

# Engineering Connection Assessment

## P2254 Hilda Wind Power Project




### Connection

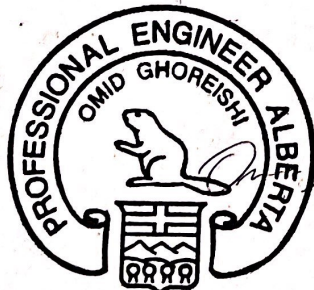
Hilda Wind L.P.


**Date:** March 30, 2022

**Version:** V1 FINAL

**Classification:** Public

Role	Name	Date	Signature
Prepared	Omid Ghoreishi, P. Eng.	March 30, 2022	
Reviewed	Myron Jin-Li, P. Eng.	March 30, 2022	
Approved	Pravin Koshti, P. Eng.	Mar 31, 2022	



  
March 30, 2022

**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.

## Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Project Overview .....	1
<b>2</b>	<b>Assessment Scope .....</b>	<b>2</b>
2.1	Objectives .....	2
2.2	Existing System .....	2
2.3	Study Area .....	2
<b>3</b>	<b>Connection Alternatives .....</b>	<b>3</b>
3.1	Overview .....	3
3.2	Connection Alternatives Examined .....	3
3.3	Connection Alternatives Selected for Further Study .....	9
3.4	Connection Alternatives Not Selected for Further Study .....	9
<b>4</b>	<b>Assessment Approach .....</b>	<b>10</b>
4.1	Standards, Criteria and Assumptions .....	10
4.2	Studies Performed .....	10
4.2.1	<i>Power Flow Studies</i> .....	10
4.2.2	<i>Transient Stability Studies</i> .....	11
4.2.3	<i>Short-Circuit Current Level Studies</i> .....	11
4.3	Mitigation Measure Development and Evaluation .....	11
4.3.1	<i>Post-Mitigation Studies</i> .....	11
4.3.2	<i>Constraint Effective Factor Studies</i> .....	11
<b>5</b>	<b>Interpretation of Results .....</b>	<b>12</b>
5.1	Results Overview .....	12
5.2	Pre-Project Study Results .....	15
5.2.1	<i>Category A Conditions</i> .....	15
5.2.2	<i>Category B Conditions</i> .....	15
5.3	Post-Project Study Results .....	15
5.3.1	<i>Category A Conditions</i> .....	15
5.3.2	<i>Category B Conditions</i> .....	15
5.4	Mitigation Measures .....	15
5.4.1	<i>Pre-Project</i> .....	15
5.4.2	<i>Post-Project</i> .....	16
5.4.3	<i>Post-Project Mitigation Study Results</i> .....	16
<b>6</b>	<b>Project Dependencies .....</b>	<b>17</b>
<b>7</b>	<b>Conclusions and Recommendations .....</b>	<b>18</b>

## Tables

Table 4-1: Connection Study Scenarios..... 10  
Table 5-1: Summary of Reliability Criteria Violations, Project Impact and Mitigation Measures ..... 13

## Figures

Figure 3-1: Connection Alternative 1.....4  
Figure 3-2: Connection Alternative 2..... 6  
Figure 3-3: Connection Alternative 3..... 8

## Attachments

Attachment A: Engineering Connection Assessment Results



# 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

Hilda Wind L.P. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its approved Hilda Wind Power Project (Facility) to the AIES. The Facility includes an approved collector substation, designated as the Hilda 662S substation.

The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 100 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 August 31, 2022.

## 2 Assessment Scope

### 2.1 Objectives

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

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

### 2.2 Existing System

Geographically, the Project is located in the AESO planning area of Empress (Area 48), which is part of the AESO South planning region. The Empress Area (Area 48) is surrounded by the planning areas of Medicine Hat (Area 4), Vauxhall (Area 52), Brooks (Area 47), Sheerness (Area 43), and Hanna (Area 42).

From a transmission system perspective, the Empress Area (Area 48) consists primarily of a 138 kV and 240 kV transmission system. The Empress Area (Area 48) is connected to the Hanna Area (Area 42) with a 138kV line, the Brooks Area (Area 47) with two 240kV lines, and the Medicine Hat Area (Area 4) with a 380kV line.

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 Brooks (Area 47), Empress (Area 48), Medicine Hat (Area 4), and Vauxhall (Area 52), including the tie lines connecting these planning areas to the rest of the AIES. All transmission facilities within the Study Area will be studied and monitored for violations of the Reliability Criteria (defined in Section 3.1 of Attachment A1).

## 3 Connection Alternatives

### 3.1 Overview

The AESO, in consultation with the TFO in the Study Area and the Market Participant, examined 3 transmission alternatives to meet the Market Participant's request for system access service, as detailed in Section 3.2.

### 3.2 Connection Alternatives Examined

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

#### **Alternative 1 – T-tap connection to 138kV transmission line 658L**

This alternative includes the following developments:

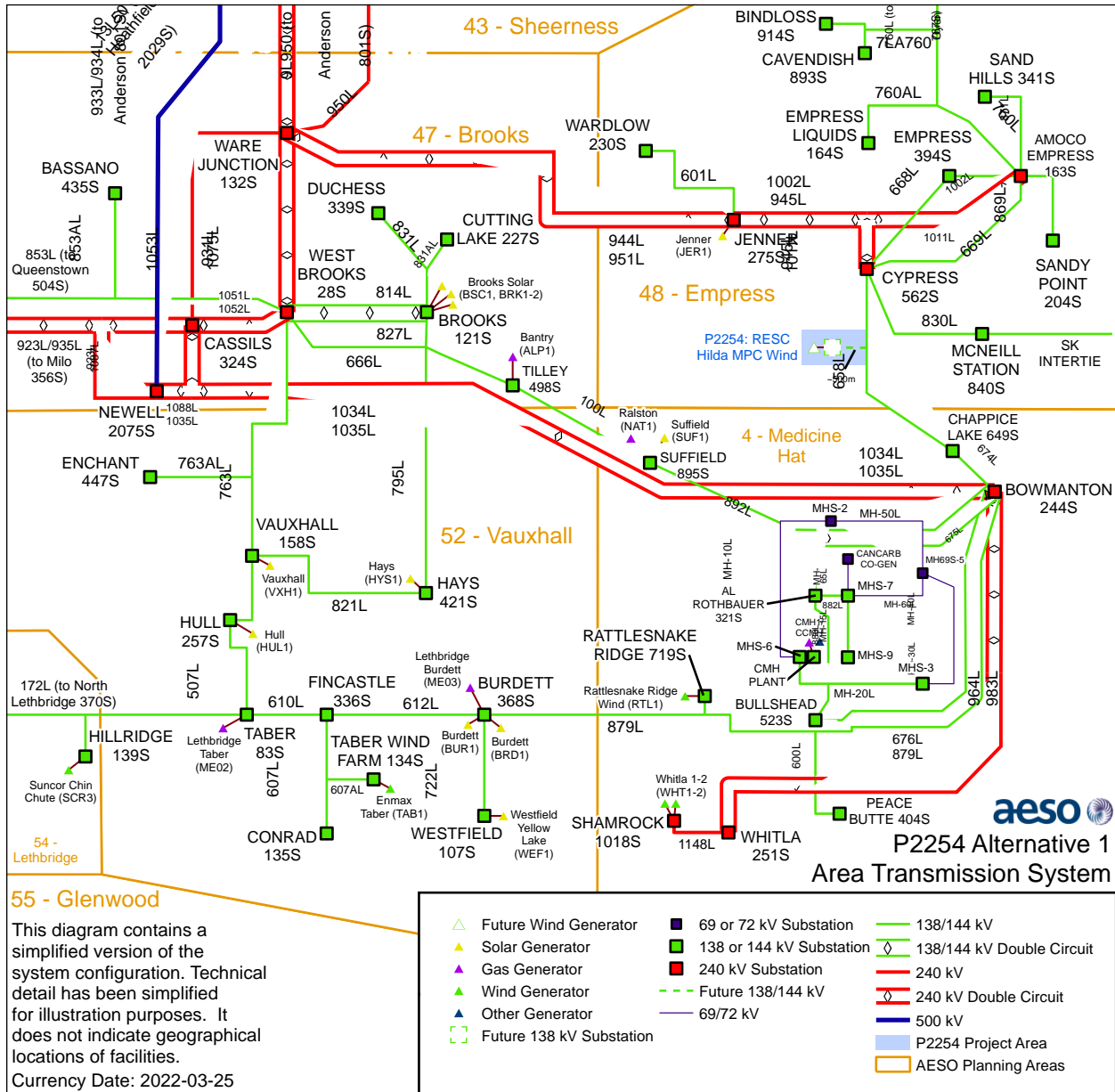
- Add one 138kV circuit, approximately 500 m in length<sup>1</sup>, to connect the Facility to the existing 138 kV transmission line 658L (Cypress 562S – Chappice Lake 649S) in a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

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

---

<sup>1</sup> Exact line length to be determined by the Market Participant

Figure 3-1: Connection Alternative 1



### **Alternative 2 – Radial 240kV Connection to Cypress 562S substation**

This alternative includes the following developments:

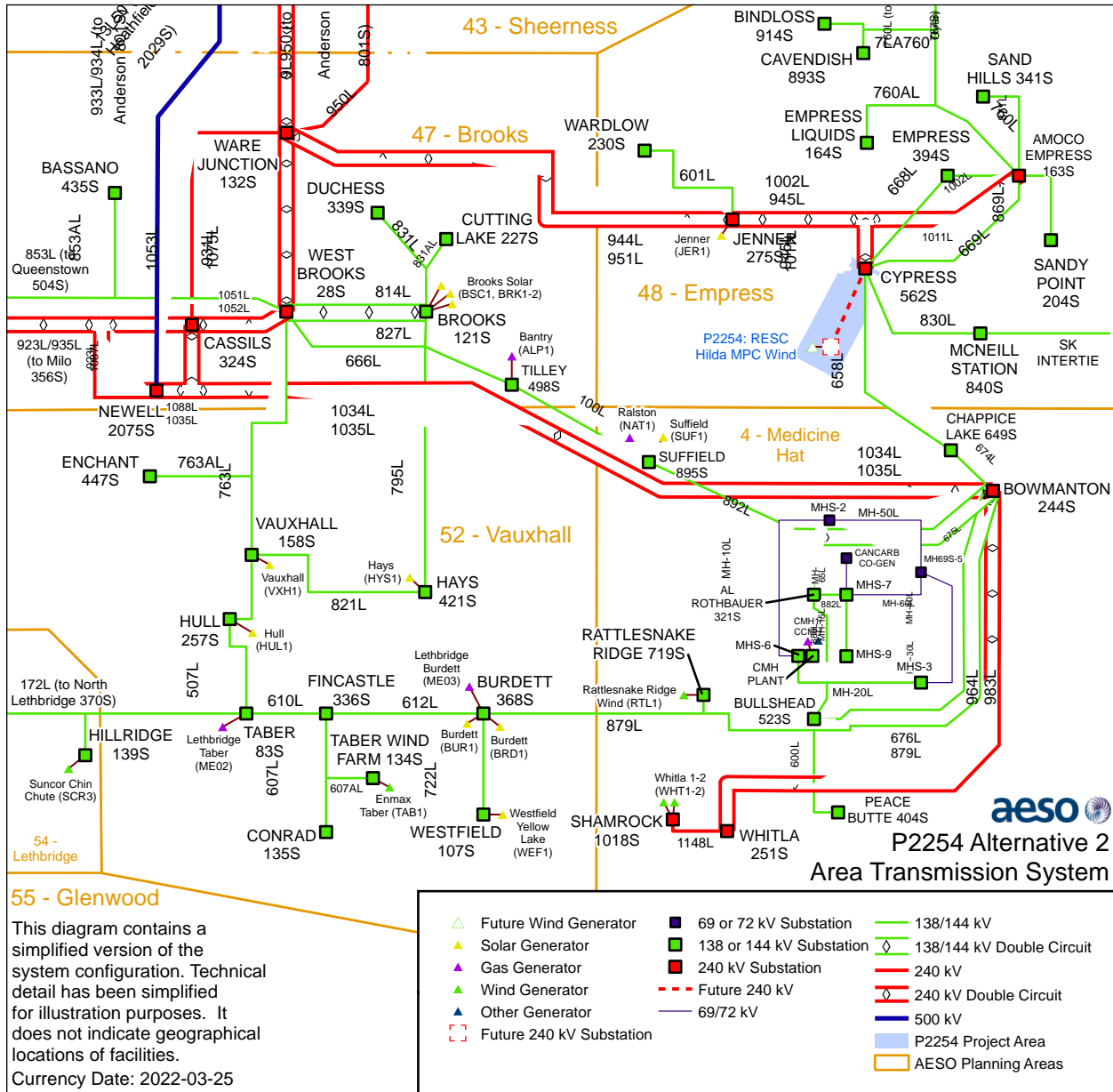
- Add one 240 kV circuit, approximately 13 km in length<sup>2</sup>, to connect the Facility to the existing Cypress 562S substation;
- Modify Cypress 562S substation, including adding one 240kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

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

---

<sup>2</sup> Exact line length to be determined by the Market Participant

Figure 3-2: Connection Alternative 2



### **Alternative 3 – Radial 138kV Connection to Cypress 562S substation**

This alternative includes the following developments:

- Add one 138 kV circuit, approximately 13 km in length<sup>3</sup>, to connect the Facility to the existing Cypress 562S substation;
- Modify Cypress 562S substation, including adding one 138 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

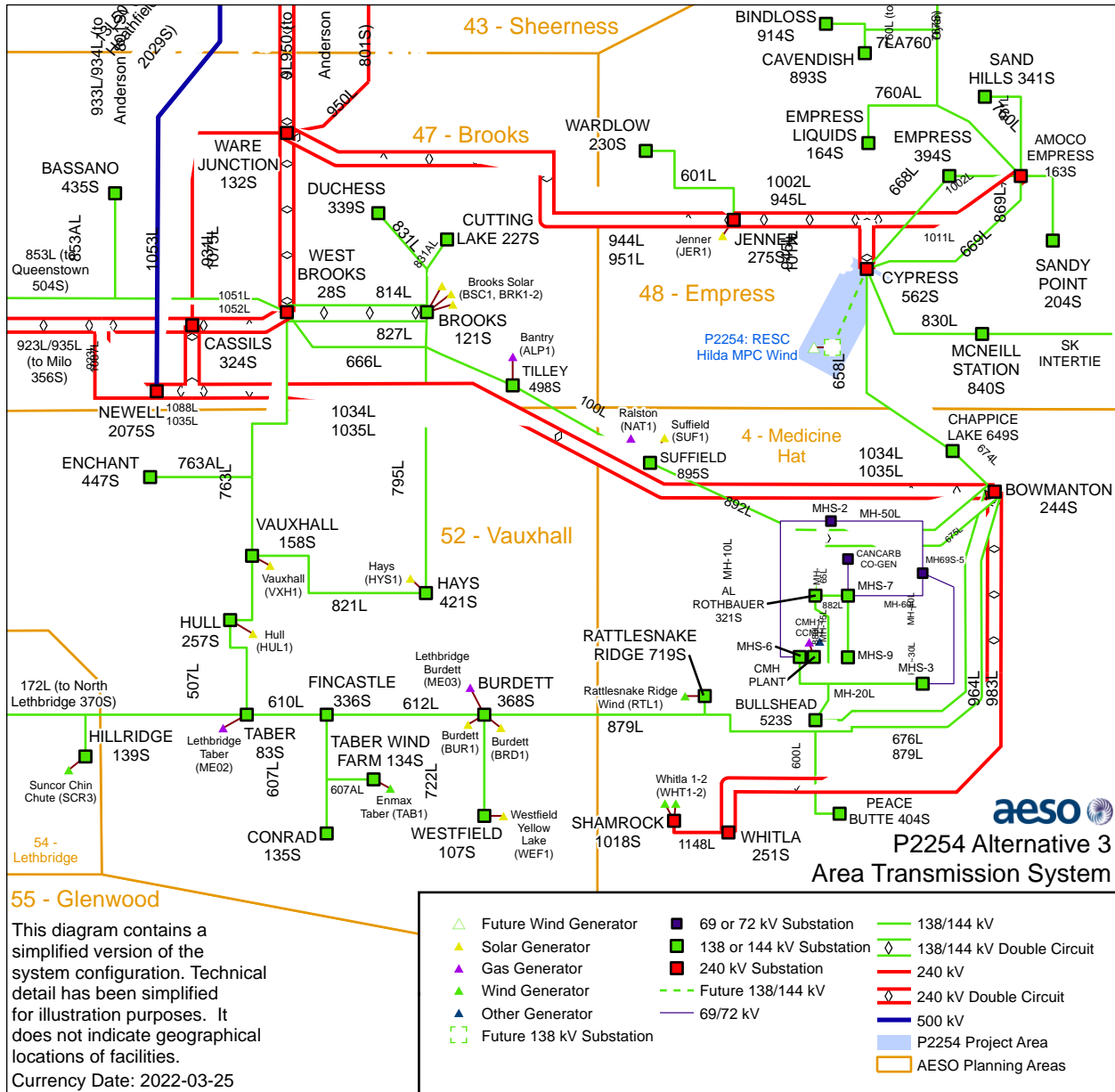
The proposed connection configuration is shown in Figure 3-3.

---

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



Figure 3-3: Connection Alternative 3



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

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

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

Alternative 2 and Alternative 3 would involve increased transmission development and hence, increased cost, compared to Alternative 1. Therefore, Alternative 2 and Alternative 3 were not selected for further study.

## 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

At the time of study, the scheduled ISD for the Project is August 31, 2022. Therefore, studies were performed using scenarios for 2022 Summer Light and Summer Peak.

Short-circuit studies were performed using the 2031 Summer Peak scenario.

Table 4-1 lists the study scenarios. Post-Project scenarios reflect the requested Rate STS contract capacity of 100 MW at the Hilda 662S substation.

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

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
<b>Pre-Project</b>					
1	2022 Summer Light (SL)	High Renewables	2022 SL Pre-Project	0	0
2	2022 Summer Peak (SP)	High Renewables	2022 SP Pre-Project	0	0
<b>Post-Project</b>					
3	2022 SL	High Renewables	2022 SL Post-Project	0	100
4	2022 SP	High Renewables	2022 SP Post-Project	0	100
5	2031 SP	All generation in the Study Area on	2031 SP Post-Project	0	100

Note: The 138 kV bus-tie breaker and switch at the Bowmanton 244S substation will be assumed to be open for all of the above scenarios.

The AESO Planning Region load forecasts used for the connection studies were based on the AESO's 2021 Long-term Outlook (2021 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.<sup>4</sup>

Power flow studies were performed for the 2022 Summer Light and 2022 Summer Peak pre-Project scenarios, and for 2022 Summer Light and 2022 Summer Peak post-Project scenarios.

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

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

Transient stability studies were performed for the 2022 Summer Light and 2022 Summer Peak post-Project scenarios.

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

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

Short circuit studies were performed for the 2022 Summer Peak pre-Project scenario and for the 2022 Summer Peak and 2031 Summer Peak post-Project scenarios.

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

As explained in Section 6 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, transient stability, and short-circuit current level studies were performed to assess the impact of the Project on the performance of the AIES following implementation of the AESO's proposed mitigation measures.

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

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

---

<sup>4</sup> The AESO's desired post-contingency voltage deviations for low voltage busses represent guidelines rather than criteria. A POD bus voltage deviation that exceeds the desired limits shown in Table 3-1 of Attachment A1 does not represent a Reliability Criteria violation. Mitigation measures would not be developed to specifically address POD bus voltage deviations that exceed the desired values in Table 3-1 of Attachment A1.

## 5 Interpretation of Results

### 5.1 Results Overview

This section provides an assessment of the impact of the Project on the performance of the AES. 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.

A thermal criteria violation was identified on the 138 kV transmission line 610L under the Category A condition pre-Project. This thermal criteria violation is mitigated by curtailing effective generation facilities. The AESO has determined that if this generation is curtailed to mitigate the Category A thermal criteria violation prior to running Category B studies, it would represent a less-stressed condition to assess the Project under. In order to consider the worst case forecast conditions, the AESO performed Category B studies assuming that the rating of 138 kV transmission line 610L is increased to 173 MVA (from its current rating of 85 MVA), which is proposed in AESO system project P7075 - *Vauxhall Area Transmission Development*<sup>5</sup>. This allows for a more representative worst case forecast conditions with existing generation levels being maintained. Furthermore, the avoidance of curtailment by assuming a higher rating for 610L for Category B studies will allow the AESO to identify RASs or other mitigation measures which may be required to alleviate Category B conditions that may have otherwise been missed if the studies proceeded with generation curtailment.

Although the 138 kV transmission line 610L was studied with a rating of 173 MVA, mitigations were developed in consideration of the existing rating of 610L.

---

<sup>5</sup> Please refer to the AESO's 2022 *Long-term Transmission Plan*. 173 MVA is assumed for the purposes of these studies only and not intended to be representative of the final scope of P7075.

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	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures			
	Pre-Project	Post-Project								
2022 Summer Light	Thermal - above emergency rating	Thermal - above emergency rating	System Normal	610L (Fincastle 336S to Taber 83S)	Materially increased violation	Real-time operational practices	Real-time operational practices			
	None	Thermal - above emergency rating	612L (Burdett 368S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S)	New Violation	Planned RAS 180	Planned RAS 180 and New RAS 207			
	Thermal - above emergency rating	Thermal - above emergency rating		879L (Bowmanton 244S to 879AL Tap)	Marginally decreased violation					
	None	Thermal - above emergency rating		658L (Cypress 562S to P2254 Tap)	New Violation					
	Thermal - above normal rating	Thermal - above normal rating		610L (Fincastle 336S to Taber 83S)	612L (Burdett 368S to Fincastle 336S)			Marginally increased violation	Planned RAS 180 and real-time operational practices	Planned RAS 180 and New RAS 207 and real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	879L (Burdett 368S to 879AL_Tap)		Marginally decreased violation					
	Thermal - above emergency rating	Thermal - above emergency rating	100L (Tilley 498S to Suffield 895S)		Materially increased violation					
	Thermal - above emergency rating	Thermal - above emergency rating	892L (Suffield 895S to Bowmanton 244S)		Materially increased violation					
	Thermal - above emergency rating	Thermal - above emergency rating	879L (244S Bowmanton to 879AL Tap)		Marginally reduced violation					
	None	Thermal - above emergency rating	658L (Cypress 562S to P2254 Tap)		New Violation					
	None	Thermal - above emergency rating	669L (Amoco Empress 163S to Cypress 562S)		668L (Empress 394S to Cypress 562S)	New Violation	None	New RAS 208		
	None	Thermal - above normal rating	100L (Tilley 498S to Suffield 895S)		612L (Burdett 368S to Fincastle 336S)	New Violation	Planned RAS 181	Planned RAS 181 and New RAS 207		
	None	Thermal - above normal rating		610L (Fincastle 336S to Taber 83S)	New Violation					
	None	Thermal - above emergency rating		658L (Cypress 562S to P2254 Tap)	New Violation					
	None	Thermal - above normal rating	892L (Suffield 895S to Bowmanton 244S)	612L (Burdett 368S to Fincastle 336S)	New Violation	Planned RAS 181	Planned RAS 181 and New RAS 207			
	None	Thermal - above normal rating		610L (Fincastle 336S to Taber 83S)	New Violation					
	None	Thermal - above emergency rating		658L (Cypress 562S to P2254 Tap)	New Violation					
	Thermal - above emergency rating	Thermal - above emergency rating	507L (Taber 83S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	Materially decreased violation	Planned RAS 180	Planned RAS 180			
	Thermal - above emergency rating	Thermal - above emergency rating	763L (Vauxhall 158S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	Materially decreased violation	Planned RAS 180	Planned RAS 180			
	None	Thermal - above normal rating	666L (Tilley 498S to West Brooks 28S)	610L (Fincastle 336S to Taber 83S)	New Violation	None	Real-time operational practices			
Thermal - above normal rating	Thermal - above normal rating	1036L (Milo 356S to Travers 554S)	507L (Taber 83S to Hull 257S)	Marginally increased violation	Real-time operational practices	Real-time operational practices				
None	Thermal - above normal rating	EATL	610L (Fincastle 336S to Taber 83S)	New Violation	None	Real-time operational practices				
Thermal - above emergency rating	Thermal - above emergency rating	1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	Materially increased violation	Real-time operational practices	Real-time operational practices				



Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
	None	Thermal - above normal rating	607L (Fincastle 336S to Conrad 135S)	612L (Burdett 368S to Fincastle 336S)	New Violation	None	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	172L (Taber 83S to Coaldale 254S)	507L (Taber 83S to Hull 257S)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above normal rating		763L (Vauxhall 158S to Hull 257S)	New Violation		
2022 Summer Peak	Thermal - above normal rating	Thermal - above emergency rating	System Normal	610L (Fincastle 336S to Taber 83S)	Materially increased violation	Real-time operational practices	Real-time operational practices
	None	Thermal - above emergency rating	System Normal	658L (Cypress 562S to P2254 Tap)	New Violation	Real-time operational practices	Real-time operational practices
	Thermal - above emergency rating	Thermal - above emergency rating	612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	Marginally reduced violation	Planned RAS 180	Planned RAS 180 and New RAS 207
	None	Thermal - above emergency rating		658L (Cypress 562S to P2254 Tap)	New Violation		
	None	Thermal - above normal rating	610L (Fincastle 336S to Taber 83S)	100L (Tilley 498S to Suffield 895S)	New Violation	Planned RAS 180	Planned RAS 180 and New RAS 207
	Thermal - above emergency rating	Thermal - above emergency rating		879L (244S Bowmanton to 879AL Tap)	No impact		
	None	Thermal - above emergency rating		658L (Cypress 562S to P2254 Tap)	New Violation		
	None	Thermal - above normal rating	949L (Jenner 275S to Halsbury 306S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above emergency rating	100L (Tilley 498S to Suffield 895S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above emergency rating	892L (Suffield 895S to Bowmanton 244S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above normal rating	507L (Taber 83S to Hull 257S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above normal rating	763L (Vauxhall 158S to Hull 257S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above normal rating	666L (Tilley 498S to West Brooks 28S)	658L (Cypress 562S to P2254 Tap)	New Violation	None	New RAS 207
	None	Thermal - above normal rating	1036L (Milo 356S to Travers 554S)	658L (Cypress 562S to P2254 Tap)	New Violation	Real-time operational practices	New RAS 207
	Thermal - above normal rating	Thermal - above normal rating		1005L (Milo 356S to P2009 Tap)	Materially reduced violation		
	None	Thermal - above normal rating	EATL	924L (Milo 356S to Langdon 102S)	New Violation	None	Real-time operational practices
	Thermal - above normal rating	Thermal - above normal rating	1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	Materially increased violation	Real-time operational practices	Real-time operational practices

Notes:

- Marginally increased (or marginally decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) between 0% and 3% (or -3%).
- Materially increased (or materially decreased) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) above or equal to 3% (or below or equal to -3%).
- RAS 180 was proposed for the approved P2212 Rattlesnake project in the *Rattlesnake Ridge Wind Project Connection* NID. This RAS is referred to herein as "Planned 180".
- RAS 181 was proposed for the approved P2212 Rattlesnake project in the *Rattlesnake Ridge Wind Project Connection* NID. This RAS is referred to herein as "Planned 181".
- In this table, "Modify" refers to adding the Project to the logic of the respective RAS



## 5.2 Pre-Project Study Results

### 5.2.1 Category A Conditions

The pre-Project power flow studies identified a thermal criteria violation under Category A conditions (i.e. all elements in service). 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).

## 5.3 Post-Project Study Results

### 5.3.1 Category A Conditions

The post-Project power flow studies identified two thermal criteria violations under Category A conditions. 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

Post-Project power flow studies and voltage stability studies identified a number of system performance issues under Category B conditions, namely: thermal criteria violations.

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. As part of this Project, mitigation measures will not be specifically developed for the POD bus voltage deviations observed under certain Category B conditions during pre-Project and post-Project scenarios.

Category A thermal criteria violations were observed on 610L in both pre- and post-project scenarios. These violations can be mitigated in the near term by applying the TCM Rule to dispatch down effective generation. Longer term, the system project P7075 Vauxhall Area Transmission Development will increase the rating of 610L, which will remove these violations.

### 5.4.1 Pre-Project

Prior to connection of the Project, all of the observed thermal criteria violations can be managed by using real-time operational practices. The remaining thermal criteria violations can be mitigated by the planned RAS 180 and RAS 181.

### **5.4.2 Post-Project**

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

The thermal criteria violation observed on 138kV transmission line 658L under Category A conditions can be mitigated by adjusting the export level at the intertie from Alberta to Saskatchewan as a real time operational practice.

Some of the remaining thermal criteria violations can be mitigated by planned RAS 180 and planned RAS 181.

After the Project is connected, two new RASs are required to mitigate observed Reliability Criteria violations. The thermal criteria violations observed on 138 kV transmission lines 658L, 892L, 612L, 100L, and 610L can be mitigated by a new RAS, referred to as the “new RAS 207 – 658L Overload Mitigation Scheme”, in combination with real time operational practices, if necessary. The new RAS will monitor the loading on 138 kV transmission line 658L and trip the Project if necessary.

The thermal criteria violations observed on 138 kV transmission line 668L can be mitigated by a new RAS, referred to as the “new RAS 208 – 668L Overload Mitigation Scheme”. The new RAS will monitor the loading on 138 kV transmission line 668L and trip the Project if necessary.

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

Under Category A conditions, the violation on 138 kV transmission line 658L is mitigated using real-time operational procedures to adjust the export levels on the Alberta-Saskatchewan intertie.

Under Category B conditions, most of the thermal criteria violations observed can be alleviated by new RAS 207 and new RAS 208 and/or planned RAS 180 and planned RAS 181. After planned RAS 180 and new RAS 207 action, real-time operational procedures would be required to fully alleviate the thermal criteria violations observed on 138 kV transmission line 879L under certain Category B conditions.

It was observed that the worst-case Category B thermal criteria violation on 138 kV transmission line 610L was sufficiently mitigated such that the post-RAS load flow on this transmission line was below the current normal rating of the transmission line before it is increased with the system project P7075 - *Vauxhall Area Transmission Development*.

## **6 Project Dependencies**

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

## 7 Conclusions and Recommendations

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

The connection assessment uses credible worst-case conditions to assess the impact of the Facility connection on the Alberta interconnected electric system. Category A thermal criteria violations were observed under these credible worst-case load and generation forecast conditions. The probability of Category A thermal criteria violations materializing is highly dependent upon the production profile of the Facility and other generation facilities in the area. Closer to the ISD, if the AESO determines that congestion will arise under Category A conditions, the AESO will make an application to the AUC to obtain approval for an “exception” under Section 15(2) of the *Transmission Regulation*.

The identified system performance issues can be mitigated through the use of planned RAS 180, planned RAS 181, new RAS 207, new RAS 208, 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 alternative 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 to connect the Facility to the existing 138 kV transmission line 658L in a T-tap configuration. The conductor used for the 138 kV circuit should have a minimum thermal rating similar to the existing 138 kV transmission line 658L.

# Attachment A: Engineering Connection Assessment Results

# Engineering Connection Assessment: Study Results




## P2254 Hilda Wind Power Project Connection

Hilda Wind L.P.

**Date:** March 30, 2022


**Version:** V1D1

**Classification:** Public

Role	Name	Date	Signature
Prepared	Yani Jazayeri, P.Eng.	March 30, 2022	
Reviewed	James Howland, P. Eng.	2022-03-30	
Approved	Yani Jazayeri, P.Eng.	March 30, 2022	



March 30, 2022  
Member ID # 74277

PERMIT TO PRACTICE HARDLINE ENGINEERING LTD.	
Signature	
Date	2022-03-30
ID:	92969
PERMIT NUMBER: P 14024 The Association of Professional Engineers and Geoscientists of Alberta	

# Contents

<b>1</b>	<b>Introduction .....</b>	<b>3</b>
<b>2</b>	<b>Pre-Project Study Results .....</b>	<b>4</b>
2.1	Power Flow Studies .....	4
2.1.1	Scenario 1: 2022 Summer Light High Renewables Pre-Project.....	4
2.1.2	Scenario 2: 2022 Summer Peak High Wind Pre-Project.....	5
<b>3</b>	<b>Post-Project Study Results .....</b>	<b>8</b>
3.1	Power Flow Studies .....	8
3.1.1	Scenario 3: 2022 Summer Light High Renewables Post-Project.....	8
3.1.2	Scenario 4: 2022 Summer Peak High Wind Post-Project.....	10
3.2	Transient Stability Studies .....	13
<b>4</b>	<b>Short Circuit Studies.....</b>	<b>15</b>
4.1	Pre-Project Results .....	15
4.2	Post-Project Results .....	15
4.2.1	Scenario 4: 2022 Summer Peak High Wind Post-Project.....	15
4.2.2	Scenario 5: 2031 SP Post-Project .....	16
<b>5</b>	<b>Mitigation Measure Development and Evaluation .....</b>	<b>17</b>
5.1	Pre-Project.....	17
5.2	Post-Project .....	18
5.3	Evaluation of Mitigation Measures.....	19
5.3.1	Scenario 3.....	19
5.3.2	Scenario 4.....	21
5.4	Constraint Effective Factor Studies .....	22



**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

## Tables

Table 2-1: Thermal Criteria Violations under Category A Conditions for Scenario 1 .....	4
Table 2-2: Thermal Criteria Violations under Category B Conditions for Scenario 1 .....	4
Table 2-3: Thermal Criteria Violations under Category A Conditions for Scenario 2 .....	6
Table 2-4: Thermal Criteria Violations under Category B Conditions for Scenario 2 .....	6
Table 3-1: Thermal Criteria Violations under Category A Conditions for Scenario 3 .....	8
Table 3-2: Thermal Criteria Violations under Category B Conditions for Scenario 3 .....	9
Table 3-3: Thermal Criteria Violations under Category A Conditions for Scenario 3 .....	10
Table 3-4: Thermal Criteria Violations under Category B Conditions for Scenario 4 .....	12
Table 3-5: Transient Stability Study Results under Category B Conditions for Scenario 3 .....	13
Table 3-6: Transient Stability Study Results under Category B Conditions for Scenario 4 .....	14
Table 4-1: Pre-Project Short-Circuit Current Levels for Scenario 2 .....	15
Table 4-2: Post-Project Short-Circuit Current Levels for Scenario 4 .....	15
Table 4-3: Post-Project Short-Circuit Current Levels for Scenario 5 .....	16
Table 5-1: Pre-Project Mitigation Measures .....	17
Table 5-2: Post-Project Mitigation Measures .....	18
Table 5-3: Post-RAS Power Flow Study Results for Scenario 3 .....	20
Table 5-4: Post-RAS Power Flow Study Results for Scenario 4 .....	21

## Attachments

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

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

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

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

**Attachment A5 Dynamic Data and Assumptions**

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

**Attachment A7 Constraint Effective Factors Table**

# 1 Introduction

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

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

## 2 Pre-Project Study Results

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

### 2.1 Power Flow Studies

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

#### 2.1.1 Scenario 1: 2022 Summer Light High Renewables Pre-Project

##### Category A Conditions

Thermal criteria violations were observed under certain Category A conditions as shown in Table 0-1. No other Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

**Table 0-1: Thermal Criteria Violations under Category A Conditions for Scenario 1**

Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
	Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
610L (Fincastle 336S to Taber 83S)	85	94	158	185

##### Category B Conditions

###### Thermal Criteria Violations

Due to the observed Category A thermal criteria violation on 138kV transmission line 610L, the rating of this line was increased to 173 MVA which will be the rating in effect once AESO system project P7075 is in service. Please refer to the Engineering Connection Assessment report for further details.

Thermal criteria violations were observed under certain Category B conditions as shown in Table 0-2.

**Table 0-2: Thermal Criteria Violations under Category B Conditions for Scenario 1**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emerg Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	85	94	142.035	167.1
610L (Fincastle 336S to Taber 83S)	612L (Burdett 368S to Fincastle 336S)	85.1	94	92.92	109.2
	879L (Burdett 368S to 879AL_Tap)	85	94	119.425	140.5
	100L (Tilley 498S to Suffield 895S)	78	86	98.04	125.7

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

	892L (Suffield 895S to Bowmanton 244S)	80	88	108.88	136.1
	674L (Chappice Lake 649S to Bowmanton 244S)	121	133	125.84	104.0
	658L (Chapp Lake 649S to Cypress 562S)	121	133	125.11	103.4
	879L (Bowmanton 244S to 879AL Tap)	85	94	234.09	275.4
949L (Jenner 275S to Halsbury 306S)	879L (Bowmanton 244S to 879AL Tap)	85	94	87.72	103.2
892L (Suffield 895S to Bowmanton 244S)	610L (Fincastle 336S to Taber 83S)	173	190	174.903	101.1
507L (Taber 83S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85	94	101.32	119.2
763L (Vauxhall 158S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85	94	100.045	117.7
830L (Cypress 562S to McNeil Station 840S)	879L (Bowmanton 244S to 879AL Tap)	85	94	88.23	103.8
1036L (Milo 356S to Travers 554S)	507L (Taber 83S to Hull 257S)	120	132	122.16	101.8
	879L (Bowmanton 244S to 879AL Tap)	85	94	86.275	101.5
1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	547	656	689.22	126.0
172L (Taber 83S to Coaldale 254S)	507L (Taber 83S to Hull 257S)	120	132	121.08	100.9
	879L (Bowmanton 244S to 879AL Tap)	85	94	85.935	101.1

Notes:

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

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

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

### *Voltage Criteria Violations*

No voltage criteria violations were observed under Category B conditions.

### *POD Bus Voltage Deviations*

No 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.

## **2.1.2 Scenario 2: 2022 Summer Peak High Wind Pre-Project**

### **Category A Conditions**

Thermal criteria violations were observed under certain Category A conditions as shown in Table 0-3. No other Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

**Table 0-3: Thermal Criteria Violations under Category A Conditions for Scenario 2**

Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
	Normal Rating	Emergency Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
610L (Fincastle 336S to Taber 83S)	85	94	87.5	103

### Category B Conditions

#### Thermal Criteria Violations

Due to the observed Category A thermal criteria violation on 138kV transmission line 610L, the rating of this line was increased to 173 MVA which will be the rating in effect once AESO system project P7075 is in service. Please refer to the Engineering Connection Assessment report for further details.

Thermal criteria violations were observed under certain Category B conditions as shown in Table 0-4.

**Table 0-4: Thermal Criteria Violations under Category B Conditions for Scenario 2**

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings <sup>a</sup> (MVA)		Pre-Project Results	
		Normal Rating	Emerg Rating	Power Flow <sup>b</sup> (MVA)	% Loading <sup>c</sup>
612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	85	94	94.605	111.3
610L (Taber 83S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	85	94	156.06	183.6
507L (Taber 83S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85	94	90.865	106.9
763L (Vauxhall 158S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85	94	89.76	105.6
1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	547	656	689.22	126.0
1036L (Milo 356S to Travers 554S)	1005L (Milo 356S to P2009 Tap)	490	588	507.76	103.6

Notes:

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

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

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

#### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

*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.

### 3 Post-Project Study Results

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

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

#### 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: 2022 Summer Light High Renewables Post-Project

###### Category A Conditions

Thermal criteria violations were observed under certain Category A conditions as shown in Table 0-1. No other Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

**Table 3-01: Thermal Criteria Violations under Category A Conditions for Scenario 3**

Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
	Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading	
610L (Fincastle 336S to Taber 83S)	85	94	158	185	167	196	11

###### Category B Conditions

###### Thermal Criteria Violations

Due to the observed Category A thermal criteria violation on 138kV transmission line 610L, the rating of this line was increased to 173 MVA which will be the rating in effect once AESO system project P7075 is in service. Please refer to the Engineering Connection Assessment report for further details.

Thermal criteria violations were observed under certain Category B conditions as shown in Table 0-2.



**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

**Table 0-2: Thermal Criteria Violations under Category B Conditions for Scenario 3**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emerg Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
612L (Burdett 368S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S)	80.0	88.0	77.1	96.4	90.5	113.1	16.7
	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	142.0	167.1	140.2	164.9	-2.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	66.4	54.9	142.5	117.8	62.9
610L (Fincastle 336S to Taber 83S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	92.9	109.2	93.0	109.3	0.1
	879L (Burdett 368S to 879AL Tap)	85.0	94.0	119.4	140.5	119.0	140.0	-0.5
	100L (Tilley 498S to Suffield 895S)	78.0	86.0	98.0	125.7	108.7	139.3	13.6
	892L (Suffield 895S to Bowmanton 244S)	80.0	88.0	108.9	136.1	120.2	150.3	14.2
	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	234.1	275.4	230.9	271.7	-3.7
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	125.1	103.4	186.3	154.0	50.6
669L (Amoco Empress 163S – Cypress 562S)	668L (Empress 394S – Cypress 562S)	121.0	133.0	116.3	96.1	148.1	122.4	26.3
100L (Tilley 498S to Suffield 895S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	76.9	90.4	89.0	104.6	14.3
	610L (Fincastle 336S to Taber 83S)	173.0	190.0	170.1	98.3	182.5	105.5	7.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	52.6	43.5	133.3	110.2	66.8
892L (Suffield 895S to Bowmanton 244S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	81.7	96.0	93.9	110.3	14.3
	610L (Fincastle 336S to Taber 83S)	173.0	190.0	174.9	101.1	187.4	108.3	7.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	62.0	51.2	143.7	118.8	67.6
507L (Taber 83S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	101.3	119.2	90.9	106.9	-12.3
763L (Vauxhall 158S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	100.0	117.7	89.6	105.4	-12.3
666L (498S to 28S)	610L (Fincastle 336S to Taber 83S)	173.0	190.0	161.3	93.2	174.0	100.6	7.4

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emerg Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
1036L (Milo 356S to Travers 554S)	507L (Taber 83S to Hull 257S)	120.0	132.0	122.2	101.8	123.7	103.1	1.3
EATL	610L (Fincastle 336S to Taber 83S)	173.0	190.0	165.6	95.7	174.4	100.8	5.1
1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	547.0	656.0	689.2	126.0	710.0	129.8	3.8
607L (Fincastle 336S to Conrad 135S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	82.2	96.6	91.3	107.3	10.7
172L (Taber 83S to Coaldale 254S)	507L (Taber 83S to Hull 257S)	120.0	132.0	121.1	100.9	128.2	106.8	5.9
	763L (Vauxhall 158S to Hull 257S)	120.0	132.0	115.7	96.4	123.0	102.5	6.1

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

## 3.1.2 Scenario 4: 2022 Summer Peak High Renewables Post-Project

### Category A Conditions

Thermal criteria violations were observed under certain Category A conditions as shown in Table 3-03. No other Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

**Table 3-03: Thermal Criteria Violations under Category A Conditions for Scenario 3**

Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
	Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading	
610L (Fincastle 336S to Taber 83S)	85	94	87.5	103	97.5	115	12
658L (Cypress 562S to P2254 Tap)	121	133	59	49	134.5	111	62

## **Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

### **Category B Conditions**

#### *Thermal Criteria Violations*

Due to the observed Category A thermal criteria violation on 138kV transmission line 610L, the rating of this line was increased to 173 MVA which will be the rating in effect once AESO system project P7075 is in service. The observed Category A thermal criteria violation on 138kV transmission line 658L was mitigated by using the real time operation action of changing the export level from Alberta to Saskatchewan. Please refer to the Engineering Connection Assessment report for further details.

Thermal criteria violations were observed under certain Category B conditions as shown in Table 0-24.

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

**Table 0-4: Thermal Criteria Violations under Category B Conditions for Scenario 4**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emerg Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	85	94	94.6	111.3	94.4	111.1	-0.2
	658L (Cypress 562S to P2254 Tap)	121	133	72.0	59.5	139.9	115.6	56.1
610L (Fincastle 336S to Taber 83S)	100L (Tilley 498S to Suffield 895S)	78	86	55.7	71.4	80.9	103.7	32.3
	879L (Bowmanton 244S to 879AL Tap)	85	94	156.1	183.6	156.1	183.6	0.0
	658L (Cypress 562S to P2254 Tap)	121	133	110.4	91.2	172.8	142.8	51.6
949L (Jenner 275S to Halsbury 306S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	73.8	61.0	131.2	108.4	47.4
100L (Tilley 498S to Suffield 895S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	75.5	62.4	145.6	120.3	57.9
892L (Suffield 895S to Bowmanton 244S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	68.9	56.9	139.9	115.6	58.7
507L (Taber 83S to Hull 257S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	68.0	56.2	125.0	103.3	47.1
763L (Vauxhall 158S to Hull 257S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	67.4	55.7	124.5	102.9	47.2
666L (498S to 28S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	57.1	47.2	129.8	107.3	60.1
1036L (Milo 356S to Travers 554S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	64.6	53.4	121.8	100.7	47.3
	1005L (Milo 356S to P2009 Tap)	490.0	588.0	507.9	103.6	490.6	100.1	-3.5
EATL	924L (Milo 356S to Langdon 102S)	547.0	656.0	511.0	93.4	562.3	102.8	9.4
1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	547.0	656.0	595.7	108.9	564.8	119.7	10.8

### Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

### POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

### 3.2 Transient Stability Studies

Transient stability studies were completed for Scenario 3 and Scenario 4.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied, as shown in Table 0-5. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A5.

**Table 0-5: Transient Stability Study Results under Category B Conditions for Scenario 3**

Studied Contingency	Fault Description and Location	Results
945L (Jenner 275S – Cypress 562S)	Jenner 275S	Stable
	Cypress 562S	Stable
1002L (Jenner 275S – Amoco Empress 163S)	Jenner 275S	Stable
	Amoco Empress 163S	Stable
1011L (Cypress 562S – Amoco Empress 163S)	Cypress 562S	Stable
	Amoco Empress 163S	Stable
668L (Empress 394S – Cypress 562S)	Empress 394S	Stable
	Cypress 562S	Stable
669L (Amoco Empress 163S – Cypress 562S)	Amoco Empress 163S	Stable
	Cypress 562S	Stable
830L (Cypress 562S – McNeil Station 840S)	Cypress 562S	Stable
	McNeil Station 840S	Stable
760L (Empress 394S – Amoco Empress 163S)	Empress 394S	Stable
	Amoco Empress 163S	Stable
892L (Suffield 895S – Bowmanton 244S)	Suffield 895S	Stable
	Bowmanton 244S	Stable
658L (Chappice Lake 649S – Cypress 562S)	Chappice Lake 649S	Stable
	Cypress 562S	Stable
674L (Chappice Lake 649S – Bowmanton 244S)	Chappice Lake 649S	Stable
	Bowmanton 244S	Stable
100L (Tilley 498S – Suffield 895S)	Tilley 498S	Stable
	Suffield 895S	Stable
879L (Burdett 368S – Bowmanton 244S)	Burdett 368S	Stable
	Bowmanton 244S	Stable

**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

**Table 0-6: Transient Stability Study Results under Category B Conditions for Scenario 4**

Studied Contingency	Fault Description and Location	Results
945L (Jenner 275S – Cypress 562S)	Jenner 275S	Stable
	Cypress 562S	Stable
1002L (Jenner 275S – Amoco Empress 163S)	Jenner 275S	Stable
	Amoco Empress 163S	Stable
1011L (Cypress 562S – Amoco Empress 163S)	Cypress 562S	Stable
	Amoco Empress 163S	Stable
668L (Empress 394S – Cypress 562S)	Empress 394S	Stable
	Cypress 562S	Stable
669L (Amoco Empress 163S – Cypress 562S)	Amoco Empress 163S	Stable
	Cypress 562S	Stable
830L (Cypress 562S – McNeil Station 840S)	Cypress 562S	Stable
	McNeil Station 840S	Stable
760L (Empress 394S – Amoco Empress 163S)	Empress 394S	Stable
	Amoco Empress 163S	Stable
892L (Suffield 895S – Bowmanton 244S)	Suffield 895S	Stable
	Bowmanton 244S	Stable
658L (Chappice Lake 649S – Cypress 562S)	Chappice Lake 649S	Stable
	Cypress 562S	Stable
674L (Chappice Lake 649S – Bowmanton 244S)	Chappice Lake 649S	Stable
	Bowmanton 244S	Stable
100L (Tilley 498S – Suffield 895S)	Tilley 498S	Stable
	Suffield 895S	Stable
879L (Burdett 368S – Bowmanton 244S)	Burdett 368S	Stable
	Bowmanton 244S	Stable

## 4 Short Circuit Studies

### 4.1 Pre-Project Results

Pre-Project short-circuit current levels are provided in Table 0-1<sup>1</sup>.

**Table 0-1: 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)
Amoco Empress 163S	240	256.1	6.98	0.008367+ j0.039054	4.76	0.013547+ j0.094623
	138	142.5	10.14	0.011012+ j0.044687	7.16	0.014827+ j0.101784
Cypress 562S	240	255.9	6.94	0.008537+ j0.039214	4.95	0.011262+ j0.087499
	138	142.4	10.22	0.011147+ j0.044301	7.40	0.012343+ j0.096665
Jenner 275S	240	256.6	9.08	0.006169+ j0.030743	5.13	0.021897+ j0.101326
Empress 394S	138	142.4	10.03	0.011324+ j0.045091	7.12	0.014837+ j0.101810
Chappice Lake 649S	138	142.1	4.10	0.044713+ j0.107013	2.59	0.079859+ j0.307618
McNeill Station 840S	138	141.2	6.90	0.019914+ j0.064107	4.50	0.029974+ j0.171284

### 4.2 Post-Project Results

#### 4.2.1 Scenario 4: 2022 Summer Peak High Wind Post-Project

Post-Project short-circuit current levels for Scenario 4 are provided in Table 0-2.

**Table 0-2: 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)
Amoco Empress 163S	240	258.8	7.09	0.006806+ j0.039148	4.85	0.013080+ j0.093751
	138	141.3	10.52	0.008052+ j0.043243	7.41	0.013834+ j0.097680
Cypress 562S	240	258.7	7.06	0.006930+ j0.039321	5.04	0.010903+ j0.086808

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

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3- $\Phi$ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1- $\Phi$ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
	138	141.4	10.64	0.007907+ j0.042879	7.66	0.011561+ j0.092923
Jenner 275S	240	257.7	9.15	0.005522+ j0.030767	5.16	0.021872+ j0.101300
Empress 394S	138	141.2	10.41	0.008332+ j0.043661	7.36	0.013911+ j0.097834
Chappice Lake 649S	138	142.4	4.18	0.042664+ j0.105481	2.62	0.079731+ j0.306781
McNeill Station 840S	138	141.2	7.03	0.014010+ j0.064358	4.60	0.029126+ j0.167427
Hilda 662S	138	142.4	6.99	0.018336+ j0.064401	1.81	0.164055+ j0.620114

### 4.2.2 Scenario 5: 2031 SP Post-Project

Post-Project short-circuit current levels for Scenario 5 are provided in Table 0-3.

**Table 0-3: Post-Project Short-Circuit Current Levels for Scenario 5**

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3- $\Phi$ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1- $\Phi$ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Amoco Empress 163S	240	254.0	7.31	0.005647+ j0.035262	5.98	0.007962+ j0.058791
	138	140.7	10.81	0.007147+ j0.039791	8.58	0.009755+ j0.070697
Cypress 562S	240	253.9	7.30	0.005713+ j0.035288	6.37	0.005602+ j0.050875
	138	140.6	11.03	0.006869+ j0.038987	9.13	0.006795+ j0.063499
Jenner 275S	240	253.8	9.29	0.004570+ j0.027890	6.26	0.012665+ j0.068124
Empress 394S	138	140.7	10.69	0.007412+ j0.040144	8.53	0.009865+ j0.070739
Chappice Lake 649S	138	138.6	11.55	0.006487+ j0.036959	10.71	0.007213+ j0.047532
McNeill Station 840S	138	140.6	7.05	0.012554+ j0.060672	4.95	0.024426+ j0.138347
Hilda 662S	138	140.7	7.71	0.015153+ j0.054683	1.85	0.155588+ j0.575750



## 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 0-1.

**Table 0-1: Pre-Project Mitigation Measures**

Mitigation Measure	Location of Observed Violation	Contingency
ISO TCM Rule 302.1	610L (Fincastle 336S to Taber 83S)	Base Case
Planned RAS 180 <sup>a</sup>	879L (Bowmanton 244S to 879AL Tap)	610L (Taber 83S to Fincastle 336S)
		612L (Burdett 368S to Fincastle 336S)
		507L (Taber 83S to Hull 257S)
		763L (Vauxhall 158S to Hull 257S)
	879L (Burdett 368S to 879AL Tap)	610L (Taber 83S to Fincastle 336S)
	100L (Tilley 498S to Suffield 895S)	610L (Taber 83S to Fincastle 336S)
	892L (Suffield 895S to Bowmanton 244S)	610L (Taber 83S to Fincastle 336S)
Planned RAS 181 <sup>b</sup>	610L (Fincastle 336S to Taber 83S)	892L (Suffield 895S to Bowmanton 244S)
Real time operational practices	612L (Burdett 368S to Fincastle 336S)	610L (Taber 83S to Fincastle 336S)
	674L (Chappice Lake 649S to Bowmanton 244S)	610L (Taber 83S to Fincastle 336S)
	658L (Chappice Lake 649S to Cypress 562S)	610L (Taber 83S to Fincastle 336S)
	879L (Bowmanton 244S to 879AL Tap)	949L (Jenner 275S to Halsbury 306S)
		830L (Cypress 562S to McNeil Station 840S)
		1036L (Milo 356S to Travers 554S)
		172L (Taber 83S to Coaldale 254S)
507L (Taber 83S to Hull 257S)	507L (Taber 83S to Hull 257S)	
	763L (Vauxhall 158S to Hull 257S)	
	507L (Taber 83S to Hull 257S)	1036L (Milo 356S to Travers 554S) 172L (Taber 83S to Coaldale 254S)
	1036L (Milo 356S to Travers 554S)	1005L (Milo 356S to P2009 Tap)
	1087L (Cassils 324S to Newell 2075S)	1088L (Cassils 324S to Newell 2075S)

Notes:

<sup>a</sup> Planned RAS 180: 879L Overload Mitigation Scheme

<sup>b</sup> Planned RAS 181: 610L Overload Mitigation Scheme

**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

## 5.2 Post-Project

Post-Project mitigation measures are summarized in Table 0-2.

**Table 0-2: Post-Project Mitigation Measures**

Mitigation Measure	Location of Observed Violation	Contingency
ISO TCM Rule 302.1	610L (Fincastle 336S to Taber 83S)	Base Case
Planned New RAS 207 <sup>a</sup>	612L (Burdett 368S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S) 100L (Suffield 895S to Tilley 498S)
	658L (Cypress 562S to P2254 Tap)	892L (Suffield 895S to Bowmanton 244S) 100L (Suffield 895S to Tilley 498S)
Planned New RAS 207 <sup>a</sup> with Planned RAS 181 <sup>d</sup>	610L (Fincastle 336S to Taber 83S)	892L (Suffield 895S to Bowmanton 244S) 100L (Suffield 895S to Tilley 498S)
Planned New RAS 208 <sup>b</sup>	668L (Empress 394S to Cypress 562S)	669L (Cypress 562S to Amoco Empress 163S)
Planned New RAS 207 <sup>a</sup> with Planned RAS 180 <sup>c</sup>	612L (Burdett 368S to Fincastle 336S)	610L (Taber 83S to Fincastle 336S)
	100L (Tilley 498S to Suffield 895S)	
	892L (Suffield 895S to Bowmanton 244S)	
	879L (Bowmanton 244S to 879AL Tap)	
	879L (Burdett 368S to 879AL Tap)	
	658L (Cypress 562S to P2254 Tap)	
	892L (Suffield 895S to Bowmanton 244S)	612L (Burdett 368S to Fincastle 336S)
	879L (Bowmanton 244S to 879AL Tap)	
658L (Cypress 562S to P2254 Tap)		
Real time operational practices	610L (Fincastle 336S to Taber 83S)	666L (Tilley 498S to West Brooks 28S) EATL
	507L (Taber 83S to Hull 257S)	1036L (Milo 356S to Travers 554S) 172L (Taber 83S to Coaldale 254S)
	1087L (Cassils 324S to Newwell 2075S)	1088L (Cassils 324S to Newwell 2075S)
	612L (Burdett 368S to Fincastle 336S)	607L (Fincastle 336S to Conrad 135S)
	763L (Vauxhall 158S to Hull 257S)	172L (Taber 83S to Coaldale 254S)
	658L (Cypress 562S to P2254 Tap)	949L (Jenner 275S to Halsbury 306S) 507L (Taber 83S to Hull 257S) 763L (Vauxhall 158S to Hull 257S) 666L (Tilley 498S to West Brooks 28S) 1036L (Milo 356S to Travers 554S)
	879L (Bowmanton 244S to 879AL Tap)	507L (Taber 83S to Hull 257S) 763L (Vauxhall 158S to Hull 257S)
	1005L (Milo 356S to P2009 Tap)	1036L (Milo 356S to Travers 554S)
	924L (Milo 356S to Langdon 102S)	EATL
	658L (Cypress 562S to P2254 Tap)	Base Case

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

Notes:

<sup>a</sup> Planned New RAS 207: 658L Overload Mitigation Scheme is proposed for P2254. This RAS monitors 658L flow direction to Cypress

<sup>b</sup> Planned New RAS 208: 668L Overload Mitigation Scheme is proposed for P2254. This RAS monitors 668L flow direction to Cypress

<sup>c</sup> Planned RAS 180: 879L Overload Mitigation Scheme

<sup>d</sup> Planned RAS 181: 610L Overload Mitigation Scheme

### 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 Scenario 3 and Scenario 4 using Alternative 1 and the RASs described in the previous section.

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 or TFO capital maintenance projects were not studied.

#### 5.3.1 Scenario 3

##### Category A Conditions

Thermal criteria violations observed under Category A conditions in the post-Project studies were mitigated by applying ISO TCM Rule 302.1 as shown in Table 0-3.

**Table 0-3: Post-TCM Rule 302.1 Power Flow Study Results for Scenario 3**

Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-Operator Action Result	
			Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
610L (Fincastle 336S to Taber 83S)	85	94	166.6	196	82.5	97

##### Category B Conditions

Thermal and voltage criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 0-4.

After RAS actions were complete, real-time operational practices are required to fully alleviate certain thermal criteria violations observed on 138 kV transmission lines 610L and 879L.

**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

**Table 0-4: 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	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
612L (Burdett 368S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S)	80.0	88.0	90.5	113.1	35.0	43.7
	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	140.2	164.9	24.5	28.9
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	142.5	117.8	12.3	10.2
610L (Taber 83S to Fincastle 336S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	93.0	109.3	63.0	74.0
	879L (Burdett 368S to 879AL Tap)	85.0	94.0	119.0	140.0	87.2	102.6
	100L (Tilley 498S to Suffield 895S)	78.0	86.0	108.7	139.3	45.5	58.3
	892L (Suffield 895S to Bowmanton 244S)	80.0	88.0	120.2	150.3	57.5	71.9
	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	230.9	271.7	84.3	99.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	186.3	154.0	26.8	22.1
669L (Cypress 562S to Amoco Empress 163S)	668L (Empress 394S to Cypress 562S)	121.0	133.0	148.1	122.4	116.3	96.1
100L (Suffield 895S to Tilley 498S)	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	89.0	104.6	12.2	14.3
	610L (Fincastle 336S to Taber 83S)	173.0	190.0	182.5	105.5	73.5	42.5
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	133.3	110.2	2.1	1.7
892L (Suffield 895S to	612L (Burdett 368S to Fincastle 336S)	85.1	94.0	93.9	110.3	17.1	20.1

**Engineering Connection Assessment: Study Results**

P2254 Hilda Wind Power Project Connection

V1D1

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
Bowmanton 244S)	610L (Fincastle 336S to Taber 83S)	173.0	190.0	187.4	108.3	78.3	45.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	143.7	118.8	9.9	8.2

**5.3.2 Scenario 4**

**Category A Conditions**

Thermal criteria violations observed under Category A conditions in the post-Project studies were mitigated by applying ISO TCM Rule 302.1 and RTOP as shown in Table 0-3.

**Table 0-5: Post-TCM Rule 302.1 Power Flow Study Results for Scenario 4**

Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-Operator Action Result	
			Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
610L (Fincastle 336S to Taber 83S)	85	94	107.1	126	82.5	97
658L (Cypress 562S to P2254 Tap)	121	133	134.5	111	116.7	97

**Category B Conditions**

The thermal and voltage criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 0-6.

**Table 0-6: Post-RAS Power Flow Study Results for Scenario 4**

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	94.4	111.1	15.0	17.6
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	139.9	115.6	7.9	6.5

## Engineering Connection Assessment: Study Results

P2254 Hilda Wind Power Project Connection

V1D1

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
610L (Taber 83S to Fincastle 336S)	100L (Tilley 498S to Suffield 895S)	78.0	86.0	80.9	103.7	32.9	42.1
	879L (Bowmanton 244S to 879AL Tap)	85.0	94.0	156.1	183.6	57.1	67.2
	658L (Cypress 562S to P2254 Tap)	121.0	133.0	172.8	142.8	32.3	26.7
100L (Suffield 895S to Tilley 498S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	145.6	120.3	75.5	62.4
892L (Suffield 895S to Bowmanton 244S)	658L (Cypress 562S to P2254 Tap)	121.0	133.0	139.9	115.6	68.8	56.9

## 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




## Hilda Wind Power Project Connection

Hilda Wind L.P.

**Date:** March 29, 2022

**Version:** V2

**Classification:** Public

Company Name	Name and Credentials	Date	Signature
Hardline Engineering Ltd.	James Howland, P. Eng.	2022-03-30	
AESO	Omid Ghoreishi, P. Eng.	March 29, 2022	
Hilda Wind L.P. / Renewable Energy Systems Canada Inc.	Patrick Henn, M.Sc.	March 30, 2022	



## Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Project Overview .....	1
1.2	Existing System Overview .....	2
1.2.1	<i>Study Area .....</i>	<i>2</i>
1.2.2	<i>Existing Constraints .....</i>	<i>2</i>
<b>2</b>	<b>Connection Alternative to be Studied .....</b>	<b>4</b>
2.1	Alternative 1 – T-tap connection to the 138 kV transmission line 658L.....	4
<b>3</b>	<b>Criteria, Standards and Requirements.....</b>	<b>6</b>
3.1	AESO Reliability Criteria .....	6
3.2	ISO Rules and Information Documents .....	7
<b>4</b>	<b>Scenarios and Assumptions .....</b>	<b>8</b>
4.1	Scenarios .....	8
4.2	Assumptions .....	8
4.2.1	<i>System Project Assumptions .....</i>	<i>8</i>
4.2.2	<i>Load Assumptions .....</i>	<i>9</i>
4.2.3	<i>Generation Assumptions .....</i>	<i>9</i>
4.2.4	<i>Inertie Flow Assumptions.....</i>	<i>15</i>
4.2.5	<i>HVDC Power Order Assumptions.....</i>	<i>15</i>
4.2.6	<i>Transmission Facility Ratings .....</i>	<i>16</i>
4.2.7	<i>Protection Fault Clearing Times.....</i>	<i>18</i>
4.2.8	<i>Project Dynamic Data .....</i>	<i>19</i>
4.2.9	<i>Voltage Profile Assumption.....</i>	<i>19</i>
<b>5</b>	<b>Study Methodology .....</b>	<b>21</b>
5.1	Power Flow Studies .....	21
5.1.1	<i>Contingencies to be Studied .....</i>	<i>21</i>
5.2	Transient Stability Studies .....	22
5.2.1	<i>Contingencies to be Studied .....</i>	<i>22</i>
5.3	Short-Circuit Current Level Studies .....	22
<b>6</b>	<b>Mitigation Measures.....</b>	<b>23</b>
6.1	Development.....	23
6.2	Evaluation .....	23
6.2.1	<i>Post-Mitigation Studies .....</i>	<i>23</i>
6.2.2	<i>Constraint Effective Factor Studies.....</i>	<i>23</i>
<b>7</b>	<b>Changes to Study Assumptions .....</b>	<b>24</b>

## Tables

Table 1-1: Project Load and Generation Details .....	1
Table 3-1: Post-Contingency Voltage Deviation Guidelines for Low Voltage Busses .....	7

Table 4-1: Connection Study Scenarios.....	8
Table 4-2: Planned Connection Projects Included in the Studies .....	8
Table 4-3: Forecast Load (at AESO South Planning Region Peak) .....	9
Table 4-4: Existing Generation (excluding Wind and Solar) Dispatch Conditions .....	10
Table 4-5: Dispatch Conditions for Existing and Under Construction Wind Generation Facilities.....	10
Table 4-6: Dispatch Conditions for Existing and Under Construction Solar Generation Facilities .....	12
Table 4-7: Dispatch Conditions for Planned Wind Generation Projects .....	12
Table 4-8: Dispatch Conditions for Planned Solar Generation Projects .....	13
Table 4-9: Intertie Flows by Scenario.....	15
Table 4-10: HVDC Power Order by Scenario .....	15
Table 4-11: HVDC to Adjacent AC System MVA Exchange Limits .....	15
Table 4-12: Thermal Rating Assumptions for Key Transmission Lines in the Study Area .....	16
Table 4-13: Summary of Key Transformer Ratings in the Study Area.....	17
Table 4-14: Summary of Key Shunt Elements in the Study Area .....	17
Table 4-15: Protection Fault Clearing Times.....	19
Table 5-1: Summary of the Studies to be Performed.....	21

## Figures

Figure 1-1: Transmission System in the Study Area.....	3
Figure 2-1: Connection Alternative 1 .....	5

## Attachments

Attachment A: Transmission Planning Criteria – Basis and Assumptions

# 1 Introduction

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

## 1.1 Project Overview

Hilda Wind L.P. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its approved Hilda Wind Power Project (Facility) to the AIES. The Facility includes an approved collector substation, designated as the Hilda 662S substation.

The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 100 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 1 MW; and a request for transmission development (collectively, the Project).

The Project in-service date (ISD) used for the purpose of the studies is August 31, 2022.

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, <i>Demand Transmission Service</i> , contract capacity	No existing contract
	Requested Rate DTS	1 MW
	Type	Station service
	Motors (number and size)	Not applicable
	Power factor	Not applicable
	Future load expansion plans	No
Generation	Generation type	Wind
	Existing Rate STS, <i>Supply Transmission Service</i> , contract capacity	No existing contract
	Requested Rate STS	100 MW
	Number and size of generating units	TBD
	Maximum authorized real power (MARP)	100 MW [include seasonal ratings as appropriate]
	Maximum capability (MC)	100 MW [include seasonal ratings as appropriate]
	Reactive power capability	32.87 MVar (0.95 pf absorbing)
48.43 MVar (0.9 pf producing)		

Project Component		Description
	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 Empress (Area 48).

The Study Area consists of the AESO planning areas of Brooks (Area 47), Empress (Area 48), Medicine Hat (Area 4), and Vauxhall (Area 52), including the tie lines connecting these planning areas to the rest of the AIES.

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

### 1.2.2 Existing Constraints

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

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

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

- RAS 27: 562S Cypress McNeil Power and Undervoltage Scheme
- RAS 28: 163S Amoco Empress Reverse Power and Undervoltage Scheme
- RAS 29: McNeil 840S Under Voltage Runback Scheme
- RAS 33: Cypress T562S Reverse Power and Undervoltage Scheme
- RAS 112: Cypress 562S - Power/Under & Over Frequency Scheme
- RAS 141: Tilley 498S voltage instability mitigation
- RAS 164: 1034L and 1035L Contingency Mitigation
- RAS 168: 172L-83S Overload Mitigation
- RAS 173: 880L-321S Overload Mitigation Scheme

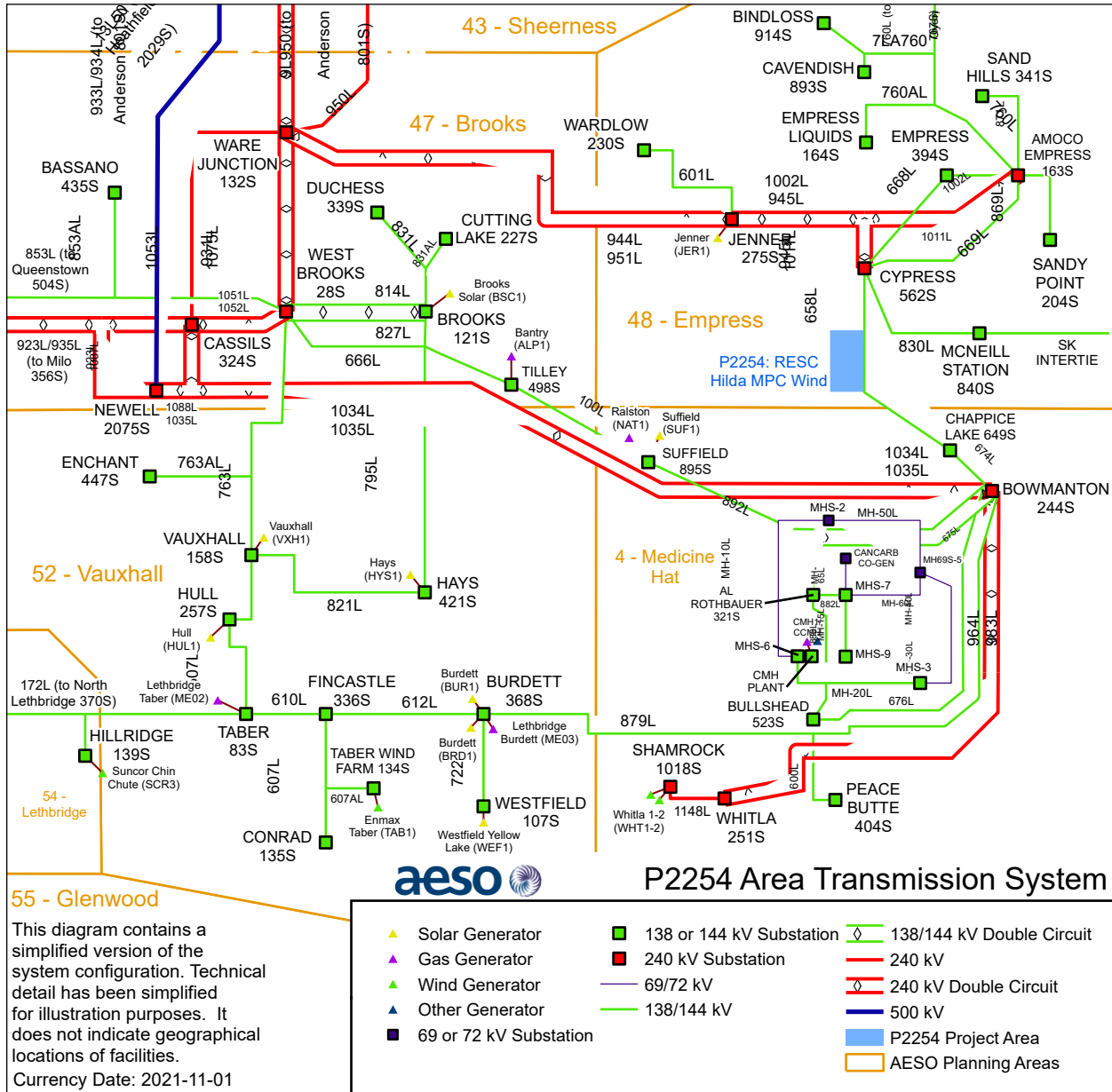
**Engineering Connection Assessment: Study Scope**

Hilda Wind Power Project Connection

V2



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



## **2 Connection Alternative to be Studied**

The following alternative will be studied:

### **2.1 Alternative 1 – T-tap connection to 138 kV transmission line 658L**

This alternative includes the following developments:

- Add one 138 kV circuit, approximately 500 m in length, to connect the Facility to the existing 138 kV transmission line 658L (Cypress 562S - Chappice Lake 649S) in a T-tap configuration;
- Add or modify associated equipment as required for the above transmission developments.

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



## 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. For the purpose of applying the TPL standards to the studies documented in this report, Applicable Ratings are defined as follows:

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



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

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

### 3.2 ISO Rules and Information Documents

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

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

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

## 4 Scenarios and Assumptions

### 4.1 Scenarios

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

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

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
<b>Pre-Project</b>					
1	2022 Summer Light (SL)	High Renewables	2022 SL Pre-Project	0	0
2	2022 Summer Peak (SP)	High Renewables	2022 SP Pre-Project	0	0
<b>Post-Project</b>					
3	2022 SL	High Renewables	2022 SL Post-Project	0	100
4	2022 SP	High Renewables	2022 SP Post-Project	0	100
5	2031 SP	All generation in the Study Area on	2031 SP Post-Project	0	100

Note: The 138 kV bus-tie breaker and switch at the Bowmanton 244S substation will be assumed to be open for all of the above scenarios.

### 4.2 Assumptions

#### 4.2.1 System Project Assumptions

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

#### 4.2.2 Connection Project Assumptions

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

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

AESO Project No.	AESO Project Name	AESO Planning Area	Generation (MW)	Load (MW)	Scheduled ISD	AUC decision No.
P1837	Fortis 498S Tilley DG PV	47-Brooks	21	0	Jan 7, 2022	Not applicable

AESO Project No.	AESO Project Name	AESO Planning Area	Generation (MW)	Load (MW)	Scheduled ISD	AUC decision No.
P2216	FortisAlberta Chappice Lake 649S DER Solar	4-Medicine Hat	11	0	Apr 15, 2022	Not applicable
P2362	Fortis Enchant 447S DER Solar	52-Vauxhall	22.0	0.0	Nov 30, 2021	Not applicable
P2363	Fortis Enchant 447S DER Solar	52-Vauxhall	18.0	0.0	Nov 30, 2021	Not applicable
P2364	Fortis Enchant 447S DER Solar	52-Vauxhall	9.0	0.0	Nov 30, 2021	Not applicable
P2365	Fortis Enchant 447S DER Solar	52-Vauxhall	23.0	0.0	Nov 30, 2021	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's *2021 Long-term Outlook (2021 LTO)*<sup>1</sup> with modifications to incorporate the latest forecast intelligence. For the post-Project studies, when the Study Area loads are modified to align with the regional load forecast, the active power to reactive power ratio in the base case scenarios shall be maintained.

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

AESO Planning Region Name	Forecast Peak Load by Year/Season (MW)	
	2022 SL	2022 SP
South Planning Region <sup>1</sup>	835	1,566

**Note:**

<sup>1</sup> The South Region comprises the following AESO planning areas: Medicine Hat (Area 4), Sheerness (Area 43), Seebe (Area 44), Strathmore/Blackie (Area 45), High River (Area 46), Brooks (Area 47), Empress (Area 48), Stavelly (Area 49), Vauxhall (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 2021 LTO with modifications to incorporate the latest forecast intelligence. The generation assumptions for the studies will assume high wind and solar generation conditions. Additional studies may be required in the event of changes to the AESO's corporate forecast.

<sup>1</sup> The 2021 LTO is available on the AESO website.

## Engineering Connection Assessment: Study Scope

Hilda Wind Power Project Connection

V2



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

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

Facility Name	Unit No.	Bus No.	MC (MW)	AESO Planning Area No.	Unit Net Generation <sup>a</sup> (MW) by Scenario	
					2024 SL	2024 SP
Lethbridge Taber (ME02)	2	3272	8	52	0	7
Lethbridge Burdett (ME03)	3	4269	7	52	0	7
Altogas Bantry (ALP1)	1	4275	7	47	0	5
Ralston (NAT1)	G1,G2,G3, G4,G5,G6, G7,G8,G9, GX	3270	25	4	0	17
Medicine Hat #1 (CMH1)		667, 683, 686, 687, 689, 712, 713, 1715	297	4	130	238

**Notes:**

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

Pre-Project dispatch levels for the existing and under construction wind and solar generation facilities are shown in Table 4-5 and Table 4-6.

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

Facility Name and Code	AESO Planning Area No.	Bus No.	MC (MW)	Unit Net Generation <sup>s</sup> (MW)	
				2022 SL	2022 SP
Ardenville Wind (ARD1)	53	4735, 4740	68	63	58
Bull Creek Phases 1 and 2 (Bul1 & BUL2)	37	550003, 550004	29.5	27	25
Blackspring Ridge (BSR1)	49	61736, 61737	300	276	255
Blue Trail Wind (BTR1)	53	66328, 67328	66	61	56
Castle River #1 (CR1)	53	2234, 3234	39	36	33
Castle Rock Ridge 2 (CRR2)	53	567221	30.6	27	25

## Engineering Connection Assessment: Study Scope

Hilda Wind Power Project Connection

V2



Facility Name and Code	AESO Planning Area No.	Bus No.	MC (MW)	Unit Net Generation <sup>a</sup> (MW)	
				2022 SL	2022 SP
Castle Rock Wind Farm (CRR1)	53	67221	77	71	65
Cowley Ridge (CRE3)	53	4264	20	18	17
Enmax Taber (TAB1)	52	15343, 16343	81	75	69
Ghost Pine (NEP1)	42	2621, 2622, 2623, 2624, 2625	82	75	70
Halkirk Wind Power Facility (HAL1)	42	66435, 67435	150	138	128
Kettles Hill (KHW1)	53	2402, 3402	63	58	54
McBride Lake Windfarm (AKE1)	53	2901, 3901, 4901	73	67	62
Old Man 2 Wind Farm 1 (OWF1)	53	61543	46	42	39
Rattlesnake Ridge Wind (RTL1)	4	60873	130	120	111
Riverview (RIV1)	53	69221	115	97	89
Soderglen Wind (GWW1)	53	12358, 13358	71	65	60
Summerview 1 (IEW1)	53	2338, 3338	66	61	56
Summerview 2 (IEW2)	53	4339, 5337	66	61	56
Suncor Chin Chute (SCR3)	54	2389	30	28	26
Suncor Magrath (SCR2)	53	11002	30	28	26
Whitla Wind Power Facility (WHT1)	4	60990	201.6	186	172
Whitla Wind Power Facility Phase 2	4	61990	97.2	89	82
Whitla Wind Power Facility Phase 3	4	64990	54	49	46
Windrise (WRW1)	53	567031	207	190	176
Wintering Hills (SCR4)	43	60789, 60791, 60793, 60846, 60848, 60850	88	81	75

**Note:**

<sup>a</sup> "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 wind and solar generation projects in the AESO South and Central planning regions that are included in the study scenarios.

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

Facility Name and Code	AESO Planning Area No.	Bus No.	MC (MW)	Unit Net Generation <sup>s</sup> (MW)	
				2022 SL	2022 SP
Burdett (BRD1)	52	2269	11	7.7	6
Burdett (BUR1)	52	557269	20	14	10
Brooks Solar (BSC1)	47	553257	15	0	8
Claresholm 1 (CLR1)	49	60894	58	0	29
Claresholm 2 (CLR2)	49	61894	75	0	38
Hays (HYS1)	52	554401	24	0	12
Hull (HUL1)	52	2401	24.5	0	13
Innisfail (INF1)	39	557120	22	0	11
Jenner (JER1)	48	554986	23	0	12
Suffield (SUF1)	4	3270	23	0	12
Vauxhall (VXH1)	52	4274	22	0	11
Westfield Yellow Lake (WEF1)	52	557277	19	13.3	10

**Note:**

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

Table 4-7 and Table 4-8 list the pre-Project dispatch levels for the planned wind and solar generation projects, respectively, in the AIES that are included in the study scenarios.

**Table 4-7: Dispatch Conditions for Planned Wind Generation Projects**

Facility Name and Code	Bus No.	Planned ISD	Planning Area No.	MC (MW)	Unit Net Generation <sup>s</sup> (MW)	
					2022 SL	2022 SP
P1892 Fortis Buffalo Atlee Cluster 3 WAGF	552260	Dec 1, 2021	47	17.3	16	15
P1853 Fortis Buffalo Atlee Cluster 1 WAGF	553260	Dec 1, 2021	47	17.3	16	15
P2199 Buffalo Atlee Wind Farm 2	557261	Dec 1, 2021	47	13.8	13	12
P1719 Stirling WAGF Project	61630	Nov 1, 2022	54	113	104	96
P2122 EDF Cypress Wind	560003	Nov 1, 2022	4	201.6	185	171
P1533 Joss MPC WAGF	60798, 60799	Jun 30, 2022	47	122	113	104

## Engineering Connection Assessment: Study Scope

Hilda Wind Power Project Connection

V2



Facility Name and Code	Bus No.	Planned ISD	Planning Area No.	MC (MW)	Unit Net Generation <sup>s</sup> (MW)	
					2022 SL	2022 SP
P1698 Joss Jenner WAGF - Phase 2	61798, 61799	Jun 30, 2022	47	71.4	66	61
P2234 Jenner Wind Phase 3		Jun 30, 2022	48	109.2	101	93
P1812 Suncor Forty Mile Granlea WAGF	61994, 62994	Nov 16, 2021	4	200	184	170
P1718 Wheatland WAGF Project	60632, 61632	Jun 30, 2022	43	120	110	102
P1909 TransAlta Garden Plain Wind	565002	Jul 1, 2022	42	130	120	110.5
P1898 Pattern Lanfine North Wind	60996	September 30, 2022	42	145	133	123

**Note:**

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

**Table 4-8: Dispatch Conditions for Planned Solar Generation Projects**

Facility Name and Code	Bus No.	Planned ISD	Planning Area No.	MC (MW)	Unit Net Generations (MW)	
					2022 SL	2022 SP
P2009 Greengate Travers MPC Solar & P2341 Travers Solar Phase 2	560026 561026 562026	Dec 10, 2021 & Apr 1, 2022	49	465	0	233
P1831 Fortis 255S Vulcan Faribault Farms DG PV	4244	May 24, 2021	49	22	0	11
P1850 Fortis Coaldale 254S DER Solar 3	554691	May 24, 2021	54	22	0	11
P1851 Fortis Monarch 492S DER Solar	2005	May 24, 2021	54	23.6	0	12
P1862 Fortis Spring Coulee 385S Solar DG	553246 554246	Oct 15, 2021	55	29.5	0	15
P1870 Fortis Stavely 349S DER Solar	2004	Feb 1, 2022	49	18.5	0	9
P1918 Fortis Alberta Conrad DER Solar 1	554291	Dec 21, 2021	52	23.4	16.4	12
P1932 Fortis Alberta Namaka DER Solar	552340	Sep 3, 2021	45	20.1	0	10
P1959 Fortis Alberta Conrad DER Solar 2	553291	Dec 21, 2021	52	22.5	15.8	12

## Engineering Connection Assessment: Study Scope

Hilda Wind Power Project Connection

V2



Facility Name and Code	Bus No.	Planned ISD	Planning Area No.	MC (MW)	Unit Net Generations (MW)	
					2022 SL	2022 SP
P2216 FortisAlberta Chappice Lake 649S DER Solar	557320	Apr 15, 2022	4	11	7.7	5.5
P2029 FortisAlberta Strathmore 151S DER Solar 1	557259	Nov 8, 2021	45	19.5	0	9
P2030 FortisAlberta Strathmore 151S DER Solar 2	558259	Nov 8, 2021	45	25	0	12
P2086 FortisAlberta Brooks 121S DER Solar (83L)	553256	Under review	47	12.5	0	6
P2092 FortisAlberta Brooks 121S DER Solar (257LE)	554257	Under review	47	14	0	7
P2195 FortisAlberta Bassano 435S DER Solar	557399	Feb 1, 2023	47	9.25	0	4.5
P2249 FortisAlberta Empress 394S DER Solar 1	558316	Nov 1, 2021	48	22	0	11
P2250 FortisAlberta Empress 394S DER Solar 2	558016	Nov 1, 2021	48	16	0	8
P2362 Fortis Enchant 447S DER Solar	993287	Nov 30, 2021	52	23	0	11.5
P2363 Fortis Enchant 447S DER Solar	993289	Nov 30, 2021	52	17.9	0	9
P2364 Fortis Enchant 447S DER Solar	994287	Nov 30, 2021	52	10	0	5
P2365 Fortis Enchant 447S DER Solar	994289	Nov 30, 2021	52	24	0	12
P2300 RESC Enterprise MPC Solar	563070	Aug 31, 2022	49	65	0	32.5

**Note:**

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

The post-Project scenario wind and solar generation dispatch levels are identical to the pre-Project scenario dispatch levels shown in Table 4-5 to Table 4-8. The Facility will be dispatched to 100 MW in all post-Project scenarios.



#### 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 4-9.

For the 2031 WP scenario, the intertie flow values should be set to the AESO planning base cases.

**Table 4-9: Intertie Flows by Scenario**

Scenario Number	Scenario Name	Import (-) / Export (+) by Intertie		
		AB-BC*	AB-SK	MATL
1,3,6, 8	2022 SL	527	-150	0
2, 4, 7, 9	2022 SP	-23	150	-300

\*Generation in Areas 40 and 25 will be scaled to achieve the desired AB-BC interchange.

#### 4.2.6 HVDC Power Order Assumptions

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

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

**Table 4-10: HVDC Power Order by Scenario**

Scenario Number	Scenario Name	WATL (MW)*	EATL (MW)*
1, 3	2022 SL Pre-Project and Post-Project	375 S→N	1000 S→N
2, 4	2022 SP Pre-Project and Post-Project	525 S→N	1000 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 4-11. These limits must be maintained when performing the studies.

**Table 4-11: 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 4-12 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 4-12: Thermal Rating Assumptions for Key Transmission Lines in the Study Area**

Line ID	Line Description	Voltage Class (kV)	Summer Normal Rating (MVA)	Summer Emergency Rating (MVA)
1087L	Cassils 324S - Newell 2075S	240	547	656
892L	Bowmanton 244S - Suffield 895S	138	80	88
666L	West Brooks 28S - Tilley 498S	138	120CT	133
100L	Tilley 498S - Suffield 895S	138	78	86
612L	Fincastle 336S - Suffield 895S	138	85	94
610L*	Taber 83S - Fincastle 336S	138	85	94
879L	Bowmanton 244S - Burdett 368S	138	85	94
658L	Chappice Lake 649S - Cypress 562S	138	121	133
668L	Cypress 562S - Empress 394S	138	121	133
669L	Cypress 562S - Amoco Empress 163S	138	177	195
674L	Bowmanton 244S - Chappice Lake 649S	138	121	133
507L	Hull 257S – Taber 83S	138	120	132
172L	Coaldale 254S - Taber 83S	138	119	131
763L	West Brooks 28S - Vauxhall 158S	138	120	132
763L	Vauxhall 158S - Hull 257S	138	120	132
763AL	Enchant 447S – Enchant 447S tap point	138	96	96
821L	Hays 421S - Vauxhall 158S	138	85	94
795L	Hays 421S - Brooks 121S	138	119	131
814L/827L	Brooks 121S - West Brooks 28S	138	167	184
1088L	Cassils 324S - Newell 2075S	240	931M	1024M
760AL	Empress Liquids 164S – 760AL Tap	138	99	109
760L/7L760	760AL Tap Point – 760AL Tap Point	138	110.2	122.7
760L	Amoco Empress 163S – 760AL Tap Point	138	120	132
760L	Empress 394S – Amoco Empress 163S	138	119	131
944L	Jenner 275S – Ware Junction 132S	240	550	660

## Engineering Connection Assessment: Study Scope

Hilda Wind Power Project Connection

V2



Line ID	Line Description	Voltage Class (kV)	Summer Normal Rating (MVA)	Summer Emergency Rating (MVA)
951L	Jenner 275S – Ware Junction 132S	240	550	654M
1002L	Jenner 275S – Amoco Empress 163S	240	333	499
945L	Jenner 275S – Cypress 562S	240	550	660
1011L	Cypress 562S – Amoco Empress 163S	240	333	499

### Note:

\* P7075 is a system project which will increase the rating of transmission line 610L to 173MVA. This system project likely will not be completed by the time P2254 is energized. The higher rating is assumed in the studies for CAT B studies so that generation curtailment is not simulated, so the system remains reasonably stressed to find any violations.

“CT” indicates that the transmission line is limited by current transformer.

“M” indicates that the transmission line rating is limited for reasons other than protection equipment, transformer, current transformer, line, ganged switch, circuit breaker, or regulator.

The TFO provided the details of the substation transformers in the Study Area. The key transformers in the Study Area are shown in Table 4-13.

**Table 4-13: Summary of Key Transformer Ratings in the Study Area**

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	Transformer Rating (MVA)
Westbrooks 28S	T1	240/138 kV	400
	T2	240/138 kV	400
Bowmanton 244S	T1	240/138 kV	200
	T2	240/138 kV	200
Amoco Empress 163S	T5	240/138 kV	191.2
Cypress 562S	T1	240/138 kV	200
	T2	240/138 kV	200

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 4-14.

**Table 4-14: 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)
Taber 83S	138	1	24.46	-	-
		1	27.2		

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)
Hays 421S	138	1	22.96	-	-
Burdett 368S	138	1	24.46	-	-
		1	22.96		
Tilley 498S	138	1	27.17	-	-
West Brooks 28S	240	-	-	1	50
Whitla 251S	240	-	-	2	150
McNeil 840S	138	2	49.6	-	-
Bullshead 523S	138	1	18.3	-	-
Amoco Empress 163S	138	2	48.7		

#### 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 4-15. Only those contingencies shown in Table 4-15 will be studied for transient stability studies. If the TFO did not specify the fault clearing times (e.g. for new transmission lines) for a selected contingency, then the studies for that contingency will be performed using the standard fault clearing times that are specified in Table 2-3 of the AESO's *Transmission Planning Criteria – Basis and Assumptions*.

**Table 4-15: Protection Fault Clearing Times**

Contingency (System Element Lost)	Fault Location	Clearing Times (Cycles)	
		Near End	Far End
945L (Jenner 275S – Cypress 562S)	Jenner 275S	5.5	6.5
	Cypress 562S	5	6
1002L (Jenner 275S – Amoco Empress 163S)	Jenner 275S	5	6
	Amoco Empress 163S	5	6
1011L (Cypress 562S – Amoco Empress 163S)	Cypress 562S	6	6
	Amoco Empress 163S	6	6
668L (Empress 394S – Cypress 562S)	Empress 394S	9	30
	Cypress 562S	9	30
669L (Amoco Empress 163S – Cypress 562S)	Amoco Empress 163S	9	30
	Cypress 562S	9	30
830L (Cypress 562S – Mcneill Station 840S)	Cypress 562S	9	30
	Mcneill Station 840S	9	30
760L (Empress 394S – Amoco Empress 163S)	Empress 394S	9	30
	Amoco Empress 163S	9	30
892L (Suffield 895S – Bowmanton 244S)	Suffield 895S	6	27
	Bowmanton 244S	6	27
658L (Chappice Lake 649S – Cypress 562S)	Chappice Lake 649S	6	27
	Cypress 562S	6	27
674L (Chappice Lake 649S – Bowmanton 244S)	Chappice Lake 649S	6	27
	Bowmanton 244S	6	27
100L (Tilley 498S - Suffield 895S)	Tilley 498S	9	30
	Suffield 895S	9	30
879L (Burdett 368S – Bowmanton 244S)	Burdett 368S	6	27
	Bowmanton 244S	6	27

#### 4.2.9 Project Dynamic Data

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

#### 4.2.10 Voltage Profile Assumption

ID #2010-007RS will be used to establish system normal (i.e., pre-contingency) voltage profiles for key area busses prior to commencing any studies. Table 2-1 of the *Transmission Planning Criteria – Basis and*

**Engineering Connection Assessment: Study Scope**

Hilda Wind Power Project Connection

V2



*Assumptions* applies for the busses not included in ID #2010-007RS. These voltages will be used to set the voltage profile for the study base cases prior to the power flow studies.

## 5 Study Methodology

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

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

Scenario No. and Name		Power Flow			Voltage Stability			Transient Stability			Short Circuit
		Category			Category			Category			Category A
		A	B	C5	A	B	C5	A	B	C5	
<b>Post-Project</b>											
1	2022 SL	X	X								
2	2022 SP	X	X								X
<b>Post-Project</b>											
3	2022 SL	X	X					X	X		
4	2022 SP	X	X					X	X		X
5	2031 SP										X

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

### 5.1 Power Flow Studies

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

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

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

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

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

#### 5.1.1 Contingencies to be Studied

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

## 5.2 Transient Stability Studies

The Keephills generating Unit 3 in Wabamun planning area (Area 40) will be used as the reference for the studies.

The report presenting the results of the transient stability studies must provide response plots for several variables as applicable, including rotor angle, and active and reactive power output for the Sheerness#1 Power Plant and other generators in the vicinity of the Project. The results report must also provide the 500 kV, 240 kV and 138 kV bus voltage levels for substations near the point of connection. Other busses will be monitored and will be reported as determined by the results. The results report must also provide the key branch active and reactive power flow surrounding the Facility.

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

### 5.2.1 Contingencies to be Studied

Transient stability studies will be performed for the contingencies shown in Table 4-15

## 5.3 Short-Circuit Current Level Studies

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

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

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

- Amoco Empress 163S 240 kV and 138 kV buses
- Cypress 562S 240 kV and 138 kV buses
- Jenner 275S 240 kV bus
- Empress 394S 138 kV bus
- Chappice Lake 649S 138 kV bus
- McNeill Station 840S 138 kV bus
- Hilda 662S 138 kV bus

Further sensitivity studies, in consultation with the TFO, may be required if the primary short-circuit analysis indicates a potential to exceed or approach the existing fault rating of the transmission facilities. The scenarios to be studied are as shown in Table 5-1.



## 6 Mitigation Measures

### 6.1 Development

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

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

- Develop tables showing the constraint effective factors<sup>2</sup> for generation or load based on thermal criteria violations that are observed.
- Collaborate with the AESO to propose changes, if any, to the connection alternatives that could remove the requirement for a RAS.
- Collaborate with the AESO to study modifications to existing and/or planned RASs, proposed by the AESO, to ensure the coordination of existing protection schemes with the addition of any proposed protection schemes.
- Collaborate with the AESO to identify and study new RASs, if any, that may be required to ensure system reliability is maintained after connecting the Project to the AES.

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

### 6.2 Evaluation

#### 6.2.1 Post-Mitigation Studies

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

#### 6.2.2 Constraint Effective Factor Studies

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

---

<sup>2</sup> Constraint effective factor studies are performed to determine the generator- and load- constraint effective factors. Constraint effective factors are used to estimate the ability of generators and loads to manage transmission constraints. A generator's or load's constraint effective factor is defined as the change in power flow over a specific transmission line following a change in the generator's energy production or in the load's energy consumption. The greater the constraint effective factor, the more effective a generator or load can be in managing a thermal criteria violation on the specific transmission line.

## **7 Changes to Study Assumptions**

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

# Attachment A: Transmission Planning Criteria – Basis and Assumptions

# Transmission Planning Criteria – Basis and Assumptions

**Date:** July 9, 2019

**Version:** V1.2

## 1. Introduction

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

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

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

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

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

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

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

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

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

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

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

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

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

---

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

## 2.1 Thermal Loading Criteria

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

## 2.2 Voltage Range and Voltage Stability Criteria

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

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

Nominal Voltage	Extreme Minimum	Normal Minimum	Normal Maximum	Extreme Maximum
500	475	500	525	550
240	216	234	252	264
260 (Northeast & Northwest)*	234	247	266	275
144	130	137	151	155
138	124	135	145	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 or No Fault DC Disturbance	MW Margin (P-V method) (5)(6)(7)	MVAr Margin (V-Q method) (6)(7)
A	Any element such as: One Generator One Circuit One Transformer One Reactive Power Source One DC Monopole	$\geq 5\%$	Worst Case Scenario(8)
B	Bus Section	$\geq 5\%$	50% of Margin Requirement in Level A
C	Any combination of two elements such as: A Line and a Generator A Line and a Reactive Power Source Two Generators Two Circuits Two Transformers Two Reactive Power Sources DC Bipole	$\geq 2.5\%$	50% of Margin Requirement in Level A
D	Any combination of three or more elements such as: Three or More Circuits on ROW Entire Substation Entire Plant Including Switchyard	$> 0$	$> 0$

## 2.3 Transient Stability Analysis Assumptions

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

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

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

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

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

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

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

# Attachment A2

## Pre-Project Power Flow Diagrams







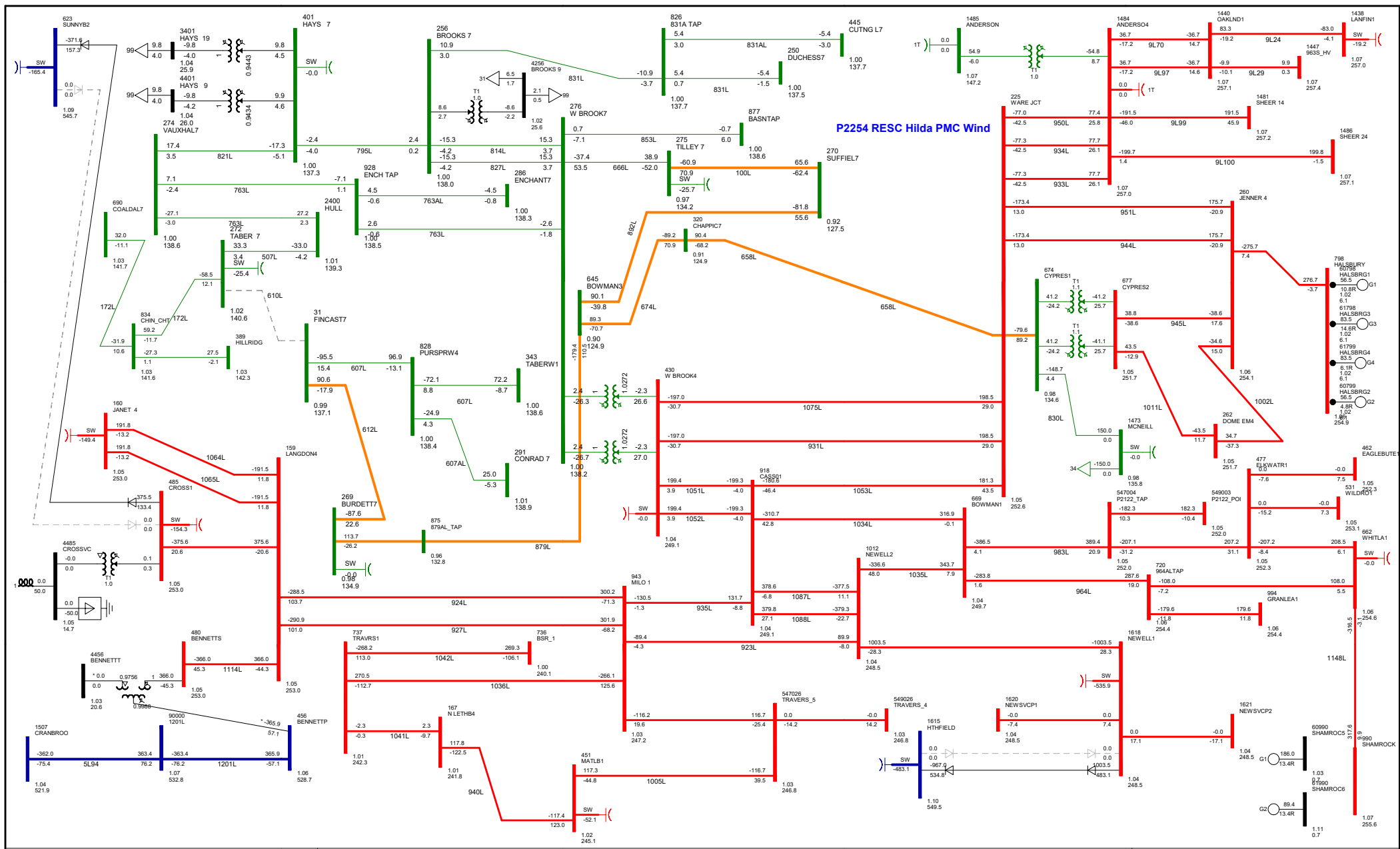


FIGURE A2.1-3 N-1: 610L (TABER 83S - FINCASTLE 336S)  
 2022 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

BC Import: -463.0 MW Sask Import: 150.0 MW MATL Import: 0.0 MW  
 MH Export: -1.9 MW

Bus - Voltage (kV) (p.u.)  
 Branch - MW (MW) (p.u.)  
 Equipment - MW (MW) (p.u.)  
 MW <= 0.000 <= 0.000 <= 138.000 <= 240.000 <= 500.000 <= 500.000

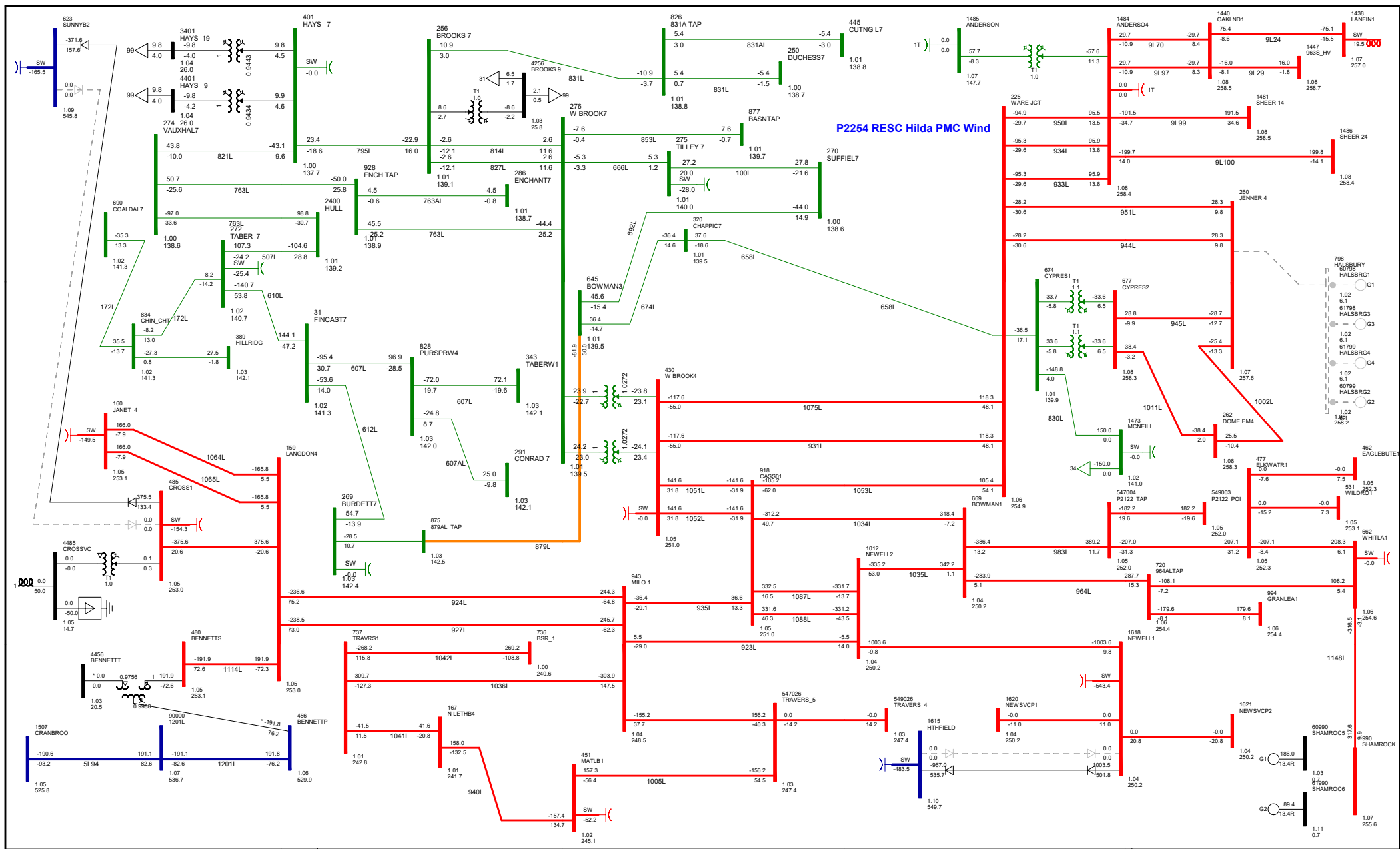


FIGURE A2.1-4 N-1: 949L (JENNER 275S - HALSBURY 306S)  
 2022 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kVp)  
 Branch - MW/Bus  
 Equipment - MW/Bus  
 115000 0.95000  
 MW <=45.000 <=138.000 <=240.000 <=500.000 <=500.000

BC Import: -273.9 MW Sask Import: 150.0 MW MATL Import: 0.0 MW  
 MH Export: -1.9 MW

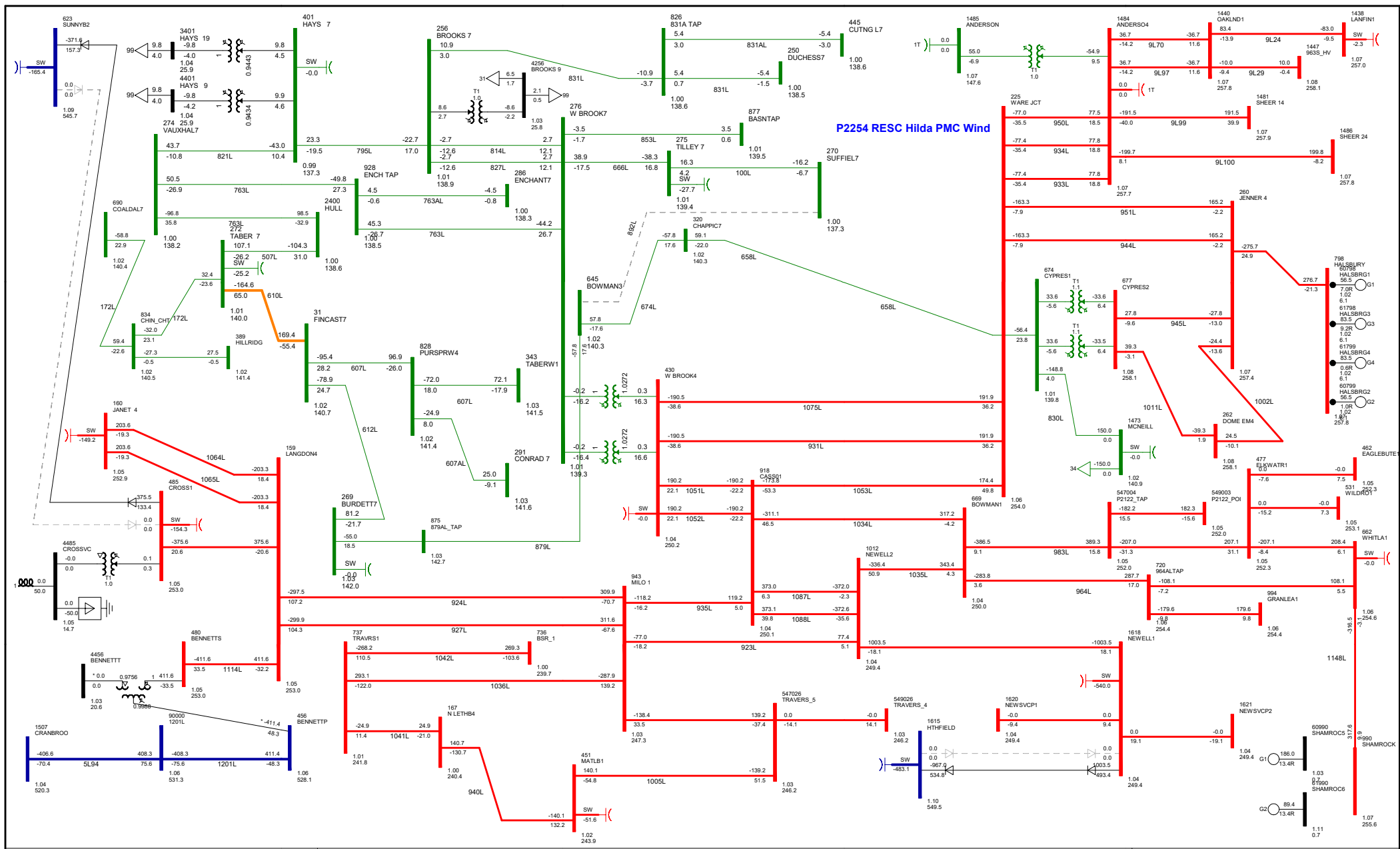
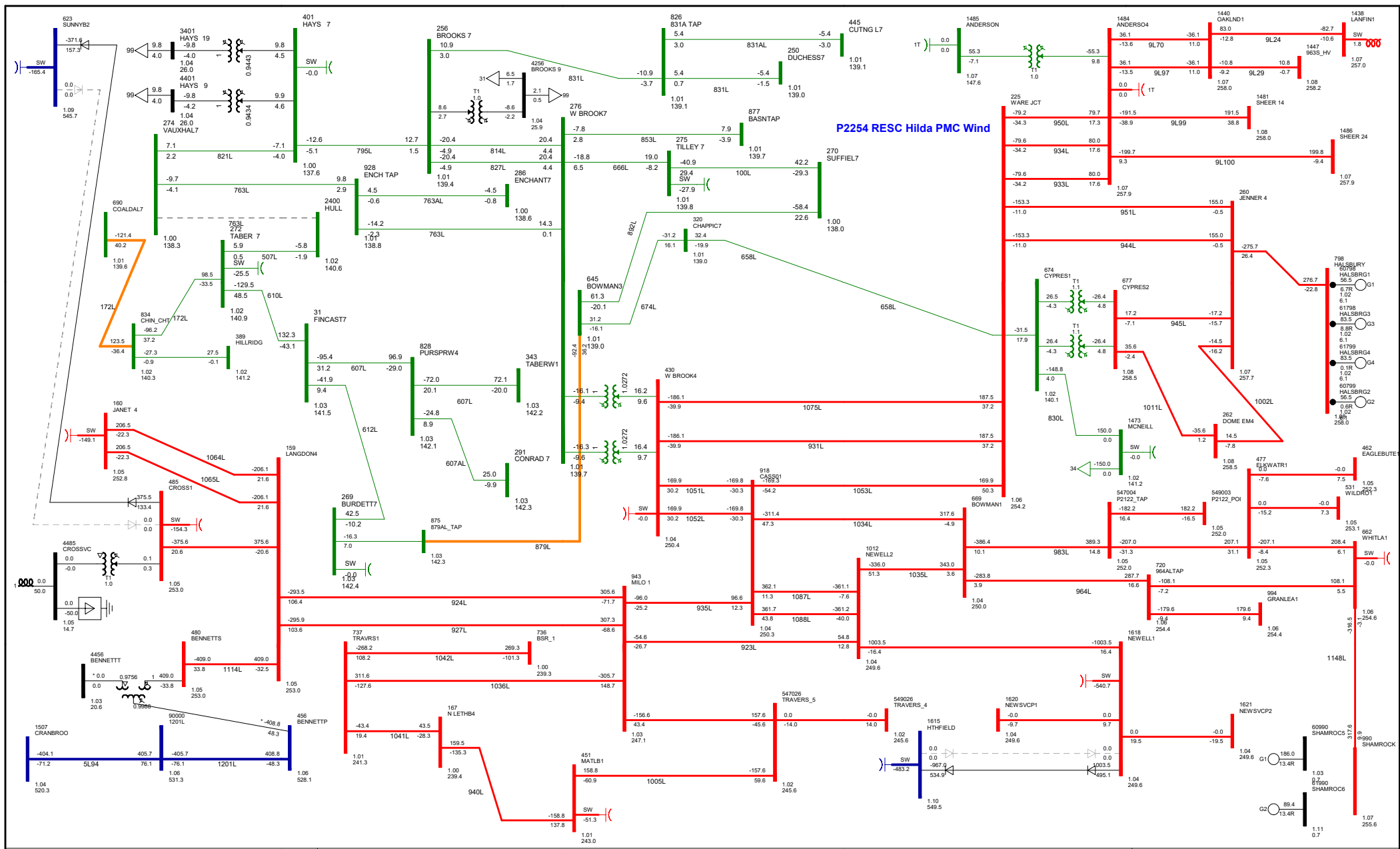


FIGURE A2.1-5 N-1: 892L (SUFFIELD 895S - BOWMANTON 244S)  
 2022 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p)  
 Branch - MW (w)  
 Equipment - MW (w)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import: -513.4 MW Sask Import: 150.0 MW MATL Import: -0.0 MW  
 MH Export: -1.9 MW





P2254 RESC Hilda PMC Wind

BC Import:-511.3 MW Sask Import:150.0 MW MATL Import:0.0 MW  
MH Export:-1.9 MW

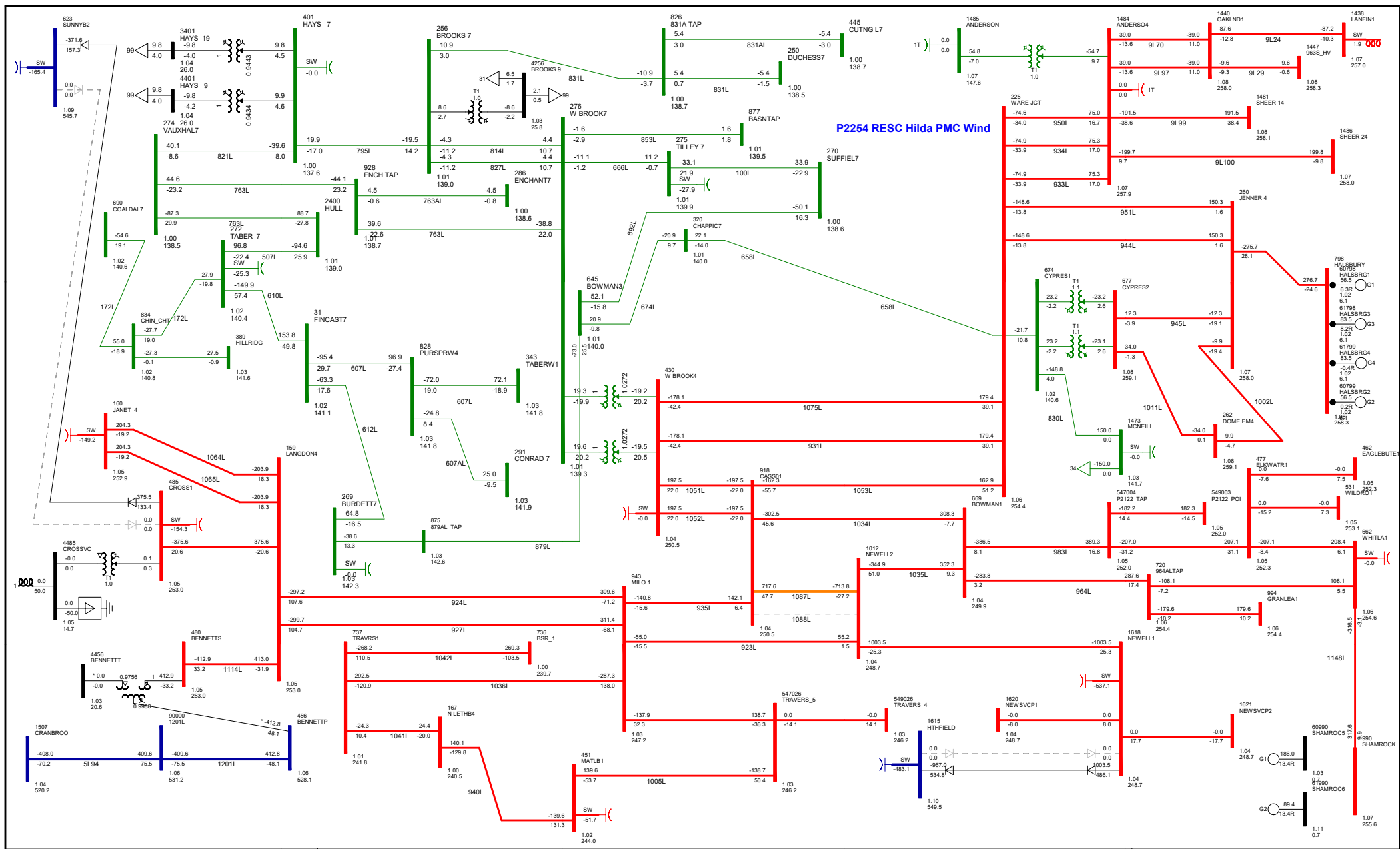
FIGURE A2.1-7 N-1: 763L (VAUXHALL 158S - HULL 257S)  
2022 SUMMER LIGHT (PRE-CONNECTION)  
PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kVp)  
Branch - MW/Bus  
Equipment - MW/Bus  
115000 0.0000  
115000 0.0000  
115000 0.0000  
115000 0.0000









BC Import:-514.9 MW Sask Import:150.0 MW MATL Import:0.0 MW  
 MH Export:-1.9 MW

**FIGURE A2.1-10 N-1: 1088L (CASSIS 324S – NEWELL 2075S)  
 2022 SUMMER LIGHT (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022**

Bus - Voltage (V/ps)  
 Branch - MW/ps  
 Equipment - MW/ps  
 115000.00000  
 115000.00000  
 115000.00000  
 115000.00000







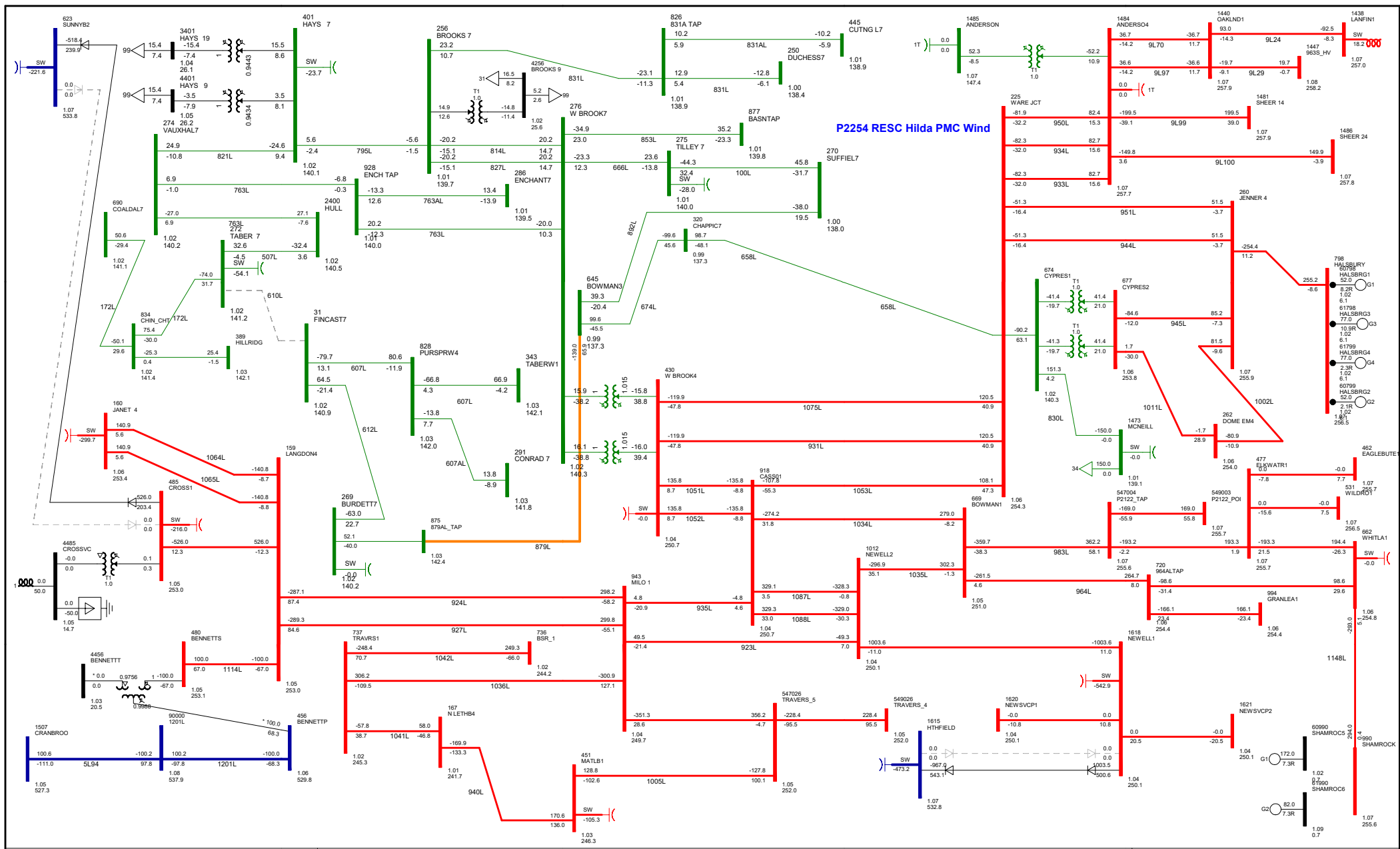


FIGURE A2.2-3 N-1: 610L (TABER 83S - FINCASTLE 336S)  
 2022 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kV)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 MW <= 50.000 <= 100.000 <= 150.000 <= 200.000 <= 250.000 <= 300.000

BC Import: 47.0 MW  
 Sask Import: -150.0 MW  
 MATL Import: 308.5 MW  
 MH Export: -14.9 MW









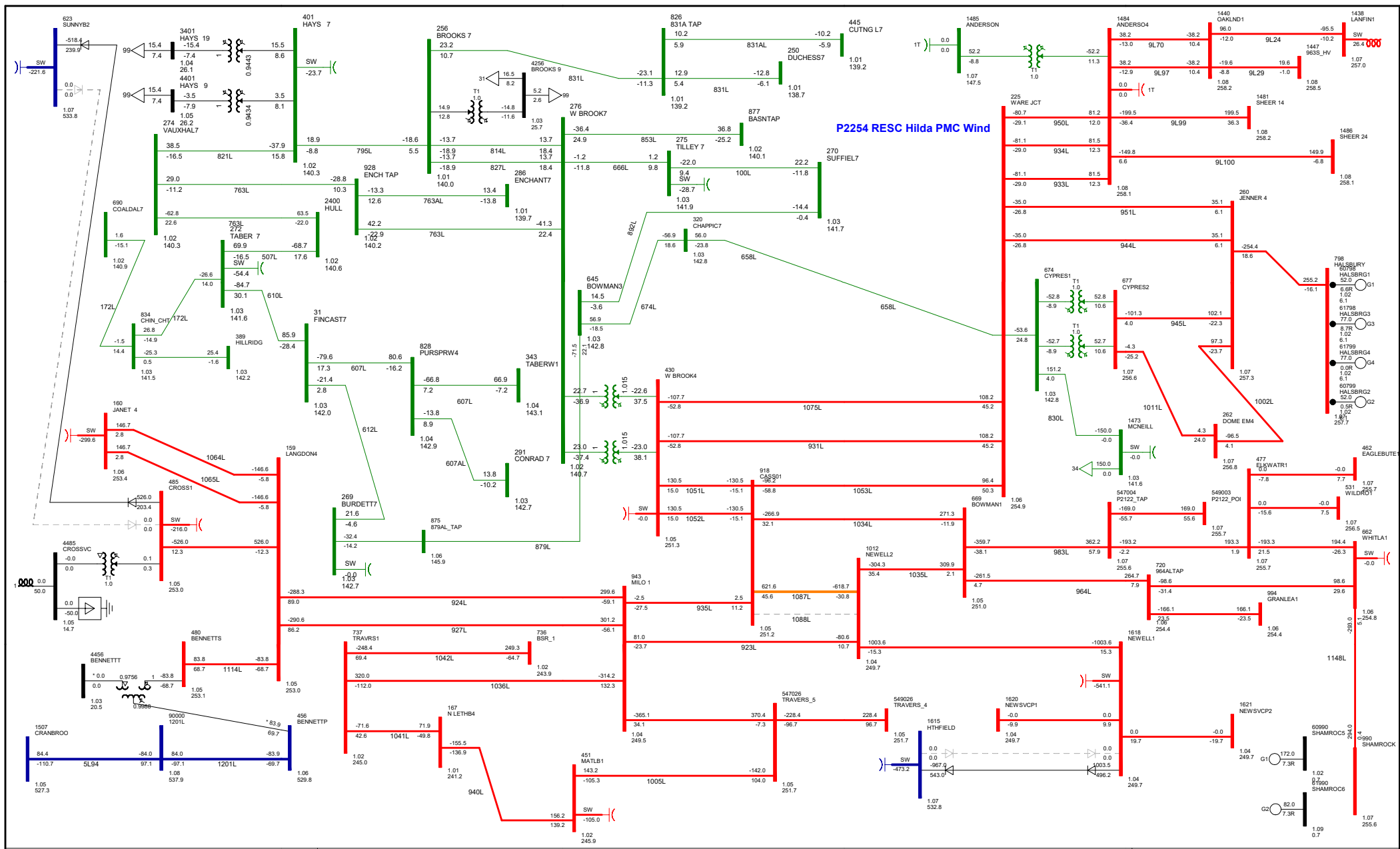


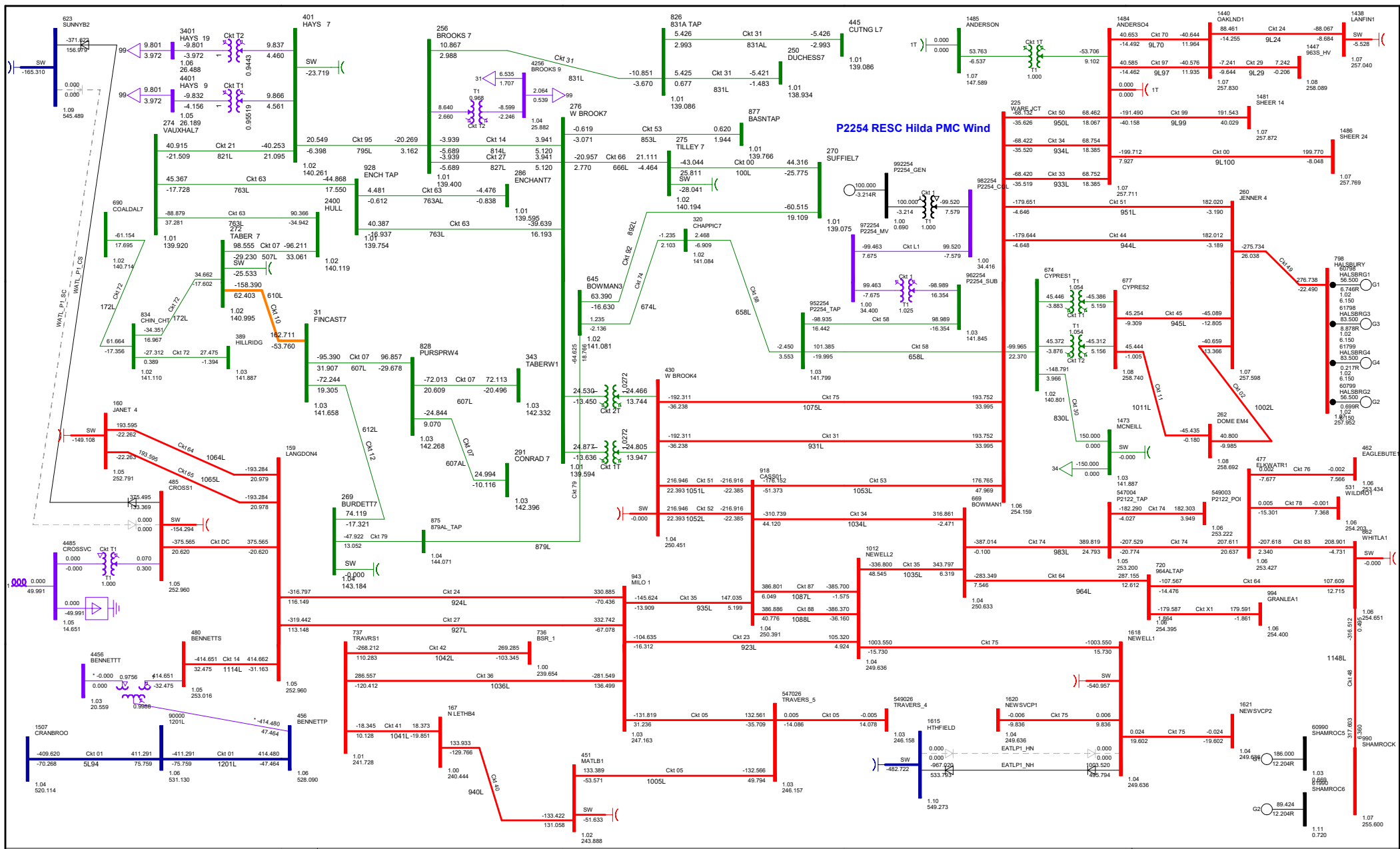
FIGURE A2.2-7 N-1: 1088L (CASSILS 324S – NEWELL 2075S)  
 2022 SUMMER PEAK (PRE-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kV) (Wpp)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 MW <= 50.000 <= 100.000 <= 150.000 <= 200.000 <= 250.000 <= 300.000

BC Import: 28.2 MW    Sask Import: -150.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

# Attachment A3

## Post-Project Power Flow Diagrams



**P2254 RESC Hilda PMC Wind**

BC Import: -517.129 MW Sask Import: 150.000 MW MATL Import: -0.000 MW  
 MH Export: -1.867 MW

**FIGURE A3.1-1-N-0: NORMAL OPERATION  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022**

Bus - Voltage (kV) (p.u.)  
 Branch - MW (MW)  
 Equipment - MW (MW)  
 1.0000 0.9999  
 1.0000 0.9999  
 1.0000 0.9999  
 1.0000 0.9999

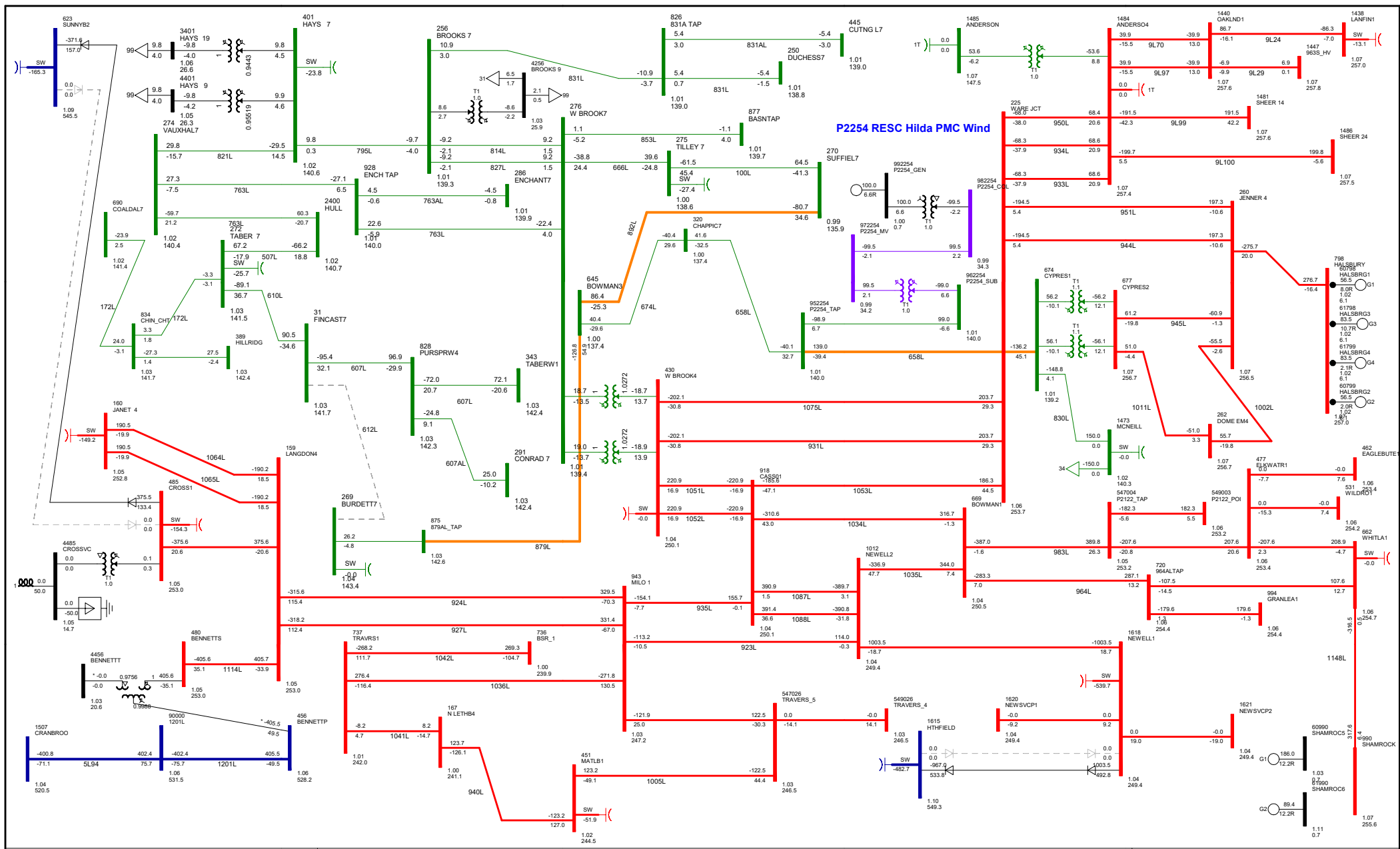


FIGURE A3.1-2 N-1: 612L (BURDETT 268S - FINCASTLE 336S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

BC Import:507.0 MW Sask Import:150.0 MW MATL Import:0.0 MW  
 MH Export: -1.9 MW

Bus - Voltage (V) (p.u.)  
 Branch - MW (MW)  
 Equipment - MW (MW)  
 115000.0 50000.0  
 115000.0 50000.0  
 115000.0 50000.0  
 115000.0 50000.0



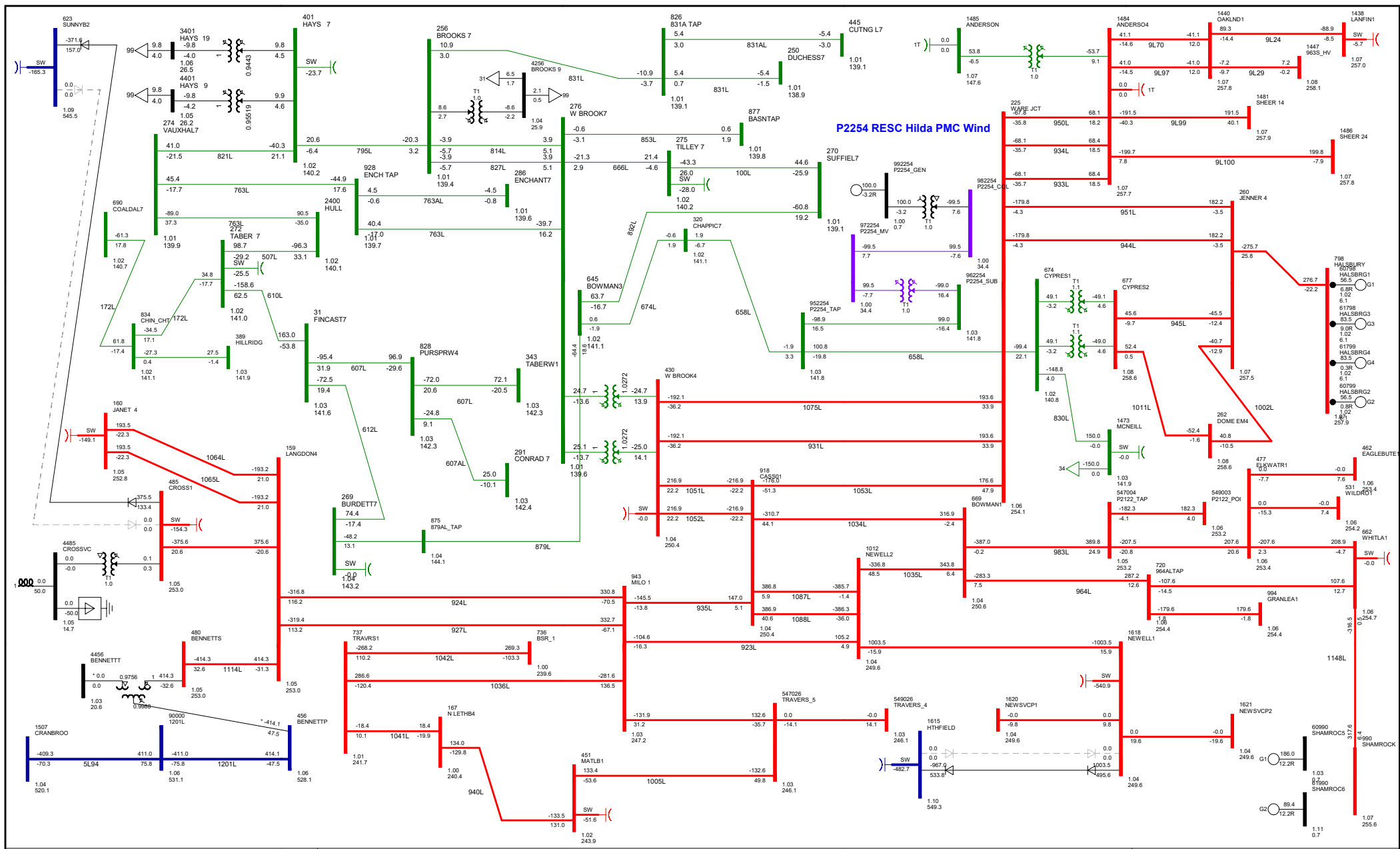


FIGURE A3.1-4 N-1: 669L (CYPRESS 562S - AMOCO EMPRESS 163S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

BC Import:-516.8 MW Sask Import:150.0 MW MATL Import:0.0 MW  
 MH Export:-1.9 MW

Bus - Voltage (kVp)  
 Branch - MW/Bus  
 Equipment - MW/Bus  
 115000 0.9600  
 49 <= 0.00 <= 0.00 <= 133.00 <= 240.00 <= 500.00 <= 500.00







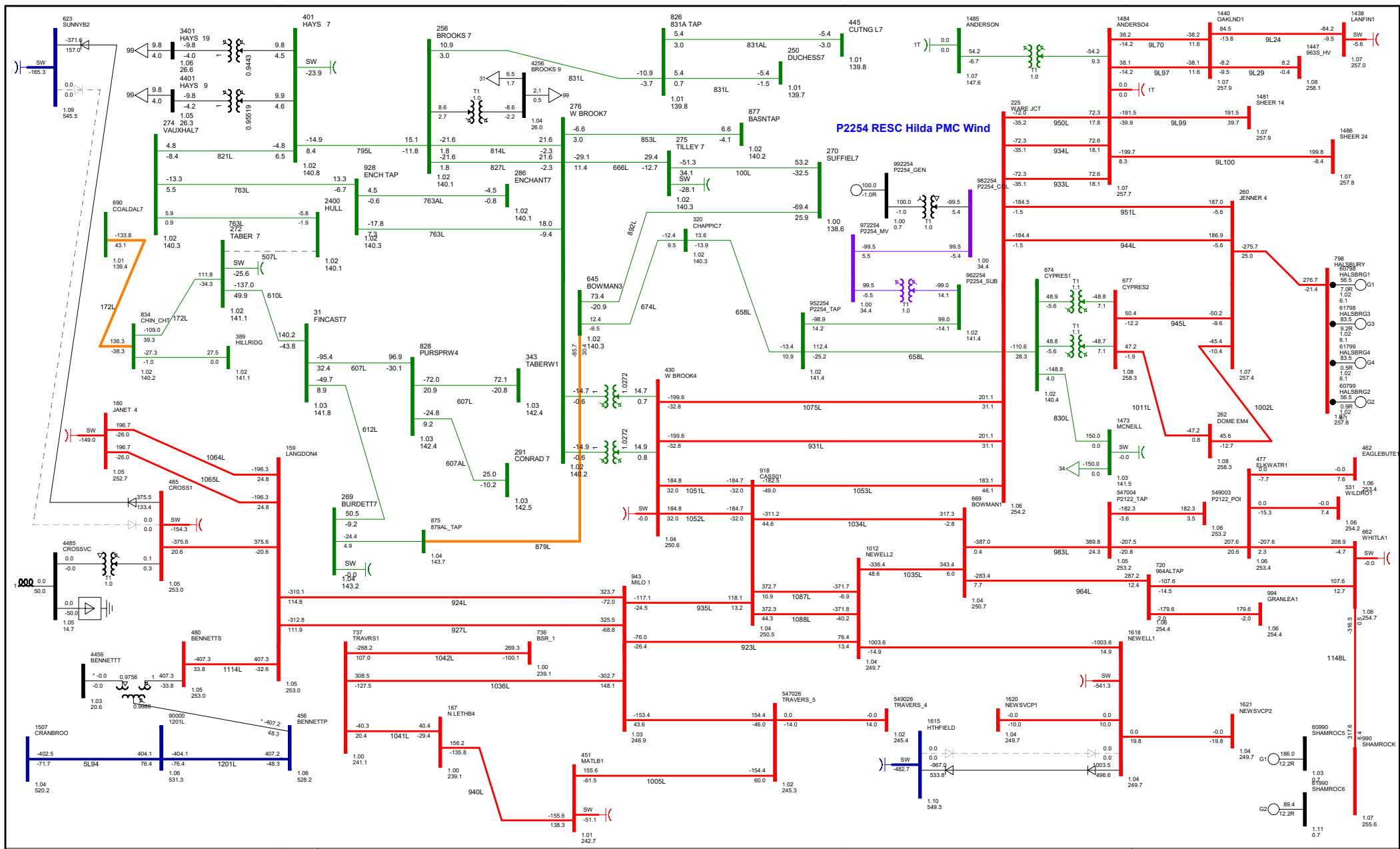


FIGURE A3.1-7 N-1: 507L (TABER 83S - HULL 257S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kVp)  
 Branch - MW/Max  
 Equipment - MW/Max  
 115000 0.9600V  
 400 <=50.000+100.000+130.000+240.000+500.000+500.000

BC Import-510.0 MW Sask Import-150.0 MW MATL Import-0.0 MW  
 MH Export-1.9 MW

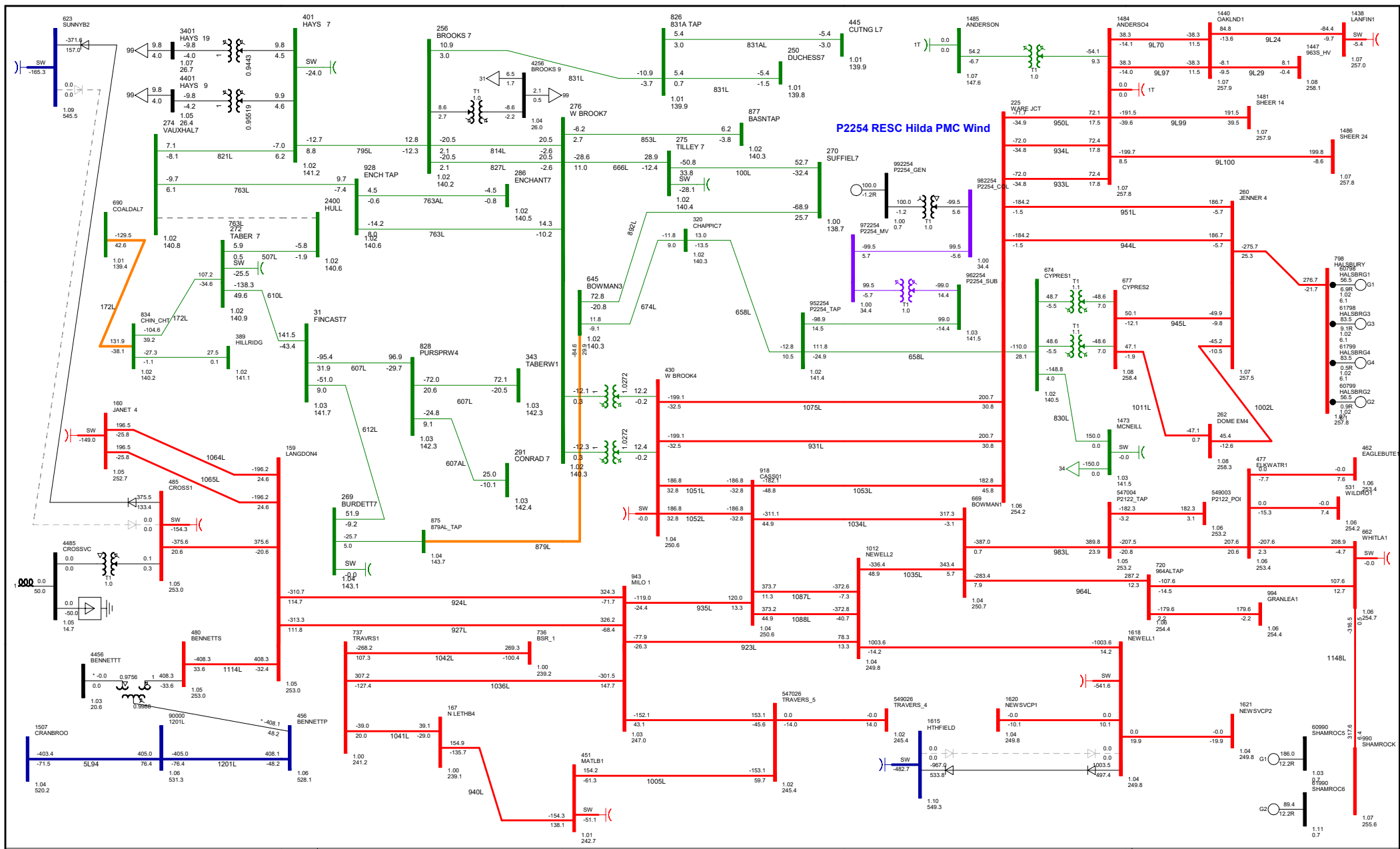


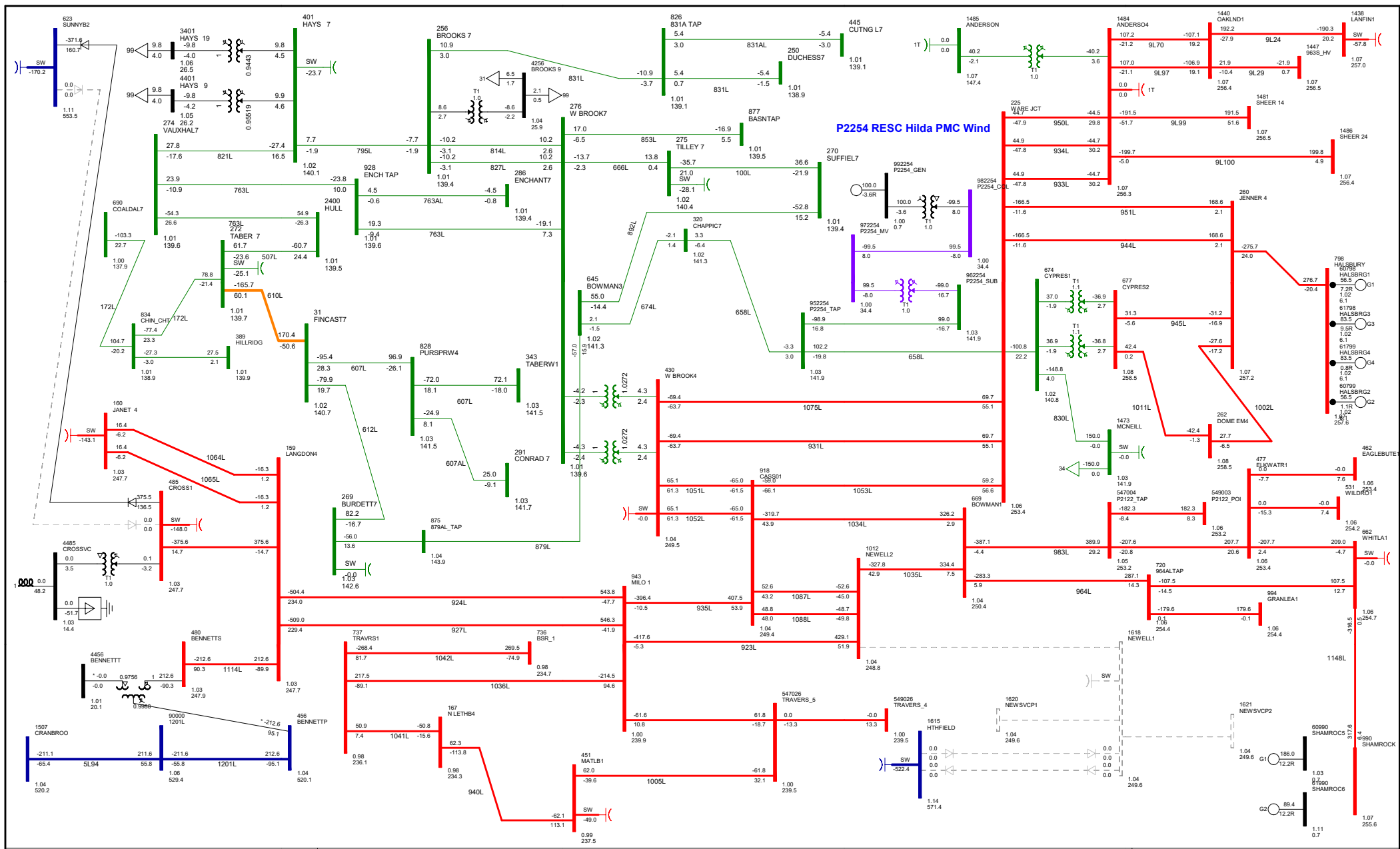
FIGURE A3.1-8 N-1: 763L (VAUXHALL 158S - HULL 257S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p) (m)  
 Branch - MW (m) (p)  
 Equipment - MW (m) (p)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import-511.0 MW Sask Import:150.0 MW MATL Import-0.0 MW  
 MH Export: -1.9 MW







P2254 RESC Hilda PMC Wind

BC Import:-302.8 MW Sask Import:150.0 MW MATL Import:-0.0 MW  
MH Export:-1.9 MW

FIGURE A3.1-11 N-1: EATL  
2022 SUMMER LIGHT (POST-CONNECTION)  
PRINTED ON SUNDAY 20. MARCH 2022

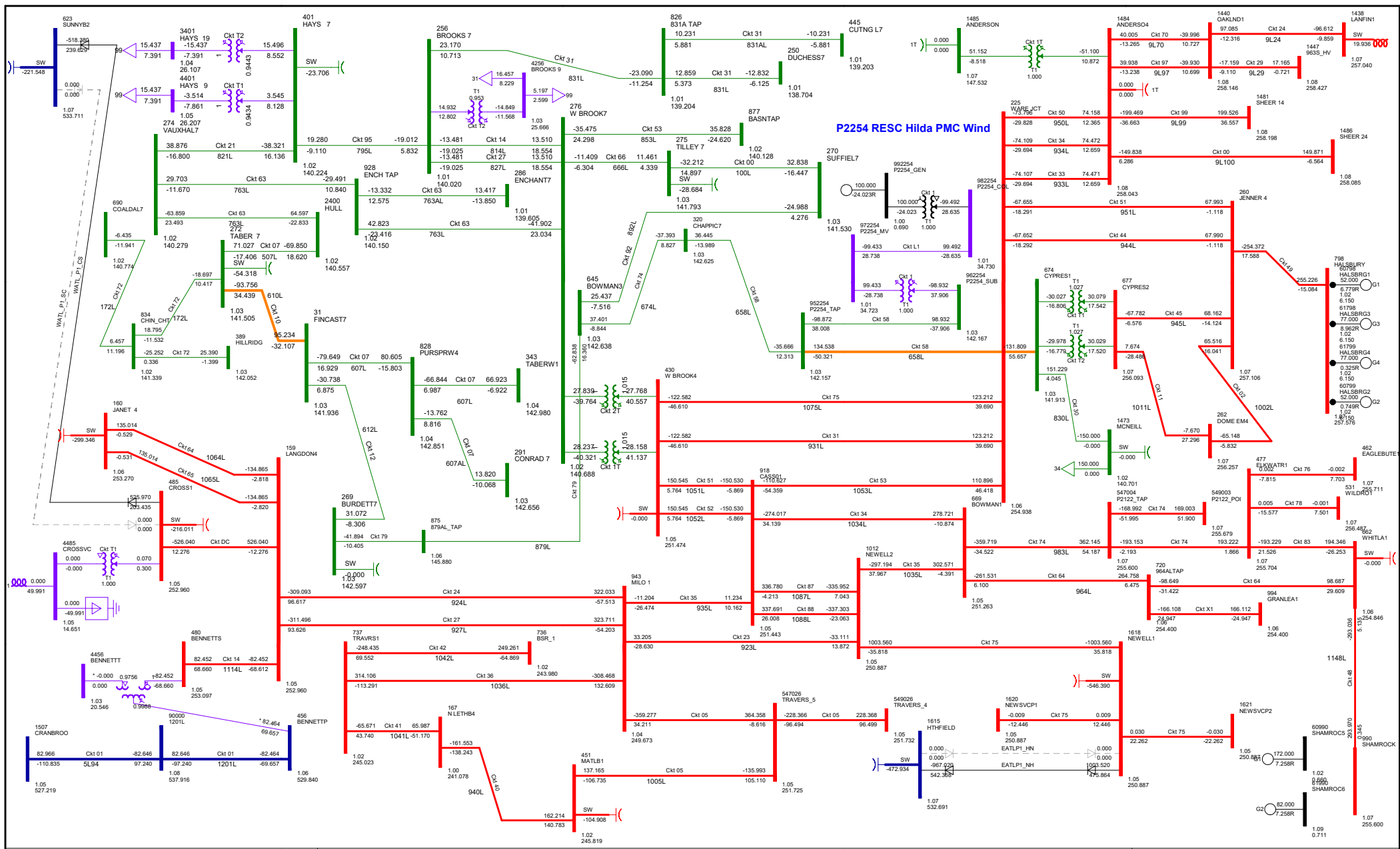
Bus - Voltage (kV) (p) (m)  
Branch - MW (m)  
Equipment - MW (m)  
115000 0.0000  
115000 0.0000  
115000 0.0000  
115000 0.0000











BC Import:26.109 MW Sask Import:-150.000 MWMATL Import:308.487 MW  
 MH Export:-14.943 MW

**FIGURE A3.2-1-N-0: NORMAL OPERATION  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022**

Bus - Voltage (kVpp)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 11500 0.0000  
 11500 0.0000  
 11500 0.0000  
 11500 0.0000

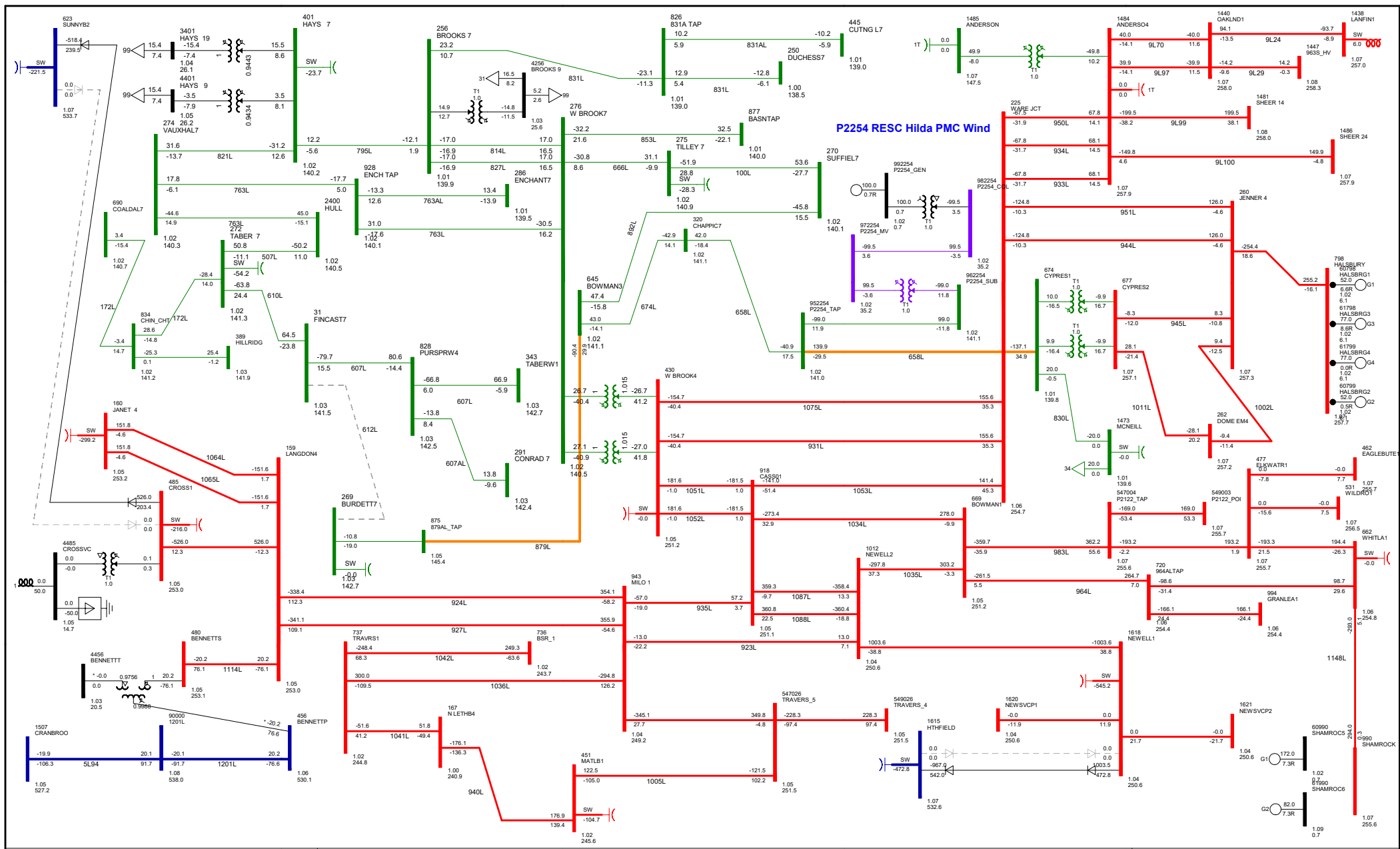


FIGURE A3.2-2 N-1: 612L (BURDETT 268S - FINCASTLE 336S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p.u.)  
 Branch - MW (MW)  
 Equipment - MW (MW)  
 115000.0 50000.0  
 115000.0 50000.0  
 115000.0 50000.0

BC Import: -87.8 MW    Sask Import: -20.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

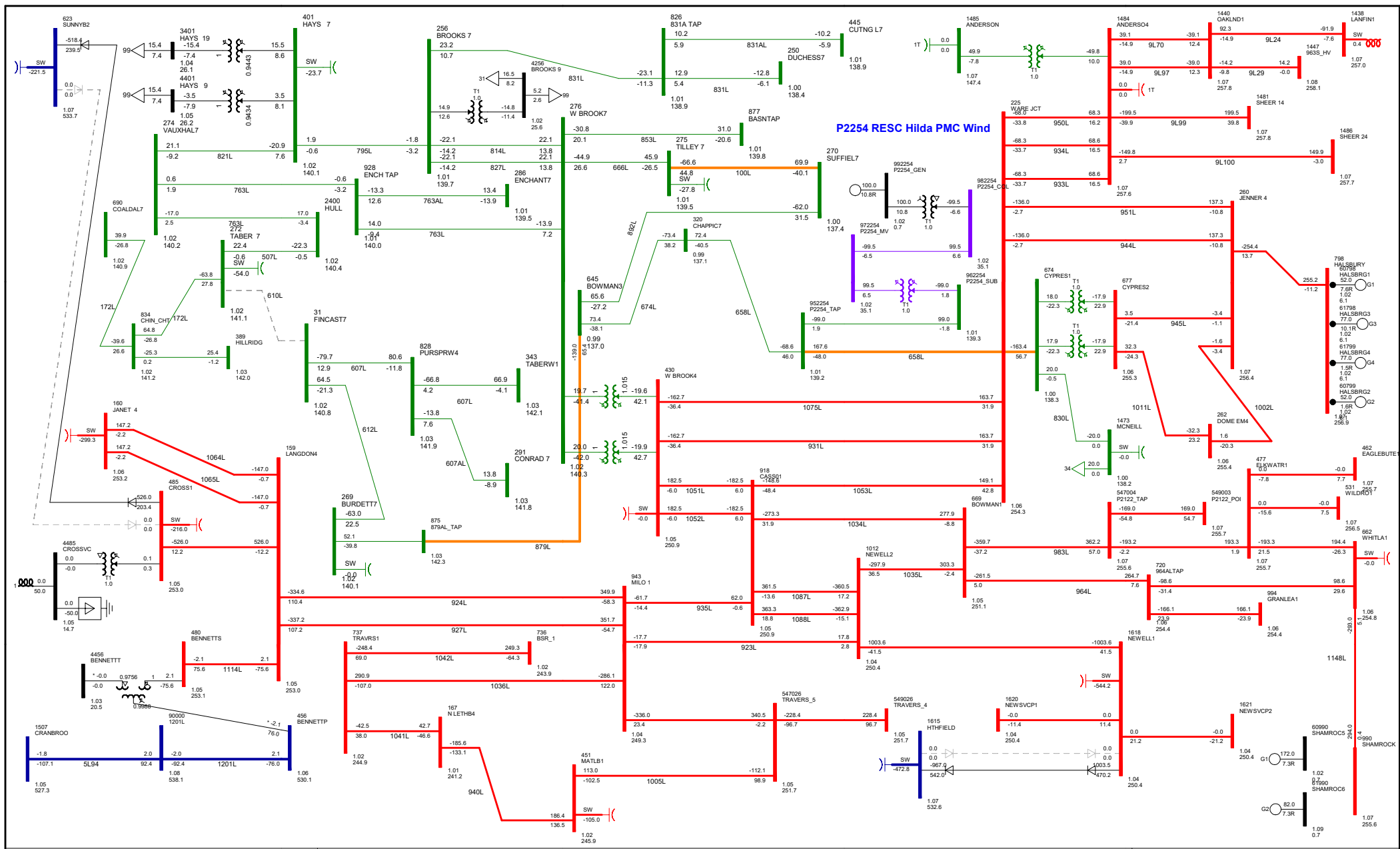


FIGURE A3.2-3 N-1: 610L (TABER 83S - FINCASTLE 336S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kVp)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 1.0000 0.9500 1.0500  
 1.0000 0.9500 1.0500

BC Import: -67.2 MW    Sask Import: -20.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

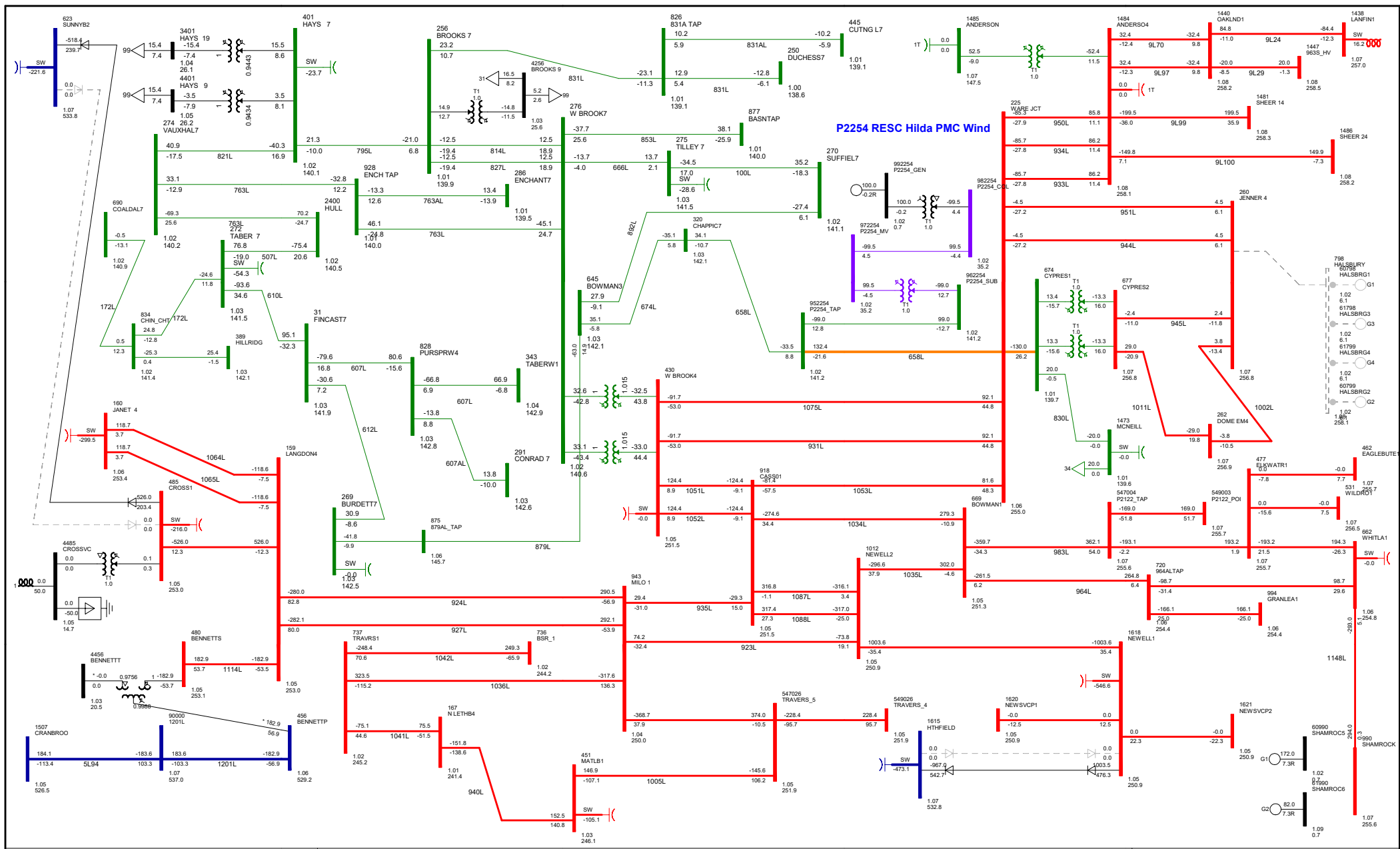
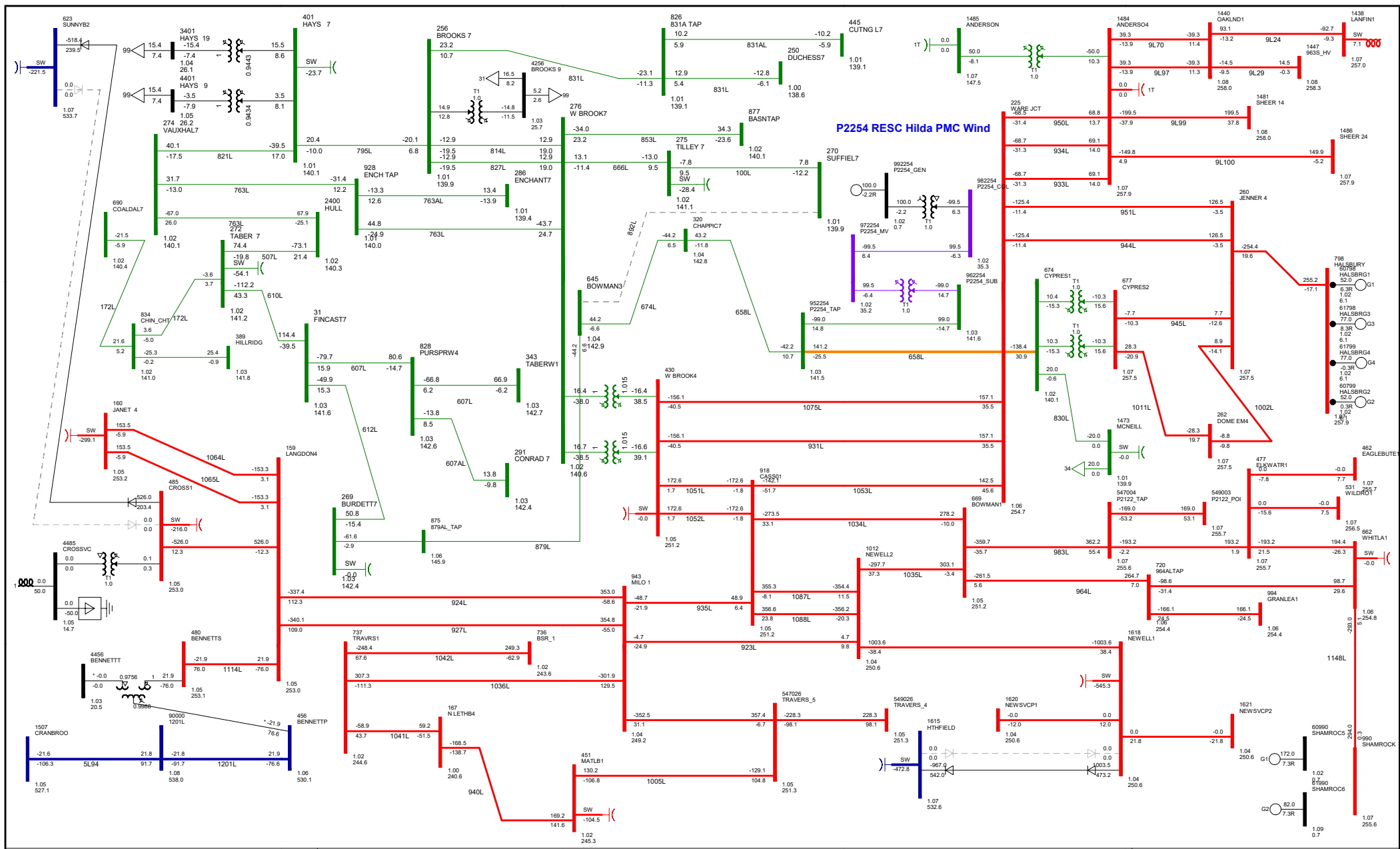


FIGURE A3.2.4 N-1: 949L (JENNER 275S - HALSBURY 306S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kV) (p.u.)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 115000 0.9600  
 115000 0.9600  
 115000 0.9600

BC Import:138.5 MW    Sask Import:-20.0 MW    MATL Import:308.5 MW  
 MH Export:-14.9 MW





P2254 RESC Hilda PMC Wind

FIGURE A3.2-6 N-1: 892L (SUFFIELD 895S - BOWMANTON 244S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

BC Import: -90.0 MW    Sask Import: -20.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

Bus - Voltage (kV)    Branch - MW/Bus  
 Equipment - MW/Bus  
 115000 0.9600V  
 115000 0.9600V  
 115000 0.9600V  
 115000 0.9600V



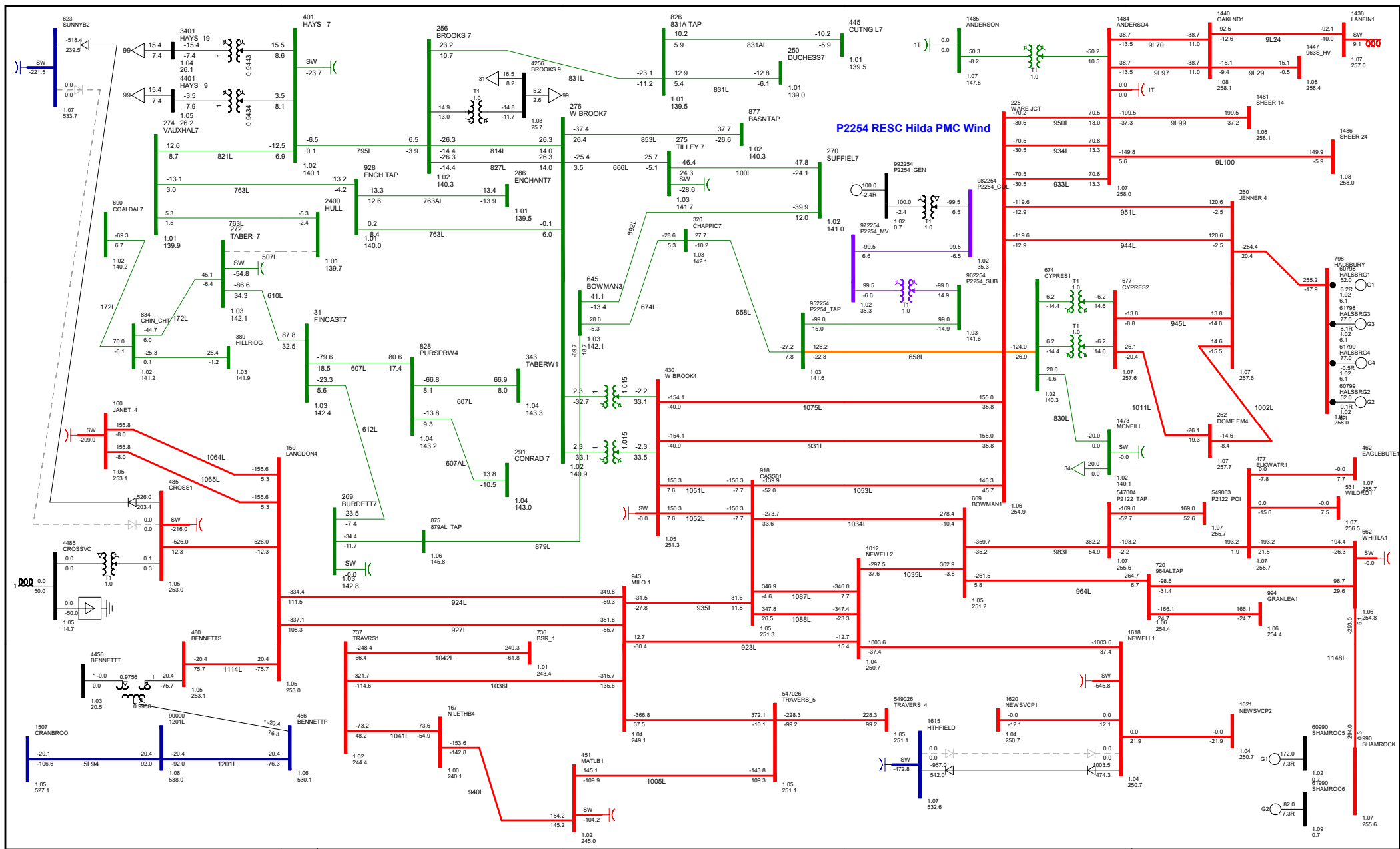


FIGURE A3.2-7 N-1: 507L (TABER 83S - HULL 257S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p) (m)  
 Branch - MW (m) (p)  
 Equipment - MW (m) (p)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import-89.1 MW Sask Import-20.0 MW MATL Import 308.5 MW  
 MH Export -14.9 MW



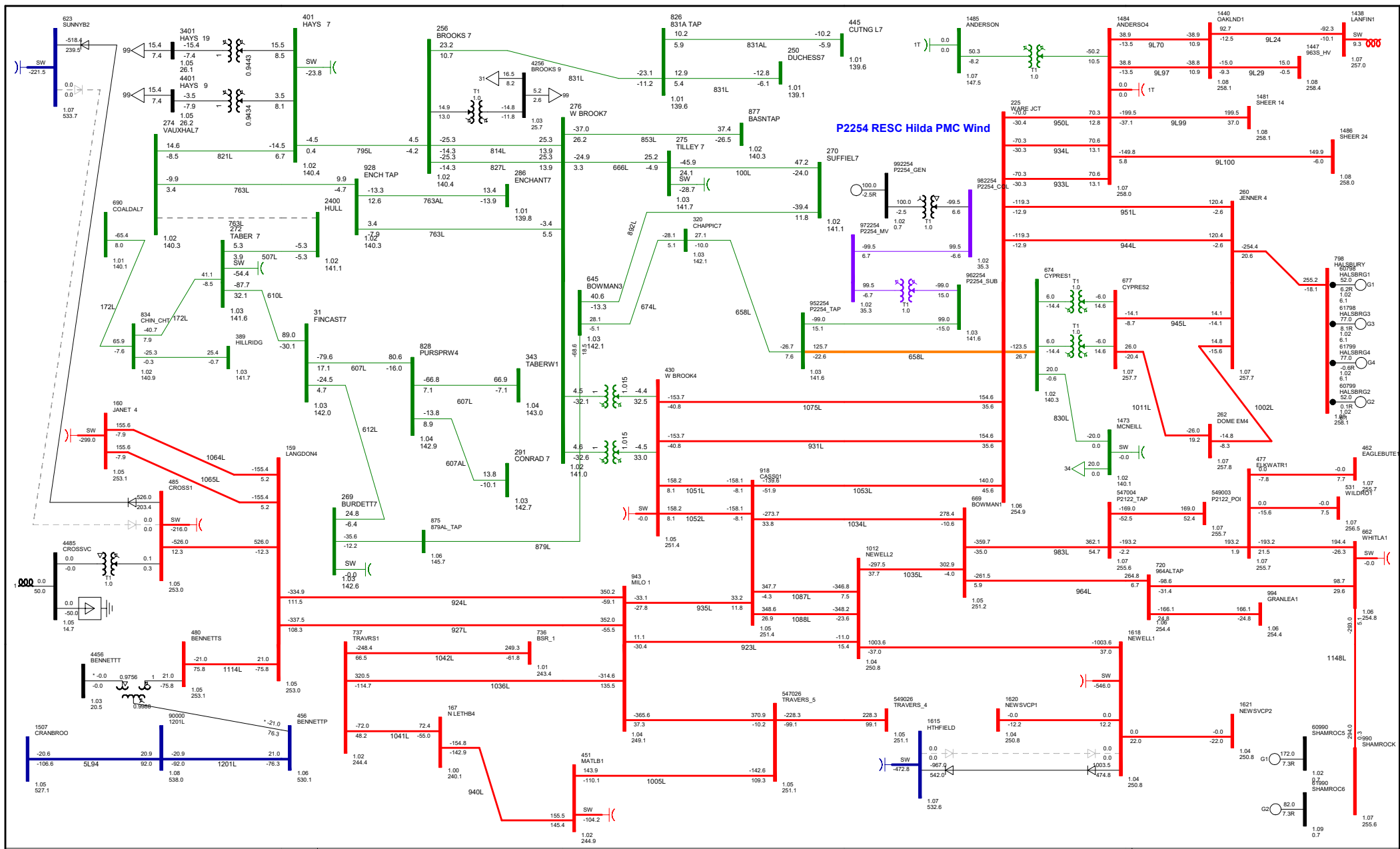


FIGURE A3.2-8 N-1: 763L (VAUXHALL 158S - HULL 257S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p) (m)  
 Branch - MW (m) (w)  
 Equipment - MW (m) (w)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import-89.6 MW    Sask Import-20.0 MW    MATL Import 308.5 MW  
 MH Export -14.9 MW

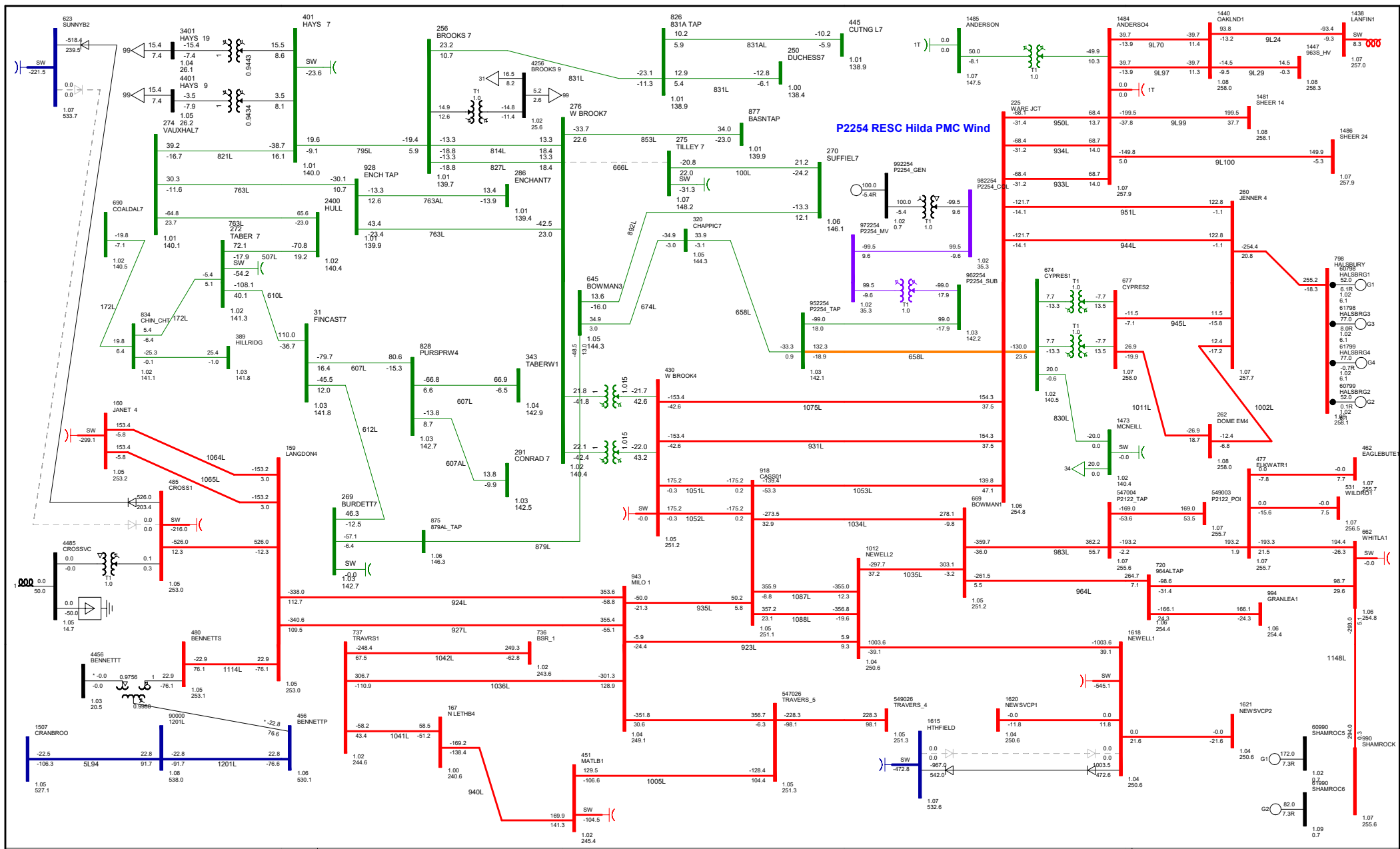


FIGURE A3.2-9 N-1: 666L (TILLEY 498S - WEST BROOKS 28S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (V) (p.u.)  
 Branch - MW (MW)  
 Equipment - MW (MW)  
 1.0000 0.9500  
 1.0500 0.9000  
 1.1000 0.8500  
 1.1500 0.8000  
 1.2000 0.7500

BC Import: -91.1 MW    Sask Import: -20.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

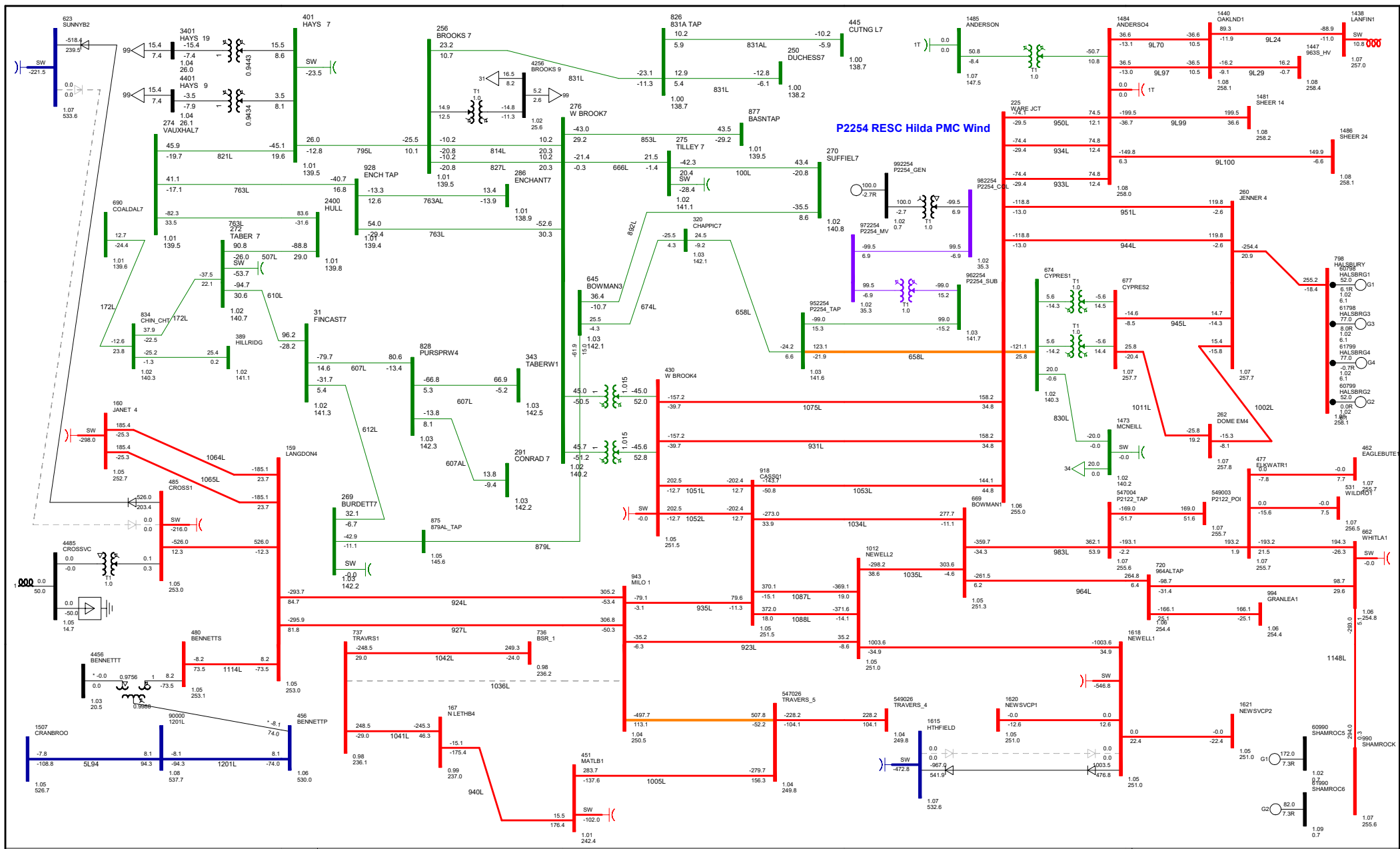


FIGURE A3.2-10 N-1: 1036L (MILO 356S - TAVERS 554S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

Bus - Voltage (kVp)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import-80.6 MW    Sask Import-20.0 MW    MATL Import:308.5 MW  
 MH Export:-14.9 MW



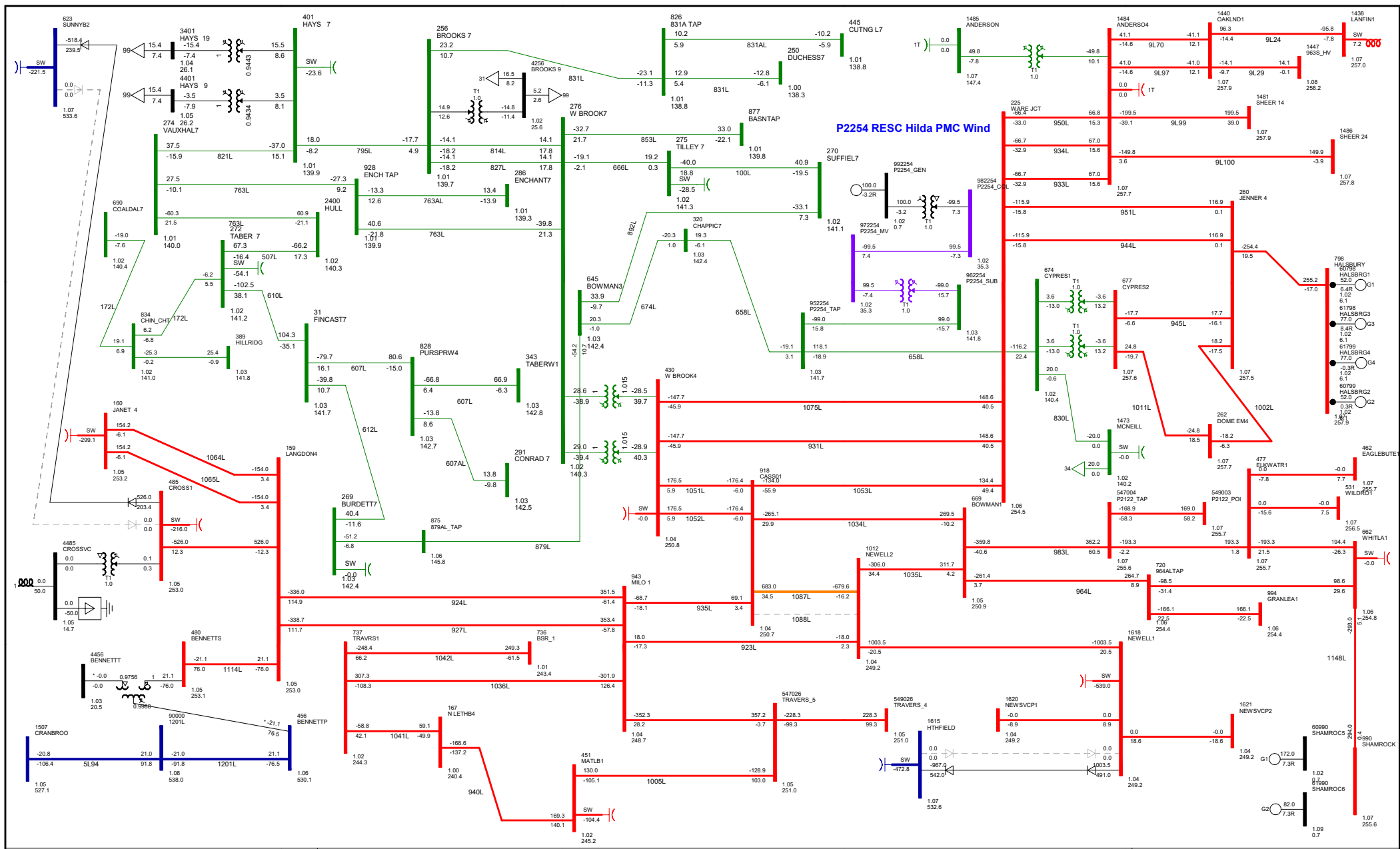


FIGURE A3.2-12 N-1: 1088L (CASSILS 324S – NEWELL 2075S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON SUNDAY 20. MARCH 2022

BC Import: -89.1 MW    Sask Import: -20.0 MW    MATL Import: 308.5 MW  
 MH Export: -14.9 MW

Bus - Voltage (kV)    Branch - MW/Mvar  
 Equipment - MW/Mvar  
 115000 0.9600  
 115000 0.9600  
 115000 0.9600  
 115000 0.9600

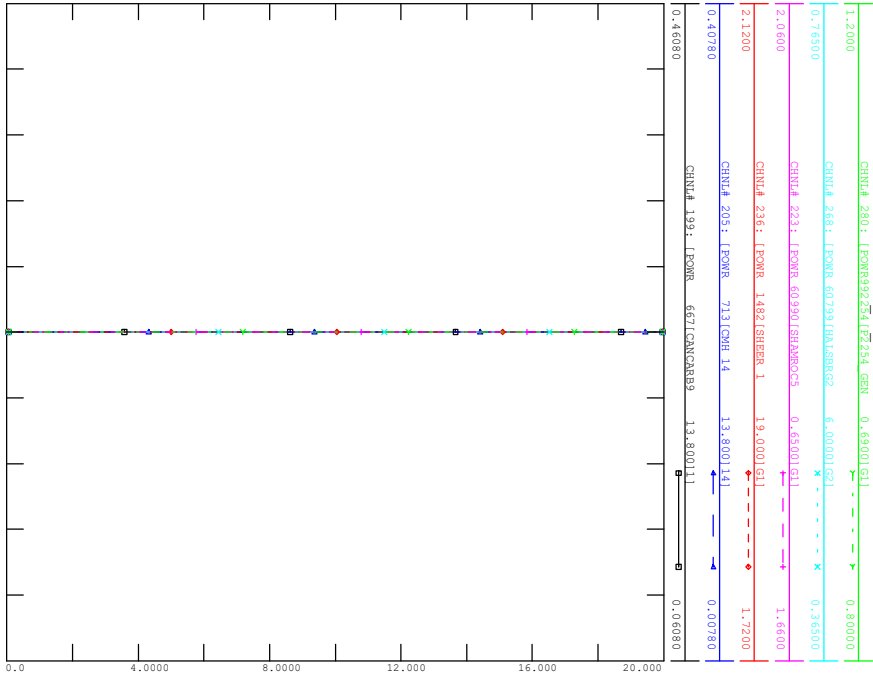
# Attachment A4

## Post-Project Transient Stability Diagrams

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT



FILE: scn3\_sl\_nofault.out

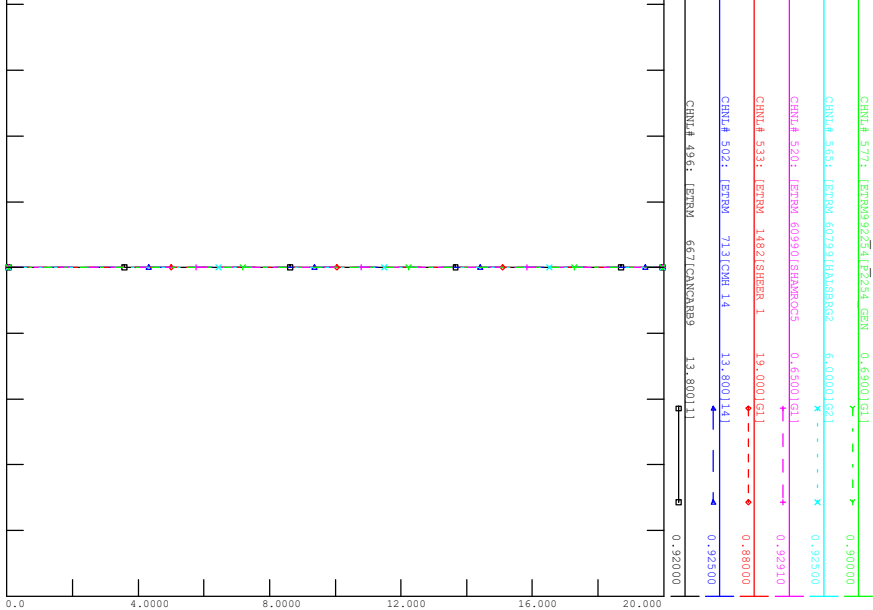


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT



FILE: scn3\_sl\_nofault.out

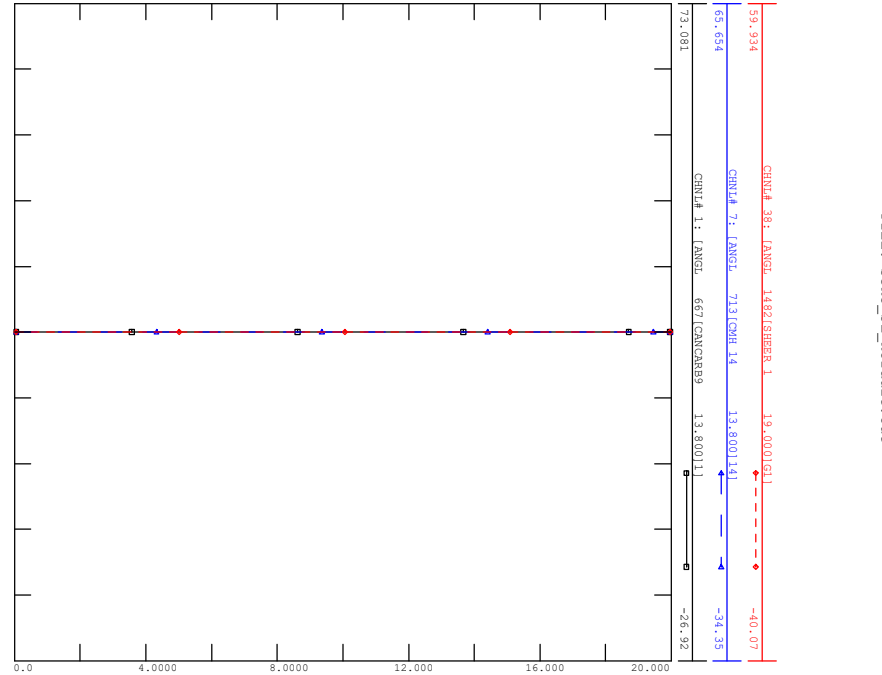


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT



FILE: scn3\_sl\_nofault.out

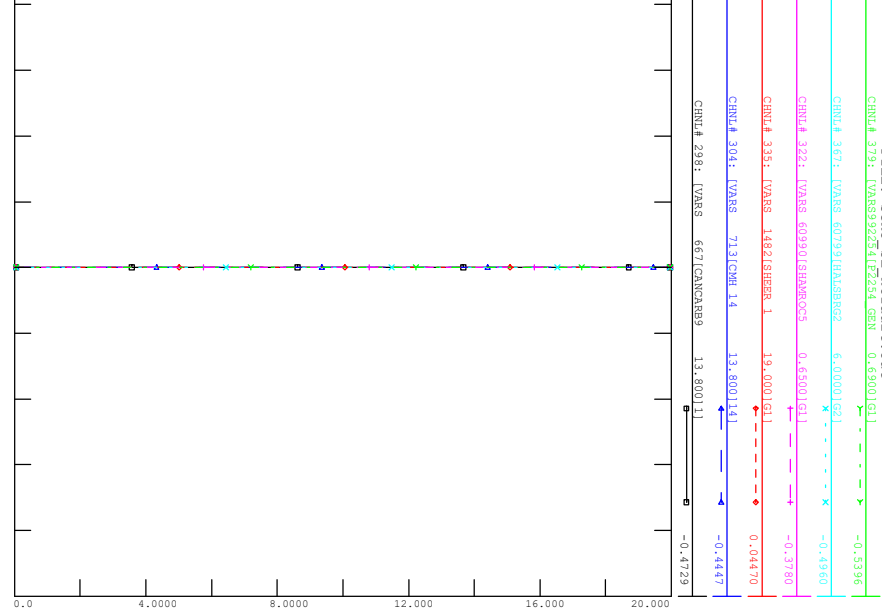


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT

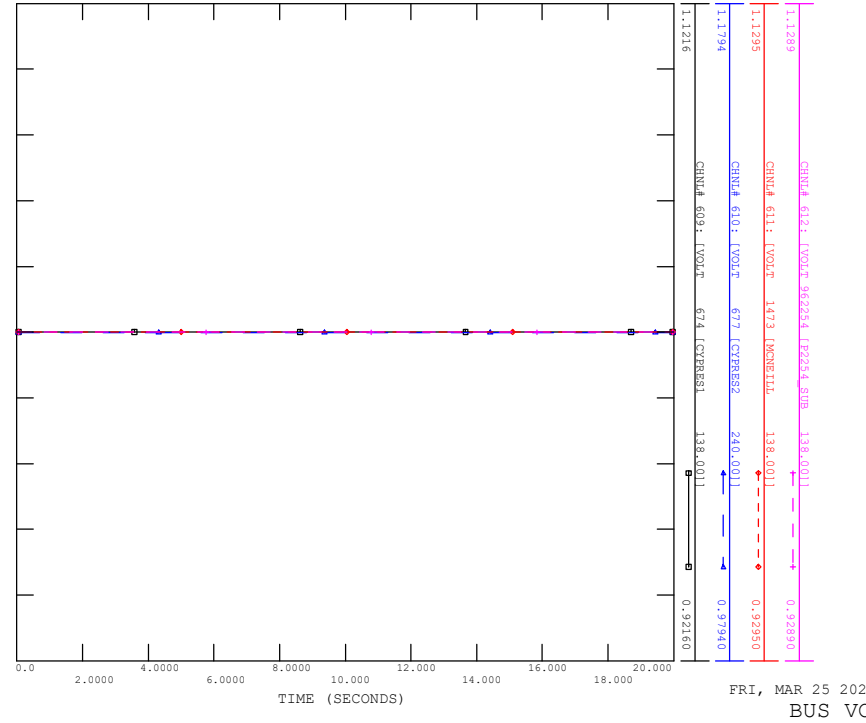


FILE: scn3\_sl\_nofault.out

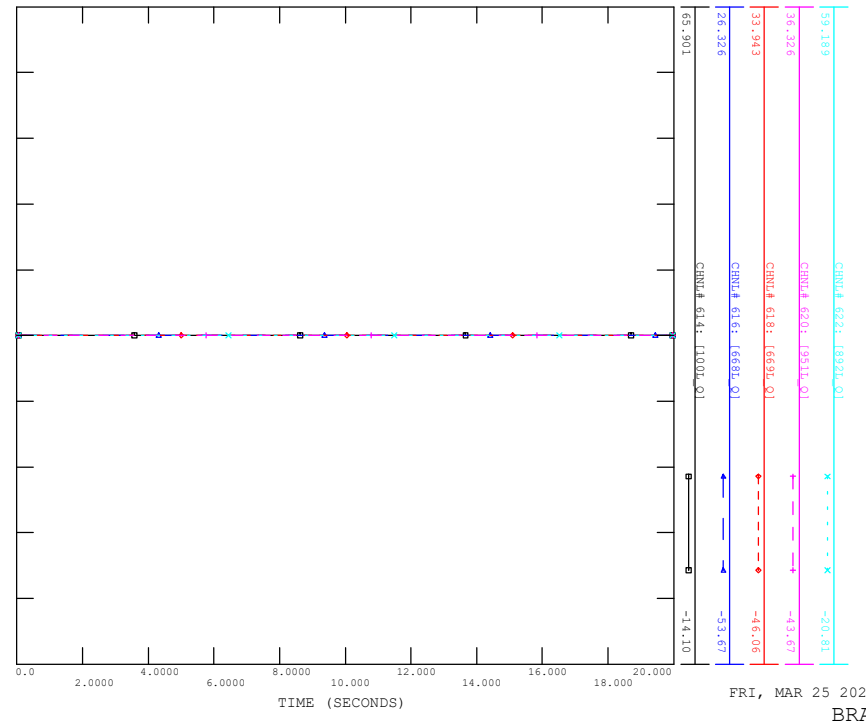


FRI, MAR 25 2022 10:52  
REACTIVE POWER

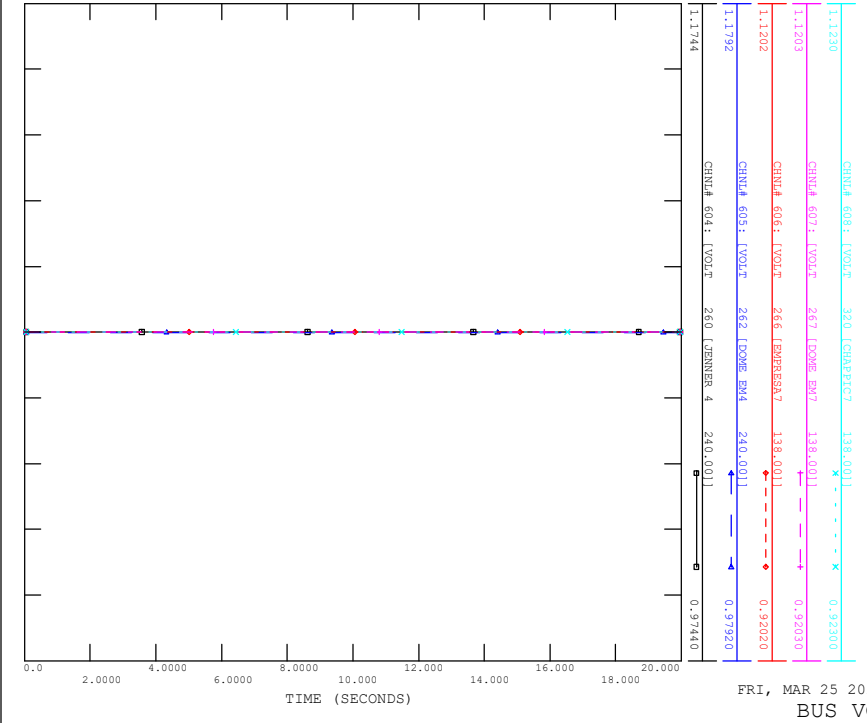
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT  
FILE: scn3\_sl\_nofault.out



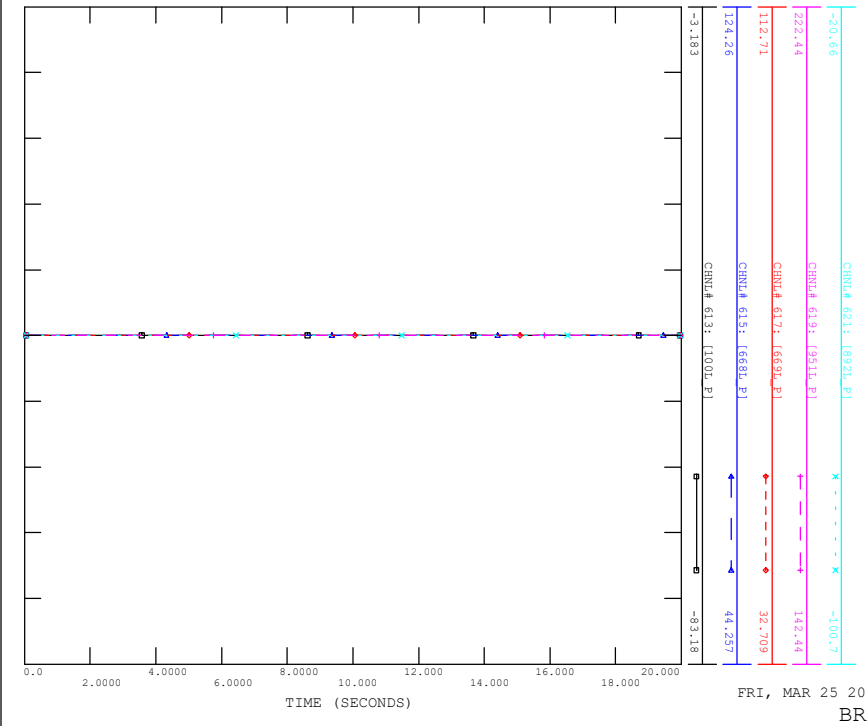
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT  
FILE: scn3\_sl\_nofault.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT  
FILE: scn3\_sl\_nofault.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT  
FILE: scn3\_sl\_nofault.out

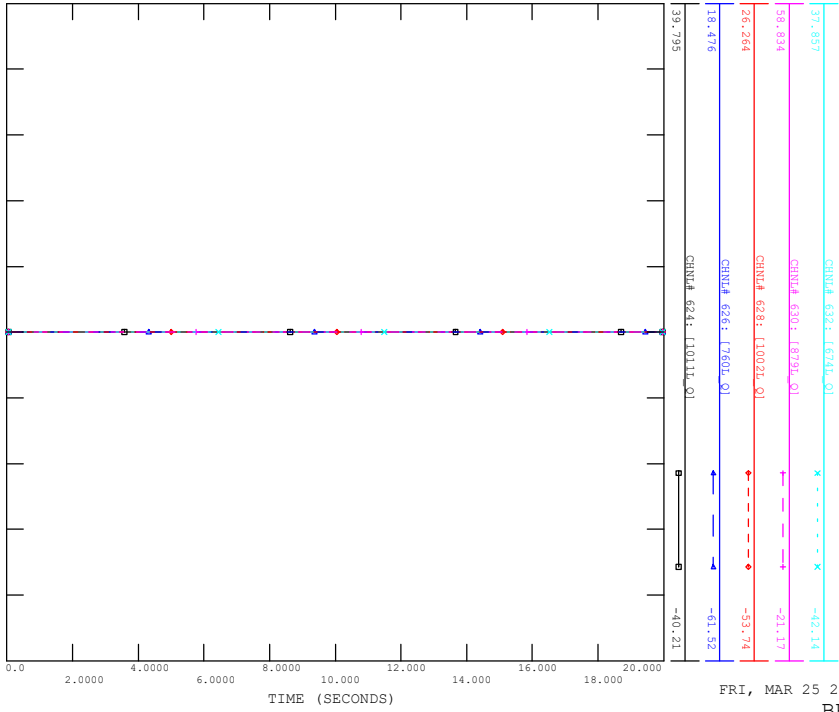






SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT

FILE: scn3\_sl\_nofault.out

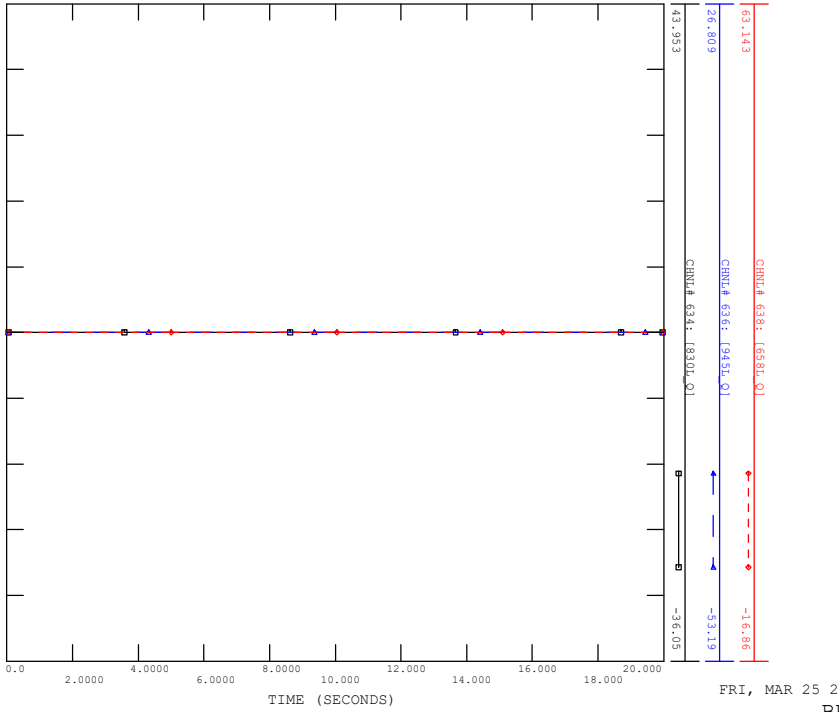


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT

FILE: scn3\_sl\_nofault.out

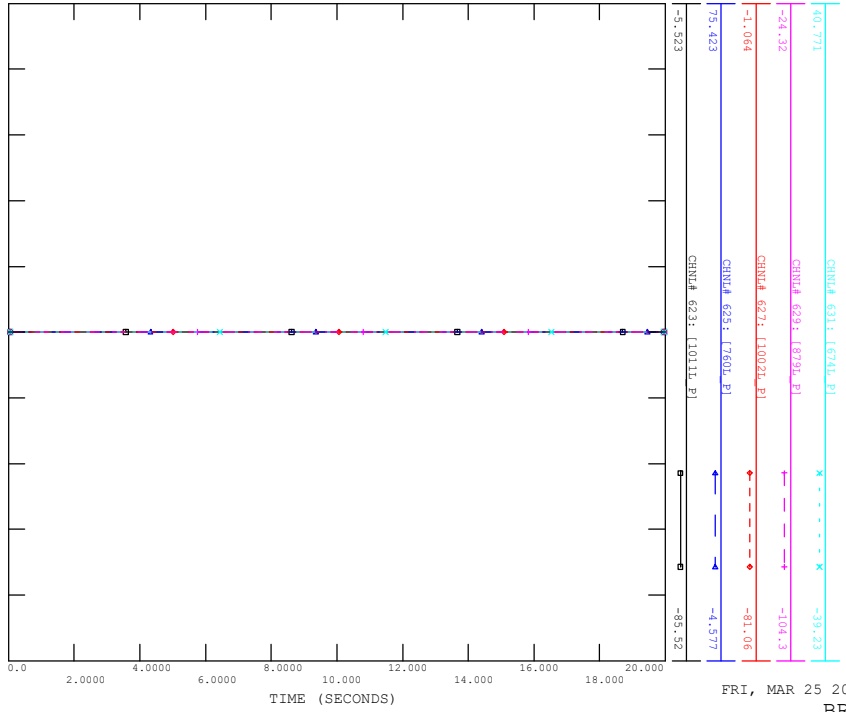


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT

FILE: scn3\_sl\_nofault.out

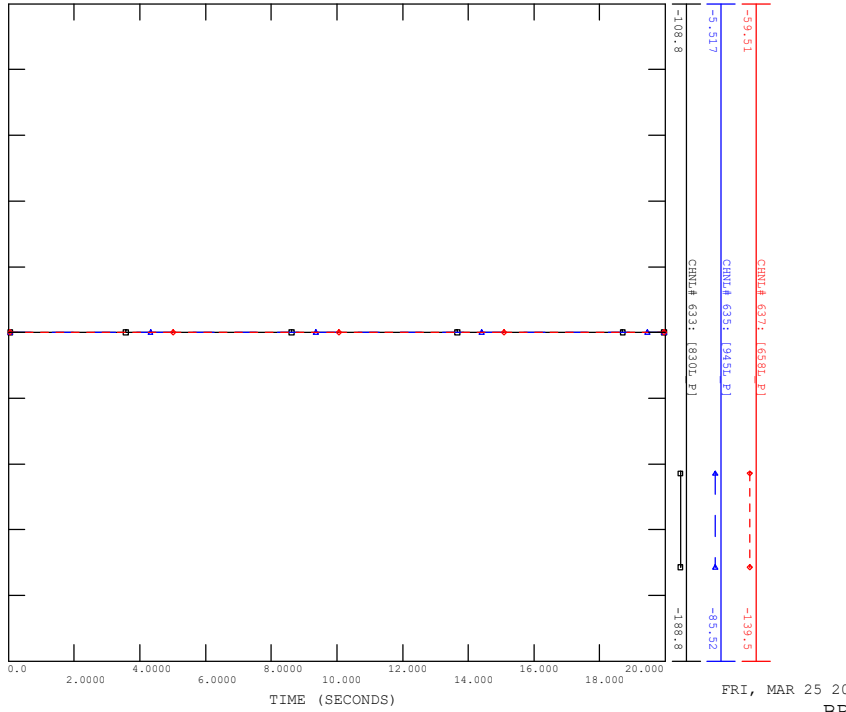


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_NOFAULT

FILE: scn3\_sl\_nofault.out

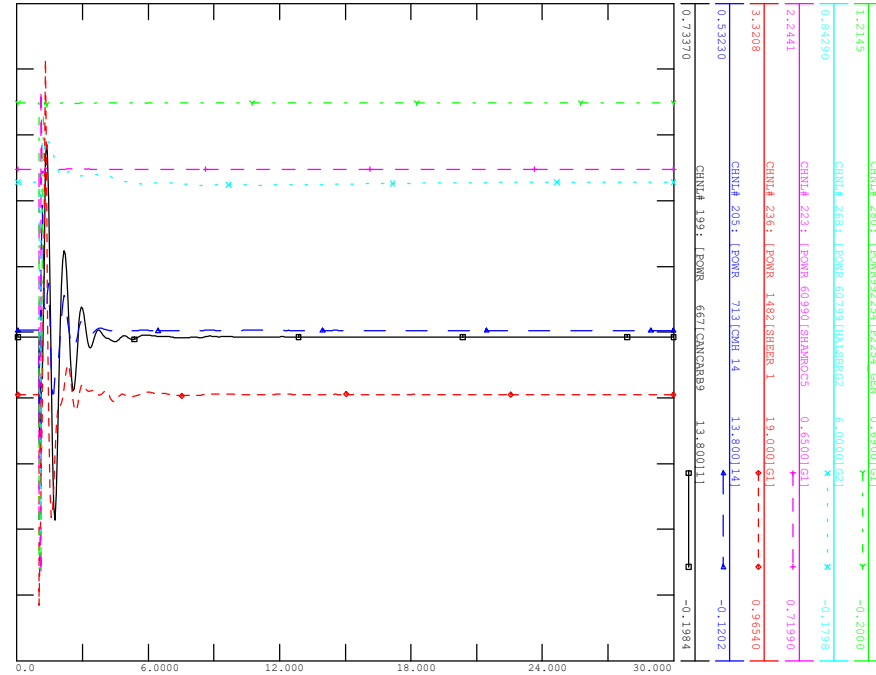


FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER



FILE: scn3\_sl\_01\_945L\_Jenner.out

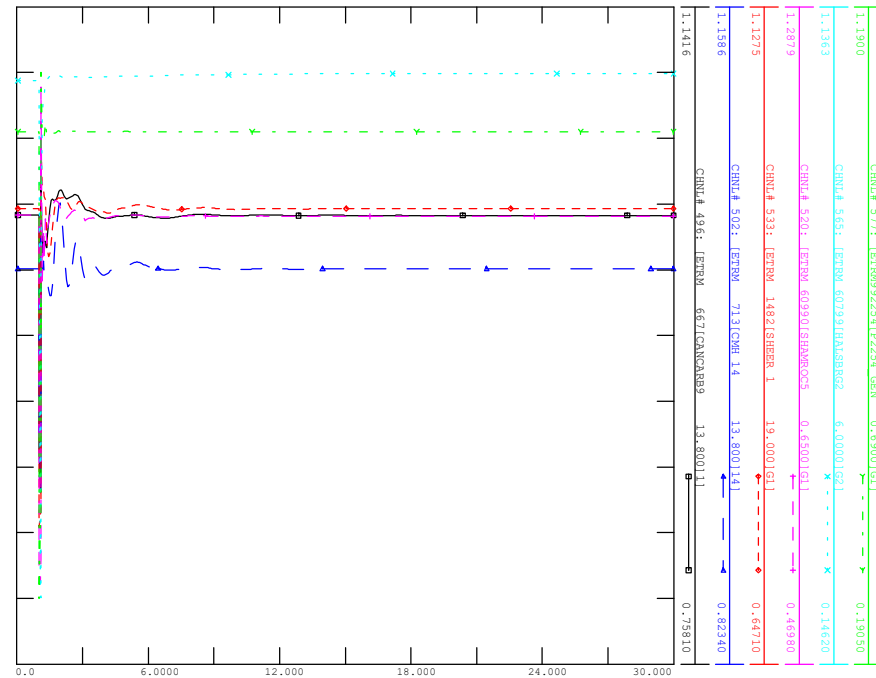


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER



FILE: scn3\_sl\_01\_945L\_Jenner.out

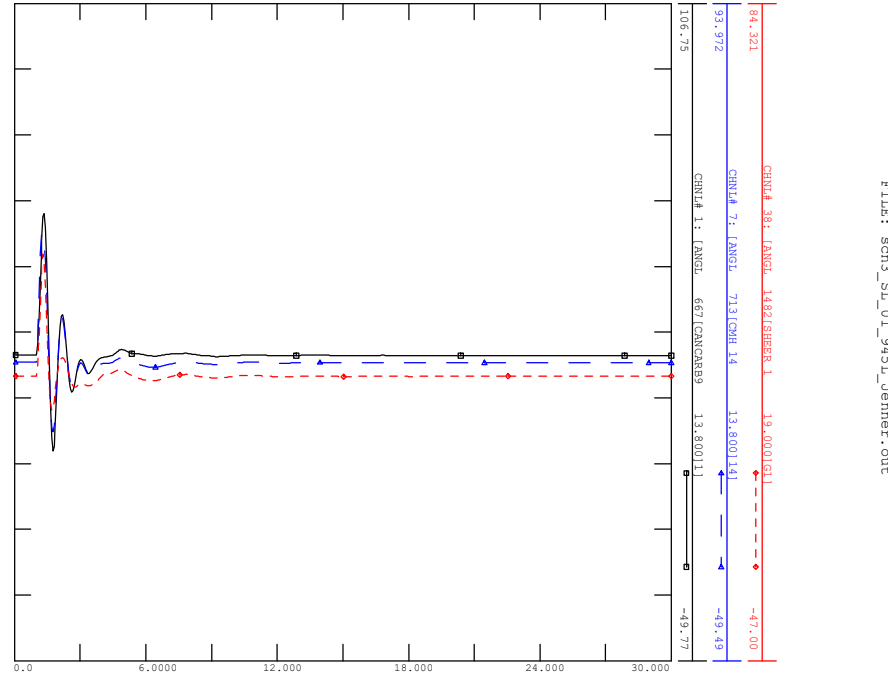


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER



FILE: scn3\_sl\_01\_945L\_Jenner.out

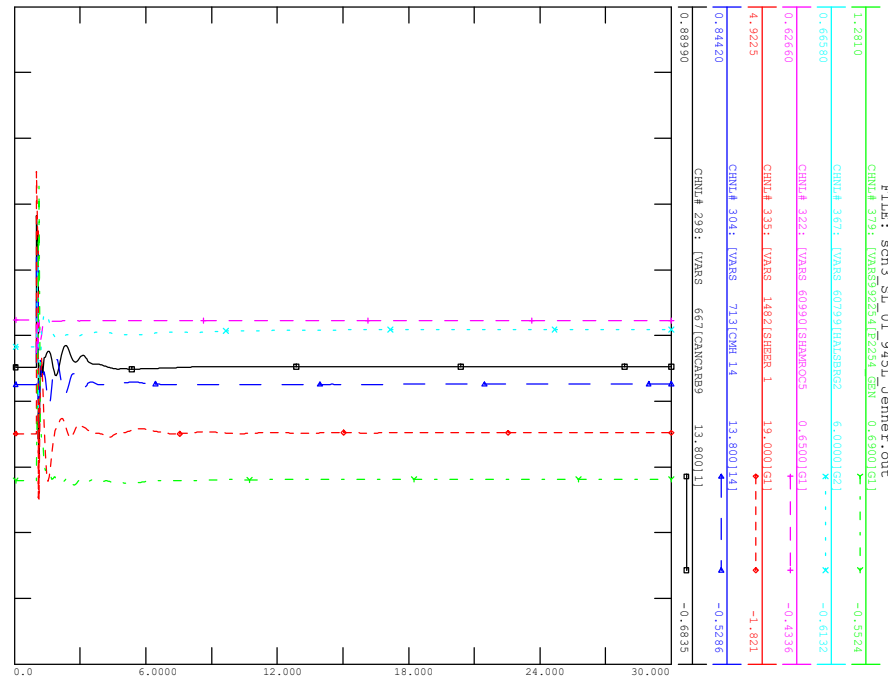


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER

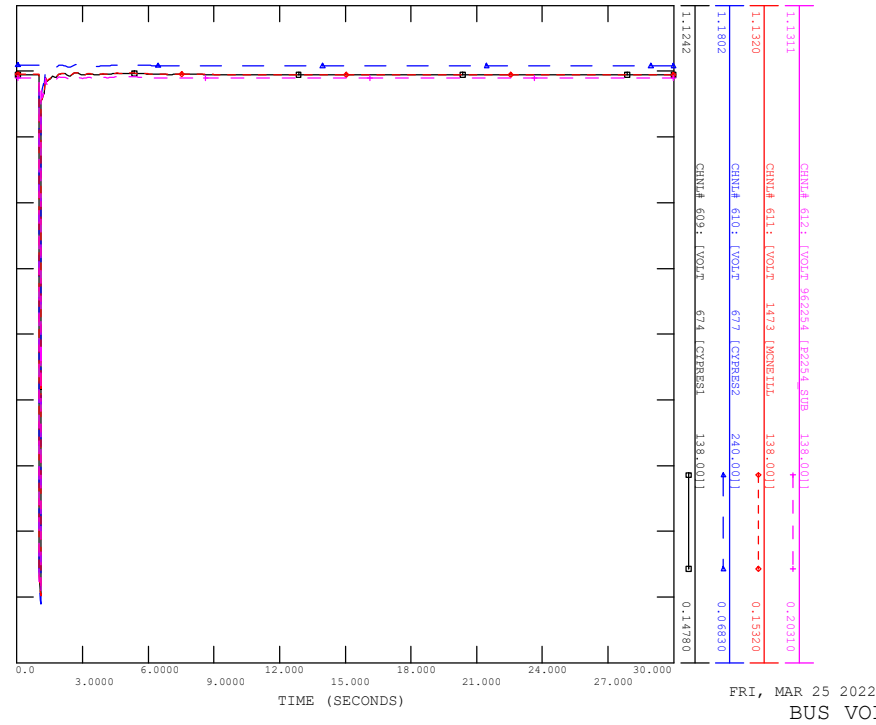


FILE: scn3\_sl\_01\_945L\_Jenner.out



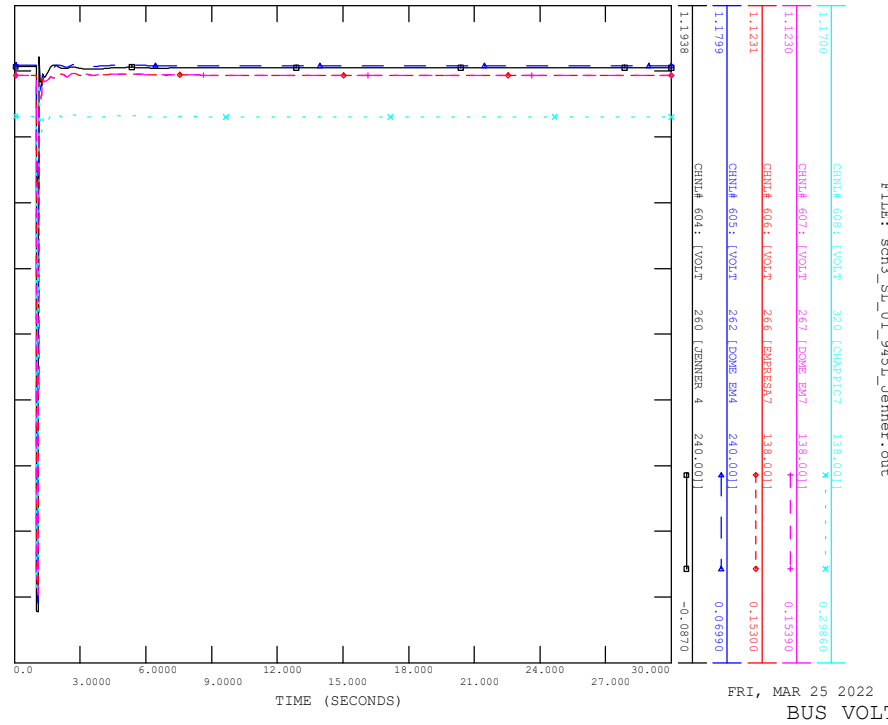
FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER  
FILE: scn3\_sl\_01\_945L\_Jenner.out



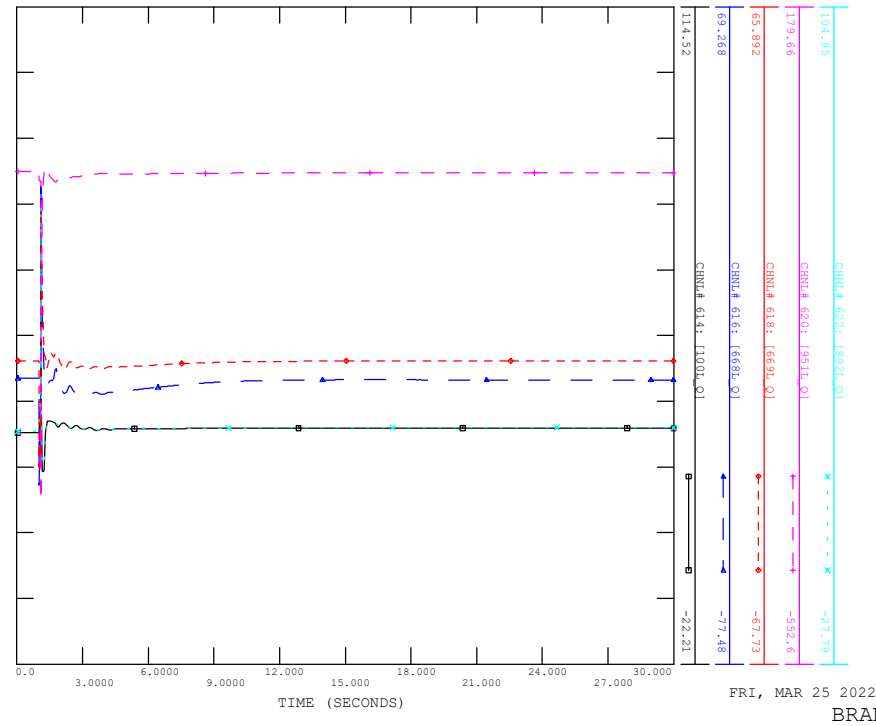
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER  
FILE: scn3\_sl\_01\_945L\_Jenner.out



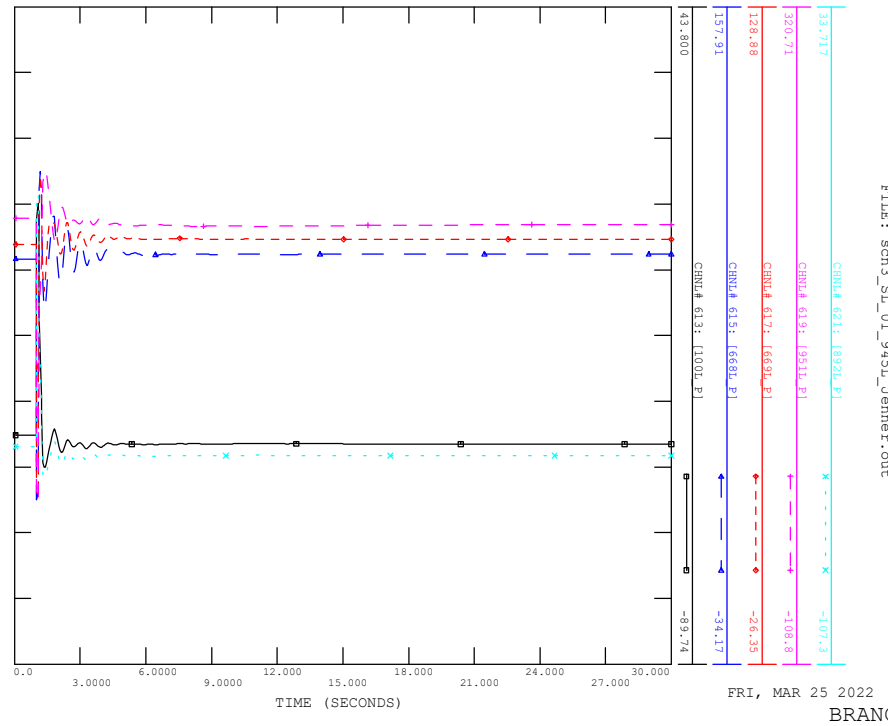
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER  
FILE: scn3\_sl\_01\_945L\_Jenner.out



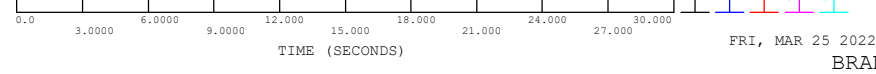
FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER  
FILE: scn3\_sl\_01\_945L\_Jenner.out



FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER  
FILE: scn3\_sl\_01\_945L\_Jenner.out

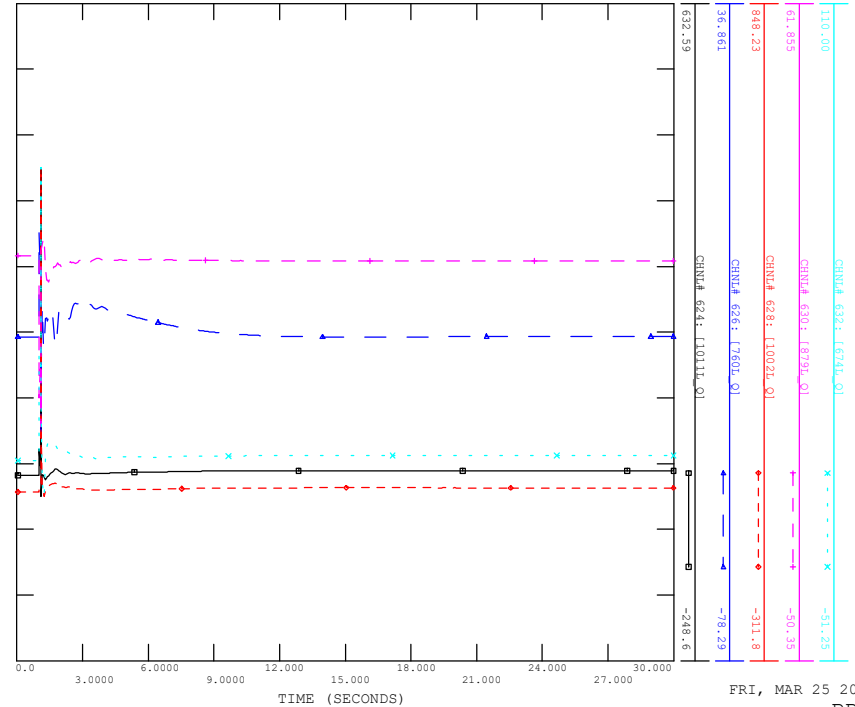


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER

FILE: scn3\_sl\_01\_945L\_Jenner.out

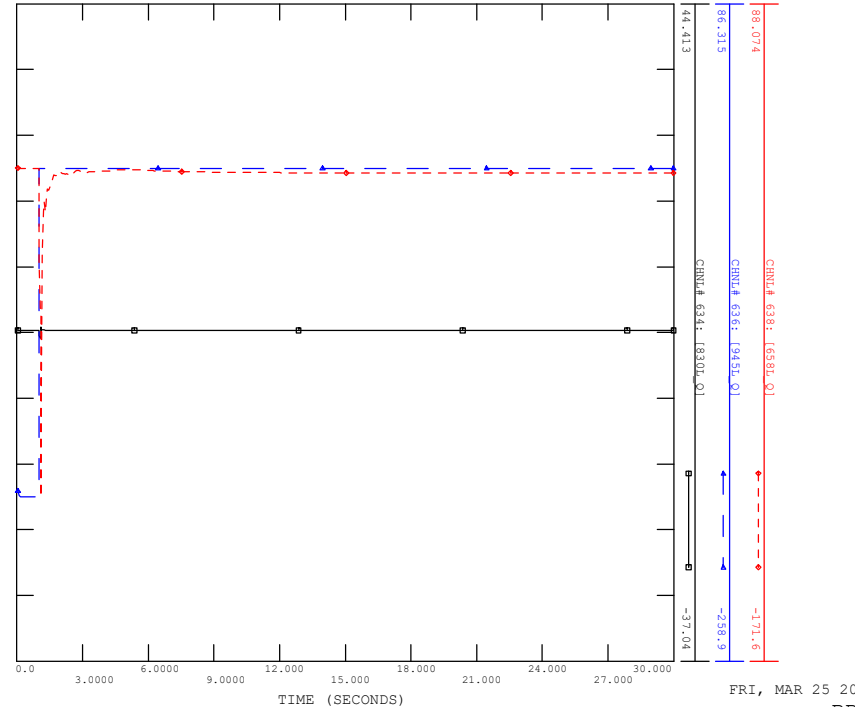


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER

FILE: scn3\_sl\_01\_945L\_Jenner.out

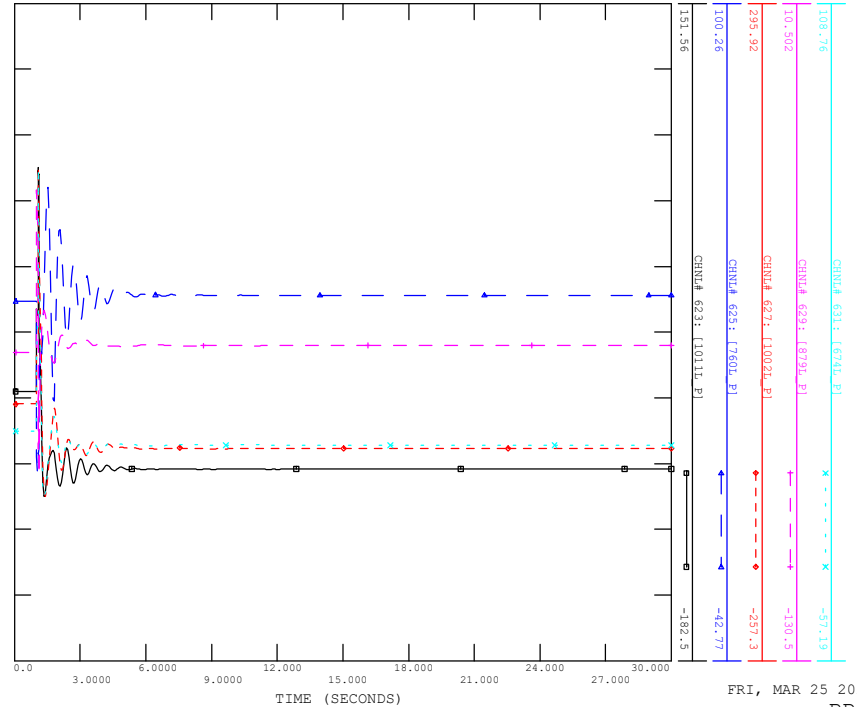


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER

FILE: scn3\_sl\_01\_945L\_Jenner.out

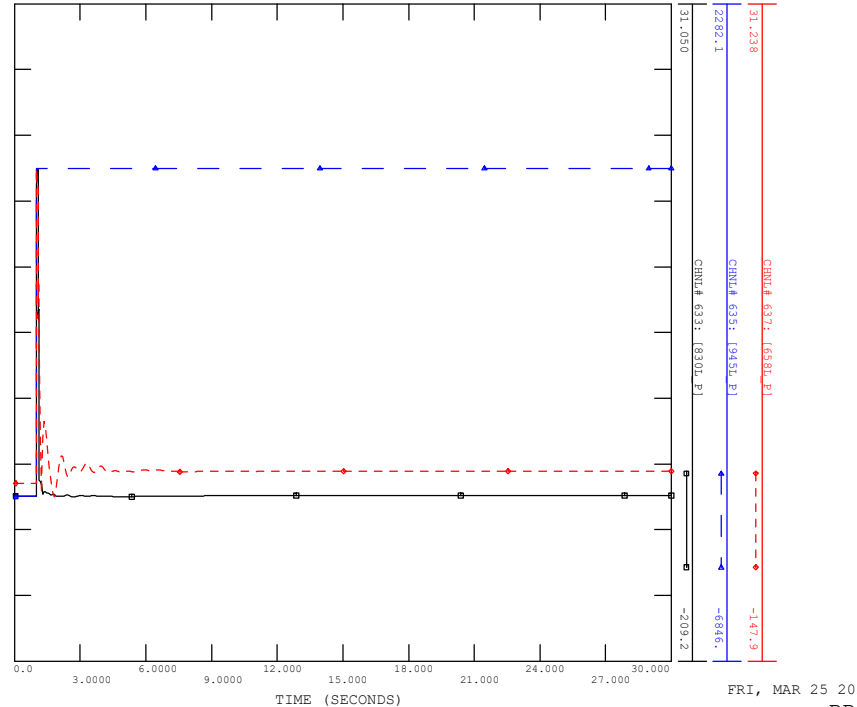


FRI, MAR 25 2022 10:52  
BRANCH P



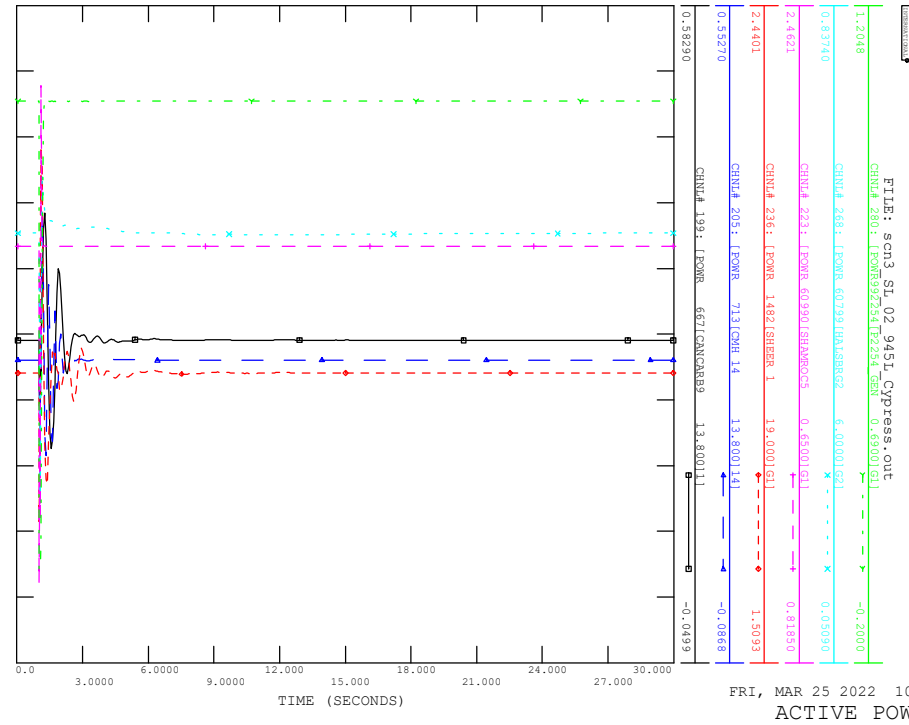
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_01\_945L\_JENNER

FILE: scn3\_sl\_01\_945L\_Jenner.out

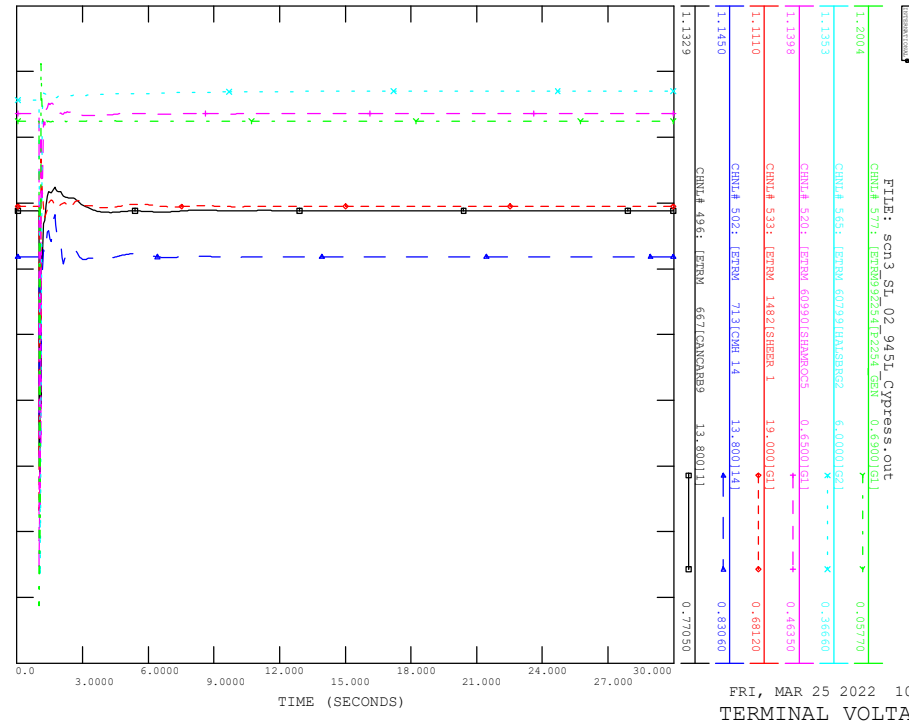


FRI, MAR 25 2022 10:52  
BRANCH P

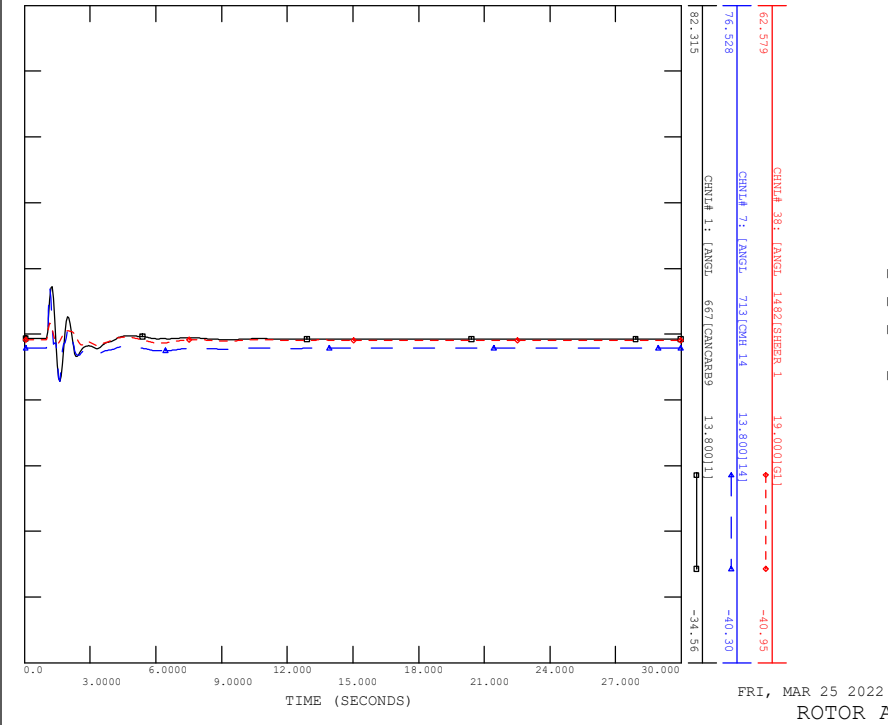
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS



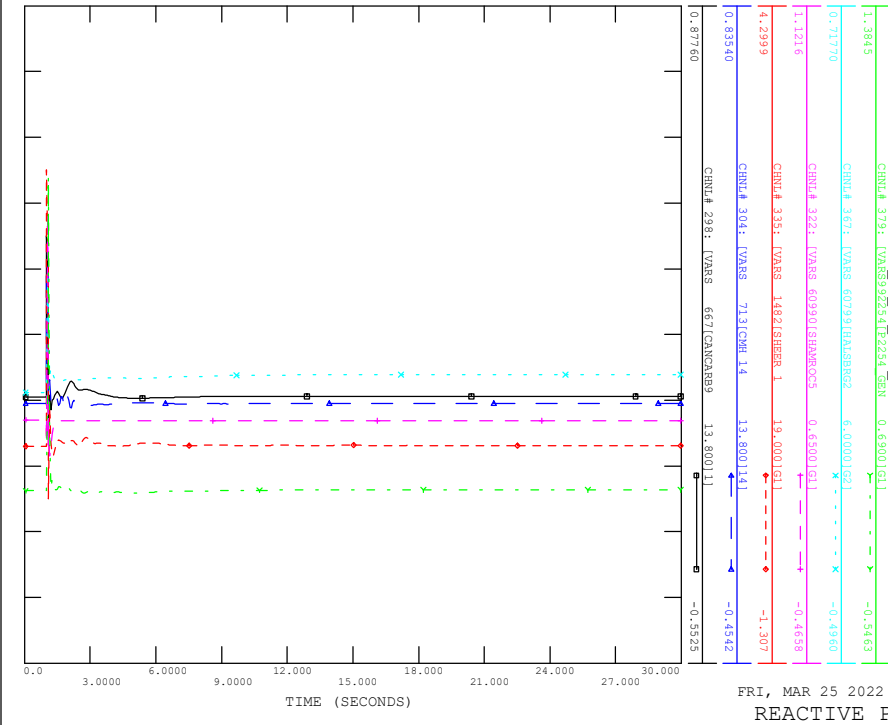
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

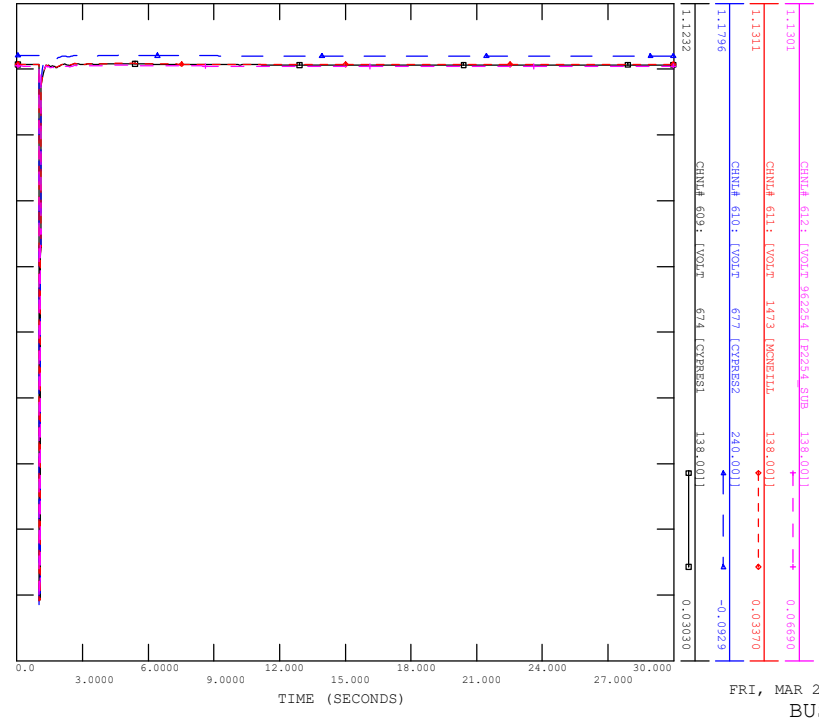


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

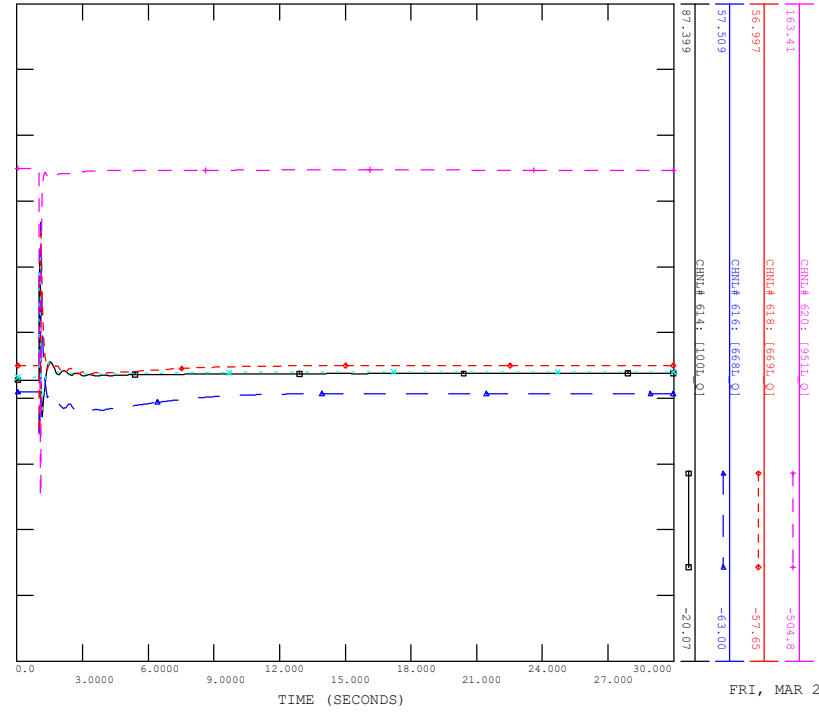
FILE: scn3\_sl\_02\_945L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

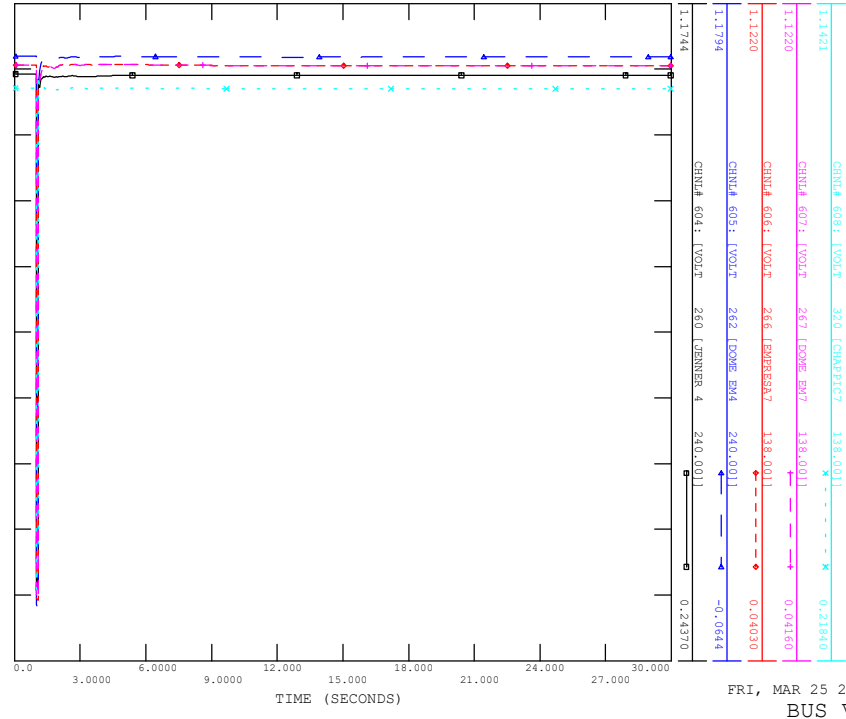
FILE: scn3\_sl\_02\_945L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

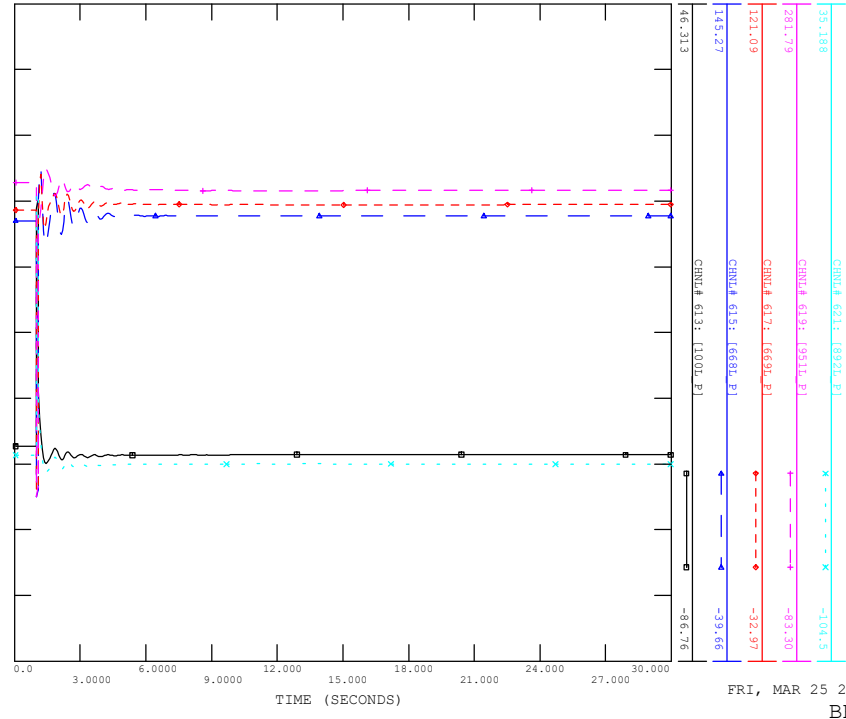
FILE: scn3\_sl\_02\_945L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

FILE: scn3\_sl\_02\_945L\_Cypress.out

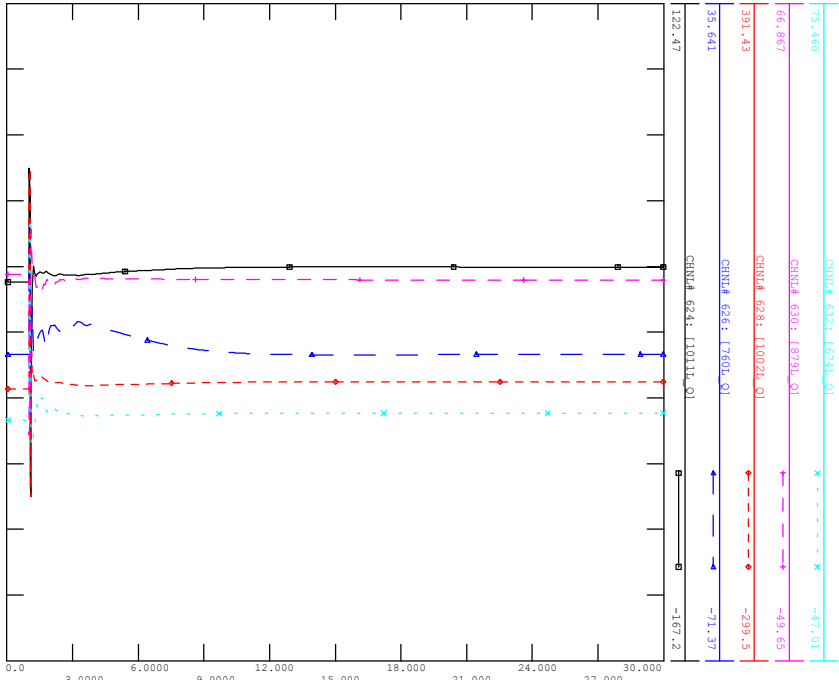


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

FILE: scn3\_sl\_02\_945L\_Cypress.out

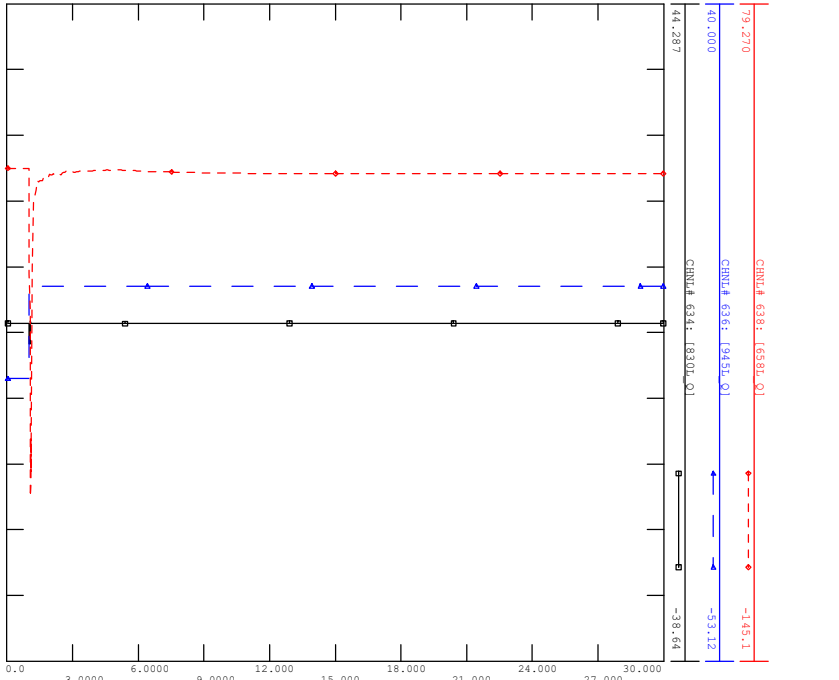


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

FILE: scn3\_sl\_02\_945L\_Cypress.out

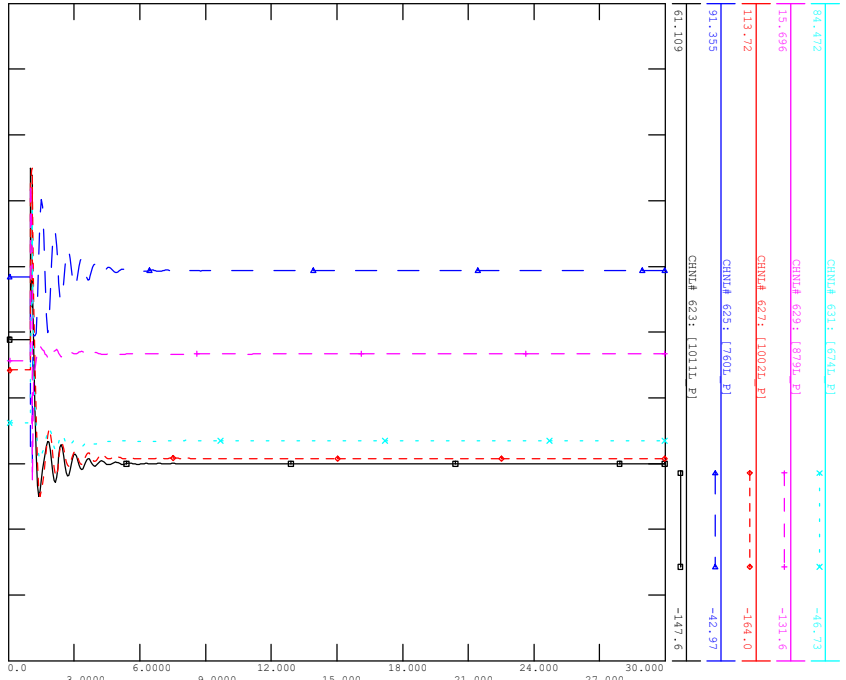


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

FILE: scn3\_sl\_02\_945L\_Cypress.out

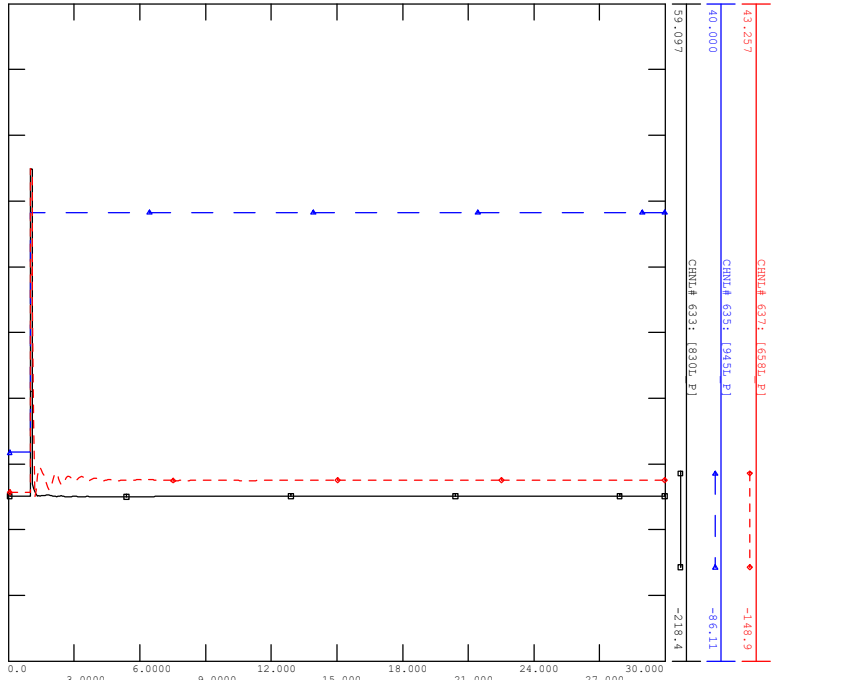


FRI, MAR 25 2022 10:52  
BRANCH P



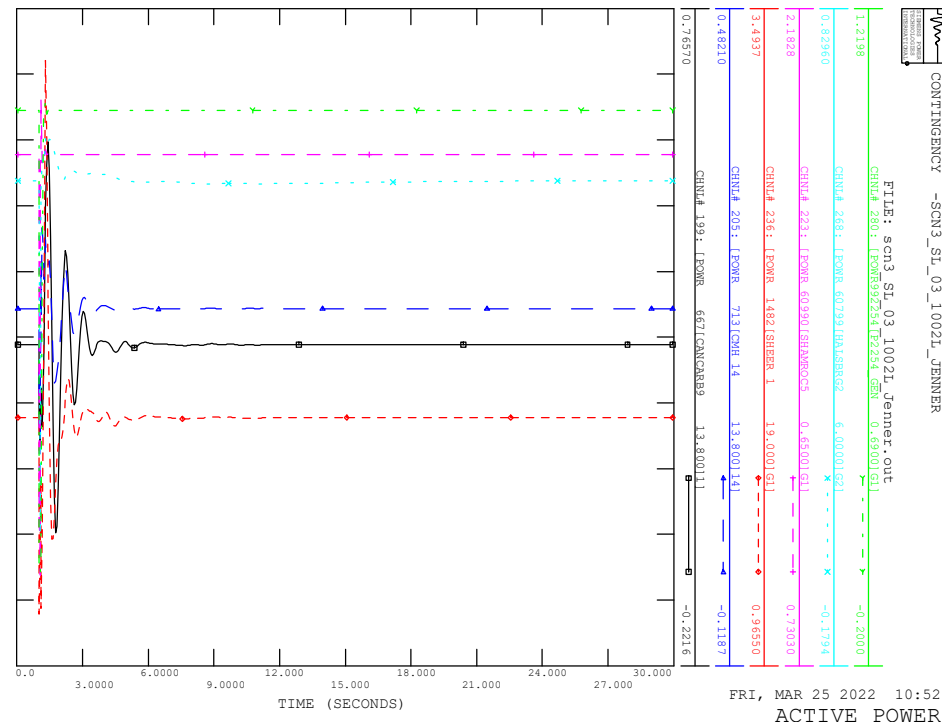
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_02\_945L\_CYPRESS

FILE: scn3\_sl\_02\_945L\_Cypress.out

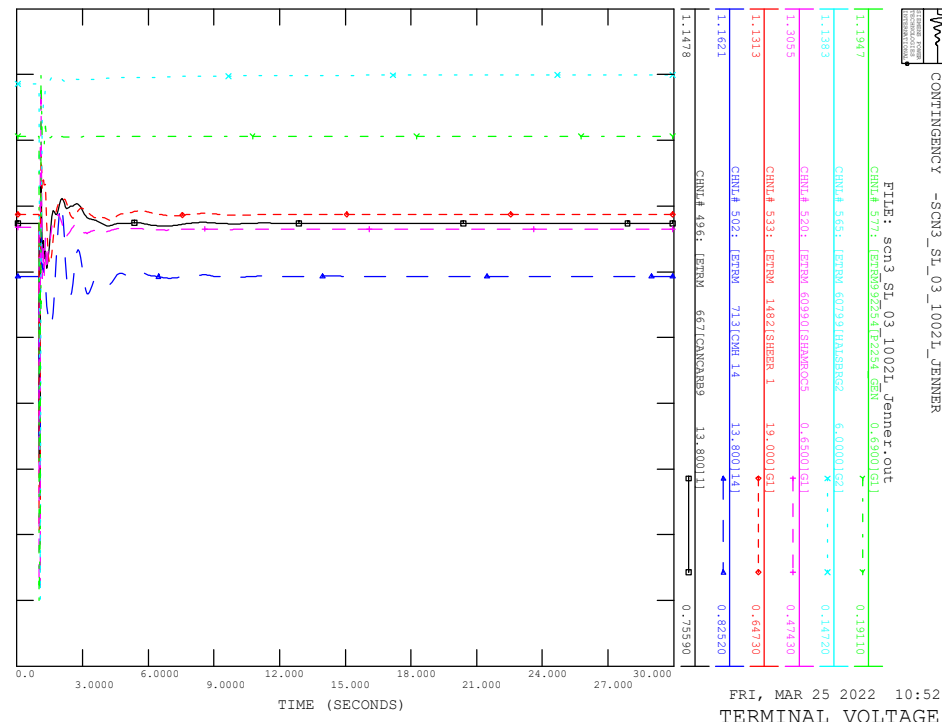


FRI, MAR 25 2022 10:52  
BRANCH P

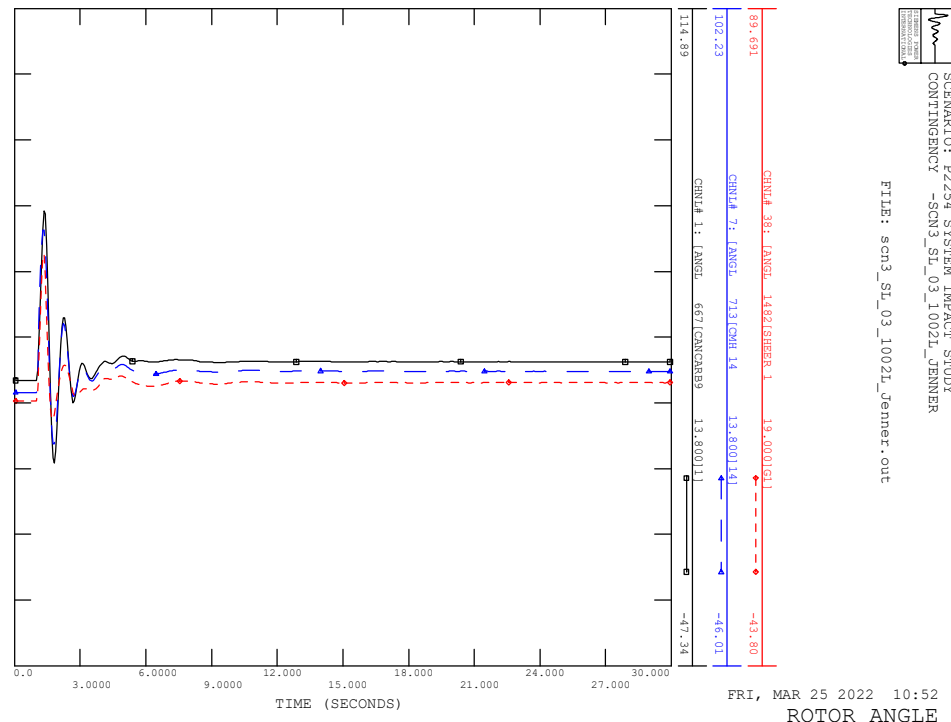
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER



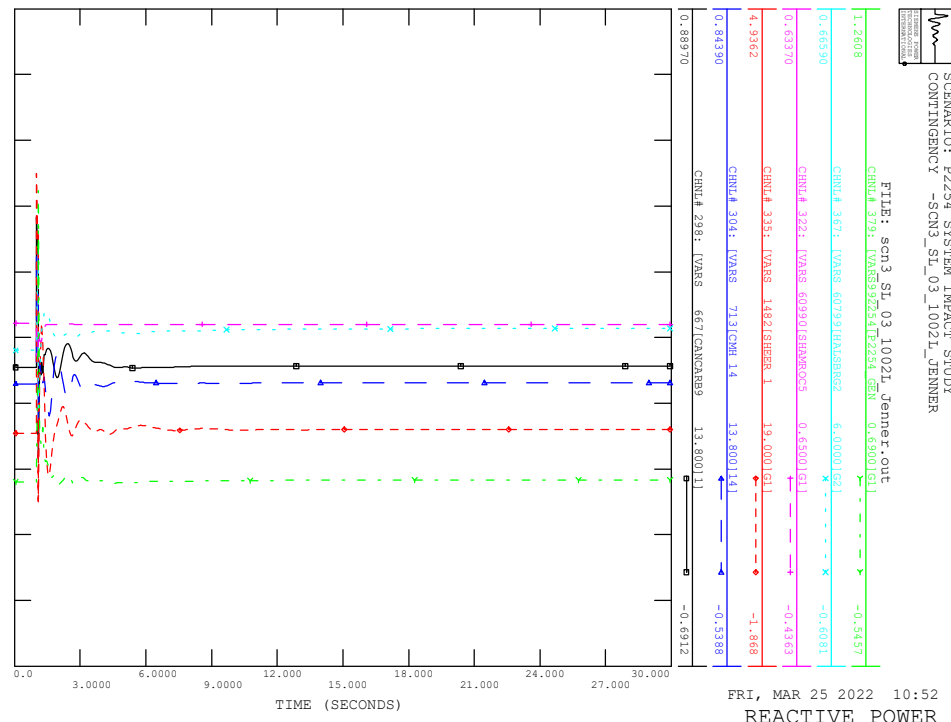
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER

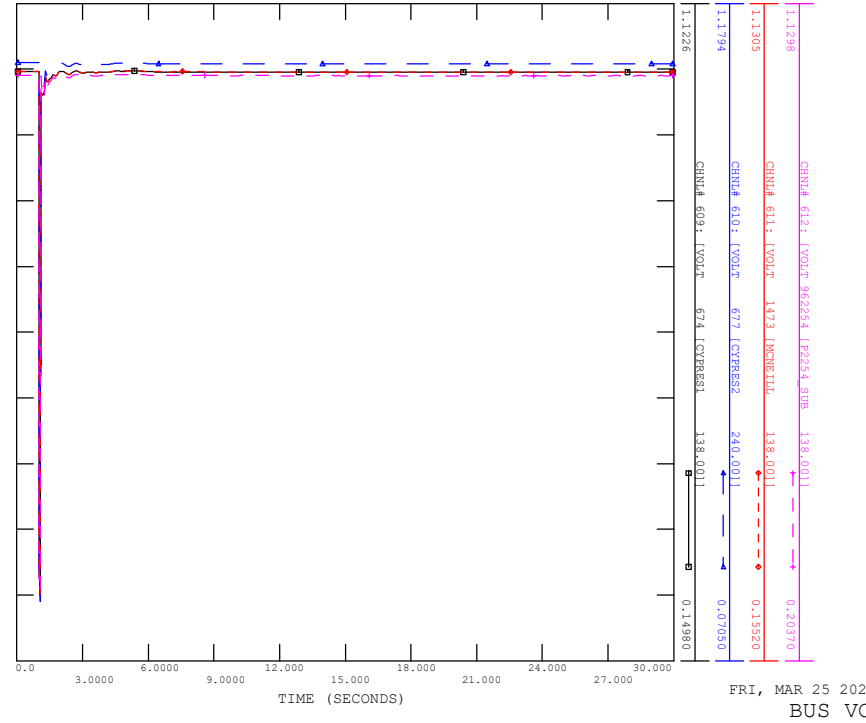


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER



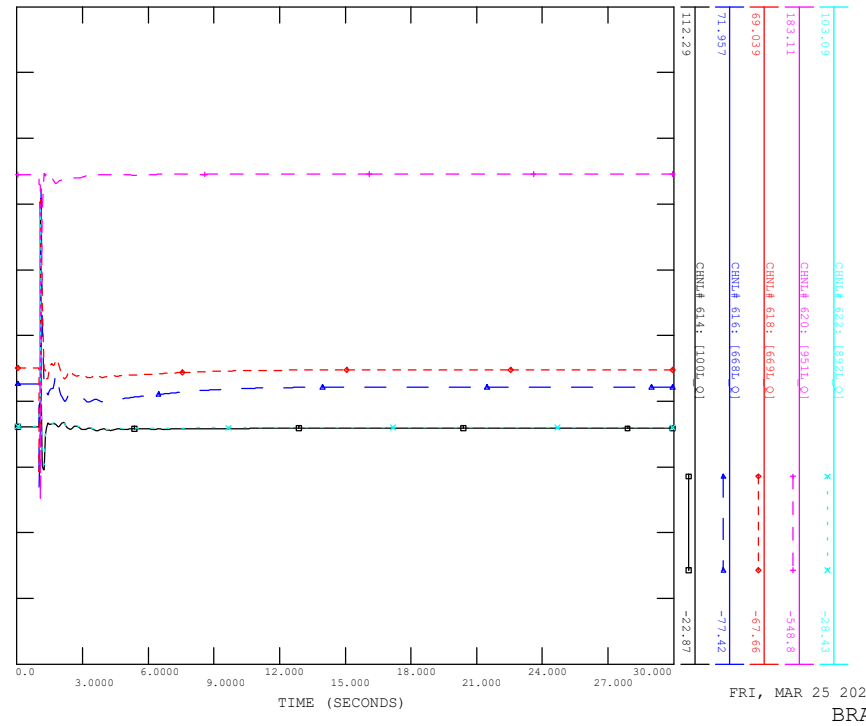


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER  
FILE: scn3\_sl\_03\_1002L\_jenner.out



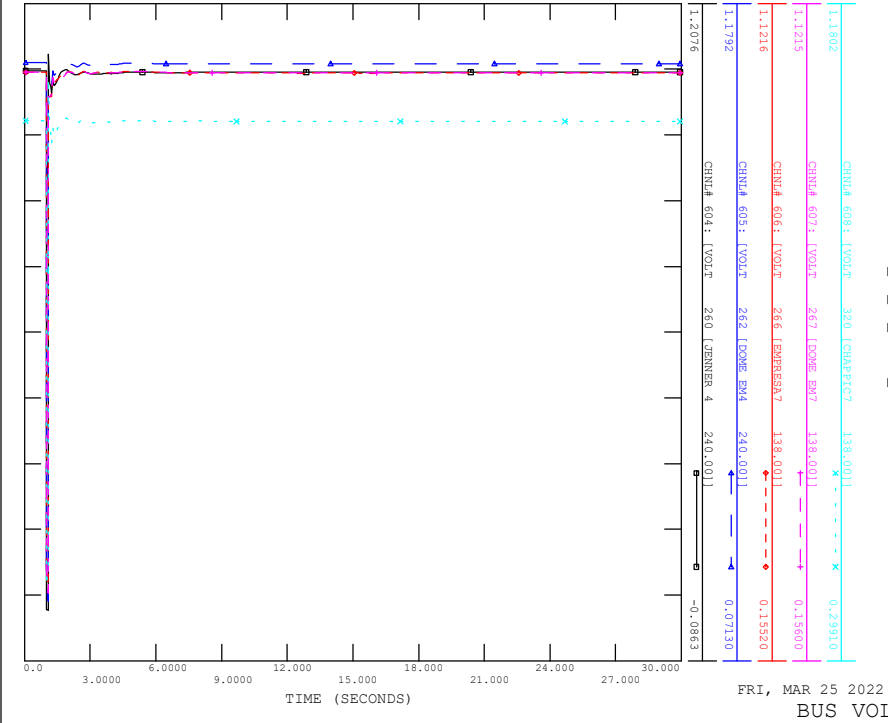
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER  
FILE: scn3\_sl\_03\_1002L\_jenner.out



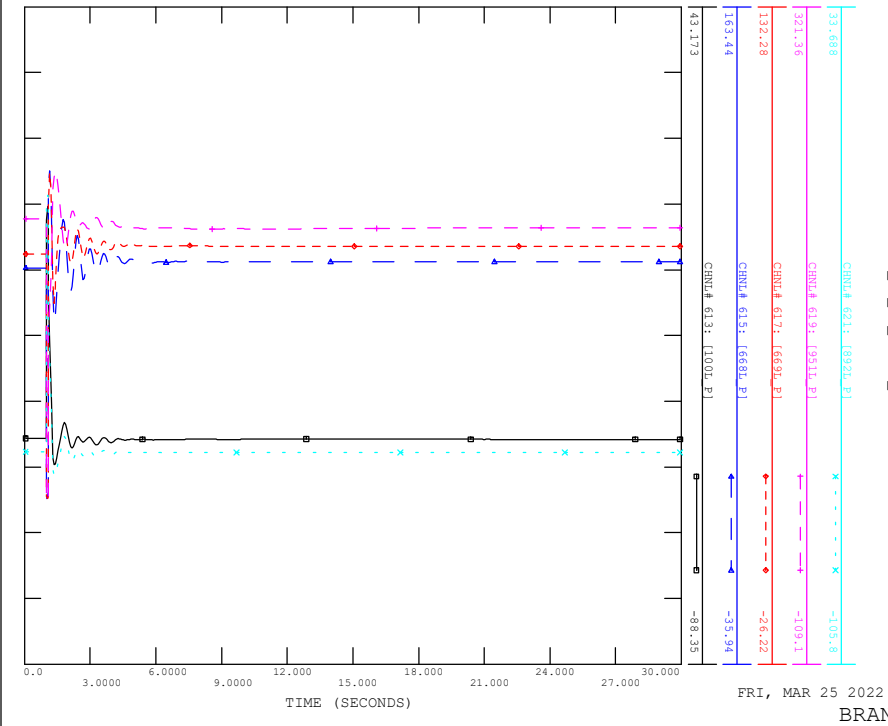
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER  
FILE: scn3\_sl\_03\_1002L\_jenner.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER  
FILE: scn3\_sl\_03\_1002L\_jenner.out

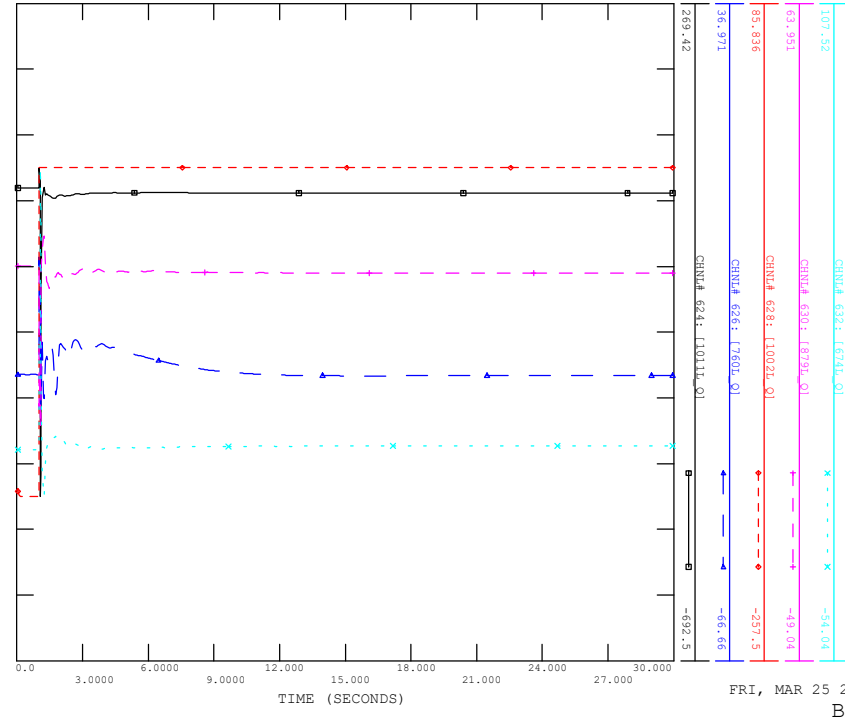


FRI, MAR 25 2022 10:52  
BRANCH P



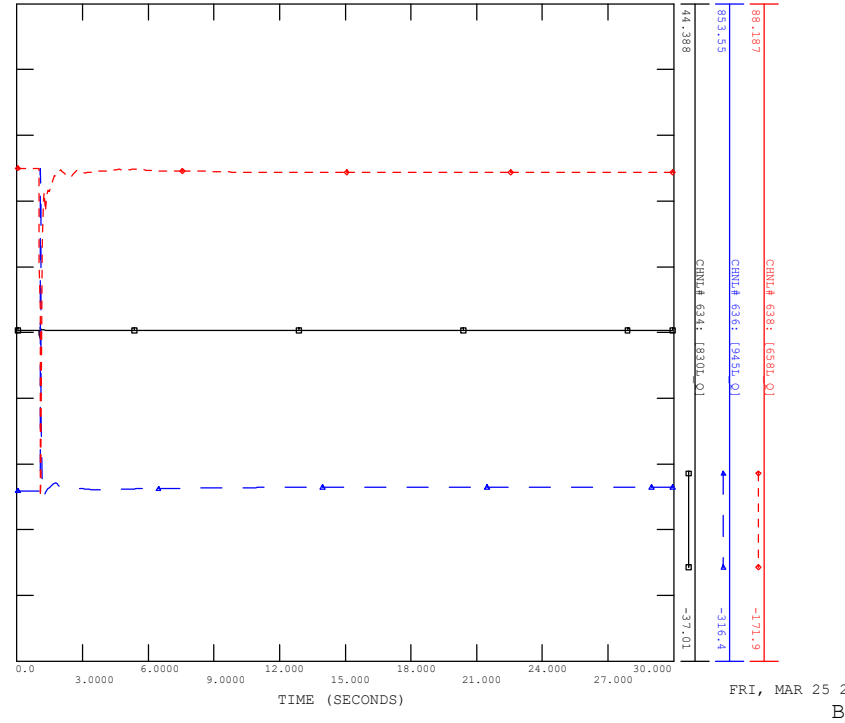
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER

FILE: scn3\_sl\_03\_1002L\_jenner.out



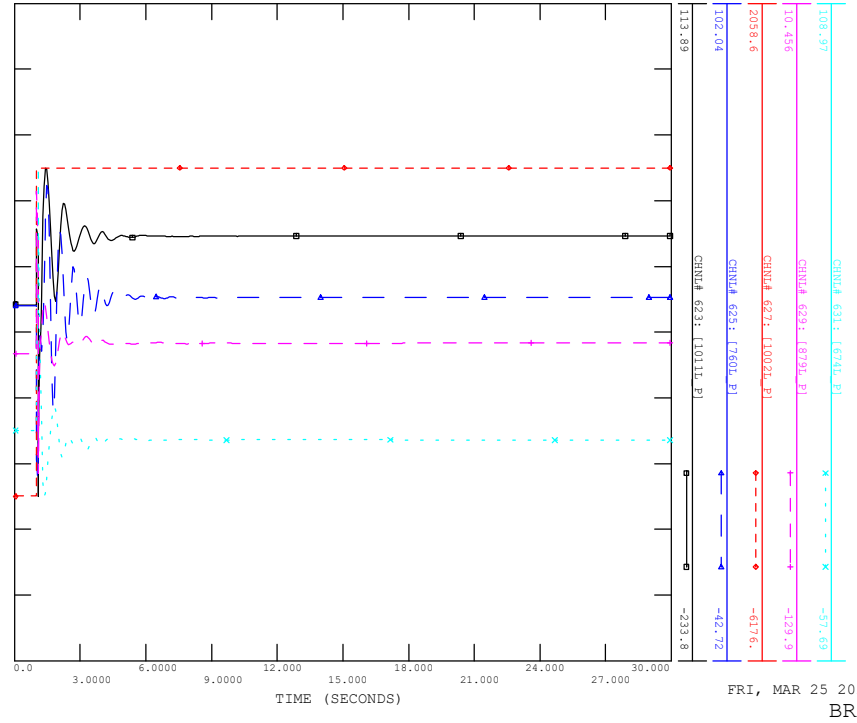
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER

FILE: scn3\_sl\_03\_1002L\_jenner.out



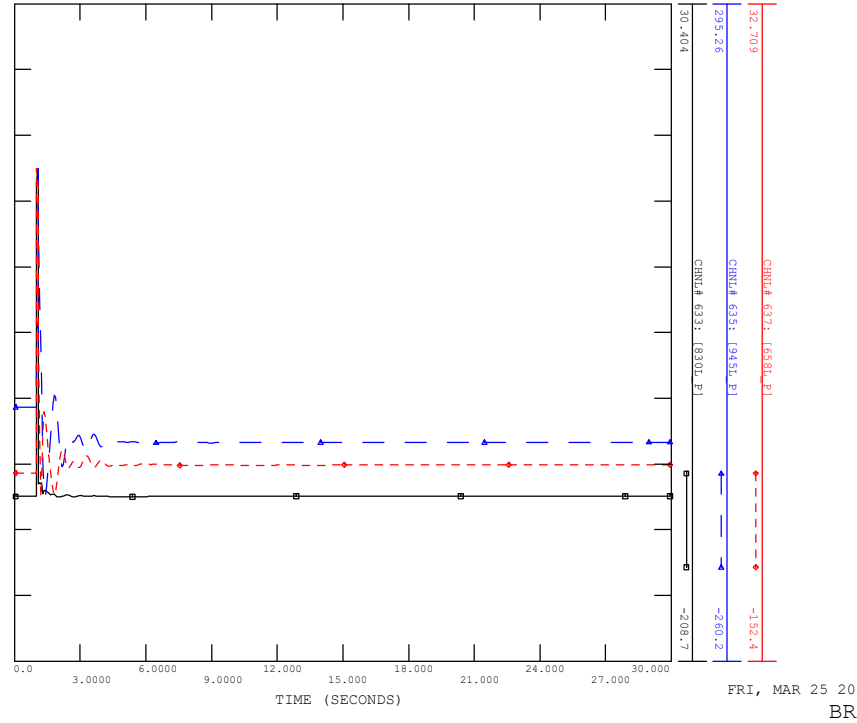
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER

FILE: scn3\_sl\_03\_1002L\_jenner.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_03\_1002L\_JENNER

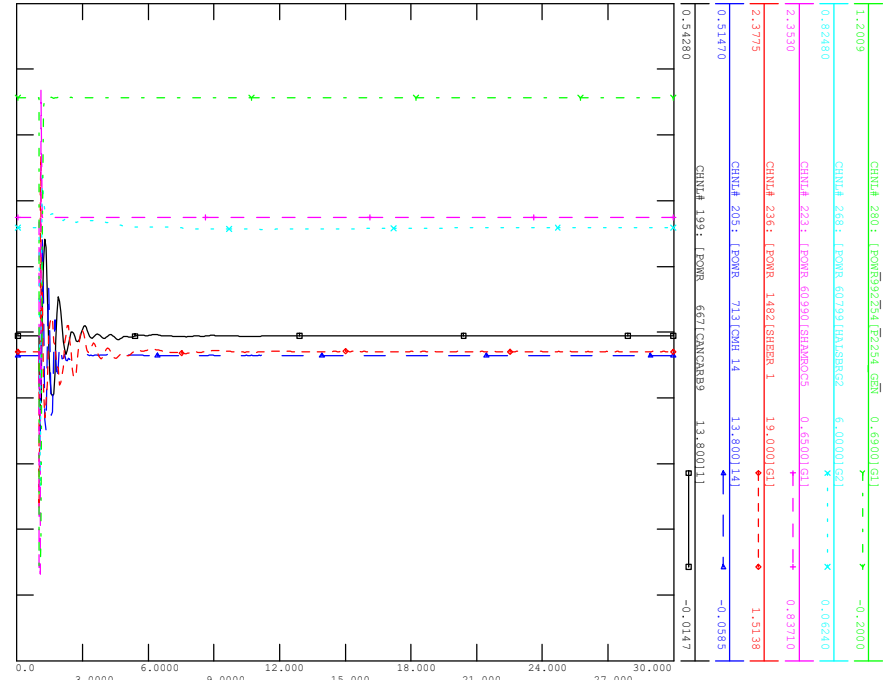
FILE: scn3\_sl\_03\_1002L\_jenner.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO



FILE: scn3\_sl\_04\_1002L\_Amoco.out

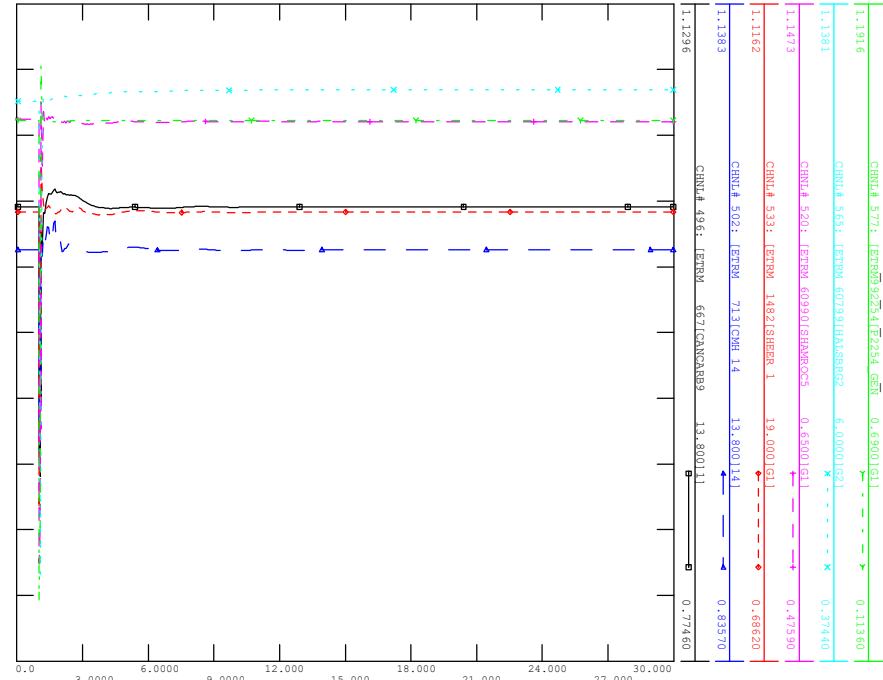


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO



FILE: scn3\_sl\_04\_1002L\_Amoco.out

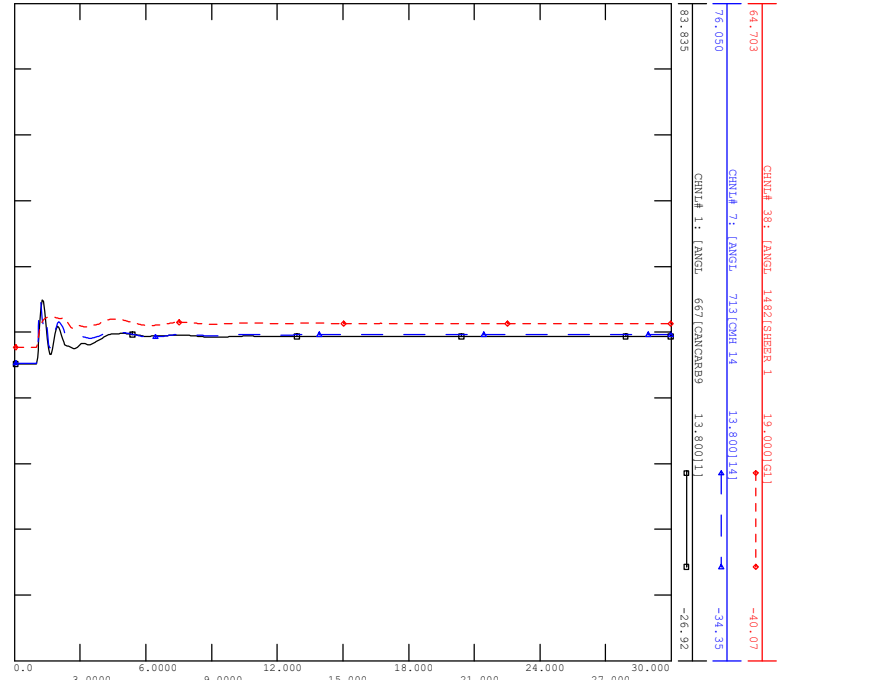


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO



FILE: scn3\_sl\_04\_1002L\_Amoco.out

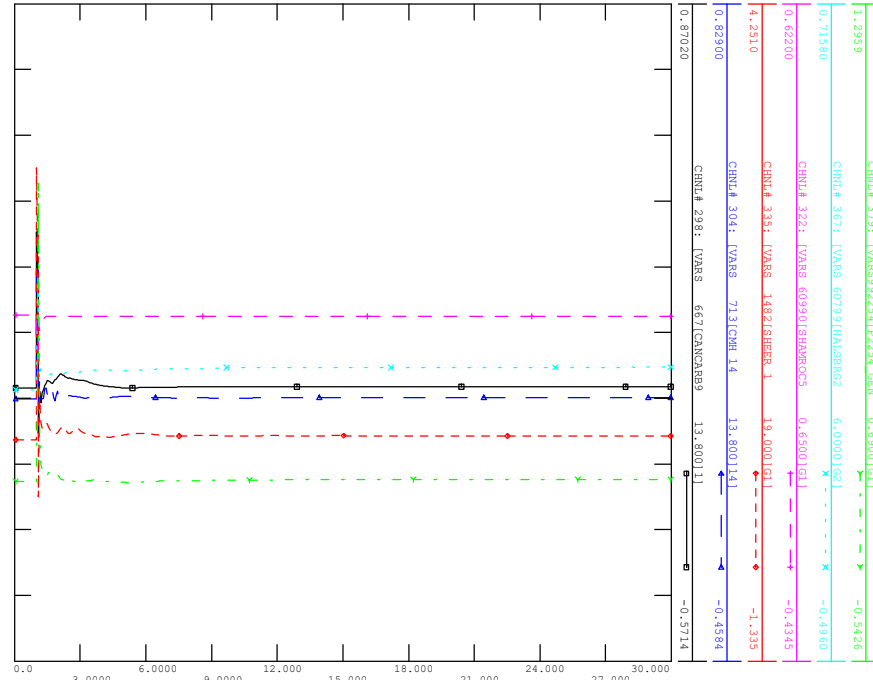


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO

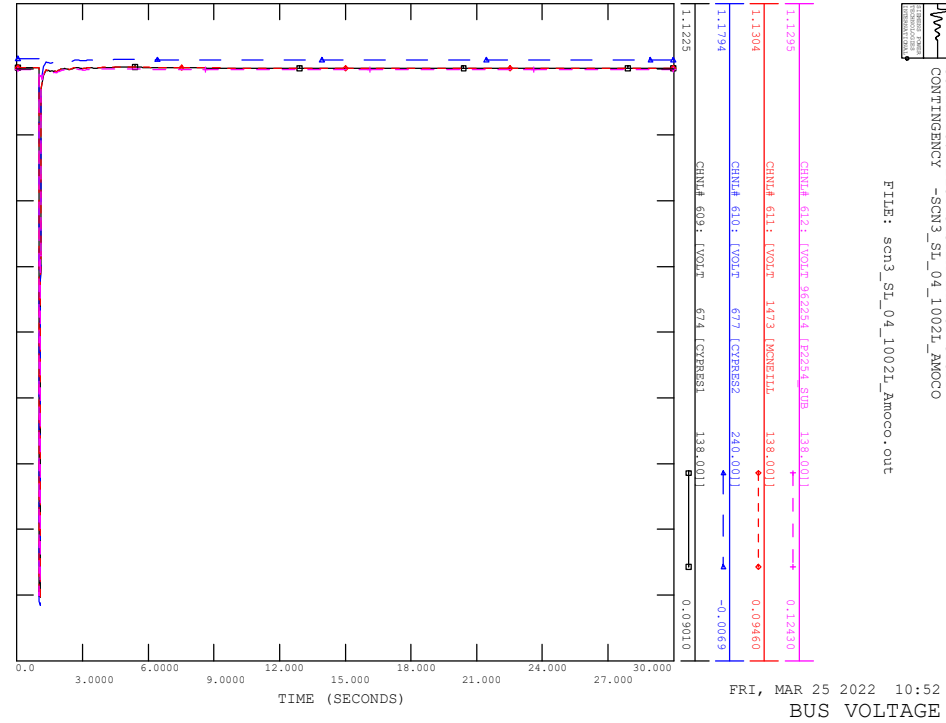


FILE: scn3\_sl\_04\_1002L\_Amoco.out

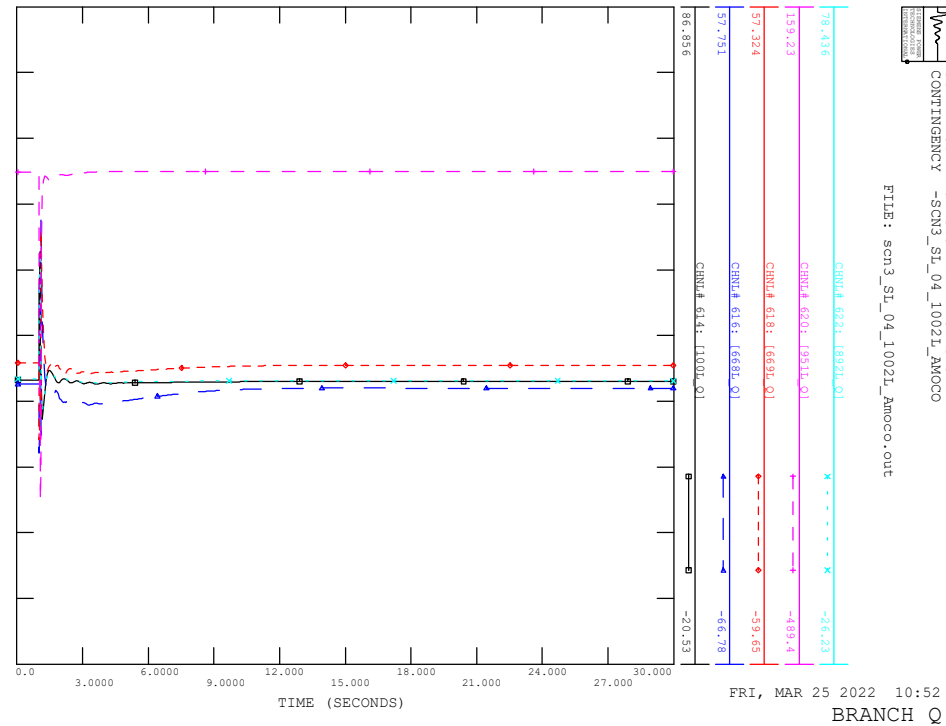


FRI, MAR 25 2022 10:52  
REACTIVE POWER

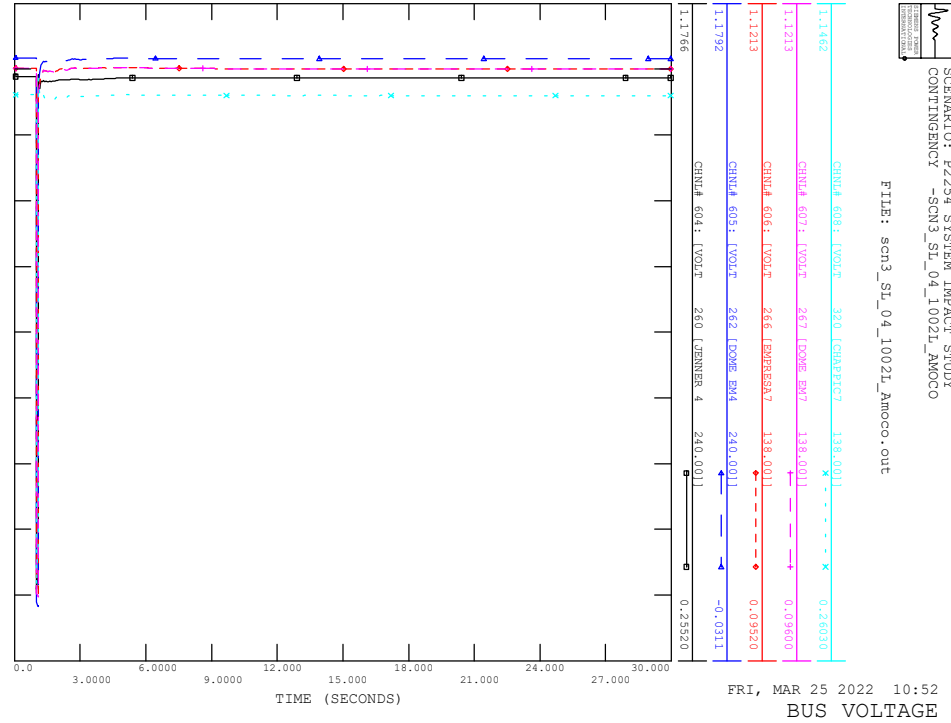
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



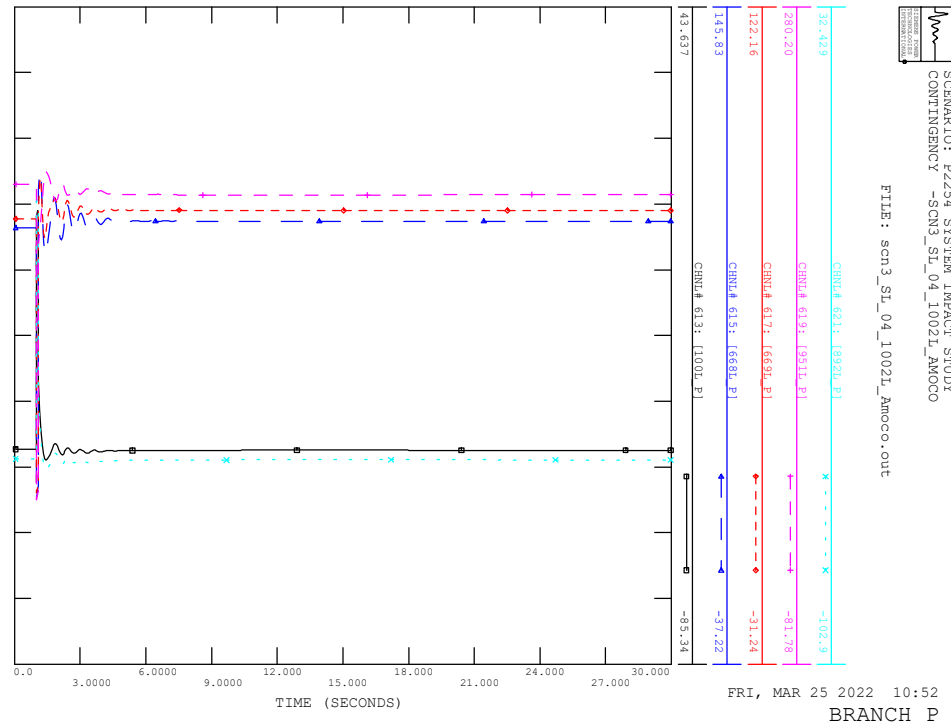
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



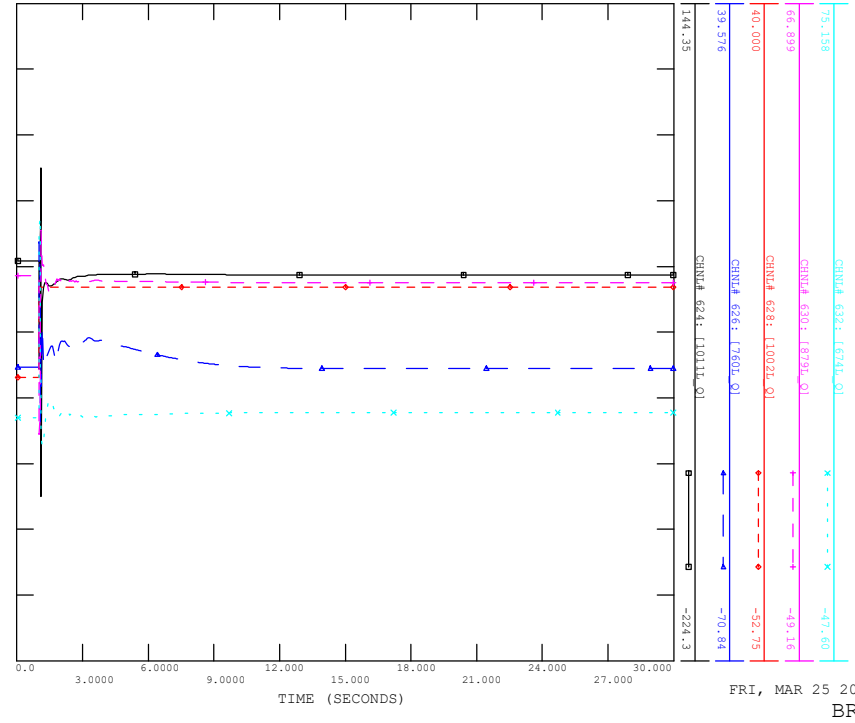
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out

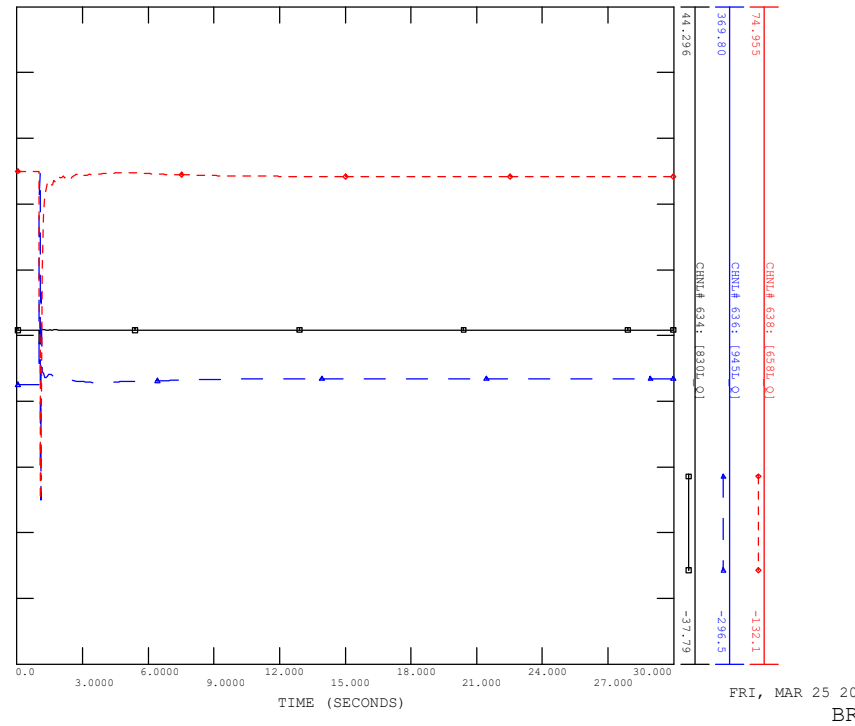


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



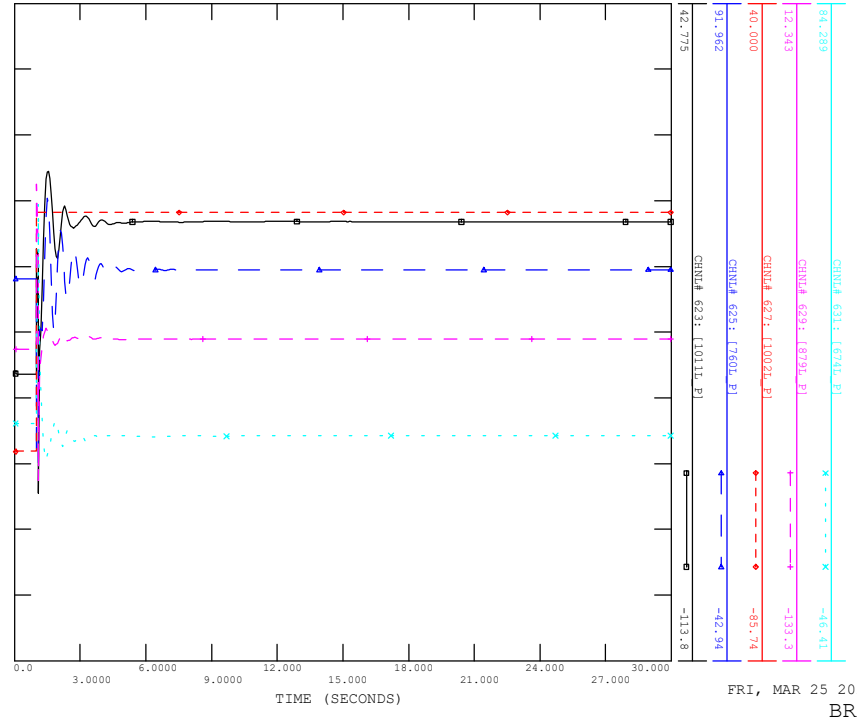
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



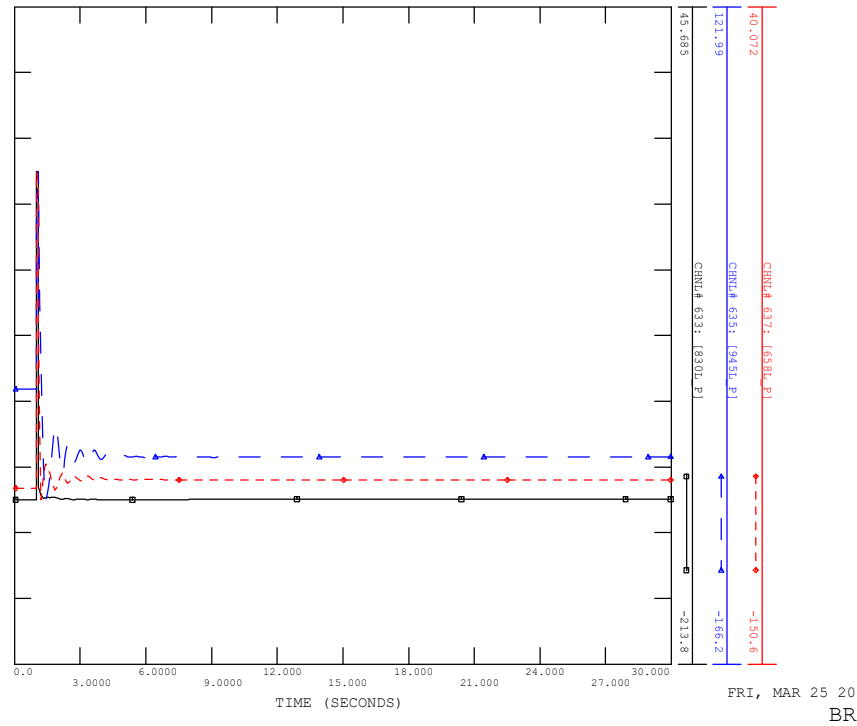
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out



FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_04\_1002L\_AMOCO  
FILE: scn3\_sl\_04\_1002L\_Amoco.out

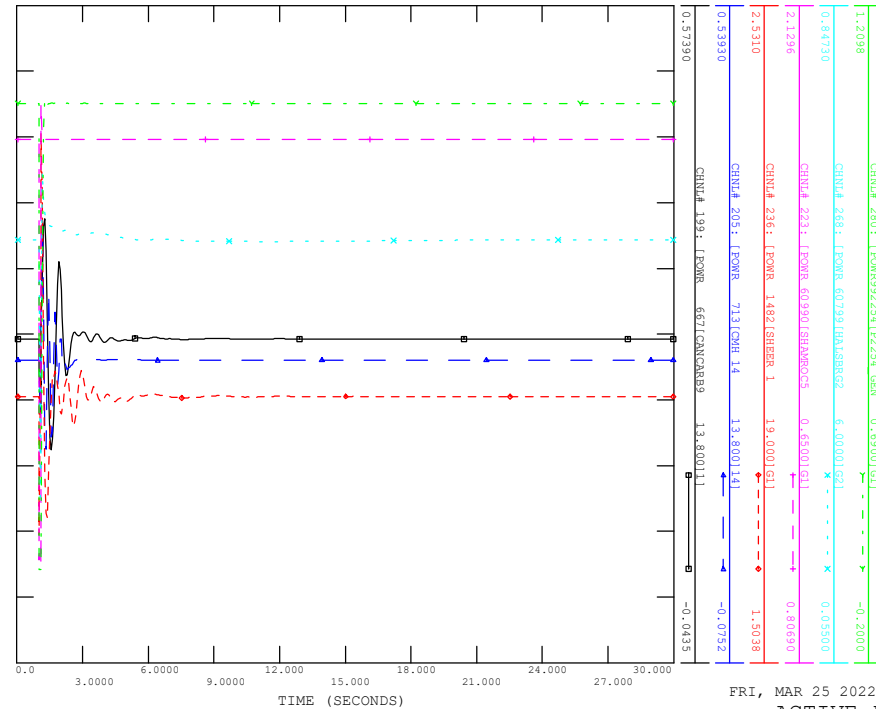


FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS



FILE: scn3\_sl\_05\_1011L\_Cypress.out

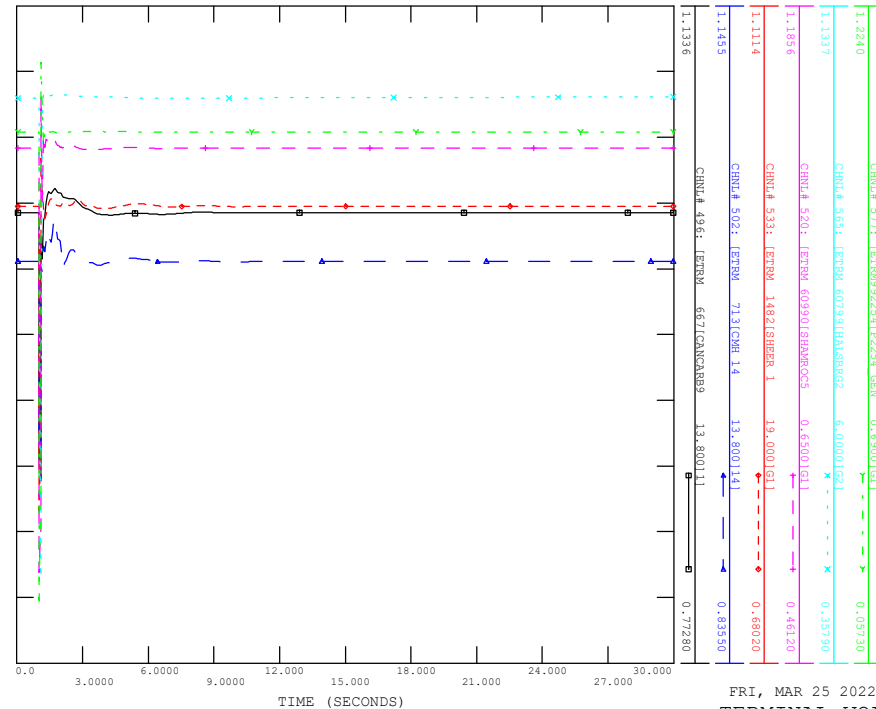


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS



FILE: scn3\_sl\_05\_1011L\_Cypress.out

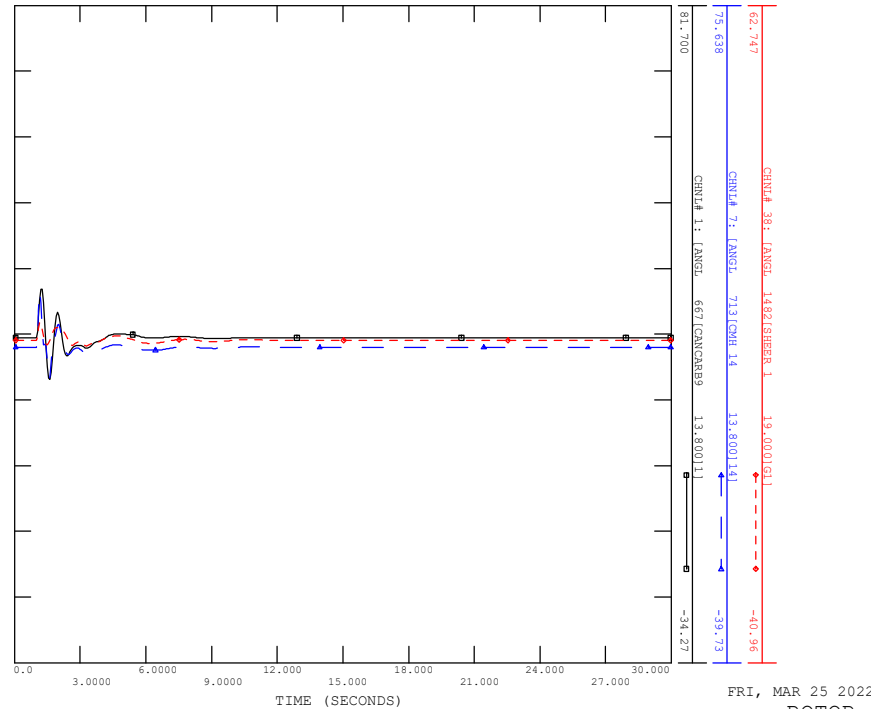


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS



FILE: scn3\_sl\_05\_1011L\_Cypress.out

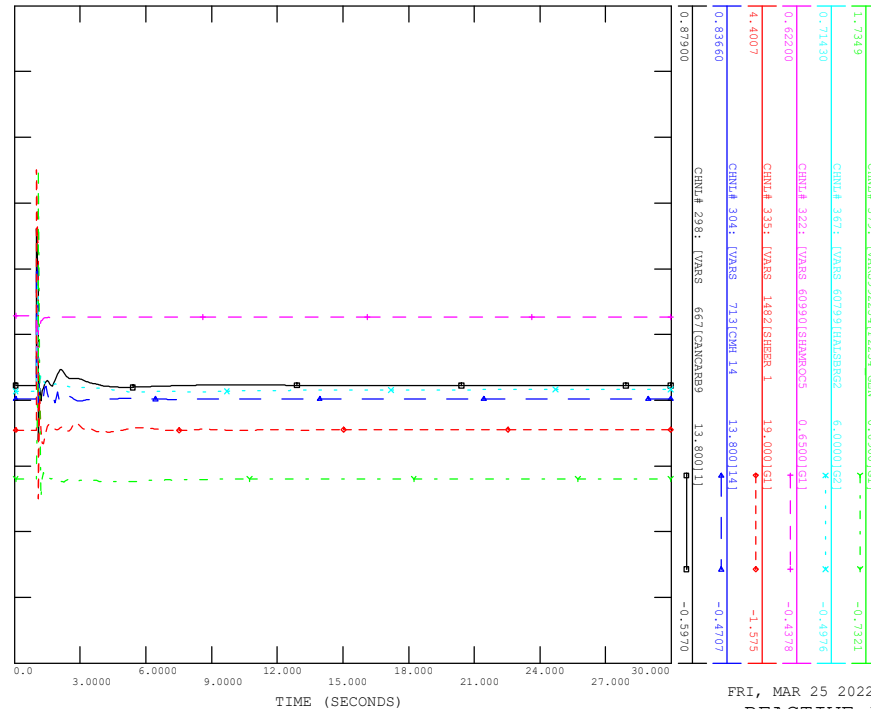


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS



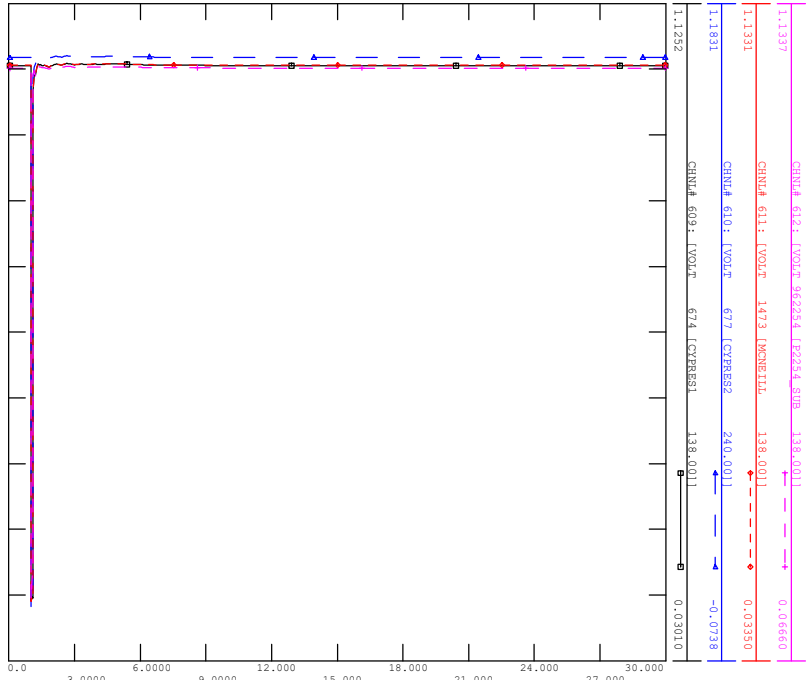
FILE: scn3\_sl\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS

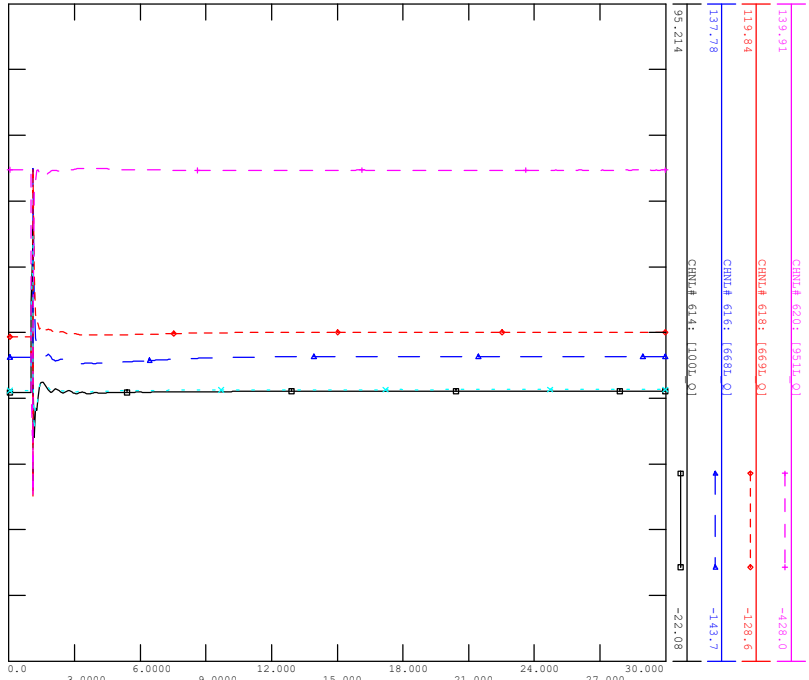
FILE: scn3\_sl\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS

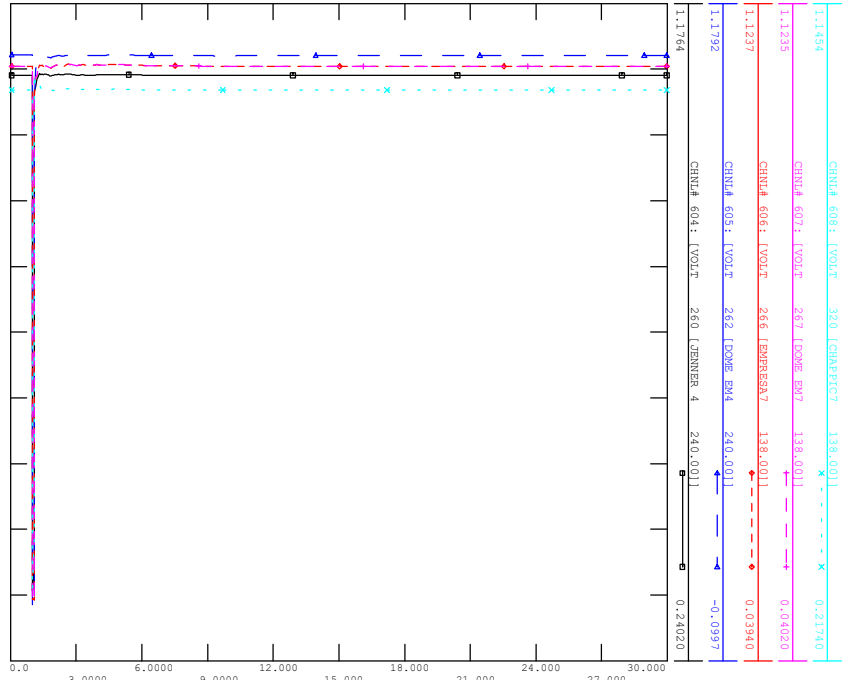
FILE: scn3\_sl\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS

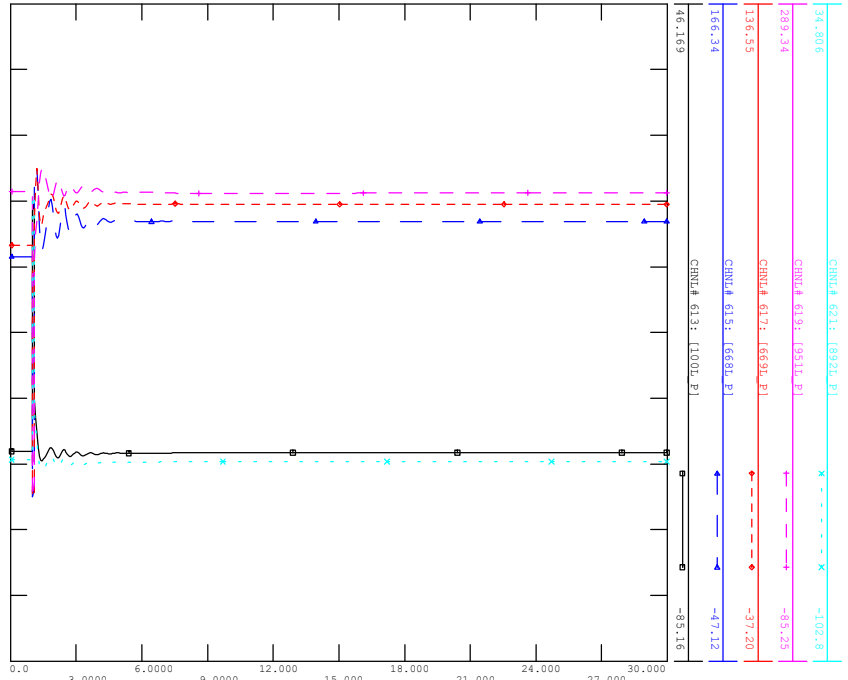
FILE: scn3\_sl\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

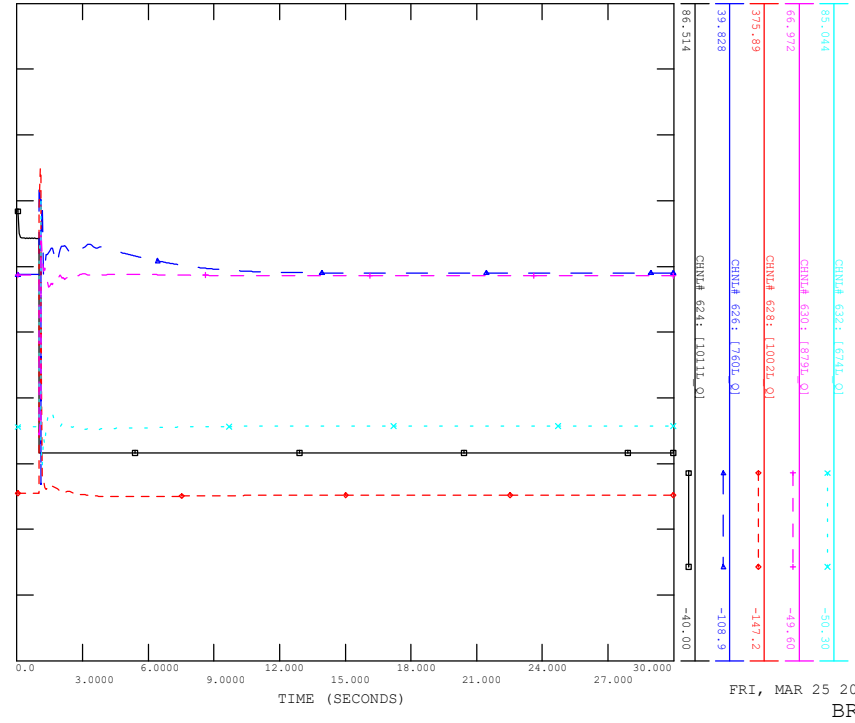
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS

FILE: scn3\_sl\_05\_1011L\_Cypress.out

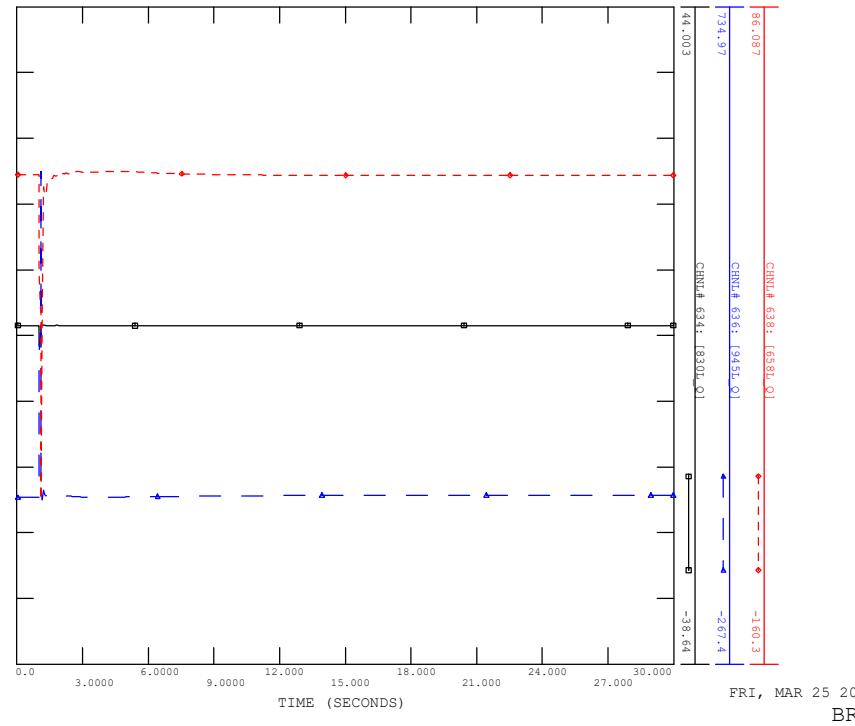


FRI, MAR 25 2022 10:52  
BRANCH P

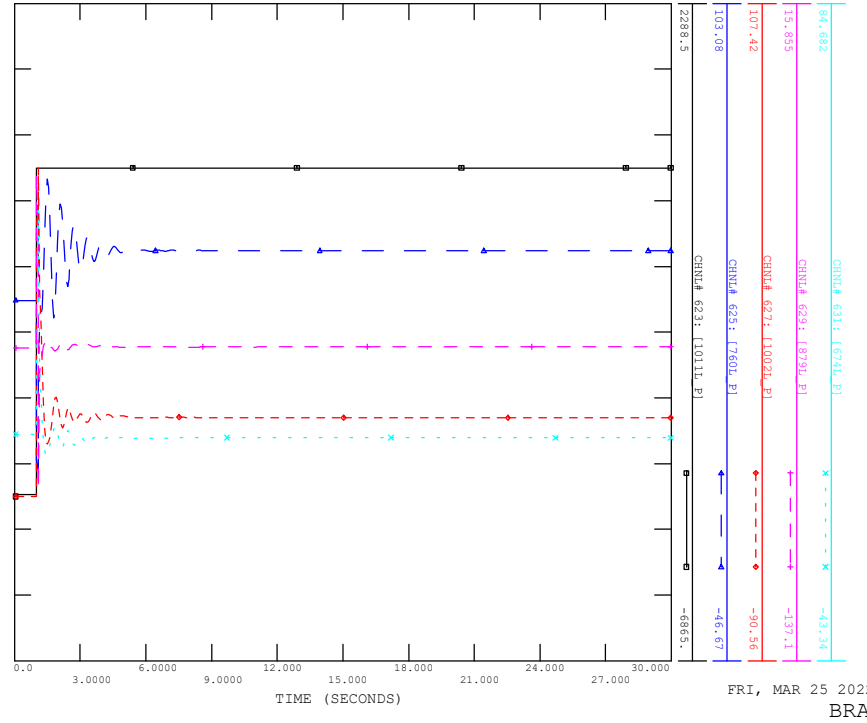
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS  
FILE: scn3\_sl\_05\_1011L\_Cypress.out



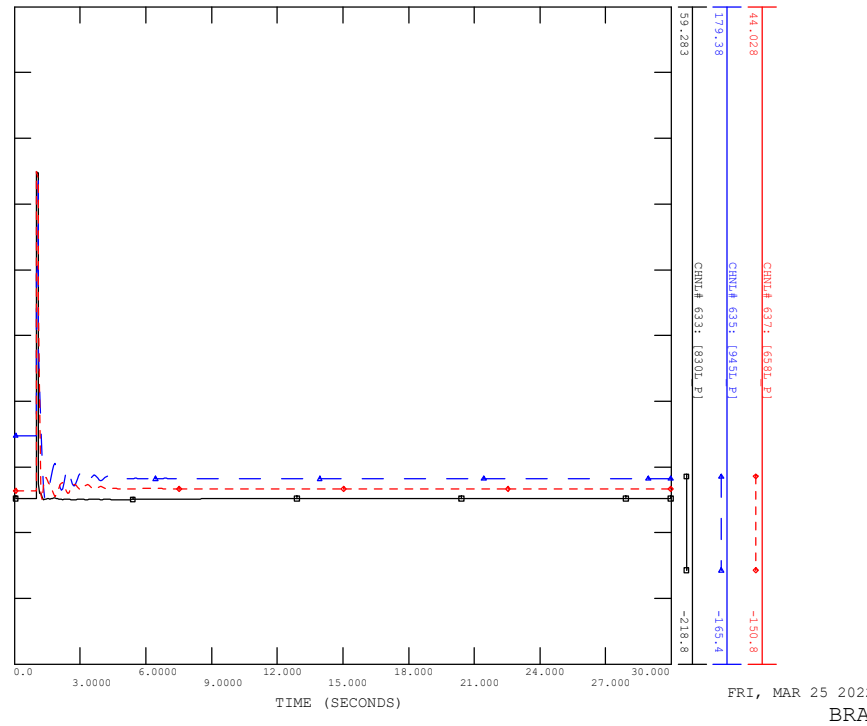
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS  
FILE: scn3\_sl\_05\_1011L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS  
FILE: scn3\_sl\_05\_1011L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_05\_1011L\_CYPRESS  
FILE: scn3\_sl\_05\_1011L\_Cypress.out

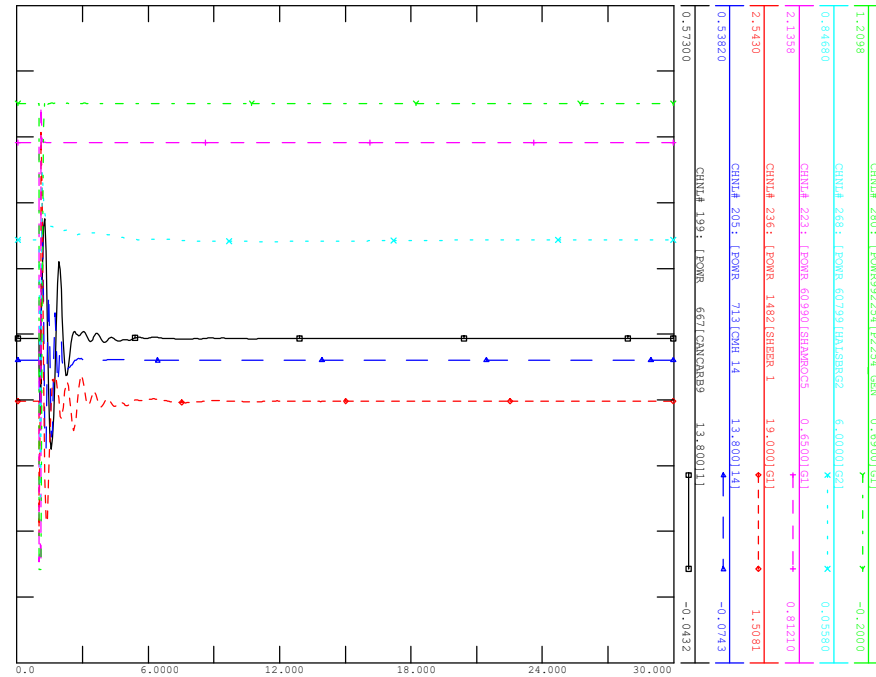




SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO



FILE: scn3\_sl\_06\_1011L\_Amoco.out

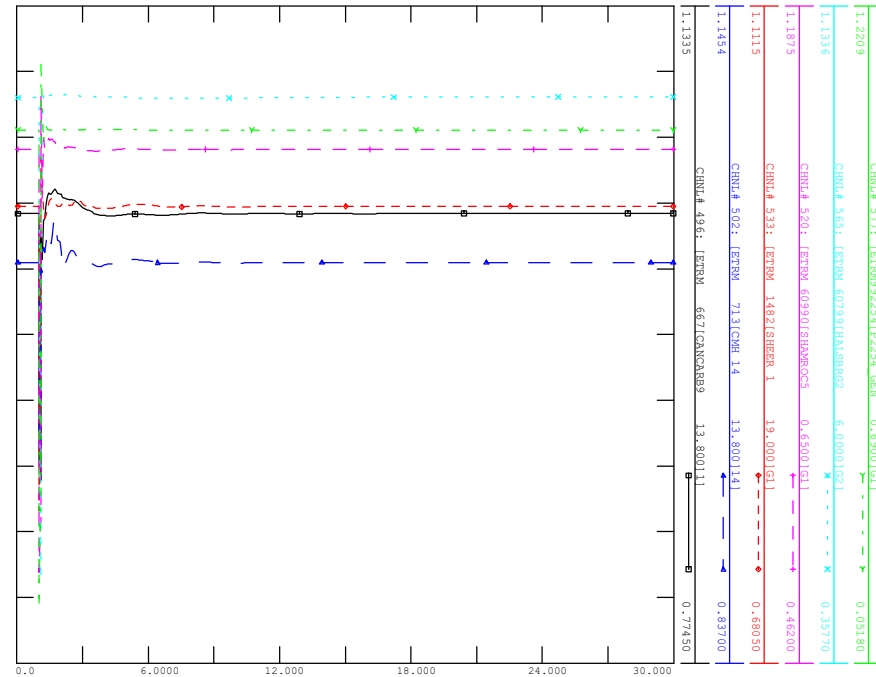


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO



FILE: scn3\_sl\_06\_1011L\_Amoco.out

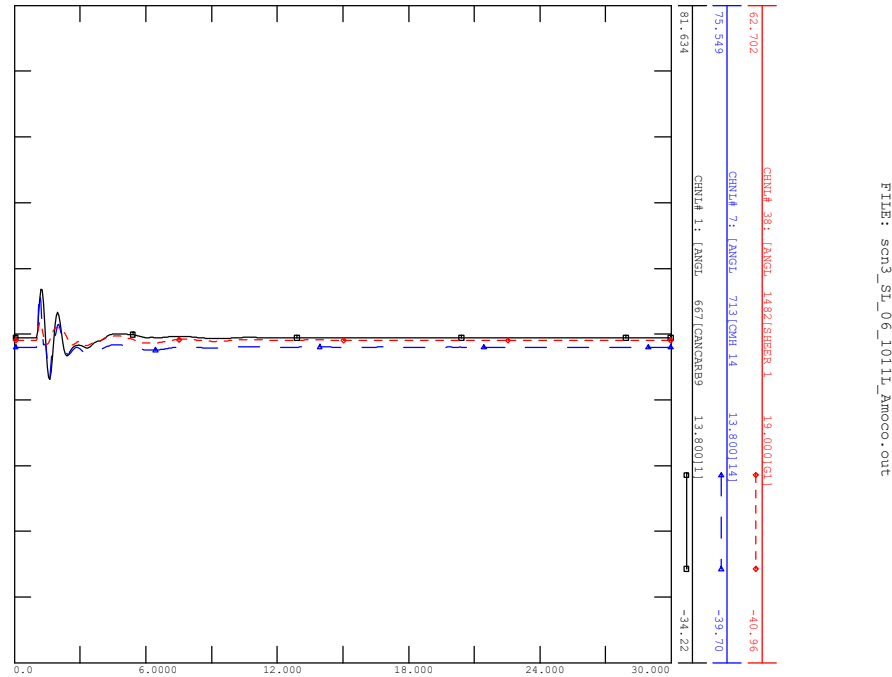


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO



FILE: scn3\_sl\_06\_1011L\_Amoco.out

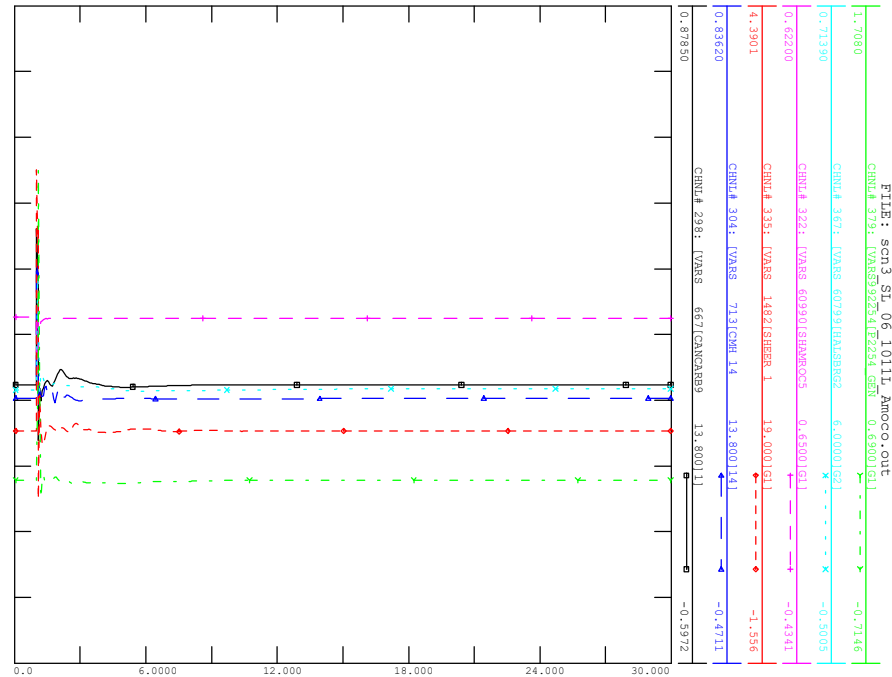


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO

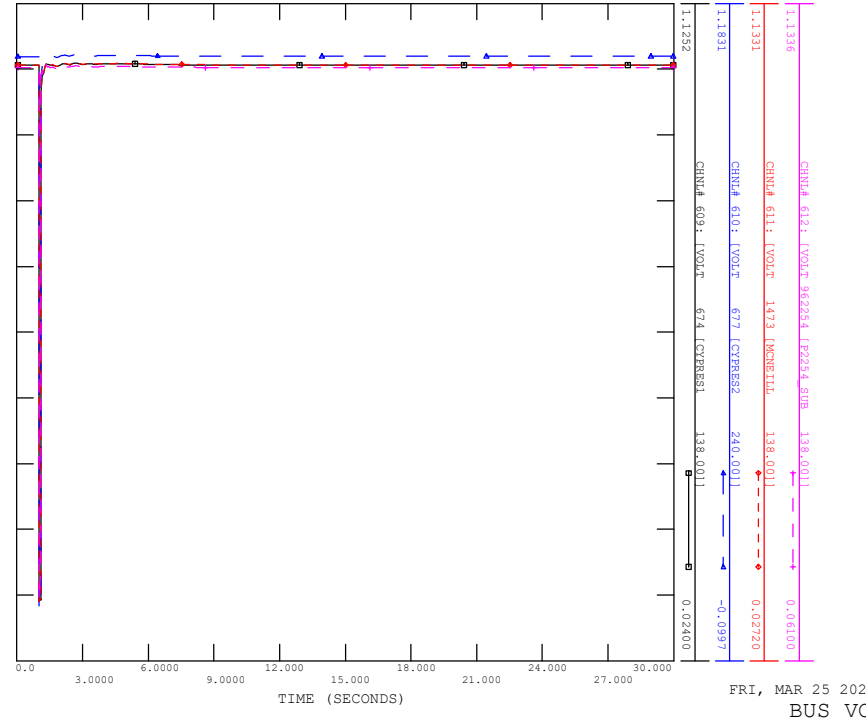


FILE: scn3\_sl\_06\_1011L\_Amoco.out



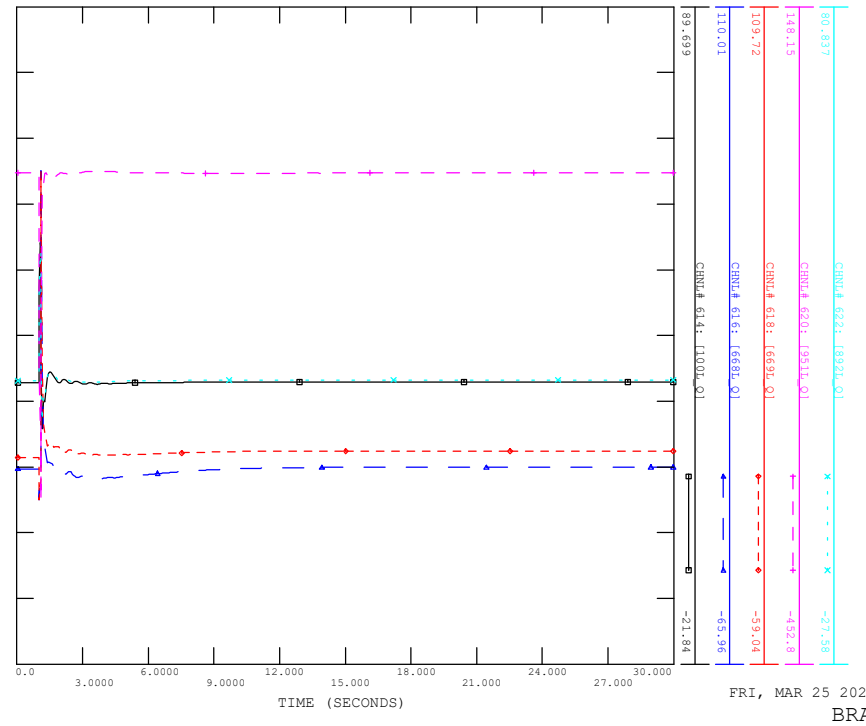
FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



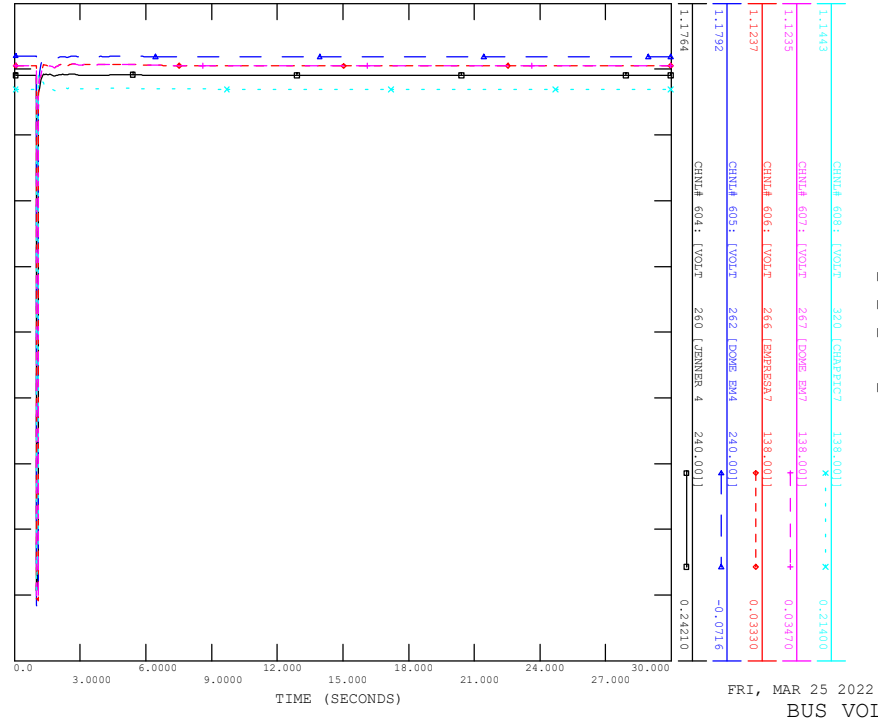
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



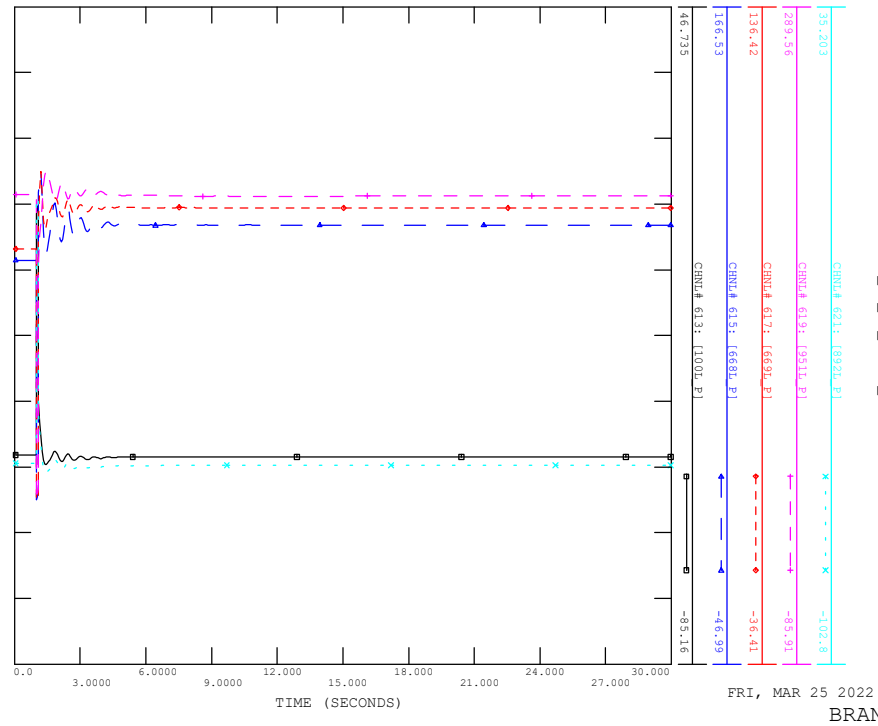
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



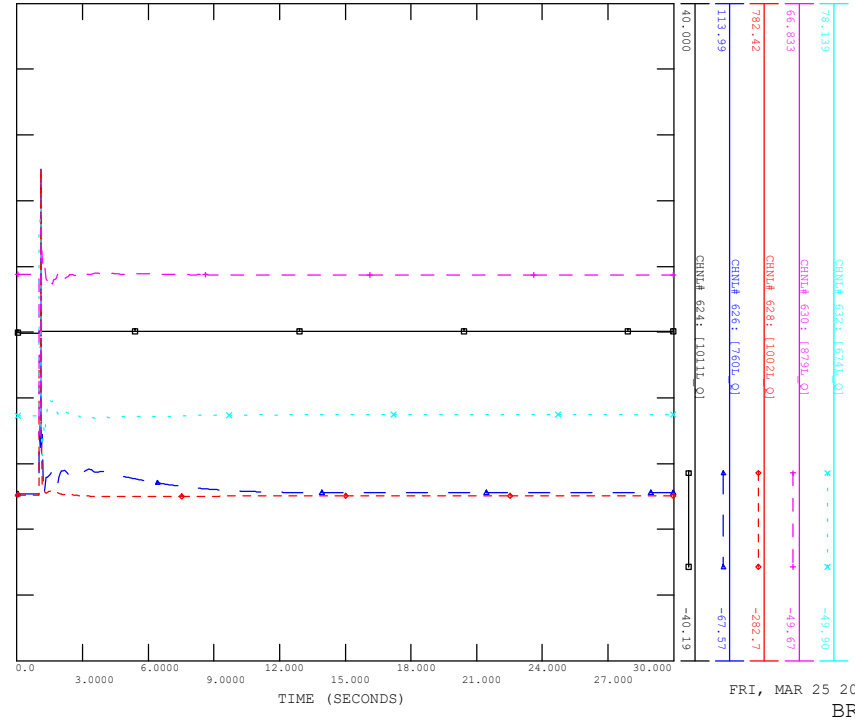
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out

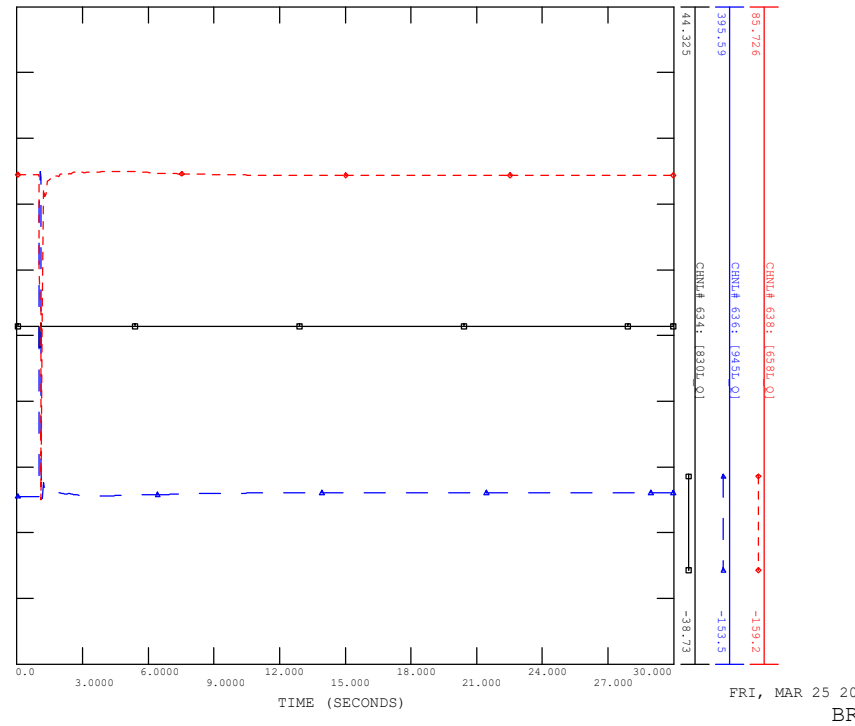


FRI, MAR 25 2022 10:52  
BRANCH P

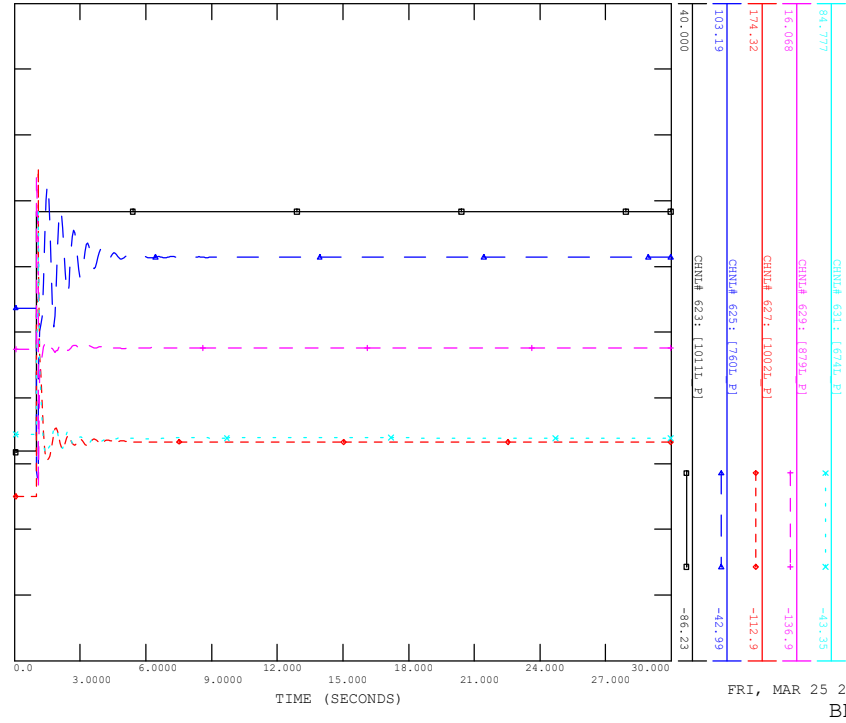
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



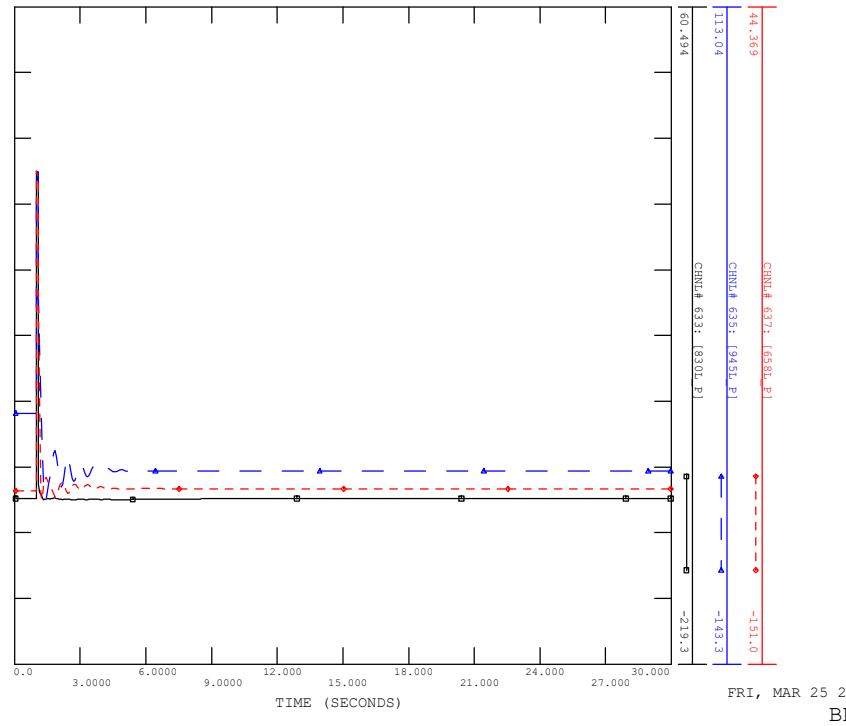
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



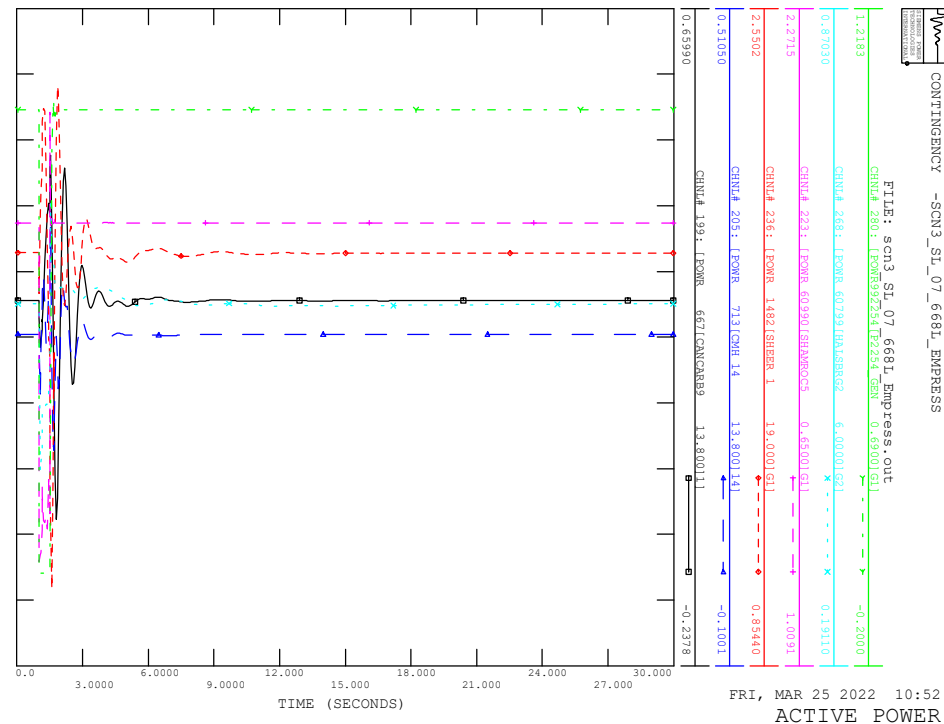
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



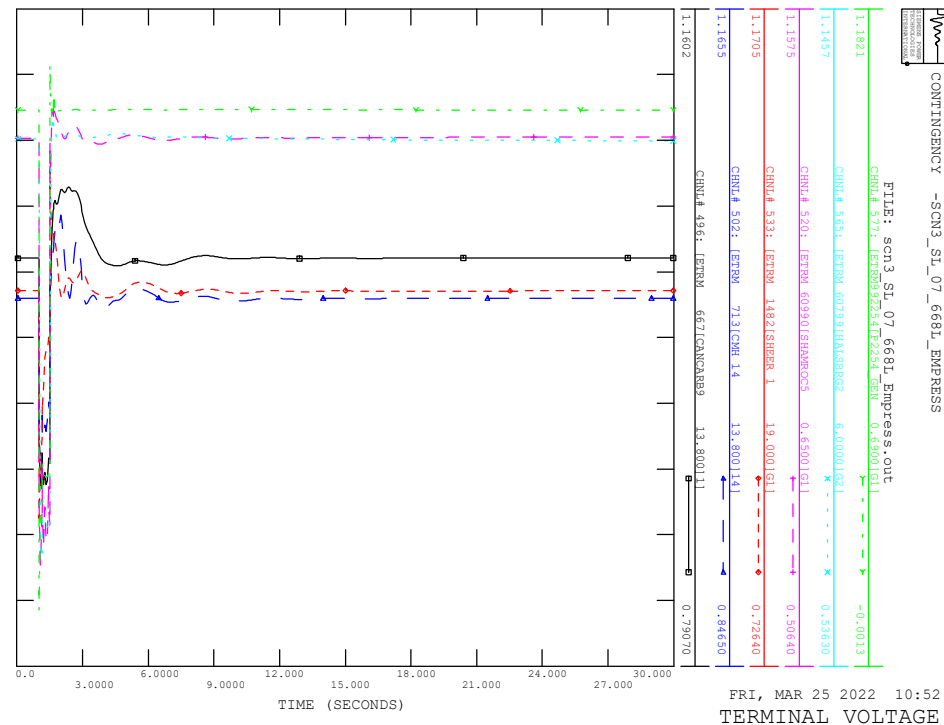
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_06\_1011L\_AMOCO  
FILE: scn3\_sl\_06\_1011L\_Amoco.out



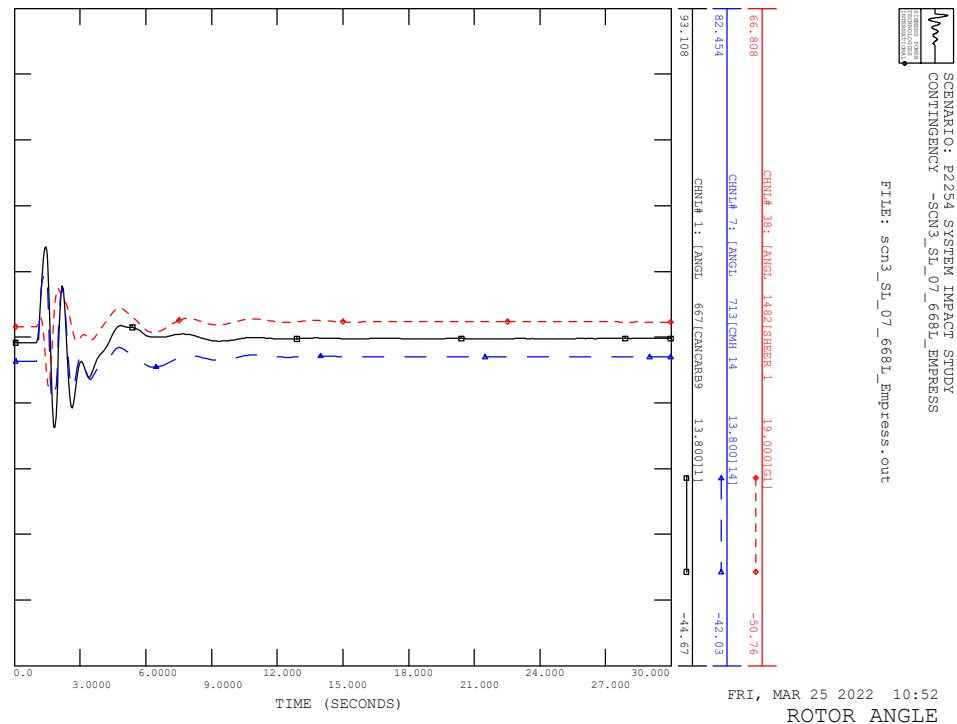
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS



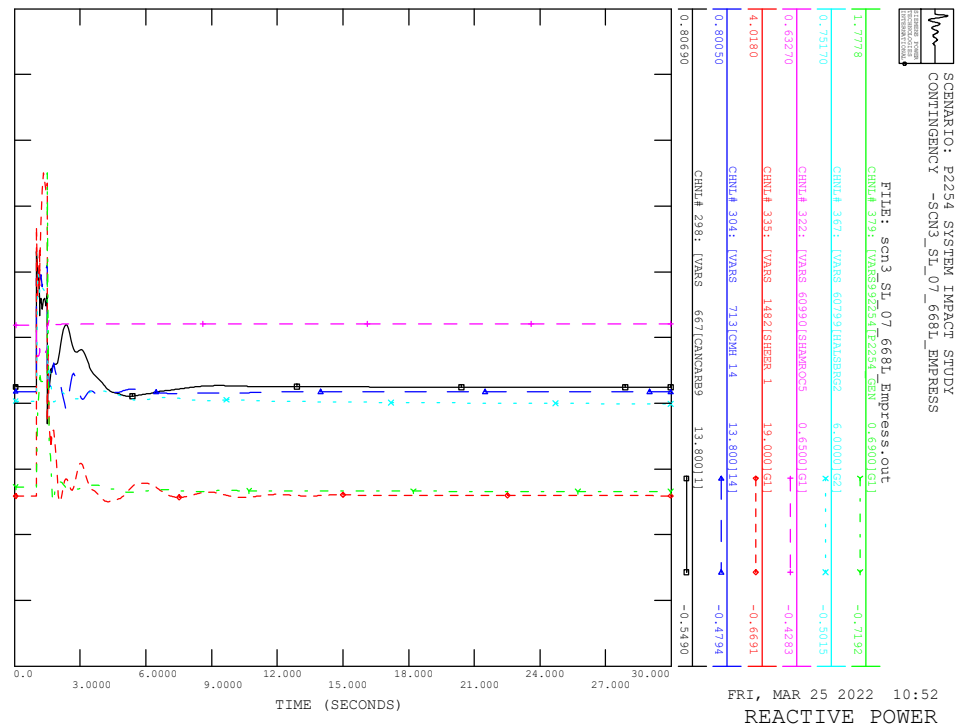
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS

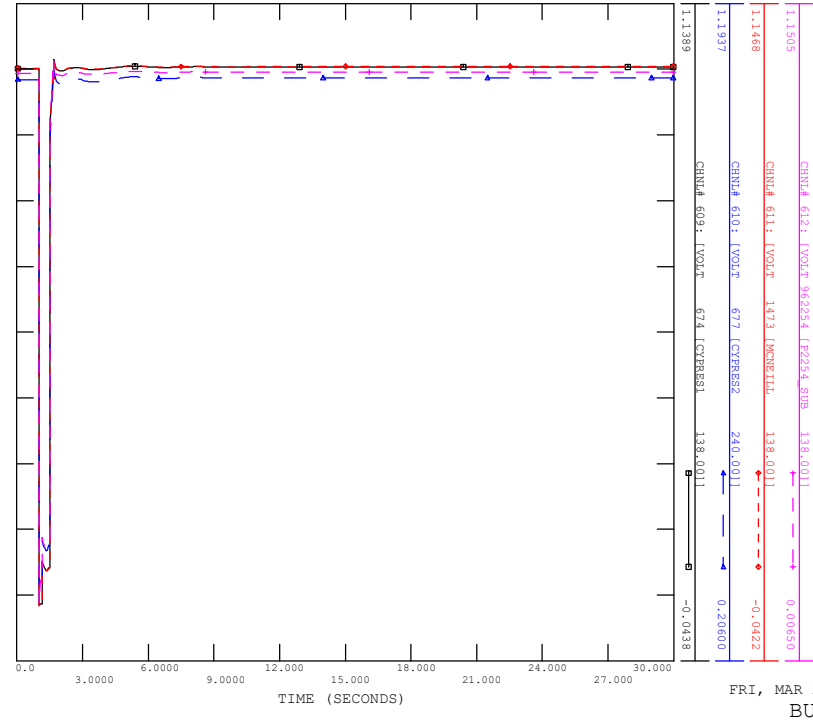


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_668L\_EMPRESS

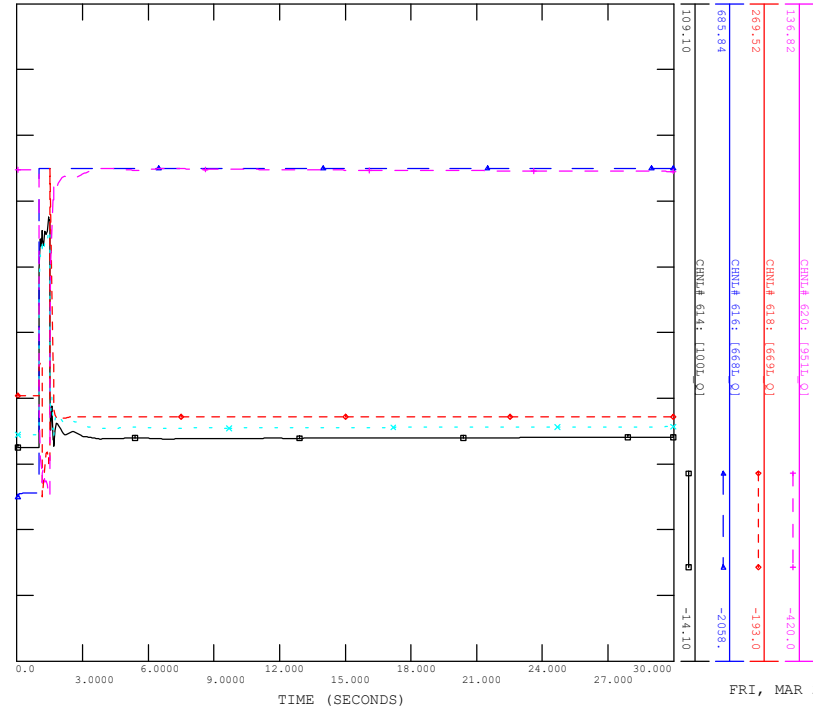
FILE: scn3\_sl\_07\_668L\_emptress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_668L\_EMPRESS

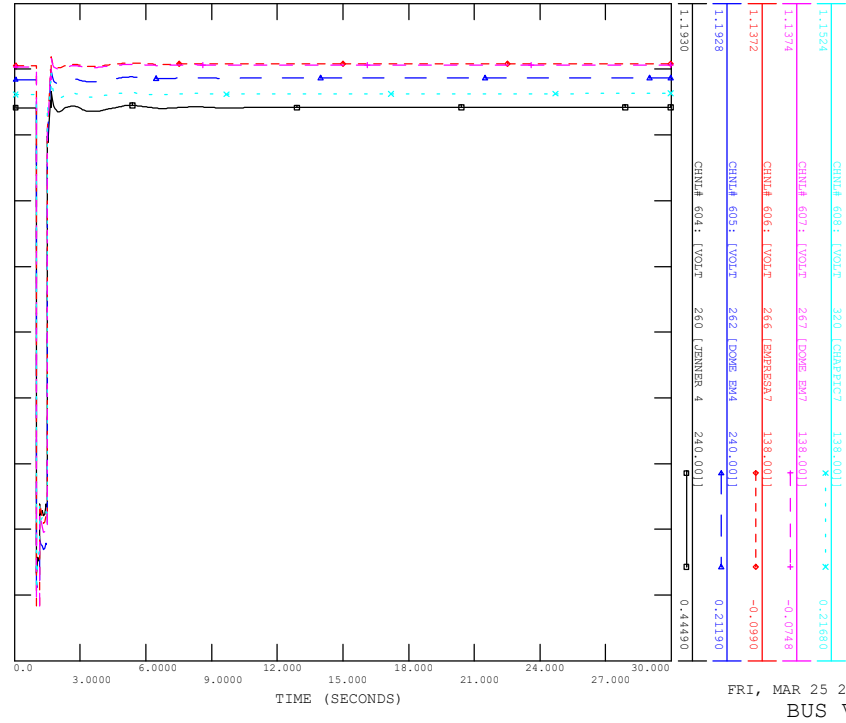
FILE: scn3\_sl\_07\_668L\_emptress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_668L\_EMPRESS

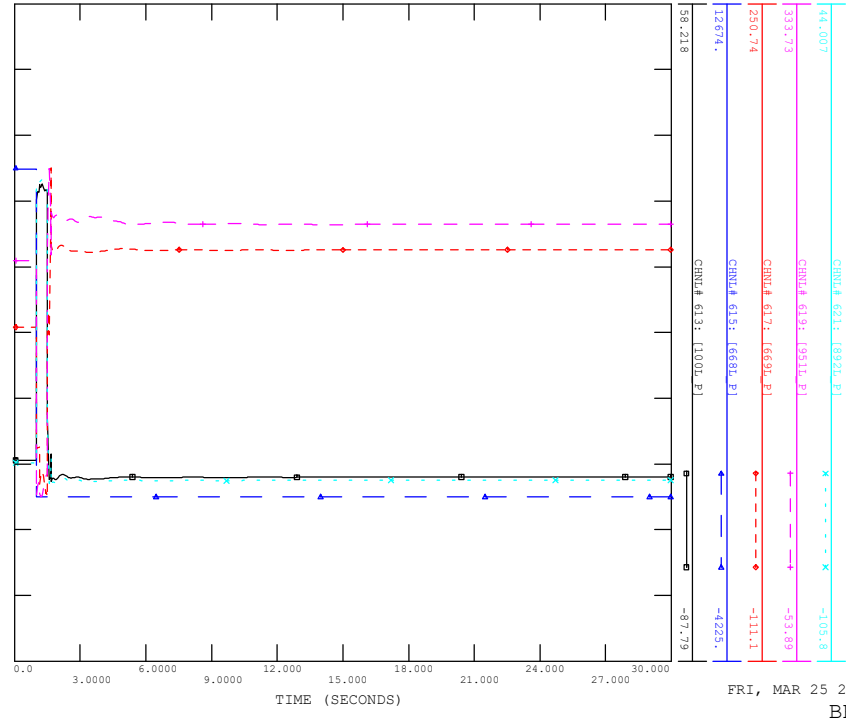
FILE: scn3\_sl\_07\_668L\_emptress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_668L\_EMPRESS

FILE: scn3\_sl\_07\_668L\_emptress.out

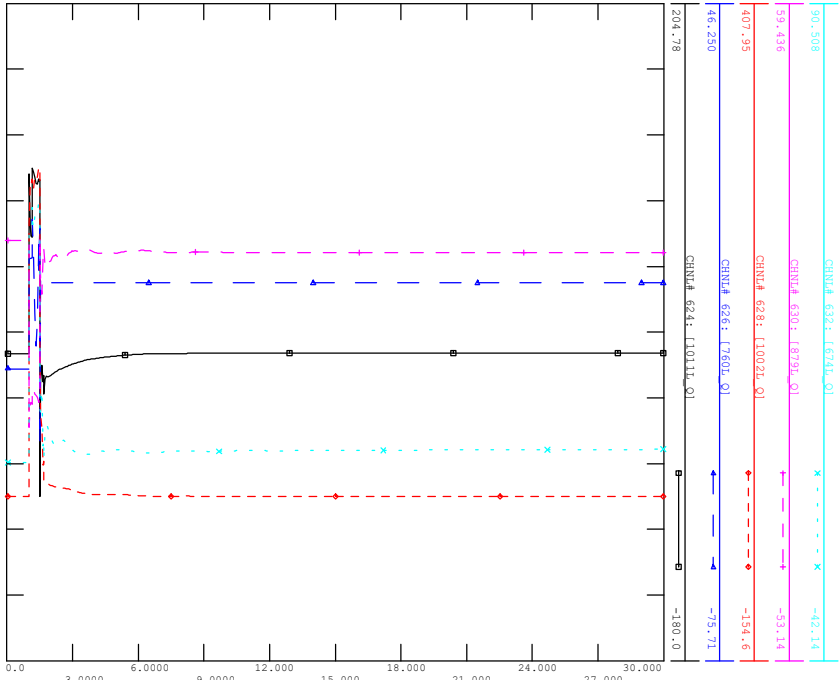


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS

FILE: scn3\_sl\_07\_6681\_emptress.out

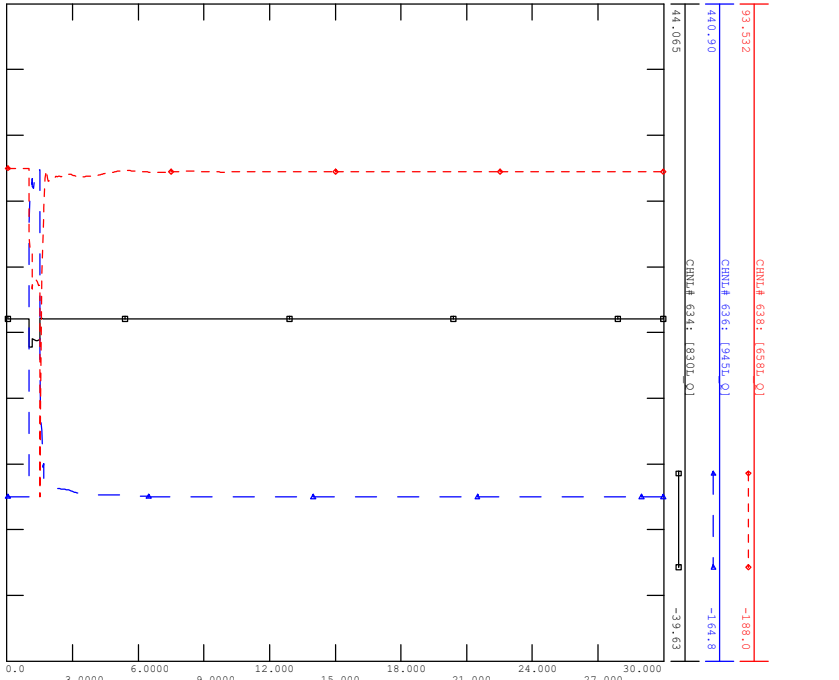


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS

FILE: scn3\_sl\_07\_6681\_emptress.out

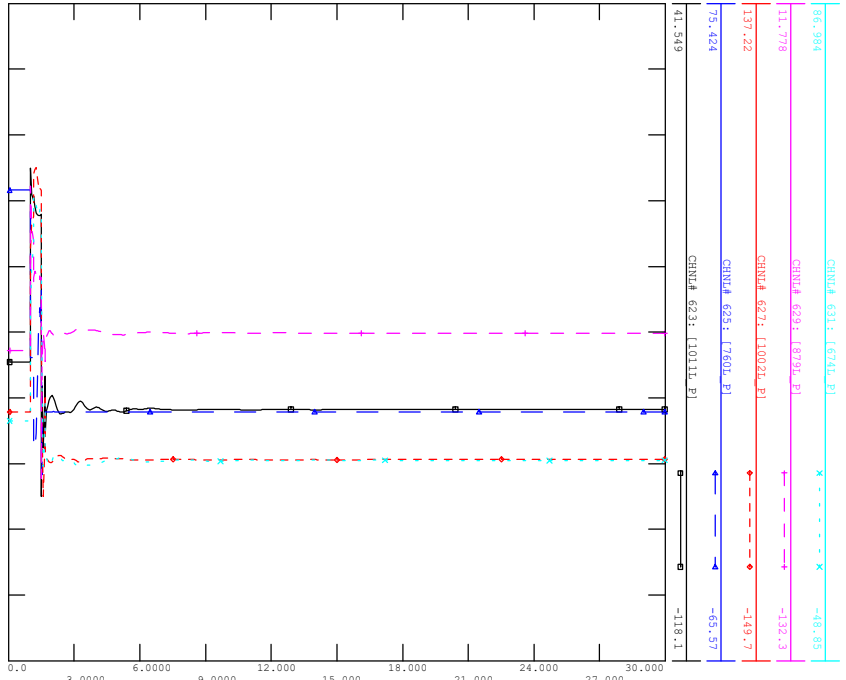


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS

FILE: scn3\_sl\_07\_6681\_emptress.out

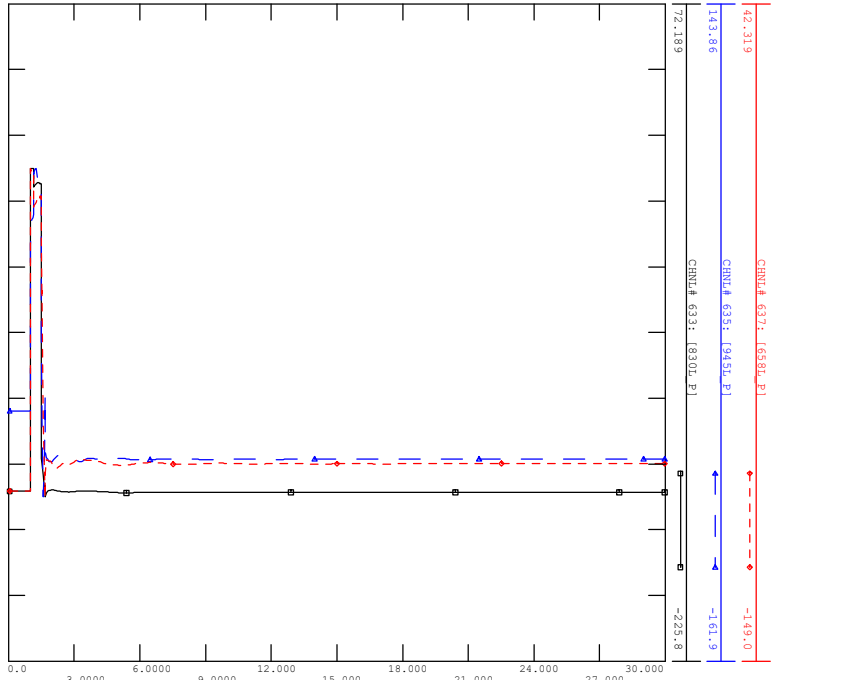


FRI, MAR 25 2022 10:52  
BRANCH P



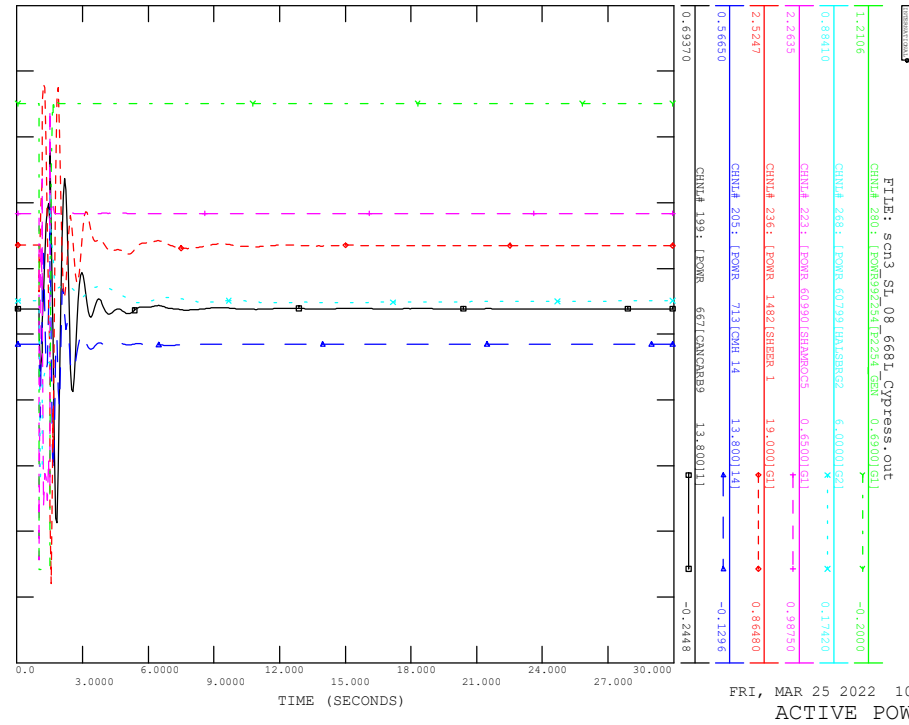
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_07\_6681\_EMPRESS

FILE: scn3\_sl\_07\_6681\_emptress.out

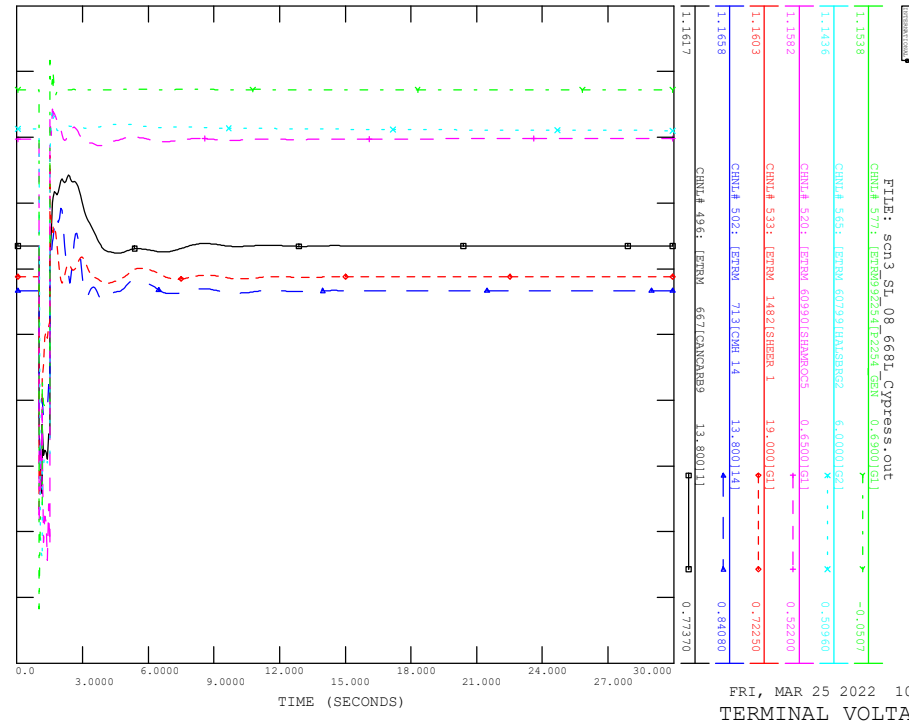


FRI, MAR 25 2022 10:52  
BRANCH P

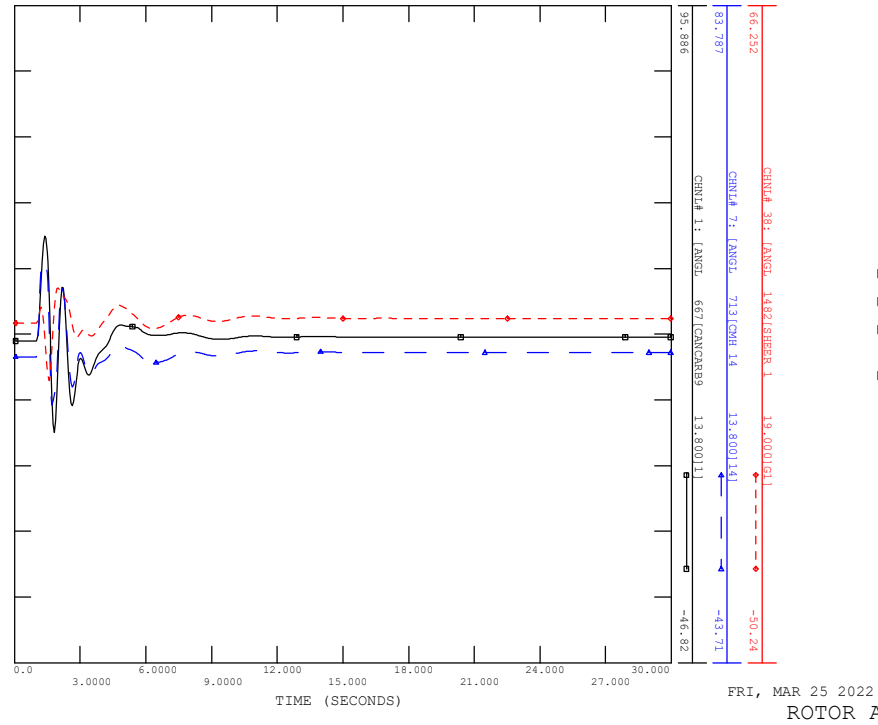
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_6681\_CYPRESS



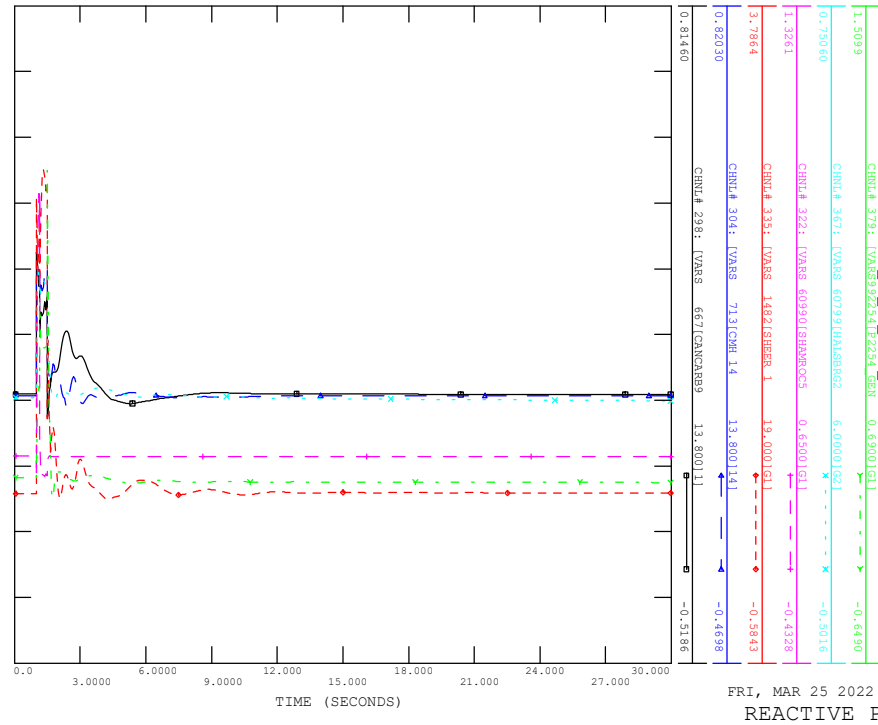
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_6681\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_6681\_CYPRESS

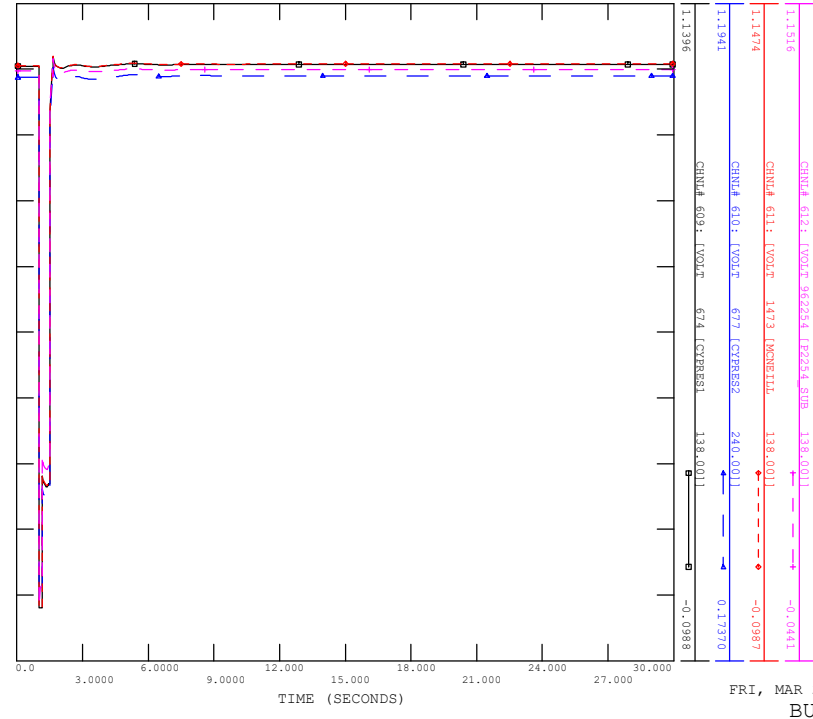


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_6681\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_668L\_CYPRESS

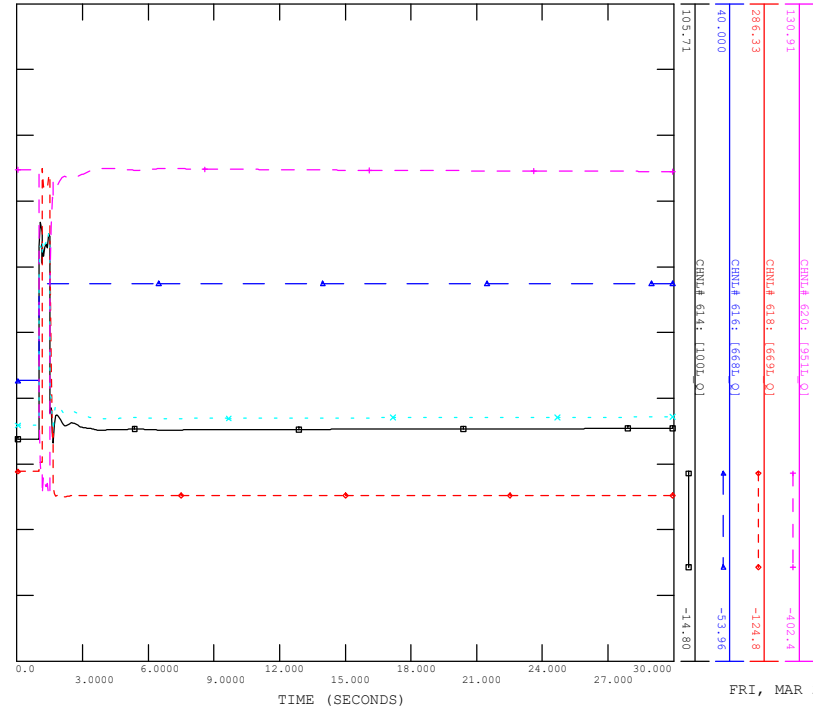
FILE: scn3\_sl\_08\_668L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_668L\_CYPRESS

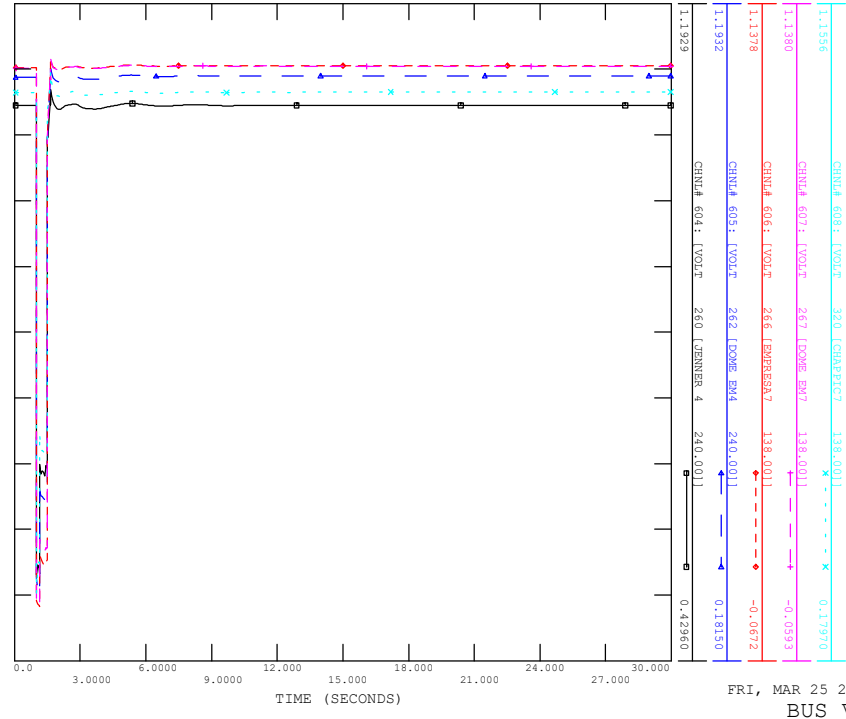
FILE: scn3\_sl\_08\_668L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_668L\_CYPRESS

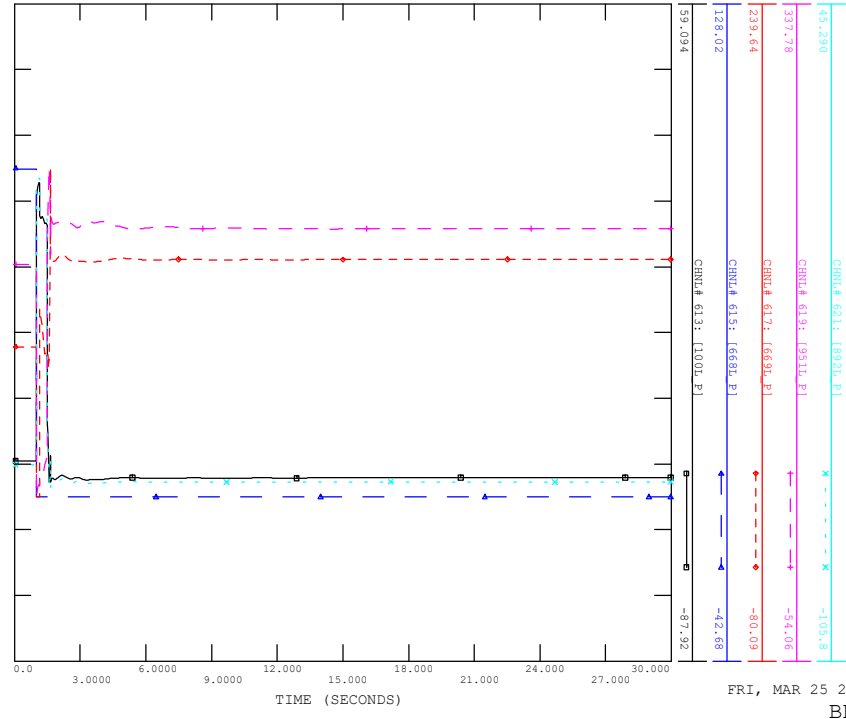
FILE: scn3\_sl\_08\_668L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_08\_668L\_CYPRESS

FILE: scn3\_sl\_08\_668L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH P

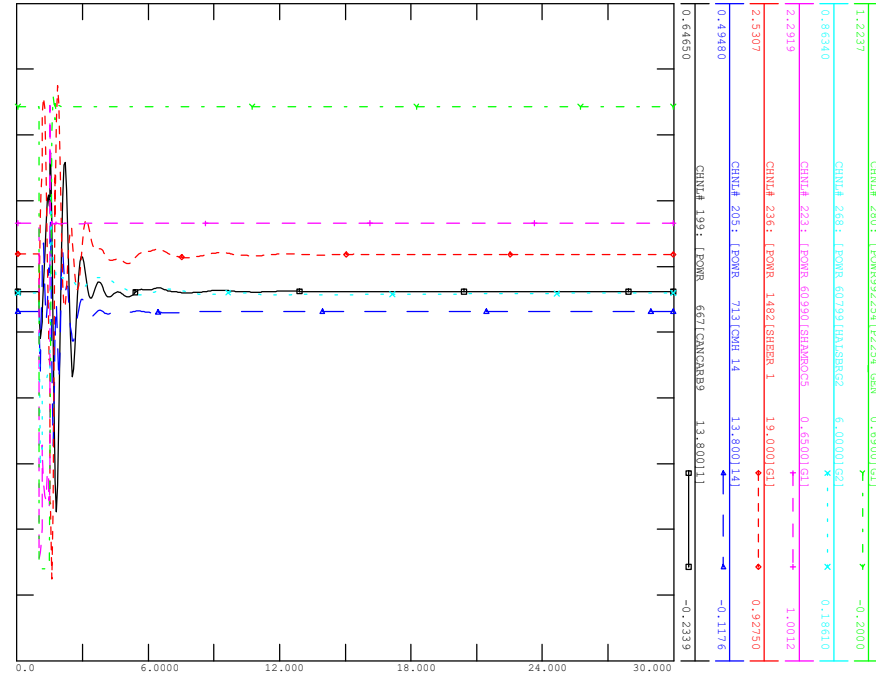




SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO



FILE: scn3\_sl\_09\_6691\_Amoco.out

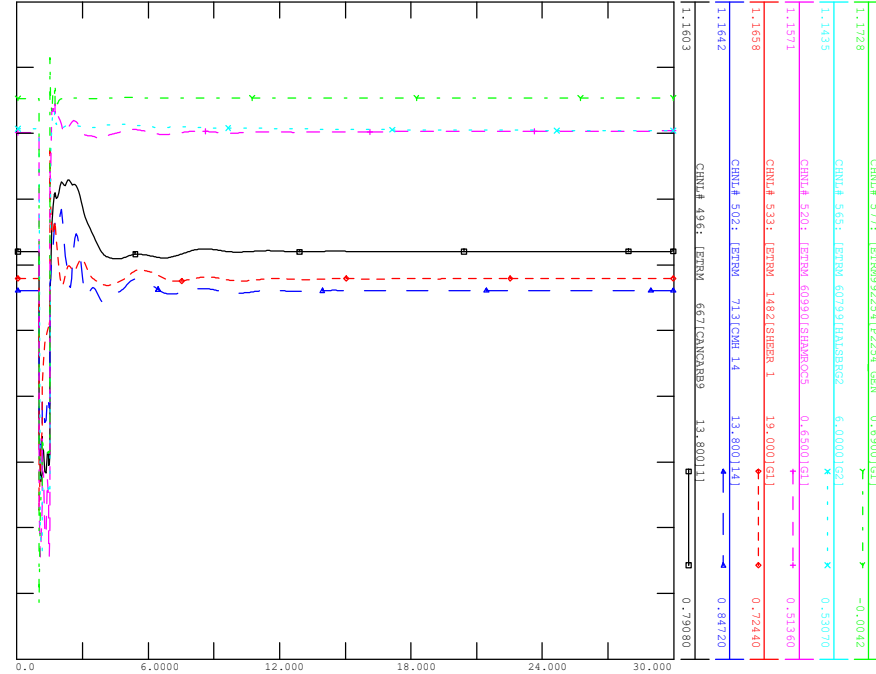


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO



FILE: scn3\_sl\_09\_6691\_Amoco.out

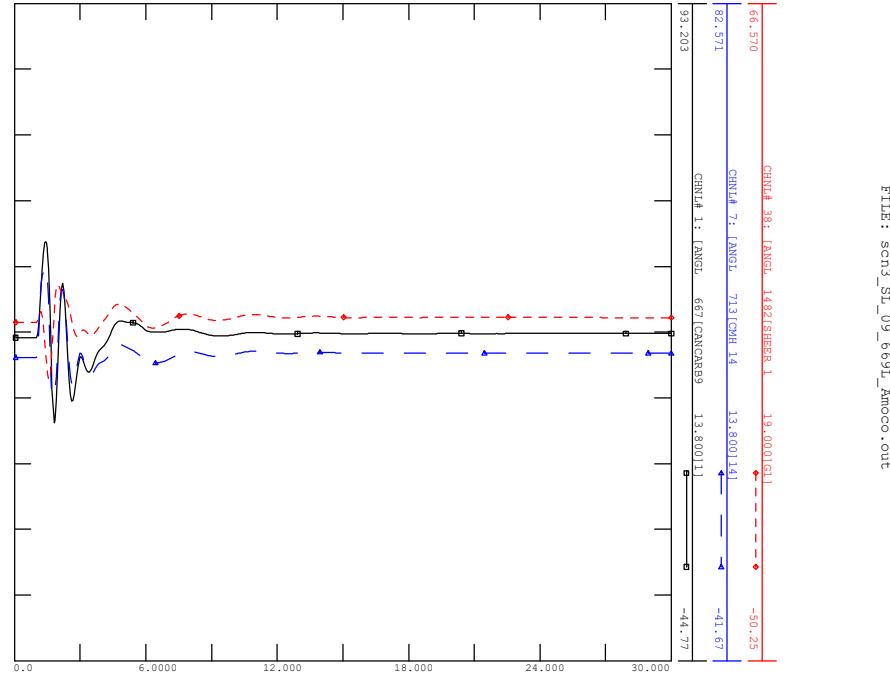


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO



FILE: scn3\_sl\_09\_6691\_Amoco.out

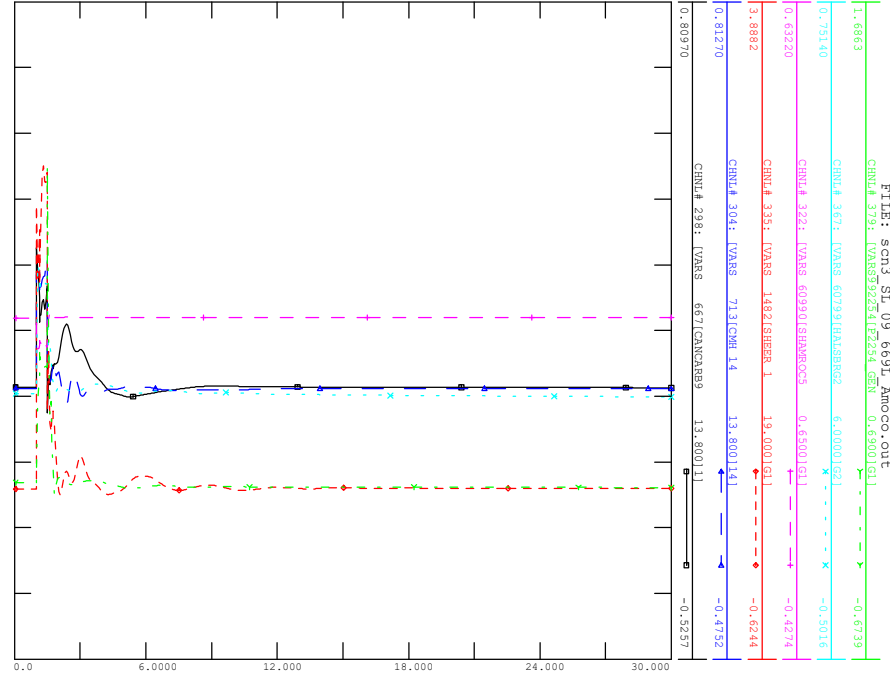


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO

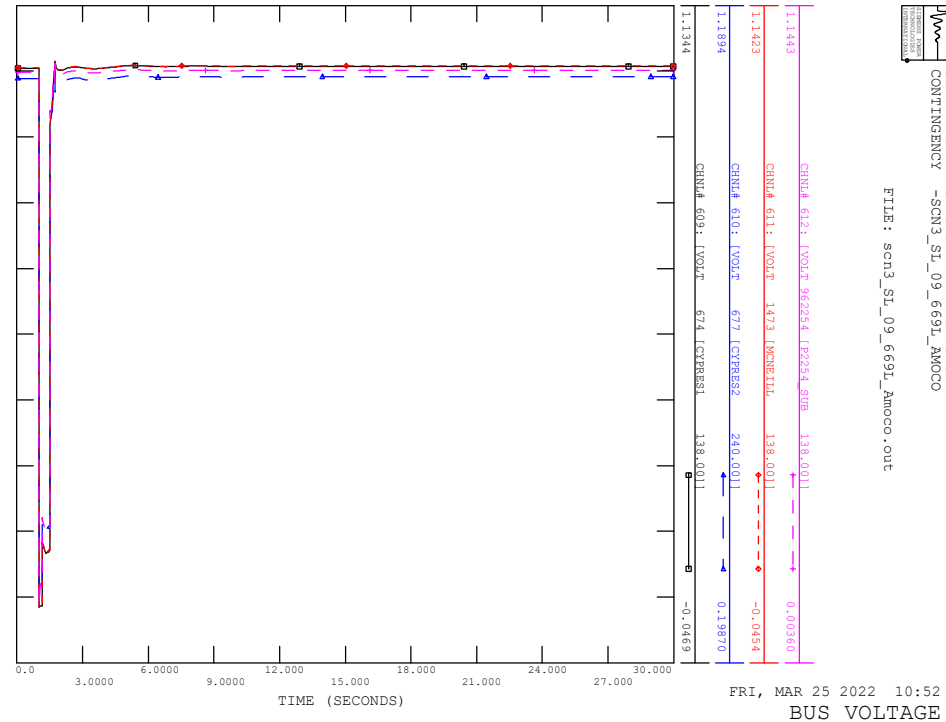


FILE: scn3\_sl\_09\_6691\_Amoco.out

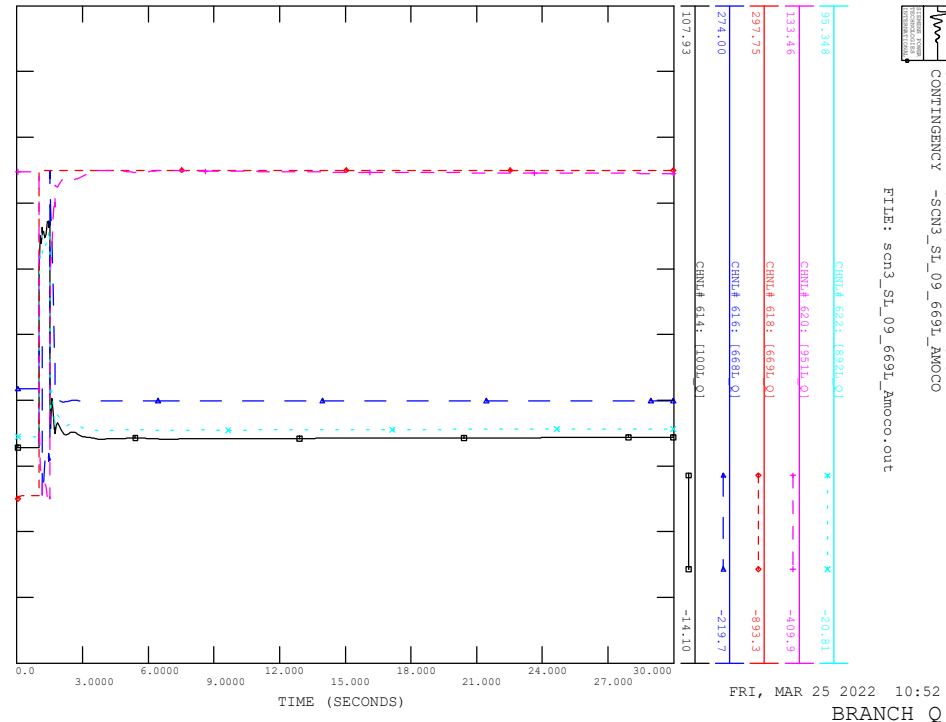


FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_669L\_AMOCO  
FILE: scn3\_sl\_09\_669L\_Amoco.out

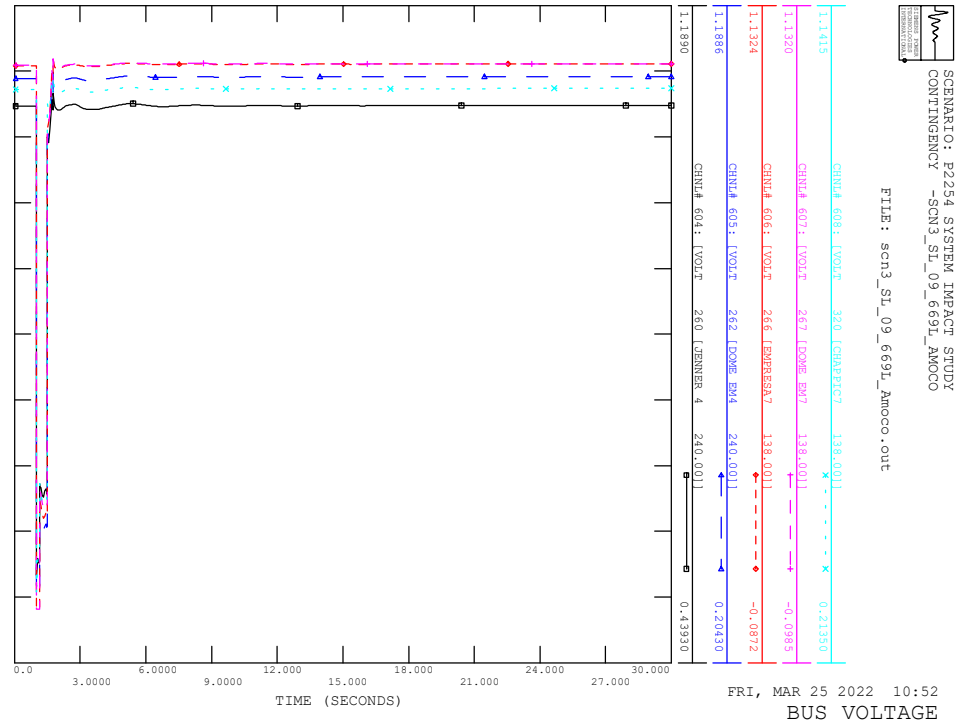


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_669L\_AMOCO  
FILE: scn3\_sl\_09\_669L\_Amoco.out



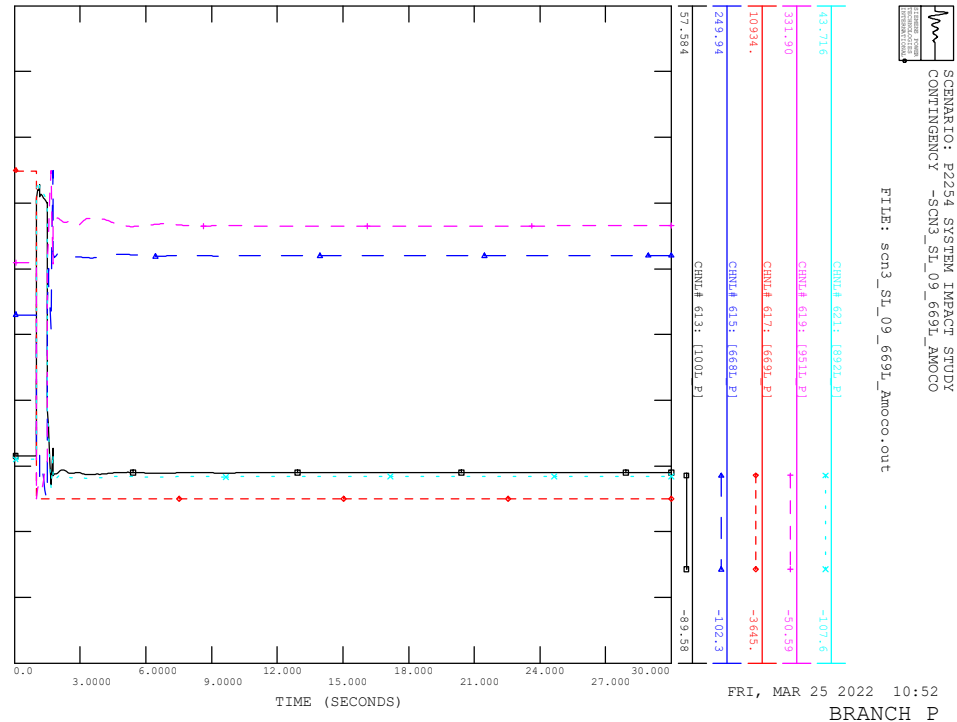
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_669L\_AMOCO  
FILE: scn3\_sl\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:52  
BRANCH P

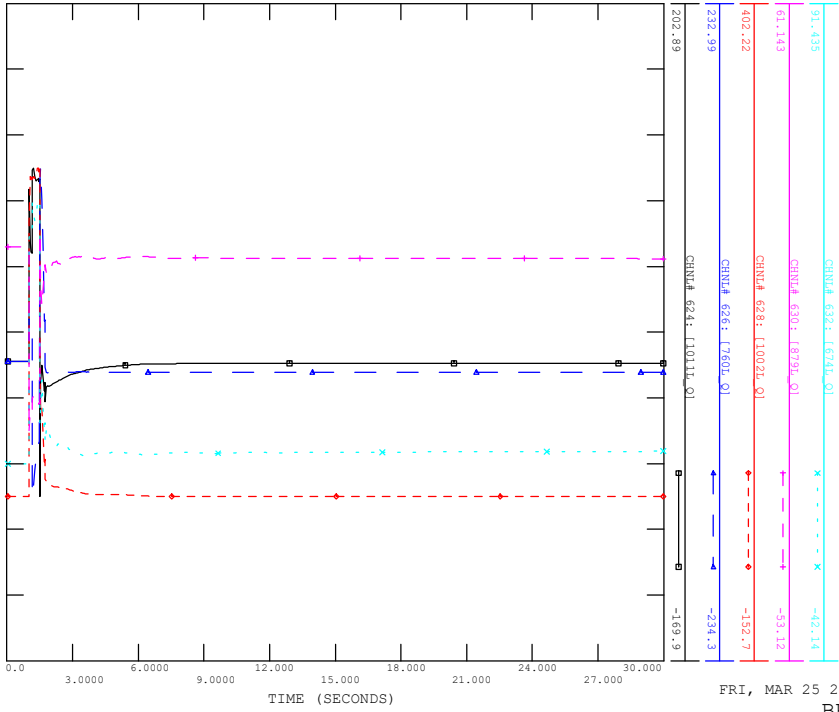
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_669L\_AMOCO  
FILE: scn3\_sl\_09\_669L\_Amoco.out





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO

FILE: scn3\_sl\_09\_6691\_Amoco.out

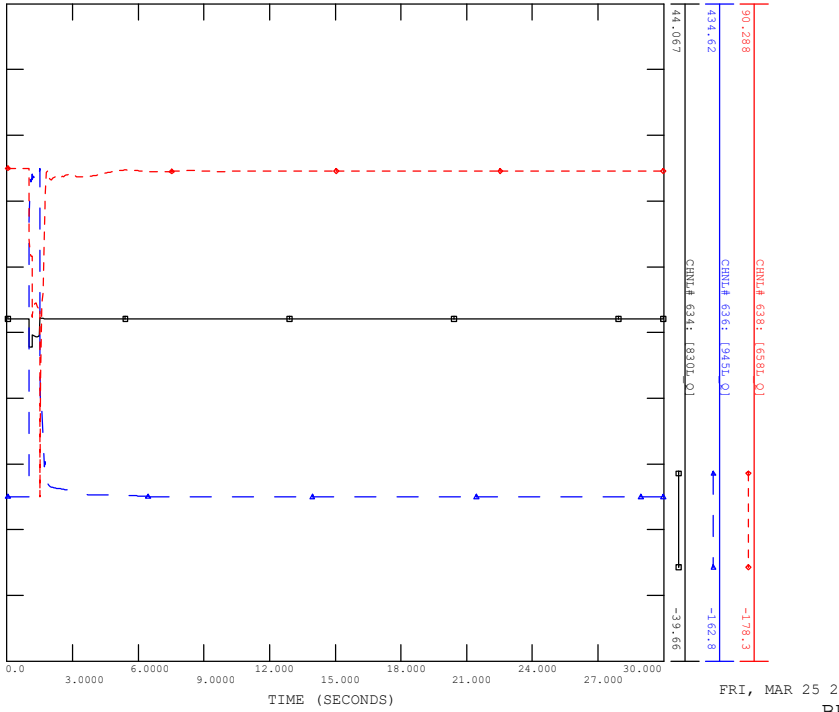


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO

FILE: scn3\_sl\_09\_6691\_Amoco.out

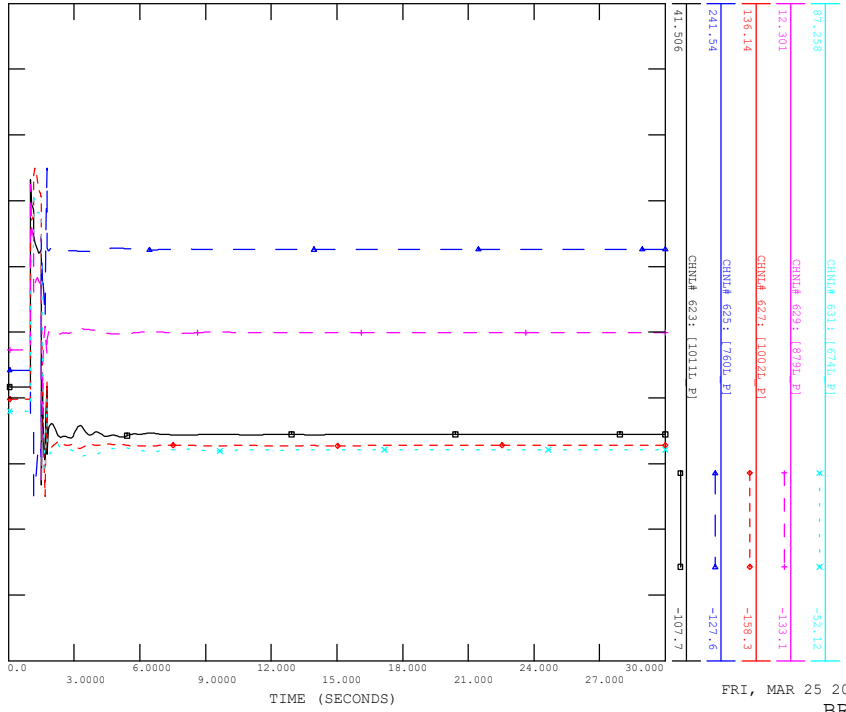


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO

FILE: scn3\_sl\_09\_6691\_Amoco.out

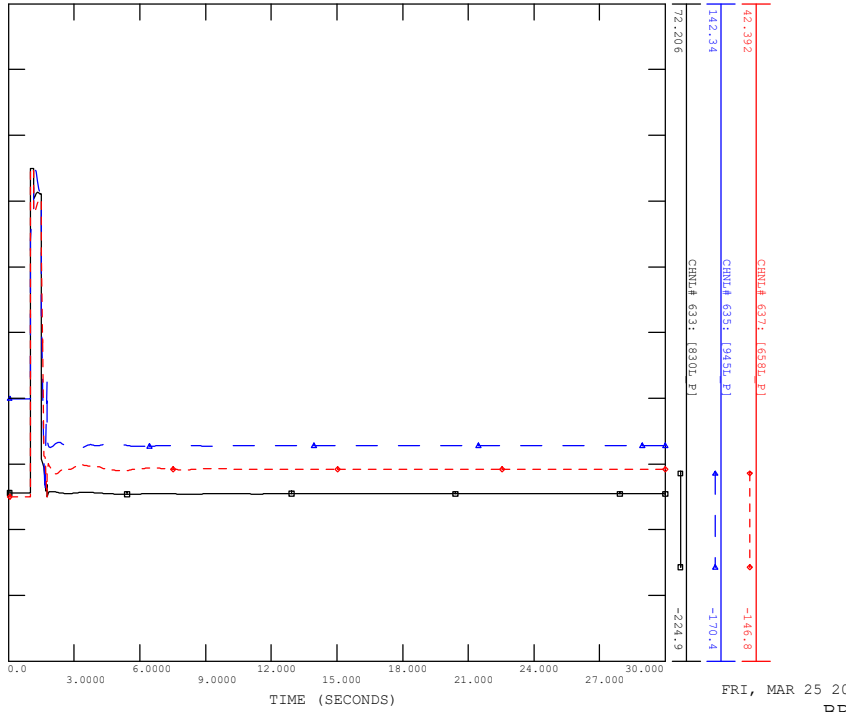


FRI, MAR 25 2022 10:52  
BRANCH P



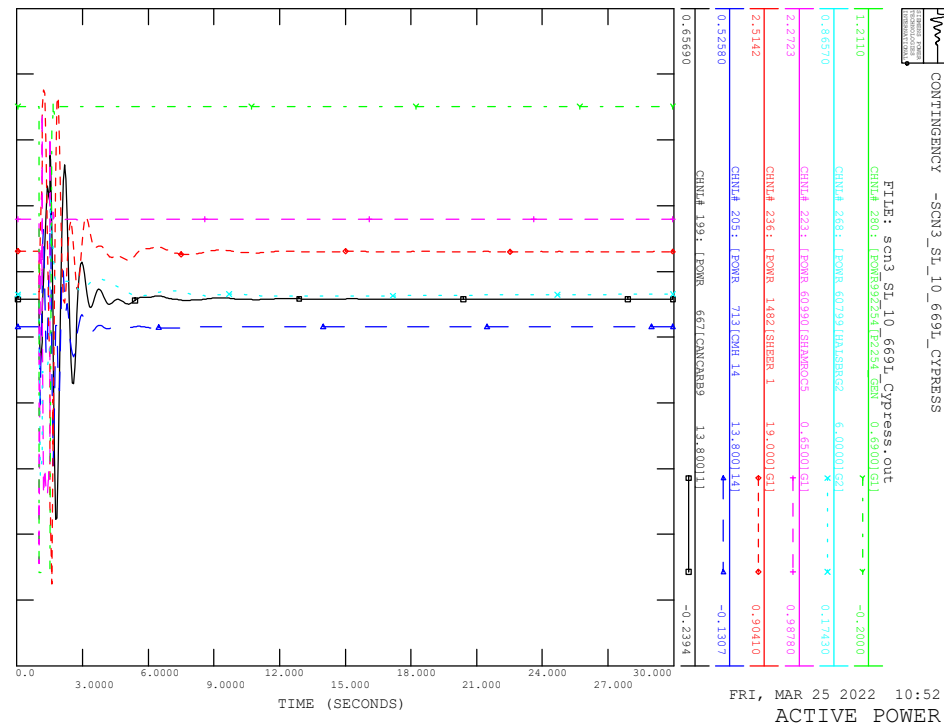
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_09\_6691\_AMOCO

FILE: scn3\_sl\_09\_6691\_Amoco.out

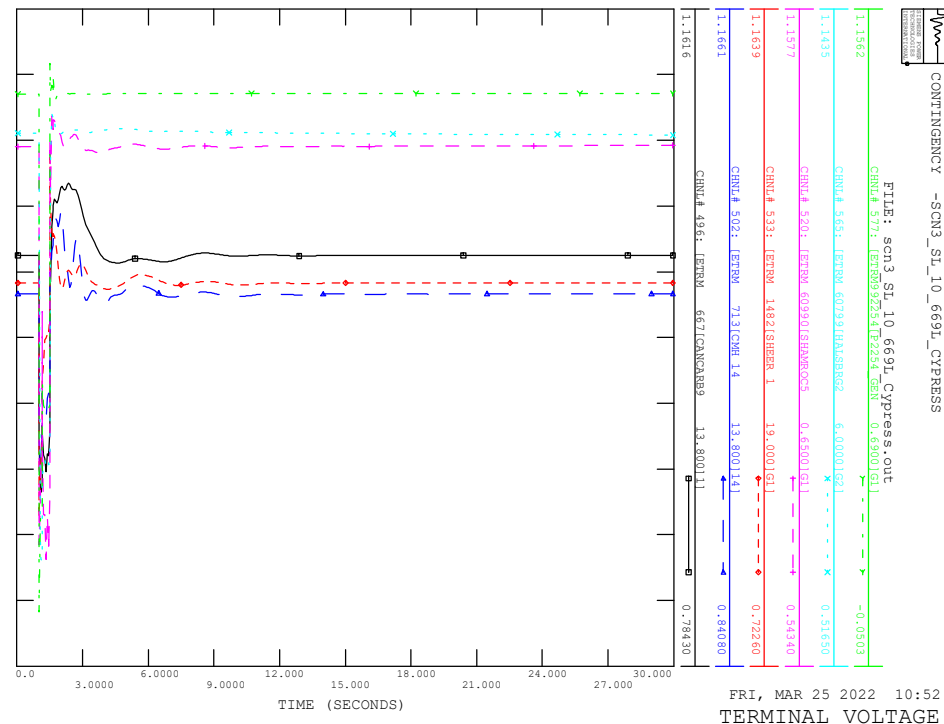


FRI, MAR 25 2022 10:52  
BRANCH P

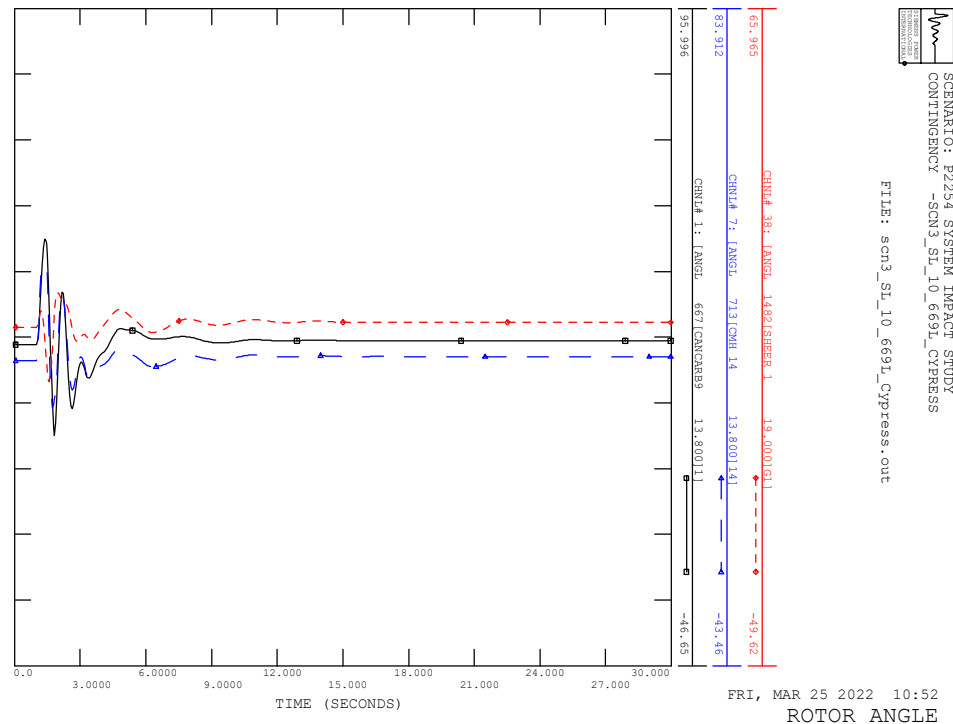
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_6691\_CYPRESS



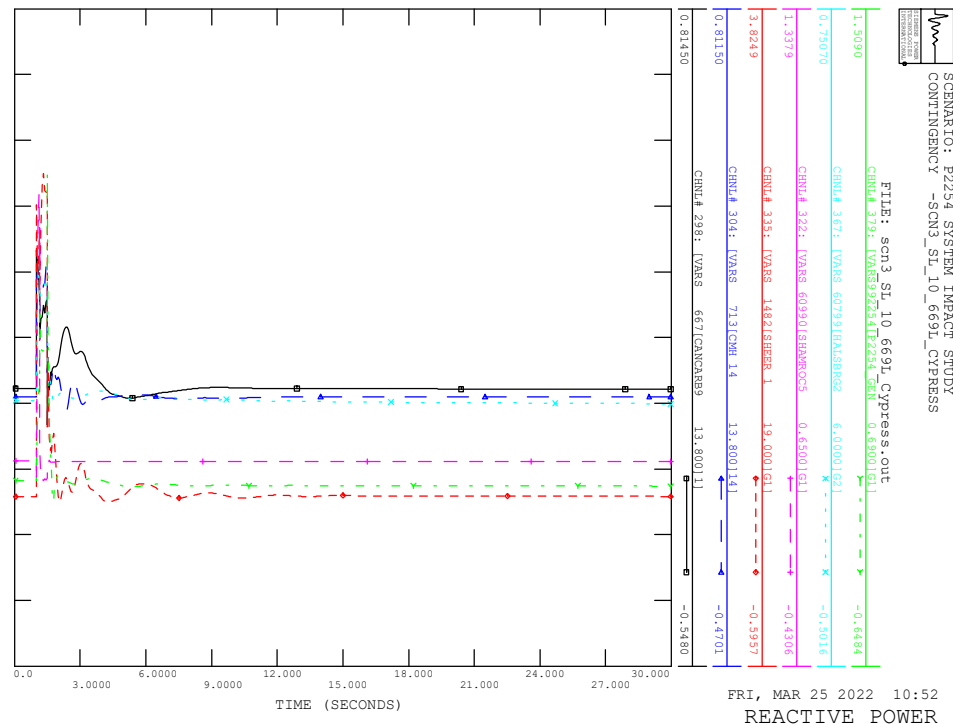
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_6691\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_6691\_CYPRESS

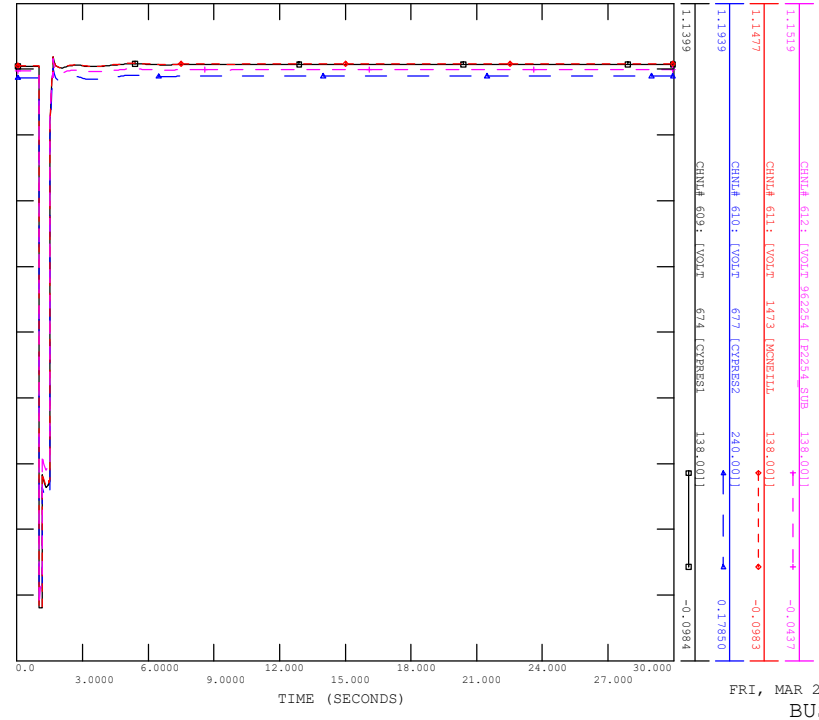


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_6691\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

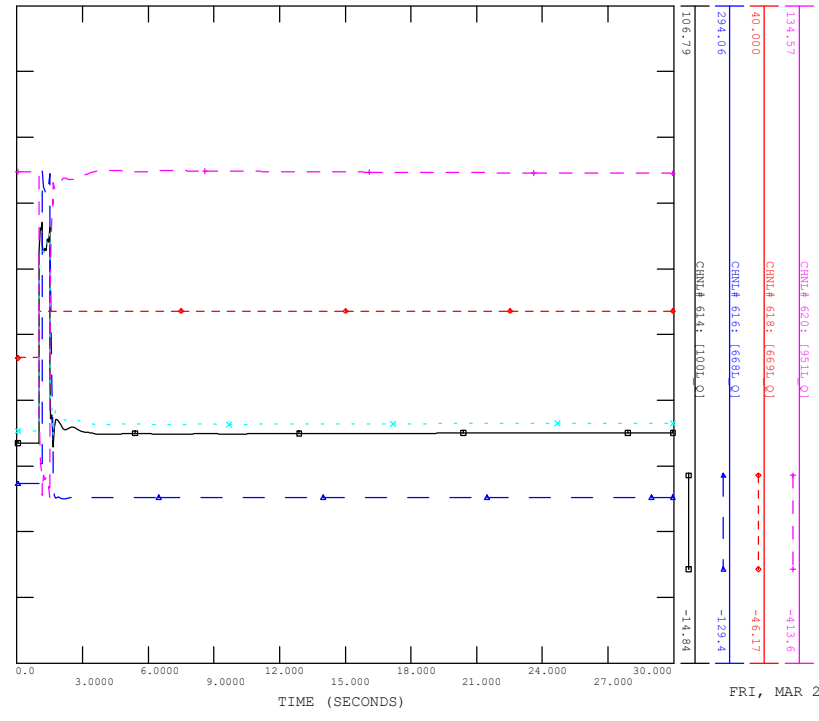
FILE: scn3\_sl\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

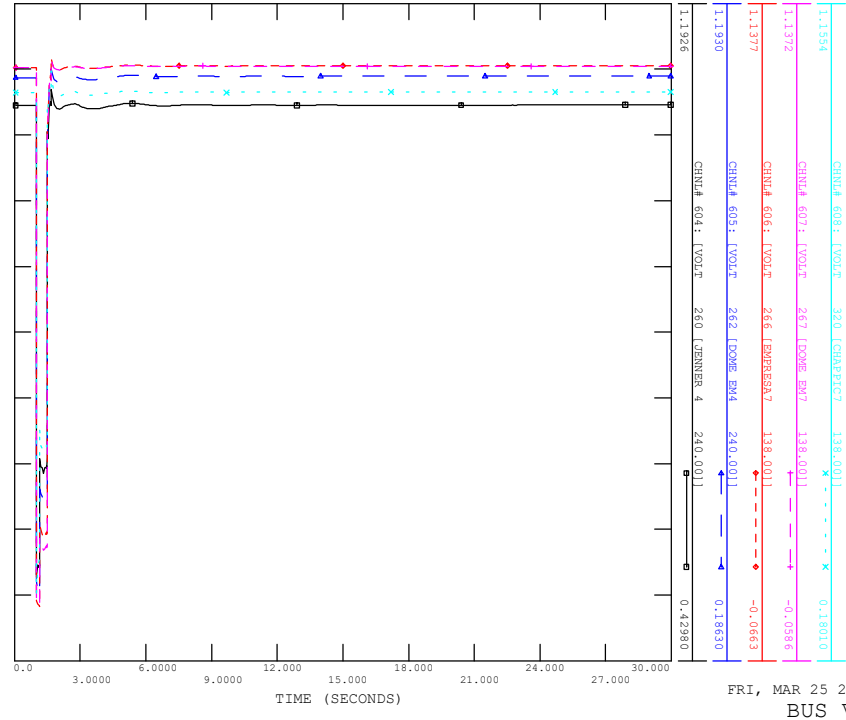
FILE: scn3\_sl\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

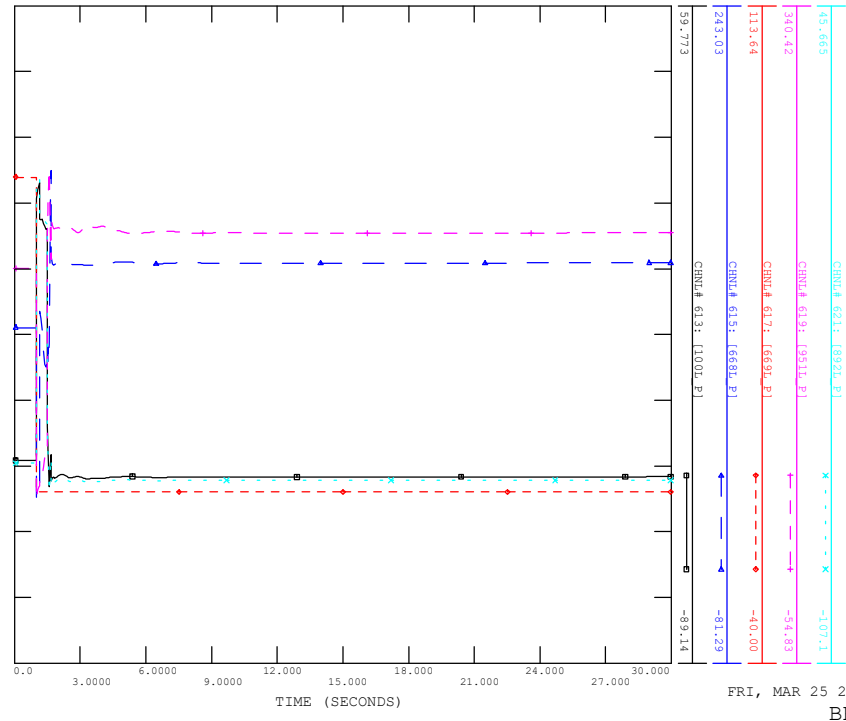
FILE: scn3\_sl\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

FILE: scn3\_sl\_10\_669L\_Cypress.out

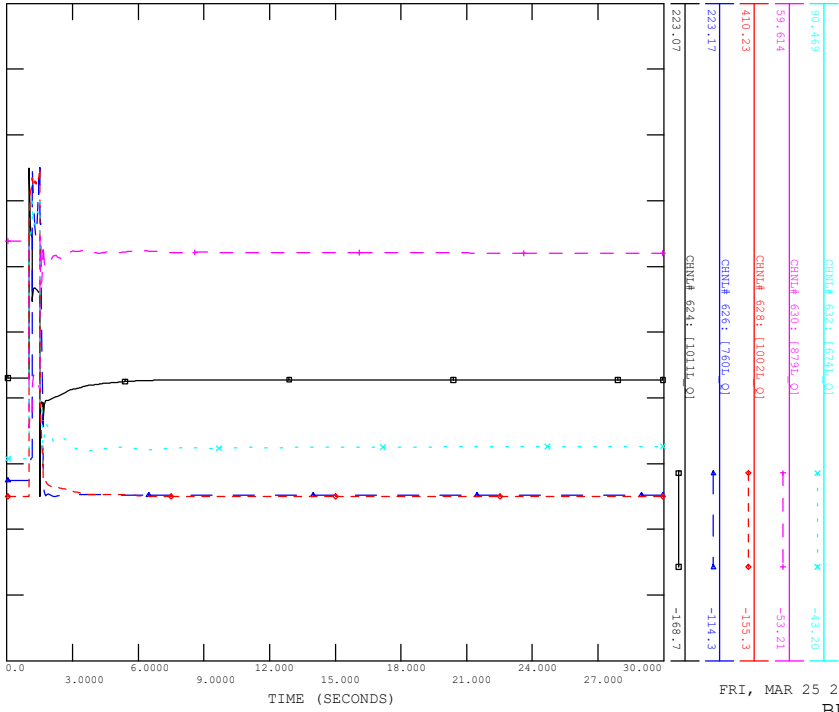


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

FILE: scn3\_sl\_10\_669L\_Cypress.out

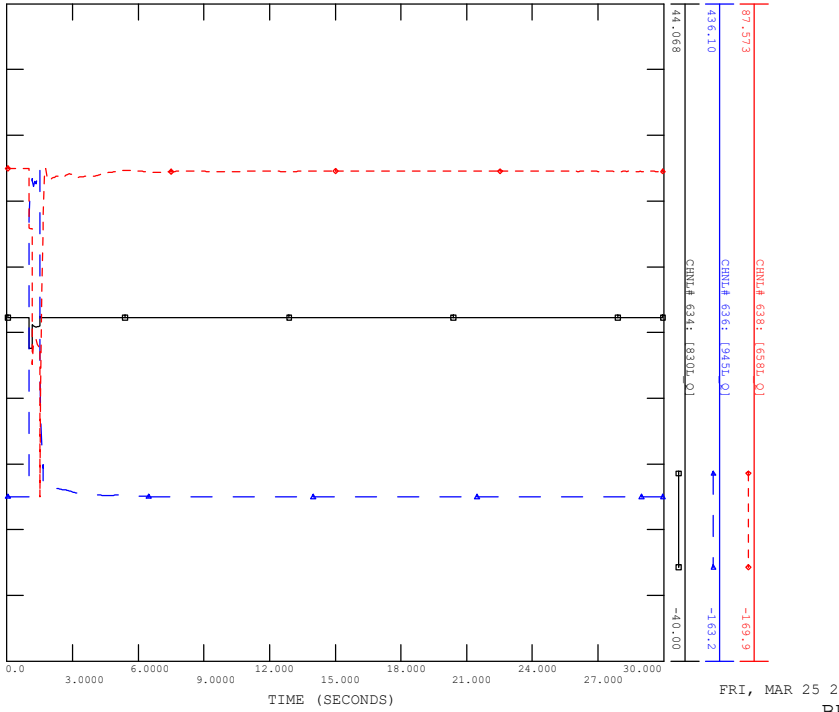


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

FILE: scn3\_sl\_10\_669L\_Cypress.out

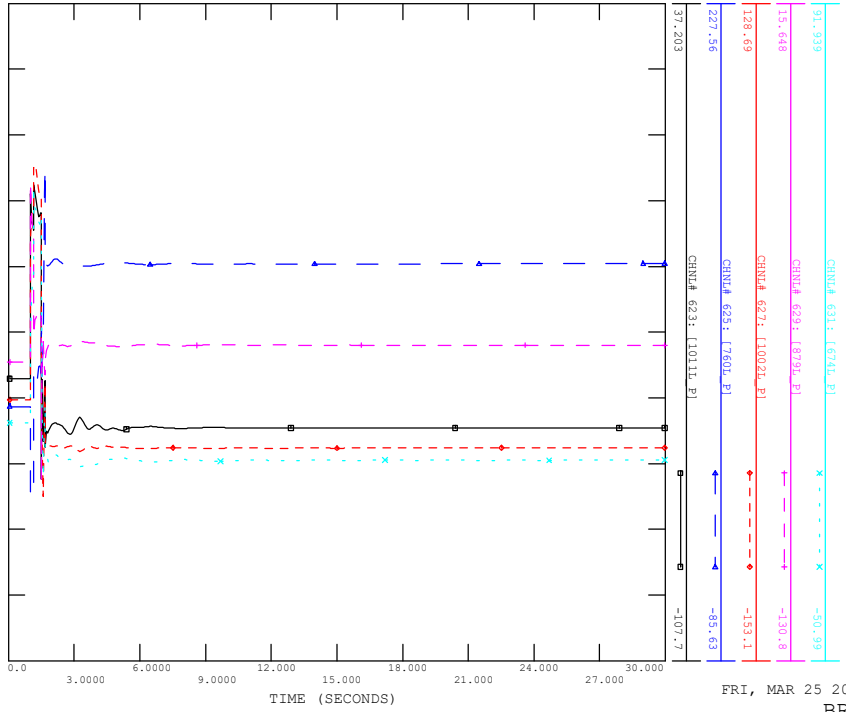


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

FILE: scn3\_sl\_10\_669L\_Cypress.out

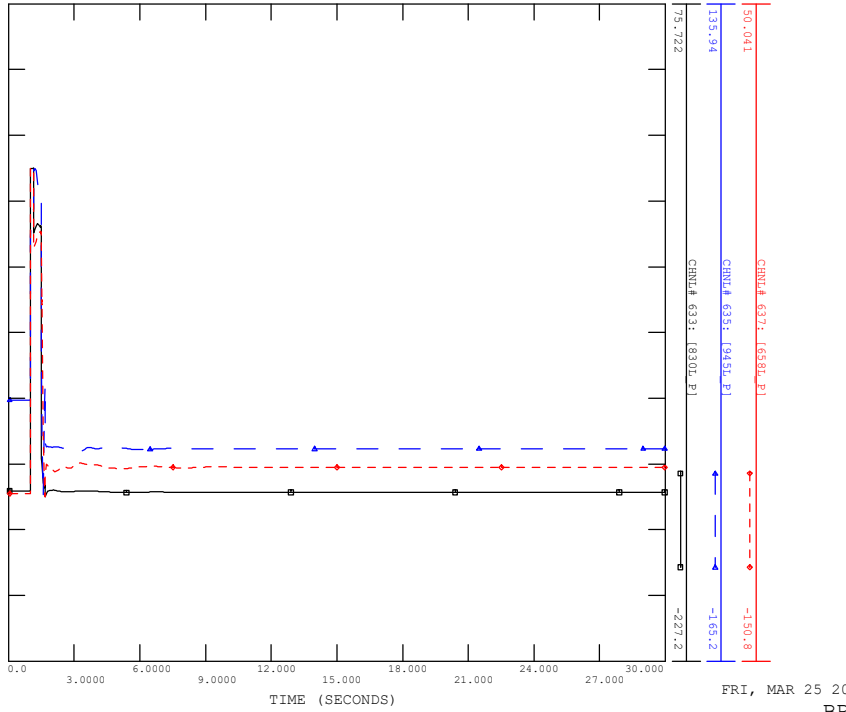


FRI, MAR 25 2022 10:52  
BRANCH P



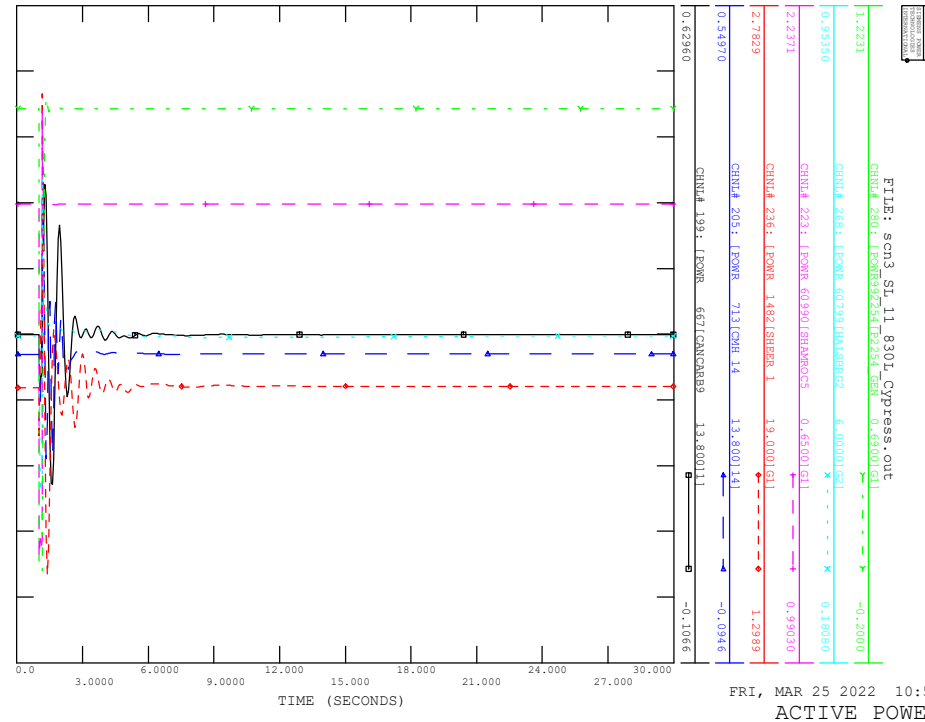
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_10\_669L\_CYPRESS

FILE: scn3\_sl\_10\_669L\_Cypress.out

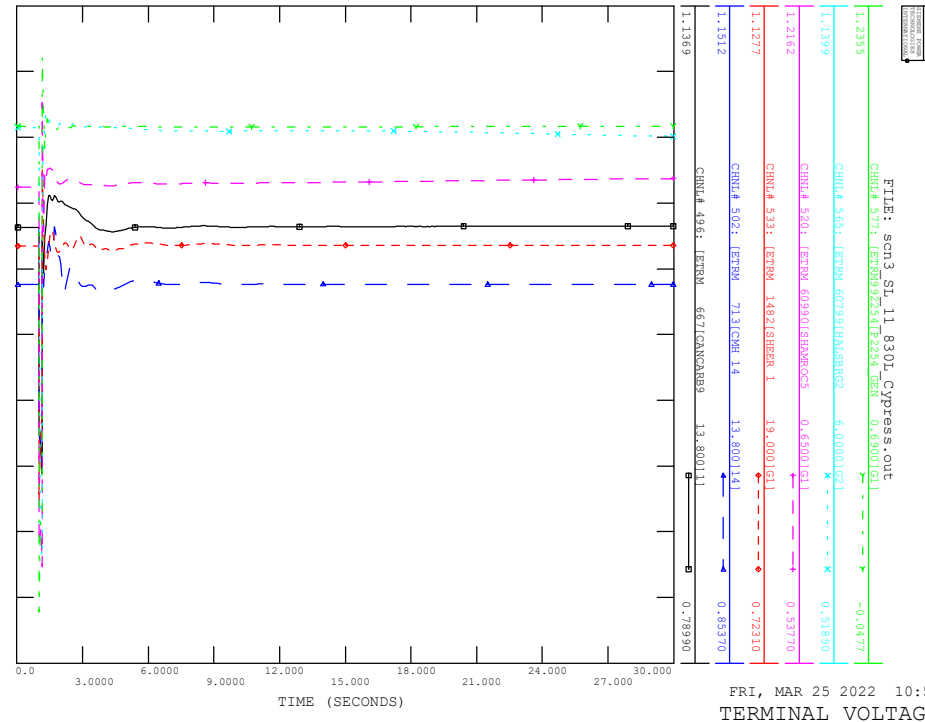


FRI, MAR 25 2022 10:52  
BRANCH P

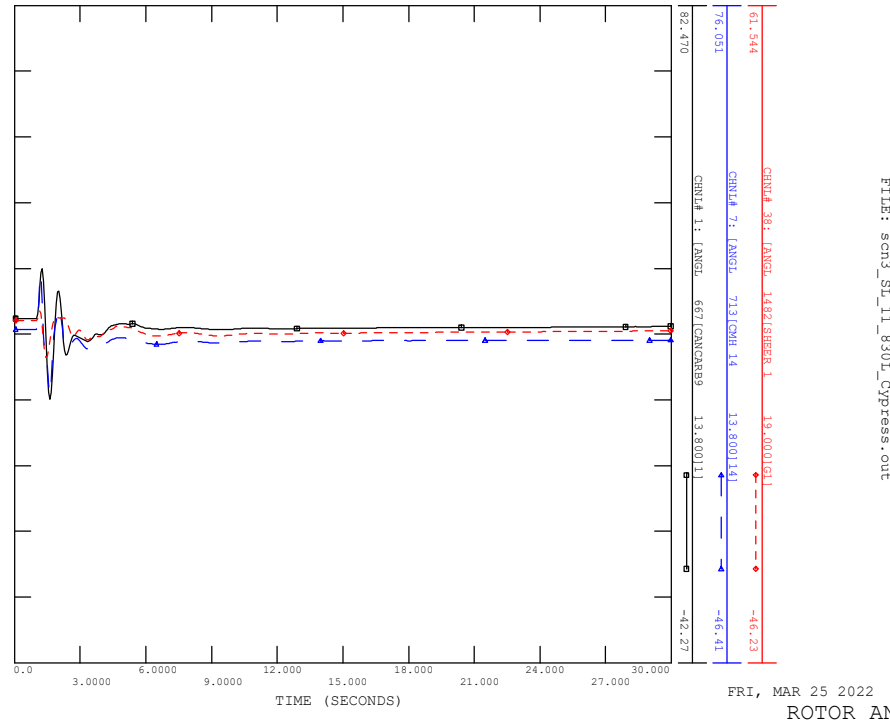
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS



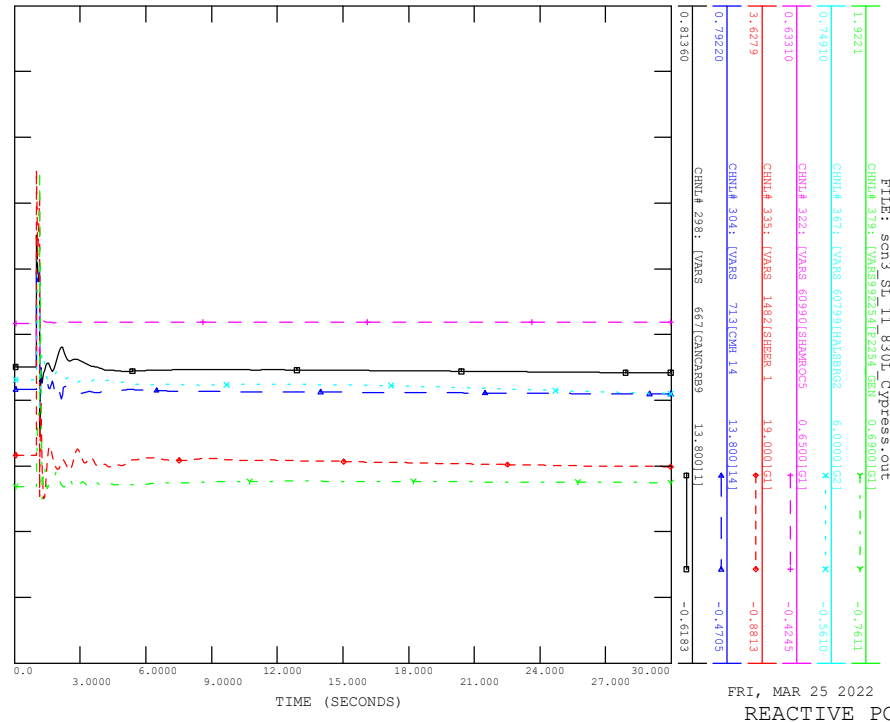
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS



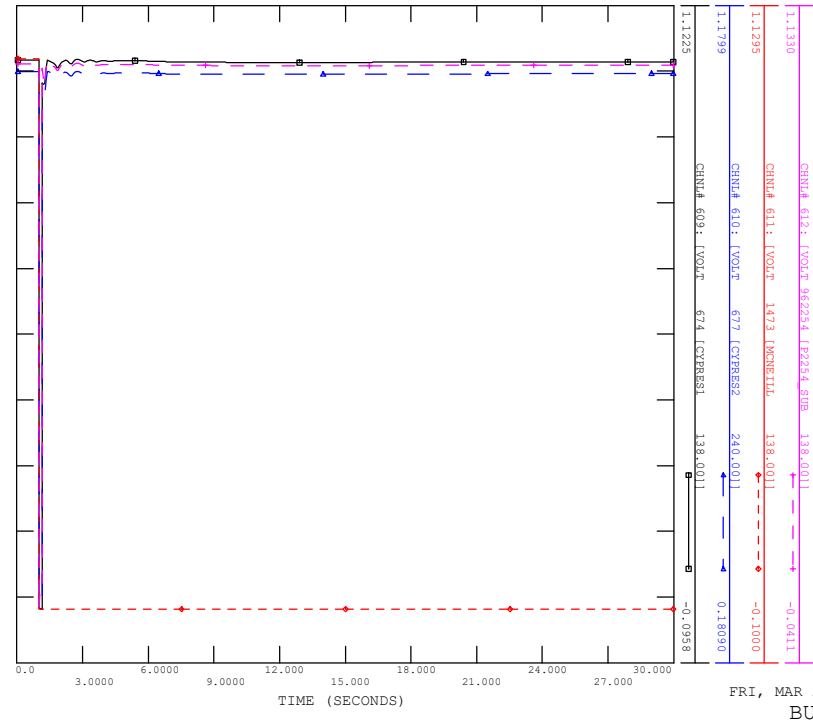
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS

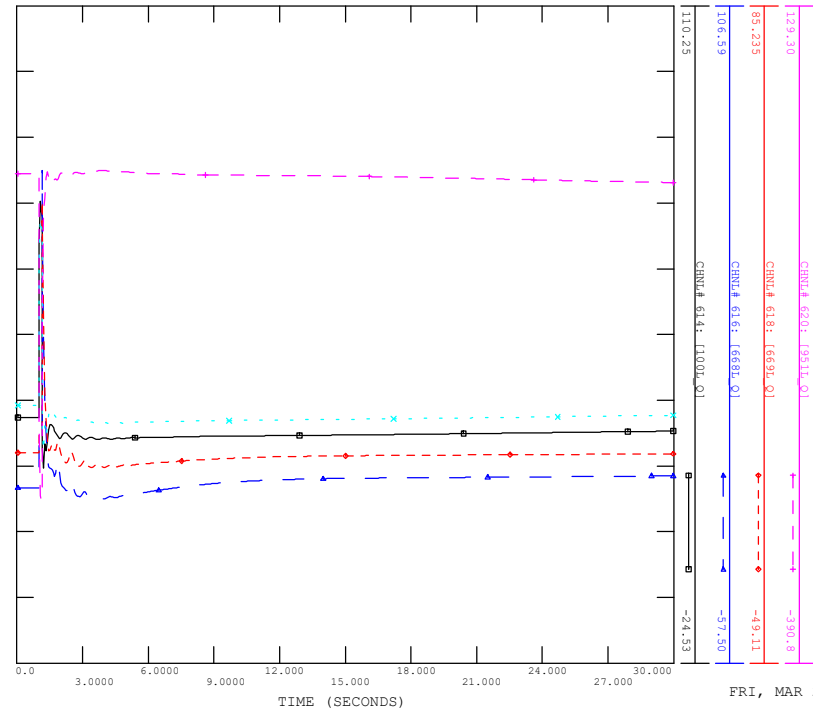
FILE: scn3\_sl\_11\_830L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS

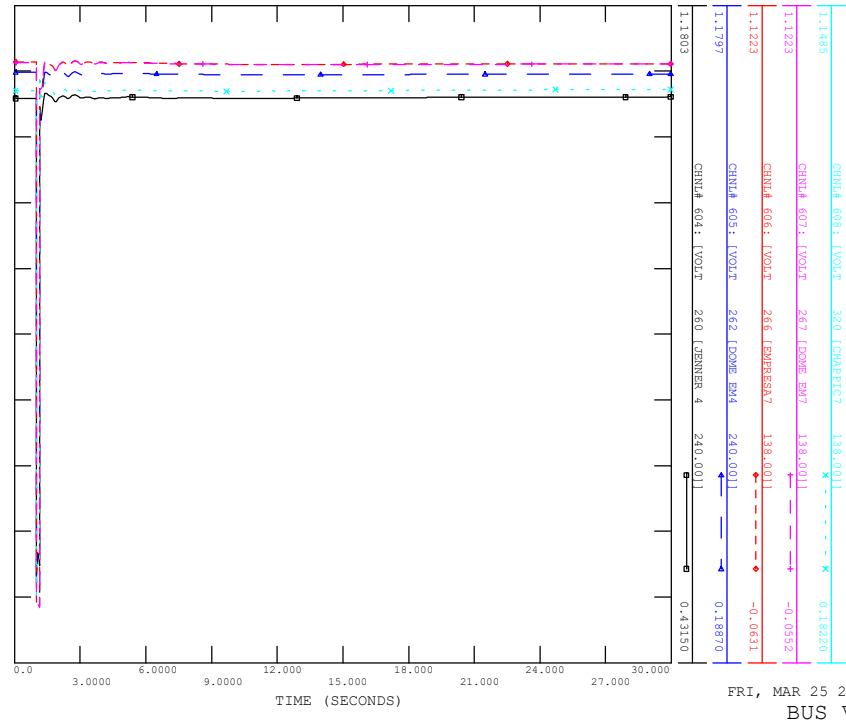
FILE: scn3\_sl\_11\_830L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS

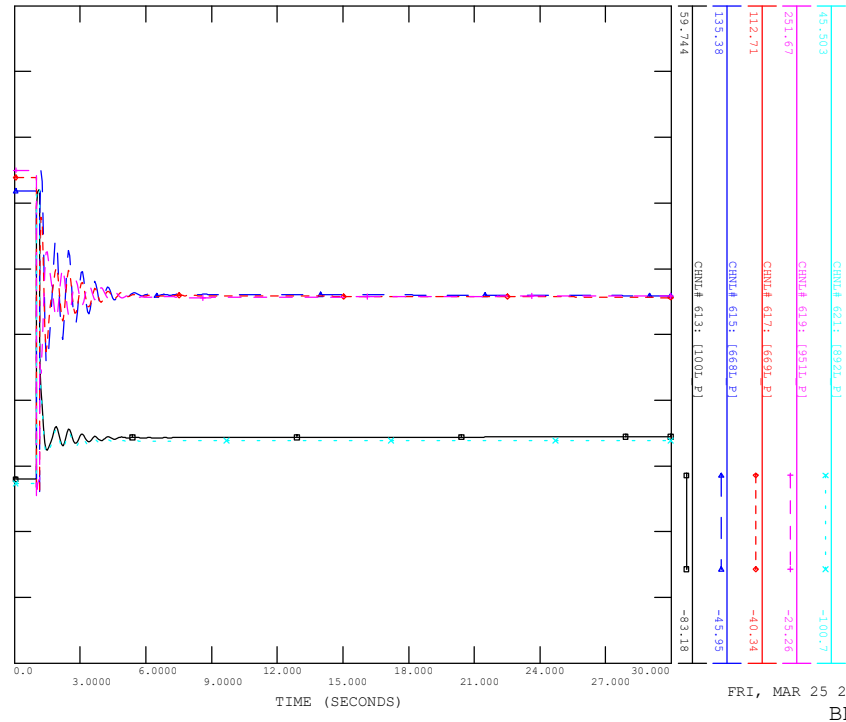
FILE: scn3\_sl\_11\_830L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

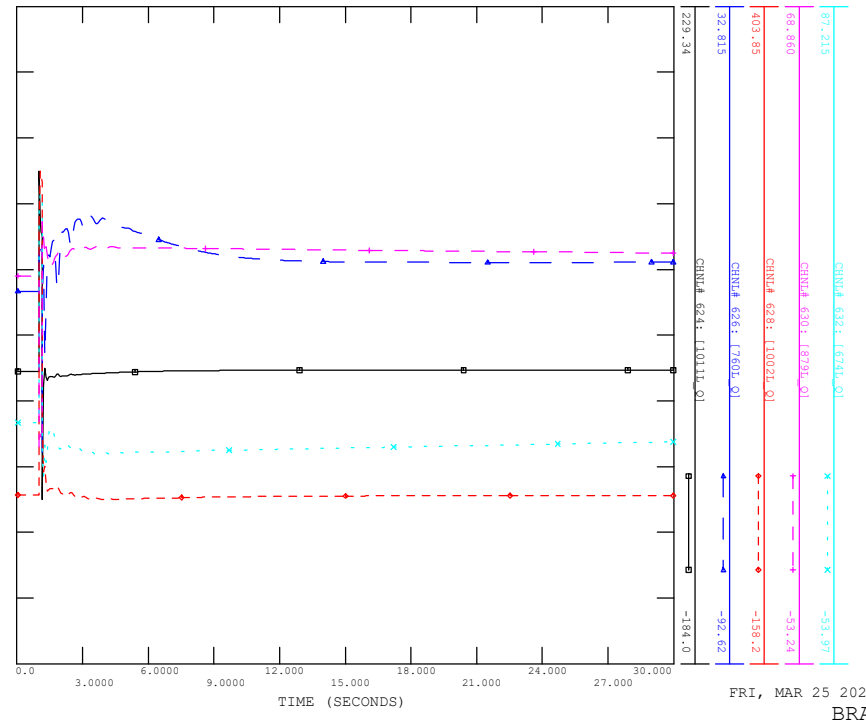
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS

FILE: scn3\_sl\_11\_830L\_Cypress.out



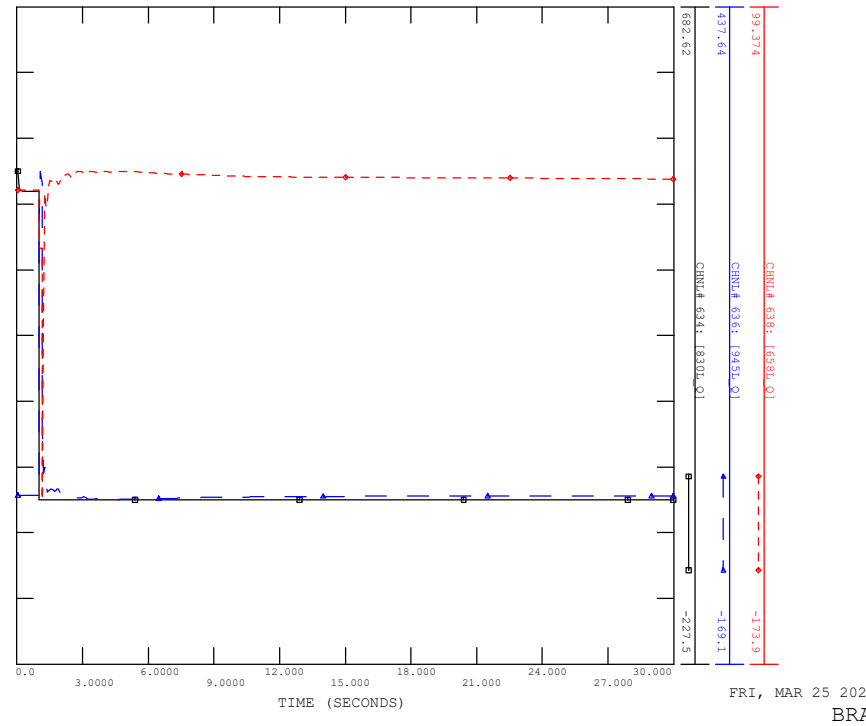
FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS  
FILE: scn3\_sl\_11\_830L\_Cypress.out



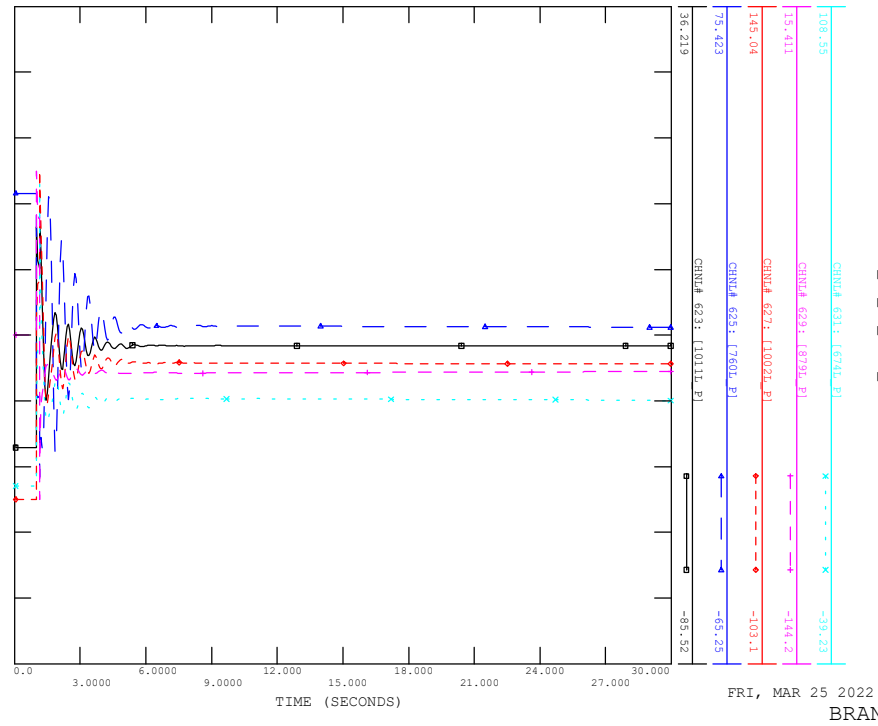
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS  
FILE: scn3\_sl\_11\_830L\_Cypress.out



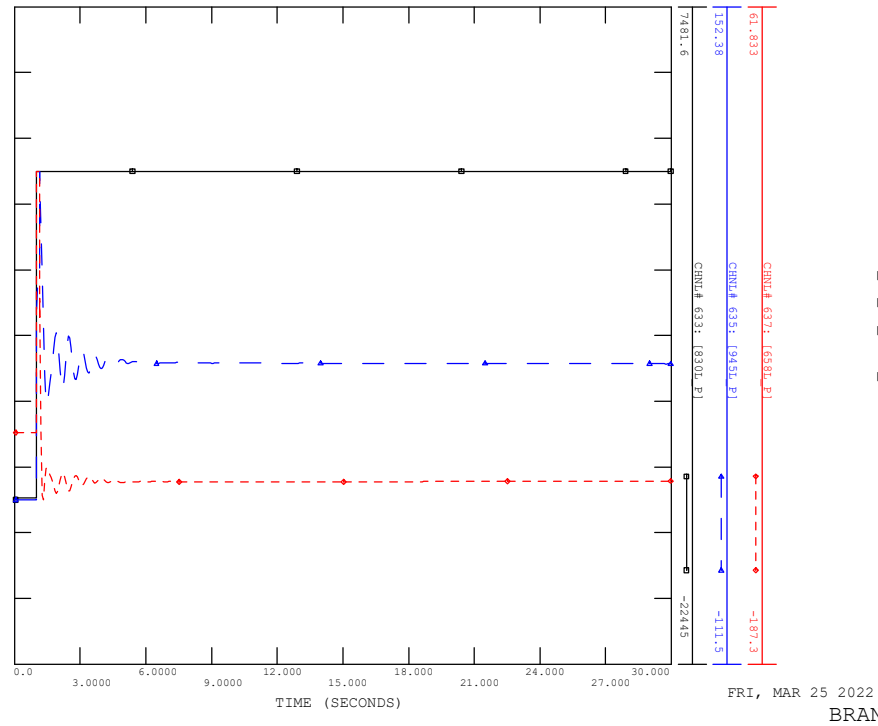
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS  
FILE: scn3\_sl\_11\_830L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_11\_830L\_CYPRESS  
FILE: scn3\_sl\_11\_830L\_Cypress.out

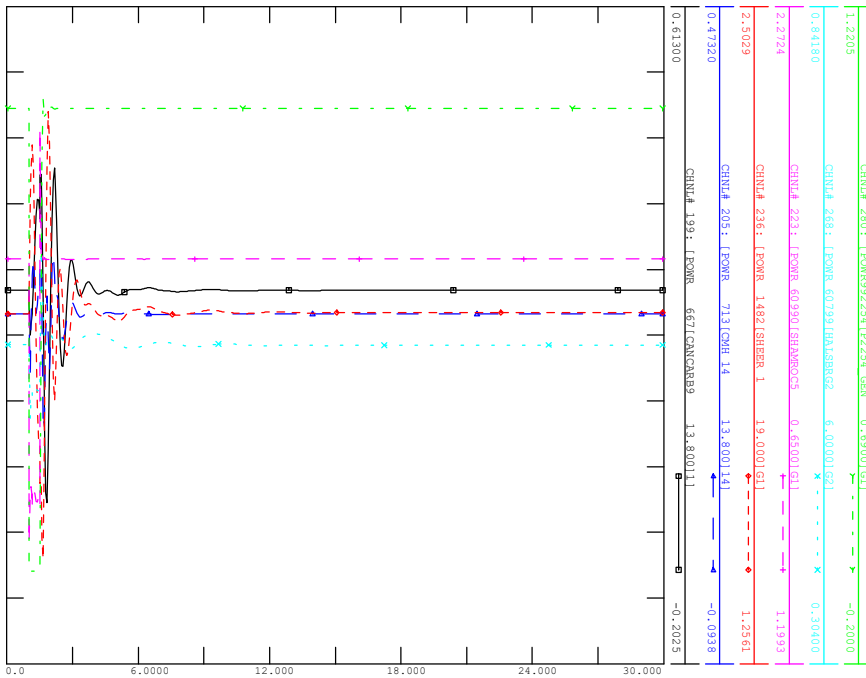


FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill



FILE: scn3\_sl\_12\_830L\_McNeill.out

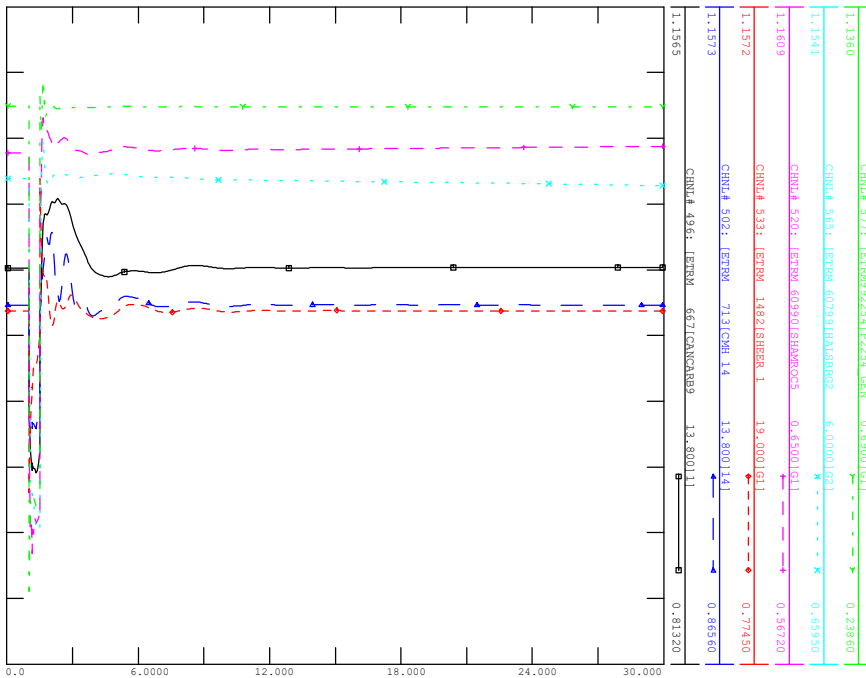


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill



FILE: scn3\_sl\_12\_830L\_McNeill.out

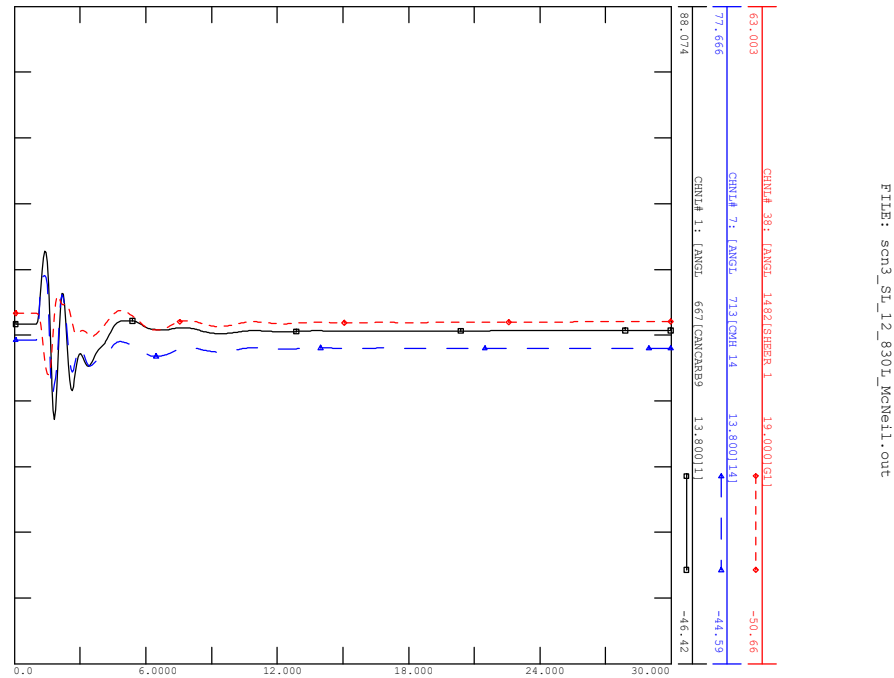


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill



FILE: scn3\_sl\_12\_830L\_McNeill.out

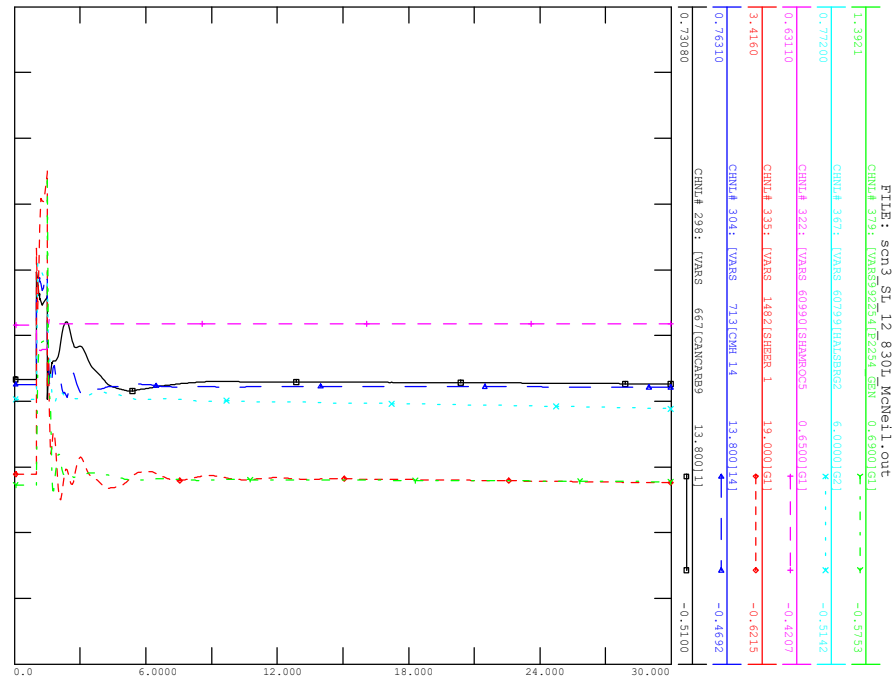


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill

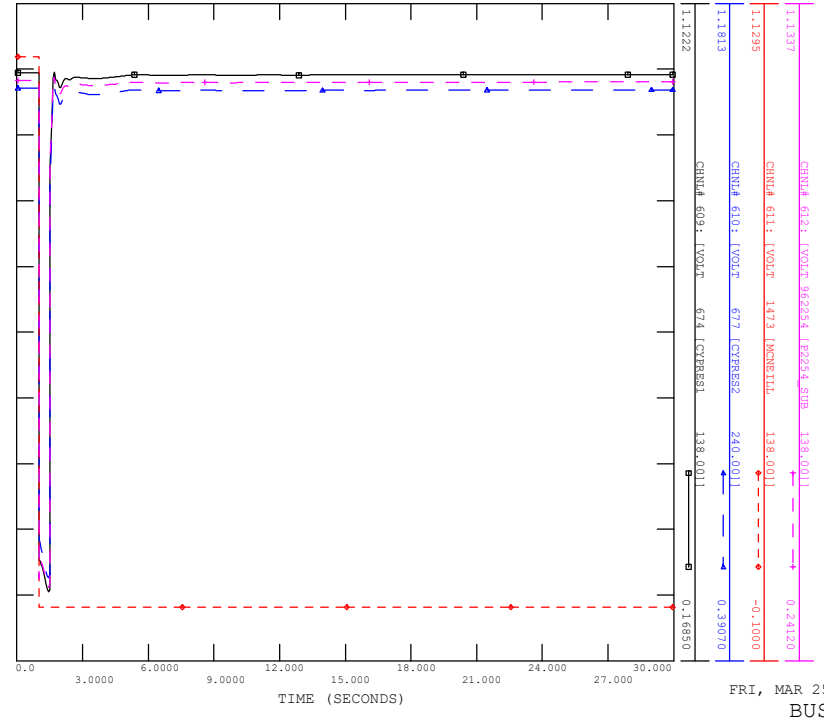


FILE: scn3\_sl\_12\_830L\_McNeill.out



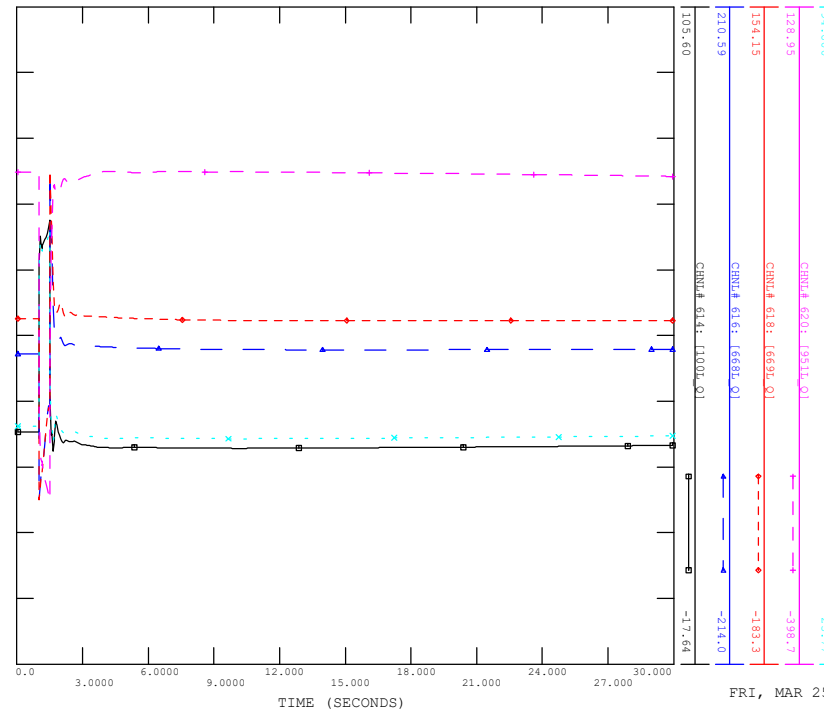
FRI, MAR 25 2022 10:52  
REACTIVE POWER

FILE: scn3\_sl\_12\_830L\_McNeill.out



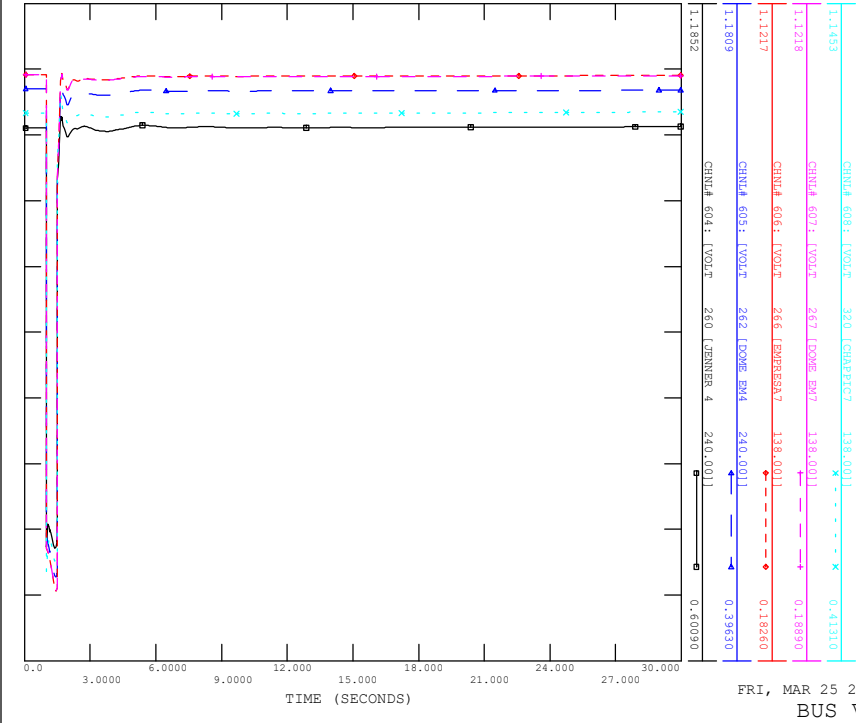
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

FILE: scn3\_sl\_12\_830L\_McNeill.out



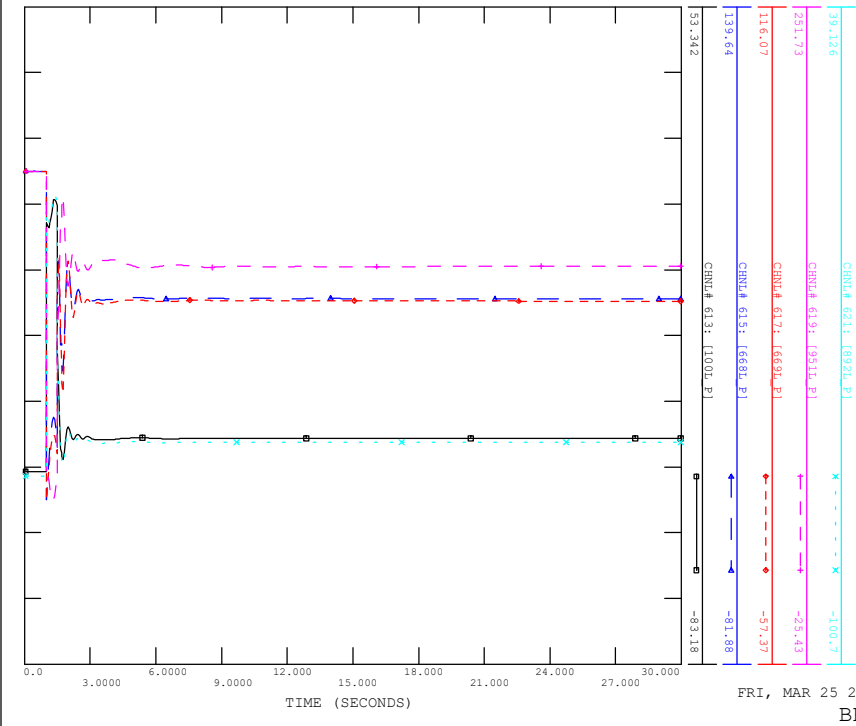
FRI, MAR 25 2022 10:52  
BRANCH Q

FILE: scn3\_sl\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

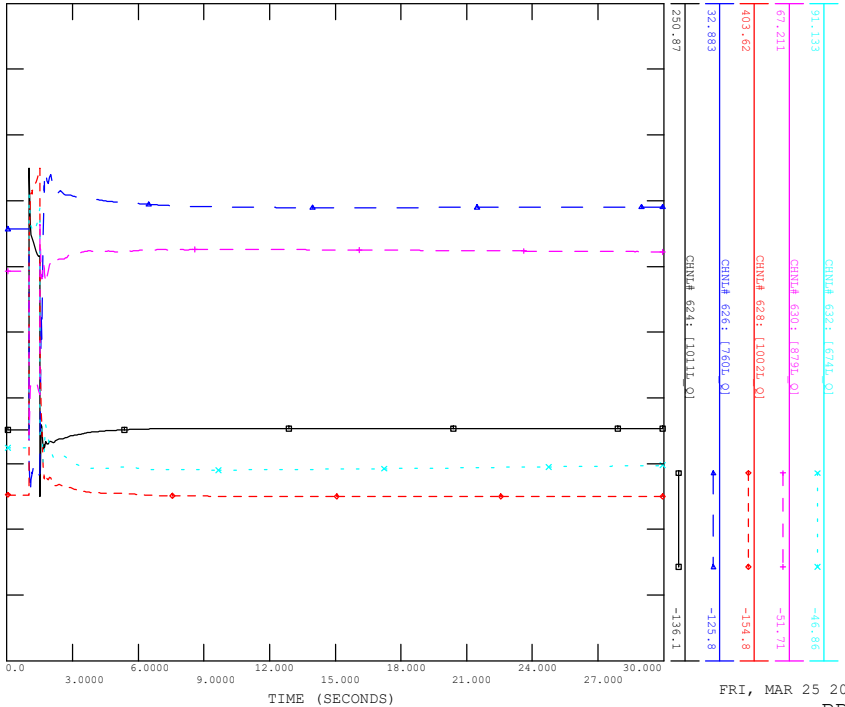
FILE: scn3\_sl\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:52  
BRANCH P

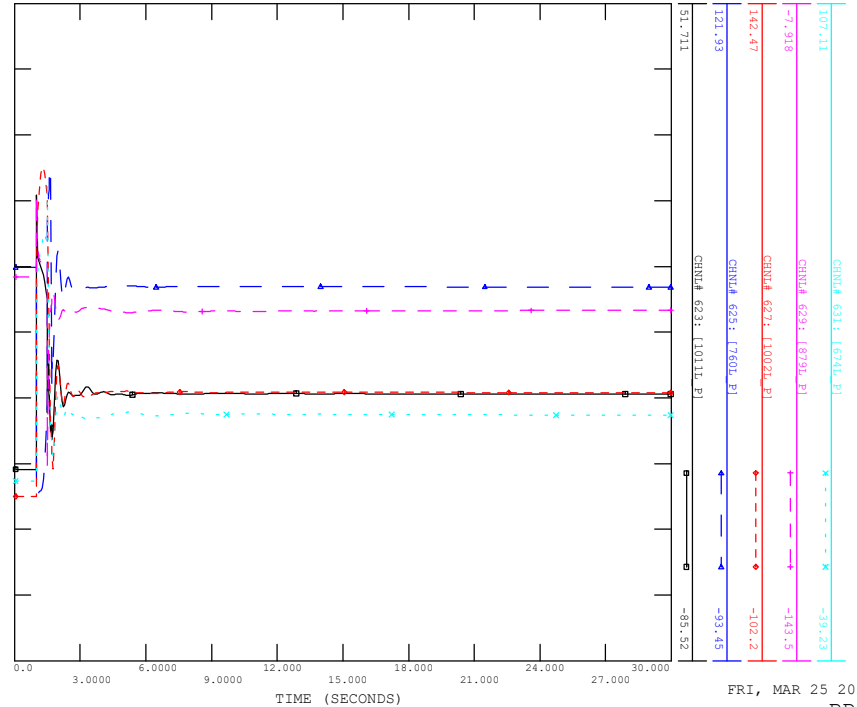
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill

FILE: scn3\_sl\_12\_830L\_McNeill.out



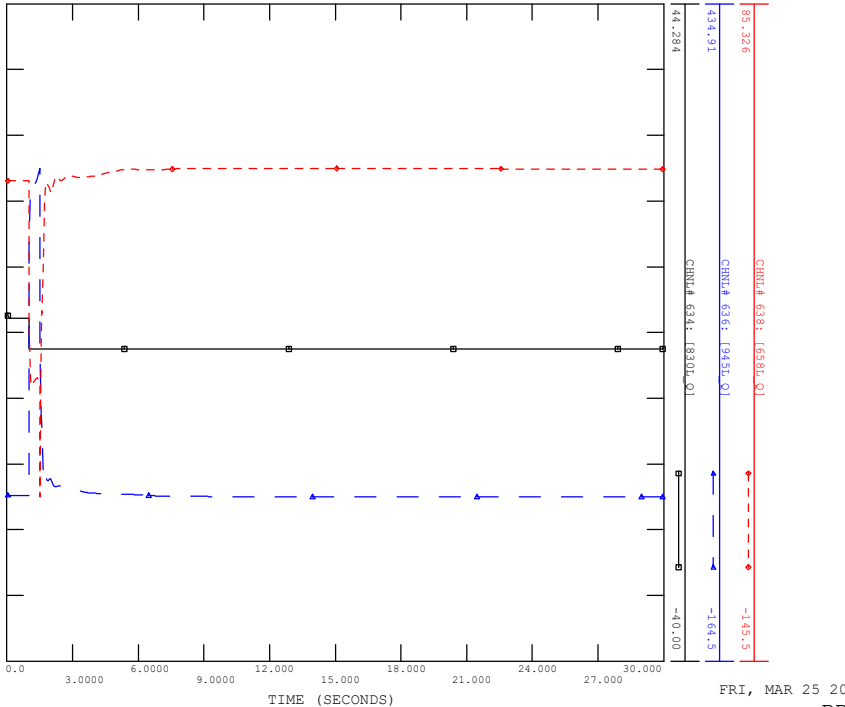
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill

FILE: scn3\_sl\_12\_830L\_McNeill.out



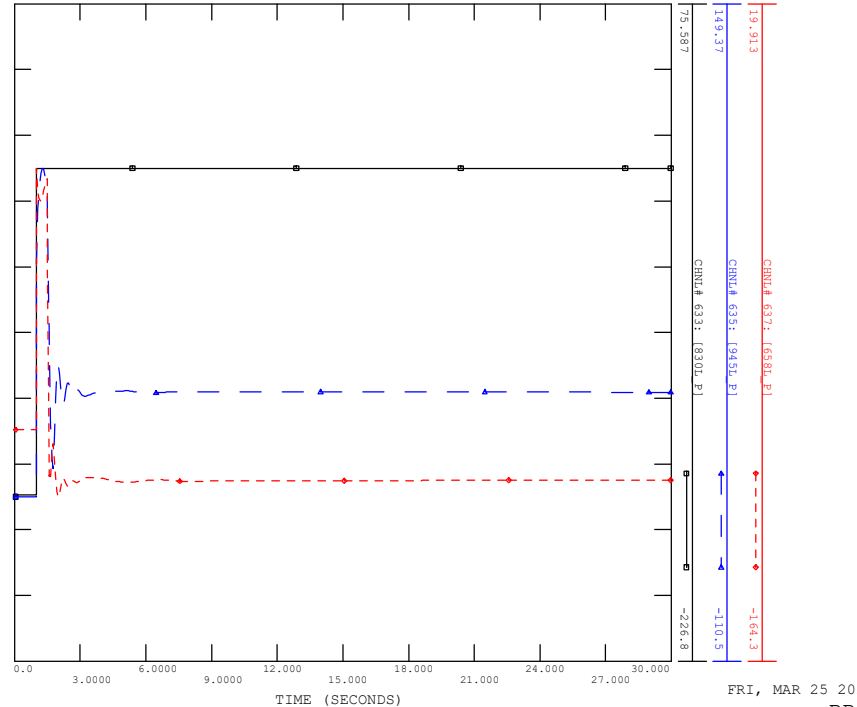
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill

FILE: scn3\_sl\_12\_830L\_McNeill.out

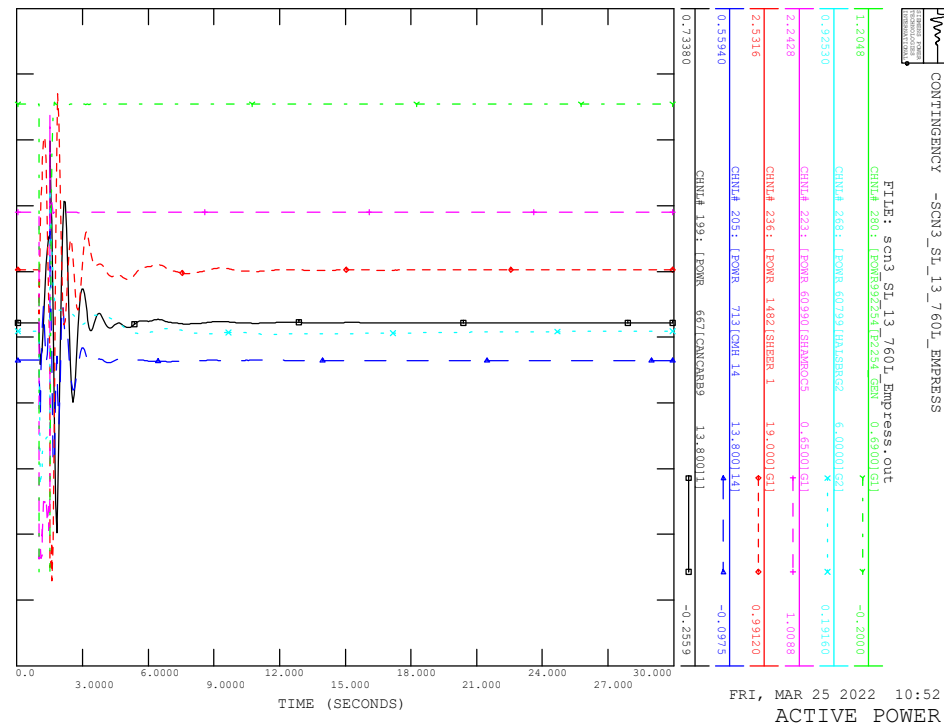


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_12\_830L\_McNeill

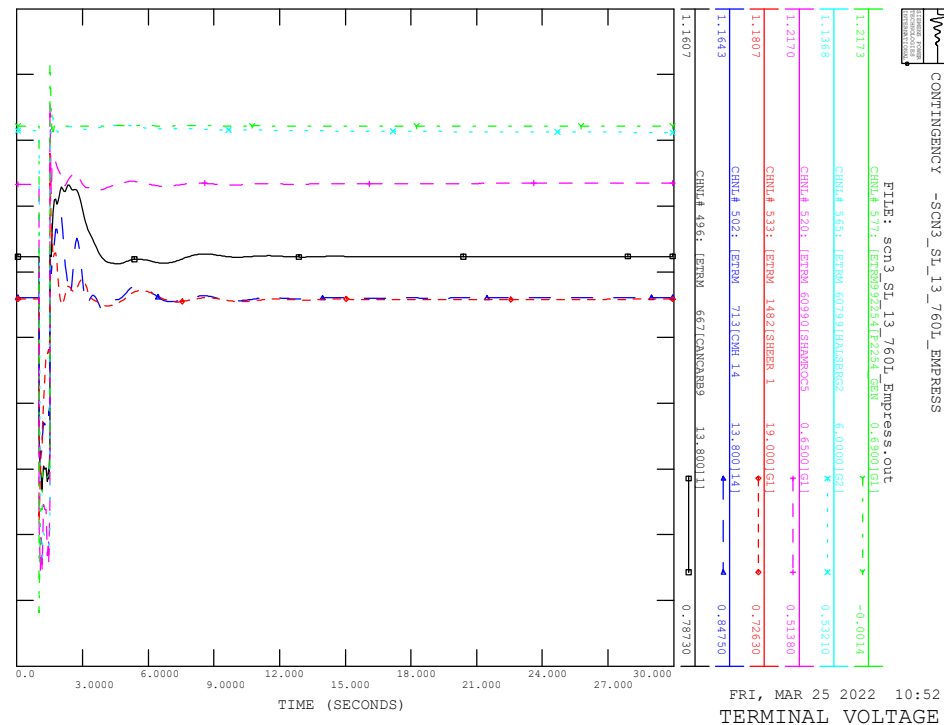
FILE: scn3\_sl\_12\_830L\_McNeill.out



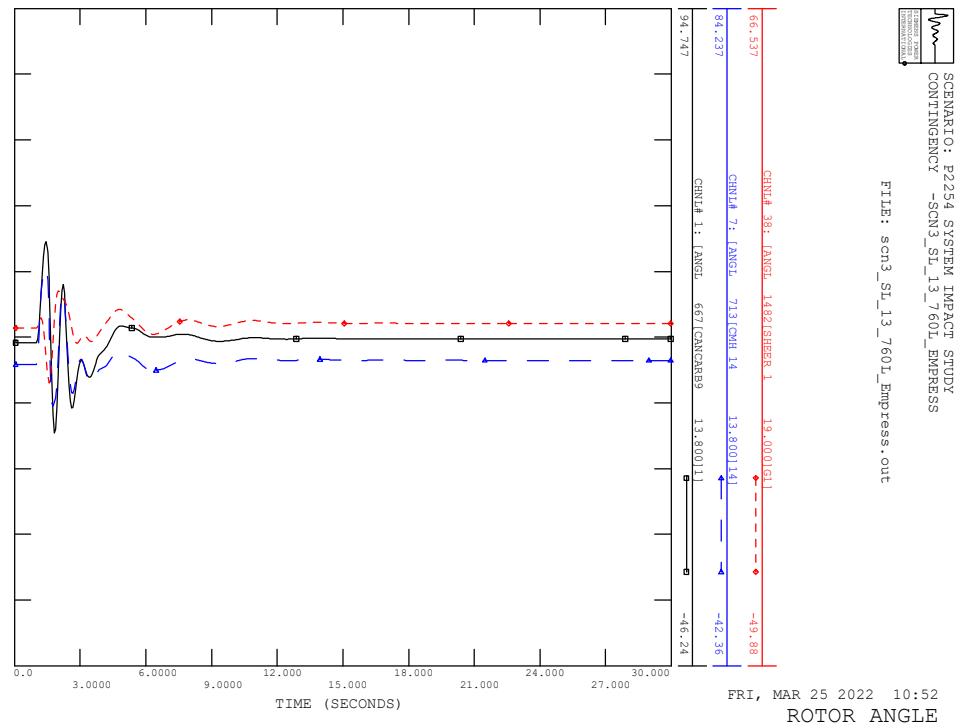
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_7601\_EMPRESS



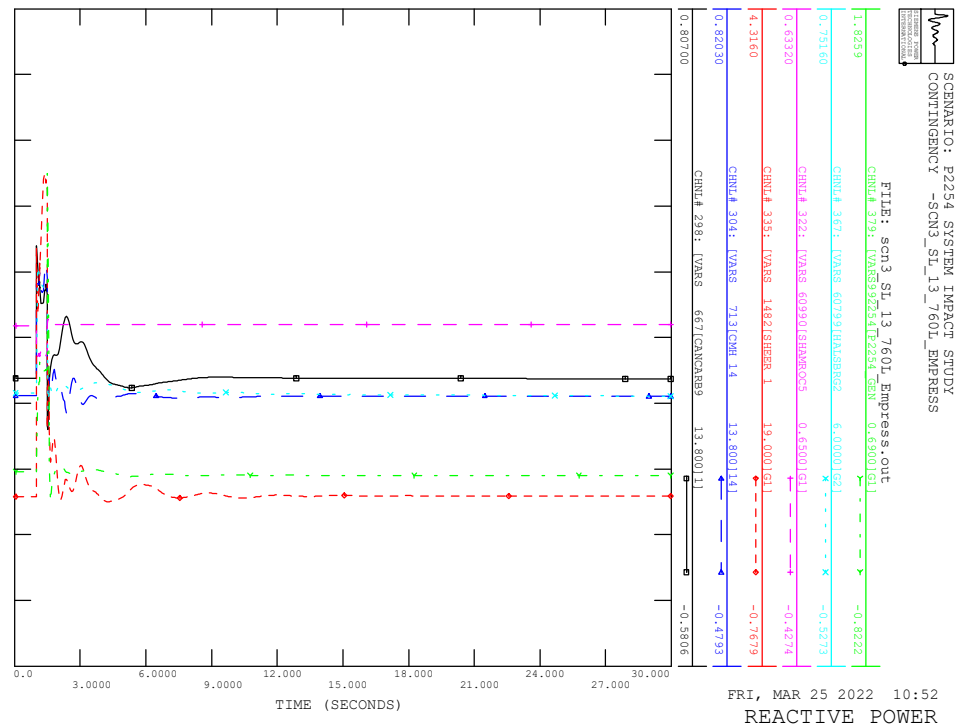
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_7601\_EMPRESS

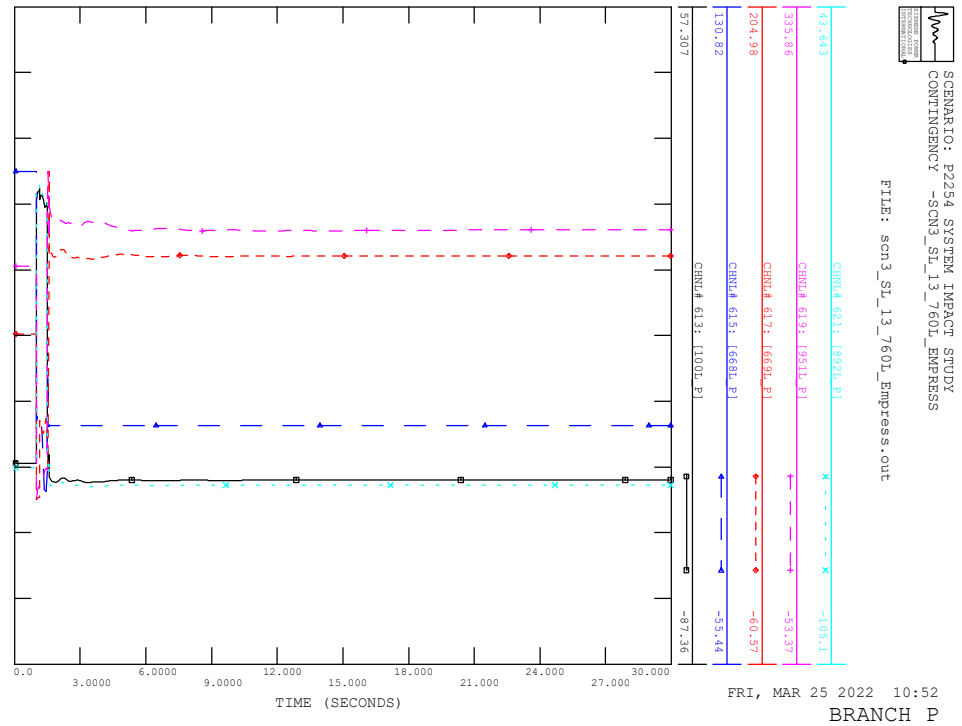
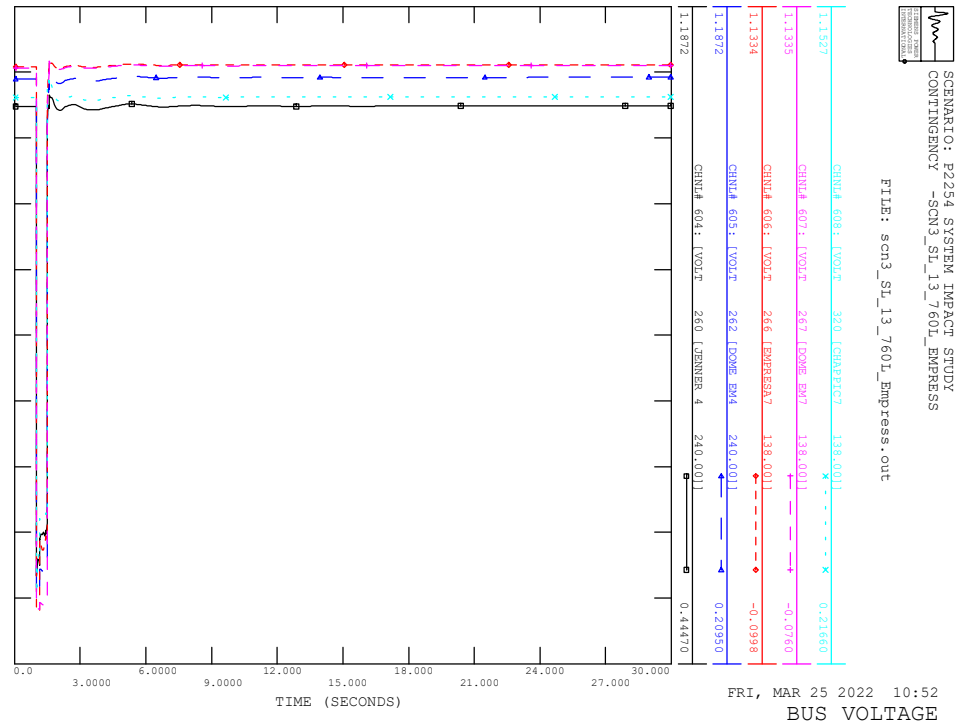
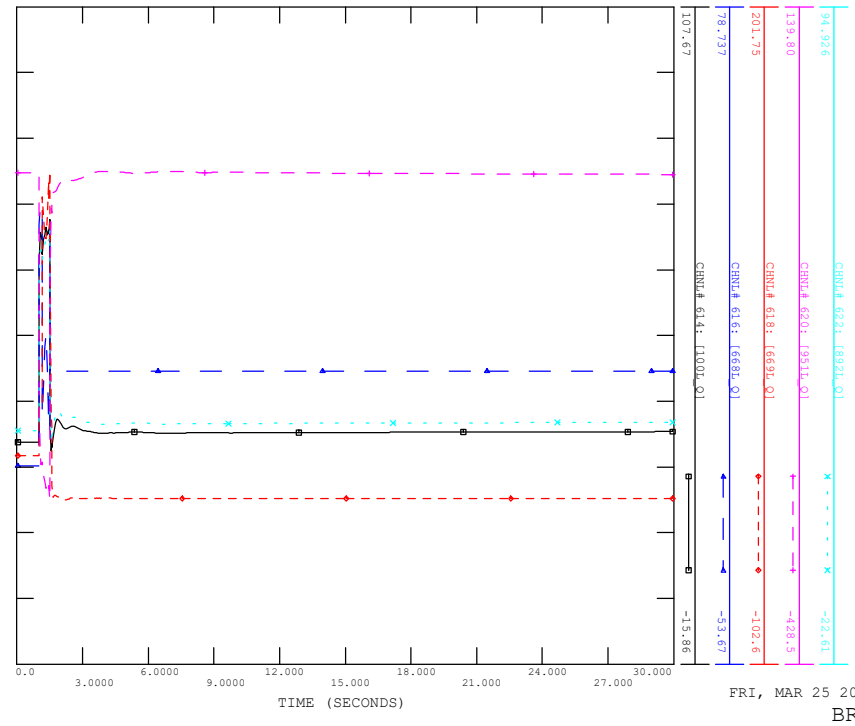
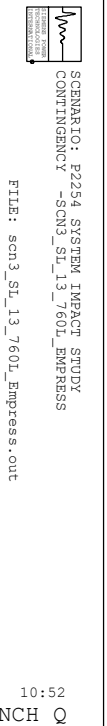
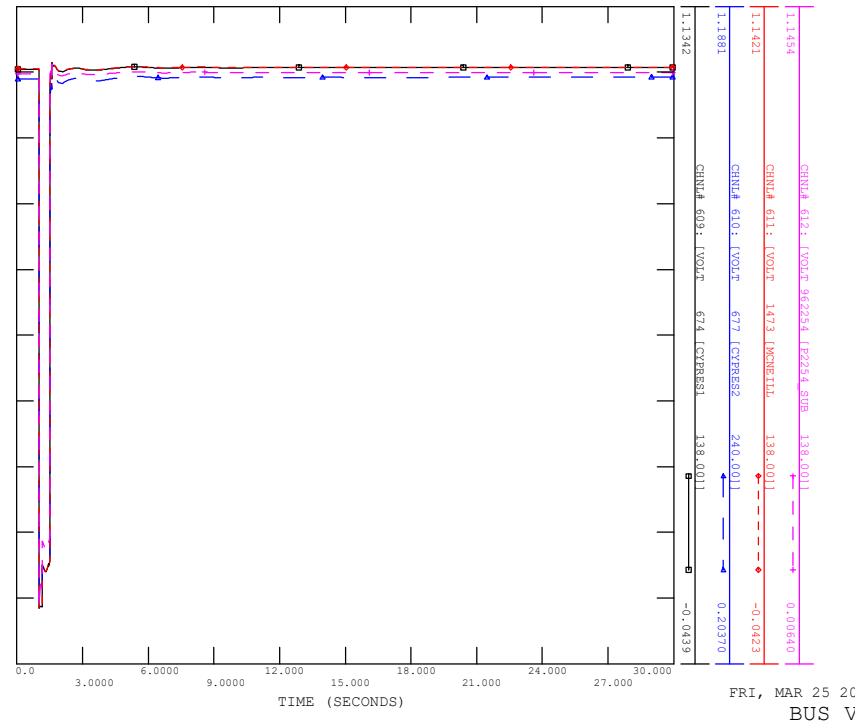
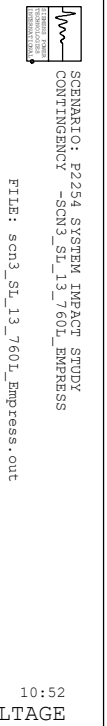


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_7601\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_7601\_EMPRESS

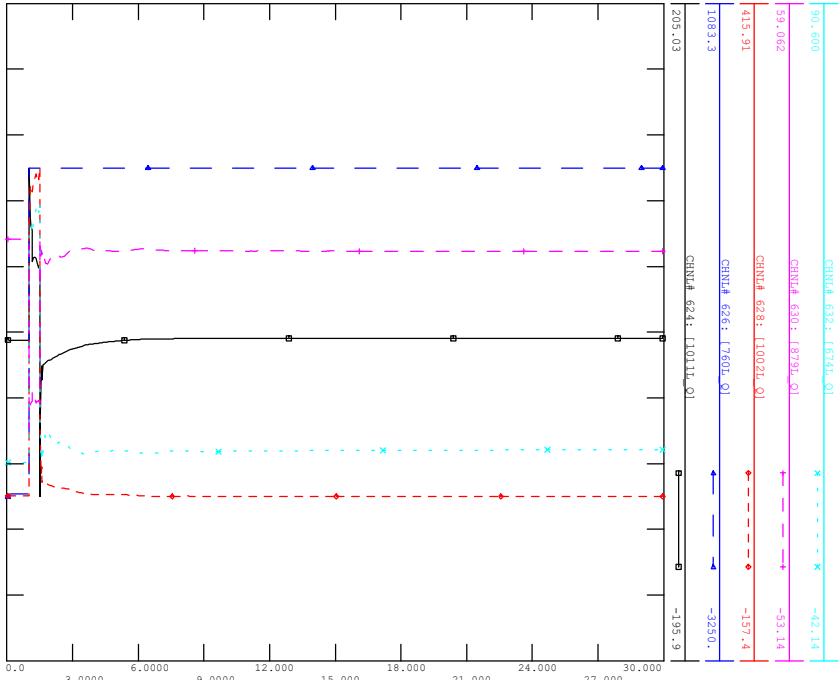






SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_760L\_EMPRESS

FILE: scn3\_sl\_13\_760L\_emptress.out

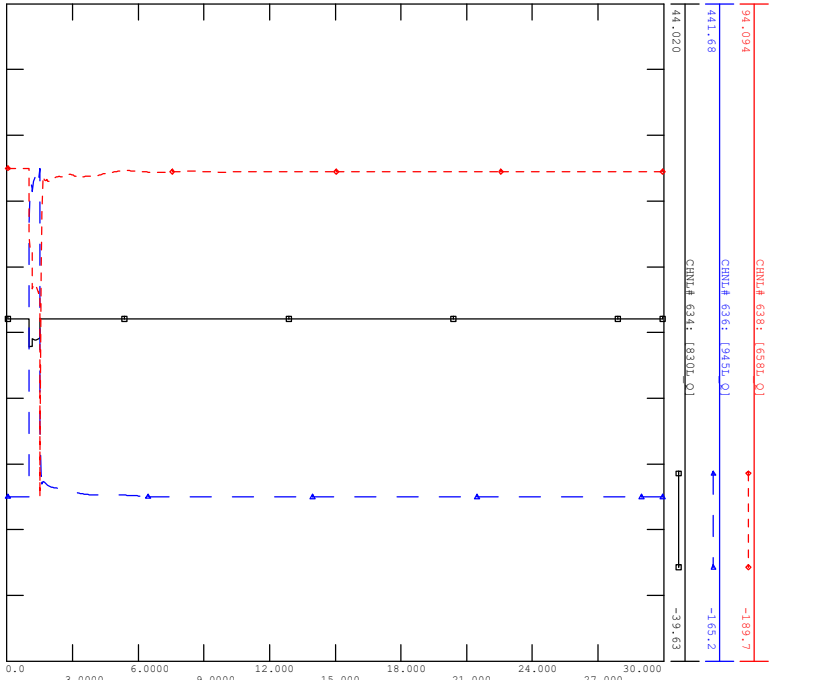


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_760L\_EMPRESS

FILE: scn3\_sl\_13\_760L\_emptress.out

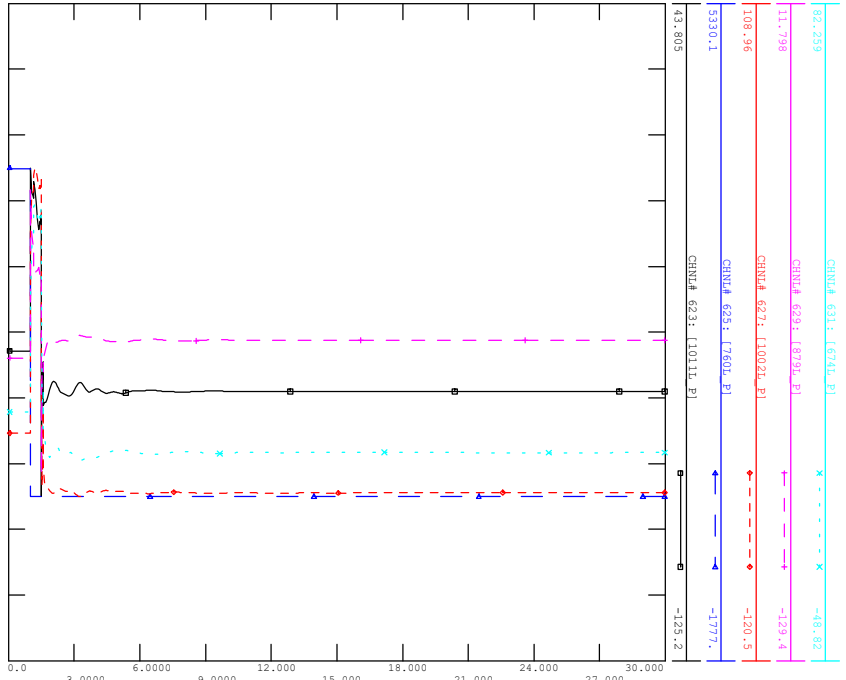


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_760L\_EMPRESS

FILE: scn3\_sl\_13\_760L\_emptress.out

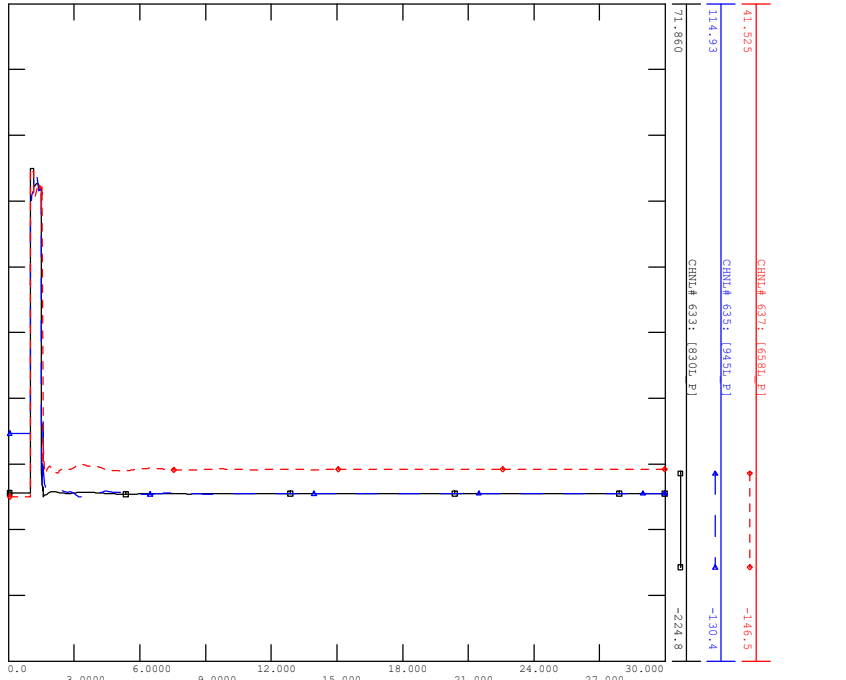


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_13\_760L\_EMPRESS

FILE: scn3\_sl\_13\_760L\_emptress.out



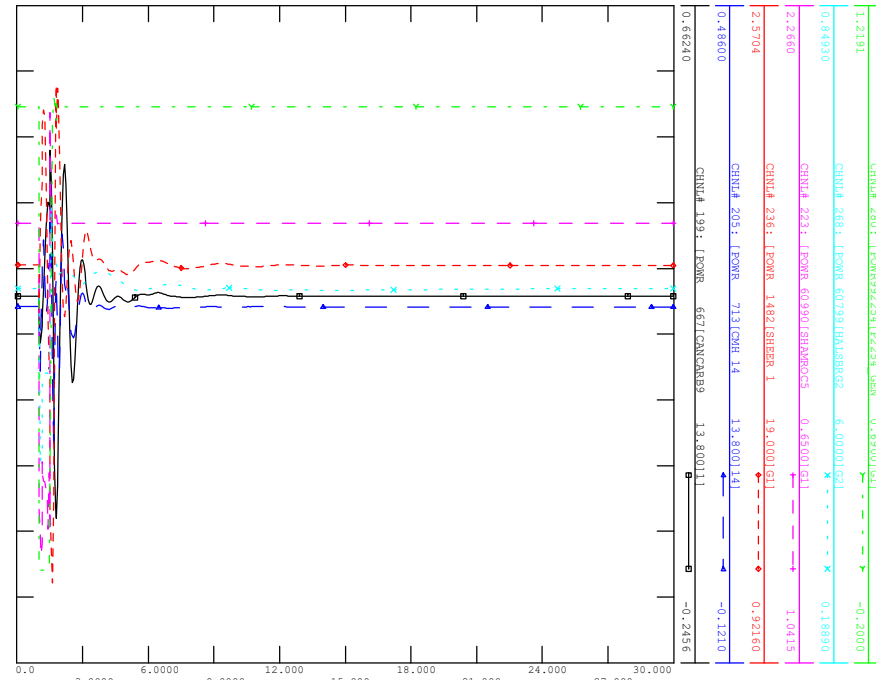
FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO



FILE: scn3\_sl\_14\_760L\_Amoco.out

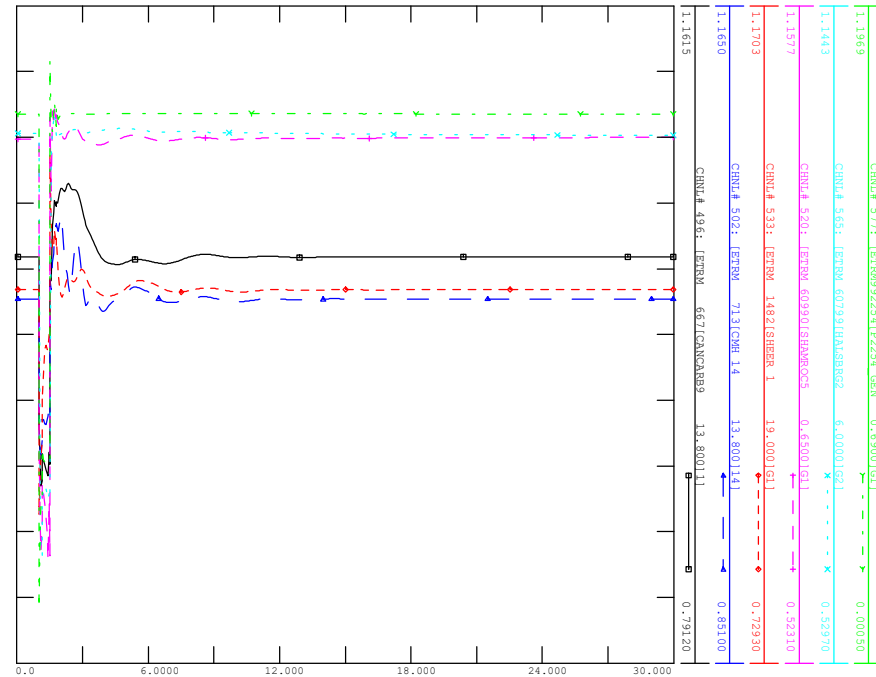


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO



FILE: scn3\_sl\_14\_760L\_Amoco.out

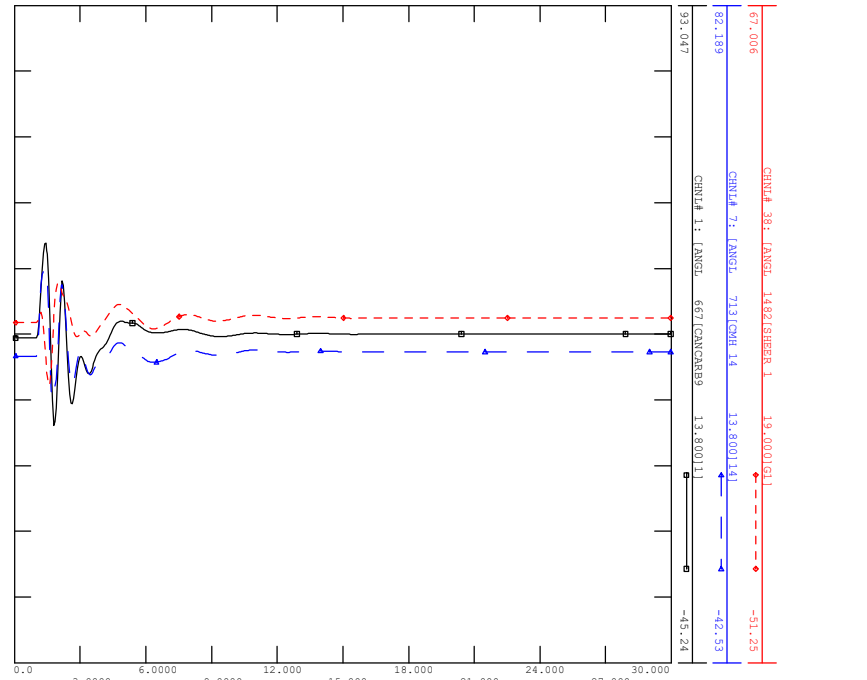


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO



FILE: scn3\_sl\_14\_760L\_Amoco.out

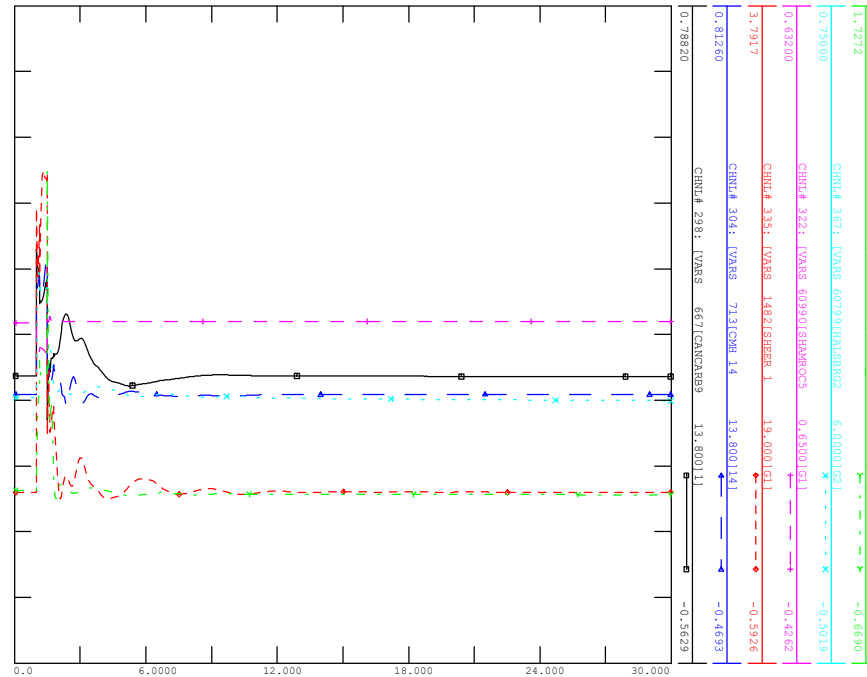


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO



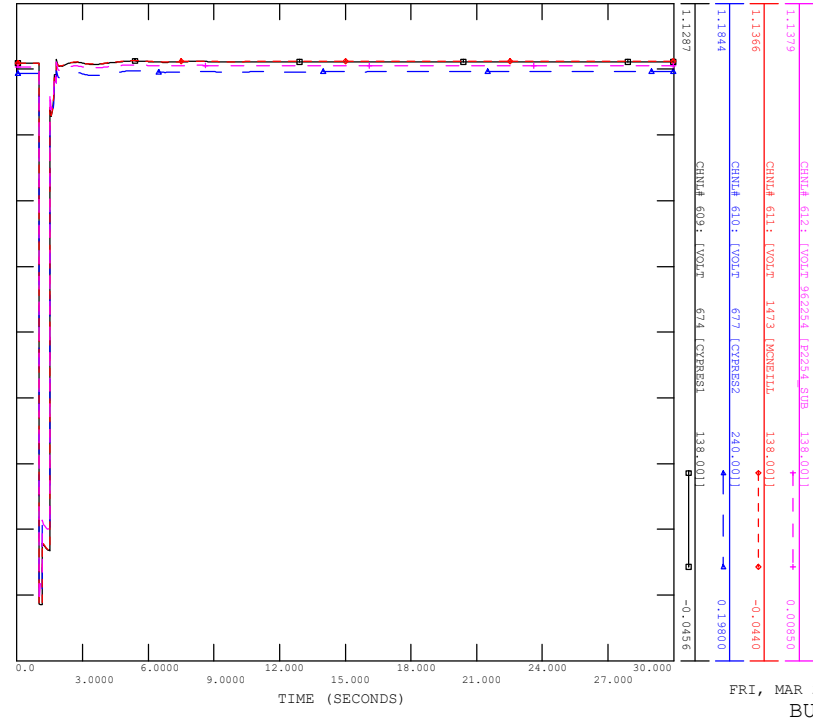
FILE: scn3\_sl\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

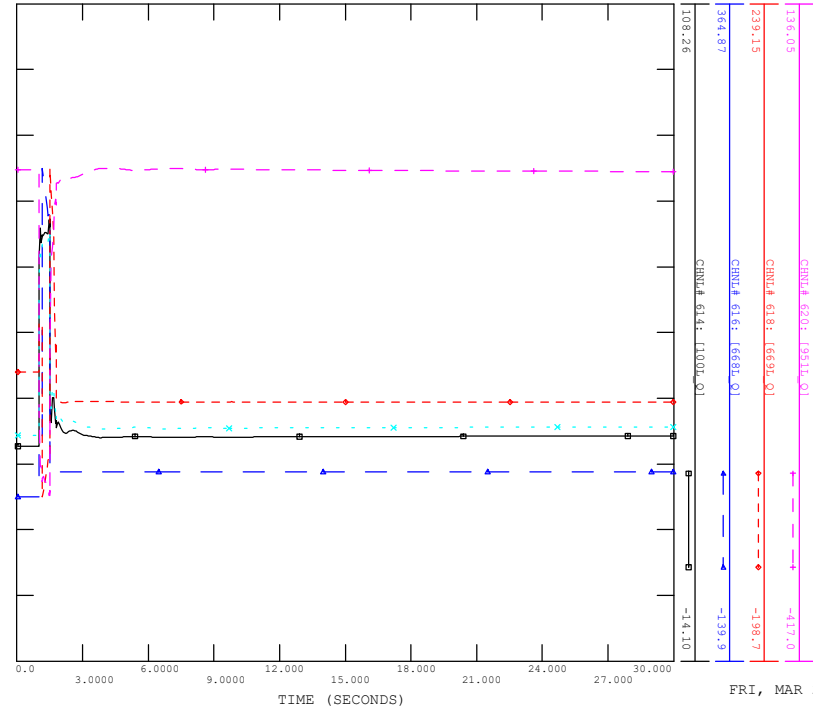
FILE: scn3\_SL\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

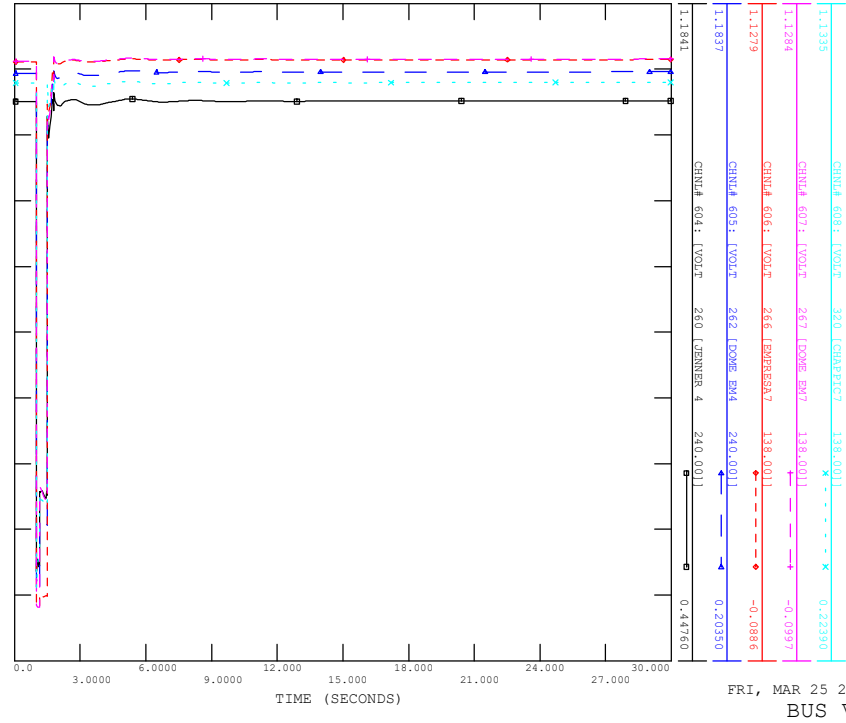
FILE: scn3\_SL\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

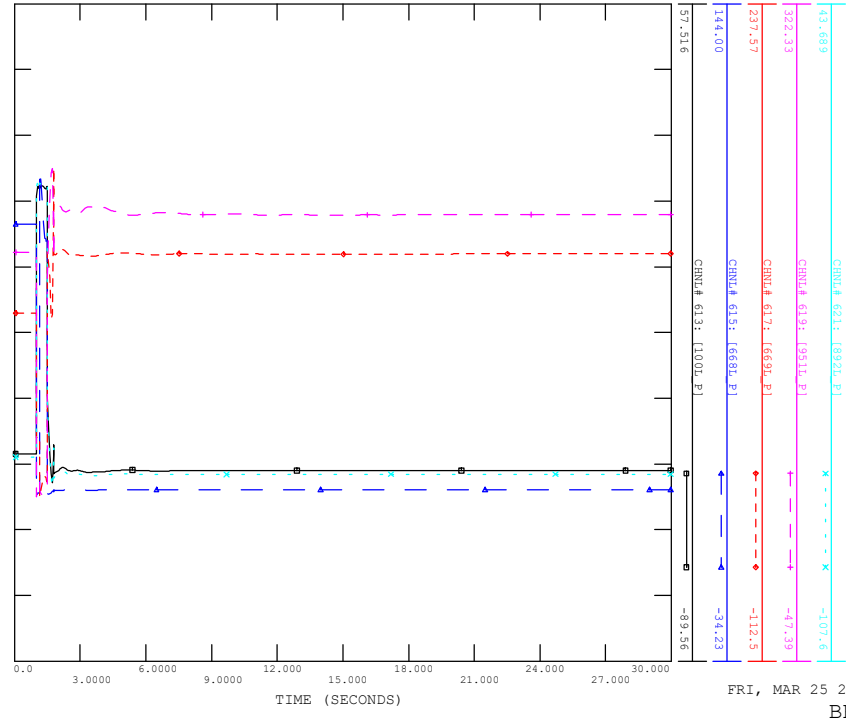
FILE: scn3\_SL\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

FILE: scn3\_SL\_14\_760L\_Amoco.out

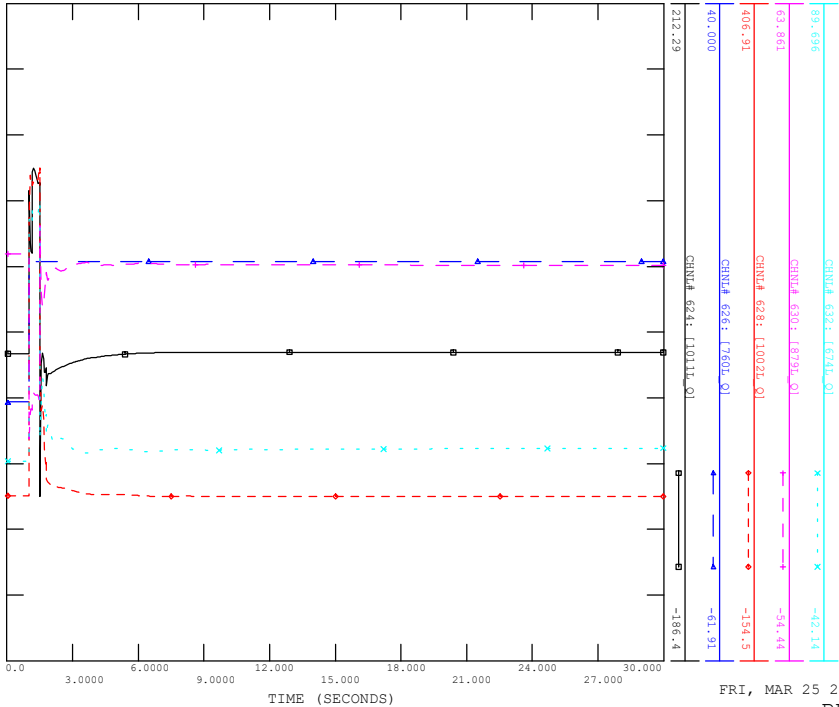


FRI, MAR 25 2022 10:52  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

FILE: scn3\_sl\_14\_760L\_Amoco.out

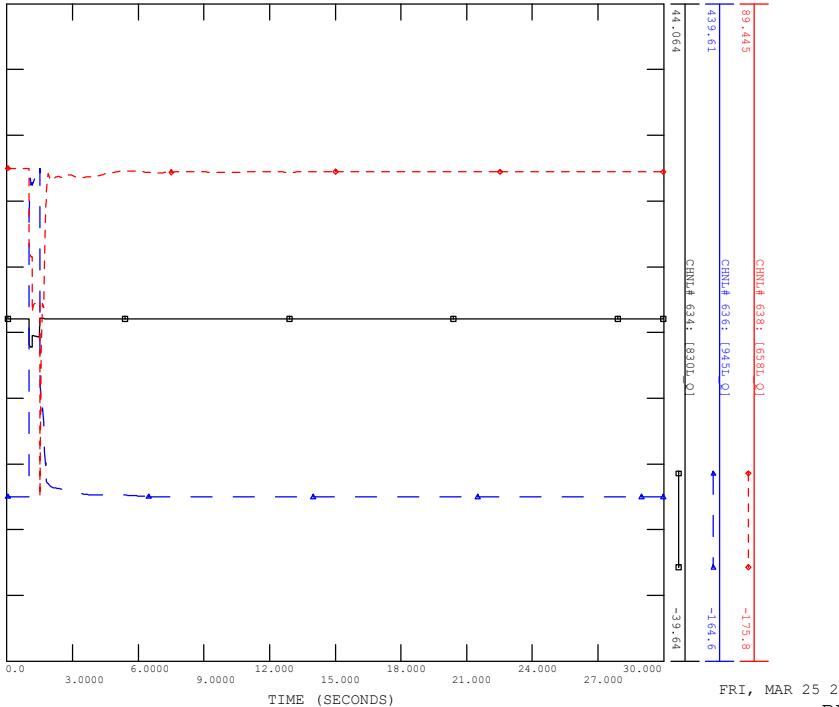


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

FILE: scn3\_sl\_14\_760L\_Amoco.out

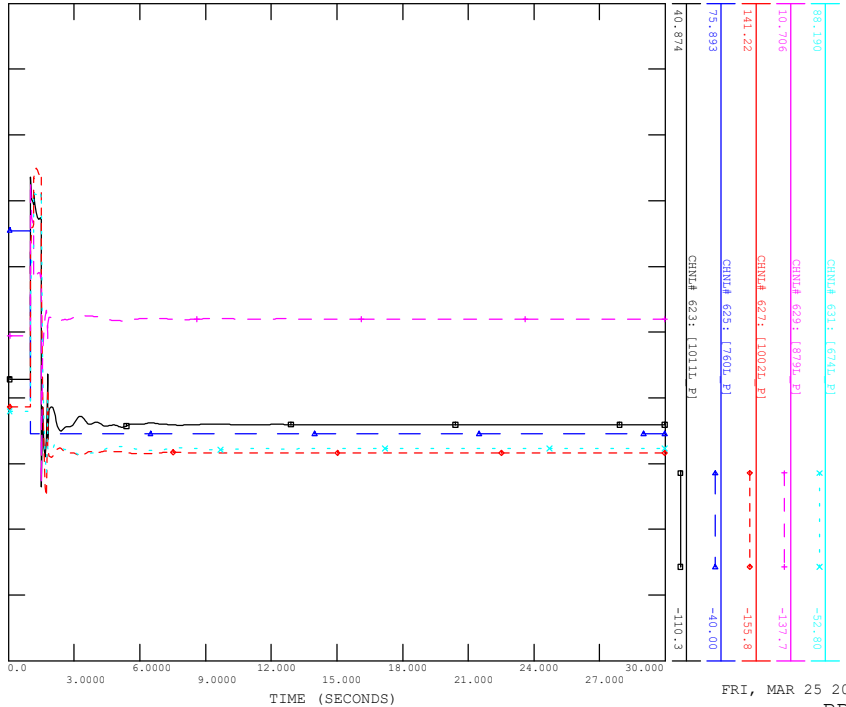


FRI, MAR 25 2022 10:52  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

FILE: scn3\_sl\_14\_760L\_Amoco.out

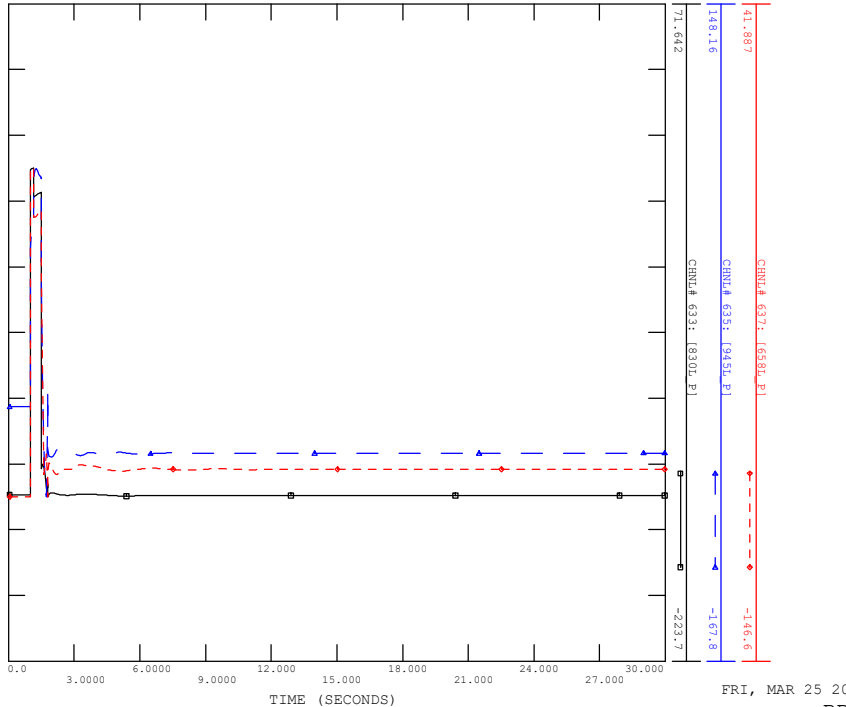


FRI, MAR 25 2022 10:52  
BRANCH P



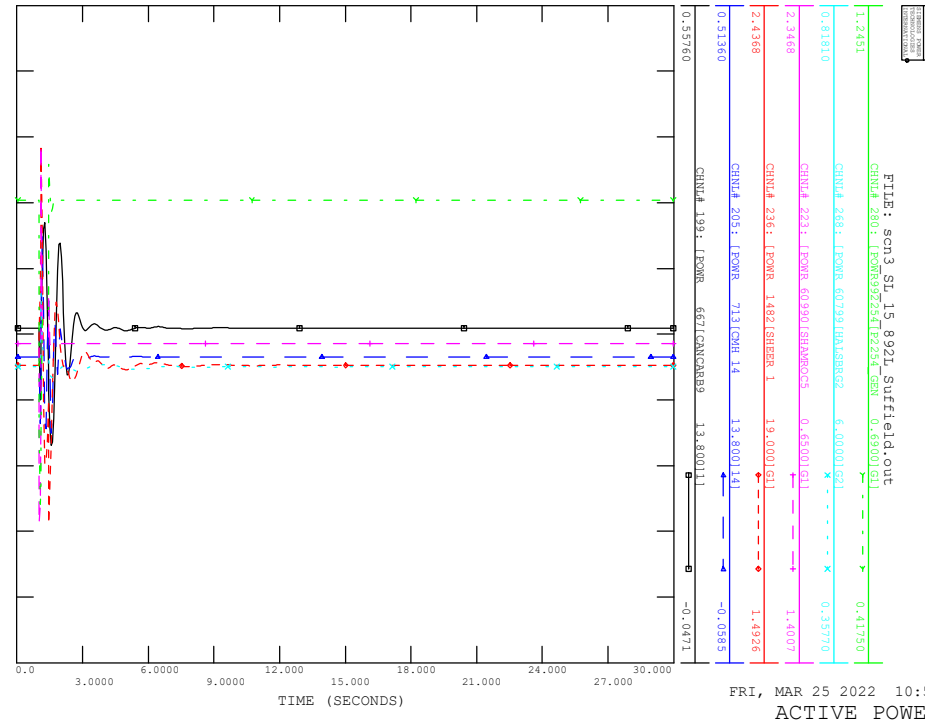
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_14\_760L\_AMOCO

FILE: scn3\_sl\_14\_760L\_Amoco.out

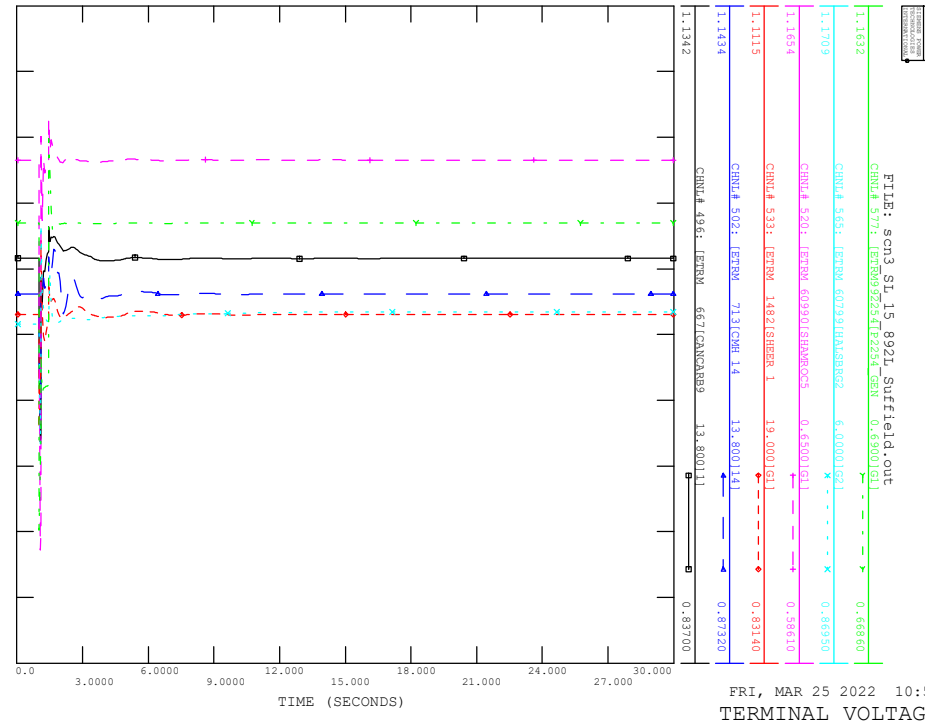


FRI, MAR 25 2022 10:52  
BRANCH P

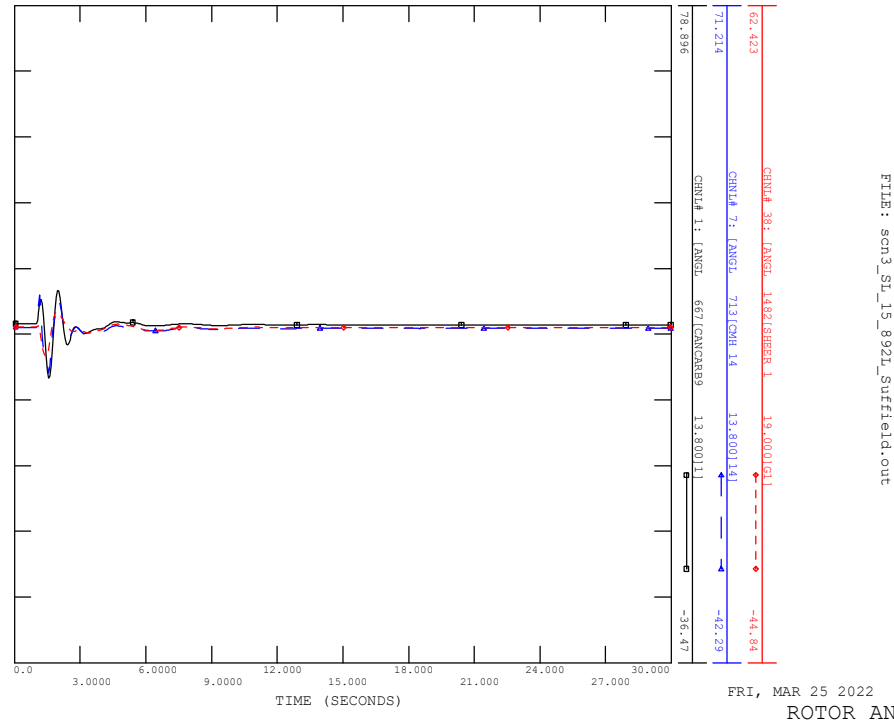
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_SUPFIELD



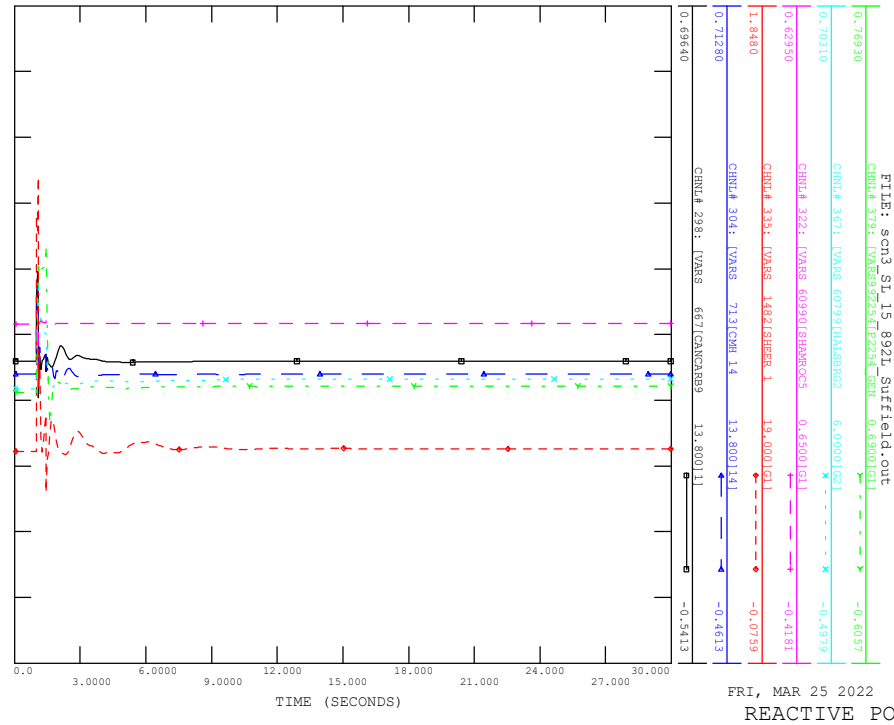
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_SUPFIELD



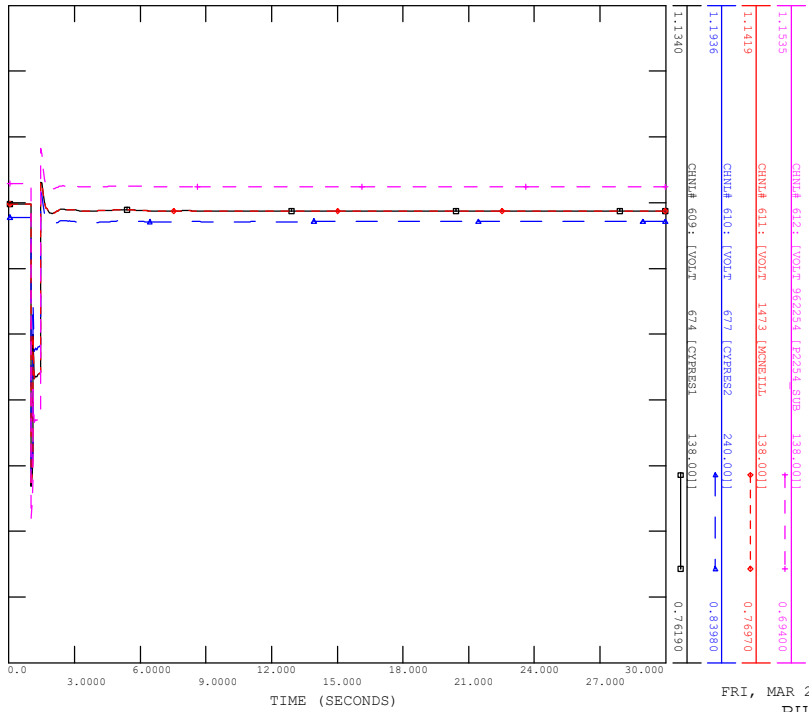
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_SUPFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_SUPFIELD

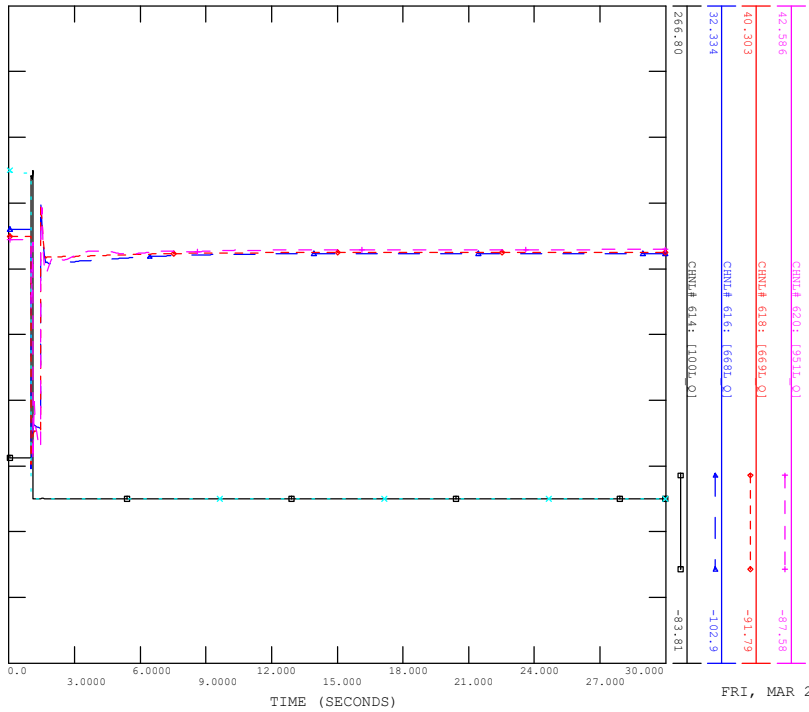


FILE: scn3\_sl\_15\_892L\_Suffield.out



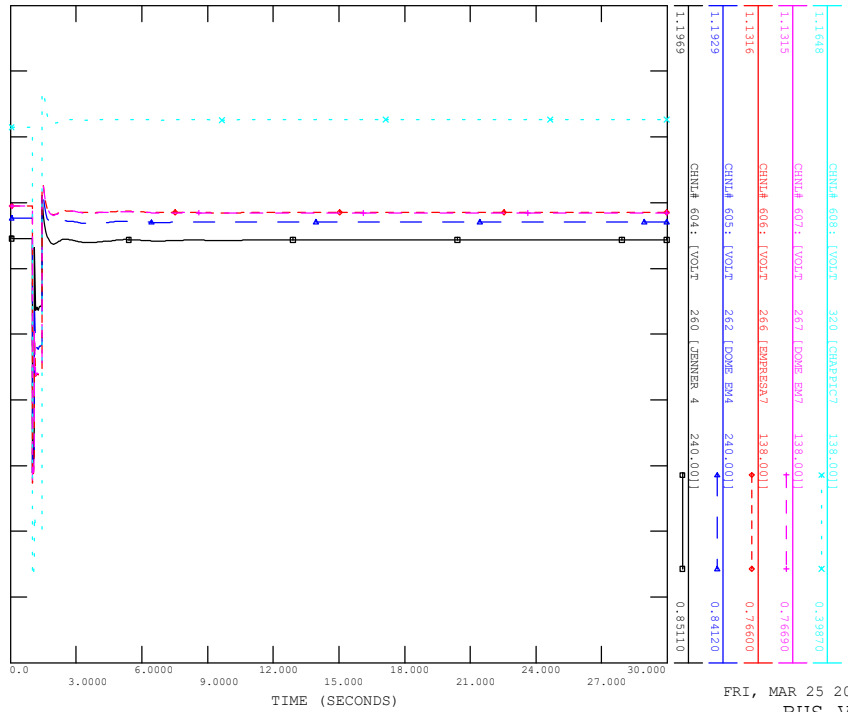
FRI, MAR 25 2022 10:52  
BUS VOLTAGE

FILE: scn3\_sl\_15\_892L\_Suffield.out



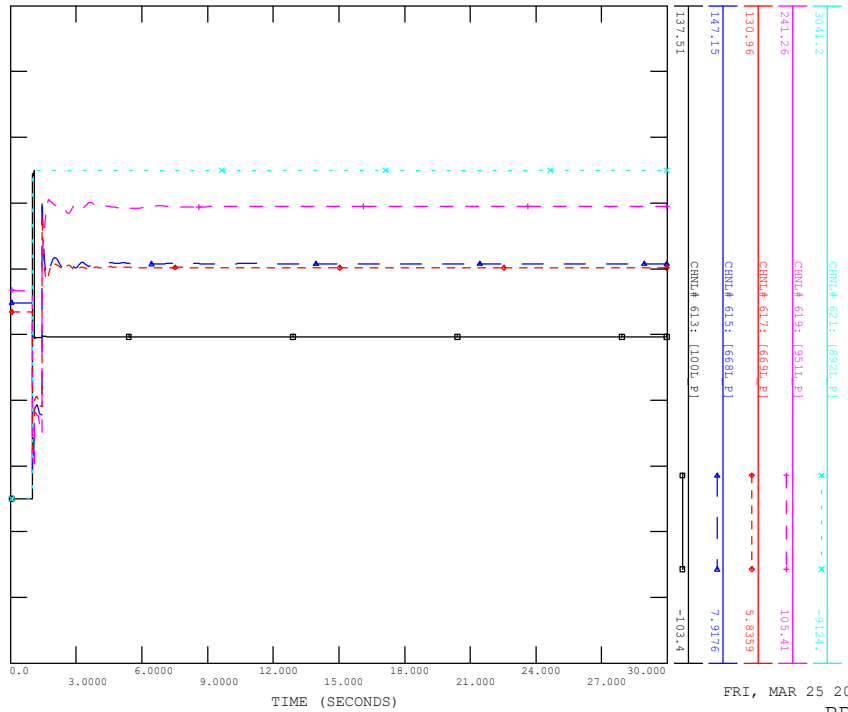
FRI, MAR 25 2022 10:52  
BRANCH Q

FILE: scn3\_sl\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

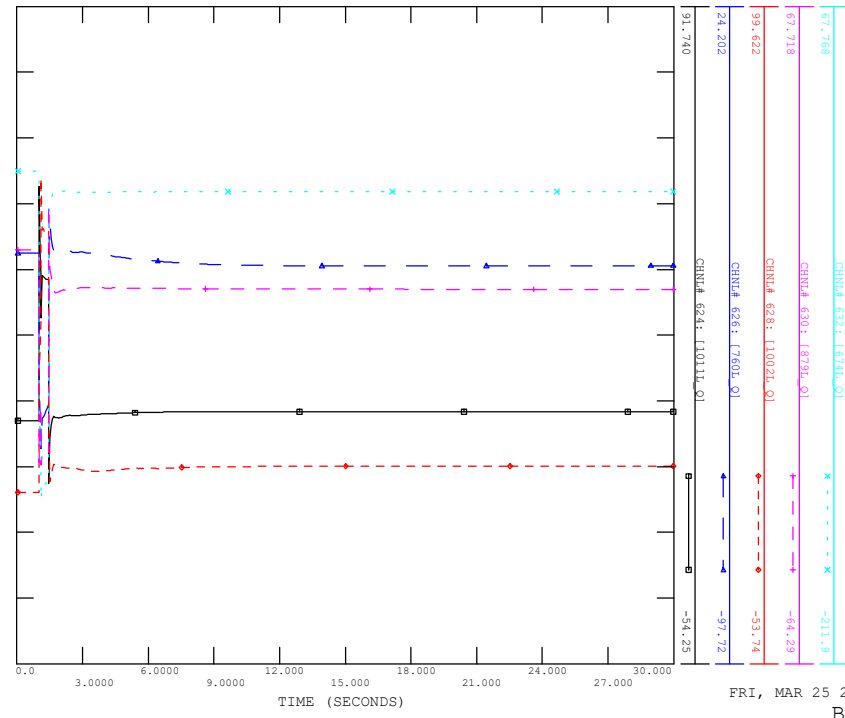
FILE: scn3\_sl\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_Suffield

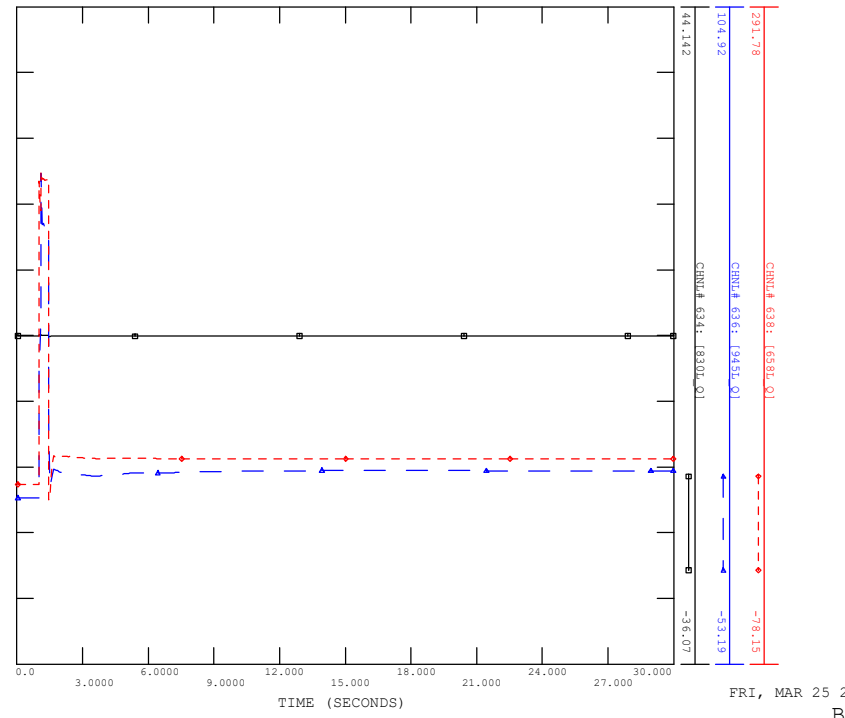
FILE: scn3\_sl\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_Suffield

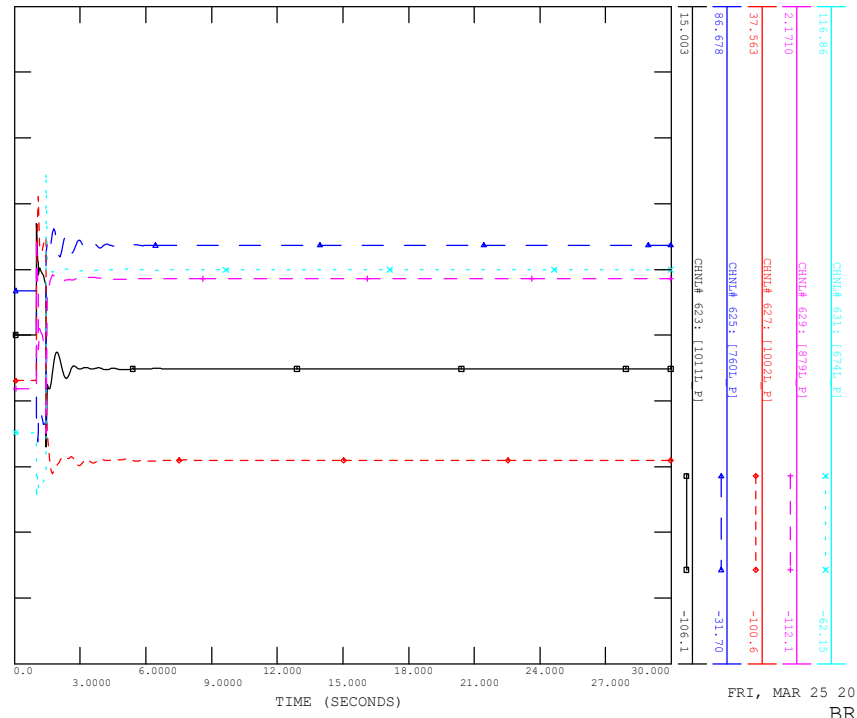
FILE: scn3\_sl\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_Suffield

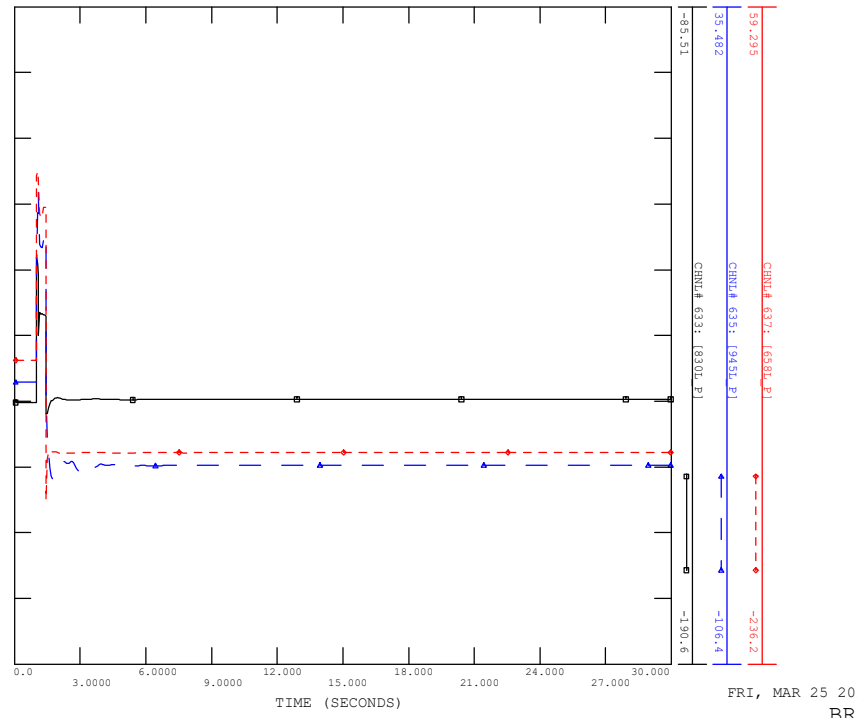
FILE: scn3\_sl\_15\_892L\_Suffield.out



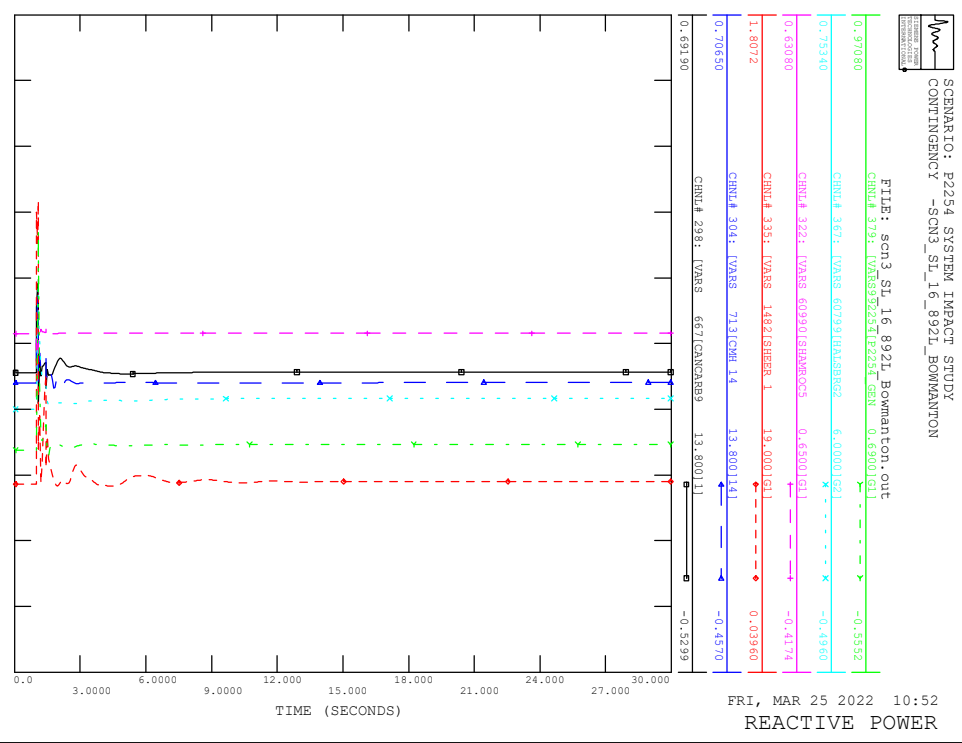
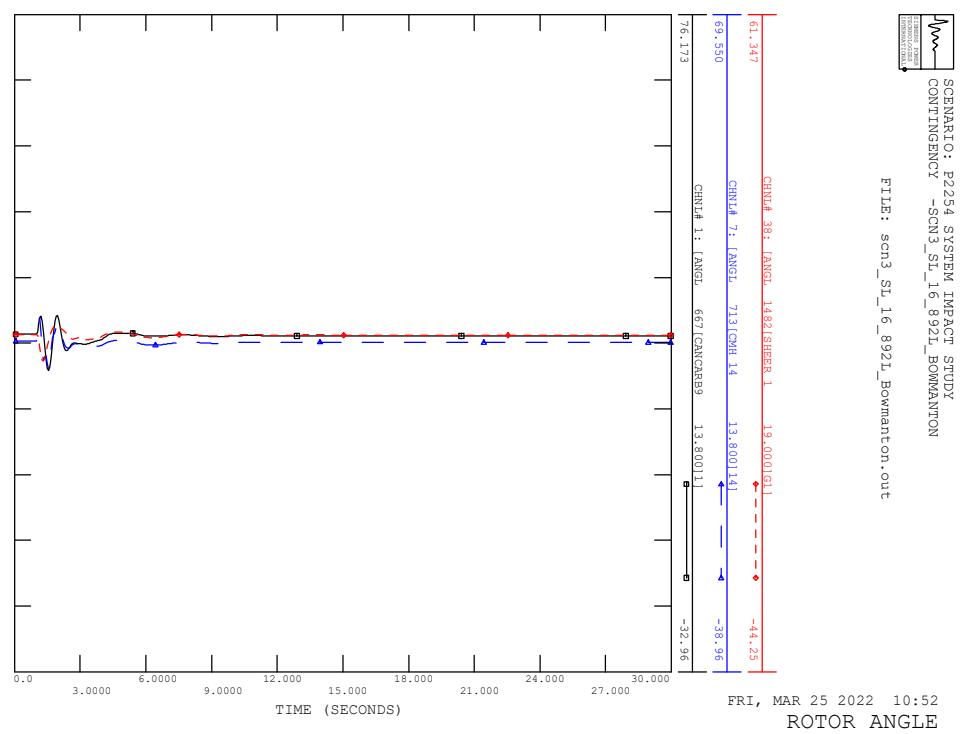
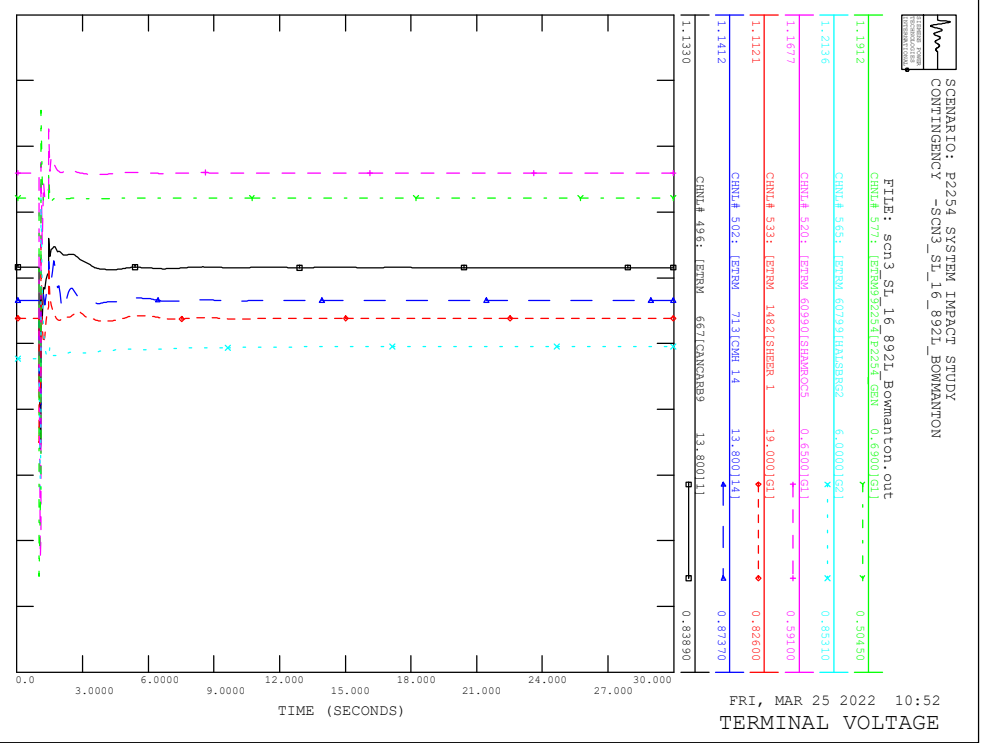
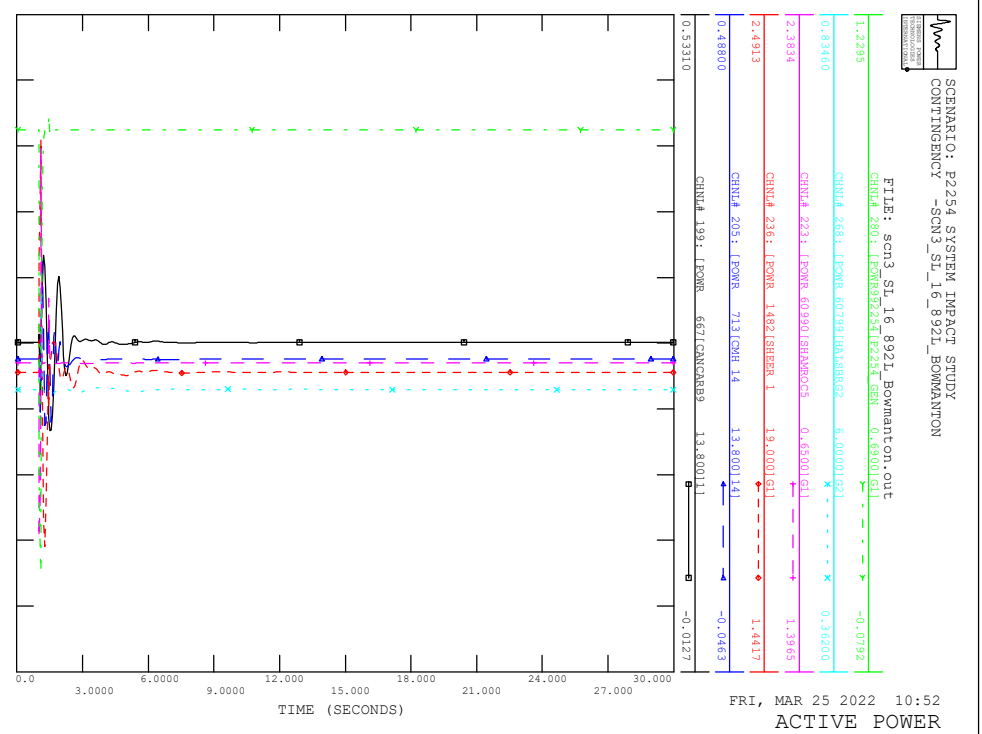
FRI, MAR 25 2022 10:52  
BRANCH P

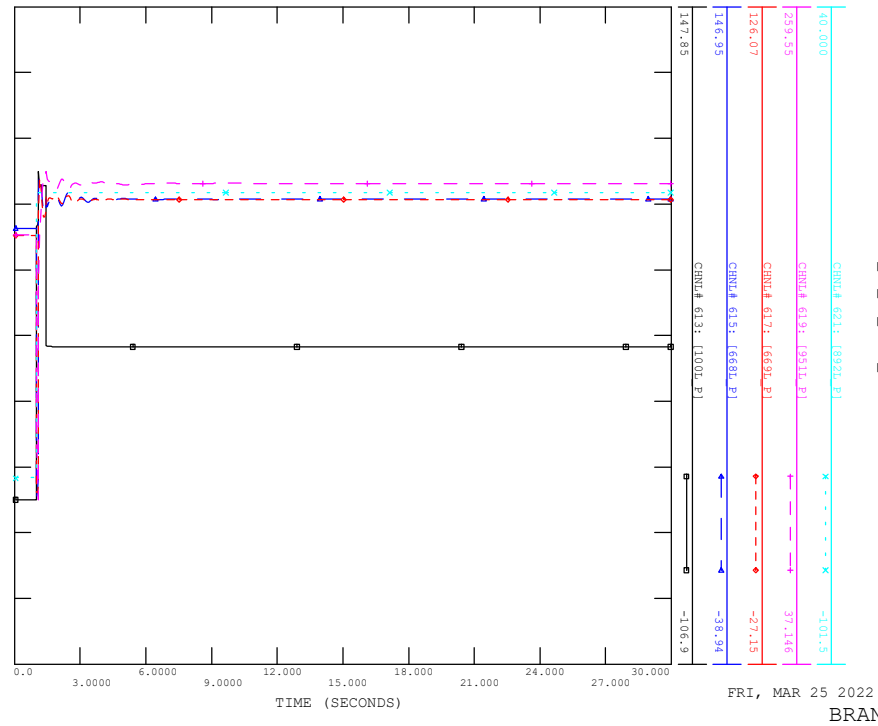
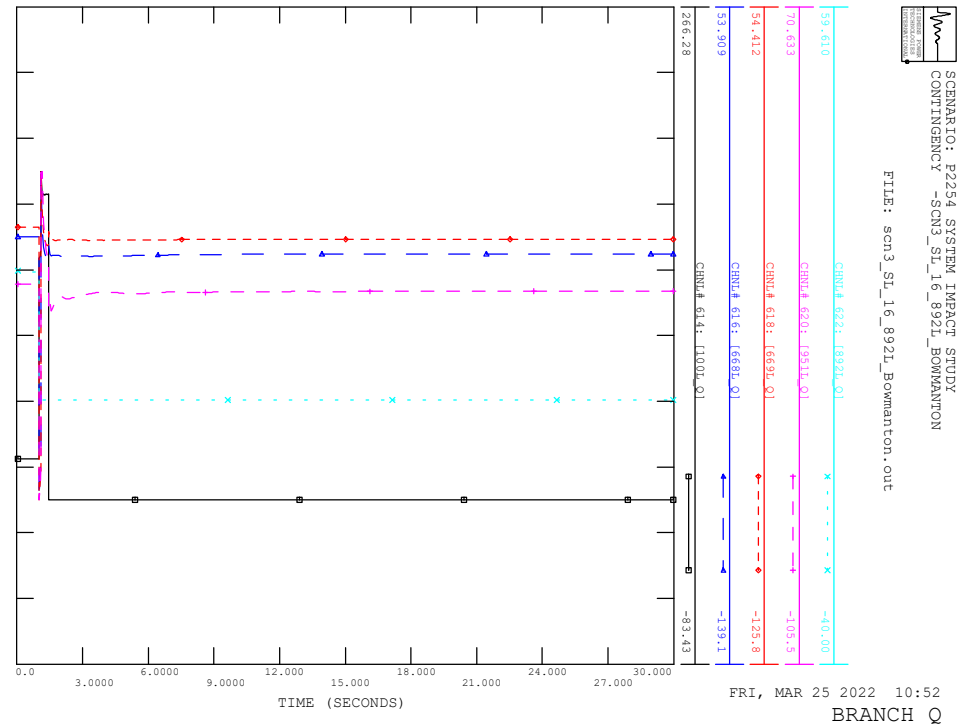
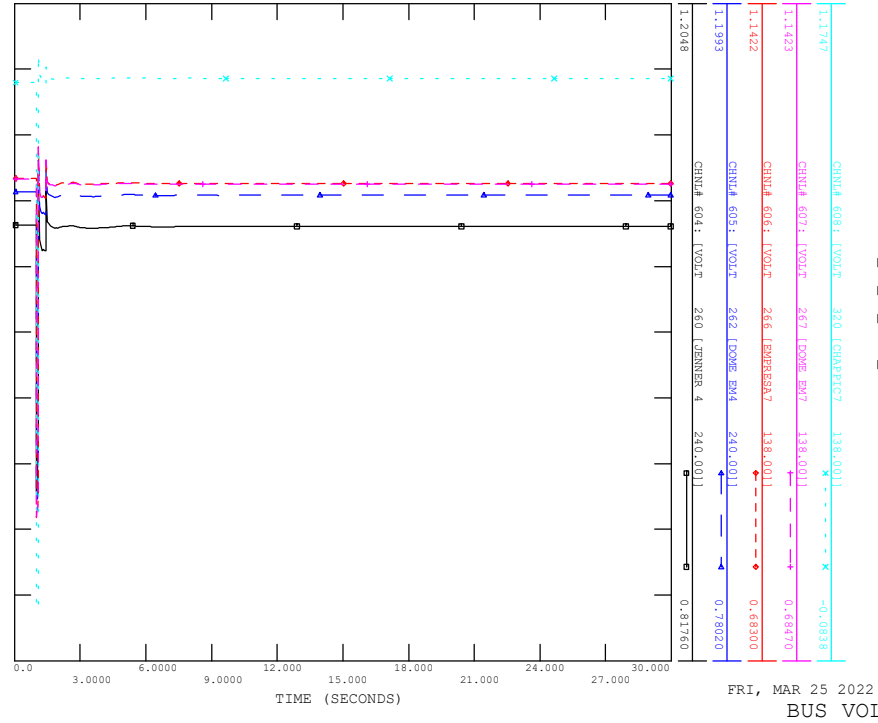
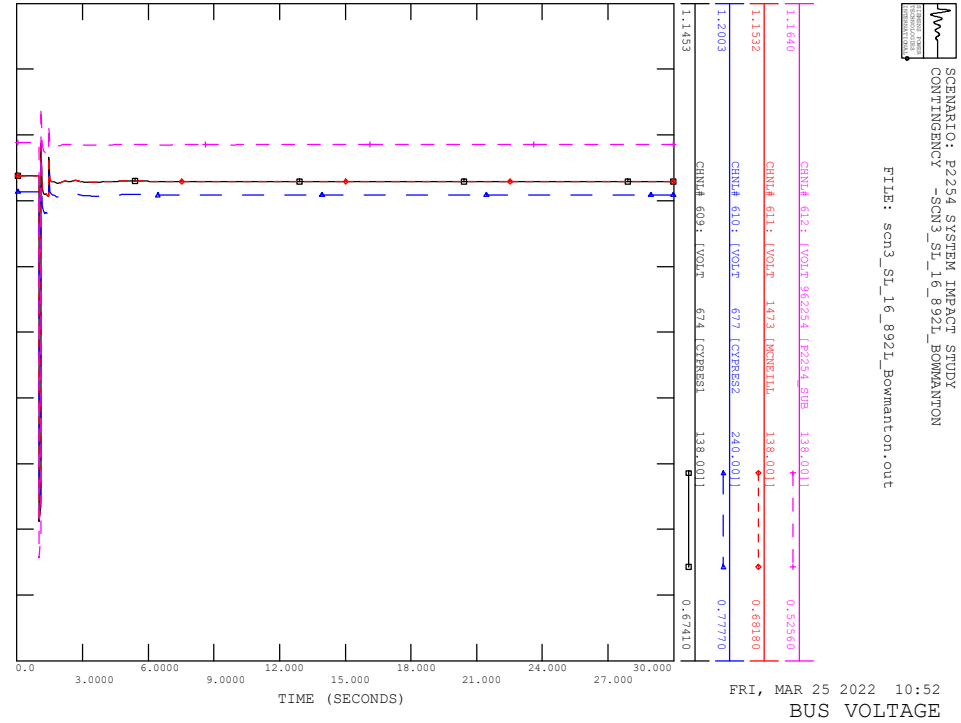
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_15\_892L\_Suffield

FILE: scn3\_sl\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:52  
BRANCH P

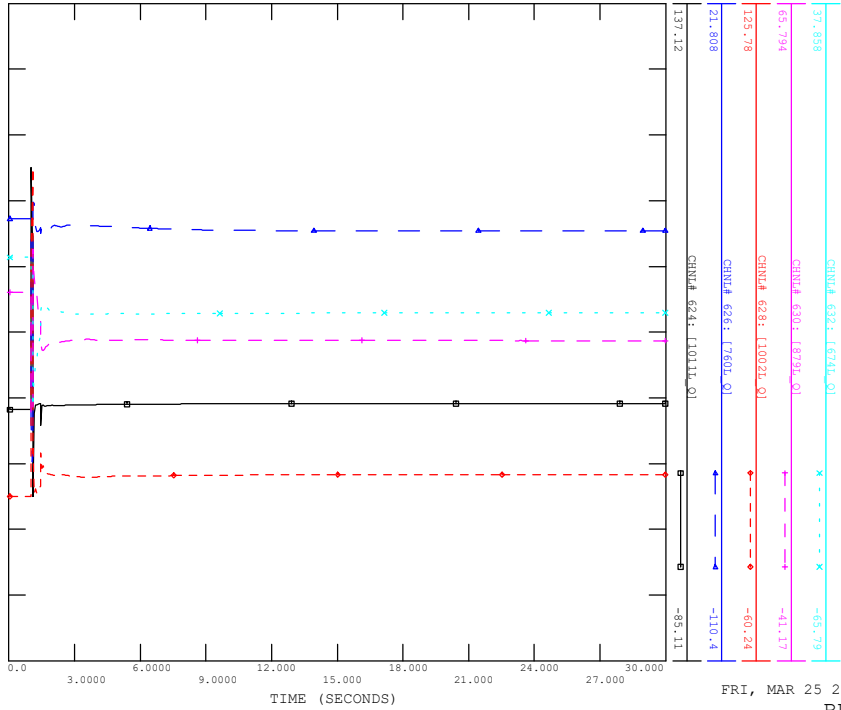






SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_16\_892L\_BOWMANTON

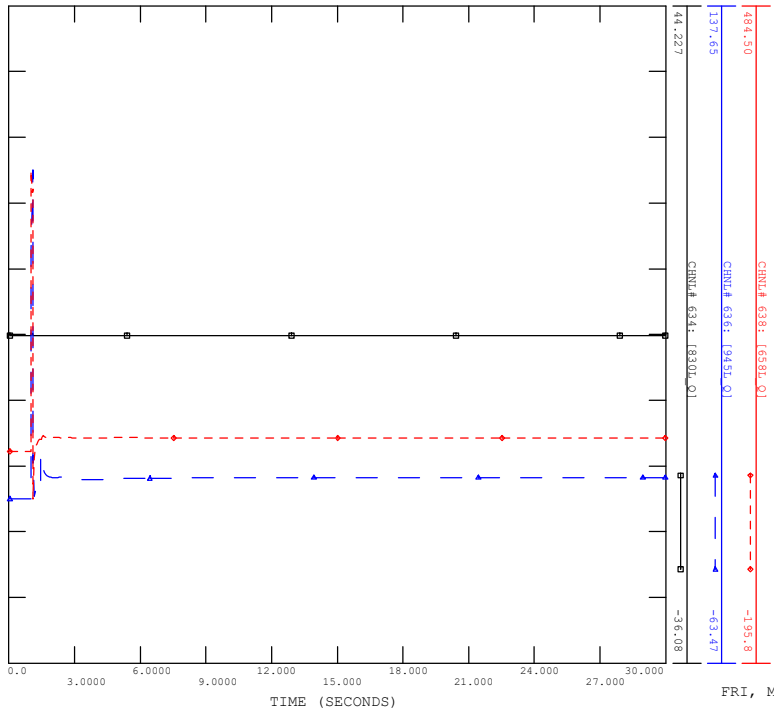
FILE: scn3\_sl\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_16\_892L\_BOWMANTON

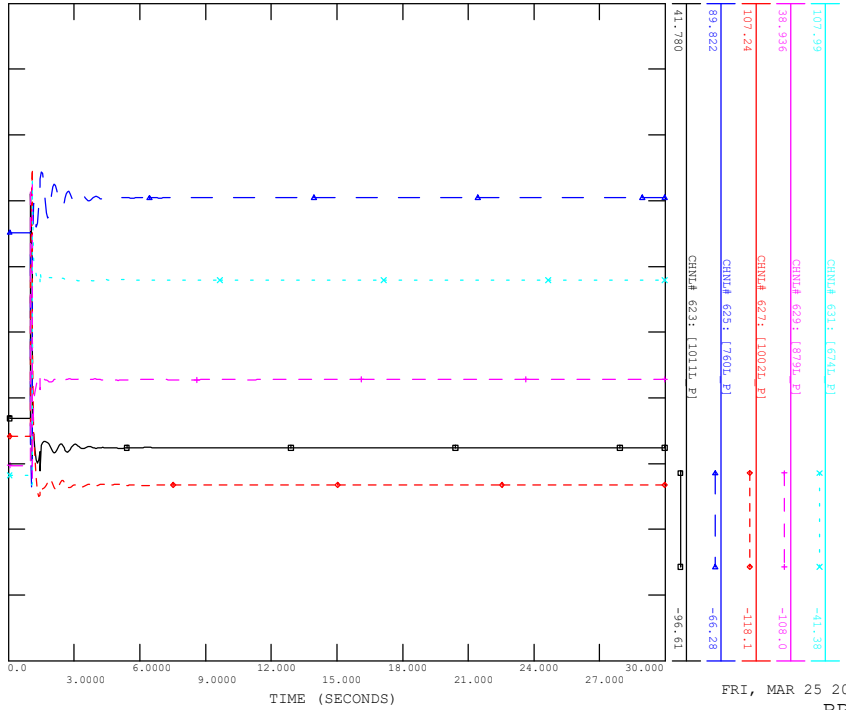
FILE: scn3\_sl\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_16\_892L\_BOWMANTON

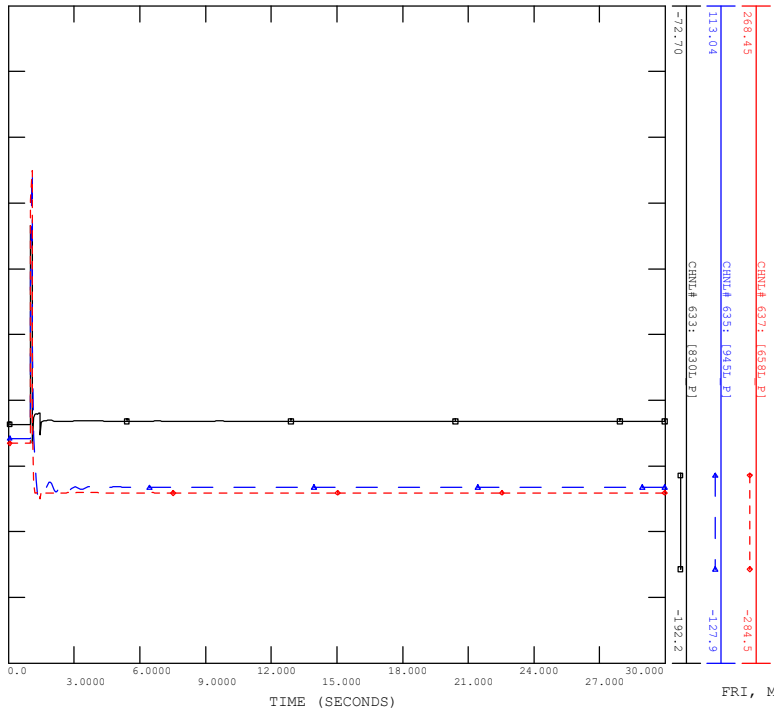
FILE: scn3\_sl\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_16\_892L\_BOWMANTON

FILE: scn3\_sl\_16\_892L\_Bowmanton.out

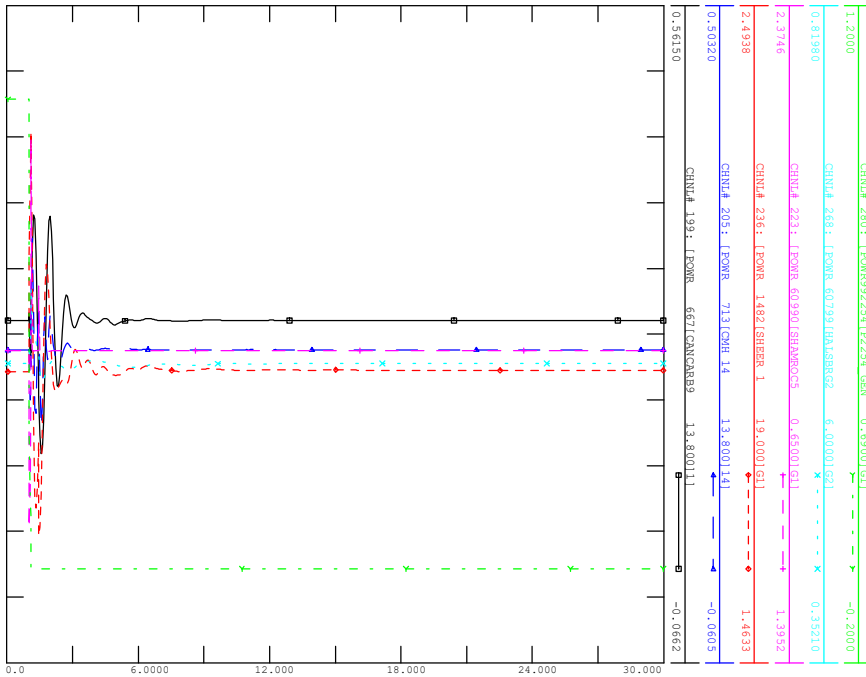


FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_6581\_CHAPLICE



FILE: scn3\_sl\_17\_6581\_Chaplice.out

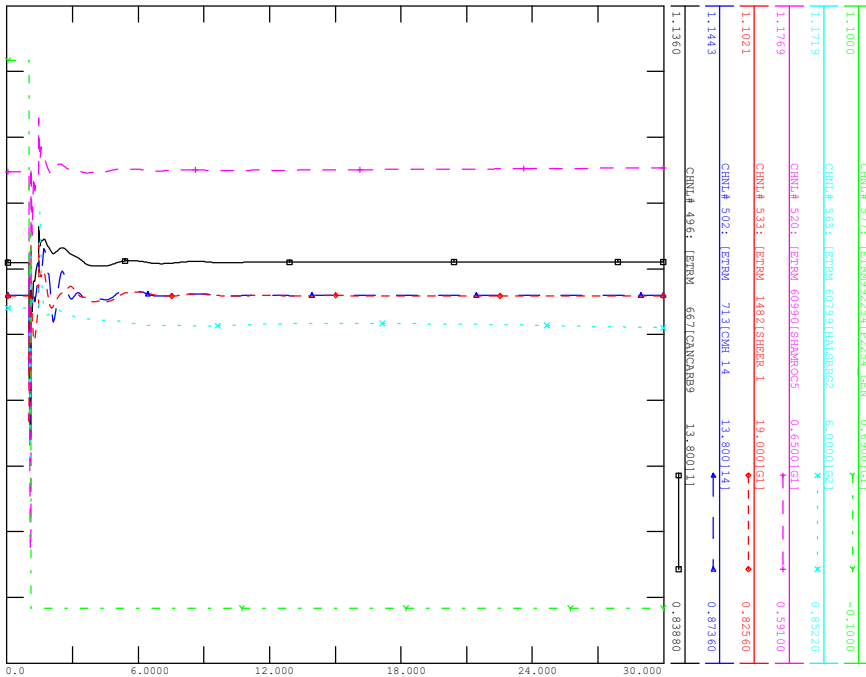


FRI, MAR 25 2022 10:52  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_6581\_CHAPLICE



FILE: scn3\_sl\_17\_6581\_Chaplice.out

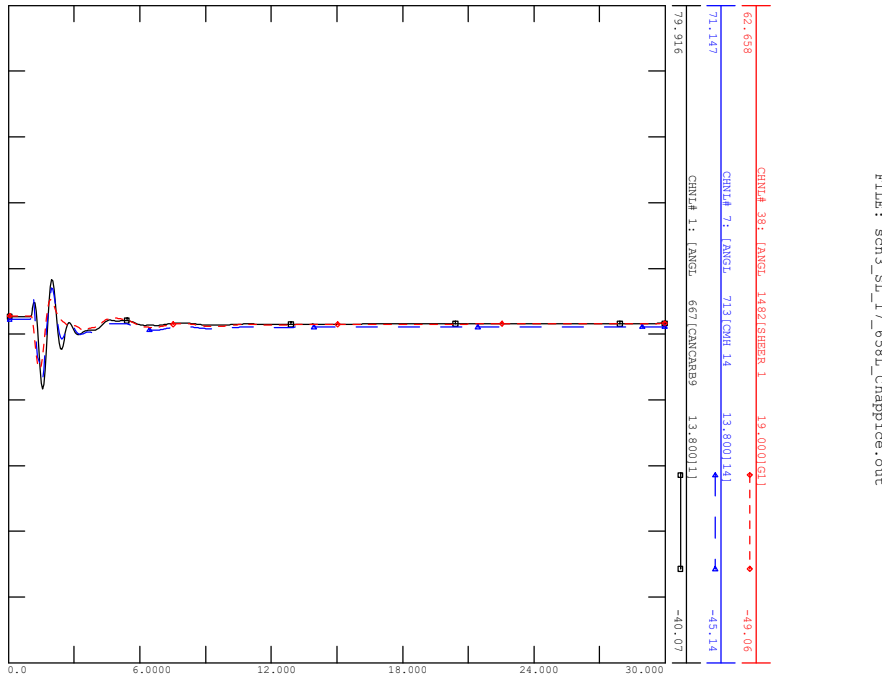


FRI, MAR 25 2022 10:52  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_6581\_CHAPLICE



FILE: scn3\_sl\_17\_6581\_Chaplice.out

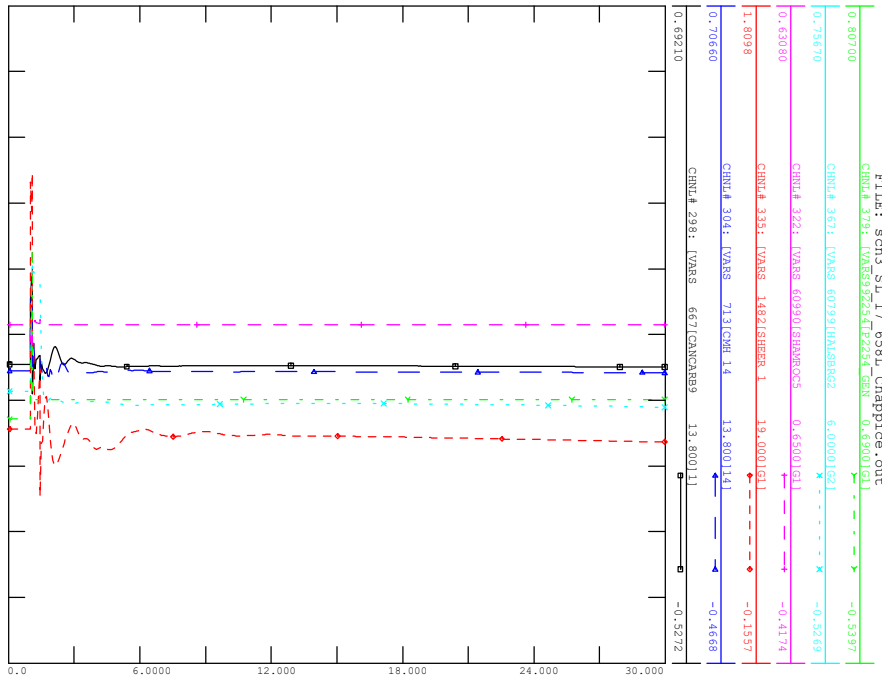


FRI, MAR 25 2022 10:52  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_6581\_CHAPLICE



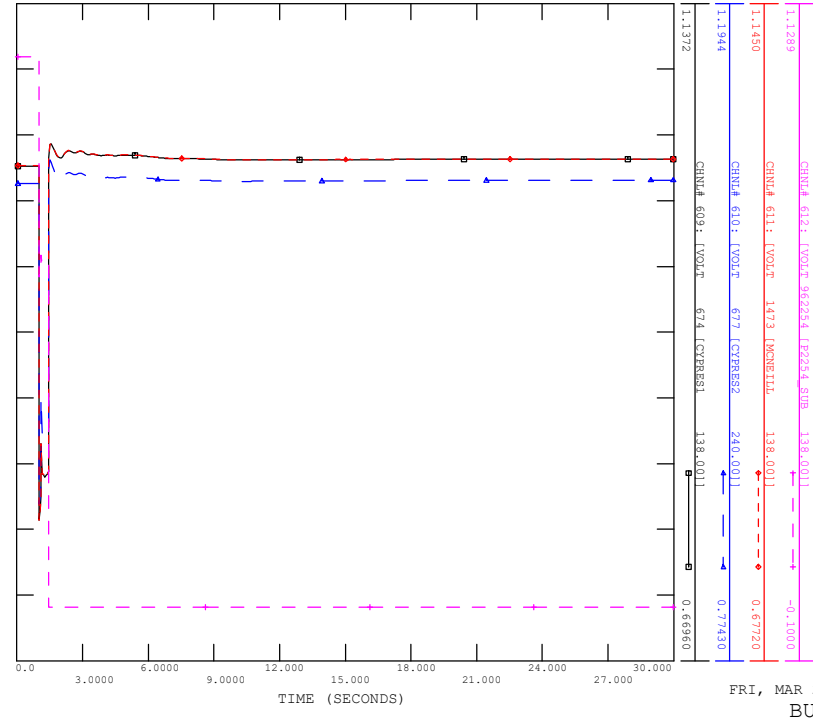
FILE: scn3\_sl\_17\_6581\_Chaplice.out



FRI, MAR 25 2022 10:52  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE

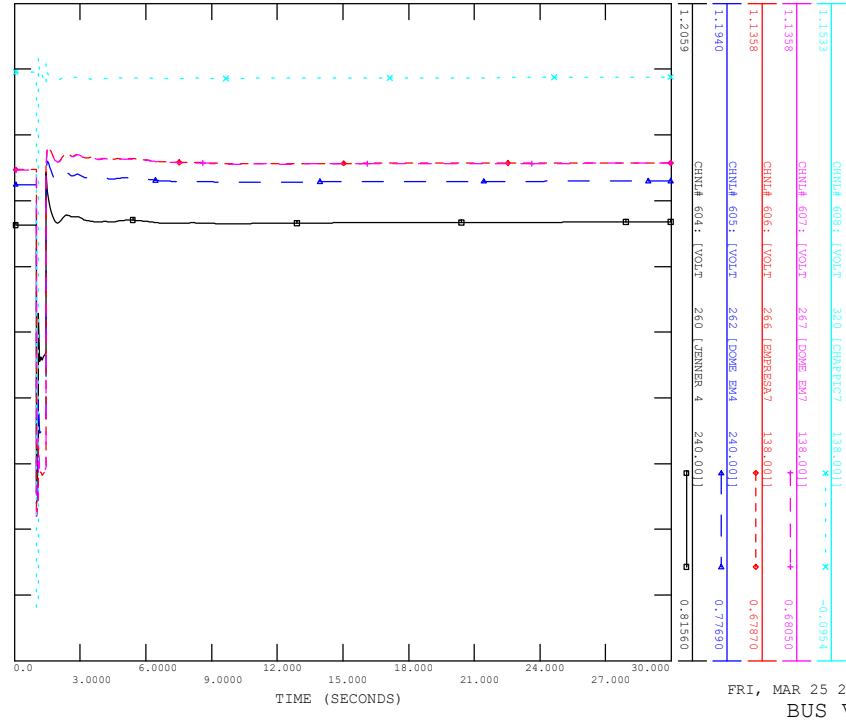
FILE: scn3\_sl\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE

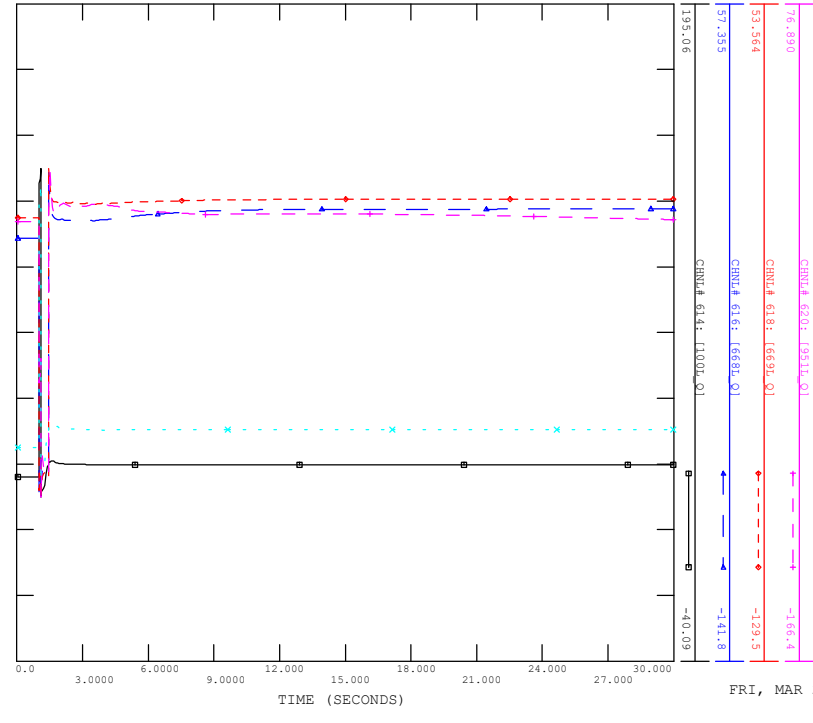
FILE: scn3\_sl\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE

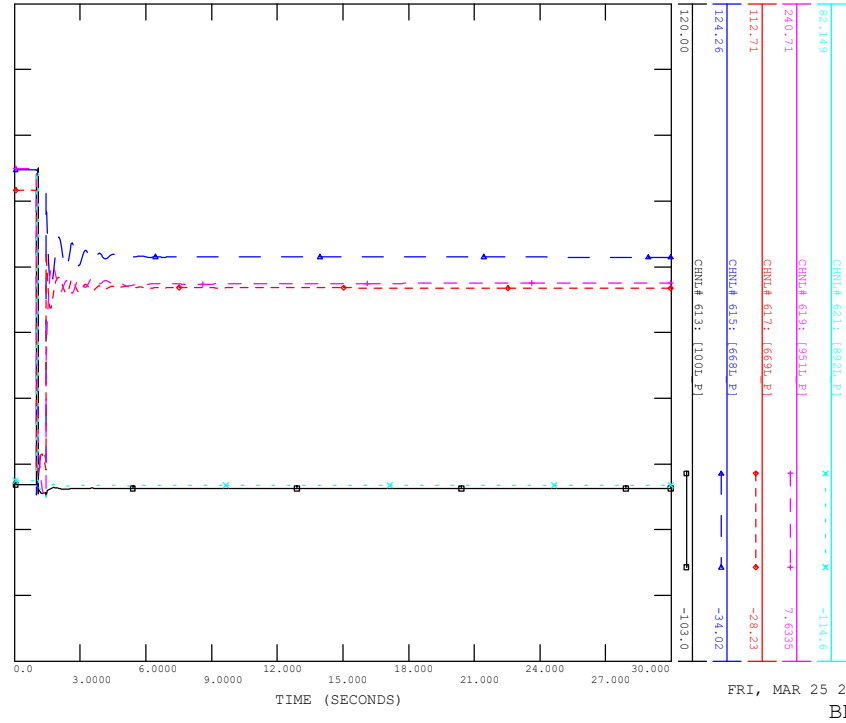
FILE: scn3\_sl\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:52  
BRANCH Q

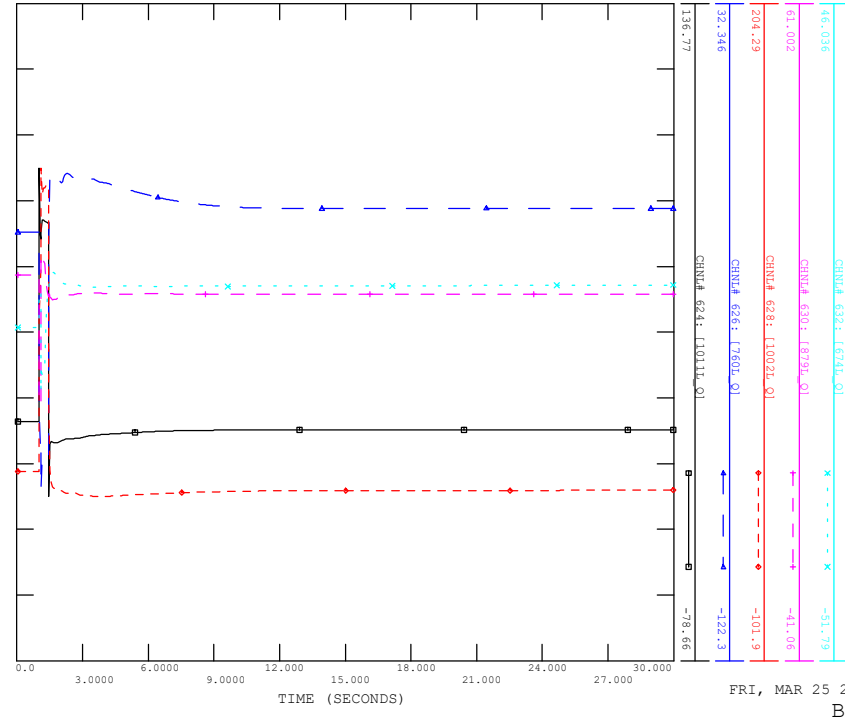
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE

FILE: scn3\_sl\_17\_658L\_Chappice.out



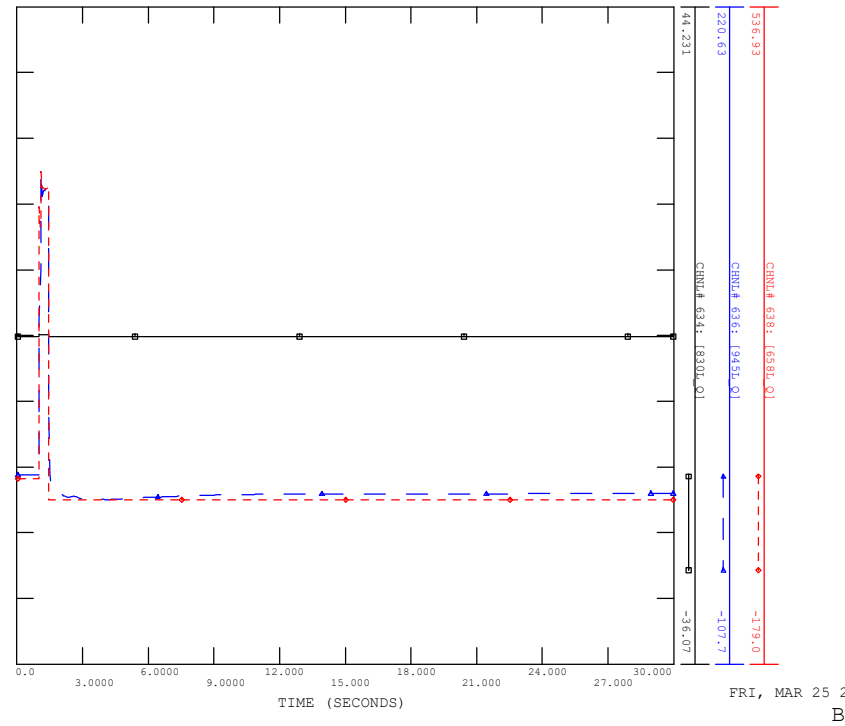
FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE  
FILE: scn3\_sl\_17\_658L\_Chappice.out



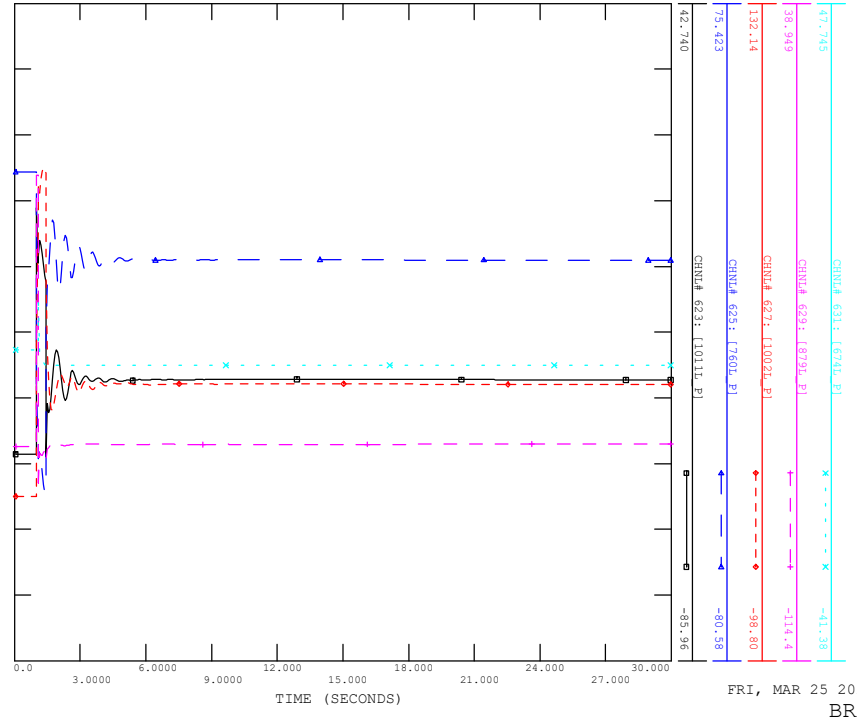
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE  
FILE: scn3\_sl\_17\_658L\_Chappice.out



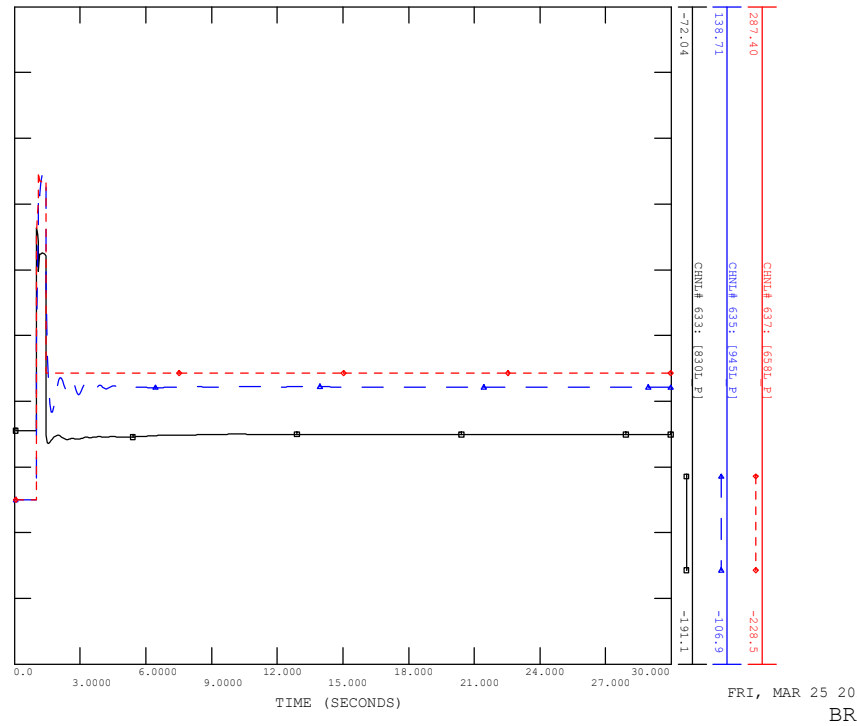
FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE  
FILE: scn3\_sl\_17\_658L\_Chappice.out



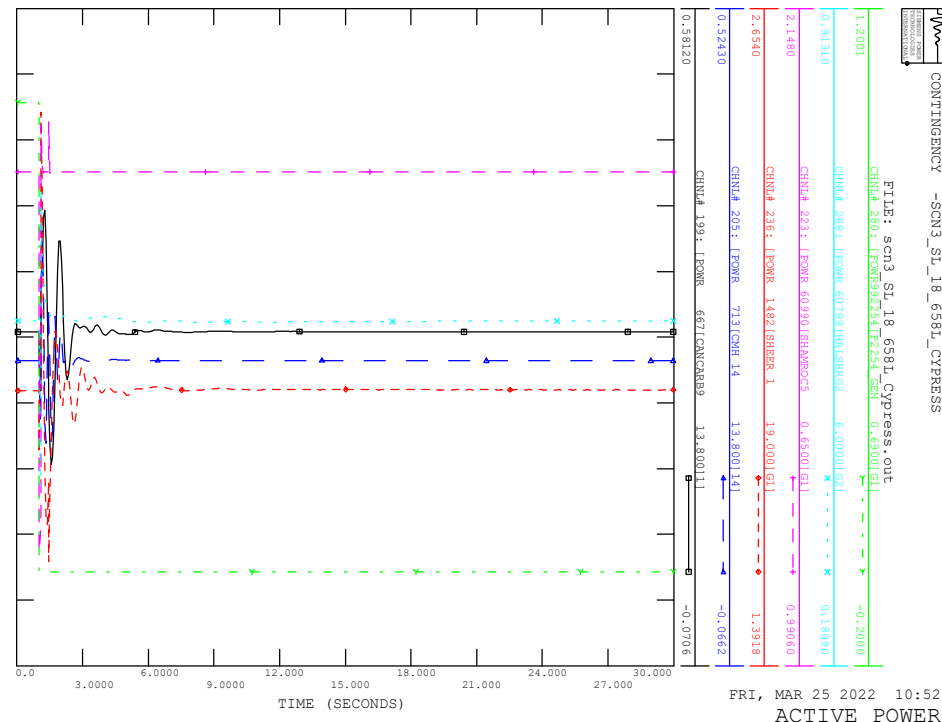
FRI, MAR 25 2022 10:52  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_17\_658L\_CHAPFICE  
FILE: scn3\_sl\_17\_658L\_Chappice.out

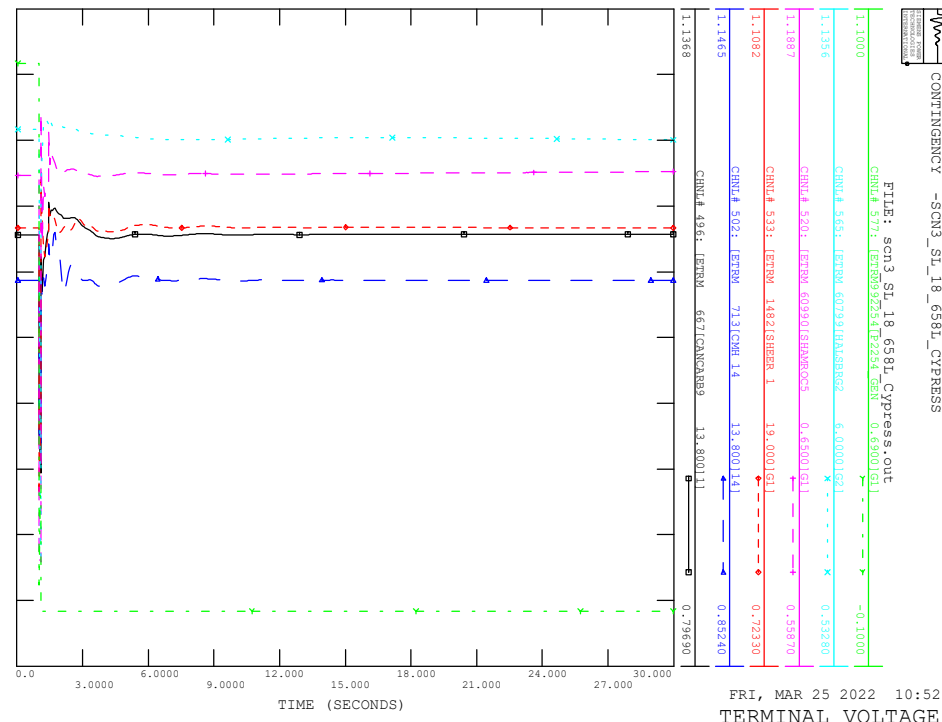


FRI, MAR 25 2022 10:52  
BRANCH P

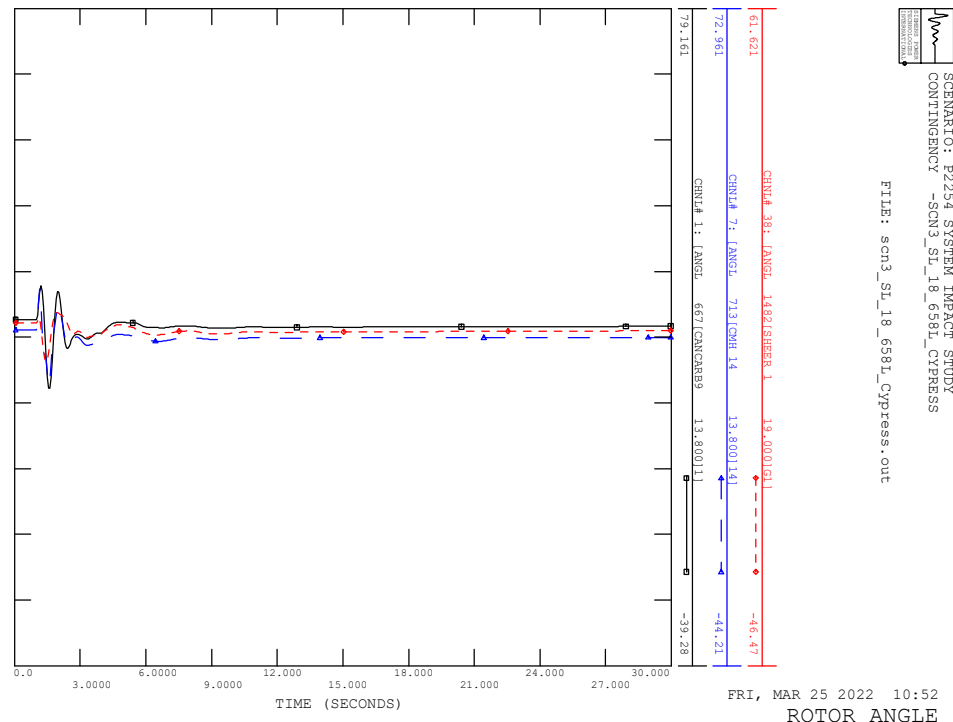
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581\_CYPRESS



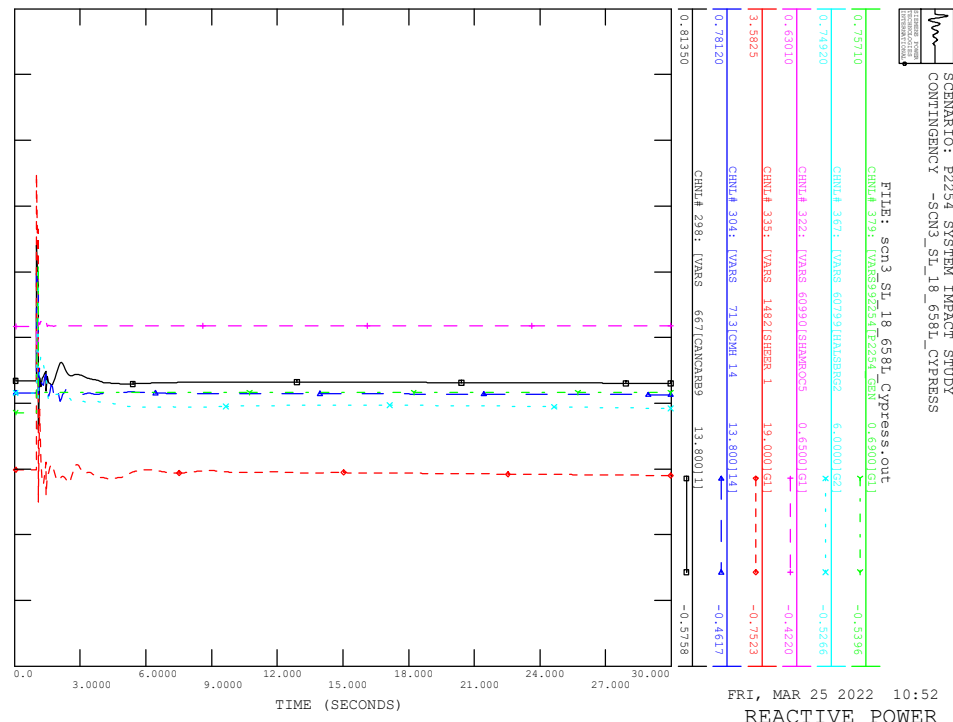
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581\_CYPRESS

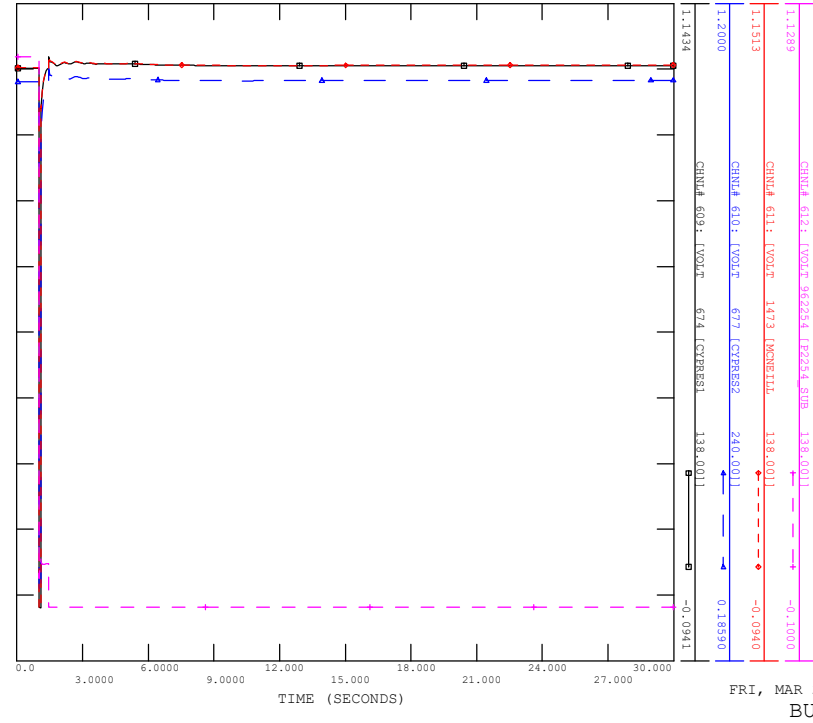


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

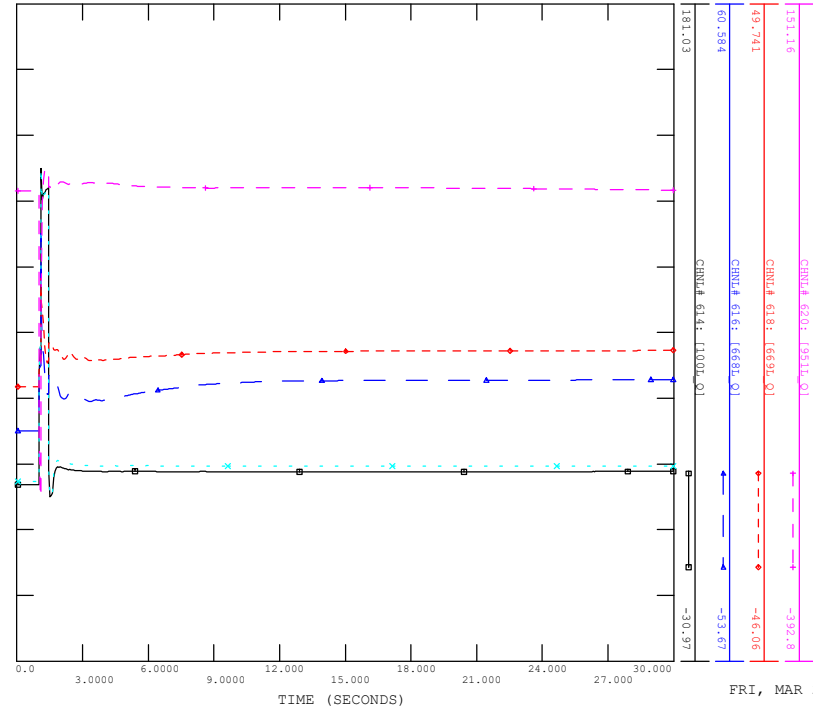
FILE: scn3\_sl\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

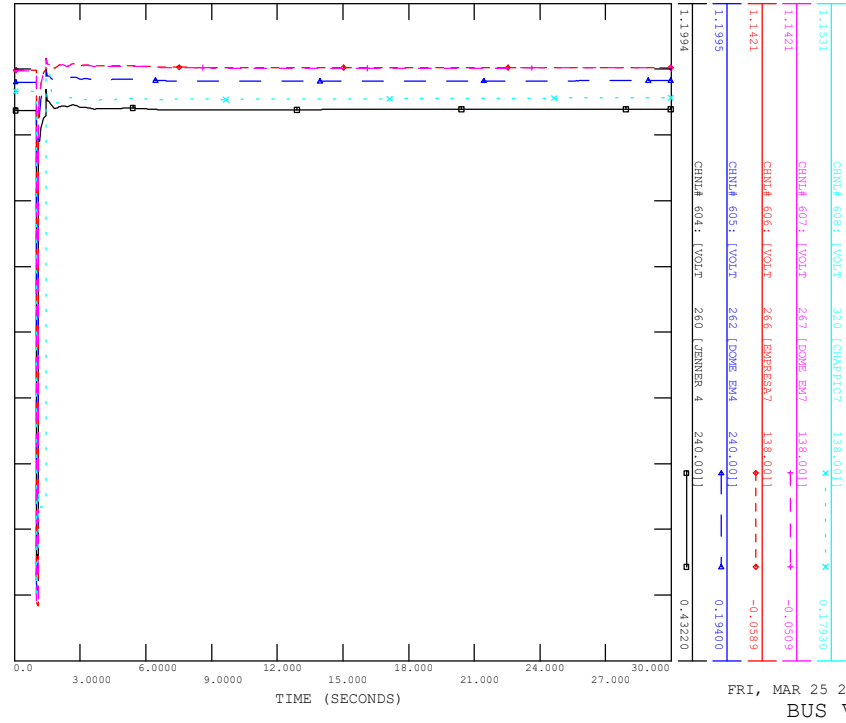
FILE: scn3\_sl\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

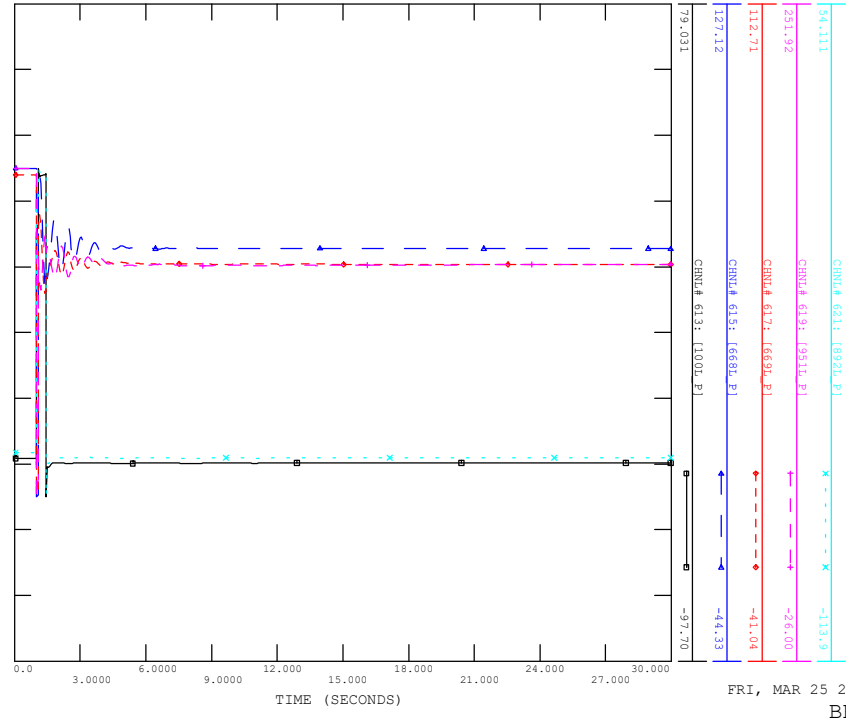
FILE: scn3\_sl\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:52  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

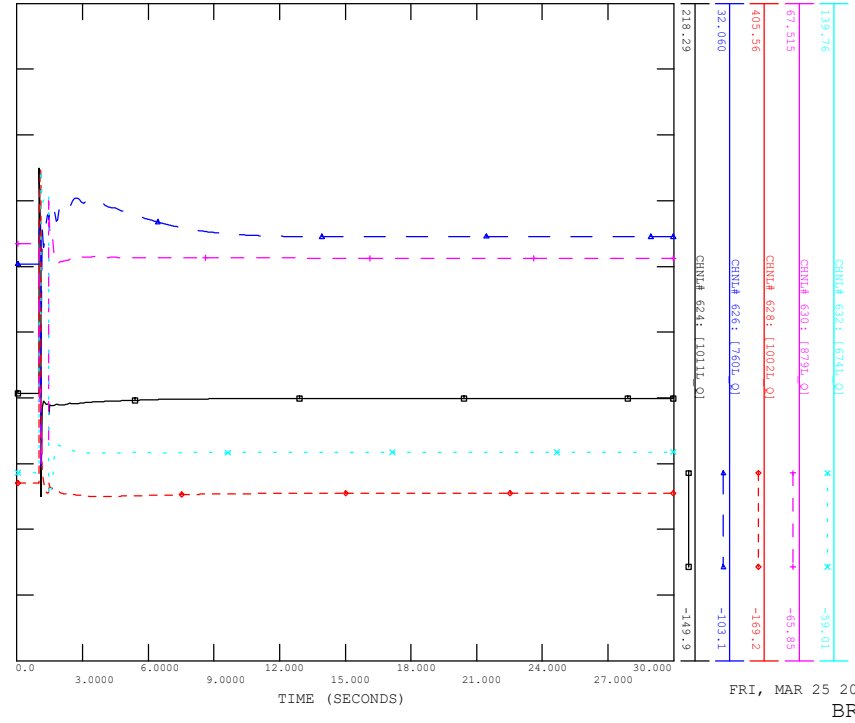
FILE: scn3\_sl\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:52  
BRANCH P

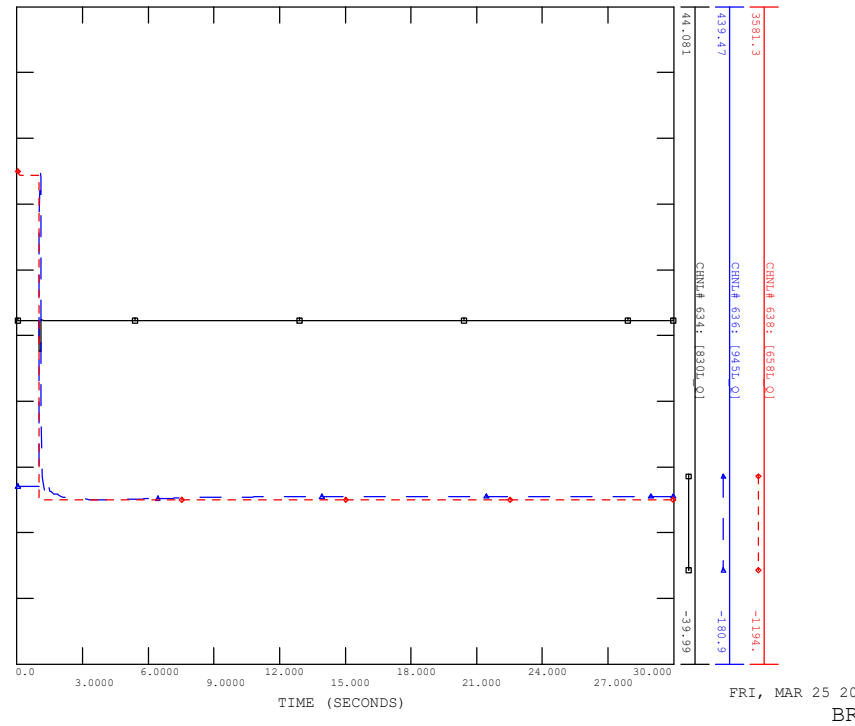
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

FILE: scn3\_sl\_18\_6581L\_Cypress.out



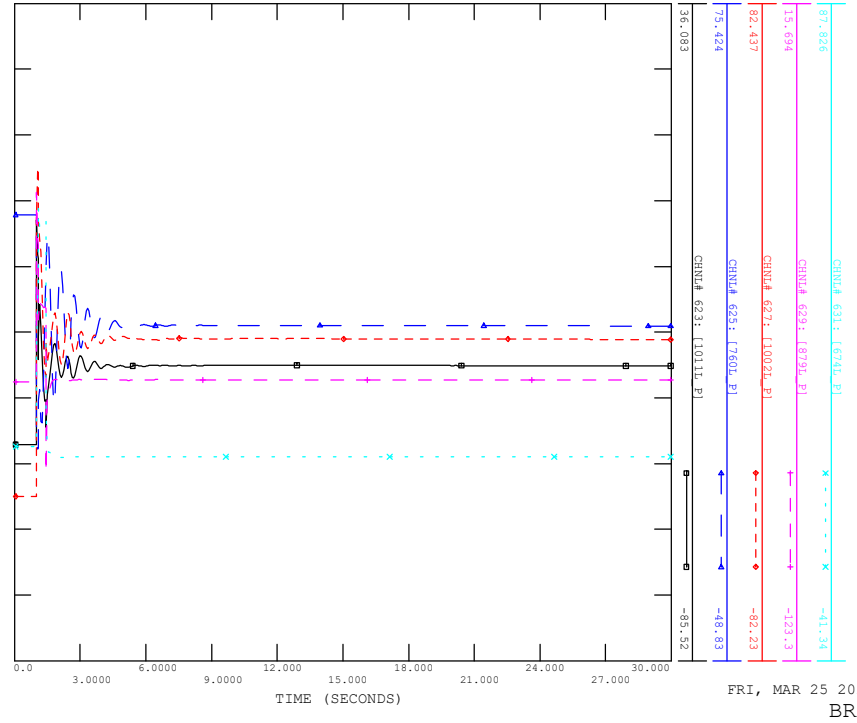
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

FILE: scn3\_sl\_18\_6581L\_Cypress.out



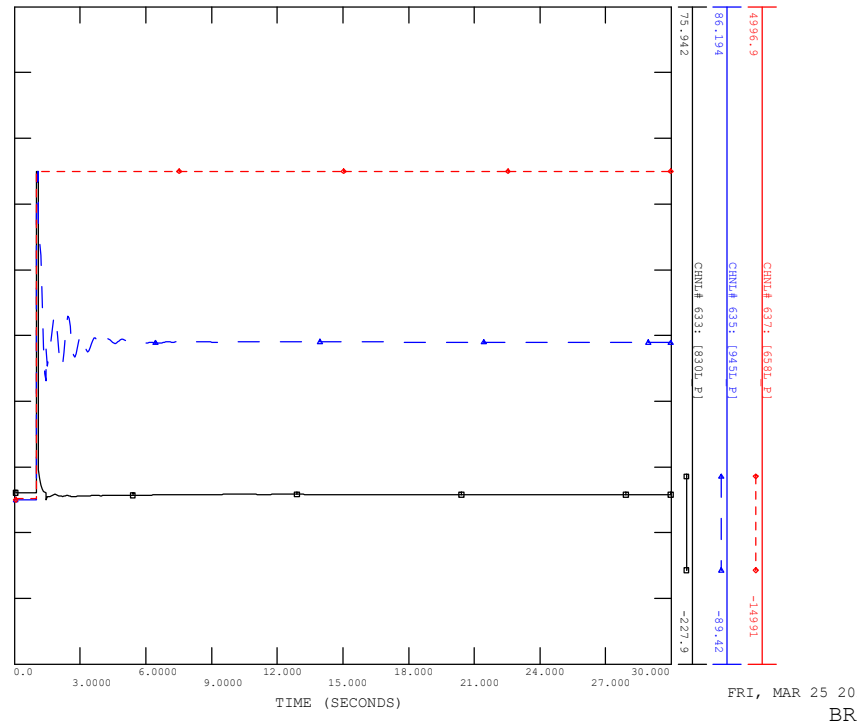
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

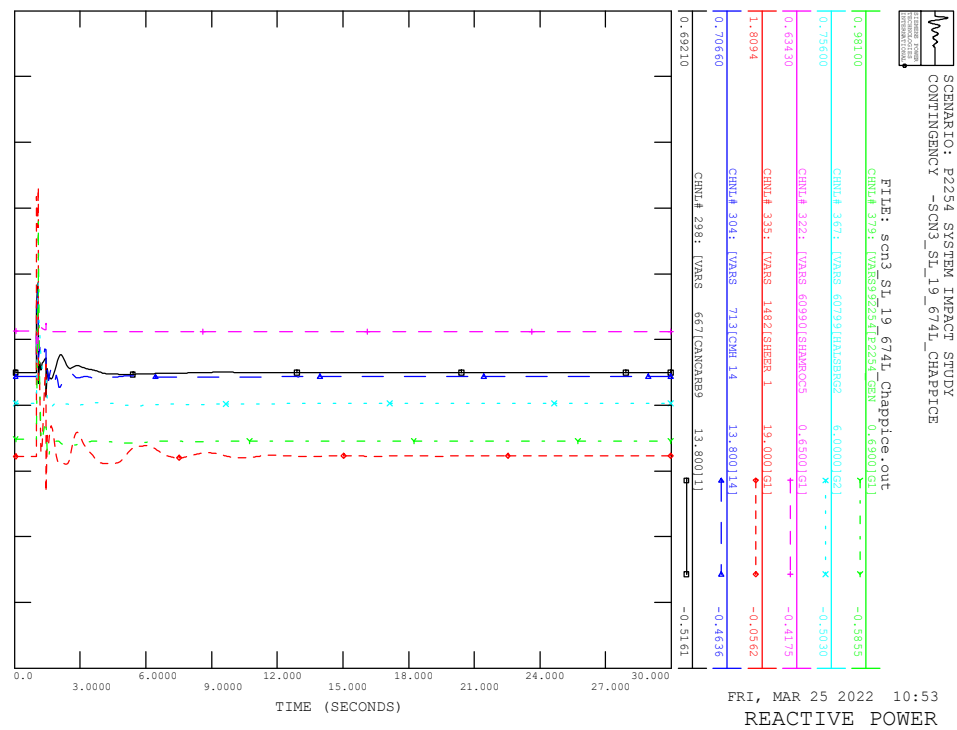
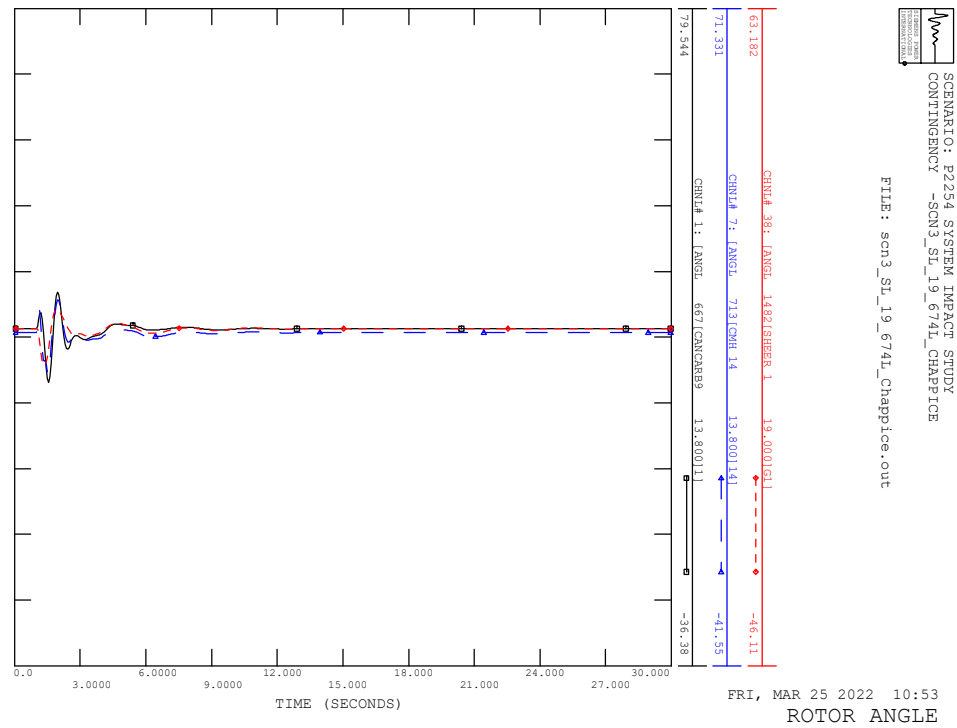
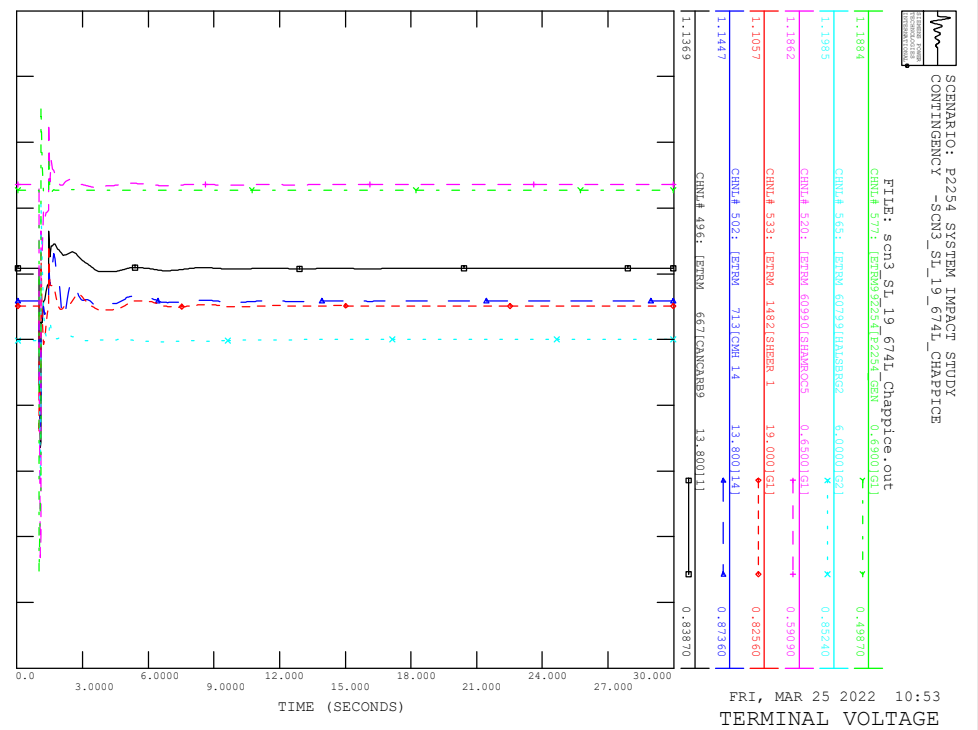
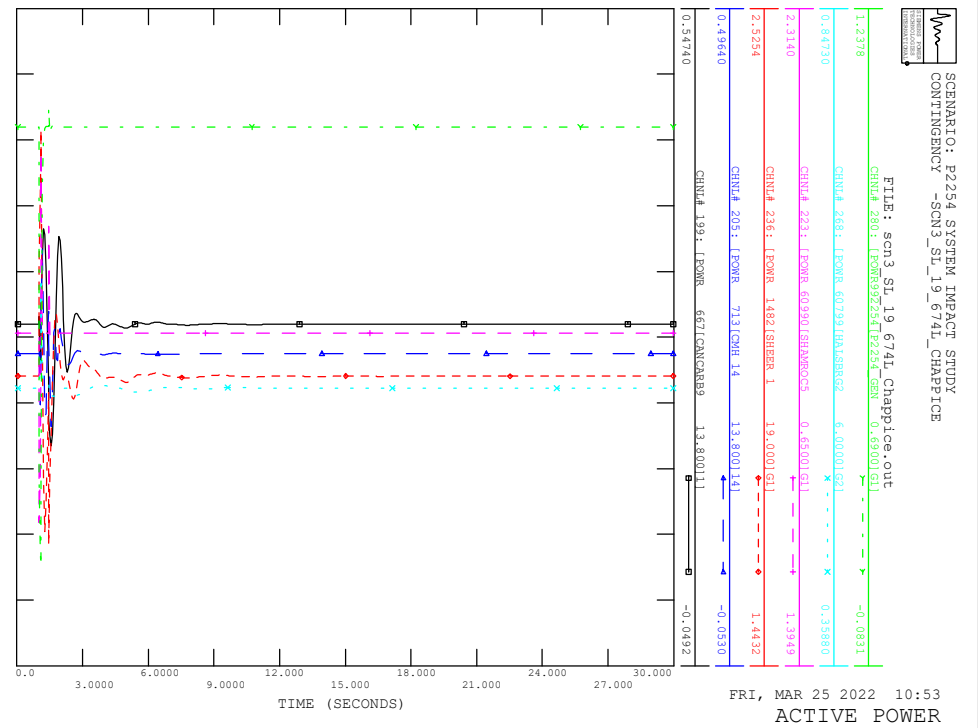
FILE: scn3\_sl\_18\_6581L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_18\_6581L\_CYPRESS

FILE: scn3\_sl\_18\_6581L\_Cypress.out

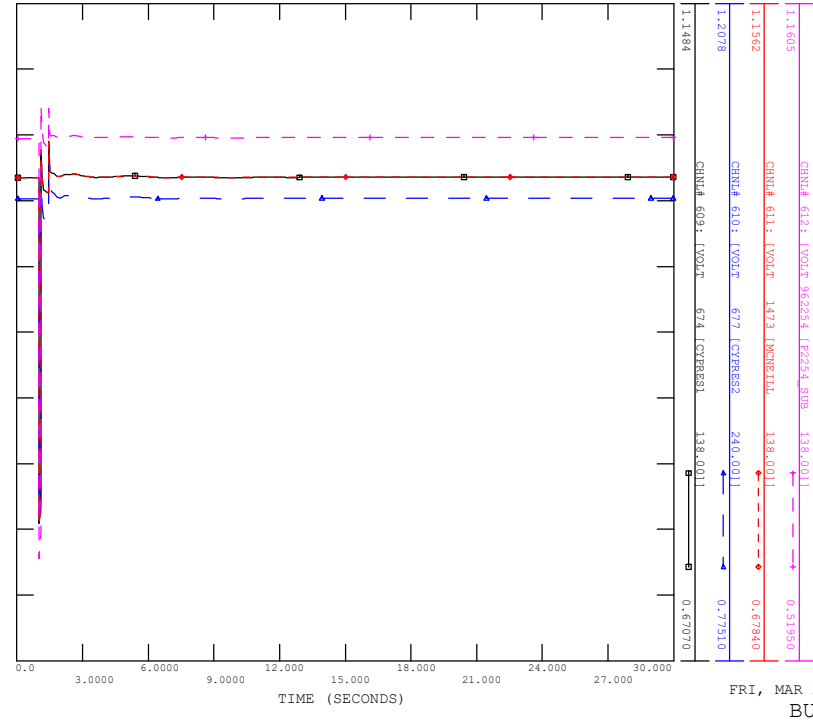






SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_ST\_19\_674L\_CHAPFICE

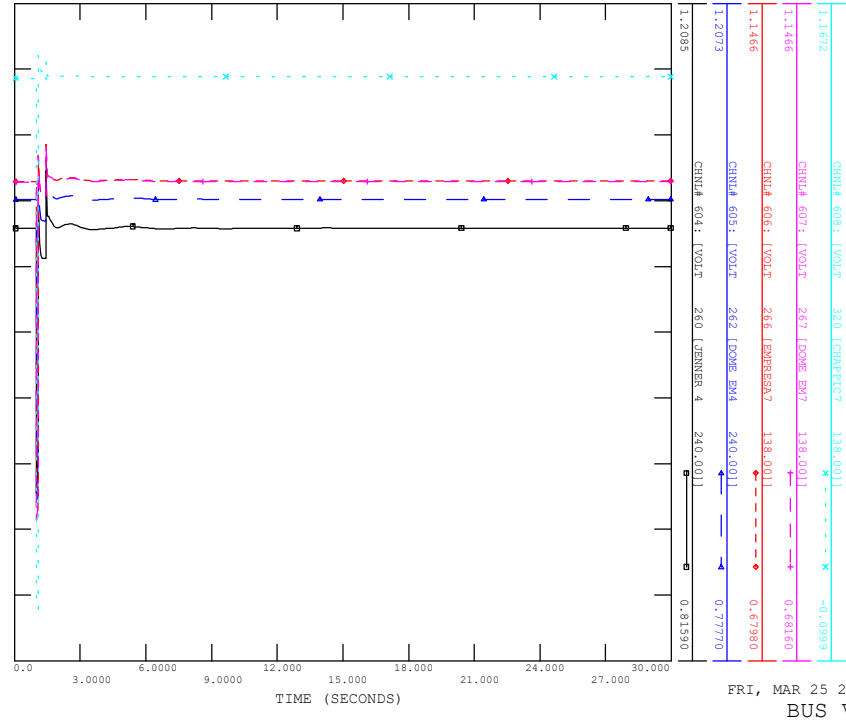
FILE: scn3\_st\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_ST\_19\_674L\_CHAPFICE

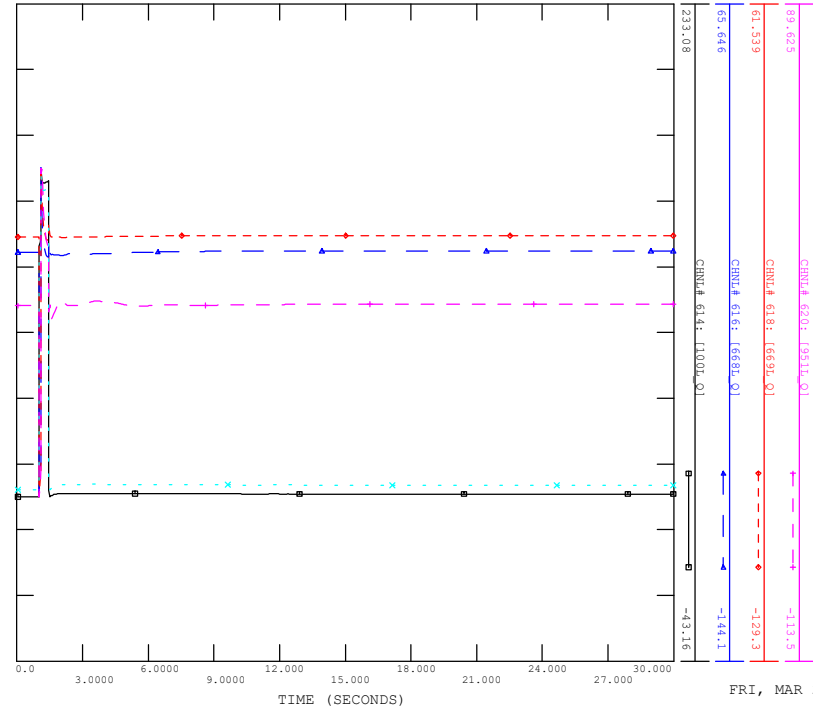
FILE: scn3\_st\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_ST\_19\_674L\_CHAPFICE

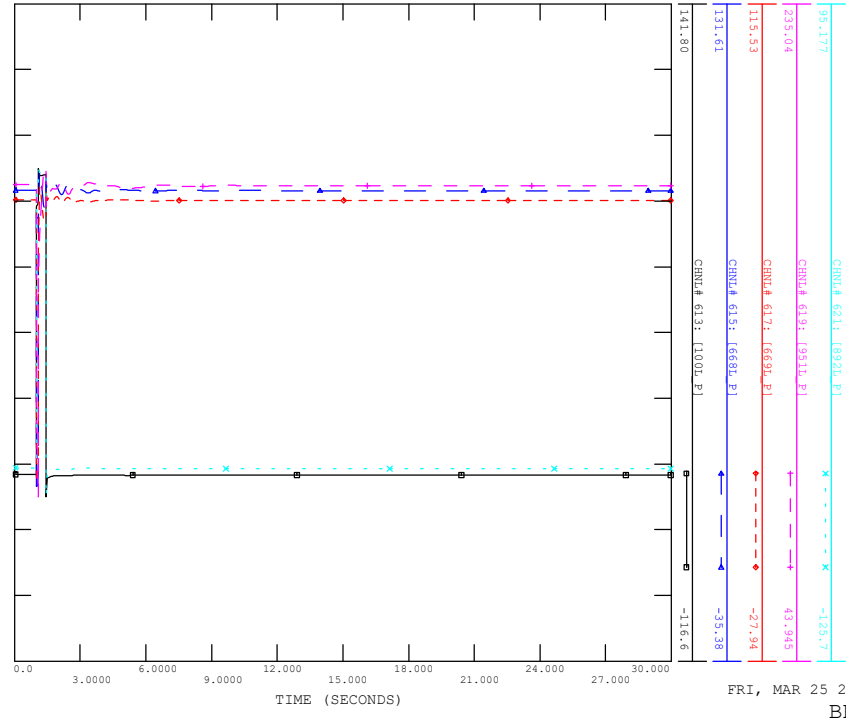
FILE: scn3\_st\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH Q

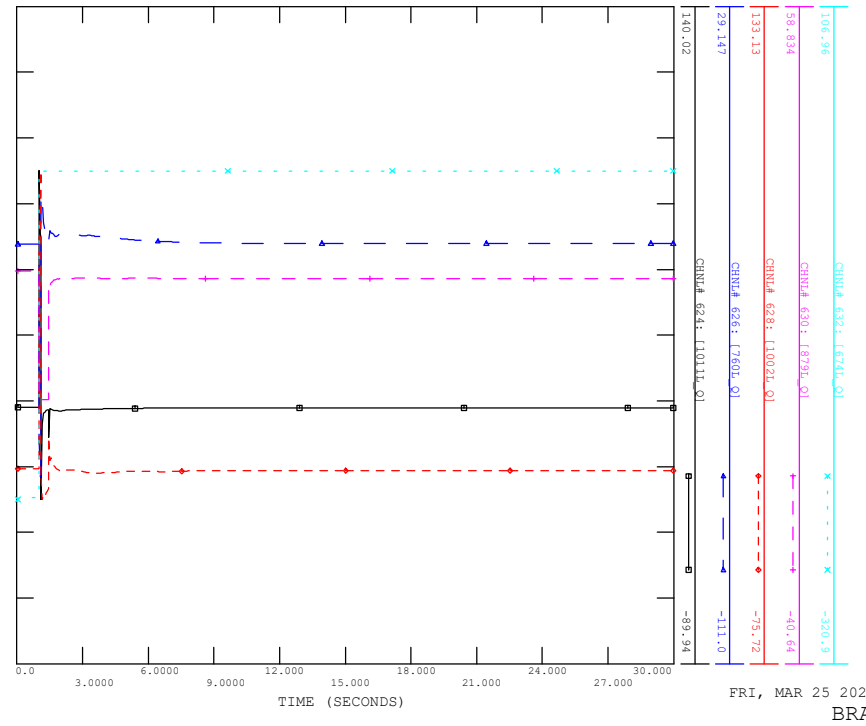
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_ST\_19\_674L\_CHAPFICE

FILE: scn3\_st\_19\_674L\_Chappice.out



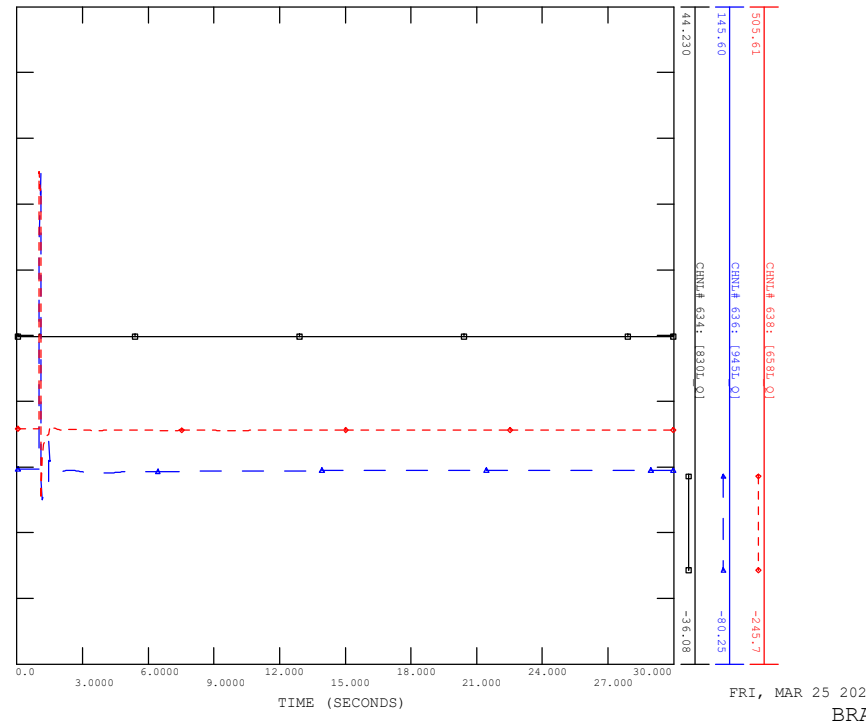
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_19\_674L\_CHAPFICE  
FILE: scn3\_stl\_19\_674L\_Chapfice.out



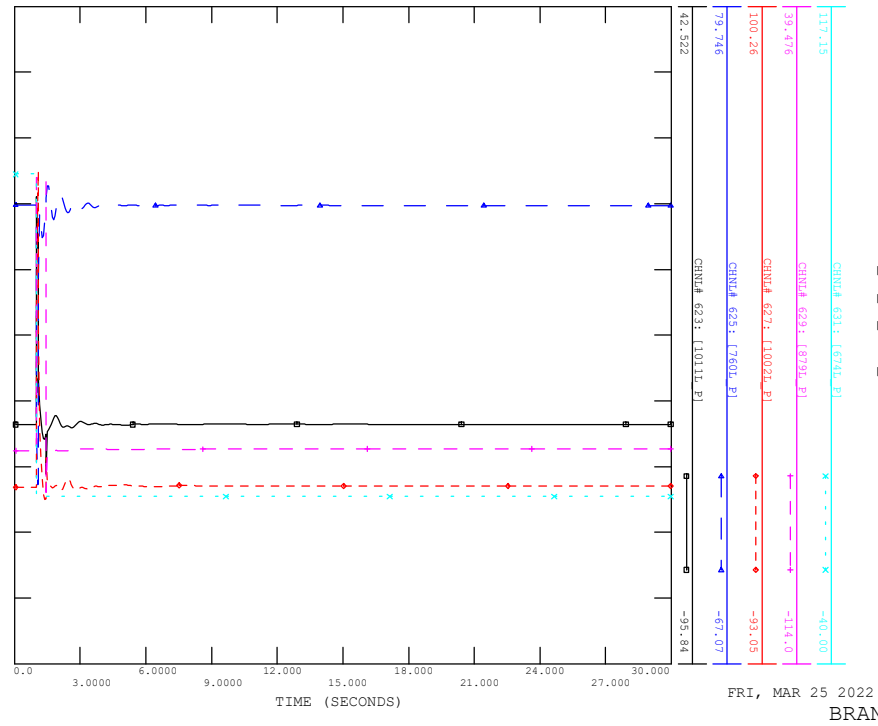
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_19\_674L\_CHAPFICE  
FILE: scn3\_stl\_19\_674L\_Chapfice.out



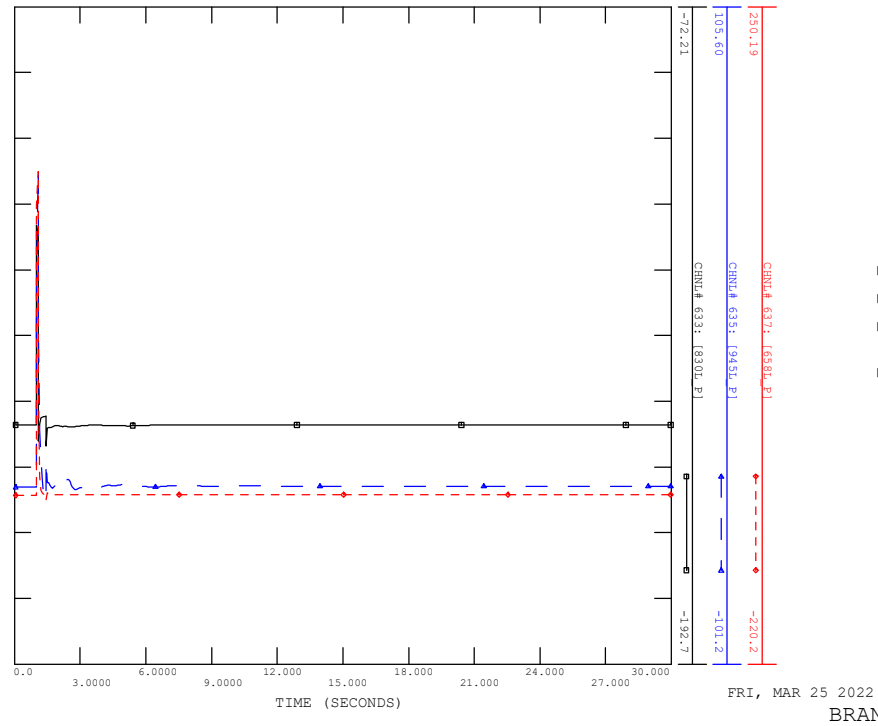
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_19\_674L\_CHAPFICE  
FILE: scn3\_stl\_19\_674L\_Chapfice.out



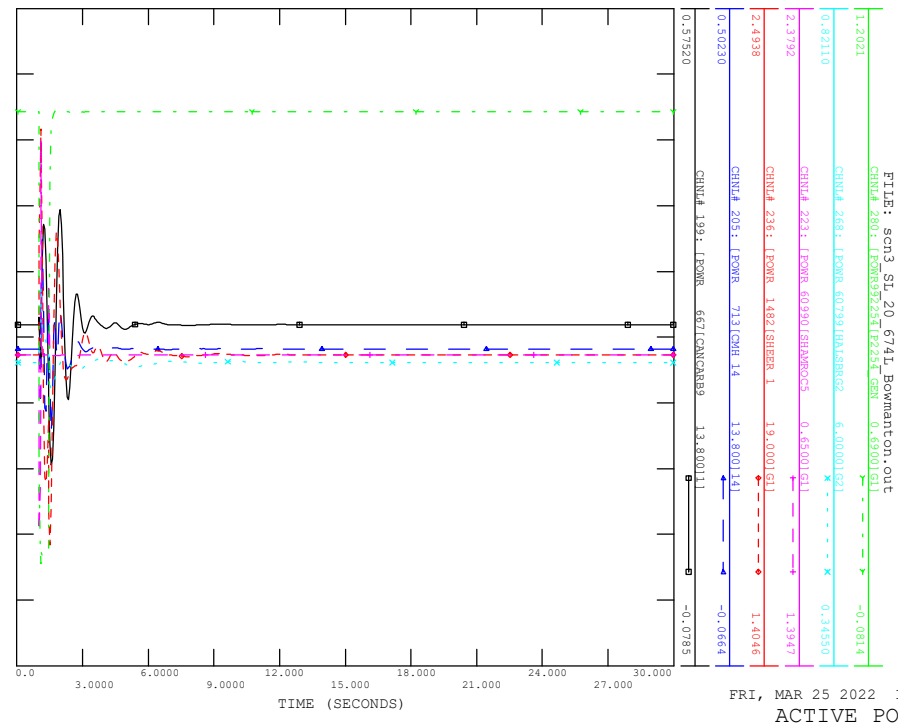
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_19\_674L\_CHAPFICE  
FILE: scn3\_stl\_19\_674L\_Chapfice.out

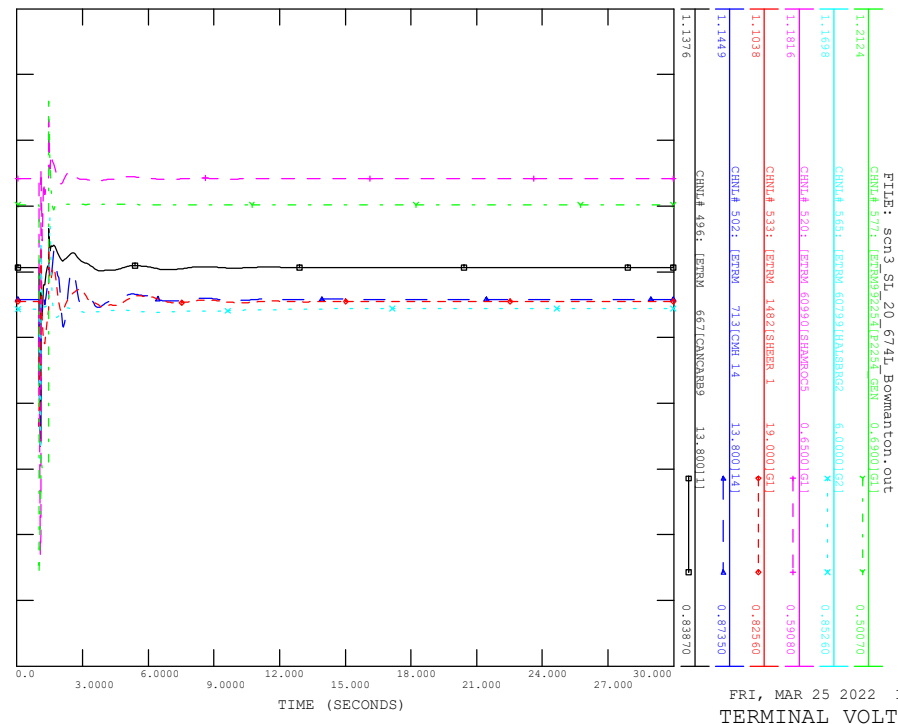


FRI, MAR 25 2022 10:53  
BRANCH P

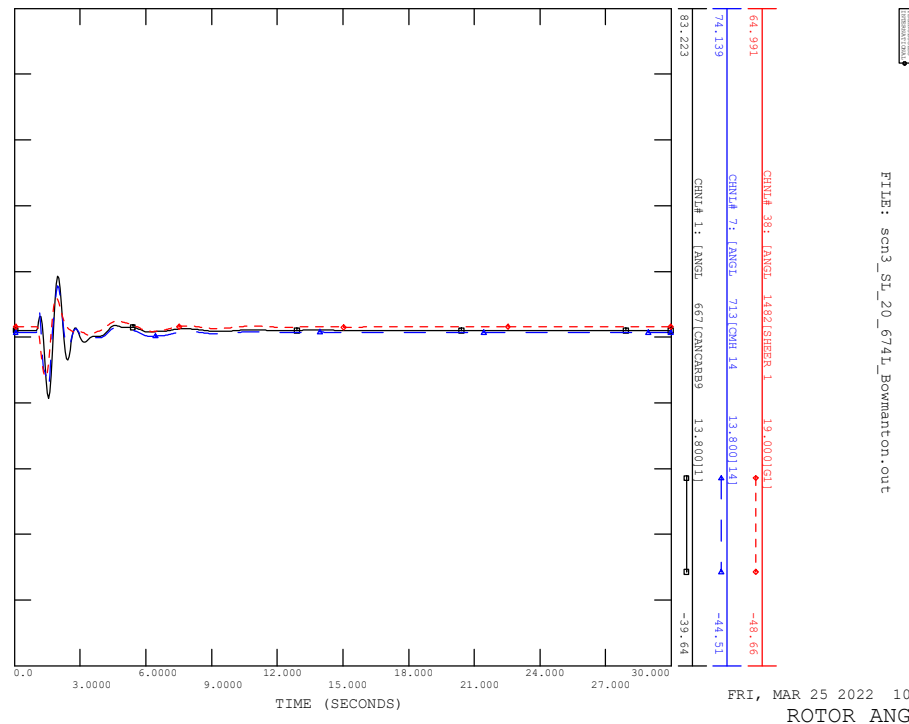
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON



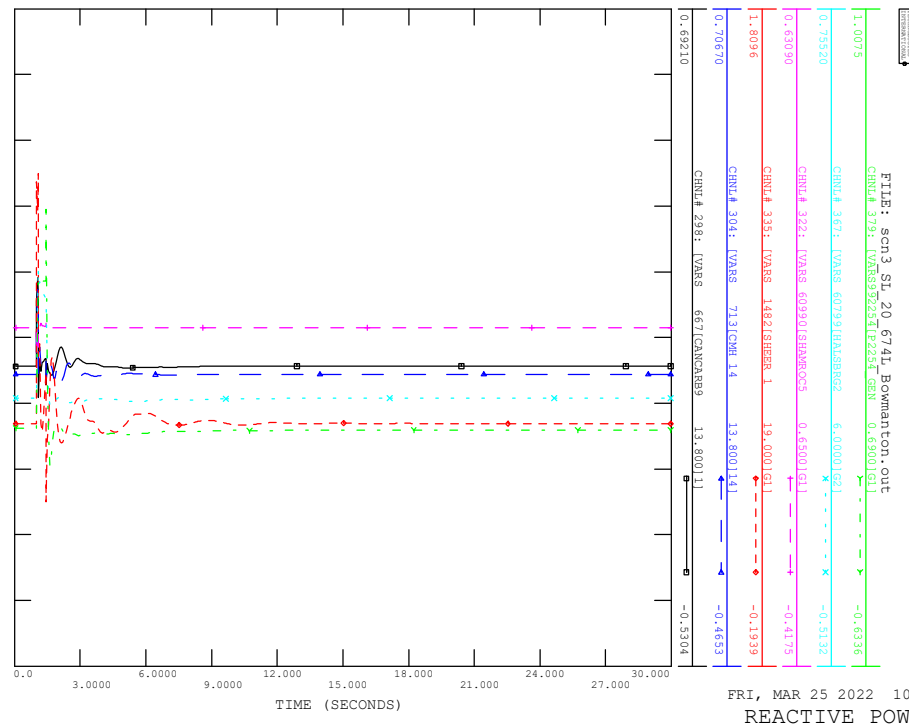
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON



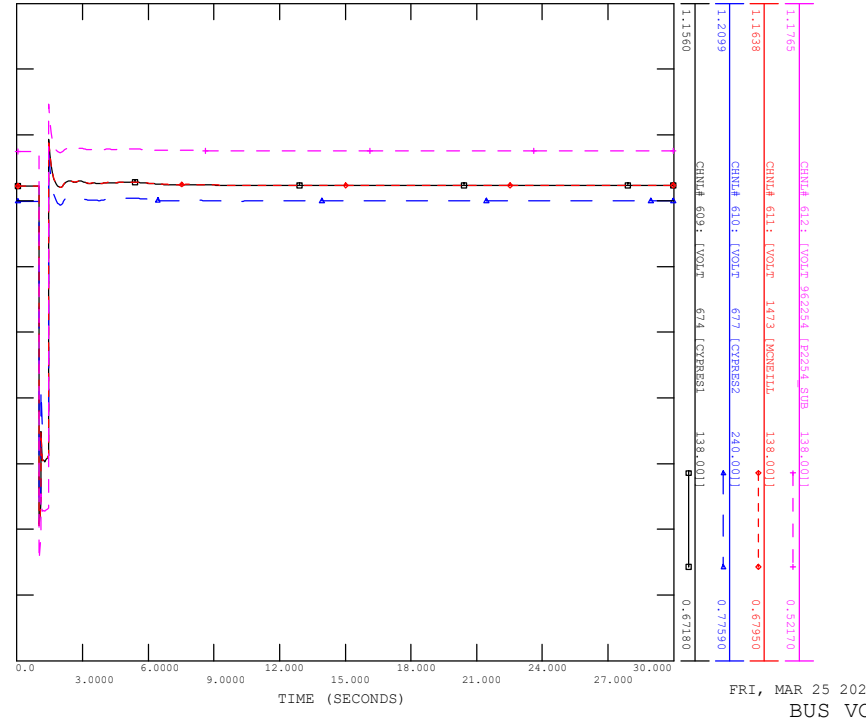
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON

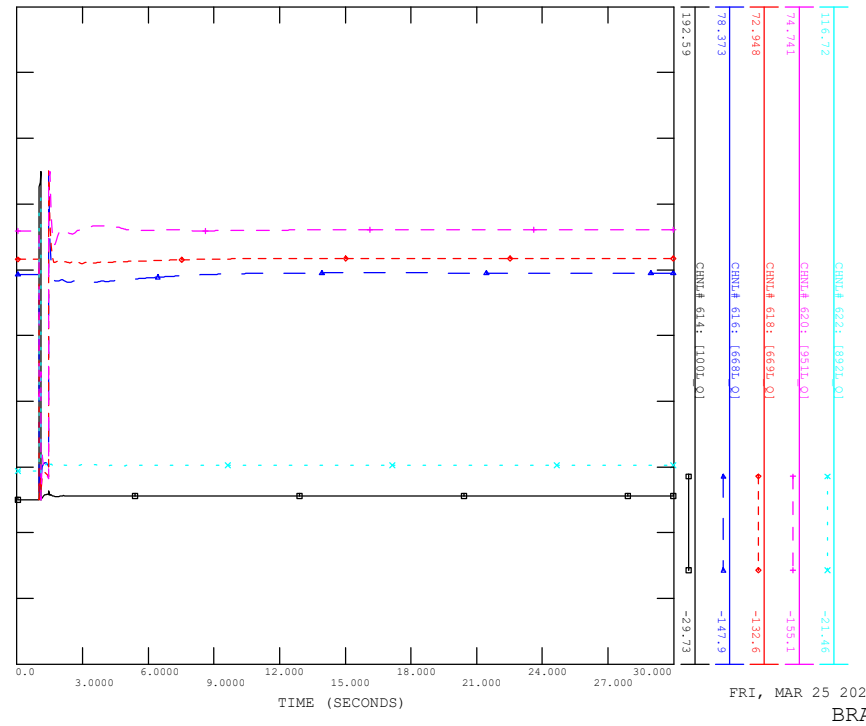


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON  
FILE: scn3\_sl\_20\_674L\_Bowmanton.out



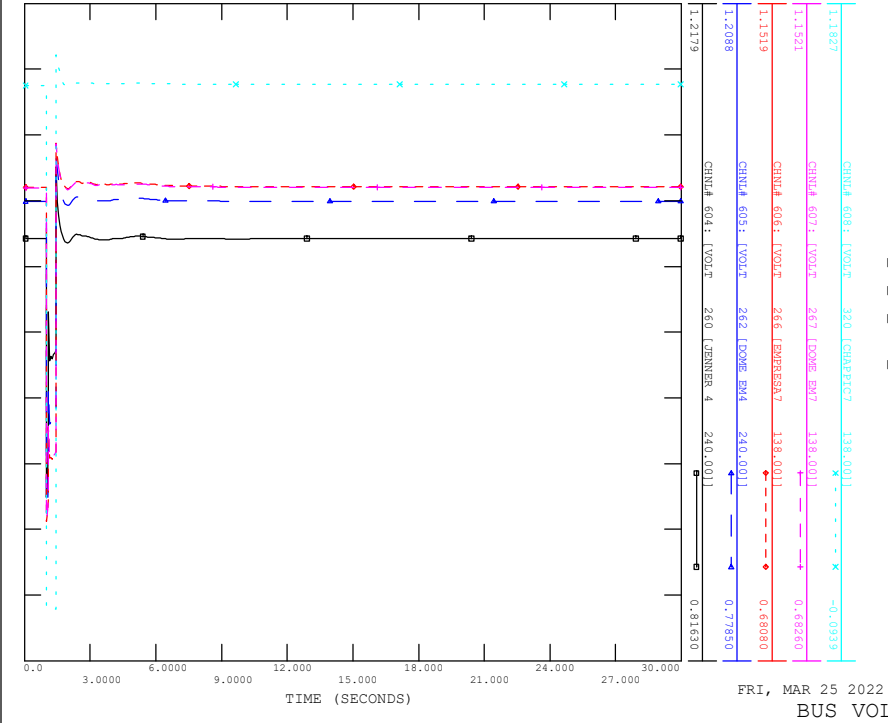
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON  
FILE: scn3\_sl\_20\_674L\_Bowmanton.out



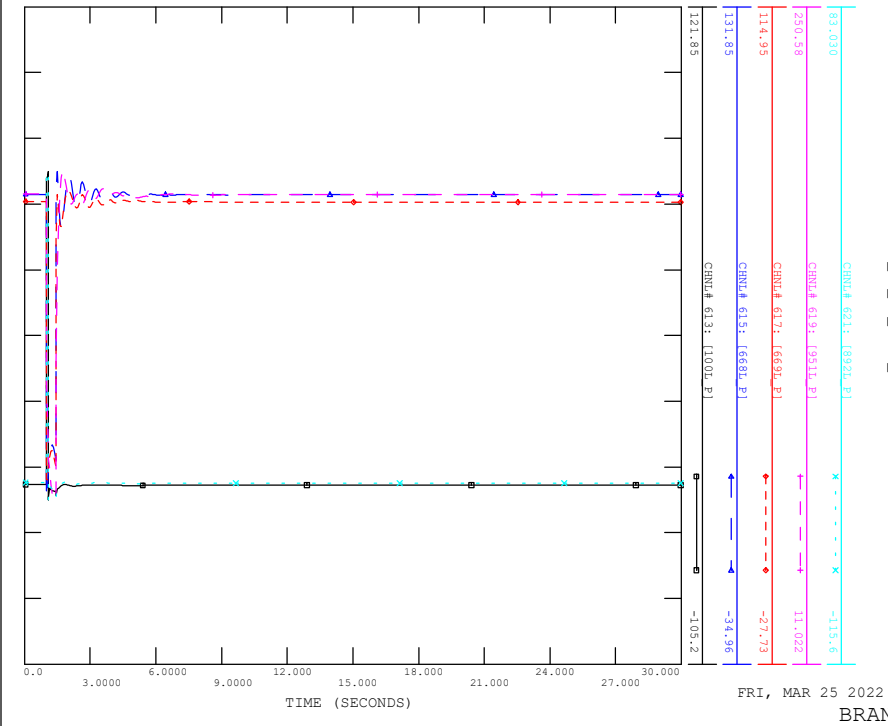
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON  
FILE: scn3\_sl\_20\_674L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

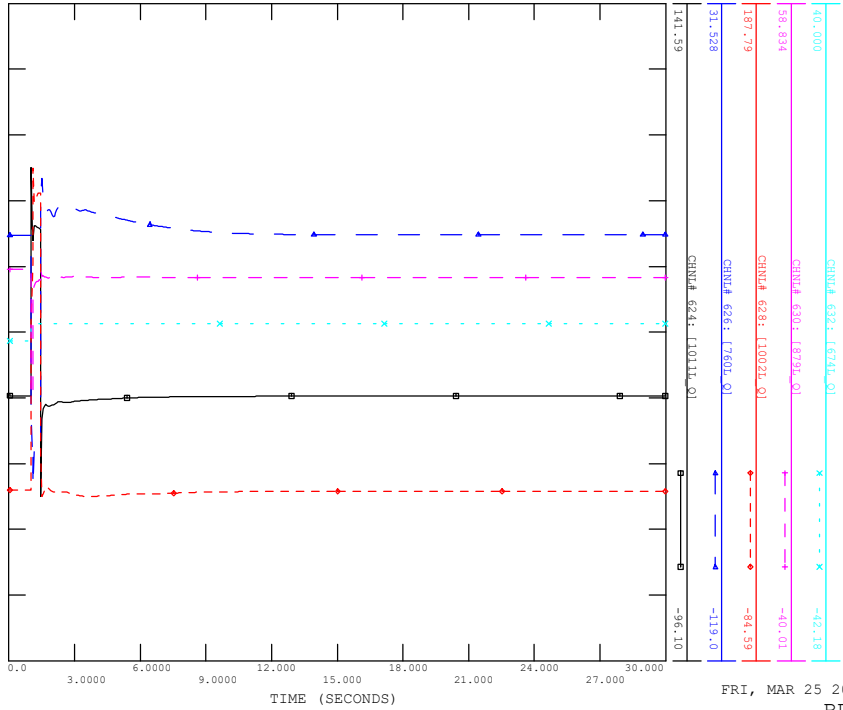
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON  
FILE: scn3\_sl\_20\_674L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH P

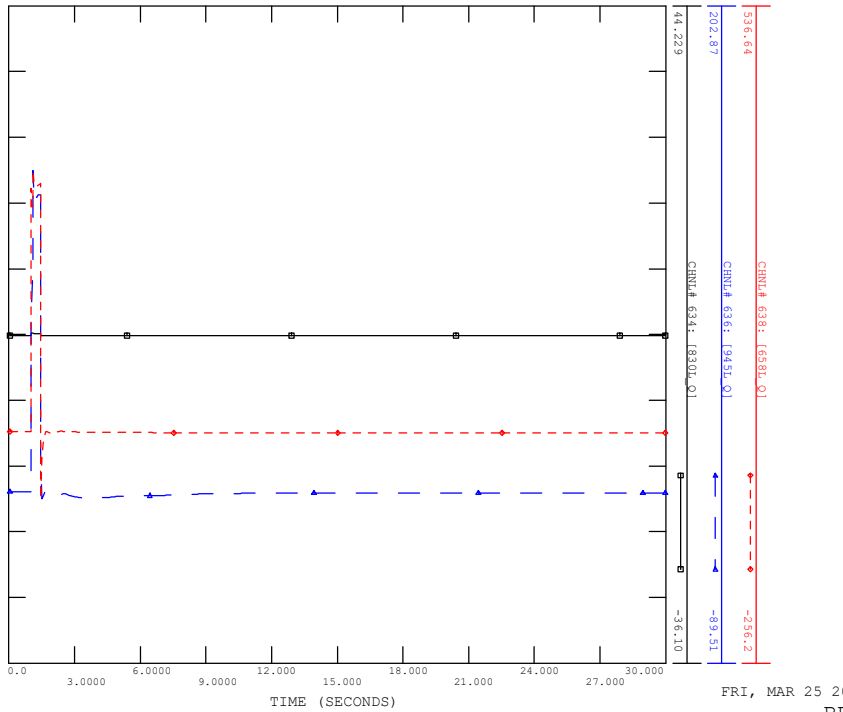
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON

FILE: scn3\_sl\_20\_674L\_Bowmanton.out



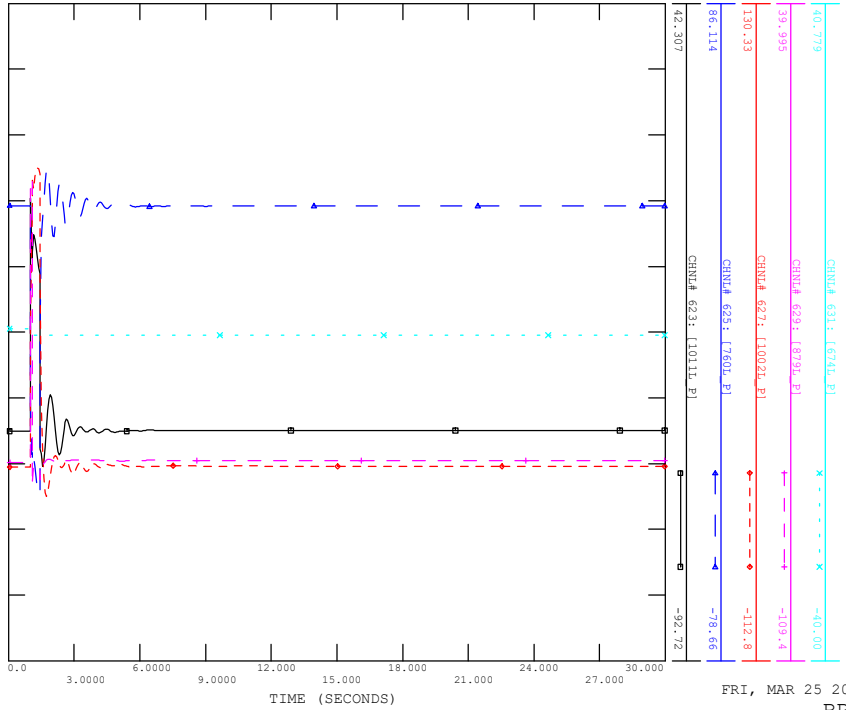
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON

FILE: scn3\_sl\_20\_674L\_Bowmanton.out



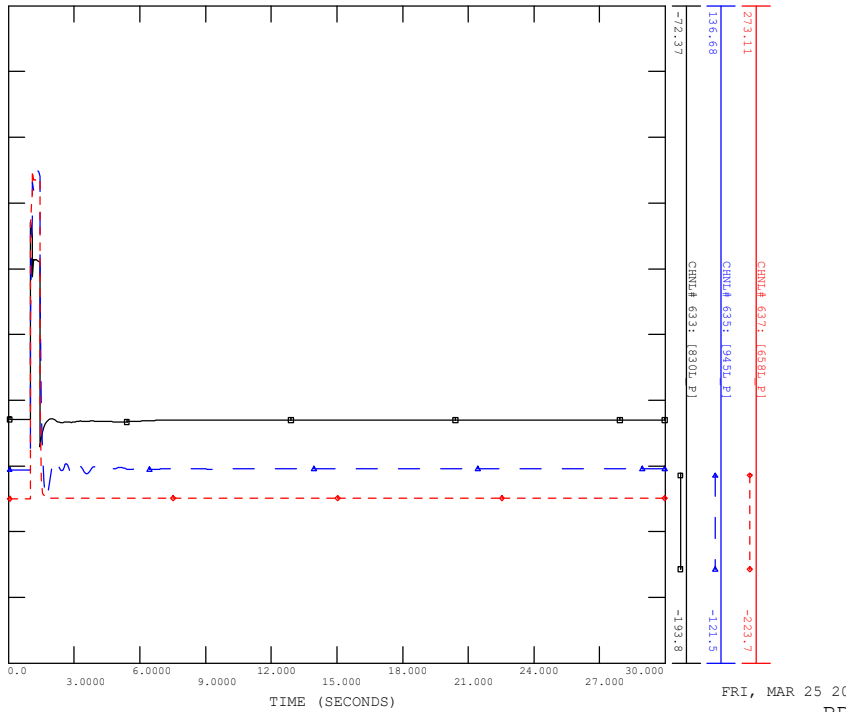
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON

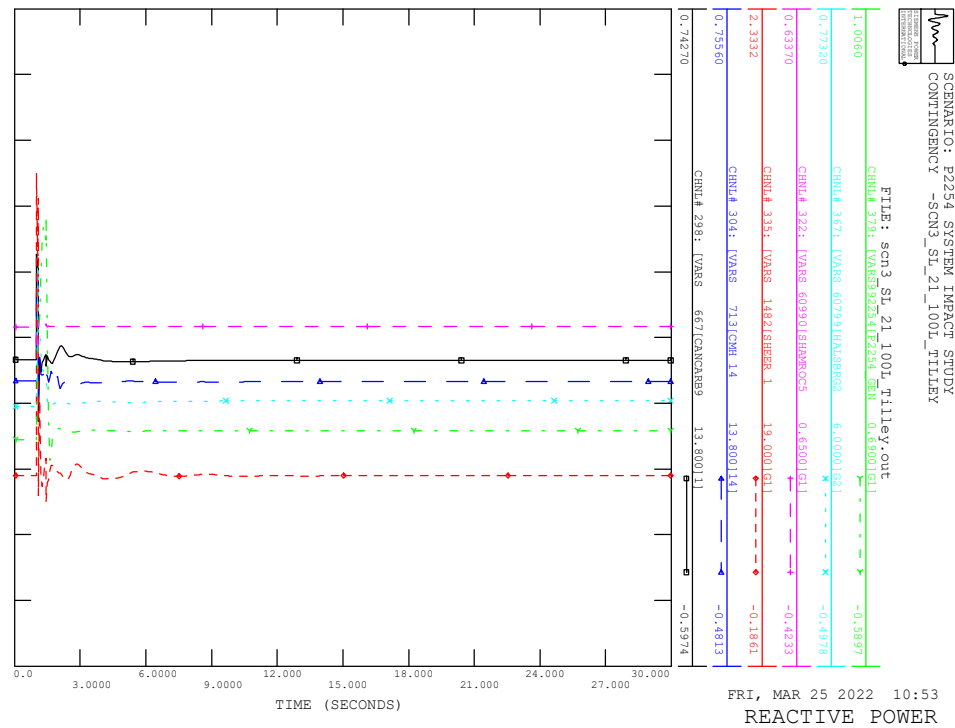
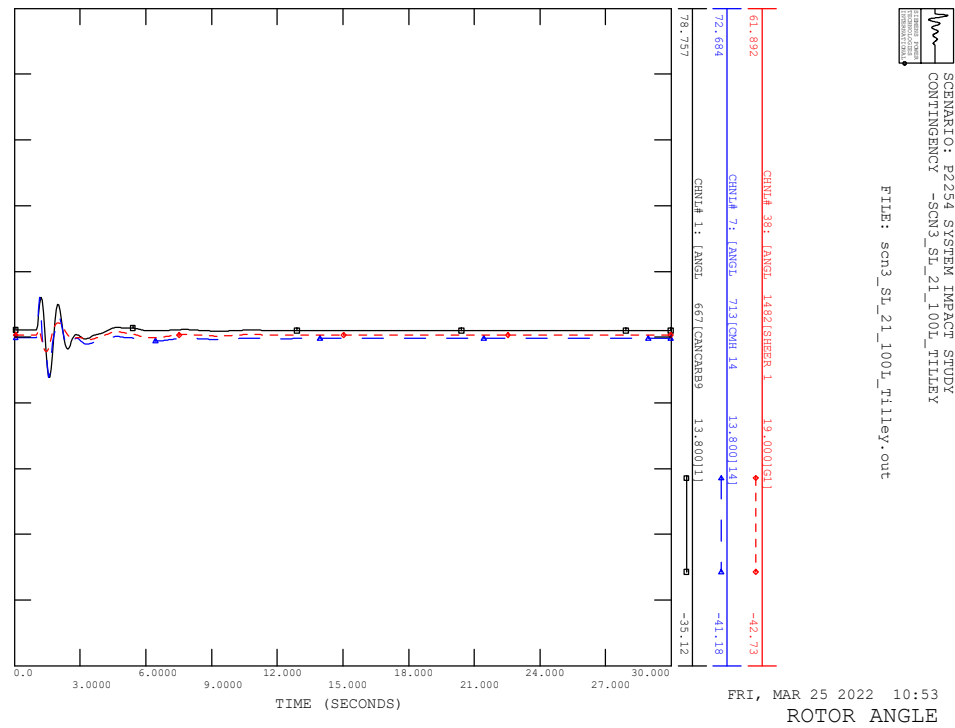
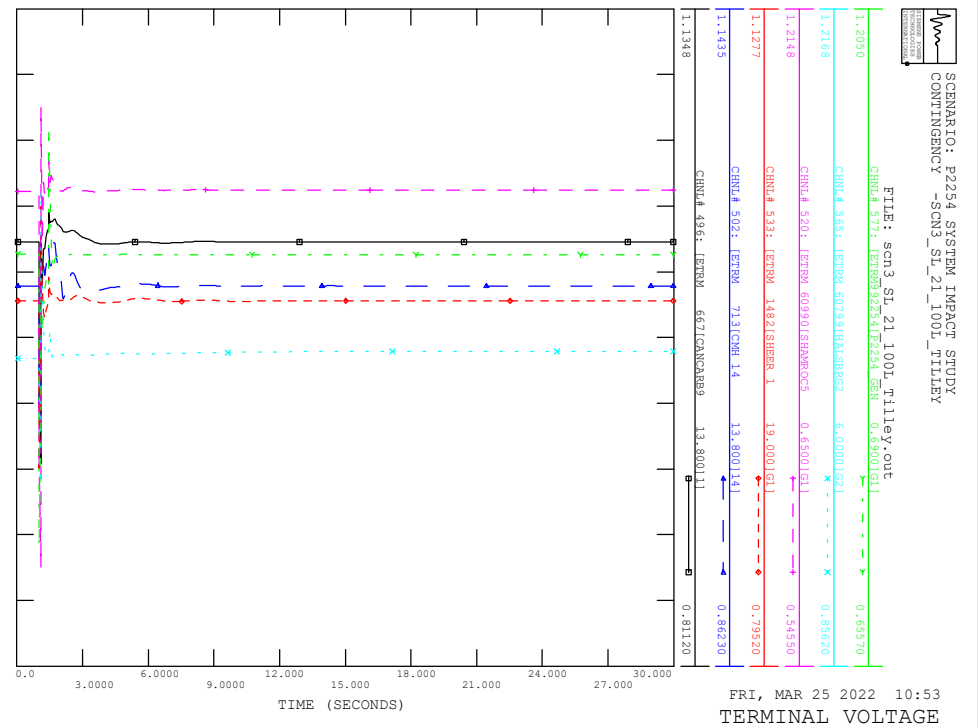
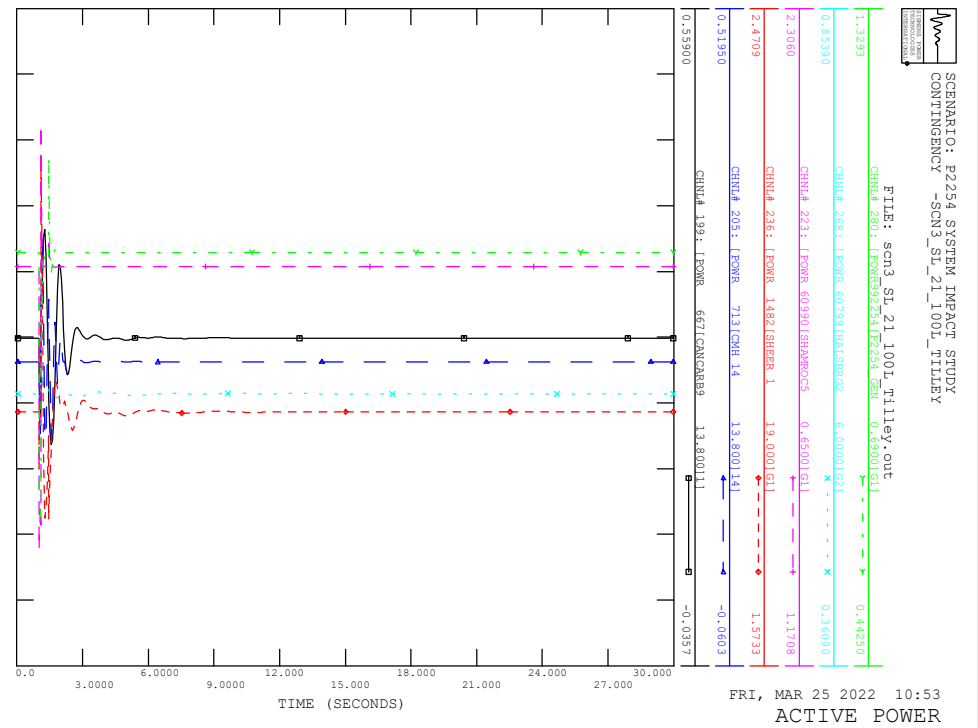
FILE: scn3\_sl\_20\_674L\_Bowmanton.out

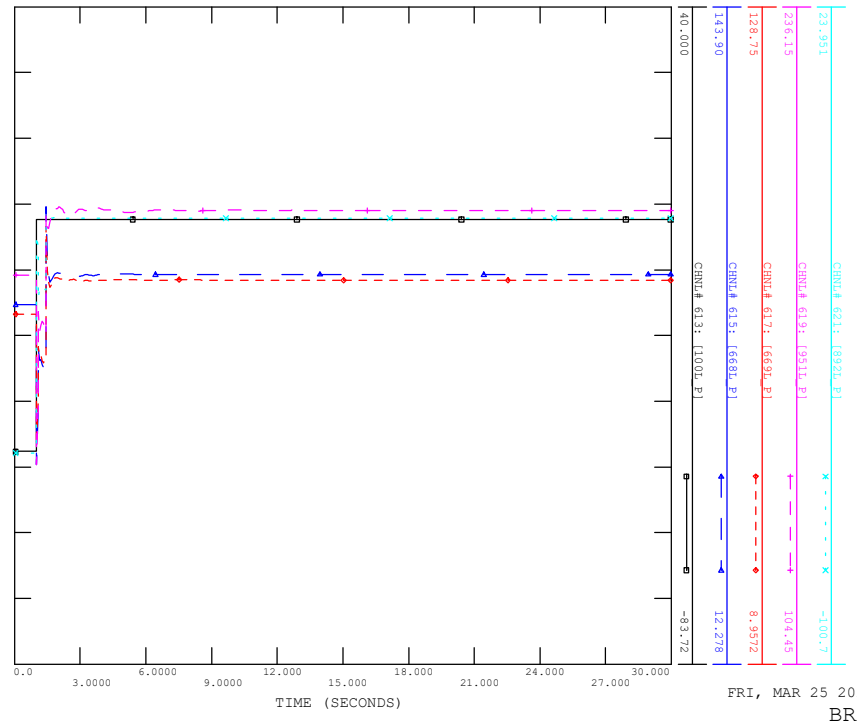
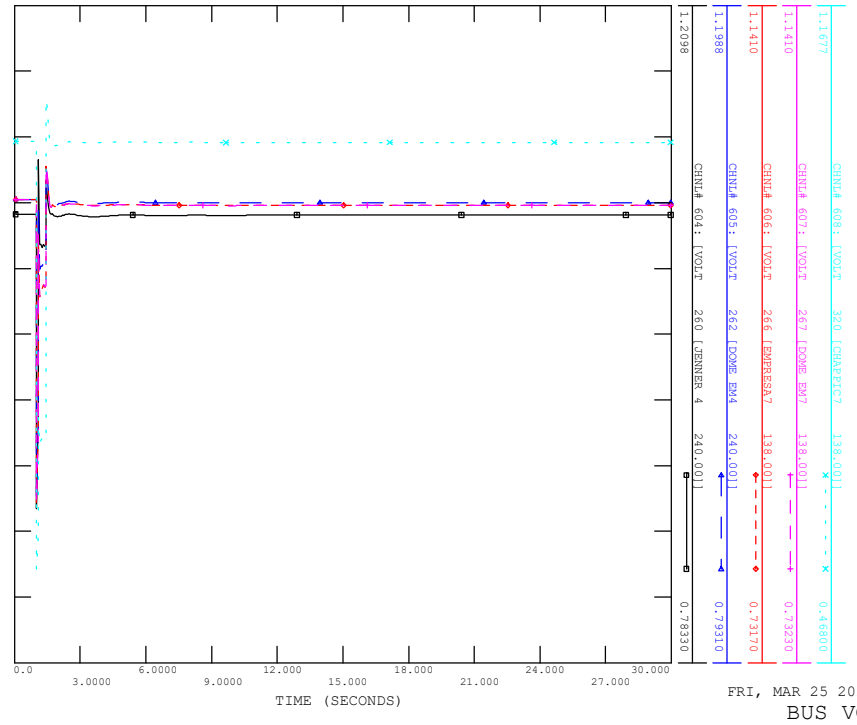
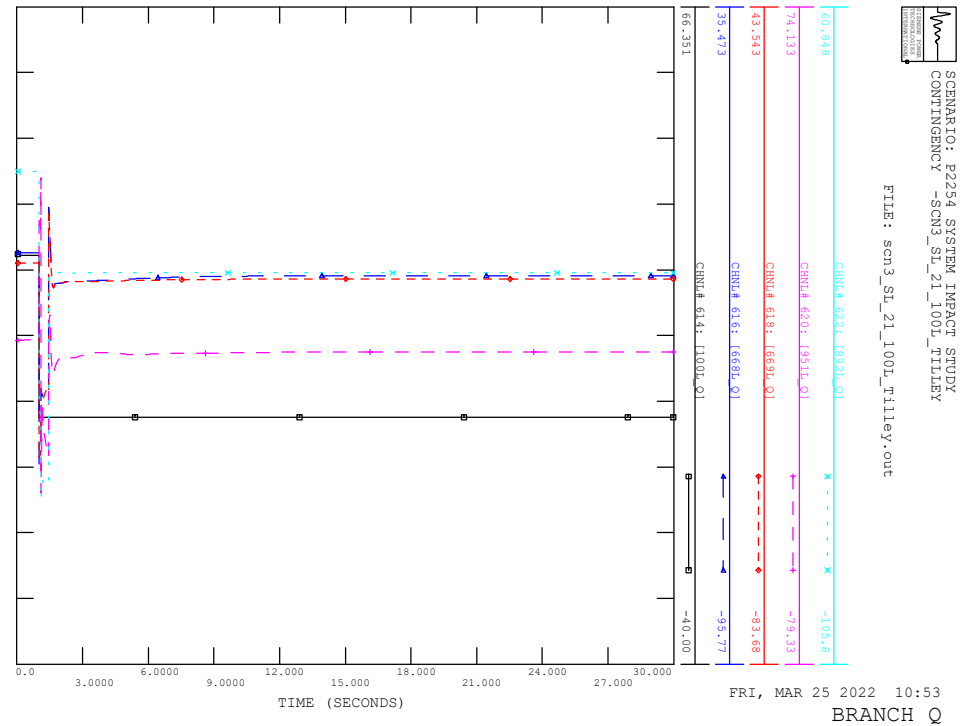
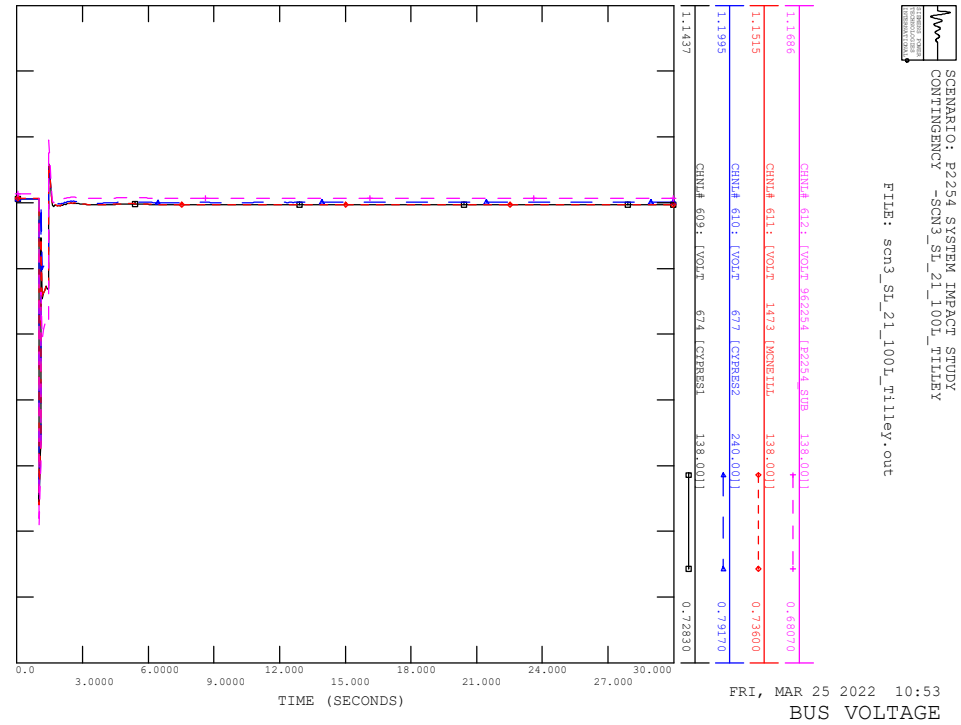


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_20\_674L\_BOWMANTON

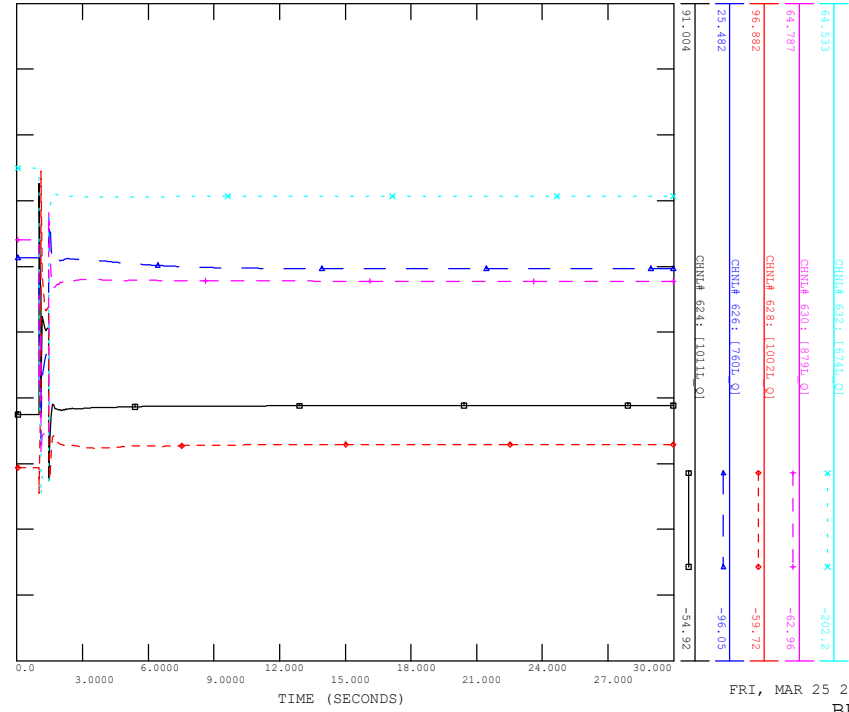
FILE: scn3\_sl\_20\_674L\_Bowmanton.out





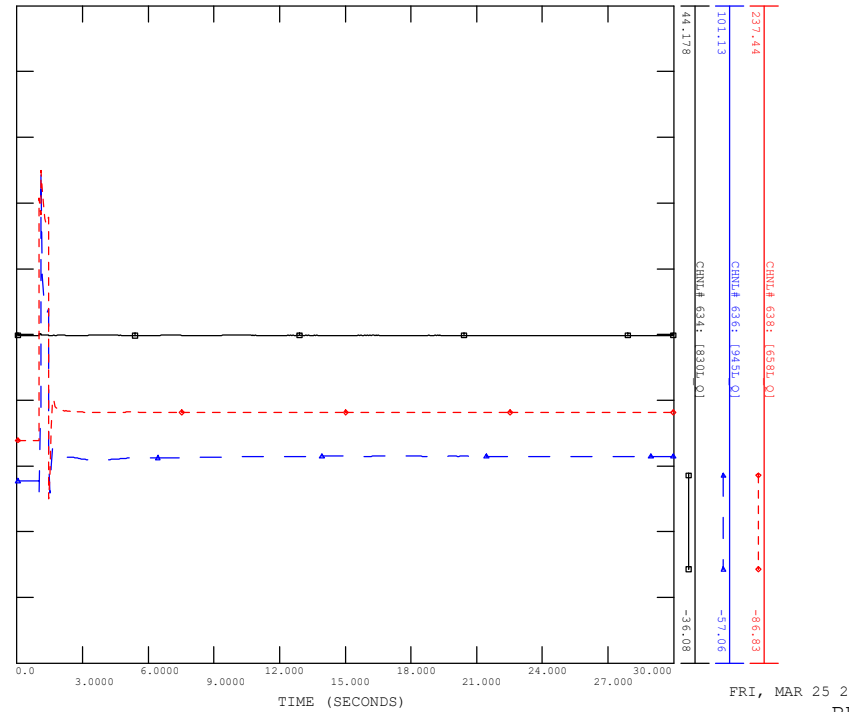


FILE: scn3\_sl\_21\_100L\_Tilley.out



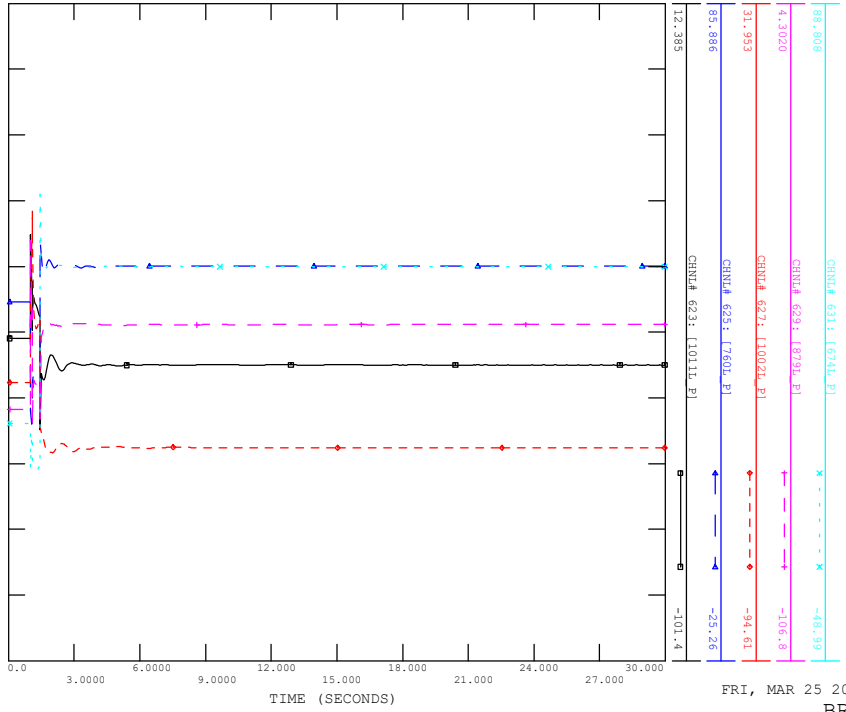
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: scn3\_sl\_21\_100L\_Tilley.out



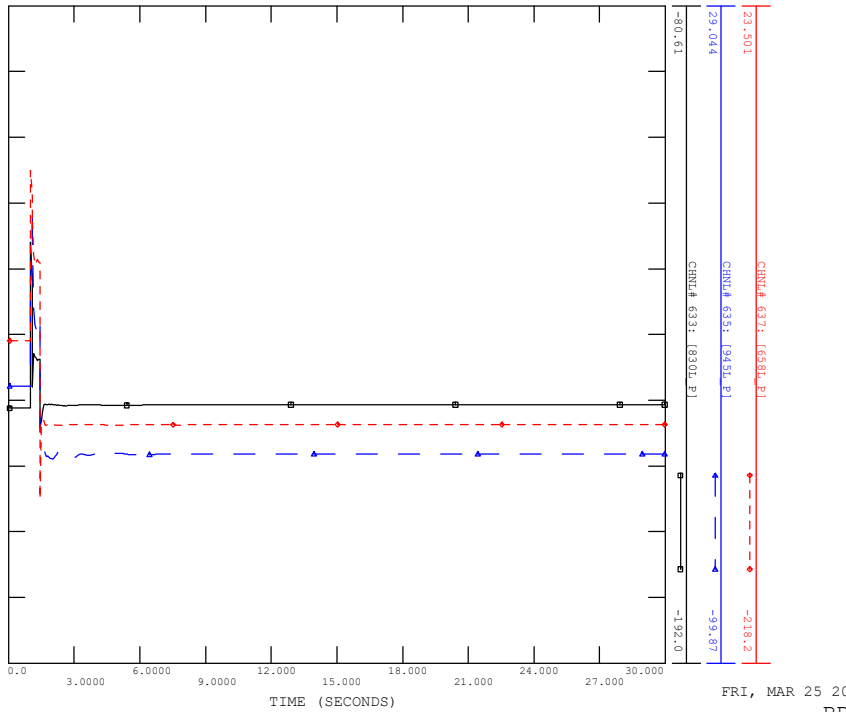
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: scn3\_sl\_21\_100L\_Tilley.out



FRI, MAR 25 2022 10:53  
BRANCH P

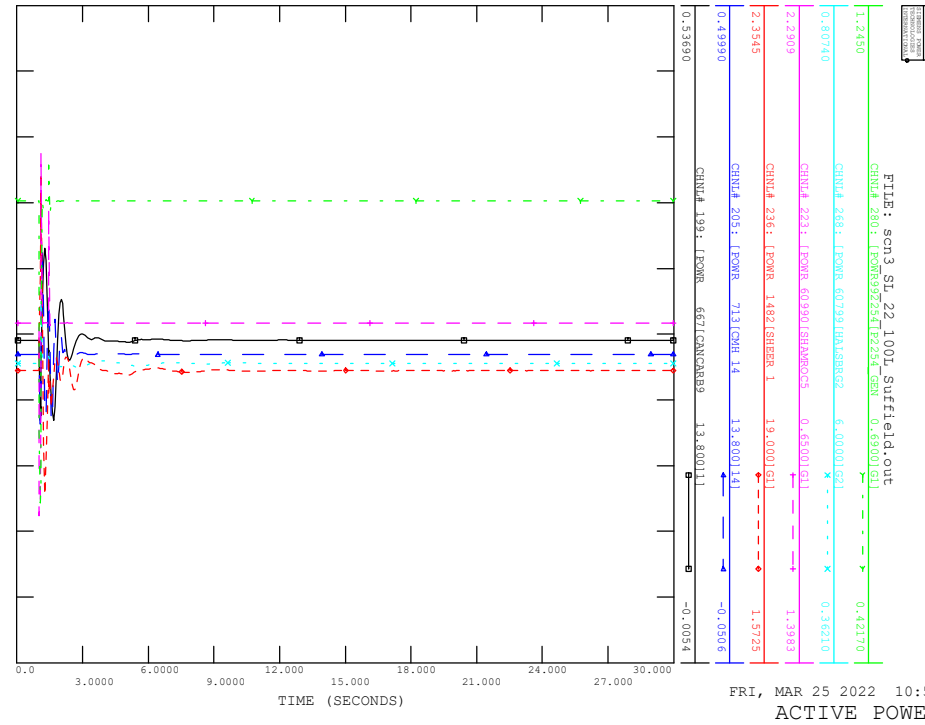
FILE: scn3\_sl\_21\_100L\_Tilley.out



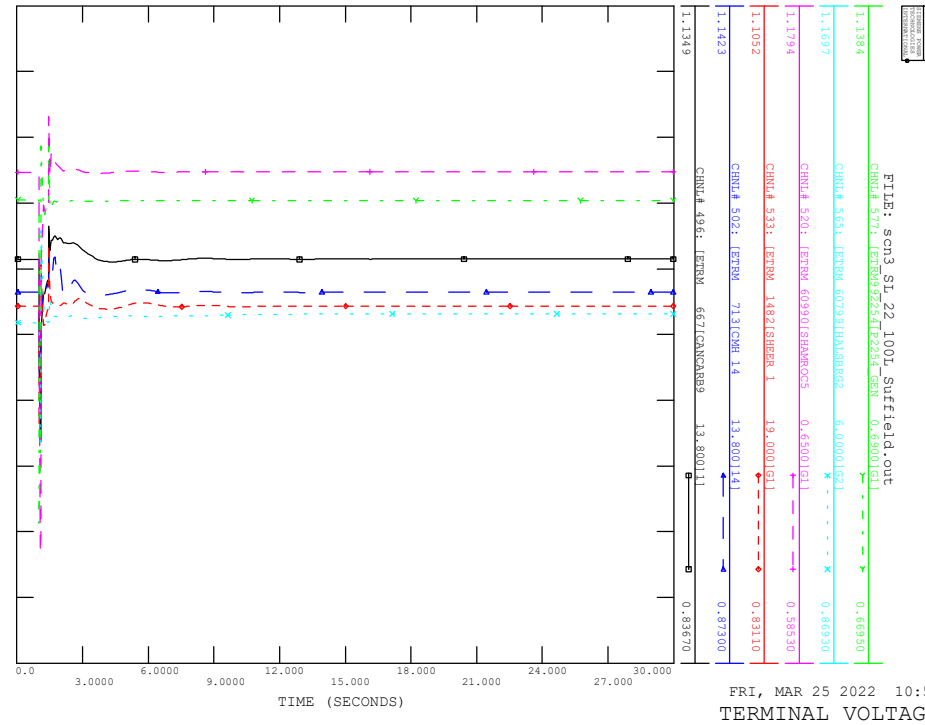
FRI, MAR 25 2022 10:53  
BRANCH P



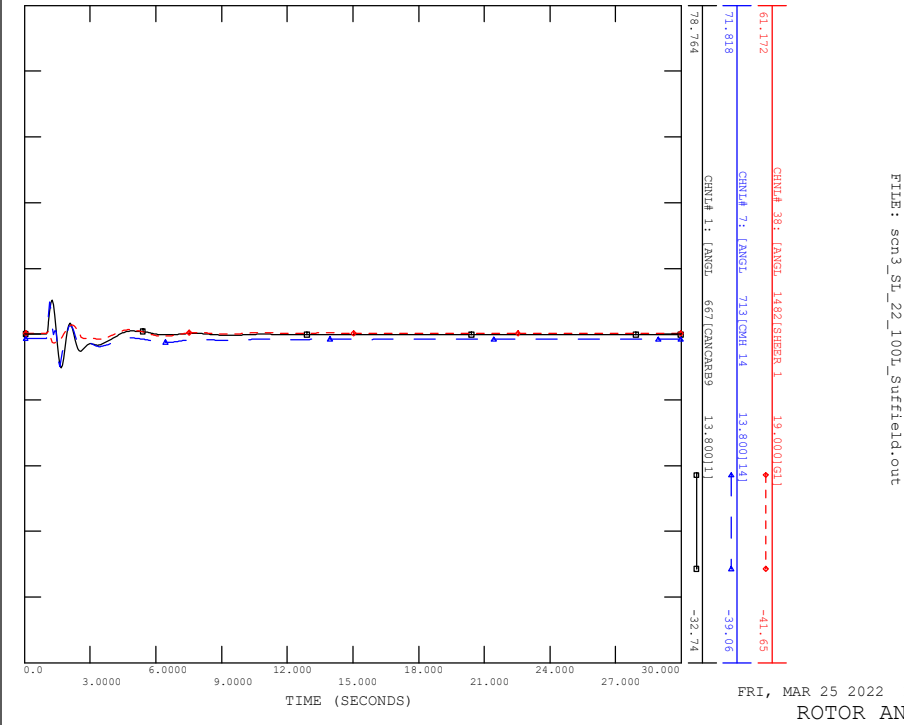
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_22\_100L\_SUPFIELD



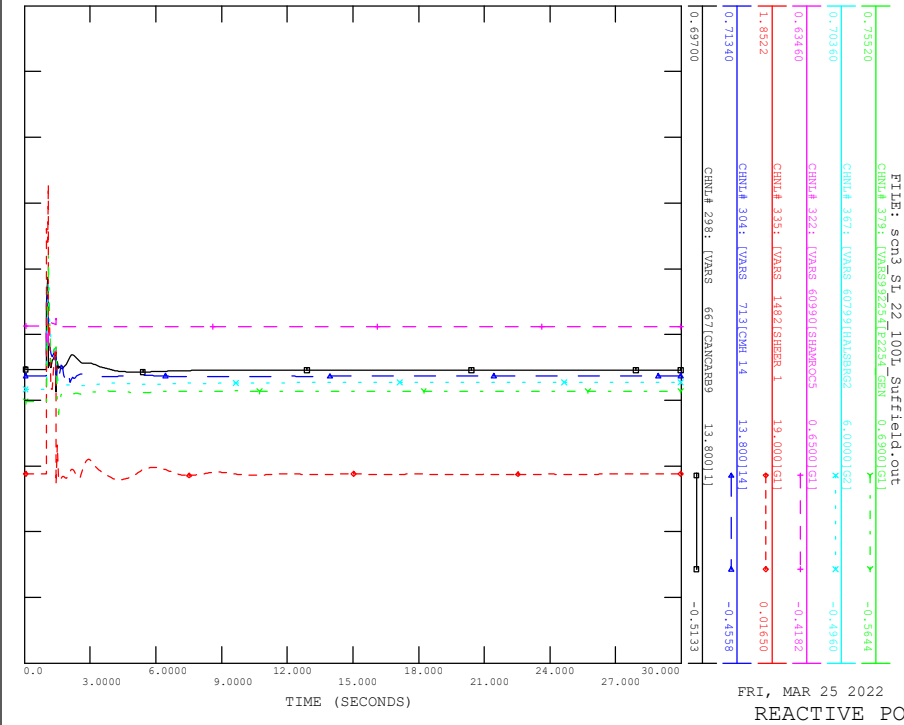
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_22\_100L\_SUPFIELD



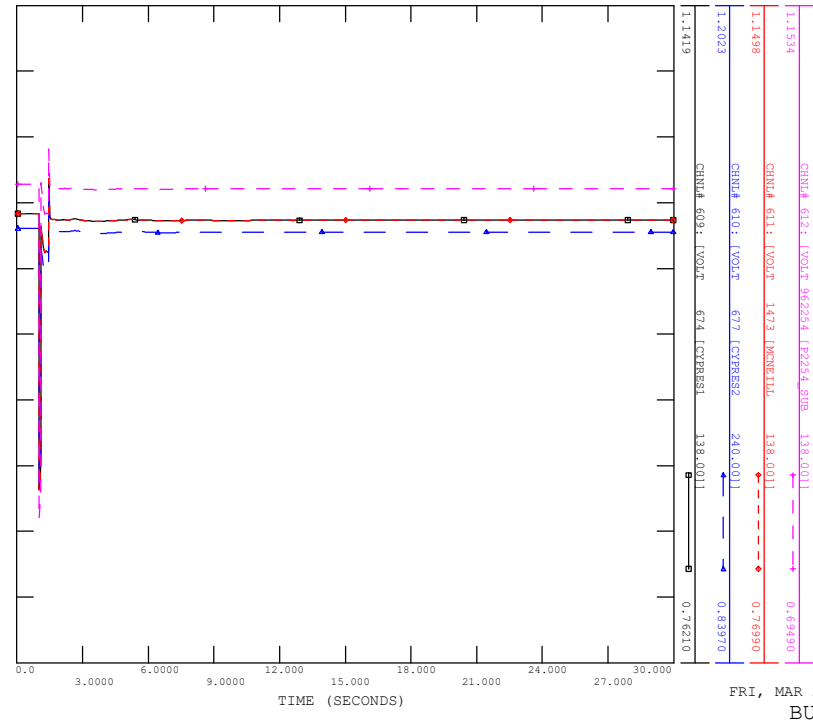
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_22\_100L\_SUPFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_STL\_22\_100L\_SUPFIELD

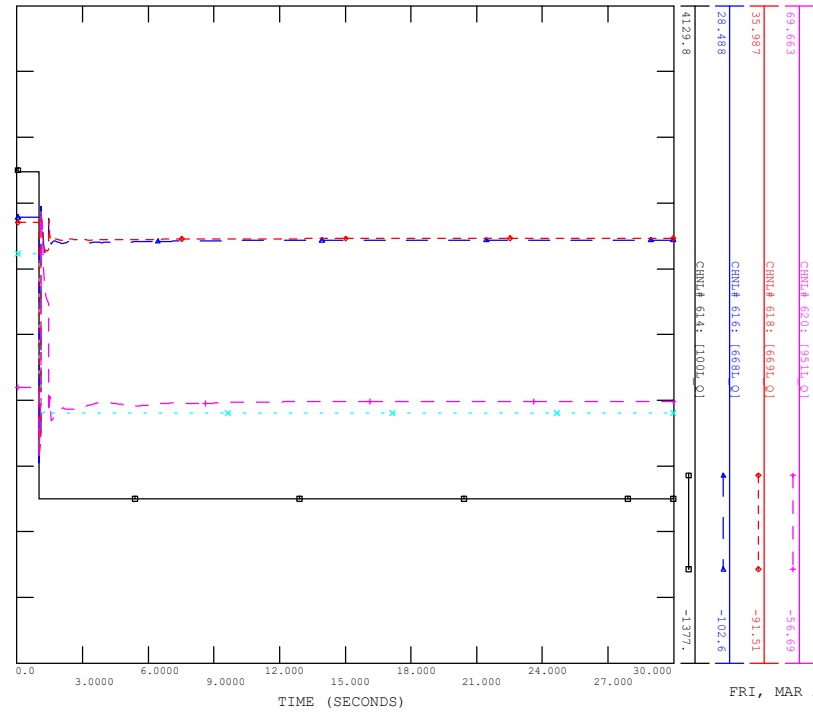


FILE: scn3\_sl\_22\_100L\_Suffield.out



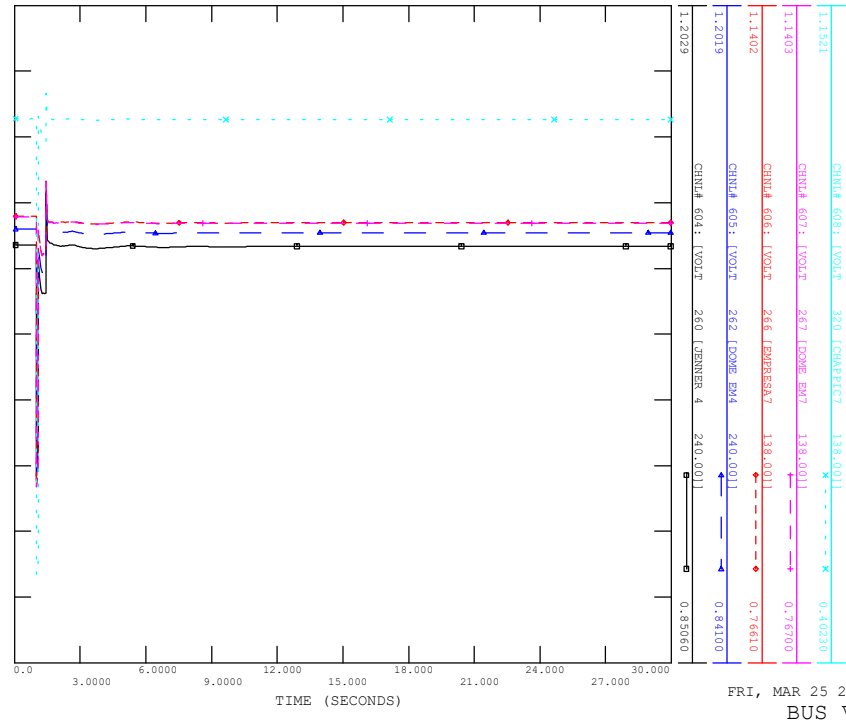
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn3\_sl\_22\_100L\_Suffield.out



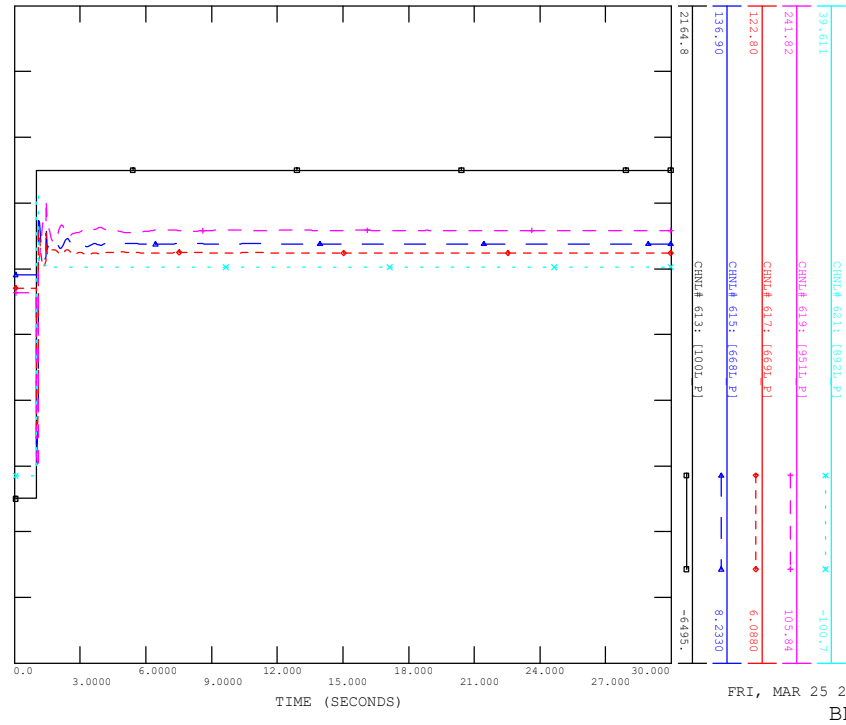
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: scn3\_sl\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

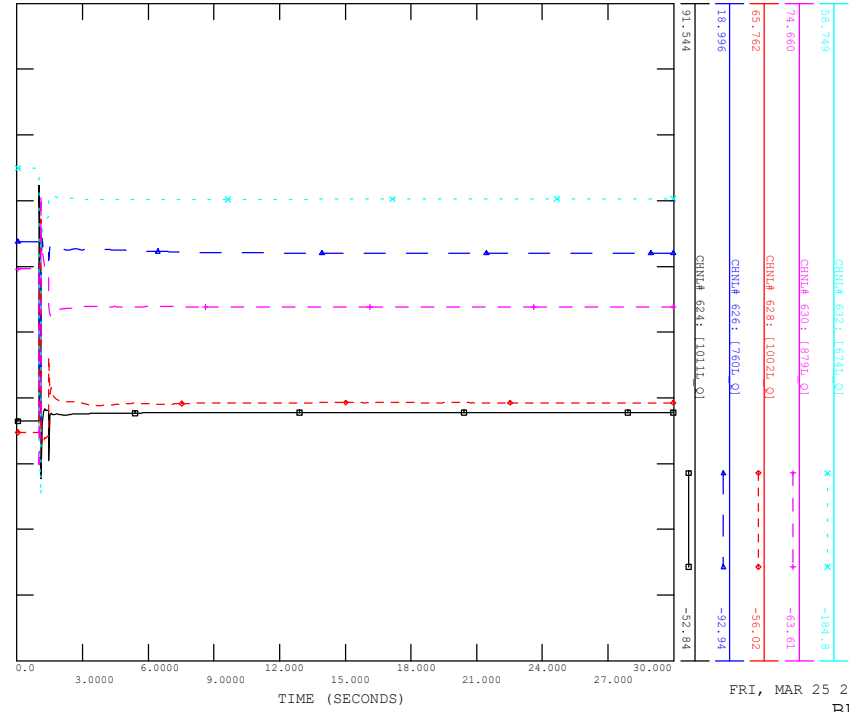
FILE: scn3\_sl\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH P

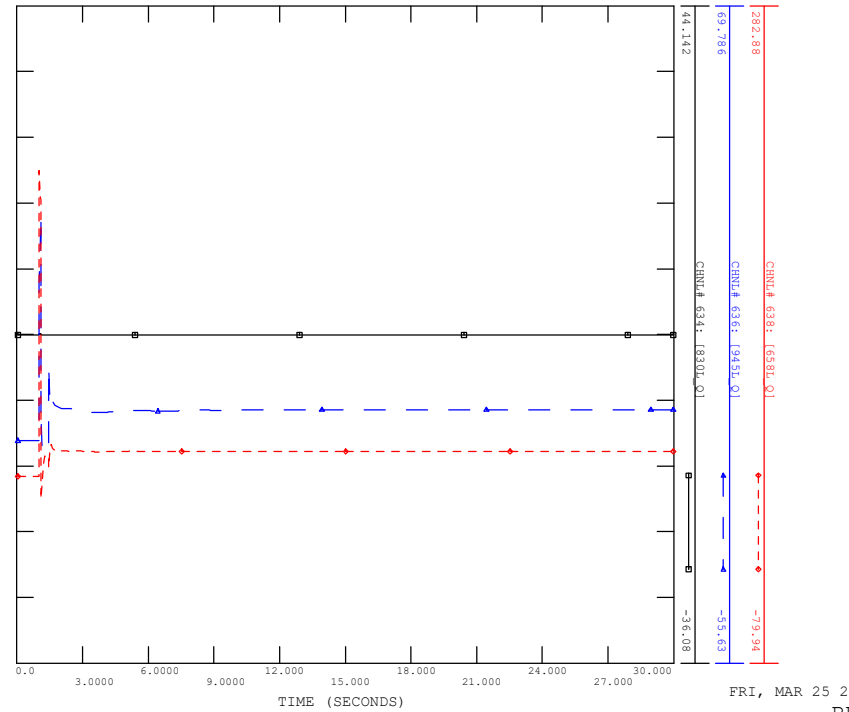
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_22\_100L\_Suffield

FILE: scn3\_sl\_22\_100L\_Suffield.out



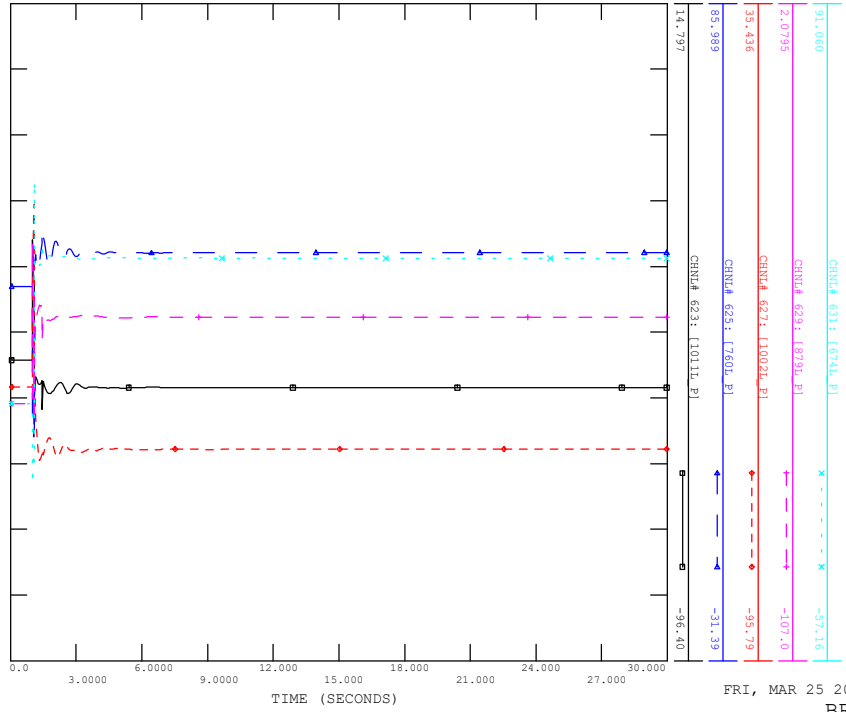
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_22\_100L\_Suffield

FILE: scn3\_sl\_22\_100L\_Suffield.out



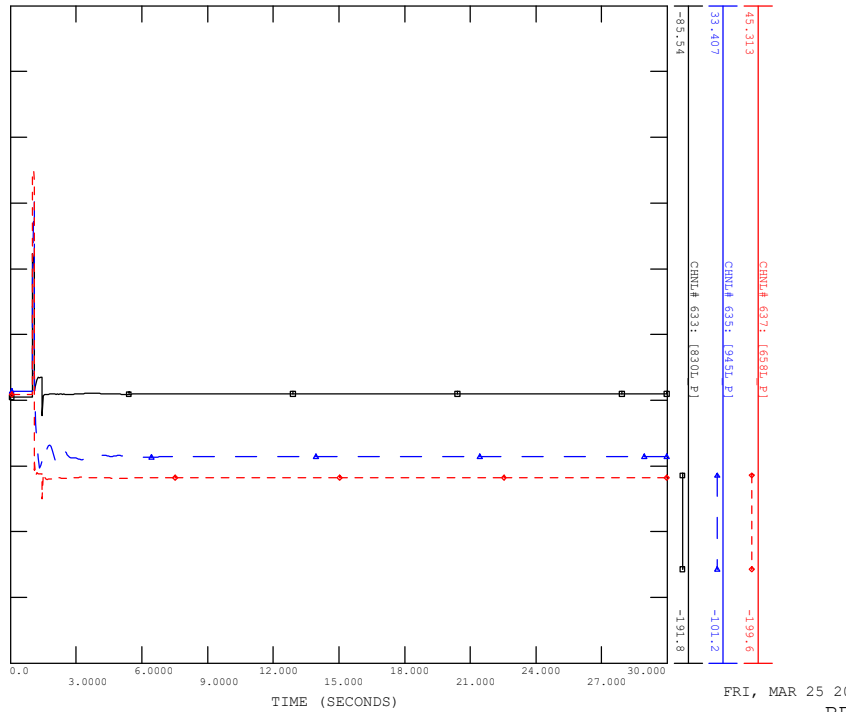
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_22\_100L\_Suffield

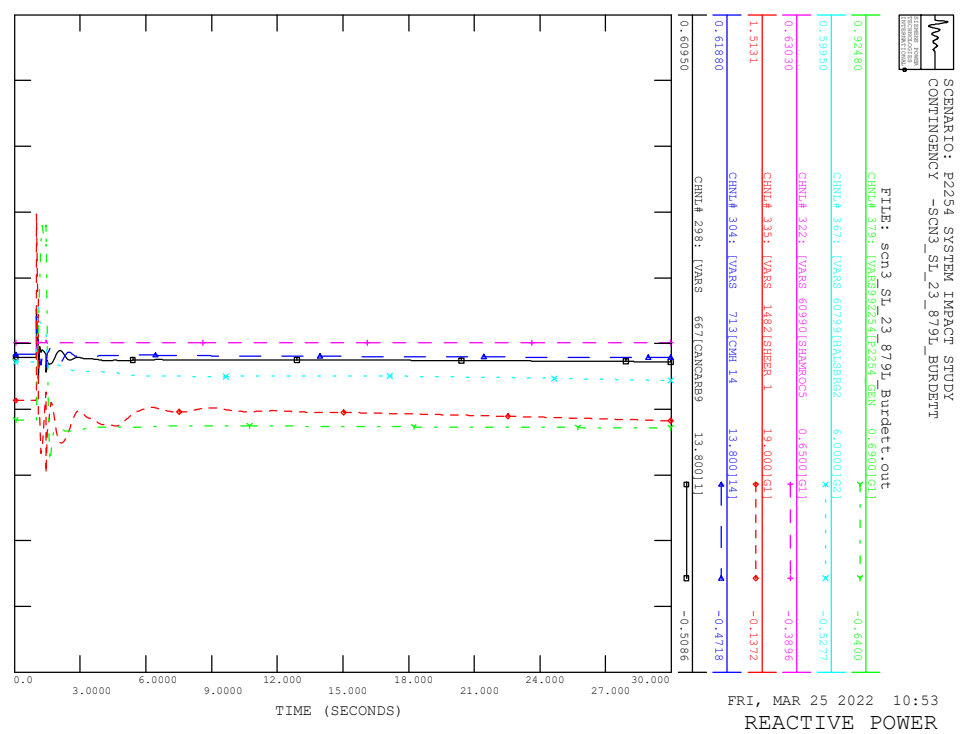
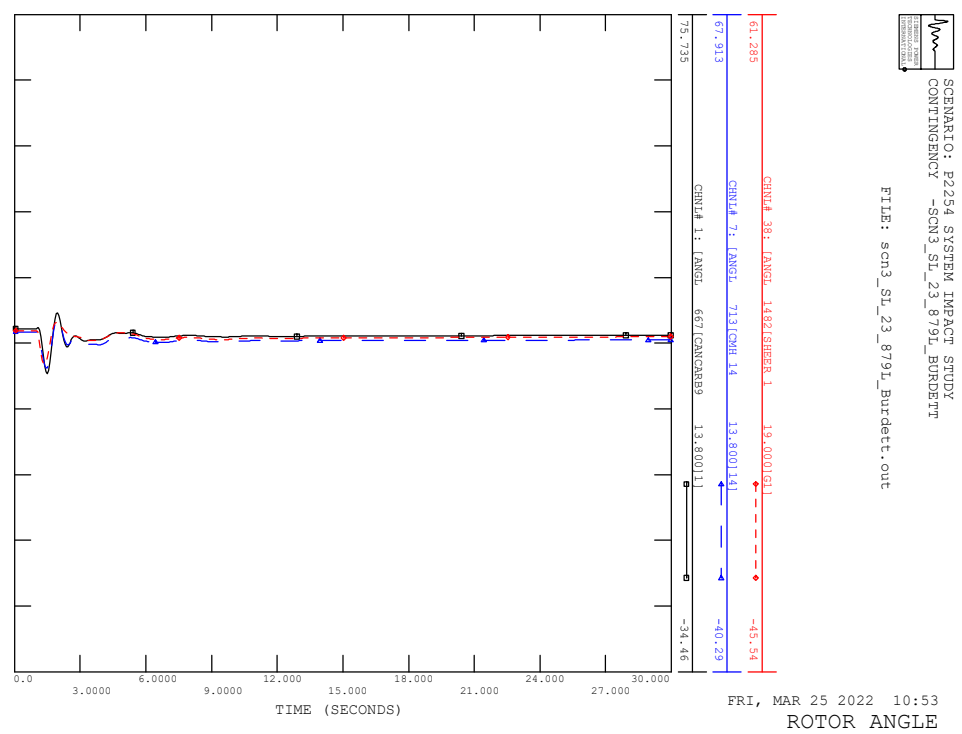
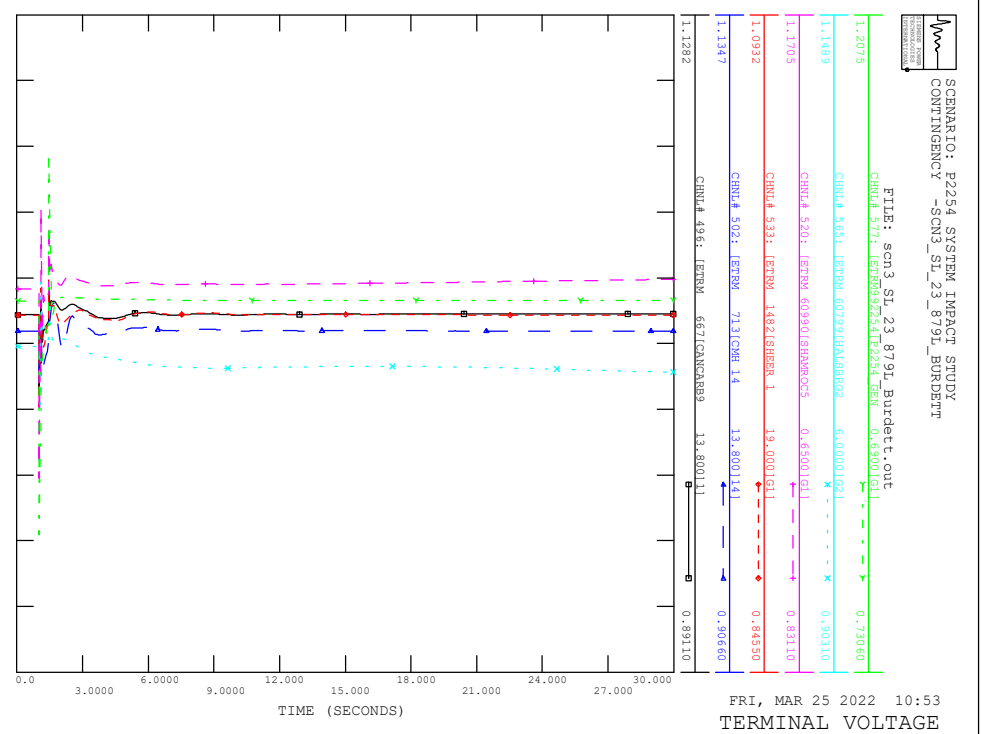
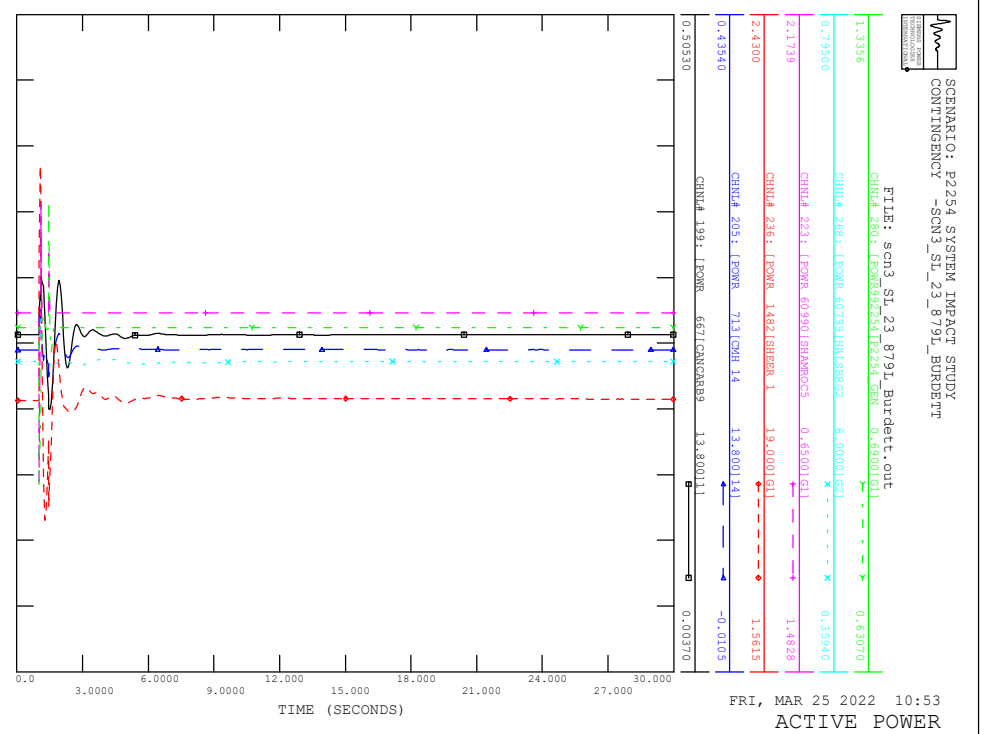
FILE: scn3\_sl\_22\_100L\_Suffield.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_22\_100L\_Suffield

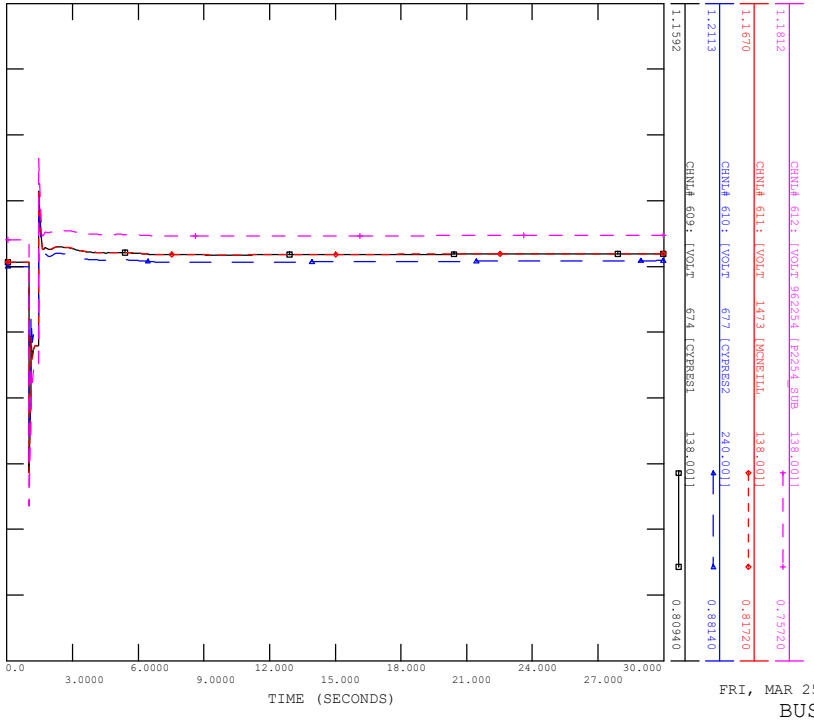
FILE: scn3\_sl\_22\_100L\_Suffield.out





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

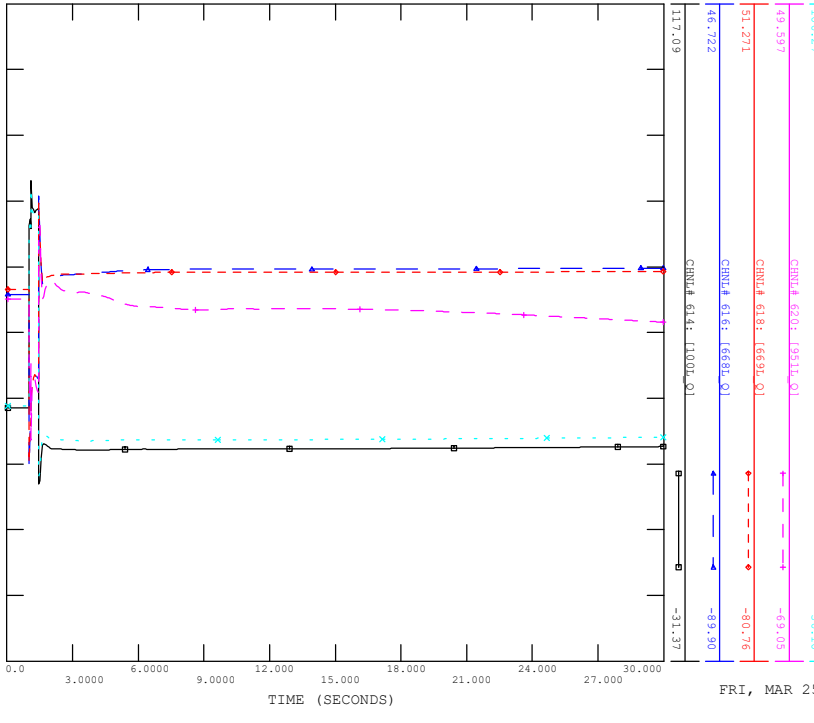
FILE: scn3\_sl\_23\_879L\_Burdett.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

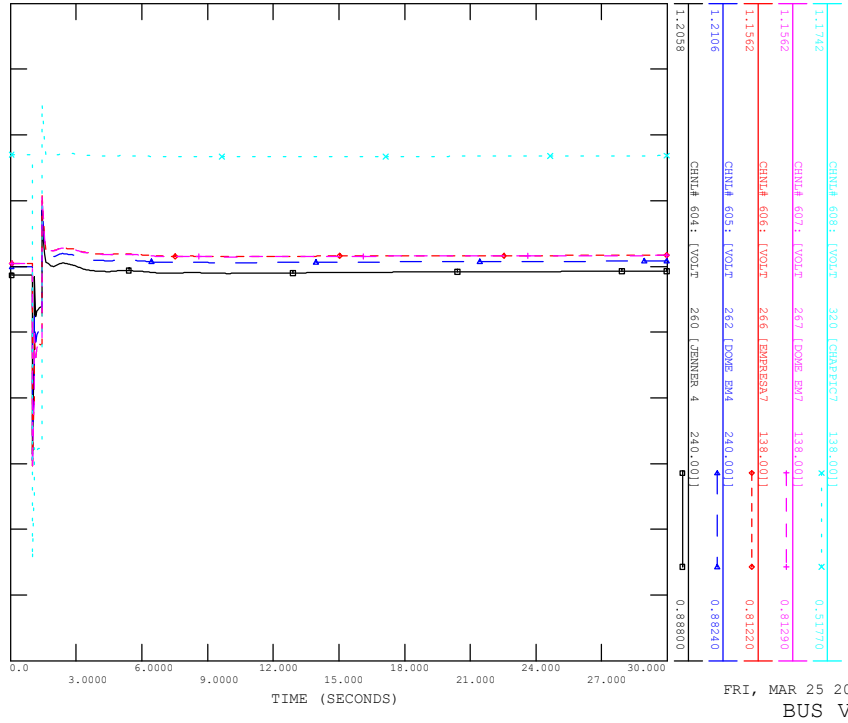
FILE: scn3\_sl\_23\_879L\_Burdett.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

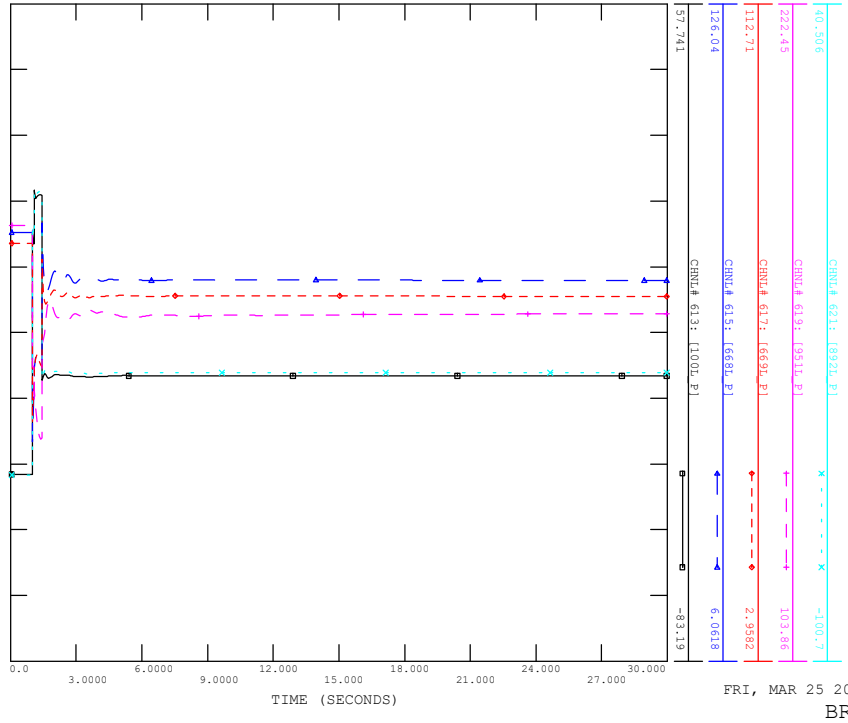
FILE: scn3\_sl\_23\_879L\_Burdett.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

FILE: scn3\_sl\_23\_879L\_Burdett.out

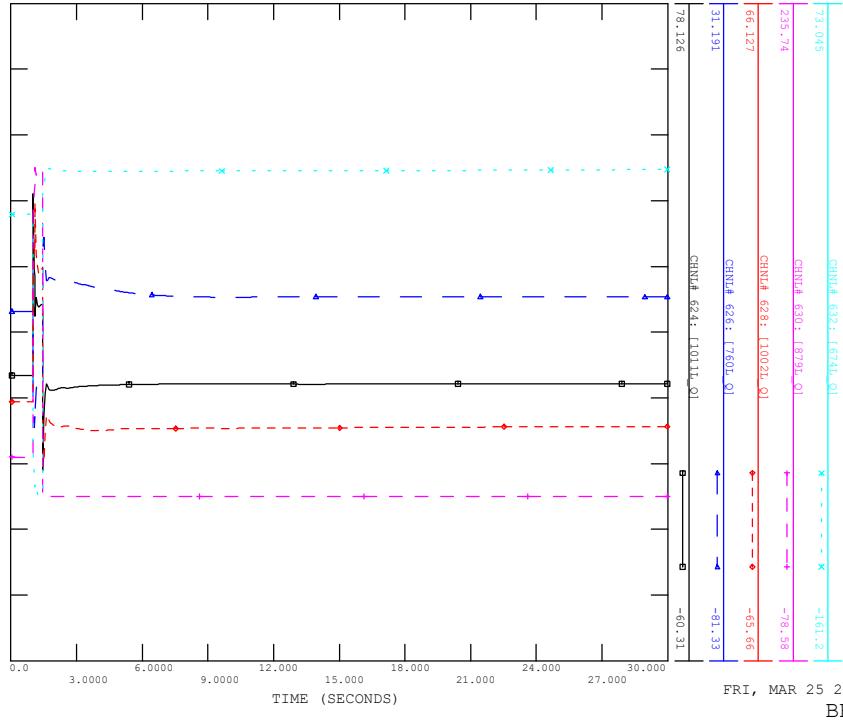


FRI, MAR 25 2022 10:53  
BRANCH P



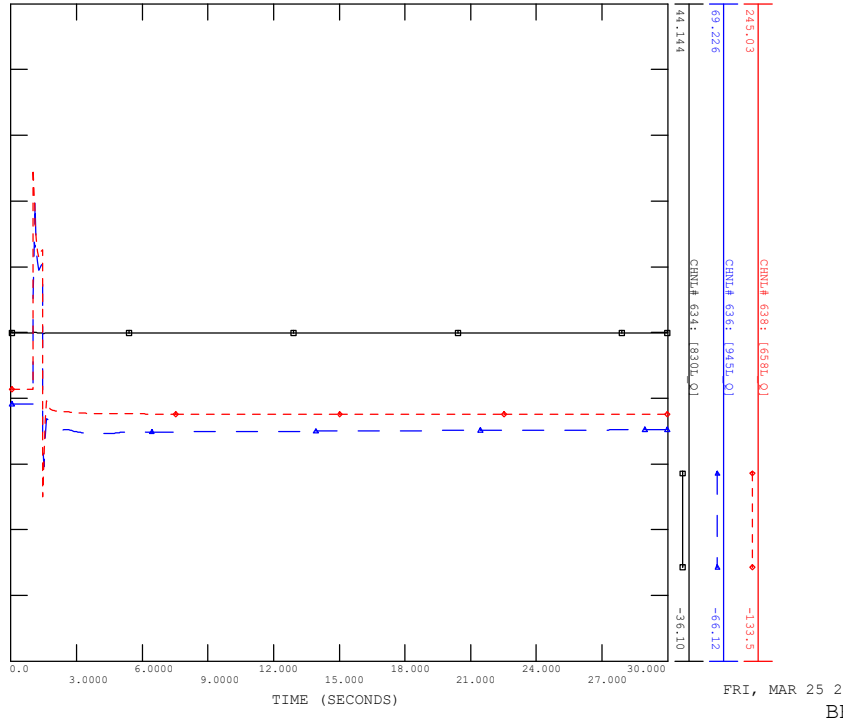
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

FILE: scn3\_sl\_23\_879L\_Burdett.out



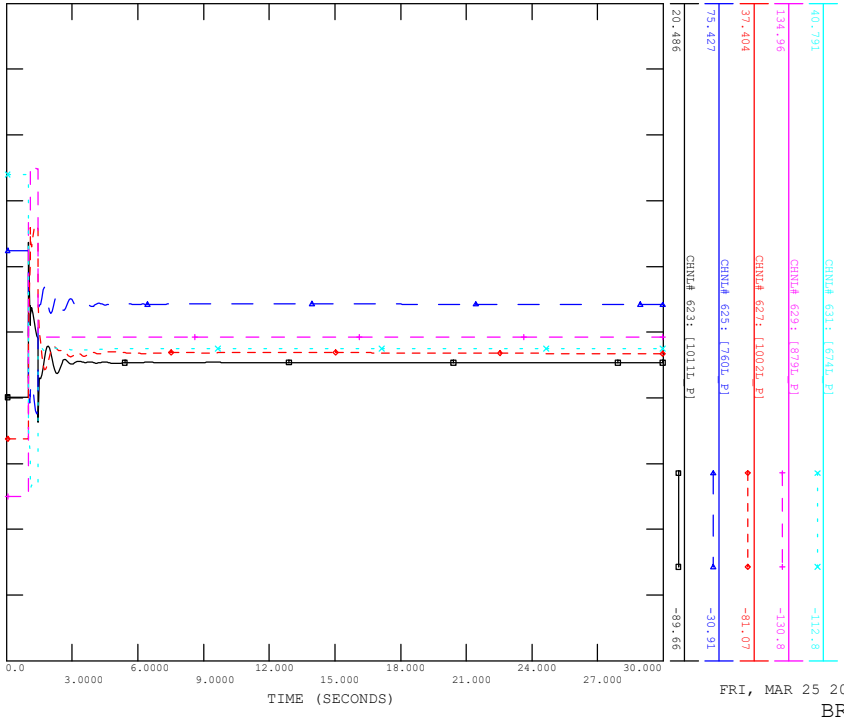
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

FILE: scn3\_sl\_23\_879L\_Burdett.out



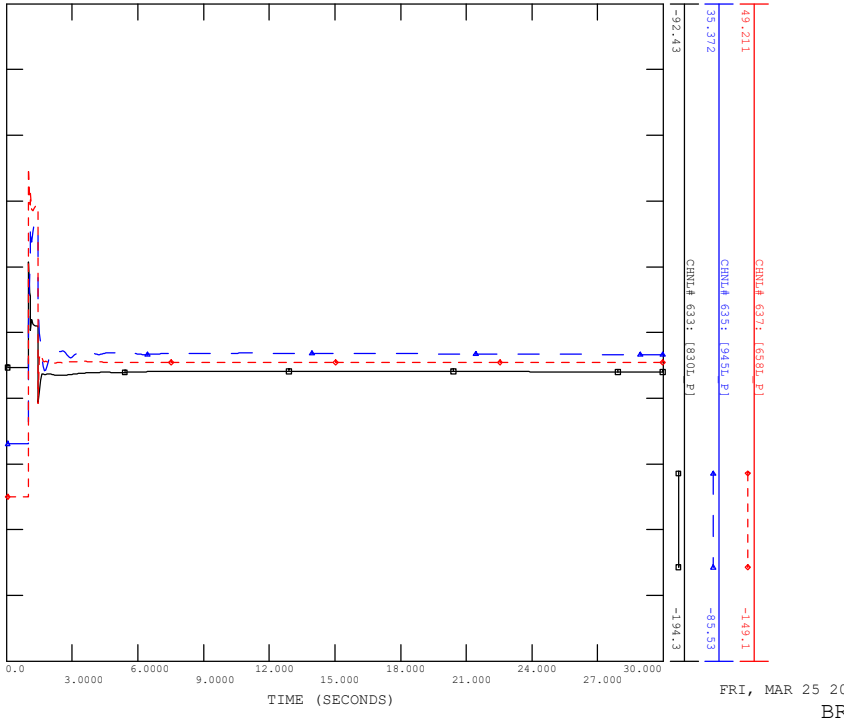
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

FILE: scn3\_sl\_23\_879L\_Burdett.out

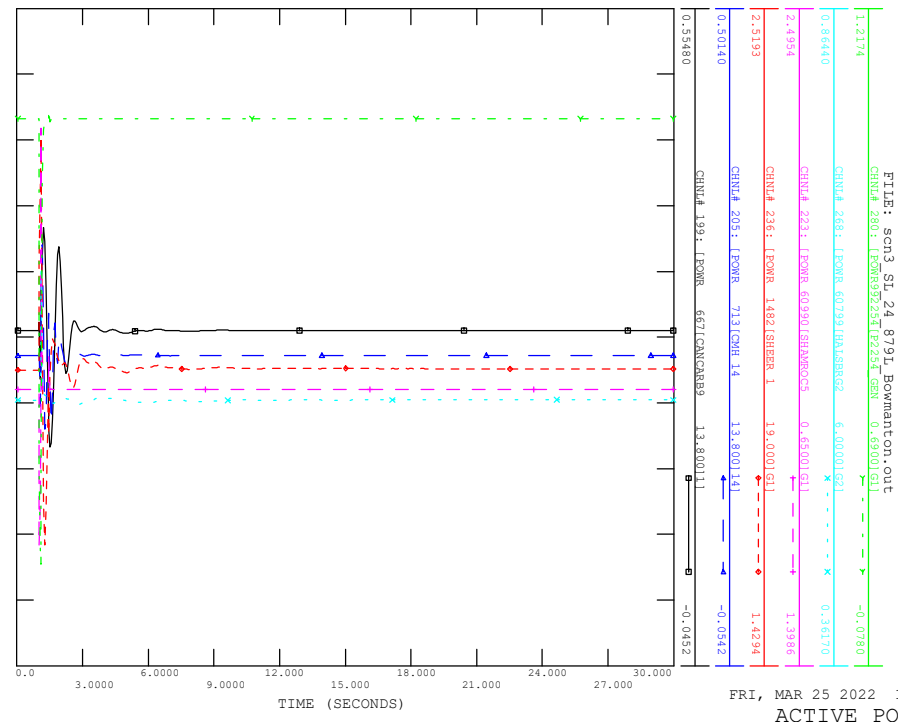


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_23\_879L\_BURDETT

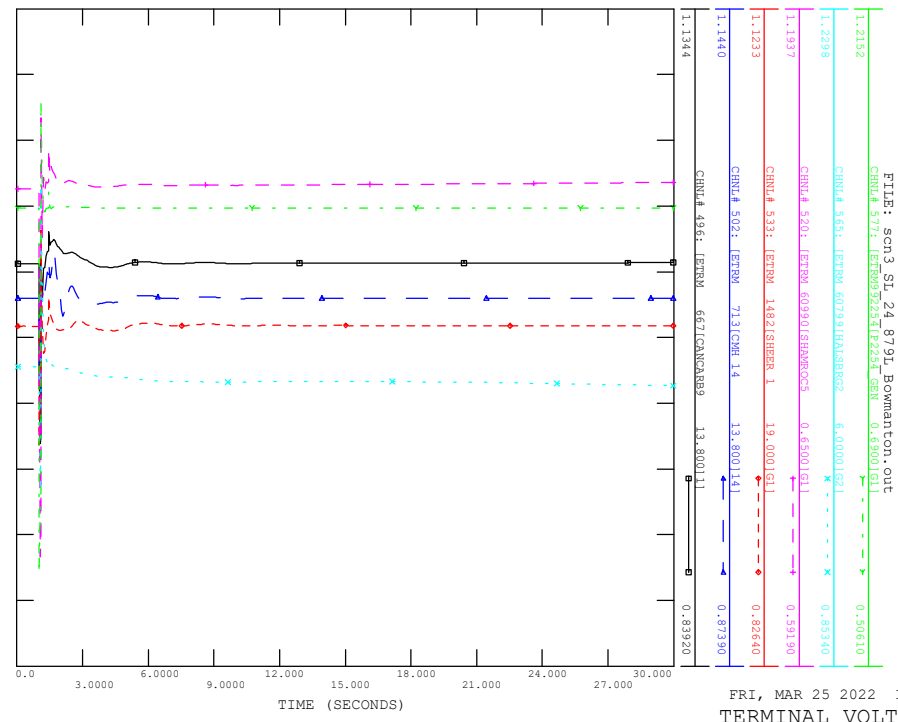
FILE: scn3\_sl\_23\_879L\_Burdett.out



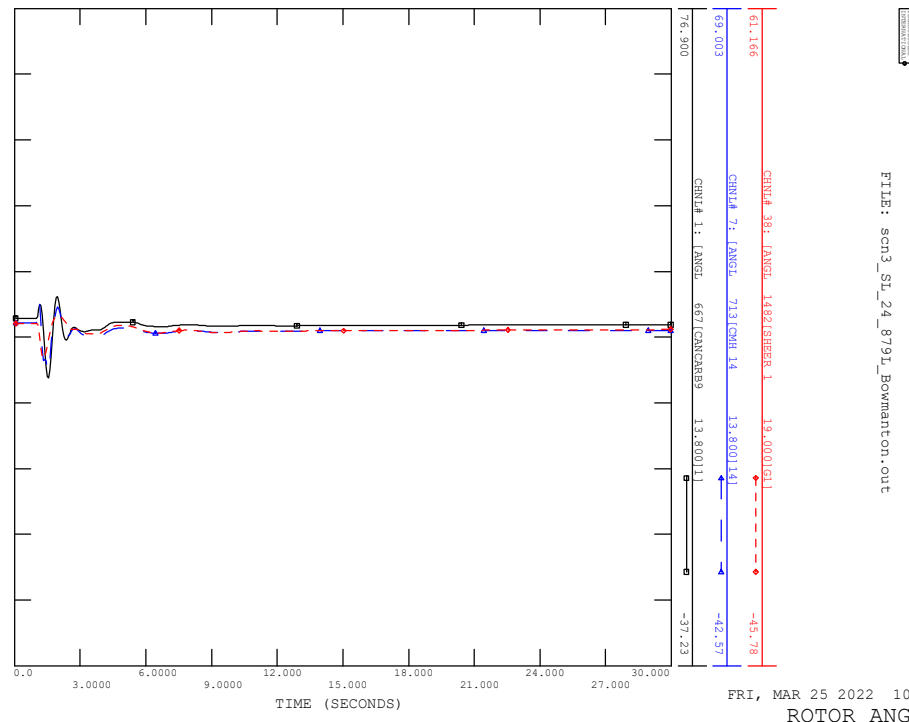
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON



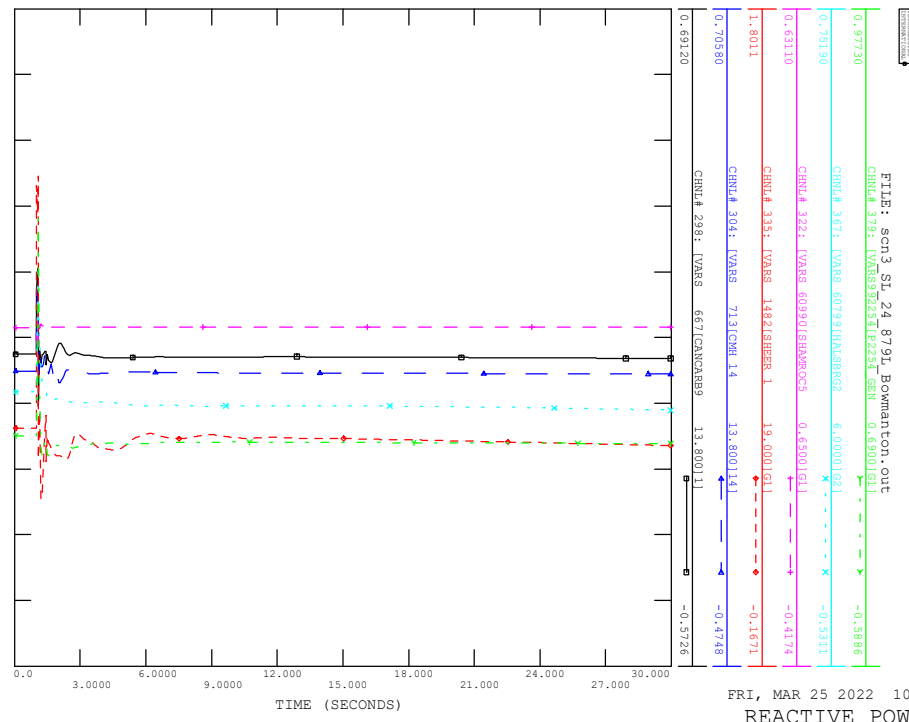
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON



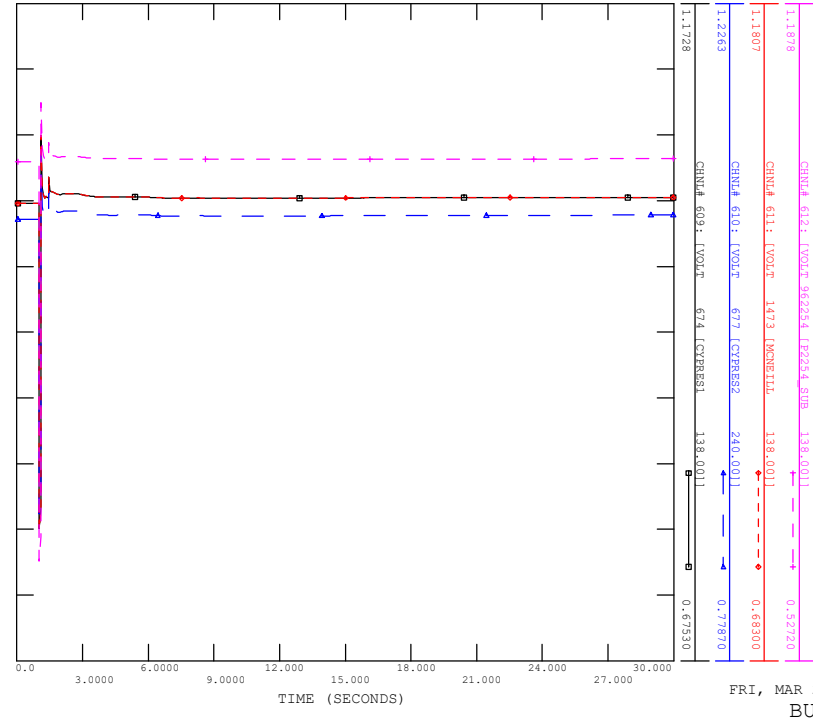
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON

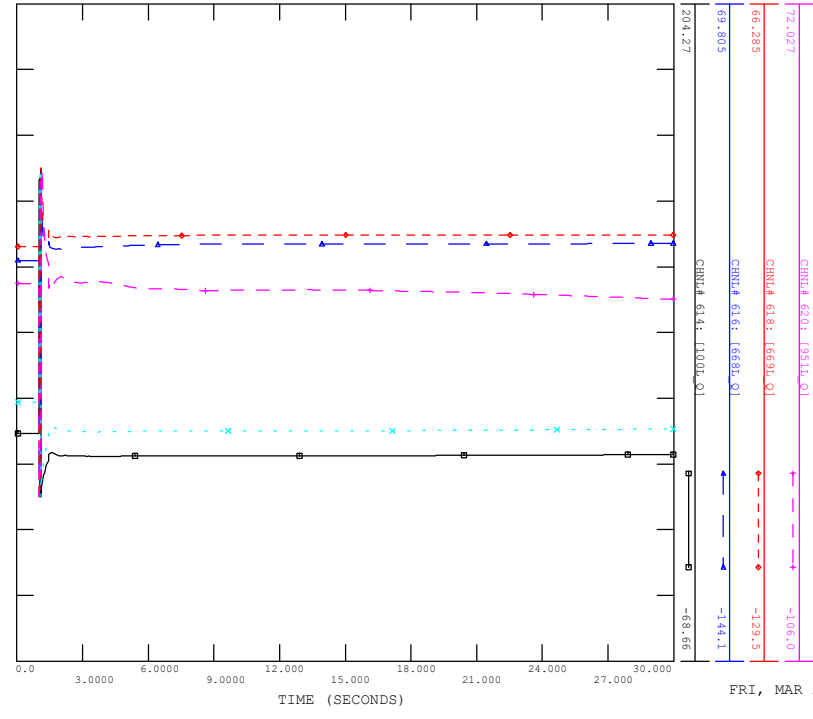


FILE: scn3\_sl\_24\_879L\_Bowmanton.out



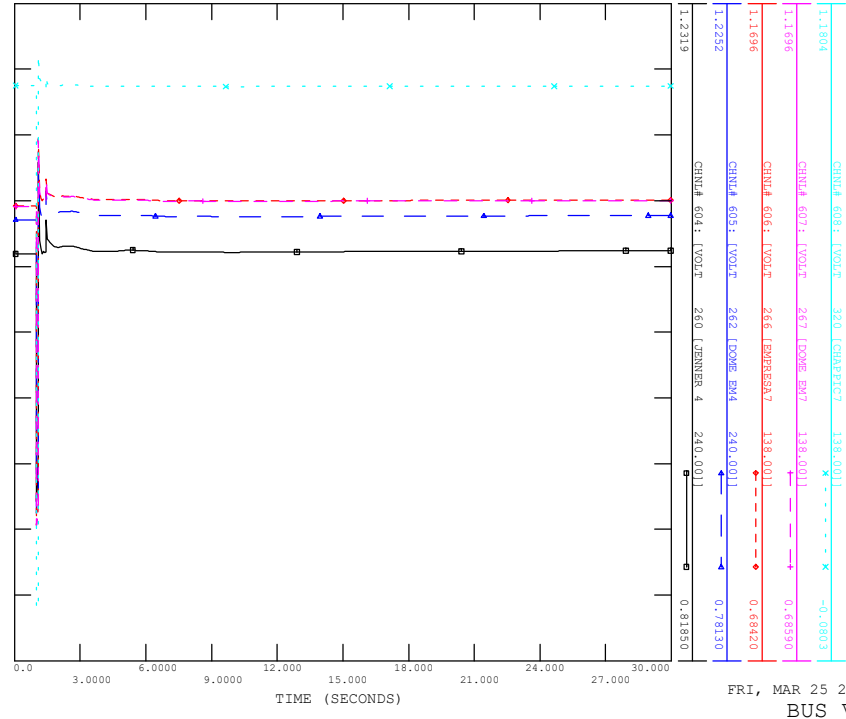
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn3\_sl\_24\_879L\_Bowmanton.out



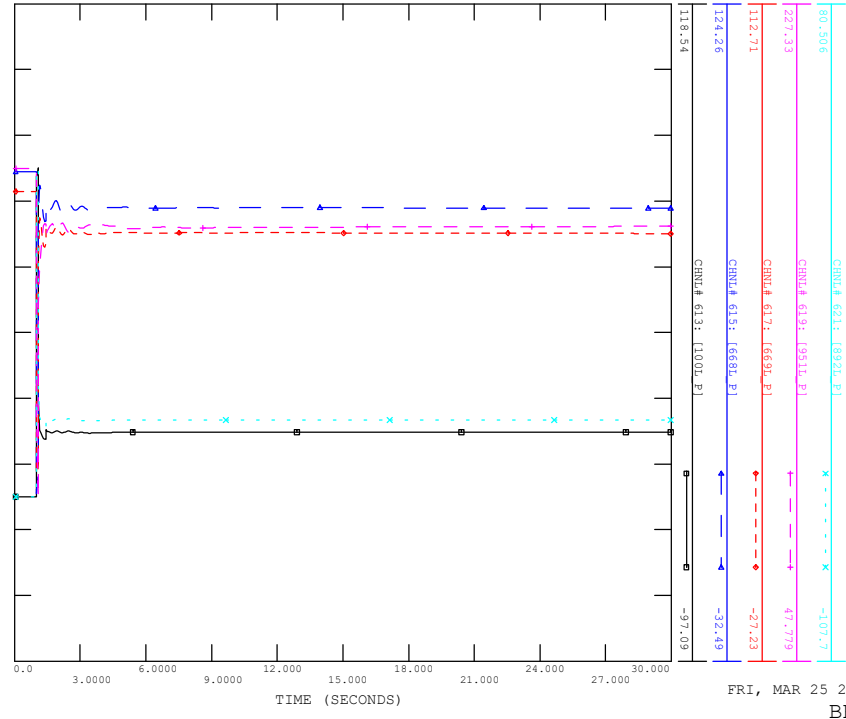
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: scn3\_sl\_24\_879L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn3\_sl\_24\_879L\_Bowmanton.out

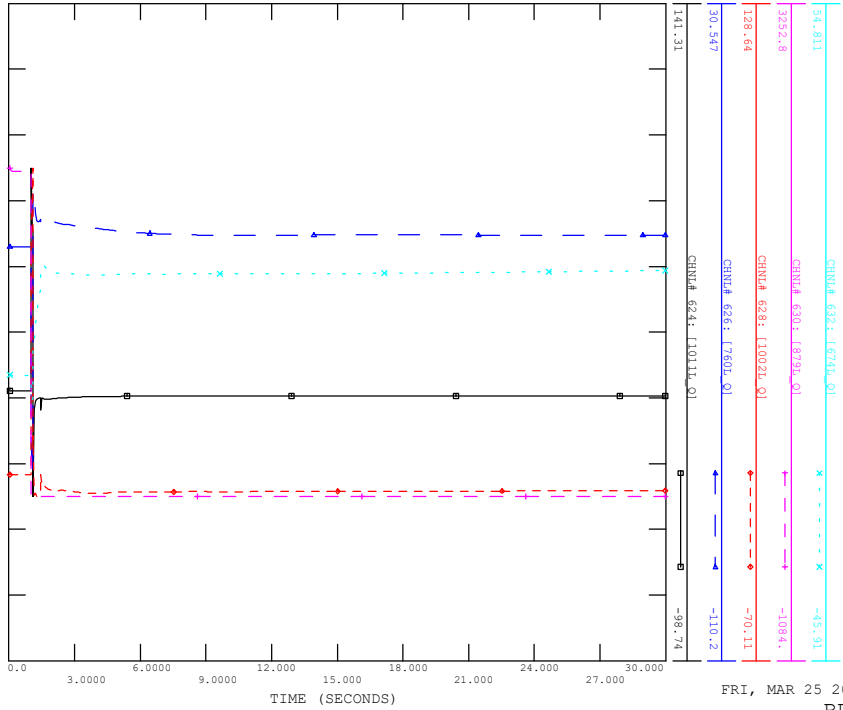


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON

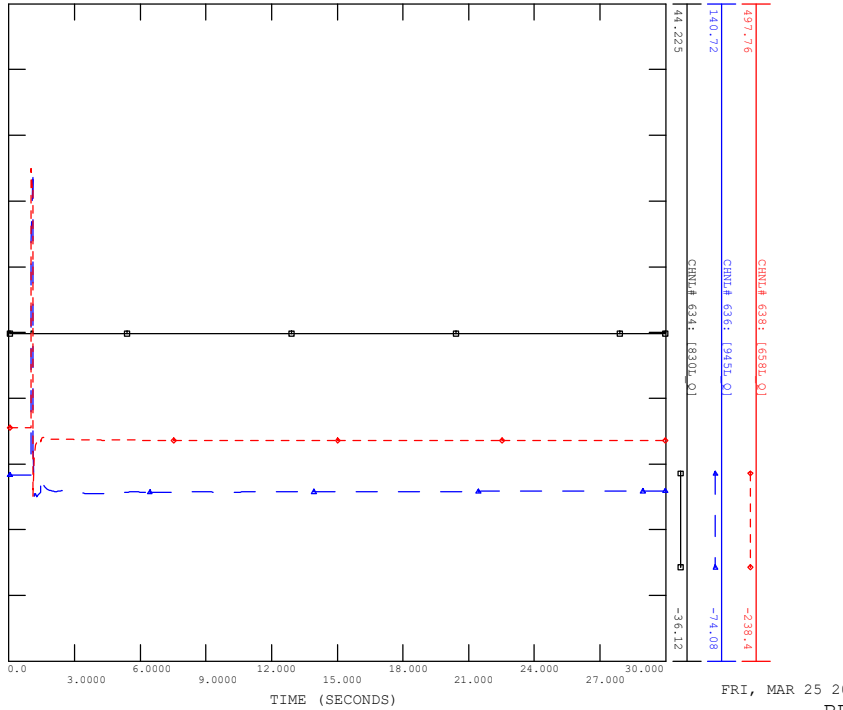
FILE: scn3\_sl\_24\_879L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON

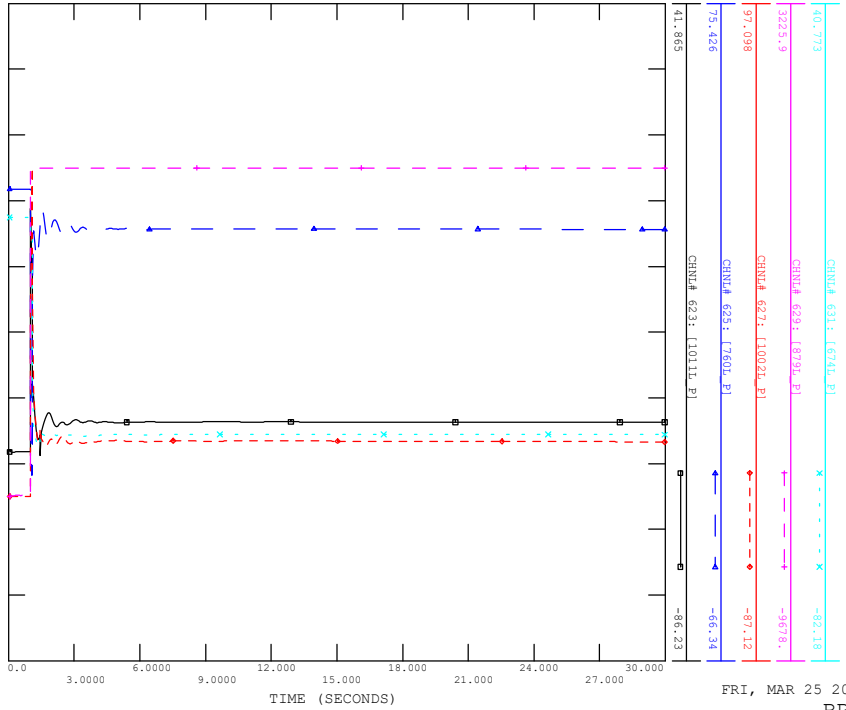
FILE: scn3\_sl\_24\_879L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON

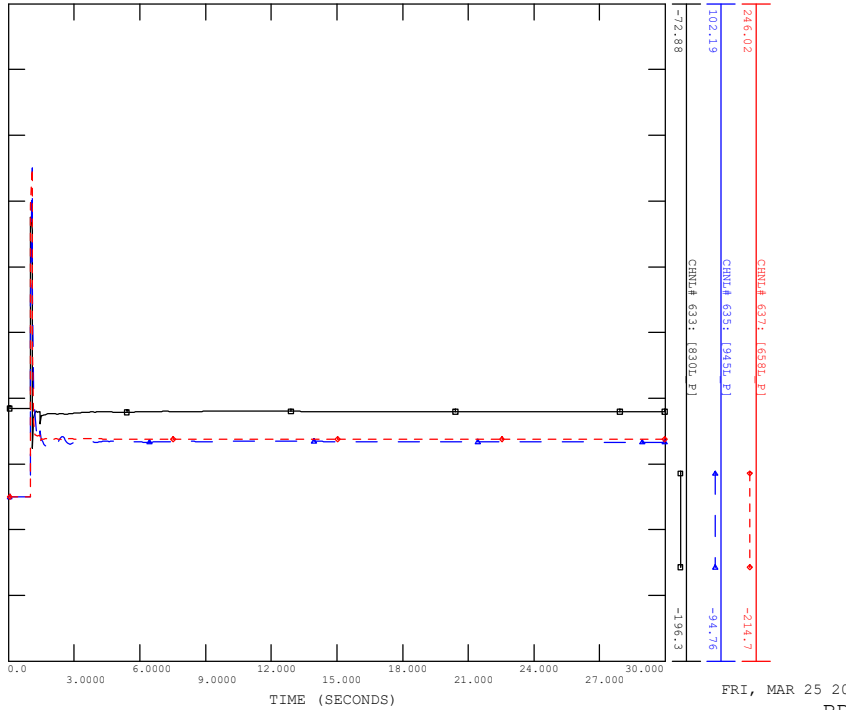
FILE: scn3\_sl\_24\_879L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN3\_SL\_24\_879L\_BOWMANTON

FILE: scn3\_sl\_24\_879L\_Bowmanton.out

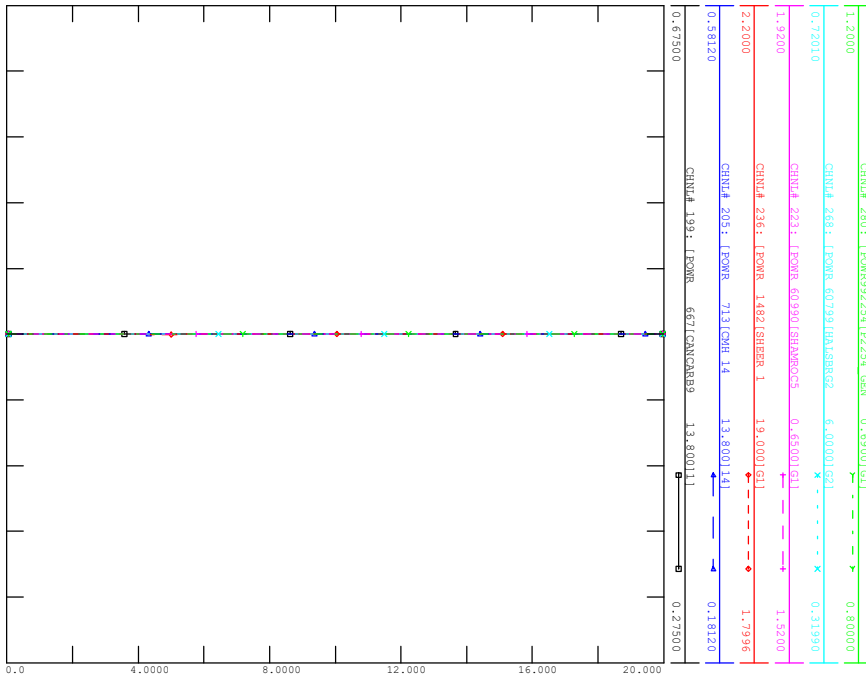


FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT



FILE: Scn4\_SP\_nofault.out

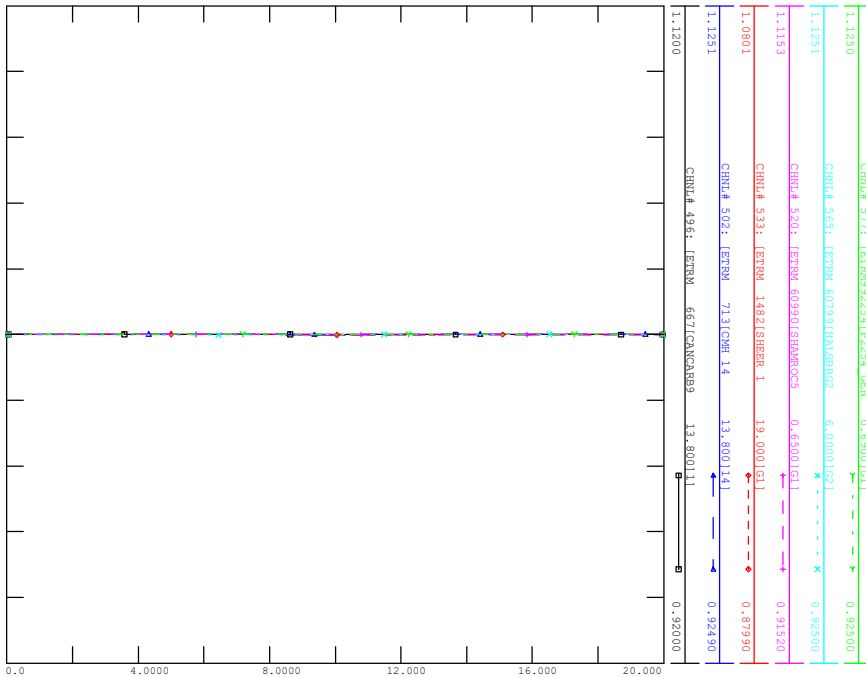


FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT



FILE: Scn4\_SP\_nofault.out

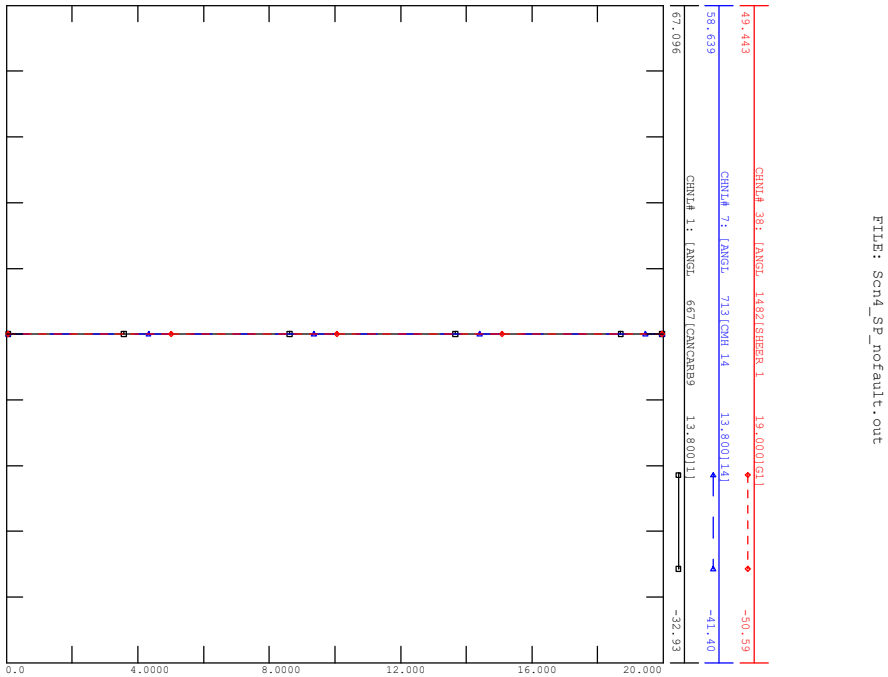


FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT



FILE: Scn4\_SP\_nofault.out

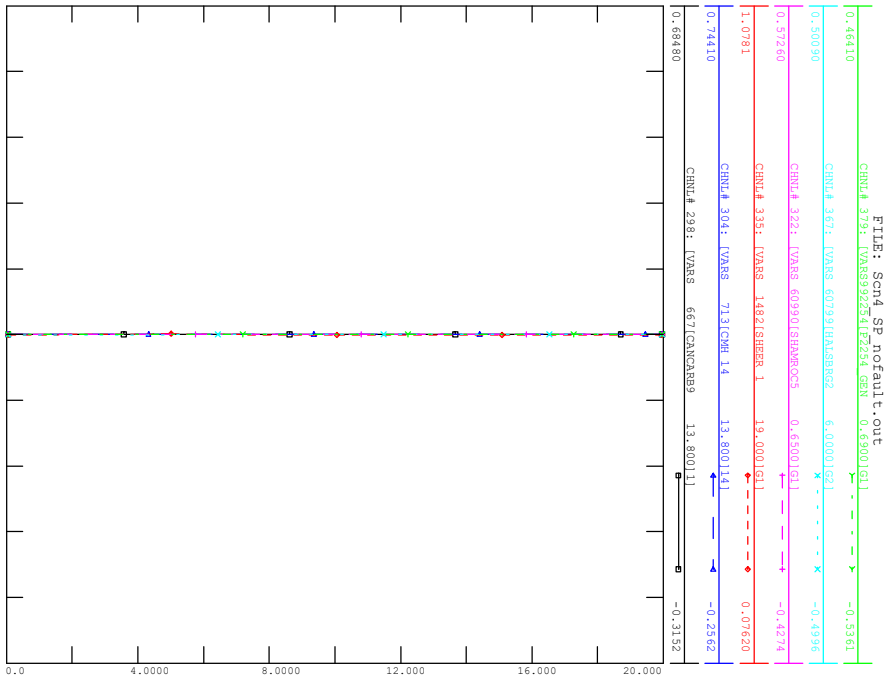


FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT

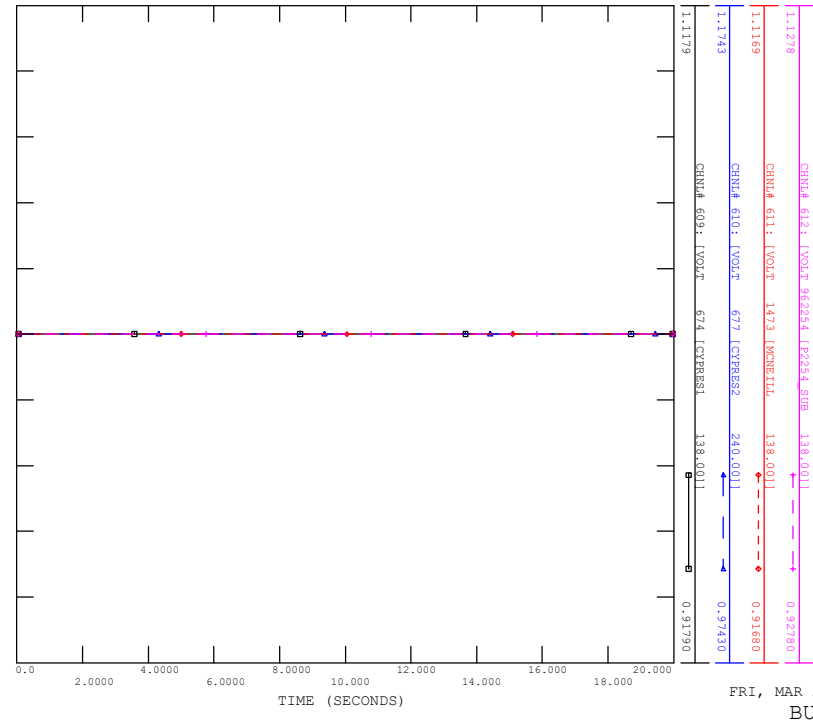


FILE: Scn4\_SP\_nofault.out



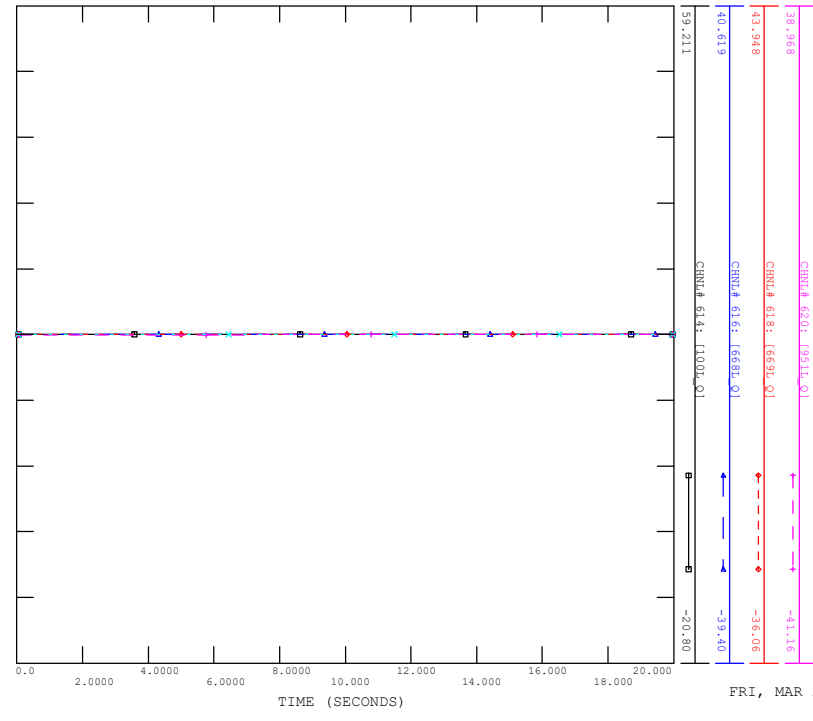
FRI, MAR 25 2022 10:53  
REACTIVE POWER

FILE: Scn4\_sp\_nofault.out



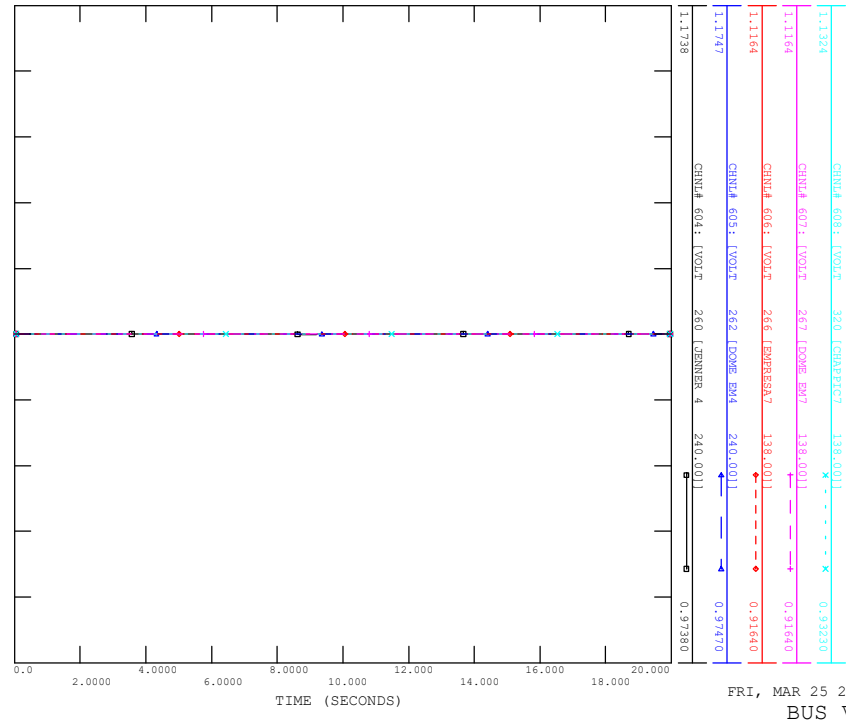
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: Scn4\_sp\_nofault.out



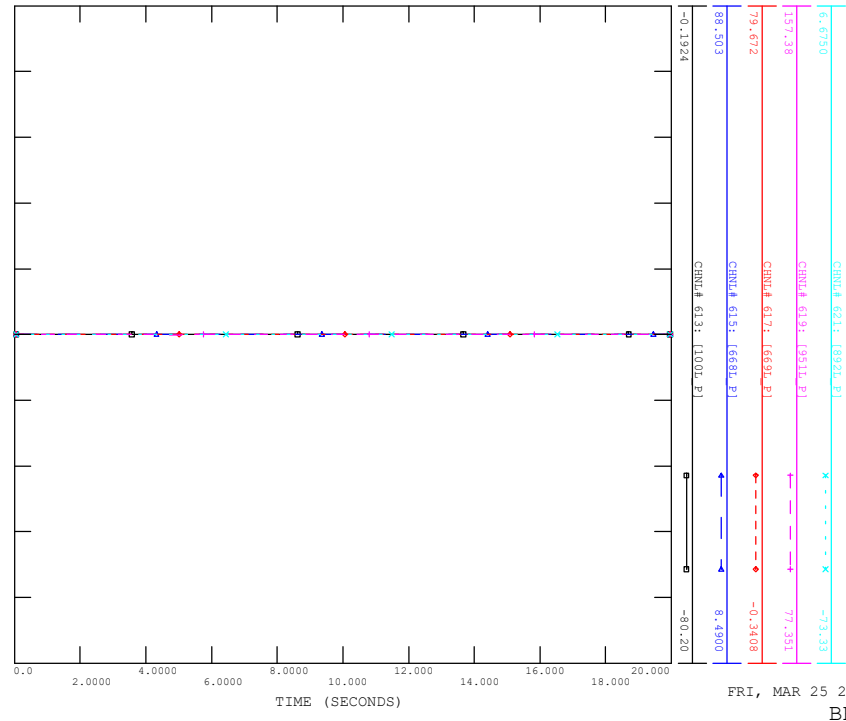
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: Scn4\_sp\_nofault.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: Scn4\_sp\_nofault.out

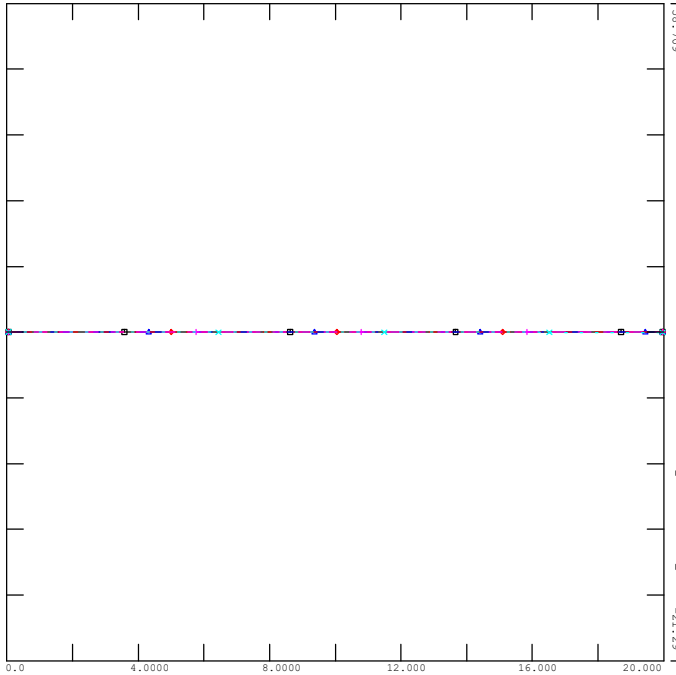


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT

FILE: Scn4\_sp\_nofault.out

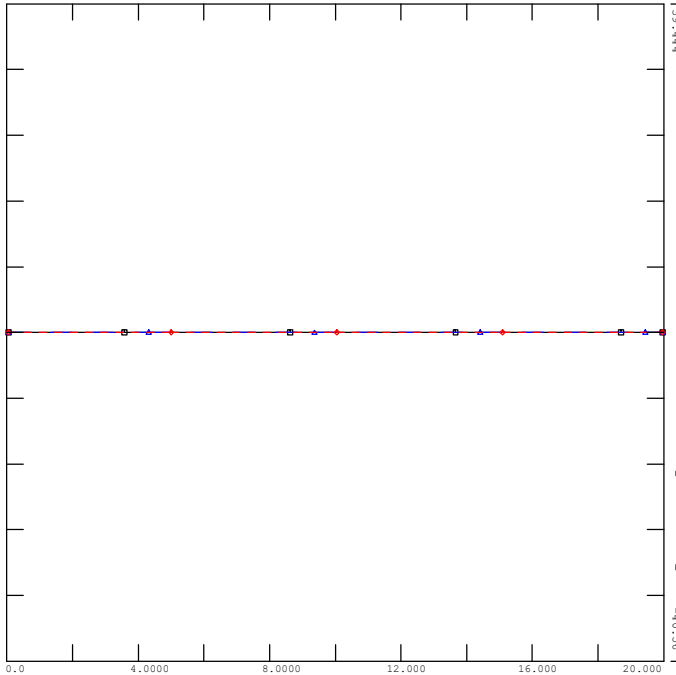


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT

FILE: Scn4\_sp\_nofault.out

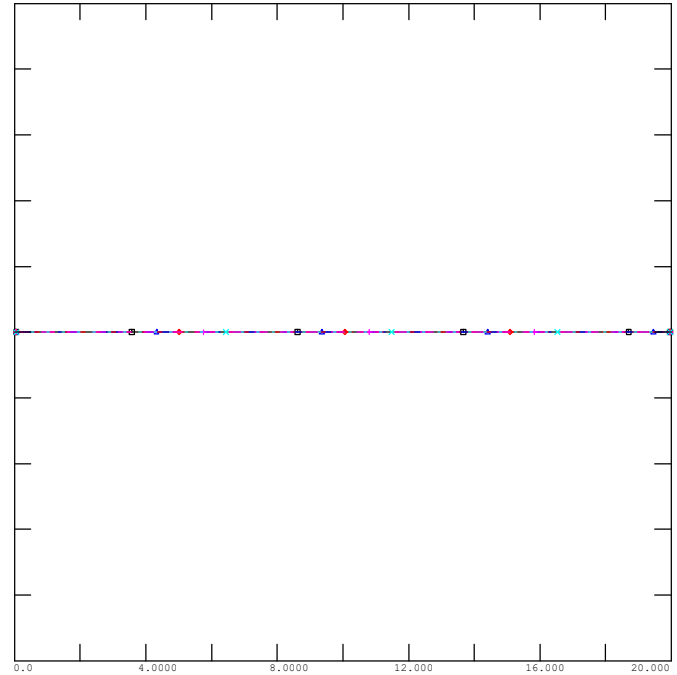


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT

FILE: Scn4\_sp\_nofault.out

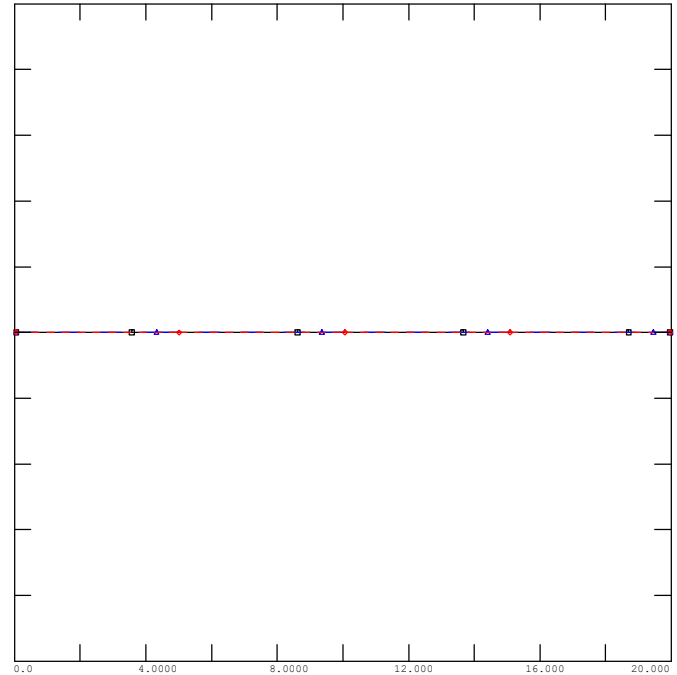


FRI, MAR 25 2022 10:53  
BRANCH P



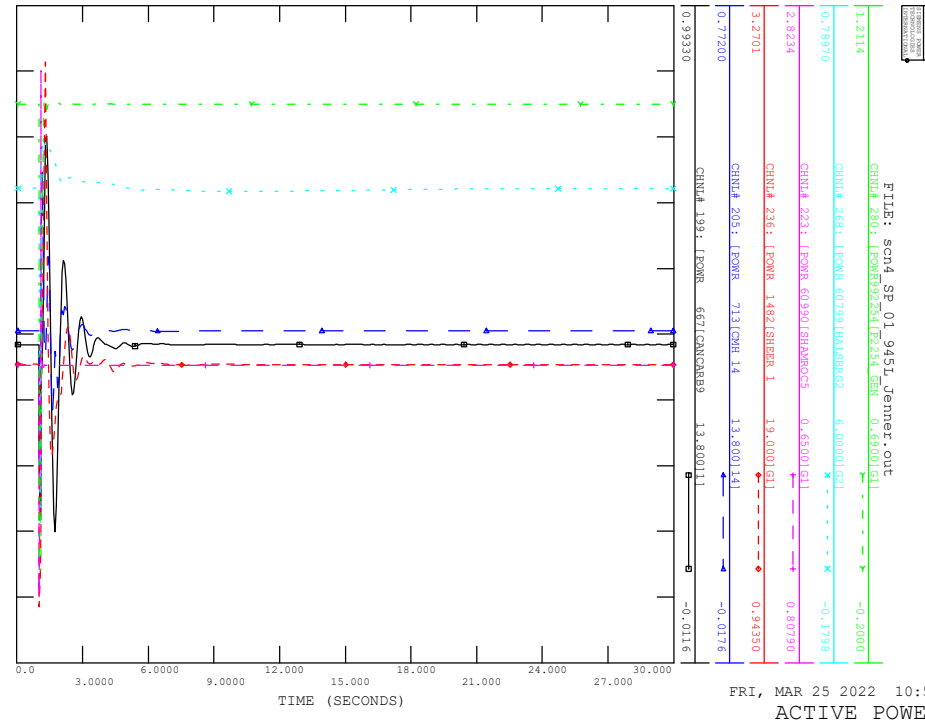
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_NOFAULT

FILE: Scn4\_sp\_nofault.out

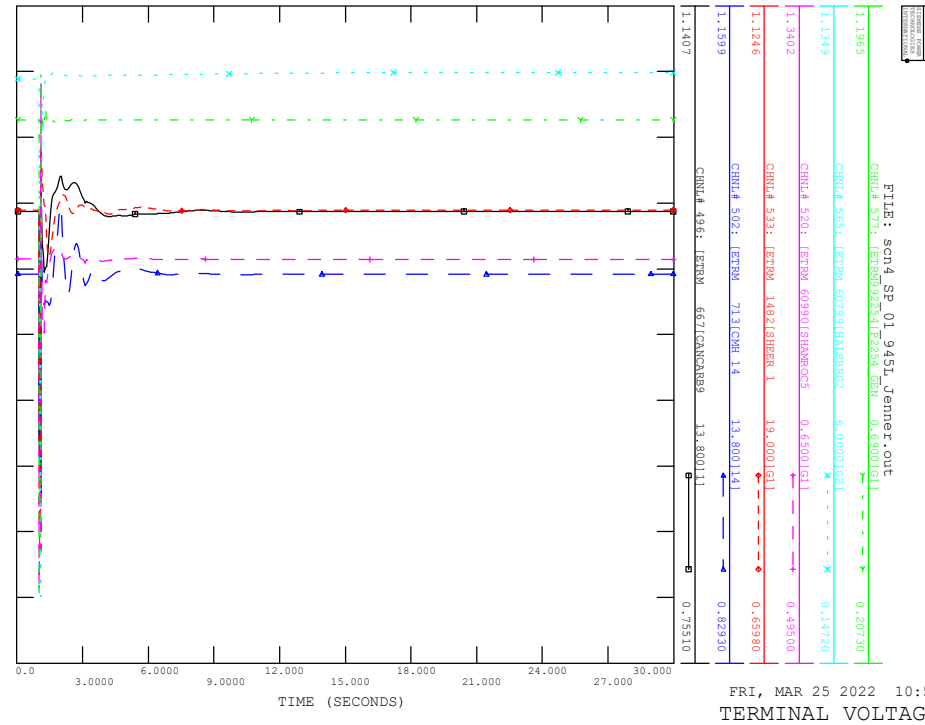


FRI, MAR 25 2022 10:53  
BRANCH P

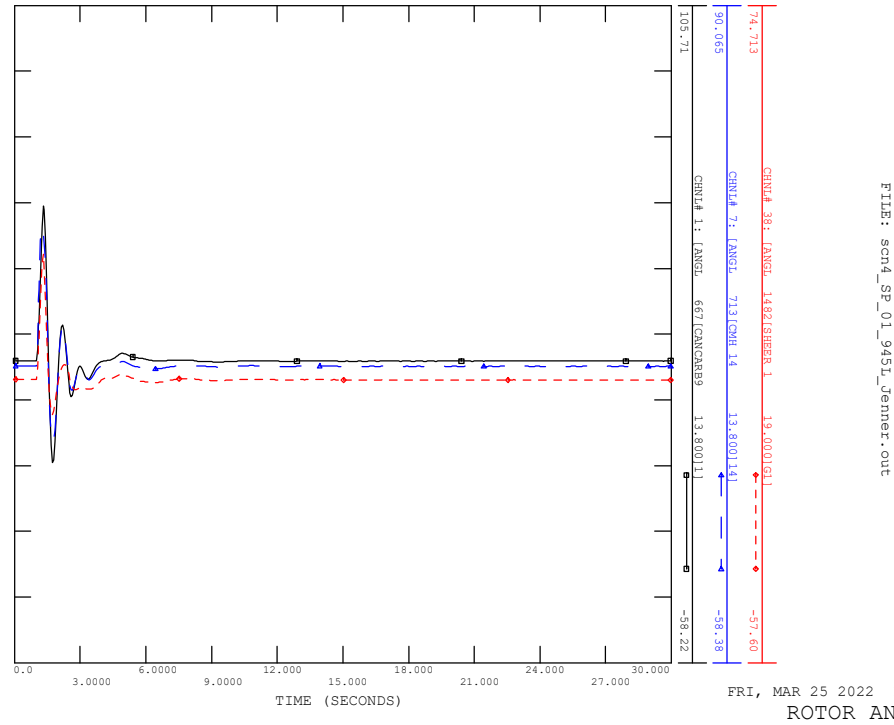
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER



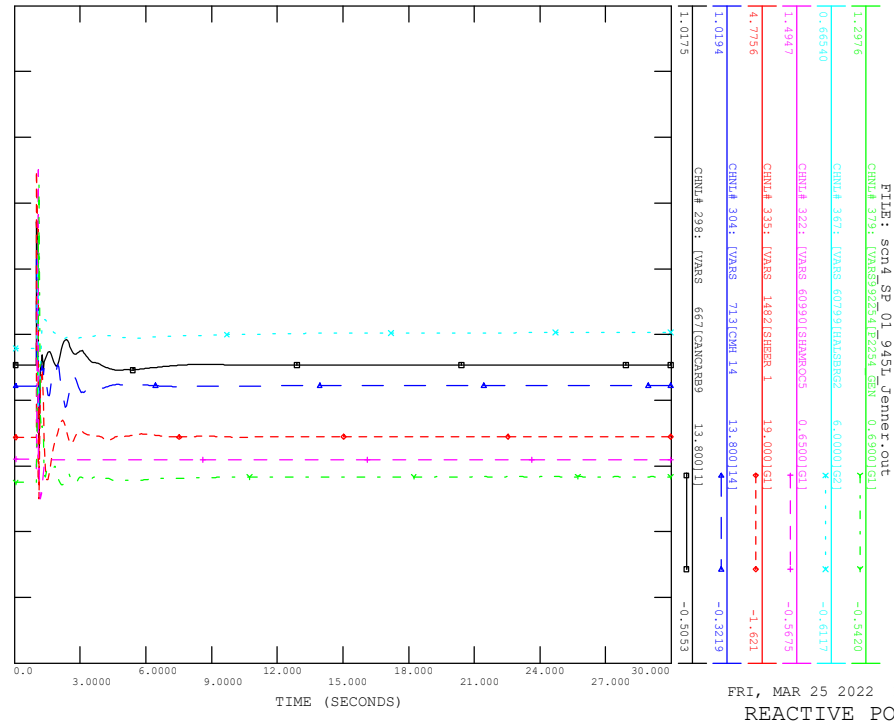
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER



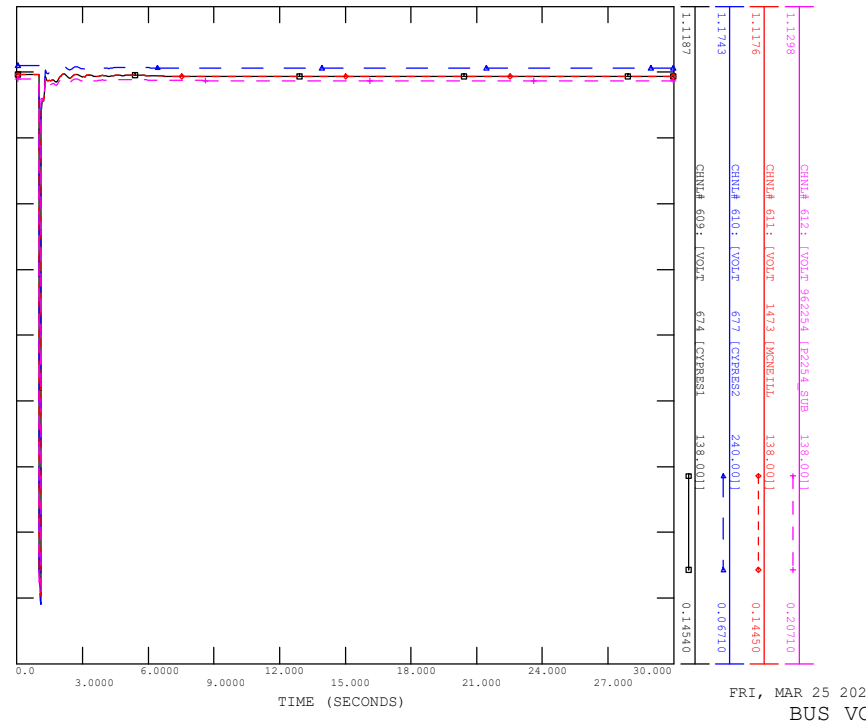
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER

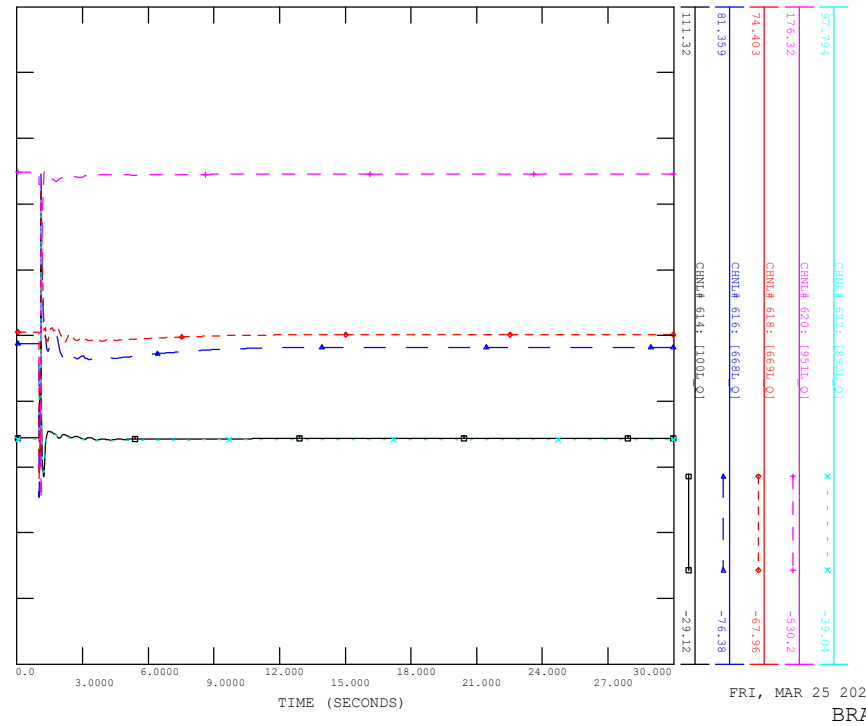


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER  
FILE: scn4\_sp\_01\_9451\_Jenner.out



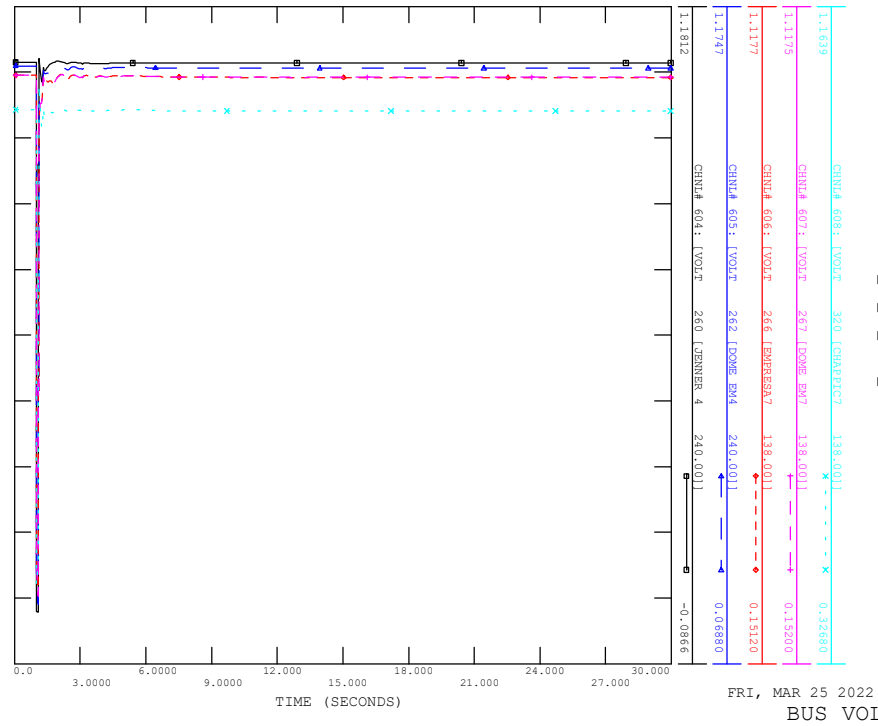
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER  
FILE: scn4\_sp\_01\_9451\_Jenner.out



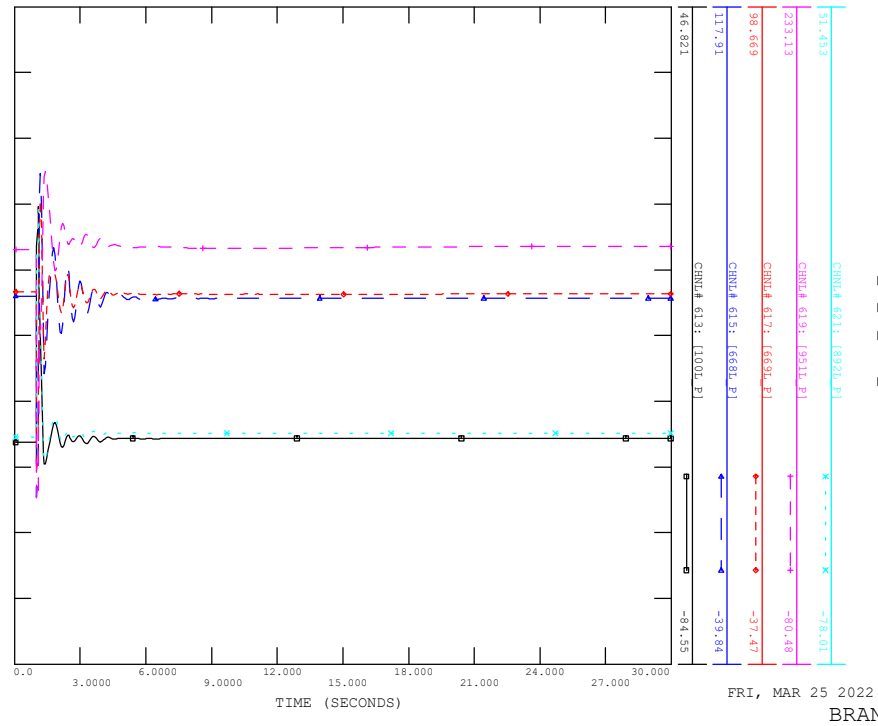
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER  
FILE: scn4\_sp\_01\_9451\_Jenner.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

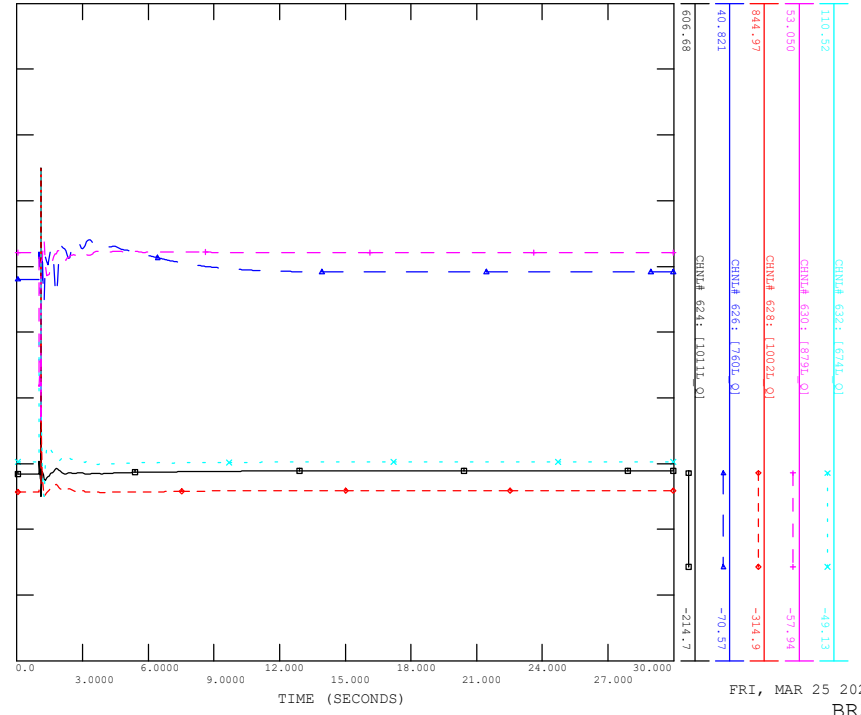
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_9451\_JENNER  
FILE: scn4\_sp\_01\_9451\_Jenner.out



FRI, MAR 25 2022 10:53  
BRANCH P

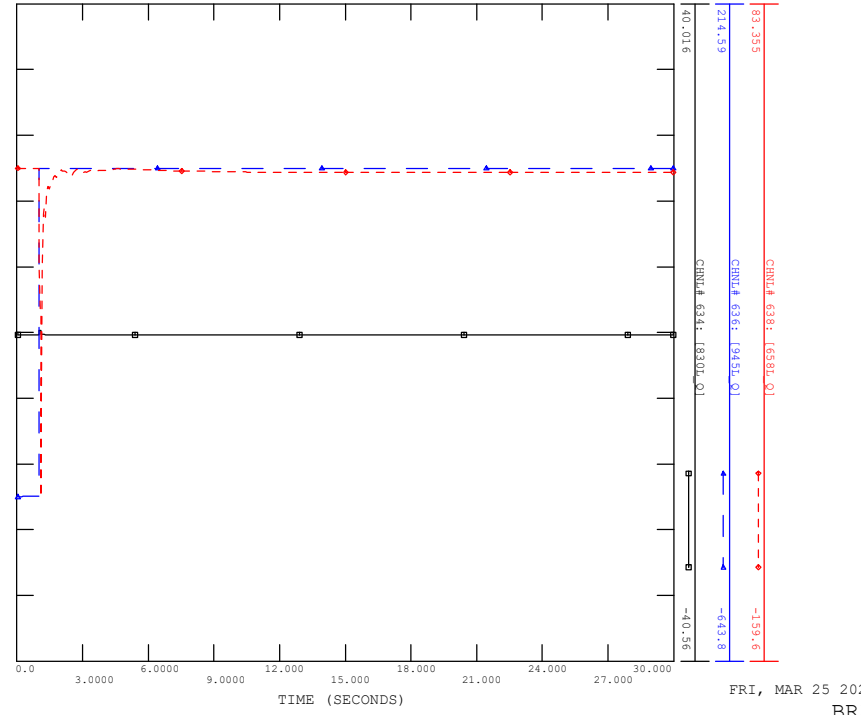
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_945L\_JENNER

FILE: scn4\_sp\_01\_945L\_Jenner.out



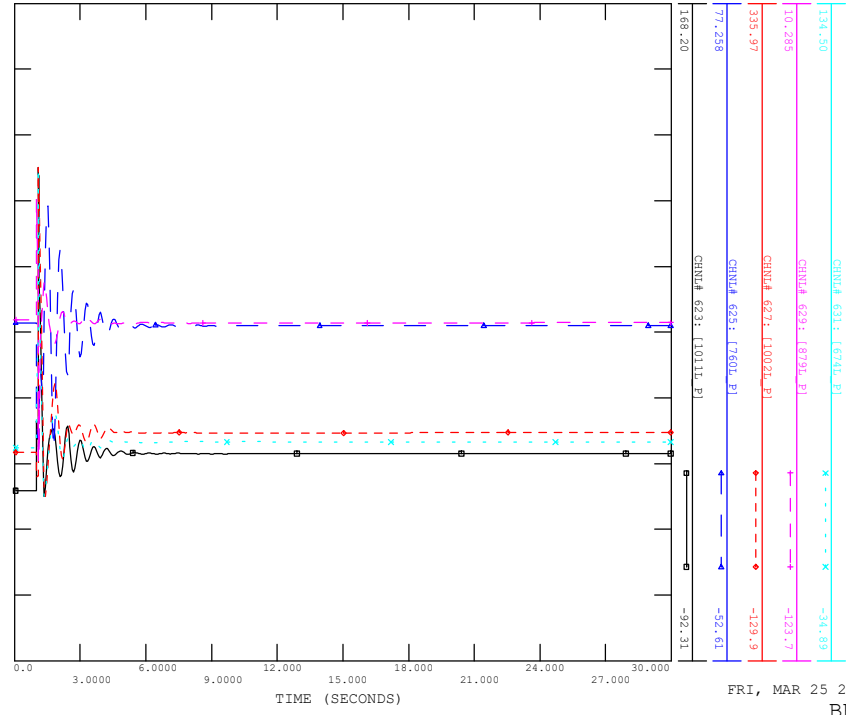
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_945L\_JENNER

FILE: scn4\_sp\_01\_945L\_Jenner.out



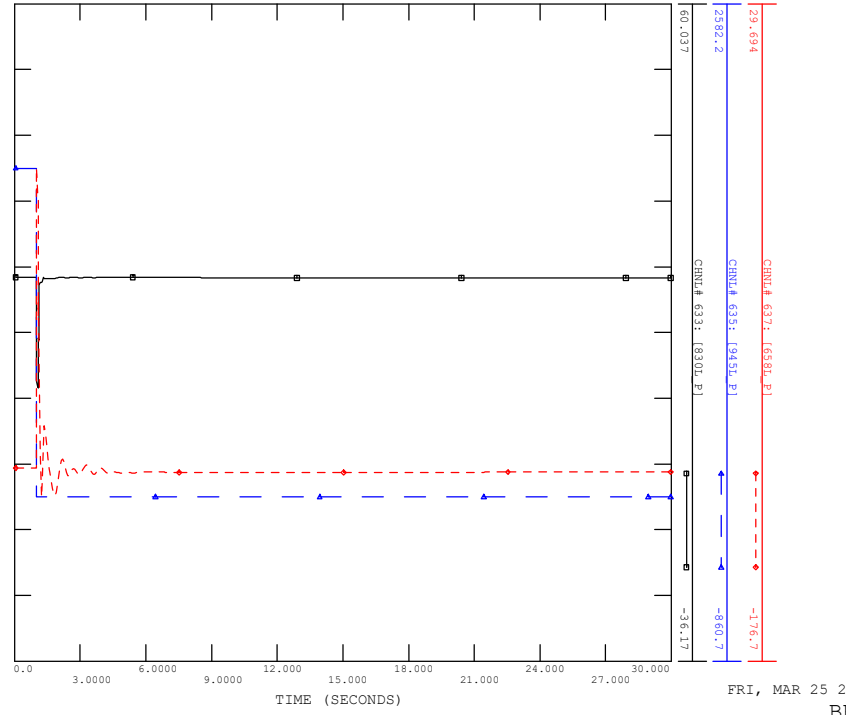
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_945L\_JENNER

FILE: scn4\_sp\_01\_945L\_Jenner.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_01\_945L\_JENNER

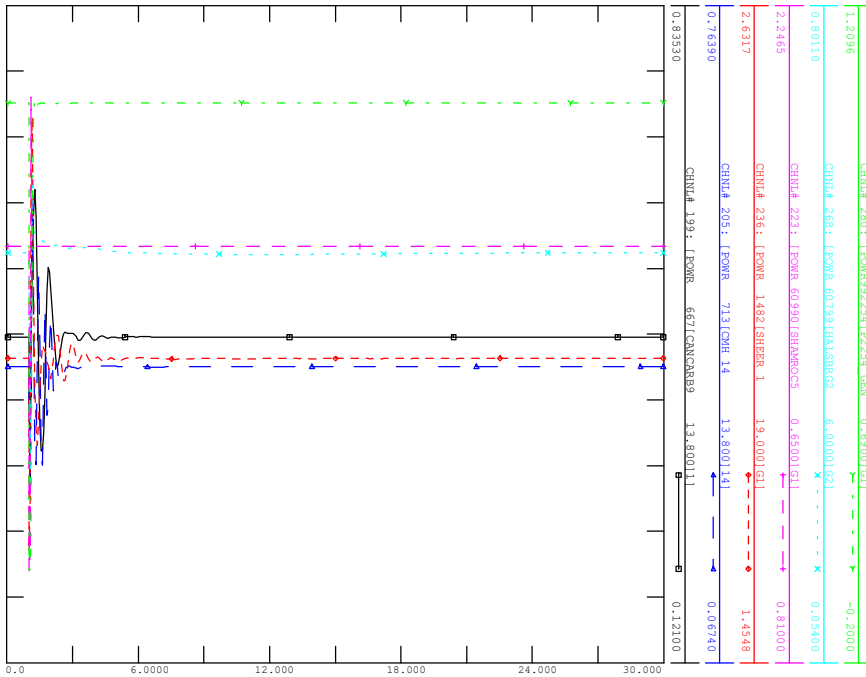
FILE: scn4\_sp\_01\_945L\_Jenner.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_9451\_CYPRESS



FILE: scn4\_sp\_02\_9451\_Cypress.out

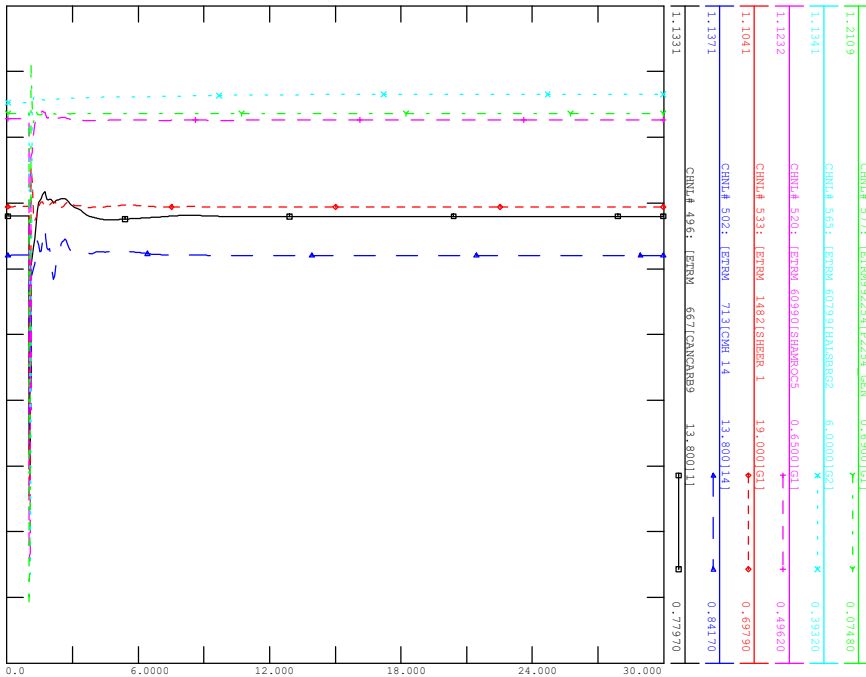


FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_9451\_CYPRESS



FILE: scn4\_sp\_02\_9451\_Cypress.out

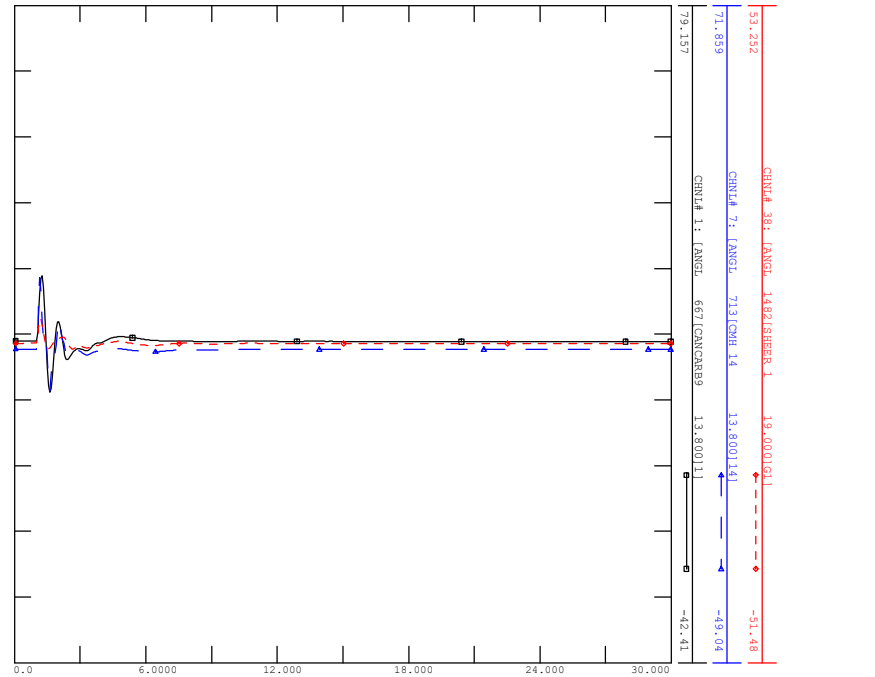


FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_9451\_CYPRESS



FILE: scn4\_sp\_02\_9451\_Cypress.out

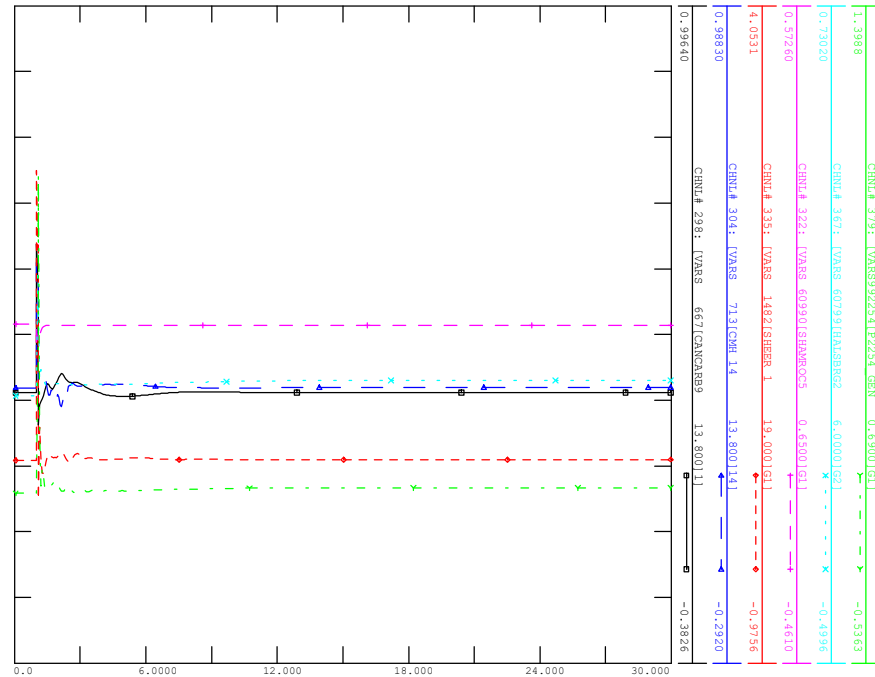


FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_9451\_CYPRESS



FILE: scn4\_sp\_02\_9451\_Cypress.out

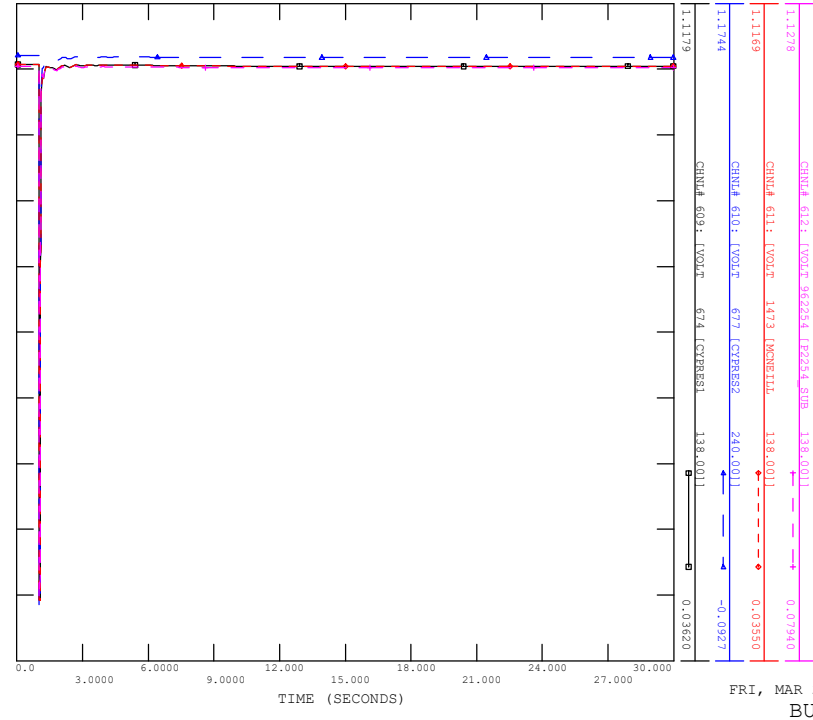


FRI, MAR 25 2022 10:53  
REACTIVE POWER



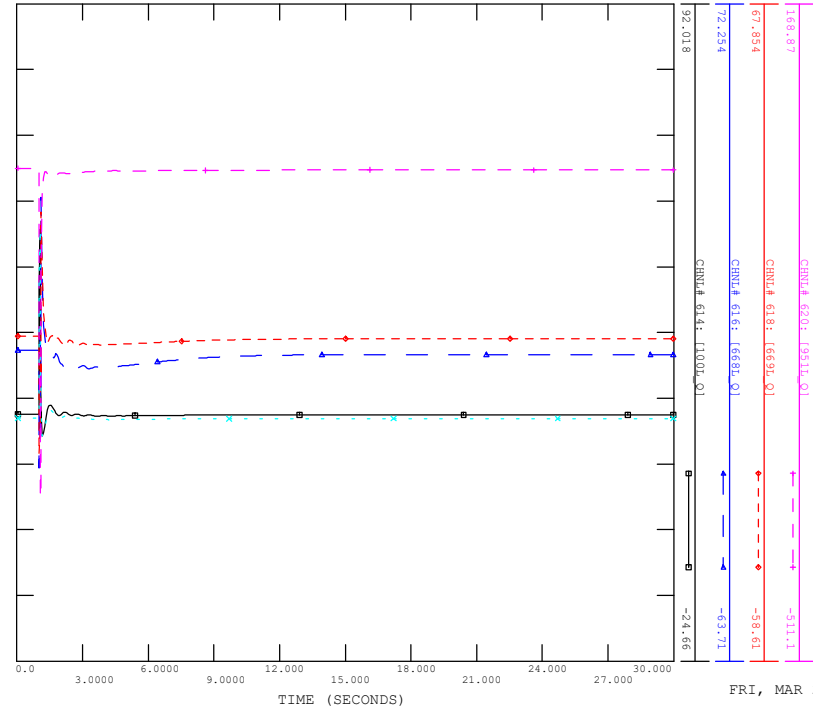
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out



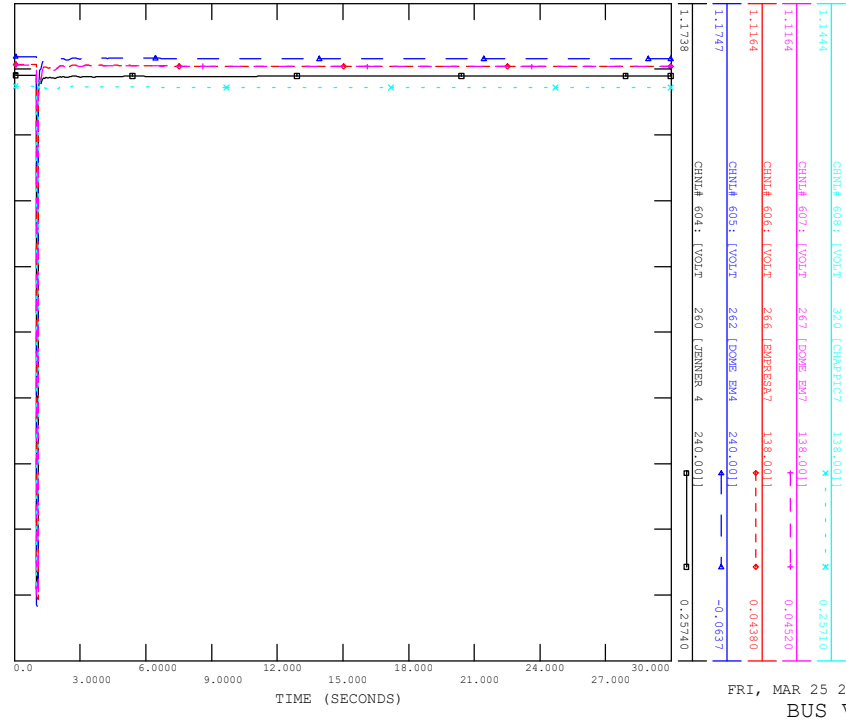
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out



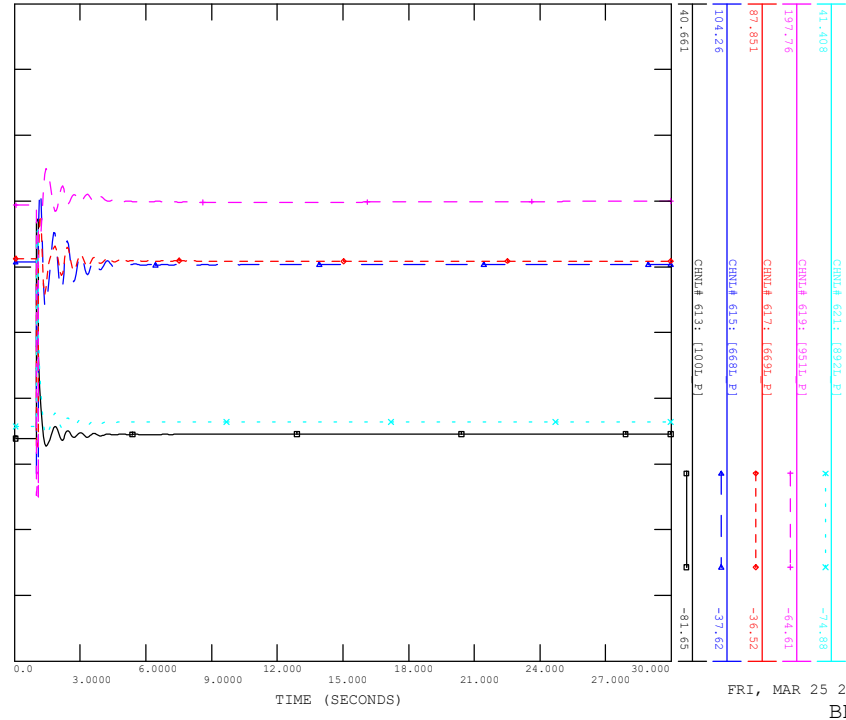
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

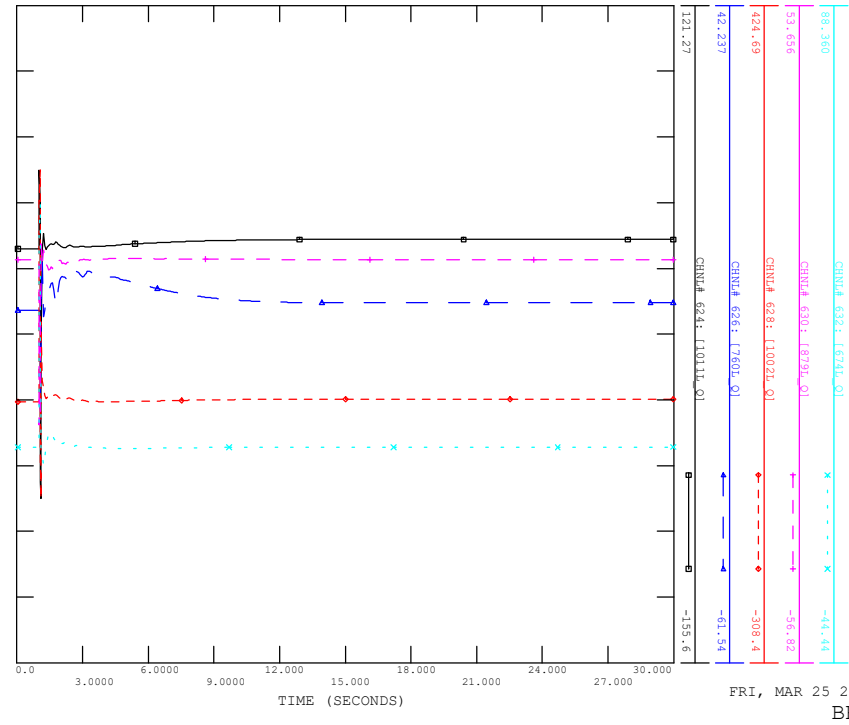
FILE: scn4\_sp\_02\_945L\_Cypress.out





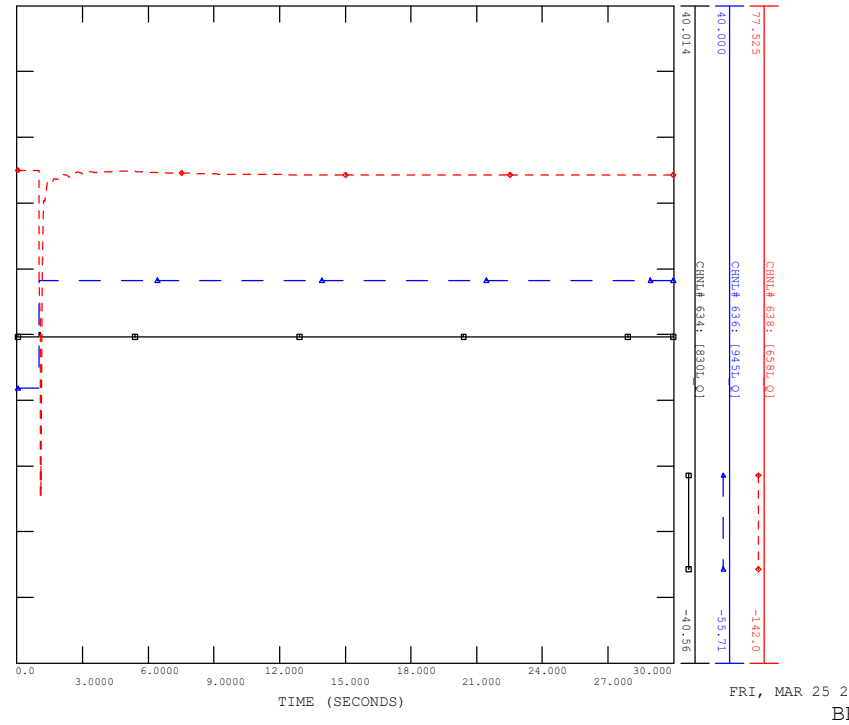
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out



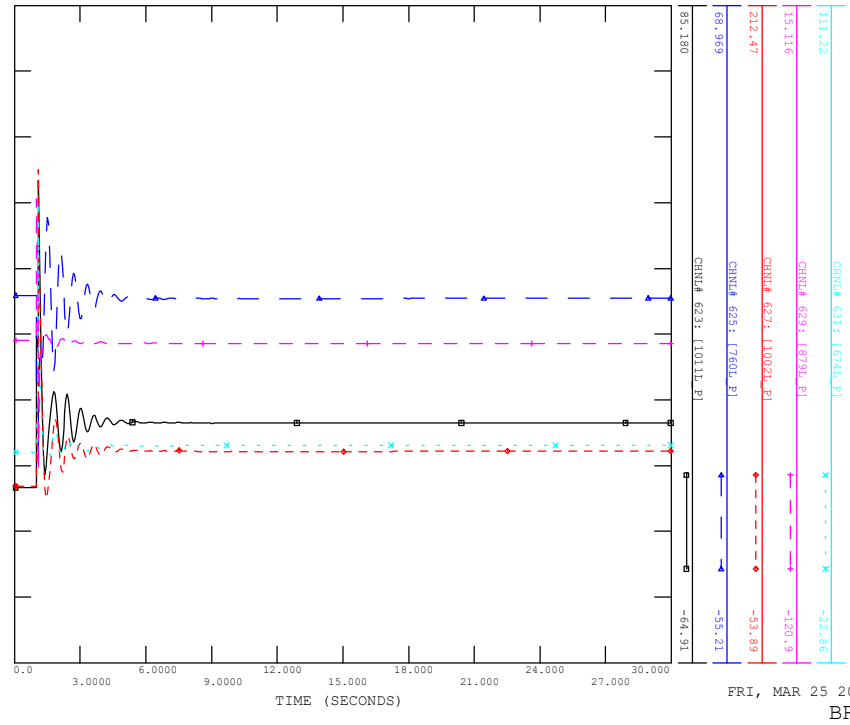
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out



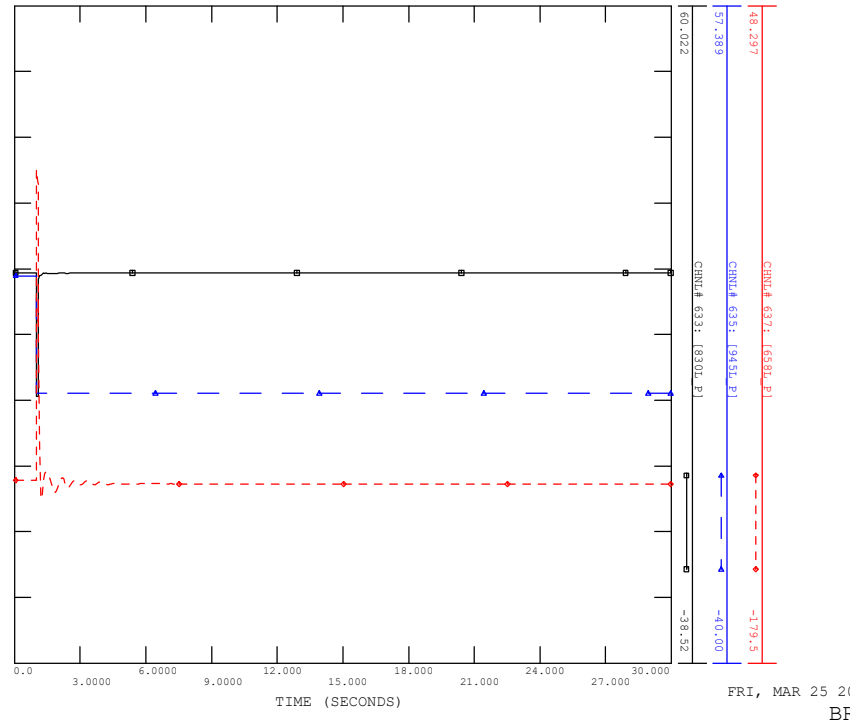
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

FILE: scn4\_sp\_02\_945L\_Cypress.out

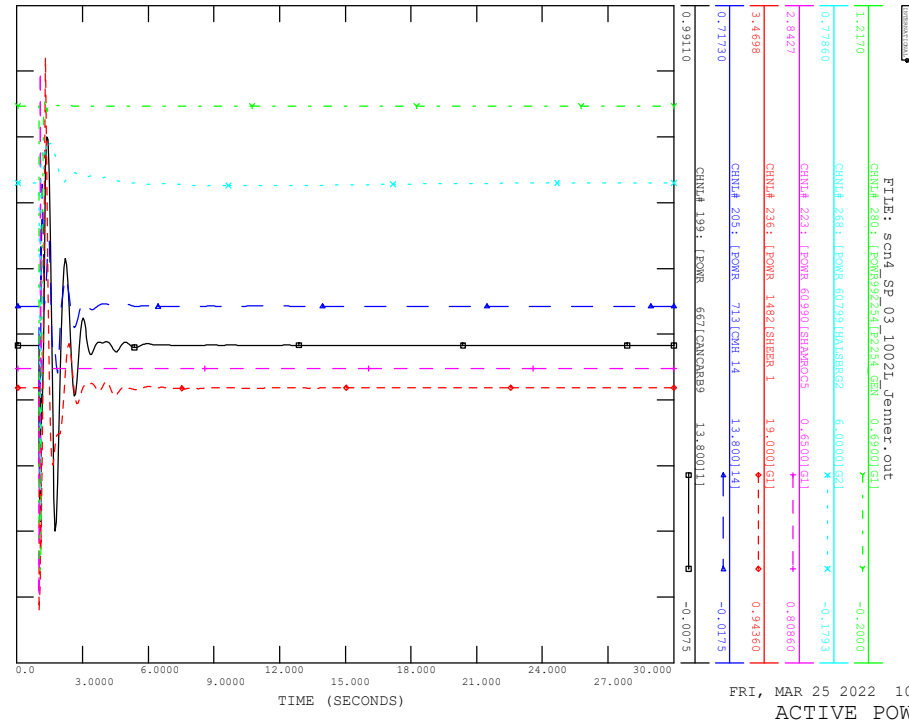


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_02\_945L\_CYPRESS

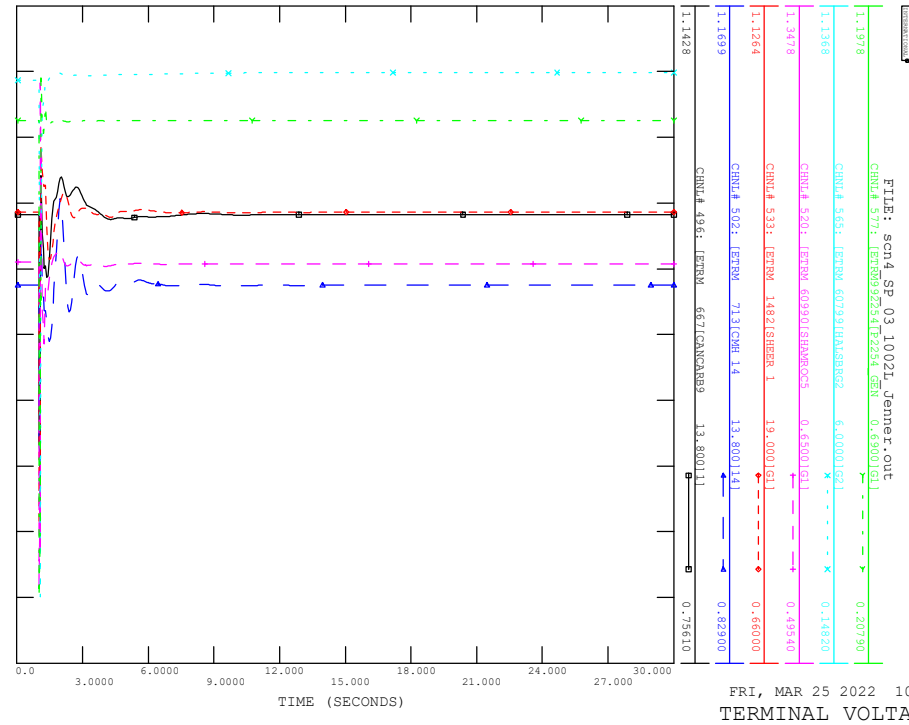
FILE: scn4\_sp\_02\_945L\_Cypress.out



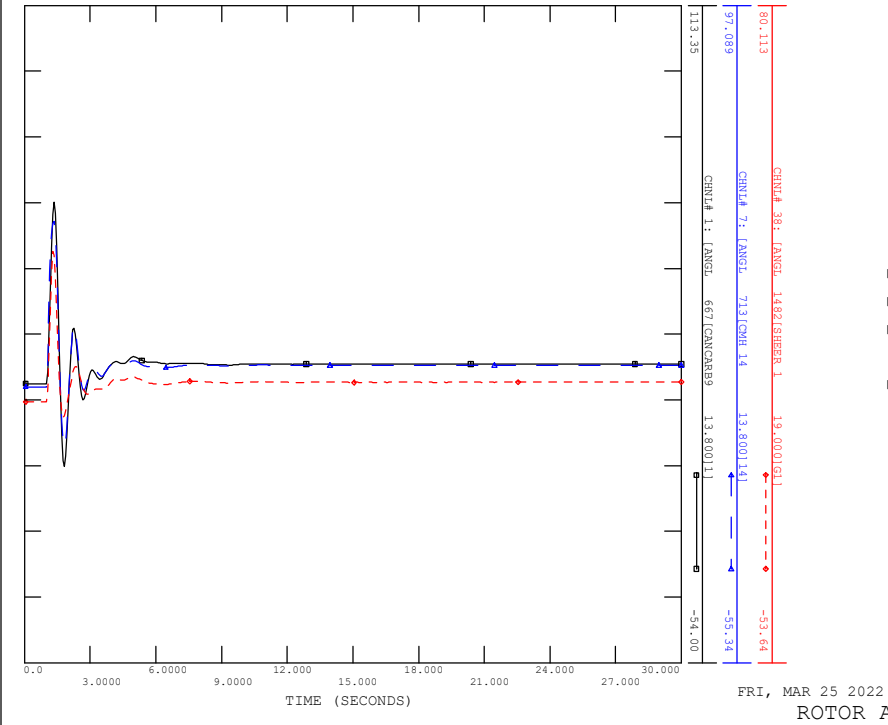
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER



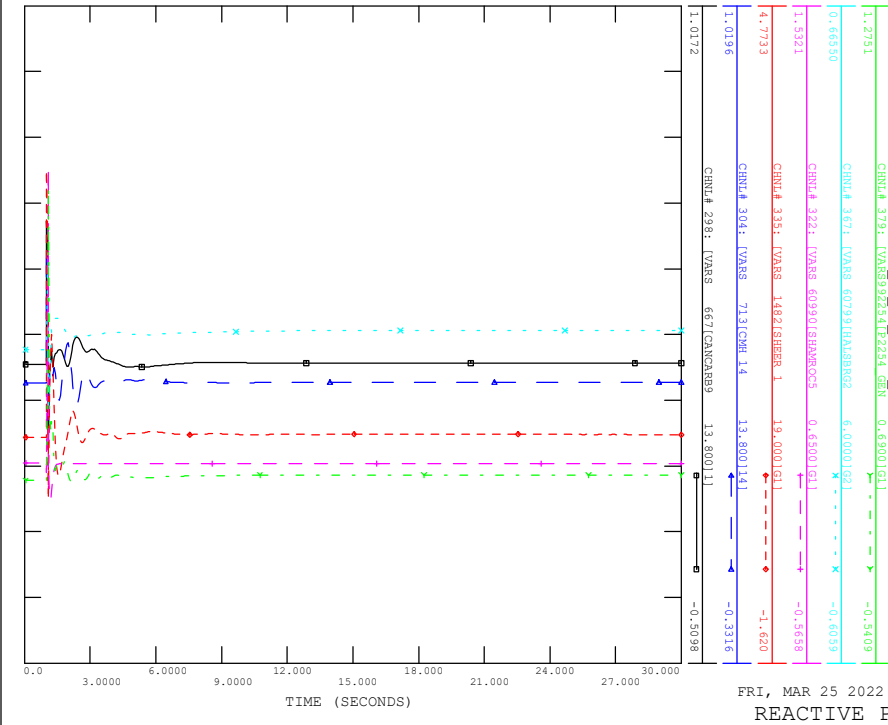
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

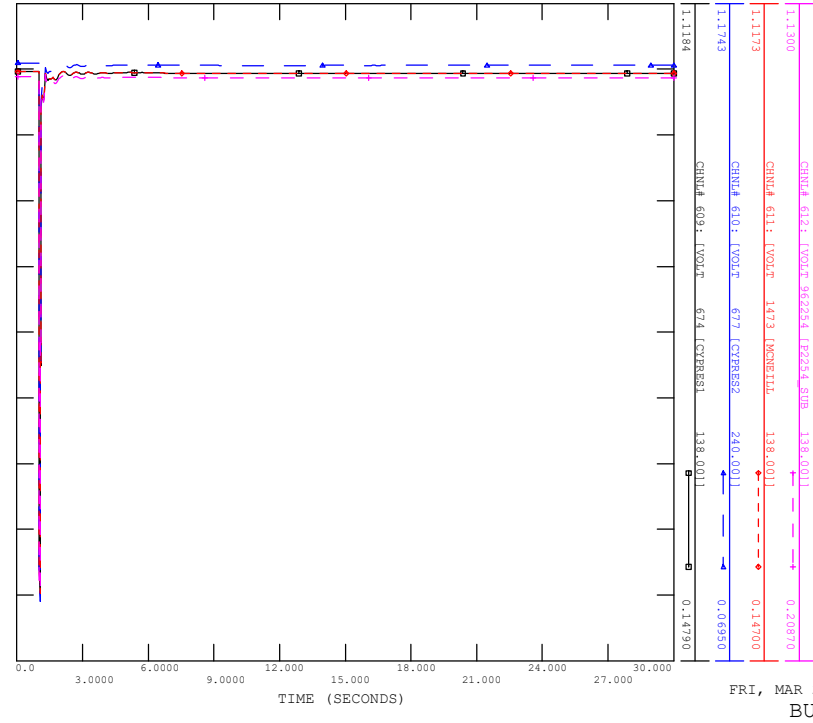


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

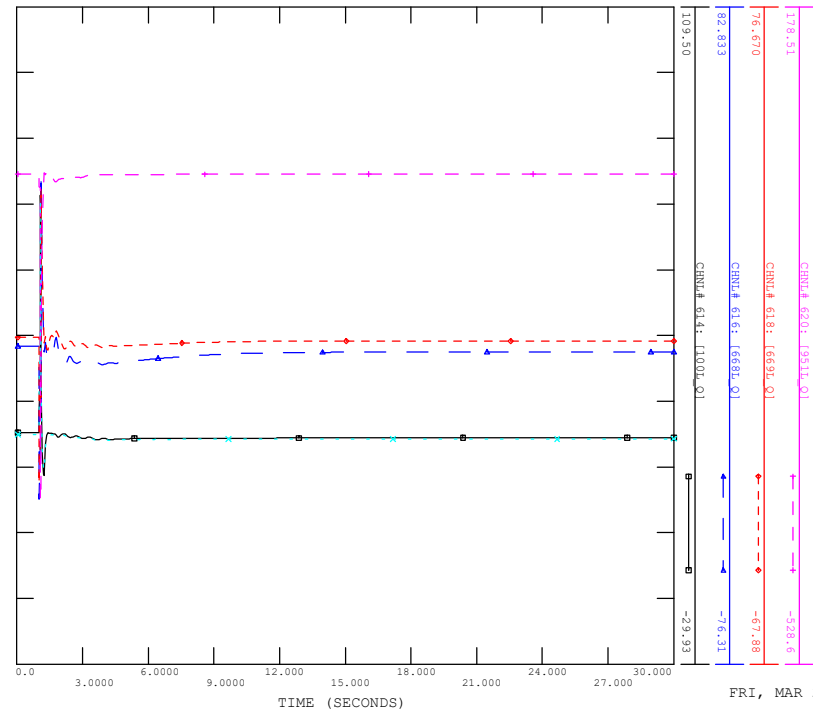
FILE: scn4\_sp\_03\_1002L\_Jenner.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

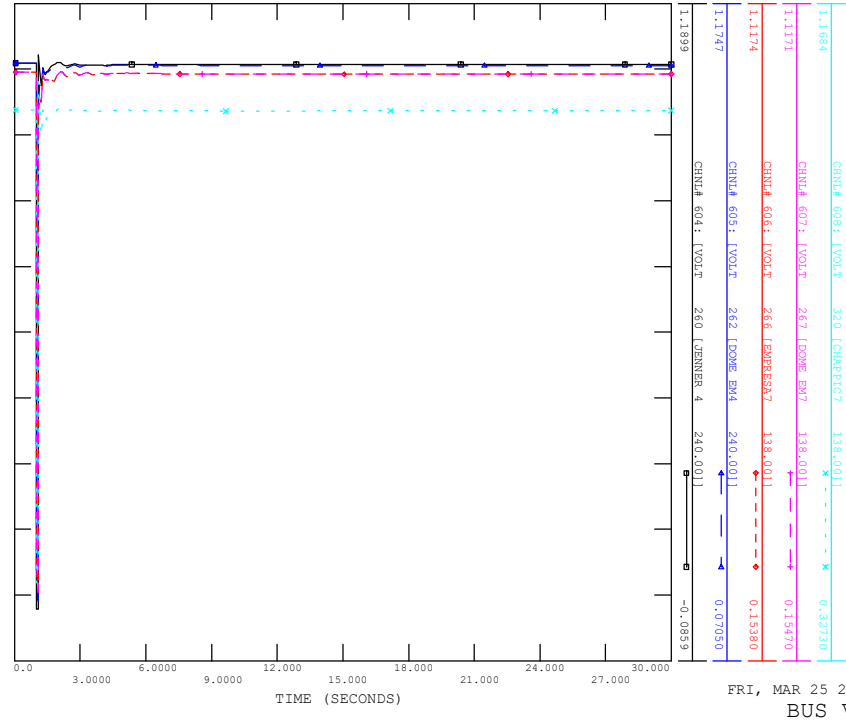
FILE: scn4\_sp\_03\_1002L\_Jenner.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

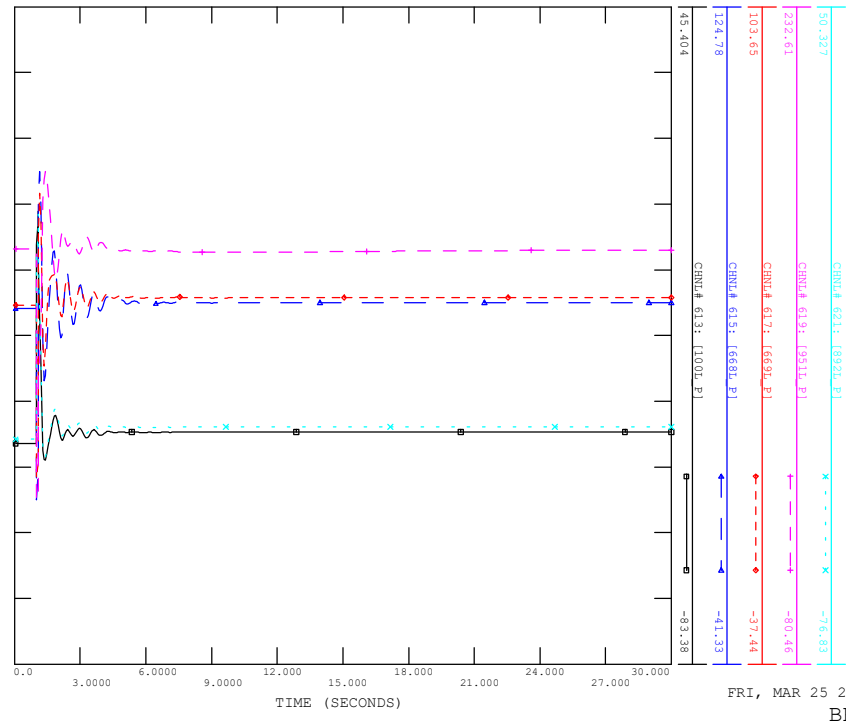
FILE: scn4\_sp\_03\_1002L\_Jenner.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

FILE: scn4\_sp\_03\_1002L\_Jenner.out

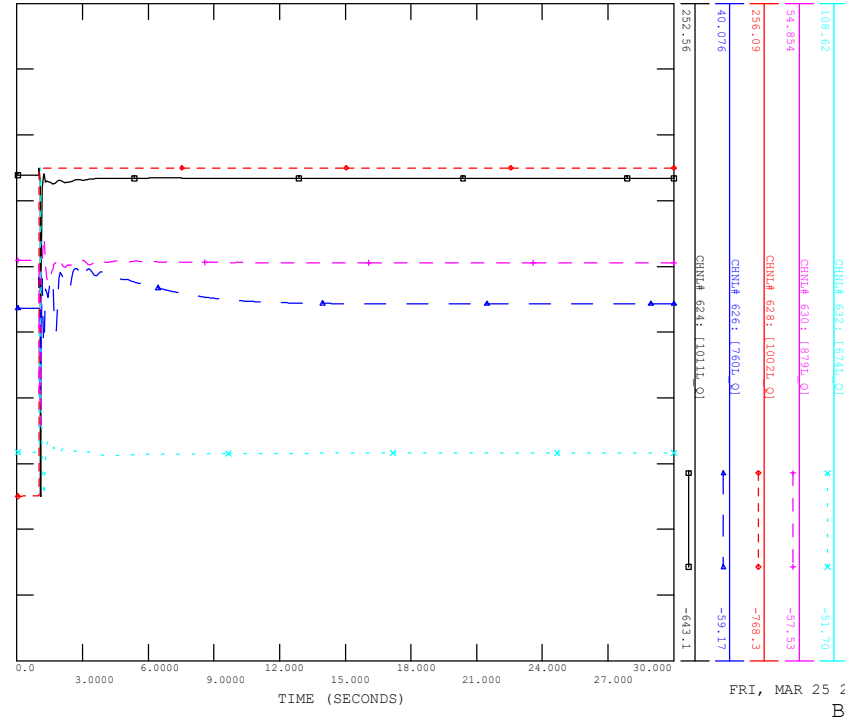


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

FILE: scn4\_sp\_03\_1002L\_jenner.out

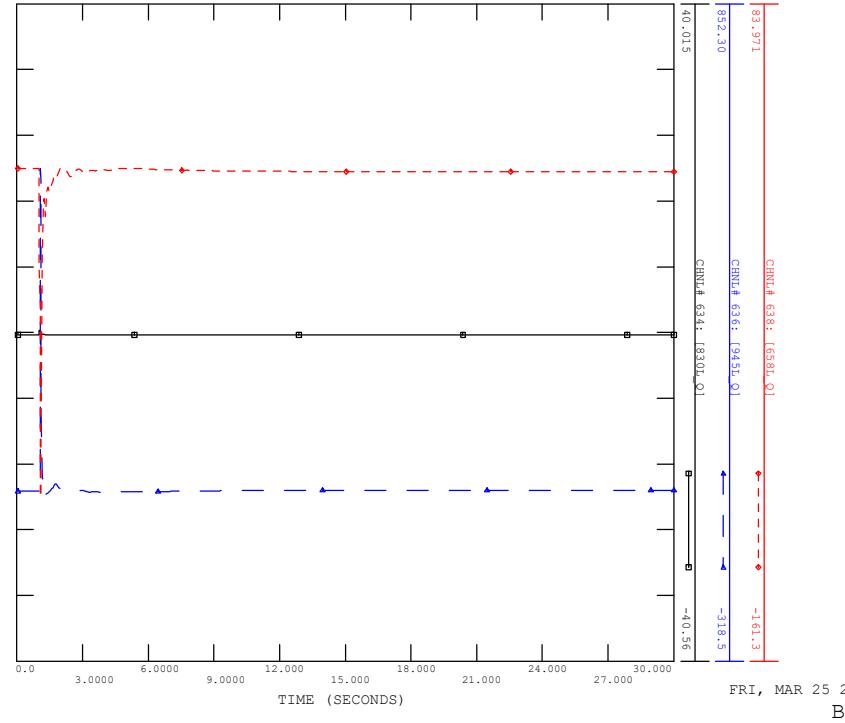


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

FILE: scn4\_sp\_03\_1002L\_jenner.out

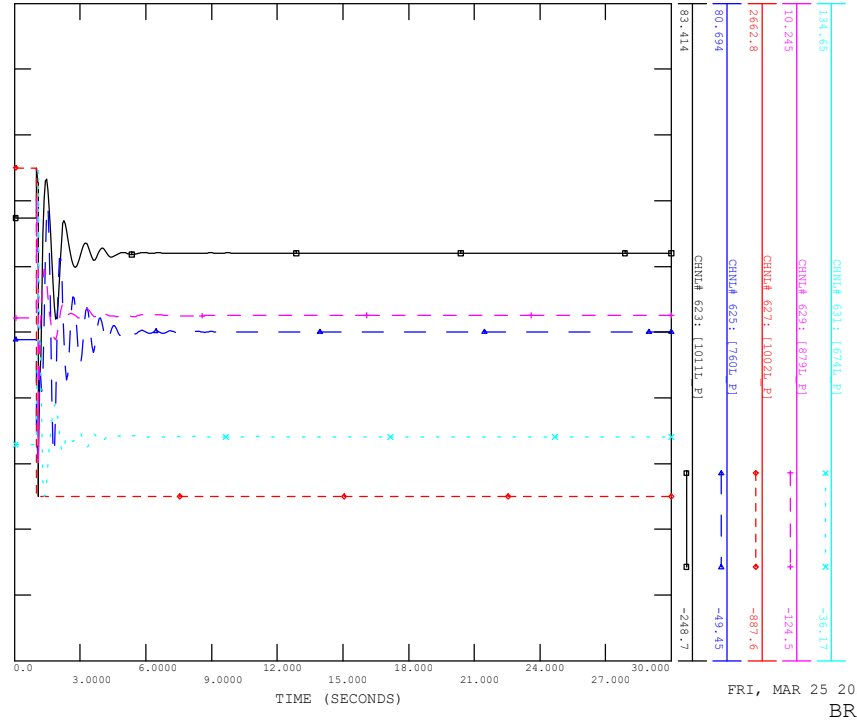


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

FILE: scn4\_sp\_03\_1002L\_jenner.out

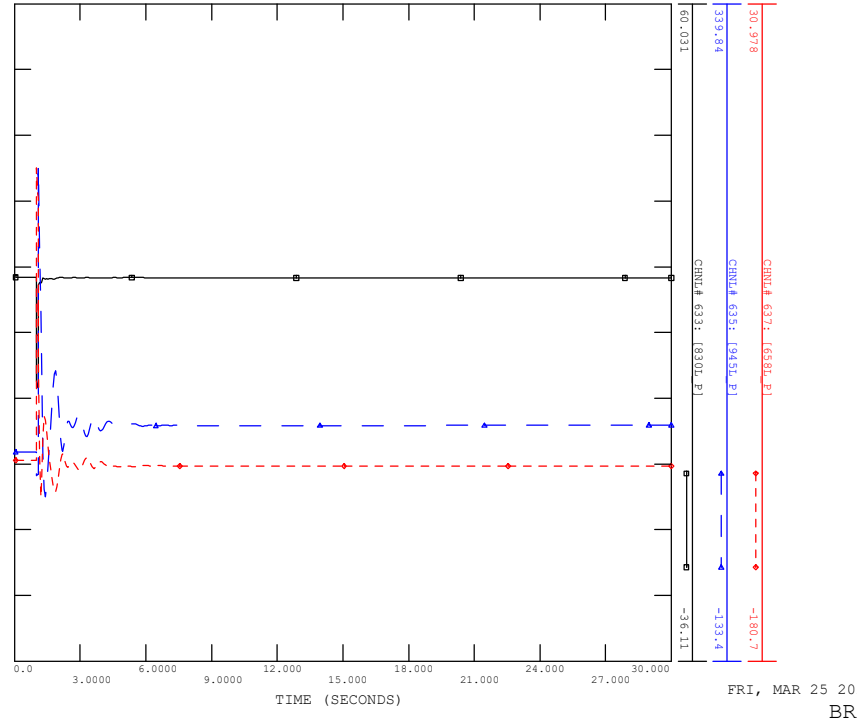


FRI, MAR 25 2022 10:53  
BRANCH P



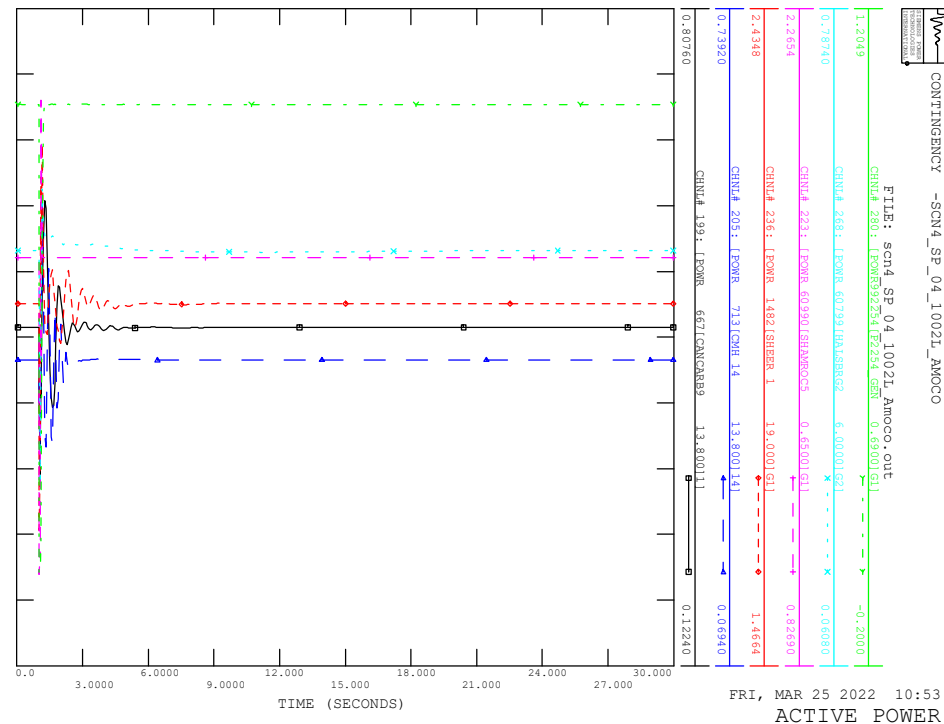
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_03\_1002L\_JENNER

FILE: scn4\_sp\_03\_1002L\_jenner.out

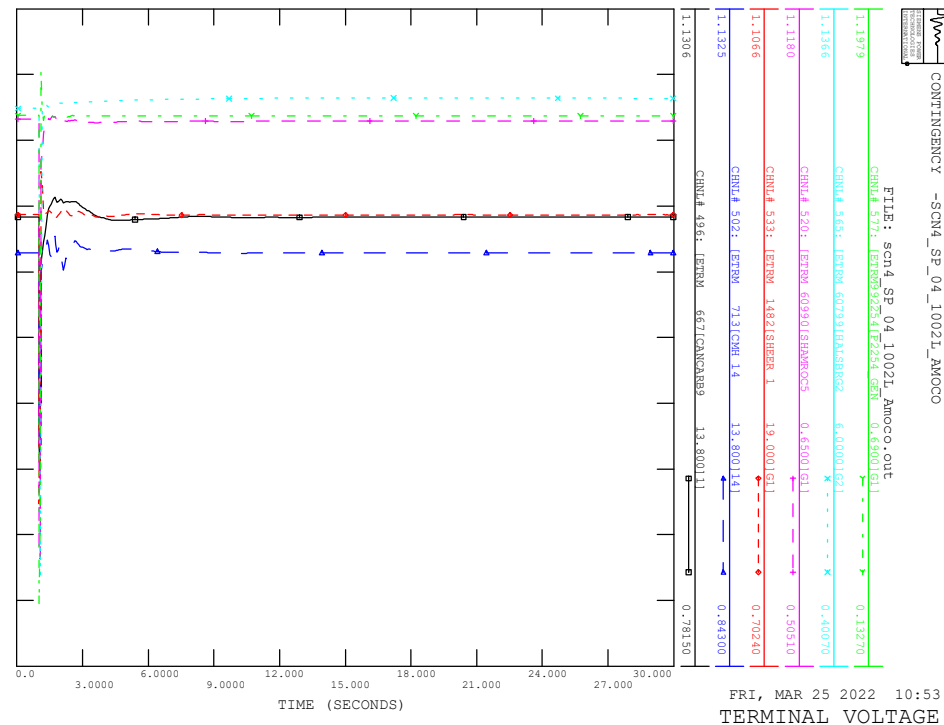


FRI, MAR 25 2022 10:53  
BRANCH P

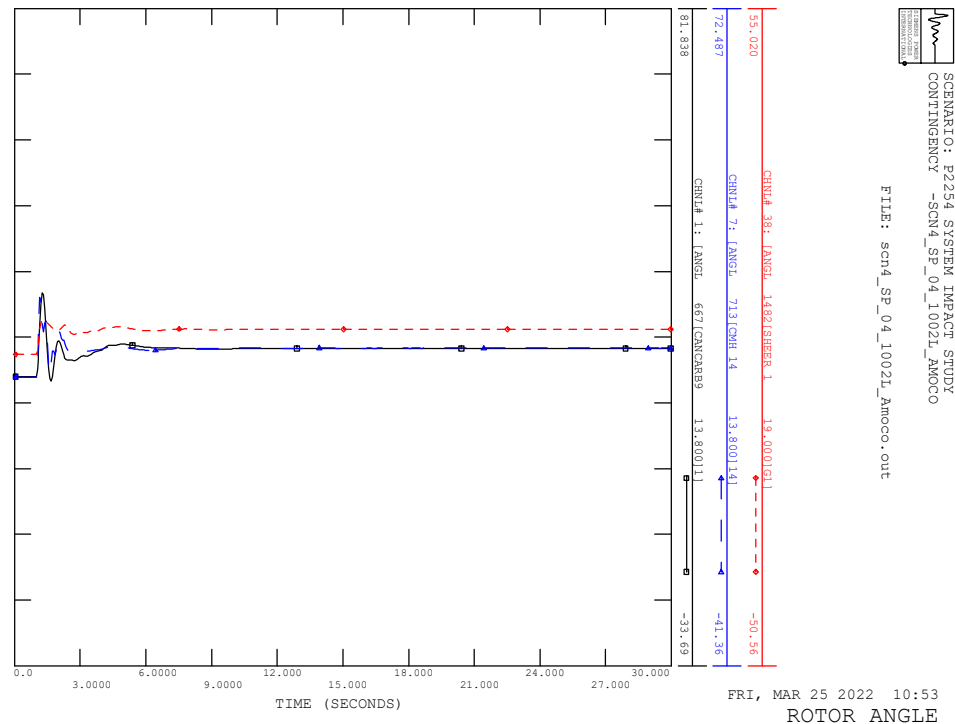
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO



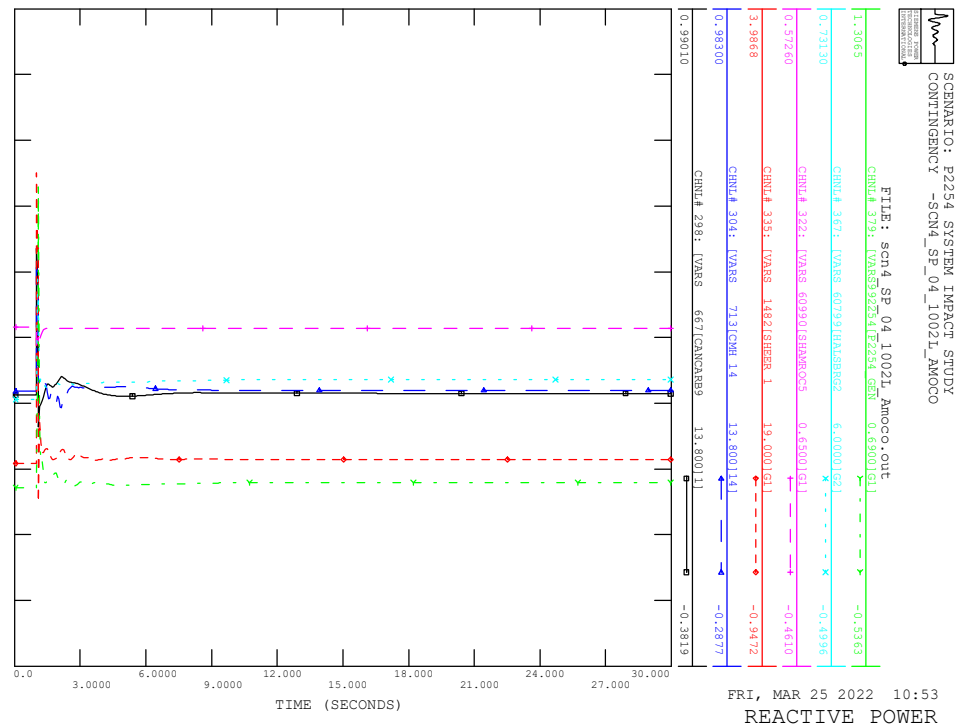
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO



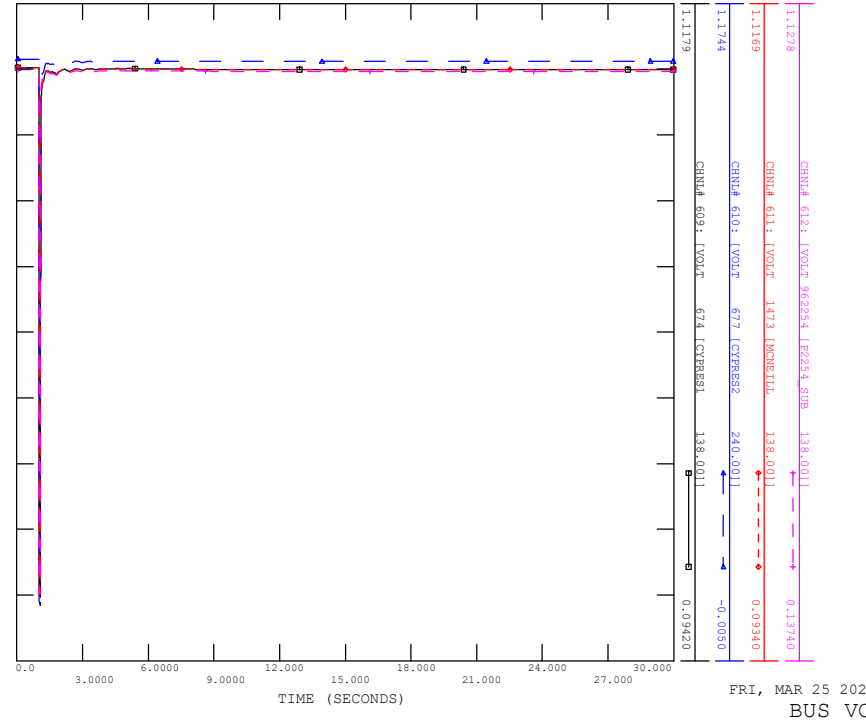
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO

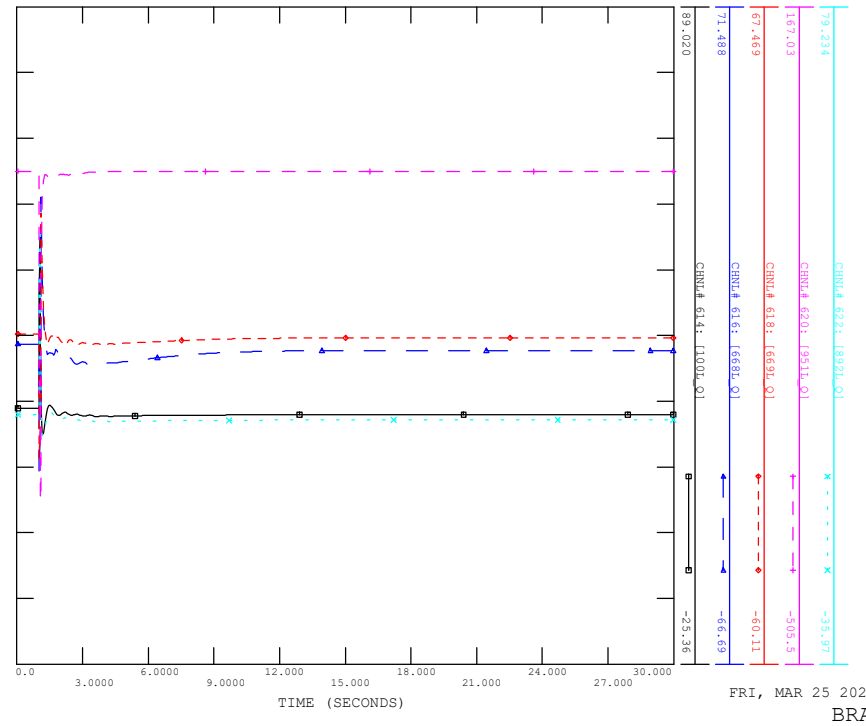


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out



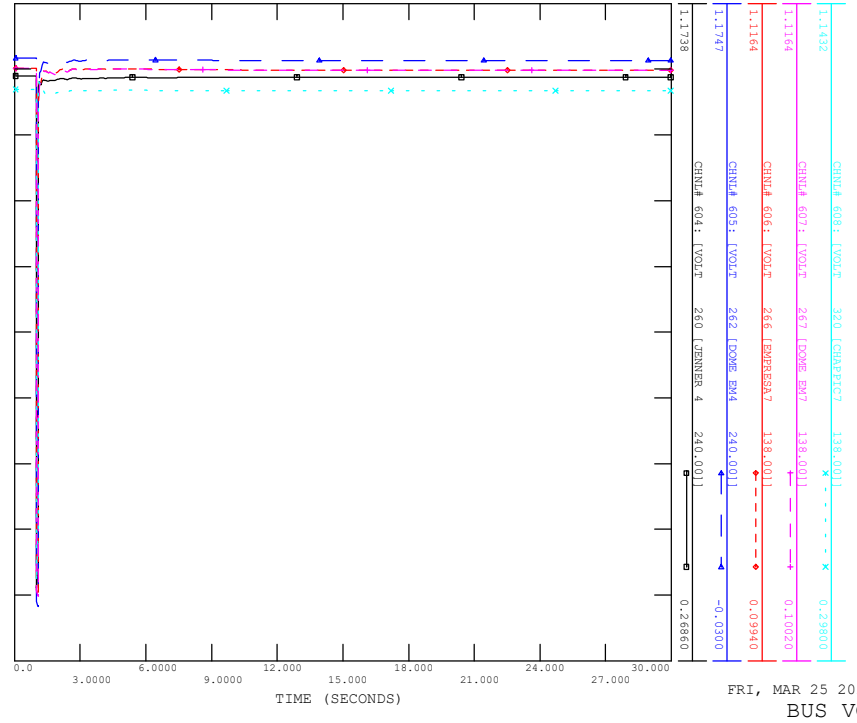
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out



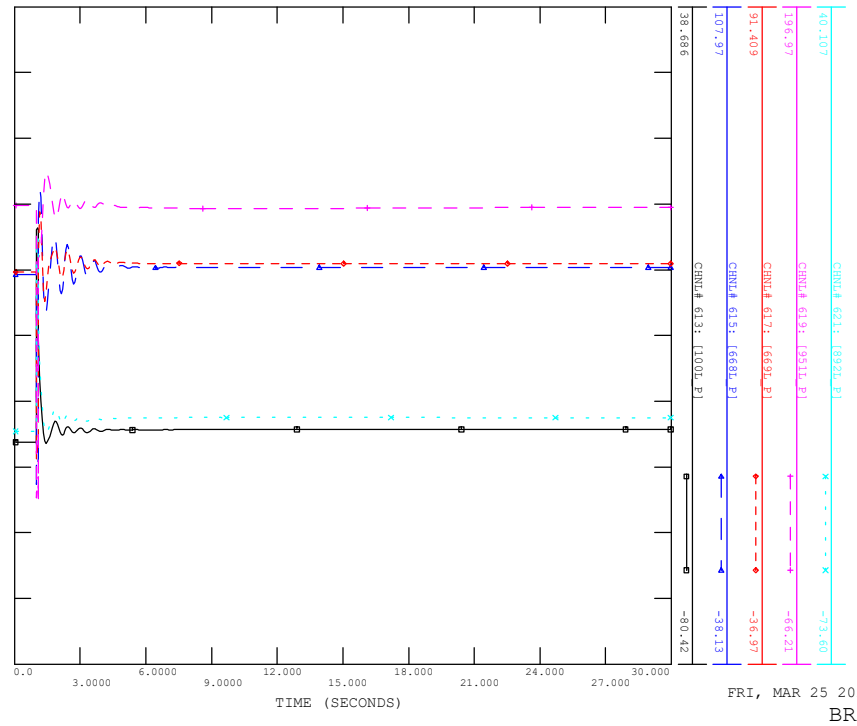
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out



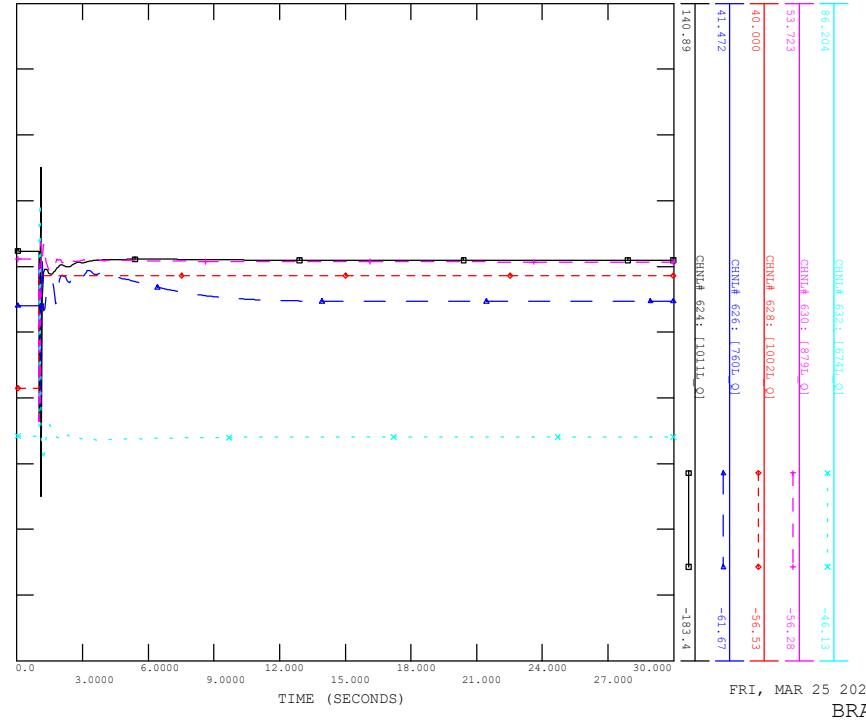
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out

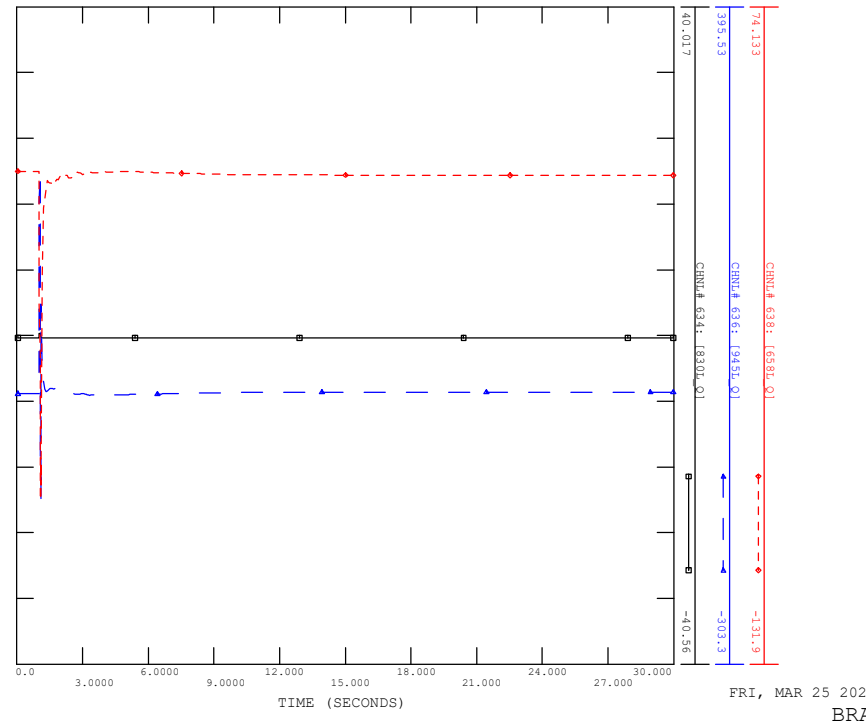


FRI, MAR 25 2022 10:53  
BRANCH P

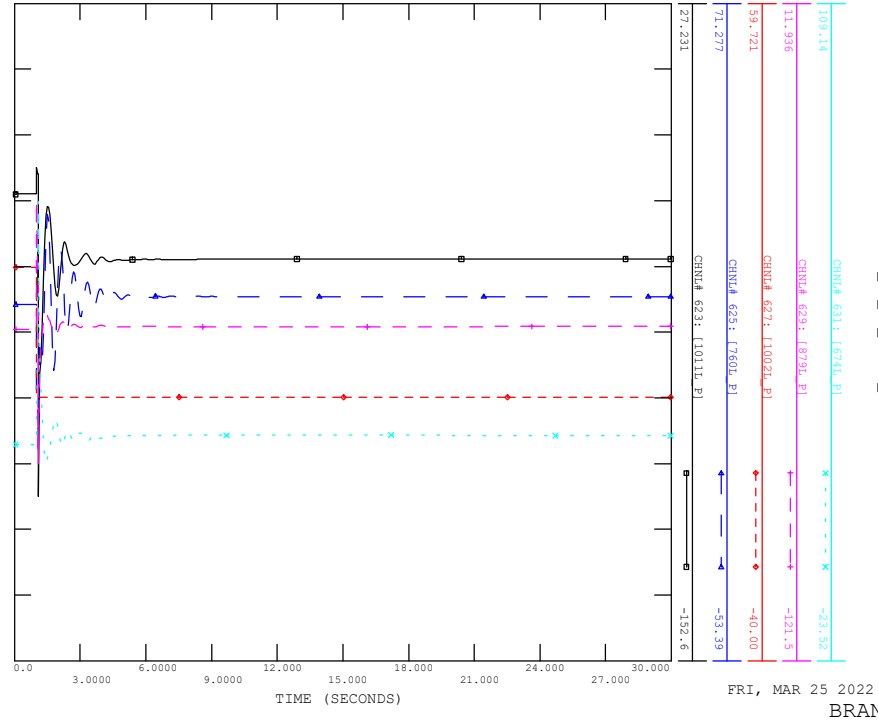
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out



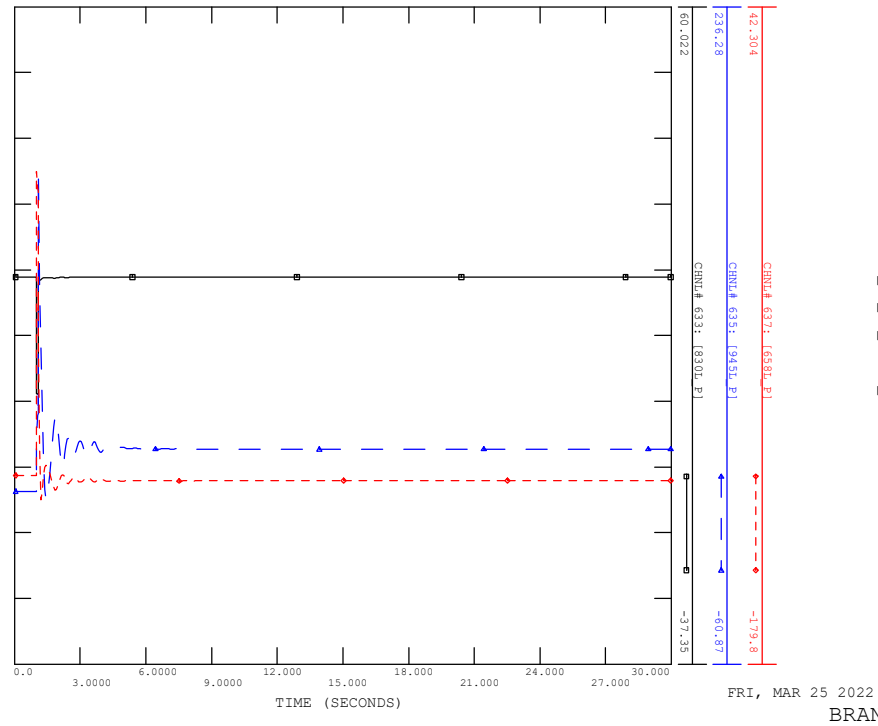
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out

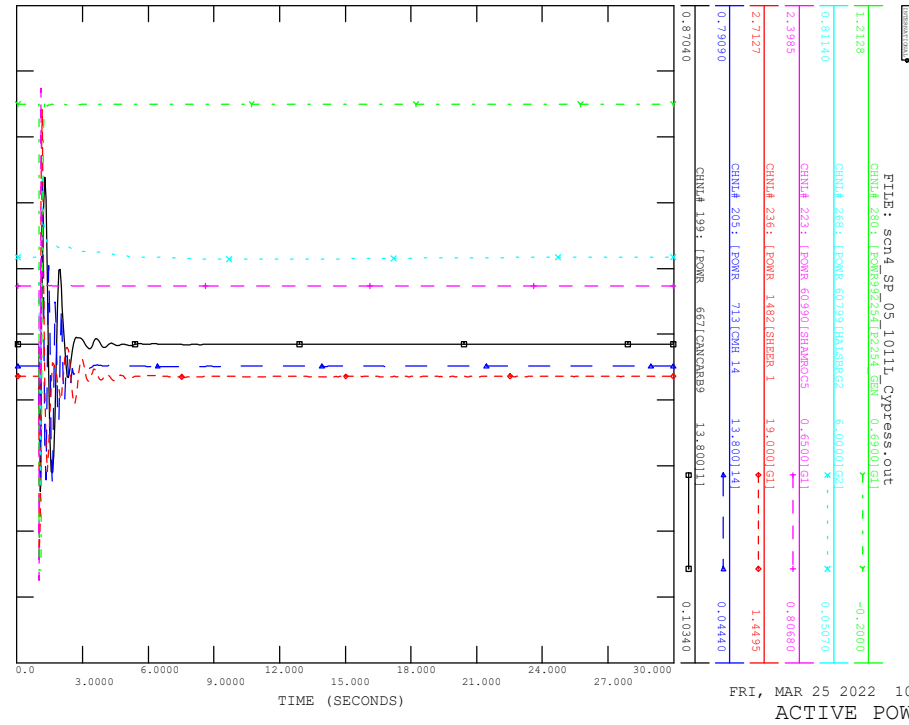


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_04\_1002L\_AMOCO  
FILE: scn4\_sp\_04\_1002L\_Amoco.out

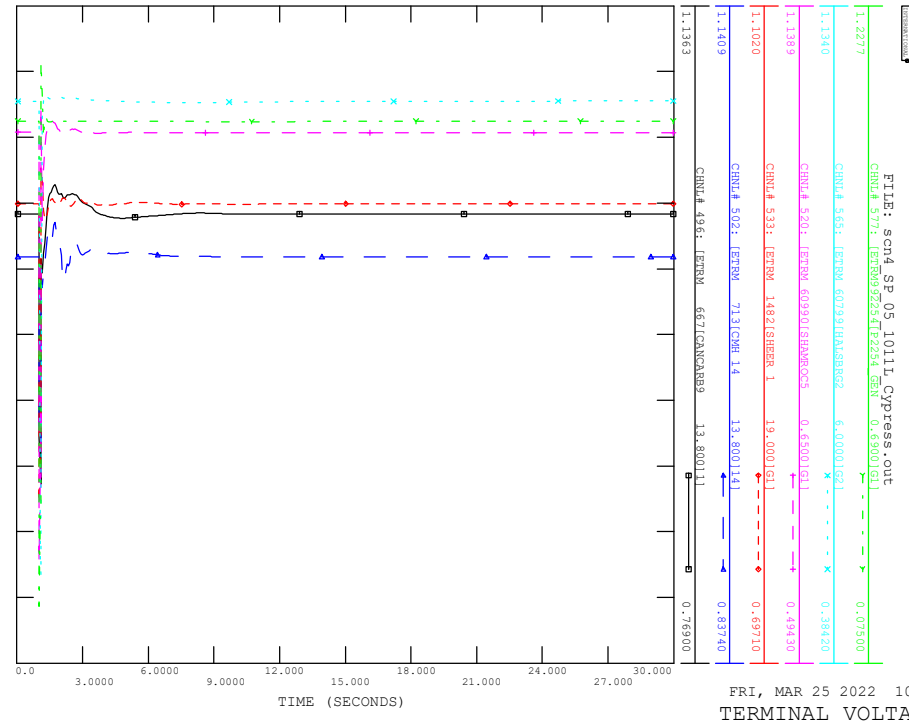




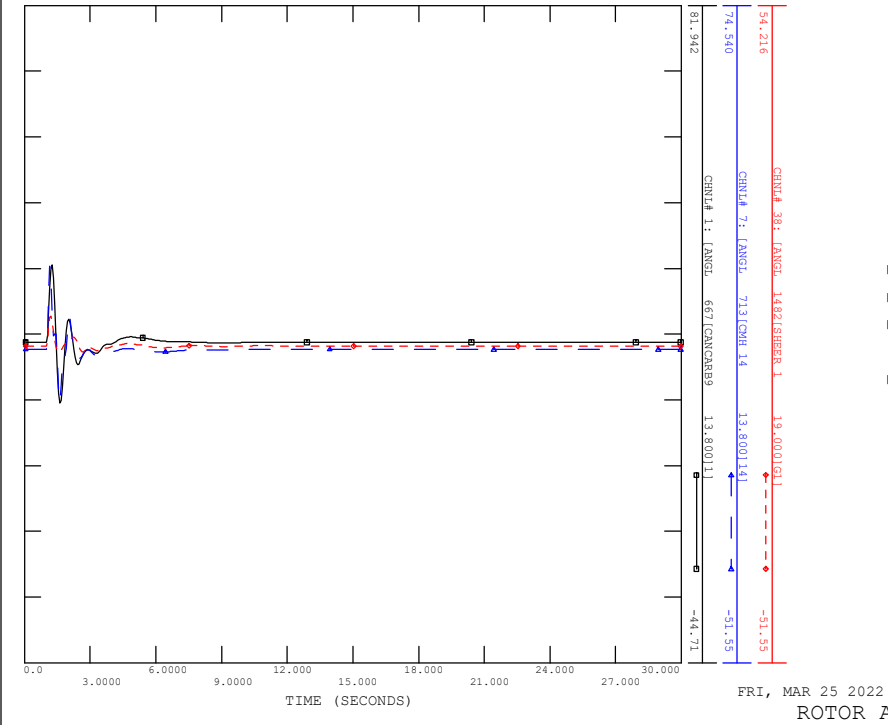
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS



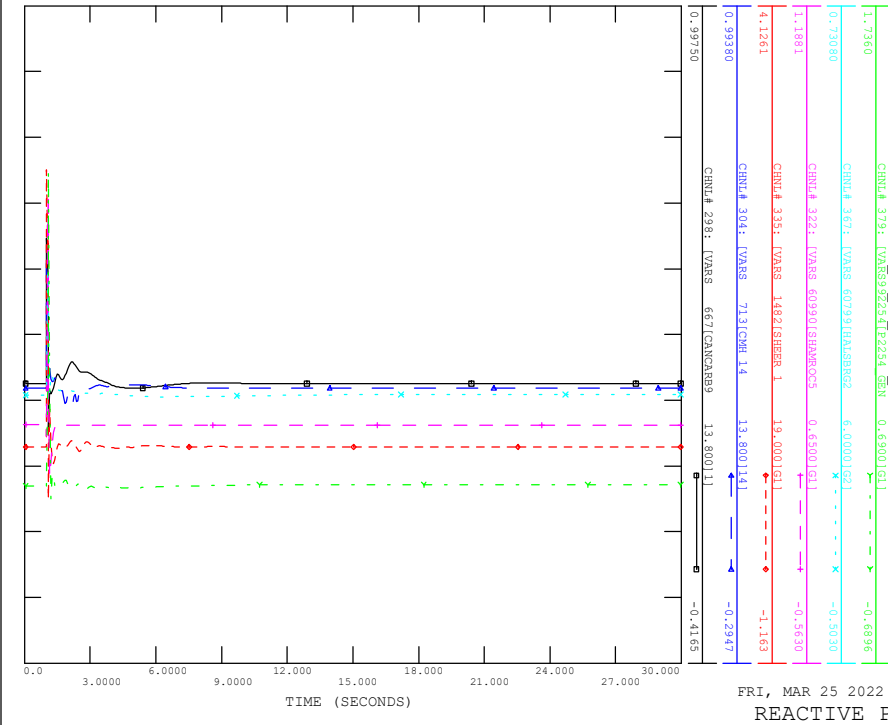
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

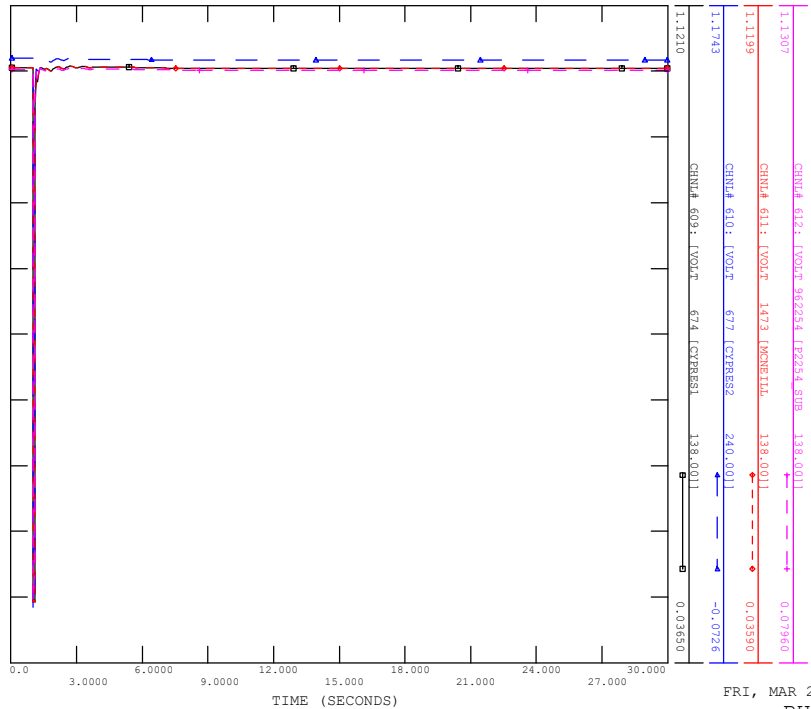


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

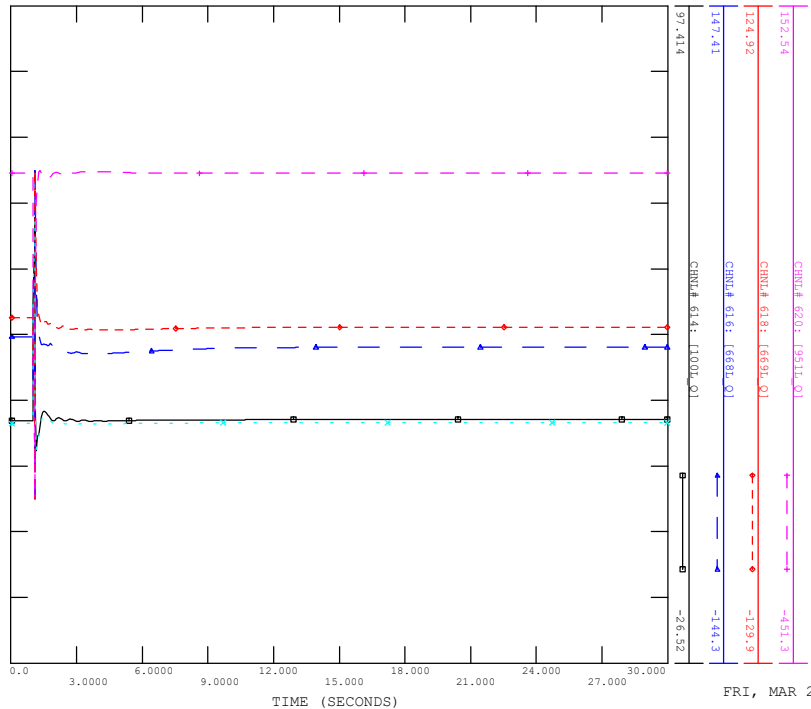
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

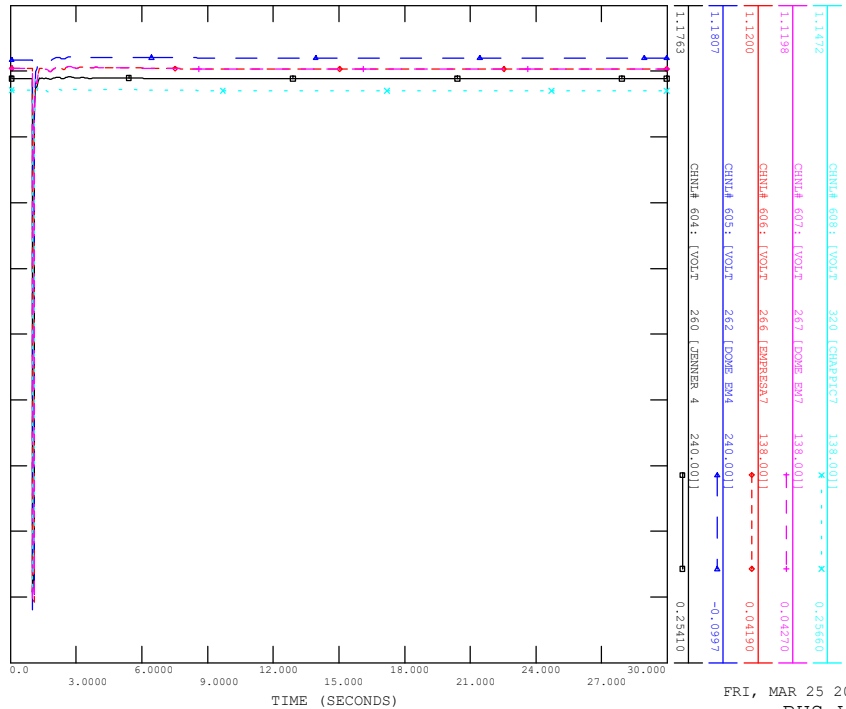
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

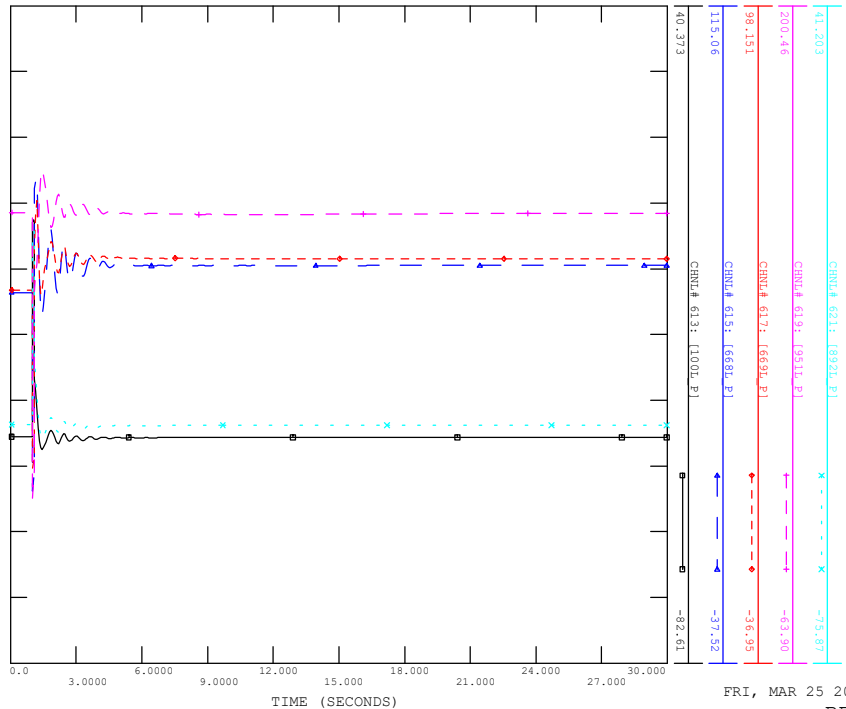
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

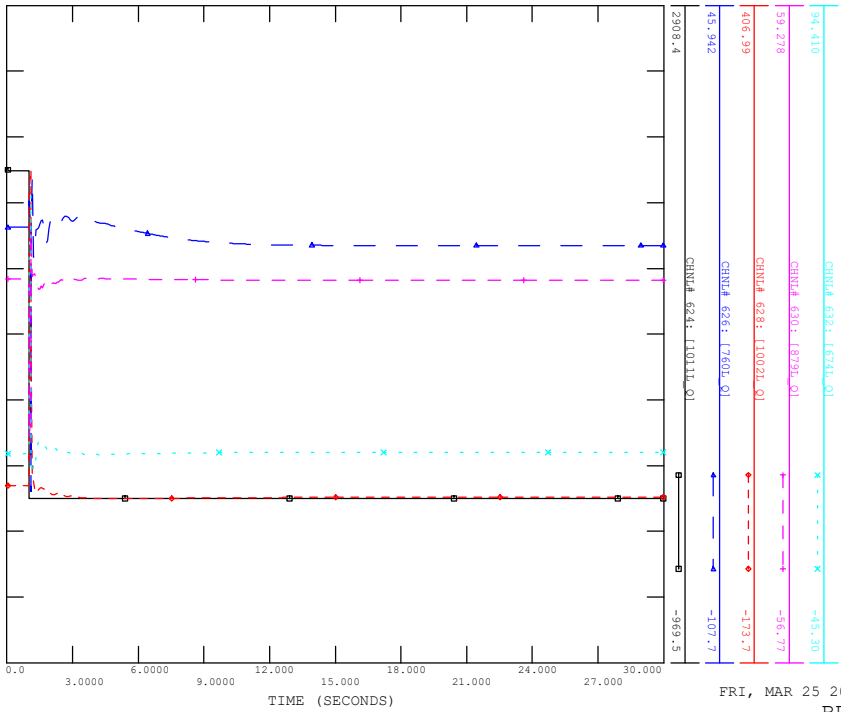
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

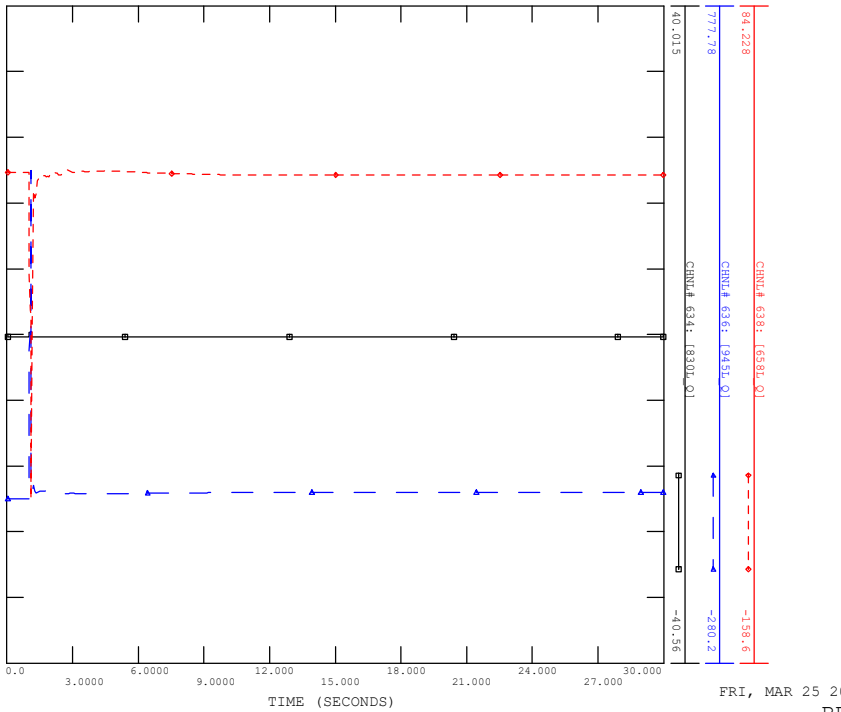
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

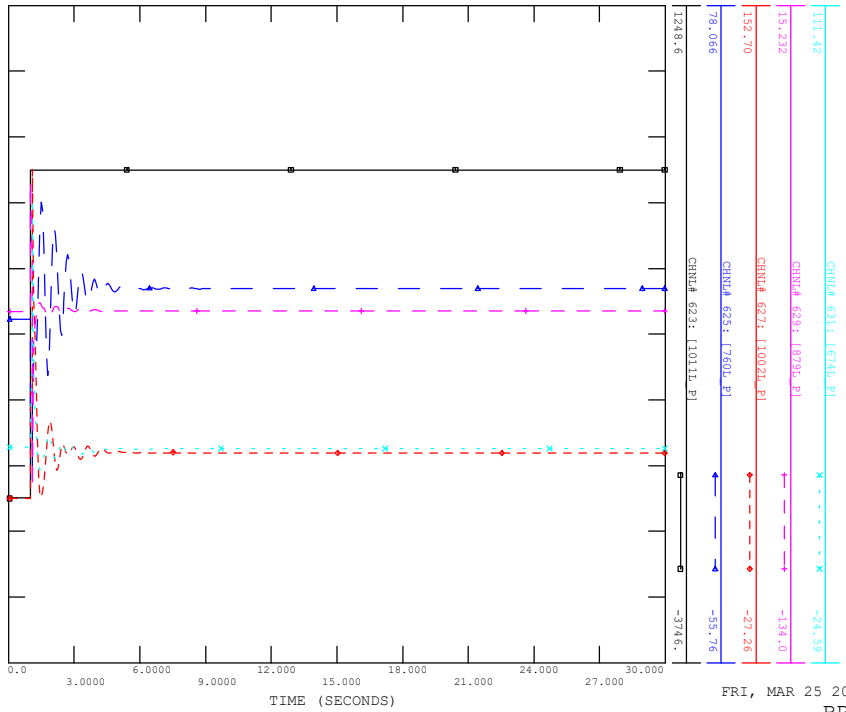
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

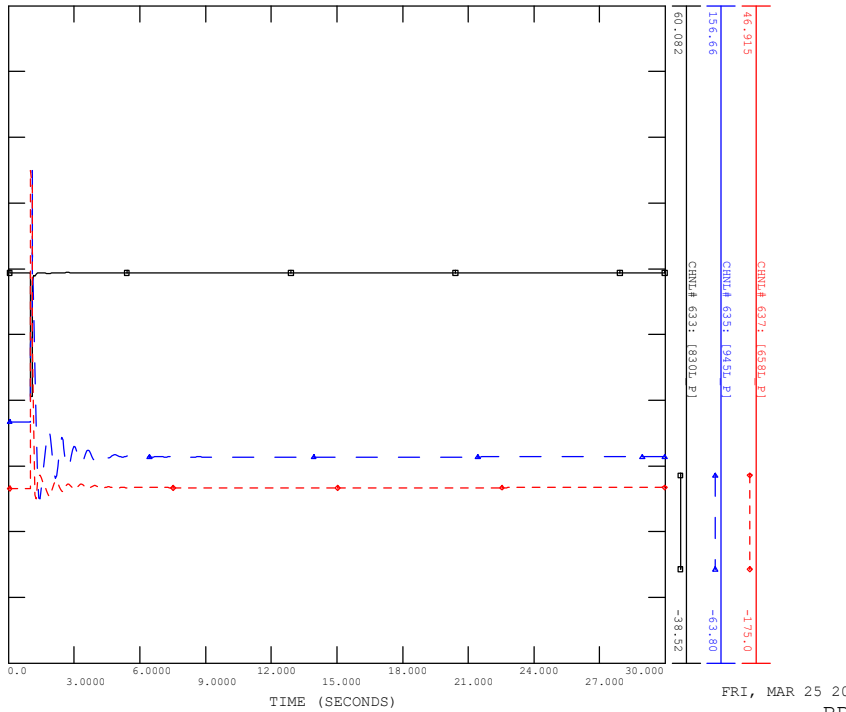
FILE: scn4\_sp\_05\_1011L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH P

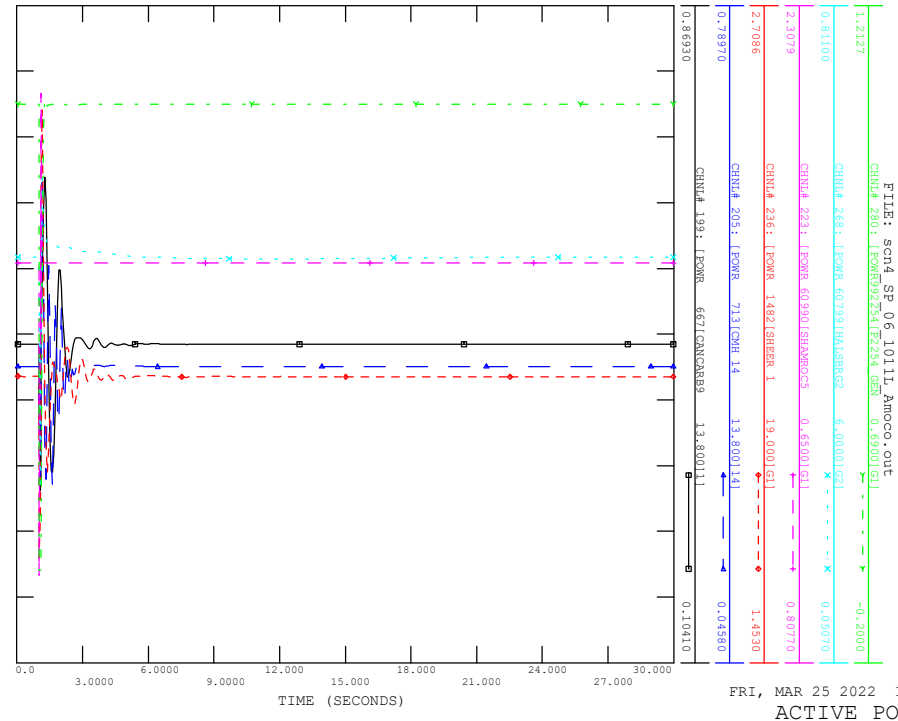
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_05\_1011L\_CYPRESS

FILE: scn4\_sp\_05\_1011L\_Cypress.out

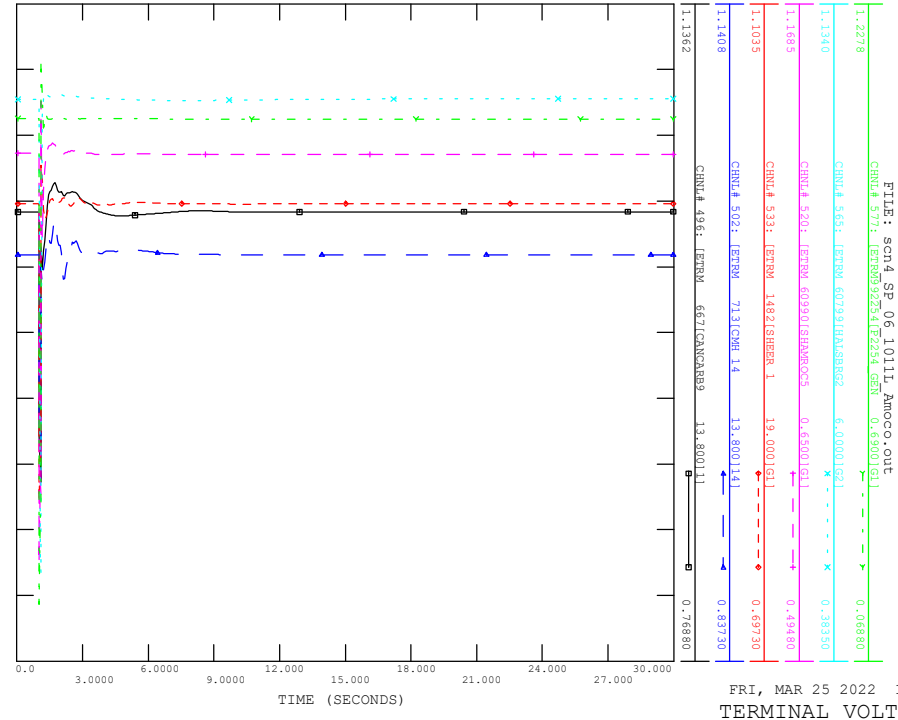


FRI, MAR 25 2022 10:53  
BRANCH P

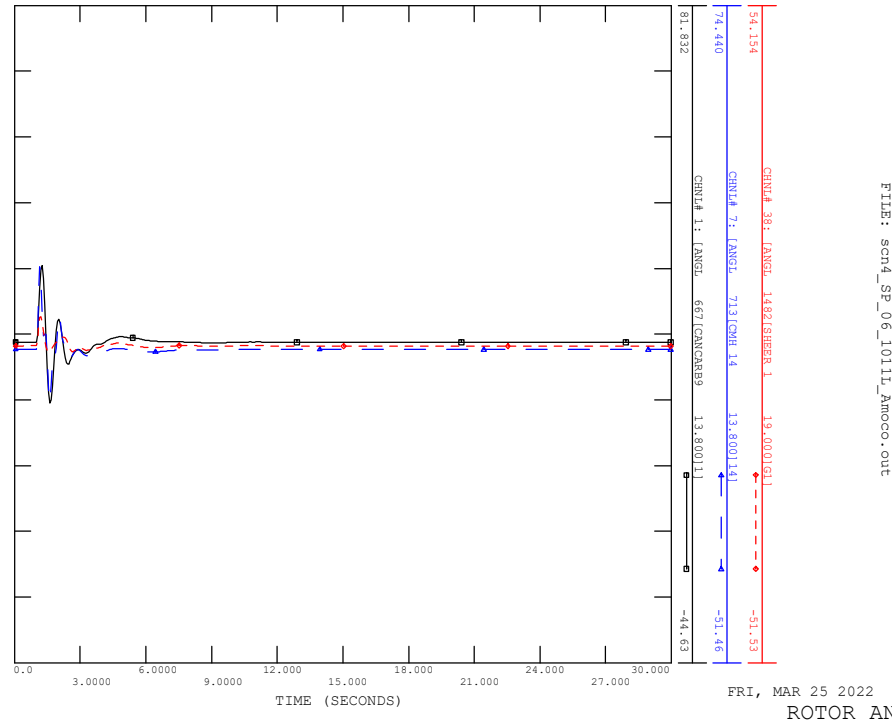
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO



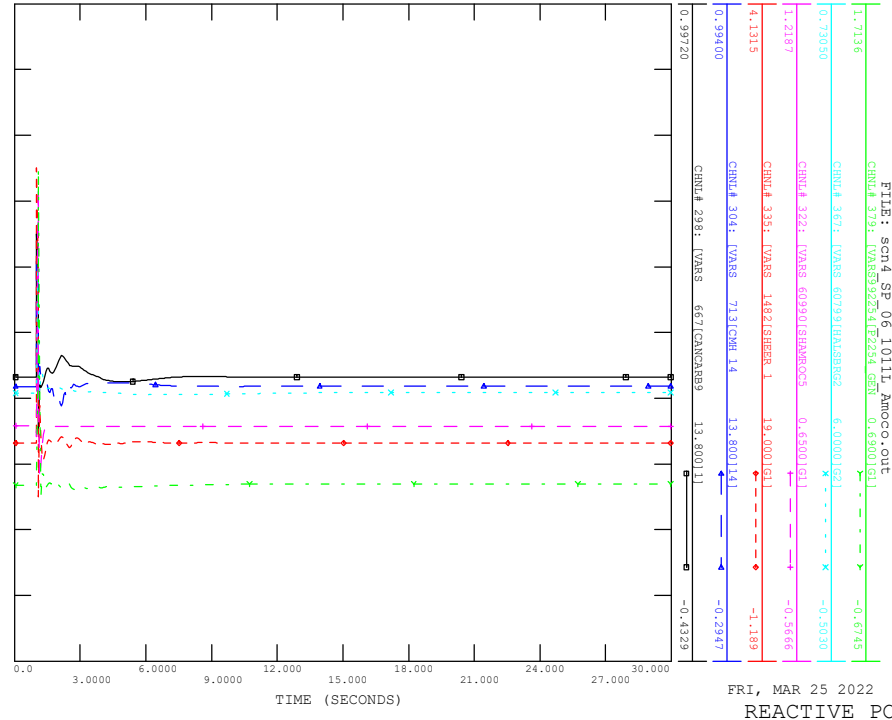
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO



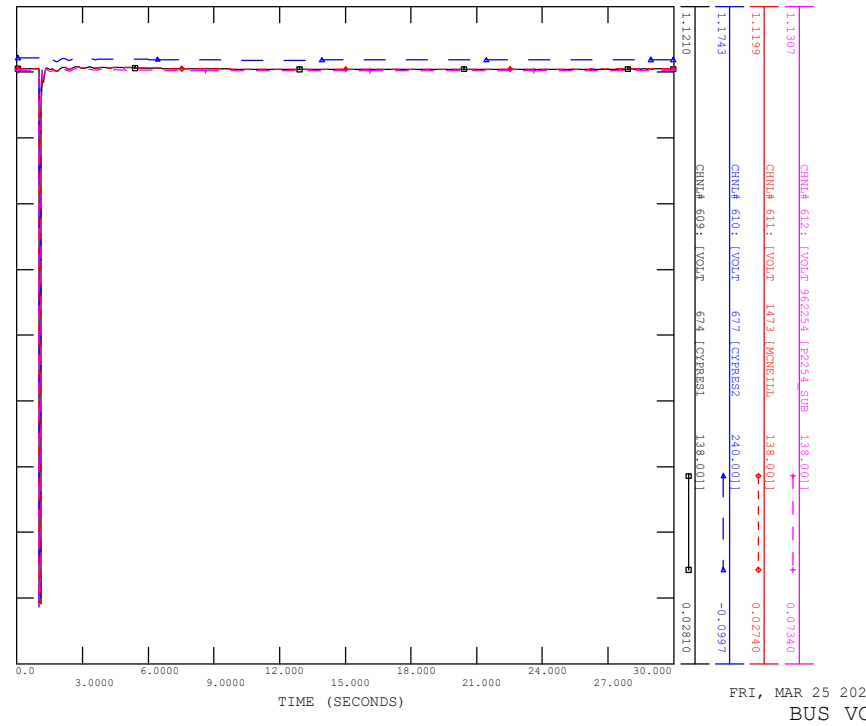
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO

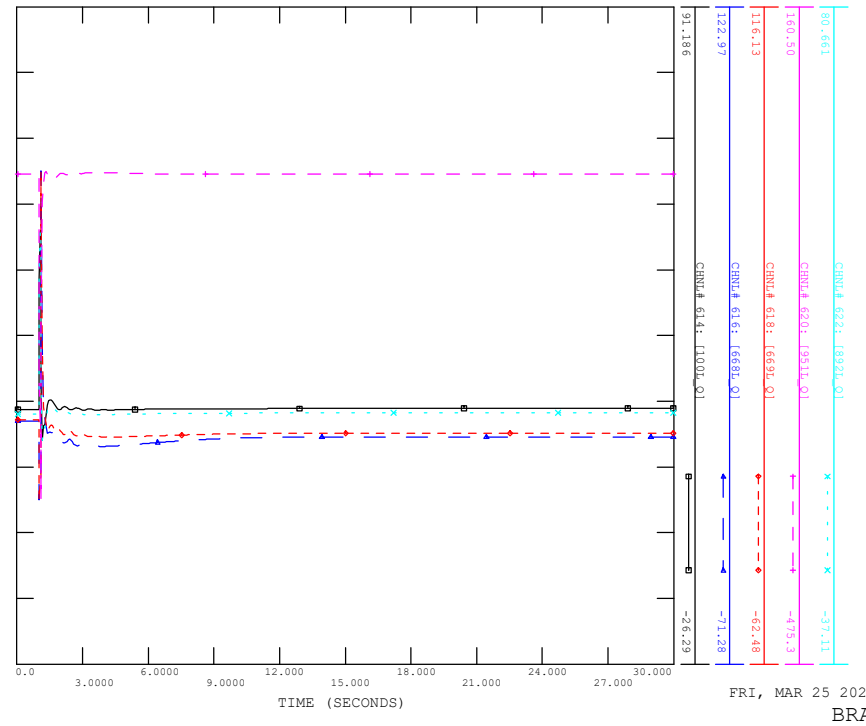


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



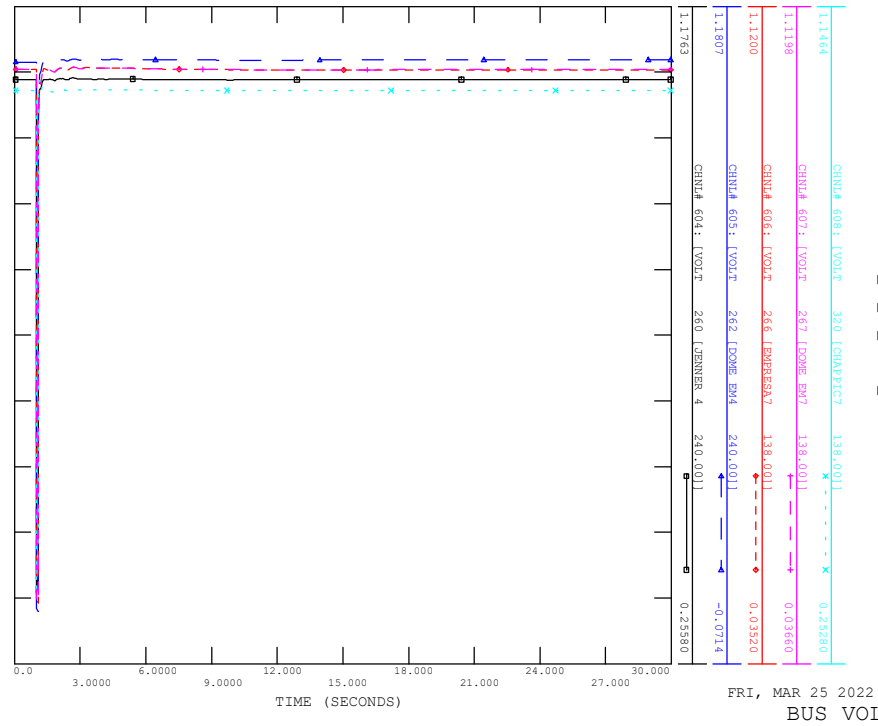
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



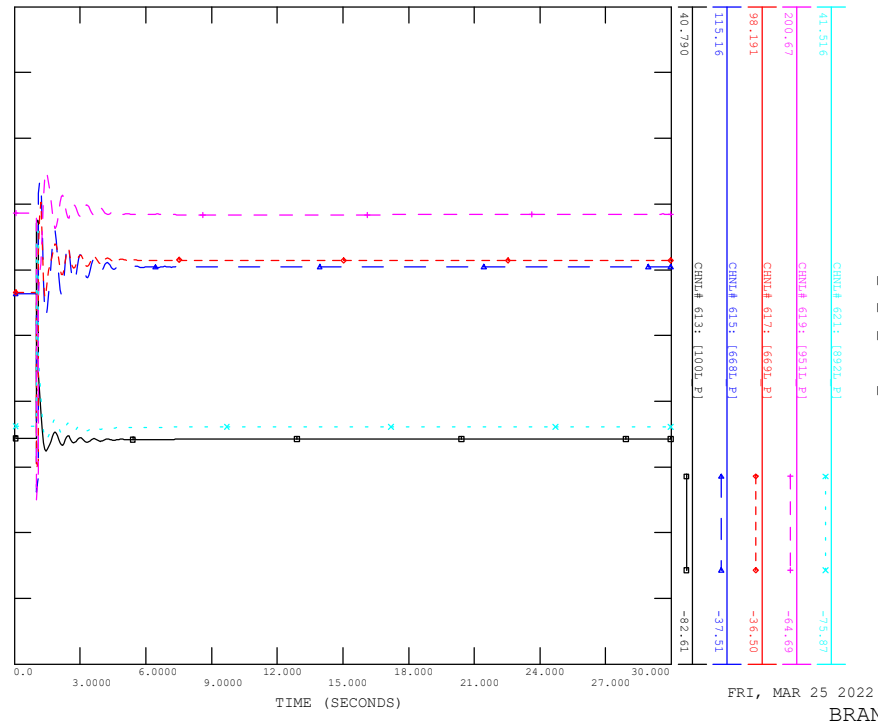
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



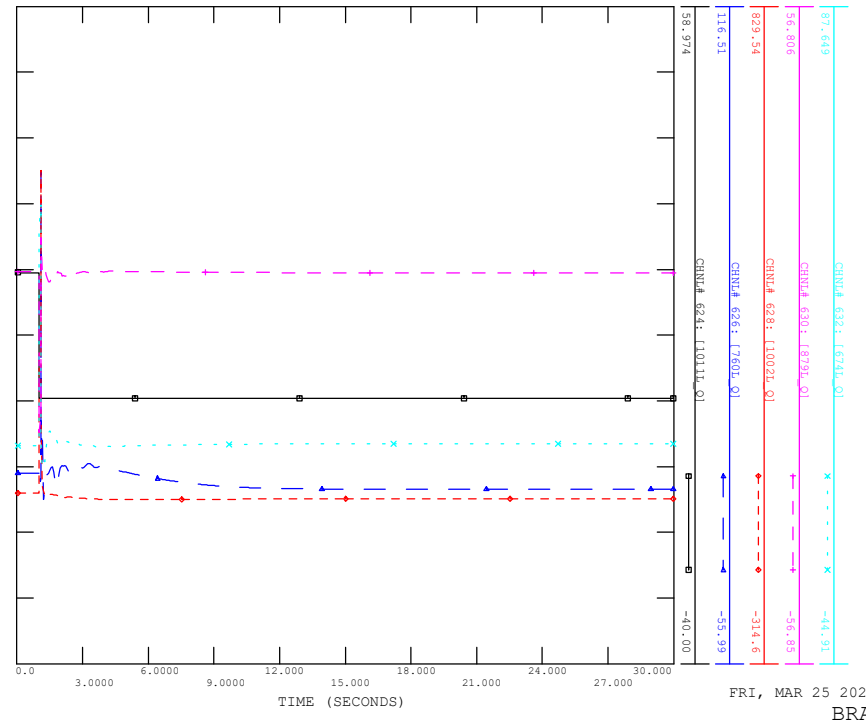
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



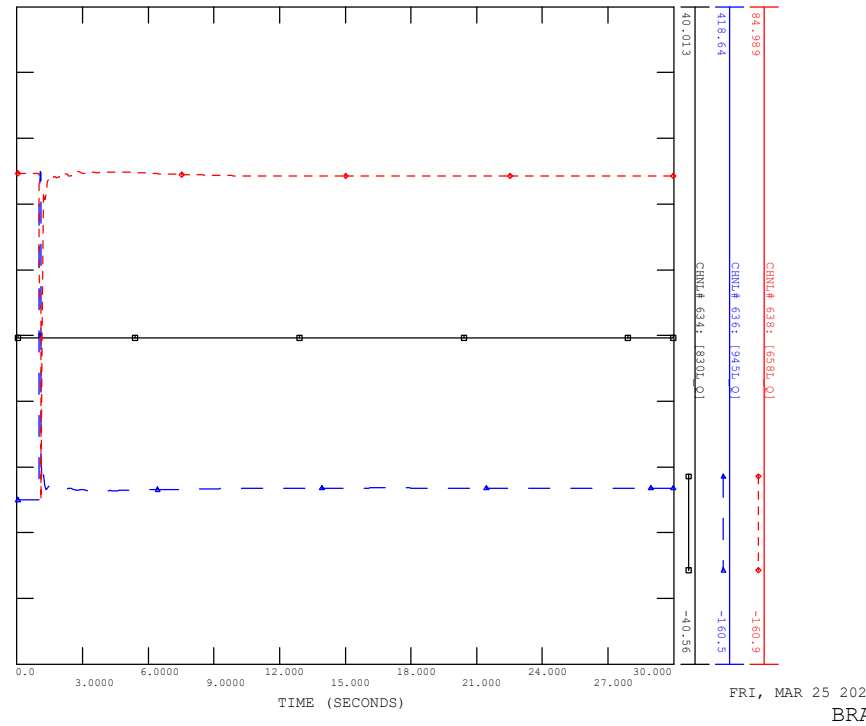
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



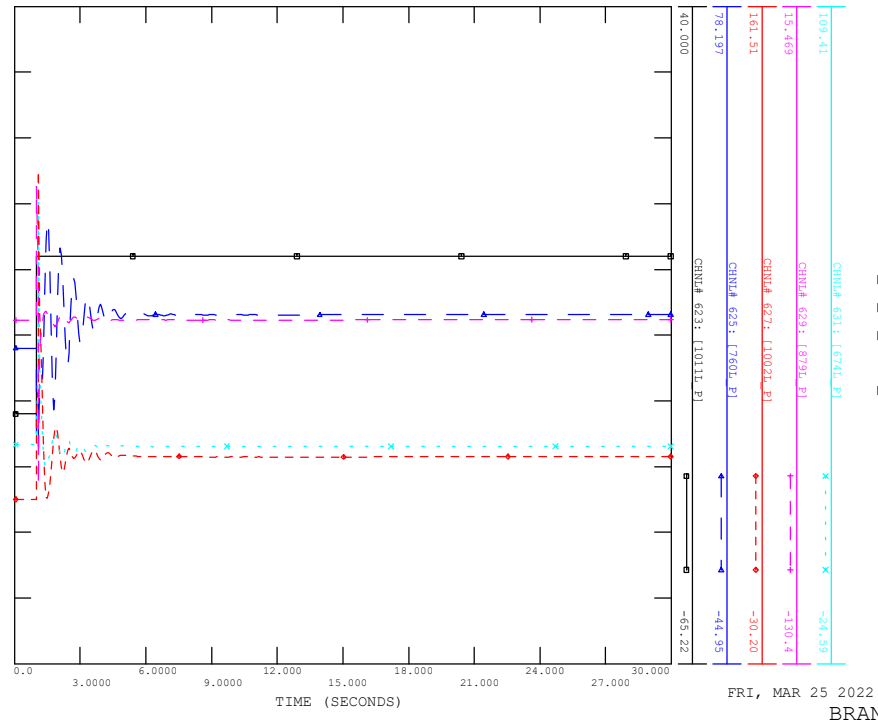
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



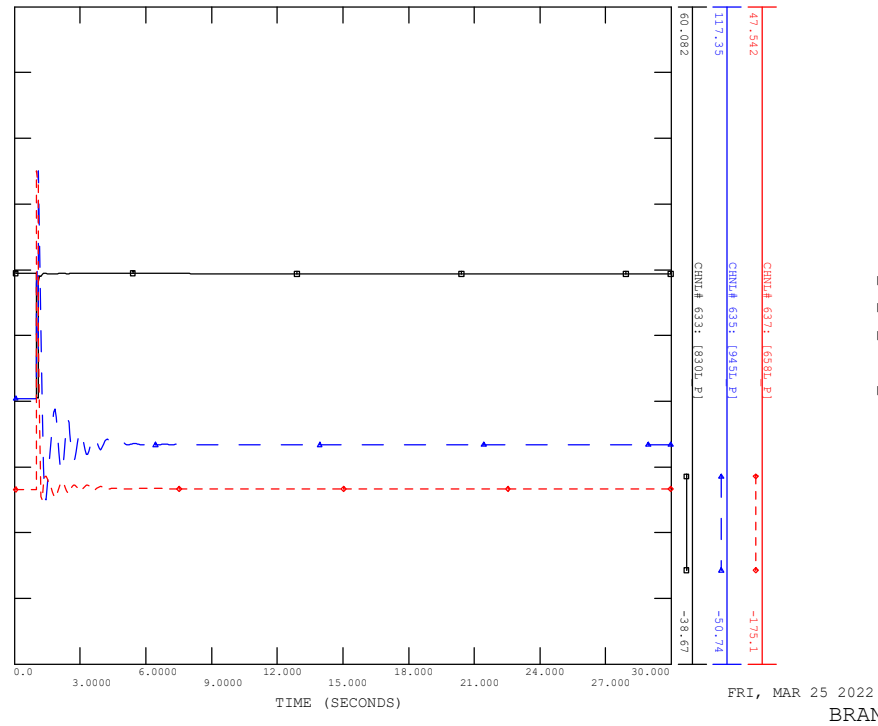
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out



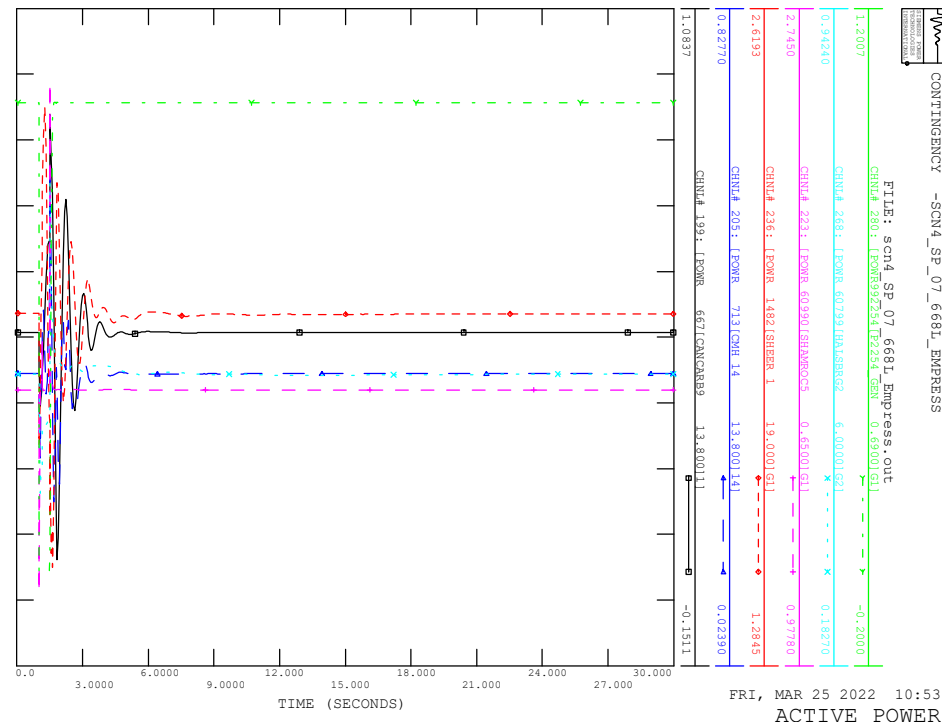
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_06\_1011L\_AMOCO  
FILE: scn4\_sp\_06\_1011L\_Amoco.out

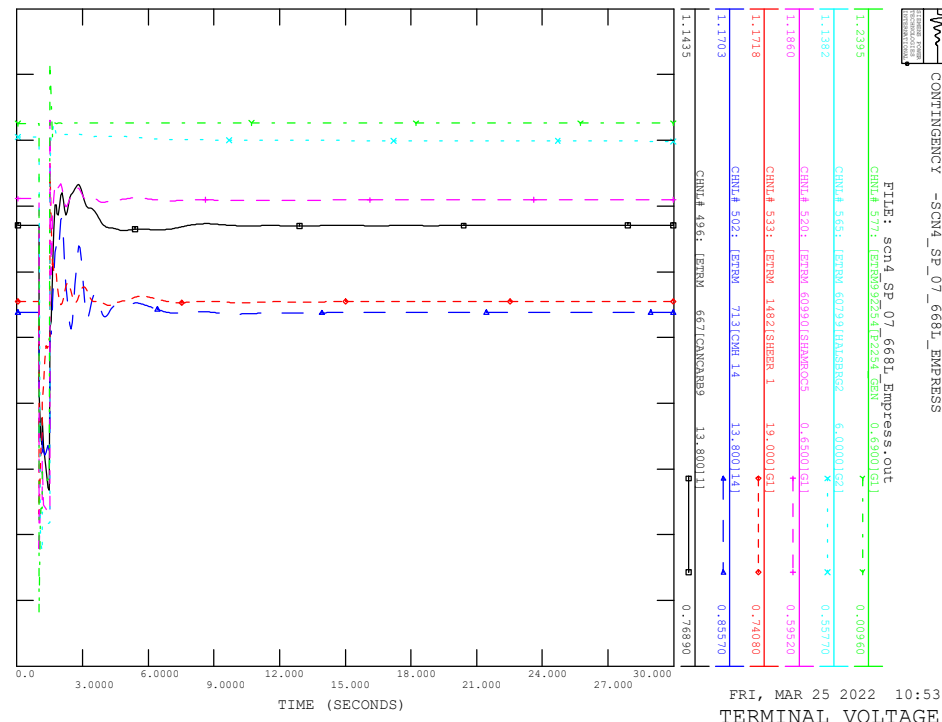


FRI, MAR 25 2022 10:53  
BRANCH P

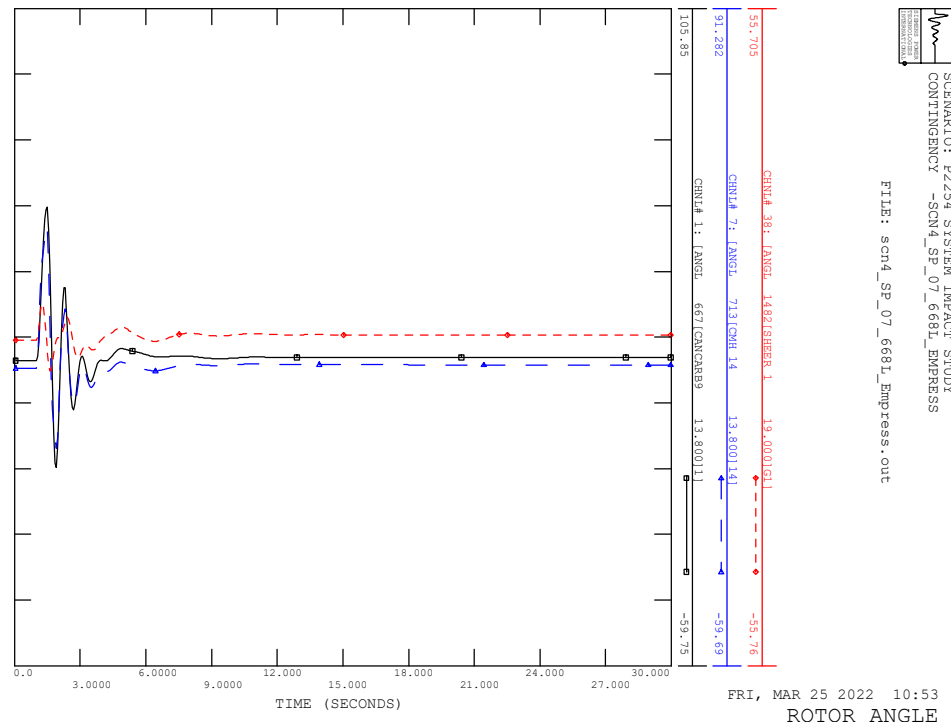
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS



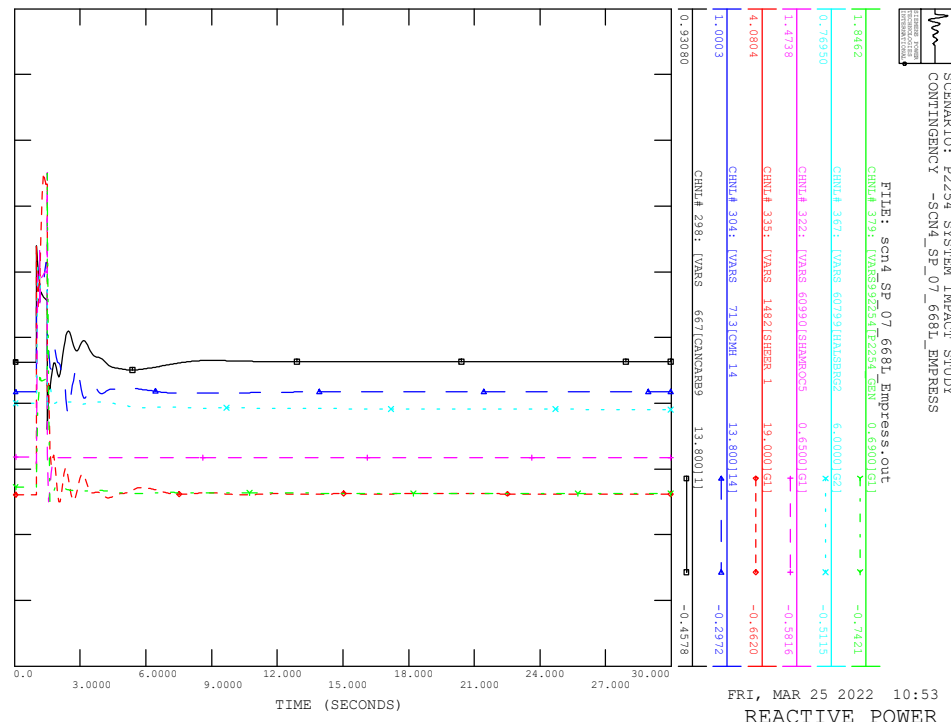
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS



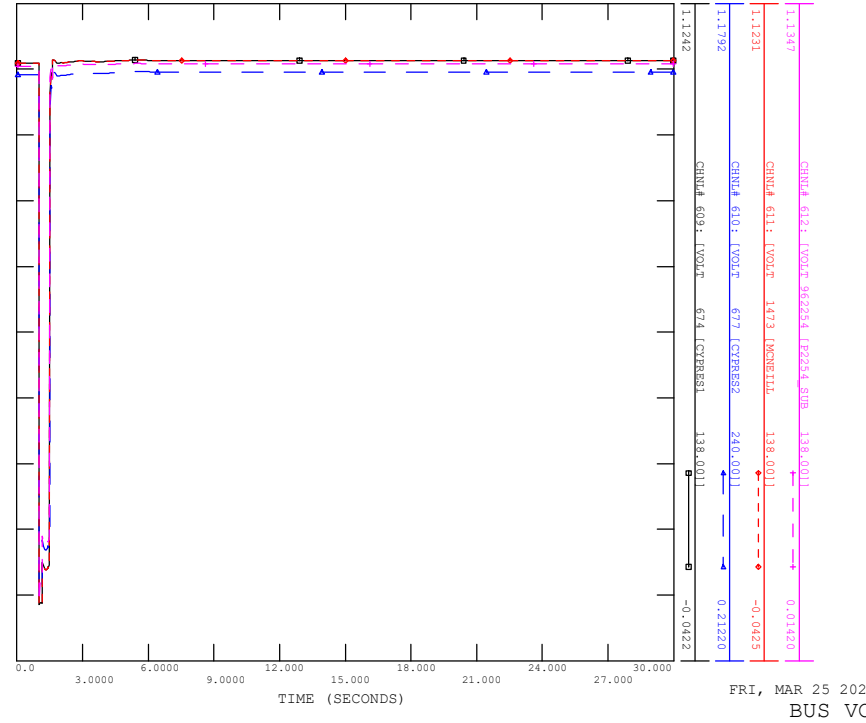
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS

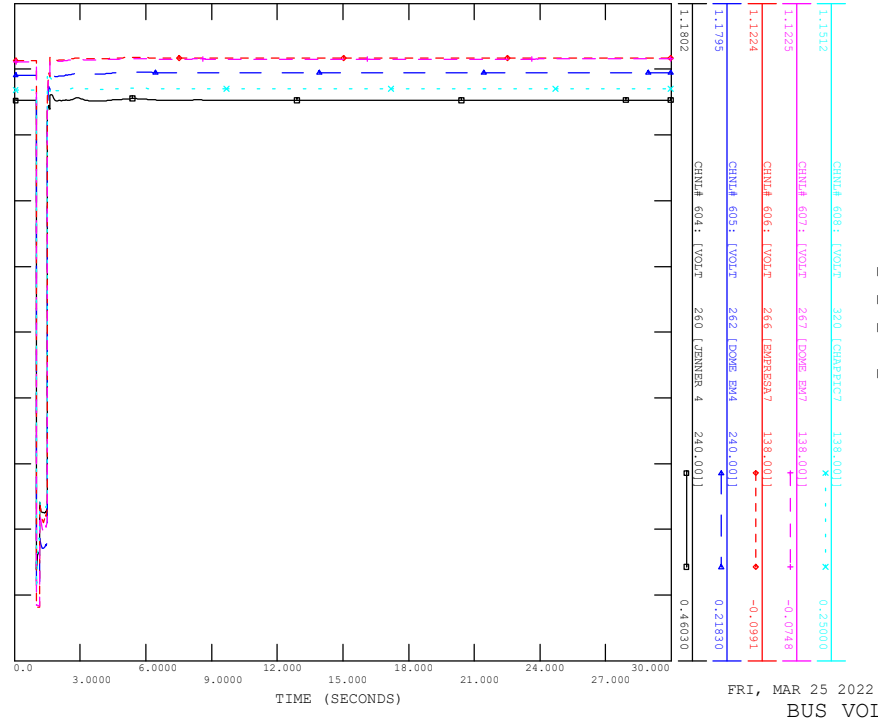


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681L\_EMPRESS  
FILE: scn4\_sp\_07\_6681L\_emptress.out



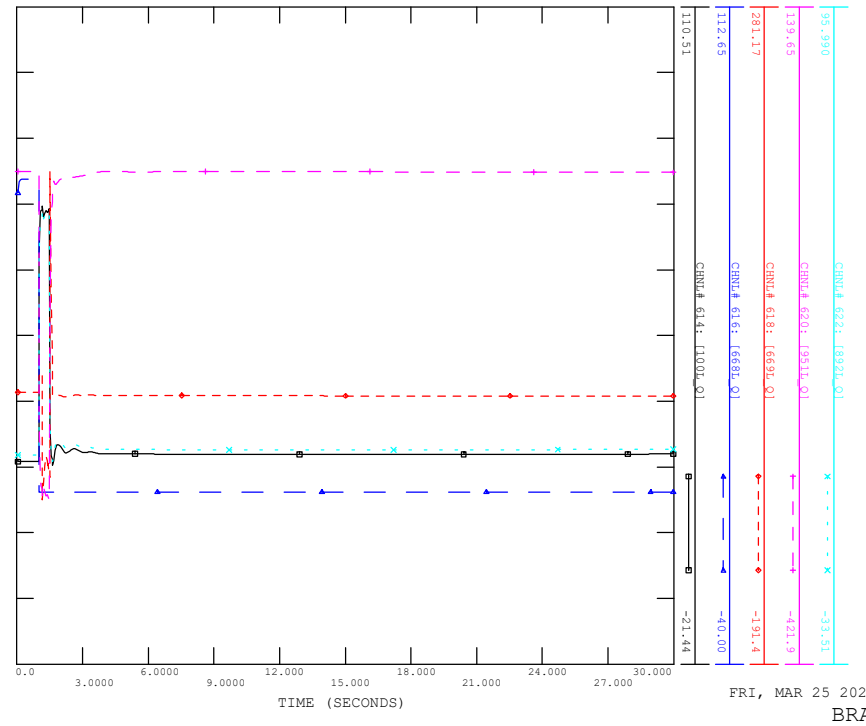
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681L\_EMPRESS  
FILE: scn4\_sp\_07\_6681L\_emptress.out



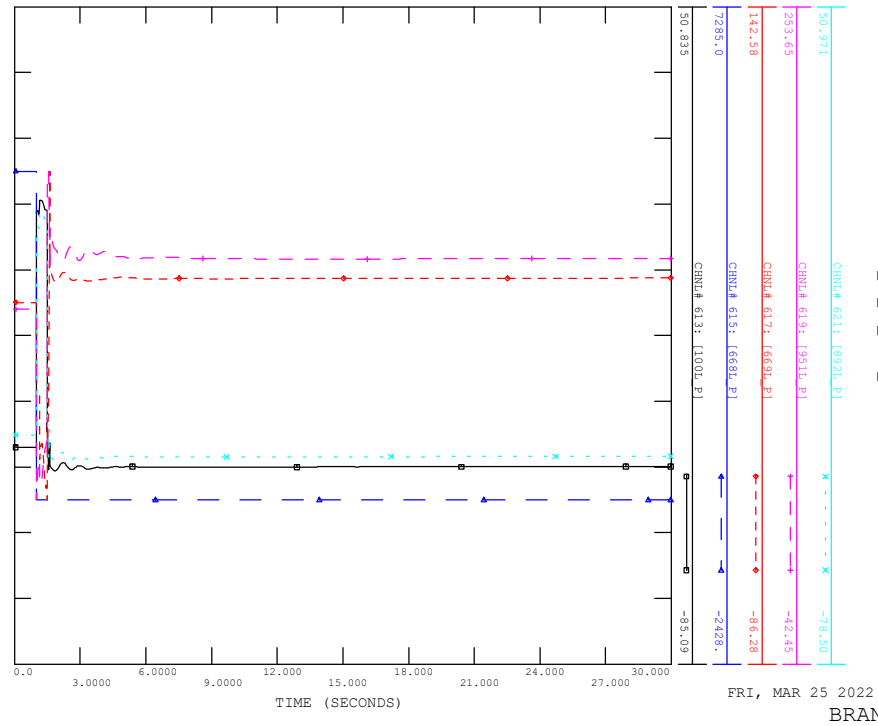
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681L\_EMPRESS  
FILE: scn4\_sp\_07\_6681L\_emptress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681L\_EMPRESS  
FILE: scn4\_sp\_07\_6681L\_emptress.out



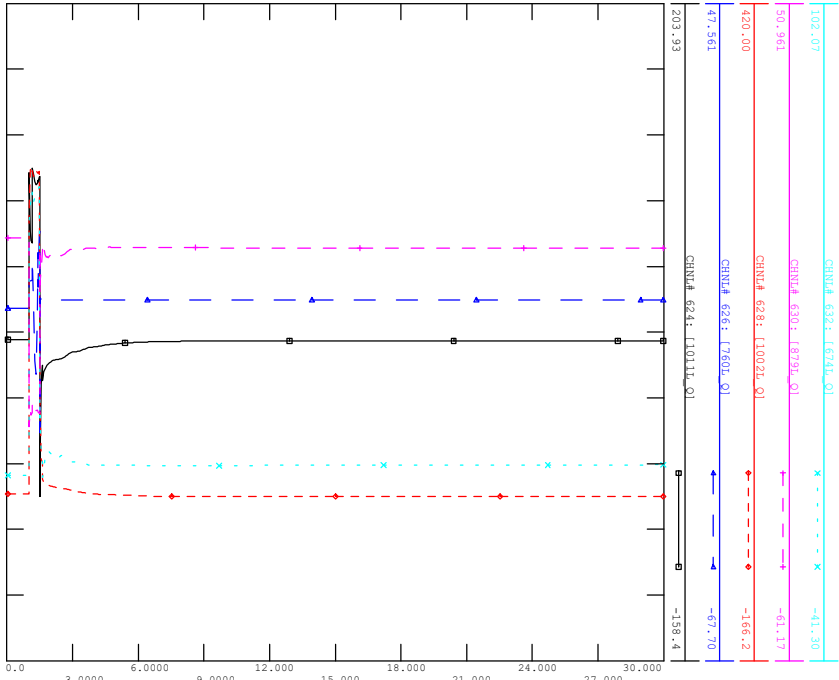
FRI, MAR 25 2022 10:53  
BRANCH P





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS

FILE: scn4\_sp\_07\_6681\_emptress.out

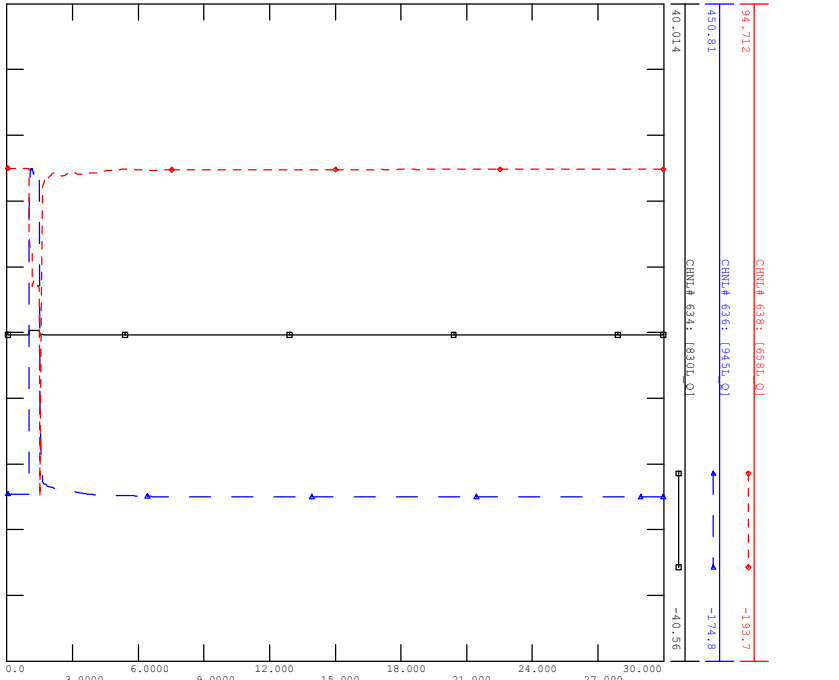


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS

FILE: scn4\_sp\_07\_6681\_emptress.out

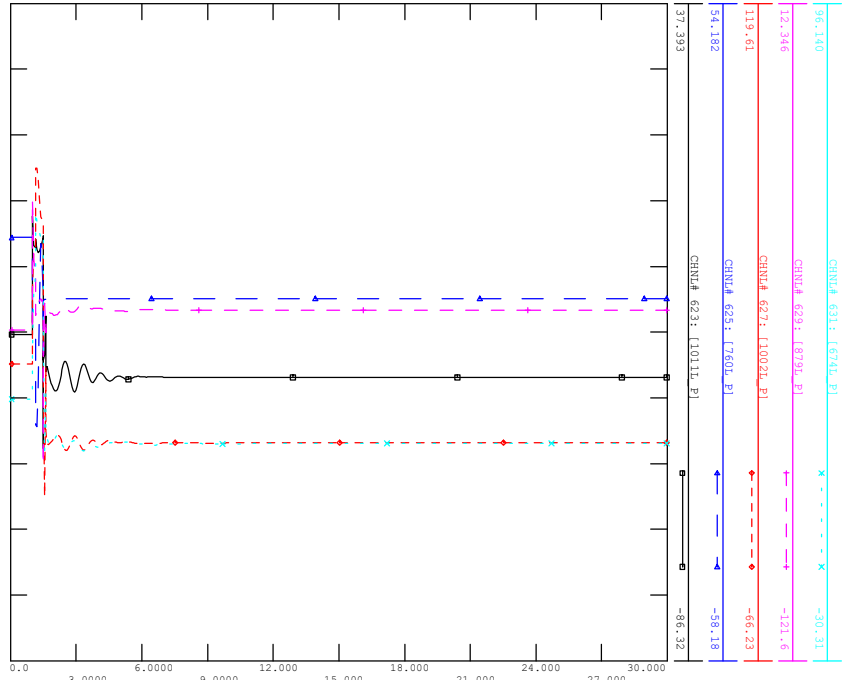


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS

FILE: scn4\_sp\_07\_6681\_emptress.out

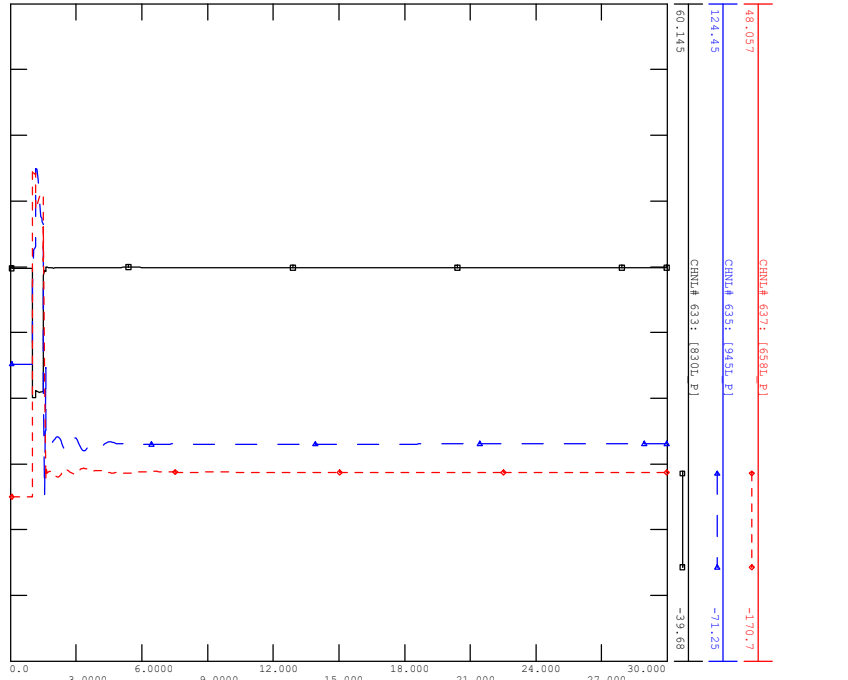


FRI, MAR 25 2022 10:53  
BRANCH P

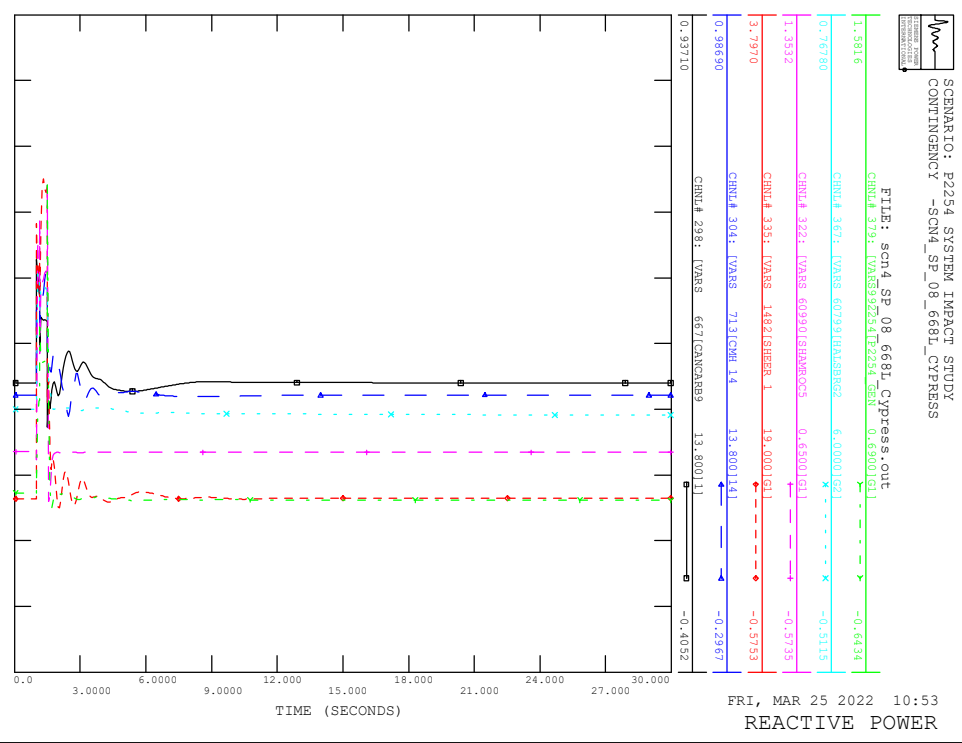
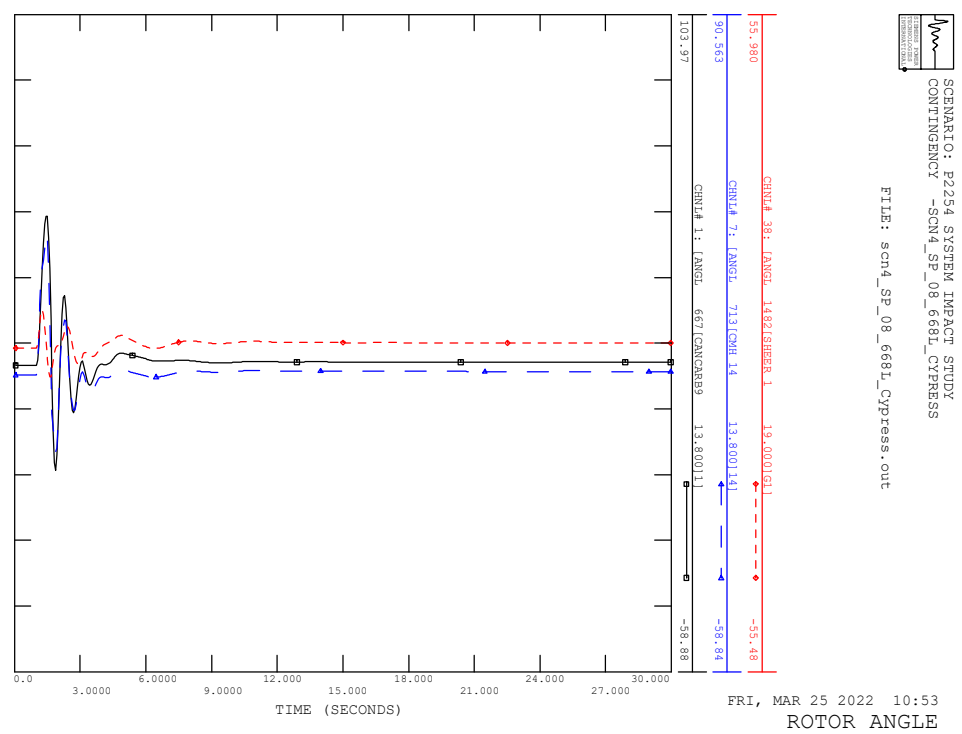
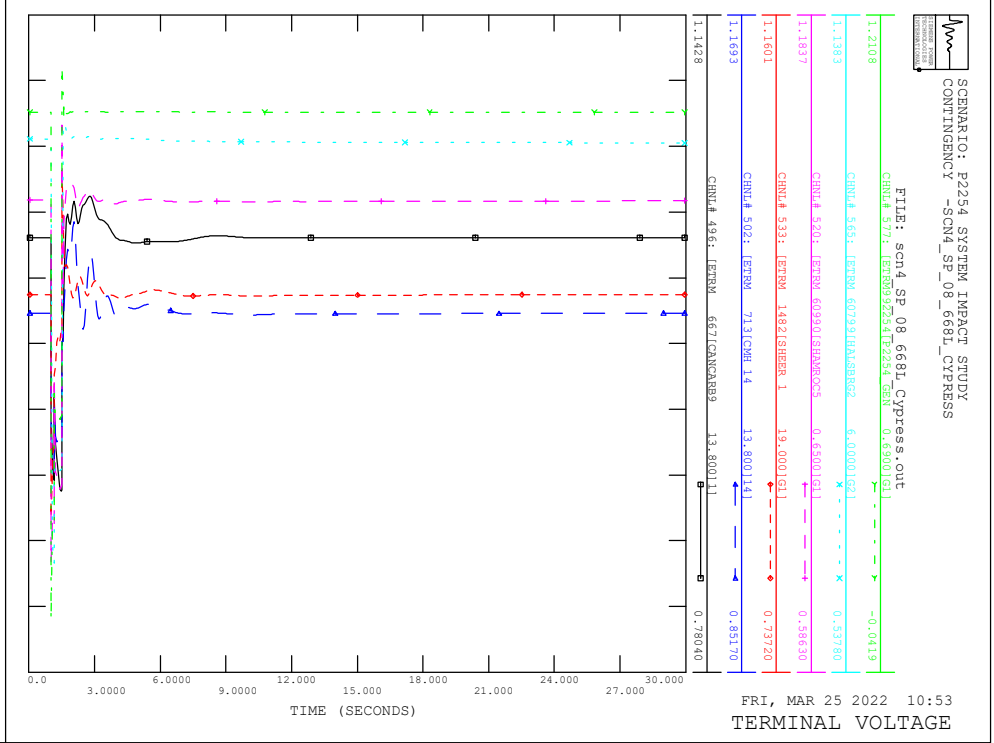
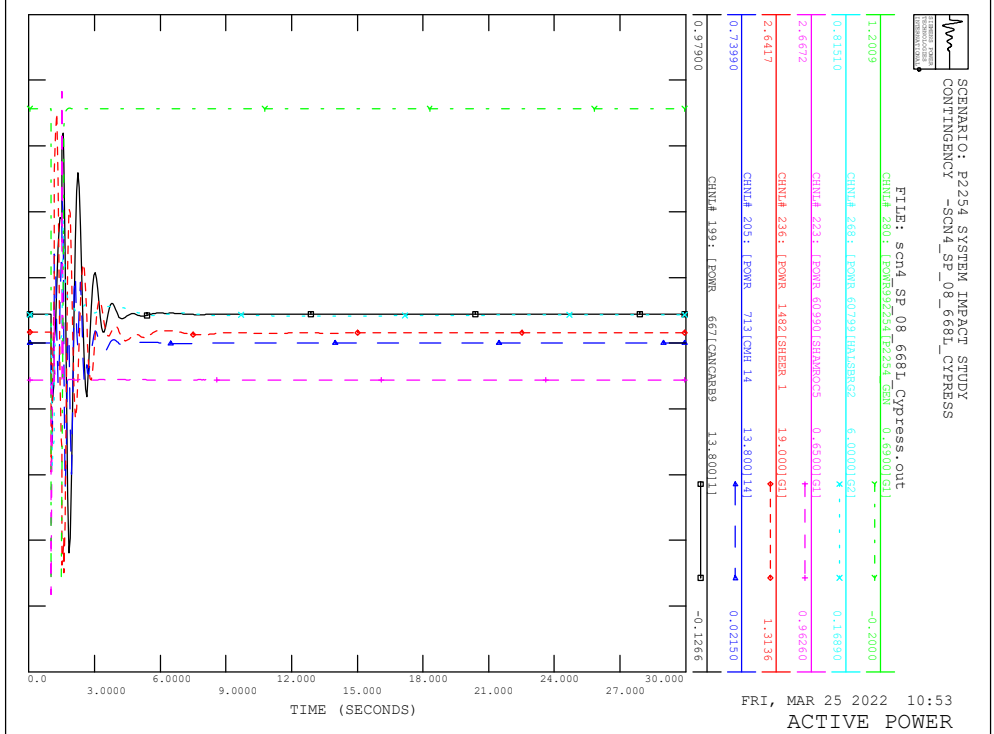


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_07\_6681\_EMPRESS

FILE: scn4\_sp\_07\_6681\_emptress.out

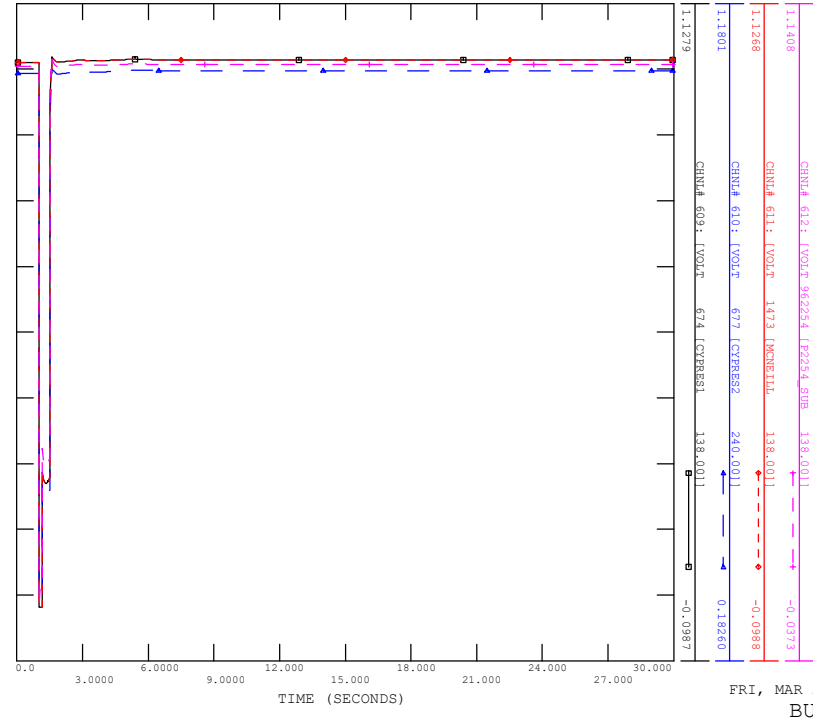


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

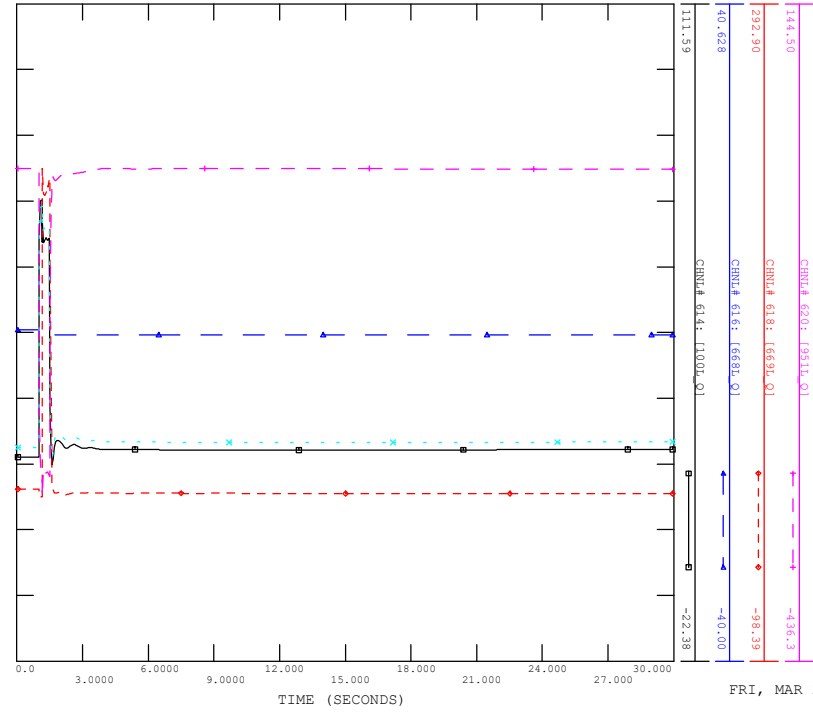
FILE: scn4\_sp\_08\_6681L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

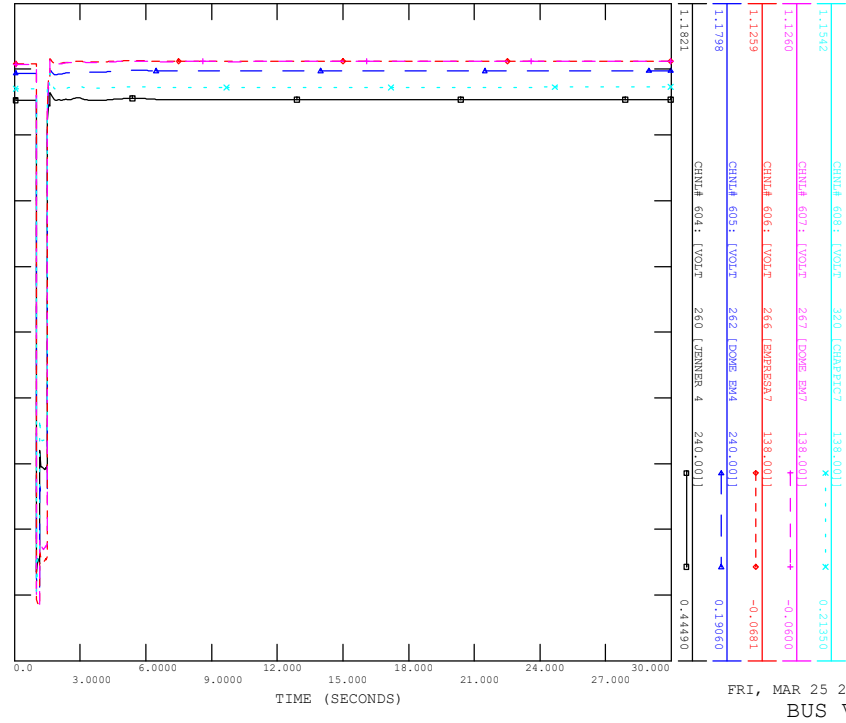
FILE: scn4\_sp\_08\_6681L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

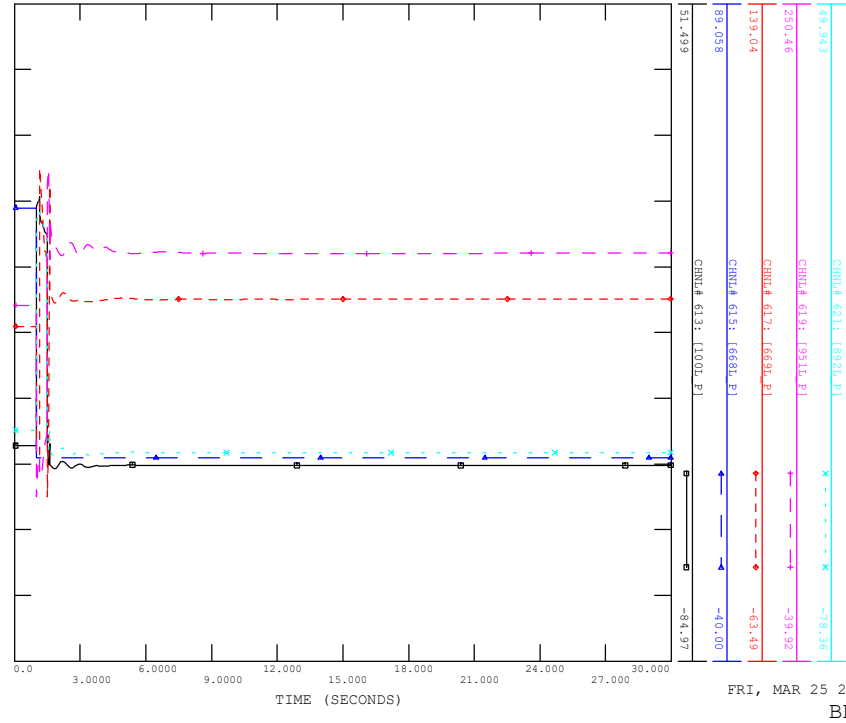
FILE: scn4\_sp\_08\_6681L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

FILE: scn4\_sp\_08\_6681L\_Cypress.out

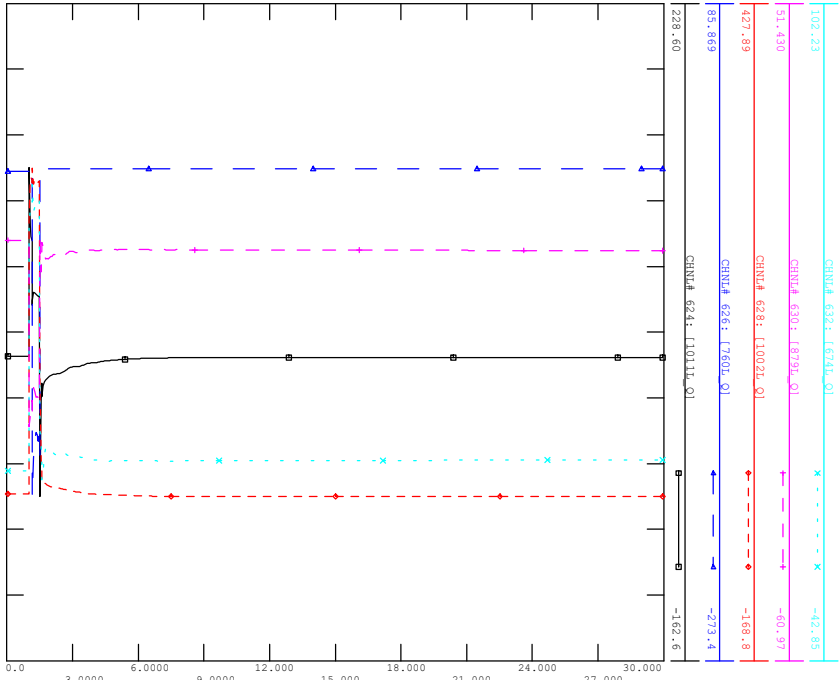


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

FILE: scn4\_sp\_08\_6681L\_Cypress.out

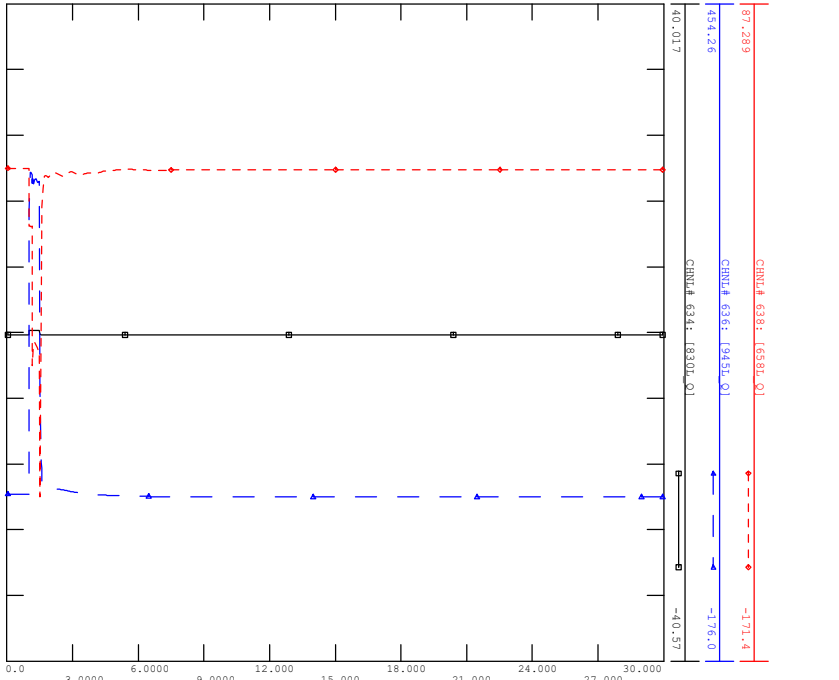


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

FILE: scn4\_sp\_08\_6681L\_Cypress.out

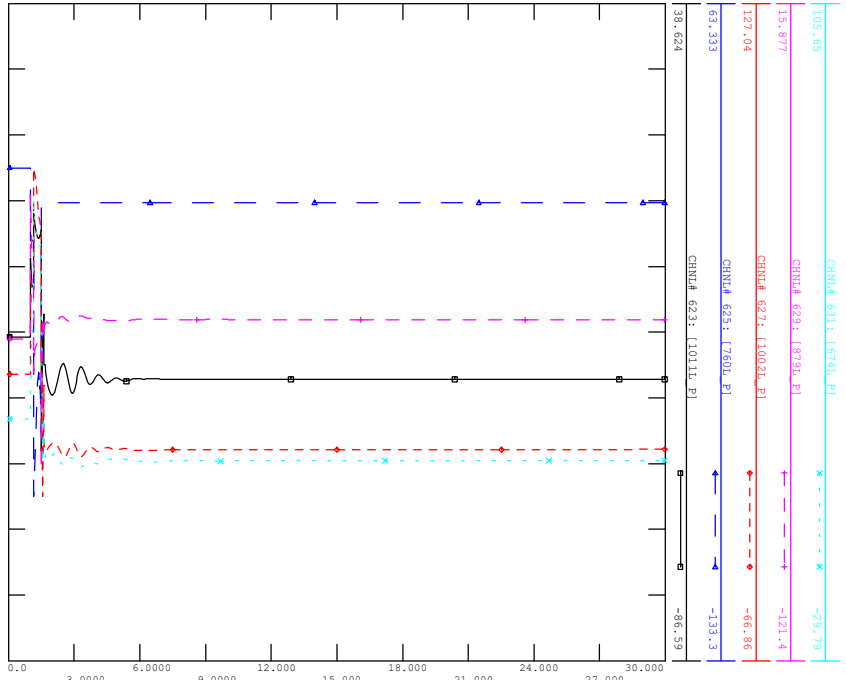


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

FILE: scn4\_sp\_08\_6681L\_Cypress.out

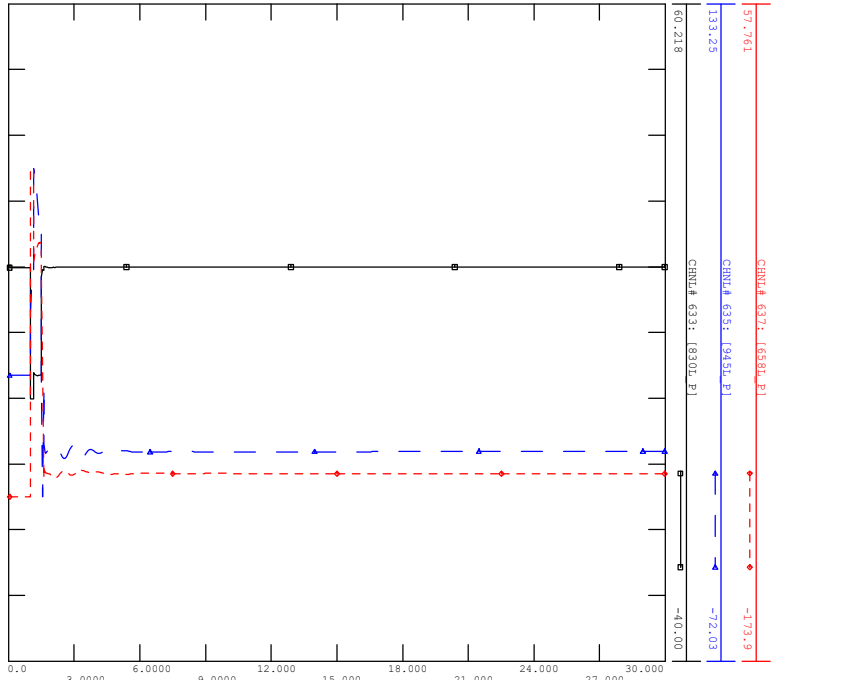


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_08\_6681L\_CYPRESS

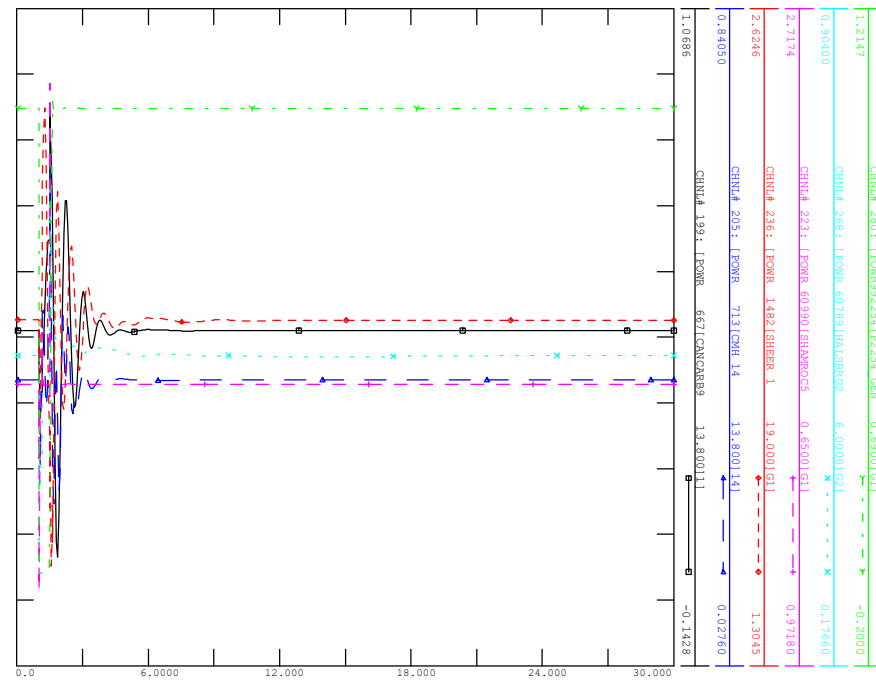
FILE: scn4\_sp\_08\_6681L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_6691\_AMOCO

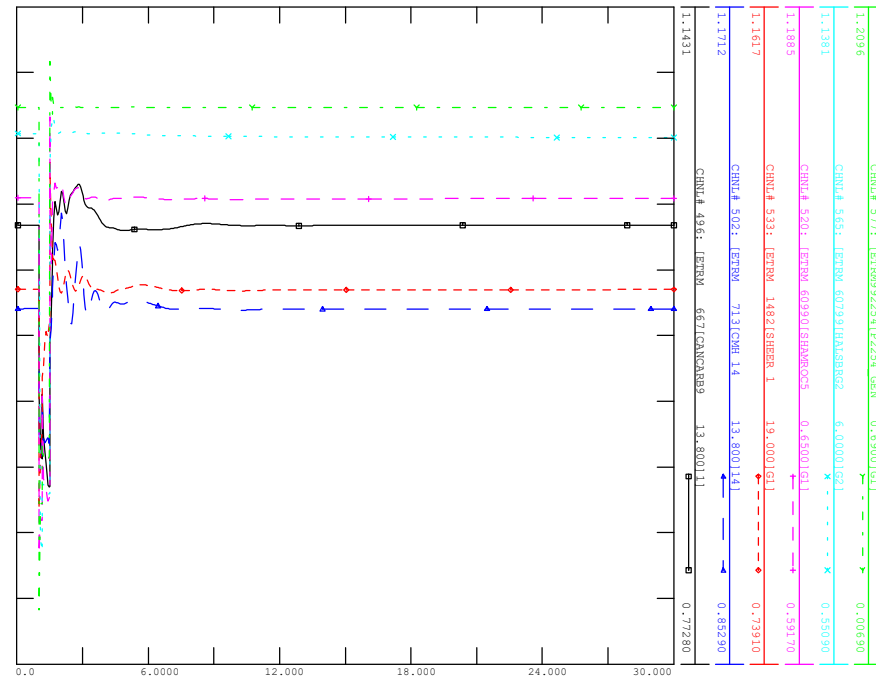
FILE: scn4\_sp\_09\_6691\_Amoco.out



FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_6691\_AMOCO

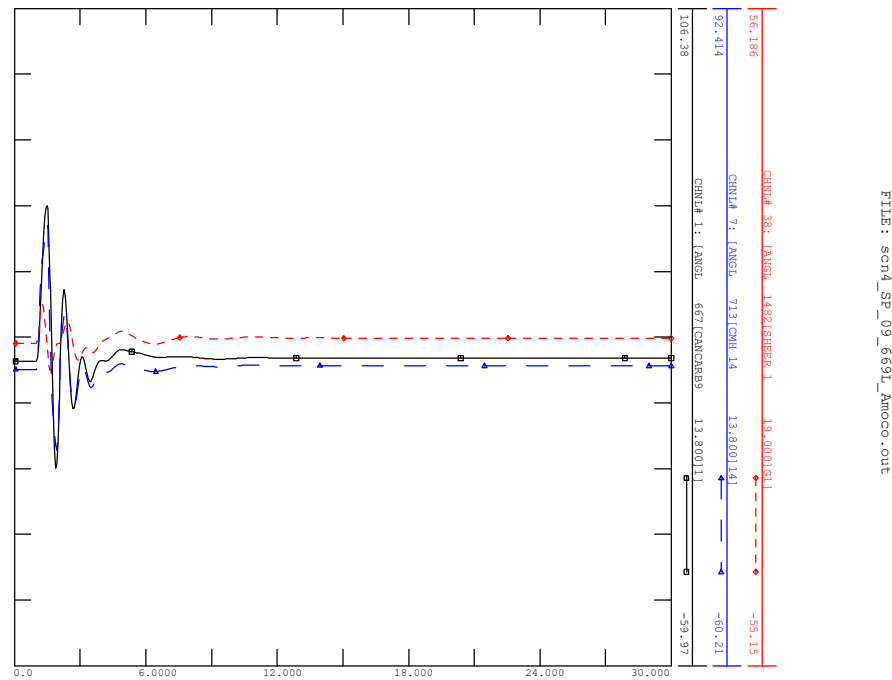
FILE: scn4\_sp\_09\_6691\_Amoco.out



FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_6691\_AMOCO

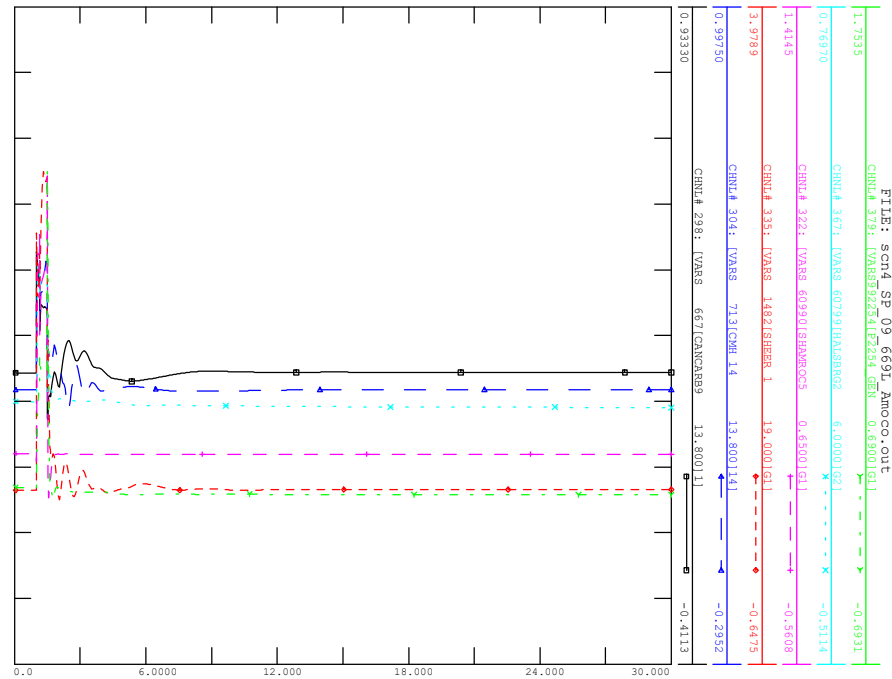
FILE: scn4\_sp\_09\_6691\_Amoco.out



FRI, MAR 25 2022 10:53  
ROTOR ANGLE

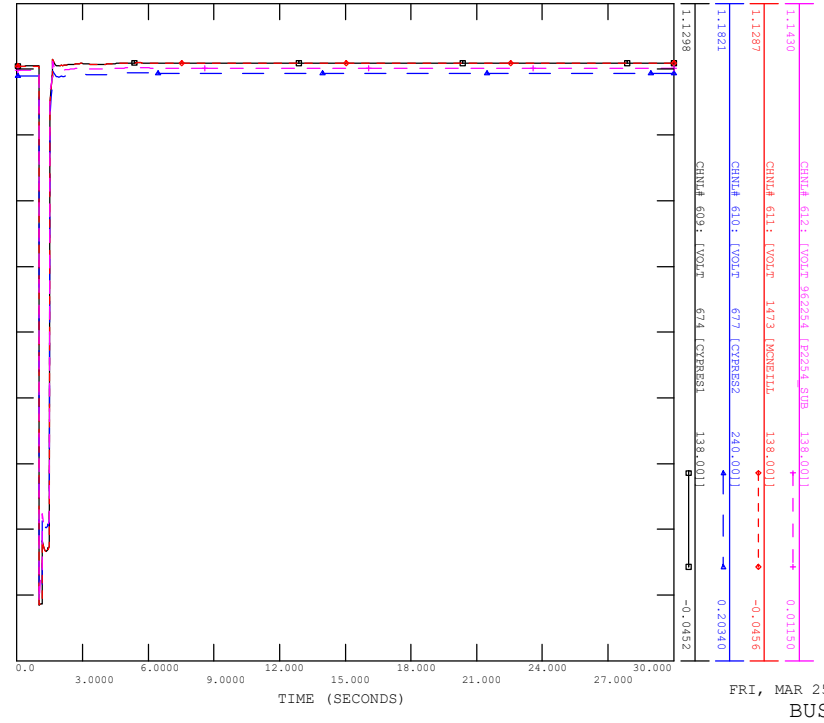
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_6691\_AMOCO

FILE: scn4\_sp\_09\_6691\_Amoco.out



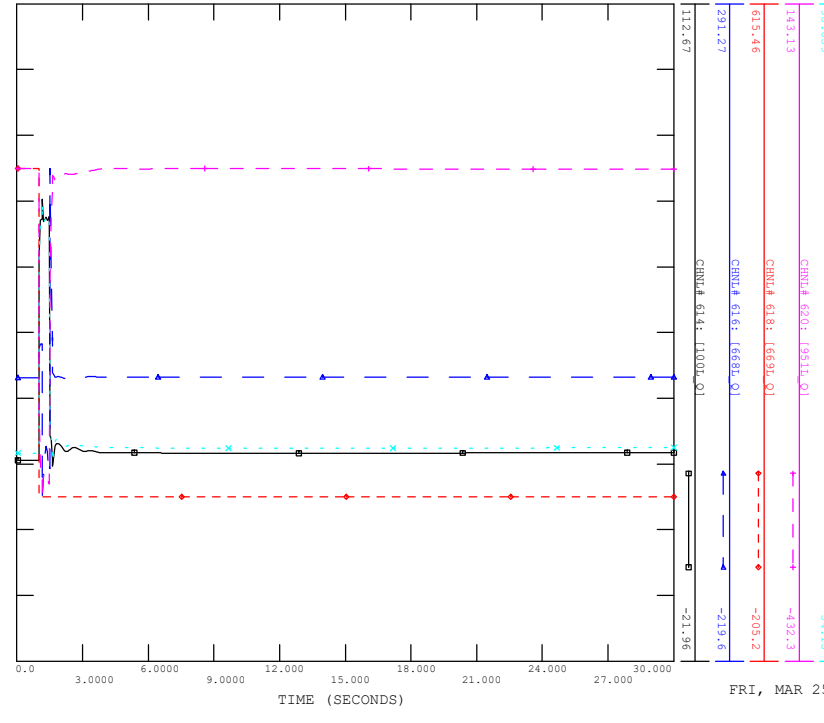
FRI, MAR 25 2022 10:53  
REACTIVE POWER

FILE: scn4\_sp\_09\_669L\_Amoco.out



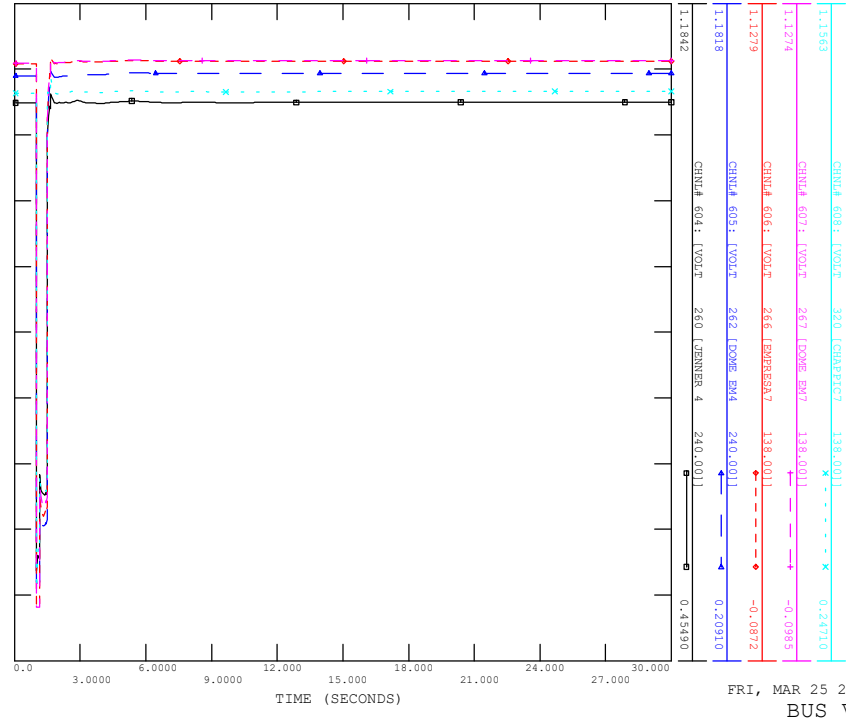
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn4\_sp\_09\_669L\_Amoco.out



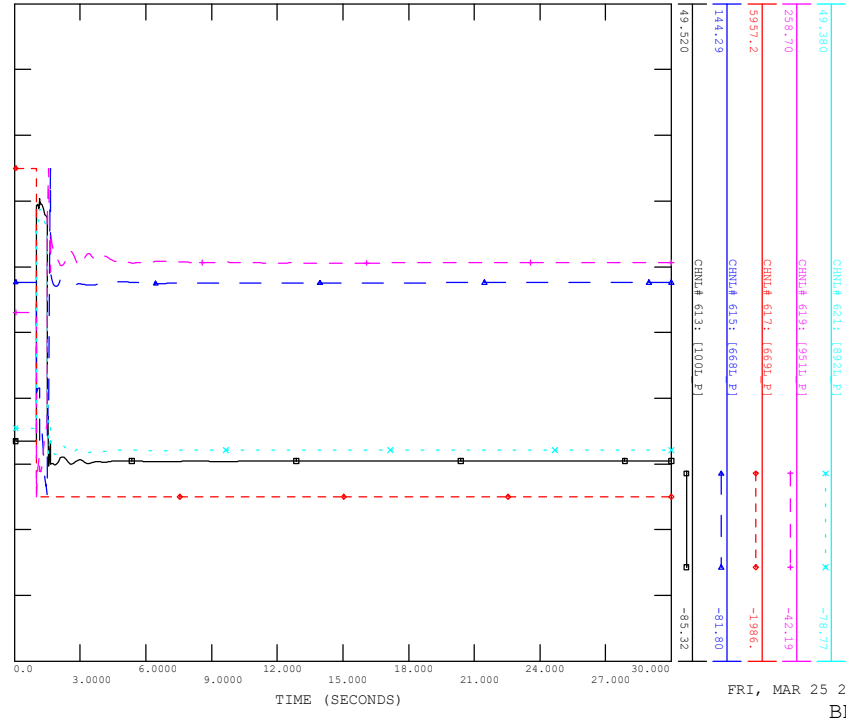
FRI, MAR 25 2022 10:53  
BRANCH P

FILE: scn4\_sp\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

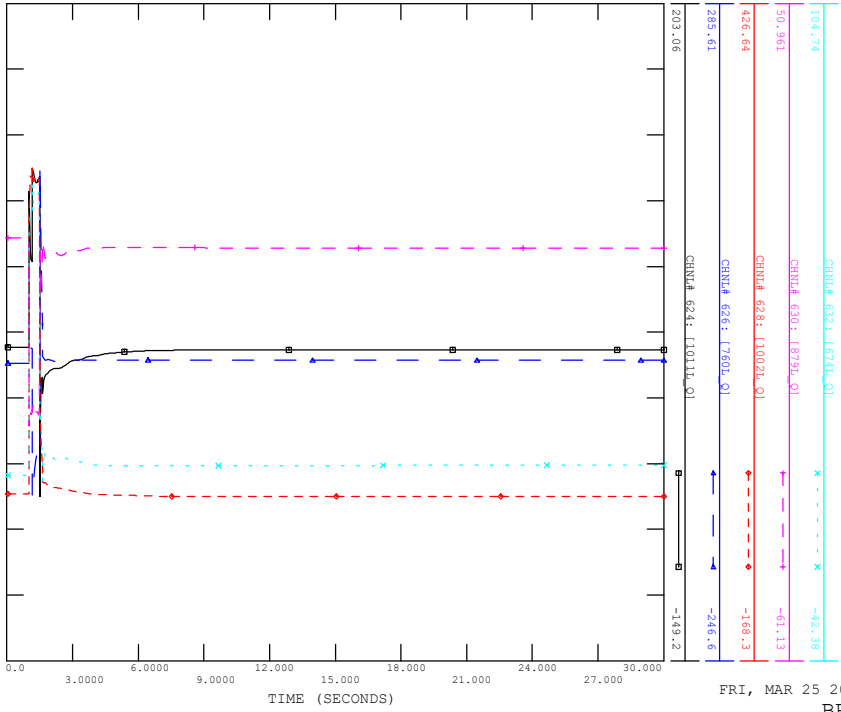
FILE: scn4\_sp\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_669L\_AMOCO

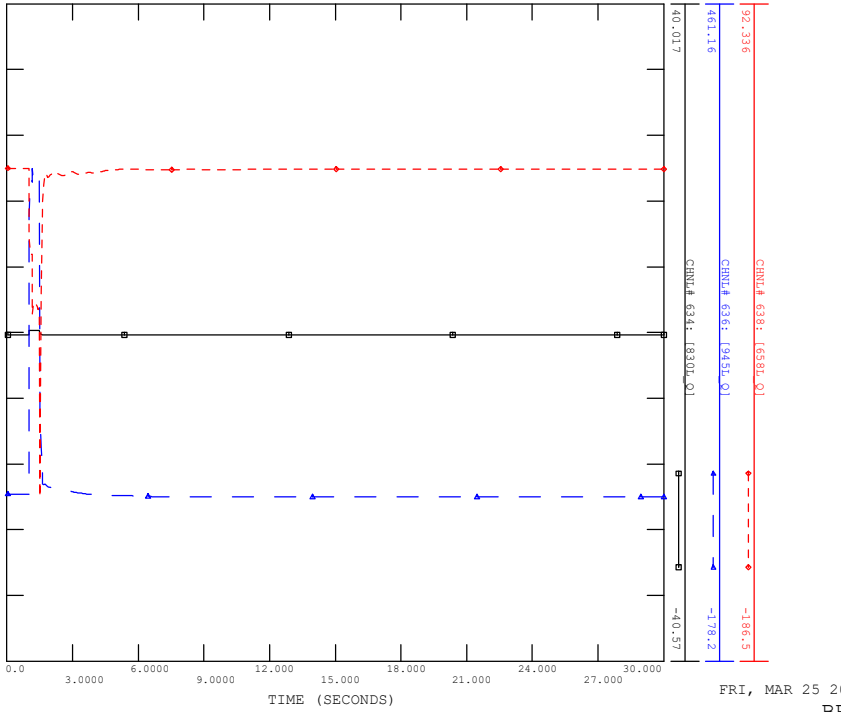
FILE: scn4\_sp\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_669L\_AMOCO

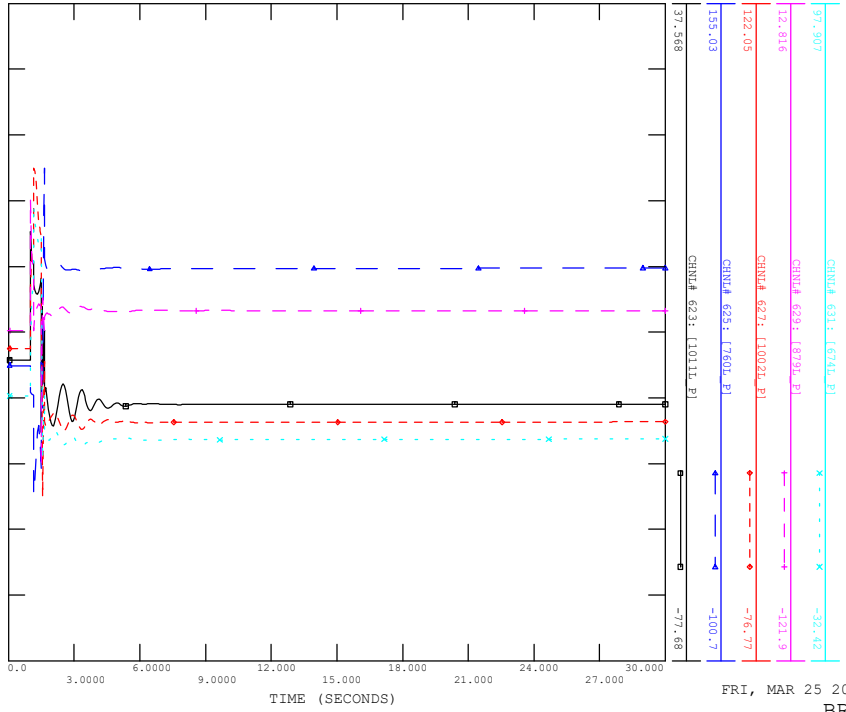
FILE: scn4\_sp\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_669L\_AMOCO

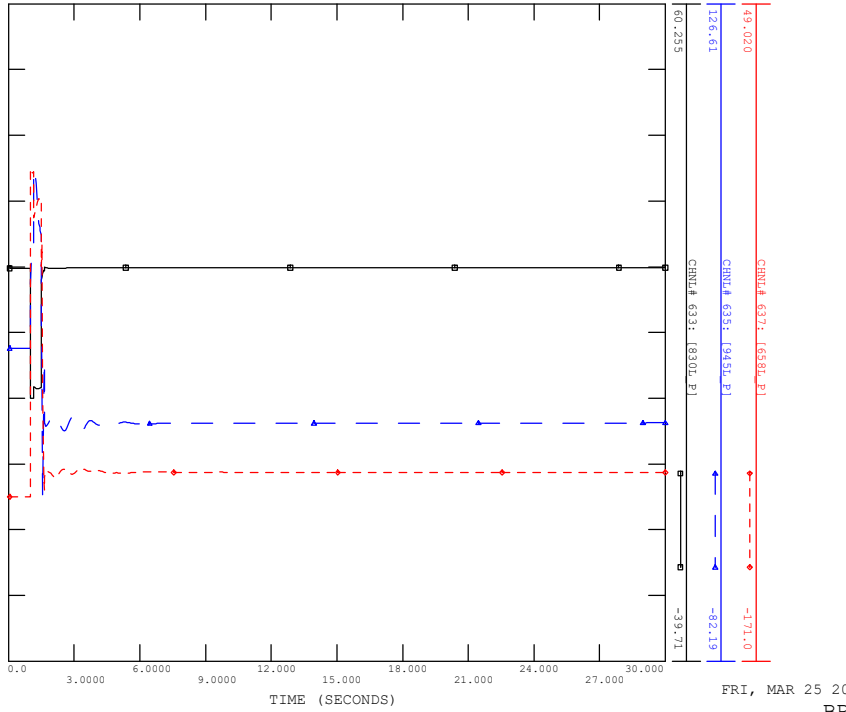
FILE: scn4\_sp\_09\_669L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH P

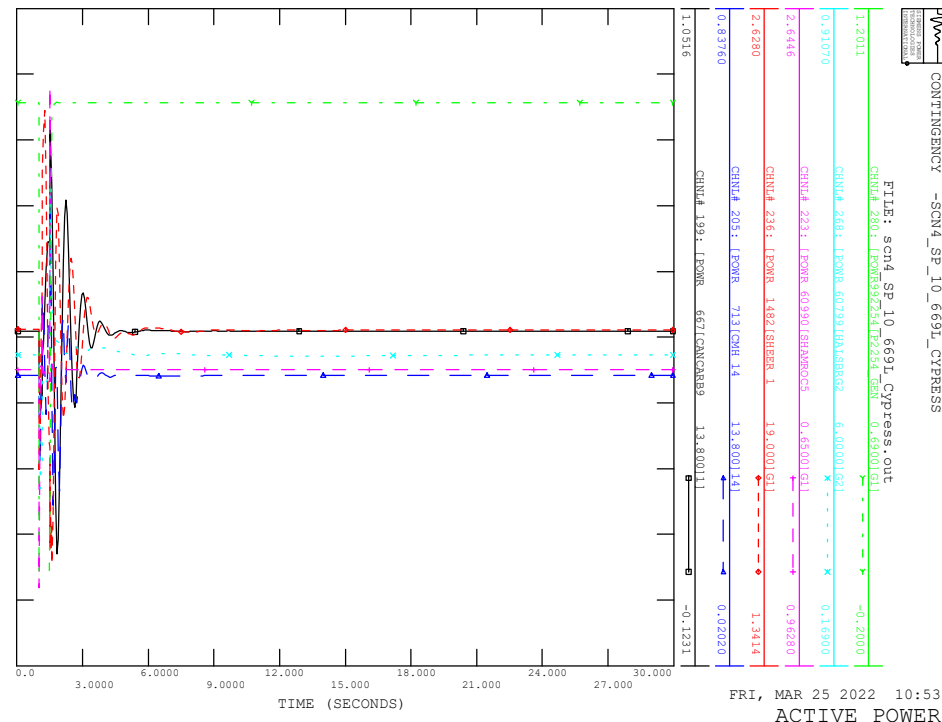
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_09\_669L\_AMOCO

FILE: scn4\_sp\_09\_669L\_Amoco.out

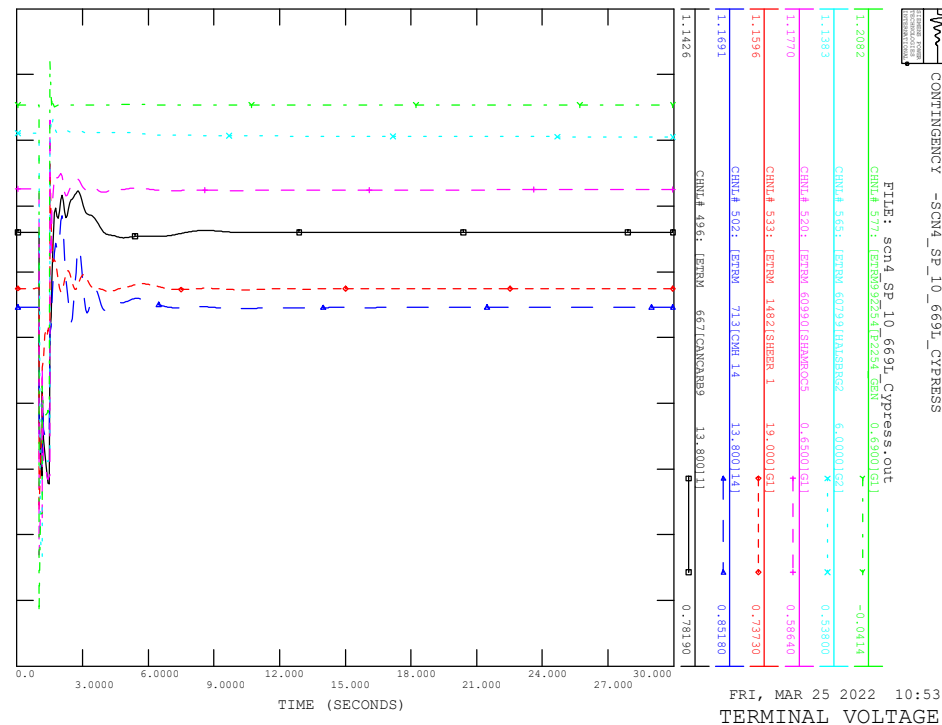


FRI, MAR 25 2022 10:53  
BRANCH P

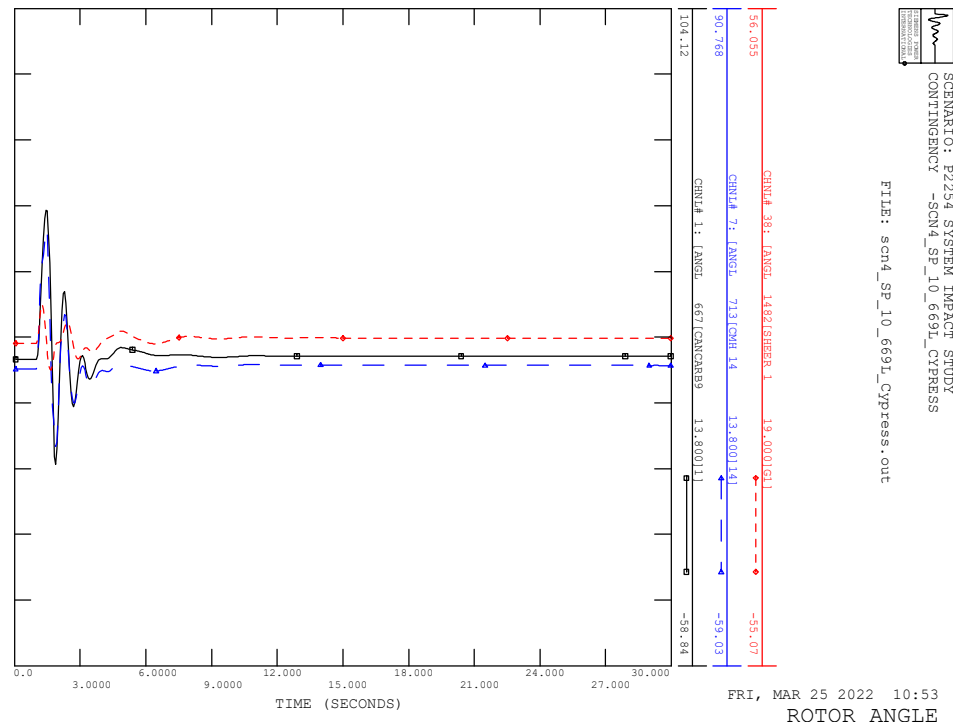
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS



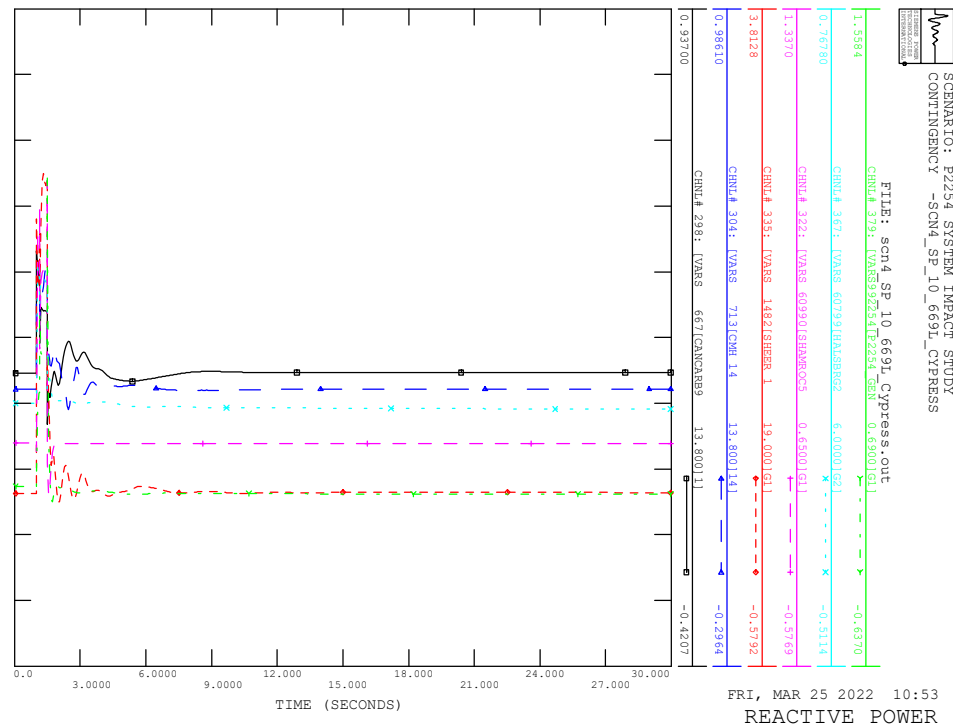
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS



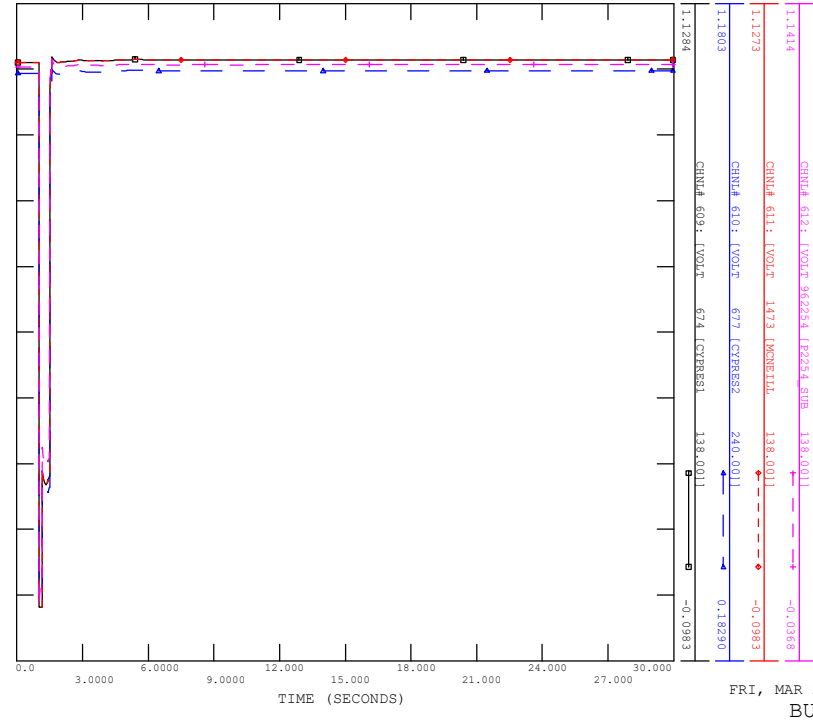
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_669L\_CYPRESS

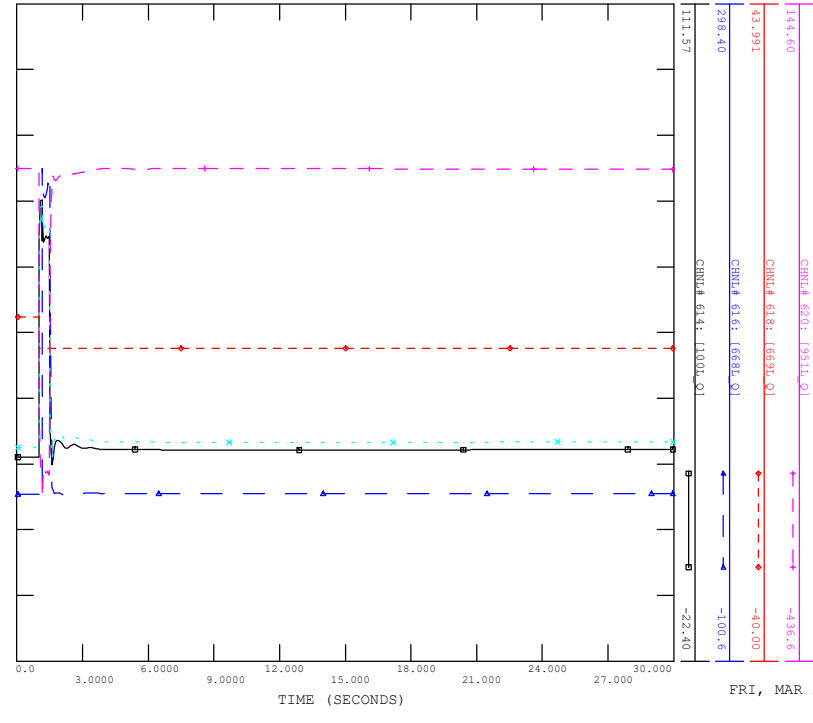
FILE: scn4\_sp\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_669L\_CYPRESS

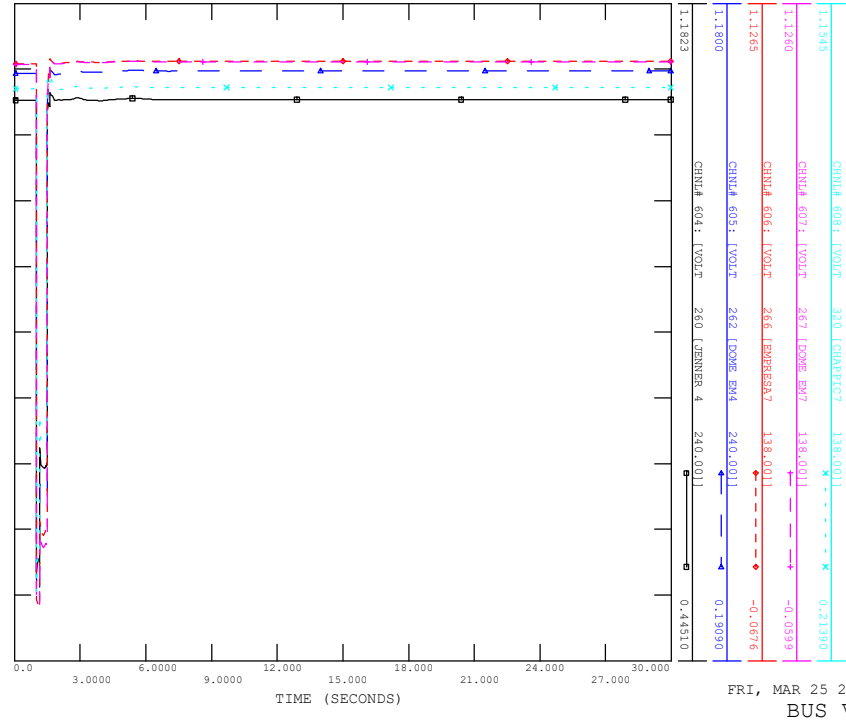
FILE: scn4\_sp\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_669L\_CYPRESS

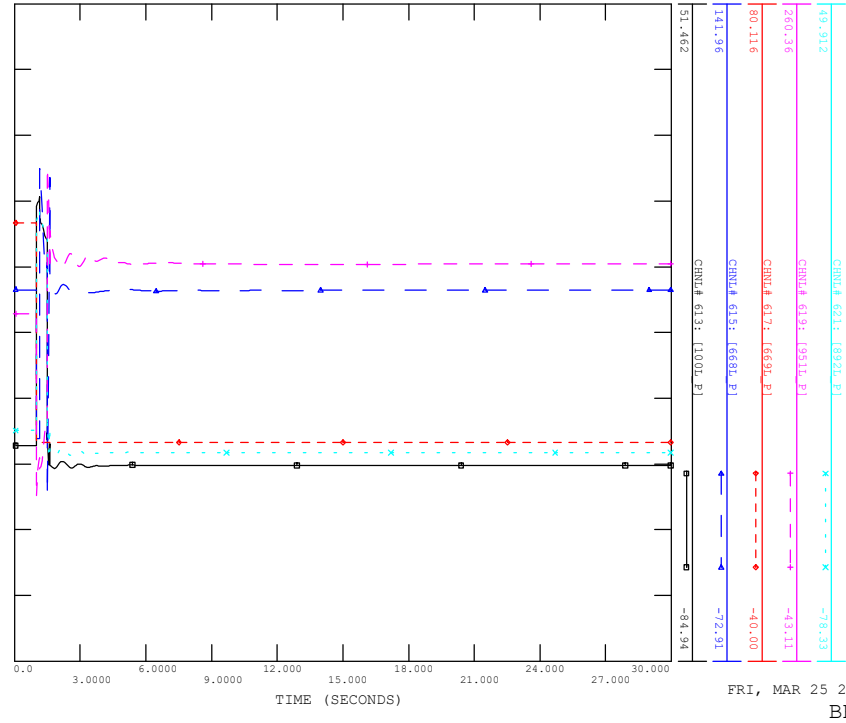
FILE: scn4\_sp\_10\_669L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_669L\_CYPRESS

FILE: scn4\_sp\_10\_669L\_Cypress.out

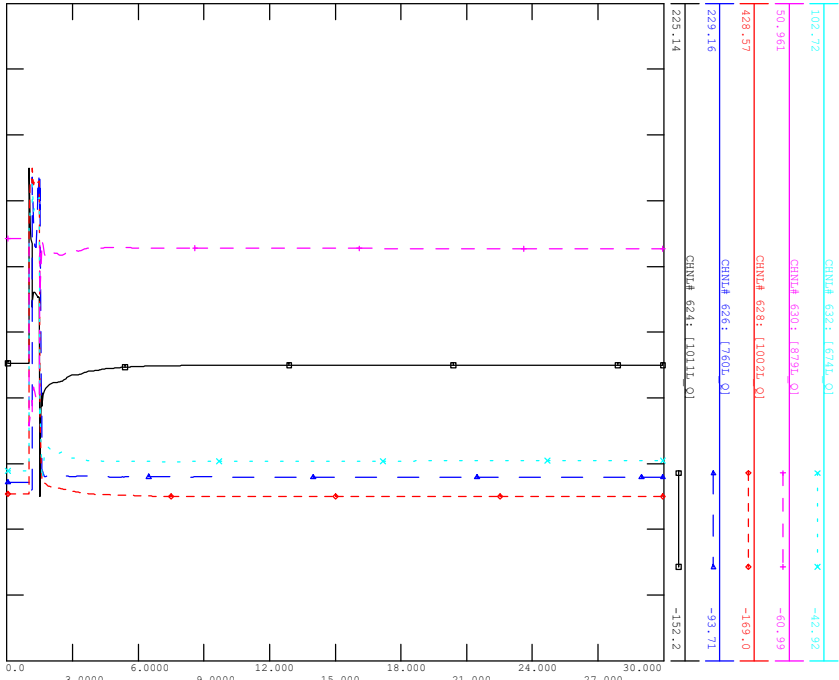


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS

FILE: scn4\_sp\_10\_6691\_Cypress.out

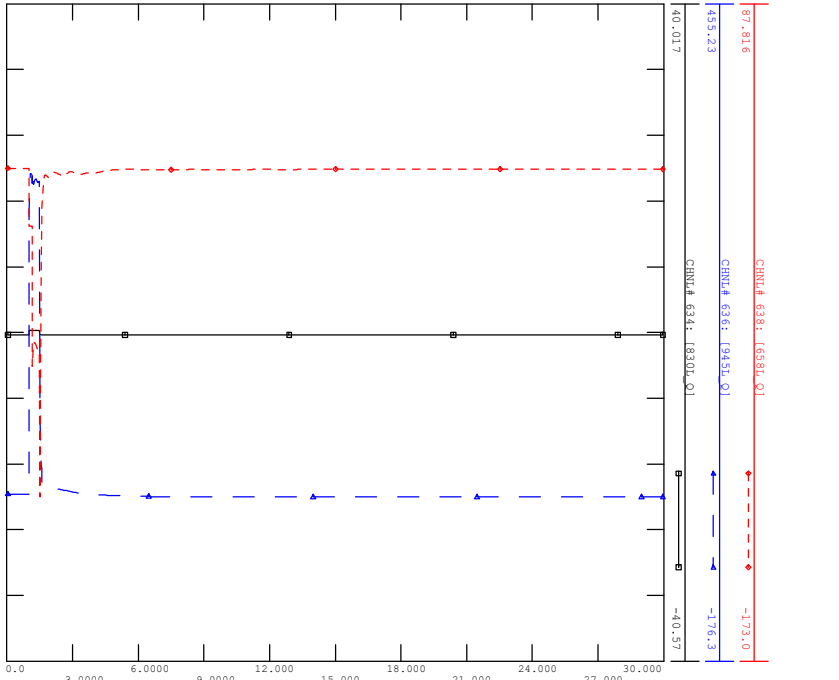


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS

FILE: scn4\_sp\_10\_6691\_Cypress.out

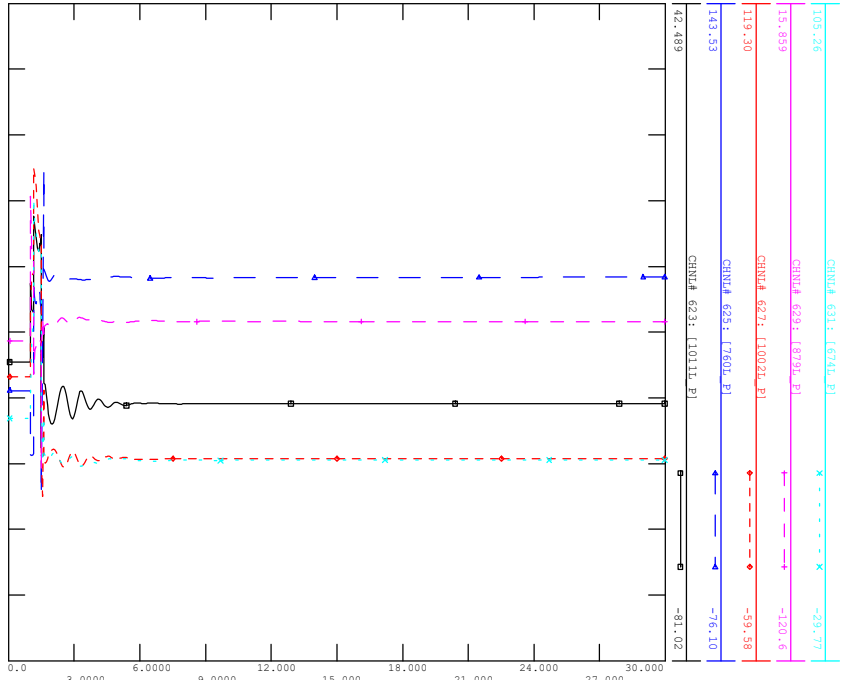


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS

FILE: scn4\_sp\_10\_6691\_Cypress.out

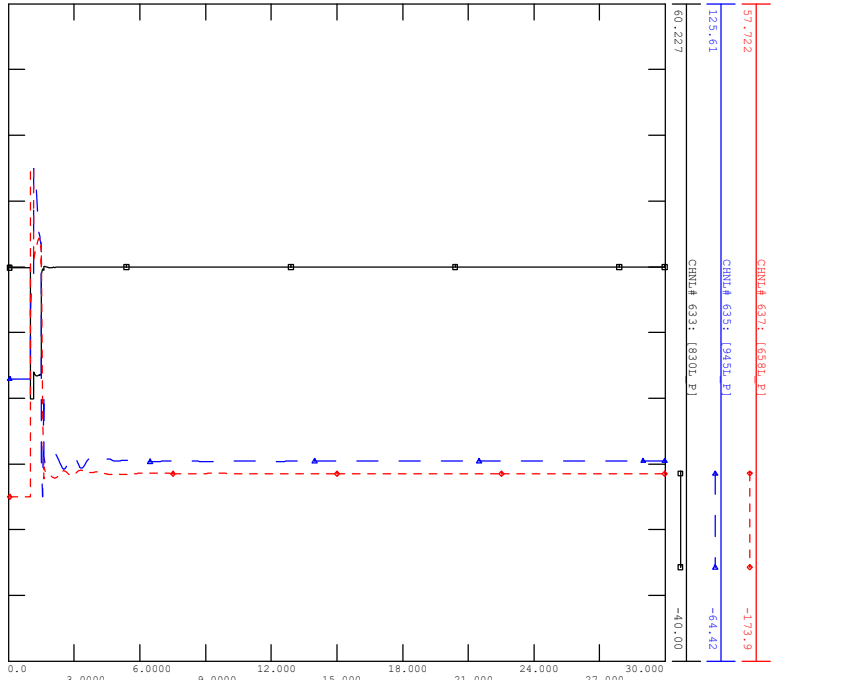


FRI, MAR 25 2022 10:53  
BRANCH P



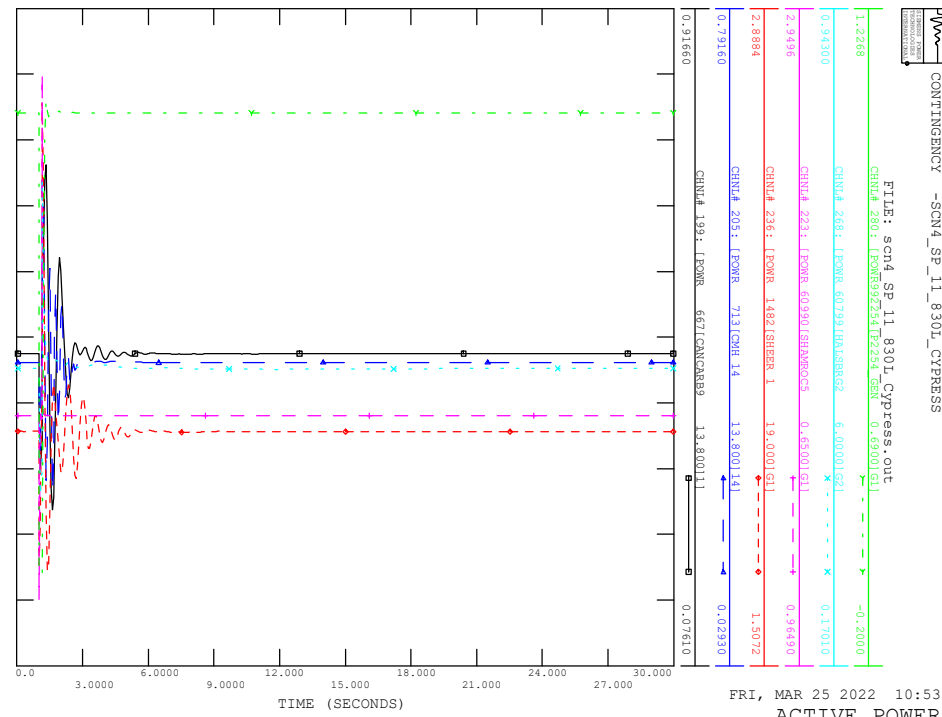
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_10\_6691\_CYPRESS

FILE: scn4\_sp\_10\_6691\_Cypress.out

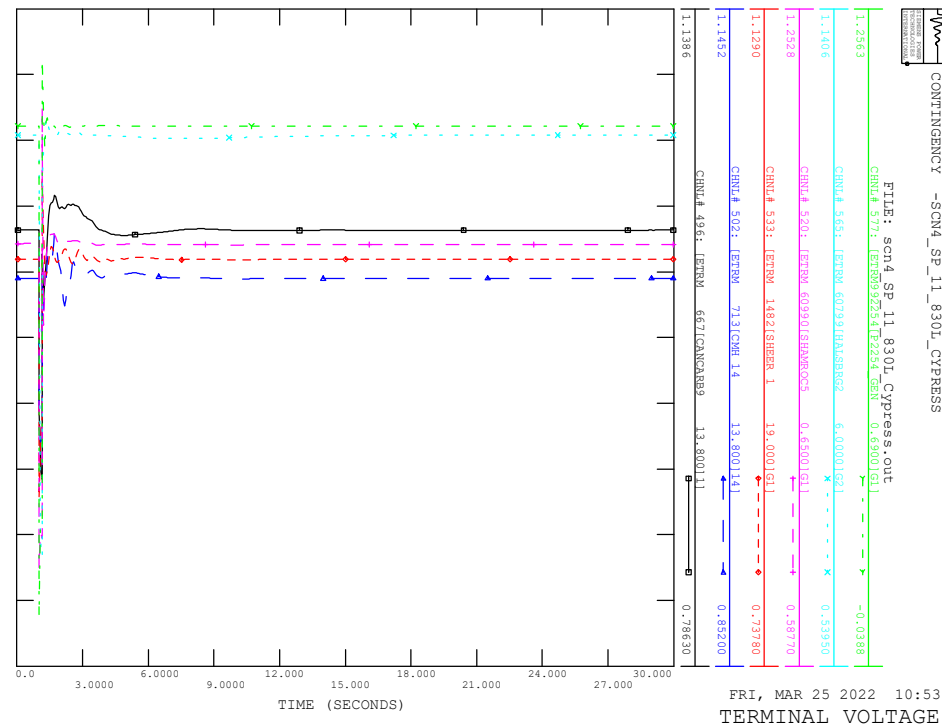


FRI, MAR 25 2022 10:53  
BRANCH P

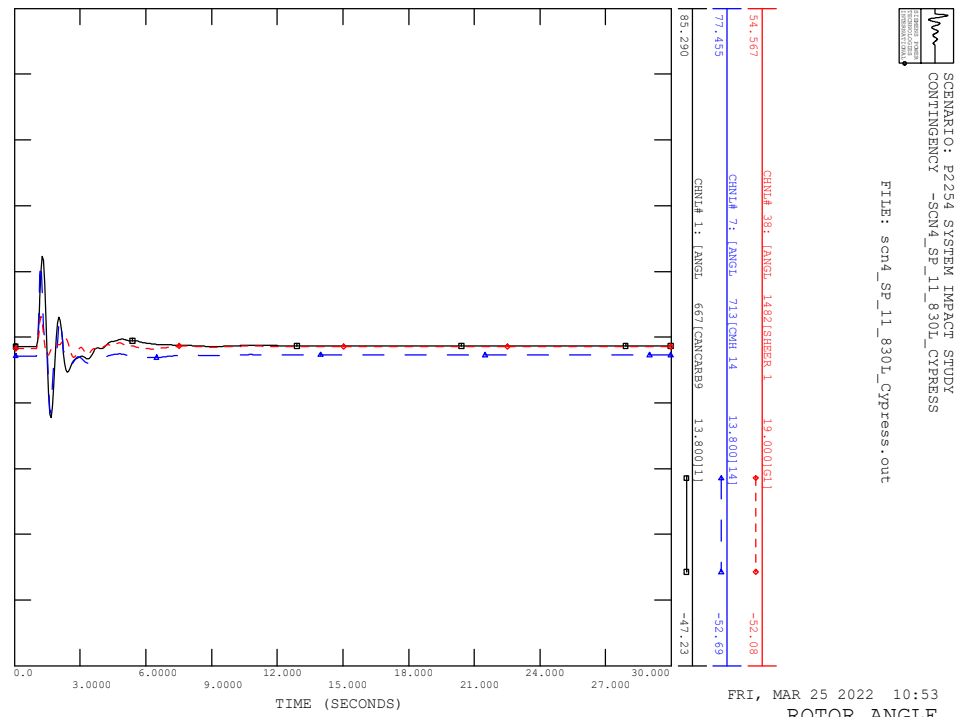
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS



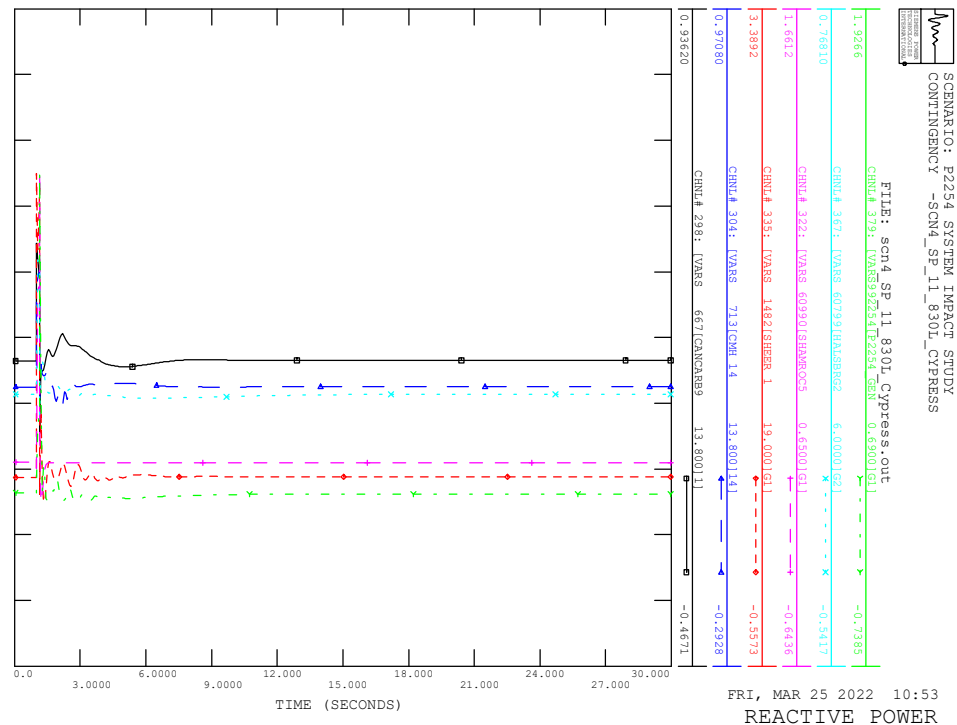
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS



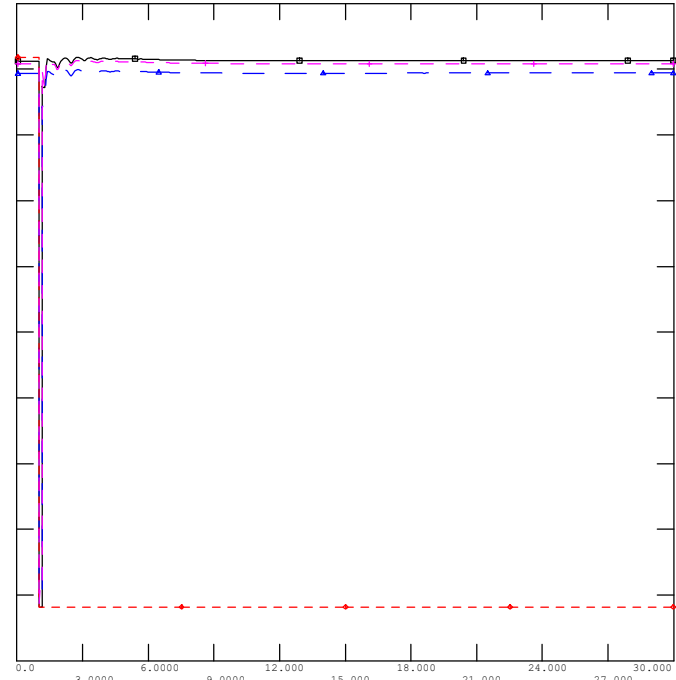
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS





SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out

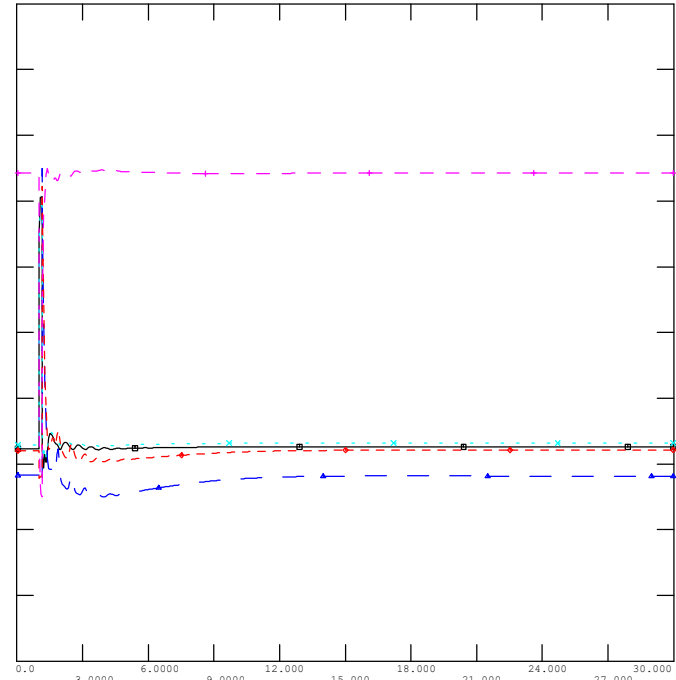


FRI, MAR 25 2022 10:53  
BUS VOLTAGE



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out

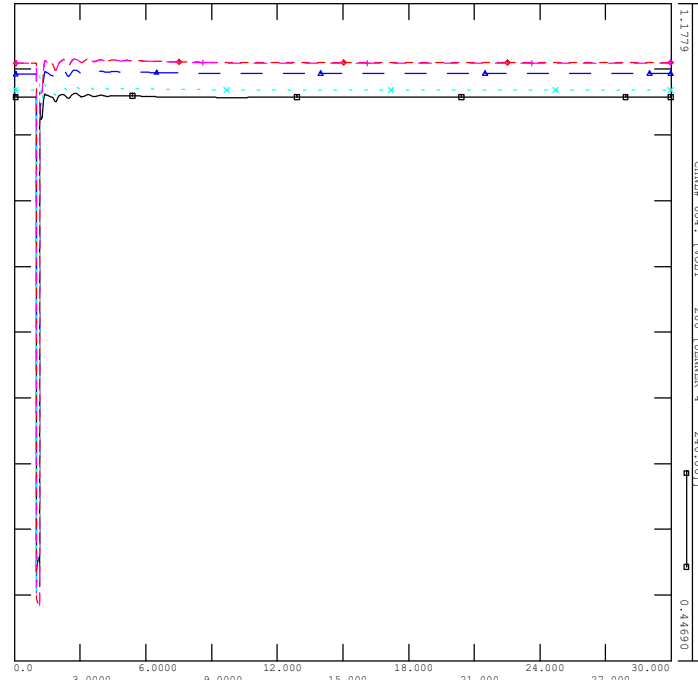


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out

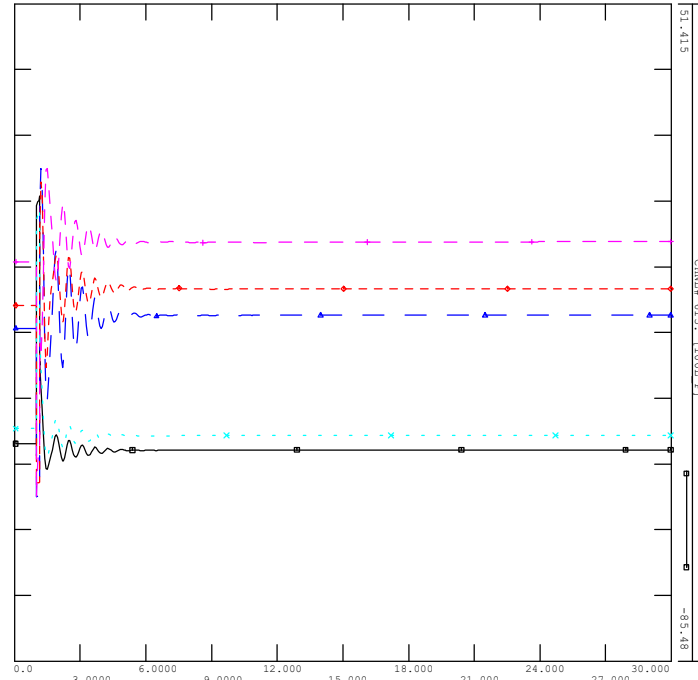


FRI, MAR 25 2022 10:53  
BUS VOLTAGE



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out

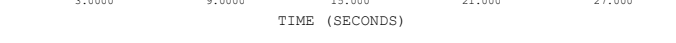


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out

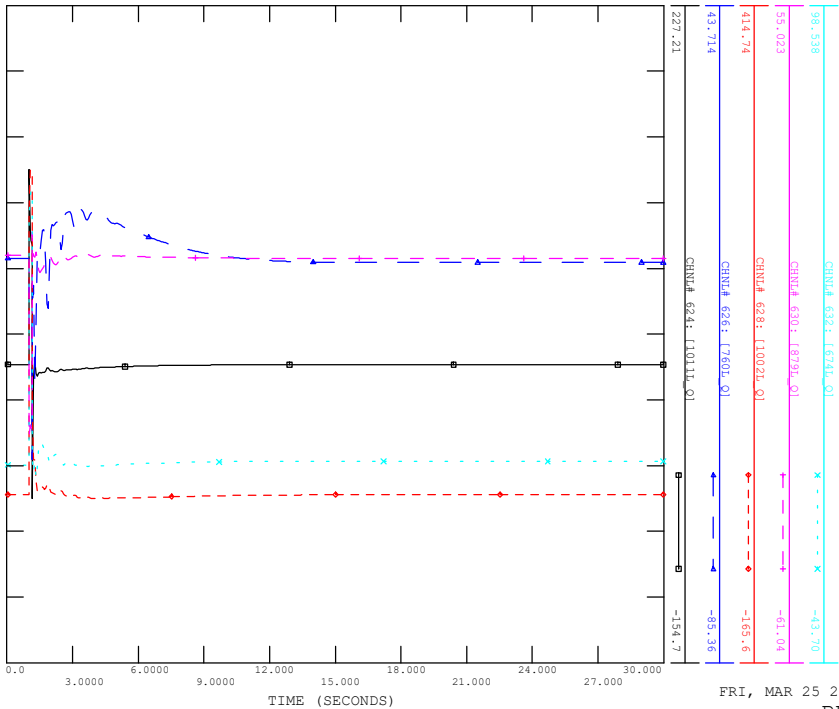


FRI, MAR 25 2022 10:53  
BRANCH Q



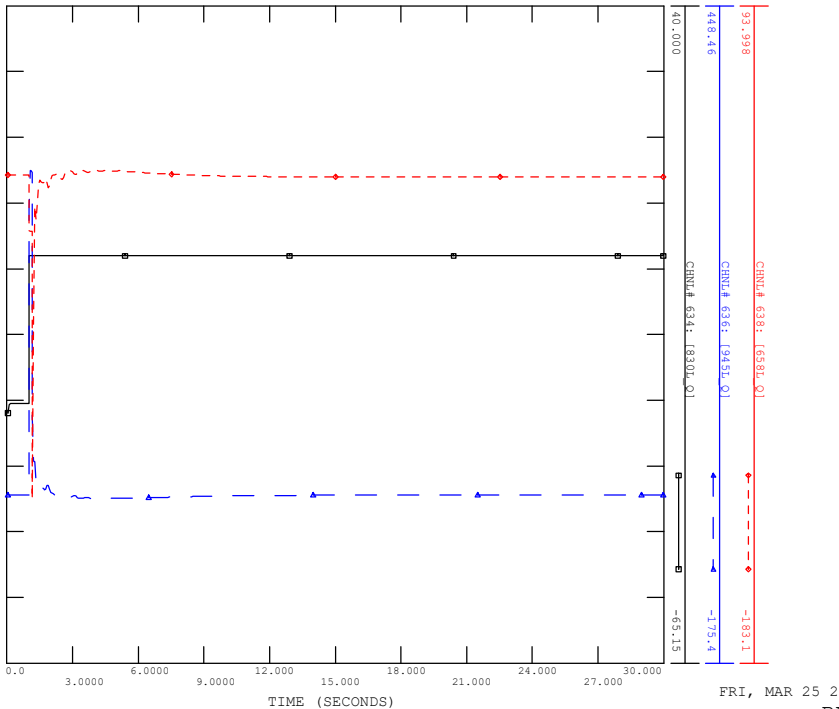
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out



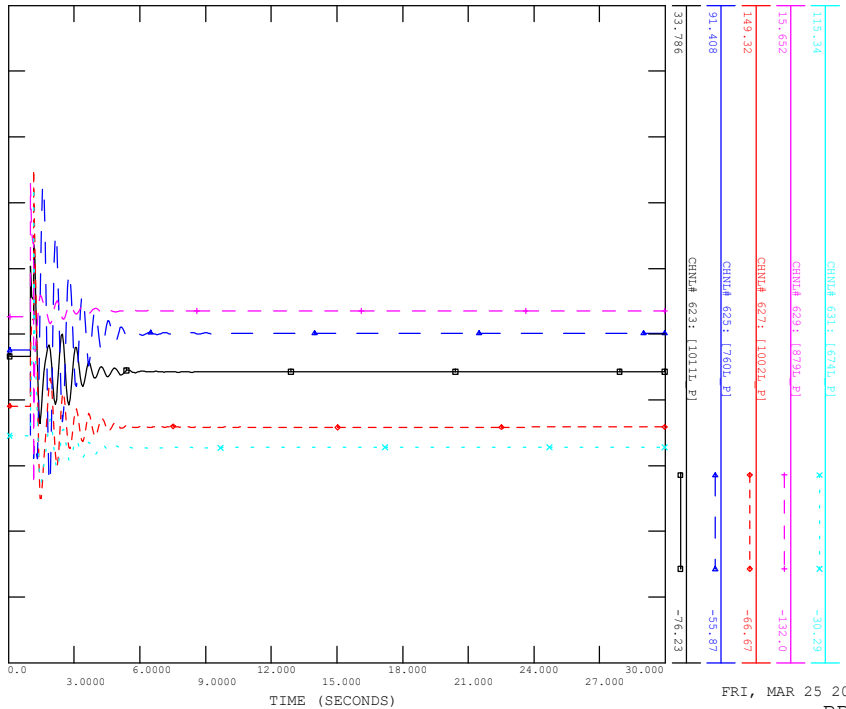
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out



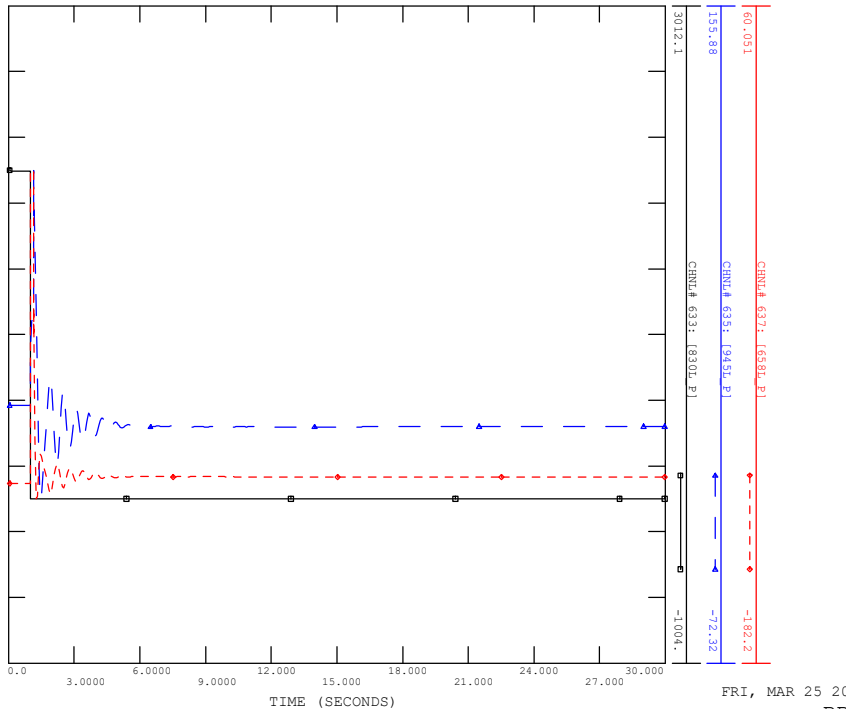
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

FILE: scn4\_sp\_11\_830L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_11\_830L\_CYPRESS

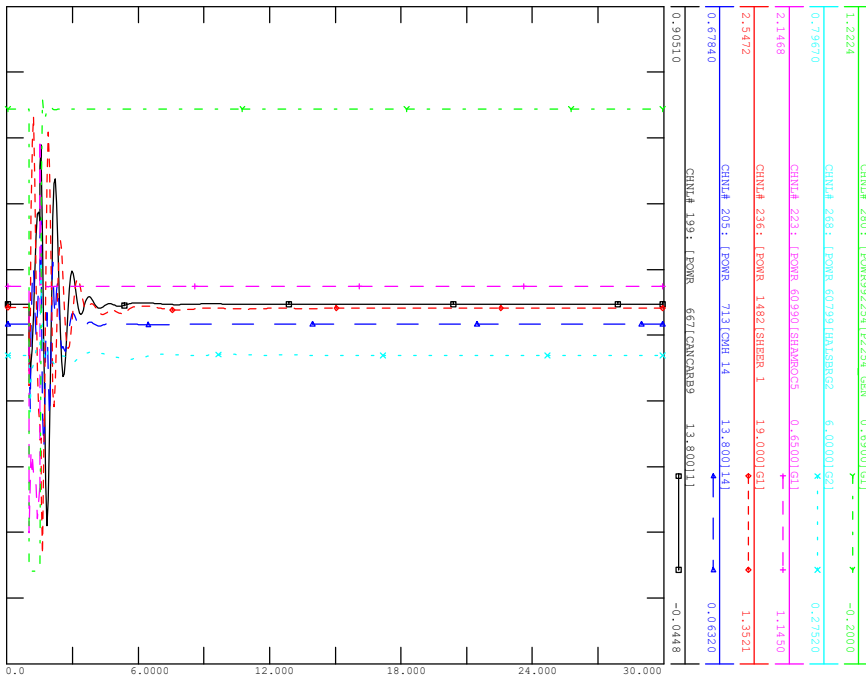
FILE: scn4\_sp\_11\_830L\_Cypress.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill



FILE: scn4\_sp\_12\_830L\_McNeill.out

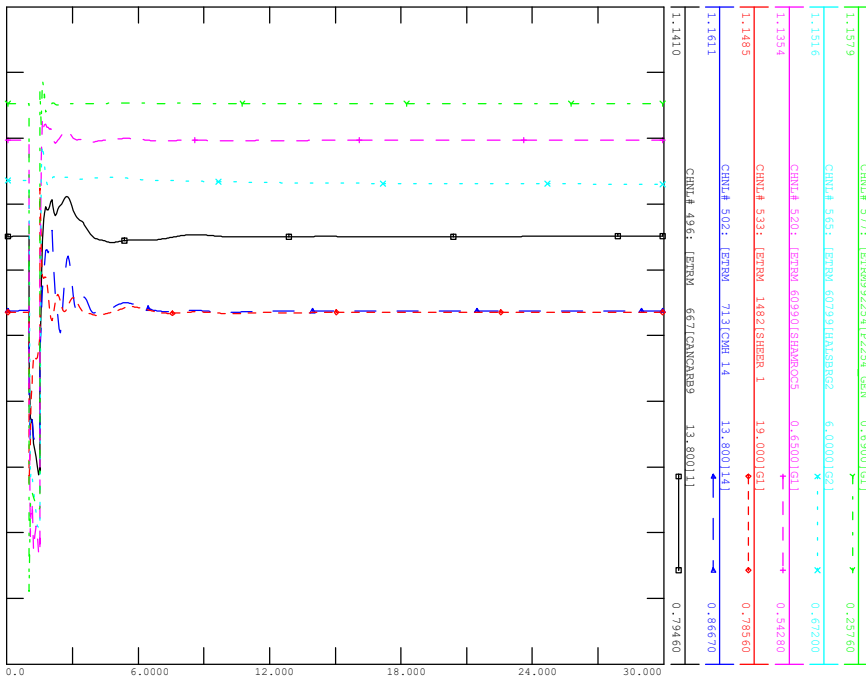


FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill



FILE: scn4\_sp\_12\_830L\_McNeill.out

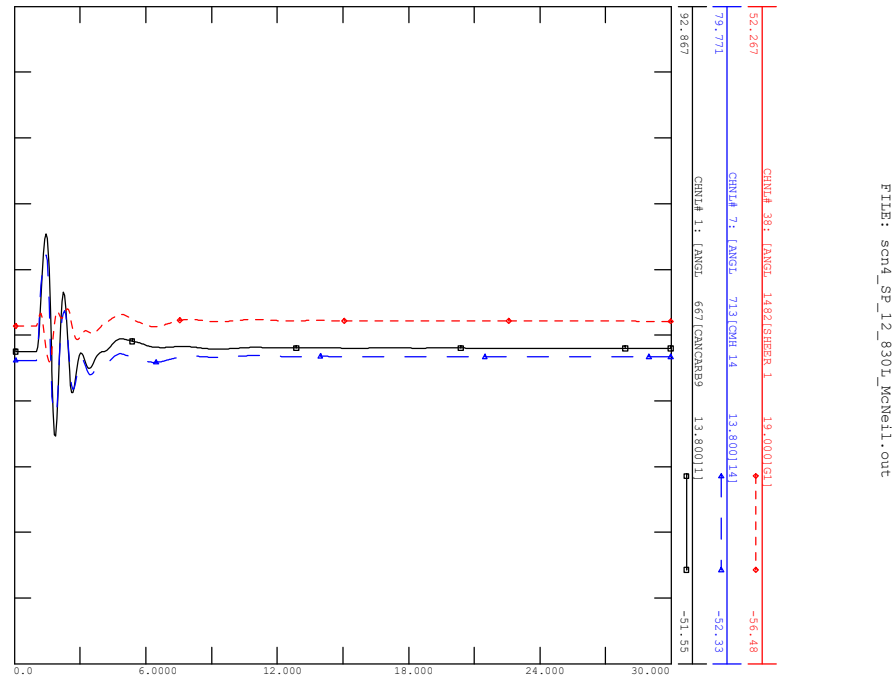


FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill



FILE: scn4\_sp\_12\_830L\_McNeill.out

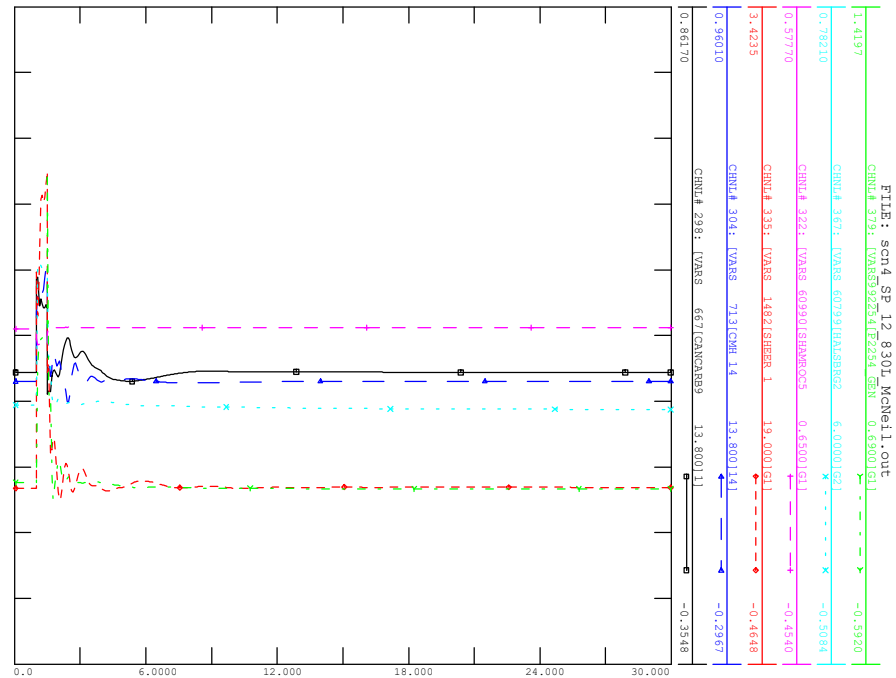


FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill



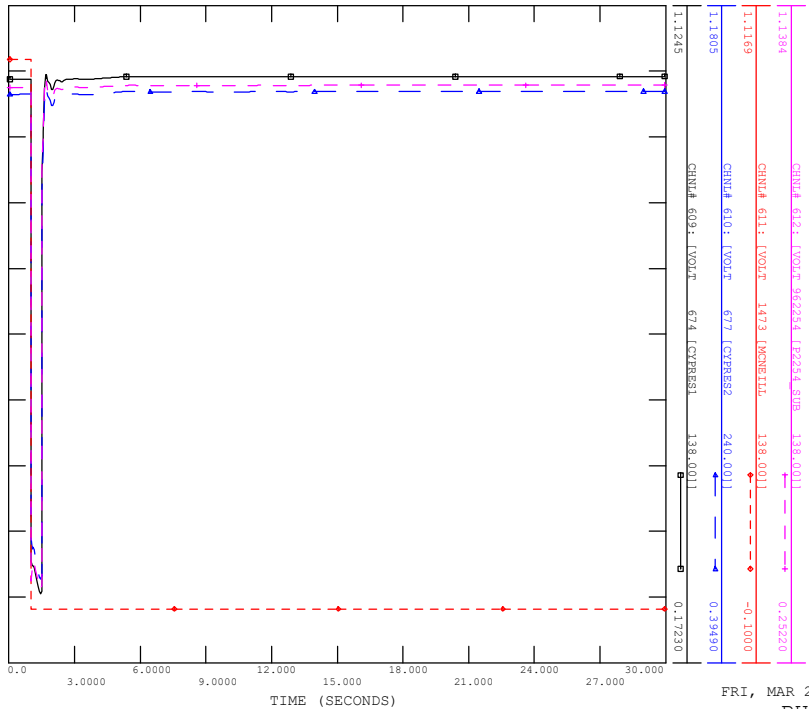
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill

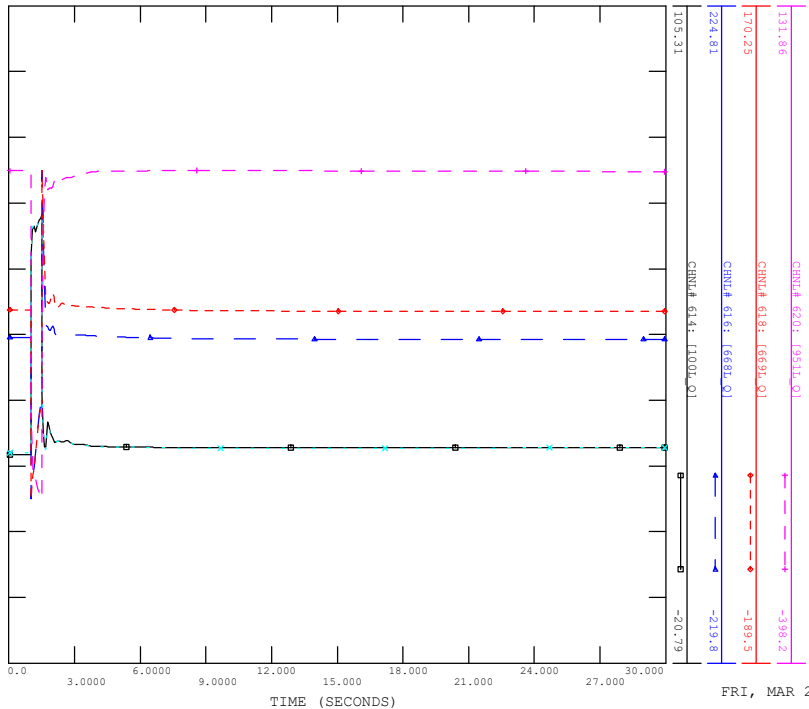
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill

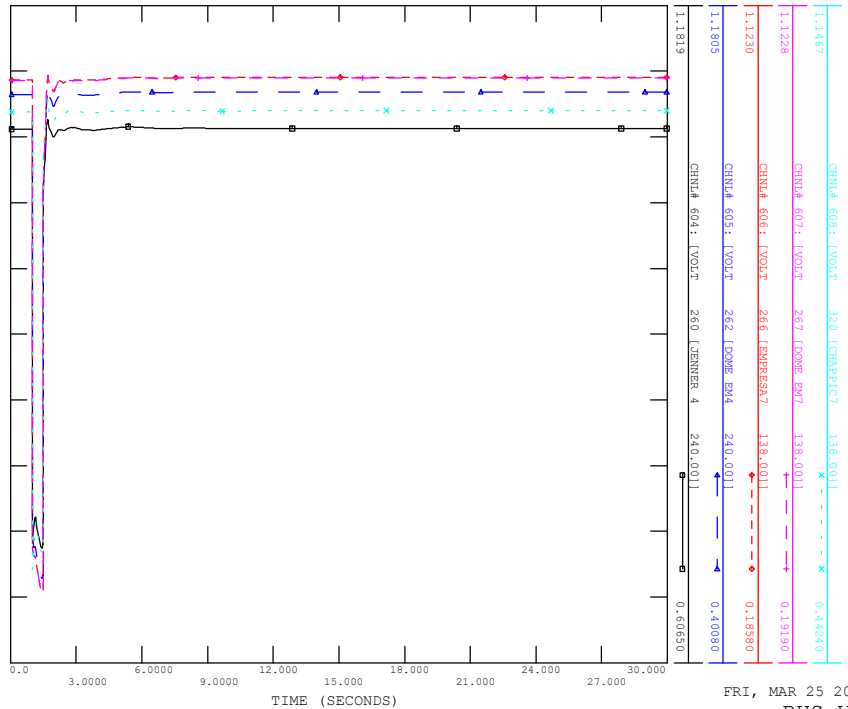
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill

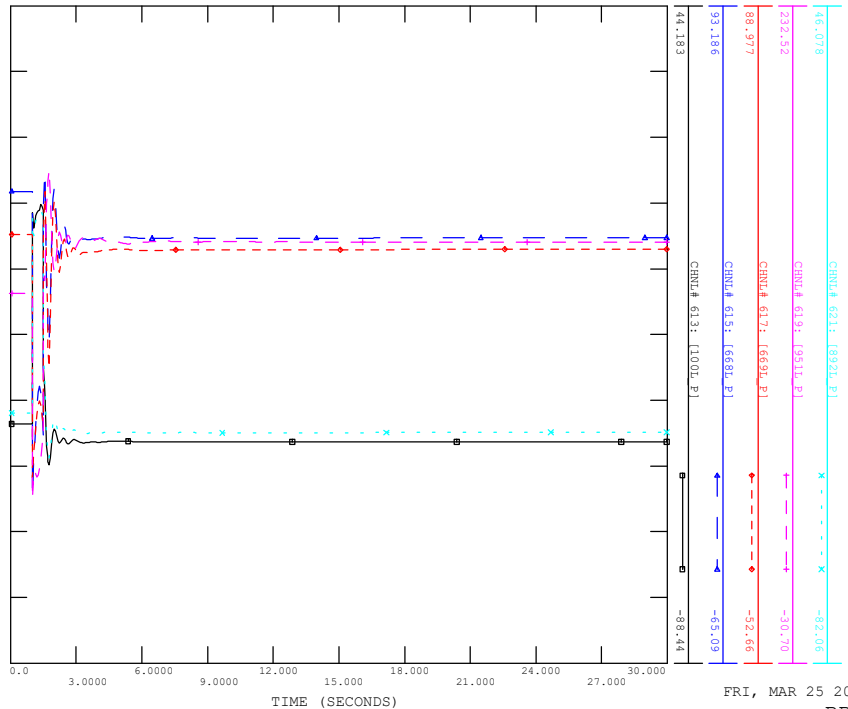
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNeill

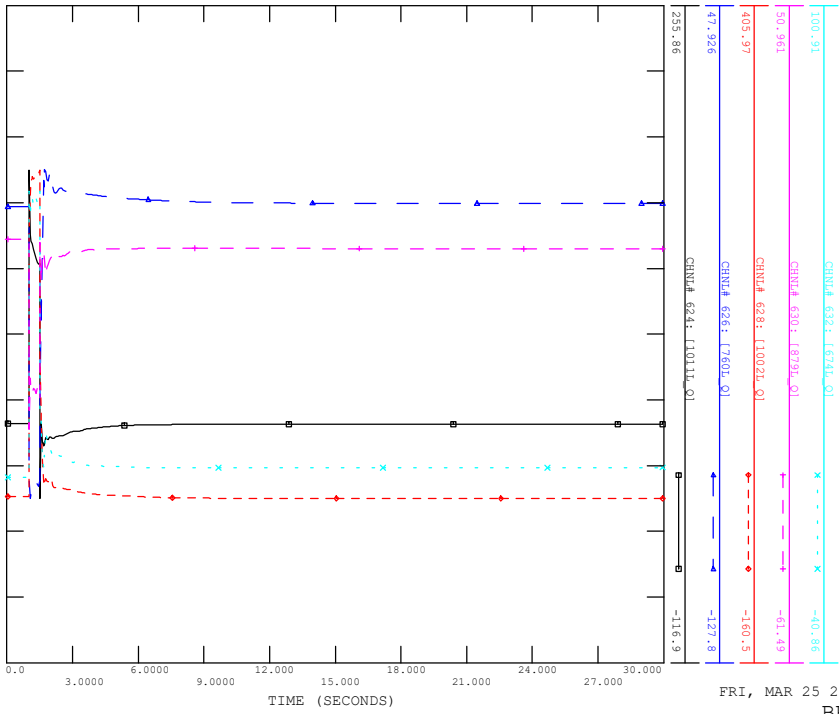
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNEILL

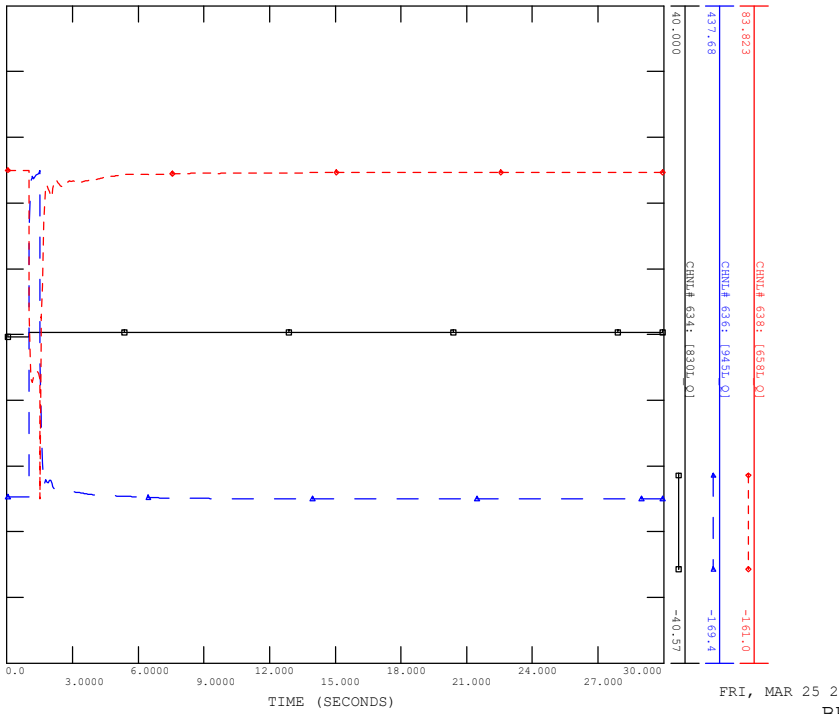
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNEILL

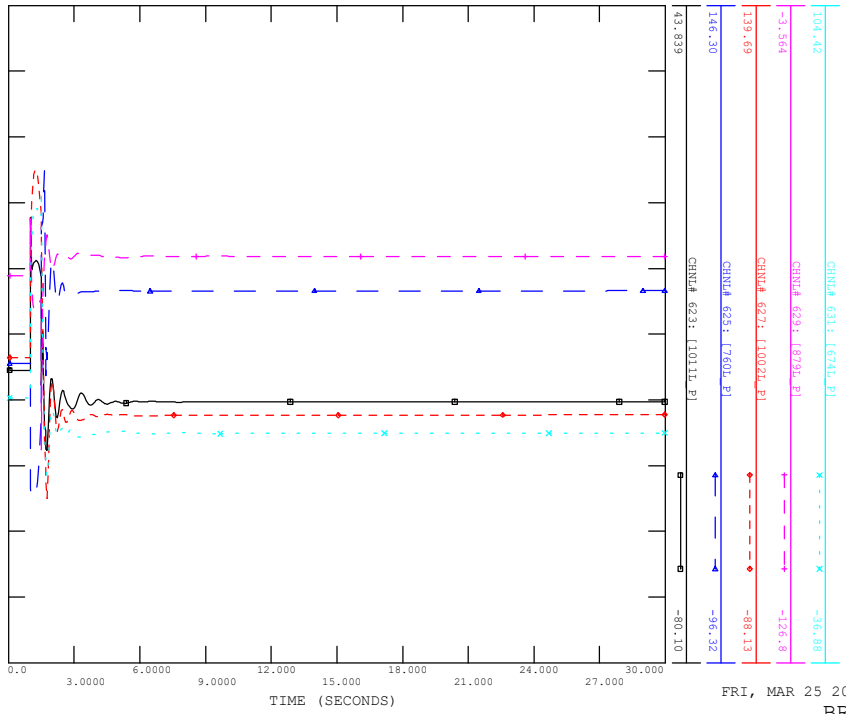
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNEILL

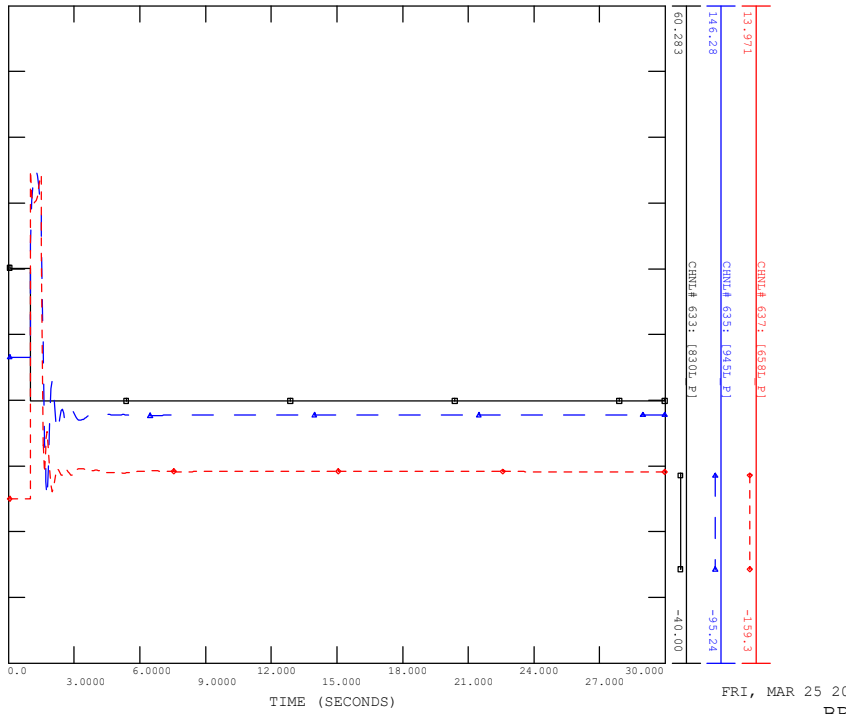
FILE: scn4\_sp\_12\_830L\_McNeill.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_12\_830L\_McNEILL

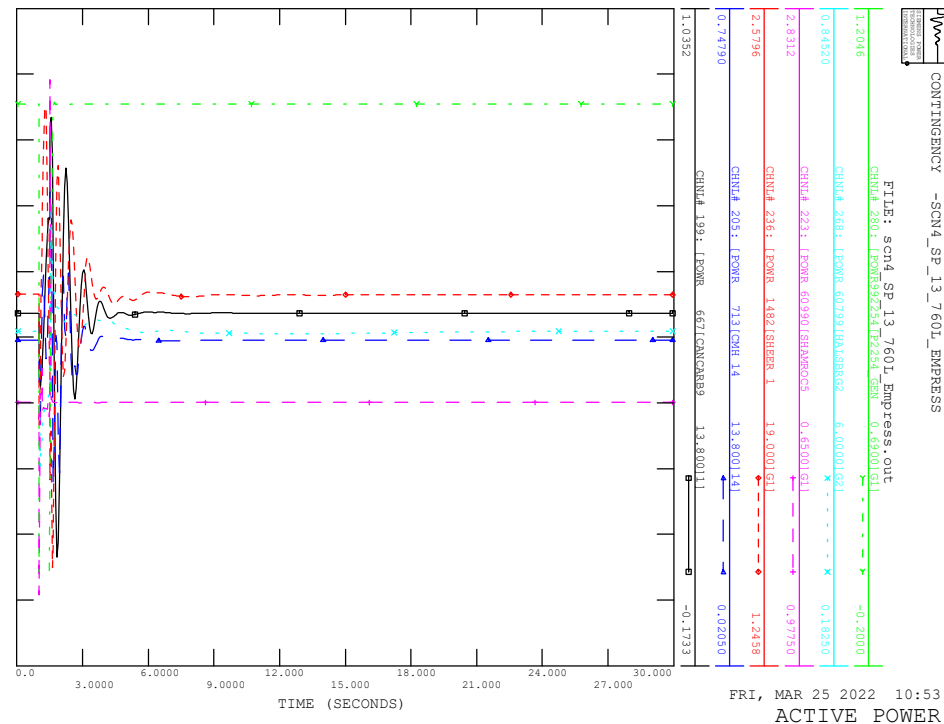
FILE: scn4\_sp\_12\_830L\_McNeill.out



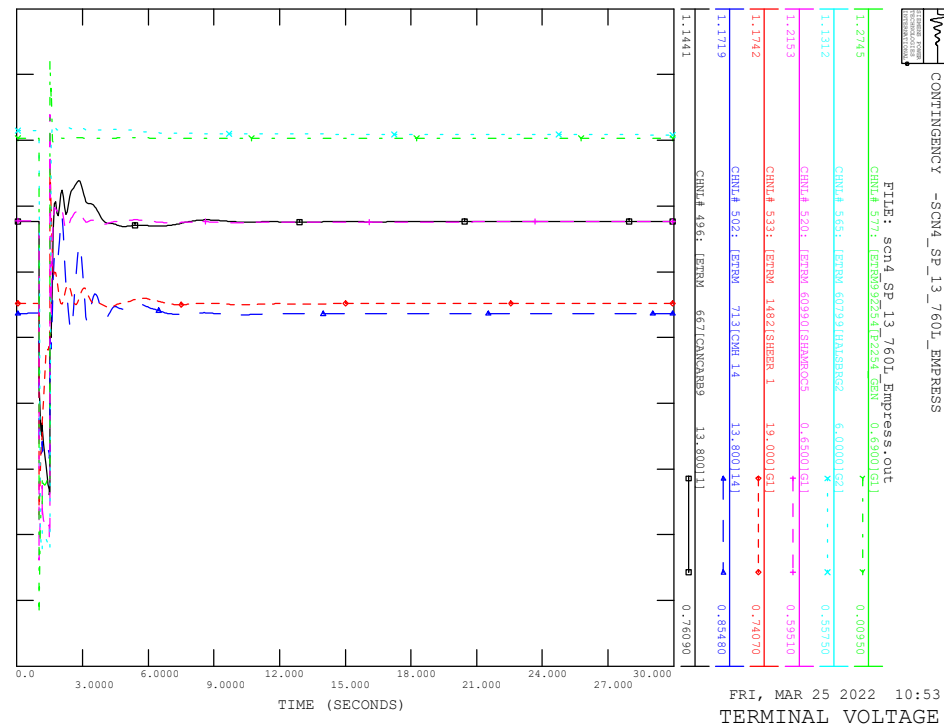
FRI, MAR 25 2022 10:53  
BRANCH P



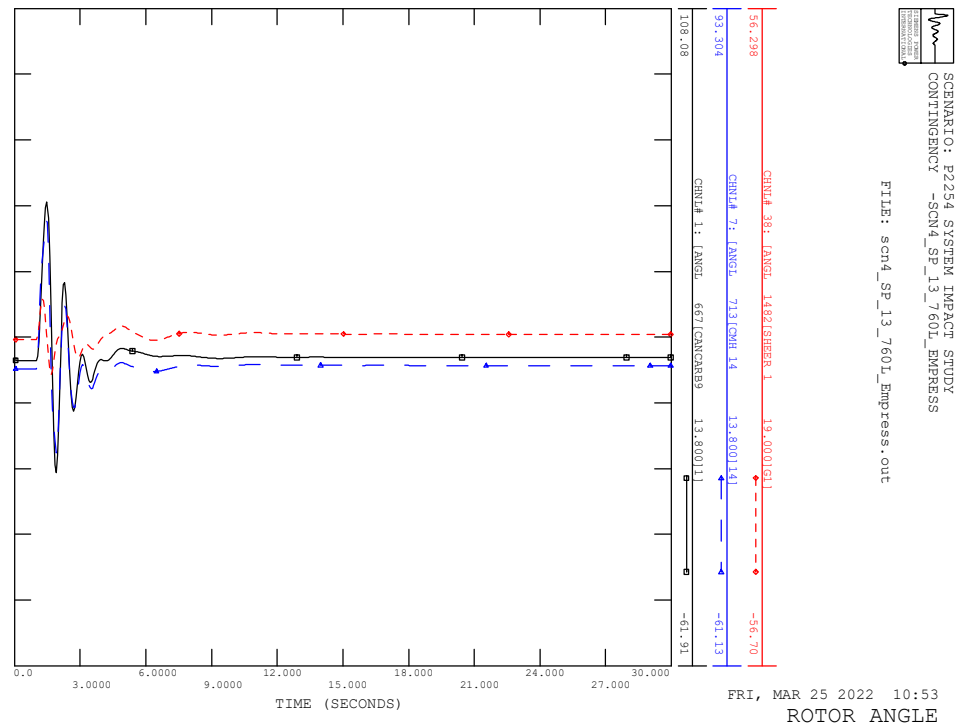
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_7601\_EMPRESS



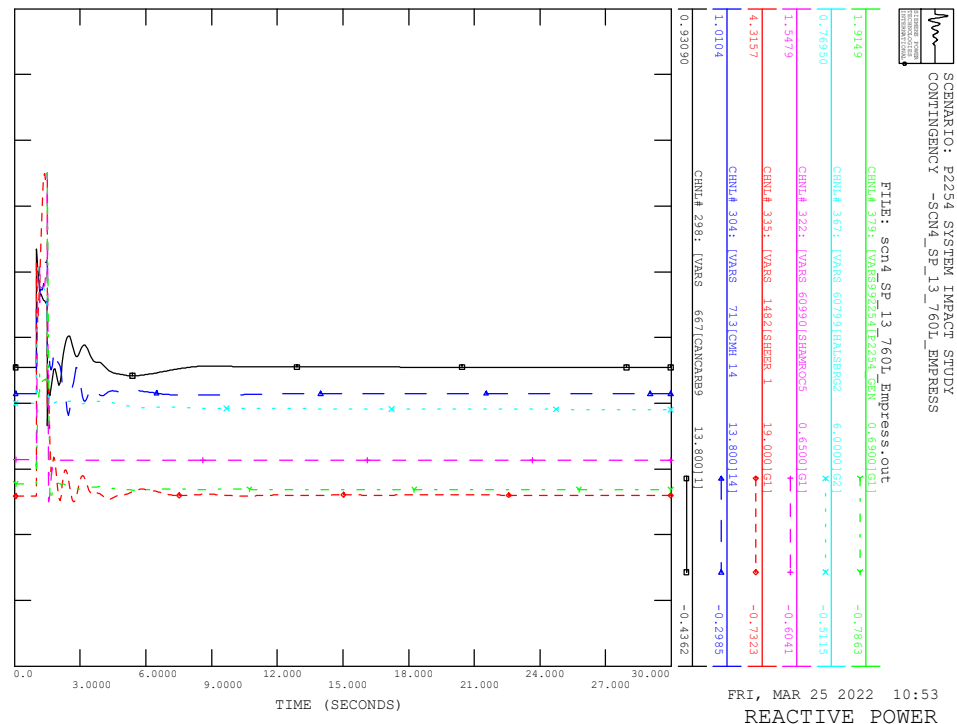
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_7601\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_7601\_EMPRESS

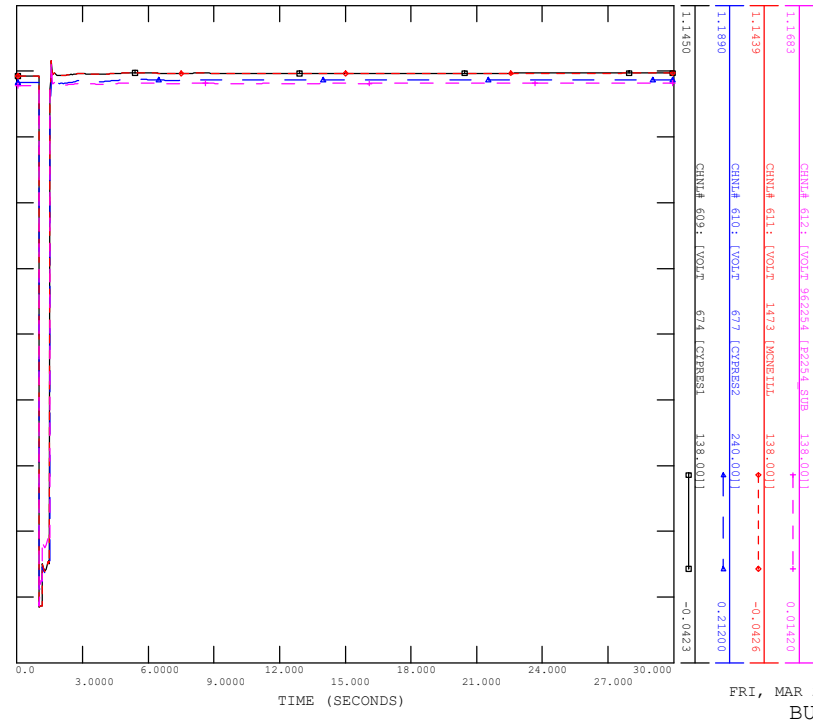


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_7601\_EMPRESS



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

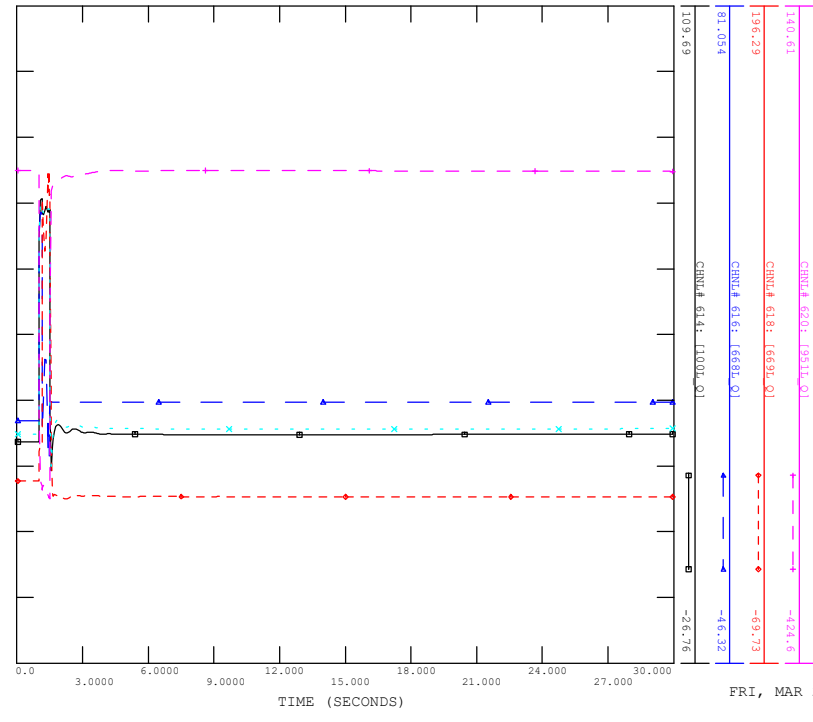
FILE: scn4\_sp\_13\_760L\_emptress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

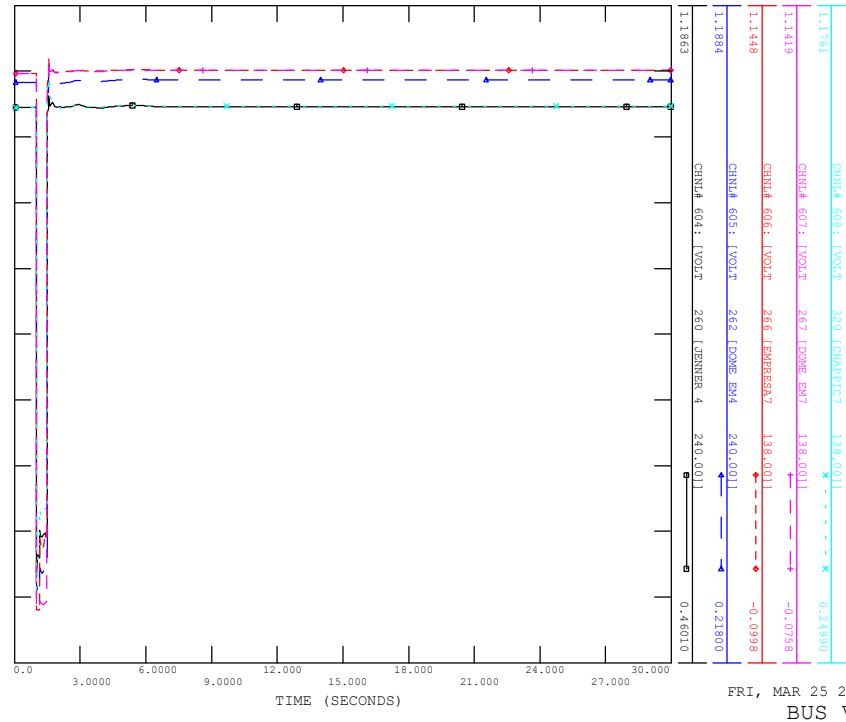
FILE: scn4\_sp\_13\_760L\_emptress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

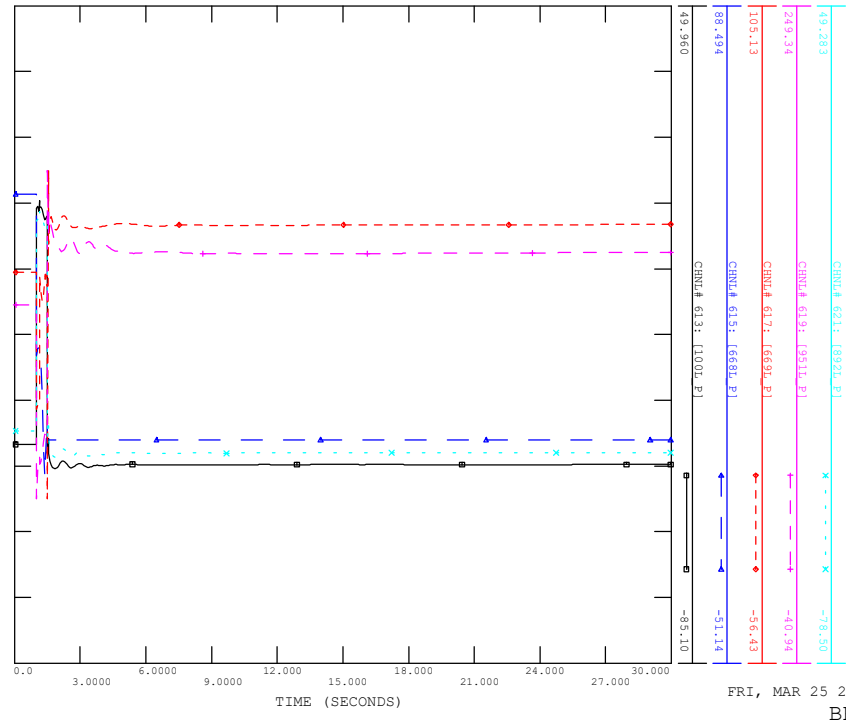
FILE: scn4\_sp\_13\_760L\_emptress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

FILE: scn4\_sp\_13\_760L\_emptress.out

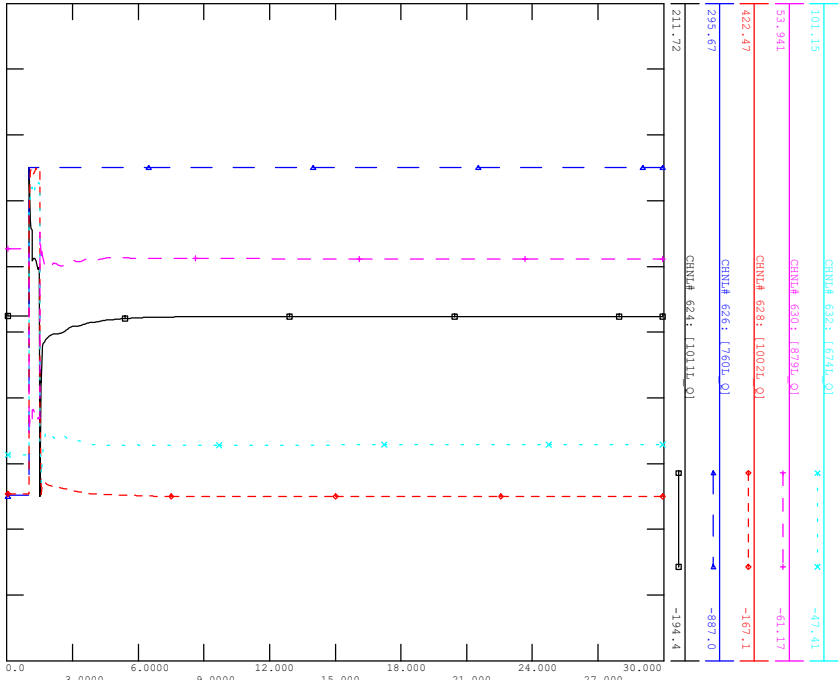


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

FILE: scn4\_sp\_13\_760L\_Empress.out

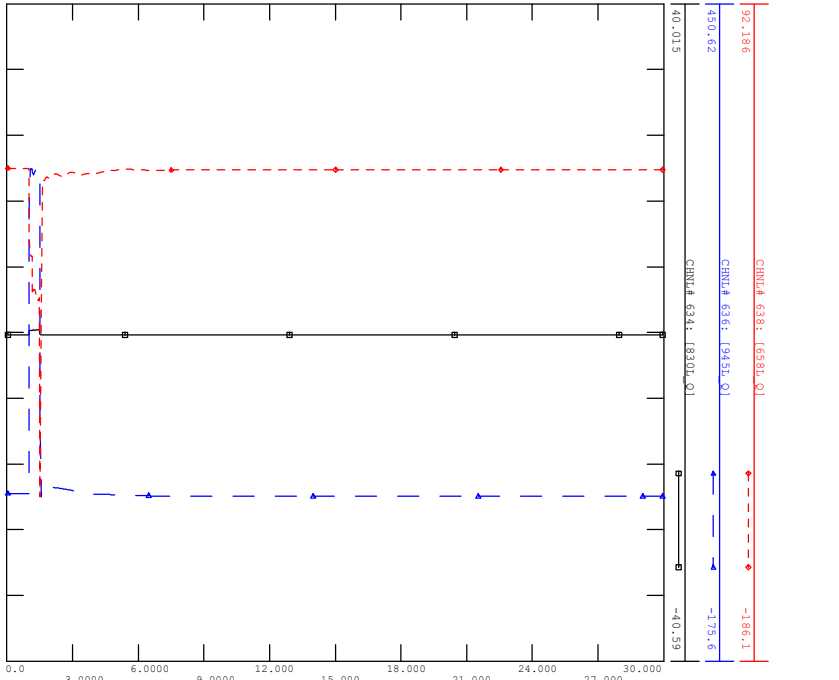


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

FILE: scn4\_sp\_13\_760L\_Empress.out

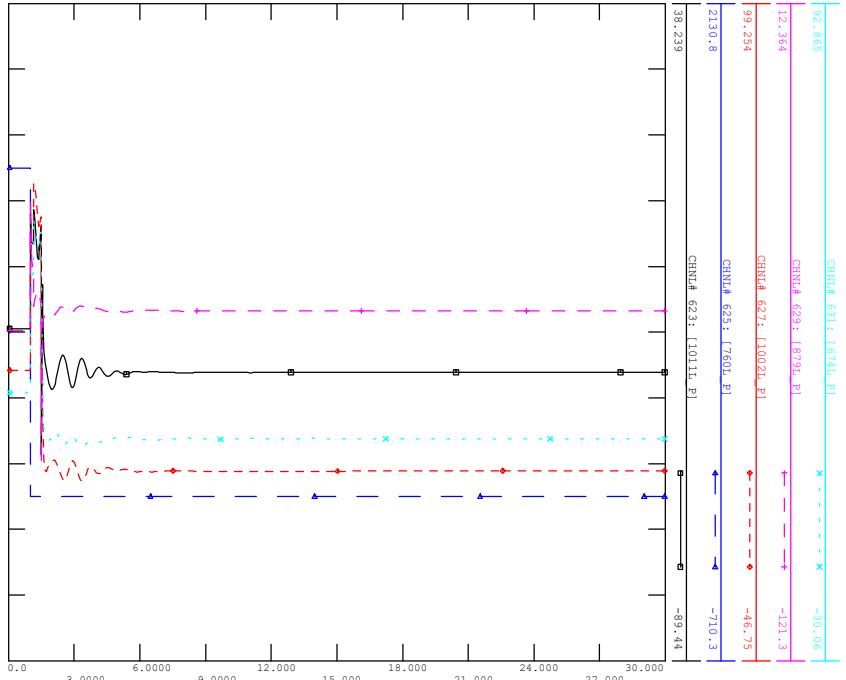


FRI, MAR 25 2022 10:53  
BRANCH Q



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

FILE: scn4\_sp\_13\_760L\_Empress.out

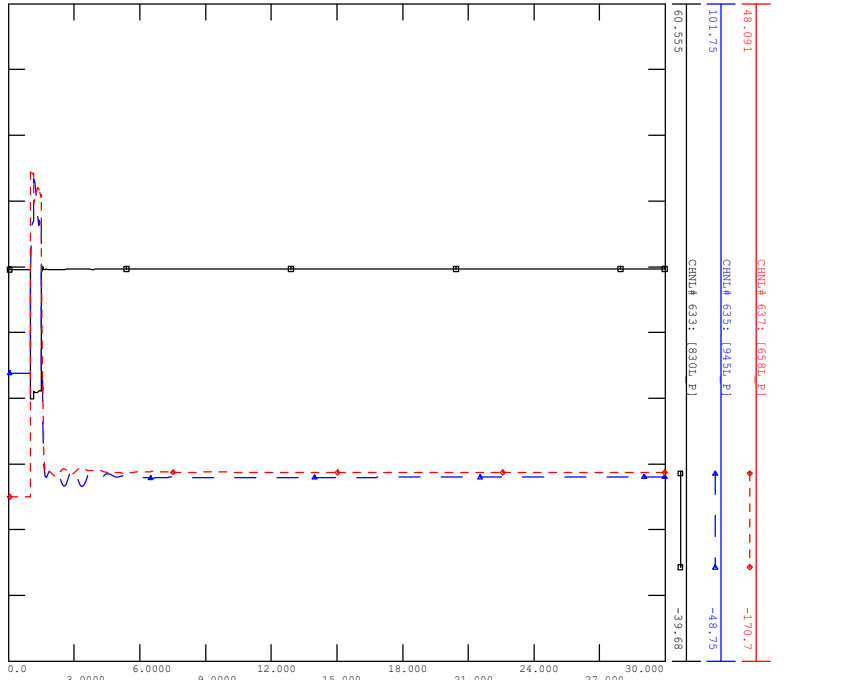


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_13\_760L\_EMPRESS

FILE: scn4\_sp\_13\_760L\_Empress.out

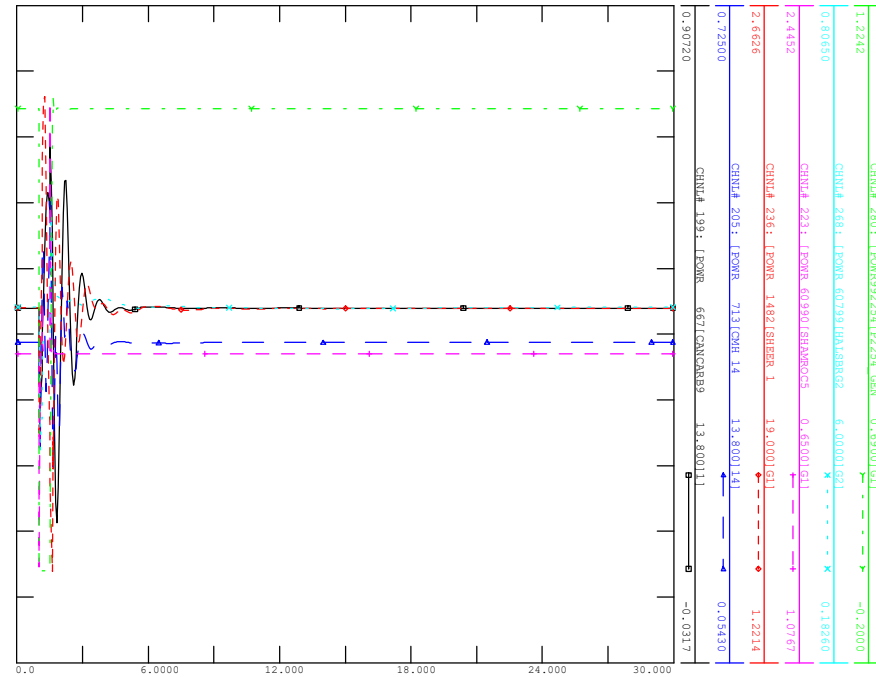


FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO



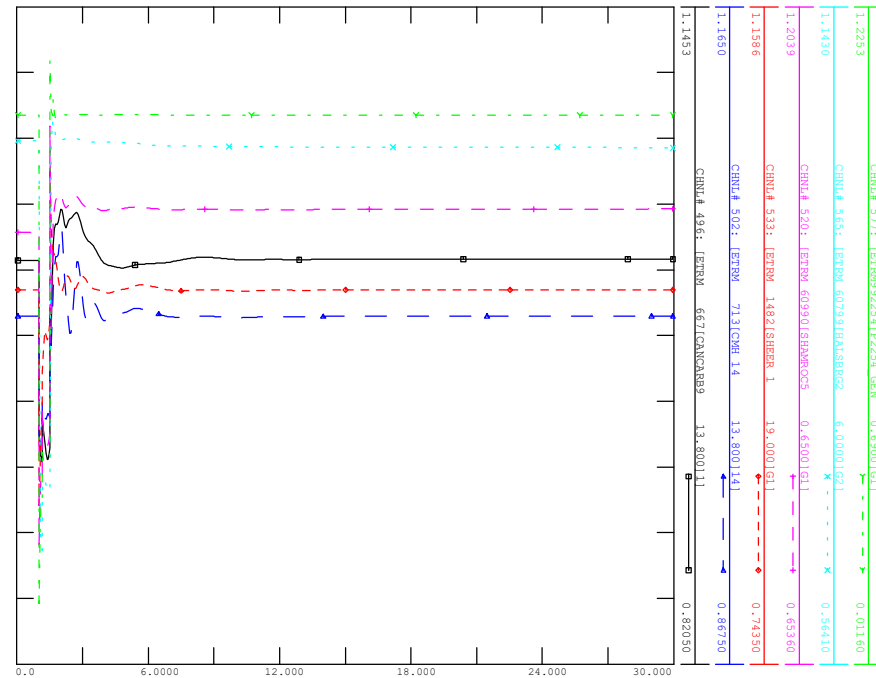
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

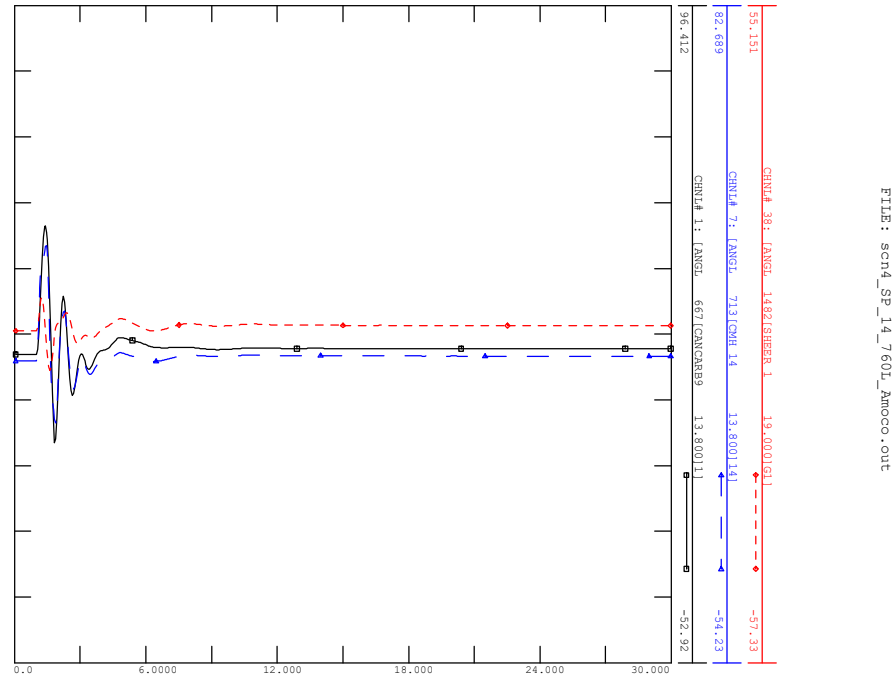
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

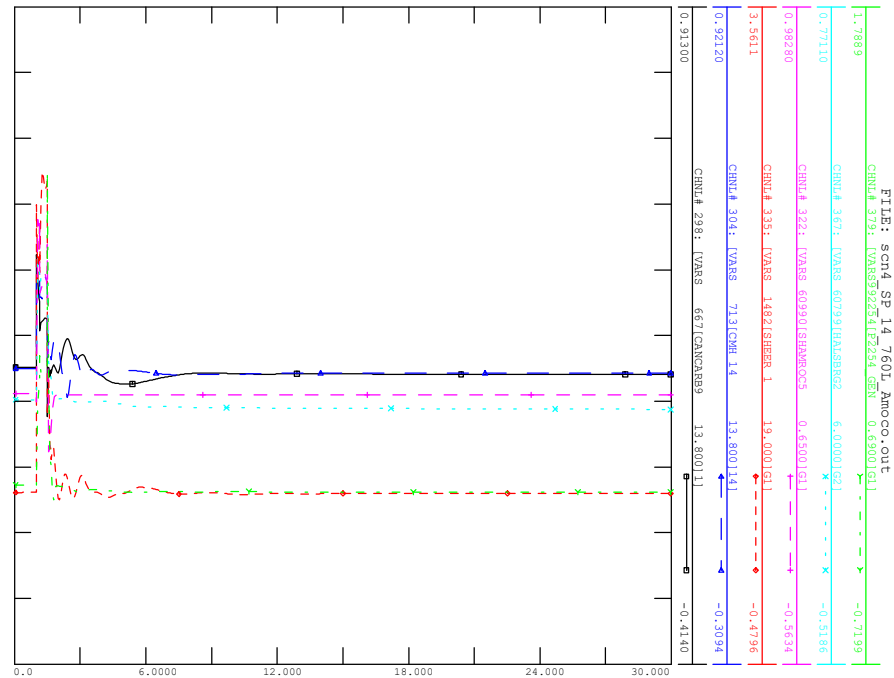
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

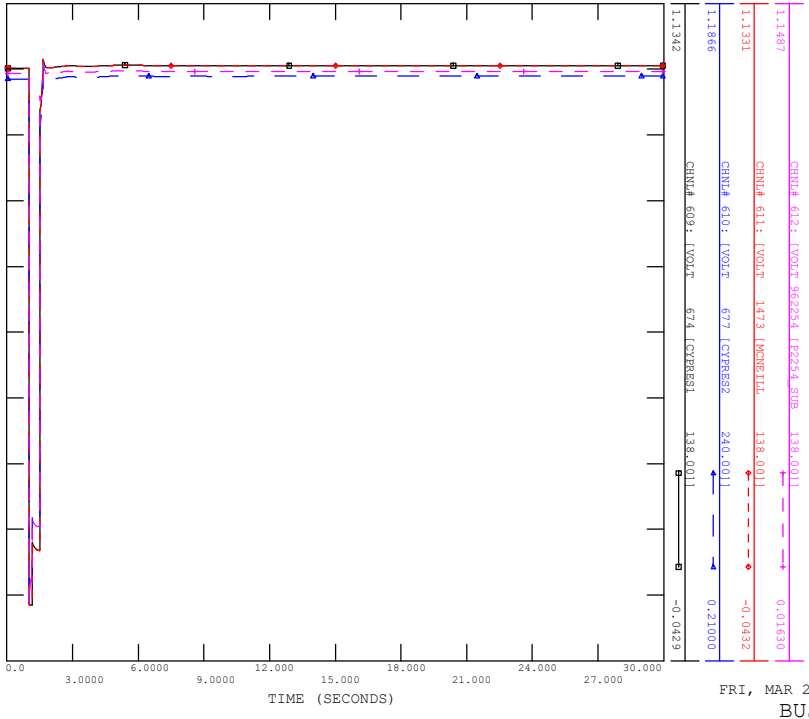
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

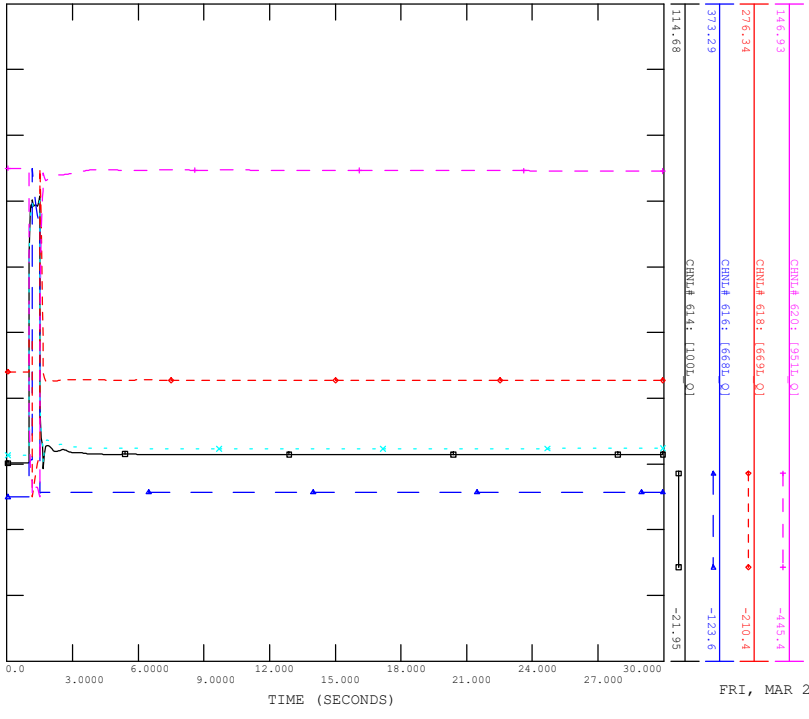
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

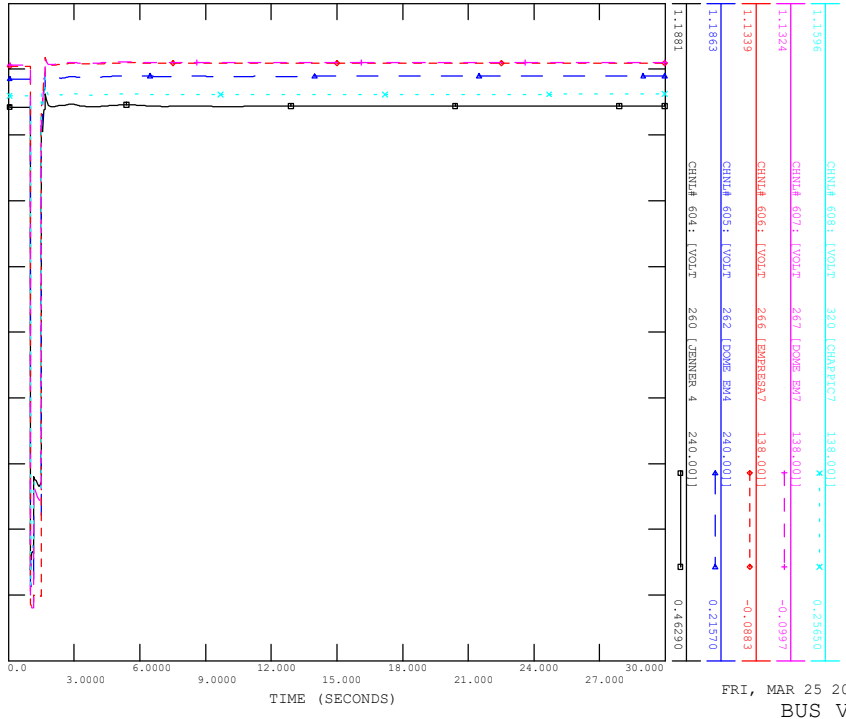
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

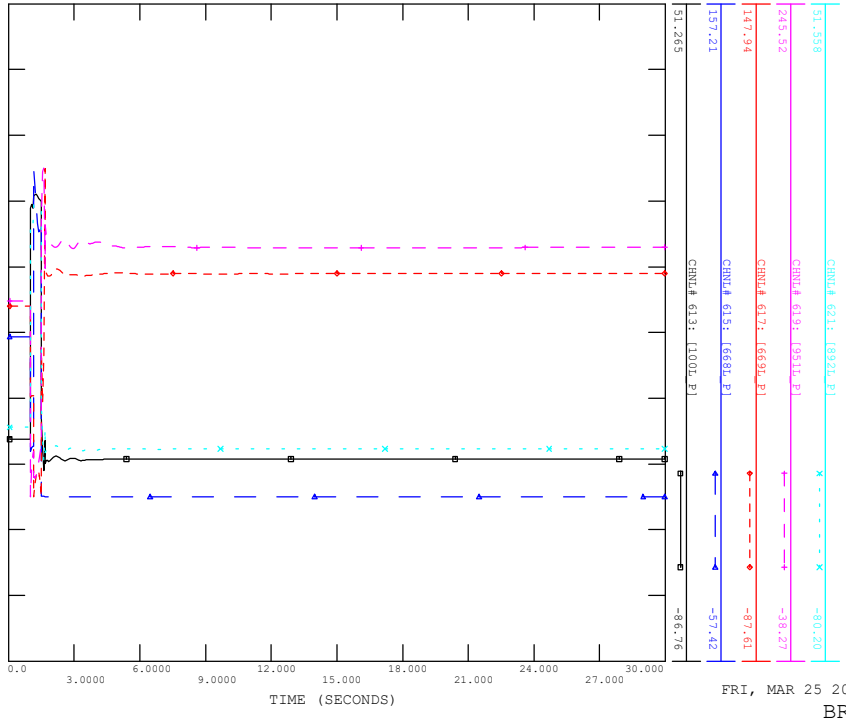
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

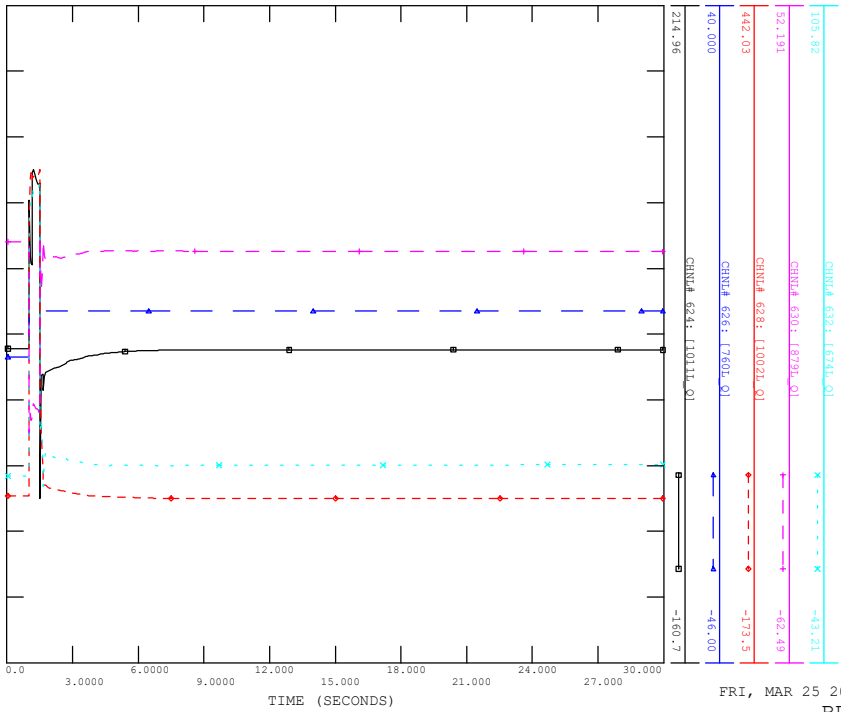
FILE: scn4\_sp\_14\_760L\_Amoco.out



FRI, MAR 25 2022 10:53  
BRANCH P

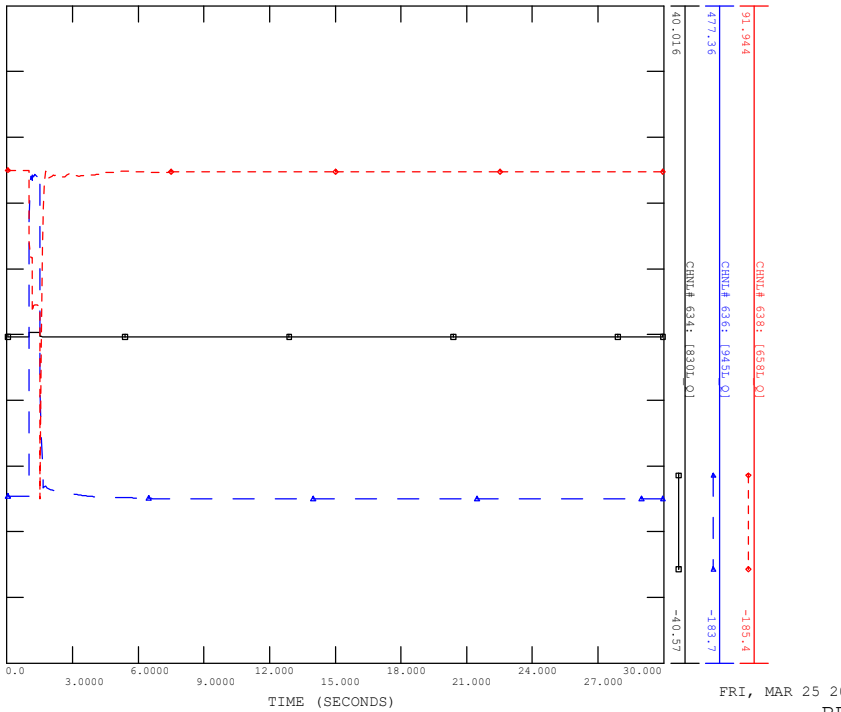
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

FILE: scn4\_sp\_14\_760L\_Amoco.out



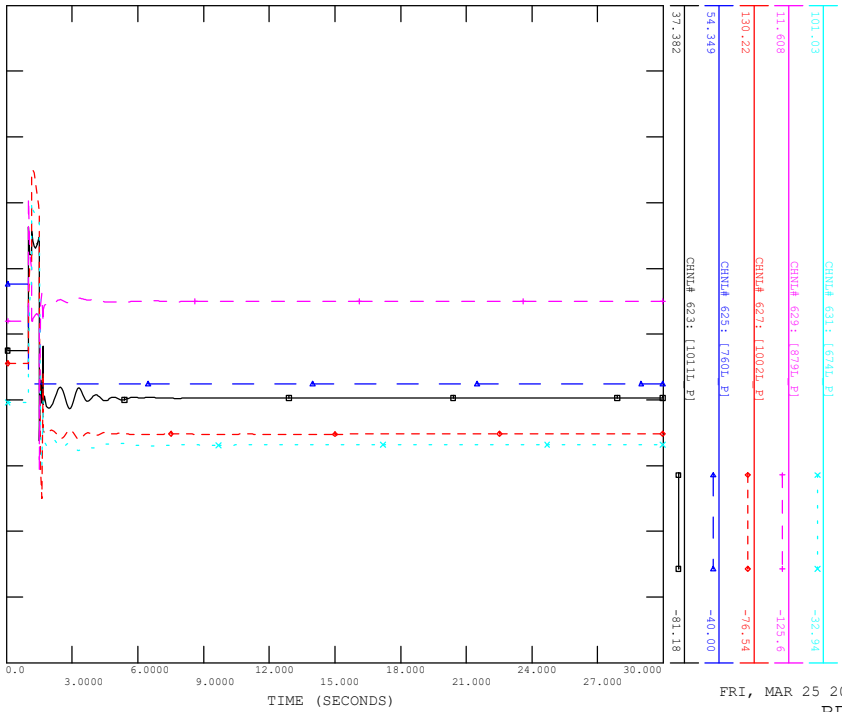
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

FILE: scn4\_sp\_14\_760L\_Amoco.out



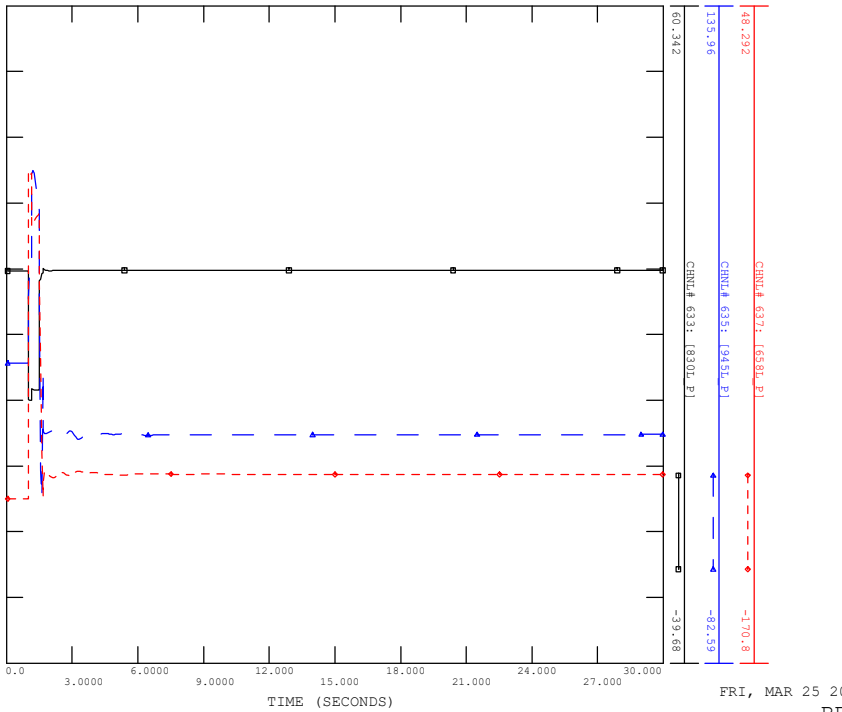
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

FILE: scn4\_sp\_14\_760L\_Amoco.out

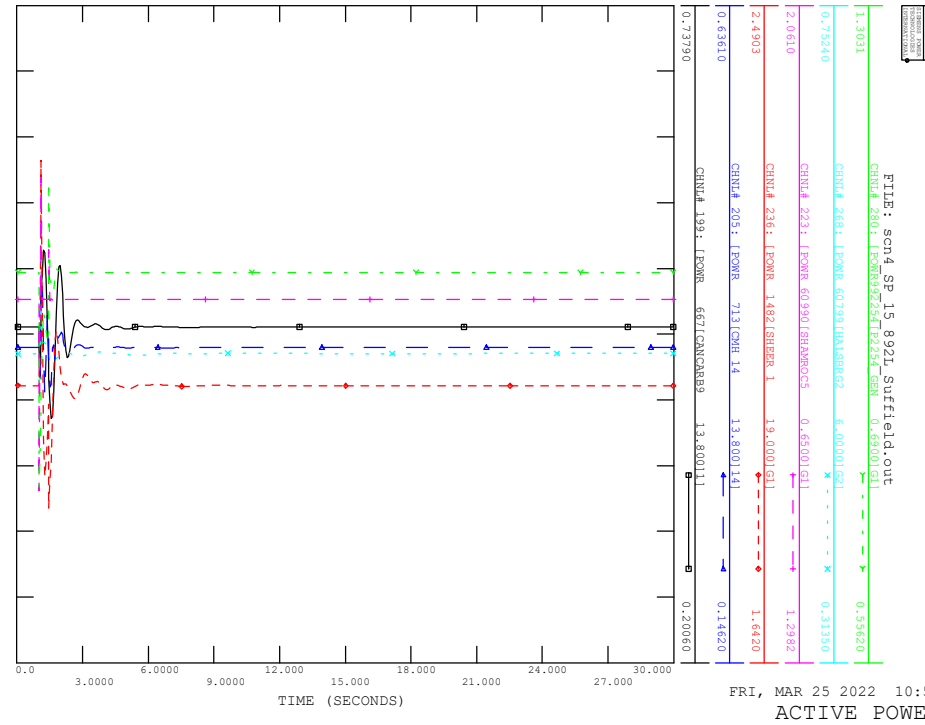


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_14\_760L\_AMOCO

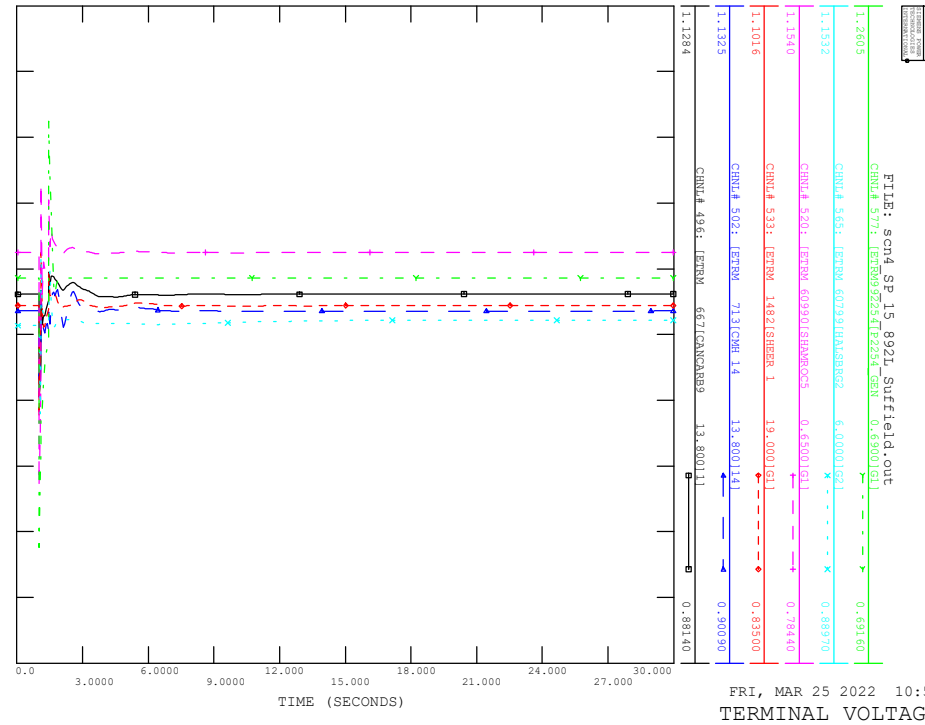
FILE: scn4\_sp\_14\_760L\_Amoco.out



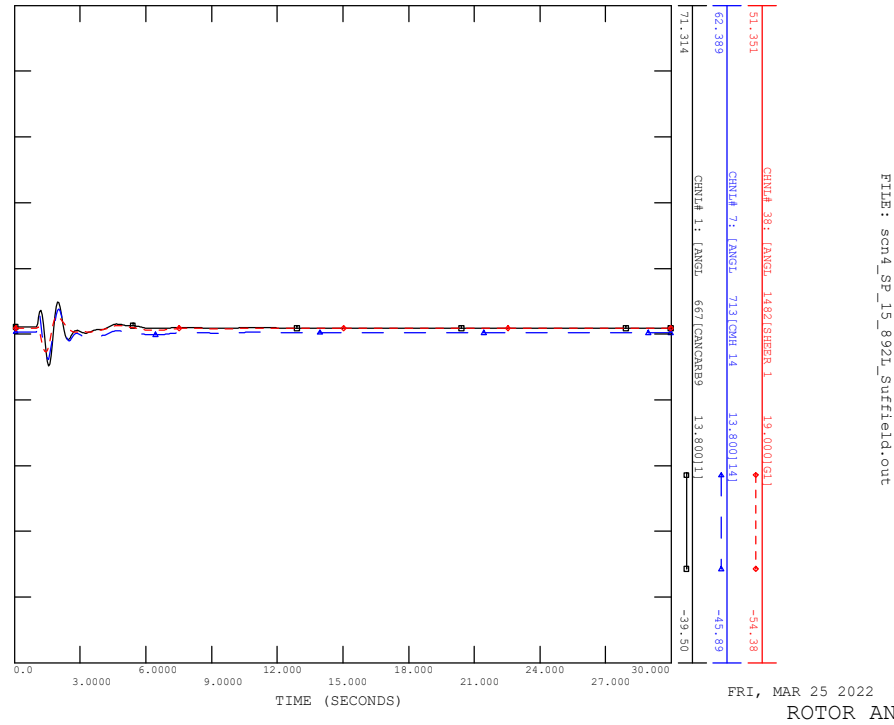
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD



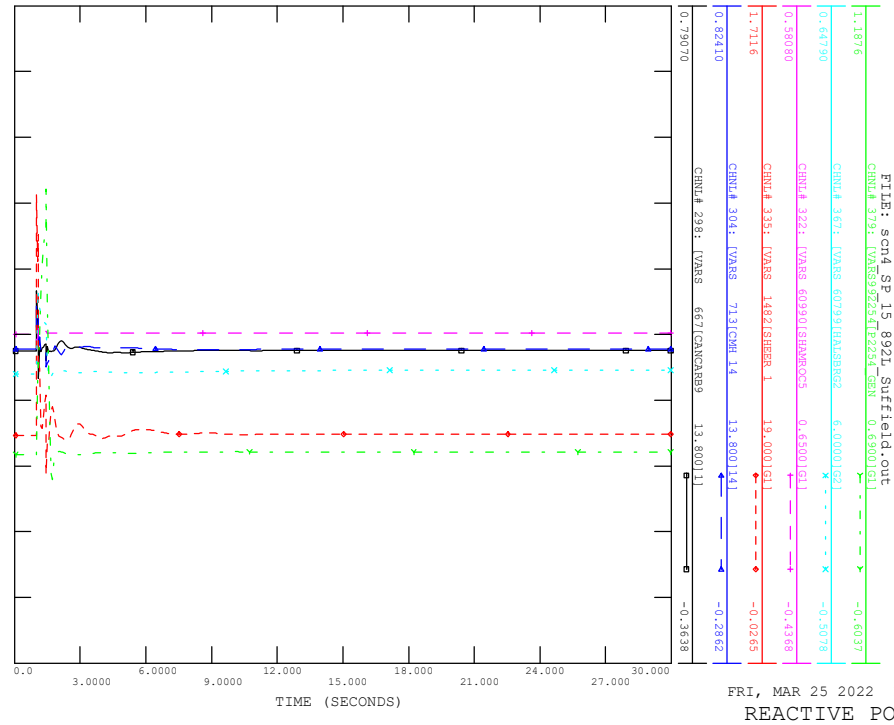
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD

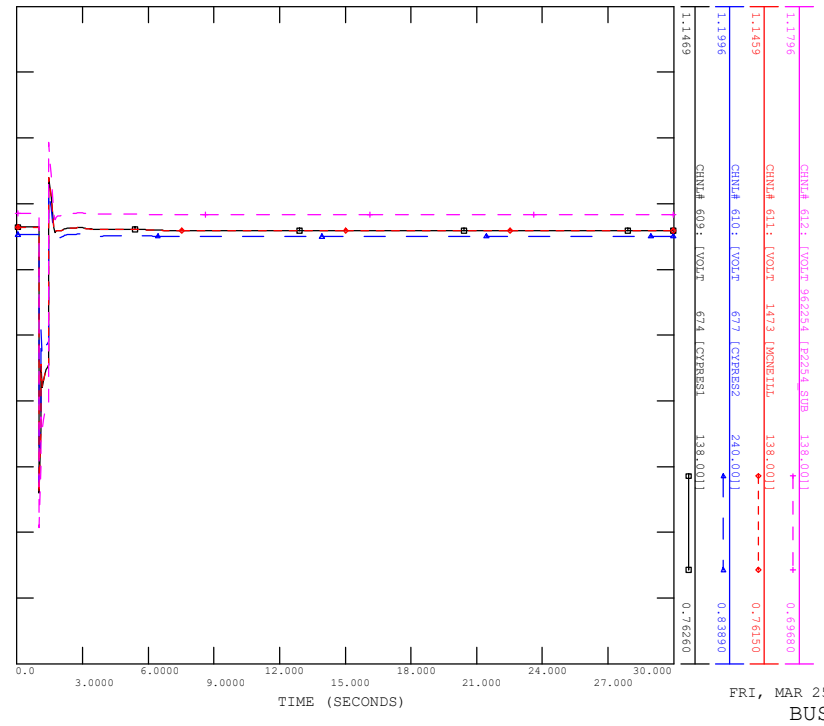


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_Suffield

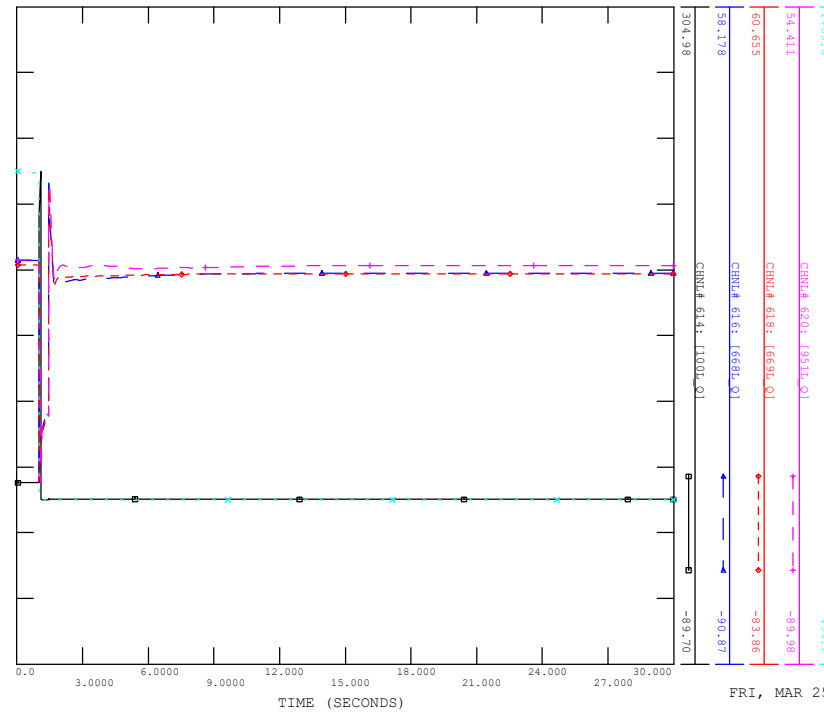
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_Suffield

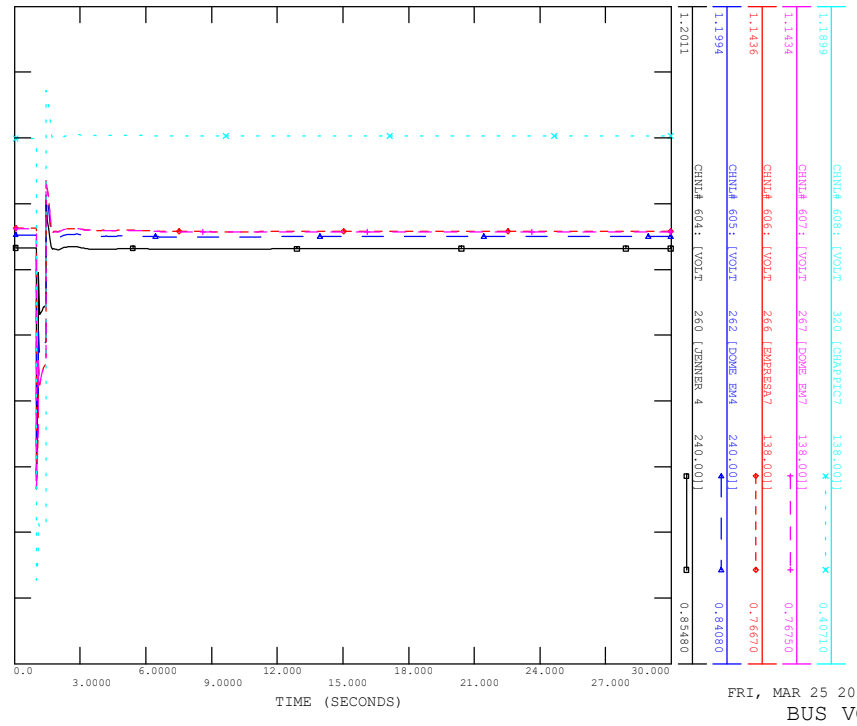
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_Suffield

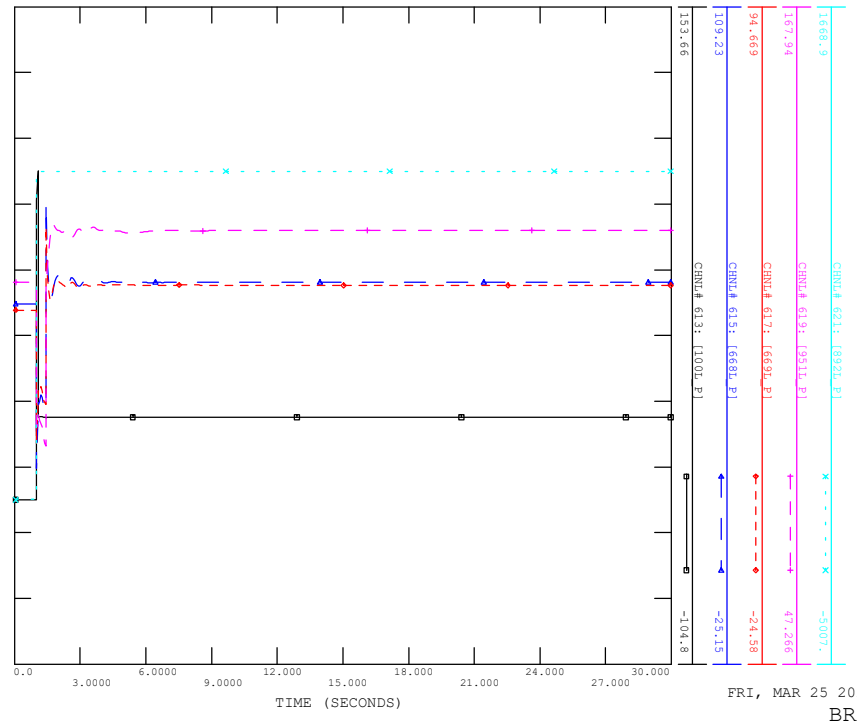
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_Suffield

FILE: scn4\_sp\_15\_892L\_Suffield.out

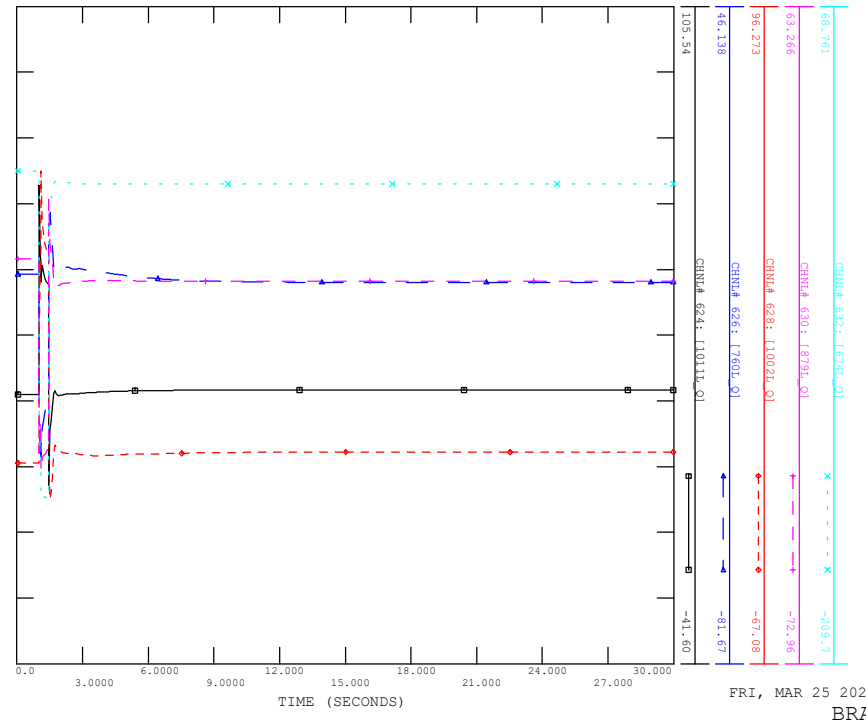


FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD

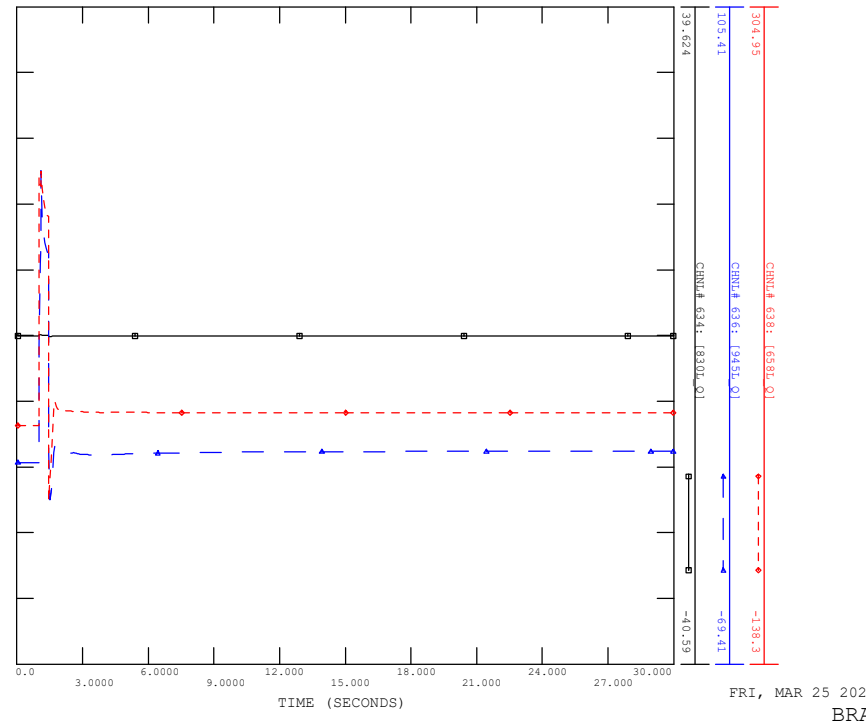
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD

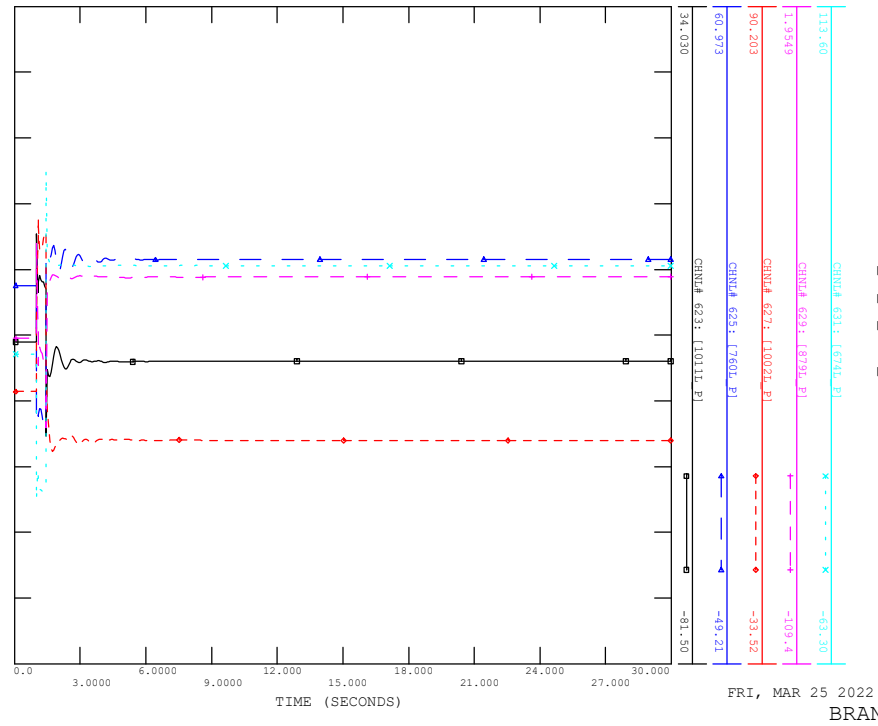
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD

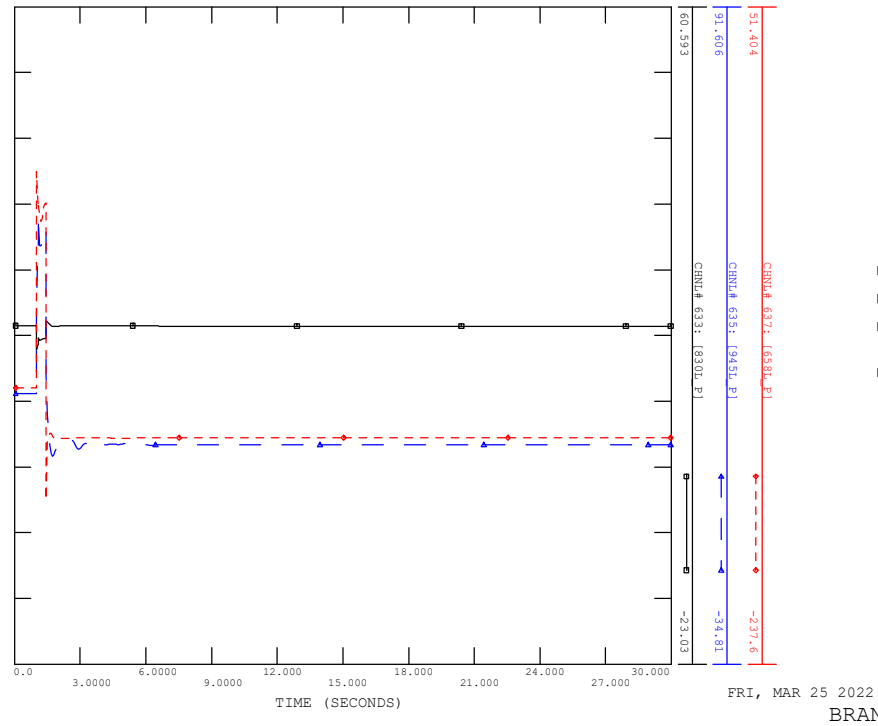
FILE: scn4\_sp\_15\_892L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH P

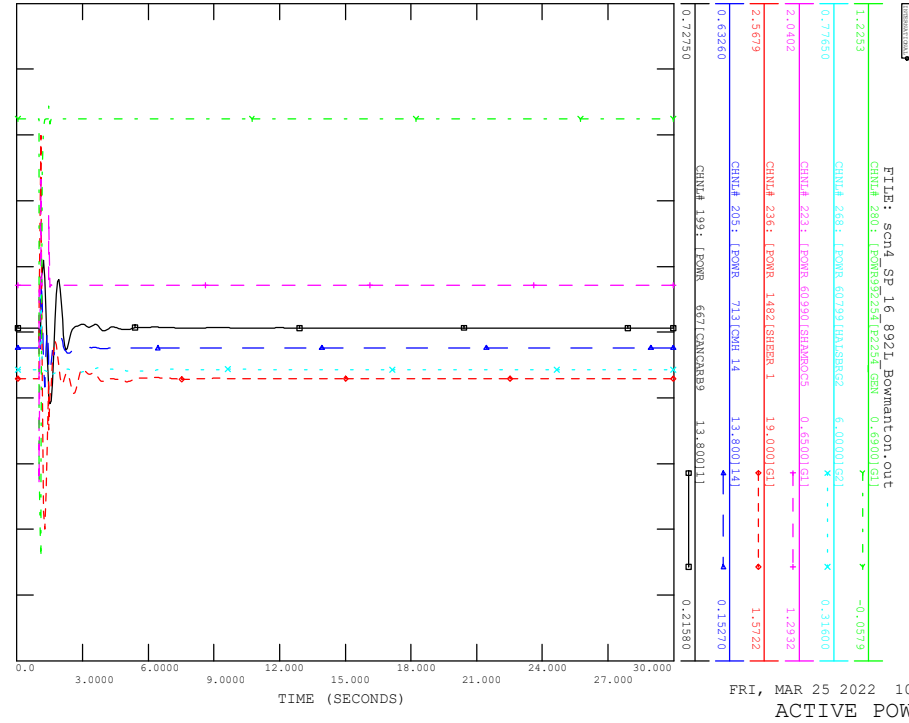
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_15\_892L\_SUFFIELD

FILE: scn4\_sp\_15\_892L\_Suffield.out

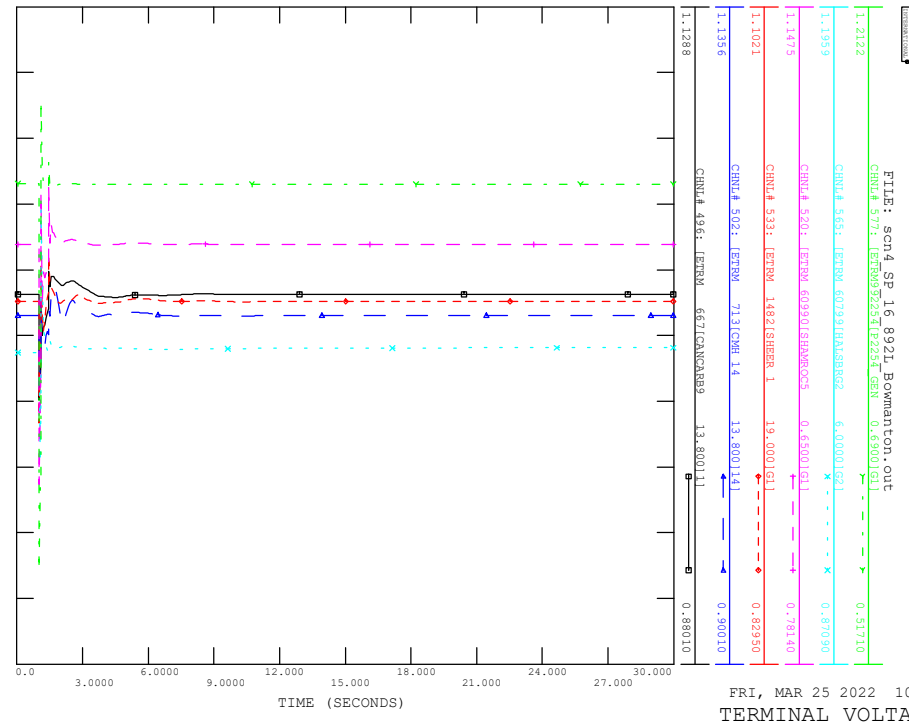


FRI, MAR 25 2022 10:53  
BRANCH P

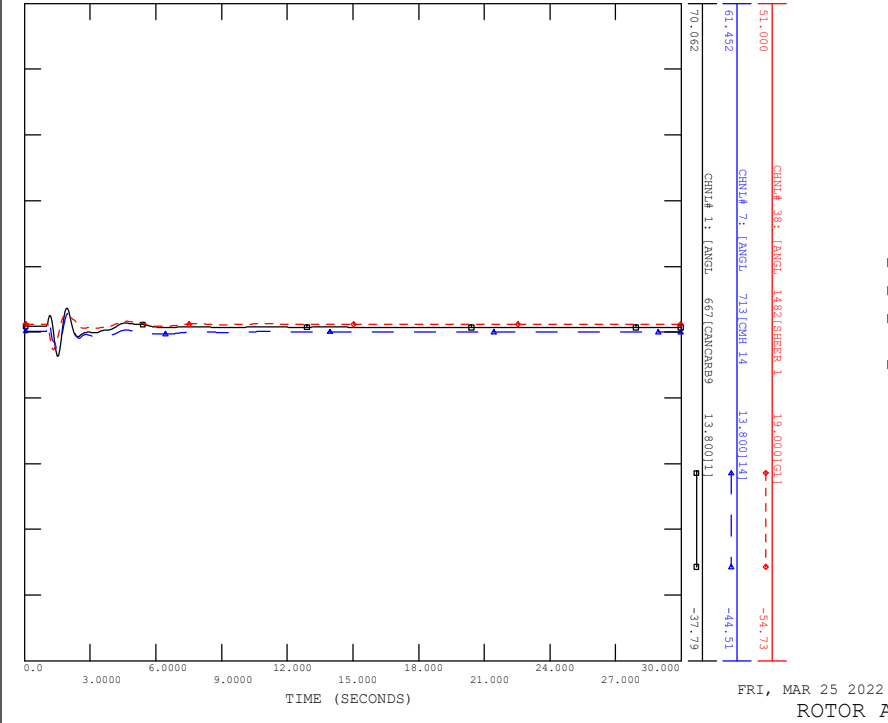
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON



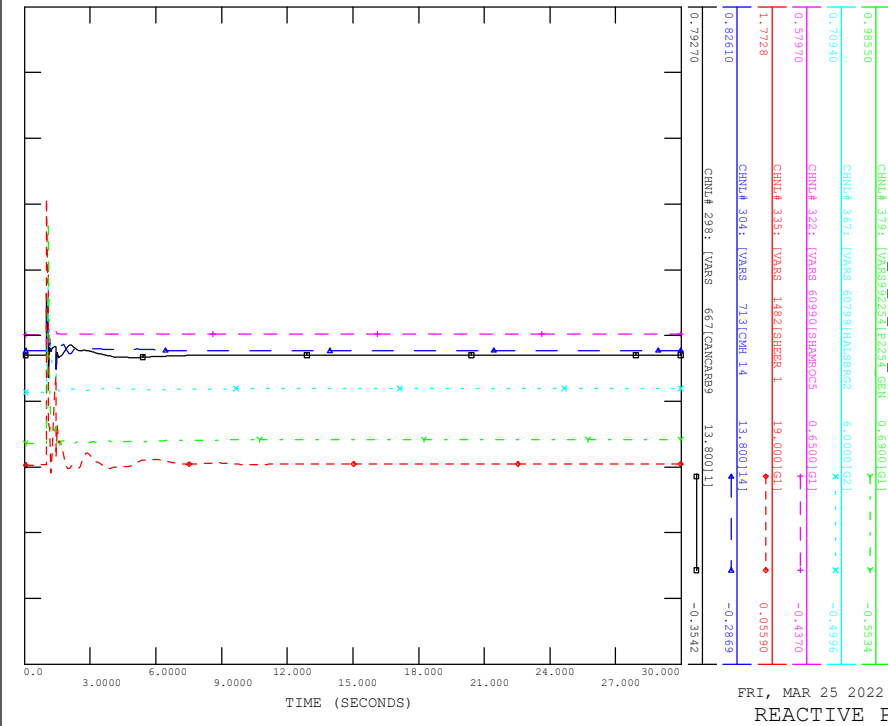
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON



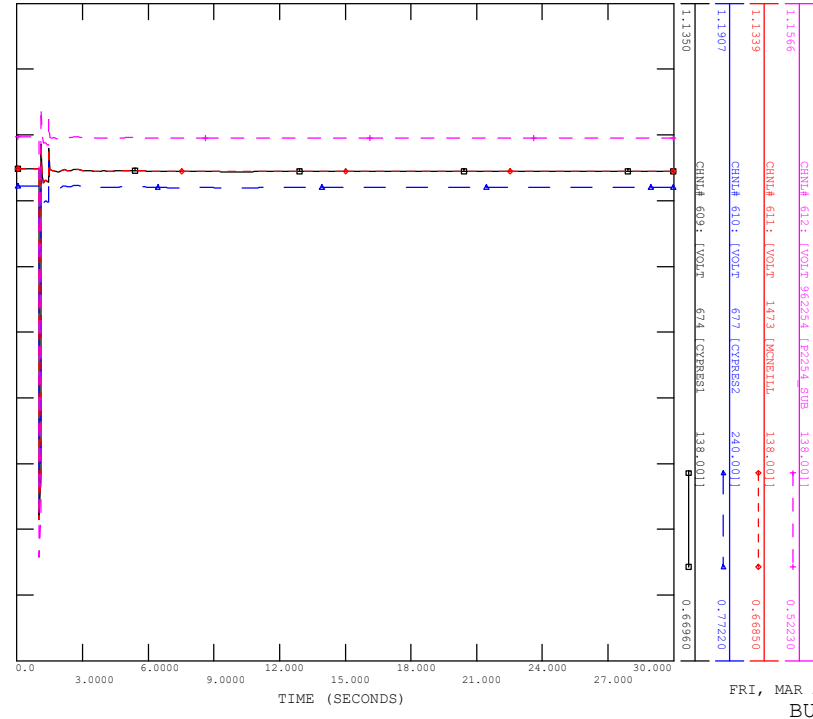
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON

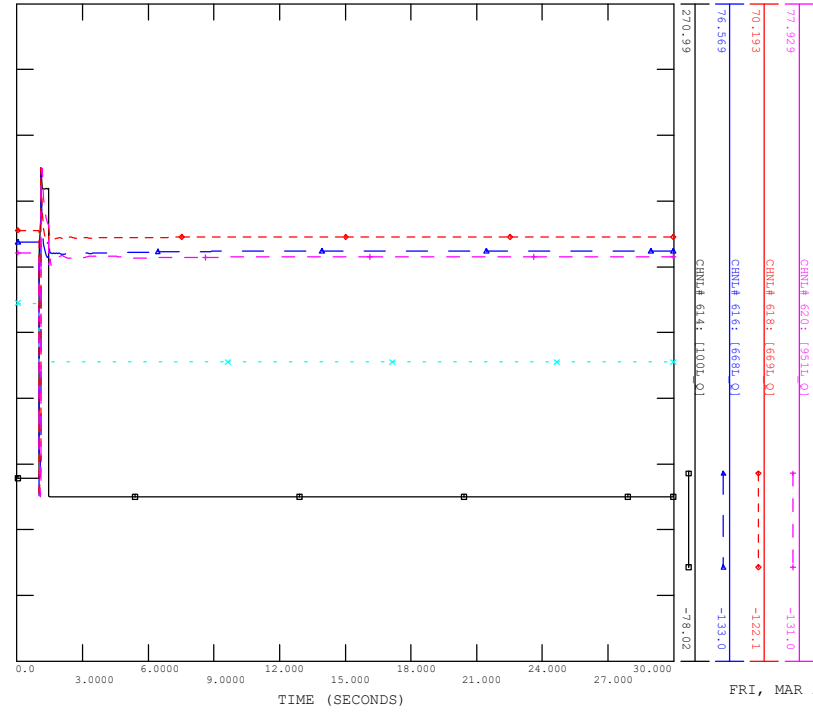


FILE: scn4\_sp\_16\_892L\_Bowmanton.out



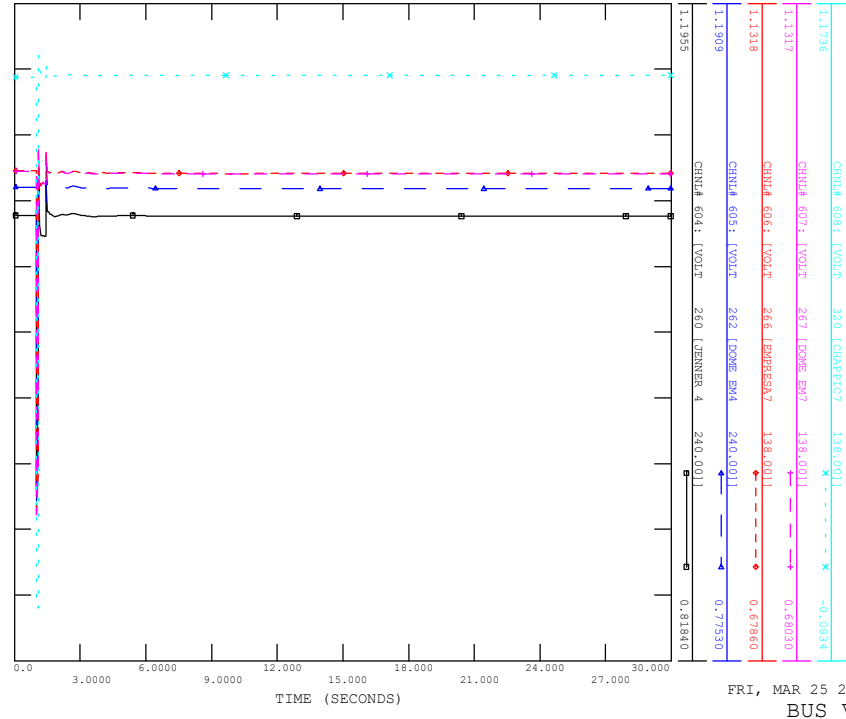
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn4\_sp\_16\_892L\_Bowmanton.out



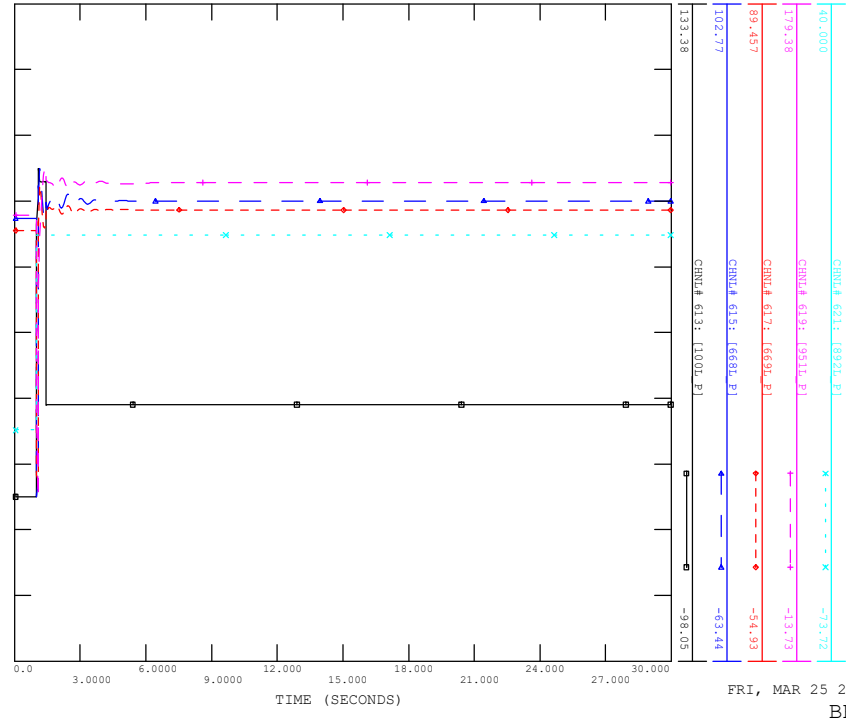
FRI, MAR 25 2022 10:53  
BRANCH P

FILE: scn4\_sp\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

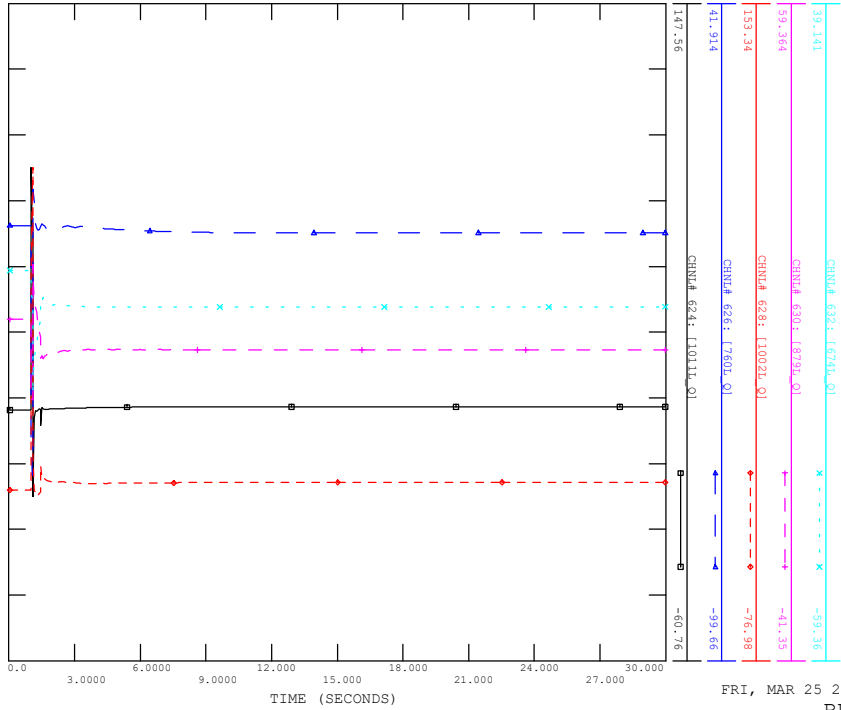
FILE: scn4\_sp\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON

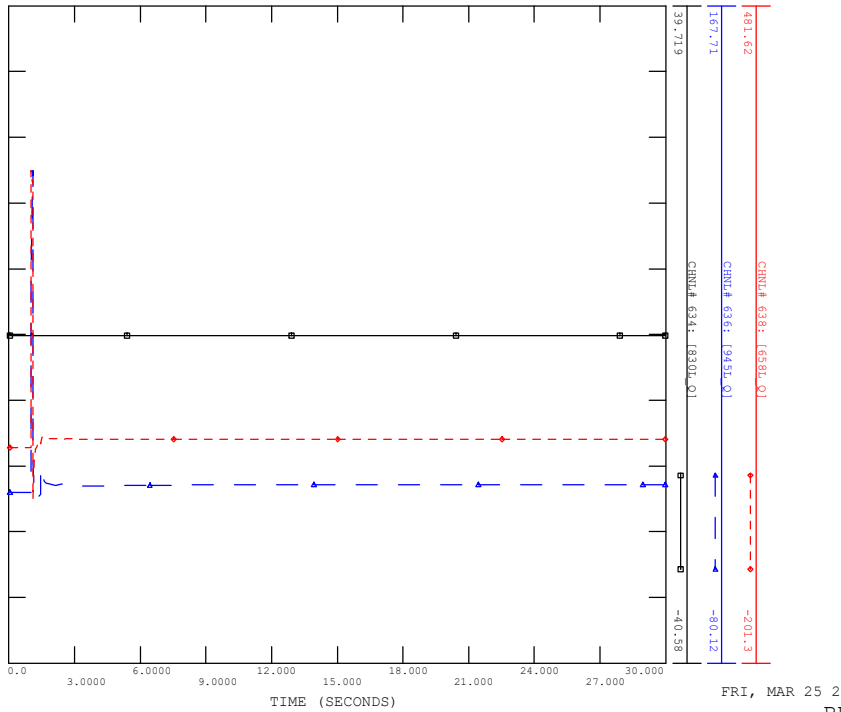
FILE: scn4\_sp\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON

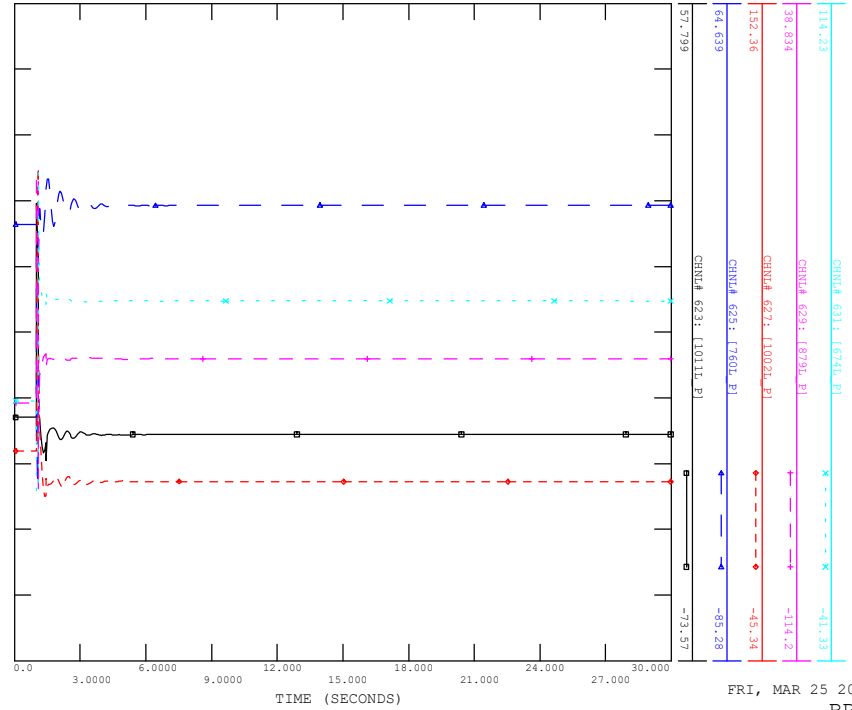
FILE: scn4\_sp\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON

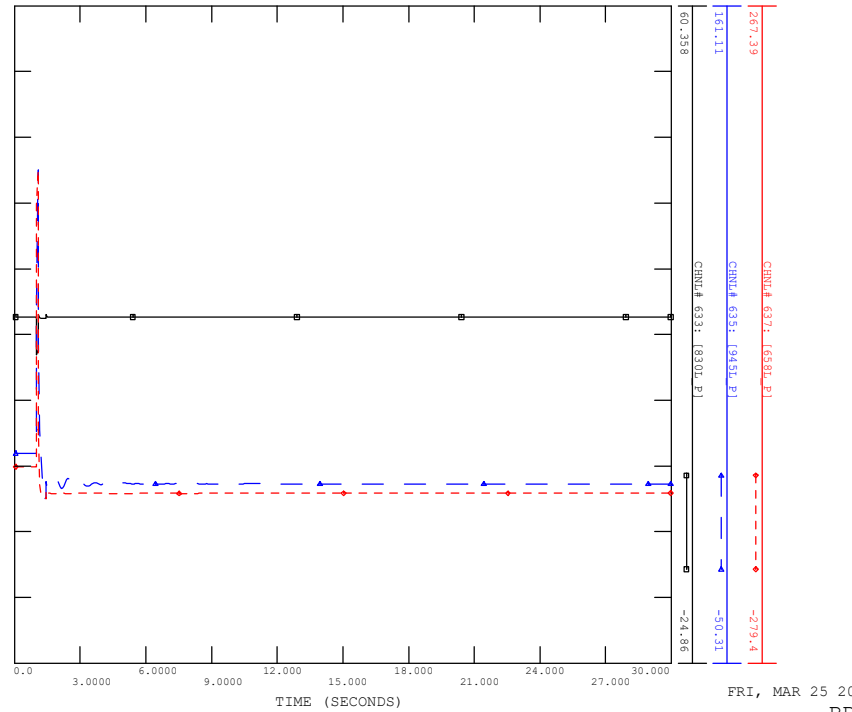
FILE: scn4\_sp\_16\_892L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH P

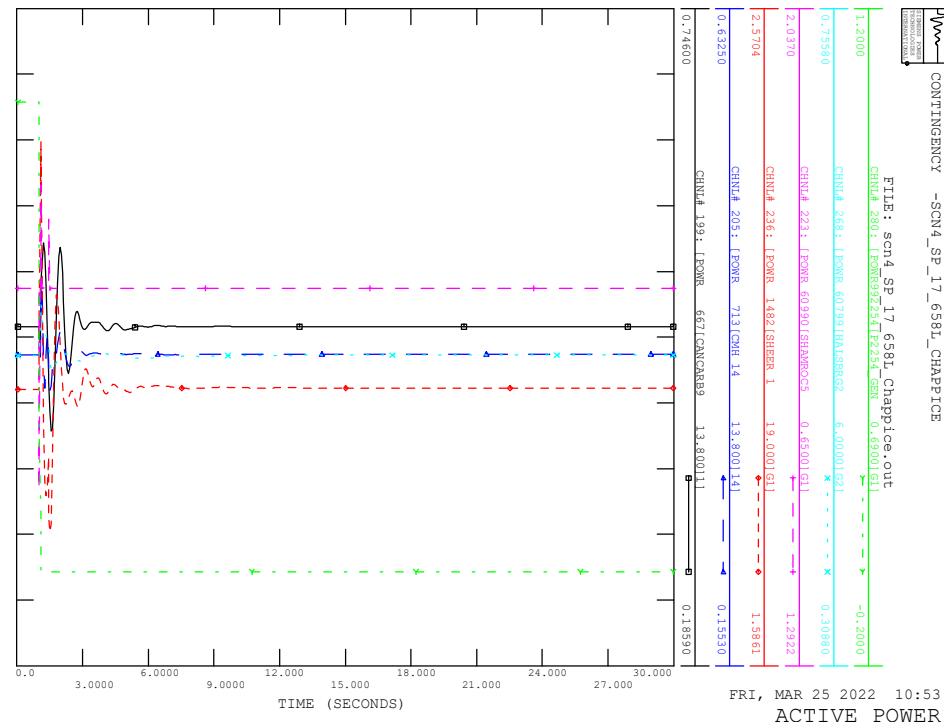
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_16\_892L\_BOWMANTON

FILE: scn4\_sp\_16\_892L\_Bowmanton.out

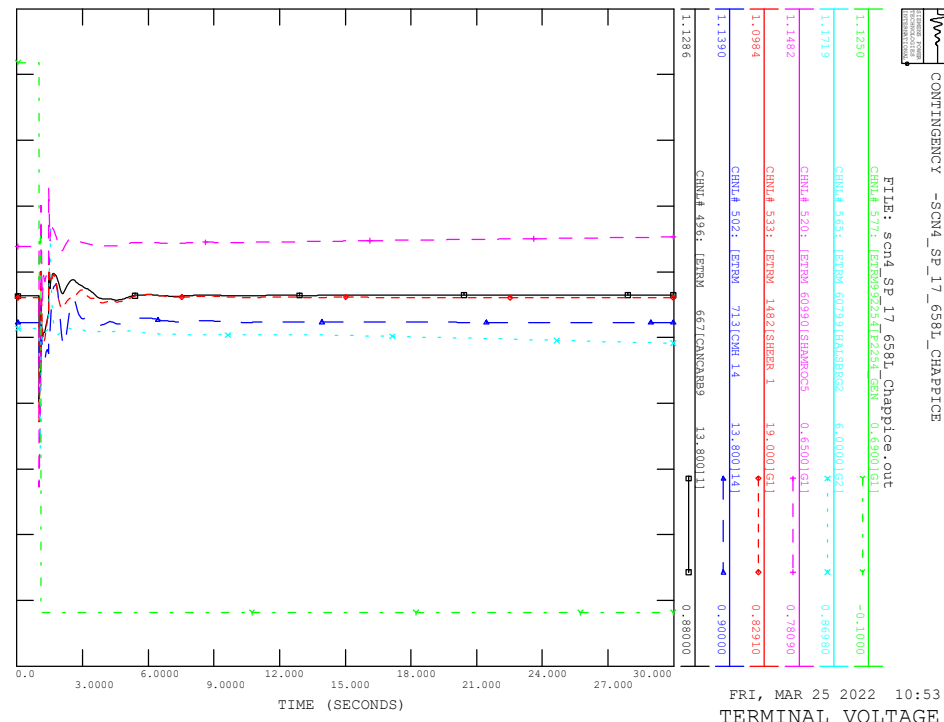


FRI, MAR 25 2022 10:53  
BRANCH P

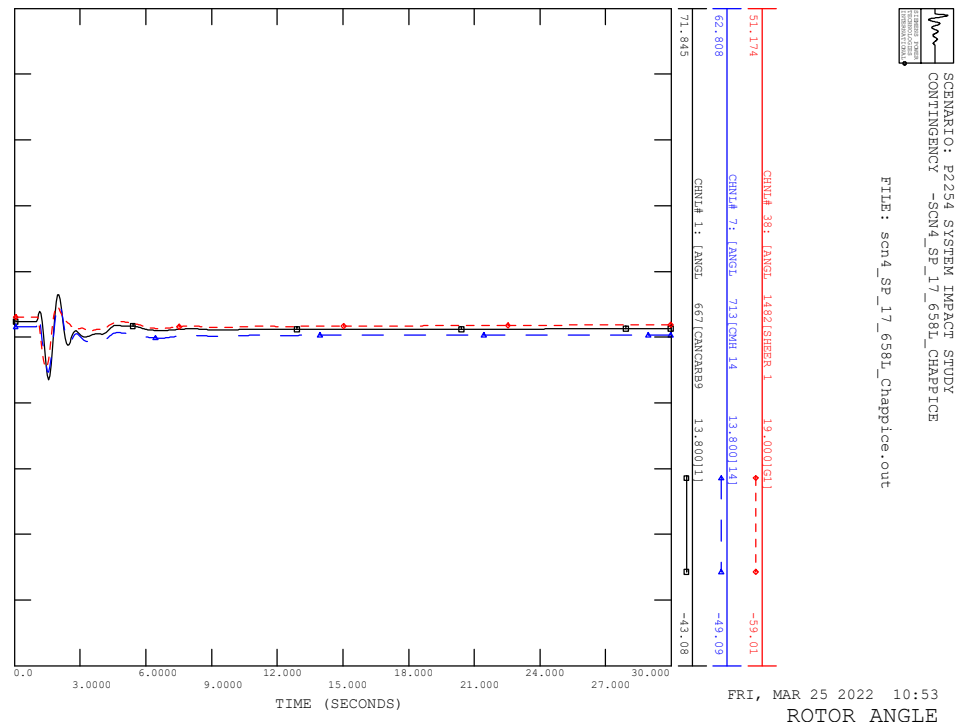
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581\_CHAPFICE



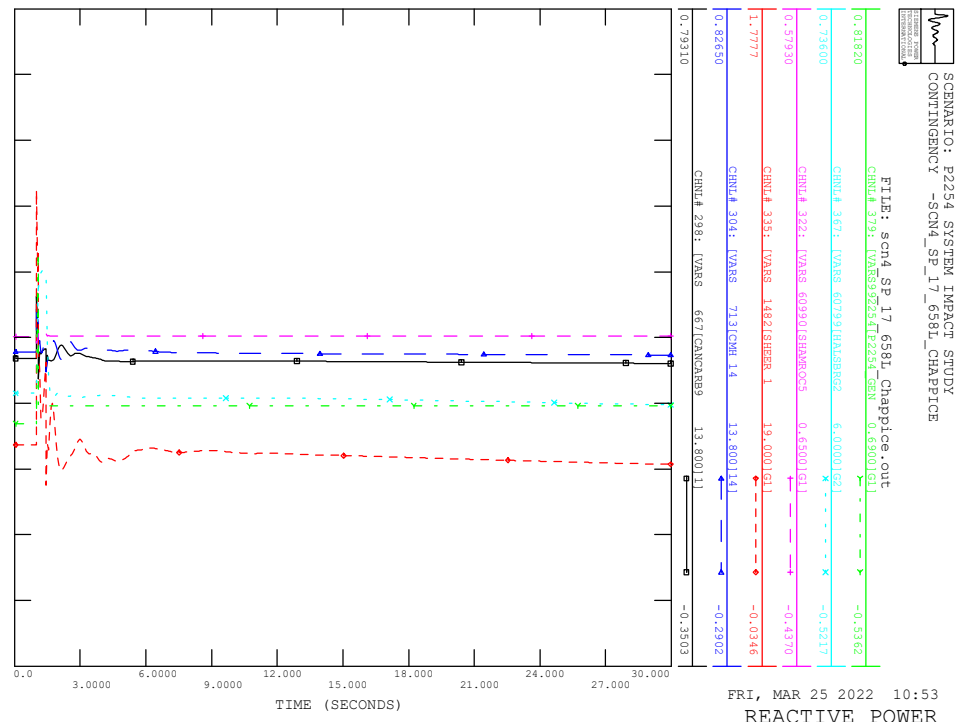
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581\_CHAPFICE



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581\_CHAPFICE

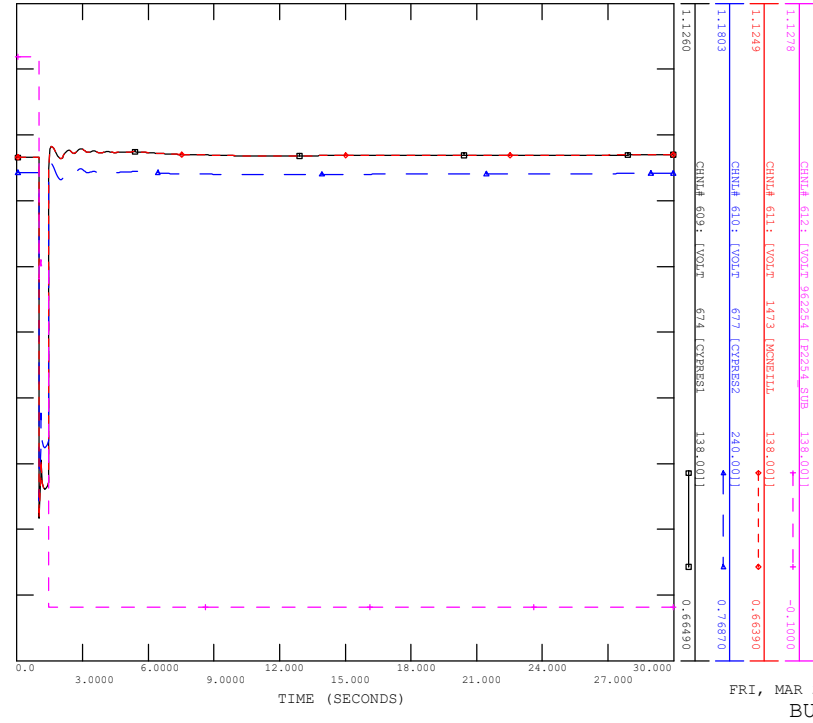


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581\_CHAPFICE



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_658L\_CHAPFICE

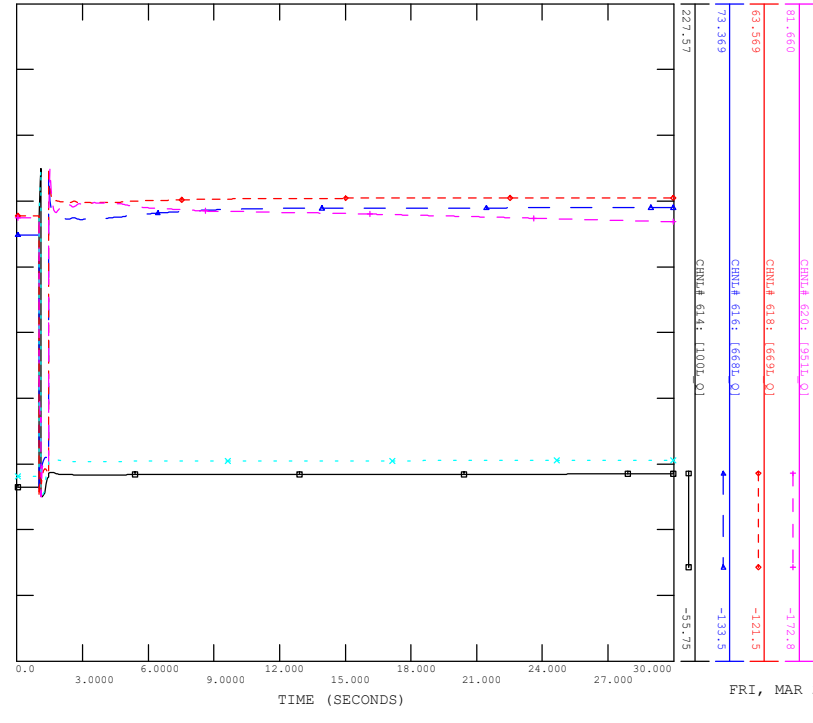
FILE: scn4\_sp\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_658L\_CHAPFICE

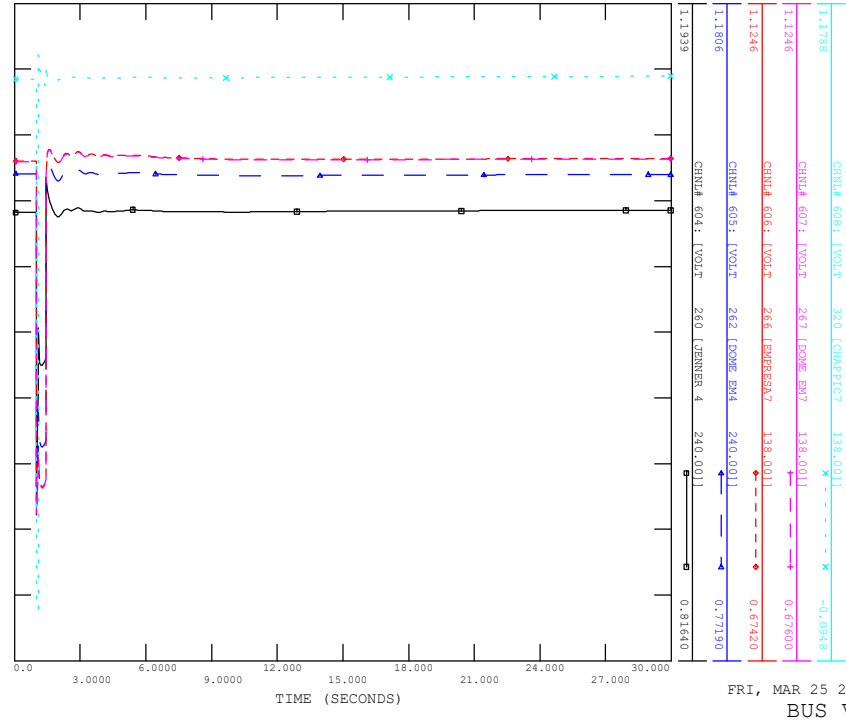
FILE: scn4\_sp\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_658L\_CHAPFICE

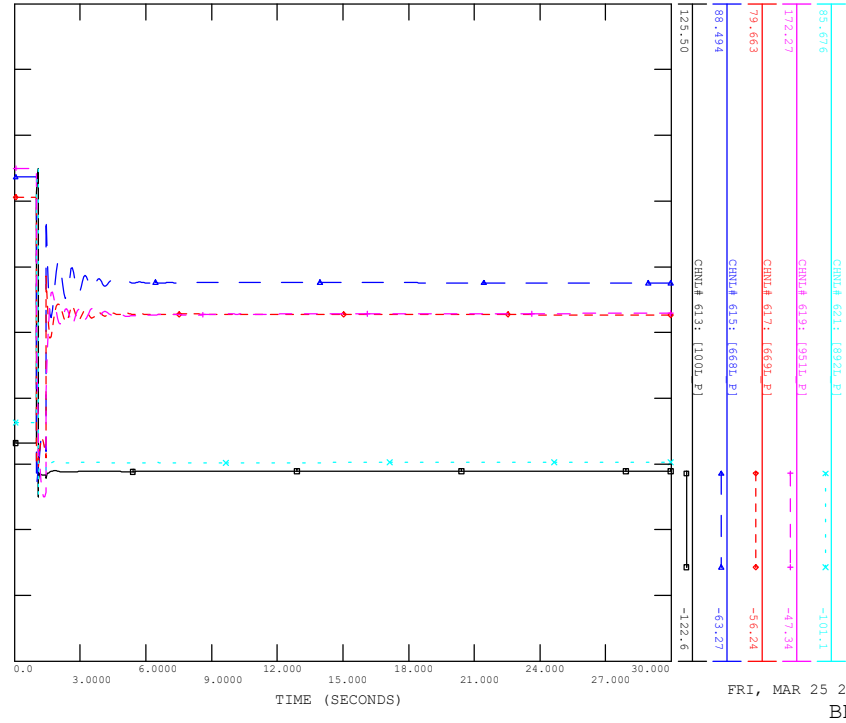
FILE: scn4\_sp\_17\_658L\_Chappice.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

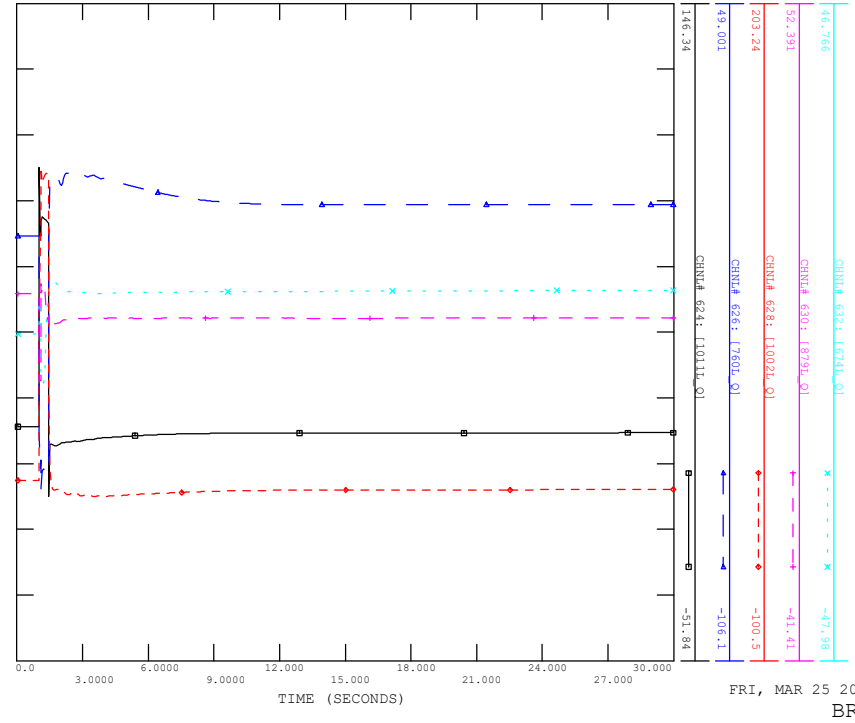
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_658L\_CHAPFICE

FILE: scn4\_sp\_17\_658L\_Chappice.out



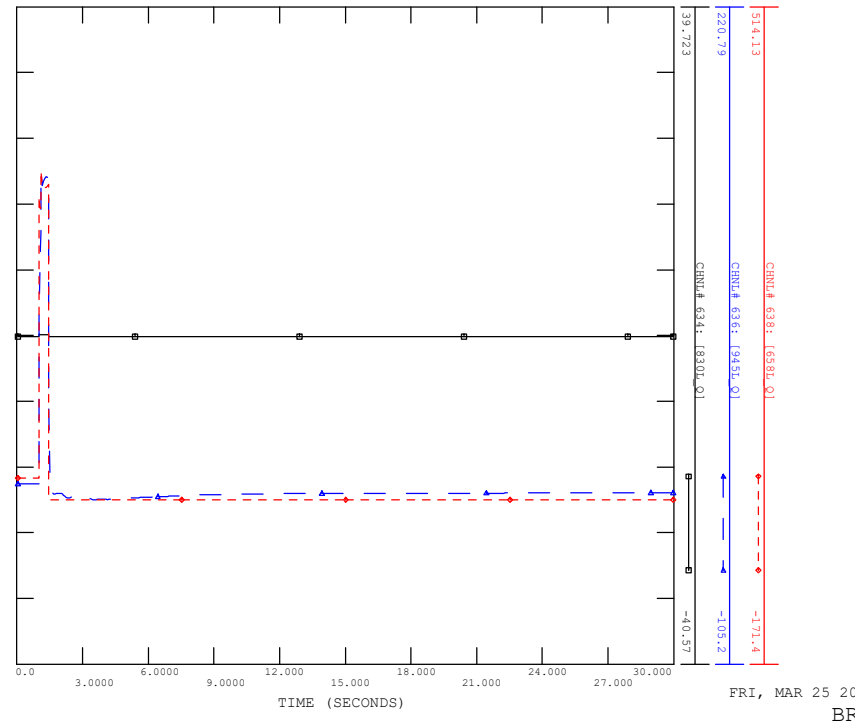
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581L\_CHAPFICE  
FILE: scn4\_sp\_17\_6581L\_Chappice.out



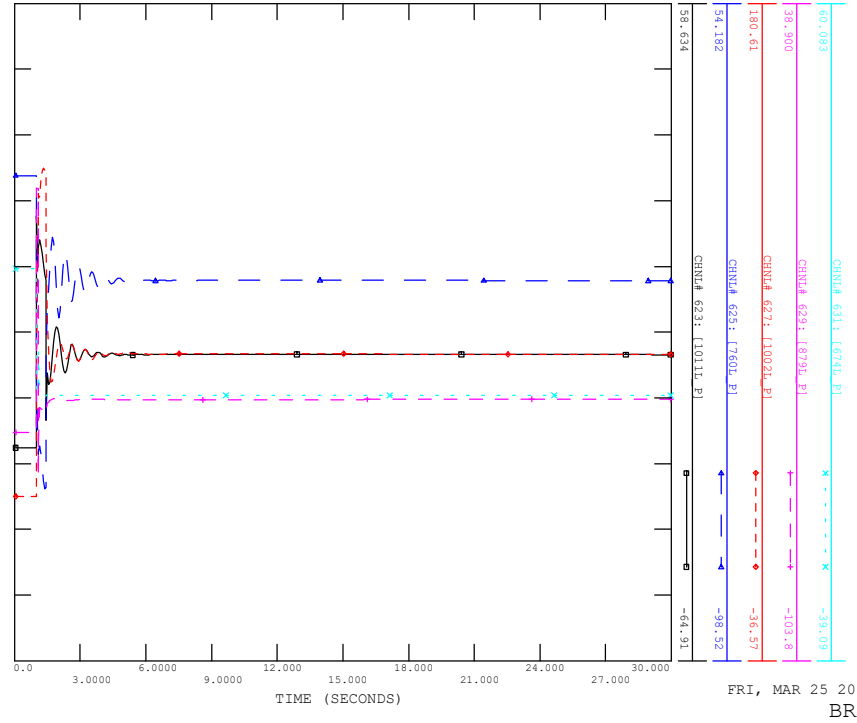
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581L\_CHAPFICE  
FILE: scn4\_sp\_17\_6581L\_Chappice.out



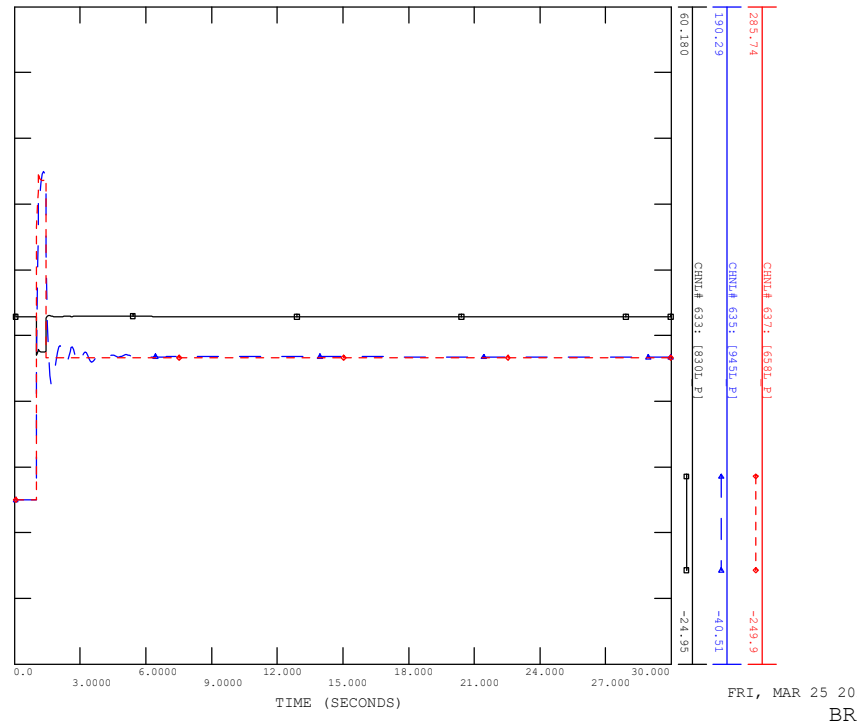
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581L\_CHAPFICE  
FILE: scn4\_sp\_17\_6581L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_17\_6581L\_CHAPFICE  
FILE: scn4\_sp\_17\_6581L\_Chappice.out

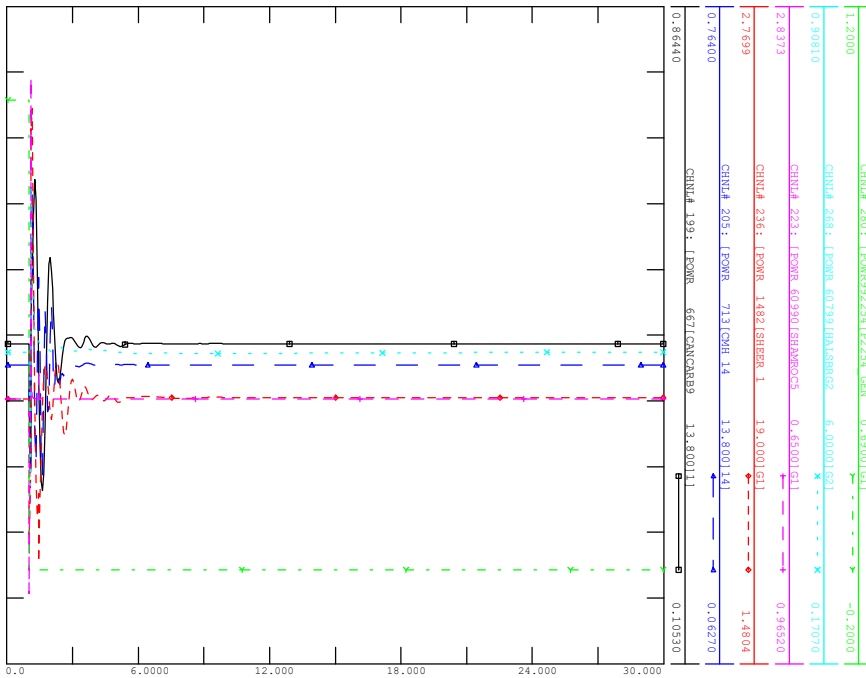


FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581\_CYPRESS



FILE: scn4\_sp\_18\_6581\_Cypress.out

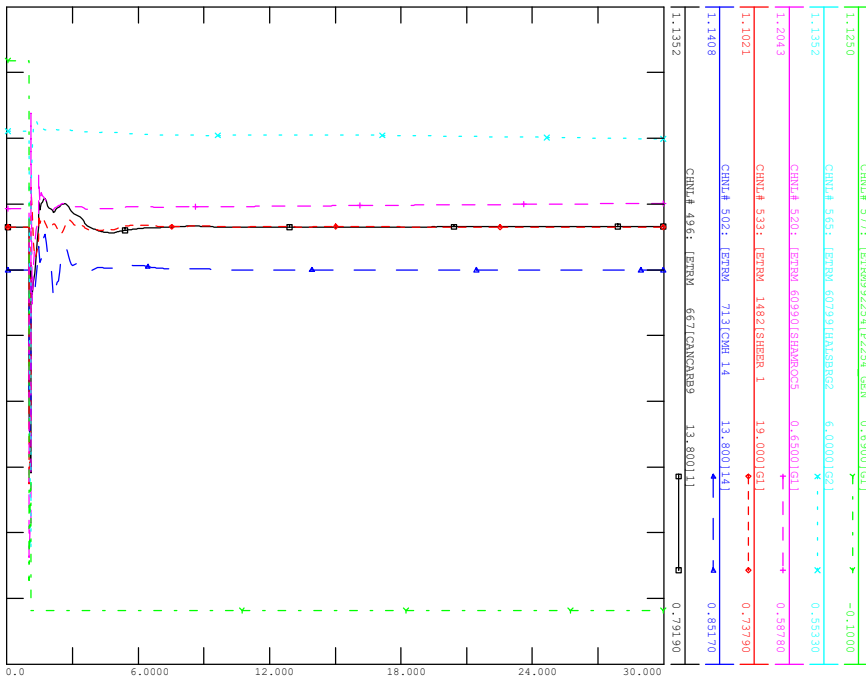


FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581\_CYPRESS



FILE: scn4\_sp\_18\_6581\_Cypress.out

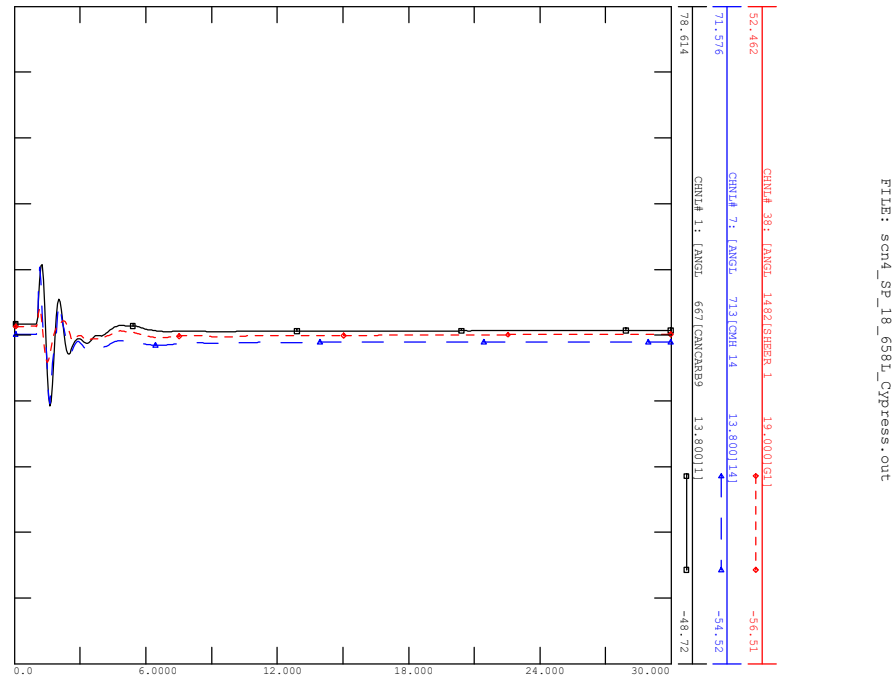


FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581\_CYPRESS



FILE: scn4\_sp\_18\_6581\_Cypress.out

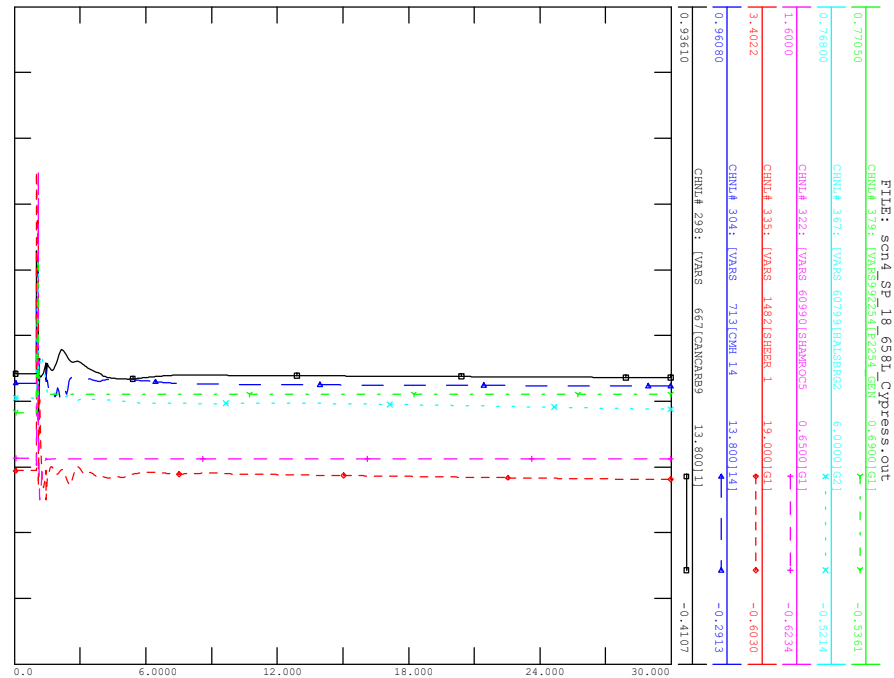


FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581\_CYPRESS



FILE: scn4\_sp\_18\_6581\_Cypress.out

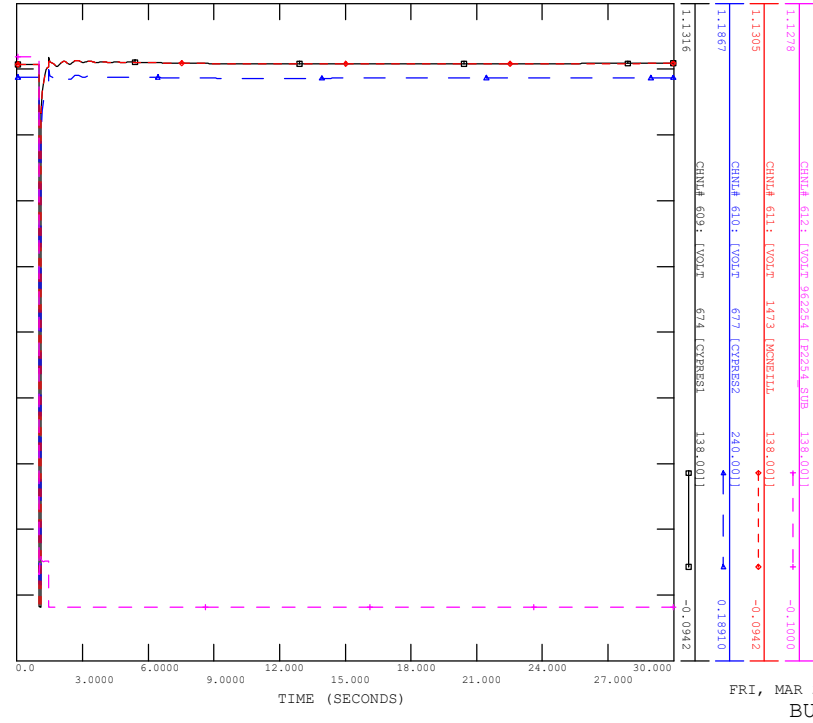


FRI, MAR 25 2022 10:53  
REACTIVE POWER



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS

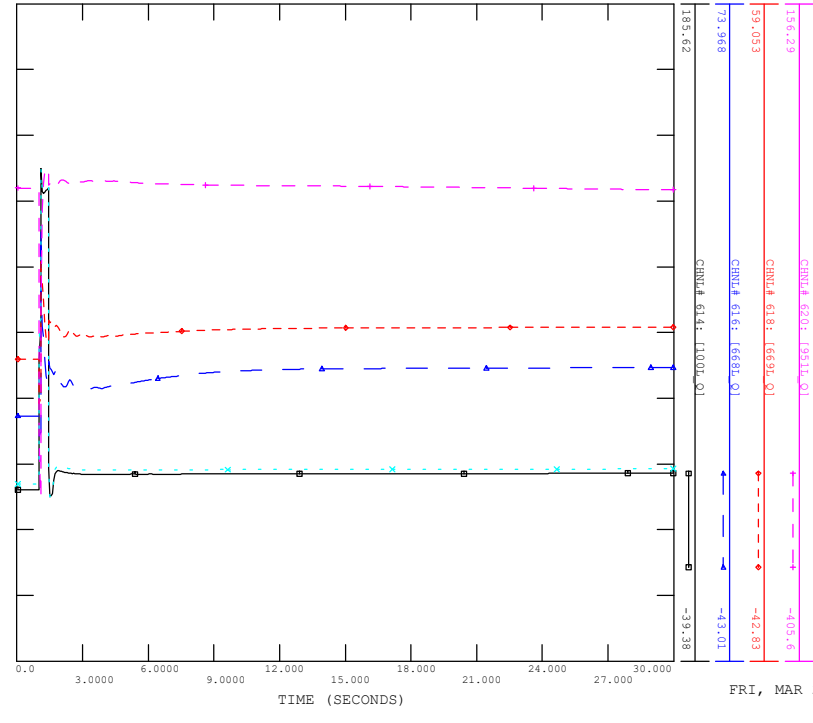
FILE: scn4\_sp\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS

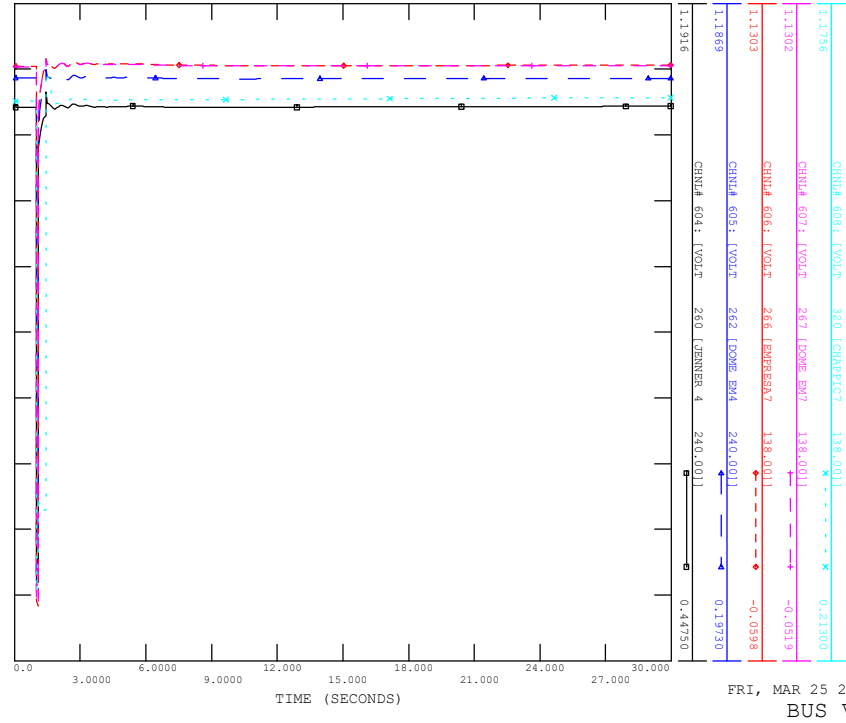
FILE: scn4\_sp\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS

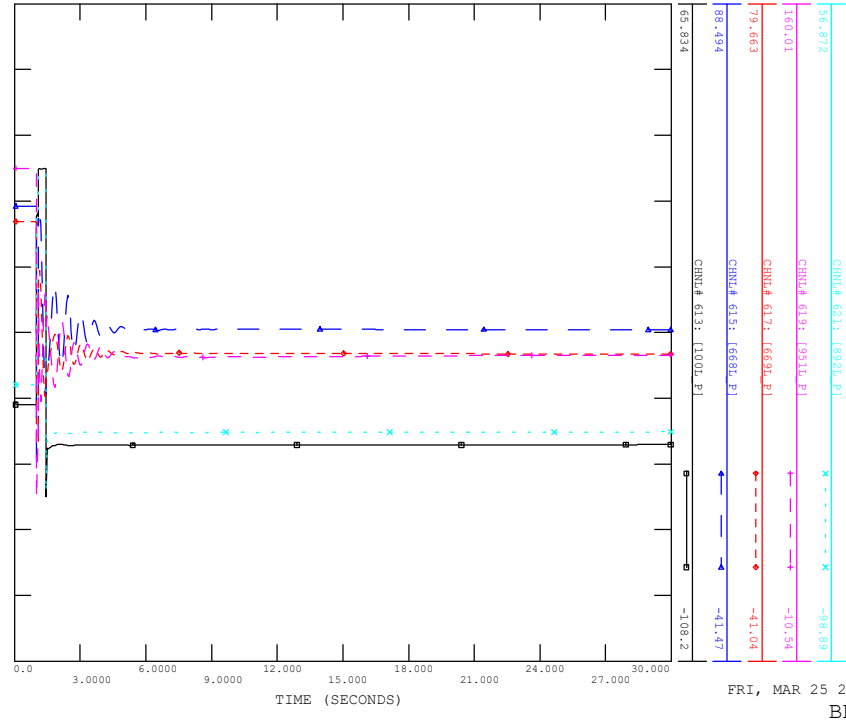
FILE: scn4\_sp\_18\_6581L\_Cypress.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

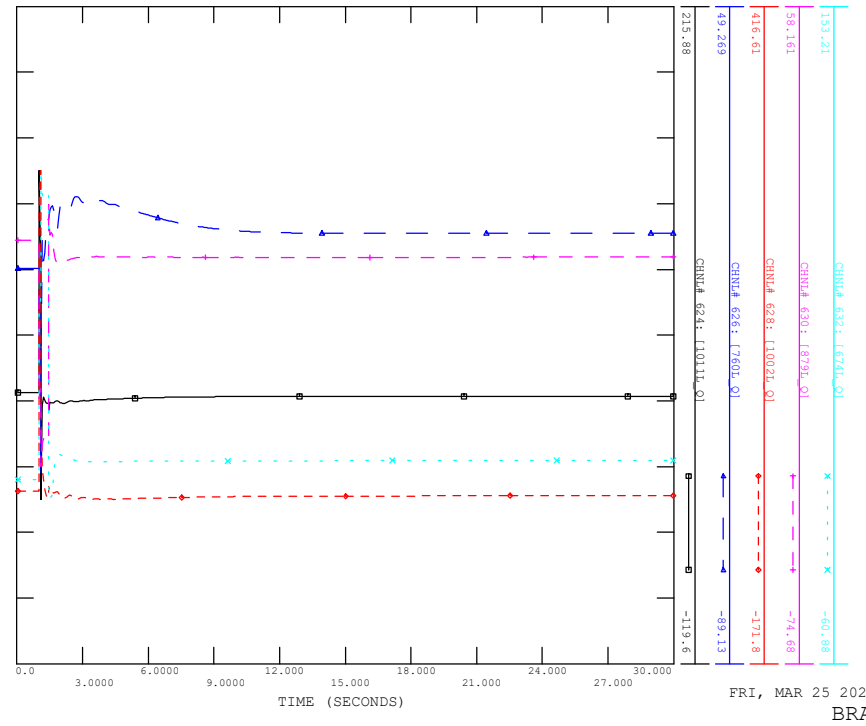
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS

FILE: scn4\_sp\_18\_6581L\_Cypress.out



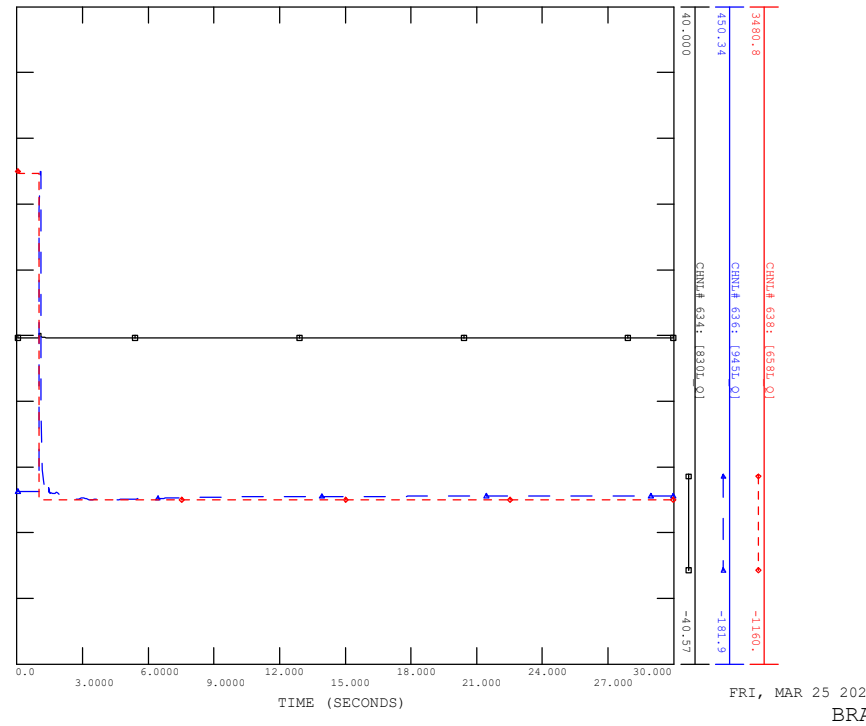
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS  
FILE: scn4\_sp\_18\_6581L\_Cypress.out



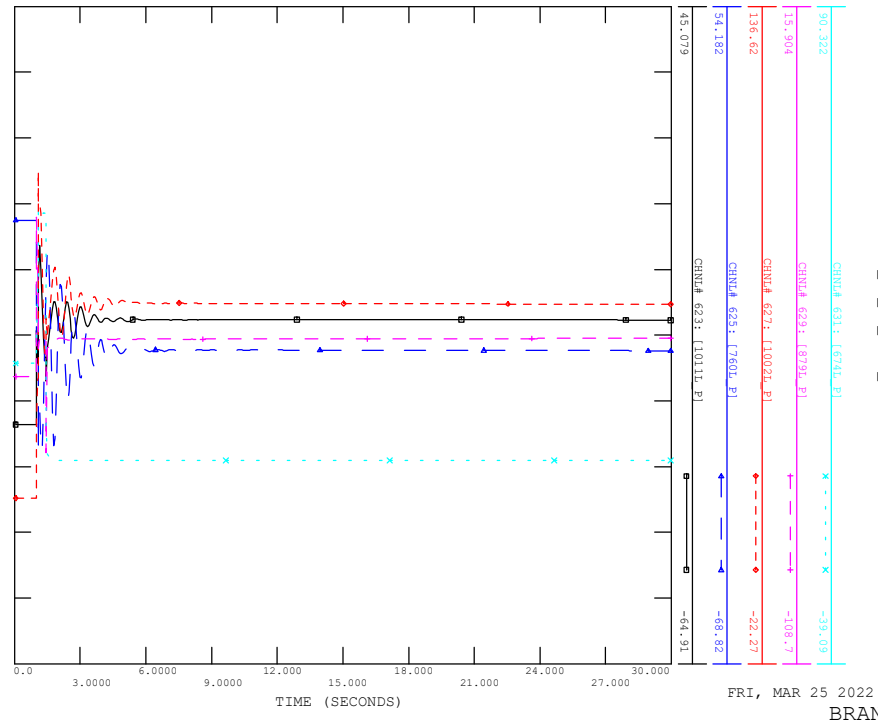
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS  
FILE: scn4\_sp\_18\_6581L\_Cypress.out



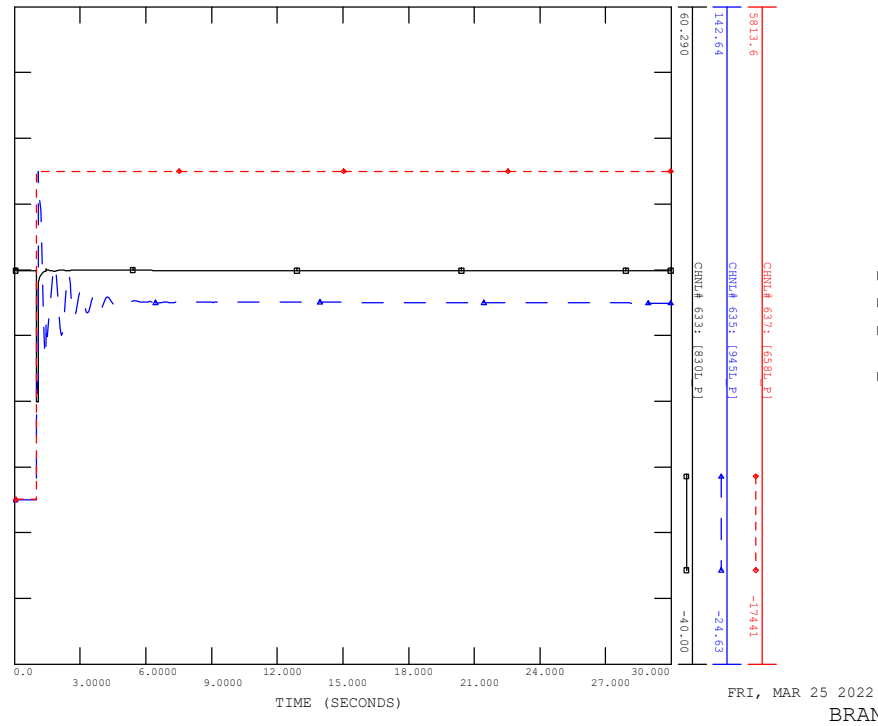
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS  
FILE: scn4\_sp\_18\_6581L\_Cypress.out



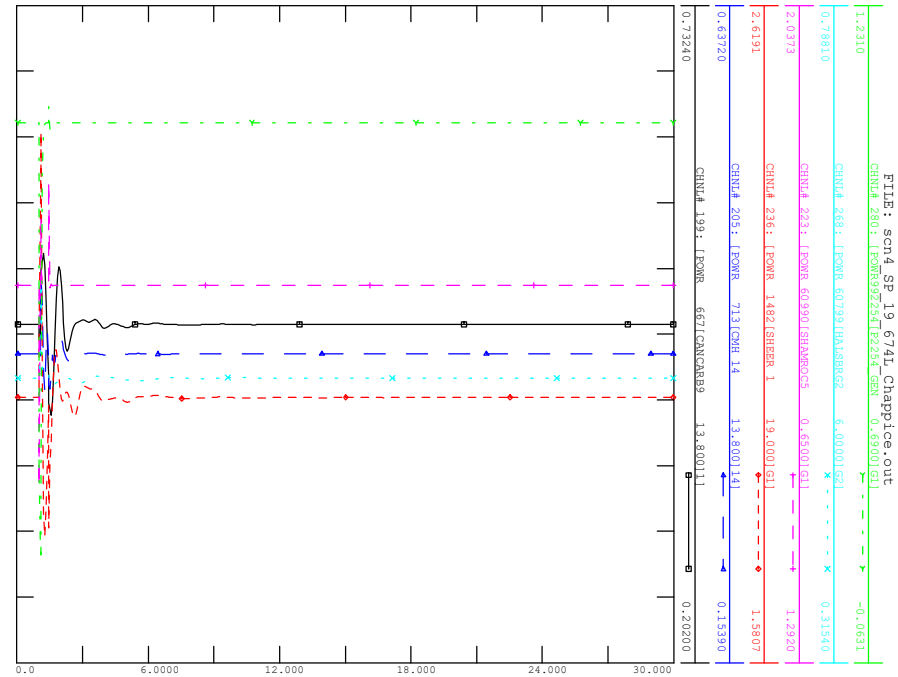
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_18\_6581L\_CYPRESS  
FILE: scn4\_sp\_18\_6581L\_Cypress.out



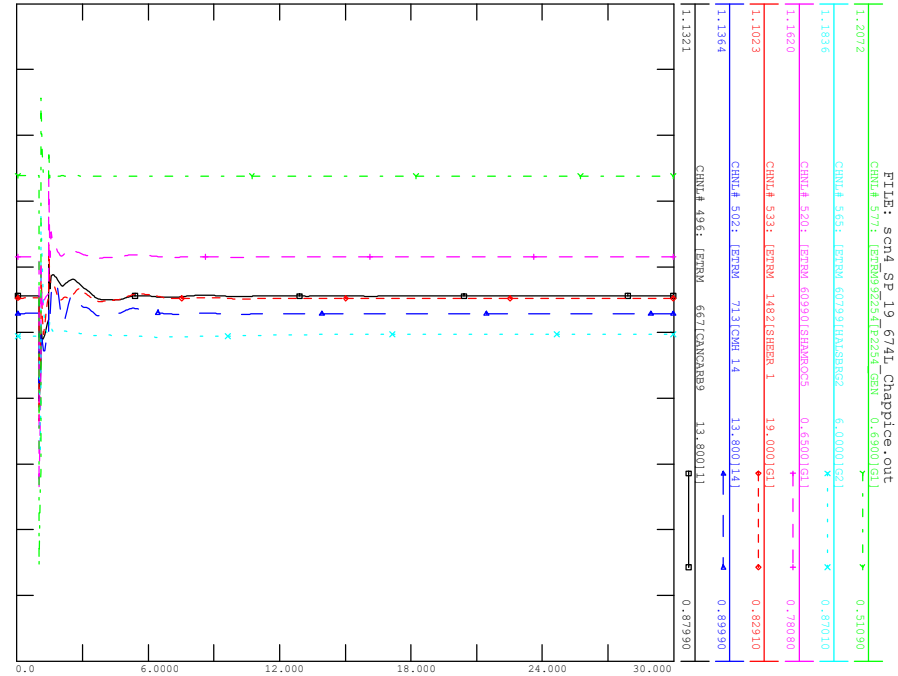
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE



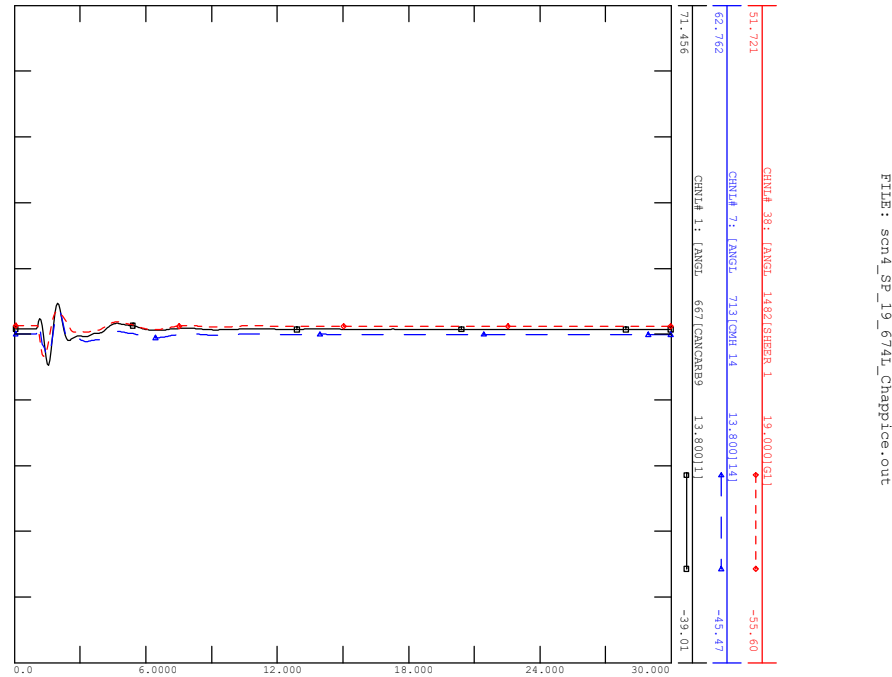
FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE



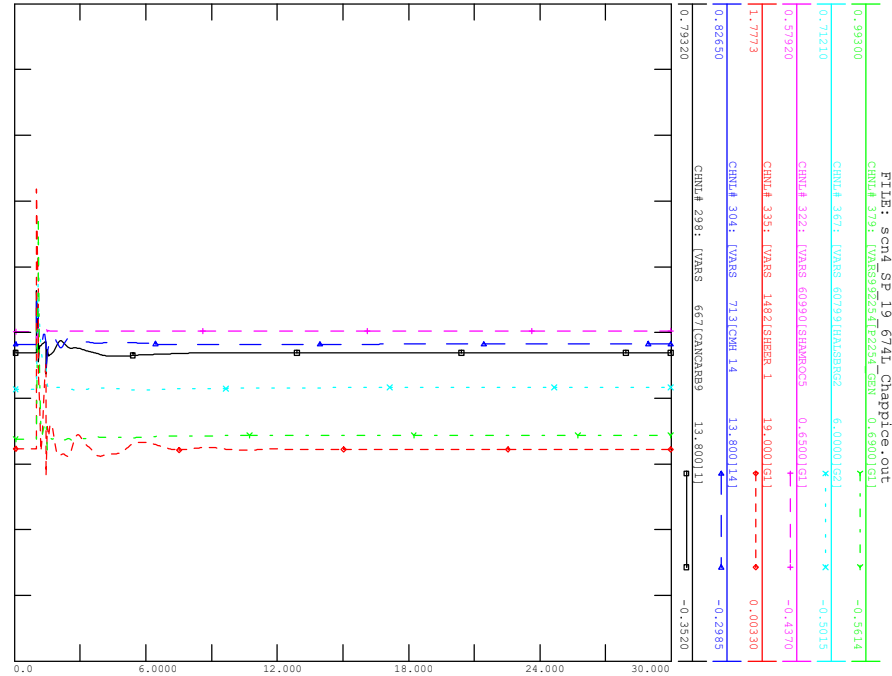
FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE



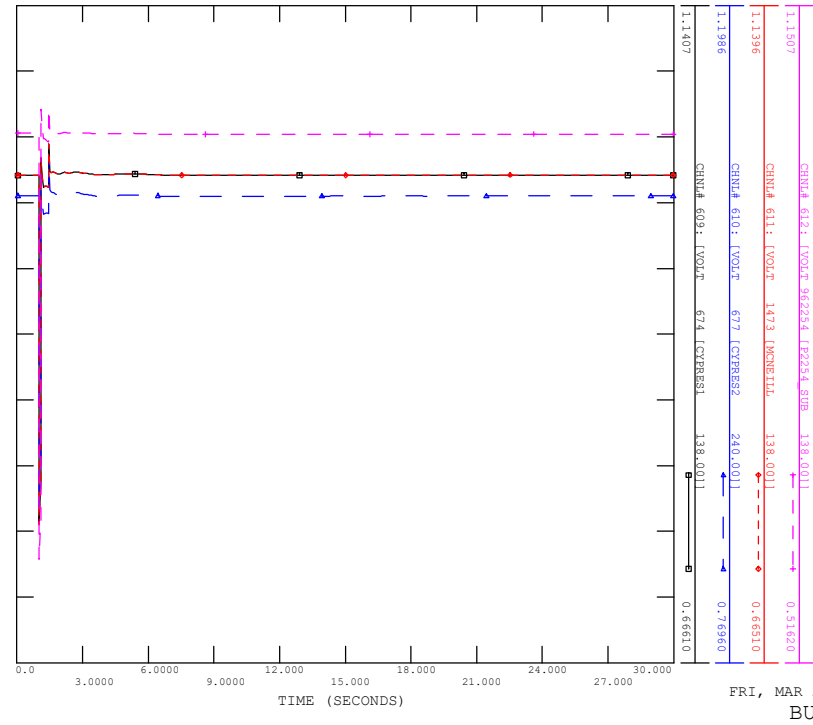
FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE



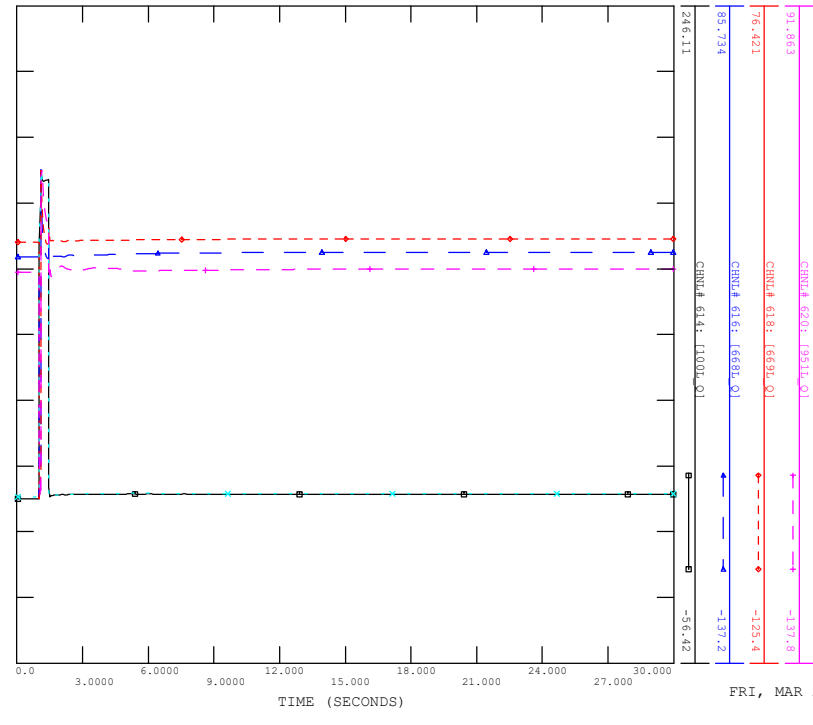
FRI, MAR 25 2022 10:53  
REACTIVE POWER

FILE: scn4\_sp\_19\_674L\_Chapfice.out



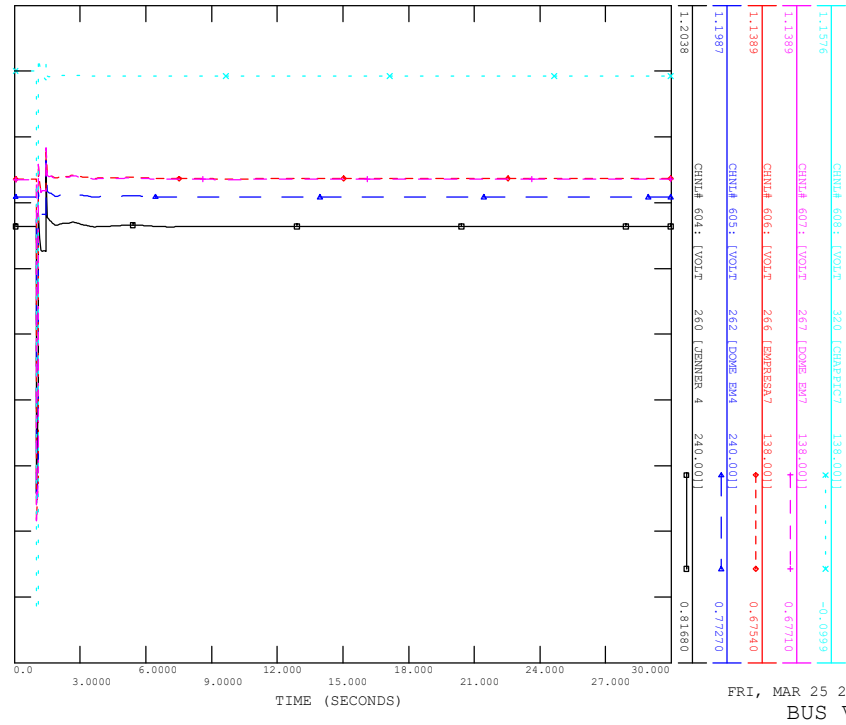
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

FILE: scn4\_sp\_19\_674L\_Chapfice.out



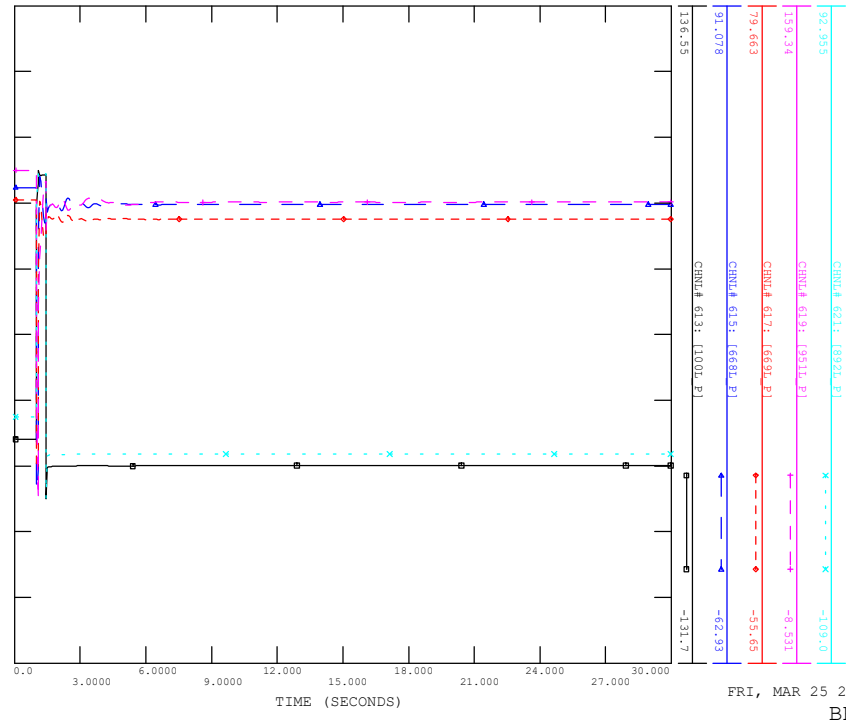
FRI, MAR 25 2022 10:53  
BRANCH Q

FILE: scn4\_sp\_19\_674L\_Chapfice.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

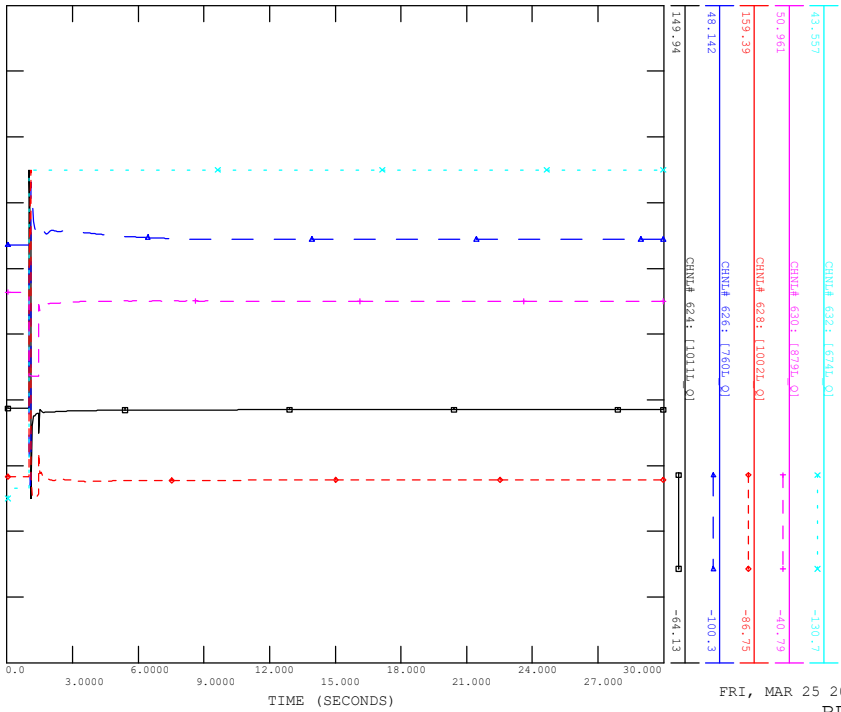
FILE: scn4\_sp\_19\_674L\_Chapfice.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE

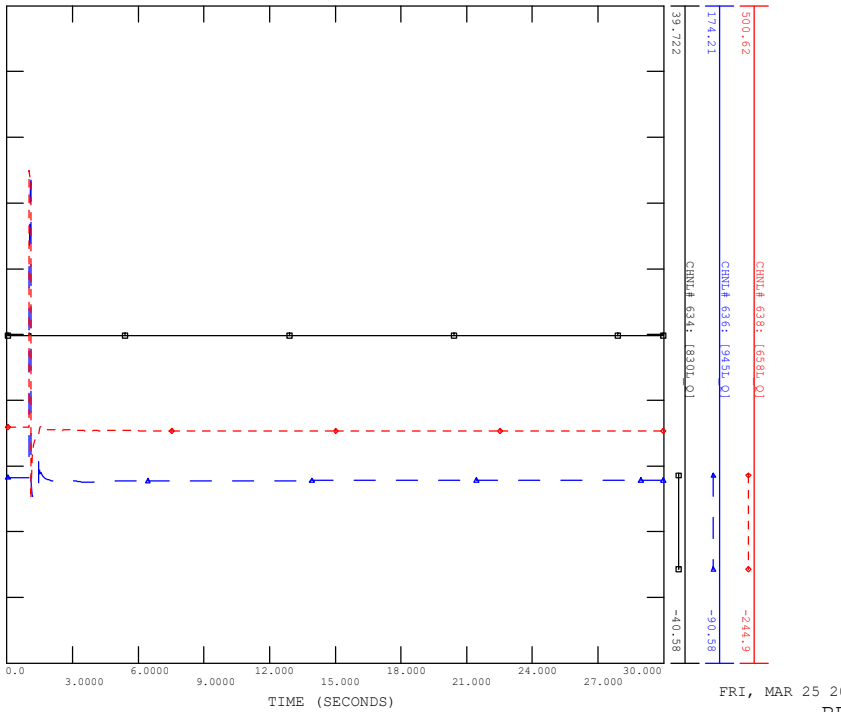
FILE: scn4\_sp\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE

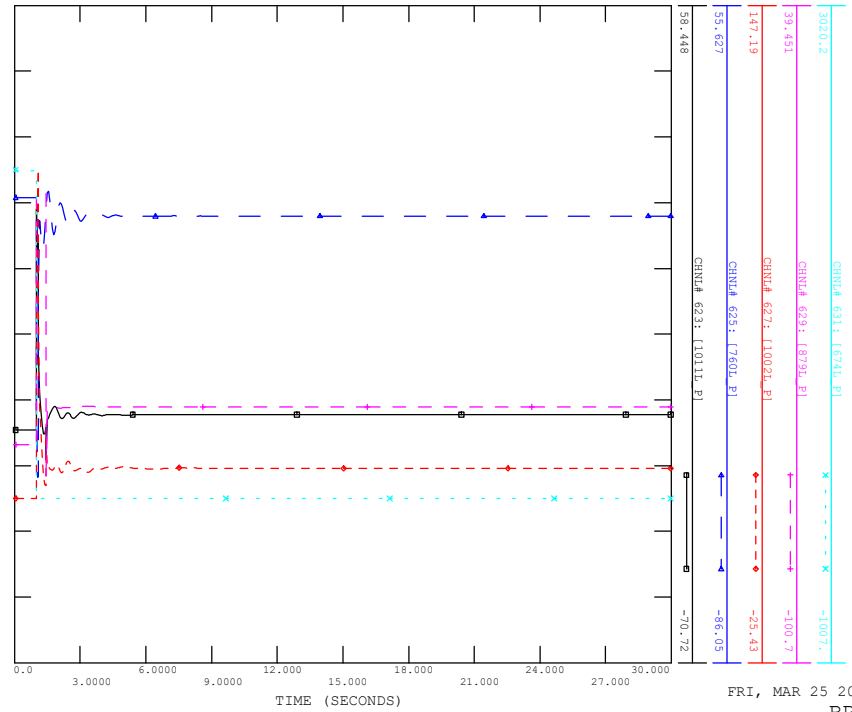
FILE: scn4\_sp\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE

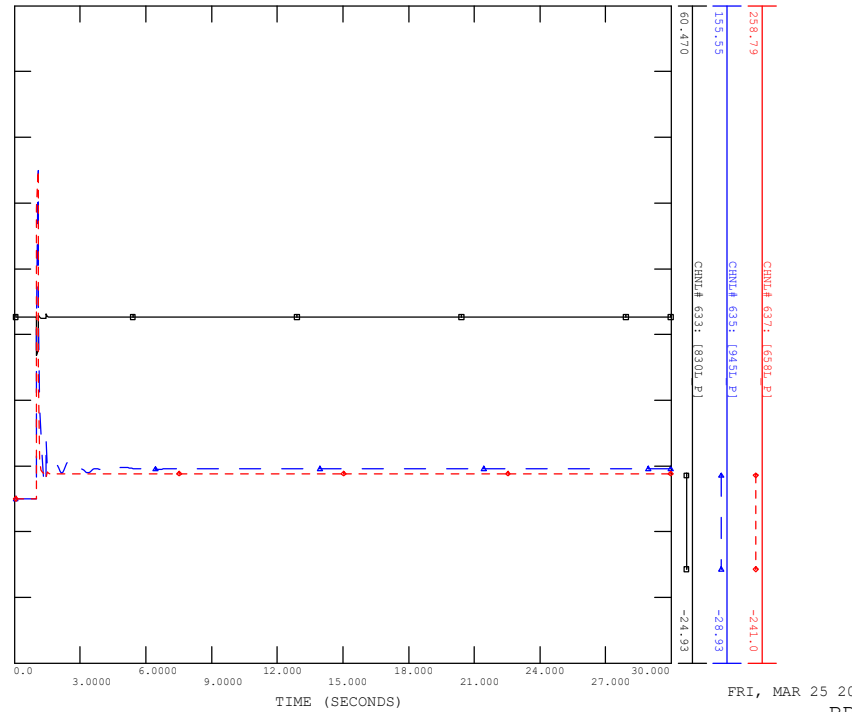
FILE: scn4\_sp\_19\_674L\_Chappice.out



FRI, MAR 25 2022 10:53  
BRANCH P

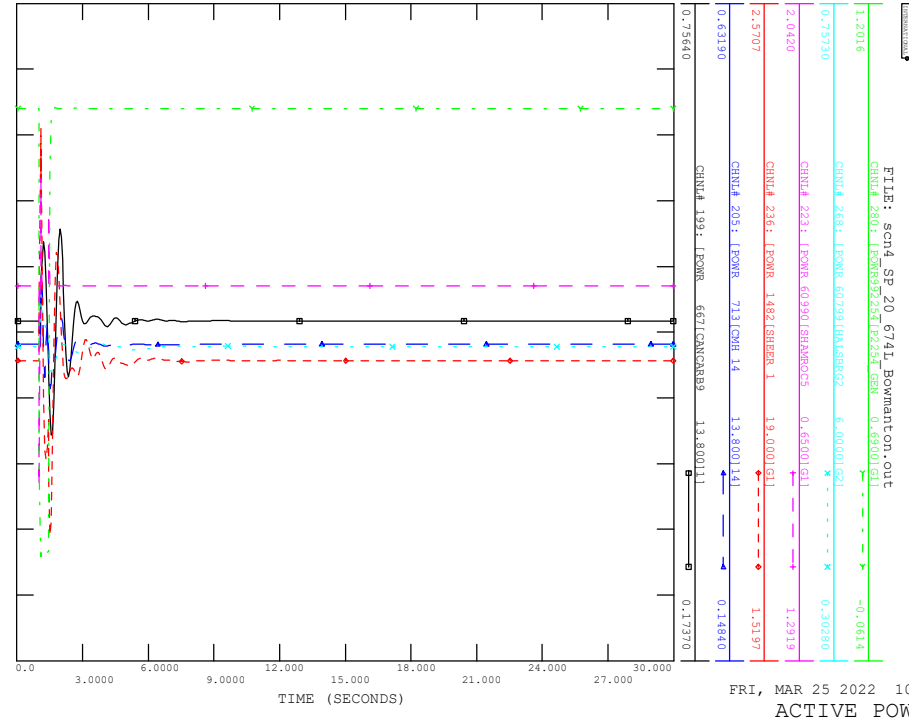
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_19\_674L\_CHAPFICE

FILE: scn4\_sp\_19\_674L\_Chappice.out

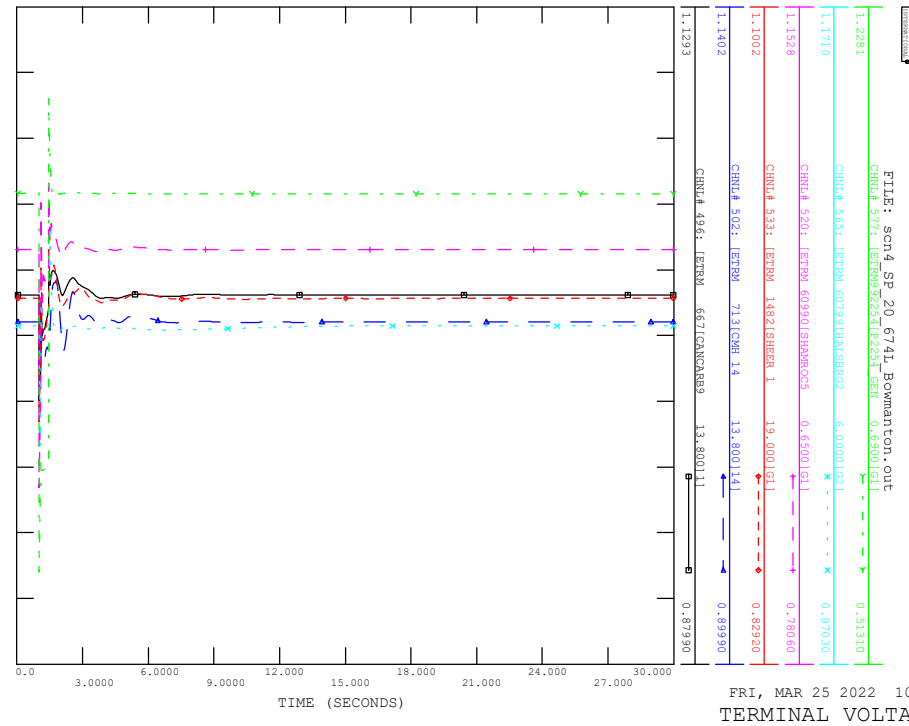


FRI, MAR 25 2022 10:53  
BRANCH P

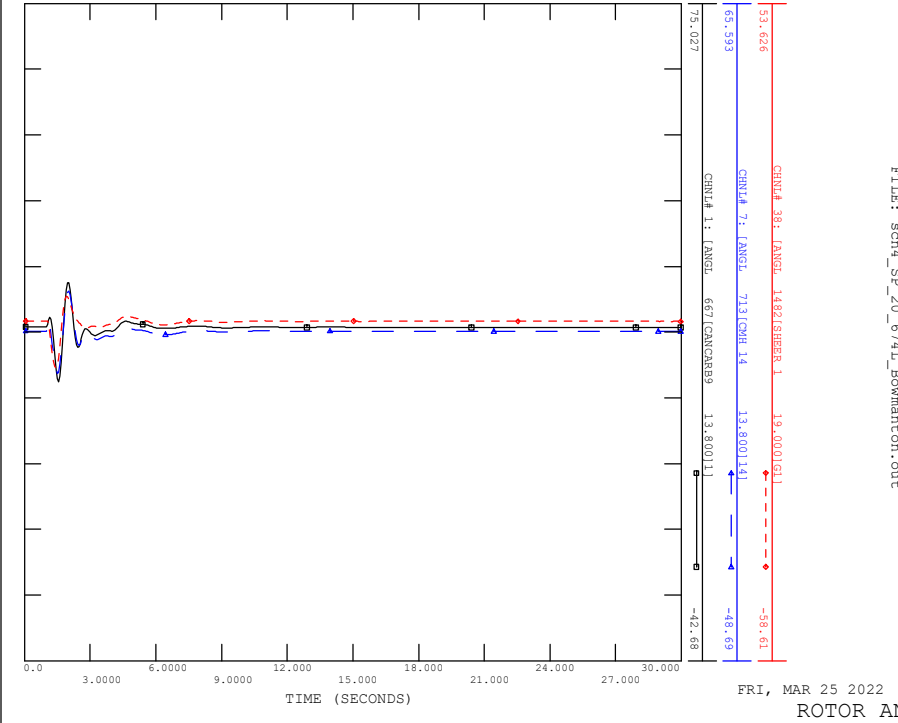
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON



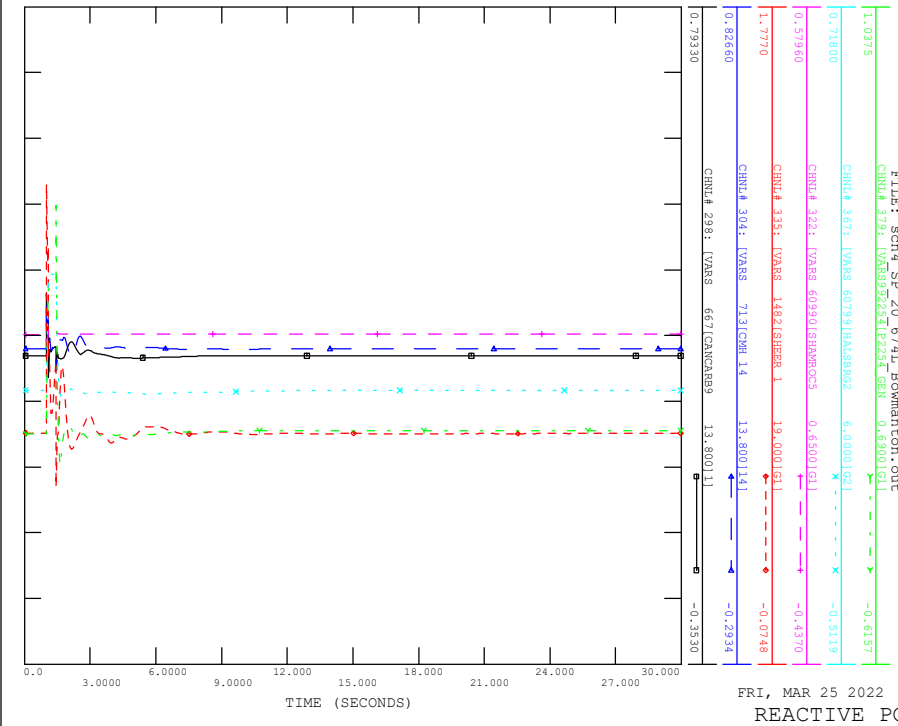
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON



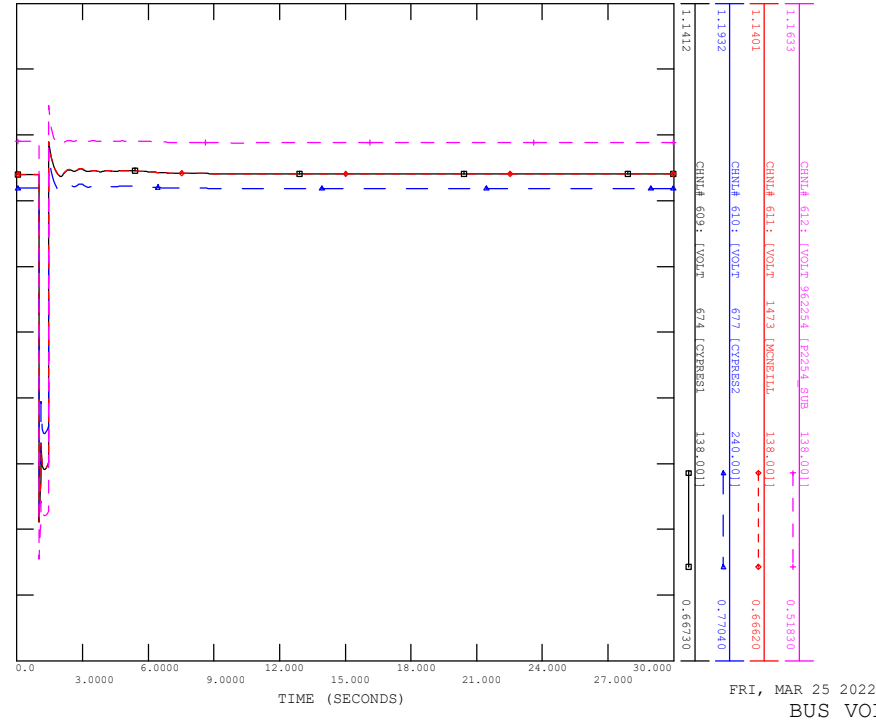
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON



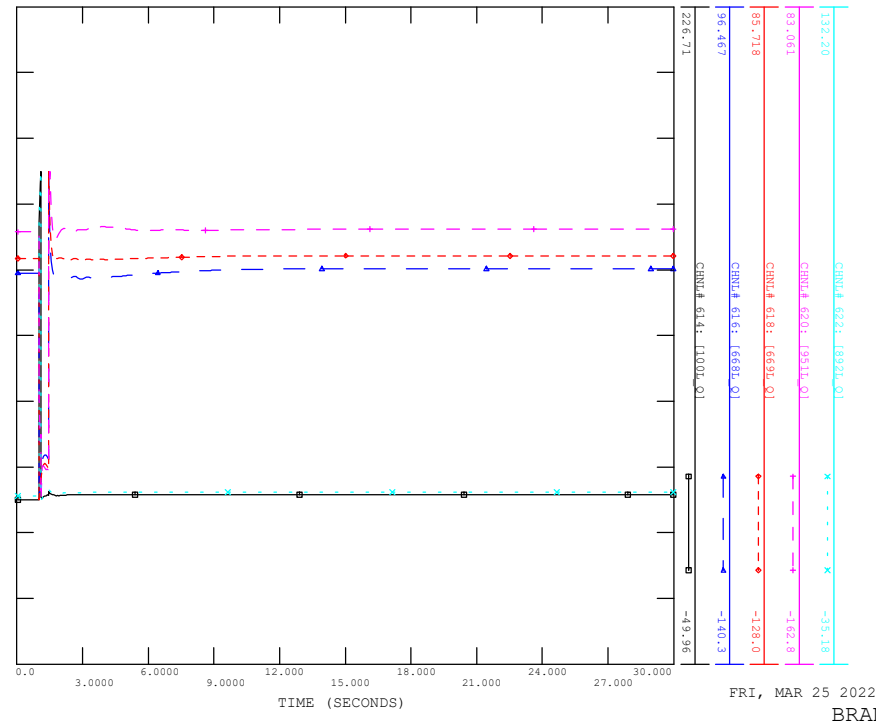
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON



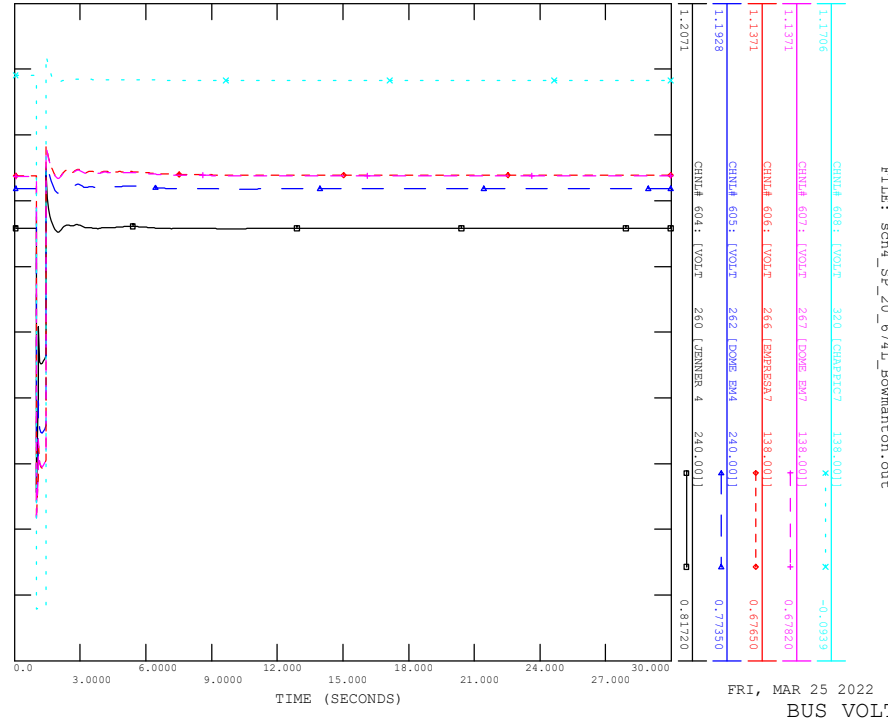
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON  
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



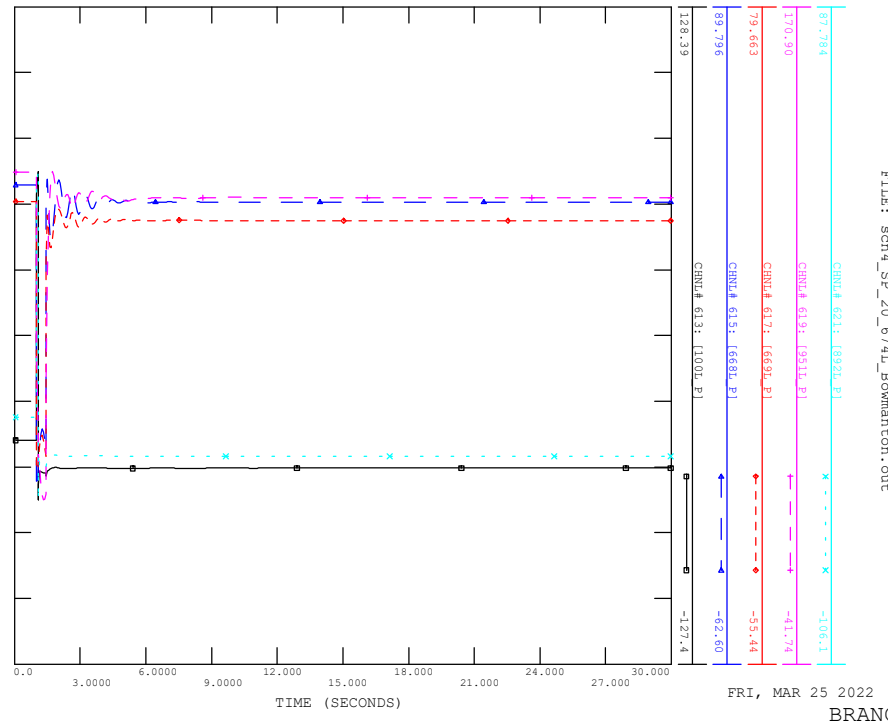
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON  
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON  
FILE: scn4\_sp\_20\_674L\_Bowmanton.out

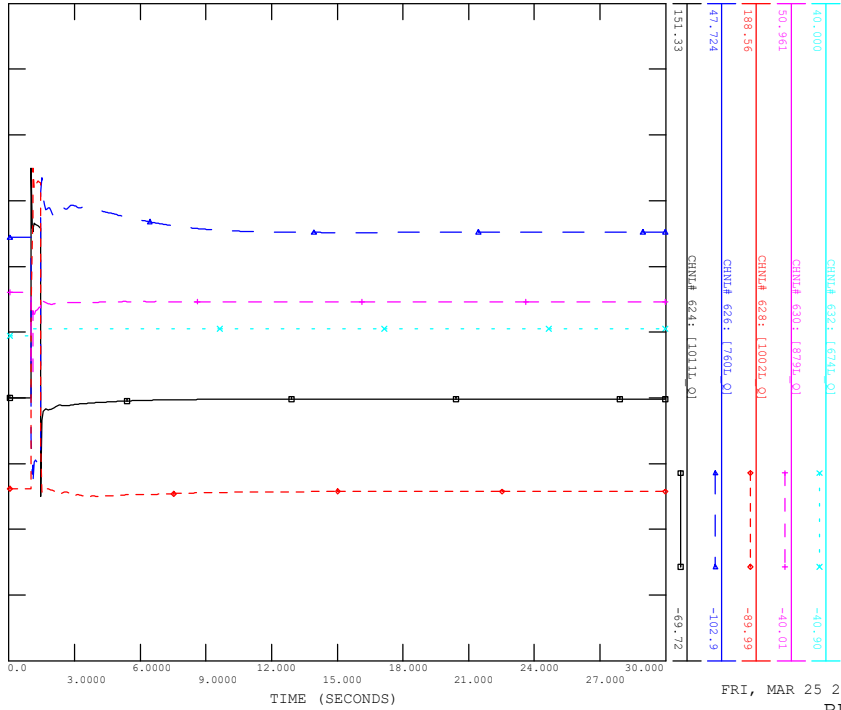


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON  
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON

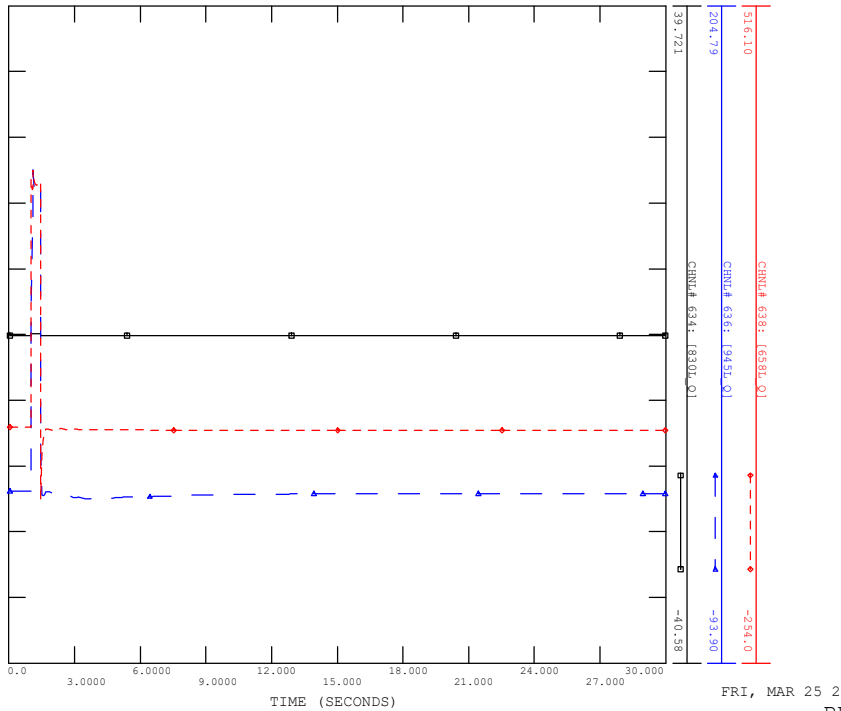
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON

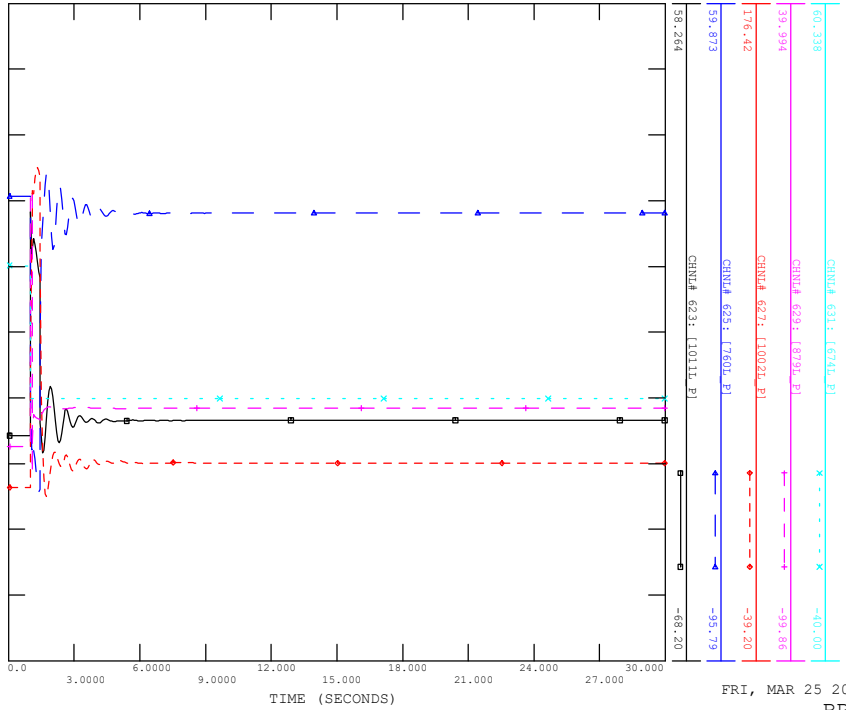
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON

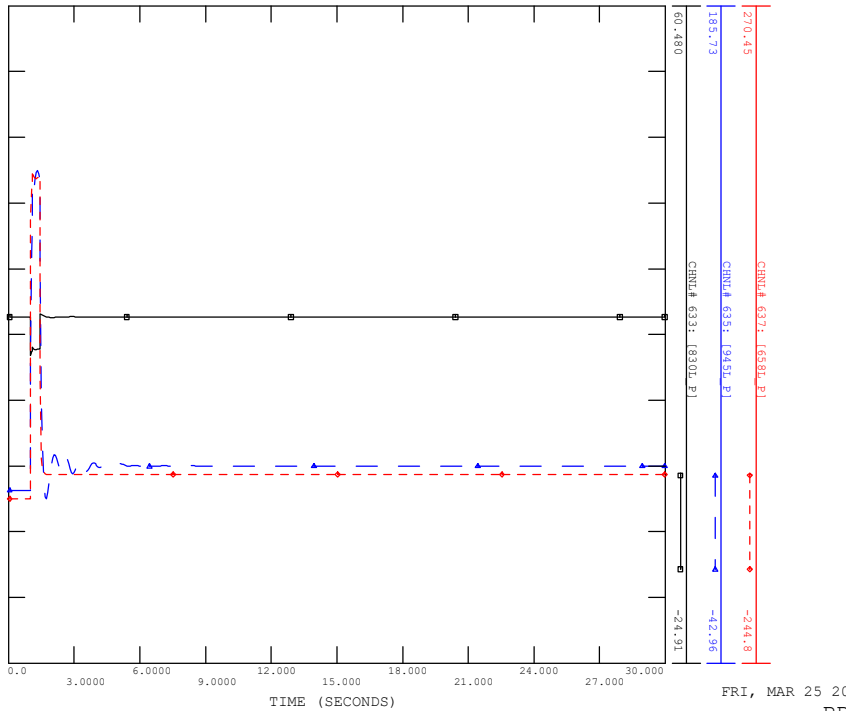
FILE: scn4\_sp\_20\_674L\_Bowmanton.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_20\_674L\_BOWMANTON

FILE: scn4\_sp\_20\_674L\_Bowmanton.out



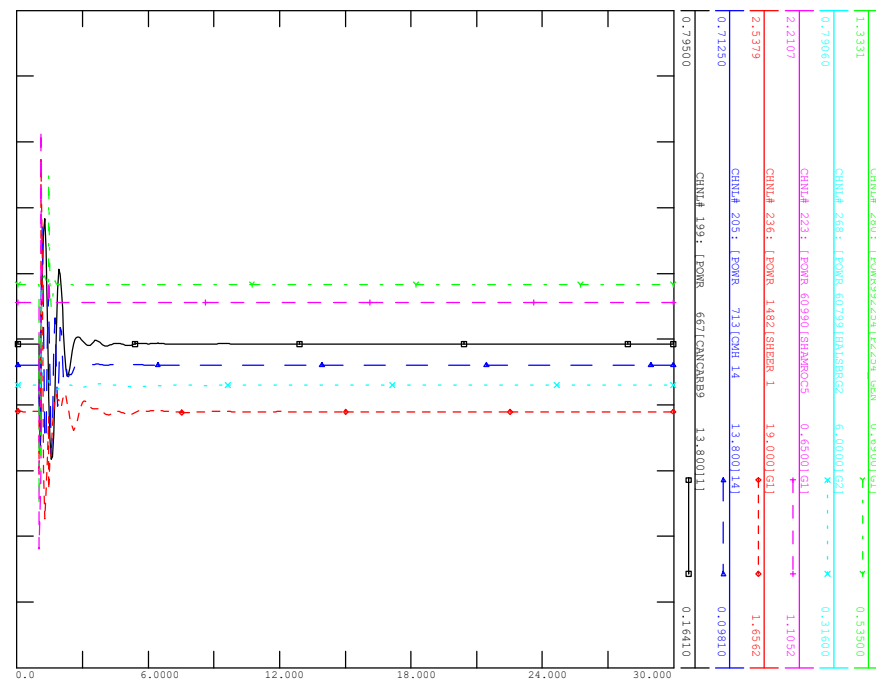
FRI, MAR 25 2022 10:53  
BRANCH P



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY



FILE: scn4\_sp\_21\_100L\_Tilley.out

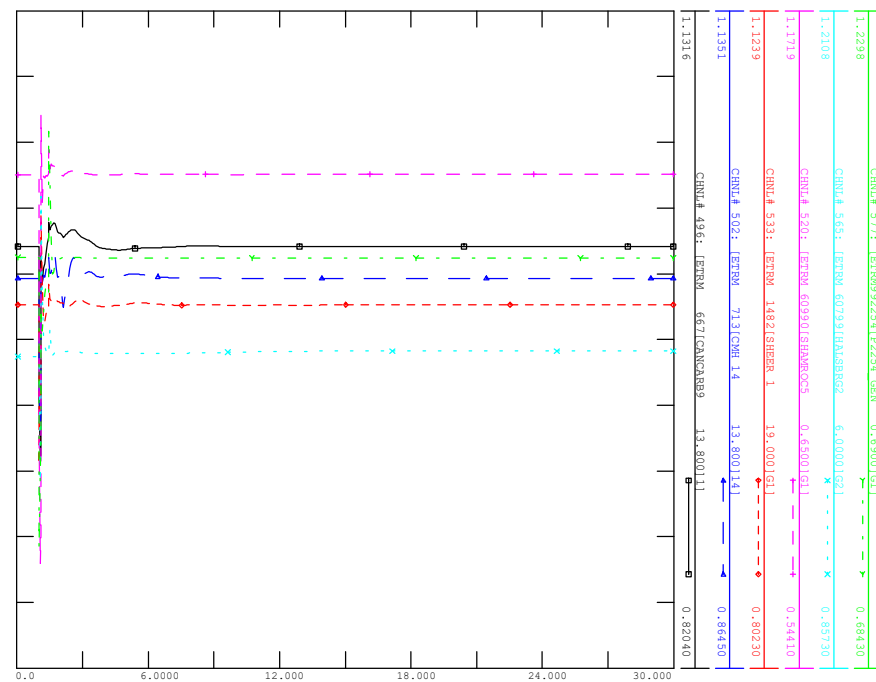


FRI, MAR 25 2022 10:53  
ACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY



FILE: scn4\_sp\_21\_100L\_Tilley.out

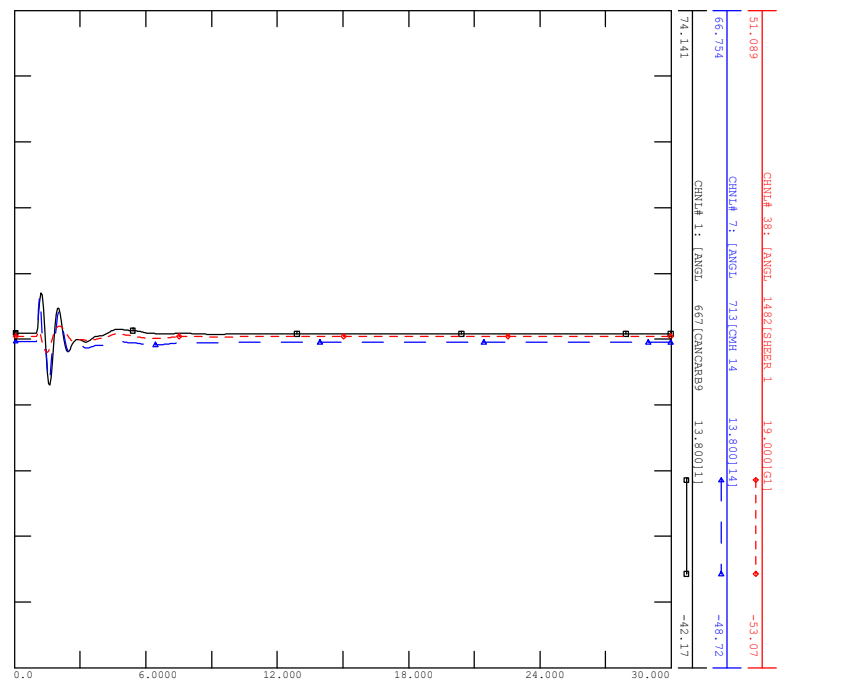


FRI, MAR 25 2022 10:53  
TERMINAL VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY



FILE: scn4\_sp\_21\_100L\_Tilley.out

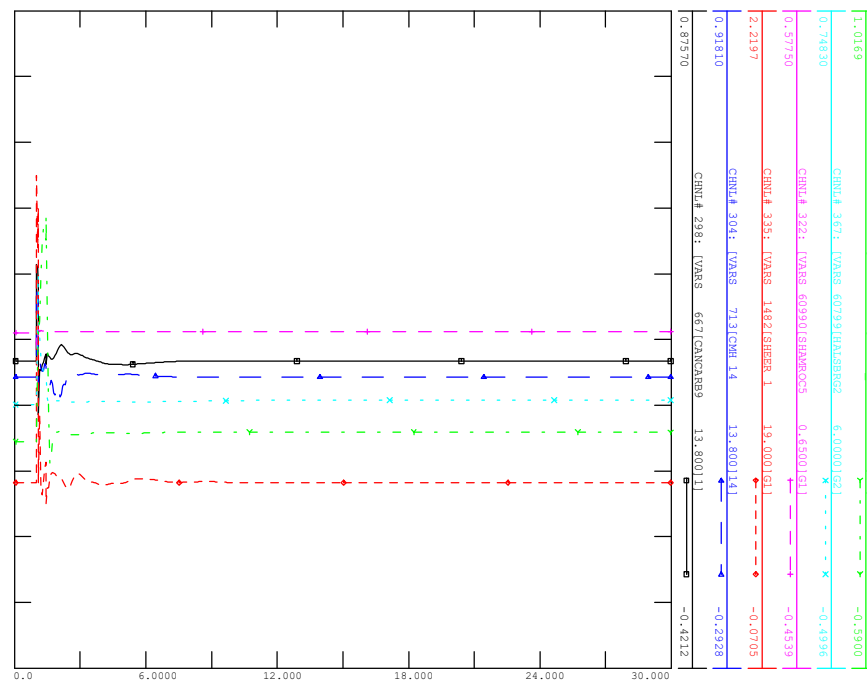


FRI, MAR 25 2022 10:53  
ROTOR ANGLE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY

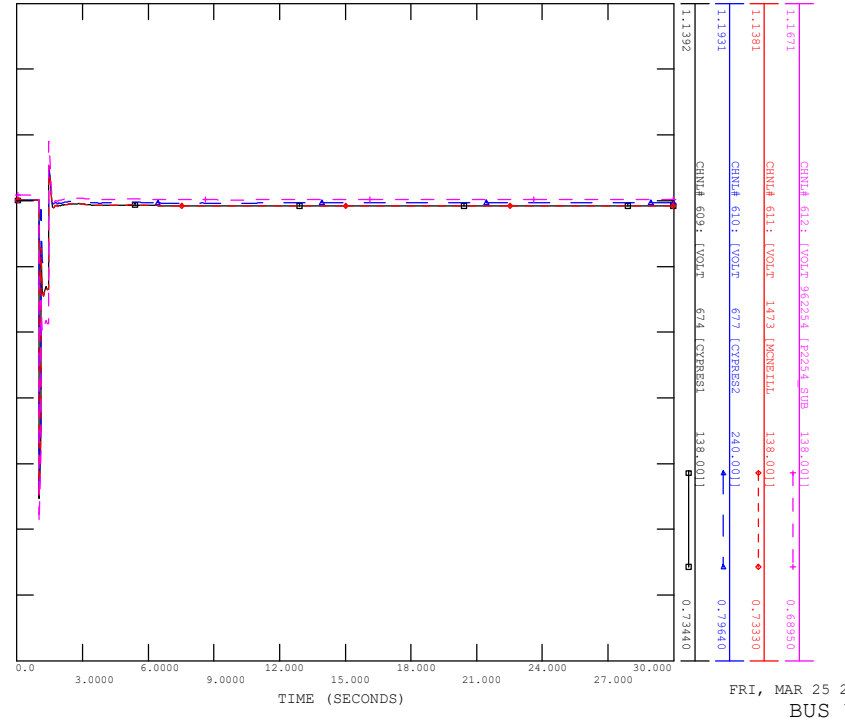


FILE: scn4\_sp\_21\_100L\_Tilley.out



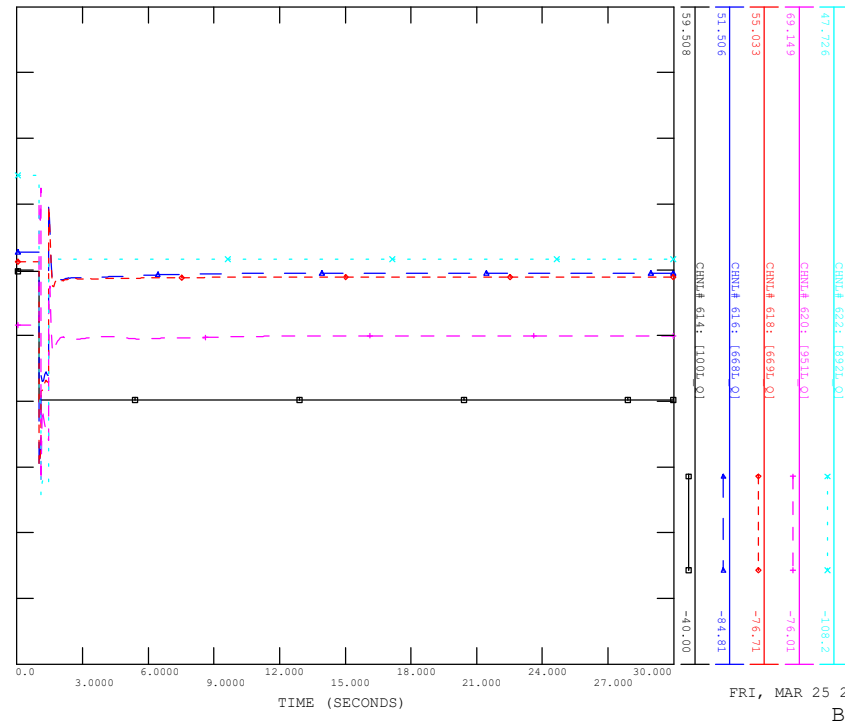
FRI, MAR 25 2022 10:53  
REACTIVE POWER

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



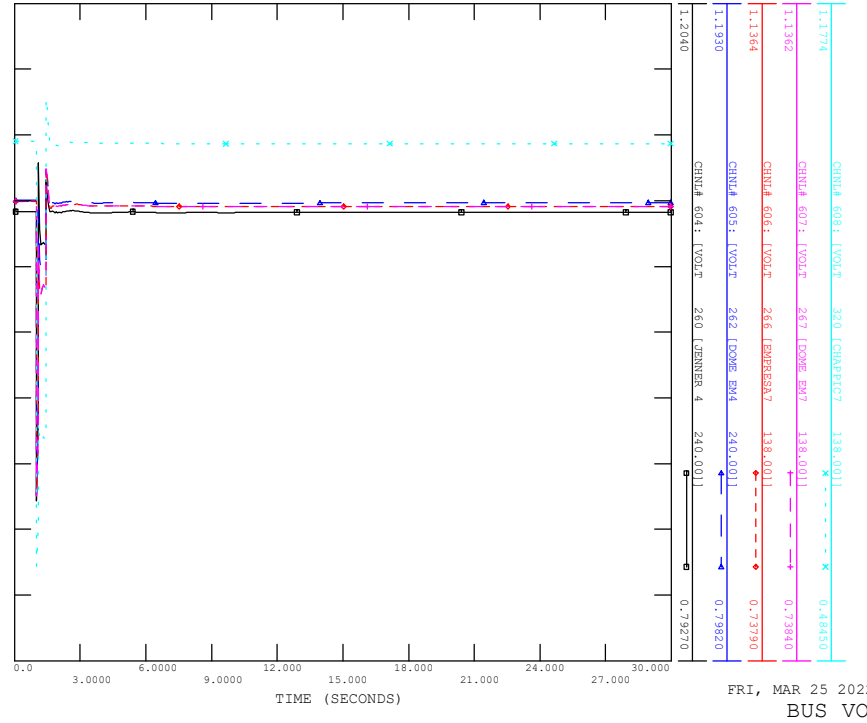
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



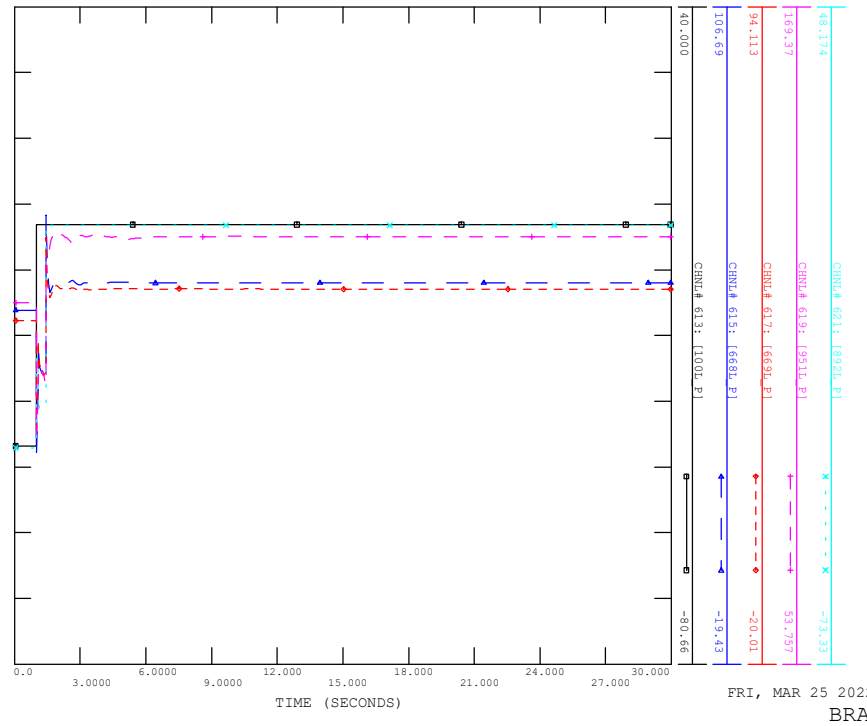
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



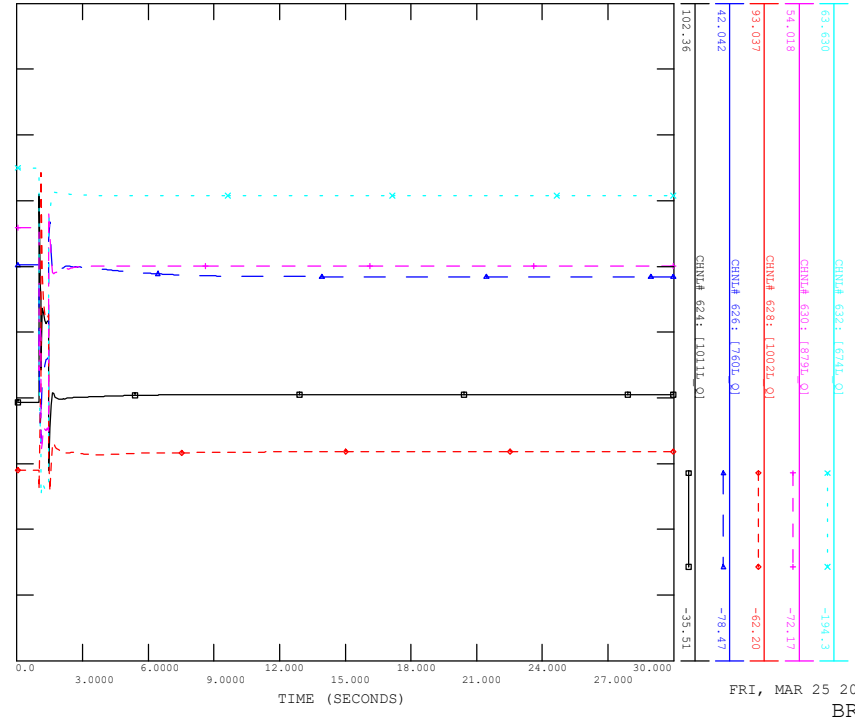
FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



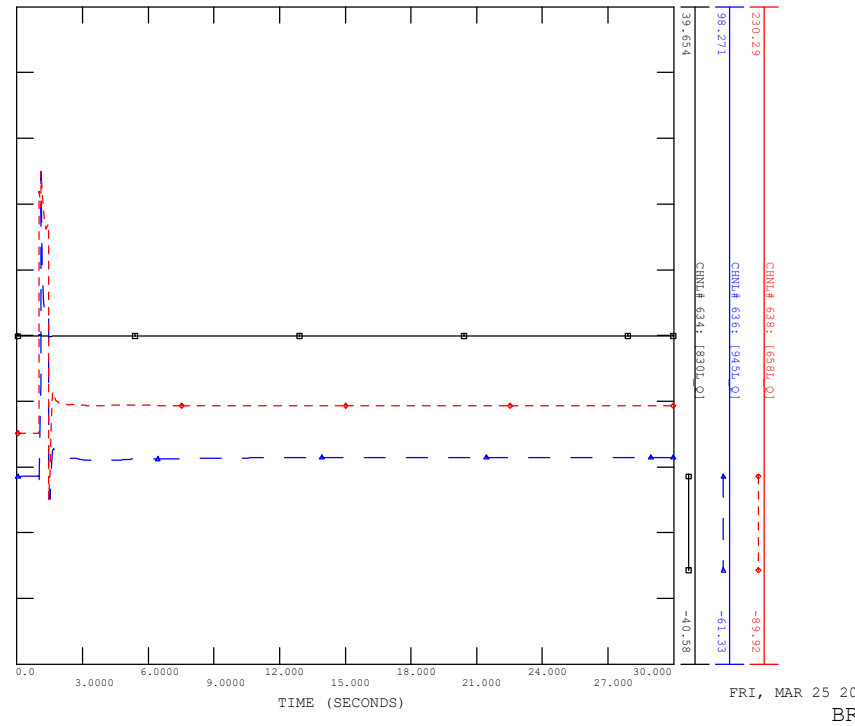
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



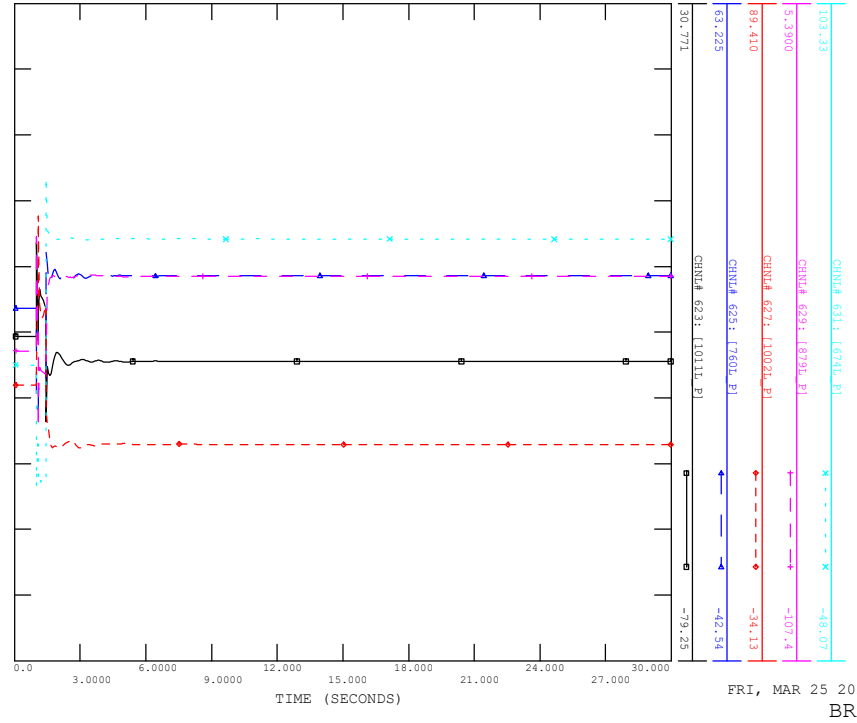
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



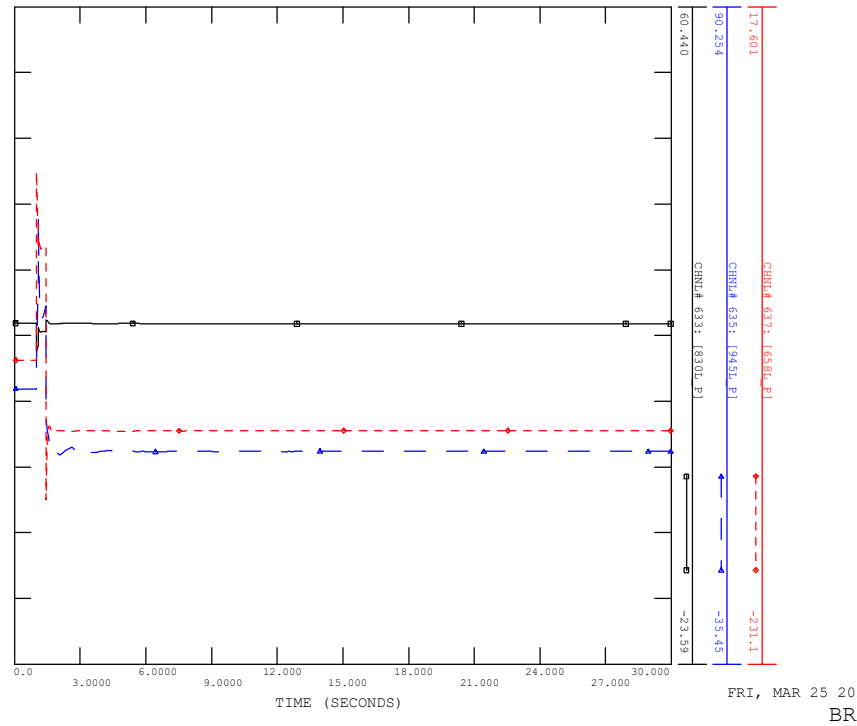
FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out



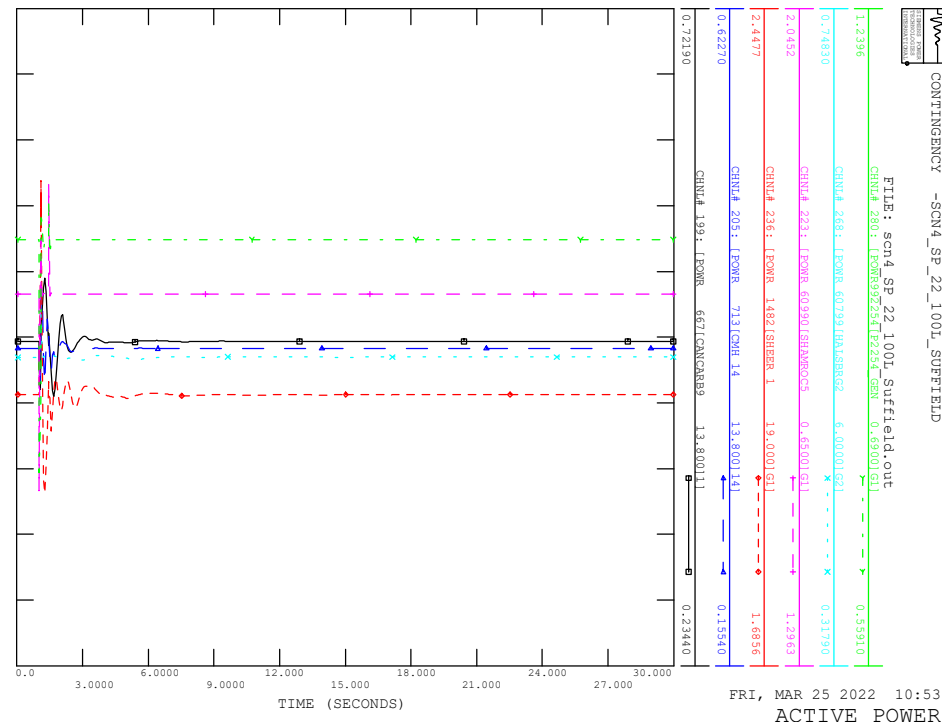
FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_21\_100L\_TILLEY  
FILE: scn4\_sp\_21\_100L\_Tilley.out

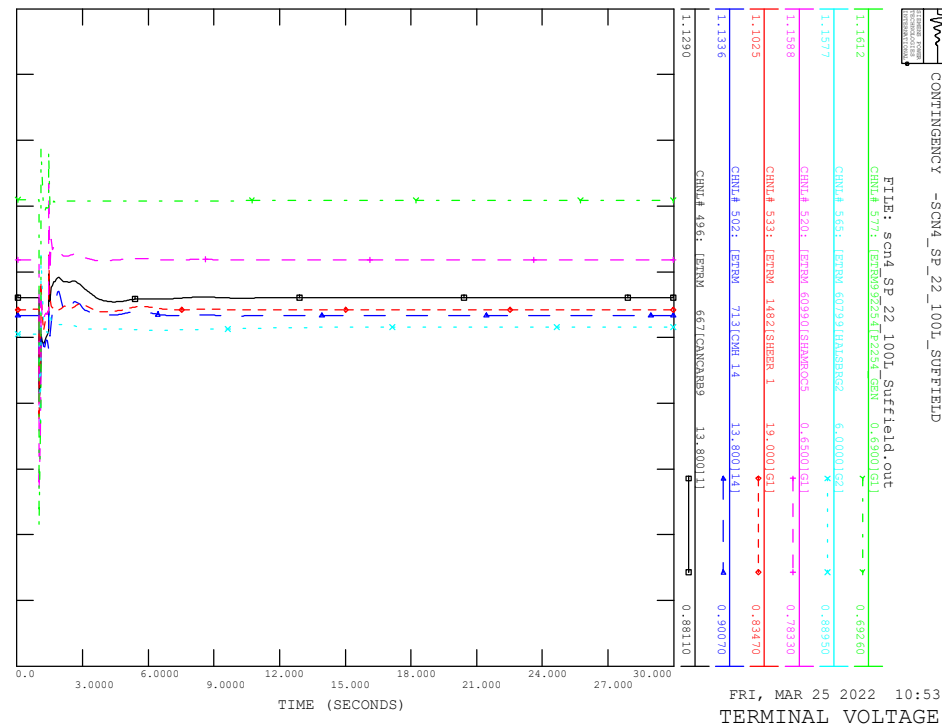


FRI, MAR 25 2022 10:53  
BRANCH P

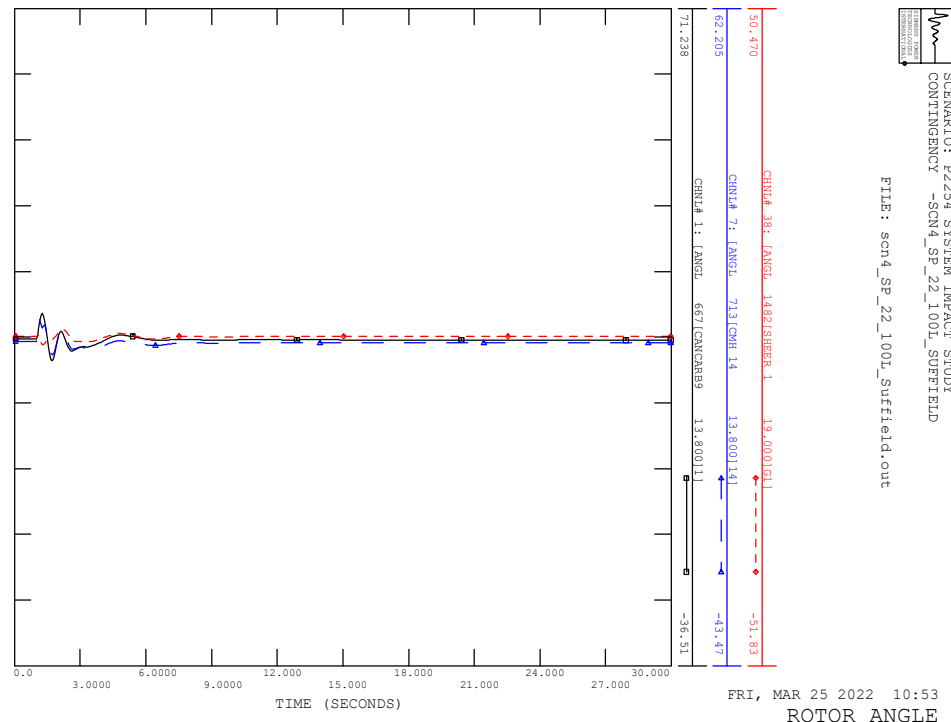
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_1001\_SUPFIELD



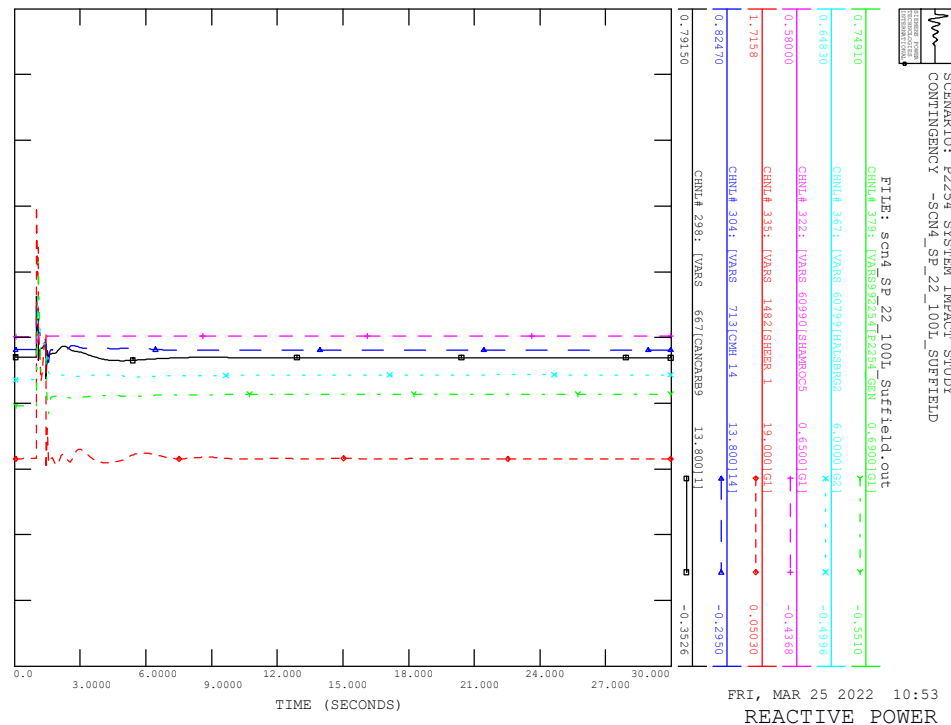
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_1001\_SUPFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_1001\_SUPFIELD

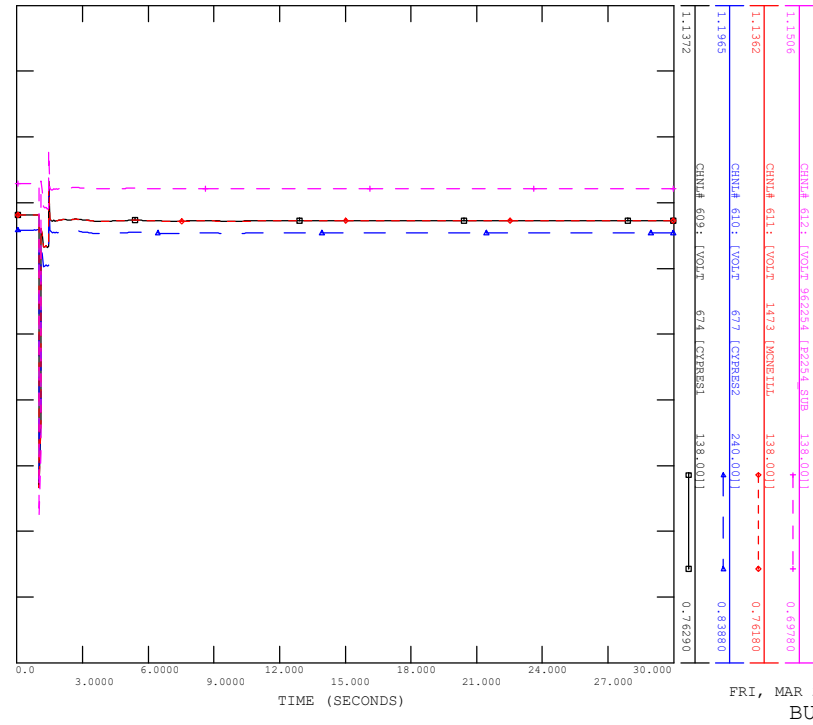


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_1001\_SUPFIELD



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_Suffield

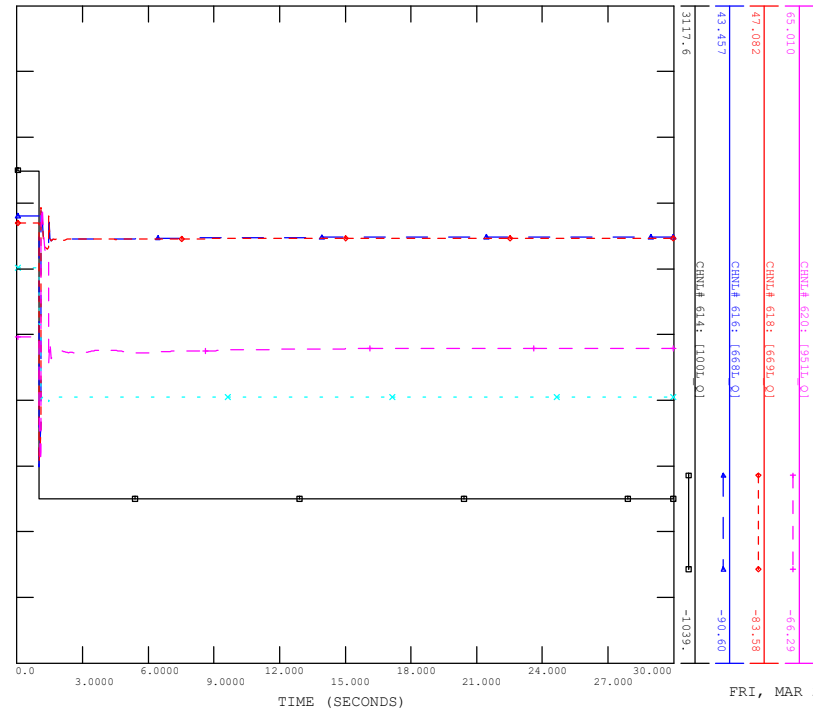
FILE: scn4\_sp\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_Suffield

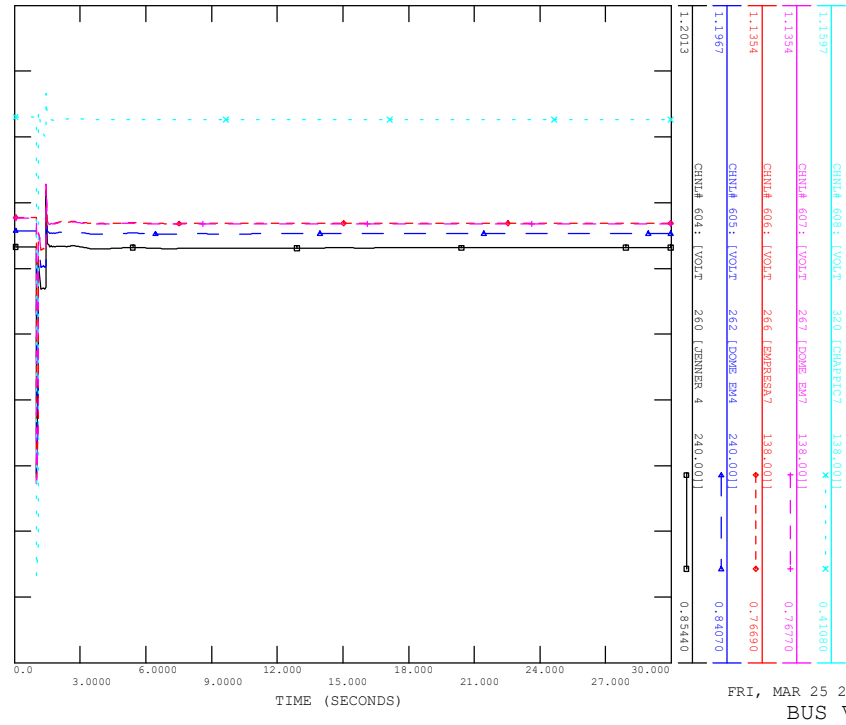
FILE: scn4\_sp\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_Suffield

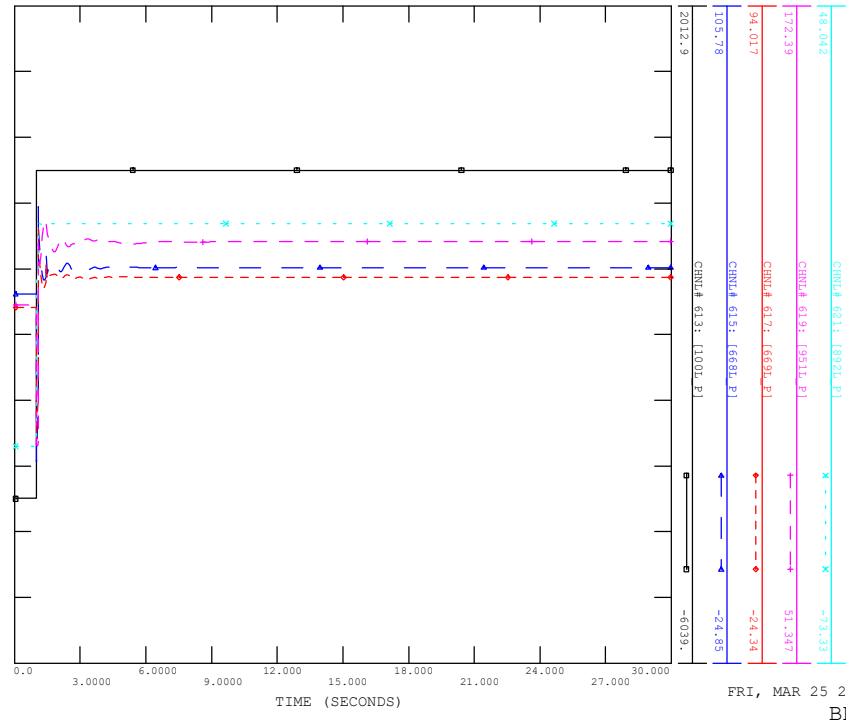
FILE: scn4\_sp\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BUS VOLTAGE

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_Suffield

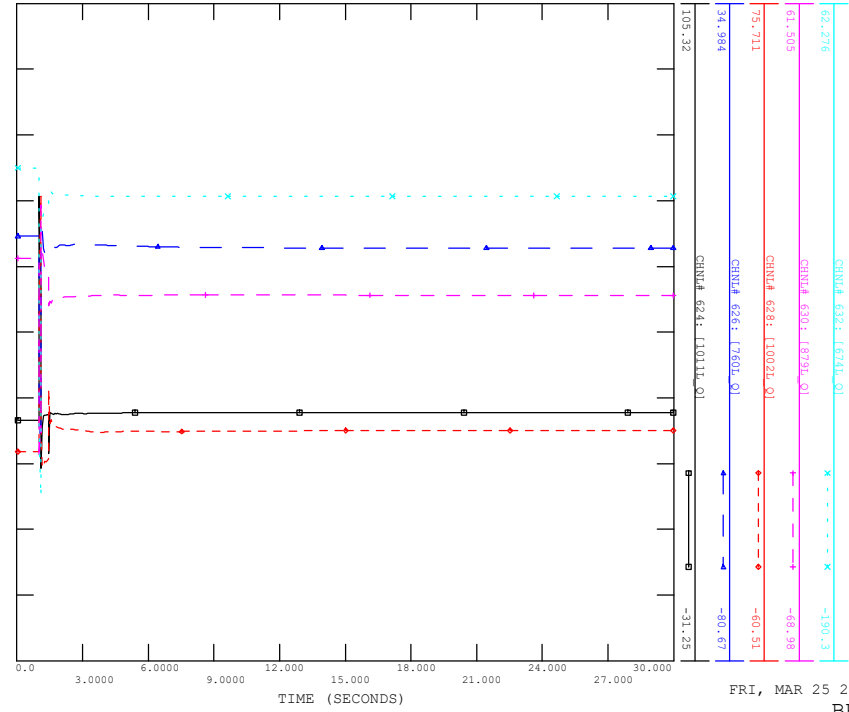
FILE: scn4\_sp\_22\_100L\_Suffield.out



FRI, MAR 25 2022 10:53  
BRANCH P

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_SufField

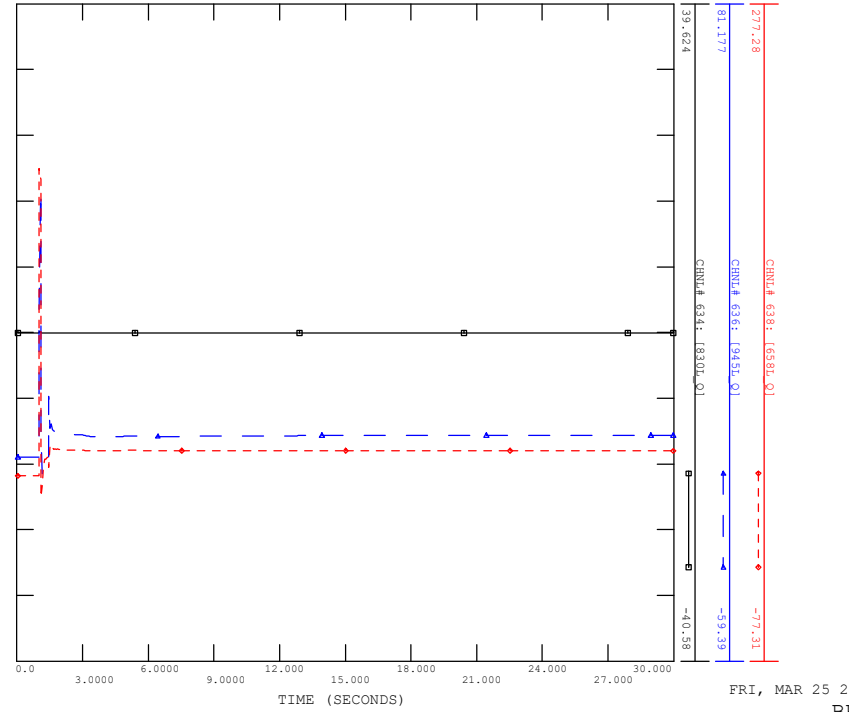
FILE: scn4\_sp\_22\_100L\_SufField.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_SufField

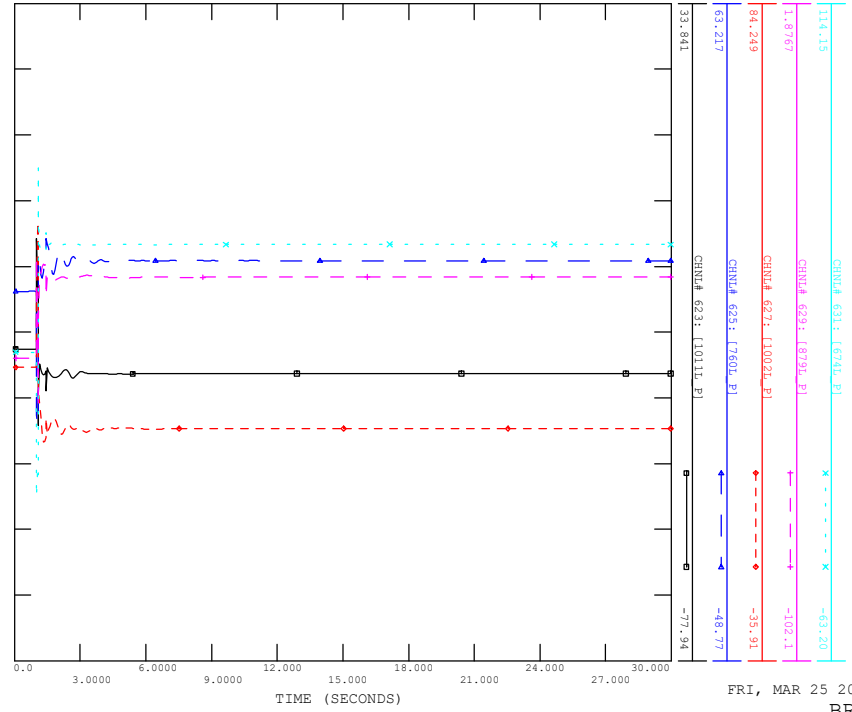
FILE: scn4\_sp\_22\_100L\_SufField.out



FRI, MAR 25 2022 10:53  
BRANCH Q

SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_SufField

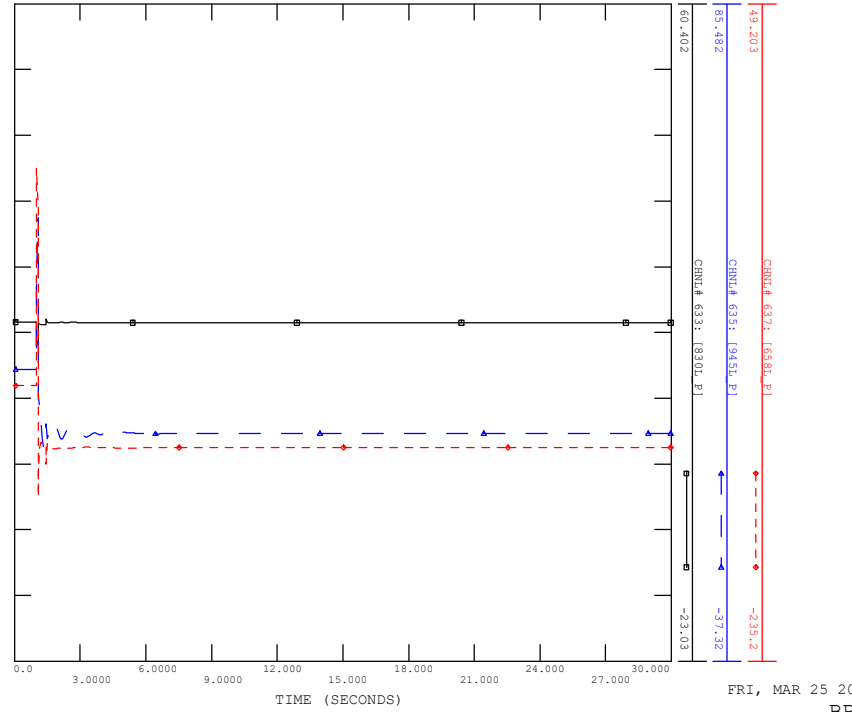
FILE: scn4\_sp\_22\_100L\_SufField.out



FRI, MAR 25 2022 10:53  
BRANCH P

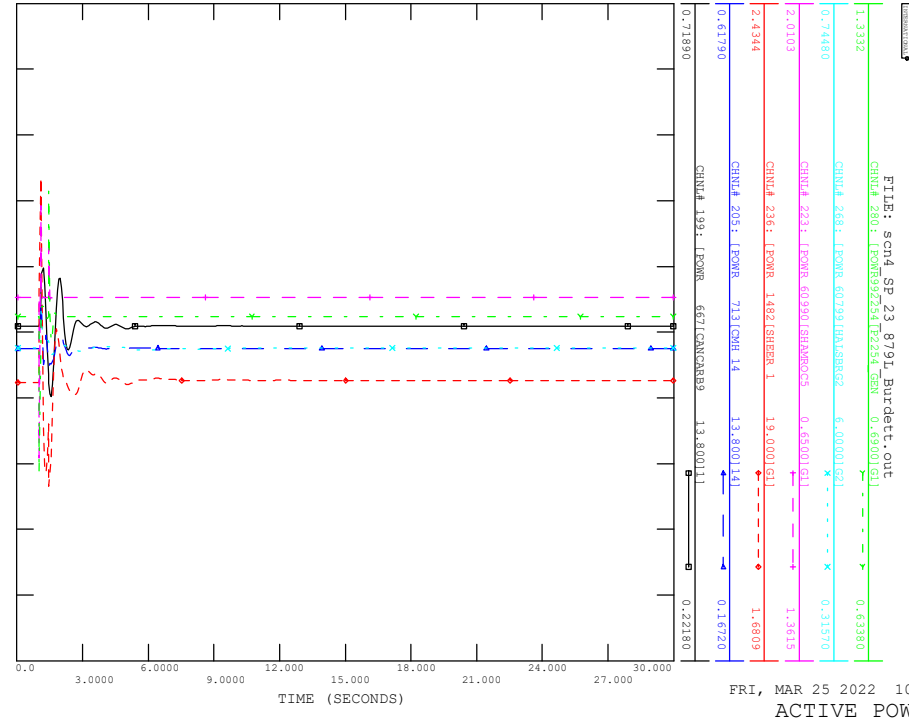
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_22\_100L\_SufField

FILE: scn4\_sp\_22\_100L\_SufField.out

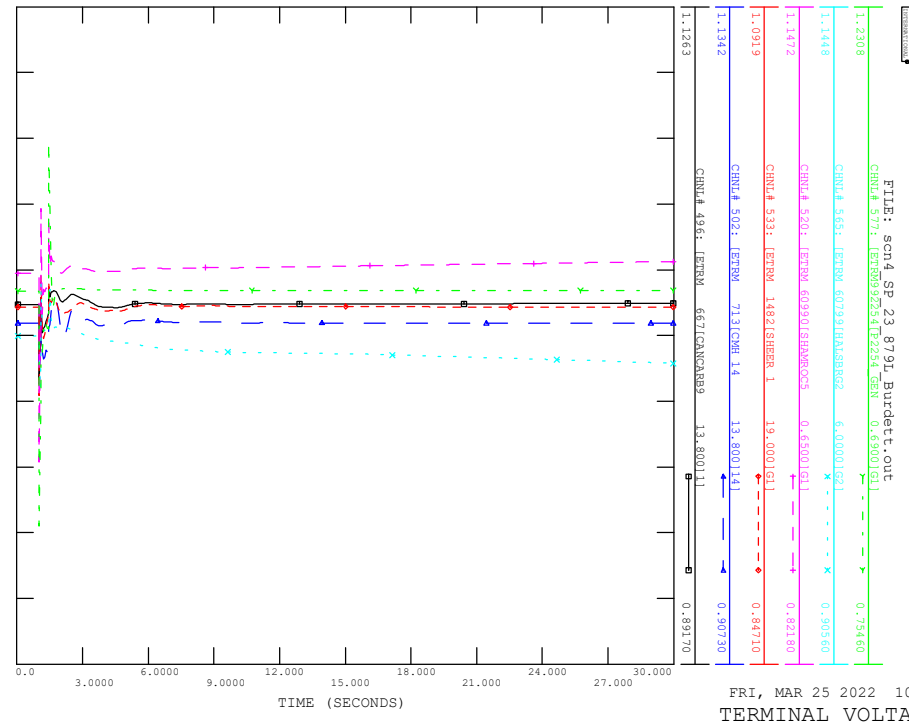


FRI, MAR 25 2022 10:53  
BRANCH P

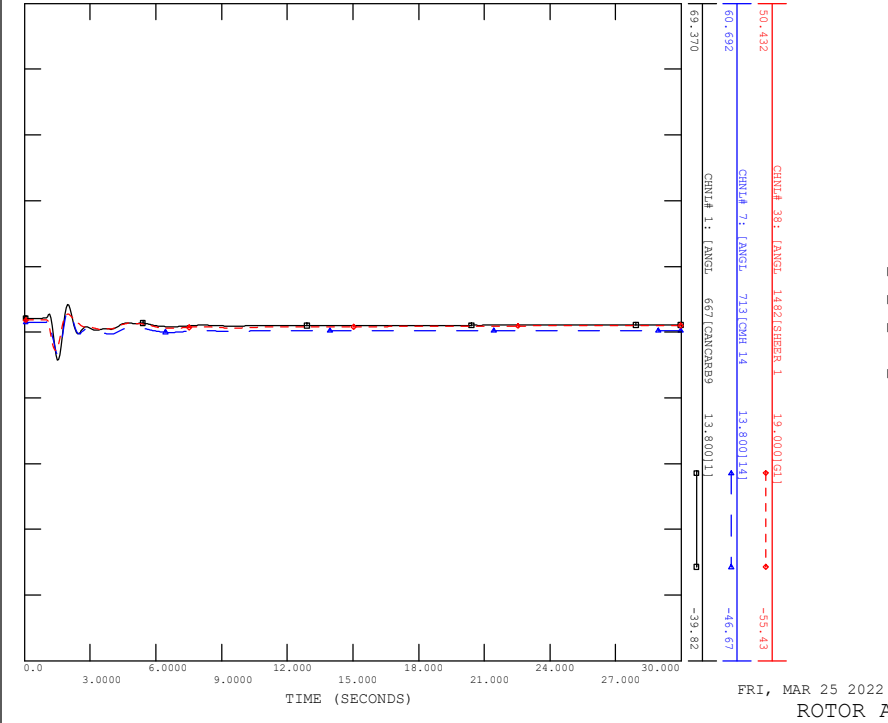
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_8791\_BURDETT



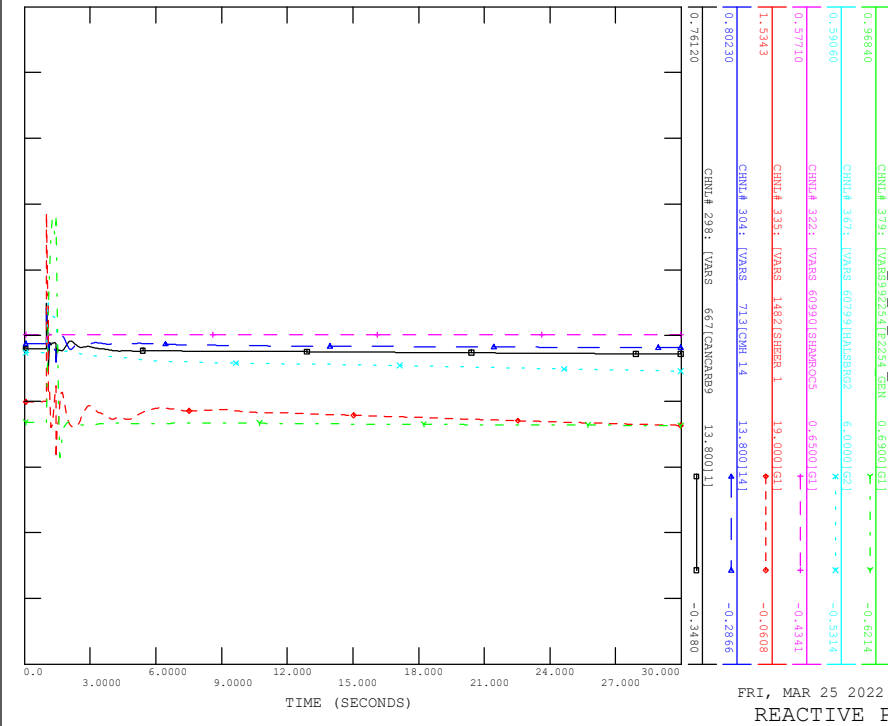
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_8791\_BURDETT



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_8791\_BURDETT

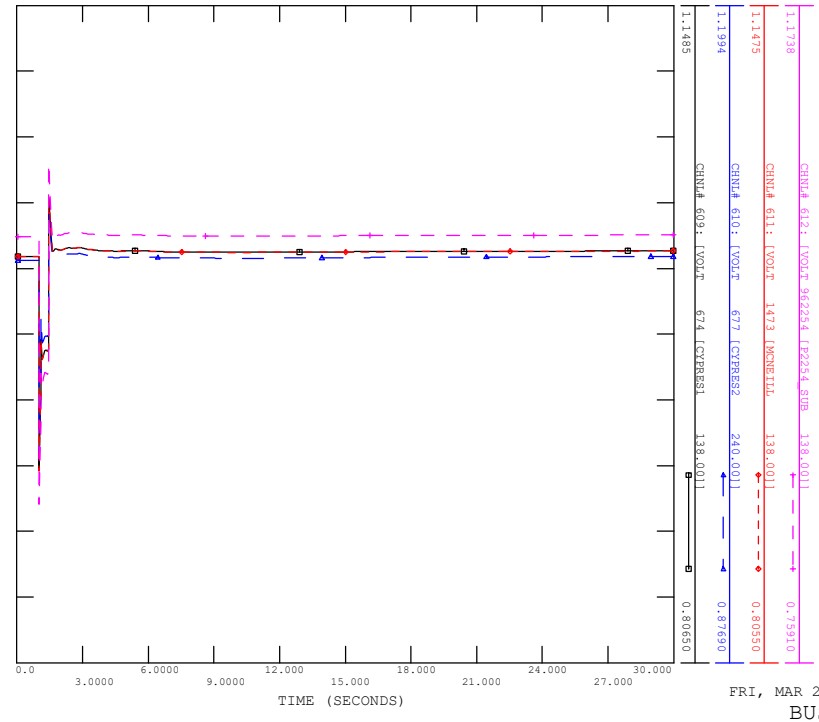


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_8791\_BURDETT



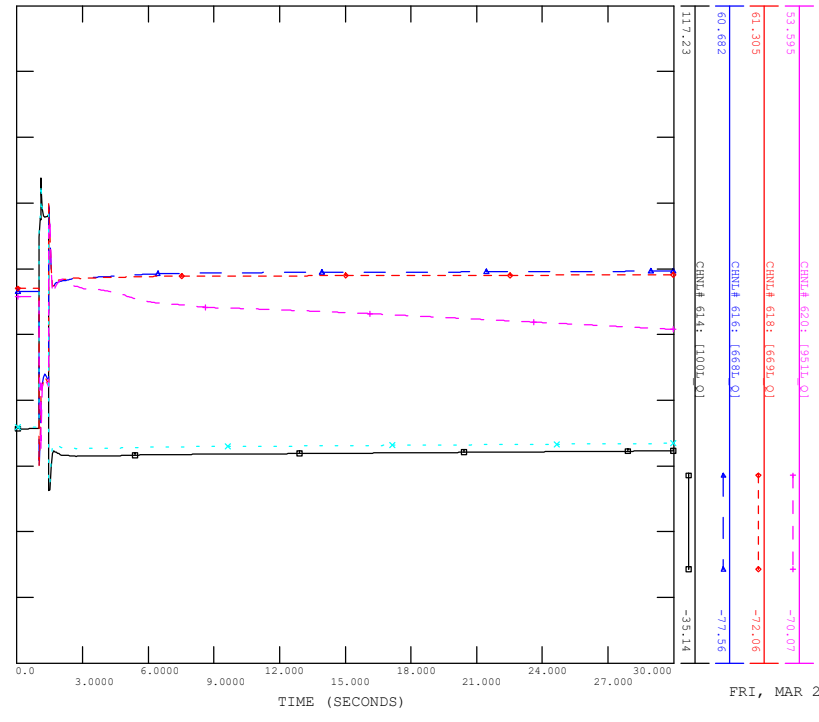
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out



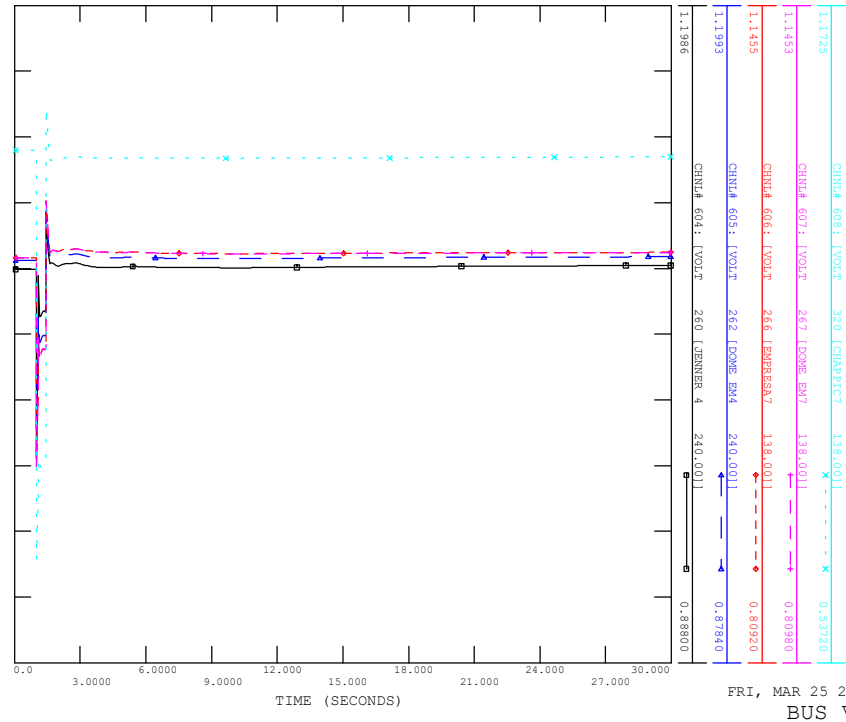
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out



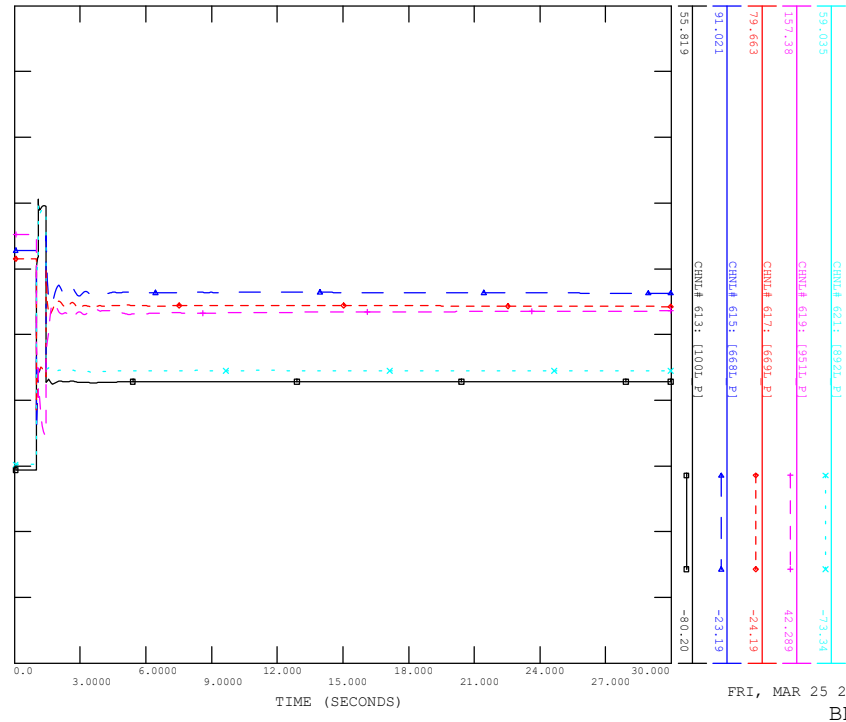
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

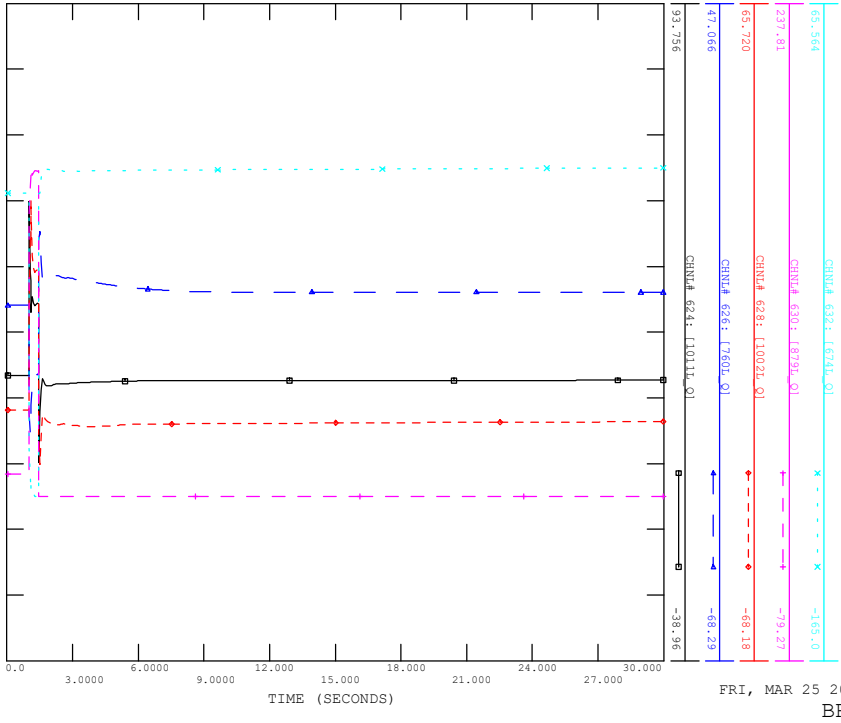
FILE: scn4\_sp\_23\_879L\_Burdett.out





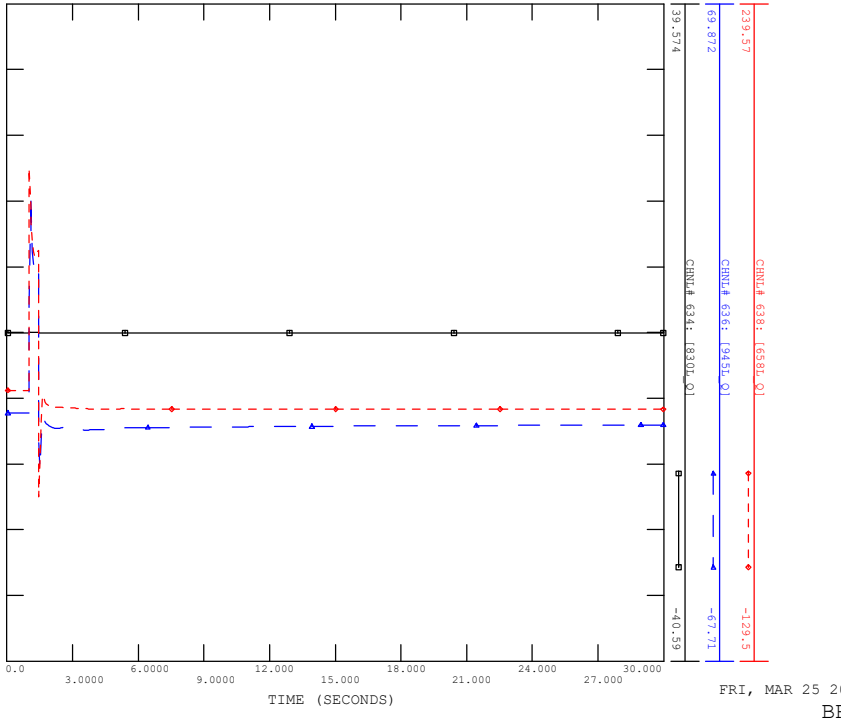
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out



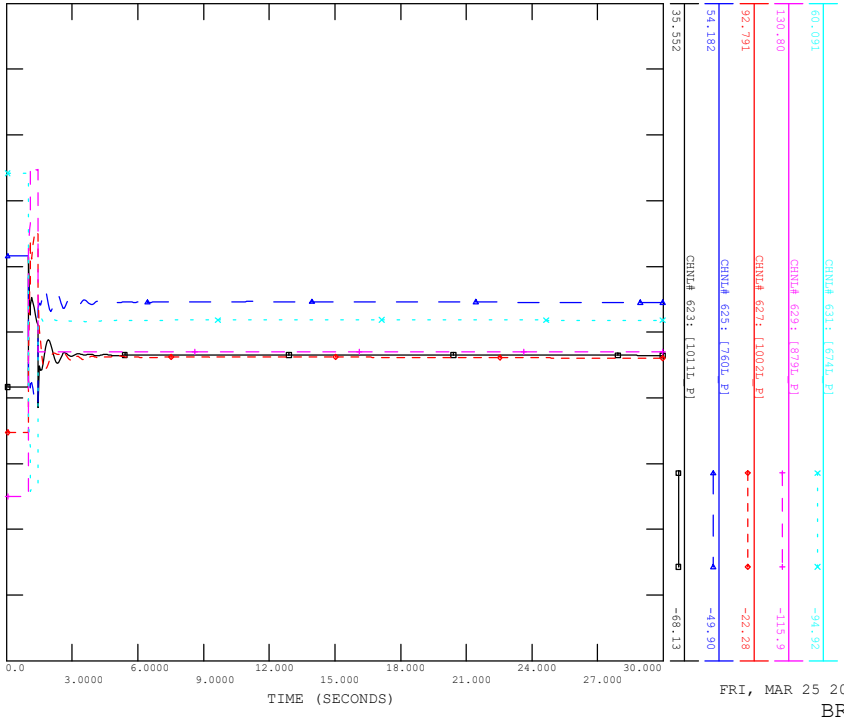
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out



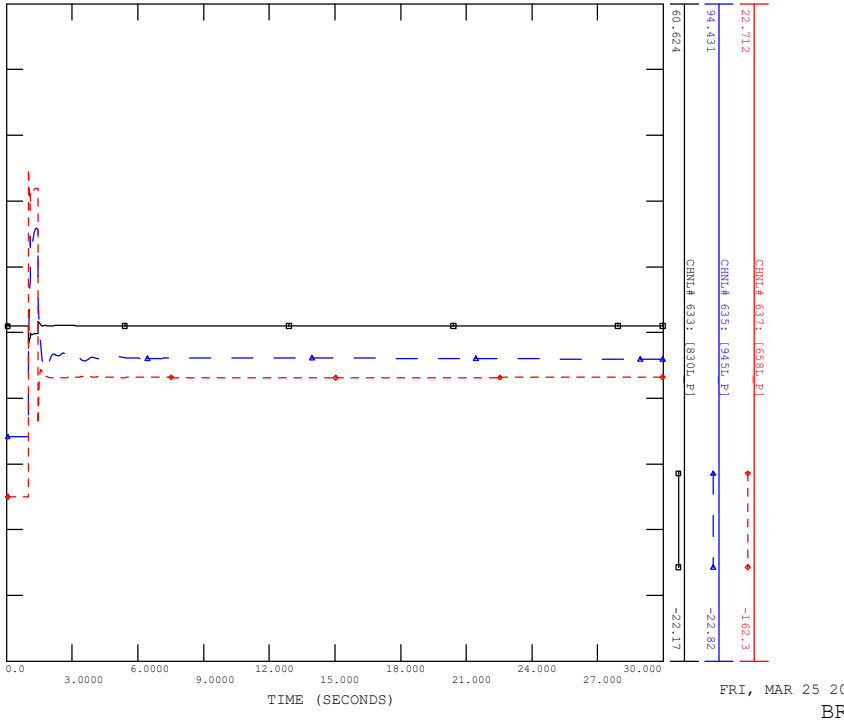
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

FILE: scn4\_sp\_23\_879L\_Burdett.out

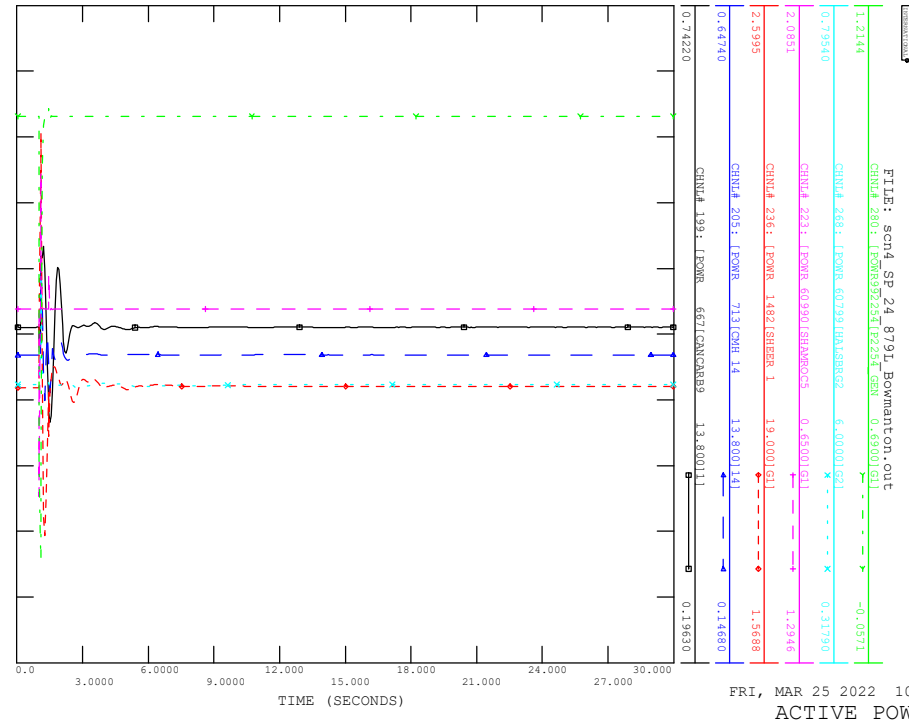


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_23\_879L\_BURDETT

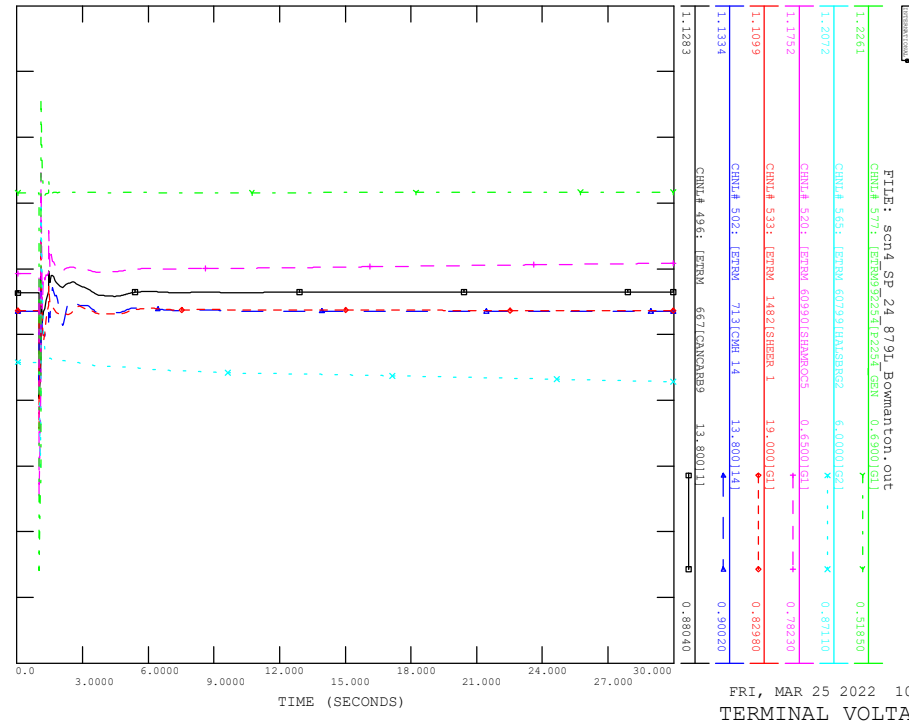
FILE: scn4\_sp\_23\_879L\_Burdett.out



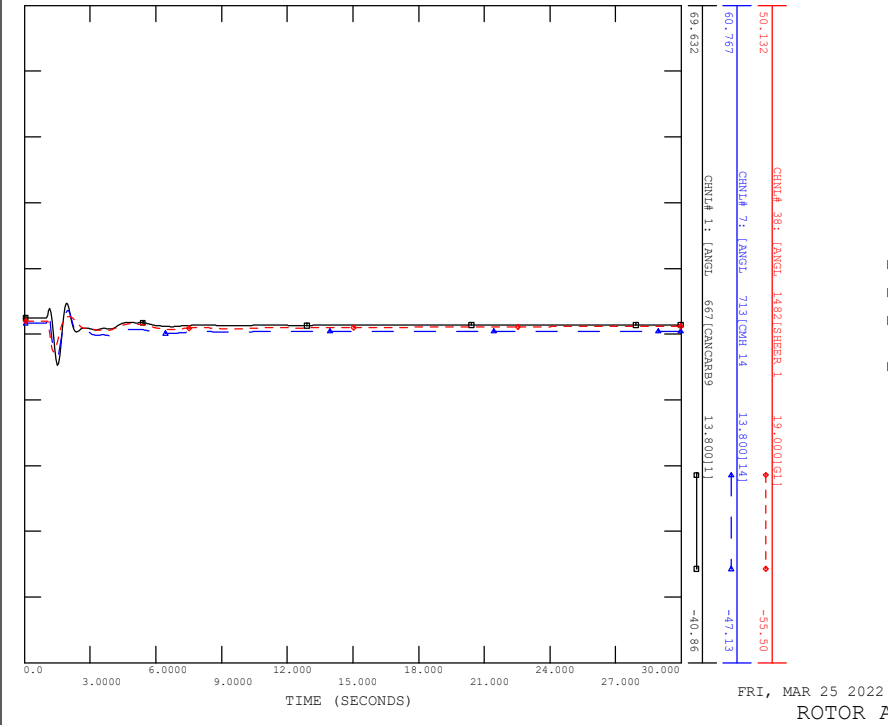
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_8791\_BOWMANTON



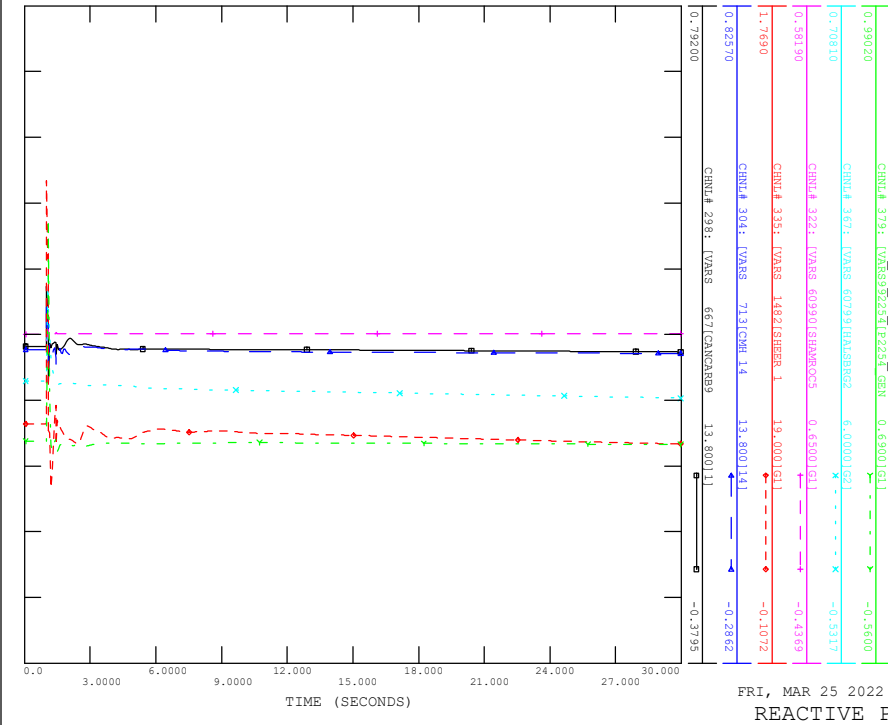
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_8791\_BOWMANTON

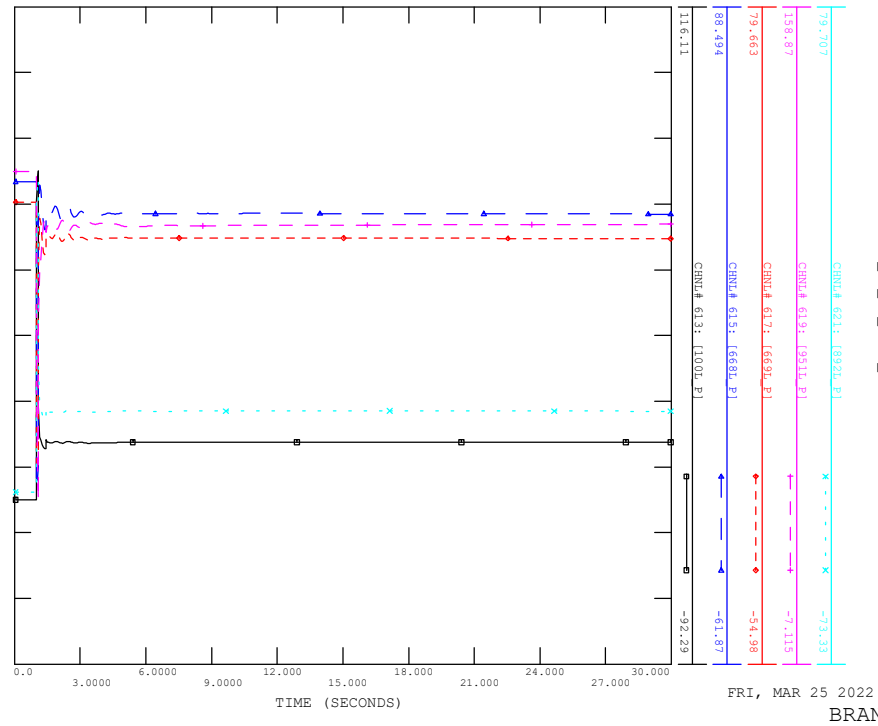
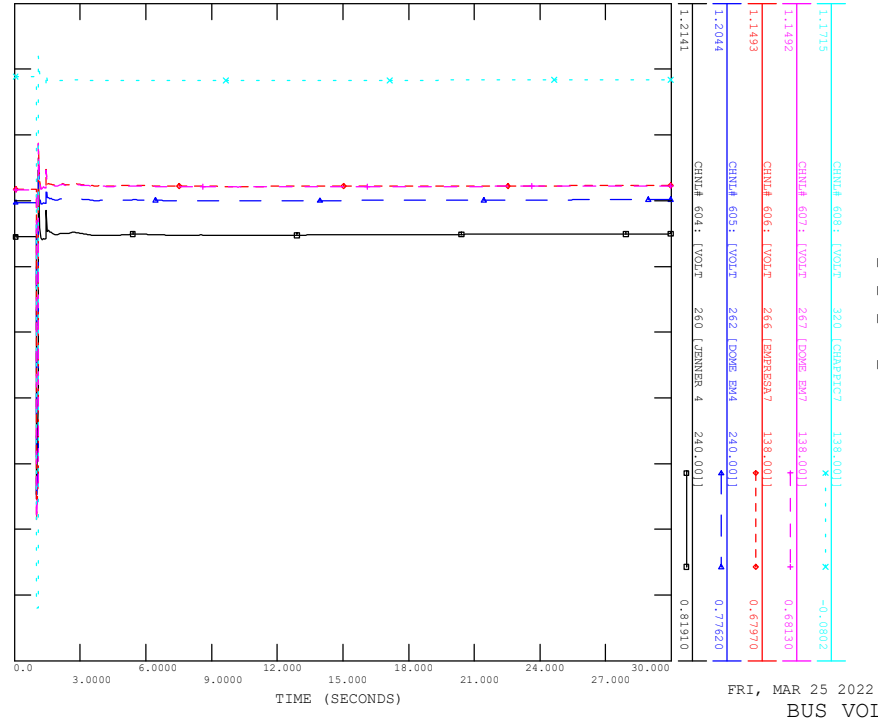
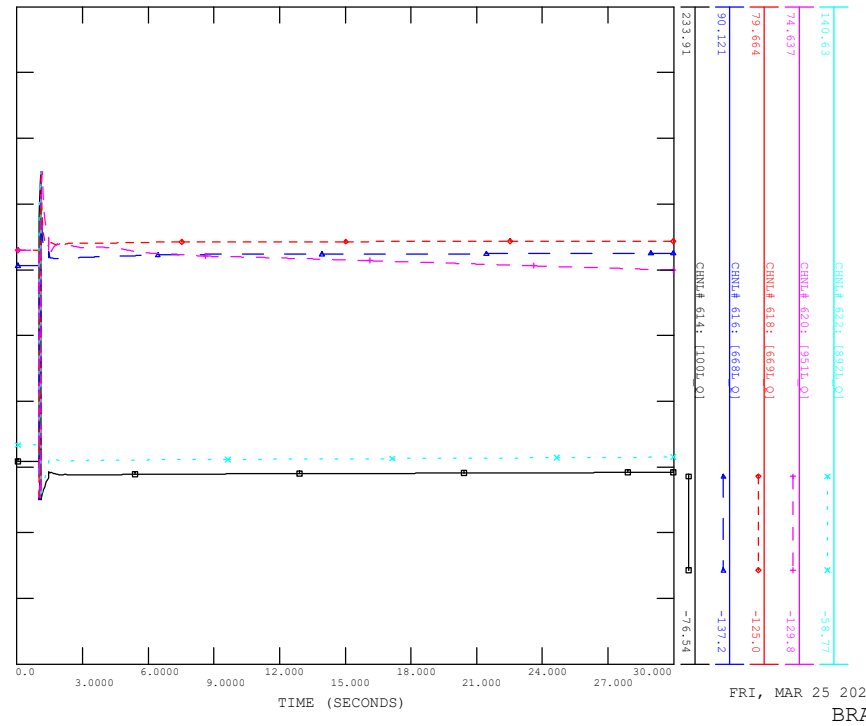
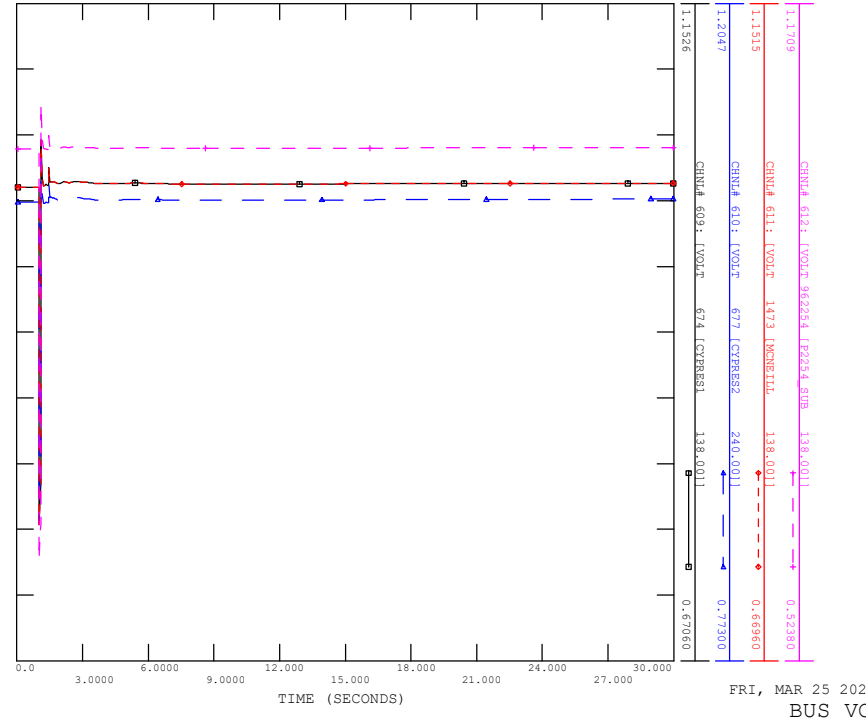


SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_8791\_BOWMANTON



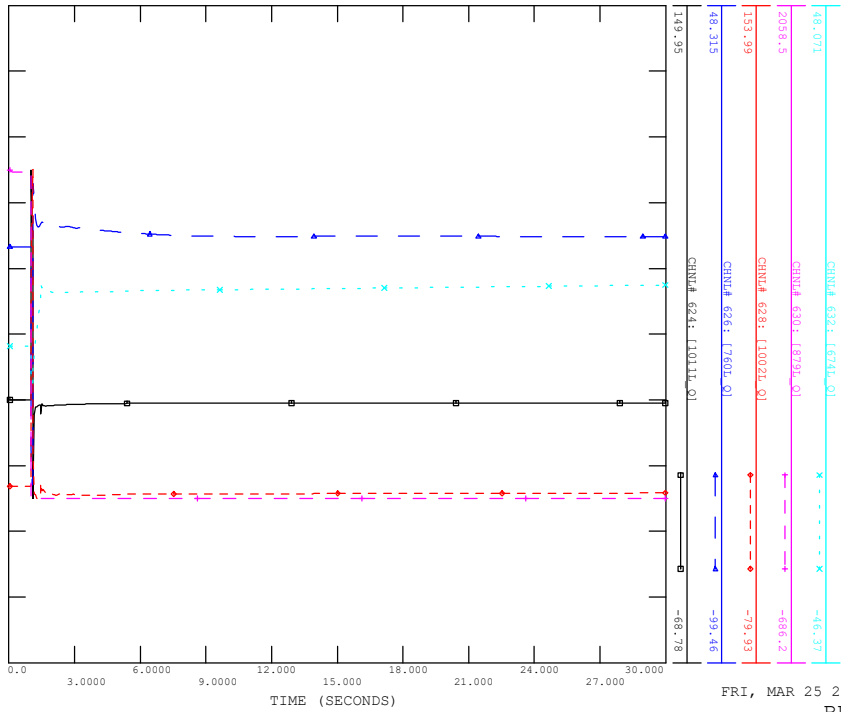
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_8791\_BOWMANTON





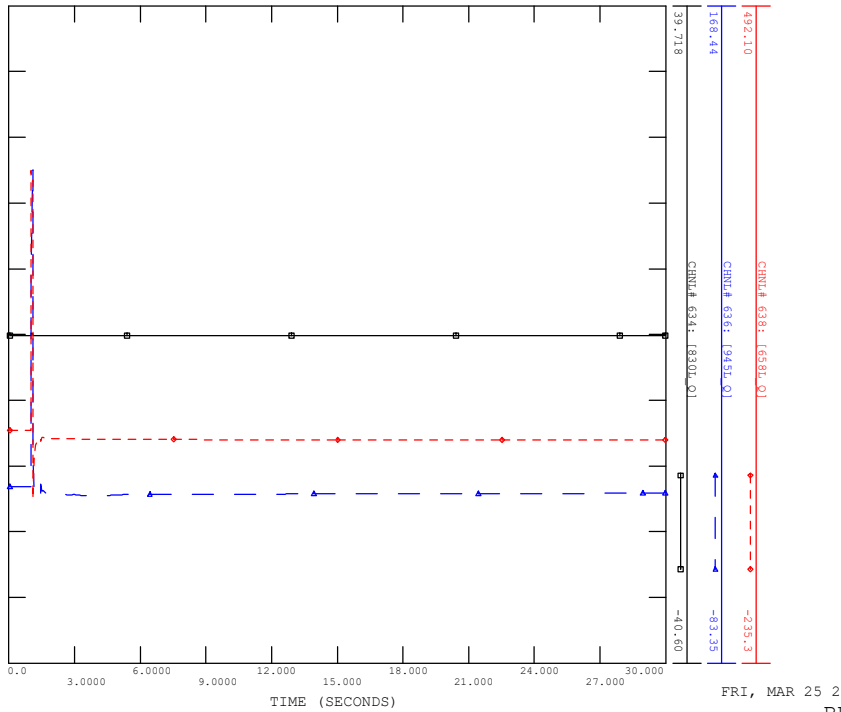
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_879L\_BOWMANTON

FILE: scn4\_sp\_24\_879L\_Bowmanton.out



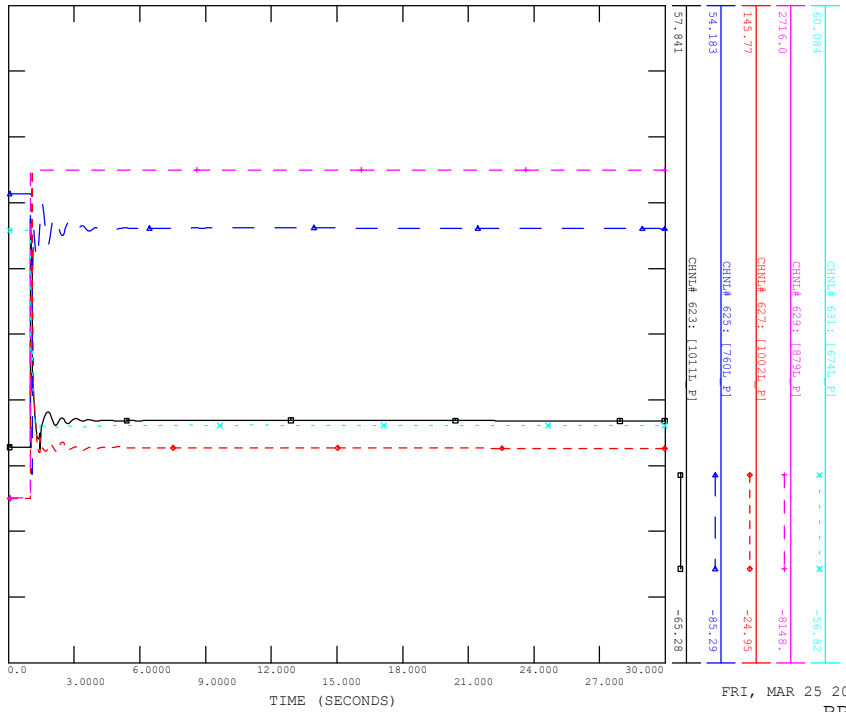
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_879L\_BOWMANTON

FILE: scn4\_sp\_24\_879L\_Bowmanton.out



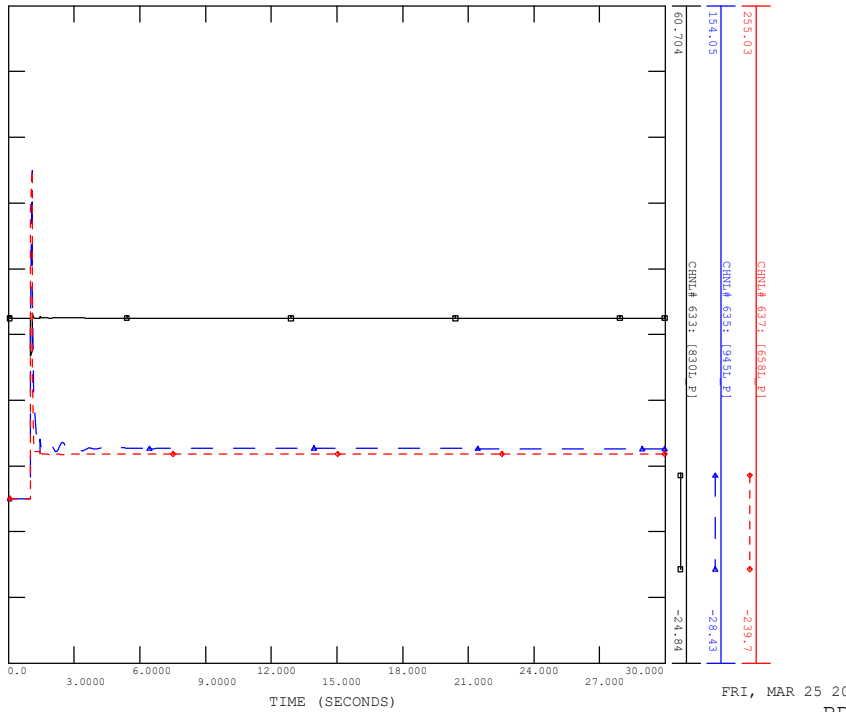
SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_879L\_BOWMANTON

FILE: scn4\_sp\_24\_879L\_Bowmanton.out



SCENARIO: P2254 SYSTEM IMPACT STUDY  
CONTINGENCY -SCN4\_SP\_24\_879L\_BOWMANTON

FILE: scn4\_sp\_24\_879L\_Bowmanton.out



# Attachment A5

## Dynamic Data and Assumptions

**Engineering Connection Assessment: Study Results**

P2254 RESC Hilda MPC Wind

V1D1

/ \*\*\*\*\*Dynamic Data\*\*\*\*\* /

/ \*\*\*\*\* P2254: 100.0 MW Generation at bus #992254 \*\*\*\*\* /

992254 'USRMDL' G1 'REGCAU1' 101 1 1 14 3 4

1

0.20000E-01 10.000 0.90000 0.50000 1.2200 1.2000 0.80000 0.40000

-1.3000 0.20000E-01 0.70000 10.5 -10.5 0.7000 /

992254 'USRMDL' G1 'REECAU1' 102 0 6 45 6 9

0 0 1 1 0 0

0.9000 1.1000 0.0200 -0.100 0.1000

0.50000 1.0 -1.0 0.0000 0.0

0.0 0.0 0.02 1.0 -1.0

1.500 0.800 0.5 5.0 1.0

10.00 0.0 0.02 10.0 -10.0

1.0 0.0 1.0 0.02 0.0

1.0 2.0 1.0 0.0 0.0

0.0 0.0 0.2 0.0 0.75

0.23 0.85 0.85 1.0 1.0 /

992254 'USRMDL' G1 'REPCAU1' 107 0 7 27 7 9

0 0 0 '0' 0 1 0

0.20000E-01 18.000 5.0000 0.0000 0.75000E-01 0.0000 0.0000

0.0000 0.20000E-01 0.10000 -0.10000 0.0000 0.0000 0.43600 -0.4360

0.10000 0.50000E-01 0.25000 0.0000 0.0000 999.00 -999.00

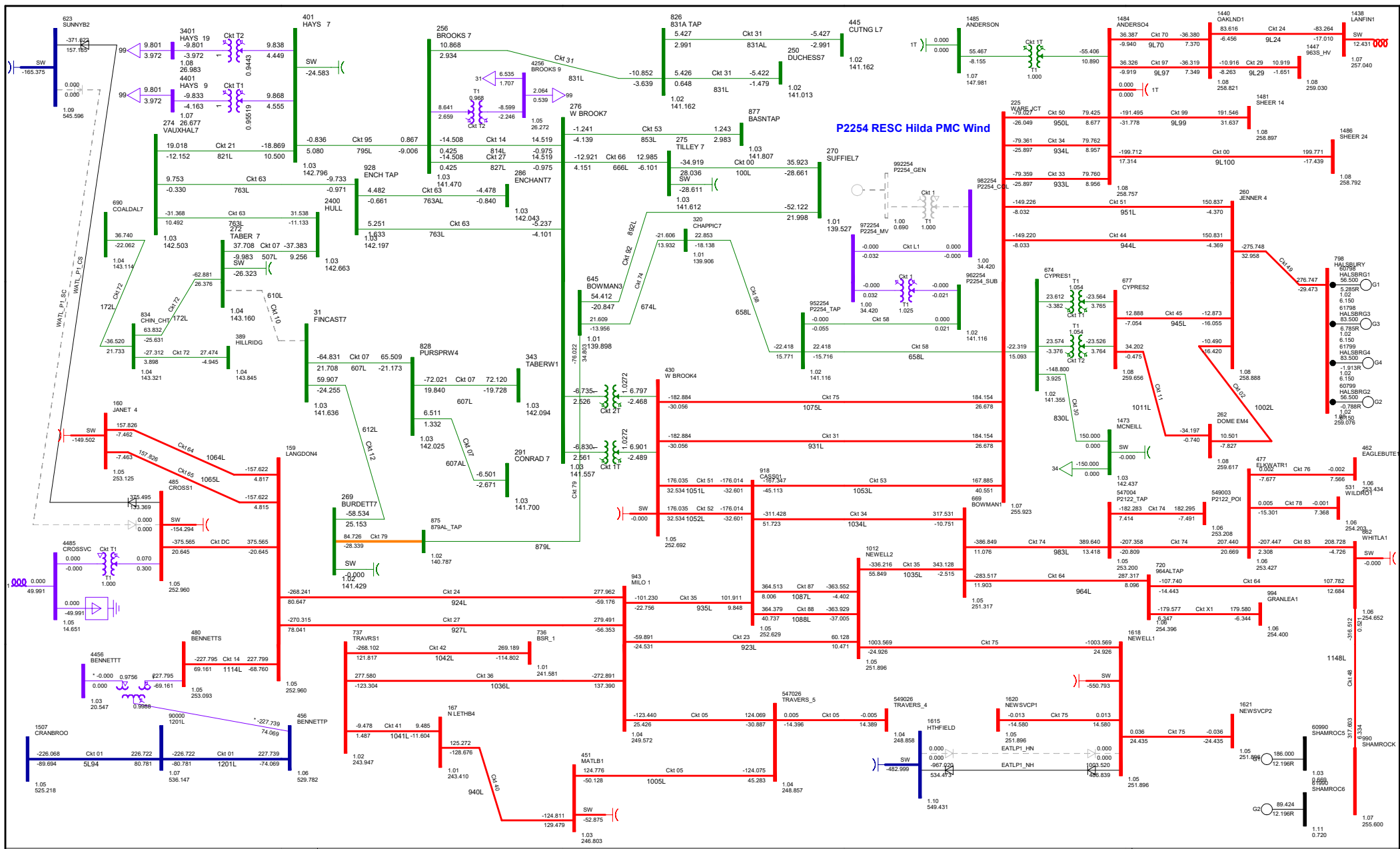
1.200 0.00 0.10000 20.000 0.0000 /

# Attachment A6

## Post-Mitigation Power Flow Diagrams







BC Import: -312.600 MW  
 Sask Import: 150.000 MW  
 MATL Import: -0.000 MW  
 MH Export: -1.869 MW

**FIGURE A6.1-2 N-1: 610L (TABER 83S - FINCASTLE 336S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022**

Bus - Voltage (kV) 115.000  
 Branch - MW/Bus  
 Equipment - MW/Bus  
 115.000 0.000 MW  
 115.000 0.000 MW  
 115.000 0.000 MW  
 115.000 0.000 MW

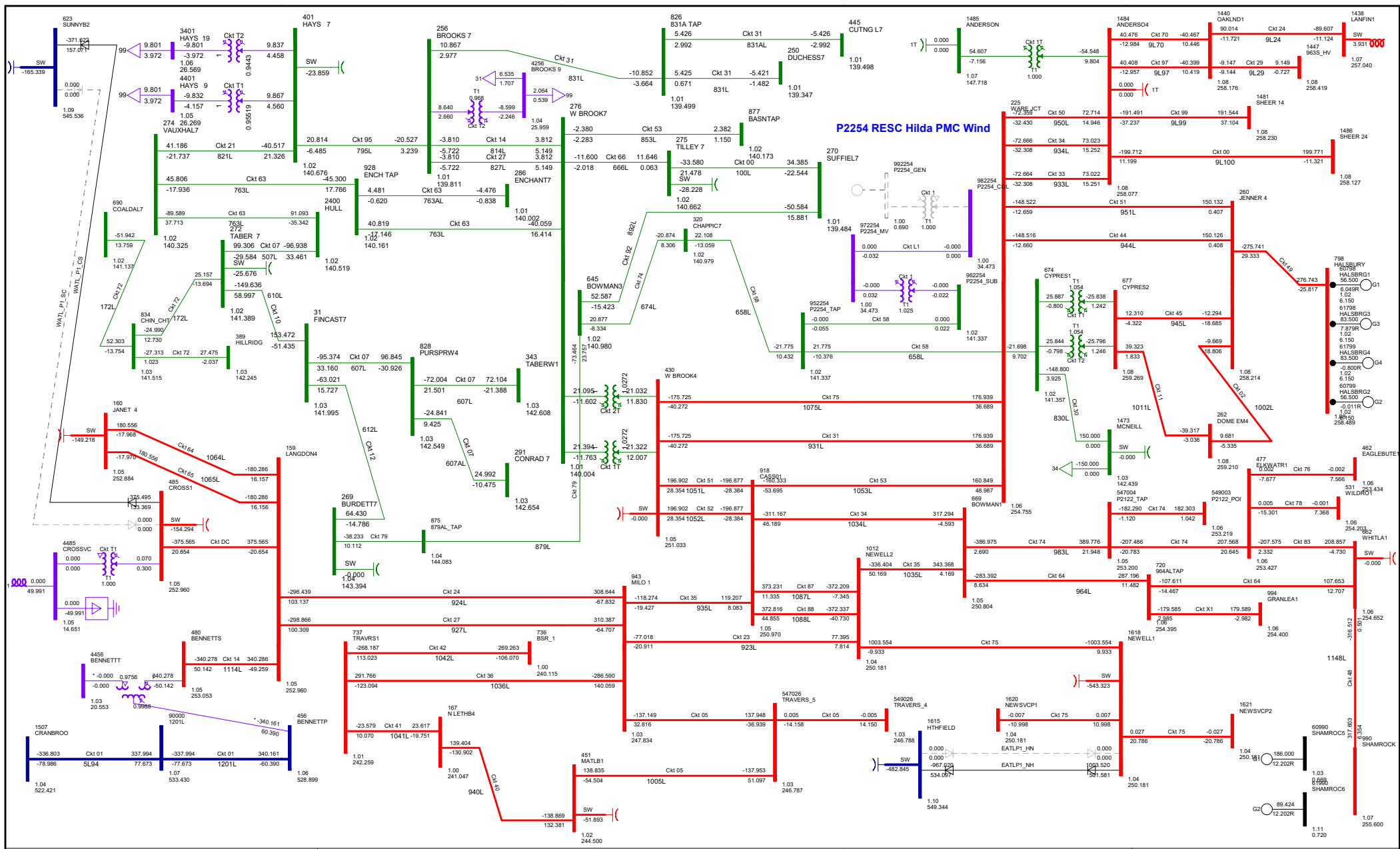
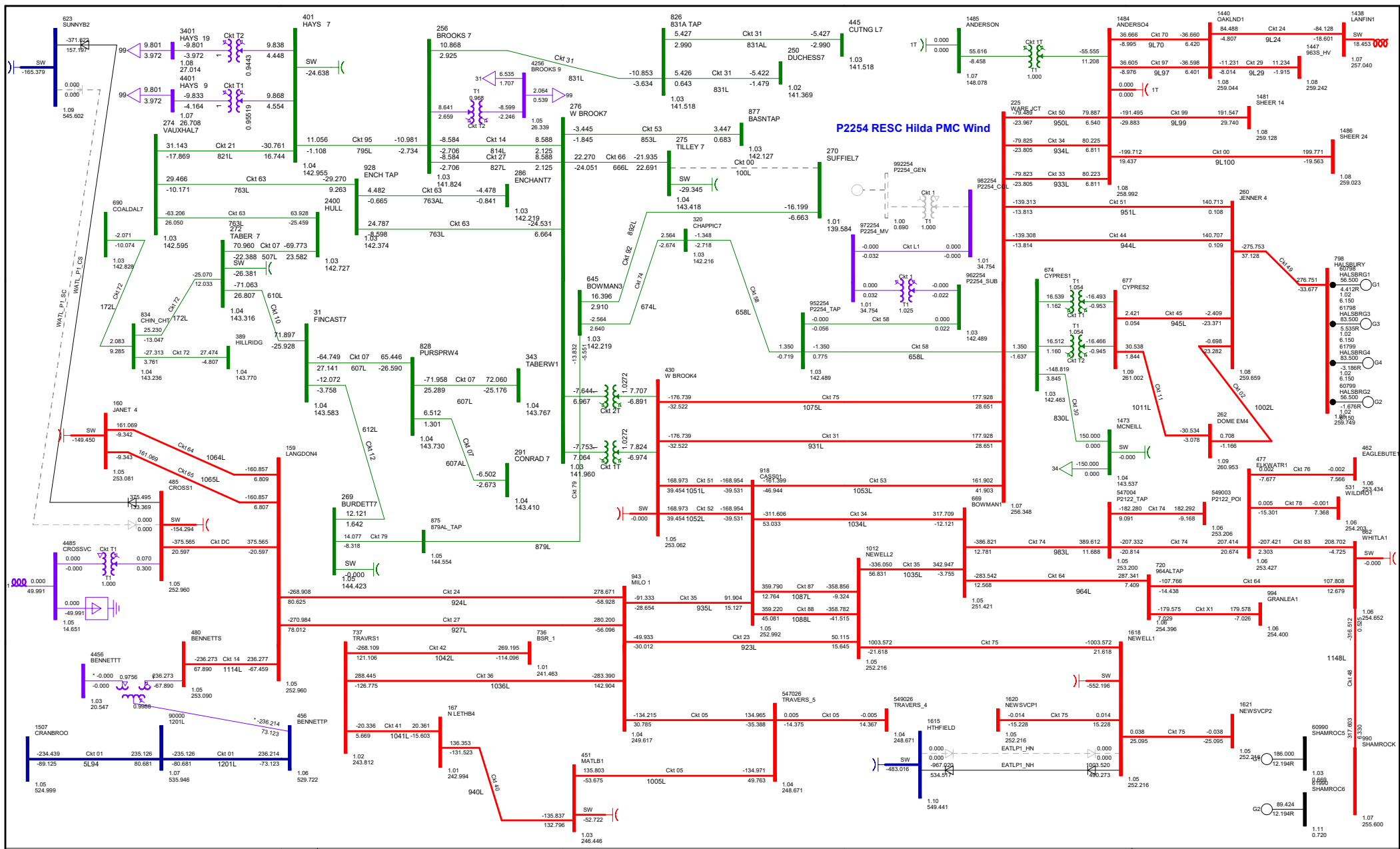


FIGURE A6.1-3 N-1: 669L (CYPRESS 562S - AMOCO EMPRESS 163S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022

Bus - Voltage (kV) (MW)  
 Branch - MW (MW)  
 Equipment - MW (MW)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import: -436.491 MW  
 Sask Import: 150.000 MW  
 MATL Import: -0.000 MW  
 MH Export: -1.888 MW



BC Import: -322.423 MWSask Import: 150.000 MW MATL Import: -0.000 MW  
 MH Export: -1.889 MW

**FIGURE A6.1-4 N-1: 100L (SUFFIELD 895S - TILLEY 498S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022**

Bus - Voltage (kV) Bus  
 Branch - MW Bus  
 Equipment - MW/Mvar  
 1.000 0.000 MW  
 1.000 0.000 MW  
 1.000 0.000 MW  
 1.000 0.000 MW

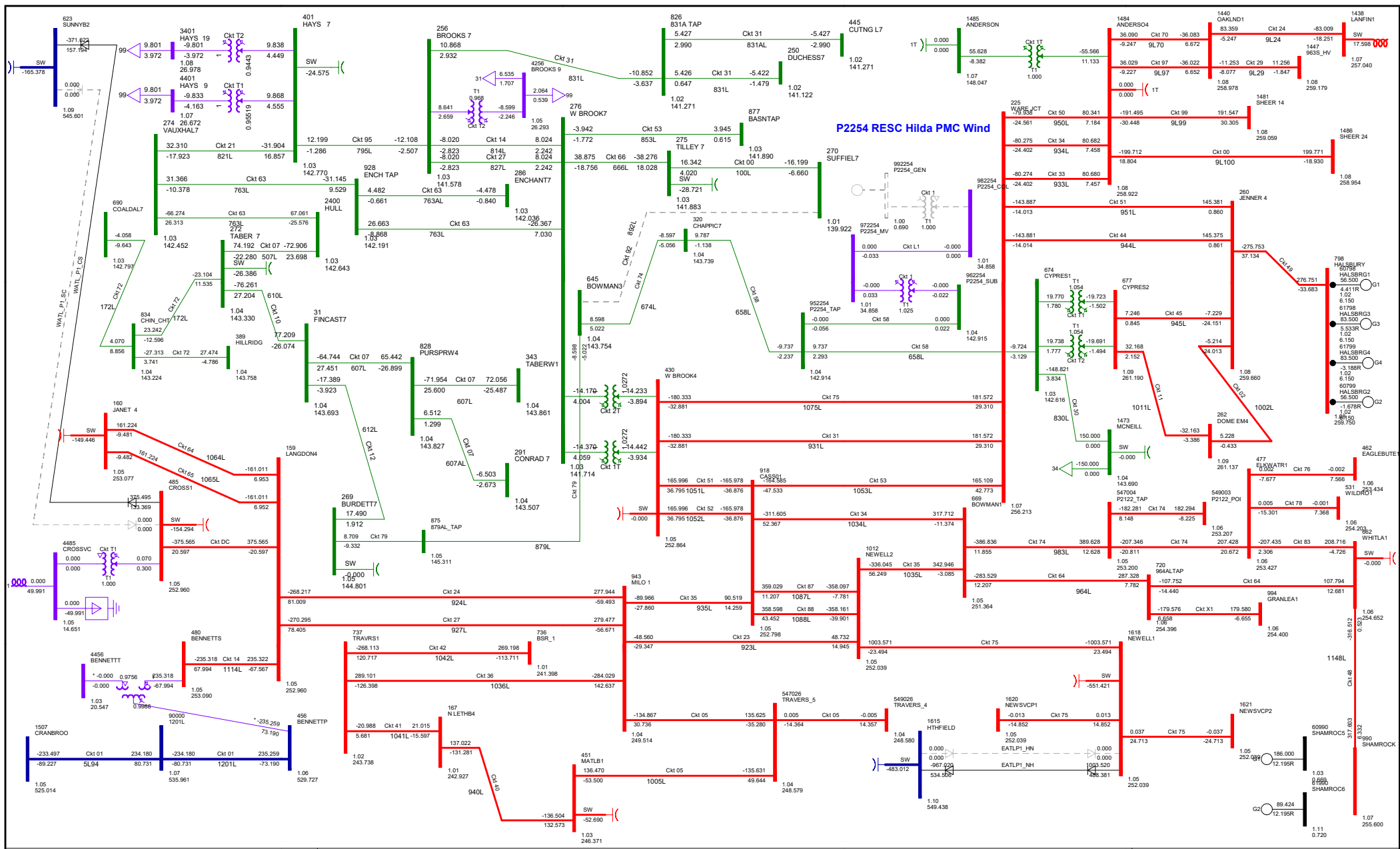
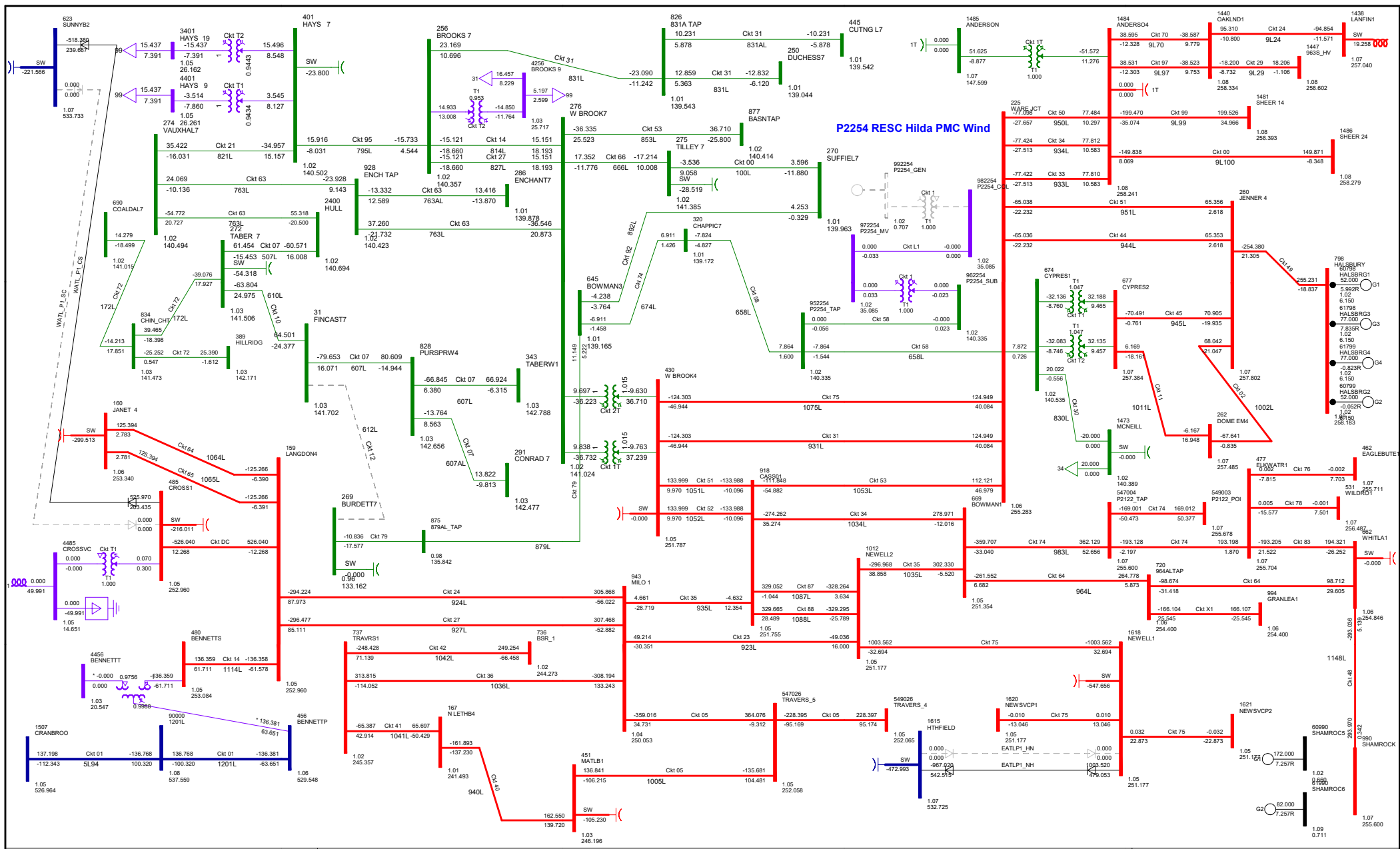


FIGURE A6.1-5 N-1: 892L (SUFFIELD 895S - BOWMANTON 244S)  
 2022 SUMMER LIGHT (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022

Bus - Voltage (kV) (p) (m)  
 Branch - MW (MW) (MW)  
 Equipment - MW (MW) (MW)  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import: -321.396 MW Sask Import: 150.000 MW MATL Import: -0.000 MW  
 MH Export: -1.869 MW



P2254 RESC Hilda PMC Wind

FIGURE A6.2-1 N-1: 612L (BURDETT 268S - FINCASTLE 336S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022

BC Import:86.658 MW Sask Import:-20.000 MW MATL Import:308.487 MW  
 MH Export:-14.942 MW

Bus - Voltage (V/pu)  
 Branch - MW/Mvar  
 Equipment - MW/Mvar  
 1.000 0.9600  
 1.000 0.9600  
 1.000 0.9600





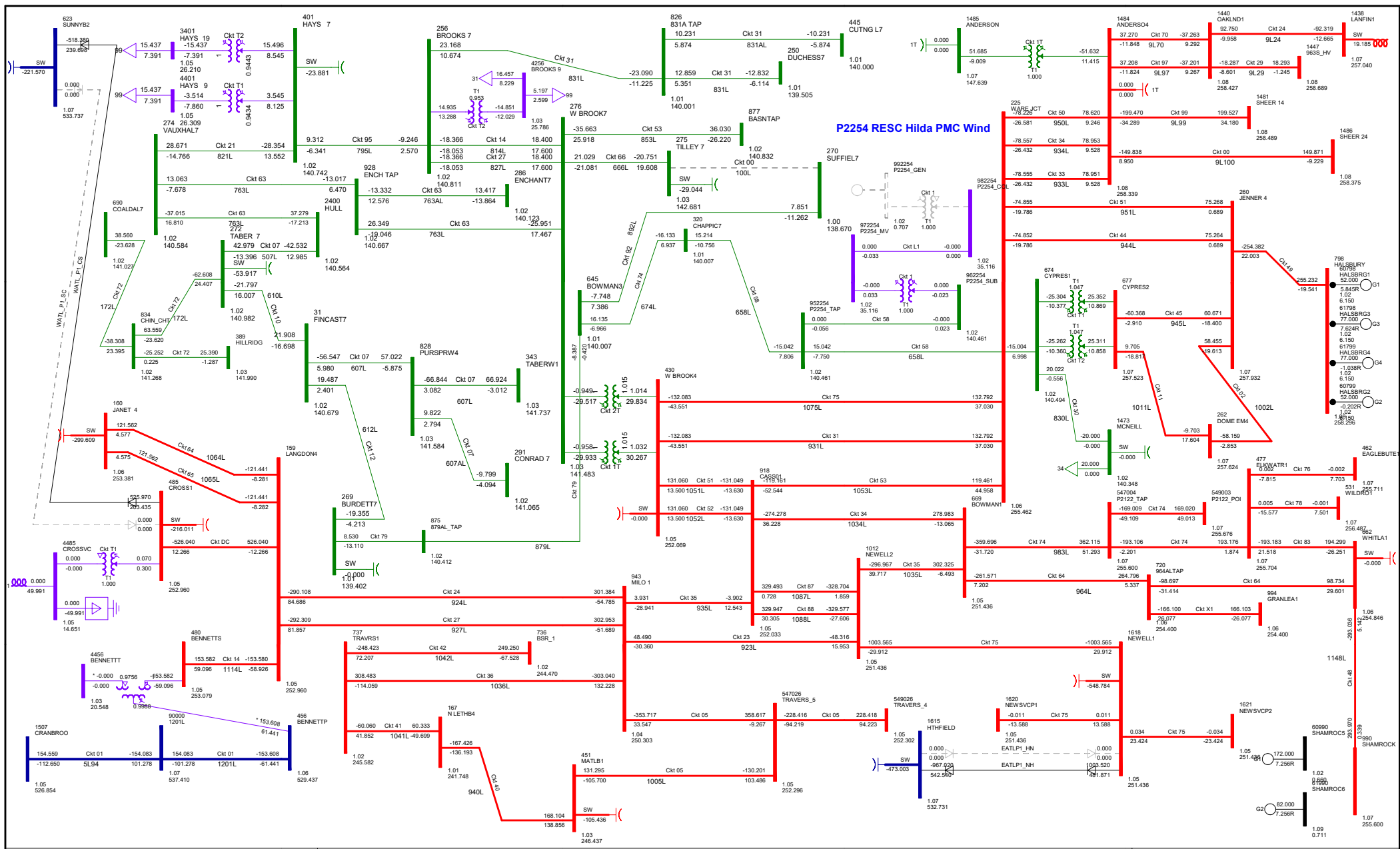


FIGURE A6.2-3 N-1: 100L (SUFFIELD 895S - TILLEY 498S)  
 2022 SUMMER PEAK (POST-CONNECTION)  
 PRINTED ON WEDNESDAY 23. MARCH 2022

Bus - Voltage (kVpp)  
 Branch - MW/Bus  
 Equipment - MW/Bus  
 115000 0.0000  
 115000 0.0000  
 115000 0.0000

BC Import:106.352 MW Sask Import:-20.000 MW MATL Import:308.487 MW  
 MH Export:-14.942 MW





# Attachment A7

## Constraint Effective Factors Table

Case	Contingency	Line	Power Plant																																			
			Whitla W	P1222 C	Rattlesn	P2254 H	P1812 S	Joss Jen	Joss Jen	Enmax T	P1892 B	P1853 B	Hull (HU)	Hyas (HY)	P1959 C	P1918 C	Jenner (J)	P2199 BAC	Suffield (S)	P2365	P2362	Vauxhall (V)	P2249	Burdett (B)	Westfield	P2363	Brooks Sol	P2250	Lethbridge	Lethbridge	P2092	Burdett (B)	P2086	P2216	Altgas Ba	P2364	P2195	Ralston (NAT1)
2022SL_Post-Project.sav	612L (Burdett 368S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S)	-0.0072	-0.0073	0.2715	0.1311	-0.0072	0.0293	0.0293	-0.0183	0.0283	0.0284	-0.0193	-0.0219	-0.0183	-0.0183	0.0299	0.0293	-0.2734	-0.0230	-0.0230	-0.0214	0.0815	0.2761	0.2698	-0.0230	-0.0251	0.0816	-0.0162	0.2787	-0.0251	0.2778	-0.0251	0.3240	-0.1136	-0.0230	-0.0231	-0.2734
	612L (Burdett 368S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	-0.0026	-0.0027	0.8717	-0.0102	-0.0026	-0.0047	-0.0047	-0.0036	-0.0043	-0.0049	-0.0007	0.0010	-0.0036	-0.0036	-0.0026	-0.0042	0.0293	0.0003	0.0003	-0.0002	-0.0031	0.8798	0.8670	0.0003	0.0015	-0.0021	-0.0012	0.8821	0.0015	0.8850	0.0015	-0.0270	0.0155	0.0003	0.0021	0.0293
	612L (Burdett 368S to Fincastle 336S)	658L (Cypress 562S to P2254 Tap)	-0.0004	-0.0004	0.5010	0.8322	-0.0004	-0.0415	-0.0415	0.0085	-0.0393	-0.0414	0.0164	0.0226	0.0085	0.0086	-0.0348	-0.0398	0.3152	0.0221	0.0221	0.0195	-0.0835	0.5082	0.4981	0.0221	0.0269	-0.0800	0.0121	0.5117	0.0269	0.5112	0.0269	0.5877	0.1375	0.0221	0.0263	0.3152
	610L (Taber 83S to Fincastle 336S)	612L (Fincastle 336S to Suffield 895S)	-0.0005	-0.0005	-0.0392	-0.0022	-0.0005	-0.0009	-0.0009	0.9109	-0.0008	-0.0009	0.0000	0.0003	0.9080	0.9104	-0.0005	-0.0008	0.0049	0.0002	0.0002	0.0001	-0.0007	-0.0345	-0.0462	0.0002	0.0003	-0.0005	0.0000	-0.0166	0.0003	-0.0333	0.0003	-0.0072	0.0028	0.0002	0.0004	0.0049
	610L (Taber 83S to Fincastle 336S)	879L (Burdett 368S to 879AL Tap)	-0.0005	-0.0005	-0.0414	-0.0023	-0.0005	-0.0009	-0.0009	0.8844	-0.0009	-0.0010	0.0000	0.0003	0.8816	0.8837	-0.0005	-0.0008	0.0052	0.0002	0.0002	0.0001	-0.0008	0.9587	0.9508	0.0002	0.0003	-0.0006	0.0000	0.9432	0.0003	0.9629	0.0003	-0.0076	0.0029	0.0002	0.0004	0.0052
	610L (Taber 83S to Fincastle 336S)	100L (Tilley 498S to Suffield 895S)	-0.0094	-0.0095	0.2246	0.1126	-0.0094	0.0225	0.0226	0.1827	0.0218	0.0218	-0.0149	-0.0154	0.1822	0.1828	0.0232	0.0226	0.5023	-0.0179	-0.0179	-0.0166	0.0674	0.2122	0.2062	-0.0179	-0.0190	0.0671	-0.0123	0.2147	-0.0190	0.2135	-0.0190	0.2952	-0.0695	-0.0179	-0.0162	0.5023
	610L (Taber 83S to Fincastle 336S)	892L (Suffield 895S to Bowmanton 244S)	-0.0086	-0.0087	0.2026	0.1157	-0.0086	0.0239	0.0239	0.1591	0.0231	0.0231	-0.0155	-0.0167	0.1586	0.1592	0.0246	0.0239	-0.2293	-0.0188	-0.0188	-0.0174	0.0703	0.1898	0.1831	-0.0188	-0.0203	0.0703	-0.0127	0.1942	-0.0203	0.1912	-0.0203	0.2982	-0.0821	-0.0188	-0.0178	-0.2293
	610L (Taber 83S to Fincastle 336S)	879L (Bowmanton 244S to 879AL Tap)	-0.0040	-0.0041	0.7723	-0.0188	-0.0040	-0.0075	-0.0075	0.6480	-0.0069	-0.0078	0.0007	0.0026	0.6461	0.6480	-0.0043	-0.0067	0.0422	0.0015	0.0015	0.0011	-0.0061	0.7348	0.7191	0.0015	0.0026	-0.0045	0.0004	0.7368	0.0026	0.7391	-0.0026	-0.0617	0.0236	0.0015	0.0034	0.0422
	610L (Taber 83S to Fincastle 336S)	658L (Cypress 562S to P2254 Tap)	-0.0028	-0.0029	0.4244	0.8166	-0.0028	-0.0431	-0.0430	0.3435	-0.0403	-0.0433	0.0151	0.0202	0.3426	0.3437	-0.0327	-0.0405	0.2814	0.0196	0.0196	0.0176	-0.0768	0.4005	0.3888	0.0196	0.0234	-0.0709	0.0118	0.4062	0.0234	0.4032	0.0234	0.5776	0.1155	0.0196	0.0229	0.2814
	669L (Cypress 562S to Amoco Empress 163S)	668L (Empress 394S to Cypress 562S)	0.0134	0.0136	0.1093	0.3174	0.0134	0.0260	0.0260	0.0529	0.0255	0.0253	0.0380	0.0311	0.0528	0.0529	0.0272	0.0262	0.1216	0.0307	0.0307	0.0340	-0.5464	0.0824	0.0811	0.0307	0.0250	-0.5444	0.0436	0.0827	0.0250	0.0828	0.0250	0.1922	0.0635	0.0307	0.0245	0.1216
	100L (Suffield 895S to Tilley 498S)	612L (Fincastle 336S to Suffield 895S)	0.0043	0.0046	0.5571	0.1289	0.0044	0.0375	0.0375	-0.1776	0.0361	0.0364	-0.0683	-0.0311	-0.1768	-0.1768	0.0377	0.0373	0.3072	-0.0320	-0.0320	-0.0484	0.0840	0.7009	0.7002	-0.0320	-0.0054	0.0840	-0.0952	0.6953	-0.0054	0.7051	-0.0054	0.2996	-0.0028	-0.0320	-0.0048	0.3072
	100L (Suffield 895S to Tilley 498S)	610L (Fincastle 336S to Taber 83S)	0.0014	0.0016	0.5360	0.1222	0.0014	0.0337	0.0337	0.7974	0.0325	0.0326	-0.0527	-0.0201	0.7949	0.7966	0.0347	0.0337	0.2999	-0.0236	-0.0236	-0.0368	0.0797	0.6903	0.6832	-0.0236	-0.0041	0.0798	-0.0730	0.6898	-0.0041	0.6944	-0.0041	0.2872	-0.0012	-0.0236	-0.0033	0.2999
	100L (Suffield 895S to Tilley 498S)	658L (Cypress 562S to P2254 Tap)	-0.0100	-0.0104	0.3507	0.8478	-0.0100	-0.0448	-0.0448	0.1439	-0.0425	-0.0444	0.0722	0.0361	0.1435	0.1438	-0.0391	-0.0433	0.6646	0.0345	0.0345	0.0516	-0.0797	0.2483	0.2462	0.0345	0.0061	-0.0767	0.1012	0.2478	0.0061	0.2497	0.0061	0.6329	0.0047	0.0345	0.0063	0.6646
	892L (Suffield 895S to Bowmanton 244S)	612L (Fincastle 336S to Suffield 895S)	0.0044	0.0047	0.5533	0.1288	0.0044	0.0376	0.0376	-0.1783	0.0362	0.0365	-0.0682	-0.0309	-0.1775	-0.1774	0.0378	0.0374	-0.0022	-0.0318	-0.0318	-0.0483	0.0839	0.6992	0.6979	-0.0318	-0.0053	0.0839	-0.0952	0.6939	-0.0053	0.7033	-0.0053	0.2965	-0.0026	-0.0318	-0.0048	-0.0022
	892L (Suffield 895S to Bowmanton 244S)	610L (Fincastle 336S to Taber 83S)	0.0015	0.0017	0.5317	0.1219	0.0015	0.0338	0.0338	0.7965	0.0326	0.0327	-0.0528	-0.0200	0.7939	0.7956	0.0347	0.0338	0.0005	-0.0235	-0.0235	-0.0368	0.0795	0.6882	0.6806	-0.0235	-0.0040	0.0796	-0.0734	0.6881	-0.0040	0.6923	-0.0040	0.2836	-0.0005	-0.0235	-0.0032	0.0005
	892L (Suffield 895S to Bowmanton 244S)	658L (Cypress 562S to P2254 Tap)	-0.0098	-0.0102	0.3491	0.8458	-0.0099	-0.0446	-0.0446	0.1442	-0.0423	-0.0442	0.0721	0.0360	0.1437	0.1440	-0.0391	-0.0432	0.0058	0.0345	0.0344	0.0515	-0.0800	0.2477	0.2457	0.0344	0.0062	-0.0771	0.1010	0.2471	0.0062	0.2492	0.0062	0.6247	0.0051	0.0345	0.0063	0.0058
	507L (Taber 83S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	-0.0183	-0.0191	0.4671	-0.1012	-0.0184	-0.0407	-0.0408	0.2397	-0.0390	-0.0398	-0.0225	-0.0220	0.2390	0.2395	-0.0391	-0.0402	-0.0925	-0.0229	-0.0229	-0.0228	-0.0678	0.3540	0.3515	-0.0229	-0.0227	-0.0670	0.1969	-0.0227	0.3561	-0.0227	-0.2184	-0.0476	-0.0229	-0.0170	-0.0925	
	763L (Vauxhall 158S to Hull 257S)	879L (Bowmanton 244S to 879AL Tap)	-0.0184	-0.0191	0.4677	-0.1012	-0.0185	-0.0408	-0.0408	0.2402	-0.0390	-0.0398	0.1996	-0.0222	0.2395	0.2400	-0.0392	-0.0402	-0.0930	-0.0230	-0.0230	-0.0229	-0.0679	0.3545	0.3521	-0.0230	-0.0228	-0.0671	0.1974	0.3534	-0.0228	0.3566	-0.0228	-0.2184	-0.0479	-0.0230	-0.0171	-0.0930
	666L (Tilley 498S to West Brooks 28S)	610L (Fincastle 336S to Taber 83S)	0.0017	0.0019	0.5386	0.1246	0.0017	0.0346	0.0347	0.7969	0.0334	0.0335	-0.0555	-0.0221	0.7944	0.7961	0.0357	0.0347	0.3059	-0.0253	-0.0253	-0.0390	0.0815	0.6910	0.6841	-0.0253	-0.0045	0.0817	-0.0765	0.6904	-0.0045	0.6951	-0.0045	0.2925	0.3076	-0.0253	-0.0037	0.3059
	1036L (Milo 356S to Travers 554S)	507L (Taber 83S to Hull 257S)	-0.0426	-0.0442	0.1794	-0.0063	-0.0427	-0.0333	-0.0333	0.3091	-0.0319	-0.0323	-0.4251	-0.2337	0.3082	0.3090	-0.0330	-0.0330	-0.0155	-0.2341	-0.2340	-0.3207	-0.0190	0.2573	0.2524	-0.2340	-0.0913	-0.0188	0.3631	0.2589	-0.0913	0.2588	-0.0913	0.0436	-0.0543	-0.2341	-0.0665	-0.0155
	EATL	610L (Fincastle 336S to Taber 83S)	0.0003	0.0005	0.4890	0.0856	0.0003	0.0236	0.0236	0.7779	0.0227	0.0227	-0.0670	-0.0267	0.7754	0.7772	0.0246	0.0237	0.1130	-0.0291	-0.0291	-0.0466	0.0561	0.6582	0.6503	-0.0291	-0.0004	0.0563	-0.0924	0.6586	-0.0004	0.6622	-0.0004	0.2038	0.0467	-0.0291	0.0003	0.1130
	1088L (Cassils 324S to Newell 2075S)	1087L (Cassils 324S to Newell 2075S)	-0.1549	-0.1587	0.0971	0.2032	-0.1552	0.2295	0.2299	0.0647	0.2209	0.2204	0.1375	0.2089	0.0645	0.0649	0.2408	0.2305	0.2319	0.2085	0.2084	0.1763	0.2257	0.0889	0.0840	0.2084	0.2637	0.2269	0.0825	0.0915	0.2637	0.0897	0.2637	0.1649	0.2557	0.2085	0.2490	0.2319
	607L (Fincastle 336S to Conrad 135S)	612L (Fincastle 336S to Suffield 895S)	0.0059	0.0063	0.5124	0.0929	0.0059	0.0292	0.0292	0.0000	0.0281	0.0282	-0.0650	-0.0241	0.0000	0.0000	0.0300	0.0292	0.1202	-0.0255	-0.0255	-0.0437	0.0623	0.6742	0.6728	-0.0255	0.0048	0.0624	-0.0927	0.6693	0.0048	0.2155	0.0524	-0.0255	0.0051	0.1202		
	172L (Taber 83S to Coaldale 254S)	507L (Taber 83S to Hull 257S)	-0.0066	-0.0067	0.3960	0.0631	-0.0066	0.0120	0.0121	0.6297	0.0117	0.0115	-0.1477	-0.0673	0.6279	0.6295	0.0130	0.0122	0.0803	-0.0711	-0.0711	-0.1056	0.0390	0.5386	0.5289	-0.0711	-0.0177	0.0392	-0.0711	0.5415	-0.0177	0.5418	-0.0177	0.1604	0.0241	-0.0171	-0.0114	0.0803
	172L (Taber 83S to Coaldale 254S)	763L (Vauxhall 158S to Hull 257S)	-0.0084	-0.0086	0.3923	0.0606	-0.0085	0.0102	0.0102	0.6213	0.0099																											