APPENDIX A CONNECTION ASSESSMENT

Engineering Connection Assessment

McLaughlin Wind Power Plant Connection

Renewable Energy Services Ltd.

AESO Project 1500

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NOTE:

The conclusions and recommendations in this report are based on the results presented in *Attachment 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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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.

Attached to this Engineering Connection Assessment are the results of the engineering studies (see Attachment A) and the scope and methodology used to perform the studies (see Attachment A1 to Attachment 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

Renewable Energy Services Canada Ltd. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its approved McLaughlin Wind Power Plant (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 47 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 1 MW; and a request for transmission development (collectively, the Project).

The scheduled in-service date (ISD) for the Project is November 30, 2020.

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 legal owner of a Transmission Facility (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 Fort Macleod (Area 53), close to the boundary of the Glenwood planning area (Area 55), which is part of the AESO South planning region. The Fort Macleod area is adjacent to the planning areas of High River (Area 46), Stavely (Area 49), Lethbridge (Area 54), and Glenwood (Area 55).

From a transmission system perspective, the Fort Macleod area consists mainly of 69 kV, 138 kV and 240 kV transmission systems.

Existing constraints in the South 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 Macleod (Area 53), Lethbridge (Area 54), and Glenwood (Area 55), including the tie lines connecting these planning areas to the rest of the AIES. All transmission facilities within the Study Area were studied and monitored for violations of the Reliability Criteria (defined in Section 3.1 of Attachment A1).

3 Connection Alternatives

3.1 Overview

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

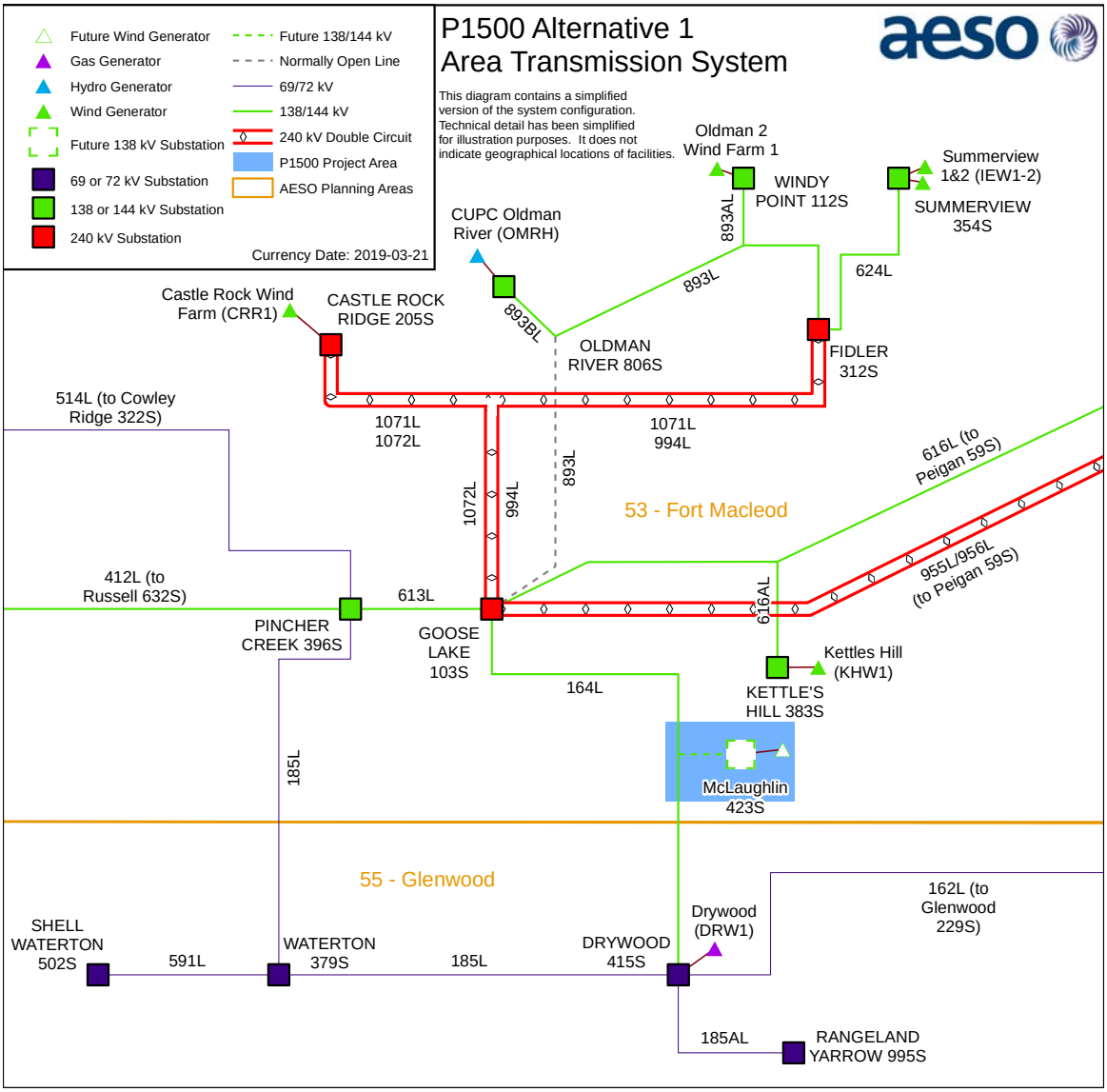
3.2 Connection Alternative Examined

Alternative 1 – T-tap connection to the 138 kV transmission line 164L

This alternative includes the following developments:

- Connect the Facility to the existing 138 kV transmission line 164L (between the Goose Lake 103S substation and the Drywood 415S substation) using a T-tap configuration. This would require the addition of one 138 kV circuit, approximately 110 m in length; and
- Add or modify associated equipment as required for the above transmission development.

Figure 3-1: Connection Alternative 1



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 Attachment A (see Attachment A1).

4.2 Studies Performed

The scheduled ISD for the Project is November 30, 2020. Therefore, studies were performed using scenarios for 2020.

Short-circuit studies were performed using the 2020 Summer Peak scenarios, and the 2027 scenario.

Table 4-1 lists the study scenarios. Post-Project scenarios reflect the requested Rate STS contract capacity of 47 MW. Sensitivity scenarios will also be studied to assess both the Project and the Drywood Expansion Power Plant Connection (AESO Project 1864) on the Study Area.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
Pre-Project					
1	2020 Summer Light (SL)	High Wind, Zero Import	2020 SL Pre-Project	0	0
2	2020 Summer Peak (SP)	High Wind, High Import	2020 SP Pre-Project	0	0
Post-Project					
3	2020 SL	High Wind, Zero Import	2020 SL Post-Project	0	47
4	2020 SP	High Wind, High Import	2020 SP Post-Project	0	47
9	2027 Winter Peak (WP)	All generation in the Study Area on	2027 WP Post-Project	0	47
Pre-Project Sensitivity					
5	2020 SL	High Wind, Zero Import	2020 SL Pre-Project Sensitivity	0	0
6	2020 SP	High Wind, High Import	2020 SP Pre-Project Sensitivity	0	0
Post-Project Sensitivity					
7	2020 SL	High Wind, Zero Import	2020 SL Post-Project Sensitivity	0	47
8	2020 SP	High Wind, High Import	2020 SP Post-Project Sensitivity	0	47

The AESO Planning Region load forecasts used for the connection studies were based on the *AESO 2017 Long Term Outlook* (2017 LTO).

4.2.1 Power Flow Studies

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

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 Attachment A1[1].

Power flow studies were performed for 2020 pre-Project scenarios, and for 2020 post-Project scenarios.

4.2.2 Transient Stability Studies

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

Transient stability studies were performed for 2020 post-Project scenarios.

4.2.3 Short-Circuit Current Level Studies

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

Short circuit studies were performed for the 2020 pre-Project scenario and for 2020 and 2027 post-Project scenarios.

4.3 Mitigation Measure Development and Evaluation

As explained in Section 5 of Attachment A1, mitigation measures were developed to address system performance issues that were identified in the post-Project scenarios. Studies performed to assess the effectiveness of mitigation measures are briefly outlined below.

4.3.1 Post-Mitigation Studies

Power flow studies were performed to assess the impact of the Project on the performance of the AIES following implementation of the AESO's proposed mitigation measures.

4.3.2 Constraint Effective Factor Studies

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

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

5 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 Table 5-1.

- 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 Attachment A.

Table 5-1: Summary of Reliability Criteria Violations, Project Impact and Mitigation Measures

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Project Impact[a]	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
2020 SL	Thermal - below emergency rating	Thermal - below emergency rating	225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126[c] + Real time operational practices	RAS 126 + Real time operational practices
	None	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	New violation	None	
	Thermal - above emergency rating	Thermal - above emergency rating	618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	Materially decreased violation	RAS 36[b] + Real time operational practices	RAS 36 + Real time operational practices
	Thermal - above emergency rating	Thermal - below emergency rating		225L (Spring Coulee 385S - Magrath 225S)	Materially decreased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		225L (Stirling 67S - Raymond Reservoir 313S Tap)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Coaldale 254S - 820AL Tap)	Marginally increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	Marginally increased violation		
	Thermal - below emergency rating	Thermal - below emergency rating	863L (Magrath 225S to-Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126 + Real time operational practices	RAS 126 + Real time operational practices
	None	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	New violation	None	
	None	Thermal - below emergency rating	1036L (Milo 356S to- Travers 554S)	172L (Taber 83S - 172EL Tap)	New violation	None	Real time operational practices
	Thermal - below emergency rating	Thermal - below emergency rating	607L (Fincastle 336S to-Conrad 135S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Real time operational practices	Real time operational practices
2020 SP	Thermal - below emergency rating	Thermal - below emergency rating	1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Real time operational practices	Real time operational practices
	Thermal - below emergency rating	Thermal - below emergency rating	225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126	RAS 126
	Thermal - above emergency rating	Thermal - below emergency rating	618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Spring Coulee 385S - Magrath 225S)	Materially decreased violation	RAS 36 + Real time operational practices	RAS 36 + Real time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating		225L (Stirling 67S - Raymond Reservoir 313S Tap)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Coaldale 254S - 820AL Tap)	Marginally increased violation		
	Thermal - below emergency rating	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	Marginally increased violation		

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Project Impact[a]	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	Thermal - below emergency rating	Thermal - below emergency rating	863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126	RAS 126
	Thermal - above emergency rating	Thermal - above emergency rating	1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Planned 172L RAS[d]	Planned 172L RAS
	Thermal - above emergency rating	Thermal - above emergency rating	607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Planned 172L RAS	Planned 172L RAS
2020 SL Sensitivity	Thermal - below emergency rating	Thermal - below emergency rating	225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126 + Real time operational practices	RAS 126 + Real time operational practices
	None	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	New violation	None	
	Thermal - above emergency rating	Thermal - above emergency rating	618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	Materially decreased violation	RAS 36 + Real time operational practices	RAS 36 + Real time operational practices
	Thermal - below emergency rating	Thermal - below emergency rating		225L (Spring Coulee 385S - Magrath 225S)	Materially decreased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		225L (Stirling 67S - Raymond Reservoir 313S Tap)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Coaldale 254S - 820AL Tap)	Marginally increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	Marginally increased violation		
	Thermal - below emergency rating	Thermal - below emergency rating	863L (Magrath 225S to-Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126 + Real time operational practices	RAS 126 + Real time operational practices
	None	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	New violation	None	
	Thermal - below emergency rating	Thermal - below emergency rating	1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Real time operational practices	Real time operational practices
	Thermal - below emergency rating	Thermal - below emergency rating	607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Real time operational practices	Real time operational practices
2020 SP Sensitivity	Thermal - below emergency rating	Thermal - below emergency rating	1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Real time operational practices	Real time operational practices
	Thermal - below emergency rating	Thermal - below emergency rating	225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126	RAS 126
	Thermal - below emergency rating	Thermal - below emergency rating	618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Spring Coulee 385S - Magrath 225S)	Materially decreased violation	RAS 36 + Real time operational practices	RAS 36 + Real time operational practices

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Project Impact[a]	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	Thermal - above emergency rating	Thermal - above emergency rating		225L (Stirling 67S - Raymond Reservoir 313S Tap)	Materially increased violation		
	Thermal - above emergency rating	Thermal - above emergency rating		820L (Coaldale 254S - 820AL Tap)	Marginally increased violation		
	Thermal - below emergency rating	Thermal - below emergency rating		820L (Red Coat 967S Tap - 820AL Tap)	Marginally increased violation		
	Thermal - below emergency rating	Thermal - below emergency rating	863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	Marginally increased violation	RAS 126	RAS 126
	Thermal - above emergency rating	Thermal - above emergency rating	1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Planned 172L RAS	Planned 172L RAS
	Thermal - above emergency rating	Thermal - above emergency rating	607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	Materially increased violation	Planned 172L RAS	Planned 172L RAS

Notes:

[a] Marginally increased or Marginally decreased violation refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) below 3%. Materially increased or Materially decreased violation refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) above or equal to 3%.

[b] RAS 36 is an existing RAS (see Section 1.2.2 of Attachment A1). Further information is provided in Section 5.3 of Attachment A

[c] RAS 126 is an existing RAS (see Section 1.2.2 of Attachment A1). Further information is provided in Section 5.3 of Attachment A

[d] 172L RAS was proposed for the approved Stirling Wind Project in the *Stirling Wind Project Connection NID.* This RAS is referred to herein as “Planned RAS 172L”. Further information is provided in Section 5.3 of Attachment 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 a number of thermal violations under Category B conditions (i.e., loss of a single system element).

No voltage deviations were observed that were beyond the limits listed in Table 3-1 of Attachment A1 (hereafter referred to as point of delivery (POD) bus voltage deviations) under Category B conditions.

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.

5.3.2 Category B Conditions

The post-Project power flow studies identified a number of thermal violations under Category B conditions.

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

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

5.4 Mitigation Measures

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

5.4.1 Pre-Project

Prior to connection of the Project, some of the observed thermal criteria violations can be managed by using real-time operational practices.

Some of the remaining thermal criteria violations can be mitigated with the planned 172L RAS and the existing RAS 126.

The remaining thermal criteria violations can be mitigated with the existing RAS 126, in combination with real time operational practices, and the existing RAS 36, in combination with real time operational practices.

5.4.2 Post-Project

The pre-Project mitigation measures are also effective post-Project. After the connection of the Project, some of the observed thermal criteria violations can be managed by using real-time operational practices.

Some of the remaining thermal criteria violations can be mitigated with the planned 172L RAS and the existing RAS 126.

The remaining thermal criteria violations can be mitigated with the existing RAS 126, in combination with real time operational practices, and the existing RAS 36, in combination with real time operational practices.

Based on Table 5-1, following the contingency of Riverbend 618S T1, a thermal criteria violation occurs on transmission line 225L (Stirling 67S - Raymond Reservoir 313S tap point) prior and following the Project connection. The Project would materially increase the thermal violation observed on transmission line 225L (Stirling 67S - Raymond Reservoir 313S tap point), but at the same time materially decrease the thermal violations observed on transmission lines 225L (Magrath 225S - Spring Coulee 385S) and 225L (Glenwood 229S - Spring Coulee 385S). As a result adding this Project as part of the existing RAS 36 would be ineffective in reducing the thermal violations observed on transmission lines 225L Magrath 225S - Spring Coulee 385S and 225L Glenwood 229S - Spring Coulee 385S. Therefore no modifications are required to add this Project to the existing RAS 36.

Following the connection of the Project, the observed violations on 172L (Taber 83S - 172EL Tap) are materially increased. However, as shown in Attachment A7, the Project is not significantly effective in mitigating these thermal violations. Therefore, no modifications are required to add the Project to the planned 172L RAS.

5.4.3 Post-Project Mitigation Study Results

Under Category B conditions, most of the observed Reliability Criteria violations requiring RAS were mitigated. Under certain conditions, after existing RAS 126 and existing RAS 36 action, real-time operational practices would be required to fully alleviate the thermal criteria violations observed on the 138 kV transmission line 820L.

Please refer to Section 5.3 of Attachment A for the detailed evaluation results.

6 Project Dependencies

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

7 Conclusions and Recommendations

Based on the study results, Alternative 1 is technically viable. The connection assessment identified a number of pre-Project and post-Project system performance issues.

These issues can be mitigated through the use of the existing RAS 36, the existing RAS 126, the planned 172L RAS, and real-time operational practices, alone or in combination, as appropriate. With implementation of these mitigation measures, connecting the project with the preferred alternative does not adversely affect the performance of the AIES.

The AESO recommends proceeding with the Project using Alternative 1 as the preferred option to respond to the Market Participant's request for system access service. Real-time operational practices and the RAS mentioned above are recommended to mitigate the identified system performance issues.

Alternative 1 involves adding one 138 kV circuit, approximately 110 metres in length, to connect the Facility to the 138 kV transmission line 164L using a T-tap configuration.

A minimum thermal rating similar to the existing 138 kV transmission line 164L is recommended for the new 138 kV circuit. This will meet the Market Participant's requested Rate STS contract capacity of 47 MW.

Attachment A:
Engineering Connection Assessment Results

Engineering Connection Assessment: Study Results

P1500 McLaughlin Wind Power Plant Connection

Renewable Energy Services Ltd.

Date: June 06, 2019
Version: V4
Classification: Public

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Prepared	Yani Jazayeri, P. Eng.	June 19, 2019	
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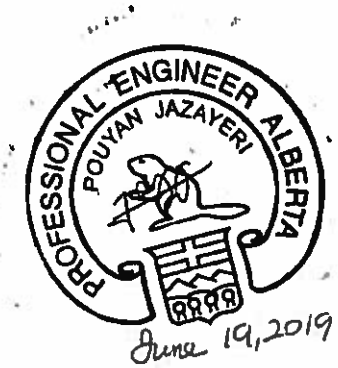

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1 Introduction

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

The power system network analysis tool that was used for the studies in this connection assessment was PSS/E version 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: 2020 SL Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) 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 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[a] (MVA)	% Loading[b]
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	129.6	108.0
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	28.0	127.2
	225L (Spring Coulee 385S - Magrath 225S)	24	28	29.2	121.6
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	34.7	138.8
	820L (Coaldale 254S - 820AL Tap)	120	132	145.0	120.8
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	134.9	112.4
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	129.8	108.2
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	122.1	102.6

Notes:

[a] Power Flow (MVA) is current expressed as MVA (ie. $S = \sqrt{3} \times V_{base} \times I_{actual}$)

[b] % loading is reported as a percentage of the observed power flow (in MVA ie. S =√3 x Vbase x Iactual) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 (hereafter referred to as point of delivery (POD) bus voltage deviations) were observed under certain Category B conditions.

2.1.2 Scenario 2: 2020 SP Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) 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 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[a] (MVA)	% Loading[b]
1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	119	131	119.6	100.5
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	123.5	102.9
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	22.5	102.2
	225L (Spring Coulee 385S - Magrath 225S)	24	28	28.0	116.5
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	33.7	134.7
	820L (Coaldale 254S - 820AL Tap)	120	132	138.6	115.5
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	128.5	107.1
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	123.7	103.1
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	131.7	110.7
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	132.1	111.0

Notes:

[a] Power Flow (MVA) is current expressed as MVA (ie. $S = \sqrt{3} \times V_{base} \times I_{actual}$)

[b] % loading is reported as a percentage of the observed power flow (in MVA ie. S =√3 x Vbase x Iactual) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

Voltage Criteria Violations

No voltage criteria violations were observed under certain Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

2.1.3 Scenario 5: 2020 SL Pre-Project Sensitivity

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) 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 2-3.

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

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Observed Power Flow[a] (MVA)	% Loading[b]
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	129.2	107.7
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	26.3	119.7
	225L (Spring Coulee 385S - Magrath 225S)	24	28	27.5	114.6
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	36.3	145.3
	820L (Coaldale 254S - 820AL Tap)	120	132	144.4	120.3
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	134.0	111.7
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	129.5	107.9
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	120.7	101.4
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	123.3	103.6

Notes:

[a] Power Flow (MVA) is current expressed as MVA (ie. $S = \sqrt{3} \times V_{base} \times I_{actual}$)

[b] % loading is reported as a percentage of the observed power flow (in MVA ie. S =√3 x Vbase x Iactual) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

Voltage Criteria Violations

No voltage criteria violations were observed under certain Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

2.1.4 Scenario 6: 2020 SP Pre-Project Sensitivity

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) 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 2-4.

Table 2-4: Thermal Criteria Violations under Category B Conditions for Scenario 6

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings[a] (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Observed Power Flow[a] (MVA)	% Loading[b]
1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	119	131	120.8	101.5
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	124.4	103.7
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	22.1	100.5
	225L (Spring Coulee 385S - Magrath 225S)	24	28	27.4	114.2
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	35.8	143.3
	820L (Coaldale 254S - 820AL Tap)	120	132	139.8	116.5
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	129.8	108.2
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	124.7	103.9
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	133.0	111.8
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	133.0	111.8

Notes:

[a] Power Flow (MVA) is current expressed as MVA (ie. S =√3 x V_{base} x I_{actual})

[b] % loading is reported as a percentage of the observed power flow (in MVA ie. S =√3 x Vbase x Iactual) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.

Voltage Criteria Violations

No voltage criteria violations were observed under certain Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

3 Post-Project Study Results

This section describes the results of the post-Project power flow studies, transient stability studies and transient stability studies. As described in Section 2 of Attachment A1, the post-Project studies were performed using Alternative 1.

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: 2020 SL Post-Project

Category A Conditions

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		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	129.6	108.0	130.7	108.9	0.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	119.3	99.4	120.5	100.4	1.0
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	28.0	127.2	26.8	121.6	-5.6
	225L (Spring Coulee 385S - Magrath 225S)	24	28	29.2	121.6	27.9	116.3	-5.3
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	34.7	138.8	36.0	143.8	5.0
	820L (Coaldale 254S - 820AL Tap)	120	132	145.0	120.8	146.2	121.8	1.0
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	134.9	112.4	136.0	113.3	0.9

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	129.8	108.2	131.0	109.2	1.0
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	119.5	99.6	120.7	100.6	1.0
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	118.8	99.8	123.6	103.9	4.1
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	122.1	102.6	125.9	105.8	3.2

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

3.1.2 Scenario 4: 2020 SP Post-Project

Category A Conditions

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		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	119	131	119.6	100.5	124.4	104.5	4.0
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	123.5	102.9	124.7	103.9	1.0
618ST1 (Riverbend	225L (Spring Coulee 385S - Magrath 225S)	24	28	28.0	116.5	26.7	111.1	-5.4

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
618S 138/25 kV Transformer T1)	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	33.7	134.7	35.0	139.8	5.1
	820L (Coaldale 254S - 820AL Tap)	120	132	138.6	115.5	139.8	116.5	1.0
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	128.5	107.1	129.7	108.1	1.0
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	123.7	103.1	124.9	104.1	1.0
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	131.7	110.7	136.6	114.8	4.1
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	132.1	111.0	135.8	114.1	3.1

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

3.1.3 Scenario 7: 2020 SL Post-Project Sensitivity

Category A Conditions

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 3-3.

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

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	129.2	107.7	130.3	108.6	0.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	118.8	99.0	120.0	100.0	1.0
618ST1	225L (Glenwood	22	24	26.3	119.7	25.1	113.9	-5.8

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	
(Riverbend 618S 138/25 kV Transformer T1)	229S - Spring Coulee 385S)							
	225L (Spring Coulee 385S - Magrath 225S)	24	28	27.5	114.6	26.2	109.3	-5.3
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	36.3	145.3	37.6	150.5	5.2
	820L (Coaldale 254S - 820AL Tap)	120	132	144.4	120.3	145.4	121.2	0.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	134.0	111.7	135.2	112.7	1.0
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	129.5	107.9	130.6	108.8	0.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	119.1	99.2	120.2	100.2	1.0
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	120.7	101.4	125.5	105.5	4.1
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	123.3	103.6	127.2	106.9	3.3

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

3.1.4 Scenario 8: 2020 SP Post-Project Sensitivity

Category A Conditions

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 3-4.

Table 3-4: Thermal Criteria Violations under Category B Conditions for Scenario 8

Contingency (System Element	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		%Loading Difference (Post-Pre)
				Observed Flow (MVA)	% Loading	Observed Flow (MVA)	% Loading	

Lost)								
1005L (Picture Butte 120S - Milo 356S)	172L (Taber 83S - 172EL Tap)	119	131	120.8	101.5	125.5	105.5	4.0
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	124.4	103.7	125.6	104.7	1.0
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Spring Coulee 385S - Magrath 225S)	24	28	27.4	114.2	26.1	108.7	-5.5
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	35.8	143.3	37.1	148.3	5.0
	820L (Coaldale 254S - 820AL Tap)	120	132	139.8	116.5	140.9	117.4	0.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	129.8	108.2	130.9	109.1	0.9
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	124.7	103.9	125.9	104.9	1.0
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	133.0	111.8	137.9	115.9	4.1
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	133.0	111.8	136.9	115.0	3.2

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1 were observed under certain Category B conditions.

3.2 Transient Stability Studies

Transient stability studies were completed for all the post-project scenarios, i.e., Scenario 3, 4, 7, and 8.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all selected Category B conditions, as shown in Table 3-5, Table 3-6, Table 3-7 and Table 3-8. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in are provided in Attachment A5.

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

Studied Contingency	Fault Description and Location	Results
994L (Goose Lake 103S – Fidler 312S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Fidler 312S	Stable
1071L (Castle Rock Ridge 205S – Fidler 312S)	3-phase fault at Terminal Castle Rock Ridge 205S	Stable
	3-phase fault at Terminal Fidler 132S	Stable
1072L (Goose Lake 103S – Castle Rock Ridge 205S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Castle Rock Ridge 205S	Stable
955L (Goose Lake 103S – Peigan 59S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Peigan 59S	Stable
1048L (Peigan 59S – Windy Flats 138S)	3-phase fault at Terminal Peigan 59S	Stable
	3-phase fault at Terminal Windy Flats 138S	Stable
1037L (Windy Flats 138S – Foothills 237S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal Foothills 237S	Stable
967L (Windy Flats 138S – North Lethbridge 370S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal North Lethbridge	Stable

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

Studied Contingency	Fault Description and Location	Results
994L (Goose Lake 103S – Fidler 312S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Fidler 312S	Stable
1071L (Castle Rock Ridge 205S – Fidler 312S)	3-phase fault at Terminal Castle Rock Ridge	Stable

Studied Contingency	Fault Description and Location	Results
	3-phase fault at Terminal Fidler 132S	Stable
1072L (Goose Lake 103S – Castle Rock Ridge 205S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Castle Rock Ridge	Stable
955L (Goose Lake 103S – Peigan 59S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Peigan 59S	Stable
1048L (Peigan 59S – Windy Flats 138S)	3-phase fault at Terminal Peigan 59S	Stable
	3-phase fault at Terminal Windy Flats 138S	Stable
1037L (Windy Flats 138S – Foothills 237S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal Foothills 237S	Stable
967L (Windy Flats 138S – North Lethbridge 370S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal North Lethbridge	Stable

Table 3-7: Transient Stability Study Results under Category B Conditions for Scenario 7

Studied Contingency	Fault Description and Location	Results
994L (Goose Lake 103S – Fidler 312S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Fidler 312S	Stable
1071L (Castle Rock Ridge 205S – Fidler 312S)	3-phase fault at Terminal Castle Rock Ridge	Stable
	3-phase fault at Terminal Fidler 132S	Stable
1072L (Goose Lake 103S – Castle Rock Ridge 205S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Castle Rock Ridge	Stable
955L (Goose Lake 103S – Peigan 59S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Peigan 59S	Stable
1048L (Peigan 59S – Windy Flats 138S)	3-phase fault at Terminal Peigan 59S	Stable
	3-phase fault at Terminal Windy Flats 138S	Stable
1037L (Windy Flats 138S – Foothills 237S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal Foothills 237S	Stable
967L (Windy Flats 138S – North Lethbridge 370S)	3-phase fault at Terminal Windy Flats 138S	Stable

	3-phase fault at Terminal North Lethbridge	Stable

Table 3-8: Transient Stability Study Results under Category B Conditions for Scenario 8

Studied Contingency	Fault Description and Location	Results
994L (Goose Lake 103S – Fidler 312S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Fidler 312S	Stable
1071L (Castle Rock Ridge 205S – Fidler 312S)	3-phase fault at Terminal Castle Rock Ridge	Stable
	3-phase fault at Terminal Fidler 132S	Stable
1072L (Goose Lake 103S – Castle Rock Ridge 205S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Castle Rock Ridge	Stable
955L (Goose Lake 103S – Peigan 59S)	3-phase fault at Terminal Goose Lake 103S	Stable
	3-phase fault at Terminal Peigan 59S	Stable
1048L (Peigan 59S – Windy Flats 138S)	3-phase fault at Terminal Peigan 59S	Stable
	3-phase fault at Terminal Windy Flats 138S	Stable
1037L (Windy Flats 138S – Foothills 237S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal Foothills 237S	Stable
967L (Windy Flats 138S – North Lethbridge 370S)	3-phase fault at Terminal Windy Flats 138S	Stable
	3-phase fault at Terminal North Lethbridge	Stable

4 Short Circuit Studies

4.1 Pre-Project Results

Pre-Project short-circuit current levels are provided in Table 4-1[1] and Table 4-2 for Scenario 2 and Scenario 6, respectively.

Table 4-1: Pre-Project Short-Circuit Current Levels for 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)
Peigan 59S	240	244.5	12.26	0.003463+ j0.021182	11.39	0.005534+ j0.026161
	138	143.8	8.26	0.008038+ j0.055871	7.64	0.008600+ j0.070456
Castle Rock Ridge 205S	240	248.1	9.14	0.003932+ j0.028729	7.73	0.012398+ j0.043671
Goose Lake 103S	240	248.0	10.52	0.003690+ j0.024948	9.01	0.009405+ j0.037088
	138	143.2	11.20	0.005191+ j0.040843	10.55	0.008768+ j0.049909
Filder 312S	240	248.6	9.03	0.003898+ j0.029156	7.66	0.010027+ j0.044292
	138	143.2	8.85	0.003457+ j0.051731	8.67	0.008166+ j0.053409
Drywood 415S	138	142.9	4.10	0.034278+ j0.106687	2.88	0.066535+ j0.247187
	69	70.9	4.53	0.051134+ j0.194962	3.24	0.120517+ j0.425809
Pincher Creek 396S	138	143.2	10.95	0.005610+ j0.041717	10.23	0.009389+ j0.052132
	69	72.3	4.63	0.025272+ j0.199155	4.69	0.022290+ j0.193623

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

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)
Peigan 59S	240	243.4	12.44	0.003365+ j0.020805	11.47	0.005530+ j0.026137
	138	143.1	8.35	0.007976+ j0.054994	7.67	0.008595+ j0.070427
Castle Rock Ridge 205S	240	247.2	9.30	0.003769+ j0.028156	7.81	0.012331+ j0.043499
Goose Lake 103S	240	247.1	10.73	0.003525+ j0.024372	9.12	0.009356+ j0.036948

[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.

	138	142.6	11.73	0.004764+ j0.038771	10.83	0.008730+ j0.049834
Filder 312S	240	247.6	9.18	0.003736+ j0.028576	7.75	0.009900+ j0.043942
	138	144.1	8.90	0.003405+ j0.051777	8.70	0.008245+ j0.053690
Drywood 415S	138	142.7	4.77	0.025110+ j0.092201	3.07	0.066429+ j0.246938
	69	70.4	4.67	0.045043+ j0.187707	3.27	0.120353+ j0.425270
Pincher Creek 396S	138	142.6	11.46	0.005185+ j0.039658	10.49	0.009354+ j0.052065
	69	70.3	4.63	0.023583+ j0.193406	4.67	0.021863+ j0.190421

4.2 Post-Project Results

4.2.1 Scenario 4: 2020 SP Post-Project

Post-Project short-circuit current levels for Scenario 6 are provided in Table 4-3.

Table 4-3: Post-Project Short-Circuit Current Levels for 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)
Peigan 59S	240	244.6	12.27	0.003488+ j0.021275	11.40	0.005513+ j0.026255
	138	143.7	8.28	0.008063+ j0.055960	7.66	0.008573+ j0.070568
Castle Rock Ridge 205S	240	249.0	9.17	0.003960+ j0.028849	7.71	0.012347+ j0.044563
Goose Lake 103S	240	248.7	10.54	0.003715+ j0.025049	9.00	0.009360+ j0.037588
	138	143.5	11.24	0.005213+ j0.040929	10.56	0.008755+ j0.050271
Filder 312S	240	249.4	9.05	0.003924+ j0.029263	7.66	0.009972+ j0.044804
	138	143.5	8.88	0.003476+ j0.051818	8.68	0.008150+ j0.053791
Drywood 415S	138	143.3	4.13	0.034275+ j0.106692	2.90	0.066512+ j0.247406
	69	70.9	4.55	0.051151+ j0.194769	3.26	0.120501+ j0.425807
Pincher Creek 396S	138	143.5	10.99	0.005632+ j0.041805	10.24	0.009376+ j0.052486
	69	71.8	4.63	0.025126+ j0.198490	4.69	0.022070+ j0.192934
McLaughlin 423S	138	144.1	6.34	0.018769+ j0.070968	4.71	0.036013+ j0.147006

4.2.2 Scenario 8: 2020 SP Post-Project Sensitivity

Post-Project short-circuit current levels for Scenario 8 are provided in Table 4-4.

Table 4-4: Post-Project Short-Circuit Current Levels for Scenario 8

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)
Peigan 59S	240	242.4	12.32	0.003361+ j0.020802	11.35	0.005535+ j0.026155
	138	142.3	8.26	0.007969+ j0.054998	7.59	0.008600+ j0.070451
Castle Rock Ridge 205S	240	246.5	9.22	0.003768+ j0.028165	7.74	0.012374+ j0.043588
Goose Lake 103S	240	246.4	10.64	0.003523+ j0.024380	9.03	0.009400+ j0.037040
	138	142.3	11.65	0.004756+ j0.038794	10.74	0.008769+ j0.049927
Filder 312S	240	247.0	9.10	0.003735+ j0.028587	7.67	0.009953+ j0.044072
	138	143.7	8.83	0.003406+ j0.051817	8.63	0.008297+ j0.053940
Drywood 415S	138	142.9	4.76	0.025102+ j0.092218	3.06	0.066485+ j0.247034
	69	70.6	4.66	0.045031+ j0.187727	3.26	0.120480+ j0.425543
Pincher Creek 396S	138	142.3	11.37	0.005177+ j0.039683	10.40	0.009393+ j0.052161
	69	70.2	4.60	0.023573+ j0.193428	4.64	0.021898+ j0.190498
McLaughlin 423S	138	143.1	6.68	0.016801+ j0.066314	4.79	0.036000+ j0.146622

4.2.3 Scenario 9: 2027 WP Post-Project

Post-Project short-circuit current levels for Scenario 9 are provided in Table 4-5.

Table 4-5: Pre-Project Short-Circuit Current Levels for Scenario 9

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)
Peigan 59S	240	246.6	11.65	0.003010+ j0.021078	10.44	0.005767+ j0.028566
	138	139.3	7.63	0.007358+ j0.055058	7.04	0.008136+ j0.069851
Castle Rock Ridge 205S	240	247.6	8.16	0.003887+ j0.030243	7.90	0.004555+ j0.033902
Goose Lake 103S	240	247.9	9.21	0.003717+ j0.026806	8.72	0.005025+ j0.031834
	138	139.3	10.15	0.005310+ j0.041391	10.02	0.005283+ j0.045121
Filder 312S	240	247.9	8.03	0.003894+ j0.030793	7.48	0.005768+ j0.038106
	138	139.1	8.12	0.003432+ j0.051965	8.41	0.005063+ j0.046751
Drywood 415S	138	138.7	3.73	0.035395+ j0.107562	2.81	0.045780+ j0.221780
	69	68.7	3.97	0.056794+ j0.202827	3.84	0.038424+ j0.231262
Pincher Creek 396S	138	139.4	9.94	0.005737+ j0.042260	9.70	0.006069+ j0.047493
	69	69.7	4.22	0.025836+ j0.199263	4.34	0.018697+ j0.184481

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)
McLaughlin 423S	138	139.7	5.73	0.019093+ j0.071584	4.42	0.030266+ j0.139030

5 Mitigation Measure Development and Evaluation

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

5.1 Pre-Project

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

Table 5-1: Pre-Project Mitigation Measures

Mitigation Measure	Location of Observed Violation	Contingency
Existing RAS 36[a] + Real Time Operational Practices (RTOP)[c]	225L (Glenwood 229S - Spring Coulee 385S)	618ST1 (Riverbend 618S 138/25 kV Transformer T1)
	225L (Spring Coulee 385S - Magrath 225S)	
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	
	820L (Coaldale 254S - 820AL Tap)	
	820L (Red Coat 967S Tap - 820AL Tap)	
Existing RAS 126[a]	820L (Coaldale 254S - 820AL Tap)	863L (Magrath 225S - Riverbend 618S, or 225ST1 (Magrath 225S 138/69 kV Transformer T1)
Existing RAS 126[a] + RTOP	820L (Coaldale 254S - 820AL Tap)	
Planned 172L RAS[b]	172L (Taber 83S - 172EL Tap)	1036L (Milo 356S - Travers 554S)
		607L (Fincastle 336S - Conrad 135S)
RTOP	172L (Taber 83S - 172EL Tap)	1005L (Picture Butte 120S - Milo 356S)
		1036L (Milo 356S - Travers 554S)[d]
		607L (Fincastle 336S - Conrad 135S)

Notes:

[a] RAS 36 and RAS 126 are existing RASs (see Section 1.2.2 of Attachment A1).

[b] Planned 172L RAS is a RAS proposed for the approved Stirling Wind Project.

[c] Real time operational practices: Runback Stirling Wind Project until 820L or 172L loading < 98%.

[d] Observed only on Sensitivity Scenarios

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
Existing RAS 36[a] + RTOP[c]	225L (Glenwood 229S - Spring Coulee 385S)	618ST1 (Riverbend 618S 138/25 kV Transformer T1)
	225L (Spring Coulee 385S - Magrath 225S)	

Mitigation Measure	Location of Observed Violation	Contingency
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	
	820L (Coaldale 254S - 820AL Tap)	
	820L (Red Coat 967S Tap - 820AL Tap)	
Existing RAS 126[a]	820L (Coaldale 254S - 820AL Tap)	863L (Magrath 225S - Riverbend 618S, or 225ST1 (Magrath 225S 138/69 kV Transformer T1)
Existing RAS 126[a] + RTOP	820L (Coaldale 254S - 820AL Tap)	
	820L (Red Coat 967S Tap - 820AL Tap)	
Planned 172L RAS[b]	172L (Taber 83S - 172EL Tap)	1036L (Milo 356S - Travers 554S)
		607L (Fincastle 336S - Conrad 135S)
RTOP	172L (Taber 83S - 172EL Tap)	1005L (Picture Butte 120S - Milo 356S)
		1036L (Milo 356S - Travers 554S)
		607L (Fincastle 336S - Conrad 135S)

Notes:

[a] RAS 36 and RAS 126 are existing RASs (see Section 1.2.2 of Attachment A1).

[b] Planned 172L RAS is a RAS proposed for the approved Stirling Wind Project.

[c] Real time operational practices: Runback Stirling Wind Project until 820L or 172L loading < 98%.

5.3 Evaluation of Mitigation Measures

This section describes the results of the power flow studies that were performed to assess the impact of the Project on the performance of the AIES following the implementation of proposed mitigation measures. The post-mitigation measures studies were performed under Category B conditions for all the four (4) post-Project scenarios using Alternative 1 and the following RASs:

- Existing RAS 36: mitigates overload on 225L by tripping Suncor Magrath (SCR2)
- Existing RAS 126: mitigates overload on 225L by trip Taylor Hydro (TAY1)
- Planned 172L RAS: mitigates overload on 172L by tripping planned Stilring Wind Project

The post-mitigation power flow diagrams for selected Category B conditions are provided in Attachment A6. Post-mitigation power flow diagrams present only those post-Project contingencies that result in thermal criteria violations that require RAS mitigation. Post-Project contingencies that result in thermal criteria violations that can be mitigated by real-time operational practices were not studied.

5.3.1 Scenario 3: 2020 SL Post-Project

Category B Conditions

Thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 5-3.

Table 5-3: Post-RAS Power Flow Study Results for Scenario 3

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	130.7	108.9	123.6	103.0
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	120.5	100.4	113.3	94.4
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	26.8	121.6	13.6	62.0
	225L (Spring Coulee 385S - Magrath 225S)	24	28	27.9	116.3	14.9	61.9
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	36.0	143.8	18.3	73.1
	820L (Coaldale 254S - 820AL Tap)	120	132	146.2	121.8	130.9	109.1
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	136.0	113.3	120.7	100.6
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	131.0	109.2	123.8	103.2
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	120.7	100.6	113.5	94.6

Notes:

[a] If thermal violation remained after RAS actions were complete, real-time operational practices will be used to mitigate the overload.

5.3.2 Scenario 4: 2020 SP Post-Project

Category B Conditions

The thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 5-4.

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

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	124.7	103.9	117.4	97.8
618ST1 (Riverbend 618S	225L (Spring Coulee 385S -	24	28	26.7	111.1	14.8	61.6

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
138/25 kV Transformer T1)	Magrath 225S)						
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	35.0	139.8	19.1	76.3
	820L (Coaldale 254S - 820AL Tap)	120	132	139.8	116.5	124.8	104
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	129.7	116.5	114.7	95.6
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	124.9	104.1	117.6	98
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	136.6	114.8	114.1	95.9
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	135.8	114.1	115.4	97

Notes:
[a] If thermal violation remained after RAS actions were complete, real-time operational practices will be used to mitigate the overload.

5.3.3 Scenario 7: 2020 SL Post-Project Sensitivity

Category B Conditions

The thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 5-5.

Table 5-5: Post-RAS Power Flow Study Results for Scenario 7

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	130.3	108.6	123.2	102.7
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	120.0	100.0	112.9	94.1
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Glenwood 229S - Spring Coulee 385S)	22	24	25.1	113.9	11.9	54.0
	225L (Spring Coulee 385S - Magrath 225S)	24	28	26.2	109.3	13.2	54.8

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	37.6	150.5	19.9	79.4
	820L (Coaldale 254S - 820AL Tap)	120	132	145.4	121.2	130.6	108.8
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	135.2	112.7	120.2	100.2
863L (Magrath 225S - Riverbend 618S)	820L (Coaldale 254S - 820AL Tap)	120	132	130.6	108.8	123.5	102.9
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	120.2	100.2	113.2	94.3

Notes:
[a] If thermal violation remained after RAS actions were complete, real-time operational practices will be used to mitigate the overload.

5.3.4 Scenario 8: 2020 SP Post-Project Sensitivity

Category B Conditions

The thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 5-6.

Table 5-6: Post-RAS Power Flow Study Results for Scenario 8

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
225ST1 (Magrath 225S 138/69 kV Transformer T1)	820L (Coaldale 254S - 820AL Tap)	120	132	125.6	104.7	117.5	97.9
618ST1 (Riverbend 618S 138/25 kV Transformer T1)	225L (Spring Coulee 385S - Magrath 225S)	24	28	26.1	108.7	13.8	57.5
	225L (Stirling 67S - Raymond Reservoir 313S Tap)	25	28	37.1	148.3	20.3	81.1
	820L (Coaldale 254S - 820AL Tap)	120	132	140.9	117.4	125.8	104.8
	820L (Red Coat 967S Tap - 820AL Tap)	120	132	130.9	117.4	115.7	96.4
863L (Magrath 225S - Riverbend	820L (Coaldale 254S - 820AL	120	132	125.9	104.9	118.6	98.8

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results [a]	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
618S)	Tap)						
1036L (Milo 356S - Travers 554S)	172L (Taber 83S - 172EL Tap)	119	131	137.9	115.9	115.3	96.9
607L (Fincastle 336S - Conrad 135S)	172L (Taber 83S - 172EL Tap)	119	131	136.9	115.0	116.4	97.8

Notes:
[a] If thermal violation remained after RAS actions were complete, real-time operational practices will be used to mitigate the overload

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 A7

Attachment A1
Engineering Connection Assessment: Study Scope

Engineering Connection Assessment: Study Scope

McLaughlin Wind Power Plant Connection

Renewable Energy Services Ltd.

AESO Project Number: P1500

Date: June 5, 2019

Version: V3 Final

Classification: Public

Company Name	Name and Credentials	Date	Signature
AltaLink LP (Studies Consultant and TFO)	For Ryan Cui, P. Eng.	2019-06-17	
AESO (Project Studies Engineer)	Jorge Villena, P. Eng.	2019-06-18	
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1 Introduction

This Study Scope provides an overview of the engineering studies to be completed by AltaLink LP (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

Renewable Energy Services Ltd. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its proposed McLaughlin Wind Power Plant (Facility) to the AIES. The Facility includes the approved collector substation, the McLaughlin 423S substation. The Facility is planned to be located in the Pincher Creek area, in the AESO planning area of Fort Macleod (Area 53).

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 47 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 1 MW; and a request for transmission development (collectively, the Project).

The scheduled in-service date (ISD) for the Project is November 30, 2020.

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	Not existing contract
	Requested Rate DTS	1 MW
	Type	Substation service and auxiliary load
	Motors (number and size)	Not applicable
	Power factor	0.9 pf
	Future load expansion plans	No
Generation	Generation type	Wind
	Existing Rate STS, *Supply Transmission Service,* contract capacity	Not existing contract
	Requested Rate STS	47 MW
	Number and size of generating units	11 x 4.2 MW wind turbines
	Maximum authorized real power (MARP)	47 MW
	Maximum capability (MC)	47 MW
	Reactive power capability	15.4 MVAr (0.95 pf absorbing)

Project Component		Description
		22.8 MVAr (0.9 pf producing)
	Future generation expansion plans	No

Note:

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

1.2 Existing System Overview

1.2.1 Study Area

Geographically, the Project is located in the AESO planning area of Fort MacLeod (Area 53), which is part of the AESO South Planning Region.

The Fort Macleod area is adjacent to the planning areas of High River (Area 46), Stavely (Area 49), Lethbridge (Area 54) and Glenwood (Area 55).

From a transmission system perspective, the Fort Macleod area consists mainly of 69 kV, 138 kV and 240 kV transmission systems.

The Study Area for the Project consists of the AESO planning areas of Fort MacLeod (Area 53), Lethbridge (Area 54) and Glenwood (Area 55). The Study Area also includes the tie lines connecting these planning areas to neighboring planning areas. All transmission facilities within the Study Area were studied and monitored to assess the impact of the Project on the AIES, including any violations of the Reliability Criteria (as defined in Section 2.1.1).

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

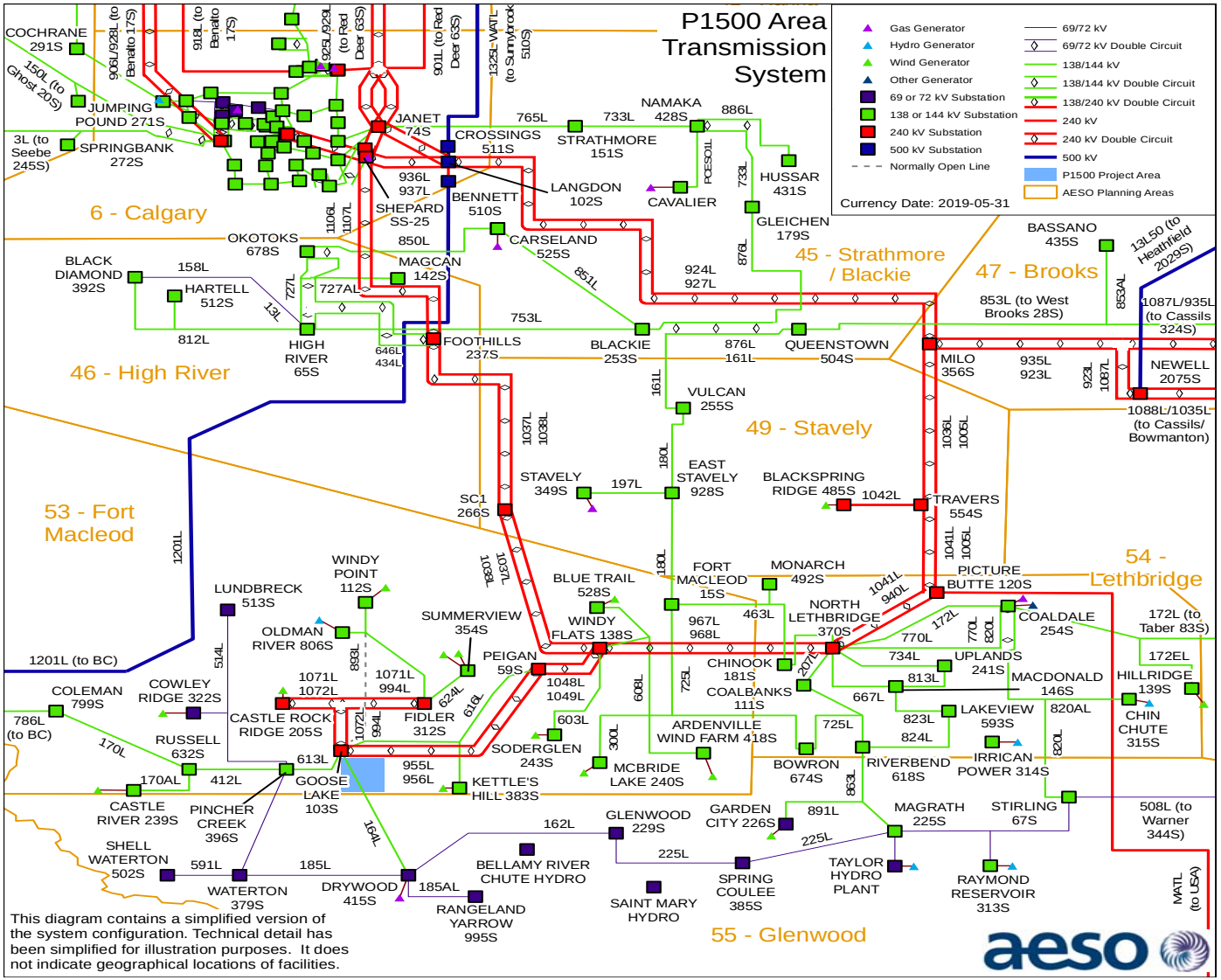
1.2.2 Existing Constraints

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). The following Remedial action schemes (RASs) and/or other protection schemes are being used to mitigate certain existing constraints in the Study Area:

1. RAS 36: Garden City 226s WAGF Trip Scheme.
2. RAS 37: Peigan 59s-616L Overload Mitigation Scheme
3. RAS 40: Coleman 799S- 786L Overload Mitigation Scheme
4. RAS 43: Stirling 67s - 508L Load Trip Scheme
5. RAS 126: Magrath 225s Generation Trip Scheme
6. RAS 129: Goose Lake 103s 613L Overload Mitigation Scheme
7. RAS 136: Direct Transfer Trip to MATL on Loss of 1201L
8. RAS 137: MATL Local Detection Scheme

9. RAS 604: Windy Point/Oldman River Tripping Scheme
10. RAS 605: Summerview Tripping Scheme

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



2 Connection Alternative to be Studied

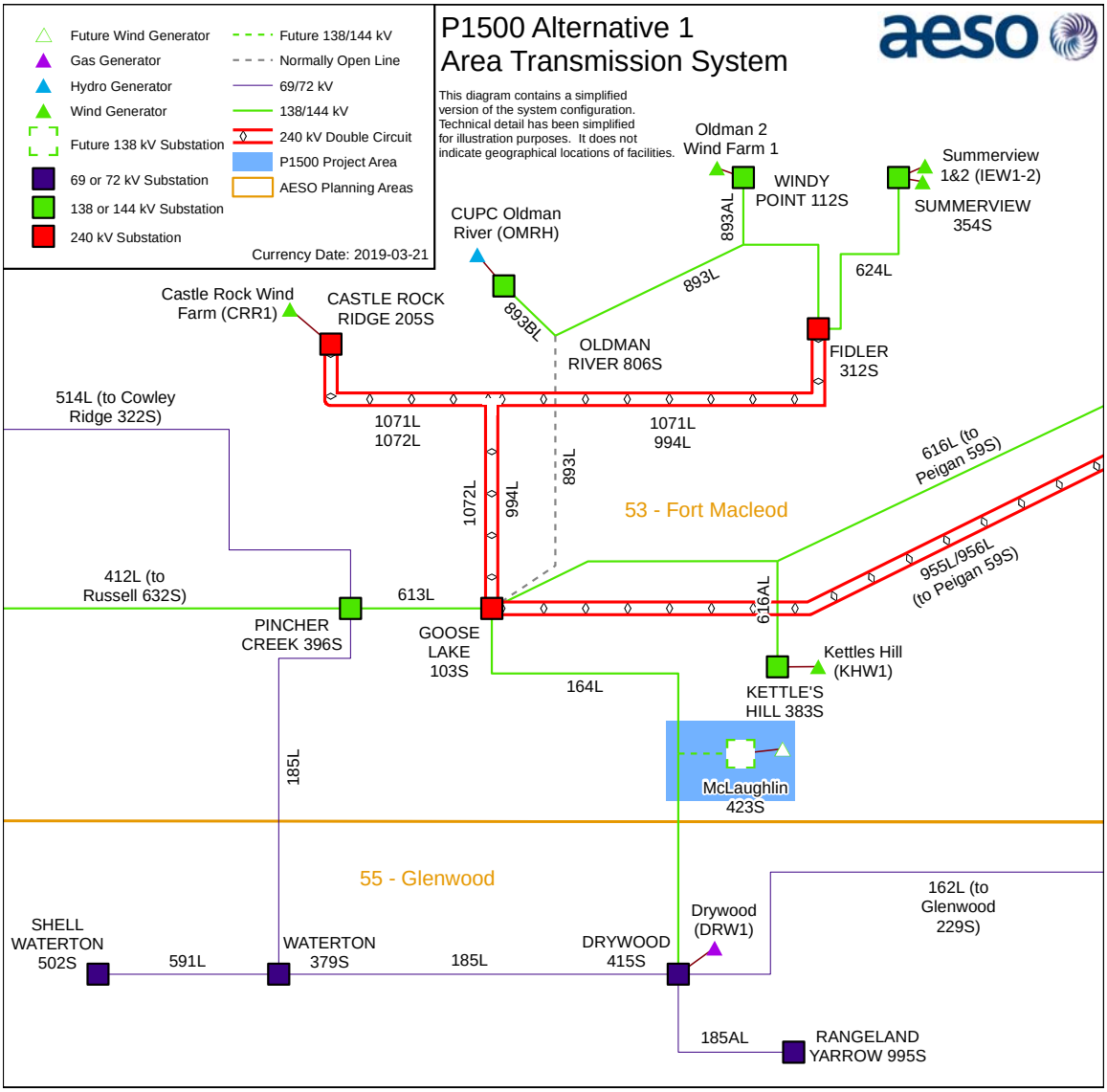
The following alternative will be studied:

Alternative 1 – T-tap connection to the existing 138 kV transmission line 164L

This alternative includes the following developments:

- Connect the Facility to the existing 138 kV transmission line 164L (between the Goose Lake 103S substation and the Drywood 415S substation) using a T-tap configuration. This would require the addition of one 138 kV circuit, approximately 110 m in length.
- Add or modify associated equipment as required for the above transmission developments.

Figure 2-1: Connection Alternative 1



3 Criteria, Standards and Requirements

3.1 AESO Reliability Criteria

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

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

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

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

- Normal thermal rating of the line's loading limits for each season.
- The highest specified loading limits for transformers
- For Category A conditions: Voltage range under normal operating condition per AESO Information Document #2010-007RS, *General Operating Practices – Voltage Control* (ID #2010-007RS). For the busses not listed in ID #2010-007RS, Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions* applies.
- For Category B conditions: The extreme voltage range values per Table 2-1 in the *Transmission Planning Criteria – Basis and Assumptions.*
- 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 AESO's *Connection Study Requirements*, the AESO's *Generation and Load Interconnection Standard*, and Sections 502.5 and 502.6 of the ISO rules as they relate to Generating Unit Technical and Operating requirements.

3.3 Aggregated Generating Facility Requirements

The Facility should meet the technical requirements presented in Section 502.1 of the ISO rules, *Aggregated Generating Facilities Technical 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. The Study Area has low load variation between winter and summer seasons and the transmission facilities in the Study Area have summer ratings that are significantly lower than the winter ratings. As a result, summer loading scenarios, both summer light (SL) and summer peak (SP), are selected since they provide the most stressed operating conditions. The scheduled ISD for the Project is November 30, 2020. Therefore, the studies will be conducted using 2020 summer peak (2020 SP) and 2020 summer light (2020 SL) study scenarios. The Project load is not significant compared to the load in the Study Area, hence it will not be considered in this study. Sensitivity scenarios will also be studied to assess both the Project and the Drywood Expansion Power Plant Connection (AESO Project 1864) on the Study Area.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
Pre-Project					
1	2020 Summer Light (SL)	High Wind, Zero Import	2020 SL Pre-Project	0	0
2	2020 Summer Peak (SP)	High Wind, High Import	2020 SP Pre-Project	0	0
Post-Project					
3	2020 SL	High Wind, Zero Import	2020 SL Post-Project	0	47
4	2020 SP	High Wind, High Import	2020 SP Post-Project	0	47
9	2027 Winter Peak (WP)	All generation in the Study Area on	2027 WP Post-Project	0	47
Pre-Project Sensitivity					
5	2020 SL	High Wind, Zero Import	2020 SL Pre-Project Sensitivity	0	0
6	2020 SP	High Wind, High Import	2020 SP Pre-Project Sensitivity	0	0
Post-Project Sensitivity					
7	2020 SL	High Wind, Zero Import	2020 SL Post-Project Sensitivity	0	47
8	2020 SP	High Wind, High Import	2020 SP Post-Project Sensitivity	0	47

4.2 Assumptions

4.2.1 System Project Assumptions

The *AESO 2017 Long-term Transmission Plan*[1] (2017 LTP) identifies the following transmission development in the Study Area. This transmission development will enable integration of additional generation in renewable resource-rich areas of the southern region

- The Chapel Rock-Pincher Creek Transmission Development, which includes a 500/240 kV substation and two 240 kV lines.

The pre-Project and post-Project connection assessment will not include the above transmission development because it is not expected to be in service before the scheduled Project ISD.

4.2.2 Connection Project Assumptions

Table 4-2 summarizes the connection projects that will be included in the studies.

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

AESO Project Number	AESO Project Name	AESO Planning Area	Generation (MW)	Load (MW)	Scheduled ISD	AUC Proceeding or Approval No.
462	Castle Rock Ridge Wind Power Plant Phase II	53	31.0	0.0	Nov 1, 2019	23753
524	Riverview Wind Farm Connection	53	115.0	1.0	Jun 3, 2019	2402
1719	Stirling Wind Project Connection	54	113.0	0.0	Dec 20, 2019	22546-D05-2019
2041	TransAlta Windrise MPC Wind	53	220	3.0	Nov 2, 2020	Not Applicable
1864	Drywood Expansion Power Plant Connection	55	33.9	1.0	Oct 1, 2019	Not Applicable

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 South Planning Region peak based on the *AESO 2017 Long-term Outlook* (2017 LTO)[2]. For the studies, when loads for the Alberta Internal Load (AIL) are modified to align with the load forecast in the 2017 LTO, the active power to reactive power ratio in the base case scenarios will be maintained.

[1] The 2017 LTP is available on the AESO website.

[2] The 2017 LTO is available on the AESO website.

Table 4-3: Forecast Load (2017 LTO at AESO South Planning Region Peak)

AESO Planning Region Name	2020 Forecast Peak Load (MW)	
	SP	SL
South Planning Region	1397	839

Note:
The South Region comprises the following AESO planning areas: Medicine Hat (Area 4), Sheerness (Area 43) ,Seebe (Area 44) ,Strathmore/Blackie (Area 45) ,HighRiver (Area 46) ,Brooks (Area 47), Empress (Area 48), Stavely (Area 49), Vauxhaul (Area 52), Fort Macleod (Area 53) ,Lethbridge (Area 54), and Glenwood (Area 55)

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 2017 LTO. Additional studies may be required in the event of changes to the AESO's corporate forecast.

The non-renewable and hydro generation dispatch conditions for the study scenarios are described in Table 4-4.

Table 4-4: Existing Non-Renewable and Hydro Generation Dispatch Conditions

Facility Name	Bus No.	Pmax (MW)	AESO Planning Area No.	Unit Net Generation[a] (MW) per Scenario	
				2020 SL	2020 SP
Taylor Hydro Facility	4670	14	55	13.5	13.5
Raymond Reservoir Hydroelectric Facility	414	21	55	19.6	19.2
Irrican Hydro Facility	450	7	55	6.9	6.8
Drywood Power Plant	4226	6	55	6	6
Lethbridge Coaldale	4690	6.4	54	6	6.0
Chin Chute Hydroelectric Facility	407	15	54	10.6	10.7
Old Man River Dam	2230	32	53	31.5	31.7
Drywood Expansion Power Plant Connection (AESO Project 1864)[b]	4226	38	55	33.9	33.9

Notes:
[a] "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.
[b] Applicable to Sensitivity Scenario only

Per the 2017 LTO, the total forecast wind and solar electricity generation in 2020 is 2,594 MW. This includes existing, under construction and planned wind and solar electricity generation facilities. Using

this value, the wind and solar generation facilities will be dispatched to yield the credible worst-case power flow conditions for the Study Area.

Pre-Project dispatch levels for the existing and under-construction wind and solar electricity generation facilities are shown in Table 4-5.

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

Facility Name and Code	AESO Planning Area No.	Bus Number	MC (MW)	Unit Net Generation[s] (MW) per Scenario
				2020 SP/SL
Ardenville Wind (ARD1)	53	4735, 4740	68	68
Blue Trail Wind (BTR1)	53	66328, 67328	66	66
Castle River #1 (CR1)	53	2234, 3234	39	39
Castle Rock Wind Farm (CRR1)	53	67221	77	77
Cowley Ridge (CRWD)	53	255, 265, 4264	20	20
Enmax Taber (TAB1)	52	15343, 16343	81	81
Kettles Hill (KHW1)	53	2402, 3402	63	63
McBride Lake Windfarm (AKE1)	53	2901, 3901, 4901	73	73
Soderglen Wind (GWW1)	53	12358, 13358	71	71
Summerview 1 (IEW1)	53	2338, 3338	66	66
Summerview 2 (IEW2)	53	4339, 5337	66	66
Suncor Chin Chute (SCR3)	54	2389	30	30
Suncor Magrath (SCR2)	53	11002	30	30
Suncor Wintering Hills (SCR4)	43	60789, 60791, 60793, 60846, 60848, 60850	88	88
Old Man River(OWF1)	53	61543	46	46
Blackspring Ridge(BSR1)	49	61736, 61737	300	300
Brooks Solar (BSC1)	47	553257	15	15
AESO South Planning Region Subtotal			1,199	1,199
Ghost Pine (NEP1)	42	2621 to 2625	82	0
Halkirk (HAL1)	42	66435, 67435	150	150
Fortis Bull Creek Phases 1 and 2 (BUL1&BUL2)	37	550003, 550004	29.5	29.5
AESO Central Planning Region Subtotal			261.5	179.5
Total			1461	1,378.5

Note:

[a] "Unit Net Generation" refers to gross generating unit output (MW) less unit service load.

Table 4-6 lists the pre-Project dispatch levels for the planned renewable generation projects in the AESO South and Central planning regions that are included in the study scenarios. Planned renewable generation projects not listed in Table 4-6 are not included in the study and will not be dispatched.

Table 4-6: Dispatch Conditions for Planned Wind and Solar Generation Projects

Project Name	Energy Resource	AESO Project Number	Planned ISD	AESO Planning Area	Gen (MW)	2019 SP/SL Unit Net Generation (MW)
South Planning Region						
Enel Alberta Riverview Wind Farm	Wind	524	May-19	53	115	115
Phase 2 of Castle Rock Ridge Wind Power Plant	Wind	462	Dec-19	53	31	30.6
Capital Power Whitla Wind	Wind	1800	Jun-19	4	300	201.6
Joss MPC WAGF	Wind	1533	Jun-19	48	120	122.4
Joss Jenner WAGF - Phase 2	Wind	1698	May-19	48	180	71.4
Stirling WAGF Project	Wind	1719	Dec-19	54	113	113
Fortis Buffalo Atlee Cluster 1 WAGF	Wind	1853	Mar-19	48	18.3	17.25
Fortis Buffalo Atlee Cluster 3 WAGF	Wind	1892	Mar-19	48	17.3	17.25
Fortis Buffalo Atlee Cluster 2 WAGF	Wind	2199	Mar-19	48	17.3	13.8
TransAlta Windrise MPC Wind	Wind	2041	Nov-20	53	220	207
EDF Cypress Wind	Wind	2122	Jun-21	4	450	201.6
Subtotal (Southern Alberta)						**1110.9**
Central Planning Region						
Sharp Hills Wind Facility	Wind	1567	May-19	42	300	104.6
Subtotal (Central Alberta)						**104.6**
Subtotal						**1215.5**
Total						**2,594**

The post-Project scenario renewable generation dispatch levels are identical to the pre-Project scenario dispatch levels shown in Table 4-5 and Table 4-6, except that the Sharp Hills Wind Faciliy (AESO project 1567) dispatch will be reduced to 57.6 MW. The Facility will be dispatched to 47 MW in all post-Project

scenarios. This will result in a total wind and solar generation dispatch consistent with the 2017 LTO's 2020 forecast wind and solar capacity of 2,594 MW.

4.2.5 Intertie Flow Assumptions

The intertie flow assumptions for the Alberta-British Columbia (AB-BC), Alberta-Saskatchewan (AB-SK), and Alberta-Montana (MATL) interties are shown in Table 4-7. The flow exchange between the AIES and the City of Medicine Hat are also shown in Table 4-7.

For the 2027 WP scenario, the intertie flows should be as per the published AESO base cases.

Table 4-7: Intertie Flows by Scenario

Scenario Number	Scenario Name	Import (+) / Export (-) by Intertie			Import (+)/Export (-) to City of Medicine Hat (MW)
		AB-BC	AB-SK	MATL	
1, 3, 5, 7	2020 SL	0	0	0	-26
2, 4, 6, 8	2020 SP	430	0	300	-26

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 2027 WP scenario, the HVDC flows should be as per the published AESO base cases.

Table 4-8: HVDC Power Order by Scenario

Scenario Number	Scenario Name	WATL (MW)*	EATL (MW)*
1, 3, 5, 7	2020 SL	250 S→N	650 S→N
2, 4, 6, 8	2020 SP	400 S→N	850 S→N

Notes:
N → S: HVDC flow direction is North to South
S → N: HVDC flow direction is South to North

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 4-9. These limits must be maintained when performing the studies.

Table 4-9: 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 a transmission facility (TFO) provided the thermal ratings assumptions for the existing transmission lines in the Study Area. Table 4-10 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 4-10: Thermal Rating Assumptions for Key Transmission Lines in the Study Area

Line ID	Line Description	Voltage Class (kV)	Summer	
			Normal Rating (MVA)	Emergency Rating (MVA)
164L	Goose Lake 103S - Drywood 415S	138	111	122
616L	Goose Lake 103S - Peigan 59S	138	119	131
412L	Pincher Creek 396S - Russell 632S	138	121	133
170L	Russell 632S -Coleman 799S	138	121	133
786L	Natal B1S - Coleman 799S	138	99	109
613L	Goose Lake 103S - Pincher Creek 396S	138	119	131
1071L	Fidler 312S -Castle Rock Ridge 205S	240	952	1047
1072L	Goose Lake 103S - Castle Rock Ridge 205S	240	967	1160
994L	Goose Lake 103S - Fidler 312S	240	831	1047
967L	Windy Flats 138S - N Lethbridge 370S	240	499	599
968L	Windy Flats 138S - N Lethbridge 370S	240	499	733
185L	Pincher Creek 396S - Shell Canada Waterton 379S	69	41	45
185L	Shell Canada Waterton 379S -Drywood 415S	69	57	63
162L	Drywood 415S -Glenwood 229S	69	40	44
225L	Glenwood 229S -Spring Coulee 385S	69	22	24
225L	Spring Coulee 385S - Magrath 225S	69	24	28
225L	Magrath 225S- Raymond 313S tap-point	69	25	28
225L	Stirling 67S - Raymond 313S tap-point	69	25	28
1037L/ 1038L	Windy Flats 138S - Foothills 237S	240	973	1071
955L /956L	Goose Lake 103S - Peigan 59S	240	611	751
1048L/ 1049L	Peigan 59S - Windy Flats 138S	240	611	733
820L	Stirling 67S - 820L Tap - Coaldale 254S	138	120	132
172L	Coaldale 254S - Taber 83S	138	119	131

The TFO provided the details of the substation transformers in the Study Area. The key transformers in the Study Area are shown in Table 4-11.

Table 4-11: Summary of Key Transformer Ratings in the Study Area

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	MVA Rating
North Lethbridge 370S	T3	240/138	193.6
	T5	240/138	200
	T6	240/138	200
West Brooks 28S	T1	240/138	400
	T2	240/138	400
Stirling 67S	T2	138/69	50
Magrath 225S	T1	138/69	50
Drywood 415S	T1	138/69	50
Pincher 396S	T1	138/69	50

The TFO provided the details of the shunt elements in the Study Area. The key shunt elements in the Study Area are shown in Table 4-12.

Table 4-12: 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)
Pincher Creek 396S	138	1x24.46	24.46	-	-
Windy Flats 138S	240	-	-	2x75	150
Picture Butte 120S	240	2 x 50.00 MVAr	100.00	-	-

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 4-13. 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 4-13: Protection Fault Clearing Times

Contingency (System Element Lost)	Faulted Location	Clearing Time (No. of Cycles)	
		Near End	Far End
994L (Fidler 312S - Goose Lake 103S)	Fidler 312S	4	5

	Goose Lake 103S	4	5
1071L (Fidler 312S - Castle Rock Ridge 205S)	Fidler 312S	4	5
	Castle Rock Ridge 205S	4	5
1072L (Castle Rock Ridge 205S - Goose Lake 103S)	Castle Rock Ridge 205S	4	5
	Goose Lake 103S	4	5
955L Peigan 59S - Goose Lake 103S)	Peigan 59S	5	5
	Goose Lake 103S	4	6
1048L (Peigan 59S - Windy Flat 138S)	Peigan 59S	4	5
	Windy Flat 138S	4	5
1037L (Windy Flat 138S - Foothills 237S)	Windy Flat 138S	5.5	4.5
	Foothills 237S	4.5	5.5
967L (Windy Flat 138S - North Lethbridge 370S)	Windy Flat 138S	5	6
	North Lethbridge 370S	5	6

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4.2.9 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

5.1 Engineering Studies

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

Table 5-1: Summary of Engineering Studies to be Performed

Scenario Number and Name		System Conditions	Power Flow	Transient Stability	Short-circuit
Pre-Project					
1	2020 SL Pre-Project	Category A and Category B	X		
2	2020 SP Pre-Project	Category A and Category B	X		X
Post-Project					
3	2020 SL Post-Project	Category A and Category B	X	X	
4	2020 SP Post-Project	Category A and Category B	X	X	X
9	2027 WP Post-project	Category A			X
Pre-Project Sensitivity					
5	2020 SL Pre-Project Sensitivity	Category A and Category B	X		
6	2020 SP Pre-Project Sensitivity	Category A and Category B	X		X
Post-Project Sensitivity					
7	2020 SL Post-Project Sensitivity	Category A and Category B	X	X	
8	2020 SP Post-Project Sensitivity	Category A and Category B	X	X	X

For the engineering studies, all transmission facilities 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).

5.2 Power Flow Studies

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

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

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

5.2.1 Contingencies to be Studied:

Power flow studies will be performed for the Category A and all Category B conditions in the Study Area. In addition, the following contingencies outside the Study Area will be studied, because these contingencies may impact elements within the Study Area:

- 1036L (Milo 356S – Travers 554S),
- 1005L (Picture Butte 120S – Milo 356S), and
- 607L (Conrad 135S – Fincastle 336S).

5.3 Transient Stability Studies

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

The report presenting the results of the transient stability studies will provide response plots for bus voltage, machine relative angle and active and reactive power outputs for all available generation units within the Study Area will be provided. The results report will also provide the key branch active and reactive power flow surrounding the Facility.

Near and far end three-phase–to-ground faults were applied to transmission lines to assess the stability of the system. The applied faults were cleared by opening the respective near-end and far-end line breakers using the fault clearing times as depicted in Table 4-13.

A system dynamic response was considered acceptable if the following conditions were met after a disturbance:

- All the generators exhibited stable and damped response and remained connected to the AIES,
- All oscillations in the system were damped successfully as per Western Electricity Coordinating Council (WECC) and *AESO Transmission Planning Criteria – Basis and Assumptions*.

5.3.1 Contingencies to be Studied:

Transient stability studies will be performed for selected Category B contingencies, as shown in Table 4-13.

5.4 Short-Circuit Current Level Studies

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.

A maximum fault level will 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.

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

- Castle Rock Ridge 205S
- Drywood 415S
- Goose Lake 103S
- Fidler 312S
- McLaughlin 423S
- Peigan 59S
- Pincher Creek 396S

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[3] 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.

[3] 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 include the AESO's current corporate forecast (2017 LTO). Sensitivity studies or restudy may be required in the event of revisions to the AESO's corporate forecast. 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

Version 1.1

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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 these standards is given in: AESO. *Alberta Reliability Standards*. Available at: 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	152
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

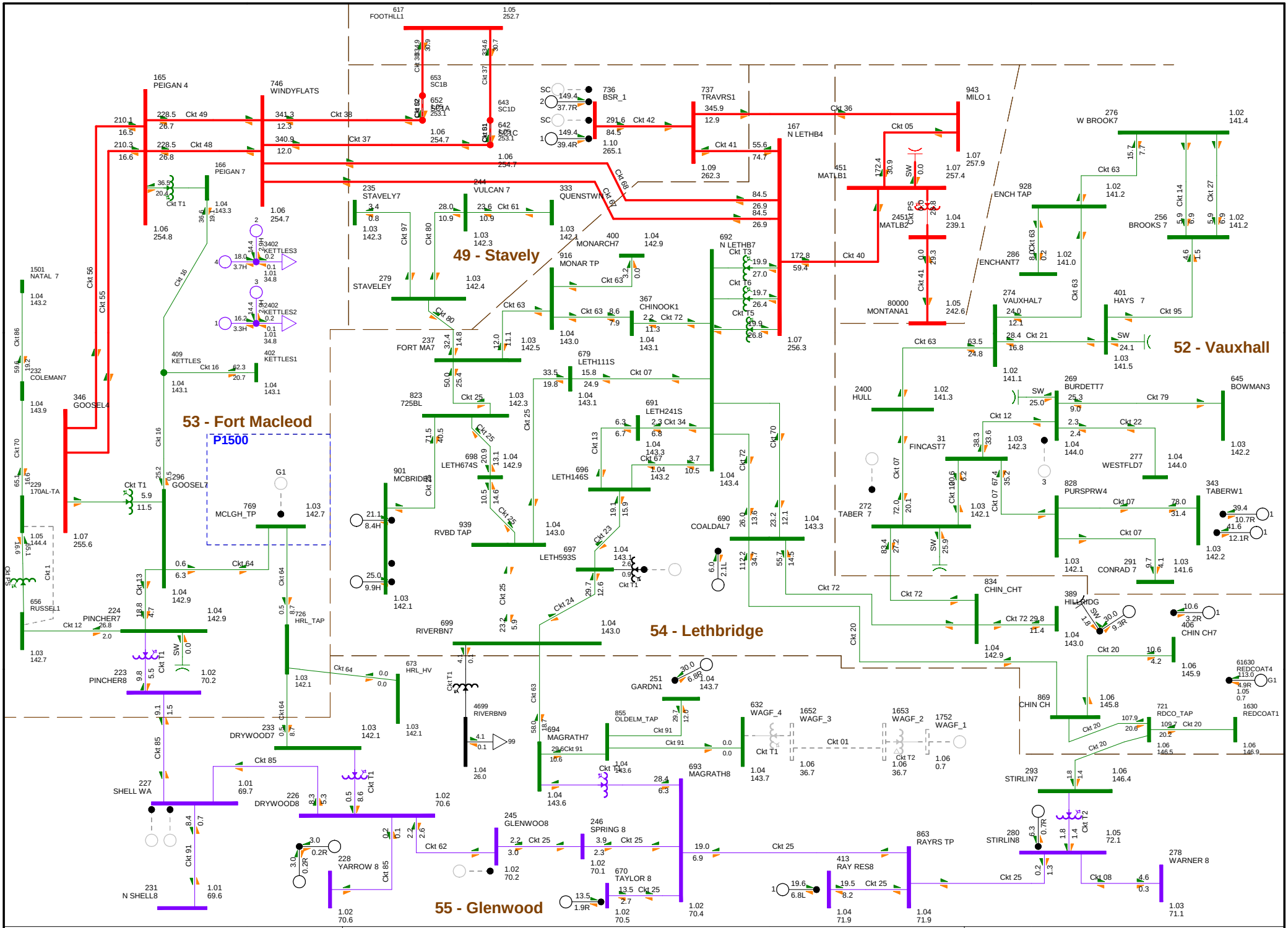
Table 2-4: Stuck Breaker Clearing Times for Lines

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



P1500 - RESL McLaughlin WAGF

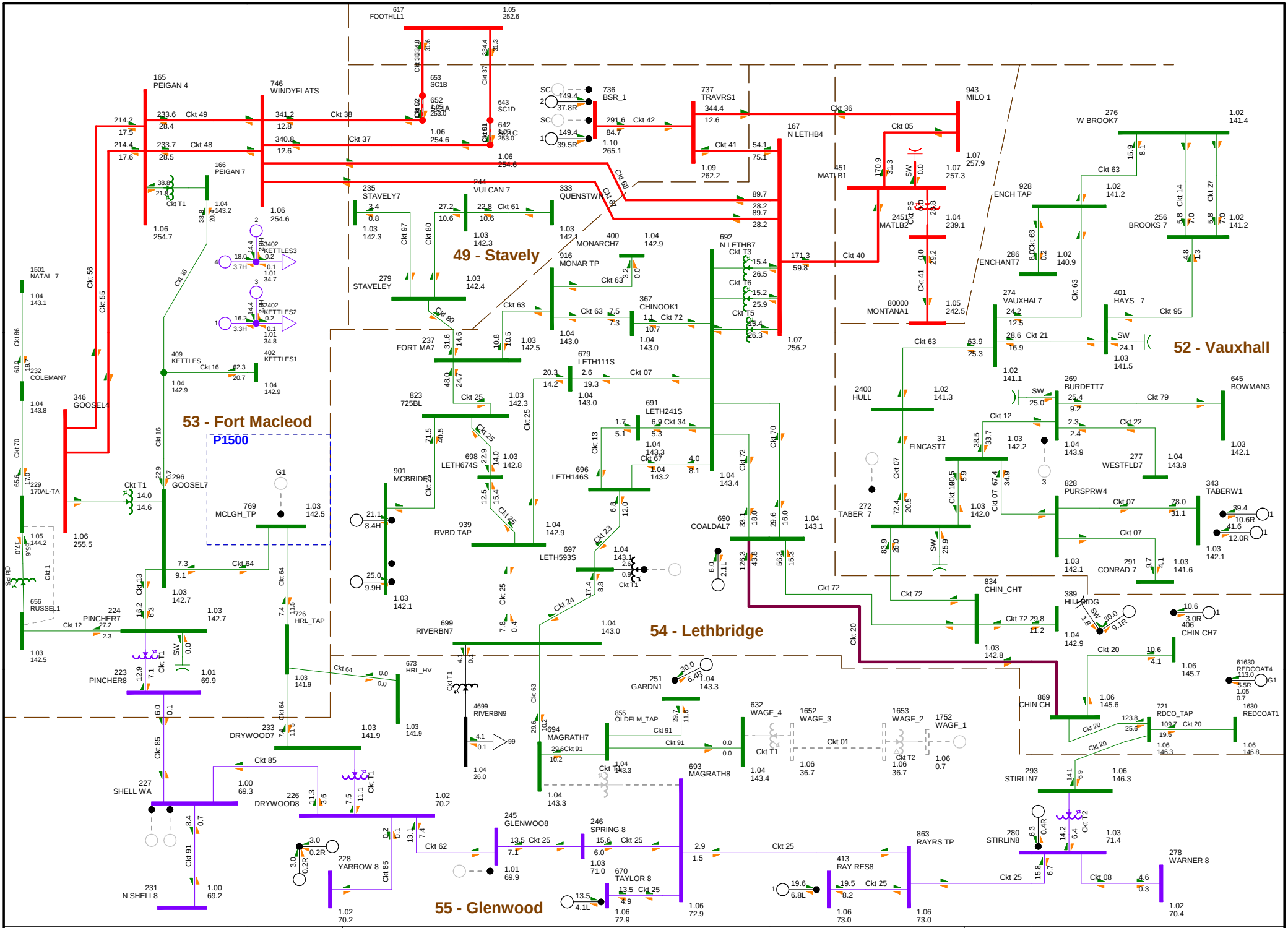
BC Import:0.4 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.1-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

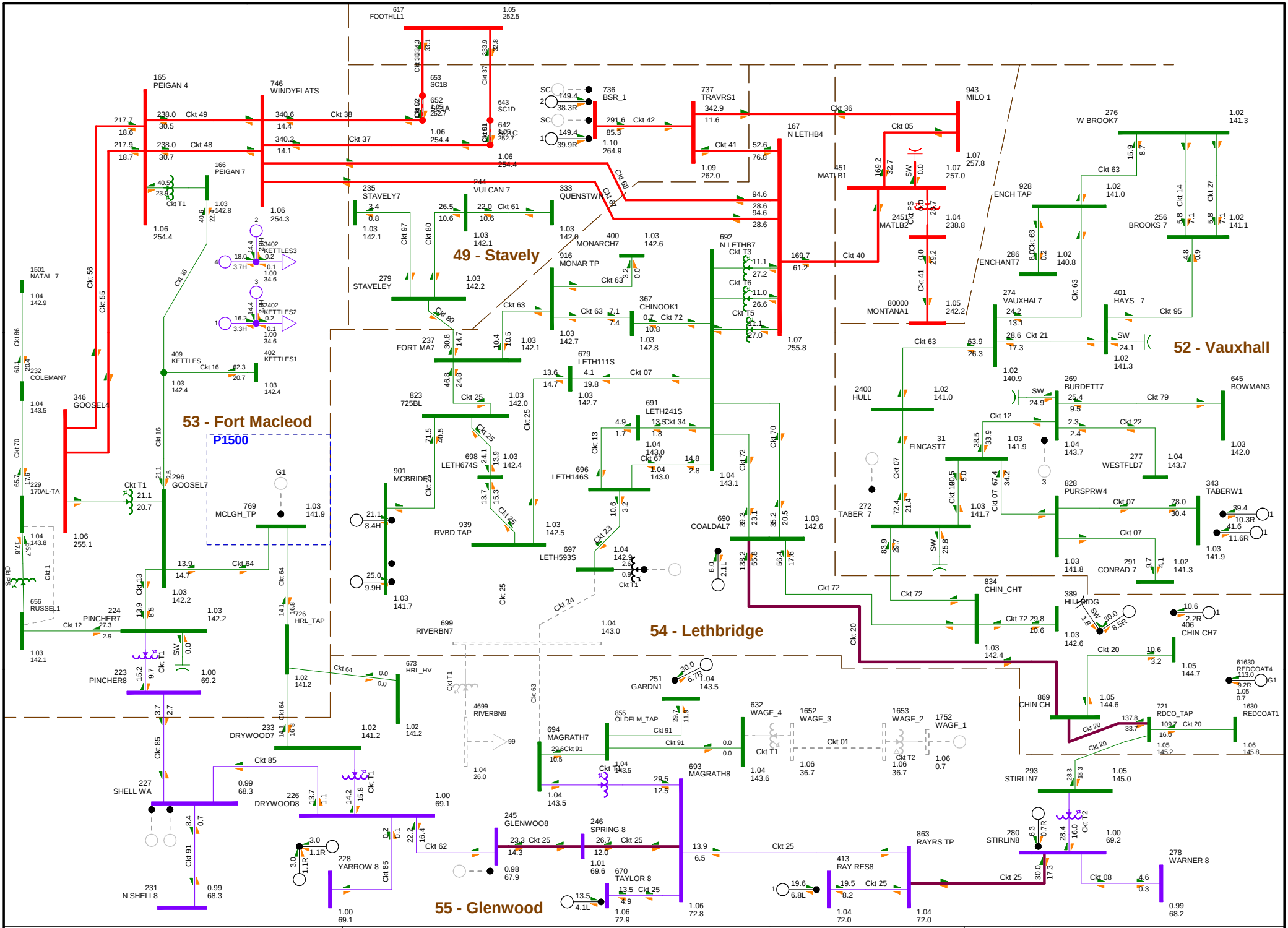
BC Import:3.3 MW Sask Import:0.0 MW MATL Import:0.0 MW

MH Import: 26.2 MW

FIGURE A2.1-2 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER LIGHT (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

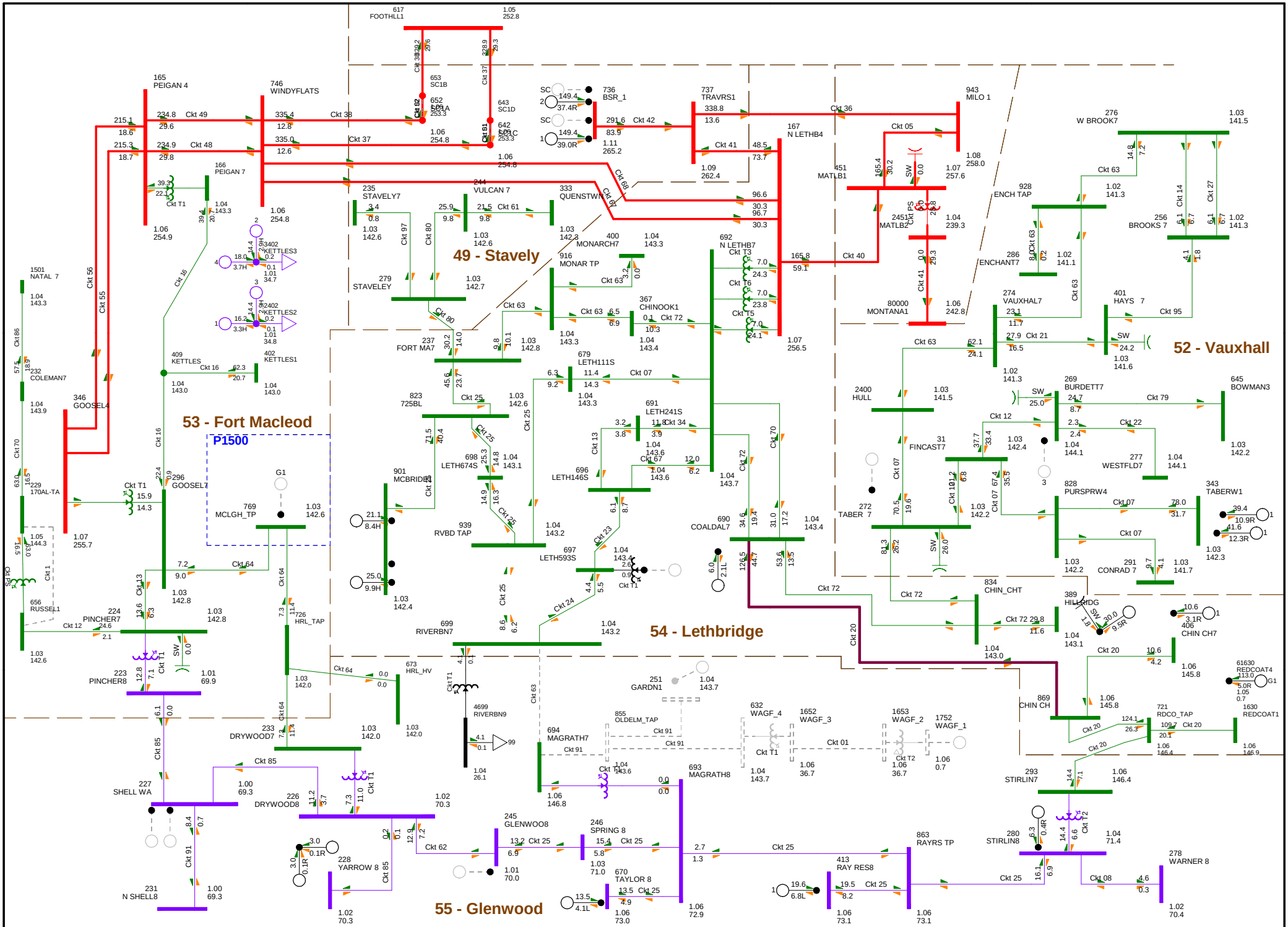
BC Import:8.0 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.1-3 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER LIGHT (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

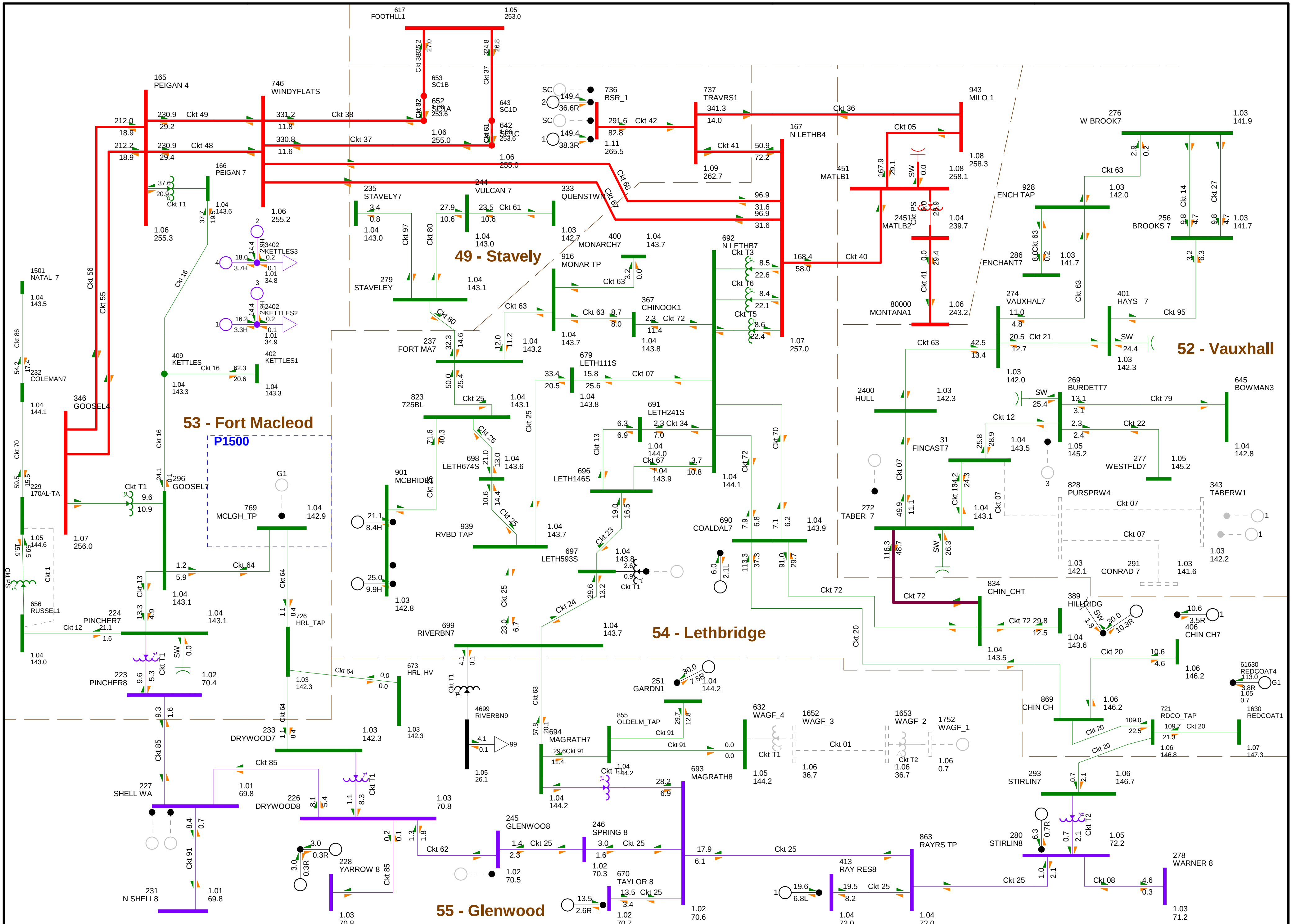
BC Import:30.5 MW Sask Import:0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.1-4 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER LIGHT (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
2451 MATLB2
80000 MONTANA1
276 W BROOK7
928 ENCH TAP
286 ENCHANT7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
235 STAVELY7
244 VULCAN 7
333 QUESTNWN
400 MONARCH7
916 MONAR TP
692 N LETHB7
367 CHINOOK1
279 STAVELEY
1501 NATAL 7
232 COLEMAN7
3402 KETTLES3
2402 KETTLES2
409 KETTLES
402 KETTLES1
237 FORT MA7
679 LETH111S
691 LETH241S
696 LETH146S
697 LETH593S
823 725BL
698 LETH674S
901 MCBRIDE
939 RVBD TAP
346 GOOSEL4
229 170AL-TA
296 GOOSEL7
769 MCLGH_TP
G1
656 RUSSEL1
224 PINCHER7
223 PINCHER8
726 HRL_TAP
673 HRL_HV
699 RIVERBN7
4699 RIVERBN9
690 COALDAL7
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRIDG
406 CHIN CH7
61630 REDCOAT4
1630 REDCOAT1
721 RDCO_TAP
869 CHIN CH
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
251 GARDN1
855 OLDELM_TAP
694 MAGRATH7
693 MAGRATH8
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
863 RAYRS TP
413 RAY RES8

P1500 - RESL McLaughlin WAGF

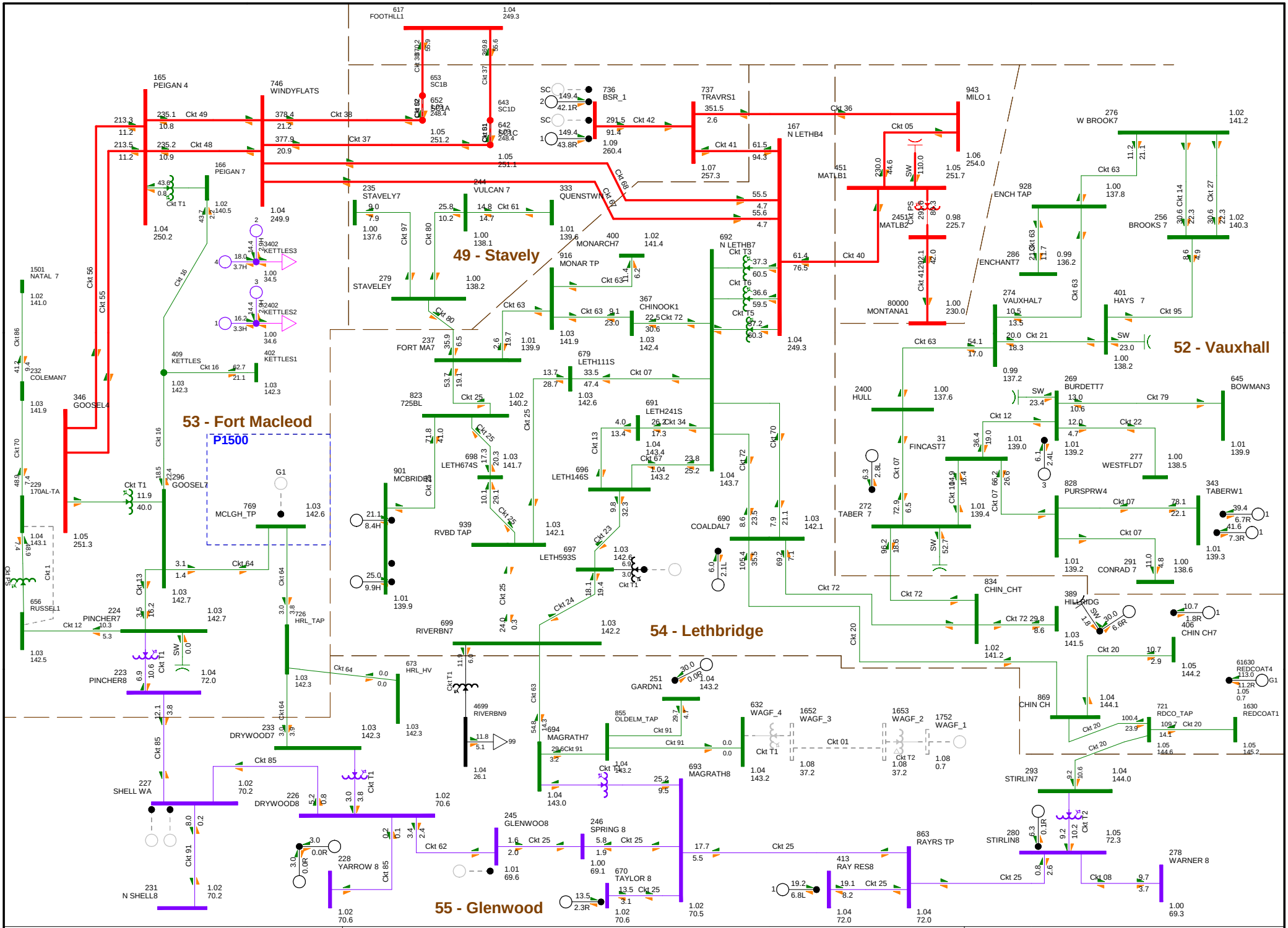
BC Import:64.7 MW   Sask Import:-0.0 MW   MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.1-5 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER LIGHT (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

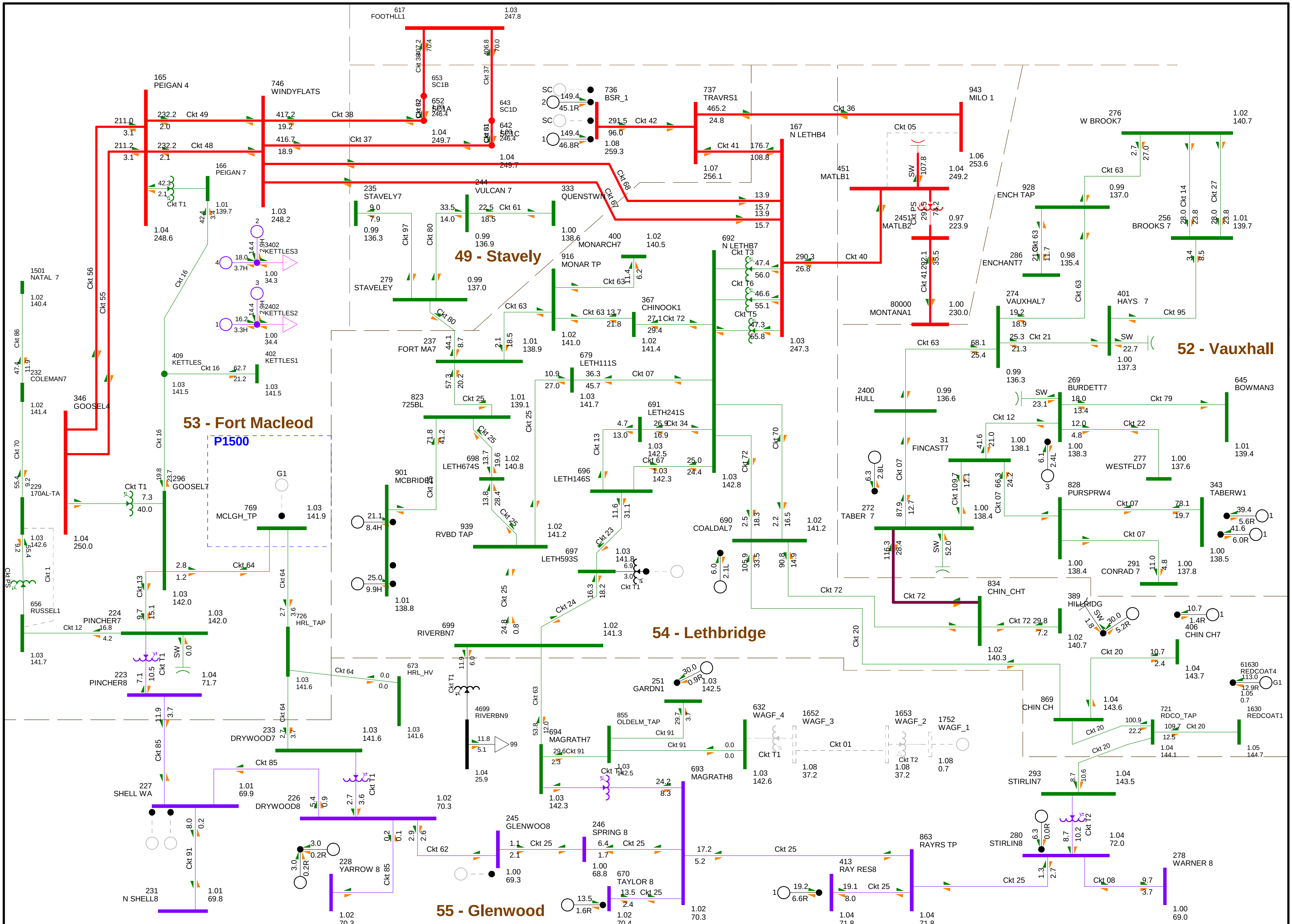
BC Import:430.8 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.2-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

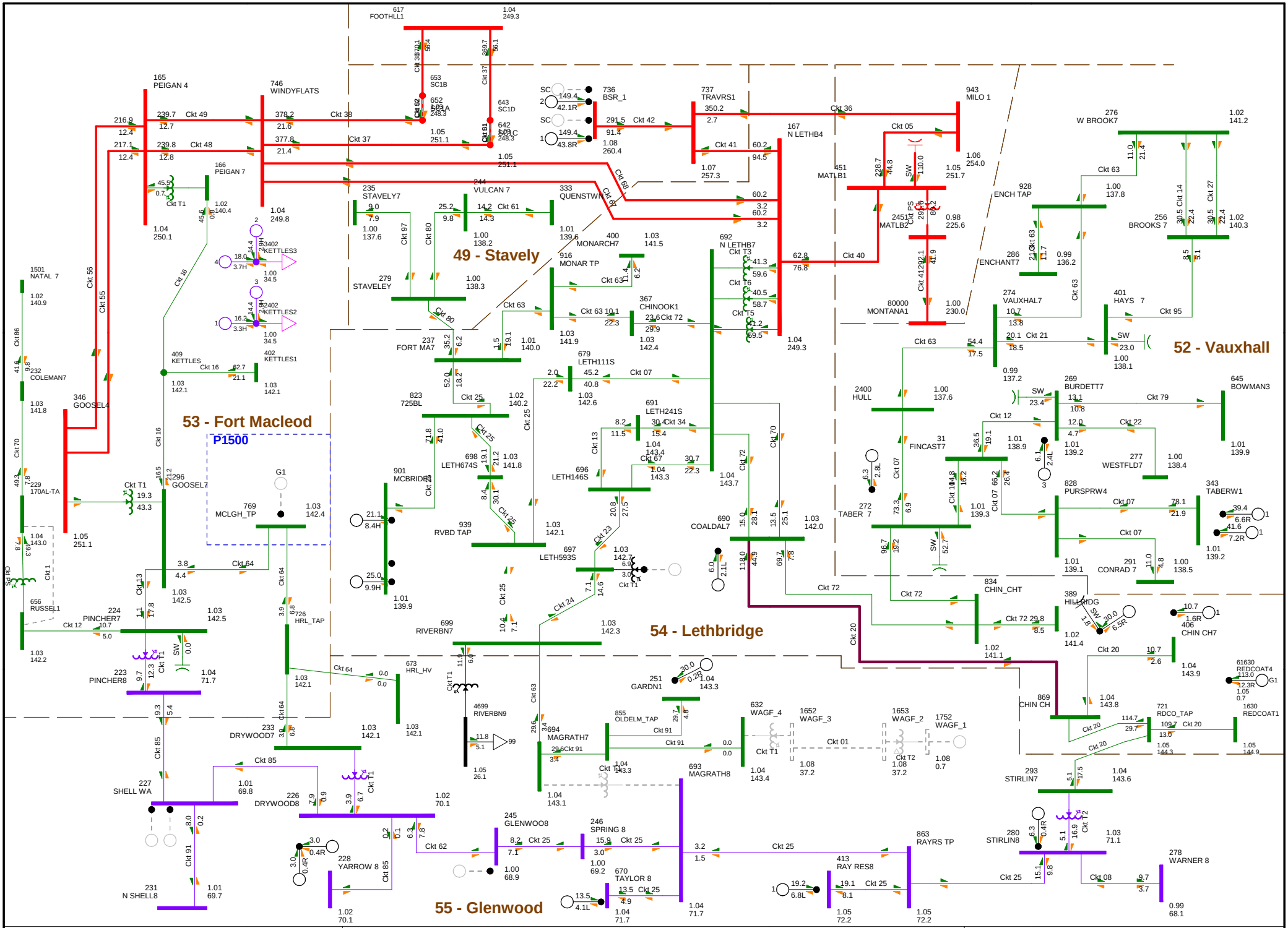
BC Import:439.4 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.2-2 N-1: 1005L (MILO 356S TO PICTURE BUTTE 120S)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

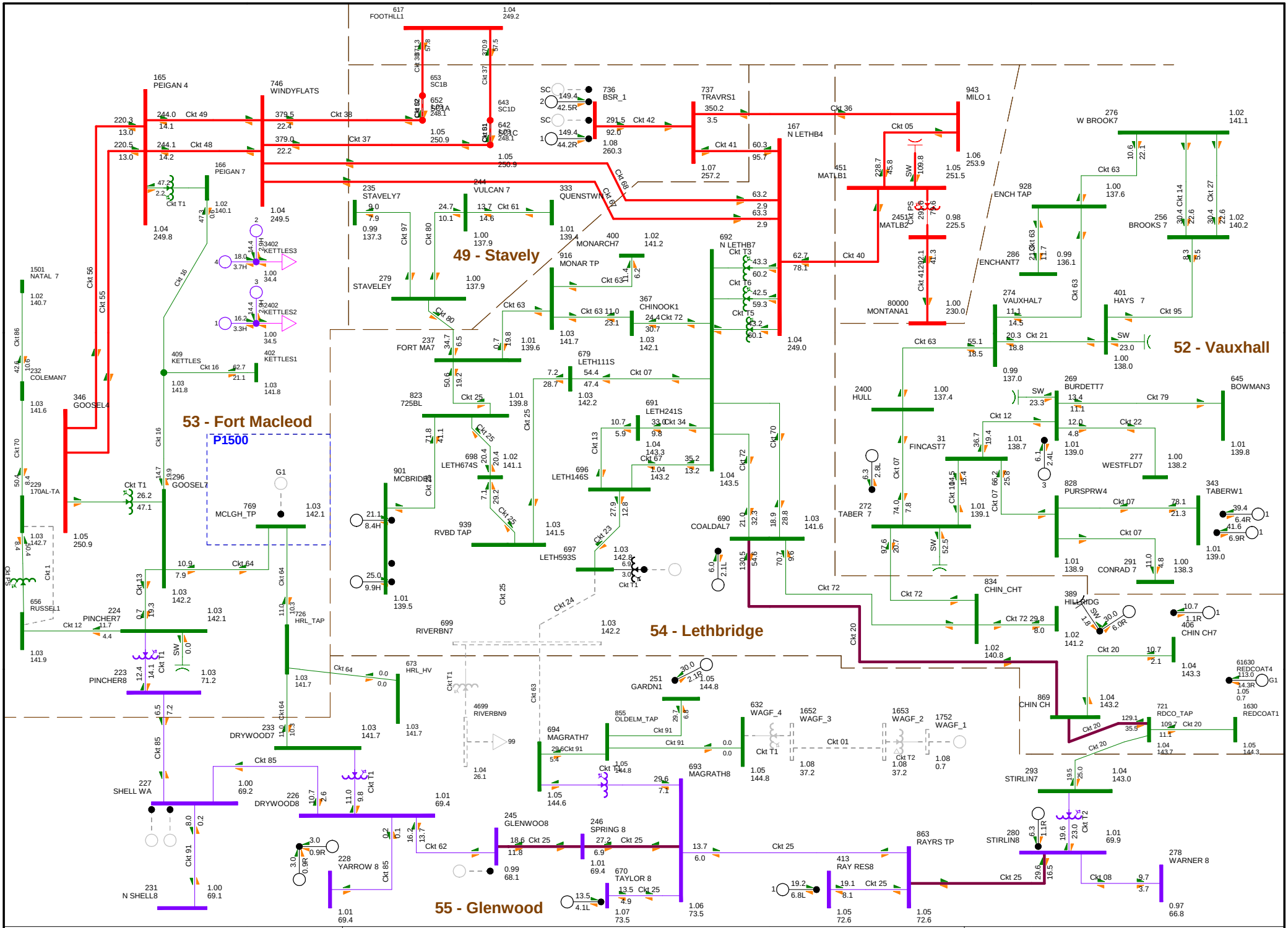
BC Import:433.3 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.2-3 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

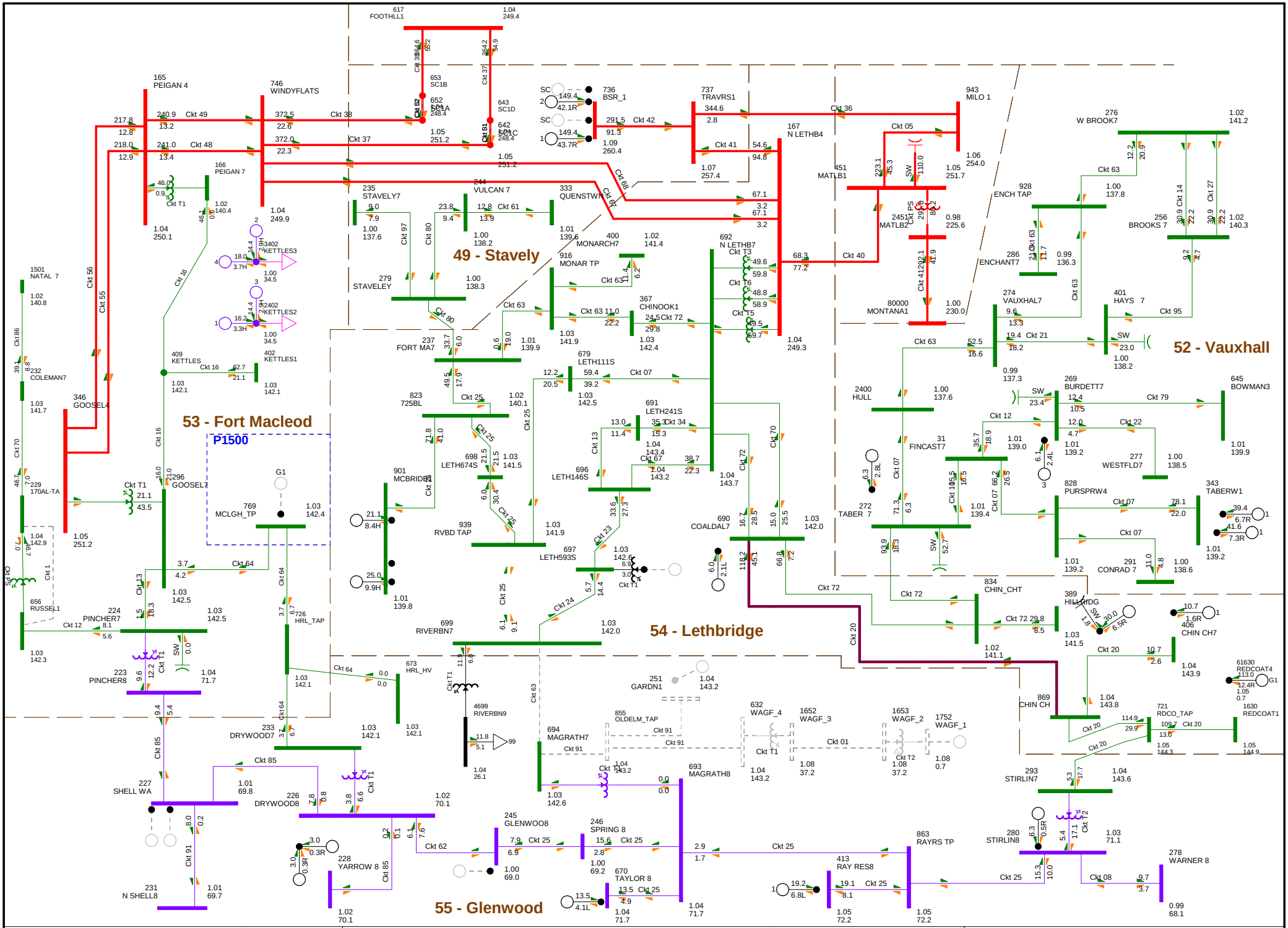
BC Import:429.7 MW Sask Import:0.0 MW MATL Import:300.0 MW

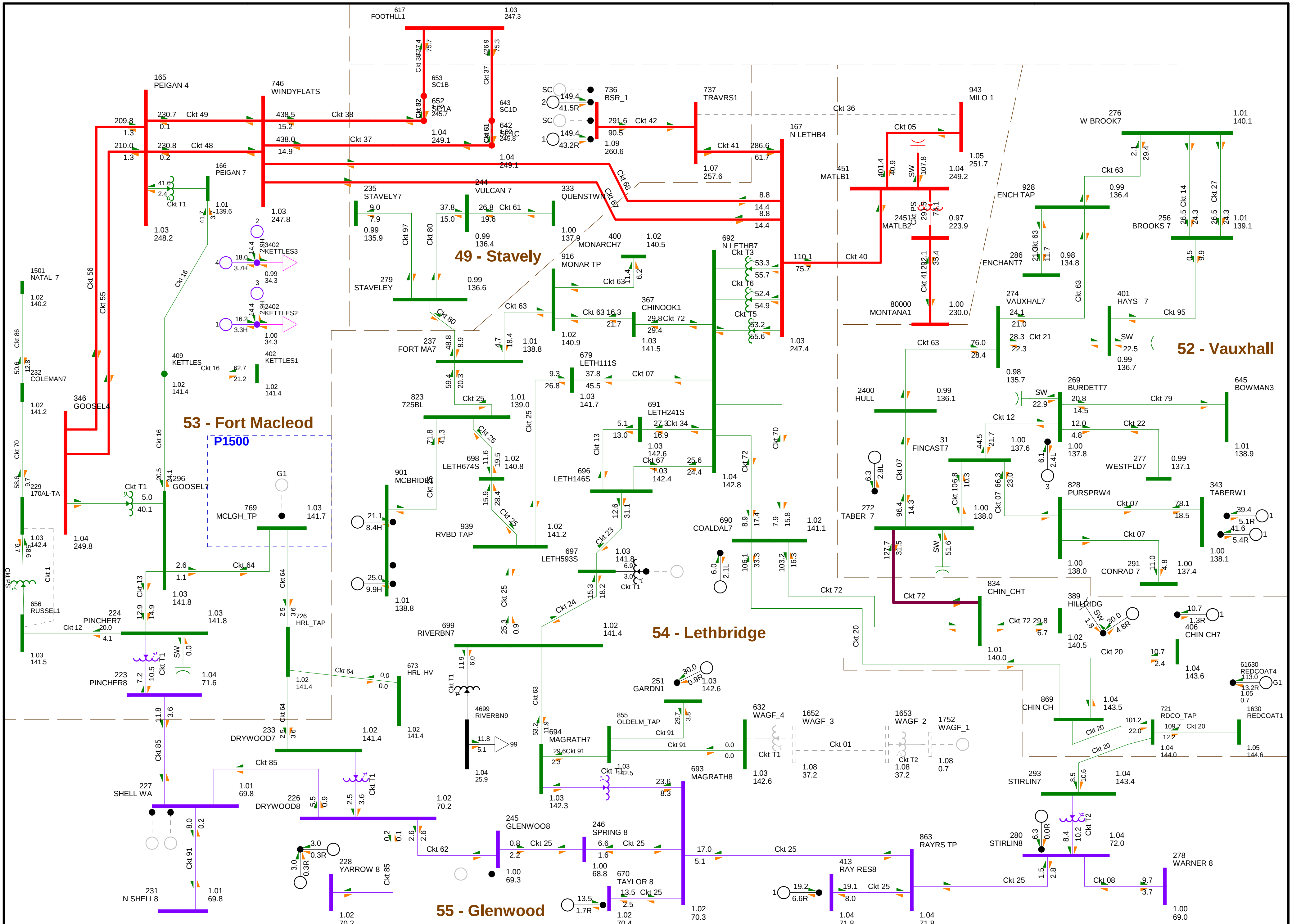
MH Import: 26.1 MW

FIGURE A2.2-4 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
679 LETH111S
691 LETH241S
696 LETH146S
698 LETH674S
690 COALDAL7
699 RIVERBN7
694 MAGRATH7
693 MAGRATH8
736 BSR_1
737 TRAVRS1
167 N LETHB4
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
2400 HULL
269 BURDETT7
645 BOWMAN3
828 PURSPRW4
343 TABERW1
277 WESTFLD7
291 CONRAD 7
31 FINCAST7
272 TABER 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
229 170AL-TA
1296 GOOSEL7
656 RUSSEL1
224 PINCHER7
223 PINCHER8
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
823 725BL
901 MCBRIDE1
939 RVBD TAP
769 MCLGH_TP
673 HRL_HV
726 HRL_TAP
4699 RIVERBN9
237 FORT MA7
855 OLDELM_TAP
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
251 GARDN1
293 STIRLIN7
280 STIRLIN8
863 RAYRS TP
413 RAY RES8
278 WARNER 8
670 TAYLOR 8
246 SPRING 8
245 GLENWOO8
P1500 - RESL McLaughlin WAGF
BC Import:461.2 MW
Sask Import:-0.0 MW
MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A2.2-5 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

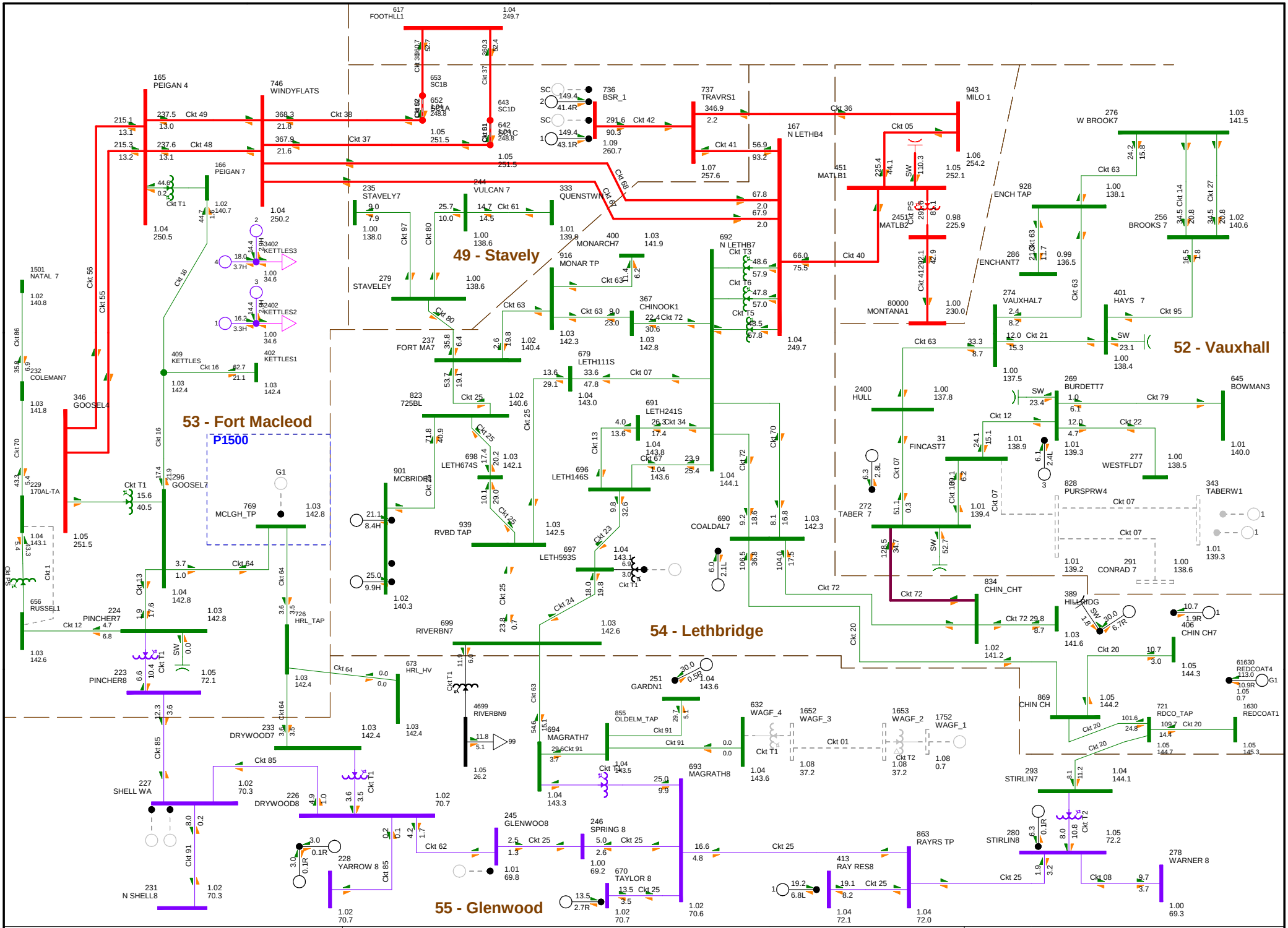
BC Import:447.7 MW   Sask Import:0.0 MW   MATL Import:300.0 MW

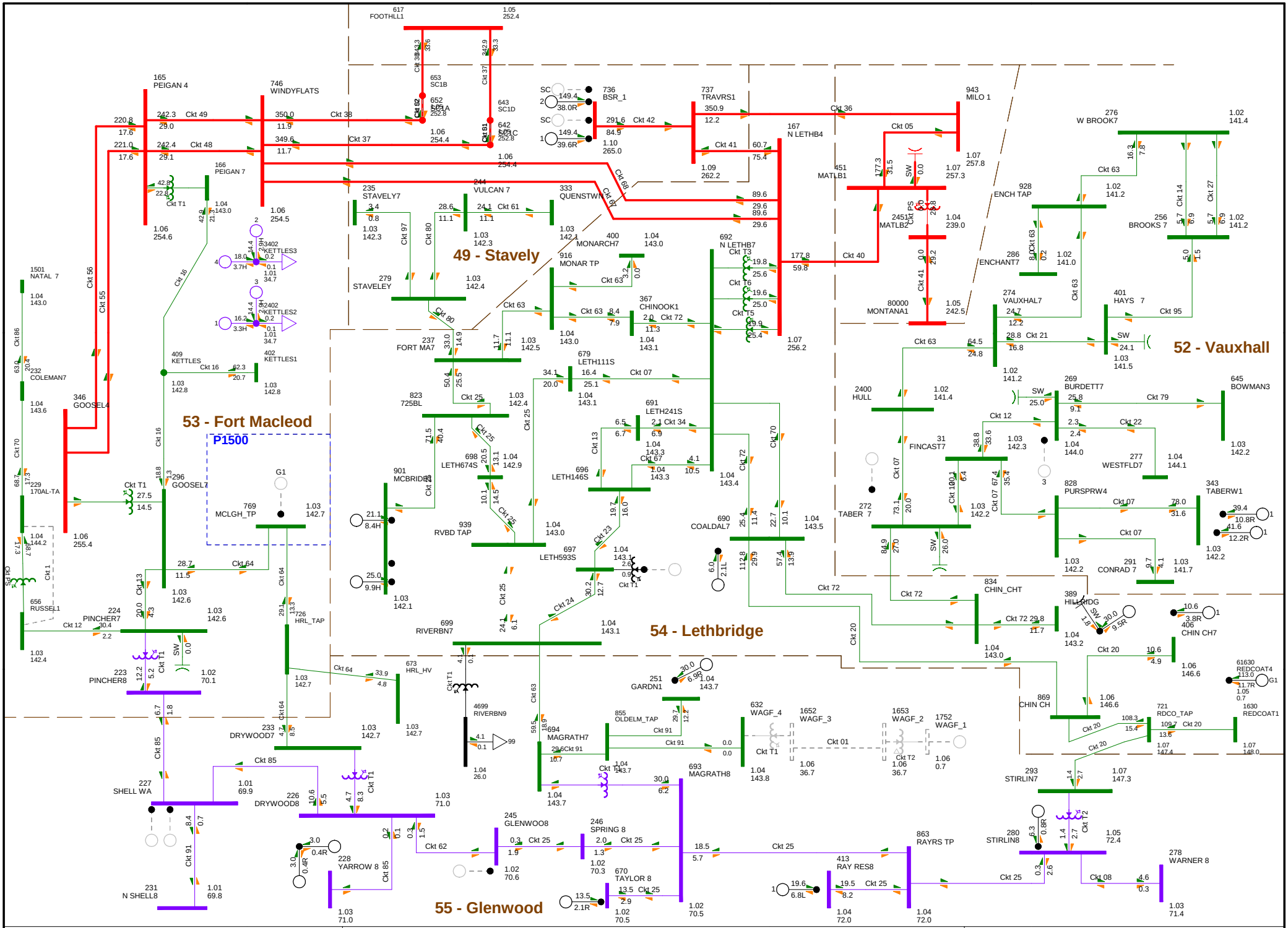
MH Import: 26.1 MW

FIGURE A2.2-6 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
167 N LETHB4
736 BSR_1
737 TRAVRS1
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
237 FORT MA7
679 LETH111S
691 LETH241S
690 COALDAL7
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
697 LETH593S
939 RVBD TAP
769 MCLGH_TP
699 RIVERBN7
4699 RIVERBN9
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
656 RUSSEL1
224 PINCHER7
223 PINCHER8
673 HRL_HV
726 HRL_TAP
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
251 GARDN1
855 OLDELM_TAP
694 MAGRATH7
693 MAGRATH8
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
863 RAYRS TP
413 RAY RES8
P1500 - RESL McLaughlin WAGF
BC Import:495.9 MW
Sask Import:0.0 MW
MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A2.2-7 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER PEAK (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

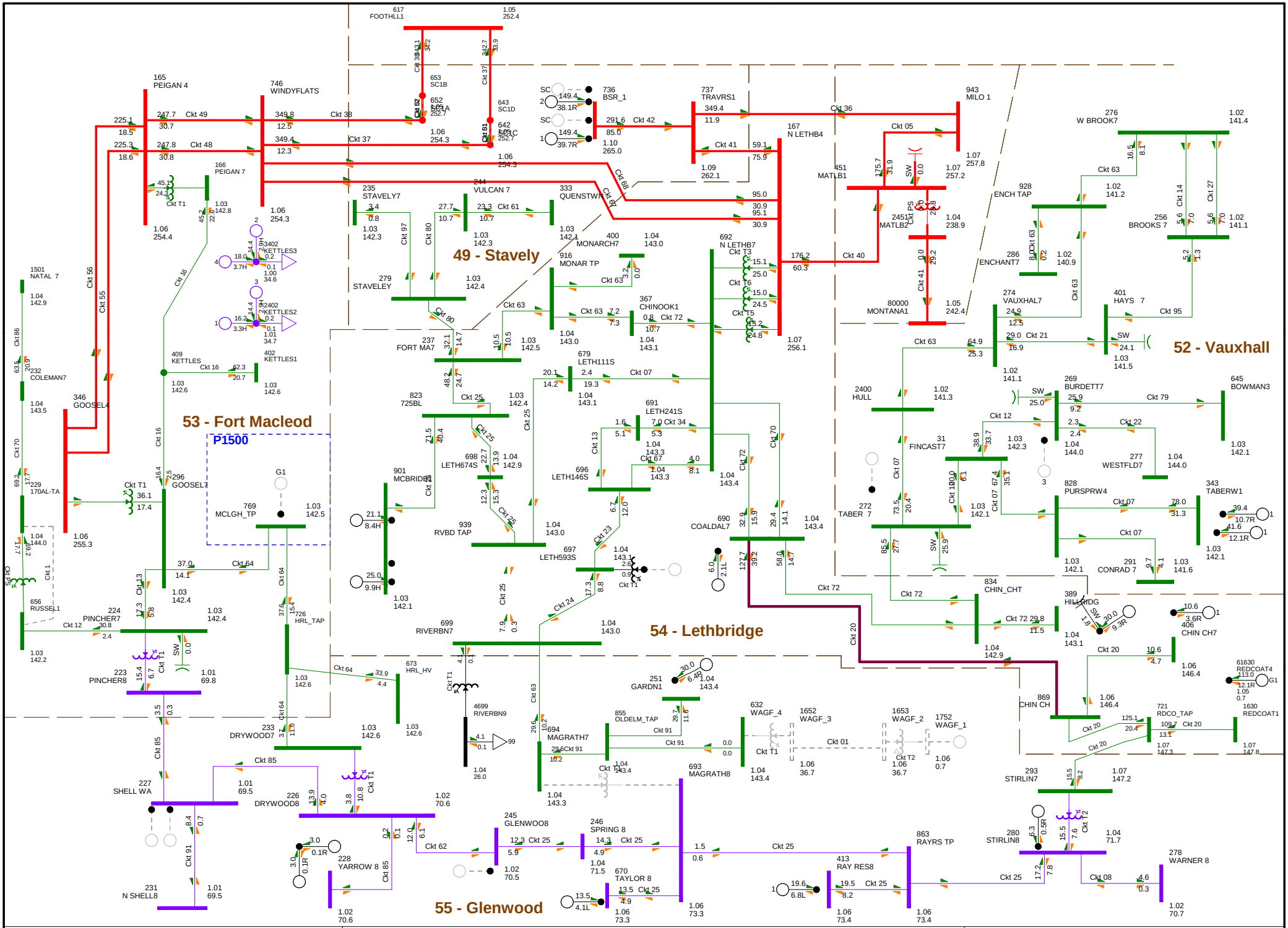
BC Import:-1.2 MW Sask Import:0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.3-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

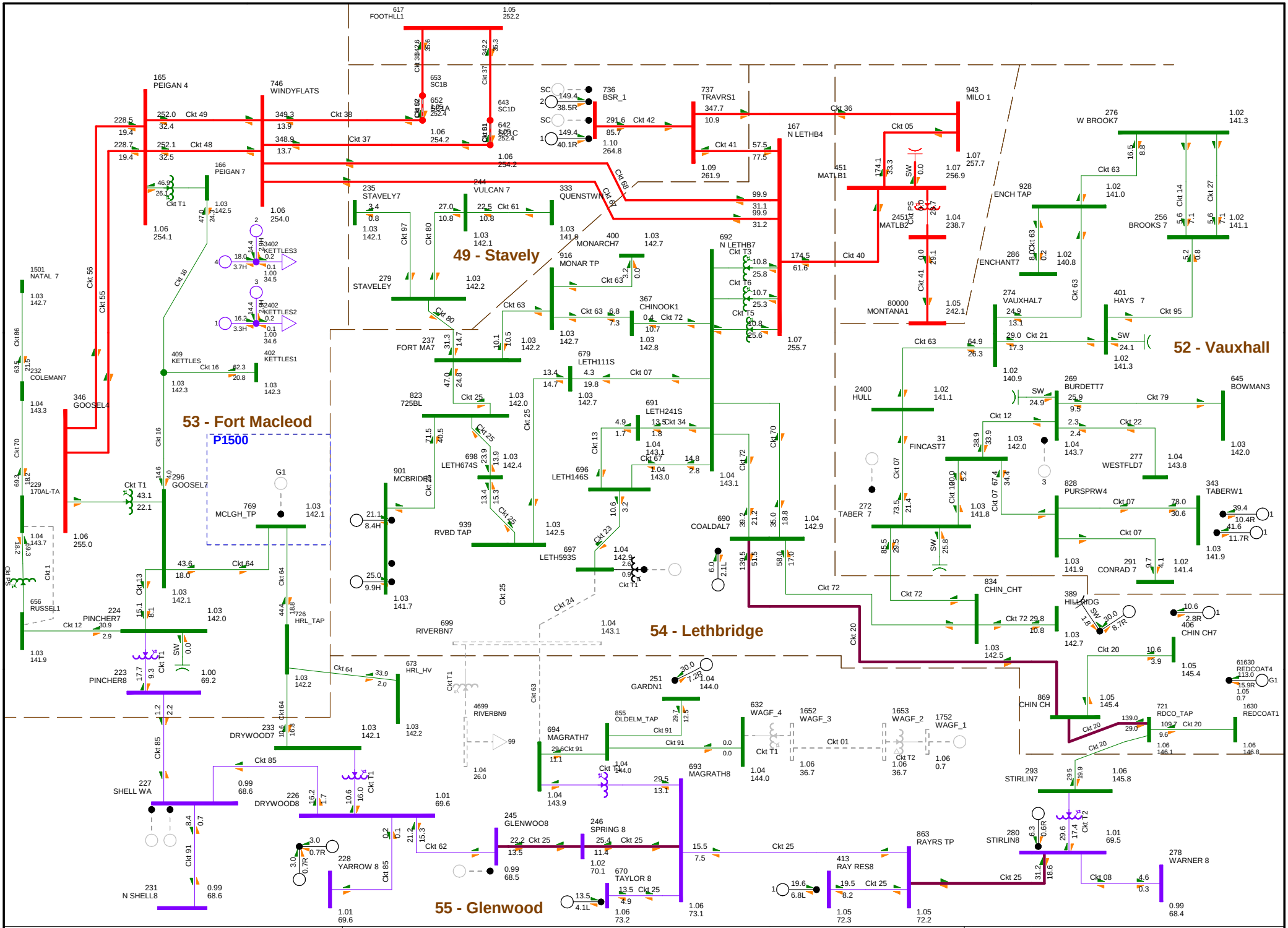
BC Import:1.9 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.3-2 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

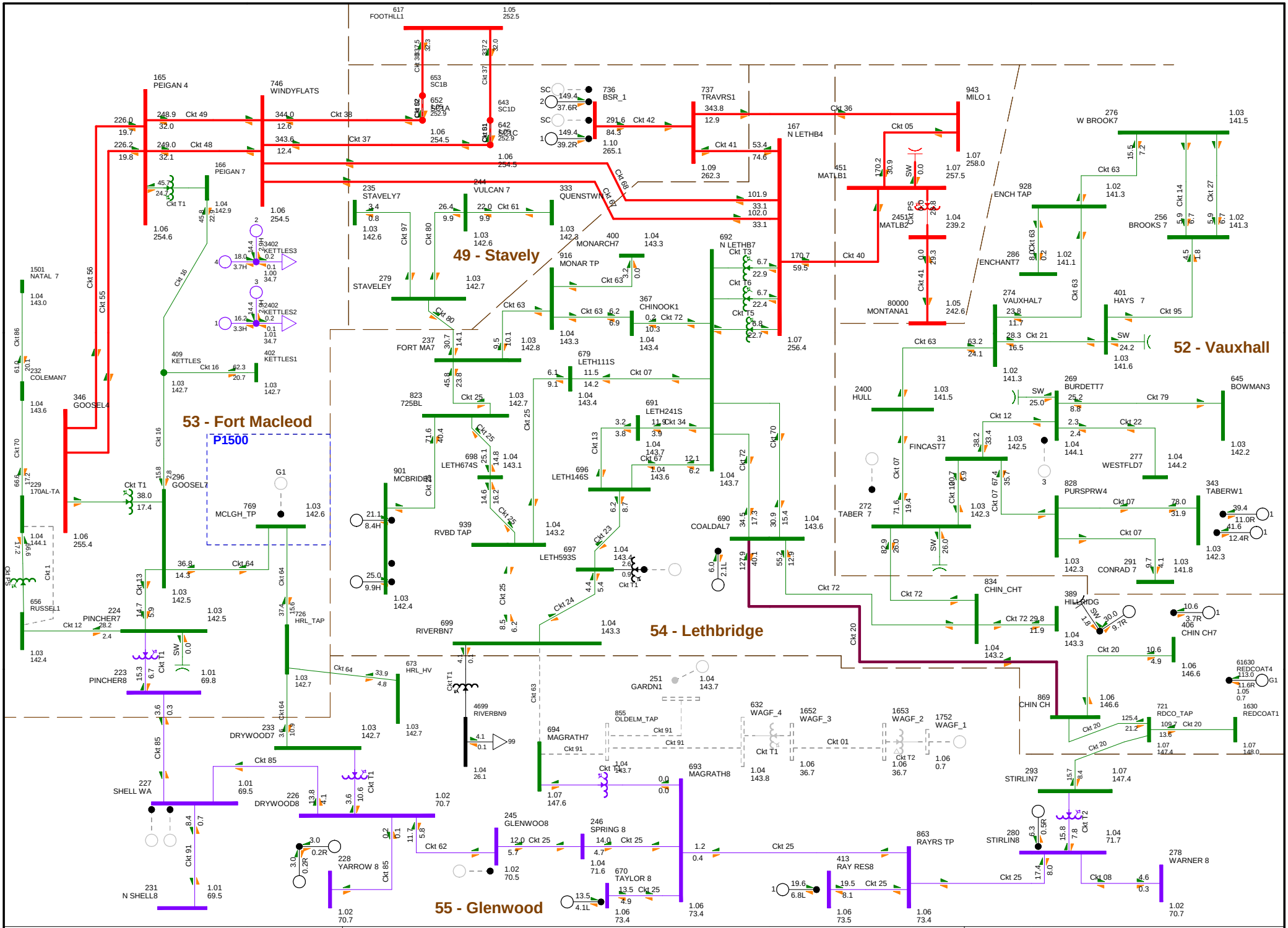
BC Import:6.7 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

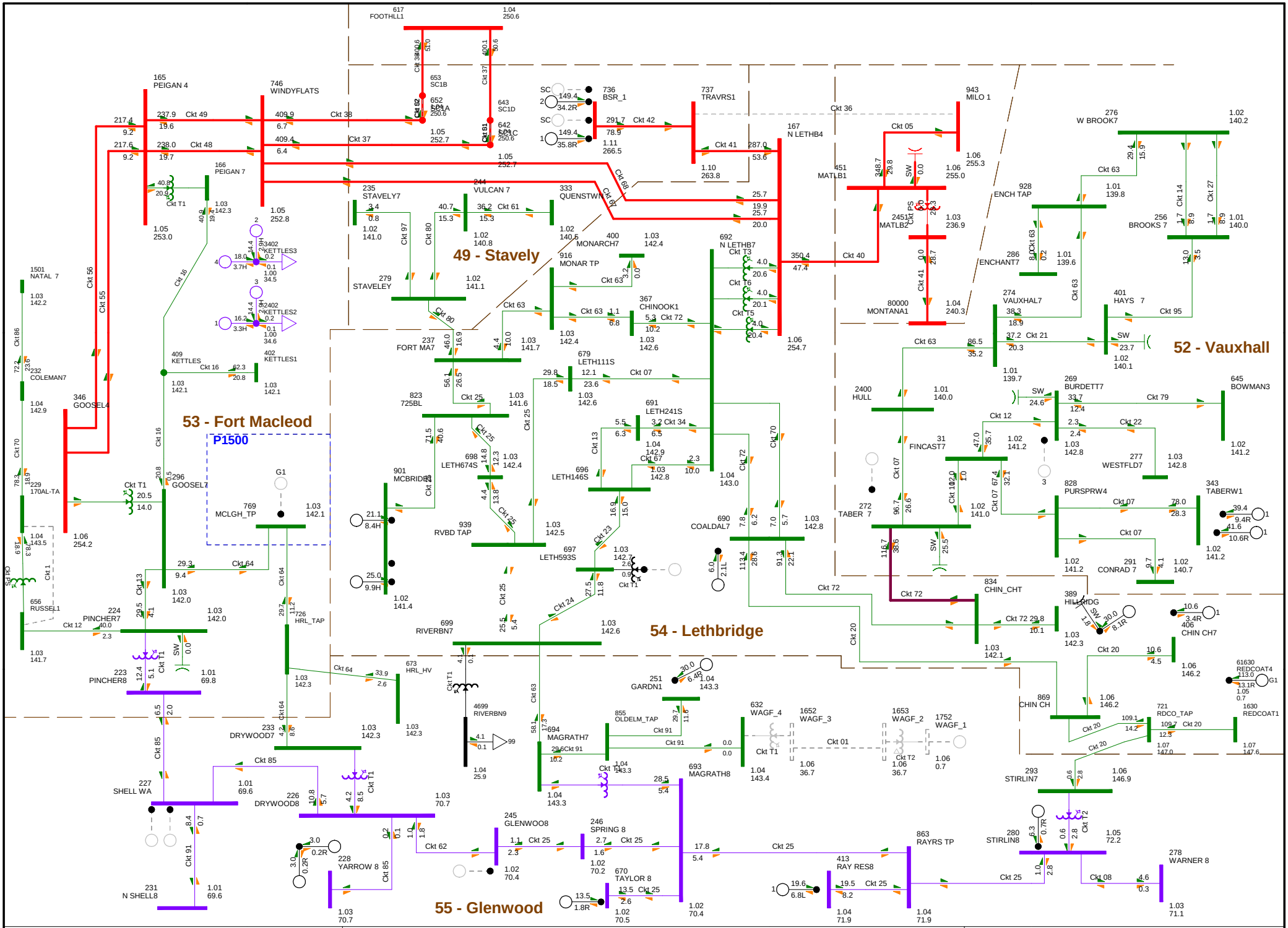
MH Import: 26.2 MW

FIGURE A2.3-3 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
692 N LETHB7
167 N LETHB4
736 BSR_1
737 TRAVRS1
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
229 170AL-TA
296 GOOSEL7
656 RUSSEL1
224 PINCHER7
223 PINCHER8
237 FORT MA7
679 LETH111S
691 LETH241S
690 COALDAL7
367 CHINOOK1
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
697 LETH593S
939 RVBD TAP
769 MCLGH_TP
G1
699 RIVERBN7
4699 RIVERBN9
673 HRL_HV
726 HRL_TAP
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
693 MAGRATH8
694 MAGRATH7
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
863 RAYRS TP
413 RAY RES8
272 TABER 7
2400 HULL
31 FINCAST7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:29.0 MW
Sask Import:-0.0 MW
MATL Import:-0.0 MW
MH Import: 26.2 MW
FIGURE A2.3-4 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

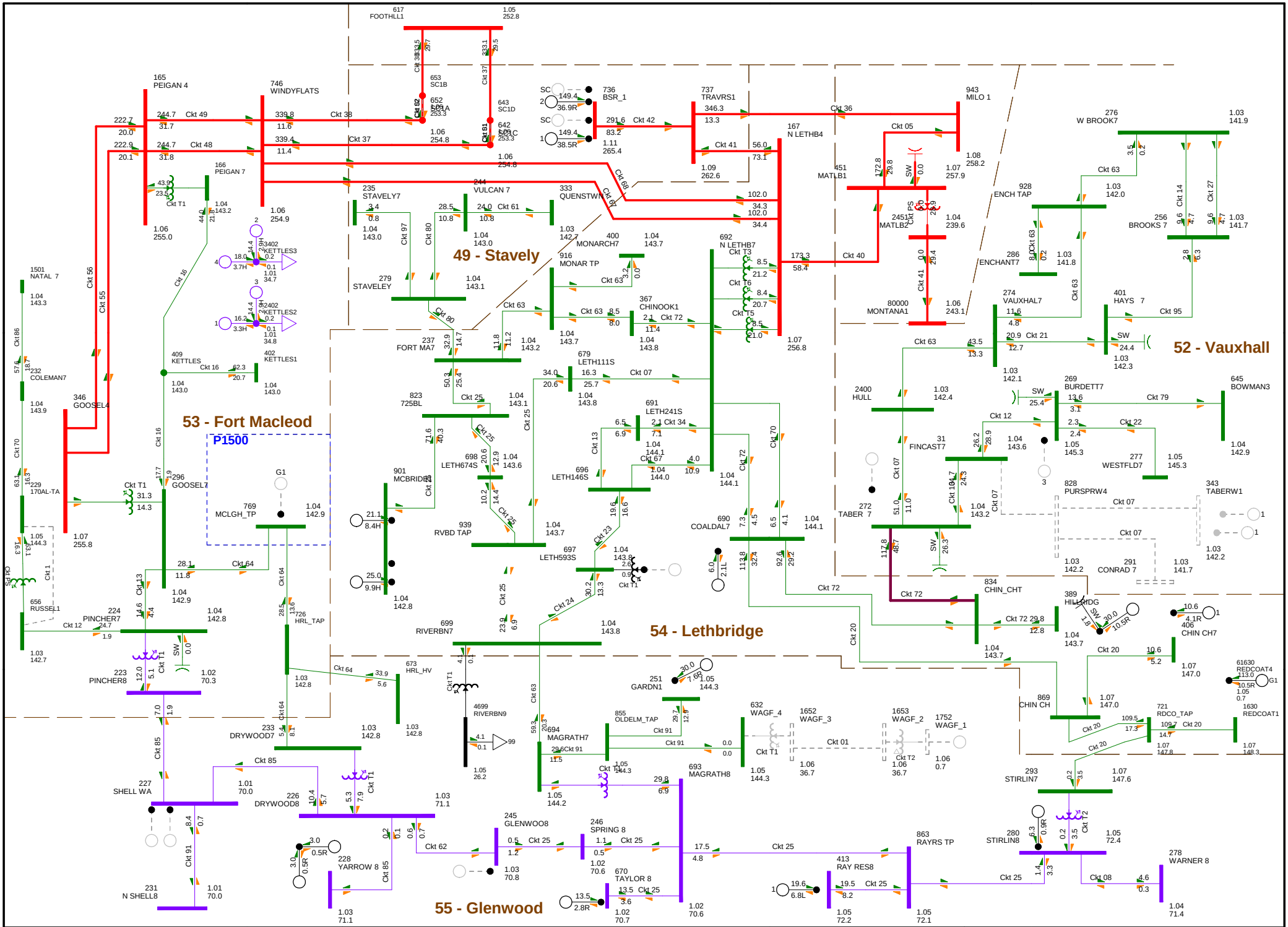
BC Import:14.0 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.3-5 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

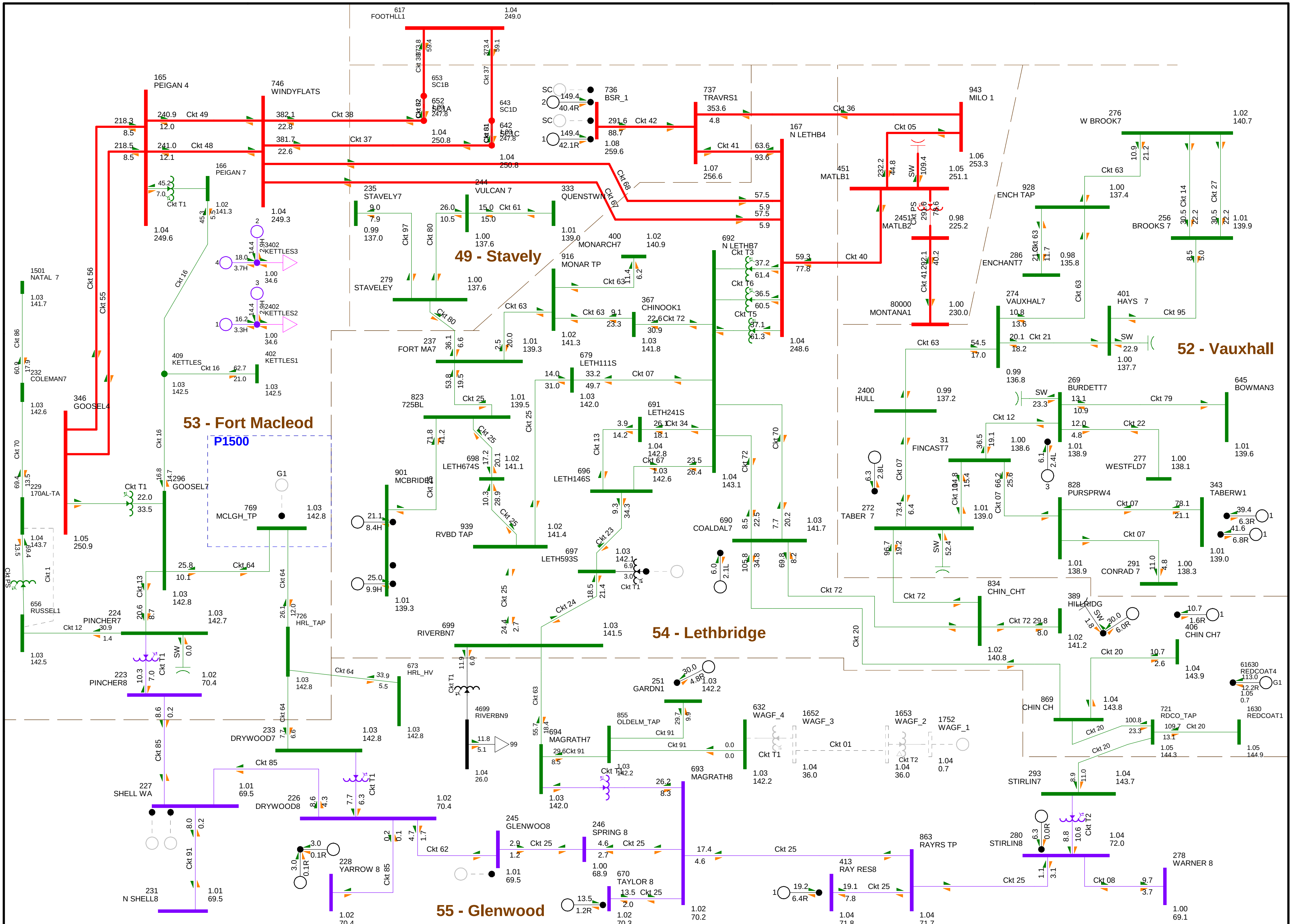
BC Import:63.0 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A2.3-6 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER LIGHT SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
FOOTHLL1
PEIGAN 4
WINDYFLATS
BSR_1
TRAVRS1
MILO 1
W BROOK7
N LETHB4
MATLB1
MATLB2
STAVELY7
VULCAN 7
QUESTNWN
PEIGAN 7
KETTLES3
KETTLES2
KETTLES1
NATAL 7
COLEMAN7
GOOSEL4
170AL-TA
GOOSEL7
RUSSEL1
PINCHER7
PINCHER8
MCLGH_TP
HRL_TAP
HRL_HV
DRYWOOD7
DRYWOOD8
SHELL WA
N SHELL8
YARROW 8
STAVELEY
FORT MA7
725BL
LETH674S
MCBRIDE1
RVBD TAP
RIVERBN7
RIVERBN9
MONARCH7
MONAR TP
CHINOOK1
LETH111S
LETH241S
LETH146S
LETH593S
N LETHB7
COALDAL7
GARDN1
OLDELM_TAP
MAGRATH7
MAGRATH8
GLENWOO8
SPRING 8
TAYLOR 8
WAGF_4
WAGF_3
WAGF_2
WAGF_1
RAYRS TP
RAY RES8
MONTANA1
ENCH TAP
ENCHANT7
BROOKS 7
VAUXHAL7
HAYS 7
HULL
BURDETT7
BOWMAN3
FINCAST7
WESTFLD7
PURSPRW4
TABERW1
TABER 7
CONRAD 7
CHIN_CHT
HILLRIDG
CHIN CH7
CHIN CH
REDCOAT4
RDCO_TAP
REDCOAT1
STIRLIN7
STIRLIN8
WARNER 8

P1500 - RESL McLaughlin WAGF

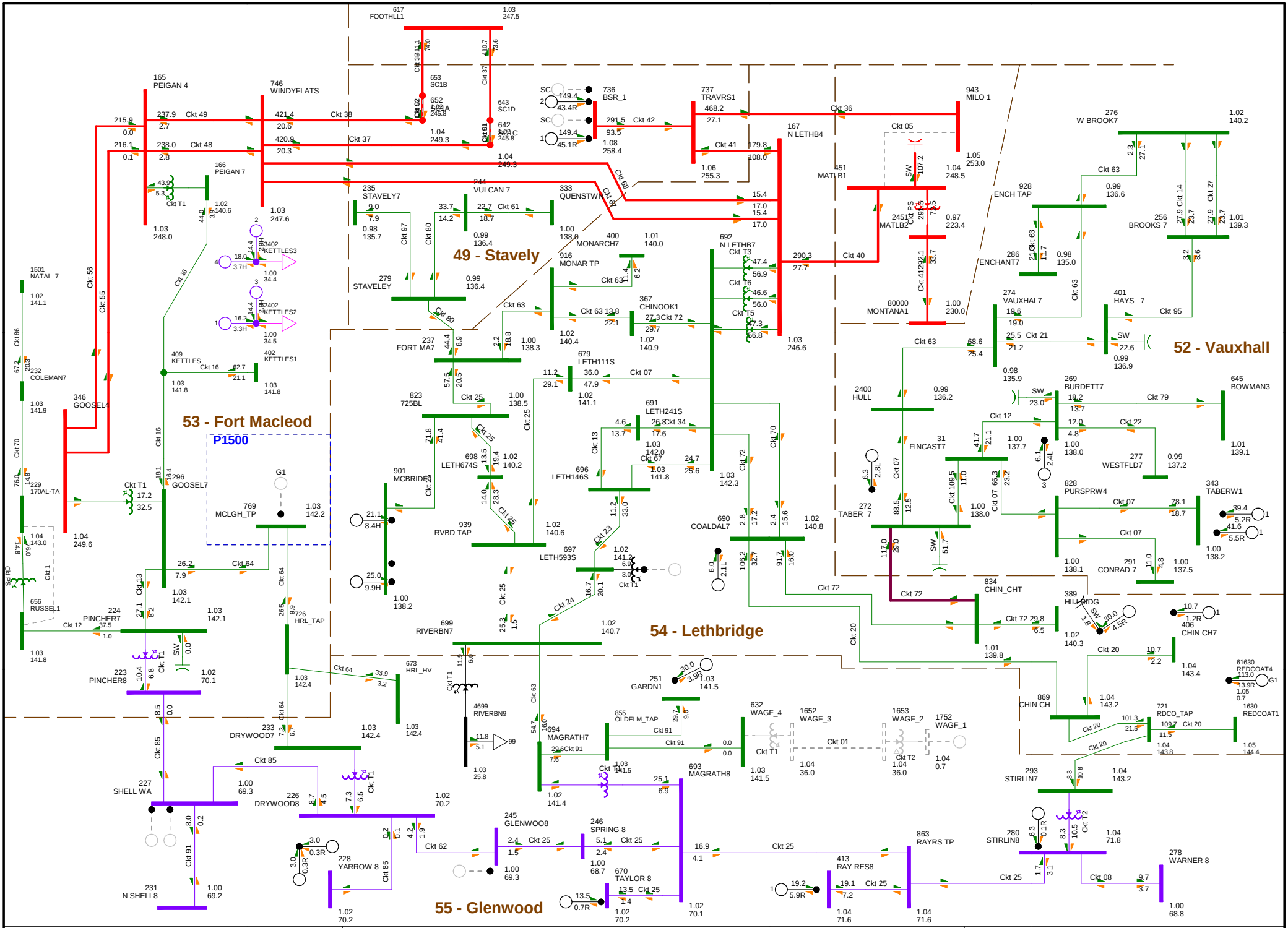
BC Import:430.7 MW   Sask Import:-0.0 MW   MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.4-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

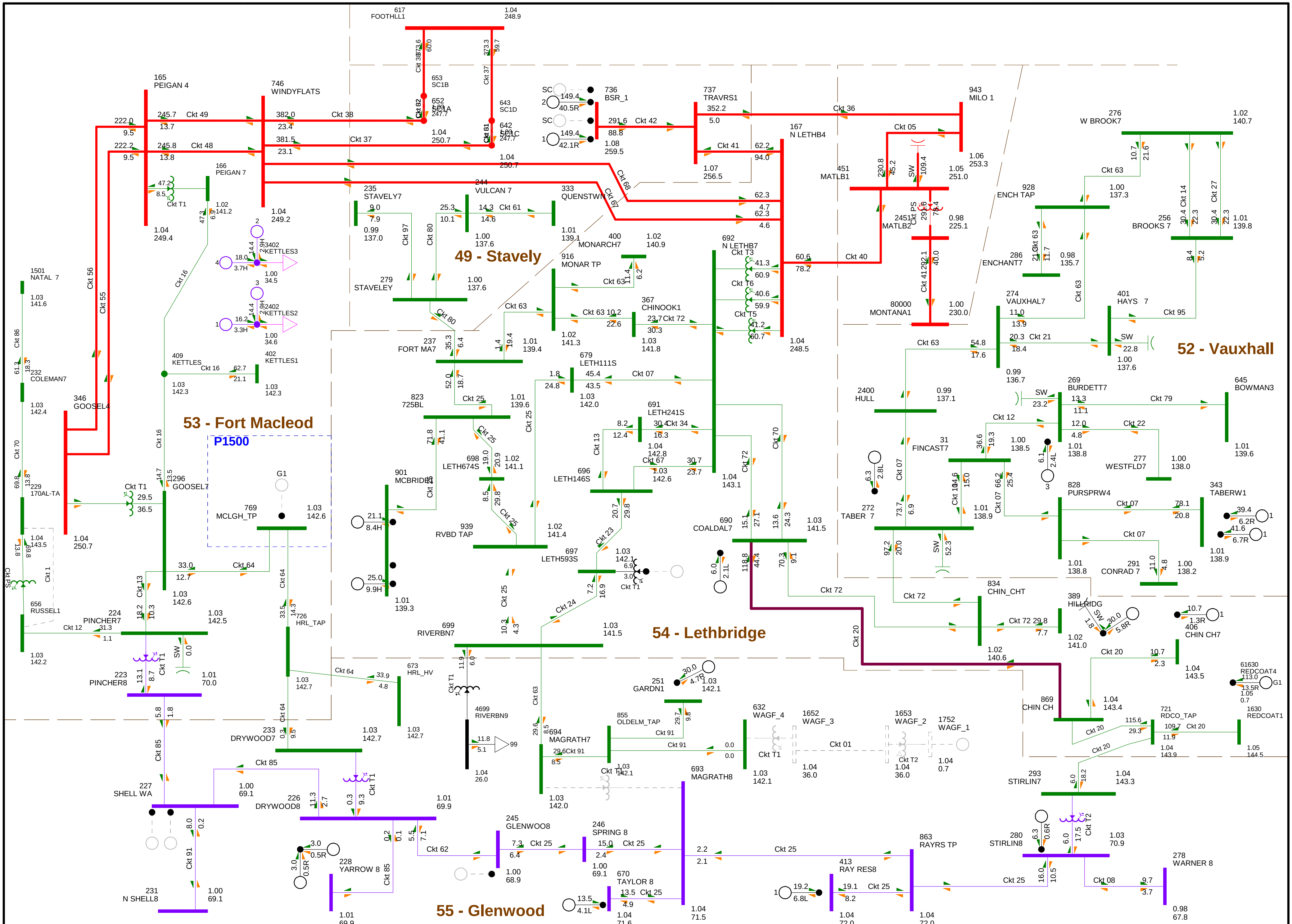
BC Import:439.8 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.4-2 N-1: 1005L (MILO 356S TO PICTURE BUTTE 120S)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

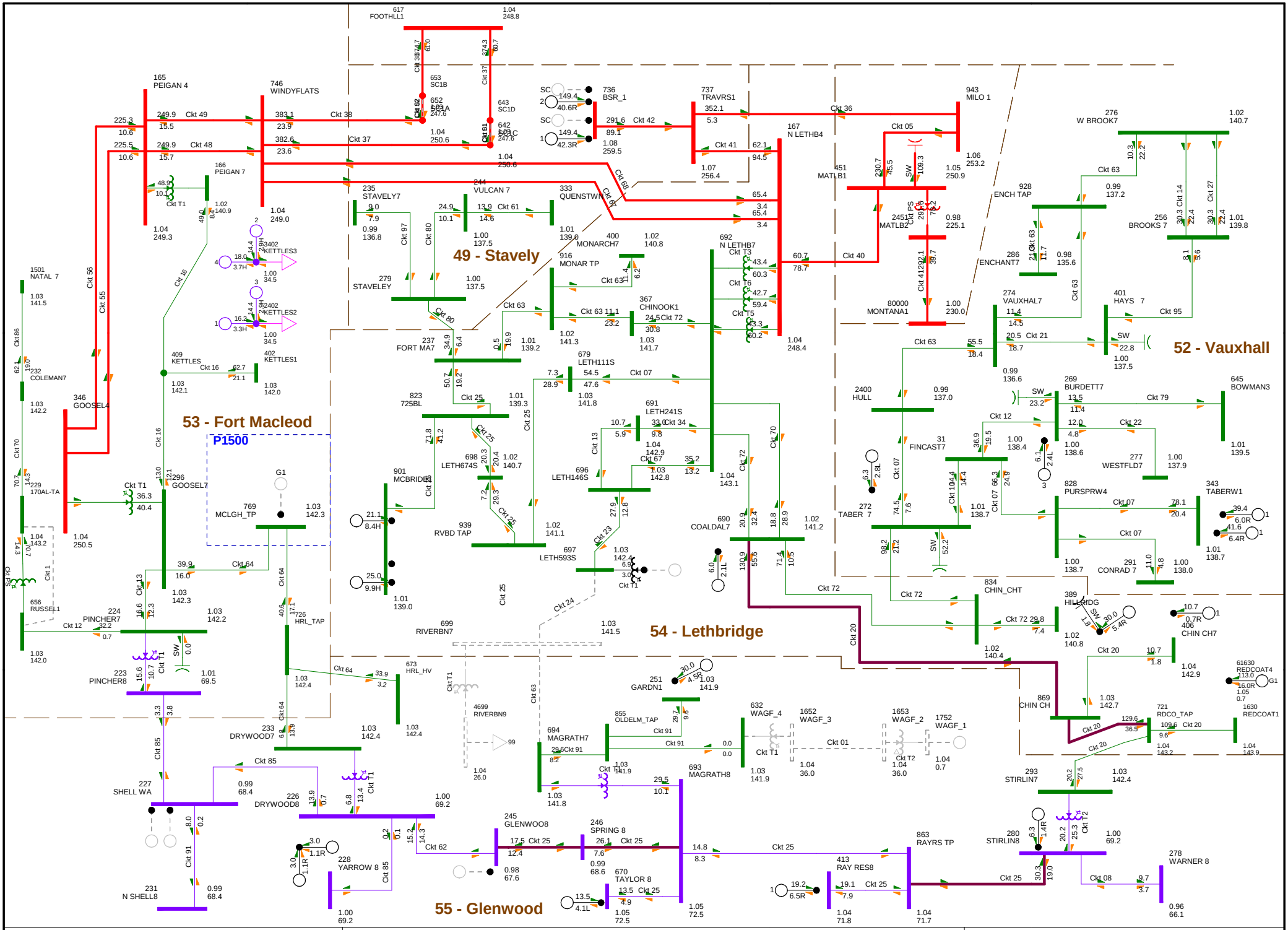
BC Import:433.4 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.4-3 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01, JUNE 2019

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



P1500 - RESL McLaughlin WAGF

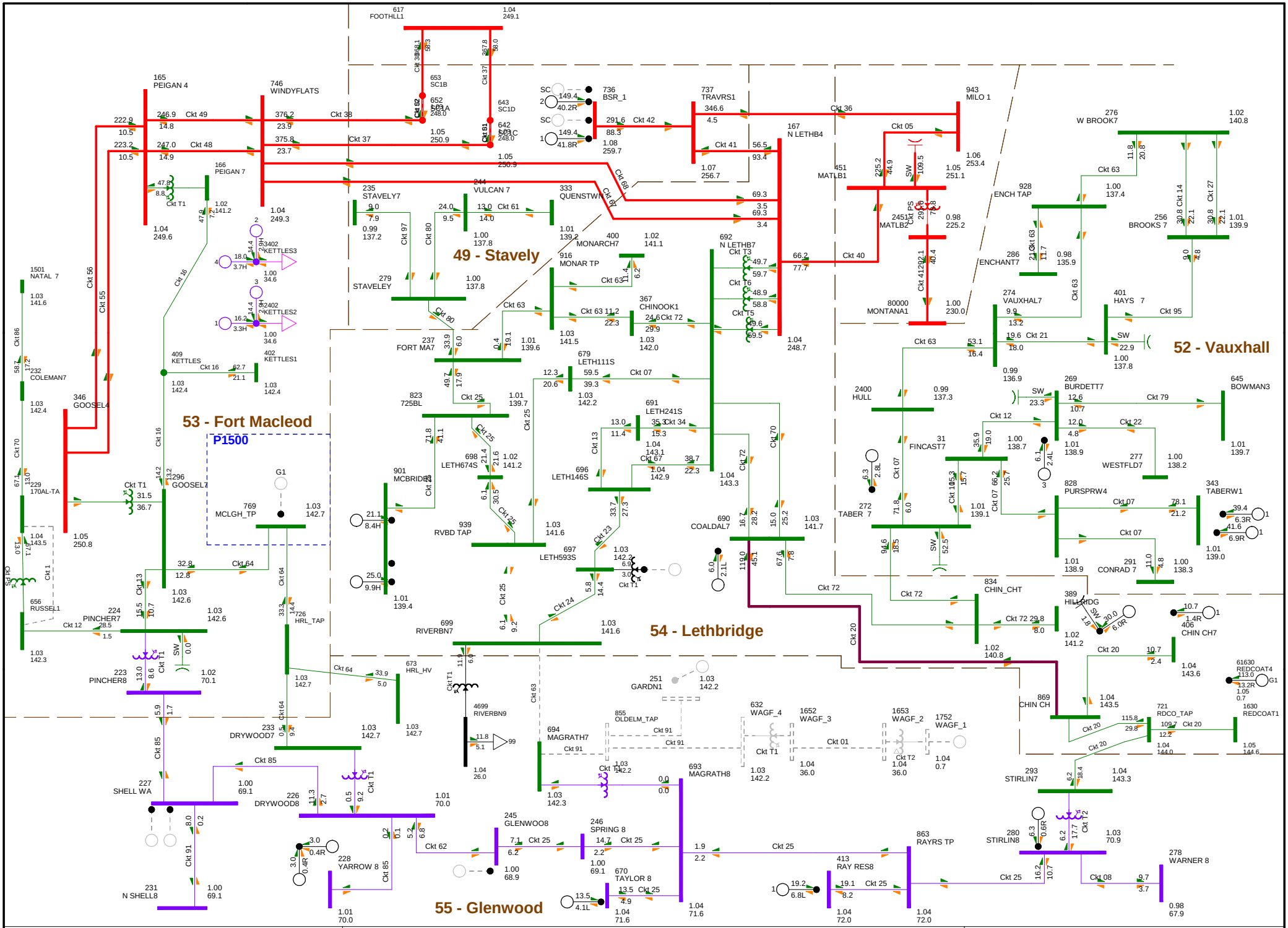
BC Import:430.3 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A2.4-4 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

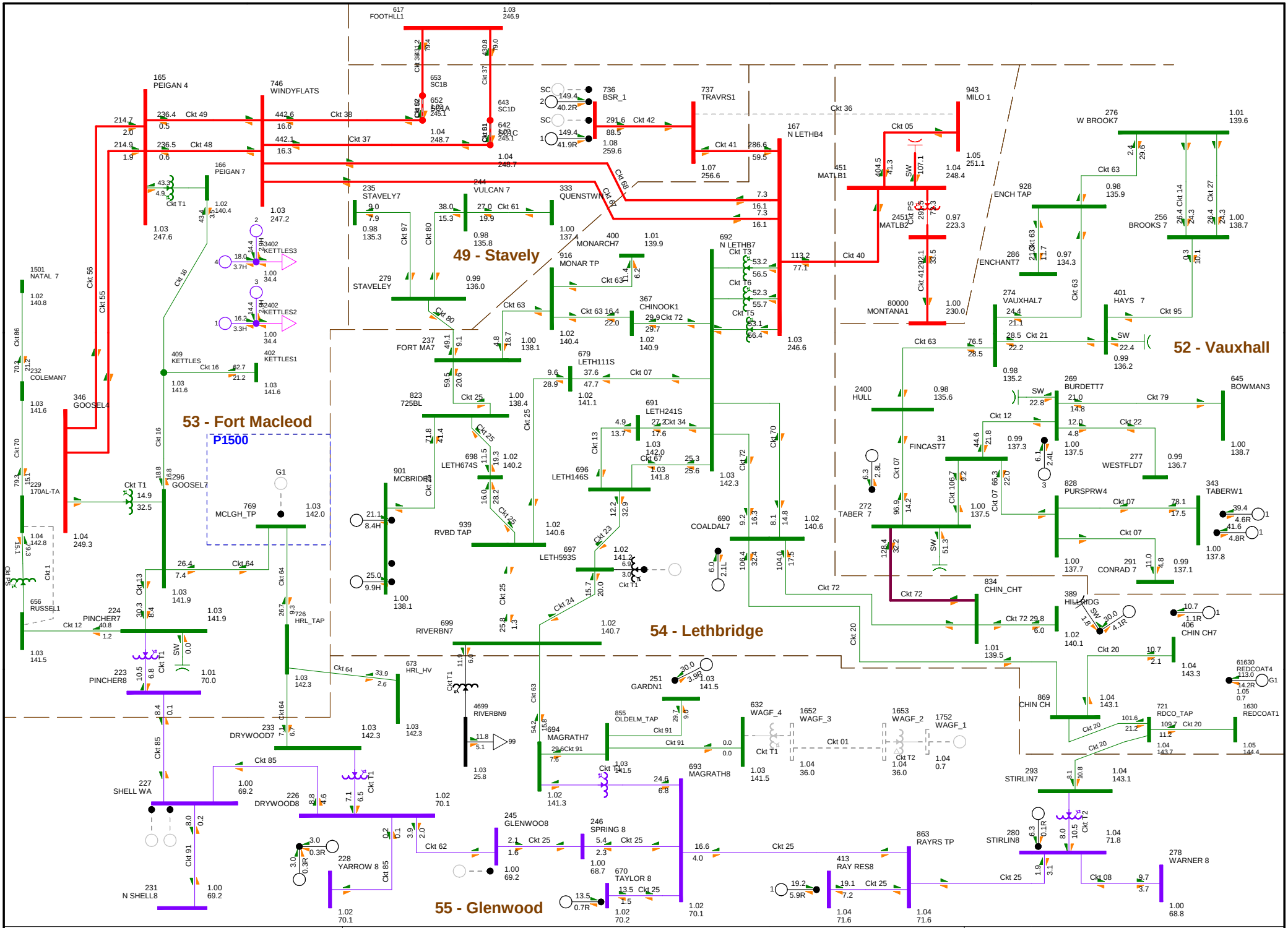
BC Import:461.0 MW Sask Import:-0.0 MW MATL Import:300.0 MW

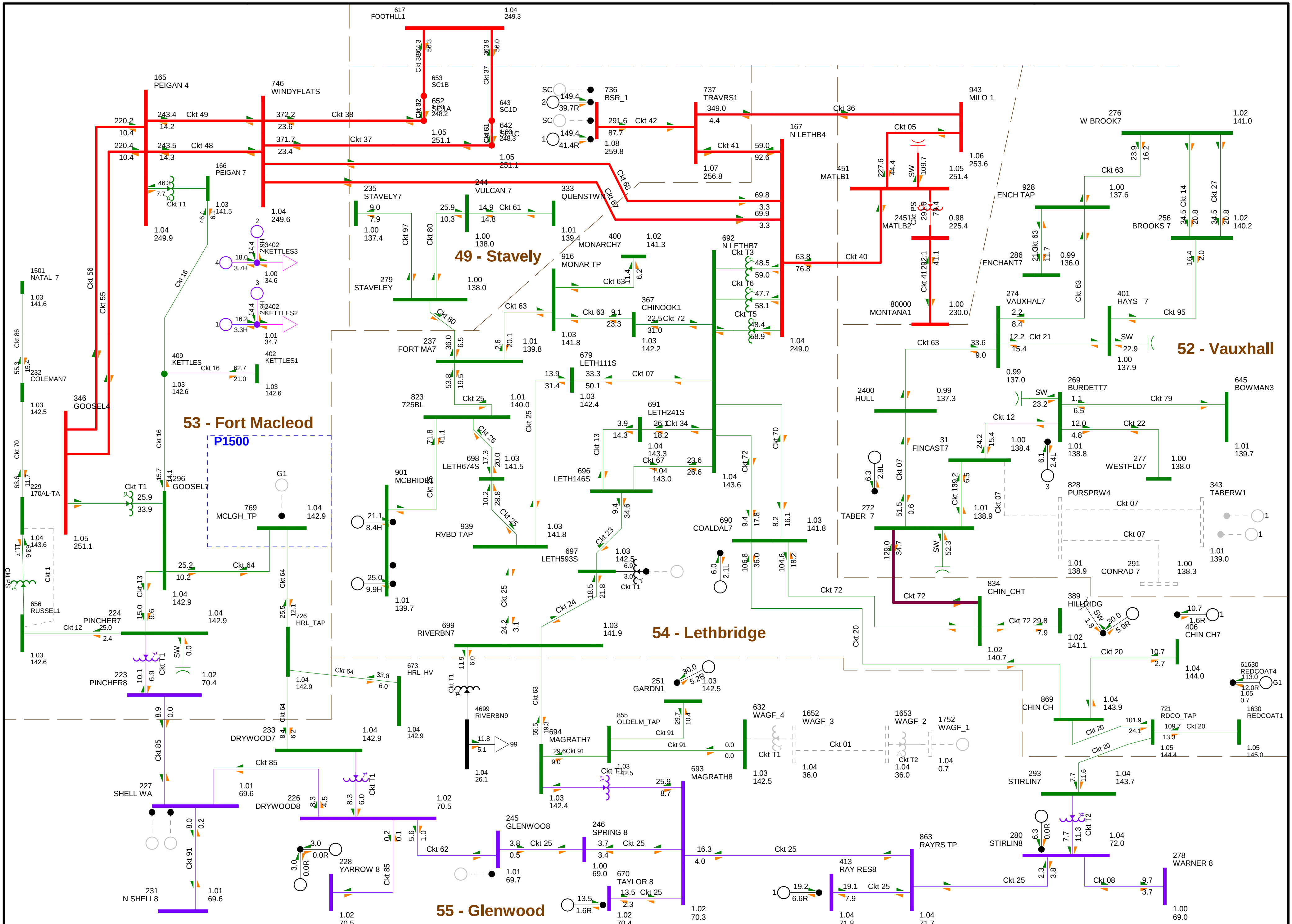
MH Import: 26.1 MW

FIGURE A2.4-5 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
229 170AL-TA
296 GOOSEL7
656 RUSSEL1
224 PINCHER7
223 PINCHER8
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
235 STAVELY7
244 VULCAN 7
279 STAVELEY
237 FORT MA7
823 725BL
901 MCBRIDE1
939 RVBD TAP
698 LETH674S
696 LETH146S
697 LETH593S
679 LETH111S
691 LETH241S
916 MONAR TP
400 MONARCH7
333 QUENSTWN
367 CHINOOK1
692 N LETH7
690 COALDAL7
769 MCLGH_TP
699 RIVERBN7
4699 RIVERBN9
673 HRL_HV
726 HRL_TAP
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
251 GARDN1
736 BSR_1
737 TRAVRS1
167 N LETHB4
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
863 RAYRS TP
413 RAY RES8
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
P1500 - RESL McLaughlin WAGF
BC Import:448.4 MW Sask Import:0.0 MW MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A2.4-6 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

BC Import:495.7 MW   Sask Import:-0.0 MW   MATL Import:300.0 MW

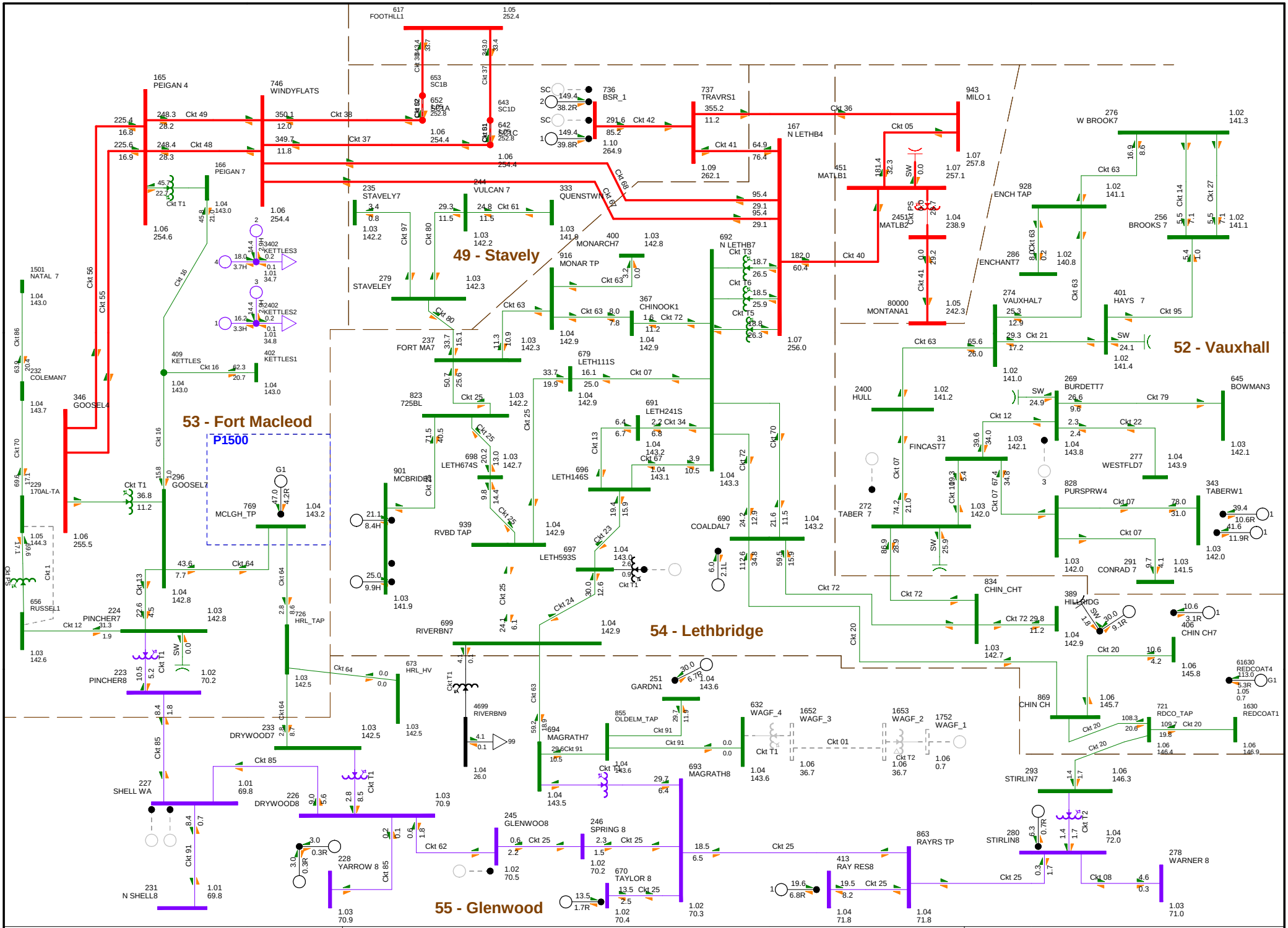
MH Import: 26.1 MW

FIGURE A2.4-7 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER PEAK SENSITIVITY (PRE-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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

Attachment A3
Post-Project Power Flow Diagrams



P1500 - RESL McLaughlin WAGF

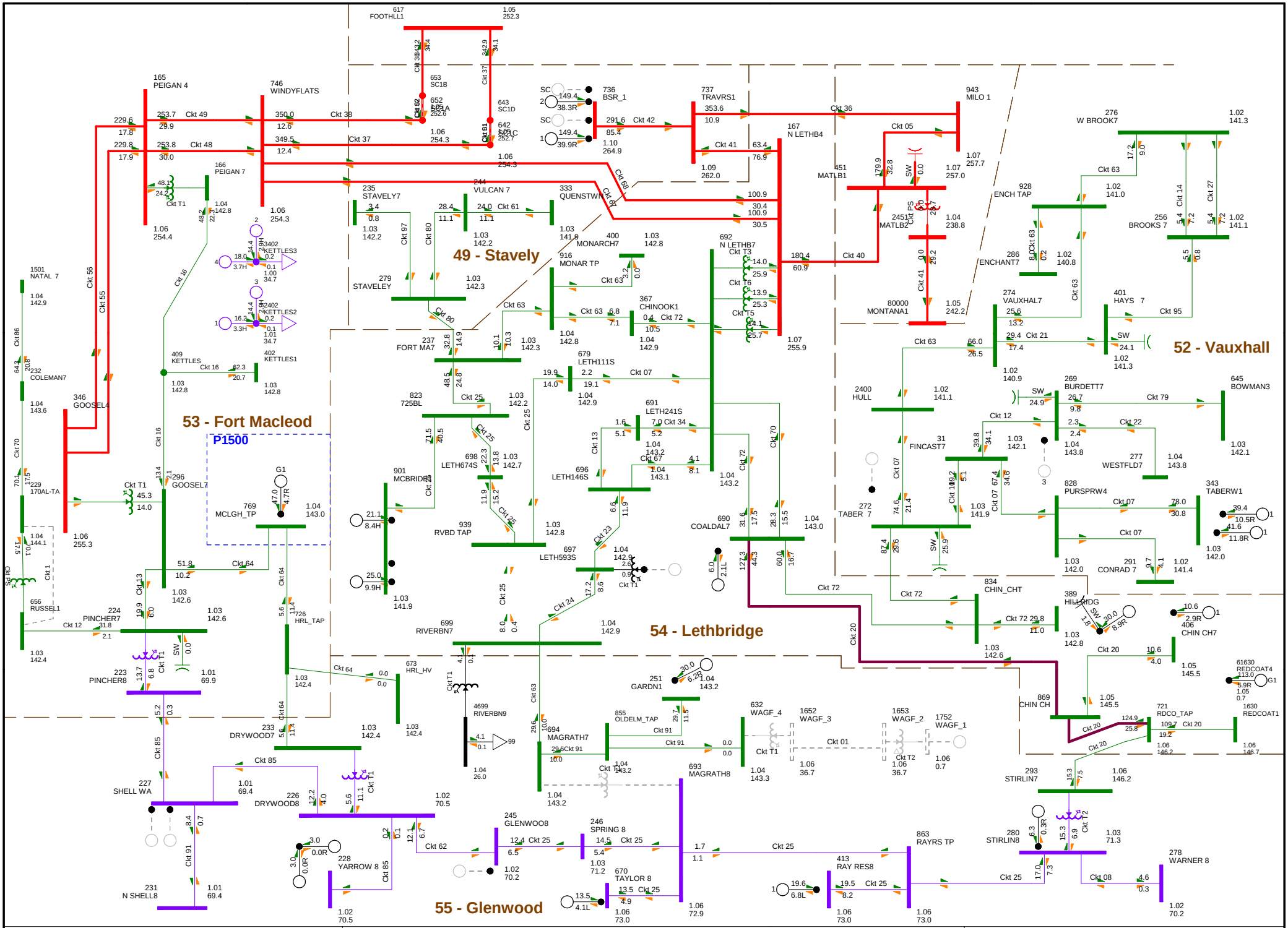
BC Import:0.5 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A3.1-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

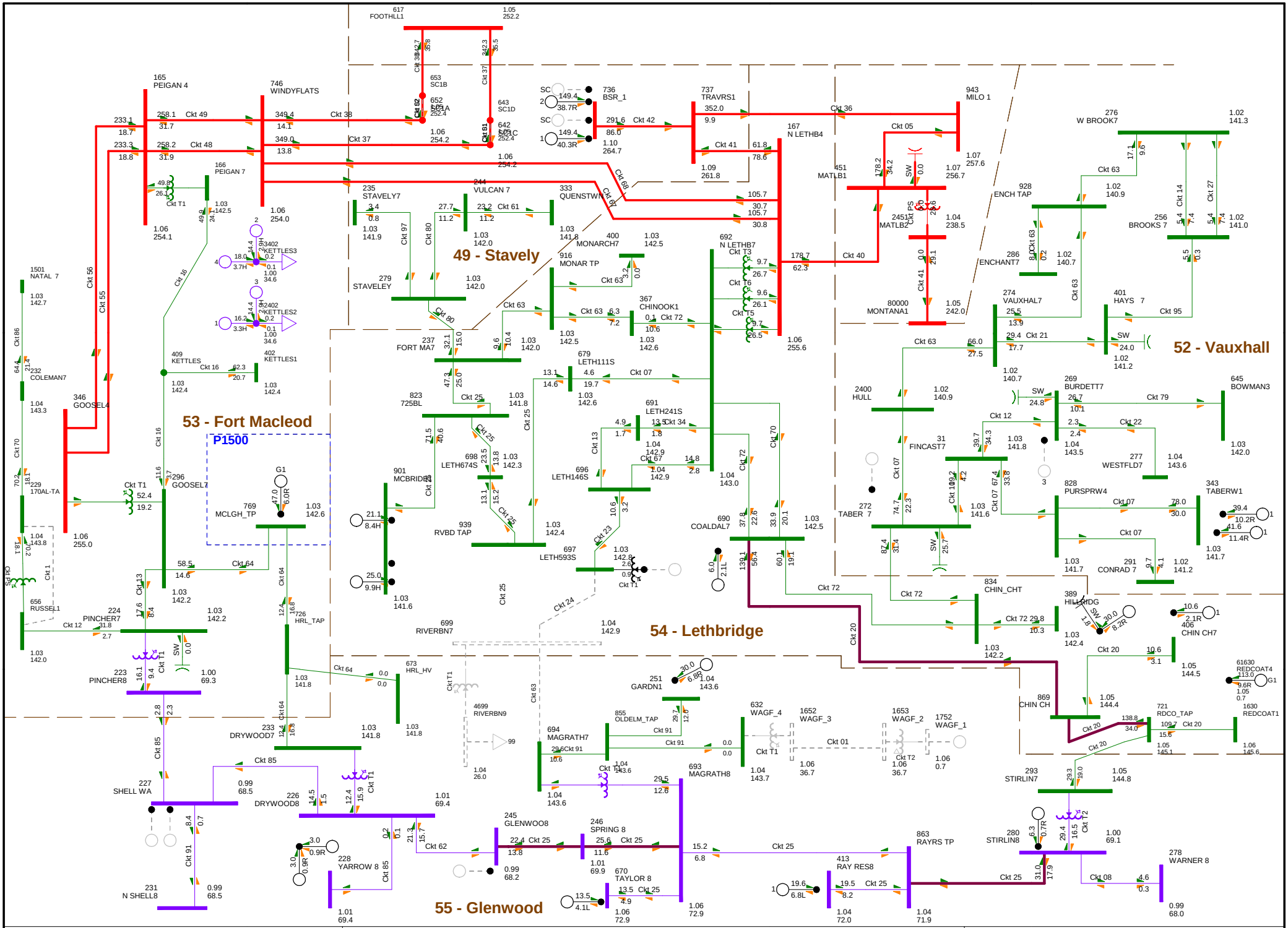
BC Import:3.6 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

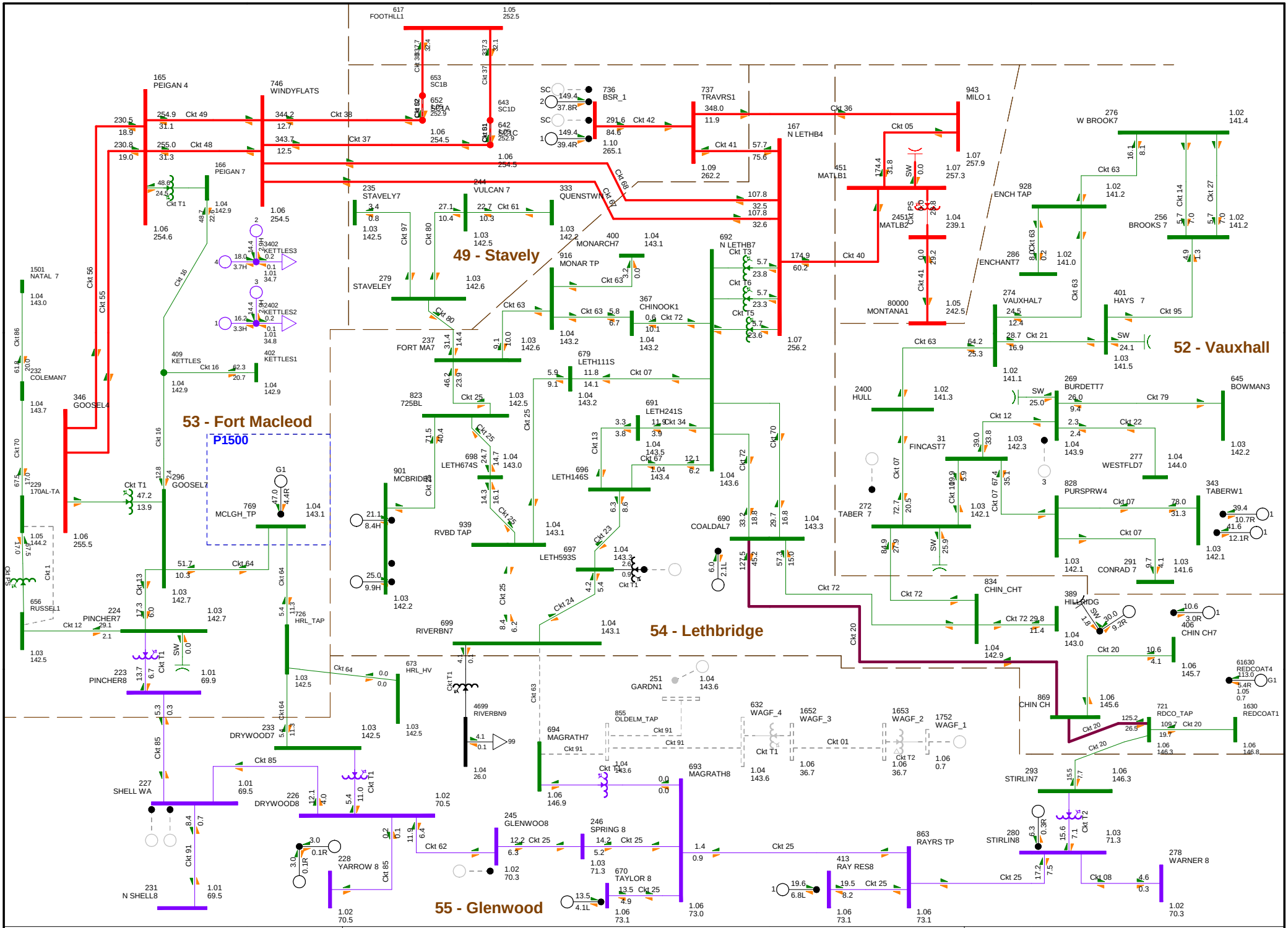
MH Import: 26.2 MW

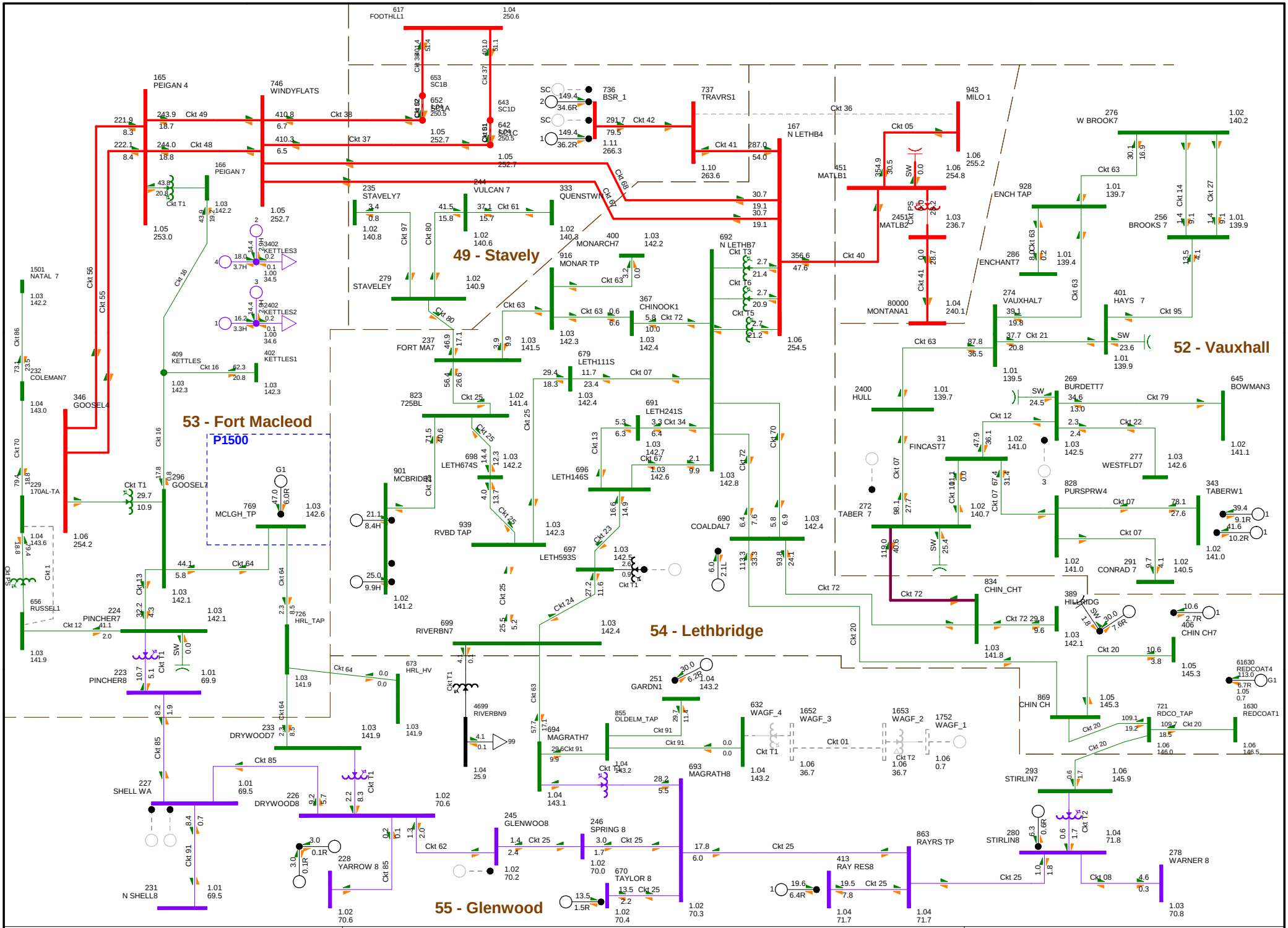
FIGURE A3.1-2 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

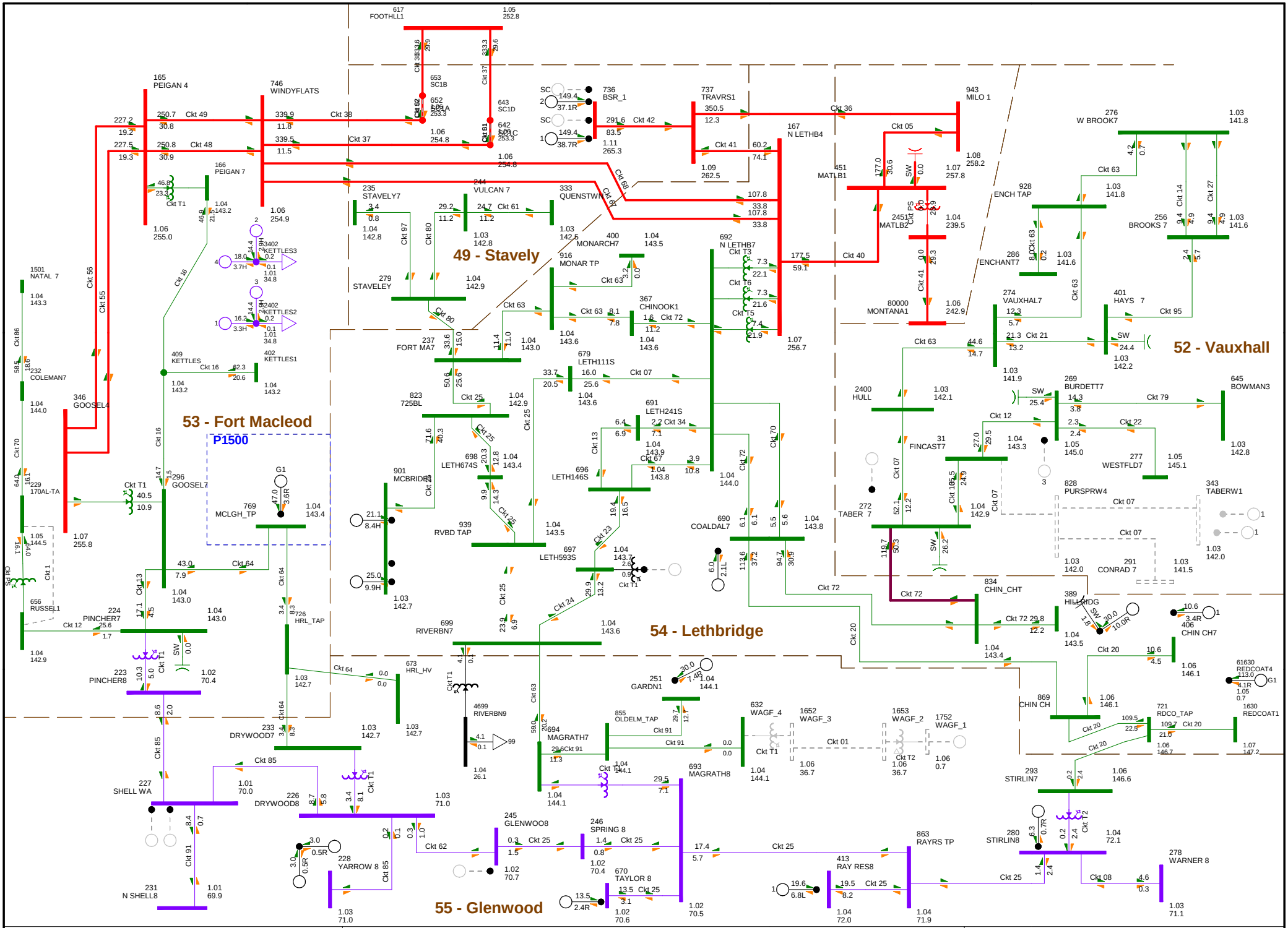
Bus - Voltage (kV/pu)
Branch - MW/Mvar
Equipment - MW/Mvar
100.0%Rate A

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
80000 MONTANA1
235 STAVELY7
244 VULCAN 7
333 QUEENSTN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
237 FORT MA7
679 LETH111S
691 LETH241S
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
939 RVBD TAP
697 LETH593S
690 COALDAL7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
229 170AL-TA
296 GOOSEL7
769 MCLGH_TP
656 RUSSEL1
224 PINCHER7
223 PINCHER8
673 HRL_HV
726 HRL_TAP
699 RIVERBN7
4699 RIVERBN9
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
863 RAYRS TP
413 RAY RES8
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
P1500 - RESL McLaughlin WAGF
BC Import:8.4 MW
Sask Import:0.0 MW
MATL Import:-0.0 MW
MH Import: 26.2 MW
FIGURE A3.1-3 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
2400 HULL
269 BURDETT7
645 BOWMAN3
31 FINCAST7
277 WESTFLD7
828 PURSPRW4
343 TABERW1
272 TABER 7
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
863 RAYRS TP
413 RAY RES8
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
229 170AL-TA
296 GOOSEL7
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
656 RUSSEL1
224 PINCHER7
223 PINCHER8
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
237 FORT MA7
400 MONARCH7
916 MONAR TP
367 CHINOOK1
692 N LETHB7
679 LETH111S
691 LETH241S
690 COALDAL7
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
939 RVBD TAP
697 LETH593S
699 RIVERBN7
769 MCLGH_TP
726 HRL_TAP
673 HRL_HV
4699 RIVERBN9
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
251 GARDN1
P1500 - RESL McLaughlin WAGF
BC Import:30.8 MW
Sask Import:-0.0 MW
MATL Import:-0.0 MW
MH Import: 26.2 MW
FIGURE A3.1-4 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
237 FORT MA7
400 MONARCH7
916 MONAR TP
367 CHINOOK1
692 N LETHB7
679 LETH111S
691 LETH241S
696 LETH146S
698 LETH674S
690 COALDAL7
699 RIVERBN7
697 LETH593S
939 RVBD TAP
823 725BL
901 MCBRIDE1
769 MCLGH_TP
736 BSR_1
737 TRAVRS1
167 N LETHB4
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
296 GOOSEL7
229 170AL-TA
656 RUSSEL1
224 PINCHER7
223 PINCHER8
726 HRL_TAP
673 HRL_HV
4699 RIVERBN9
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
413 RAY RES8
863 RAYRS TP
P1500 - RESL McLaughlin WAGF
BC Import:16.4 MW
Sask Import:-0.0 MW
MATL Import:0.0 MW
MH Import: 26.2 MW
FIGURE A3.1-5 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

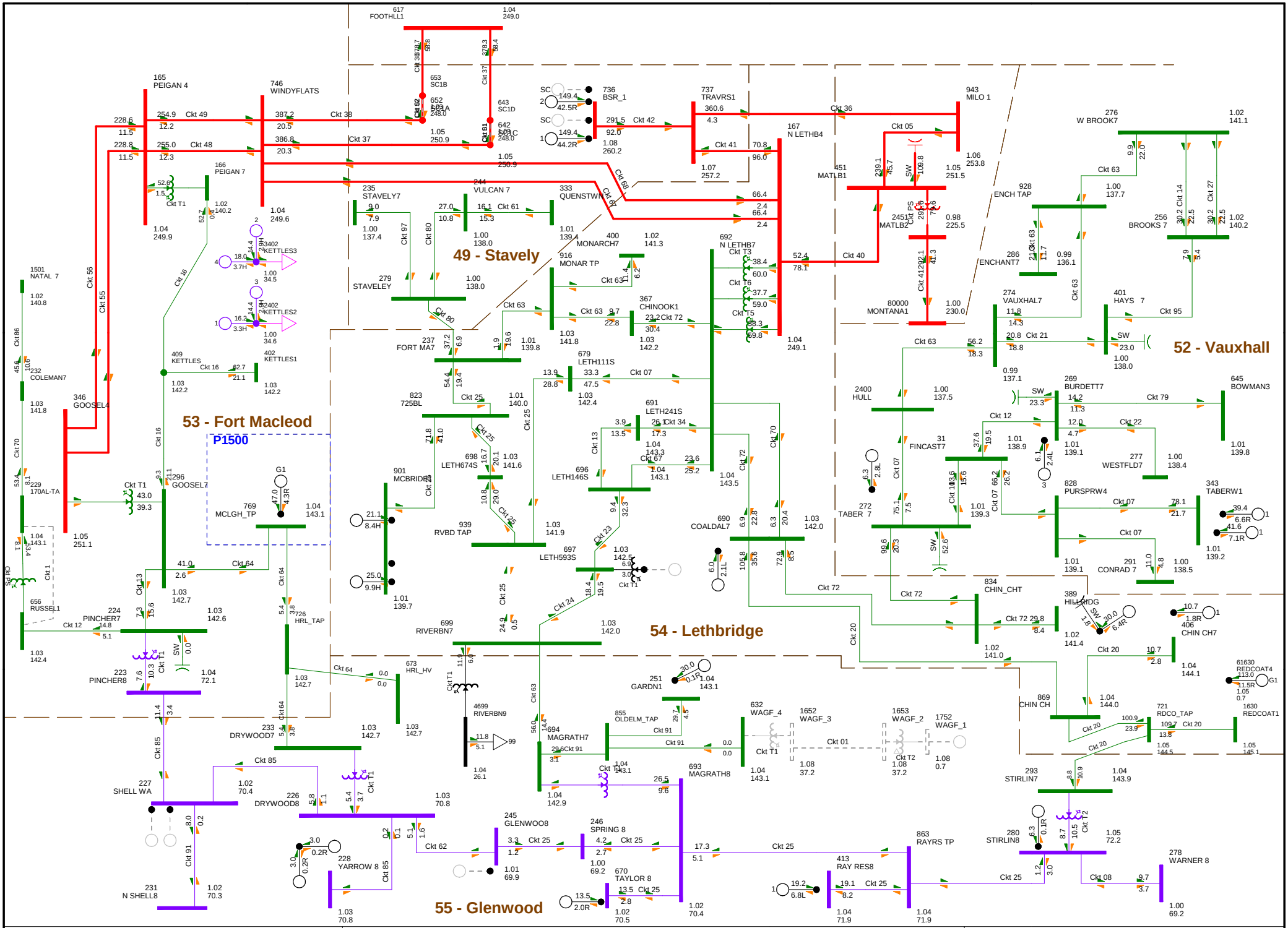
BC Import:64.9 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A3.1-6 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

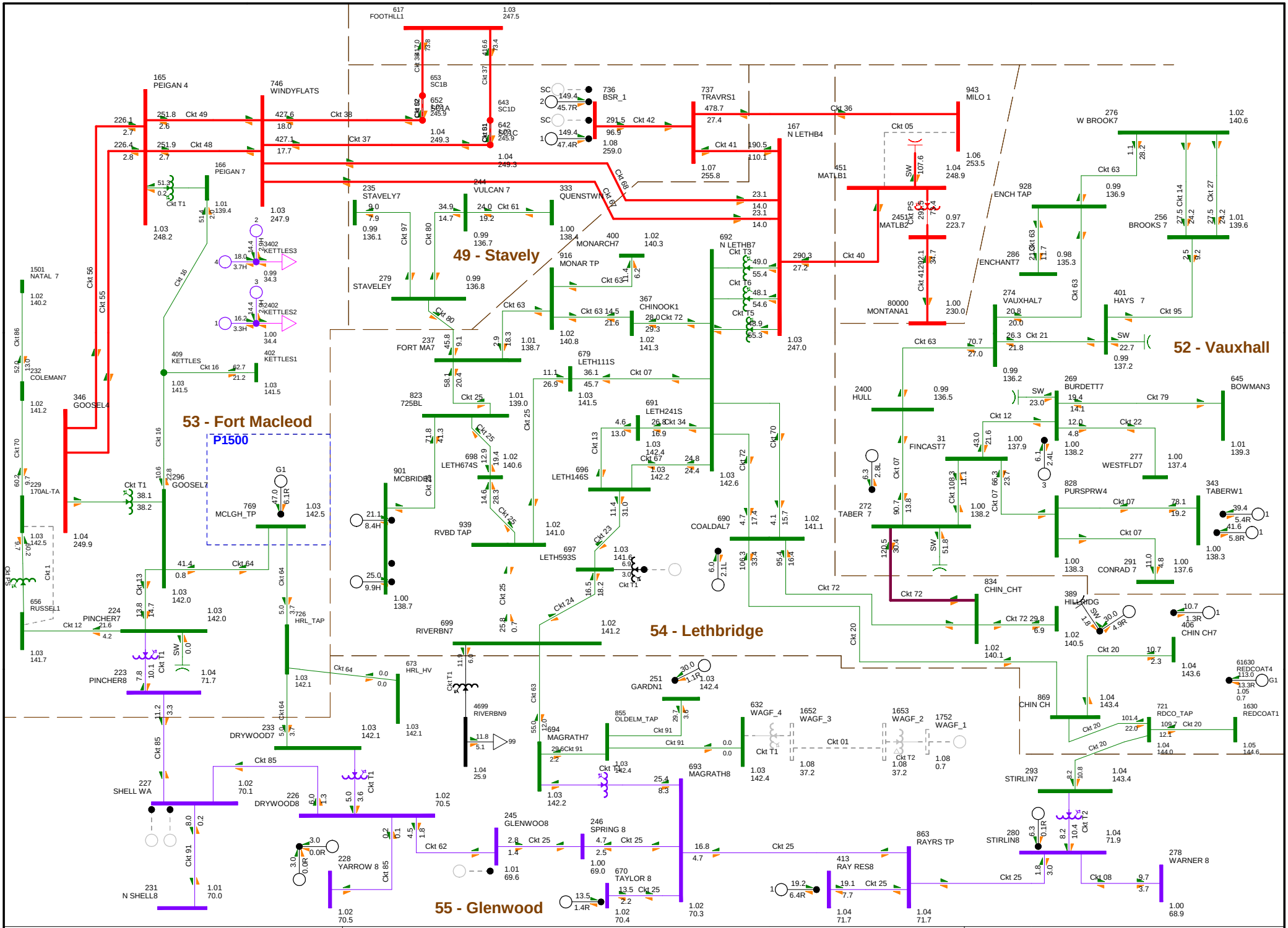
BC Import:430.4 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

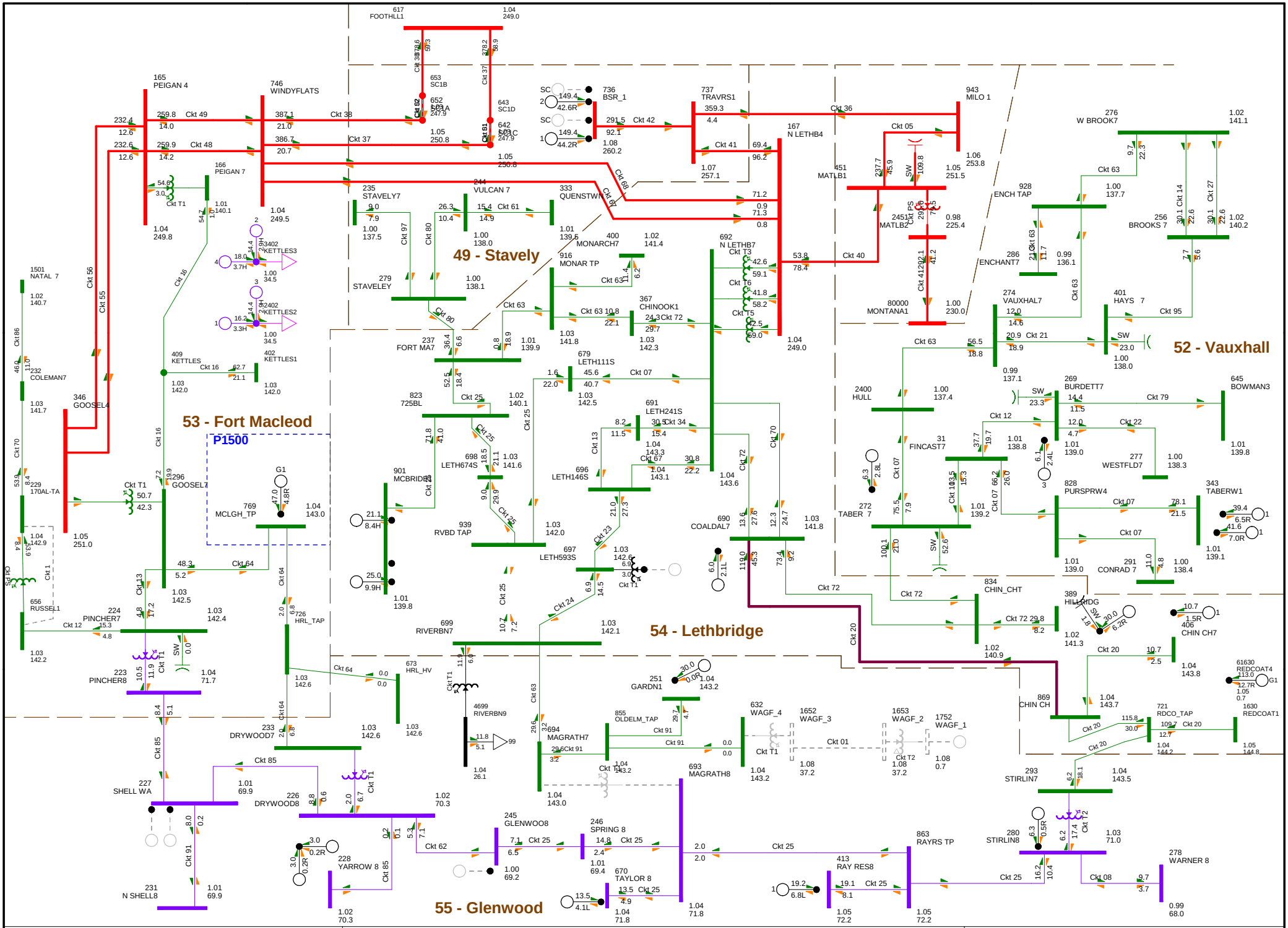
BC Import:440.0 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-2 N-1: 1005L (MILO 356S TO PICTURE BUTTE 120S)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

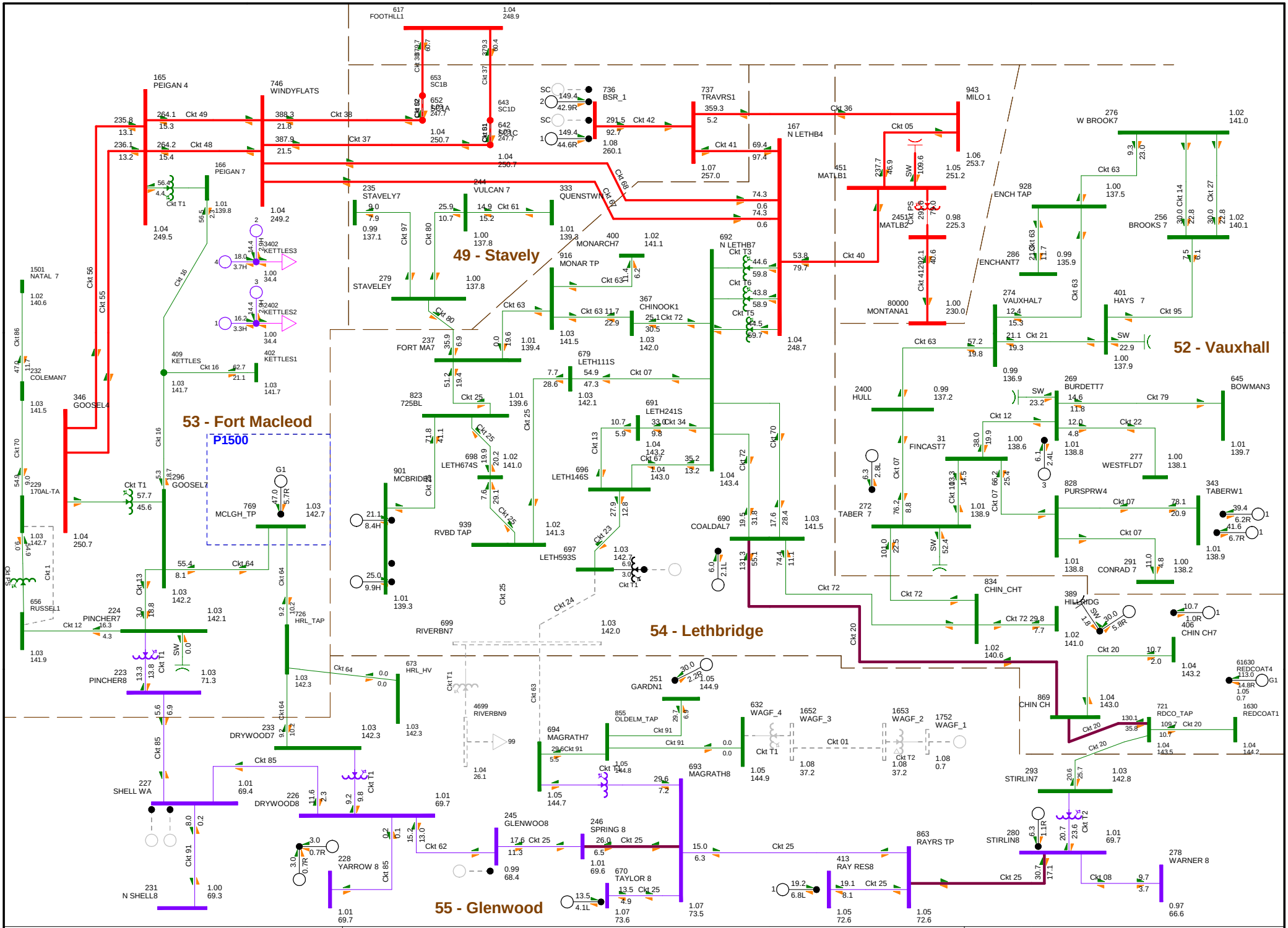
BC Import:433.1 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-3 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

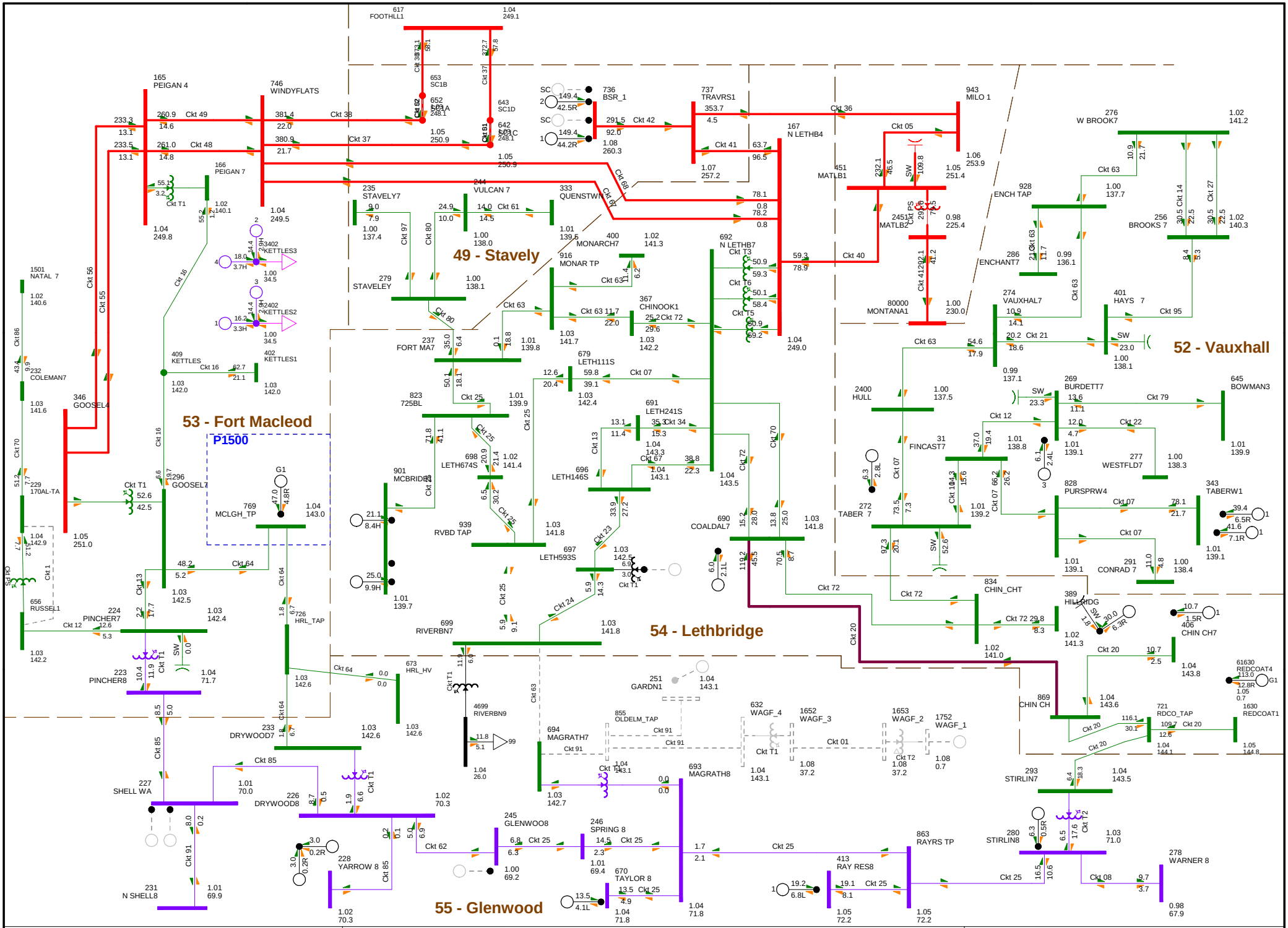
BC Import:429.5 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-4 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

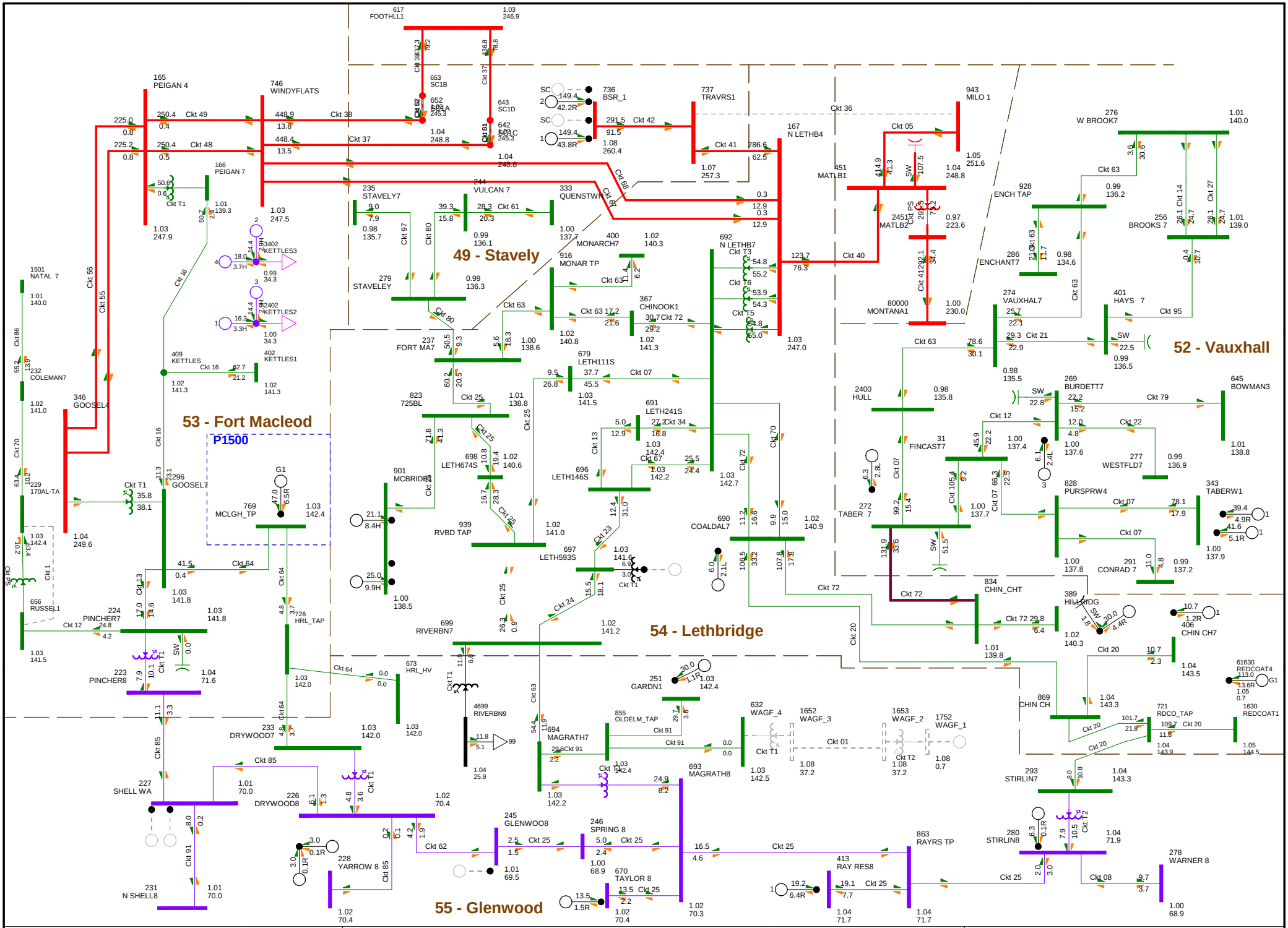
BC Import:460.9 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-5 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

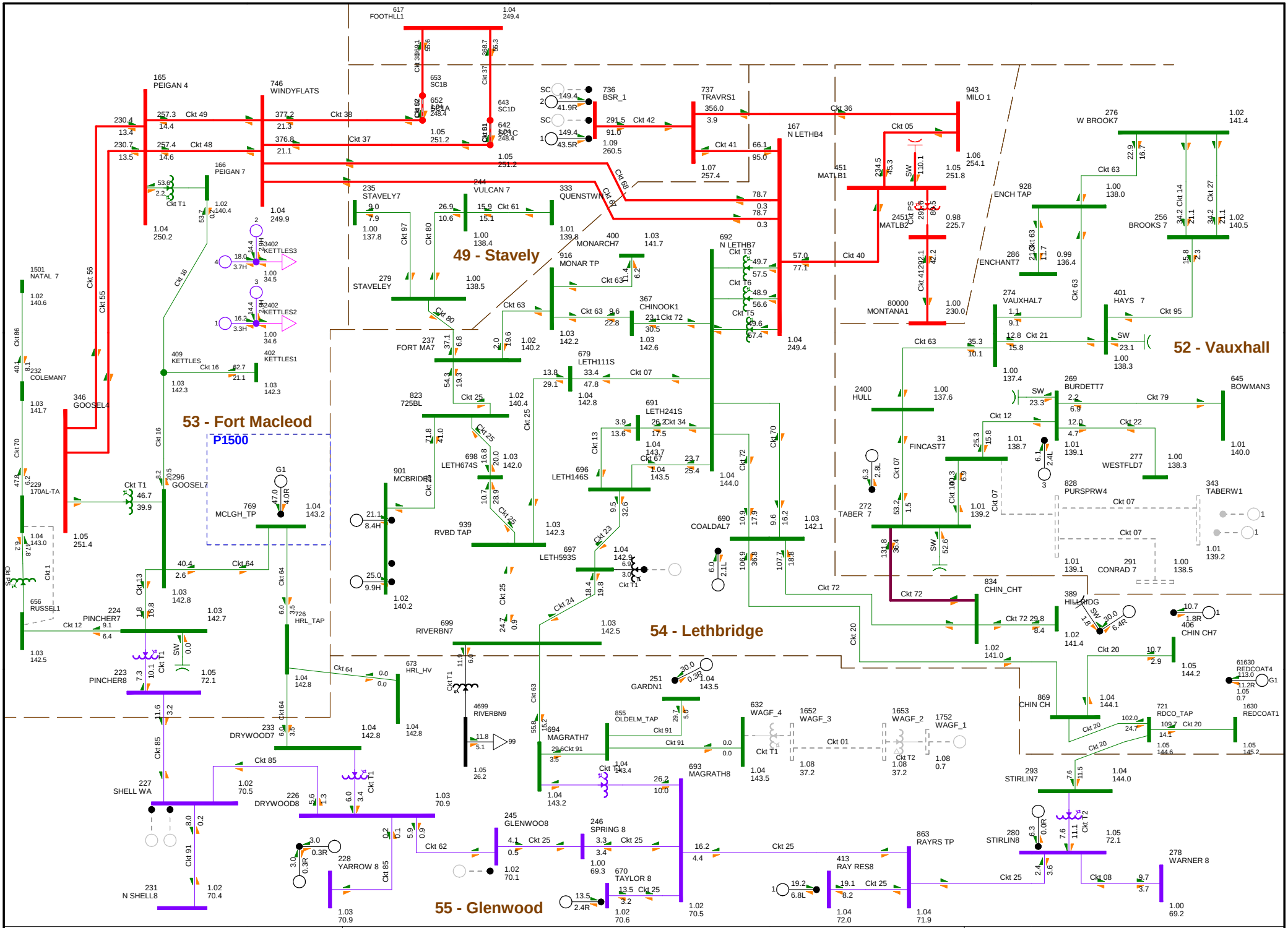
BC Import:448.7 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-6 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

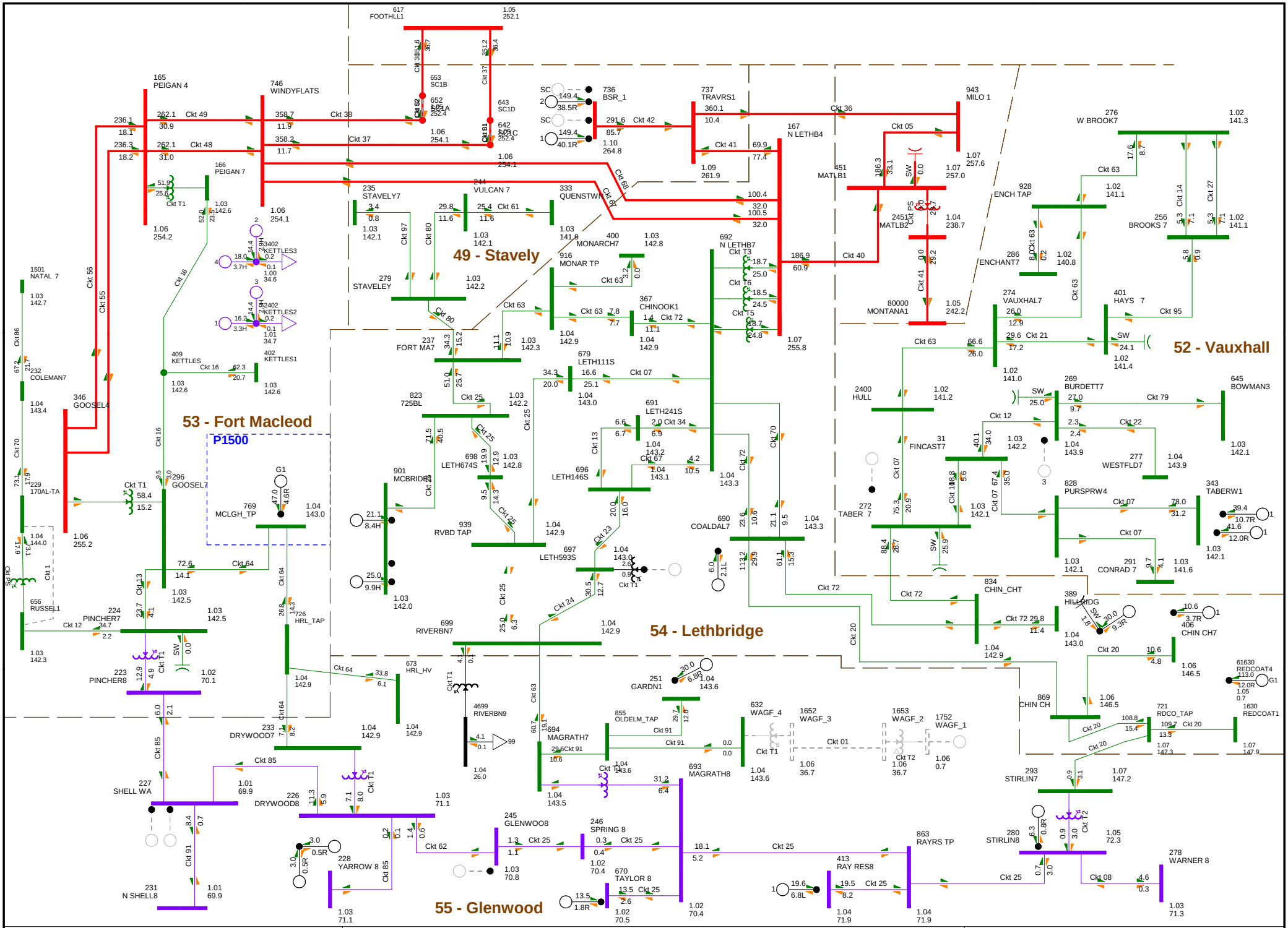
BC Import:495.6 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.2-7 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

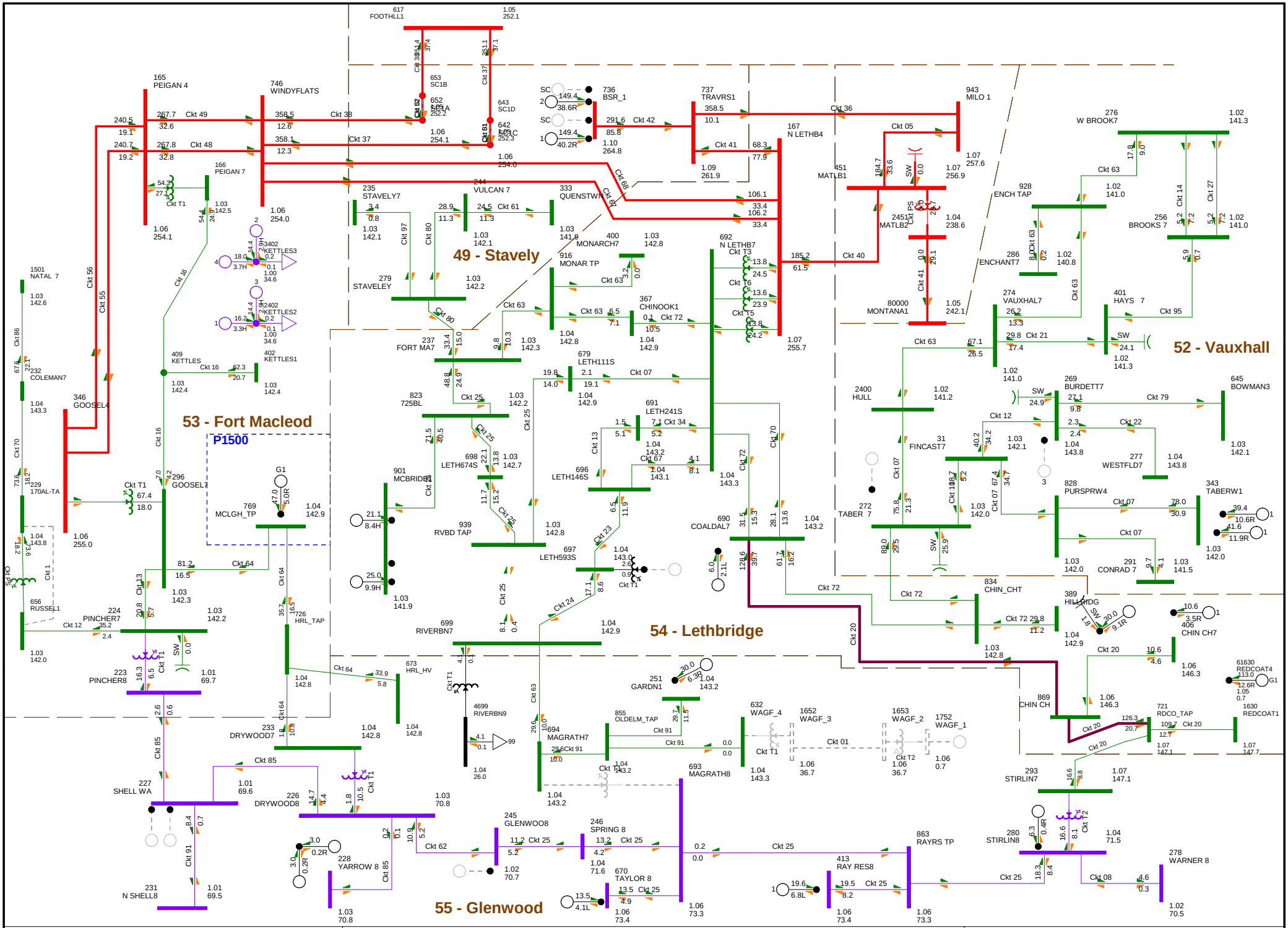
BC Import:0.1 MW Sask Import:-0.0 MW MATL Import:0.0 MW

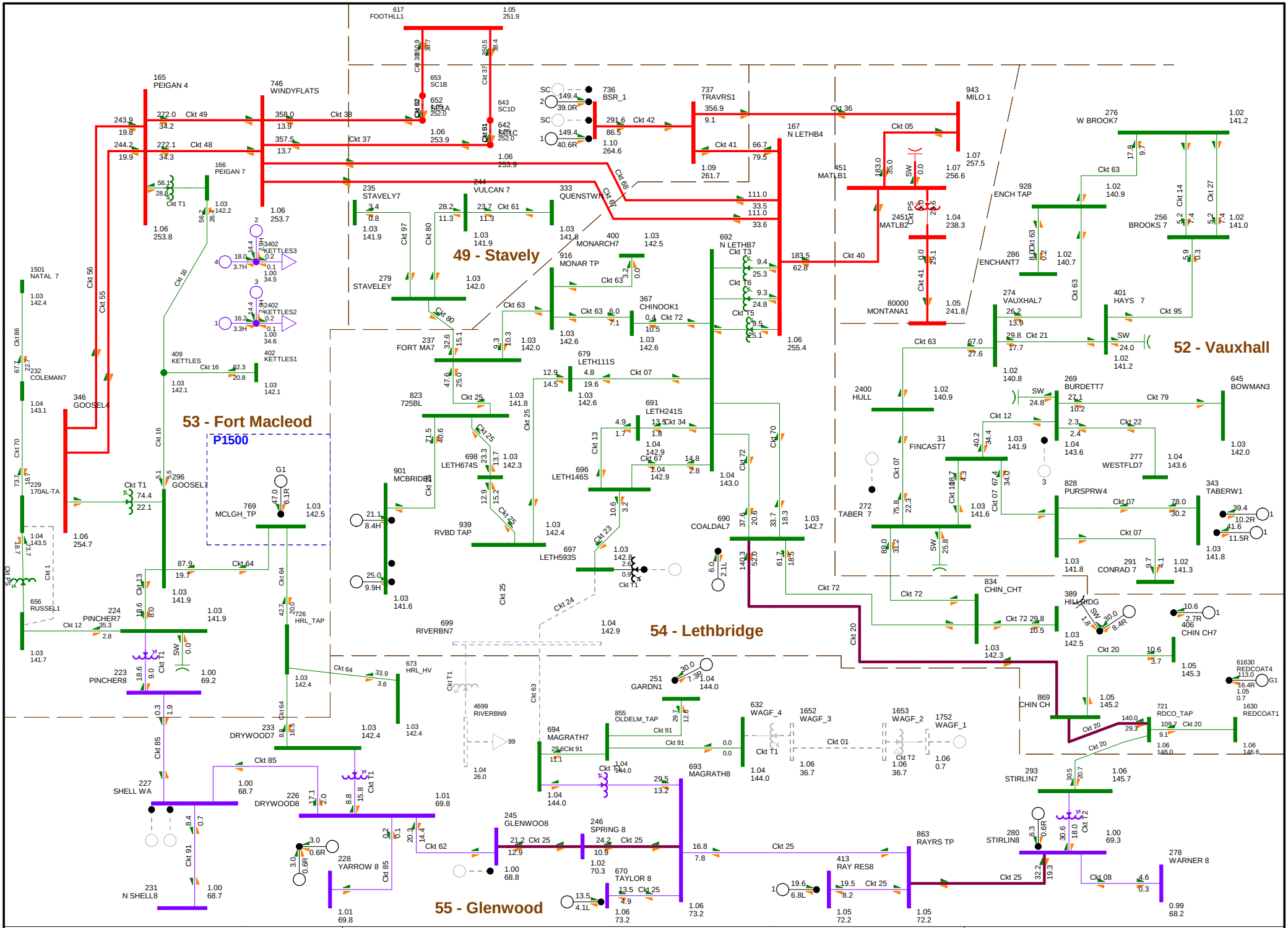
MH Import: 26.2 MW

FIGURE A3.3-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
80000 MONTANA1
274 VAUXHAL7
401 HAYS 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
692 N LETHB7
367 CHINOOK1
237 FORT MA7
679 LETH111S
691 LETH241S
696 LETH146S
690 COALDAL7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
823 725BL
901 MCBRIDE1
698 LETH674S
939 RVBD TAP
697 LETH593S
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
863 RAYRS TP
413 RAY RES8
670 TAYLOR 8
246 SPRING 8
245 GLENWOO8
228 YARROW 8
231 N SHELL8
227 SHELL WA
226 DRYWOOD8
233 DRYWOOD7
223 PINCHER8
224 PINCHER7
656 RUSSEL1
229 170AL-TA
769 MCLGH_TP
G1
699 RIVERBN7
4699 RIVERBN9
673 HRL_HV
726 HRL_TAP
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
251 GARDN1
P1500 - RESL McLaughlin WAGF
BC Import:3.3 MW
Sask Import:-0.0 MW
MATL Import:-0.0 MW
MH Import: 26.2 MW
FIGURE A3.3-2 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

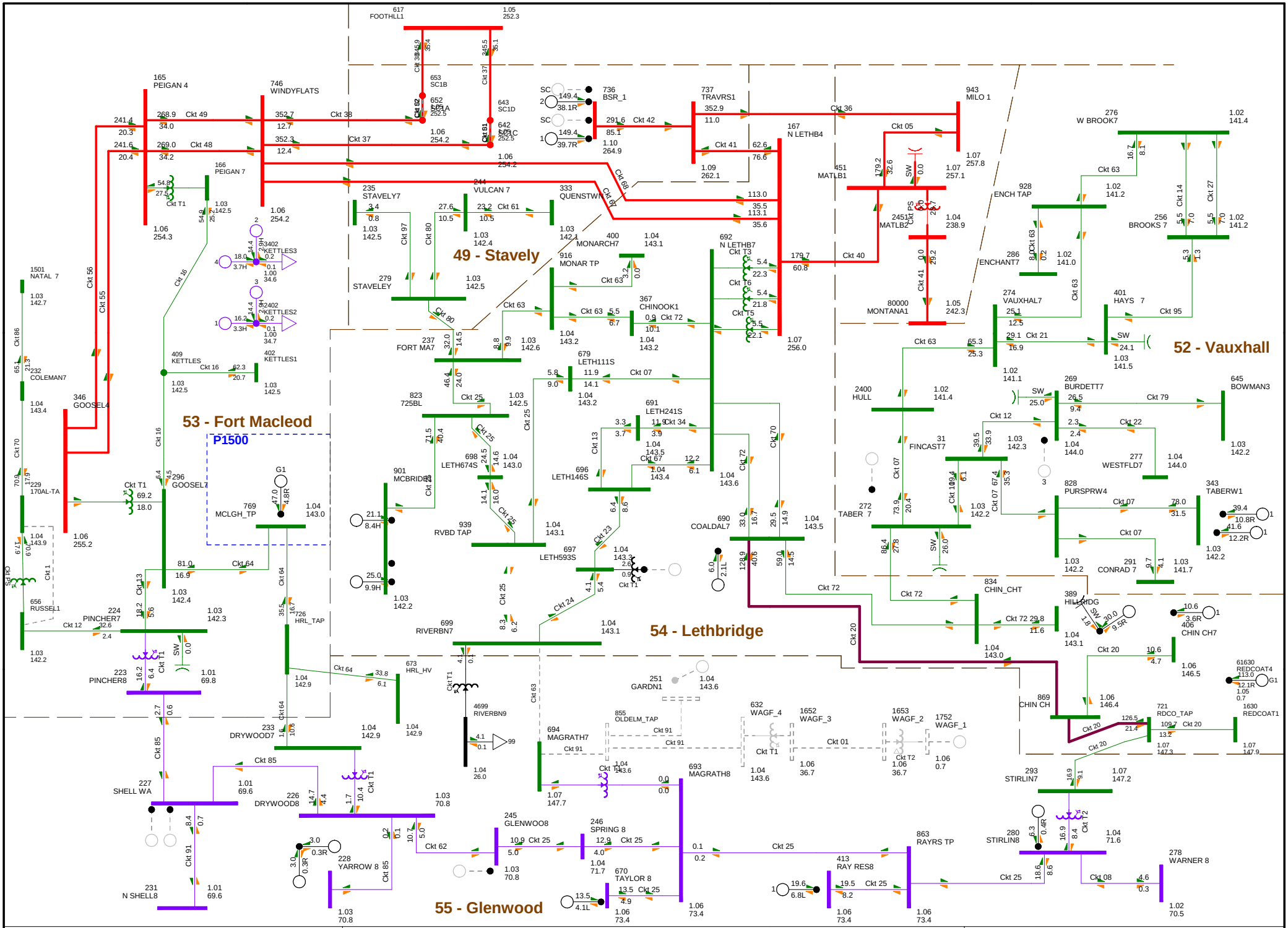
BC Import:8.2 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A3.3-3 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

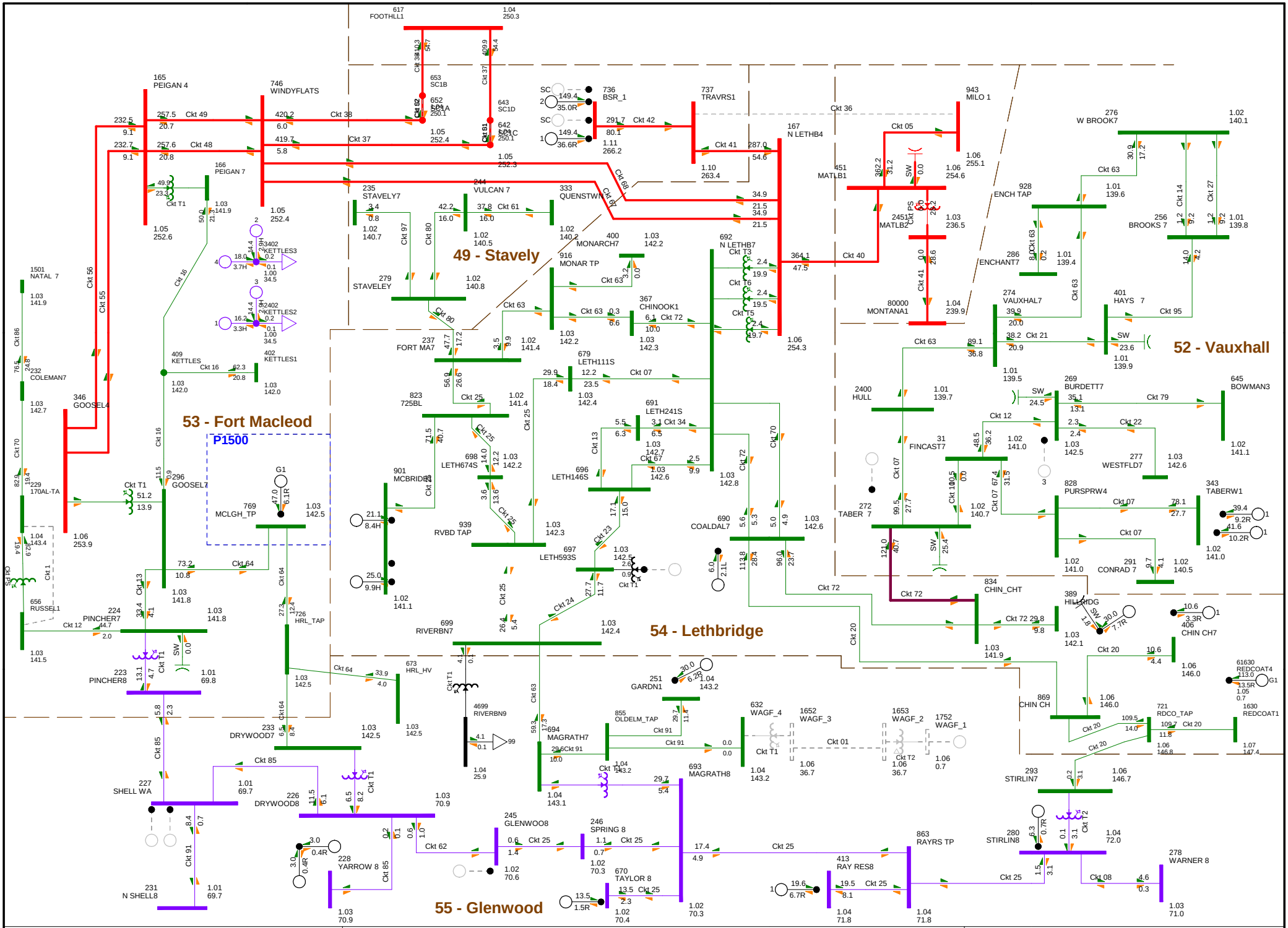
BC Import:30.4 MW Sask Import:-0.0 MW MATL Import:0.0 MW

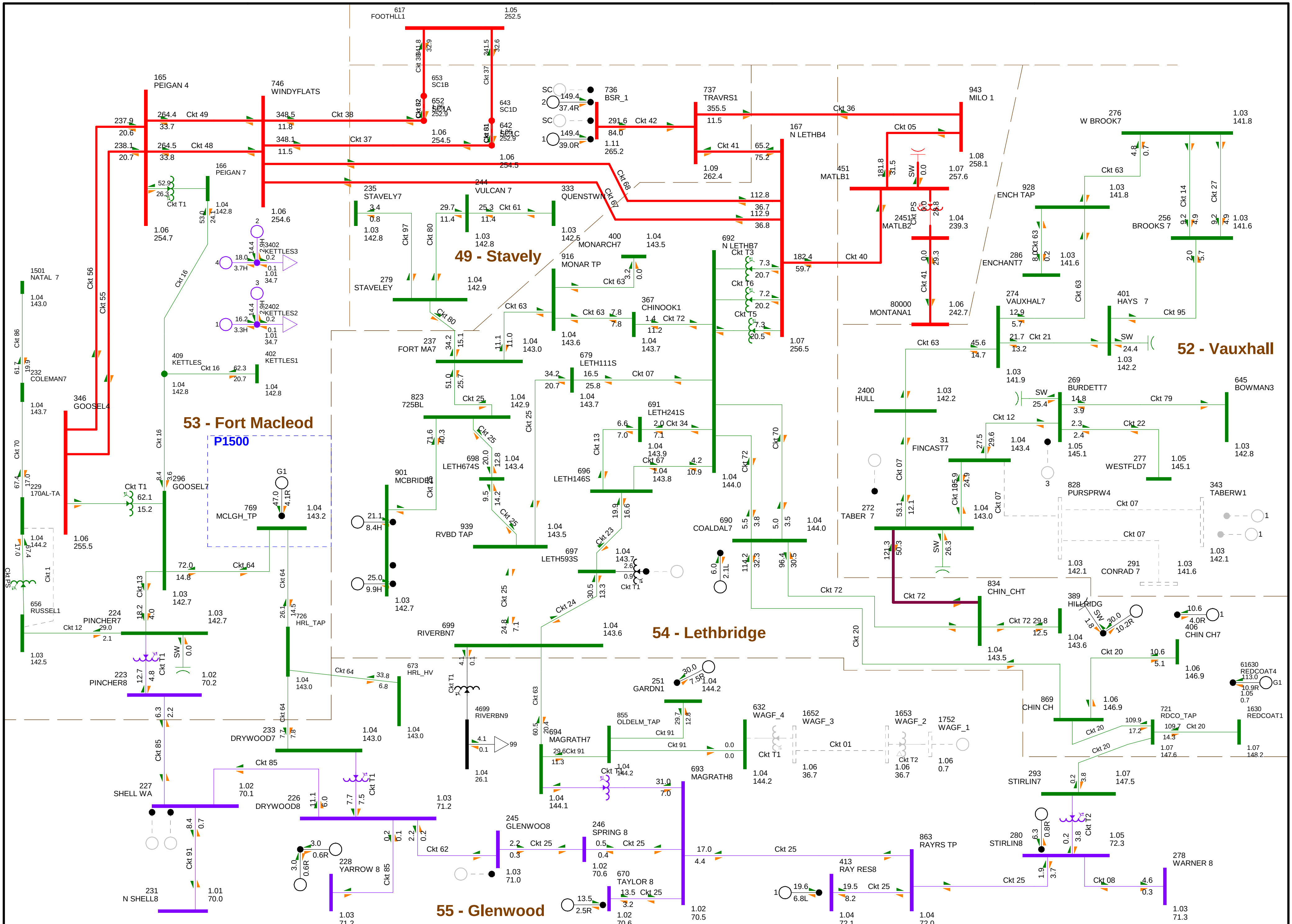
MH Import: 26.2 MW

FIGURE A3.3-4 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
80000 MONTANA1
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
237 FORT MA7
400 MONARCH7
916 MONAR TP
367 CHINOOK1
692 N LETHB7
679 LETH111S
691 LETH241S
696 LETH146S
698 LETH674S
690 COALDAL7
823 725BL
901 MCBRIDE1
939 RVBD TAP
697 LETH593S
699 RIVERBN7
4699 RIVERBN9
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
296 GOOSEL7
229 170AL-TA
656 RUSSEL1
224 PINCHER7
223 PINCHER8
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
769 MCLGH_TP
726 HRL_TAP
673 HRL_HV
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
2400 HULL
272 TABER 7
31 FINCAST7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
293 STIRLIN7
280 STIRLIN8
863 RAYRS TP
413 RAY RES8
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:16.6 MW
Sask Import:0.0 MW
MATL Import:-0.0 MW
MH Import: 26.2 MW
FIGURE A3.3-5 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

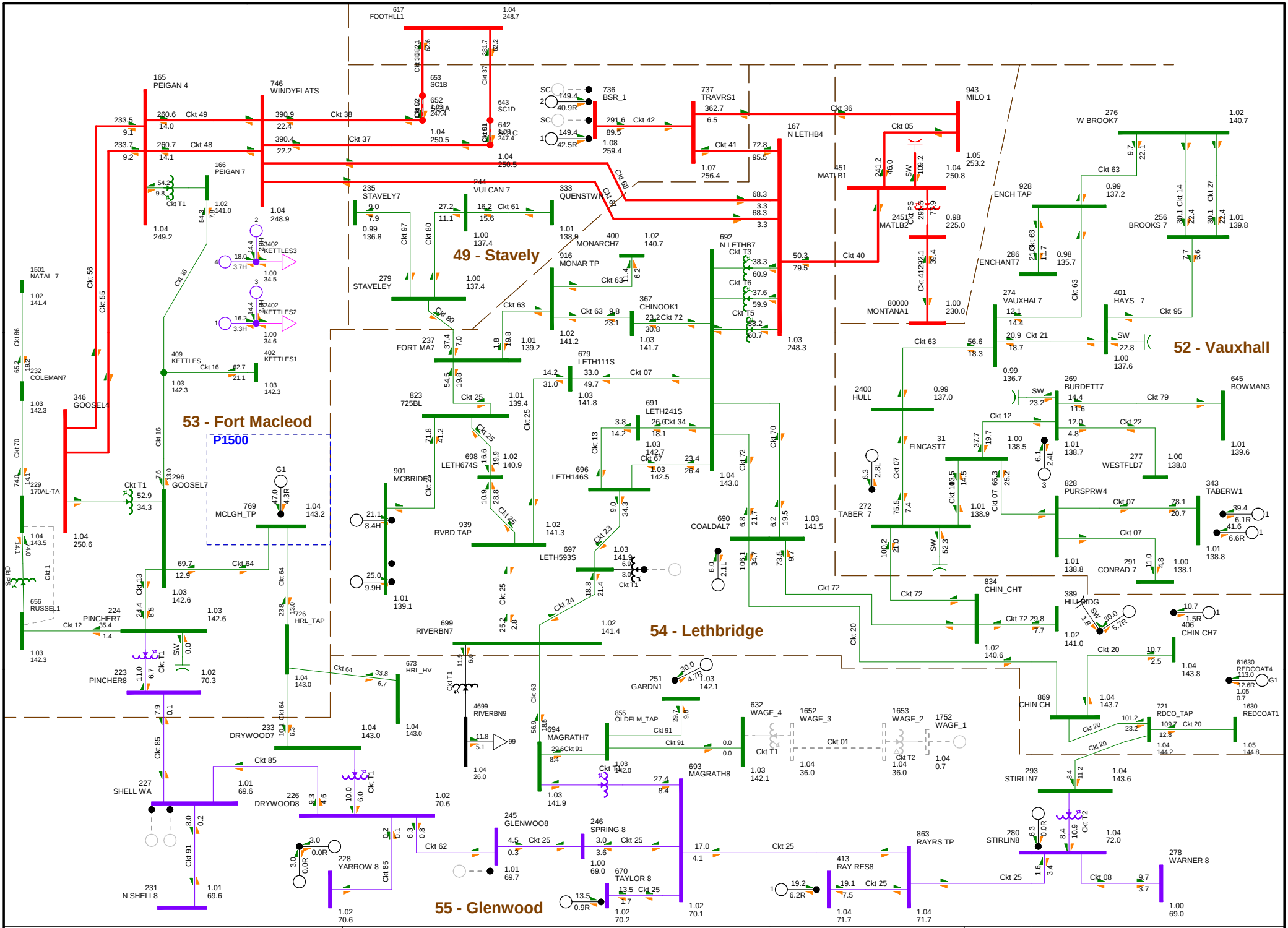
BC Import:64.4 MW   Sask Import:-0.0 MW   MATL Import:-0.0 MW

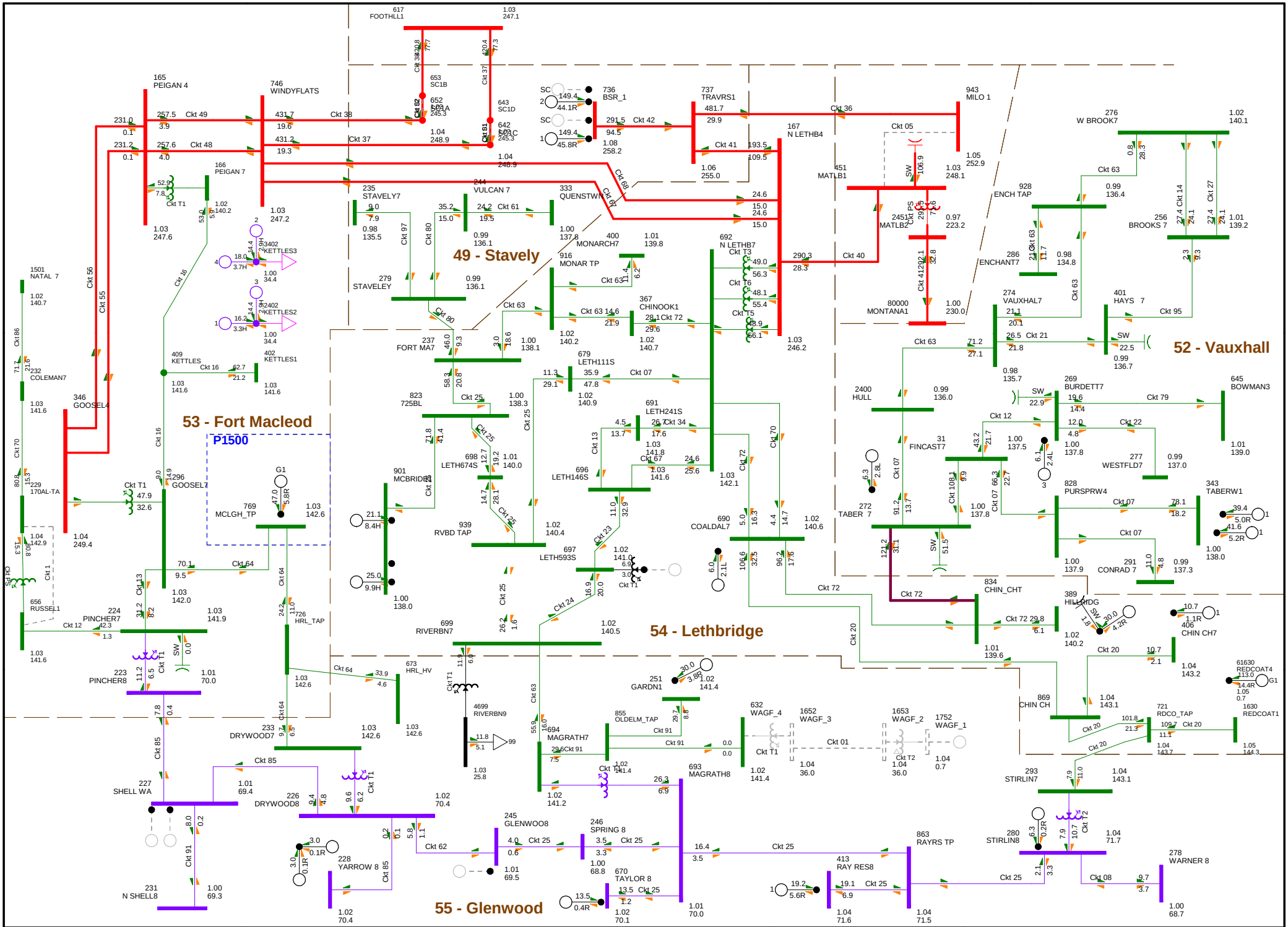
MH Import: 26.2 MW

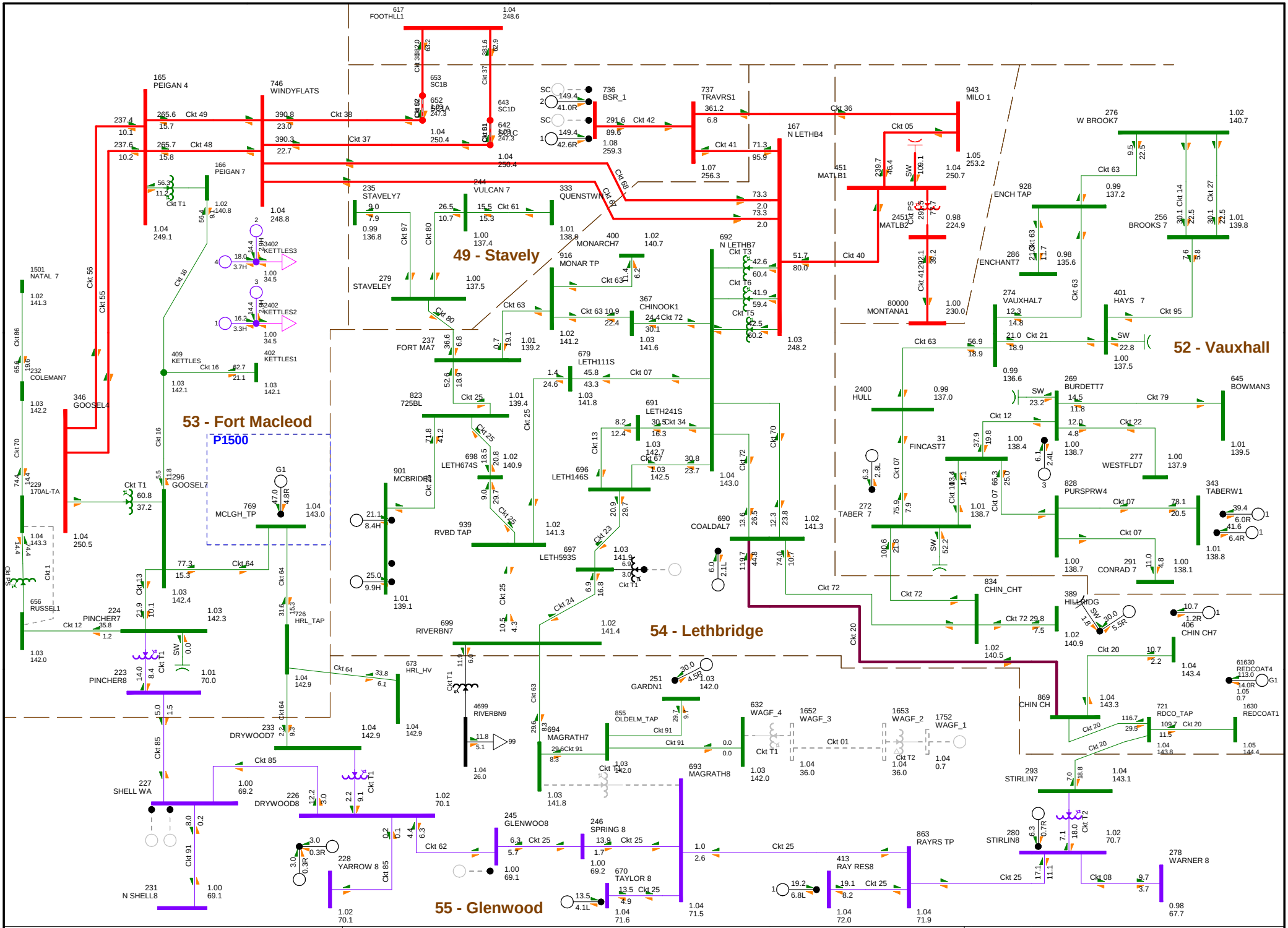
FIGURE A3.3-6 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
237 FORT MA7
679 LETH111S
691 LETH241S
696 LETH146S
690 COALDAL7
2400 HULL
31 FINCAST7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
272 TABER 7
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
863 RAYRS TP
413 RAY RES8
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
296 GOOSEL7
229 170AL-TA
656 RUSSEL1
224 PINCHER7
223 PINCHER8
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
823 725BL
901 MCBRIDE1
769 MCLGH_TP
939 RVBD TAP
698 LETH674S
697 LETH593S
699 RIVERBN7
4699 RIVERBN9
673 HRL_HV
726 HRL_TAP
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
228 YARROW 8
231 N SHELL8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
Ckt 49
Ckt 48
Ckt 38
Ckt 37
Ckt 42
Ckt 41
Ckt 36
Ckt 05
Ckt 40
Ckt 72
Ckt 63
Ckt 80
Ckt 97
Ckt 61
Ckt 60
Ckt 07
Ckt 25
Ckt 34
Ckt 67
Ckt 23
Ckt 24
Ckt 64
Ckt 85
Ckt 91
Ckt 62
Ckt 01
Ckt 20
Ckt 95
Ckt 79
Ckt 22
Ckt 12
Ckt 21
Ckt 16
Ckt 55
Ckt 56
Ckt 86
Ckt 70
Ckt 13
Ckt 08
P1500 - RESL McLaughlin WAGF
BC Import:430.2 MW Sask Import:-0.0 MW MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A3.4-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
80000 MONTANA1
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
237 FORT MA7
679 LETH111S
691 LETH241S
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
939 RVBD TAP
697 LETH593S
690 COALDAL7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
229 170AL-TA
296 GOOSEL7
769 MCLGH_TP
656 RUSSEL1
224 PINCHER7
223 PINCHER8
227 SHELL WA
231 N SHELL8
233 DRYWOOD7
226 DRYWOOD8
228 YARROW 8
673 HRL_HV
1726 HRL_TAP
4699 RIVERBN9
699 RIVERBN7
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
251 GARDN1
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
863 RAYRS TP
413 RAY RES8
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:440.3 MW
Sask Import:0.0 MW
MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A3.4-2 N-1: 1005L (MILO 356S TO PICTURE BUTTE 120S)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

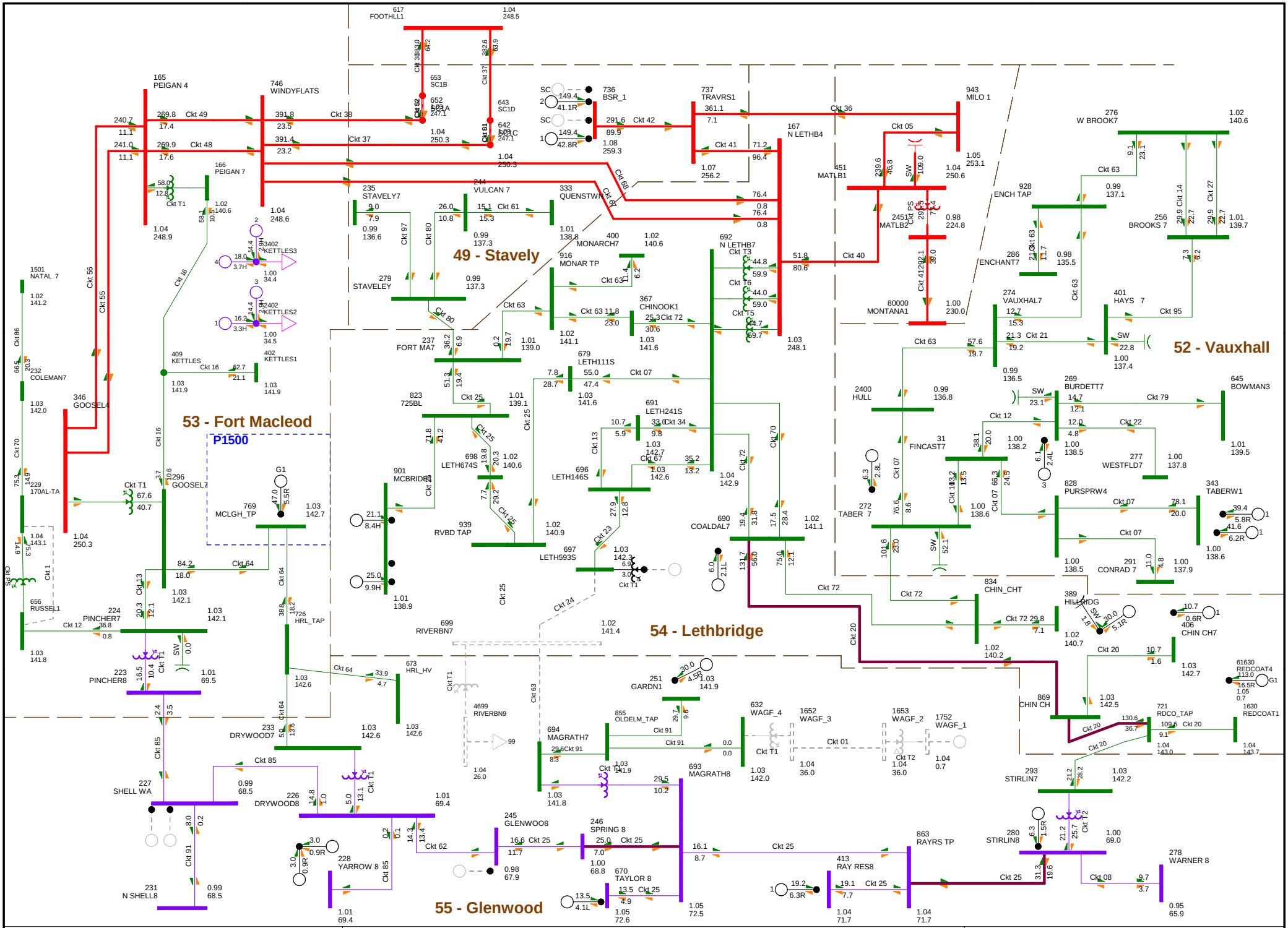
BC Import:433.1 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.4-3 N-1: 225ST1 (MAGRATH 225S 138/69 KV TRANSFORMER T1)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

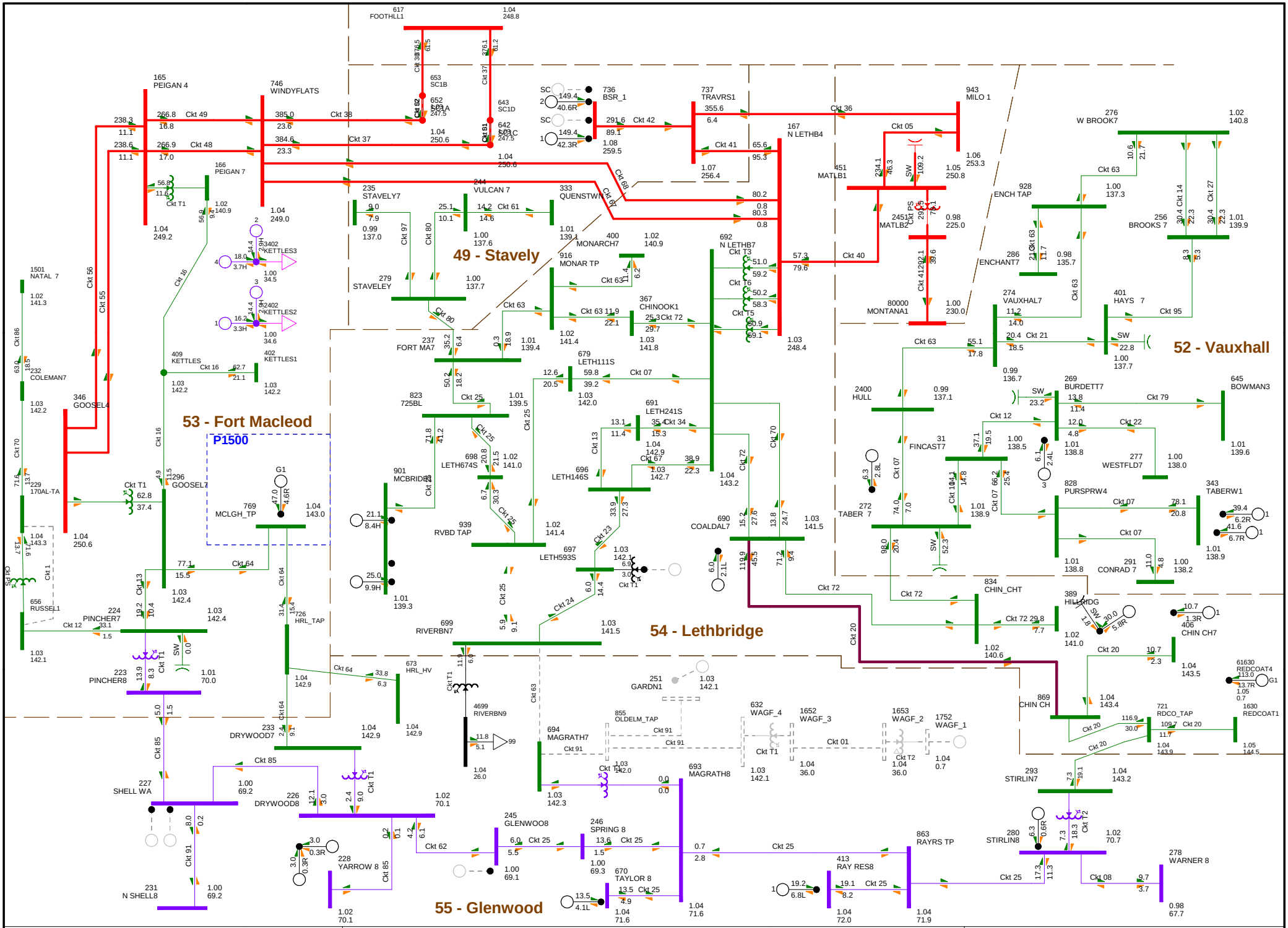
BC Import:430.1 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.4-4 N-1: 618ST1 (RIVERBEND 618S 138/25 KV TRANSFORMER T1)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

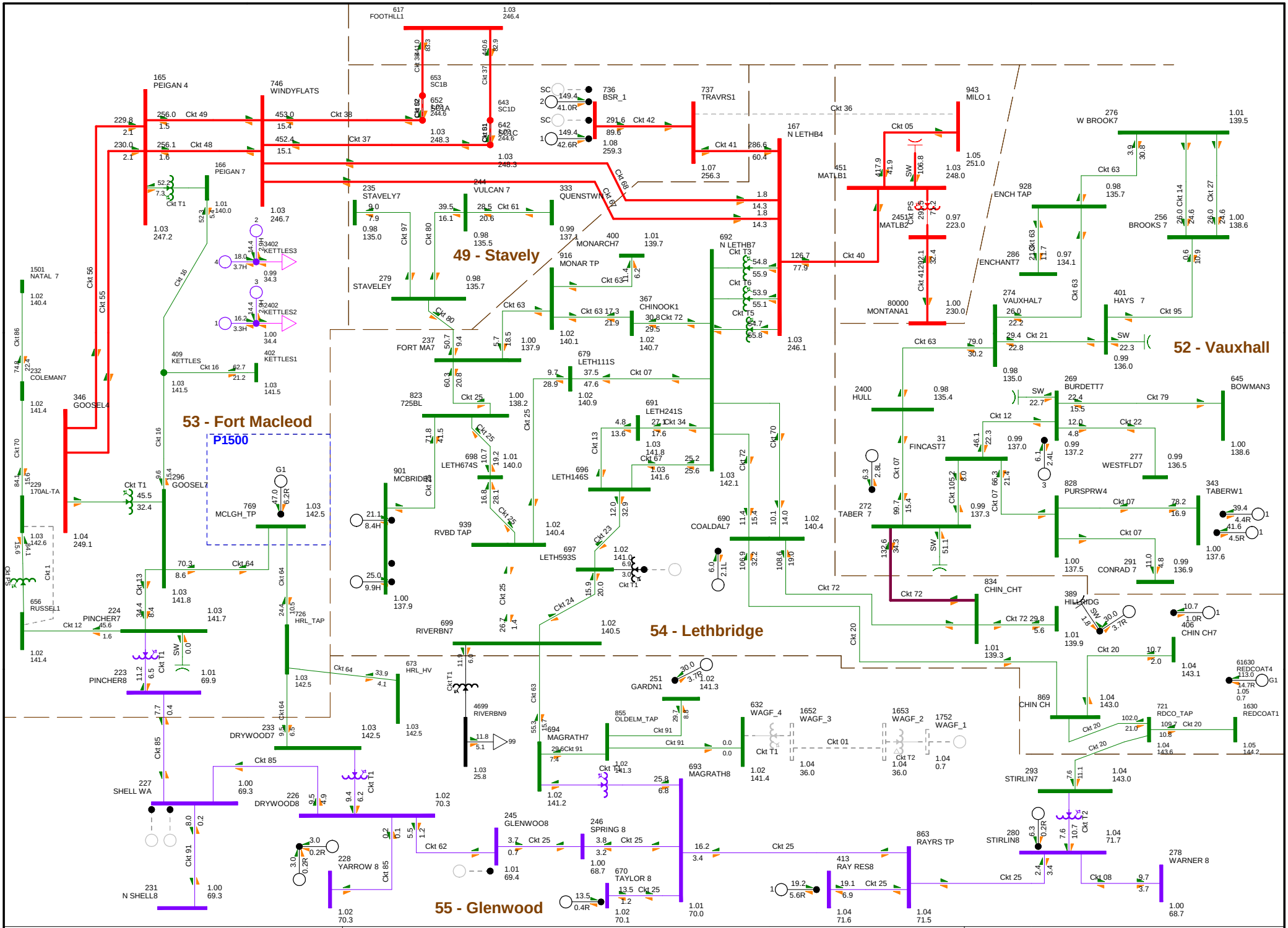
BC Import:460.7 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.4-5 N-1: 863L (MAGRATH 225S TO RIVERBEND 618S)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

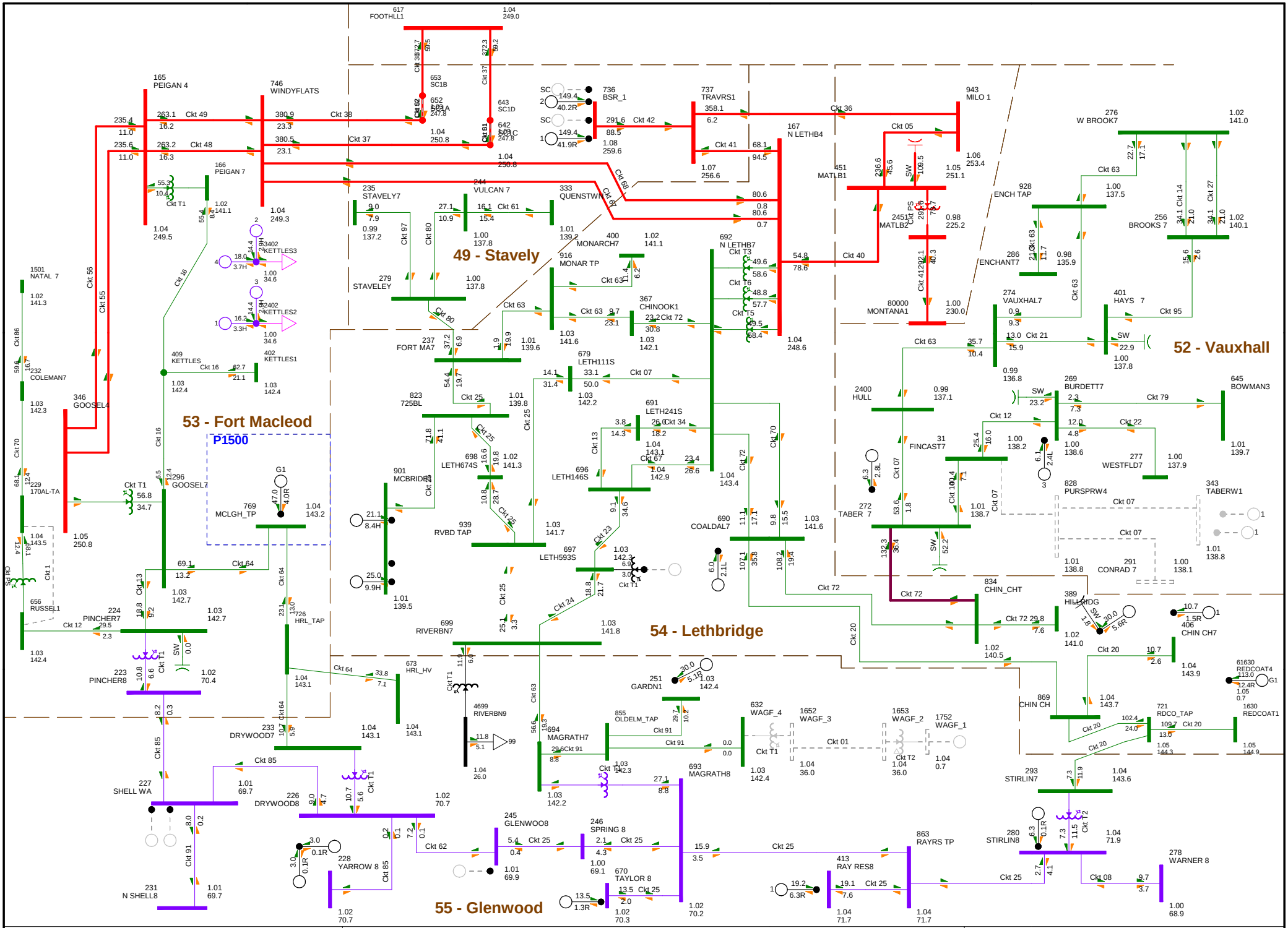
BC Import:449.4 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.4-6 N-1: 1036L (MILO 356S TO TRAVERS 554S)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

BC Import:495.4 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A3.4-7 N-1: 607L (FINCASTLE 336S TO CONRAD 135S)
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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

Attachment A4
Post-Project Transient Stability Diagrams

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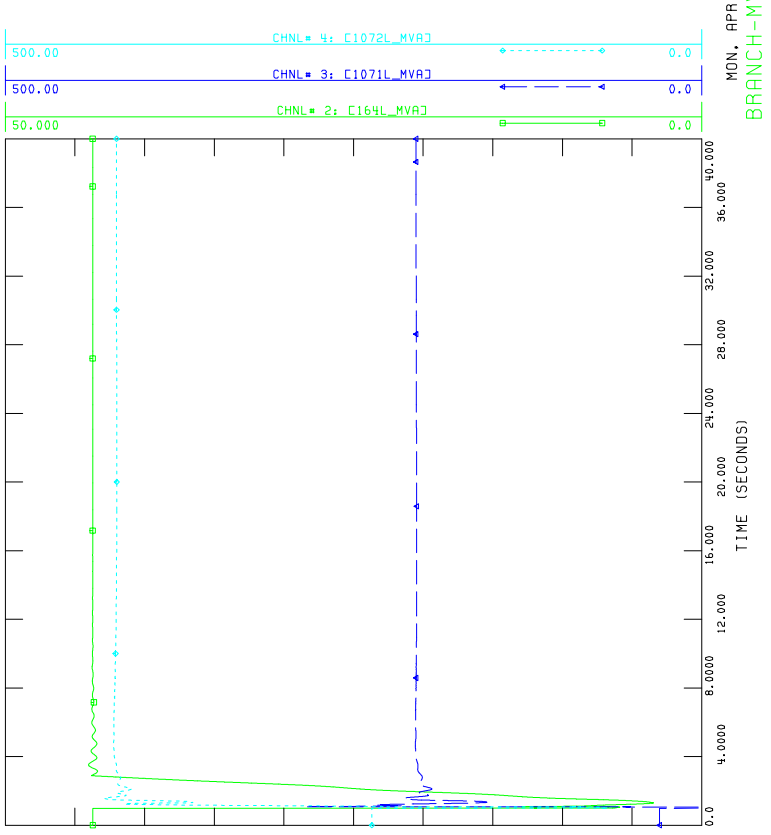

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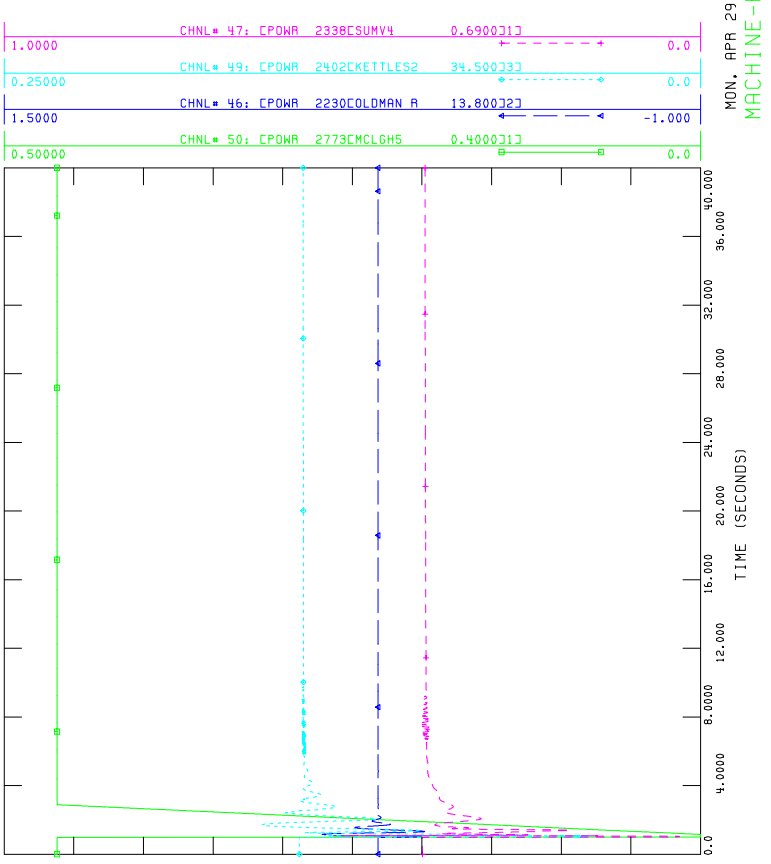

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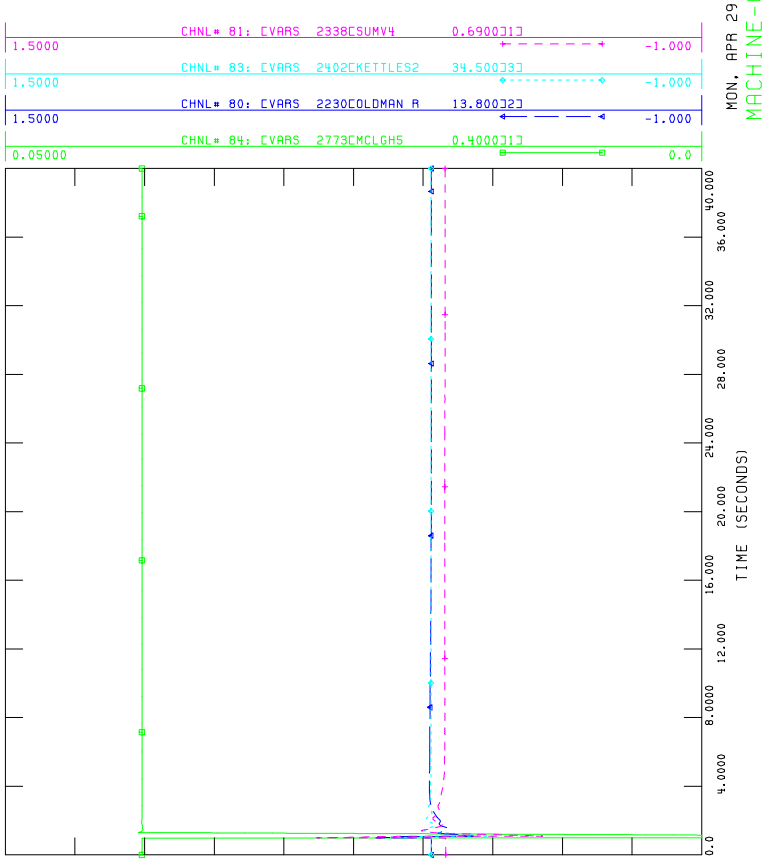

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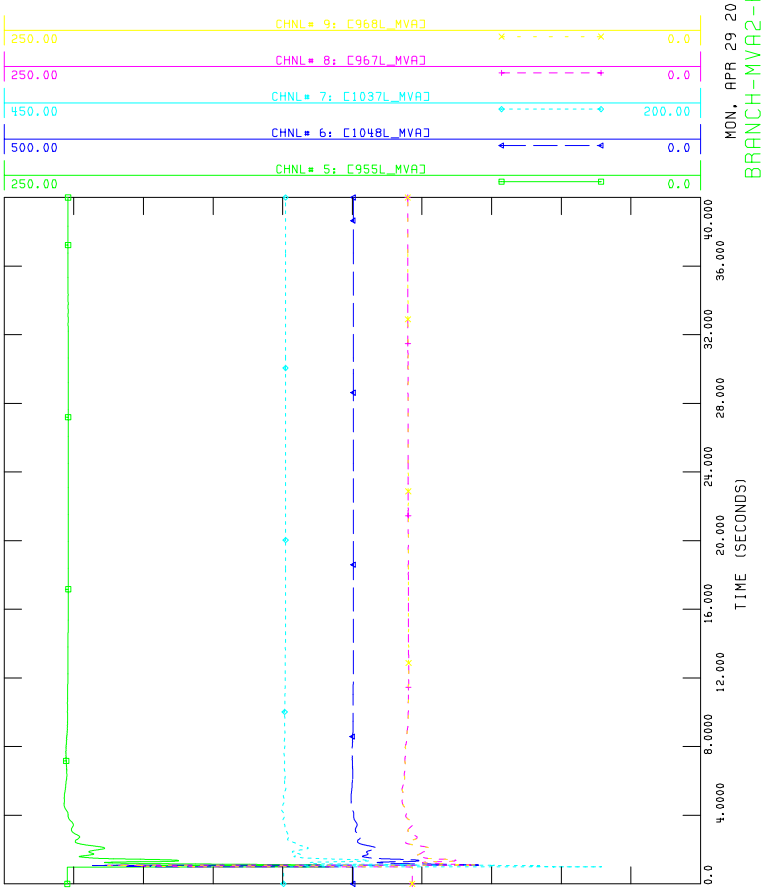

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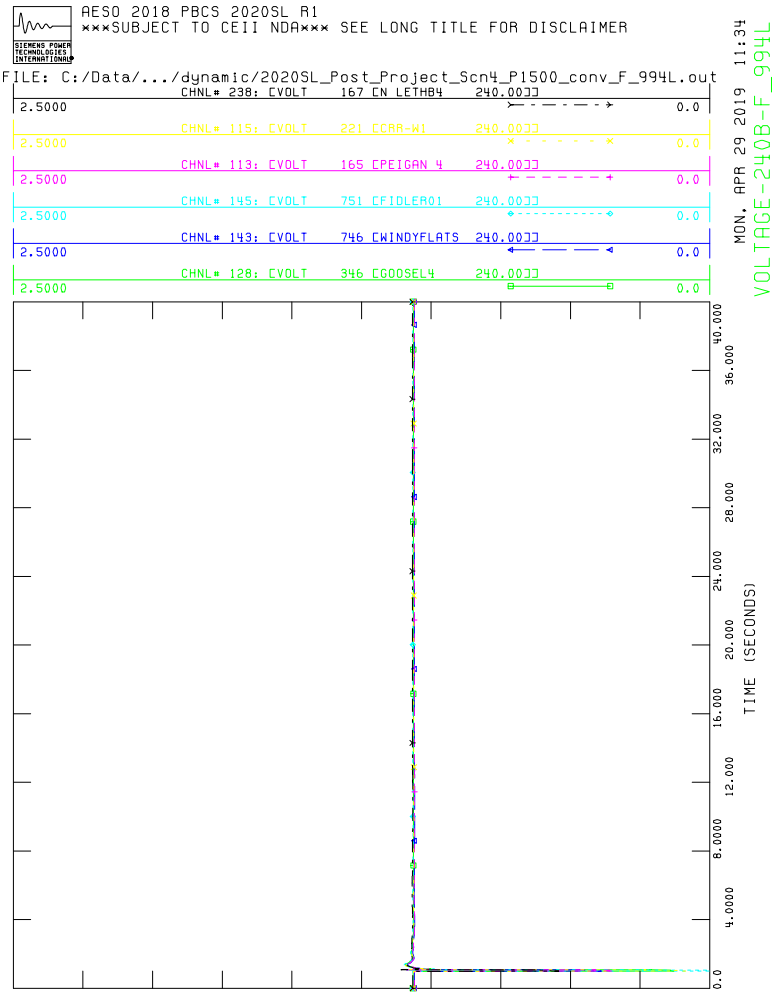
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CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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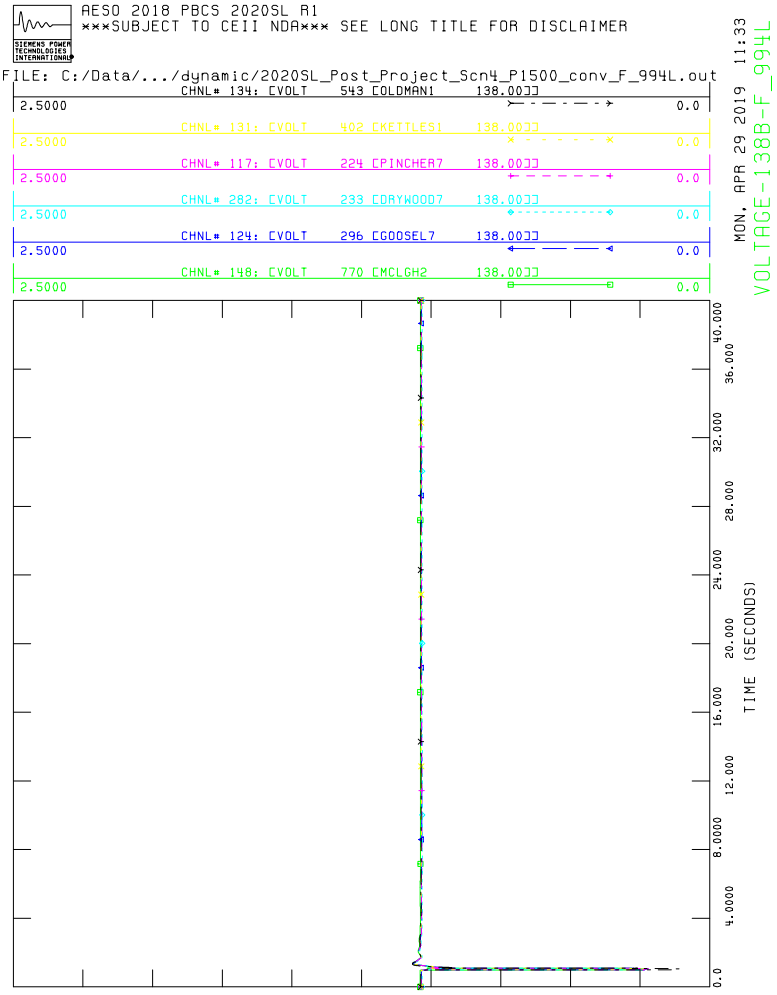
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
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CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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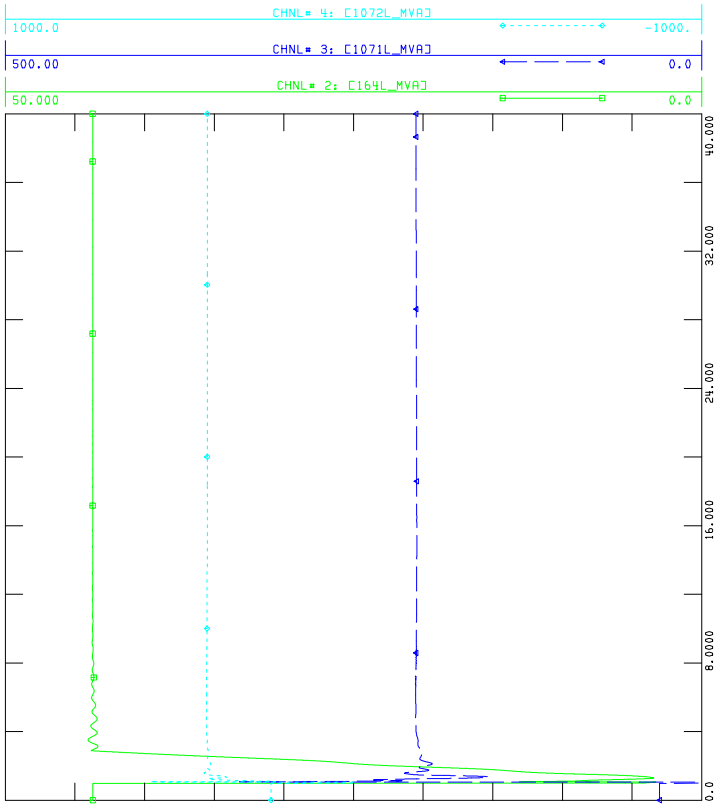

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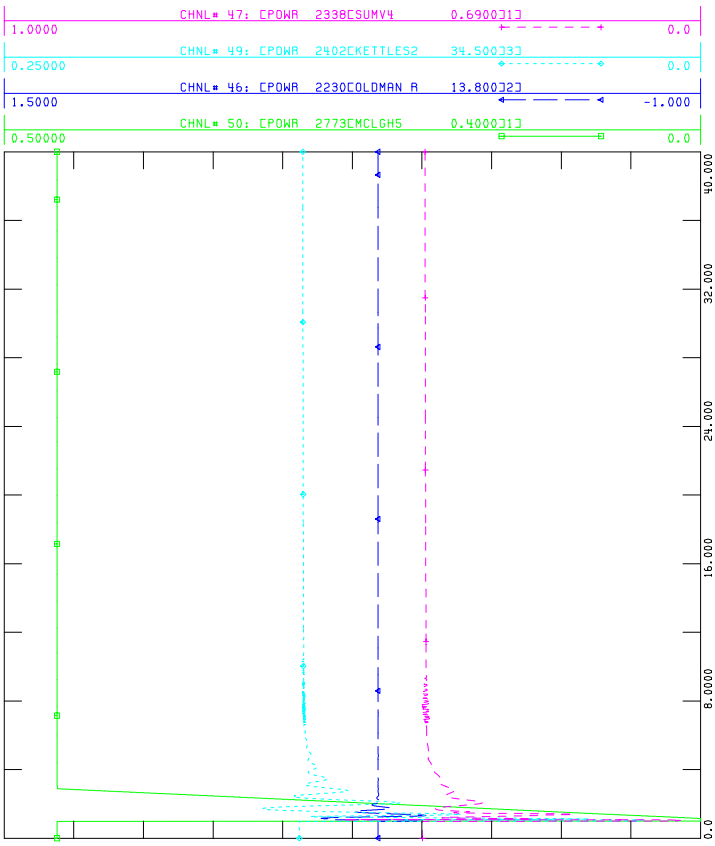

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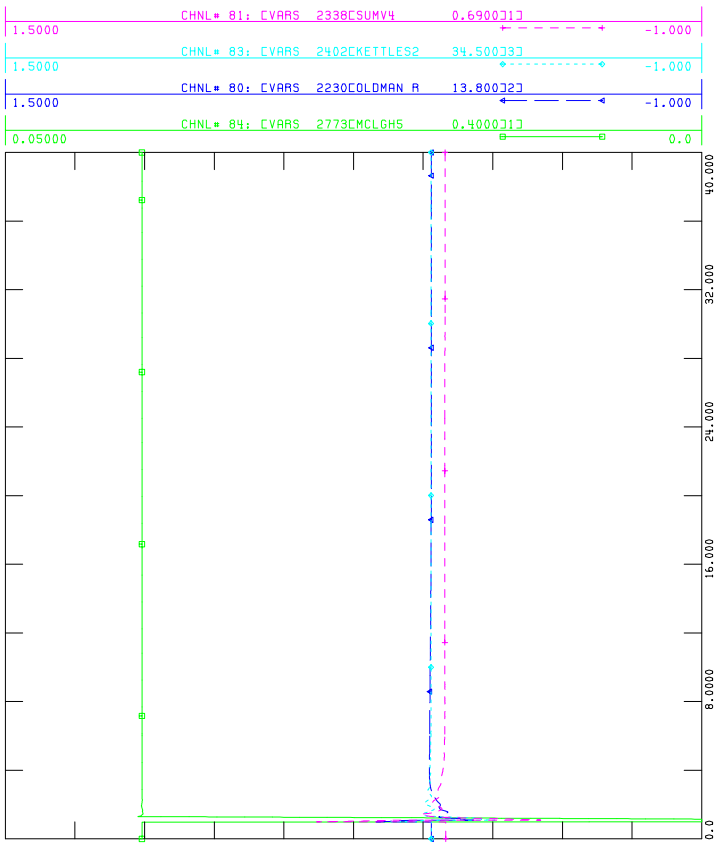

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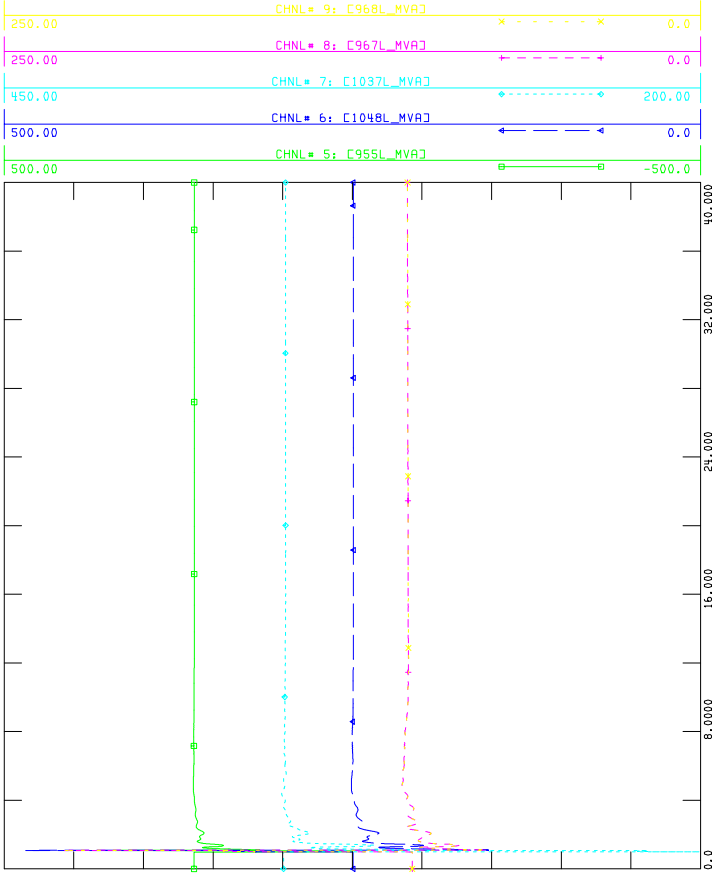

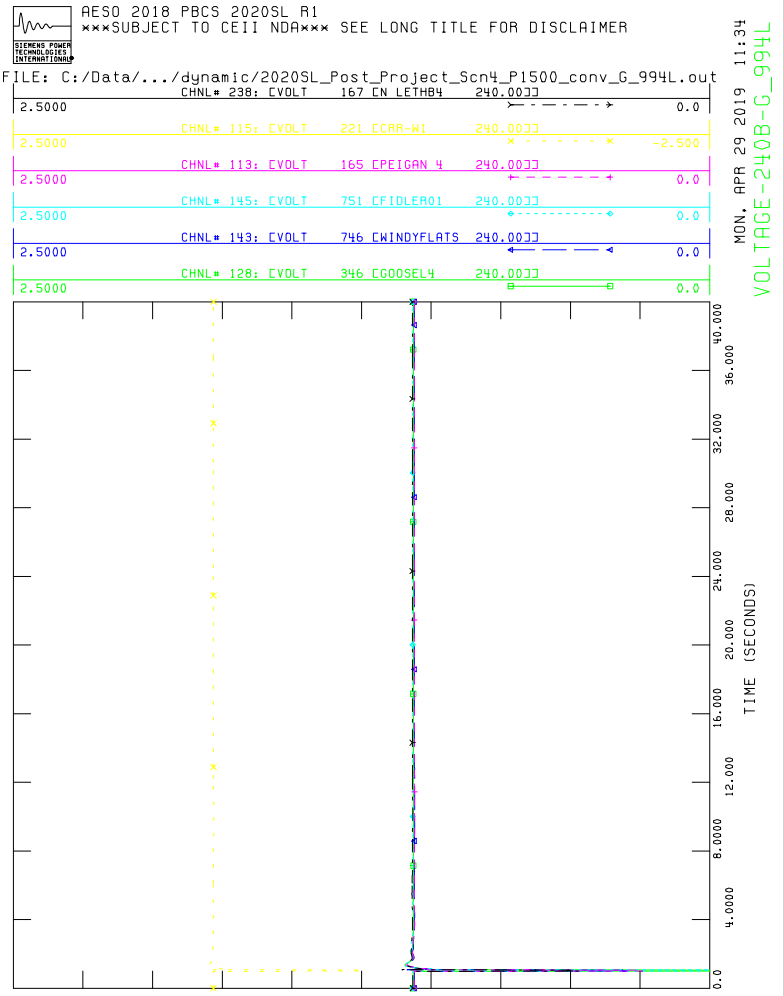
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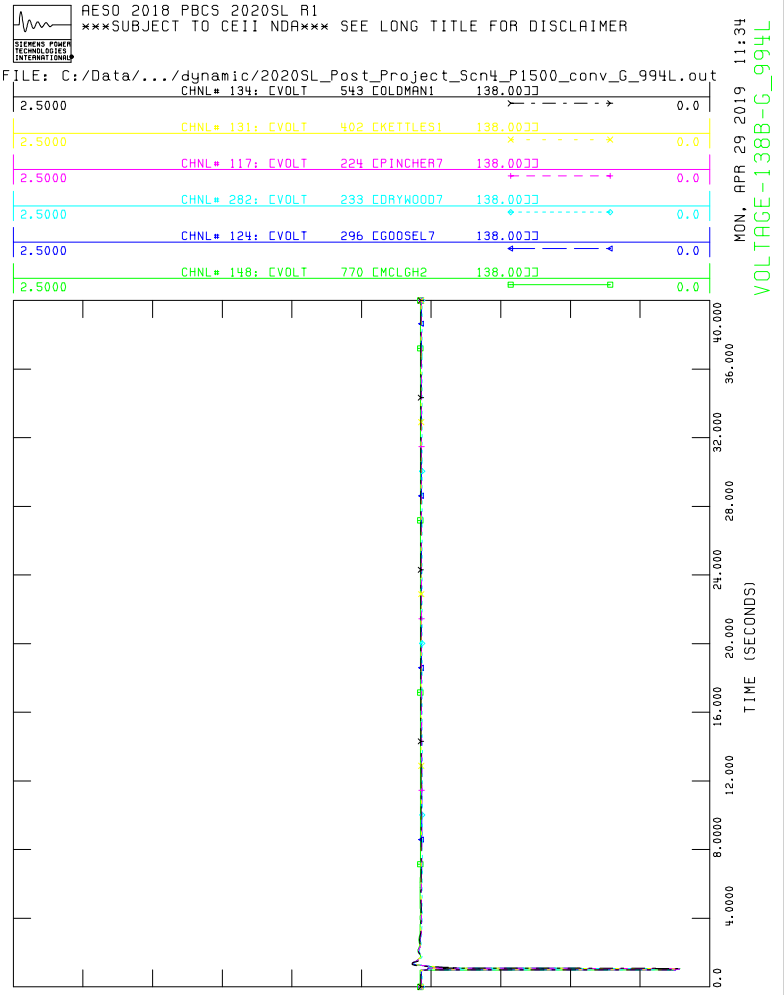
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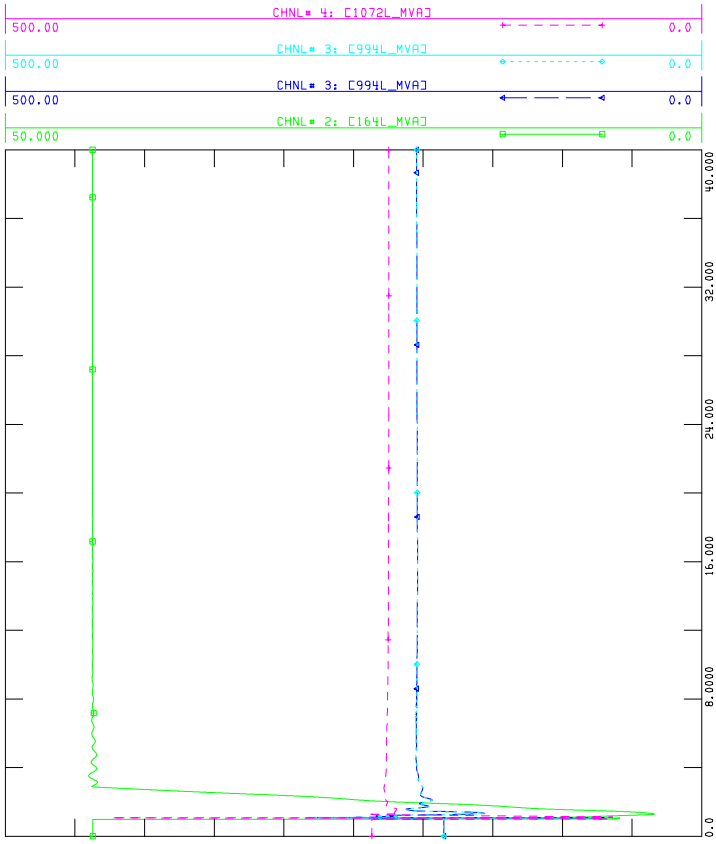

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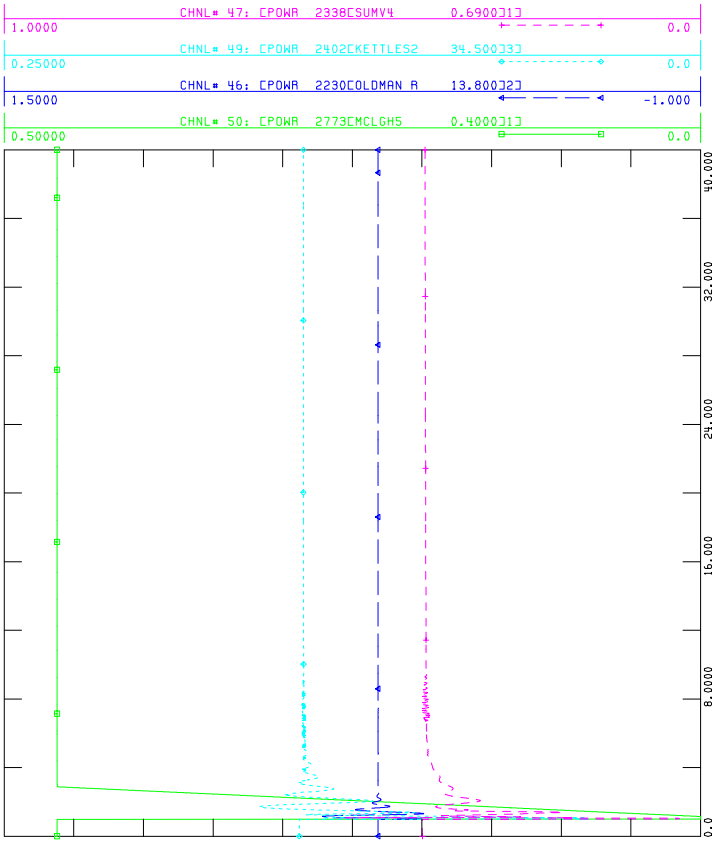

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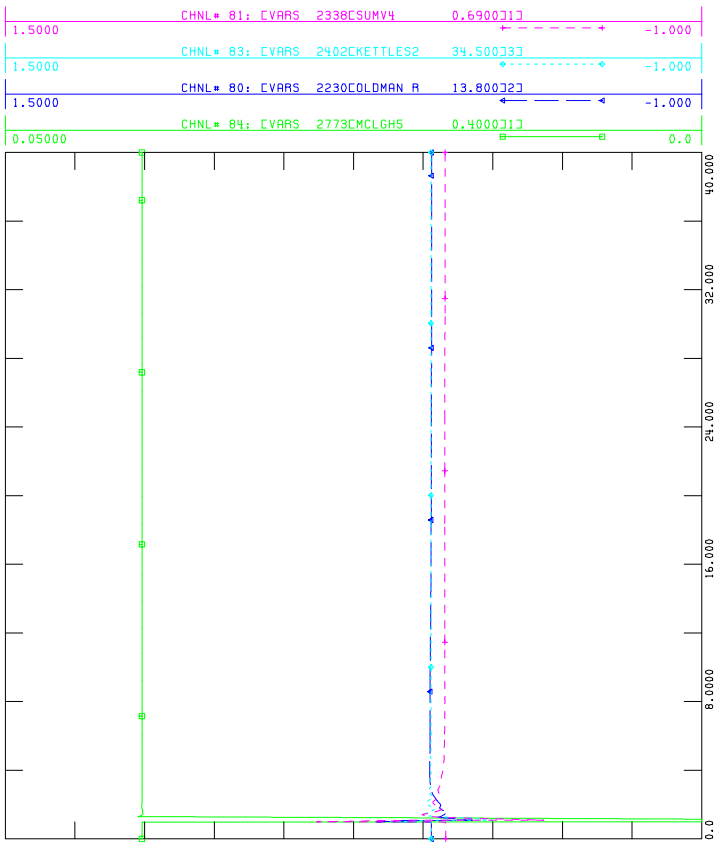

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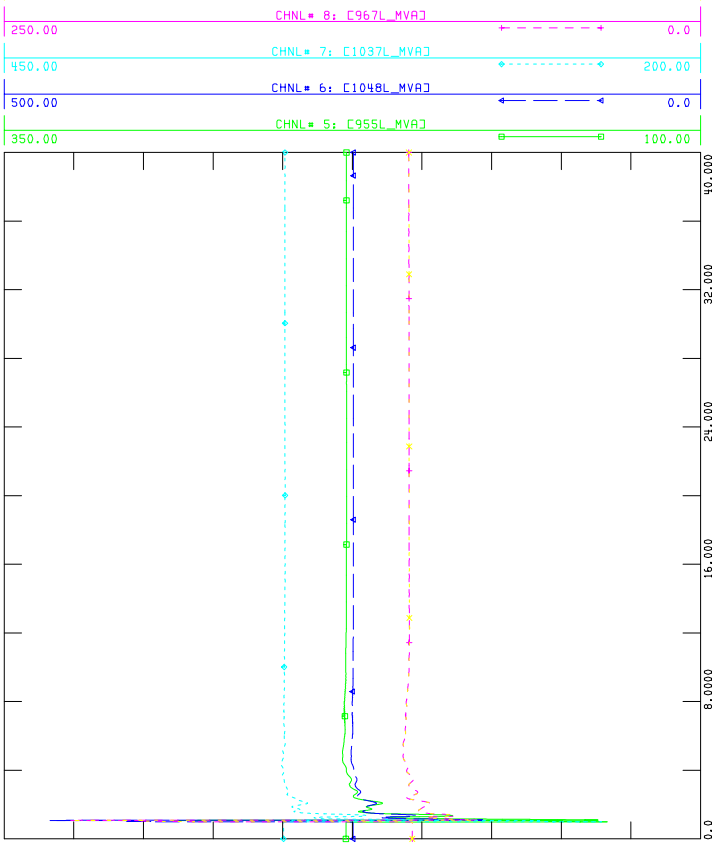

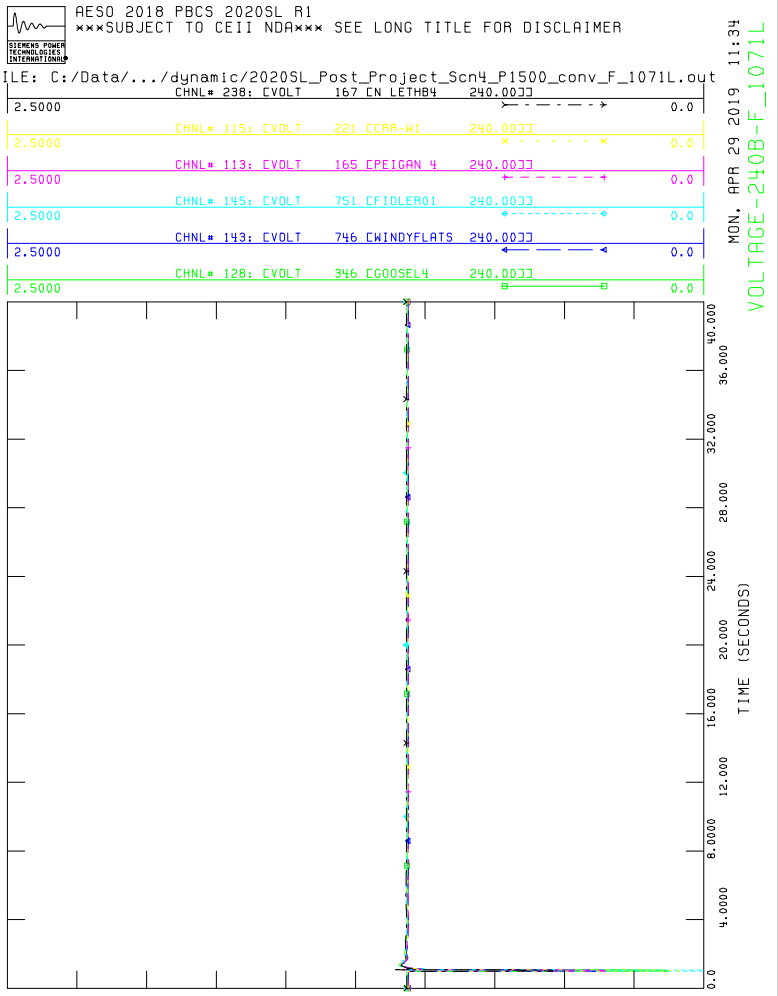
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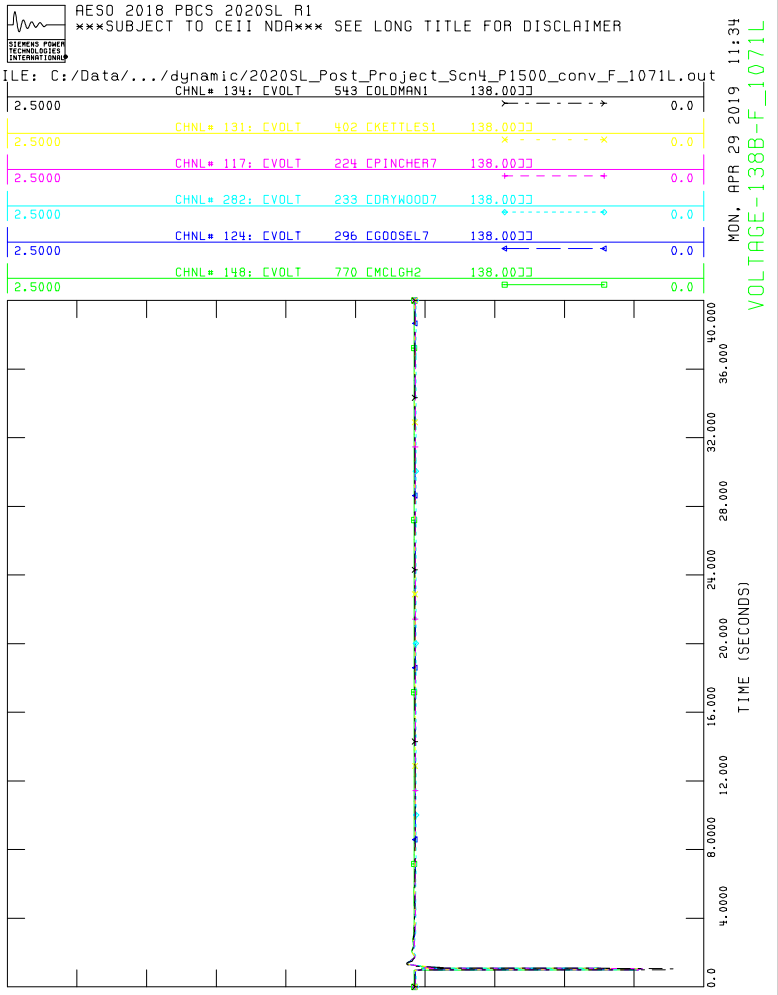
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CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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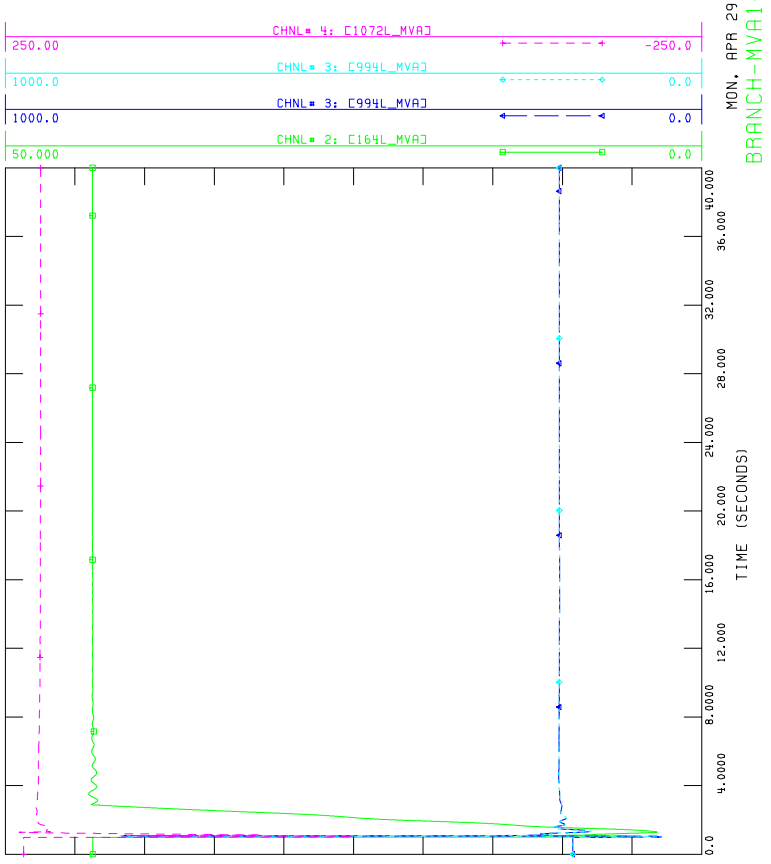

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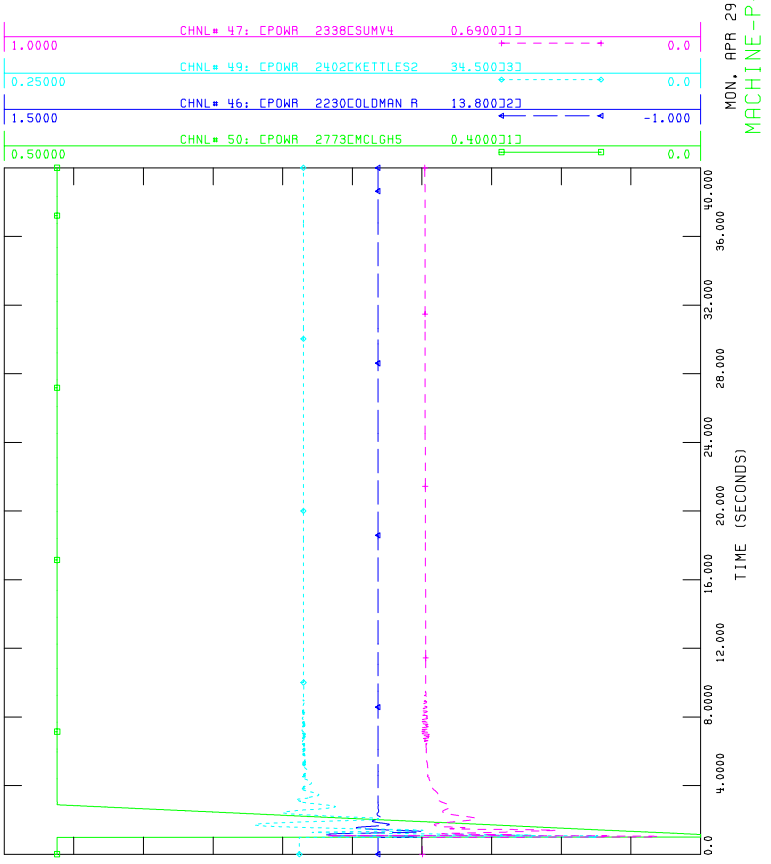

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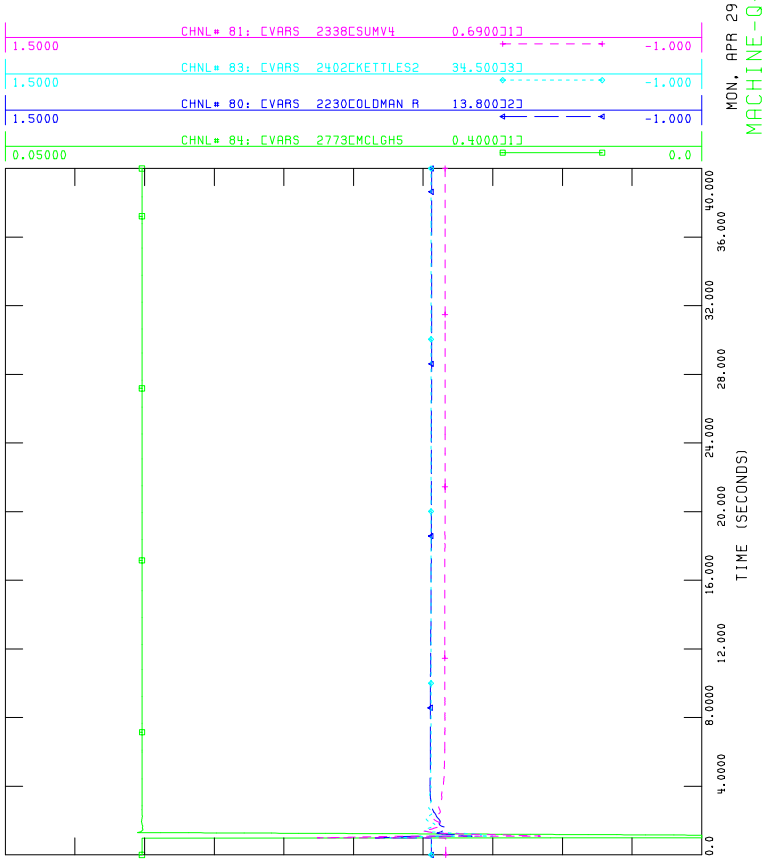

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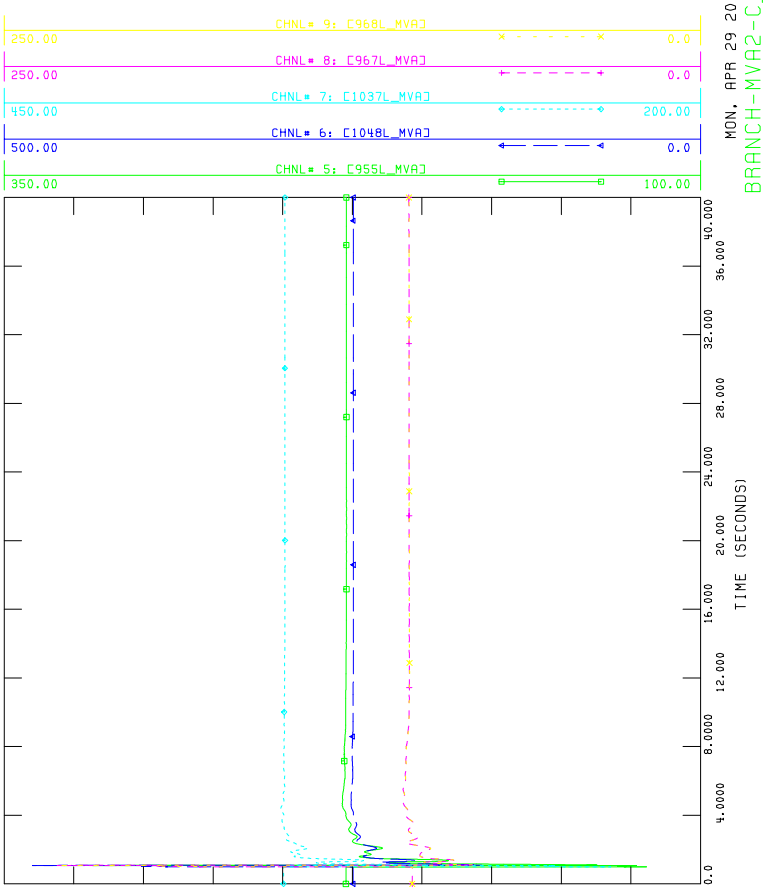

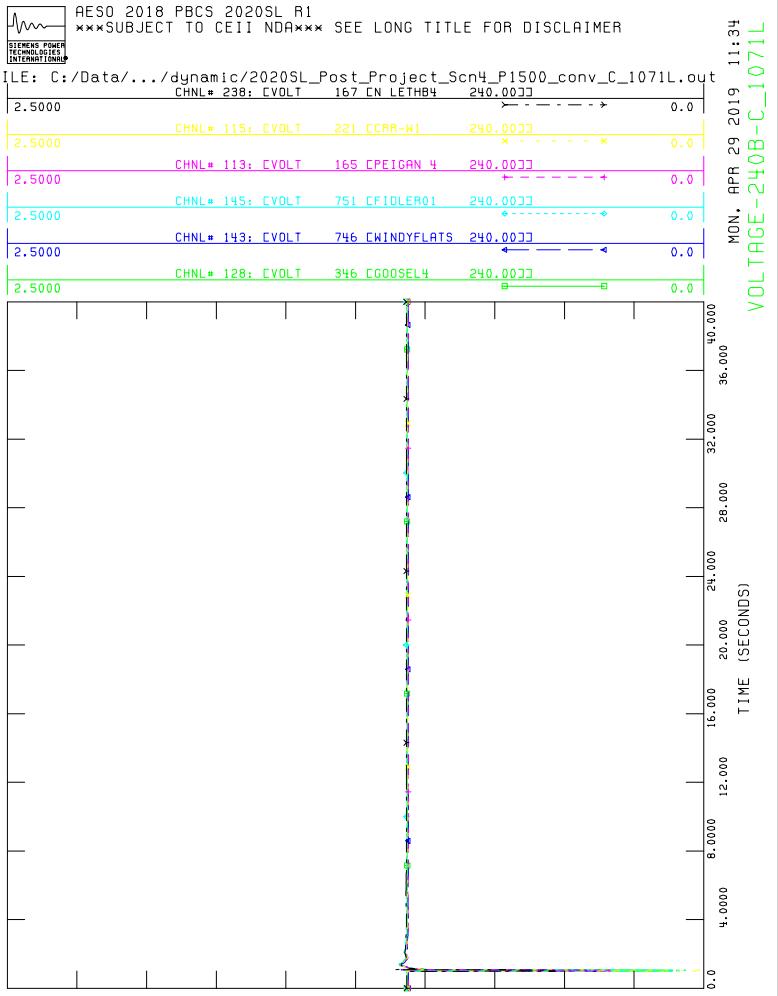
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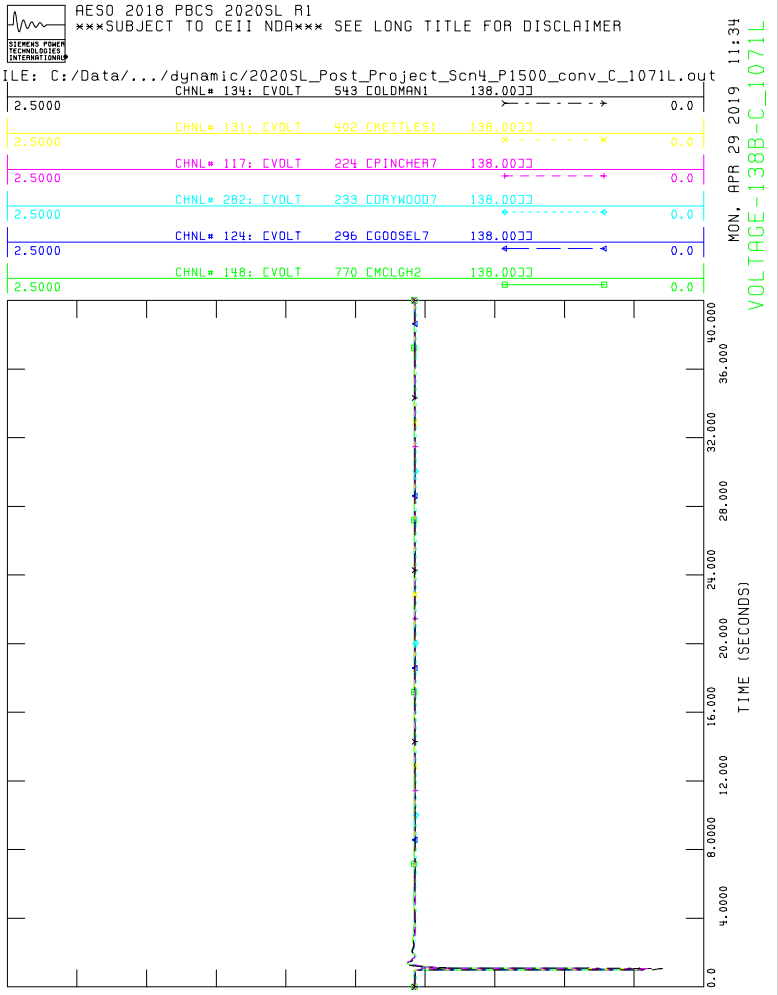
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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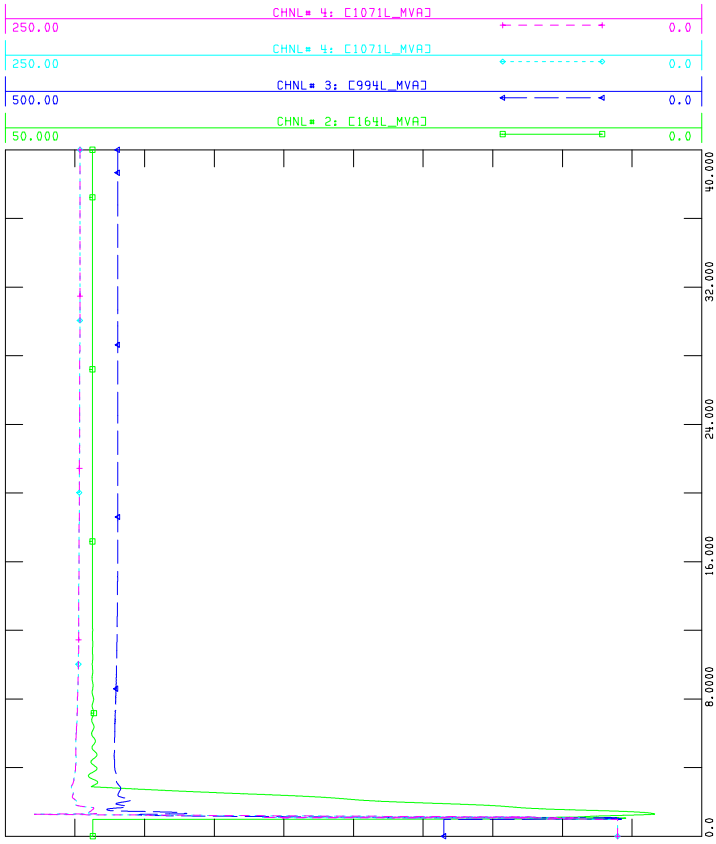

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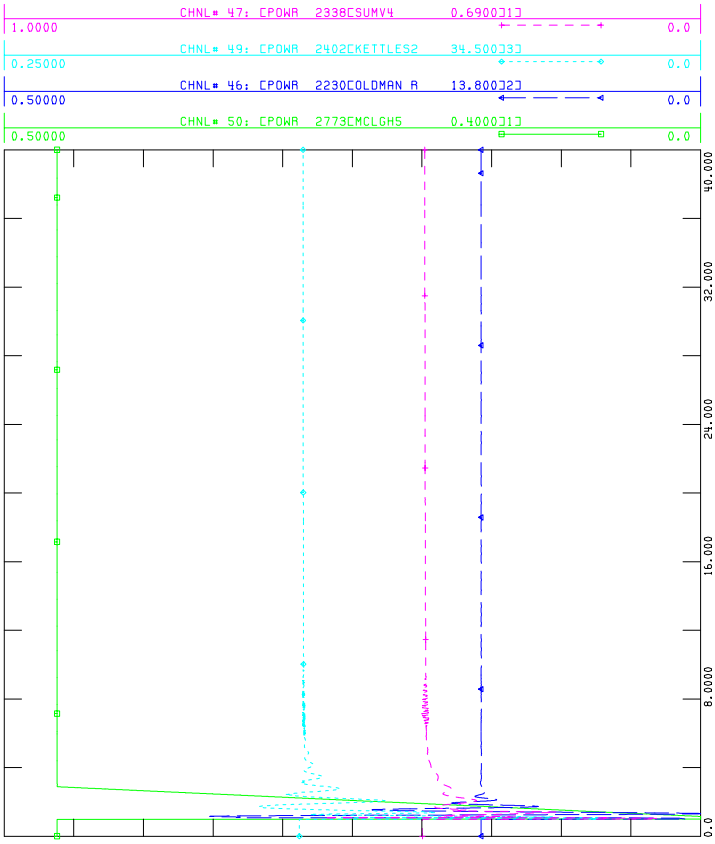

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MON, APR 29 2019 11:35
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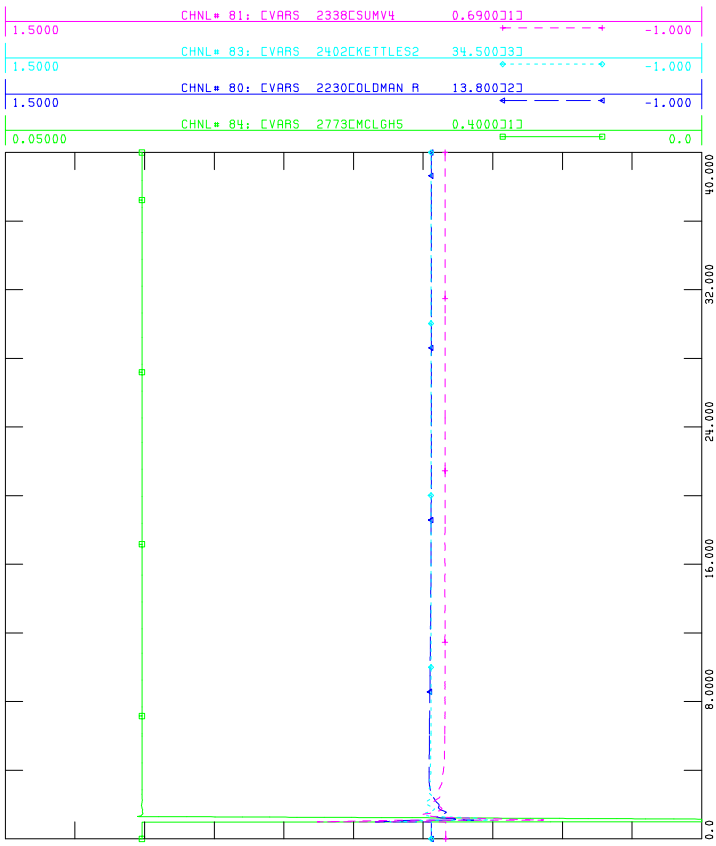

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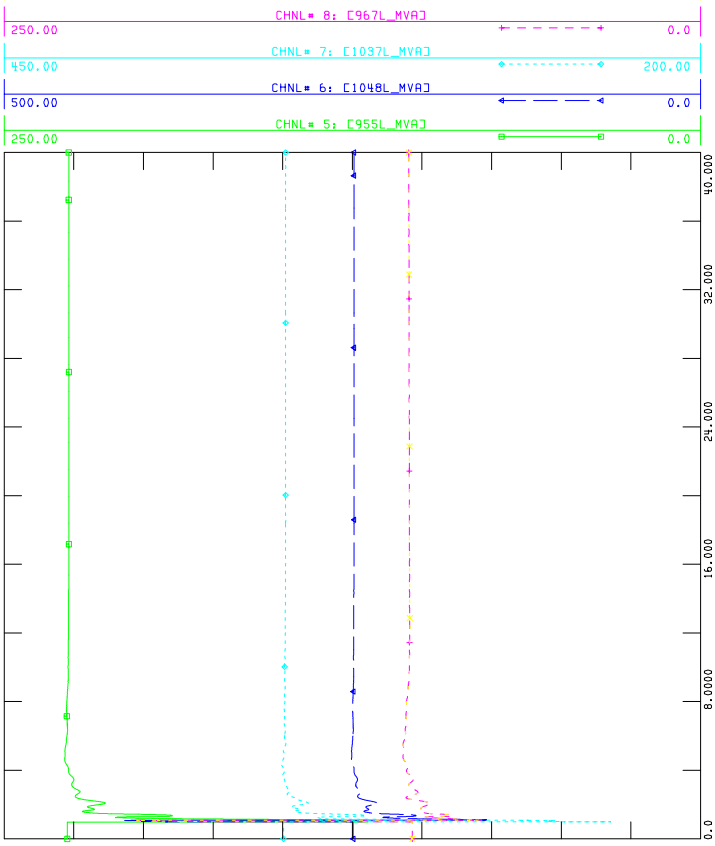
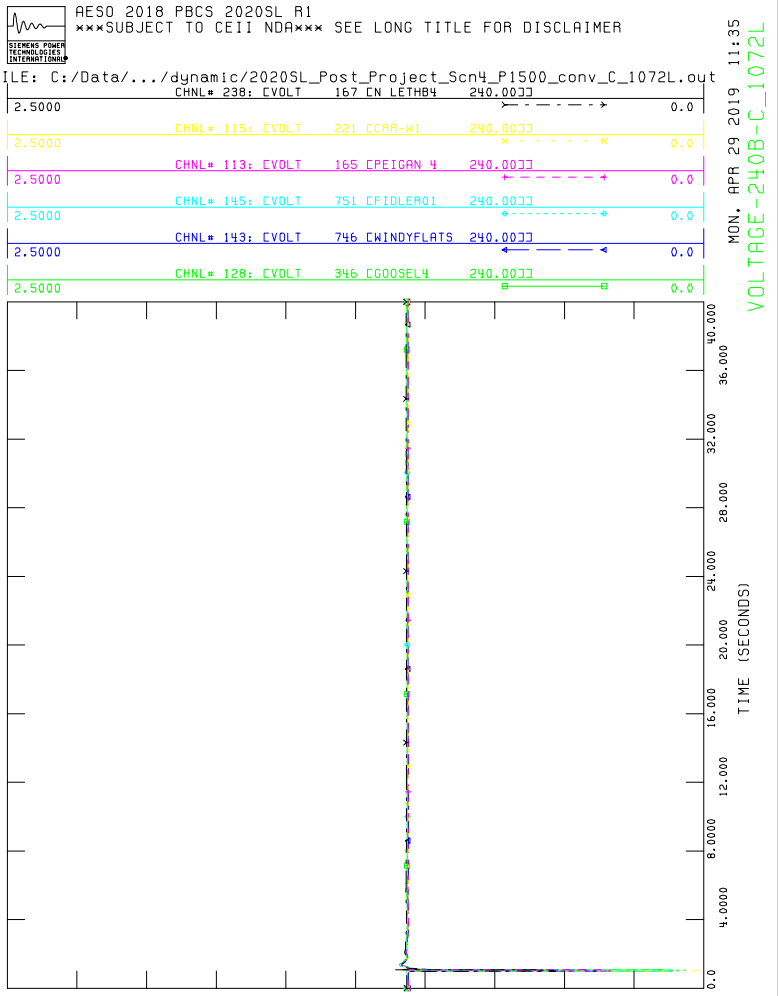
BRANCH-MVA2-C_1072L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_C_1072L.out
CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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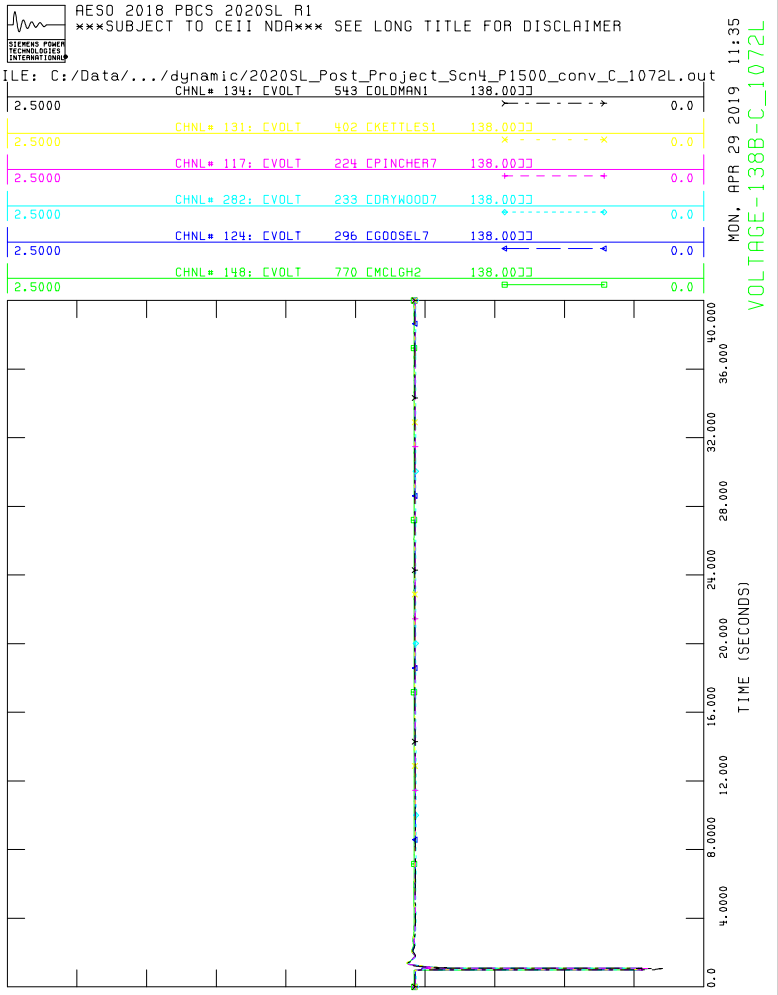
MON, APR 29 2019 11:35
VOLTAGE-240B-C_1072L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:35
VOLTAGE-138B-C_1072L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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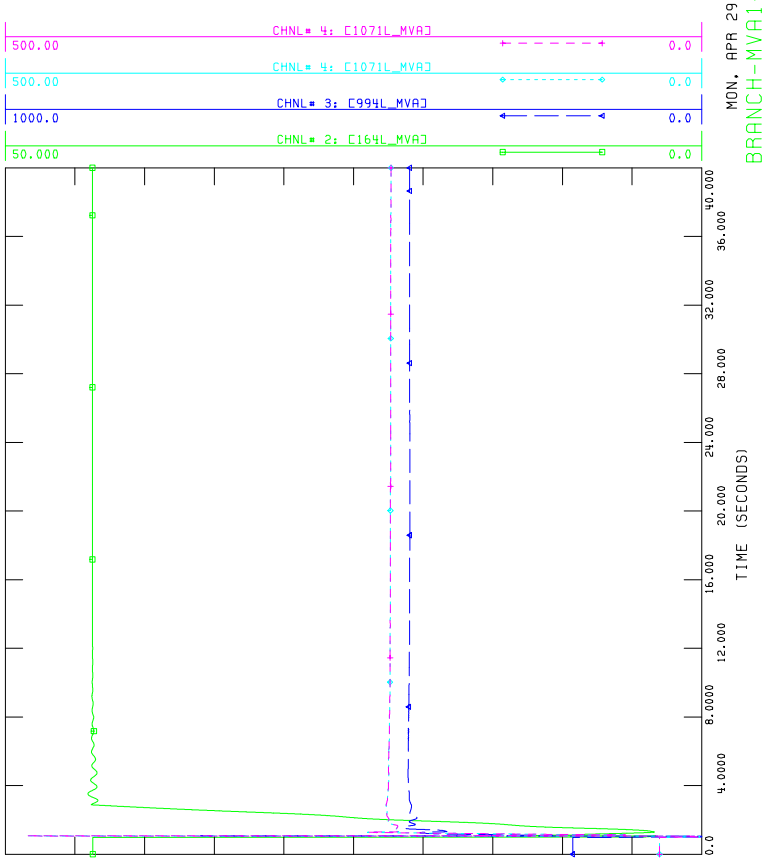

AESO 2018 PBCS 2020SL R1
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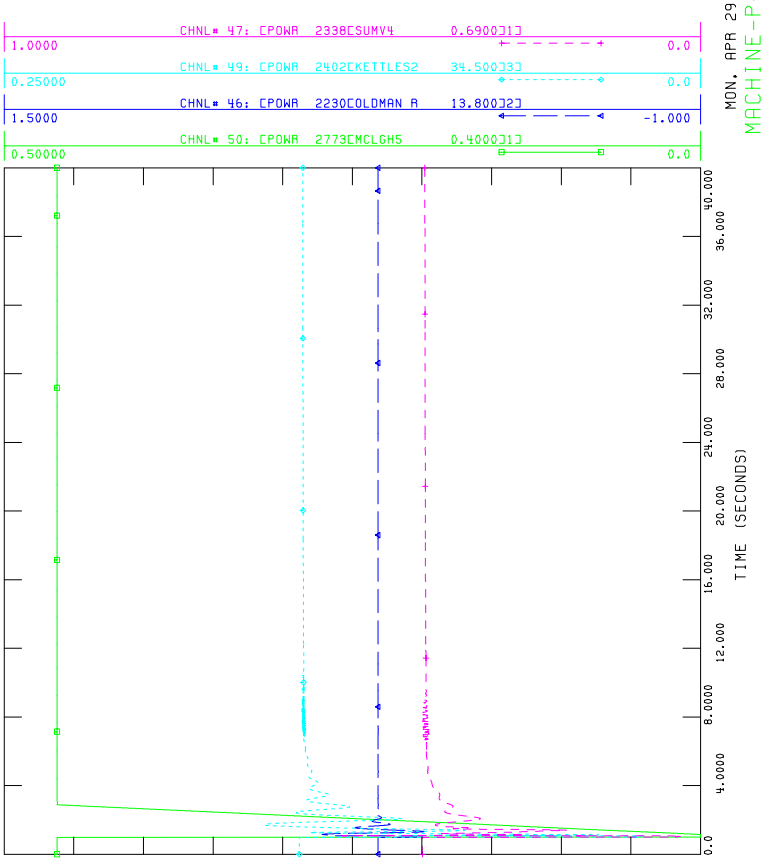

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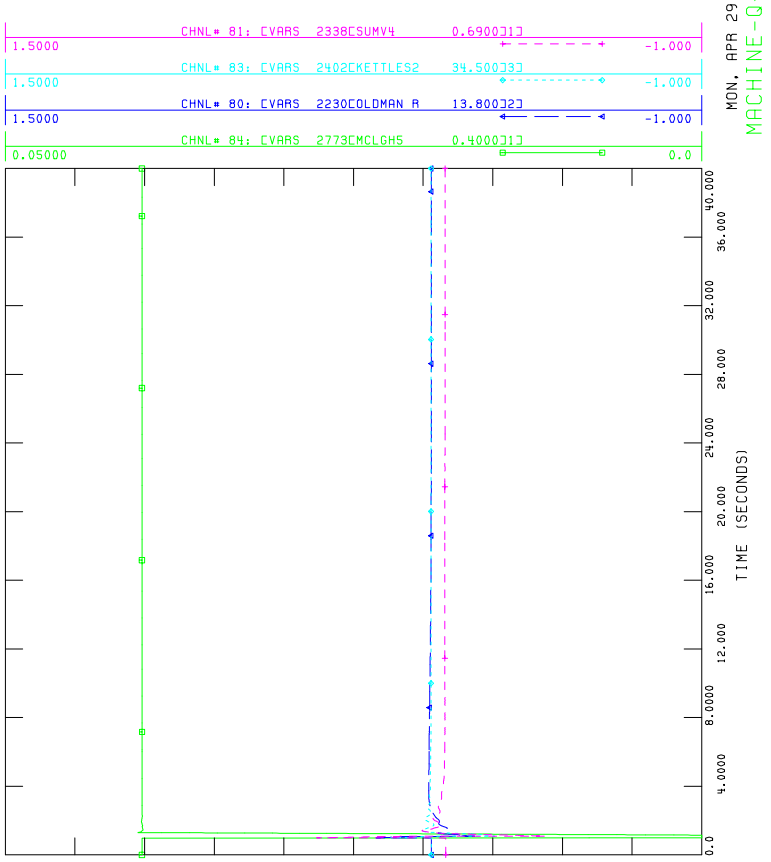

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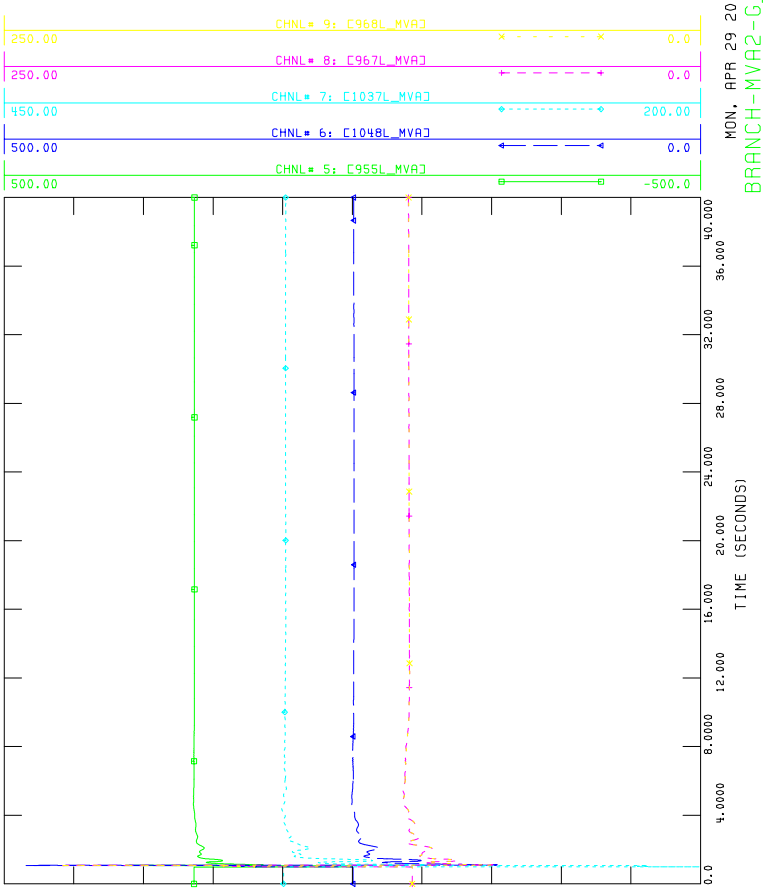

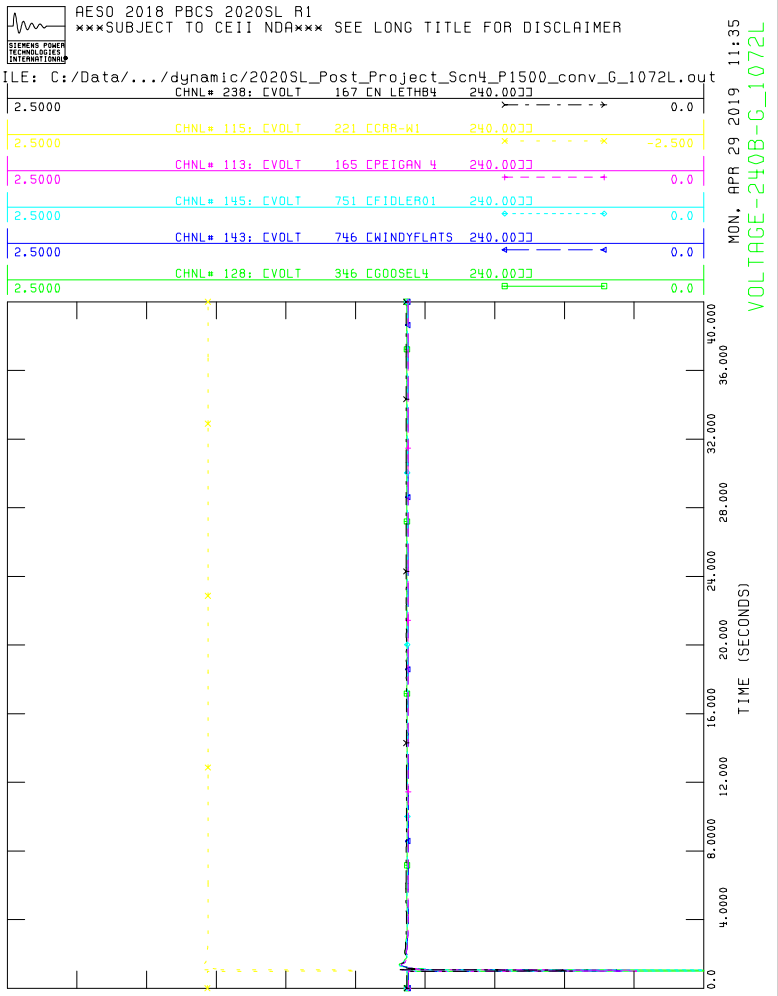
AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_G_1072L.out
CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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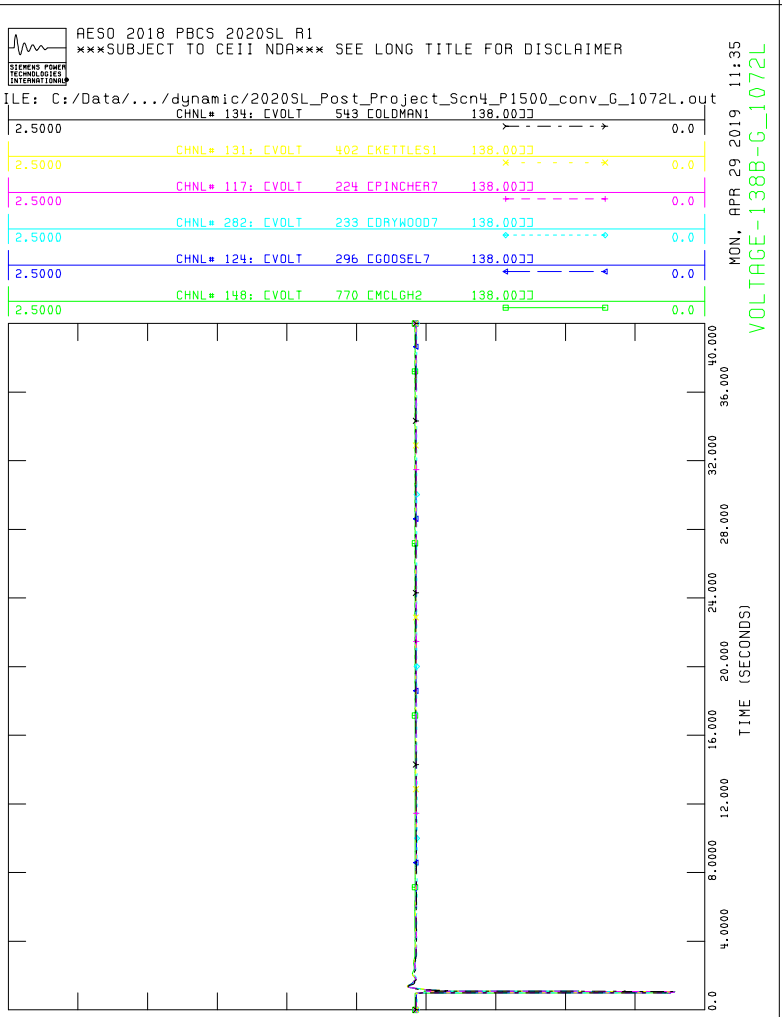
MON, APR 29 2019 11:35
VOLTAGE-240B-G_1072L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_G_1072L.out
CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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TIME (SECONDS)
MON, APR 29 2019 11:35
VOLTAGE-138B-G_1072L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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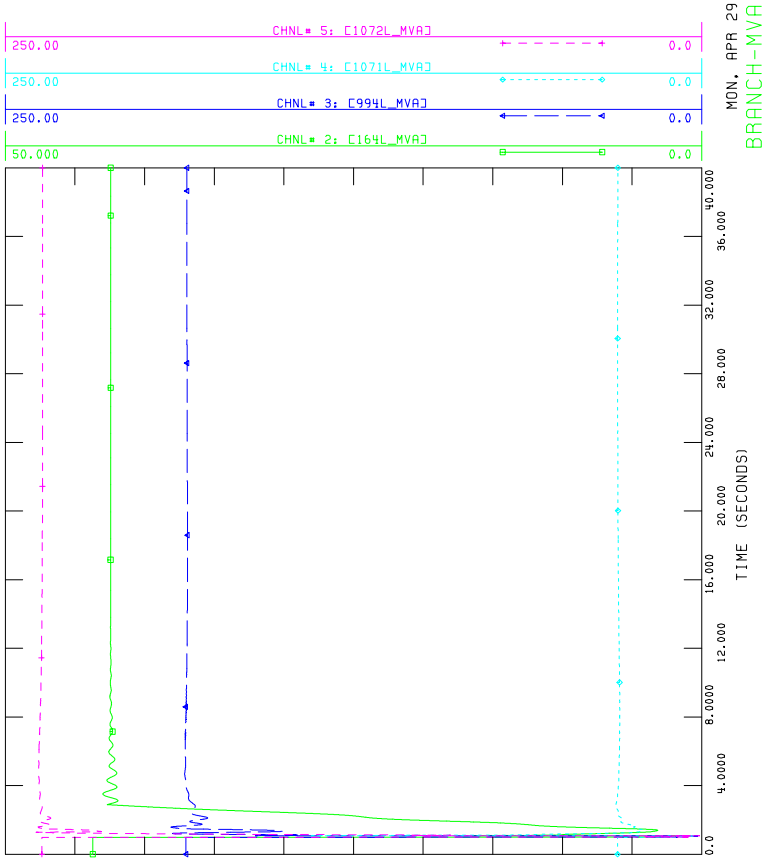
BRANCH-MVA1-P_955L



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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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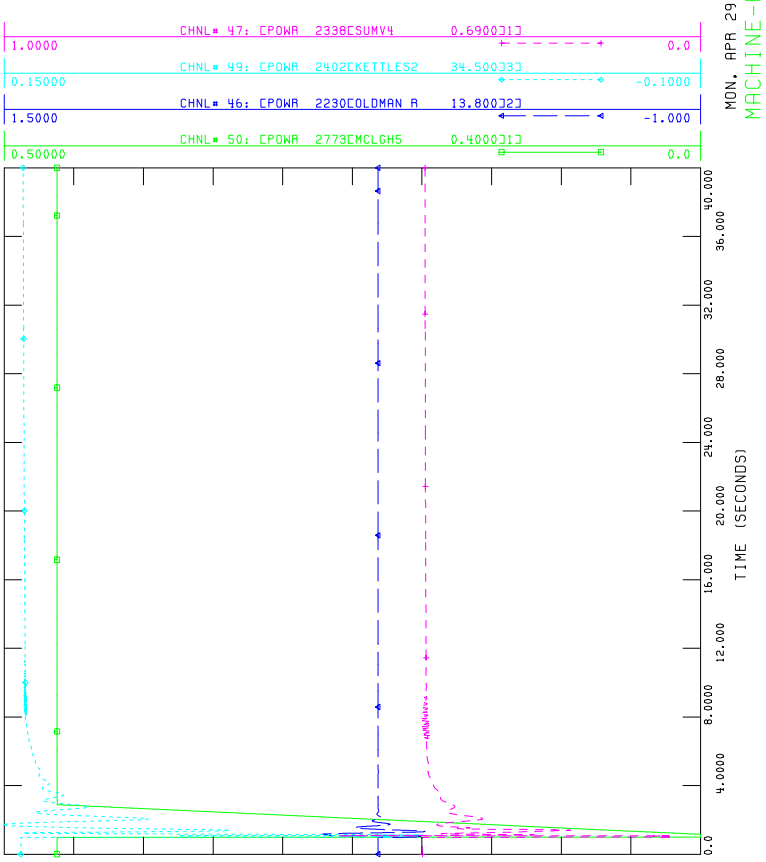

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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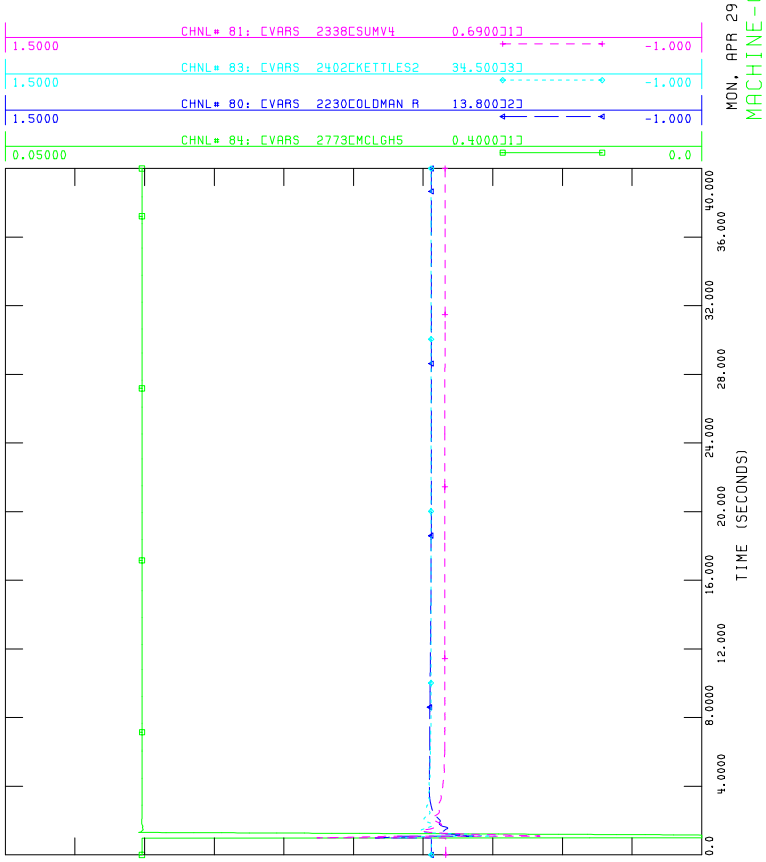
MACHINE-Q-P_955L



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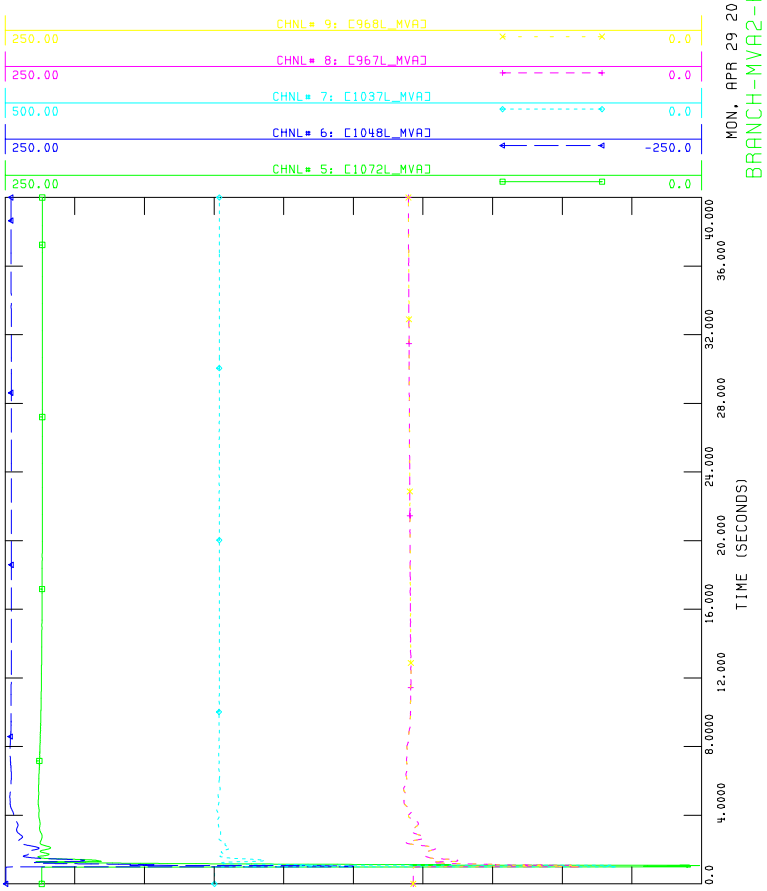
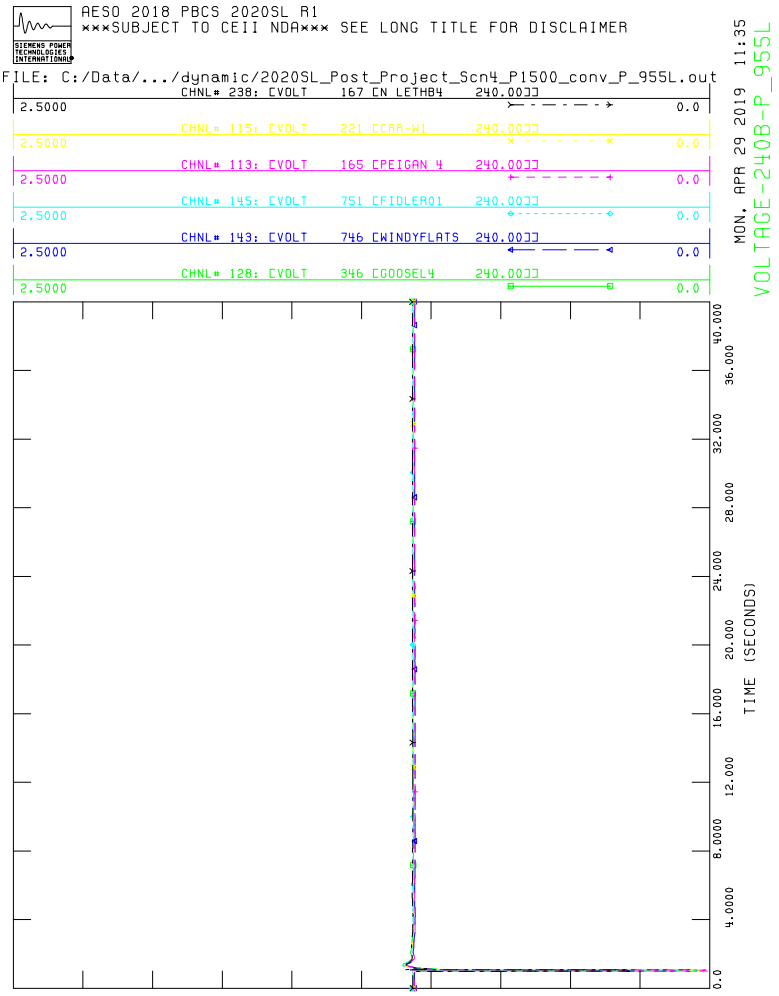
BRANCH-MVA2-P_955L

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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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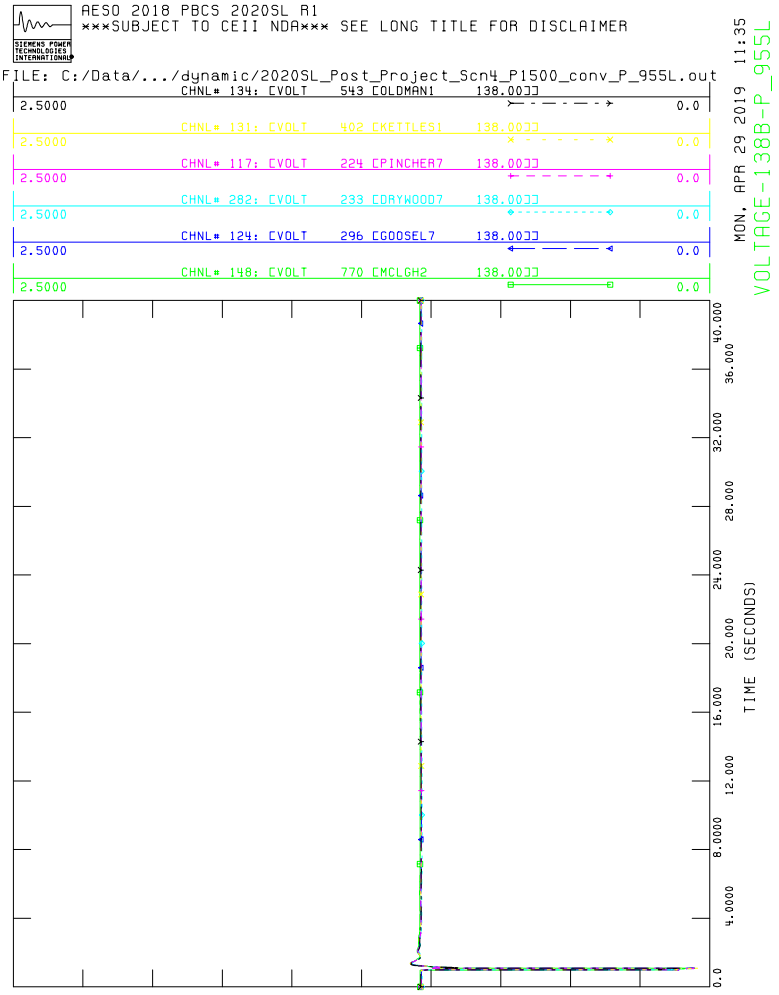
MON, APR 29 2019 11:35
VOLTAGE-240B-P_955L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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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TIME (SECONDS)
MON, APR 29 2019 11:35
VOLTAGE-138B-P_955L

AESO 2018 PBCS 2020SL R1
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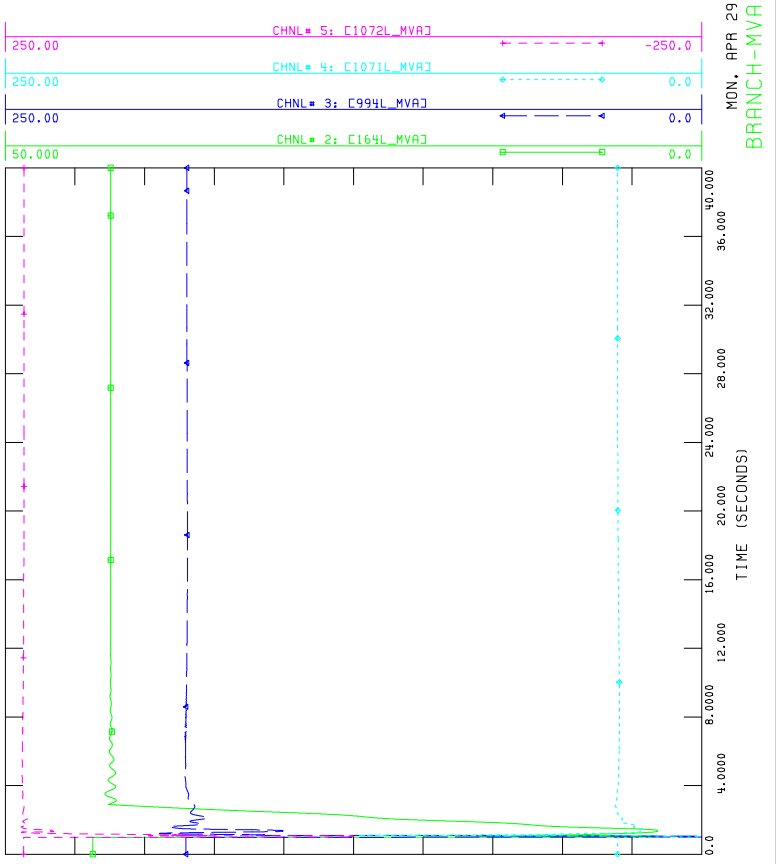

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BRANCH-MVA1-G_955L

AESO 2018 PBCS 2020SL R1
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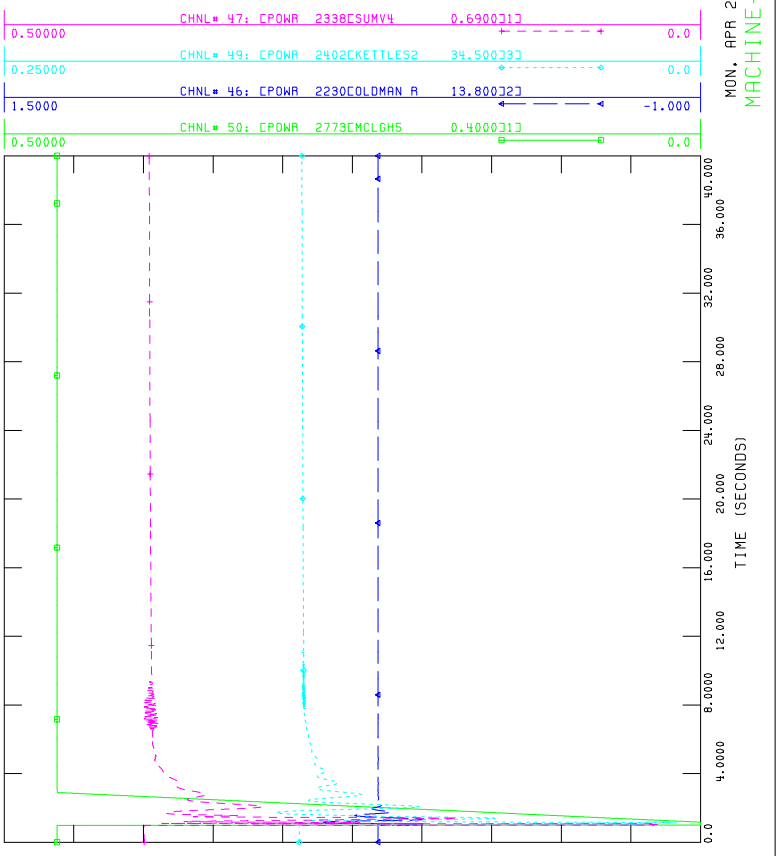

MON, APR 29 2019 11:36
MACHINE-P-G_955L

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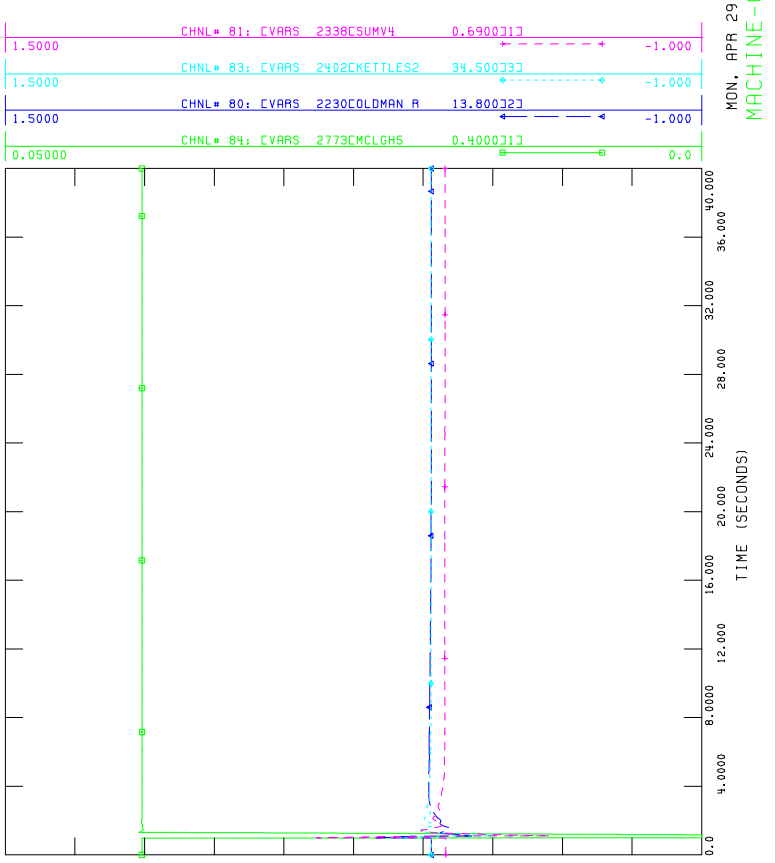

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MACHINE-Q-G_955L

AESO 2018 PBCS 2020SL R1
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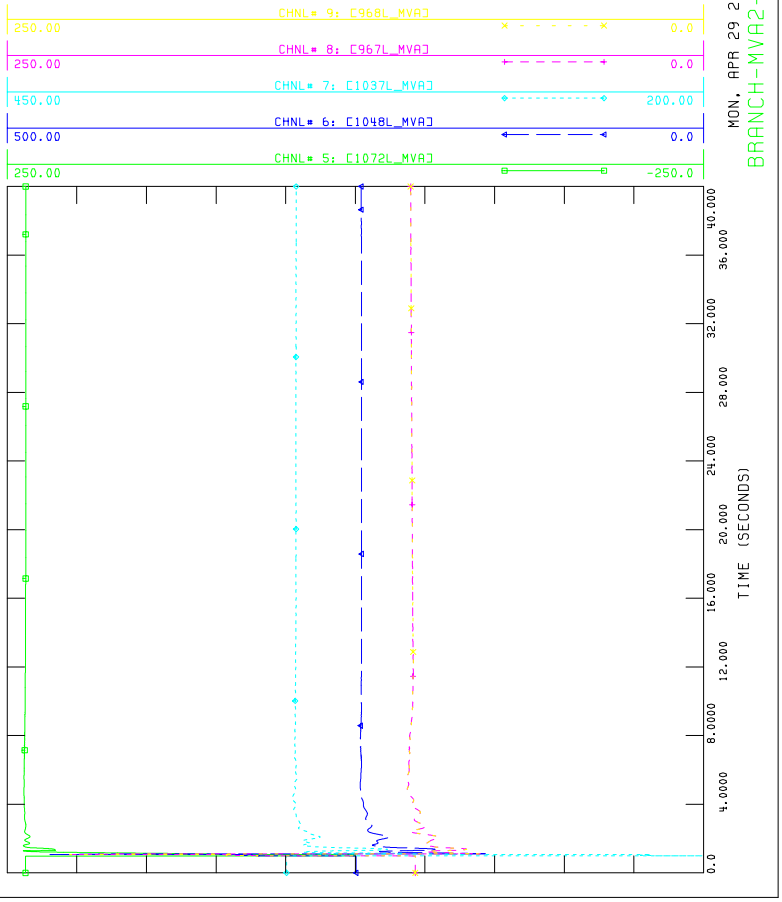

MON, APR 29 2019 11:36
BRANCH-MVA2-G_955L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_G_955L.out

MON, APR 29 2019 11:36

VOLTAGE-240B-G_955L

CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
2.5000 0.0

CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
2.5000 -2.500

CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
2.5000 0.0

CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
2.5000 0.0

CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
2.5000 0.0

CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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TIME (SECONDS)

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_G_955L.out

MON, APR 29 2019 11:36

VOLTAGE-138B-G_955L

CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
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CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
2.5000 0.0

CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
2.5000 0.0

CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
2.5000 0.0

CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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TIME (SECONDS)

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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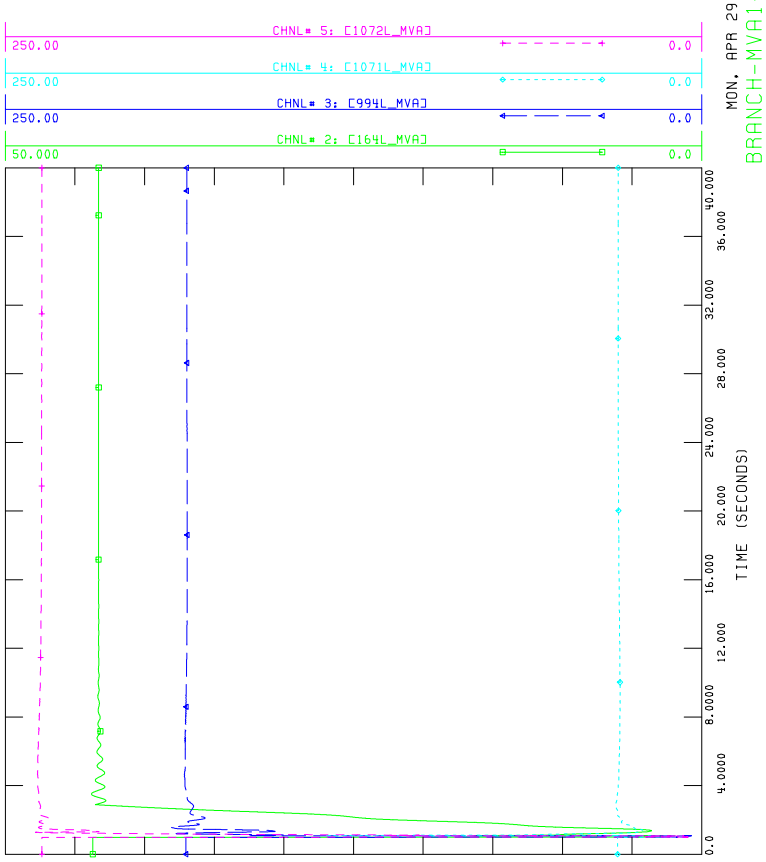

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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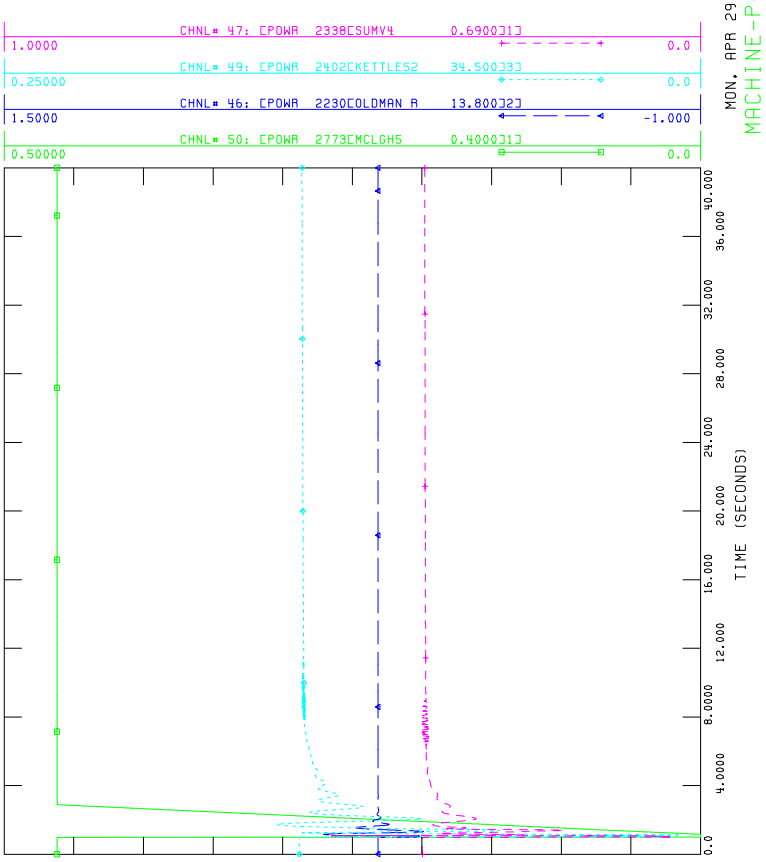
MACHINE-P-P_1048L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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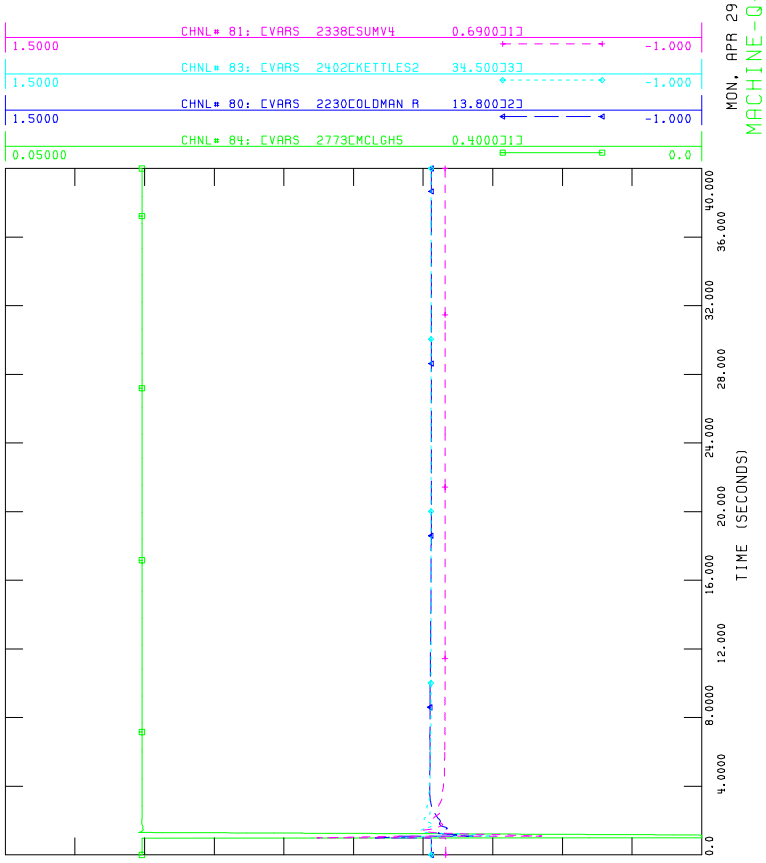
MON, APR 29 2019 11:36
MACHINE-Q-P_1048L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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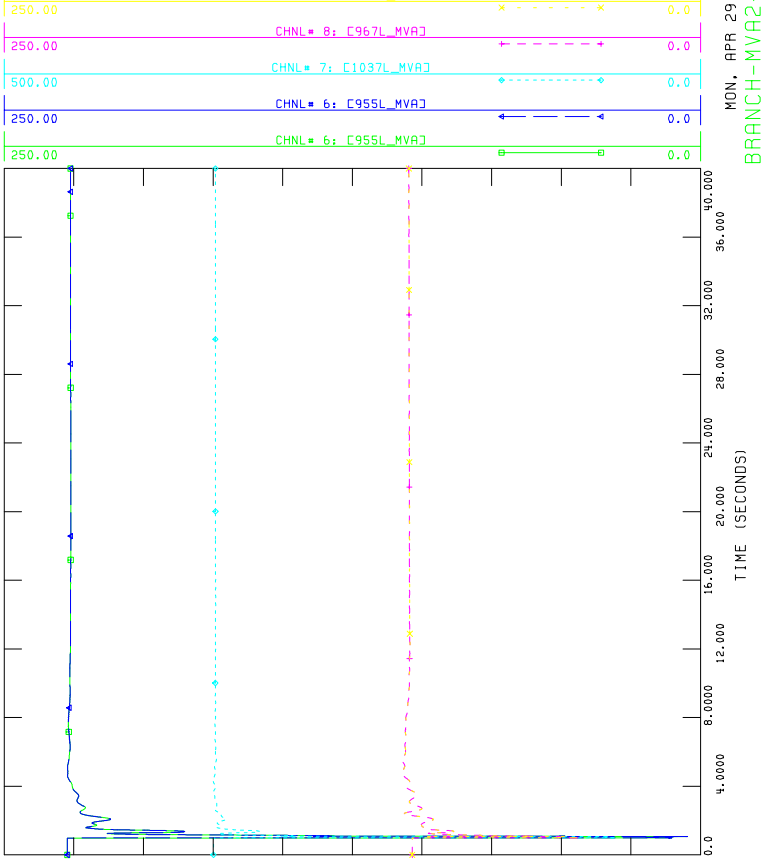
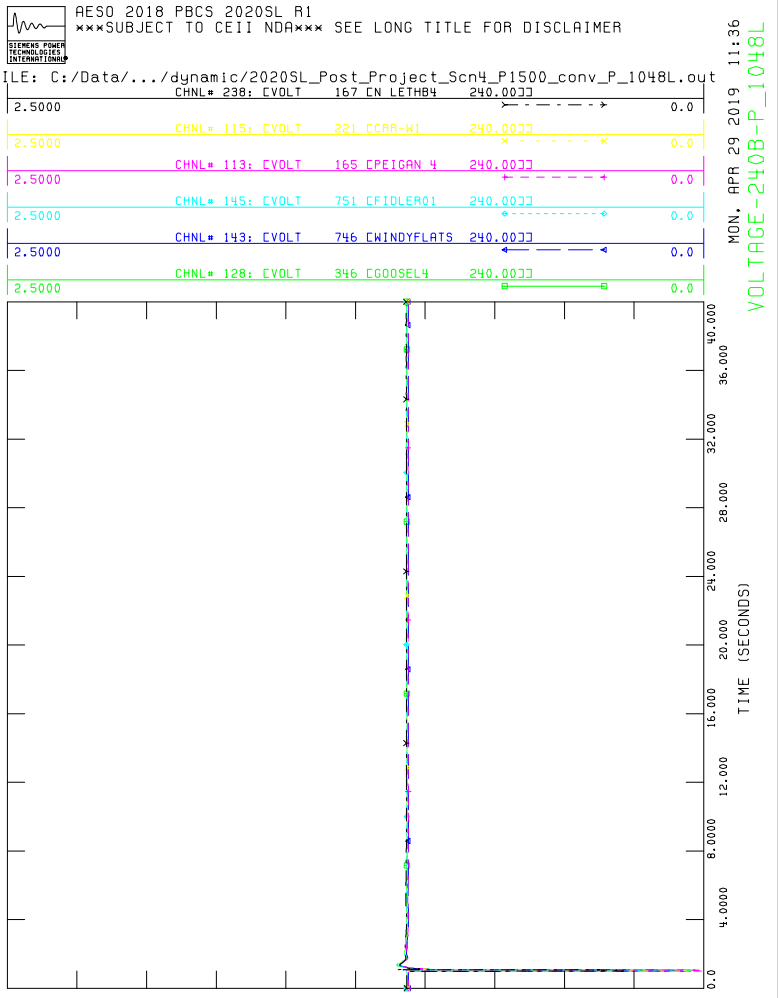
BRANCH-MVA2-P_1048L




AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_P_1048L.out
CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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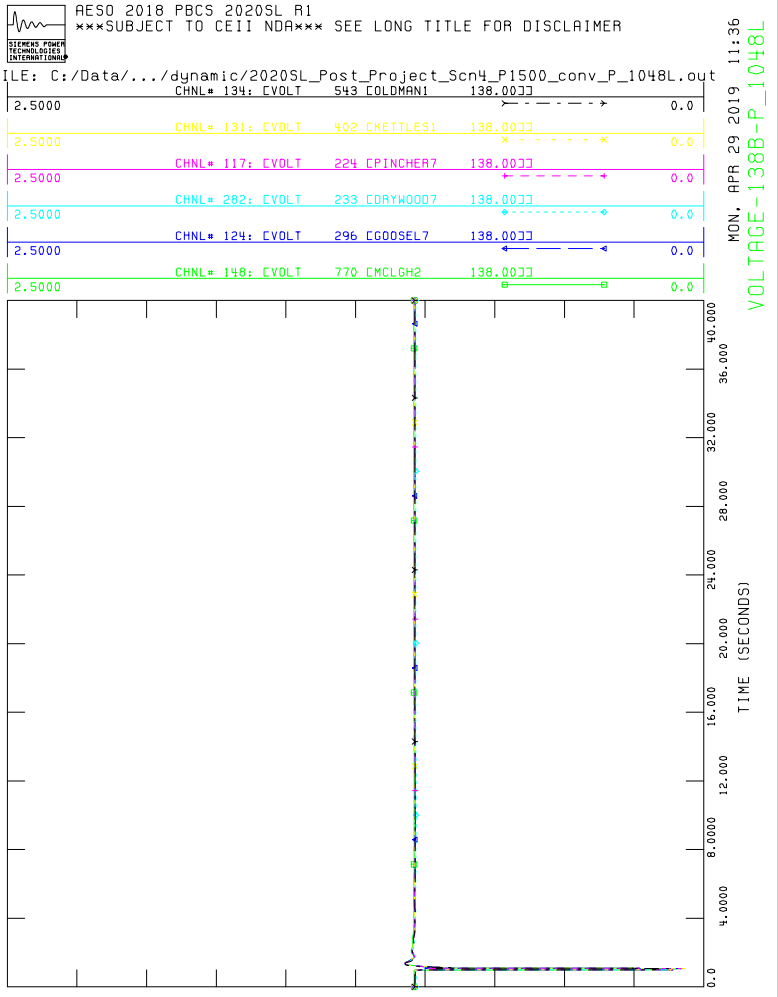
TIME (SECONDS)
MON, APR 29 2019 11:36
VOLTAGE-240B-P_1048L


AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_P_1048L.out
CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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TIME (SECONDS)
MON, APR 29 2019 11:36
VOLTAGE-138B-P_1048L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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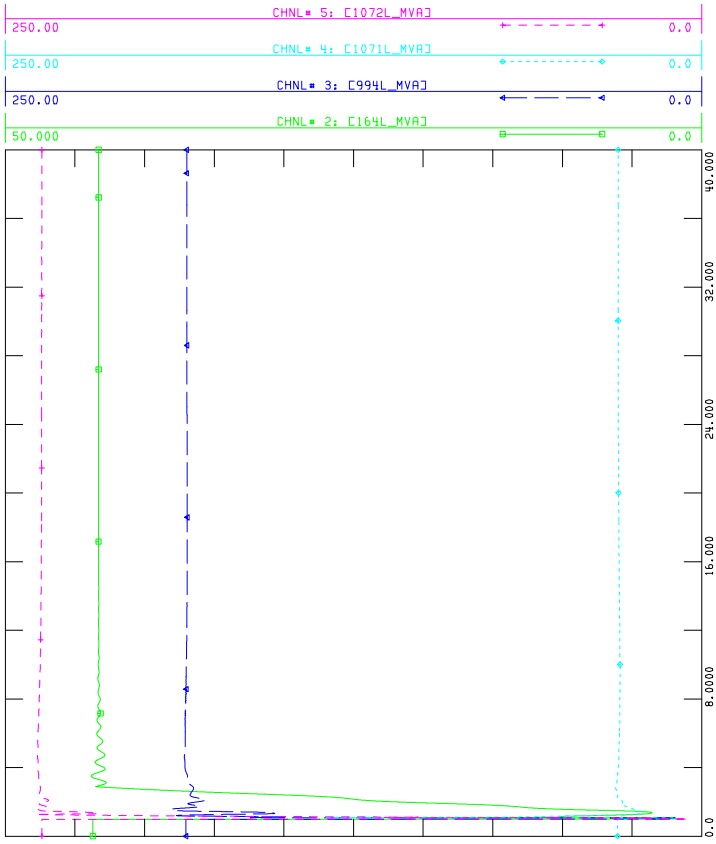

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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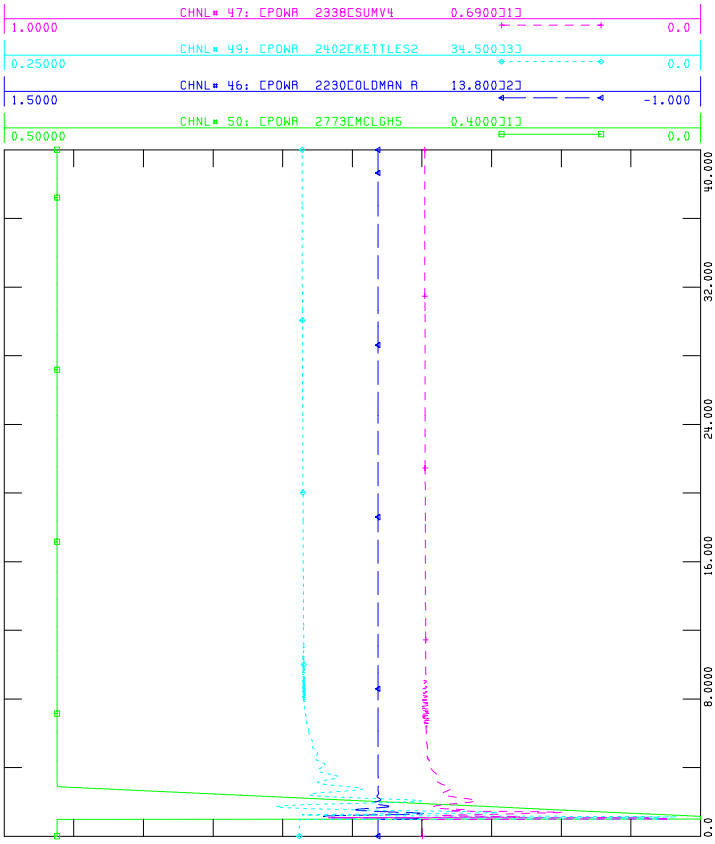

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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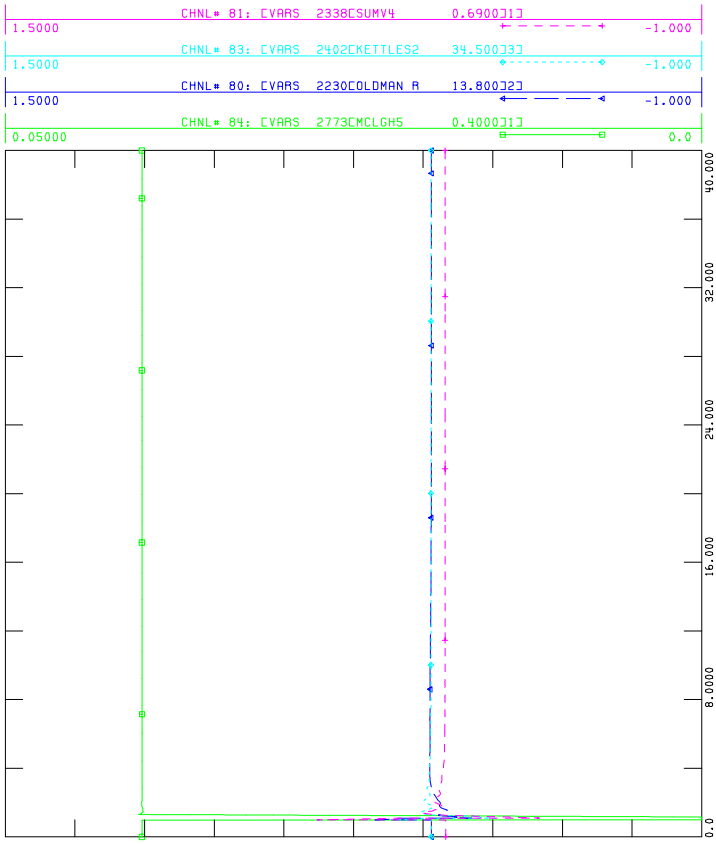

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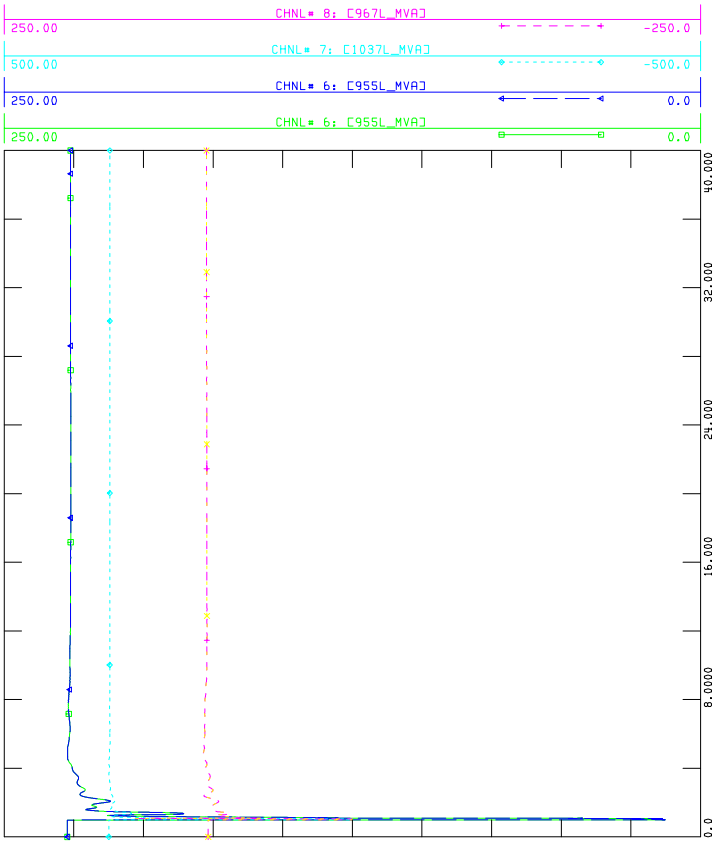

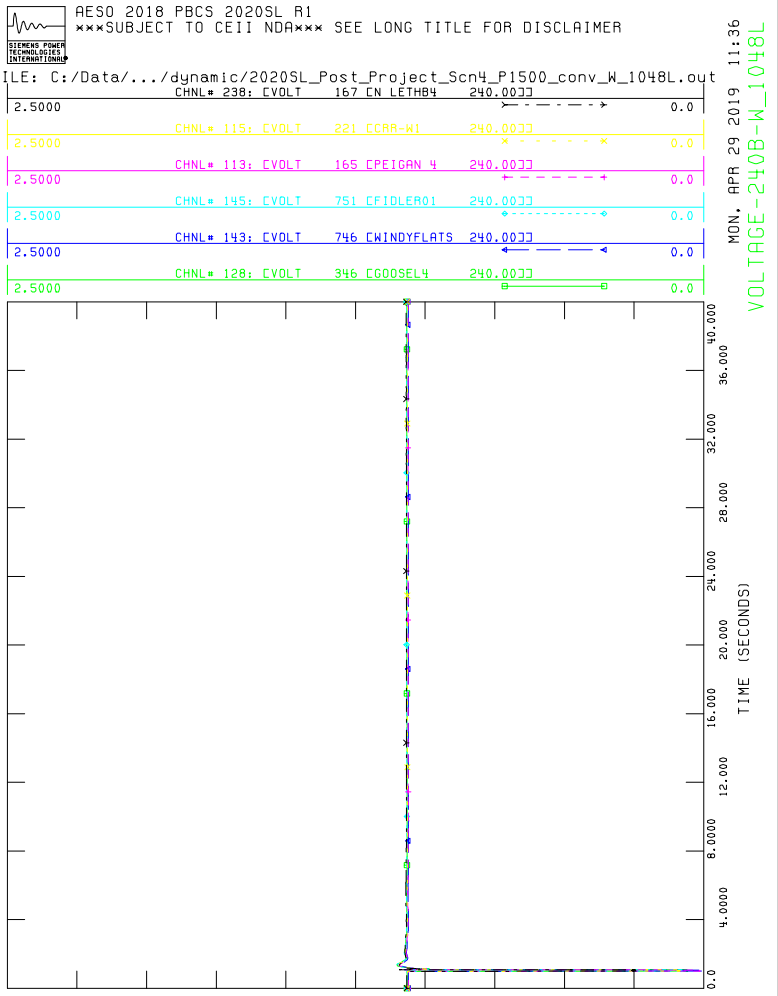
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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MON, APR 29 2019 11:36
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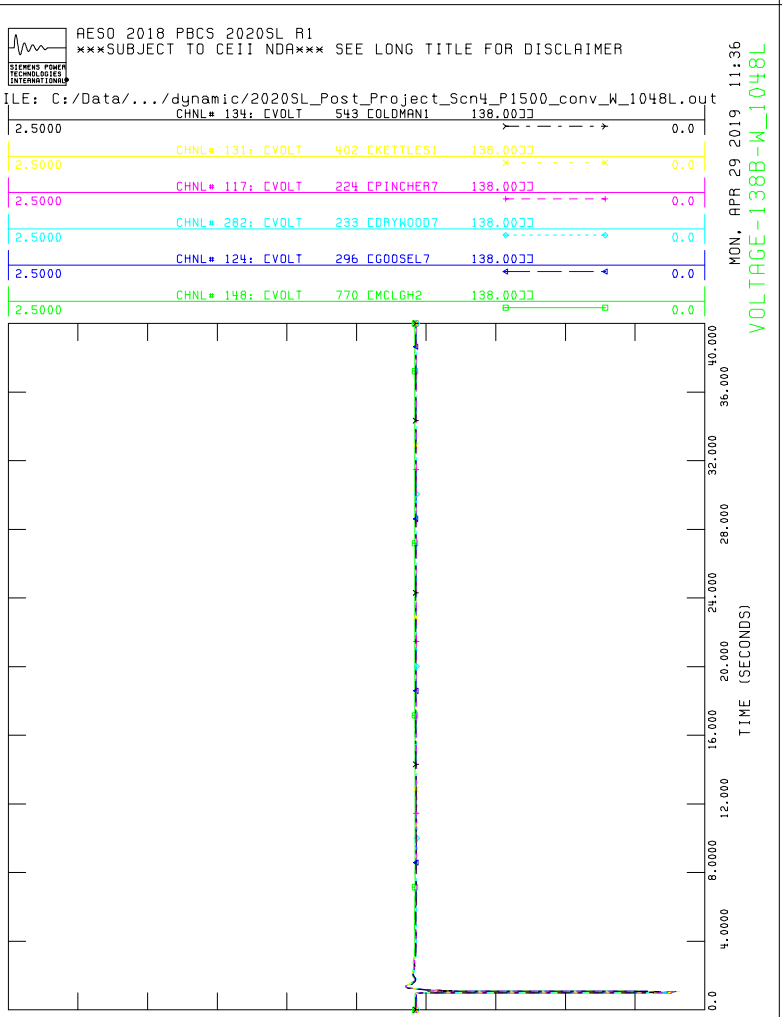
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
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MON, APR 29 2019 11:36
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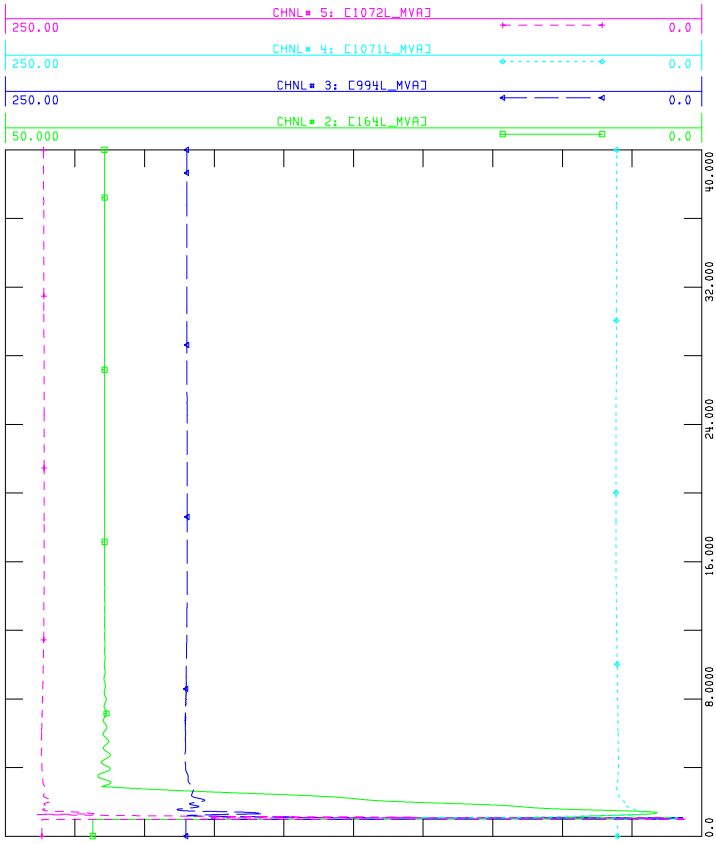

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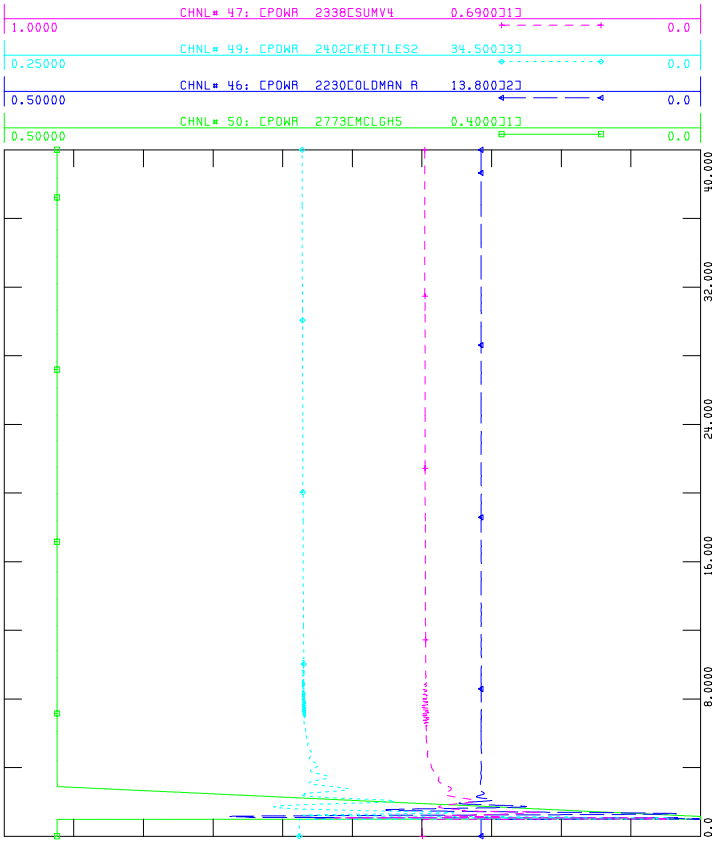

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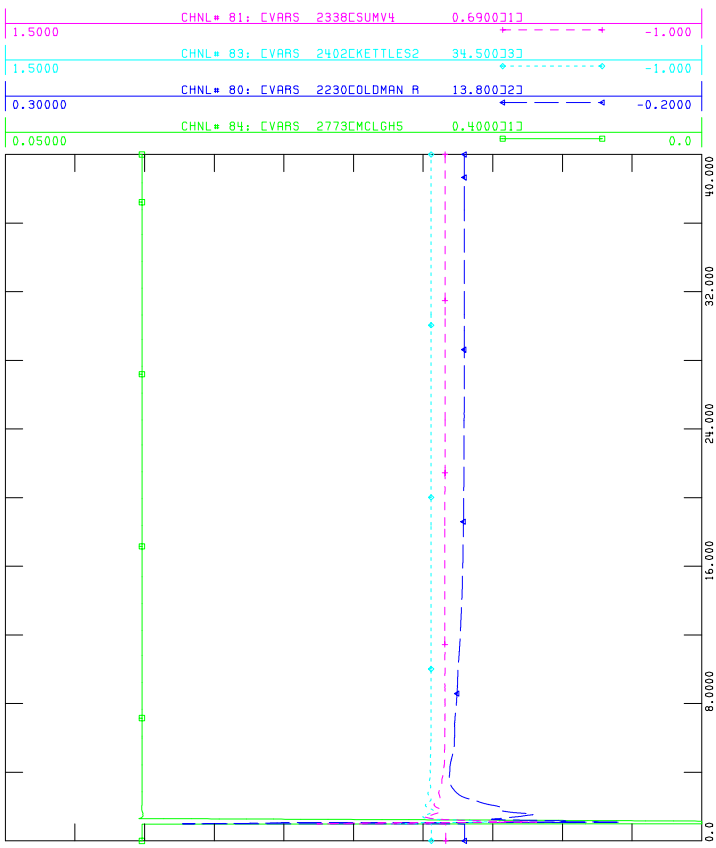

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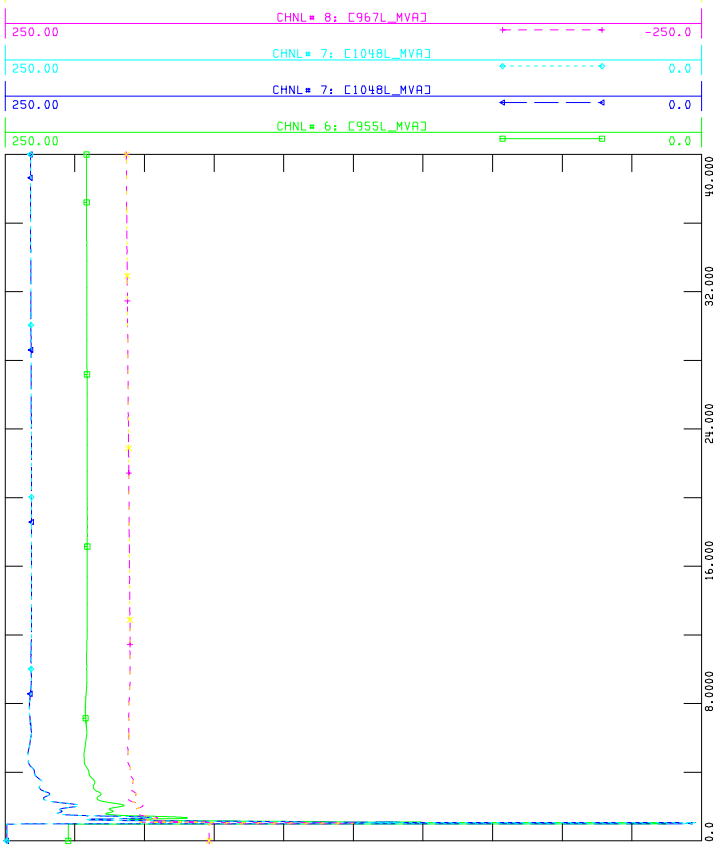

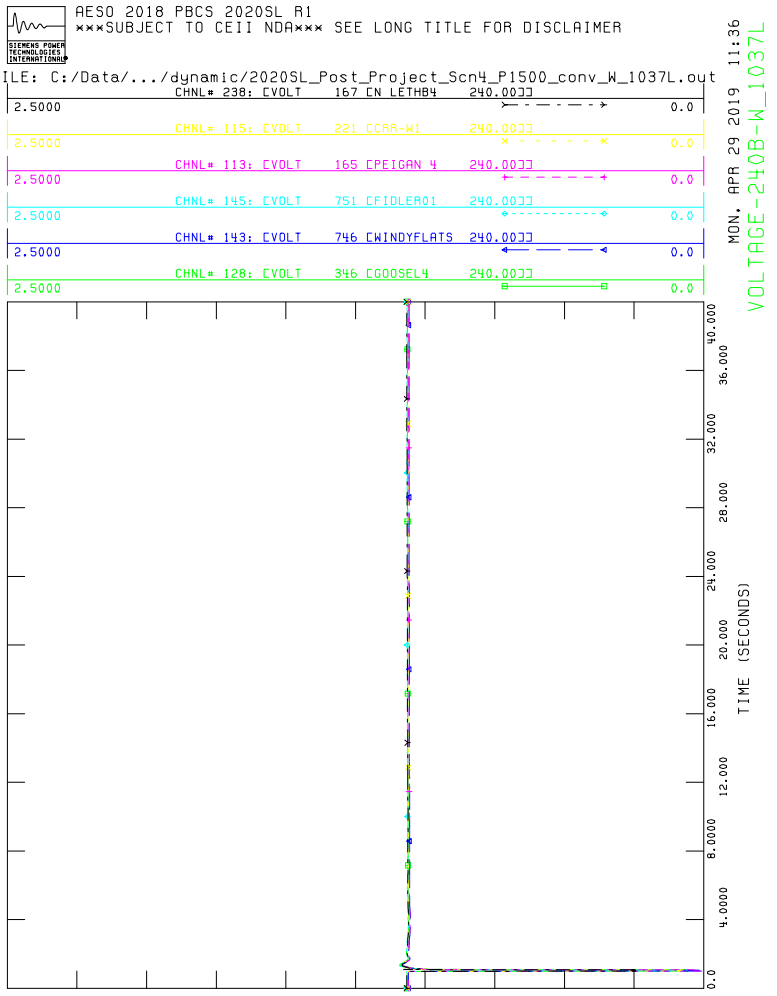
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_W_1037L.out
CHNL# 238: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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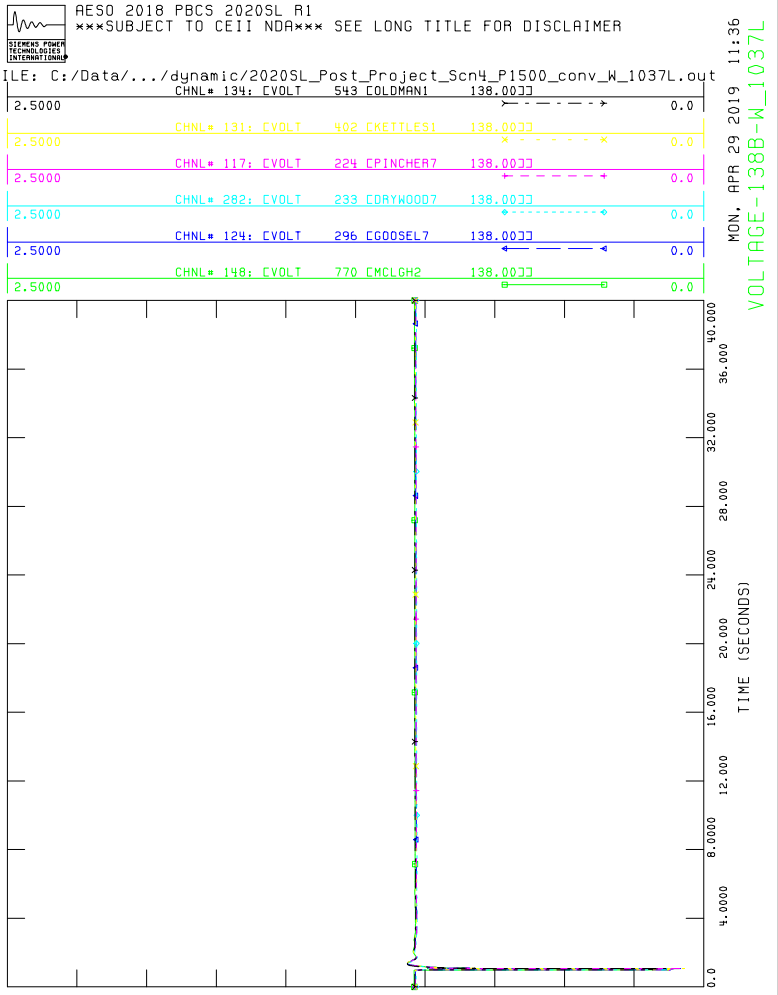
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SL_Post_Project_Scn4_P1500_conv_W_1037L.out
CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
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VOLTAGE-138B-W_1037L

AESO 2018 PBCS 2020SL R1
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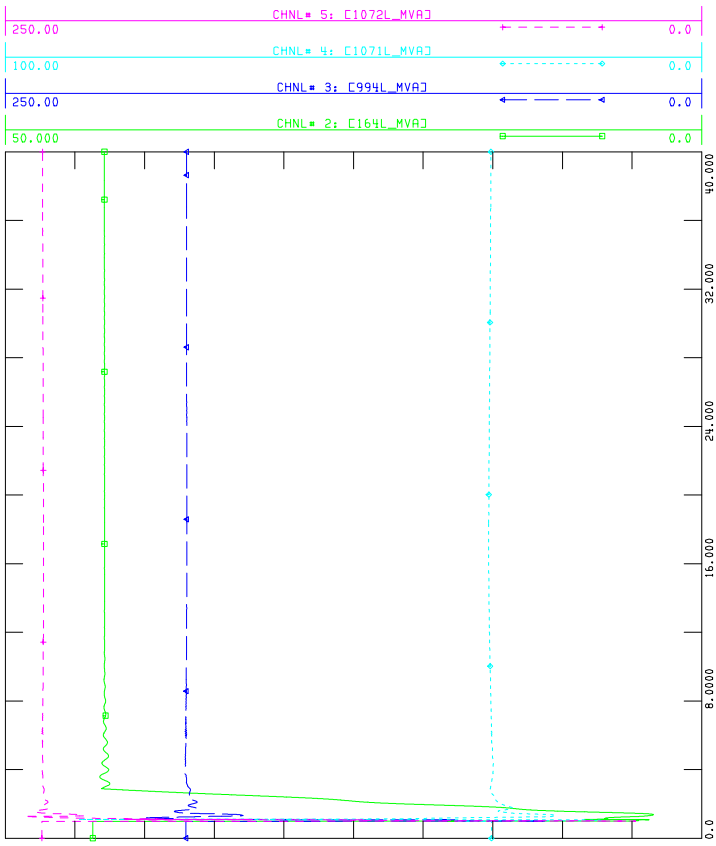

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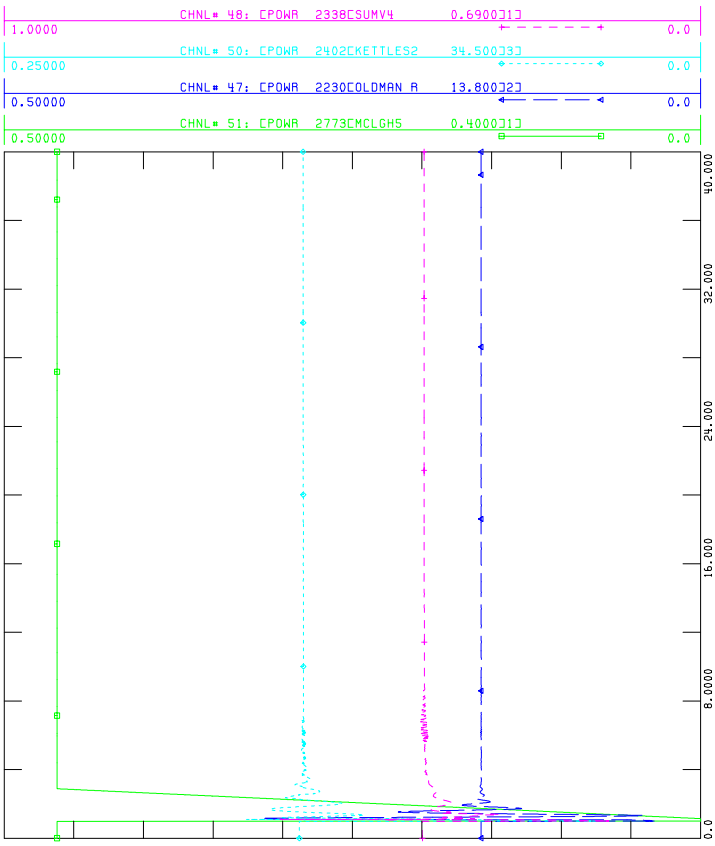

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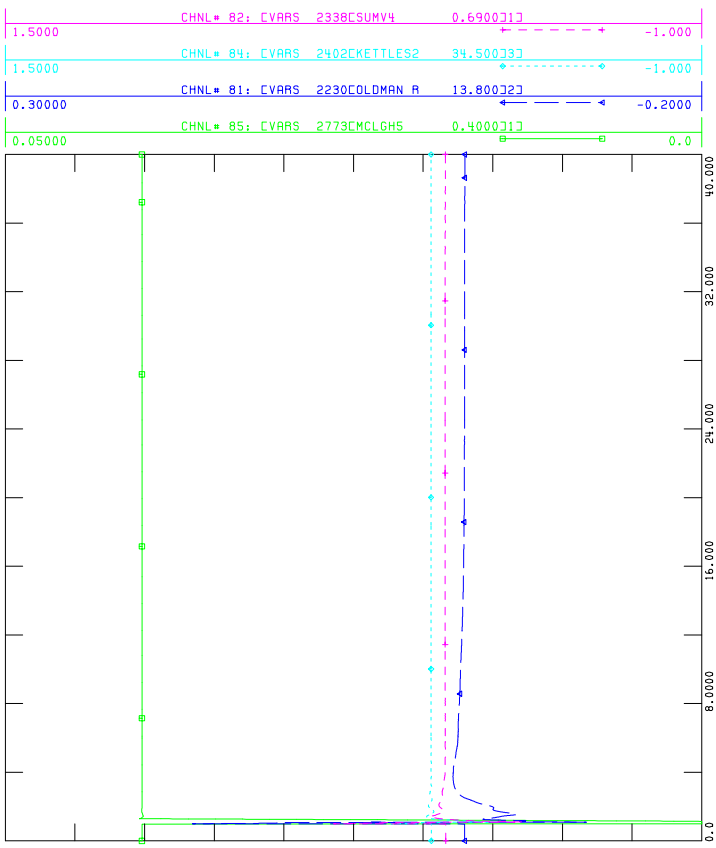

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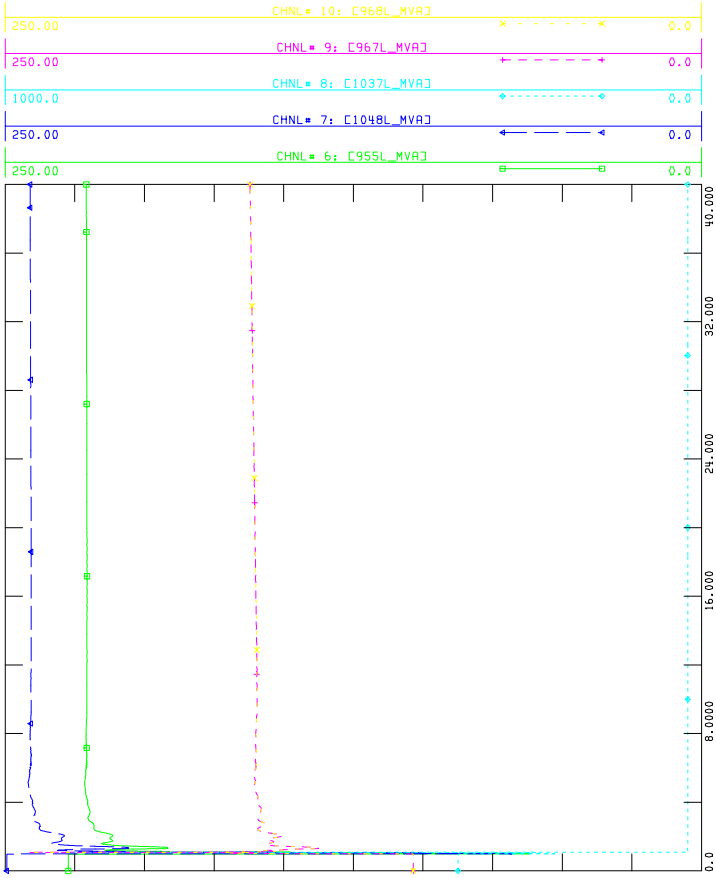

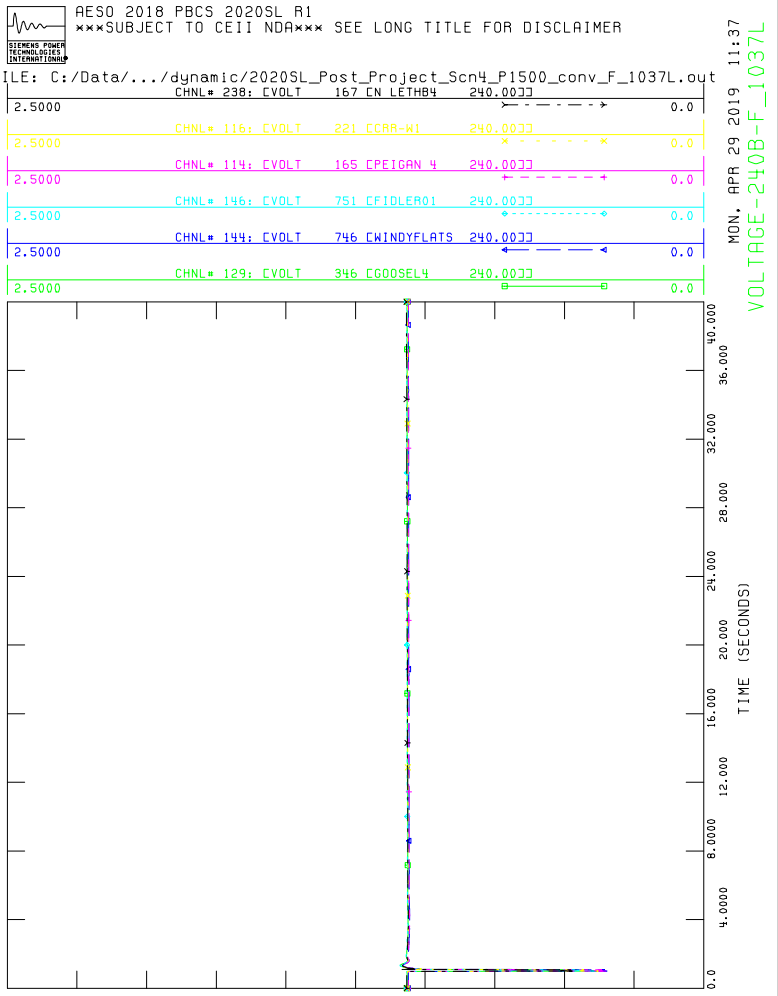
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 116: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 114: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 146: CVOLT 751 CFIDLER01 240.00JJ
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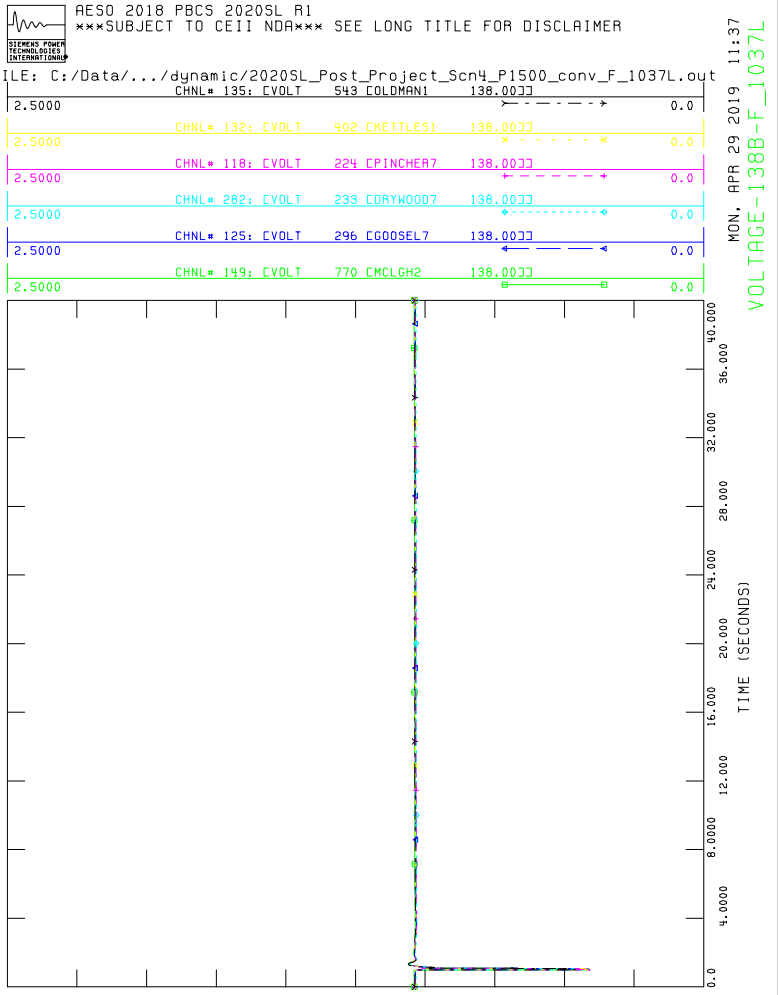
VOLTAGE-240B-F_1037L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 135: CVOLT 543 COLDMAN1 138.00JJ
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VOLTAGE-138B-F_1037L

AESO 2018 PBCS 2020SL R1
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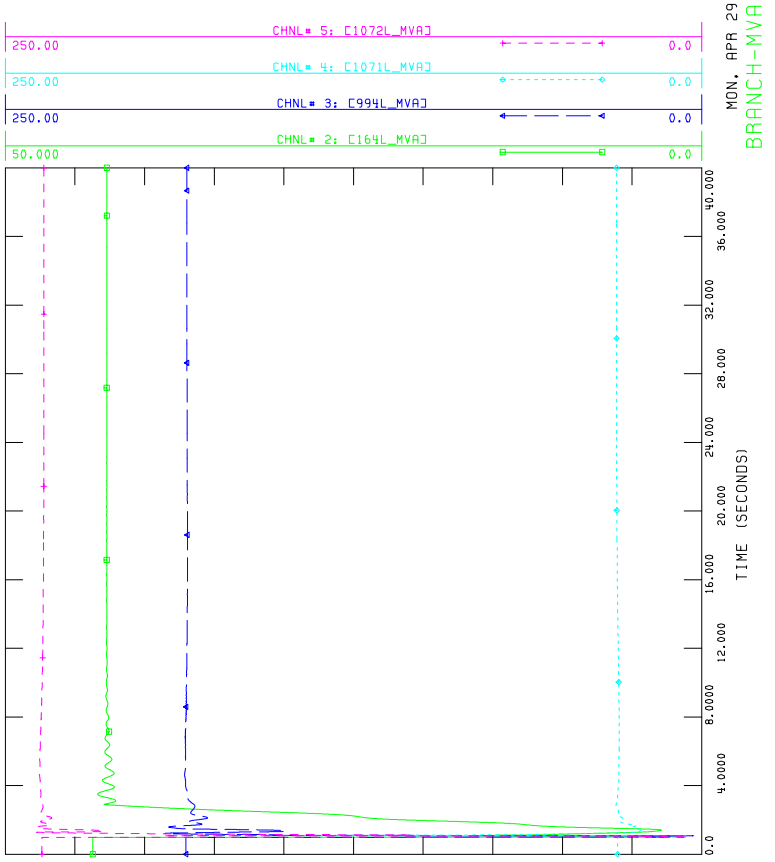

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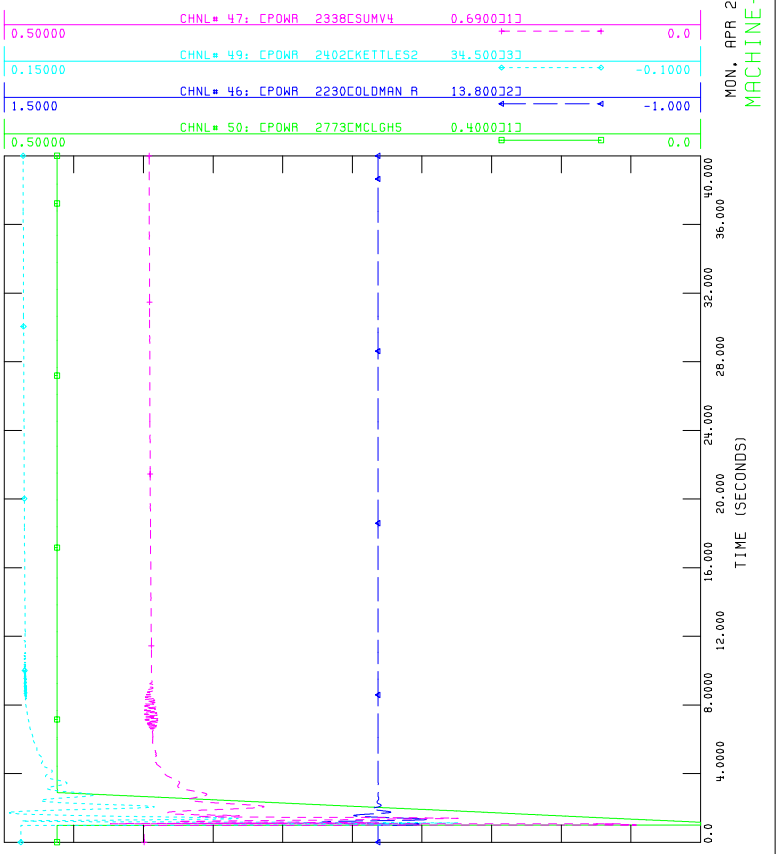

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MACHINE-P-W_967L

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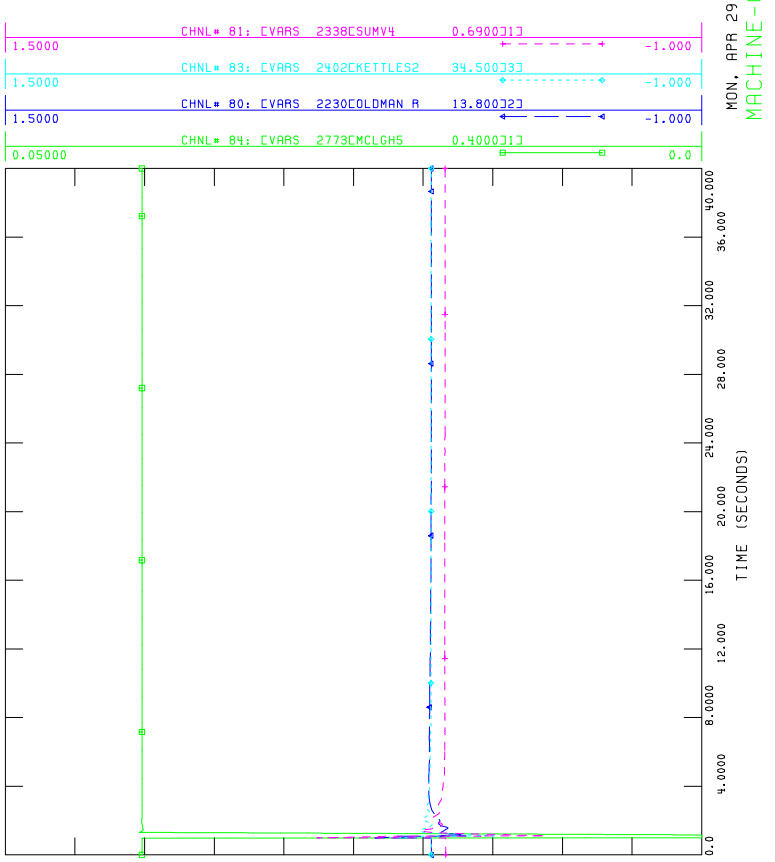

MON, APR 29 2019 11:37
MACHINE-Q-W_967L

AESO 2018 PBCS 2020SL R1
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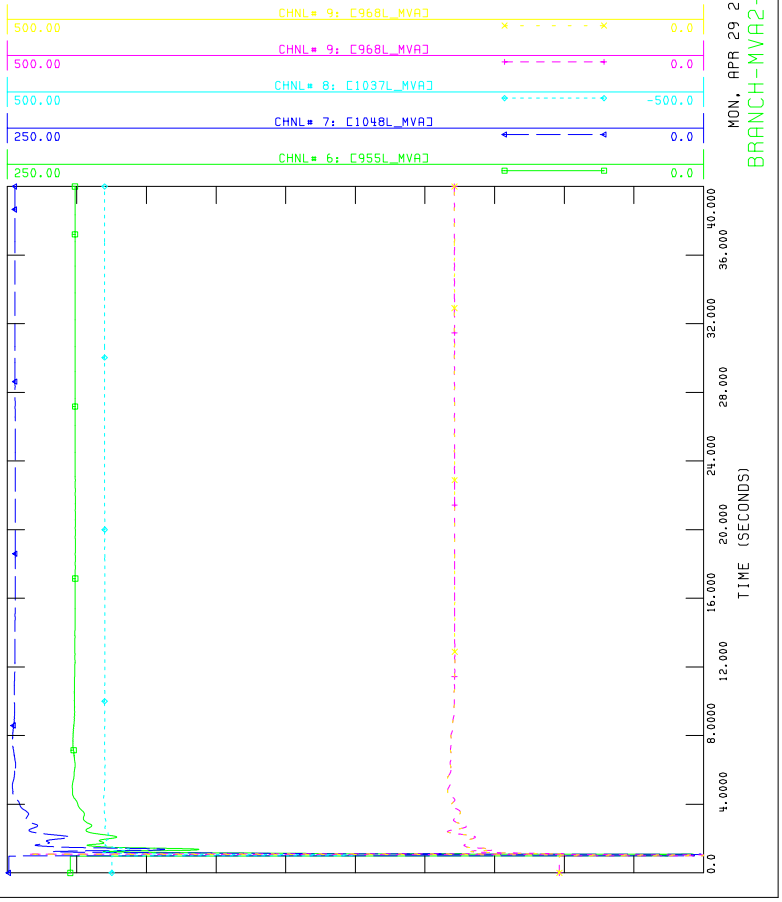

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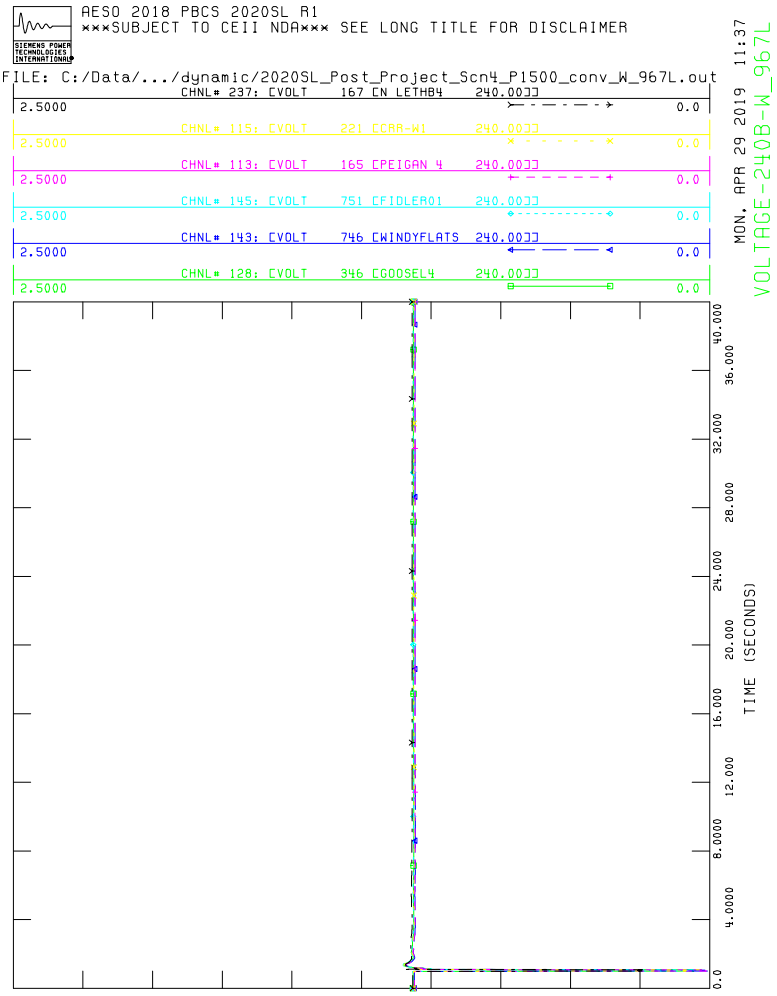
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CHNL# 237: CVOLT 167 CN LETH84 240.00JJ
CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
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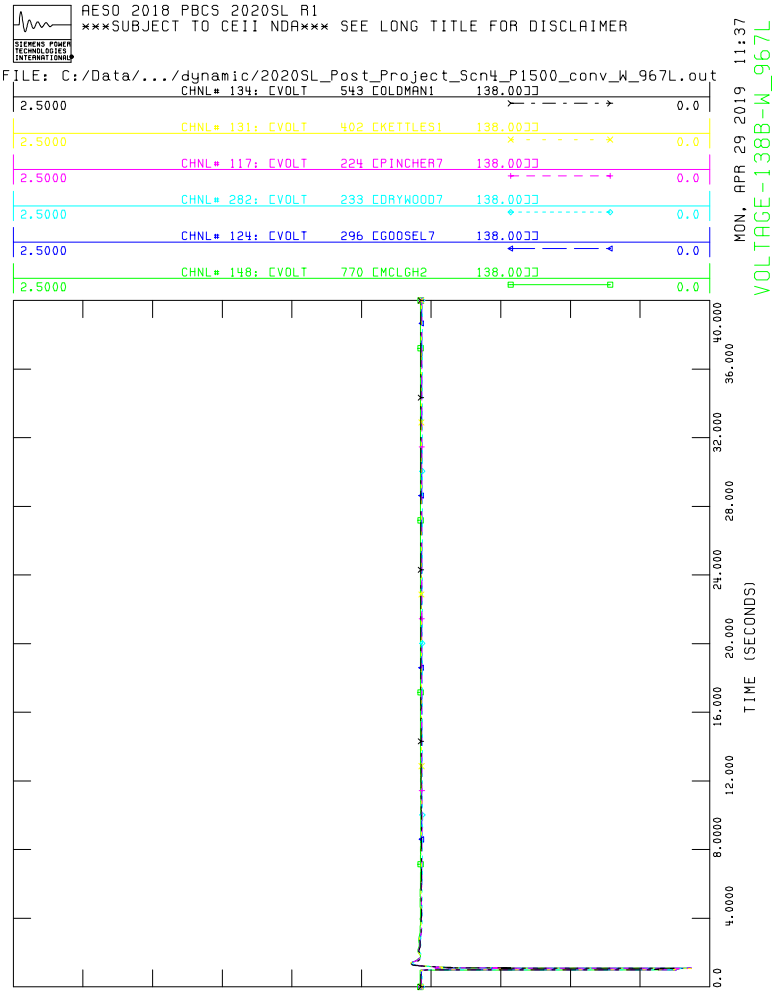
VOLTAGE-240B-W_967L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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
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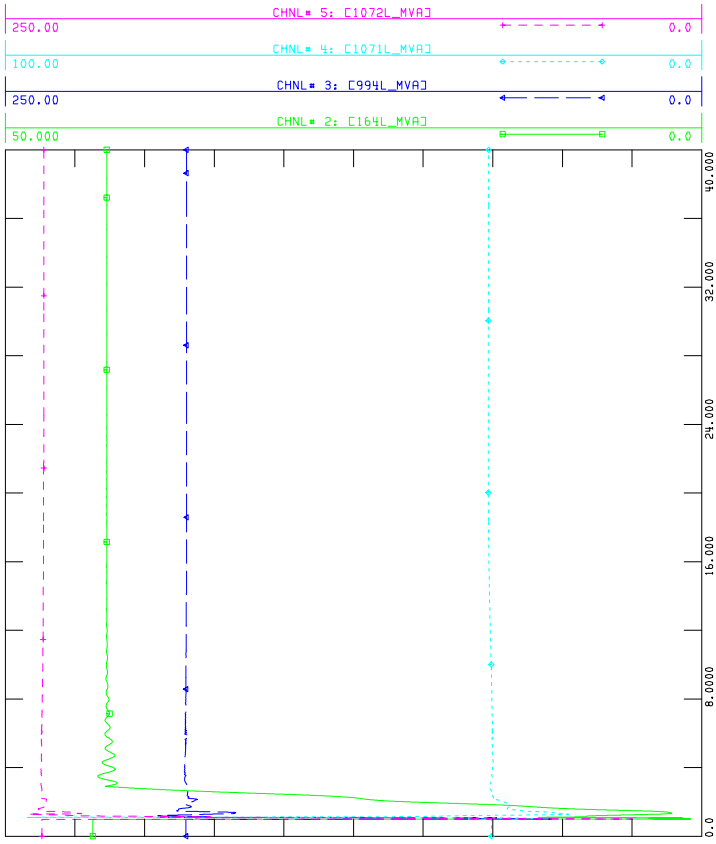

AESO 2018 PBCS 2020SL R1
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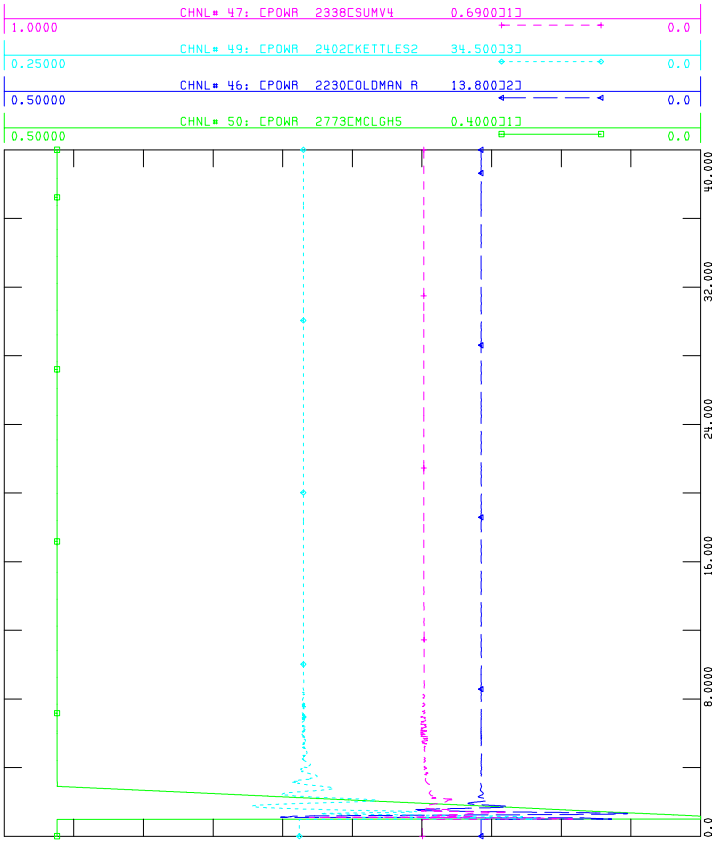
MACHINE-P-N_967L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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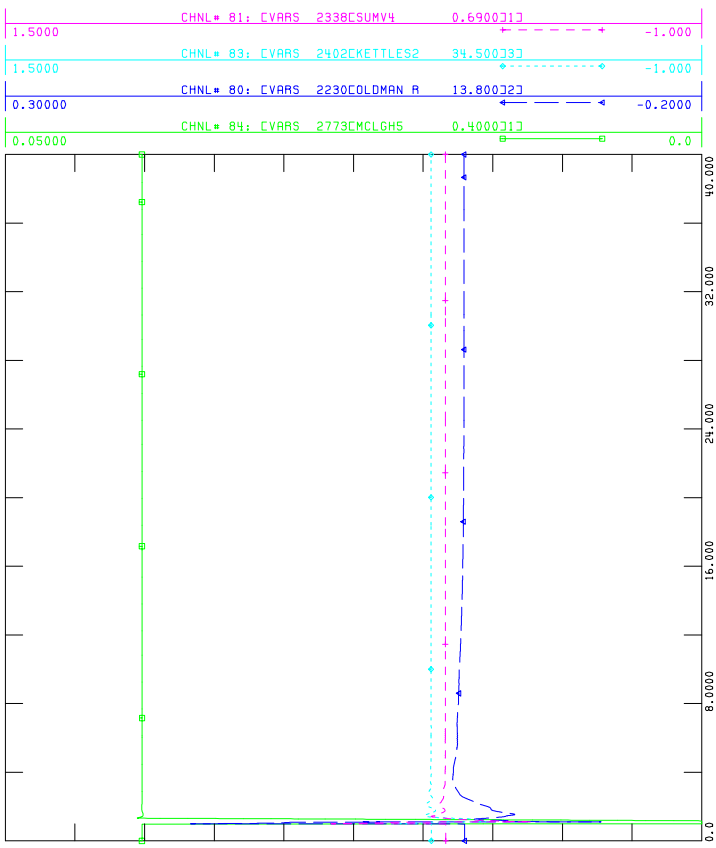
MACHINE-Q-N_967L



AESO 2018 PBCS 2020SL R1
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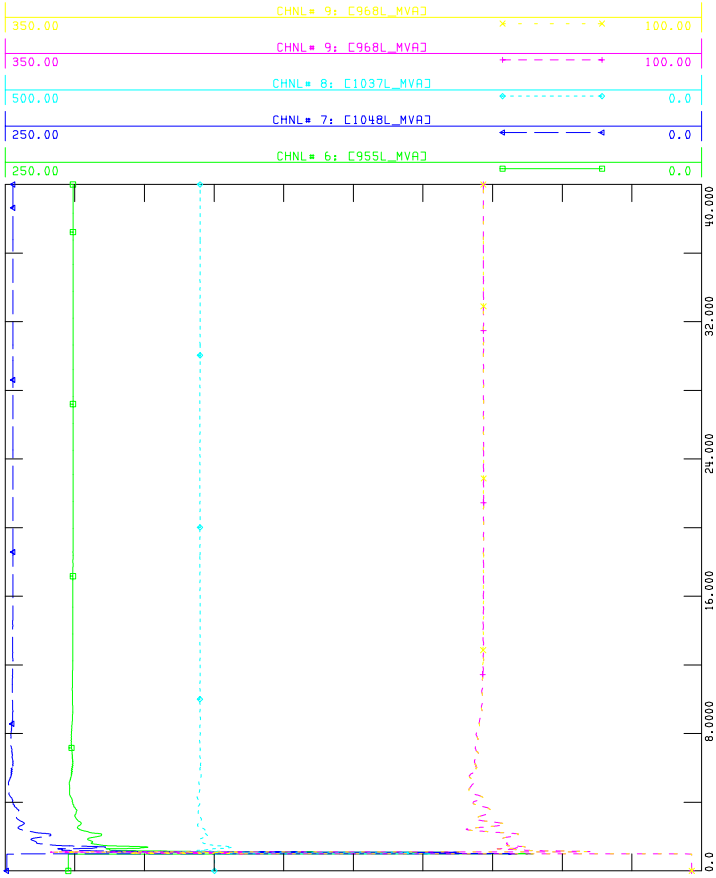
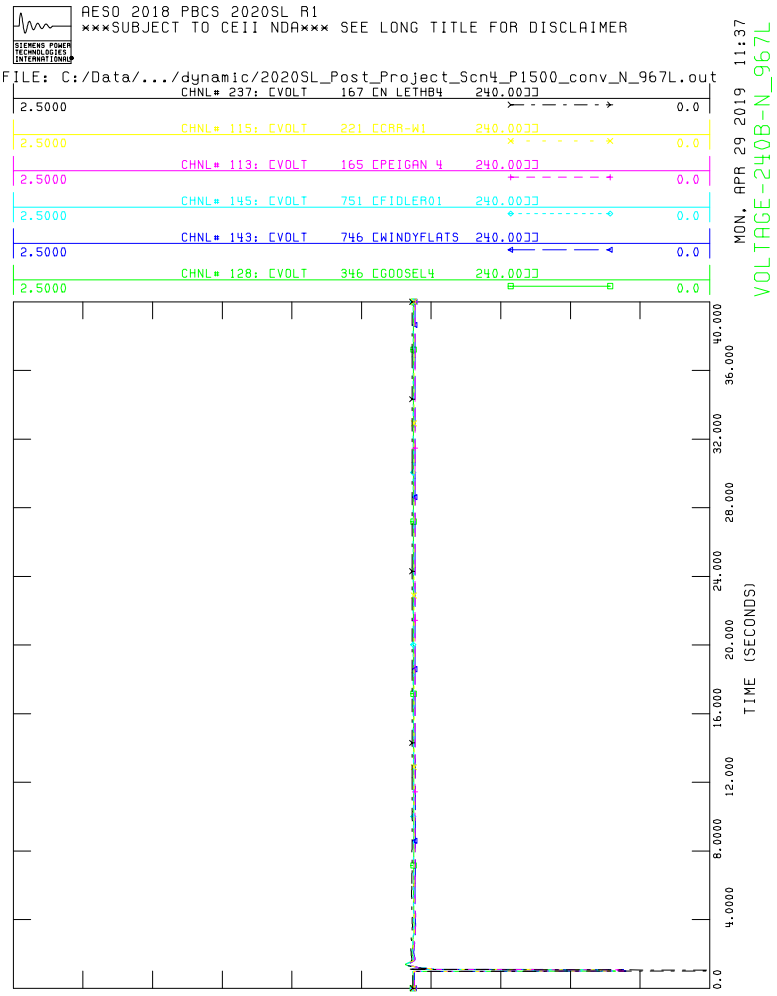
BRANCH-MVA2-N_967L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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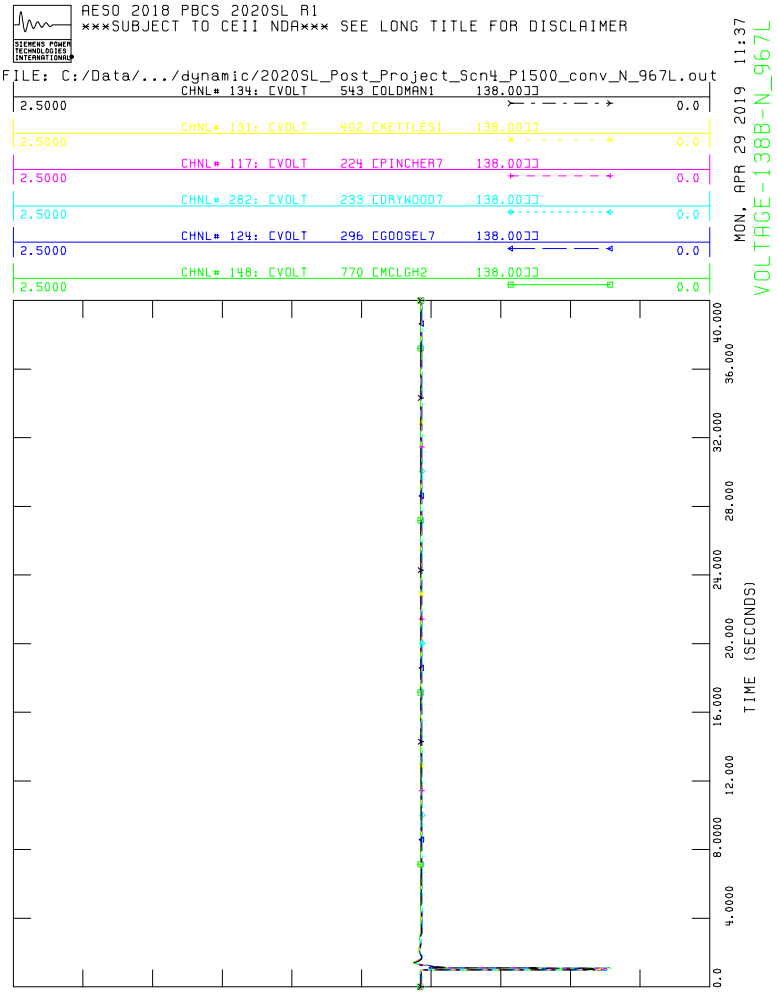
MON, APR 29 2019 11:37
VOLTAGE-240B-N_967L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CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
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CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:37
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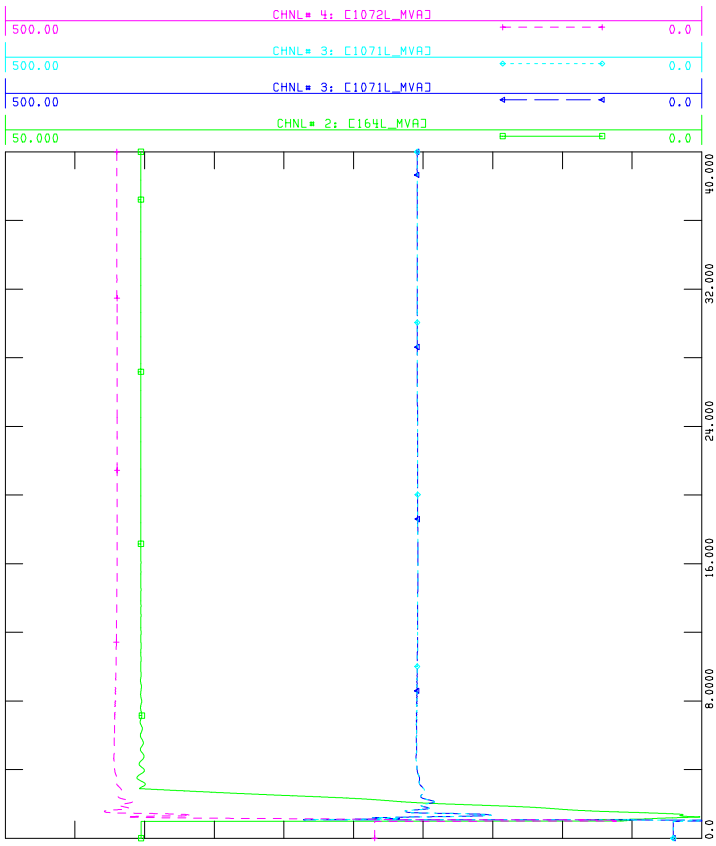
MON, APR 29 2019 11:38
BRANCH-MVA1-F_994L



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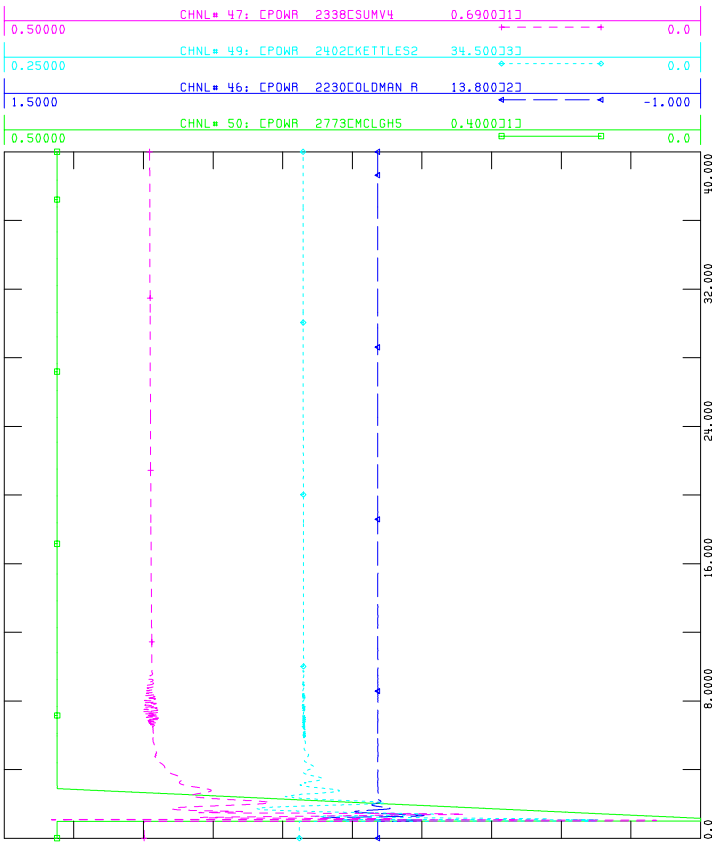

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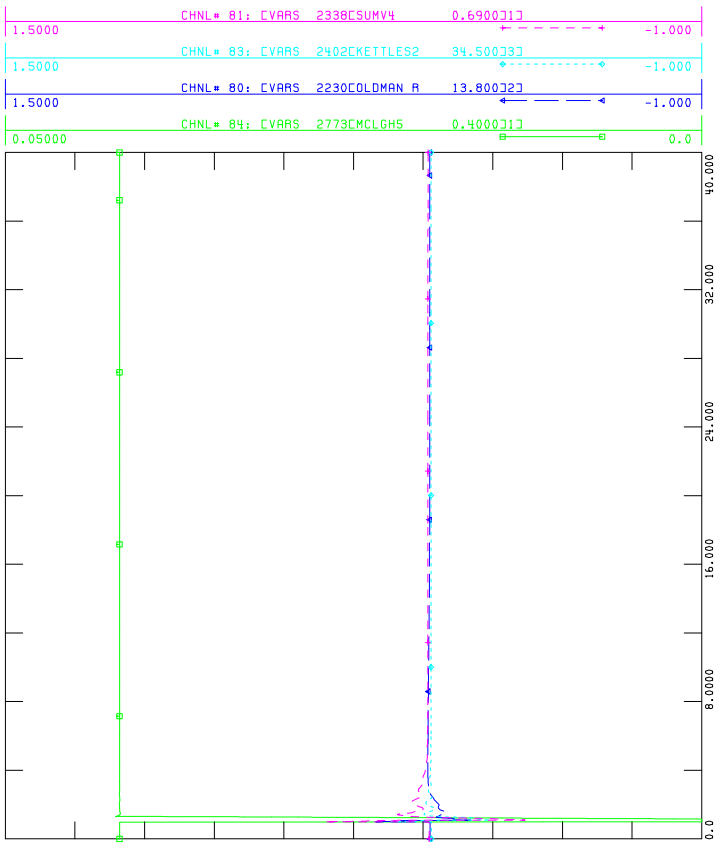

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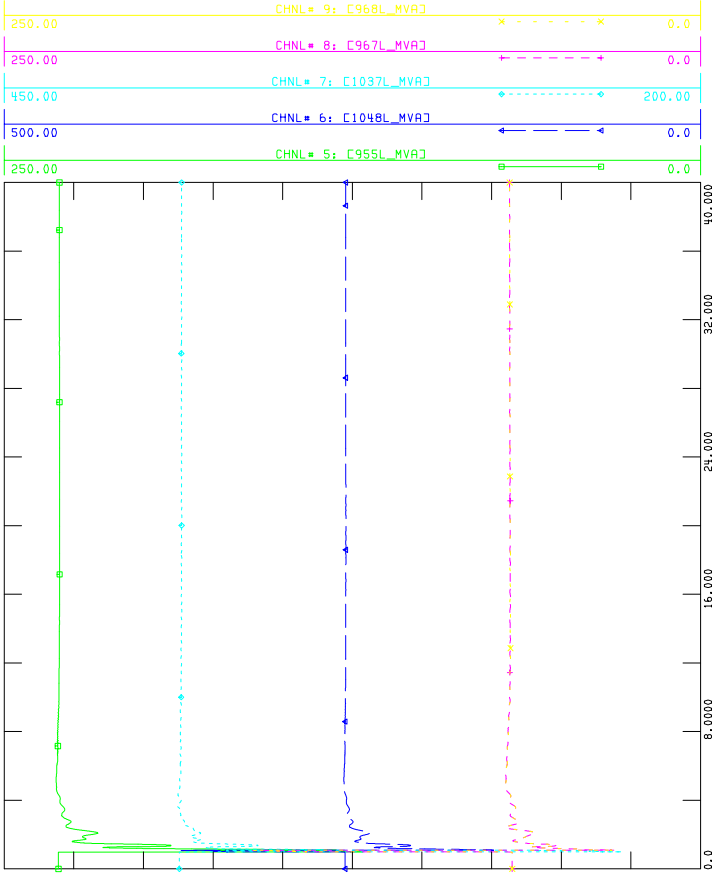

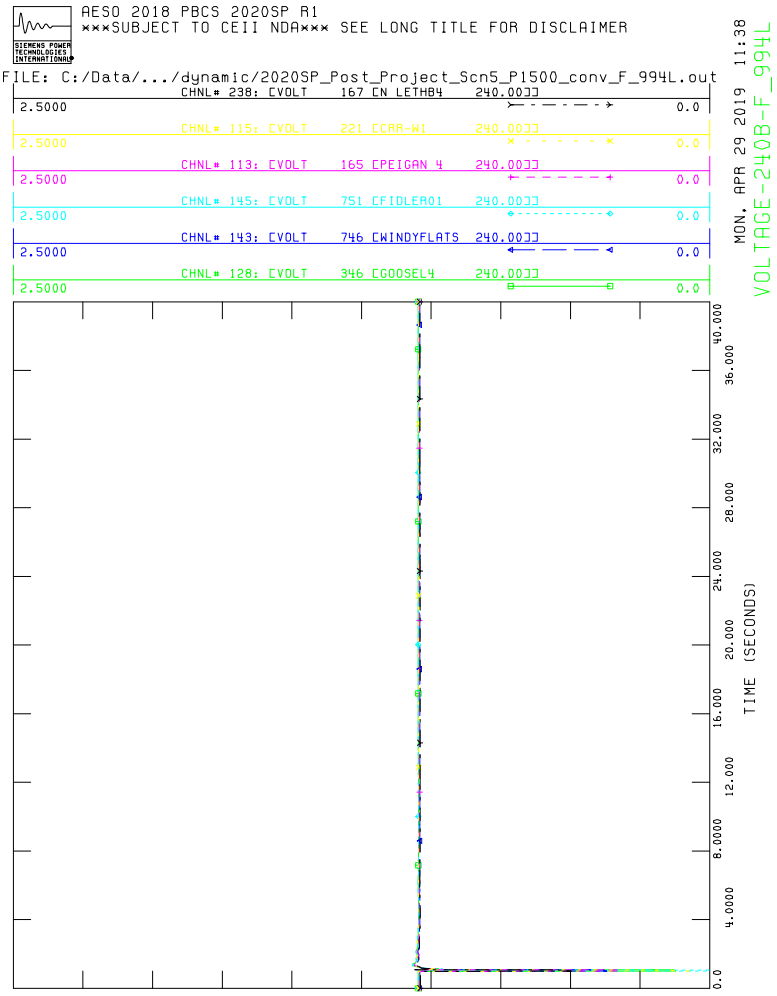
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CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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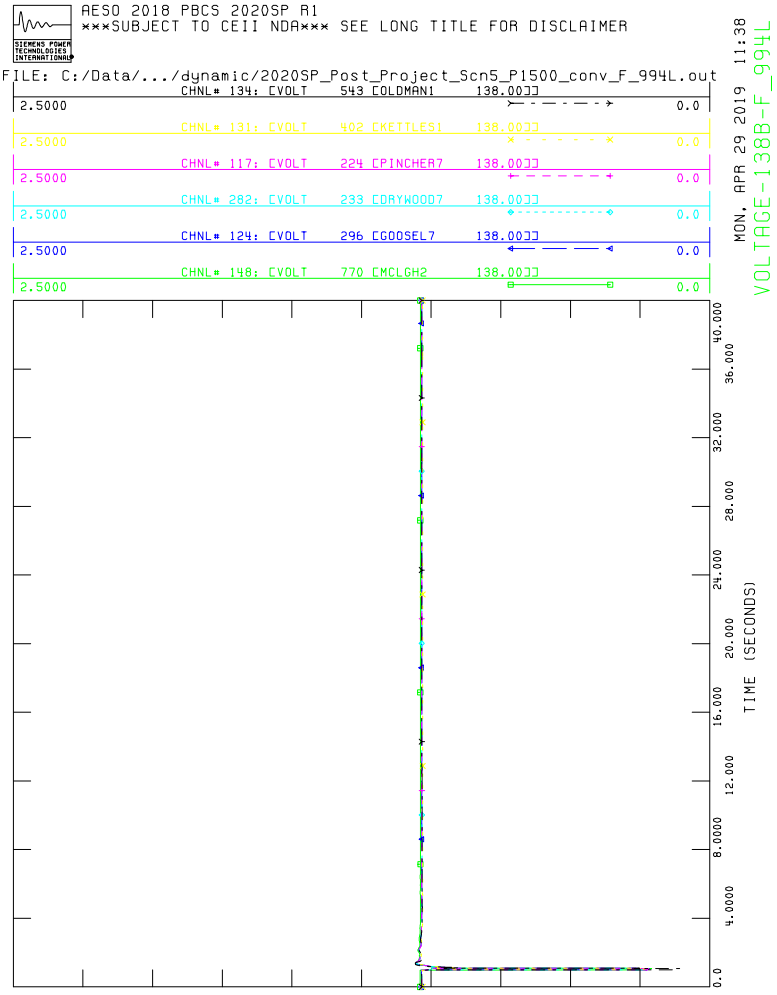
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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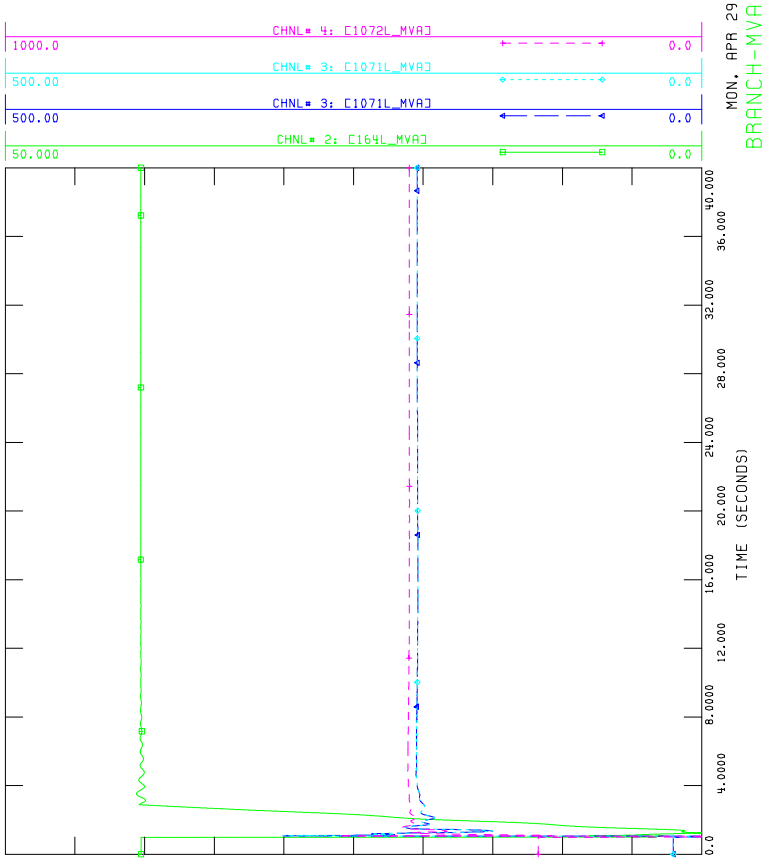

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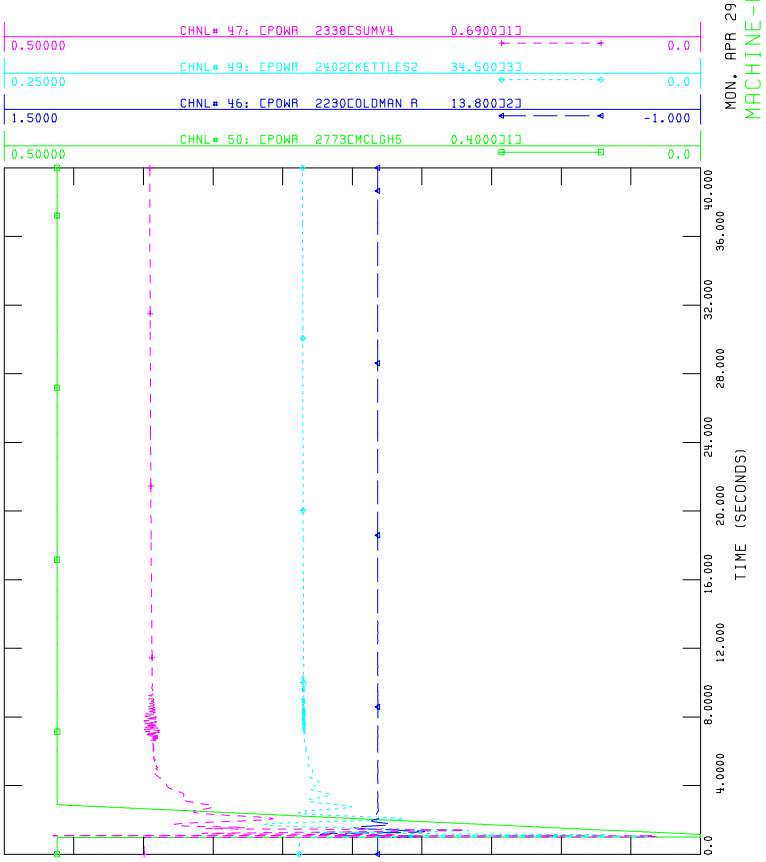

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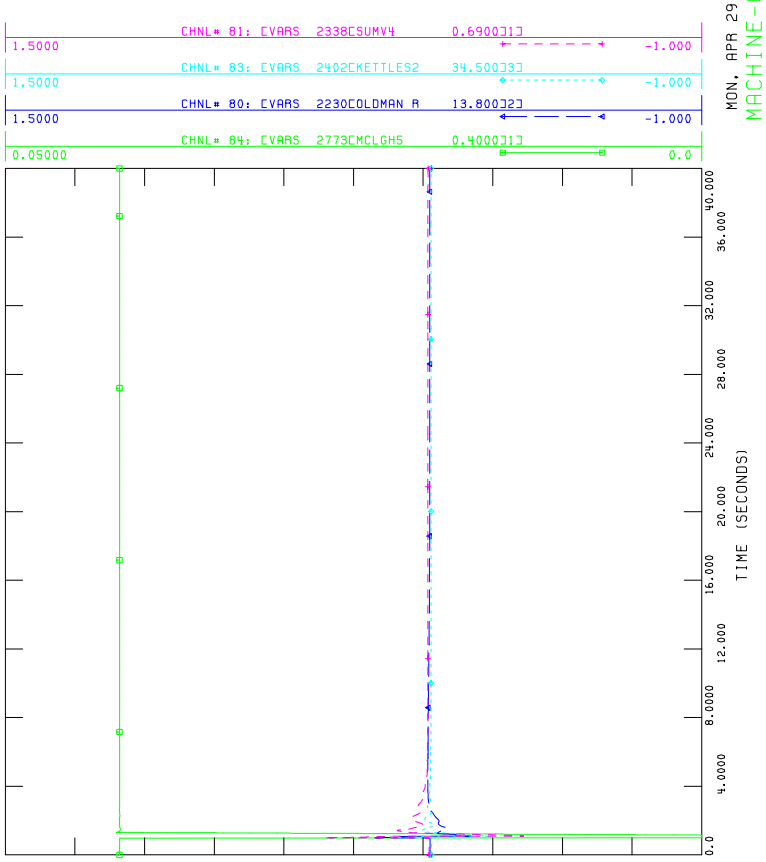

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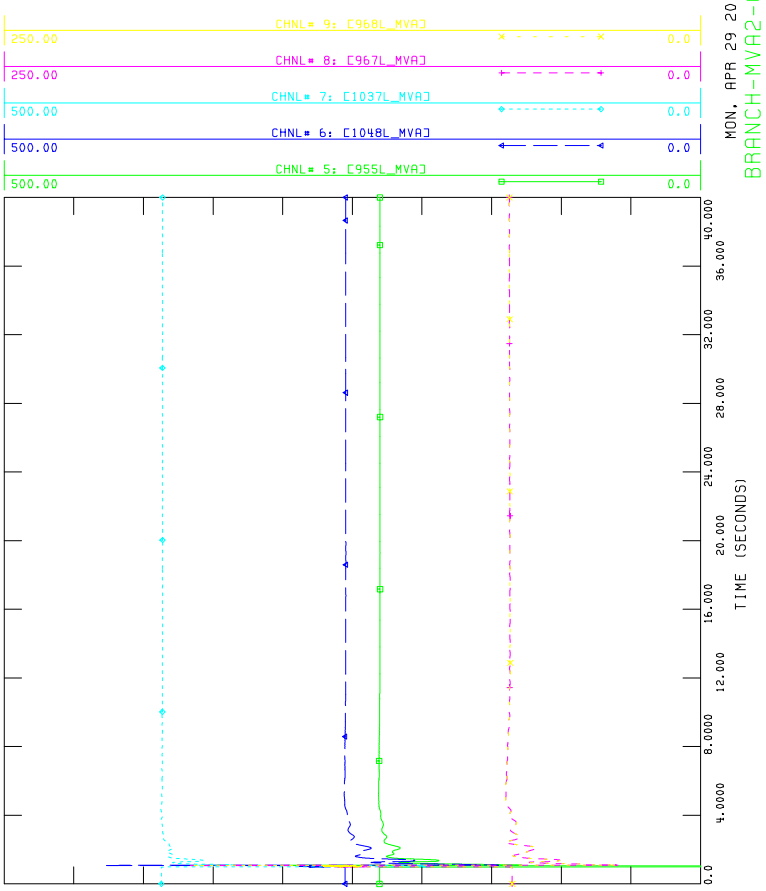

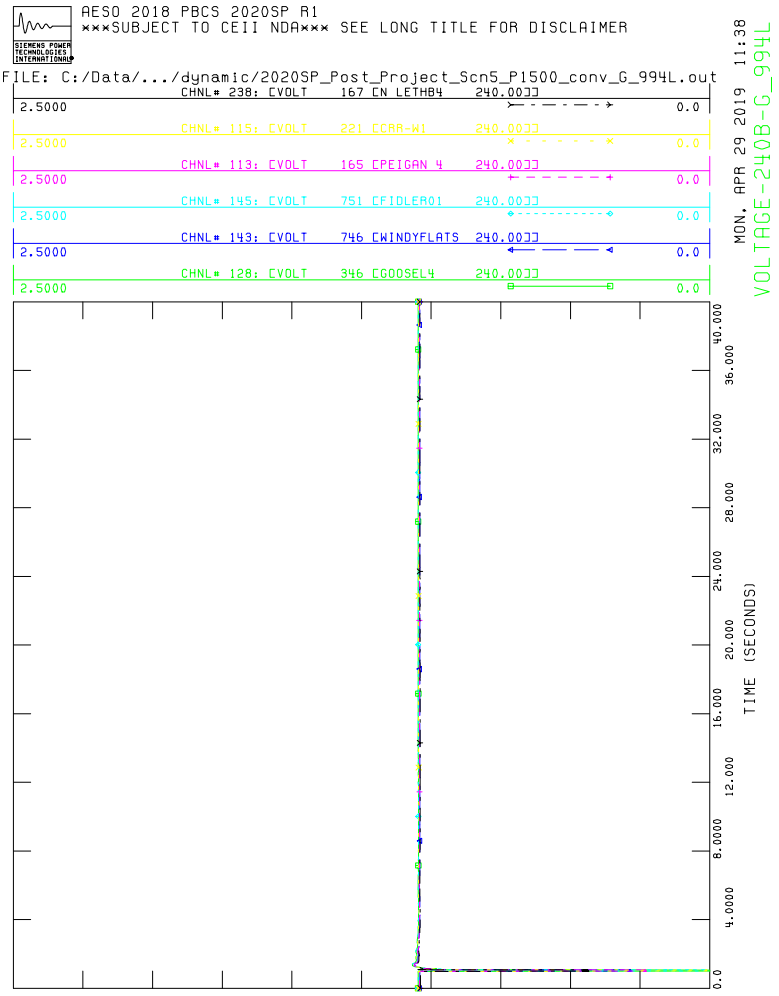
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
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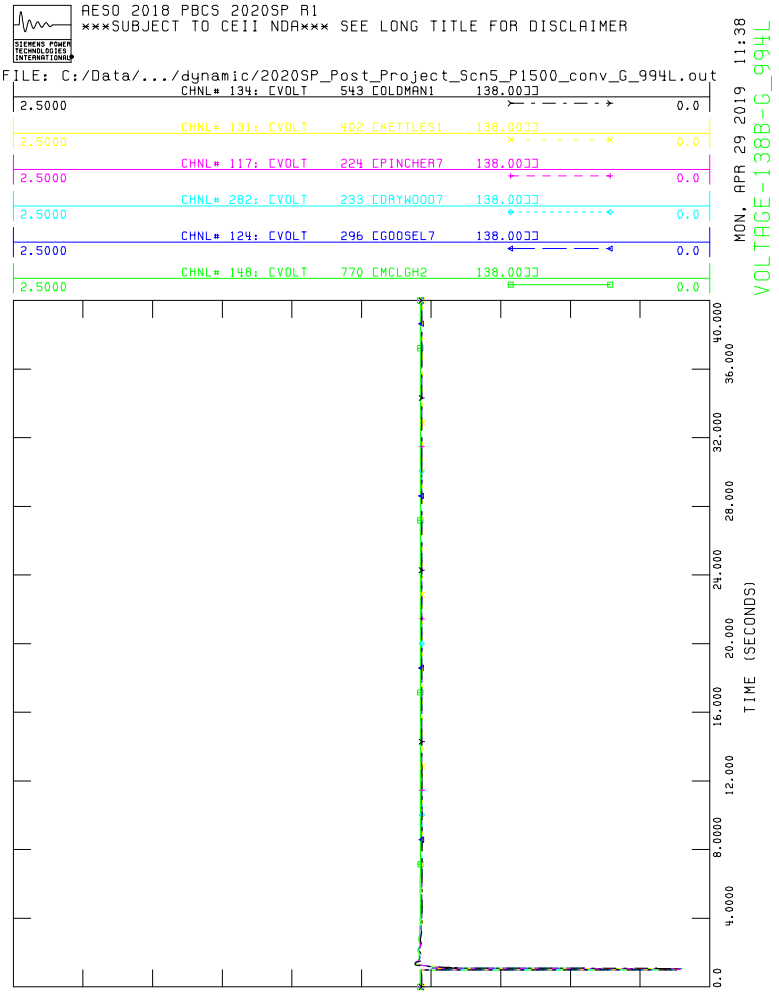
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 131: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
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AESO 2018 PBCS 2020SP R1
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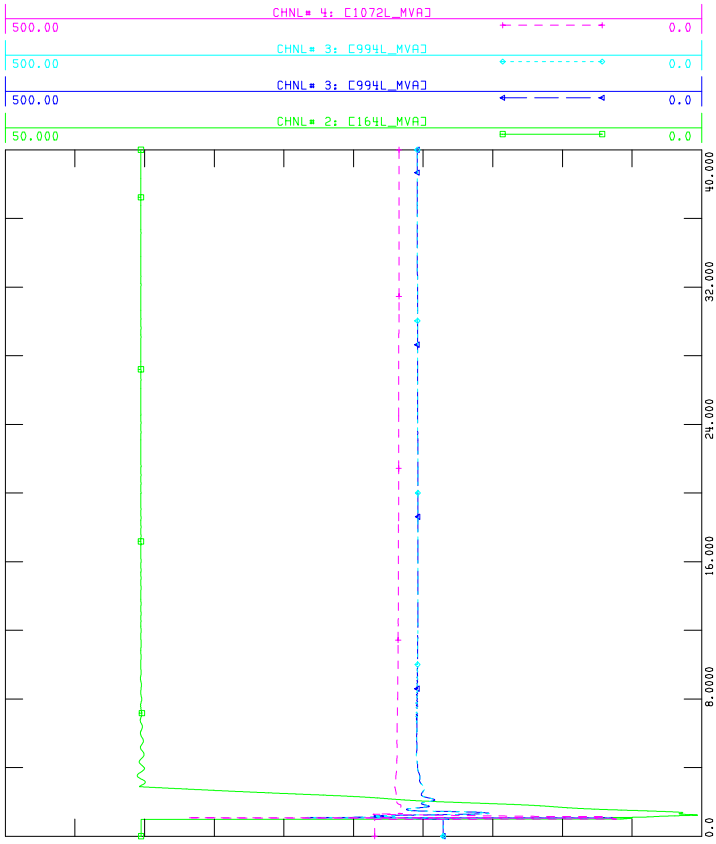

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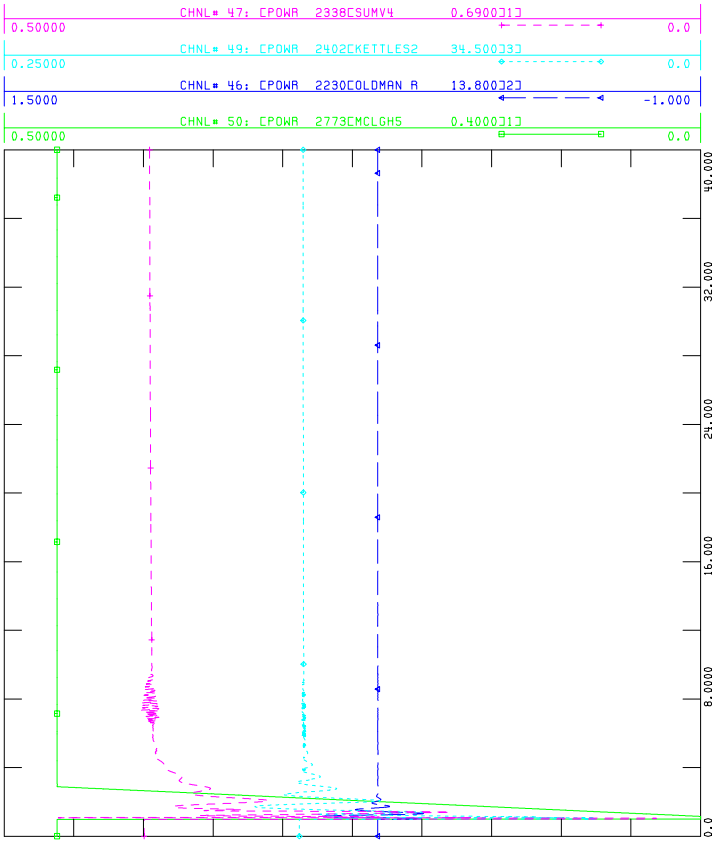

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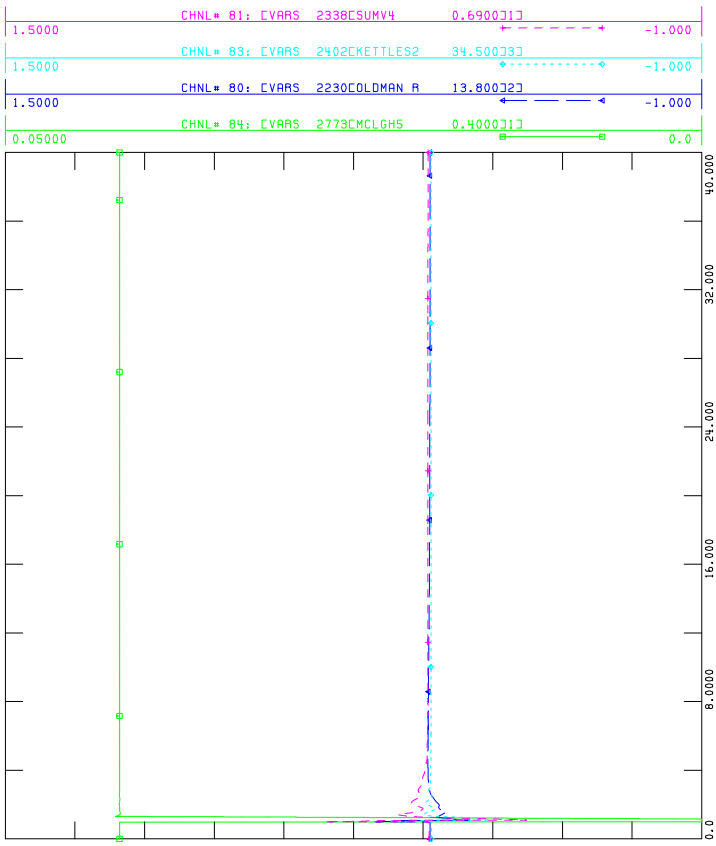

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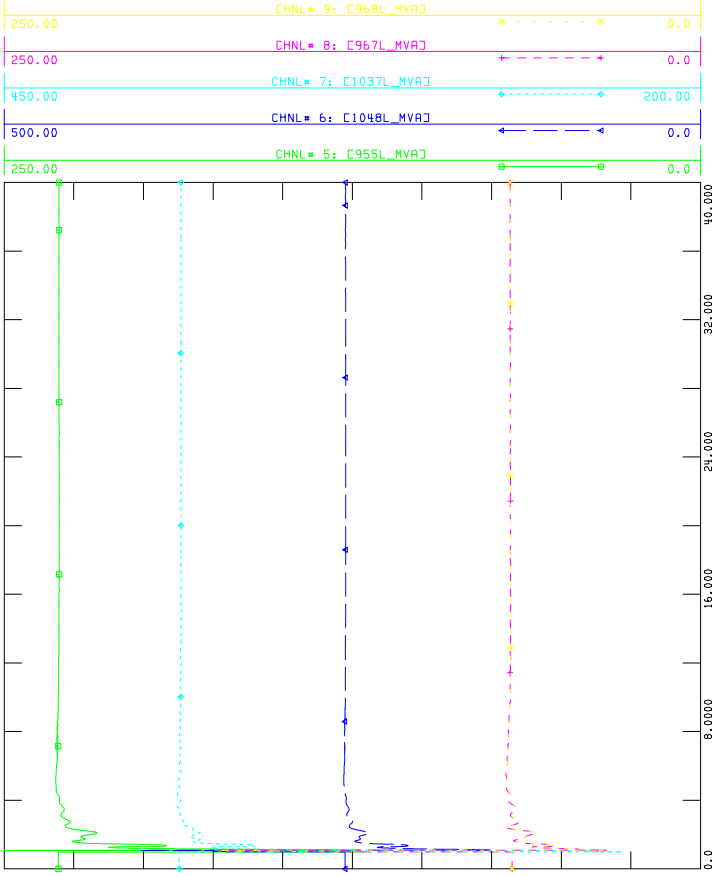
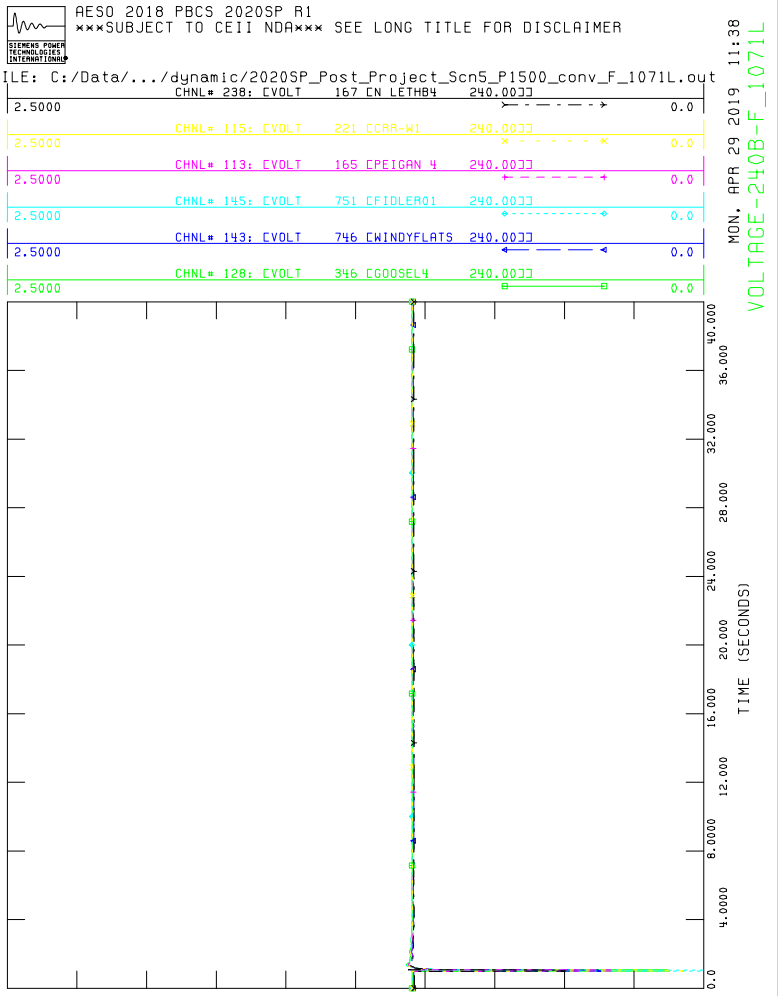
BRANCH-MVA2-F_1071L

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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 113: CVOLT 165 CPEIGAN 4 240.000
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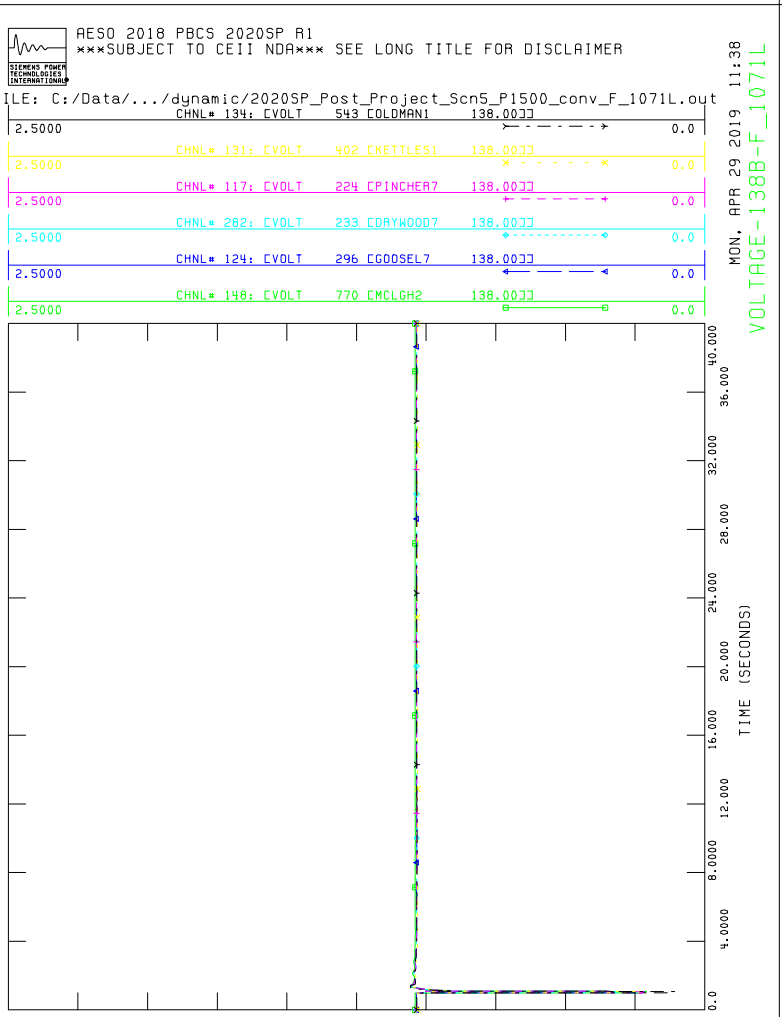
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CHNL# 282: CVOLT 233 CDRYWOOD7 138.000
CHNL# 124: CVOLT 296 CGOOSEL7 138.000
CHNL# 148: CVOLT 770 CMCLGH2 138.000
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AESO 2018 PBCS 2020SP R1
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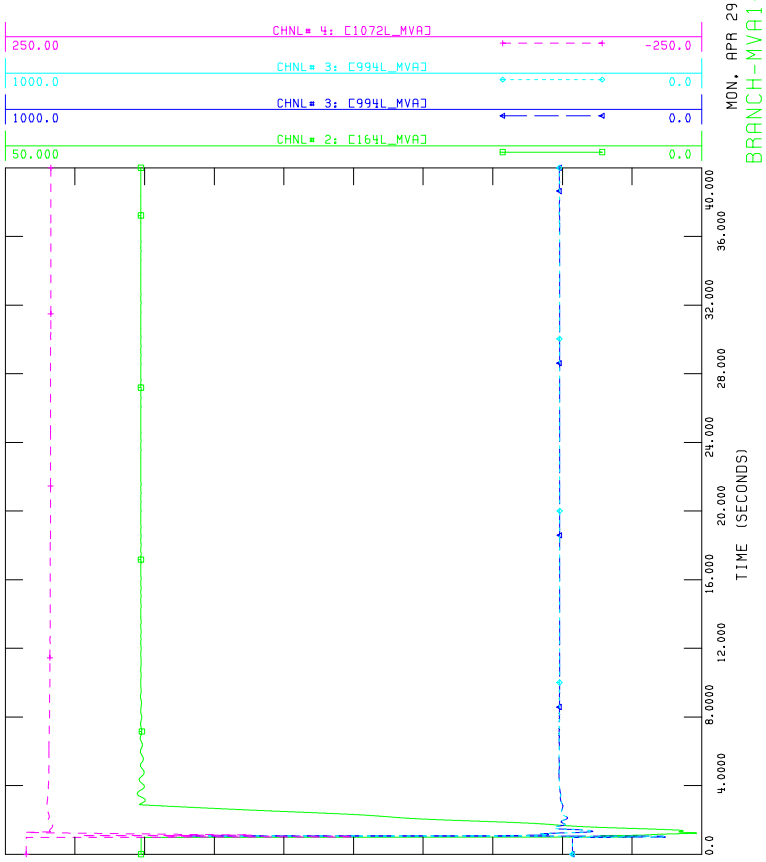

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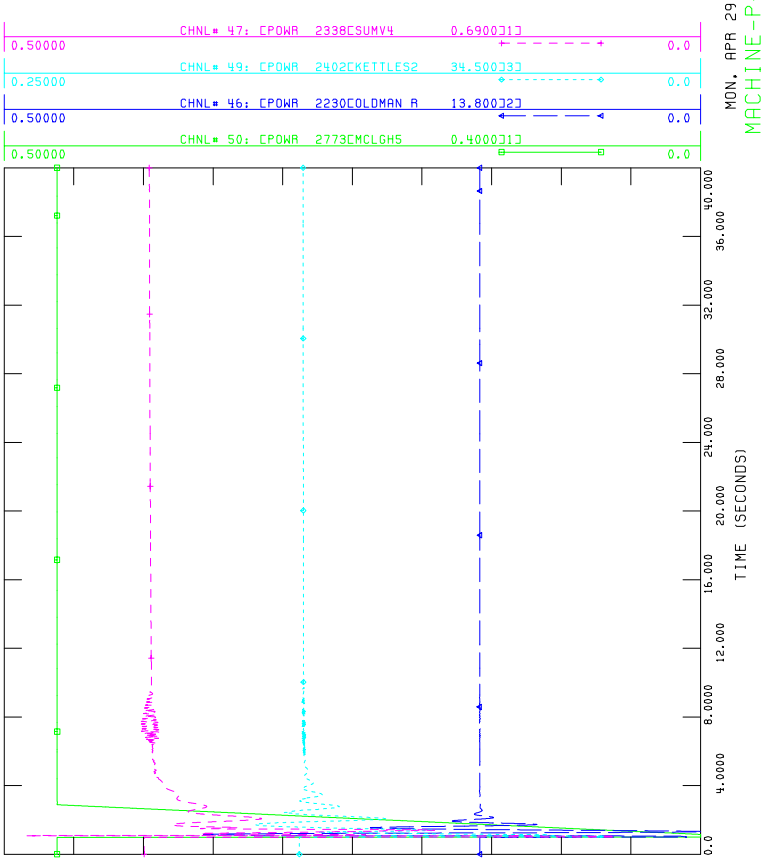

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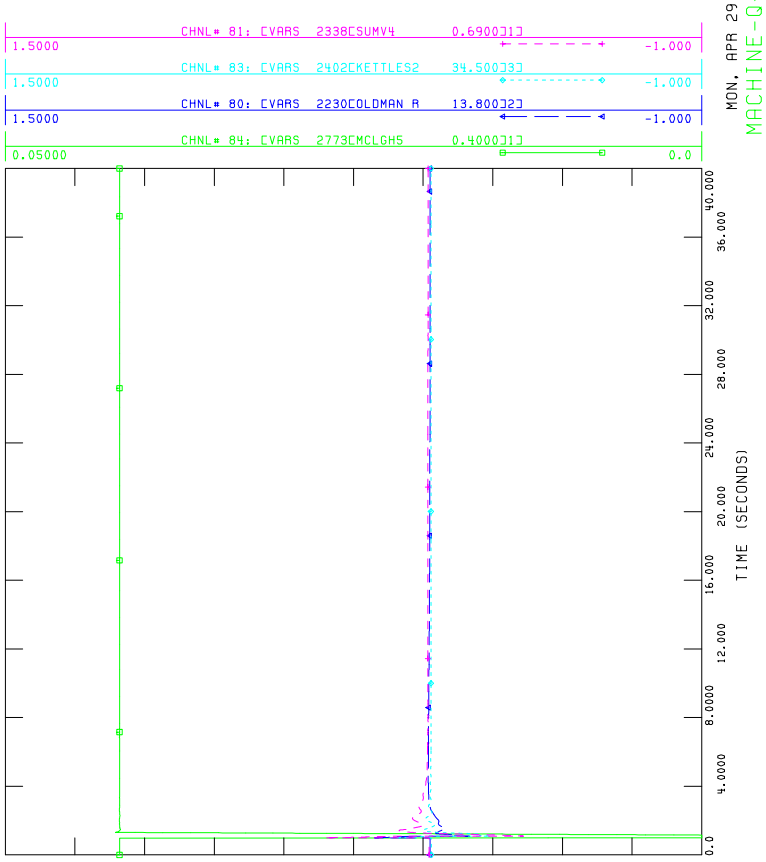

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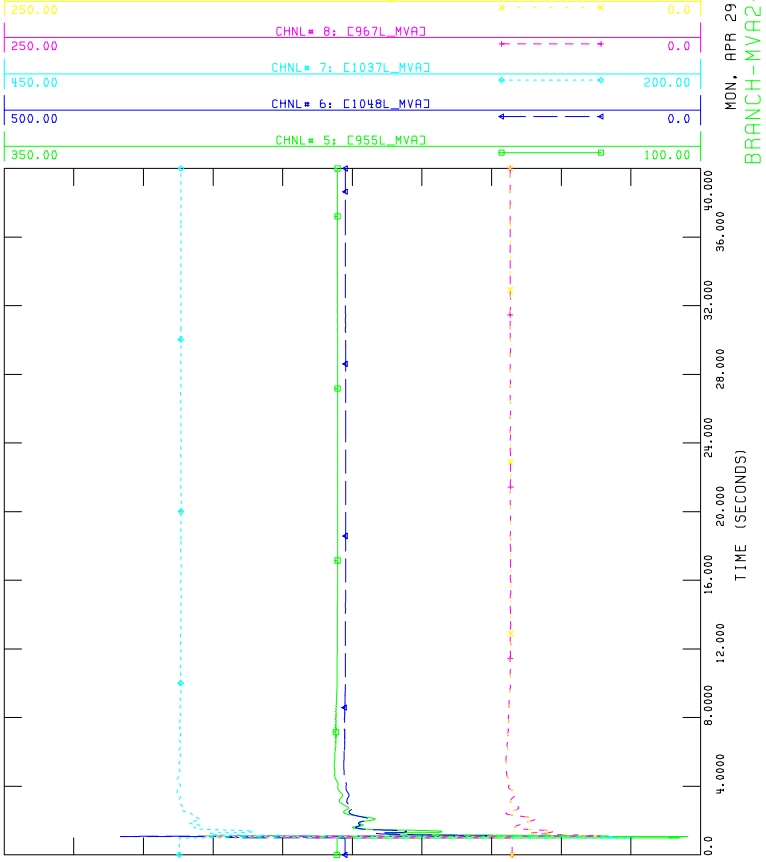

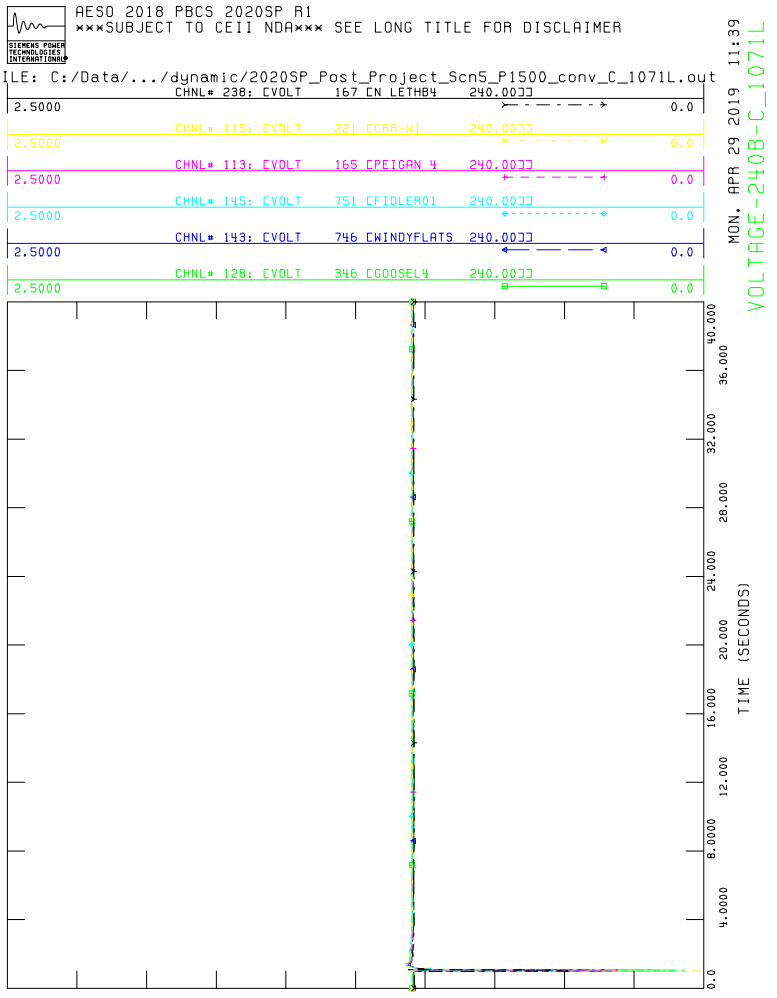
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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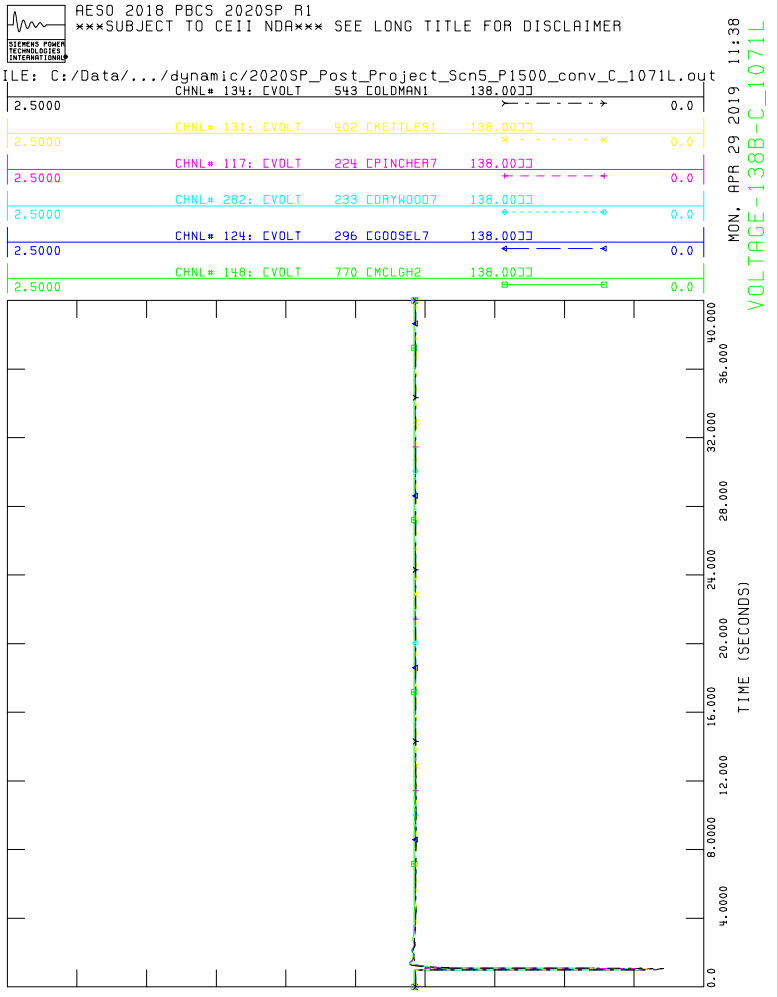
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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VOLTAGE-138B-C_1071L

AESO 2018 PBCS 2020SP R1
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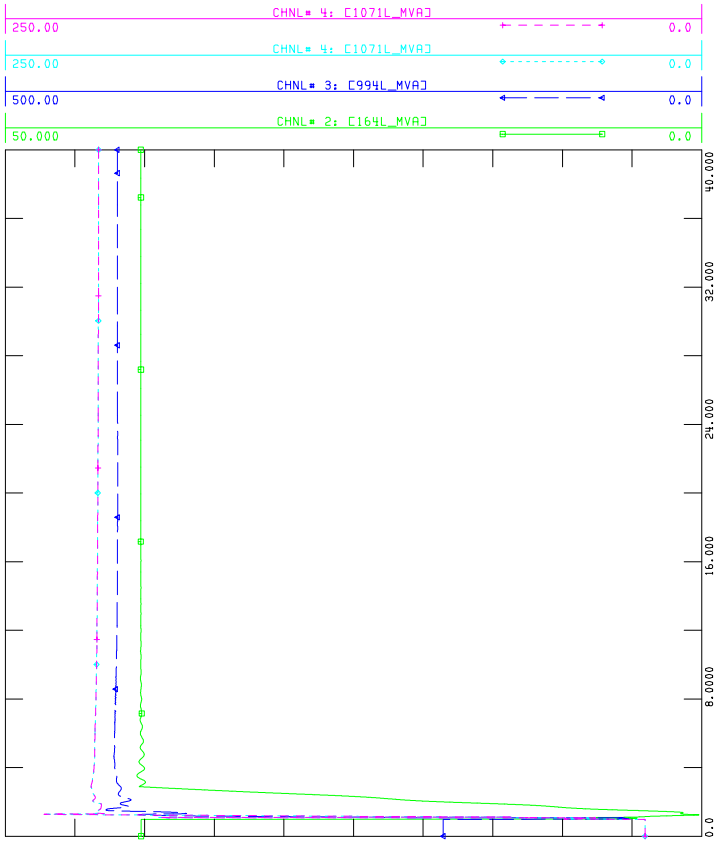

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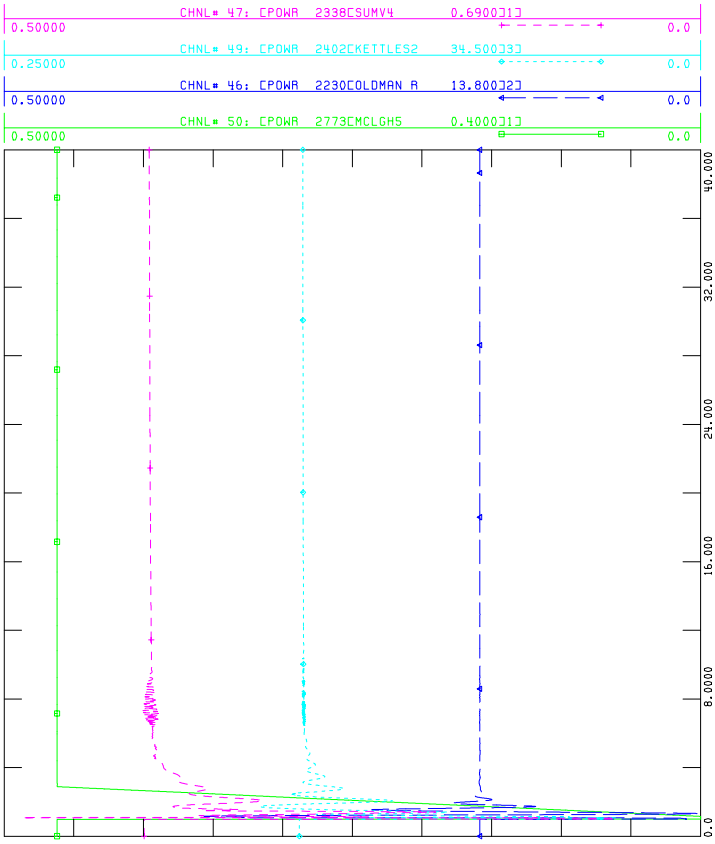

AESO 2018 PBCS 2020SP R1
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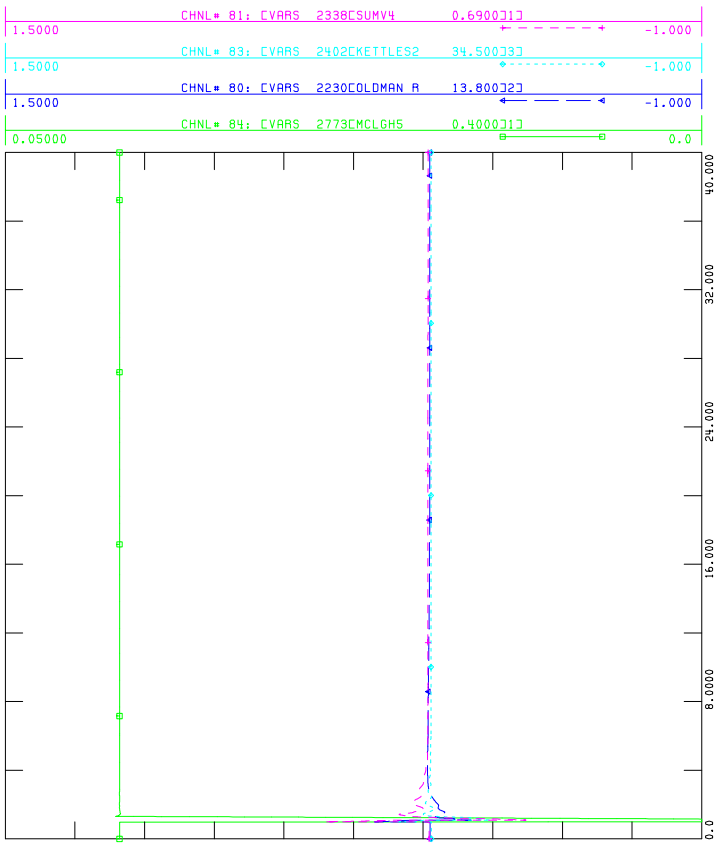

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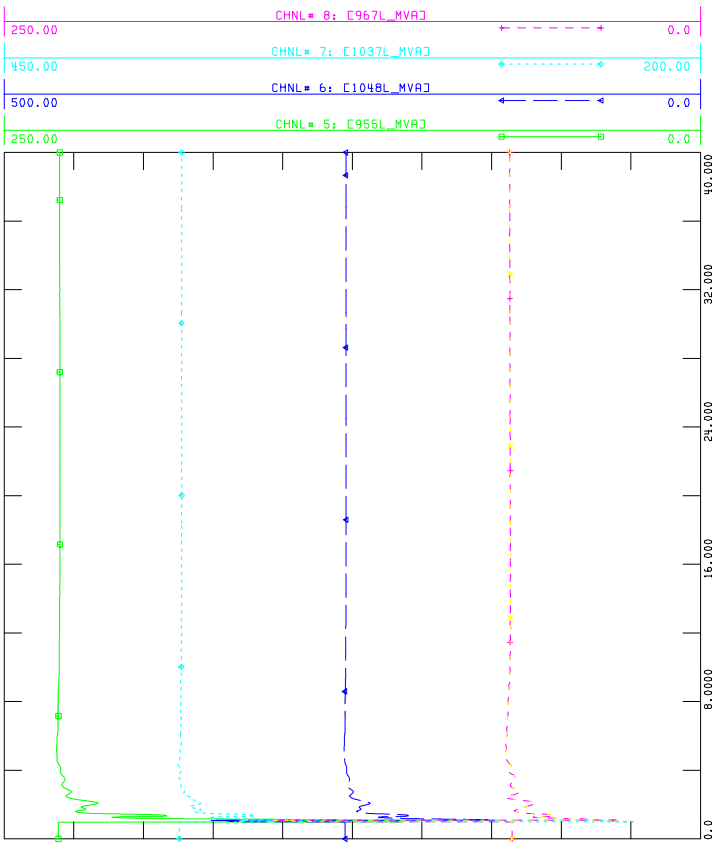

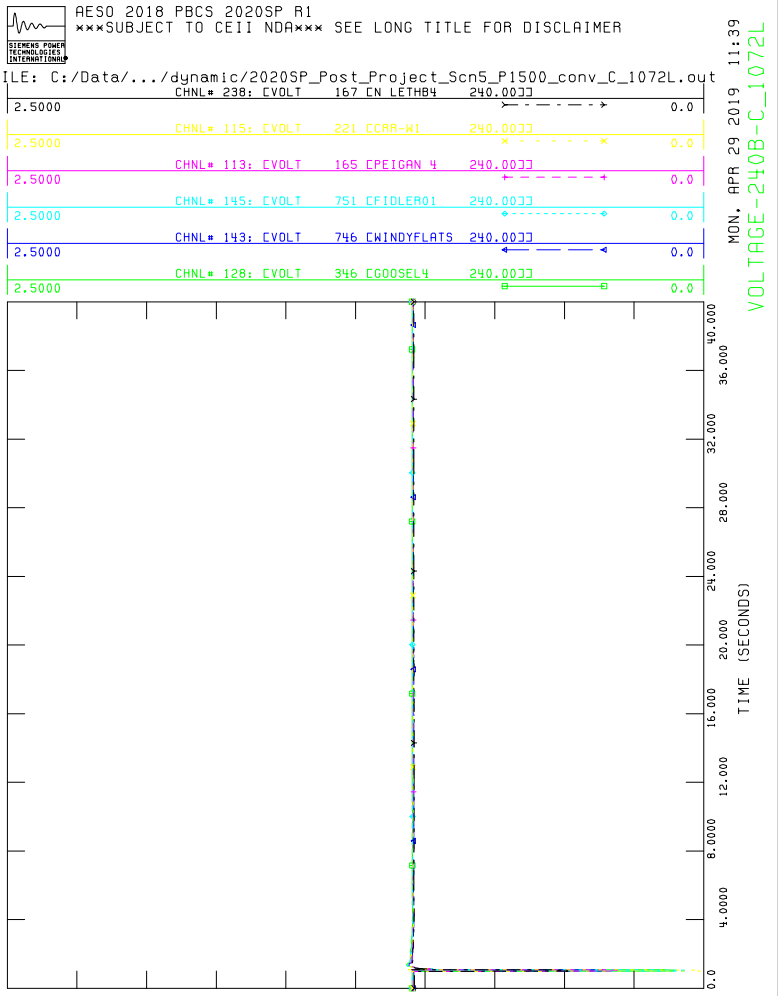
AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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MON, APR 29 2019 11:39
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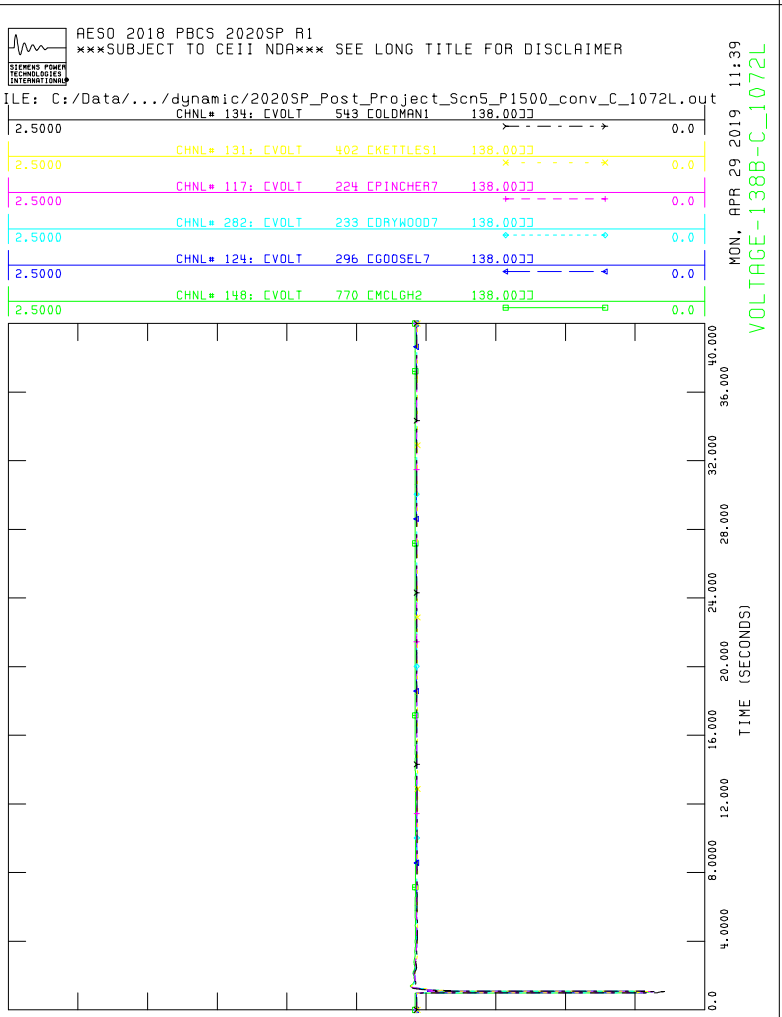
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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VOLTAGE-138B-C_1072L

AESO 2018 PBCS 2020SP R1
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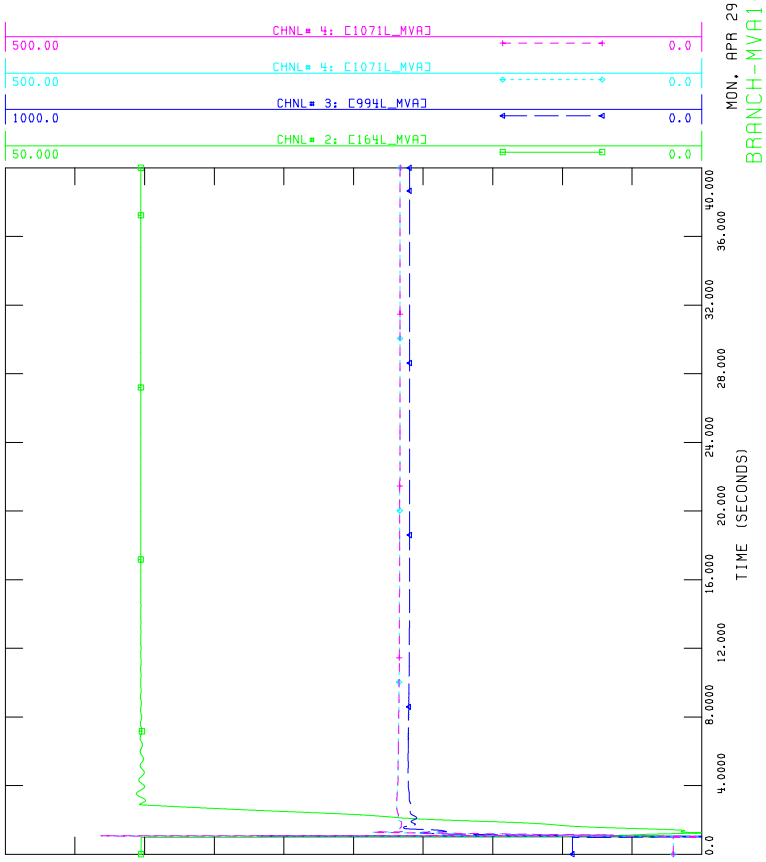

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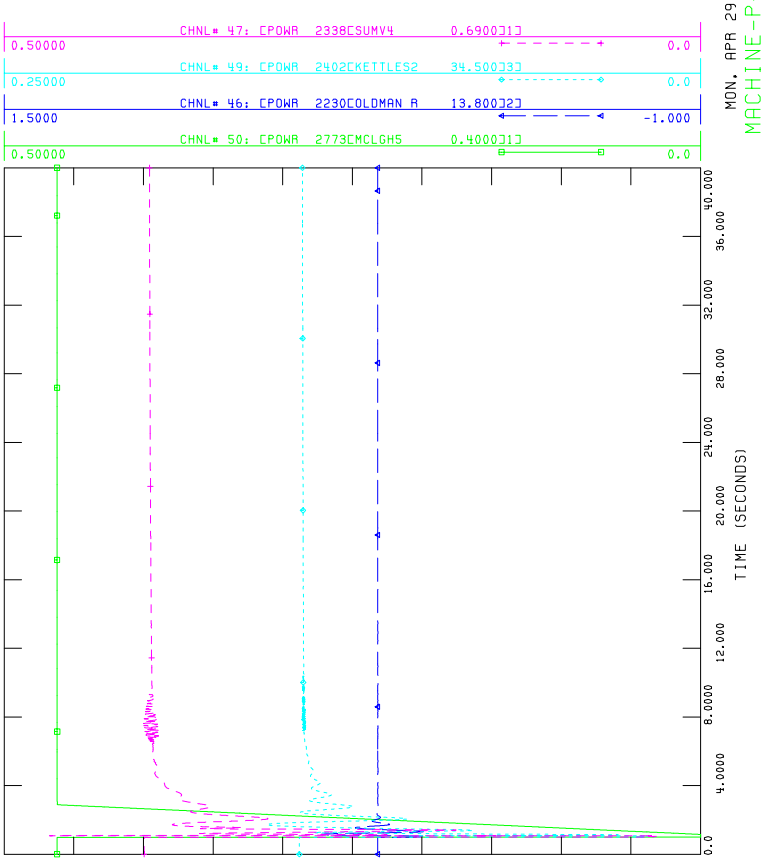

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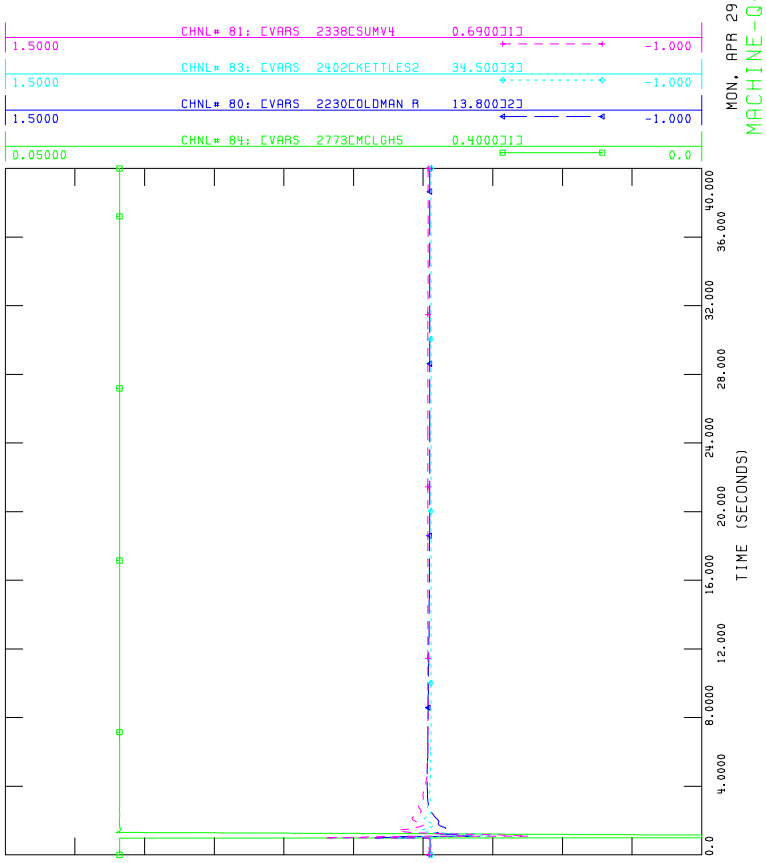

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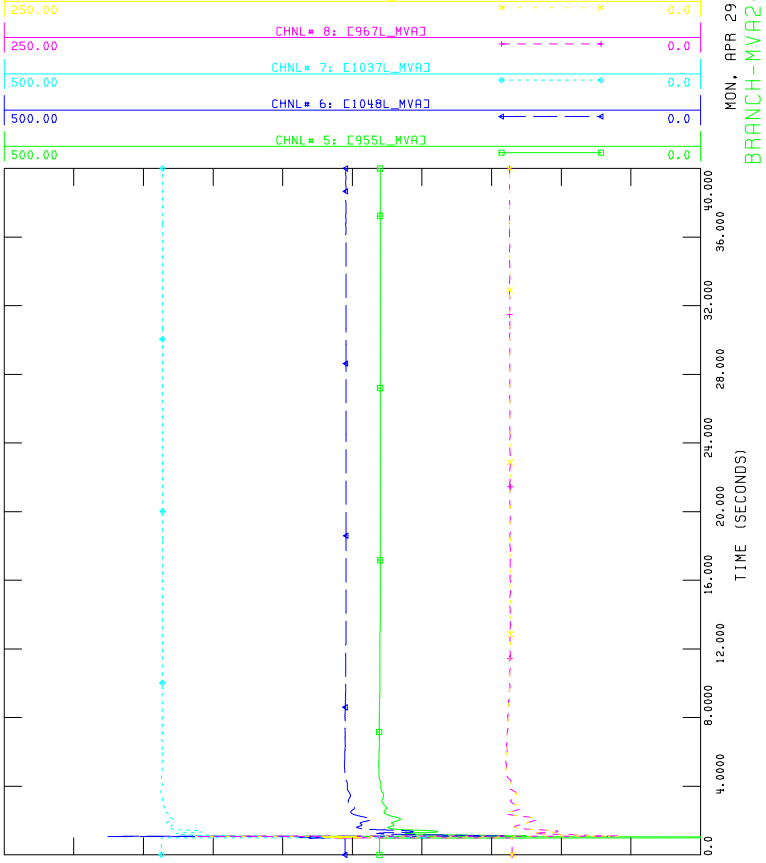

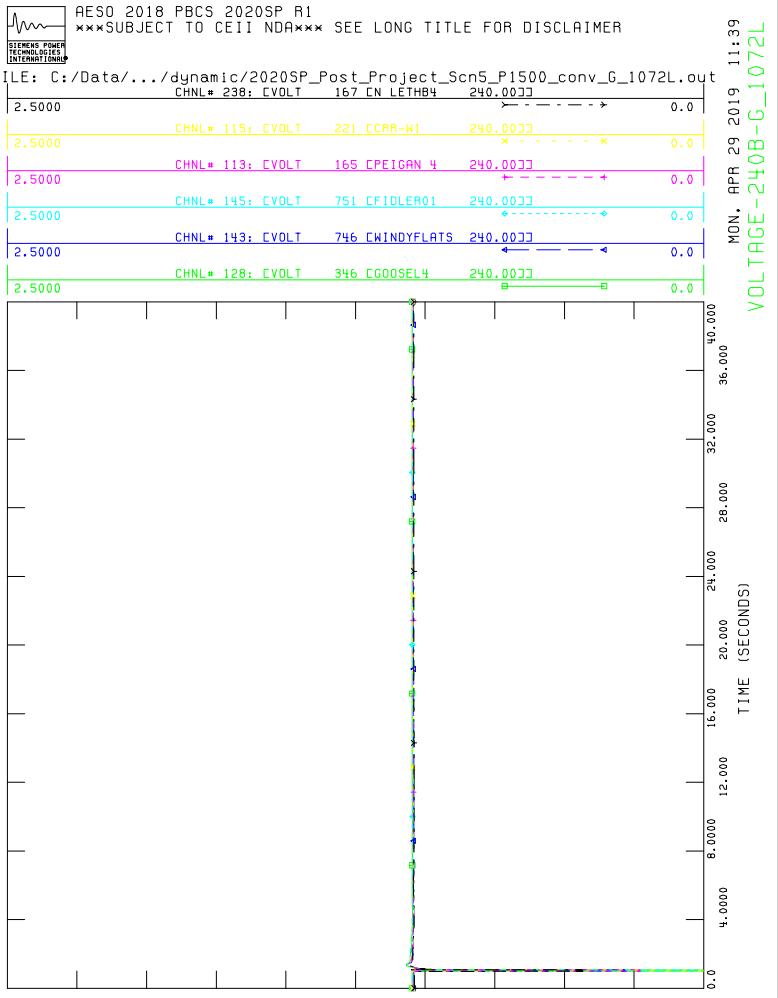
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: C:/Data/.../dynamic/2020SP_Post_Project_Scn5_P1500_conv_G_1072L.out
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CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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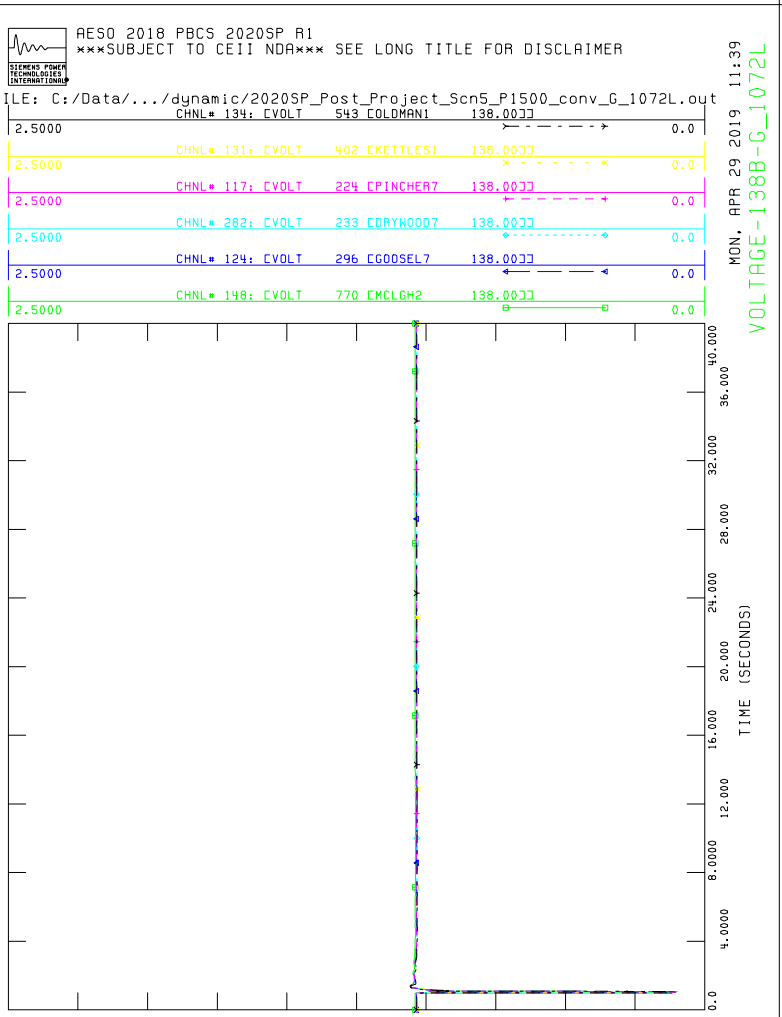
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
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CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
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AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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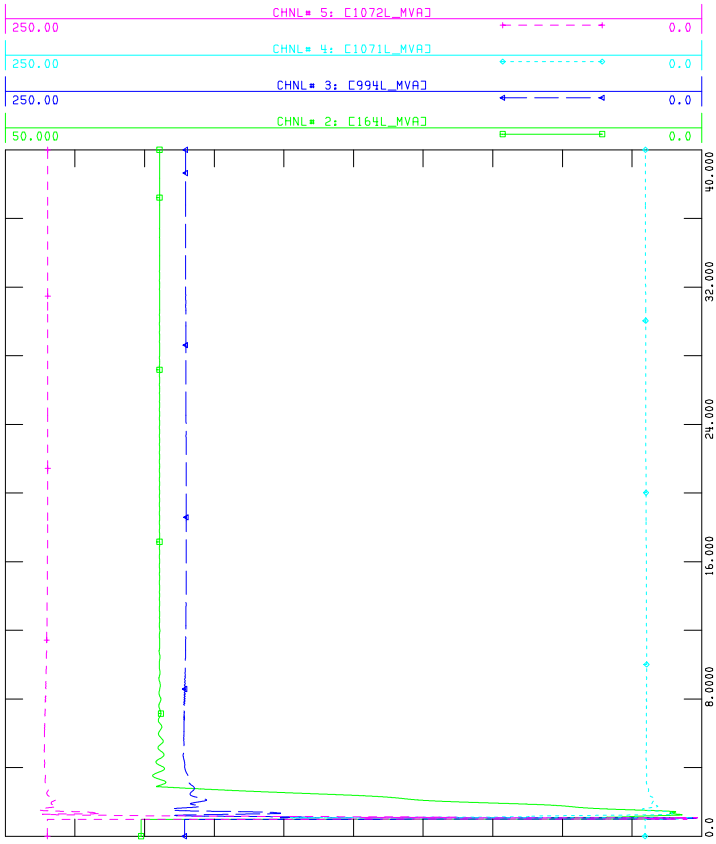

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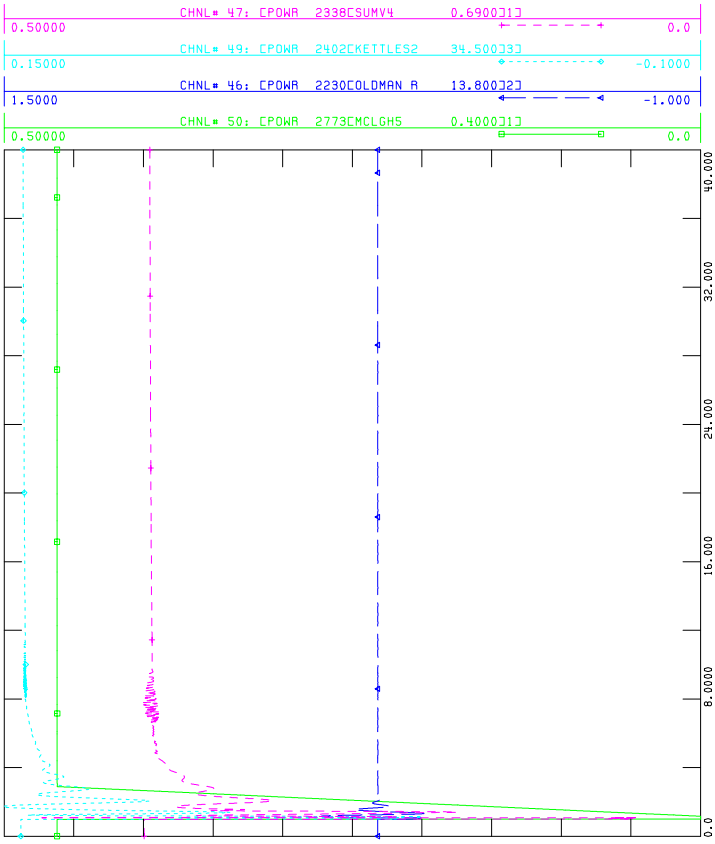

AESO 2018 PBCS 2020SP R1
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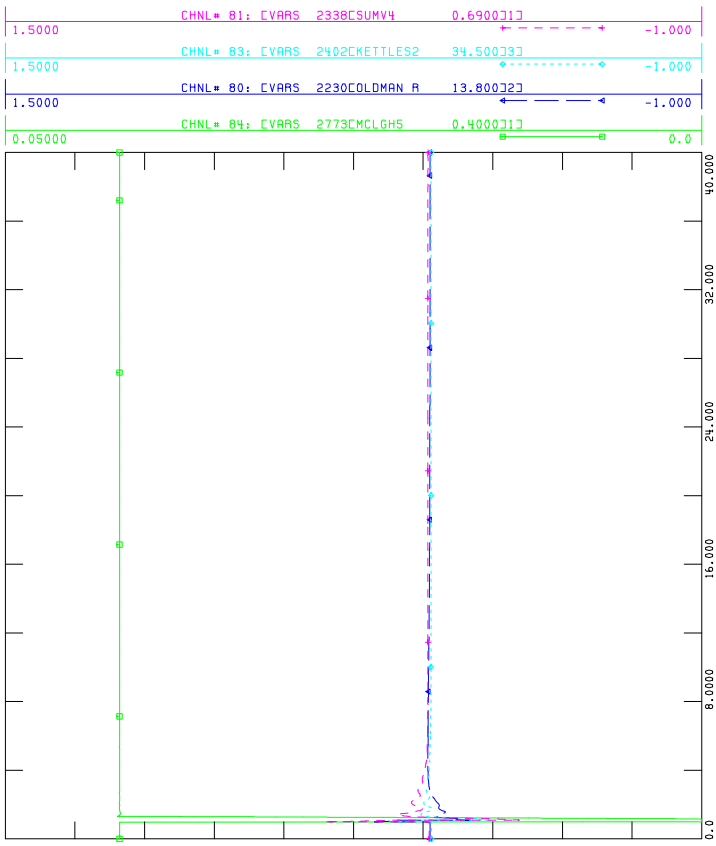

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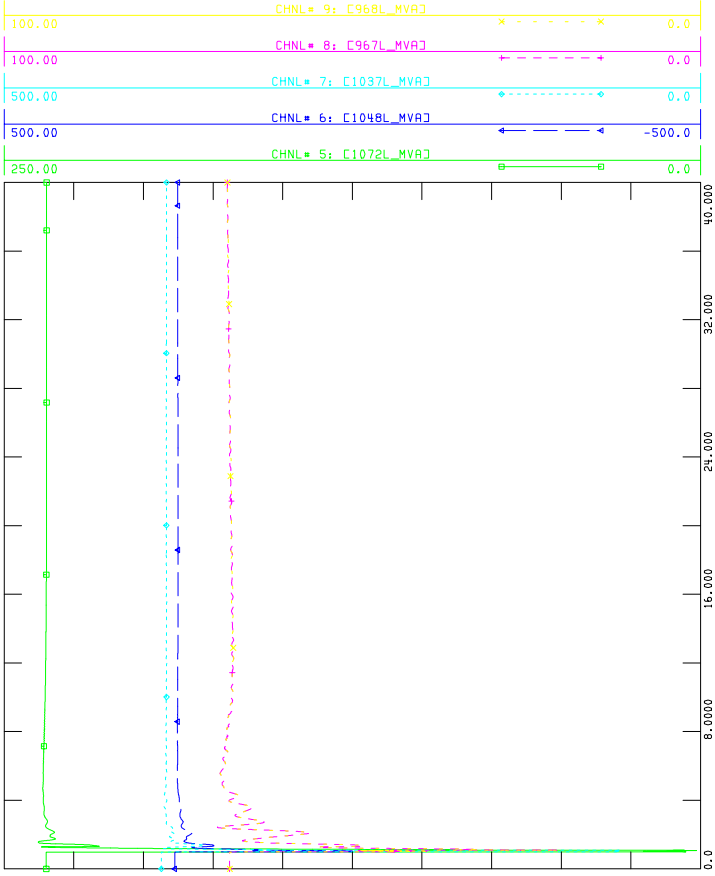

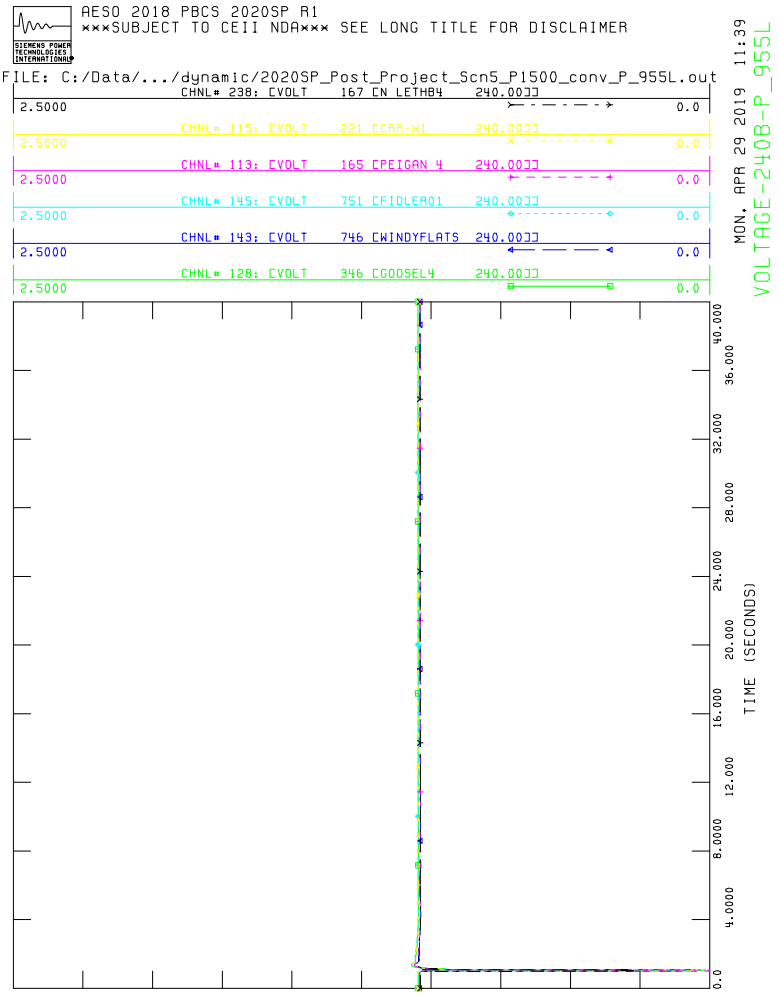
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
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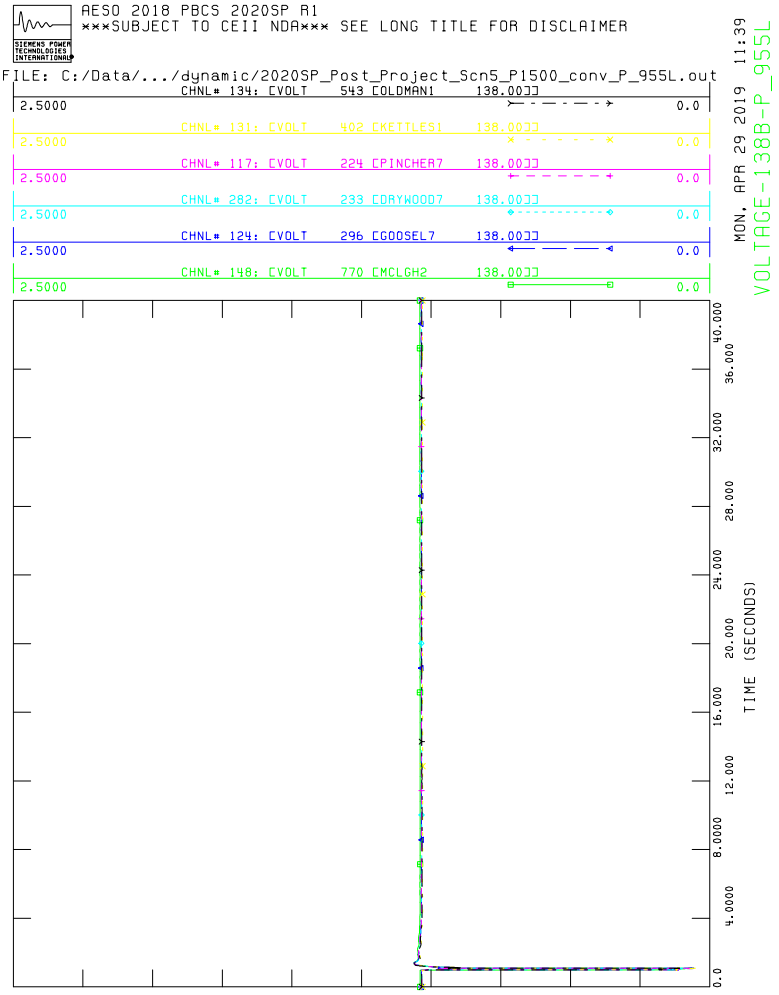
VOLTAGE-240B-P_955L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 134: CVOLT 543 COLDMAN1 138.00JJ
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
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CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
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VOLTAGE-138B-P_955L

AESO 2018 PBCS 2020SP R1
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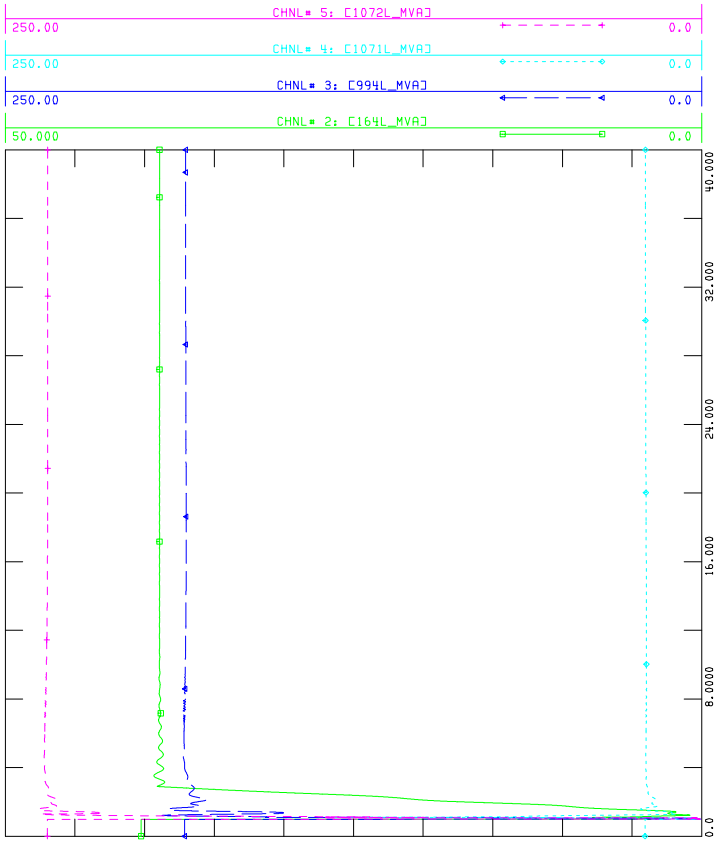

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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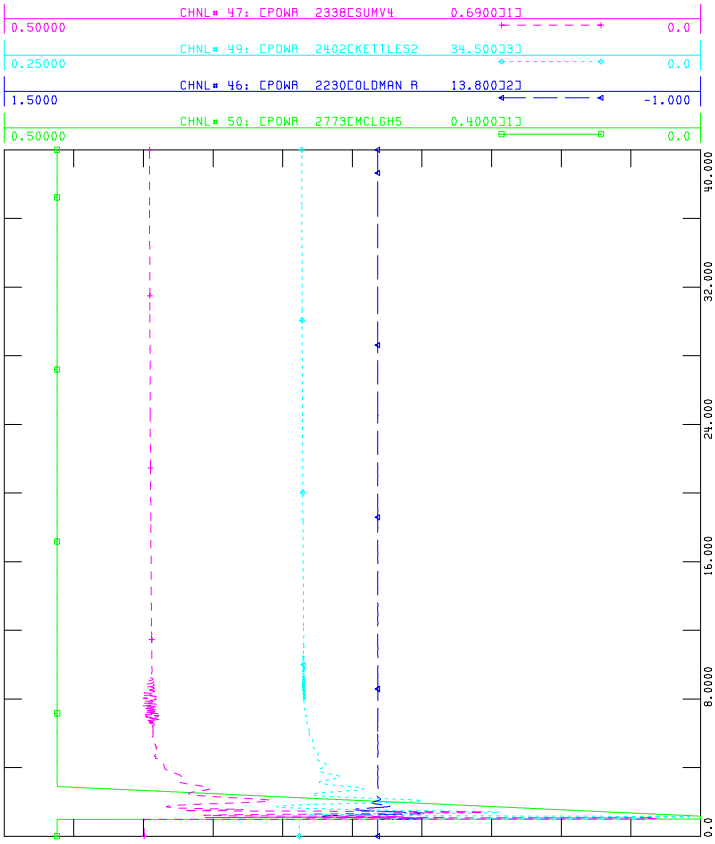
MACHINE-P-G_955L



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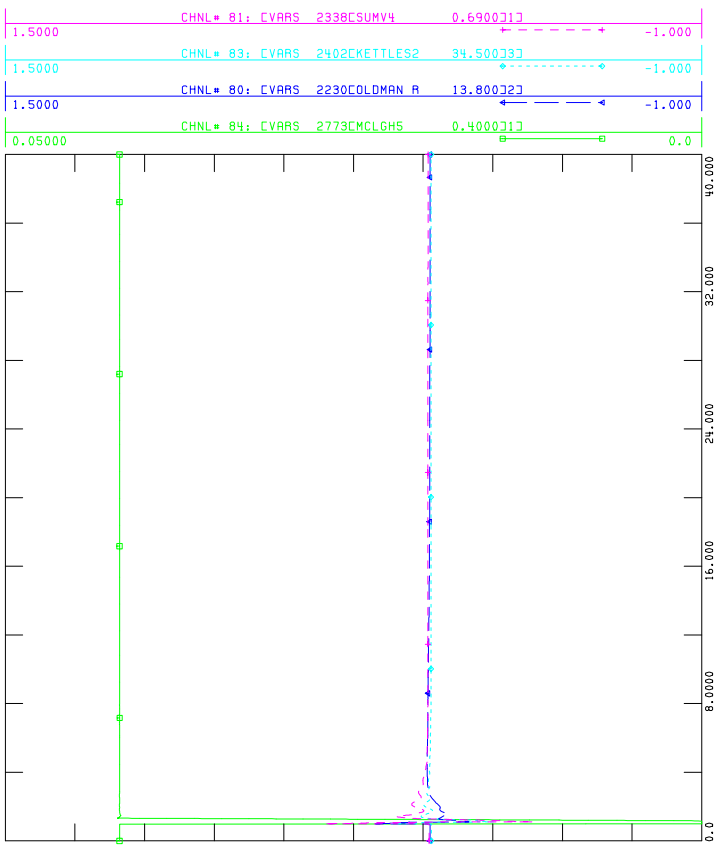

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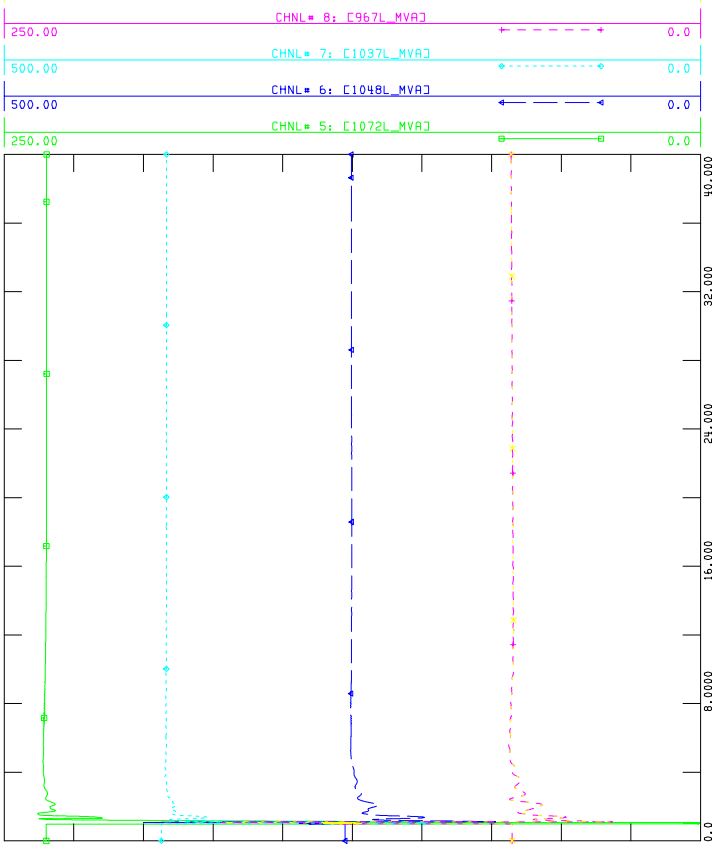

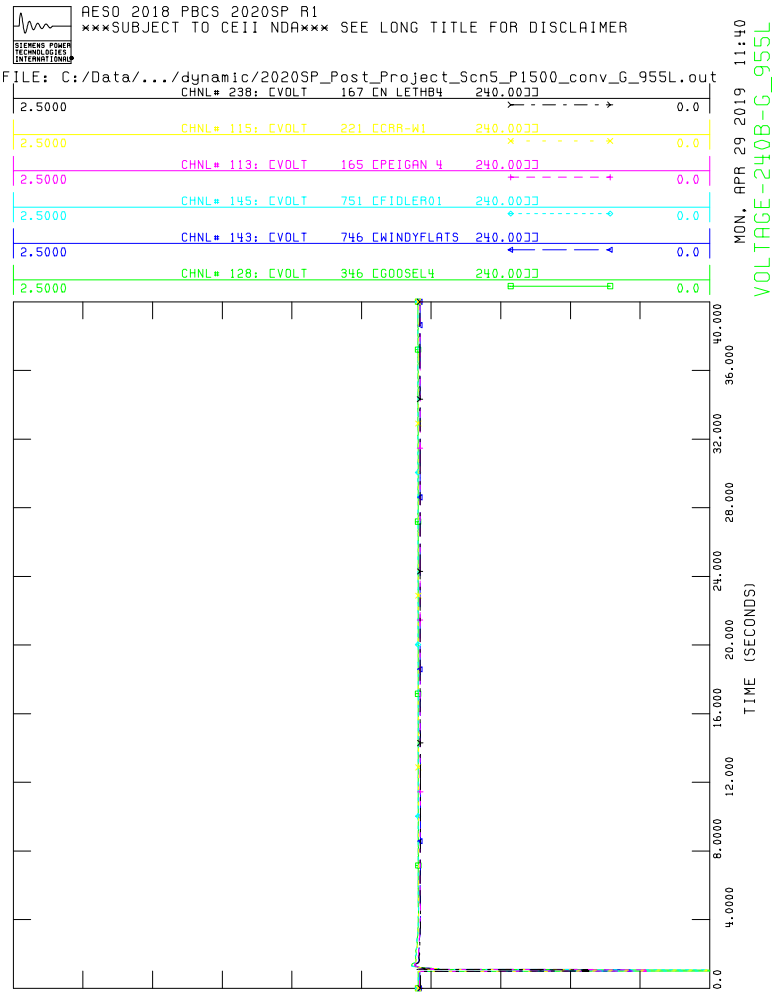
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 115: CVOLT 221 CCRR-W1 240.00
CHNL# 113: CVOLT 165 CPEIGAN 4 240.00
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CHNL# 143: CVOLT 746 CWINDYFLATS 240.00
CHNL# 128: CVOLT 346 CGOOSEL4 240.00
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MON, APR 29 2019 11:40
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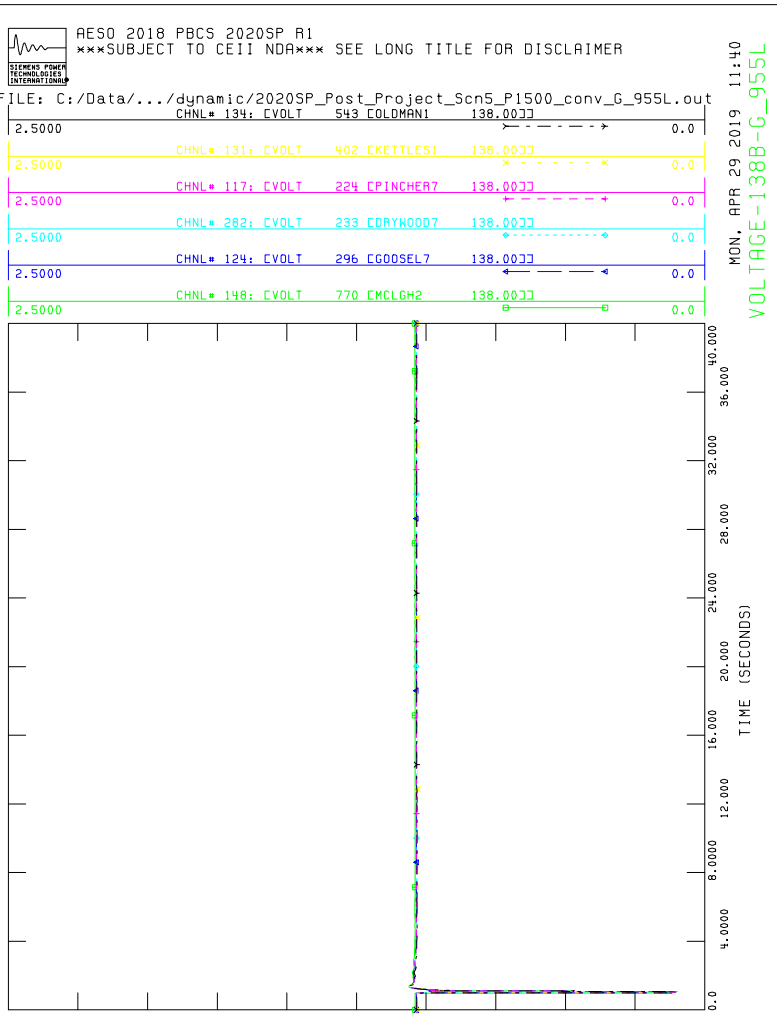
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VOLTAGE-138B-G_955L

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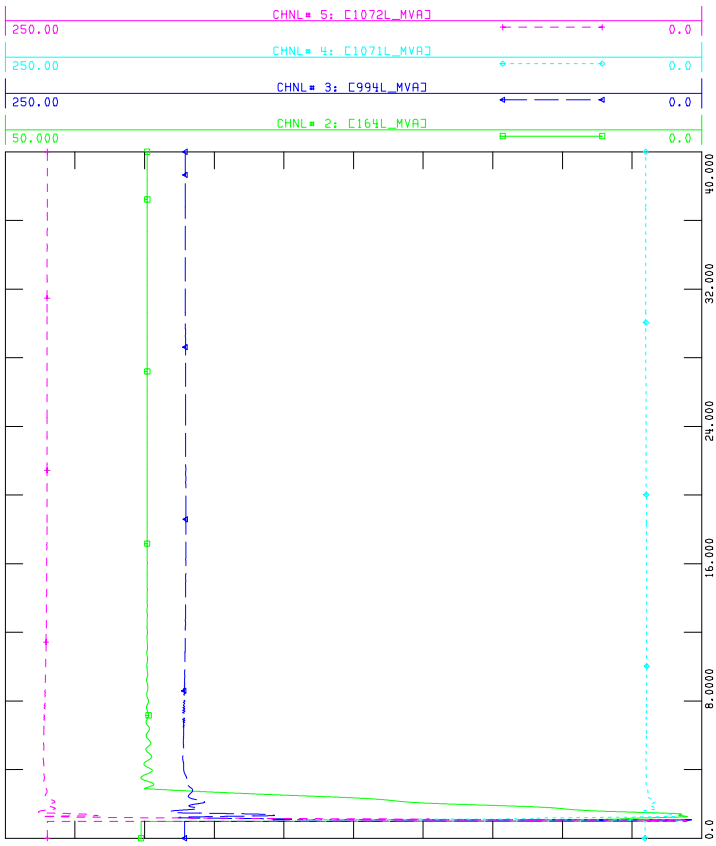

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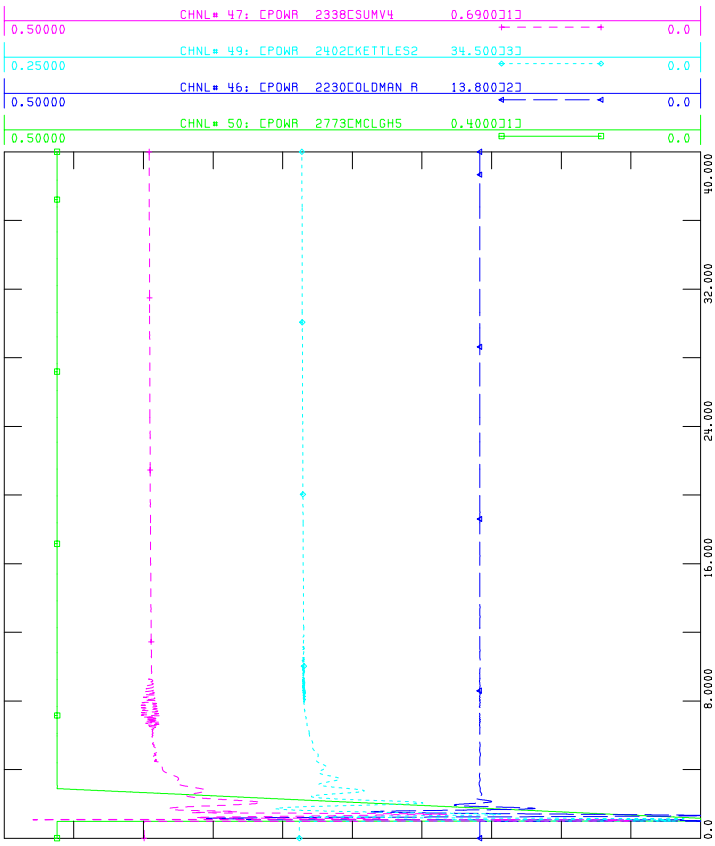

AESO 2018 PBCS 2020SP R1
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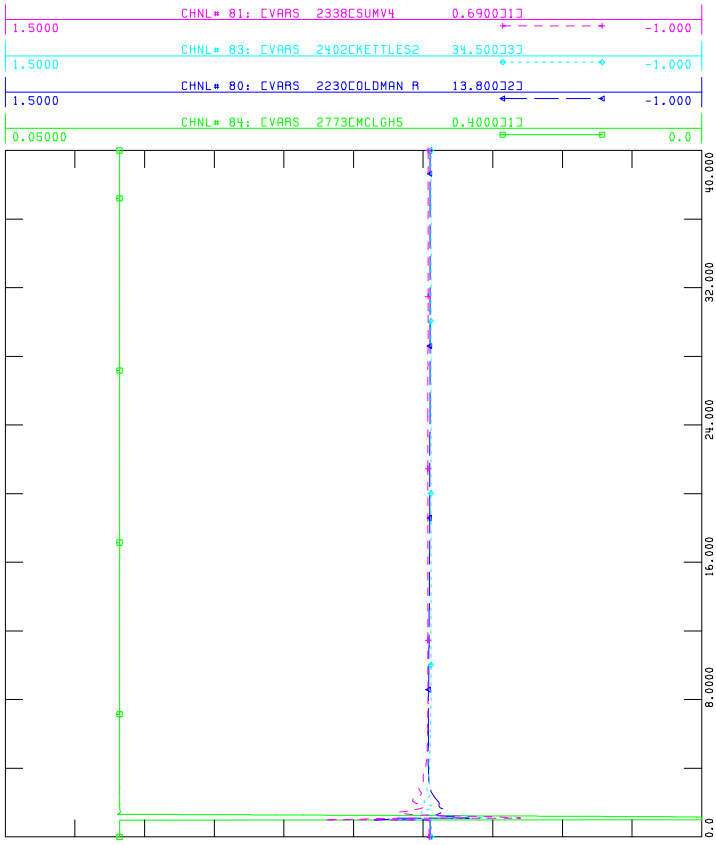

AESO 2018 PBCS 2020SP R1
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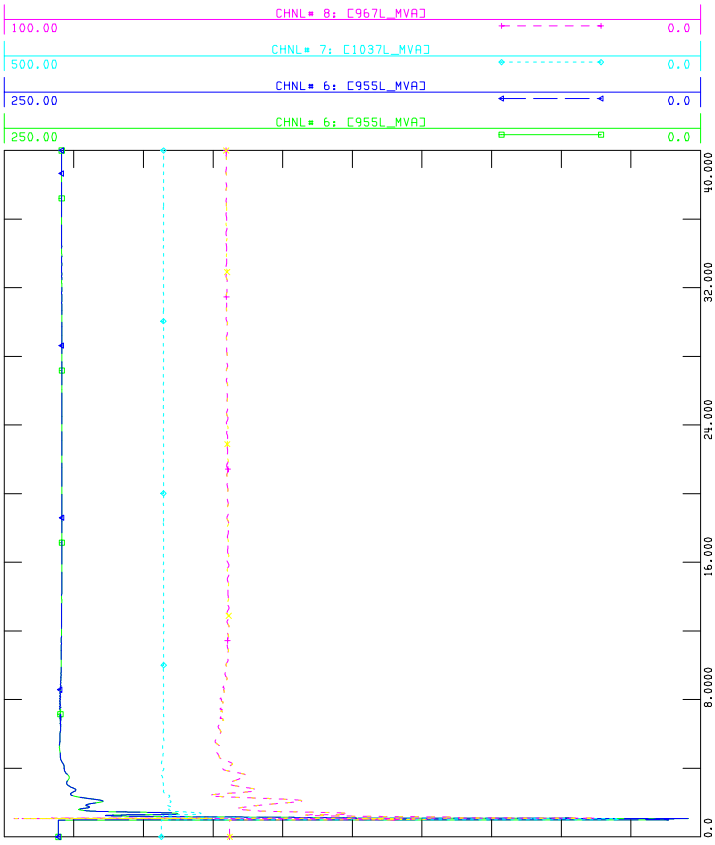
BRANCH-MVA2-P_1048L



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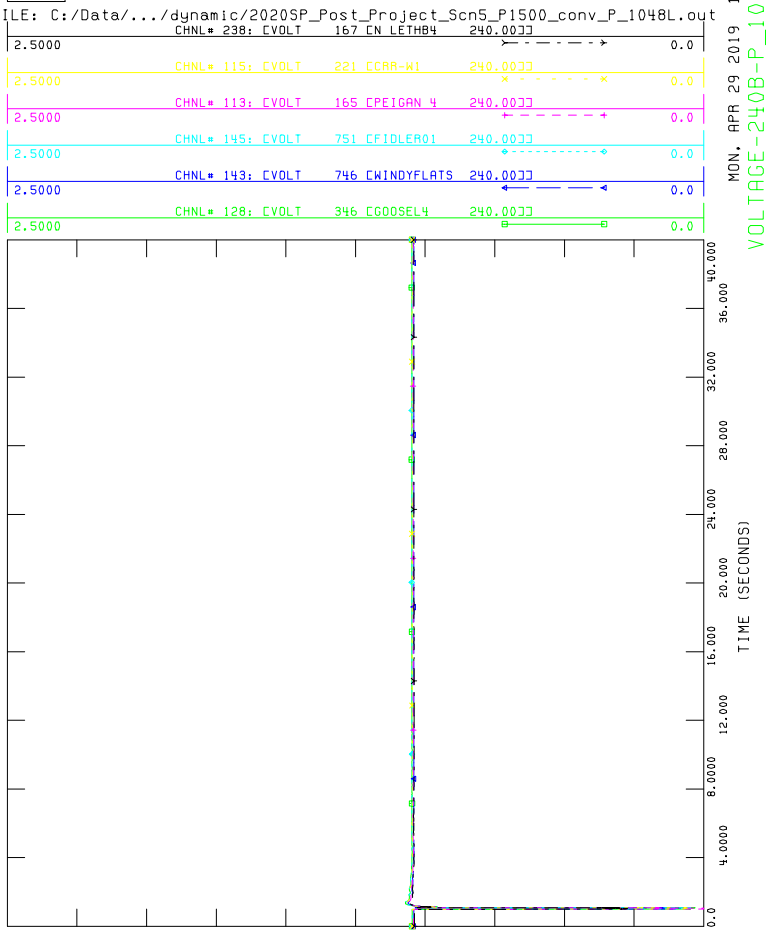

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VOLTAGE-240B-P_1048L

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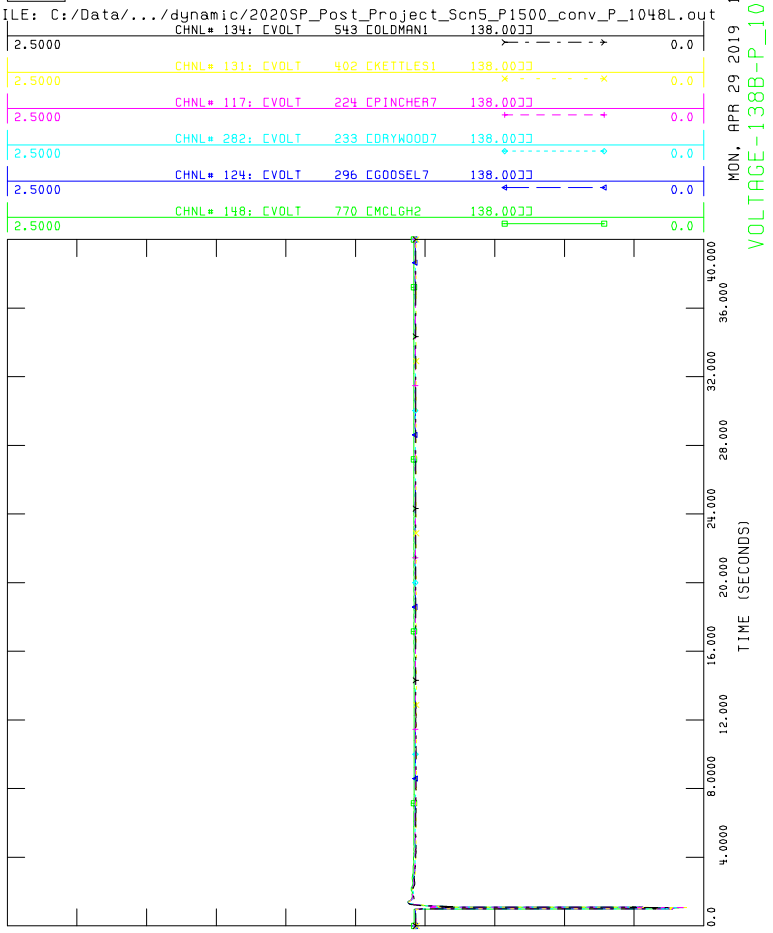

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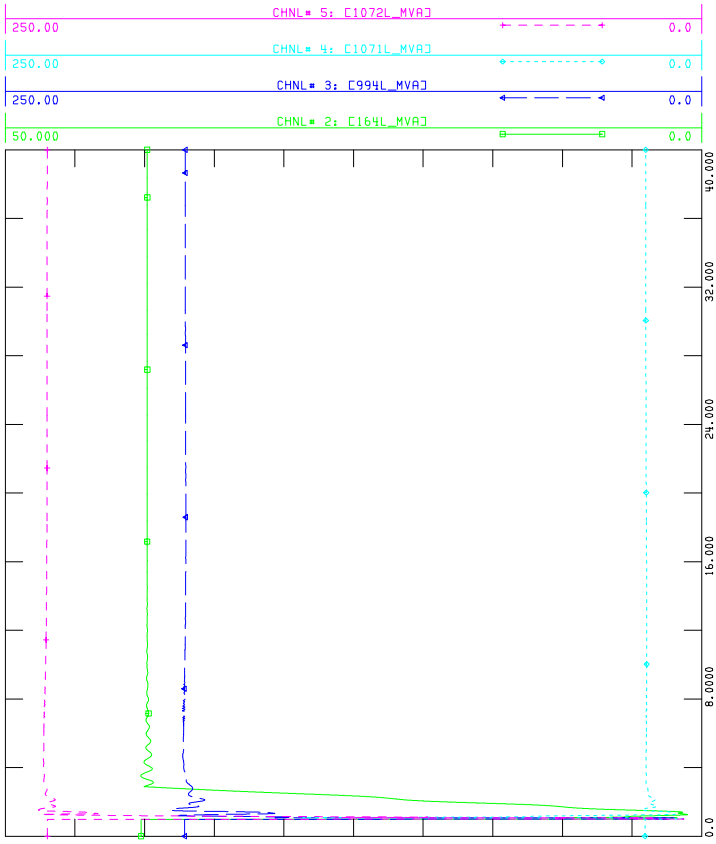

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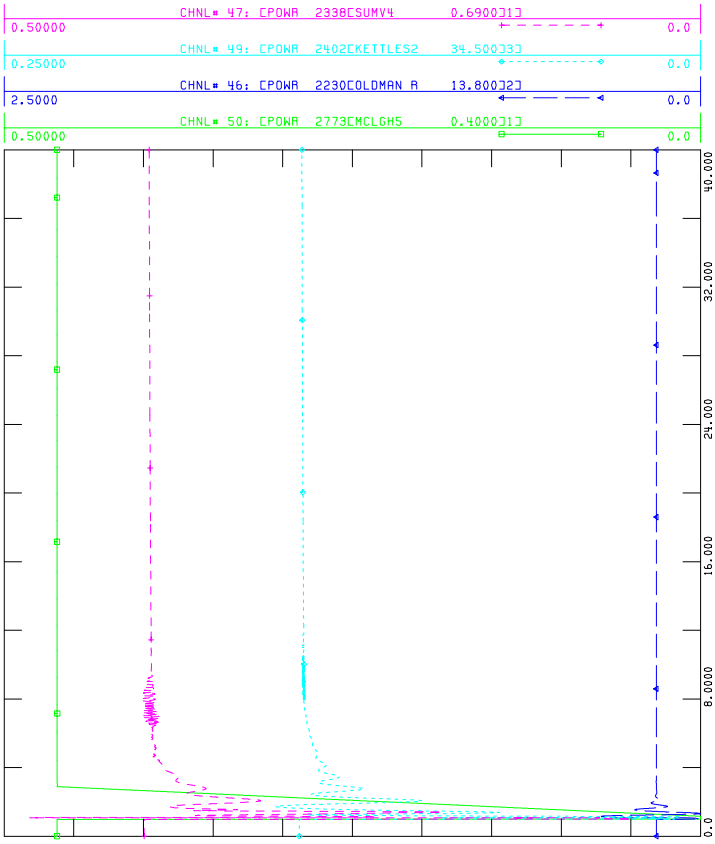

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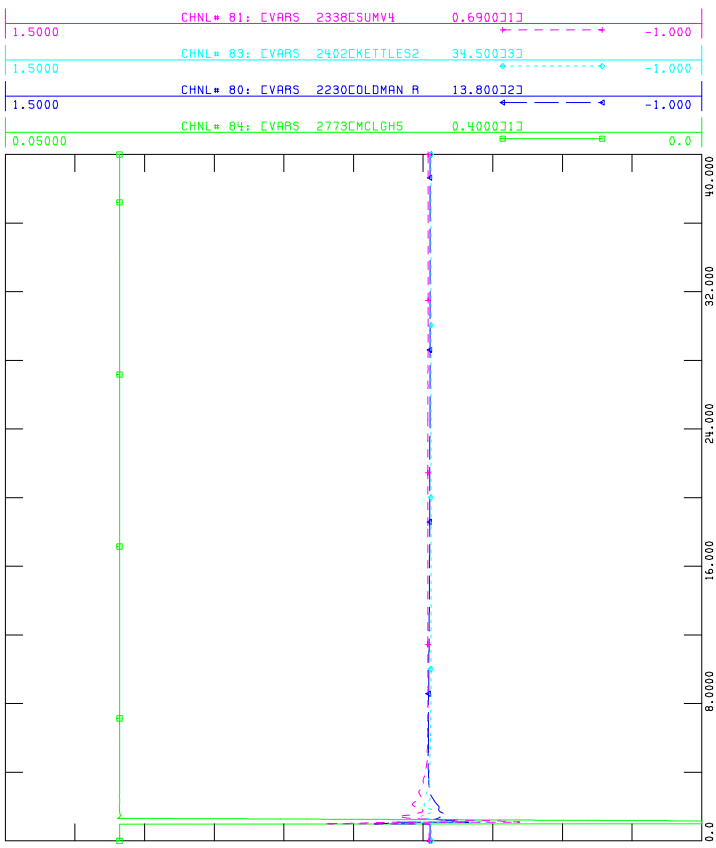

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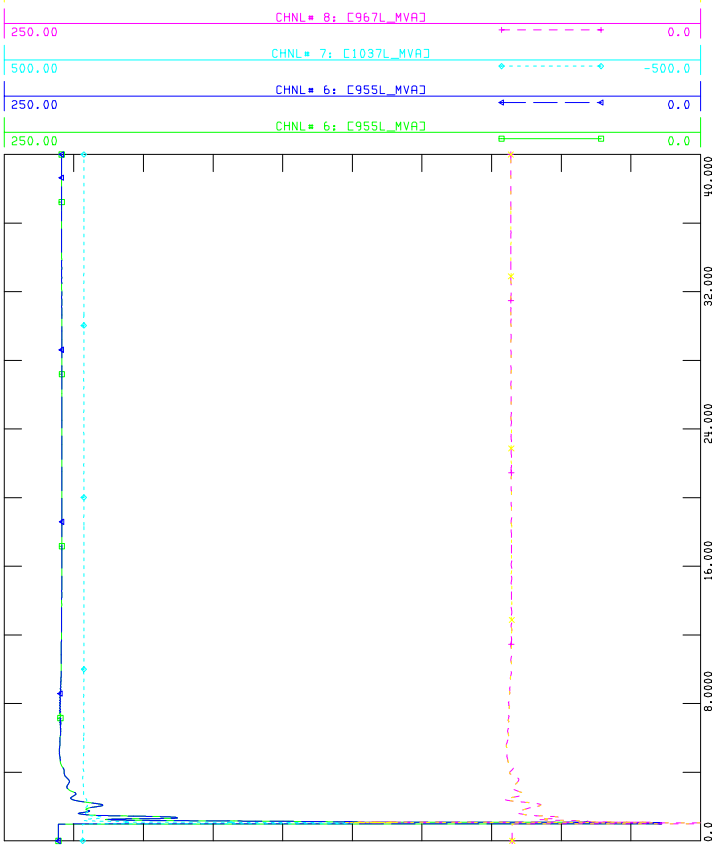
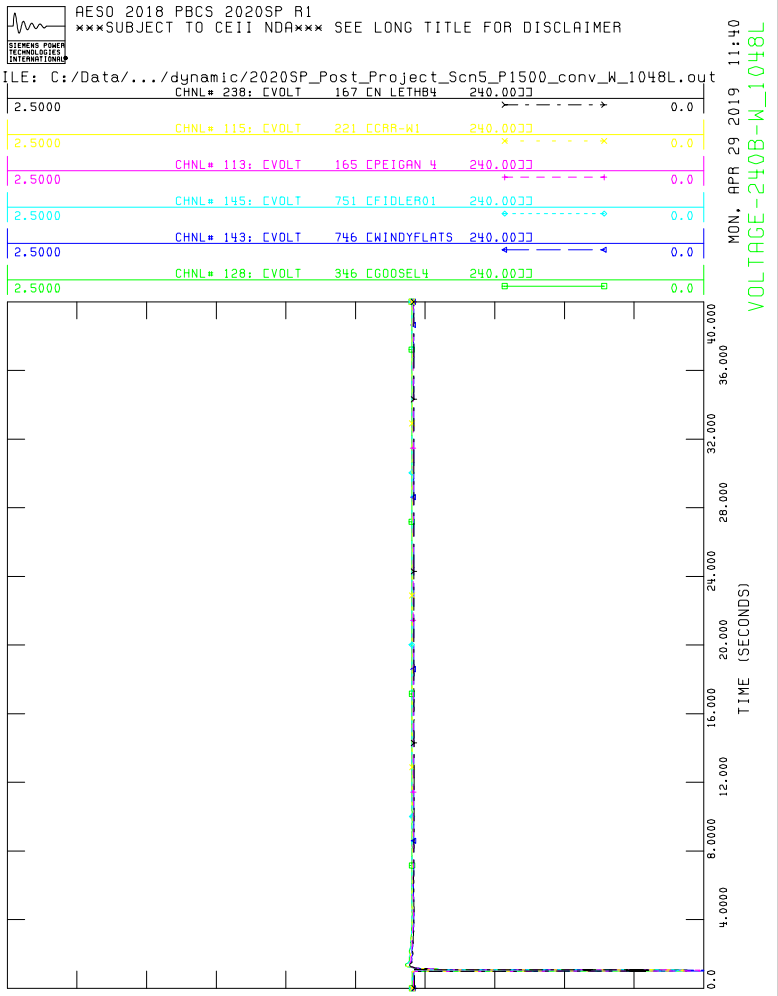
BRANCH-MVA2-W_1048L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 115: CVOLT 221 CCRR-W1 240.000
CHNL# 113: CVOLT 165 CPEIGAN 4 240.000
CHNL# 145: CVOLT 751 CFIDLER01 240.000
CHNL# 143: CVOLT 746 CWINDYFLATS 240.000
CHNL# 128: CVOLT 346 CGOOSEL4 240.000
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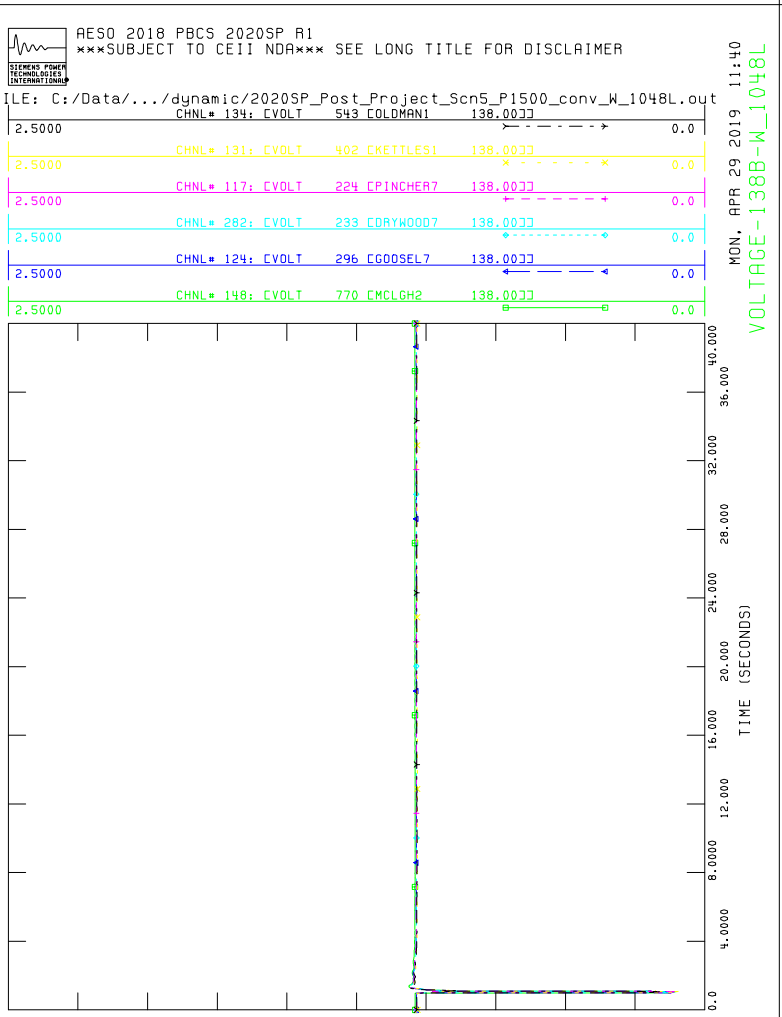
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CHNL# 117: CVOLT 224 CPINCHER7 138.000
CHNL# 282: CVOLT 233 CDRYWOOD7 138.000
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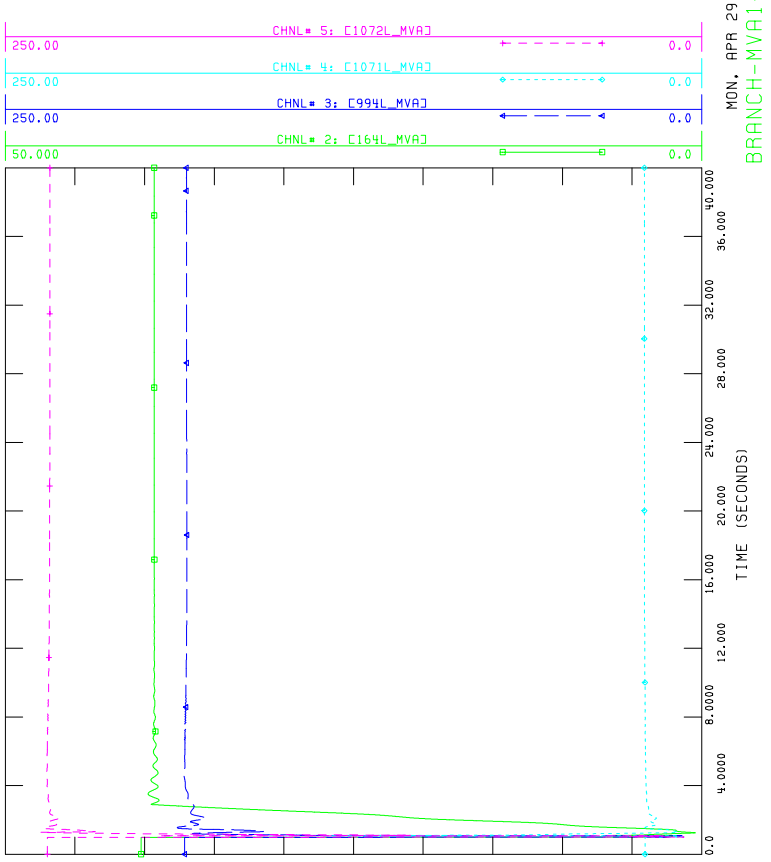

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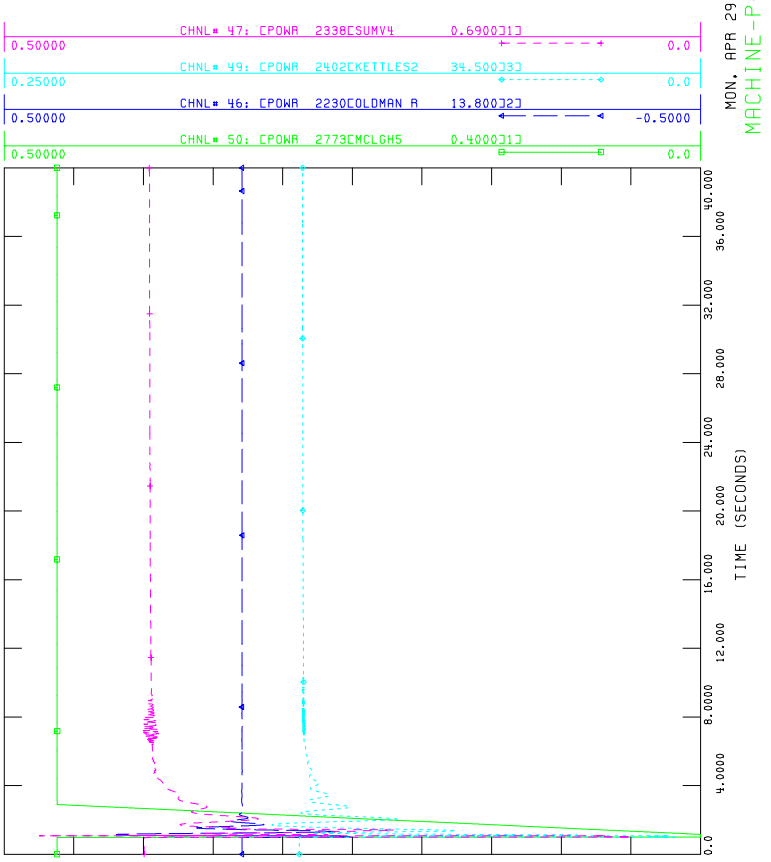

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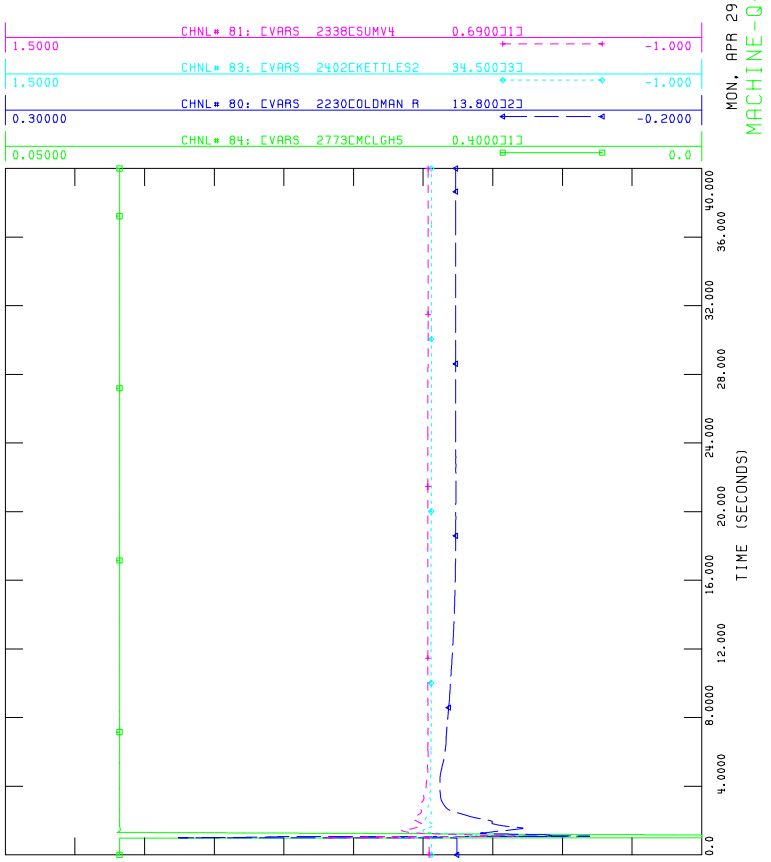

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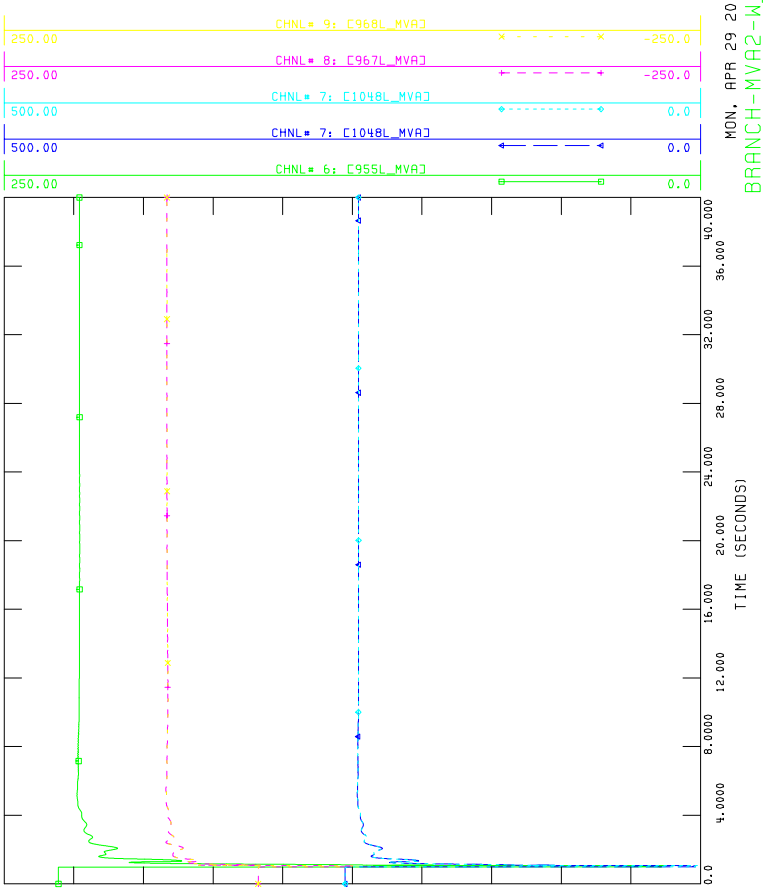

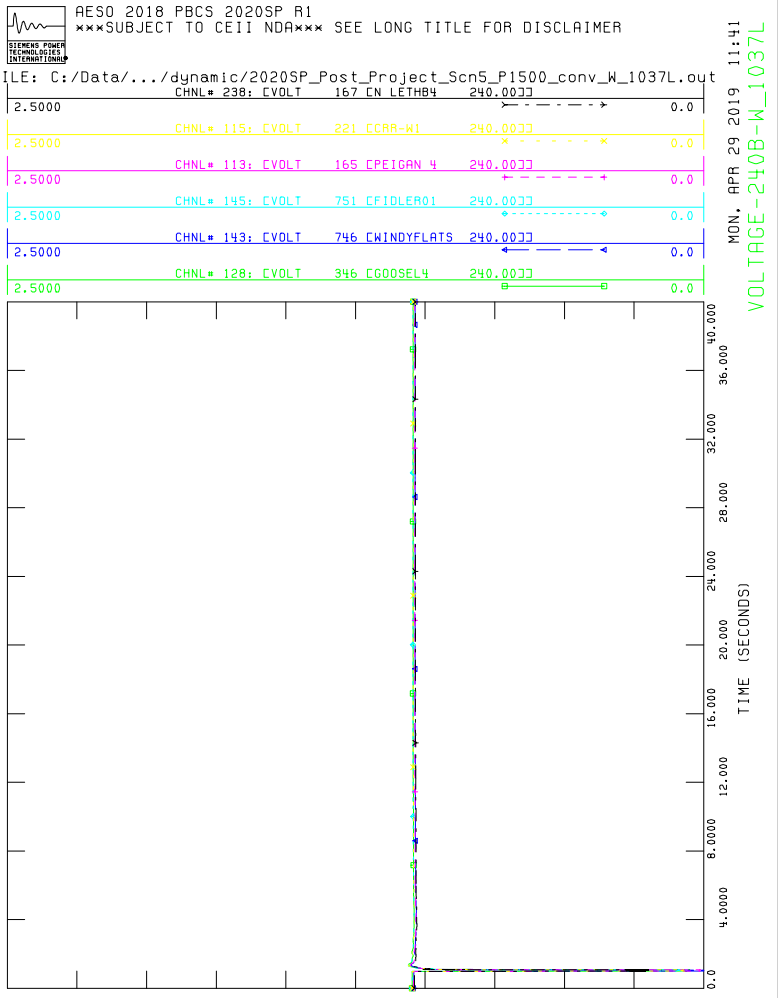
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 113: CVOLT 165 CPEIGAN 4 240.000
CHNL# 145: CVOLT 751 CFIDLER01 240.000
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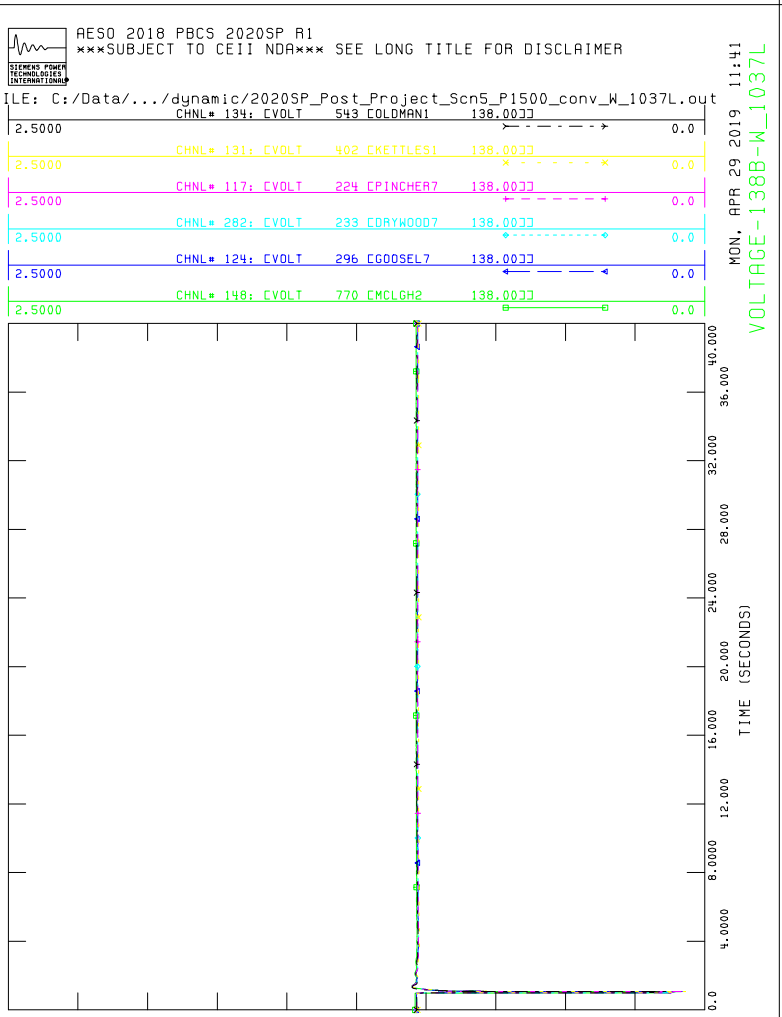
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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CHNL# 131: CVOLT 402 CKETTLES1 138.000
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CHNL# 282: CVOLT 233 CDRYWOOD7 138.000
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AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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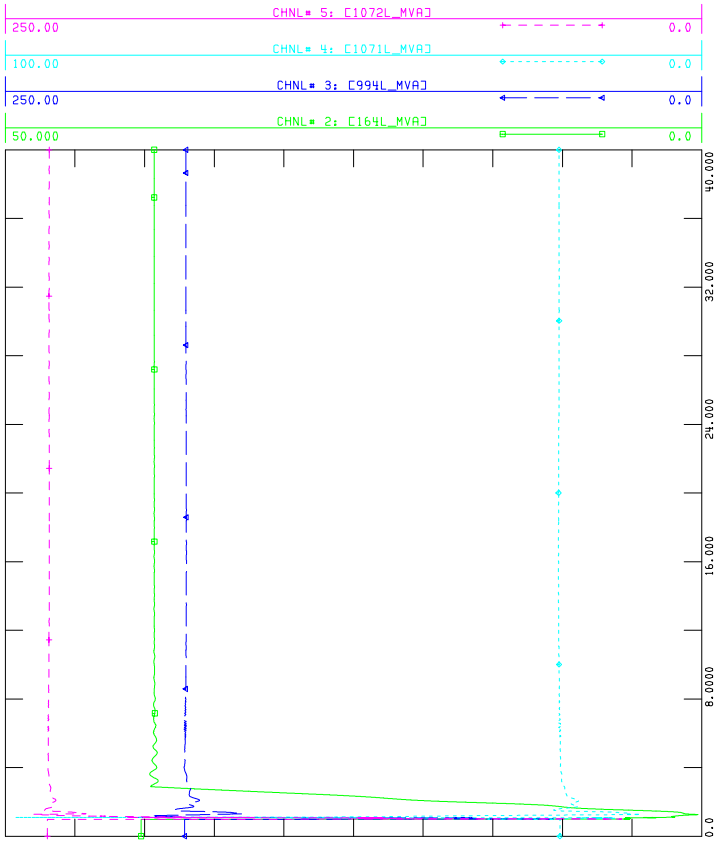

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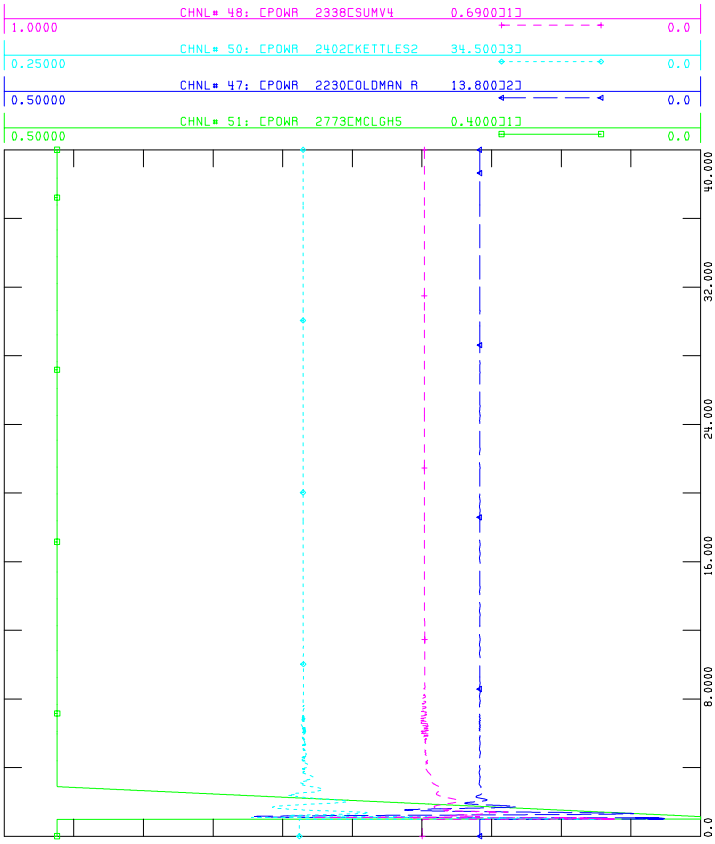

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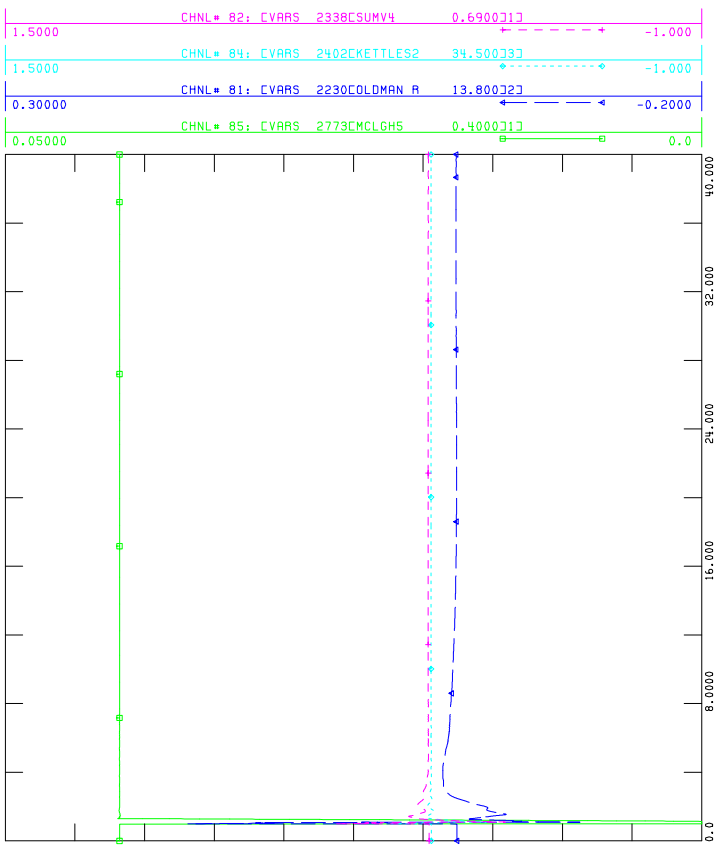

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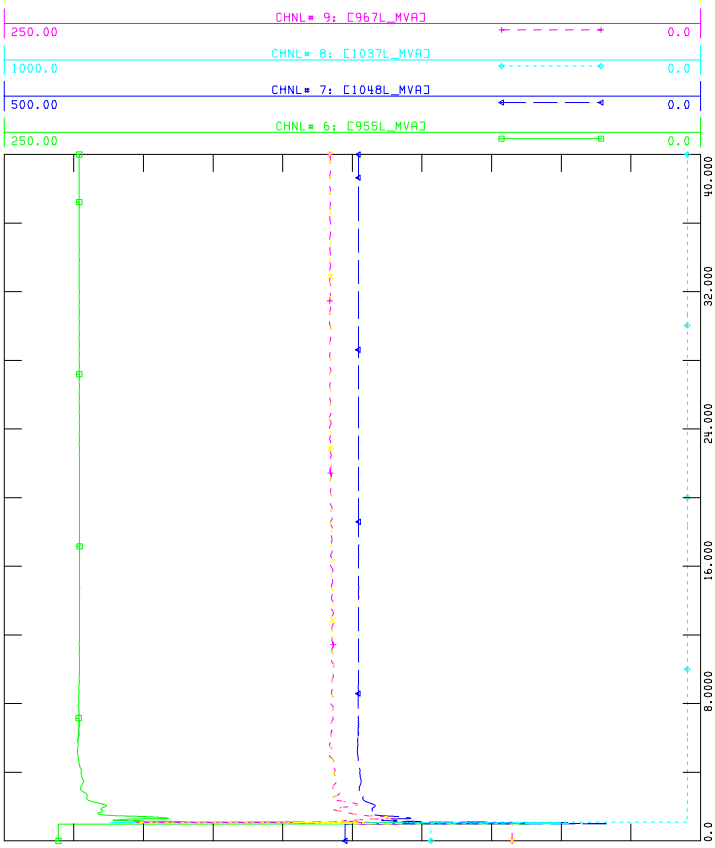

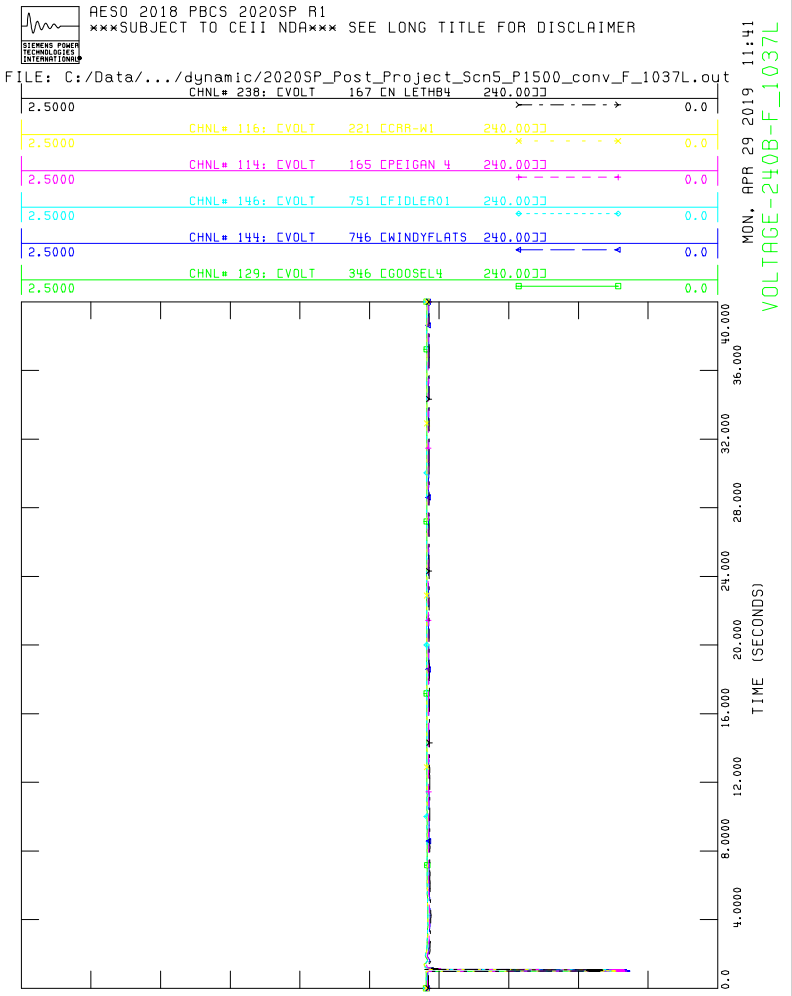
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 114: CVOLT 165 CPEIGAN 4 240.000
CHNL# 146: CVOLT 751 CFIDLER01 240.000
CHNL# 144: CVOLT 746 CWINDYFLATS 240.000
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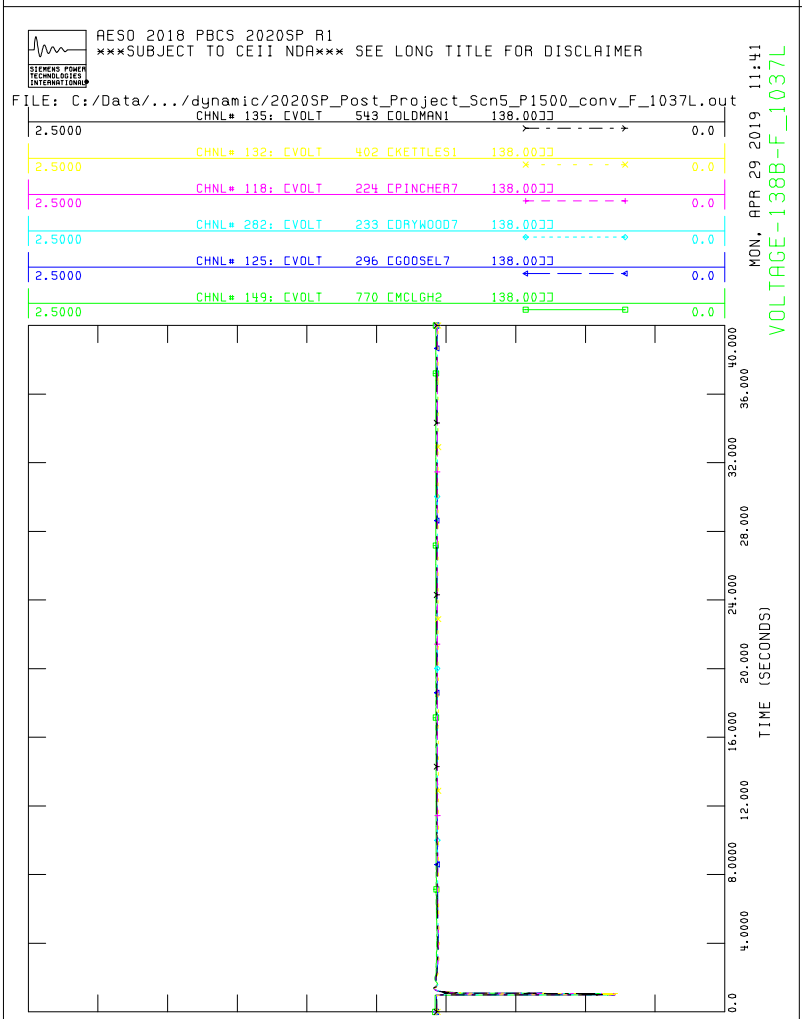
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CHNL# 135: CVOLT 543 COLDMAN1 138.000
CHNL# 132: CVOLT 402 CKETTLES1 138.000
CHNL# 118: CVOLT 224 CPINCHER7 138.000
CHNL# 282: CVOLT 233 CDRYWOOD7 138.000
CHNL# 125: CVOLT 296 CGOOSEL7 138.000
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VOLTAGE-138B-F_1037L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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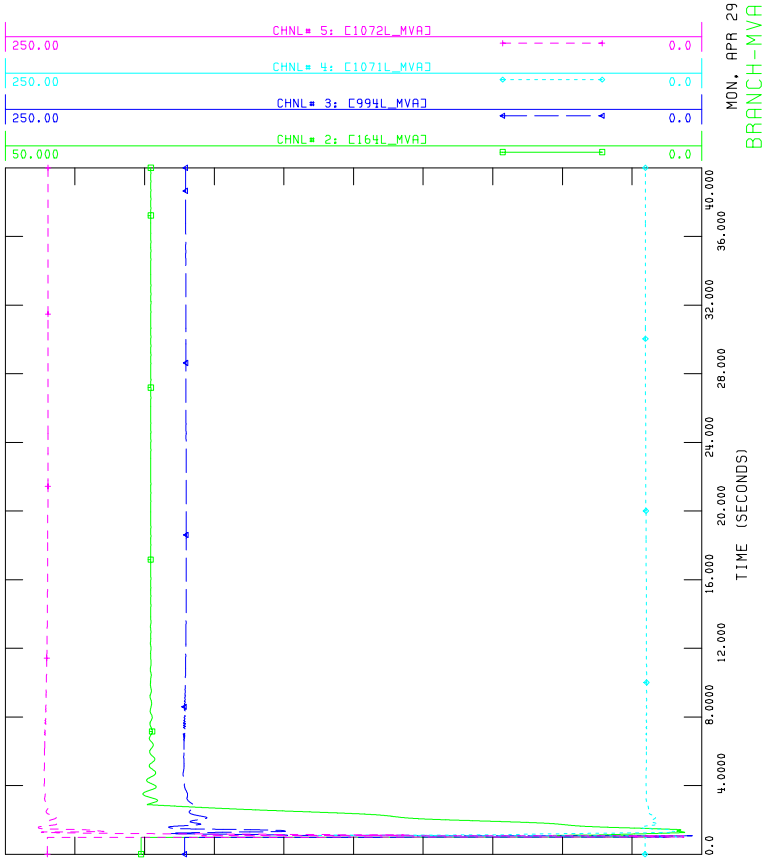

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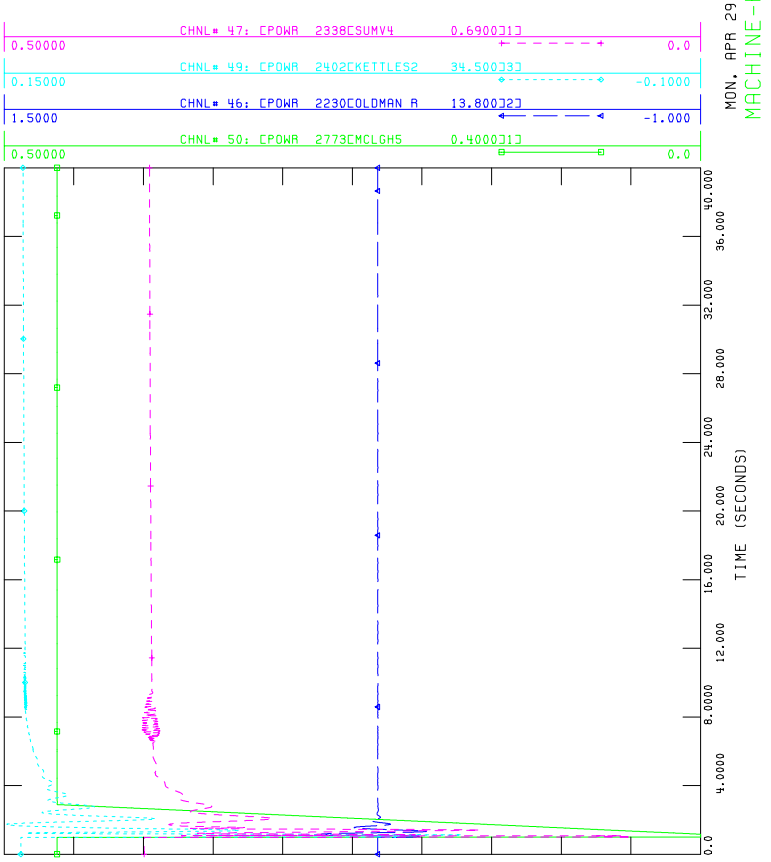

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MACHINE-P-W_967L

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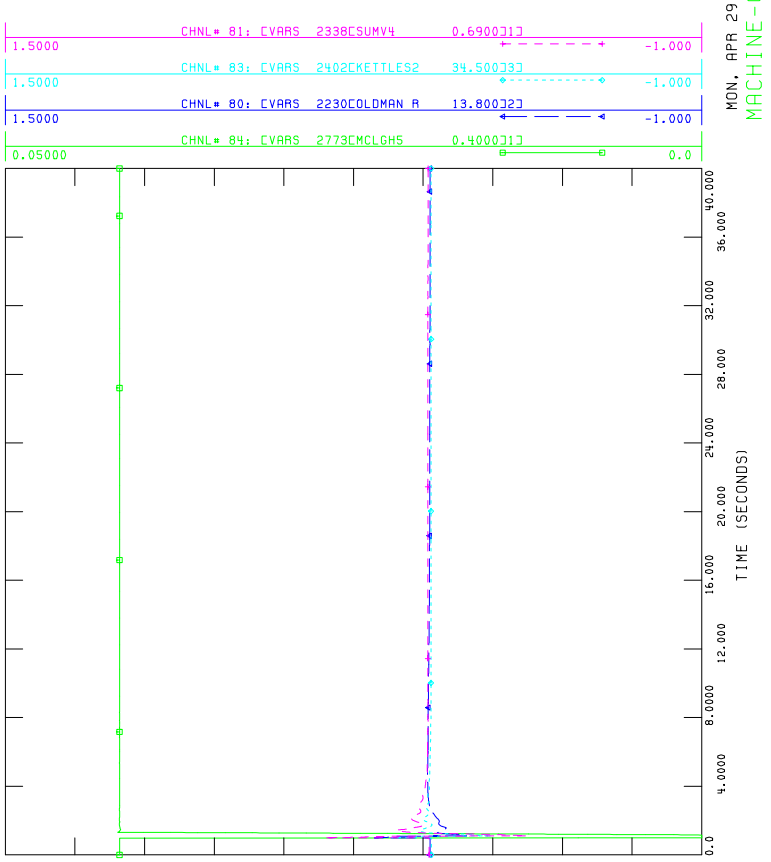

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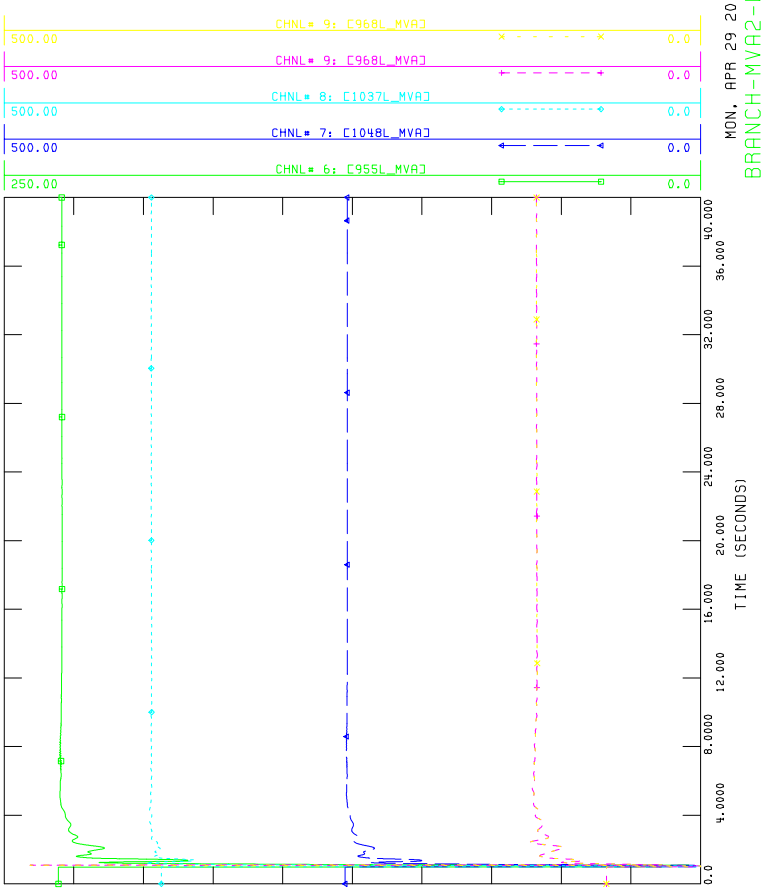

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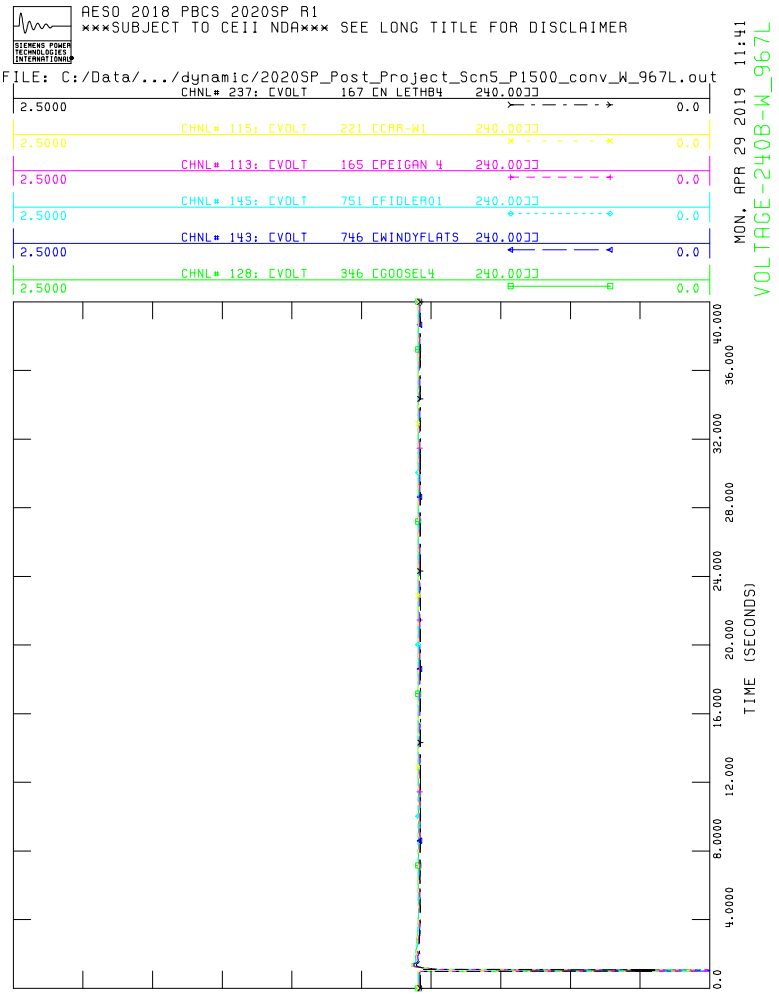
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CHNL# 115: CVOLT 221 CCRR-W1 240.00JJ
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CHNL# 145: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 143: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 128: CVOLT 346 CGOOSEL4 240.00JJ
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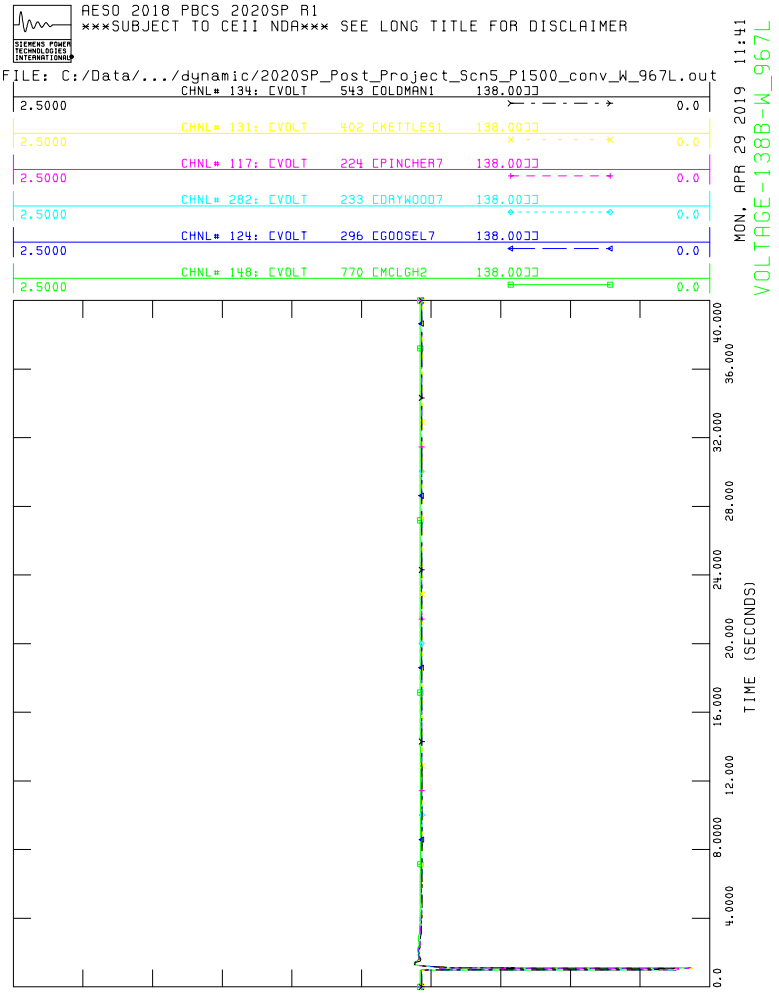
VOLTAGE-240B-W_967L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VOLTAGE-138B-W_967L

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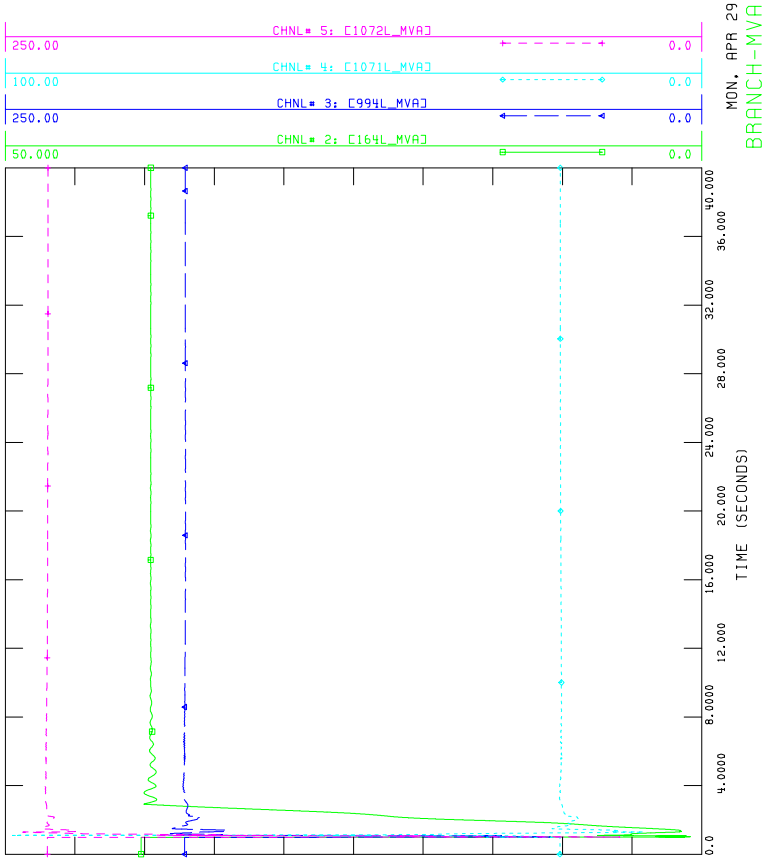

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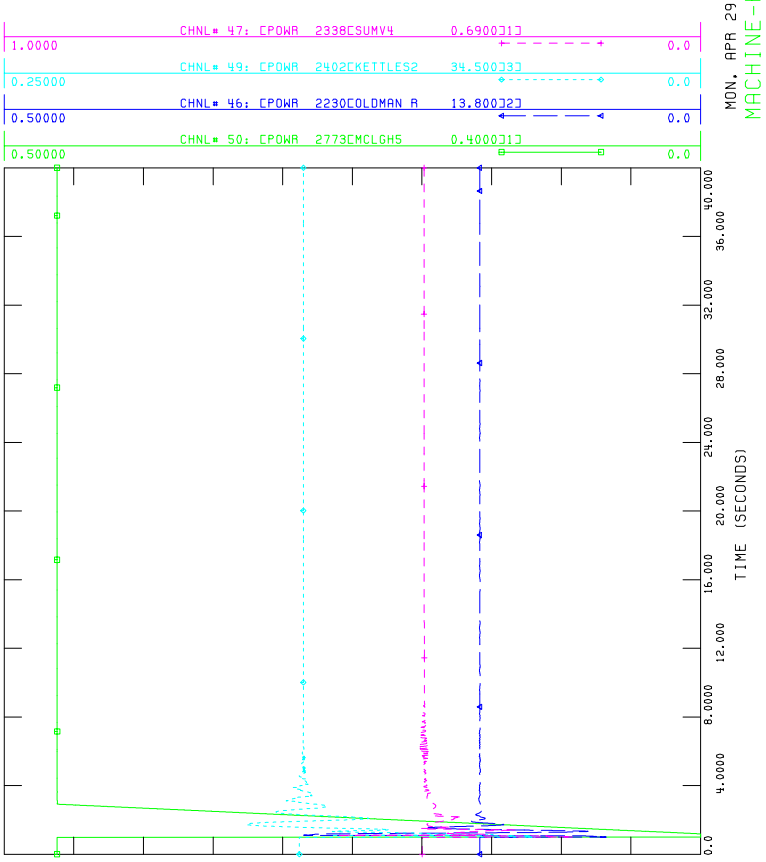
MACHINE-P-N_967L



AESO 2018 PBCS 2020SP R1
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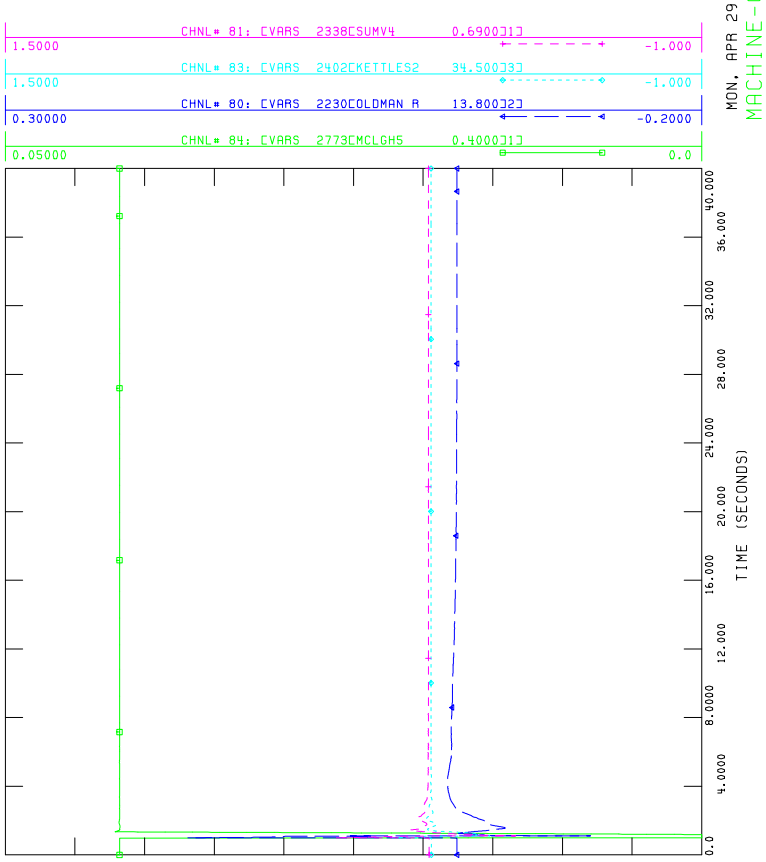
MACHINE-Q-N_967L



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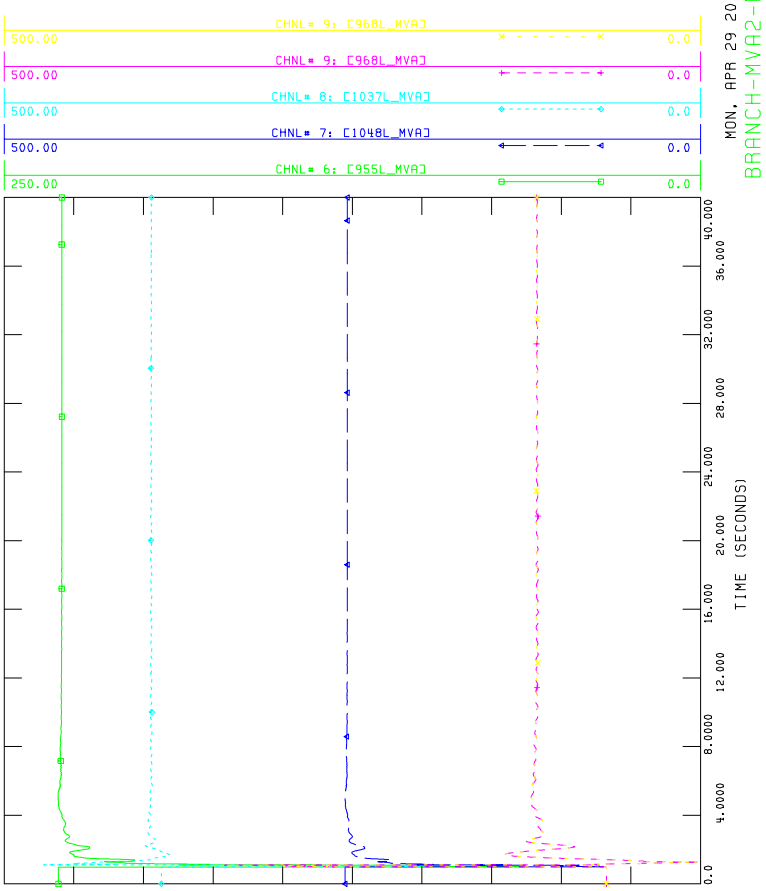
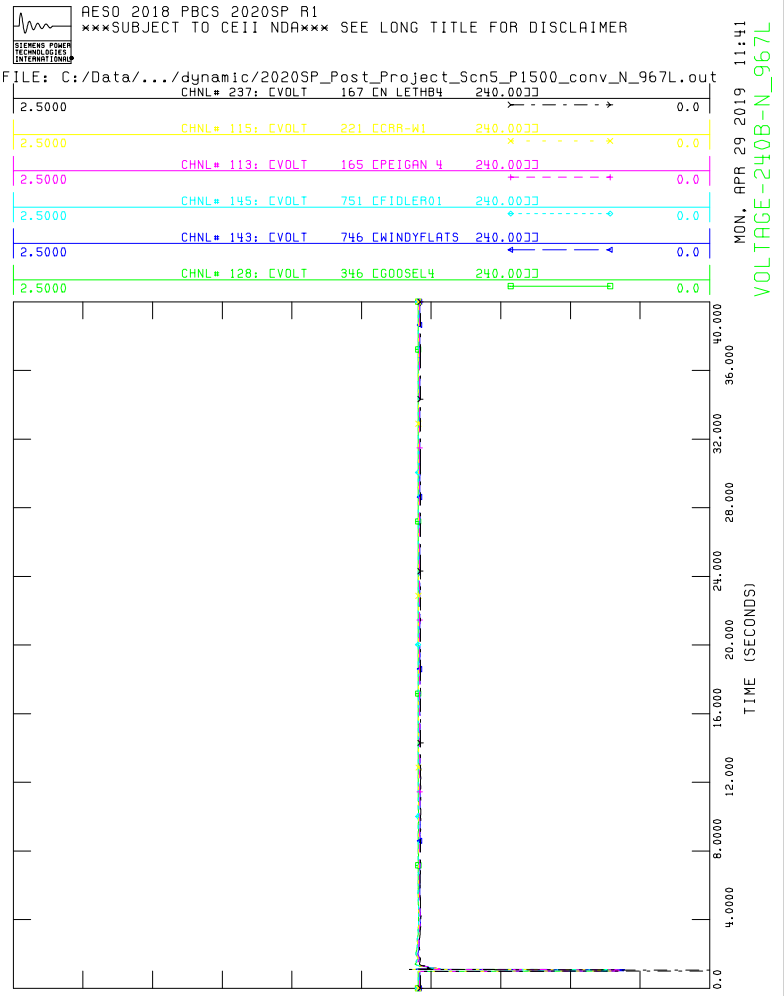
MON, APR 29 2019 11:41
BRANCH-MVA2-N_967L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 237: CVOLT 167 CN LETH84 240.00JJ
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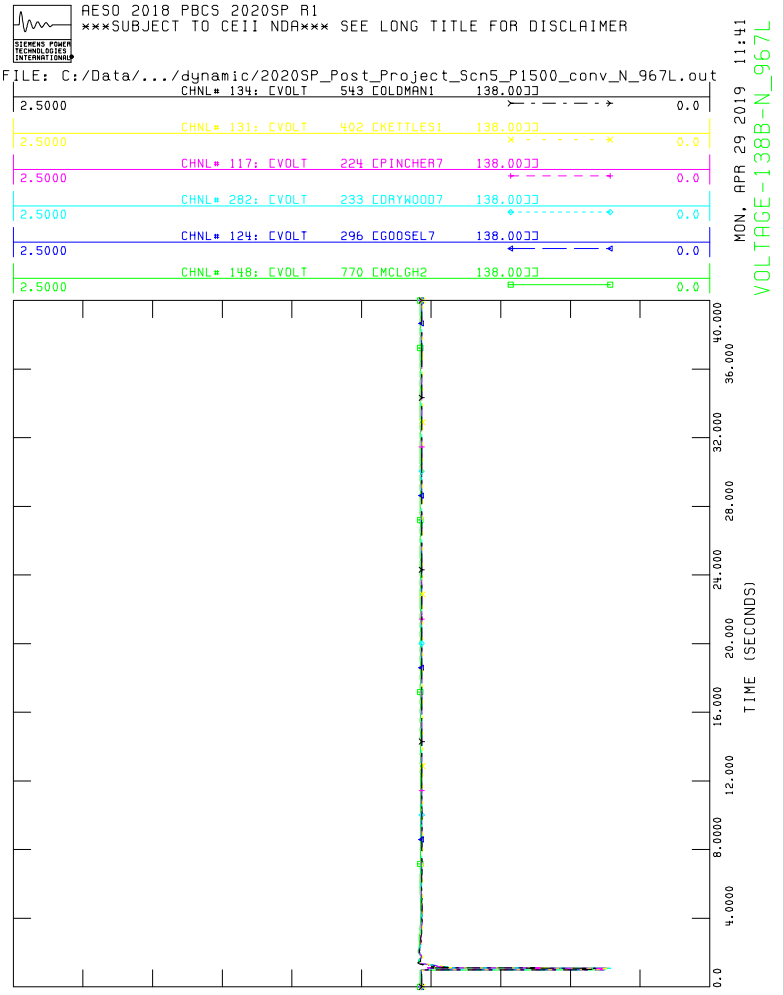
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CHNL# 117: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 282: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 124: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 148: CVOLT 770 CMCLGH2 138.00JJ
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TIME (SECONDS)
MON, APR 29 2019 11:41
VOLTAGE-138B-N_967L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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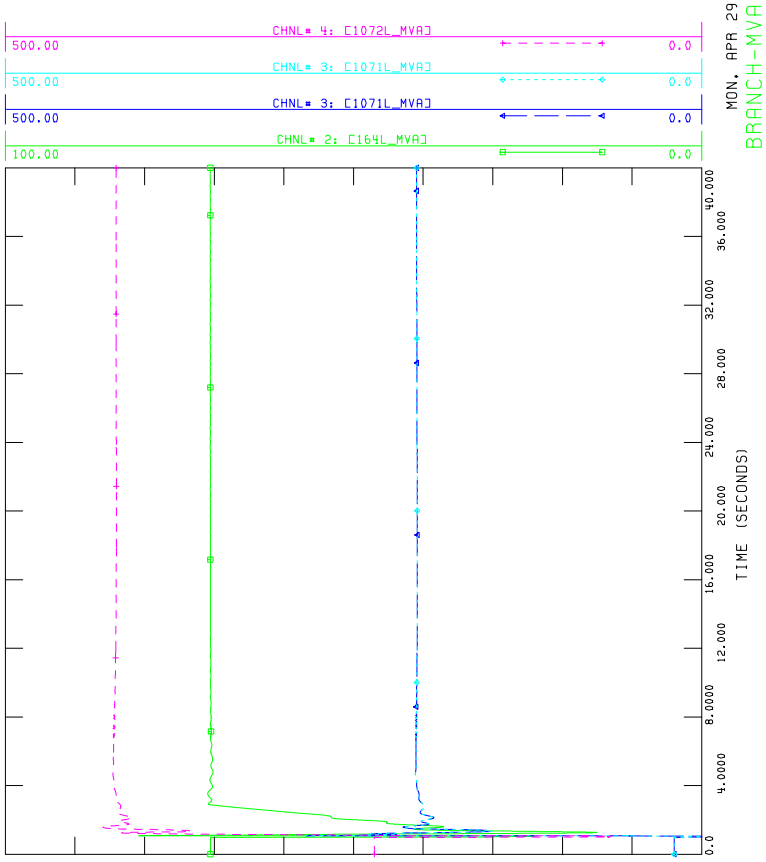

AESO 2018 PBCS 2020SP R1
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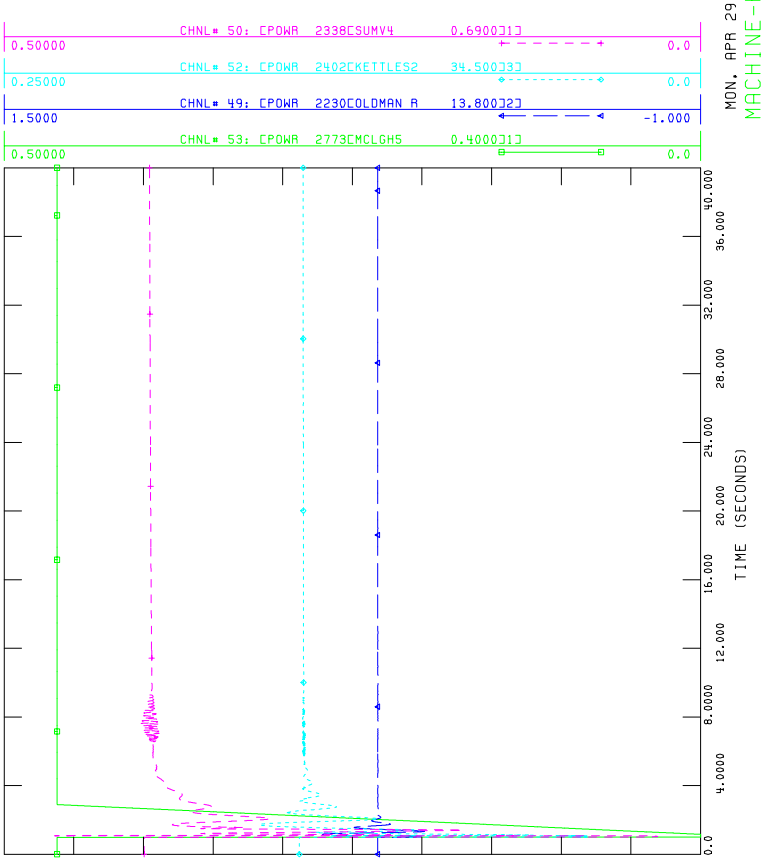
MON, APR 29 2019 11:42
MACHINE-P-F_994L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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MON, APR 29 2019 11:42
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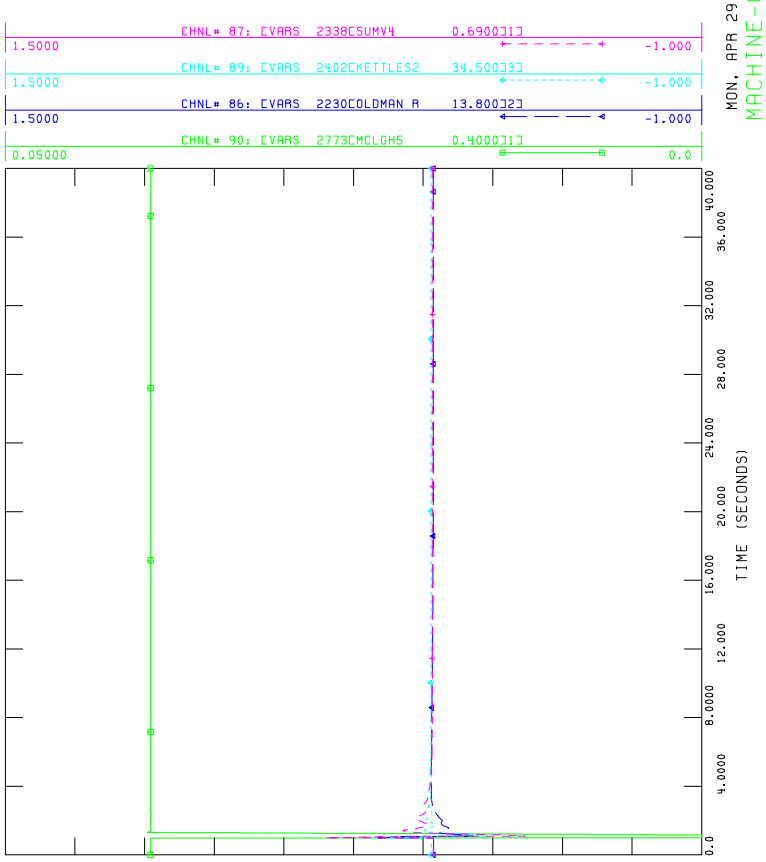

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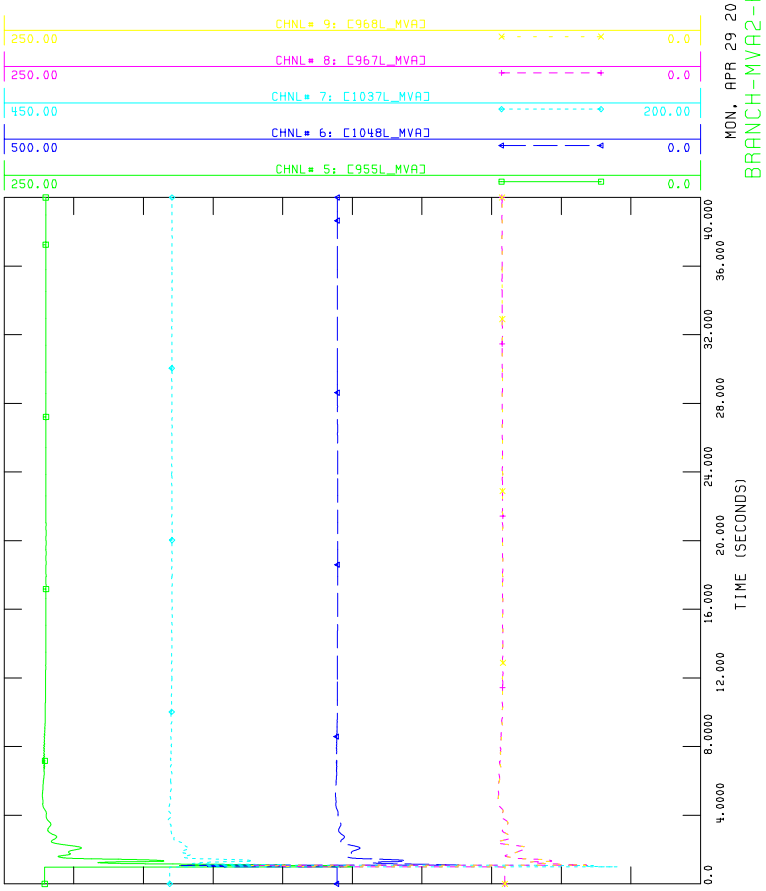
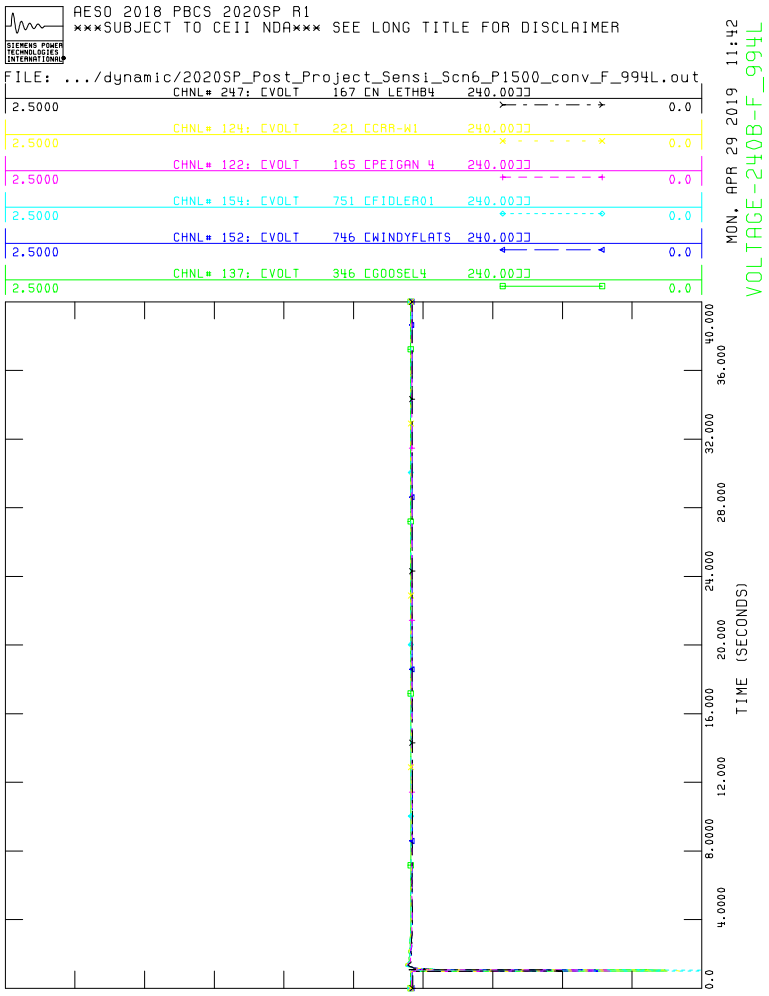
BRANCH-MVA2-F_994L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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MON, APR 29 2019 11:42
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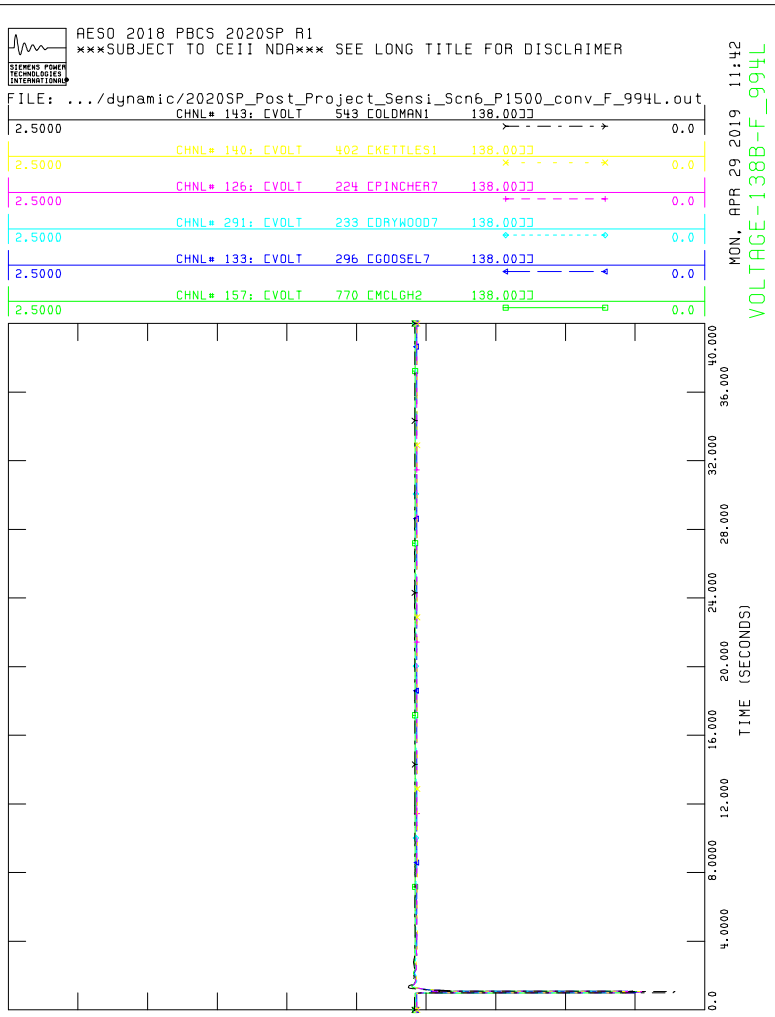
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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VOLTAGE-138B-F_994L

AESO 2018 PBCS 2020SP R1
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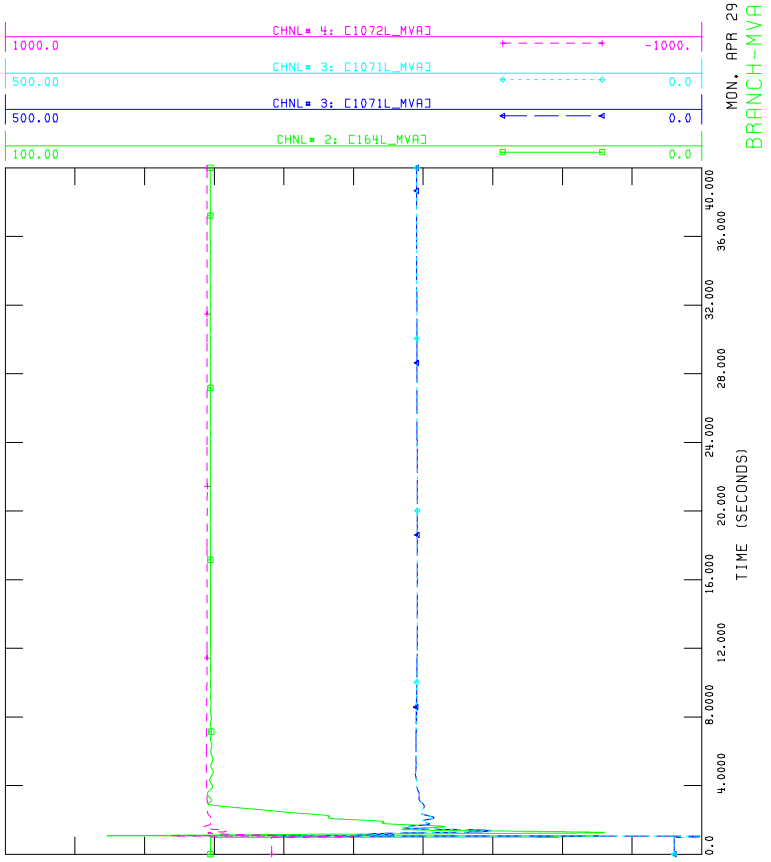

MON, APR 29 2019 11:42
BRANCH-MVA1-G_994L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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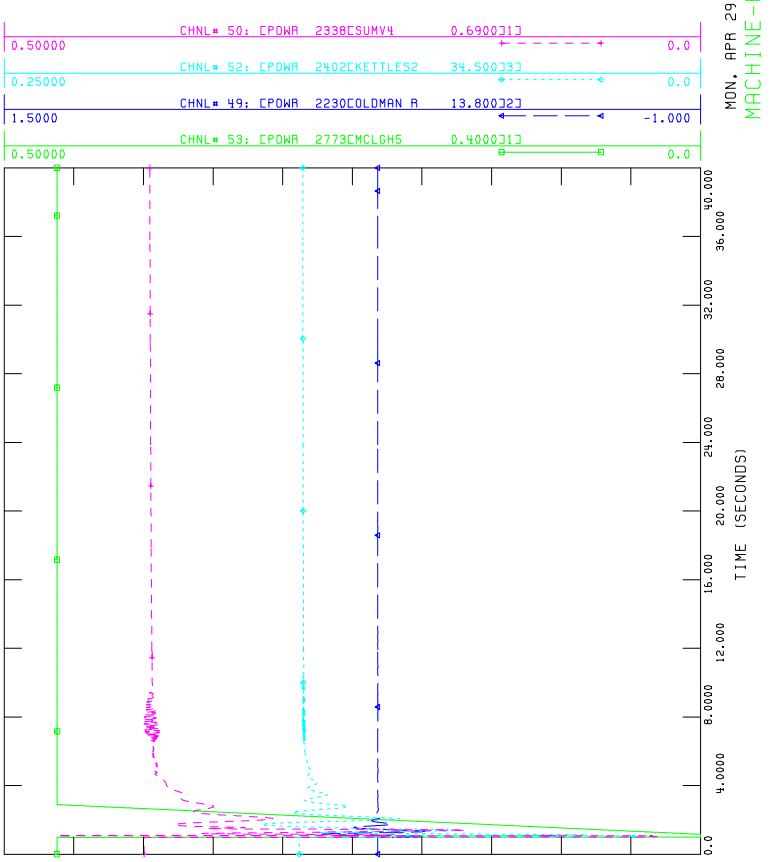

MON, APR 29 2019 11:42
MACHINE-P-G_994L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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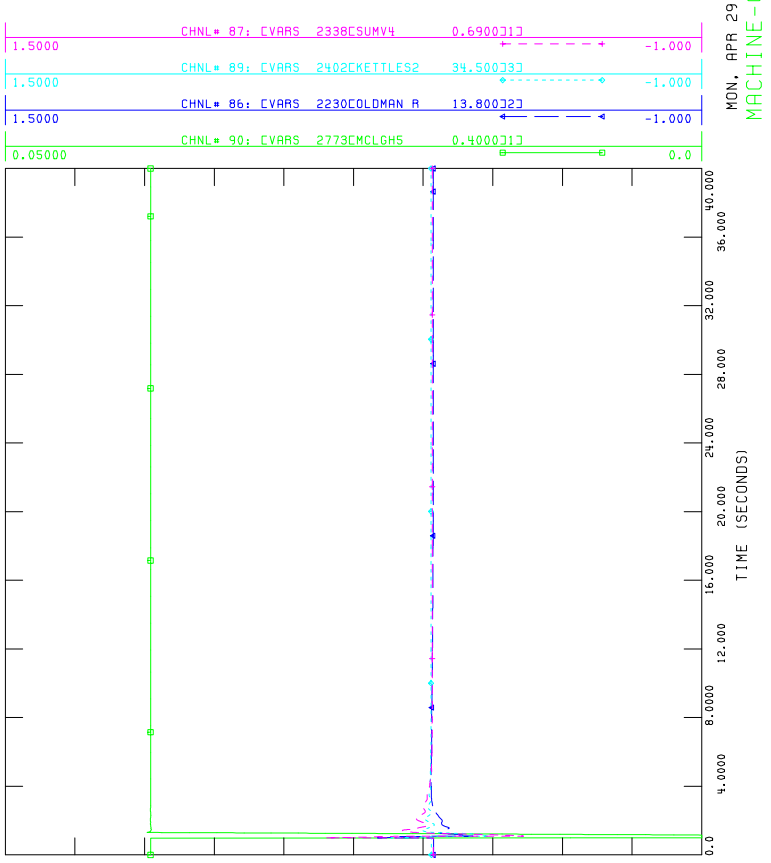

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AESO 2018 PBCS 2020SP R1
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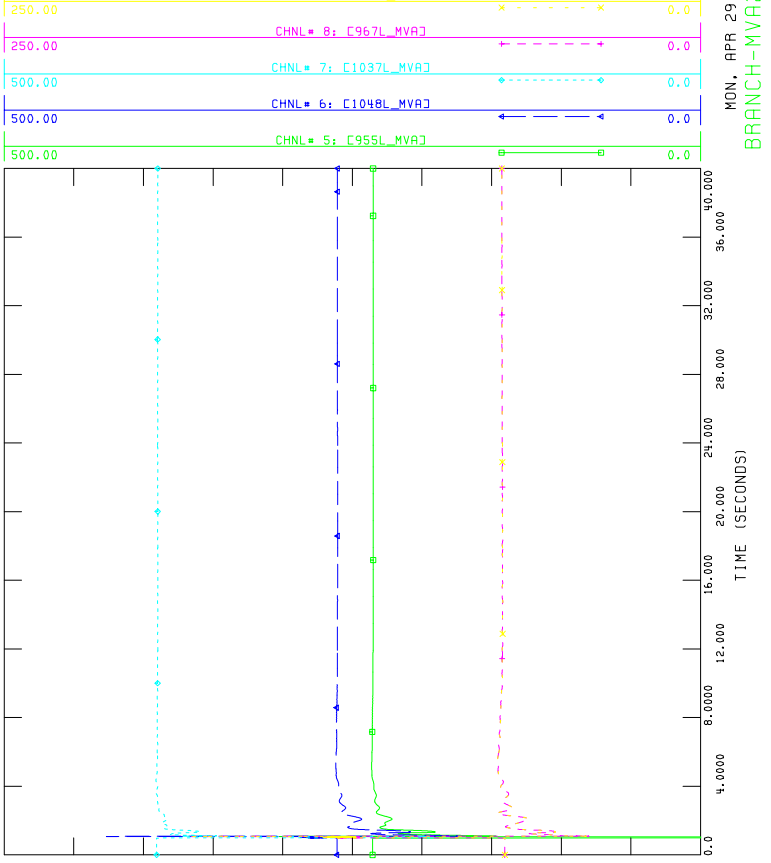

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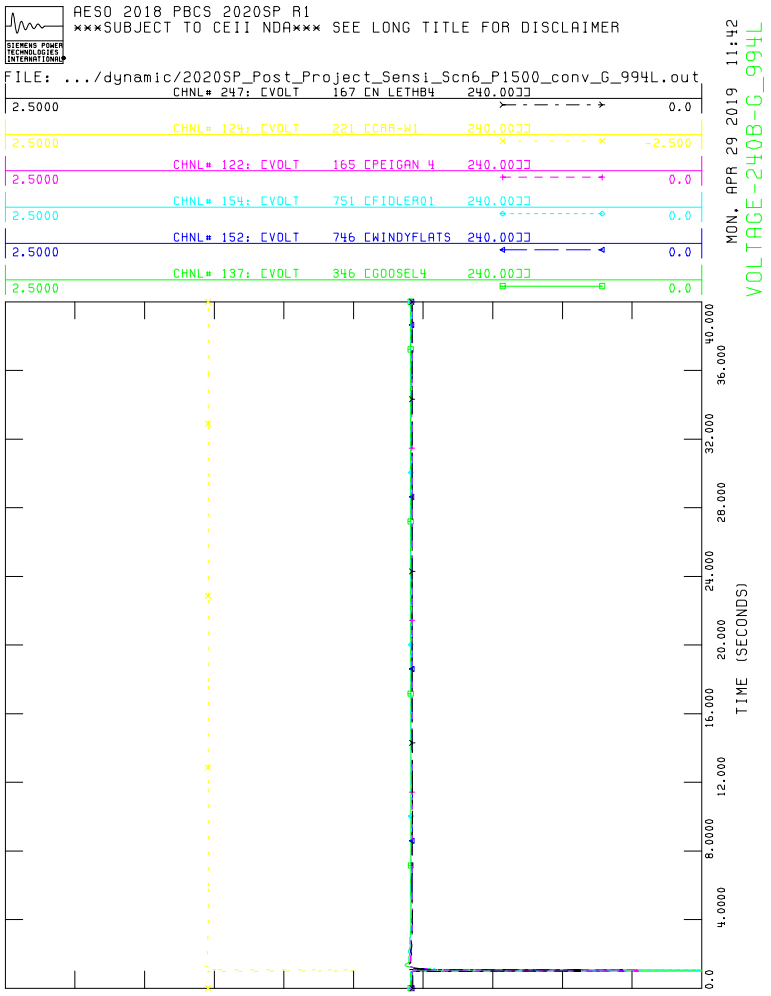
AESO 2018 PBCS 2020SP R1
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
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CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
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CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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MON, APR 29 2019 11:42
VOLTAGE-240B-G_994L
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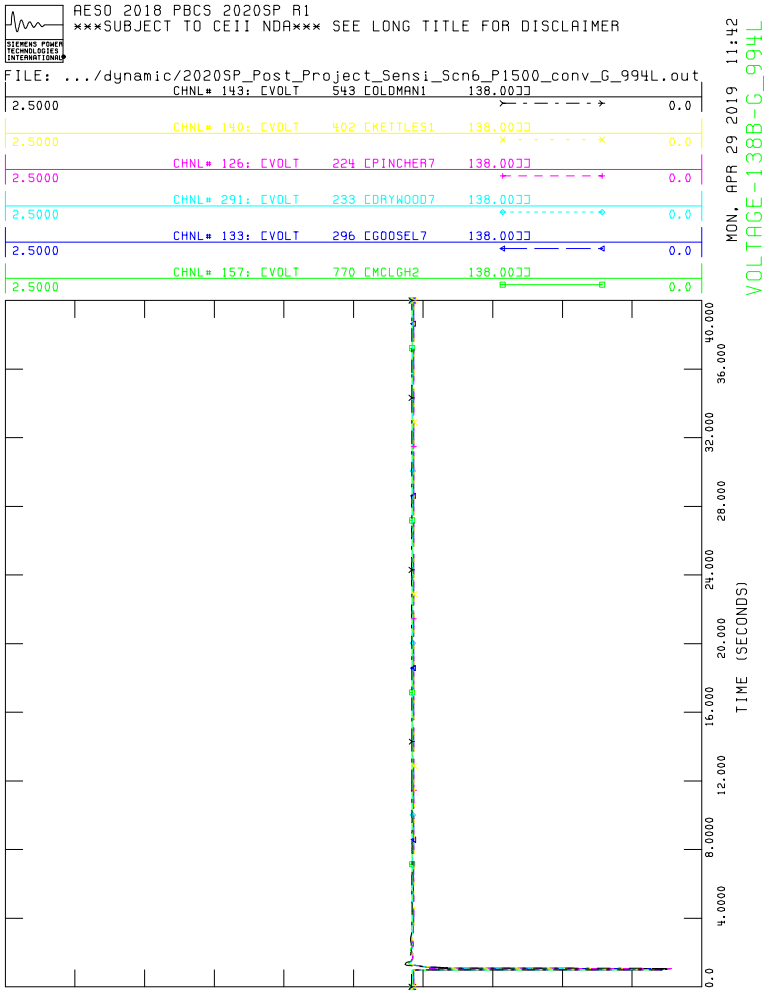
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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MON, APR 29 2019 11:42
VOLTAGE-138B-G_994L
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AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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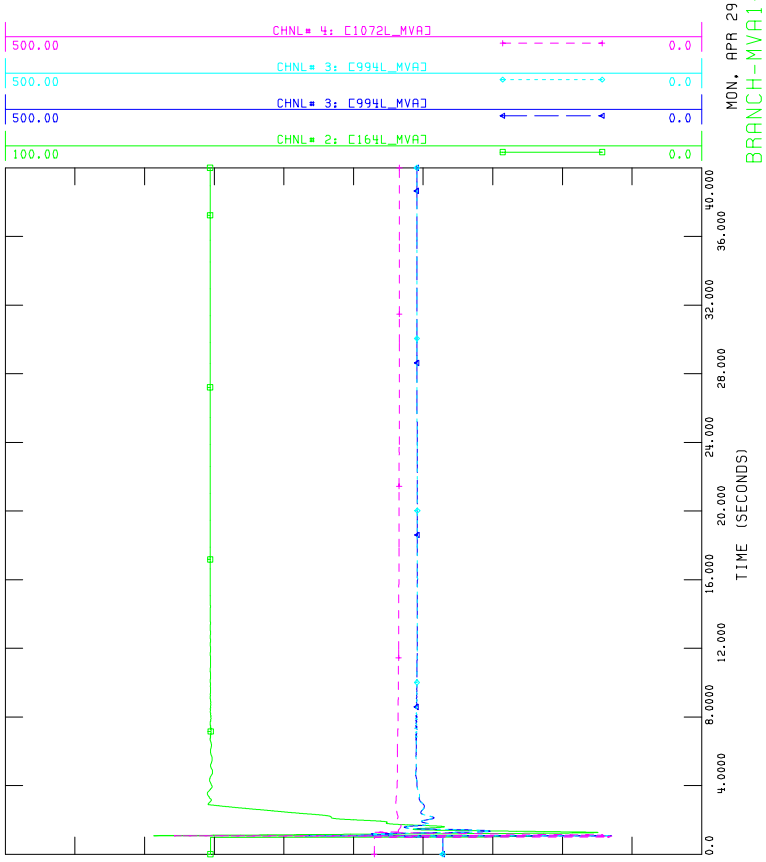
BRANCH-MVA1-F_1071L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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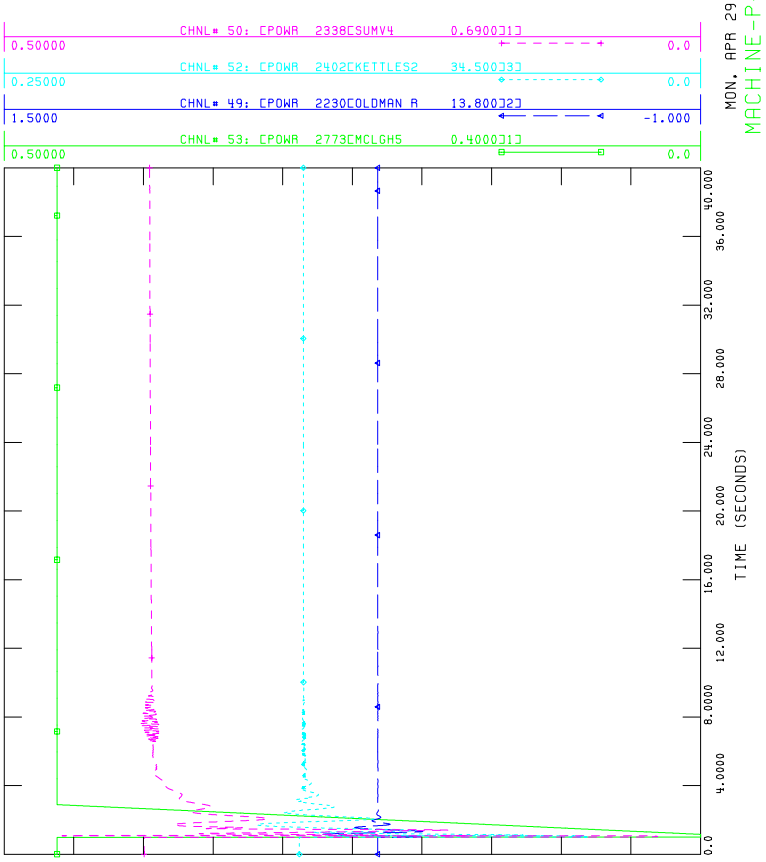
MON, APR 29 2019 11:42

MACHINE-P-F_1071L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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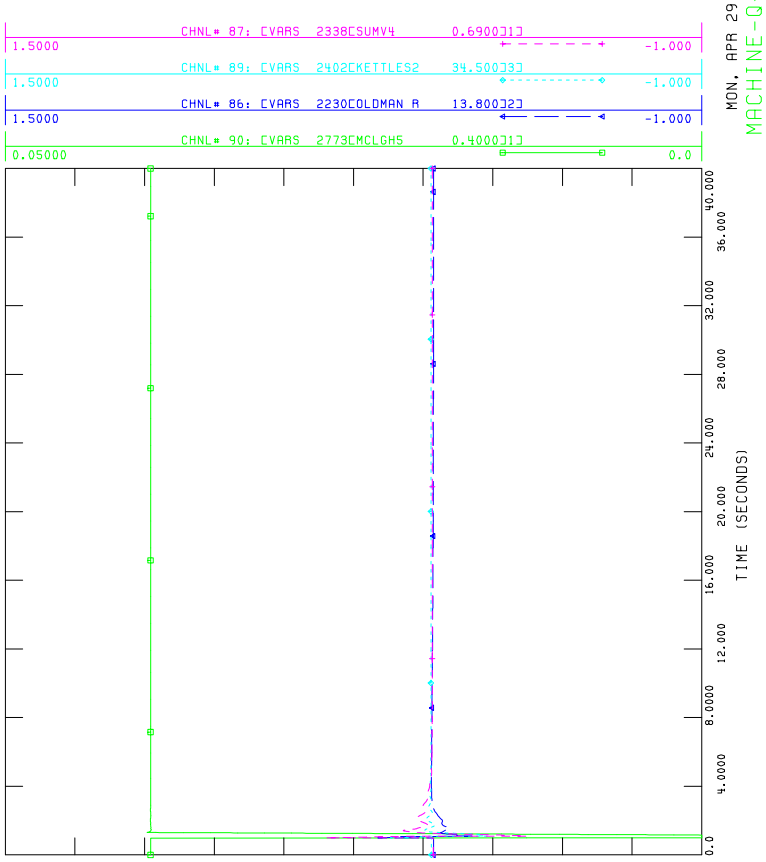
MON, APR 29 2019 11:42

MACHINE-Q-F_1071L



AESO 2018 PBCS 2020SP R1
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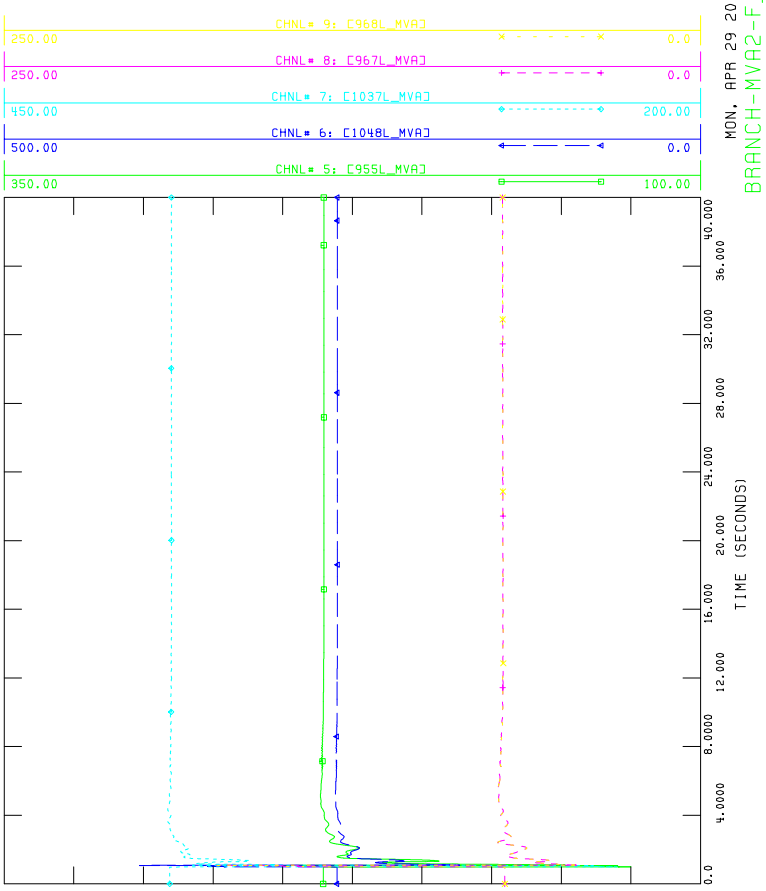

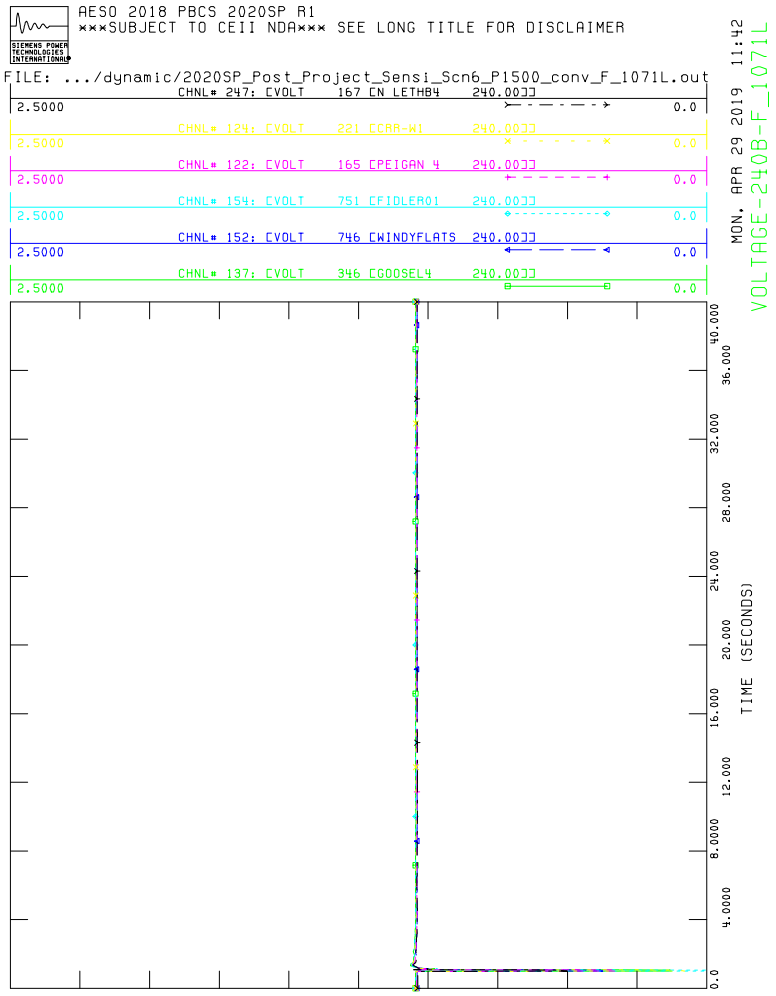
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
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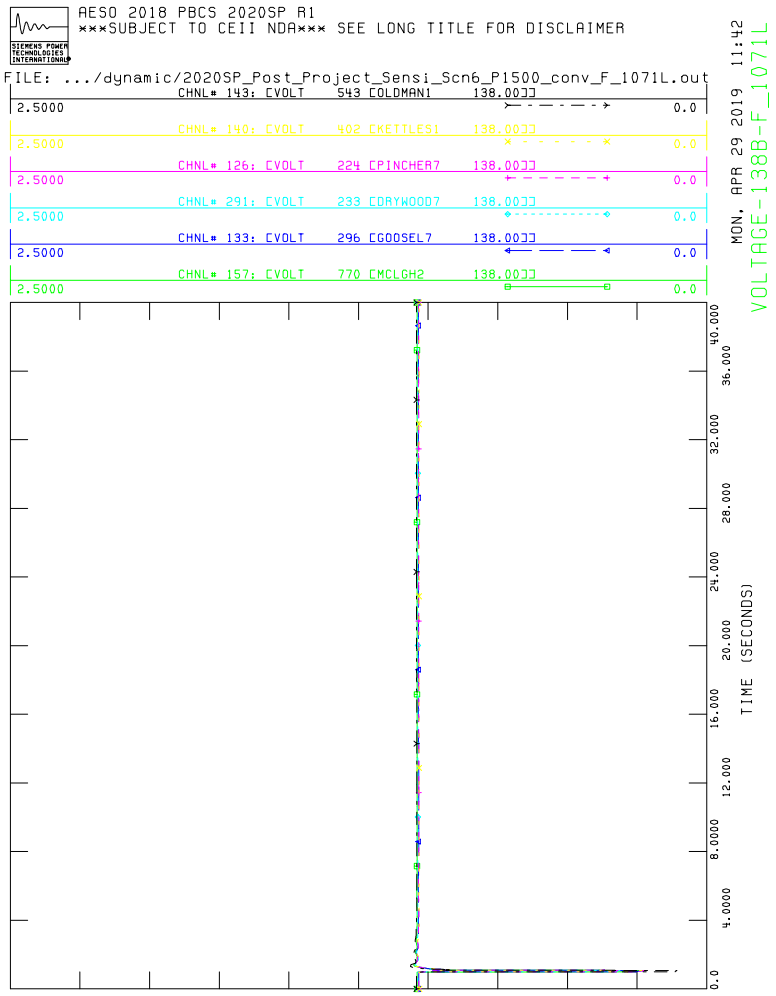
MON, APR 29 2019 11:42
VOLTAGE-240B-F_1071L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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MON, APR 29 2019 11:42
VOLTAGE-138B-F_1071L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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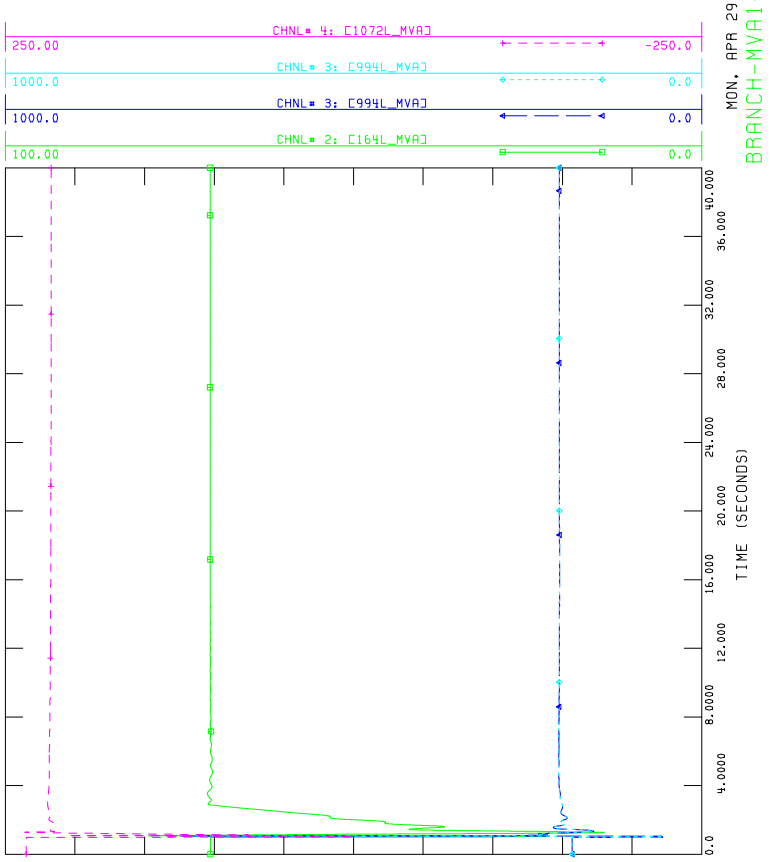
MON, APR 29 2019 11:43

BRANCH-MVA1-C_1071L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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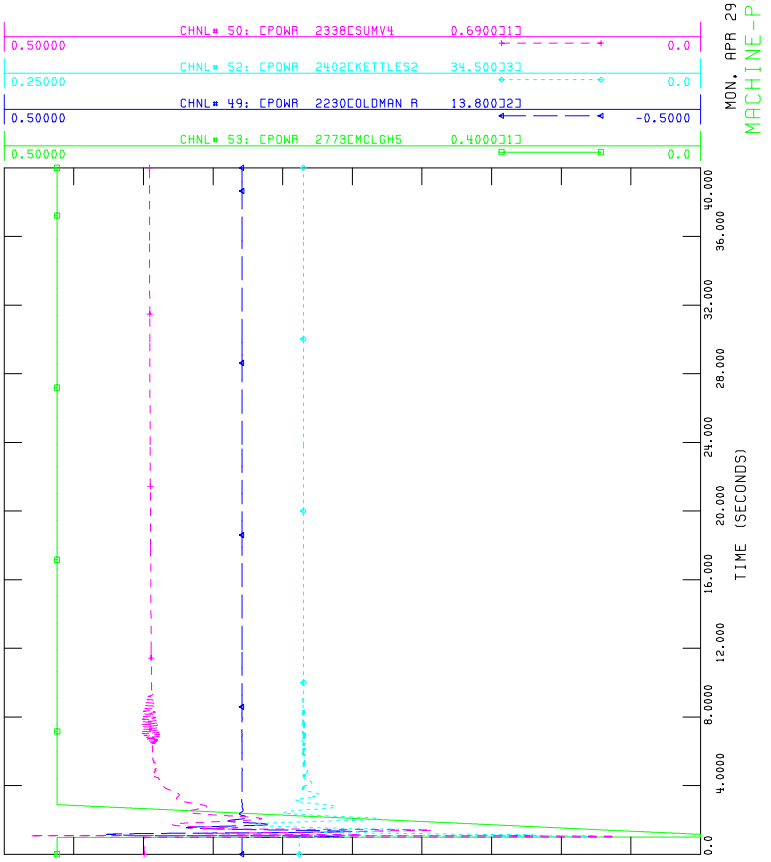
MON, APR 29 2019 11:43

MACHINE-P-C_1071L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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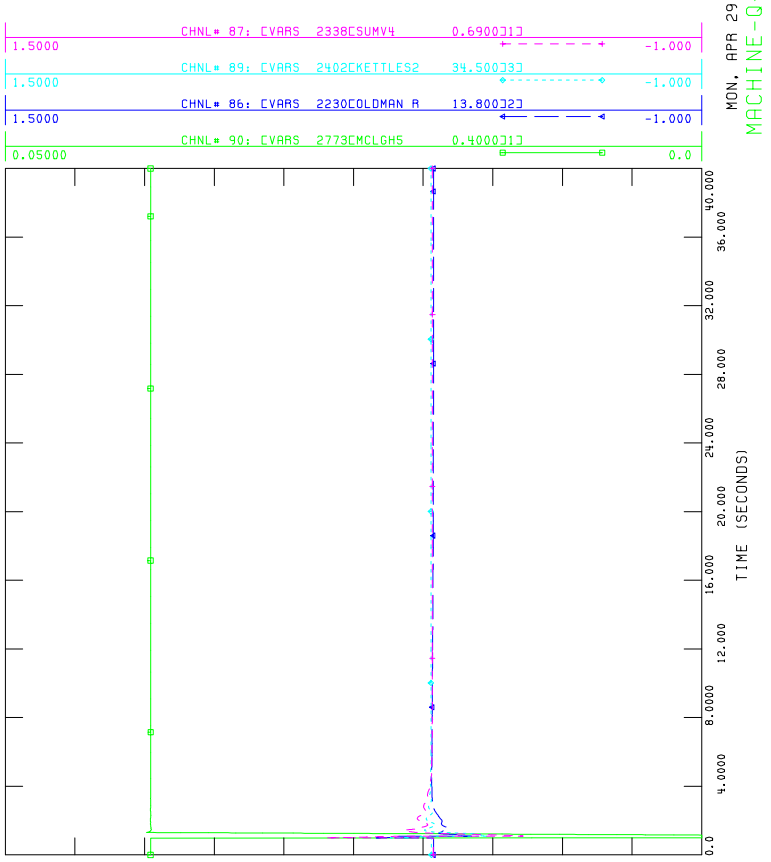
MON, APR 29 2019 11:43

MACHINE-Q-C_1071L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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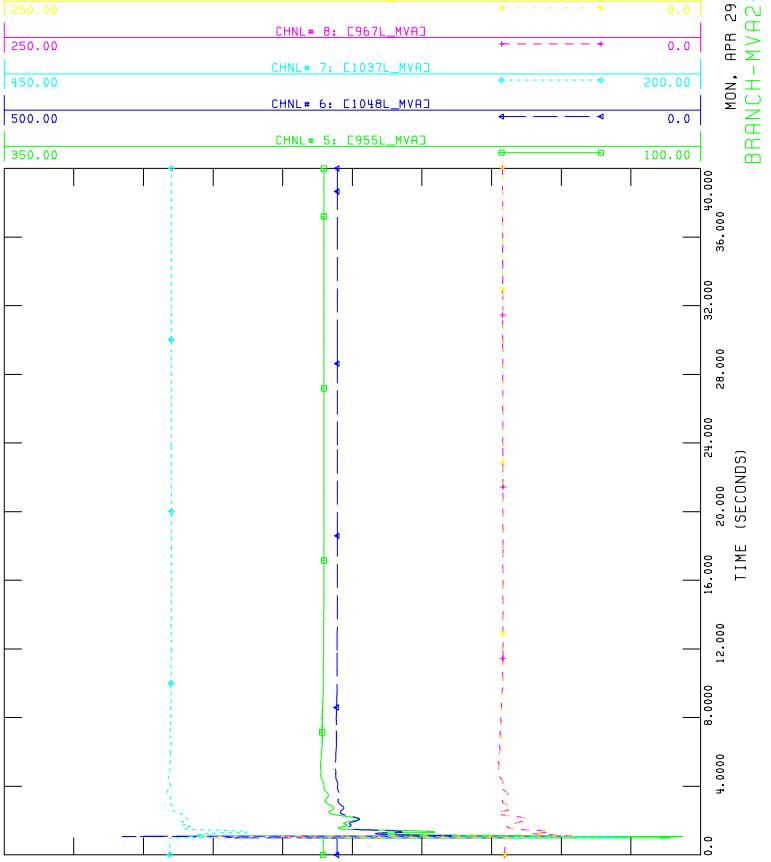
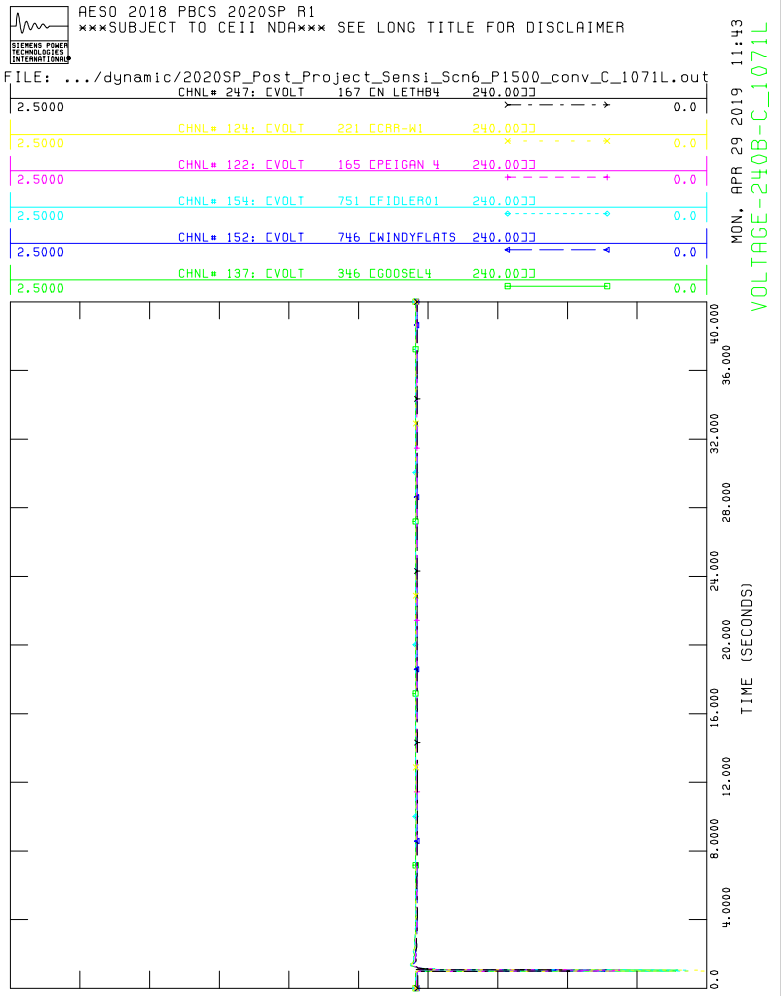
MON, APR 29 2019 11:43

BRANCH-MVA2-C_1071L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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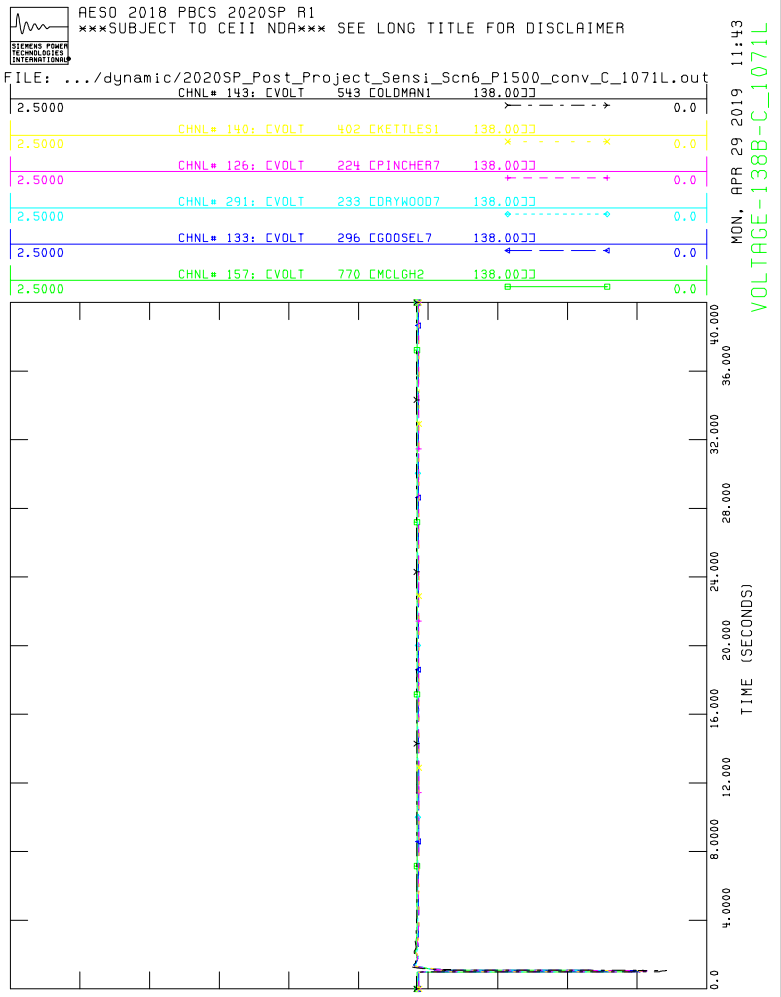
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
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MON, APR 29 2019 11:43
VOLTAGE-138B-C_1071L

AESO 2018 PBCS 2020SP R1
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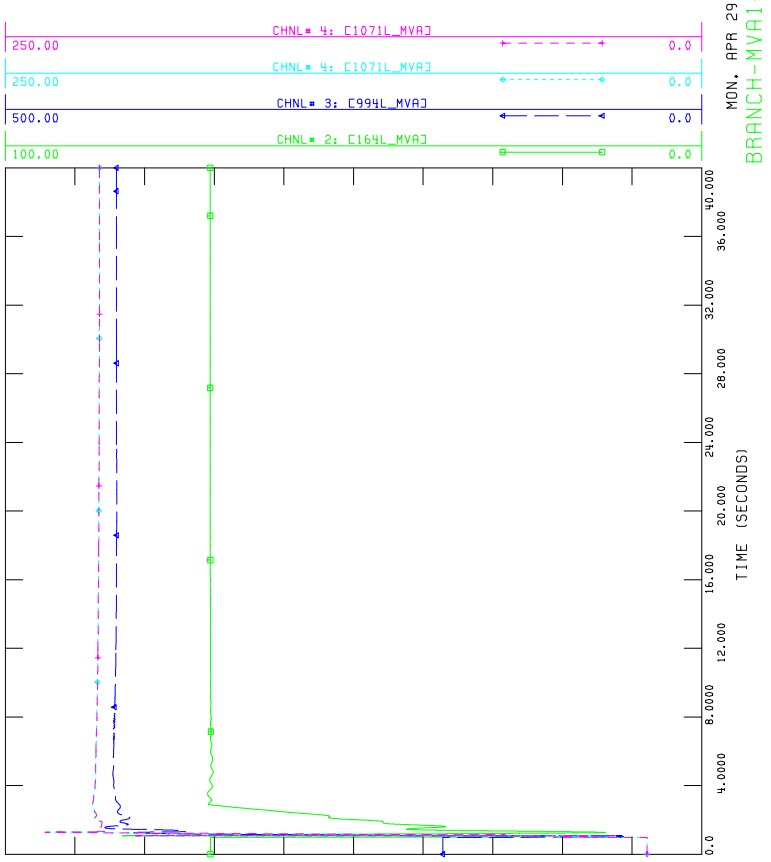

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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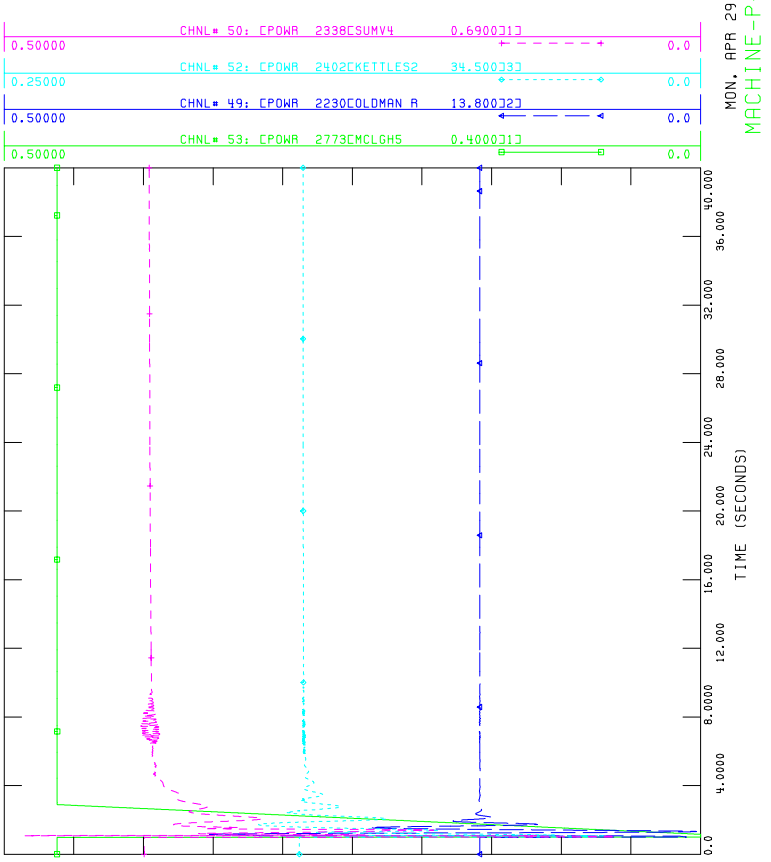
MON, APR 29 2019 11:43

MACHINE-P-C_1072L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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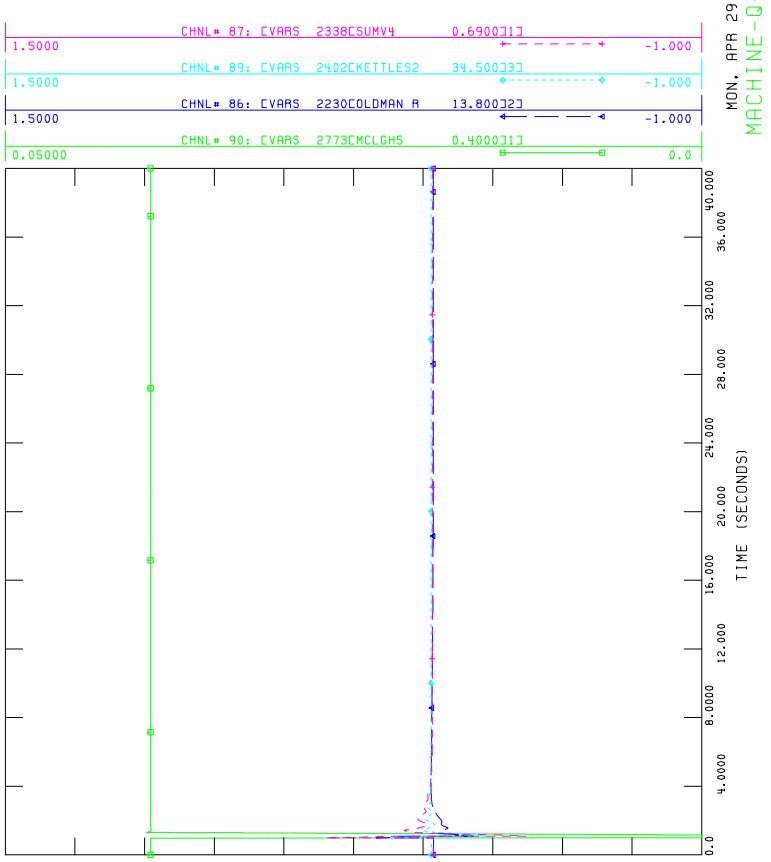
MON, APR 29 2019 11:43

MACHINE-Q-C_1072L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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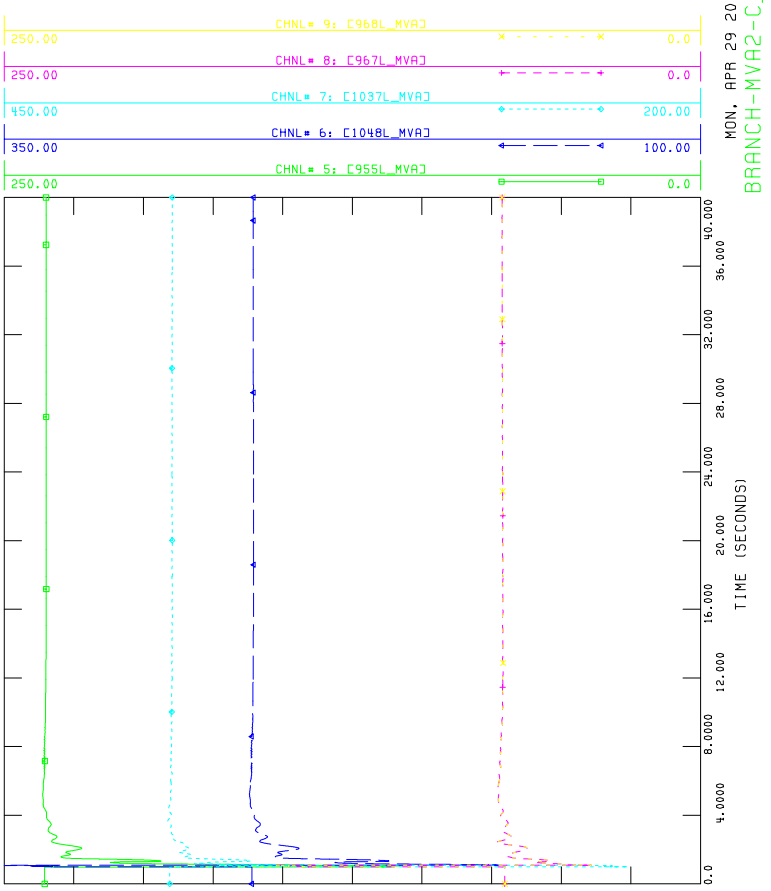
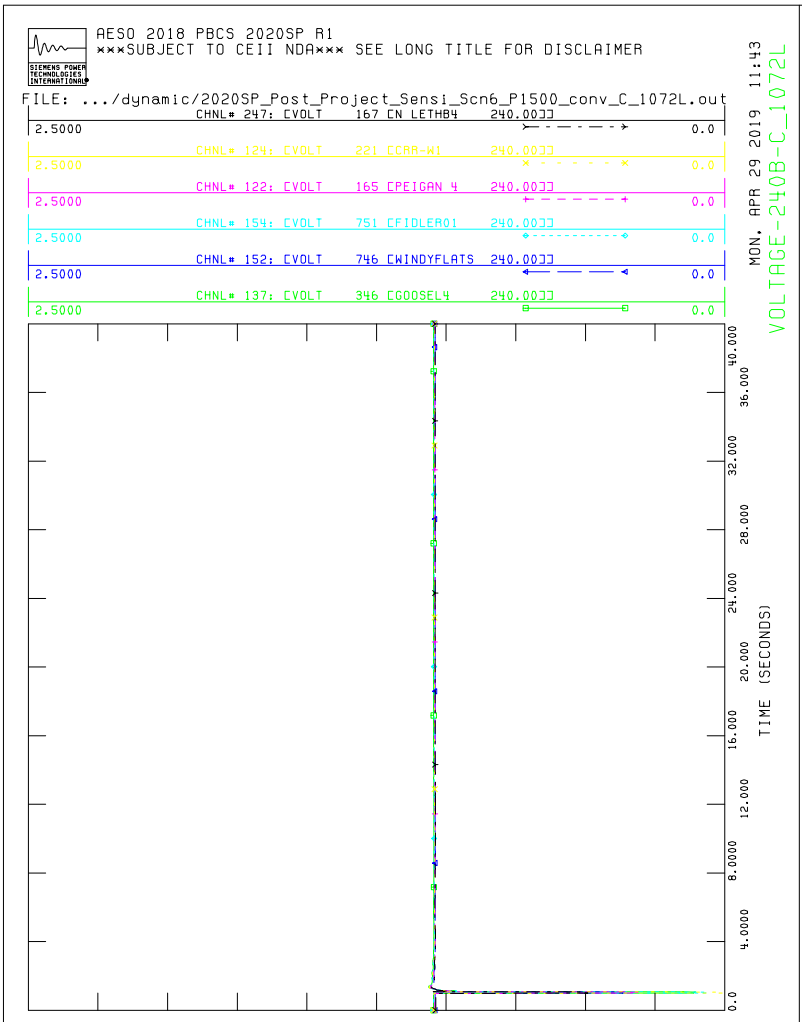
BRANCH-MVA2-C_1072L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_C_1072L.out
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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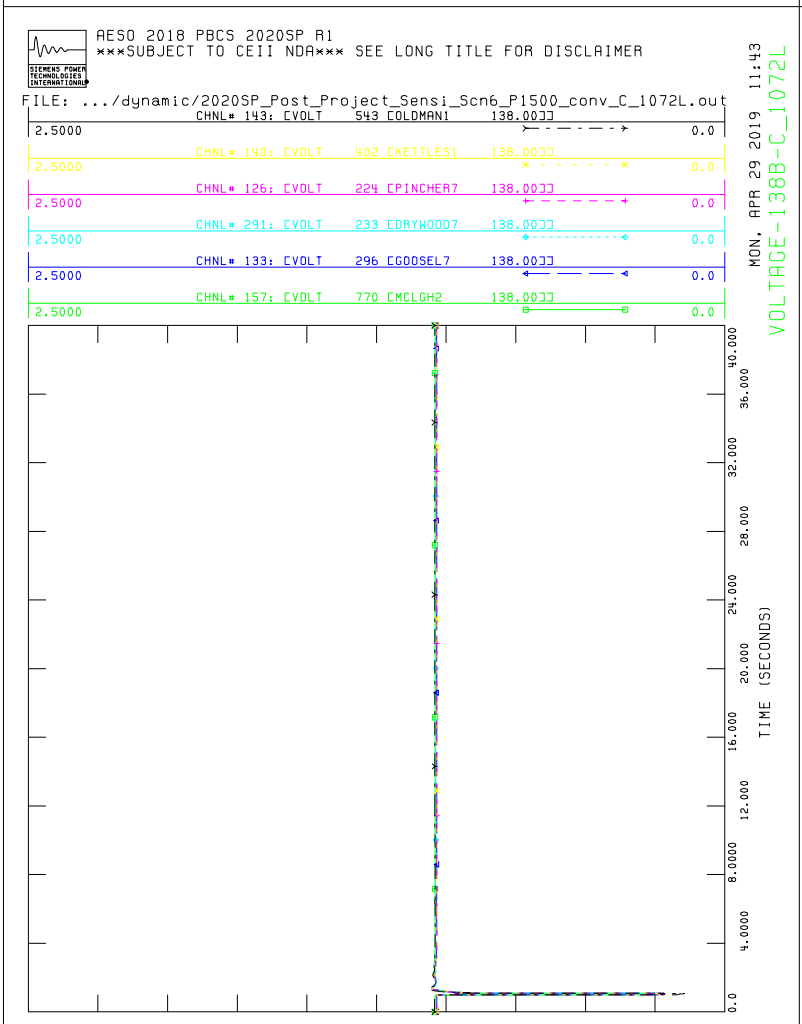
MON, APR 29 2019 11:43
VOLTAGE-240B-C_1072L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_C_1072L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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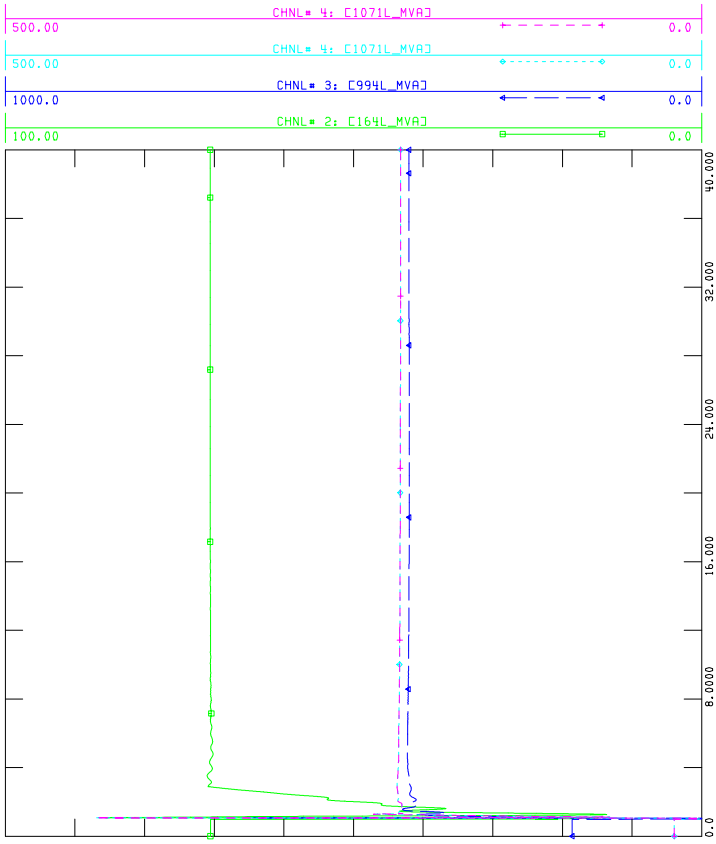
TIME (SECONDS)
MON, APR 29 2019 11:43
VOLTAGE-138B-C_1072L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_G_1072L.out

MON, APR 29 2019 11:43

BRANCH-MVA1-G_1072L

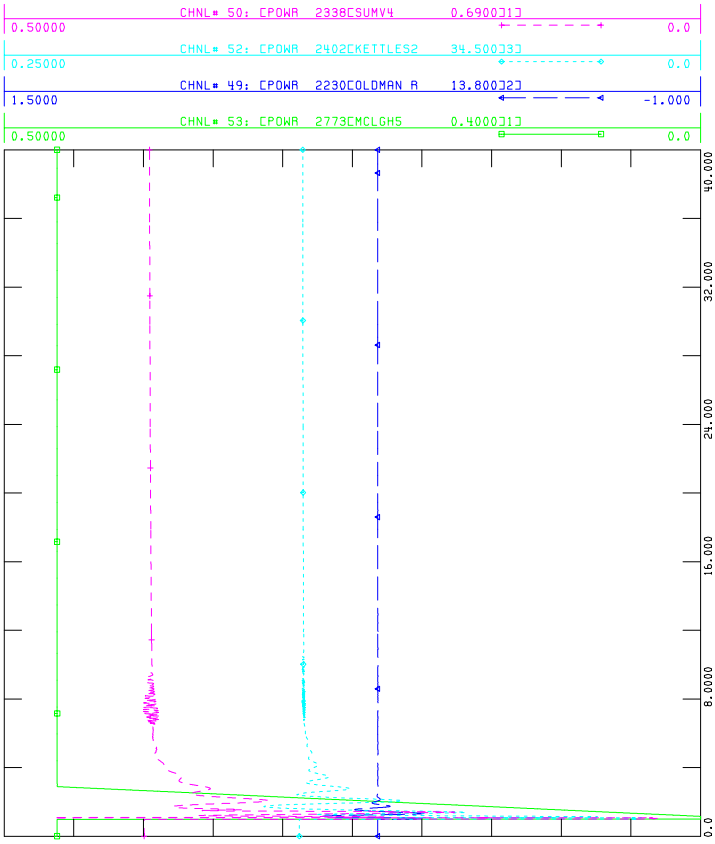


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_G_1072L.out

MON, APR 29 2019 11:43

MACHINE-P-G_1072L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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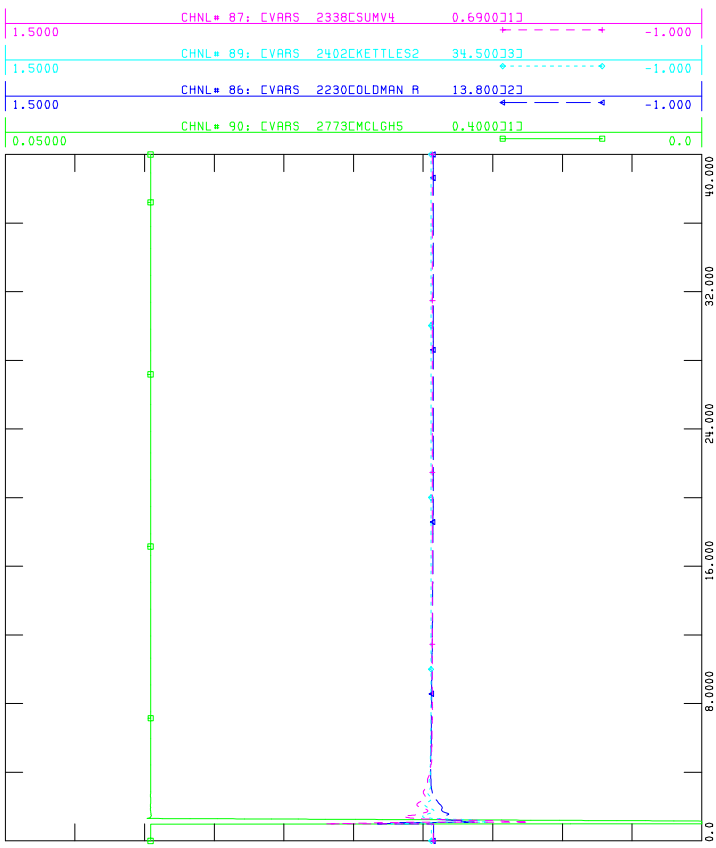
MON, APR 29 2019 11:43

MACHINE-Q-G_1072L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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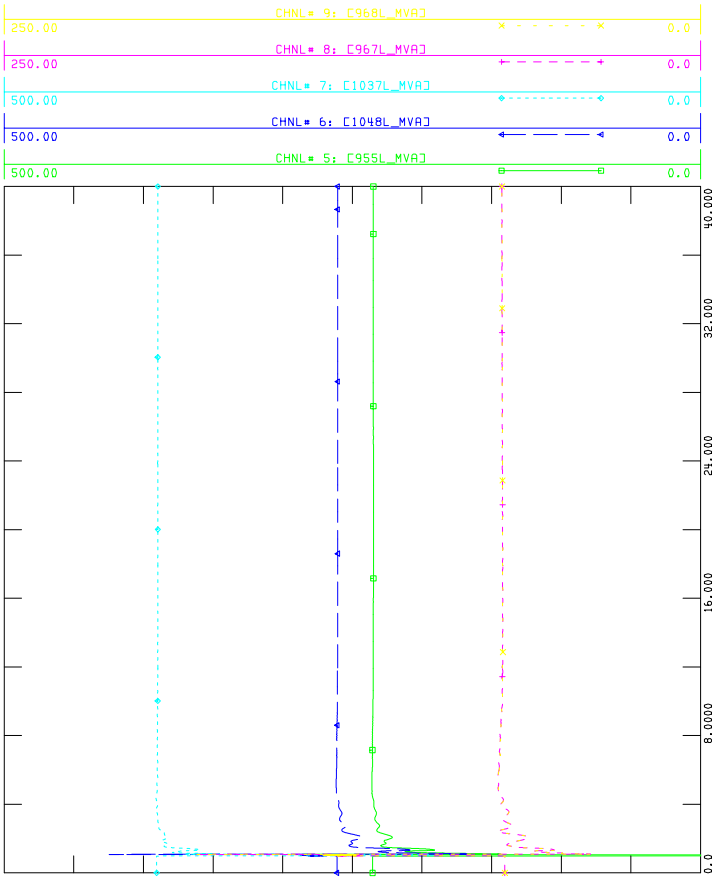
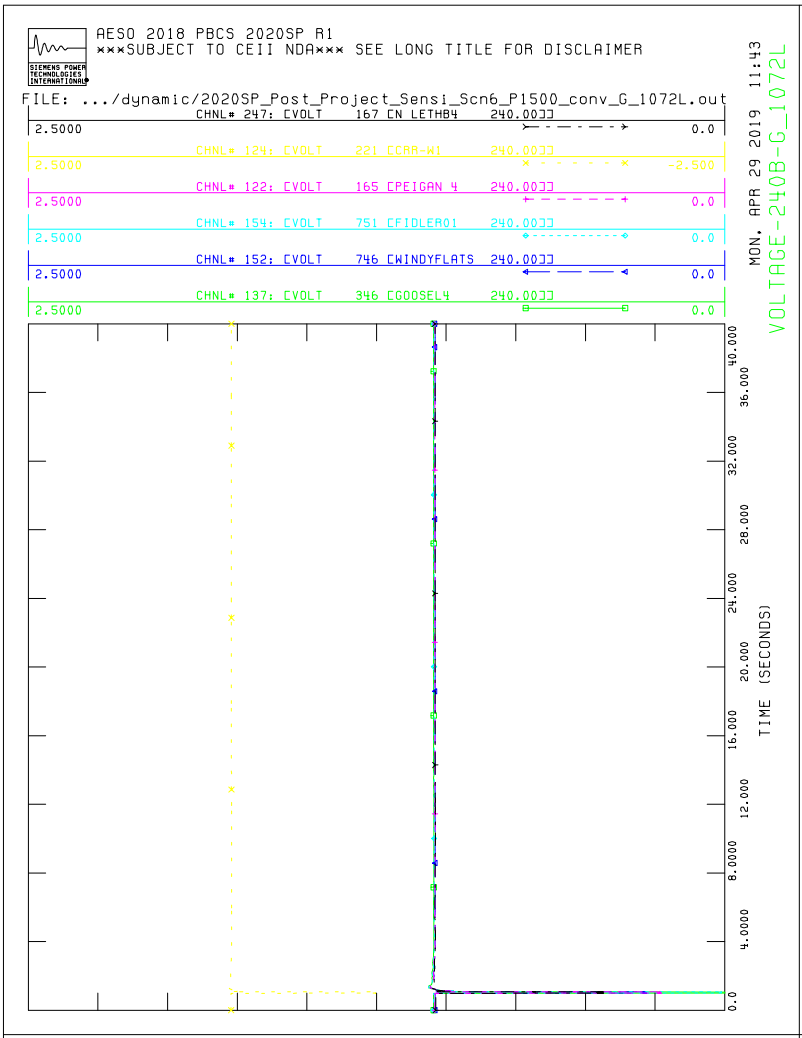
MON, APR 29 2019 11:43

BRANCH-MVA2-G_1072L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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MON, APR 29 2019 11:43
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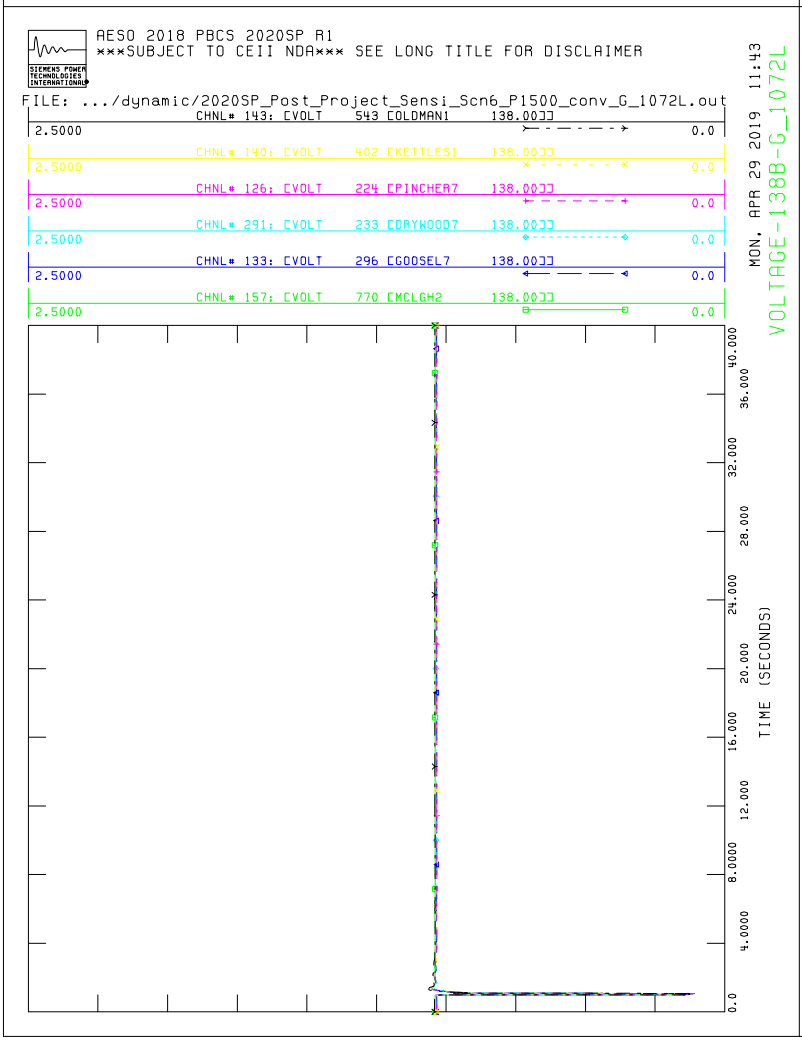
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_G_1072L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:43
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TIME (SECONDS)

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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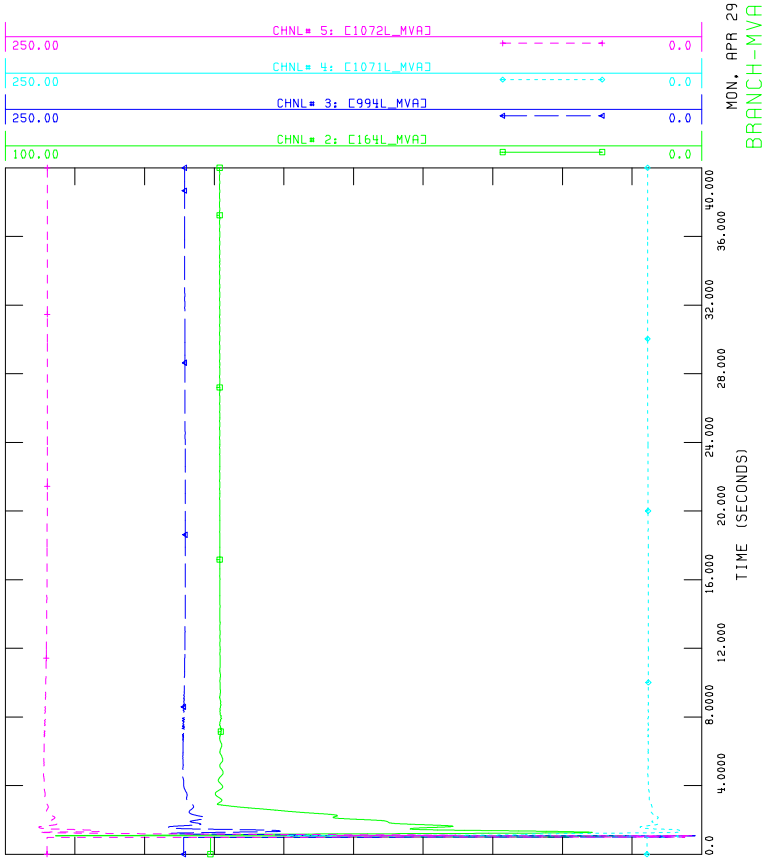
MON, APR 29 2019 11:43
BRANCH-MVA1-P_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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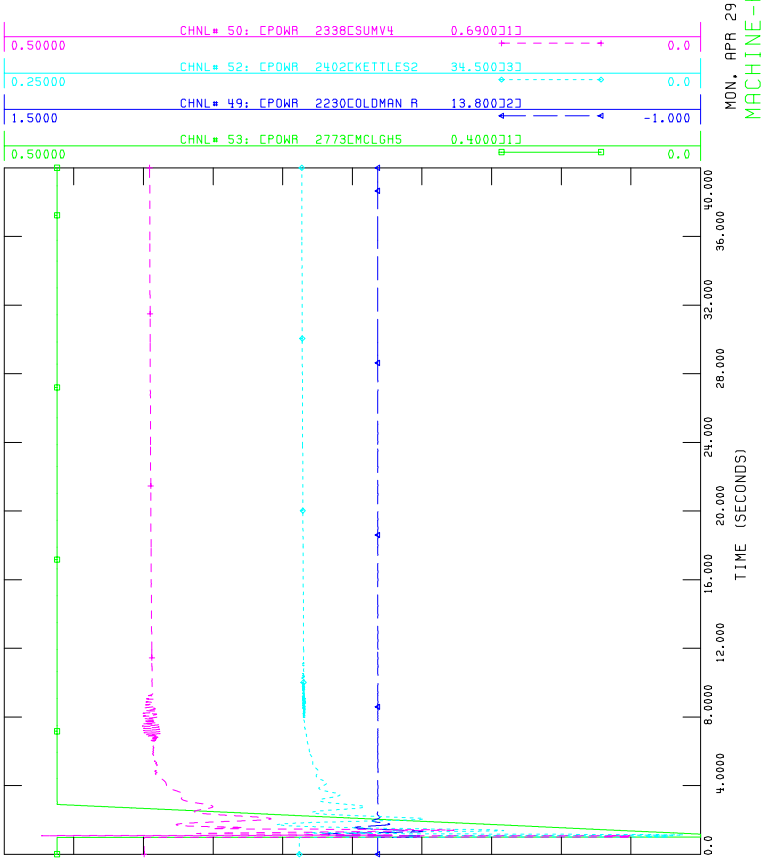
MON, APR 29 2019 11:43
MACHINE-P-P_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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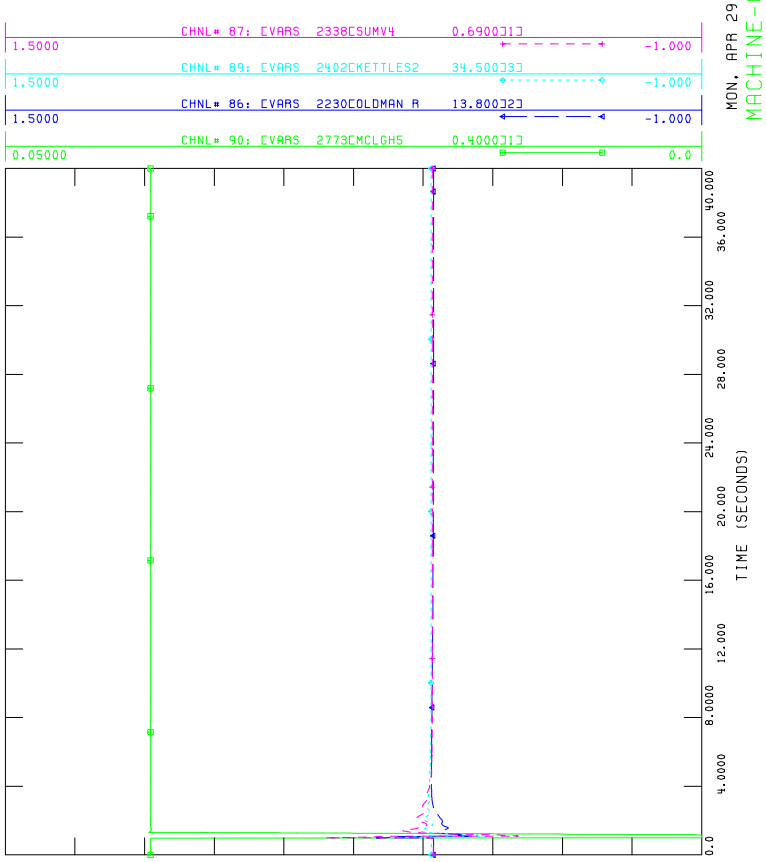
MON, APR 29 2019 11:43
MACHINE-Q-P_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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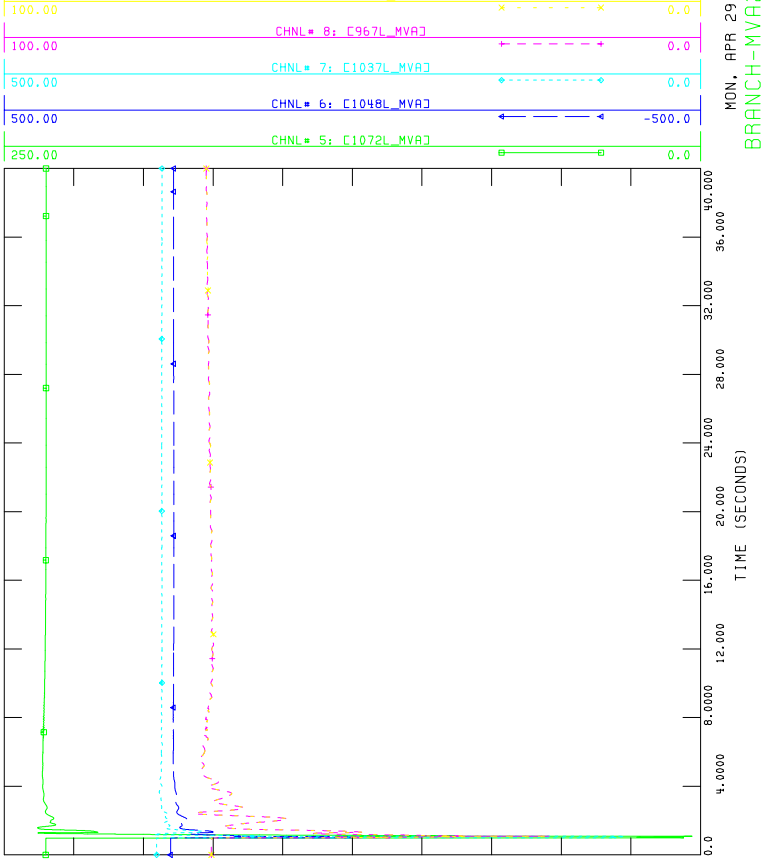
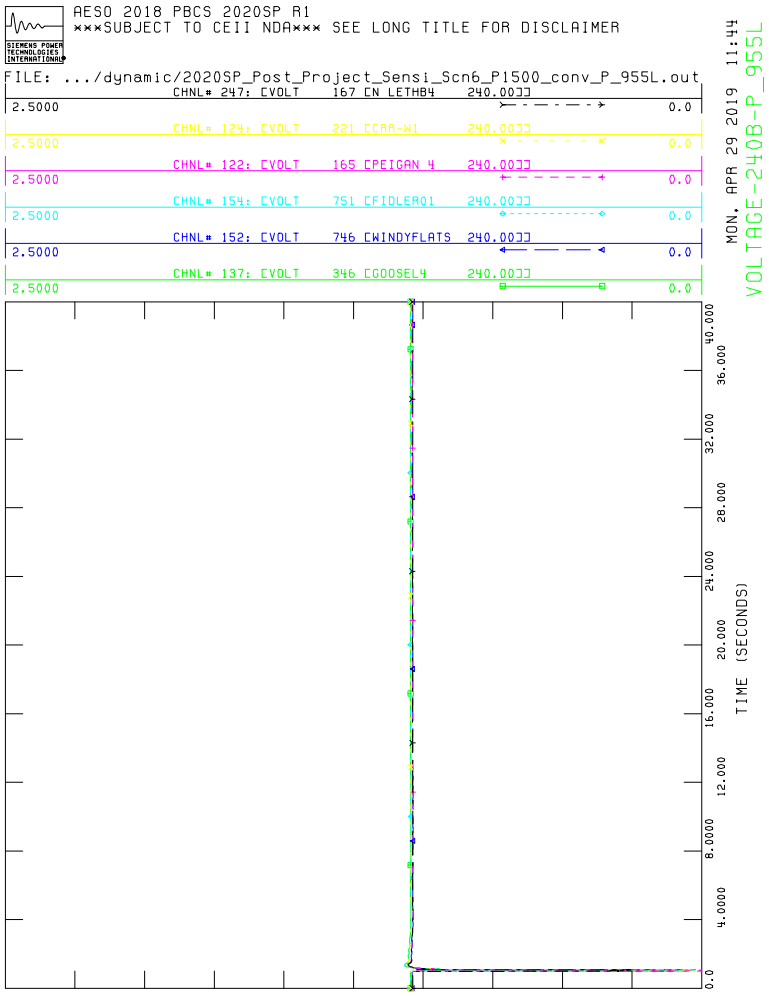
MON, APR 29 2019 11:43
BRANCH-MVA2-P_955L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 247: CVOLT 167 CN LETH84 240.000
CHNL# 124: CVOLT 221 CCRR-W1 240.000
CHNL# 122: CVOLT 165 CPEIGAN 4 240.000
CHNL# 154: CVOLT 751 CFIDLER01 240.000
CHNL# 152: CVOLT 746 CWINDYFLATS 240.000
CHNL# 137: CVOLT 346 CGOOSEL4 240.000
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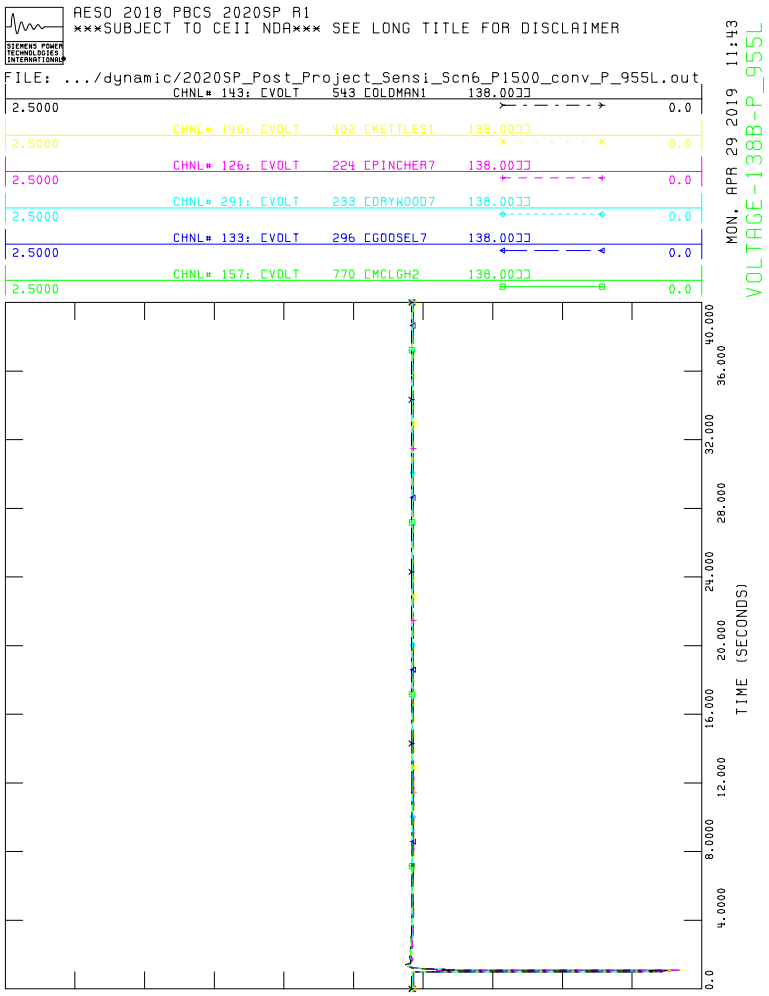
MON, APR 29 2019 11:44
VOLTAGE-240B-P_955L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_P_955L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.000
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CHNL# 126: CVOLT 224 CPINCHER7 138.000
CHNL# 291: CVOLT 233 CDRYWOOD7 138.000
CHNL# 133: CVOLT 296 CGOOSEL7 138.000
CHNL# 157: CVOLT 770 CMCLGH2 138.000
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VOLTAGE-138B-P_955L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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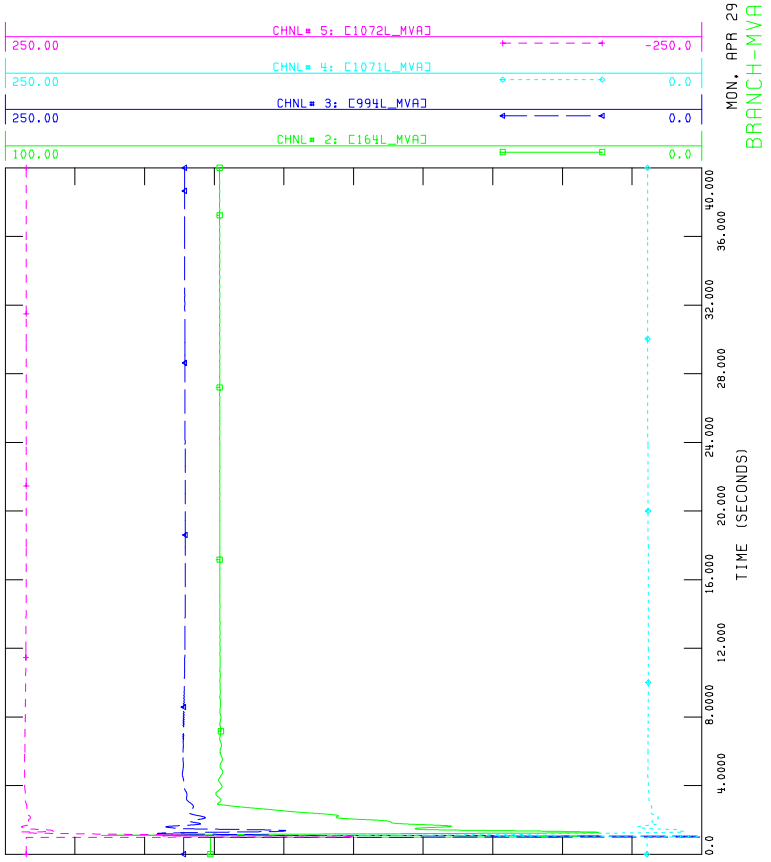
MON, APR 29 2019 11:44
BRANCH-MVA1-G_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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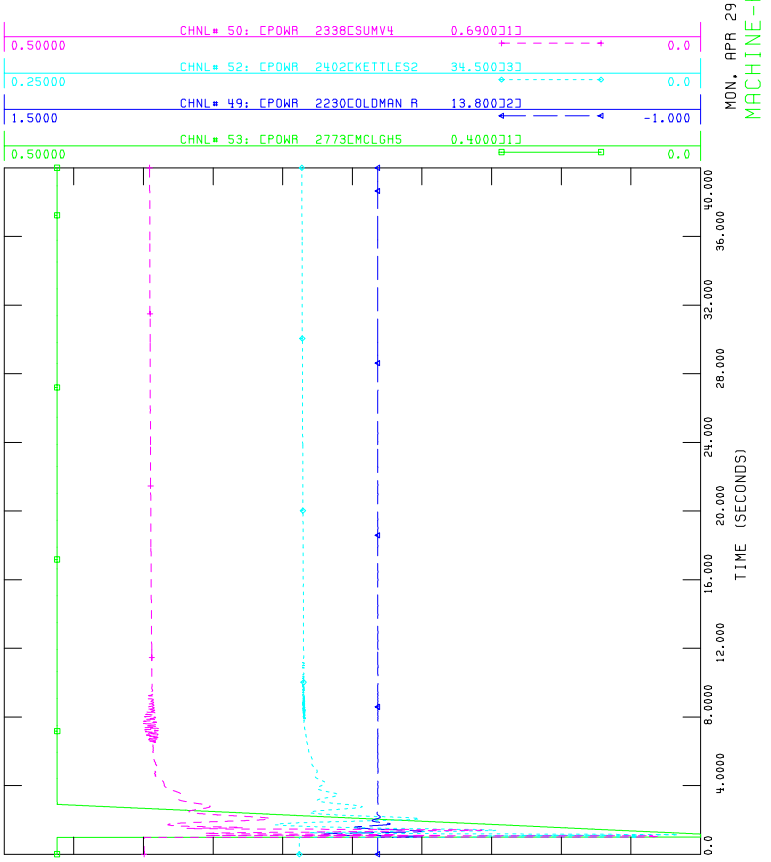
MON, APR 29 2019 11:44
MACHINE-P-G_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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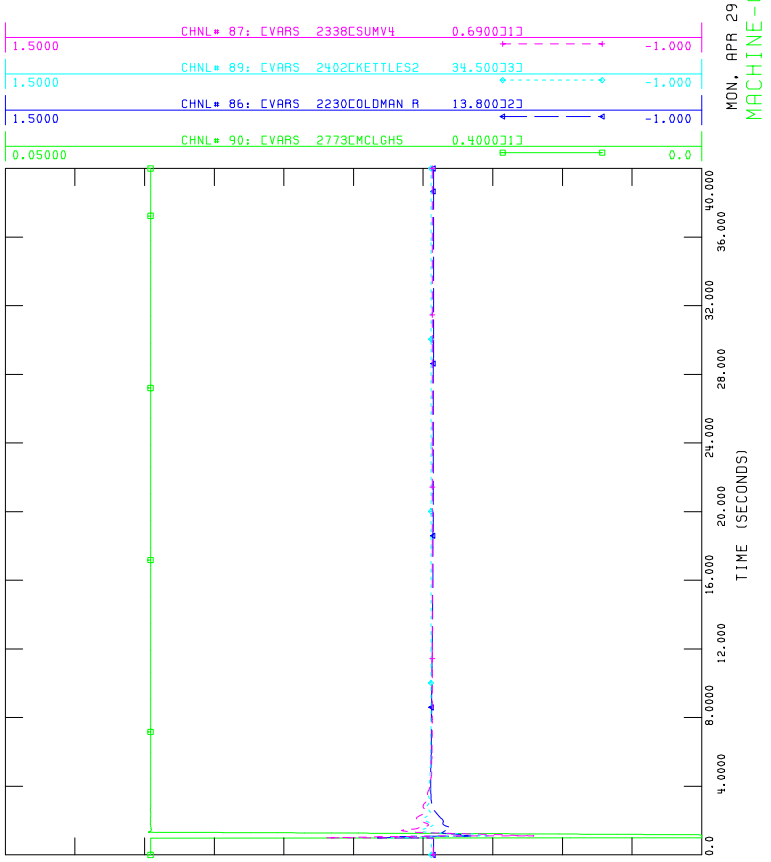
MON, APR 29 2019 11:44
MACHINE-Q-G_955L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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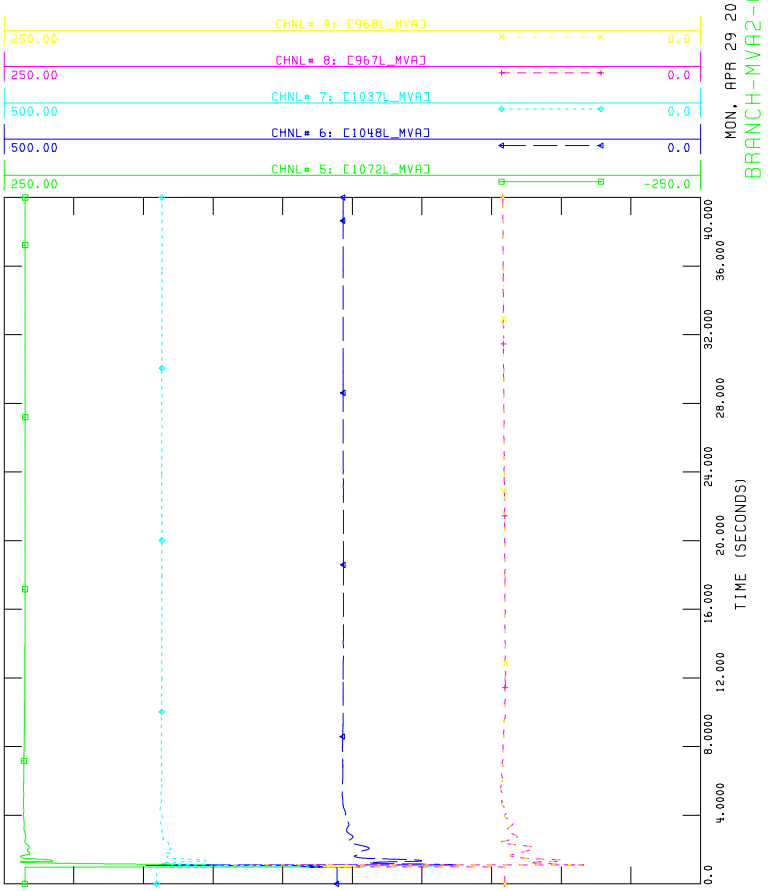
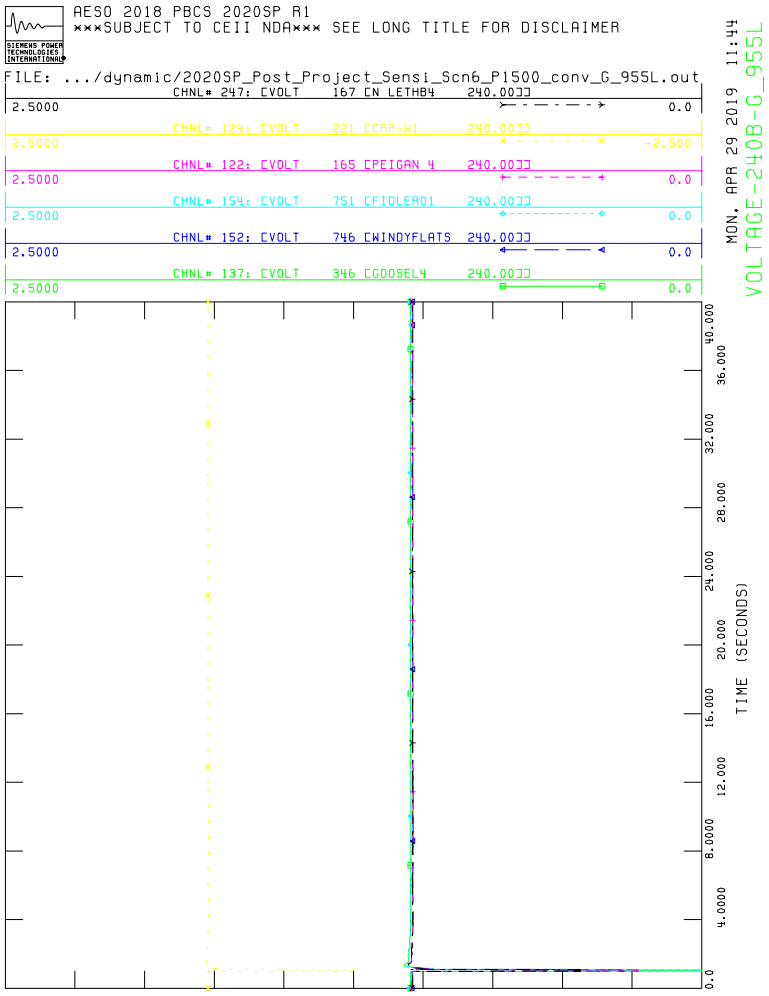
MON, APR 29 2019 11:44
BRANCH-MVA2-G_955L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 247: CVOLT 167 CN LETH84 240.00JJ
CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
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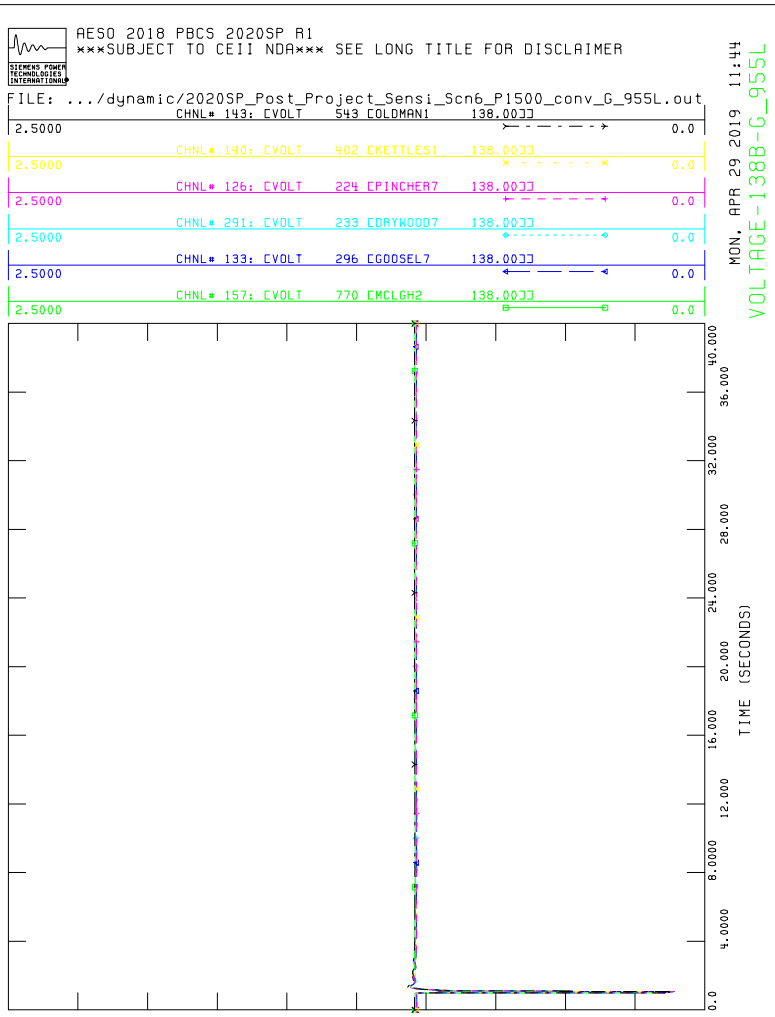
MON, APR 29 2019 11:44
VOLTAGE-240B-G_955L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:44
VOLTAGE-138B-G_955L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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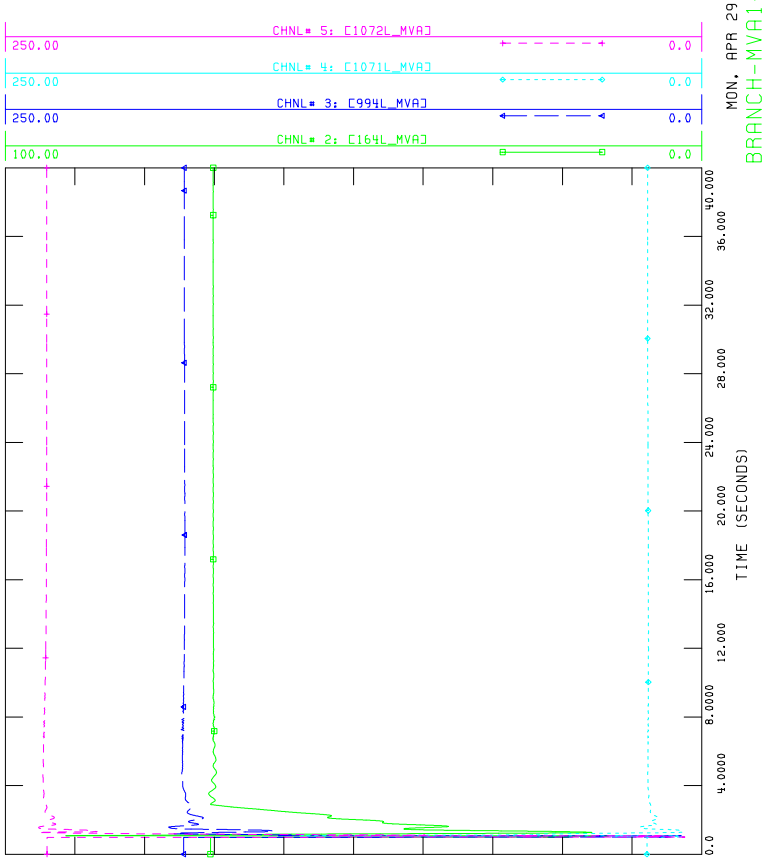

MON, APR 29 2019 11:44
BRANCH-MVA1-P_1048L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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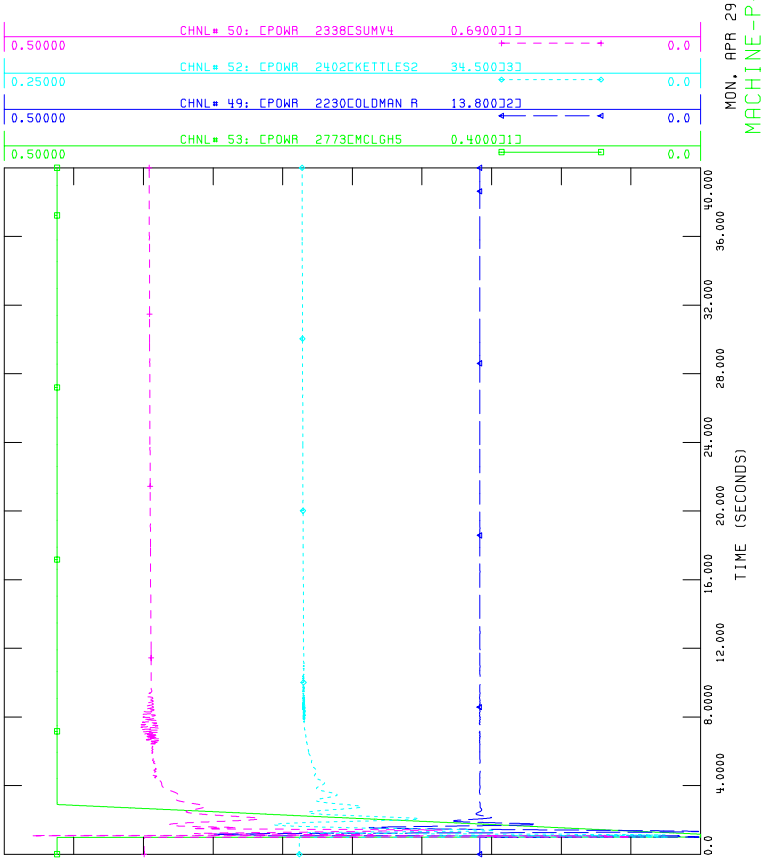

MON, APR 29 2019 11:44
MACHINE-P-P_1048L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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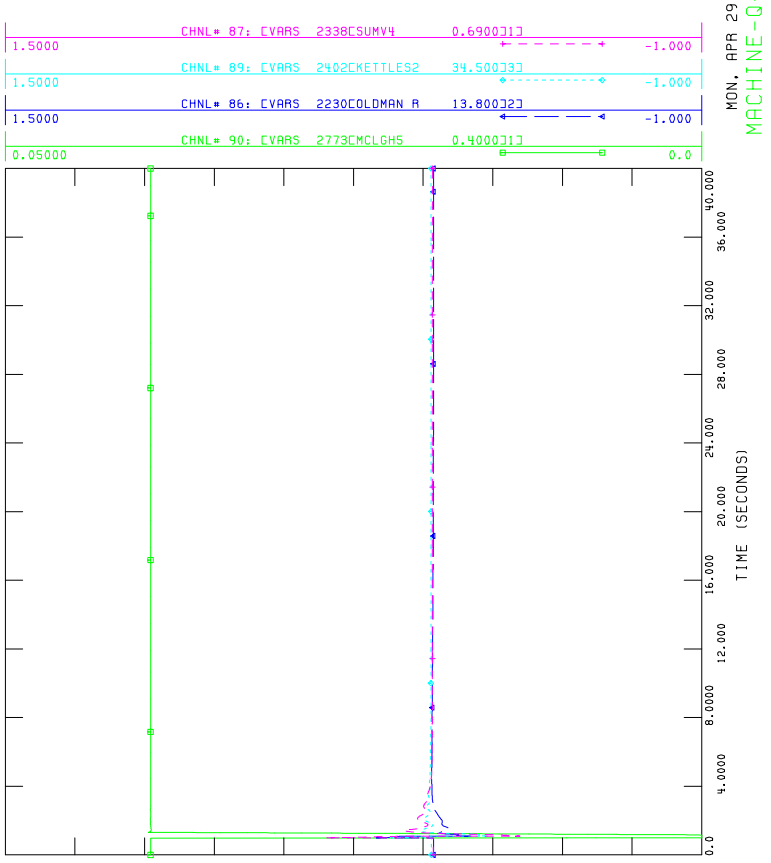

MON, APR 29 2019 11:44
MACHINE-Q-P_1048L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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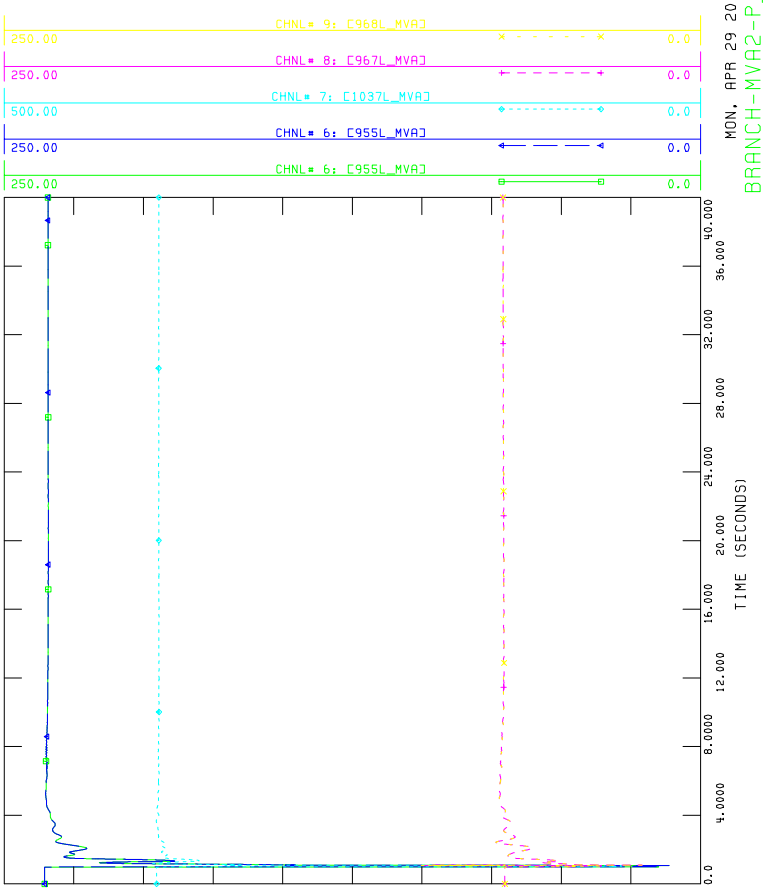
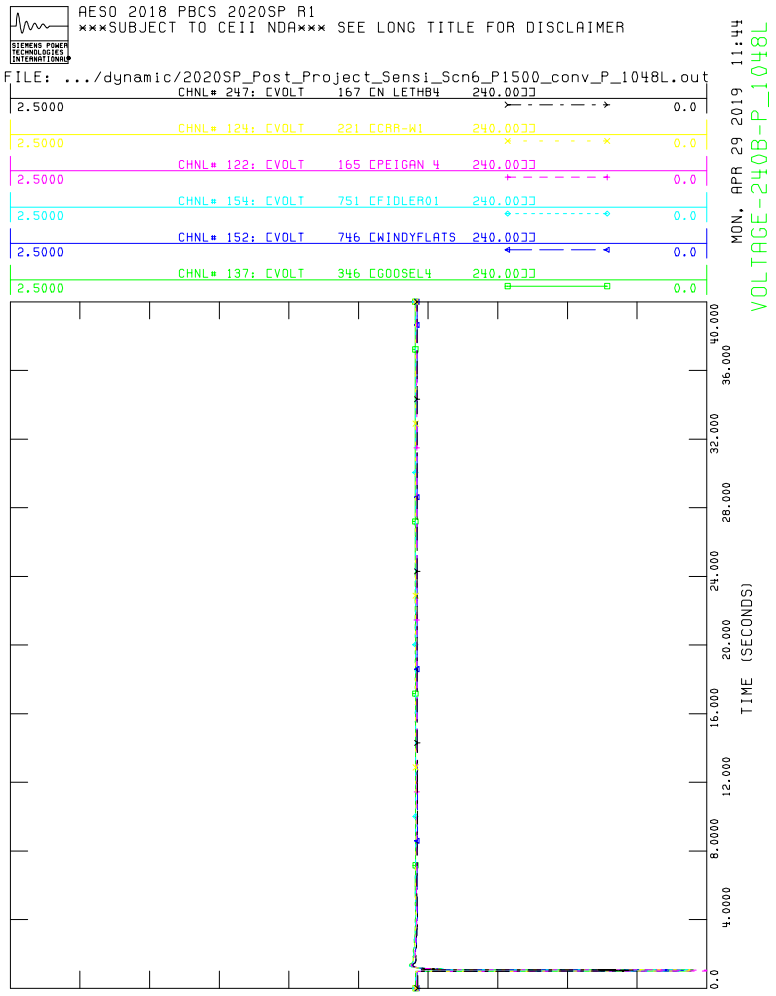


MON, APR 29 2019 11:44
BRANCH-MVA2-P_1048L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 247: CVOLT 167 CN LETH84 240.000
CHNL# 124: CVOLT 221 CCRR-W1 240.000
CHNL# 122: CVOLT 165 CPEIGAN 4 240.000
CHNL# 154: CVOLT 751 CFIDLER01 240.000
CHNL# 152: CVOLT 746 CWINDYFLATS 240.000
CHNL# 137: CVOLT 346 CGOOSEL4 240.000
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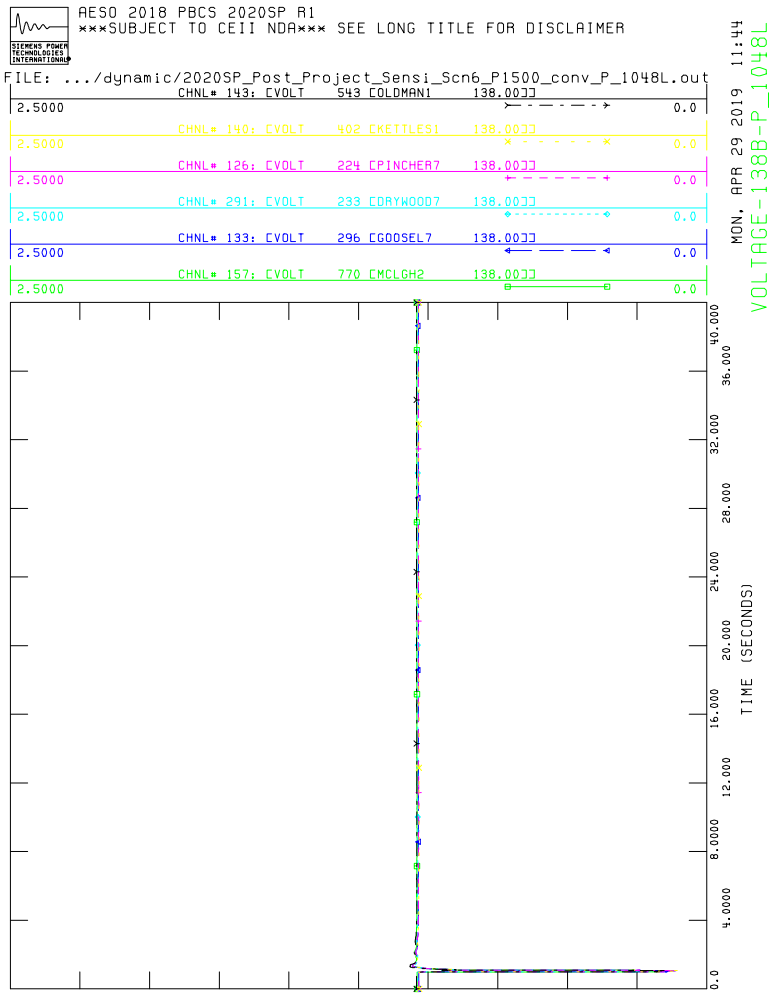
MON, APR 29 2019 11:44
VOLTAGE-240B-P_1048L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_P_1048L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.000
CHNL# 140: CVOLT 402 CKETTLES1 138.000
CHNL# 126: CVOLT 224 CPINCHER7 138.000
CHNL# 291: CVOLT 233 CDRYWOOD7 138.000
CHNL# 133: CVOLT 296 CGOOSEL7 138.000
CHNL# 157: CVOLT 770 CMCLGH2 138.000
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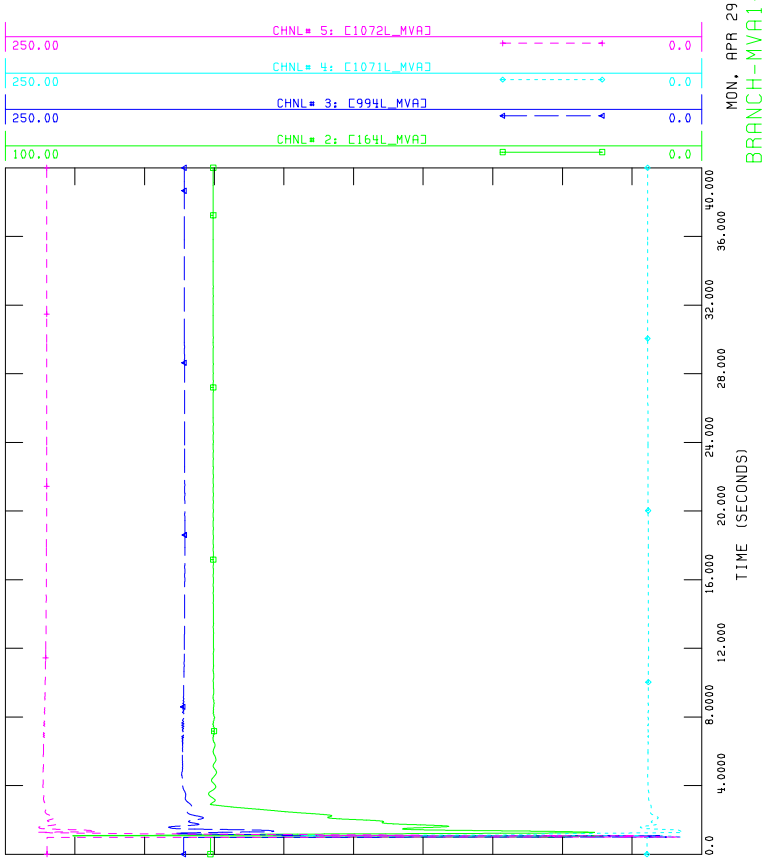
MON, APR 29 2019 11:44
VOLTAGE-138B-P_1048L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_W_1048L.out

MON, APR 29 2019 11:44

BRANCH-MVA1-W_1048L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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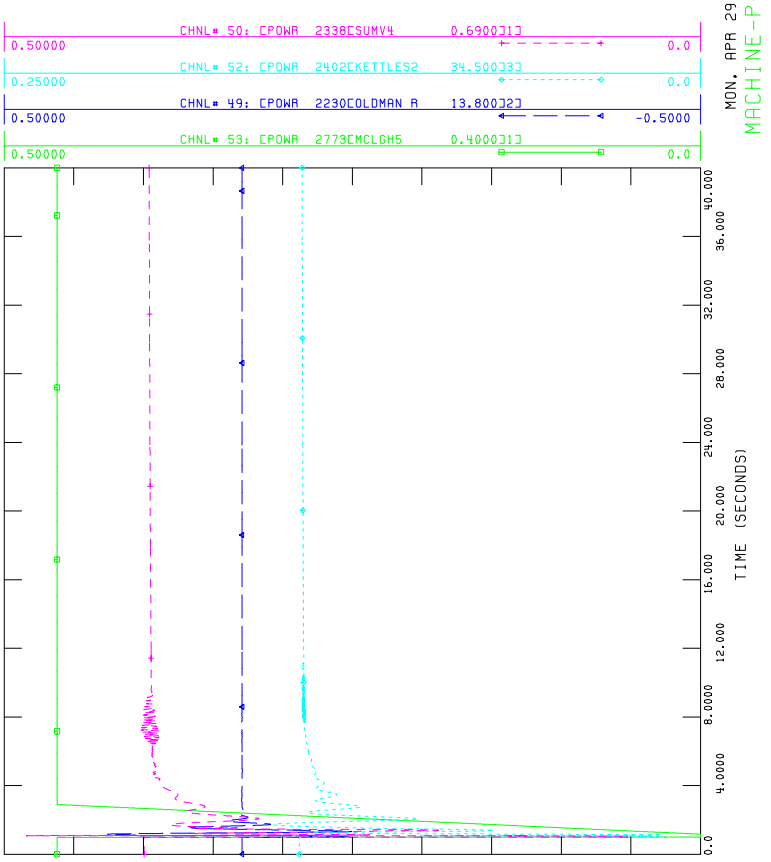
MON, APR 29 2019 11:44

MACHINE-P-W_1048L

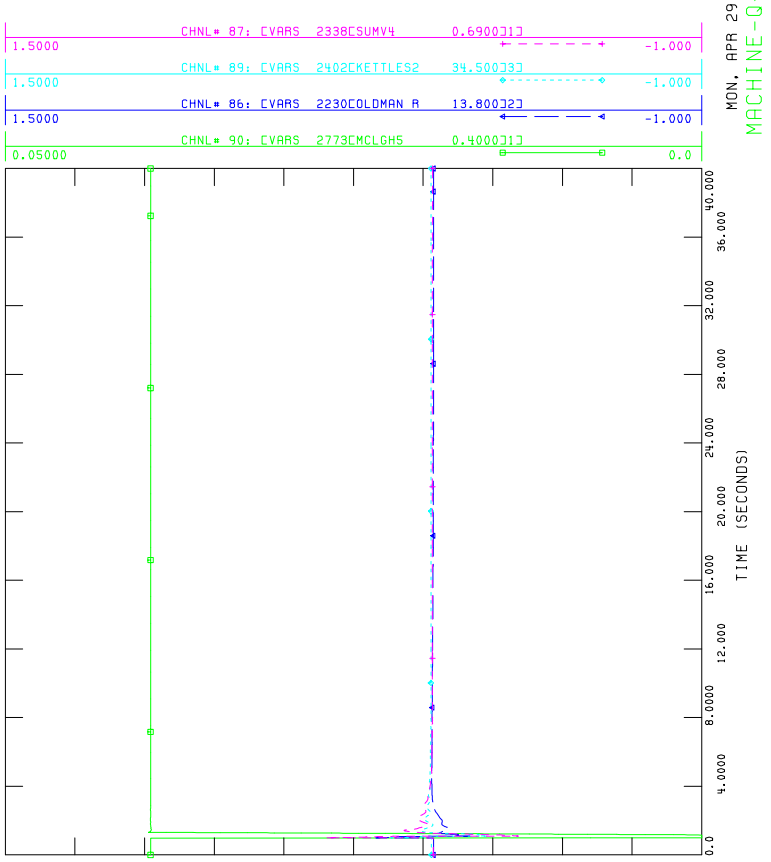


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_W_1048L.out

MON, APR 29 2019 11:44

MACHINE-Q-W_1048L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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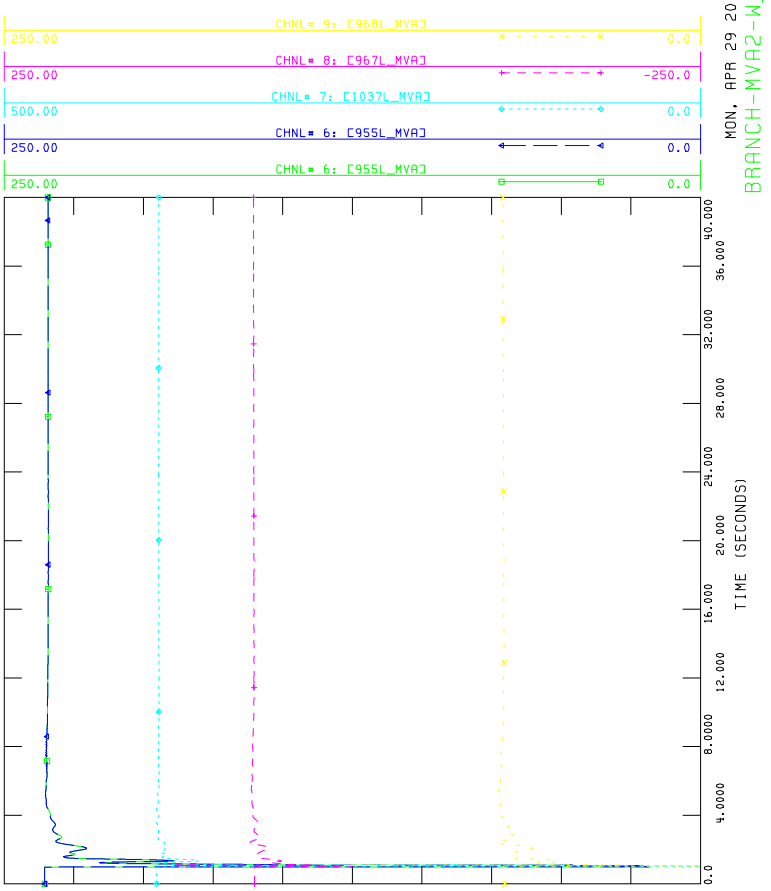
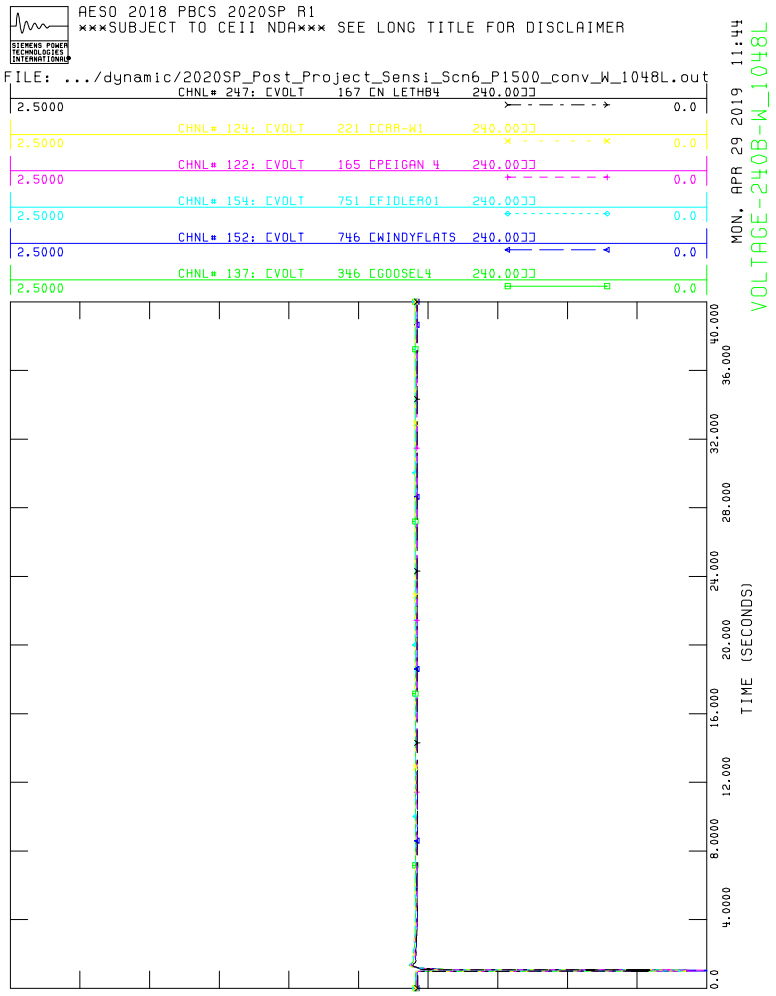
MON, APR 29 2019 11:44

BRANCH-MVA2-W_1048L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_W_1048L.out
CHNL# 247: CVOLT 167 CN LETH84 240.00JJ
CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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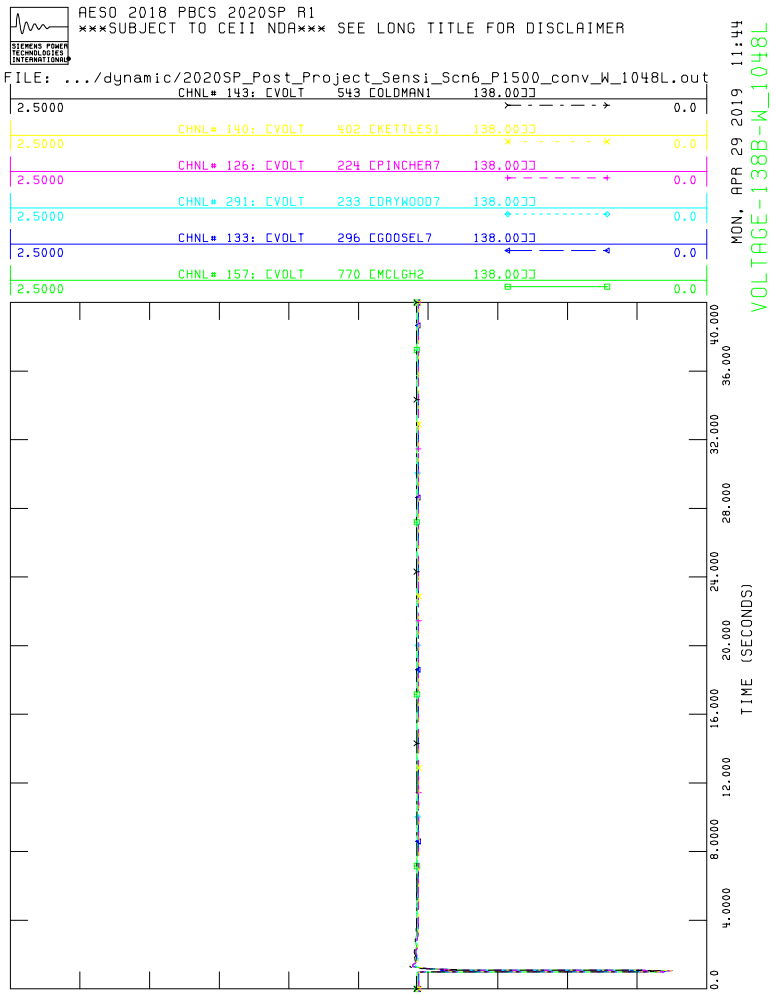
TIME (SECONDS)
MON, APR 29 2019 11:44
VOLTAGE-240B-W_1048L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_W_1048L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
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MON, APR 29 2019 11:44
VOLTAGE-138B-W_1048L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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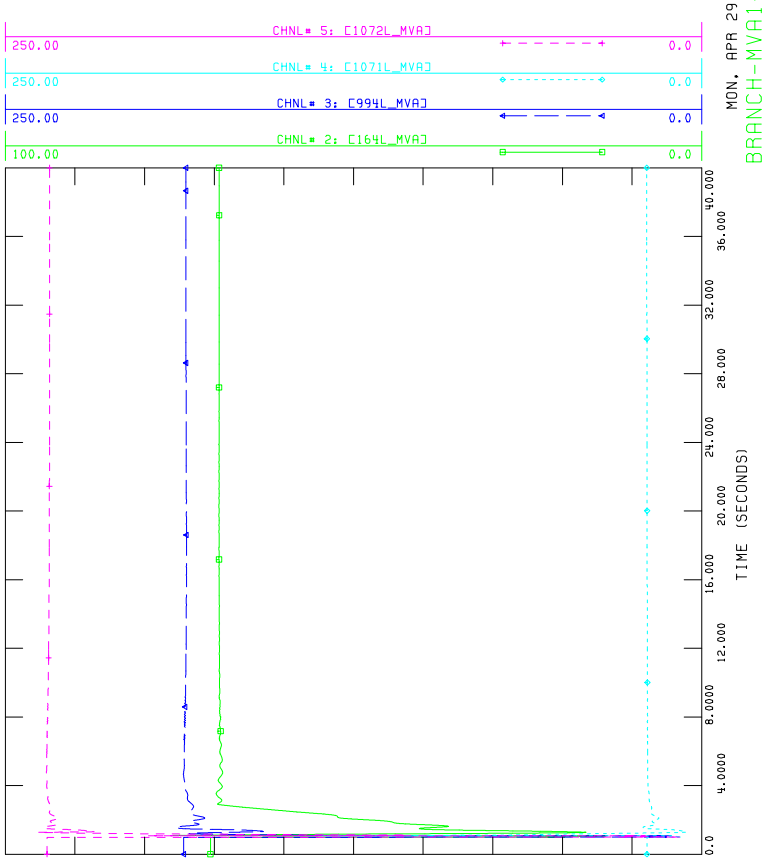

MON, APR 29 2019 11:45
BRANCH-MVA1-W_1037L

AESO 2018 PBCS 2020SP R1
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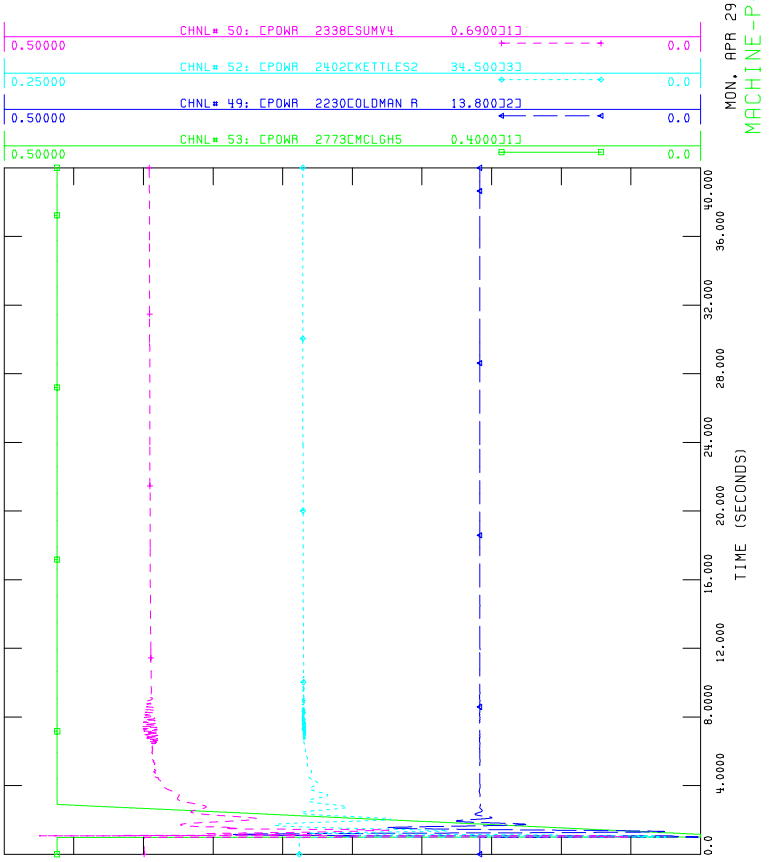

MON, APR 29 2019 11:45
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AESO 2018 PBCS 2020SP R1
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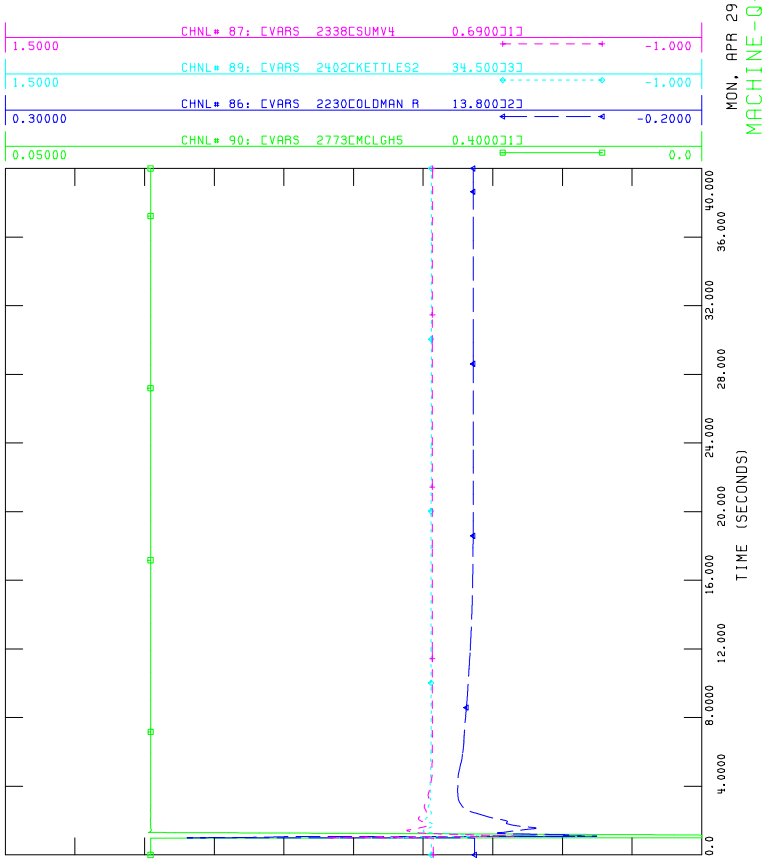

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AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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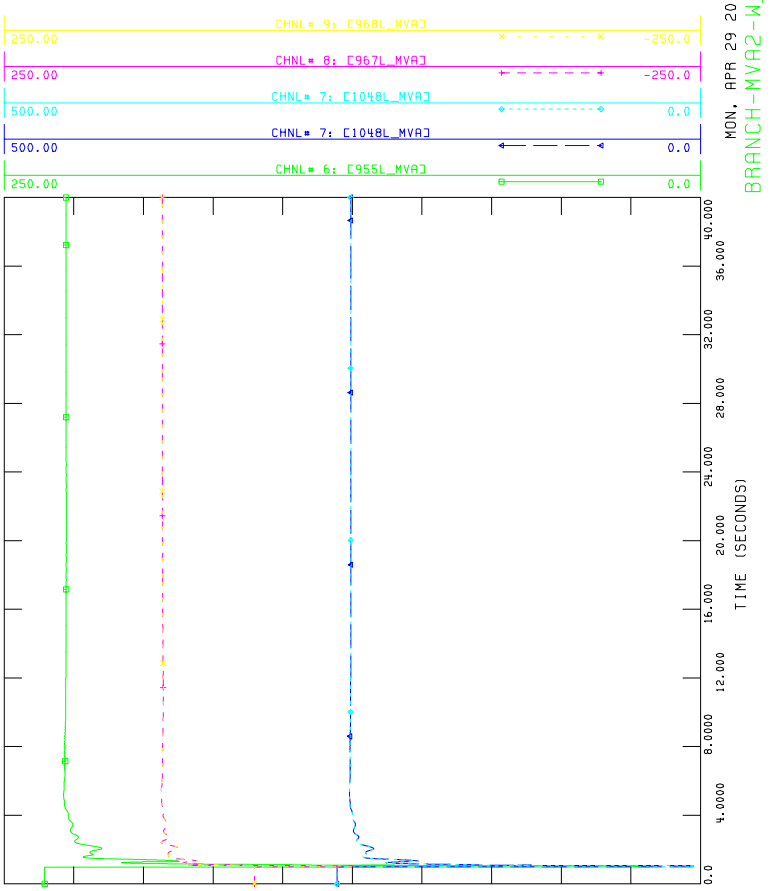

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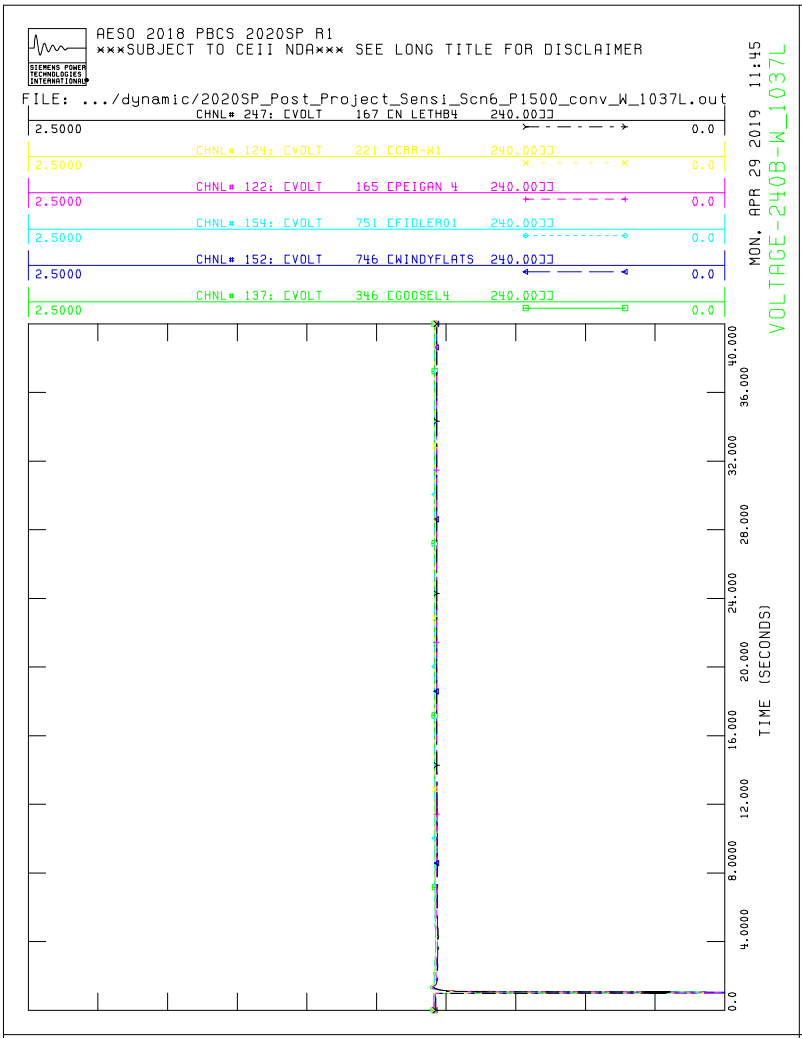
BRANCH-MVA2-W_1037L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 122: CVOLT 165 CPEIGAN 4 240.000
CHNL# 154: CVOLT 751 CFIDLER01 240.000
CHNL# 152: CVOLT 746 CWINDYFLATS 240.000
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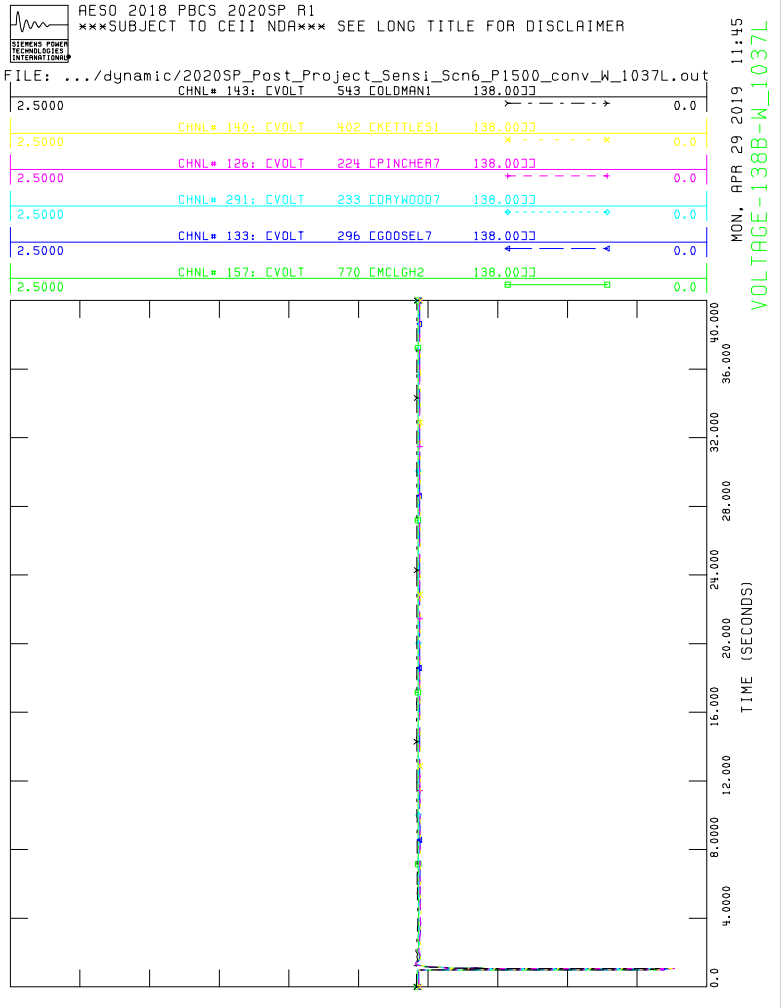
MON, APR 29 2019 11:45
VOLTAGE-240B-W_1037L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 143: CVOLT 543 COLDMAN1 138.000
CHNL# 140: CVOLT 402 CKETTLES1 138.000
CHNL# 126: CVOLT 224 CPINCHER7 138.000
CHNL# 291: CVOLT 233 CDRYWOOD7 138.000
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VOLTAGE-138B-W_1037L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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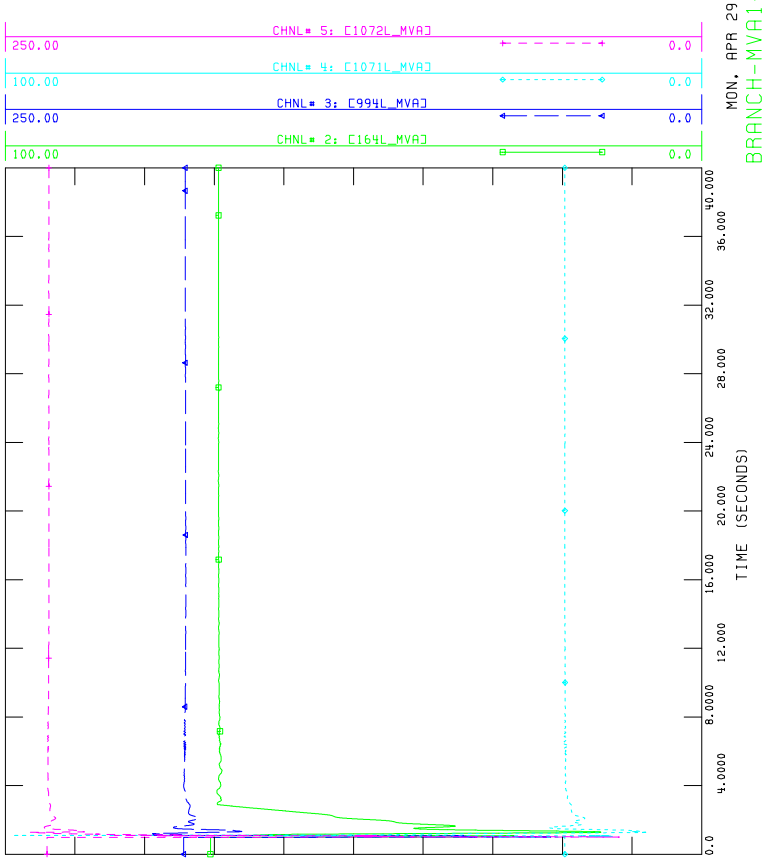
BRANCH-MVA1-F_1037L



AESO 2018 PBCS 2020SP R1
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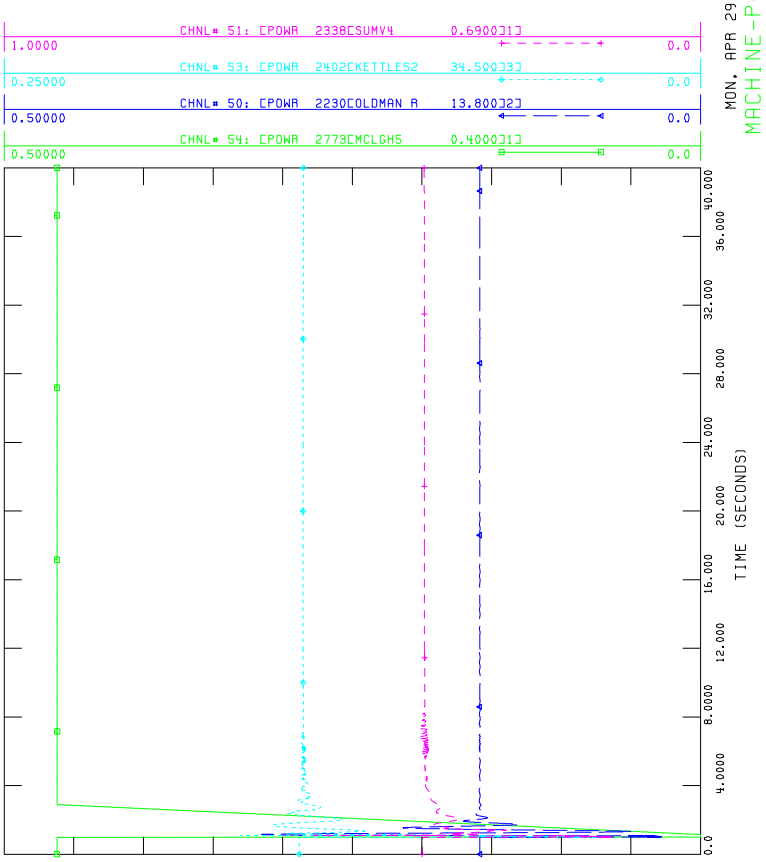
MON, APR 29 2019 11:45
MACHINE-P-F_1037L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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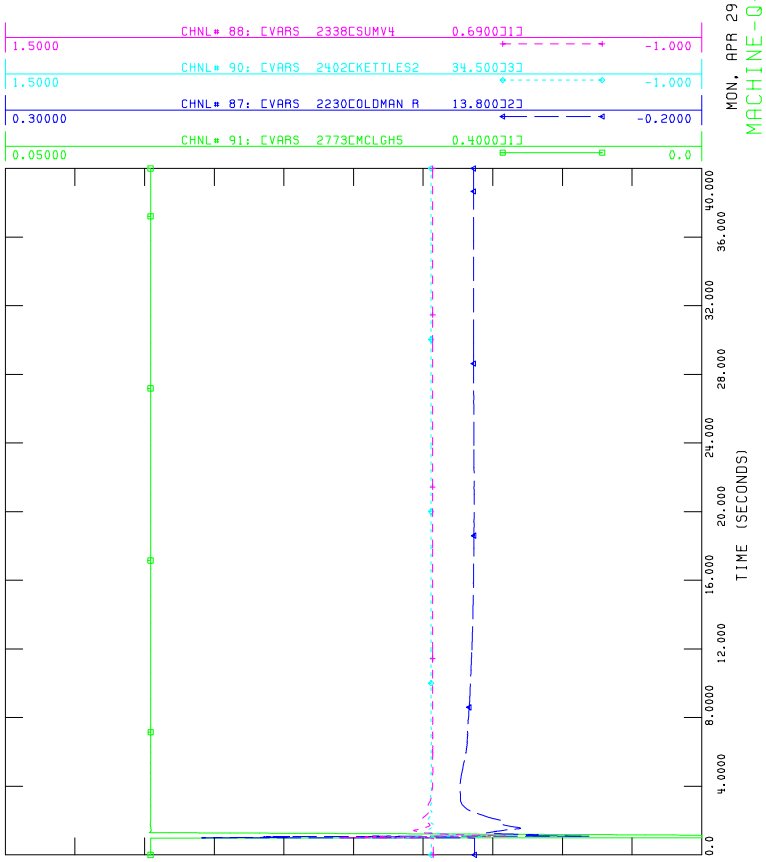

AESO 2018 PBCS 2020SP R1
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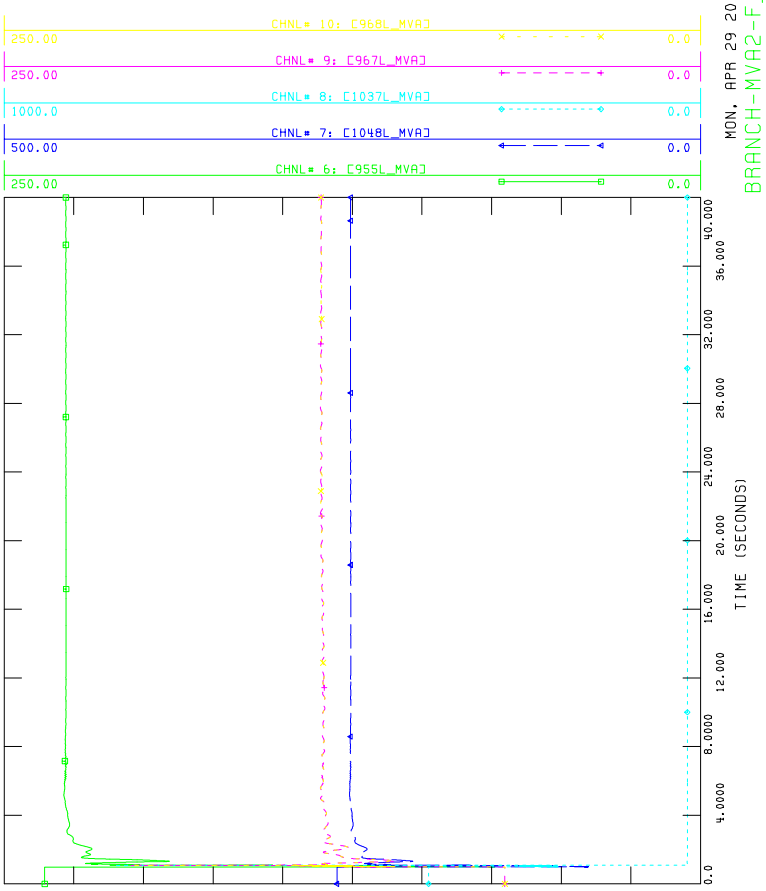
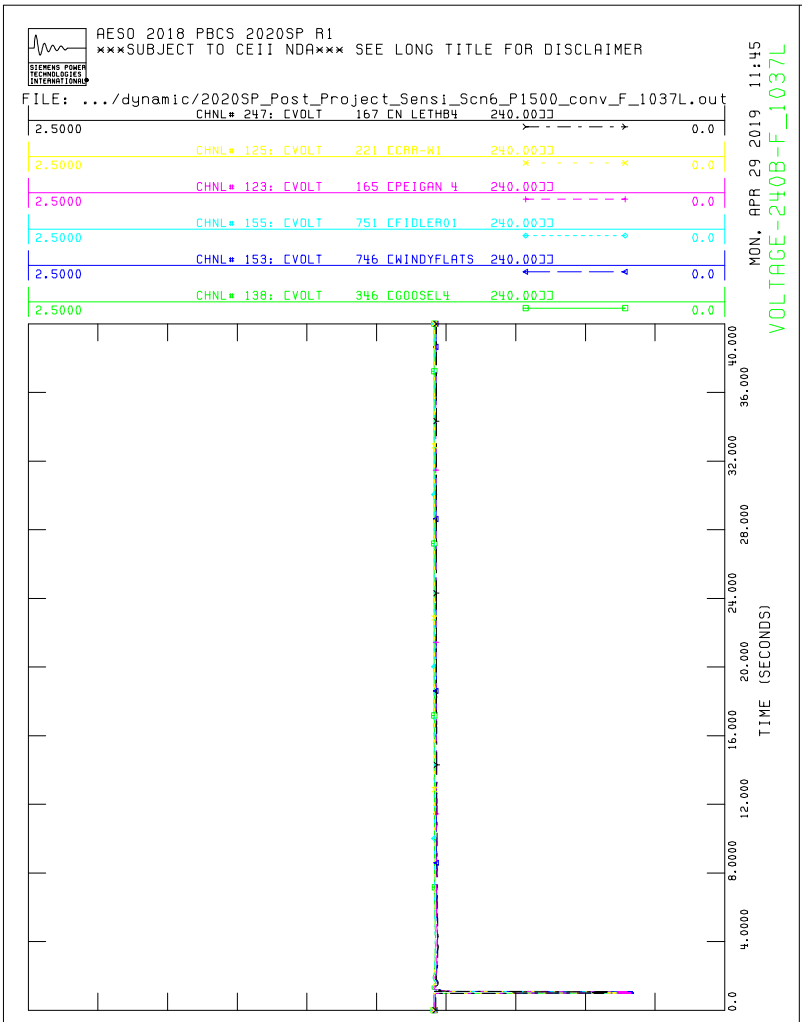
BRANCH-MVA2-F_1037L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 247: CVOLT 167 CN LETH84 240.00JJ
CHNL# 125: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 123: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 155: CVOLT 751 CFIDLER01 240.00JJ
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CHNL# 138: CVOLT 346 CGOOSEL4 240.00JJ
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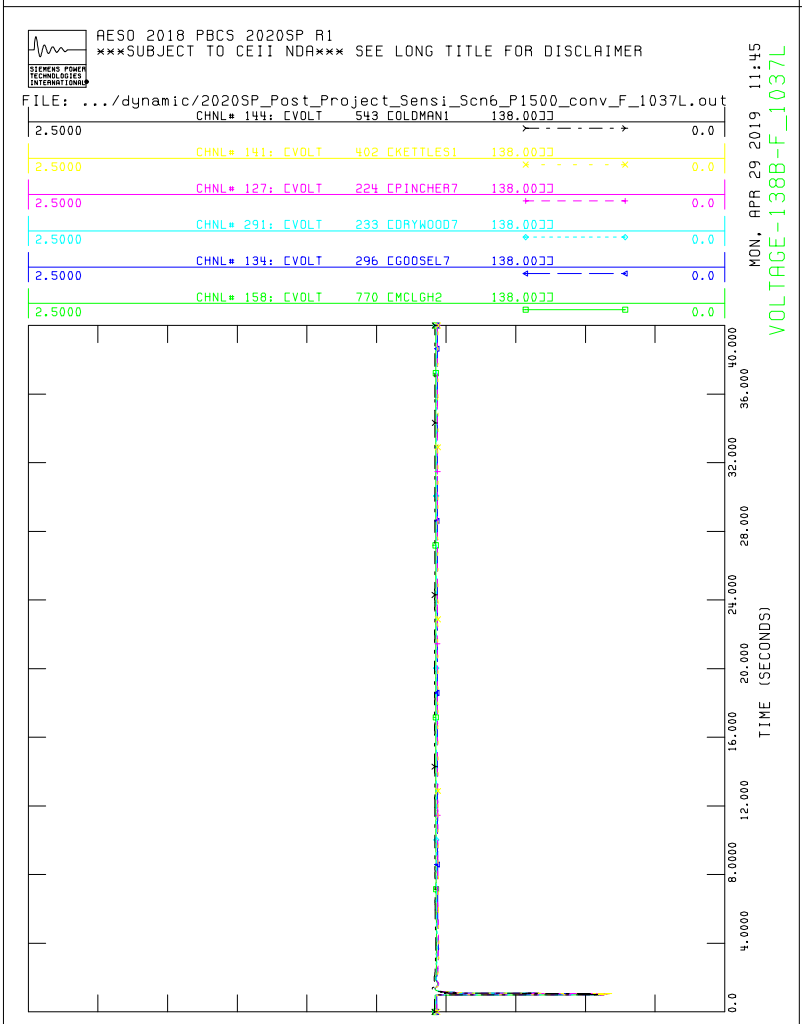
MON, APR 29 2019 11:45
VOLTAGE-240B-F_1037L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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_F_1037L.out
CHNL# 144: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 141: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 127: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 134: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 158: CVOLT 770 CMCLGH2 138.00JJ
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VOLTAGE-138B-F_1037L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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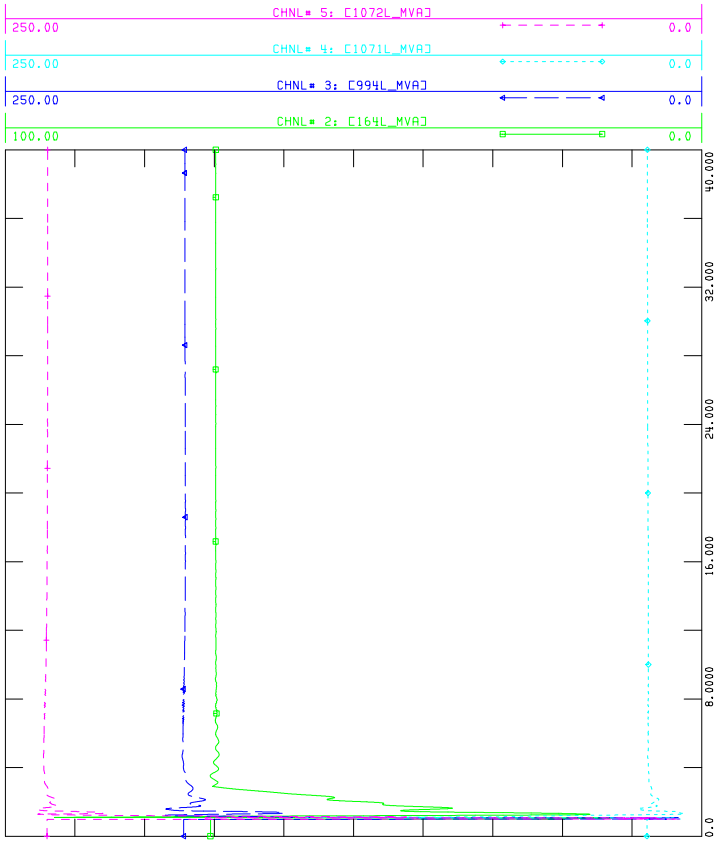
MON, APR 29 2019 11:45

BRANCH-MVA1-W_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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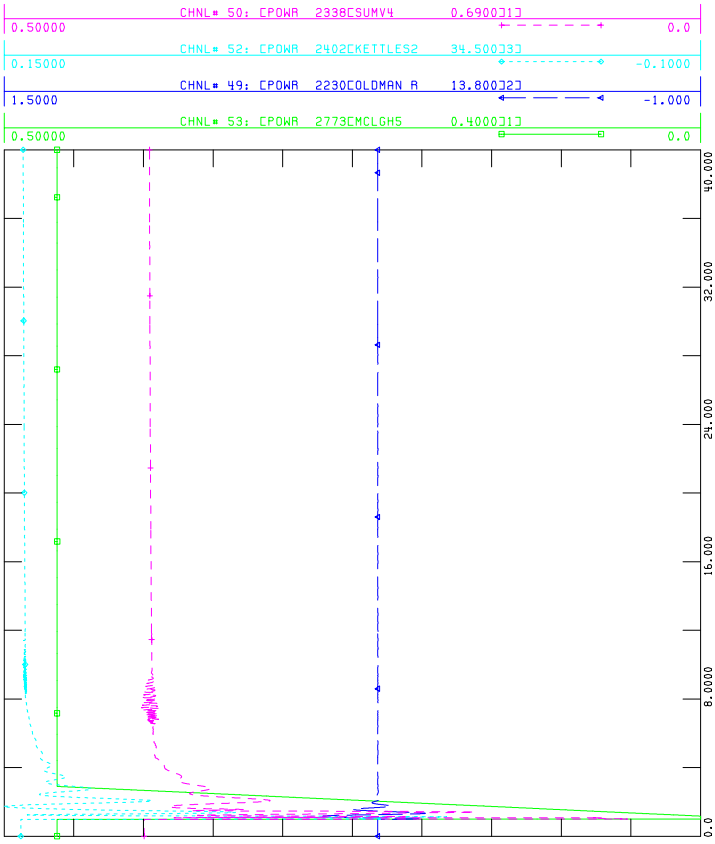
MON, APR 29 2019 11:45

MACHINE-P-W_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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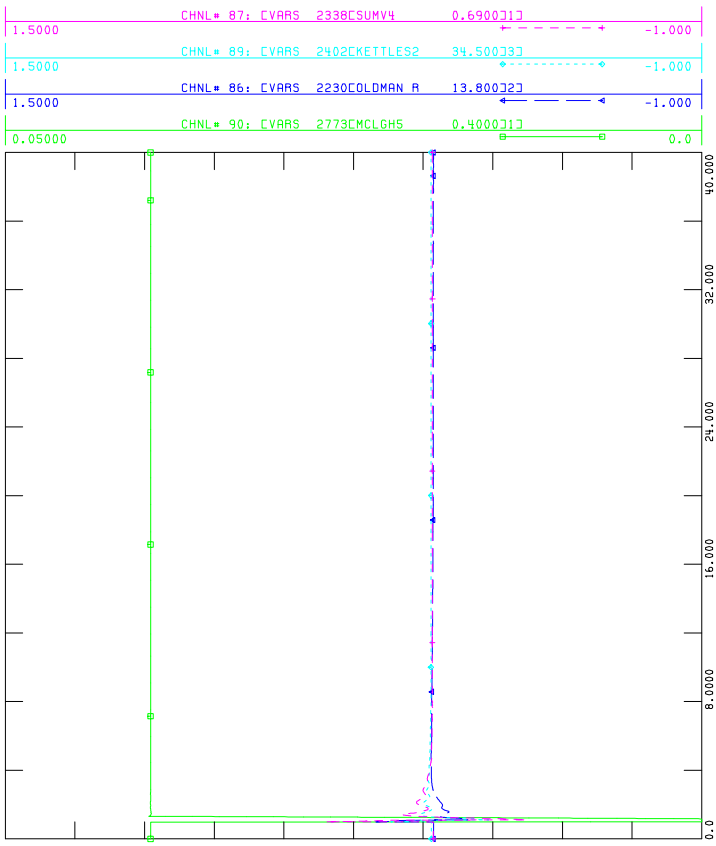
MON, APR 29 2019 11:45

MACHINE-Q-W_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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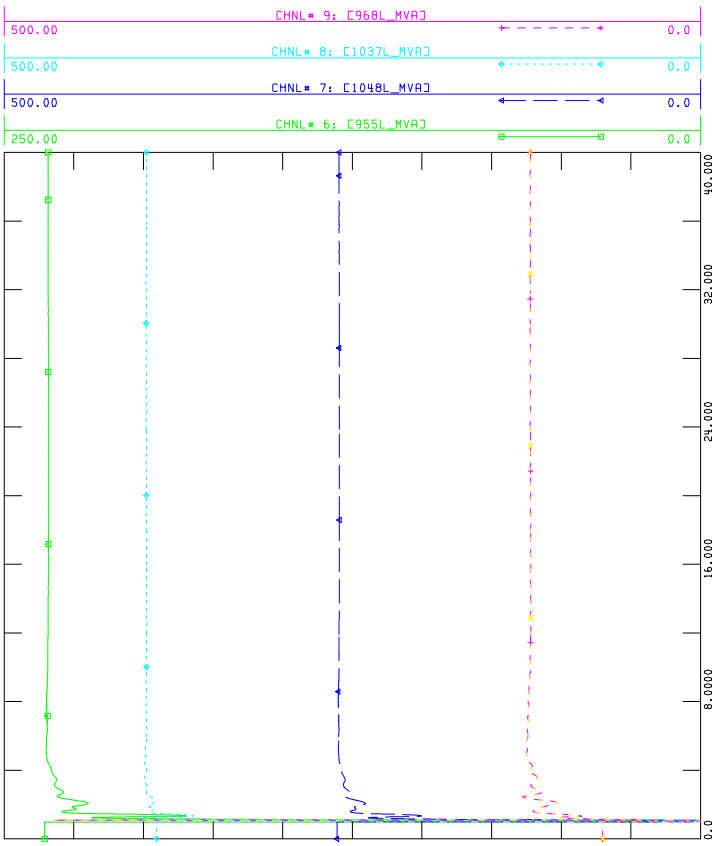
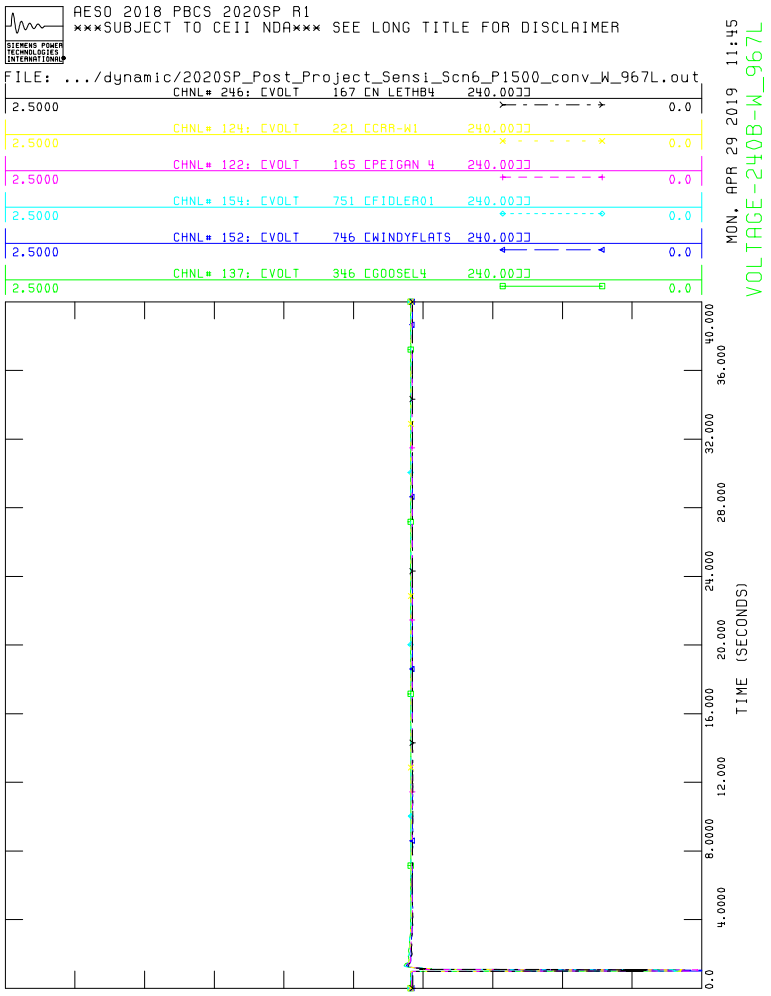
MON, APR 29 2019 11:45

BRANCH-MVA2-W_967L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
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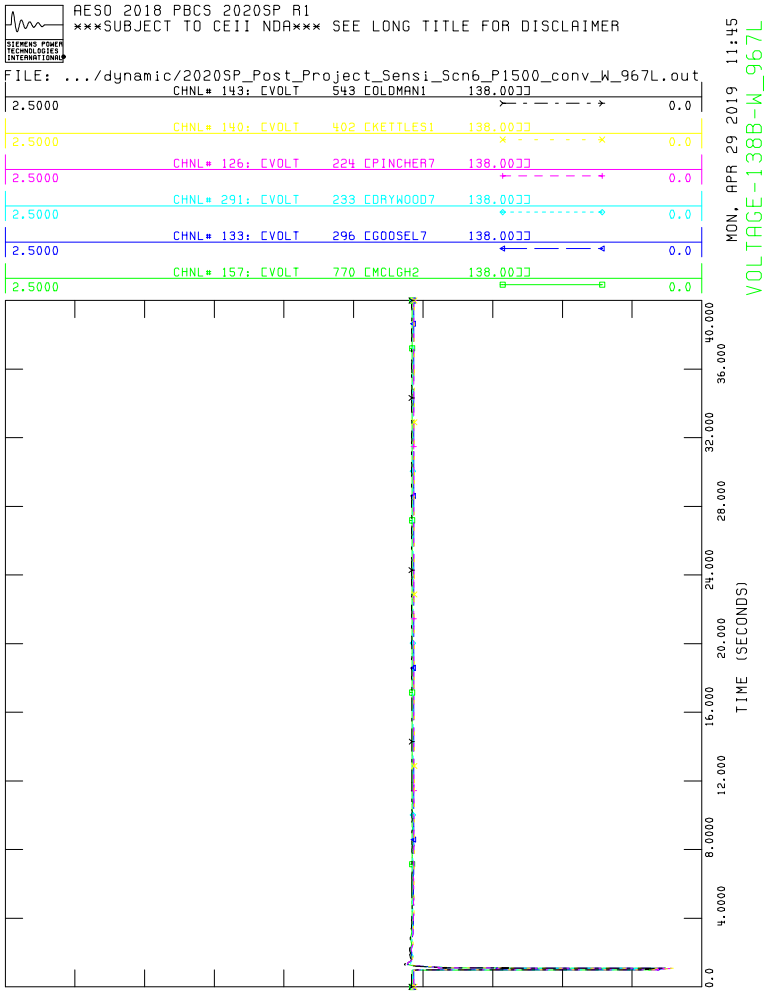
MON, APR 29 2019 11:45
VOLTAGE-240B-W_967L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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:45
VOLTAGE-138B-W_967L

AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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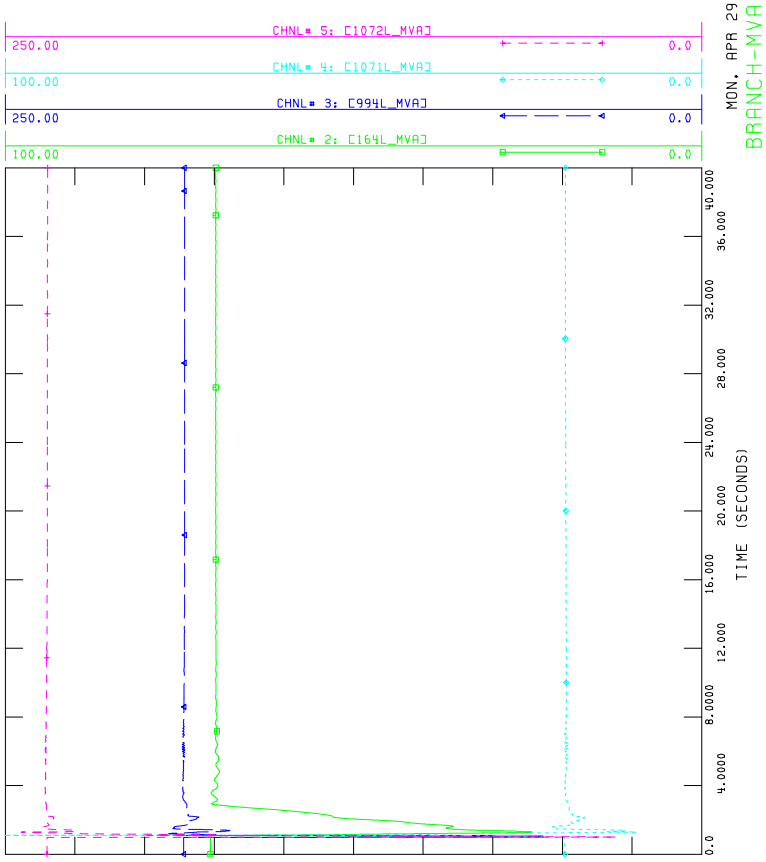
MON, APR 29 2019 11:46
BRANCH-MVA1-N_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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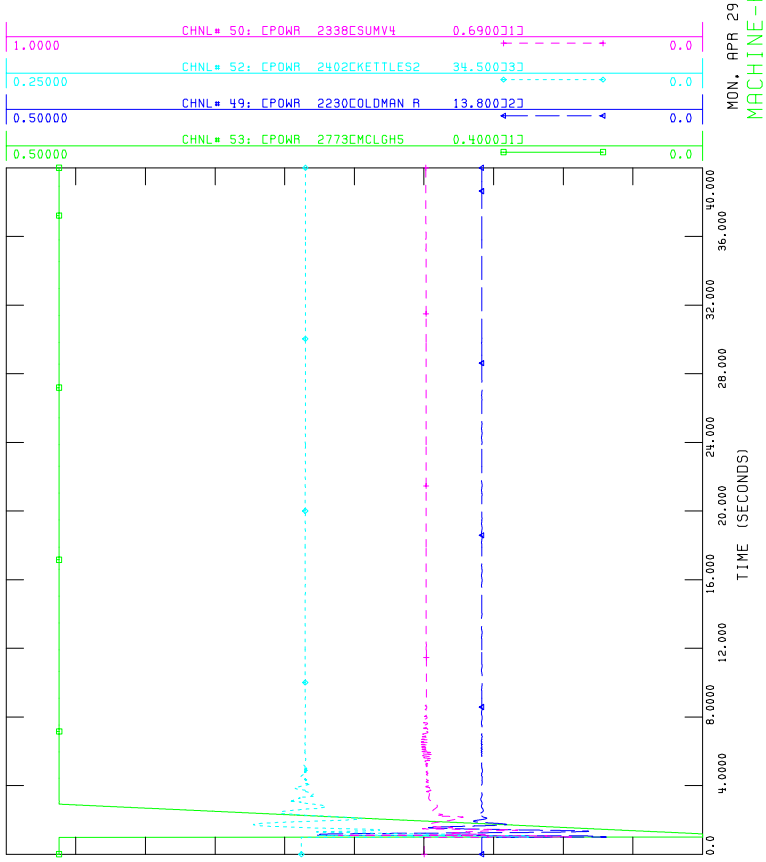
MACHINE-P-N_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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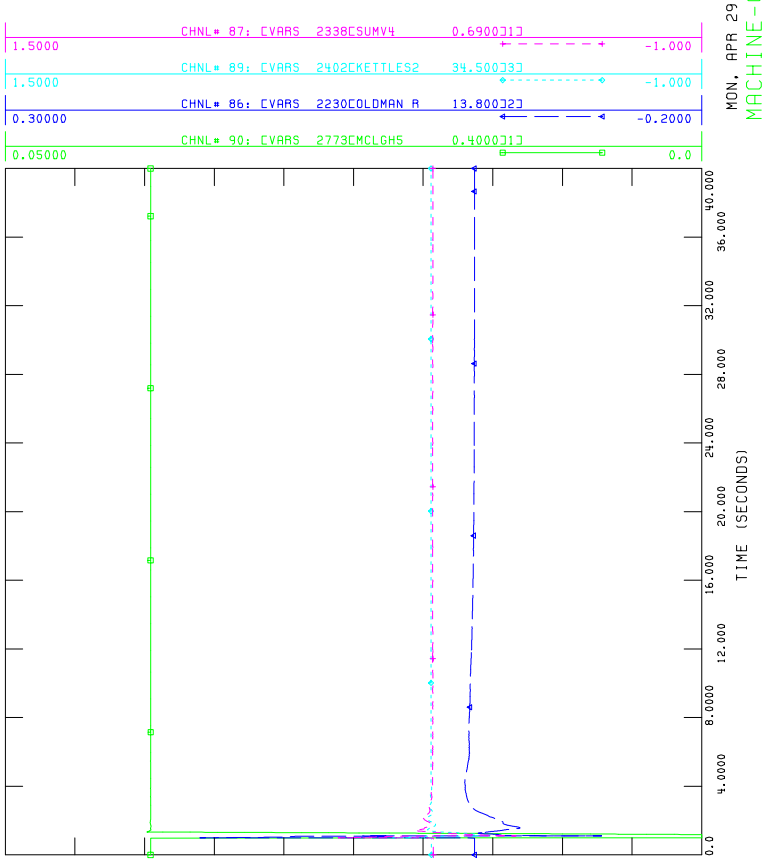
MON, APR 29 2019 11:45
MACHINE-Q-N_967L



AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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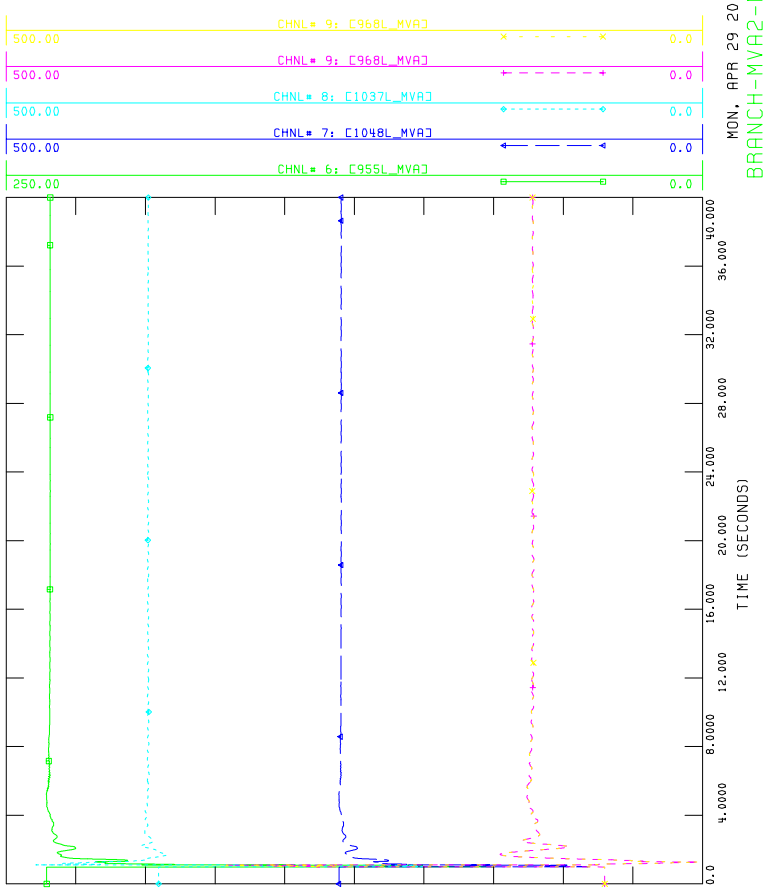
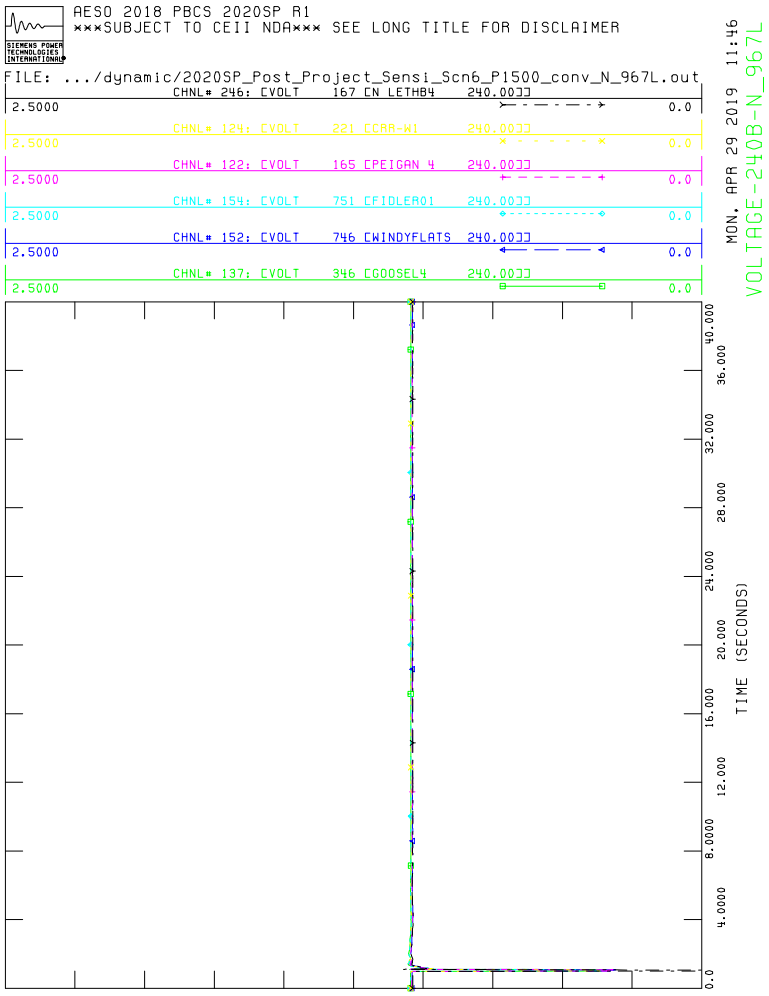
BRANCH-MVA2-N_967L




AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 246: CVOLT 167 CN LETH84 240.00JJ
CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
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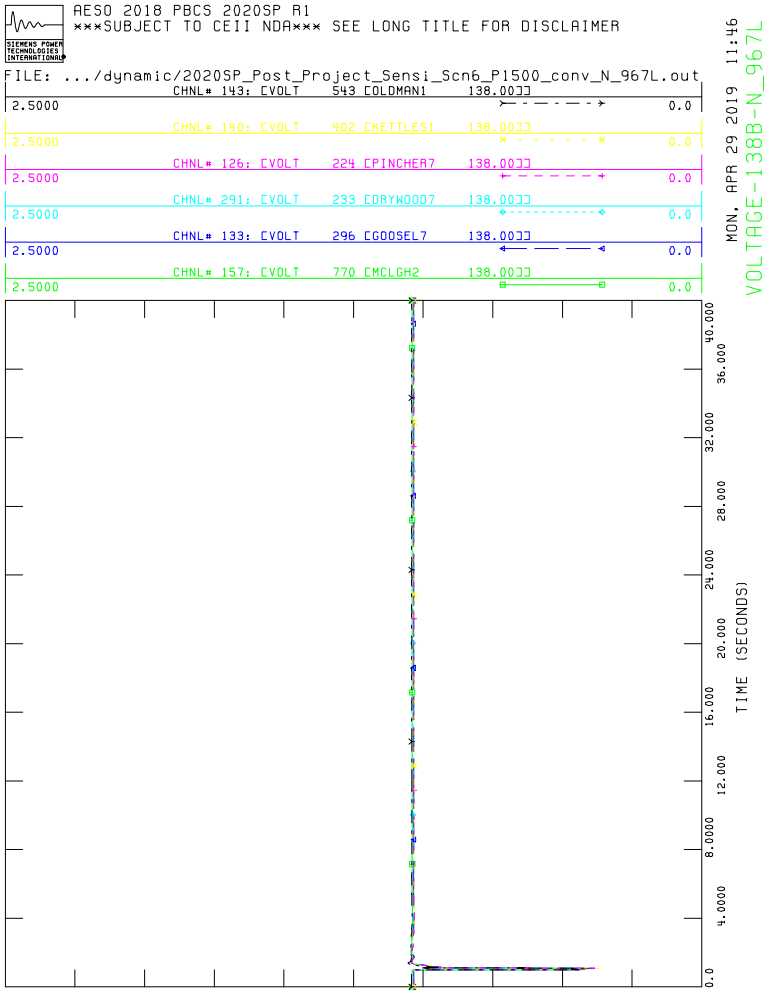
MON, APR 29 2019 11:46
VOLTAGE-240B-N_967L


AESO 2018 PBCS 2020SP R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: .../dynamic/2020SP_Post_Project_Sensi_Scn6_P1500_conv_N_967L.out
CHNL# 143: CVOLT 543 COLDMAN1 138.00JJ
CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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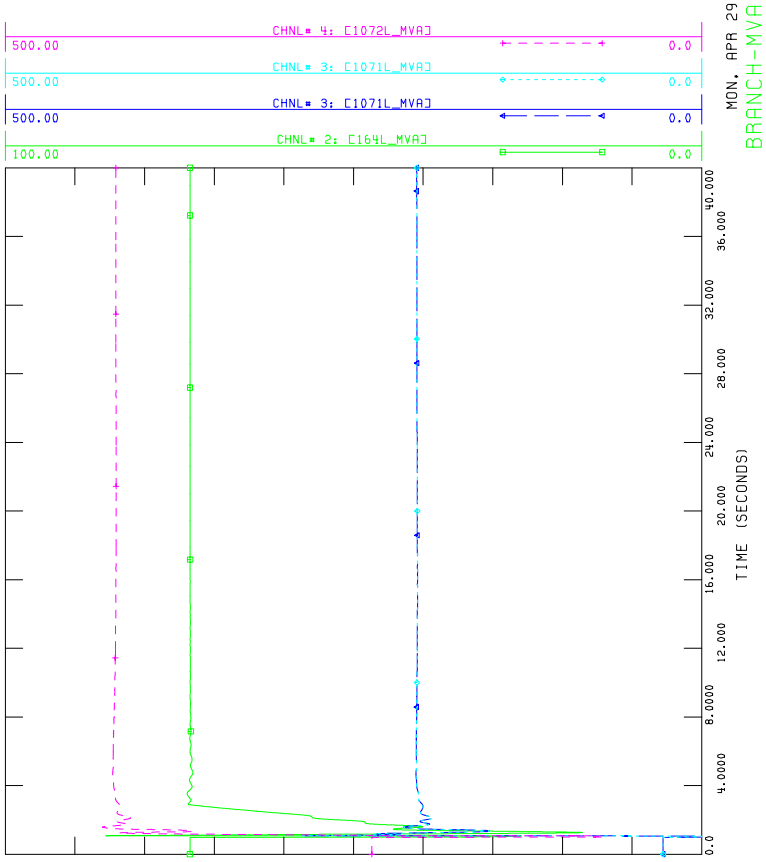
MON, APR 29 2019 11:46
VOLTAGE-138B-N_967L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

FILE: .../dynamic/2020SL_Post_Project_Sensi_Scn8_P1500_conv_F_994L.out

MON, APR 29 2019 11:46

BRANCH-MVA1-F_994L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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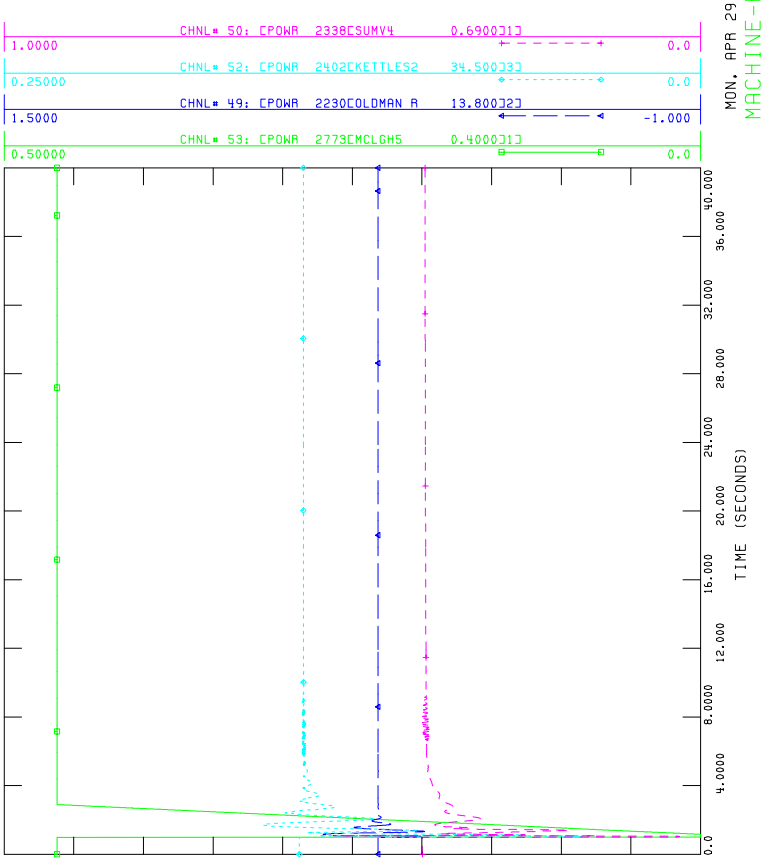
MON, APR 29 2019 11:46

MACHINE-P-F_994L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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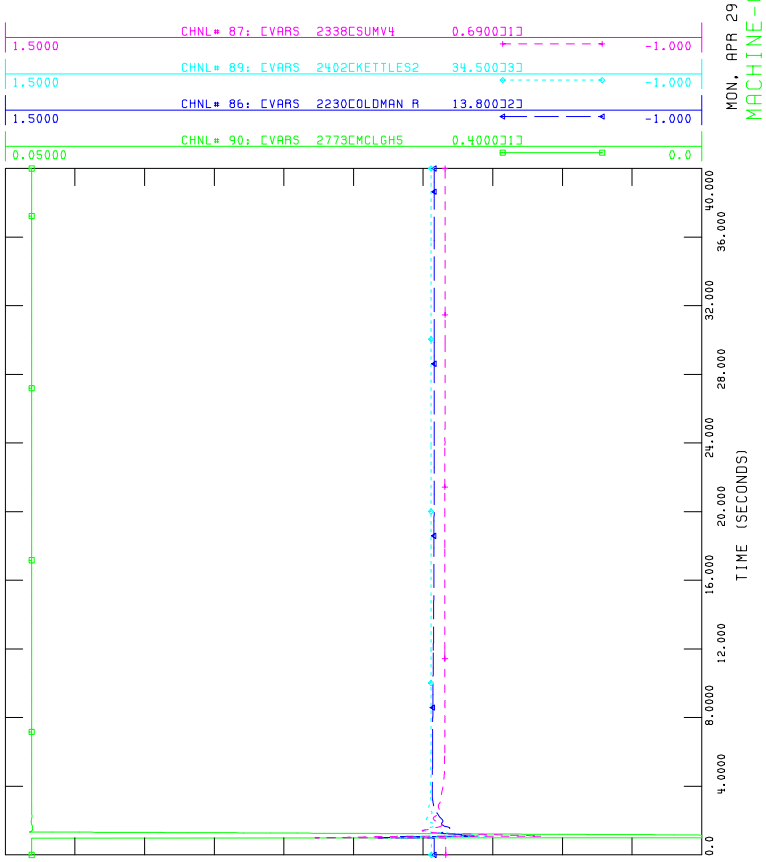
MON, APR 29 2019 11:46

MACHINE-Q-F_994L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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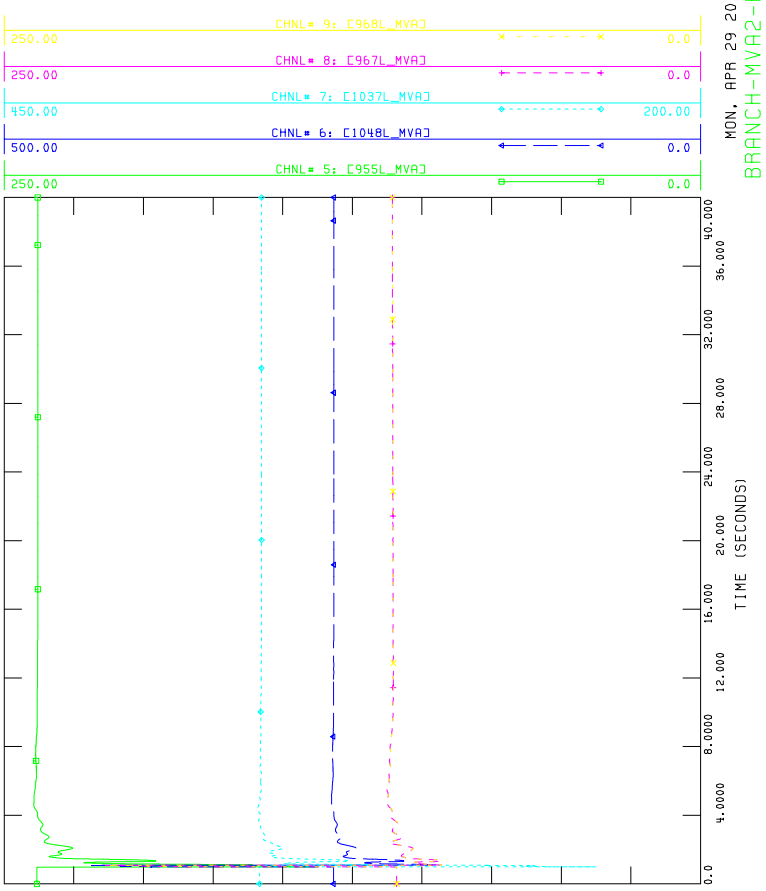
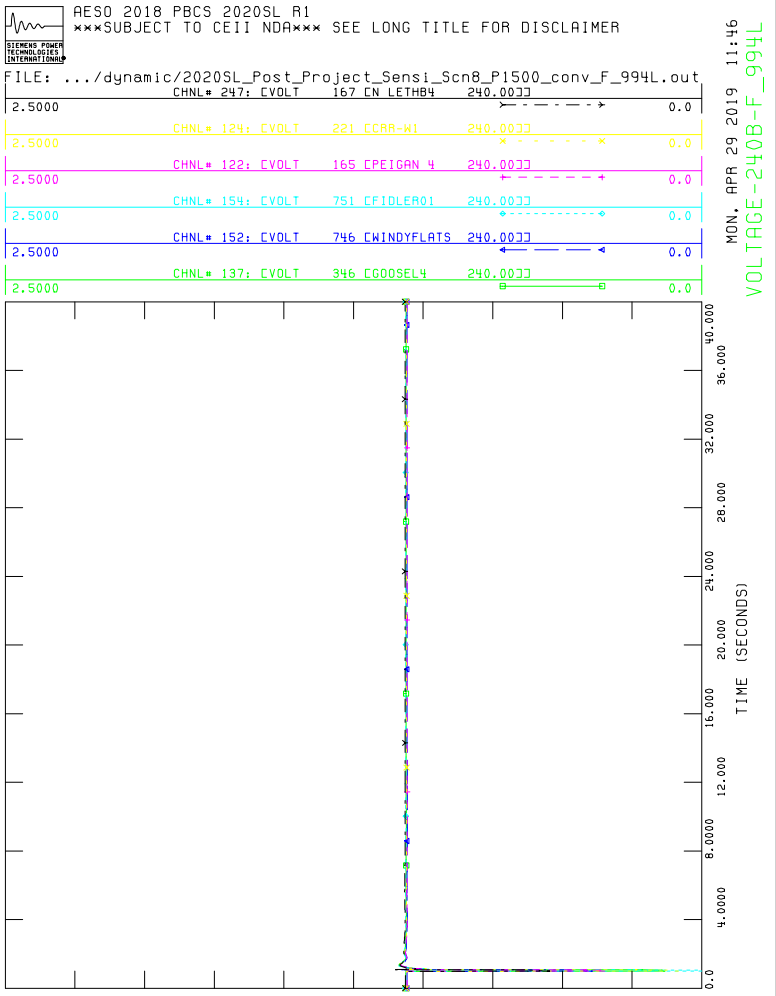
MON, APR 29 2019 11:46

BRANCH-MVA2-F_994L

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CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
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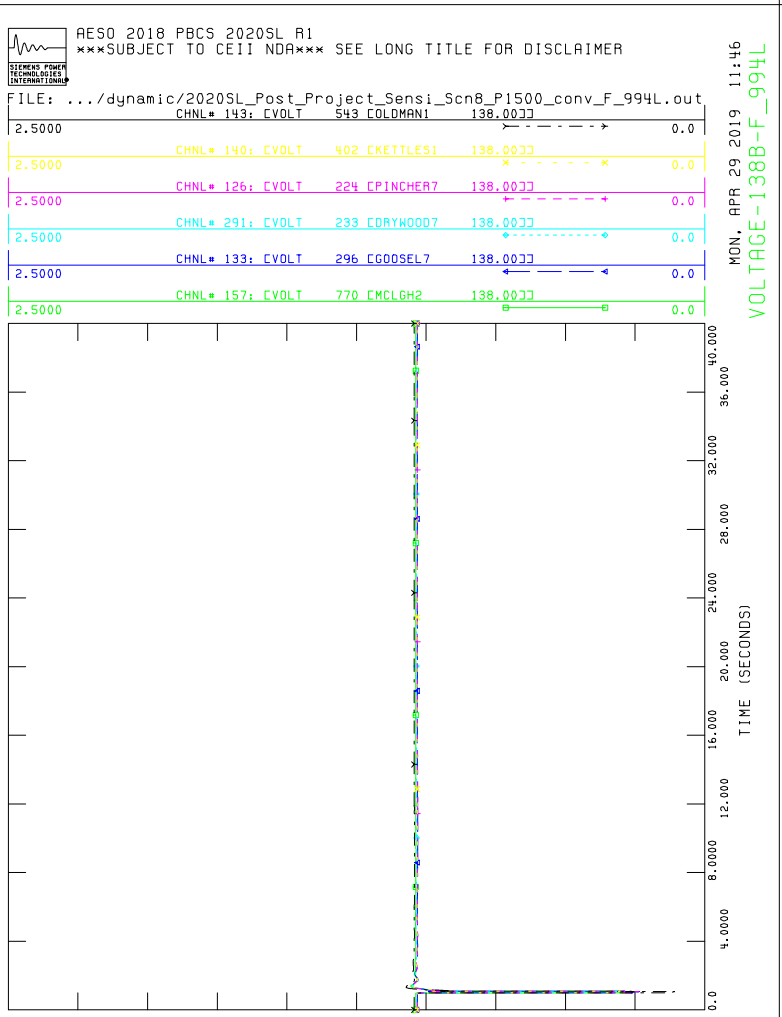
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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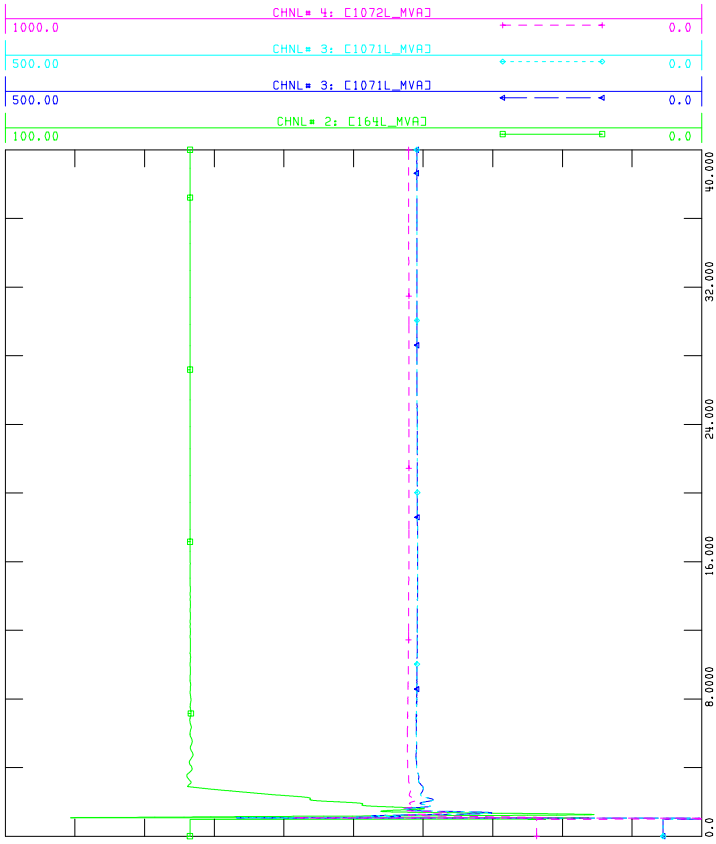

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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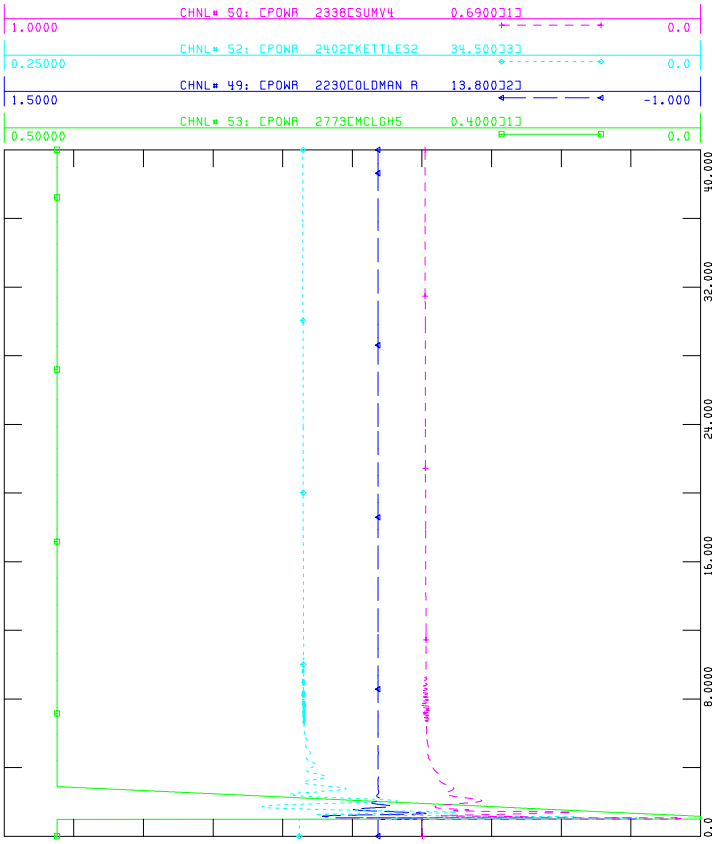

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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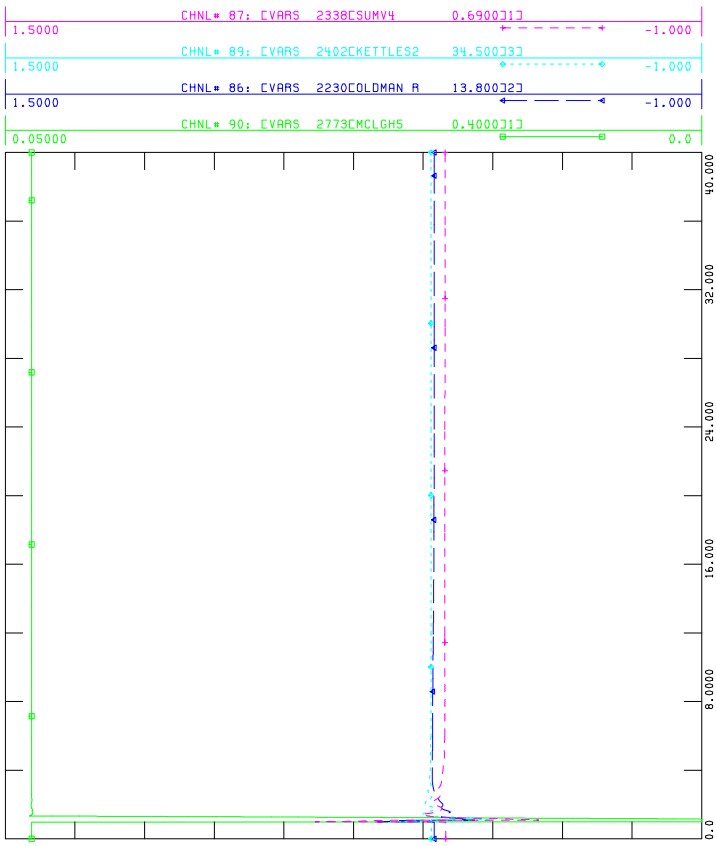

AESO 2018 PBCS 2020SL R1
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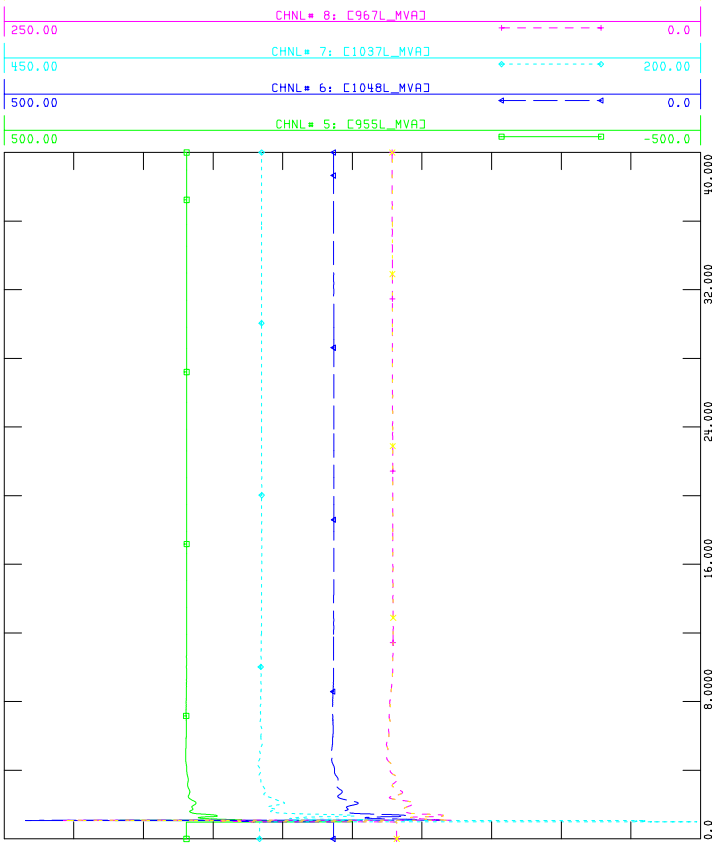

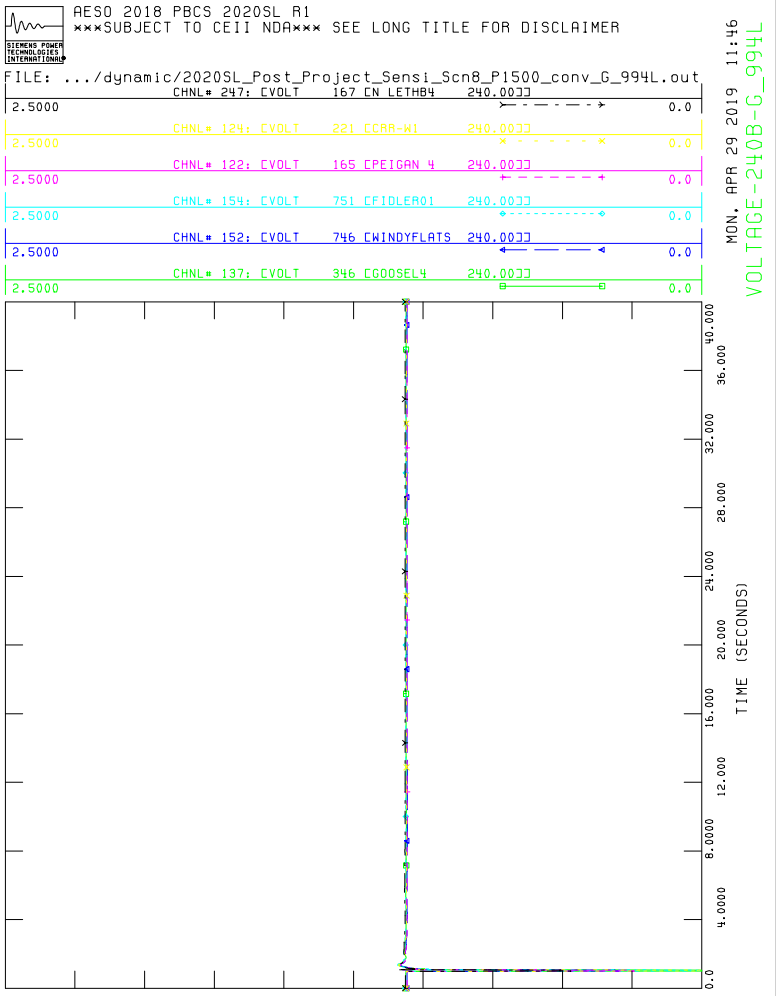
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CHNL# 154: CVOLT 751 CFIDLER01 240.000
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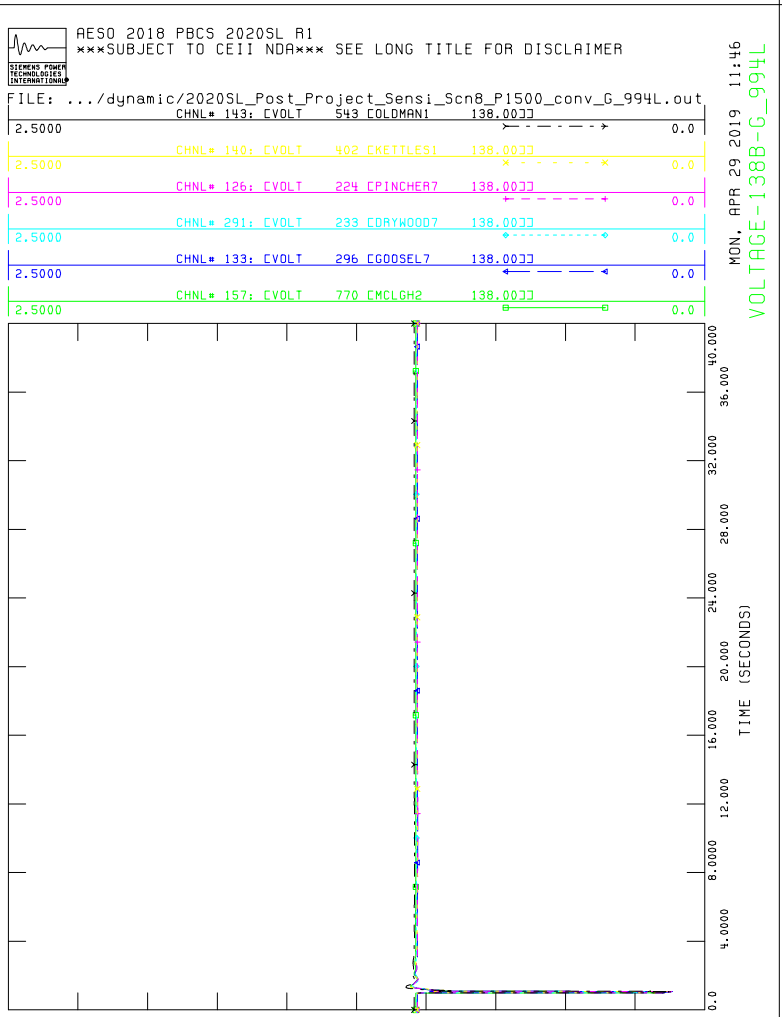
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AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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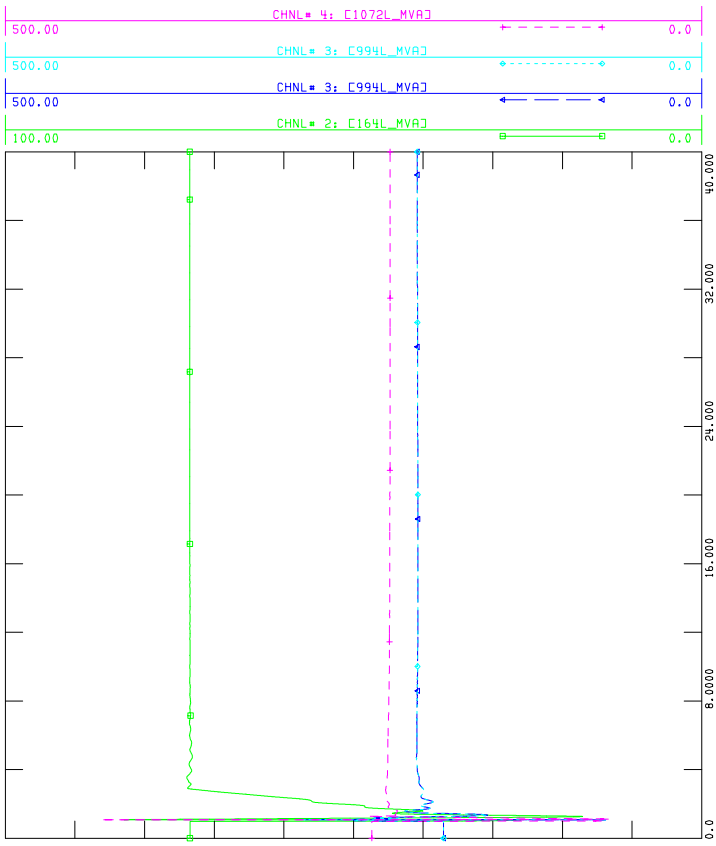

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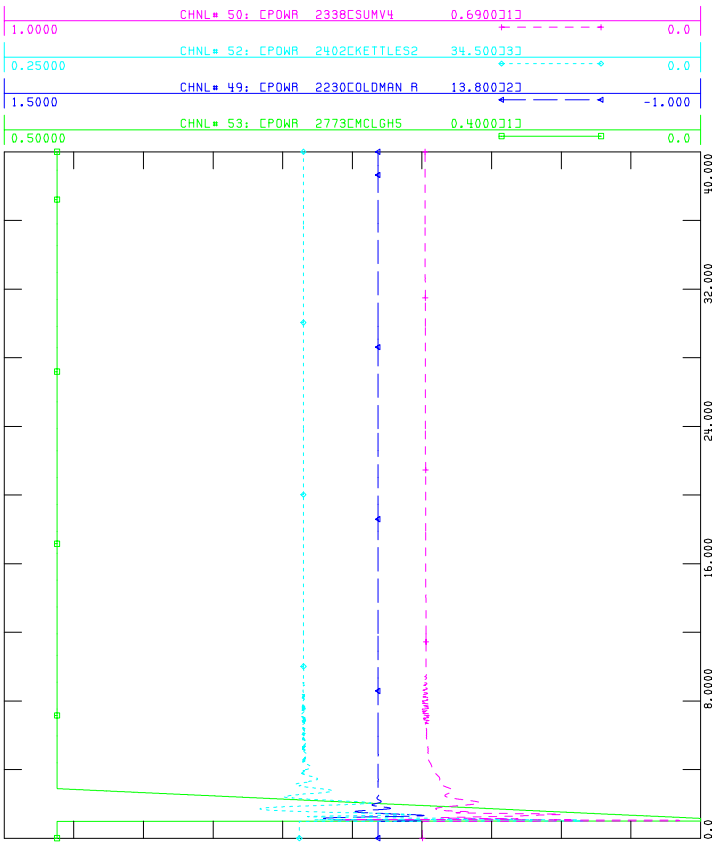

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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MON, APR 29 2019 11:46

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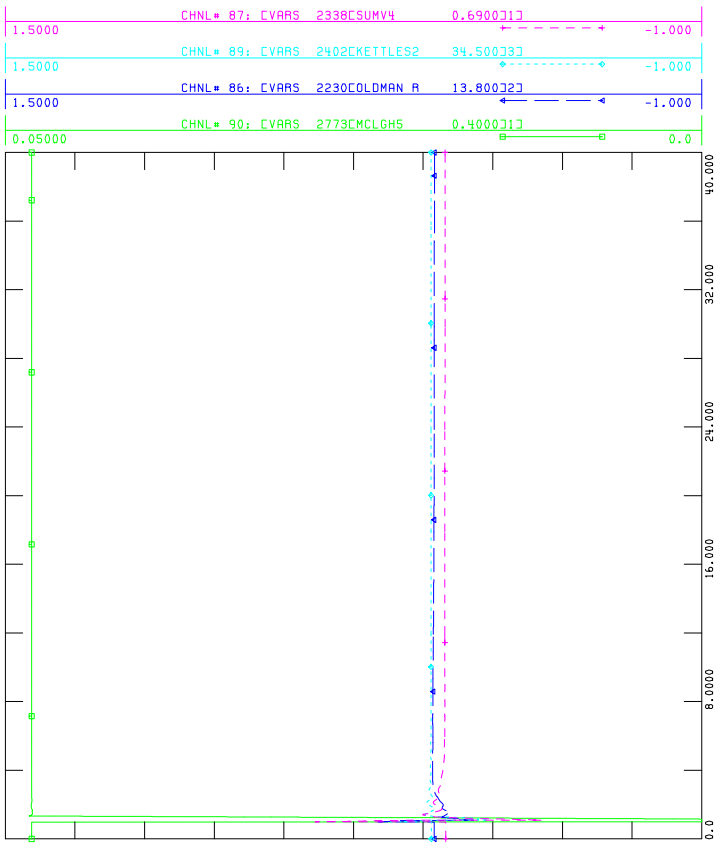

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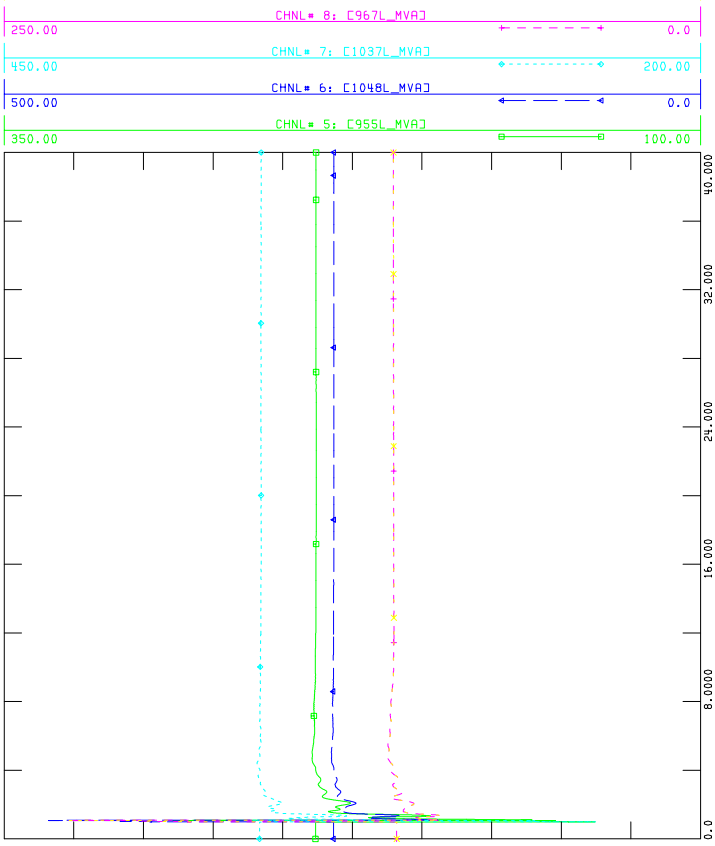
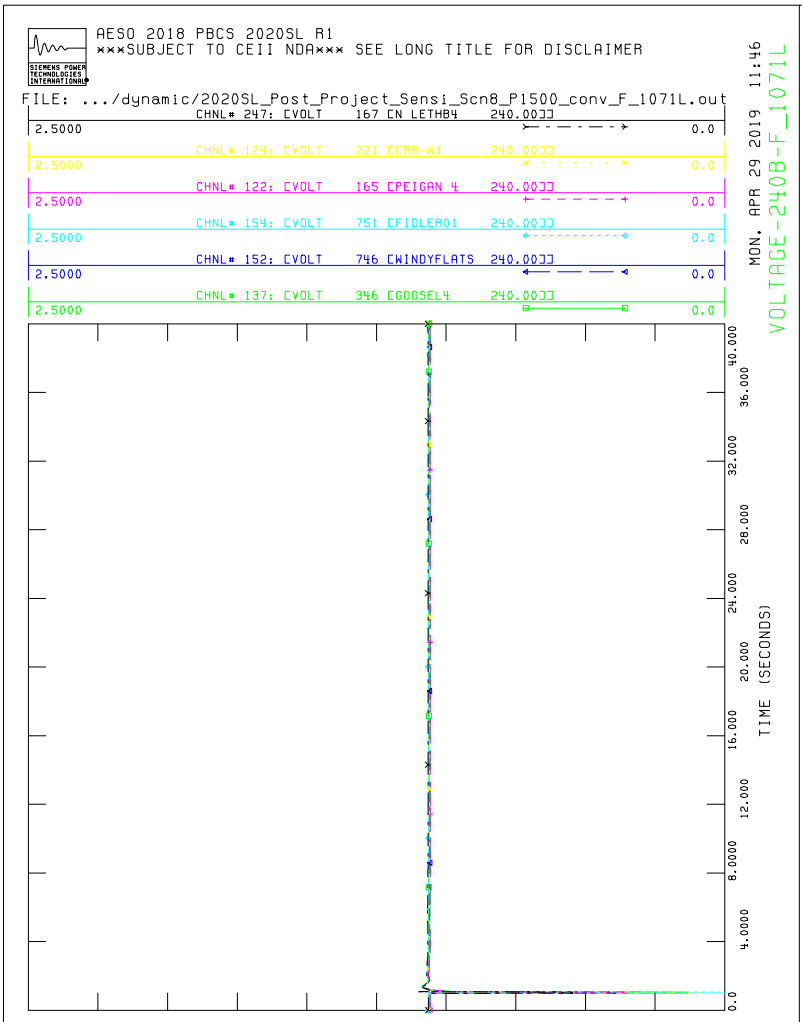
BRANCH-MVA2-F_1071L

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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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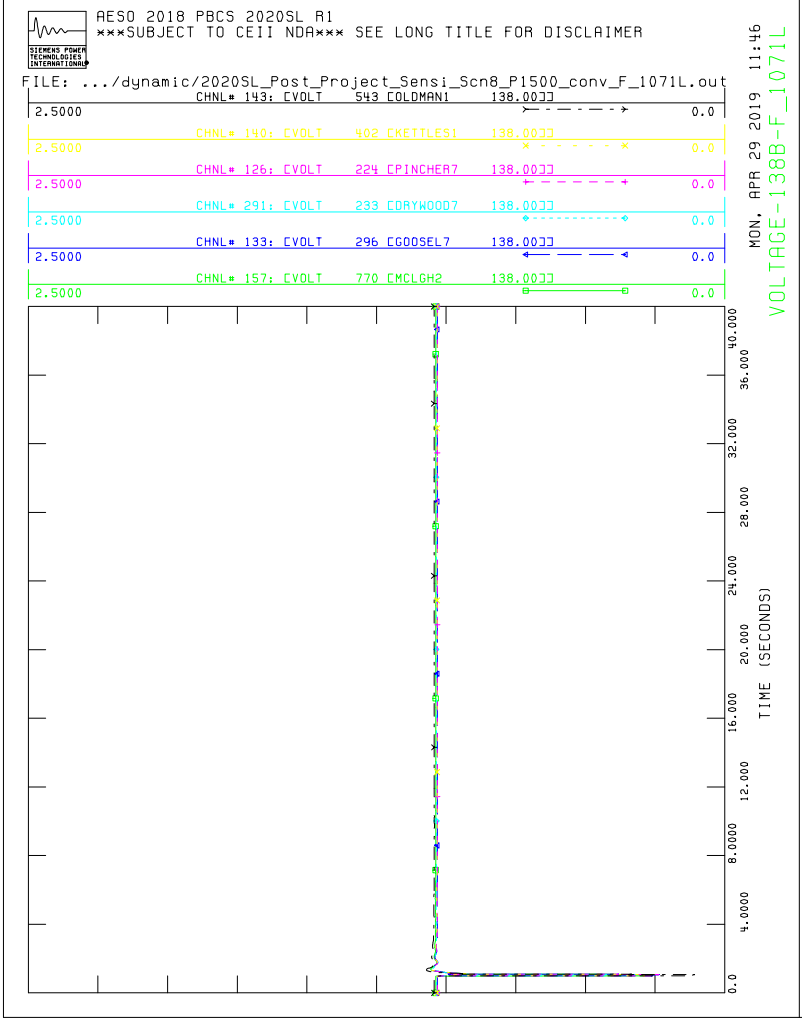
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
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AESO 2018 PBCS 2020SL R1
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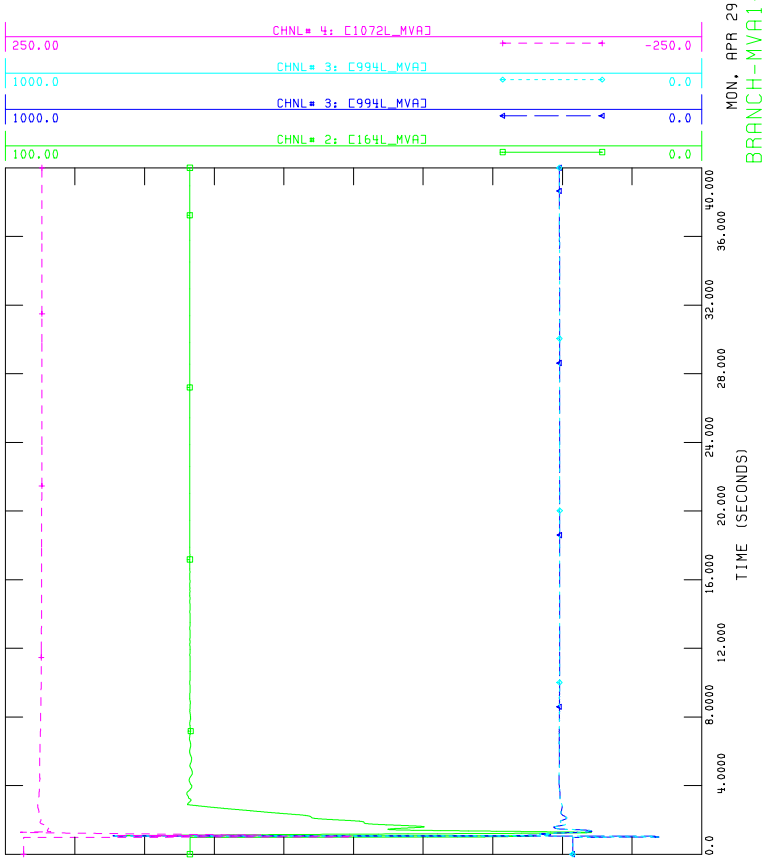

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AESO 2018 PBCS 2020SL R1
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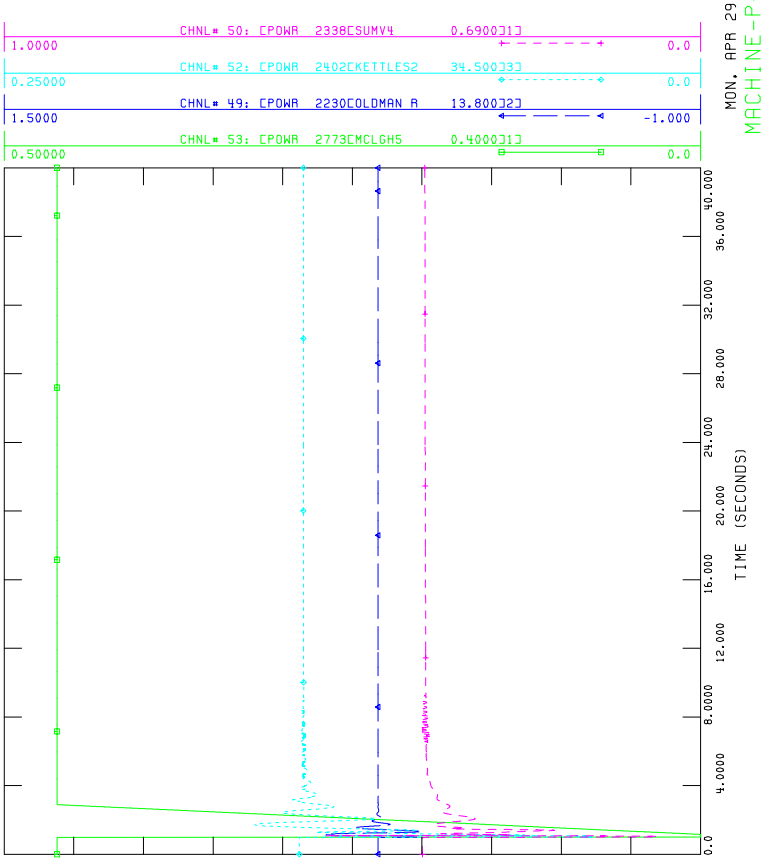

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AESO 2018 PBCS 2020SL R1
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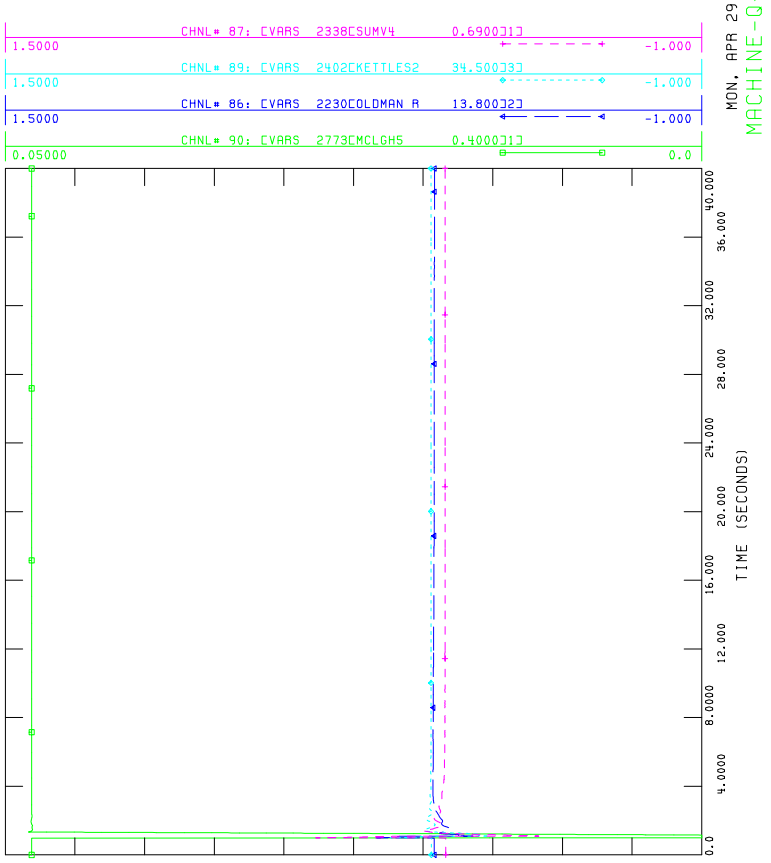

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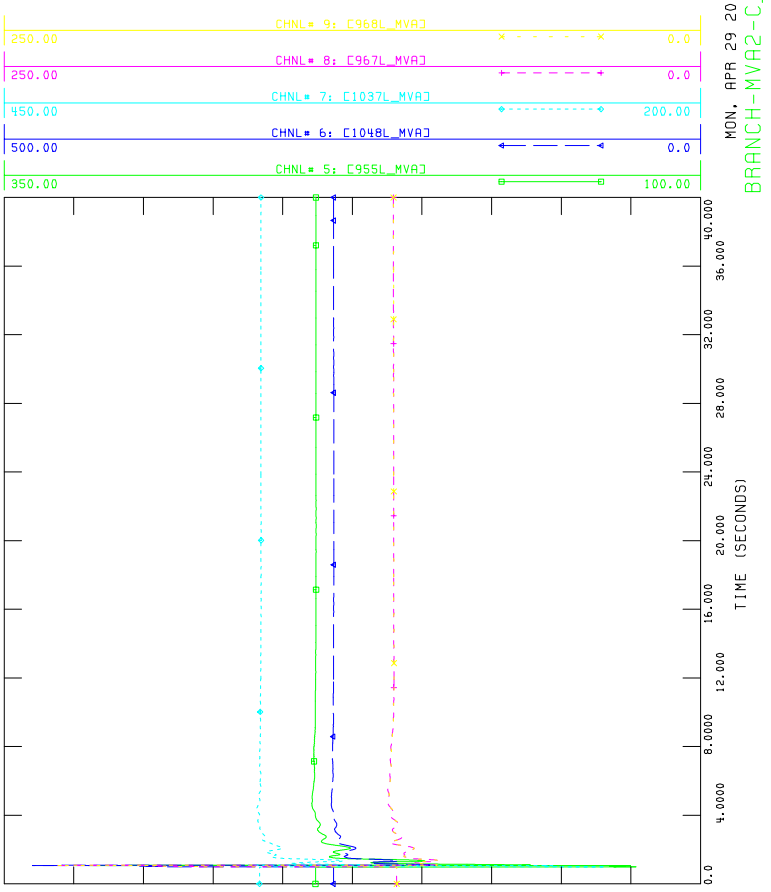

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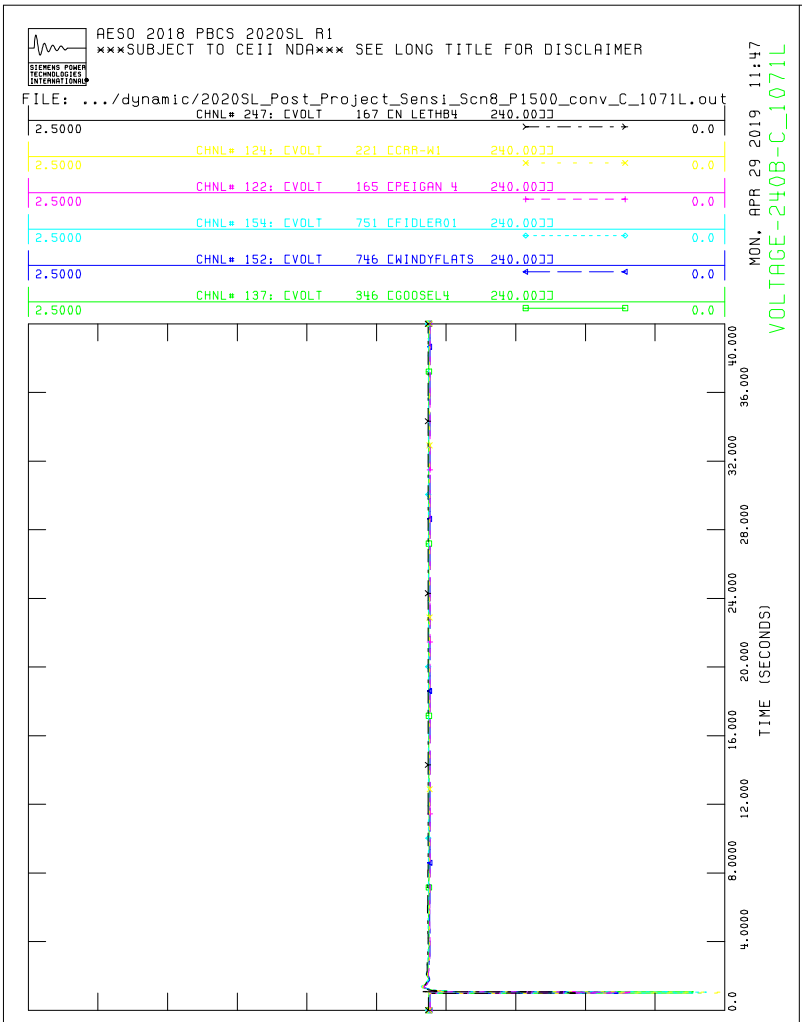
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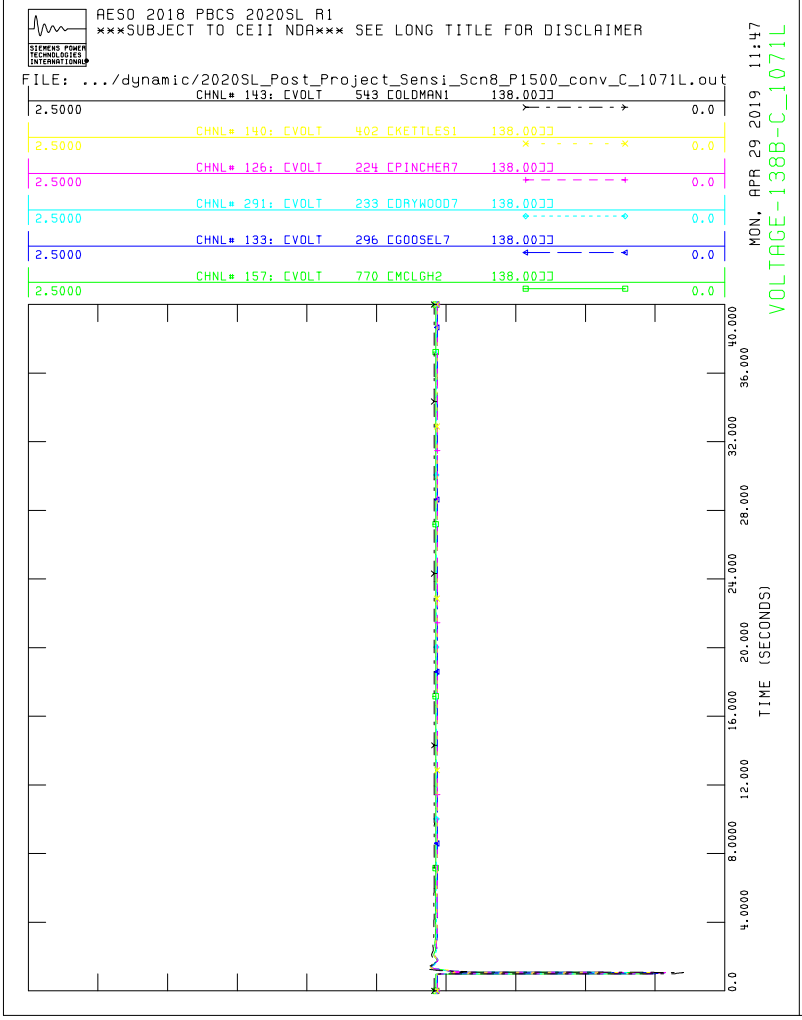
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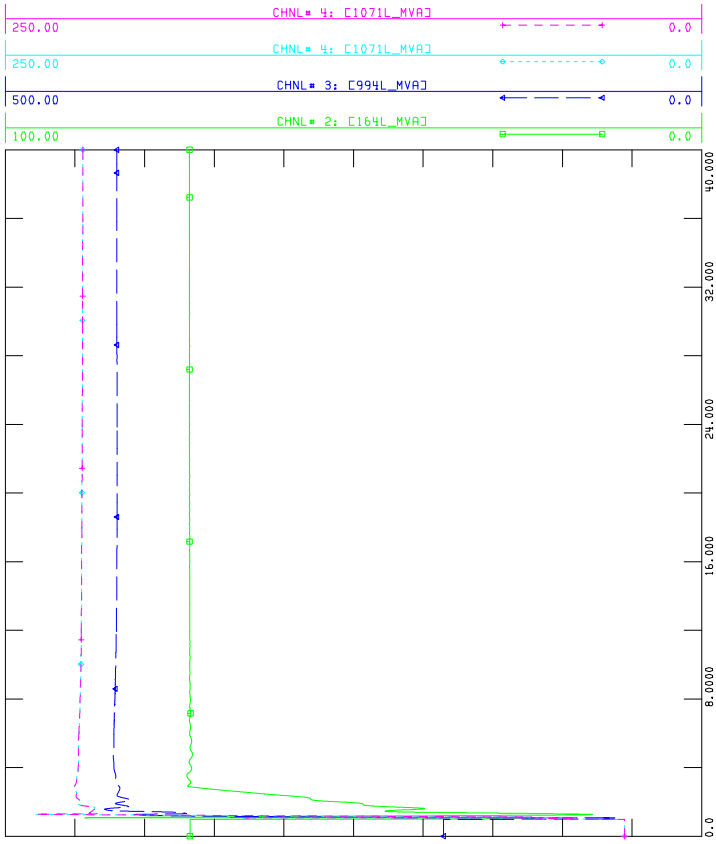

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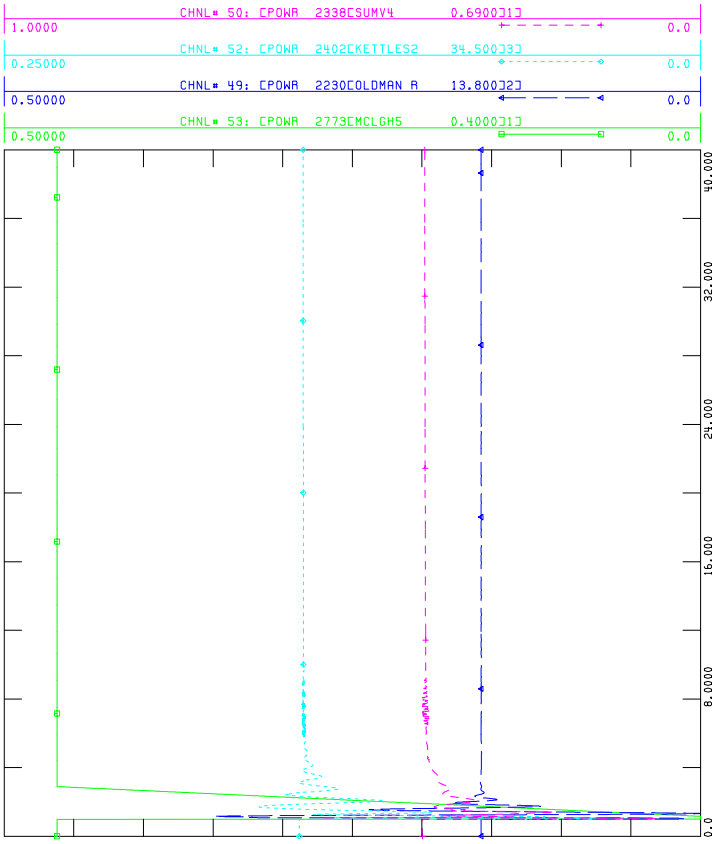

AESO 2018 PBCS 2020SL R1
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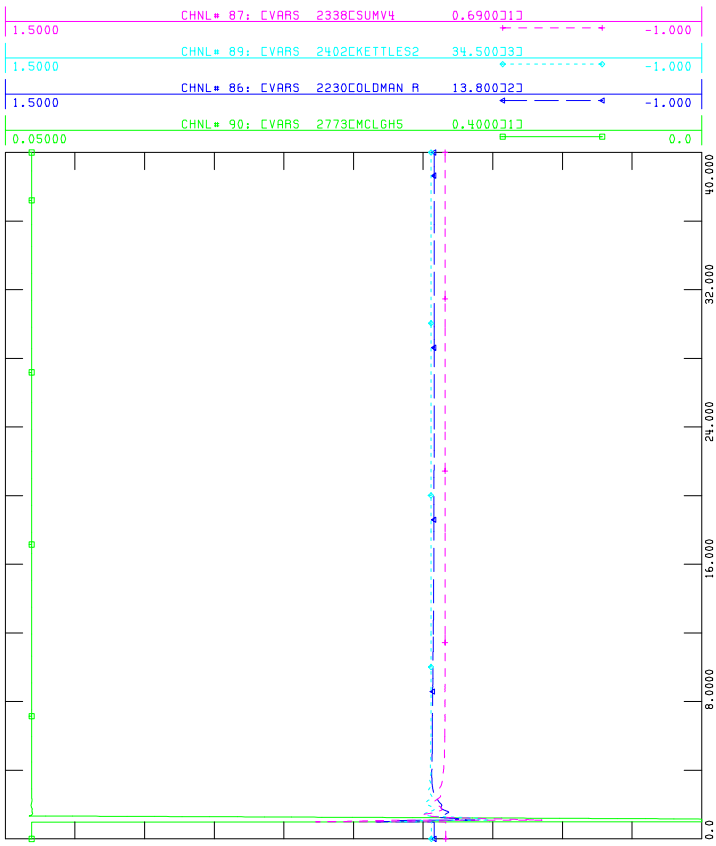

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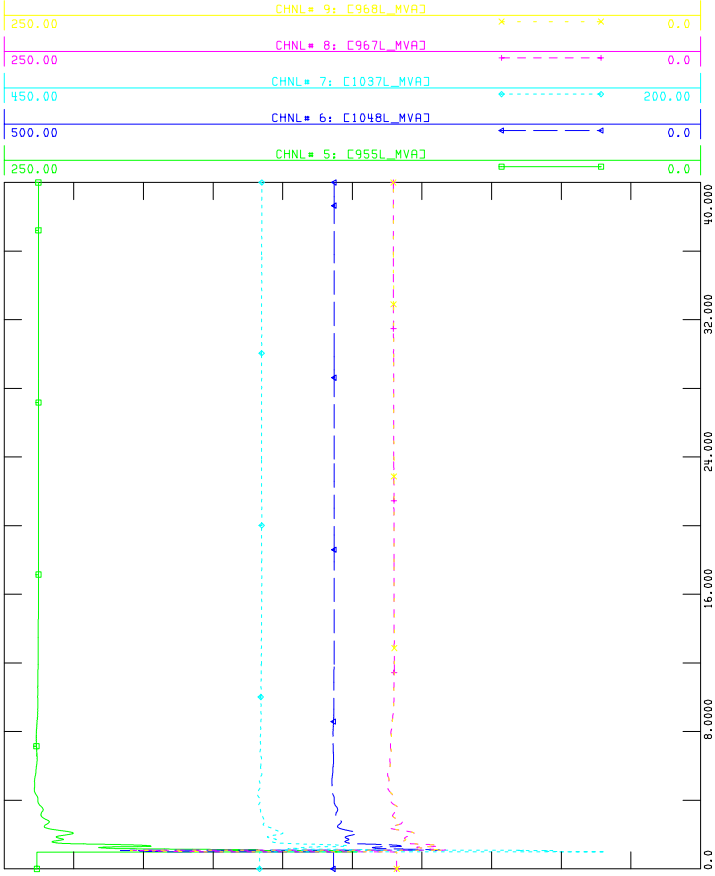
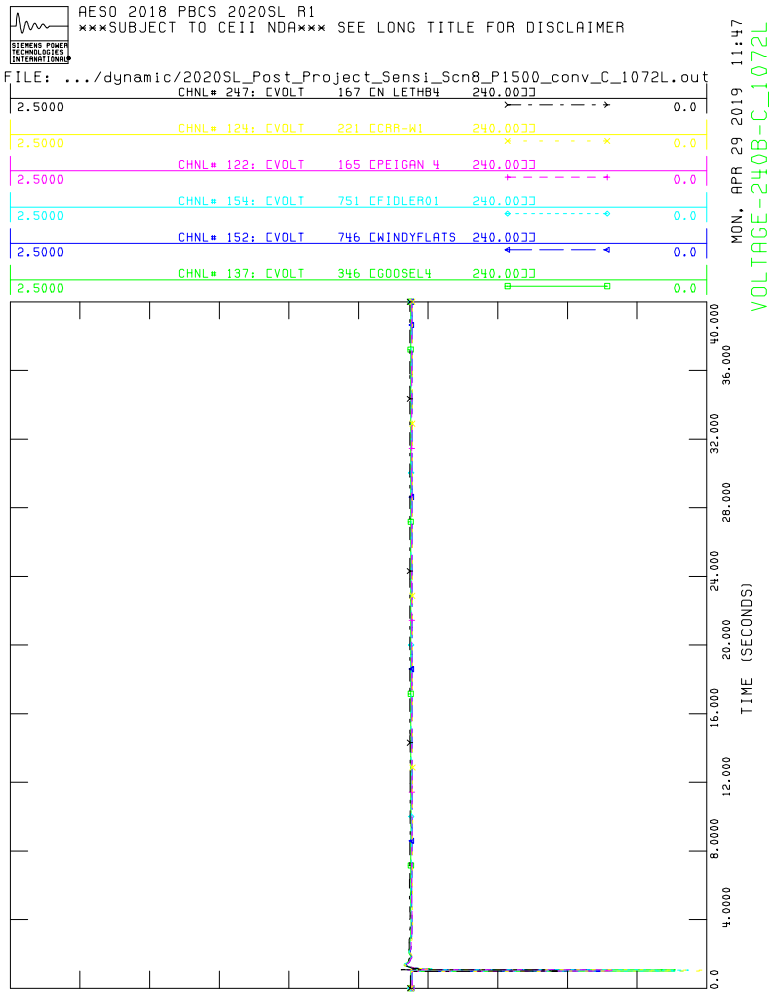
BRANCH-MVA2-C_1072L

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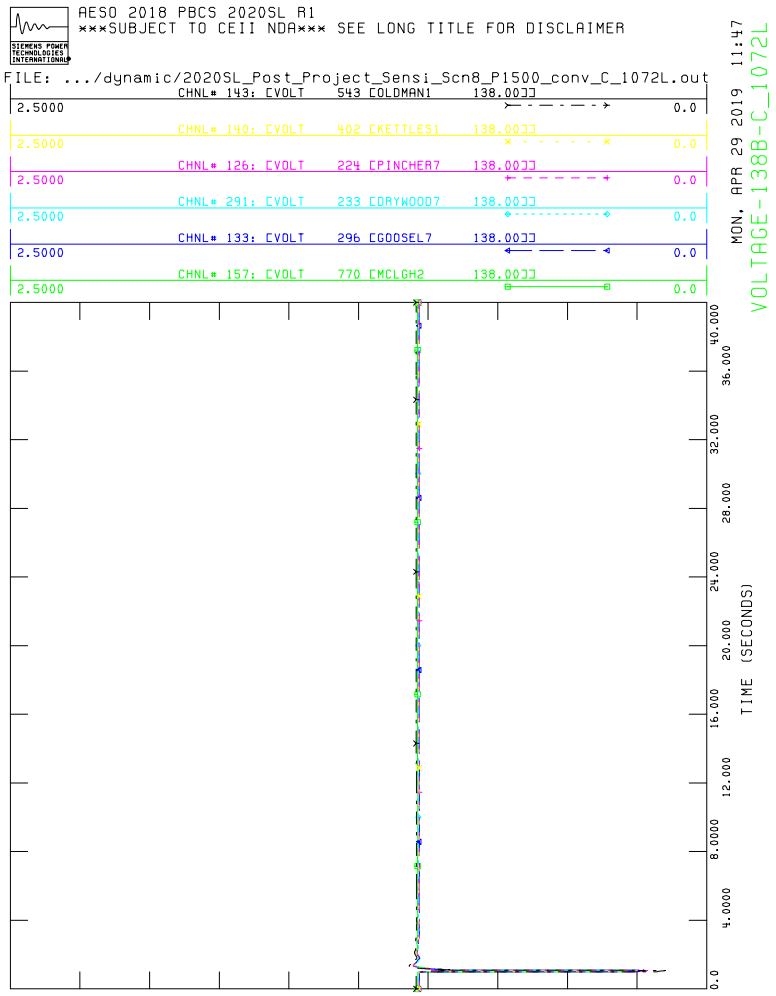
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AESO 2018 PBCS 2020SL R1
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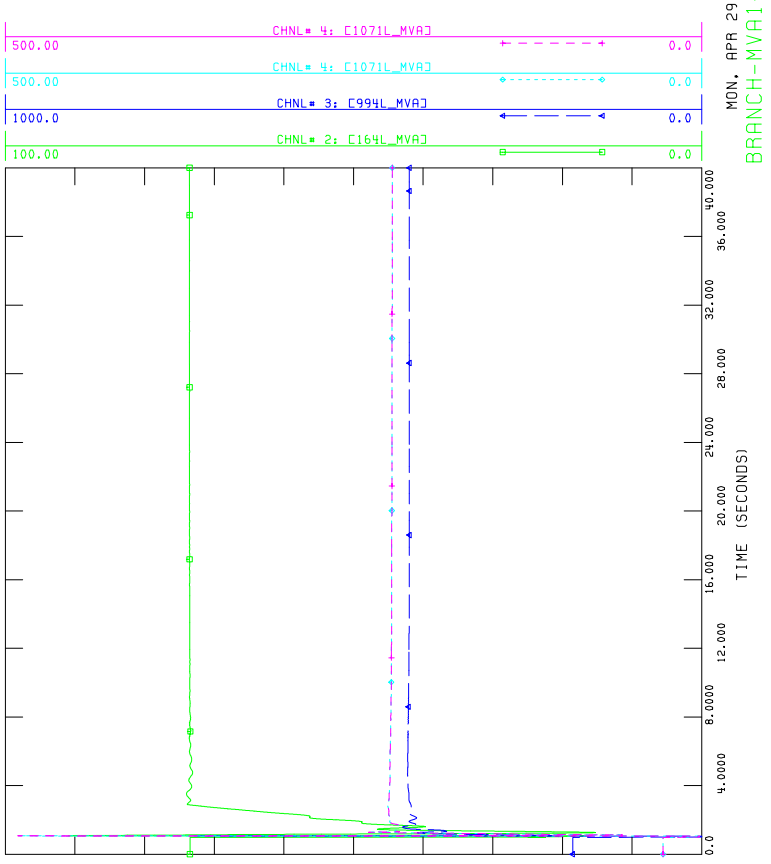
MON, APR 29 2019 11:47

BRANCH-MVA1-G_1072L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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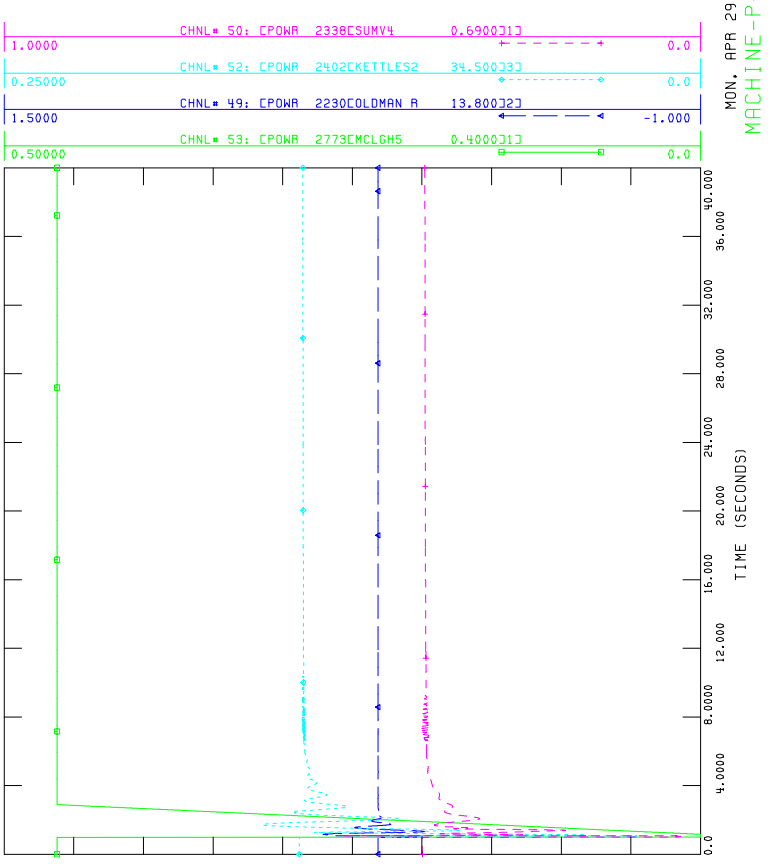
MON, APR 29 2019 11:47

MACHINE-P-G_1072L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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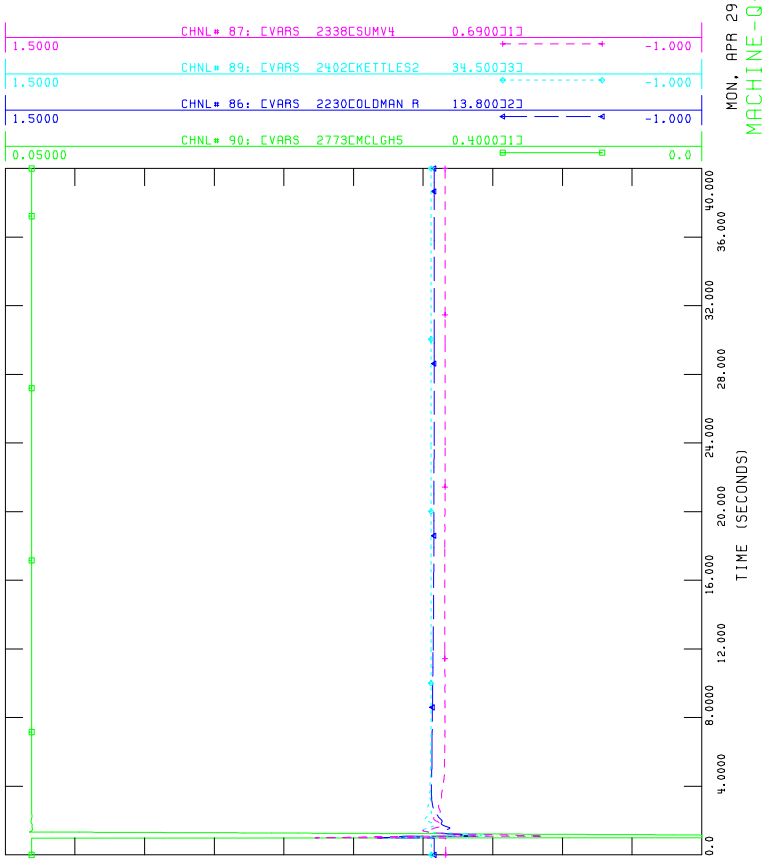

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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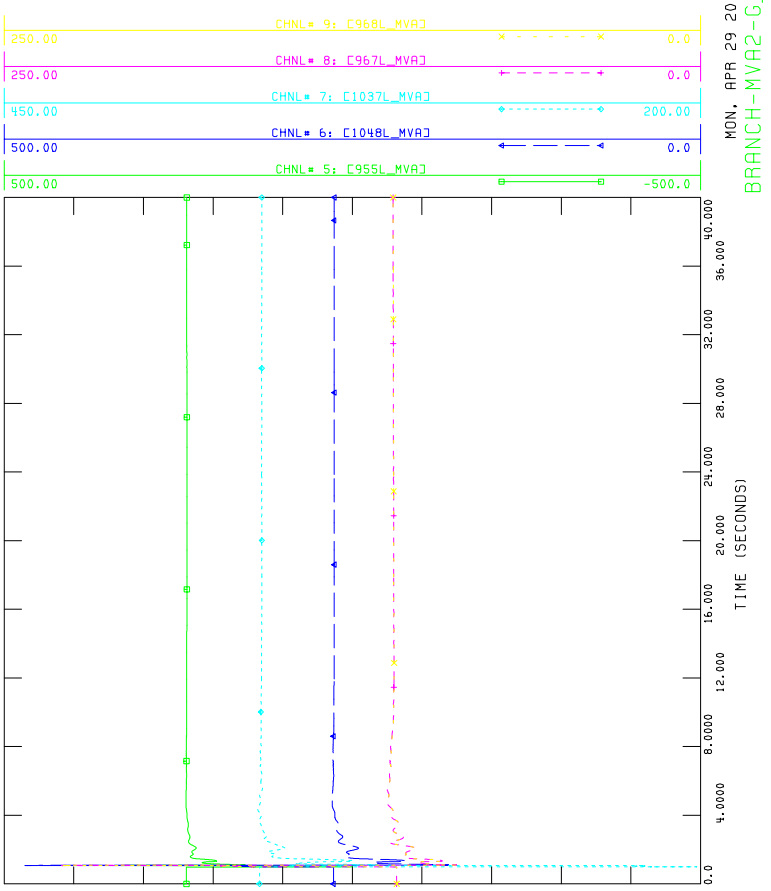
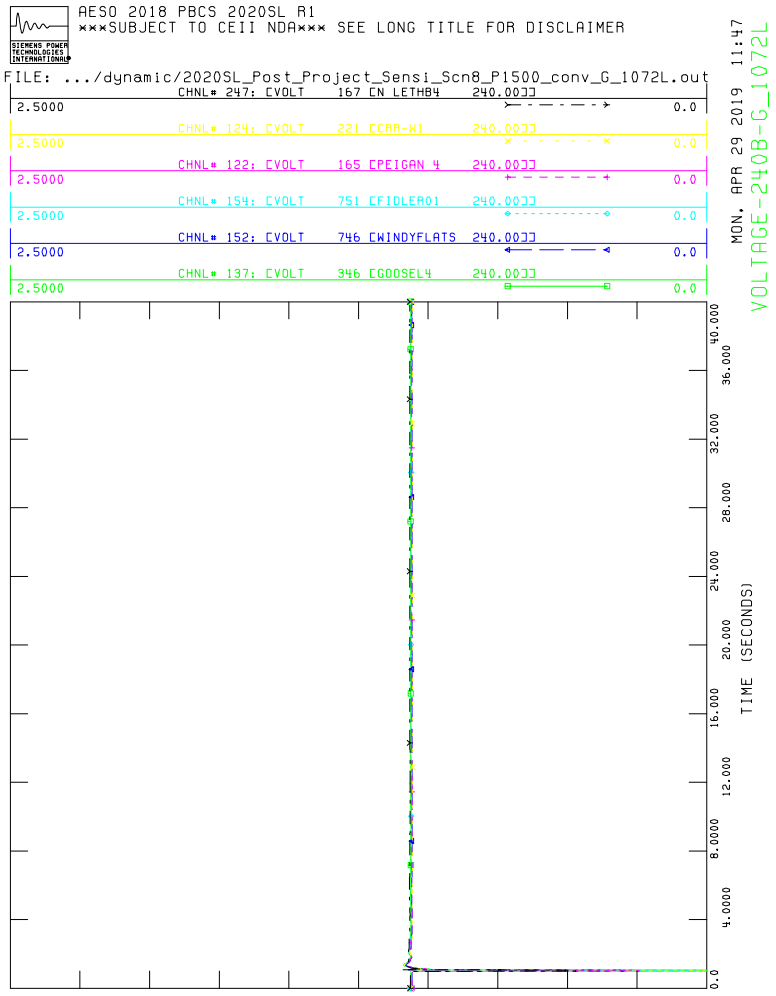
BRANCH-MVA2-G_1072L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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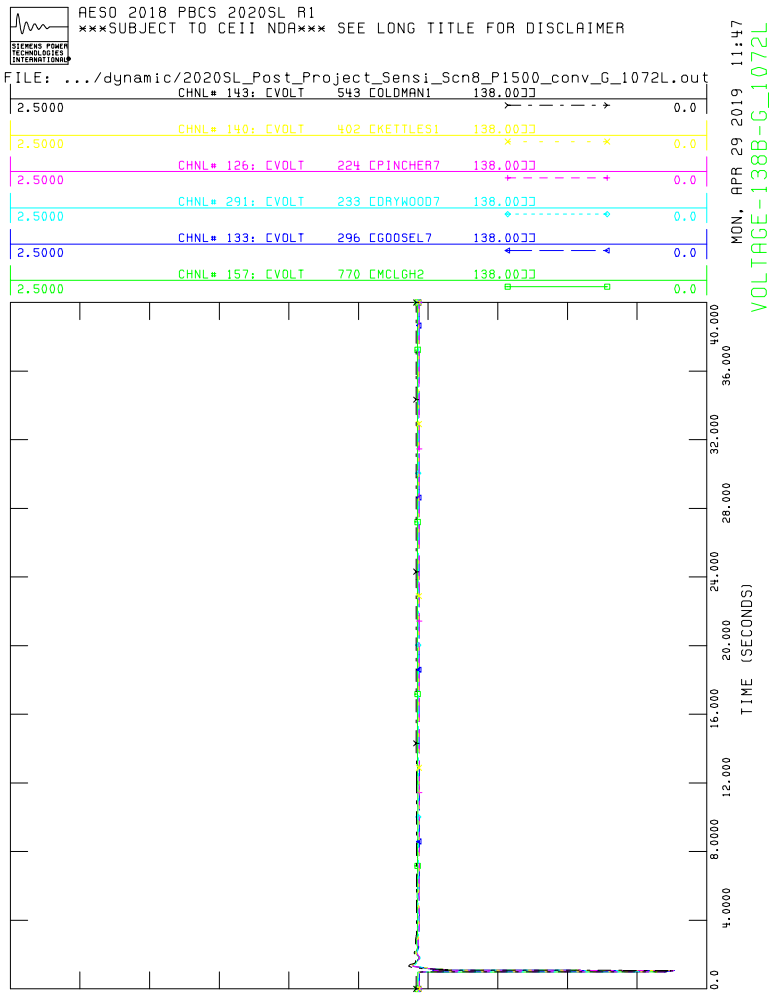
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 140: CVOLT 402 CKETTLES1 138.00JJ
CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
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AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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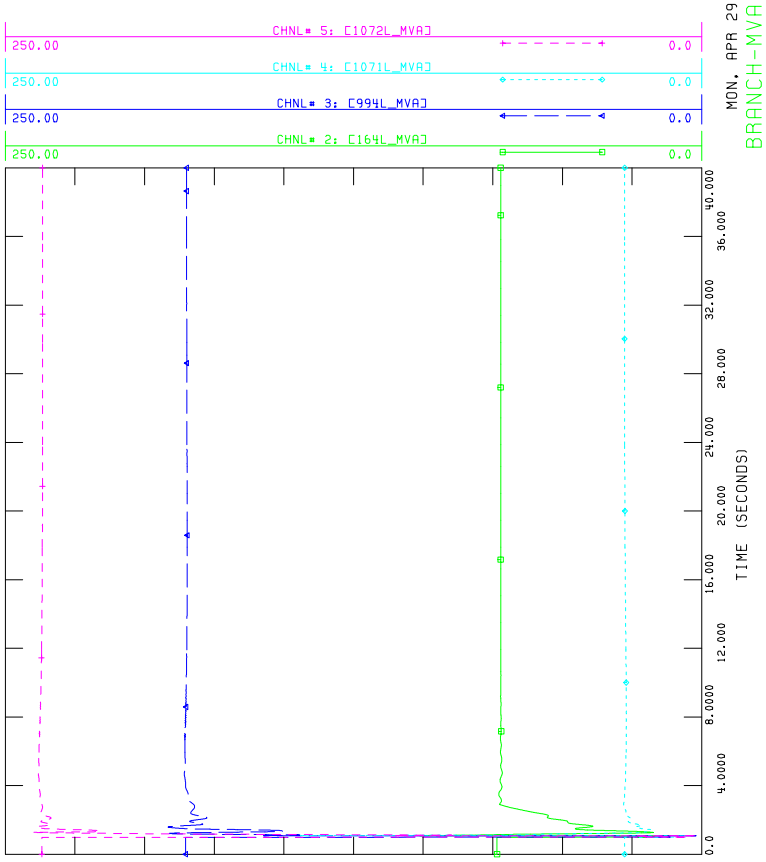

AESO 2018 PBCS 2020SL R1
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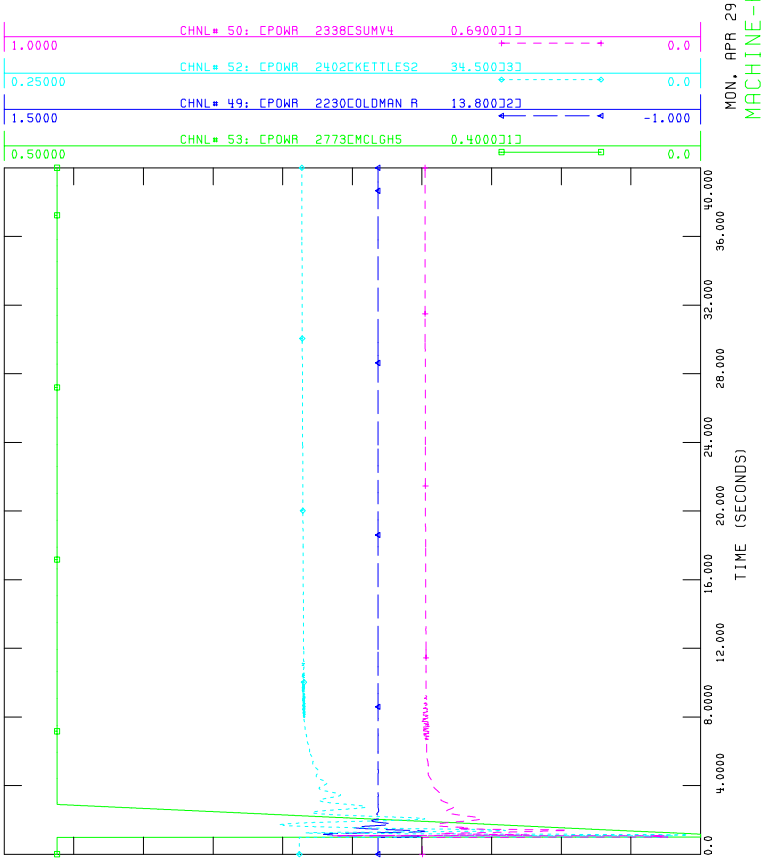

AESO 2018 PBCS 2020SL R1
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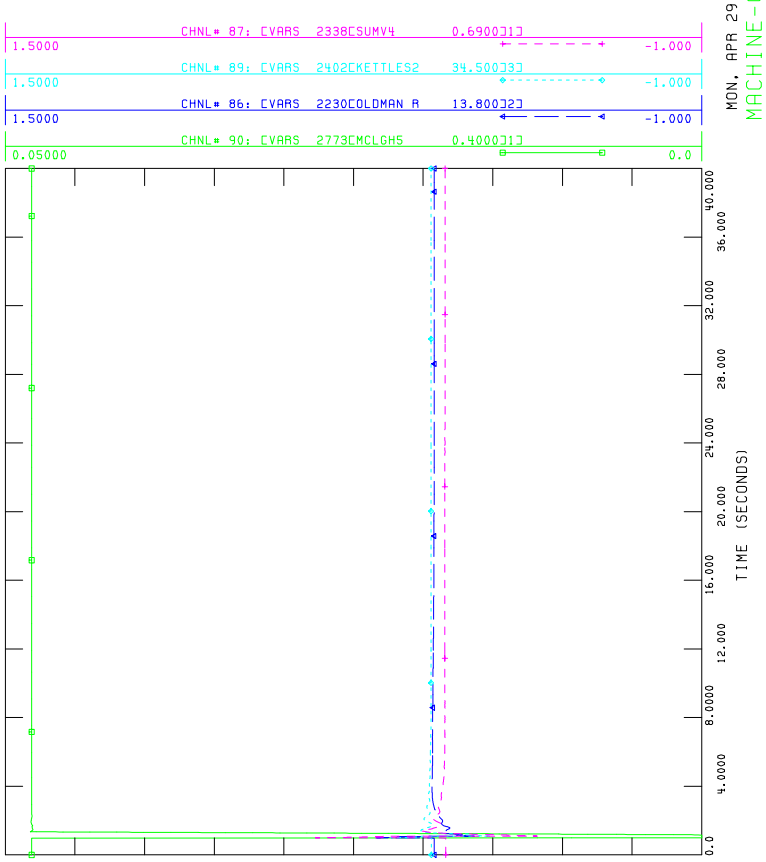

AESO 2018 PBCS 2020SL R1
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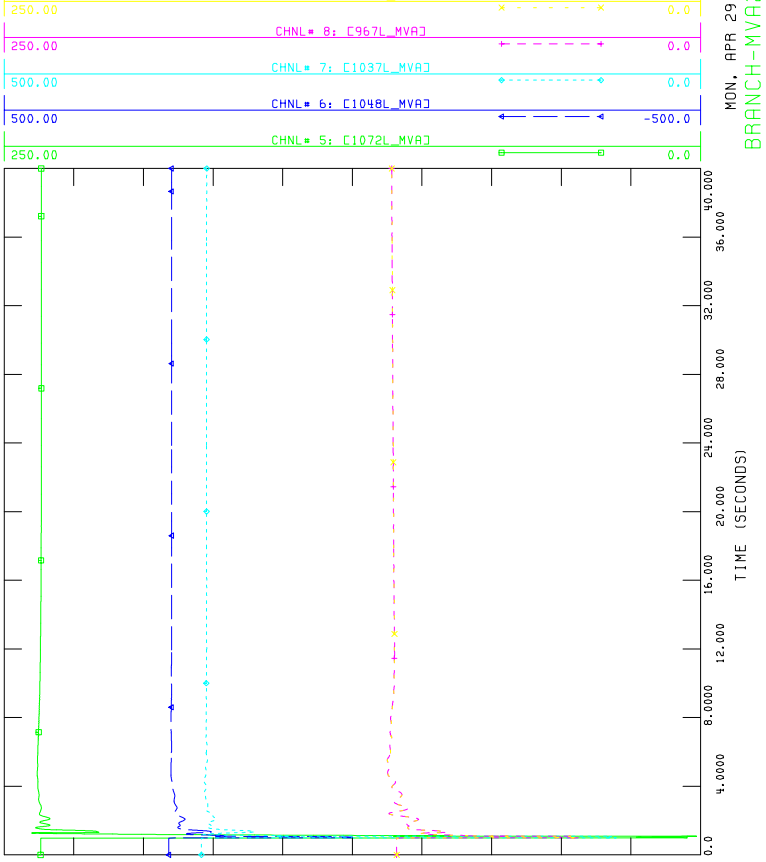

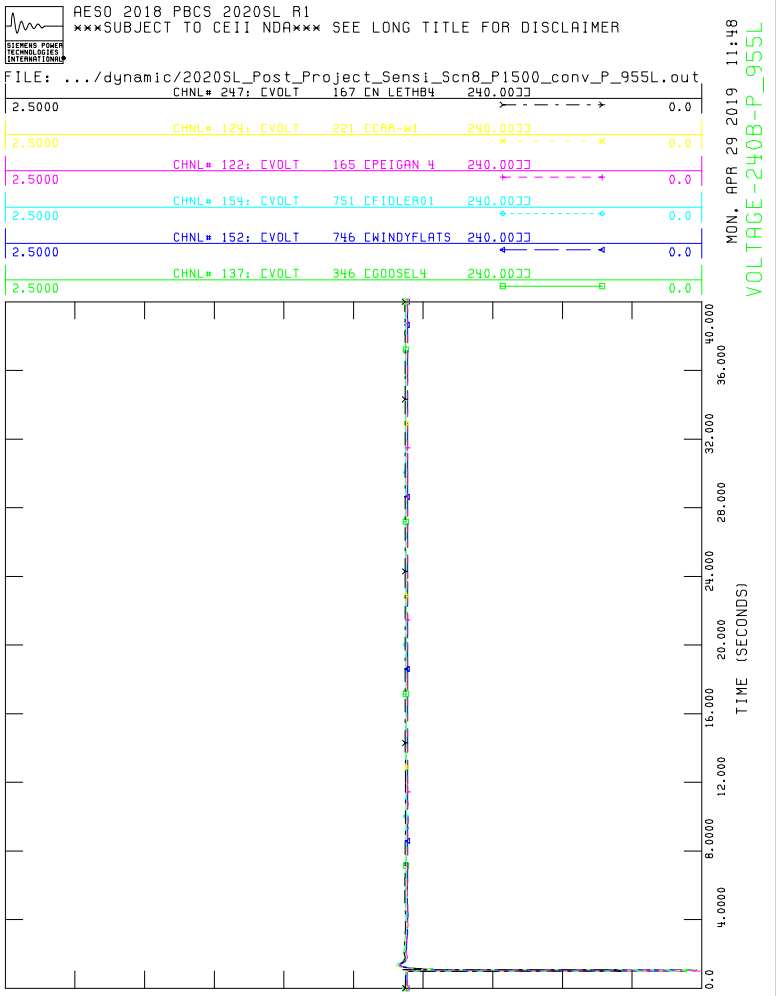
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
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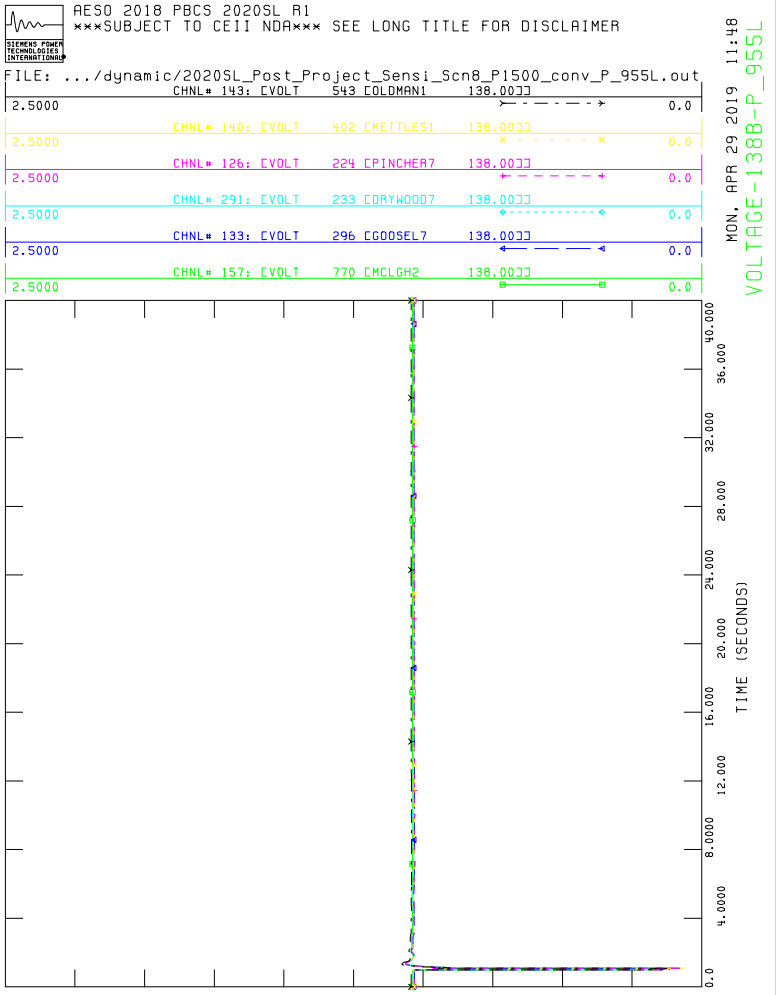
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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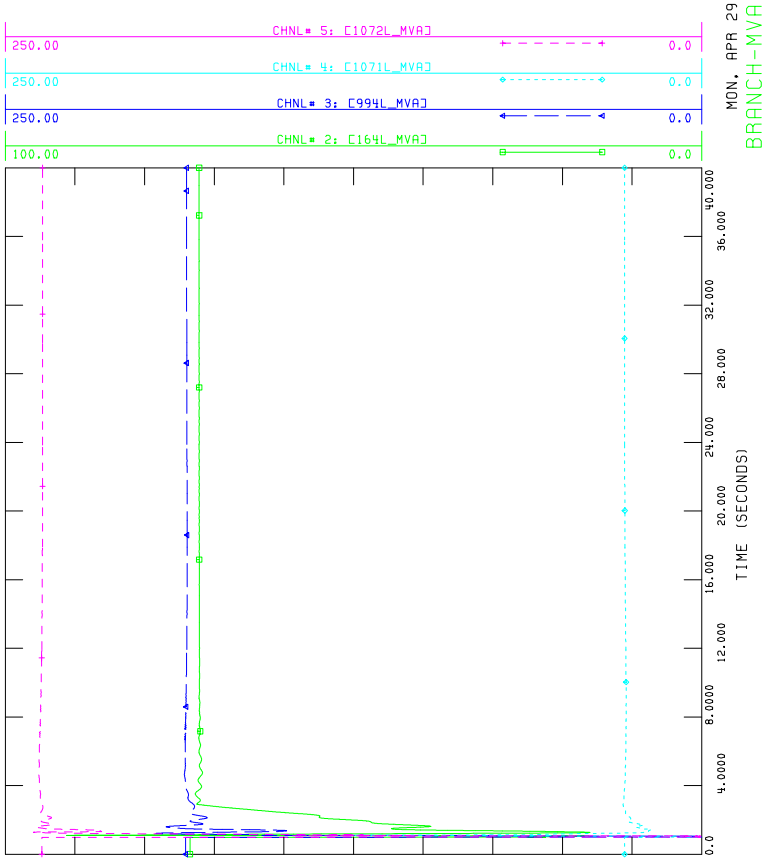
BRANCH-MVA1-G_955L



AESO 2018 PBCS 2020SL R1
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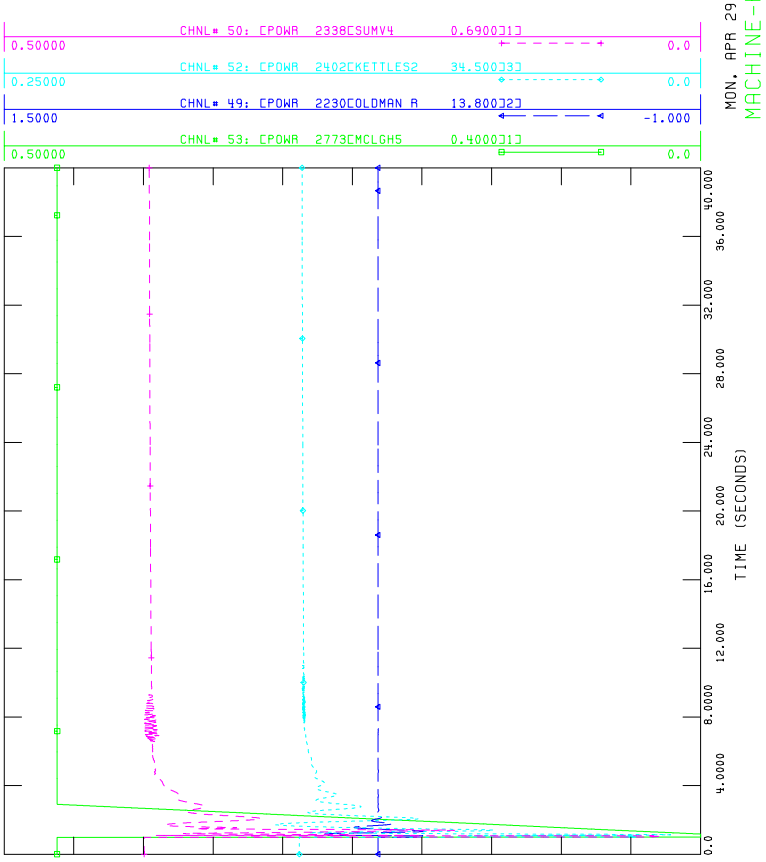
MON, APR 29 2019 11:48

MACHINE-P-G_955L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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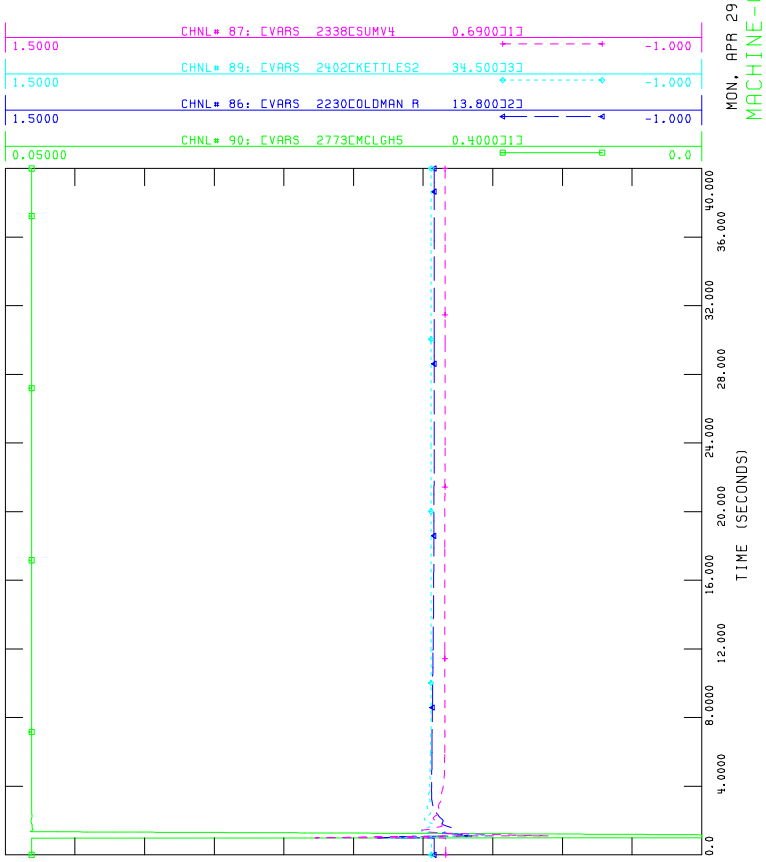
MACHINE-Q-G_955L



AESO 2018 PBCS 2020SL R1
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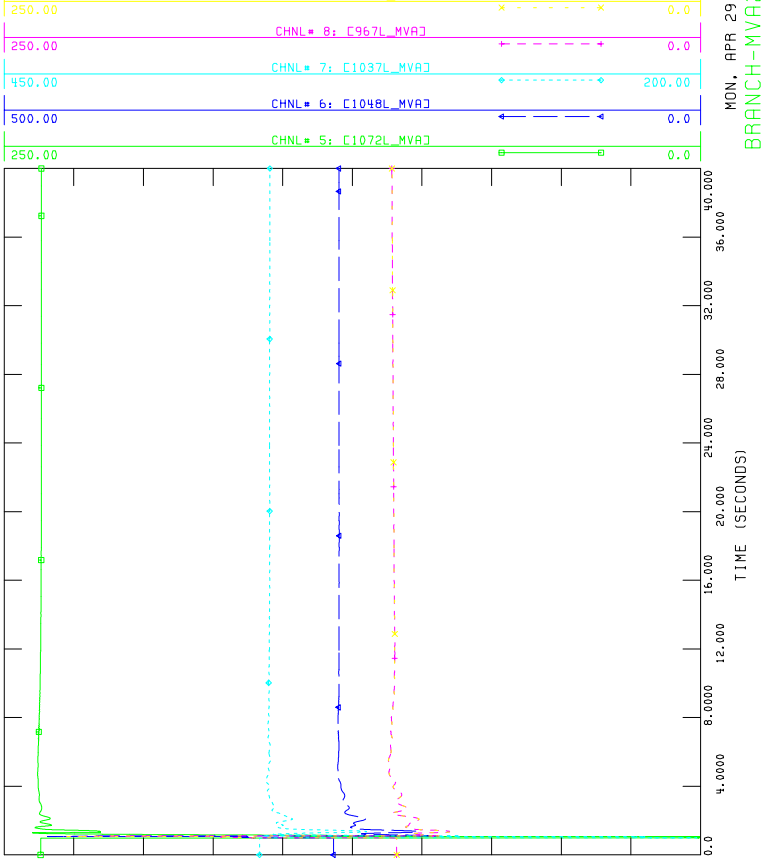

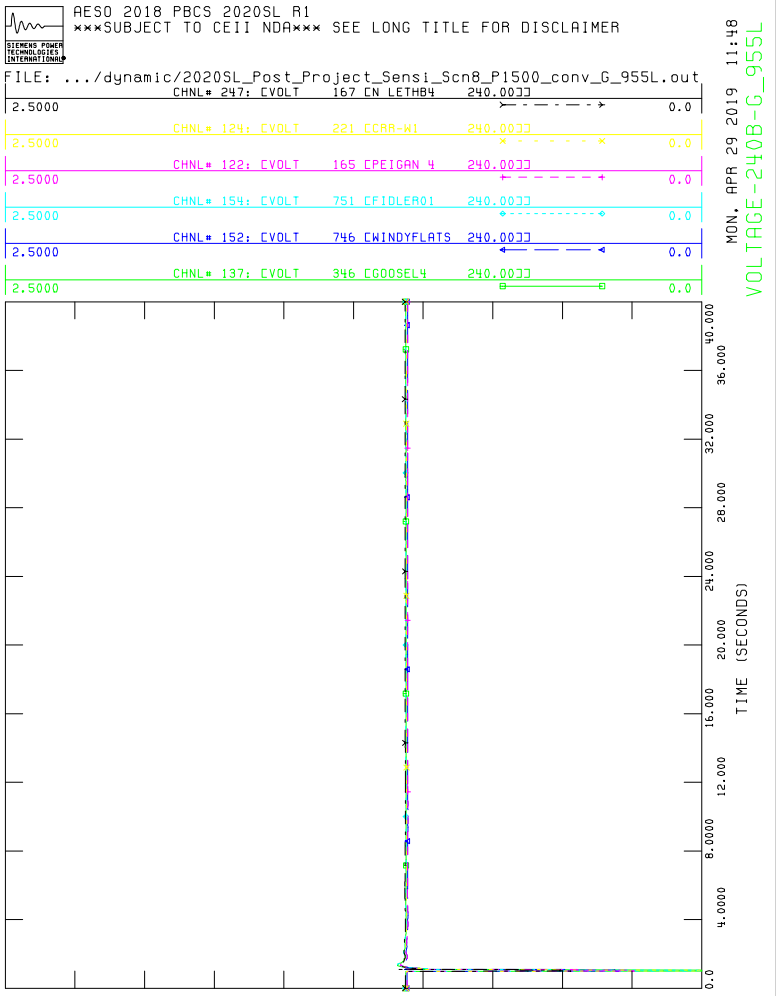
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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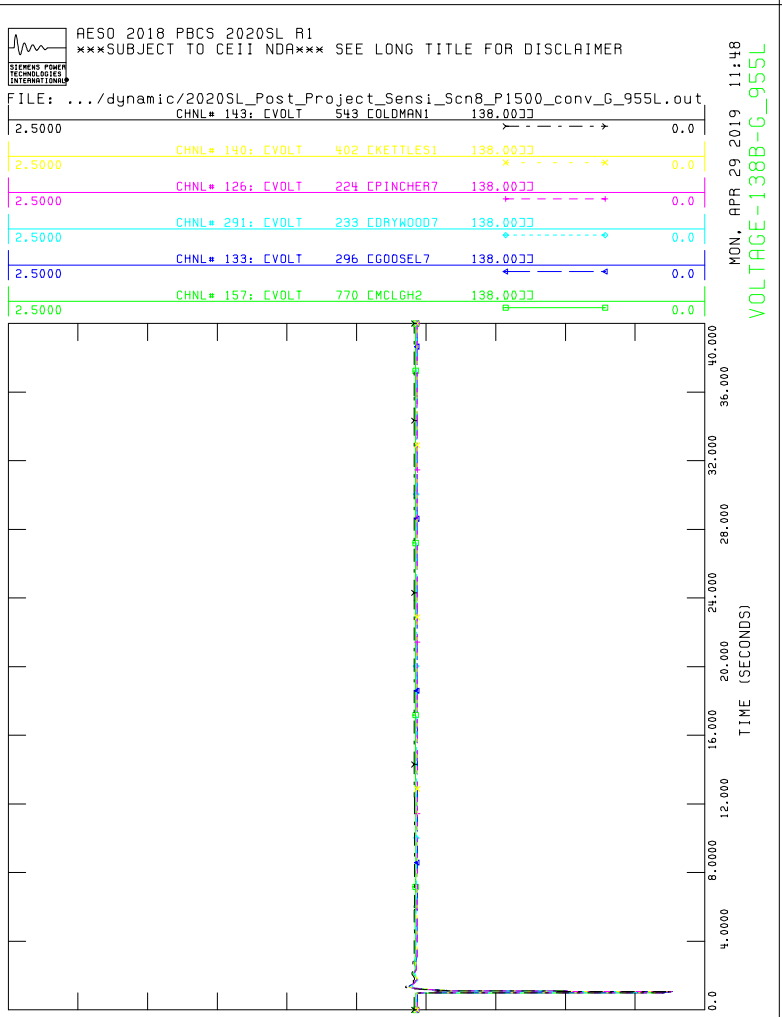
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SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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VOLTAGE-138B-G_955L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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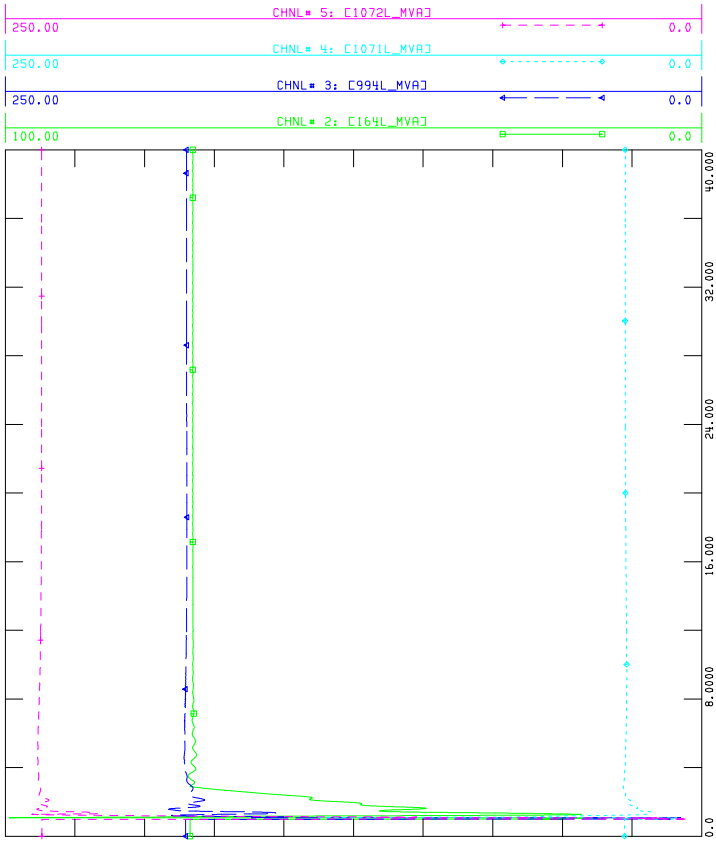

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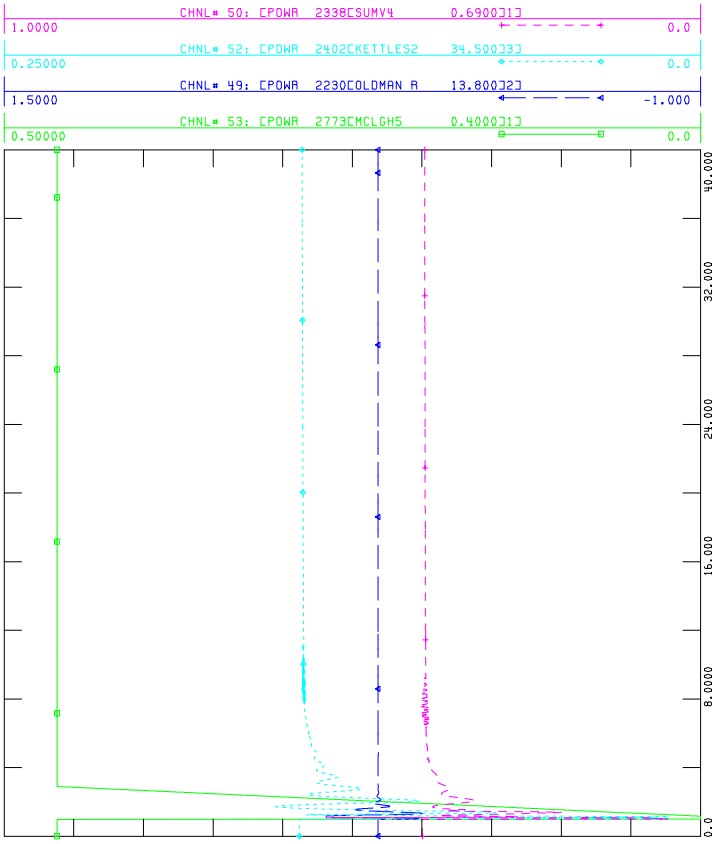

AESO 2018 PBCS 2020SL R1
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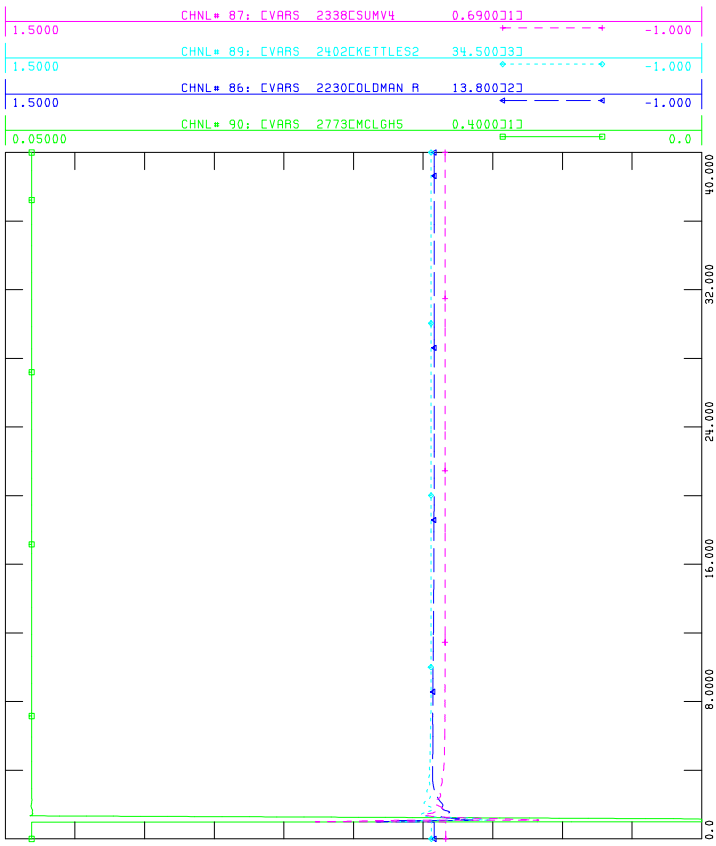

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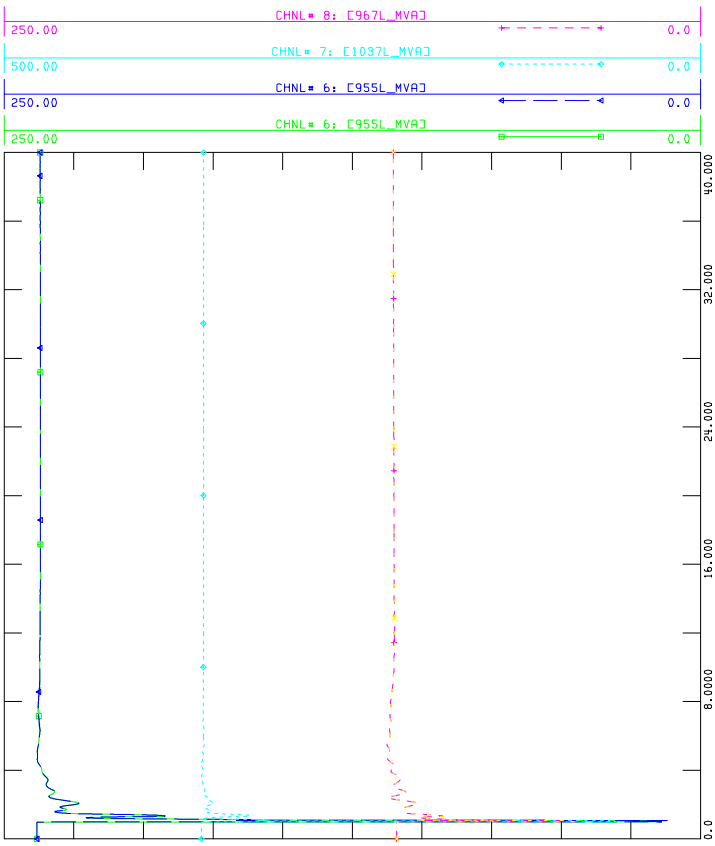
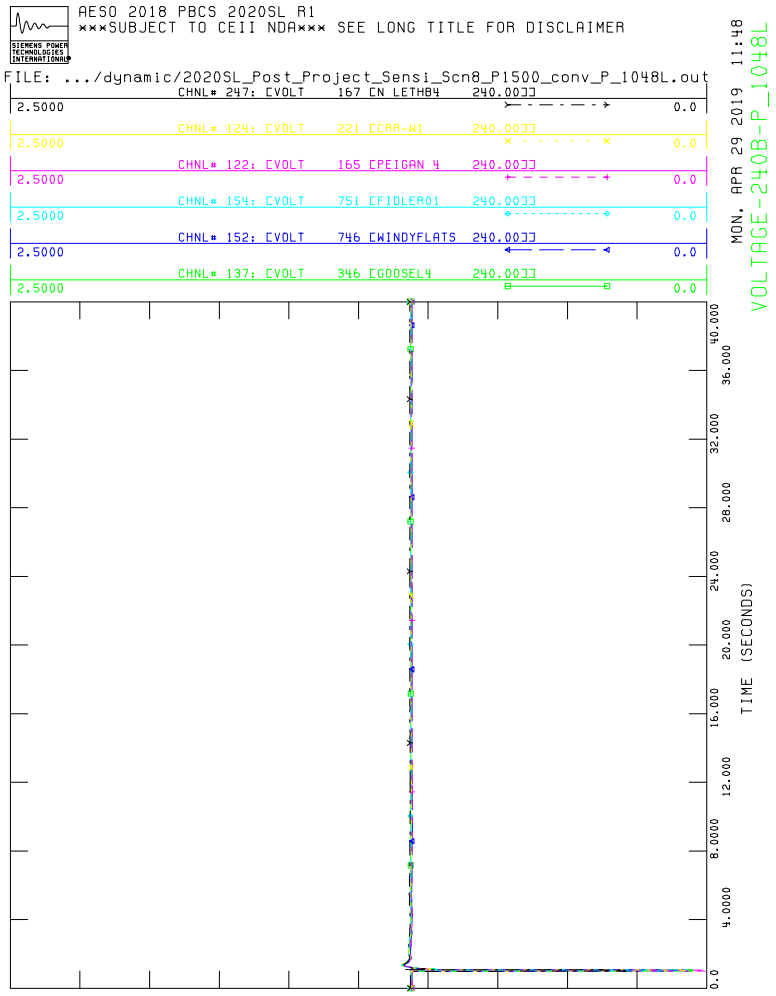
BRANCH-MVA2-P_1048L

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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
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CHNL# 124: CVOLT 221 CCRR-W1 240.00JJ
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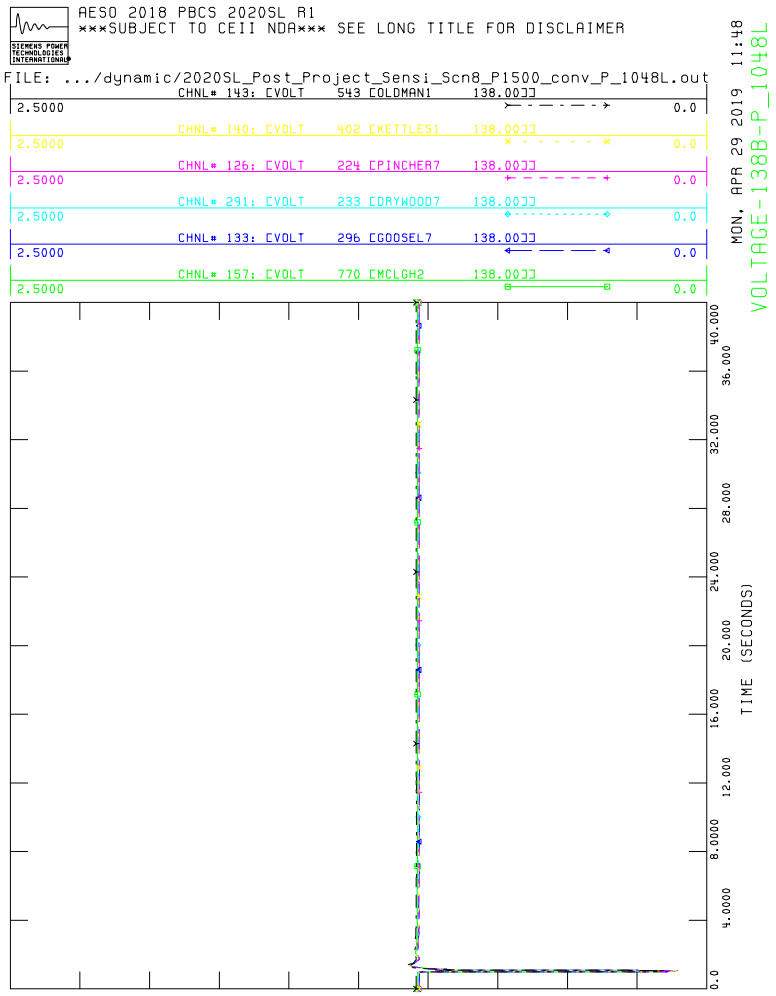
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SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
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VOLTAGE-138B-P_1048L

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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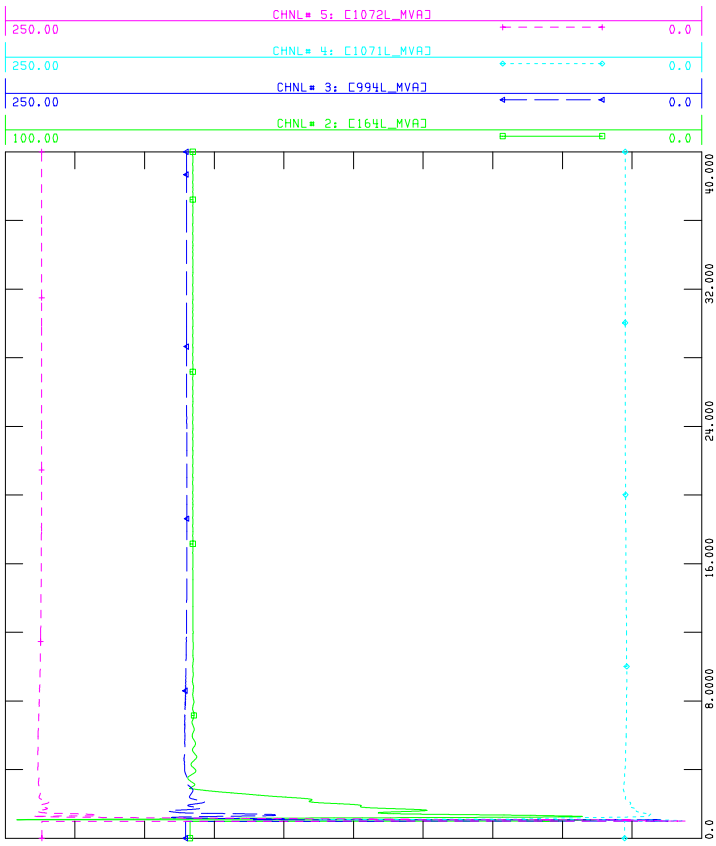
MON, APR 29 2019 11:48

BRANCH-MVA1-W_1048L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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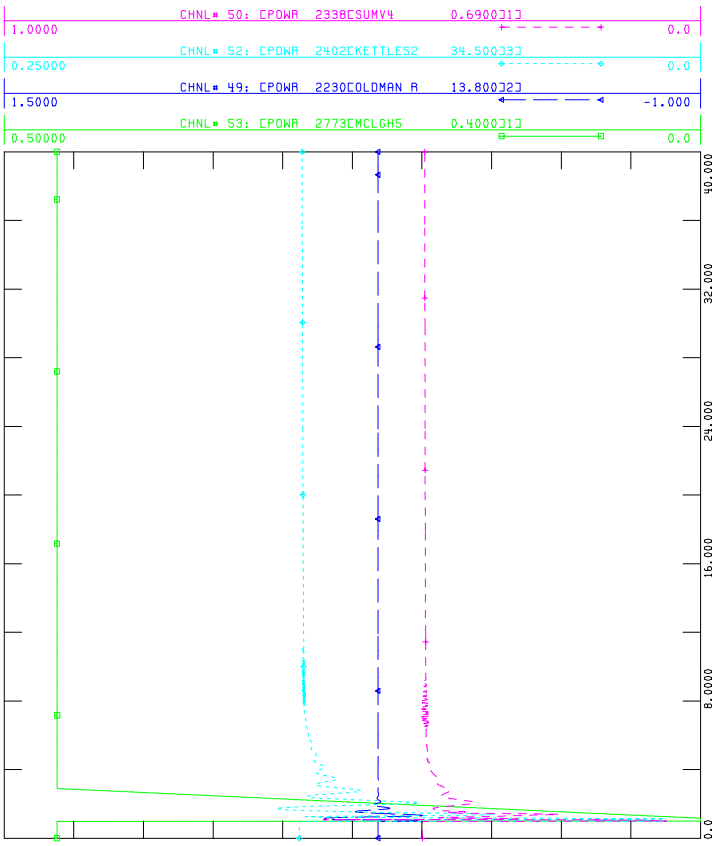
MON, APR 29 2019 11:48

MACHINE-P-W_1048L



AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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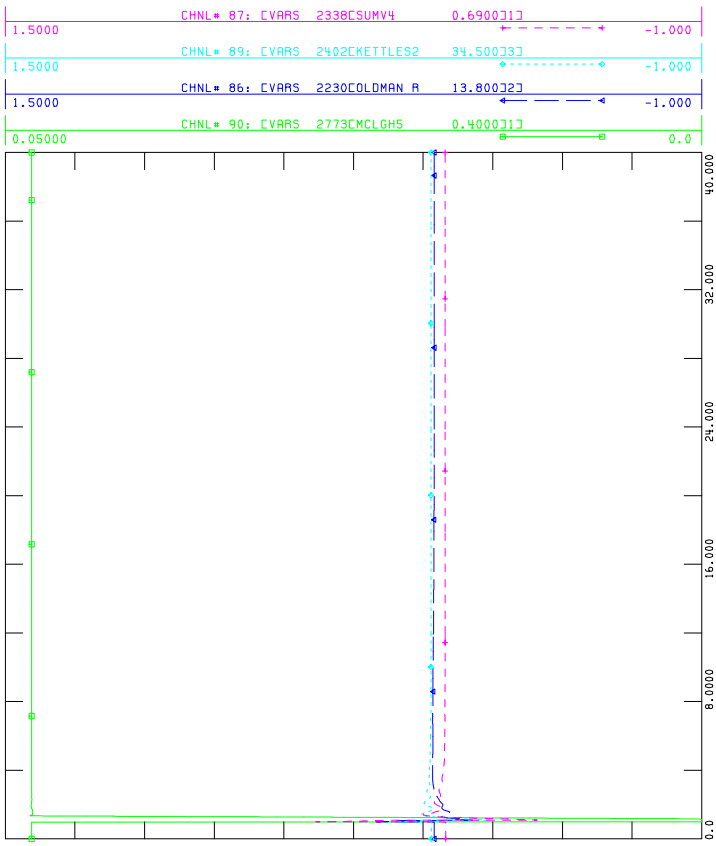
MACHINE-Q-W_1048L



AESO 2018 PBCS 2020SL R1
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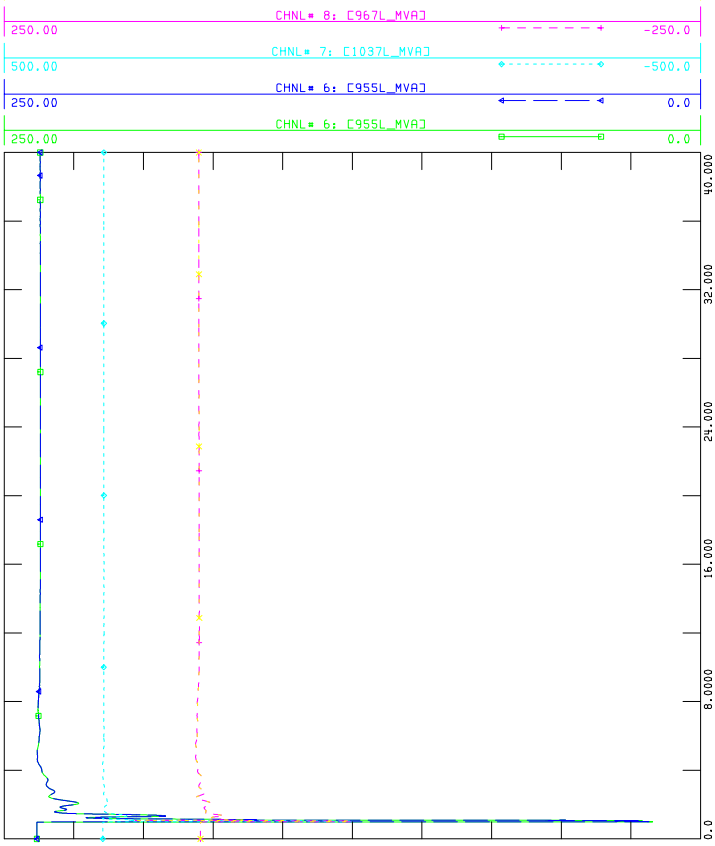
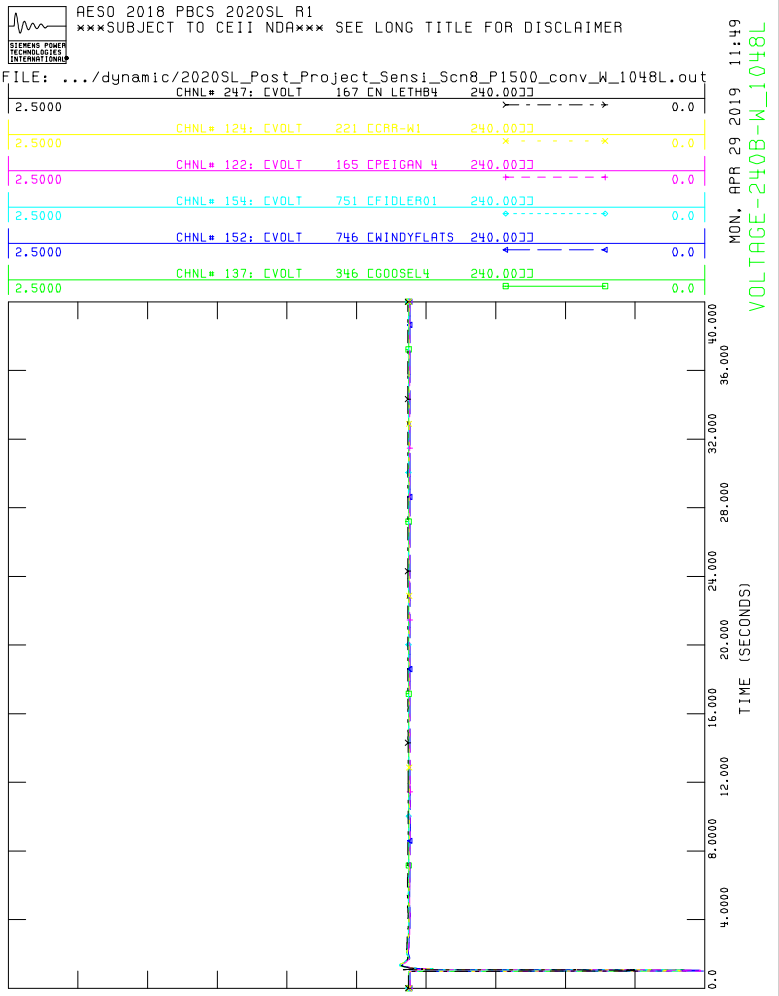
MON, APR 29 2019 11:48

BRANCH-MVA2-W_1048L

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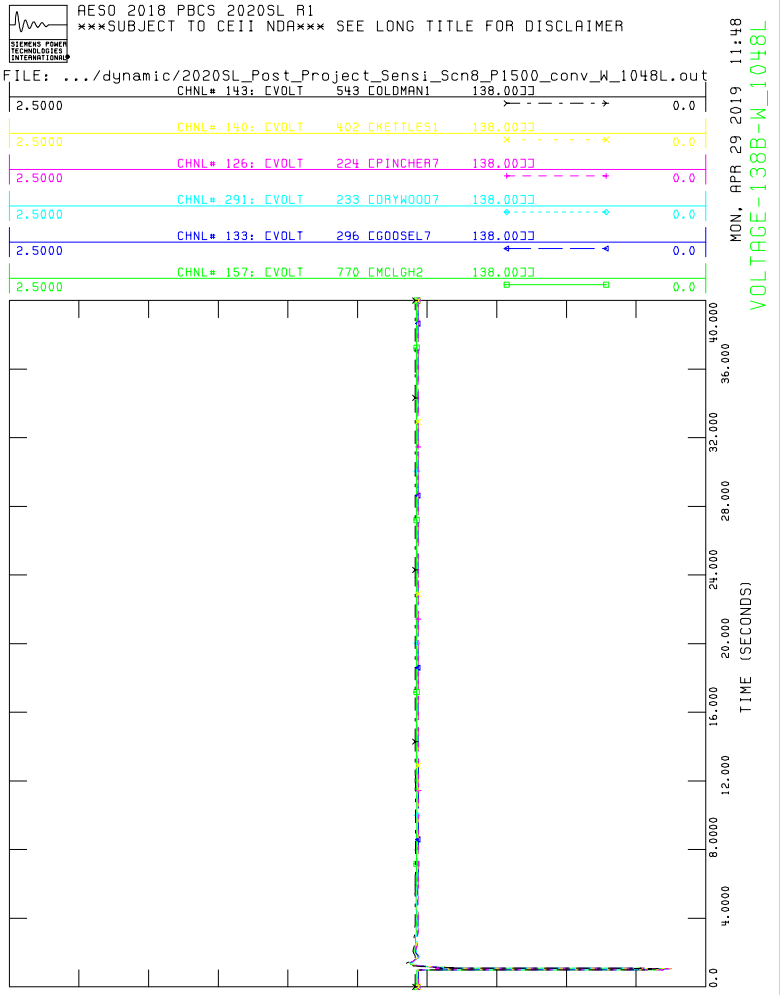
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CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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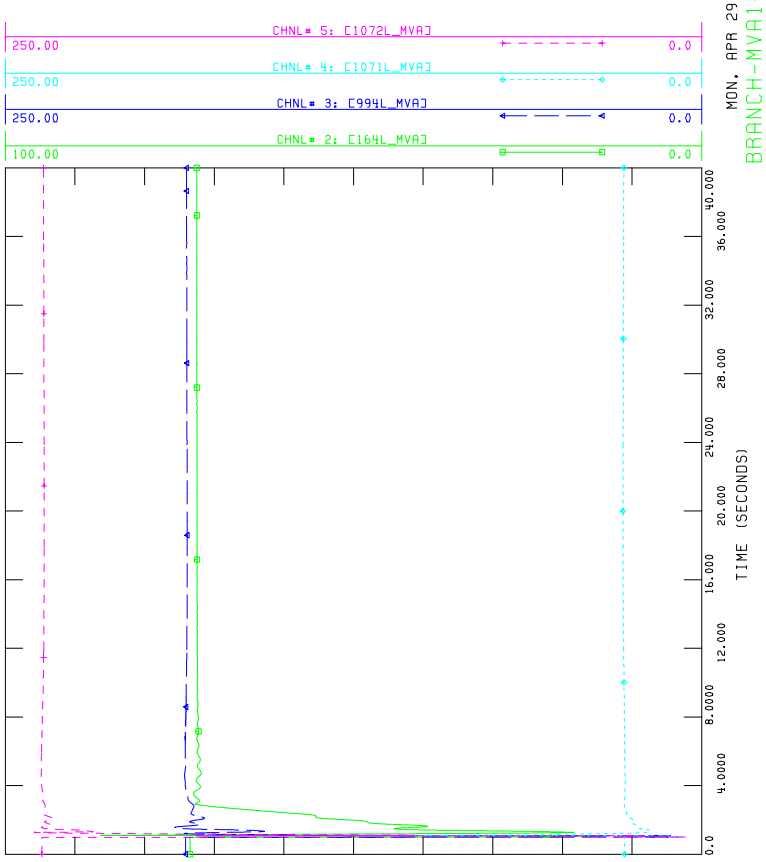

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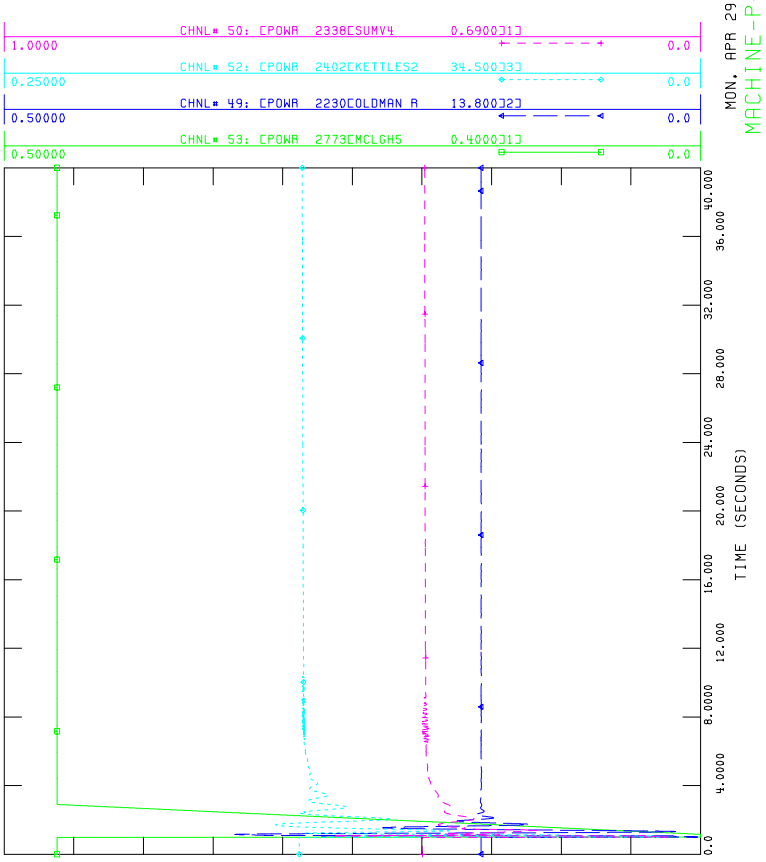

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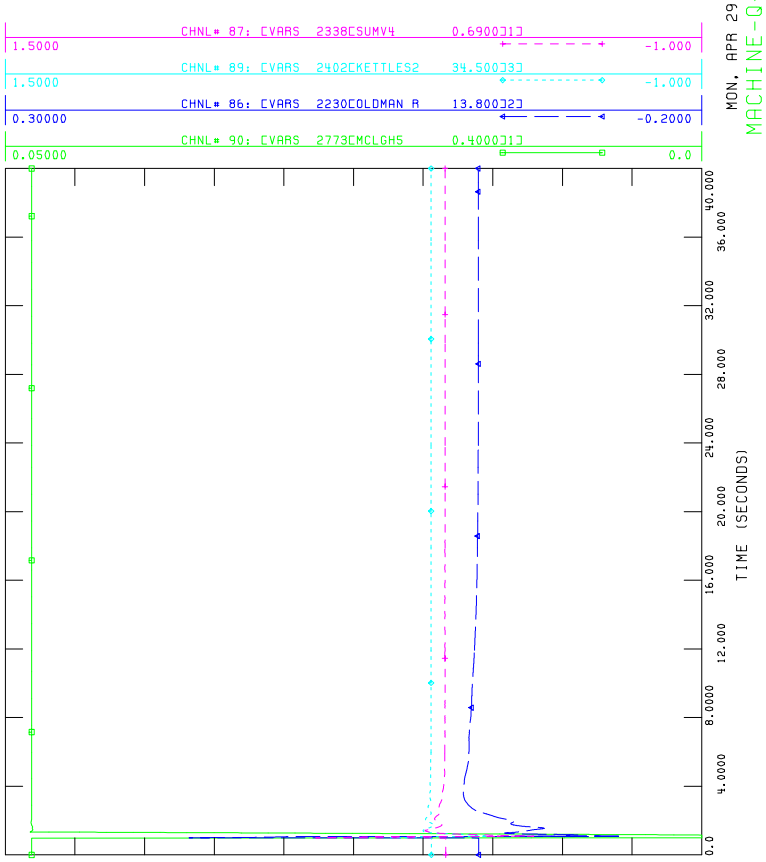

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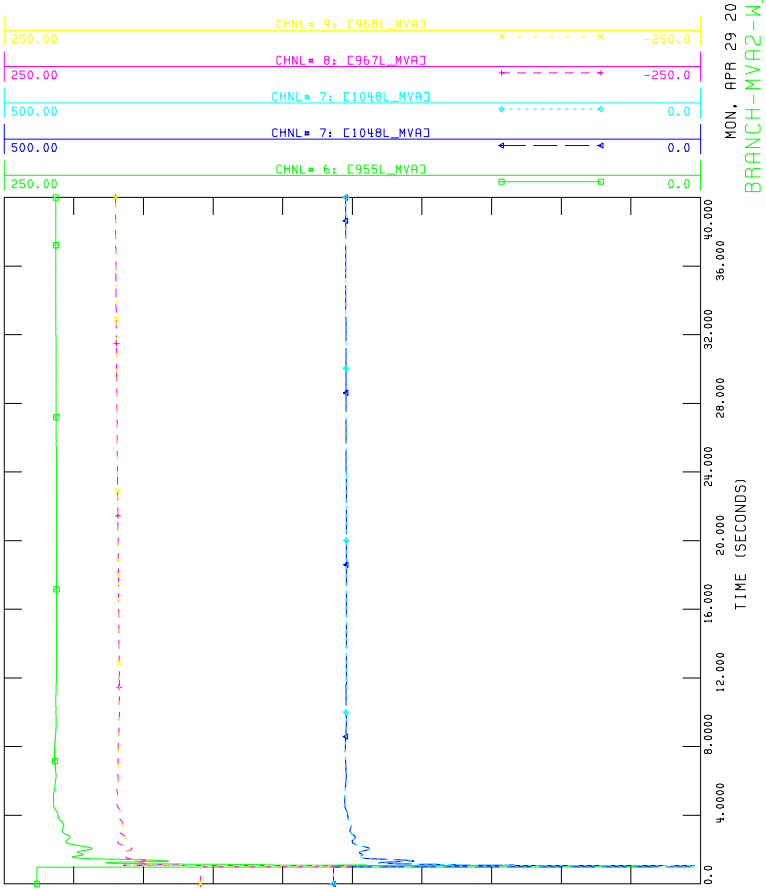

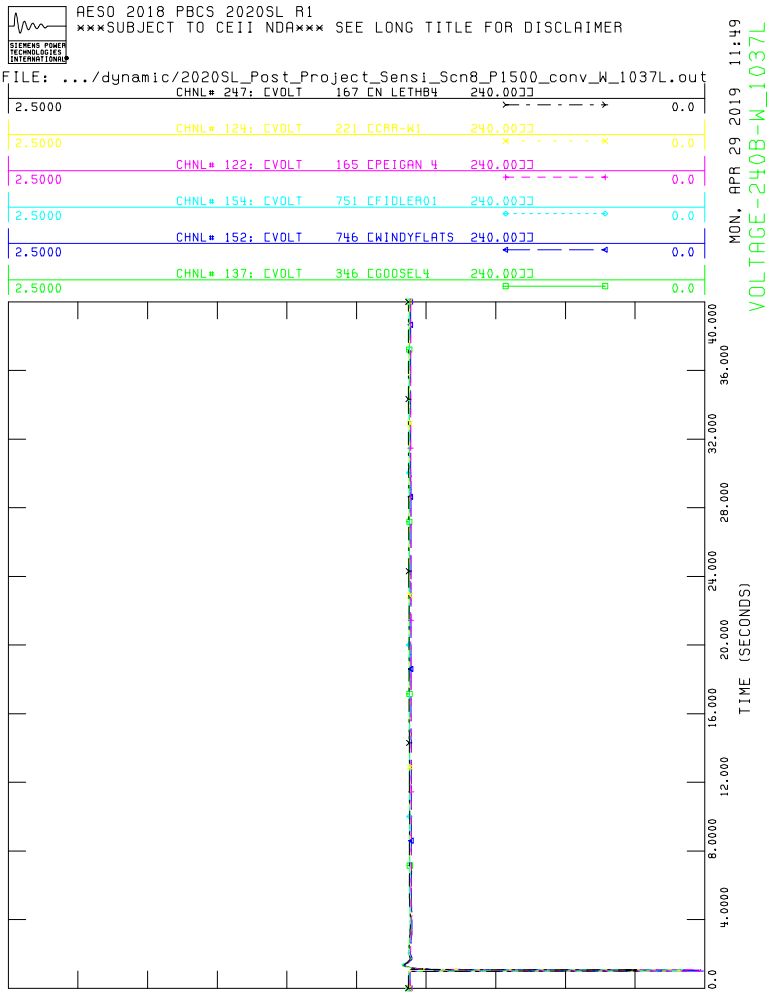
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CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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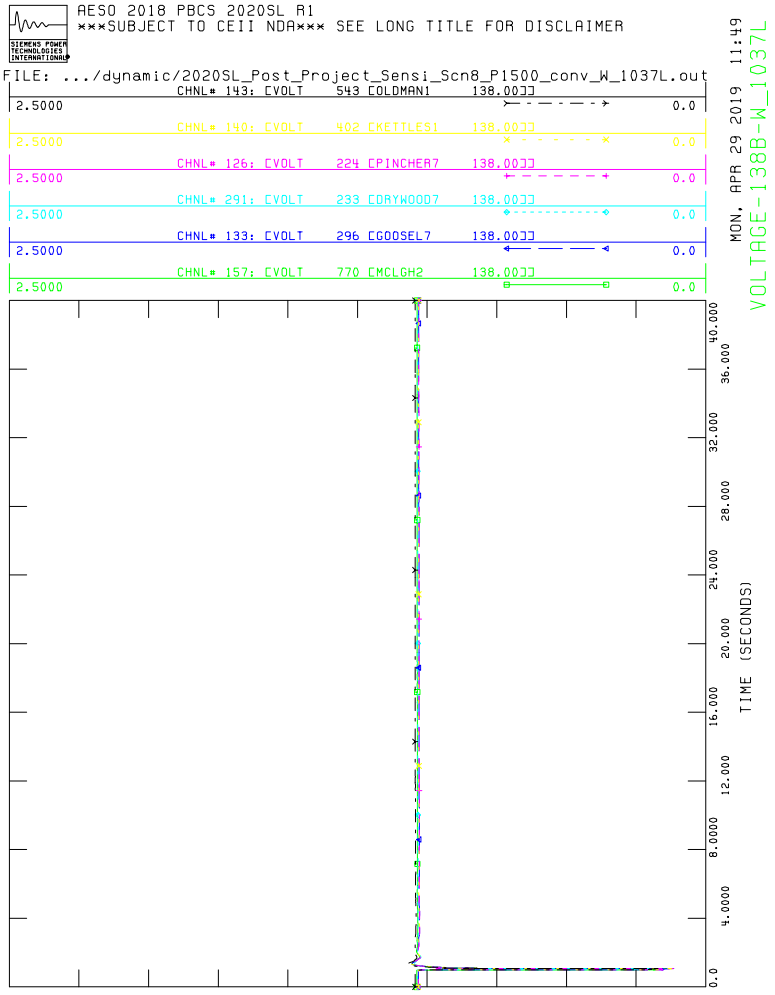
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CHNL# 126: CVOLT 224 CPINCHER7 138.00JJ
CHNL# 291: CVOLT 233 CDRYWOOD7 138.00JJ
CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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AESO 2018 PBCS 2020SL R1
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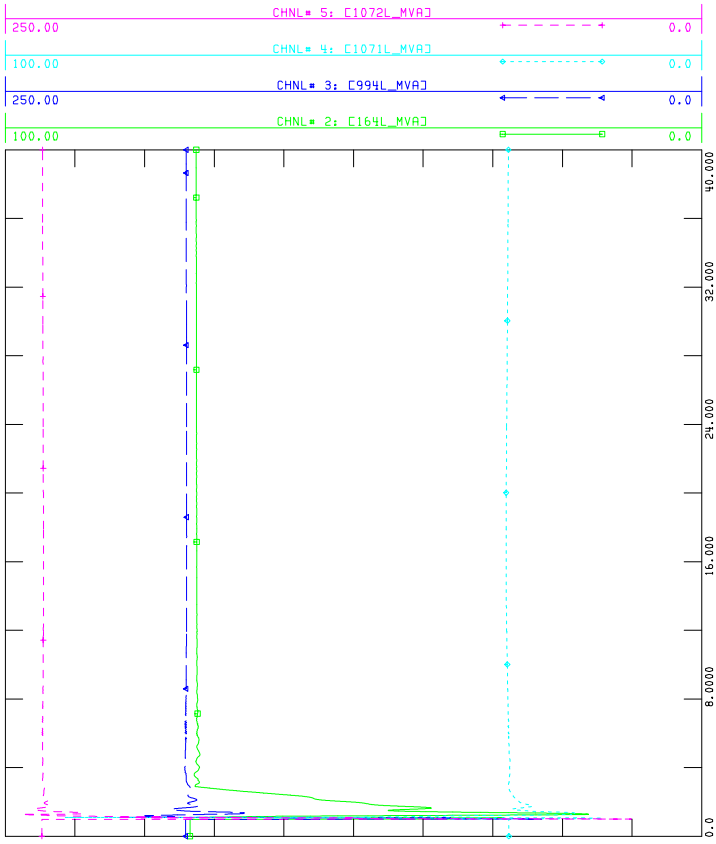

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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MON, APR 29 2019 11:49

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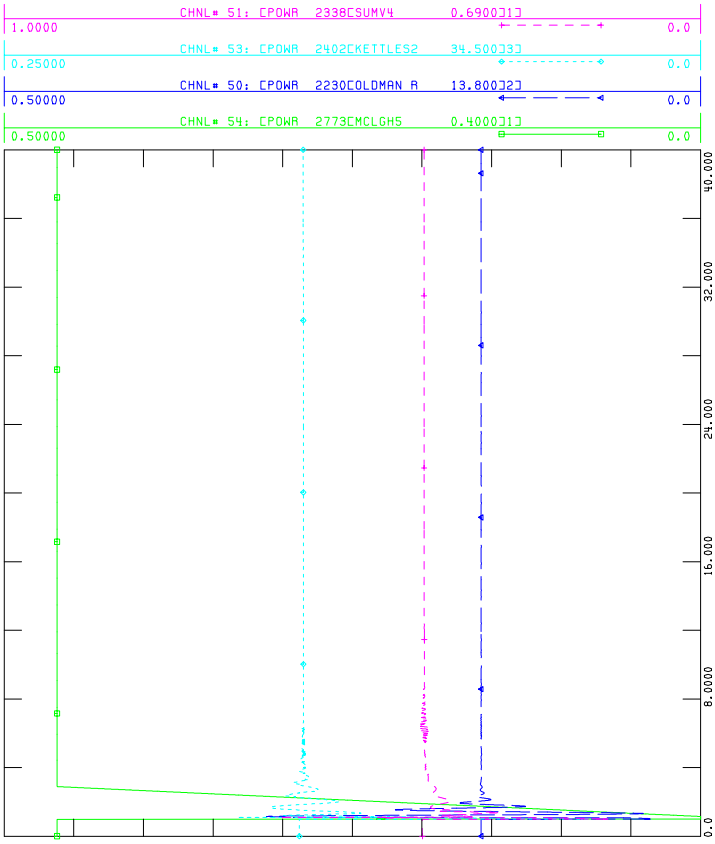

AESO 2018 PBCS 2020SL R1
SUBJECT TO CEII NDA SEE LONG TITLE FOR DISCLAIMER

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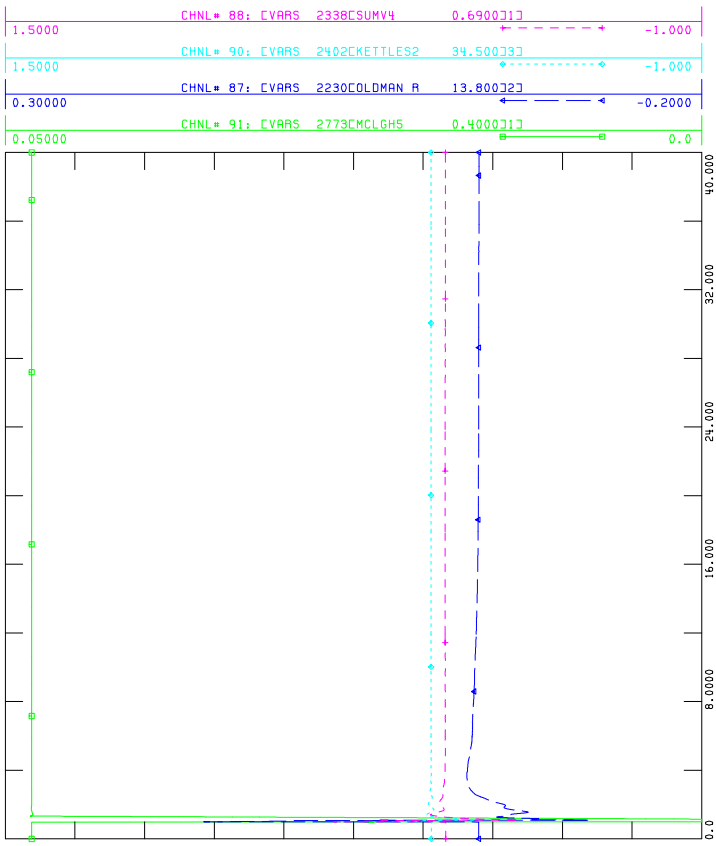

AESO 2018 PBCS 2020SL R1
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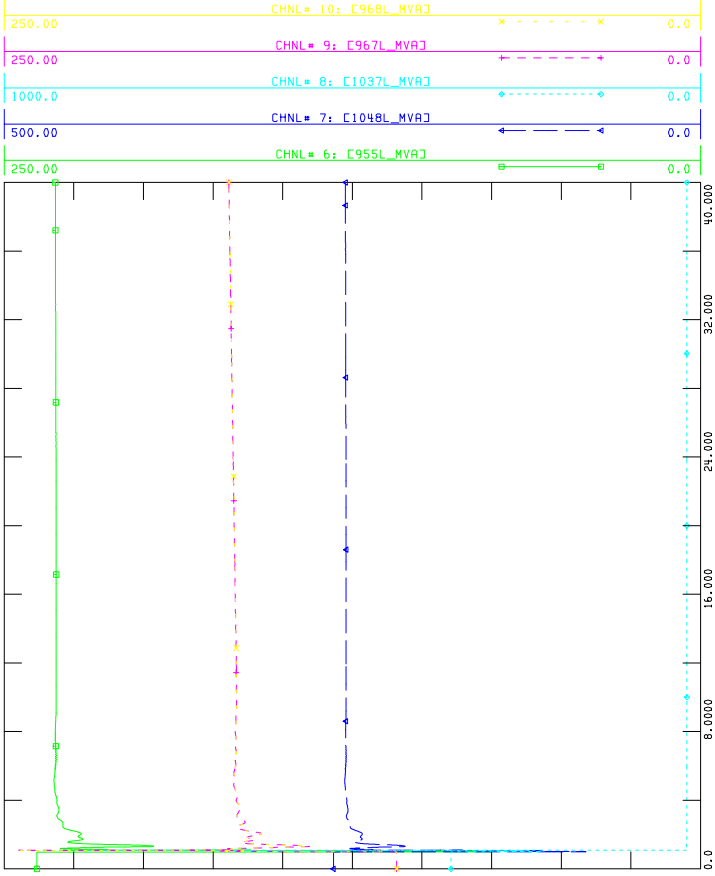

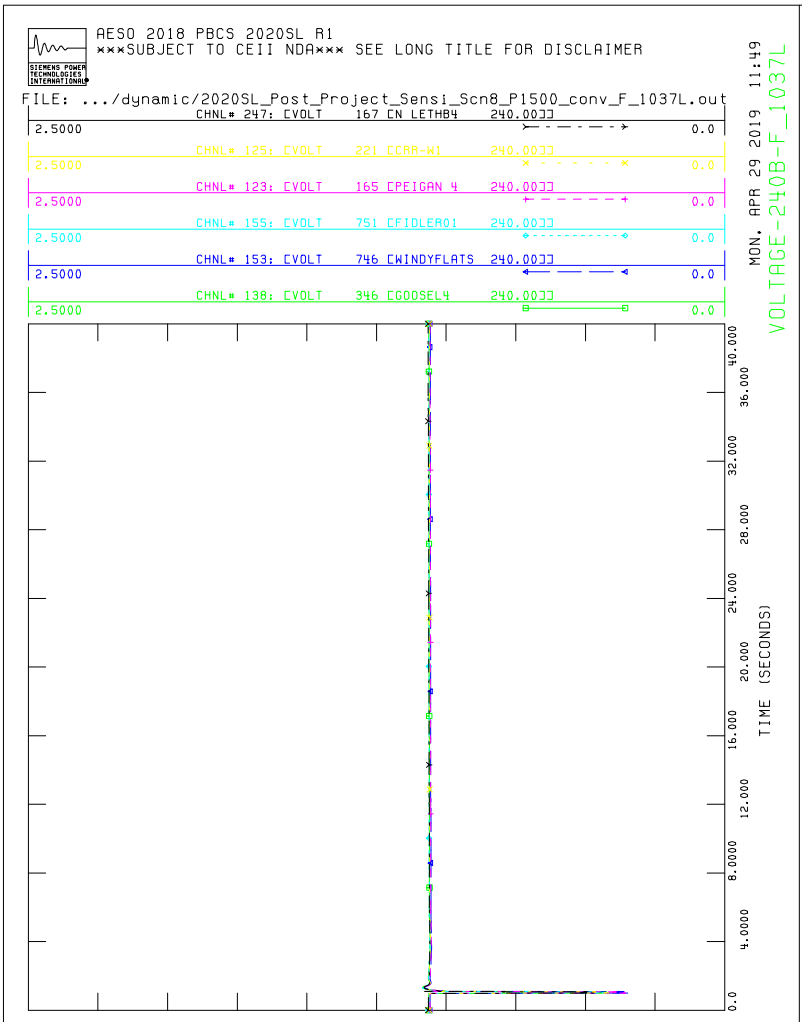
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CHNL# 153: CVOLT 746 CWINDYFLATS 240.000
CHNL# 138: CVOLT 346 CGOOSEL4 240.000
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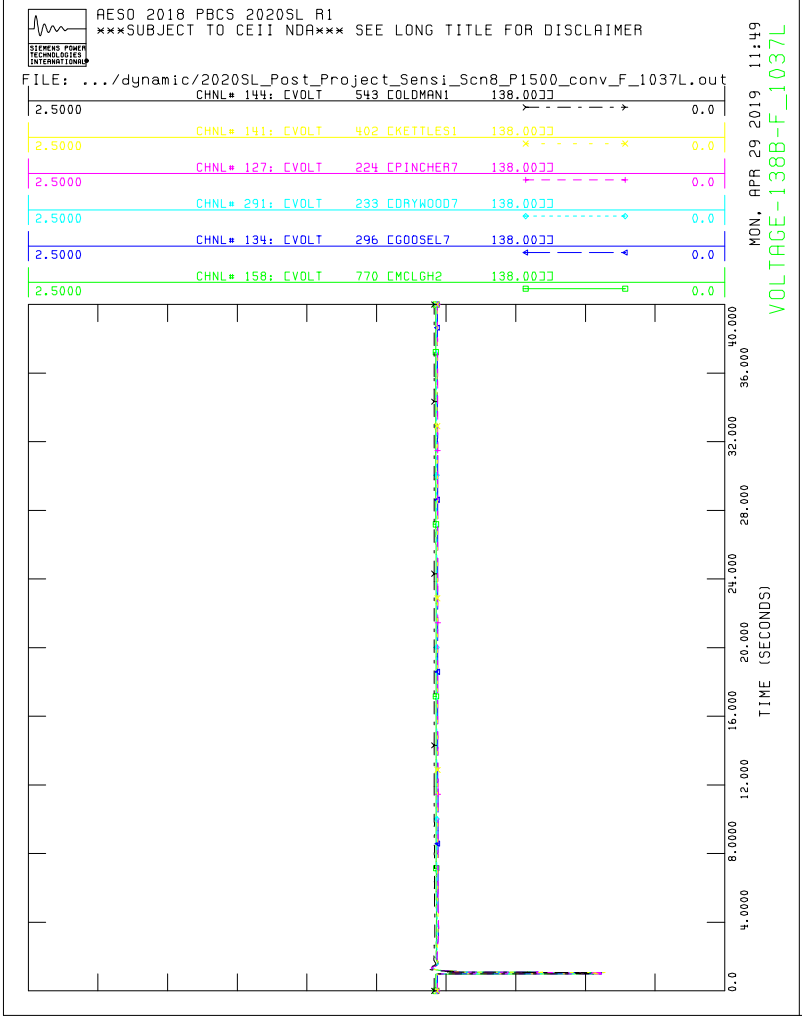
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CHNL# 291: CVOLT 233 CDRYWOOD7 138.000
CHNL# 134: CVOLT 296 CGOOSEL7 138.000
CHNL# 158: CVOLT 770 CMCLGH2 138.000
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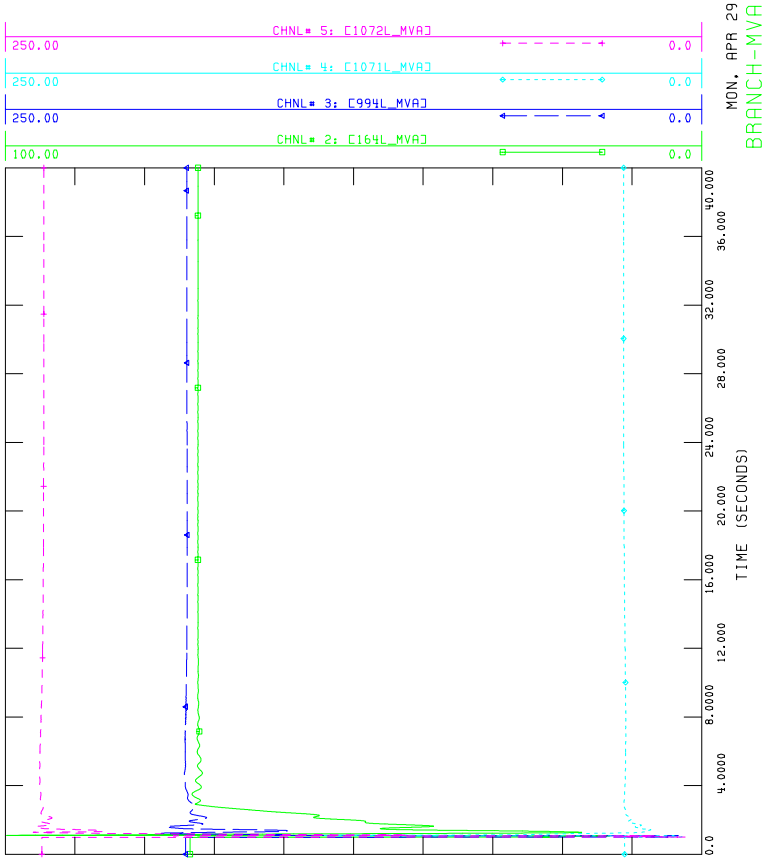

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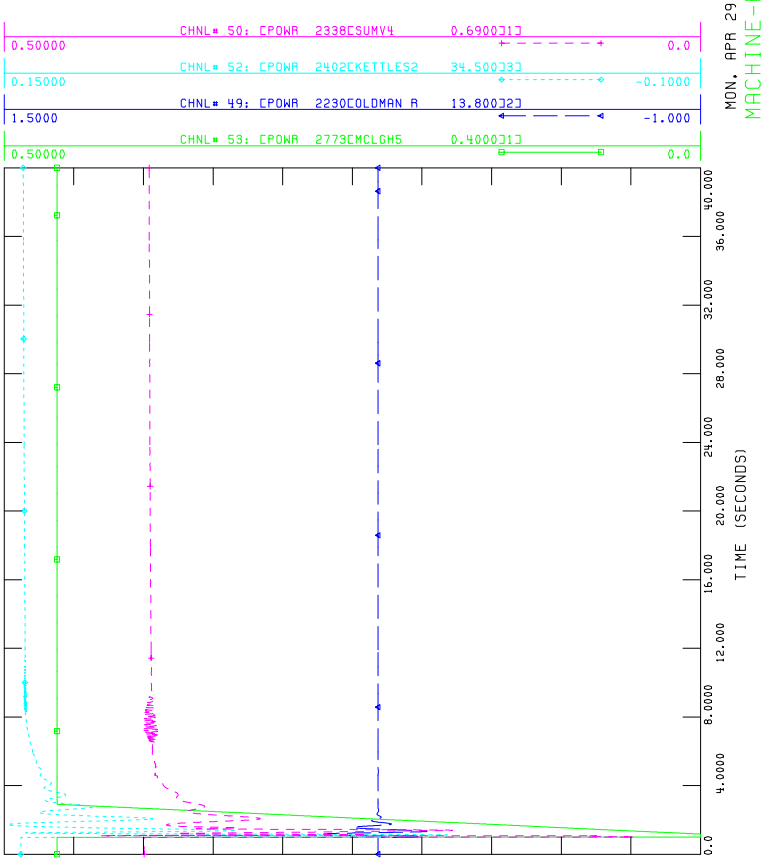

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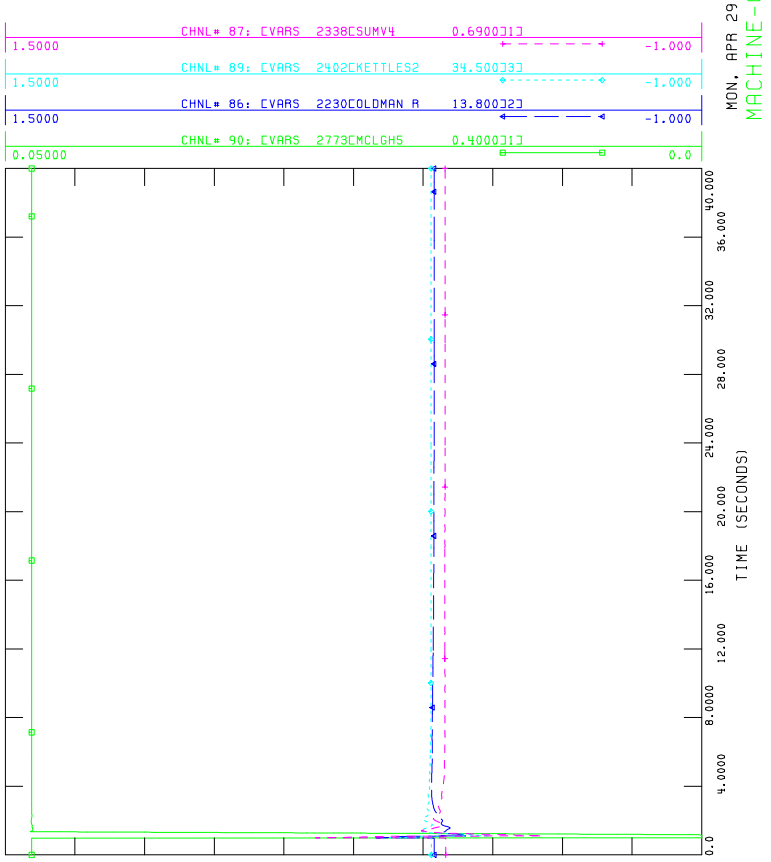

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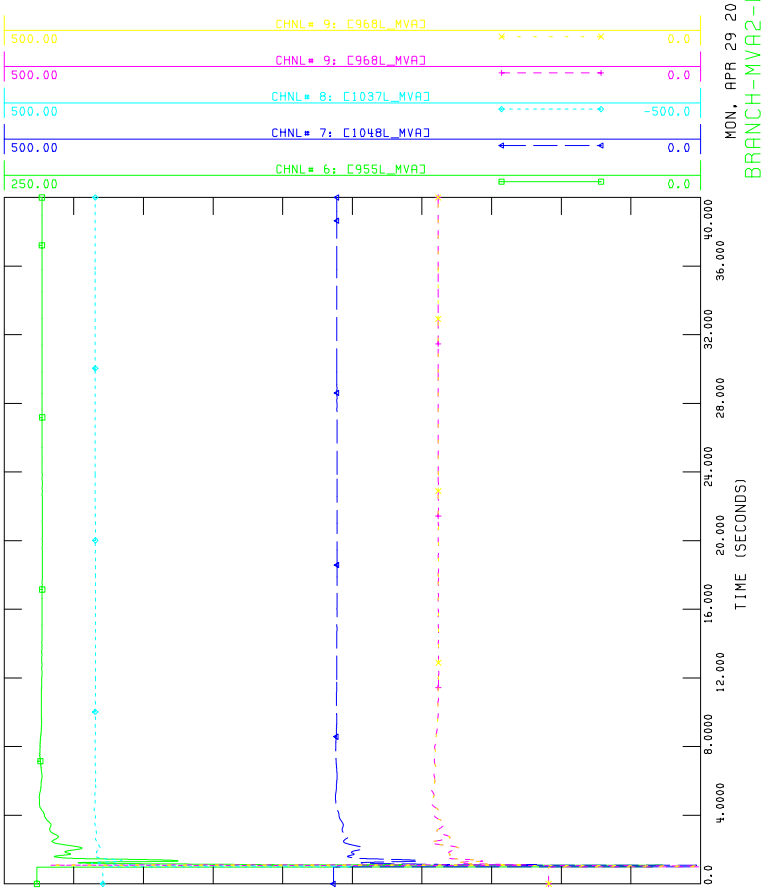

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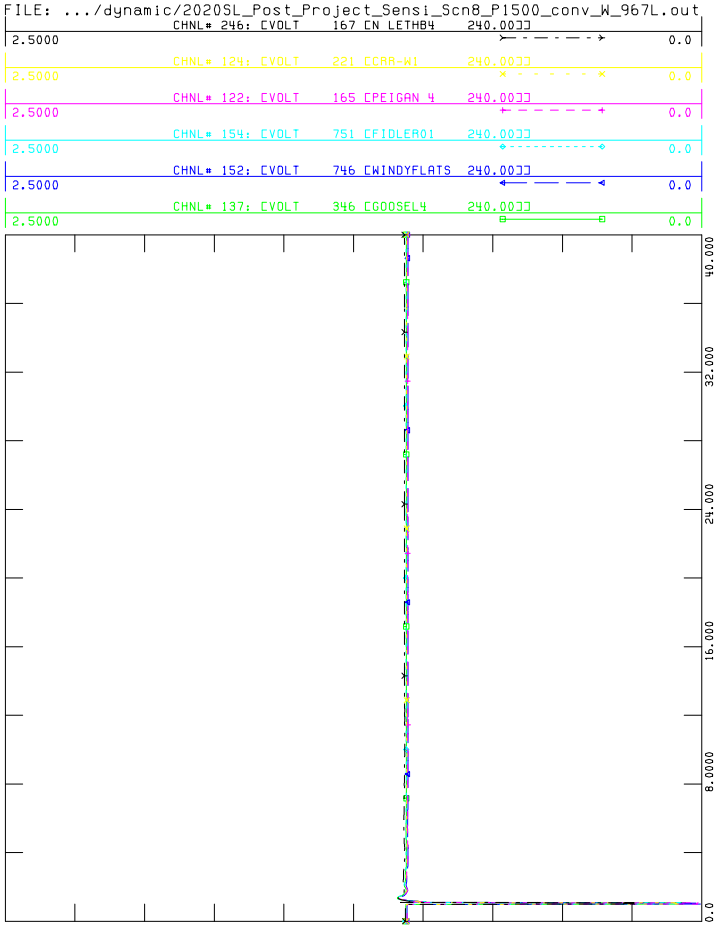

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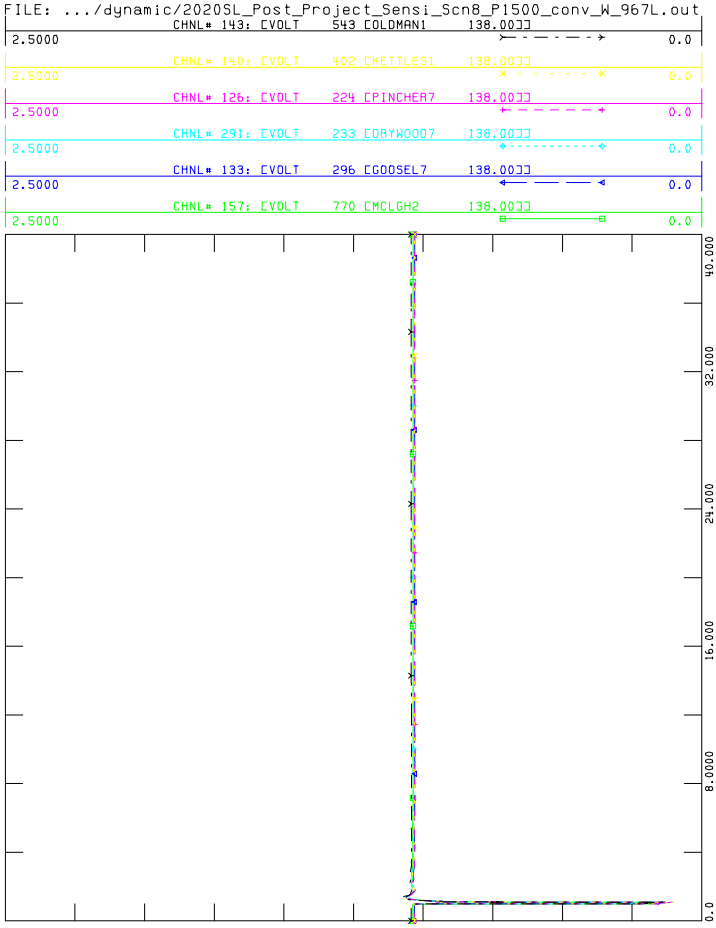

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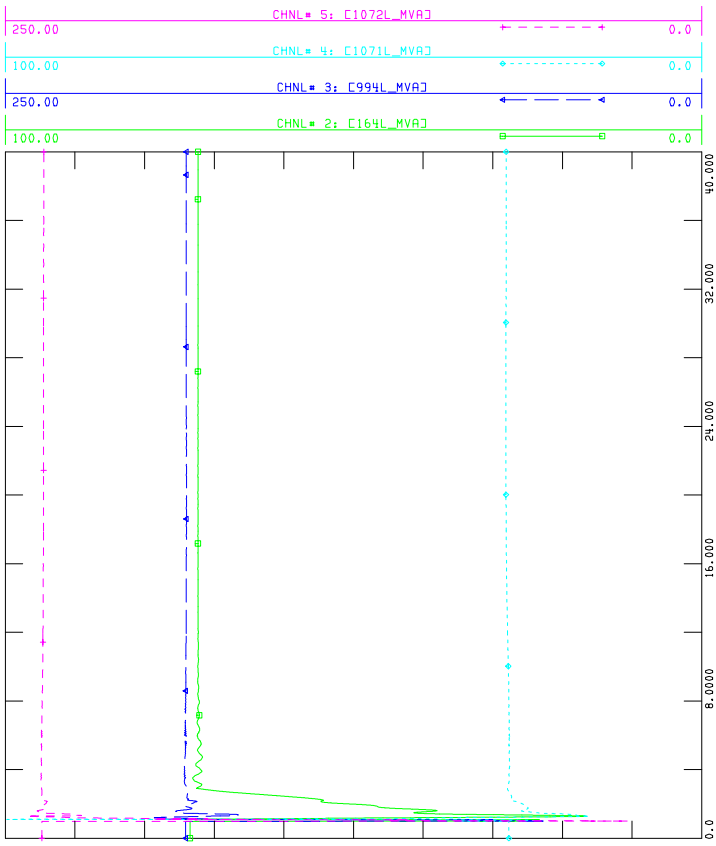

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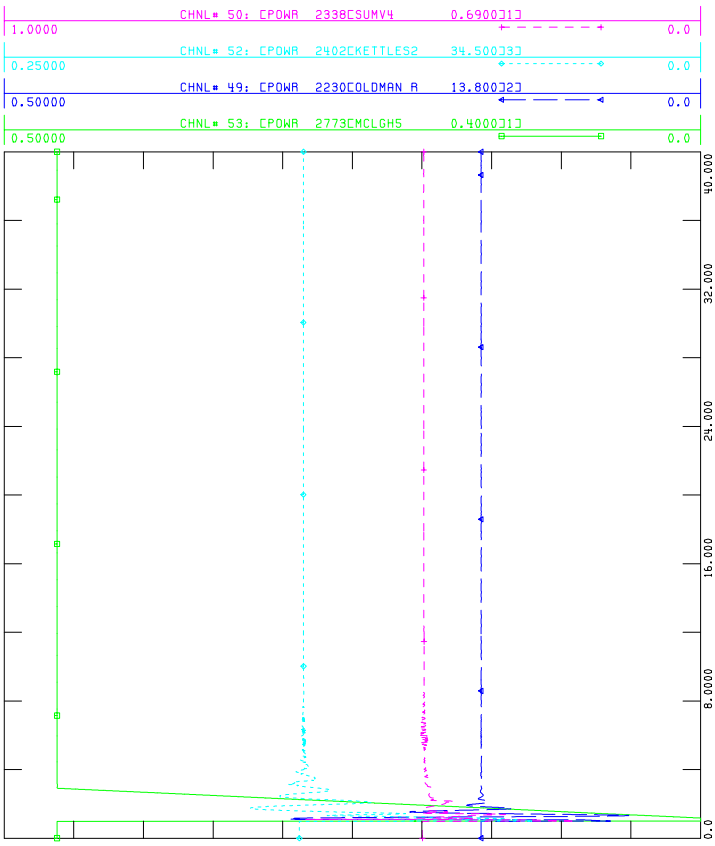

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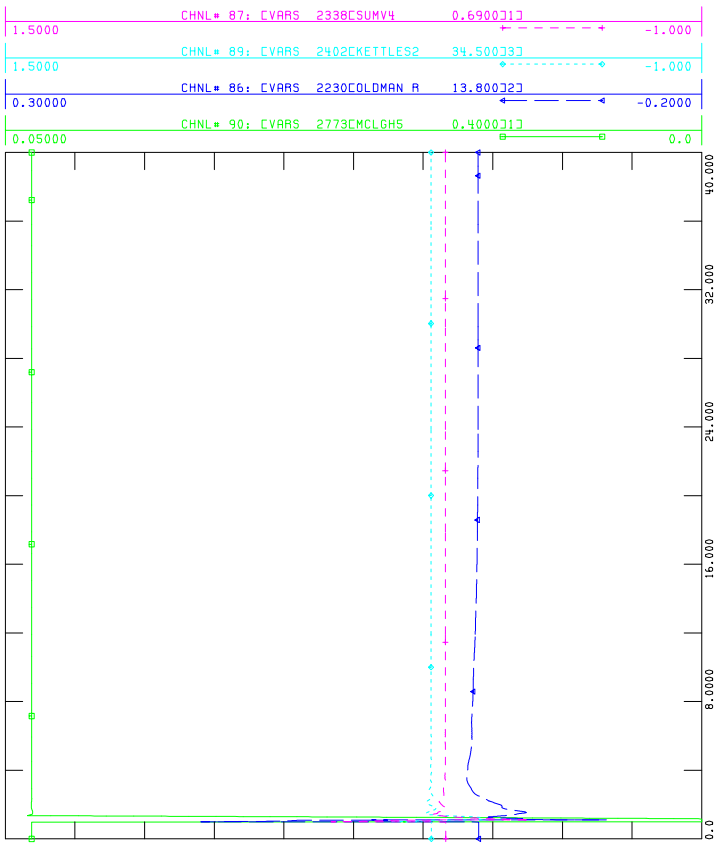

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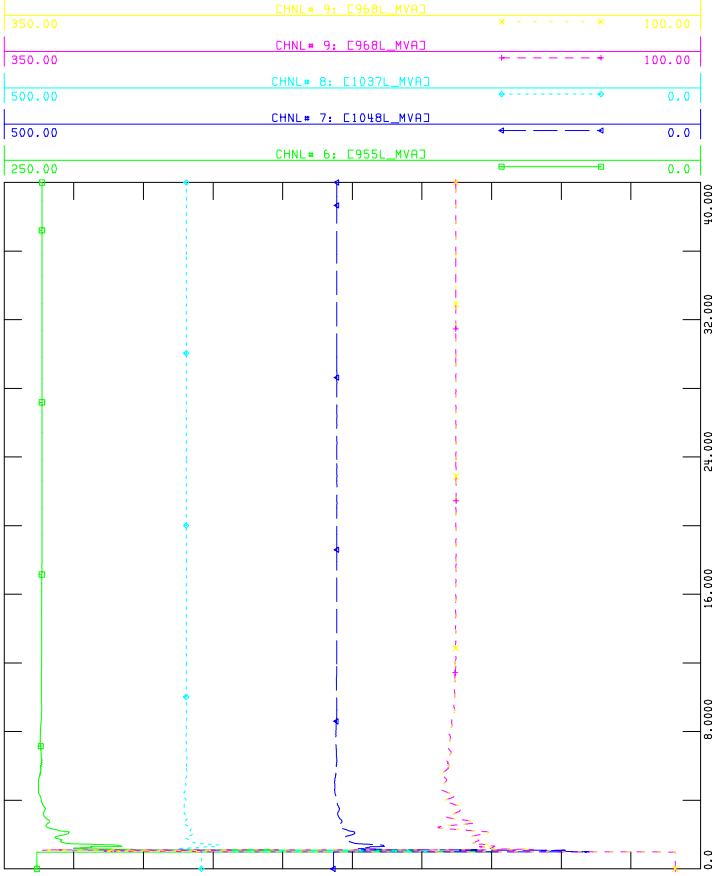

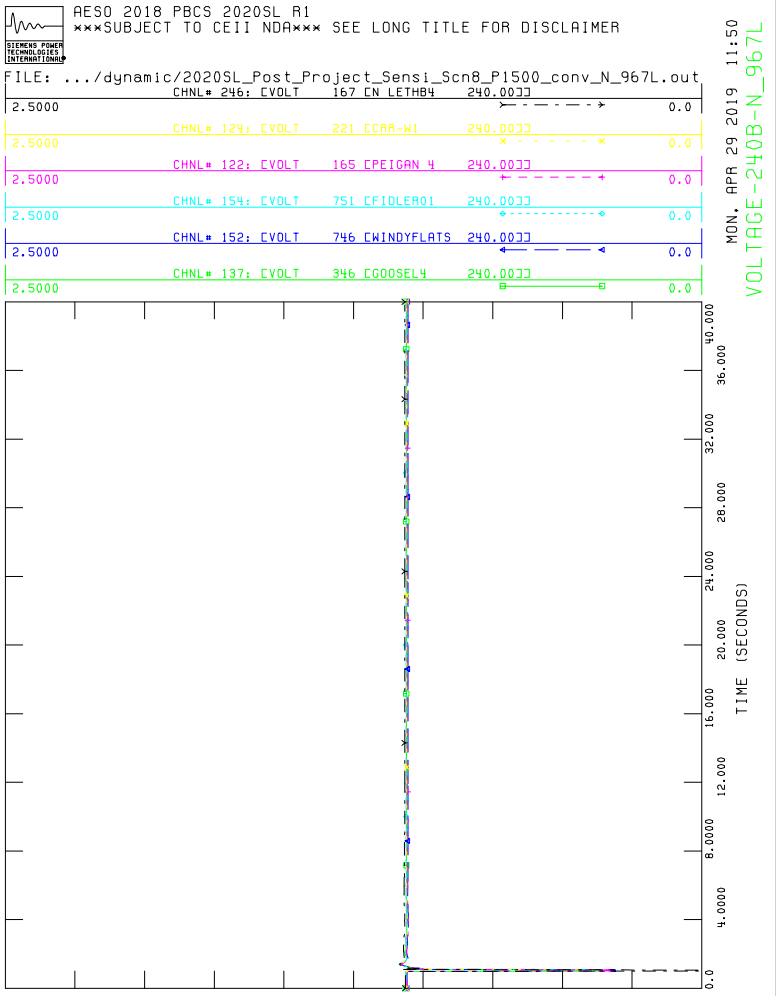
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CHNL# 122: CVOLT 165 CPEIGAN 4 240.00JJ
CHNL# 154: CVOLT 751 CFIDLER01 240.00JJ
CHNL# 152: CVOLT 746 CWINDYFLATS 240.00JJ
CHNL# 137: CVOLT 346 CGOOSEL4 240.00JJ
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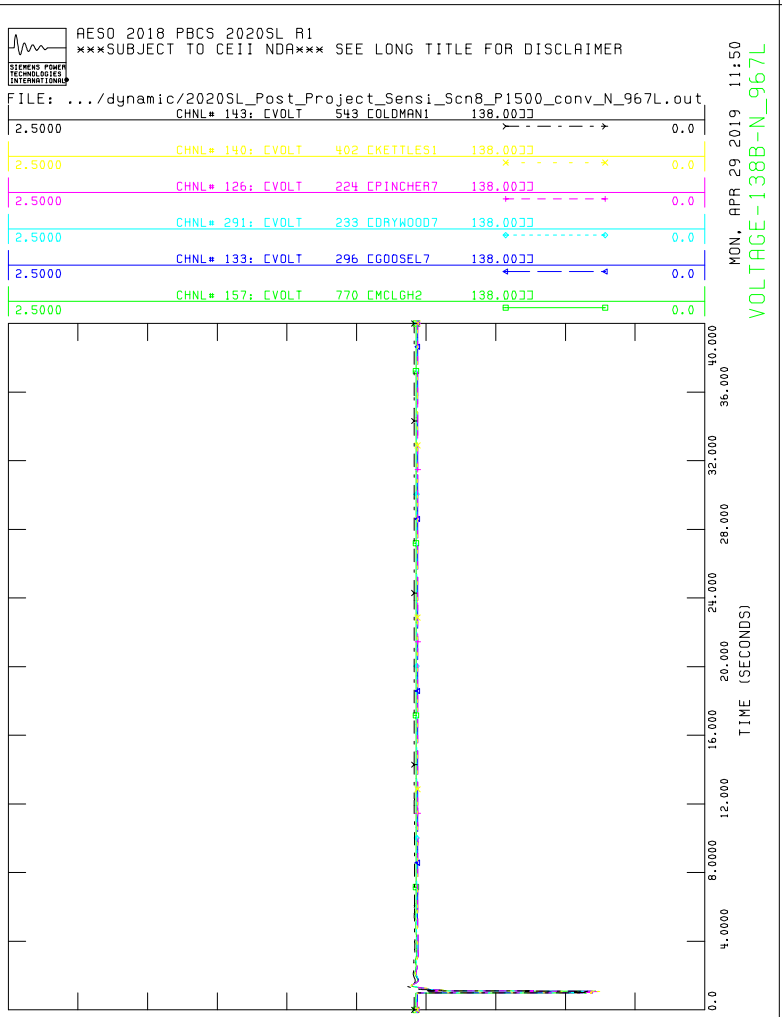
MON, APR 29 2019 11:50
VOLTAGE-240B-N_967L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CHNL# 133: CVOLT 296 CGOOSEL7 138.00JJ
CHNL# 157: CVOLT 770 CMCLGH2 138.00JJ
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MON, APR 29 2019 11:50
VOLTAGE-138B-N_967L

Attachment A5
Dynamic Data and Assumptions

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 / ========================

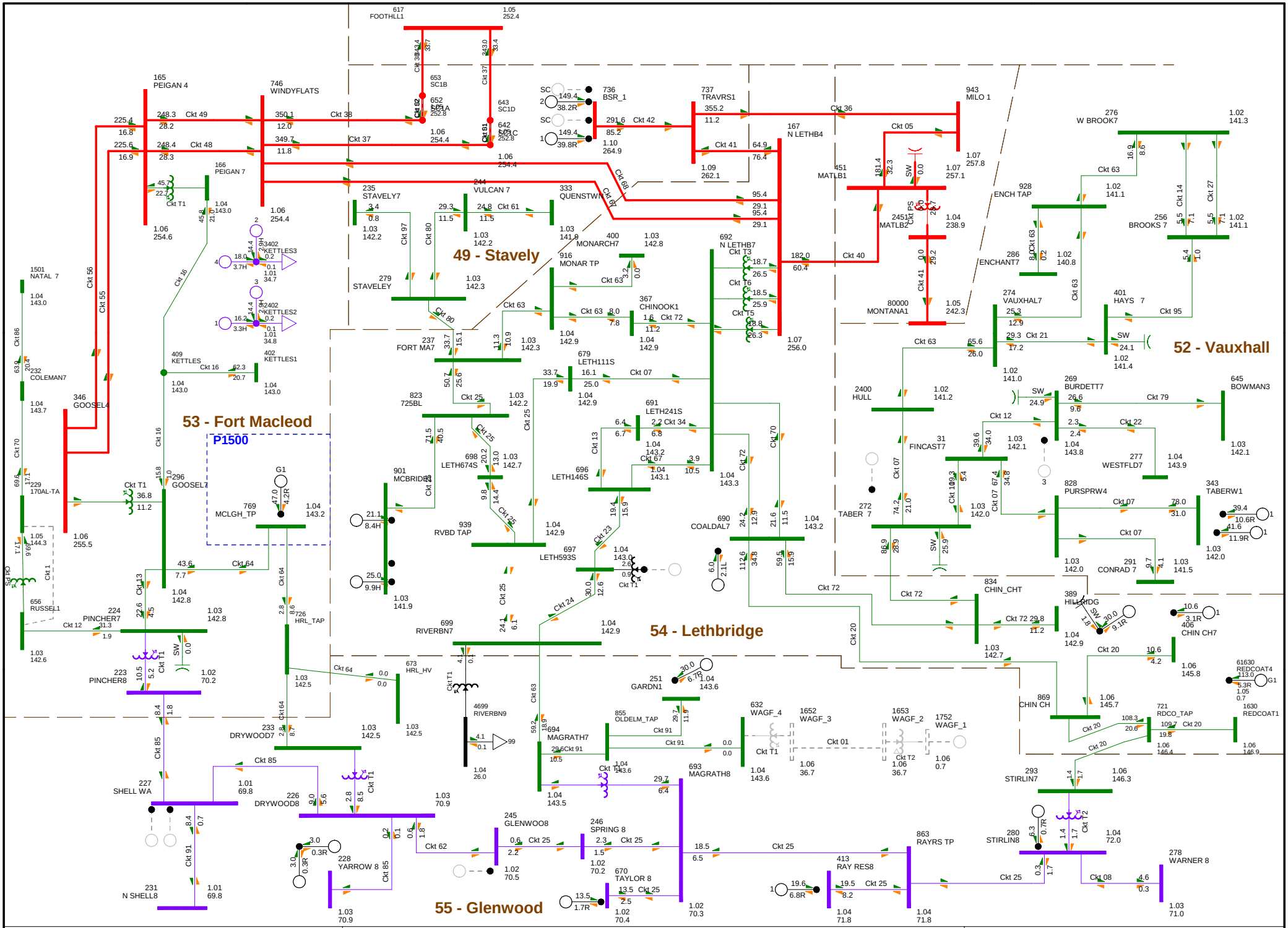
 / P1500 T-tap on 164L

 /

 2773 'USRMDL' 1 'ExF4v2'  1 1 8 47 1 57
  0        11        2        0        0        1        1       0
  4200      9000      3000     -3000
  90       91       80       4.0       50
  120      119      125       4.0      130
  5        2.3      2.3       2        2
  76       5        30        1
  110      5        120       1
  58       30       57        0.1
  60.6     180      62        0.1
  58.5     59.5     60.5      61.5      62.5      62.0
  100      100      0         65.5      20        500/
/

 0 'USRMDL' 0 'EFCU07' 8 0 5 32 0 34
  1                 2773          2772            2773            2773
  47.0              30.0    0.02  0.02
  3500              0             50
  0.04              0.5           0.02    0.0             0.0
  -0.04             0             0               0.04
  1                   0           -1              0.5
  100               0             50
  0.005     1       0.01          0.2               10
  0.7               1.2           0.02          0.02/
```

Attachment A6
Post-Mitigation Power Flow Diagrams



P1500 - RESL McLaughlin WAGF

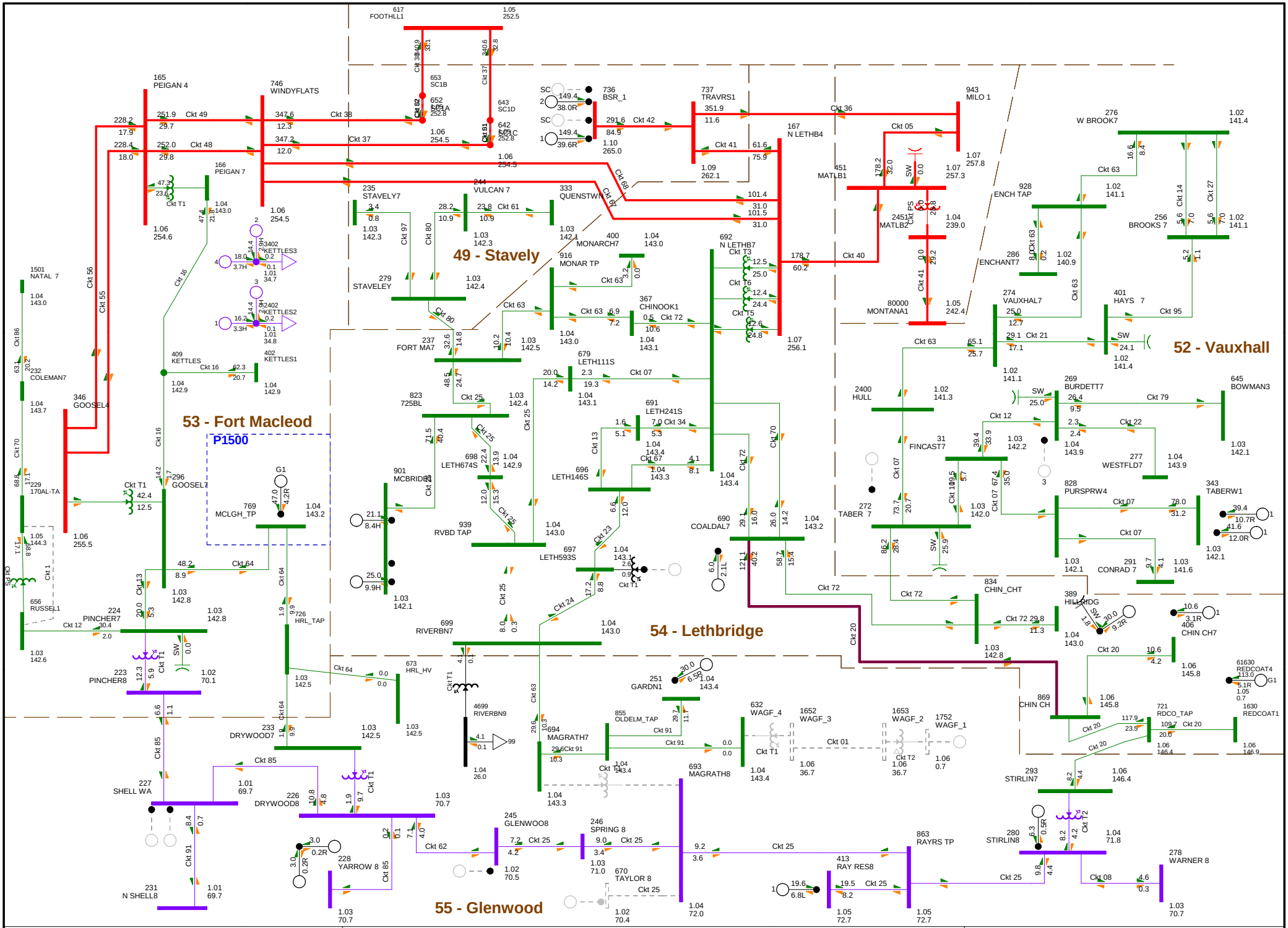
BC Import:0.5 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A6.1-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

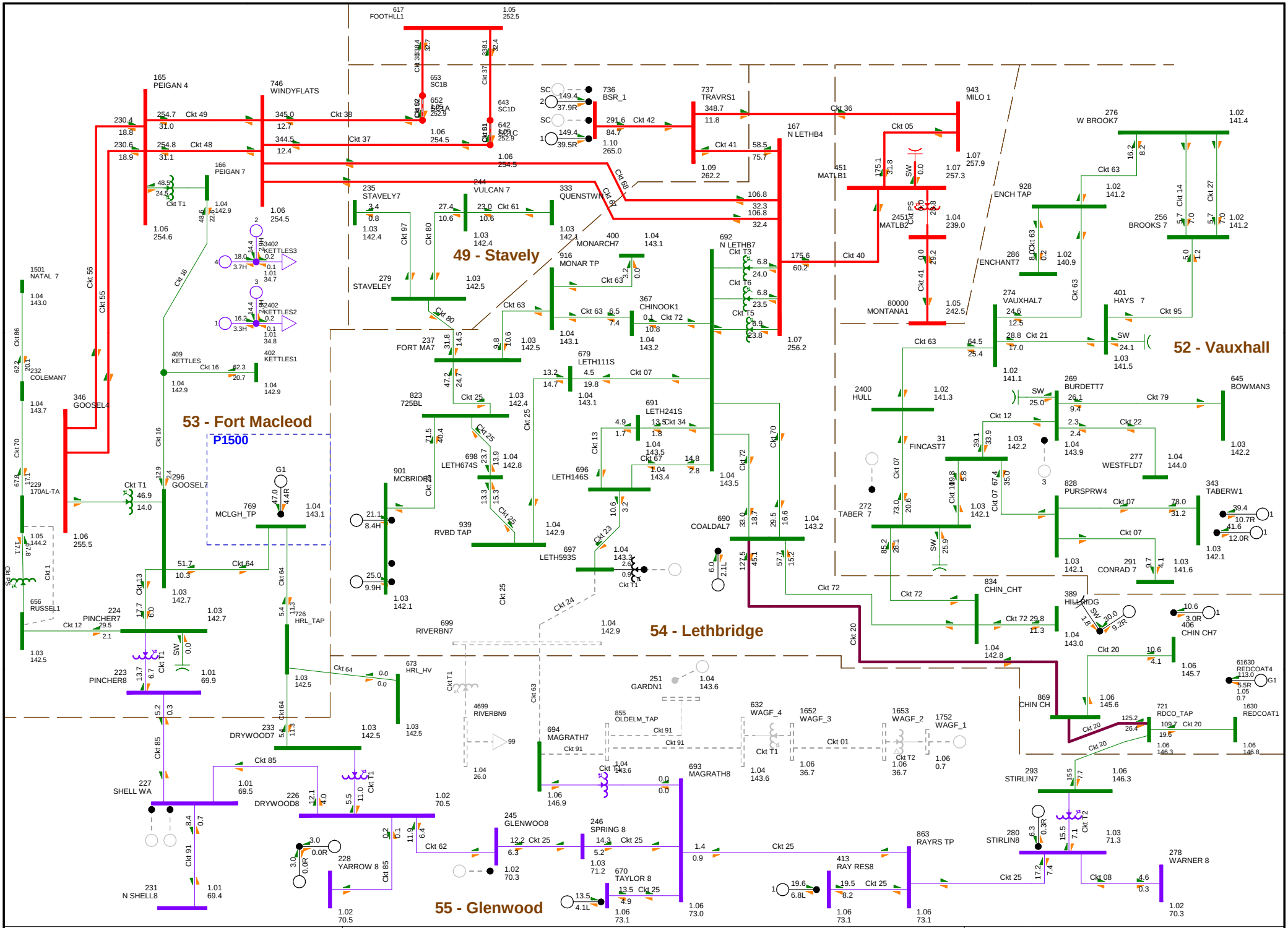
BC Import:13.7 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A6.1-2 N-1: 225ST1 WITH RAS 126
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

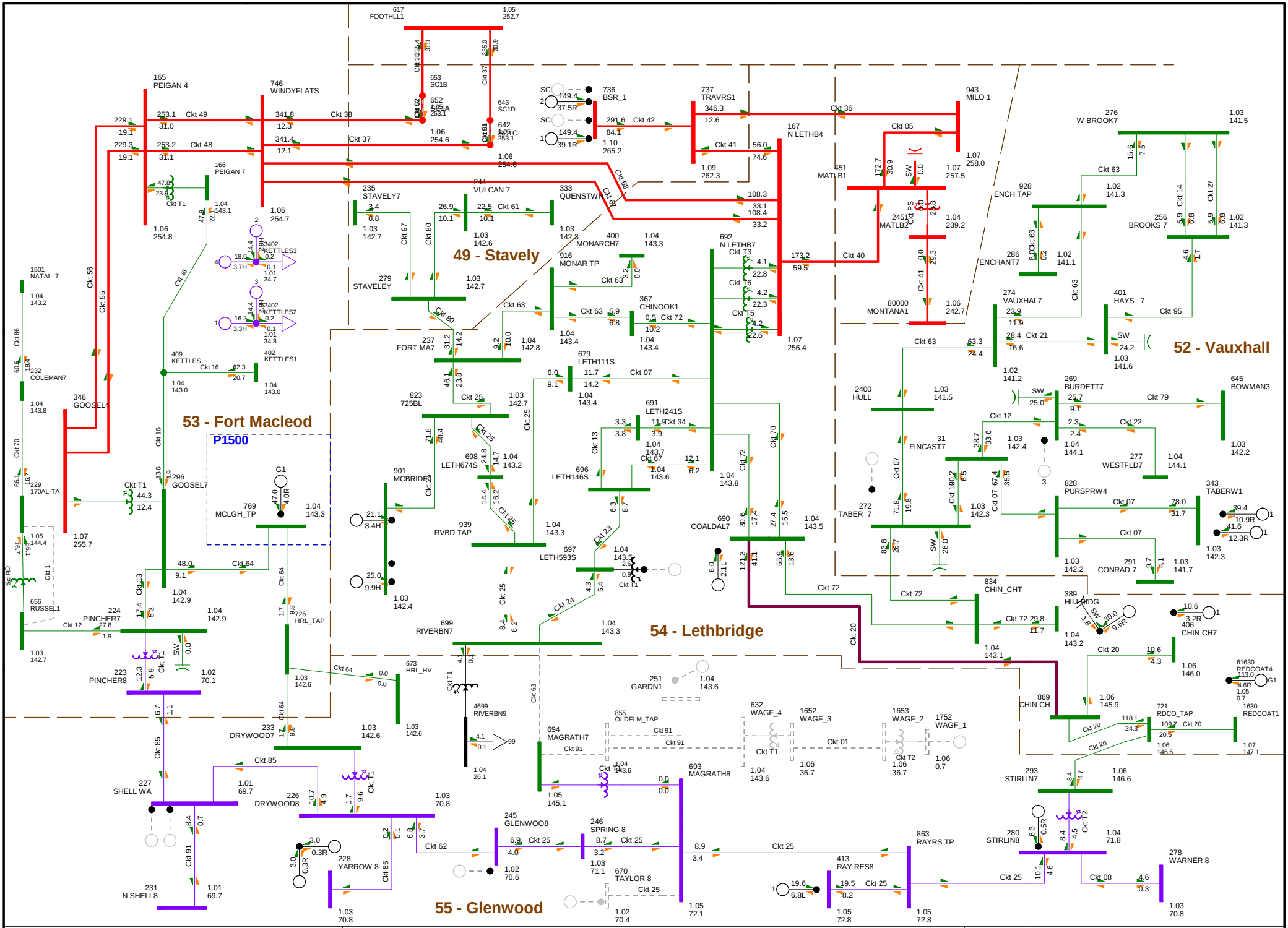
BC Import:27.0 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A6.1-3 N-1: 618ST1 WITH RAS 36
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

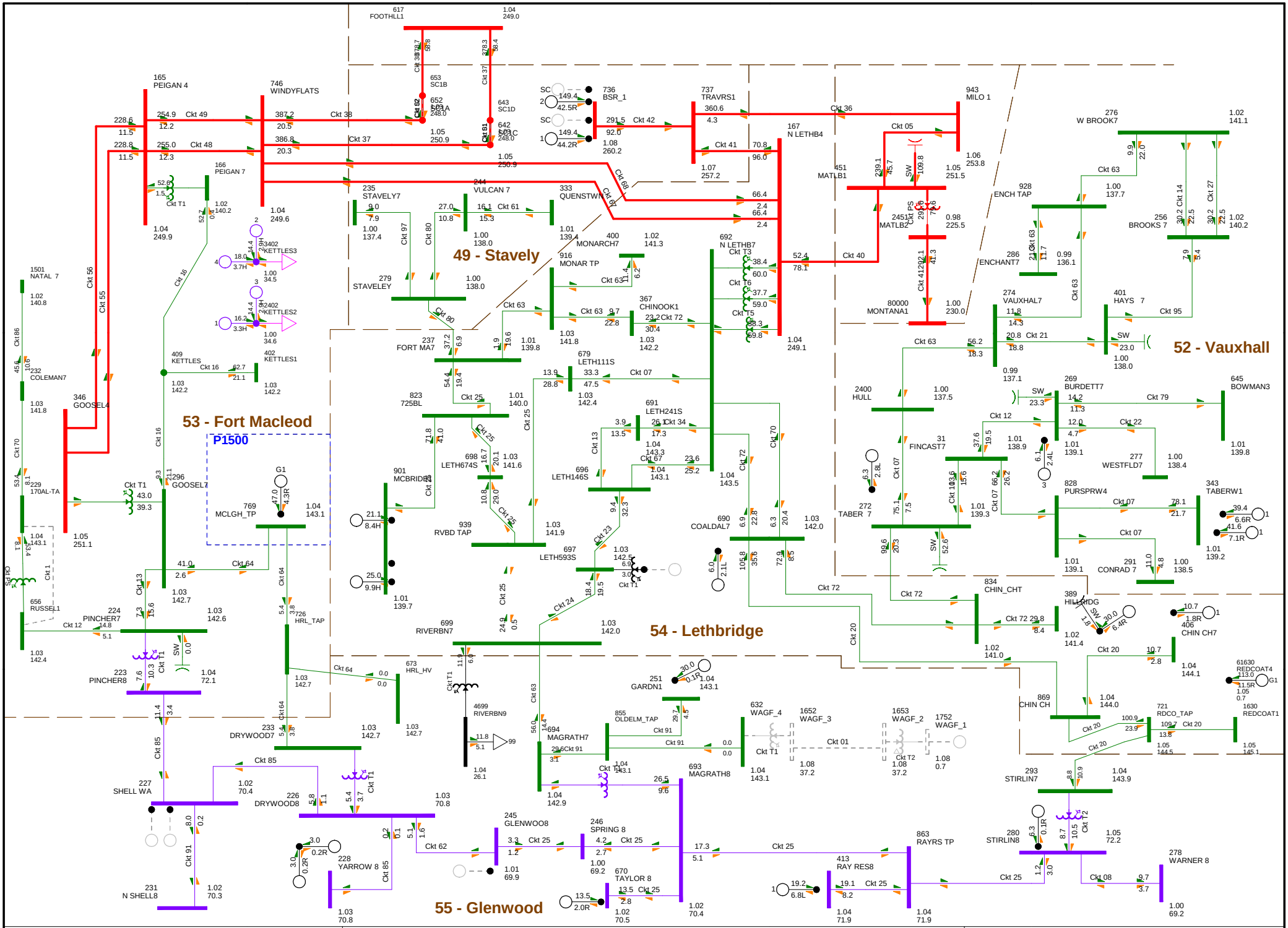
BC Import:40.9 MW Sask Import:-0.0 MW MATL Import:0.0 MW

MH Import: 26.2 MW

FIGURE A6.1-4 N-1: 863L WITH RAS 126
2020 SUMMER LIGHT (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

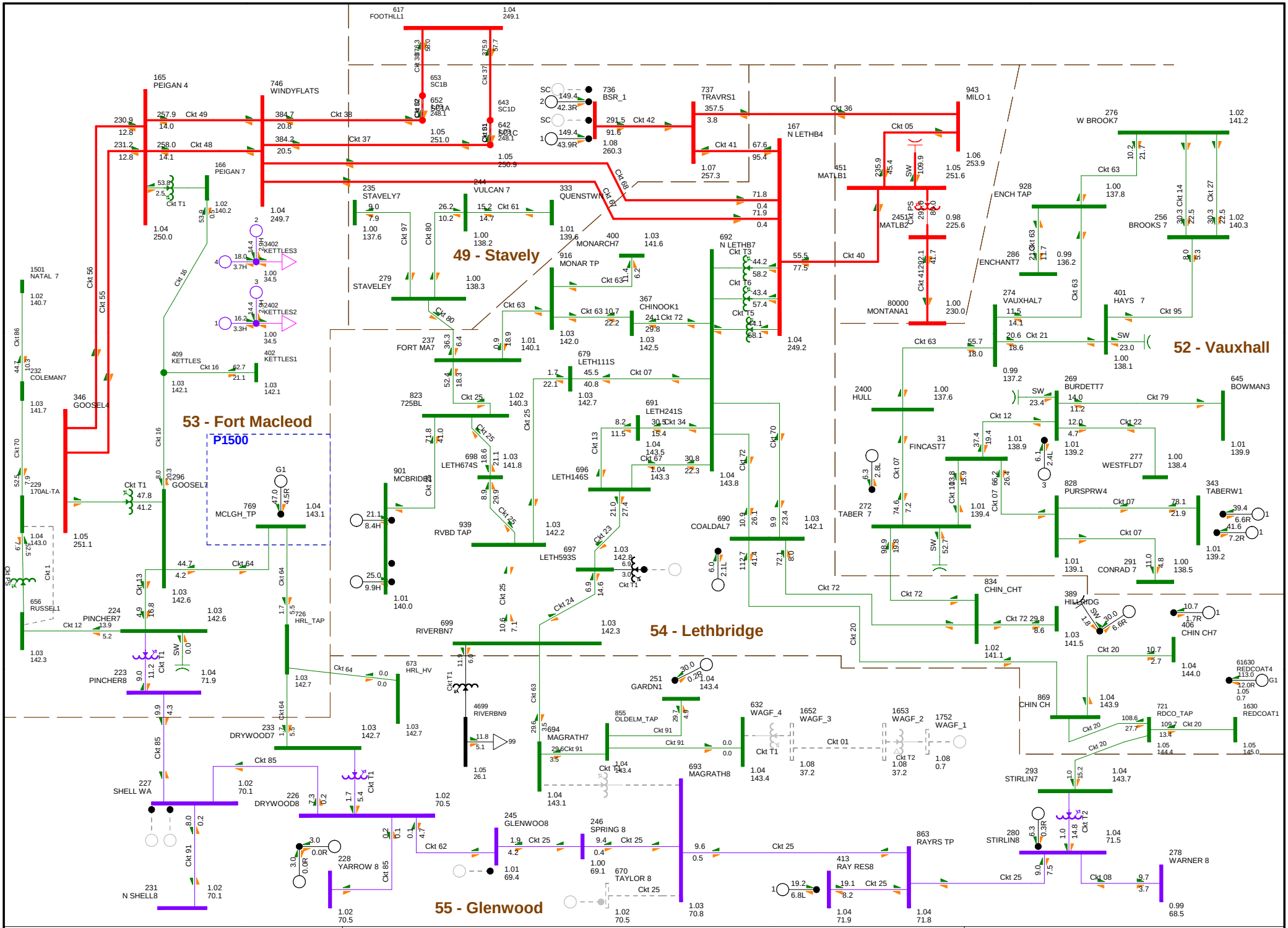
BC Import:430.4 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.2-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

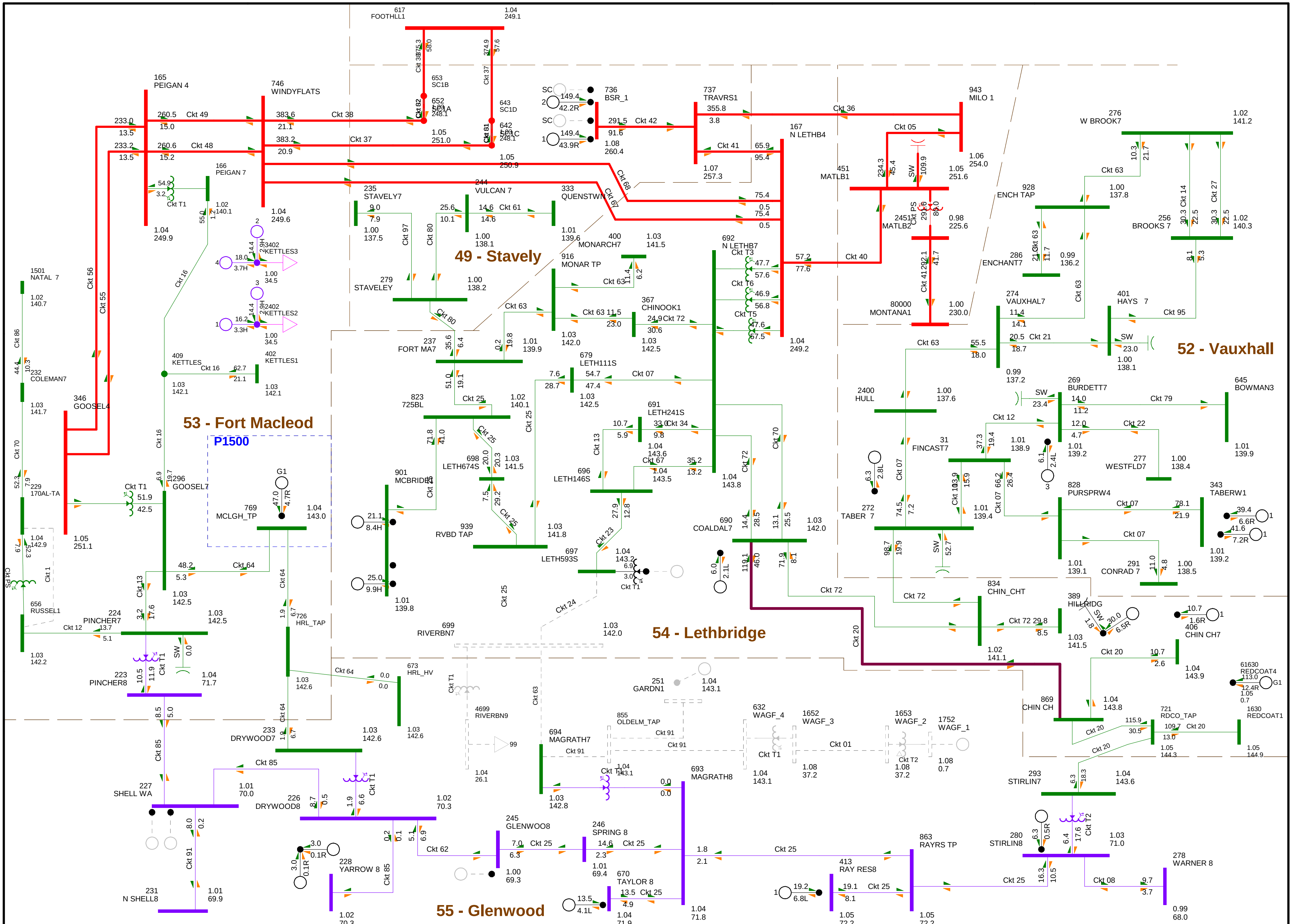
BC Import:443.4 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.2-2 N-1: 225ST1 WITH RAS 126
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

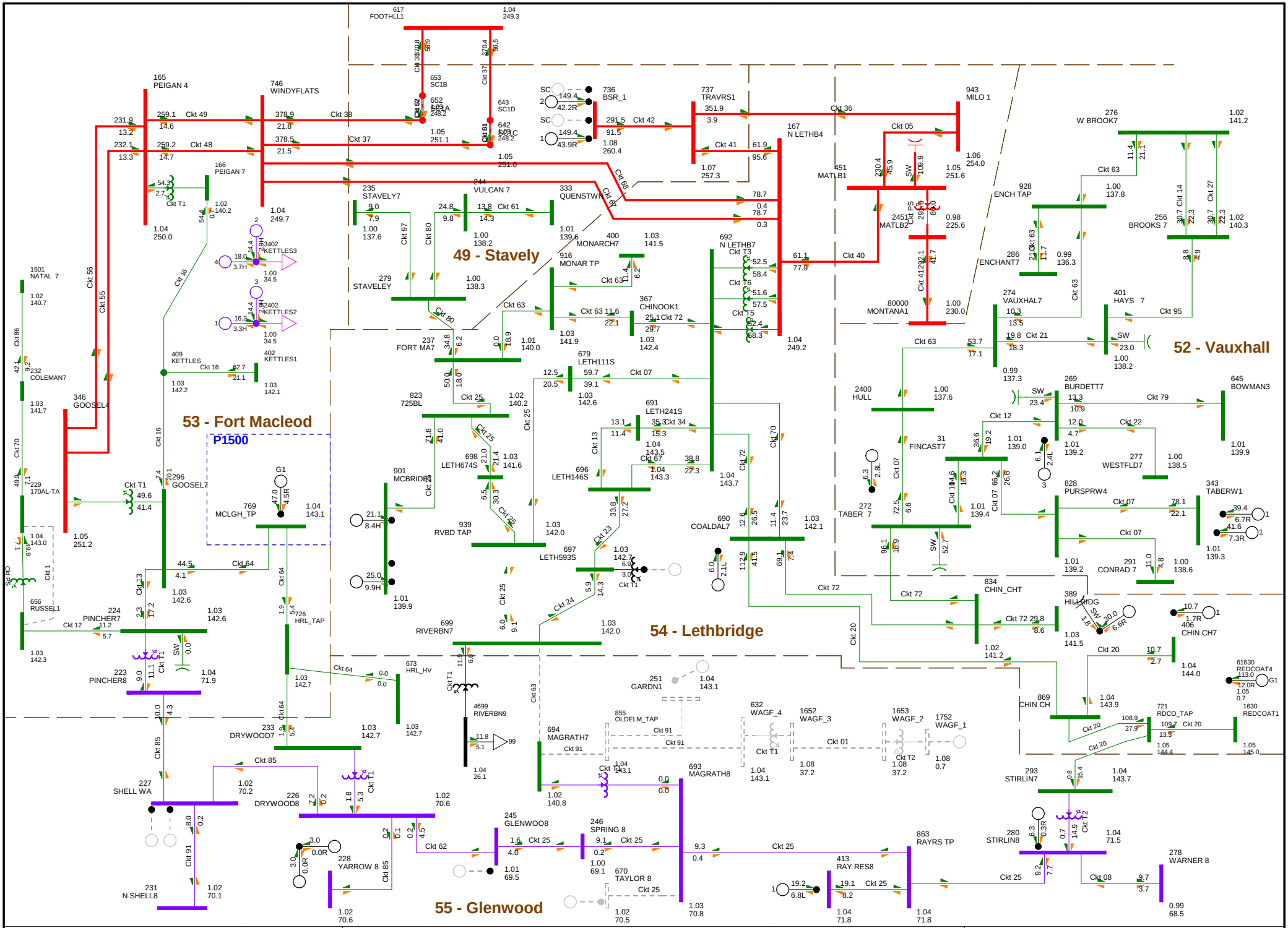
BC Import:449.5 MW Sask Import:-0.0 MW MATL Import:300.0 MW

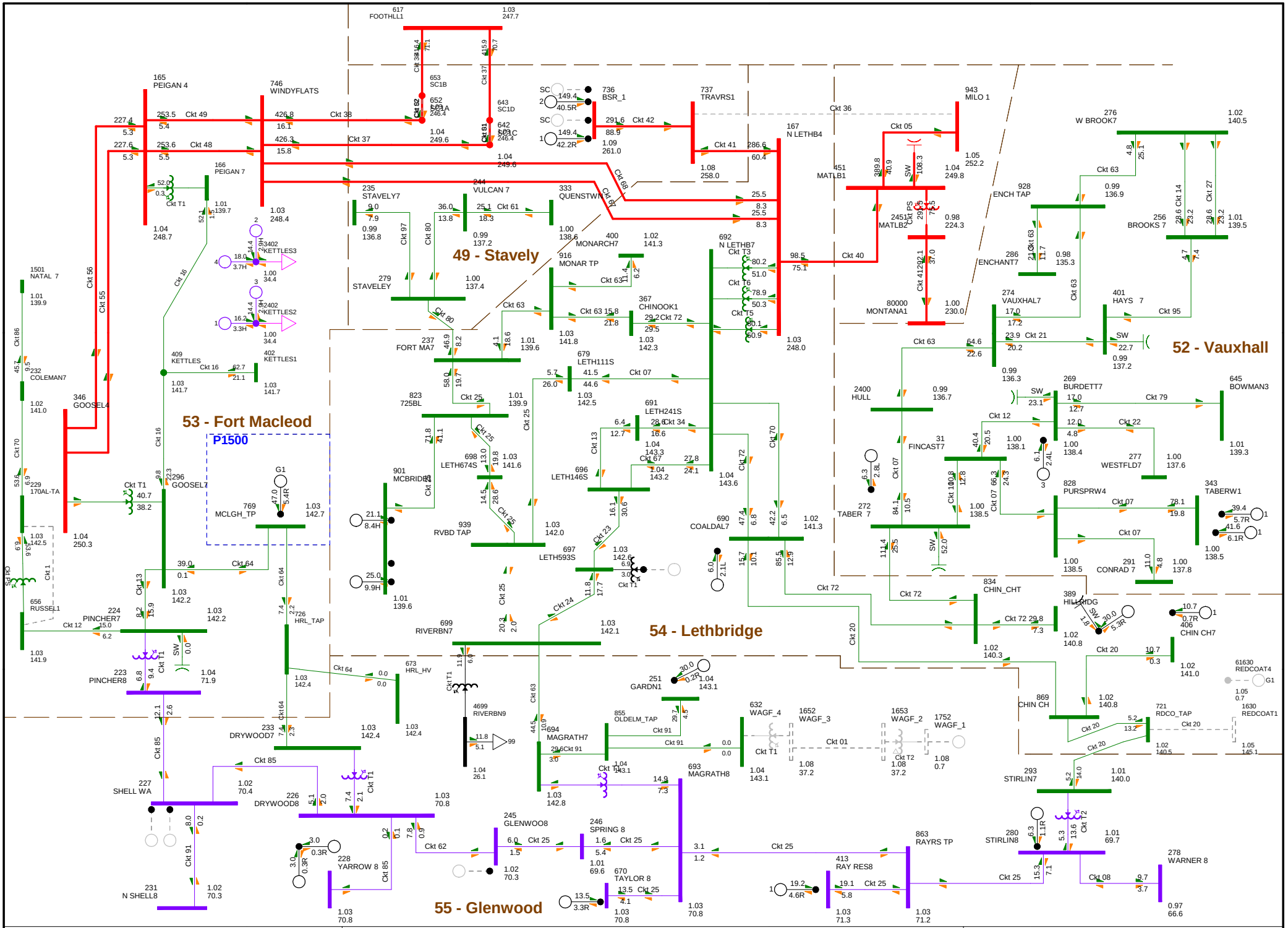
MH Import: 26.1 MW

FIGURE A6.2-3 N-1: 618ST1 WITH RAS 36
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
80000 MONTANA1
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
237 FORT MA7
679 LETH111S
691 LETH241S
696 LETH146S
698 LETH674S
823 725BL
901 MCBRIDE1
939 RVBD TAP
697 LETH593S
690 COALDAL7
2400 HULL
269 BURDETT7
645 BOWMAN3
31 FINCAST7
277 WESTFLD7
828 PURSPRW4
343 TABERW1
272 TABER 7
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
229 170AL-TA
296 GOOSEL7
769 MCLGH_TP
656 RUSSEL1
224 PINCHER7
223 PINCHER8
726 HRL_TAP
673 HRL_HV
4699 RIVERBN9
699 RIVERBN7
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
251 GARDN1
694 MAGRATH7
693 MAGRATH8
855 OLDELM_TAP
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
413 RAY RES8
863 RAYRS TP
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:471.3 MW
Sask Import:0.0 MW
MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A6.2-4 N-1: 863L WITH RAS 126
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

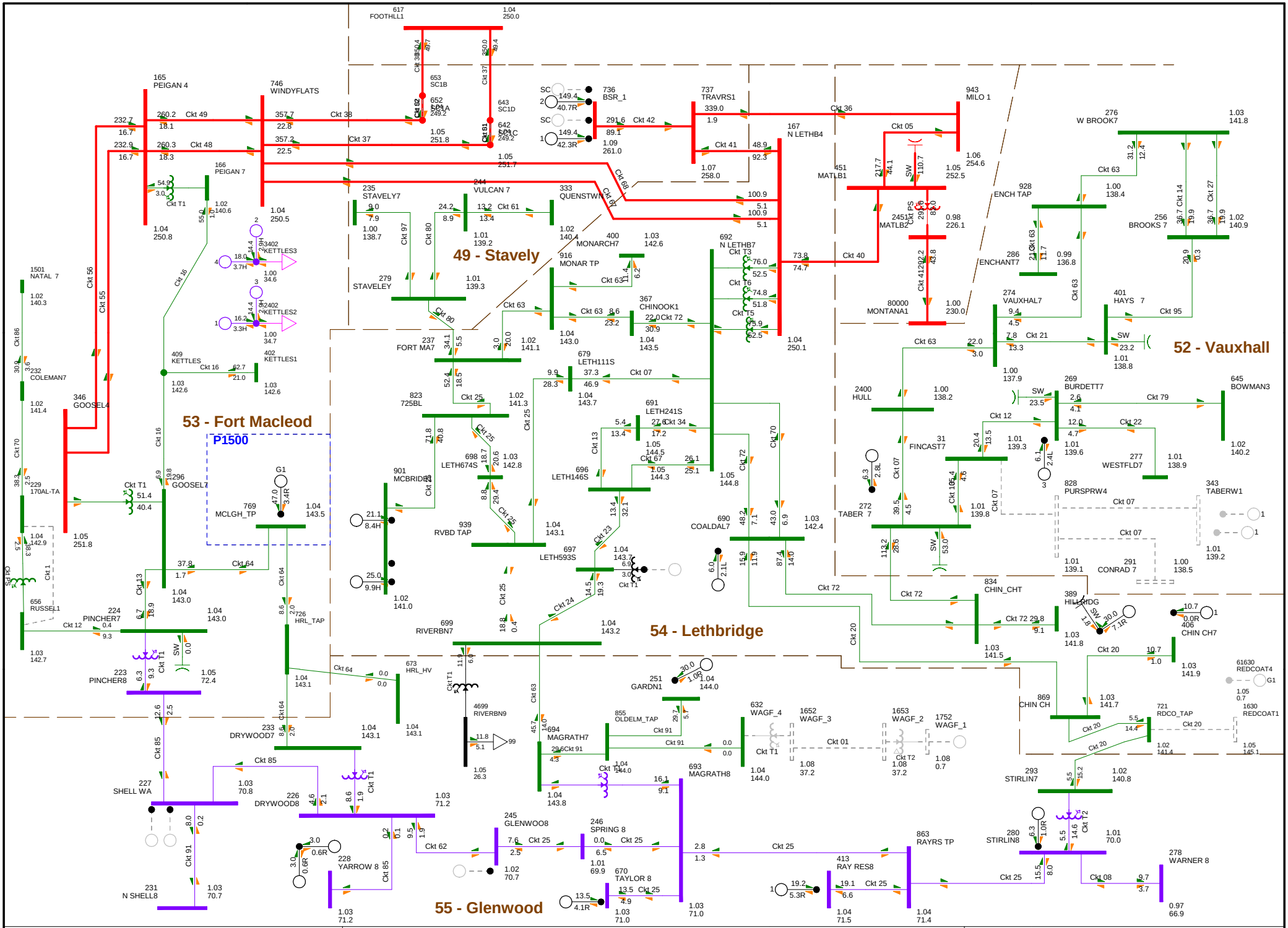
BC Import:543.8 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.2-5 N-1: 1036L WITH PLANNED 172L RAS
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

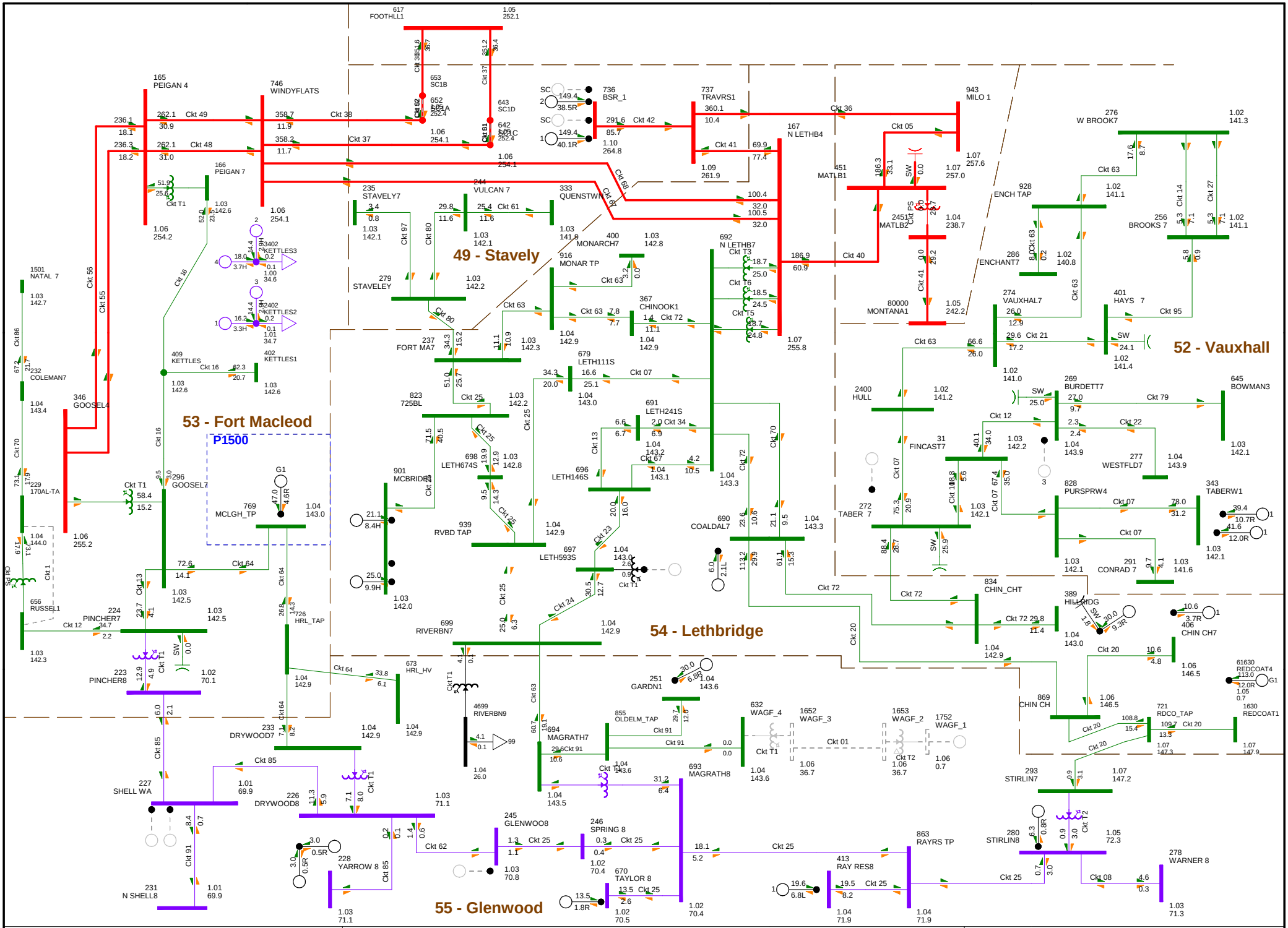
BC Import:595.2 MW Sask Import:0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.2-6 N-1: 607L WITH PLANNED 172L RAS
2020 SUMMER PEAK (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

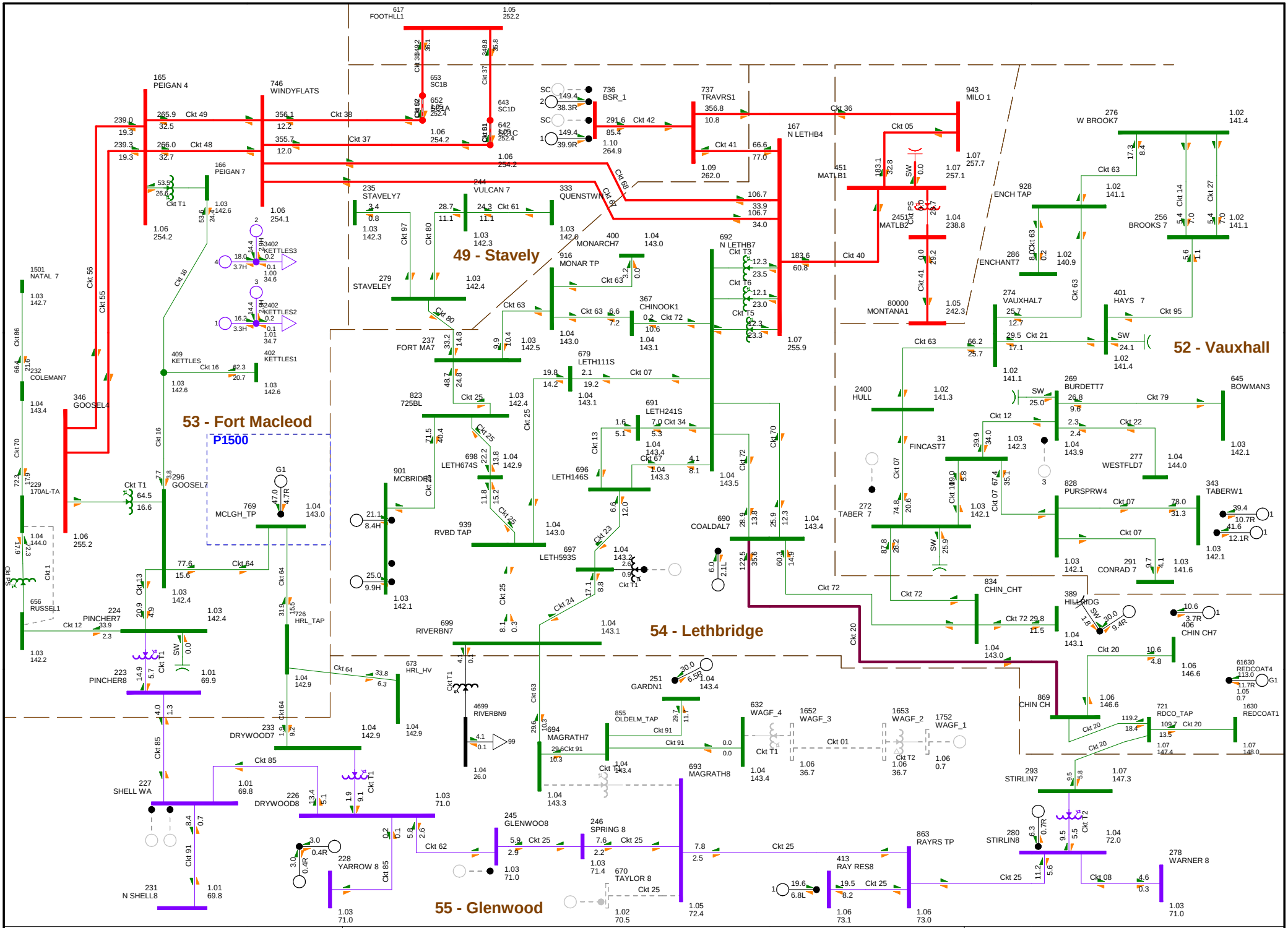
BC Import:0.1 MW Sask Import:-0.0 MW MATL Import:0.0 MW

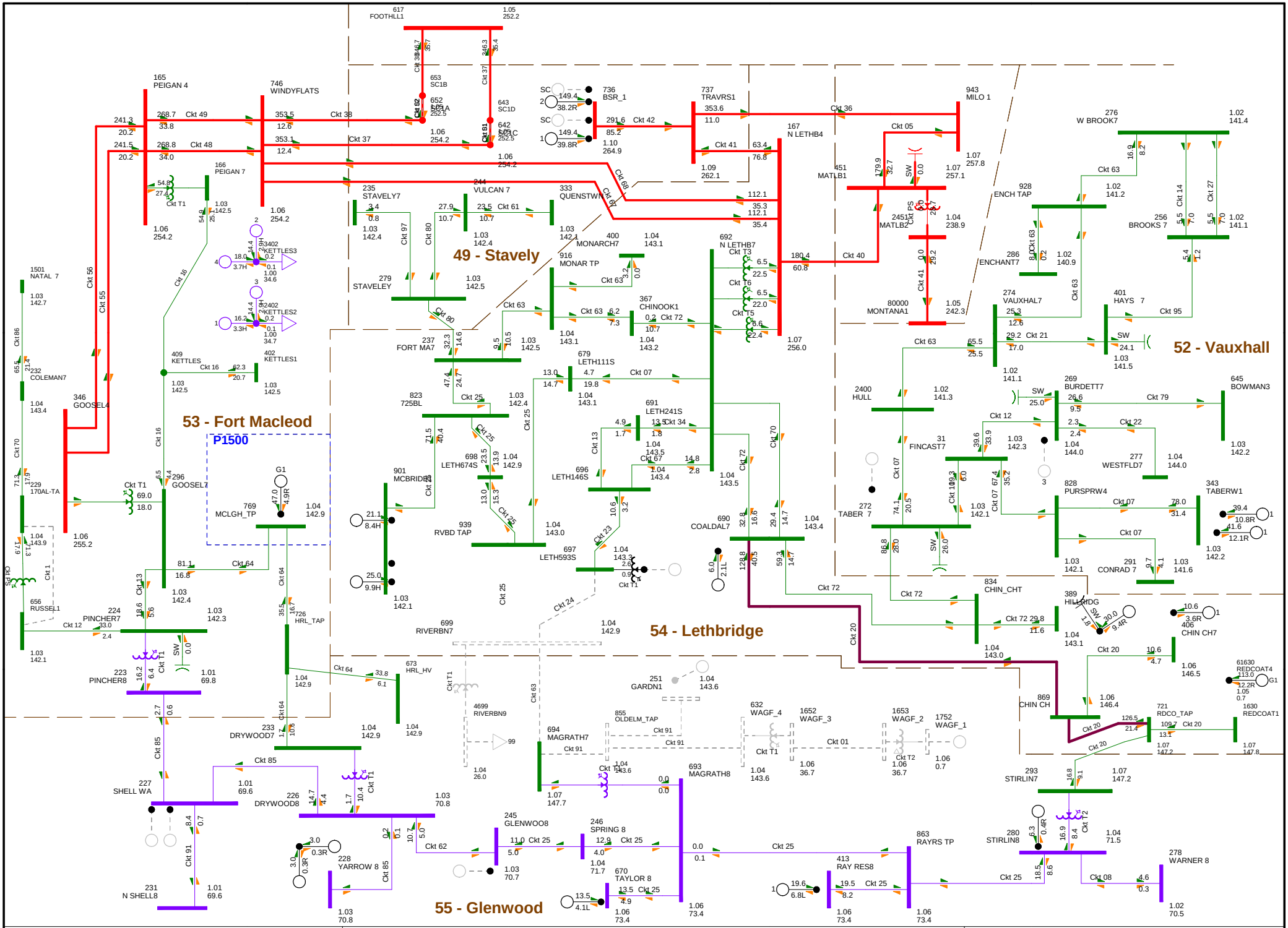
MH Import: 26.2 MW

FIGURE A6.3-1-N-0: NORMAL OPERATION
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
692 N LETHB7
167 N LETHB4
736 BSR_1
737 TRAVRS1
943 MILO 1
451 MATLB1
245 MATLB2
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
80000 MONTANA1
274 VAUXHAL7
401 HAYS 7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
237 FORT MA7
679 LETH111S
691 LETH241S
698 LETH674S
696 LETH146S
697 LETH593S
699 RIVERBN7
4699 RIVERBN9
901 MCBRIDE1
939 RVBD TAP
823 725BL
367 CHINOOK1
690 COALDAL7
2400 HULL
272 TABER 7
31 FINCAST7
269 BURDETT7
645 BOWMAN3
277 WESTFLD7
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
769 MCLGH_TP
656 RUSSEL1
224 PINCHER7
223 PINCHER8
673 HRL_HV
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
855 OLDELM_TAP
694 MAGRATH7
693 MAGRATH8
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
293 STIRLIN7
280 STIRLIN8
278 WARNER 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
863 RAYRS TP
413 RAY RES8
P1500 - RESL McLaughlin WAGF
BC Import:13.3 MW
Sask Import:-0.0 MW
MATL Import:0.0 MW
MH Import: 26.2 MW
FIGURE A6.3-2 N-1: 225ST1 WITH RAS 126
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

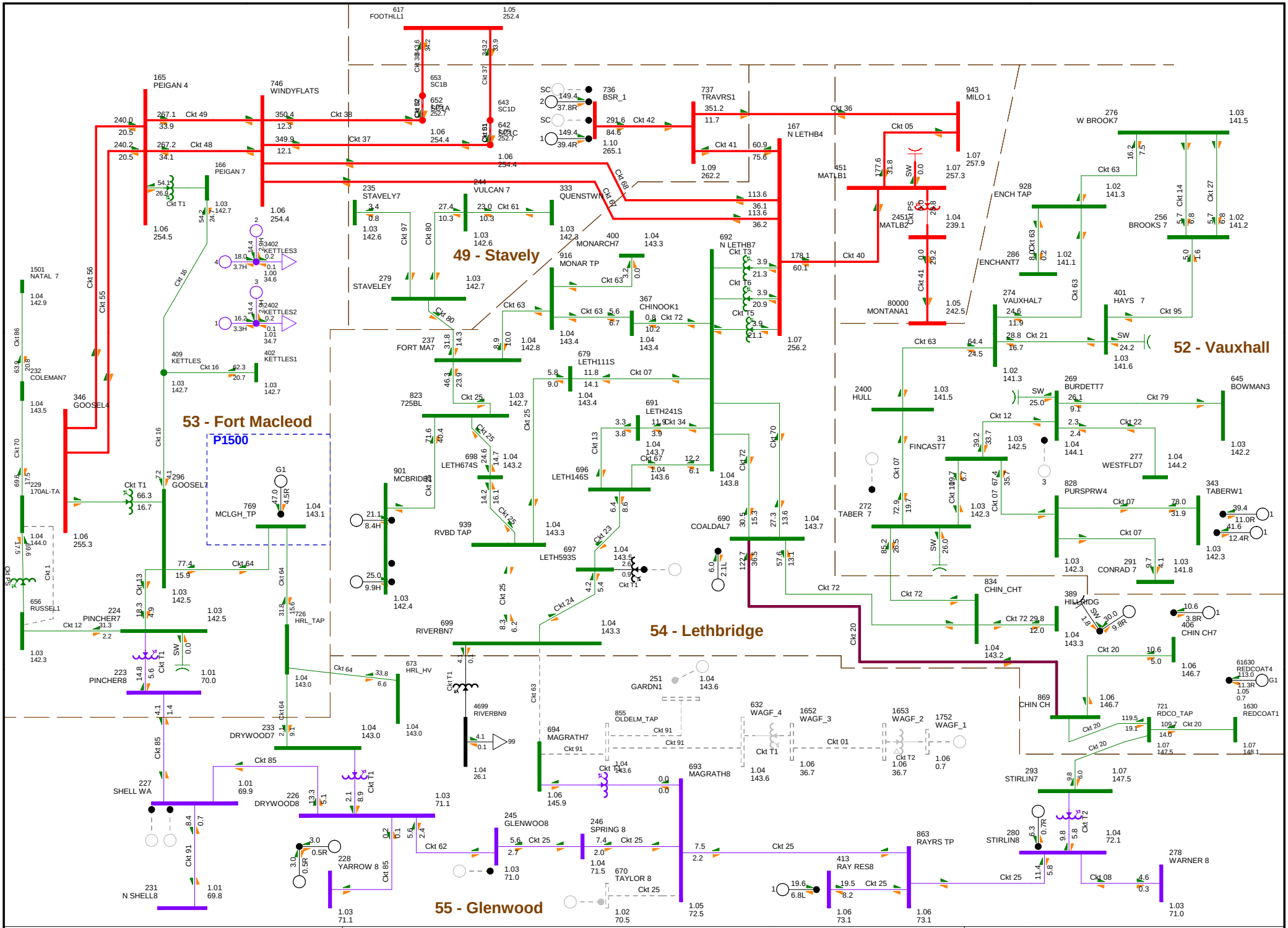
BC Import:26.6 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A6.3-3 N-1: 618ST1 WITH RAS 36
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

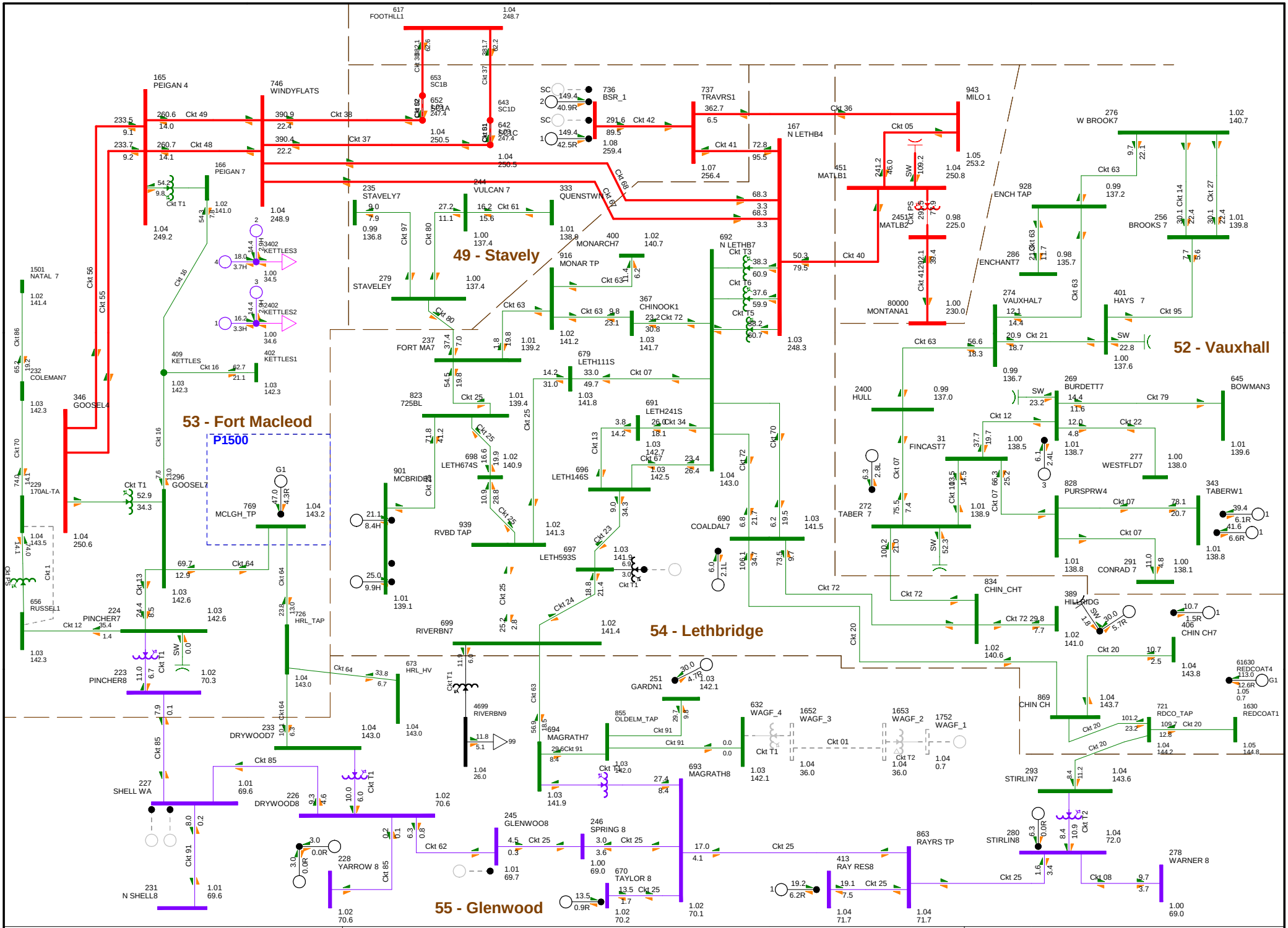
BC Import:40.5 MW Sask Import:-0.0 MW MATL Import:-0.0 MW

MH Import: 26.2 MW

FIGURE A6.3-4 N-1: 863L WITH RAS 126
2020 SUMMER LIGHT SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

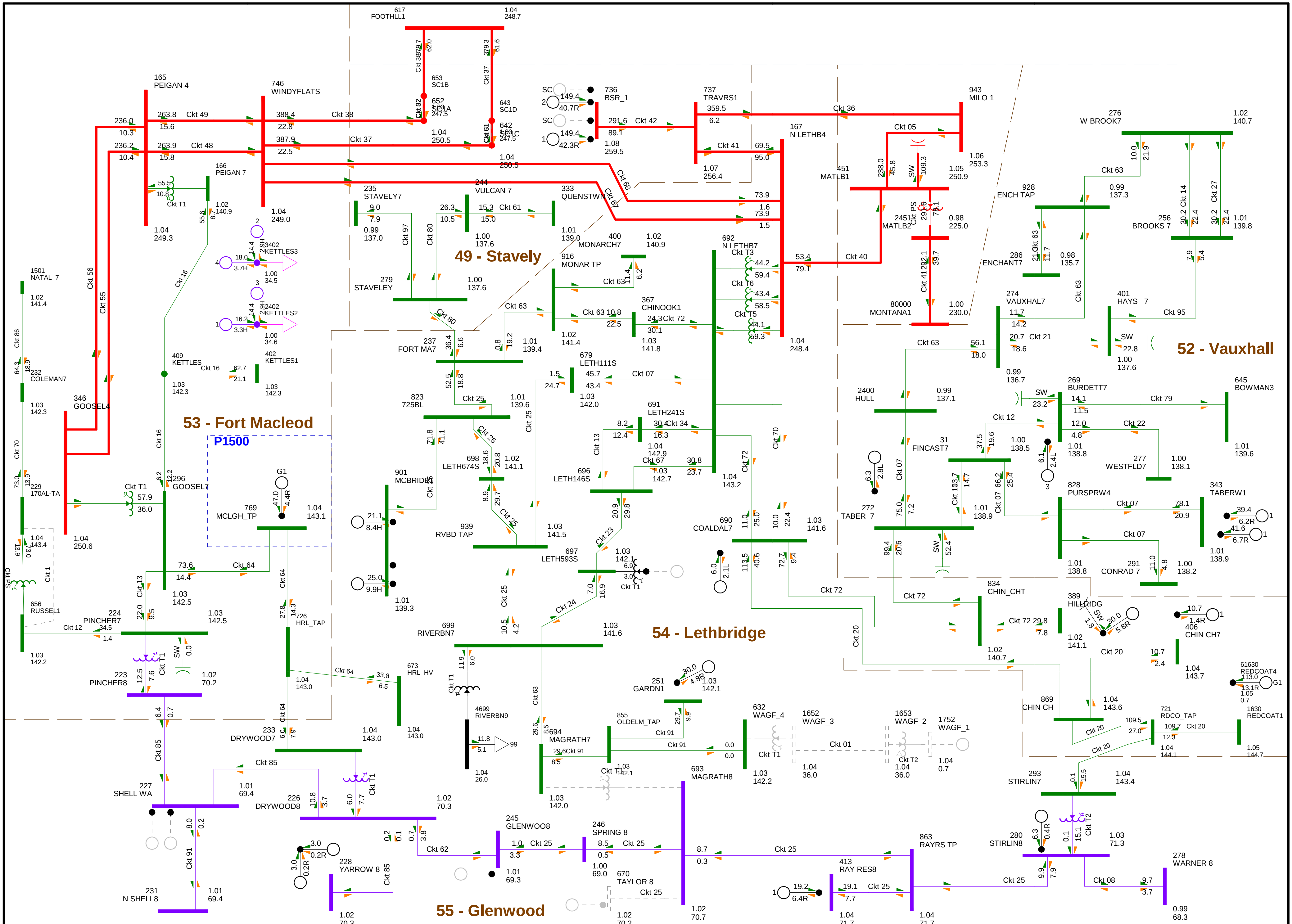
BC Import:430.2 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.4-1-N-0: NORMAL OPERATION
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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



P1500 - RESL McLaughlin WAGF

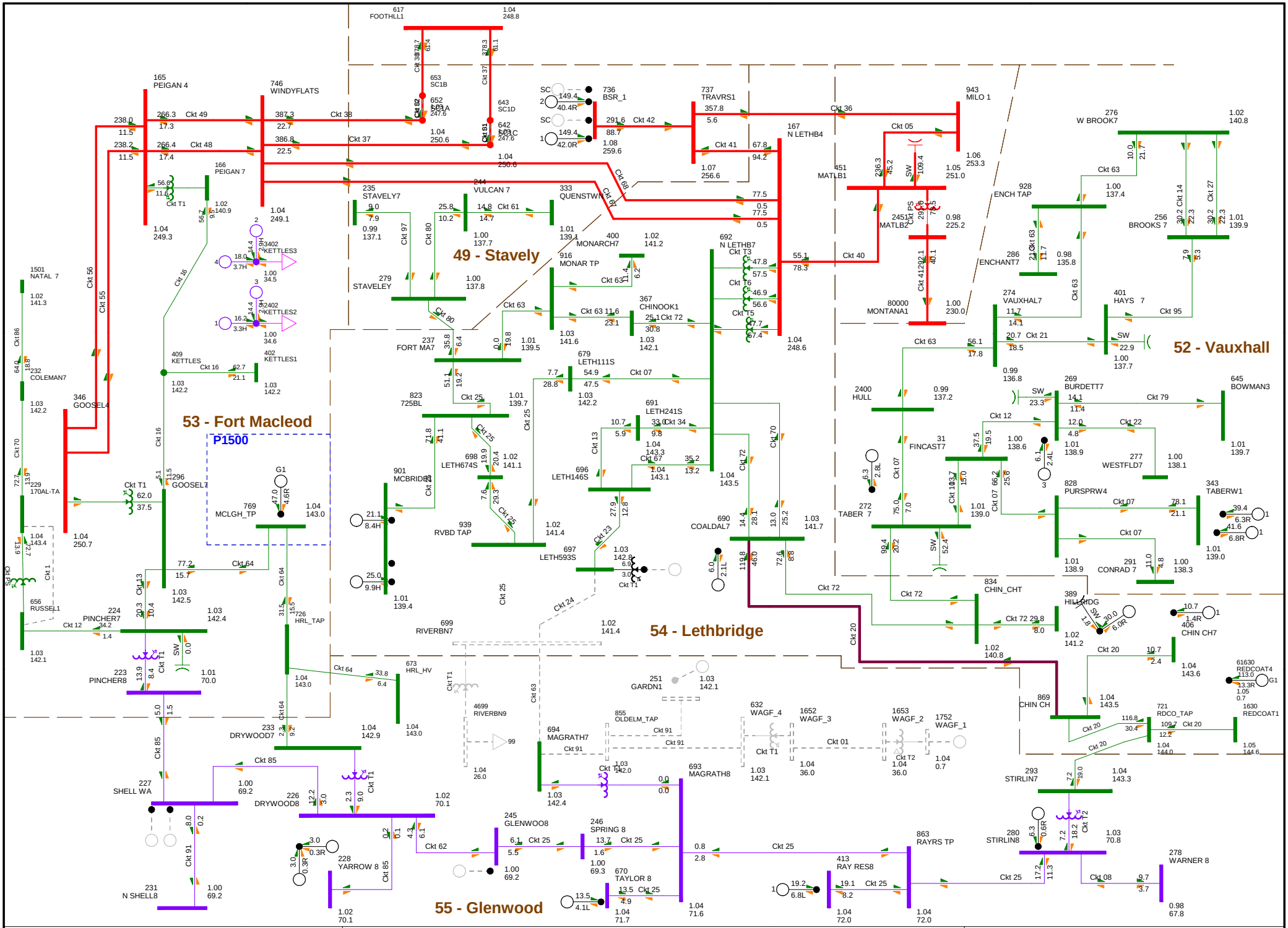
BC Import:443.3 MW   Sask Import:-0.0 MW   MATL Import:300.0 MW

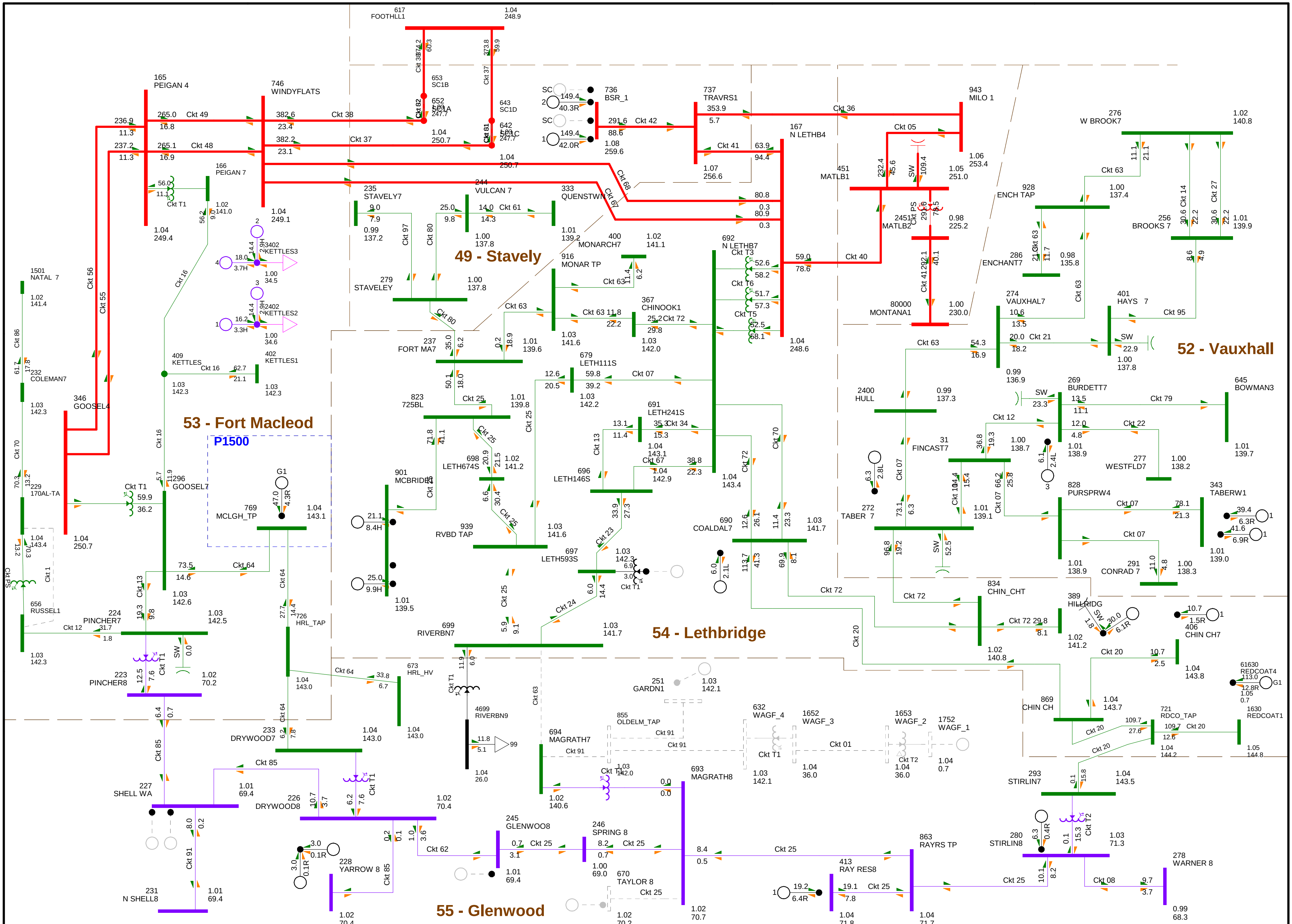
MH Import: 26.1 MW

FIGURE A6.4-2 N-1: 225ST1 WITH RAS 126
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
653 SC1B
652 SC1A
643 SC1D
642 SC1C
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
167 N LETHB4
736 BSR_1
737 TRAVRS1
943 MILO 1
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
237 FORT MA7
679 LETH111S
691 LETH241S
696 LETH146S
698 LETH674S
823 725BL
901 MCBRIDE1
939 RVBD TAP
697 LETH593S
690 COALDAL7
2400 HULL
31 FINCAST7
272 TABER 7
277 WESTFLD7
269 BURDETT7
645 BOWMAN3
828 PURSPRW4
343 TABERW1
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
1630 REDCOAT1
61630 REDCOAT4
769 MCLGH_TP
1296 GOOSEL7
229 170AL-TA
656 RUSSEL1
224 PINCHER7
223 PINCHER8
726 HRL_TAP
673 HRL_HV
699 RIVERBN7
4699 RIVERBN9
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
693 MAGRATH8
694 MAGRATH7
855 OLDELM_TAP
251 GARDN1
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
293 STIRLIN7
280 STIRLIN8
413 RAY RES8
863 RAYRS TP
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:449.4 MW Sask Import:-0.0 MW MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A6.4-3 N-1: 618ST1 WITH RAS 36
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

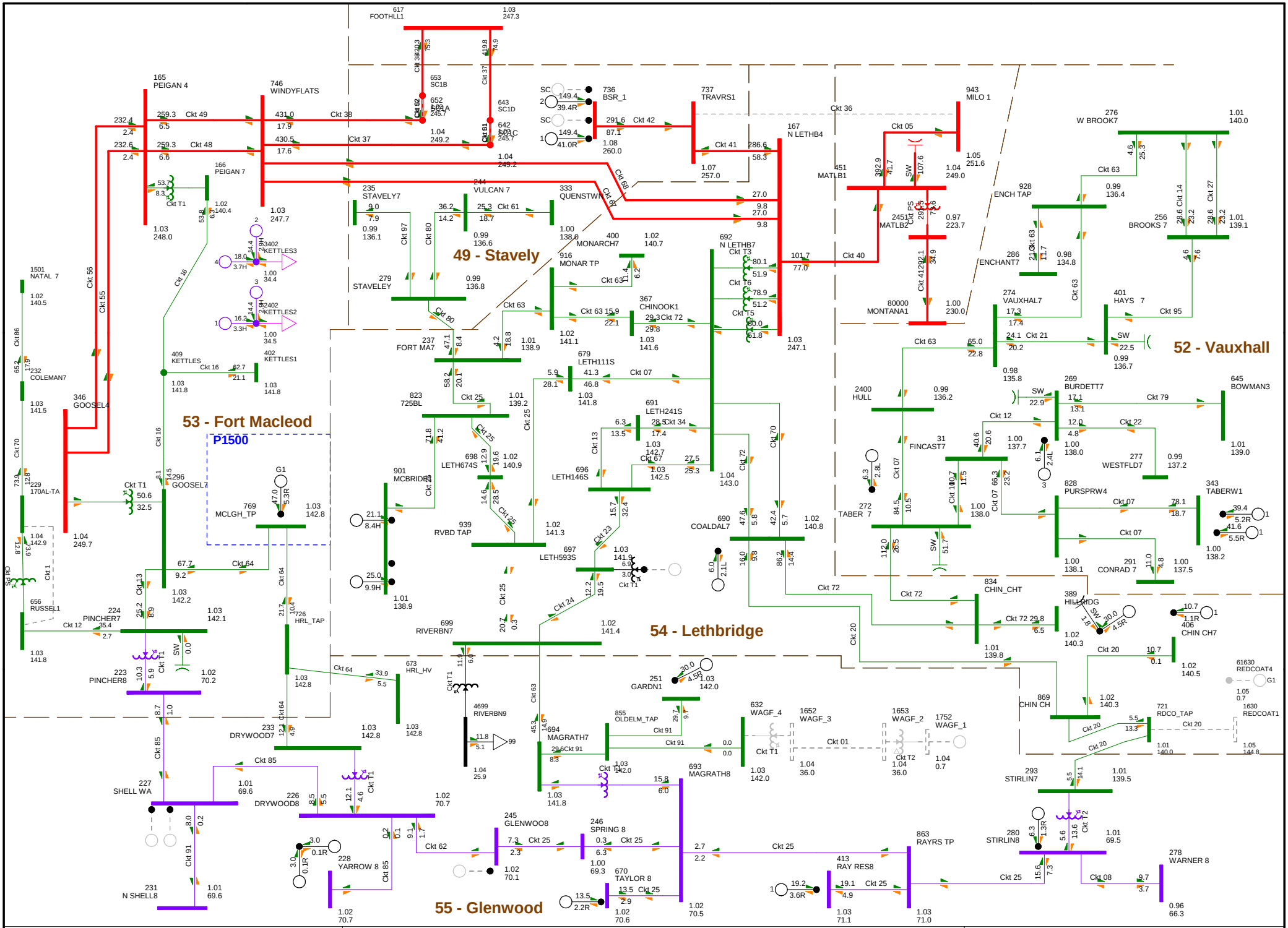
BC Import:470.9 MW Sask Import:-0.0 MW MATL Import:300.0 MW

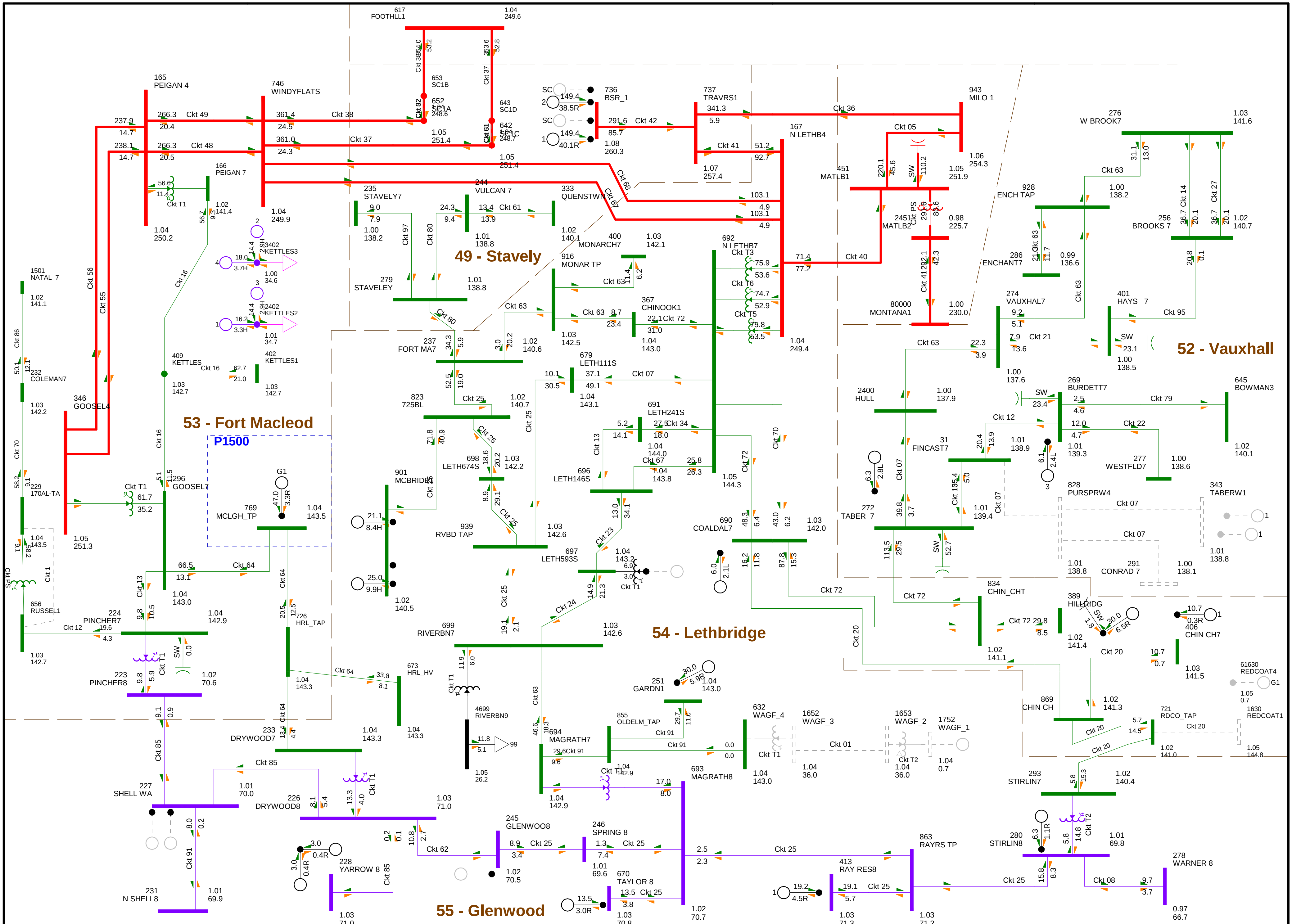
MH Import: 26.1 MW

FIGURE A6.4-4 N-1: 863L WITH RAS 126
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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


49 - Stavely
52 - Vauxhall
53 - Fort Macleod
54 - Lethbridge
55 - Glenwood
P1500
617 FOOTHLL1
165 PEIGAN 4
746 WINDYFLATS
166 PEIGAN 7
653 SC1B
652 SC1A
643 SC1D
642 SC1C
736 BSR_1
737 TRAVRS1
943 MILO 1
167 N LETHB4
451 MATLB1
245 MATLB2
80000 MONTANA1
928 ENCH TAP
286 ENCHANT7
276 W BROOK7
256 BROOKS 7
274 VAUXHAL7
401 HAYS 7
235 STAVELY7
244 VULCAN 7
333 QUENSTWN
279 STAVELEY
916 MONAR TP
400 MONARCH7
367 CHINOOK1
692 N LETHB7
237 FORT MA7
679 LETH111S
691 LETH241S
823 725BL
901 MCBRIDE1
698 LETH674S
696 LETH146S
939 RVBD TAP
697 LETH593S
690 COALDAL7
2400 HULL
31 FINCAST7
272 TABER 7
269 BURDETT7
645 BOWMAN3
828 PURSPRW4
343 TABERW1
277 WESTFLD7
291 CONRAD 7
834 CHIN_CHT
389 HILLRDG
406 CHIN CH7
869 CHIN CH
721 RDCO_TAP
61630 REDCOAT4
1630 REDCOAT1
1501 NATAL 7
232 COLEMAN7
346 GOOSEL4
296 GOOSEL7
229 170AL-TA
656 RUSSEL1
224 PINCHER7
223 PINCHER8
409 KETTLES
402 KETTLES1
3402 KETTLES3
2402 KETTLES2
769 MCLGH_TP
726 HRL_TAP
673 HRL_HV
4699 RIVERBN9
699 RIVERBN7
233 DRYWOOD7
226 DRYWOOD8
227 SHELL WA
231 N SHELL8
228 YARROW 8
245 GLENWOO8
246 SPRING 8
670 TAYLOR 8
251 GARDN1
855 OLDELM_TAP
694 MAGRATH7
693 MAGRATH8
632 WAGF_4
1652 WAGF_3
1653 WAGF_2
1752 WAGF_1
293 STIRLIN7
280 STIRLIN8
863 RAYRS TP
413 RAY RES8
278 WARNER 8
P1500 - RESL McLaughlin WAGF
BC Import:544.2 MW
Sask Import:-0.0 MW
MATL Import:300.0 MW
MH Import: 26.1 MW
FIGURE A6.4-5 N-1: 1036L WITH PLANNED 172L RAS
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019
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



P1500 - RESL McLaughlin WAGF

BC Import:594.5 MW Sask Import:-0.0 MW MATL Import:300.0 MW

MH Import: 26.1 MW

FIGURE A6.4-6 N-1: 607L WITH PLANNED 172L RAS
2020 SUMMER PEAK SENSITIVITY (POST-PROJECT)
PRINTED ON SATURDAY 01. JUNE 2019

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

Attachment A7
Constraint Effective Factors Table

A7.1 Scenario 3 (2020SL HW post-P1500 scenario)

Contingency	Branches	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
1036L	172L (Taber 83S to 172EL Tap)	0.2122	0.1514	0.0000	0.0616	0.0579	0.0608	0.3375	0.0607	0.1105	0.0601	0.1366	0.0620	0.1270	0.0612	0.0610	0.1984	0.0606	0.0583	0.0606
225ST1	820L (Coaldale 254S to 820AL Tap)	0.9063	0.6015	0.0000	0.0000	0.0114	0.0000	-0.0206	0.0095	-0.0175	0.0330	0.5007	0.0000	-0.0166	0.0000	0.0000	0.8804	0.0000	0.0000	0.0187
225ST1	820L (P1719 Tap to 820AL Tap)	-0.0589	0.6255	0.0000	0.0000	0.0134	0.0000	-0.0195	0.0118	-0.0127	0.0350	0.5207	0.0000	-0.0125	0.0000	0.0000	0.9101	0.0054	0.0000	0.0211
1005L	172L (Taber 83S to 172EL Tap)	0.2126	0.1519	0.0000	0.0603	0.0568	0.0594	0.3353	0.0595	0.1102	0.0590	0.1368	0.0606	0.1270	0.0598	0.0597	0.1997	0.0595	0.0570	0.0595
607L	172L (Taber 83S to 172EL Tap)	0.1934	0.1315	0.0000	0.0423	0.0403	0.0414	0.3206	0.0420	0.0892	0.0424	0.1156	0.0423	0.1049	0.0416	0.0418	0.1798	0.0425	0.0397	0.0424
863L	225L (Glenwood 229S to Spring Coulee 385S)	0.0593	0.2817	0.0000	-0.0083	-0.0177	-0.0088	0.0176	-0.0169	0.0076	-0.0459	0.3673	0.0000	0.3793	0.0000	-0.0085	0.0678	-0.0072	-0.0086	-0.0248
863L	225L (Spring Coulee 385S to Magrath 225S)	0.0622	0.2975	0.0000	-0.0084	-0.0180	-0.0087	0.0185	-0.0170	0.0080	-0.0460	0.3917	0.0000	0.3986	0.0000	-0.0085	0.0704	-0.0074	-0.0085	-0.0255
863L	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0619	0.5870	0.0000	0.0070	0.0164	0.0070	-0.0189	0.0151	-0.0096	0.0419	0.4967	0.0000	0.5199	0.0000	0.0070	-0.0753	0.0068	0.0067	0.0240
863L	820L (Coaldale 254S to 820AL Tap)	0.9071	0.5770	0.0000	0.0000	0.0094	0.0000	-0.0205	0.0076	-0.0192	0.0299	0.4564	0.0000	0.4537	0.0000	0.0000	0.8849	0.0000	0.0000	0.0160
863L	820L (P1719 Tap to 820AL Tap)	-0.0561	0.5914	0.0000	0.0000	0.0116	0.0000	-0.0186	0.0101	-0.0135	0.0319	0.4632	0.0000	0.4564	0.0000	0.0000	0.9122	0.0000	0.0000	0.0185
618ST1	225L (Glenwood 229S to Spring Coulee 385S)	0.0593	0.2816	0.0000	-0.0083	-0.0177	-0.0088	0.0176	-0.0169	0.0076	-0.0459	0.3672	0.0000	0.3792	0.0000	-0.0085	0.0678	-0.0072	-0.0086	-0.0247
618ST1	225L (Spring Coulee 385S to	0.0622	0.2975	0.0000	-0.0084	-0.0180	-0.0087	0.0185	-0.0170	0.0080	-0.0460	0.3917	0.0000	0.3985	0.0000	-0.0085	0.0704	-0.0074	-0.0085	-0.0255

Scenario 3

Contingency	Branches	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
	Magrath 225S)																			
618ST1	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0619	0.5871	0.0000	0.0070	0.0164	0.0070	-0.0190	0.0151	-0.0096	0.0419	0.4967	0.0000	0.5199	0.0000	0.0070	-0.0753	0.0068	0.0067	0.0240
618ST1	820L (Coaldale 254S to 820AL Tap)	0.9071	0.5770	0.0000	0.0000	0.0094	0.0000	-0.0205	0.0076	-0.0193	0.0299	0.4563	0.0000	0.4536	0.0000	0.0000	0.8848	0.0000	0.0000	0.0160
618ST1	820L (P1719 Tap to 820AL Tap)	-0.0562	0.5914	0.0000	0.0000	0.0116	0.0000	-0.0186	0.0101	-0.0135	0.0319	0.4632	0.0000	0.4564	0.0000	0.0000	0.9121	0.0000	0.0000	0.0185

A7.2 Scenario 4 (2020SP HW post-P1500 scenario)

Contingency	Branches	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
1036L	172L (Taber 83S to 172EL Tap)	0.2063	0.1459	0.0000	0.0601	0.0567	0.0587	0.3392	0.0593	0.1065	0.0585	0.1331	0.0605	0.1231	0.0593	0.0594	0.1888	0.0602	0.0564	0.0593
225ST1	820L (Coaldale 254S to 820AL Tap)	0.9098	0.6090	0.0000	0.0000	0.0101	0.0000	-0.0197	0.0082	-0.0181	0.0306	0.5090	0.0000	-0.0164	0.0000	0.0000	0.8877	0.0000	0.0000	0.0173
225ST1	820L (P1719 Tap to 820AL Tap)	-0.0579	0.6298	0.0000	0.0000	0.0124	0.0000	-0.0191	0.0107	-0.0136	0.0329	0.5265	0.0000	-0.0129	0.0000	0.0000	0.9128	0.0000	0.0000	0.0199
1005L	172L (Taber 83S to 172EL Tap)	0.2062	0.1458	0.0000	0.0589	0.0556	0.0574	0.3373	0.0581	0.1060	0.0574	0.1329	0.0592	0.1228	0.0580	0.0581	0.1893	0.0591	0.0551	0.0581
607L	172L (Taber 83S to 172EL Tap)	0.1864	0.1270	0.0000	0.0405	0.0387	0.0389	0.3225	0.0401	0.0848	0.0403	0.1114	0.0404	0.1006	0.0393	0.0397	0.1685	0.0417	0.0373	0.0405
863L	225L (Glenwood 229S to Spring Coulee 385S)	0.0621	0.2851	0.0000	-0.0091	-0.0188	-0.0097	0.0183	-0.0179	0.0077	-0.0463	0.3695	-0.0051	0.3836	-0.0053	-0.0093	0.0710	-0.0079	-0.0094	-0.0260
863L	225L (Spring Coulee 385S to Magrath 225S)	0.0625	0.2934	0.0000	-0.0083	-0.0175	-0.0084	0.0186	-0.0163	0.0077	-0.0418	0.3900	0.0000	0.3895	0.0000	-0.0083	0.0694	-0.0077	-0.0082	-0.0252
863L	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0633	0.5924	0.0000	0.0073	0.0167	0.0073	-0.0192	0.0154	-0.0095	0.0411	0.5026	0.0000	0.5238	0.0000	0.0073	-0.0766	0.0072	0.0070	0.0244
863L	820L (Coaldale 254S to 820AL Tap)	0.9075	0.5812	0.0000	0.0000	0.0085	0.0000	-0.0199	0.0066	-0.0196	0.0284	0.4638	0.0000	0.4616	-0.0051	0.0000	0.8858	0.0000	0.0000	0.0153
863L	820L (P1719 Tap to 820AL Tap)	-0.0573	0.5963	0.0000	0.0000	0.0111	0.0000	-0.0186	0.0095	-0.0142	0.0308	0.4723	0.0000	0.4669	0.0000	0.0000	0.9109	0.0000	0.0000	0.0181
618ST1	225L (Glenwood 229S to Spring Coulee 385S)	0.0620	0.2847	0.0000	-0.0091	-0.0187	-0.0097	0.0183	-0.0179	0.0076	-0.0463	0.3692	-0.0051	0.3832	-0.0053	-0.0093	0.0708	-0.0079	-0.0094	-0.0260
618ST1	225L (Spring Coulee 385S to Magrath 225S)	0.0624	0.2932	0.0000	-0.0083	-0.0174	-0.0084	0.0185	-0.0163	0.0077	-0.0418	0.3898	0.0000	0.3893	0.0000	-0.0083	0.0692	-0.0077	-0.0082	-0.0252
618ST1	225L (Stirling 67S	-0.0633	0.5925	0.0000	0.0073	0.0167	0.0073	-0.0192	0.0155	-0.0095	0.0412	0.5030	0.0000	0.5244	0.0000	0.0073	-0.0766	0.0072	0.0070	0.0245

Scenario 4

Contingency	Branches	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
	to Raymond Reservoir 313S Tap)																			
618ST1	820L (Coaldale 254S to 820AL Tap)	0.9075	0.5820	0.0000	0.0000	0.0085	0.0000	-0.0200	0.0066	-0.0198	0.0285	0.4647	0.0000	0.4628	-0.0051	0.0000	0.8864	0.0000	0.0000	0.0153
618ST1	820L (P1719 Tap to 820AL Tap)	-0.0573	0.5967	0.0000	0.0000	0.0111	0.0000	-0.0187	0.0095	-0.0144	0.0309	0.4730	0.0000	0.4679	0.0000	0.0000	0.9108	0.0000	0.0000	0.0181

A7.3 Scenario 7 (2020SL HW post-P1500 sensitivity scenario)

Contingency	Branch	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
1036L	172L (Taber 83S to 172EL Tap)	0.2124	0.1515	0.0000	0.0617	0.0580	0.0609	0.3379	0.0608	0.1106	0.0600	0.1367	0.0621	0.1270	0.0613	0.0611	0.1985	0.0607	0.0584	0.0606
225ST1	820L (Coaldale 254S to 820AL Tap)	0.9063	0.6006	0.0000	0.0000	0.0111	0.0000	-0.0205	0.0093	-0.0176	0.0324	0.4991	0.0000	-0.0167	0.0000	0.0000	0.8803	0.0000	0.0000	0.0182
225ST1	820L (P1719 Tap to 820AL Tap)	-0.0584	0.6245	0.0000	0.0000	0.0133	0.0000	-0.0193	0.0117	-0.0126	0.0345	0.5190	0.0000	-0.0124	0.0000	0.0000	0.9103	0.0053	0.0000	0.0207
1005L	172L (Taber 83S to 172EL Tap)	0.2128	0.1520	0.0000	0.0604	0.0568	0.0595	0.3357	0.0595	0.1104	0.0589	0.1369	0.0608	0.1271	0.0599	0.0598	0.1999	0.0596	0.0571	0.0594
607L	172L (Taber 83S to 172EL Tap)	0.1934	0.1315	0.0000	0.0424	0.0403	0.0414	0.3210	0.0420	0.0893	0.0422	0.1156	0.0423	0.1049	0.0416	0.0418	0.1798	0.0425	0.0397	0.0422
863L	225L (Glenwood 229S to Spring Coulee 385S)	0.0609	0.2868	0.0000	-0.0079	-0.0173	-0.0082	0.0182	-0.0163	0.0082	-0.0457	0.3723	0.0000	0.3858	0.0000	-0.0080	0.0699	-0.0072	-0.0080	-0.0248
863L	225L (Spring Coulee 385S to Magrath 225S)	0.0635	0.3014	0.0000	-0.0081	-0.0177	-0.0082	0.0190	-0.0166	0.0085	-0.0458	0.3951	0.0000	0.4035	0.0000	-0.0081	0.0722	-0.0074	-0.0080	-0.0256
863L	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0621	0.5838	0.0000	0.0067	0.0160	0.0066	-0.0191	0.0147	-0.0098	0.0413	0.4922	0.0000	0.5143	0.0000	0.0067	-0.0758	0.0067	0.0064	0.0237
863L	820L (Coaldale 254S to 820AL Tap)	0.9072	0.5750	0.0000	0.0000	0.0091	0.0000	-0.0204	0.0073	-0.0193	0.0292	0.4529	0.0000	0.4494	0.0000	0.0000	0.8849	0.0000	0.0000	0.0155
863L	820L (P1719 Tap to 820AL Tap)	-0.0558	0.5890	0.0000	0.0000	0.0114	0.0000	-0.0185	0.0099	-0.0135	0.0313	0.4592	0.0000	0.4516	0.0000	0.0000	0.9124	0.0000	0.0000	0.0181
618ST1	225L (Glenwood 229S to Spring Coulee 385S)	0.0609	0.2867	0.0000	-0.0079	-0.0173	-0.0082	0.0182	-0.0163	0.0081	-0.0457	0.3722	0.0000	0.3858	0.0000	-0.0080	0.0699	-0.0072	-0.0080	-0.0248
618ST1	225L (Spring Coulee 385S to Magrath 225S)	0.0635	0.3014	0.0000	-0.0081	-0.0177	-0.0082	0.0190	-0.0166	0.0084	-0.0458	0.3951	0.0000	0.4035	0.0000	-0.0081	0.0722	-0.0074	-0.0080	-0.0256
618ST1	225L (Stirling 67S	-0.0621	0.5839	0.0000	0.0067	0.0160	0.0066	-0.0191	0.0147	-0.0098	0.0413	0.4923	0.0000	0.5144	0.0000	0.0067	-0.0758	0.0067	0.0064	0.0237

Scenario 7

Contingency	Branch	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
	to Raymond Reservoir 313S Tap)																			
618ST1	820L (Coaldale 254S to 820AL Tap)	0.9071	0.5749	0.0000	0.0000	0.0091	0.0000	-0.0204	0.0073	-0.0194	0.0292	0.4528	0.0000	0.4494	0.0000	0.0000	0.8847	0.0000	0.0000	0.0155
618ST1	820L (P1719 Tap to 820AL Tap)	-0.0558	0.5890	0.0000	0.0000	0.0114	0.0000	-0.0185	0.0099	-0.0136	0.0313	0.4593	0.0000	0.4516	0.0000	0.0000	0.9123	0.0000	0.0000	0.0181

A7.4 Scenario 8 (2020SP HW post-P1500 sensitivity scenario)

Contingency	Branch	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
1036L	172L (Taber 83S to 172EL Tap)	0.2067	0.1462	0.0000	0.0603	0.0569	0.0589	0.3398	0.0594	0.1066	0.0584	0.1332	0.0605	0.1229	0.0595	0.0595	0.1892	0.0603	0.0566	0.0591
225ST1	820L (Coaldale 254S to 820AL Tap)	0.9099	0.6086	0.0000	0.0000	0.0099	0.0000	-0.0195	0.0081	-0.0180	0.0303	0.5081	0.0000	-0.0165	0.0000	0.0000	0.8868	0.0000	0.0000	0.0168
225ST1	820L (P1719 Tap to 820AL Tap)	-0.0573	0.6302	0.0000	0.0000	0.0122	0.0000	-0.0188	0.0106	-0.0135	0.0326	0.5262	0.0000	-0.0128	0.0000	0.0000	0.9131	0.0000	0.0000	0.0194
1005L	172L (Taber 83S to 172EL Tap)	0.2066	0.1461	0.0000	0.0590	0.0557	0.0576	0.3378	0.0582	0.1061	0.0573	0.1330	0.0592	0.1226	0.0581	0.0582	0.1897	0.0592	0.0552	0.0579
607L	172L (Taber 83S to 172EL Tap)	0.1865	0.1248	0.0000	0.0406	0.0388	0.0391	0.3230	0.0402	0.0847	0.0402	0.1114	0.0404	0.1000	0.0395	0.0399	0.1688	0.0417	0.0375	0.0404
863L	225L (Glenwood 229S to Spring Coulee 385S)	0.0631	0.2962	0.0000	-0.0090	-0.0186	-0.0094	0.0186	-0.0176	0.0077	-0.0478	0.3683	-0.0051	0.3796	-0.0052	-0.0092	0.0712	-0.0080	-0.0092	-0.0262
863L	225L (Spring Coulee 385S to Magrath 225S)	0.0630	0.2972	0.0000	-0.0082	-0.0173	-0.0083	0.0187	-0.0162	0.0078	-0.0428	0.3898	0.0000	0.3891	0.0000	-0.0082	0.0699	-0.0077	-0.0081	-0.0252
863L	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0604	0.6157	0.0000	0.0057	0.0144	0.0053	-0.0186	0.0130	-0.0107	0.0367	0.4974	0.0000	0.5035	0.0000	0.0055	-0.0785	0.0061	0.0050	0.0218
863L	820L (Coaldale 254S to 820AL Tap)	0.9091	0.5880	0.0000	0.0000	0.0076	0.0000	-0.0194	0.0057	-0.0200	0.0266	0.4594	-0.0050	0.4513	-0.0056	0.0000	0.8870	0.0000	0.0000	0.0138
863L	820L (P1719 Tap to 820AL Tap)	-0.0557	0.5995	0.0000	0.0000	0.0103	0.0000	-0.0181	0.0087	-0.0144	0.0294	0.4670	0.0000	0.4570	0.0000	0.0000	0.9118	0.0000	0.0000	0.0169
618ST1	225L (Glenwood 229S to Spring Coulee 385S)	0.0629	0.2958	0.0000	-0.0090	-0.0186	-0.0094	0.0186	-0.0176	0.0076	-0.0478	0.3680	-0.0050	0.3792	-0.0051	-0.0092	0.0710	-0.0080	-0.0092	-0.0262
618ST1	225L (Spring Coulee 385S to Magrath 225S)	0.0628	0.2969	0.0000	-0.0082	-0.0173	-0.0083	0.0187	-0.0162	0.0078	-0.0428	0.3896	0.0000	0.3890	0.0000	-0.0082	0.0698	-0.0077	-0.0080	-0.0252

Scenario 8

Contingency	Branch	Chin Chute	Raymond	P1080	Oldman River	Castle River	Summerview	Hillridge	KettleHills	McBridge	Cowley	Taylor	Ardenville	Garden City	Soderglen	Windy Point	P1719	Heritage	Castle Rock Ridge	P1500
618ST1	225L (Stirling 67S to Raymond Reservoir 313S Tap)	-0.0604	0.6158	0.0000	0.0056	0.0144	0.0053	-0.0186	0.0130	-0.0107	0.0368	0.4978	0.0000	0.5039	0.0000	0.0055	-0.0785	0.0061	0.0050	0.0218
618ST1	820L (Coaldale 254S to 820AL Tap)	0.9092	0.5889	0.0000	0.0000	0.0076	0.0000	-0.0195	0.0057	-0.0202	0.0266	0.4603	-0.0051	0.4523	-0.0057	0.0000	0.8876	0.0000	0.0000	0.0138
618ST1	820L (P1719 Tap to 820AL Tap)	-0.0557	0.6001	0.0000	0.0000	0.0103	0.0000	-0.0182	0.0087	-0.0146	0.0294	0.4676	0.0000	0.4578	0.0000	0.0000	0.9117	0.0000	0.0000	0.0169