Appendix A - Planning Report

aeso

Vauxhall Area Transmission Development

Planning Report

AESO Project Number: P7075

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Executive Summary

The AESO performs system planning studies to assess transmission system reliability. This Planning Report describes the planning studies conducted by the AESO to assess the need for transmission development in the Vauxhall area and the Preferred Transmission Development which will enhance the 138 kV transmission network allowing for the reliable connection of generation.

The Vauxhall Area Transmission Development (VATD) Study Area consists of the 138 kV path from Bowmanton 244S substation to Taber 83S substation located in the Vauxhall (Area 52) and Medicine Hat (Area 4) planning areas. The Study Area is an area rich in renewable resources and market interest. The existing 138 kV transmission lines 610L (Fincastle 336S to Taber 83S) and 879L (Burdett 368S to Bowmanton 244S substation) act as a transfer-out path for excess power produced from existing generating units and the influx of connection generation projects seeking system access along this 138 kV path. Although the conductor of the transmission lines 610L and 879L in the Study Area can carry approximately 120 MVA, due to existing distribution underbuilds and clearance issues, the Summer and Winter thermal line ratings are limited to 85 MVA and 90 MVA. With existing generation and after the connection projects now in service or considered to meet the AESO's project inclusion criteria[1], there is Category A congestion in the Study Area.

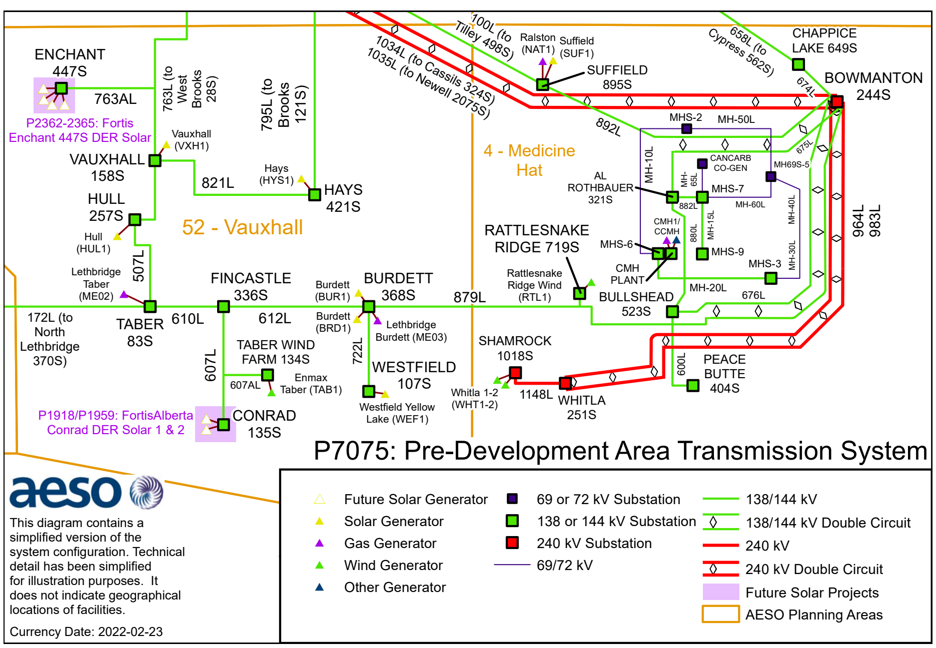

Figure A-1: Pre-Development Transmission System in the Study Area

[1] The AESO's project inclusion criteria are available in *ID #2018-018T Provision of System Access Service and the AESO Connection Process*, on the AESO website.

To evaluate transmission system reliability as generation continues to connect in the Study Area, the AESO carried out planning studies based on the congestion assessment utilizing the market simulation tool AURORA[2]. The planning studies carried out in this report were used to establish the need for transmission development, evaluate the merits of Transmission Development Options and to select the Preferred Transmission Development. The AESO conducted an additional congestion assessment with the Preferred Transmission Development modeled to re-affirm the planning recommendation made in this report. Refer to the Congestion Assessment Report[3] in the AESO's *Needs Identification Document for the Vauxhall Area Transmission Development* for the detailed congestion assessment studies and results.

Need Assessment

The AESO conducted Category A generation integration capability studies to assess the performance of the transmission system without transmission development (pre-development) in the Study Area. With existing generation and the connection and dispatch of new generation connection projects in the Study Area, Category A thermal criteria violations were observed on the 138 kV transmission lines 879L (879AL tap-point to Bowmanton 244S substation) and 610L (Fincastle 336S substation to Taber 83S substation). Without any transmission development the Study Area does not have the capability of accommodating the existing generation and new generation connection projects meeting the AESO's project inclusion criteria without the potential risk of Category A violation. Generation curtailment would be required. These Category A thermal criteria violations are observed today in real time operations.

Therefore, there is a need for transmission development in the Study Area to alleviate near term Category A thermal criteria violations to allow for the transmission of all anticipated in-merit electric energy[4]. Prior to transmission development in the Study Area, near term Category A thermal criteria violations can be managed by operational measures in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

Transmission Development Options and Comparative Assessment

To alleviate the identified constraints in the Study Area, the AESO investigated various Transmission Development Options, taking into consideration the cost, additional generation integration capability and land use and environmental effects. The Transmission Development Options are presented in Table A-1.

Table A-1: Transmission Development Options

Option	Description	Total Project Cost (+/- 30%)	Estimated Overall Total Cost[5]
1	610L and 879L Thermal Rating Increase and Add One Static Synchronous Series Capacitor (SSSC) Per Phase on 610L	$22.3M	N/A
2	610L and 879L Thermal Rating Increase and Add Two SSSC Per Phase on 610L	$25.3M	N/A
3	610L and 879L Thermal Rating Increase	$15.9M	$34.6M

[2] Aurora is an energy forecasting software published by Energy Exemplar. Please refer to their website for more information: https://energyexemplar.com/solutions/aurora/

[3] Filed under a separate cover in the AESO's *Needs Identification Document for the Vauxhall Area Transmission Development*.

[4] Refer to Part 3 Transmission System Criteria and Reliability Standards, section 15(1)(e)(i) of Alberta's *Transmission Regulation*.

[5] Estimated overall total cost with 610L end of life replacement taken into consideration.

Option	Description	Total Project Cost (+/- 30%)	Estimated Overall Total Cost[5]
4	879L Thermal Rating Increase, 610L Line Upgrade to 173 MVA and One SSSC Per Phase	$28.8M	$47.5M
5	879L Line Rating Increase and Construction of a New 173 MVA 138 kV Circuit in Parallel with the Existing 610L 173 MVA Before Salvaging 610L	$22.2M	$22.2M
5A	879L Thermal Rating Increase and Construction of a New 138 kV Circuit in 120 MVA tied to 610L	$15.7M	$37.9M
5B	879L Thermal Rating Increase and construction of a New 138 kV Circuit in 173 MVA tied to 610L	$15.8M	$20.3M

Based on the planning study results, Options 1 and 2 were not recommended for further consideration due to technical performance. Options 3, 4, 5, 5A, and 5B were all technically feasible. Cost estimates were compared to assist in the selection of the Preferred Transmission Development.

Although Options 3, 5A and 5B had the lowest initial capital costs, the 138 kV transmission lines 610L is 60-years old and replacement is expected in the next 10 to 15 years. The cost associated with the 610L end of life replacement was taken into consideration. See column Estimated Overall Total Cost in Table A-1: Transmission Development Options for new cost considered. Options 3, 4 and 5A were not recommended for further consideration due to their new estimated overall total cost with the 610L end of life replacement. AltaLink conducted a Net Present Value (NPV) assessment of Option 5 and 5B to account for the future cost of construction to replace the end-of-life transmission line to determine if deferring the discontinued use for transmission purposes of 138 kV transmission line 610L creates a cost savings opportunity. Results indicated that Options 5 and 5B had approximately equal NPV, negating any potential cost savings of deferring the discontinued use for transmission purposes of 138 kV transmission line 610L.

With lower potential environmental and land use effects when compared to Option 5B, Option 5 was selected as the Preferred Transmission Development.

The Preferred Transmission Development involves the following:

- Add a 138 kV circuit, approximately 15 km in length, between the existing Fincastle 336S and Taber 83S substations with a minimum capacity of approximately 173 MVA;
- Discontinue from use for transmission purposes the existing 138 kV transmission line 610L, between Fincastle 336S and Taber 83S substations, after the new 138 kV circuit is in service;
- Increase the minimum capacity of the existing 138 kV transmission line 879L, between 879AL and the Bowmanton 244S substation, to approximately 118 MVA; and
- Add or modify associated equipment as required for the above transmission developments.

In the case that a new generation connection project(s) arises, and it is determined by the AESO that the existing 138 kV transmission line 610L line is the most technically efficient and cost-effective way to provide system access to the project(s), then the existing 138 kV transmission line 610L will remain in place to serve as a connection facility for the new generation project(s).

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Abbreviations

AESO	Alberta Electric System Operator
AC	alternating current
AIES	Alberta interconnected electric system
BC	British Columbia
DC	direct current
EATL	Eastern Alberta Transmission Line
km	kilometer
kV	kilovolt
LTO	AESO's Long-term Outlook
LTP	AESO's Long-term Transmission Plan
MVA	megavolt ampere
MVAr	megavolt ampere reactive
MW	megawatt
NID	Needs Identification Document
RAS	Remedial Action Scheme
REP	Renewable Electricity Program
TFO	legal owner of a transmission facility
TPL	Transmission Planning Standards (part of the Alberta Reliability Standards)
VAr	volt ampere reactive
WATL	Western Alberta Transmission Line
WECC	Western Electricity Coordinating Council

1 Introduction

This Planning Report describes the planning studies conducted by the AESO to assess the need for transmission development in the Vauxhall area and the Preferred Transmission Development which will enhance the 138 kV transmission network allowing for the reliable connection of generation.

The Vauxhall Area Transmission Development (VATD) Study Area consists of the 138 kV path from Bowmanton 244S substation to Taber 83S substation located in the Vauxhall (Area 52) and Medicine Hat (Area 4) planning areas. The Study Area is an area rich in renewable resources and market interest. The existing 138 kV transmission lines 610L (Fincastle 336S substation to Taber 83S substation) and 879L (Burdett 368S substation to 244S Bowmanton substation) act as a transfer-out path for excess power produced from existing generating units and the influx of generation connection projects seeking system access along this 138kV path. Although the normal maximum current carrying capacities of transmission lines 610L and 879L in the Study Area is 120 MVA, due to existing distribution underbuilds and clearance issues, the Summer and Winter thermal line ratings are limited to 85 MVA and 90 MVA. With existing generation and after the connection projects now in service or considered to meet the AESO's project inclusion criteria, there is Category A congestion in the Study Area.

To evaluate transmission system reliability as generation continues to connect in the Study Area the AESO carried out planning studies based on congestion assessment results utilizing the market simulation tool AURORA. The planning studies carried out in this report were used to establish the need for transmission development, evaluate the merits of Transmission Development Options and to select the Preferred Transmission Development. The AESO conducted an additional congestion assessment with the Preferred Transmission Development modeled to re-affirm the planning recommendation made in this report.

1.1 Study Area Definitions

The Vauxhall Area Transmission Development (VATD) Study Area consists of the 138 kV path from Bowmanton 244S substation to Taber 83S substation located in the Medicine Hat (Area 4) and Vauxhall (Area 52) planning areas.

1.2 Transmission System in the Study Area

The Pre-Development[6] transmission system in the Study Area is shown in Figure 1-1.

The existing 138 kV transmission system serves to supply the load in the Study Area as well as provide access to connection projects. The 138 kV transmission lines 610L (Fincastle 336S to Taber 83S) and 879L (Burdett 368S to 244S Bowmanton) act as a transfer-out path for excess power produced from existing generating units and the influx of generation connection projects seeking system access along this 138 kV path.

[6] The Pre-Development transmission system is the existing transmission system with system and connection projects in service.

During conditions of high renewables generation dispatch, the bus-tie breaker connecting the 240 kV portion of the transmission system to the 138 kV portion of the transmission system at Bowmanton 244S substation is open.

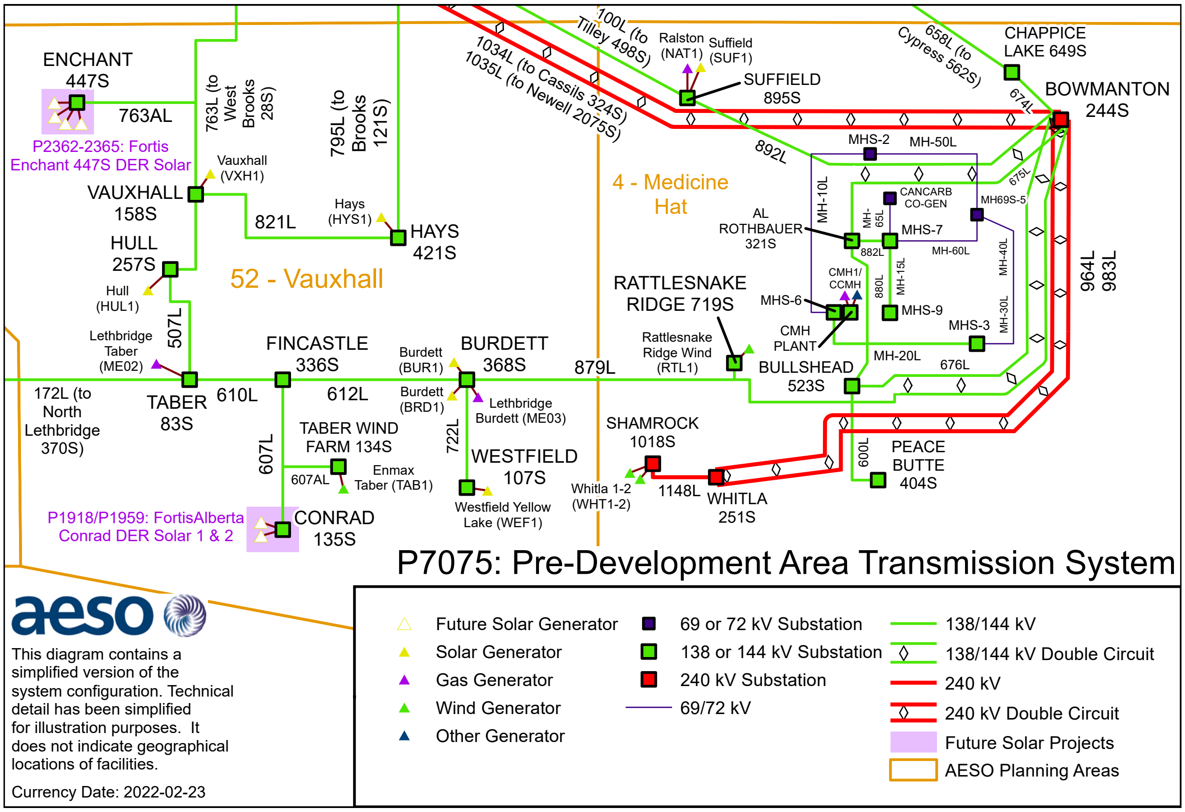

Figure 1-1: Pre-Development Transmission System in the Study Area

1.3 Study Objectives

The study objectives are summarized below.

- Assess the need for transmission development in the Study Area.
- Identify mitigation measures to ensure reliable transmission system performance until the Preferred Transmission Development is in service.
- Develop Transmission Development Options to address the identified transmission constraints.
- Assess Transmission Development Options and compare performance of these options.
- Select the Preferred Transmission Development.

1.4 Study Scope

The following planning studies were performed in the Study Area:

- **Need Assessment**

The AESO conducted a congestion assessment utilizing the market simulation tool (AURORA) to assess transmission system performance. The congestion assessment established the relationship between the addition of new generation in the Study Area and the probability of observing Category A congestion.

The congestion assessment was carried out for year 2023 for the Pre-Development transmission system. Congestion assessment results were used to develop base cases for the planning studies. The transmission system performance was compared against the requirement of the Reliability Criteria (see Section 2.1) to identify any transmission constraints under various stressed transmission system conditions.

- **Transmission Development Options**

  Several Transmission Development Options were considered to alleviate the identified constraints and to allow for the integration of generation projects in the Study Area.

- **Technical Assessment of the Transmission Development Options**

  The performance of each of the Transmission Development Options was evaluated by assessing the generation Category A integration capability provided by each of the options.

- **Selection of the Preferred Transmission Development**

  Several factors were considered when selecting the Preferred Transmission Development including a comparison of generation integration capability, operational flexibility, cost, and environmental and land use effects.

- **Validation of Performance of the Preferred Transmission Development**

  The performance of the transmission system with the Preferred Transmission Development included (Post-Development) was further evaluated through Category B power flow analysis, short-circuit and transient stability studies to ensure its performance fully complies with the Reliability Criteria as described in Section 2.1. Short circuit analyses of the transmission system were performed both before and after the Preferred Transmission Development is in service in different timeframes. A congestion assessment was performed with the Preferred Transmission Development in-service.

2 Reliability Standards, Criteria, Study Assumptions and System Model

This section discusses the applicable reliability standards, criteria, study assumptions and system model that were applied in the planning studies. The information used to create study cases, load and generation assumptions and system configuration reflects the most current information available to the AESO. While the AESO makes assumptions based on the latest available information, it is acknowledged that assumptions are subject to change over time. The AESO addresses the possible impact of changes in assumptions by monitoring active system and customer connection projects and performing regular system planning studies as part of its long-term planning process.

2.1 Transmission Reliability Standards and Criteria

The TPL reliability standards, which are part of the Alberta reliability standards[7], and *Transmission Planning Criteria – Basis and Assumptions*[8] (collectively, the Reliability Criteria) will be applied to evaluate system performance under Category A system condition (i.e., all elements in-service) and following Category B contingencies (i.e., single element outage), and Category C contingencies (i.e., multiple element outage).

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

Category B events, often referred to as the N-1 conditions, results in the loss of any single element 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.

Category C5 events results in loss of two circuits of a multiple circuit tower. 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. For Category C5, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted firm (non-recallable reserved) transmission service electric power transfers may be necessary to maintain the overall reliability of the interconnected electric system.

Category C3 events referred to as a Category B contingency, followed by manual system adjustments, followed by another Category B contingency. 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. The controlled interruption of electric supply to customers (load shedding), the removal from service of

[7] A complete description of these reliability standards can be found on the AESO website.

[8] See Attachment A: Transmission Planning Criteria – Basis and Assumptions

certain generators, and/or the curtailment of contracted firm (non-recallable reserved) transmission service electric power transfers is allowed both as a system adjustment and as a corrective action.

The TPL reliability standards, TPL-001-AB-0, TPL-002-AB1-0, and TPL-003-AB-0, have referenced Applicable Ratings when specifying the required system performance under Category A, Category B, and Category C events. For the purpose of applying the TPL reliability standards to the studies documented in this report, Applicable Ratings are defined as follows:

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

2.2 Study Years

The congestion assessment and subsequent planning studies were carried out for year 2023. The year 2023 was selected based on anticipated need and the earliest possible in-service year of the Preferred Transmission Development.

2.3 Load Forecast

The *AESO 2021 Long-term Outlook*[9] (2021 LTO) Reference Case load forecast was used for the Congestion Assessment Report and deterministic studies in this Planning Report. Hourly point-of-delivery load forecast was used for each substation within the Alberta interconnected electric system (AIES). This approach captures the localized hourly load patterns and how this load diversity impacts the transmission system power flows.

2.4 Generation Assumptions

2.4.1 Existing Generation

As of December 2021, existing generation capacity in the Study Area was 276 MW, comprised of 130 MW in Medicine Hat (Area 4) and 146 MW in Vauxhall (Area 52). Table 2-1 details the existing generation included in the planning studies.

[9] Available on the AESO website.

Table 2-1: Existing Generation in the Study Area

<table>
<tr><th>Asset</th><th>Type</th><th>Maximum Capability (MW)</th><th>Planning Area</th><th>Planning Area Total</th></tr>
<tr><td>Rattlesnake Ridge Wind (RTL1)</td><td>Wind</td><td>130</td><td>04 - Medicine Hat</td><td>130</td></tr>
<tr><td>Lethbridge Burdett (ME03)</td><td>SC</td><td>7</td><td>52 - Vauxhall</td><td rowspan="6">146</td></tr>
<tr><td>Lethbridge Taber (ME02)</td><td>SC</td><td>8</td><td>52 - Vauxhall</td></tr>
<tr><td>Enmax Taber (TAB1)</td><td>Wind</td><td>81</td><td>52 - Vauxhall</td></tr>
<tr><td>BRD1 Burdett (BRD1)</td><td>Solar</td><td>11</td><td>52 - Vauxhall</td></tr>
<tr><td>BUR1 Burdett (BUR1)</td><td>Solar</td><td>20</td><td>52 - Vauxhall</td></tr>
<tr><td>Westfield Yellow Lake (WEF1)</td><td>Solar</td><td>19</td><td>52 - Vauxhall</td></tr>
<tr><td colspan="4">Total Maximum Capability (MW)</td><td>276</td></tr>
</table>

2.4.2 New Generation

As of December 2021, several generation projects have met the AESO's project inclusion criteria and are anticipated to energize before 2023. Table 2-2 details the new generation projects in the Study Area and new generation projects in its vicinity which influence power flow in the Study Area that are included in the planning studies.

Table 2-2: New Generation Connection Projects Included

<table>
<tr><th>Project Name</th><th>Type</th><th>Maximum Capacity (MW)</th><th>Planning Area</th></tr>
<tr><td>P1918 FortisAlberta Conrad DER Solar 1</td><td>Solar</td><td>23</td><td>52 - Vauxhall</td></tr>
<tr><td>P1959 FortisAlberta Conrad DER Solar 2</td><td>Solar</td><td>23</td><td>52 - Vauxhall</td></tr>
<tr><td>P2362 Fortis Enchant 447S DER Solar*</td><td>Solar</td><td>23</td><td>52-Vauxhall</td></tr>
<tr><td>P2363 Fortis Enchant 447S DER Solar*</td><td>Solar</td><td>18</td><td>52-Vauxhall</td></tr>
<tr><td>P2364 Fortis Enchant 447S DER Solar*</td><td>Solar</td><td>10</td><td>52-Vauxhall</td></tr>
<tr><td>P2365 Fortis Enchant 447S DER Solar*</td><td>Solar</td><td>24</td><td>52-Vauxhall</td></tr>
<tr><td colspan="2">Total Maximum Capability (MW)</td><td colspan="2">121</td></tr>
</table>

*These new generation projects are located outside of the Study Area but were considered in the planning studies because of their influence on power flow in the Study Area.

2.5 Transmission Developments

There is no planned transmission development in the study area.

2.6 Interties

The AIES is presently connected to British Columbia via WECC Path 1, which is the Alberta-British Columbia Intertie (AB-BC); to Saskatchewan via WECC Path 2 (AB-SK); and to Montana via the Montana Alberta Tie-Line (MATL) (WECC Path 83). Various import and export flows were assumed in different base cases as determined by the congestion assessment, see section 3.1.4 Study Case Assumptions for intertie flows.

2.7 Voltage Profile Assumptions

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

2.8 Transmission Facility Ratings

Table 2- summarizes the assumed facility ratings of key transmission facilities in the Study Area. Table 2- summarizes the ratings of existing transformers in the Study Area. The details of shunt elements in the Study Area are provided in Table 2-.

Table 2-3: Summary of Key Transmission Line Ratings - 2022

Base Voltage (kV)	Transmission Line	From Substation	To Substation	Normal Rating	
				Summer (MVA)	Winter (MVA)
138	879L	368S BURDETT	JCT. 879AL	85	90
138	879L	JCT. 879AL	244S BOWMANTON	85	90
138	879AL	JCT. 879AL	719S RATTLESNAKE RIDGE	121	149
138	612L	336S FINCASTLE	368S BURDETT	85	90
138	722L	368S BURDETT	107S WESTFIELD	85	90
138	607L	336S FINCASTLE	JCT. 607AL	119	119
138	607L	JCT. 607AL	135S CONRAD	119	119

138	607AL	JCT. 607L	134S TABER WIND FARM	120	145
138	610L	83S TABER	336S FINCASTLE	85	90

Table 2-4: Summary of Key Transformer Ratings

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	MVA Rating
244S BOWMANTON	T1	240/138	200
244S BOWMANTON	T2	240/138	200

Table 2-5: Summary of Key Shunt Elements in the Study Area

Substation Name and Number	Base Voltage (kV)	Capacitors		Reactors	
		Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)	Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)
368S BURDETT	138	1x22.96 + 1x24.46	47.42	-	-
134S TABER WIND FARM	25	1x3.8	3.8	-	-
	25	1x3.8	3.8	-	-
83S TABER	138	1x24.46 + 1x27.2	27.20	-	-

2.9 Dynamic Data and Assumptions

In the planning studies, validated dynamic data was used for existing equipment in the AIES such as generators, wind farm turbines, motor loads, and static VAr compensators when available. If validated data was not available, generic dynamic models were adopted for existing equipment and for facilities planned to be in service within the timeline of the planning studies.

2.10 Protection Fault Clearing Times

The transient stability studies were performed using the protection fault clearing times provided by the TFOs. 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 were performed using the standard fault clearing times that are specified in Table 2-3 of the AESO's *Transmission Planning Criteria – Basis and Assumptions*.

2.11 HVDC Power Order Assumptions

The HVDC lines, Western Alberta Transmission Line (WATL) and Eastern Alberta Transmission Line (EATL), were dispatched to minimize system losses in the congestion assessment. A formula that estimates the minimum loss dispatch based on flows measured on certain alternating current (AC) transmission lines was used to determine the HVDC dispatch that should be used for each hour in the simulation.

The reactive power limits of the MVAr exchanges between the HVDC terminals (WATL and EATL) and the connected AC transmission systems are shown in Table 2-. These limits were maintained when performing the planning studies.

Table 2-6: 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

2.12 Existing RAS in Study Area

The existing transmission system in the Study Area is being operated with the help of RAS and automatic protection scheme (APS) that result in generation curtailment, reconfiguration of transmission lines, and HVDC re-dispatch to avoid thermal criteria violations and/or voltage violations during contingency conditions. Table 2- lists existing RAS and APS in the Study Area that are designed to operate automatically in real-time to protect the transmission system from Reliability Criteria violations.

Table 2-7: Existing and Planned RAS and APS in Study Area

RAS and APS No.	Scheme Name	Status
180	879L Overload Mitigation Scheme	Existing
181	610L Overload Mitigation Scheme	Existing

3 Planning Methodology

The methodology used to conduct the planning studies included the following:

- Develop reliable study cases based on the congestion assessment results for the planning studies. The congestion assessment results used for the study cases include the load and generation forecast for the Study Area.
- Conduct need assessment studies by evaluating the generation integration capability of the transmission system prior to transmission development and identify potential transmission system constraints in the Study Area.
- Develop Transmission Development Options to address the identified transmission system constraints.
- Evaluate the Category A performance of the proposed Transmission Development Options and select the Preferred Transmission Development.
- Verify the performance of the Preferred Transmission Development through Category B power flow analysis, short-circuit and transient stability studies, and the congestion assessment results.

3.1 Study Scenarios

A market simulation of the year 2023 was performed using AURORA, based on the 2021 LTO. The market simulation process generated a time series of transmission system states representing each hour in the year. A filtering process was used to identify the hours when constraints in the Study Area would be maximized. Specifically, transmission system states were found wherein:

- 138 kV transmission line 610L loading was maximized.
- 138 kV transmission line 879L loading was maximized.
- Net generation between the terminals of Bowmanton 244S and Taber 83S substations was maximized.

In creating those transmission system states, EATL and WATL were dispatched to minimize losses, generators were dispatched according to economic merit, the interties were dispatched according to economic merit, and generator dispatch was not limited by transmission constraints. Base cases were developed from the resulting scenarios for the planning studies.

3.1.1 Scenario 1 (Max flow on 879L)

Scenario 1 represents a transmission system state where flow of power is maximized on 138 kV transmission line 610L, between the Fincastle 336S and Taber 83S substations.

3.1.2 Scenario 2 (Max flow on 610L)

Scenario 2 represents a transmission system state where flow of power is maximized on 138 kV transmission line 879L, between 879AL and Bowmanton 244S substation.

3.1.3 Scenario 3 (Max Flow Out of Study Area)

Scenario 3 represents a transmission system state where the net generation is maximized between the terminals of Bowmanton 244S and Taber 83S substations.

3.1.4 Study Case Assumptions

The study case assumptions are provided in Table 3-.

Table 3-1: Planning Study Case Assumptions

Scenario	Generator Name	Dispatch (MW)	138 kV Path Gen (MW)	138 kV Path Load (MW)	EATL (+N to S)	WATL (+N to S)	AB-BC (+Export)	MATL (+Export)	AB-SK (+Export)
Scenario 1 (879L)	Rattlesnake	115.42	284.49	77.60	-1000	-600	0	0	153
	Westfield	19							
	Burdett1	11							
	Burdett2	20							
	Taber1	37.57							
	Taber2	35.6							
	Conrad1	22.5							
	Conrad2	23.4							
Scenario 2 (610L)	Rattlesnake	130	300.79	68.42	-1000	-500	441	42.5	0
	Westfield	18.48							
	Burdett1	10.64							
	Burdett2	19.35							
	Taber1	39.92							
	Taber2	37.82							
	Conrad1	21.86							
	Conrad2	22.72							
Scenario 3 (Max)	Rattlesnake	130	305.27	64.88	-1000	-950	0	0	153

	Westfield	18.92							
	Burdett1	11							
	Burdett2	20							
	Taber1	40.8							
	Taber2	38.65							
	Conrad1	22.5							
	Conrad2	23.4							

3.2 Power Flow Analysis

Category A power flow analysis was conducted for the 2023 study year to identify thermal and voltage criteria violations on the 138 kV transmission system in the Study Area. This analysis was performed for the need assessment prior to any new transmission development in the area to identify reliability standards violations and limiting elements. Category A power flow analysis was conducted again for each of the proposed Transmission Development Options. Category B power flow analysis was completed with the Preferred Transmission Development in-service for the 2023 study year. The observed thermal loading percentage shown in the result tables are as measured by current.

3.3 Short-circuit Analysis

The objective of short-circuit analysis was to assess whether the maximum fault currents exceed the capability for the circuit breakers to clear faults and to ensure equipment in the area can carry the anticipated short-circuit flow. Short-circuit levels were analyzed under three-phase-to-ground faults and single-line-to-ground faults with all the generators in the Study Area dispatched.

The short-circuit analysis was carried out both before and after the Preferred Transmission Development system is in-service for both 2023 and 2031 study years.

3.4 Transient Stability Analysis

Transient stability studies were conducted for the 2023 study year with the Preferred Transmission Development in-service. The transient stability studies utilized actual fault clearing times for the existing transmission system where available and followed standard clearing times for the remaining existing transmission lines and new transmission lines as outlined in the planning criteria. Generator terminal voltage and generator MW/MVAR outputs were monitored. Detailed study results (dynamic plots) illustrated the dynamic system behavior and any stability issues.

4 Need Assessment

The AESO conducted power flow analyses on the existing transmission system to identify reliability standards violations in the Study Area. Using the study scenarios described in Section 3, the need assessment was conducted to identify violations in the Study Area under Category A conditions.

4.1 Need Assessment Results

The sections below summarize the need assessment results for the 2023 study year. Power flow single line diagrams (SLD) for this assessment are provided in Attachment B: Power Flow SLDs – Pre-Transmission Development 2023.

4.1.1 Category A Analysis

System elements at 138 kV in the Study Area were monitored. Table 4-1 shows the most significant Category A thermal overloads. No voltage violations were observed.

Table 4-1: Summary of Category A Thermal Loading

Overloaded Element	Contingency	Study Scenario	Base kV	Rating (MVA)	Observed Thermal Loading (%)
879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	85	138
610L (336S Fincastle to 83S Taber)			138	85	128
879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	85	111
610L (336S Fincastle to 83S Taber)			138	85	187
879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	85	131
610L (336S Fincastle to 83S Taber)			138	85	174

4.1.2 Existing Capability

To mitigate Category A thermal criteria violations and determine the capability of the existing transmission system to integrate all the generation in the Study Area, generation was curtailed according to generating units most effective at reducing the loading on the existing 138 kV transmission lines 879L and 610L. Table 4-2 shows the curtailment required and existing capability.

Table 4-2: Summary of Curtailment and Existing Capability

Scenario	Generator Name	Pre-curtailment (MW)	Post-curtailment (MW)	Curtailment (MW)	138kV Path (MW)	Limiting Element	Loading (%)
Scenario 1 (879L)	Rattlesnake	115.42	39.57	75.85	208.64	879L	99
	Westfield	19	19				
	Burdett1	11	11				
	Burdett2	20	20				
	Taber1	37.57	37.57				
	Taber2	35.6	35.6			610L	81
	Conrad1	22.5	22.5				
	Conrad2	23.4	23.4				
Scenario 2 (610L)	Rattlesnake	130	130	95.80	204.98	879L	93
	Westfield	18.48	18.48				
	Burdett1	10.64	10.64				
	Burdett2	19.35	19.35				
	Taber1	39.92	26.51			610L	99
	Taber2	37.82	0				
	Conrad1	21.86	0				
	Conrad2	22.72	0				
Scenario 3 (Max)	Rattlesnake	130	109.80	97.69	207.57	879L	99
	Westfield	18.92	0				
	Burdett1	11	0				
	Burdett2	20	0				
	Taber1	40.8	40.8			610L	99
	Taber2	38.65	11.06				

	Conrad1	22.5	22.5				
	Conrad2	15.7	23.4				

4.2 Summary of Need Assessment

With existing generation and the connection and dispatch of new generation projects meeting the AESO's project inclusion criteria in the Study Area, Category A thermal criteria violations were observed on the 138 kV transmission system. Category A thermal criteria violations were observed on the 138 kV transmission lines 879L (879AL tap-point to 244S Bowmanton) and 610L (336S Fincastle to 83S Taber). The transmission lines 879L and 610L act as transfer out paths for the existing generation and new generation projects. Without any transmission development, generation curtailment is required in the Study Area. Approximately 98 MW of generation curtailment is required to mitigate the Category A thermal criteria violations observed on the 138 kV transmission lines 879L (879AL tap-point to 244S Bowmanton) and 610L (336S Fincastle to 83S Taber). No voltage violations were observed. These Category A thermal criteria violations are observed today in real time operations.

Therefore, there is a need for the existing transmission system in the Study Area to be enhanced to remove near term Category A thermal criteria violations allowing for the unconstrained dispatch of all anticipated in-merit electricity in the Study Area. Prior to the energization of the Preferred Transmission Development in the Study Area, near term Category A thermal criteria violations can be managed by operational measures in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

4.3 Real-time Generation Curtailment History

The Category A thermal criteria violations observed in the need assessment are observed today in real time operations. Real-time congestion was first experienced in the Study Area with all system elements in service in March 2022, with the real-time overload of the 138 kV transmission line 610L (between Fincastle 336S and Taber 83S substations). From March 22 to the end of July 2022 there have been a total of 57 events of real-time congestion involving both 138 kV transmission lines 610L and 879L (between Burdett 368S and Bowmanton 244S substations). Congestion was observed on 138 kV transmission line 610L for 48 events, and on 138 kV transmission line 879L for two events. Congestion was observed on both 138kV transmission lines 610L and 879L at the same time for 7 events.

5 Transmission Development Options

This section presents the seven Transmission Development Options considered to address the need identified in Section 4. Based on the Need Assessment, the 138 kV transfer-out paths in the Study Area need to be reinforced to ensure reliable evacuation of surplus generation.

5.1 Option 1: 610L and 879L Thermal Rating Increase and Add One Static Synchronous Series Capacitor (SSSC) Per Phase on 610L

Option 1 comprises of the following components:

- Increase the minimum capacity of the 138 kV transmission line 610L to approximately 118 MVA;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA;
- Add one SSSC per phase on the 138 kV transmission line 610L; and
- Add or modify associated equipment as required for the above transmission developments.

Figure 5-1 shows the simplified diagram for Option 1.

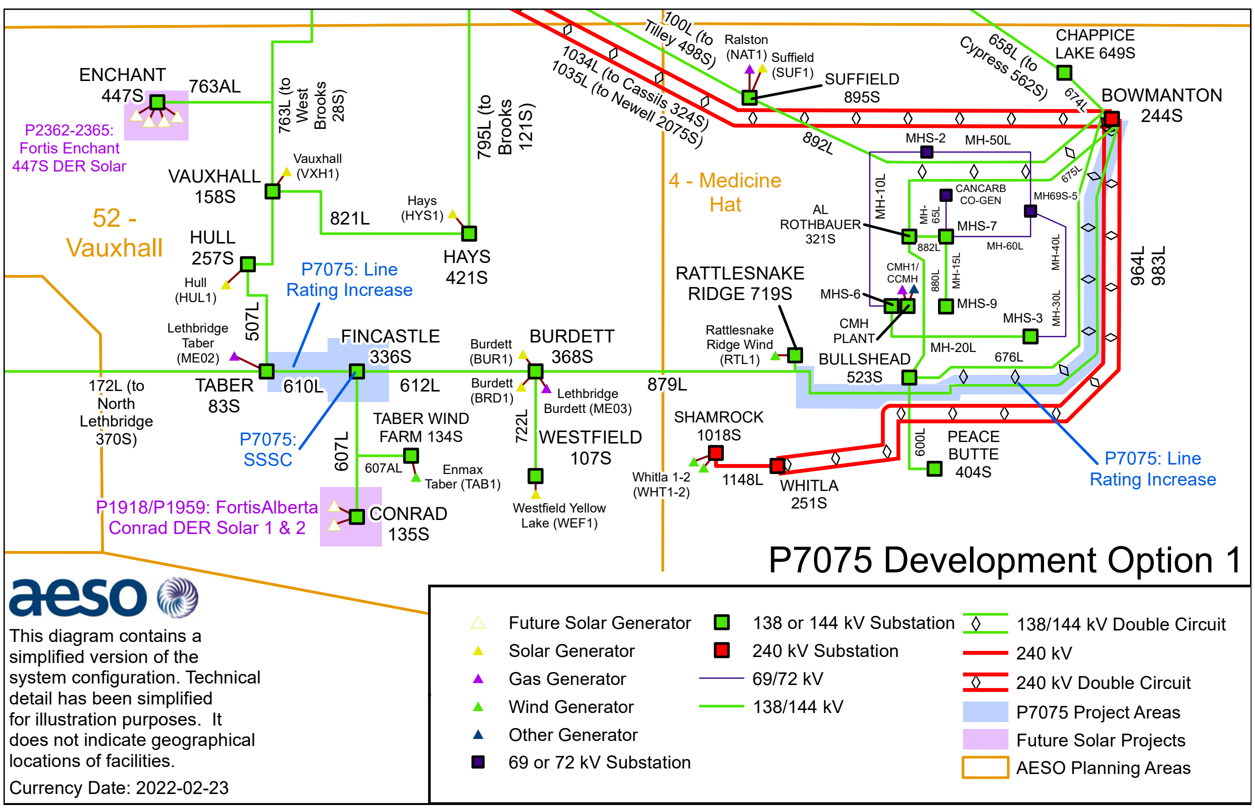

Figure 5-1: Vauxhall Area Transmission Development Option 1

5.2 Option 2: 610L and 879L Thermal Rating Increase and Add Two SSSC Per Phase on 610L

Option 2 comprises of the following components:

- Increase the minimum capacity of the 138 kV transmission line 610L to approximately 118 MVA;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA;
- Add two SSSC per phase on the 138 kV transmission line 610L; and
- Add or modify associated equipment as required for the above transmission developments.

Figure 5-2 shows the simplified diagram for Option 2.

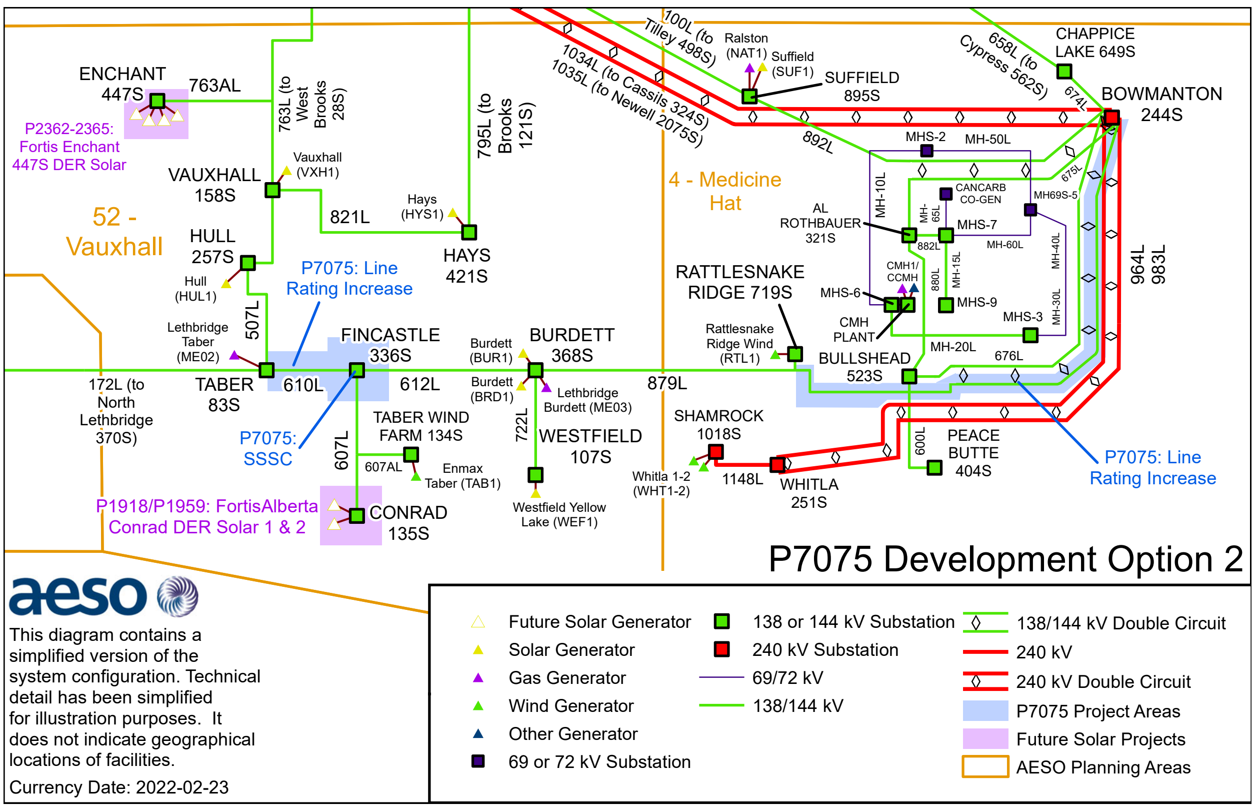

Figure 5-2: Vauxhall Area Transmission Development Option 2

5.3 Option 3: 610L and 879L Thermal Rating Increase

Option 3 comprises of the following components:

- Increase the minimum capacity of the 138 kV transmission line 610L to approximately 173 MVA;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA; and

- Add or modify associated equipment as required for the above transmission developments.

Figure 5-3 shows the simplified diagram for Option 3.

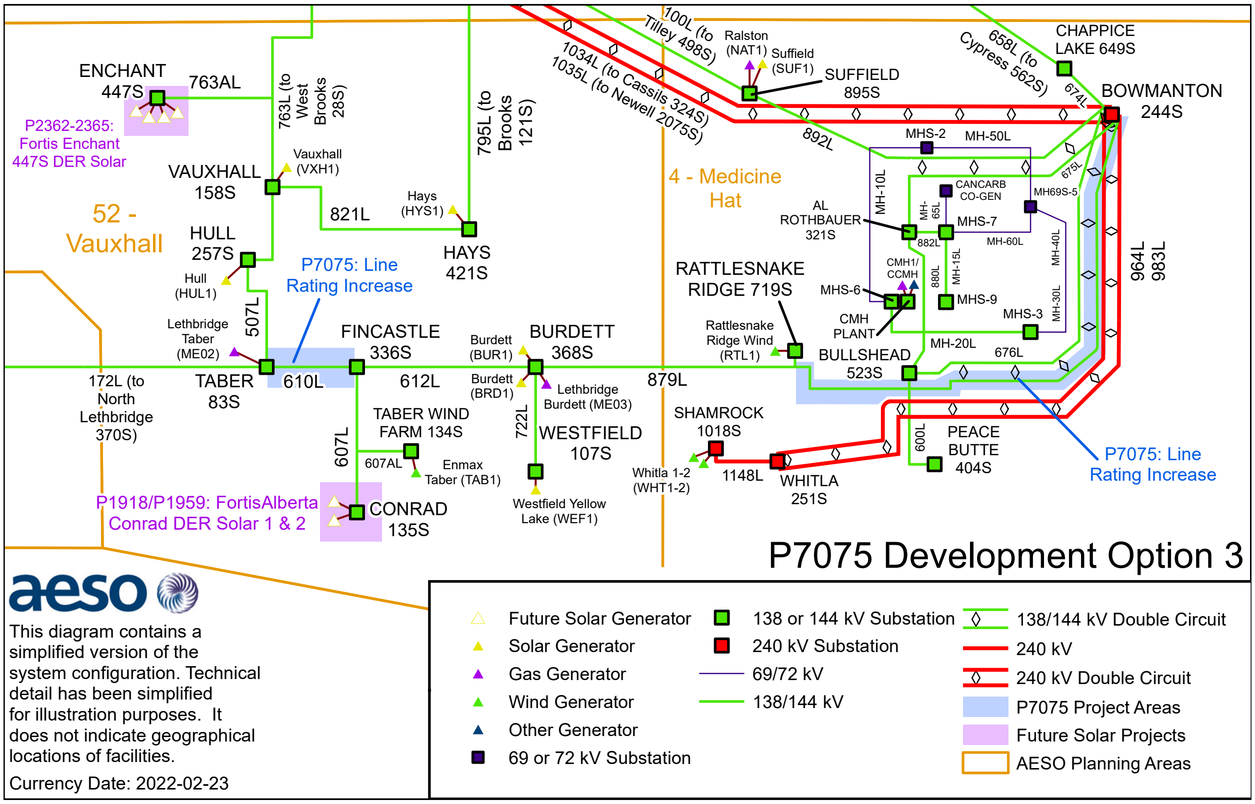

Figure 5-3: Vauxhall Area Transmission Development Option 3

5.4 Option 4: 879L Thermal Rating Increase, 610L Line Upgrade to 173 MVA and One SSSC Per Phase

Option 4 comprises of the following components:

- Increase the minimum capacity of the 138 kV transmission line 610L to approximately 173 MVA;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA;
- Add one SSSC per phase on the 138 kV transmission line 610L; and
- Add or modify associated equipment as required for the above transmission developments.

Figure 5-4 shows the simplified diagram for Option 4.

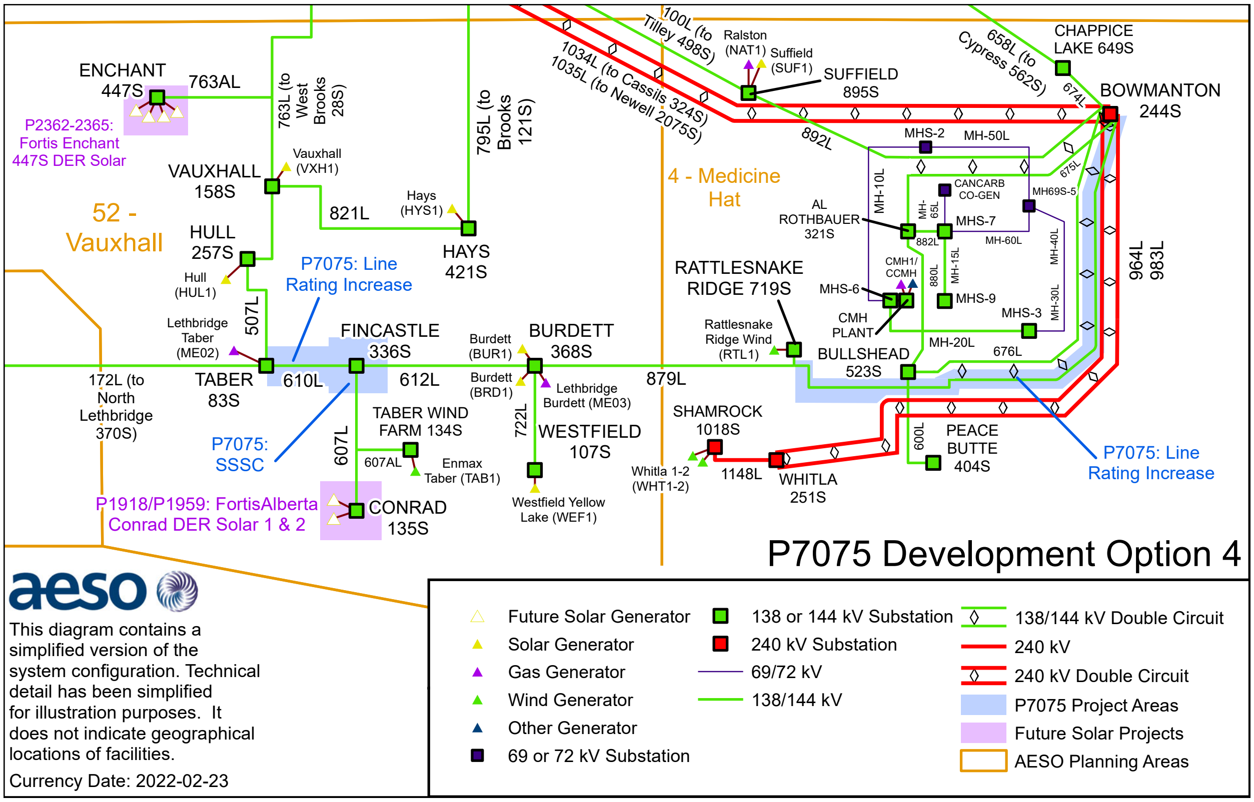

Figure 5-4: Vauxhall Area Transmission Development Option 4

5.5 Option 5: 879L Line Rating Increase and Construction of a New 173 MVA 138 kV Circuit in Parallel with the Existing 610L 173 MVA Before Salvaging 610L

Option 5 comprises of the following components:

- Add a 138 kV circuit, approximately 15 km in length, between the existing Fincastle 336S and Taber 83S substations with a minimum capacity of approximately 173 MVA;
- Discontinue from use for transmission purposes the existing 138 kV transmission line 610L, between Fincastle 336S and Taber 83S substations, after the new 138 kV circuit is in service;
- Increase the minimum capacity of the existing 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA; and
- Add or modify associated equipment as required for the above transmission developments.

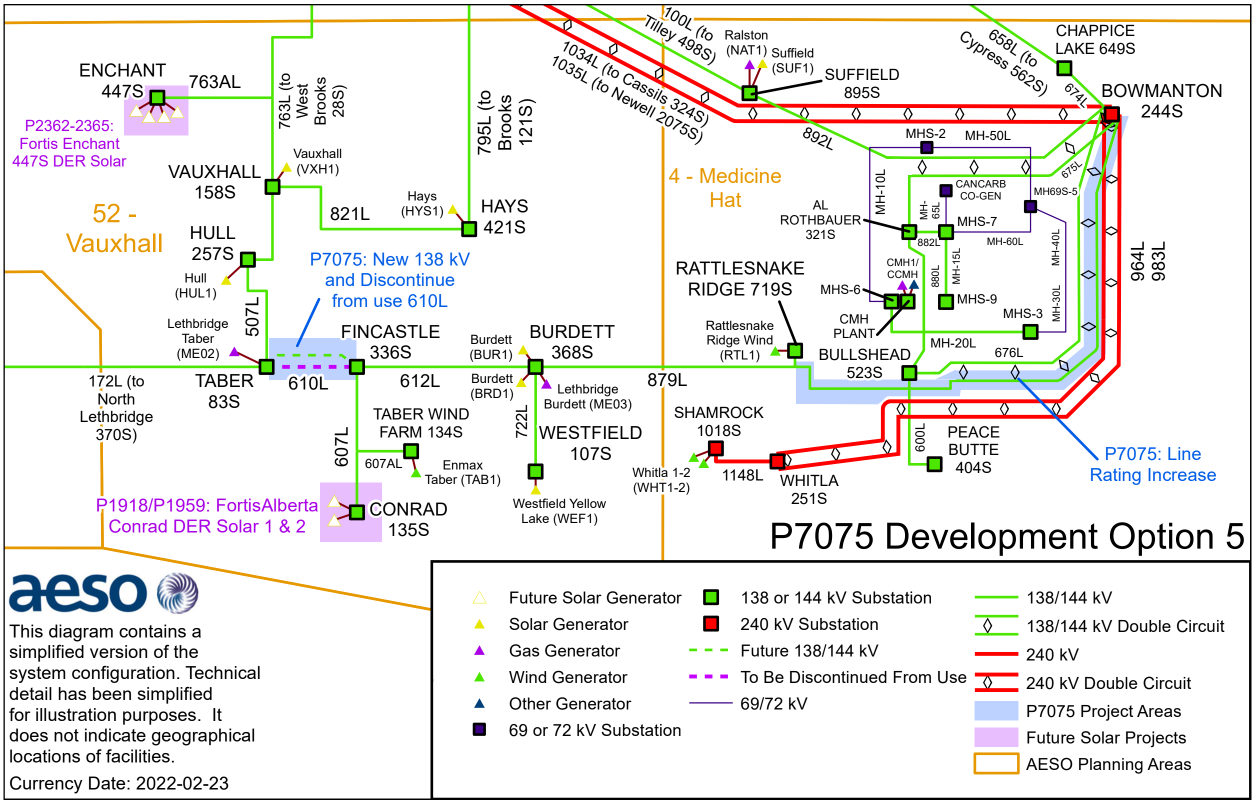

Figure 5-5 shows the simplified diagram for Option 5.

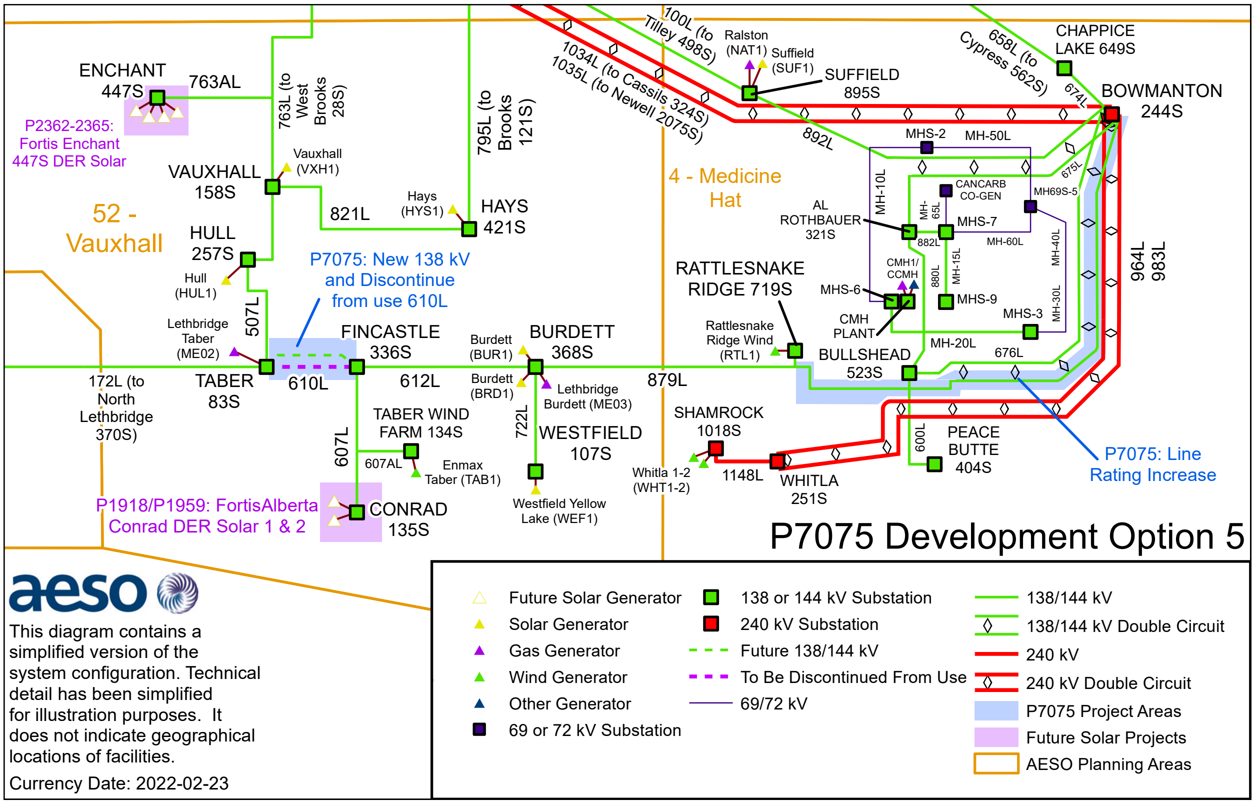

Figure 5-5: Vauxhall Area Transmission Development Option 5

5.6 Option 5A: 879L Thermal Rating Increase and Construction of a New 138 kV Circuit in 120 MVA tied to 610L

Option 5A comprises of the following components:

- Add a 138 kV circuit, approximately 15 km in length, between the existing Fincastle 336S and Taber 83S substations with a minimum capacity of approximately 120 MVA, and operate in a bundled configuration with the existing 138 kV transmission line 610L;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA; and
- Add or modify associated equipment as required for the above transmission developments.

Figure 5-6 shows the simplified diagram for Option 5A.

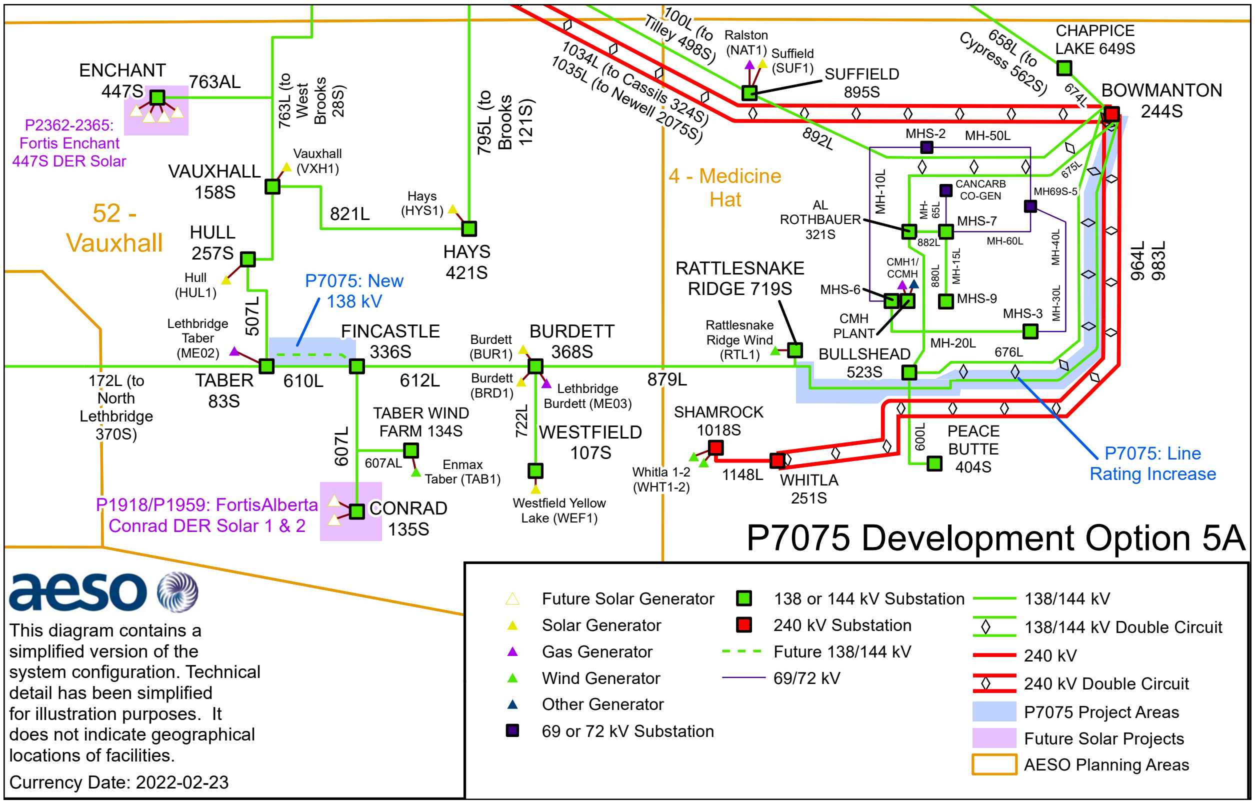

Figure 5-6: Vauxhall Area Transmission Development Option 5A

5.7 Option 5B: 879L Thermal Rating Increase and construction of a New 138 kV Circuit in 173 MVA tied to 610L

Option 5B comprises of the following components:

- Add a 138 kV circuit, approximately 15 km in length, between the existing Fincastle 336S and Taber 83S substations with a minimum capacity of approximately 173 MVA, and operate in a bundled configuration with the existing 138 kV transmission line 610L;
- Increase the minimum capacity of the 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA; and
- Add or modify associated equipment as required for the above transmission developments.

Figure 5-6 shows the simplified diagram for Option 5B.

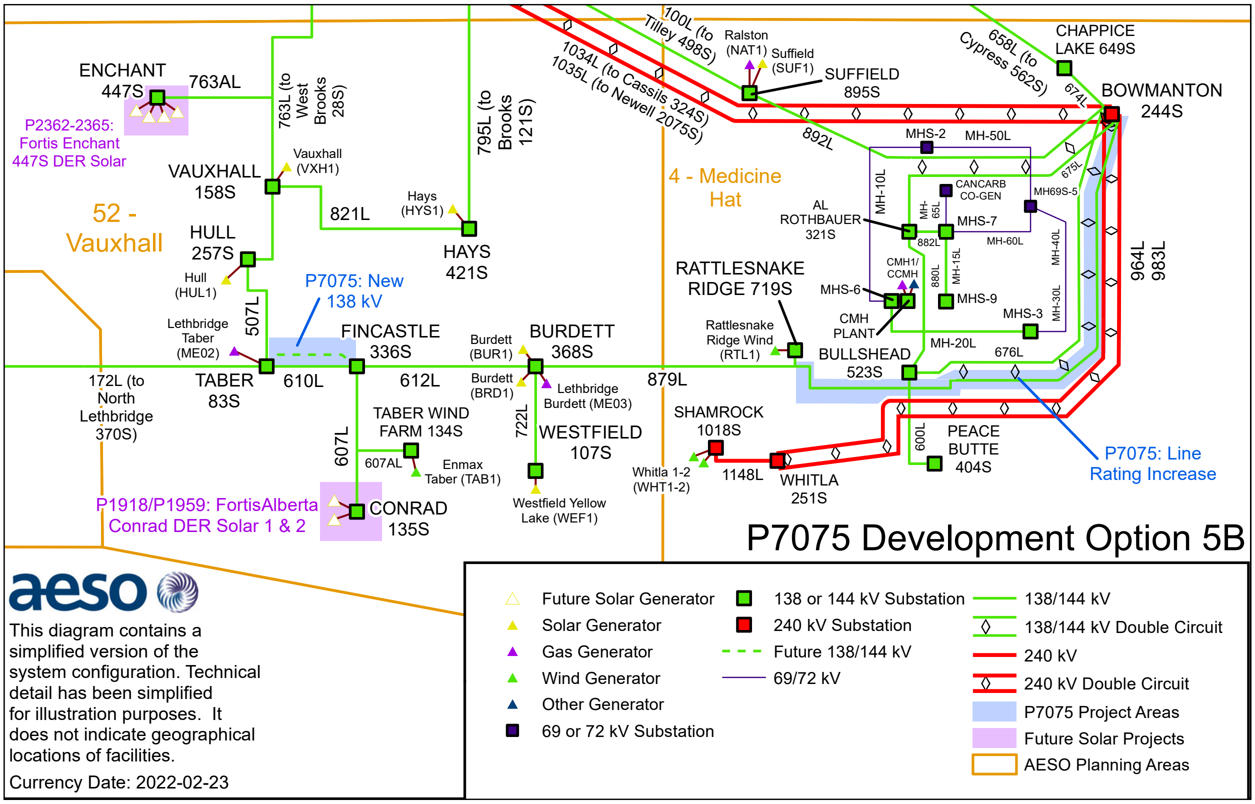

Figure 5-7: Vauxhall Area Transmission Development Option 5B

6 Selection of the Preferred Transmission Development

This section presents the evaluation and comparison of all Transmission Development Options described in Section 5, including the planning studies carried out to evaluate the transmission system performance of the Transmission Development Options. The Transmission Development Options were first evaluated based on their ability to integrate all generation projects in the Study Area under Category A conditions. Some options were ruled out if they were deemed technically inferior. For other options, cost estimates (+30/-30%), and environmental and land use effects were developed and compared.

6.1 Technical Assessment of the Transmission Development Options

Technical performance of the Transmission Development Options was evaluated using both 2023 Study Scenarios with no generation curtailment to identify each Transmission Development Option's ability to integrate all generation in the Study Area without any Category A thermal criteria violations. Power flow single line diagrams (SLD) for this assessment are provided in Attachment C: Power Flow SLDs – Assessment of Transmission Development Options.

6.1.1 Category A Analysis

Power flow simulations were performed for Category A conditions. Table 6-1 provides a summary of the Category A power flow analysis for each Transmission Development Option.

Table 6-1: Category A Power Flow Analysis of Transmission Development Options

Option	Limiting Elements	Contingency	Study Scenario	Base kV	Rating (MVA)	Observed Thermal Loading (%)
1	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	100
	610L (336S Fincastle to 83S Taber)			138	118	92
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	88
	610L (336S Fincastle to 83S Taber)			138	118	126
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	103

	610L (336S Fincastle to 83S Taber)			138	118	117
2	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	100
	610L (336S Fincastle to 83S Taber)			138	118	92
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	97
	610L (336S Fincastle to 83S Taber)			138	118	118
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	111
	610L (336S Fincastle to 83S Taber)			138	118	109
3	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	99
	610L (336S Fincastle to 83S Taber)			138	173	63
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	79
	610L (336S Fincastle to 83S Taber)			138	173	92
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	94

	610L (336S Fincastle to 83S Taber)			138	173	86
4	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	99
	610L (336S Fincastle to 83S Taber)			138	173	63
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	79
	610L (336S Fincastle to 83S Taber)			138	173	92
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	94
	610L (336S Fincastle to 83S Taber)			138	173	86
5	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	99
	610L (336S Fincastle to 83S Taber)			138	173	63
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	79
	610L (336S Fincastle to 83S Taber)			138	173	92
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	95

	610L (336S Fincastle to 83S Taber)			138	173	86
5A	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	97
	New 138kV line from 336S Fincastle to 83S Taber			138	120	47
	610L (336S Fincastle to 83S Taber)			138	85	66
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	76
	New 138kV line from 336S Fincastle to 83S Taber			138	120	68
	610L (336S Fincastle to 83S Taber)			138	85	96
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	91
	New 138kV line from 336S Fincastle to 83S Taber			138	120	64
	610L (336S Fincastle to 83S Taber)			138	85	90
5B	879L (879AL to 244S Bowmanton)	No Outage	Scenario 1 (879L)	138	118	97
	New 138kV line from 336S			138	173	34

	Fincastle to 83S Taber					
	610L (336S Fincastle to 83S Taber)			138	85	63
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 2 (610L)	138	118	76
	610L (336S Fincastle to 83S Taber)			138	173	50
	New 138kV line from 336S Fincastle to 83S Taber			138	85	93
	879L (879AL to 244S Bowmanton)	No Outage	Scenario 3 (Max)	138	118	91
	610L (336S Fincastle to 83S Taber)			138	173	46
	New 138kV line from 336S Fincastle to 83S Taber			138	85	87

Based on the Category A power flow analysis, Transmission Development Options 1 and 2 were not recommended for further technical consideration. Transmission Development Options 1 and 2 do not allow for the reliable generation integration of all generation projects in the Study Area without the potential for Category A thermal criteria violations.

Transmission Development Options 3, 4, 5, 5A, and 5B were able to facilitate the unconstrained connection of all generation projects in the Study Area and were considered for further assessment.

6.1.2 Category A Capability Assessment

The demonstrated need for transmission development is to mitigate Category A thermal criteria violations in the Study Area resulting from the connection of new generation projects that meet the AESO's project inclusion criteria. Due to the observed increase in generation interest in the Study Area, the AESO conducted a generation integration capability assessment to evaluate the capability of Transmission Development Options 3, 4, 5, 5A, and 5B to accommodate further generation development in the Study Area without Reliability Criteria violations. This section describes the Category A generation integration capability assessment carried out for Transmission Development Options 3, 4, 5, 5A, and 5B outlined in Section 5.

Assumptions

- Generation integration capability was assessed under Category A operating conditions.
- New generation in the Study Area will be in the form of solar Distributed Energy Resources (DER).
- Generation is assumed to be connected at Burdett 368S substation as this location will effectively stress the underlying 138 kV path in the Study Area.
- Existing generation and new generation projects were dispatched as outlined in the Study Scenarios in Section 3.

Methodology

- Generation from the assumed generator at Burdett 368S substation was increased until Category A congestion was observed.
- The scope of the Category A congestion focused on the 138 kV path from Bowmanton 244S to Taber 38S substations.

Table 6-1 provides a summary of the Category A generation integration capability for Transmission Development Options 3, 4, 5, 5A, and 5B.

Table 6-2: Category A Generation Integration Capability of Transmission Development Options

Options	Additional N-0 Capacity (MW)	Study Scenario	Limiting Factor
3	2	Scenario 1 (879L)	879L (879AL to 244S Bowmanton)
	20	Scenario 2 (610L)	610L (336S Fincastle to 83S Taber)
	24	Scenario 3 (Max)	879L (879AL to 244S Bowmanton)
4	16	Scenario 1 (879L)	879L (879AL to 244S Bowmanton)
	34	Scenario 2 (610L)	610L (336S Fincastle to 83S Taber)
	26	Scenario 3 (Max)	879L (879AL to 244S Bowmanton)
5	2	Scenario 1 (879L)	879L (879AL to 244S Bowmanton)

	20	Scenario 2 (610L)	610L (336S Fincastle to 83S Taber)
	24	Scenario 3 (Max)	879L (879AL to 244S Bowmanton)
5A	11	Scenario 1 (879L)	879L (879AL to 244S Bowmanton)
	9	Scenario 2 (610L)	610L (336S Fincastle to 83S Taber)
	22	Scenario 3 (Max)	610L (336S Fincastle to 83S Taber)
5B	11	Scenario 1 (879L)	879L (879AL to 244S Bowmanton)
	18	Scenario 2 (610L)	610L (336S Fincastle to 83S Taber)
	35	Scenario 3 (Max)	610L (336S Fincastle to 83S Taber)

6.1.3 Technical Assessment Summary

This section describes the technical assessment carried out for the Transmission Development Options outlined in Section 5, considering that the need for transmission development is to mitigate Category A thermal criteria violations in the Study Area after the connection of the new generation projects that have met the AESO's project inclusion criteria. The results indicated:

- Transmission Development Options 1 and 2 were not capable of facilitating the reliable and unconstrained connection of all generation in the Study Area.
- Transmission Development Options 3 and 5 had similar technical performance. Both options see the increase of 138 kV transmission line 879L summer thermal line rating to 118 MVA and 138 kV transmission line 610L summer thermal line rating to 173 MVA. After the development of Transmission Development Options 3 and 5, Category A thermal criteria violations would be mitigated.
- With installation of SSSC on 138 kV transmission line 610L in Transmission Development Option 4, the power flow control devices can reduce thermal loadings on 138 kV transmission lines 879L and 610L depending on the Study Scenario and operation setting. After the development of Transmission Development Option 4, Category A thermal criteria violations would be mitigated.
- Transmission Development Options 5A and 5B had similar technical performance. With the old 85 MVA rated transmission line tied together with the new 120 MVA or 173 MVA transmission line, the post project combined rating of 138 kV transmission line 610L will be approximately 170 MVA. After the development of Transmission Development Options 5A and 5B, Category A thermal criteria violations would be mitigated.

The AESO conducted a generation integration capability assessment to evaluate the capability of the selected Transmission Development Options to accommodate further generation development in the Study Area without Reliability Criteria violations. While there is uncertainty with the timing, location, and magnitude of future generation projects, after Transmission Development Options 3, 4, 5, 5A, and 5B, the Study Area has potential to enable future generation connection.

Based on the technical analysis described above, Options 1 and 2 were not recommended for further consideration as these developments could not mitigate Category A thermal criteria violations in the Study Area after the connection of the new generation projects that meet the AESO's project inclusion criteria. Options 3, 4, 5, 5A, and 5B all satisfied the Study Area's need for transmission development and were further considered in selecting the Preferred Transmission Development.

The economic and environmental and land use effects of Options 3, 4, 5, 5A, and 5B were assessed. This assessment is presented in the following subsections.

6.2 Cost Estimate

To further assist with its evaluation of Transmission Development Options 3, 4, 5, 5A, and 5B, the AESO directed AltaLink to prepare a NID class cost estimate, being an AACEi class 4 estimate, in an accuracy range of +30%/-30. Table 6-1 provides a summary of the cost estimates completed for each Transmission Development Option selected for further consideration and the detailed cost estimates are provided in Appendix D the AESO's *Needs Identification Document for the Vauxhall Area Transmission Development*.

Table 6-3: NID Class Cost Estimate Summary – Initial Capital Cost

Option	3	4	5	5A	5B
Transmission Capital Cost (+30%/-30%)	$12,442,365	$25,336,865	$18,733,101	$15,652,408	$15,840,899
Distribution Cost	$3,500,000	$3,500,000	$3,500,000	N/A	N/A
Total Project Cost (+/-30%)	$15,942,365	$28,836,865	$22,233,101	$15,652,408	$15,840,899

AltaLink indicated that the 138 kV transmission lines 610L is 60-years old and replacement is expected in the next 10 to 15 years. The cost associated with the 610L end of life replacement was taken into consideration. This includes cost of a new 173 MVA transmission line, salvage of existing 610L, and distribution underbuilds removal. Table 6-4 provides a summary of the estimated replacement costs and estimated overall total project cost.

Table 6-4: Costs Associated With 610L End of Life Replacement

Option	3	4	5	5A	5B
Estimated Replacement Cost	$18.7M	$18.7M	N/A	$22.2M	$4.5M
Estimated Overall Total Cost	$34.6M	$47.5M	$22.2M	$37.9M	$20.3M

Based on the cost estimates summarized above, Options 3,4 and 5A were not recommended for further consideration due to the higher new estimated total project cost associated with the 610L end of life replacement. Options 5 and 5B were selected for further consideration.

6.2.1 Net Present Value Analysis

As the proposed Transmission Development Options 5 and 5B vary in levels of modification to the 138 kV transmission line 610L (i.e., underbuild removal, re-string, or construct a brand-new transmission line) AltaLink conducted a Net Present Value (NPV) assessment to account for the future cost of construction to replace the end-of-life transmission line. See Attachment F: Letter from AltaLink Re: P7075 Vauxhall Area Transmission Development | NID Estimate Clarification. Table 6-1 provides a summary of the NPV cost for each Transmission Development Option selected for further consideration.

Table 6-5: Net Present Value (NPV) Analysis Summary

Option	5	5B
Net Present Value	$22,233,101	$21,070,585

Based on the NPV summary above, deferring the discontinued use for transmission purposes of 138 kV transmission line 610L creates a cost savings opportunity of approximately $1 million. However, further assessment of Transmission Development Option 5B revealed that construction of a new control building at Taber 38S substation may be required. Based on AESO transmission cost benchmarks, the cost of a new control building can be between $500 thousand - $1 million. This results in Transmission Development Options 5 and 5B having approximately equal NPV, negating any potential cost savings of deferring the discontinued use for transmission purposes of 138 kV transmission line 610L.

6.3 Environmental and Land Use Effects

The AESO directed AltaLink to prepare a report[10] comparing all Transmission Development Options according to the environmental and land use effects information contemplated in AUC Rule 007, *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations, Hydro Developments and Gas Utility Pipelines*, Section 7.1.1, NID2. The TFO's conclusions for Option 5 and 5B are summarized as follows:

[10] Filed under a separate cover in the AESO's *Needs Identification Document for the Vauxhall Area Transmission Development.*

- Options 5B has the highest potential environmental and land use effects as new transmission line and substation development is required and there is no removal of transmission line 610L.
- Option 5 has the second highest potential for environmental and land use effects as new transmission line development is required, however, is slightly preferred over Option 5B due to the removal of transmission line 610L.

Based on the assessment above, Option 5 has lower potential environmental and land use effects then Option 5B.

6.4 Selection of the Preferred Transmission Development Option

Due to similar costs between Option 5 and Option 5B, Option 5 was selected as the preferred alternative based on the lower potential environmental and land use effects compared to Option 5B.

Figure 5-6 shows the simplified diagram for the Preferred Transmission Development.

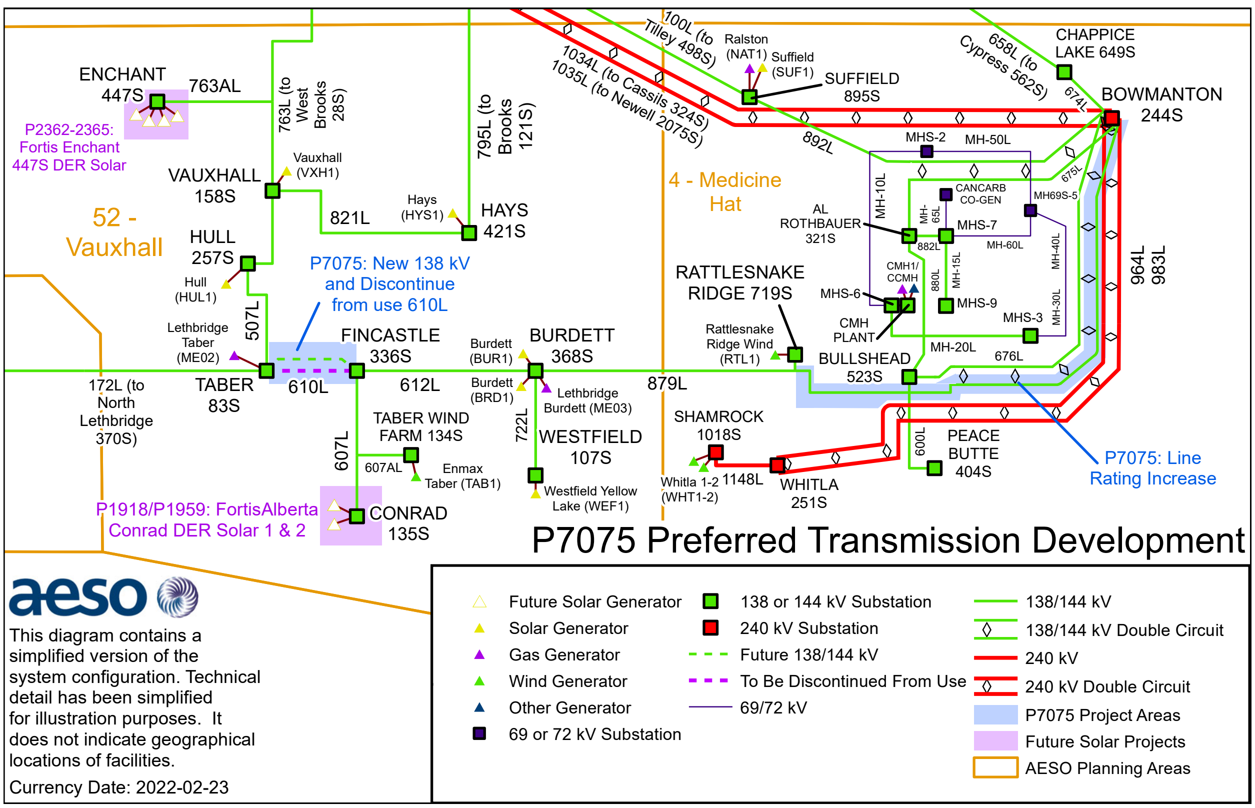

Figure 6-1: VATD Preferred Transmission Development

7 Additional Assessments for the Preferred Transmission Development

7.1 Category B Analysis

Category B power flow analysis was performed with the Preferred Transmission Development in-service. Table 6-1 provides a summary of the Category B power flow results for the Preferred Transmission Development. Power flow SLDs for this assessment are provided in Attachment C: Power Flow SLDs – Preferred Transmission Development Category B.

Table 7-1: Category B Thermal Analysis of Preferred Transmission Development

Monitored Element	Contingency	Scenario	Base (kV)	Rating (MVA)	Loading (%)
879L (368S Burdett to 879AL)	610L (336S Fincastle to 83S Taber)	Scenario 1 (879L)	138	85	144
612L (336S Fincastle to 368S Burdett)				85	113
879L (879AL to 244S Bowmanton)				118	189
879L (879AL to 244S Bowmanton)	612L (336S Fincastle to 368S Burdett)			118	112
879L (368S Burdett to 879AL)	610L (336S Fincastle to 83S Taber)	Scenario 2 (610L)		85	160
612L (336S Fincastle to 368S Burdett)				85	122
879L (879AL to 244S Bowmanton)				118	220
879L (879AL to 244S Bowmanton)	612L (336S Fincastle to 368S Burdett)			118	128
879L (879AL to 244S Bowmanton)	610L (336S Fincastle to 83S Taber)	Scenario 3 (Max)		118	235
879L (368S Burdett to 879AL)				85	172
612L (336S Fincastle to 368S Burdett)				85	127
879L (368S Burdett to 879AL_TAP)	612L (336S Fincastle to 368S Burdett)			118	130

Table 7-2 Category B Voltage Analysis of Preferred Transmission Development

Contingency	Substation	Base Voltage	Scenario	V Max (pu)	V min (pu)	V Observed (pu)
610L (336S Fincastle to 83S Taber)	244S Bowmanton	138 kV	Scenario 2 (610L)	1.1	0.9	0.895
610L (336S Fincastle to 83S Taber)	244S Bowmanton		Scenario 3 (Max)	1.1	0.9	0.866
	879AL			1.1	0.9	0.898

Study results showed various thermal and voltage violations under Category B conditions if RAS to disconnect generation is not utilized. Without the RAS, the most severe thermal overloads occurred on the

138 kV transmission line 879L (879AL to 244S Bowmanton). This section of 138 kV transmission line 879L acts as one of the main 138 kV transfer out paths for the generation connected along the 138 kV path from Bowmanton 244S substation to Taber 83S substation. With the loss of 138 kV transmission line 610L (336S Fincastle to 83S Taber), all generation along the 138 kV path must then travel eastward through the 138 kV transmission system to Bowmanton 244S substation. However, Category B thermal and voltage criteria violations can be mitigated by appropriately designed generation RAS and real-time operation procedures.

7.2 Short-Circuit Analysis

Short-circuit current level analysis was performed for the pre and post Preferred Transmission Development using 2023 and 2031 study cases to determine the maximum short-circuit current levels in the Study Area and vicinity. All generators existing and which have met the AESO project inclusion criteria in the Vauxhall (Area 52) and Medicine Hat (Area 4) planning areas were turned on. Machines and loads which are downstream of the fault bus were not turned off. The Bowmanton 244S substation bus tie breaker is closed in the following studies.

A maximum fault level is provided for the substations in the vicinity of the Preferred Transmission Development assuming normal system operation with all transmission elements in service and generation dispatched. Three-phase faults and single line-to-ground faults were simulated.

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

- Fincastle 336S
- Taber 83S
- Conrad 135S
- Westfield 107S
- Coaldale 254S
- North Lethbridge 370S
- Hull 257S
- Burdett 368S
- Bowmanton 244S

The results are summarized in the following Tables:

Table 7-3: Maximum Short-Circuit Current Levels (2023) – Pre-Project

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-phase Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-phase Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Fincastle 336S	138	139.39	5.3	0.032+0.081j	3.4	0.055+0.225j
Taber 83S	138	138.7	6.8	0.024+0.064j	4.4	0.042+0.175j
Conrad 135S	138	139.96	2.7	0.071+0.160j	1.7	0.125+0.468j

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-phase Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-phase Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Westfield 107S	138	141.96	3	0.055+0.145j	1.8	0.116+0.461j
Coaldale 254S	138	138.52	9.7	0.012+0.045j	6.9	0.020+0.100j
North Lethbridge 370S	138	140.56	13.9	0.006+0.032j	10.3	0.013+0.066j
North Lethbridge 370S	240	242.58	11.7	0.004+0.022j	8.4	0.011+0.047j
Hull 257S	138	140.36	5.8	0.030+0.076j	3.5	0.061+0.239j
Burdett 368S	138	141.73	4.5	0.035+0.098j	2.8	0.068+0.286j
Bowmanton 244S	138	143.45	11.8	0.008+0.041j	10.2	0.010+0.059j
Bowmanton 244S	138	143.45	11.8	0.008+0.041j	10.2	0.010+0.059j
Bowmanton 244S	240	249.97	7.5	0.006+0.038j	7.3	0.009+0.041j

Table 7-4: Maximum Short-Circuit Current Levels (2023) – Post-Project

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-phase Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-phase Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Fincastle 336S	138	138.68	5.4	0.029+0.080j	3.5	0.054+0.216j
Taber 83S	138	139.2	6.8	0.024+0.064j	4.4	0.042+0.174j
Conrad 135S	138	139.13	2.7	0.068+0.160j	1.7	0.125+0.460j
Westfield 107S	138	141.52	3	0.053+0.145j	1.8	0.116+0.456j
Coaldale 254S	138	138.73	9.7	0.012+0.045j	6.9	0.020+0.100j
North Lethbridge 370S	138	140.71	13.9	0.006+0.032j	10.3	0.013+0.066j
North Lethbridge 370S	138	242.71	11.7	0.004+0.022j	8.5	0.011+0.047j
Hull 257S	240	140.72	5.9	0.030+0.076j	3.5	0.061+0.239j
Burdett 368S	138	141.29	4.5	0.033+0.098j	2.8	0.067+0.282j
Bowmanton 244S	138	143.34	11.8	0.008+0.041j	10.2	0.010+0.059j
Bowmanton 244S	138	143.34	11.8	0.008+0.041j	10.2	0.010+0.059j
Bowmanton 244S	240	249.87	7.5	0.006+0.038j	7.3	0.009+0.041j

Table 7-5: Maximum Short-Circuit Current Levels (2031) – Post-Project

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-phase Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-phase Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Fincastle 336S	138	140.85	5	0.030+0.081j	3.4	0.054+0.205j
Taber 83S	138	140.82	6.2	0.026+0.065j	4.2	0.042+0.162j
Conrad 135S	138	140.79	2.5	0.069+0.160j	1.6	0.125+0.451j
Westfield 107S	138	141.88	2.8	0.054+0.144j	1.8	0.092+0.384j
Coaldale 254S	138	142.25	8.6	0.016+0.049j	6.4	0.022+0.100j
North Lethbridge 370S	138	143.11	13.3	0.007+0.032j	11.5	0.008+0.048j
North Lethbridge 370S	240	247.83	11.8	0.004+0.021j	10.1	0.006+0.031j
Hull 257S	138	139.58	5.3	0.031+0.075j	3.6	0.048+0.185j
Burdett 368S	138	141.97	4.3	0.033+0.097j	2.7	0.066+0.267j
Bowmanton 244S	138	140.06	11.6	0.006+0.037j	10.9	0.006+0.044j
Bowmanton 244S	138	140.06	11.6	0.006+0.037j	10.9	0.006+0.044j
Bowmanton 244S	240	250.96	7.2	0.004+0.035j	7.7	0.005+0.029j

The observed short-circuit levels for post Preferred Transmission Development were not significantly higher than the levels of the pre–Preferred Transmission Development. Short-circuit levels were found to be within the designed capabilities of the nearby facilities.

7.3 Transient Stability Analysis

The transmission system was found to be stable for studied Category B contingencies for the post Preferred Transmission Development. Details of protection fault clearing times for selected contingencies and results are provided in Attachment D: Transient Stability Analysis.

8 Congestion Assessment

The AESO conducted additional congestion assessment with the Preferred Transmission Development modeled to re-affirm the planning recommendations made in this planning report. To understand the potential risk of further congestion in the Study Area, two sensitivity scenarios were developed in which additional generation in the Study Area was included. One sensitivity scenario considered a future in which four Taber 83S DER projects are energized by end of 2022. The other sensitivity scenario considered a future in which an additional solar generator is connected at the Burdett 368S substation.

In all three scenarios post Preferred Transmission Development, the expected frequency and magnitude of congestion were low and within limit. For the detailed congestion assessment studies and results refer to the Congestion Assessment Report[11].

[11] Filed under a separate cover in the AESO's *Needs Identification Document for the Vauxhall Area Transmission Development*.

9 Alignment with AESO's Long Term Plan

The AESO's long-term transmission system plans are high-level assessments of transmission capability and required transmission system development in Alberta focusing on broad technical aspects. More detailed studies are performed in preparation of a needs identification document application to ensure that the AESO's Preferred Transmission Development will address the identified reliability violations in the most efficient manner.

The Preferred Transmission Development proposed by the AESO in this Application is aligned with the *AESO 2022 Long-term Transmission Plan* (2022 LTP). The 2022 LTP identified the need for transmission development on the 138 kV transmission system in the South sub-region to accommodate new generation connection in the Vauxhall (Area 52) and Medicine Hat (Area 4) planning areas.

10 Project Interdependencies

The Preferred Transmission Development is not dependent on other transmission developments that are currently planned within the AIES in this timeframe.

11 Summary and Conclusions

The AESO conducted planning studies to assess the need for transmission development in the Vauxhall (Area 52) and Medicine Hat (Area 4) planning areas, specifically on the 138 kV path from Bowmanton 244S substation to Taber 83S substation. Planning study results demonstrate that the Pre-Development transmission system does not have sufficient capacity to reliably integrate existing and future generation projects that meet the AESO's project inclusion criteria in the Study Area without Category A congestion. Therefore, there is a need for transmission development in the Study Area to alleviate the identified thermal criteria violations.

Transmission Development Options and Performance Assessment

To alleviate the identified constraints in the Study Area, the AESO investigated seven Transmission Development Options, taking into careful consideration the cost, additional generation integration capability and land use and environmental effects.

Based on the planning study results, Options 1 and 2 were not recommended for further consideration due to technical performance. Options 3, 4, 5, 5A, and 5B were all technically feasible. Cost estimates were compared to assist in the selection of the Preferred Transmission Development.

Although Options 3, 5A and 5B had the lowest initial capital costs, the 138 kV transmission lines 610L is 60-years old and replacement is expected in the next 10 to 15 years. The cost associated with the 610L end of life replacement was taken into consideration. Options 3,4 and 5A were not recommended for further consideration due to their higher new estimated total cost. AltaLink conducted a Net Present Value (NPV) assessment of Option 5 and 5B to account for the future cost of construction to replace the end-of-life transmission line to determine if deferring the discontinued use for transmission purposes of 138 kV transmission line 610L creates a cost savings opportunity. Results indicated that Options 5 and 5B had approximately equal NPV, negating any potential cost savings of deferring the discontinued use for transmission purposes of 138 kV transmission line 610L.

With lower potential environmental and land use effects when compared to Option 5B, Option 5 was selected as the Preferred Transmission Development.

The Preferred Transmission Development involves adding a 138 kV circuit, approximately 15 km in length, between the existing Fincastle 336S and Taber 83S substations with a minimum capacity of approximately 173 MVA, discontinuing from use for transmission purposes the existing 138 kV transmission line 610L, between Fincastle 336S and Taber 83S substations, after the new 138 kV circuit is in service and increasing the minimum capacity of the existing 138 kV transmission line 879L (between 879AL and the Bowmanton 244S substation) to approximately 118 MVA. In the case that a generation project arises in the next 2 years, and the AESO determines that the existing 138 kV transmission line 610L is the most efficient and cost effective way to provide transmission system access to the generation project, the AESO at that time may decide to utilize and not discontinue from use for transmission purposes the existing 138 kV transmission line 610L. Prior to the energization of the Preferred Transmission Development in the Study Area, near term Category A thermal criteria violations can be managed by operational measures in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

Appendix A: Transmission Planning Criteria – Basis and Assumptions

Transmission Planning Criteria - Basis and Assumptions

Version 1.0

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1. Introduction

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

2. Transmission Reliability Standards and Criteria[1]

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

1. **TPL-001-AB-0: System Performance Under Normal Conditions**
   Category A represents a normal system condition with all elements in service (N-0). All equipment must be within its applicable rating, voltages must be within their applicable ratings and the system must be stable with no cascading outages. Under Category A, electric supply to load cannot be interrupted and generating units cannot be removed from service.

2. **TPL-002-AB-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-AB-2: Establishing and Communicating System Operating Limits**
   The AESO is required to establish system operating limits where a contingency is not mitigated through construction of transmission facilities.

[1] A complete description of these standards are given in: AESO. *Alberta Reliability Standards*. Available from http://www.aeso.ca/rulesprocedures/17004.html

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

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)
C	Any combination of two elements such as: A Line and a Generator A Line and a Reactive Power Source Two Generators Two Circuits Two Transformers Two Reactive Power Sources DC Bipole	≥ 2.5%	50% of Margin Requirement in Level A
D	Any combination of three or more elements. i.e.: 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	Near End	Far End
kV	Cycles	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

Fault Clearing Time			Fault Clearing Time			Fault Clearing Time		
138/144 kV			240 kV			500 kV		
Near End	Far End	2nd Ckt (for C5 and C7 Only)	Near End	Far End	2nd Ckt (for C5 and C7 Only)	Near End	Far End	2nd Ckt (for C5 and C7 Only)
15	24	24	12	6	14	9	5	11

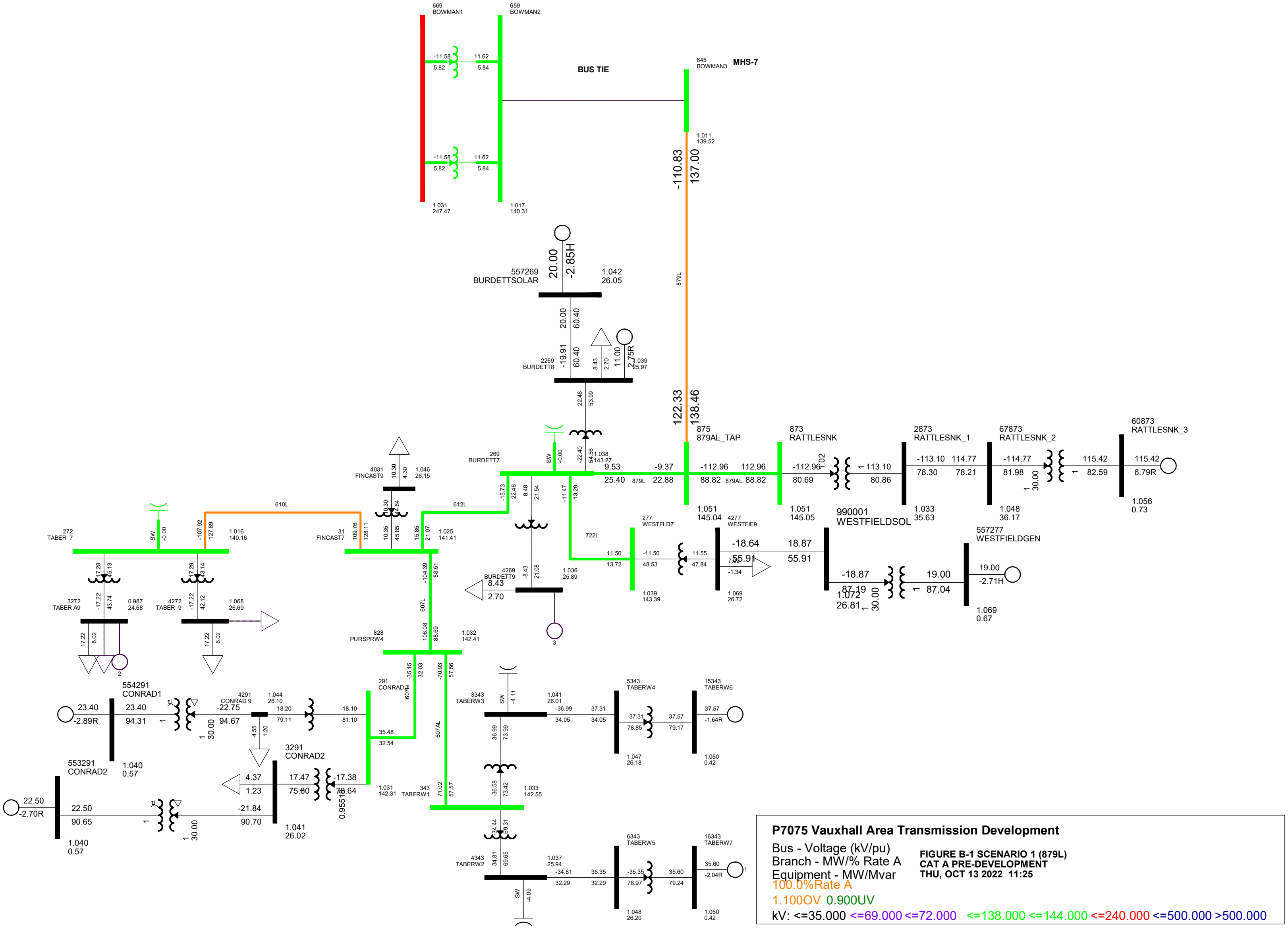
Table 2-5: Stuck Breaker Clearing Times for Transformers

Fault Clearing Time (Cycles)						Fault Clearing Time (Cycles)					
240/138 kV						500/240 kV					
Fault on 240 kV Side			Fault on 138 kV Side			Fault on 500 kV Side			Fault on 240 kV Side		
240 kV Side	138 kV Side	2nd Ckt (for Breaker Fail)	138 kV Side	240 kV Side	2nd Ckt (for Breaker Fail)	500 kV Side	240 kV Side	2nd Ckt (for Breaker Fail)	240 kV Side	500 kV Side	2nd Ckt (for Breaker Fail)
12	6	14	15	5	24	9	5	11	12	4	14

Attachment B: Power Flow SLDs – Preferred Transmission Development Category B

Table 1: Study Summary

No.	Case	Capability Category	Option	Contingency	Figure
1	Scenario 1 (879L)	A	Pre-development	Base	Figure B-1
2	Scenario 2 (610L)	A	Pre-development	Base	Figure B-2
3	Scenario 3 (MAX)	A	Pre-development	Base	Figure B-3
4	Scenario 1 (879L)	A	Pre-development Existing Cap.	Base	Figure B-4
5	Scenario 2 (610L)	A	Pre-development Existing Cap.	Base	Figure B-5
6	Scenario 3 (MAX)	A	Pre-development Existing Cap.	Base	Figure B-6


BUS TIE
MHS-7
669 BOWMAN1
659 BOWMAN2
645 BOWMAN3
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
828 PURSPRW4
291 CONRAD
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
4343 TABERW2
5343 TABERW4
15343 TABERW6
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-1 SCENARIO 1 (879L)
CAT A PRE-DEVELOPMENT
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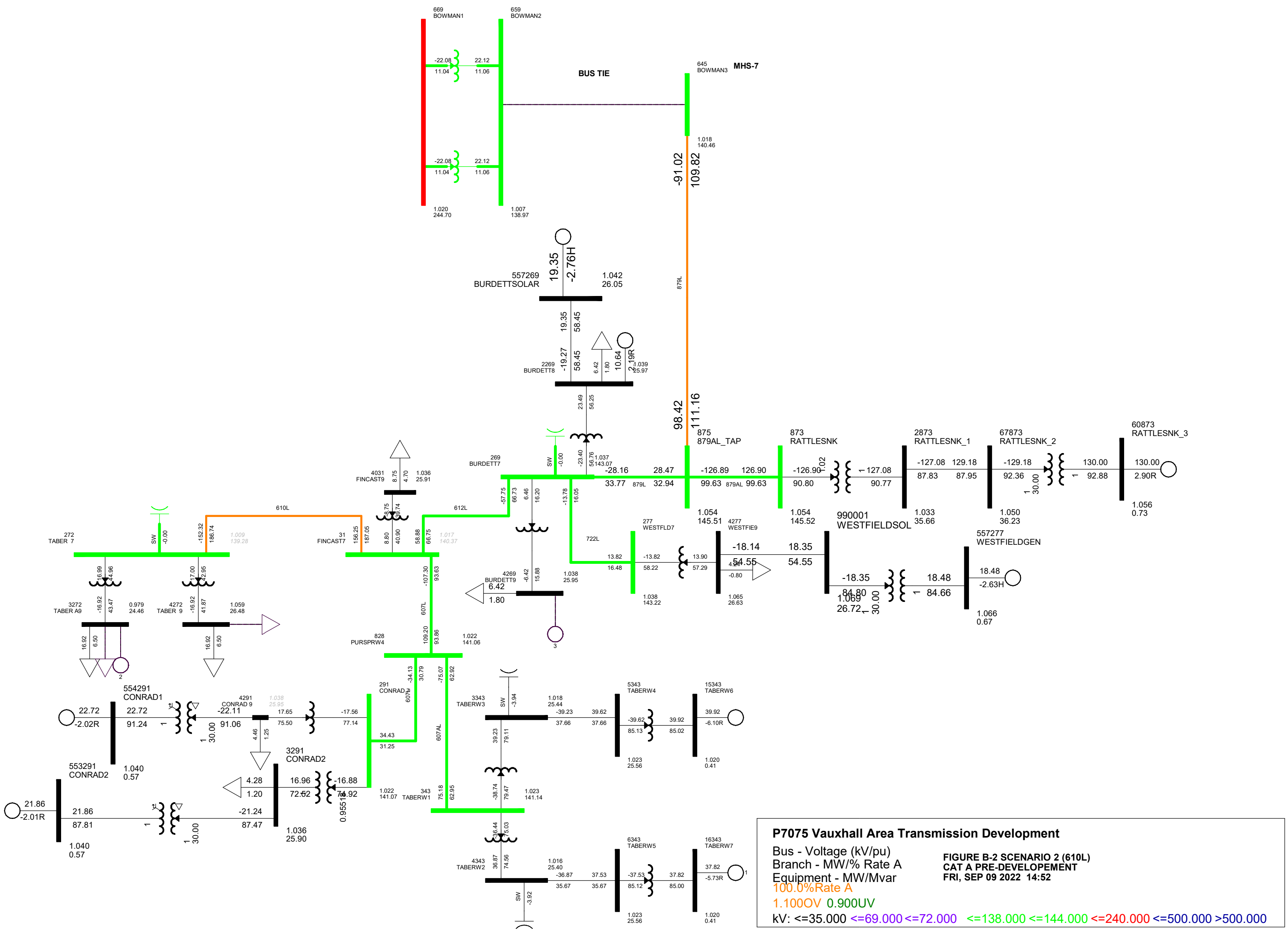
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-2 SCENARIO 2 (610L)
CAT A PRE-DEVELOPEMENT
FRI, SEP 09 2022 14:52
BUS TIE
MHS-7
669 BOWMAN1
659 BOWMAN2
645 BOWMAN3
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
291 CONRAD
3343 TABERW3
5343 TABERW4
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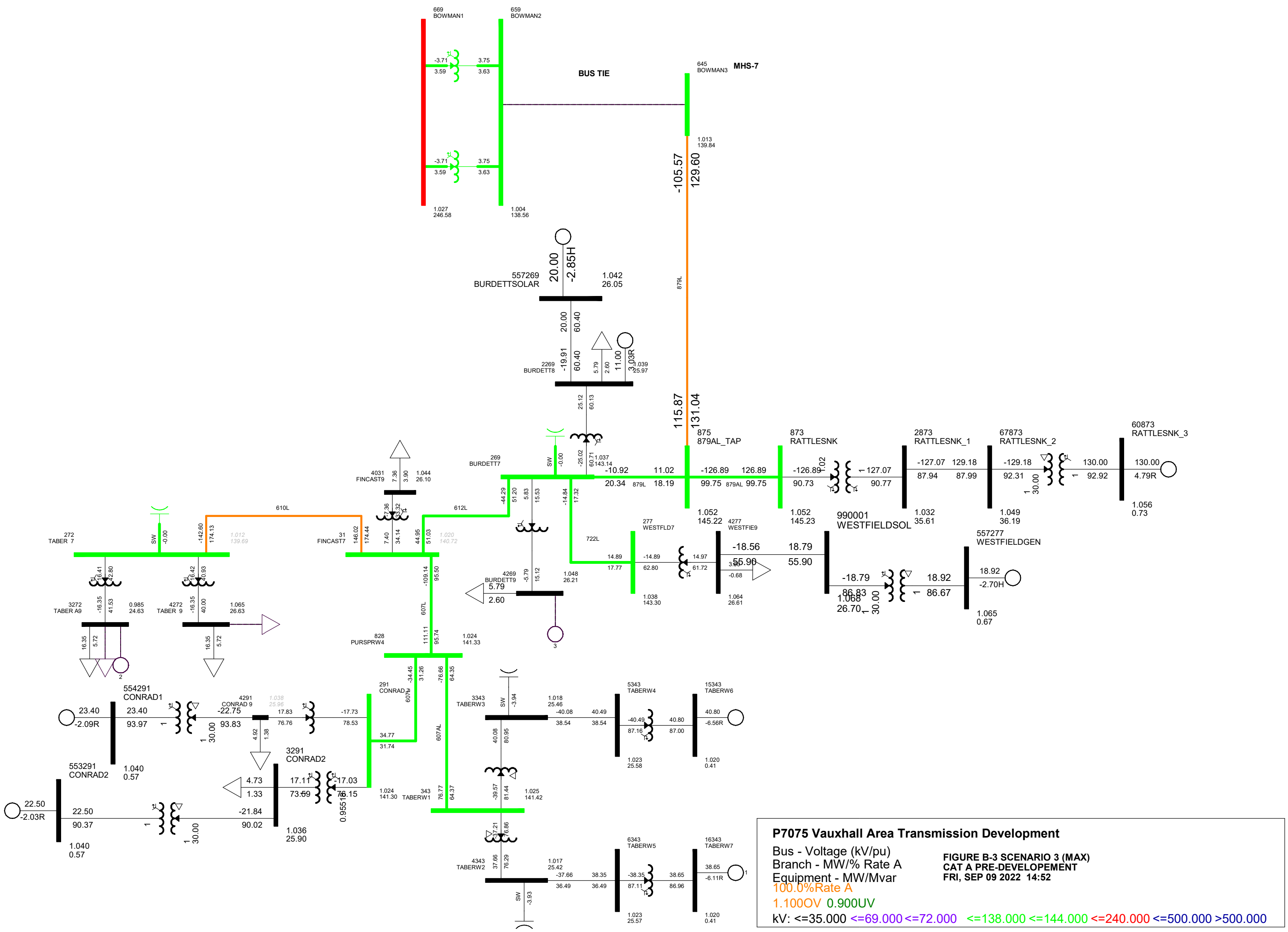
722L
607L
607AL


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD7
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
607L
607AL
879L
879AL
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-3 SCENARIO 3 (MAX)
CAT A PRE-DEVELOPEMENT
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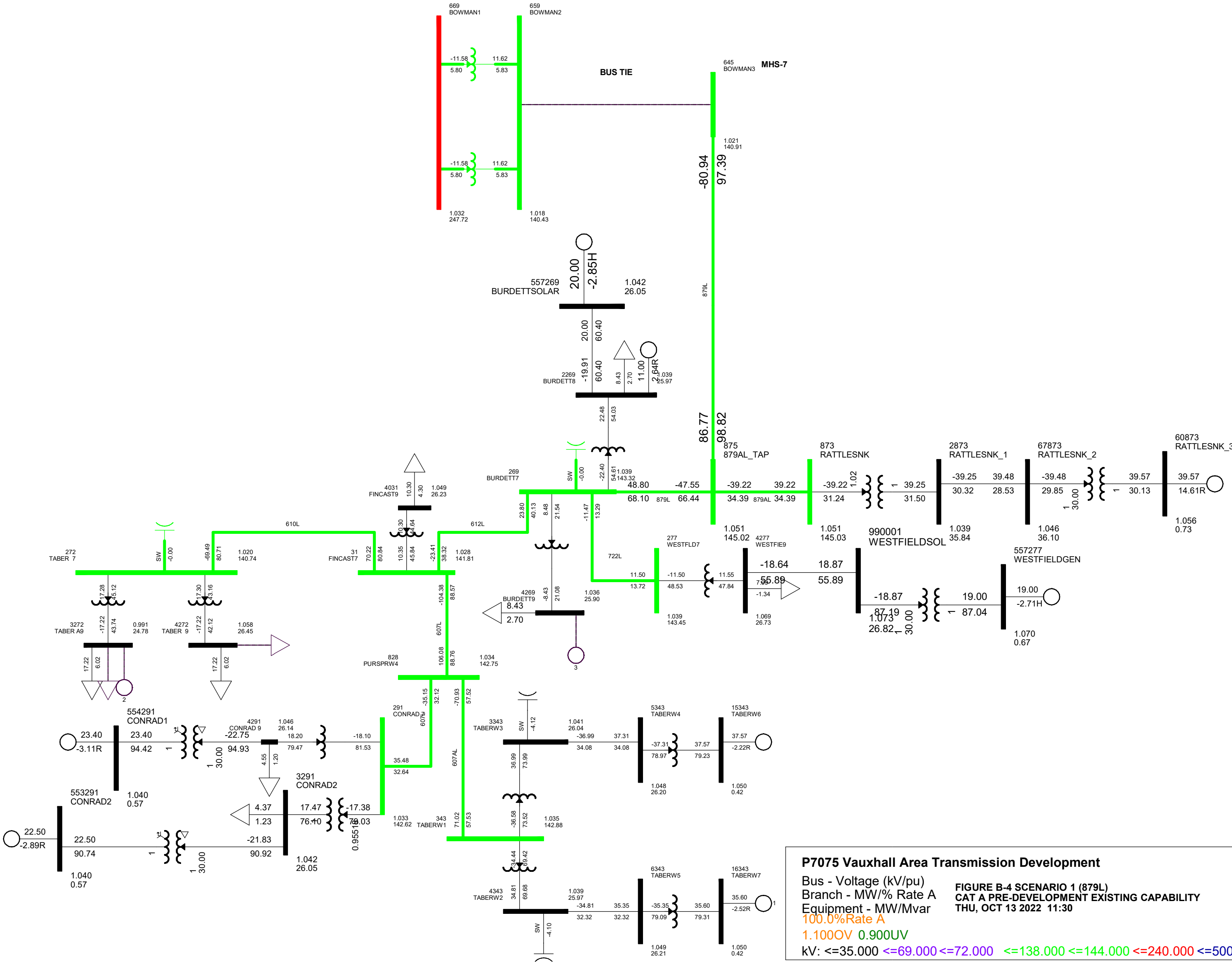
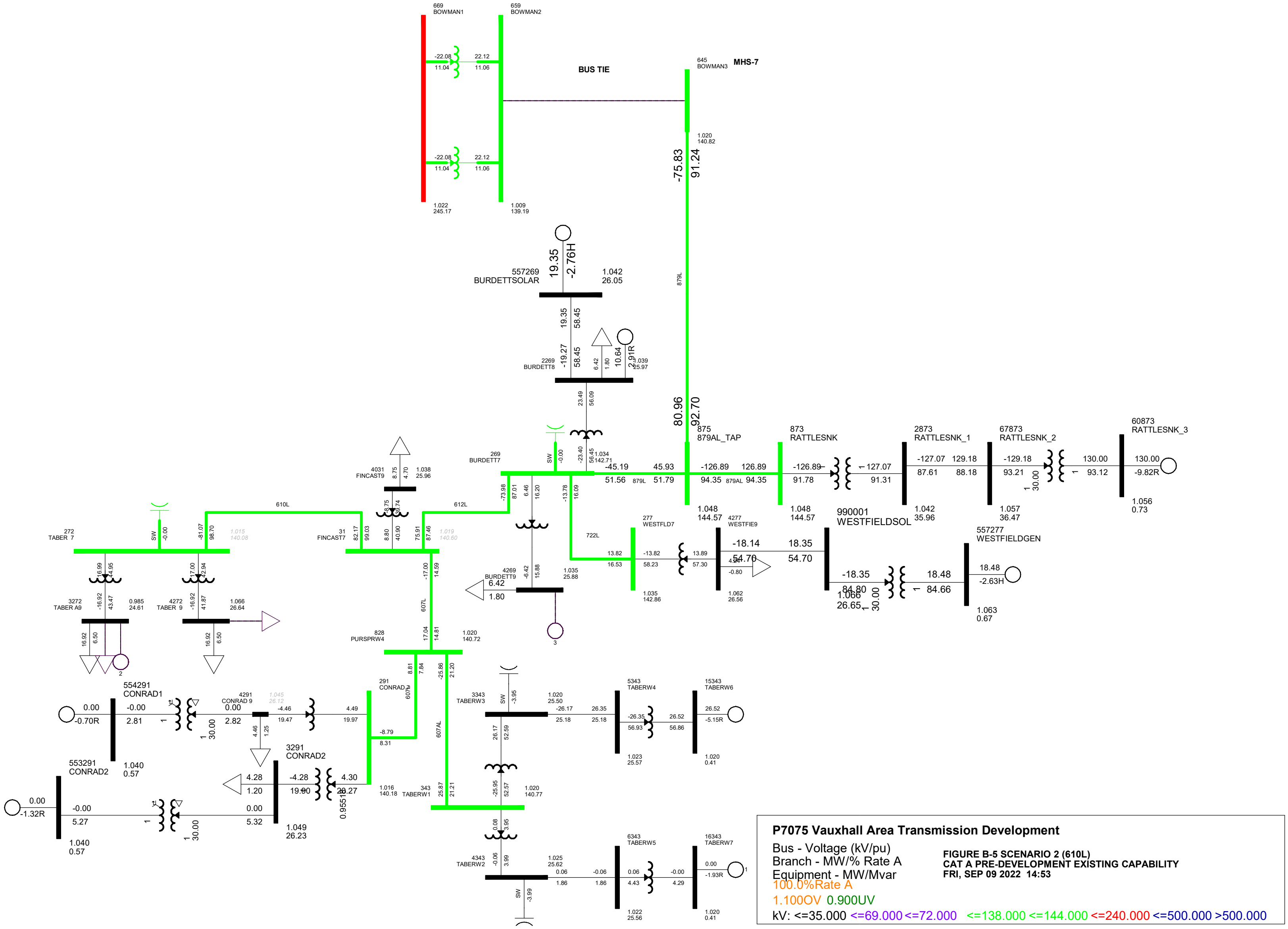
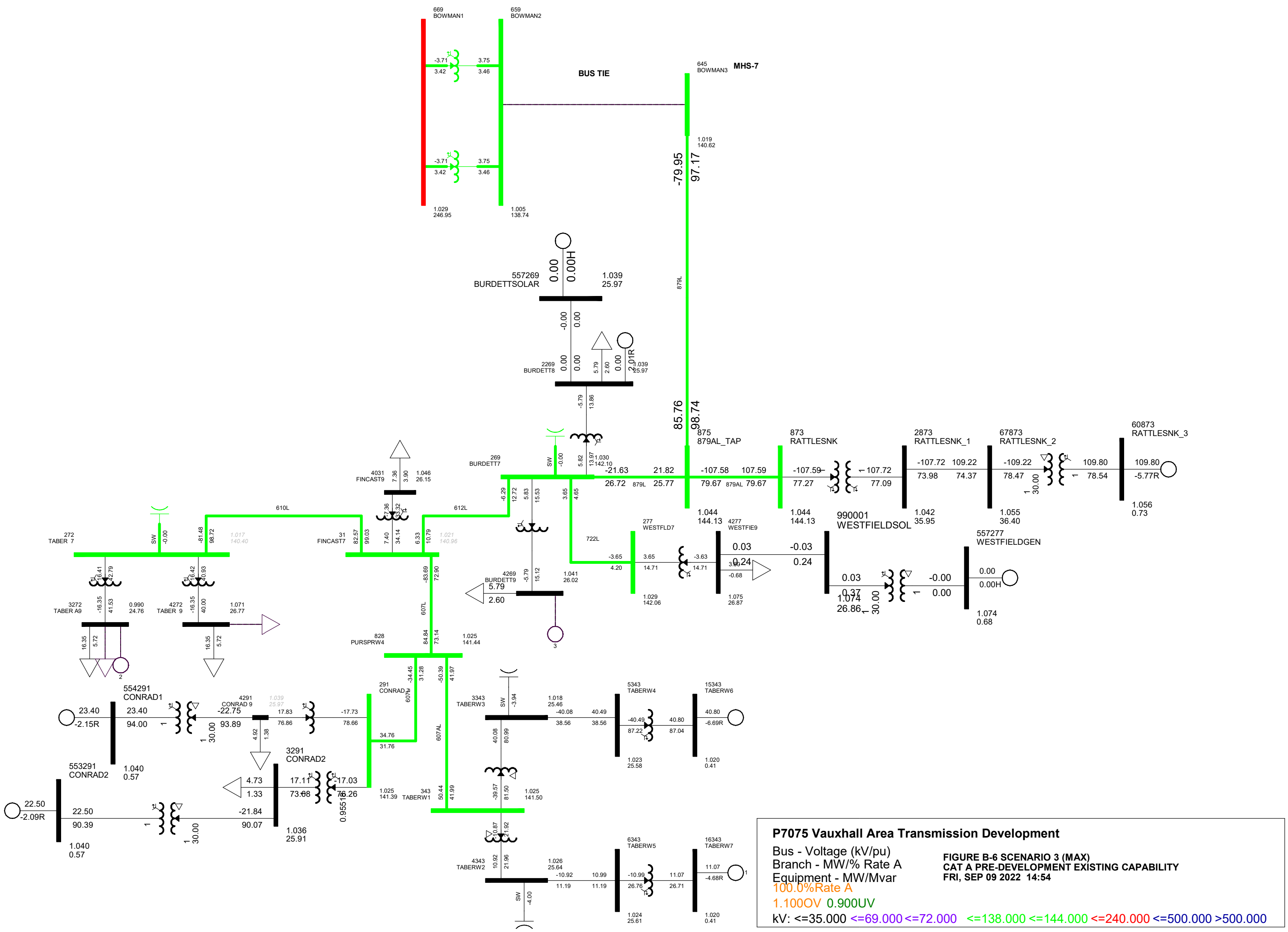


P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE B-4 SCENARIO 1 (879L)
CAT A PRE-DEVELOPMENT EXISTING CAPABILITY
THU, OCT 13 2022 11:30


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-5 SCENARIO 2 (610L)
CAT A PRE-DEVELOPMENT EXISTING CAPABILITY
FRI, SEP 09 2022 14:53
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
5343 TABERW4
15343 TABERW6
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
607L
607AL
722L
879L


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-6 SCENARIO 3 (MAX)
CAT A PRE-DEVELOPMENT EXISTING CAPABILITY
FRI, SEP 09 2022 14:54

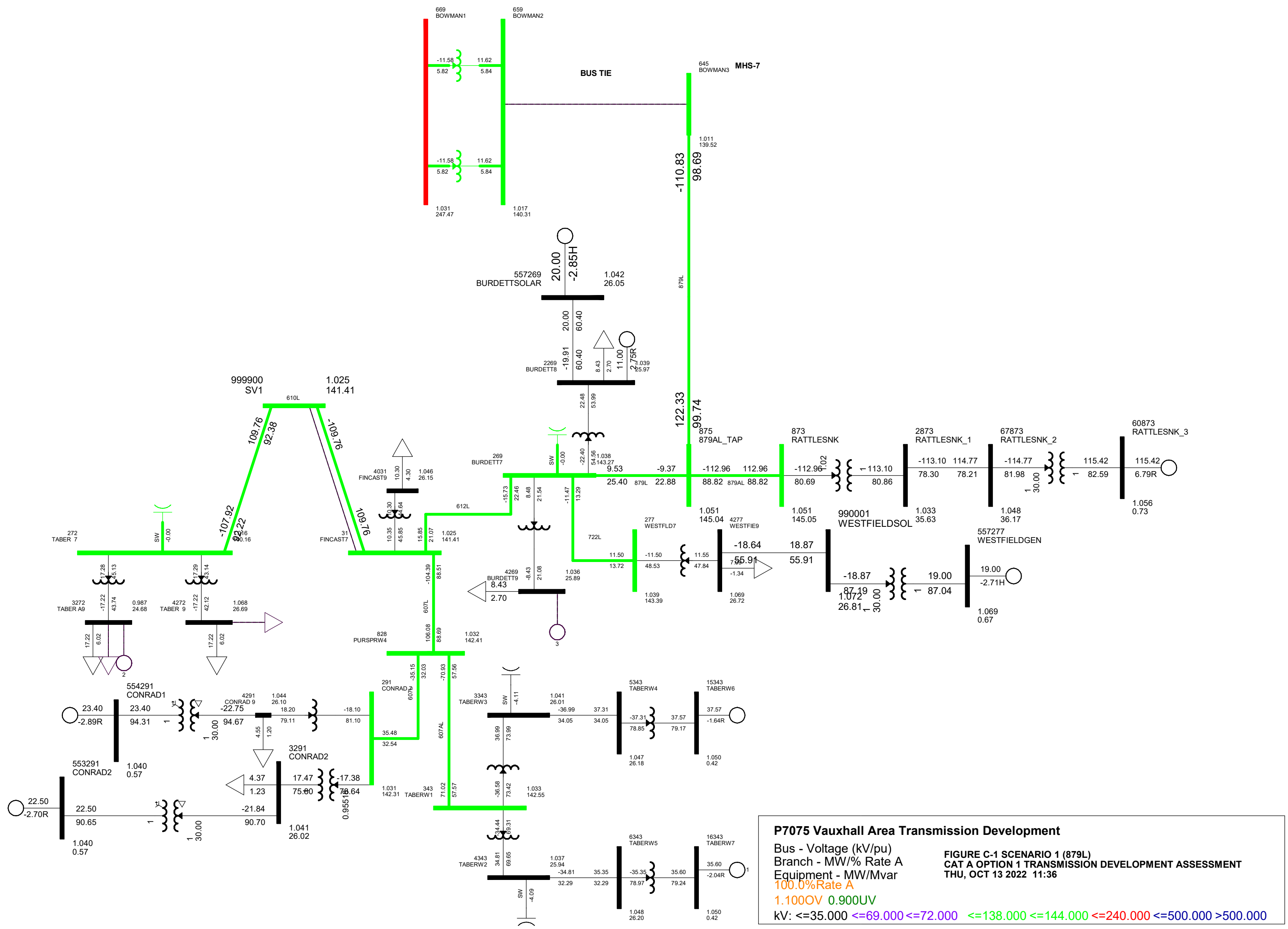
Appendix C: Power Flow SLDs – Assessment of Transmission Development Options

Table 1: Study Summary

No.	Case	Capability Category	Option	Contingency	Figure
1	Scenario 1 (879L)	A	Option 1	Base	Figure C-1
2	Scenario 2 (610L)	A	Option 1	Base	Figure C-2
3	Scenario 3 (MAX)	A	Option 1	Base	Figure C-3
4	Scenario 1 (879L)	A	Option 2	Base	Figure C-4
5	Scenario 2 (610L)	A	Option 2	Base	Figure C-5
6	Scenario 3 (MAX)	A	Option 2	Base	Figure C-6
7	Scenario 1 (879L)	A	Option 3	Base	Figure C-7
8	Scenario 2 (610L)	A	Option 3	Base	Figure C-8
9	Scenario 3 (MAX)	A	Option 3	Base	Figure C-9
10	Scenario 1 (879L)	A	Option 4	Base	Figure C-10
11	Scenario 2 (610L)	A	Option 4	Base	Figure C-11
12	Scenario 3 (MAX)	A	Option 4	Base	Figure C-12
13	Scenario 1 (879L)	A	Option5	Base	Figure C-13
14	Scenario 2 (610L)	A	Option5	Base	Figure C-14

No.	Case	Capability Category	Option	Contingency	Figure
15	Scenario 3 (MAX)	A	Option5	Base	Figure C-15
16	Scenario 1 (879L)	A	Option 5A	Base	Figure C-16
17	Scenario 2 (610L)	A	Option 5A	Base	Figure C-17
18	Scenario 3 (MAX)	A	Option 5A	Base	Figure C-18
19	Scenario 1 (879L)	A	Option 5A	Base	Figure C-19
20	Scenario 2 (610L)	A	Option 5B	Base	Figure C-20
21	Scenario 3 (MAX)	A	Option 5B	Base	Figure C-21
22	Scenario 1 (879L)	A	Option 3 Capability	Base	Figure C-22
23	Scenario 2 (610L)	A	Option 3 Capability	Base	Figure C-23
24	Scenario 3 (MAX)	A	Option 3 Capability	Base	Figure C-24
25	Scenario 1 (879L)	A	Option 4 Capability	Base	Figure C-25
26	Scenario 2 (610L)	A	Option 4 Capability	Base	Figure C-26
27	Scenario 3 (MAX)	A	Option 4 Capability	Base	Figure C-27
28	Scenario 1 (879L)	A	Option5 Capability	Base	Figure C-28

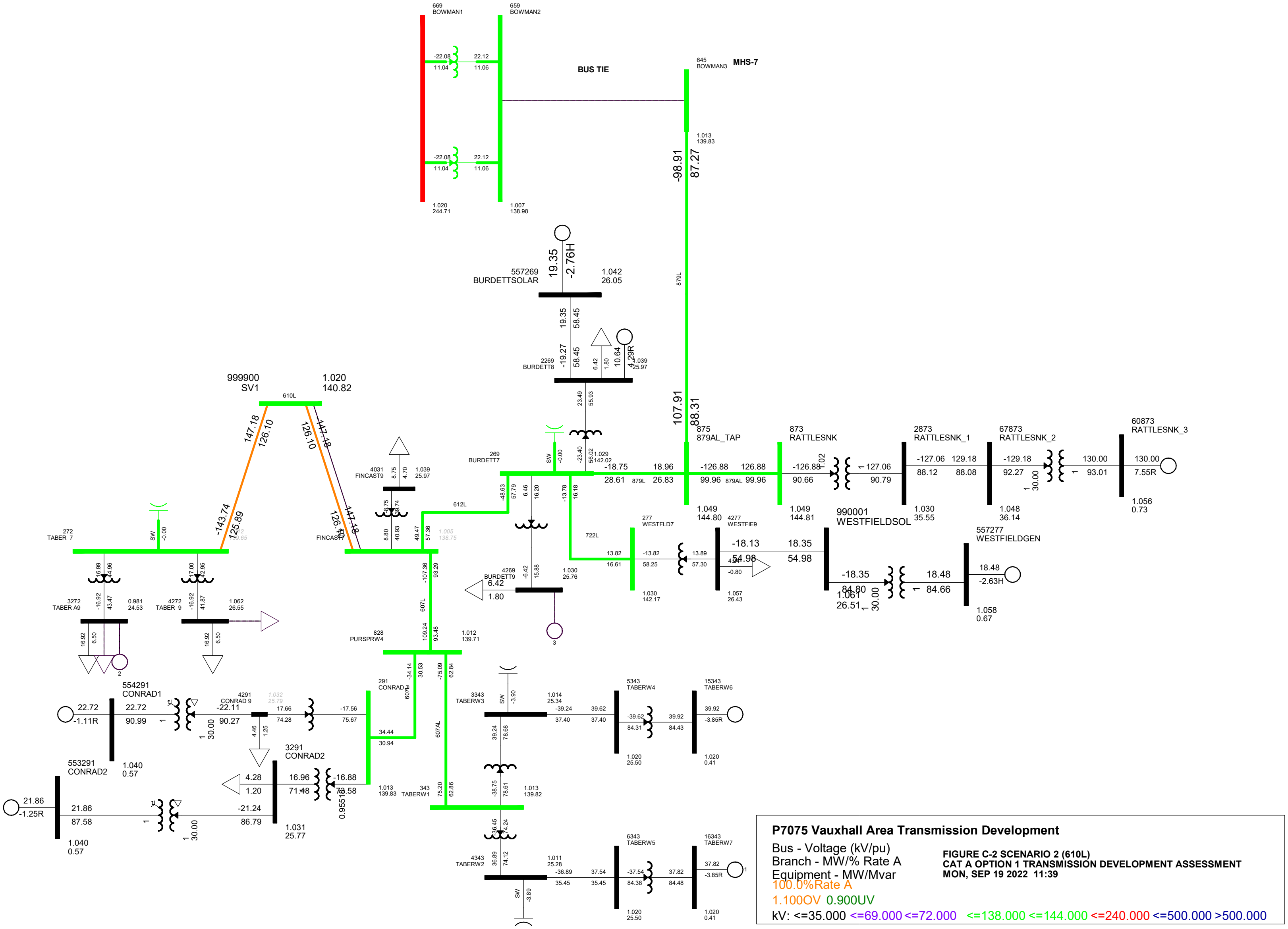
No.	Case	Capability Category	Option	Contingency	Figure
29	Scenario 2 (610L)	A	Option5 Capability	Base	Figure C-29
30	Scenario 3 (MAX)	A	Option5 Capability	Base	Figure C-30
31	Scenario 1 (879L)	A	Option 5A Capability	Base	Figure C-31
32	Scenario 2 (610L)	A	Option 5A Capability	Base	Figure C-32
33	Scenario 3 (MAX)	A	Option 5A Capability	Base	Figure C-33
34	Scenario 1 (879L)	A	Option 5A Capability	Base	Figure C-34
35	Scenario 2 (610L)	A	Option 5B Capability	Base	Figure C-35
36	Scenario 3 (MAX)	A	Option 5B Capability	Base	Figure C-36



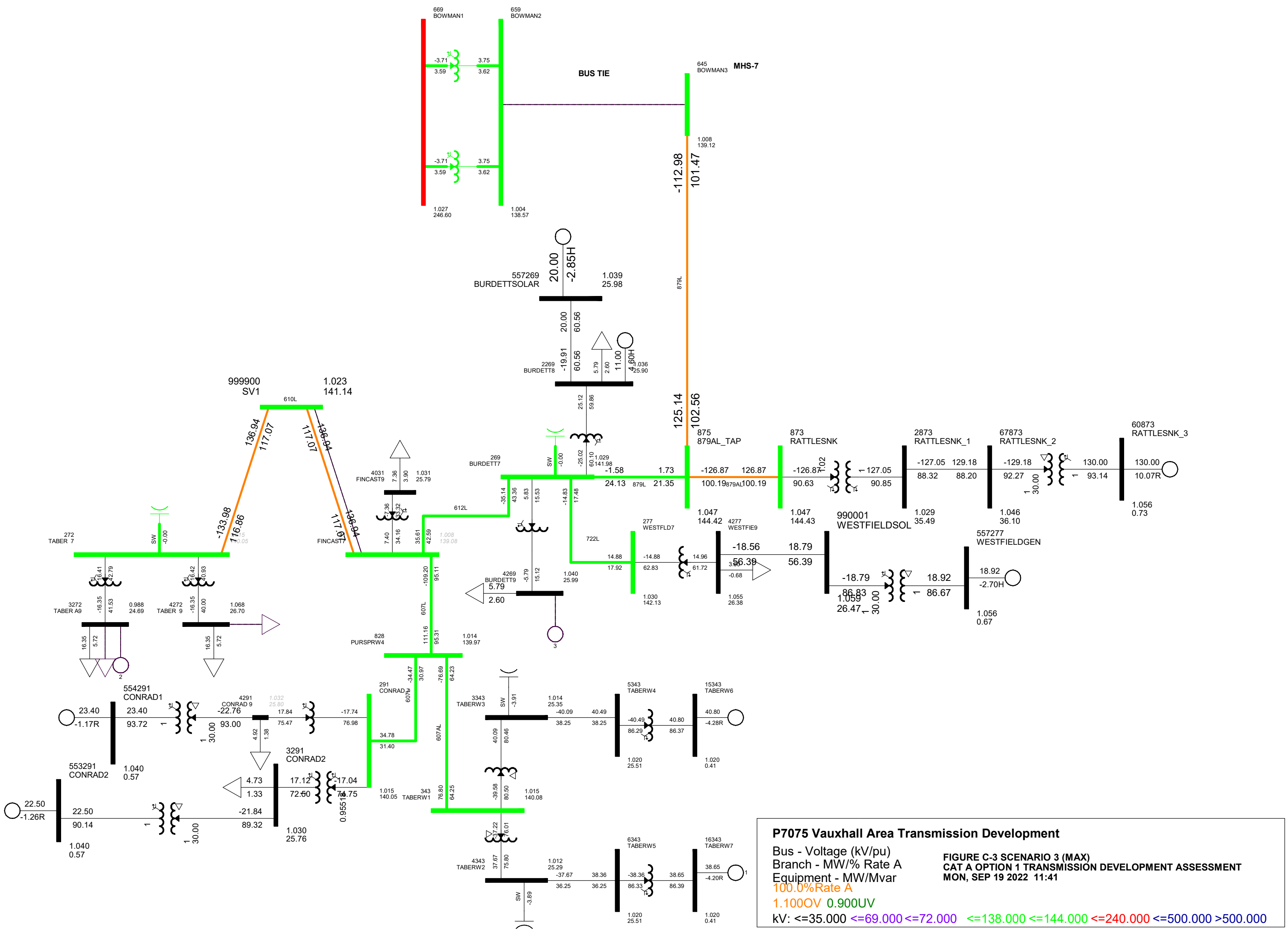
P7075 Vauxhall Area Transmission Development

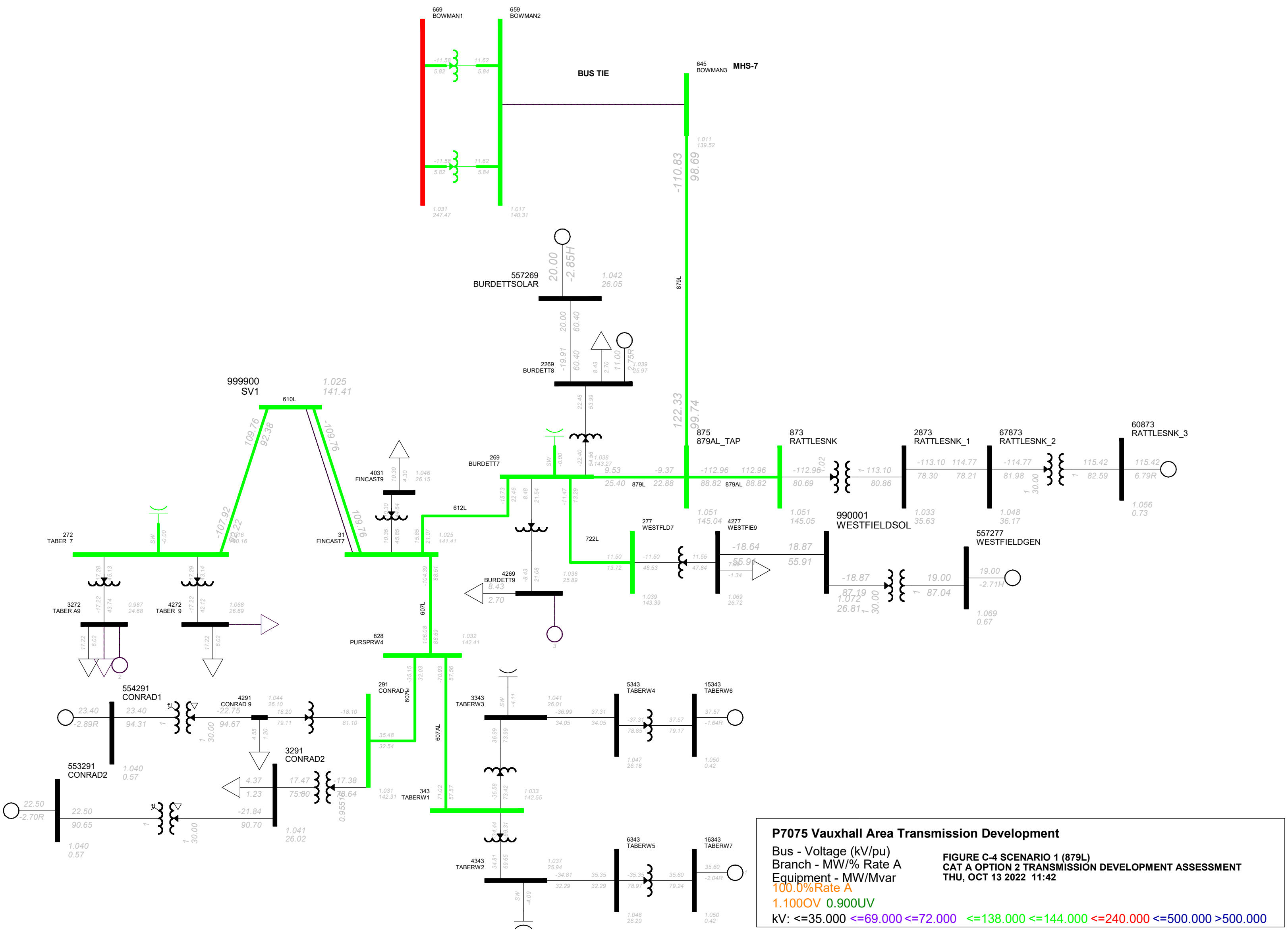
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

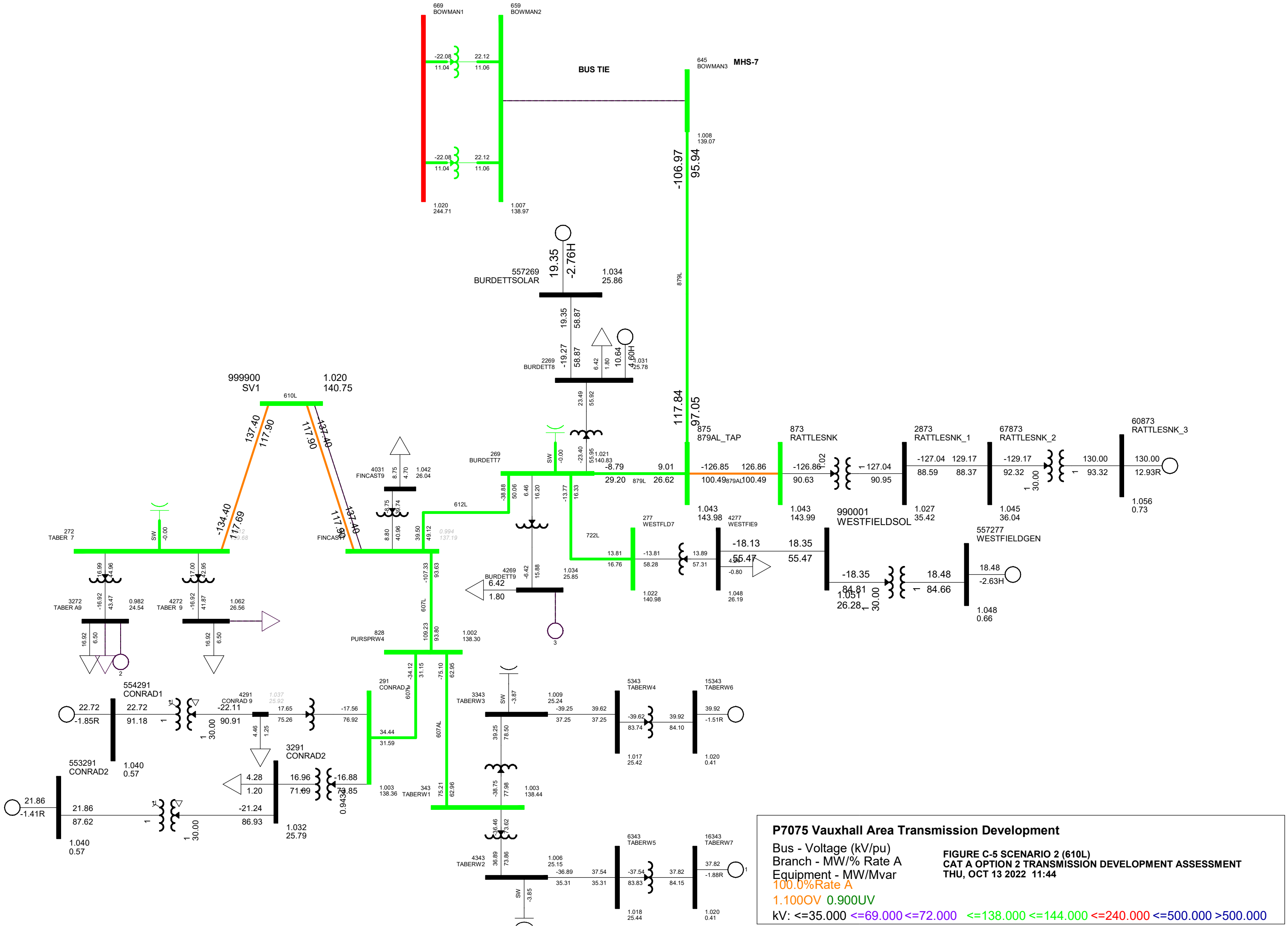
FIGURE C-1 SCENARIO 1 (879L)
CAT A OPTION 1 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:36

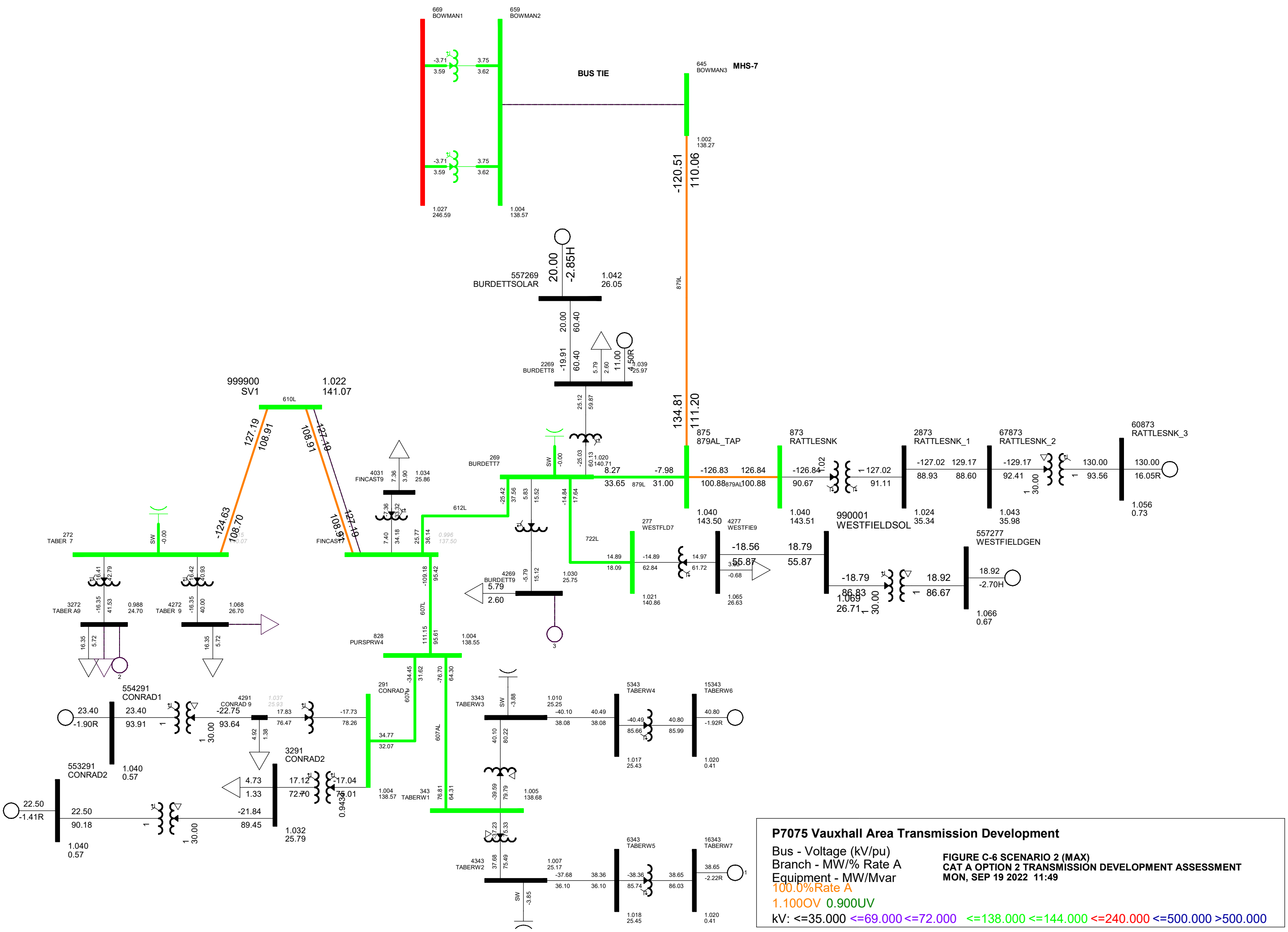


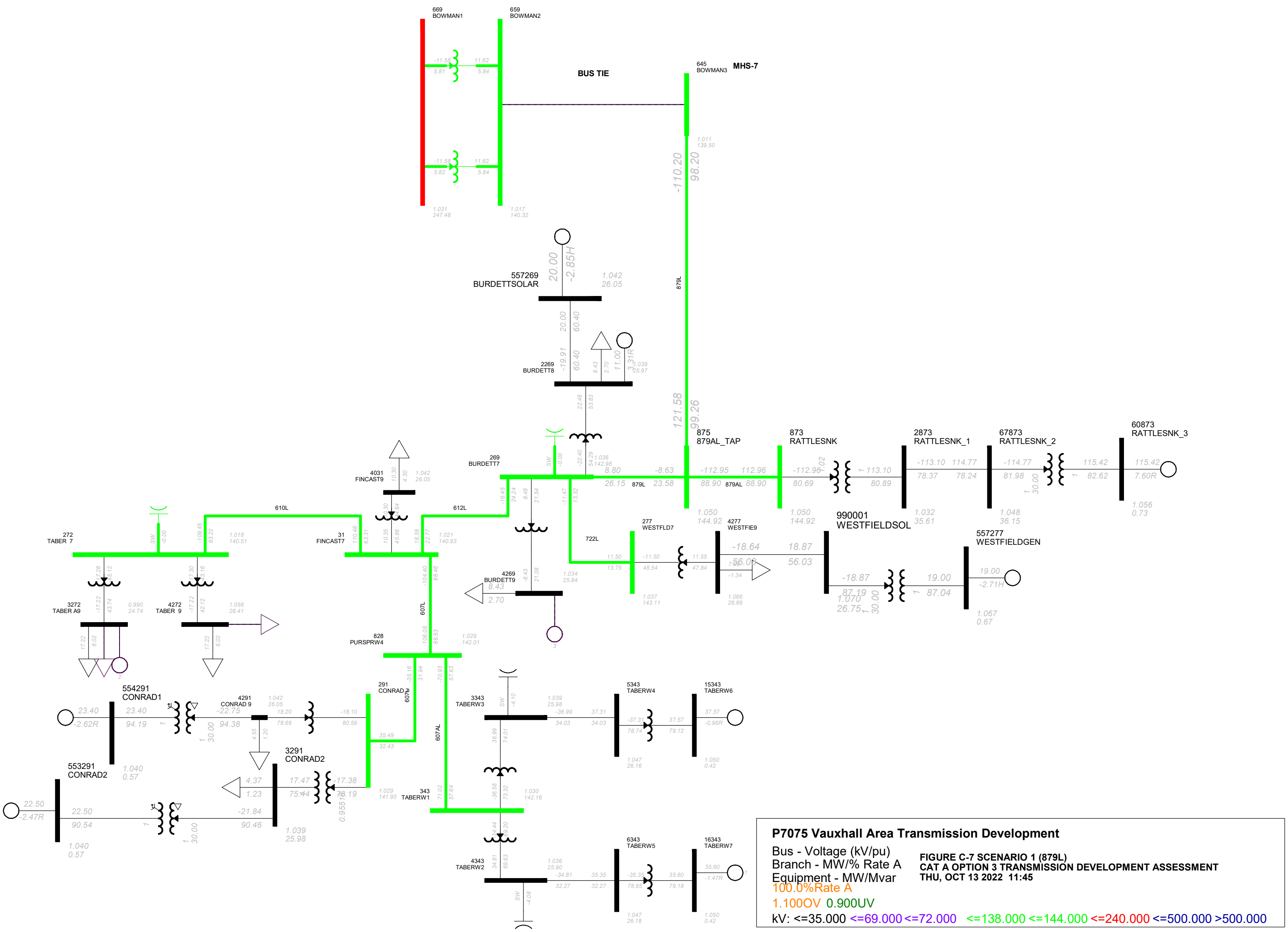
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-2 SCENARIO 2 (610L)
CAT A OPTION 1 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 11:39
BUS TIE
MHS-7
669 BOWMAN1
659 BOWMAN2
645 BOWMAN3
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
999900 SV1
272 TABER 7
4031 FINCAST9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
291 CONRAD
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
3272 TABER A9
4272 TABER 9

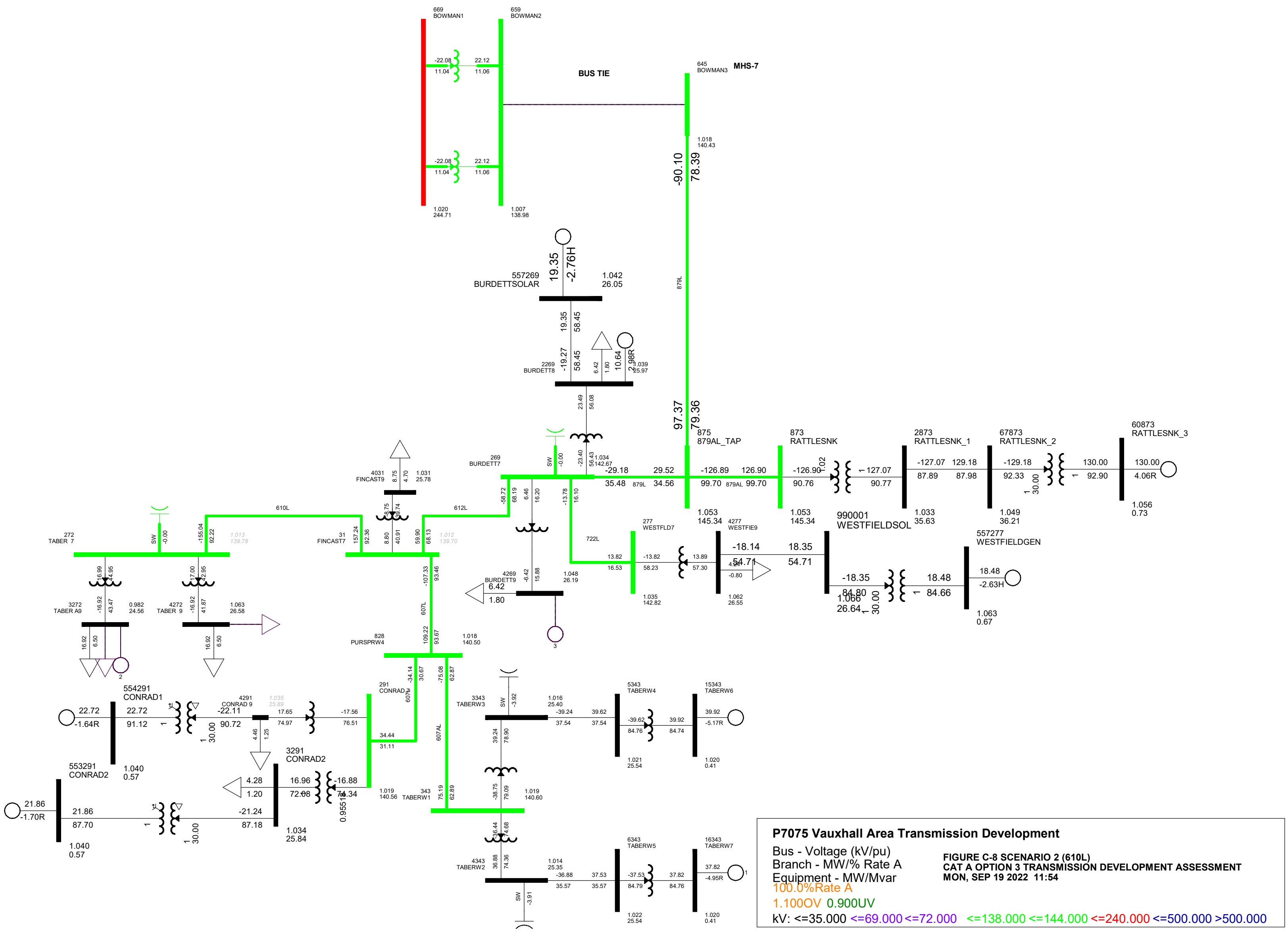

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-3 SCENARIO 3 (MAX)
CAT A OPTION 1 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 11:41
BUS TIE
MHS-7
669 BOWMAN1
659 BOWMAN2
645 BOWMAN3
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
999900 SV1
272 TABER 7
3272 TABER A9
4272 TABER 9
4031 FINCAST9
FINCAST7
828 PURSPRW4
291 CONRAD
4291 CONRAD 9
3291 CONRAD2
554291 CONRAD1
553291 CONRAD2
343 TABERW1
3343 TABERW3
4343 TABERW2
5343 TABERW4
6343 TABERW5
15343 TABERW6
16343 TABERW7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN

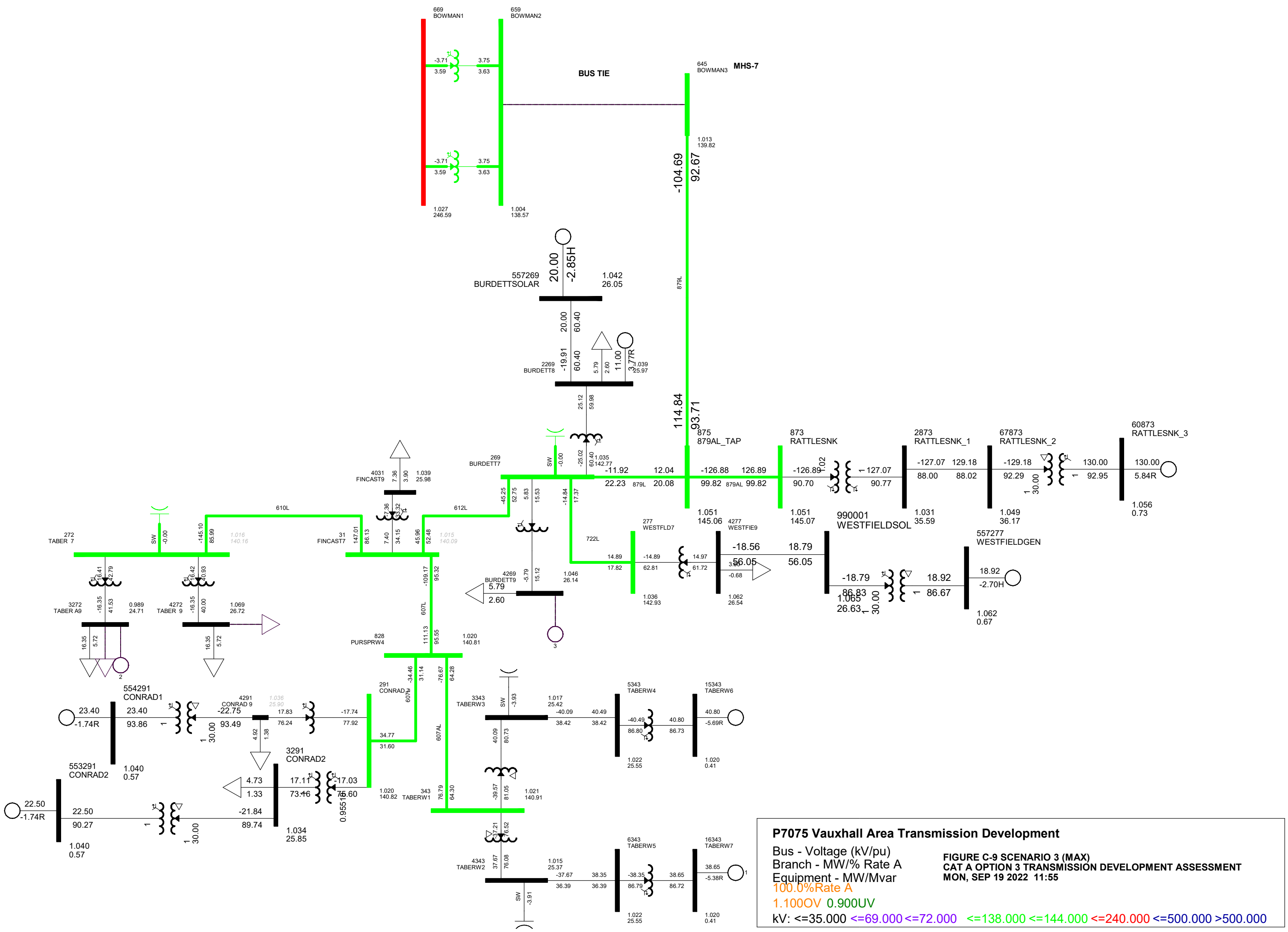

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-4 SCENARIO 1 (879L)
CAT A OPTION 2 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:42
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
999900 SV1
610L
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
612L
722L
607L
879L
879AL
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
828 PURSPRW4
291 CONRAD 7
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
607AL
3343 TABERW3
343 TABERW1
4343 TABERW2
5343 TABERW4
15343 TABERW6
6343 TABERW5
16343 TABERW7

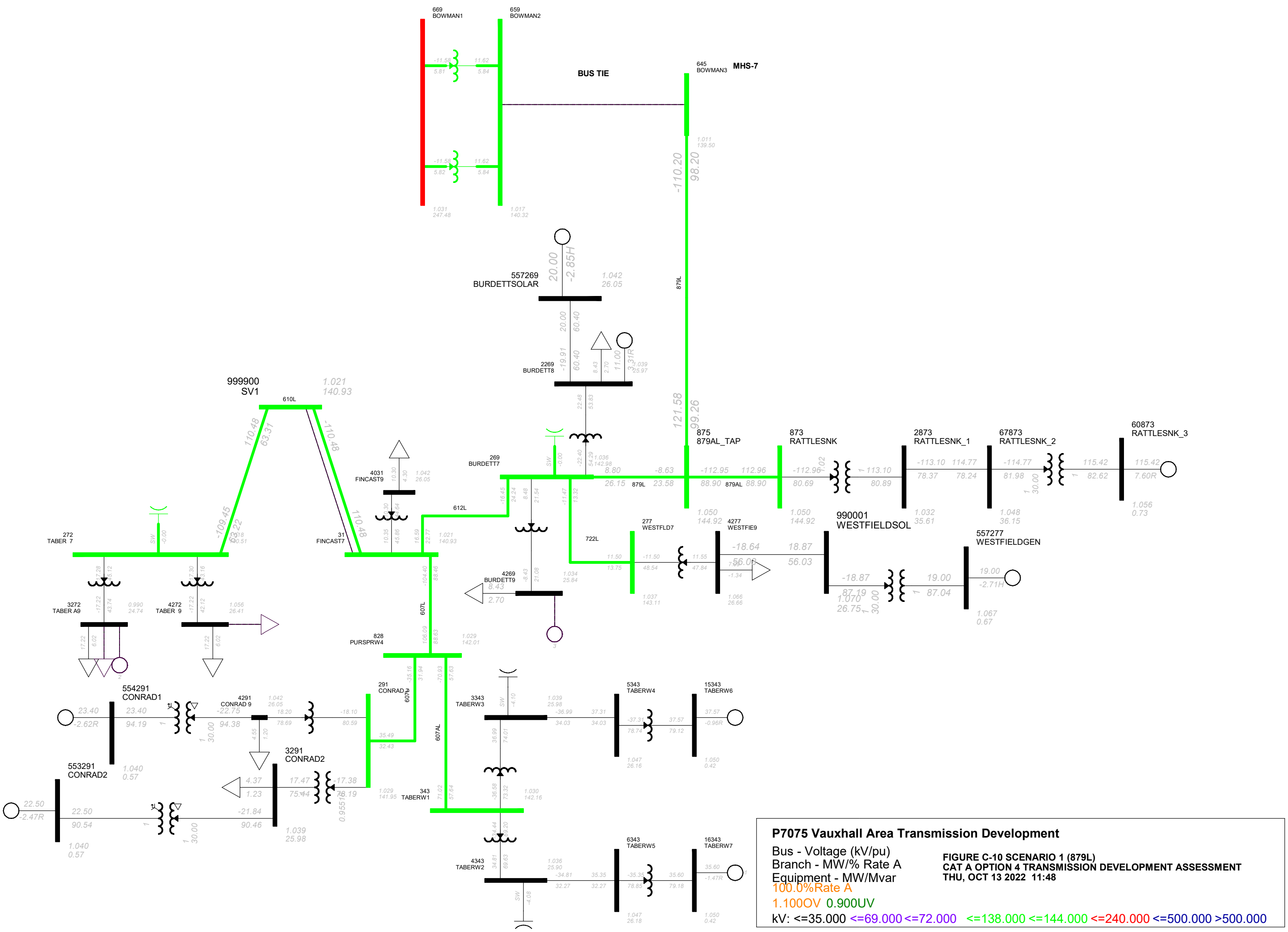

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-5 SCENARIO 2 (610L)
CAT A OPTION 2 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:44
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
999900 SV1
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7

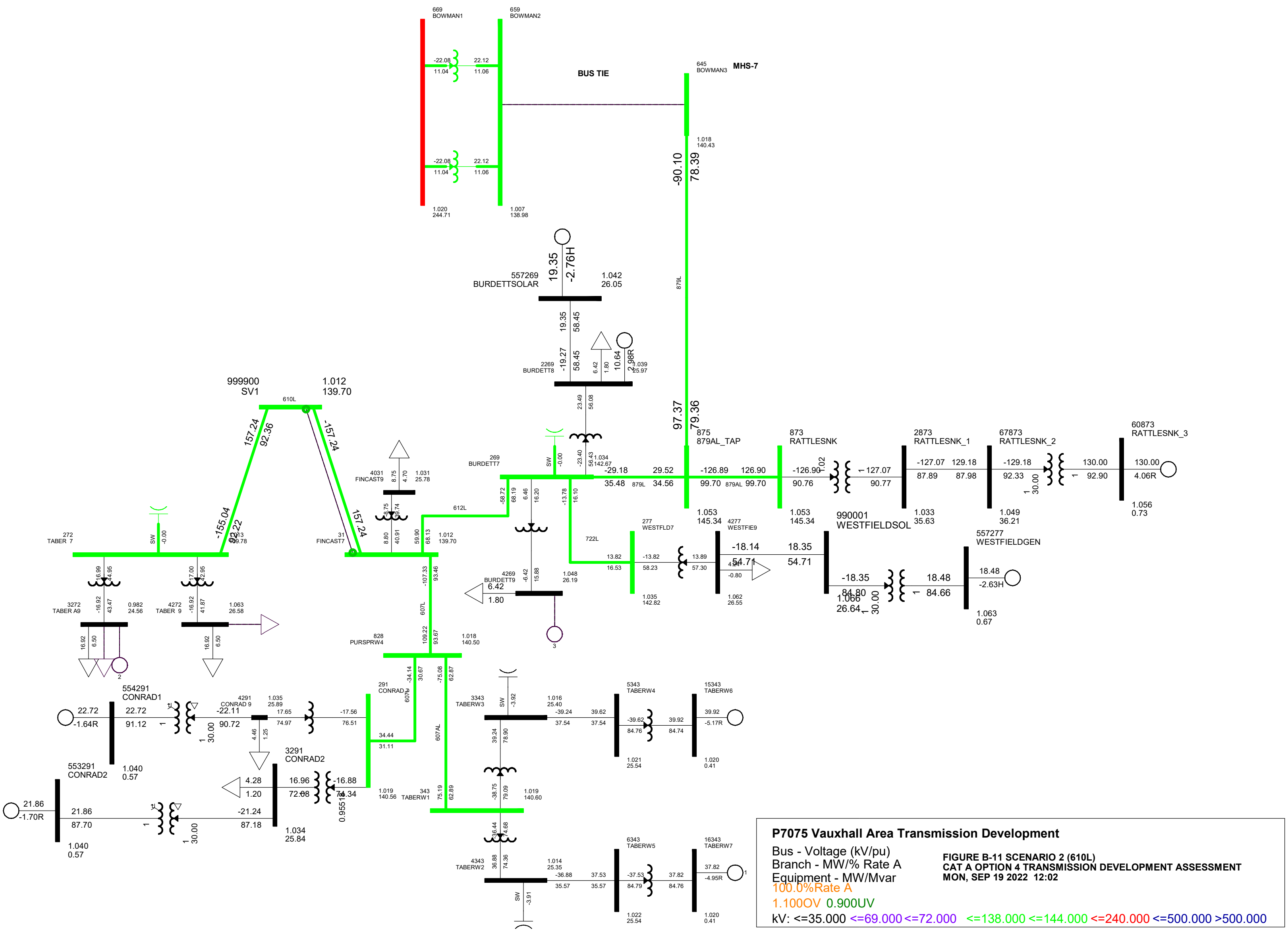

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
999900 SV1
610L
4031 FINCAST9
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
879L
612L
722L
272 TABER 7
3272 TABER A9
4272 TABER 9
FINCAST7
4269 BURDETT9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD7
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
607AL
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-6 SCENARIO 2 (MAX)
CAT A OPTION 2 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 11:49

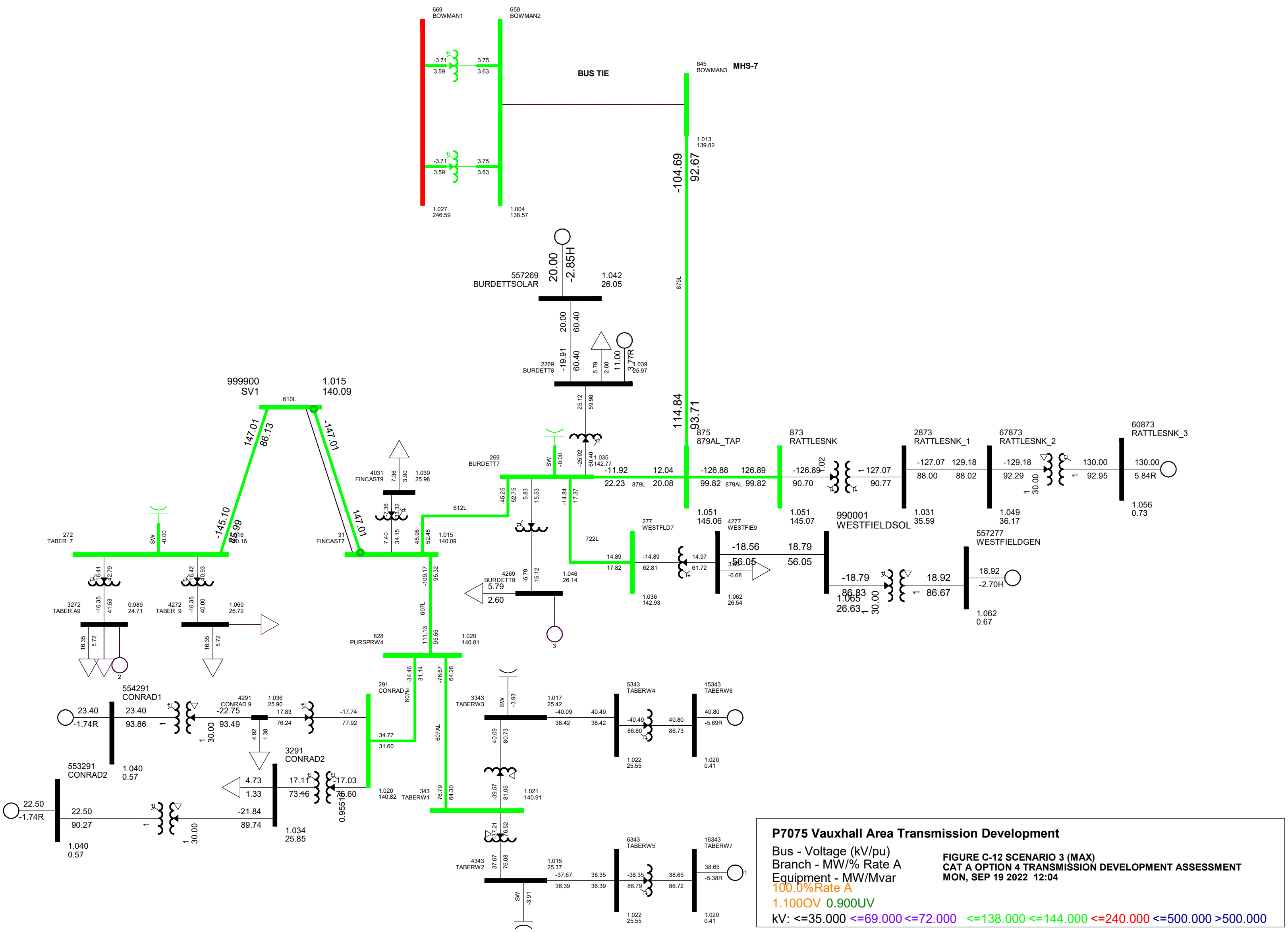

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
879L
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
879AL
4031 FINCAST9
610L
612L
272 TABER 7
31 FINCAST7
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
3272 TABER A9
4272 TABER 9
4269 BURDETT9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD 7
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
607AL
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-7 SCENARIO 1 (879L)
CAT A OPTION 3 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:45


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-8 SCENARIO 2 (610L)
CAT A OPTION 3 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 11:54
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
879L
607L
607AL


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-9 SCENARIO 3 (MAX)
CAT A OPTION 3 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 11:55
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
5343 TABERW4
15343 TABERW6
4343 TABERW2
6343 TABERW5
16343 TABERW7


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
879L
557269 BURDETTSOLAR
2269 BURDETT8
999900 SV1
610L
4031 FINCAST9
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
879AL
612L
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
272 TABER 7
31 FINCAST7
4269 BURDETT9
3272 TABER A9
4272 TABER 9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
607AL
3343 TABERW3
5343 TABERW4
15343 TABERW6
3291 CONRAD2
553291 CONRAD2
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-10 SCENARIO 1 (879L)
CAT A OPTION 4 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:48

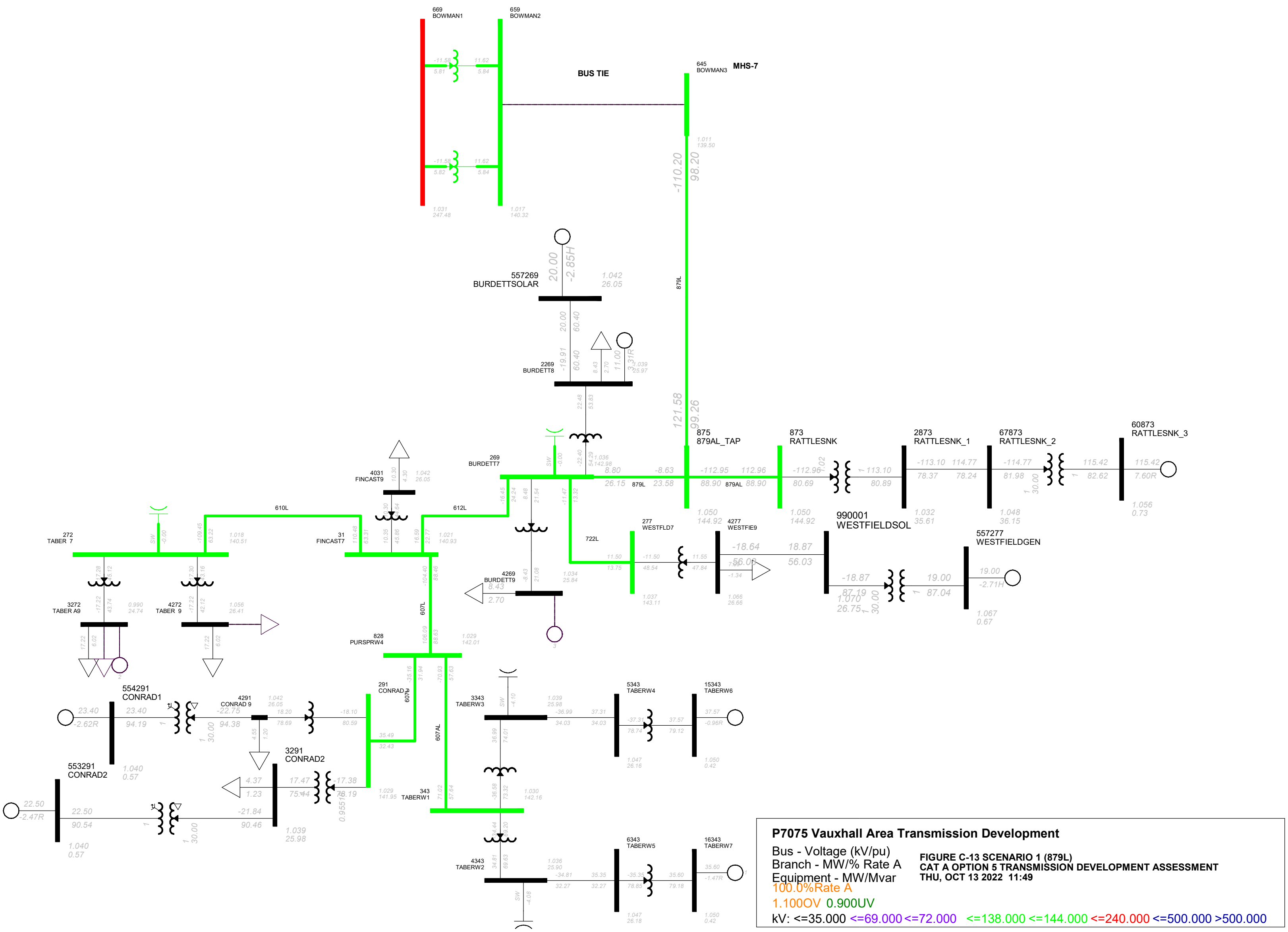

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE B-11 SCENARIO 2 (610L)
CAT A OPTION 4 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 12:02
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
999900 SV1
610L
272 TABER 7
31 FINCAST7
4031 FINCAST9
612L
607L
722L
879L
879AL
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
3272 TABER A9
4272 TABER 9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
607AL

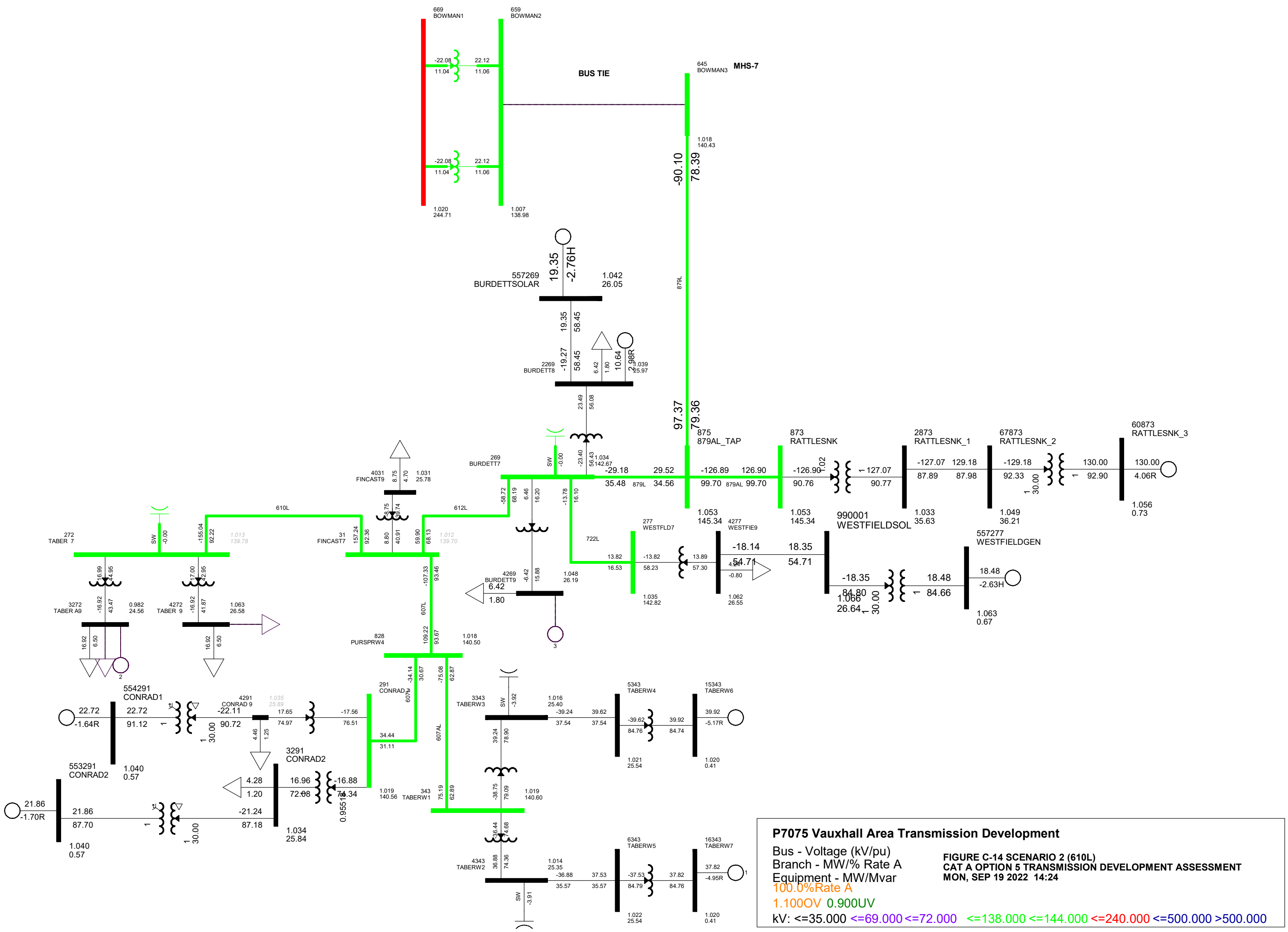


P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE C-12 SCENARIO 3 (MAX)
CAT A OPTION 4 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 12:04

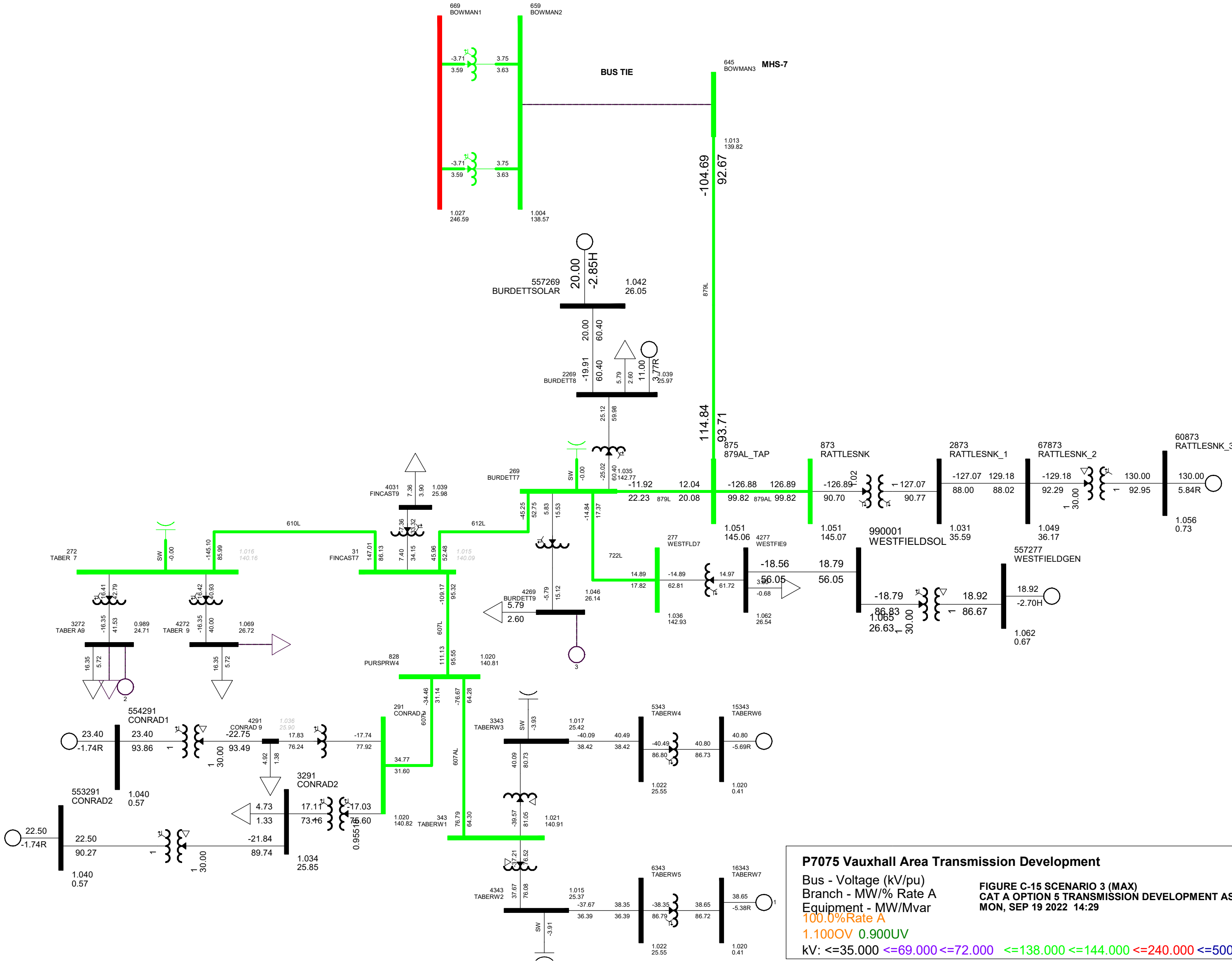

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
879L
557269 BURDETTSOLAR
2269 BURDETT8
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
269 BURDETT7
4031 FINCAST9
610L
612L
272 TABER 7
31 FINCAST7
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
3272 TABER A9
4272 TABER 9
4269 BURDETT9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD7
607AL
3343 TABERW3
5343 TABERW4
15343 TABERW6
553291 CONRAD2
3291 CONRAD2
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-13 SCENARIO 1 (879L)
CAT A OPTION 5 TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:49



P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

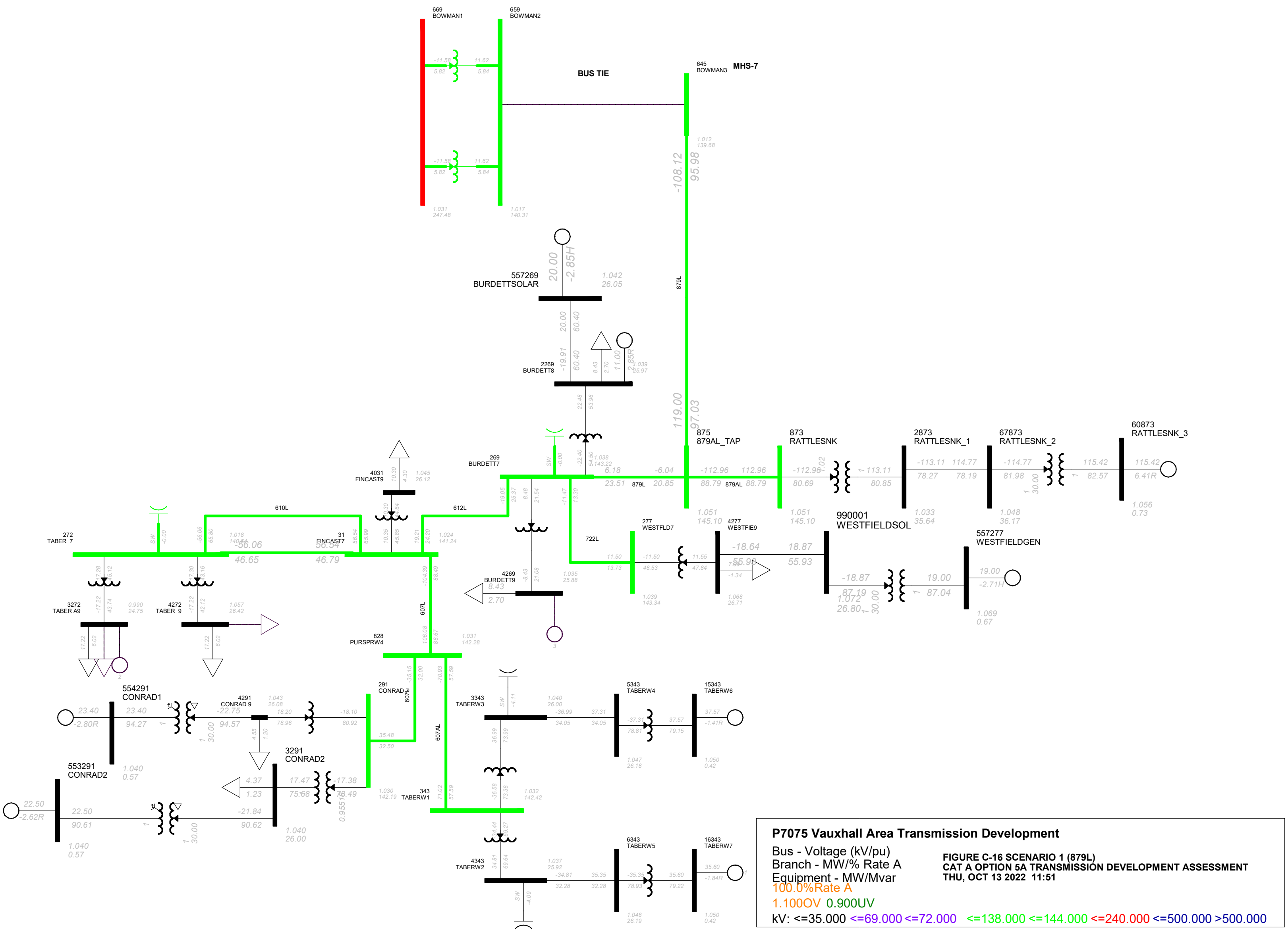
FIGURE C-14 SCENARIO 2 (610L)
CAT A OPTION 5 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 14:24

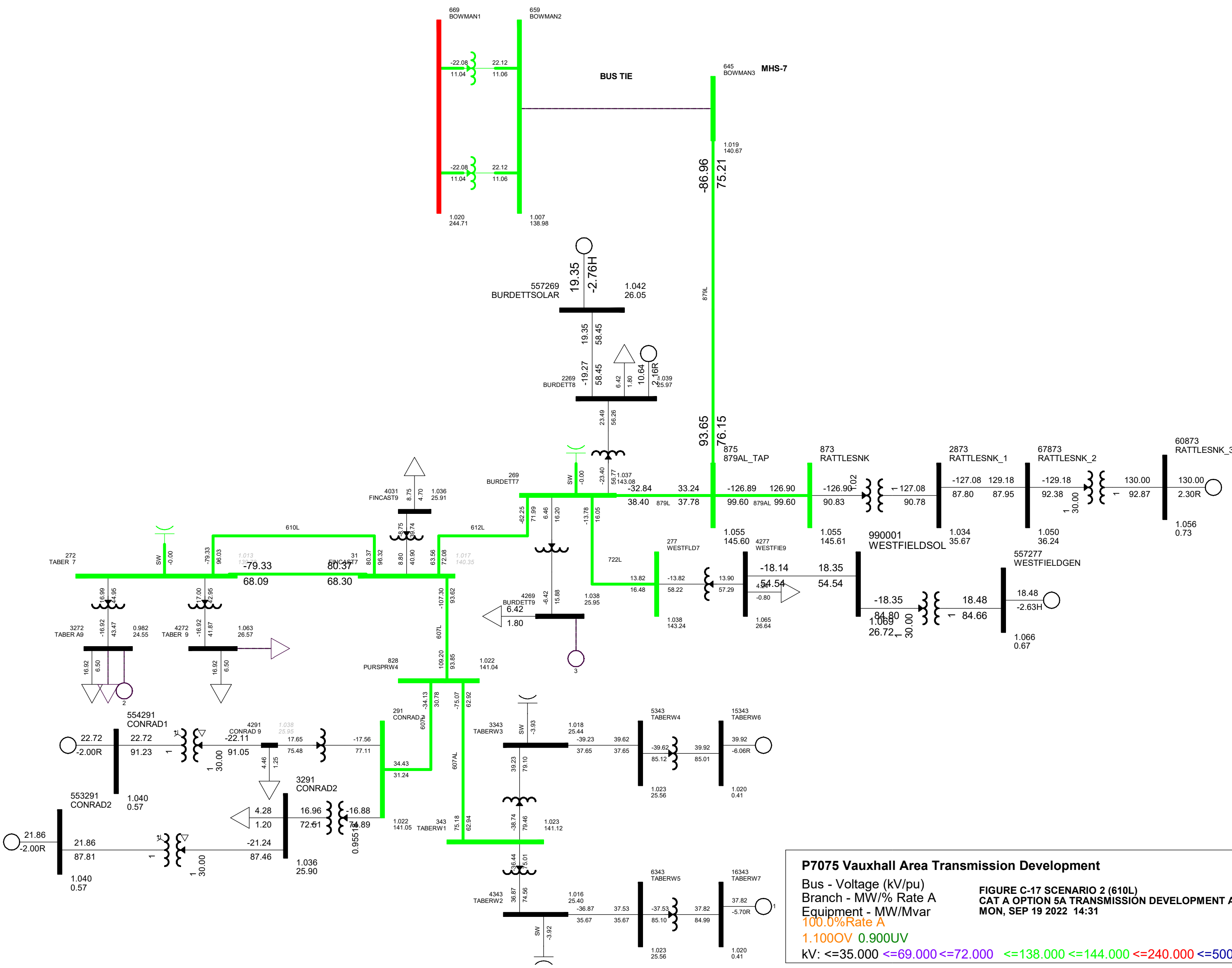


P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE C-15 SCENARIO 3 (MAX)
CAT A OPTION 5 TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 14:29

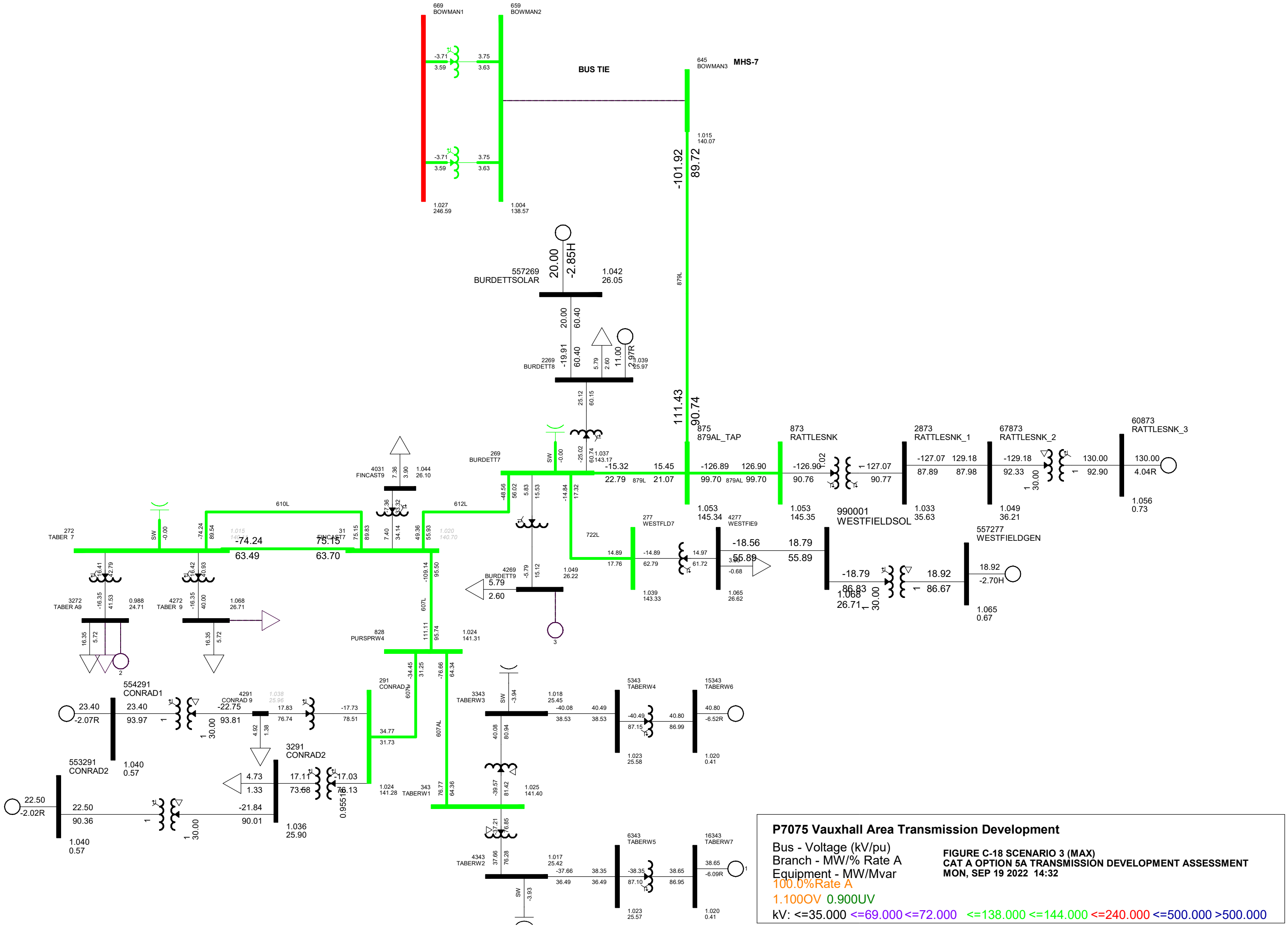

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
879L
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
269 BURDETT7
4031 FINCAST9
610L
612L
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
272 TABER 7
31 FINCAST7
4269 BURDETT9
3272 TABER A9
4272 TABER 9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD 7
3291 CONRAD2
553291 CONRAD2
607AL
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-16 SCENARIO 1 (879L)
CAT A OPTION 5A TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:51



P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

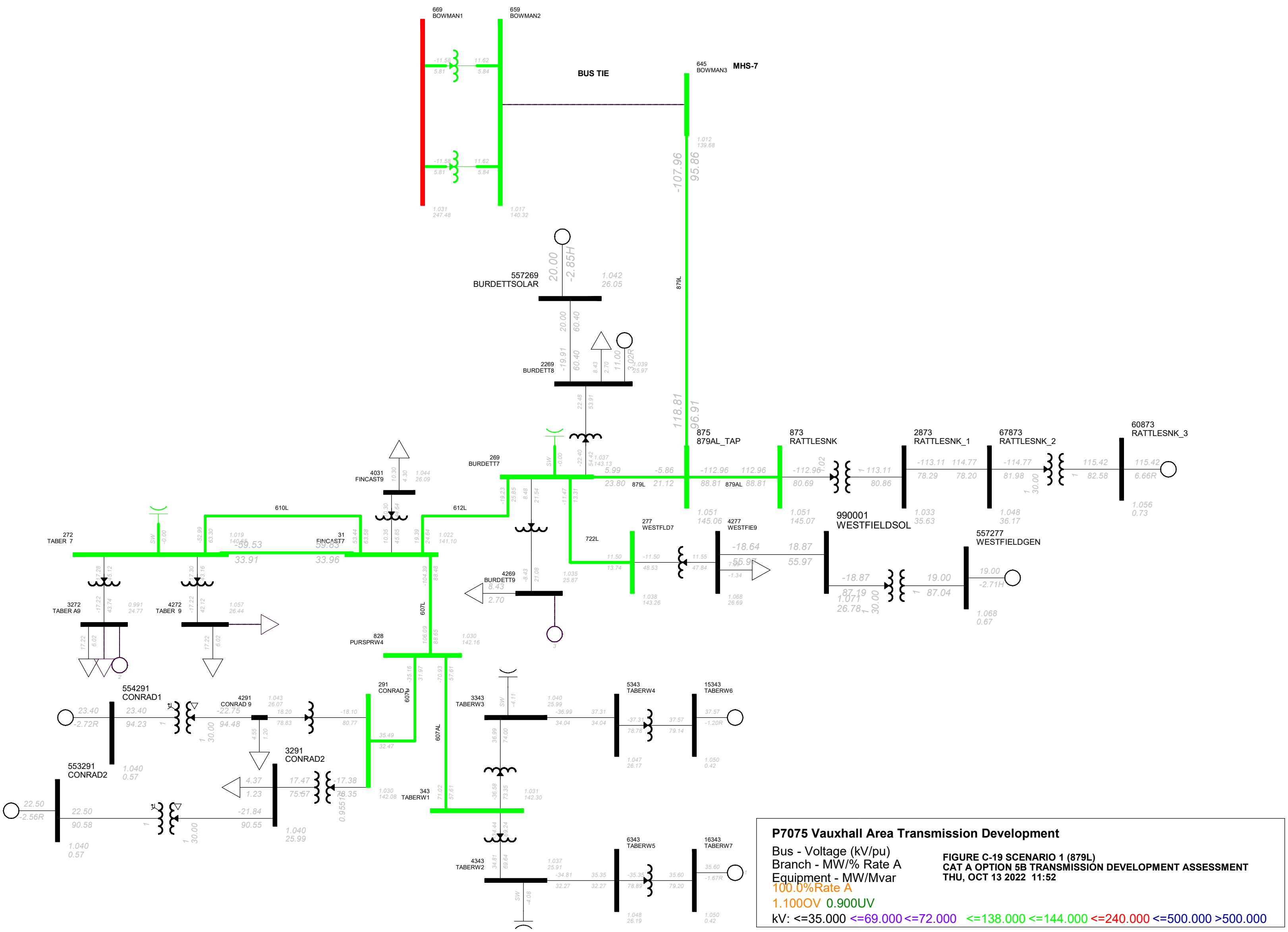
FIGURE C-17 SCENARIO 2 (610L)
CAT A OPTION 5A TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 14:31

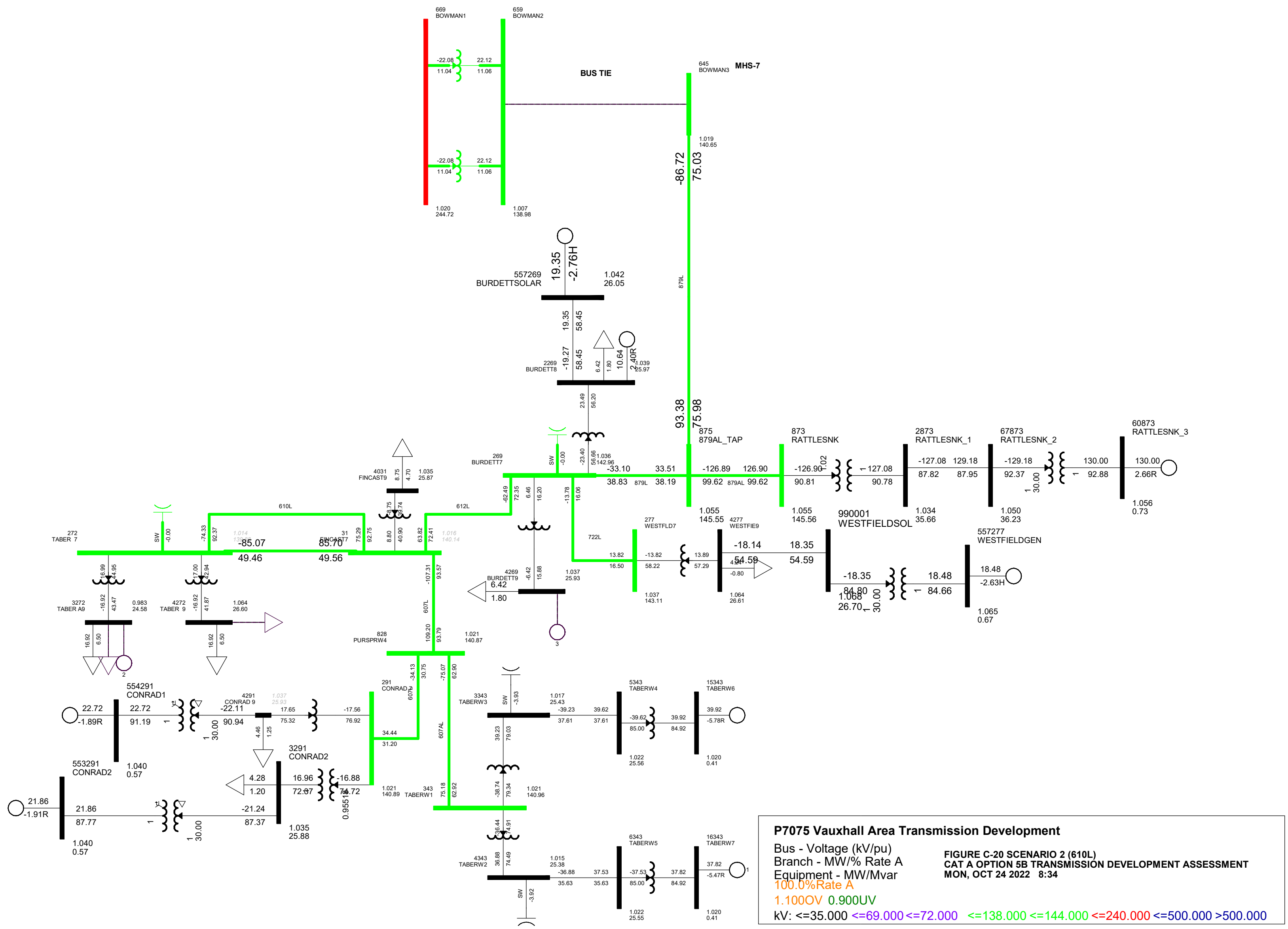


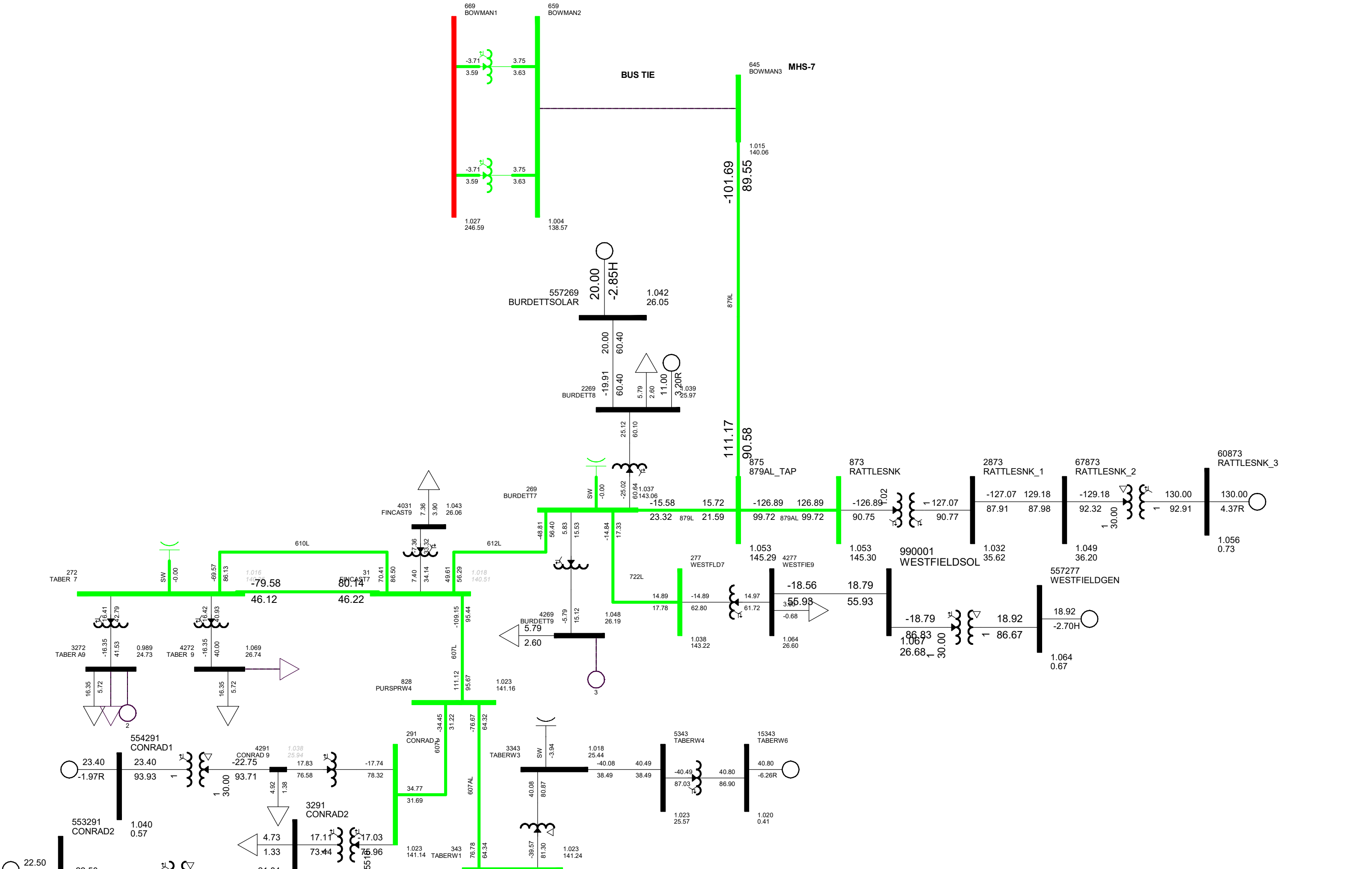
P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE C-18 SCENARIO 3 (MAX)
CAT A OPTION 5A TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 14:32


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
879L
879AL
610L
612L
722L
607L
607AL
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-19 SCENARIO 1 (879L)
CAT A OPTION 5B TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:52

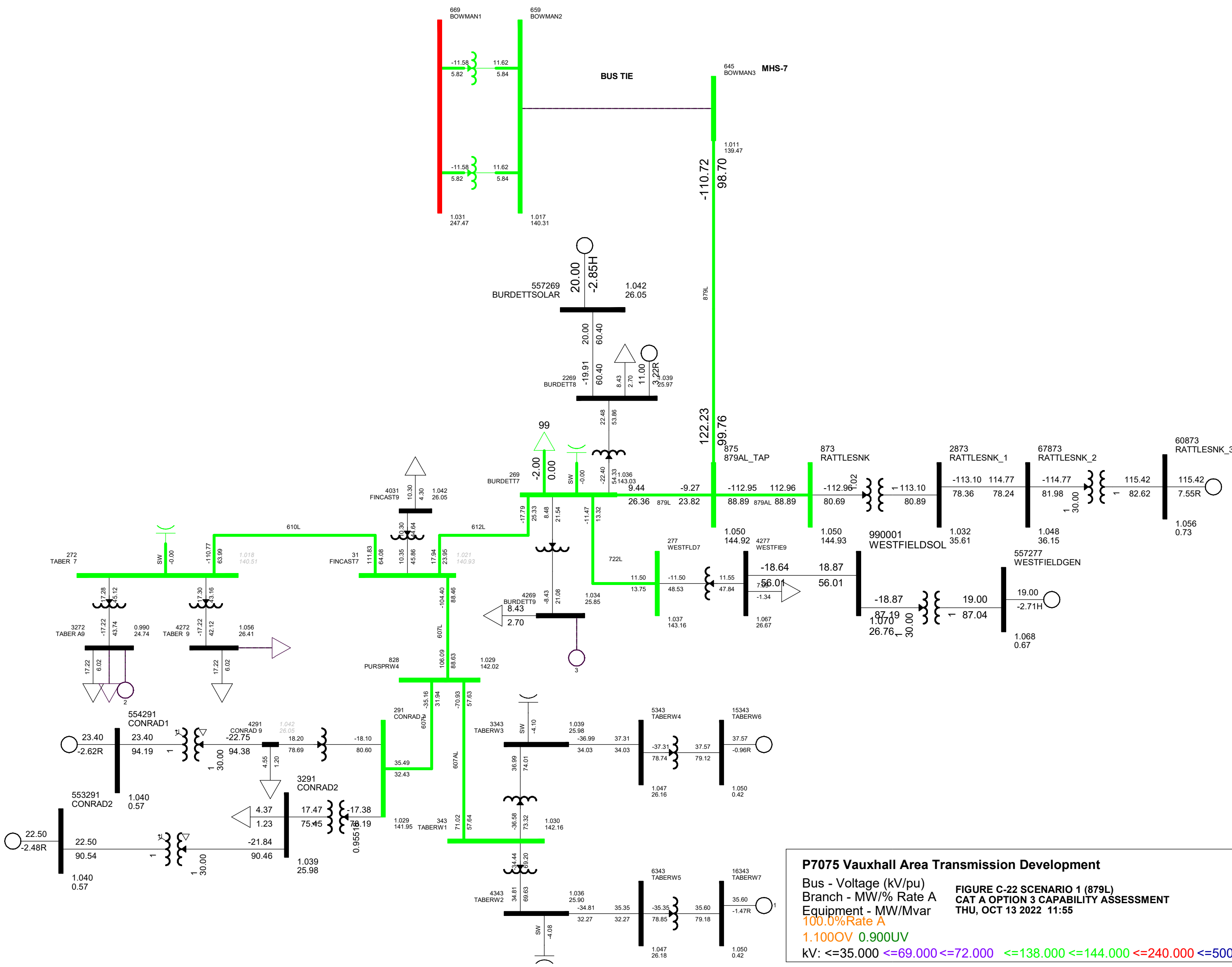

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4031 FINCAST9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
272 TABER 7
31 FINCAST7
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
879L
607L
607AL
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-20 SCENARIO 2 (610L)
CAT A OPTION 5B TRANSMISSION DEVELOPMENT ASSESSMENT
MON, OCT 24 2022 8:34



P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

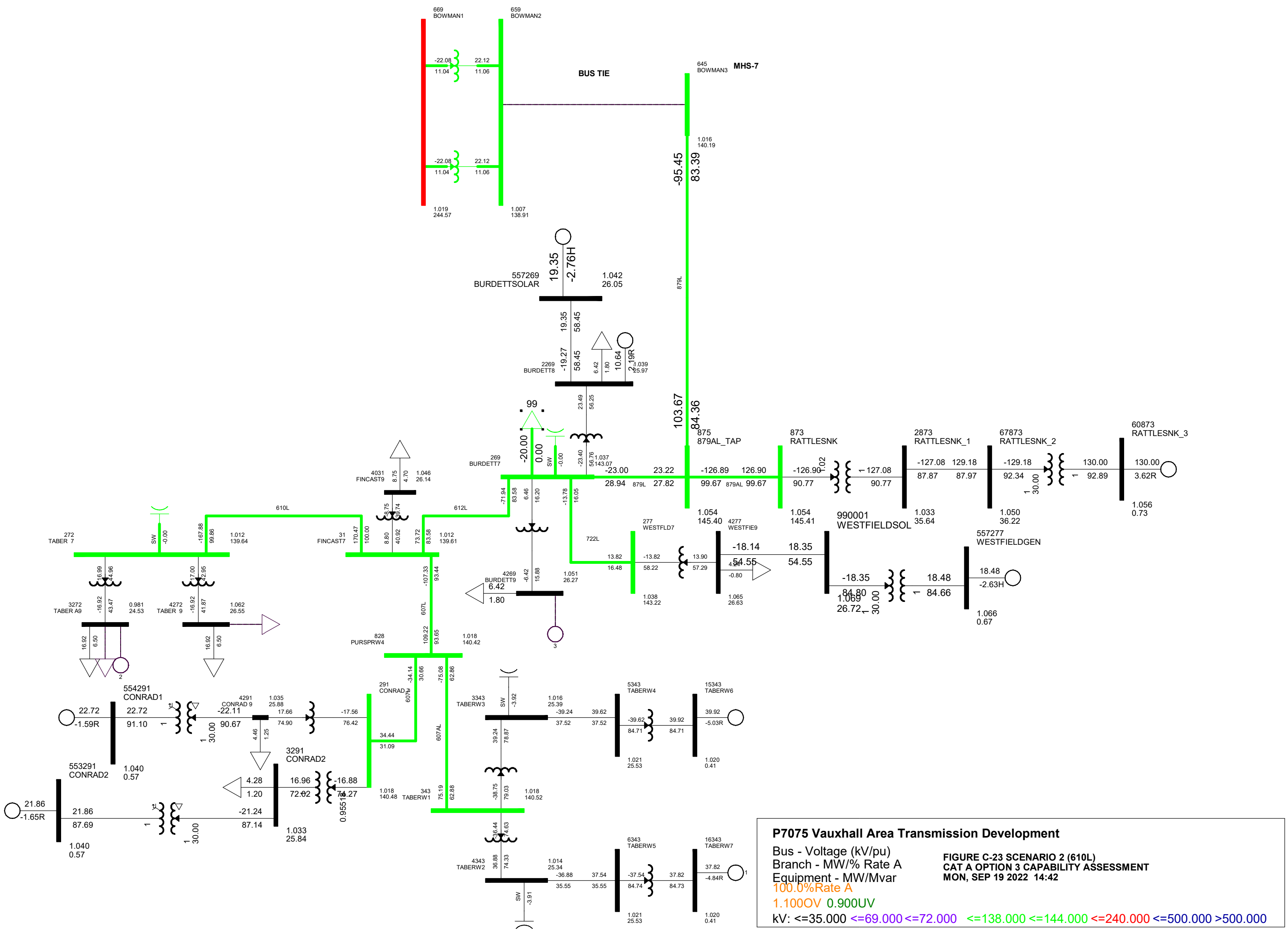
FIGURE C-21 SCENARIO 3 (MAX)
CAT A OPTION 5B TRANSMISSION DEVELOPMENT ASSESSMENT
MON, SEP 19 2022 14:36

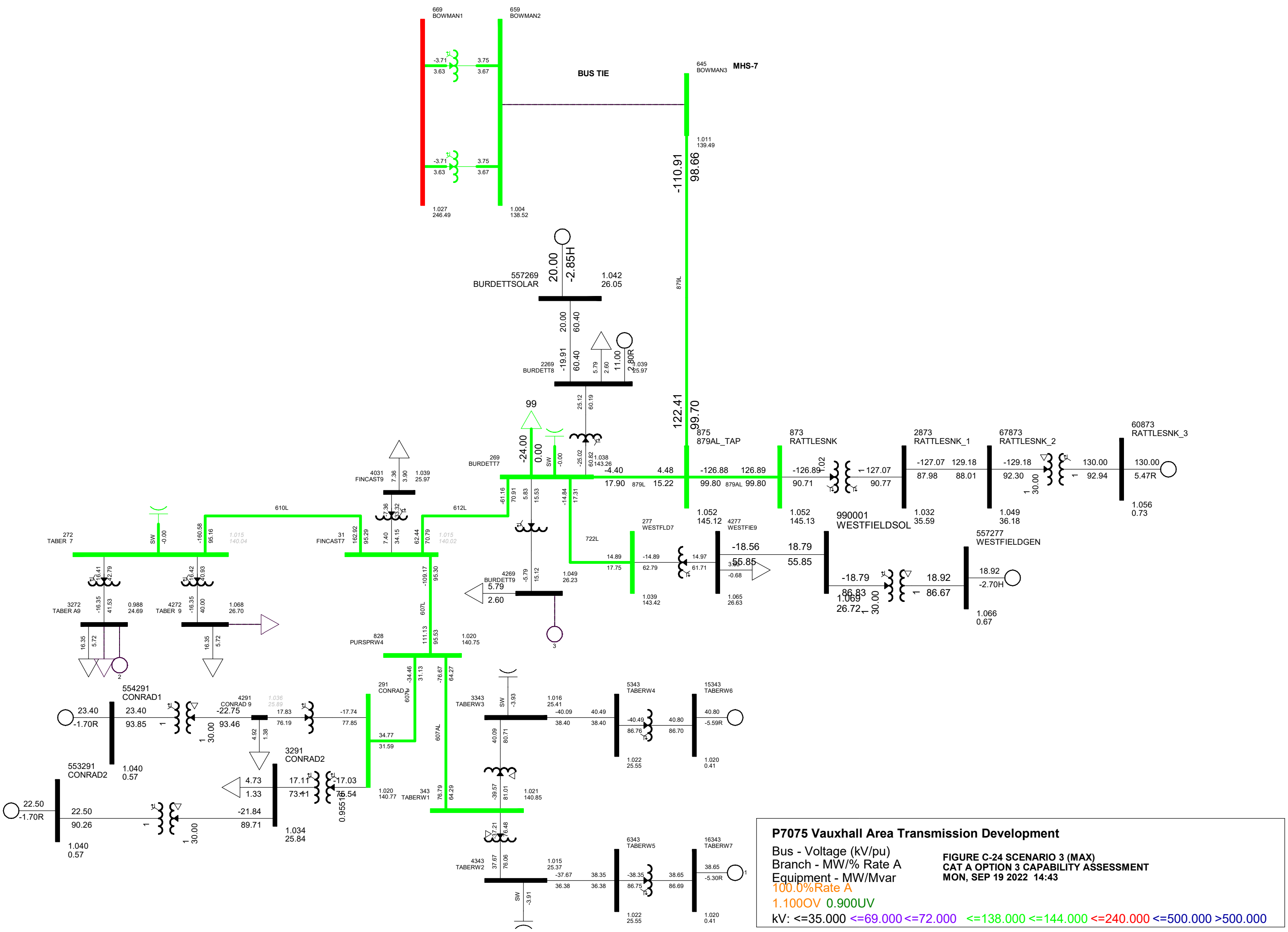


P7075 Vauxhall Area Transmission Development

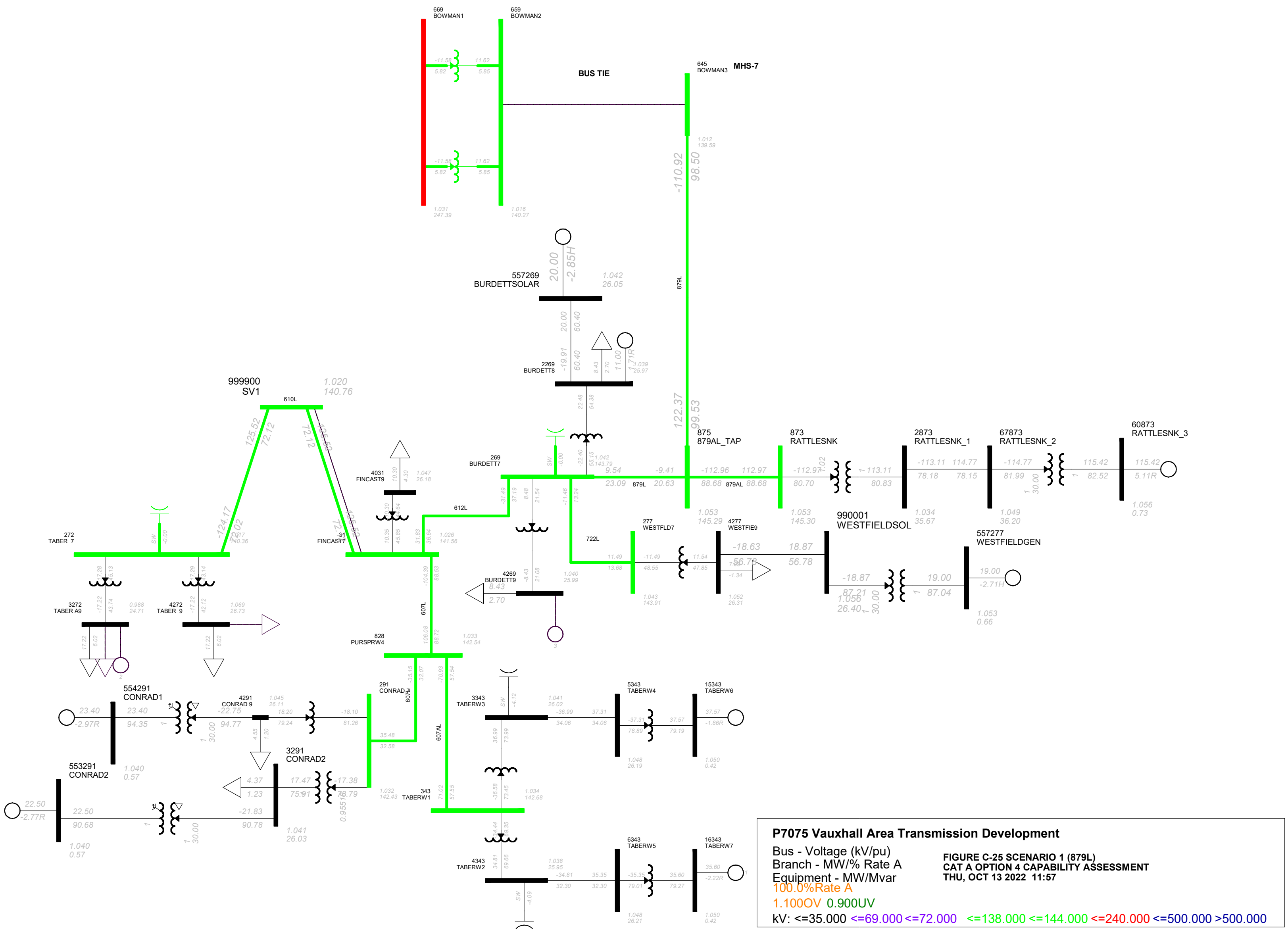
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

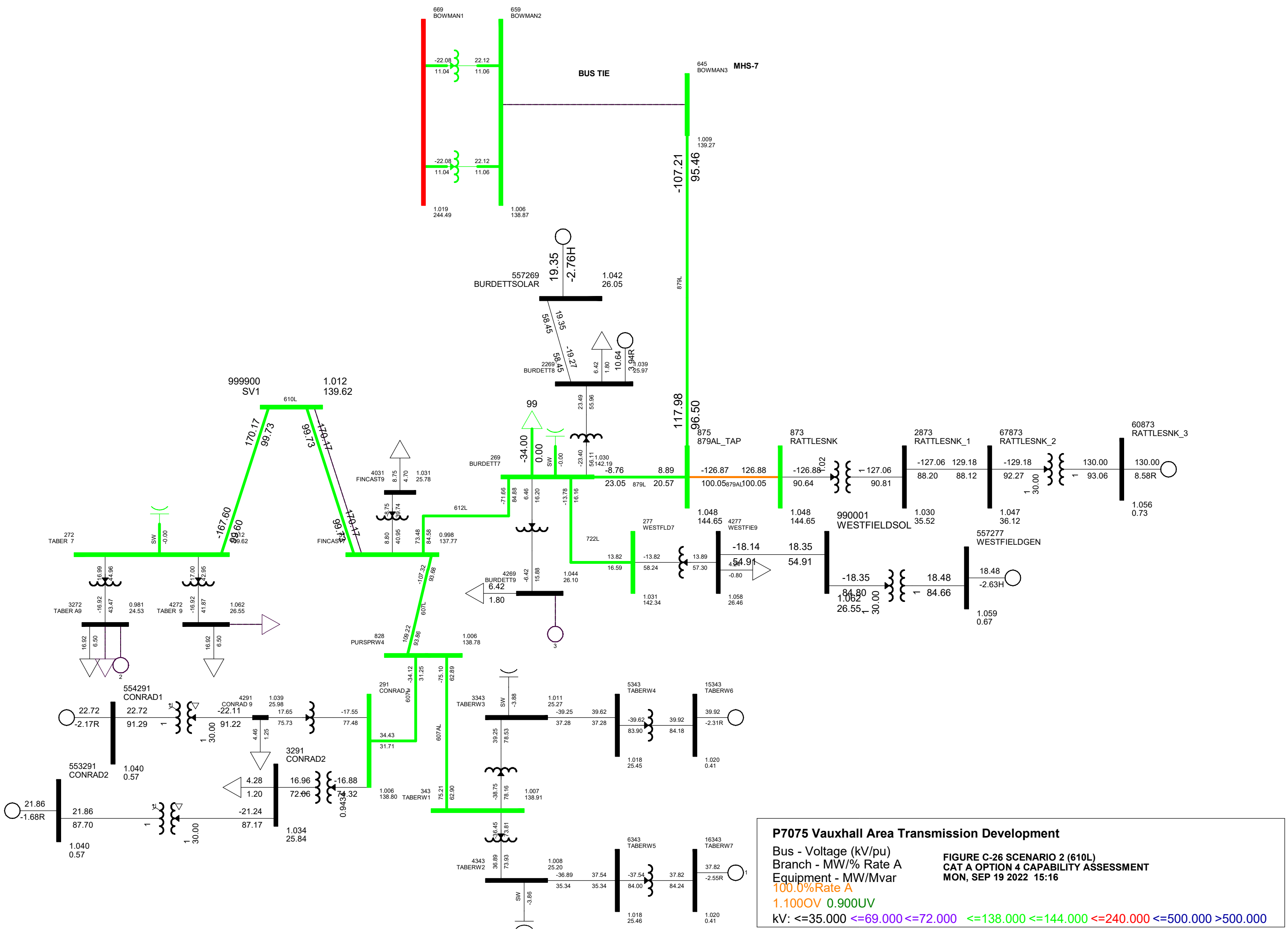
FIGURE C-22 SCENARIO 1 (879L)
CAT A OPTION 3 CAPABILITY ASSESSMENT
THU, OCT 13 2022 11:55


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-23 SCENARIO 2 (610L)
CAT A OPTION 3 CAPABILITY ASSESSMENT
MON, SEP 19 2022 14:42
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
828 PURSPRW4
291 CONRAD
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
4343 TABERW2
5343 TABERW4
15343 TABERW6
6343 TABERW5
16343 TABERW7
610L
612L
607L
607AL
722L
879L
879AL

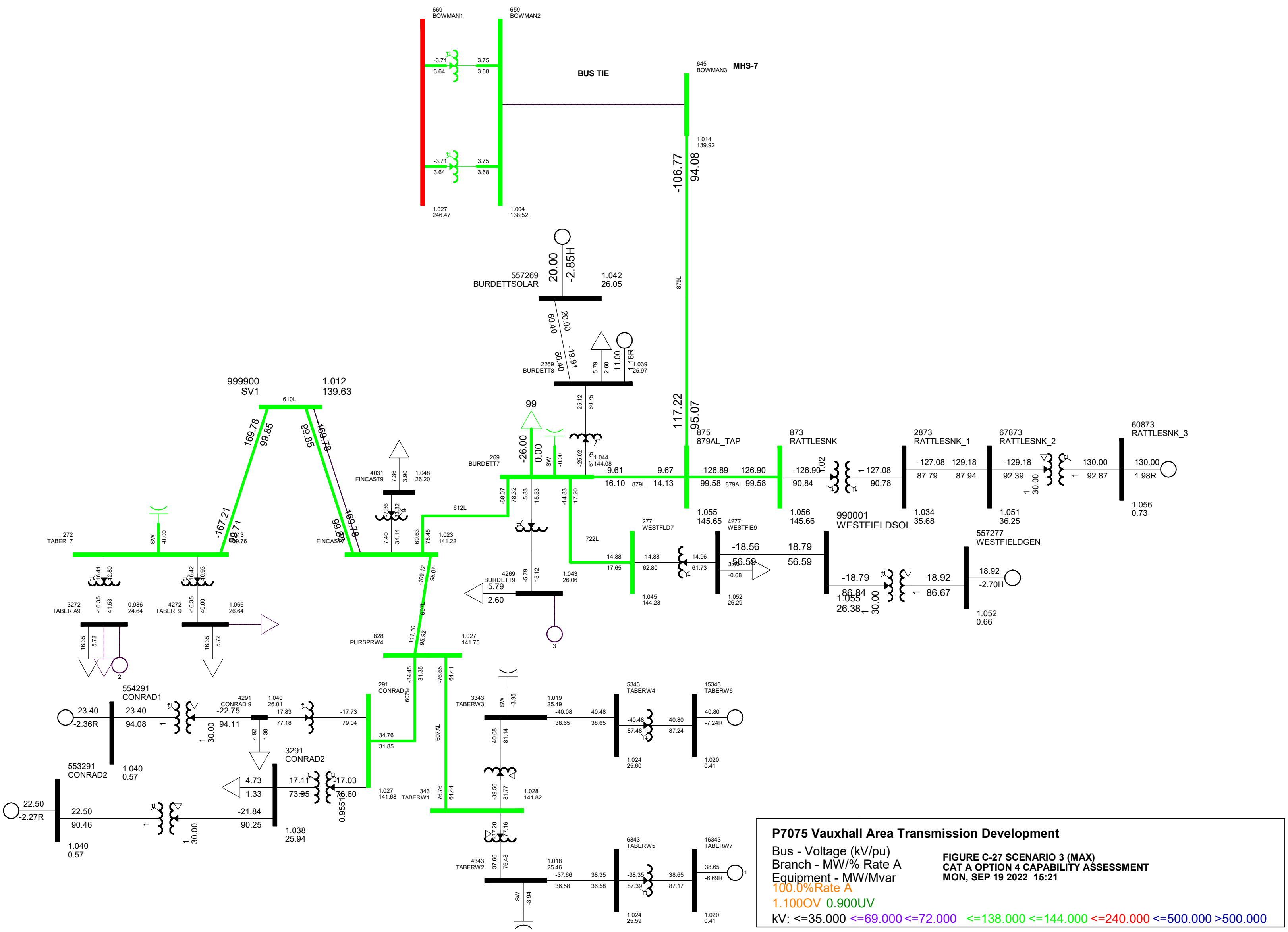


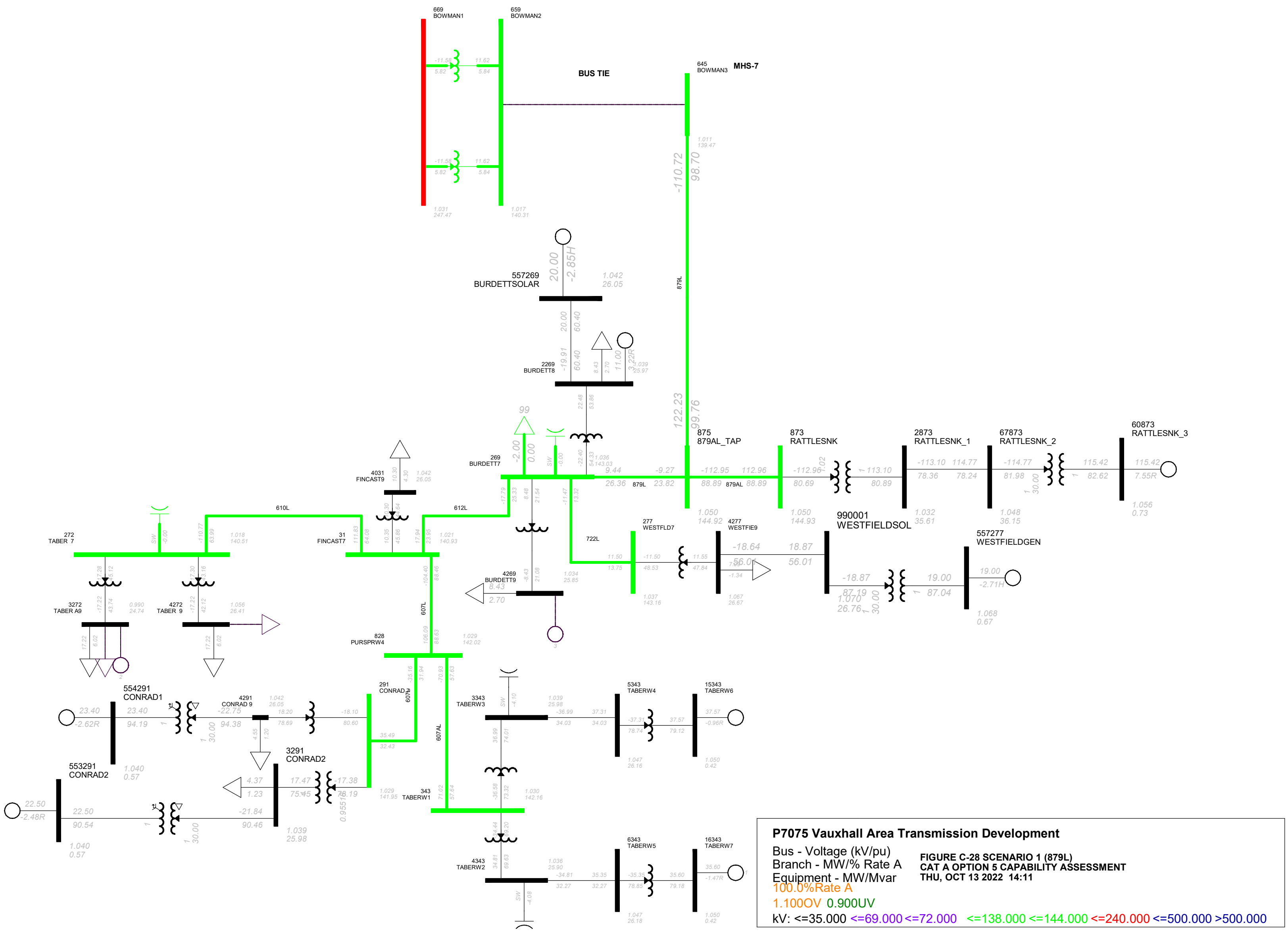
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
272 TABER 7
31 FINCAST7
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
3272 TABER A9
4272 TABER 9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-24 SCENARIO 3 (MAX)
CAT A OPTION 3 CAPABILITY ASSESSMENT
MON, SEP 19 2022 14:43


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
999900 SV1
610L
4031 FINCAST9
269 BURDETT7
879L
875 879AL_TAP
879AL
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
272 TABER 7
612L
FINCAST7
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
3272 TABER A9
4272 TABER 9
4269 BURDETT9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD 4
607AL
3343 TABERW3
5343 TABERW4
15343 TABERW6
3291 CONRAD2
553291 CONRAD2
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-25 SCENARIO 1 (879L)
CAT A OPTION 4 CAPABILITY ASSESSMENT
THU, OCT 13 2022 11:57

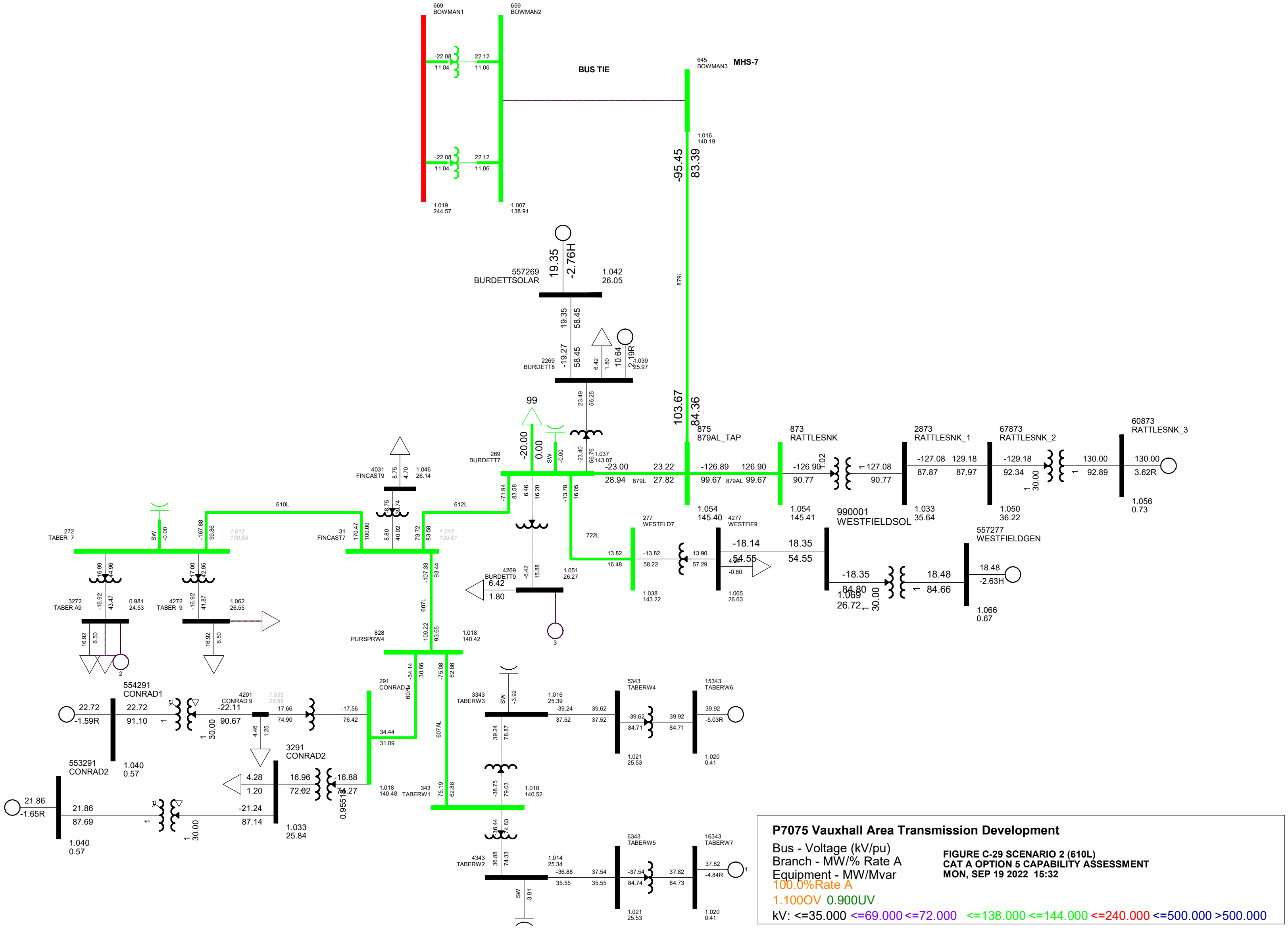


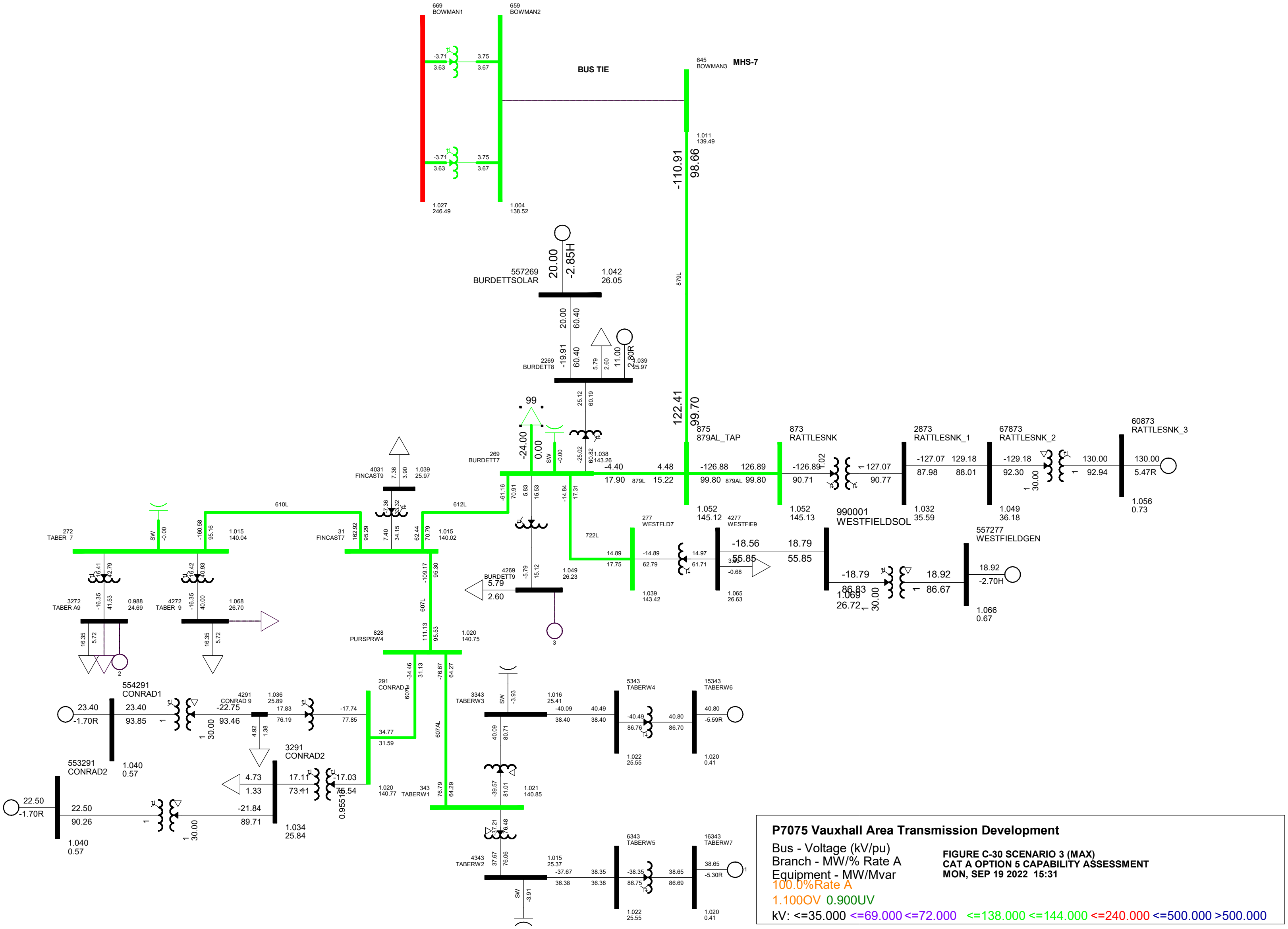
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-26 SCENARIO 2 (610L)
CAT A OPTION 4 CAPABILITY ASSESSMENT
MON, SEP 19 2022 15:16
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
999900 SV1
610L
272 TABER 7
3272 TABER A9
4272 TABER 9
4031 FINCAST9
FINCAST
612L
722L
879L
879AL
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
828 PURSPRW4
607L
607N
607AL
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
291 CONRAD
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7

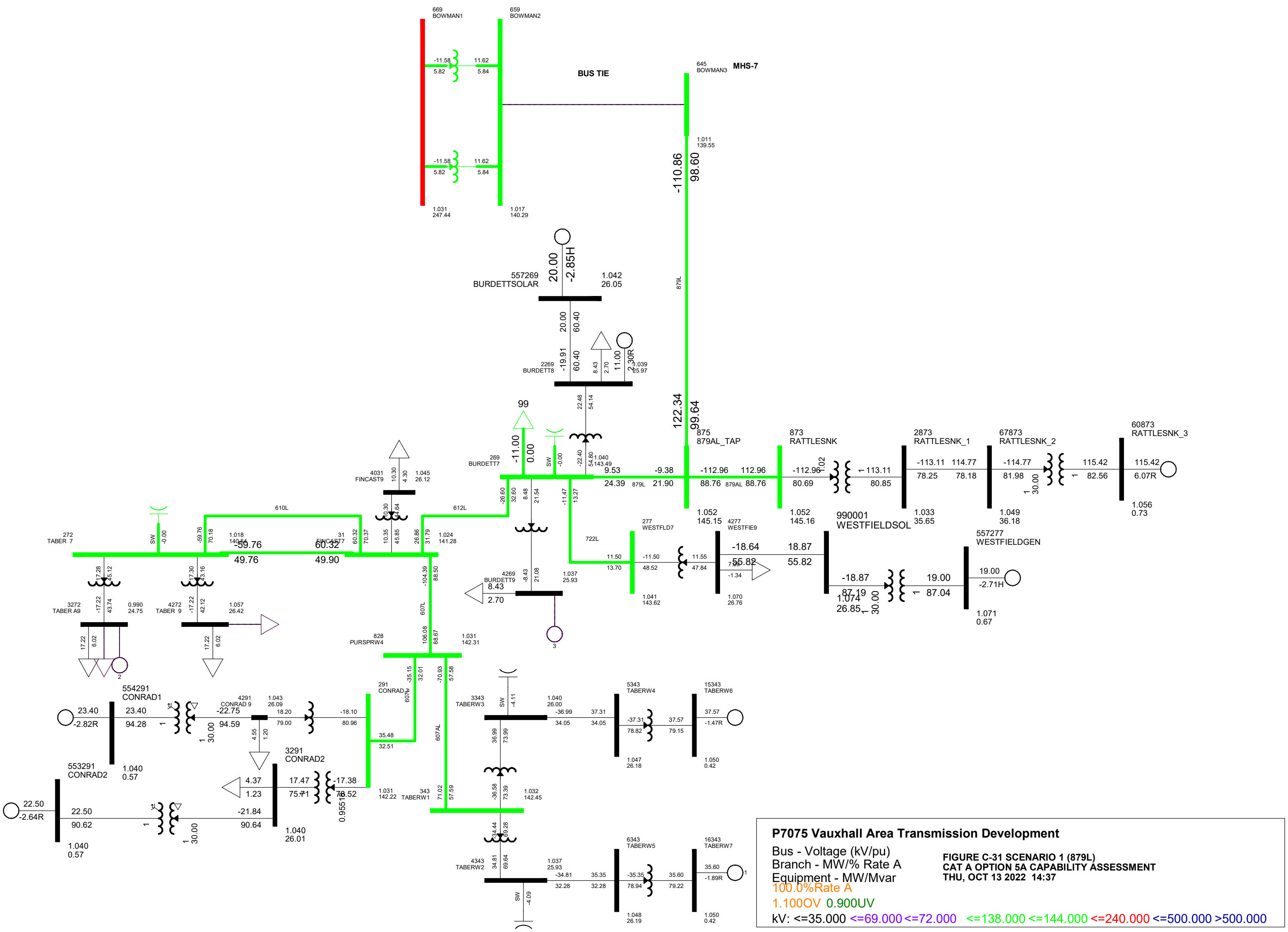

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
999900 SV1
610L
4031 FINCAST9
269 BURDETT7
612L
875 879AL_TAP
879L
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
272 TABER 7
3272 TABER A9
4272 TABER 9
FINCAST
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
828 PURSPRW4
607L
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
607AL
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-27 SCENARIO 3 (MAX)
CAT A OPTION 4 CAPABILITY ASSESSMENT
MON, SEP 19 2022 15:21

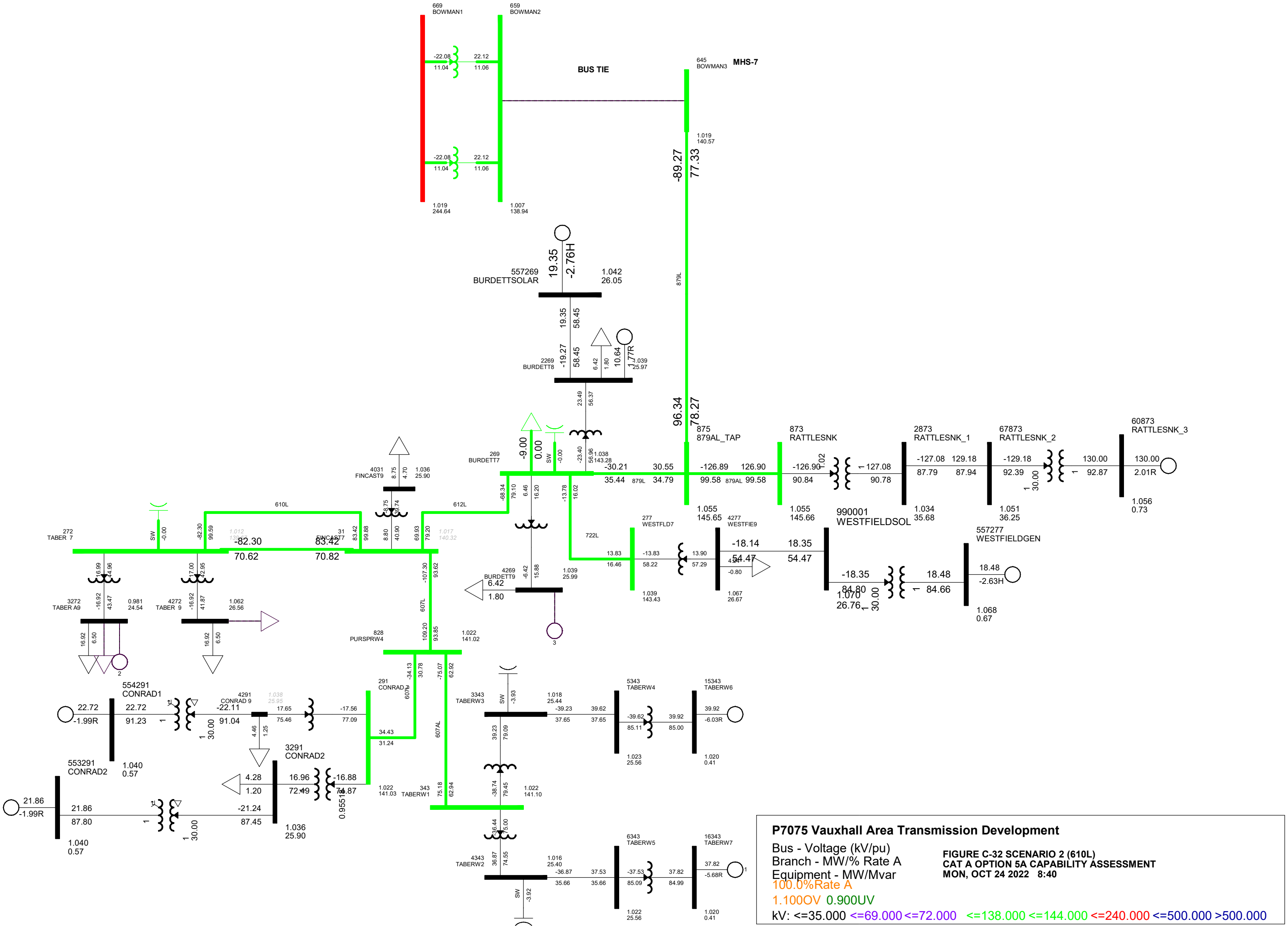


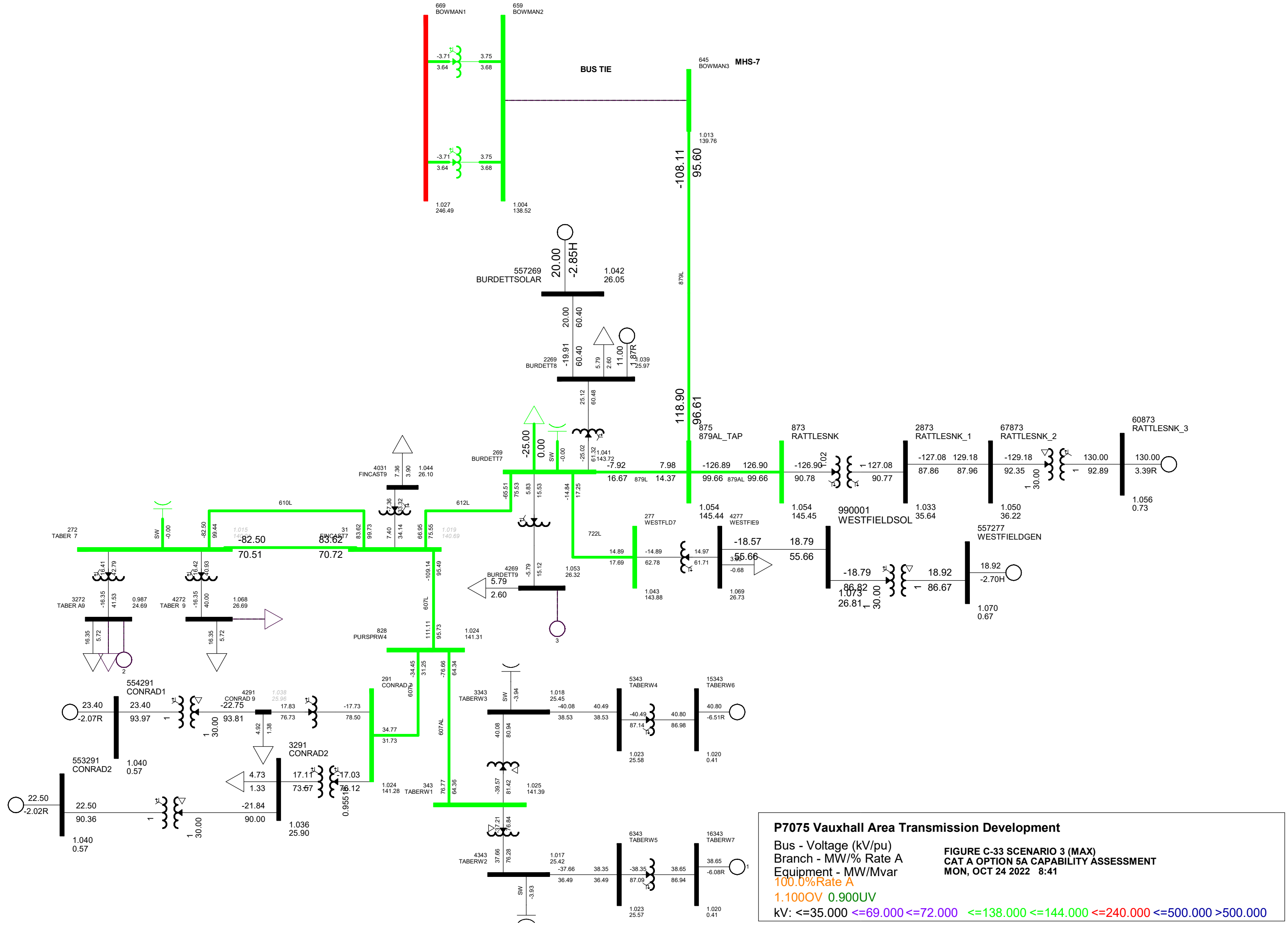
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
269 BURDETT7
4031 FINCAST9
610L
612L
722L
879L
879AL
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
272 TABER 7
31 FINCAST7
4269 BURDETT9
3272 TABER A9
4272 TABER 9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
607AL
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-28 SCENARIO 1 (879L)
CAT A OPTION 5 CAPABILITY ASSESSMENT
THU, OCT 13 2022 14:11

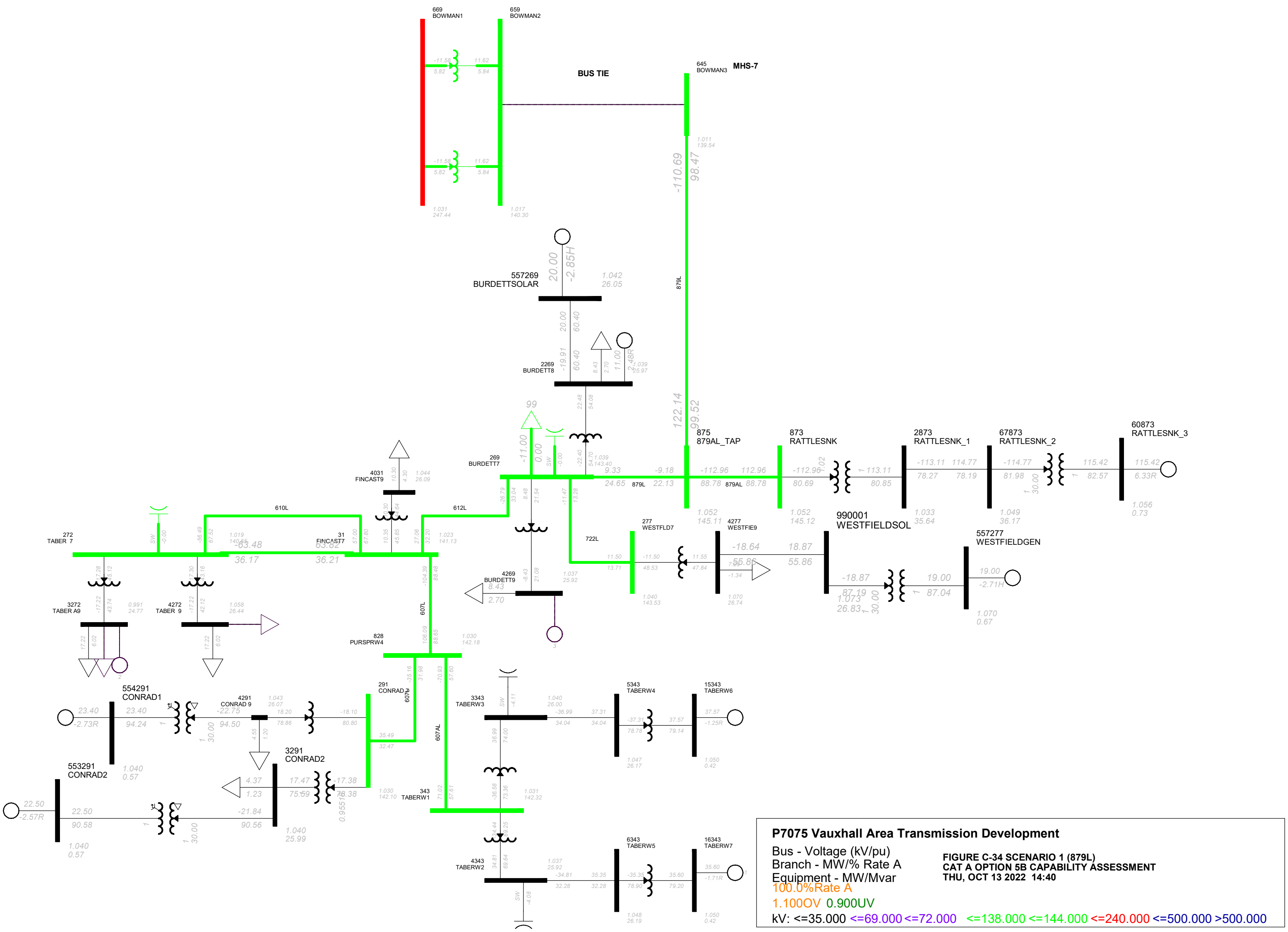

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-29 SCENARIO 2 (610L)
CAT A OPTION 5 CAPABILITY ASSESSMENT
MON, SEP 19 2022 15:32
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
5343 TABERW4
15343 TABERW6
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
607L
607AL
722L
879L

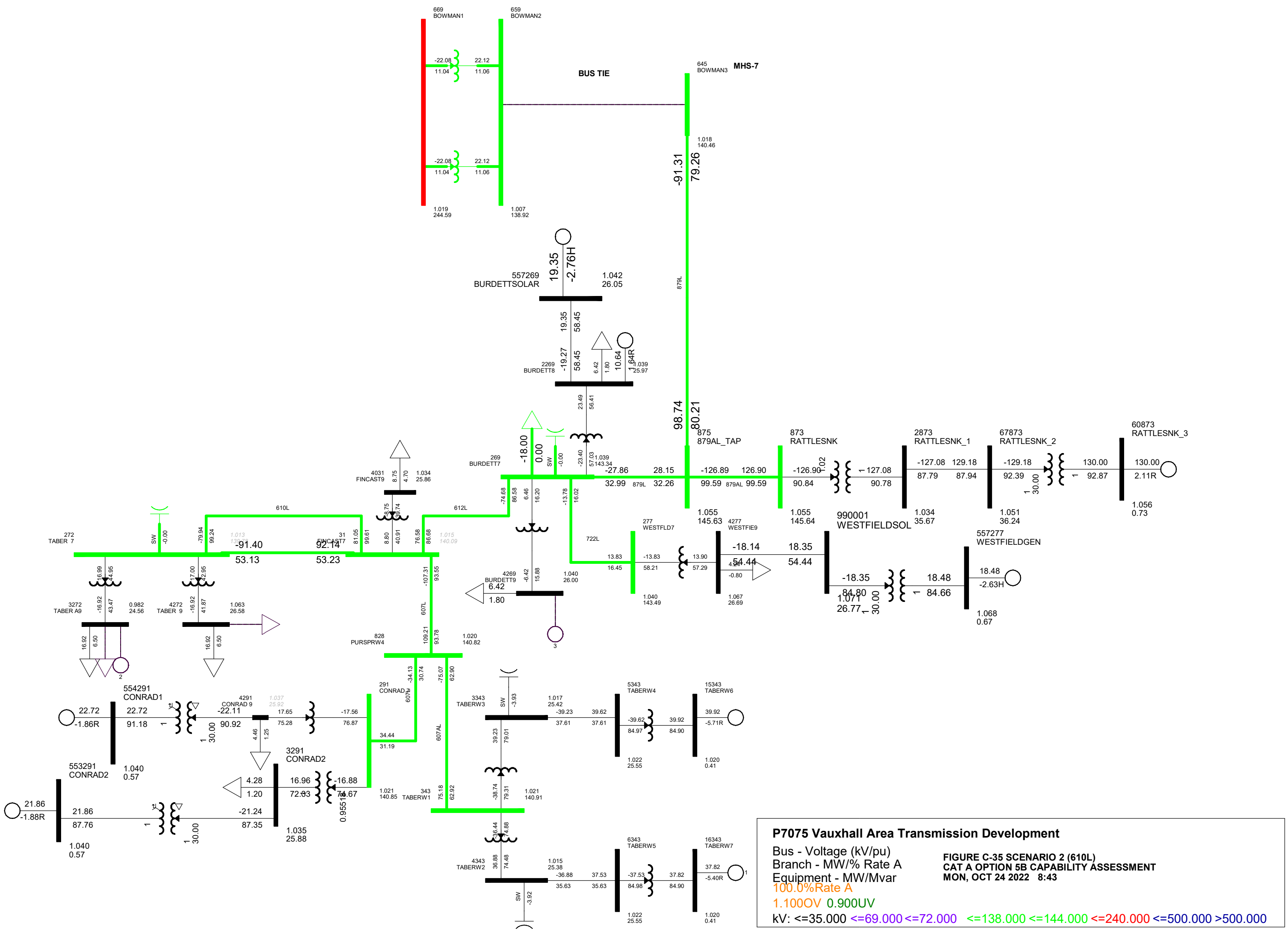

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-30 SCENARIO 3 (MAX)
CAT A OPTION 5 CAPABILITY ASSESSMENT
MON, SEP 19 2022 15:31
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
291 CONRAD
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7

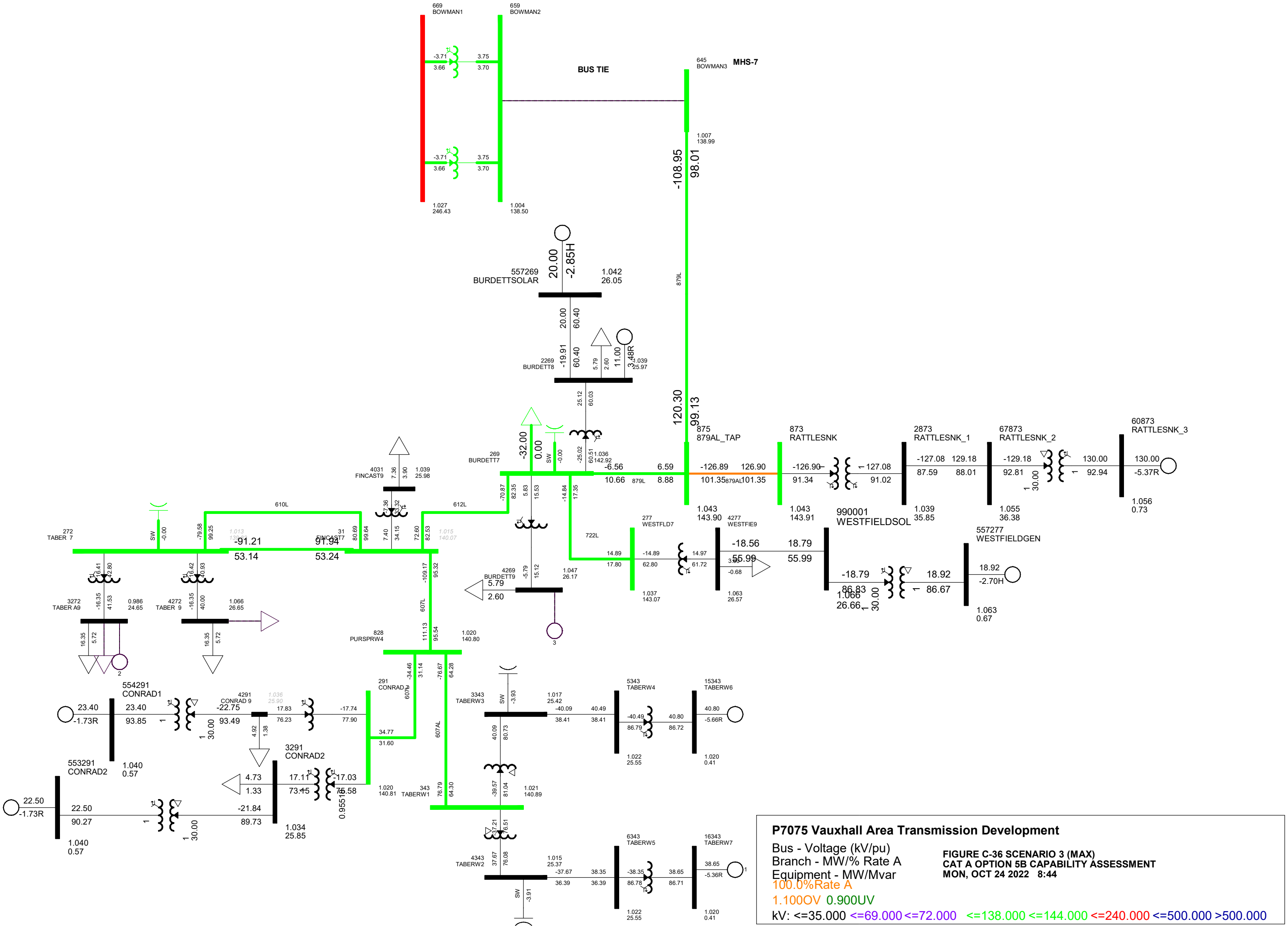

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-31 SCENARIO 1 (879L)
CAT A OPTION 5A CAPABILITY ASSESSMENT
THU, OCT 13 2022 14:37
669 BOWMAN1
659 BOWMAN2
645 BOWMAN3
MHS-7
BUS TIE
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
4269 BURDETT9
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
828 PURSPRW4
291 CONRAD
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
879L
879AL
607L
607AL
607N


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-32 SCENARIO 2 (610L)
CAT A OPTION 5A CAPABILITY ASSESSMENT
MON, OCT 24 2022 8:40
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
607L
607AL
879L


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-33 SCENARIO 3 (MAX)
CAT A OPTION 5A CAPABILITY ASSESSMENT
MON, OCT 24 2022 8:41


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
269 BURDETT7
4031 FINCAST9
272 TABER 7
31 FINCAST7
277 WESTFLD7
4277 WESTFIE9
4269 BURDETT9
3272 TABER A9
4272 TABER 9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
607L
607AL
879L
879AL
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-34 SCENARIO 1 (879L)
CAT A OPTION 5B CAPABILITY ASSESSMENT
THU, OCT 13 2022 14:40


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-35 SCENARIO 2 (610L)
CAT A OPTION 5B CAPABILITY ASSESSMENT
MON, OCT 24 2022 8:43
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
4343 TABERW2
5343 TABERW4
15343 TABERW6
6343 TABERW5
16343 TABERW7

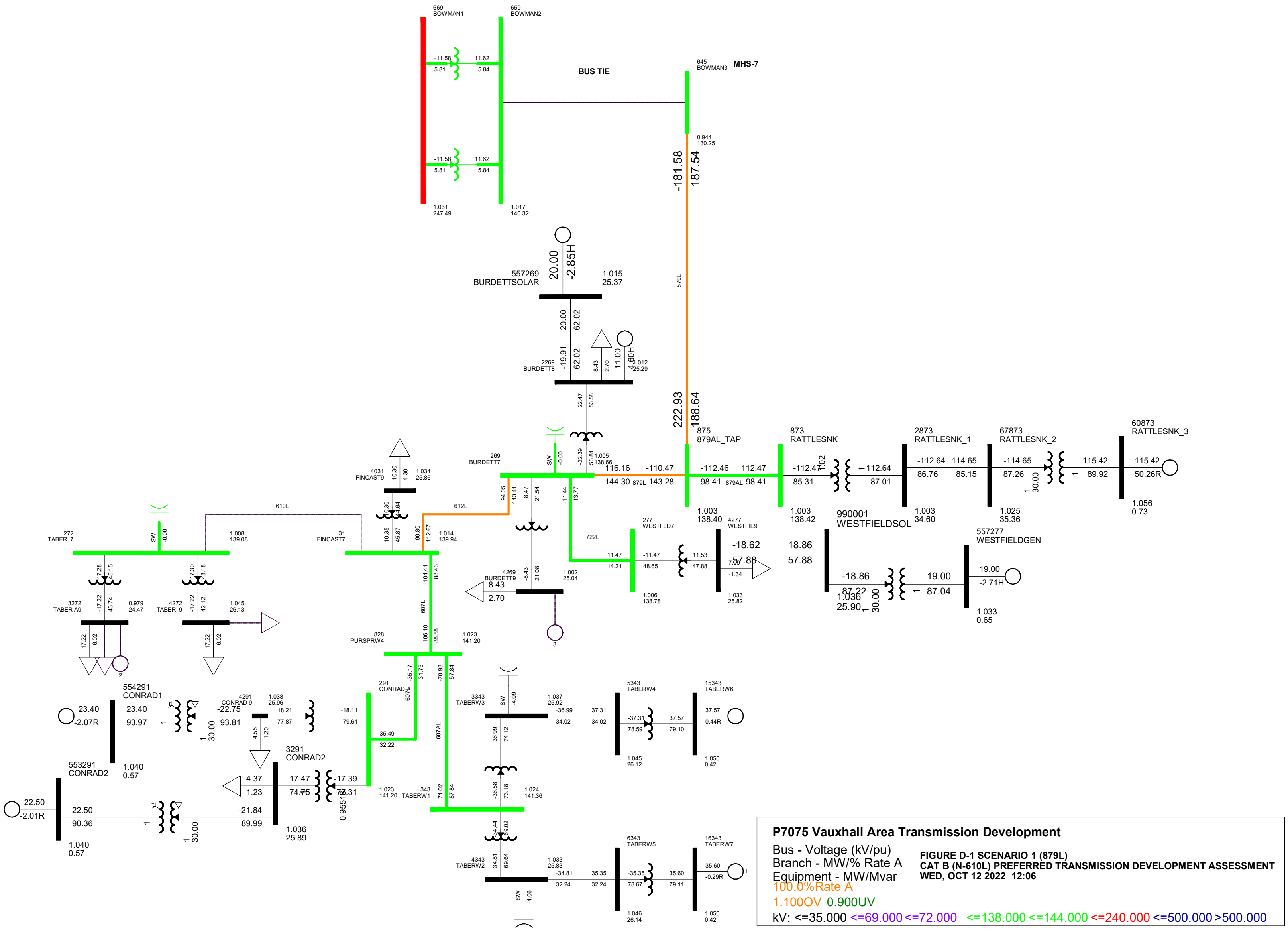

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE C-36 SCENARIO 3 (MAX)
CAT A OPTION 5B CAPABILITY ASSESSMENT
MON, OCT 24 2022 8:44
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
5343 TABERW4
15343 TABERW6
4343 TABERW2
6343 TABERW5
16343 TABERW7

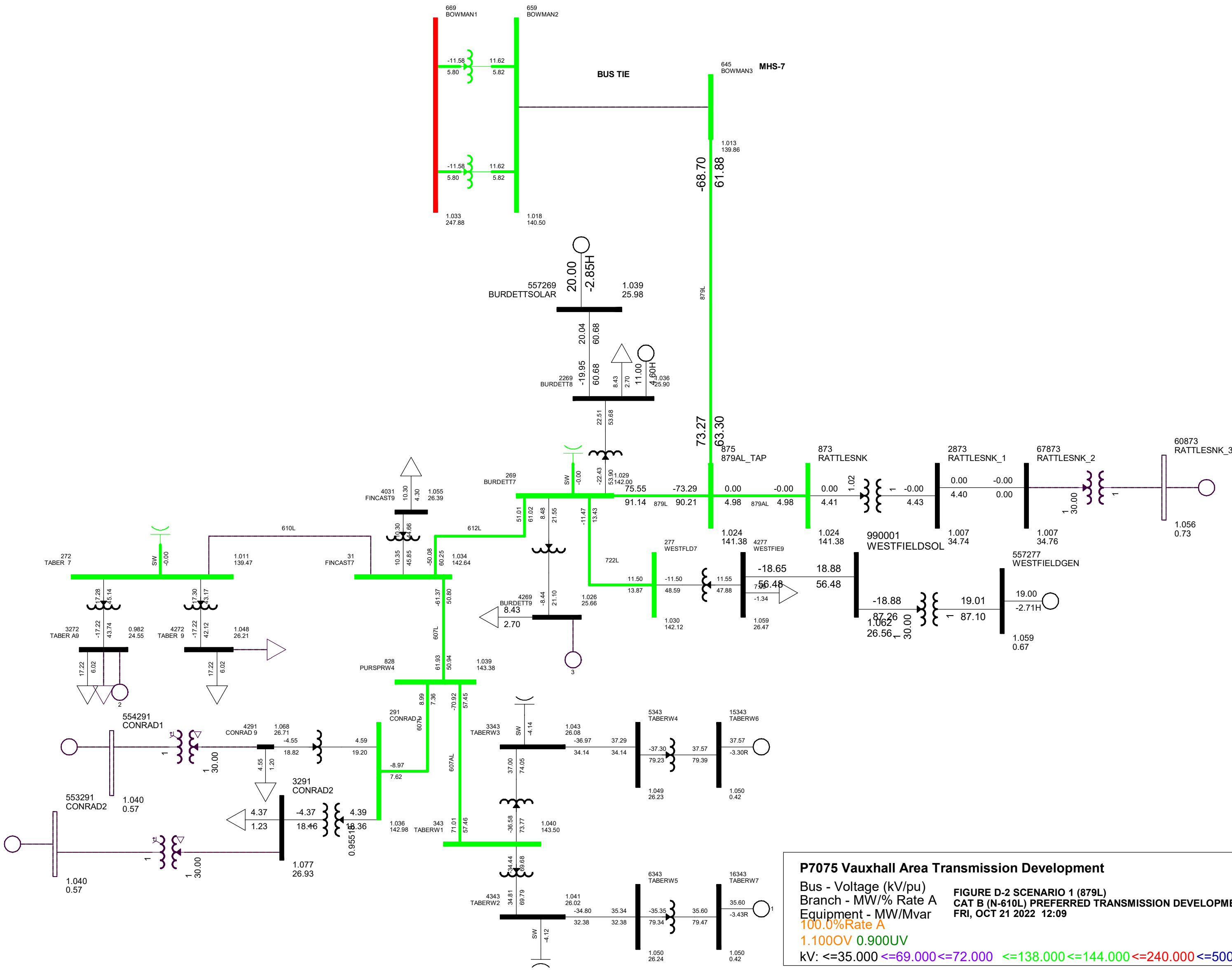
Appendix D: Power Flow SLDs – Preferred Transmission Development Category B

Table 1: Study Summary

No.	Case	Capability Category	Option	Contingency	Figure
1	Scenario 1 (879L)	B	Preferred Transmission Development	N-610L	Figure D-1
2	Scenario 1 (879L)	B	Preferred Transmission Development W/RAS	N-610L	Figure D-2
3	Scenario 2 (610L)	B	Preferred Transmission Development	N-610L	Figure D-3
4	Scenario 2 (610L)	B	Preferred Transmission Development W/RAS	N-610L	Figure D-4
5	Scenario 3 (MAX)	B	Preferred Transmission Development	N-610L	Figure D-5
6	Scenario 3 (MAX)	B	Preferred Transmission Development W/RAS	N-610L	Figure D-6
7	Scenario 1 (879L)	B	Preferred Transmission Development	N-612L	Figure D-7
8	Scenario 1 (879L)	B	Preferred Transmission Development W/RAS	N-612L	Figure D-8
9	Scenario 2 (610L)	B	Preferred Transmission Development	N-612L	Figure D-9
10	Scenario 2 (610L)	B	Preferred Transmission Development W/RAS	N-612L	Figure D-10

No.	Case	Capability Category	Option	Contingency	Figure
11	Scenario 3 (MAX)	B	Preferred Transmission Development	N-612L	Figure D-11
12	Scenario 3 (MAX)	B	Preferred Transmission Development W/RAS	N-612L	Figure D-12

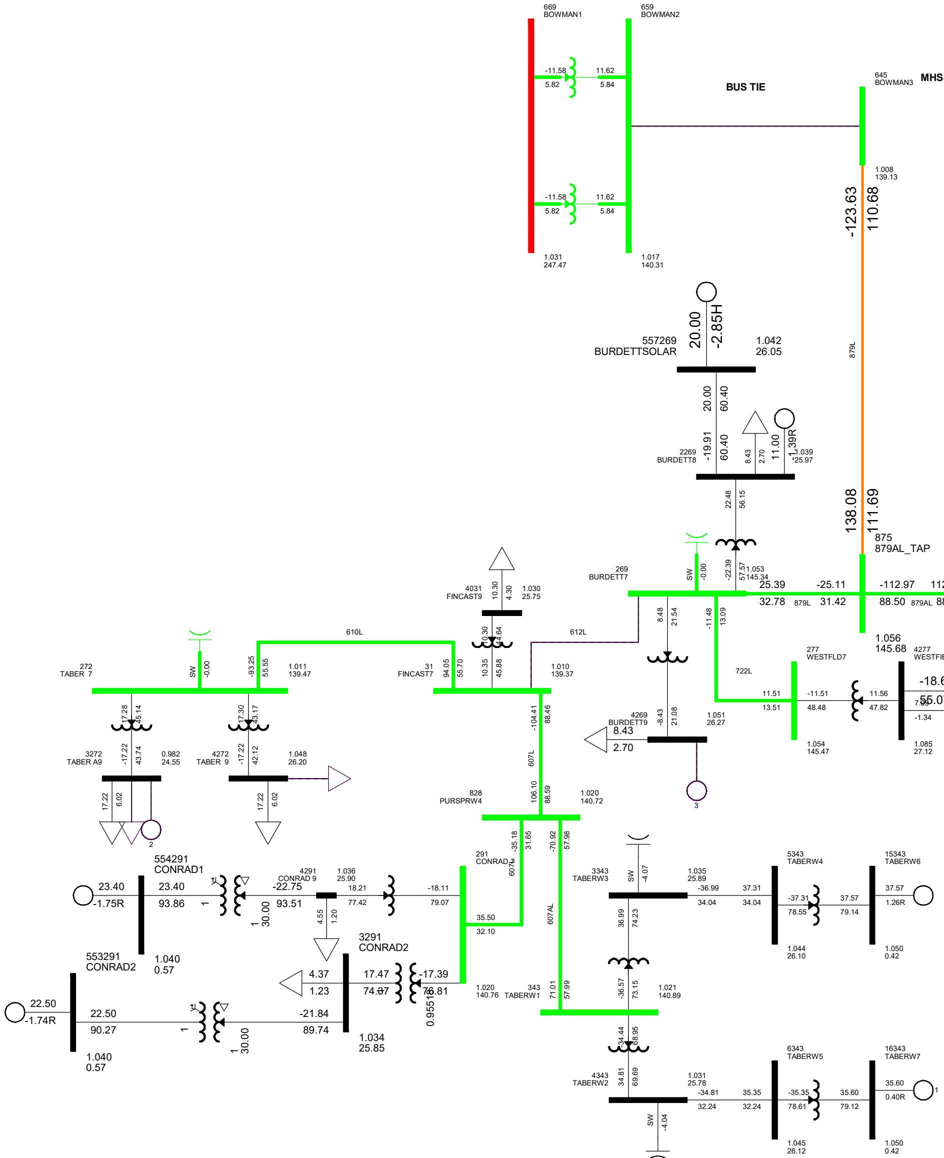

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
269 BURDETT7
4031 FINCAST9
610L
612L
879L
722L
272 TABER 7
31 FINCAST7
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
3272 TABER A9
4272 TABER 9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
607AL
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-1 SCENARIO 1 (879L)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
WED, OCT 12 2022 12:06



P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000<=72.000 <=138.000<=144.000<=240.000<=500.000>500.000

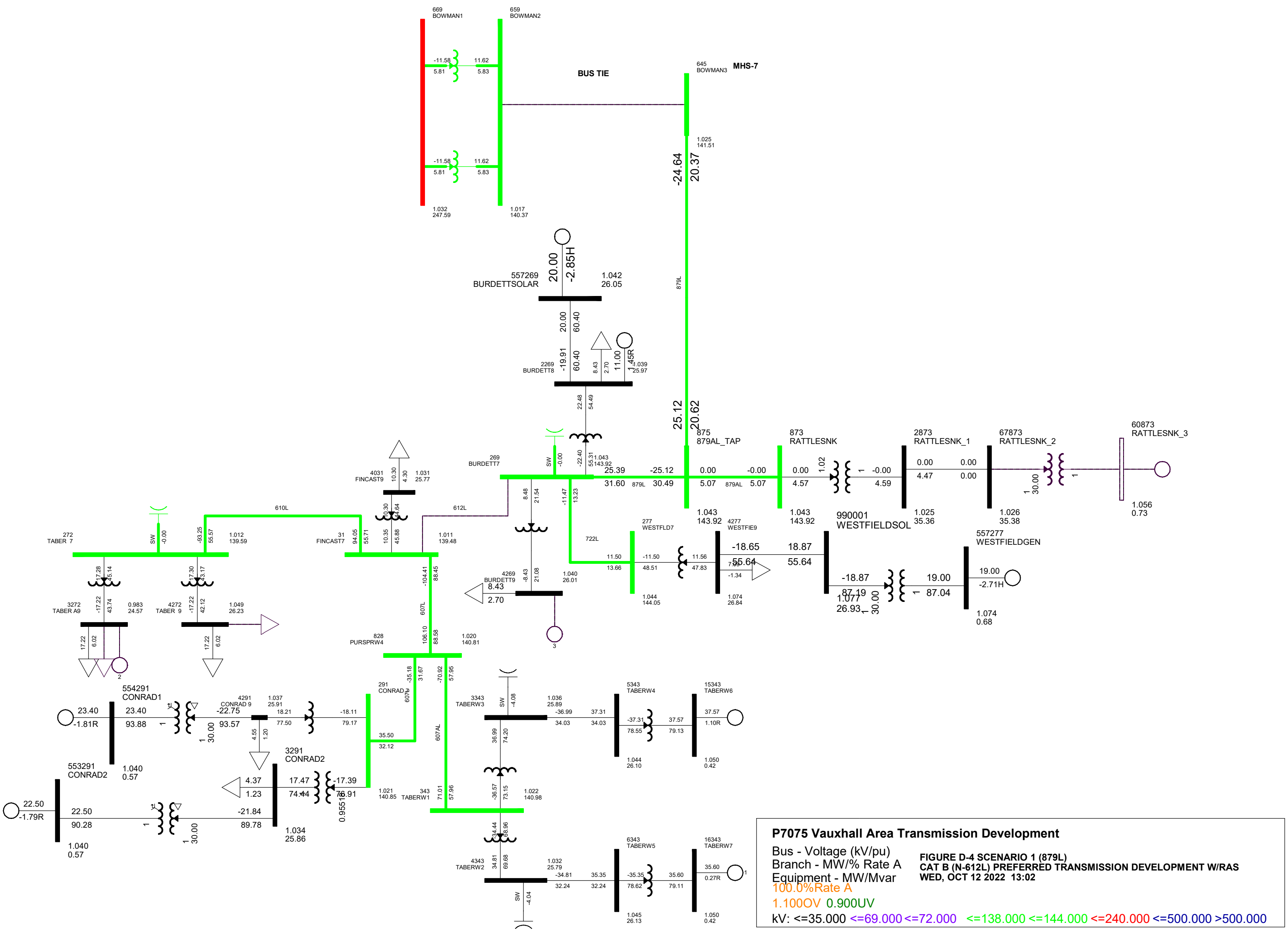
FIGURE D-2 SCENARIO 1 (879L)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
FRI, OCT 21 2022 12:09

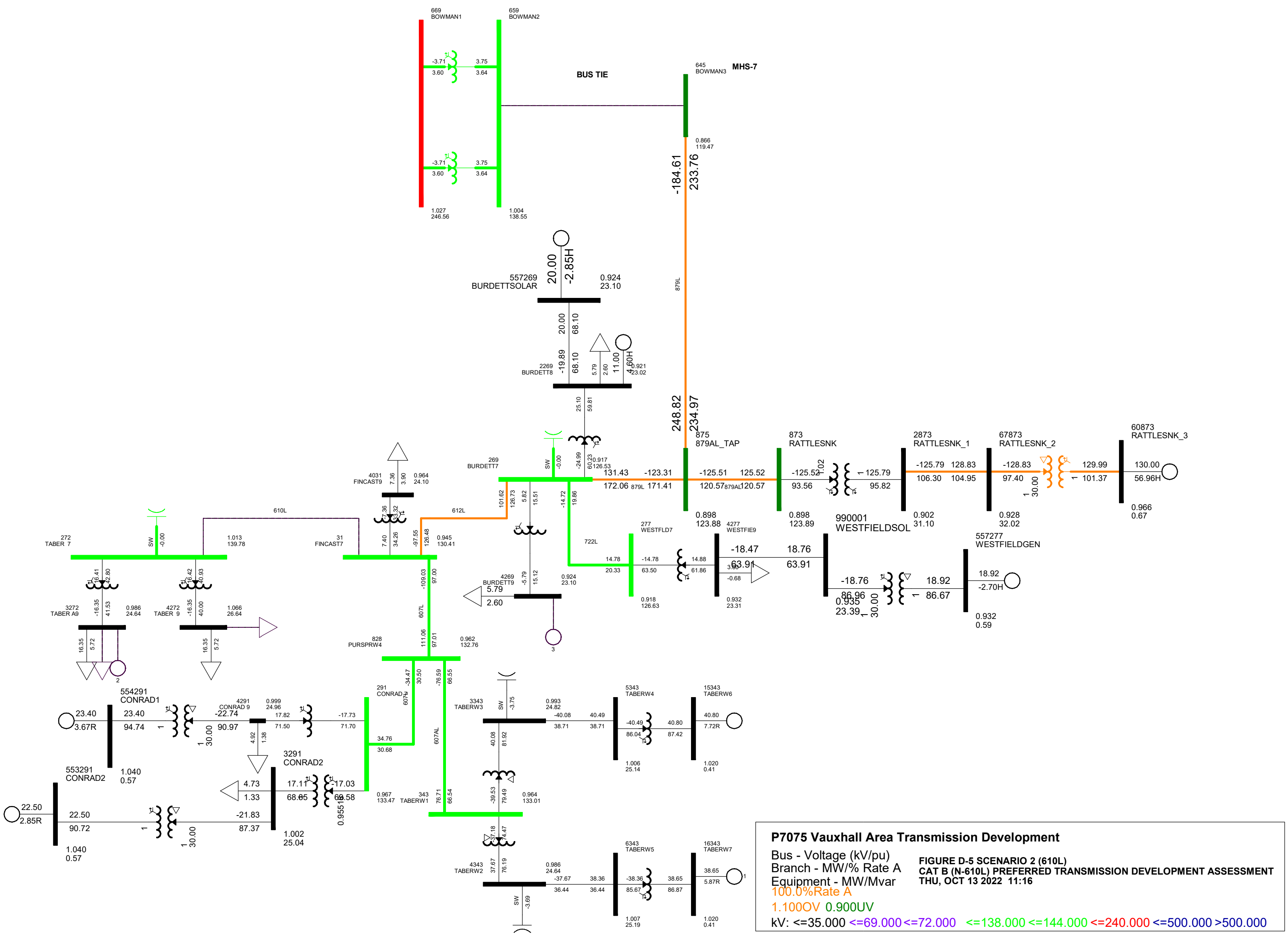


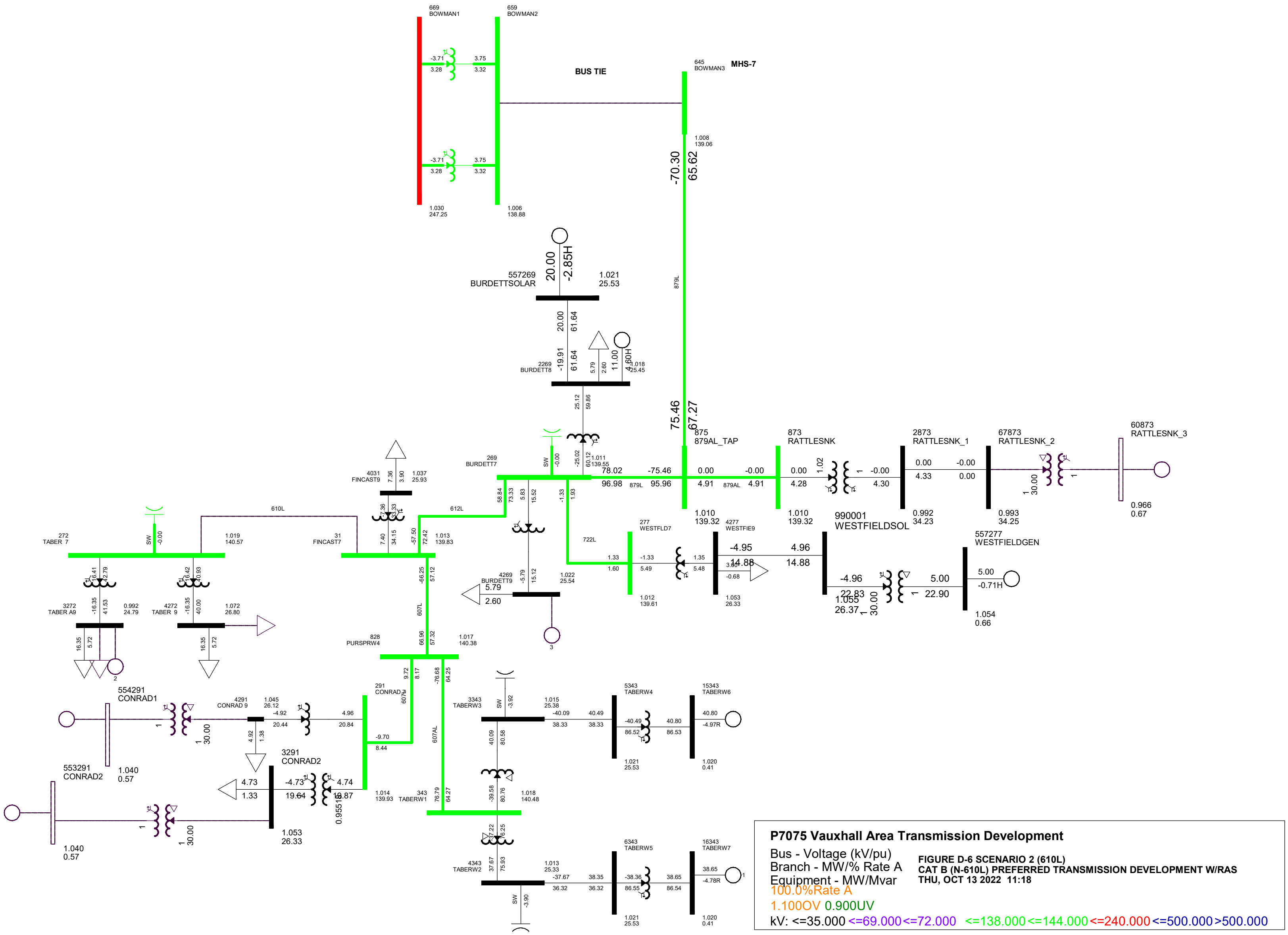
P7075 Vauxhall Area Transmission Development

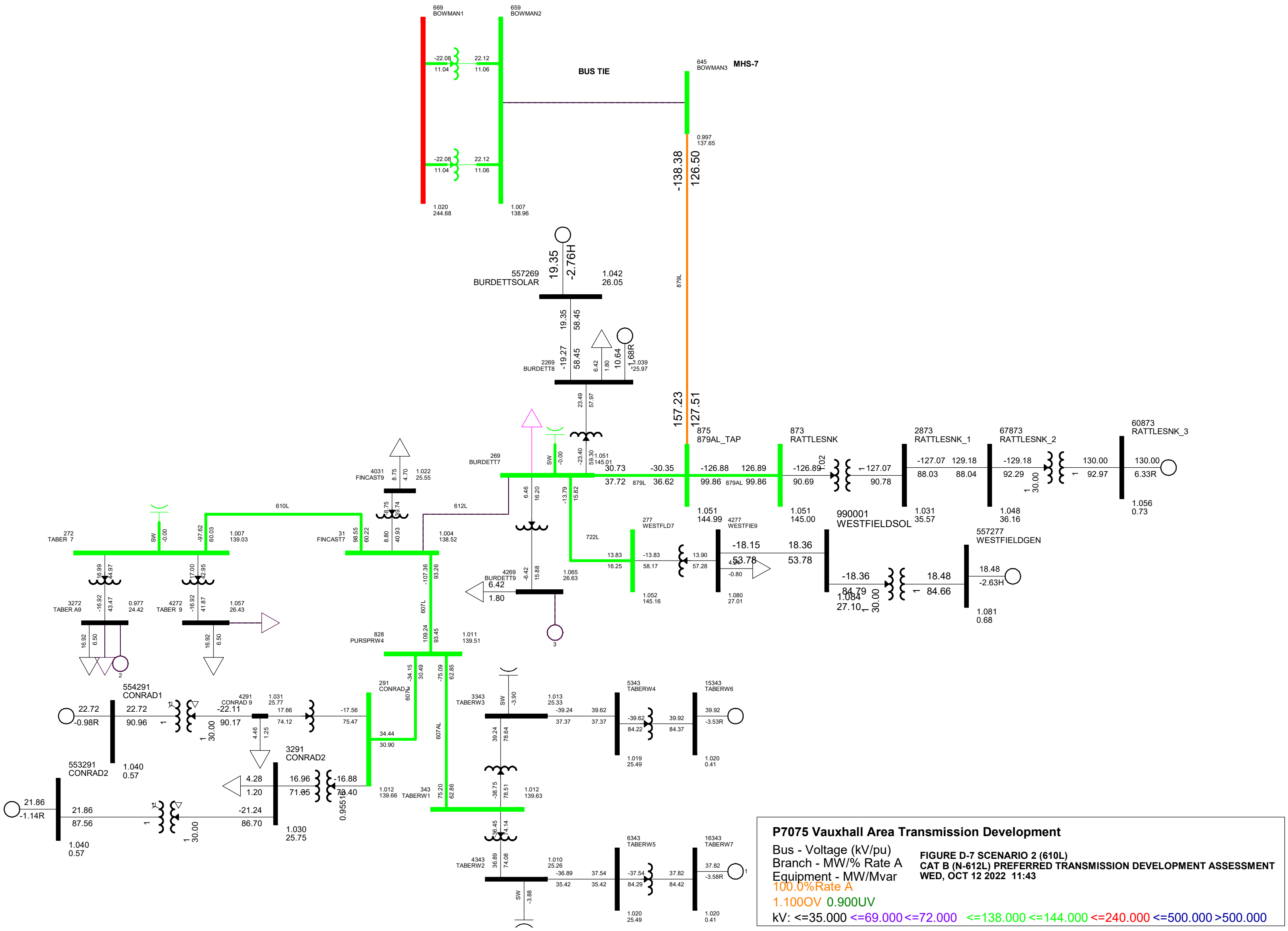
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE D-3 SCENARIO 1 (879L)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
WED, OCT 12 2022 13:01

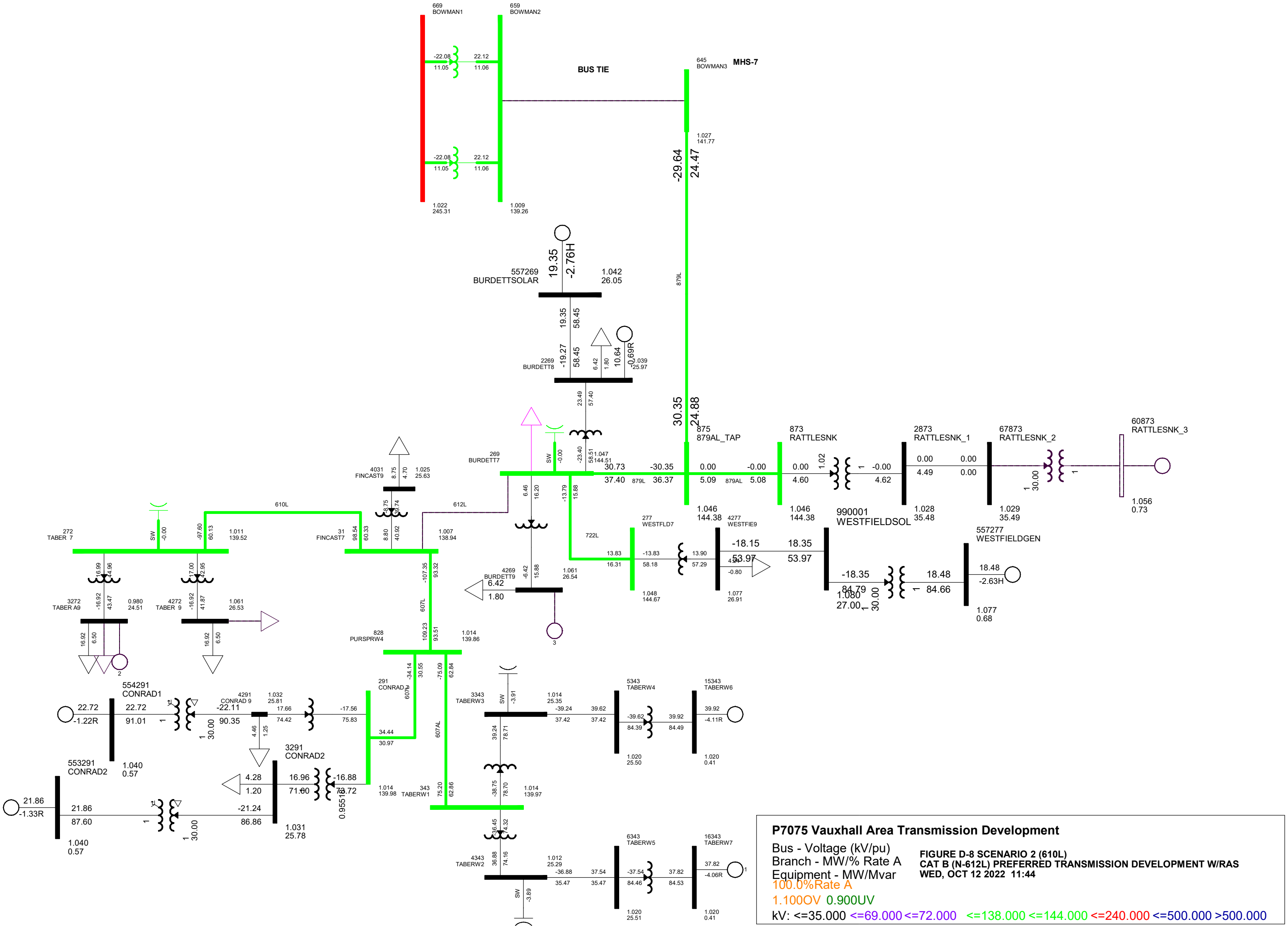

669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
343 TABERW1
4343 TABERW2
5343 TABERW4
15343 TABERW6
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-4 SCENARIO 1 (879L)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
WED, OCT 12 2022 13:02

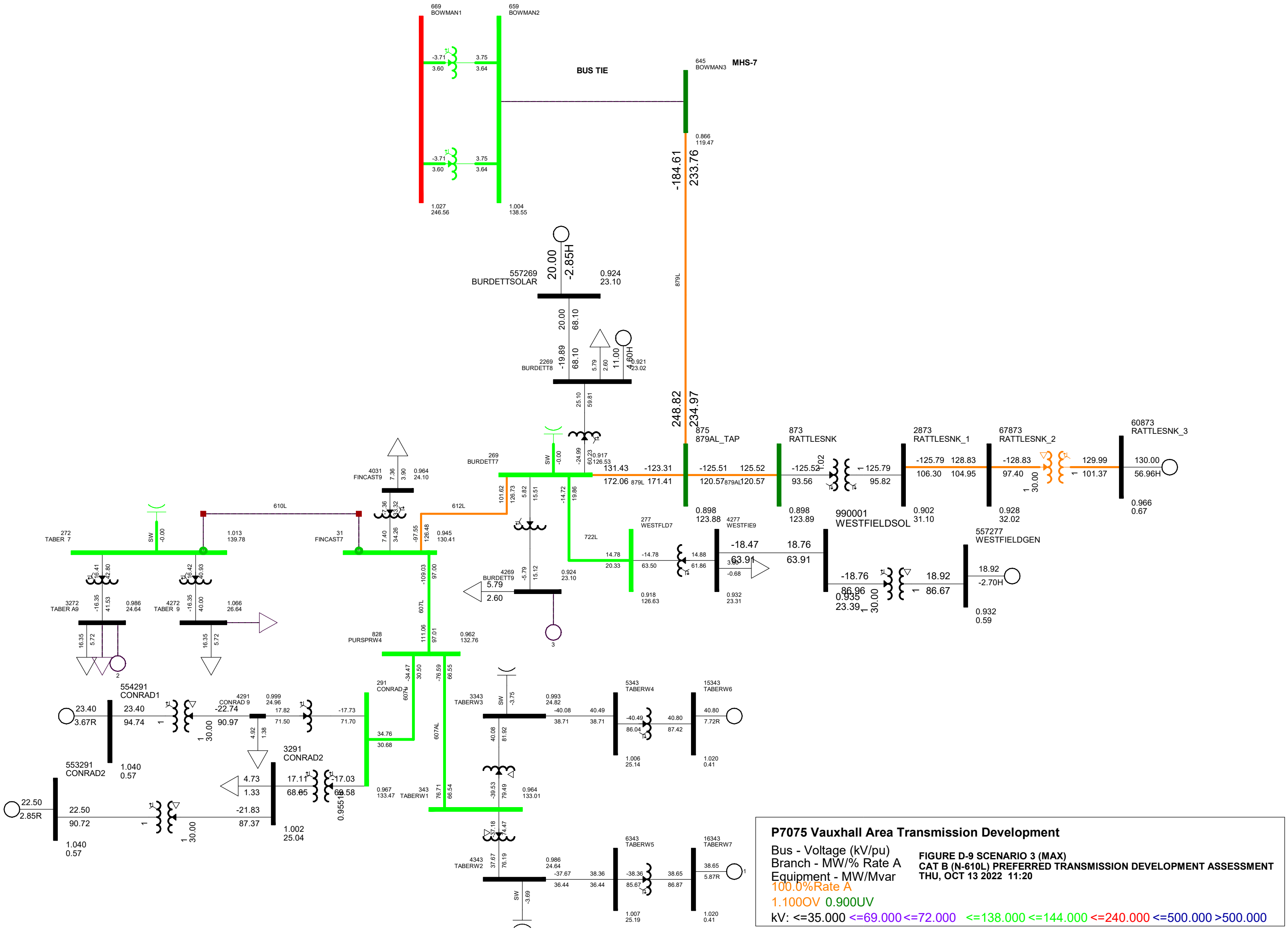

669
BOWMAN1
659
BOWMAN2
BUS TIE
645
BOWMAN3
MHS-7
879L
557269
BURDETTSOLAR
2269
BURDETT8
875
879AL_TAP
873
RATTLESNK
2873
RATTLESNK_1
67873
RATTLESNK_2
60873
RATTLESNK_3
4031
FINCAST9
269
BURDETT7
610L
612L
722L
272
TABER 7
31
FINCAST7
277
WESTFLD7
4277
WESTFIE9
990001
WESTFIELDSOL
557277
WESTFIELDGEN
3272
TABER A9
4272
TABER 9
4269
BURDETT9
607L
828
PURSPRW4
554291
CONRAD1
4291
CONRAD 9
291
CONRAD
3343
TABERW3
5343
TABERW4
15343
TABERW6
607AL
3291
CONRAD2
553291
CONRAD2
343
TABERW1
4343
TABERW2
6343
TABERW5
16343
TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-5 SCENARIO 2 (610L)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:16

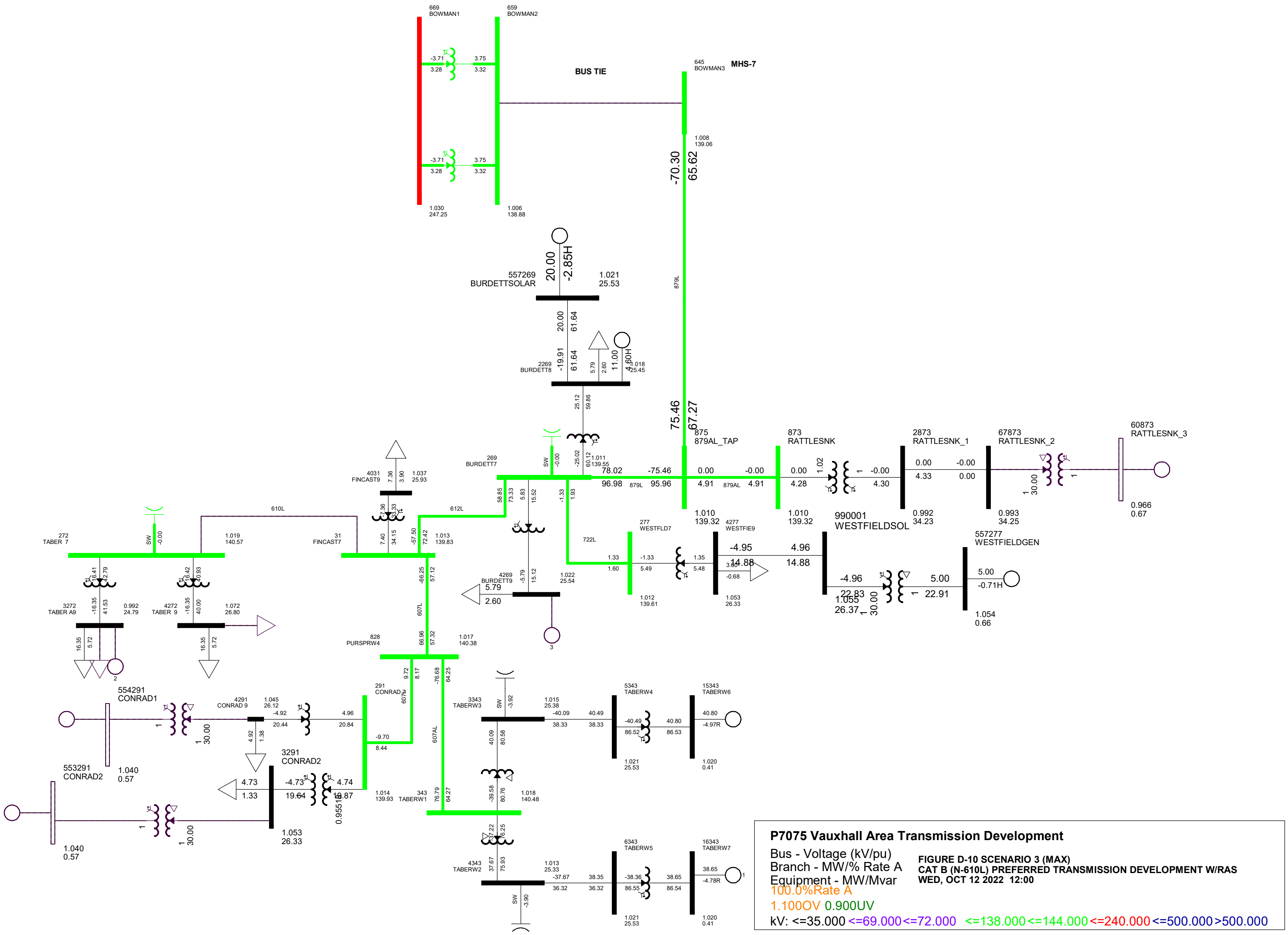

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-6 SCENARIO 2 (610L)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
THU, OCT 13 2022 11:18
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
291 CONRAD 7
554291 CONRAD1
4291 CONRAD 9
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
607L
607AL
722L
879L
879AL

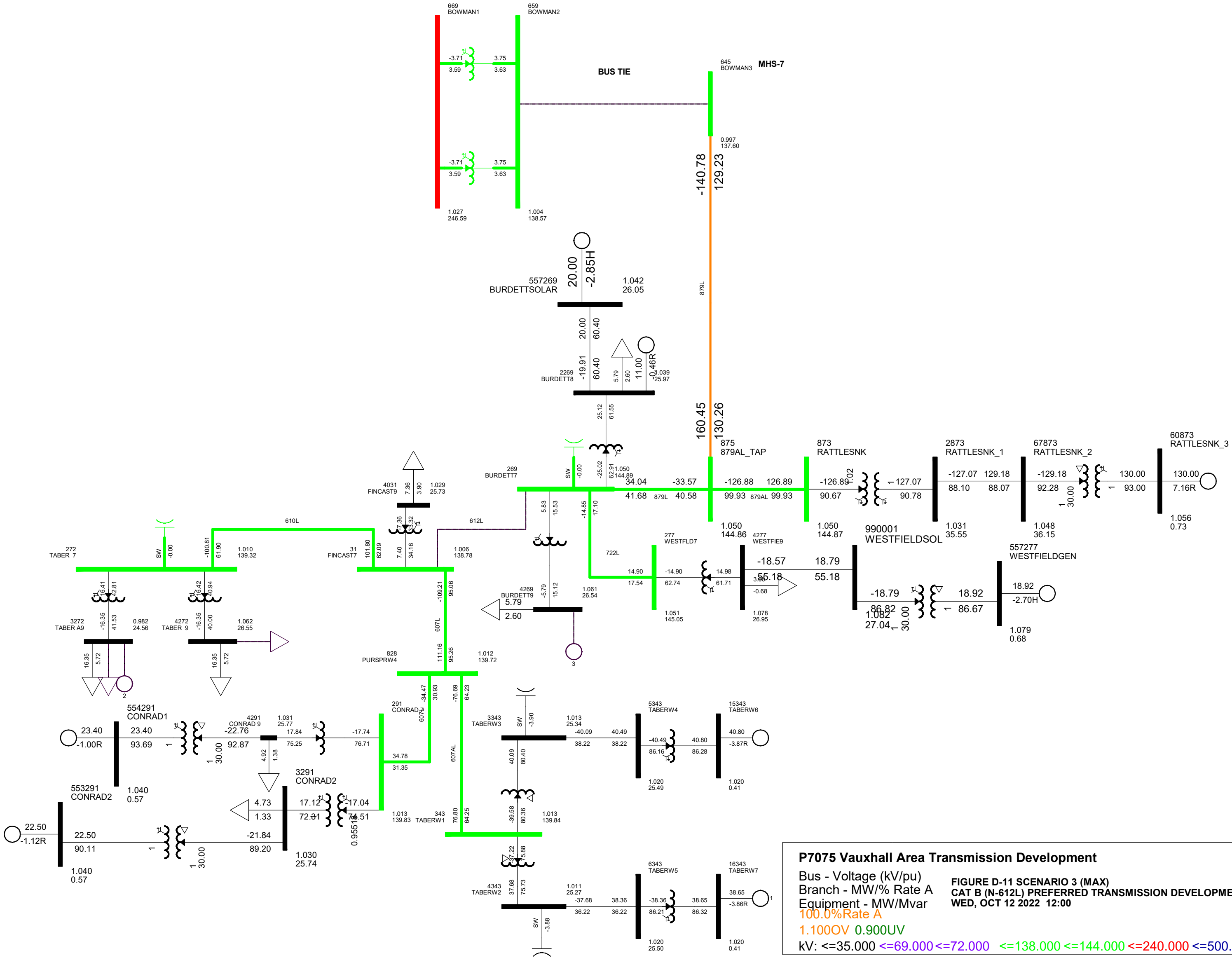


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-7 SCENARIO 2 (610L)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
WED, OCT 12 2022 11:43
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
879L
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
31 FINCAST7
610L
612L
722L
272 TABER 7
3272 TABER A9
4272 TABER 9
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
4269 BURDETT9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
607AL
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7


669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
879L
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
4031 FINCAST9
610L
612L
272 TABER 7
31 FINCAST7
722L
277 WESTFLD7
4277 WESTFIE9
990001 WESTFIELDSOL
557277 WESTFIELDGEN
3272 TABER A9
4272 TABER 9
4269 BURDETT9
607L
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
607AL
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-8 SCENARIO 2 (610L)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
WED, OCT 12 2022 11:44


669
BOWMAN1
659
BOWMAN2
BUS TIE
645
BOWMAN3
MHS-7
0.866
119.47
-184.61
233.76
1.027
246.56
1.004
138.55
879L
557269
BURDETTSOLAR
20.00
-2.85H
0.924
23.10
2269
BURDETT8
0.921
23.02
248.82
234.97
875
879AL_TAP
873
RATTLESNK
2873
RATTLESNK_1
67873
RATTLESNK_2
60873
RATTLESNK_3
130.00
56.96H
0.966
0.67
269
BURDETT7
0.917
126.53
131.43
172.06
-123.31
171.41
-125.51
120.57
125.52
120.57
-125.52
93.56
125.79
95.82
-125.79
106.30
128.83
104.95
-128.83
97.40
129.99
101.37
0.898
123.88
0.898
123.89
0.902
31.10
0.928
32.02
4031
FINCAST9
0.964
24.10
610L
612L
272
TABER 7
1.013
139.78
31
FINCAST7
0.945
130.41
722L
277
WESTFLD7
4277
WESTFIE9
990001
WESTFIELDSOL
557277
WESTFIELDGEN
-18.47
63.91
18.76
63.91
-18.76
86.96
18.92
86.67
18.92
-2.70H
0.935
23.39
0.932
0.59
0.918
126.63
0.932
23.31
3272
TABER A9
0.986
24.64
4272
TABER 9
1.066
26.64
4269
BURDETT9
0.924
23.10
5.79
2.60
607L
828
PURSPRW4
0.962
132.76
554291
CONRAD1
23.40
3.67R
23.40
94.74
4291
CONRAD 9
0.999
24.96
-22.74
90.97
291
CONRAD7
1.040
0.57
3291
CONRAD2
4.73
1.33
17.11
68.85
-17.03
69.58
0.955
553291
CONRAD2
22.50
2.85R
22.50
90.72
-21.83
87.37
1.002
25.04
1.040
0.57
3343
TABERW3
0.993
24.82
5343
TABERW4
15343
TABERW6
40.80
7.72R
1.006
25.14
1.020
0.41
607AL
343
TABERW1
0.967
133.47
0.964
133.01
4343
TABERW2
0.986
24.64
6343
TABERW5
16343
TABERW7
38.65
5.87R
1.007
25.19
1.020
0.41
P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-9 SCENARIO 3 (MAX)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
THU, OCT 13 2022 11:20

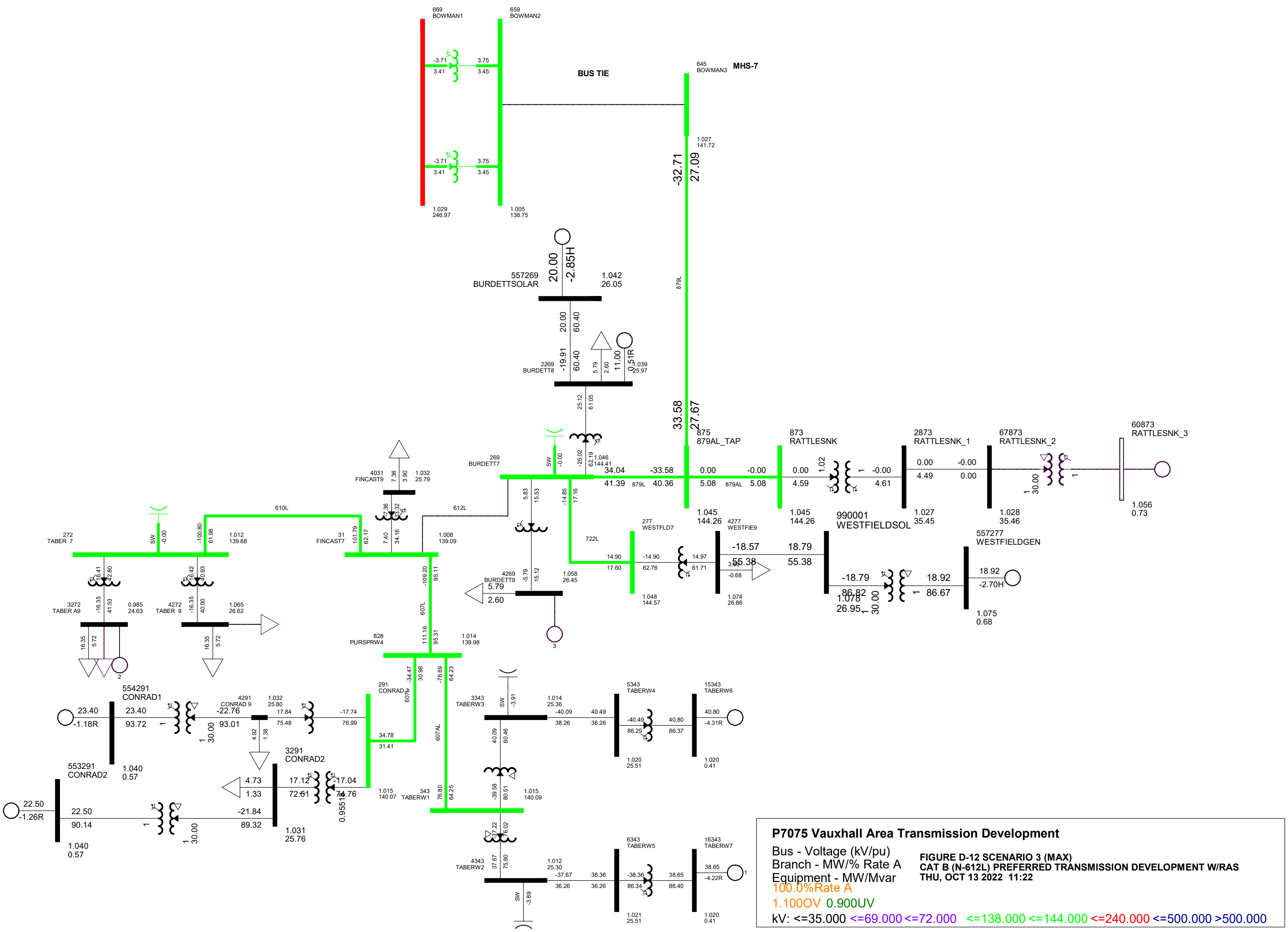

P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-10 SCENARIO 3 (MAX)
CAT B (N-610L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
WED, OCT 12 2022 12:00
669 BOWMAN1
659 BOWMAN2
BUS TIE
645 BOWMAN3
MHS-7
557269 BURDETTSOLAR
2269 BURDETT8
269 BURDETT7
875 879AL_TAP
873 RATTLESNK
2873 RATTLESNK_1
67873 RATTLESNK_2
60873 RATTLESNK_3
990001 WESTFIELDSOL
557277 WESTFIELDGEN
277 WESTFLD7
4277 WESTFIE9
4031 FINCAST9
31 FINCAST7
272 TABER 7
3272 TABER A9
4272 TABER 9
4269 BURDETT9
828 PURSPRW4
554291 CONRAD1
4291 CONRAD 9
291 CONRAD 7
3291 CONRAD2
553291 CONRAD2
3343 TABERW3
5343 TABERW4
15343 TABERW6
343 TABERW1
4343 TABERW2
6343 TABERW5
16343 TABERW7
610L
612L
722L
879L
879AL
607L
607AL



P7075 Vauxhall Area Transmission Development

Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000

FIGURE D-11 SCENARIO 3 (MAX)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT ASSESSMENT
WED, OCT 12 2022 12:00


P7075 Vauxhall Area Transmission Development
Bus - Voltage (kV/pu)
Branch - MW/% Rate A
Equipment - MW/Mvar
100.0%Rate A
1.100OV 0.900UV
kV: <=35.000 <=69.000 <=72.000 <=138.000 <=144.000 <=240.000 <=500.000 >500.000
FIGURE D-12 SCENARIO 3 (MAX)
CAT B (N-612L) PREFERRED TRANSMISSION DEVELOPMENT W/RAS
THU, OCT 13 2022 11:22

Appendix E: Transient Stability Analysis

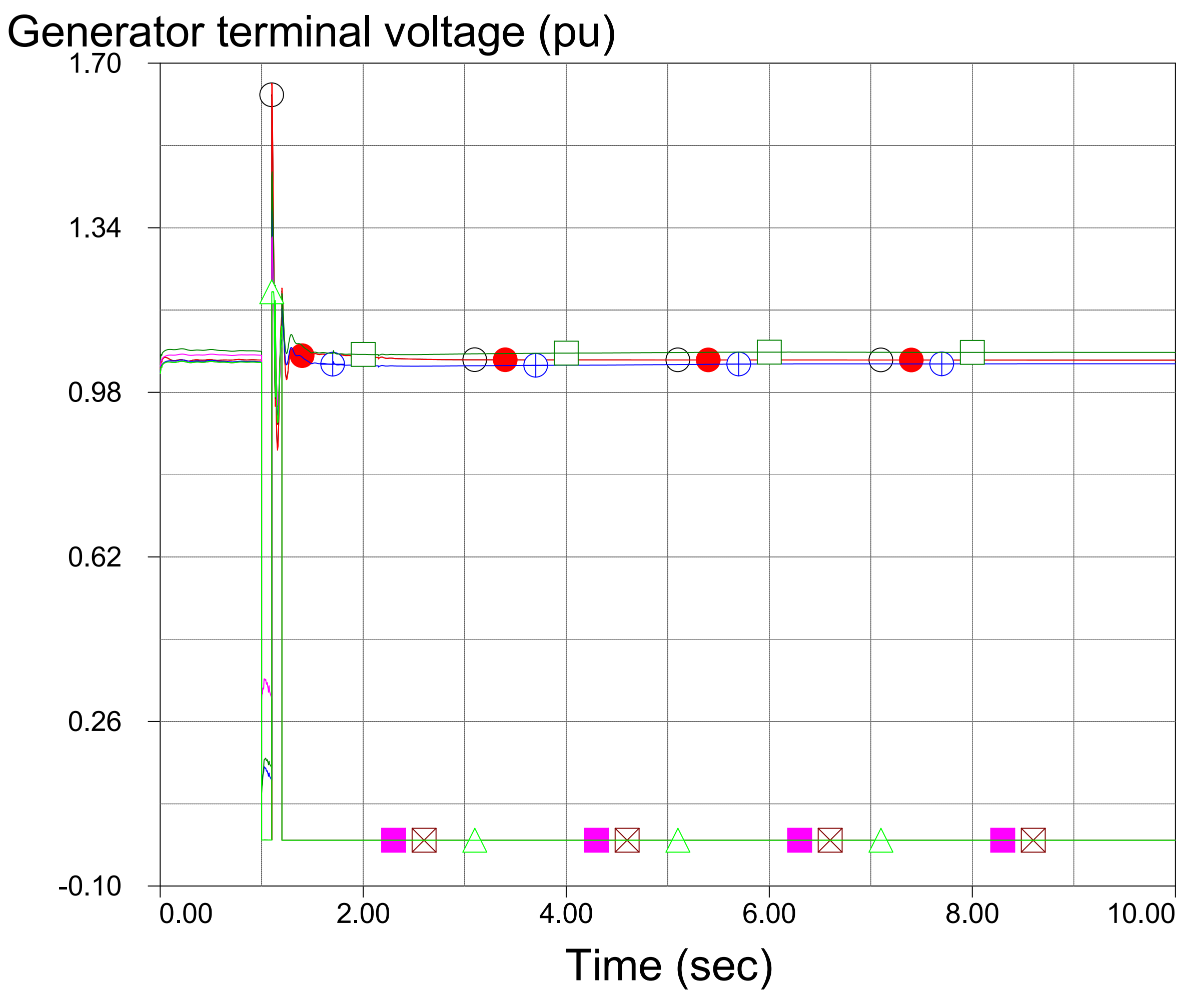
Table 1: Contingencies and Fault Clearing Times

Case	Contingency	Fault	Fault Location	Near End Clearing Time (cycles)	Far End Clear Time (cycles)	Condition
Scenario 1 (879L)	610L		Fincastle 336S			Stable
	610L		Taber 83S			Stable
	612L		Fincastle 336S			Stable
	612L		Burdett 368S	6	8	Stable
	879L		Burdett 368S			Stable
	879L		Bowmanton 244S			Stable
	1034L		Bowmanton 244S	5	6	Stable
	1034L		Cassils 324S			Stable
Scenario 2 (610L)	610L		Fincastle 336S			Stable
	610L		Taber 83S			Stable
	612L	Three Phase	Fincastle 336S			Stable
	612L		Burdett 368S	6	8	Stable
	879L		Burdett 368S			Stable
	879L		Bowmanton 244S			Stable
	1034L		Bowmanton 244S	5	6	Stable
	1034L		Cassils 324S			Stable
Scenario 3 (Max)	610L		Fincastle 336S			Stable
	610L		Taber 83S			Stable
	612L		Fincastle 336S	6	8	Stable
	612L		Burdett 368S			Stable
	879L		Burdett 368S			Stable

Case	Contingency	Fault	Fault Location	Near End Clearing Time (cycles)	Far End Clear Time (cycles)	Condition
	879L		Bowmanton 244S			Stable
	1034L		Bowmanton 244S	5	6	Stable
	1034L		Cassils 324S			Stable

TSAT Oct 20, 2022 10:30:50

Buf.	Binary Result File	Scenario	Contingency
1	Scenario 1 Post Development.bin	Scenario 1 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	1
●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

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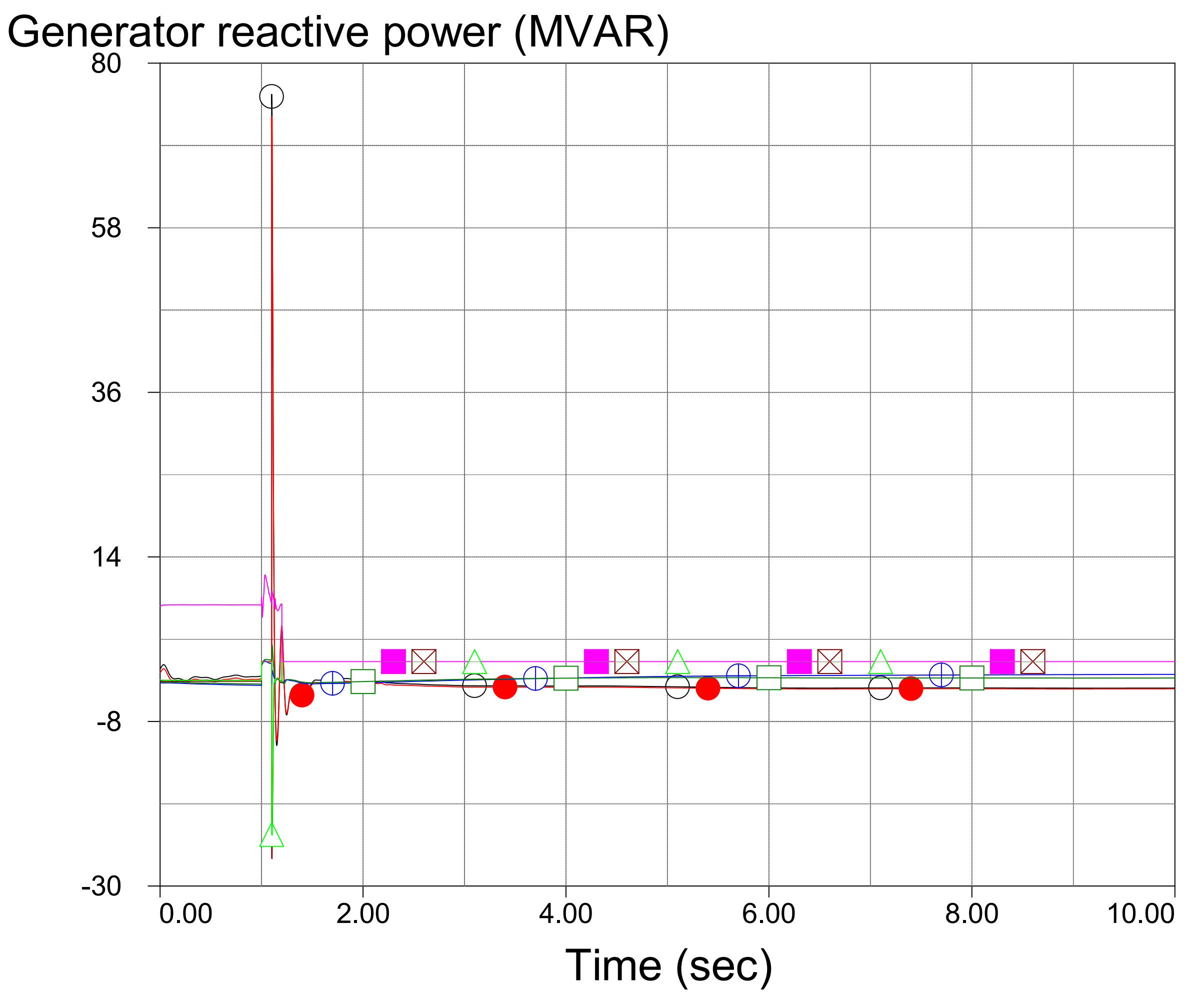
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 1 Post Development.bin	Scenario 1 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	1
●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1	0	1
□	557277	WESTFIELDGEN(G1	3	1
■	60873	RATTLESNK_3 0.	G1	1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

DSATools Output Analysis 19.0

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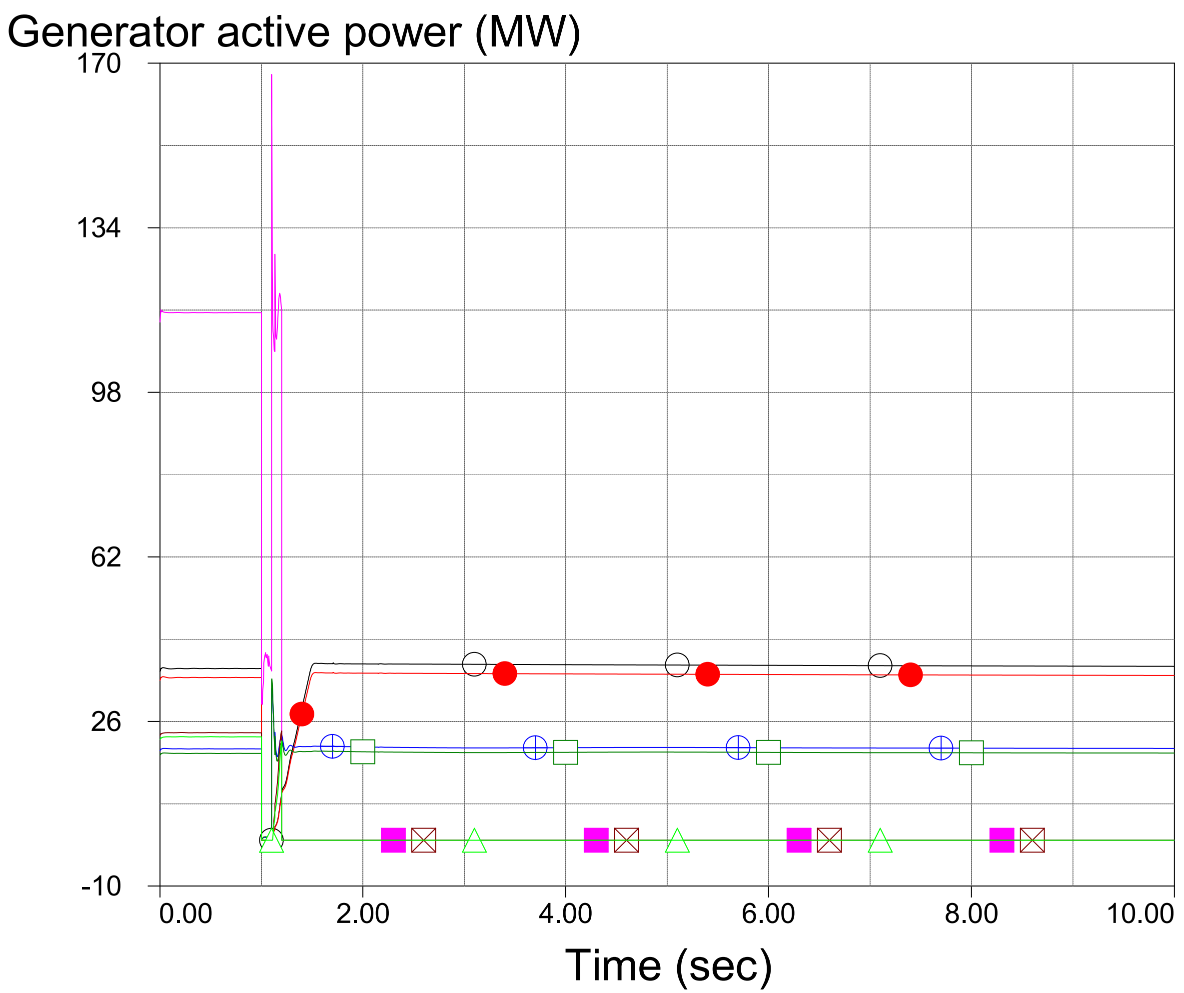
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 1 Post Development.bin	Scenario 1 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	1
●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

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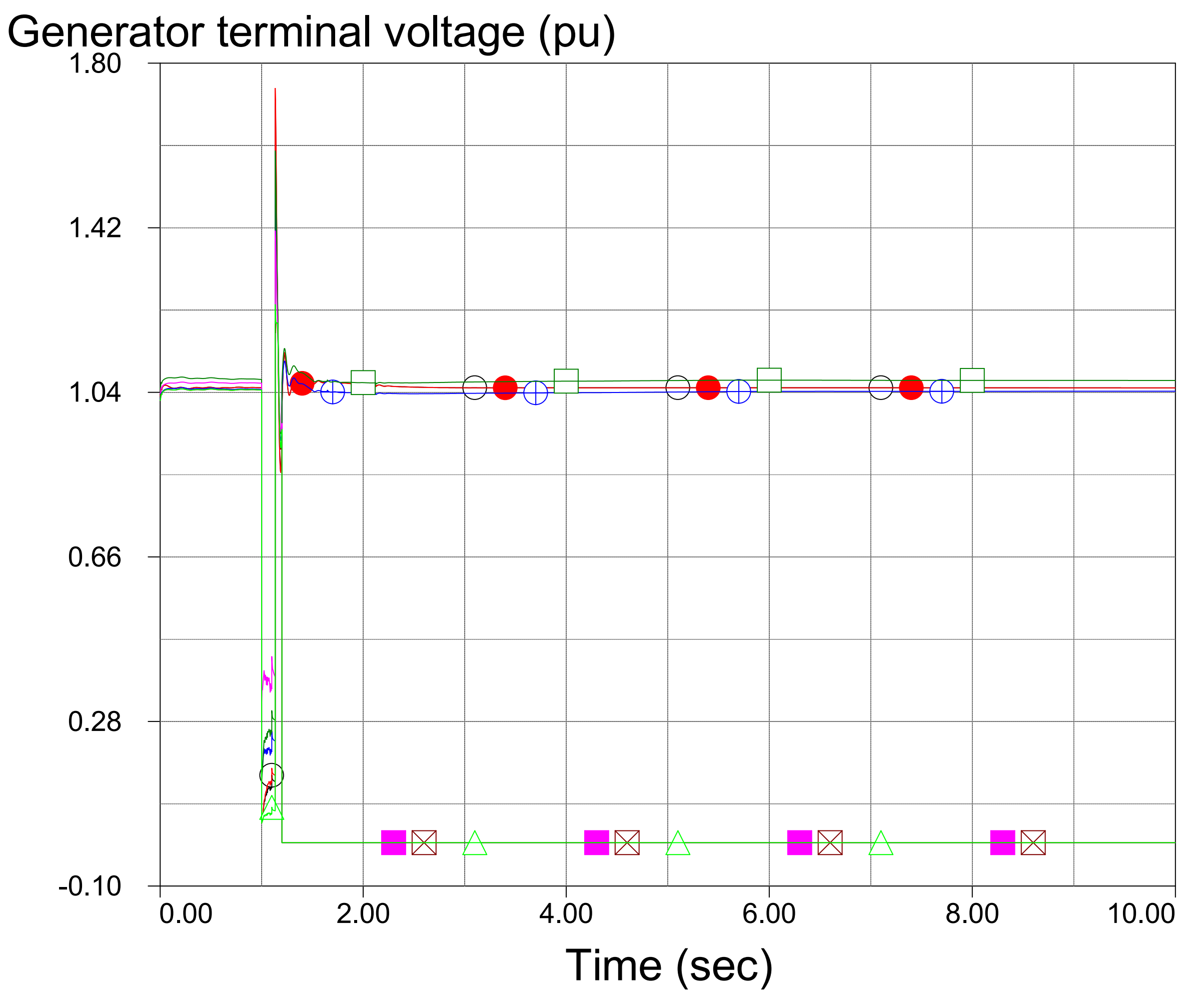
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 1 Post Development.bin	Scenario 1 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name		ID	Buf.
○	15343	TABERW6	0.40	1	2
●	16343	TABERW7	0.40	1	2
⊕	557269	BURDETTSOLARG	1.0		2
□	557277	WESTFIELDGEN(		G13	2
■	60873	RATTLESNK_3	0.	G1	2
⊠	554291	CONRAD1	0.55	G1	2
△	553291	CONRAD2	0.55	G2	2

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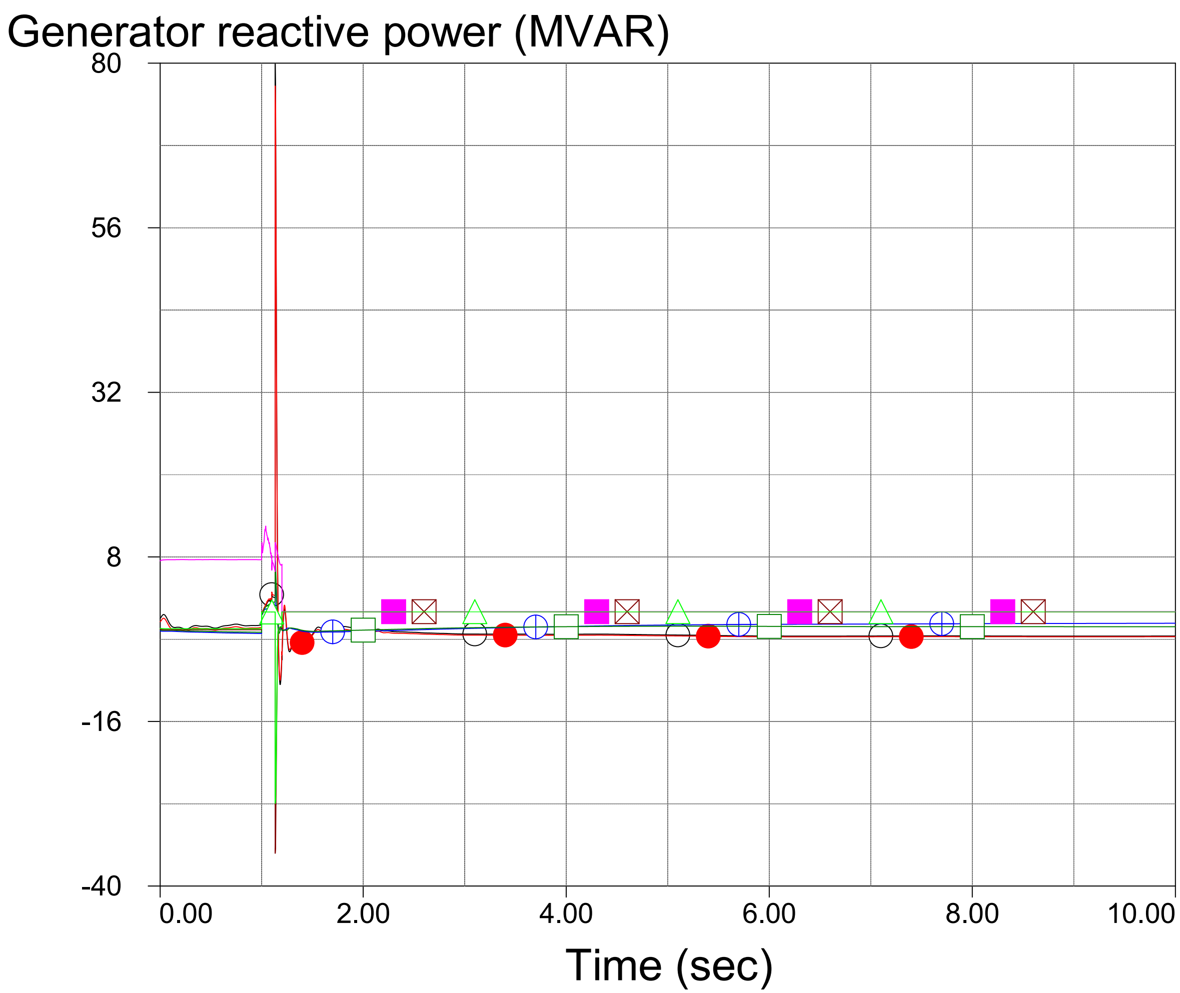
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 1 Post Development.bin	Scenario 1 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	2
●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G13		2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

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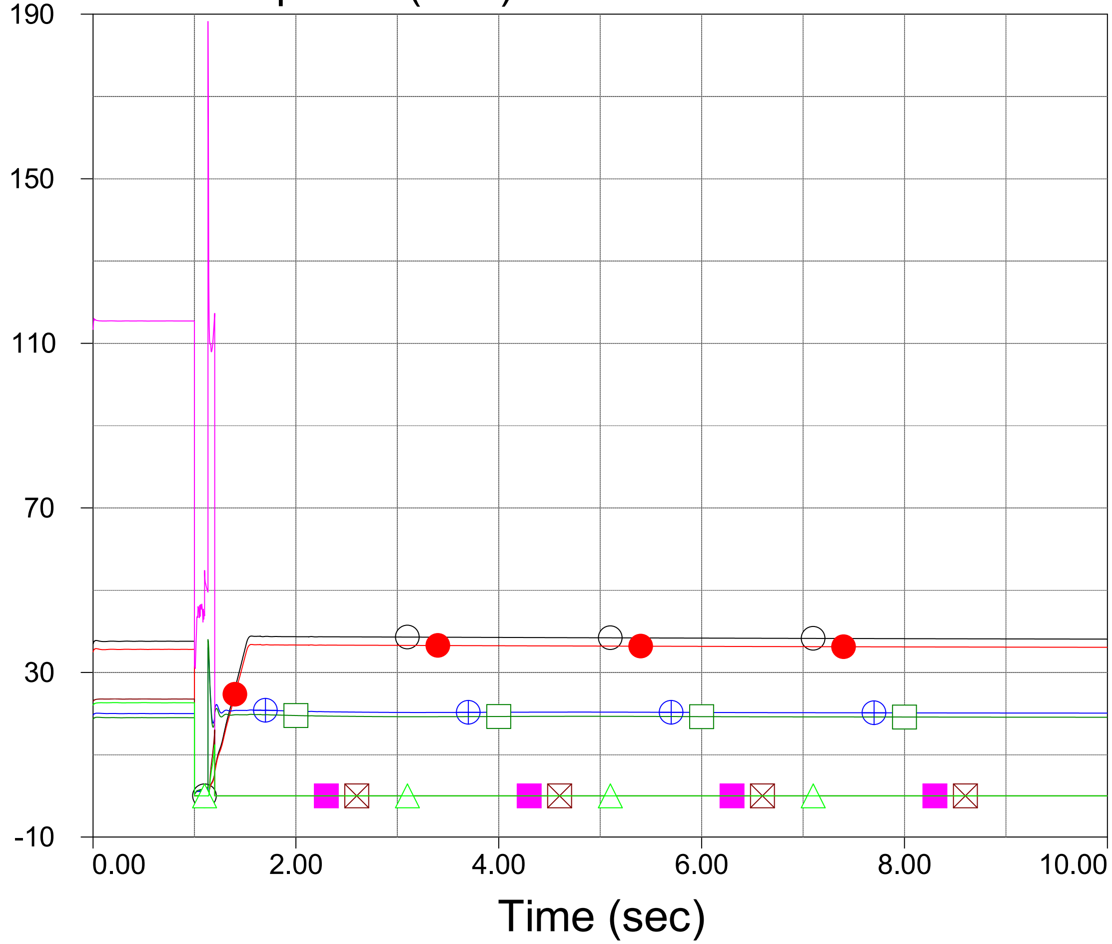
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 1 Post Development.bin	Scenario 1 Post Development	2 -- 610L F 3P FAULT(N6F8)

Generator active power (MW)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	2
●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1	0	2
□	557277	WESTFIELDGEN(G1	3	2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

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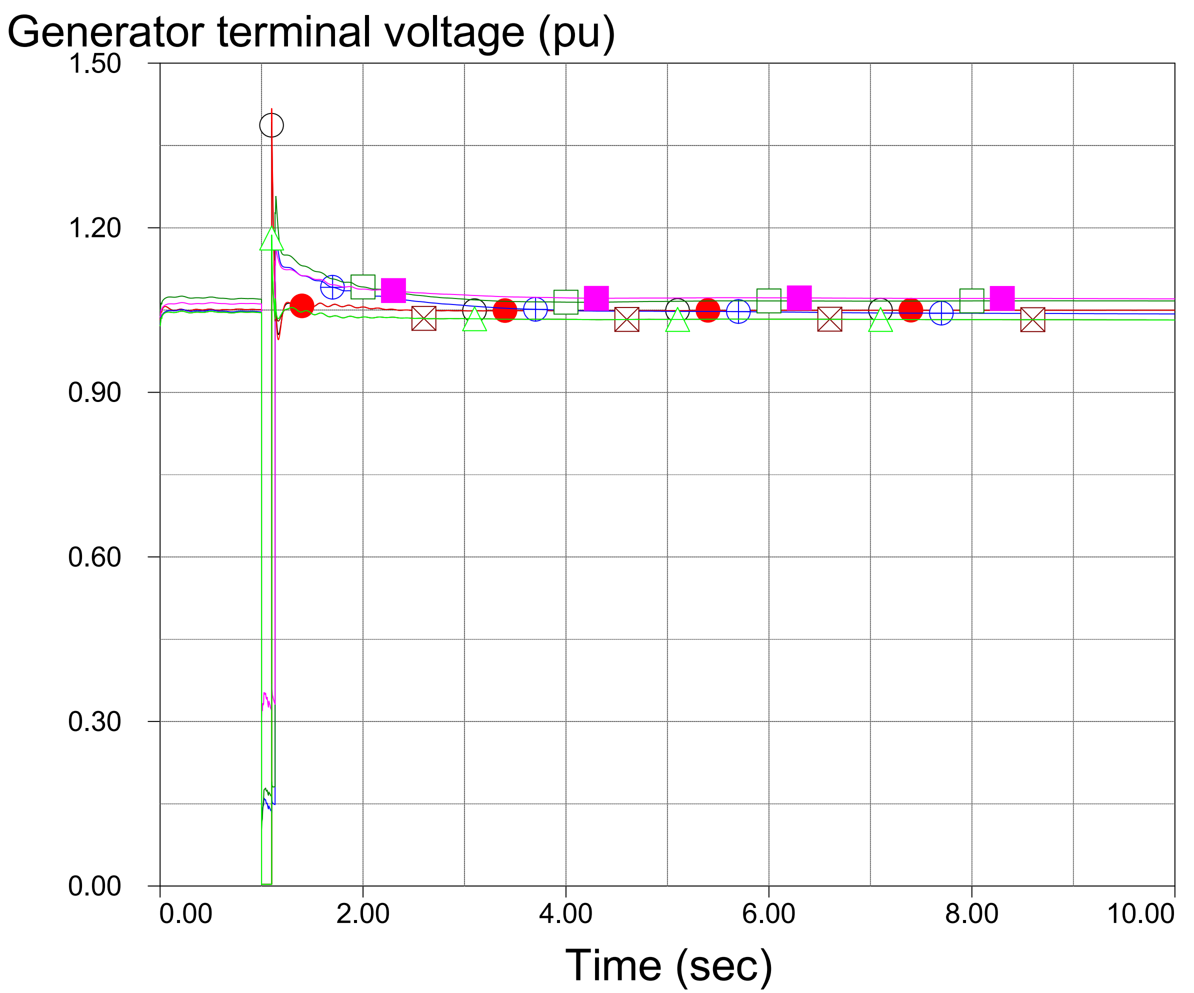
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 1 Post Development.bin	Scenario 1 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1	0	3
□	557277	WESTFIELDGEN(G1	3	3
■	60873	RATTLESNK_3 0.G1		3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

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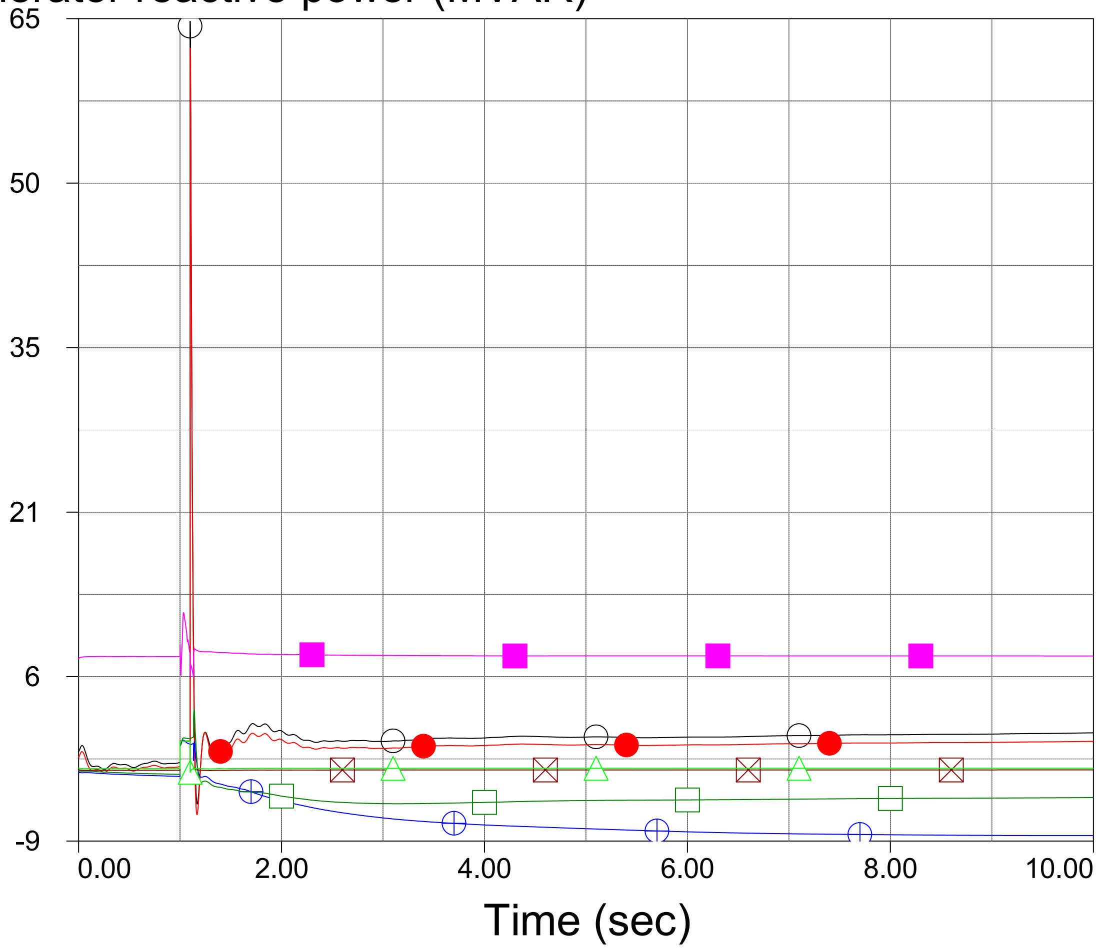
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 1 Post Development.bin	Scenario 1 Post Development	3 -- 612L N 3P FAULT(N6F8)

Generator reactive power (MVAR)



	Bus #	Bus Name	ID	Buf.
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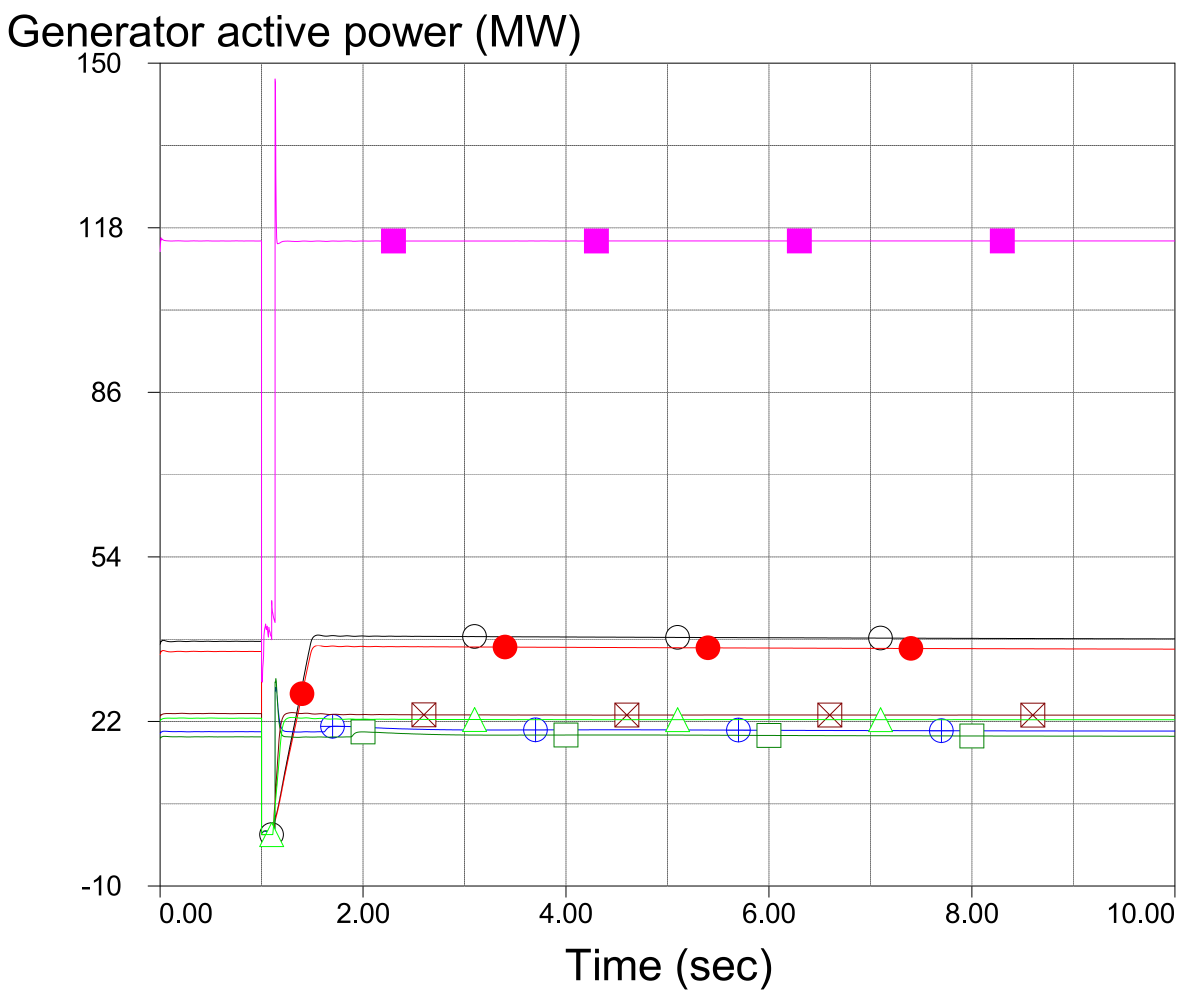
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1.0		3
□	557277	WESTFIELDGEN(G13		3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

Buf.	Binary Result File	Scenario	Contingency
3	Scenario 1 Post Development.bin	Scenario 1 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1	0	3
□	557277	WESTFIELDGEN(G1	3	3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

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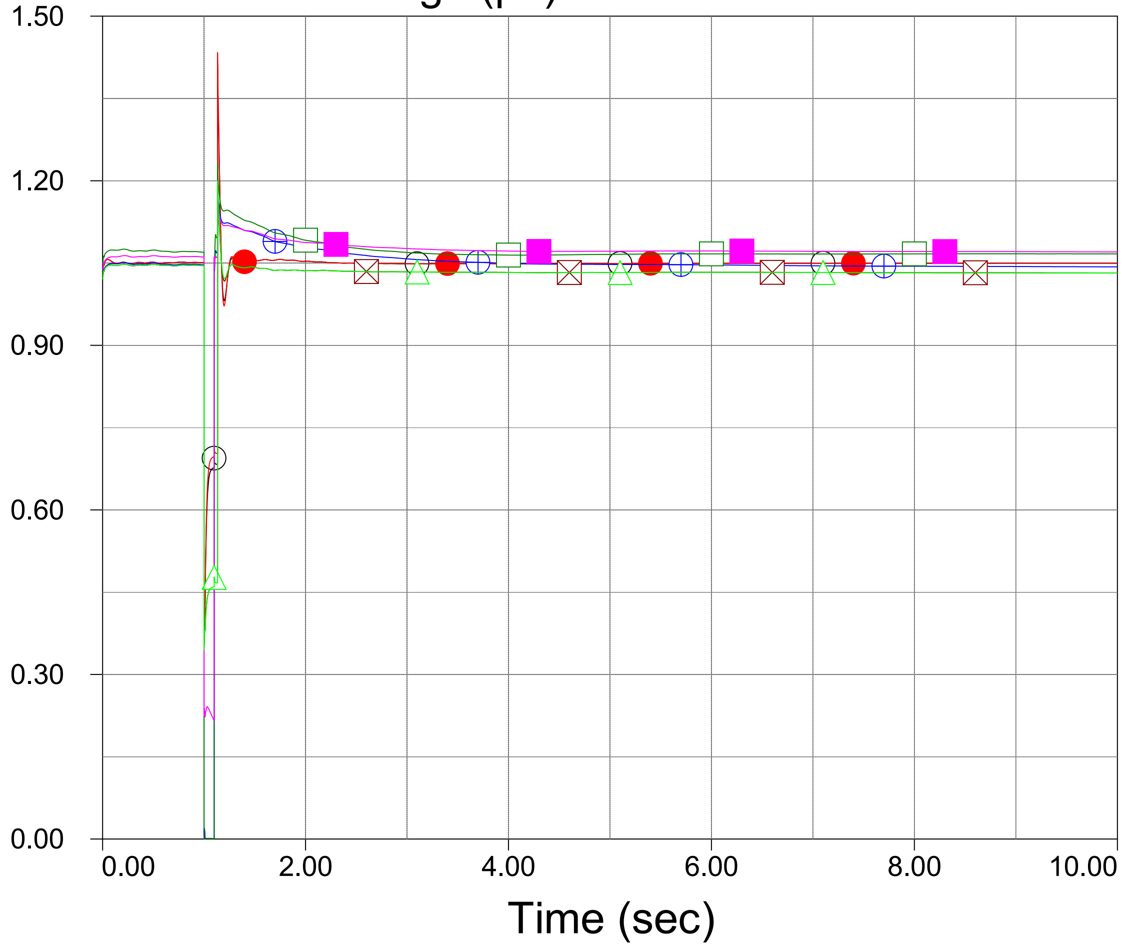
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 1 Post Development.bin	Scenario 1 Post Development	4 -- 612L F 3P FAULT(N6F8)

Generator terminal voltage (pu)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	4
●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G13		4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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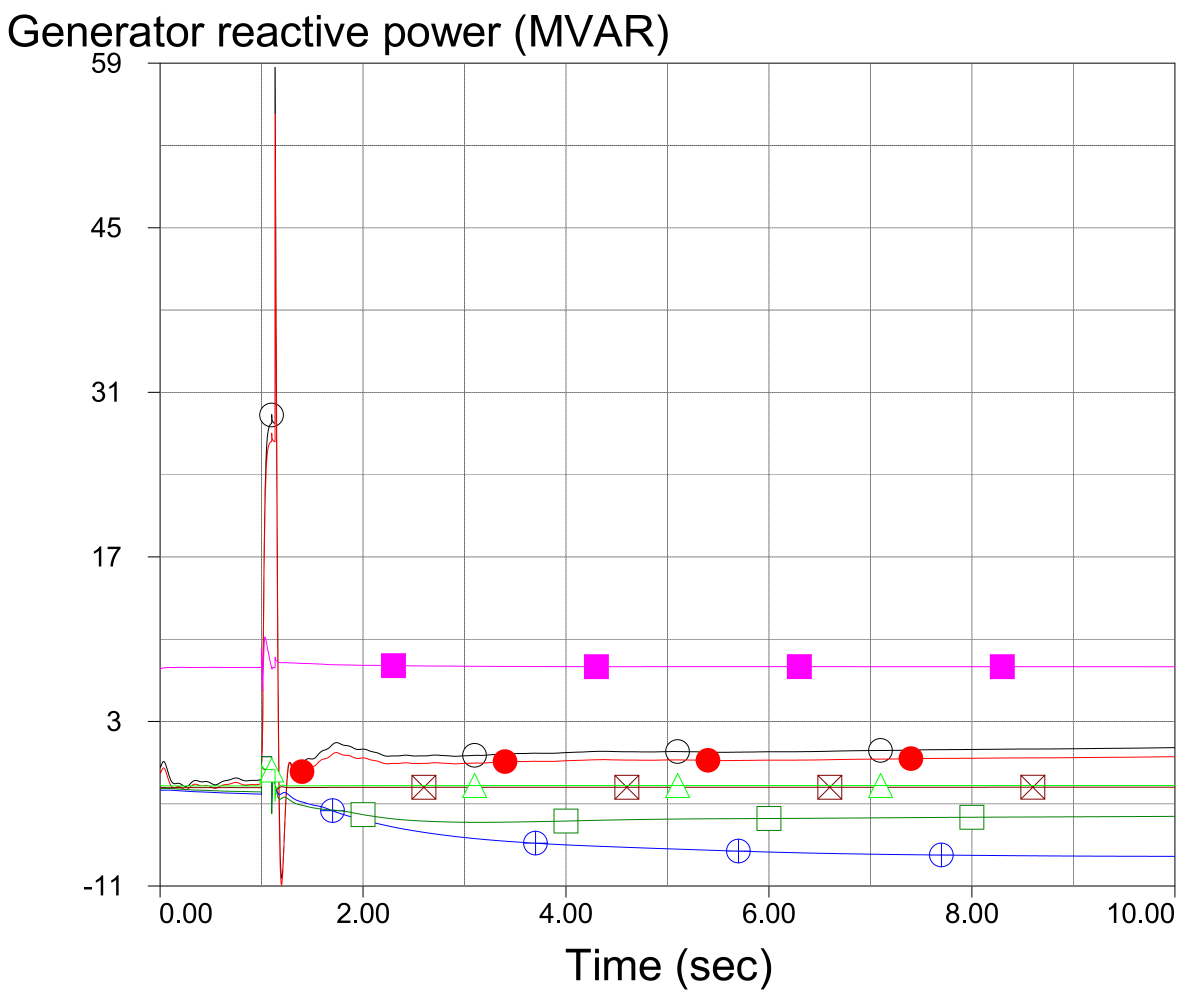
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 1 Post Development.bin	Scenario 1 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	4
●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLAR 1.0	G1	4
□	557277	WESTFIELDGEN(	G1	4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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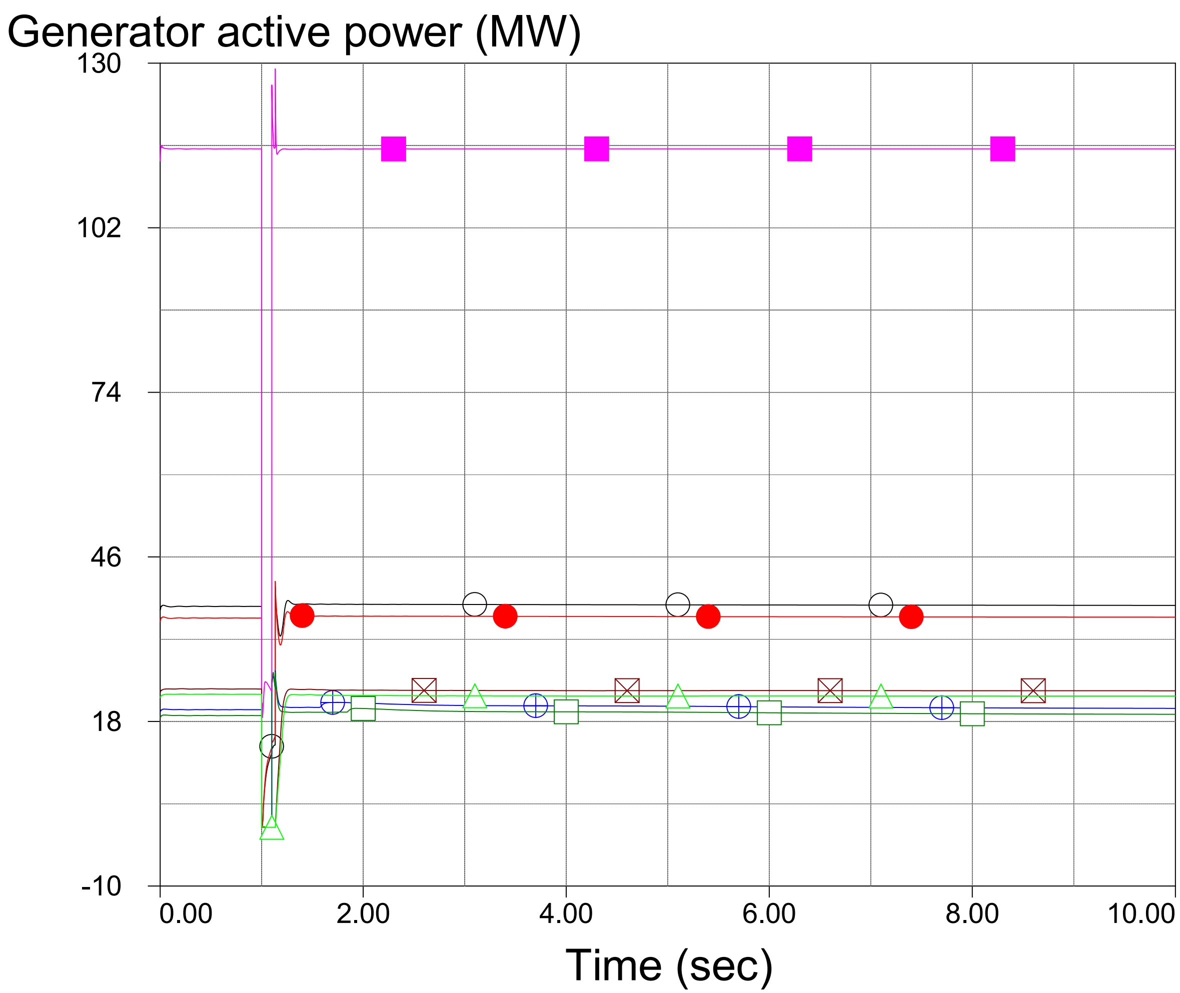
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 1 Post Development.bin	Scenario 1 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G13		4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

DSATools Output Analysis 19.0

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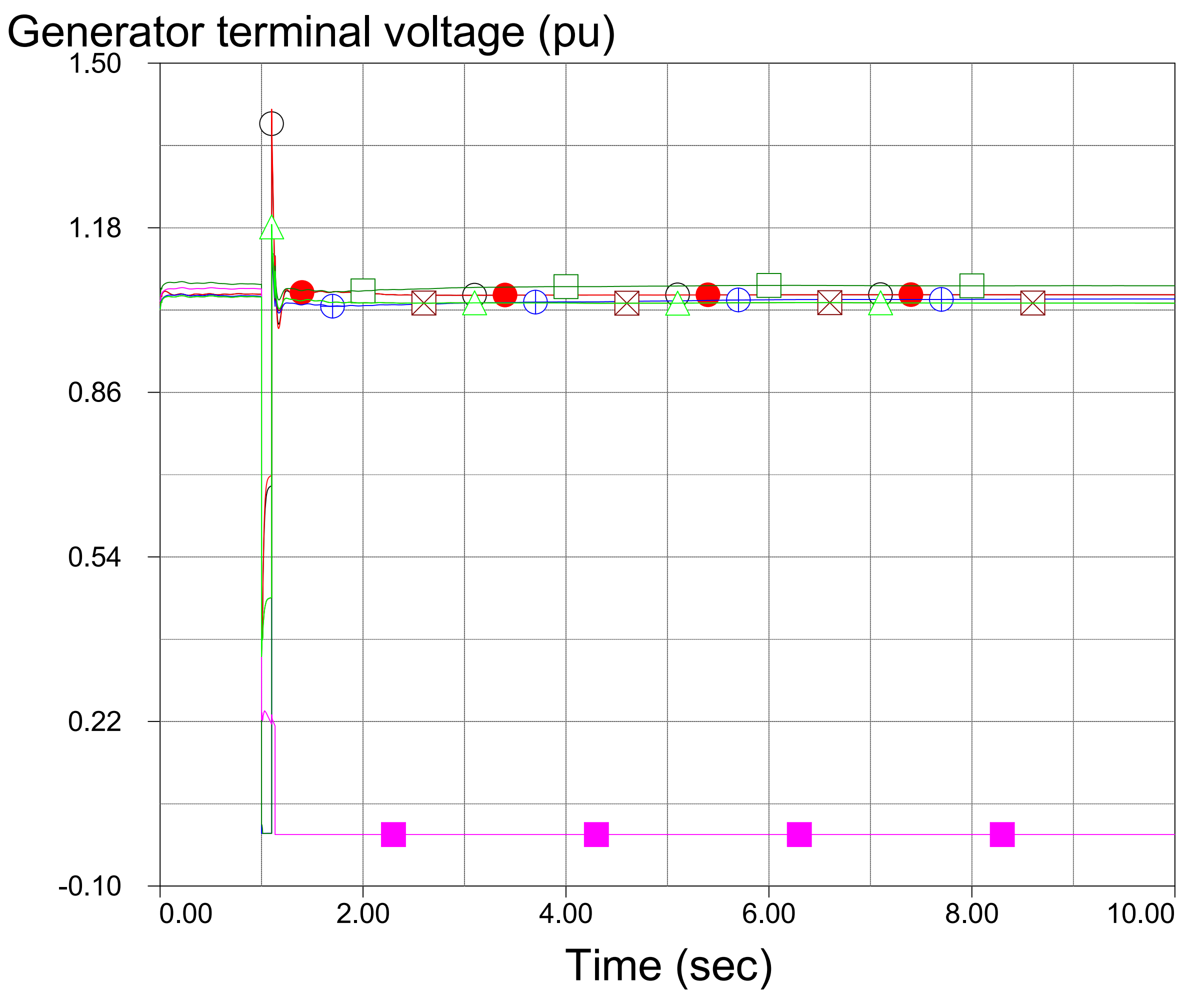
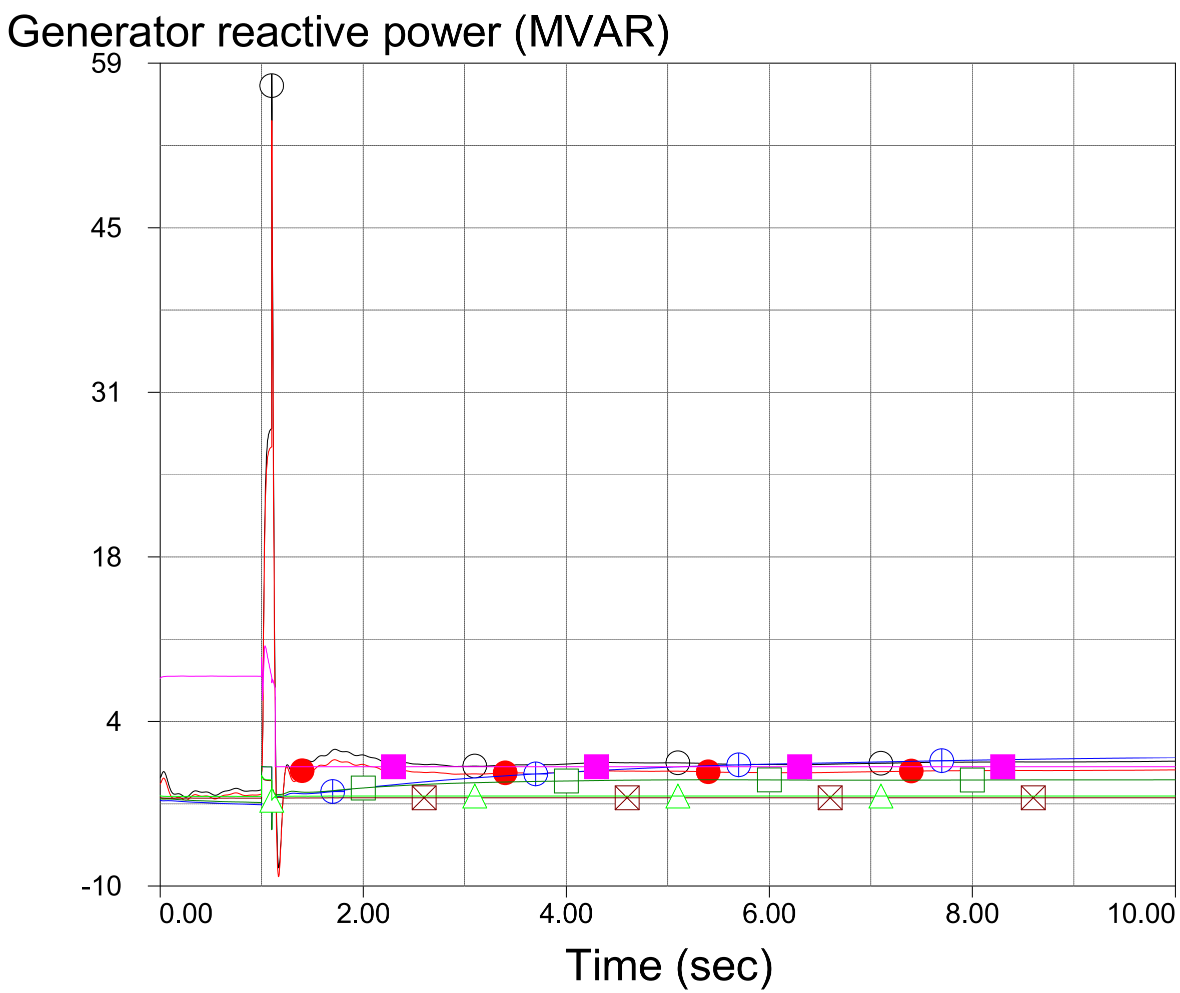
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 1 Post Development.bin	Scenario 1 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	5
●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

TSAT Oct 20, 2022 10:30:50

Buf.	Binary Result File	Scenario	Contingency
5	Scenario 1 Post Development.bin	Scenario 1 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	5
●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

DSATools Output Analysis 19.0

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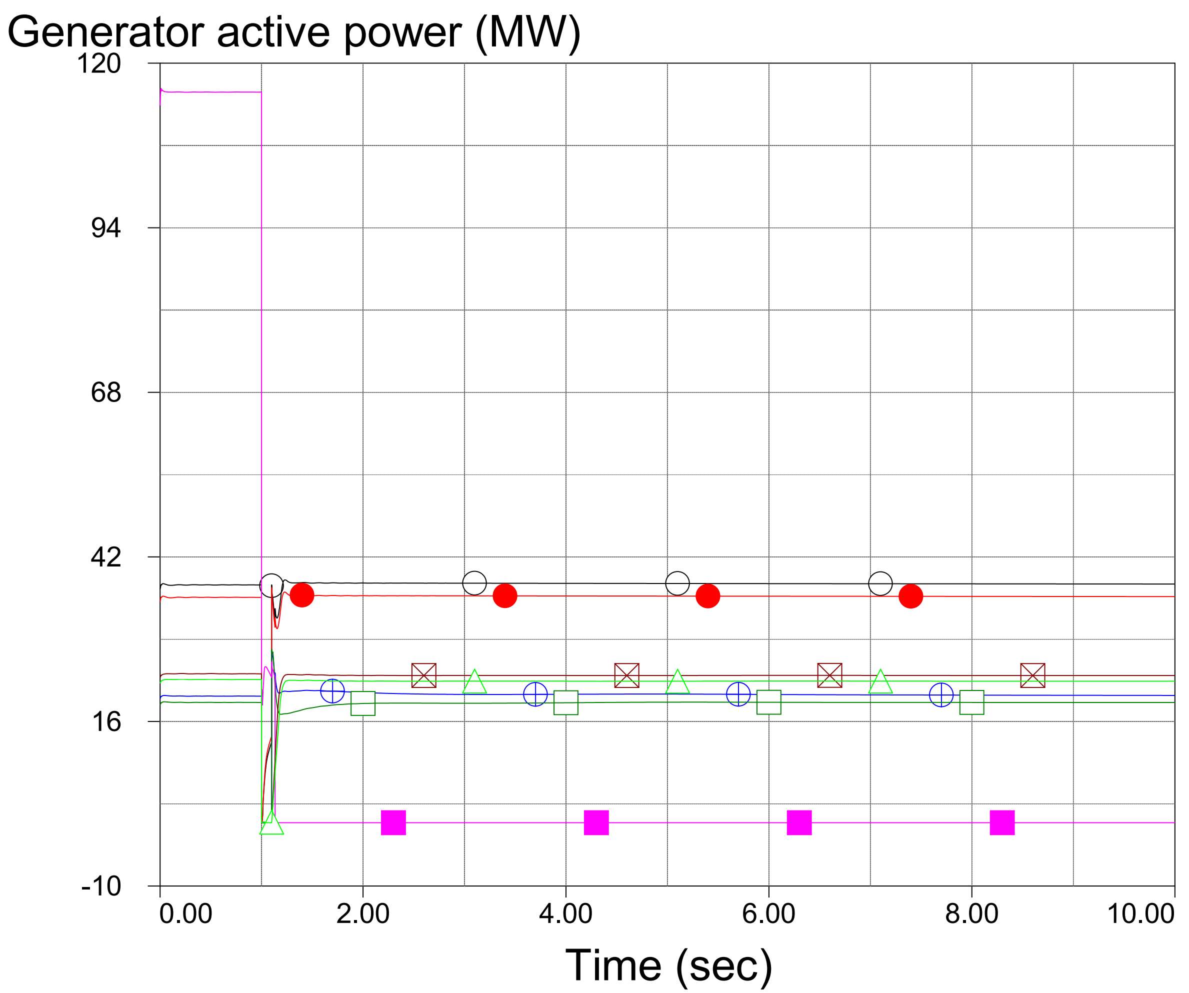
TSAT Oct 20, 2022 10:30:50

Buf.	Binary Result File	Scenario	Contingency
5	Scenario 1 Post Development.bin	Scenario 1 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	5
●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G13		5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

DSATools Output Analysis 19.0

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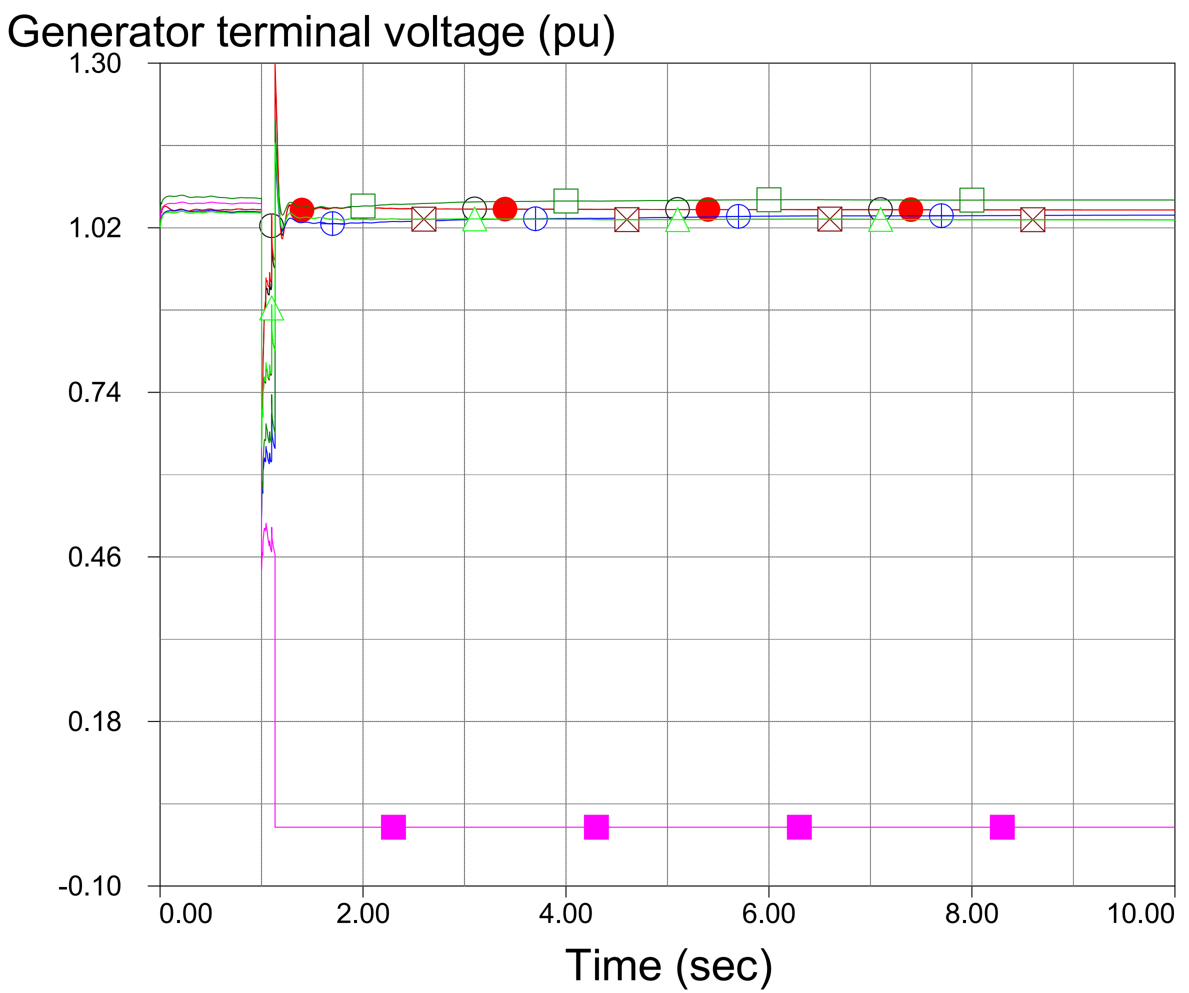
TSAT Oct 20, 2022 10:30:50

Buf.	Binary Result File	Scenario	Contingency
6	Scenario 1 Post Development.bin	Scenario 1 Post Development	6 -- 879L F 3P FAULT(N6F8)



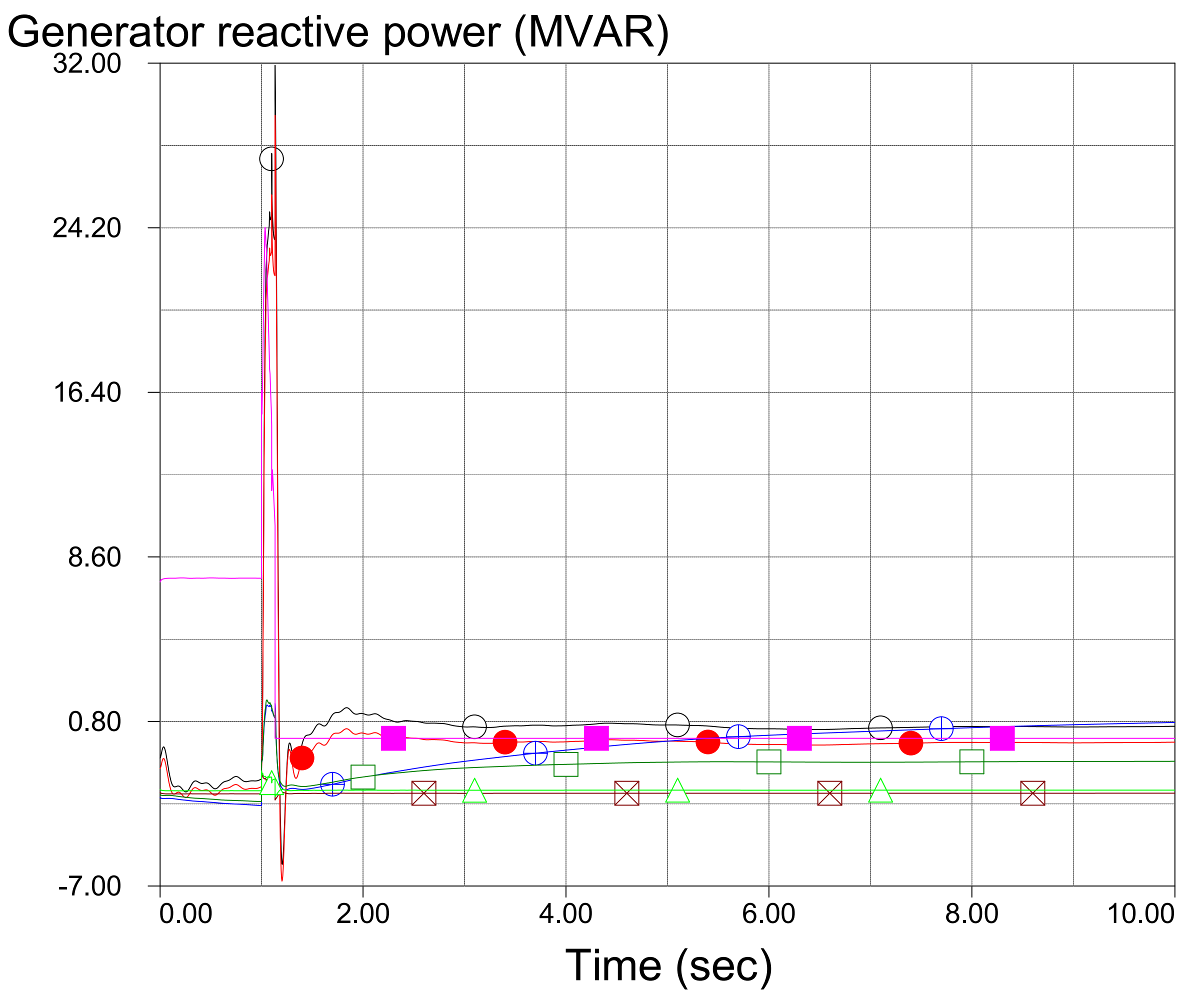
	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

DSATools Output Analysis 19.0

Powertech Labs Inc.

TSAT Oct 20, 2022 10:30:50

Buf.	Binary Result File	Scenario	Contingency
6	Scenario 1 Post Development.bin	Scenario 1 Post Development	6 -- 879L F 3P FAULT(N6F8)

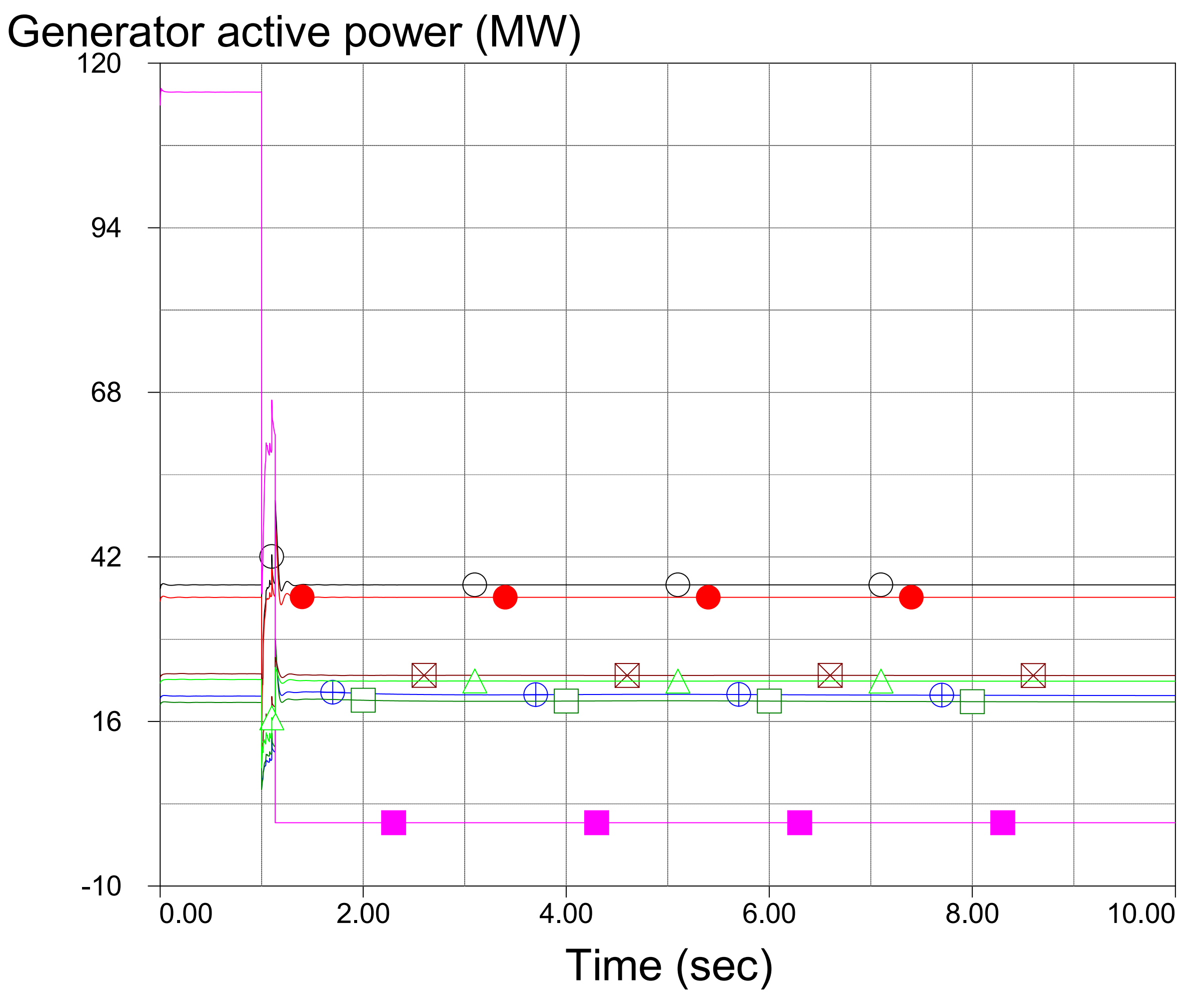


	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

DSATools Output Analysis 19.0

Powertech Labs Inc.

Buf.	Binary Result File	Scenario	Contingency
6	Scenario 1 Post Development.bin	Scenario 1 Post Development	6 -- 879L F 3P FAULT(N6F8)



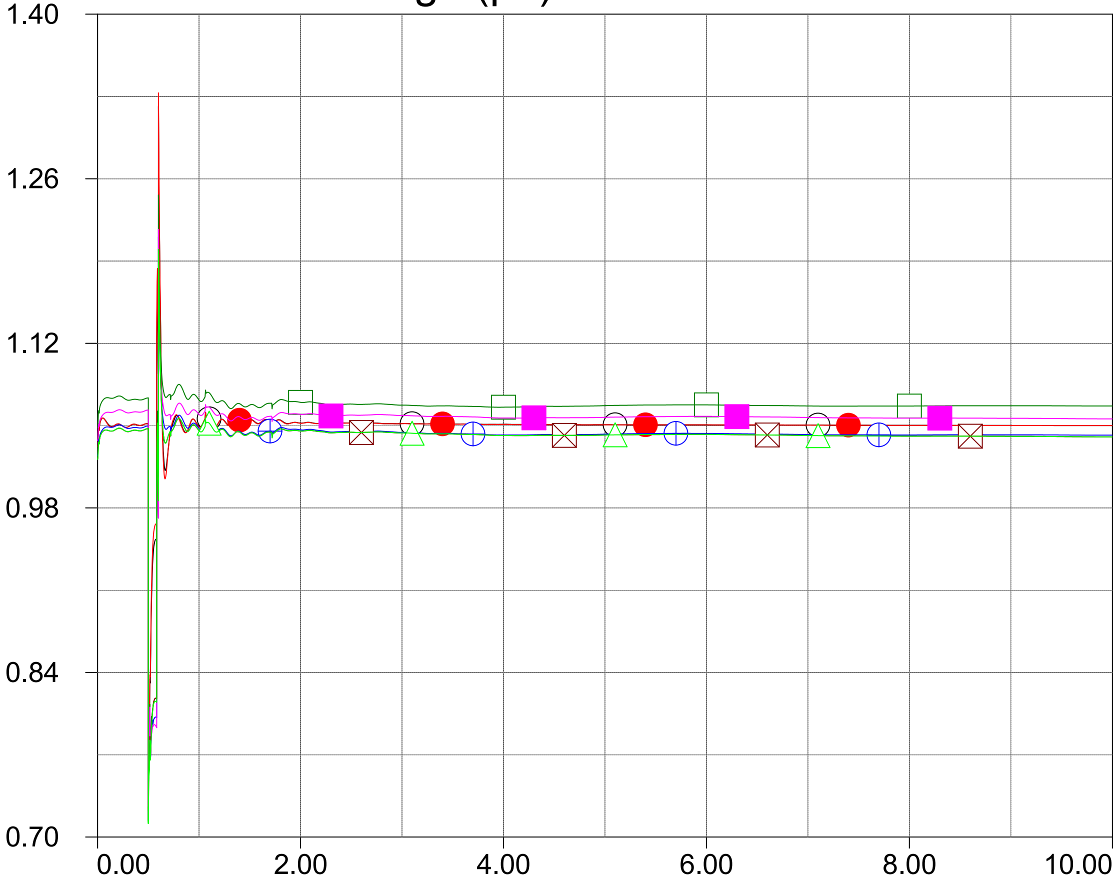
	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.G1		6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

DSATools Output Analysis 19.0

Powertech Labs Inc.

Buf.	Binary Result File	Scenario	Contingency
7	Scenario 1 Post Development.bin	Scenario 1 Post Development	7 -- 1034L N 3P FAULT(N5F6)

Generator terminal voltage (pu)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G1	3	7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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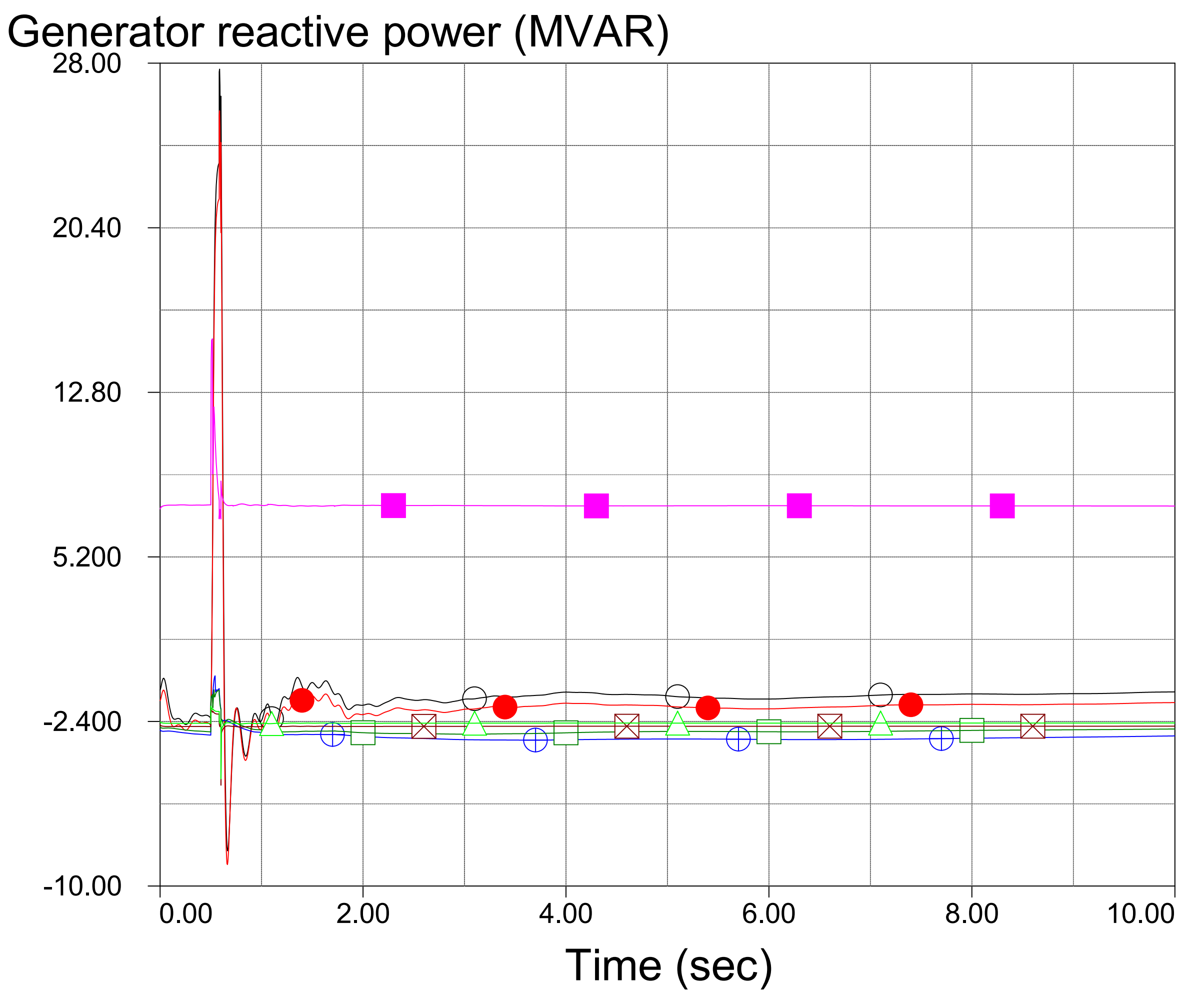
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 1 Post Development.bin	Scenario 1 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G1		7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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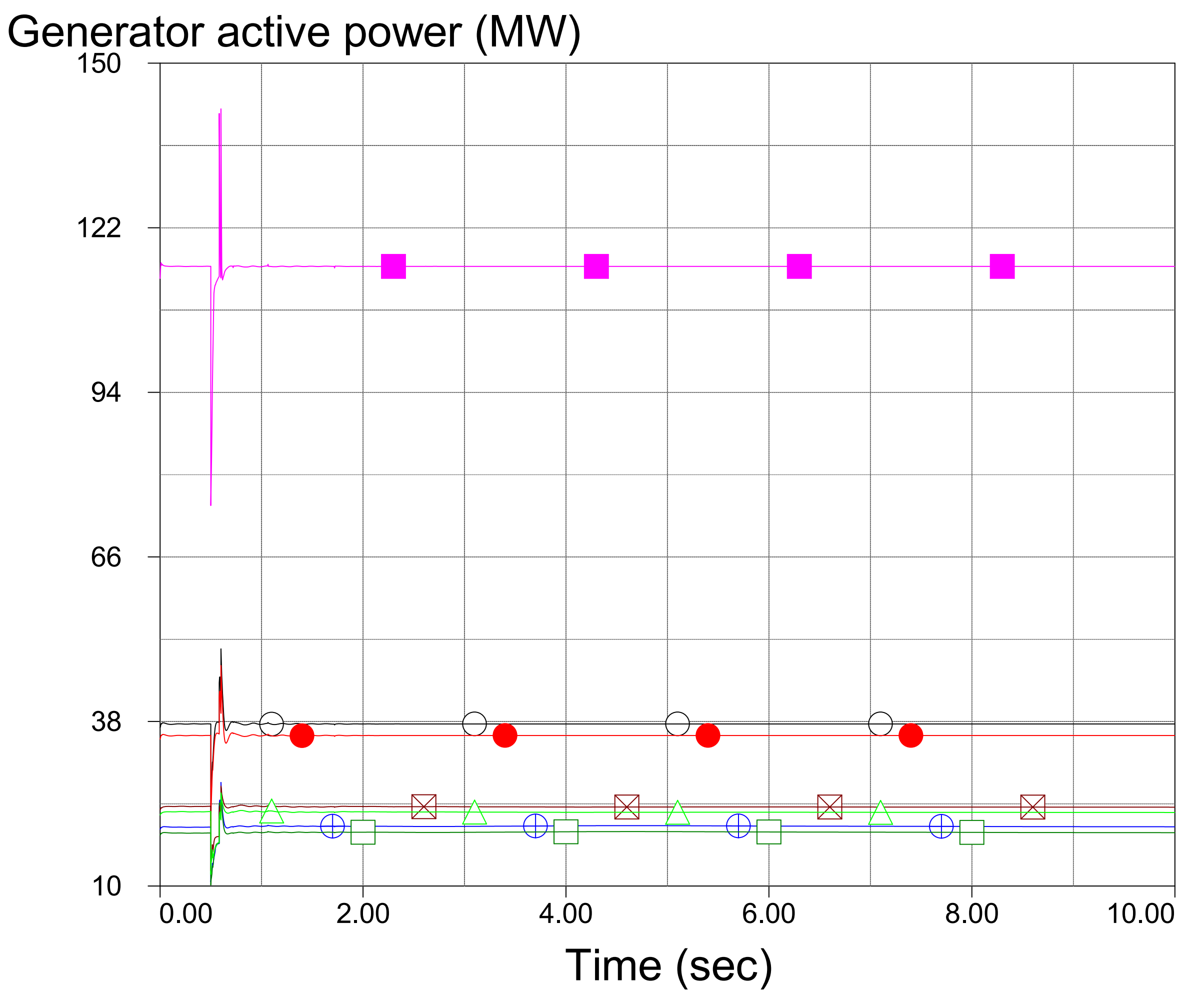
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 1 Post Development.bin	Scenario 1 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G1	3	7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

DSATools Output Analysis 19.0

Powertech Labs Inc.

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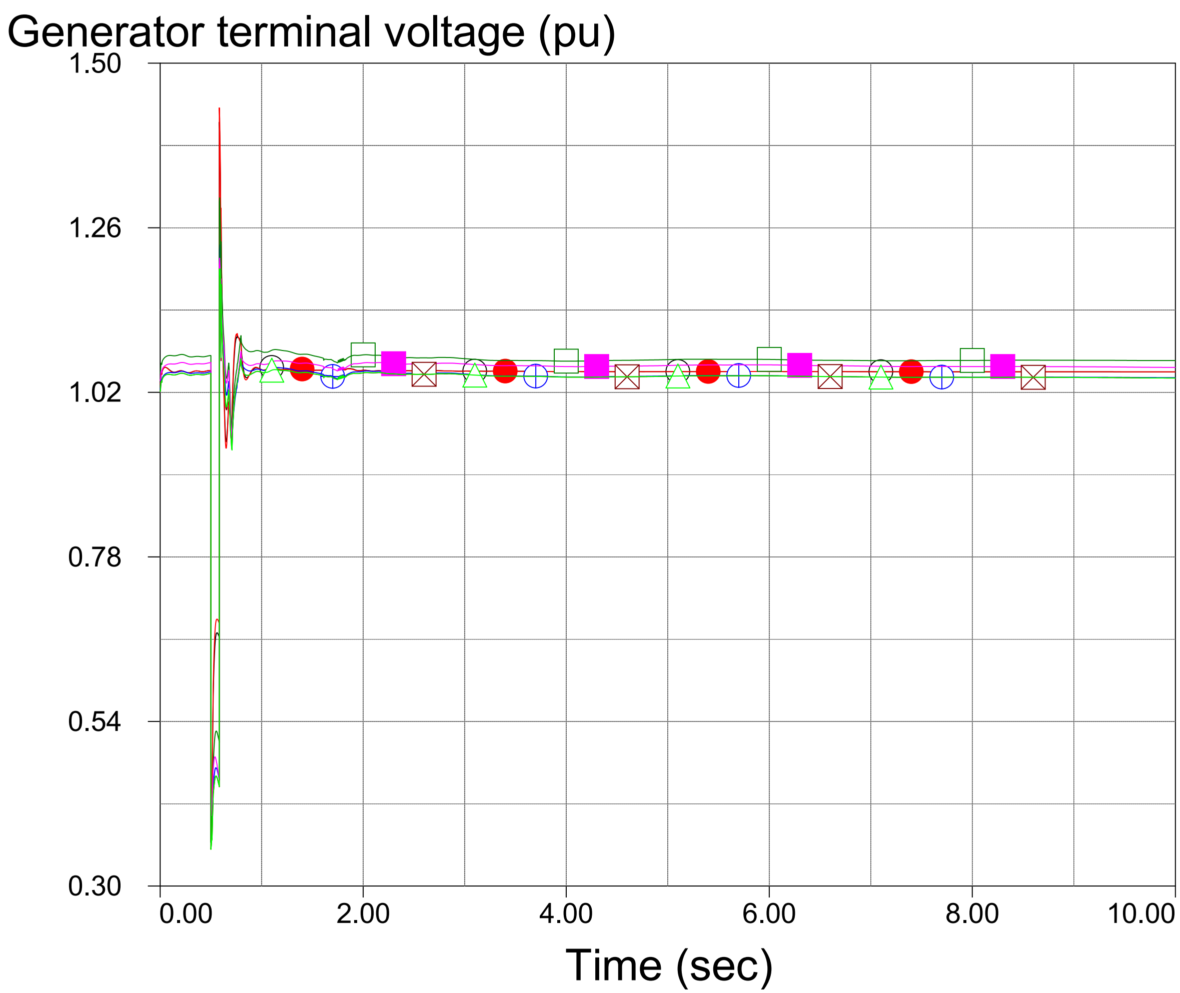
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 1 Post Development.bin	Scenario 1 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G13		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

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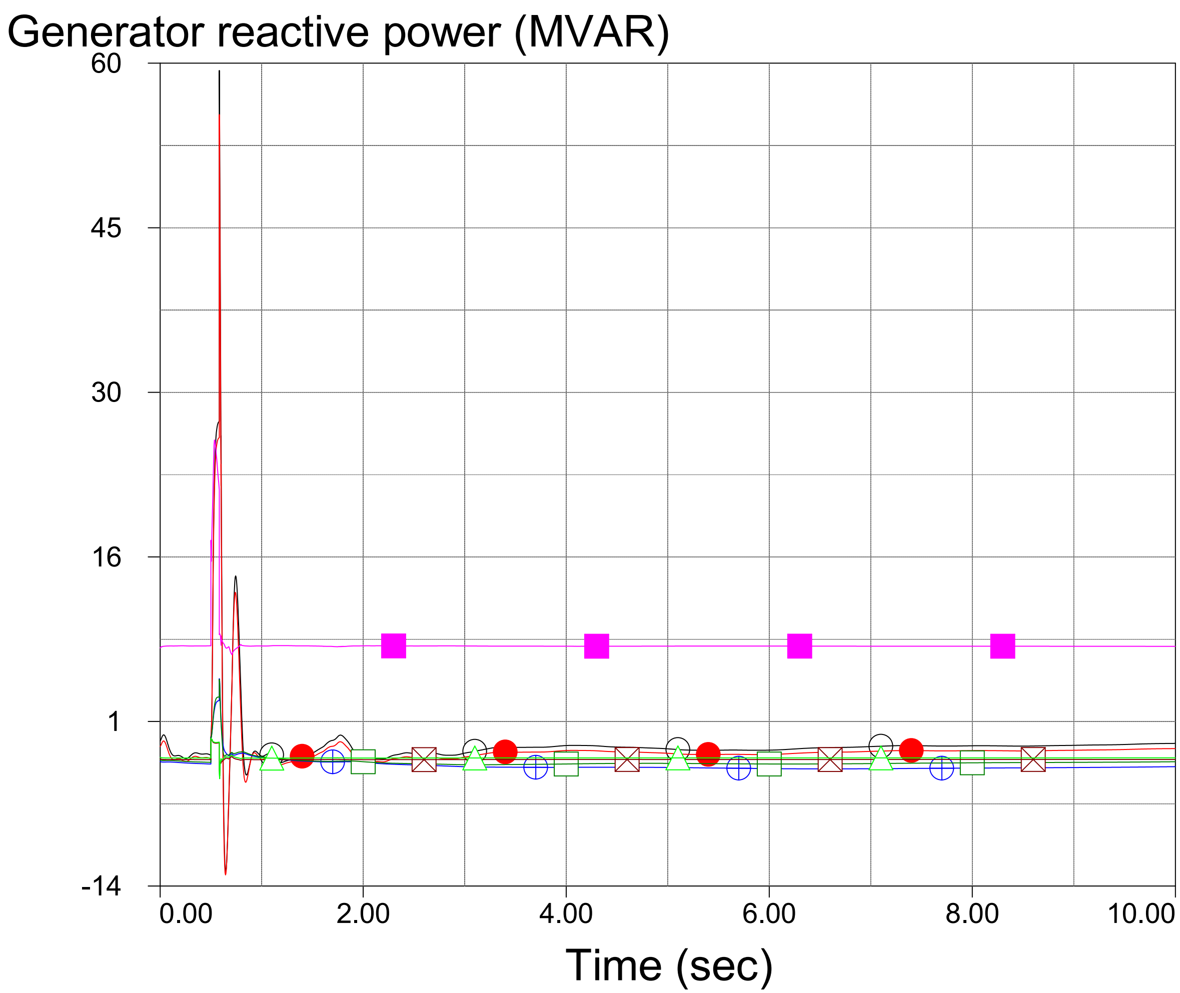
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 1 Post Development.bin	Scenario 1 Post Development	8 -- 1034L F 3P FAULT(N5F6)



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○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G1		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

Powertech Labs Inc.

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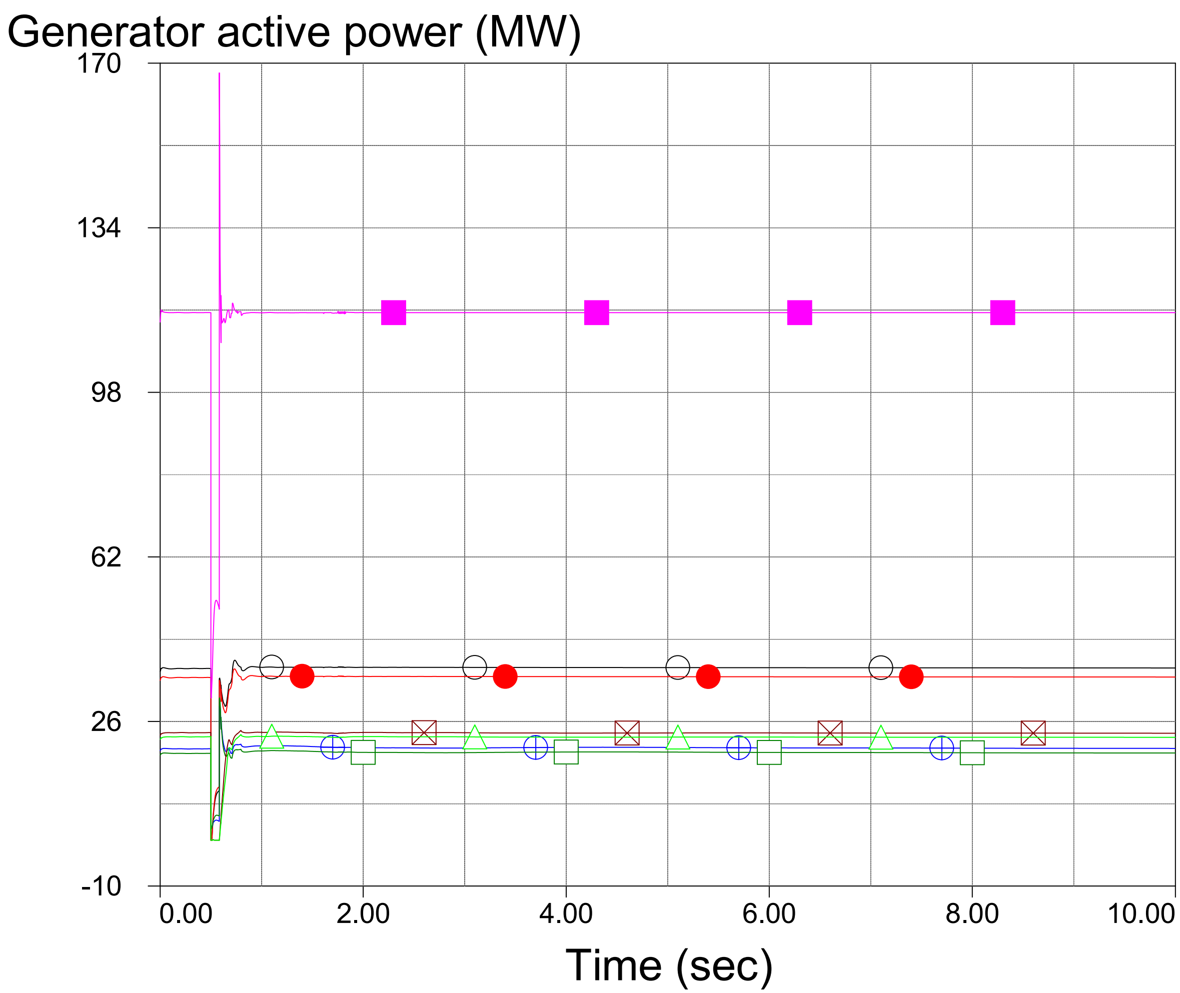
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 1 Post Development.bin	Scenario 1 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G13		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

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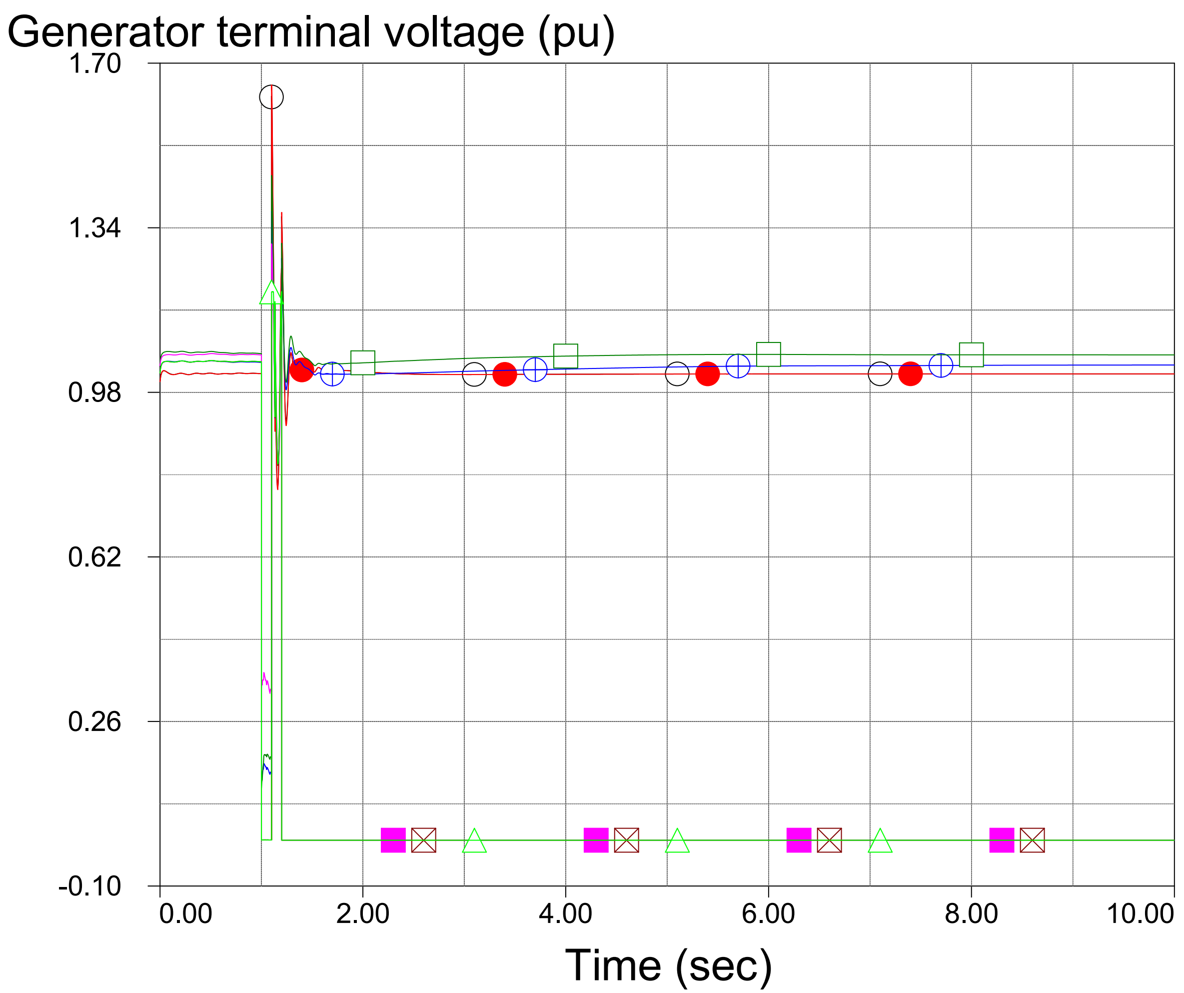
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 2 Post Development.bin	Scenario 2 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.	G1	1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

DSATools Output Analysis 19.0

Powertech Labs Inc.

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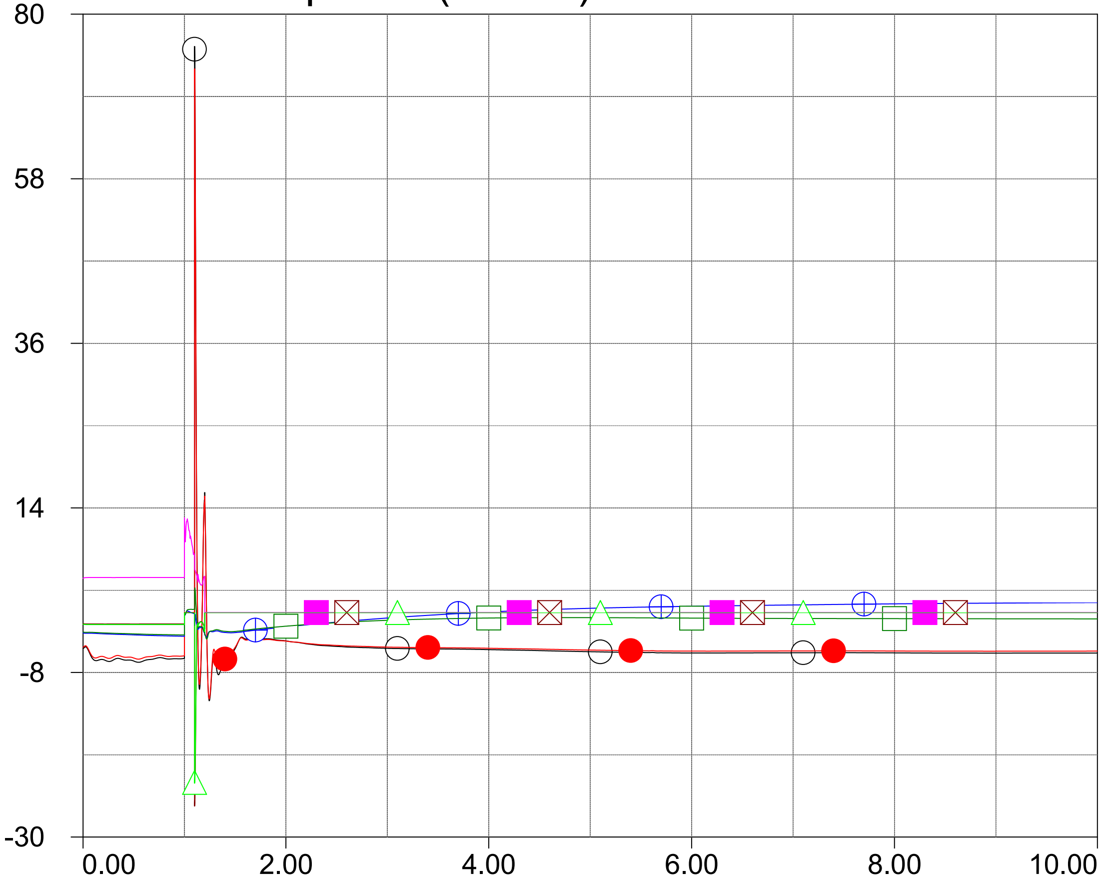
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 2 Post Development.bin	Scenario 2 Post Development	1 -- 610L N 3P FAULT(N6F8)

Generator reactive power (MVAR)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G1		1
■	60873	RATTLESNK_3 0.	G1	1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

DSATools Output Analysis 19.0

Powertech Labs Inc.

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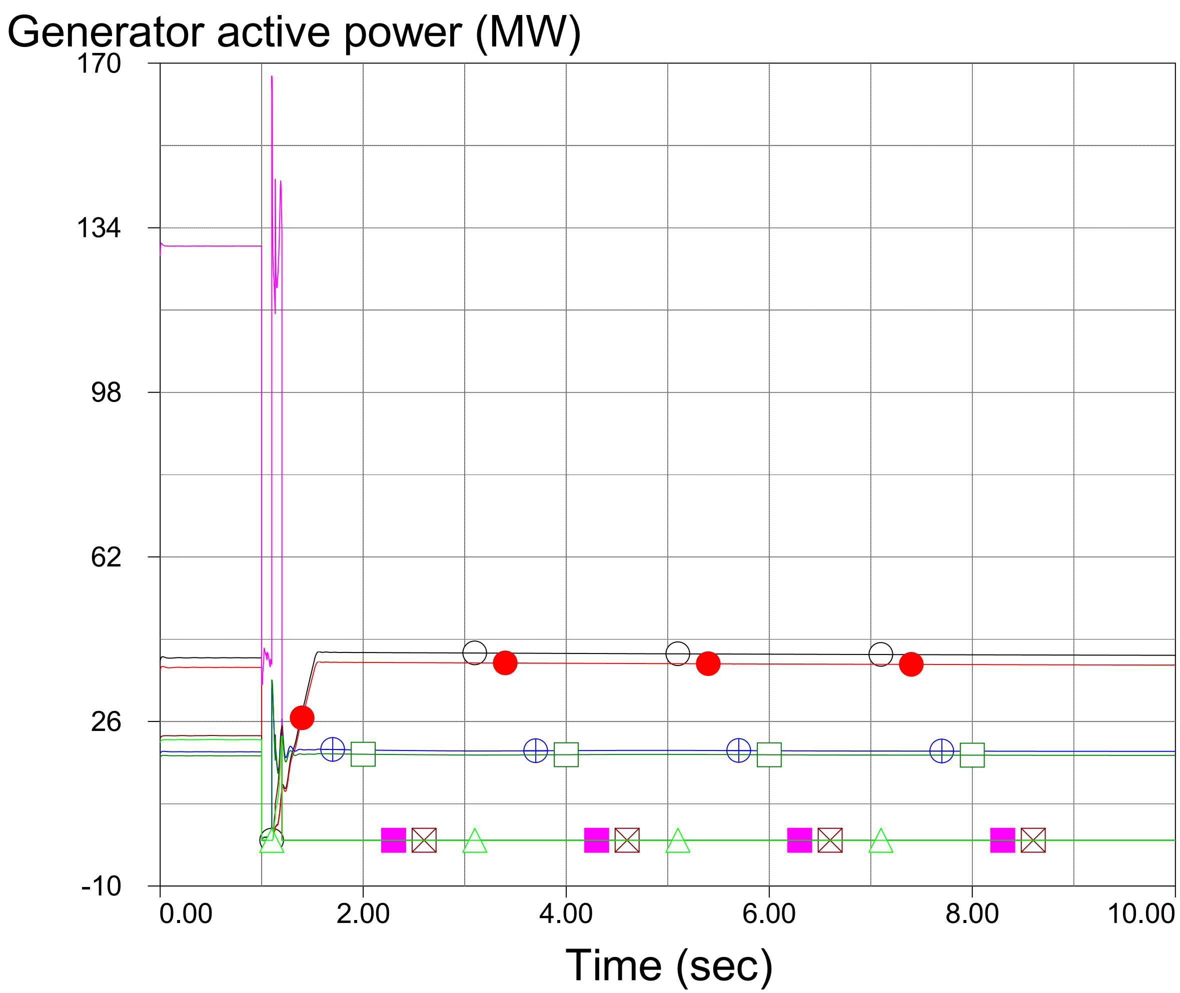
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 2 Post Development.bin	Scenario 2 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	1
●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

DSATools Output Analysis 19.0

Powertech Labs Inc.

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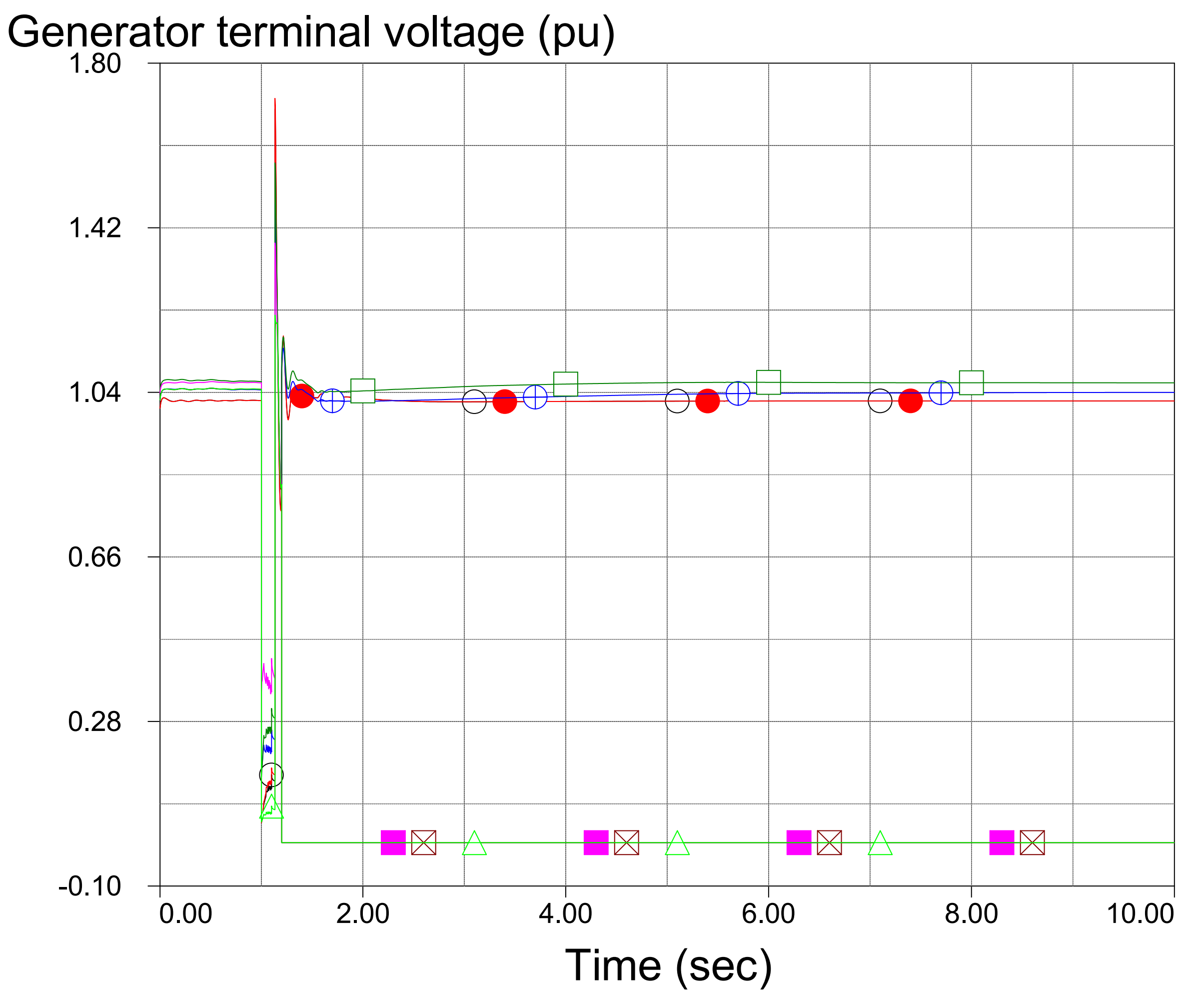
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 2 Post Development.bin	Scenario 2 Post Development	2 -- 610L F 3P FAULT(N6F8)

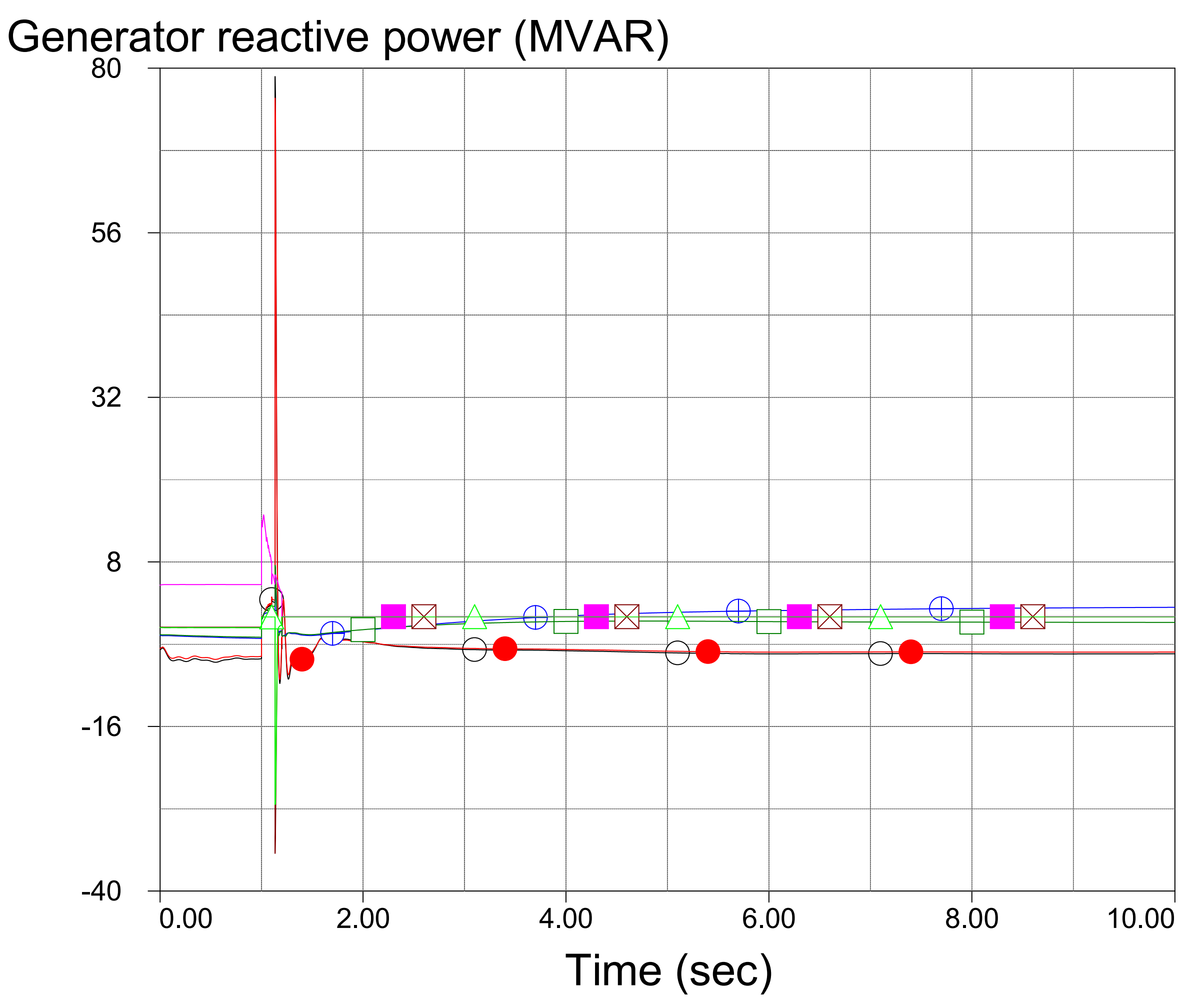


	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	2
●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G13		2
■	60873	RATTLESNK_3 0.G1		2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

DSATools Output Analysis 19.0

Powertech Labs Inc.

Buf.	Binary Result File	Scenario	Contingency
2	Scenario 2 Post Development.bin	Scenario 2 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	2
●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G13		2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

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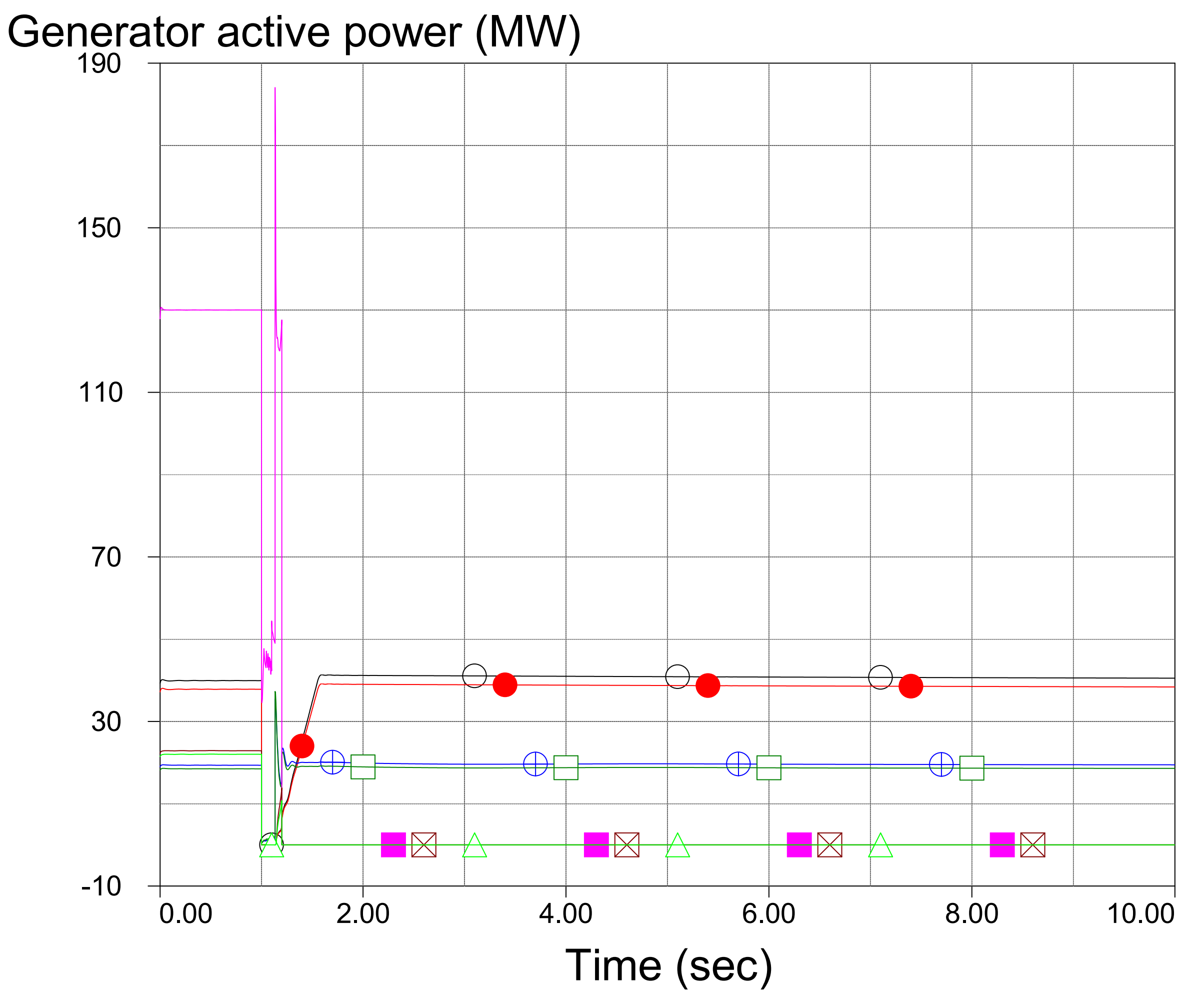
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 2 Post Development.bin	Scenario 2 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	2
●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G13		2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

DSATools Output Analysis 19.0

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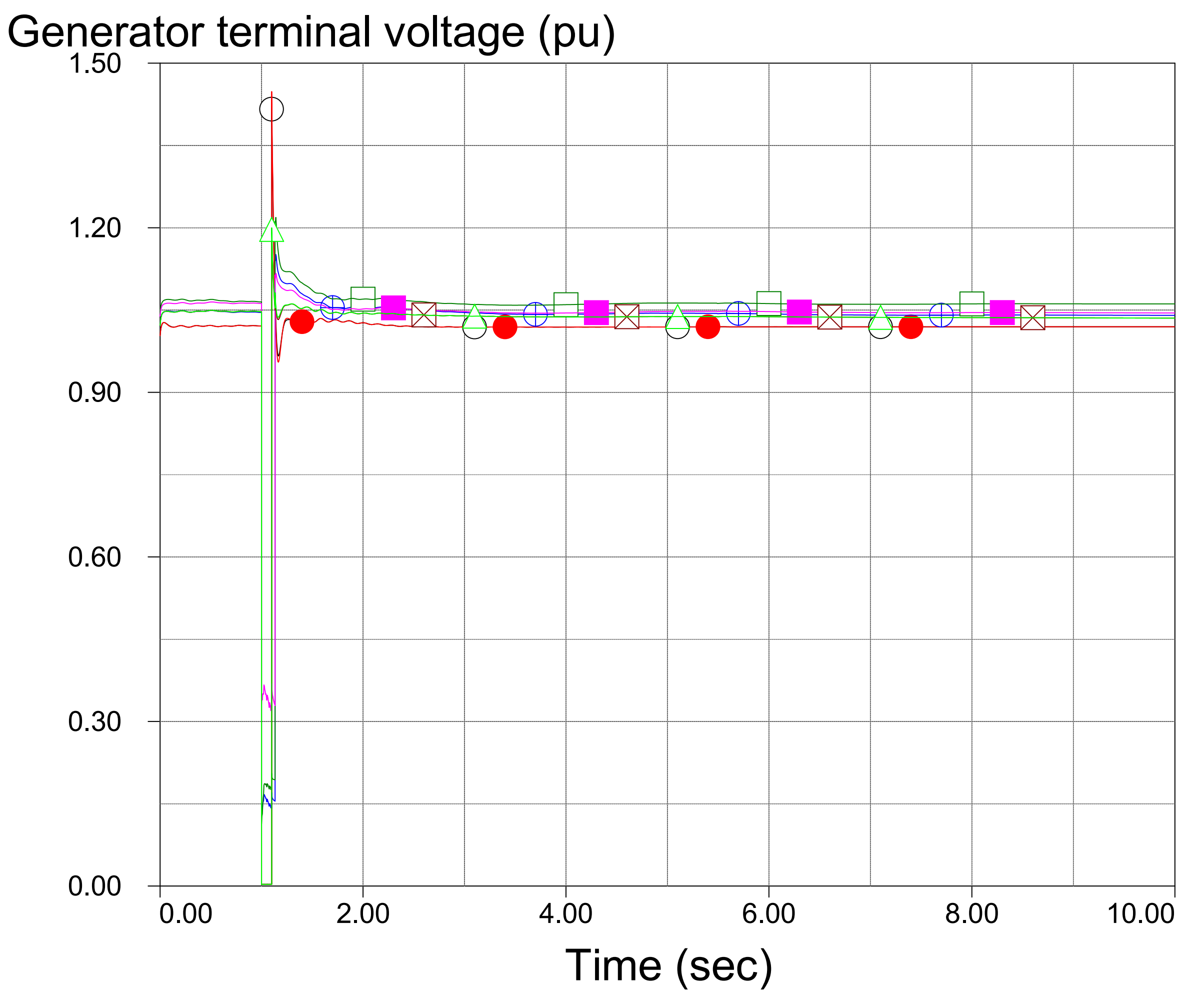
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 2 Post Development.bin	Scenario 2 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1	0	3
□	557277	WESTFIELDGEN(G1	3	3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

DSATools Output Analysis 19.0

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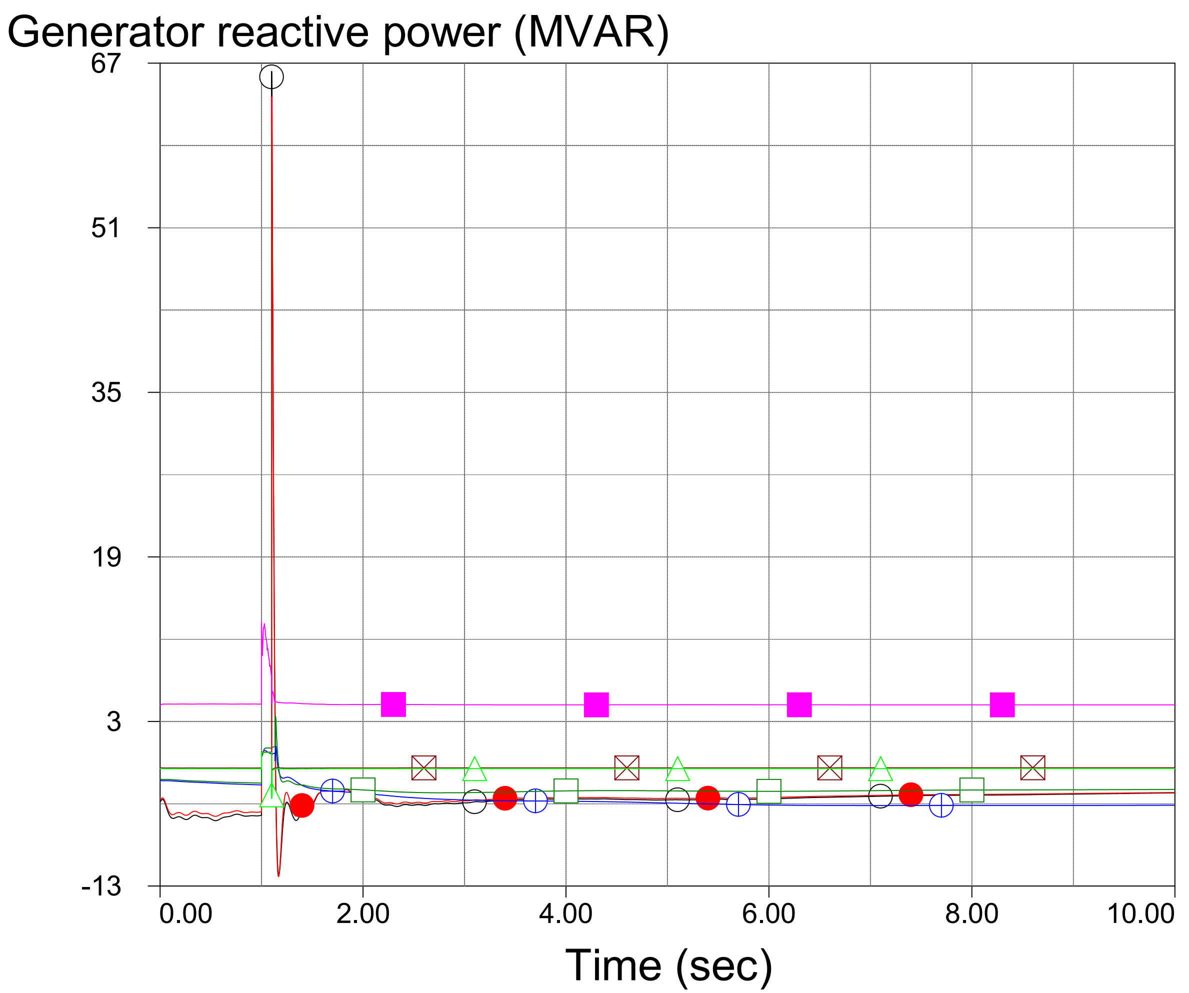
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 2 Post Development.bin	Scenario 2 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLAR	G1.0	3
□	557277	WESTFIELDGEN(	G1	3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

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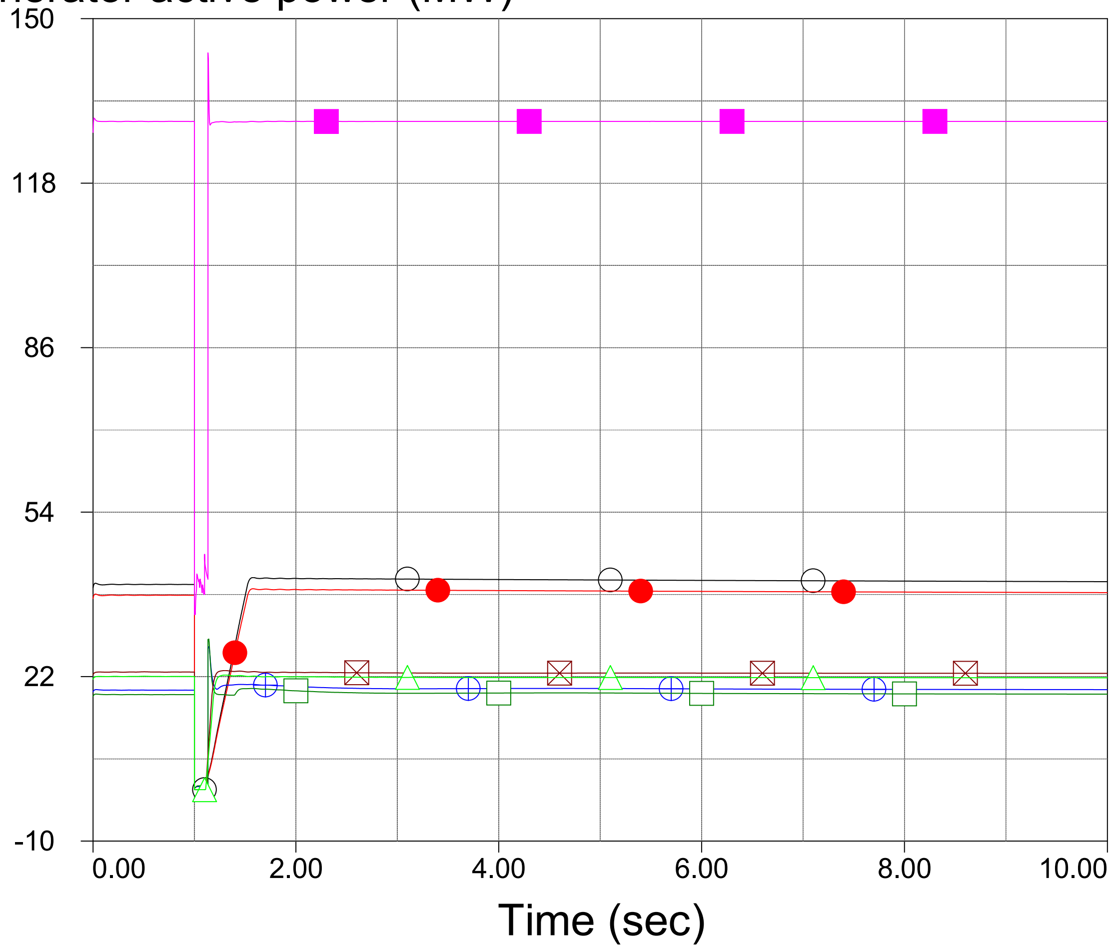
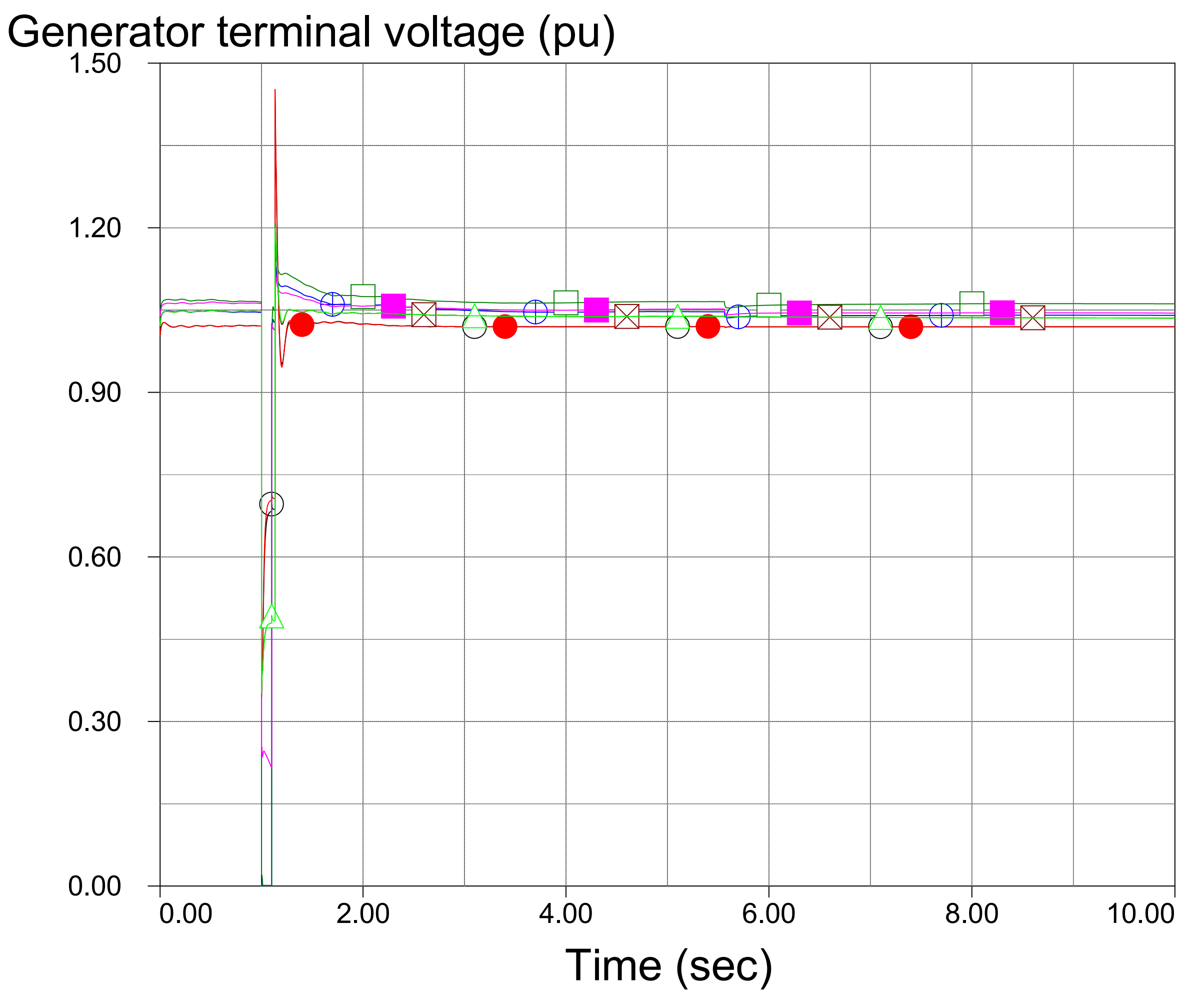
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 2 Post Development.bin	Scenario 2 Post Development	3 -- 612L N 3P FAULT(N6F8)

Generator active power (MW)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1.0		3
□	557277	WESTFIELDGEN(G1		3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

Buf.	Binary Result File	Scenario	Contingency
4	Scenario 2 Post Development.bin	Scenario 2 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G13		4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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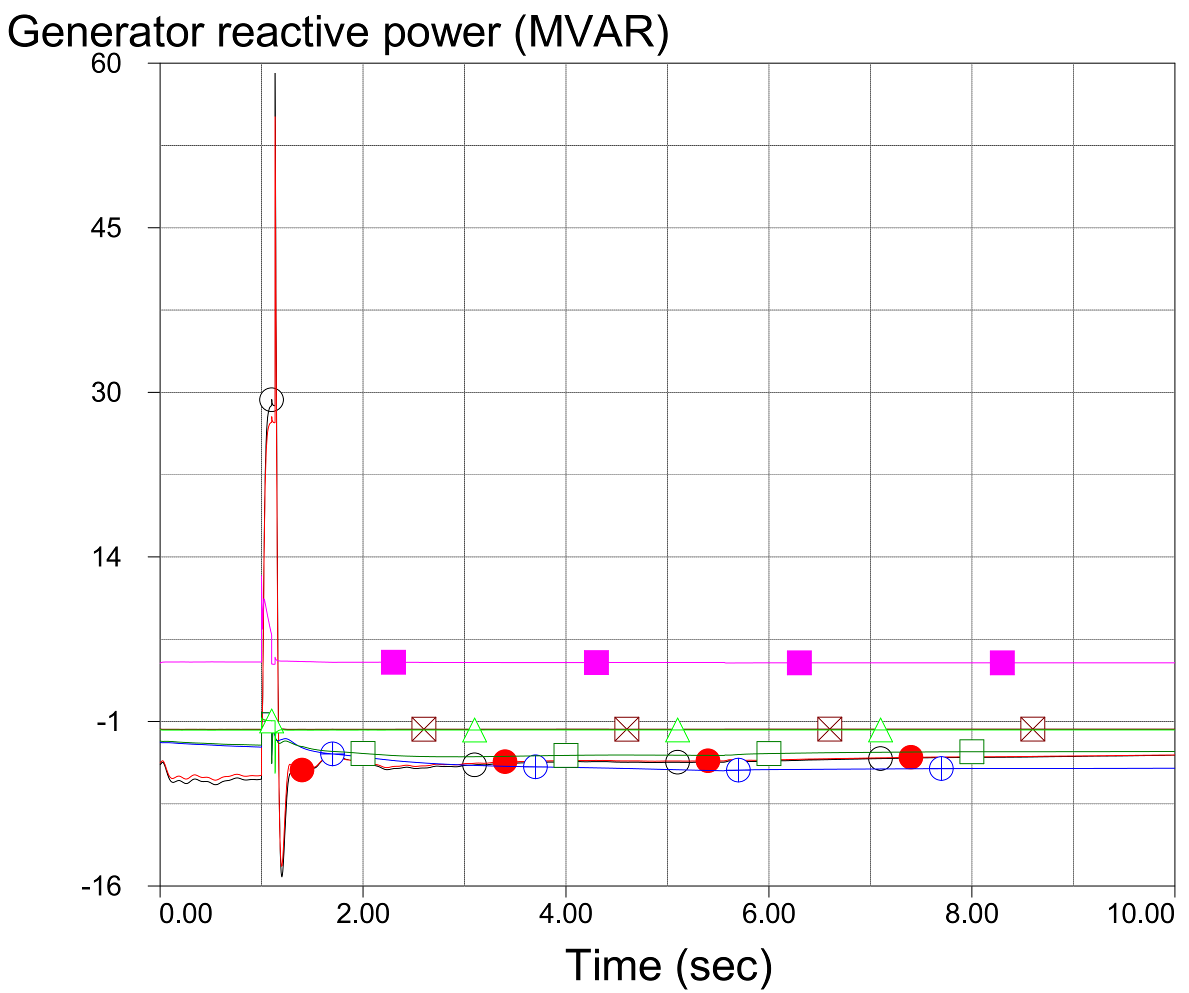
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 2 Post Development.bin	Scenario 2 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	4
●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1	0	4
□	557277	WESTFIELDGEN(G1	3	4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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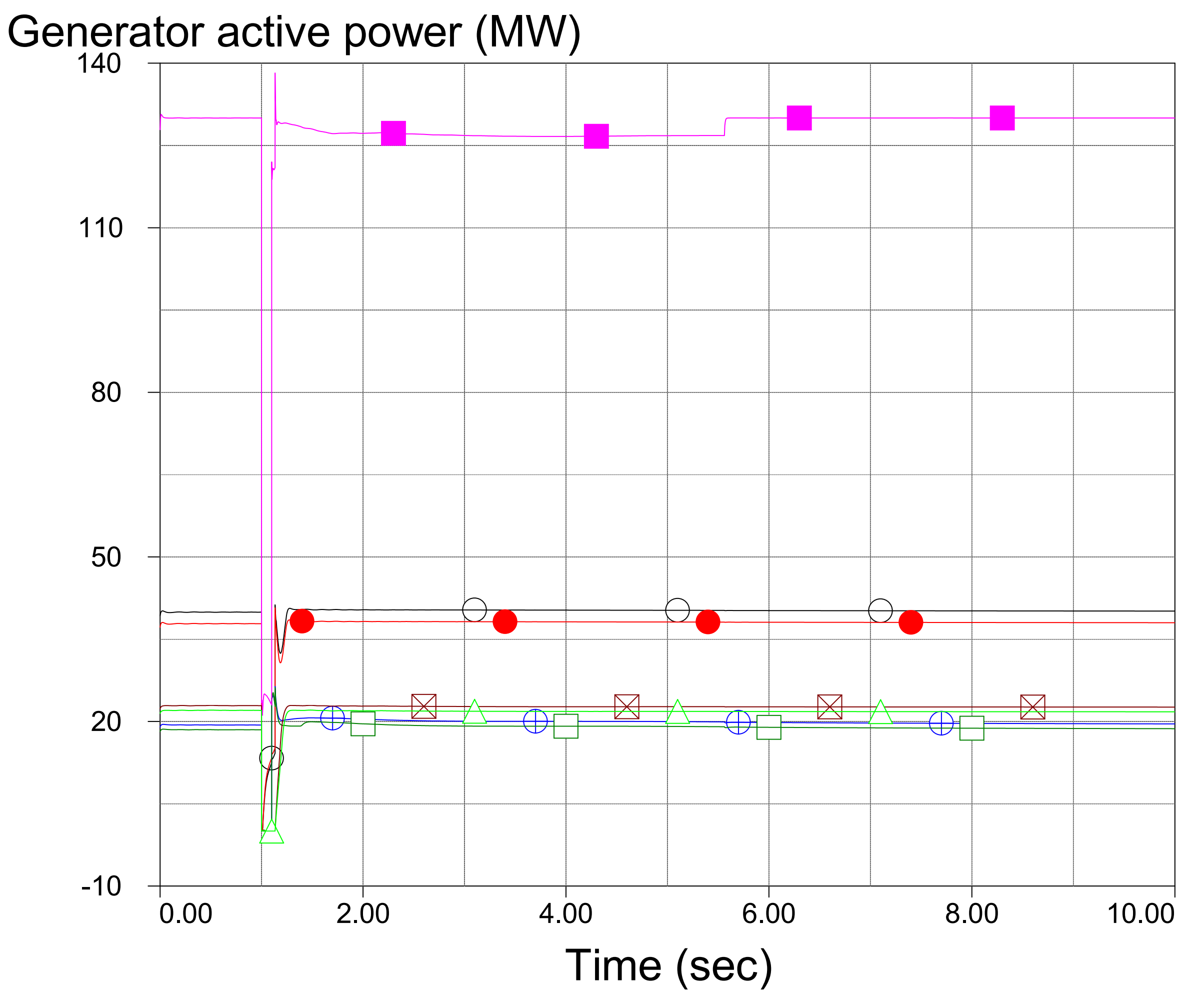
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 2 Post Development.bin	Scenario 2 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G13		4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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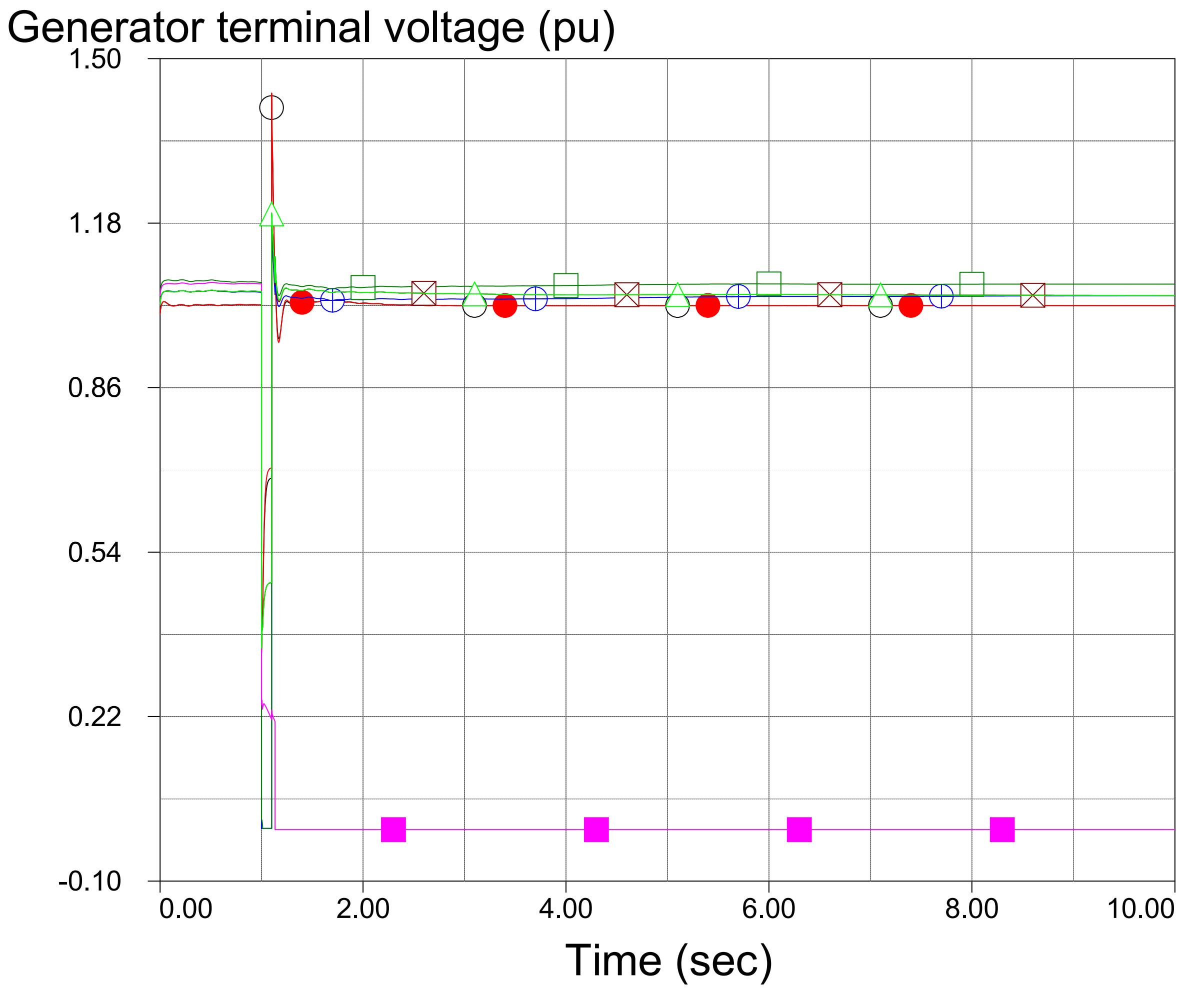
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 2 Post Development.bin	Scenario 2 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1	0	5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

DSATools Output Analysis 19.0

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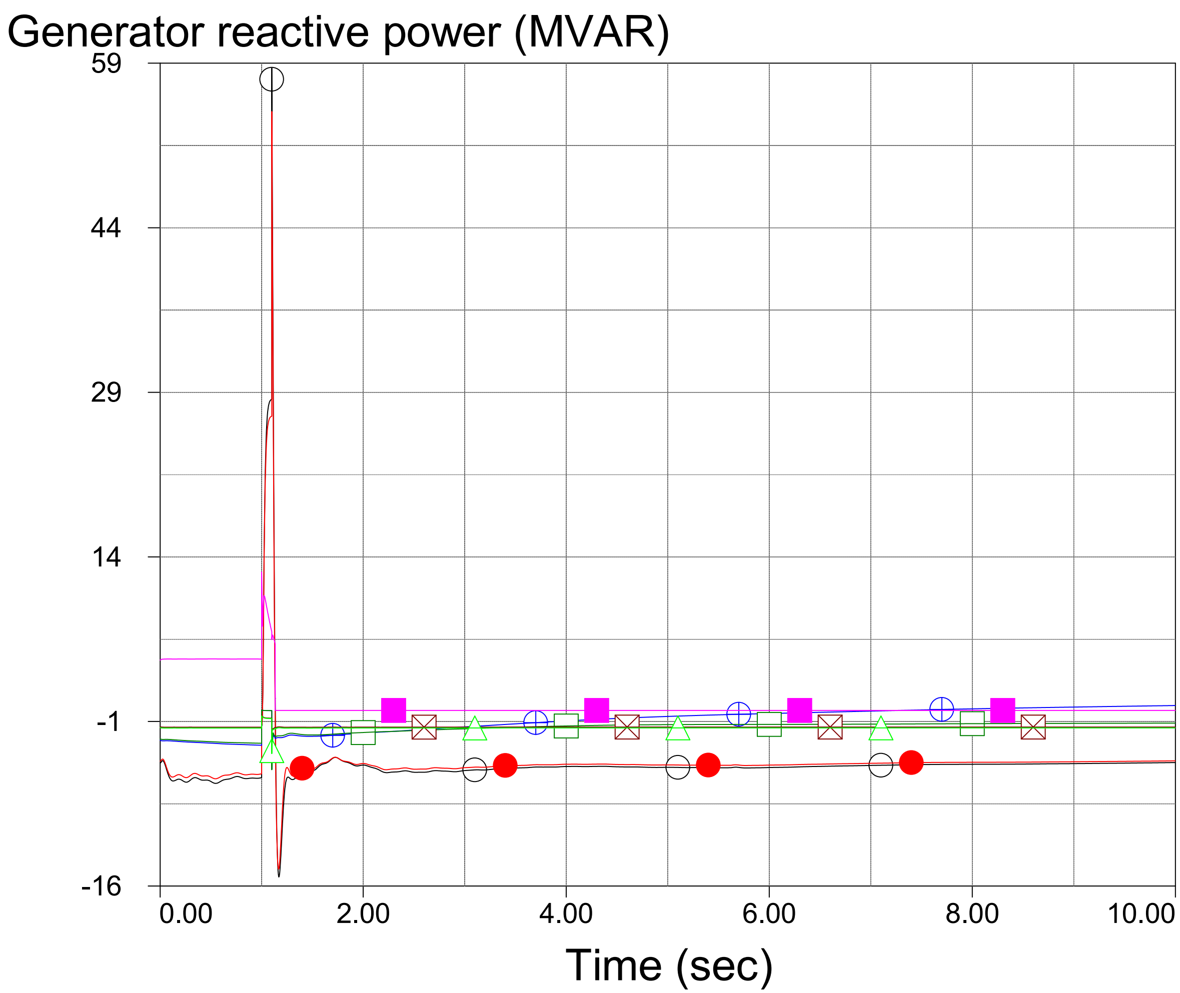
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 2 Post Development.bin	Scenario 2 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	5
●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

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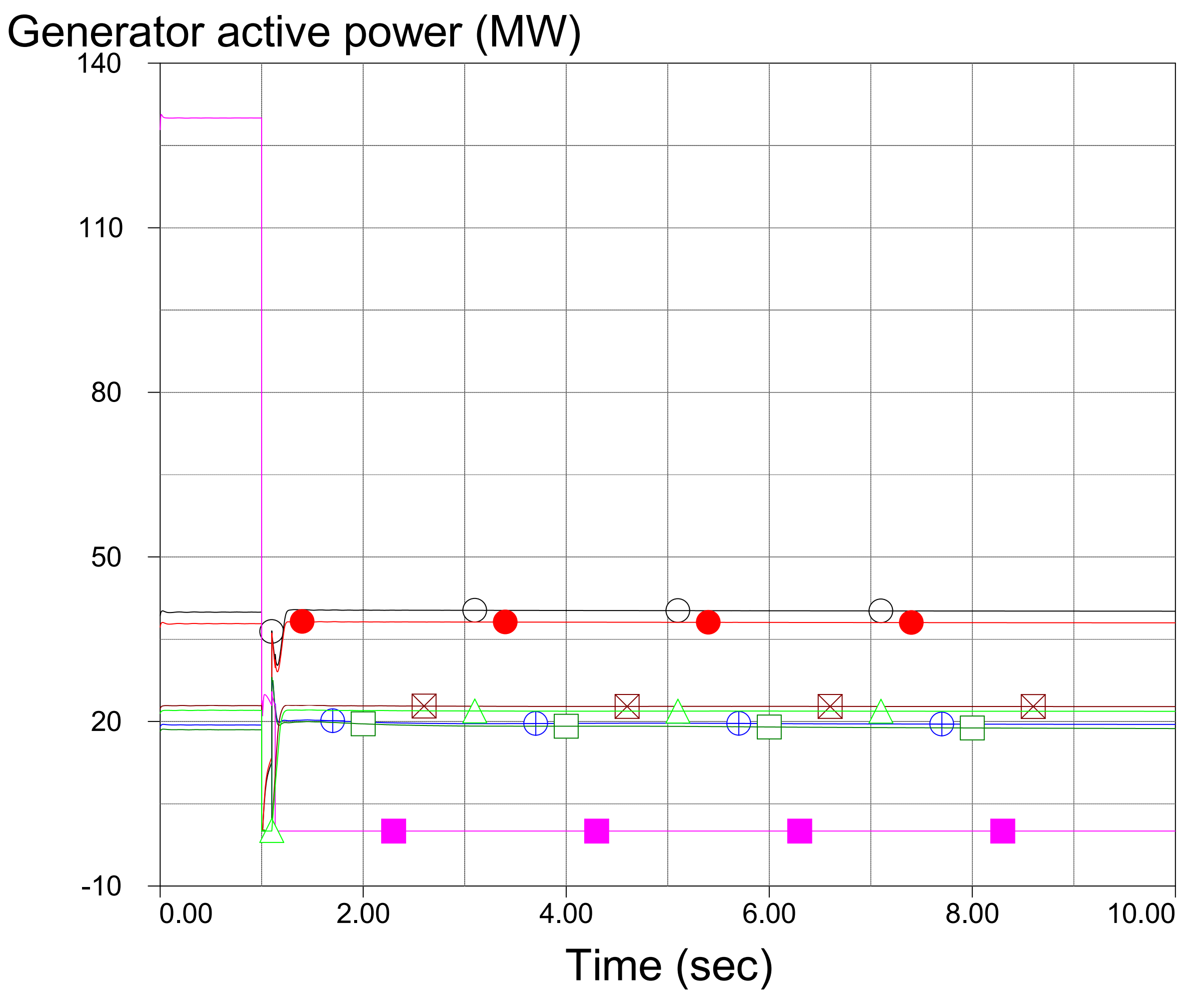
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 2 Post Development.bin	Scenario 2 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	5
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⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1		5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

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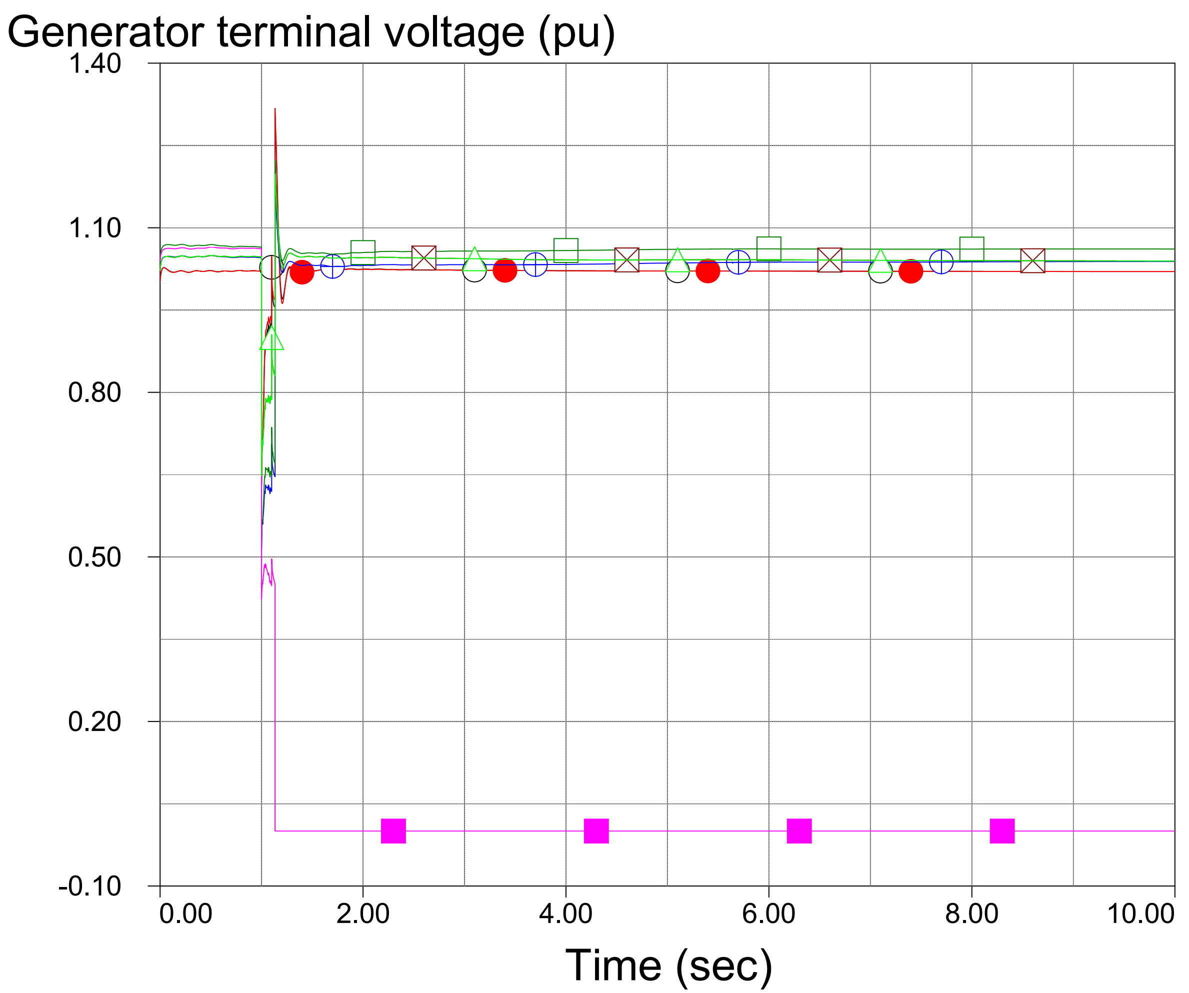
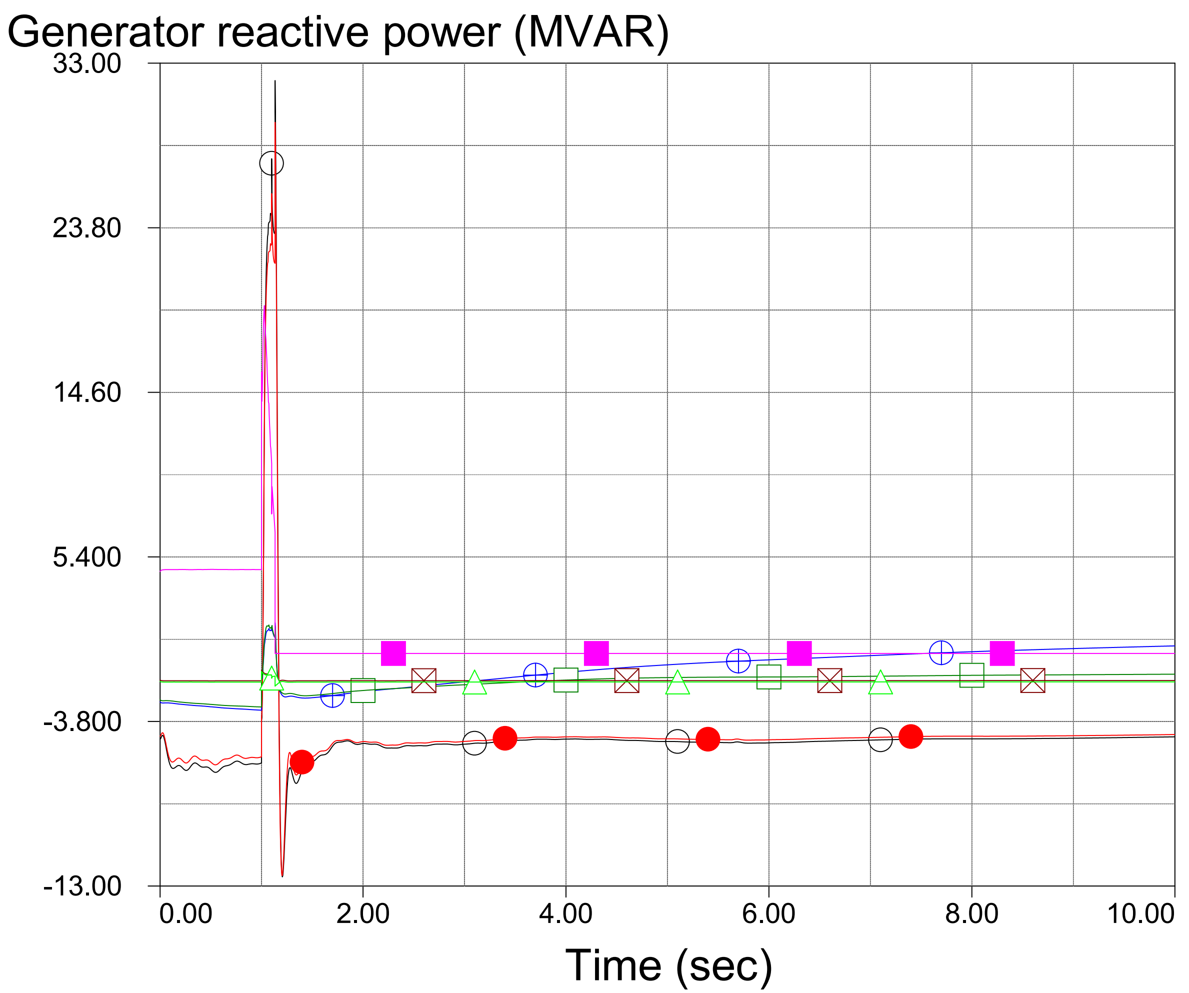
Buf.	Binary Result File	Scenario	Contingency
6	Scenario 2 Post Development.bin	Scenario 2 Post Development	6 -- 879L F 3P FAULT(N6F8)



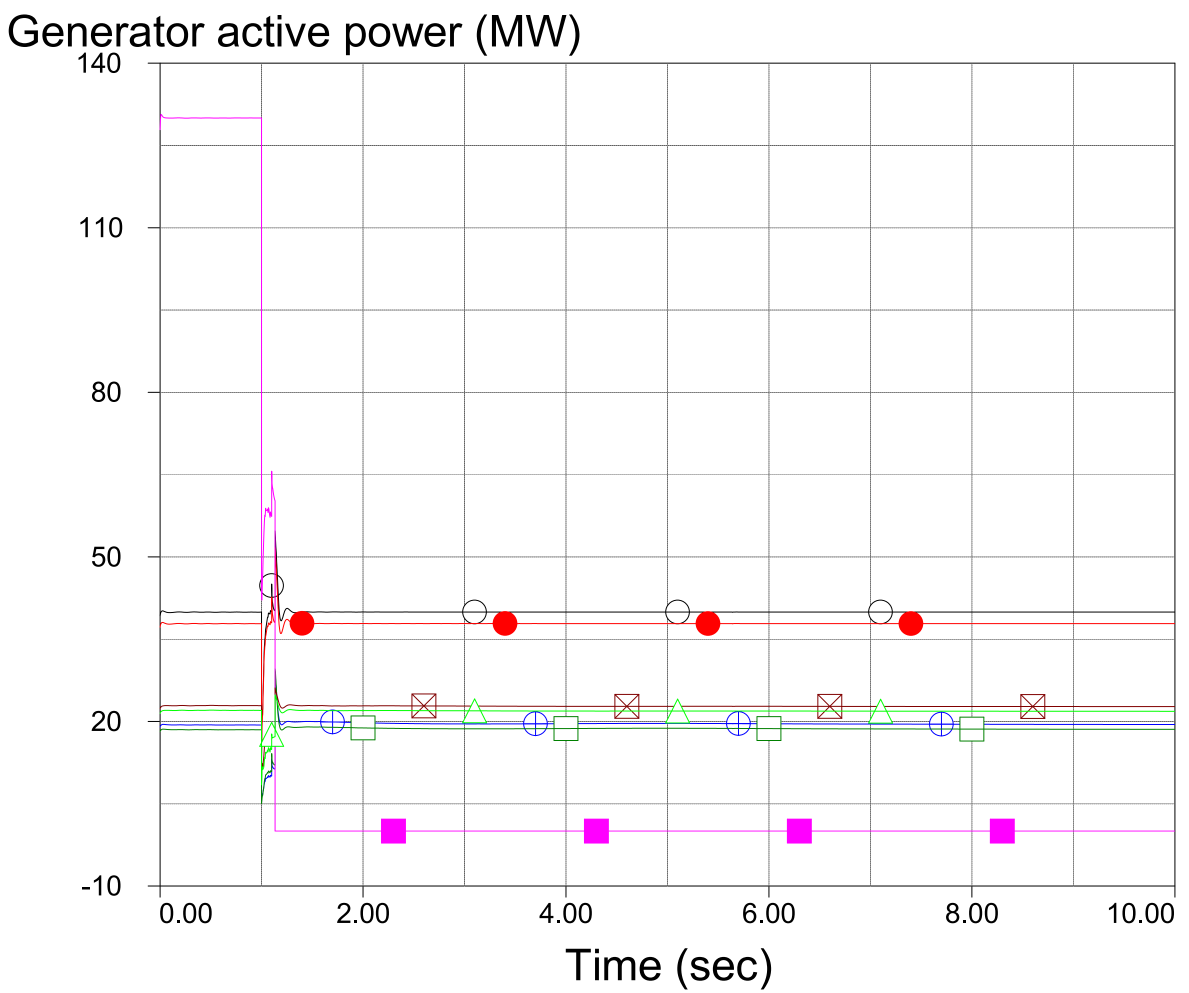
	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

Buf.	Binary Result File	Scenario	Contingency
6	Scenario 2 Post Development.bin	Scenario 2 Post Development	6 -- 879L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G1	3	6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

Buf.	Binary Result File	Scenario	Contingency
6	Scenario 2 Post Development.bin	Scenario 2 Post Development	6 -- 879L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	6
●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1	0	6
□	557277	WESTFIELDGEN(G1	3	6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

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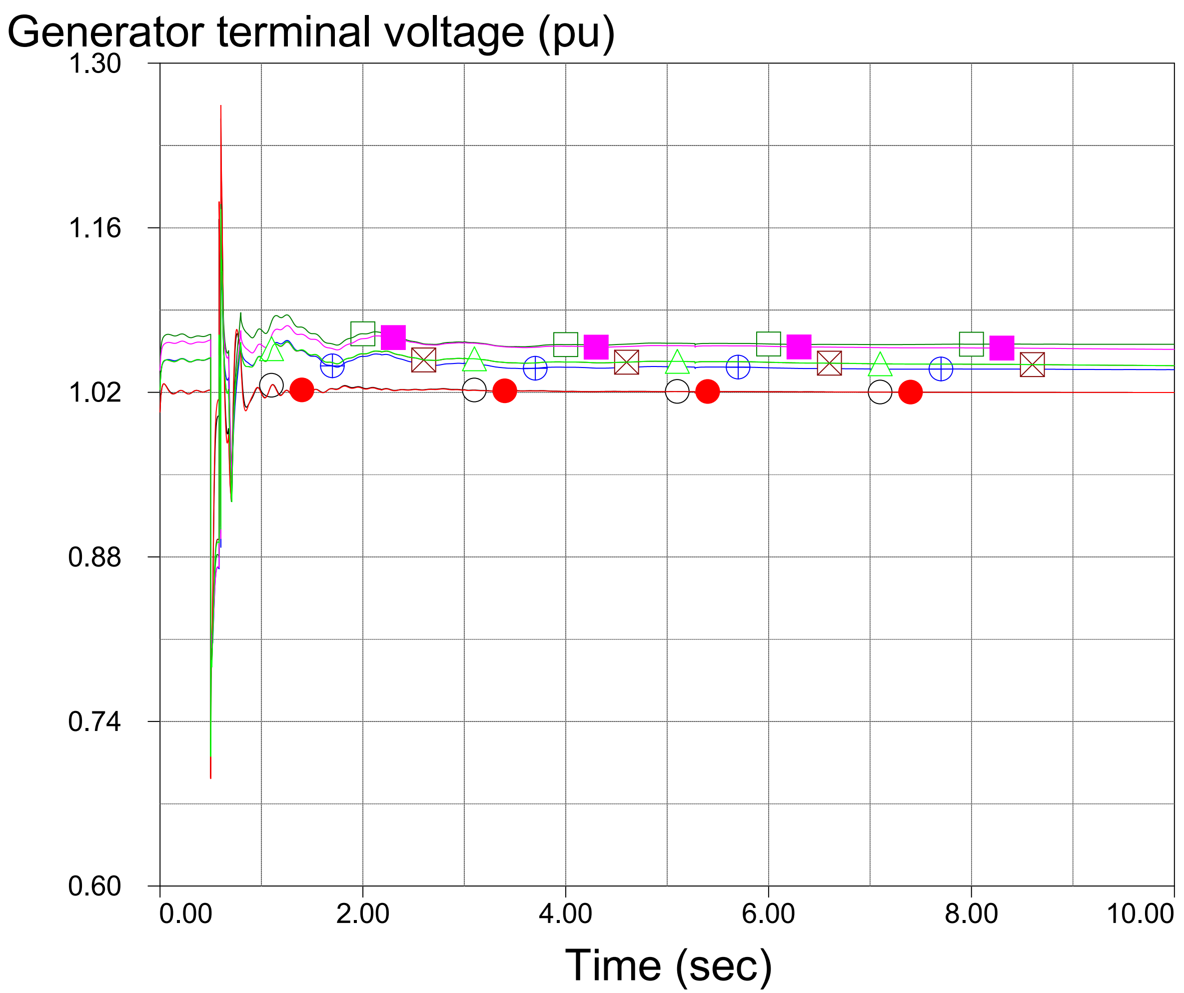
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 2 Post Development.bin	Scenario 2 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1	0	7
□	557277	WESTFIELDGEN(G1	3	7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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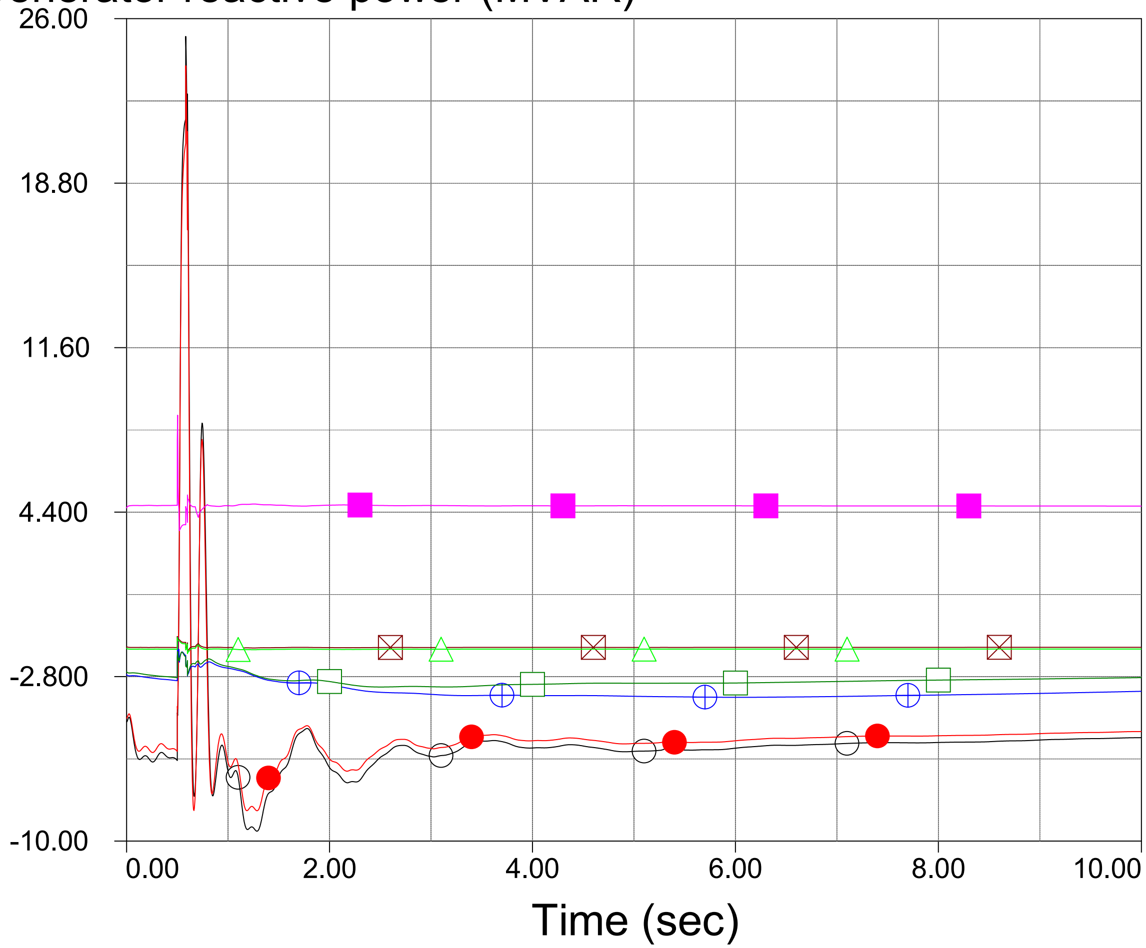
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 2 Post Development.bin	Scenario 2 Post Development	7 -- 1034L N 3P FAULT(N5F6)

Generator reactive power (MVAR)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G13		7
■	60873	RATTLESNK_3 0.G1		7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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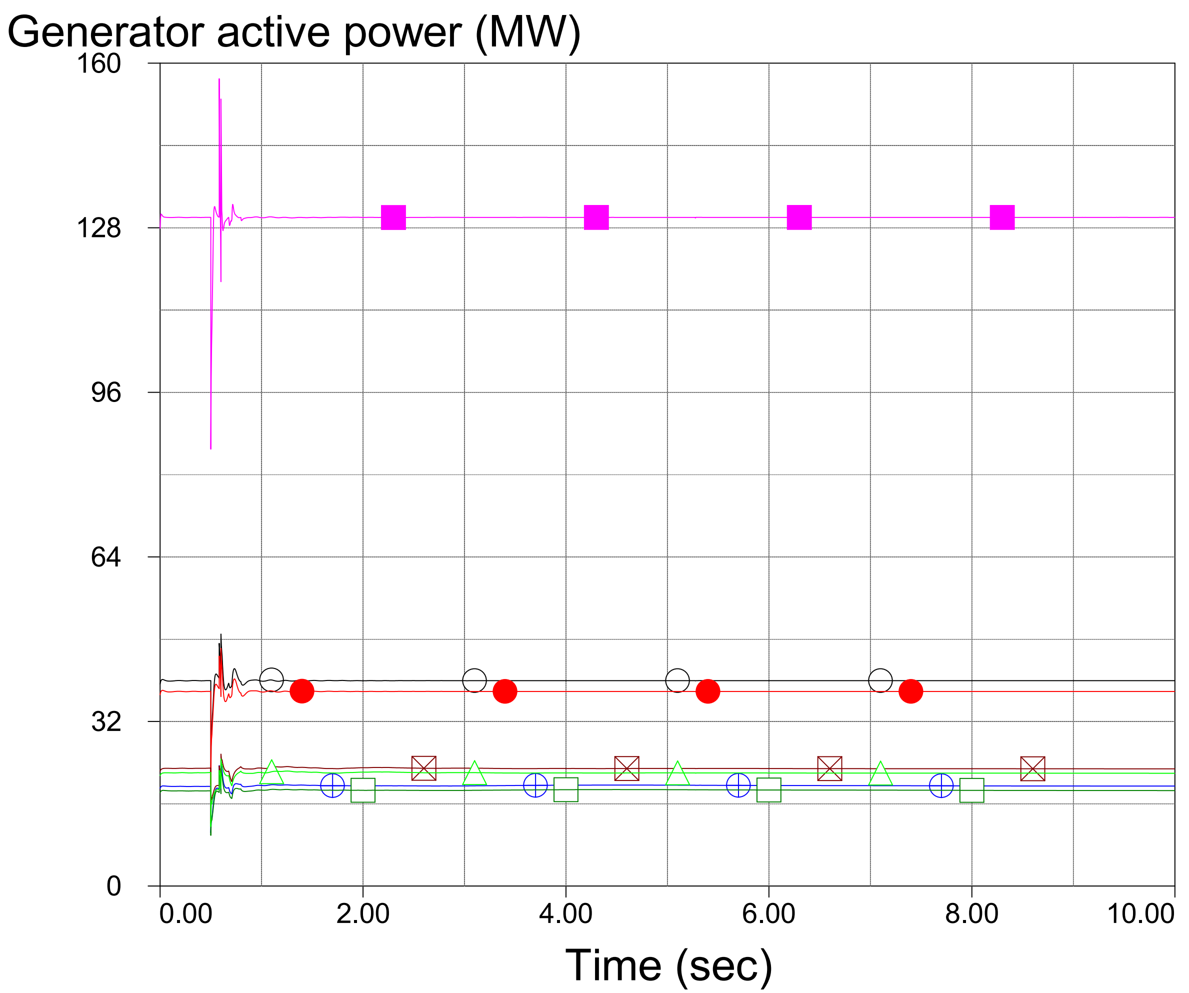
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 2 Post Development.bin	Scenario 2 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G13		7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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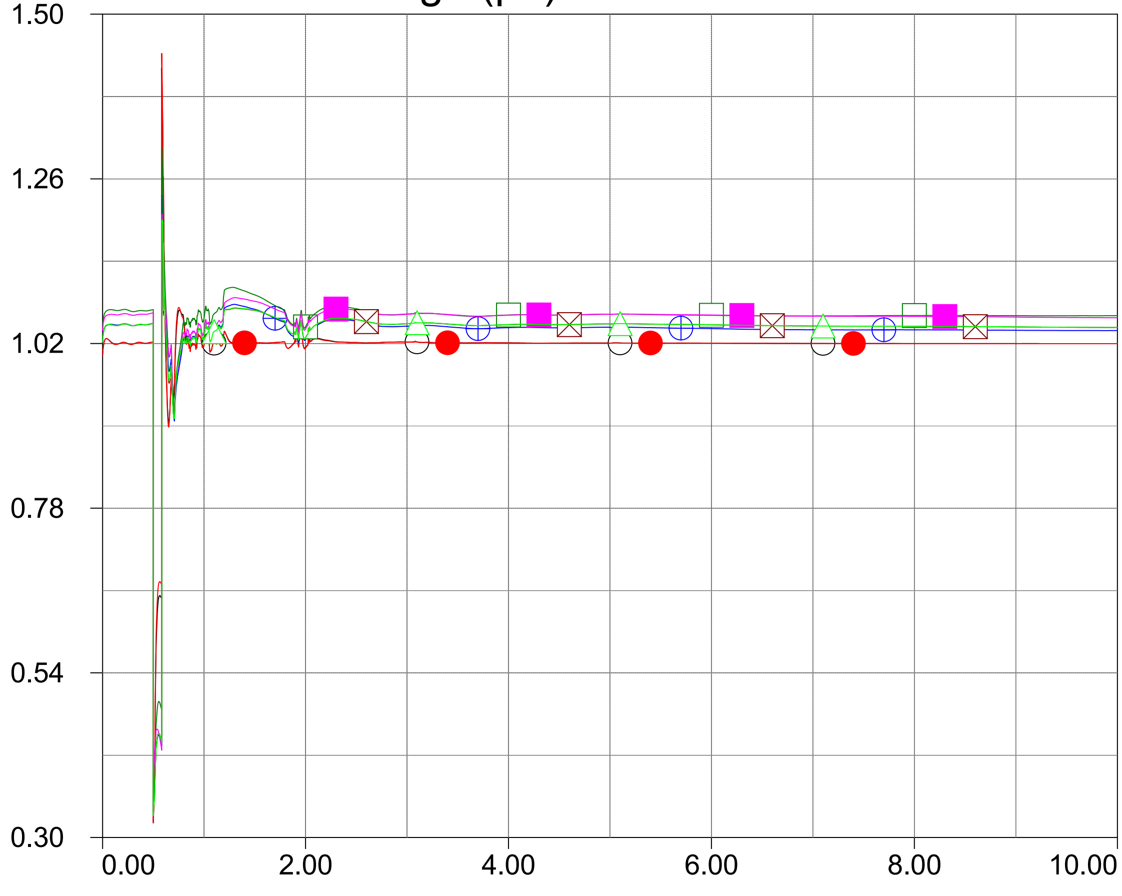
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 2 Post Development.bin	Scenario 2 Post Development	8 -- 1034L F 3P FAULT(N5F6)

Generator terminal voltage (pu)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G13		8
■	60873	RATTLESNK_3 0.G1		8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

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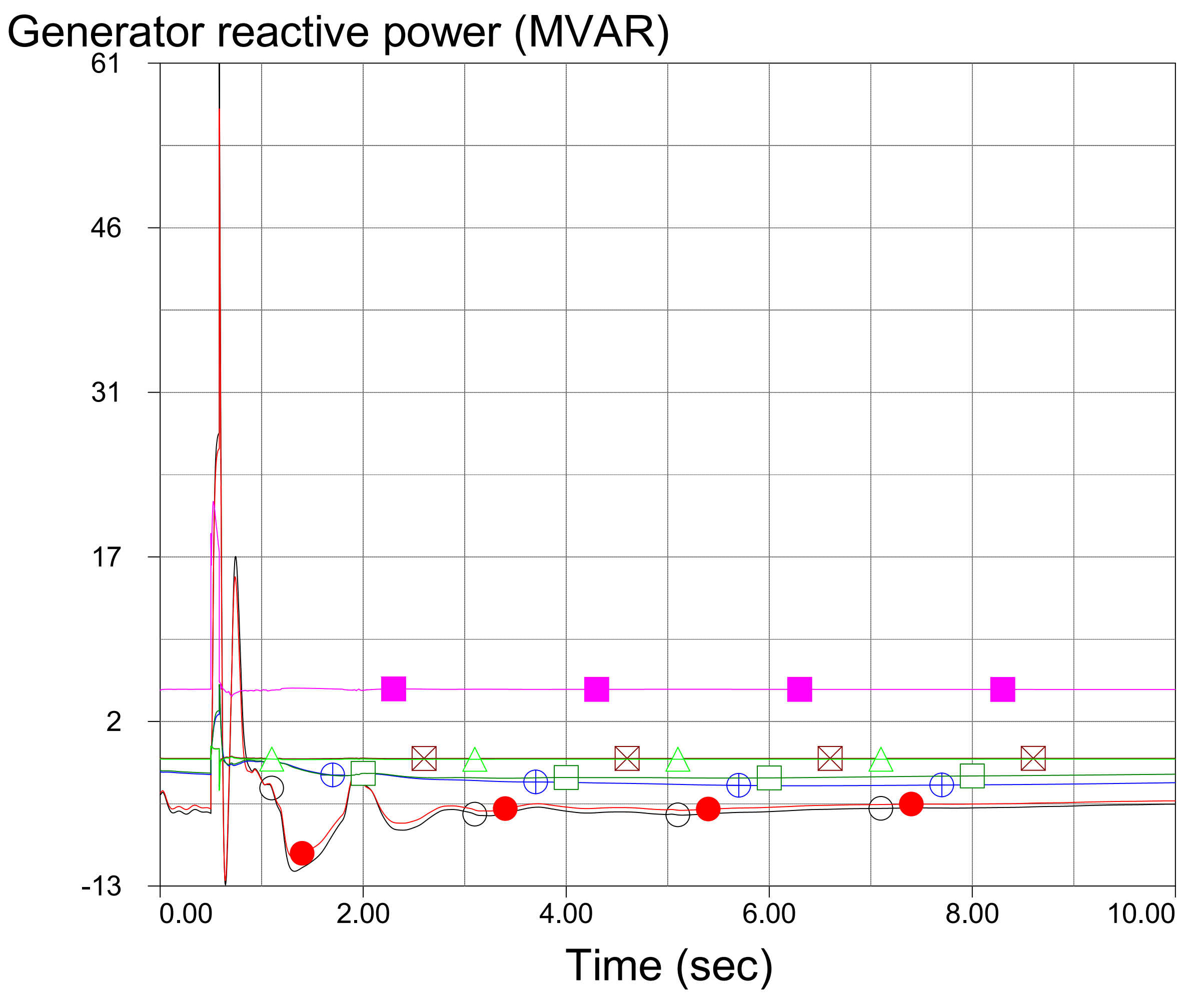
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 2 Post Development.bin	Scenario 2 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G1		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

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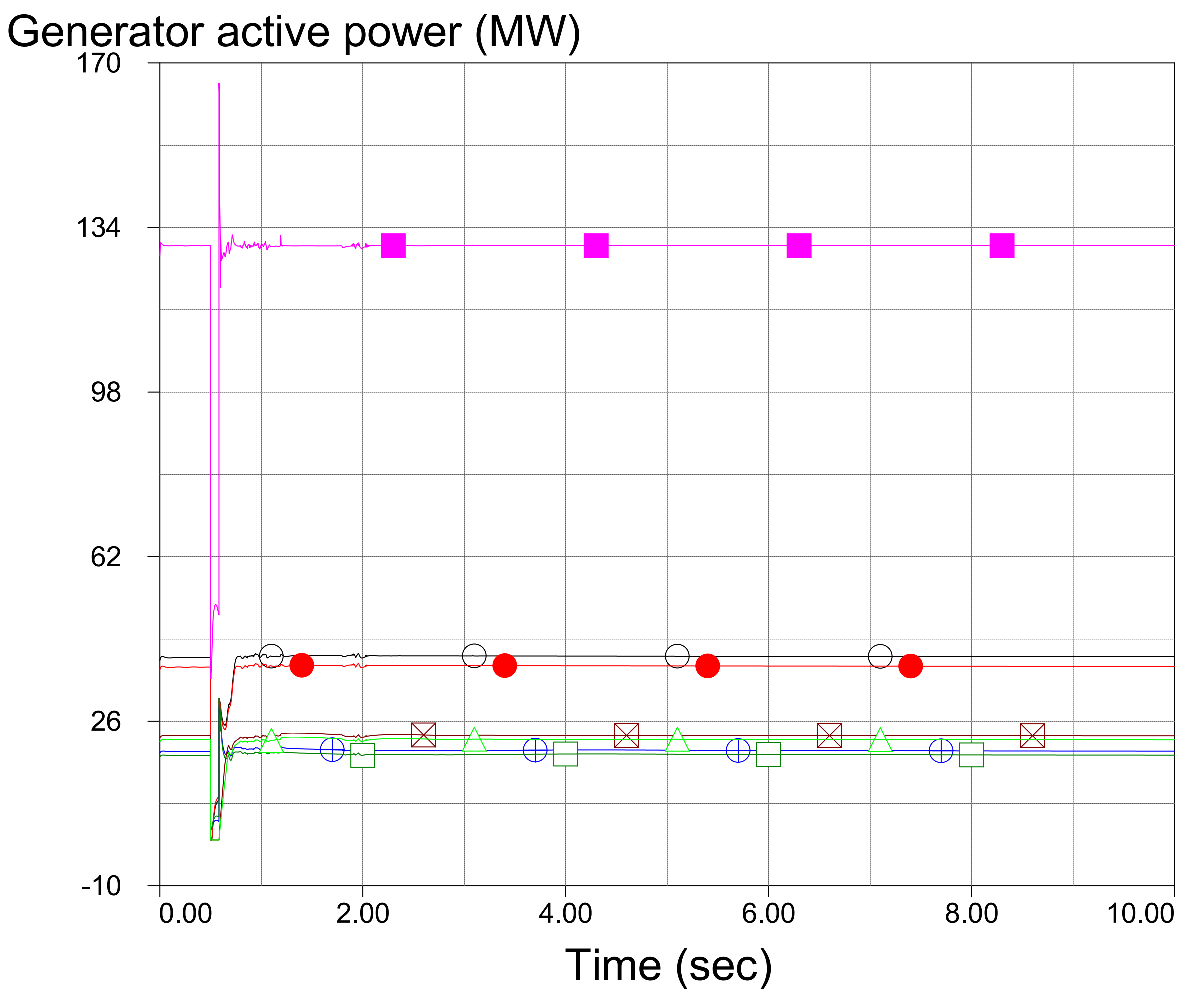
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 2 Post Development.bin	Scenario 2 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G1.3		8
■	60873	RATTLESNK_3 0.G1		8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

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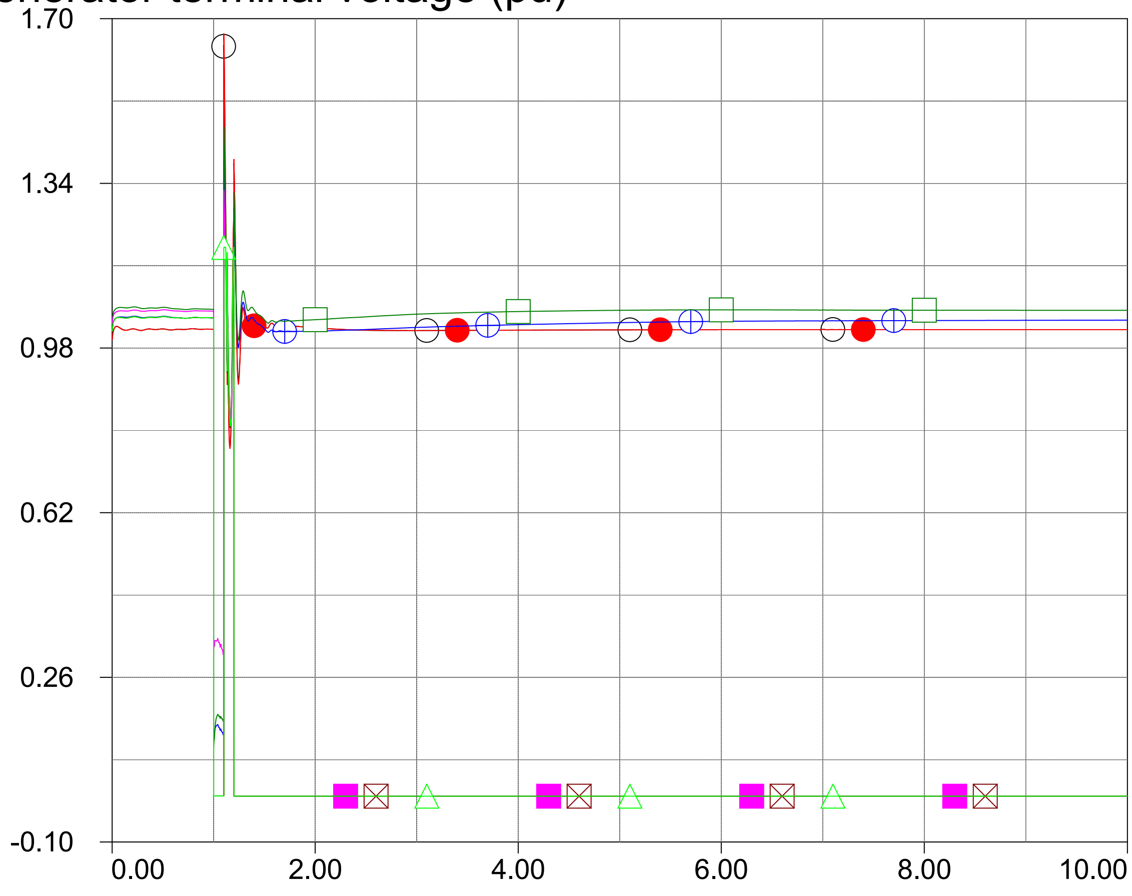
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 3 Post Development.bin	Scenario 3 Post Development	1 -- 610L N 3P FAULT(N6F8)

Generator terminal voltage (pu)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

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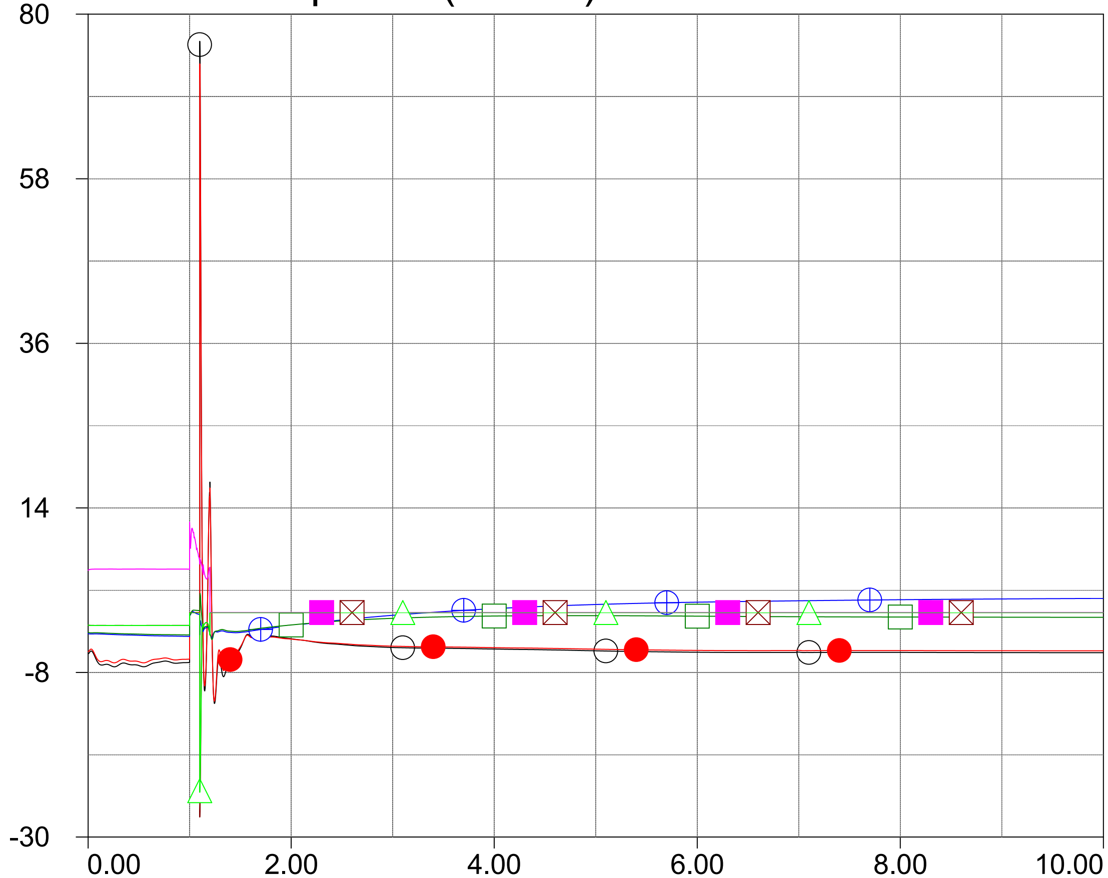
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 3 Post Development.bin	Scenario 3 Post Development	1 -- 610L N 3P FAULT(N6F8)

Generator reactive power (MVAR)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

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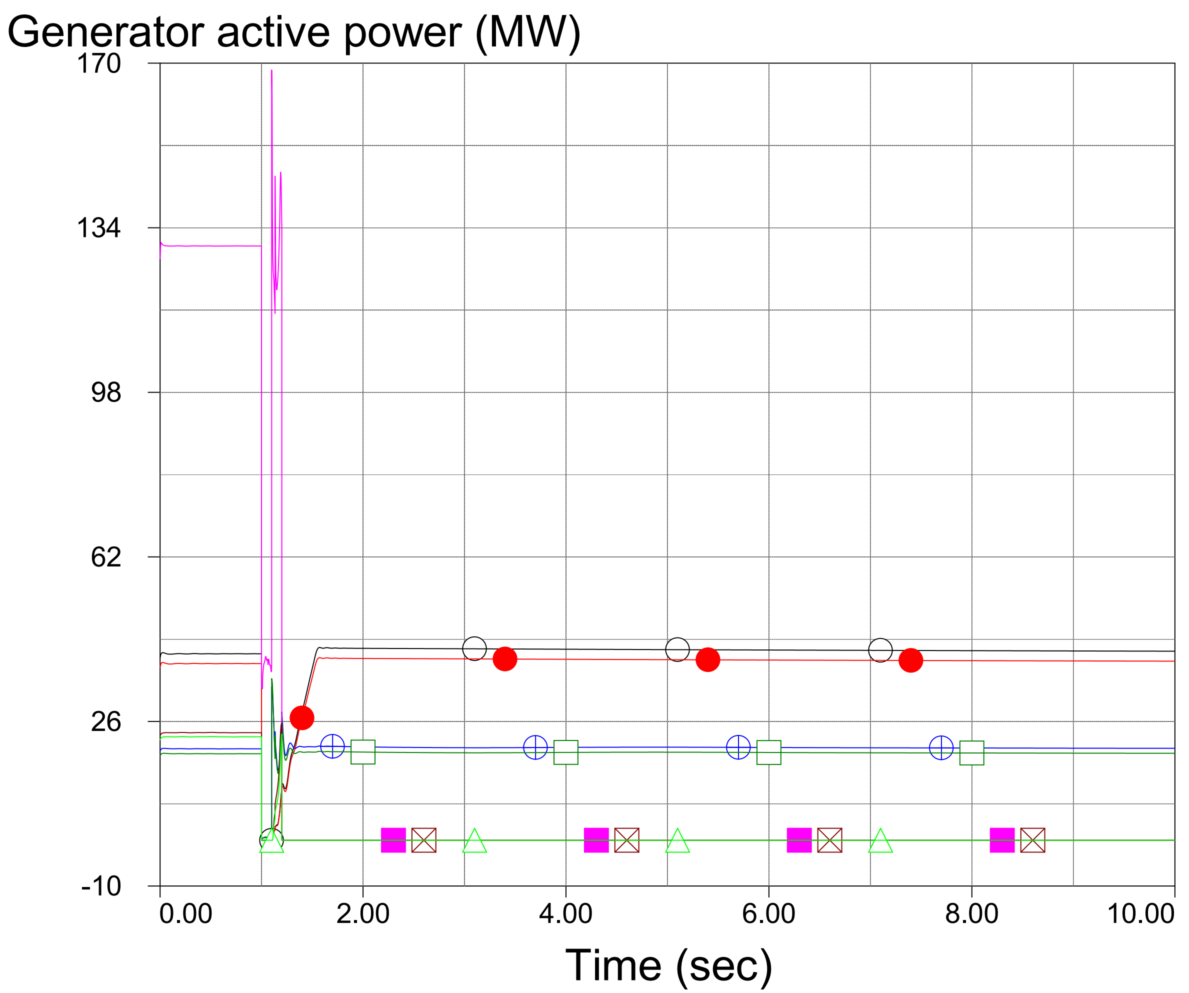
Buf.	Binary Result File	Scenario	Contingency
1	Scenario 3 Post Development.bin	Scenario 3 Post Development	1 -- 610L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	1
⊕	557269	BURDETTSOLARG1.0		1
□	557277	WESTFIELDGEN(G13		1
■	60873	RATTLESNK_3 0.G1		1
⊠	554291	CONRAD1 0.55	G1	1
△	553291	CONRAD2 0.55	G2	1

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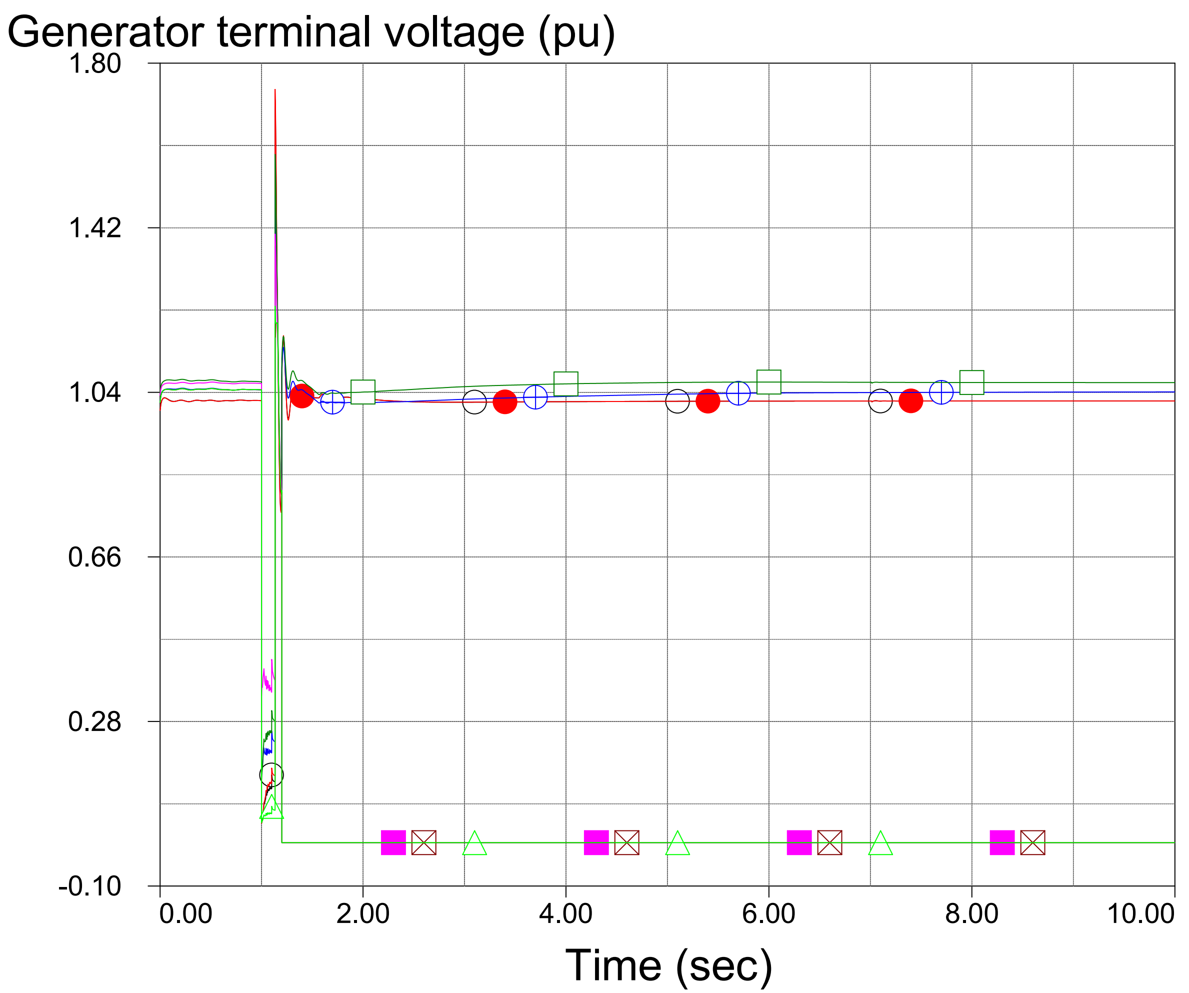
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 3 Post Development.bin	Scenario 3 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1	0	2
□	557277	WESTFIELDGEN(G1	3	2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

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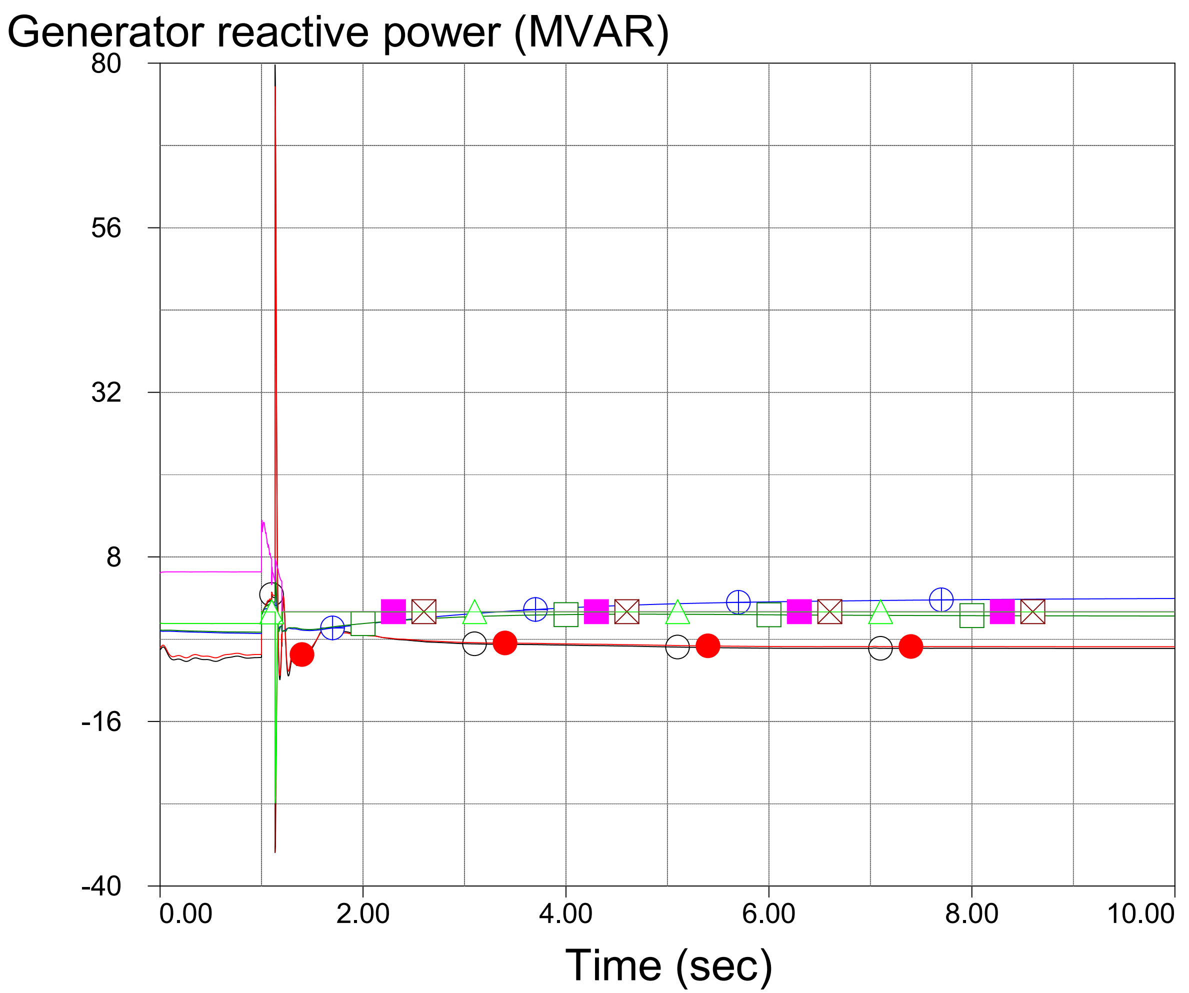
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 3 Post Development.bin	Scenario 3 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G1	3	2
■	60873	RATTLESNK_3 0.G1		2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

DSATools Output Analysis 19.0

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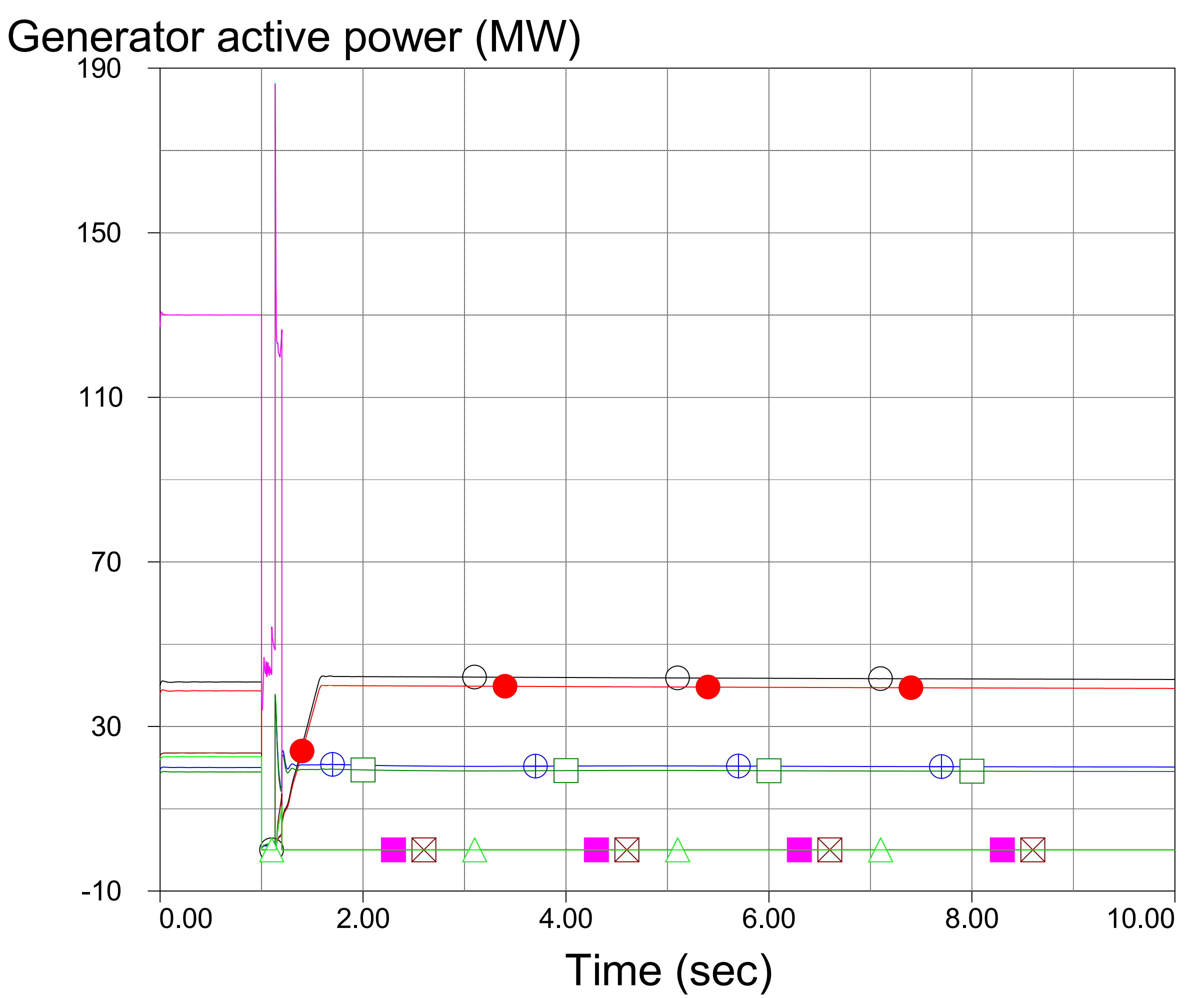
Buf.	Binary Result File	Scenario	Contingency
2	Scenario 3 Post Development.bin	Scenario 3 Post Development	2 -- 610L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	2
⊕	557269	BURDETTSOLARG1.0		2
□	557277	WESTFIELDGEN(G1 3		2
■	60873	RATTLESNK_3 0.	G1	2
⊠	554291	CONRAD1 0.55	G1	2
△	553291	CONRAD2 0.55	G2	2

DSATools Output Analysis 19.0

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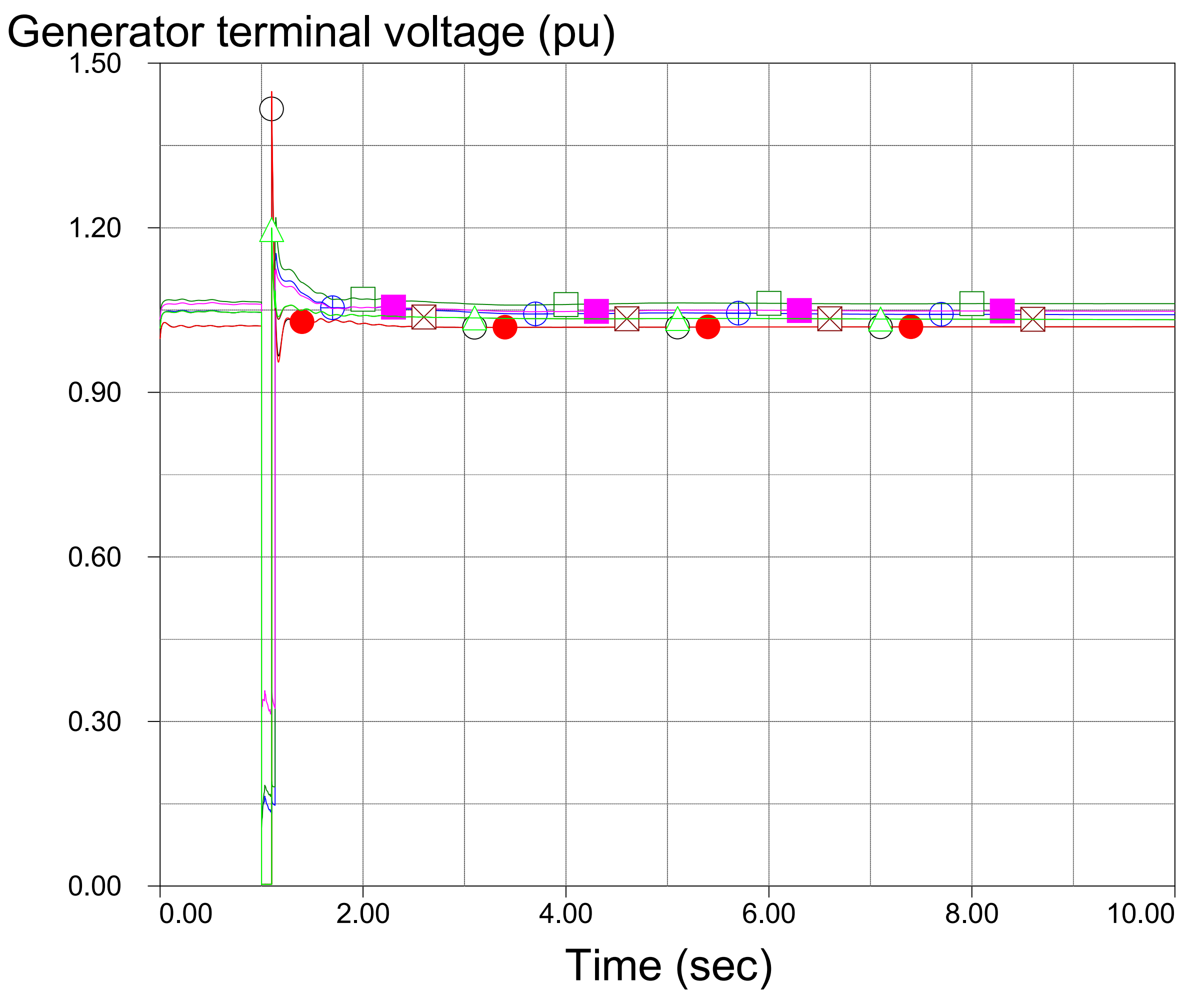
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 3 Post Development.bin	Scenario 3 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1	0	3
□	557277	WESTFIELDGEN(G1	3	3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

DSATools Output Analysis 19.0

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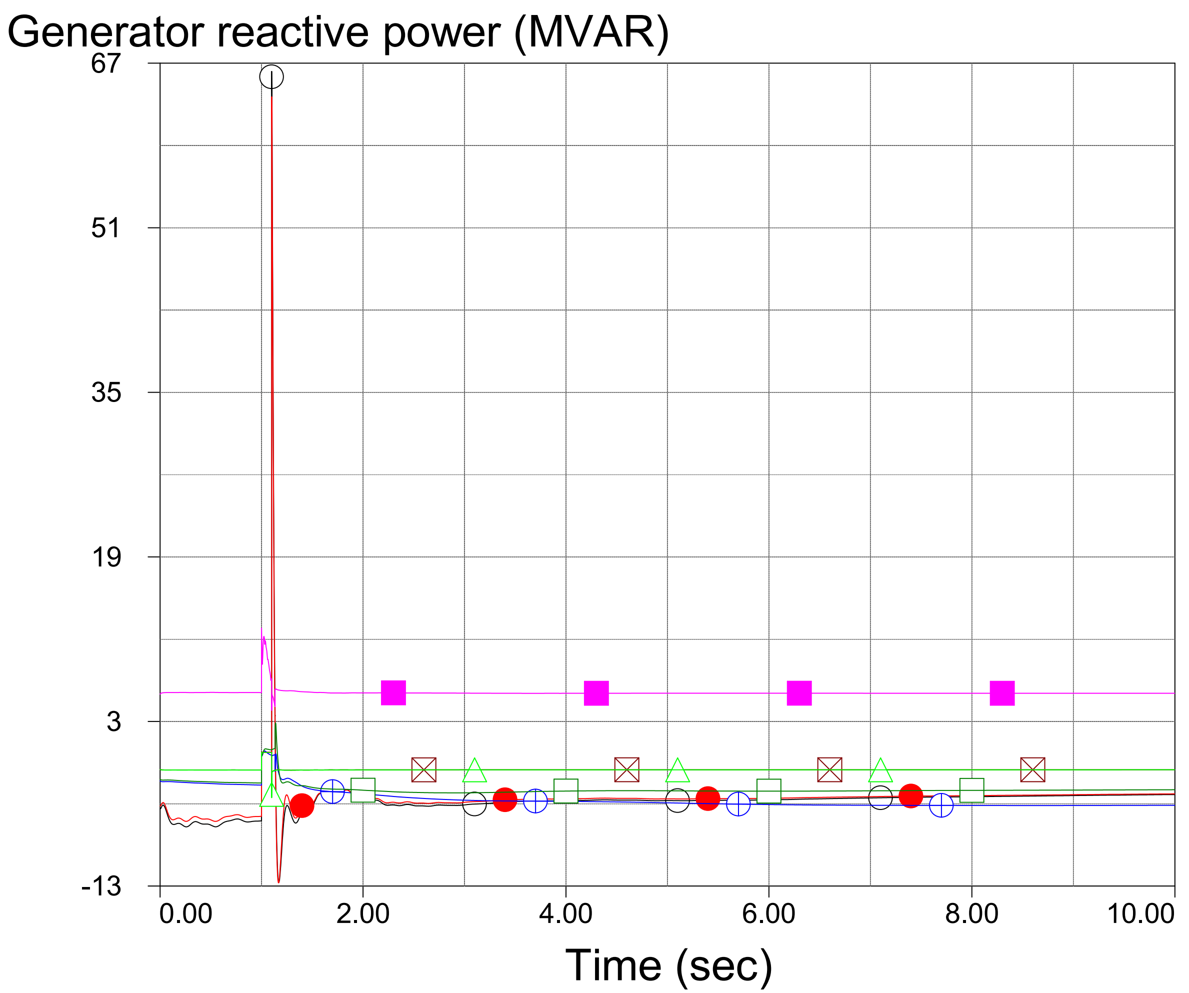
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 3 Post Development.bin	Scenario 3 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1.0		3
□	557277	WESTFIELDGEN(G1)		3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

DSATools Output Analysis 19.0

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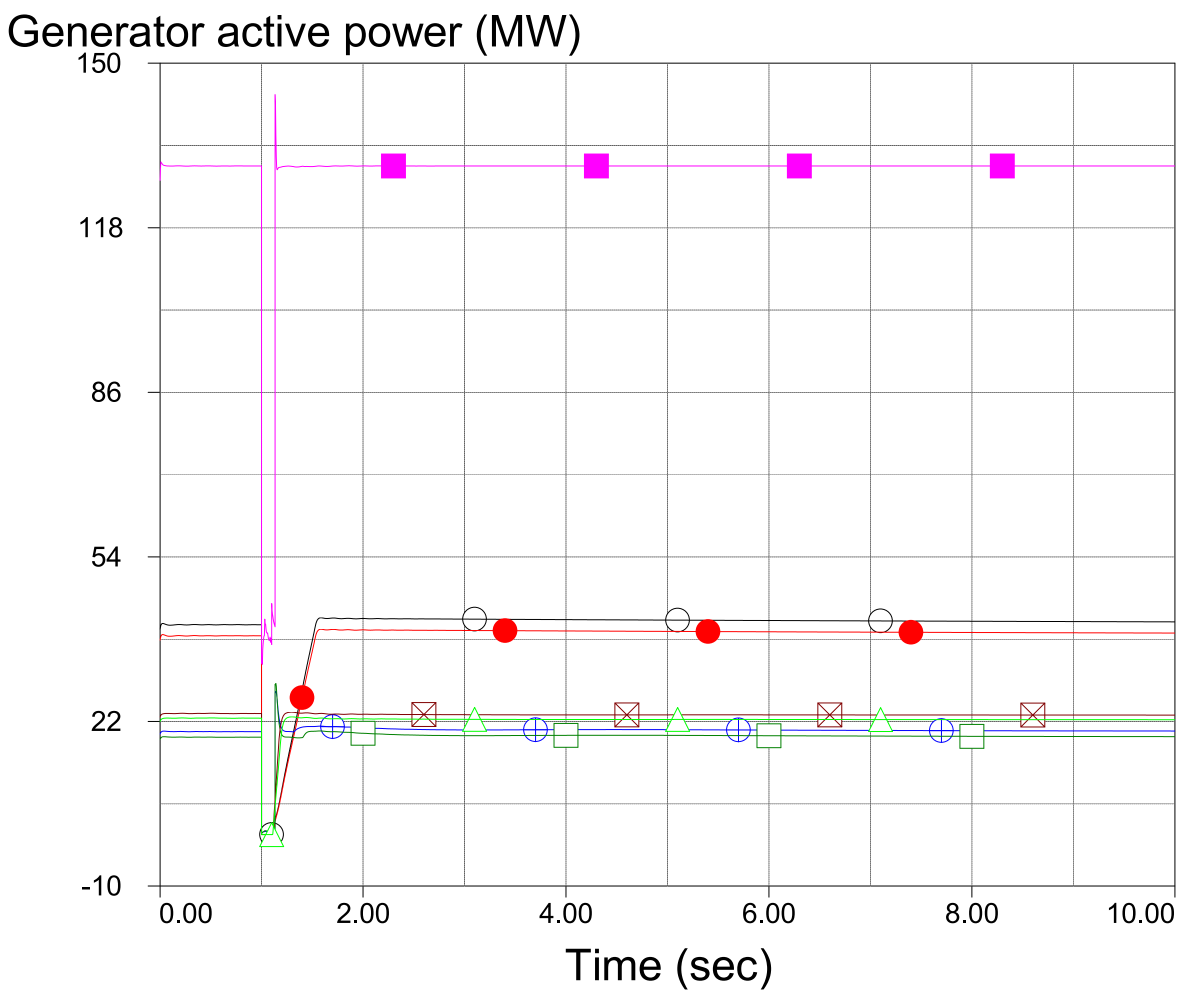
Buf.	Binary Result File	Scenario	Contingency
3	Scenario 3 Post Development.bin	Scenario 3 Post Development	3 -- 612L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	3
●	16343	TABERW7 0.40	1	3
⊕	557269	BURDETTSOLARG1.0		3
□	557277	WESTFIELDGEN(G1		3
■	60873	RATTLESNK_3 0.	G1	3
⊠	554291	CONRAD1 0.55	G1	3
△	553291	CONRAD2 0.55	G2	3

DSATools Output Analysis 19.0

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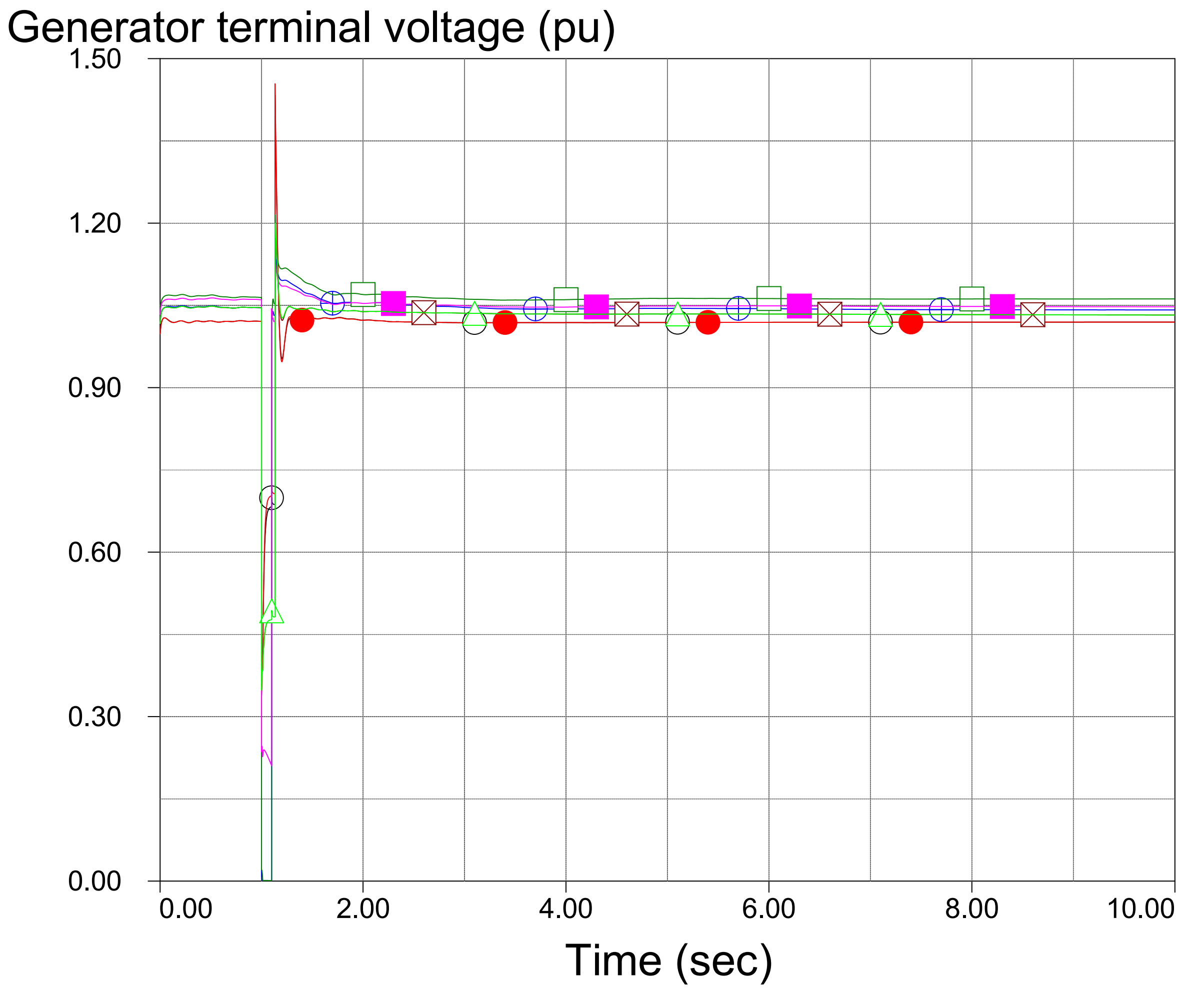
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 3 Post Development.bin	Scenario 3 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G13		4
■	60873	RATTLESNK_3 0.	G1	4
☒	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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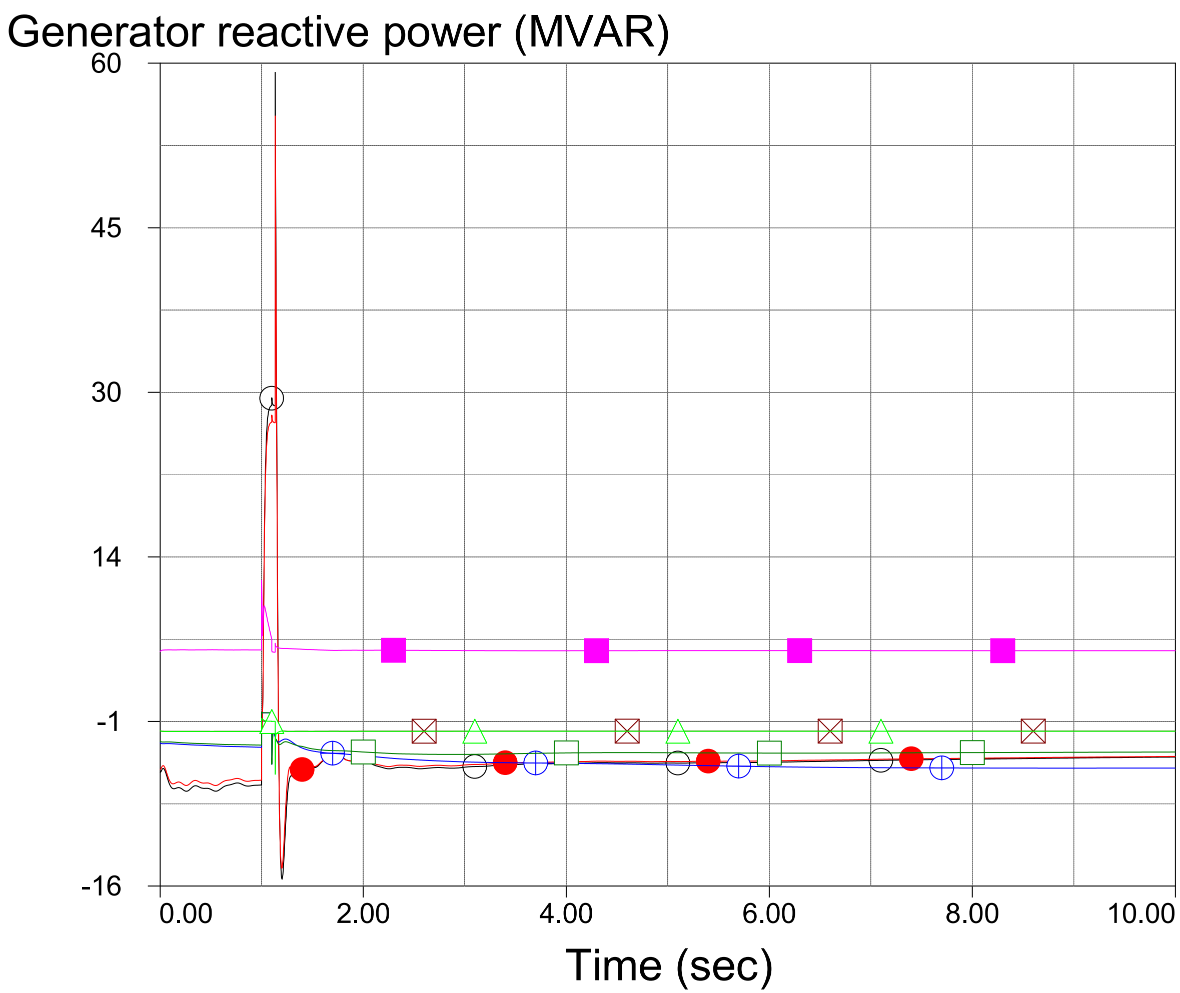
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 3 Post Development.bin	Scenario 3 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	4
●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1	0	4
□	557277	WESTFIELDGEN(G1	3	4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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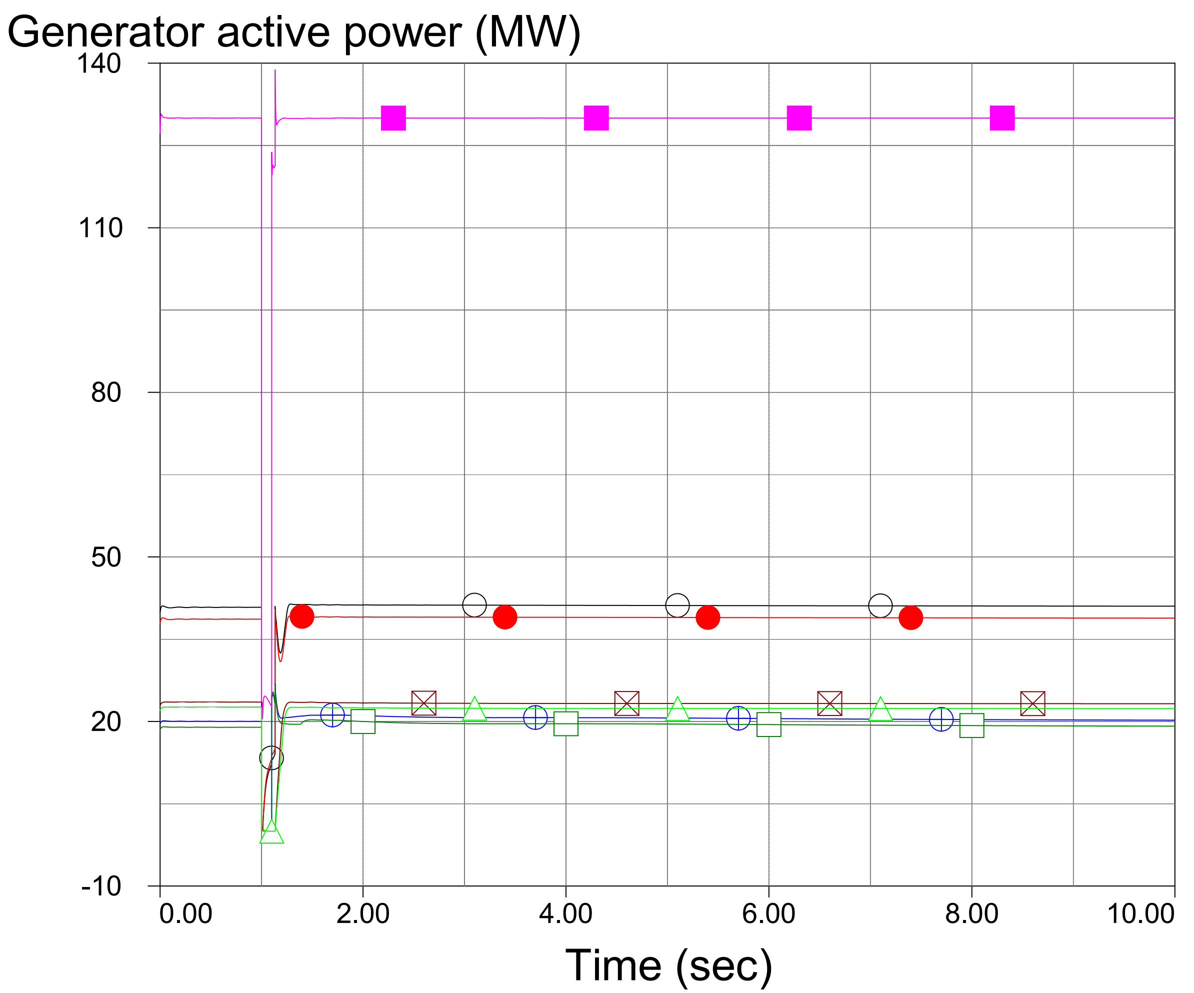
Buf.	Binary Result File	Scenario	Contingency
4	Scenario 3 Post Development.bin	Scenario 3 Post Development	4 -- 612L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	4
⊕	557269	BURDETTSOLARG1.0		4
□	557277	WESTFIELDGEN(G1:		4
■	60873	RATTLESNK_3 0.	G1	4
⊠	554291	CONRAD1 0.55	G1	4
△	553291	CONRAD2 0.55	G2	4

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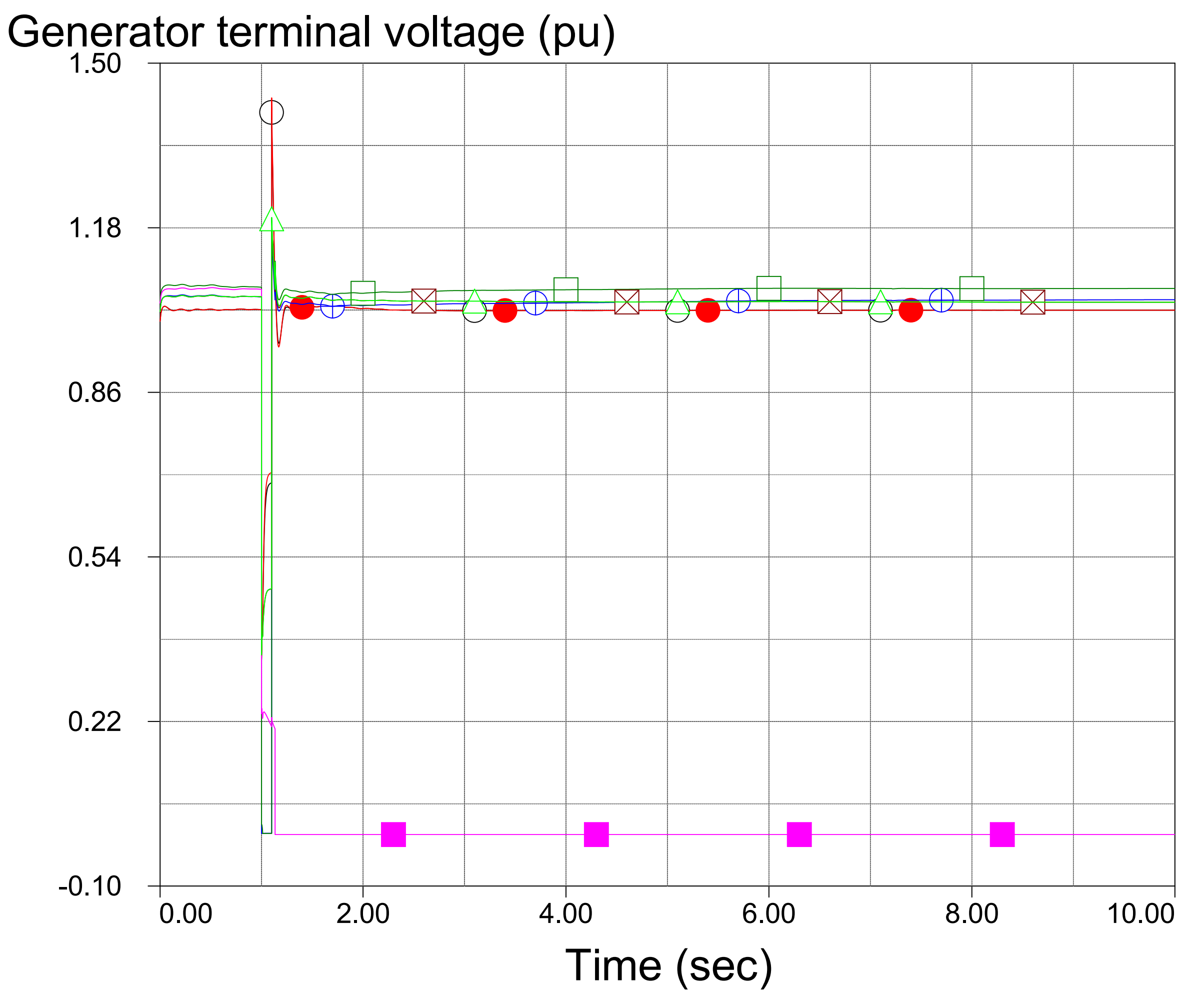
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 3 Post Development.bin	Scenario 3 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	5
⊕	557269	BURDETTSOLARG1	0	5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

DSATools Output Analysis 19.0

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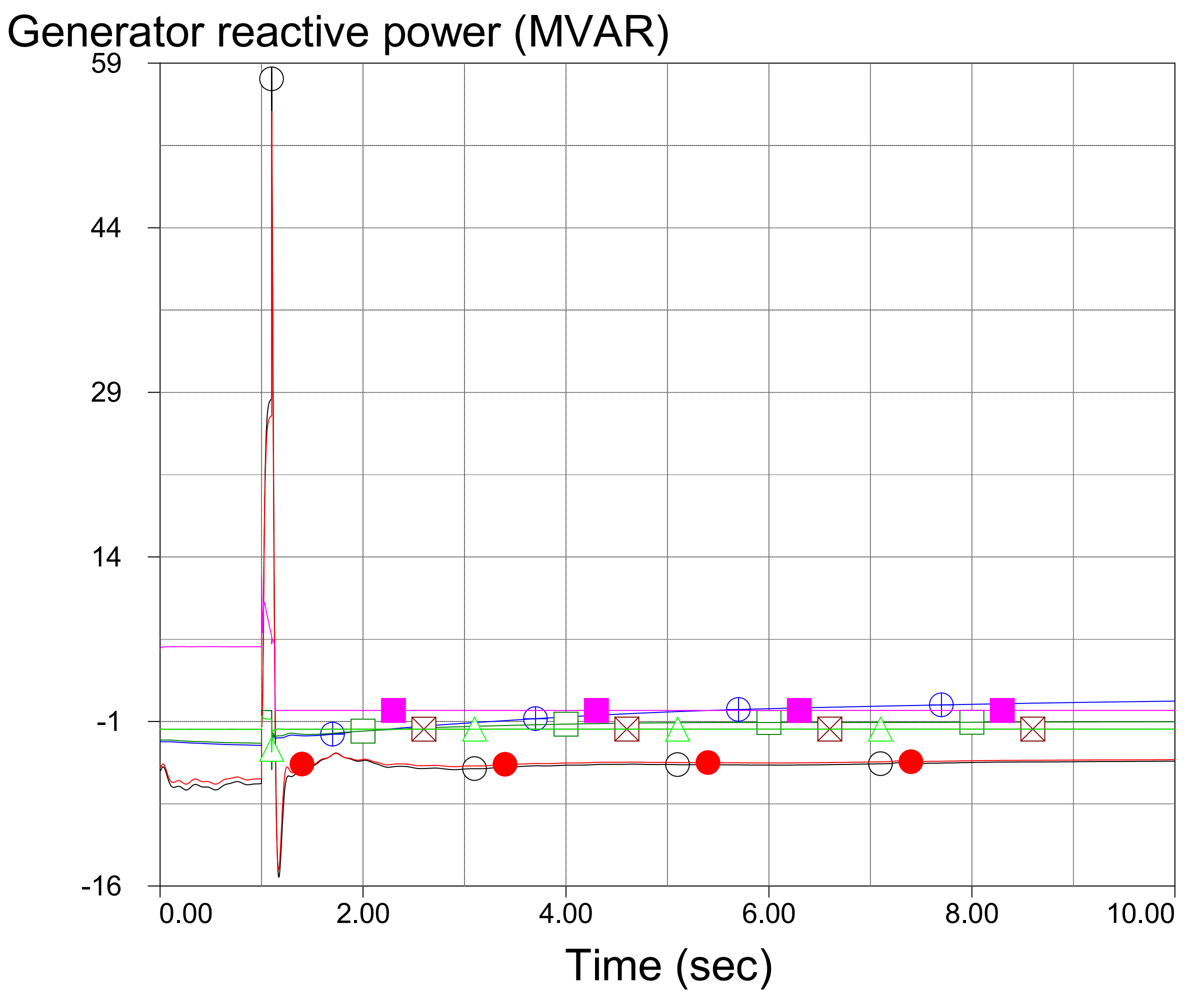
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 3 Post Development.bin	Scenario 3 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1	3	5
■	60873	RATTLESNK_3 0.G1		5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

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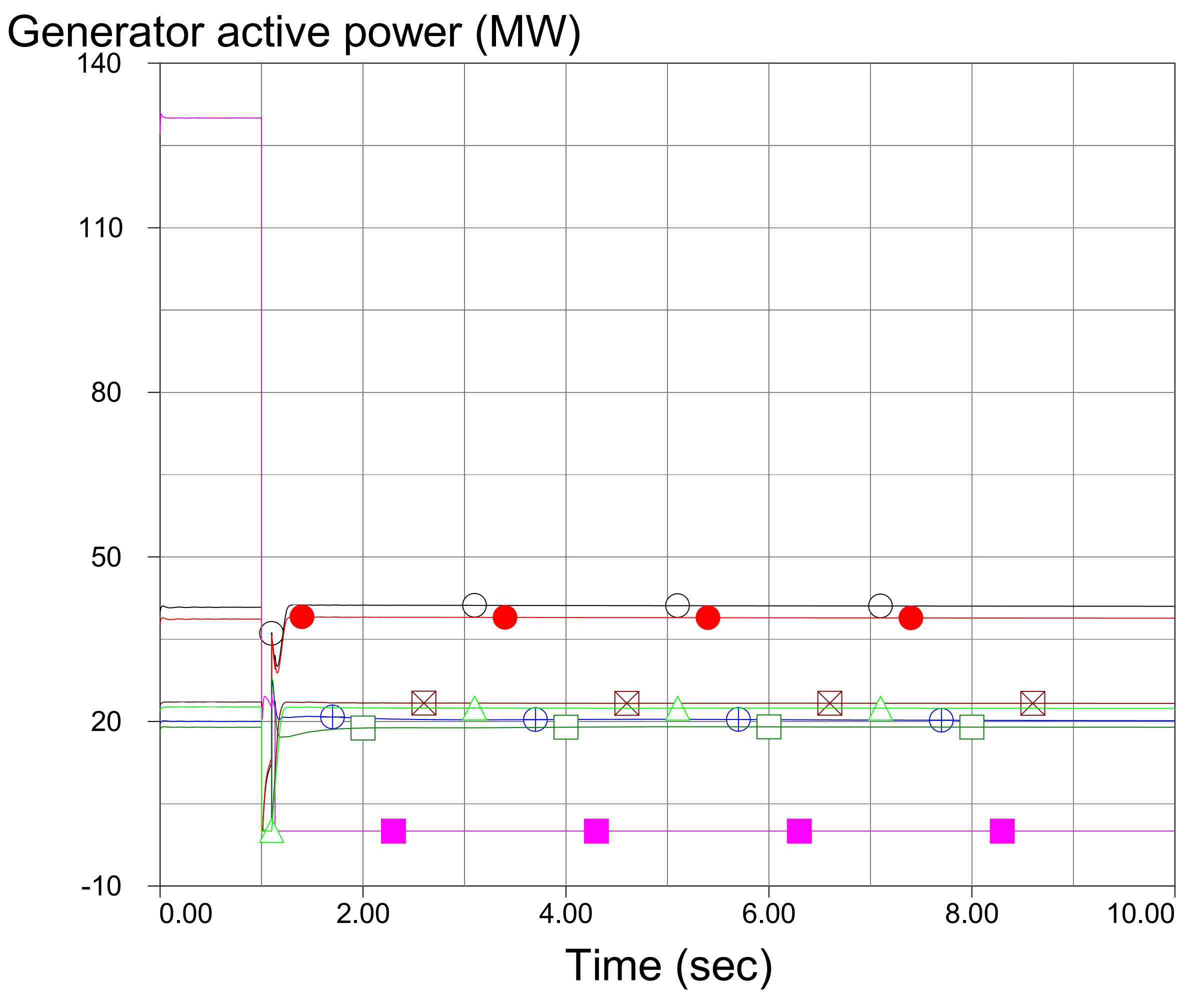
Buf.	Binary Result File	Scenario	Contingency
5	Scenario 3 Post Development.bin	Scenario 3 Post Development	5 -- 879L N 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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⊕	557269	BURDETTSOLARG1.0		5
□	557277	WESTFIELDGEN(G1}		5
■	60873	RATTLESNK_3 0.	G1	5
⊠	554291	CONRAD1 0.55	G1	5
△	553291	CONRAD2 0.55	G2	5

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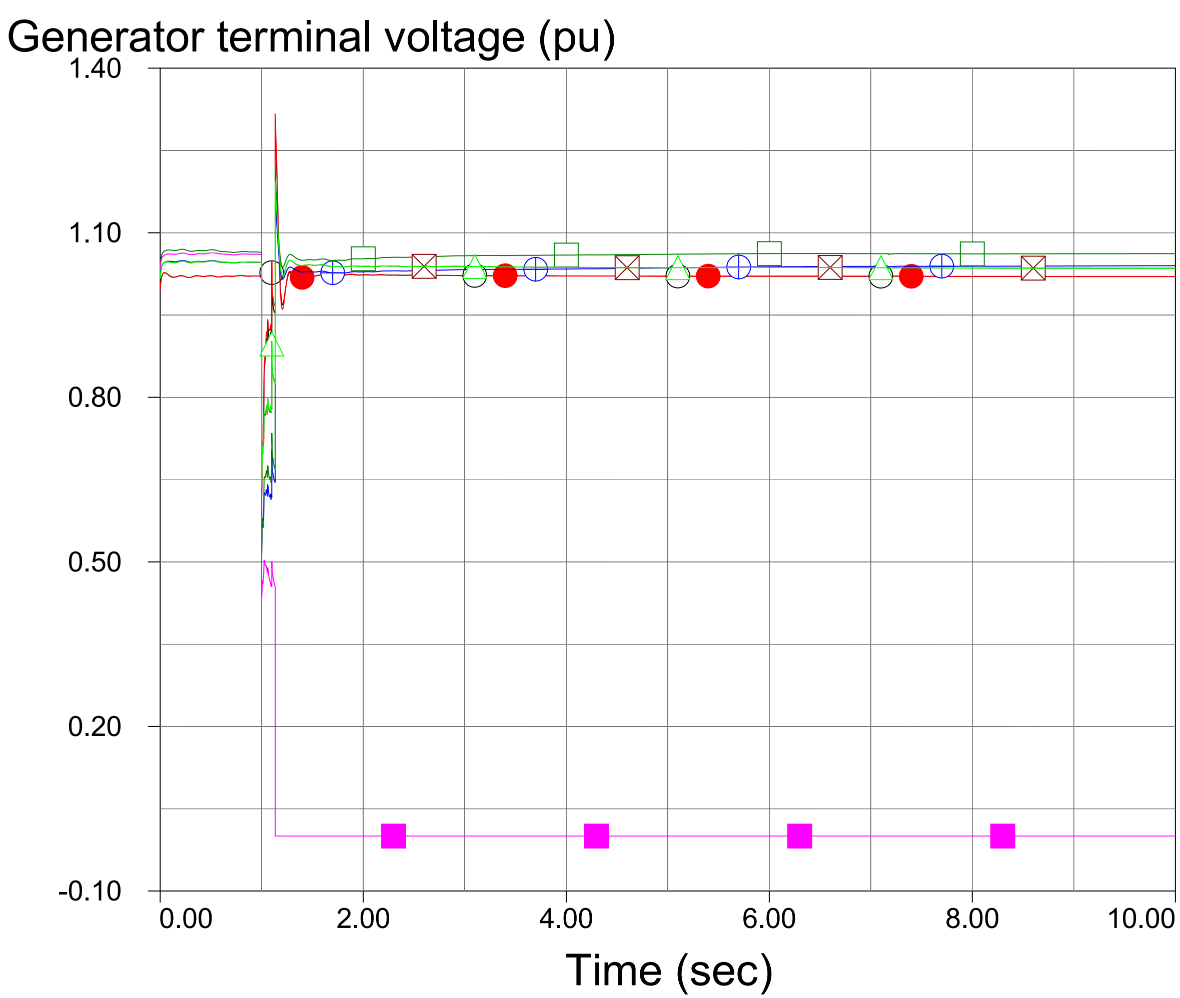
Buf.	Binary Result File	Scenario	Contingency
6	Scenario 3 Post Development.bin	Scenario 3 Post Development	6 -- 879L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1	0	6
□	557277	WESTFIELDGEN(G1	3	6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

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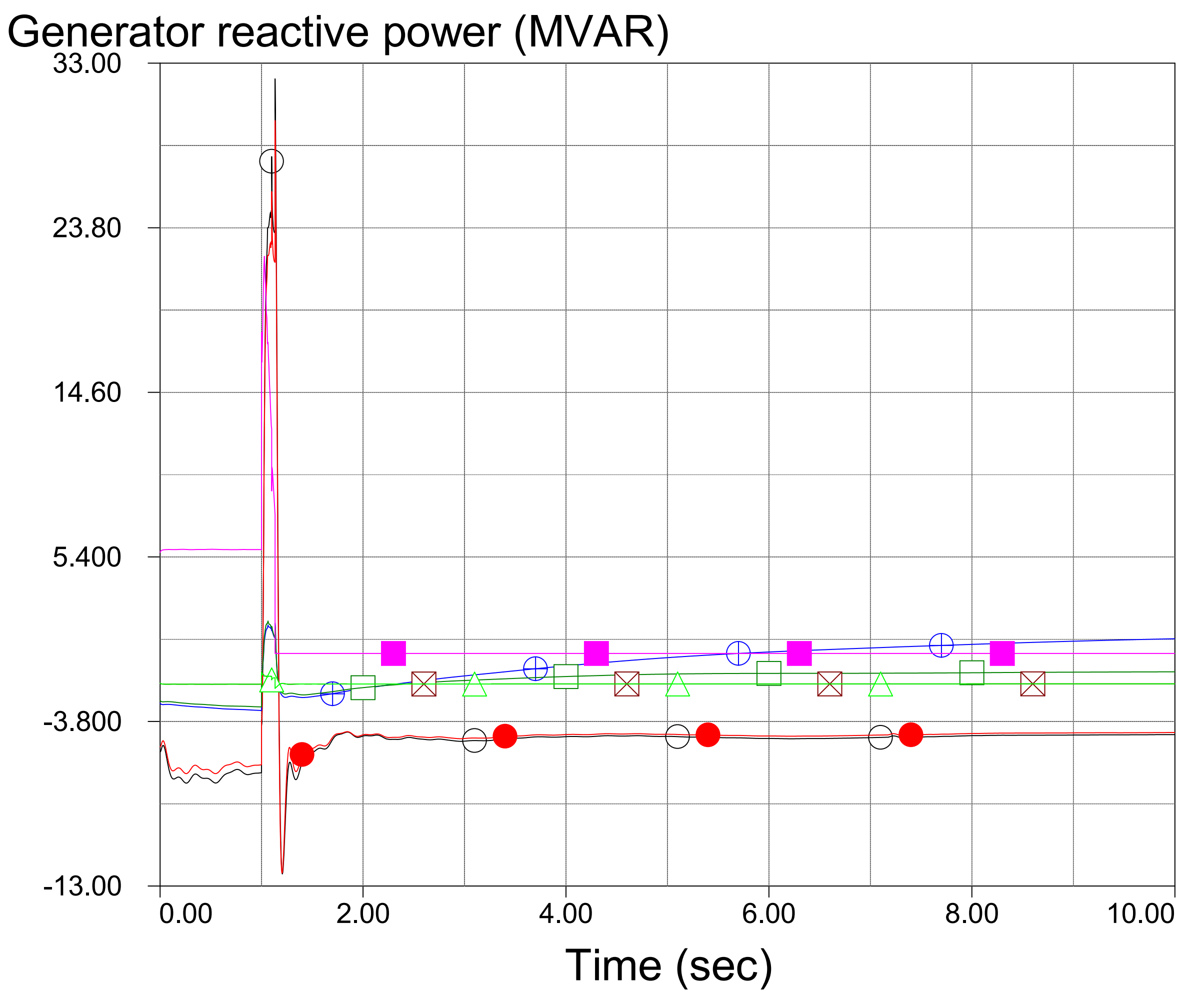
Buf.	Binary Result File	Scenario	Contingency
6	Scenario 3 Post Development.bin	Scenario 3 Post Development	6 -- 879L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	6
⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

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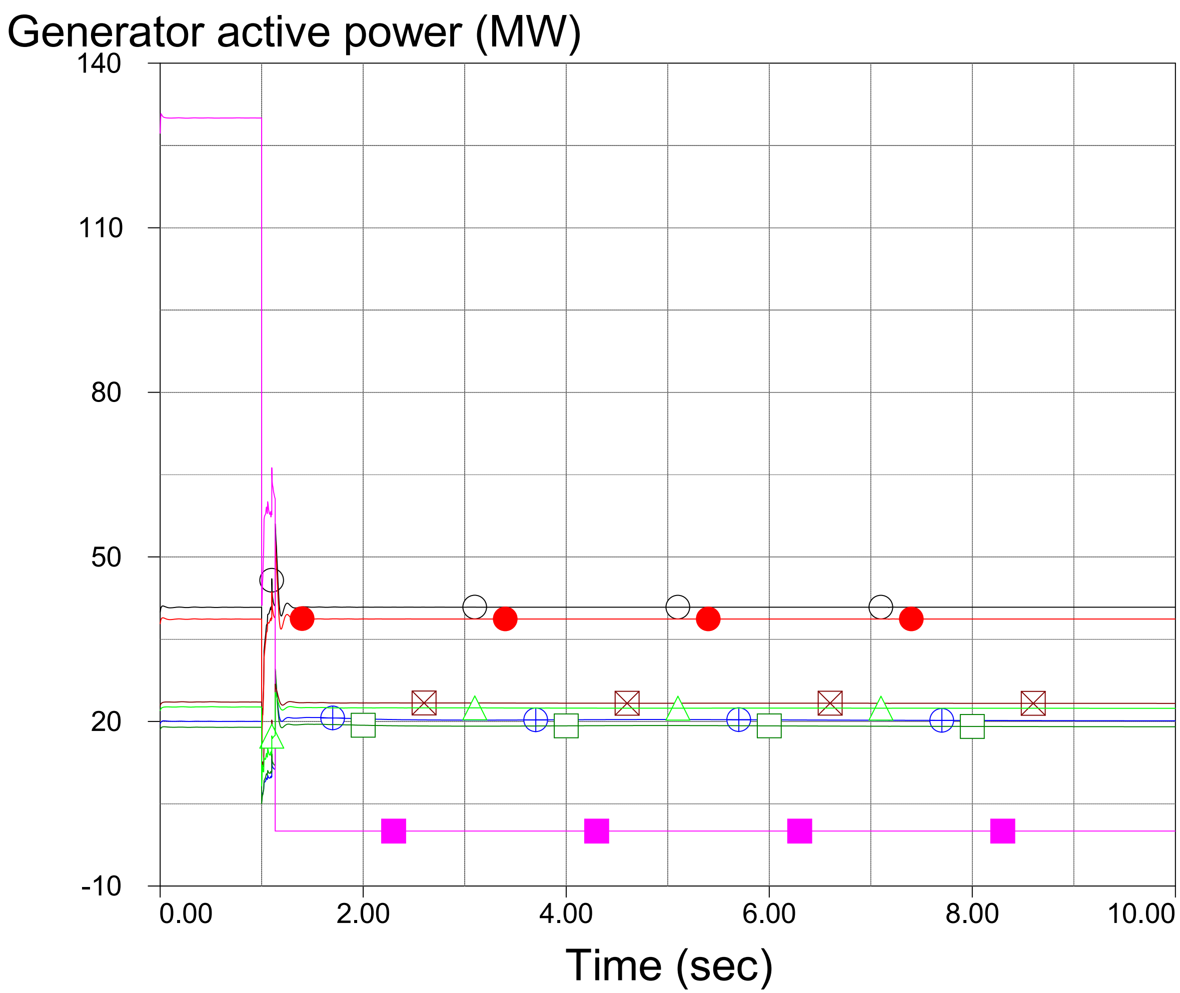
Buf.	Binary Result File	Scenario	Contingency
6	Scenario 3 Post Development.bin	Scenario 3 Post Development	6 -- 879L F 3P FAULT(N6F8)



	Bus #	Bus Name	ID	Buf.
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⊕	557269	BURDETTSOLARG1.0		6
□	557277	WESTFIELDGEN(G13		6
■	60873	RATTLESNK_3 0.	G1	6
⊠	554291	CONRAD1 0.55	G1	6
△	553291	CONRAD2 0.55	G2	6

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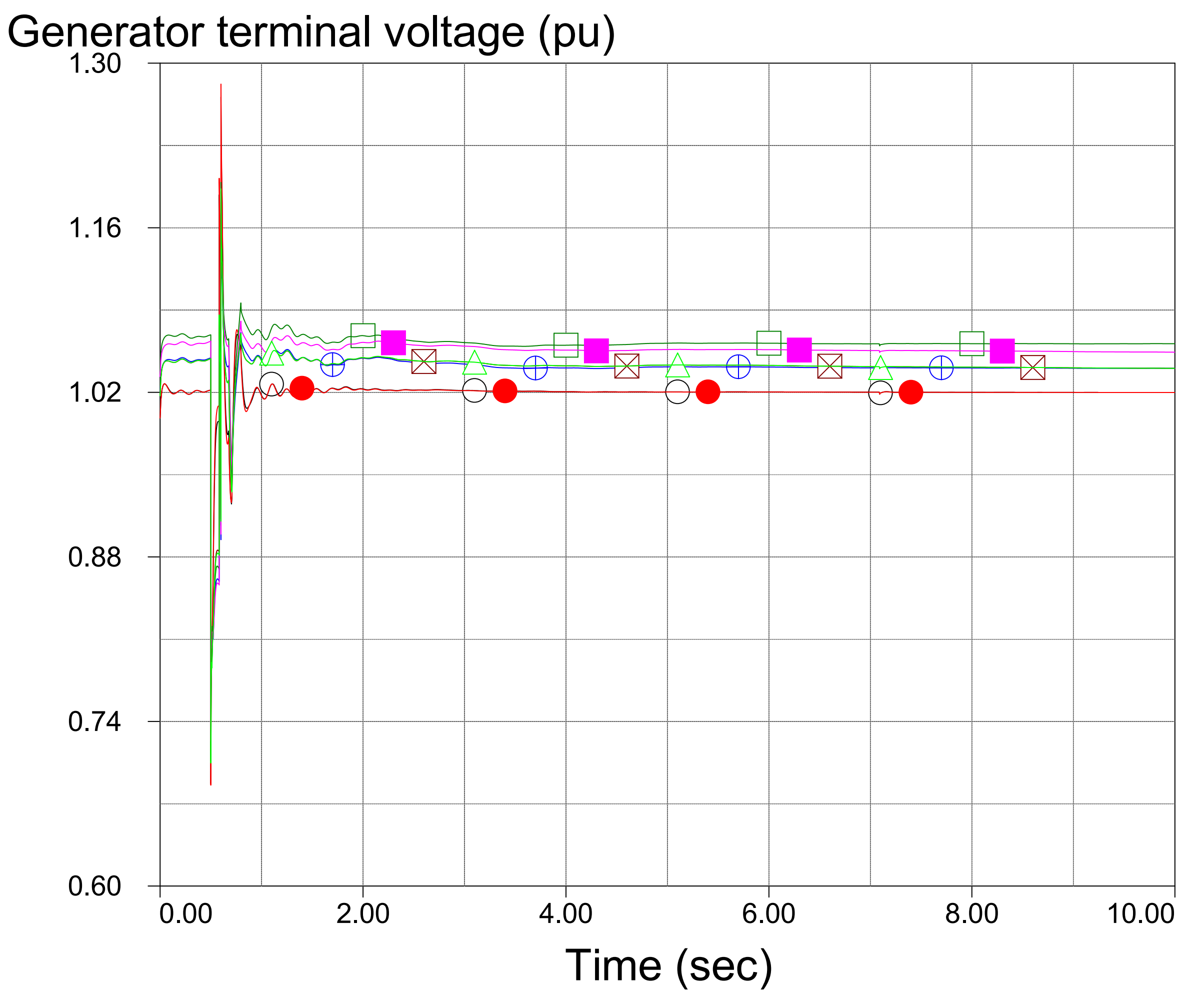
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 3 Post Development.bin	Scenario 3 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G1	3	7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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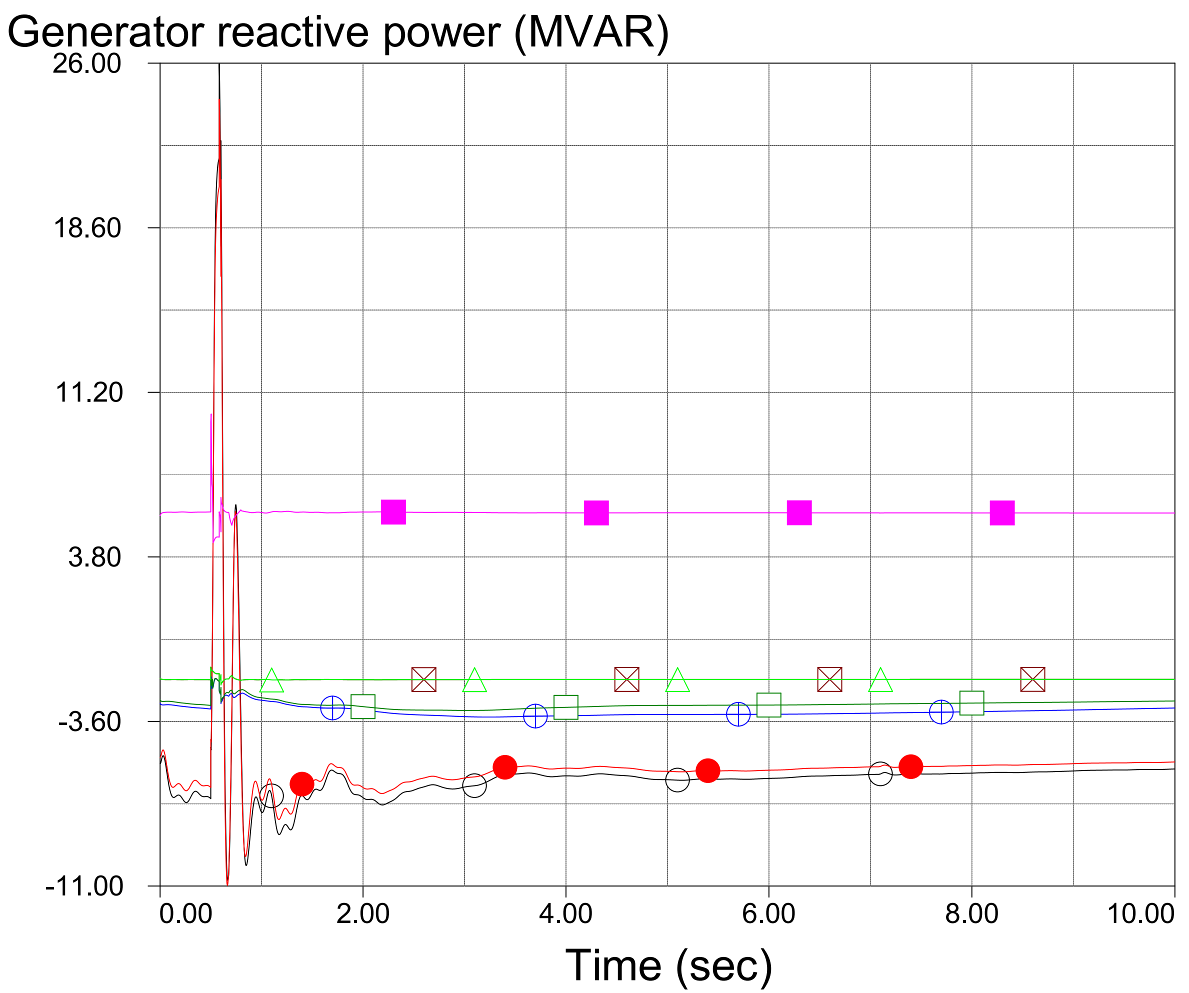
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 3 Post Development.bin	Scenario 3 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	7
●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G13		7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

DSATools Output Analysis 19.0

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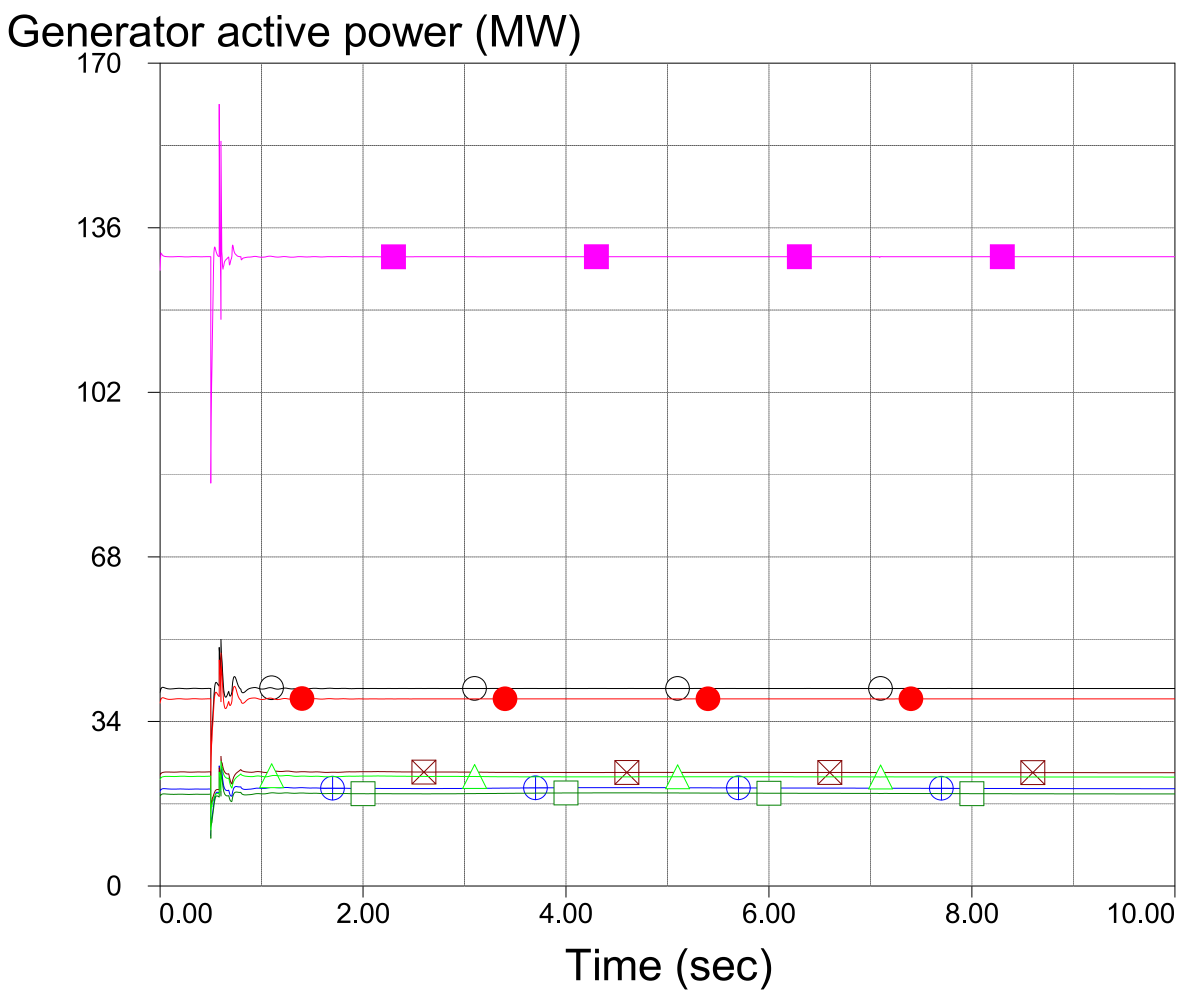
Buf.	Binary Result File	Scenario	Contingency
7	Scenario 3 Post Development.bin	Scenario 3 Post Development	7 -- 1034L N 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
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●	16343	TABERW7 0.40	1	7
⊕	557269	BURDETTSOLARG1.0		7
□	557277	WESTFIELDGEN(G13		7
■	60873	RATTLESNK_3 0.	G1	7
⊠	554291	CONRAD1 0.55	G1	7
△	553291	CONRAD2 0.55	G2	7

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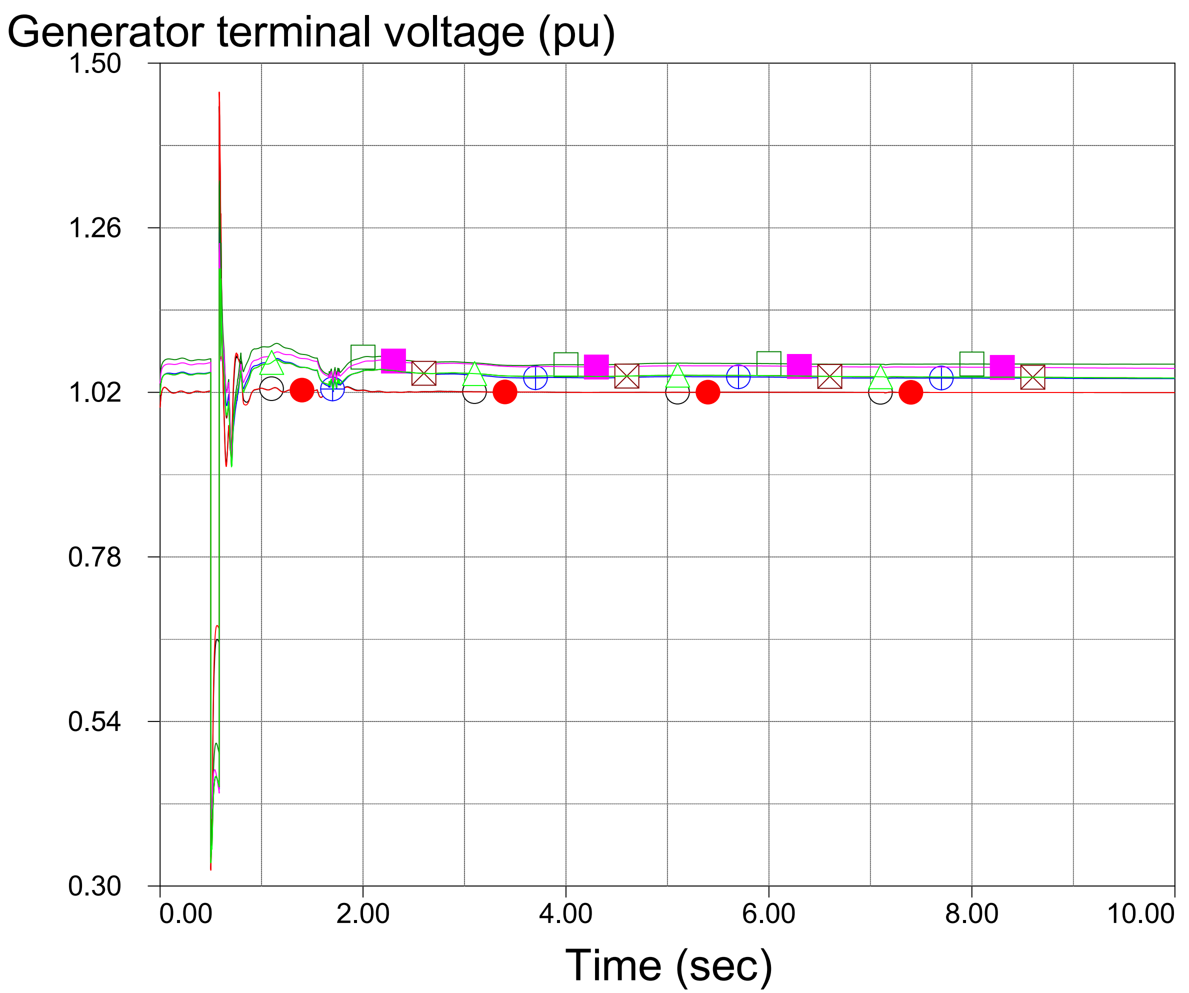
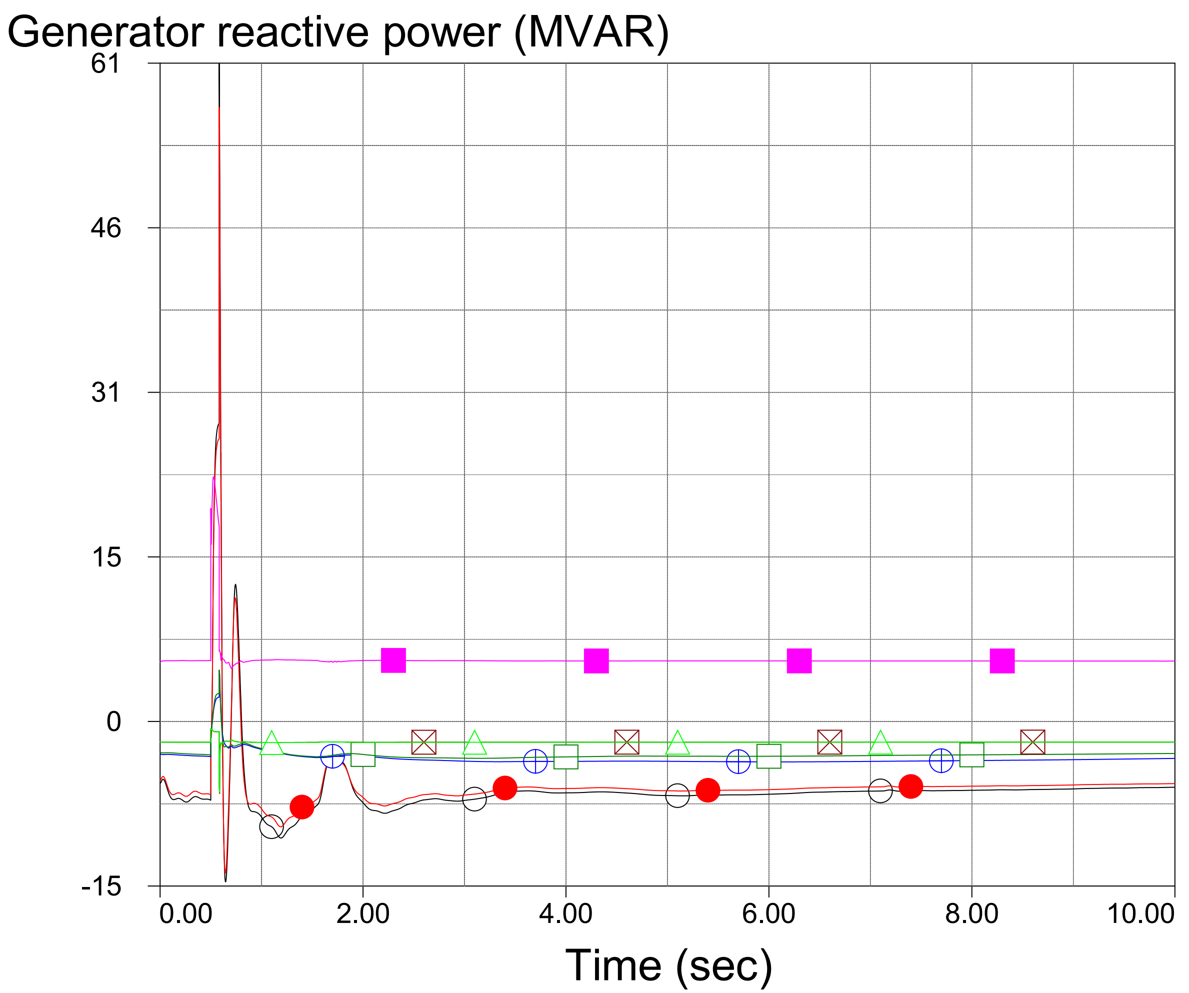
Buf.	Binary Result File	Scenario	Contingency
8	Scenario 3 Post Development.bin	Scenario 3 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G13		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0
Powertech Labs Inc.

Buf.	Binary Result File	Scenario	Contingency
8	Scenario 3 Post Development.bin	Scenario 3 Post Development	8 -- 1034L F 3P FAULT(N5F6)



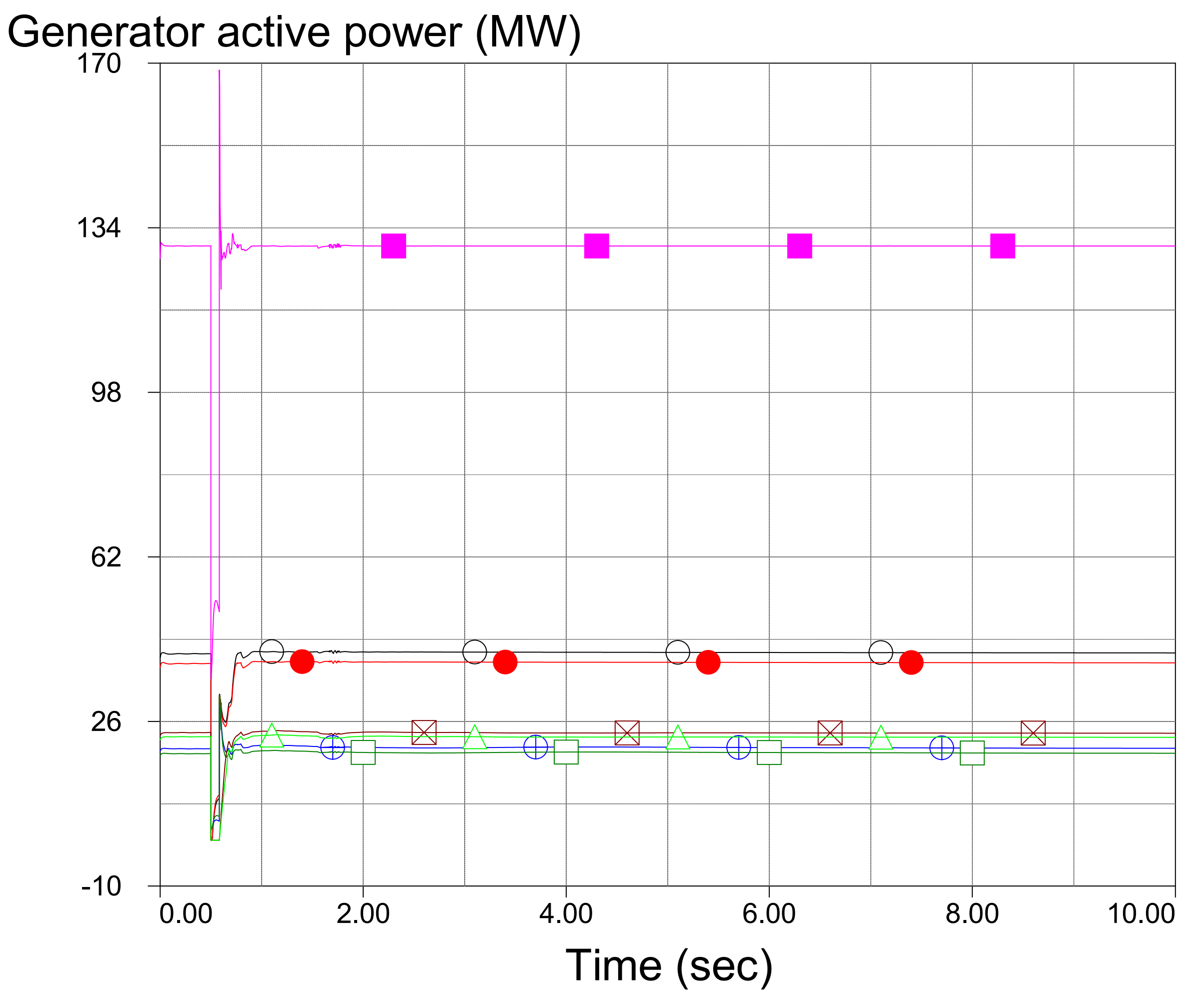
	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G1	3	8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

Powertech Labs Inc.

TSAT Oct 20, 2022 11:25:33

Buf.	Binary Result File	Scenario	Contingency
8	Scenario 3 Post Development.bin	Scenario 3 Post Development	8 -- 1034L F 3P FAULT(N5F6)



	Bus #	Bus Name	ID	Buf.
○	15343	TABERW6 0.40	1	8
●	16343	TABERW7 0.40	1	8
⊕	557269	BURDETTSOLARG1.0		8
□	557277	WESTFIELDGEN(G13		8
■	60873	RATTLESNK_3 0.	G1	8
⊠	554291	CONRAD1 0.55	G1	8
△	553291	CONRAD2 0.55	G2	8

DSATools Output Analysis 19.0

Powertech Labs Inc.

Appendix F: Letter from AltaLink Re: P7075 Vauxhall Area Transmission Development | NID Estimate Clarification

ALTALINK
A BERKSHIRE HATHAWAY ENERGY COMPANY
2611 3rd AVE SE, CALGARY, ALBERTA, T2A 7W7
WWW.ALTALINK.CA

November 15, 2021

Ata Rehman and Peter Huang
Alberta Electric System Operator
2500, 330-5th Avenue SW

Calgary, Alberta T2P 0L4

Dear Mr. Rehman and Mr. Huang:

RE: P7075 Vauxhall Area Transmission Development | NID Estimate Clarification

As per our discussion on November 5, 2021, AltaLink wishes to provide additional information to clarify the NID level estimates provided to the AESO on October 28, 2021. This clarification is in respect of Alternatives 5 and 5B.

Previously, AltaLink provided the following information:

(1) Alternative 5: $22,233,101 - 879L Line Rating Increase and Construction of a New 173 MVA 138 kV transmission line.

(2) Alternative 5B: $15,840,899 - 879L Line Rating Increase and Construction of a New 173 MVA 138 kV transmission line.

To clarify, Alternative 5 assumes that the existing 610L transmission line will be removed from service concurrently with the commissioning and energization of the new 173 MVA 138 kV transmission line. The removal costs include costs to be borne by the Distribution Facility Operator (DFO) to remove and replace the underbuilt distribution facilities on that line.

Conversely, Alternative 5B assumes that the removal of the 610L transmission line will be deferred and remain energized and tied into the new 173 MVA 138 kV transmission line for approximately 10 years before being contemplated for removal.

Based on the assumptions above, AltaLink would like to provide additional clarification regarding the overall costs, which are similar for Alternatives 5 and 5B. To this end, AltaLink has summarized the costs in Table 1 and 2 below into the following categories: Distribution Costs, New Transmission Capital Costs, Transmission Salvage Costs, Transmission Line Operating Expenses. AltaLink has provided additional information on Alternative 5B to allow for a more complete comparison between the two Alternatives.

Table 1: Alternative 5

Cost Category	Estimated Cost
Distribution Costs - Remove Fortis underbuilt facilities from existing 610L	 - $3,500,000
Transmission Capital Costs - Remove EQUS taps from existing 610L - Remove EQUS underbuilt facilities from 879L - Increase rating 879L - New 173 MVA line	 - $405,620 - $143,005 - $791,809 - $14,981,620
Salvage Costs - Salvage existing 610L (including land cost) - Salvage Existing 879L (16 poles for line clearance mitigation)	 - $2,310,737 - $100,310
Operational maintenance costs related to existing 610L	- $0
TOTAL COSTS	- $22,233,101

Table 2: Alternative 5B

Cost Category	Estimated Cost
Distribution Costs - Remove Fortis underbuilt facilities from existing 610L*	 - $2,761,013
Transmission Capital Costs - Remove EQUS taps from existing 610L* - Remove EQUS underbuilt facilities from 879L - Increase rating 879L - New 173 MVA line	 - $319,978 - $143,005 - $791,809 - $14,981,620
Salvage Costs - Salvage existing 610L (including land cost) * - Salvage Existing 879L (16 poles for line clearance mitigation)	 - $1,822,850 - $100,310
Operational and Maintenance Costs for 10 years for 610L	- $150,000
TOTAL COSTS	- $21,070,585

*represents present value of discounted expenditures over a 10-year period, adjusted to 2021 dollars

As reflected in the two tables above, the total costs represent a combination of distribution costs, transmission capital costs, salvage costs and operational and maintenance costs. From a total cost perspective, Alternative 5 is approximately $1.16M higher than Alternative 5B. However, the transmission capital costs for Alternative 5 are only approximately $85k higher than the transmission capital costs for Alternative 5B.

As previously indicated, Alternative 5B is expected to result in the highest overall impacts to affected landowners, which AltaLink identified in its ELU report. To inform the AESO's selection of its preferred technical option, from a land impact perspective, AltaLink views Alternative 5 to represent lower potential landowner impacts than Alternative 5B, with similar total costs (i.e., especially with respect to the transmission capital costs).

In addition, leaving the existing 610L transmission line in place as per Alternative 5B is not expected to provide additional line capacity above the incremental increase of the net new line by itself. AltaLink has not been advised of any other system benefit of leaving the existing 610L transmission line in-service. AltaLink would expect that the existing 610L transmission line would be removed from service as part of the project. The AESO has the authority to determine the need for transmission infrastructure in Alberta on facts and circumstances only known by the AESO. If the AESO determines the 610L is still needed upon completion of either the 5B or 5A Alternatives, AltaLink will continue to operate and maintain the 610L accordingly until such time as the AESO determines otherwise.

AltaLink looks forward to continuing its collaboration with the AESO on this project. We would be pleased to further discuss this additional information with you. If you have any questions or would like to further discuss any of these matters, please contact Keith Turriff at 403-519-9431.

Carly Duerr, Director Project & Operational Support, remains the correct contact for receipt of the confirmation of Direct Assignment.

Sincerely,

[1]

Paul Lee
VP, Projects
[1]Keith Turriff, Signed on Behalf of Paul Lee