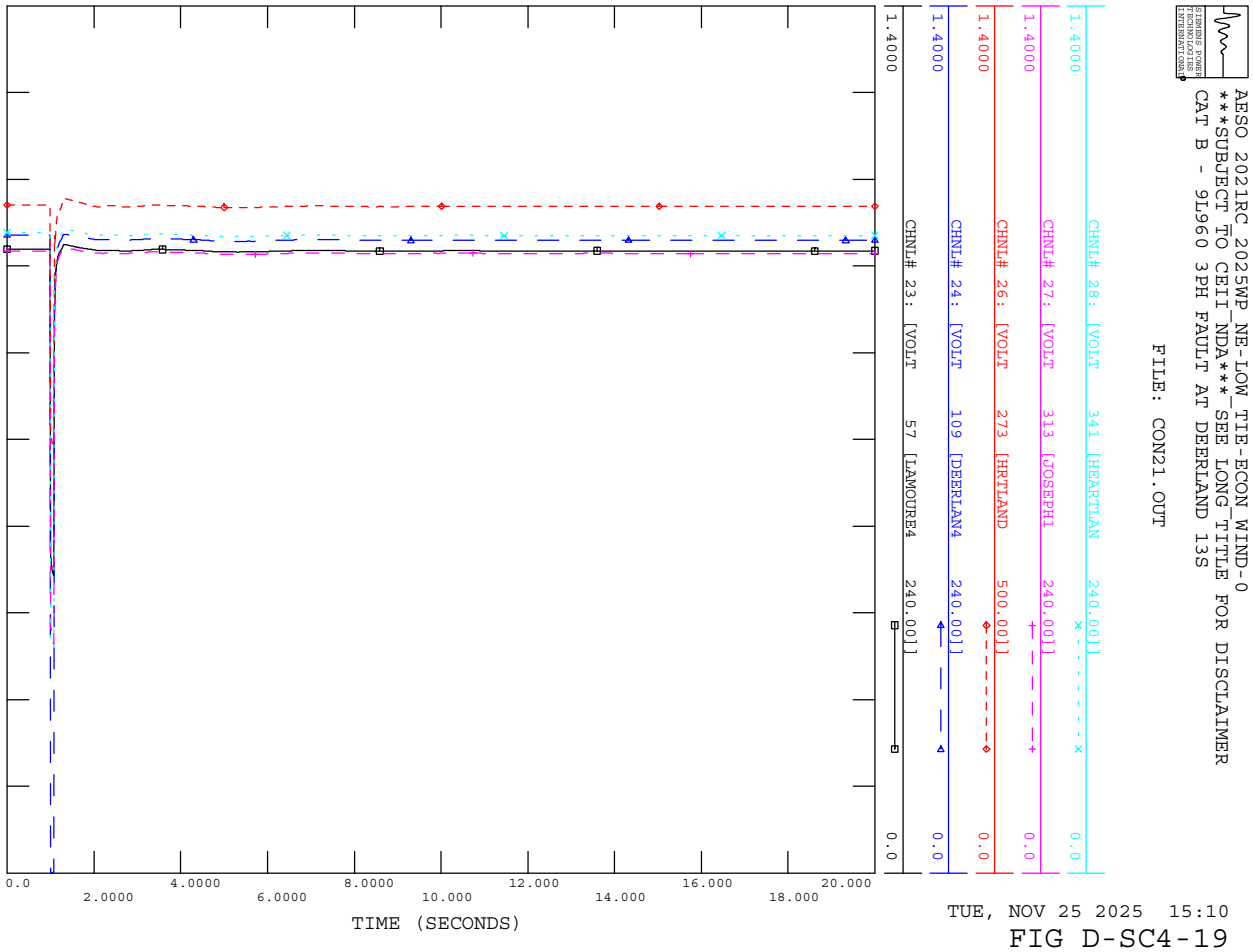


FIG D-SC4-19

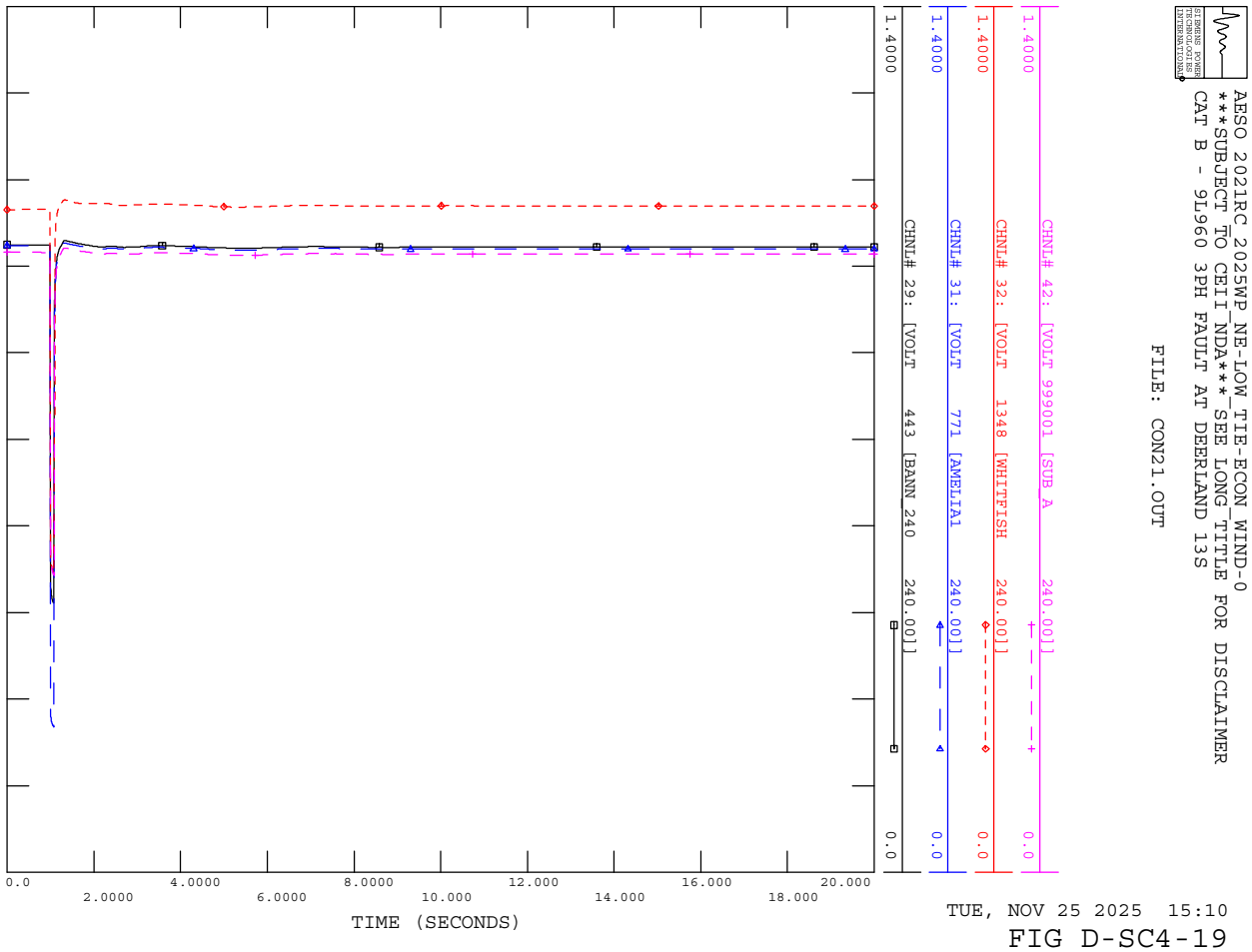


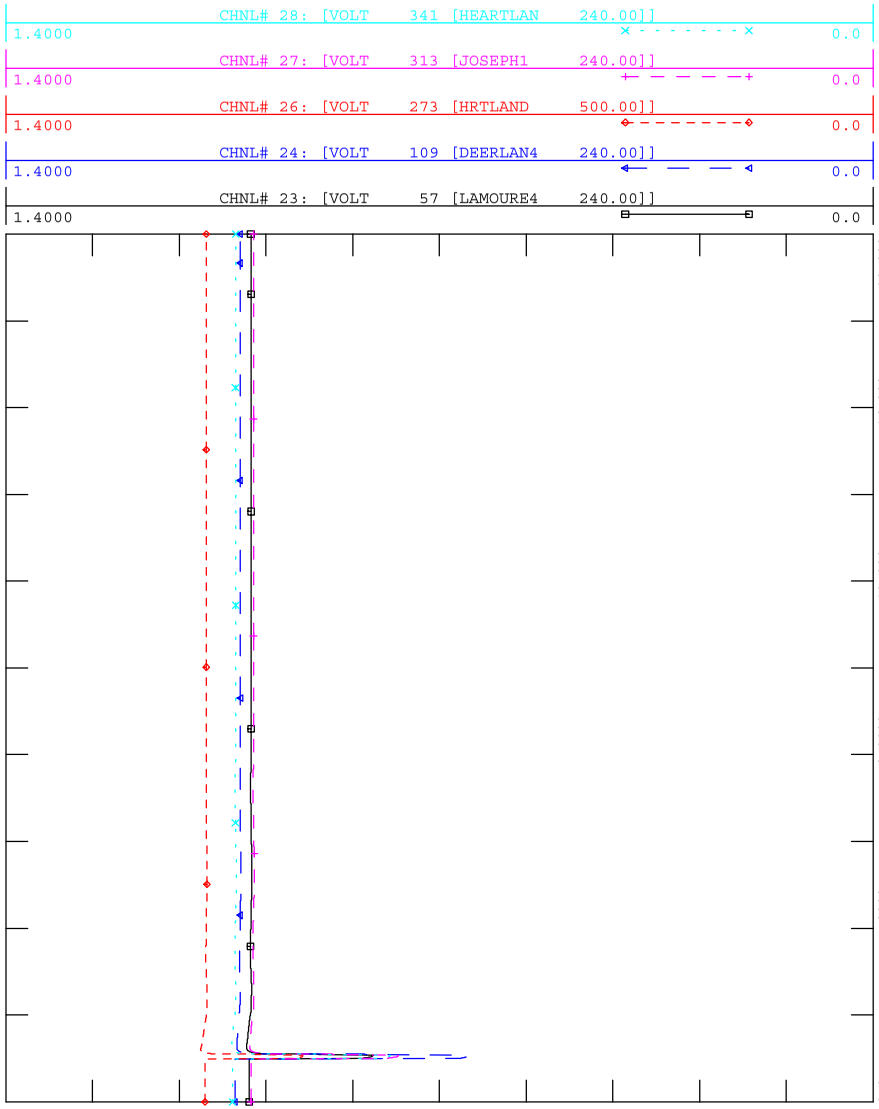
FIG D-SC4-19

AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

TUE, NOV 25 2025 15:10

FIG D-SC4-20

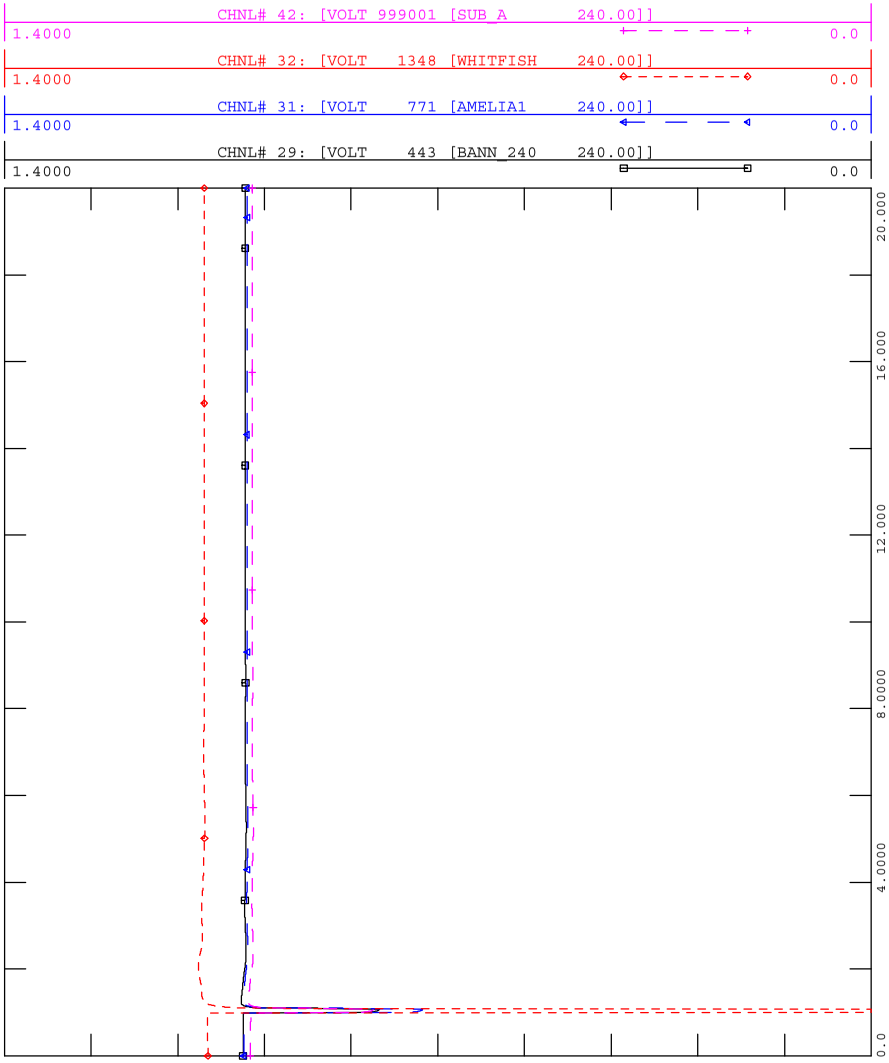


AESO 2021RC_2025WP_NE-LOW_TIE-ECON_WIND-0
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - 9L960 3PH FAULT AT WHITEFISH LAKE 825S

FILE: CON22.OUT

TUE, NOV 25 2025 15:10

FIG D-SC4-20



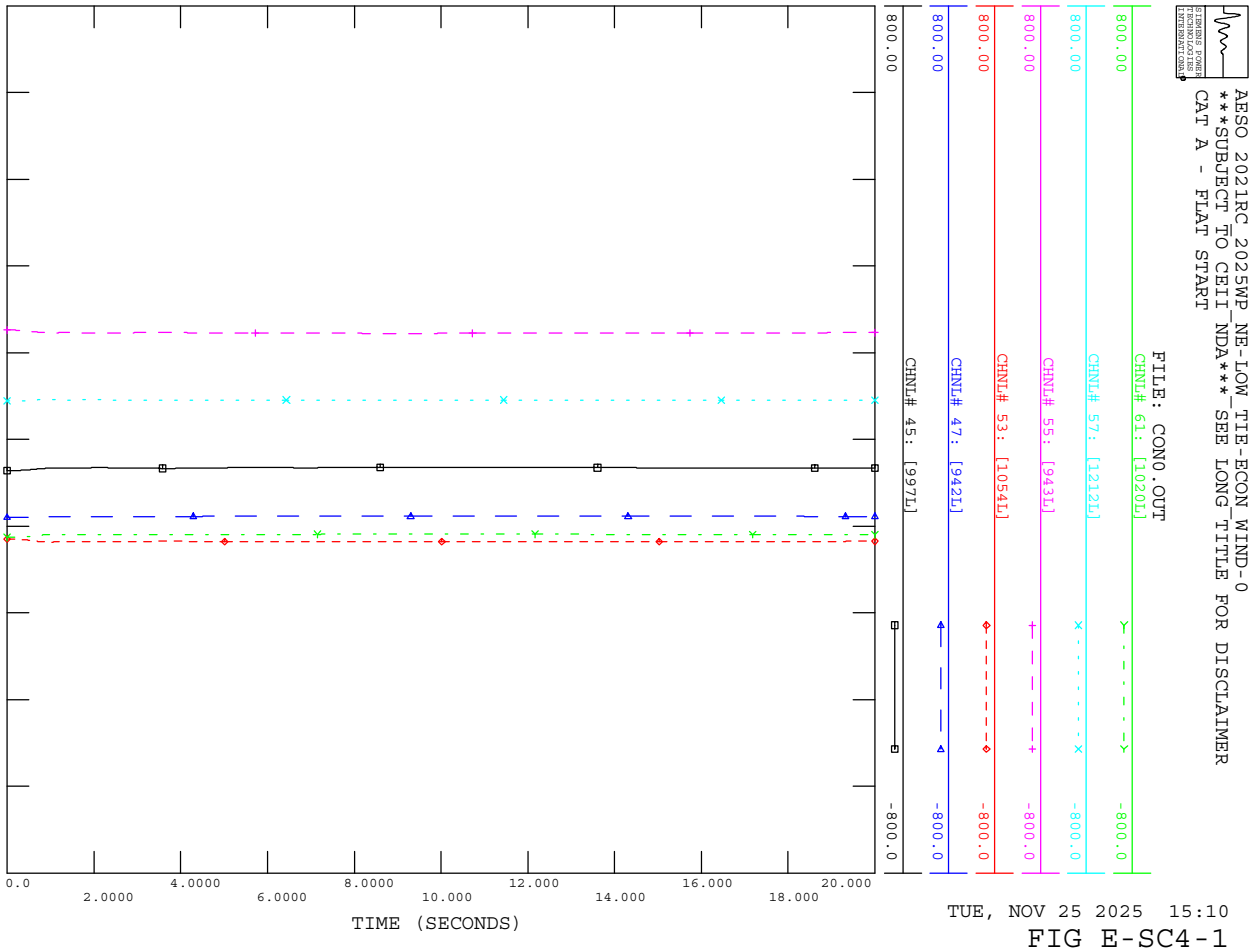


FIG E-SC4-1

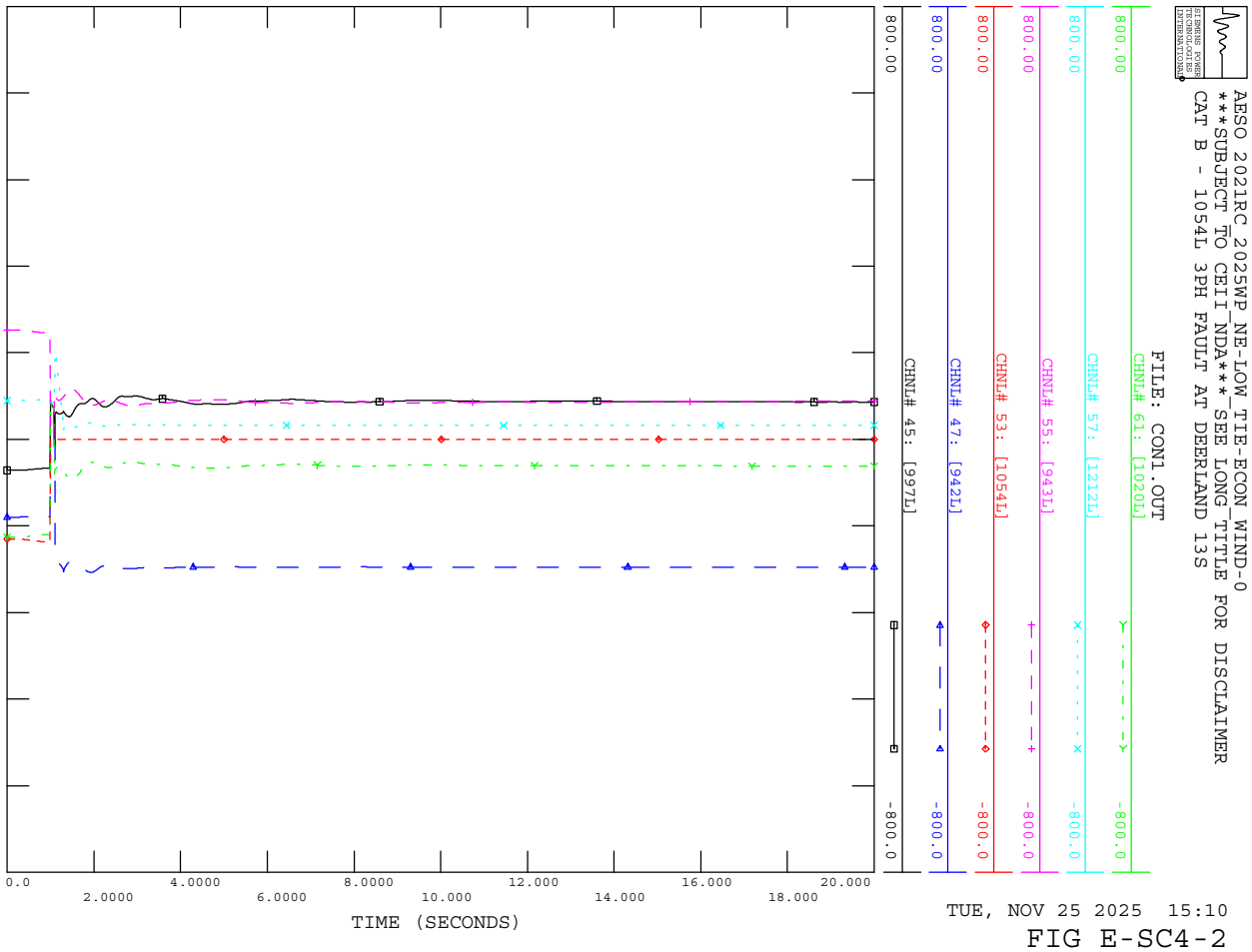


FIG E-SC4-2

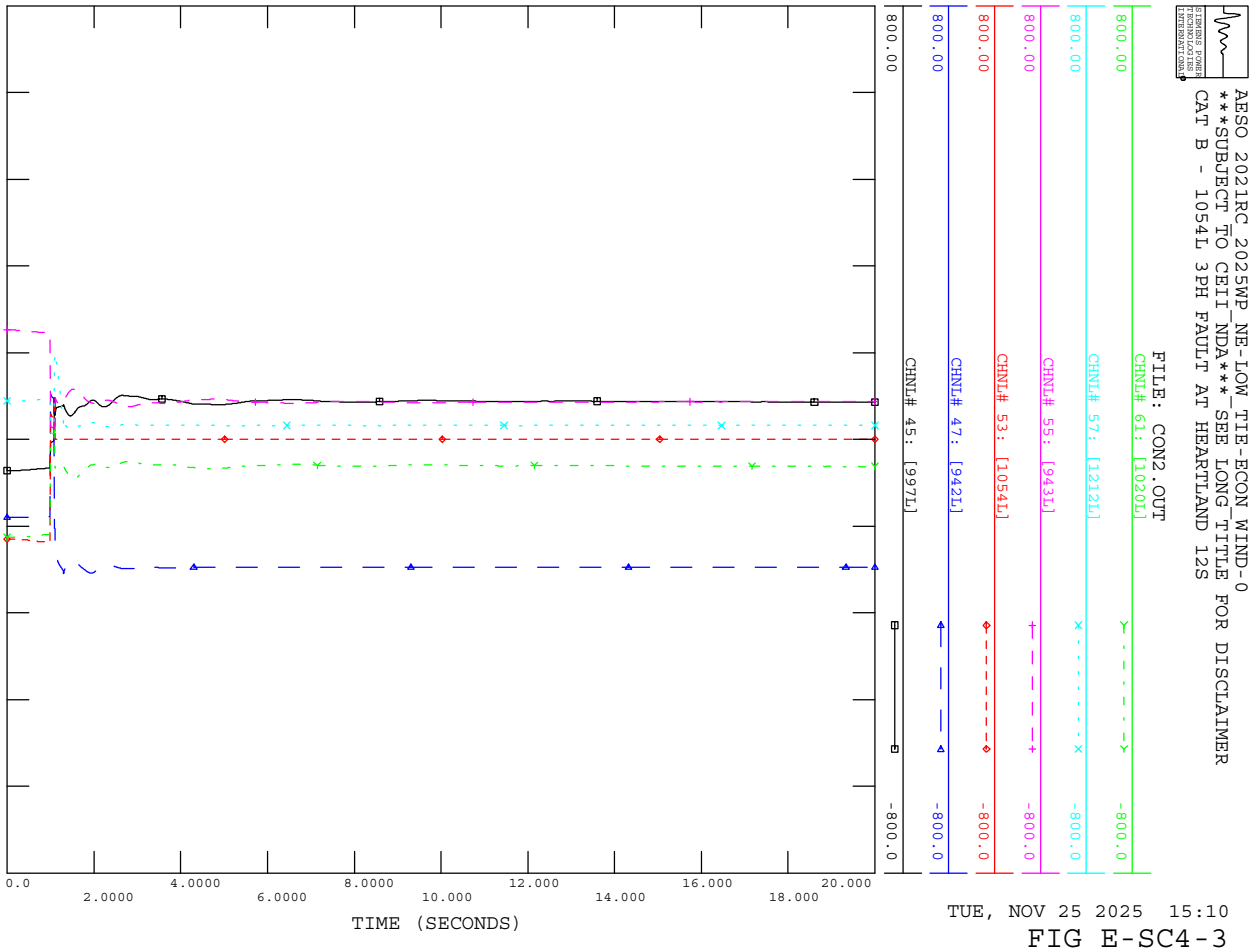


FIG E-SC4-3

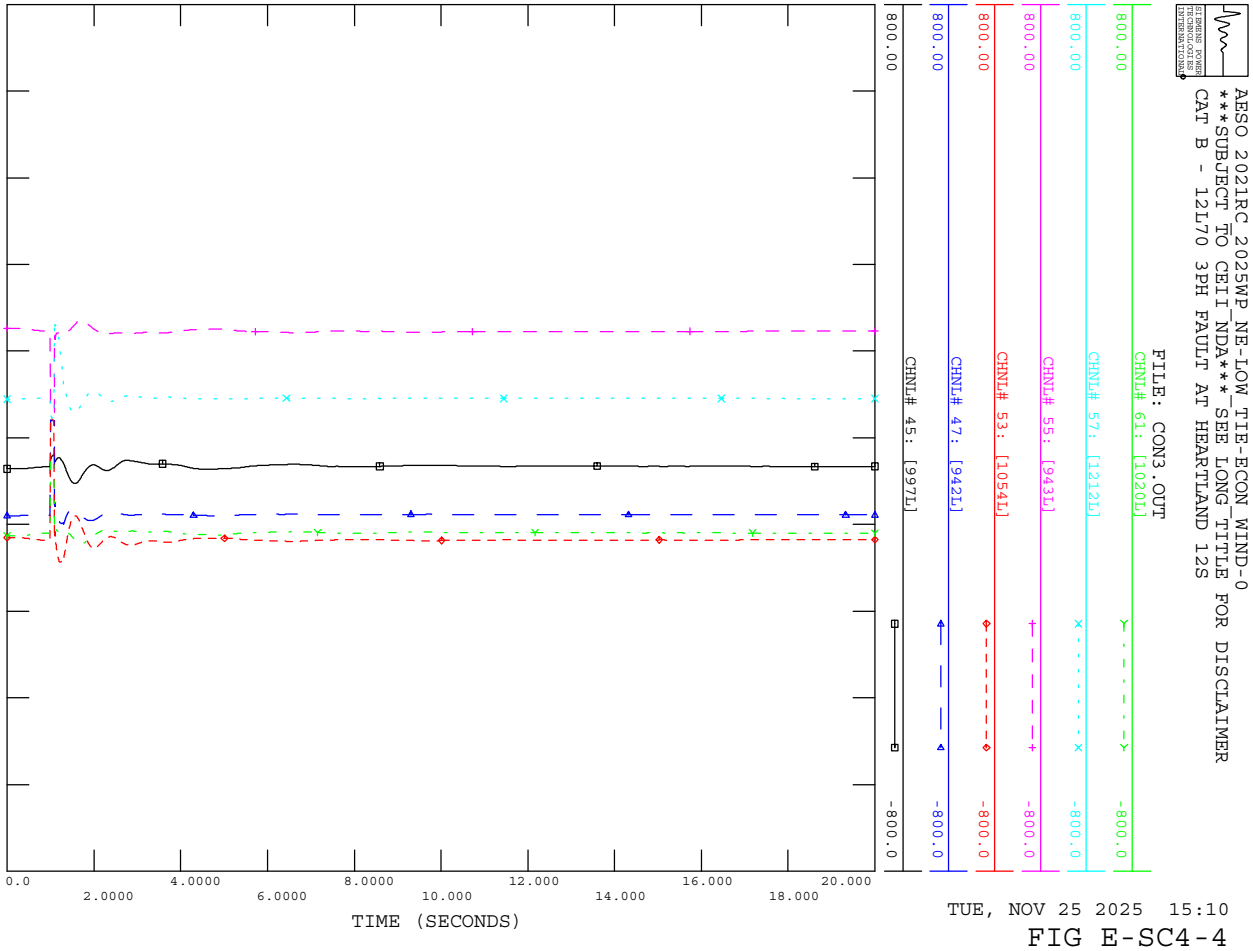


FIG E-SC4-4

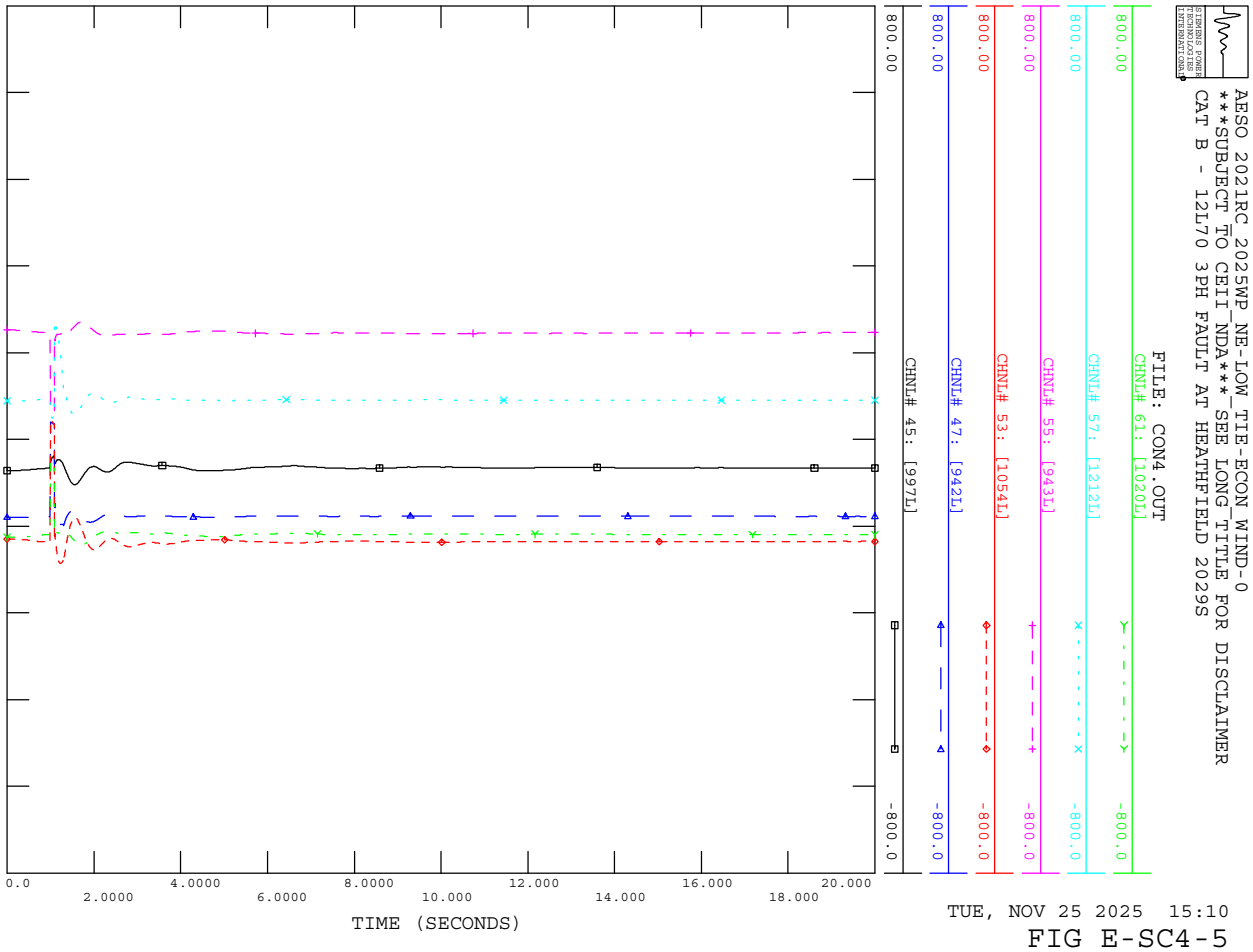


FIG E-SC4-5

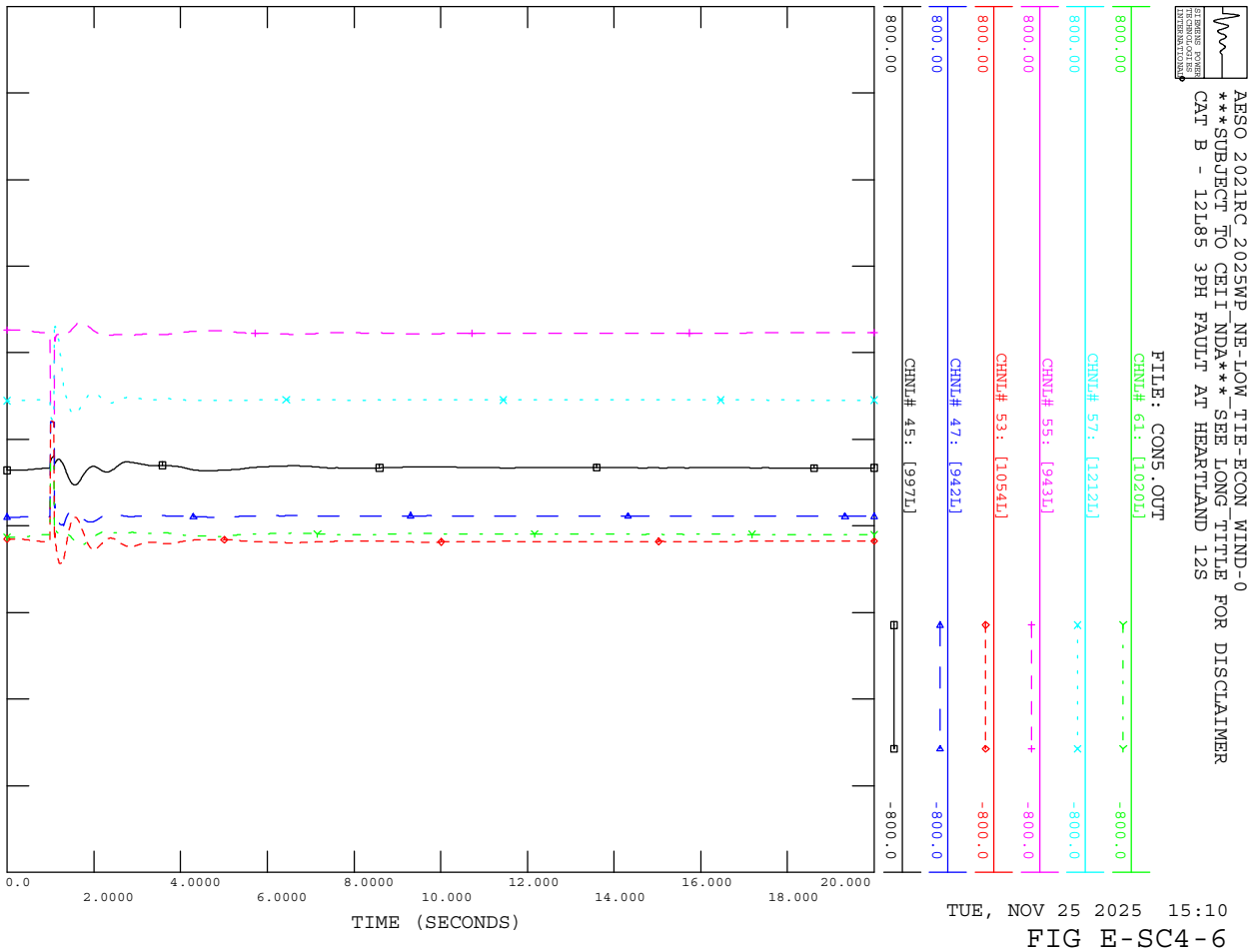


FIG E-SC4-6

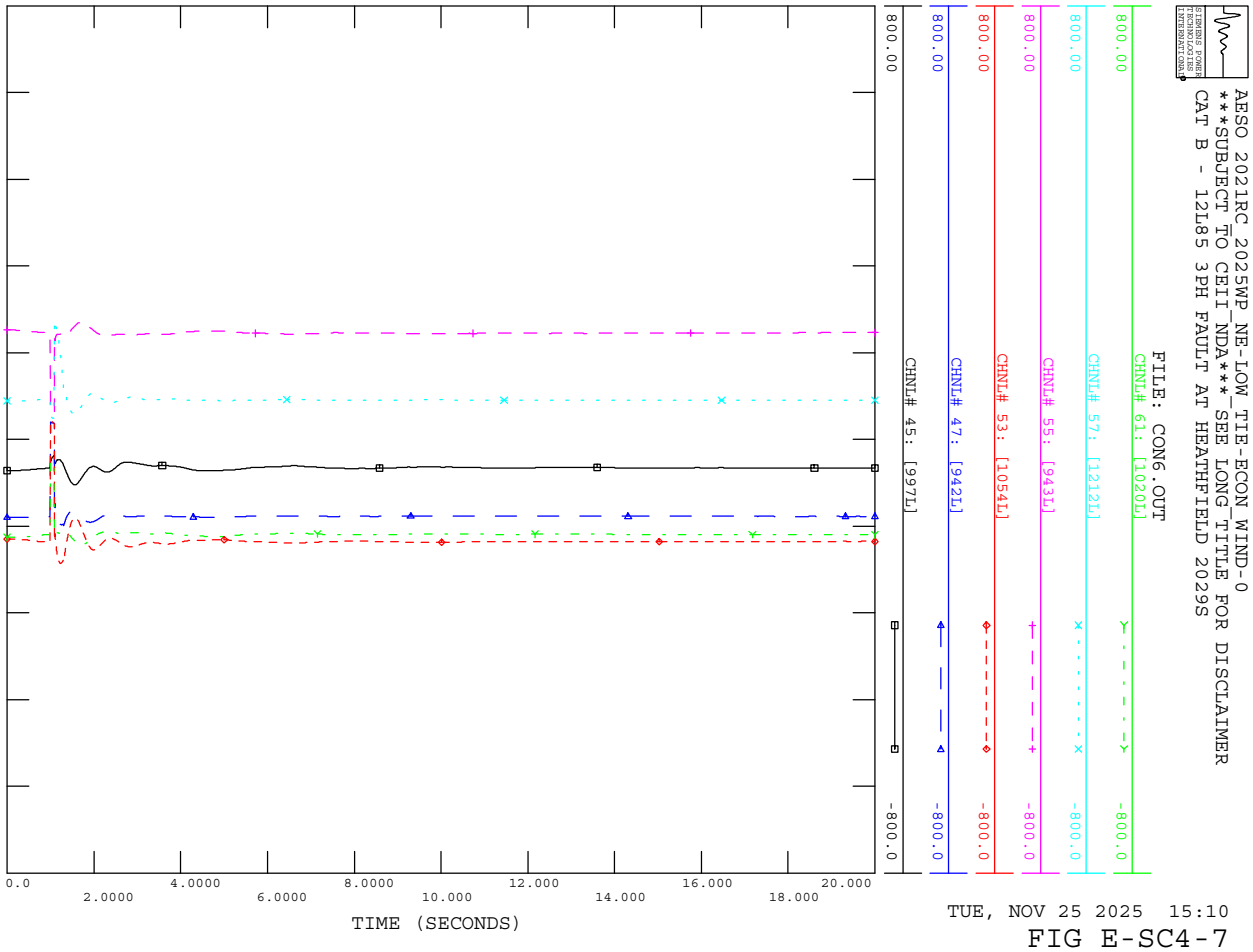


FIG E-SC4-7

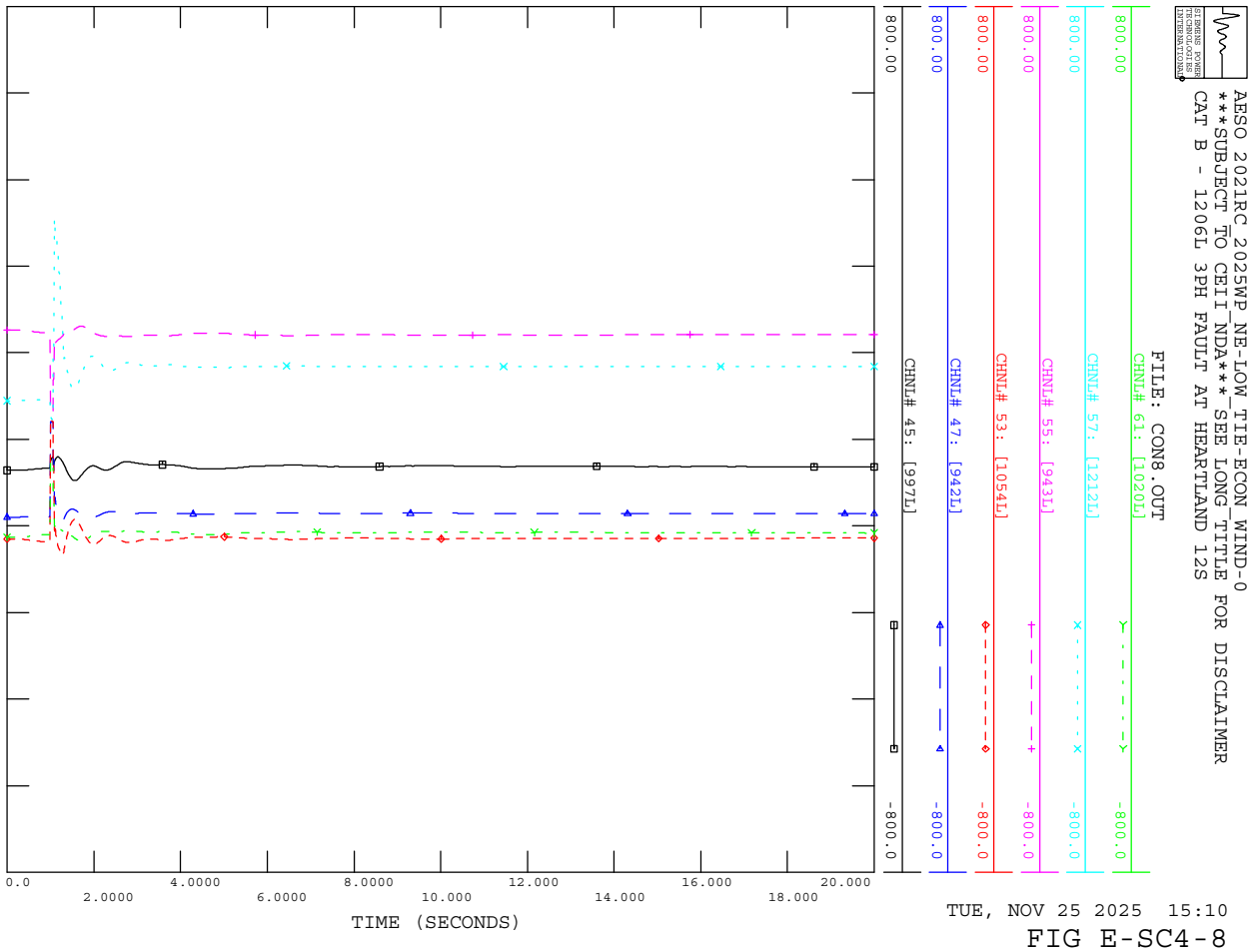


FIG E-SC4-8

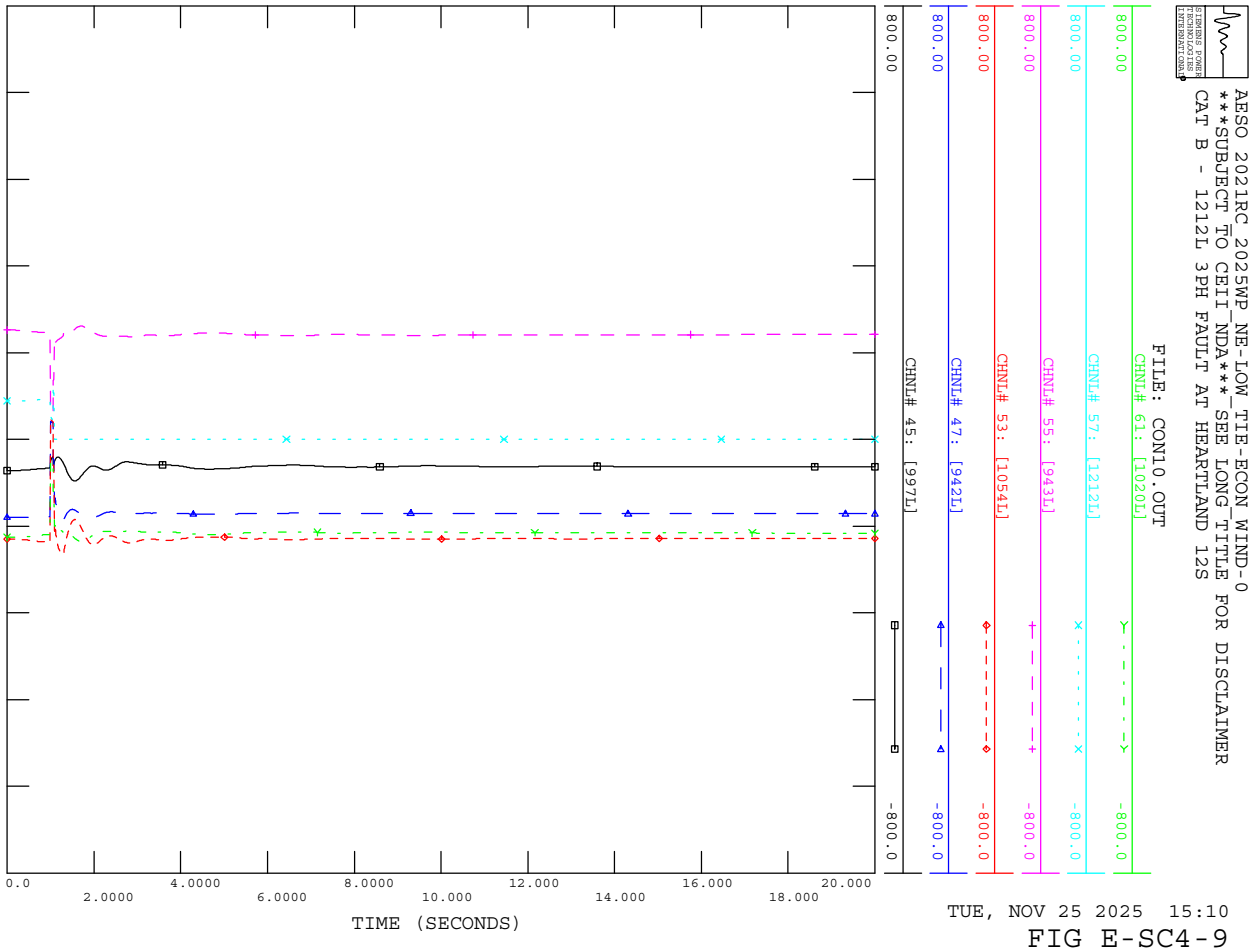


FIG E-SC4-9

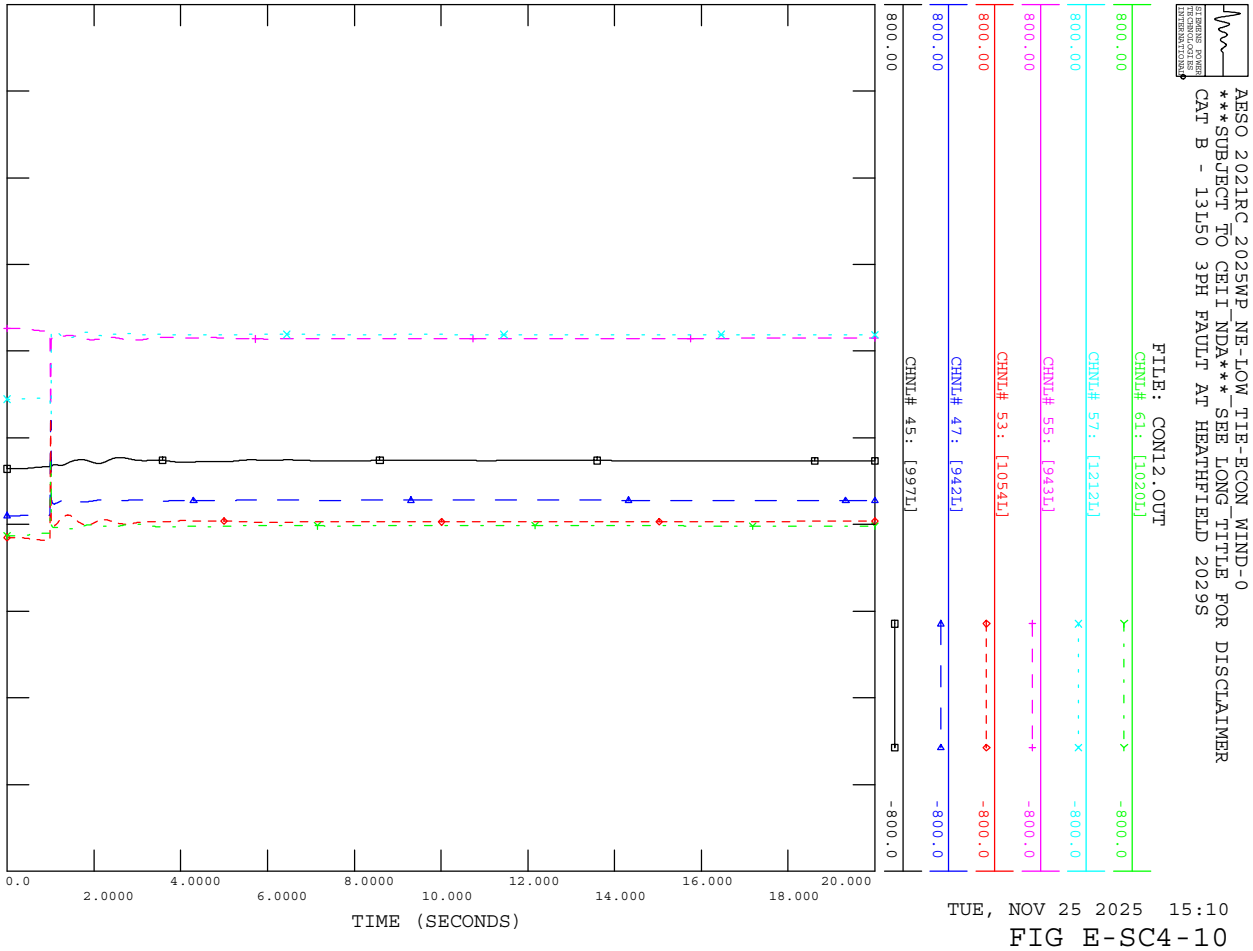


FIG E-SC4-10

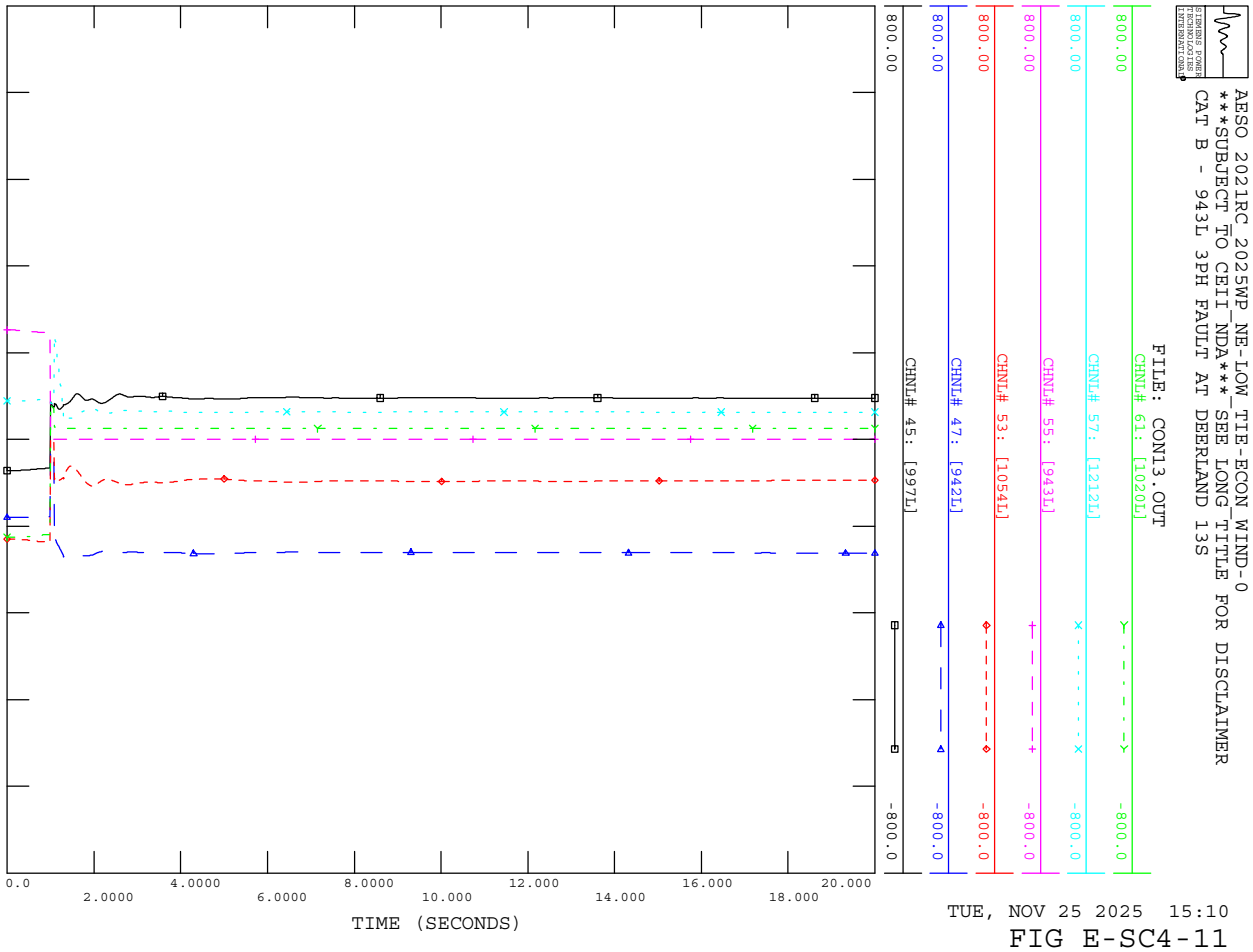


FIG E-SC4-11

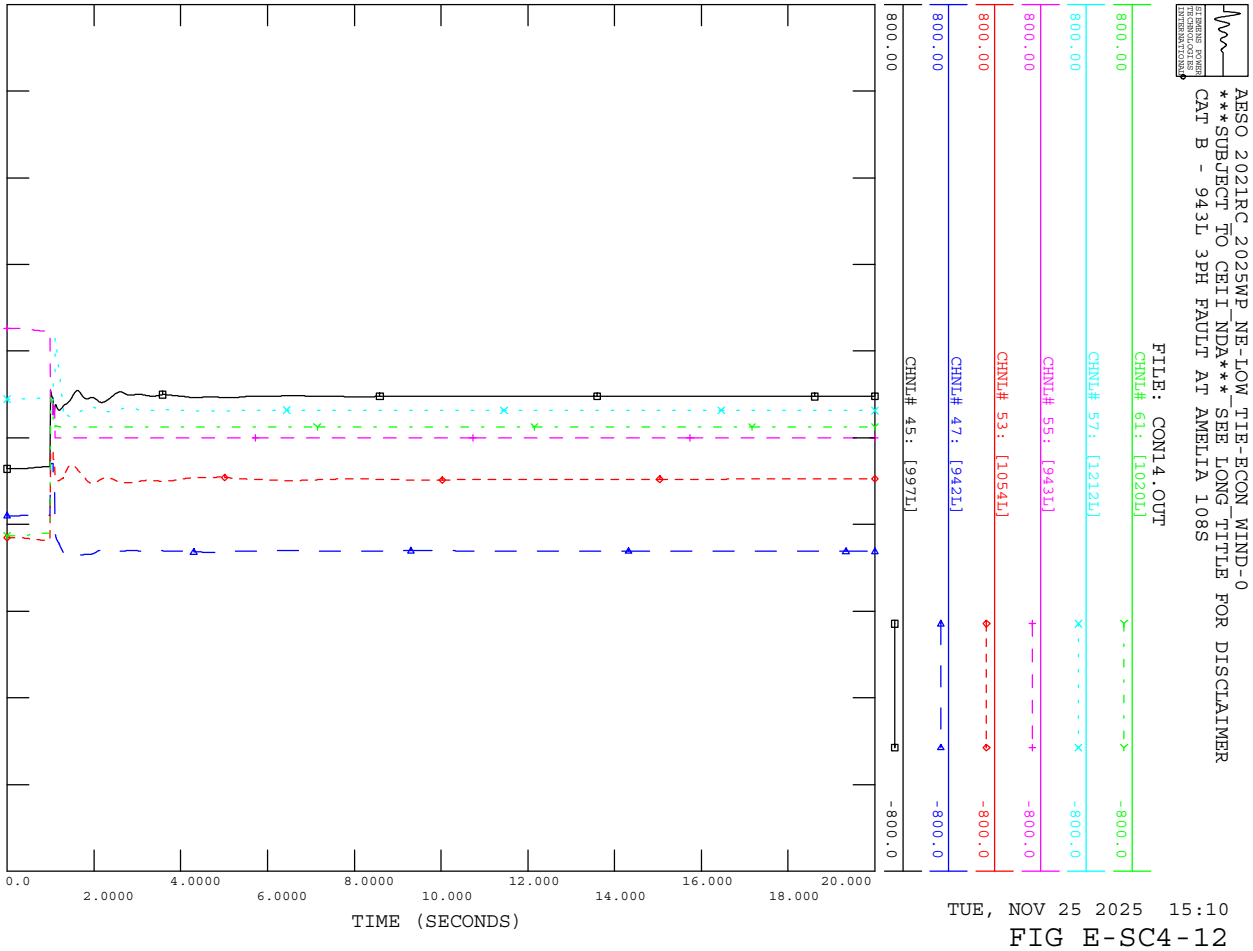


FIG E-SC4-12

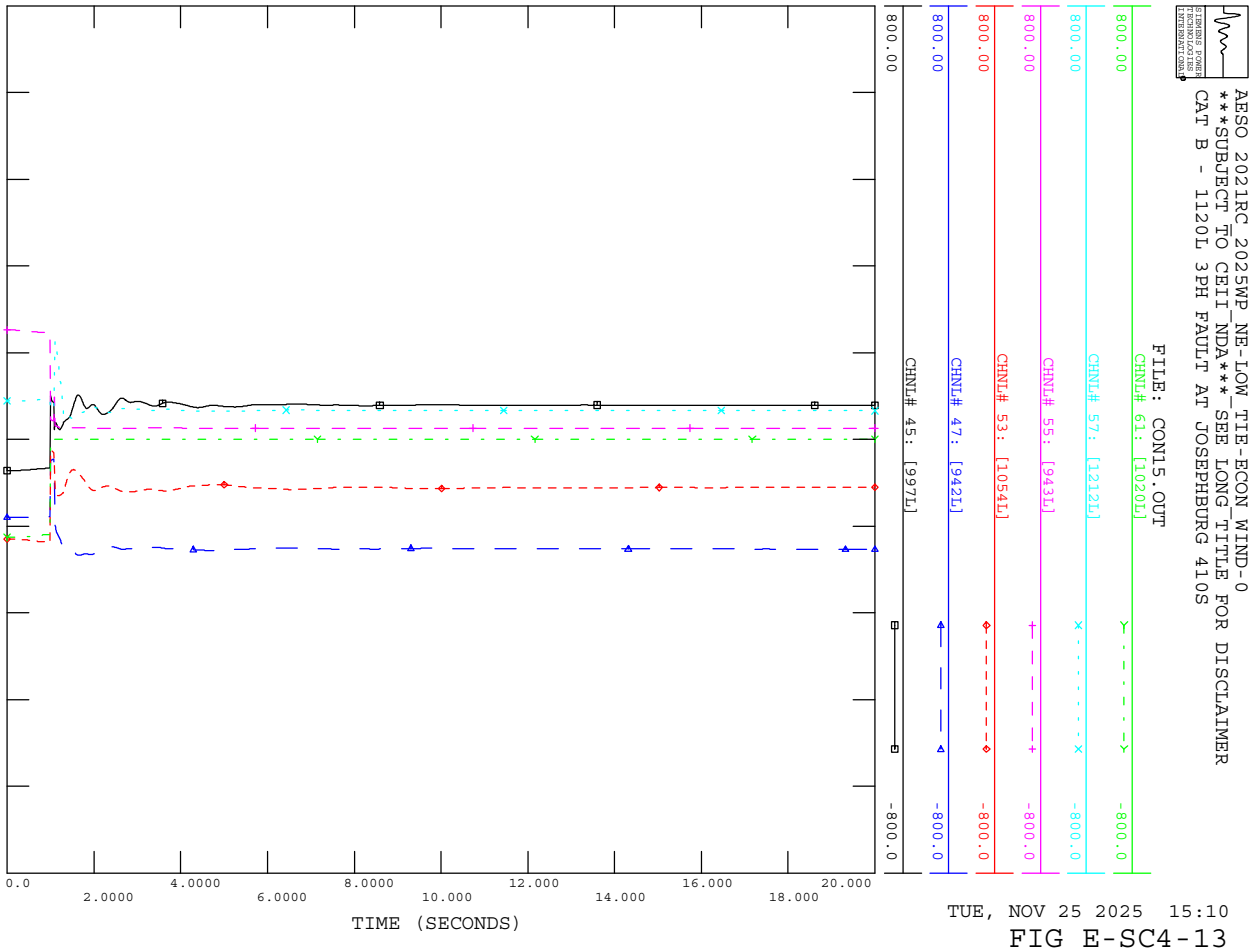


FIG E-SC4-13

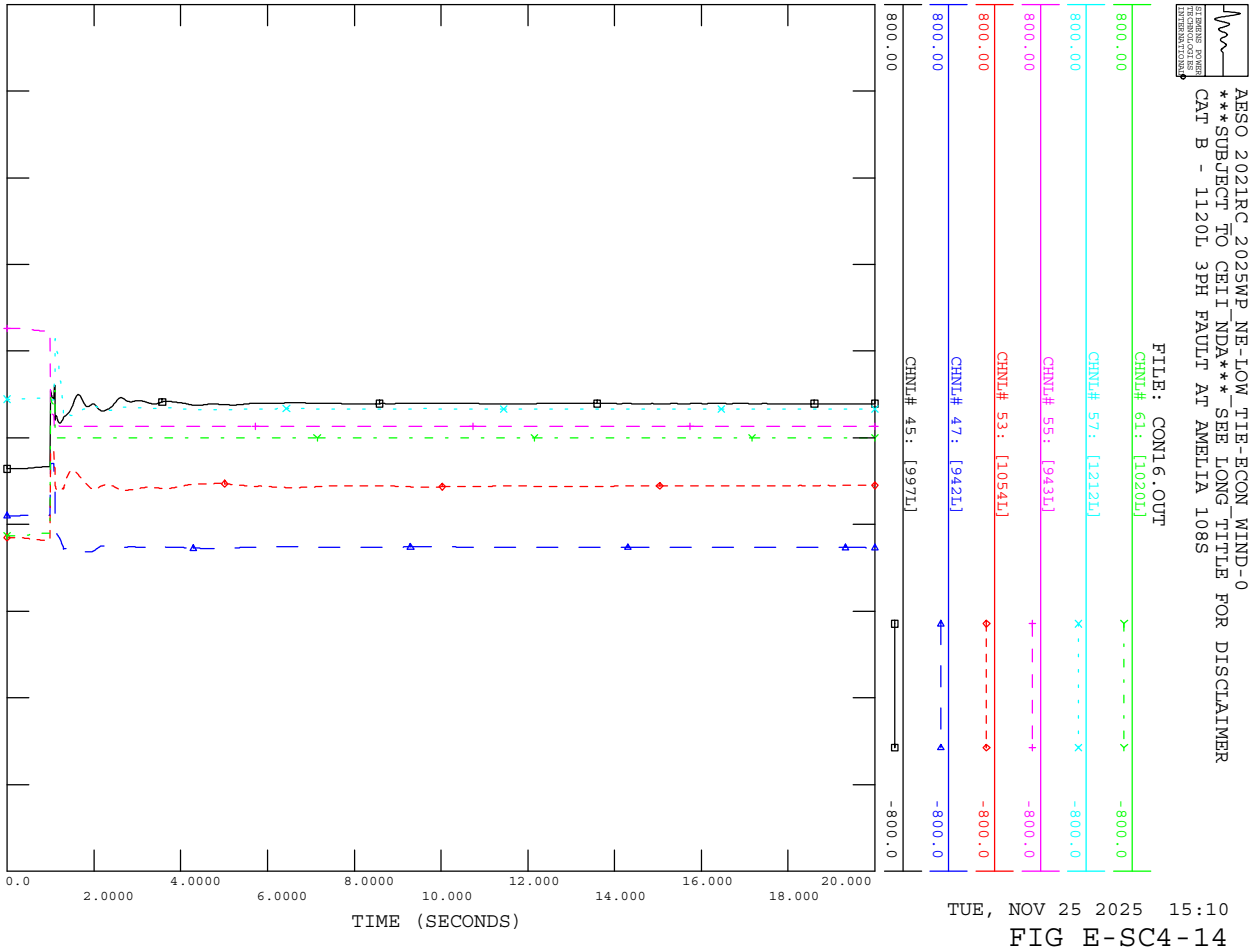


FIG E-SC4-14

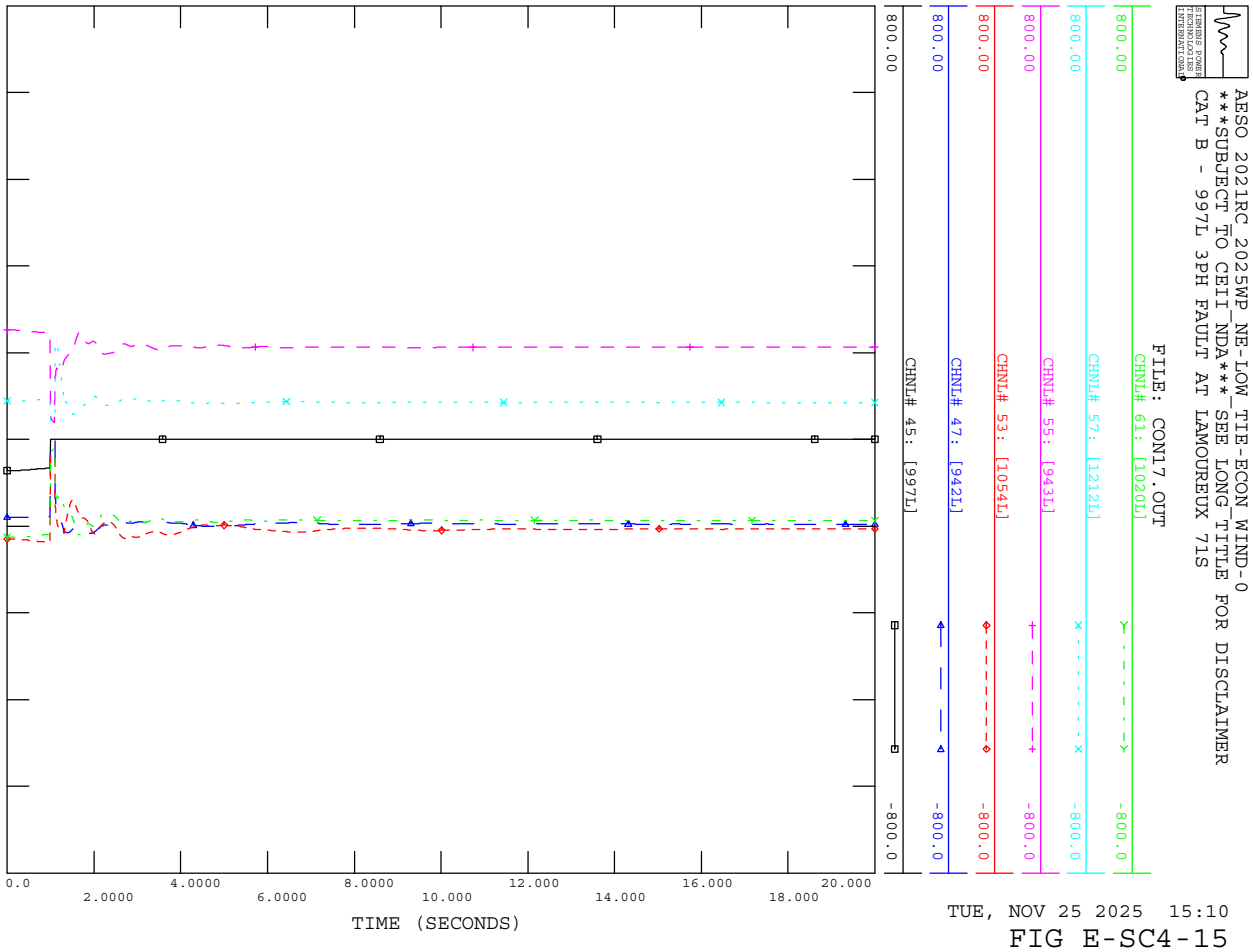


FIG E-SC4-15

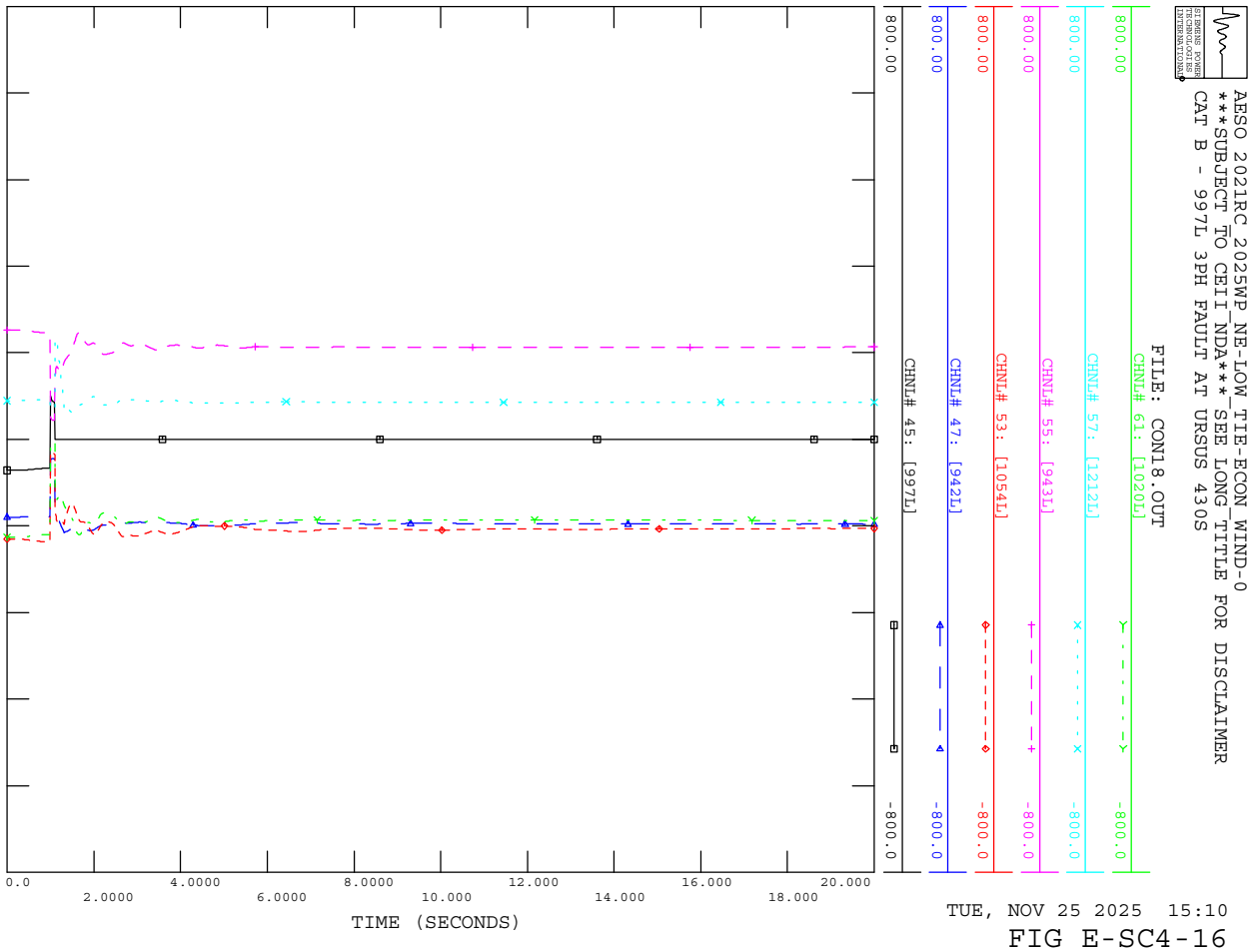


FIG E-SC4-16

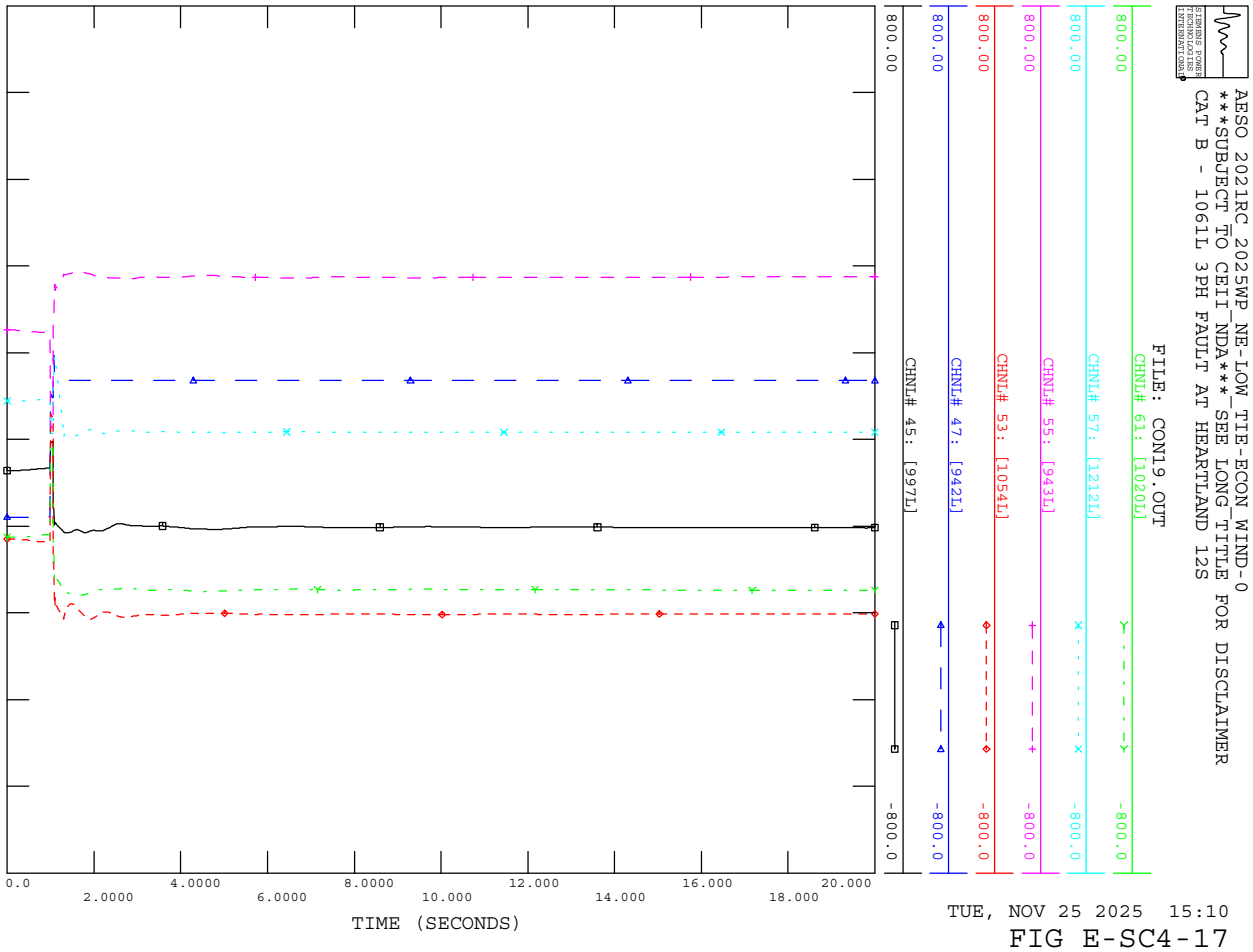


FIG E-SC4-17

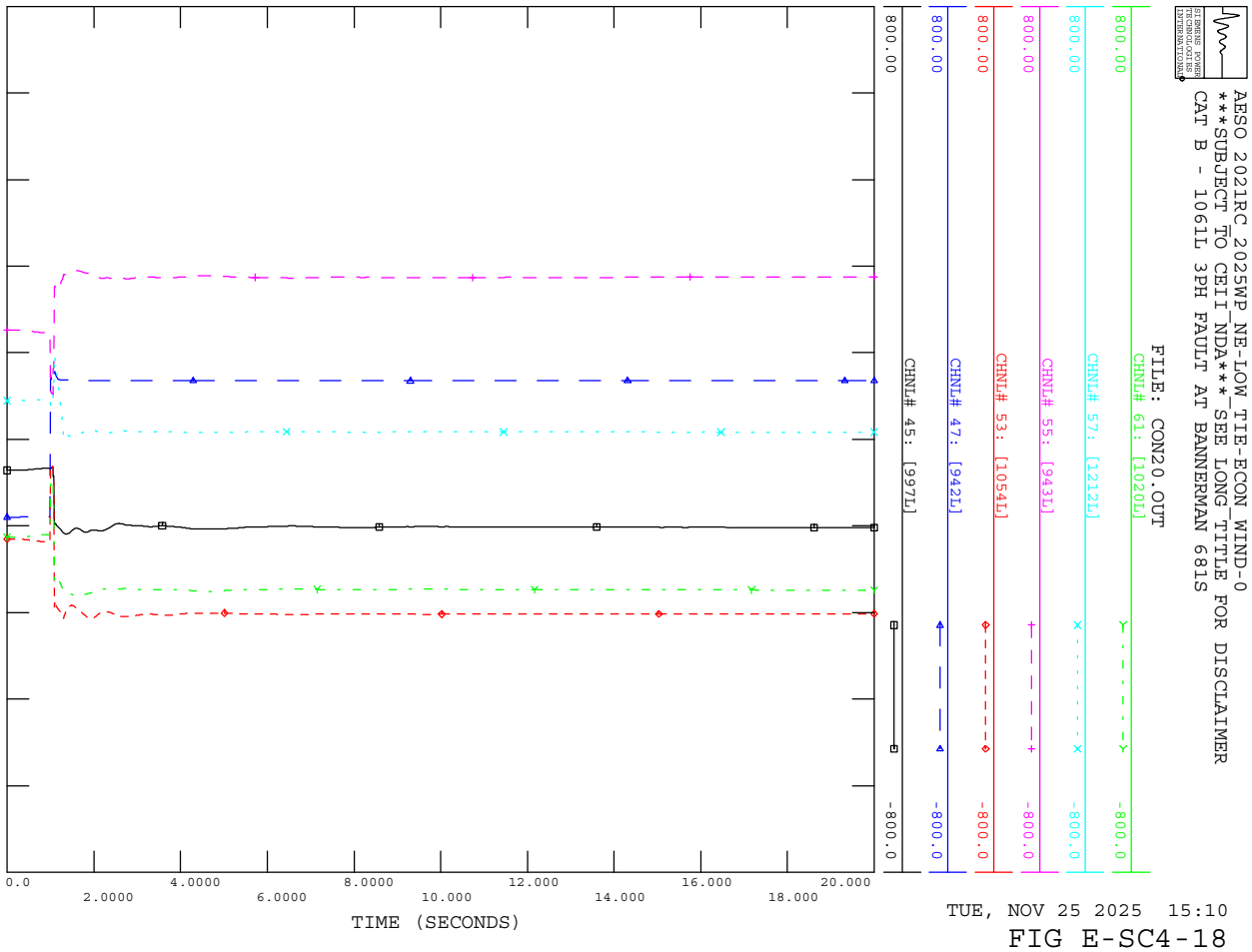


FIG E-SC4-18

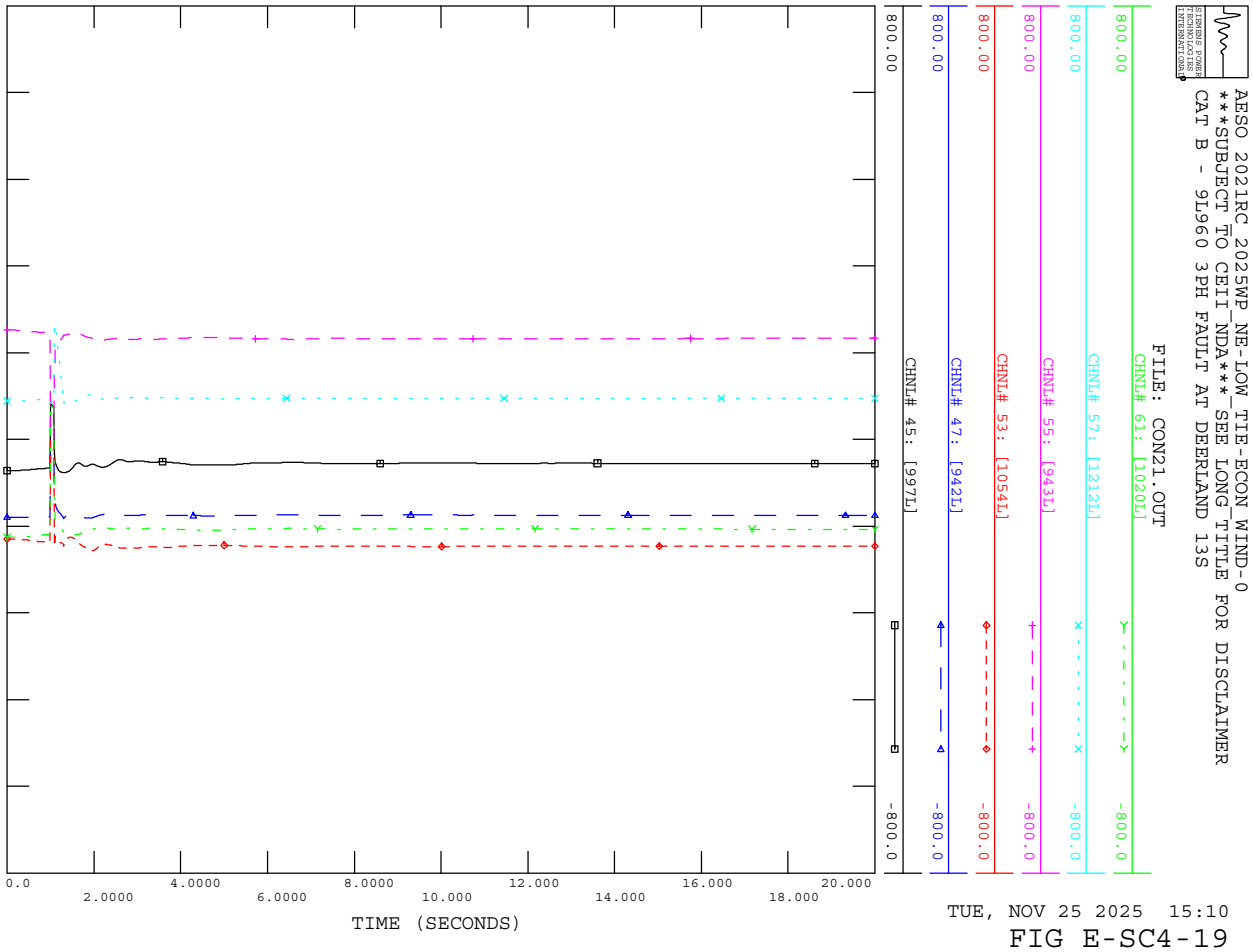


FIG E-SC4-19

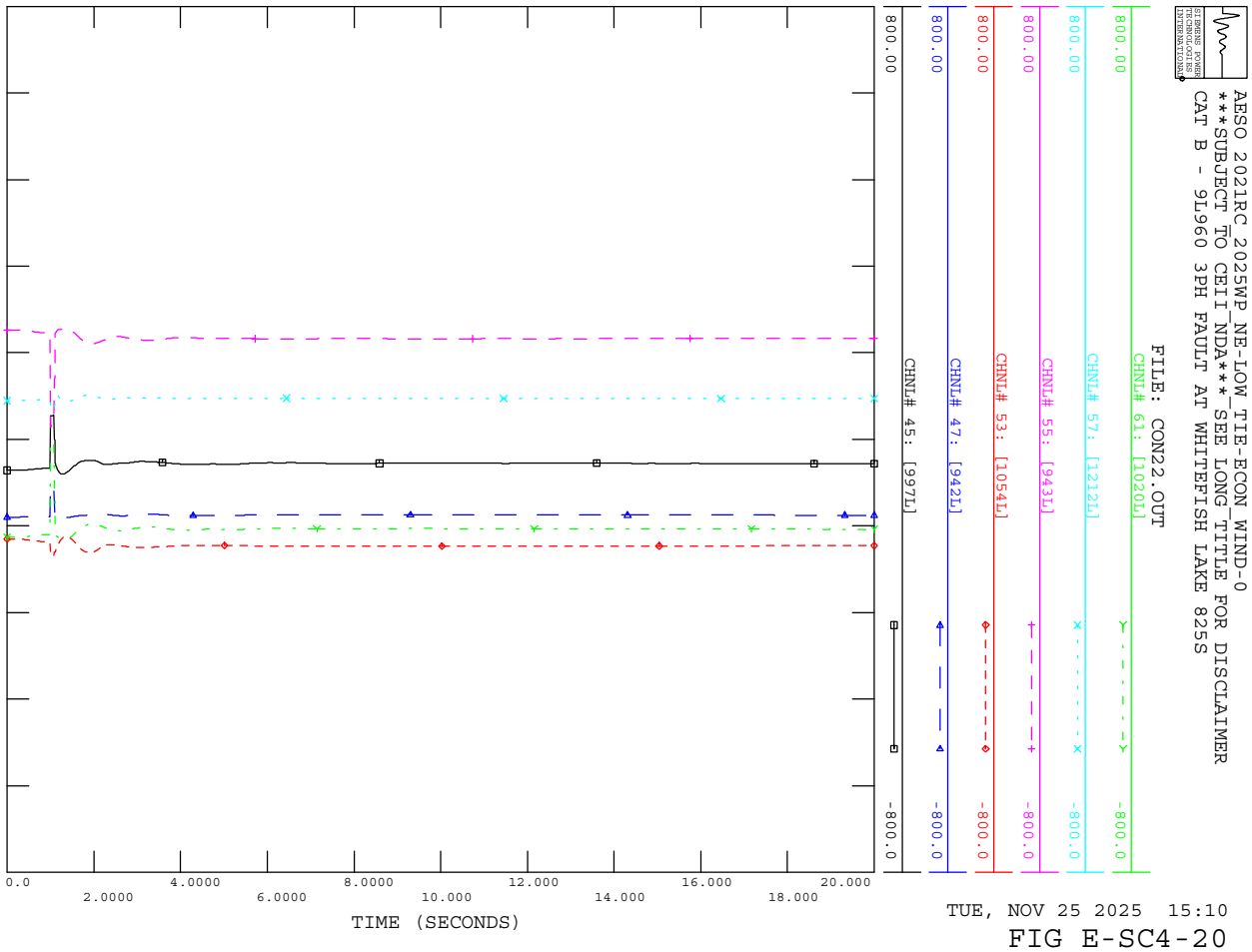


FIG E-SC4-20

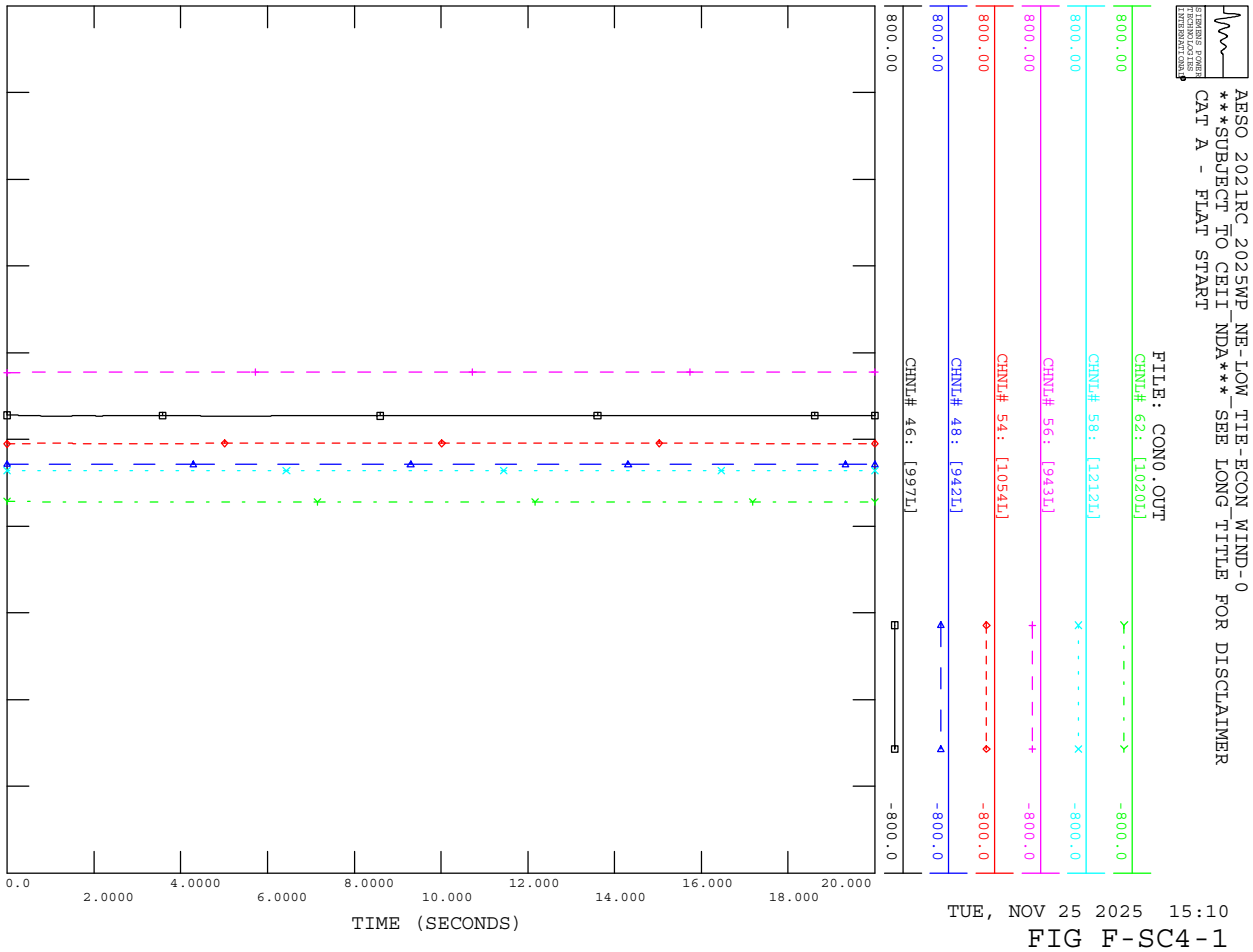


FIG F-SC4-1

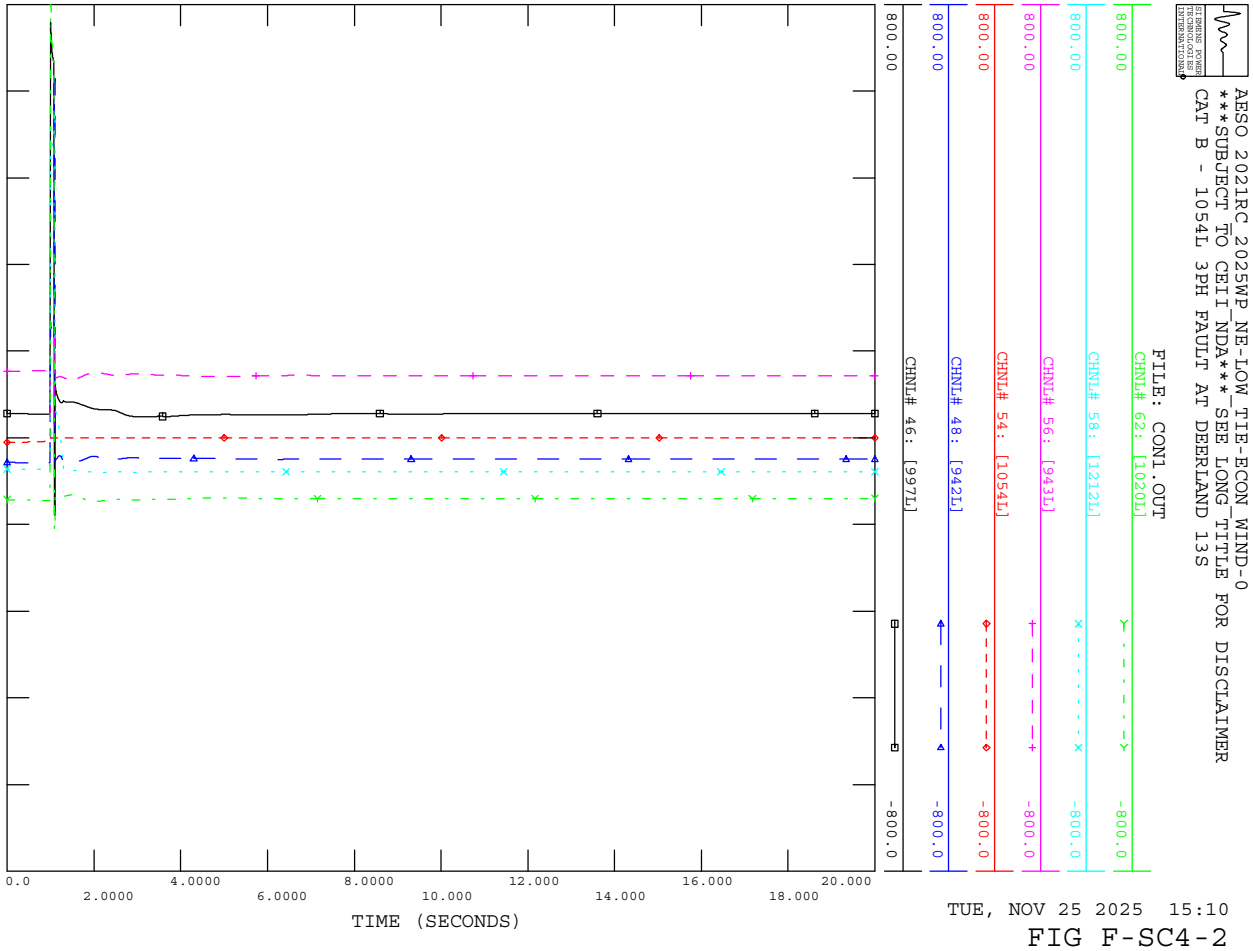


FIG F-SC4-2

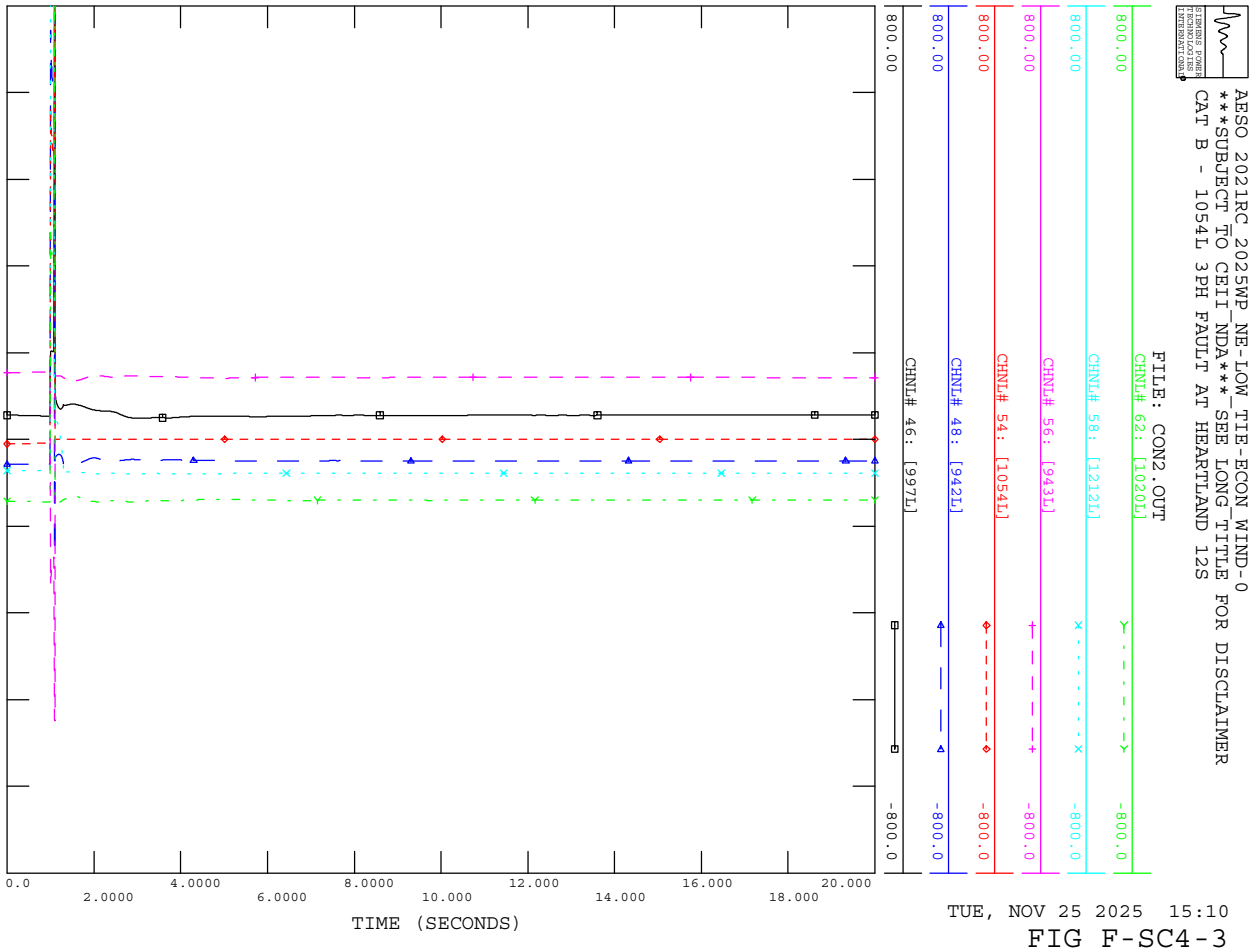


FIG F-SC4-3

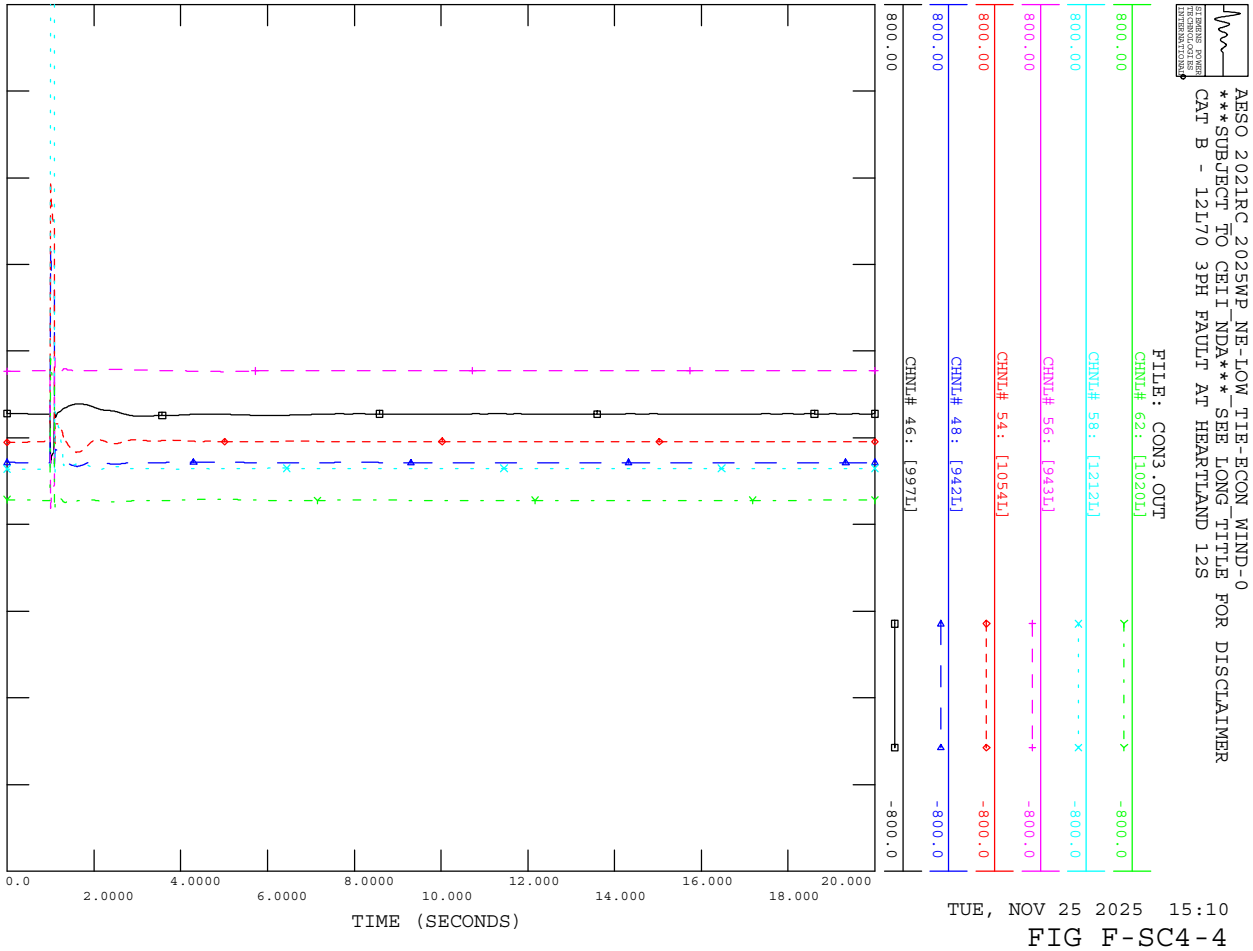


FIG F-SC4-4

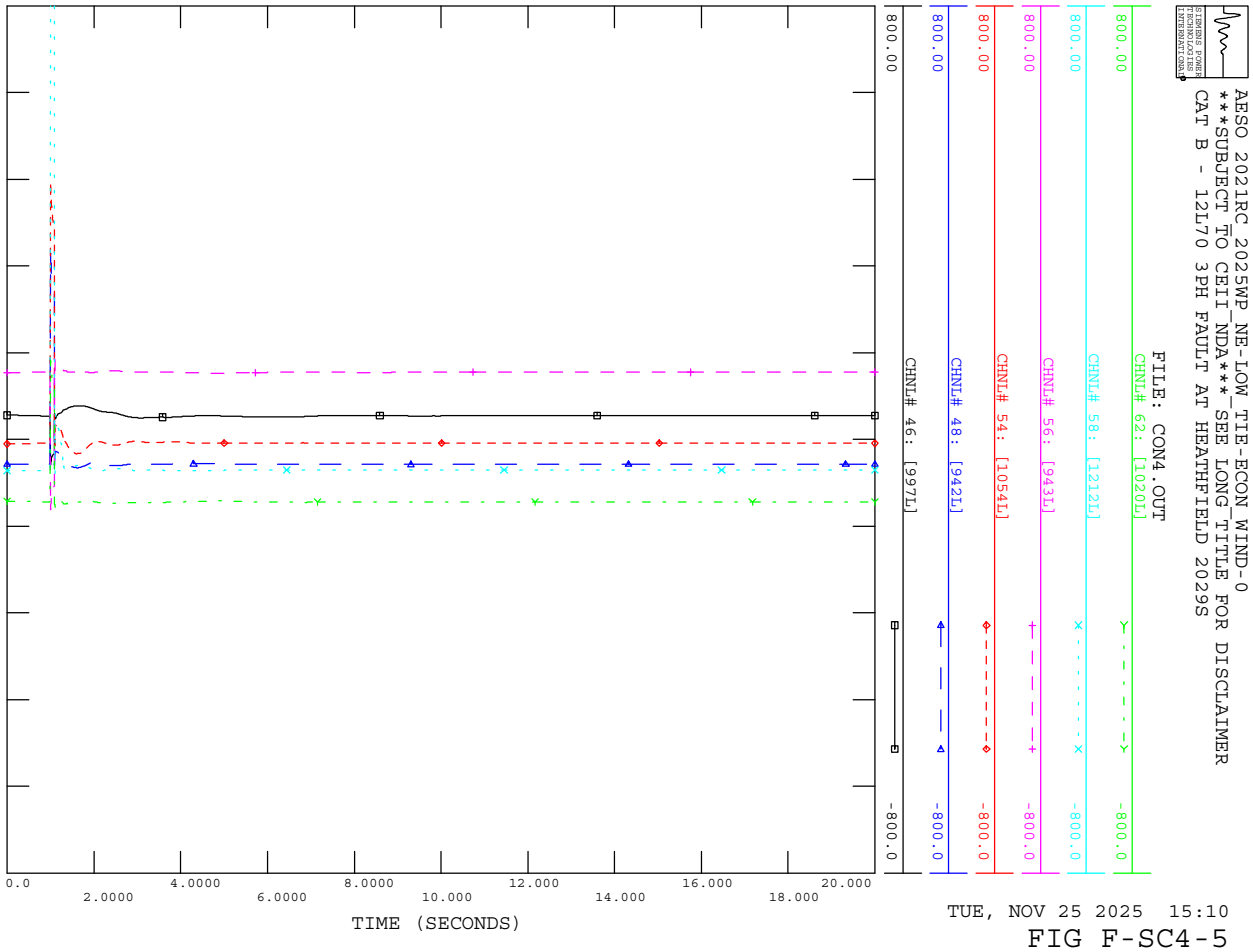


FIG F-SC4-5

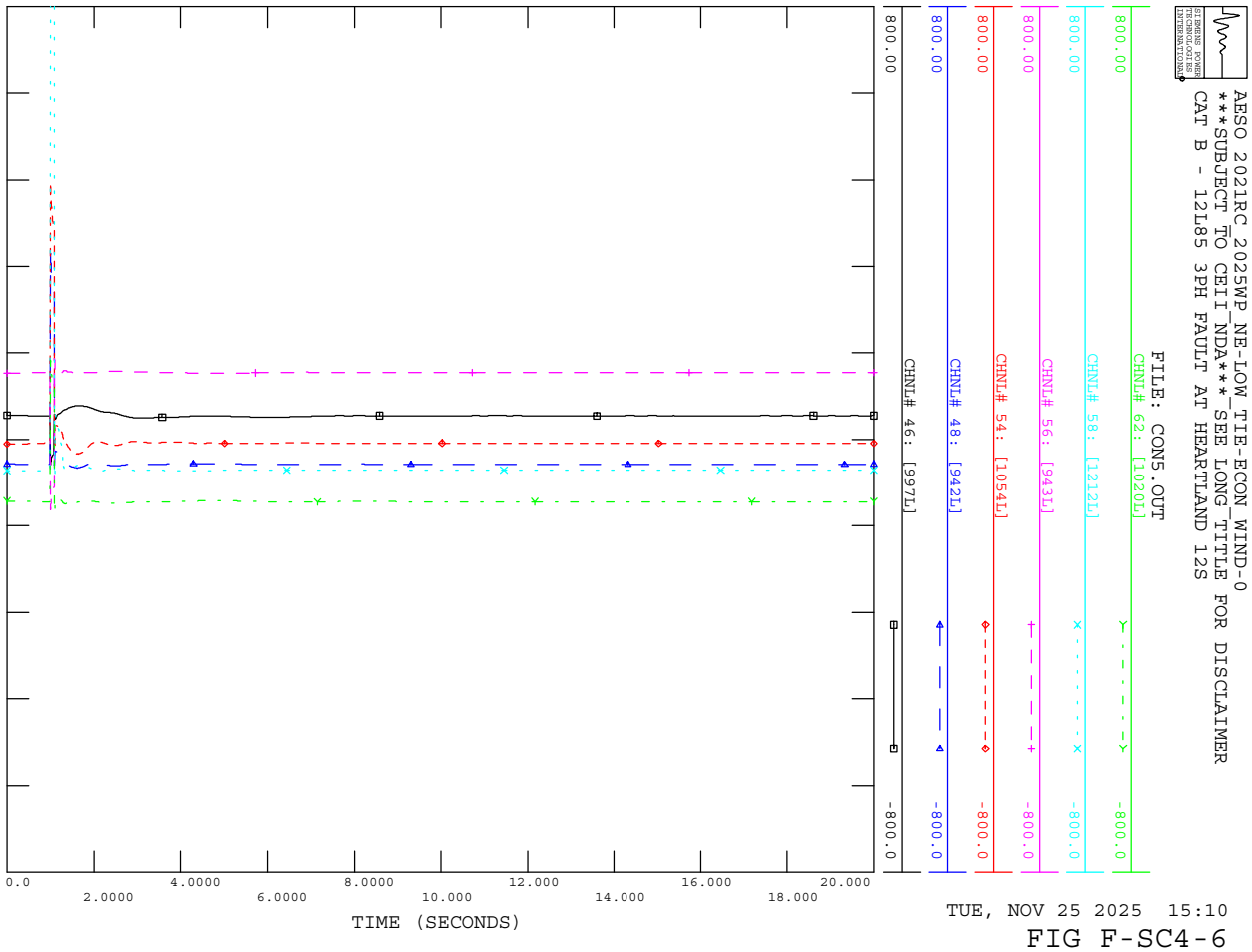


FIG F-SC4-6

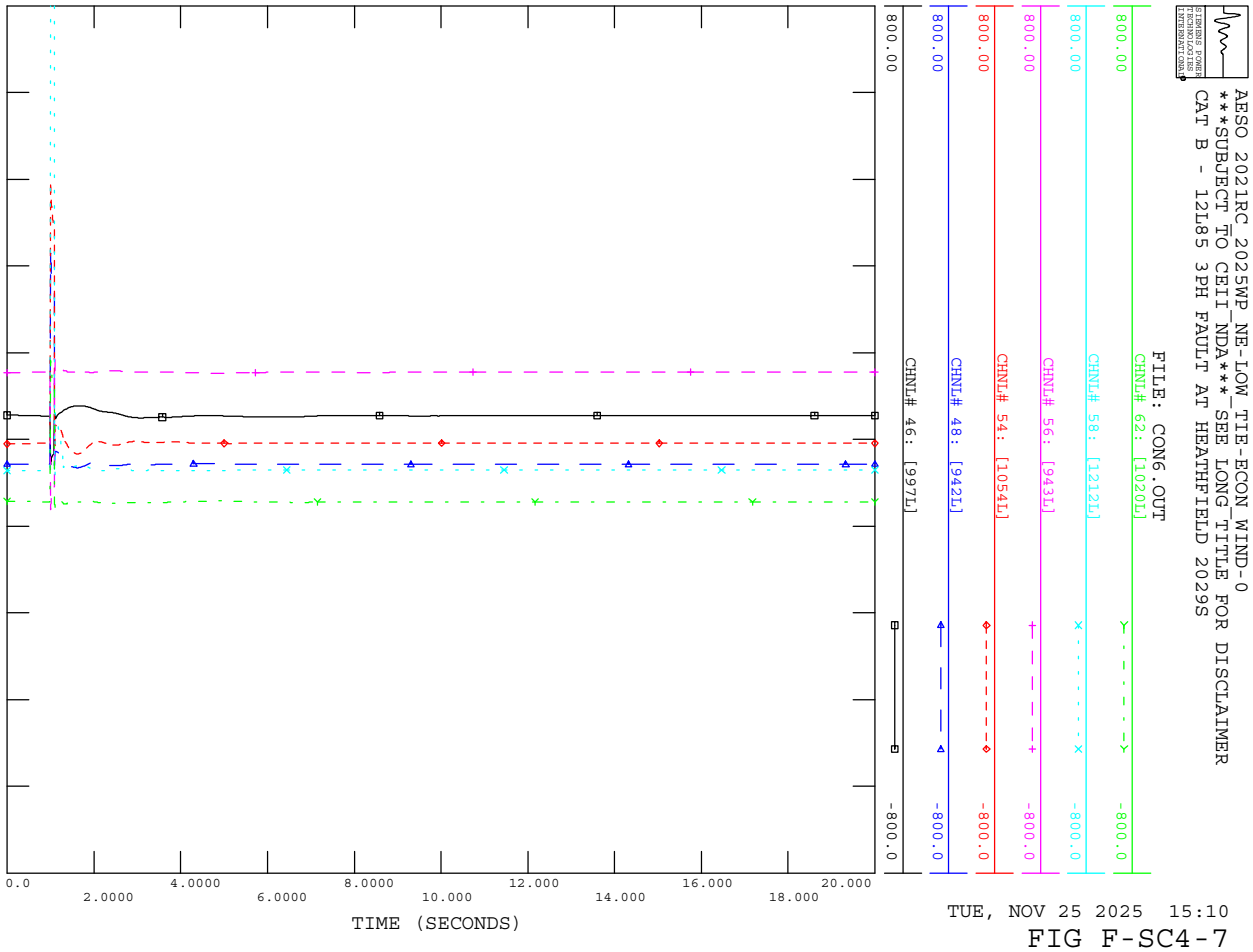


FIG F-SC4-7

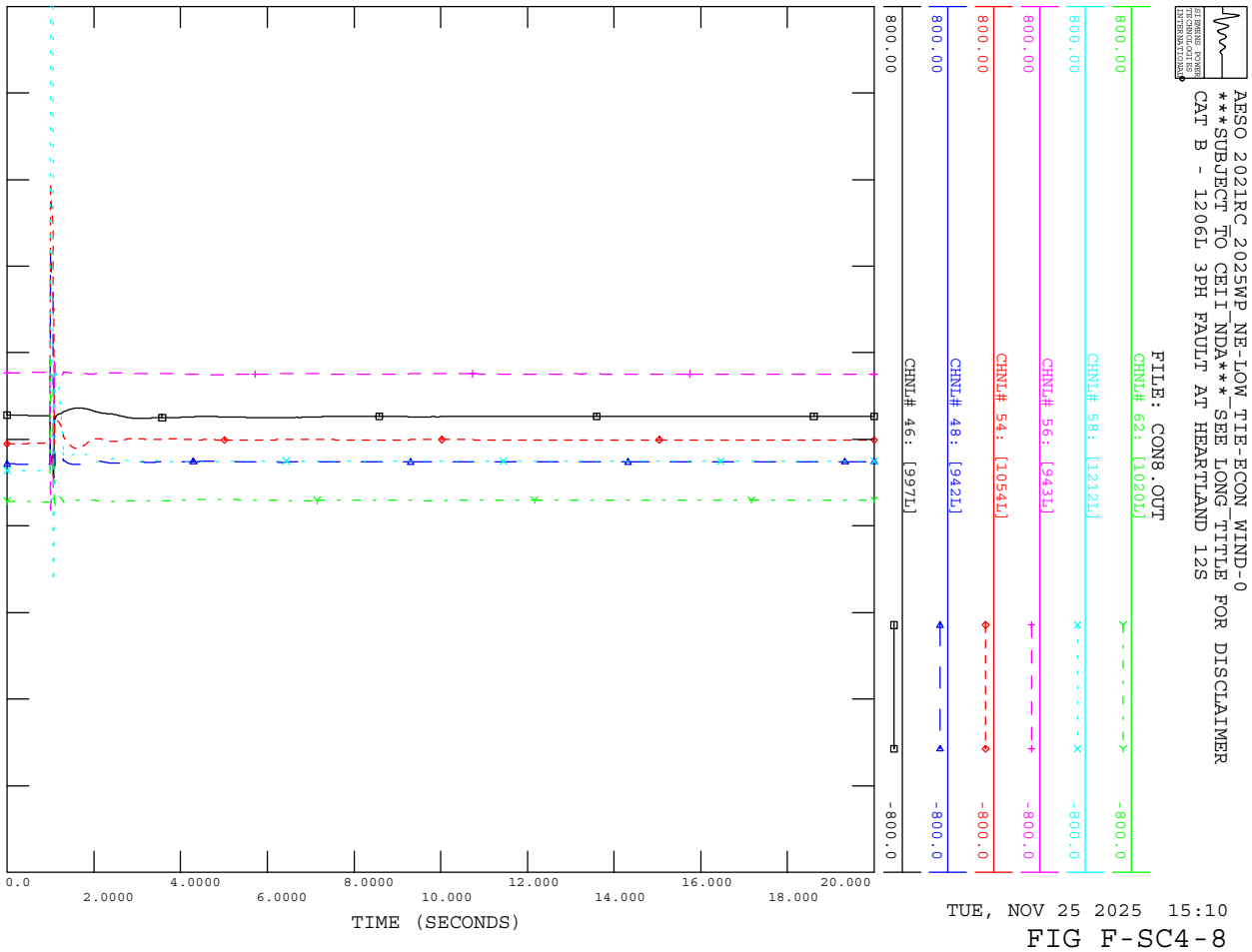


FIG F-SC4-8

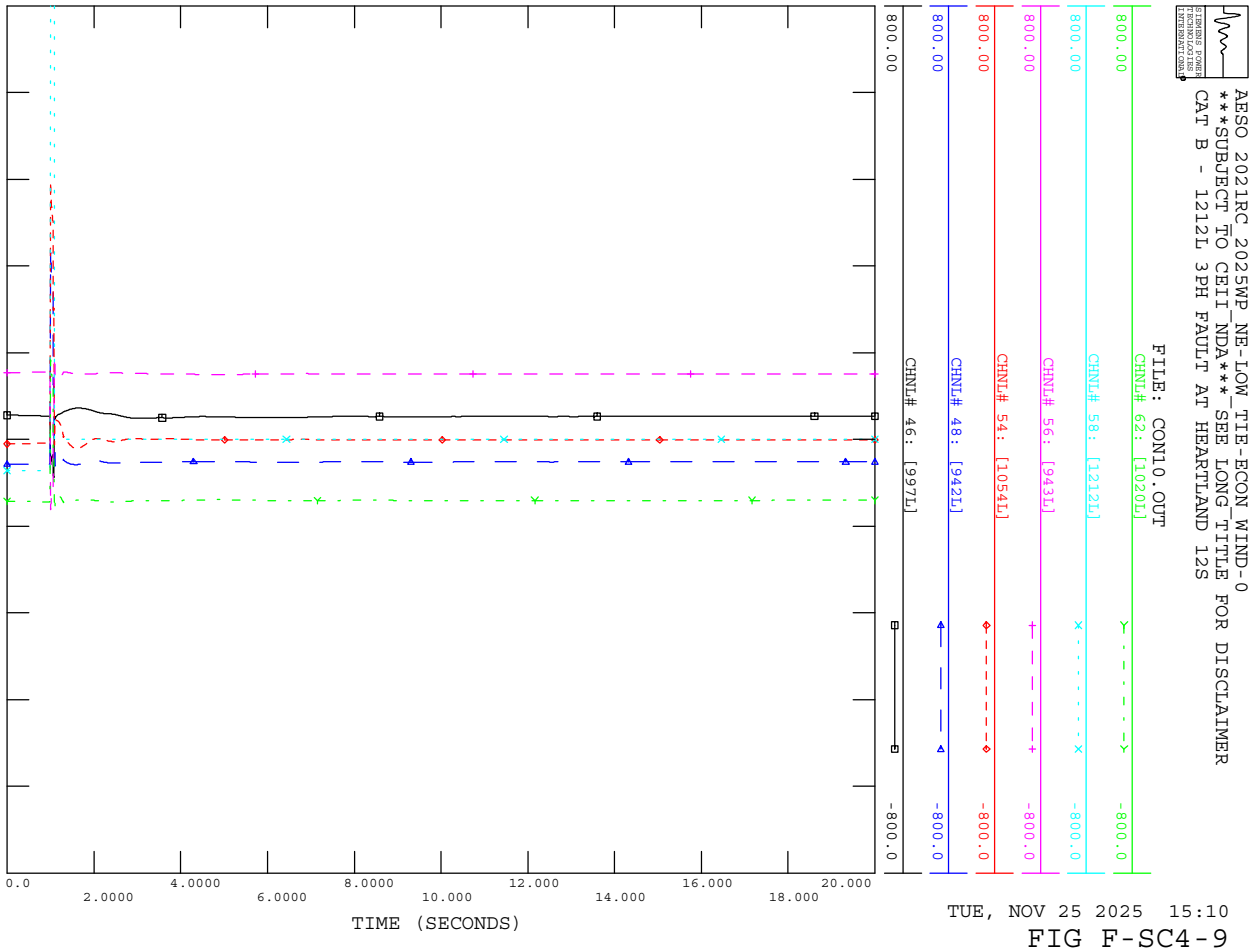


FIG F-SC4-9

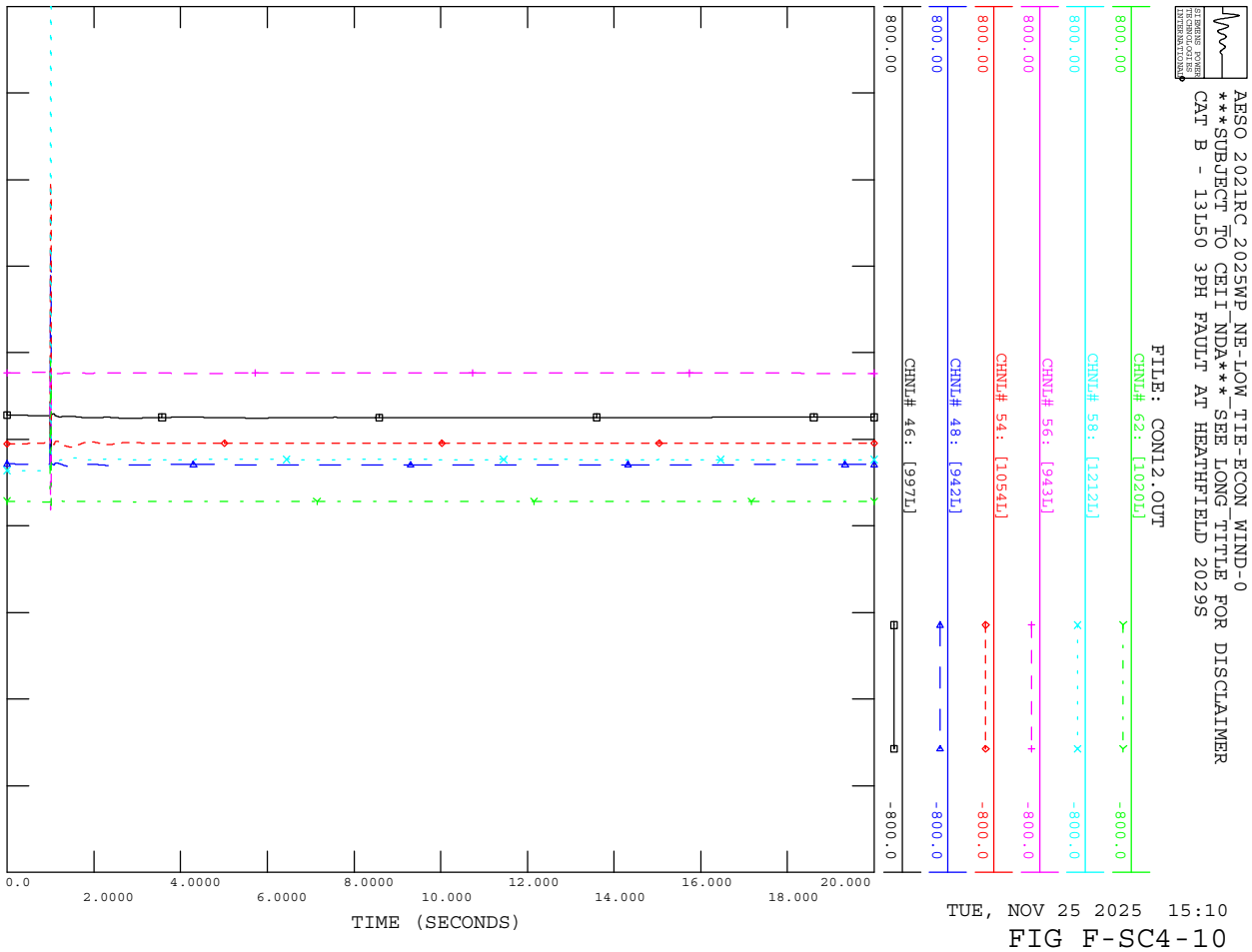


FIG F-SC4-10

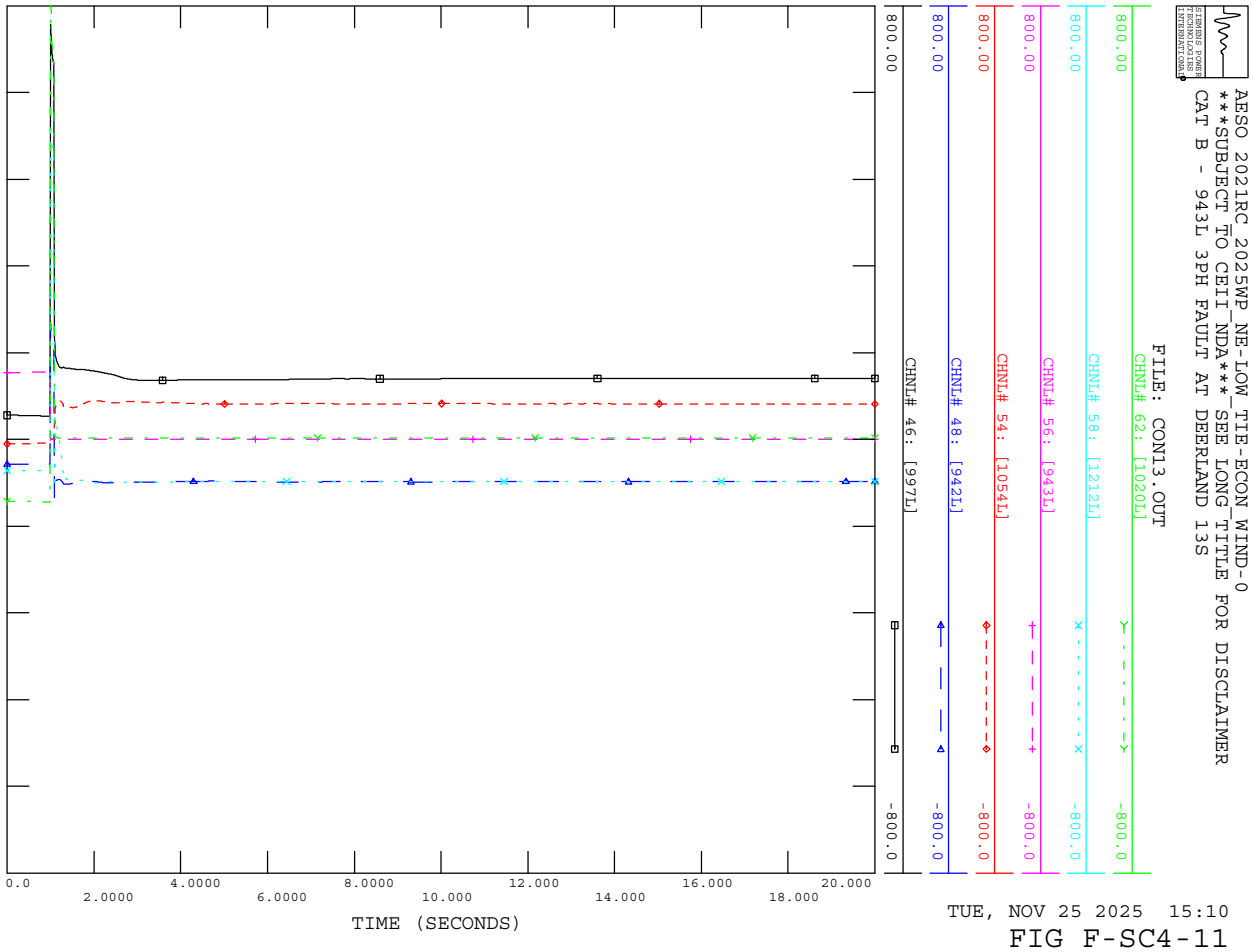


FIG F-SC4-11

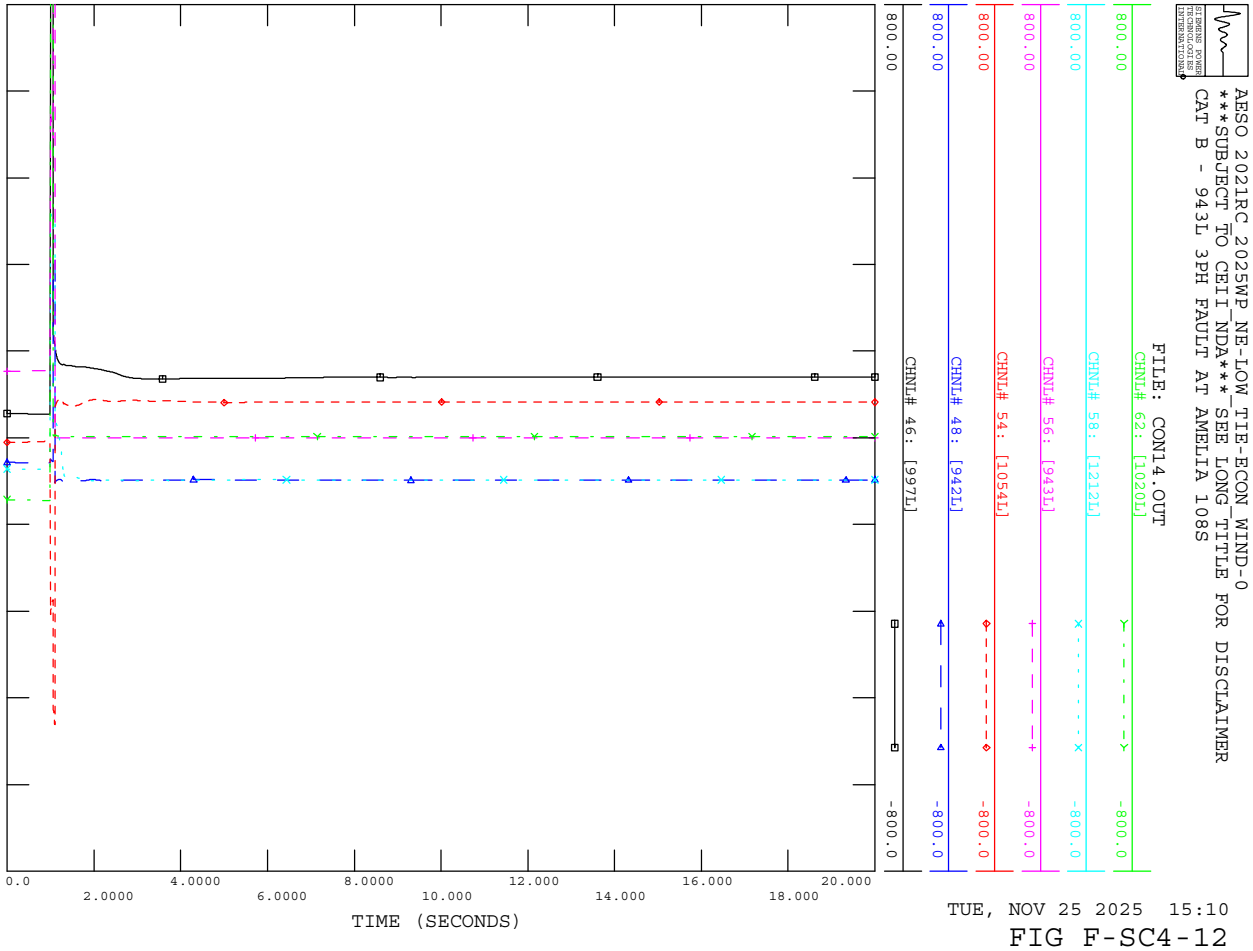


FIG F-SC4-12

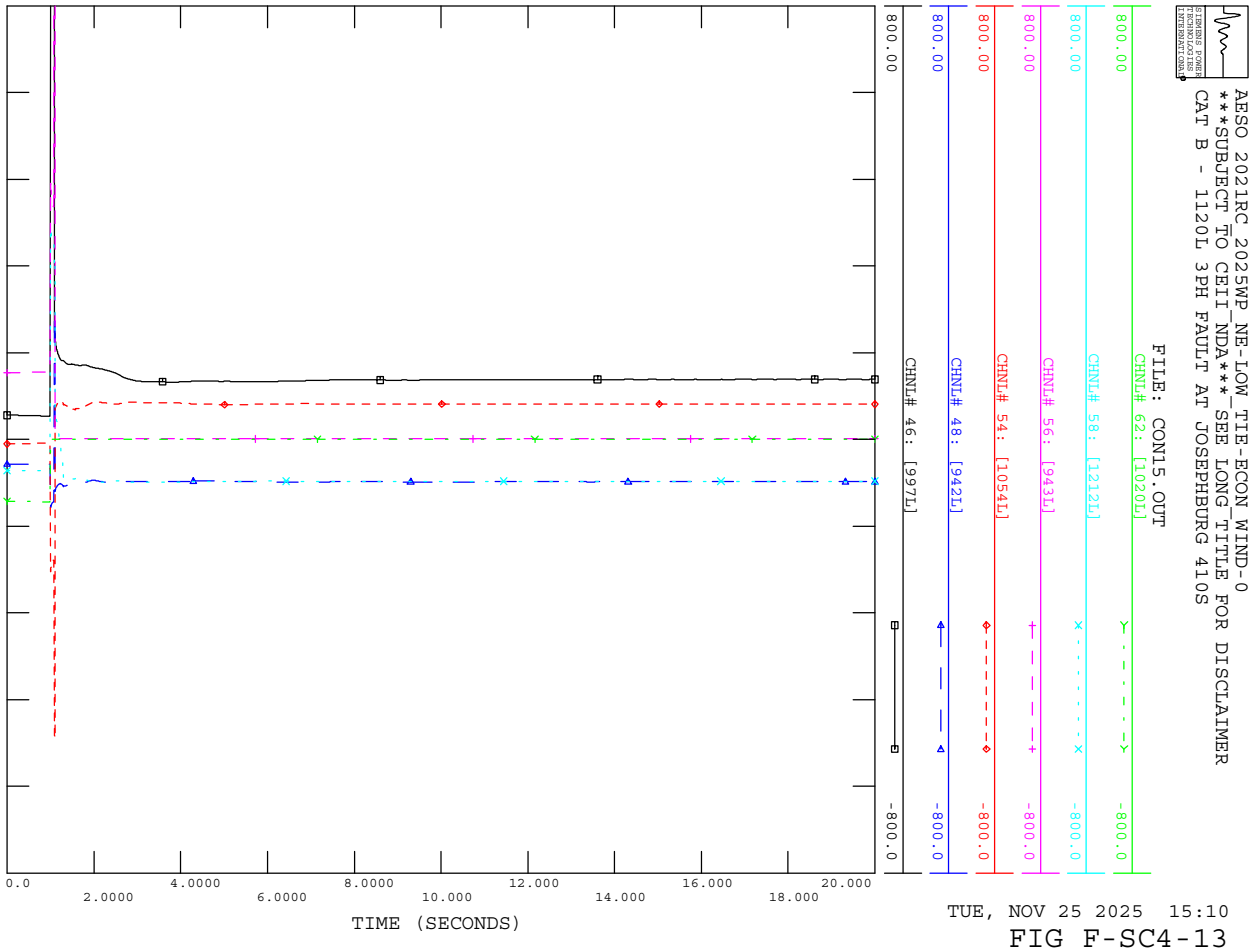


FIG F-SC4-13

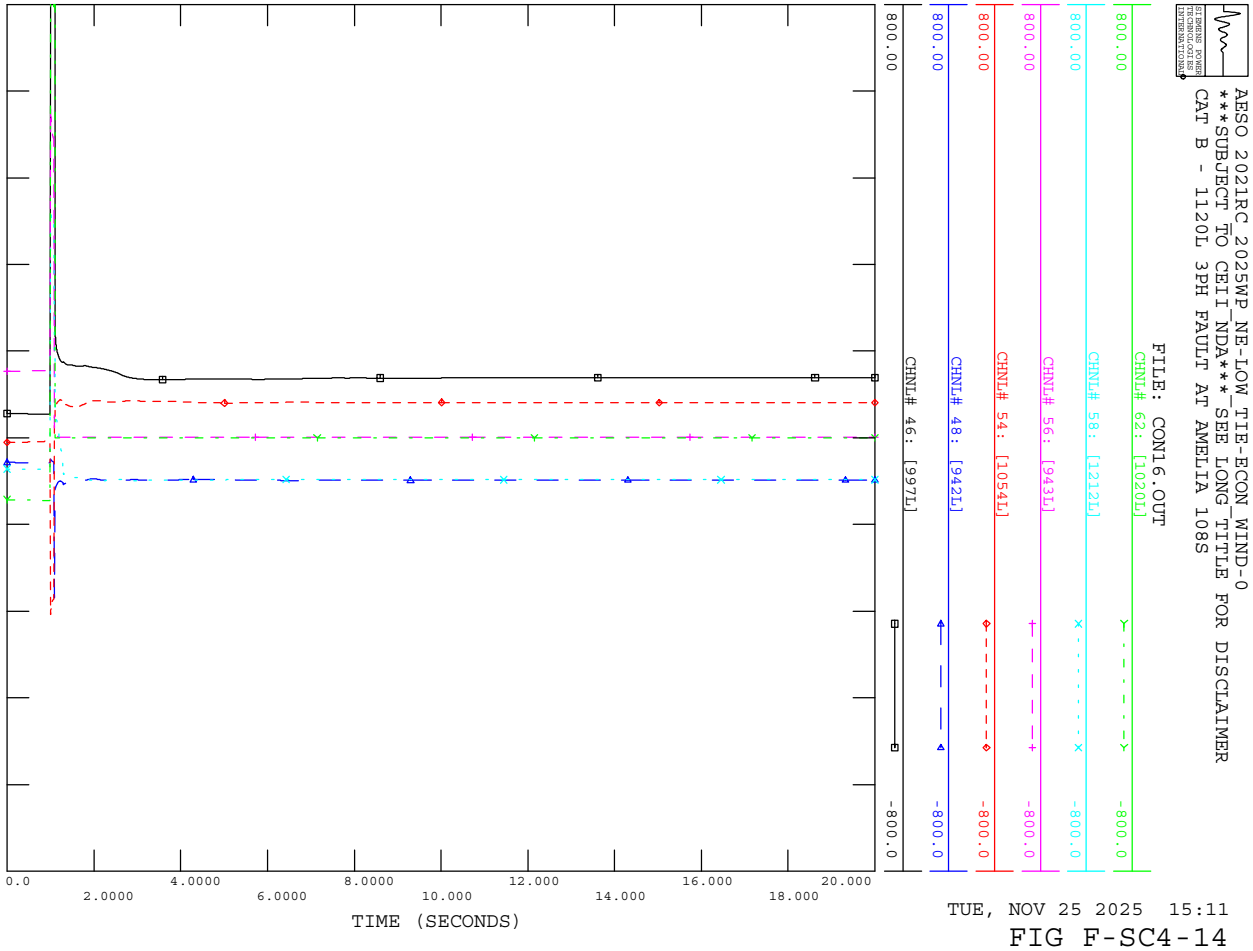


FIG F-SC4-14

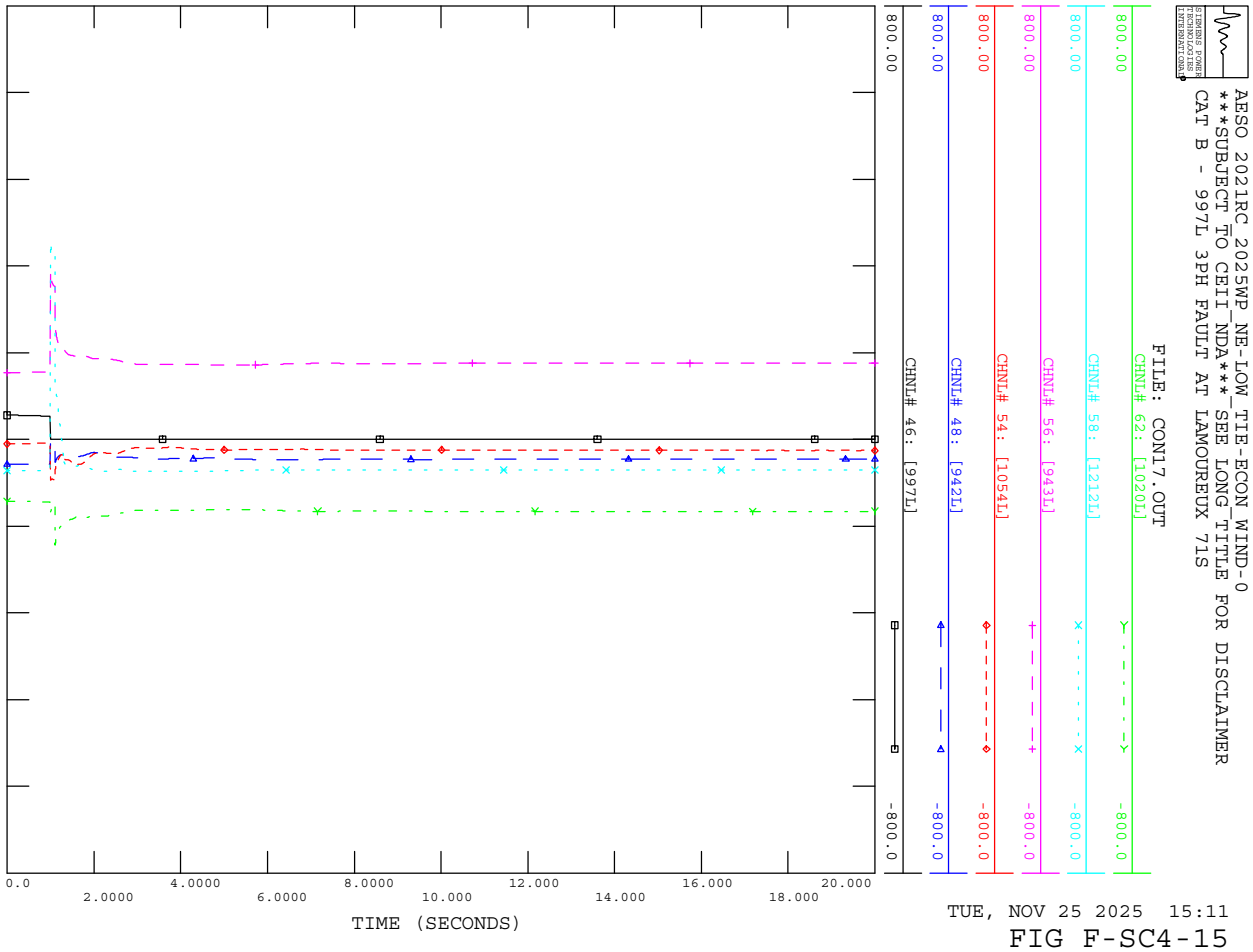


FIG F-SC4-15

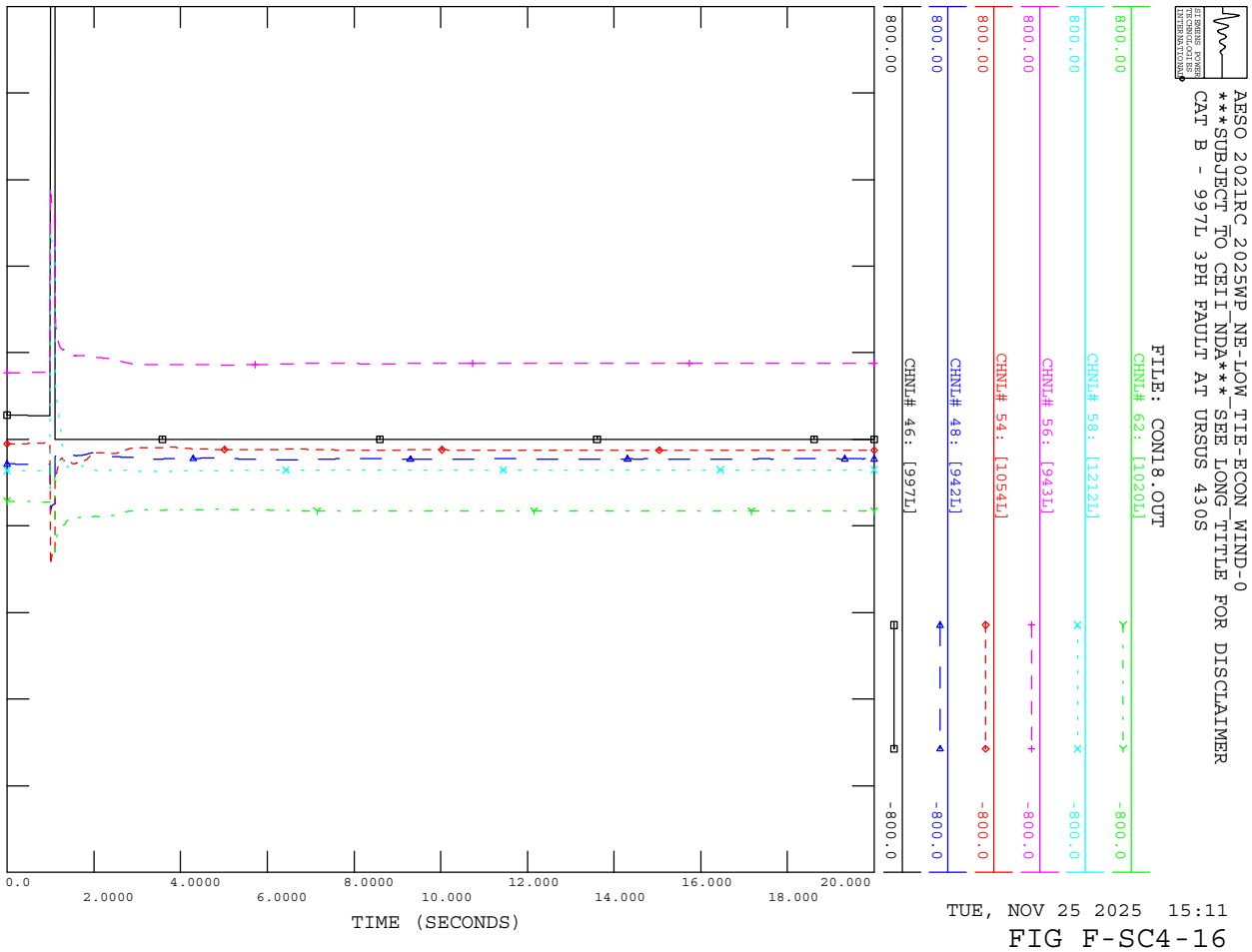


FIG F-SC4-16

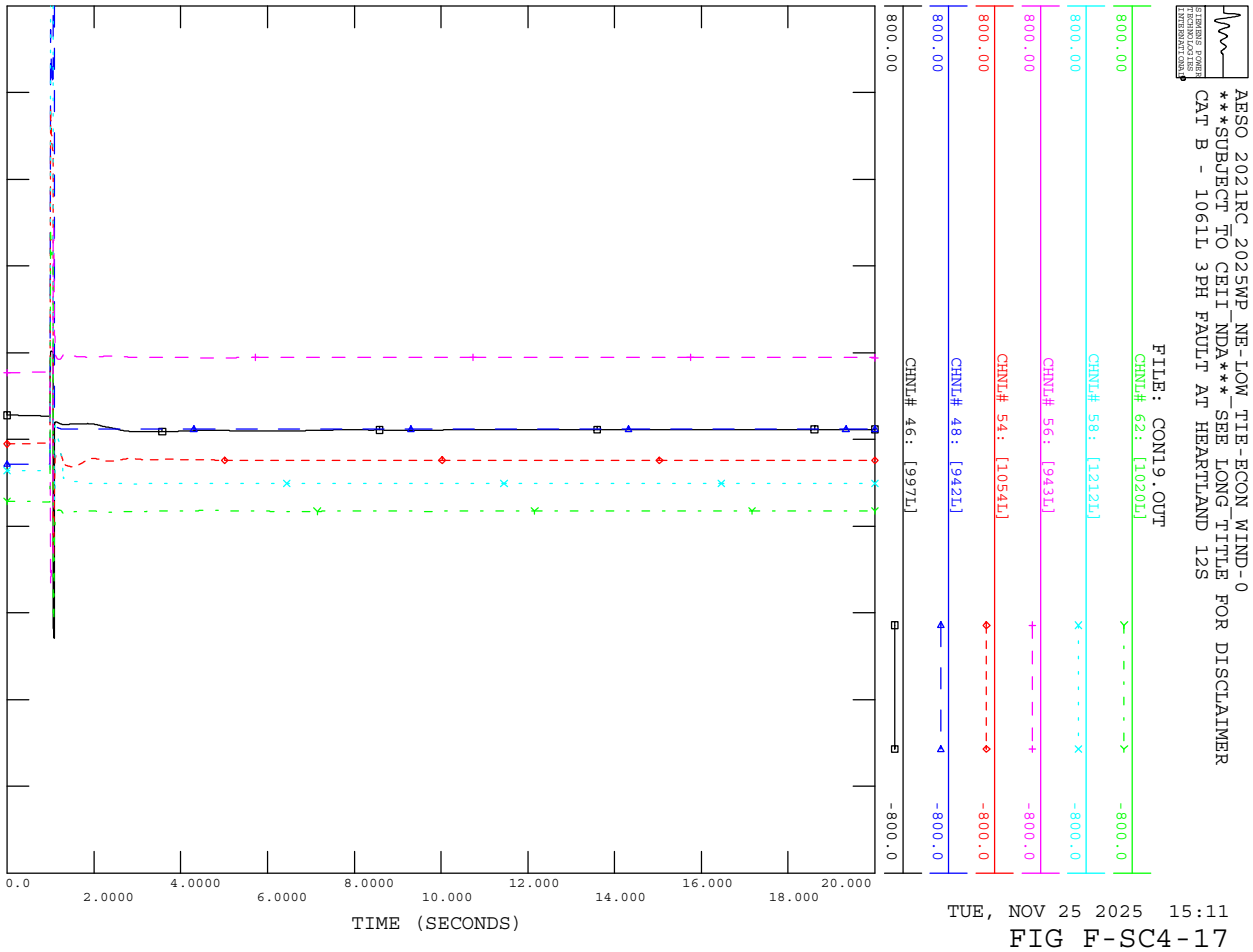


FIG F-SC4-17

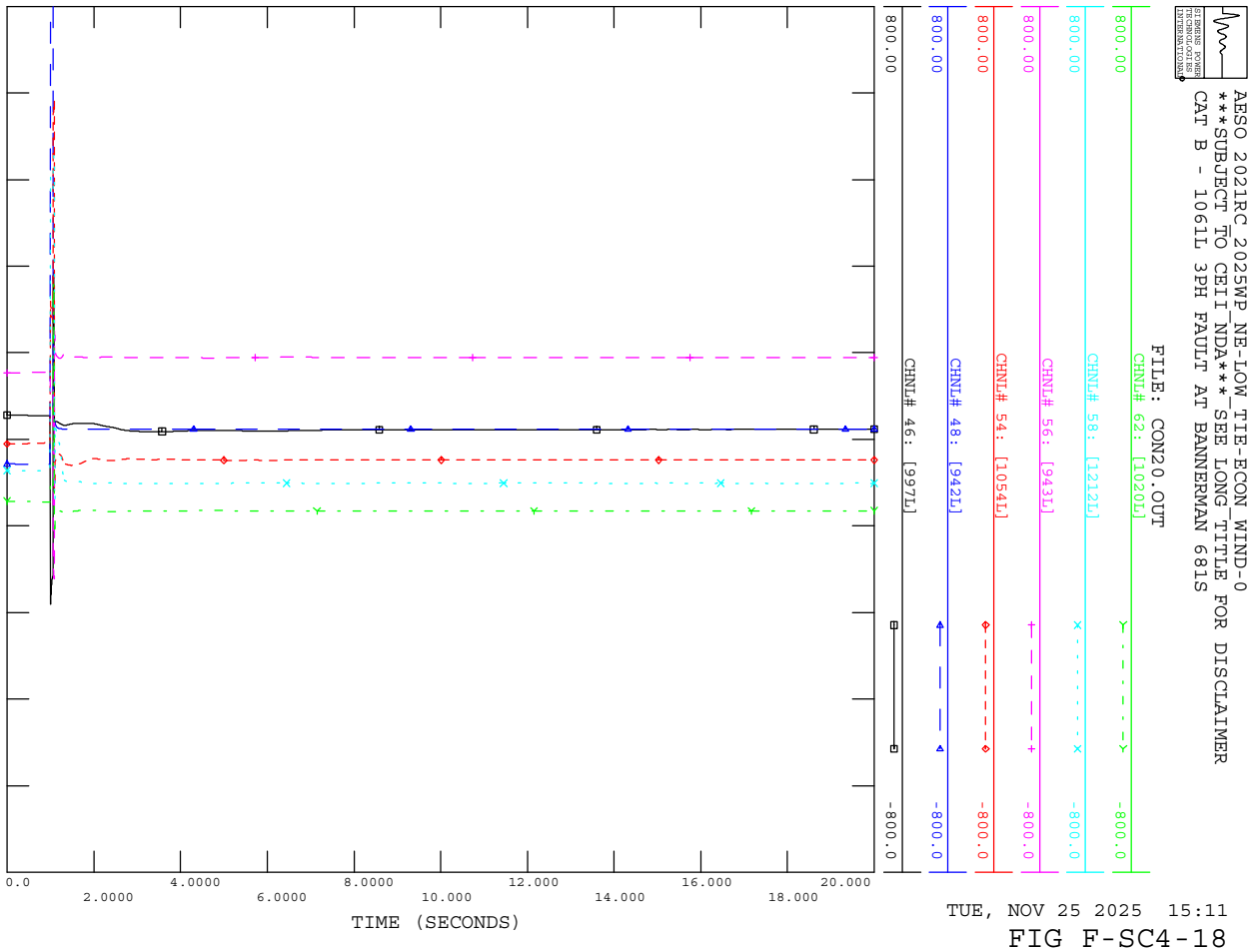


FIG F-SC4-18

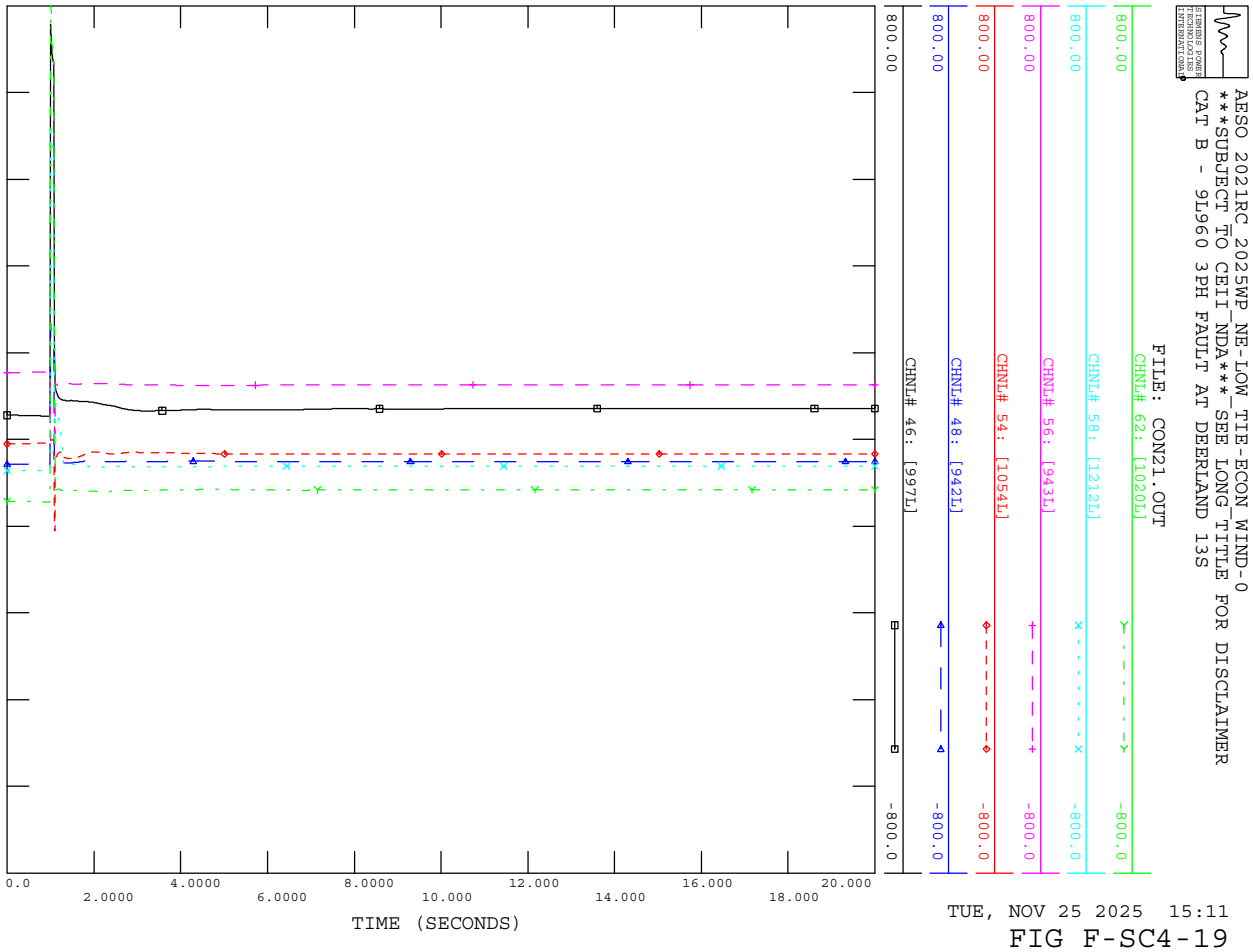


FIG F-SC4-19

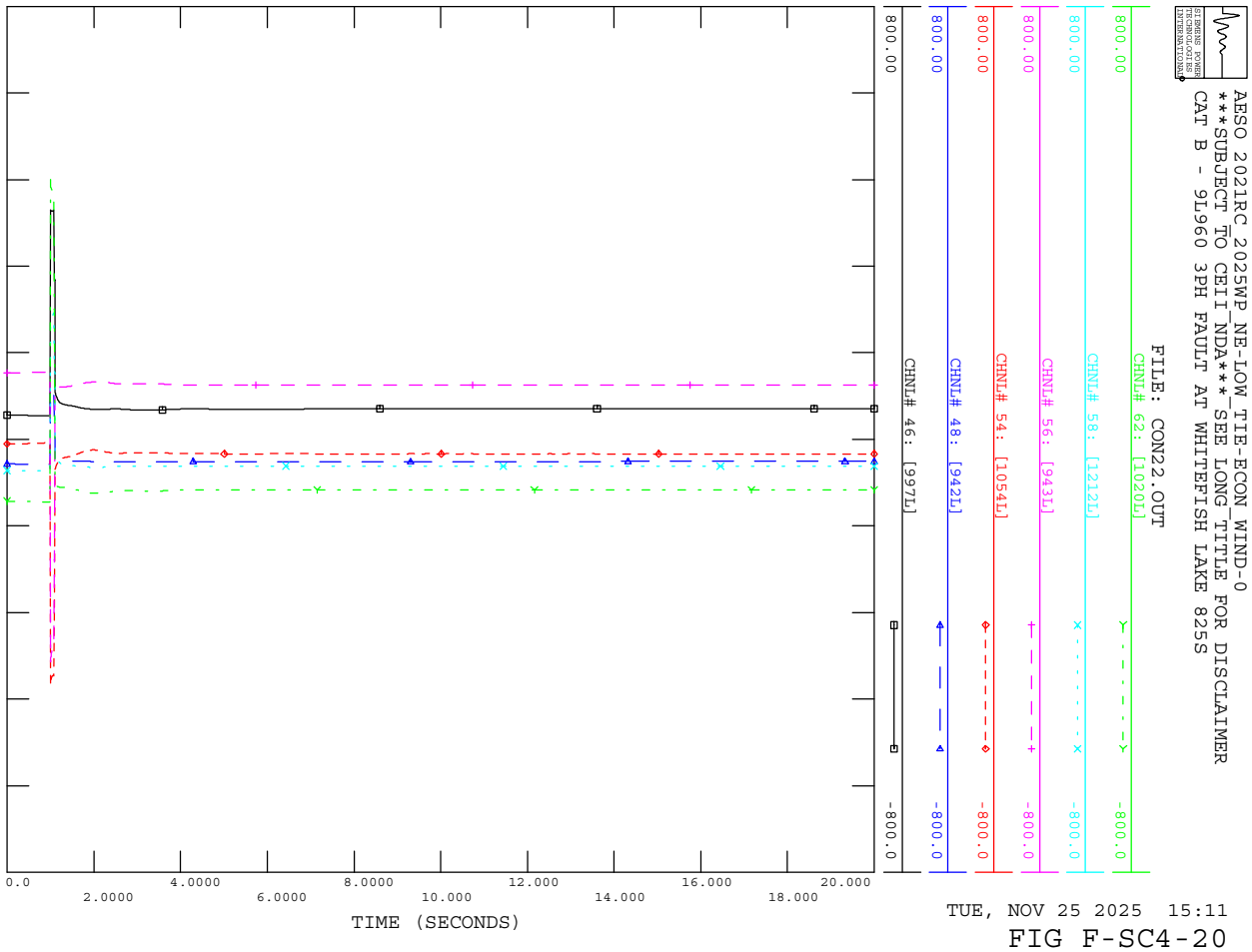


FIG F-SC4-20

Attachment A6
Motor Starting Performance Diagrams

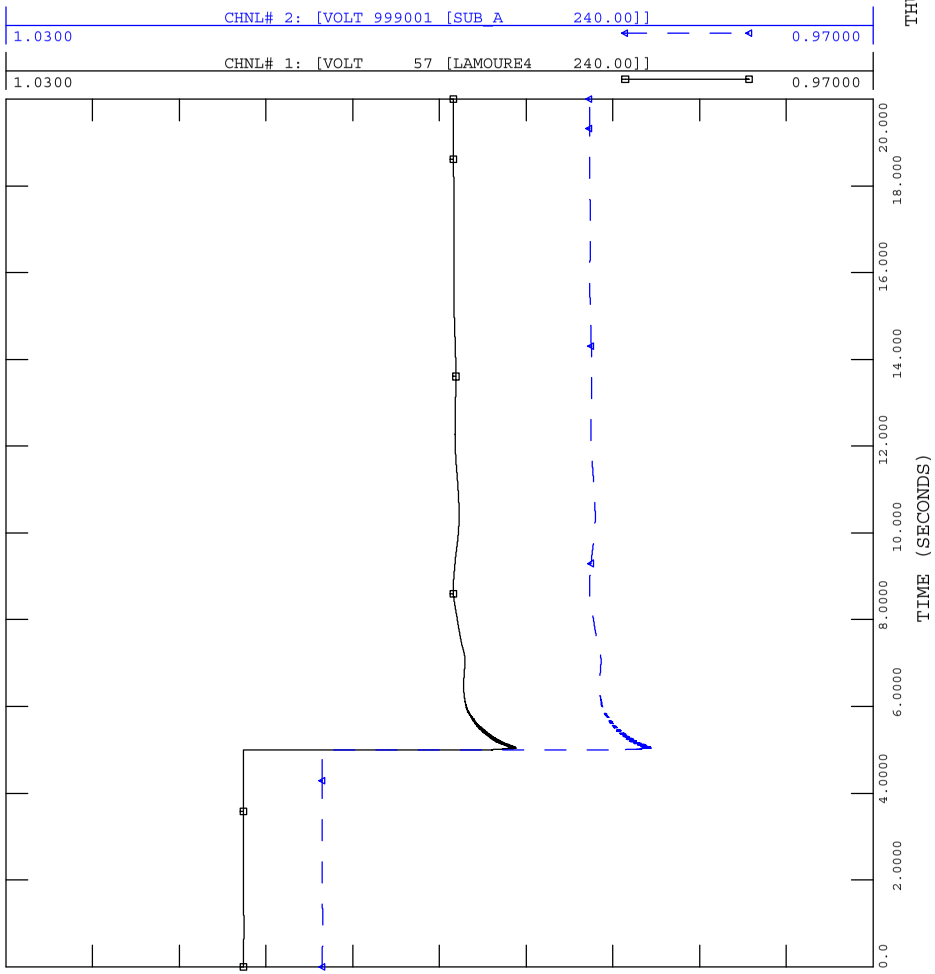
Table A6-1: List of 2025 Summer Peak Post-Project Motor Starting Diagrams

Figure	Category	Contingency
M-SC3-1	A (N-0)	System Normal
M-SC3-2	B (N-1)	Heartland 12S Transformer
M-SC3-3	B (N-1)	921L (Lamoureux 71S – Clover Bar 987S)
M-SC3-4	B (N-1)	L1 (Lamoureux 71S – Dow Substation A)

AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT A - (N-0) BASECASE

FILE: CON1.OUT

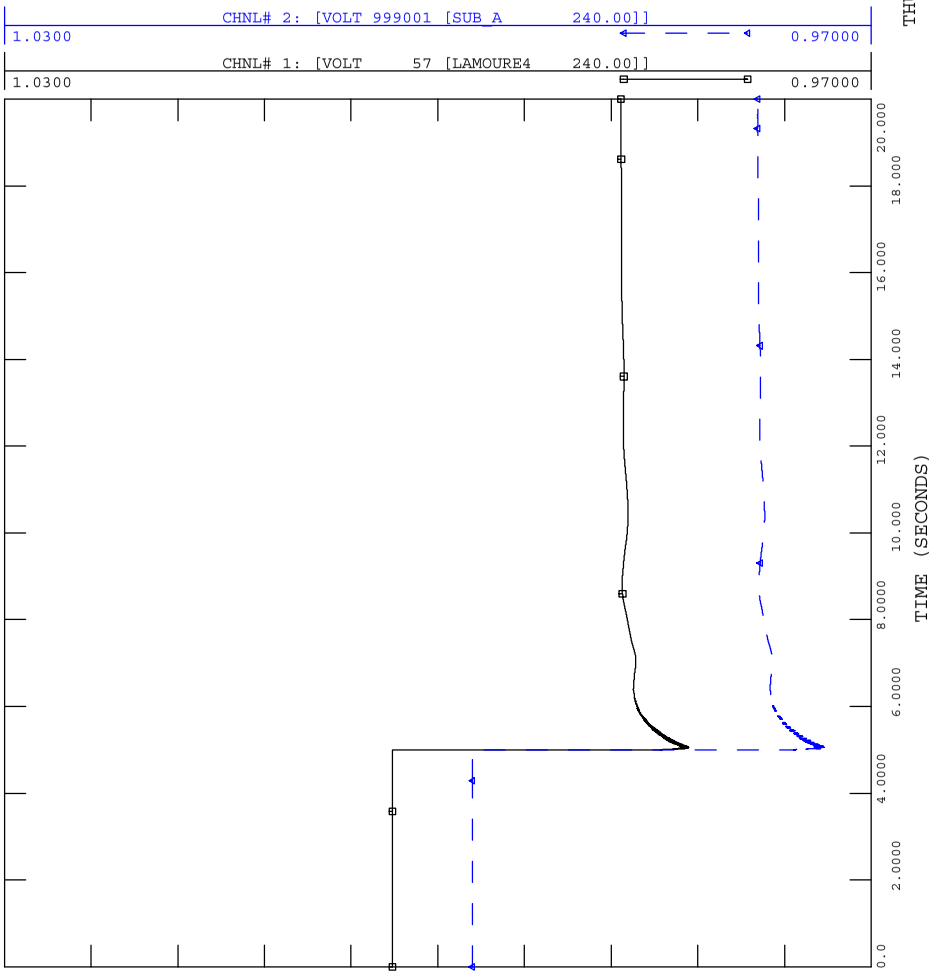
THU, NOV 27 2025 15:35
FIG M-SC3-1



AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - (N-1) HEARTLAND 12S TRANSFORMER

FILE: CON2.OUT

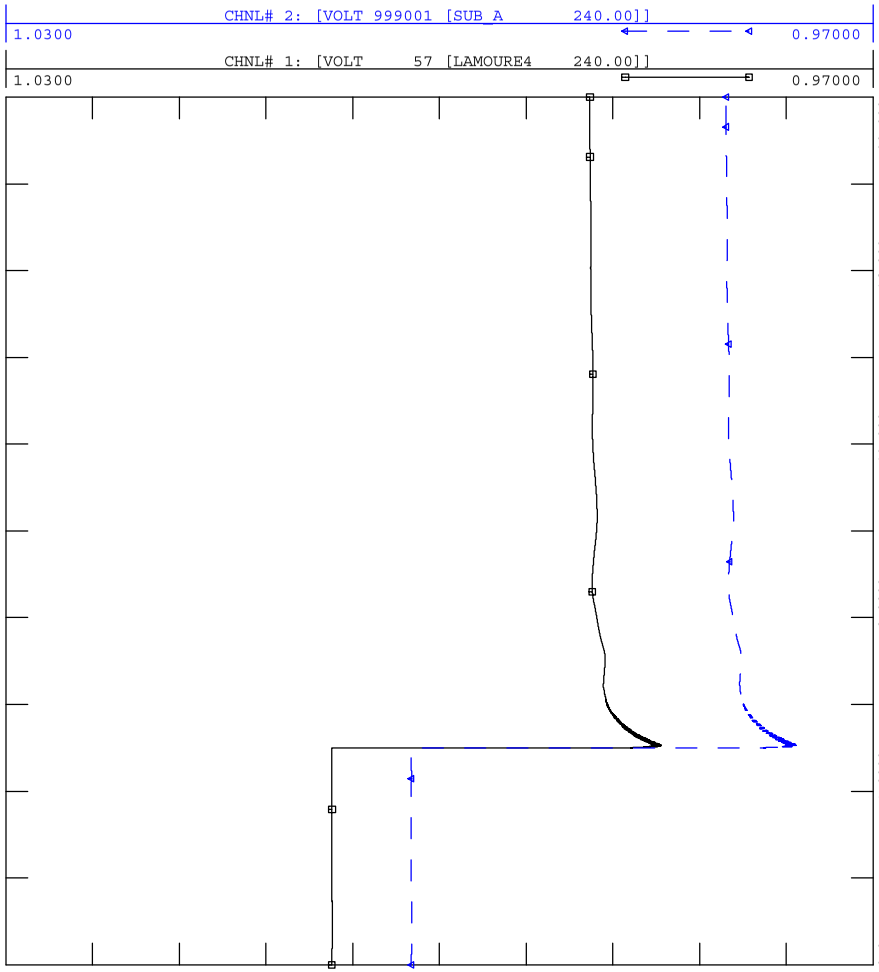
THU, NOV 27 2025 15:35
FIG M-SC3-2



AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - (N-1) 921L_LAMOUREUX 71S TO CLOVER BAR 987S

FILE: CON3.OUT

THU, NOV 27 2025 15:35
FIG M-SC3-3



AESO 2021RC_2025SP_NE-LOW_TIE-ECON_WIND-AVG_P
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
CAT B - (N-1) L1_LAMOUREUX 71S TO DOW SUB A

FILE: CON4.OUT

THU, NOV 27 2025 15:35
FIG M-SC3-4

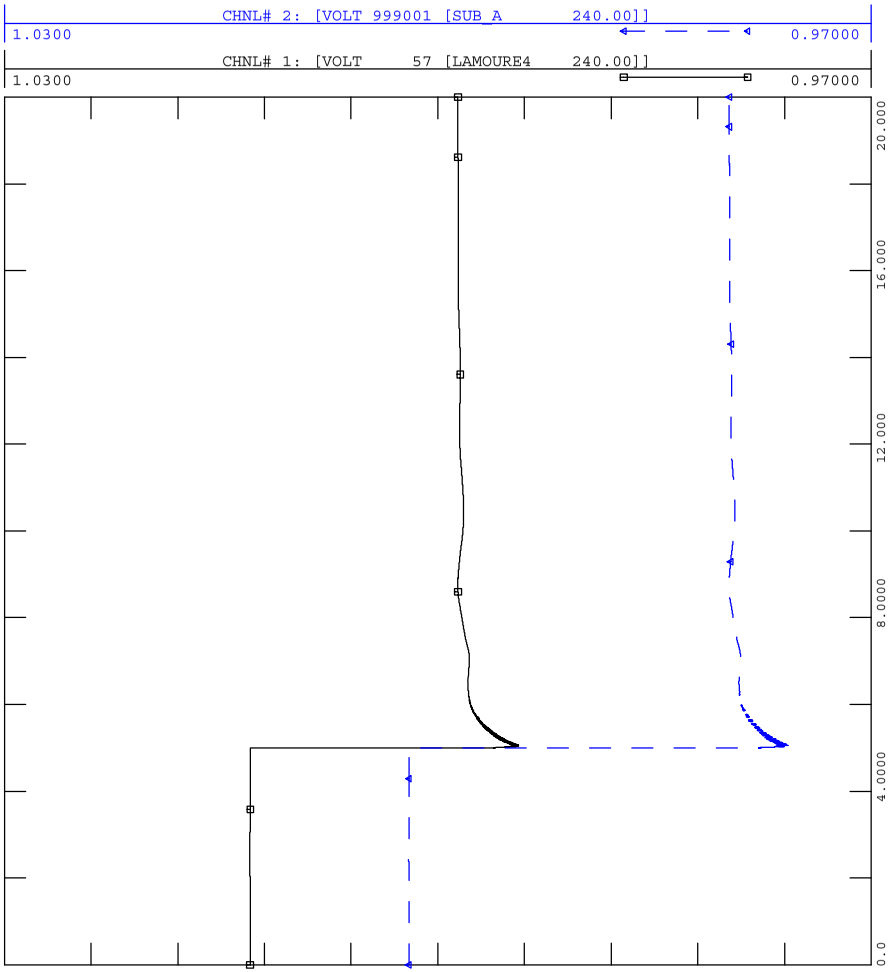


Table A6-2: List of 2025 Winter Peak Post-Project Motor Starting Diagrams

Figure	Category	Contingency
M-SC4-1	A (N-0)	System Normal
M-SC4-2	B (N-1)	Heartland 12S Transformer
M-SC4-3	B (N-1)	921L (Lamoureux 71S – Clover Bar 987S)
M-SC4-4	B (N-1)	L1 (Lamoureux 71S – Dow Substation A)

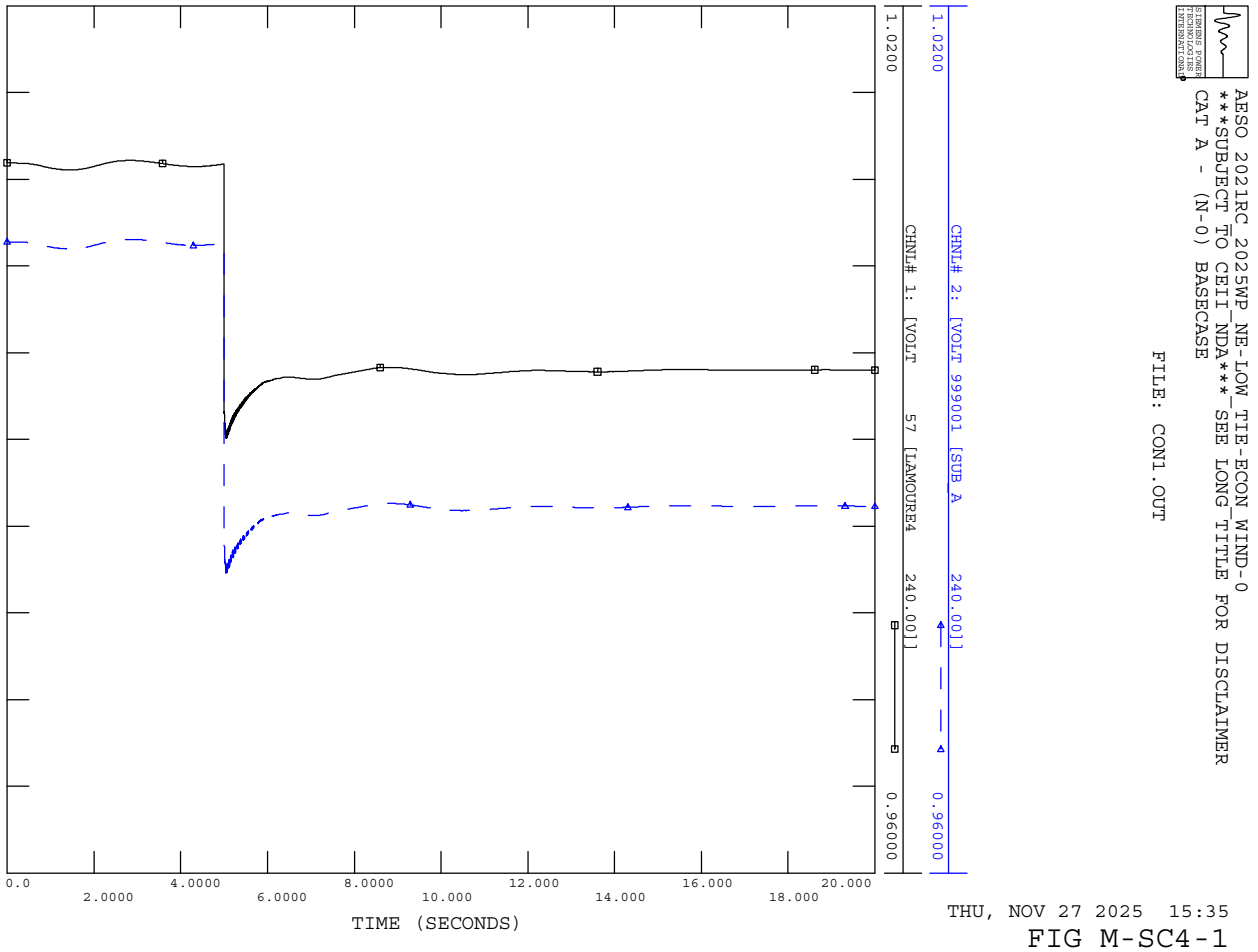


FIG M-SC4-1

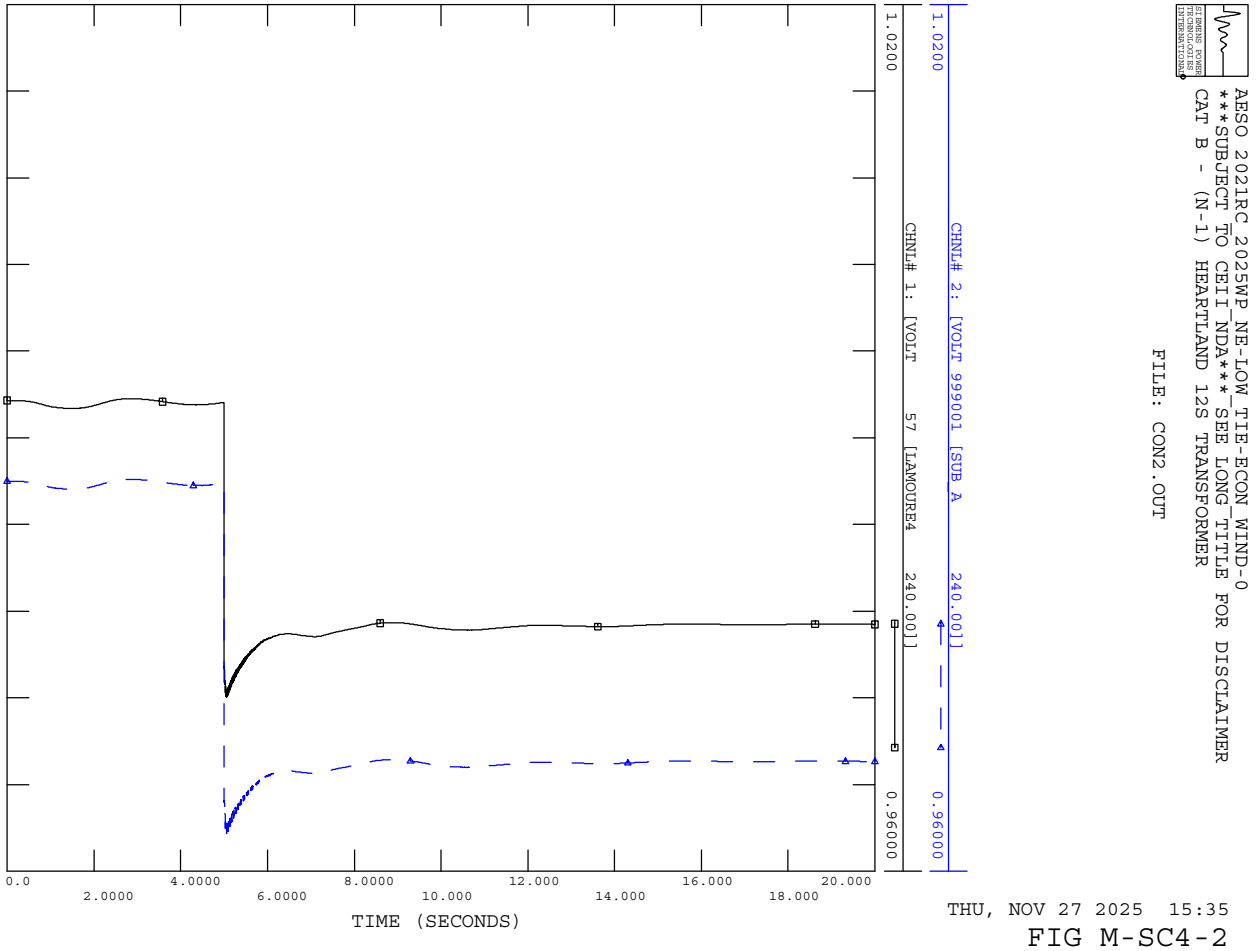


FIG M-SC4-2

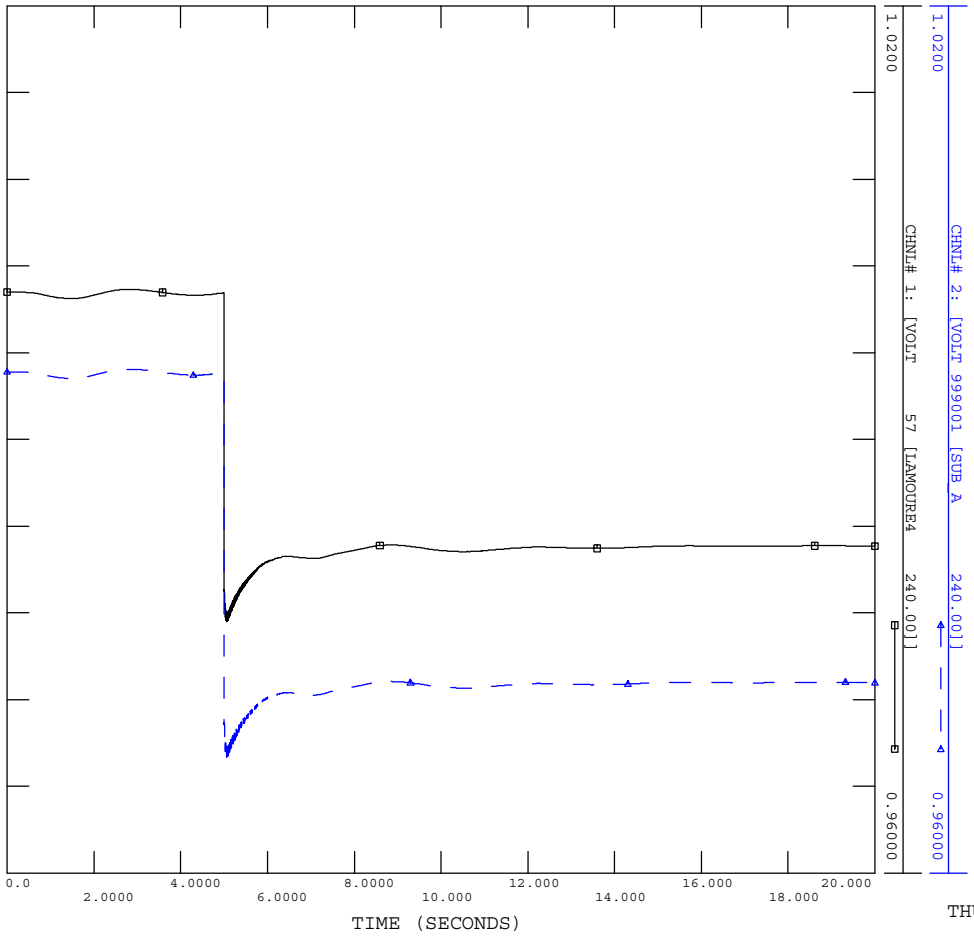


FIG M-SC4-3

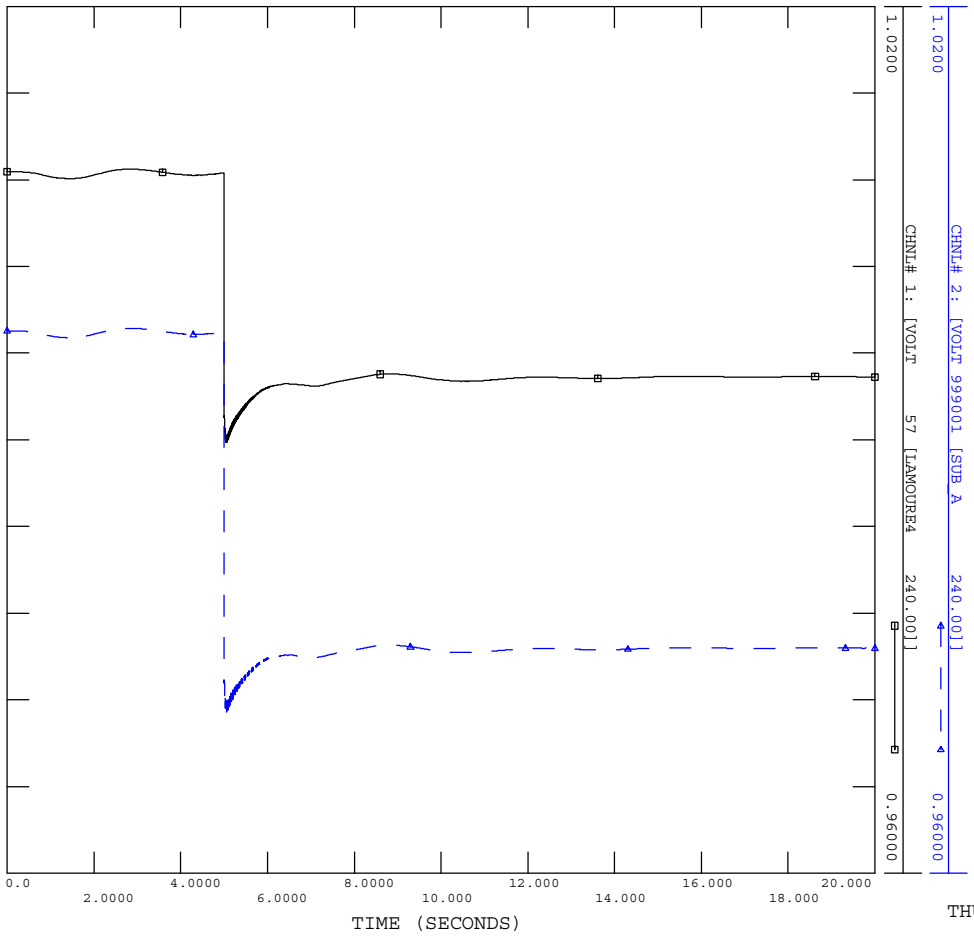


FIG M-SC4-4

Attachment A7
Dynamic Data and Assumption

Study Area load representation assumed for the transient studies is in Table A7-1

Table A7-1: Transient Stability Analysis Load Representation

Planning Areas	% of load specified as Large Motors	% of load specified as Small Motors	The Remainder of the Load (excluding Motor loads)	
			Active Power	Reactive Power
			Constant Current	Constant Impedance
Areas in NW and NE regions	*40%*	*30%*	*100%*	*100%*
Areas in other regions	*10%*	*10%*	*100%*	*100%*

The subsequent tables below are the dynamic data for the generator modelling used to conduct studies for this project:

Table A7-2: GENROU G1 & G2

Generator Dynamic Data (GENROU model)											
T'd0	**T''d0**	**T'q0**	**T''q0**	**H**	**D**	**Xd**	**Xq**	**X'd**	**X'q**	**X''d= X''q**	**Xi**
4.200	0.050	0.542	0.050	4.500	0.000	2.070	1.640	0.226	0.339	0.160	0.140
S (1.0)	**S (1.2)**										
0.098	0.201										

Table A7-3: AC7B G1 & G2

Generator Dynamic Data (AC7B model)											
Tr	**Kpr**	**Kir**	**Kdr**	**Tdr**	**Vrmax**	**Vrmin**	**Kpa**	**Kia**	**Vamax**	**Vamin**	**Kp**
0.005	28.280	14.140	0.000	0.050	26.525	-26.525	1.000	1.000	26.525	-26.525	26.525
Kl	**Kf1**	**Kf2**	**Kf3**	**Tf3**	**Kc**	**Kd**	**Ke**	**Te**	**Vfemax**	**Vemin**	**E1**
10.000	0.000	1.500	0.000	1.000	0.005	0.900	1.000	1.000	9.922	0.000	3.068
S(E1)	**E2**	**S(E2)**									
0.100	4.090	0.200									

Table A7-4: PSS2B G1 & G2

Generator Dynamic Data (PSS2B model)											
M	**M1**	**M2**	**M3**	**M4**	**M5**	**Tw1**	**Tw2**	**T6**	**Tw3**	**Tw4**	**T7**
1	0	3	0	5	1	10.000	10.000	0.000	10.000	0.000	10.000
Ks2	**Ks3**	**T8**	**T9**	**Ks1**	**T1**	**T2**	**T3**	**T4**	**T10**	**T11**	**Vs1max**
1.111	1.000	0.500	0.1000	20.000	0.090	0.020	0.090	0.020	0.090	0.020	2.000

Vs1min	Vs2max	Vs2min	Vstmax	Vstmin							
-2.000	2.000	-2.000	0.050	-0.050							

Table 7A-5: GGOV1 G1 & G2

Generator Dynamic Data (GGOV1 model)											
M	**M1**	**R**	**Tpelec**	**Maxerr**	**Minerr**	**Kpgov**	**Kigov**	**Kdgov**	**Tdgov**	**Vmax**	**Vmin**
1	0	0.050	1.000	0.050	-0.050	15.000	30.000	0.000	0.050	1.000	0.000
Tact	**Kturb**	**Wfnl**	**Tb**	**Tc**	**Teng**	**Tfload**	**Kpload**	**Kiload**	**Ldref**	**Dm**	**Ropen**
0.500	1.000	0.010	10.000	3.000	0.000	1.000	0.500	0.200	1.000	0.000	0.100
Rclose	**Kimw**	**Aset**	**Ka**	**Ta**	**Trate**	**Db**	**Tsa**	**Tsb**	**Rup**	**Rdown**	
-0.100	0.000	0.010	10.000	0.100	35.200	0.000	4.000	5.000	99.000	-99.000	

Attachment A8
Constraint Effective Factors Table

Table A8-1: 2025 SP Post Project Scenario 3 Generators Effectiveness Factors (BC Sink) for Category B (N-1) Conditions

Contingency	Plant (Bus number) / Line	Sherritt Gordon (4062)	Air Liquide (625)	ATCO Scotford Upgrader (4185)	Shell AOSP (19834)	Dow Hydrocarbon (54)	Redwater (3050)	Scoria (5793)	Ursus (14968)	Dow Sub_B1 (999003)	Dow Sub_B2 (999004)
1056L (Ellerslie 89S - Argyll Transfer Station ARGYLL)	908L (Ellerslie 89S – Petrolia)	2.94%	2.87%	2.87%	2.86%	2.78%	2.76%	2.76%	2.66%	2.21%	2.21%
72CH9 (Hardisty 377S – Cloverbar 987S)	72CH11 (Hardisty 377S – Cloverbar 987S)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72CH11 (Hardisty 377S – Cloverbar 987S)	72CH9 (Hardisty 377S – Cloverbar 987S)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
240BA2 (BELLAMY - Argyll Transfer Station ARGYLL)	908L (Ellerslie 89S – Petrolia)	2.94%	2.87%	2.87%	2.86%	2.78%	2.76%	2.76%	2.66%	2.21%	2.21%
72CK12 (Cloverbar 987S – Kennedale)	72CK13 (Cloverbar 987S – Kennedale)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72CK13 (Cloverbar 987S – Kennedale)	72CK12 (Cloverbar 987S – Kennedale)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
P1649 CKT71 (Garneau Bus 53 – P1649 Bus 580007)	P1649 CKT 11 (Garneau – P1649 Bus 580006)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table A8-2: 2025 WP Post Project Scenario 4 Generators Effectiveness Factors (BC Sink) for Category B (N-1) Conditions

Contingency	Plant (Bus number) / Line	Sherritt Gordon (4062)	Air Liquide (625)	ATCO Scotford Upgrader (4185)	Shell AOSP (19834)	Dow Hydrocarbon (54)	Redwater (3050)	Scoria (5793)	Ursus (14968)	Dow Sub_B1 (999003)	Dow Sub_B2 (999004)
72CH9 (Hardisty 377S – Cloverbar 987S)	72CH11 (Hardisty 377S – Cloverbar 987S)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72CH11 (Hardisty 377S – Cloverbar 987S)	72CH9 (Hardisty 377S – Cloverbar 987S)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72CK12 (Cloverbar 987S – Kennedale)	72CK13 (Cloverbar 987S – Kennedale)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
72CK13 (Cloverbar 987S – Kennedale)	72CK12 (Cloverbar 987S – Kennedale)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Appendix B: High-level Desktop Environment and Land Use Analysis

Date: January 19, 2025
To: Young Dawson, Senior Project Manager, Alberta Electric System Operator (AESO)
From: AltaLink Management Ltd.
Subject: Environment and Land Use Impacts Memo – P2614 Dow Fort Saskatchewan Load

AltaLink Management Ltd. (AltaLink) has reviewed and completed a high-level desktop environment and land use (ELU) analysis of Alternatives 1 through 5 from the Environment and Land Use Evaluation Scope of Work received on November 10, 2025, for the Dow Fort Saskatchewan Load project (AESO project #P2614). The customer's proposed substation location is in SE-10-55-22 W4M and illustrated on the attached mapping. A summary of the alternatives is provided below with the analysis provided in Table 1. Approximate line lengths were provided by the AESO.

Alternative 1 (in-and-out connection to 240 kilovolt (kV) transmission lines 997L and 942) includes the following developments:

- Add one 240 kV switching substation, including adding six 240 kV circuit breakers.
- Two approximately 3.5 kilometres (km) long 240 kV circuits to the proposed customer substation strung as separate single circuits.

Alternative 2 (radial 240 kV connection to the existing Lamoureux 71S substation) includes the following developments:

- Two approximately 3.5 km 240 kV circuits strung as separate single circuits between Lamoureaux 71S and the proposed customer substation.
- Modifications to the existing Lamoureux 71S substation, including expanding the 240 kV buswork and adding four 240 kV circuit breakers.

Alternative 3a (in-and-out connection to the 240 kV transmission line 997L with two single circuits) includes the following developments:

- Add one 240 kV switching substation, including adding three 240 kV circuit breakers.
- Two approximately 3.5 km 240 kV circuits strung as separate single circuits.

Alternative 3b (in-and-out connection to the 240 kV transmission line 997L with one circuit) includes the following developments:

- Add one 240 kV switching substation, including adding three 240 kV circuit breakers.
- One approximately 3.5 km 240 kV circuit.

Alternative 4a (in-and-out connection to the 240 kV transmission line 942L with two single circuits) includes the following developments:

- Add one 240 kV switching substation, including adding three 240 kV circuit breakers.
- Two approximately 3.5 km 240 kV circuits strung as separate single circuits.
- Two 240 kV line crossings are required.

Alternative 4b (in-and-out connection to the 240 kV transmission line 942L with one circuit) includes the following developments:

- Add one 240 kV switching substation, including adding three 240 kV circuit breakers.
- One approximately 3.5 km 240 kV circuit.
- Two 240 kV line crossings are required.

Alternative 5 (radial 240 kV connection to Ursus 430S substation) includes the following developments:

- Two approximately 7 km 240 kV circuits strung as separate single circuits.
- Modify the existing Ursus 430S substation, including expanding the 240 kV buswork and adding four 240 kV circuit breakers.

Questions concerning this submission can be directed to Dave Lee, Manager, Siting by email at dave.lee@altalink.ca.

Sincerely,
AltaLink Management Ltd.

Dave Lee
Manager, Siting

Table 1: P2614 – Dow Fort Saskatchewan Load – Desktop Environment and Land Use Analysis:

Metric	Criteria	Alternative 1 (in-and-out to 997L and 942L strung as two single circuits)	Alternative 2 (two single circuits to Lamoureaux 71S)	Alternative 3a (in-and-out to 997L – two single circuits)	Alternative 3b (in-and-out to 997L – single circuit)	Alternative 4a (in-and-out to 942L – two single circuits)	Alternative 4b (in-and-out to 942L – single circuit)	Alternative 5 (two single circuits to Ursus 430S)
Land	Municipality	Sturgeon County and the City of Fort Saskatchewan.	Sturgeon County and the City of Fort Saskatchewan.	Sturgeon County and the City of Fort Saskatchewan.	Sturgeon County and the City of Fort Saskatchewan.	Sturgeon County and the City of Fort Saskatchewan.	Sturgeon County and the City of Fort Saskatchewan.	City of Fort Saskatchewan and Strathcona County.
	Potential for impacts to Environmental Preservation District	Yes	Yes	Yes	Yes	Yes	Yes	No
	Potential for impacts to Crown Land	Yes	Yes	Yes	Yes	Yes	Yes	No
	Right-of-Way Requirements	Higher, two single circuits.	Higher, two single circuits.	Higher, two single circuits.	Lower, single circuit.	Higher, two single circuits.	Lower, single circuit.	Higher, two single circuits.
	Switching Station	Yes	No, no expansion of Lamoureaux 71S required.	Yes	Yes	Yes	Yes	No, however the Ursus 430S substation will likely need to be expanded to accommodate this connection scope which may impact land use in the area.
Environmental Constraints – Water & Wetlands	Watercourse Crossing (North Saskatchewan River)	Yes	Yes	Yes	Yes	Yes	Yes	No
	Large Wetlands and Waterbodies	Yes	No	Yes	Yes	Yes	Yes	Potentially
Environmental Constraints – Wildlife	Key Wildlife and Biodiversity Zones	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sensitive Raptor Range (Bald Eagle)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sharp Tailed Grouse Range	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Increased Avian Collision Risk	Yes	Yes	Yes	Yes	Yes	Yes	No
Historical Resource Value (HRV)	Potential Impacts to HRV sites	Yes, HRV 3 and HRV 5.	Yes, HRV 3 and HRV 5.	Yes, HRV 3 and HRV 5.	Yes, HRV 3 and HRV 5.	Yes, HRV 3 and HRV 5.	Yes, HRV 3 and HRV 5.	Yes, HRV 5.
Industry – Pipelines & Facilities	Crossing Agreements	Yes, multiple	Yes, multiple	Yes, multiple	Yes, multiple	Yes, multiple	Yes, multiple	Yes, routing through the DOW industrial complex is also required.

Metric	Criteria	Alternative 1 (in-and-out to 997L and 942L strung as two single circuits)	Alternative 2 (two single circuits to Lamoureaux 71S)	Alternative 3a (in-and-out to 997L – two single circuits)	Alternative 3b (in-and-out to 997L – single circuit)	Alternative 4a (in-and-out to 942L – two single circuits)	Alternative 4b (in-and-out to 942L – single circuit)	Alternative 5 (two single circuits to Ursus 430S)
	Railway Crossings	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Transmission Line Crossings	Two (708L and 861L)	No	Two (708L and 861L)	Two (708L and 861L)	Two (708L and 861L)	Two (708L and 861L)	- One (862L)
Impact on Public	Residences	Multiple near 997L and 942L	Multiple southeast of 71S	Multiple near 997L	Multiple near 997L	Multiple near 942L	Multiple near 942L	Minimal residences

AltaLink Comments and Summary:

Land:
A double circuit or single circuit configuration will likely require less right-of-way than two single circuits. There are potential impacts to Crown land and impacts to areas locally zoned as an Environmental Preservation District for all Alternatives except Alternative 5. Alternatives 1, 3a, 3b, 4a and 4b require additional land for an associated switching station, while Alternative 5 will likely require expansion of Ursus 430S. Alternative 2 does not require expansion of the fenceline at Lamoureaux 71S.

Water and Wetlands:
A crossing of the North Saskatchewan River is required for all Alternatives except Alternative 5. The presence of water bodies and wetlands may impact routing or the location of any potential switching stations.

Wildlife:
All Alternatives require crossing a key wildlife and biodiversity zone. All Alternatives at least partially overlap bald eagle and sharp-tailed grouse sensitivity ranges. Avian collision risk is increased on Alternatives 1 – 4 due to the North Saskatchewan River crossing. Alternative 5 avoids more environmental sensitivities, but the line length is longer.

Historical Resource Values:
Alternative 5 does not involve potential impacts to a Historical Resource Value listed as HRV 3 located near the North Saskatchewan River.

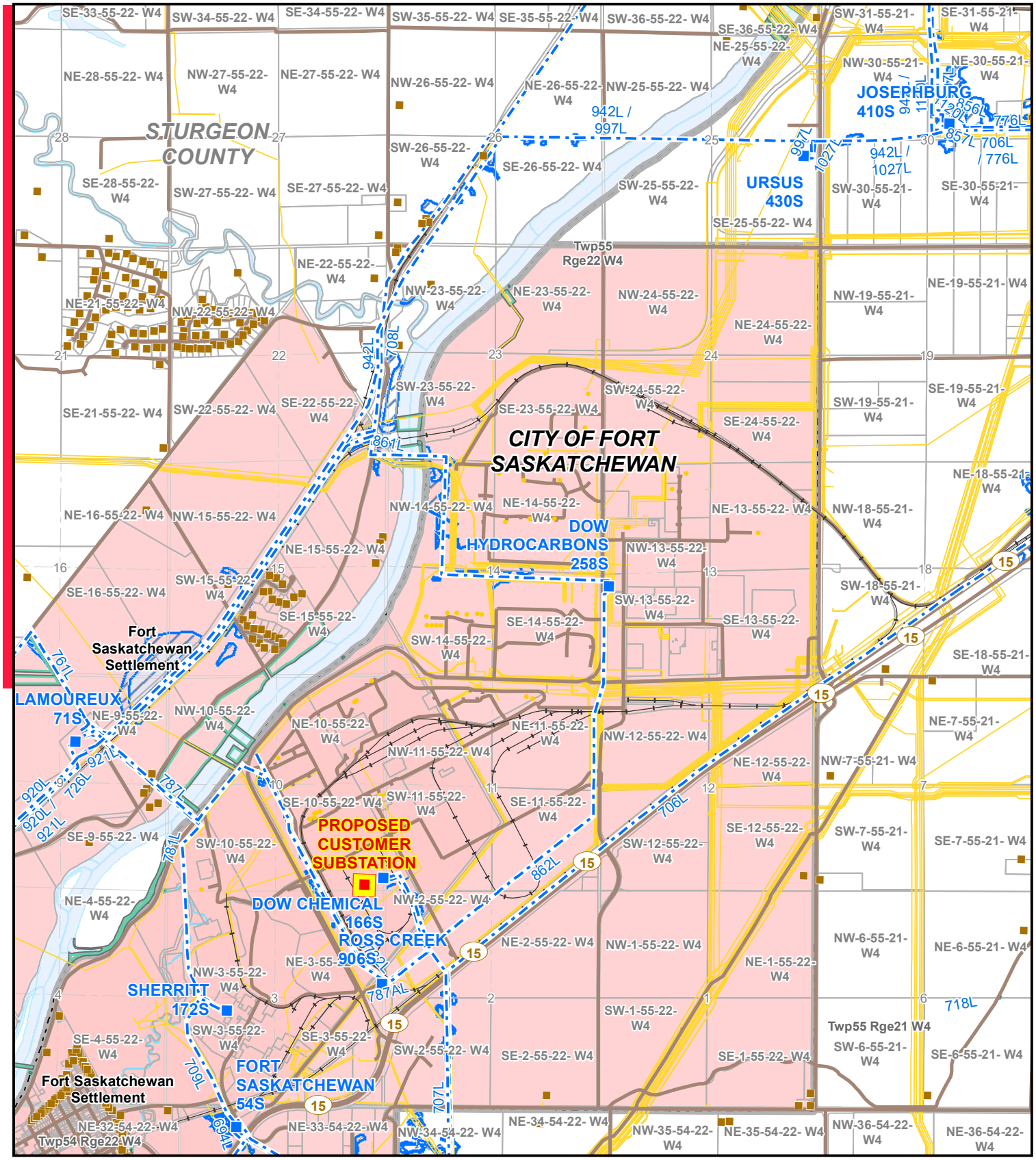
Pipelines and Facilities:
All Alternatives have some interaction with oil and gas, rail, and existing transmission facilities.

Residences:
Alternative 5 has the least potential for residential effects.

Conclusion:
Each Alternative has some level of impact, however, Alternative 5 is likely to have the least potential impact to environmental features and non-industrial land, although it is likely to have the longest transmission line length. A double circuit or single circuit configuration is likely to have less potential impact than two single circuits as less right-of-way is likely required.

Spatial Datasets:
i. Roadways including highways and local roads;
ii. Railways;
iii. Existing transmission lines;
iv. Oil and gas facilities including pipelines and wells;
v. Environmentally significant areas;
vi. Key wildlife and biodiversity zones;
vii. Parks and protected areas;
viii. Historical wildlife observations;
ix. Watercourses, water bodies, and wetlands;
x. Heritage resource values and existing historical sites;
xi. Existing residences and businesses;
xii. Land use such as cultivated and industrial;
xiii. Municipal land use classifications; and
xiv. Aerial Imagery

Attachments:
DB1 - Project Area
DB2 - Historical Resource Values
DB3 - Sensitive Raptor Range
DB4 - Sharp-tailed Grouse
DB5 - Key Wildlife and Biodiversity Zones



LEGEND

- Proposed Structure
- Existing Substation
- Existing Transmission Line
- Residence
- Wellsite
- Pipeline
- River or Stream
- Railway
- Road
- Crown Land
- Wetlands
- Urban Area
- Water Body

NO: 35035824
DRAWN: EL - ALM
FILE NO.: XXXXXXX
REVISION: 0.00.00
AL FOLDER: Z:_PROJECTS_ACTIVE_One Off Requests\

DATE: 2025-12-16

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0 0.25 Miles

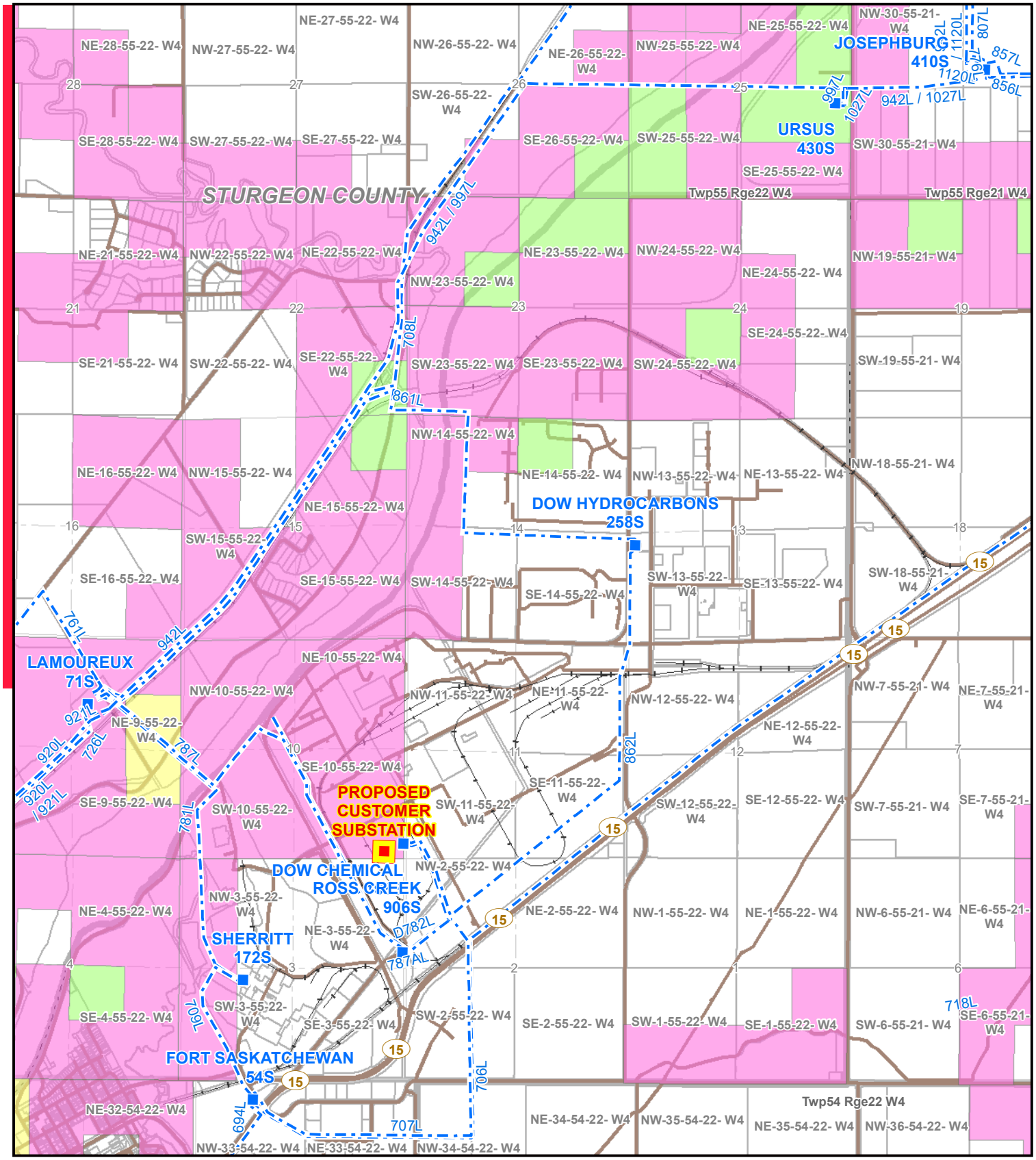
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DETAIL BASE **DB1**

ALTALINK
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Dow Fort Saskatchewan Load Desktop ELU Project Area

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LEGEND

- Proposed Structure
- Existing Substation
- Existing Transmission Line
- Railway
- Road
- HRV - 1
- HRV - 2
- HRV - 3
- HRV - 4
- HRV - 5

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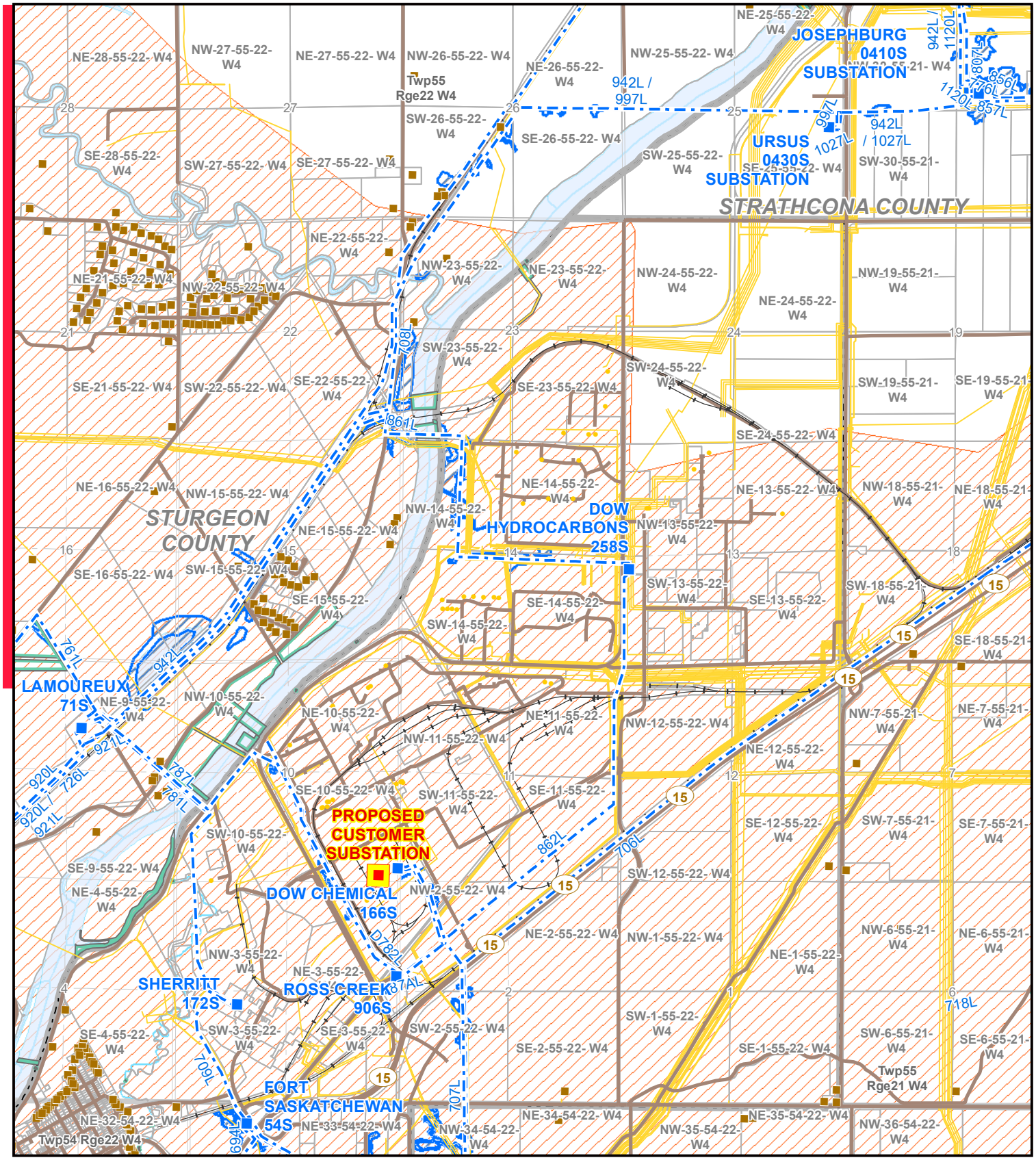
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DETAIL BASE **DB2**

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Dow Fort Saskatchewan Load Desktop ELU
Historical Resource Values



LEGEND

- Proposed Structure
- Existing Substation
- Existing Transmission Line
- Residence
- Wellsite
- Pipeline
- River or Stream
- Railway
- Road
- Crown Land
- Wetlands
- Sensitive Raptor Range
- Water Body

NO: 35035824
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FILE NO.: XXXXXXX
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AL FOLDER: Z:_PROJECTS_ACTIVE_One Off Requests\

DATE: 2025-12-16

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0 0.25 Miles

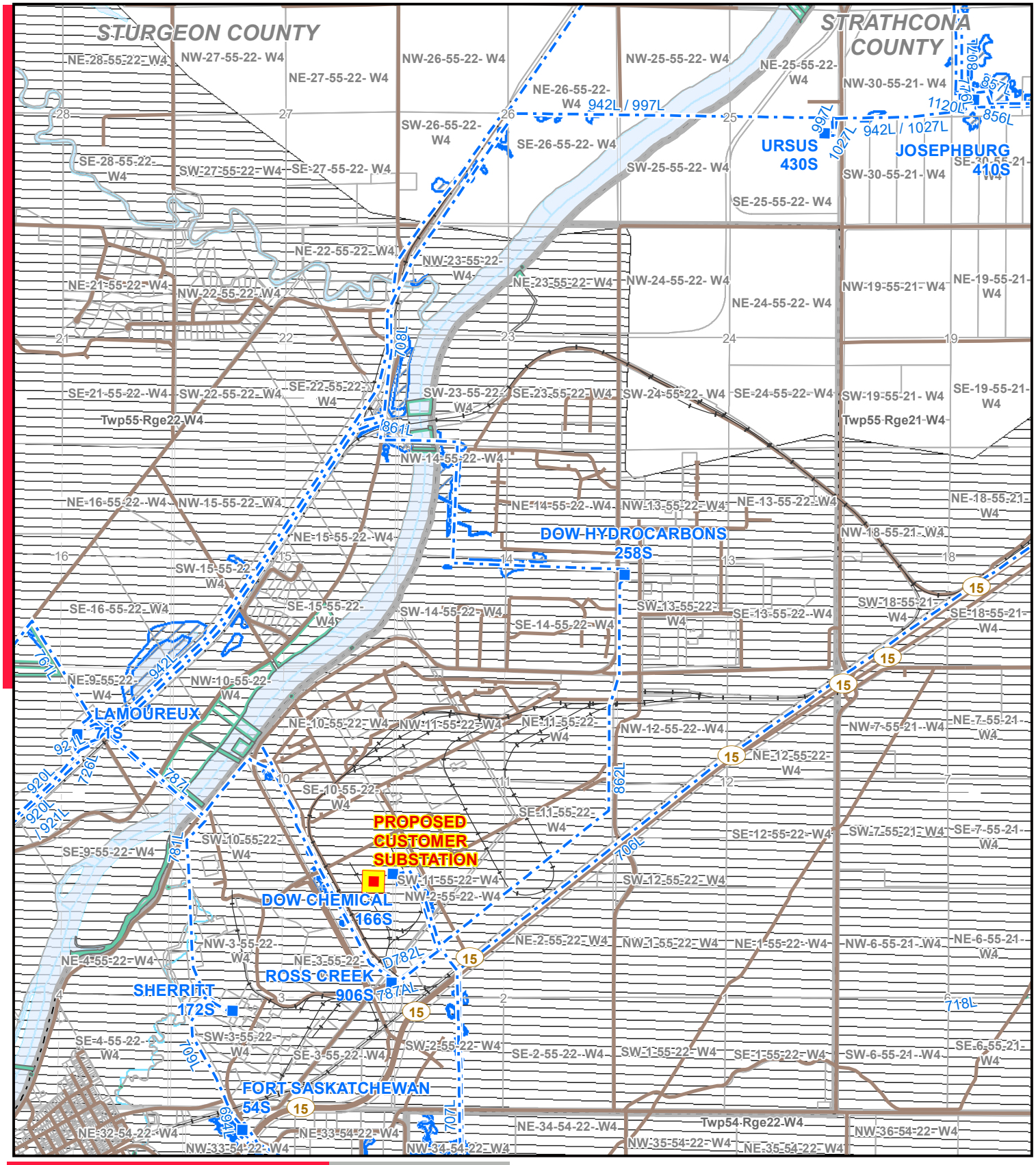
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DETAIL BASE **DB3**

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Dow Fort Saskatchewan Load Desktop ELU
Sensitive Raptor Range



LEGEND

- Proposed Structure
- Existing Substation
- Existing Transmission Line
- River or Stream
- Railway
- Road
- Crown Land
- Wetlands
- Sharp-tailed Grouse
- Water Body

NO: 35035824
DRAWN: EL - ALM
FILE NO.: XXXXXXX
REVISION: 0.00.00
AL FOLDER: Z:_PROJECTS_ACTIVE_One Off Requests\

DATE: 2025-12-16

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0 0.25 Miles

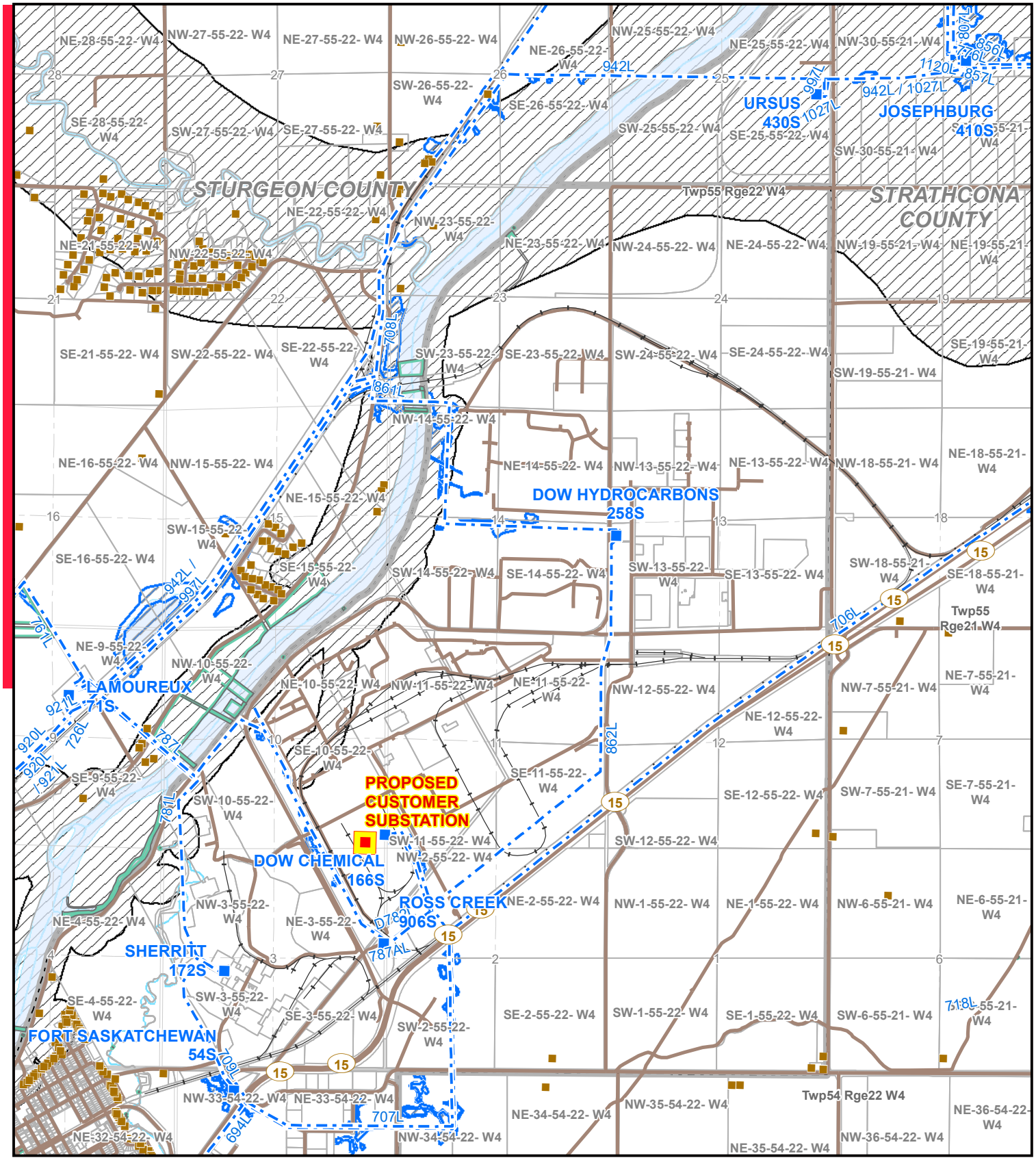
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DETAIL BASE **DB4**

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Dow Fort Saskatchewan Load Desktop ELU
Sharp-tailed Grouse



LEGEND

- Proposed Structure
- Existing Substation
- Existing Transmission Line
- Residence
- River or Stream
- Railway
- Road
- Crown Land
- Wetlands
- Key Wildlife and Biodiversity Zones
- Water Body

NO: 35035824
DRAWN: EL - ALM
FILE NO.: XXXXXXX
REVISION: 0.00.00
AL FOLDER: Z:_PROJECTS_ACTIVE_One Off Requests\

DATE: 2025-12-16

0 0.25 0.5 Kilometres

0 0.25 Miles

N

DETAIL BASE **DB5**

ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY

Dow Fort Saskatchewan Load Desktop ELU
Key Wildlife and Biodiversity Zones

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