ENGINEERING CONNECTION ASSESSMENT

Engineering Connection Assessment

P2456 Opal Gas Project Connection

Kiwetinohk Energy Corp.

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NOTE:

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

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

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1 Introduction

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

Attached to this Engineering Connection Assessment are the results of the engineering studies (see Attachment A) and the scope and methodology used to perform the studies (see Attachment A1 to Attachment A). These attachments provide details regarding the technical criteria, assumptions, and methods for performing these engineering studies, and the results of the engineering studies.

1.1 Project Overview

Kiwetinohk Energy Corp. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its approved Opal Gas Project (Facility) to the AIES. The Facility includes an approved substation, designated as the Gemini 1008S.

The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 98.5 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 0.4 MW; and a request for transmission development (collectively, the Project).

The scheduled in-service date (ISD) for the Project is December 1, 2024.

2 Assessment Scope

2.1 Objectives

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

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

2.2 Existing System

Geographically, the Project is located in the AESO planning area Fox Creek (Area 24), which is part of the AESO Northwest planning region. Fox Creek (Area 24) is surrounded by the planning areas of Valleyview (Area 23), Swan Hills (Area 26), and Hinton/Edson (Area 29).

From a transmission system perspective, Fox Creek (Area 24) consists primarily of a 144/138 kV transmission system. Fox Creek (Area 24) is connected to the surrounding areas by 138/144 kV transmission lines 7L90, 199L and 685L.

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

2.3 Study Area

The Study Area for the Project consists of the AESO Planning areas of Valleyview (Area 23), Swan Hills (Area 26), and Hinton/Edson (Area 29), including the tie lines connecting these planning areas to the rest of the AIES. All transmission facilities within the Study Area will be studied and monitored for violations of the Reliability Criteria (defined in Section 3.1 of Attachment A1).

3 Connection Alternatives

3.1 Overview

The AESO, in consultation with the TFO in the Study Area and the Market Participant, examined 5 transmission alternatives to meet the Market Participant's request for system access service, as detailed in Section 3.2.

3.2 Connection Alternatives Examined

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

Alternative 1 –T-tap connection to the 144 kV transmission line 7L199

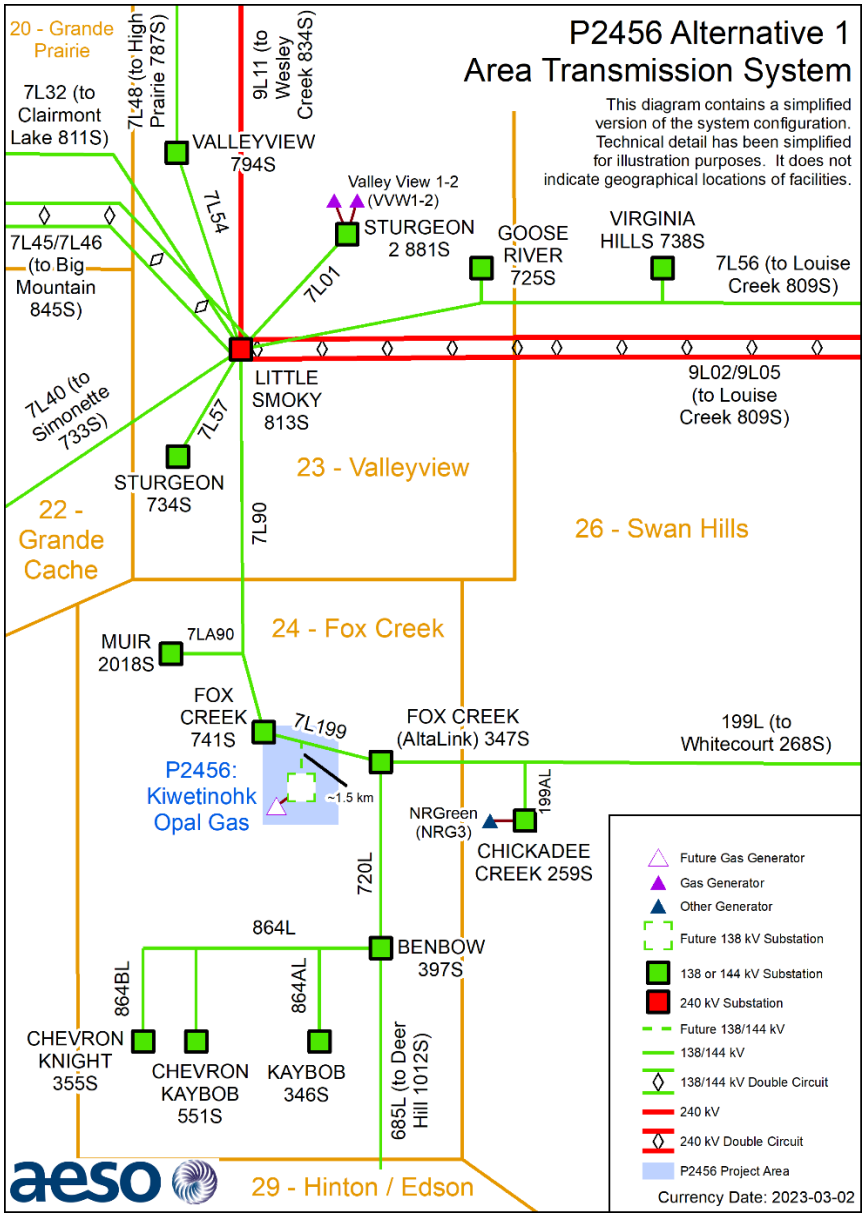
This alternative includes the following developments:

- Add one 144 kV circuit, approximately 1.5 km in length[1], to connect the Facility to the existing 144 kV transmission line 7L199 (between the existing Fox Creek 741S and Fox Creek 347S substations) using a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

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

[1] Exact line length to be determined by TFO

Figure 3-1: Connection Alternative 1



Alternative 2 – In-and-out connection to the 144 kV transmission line 7L199

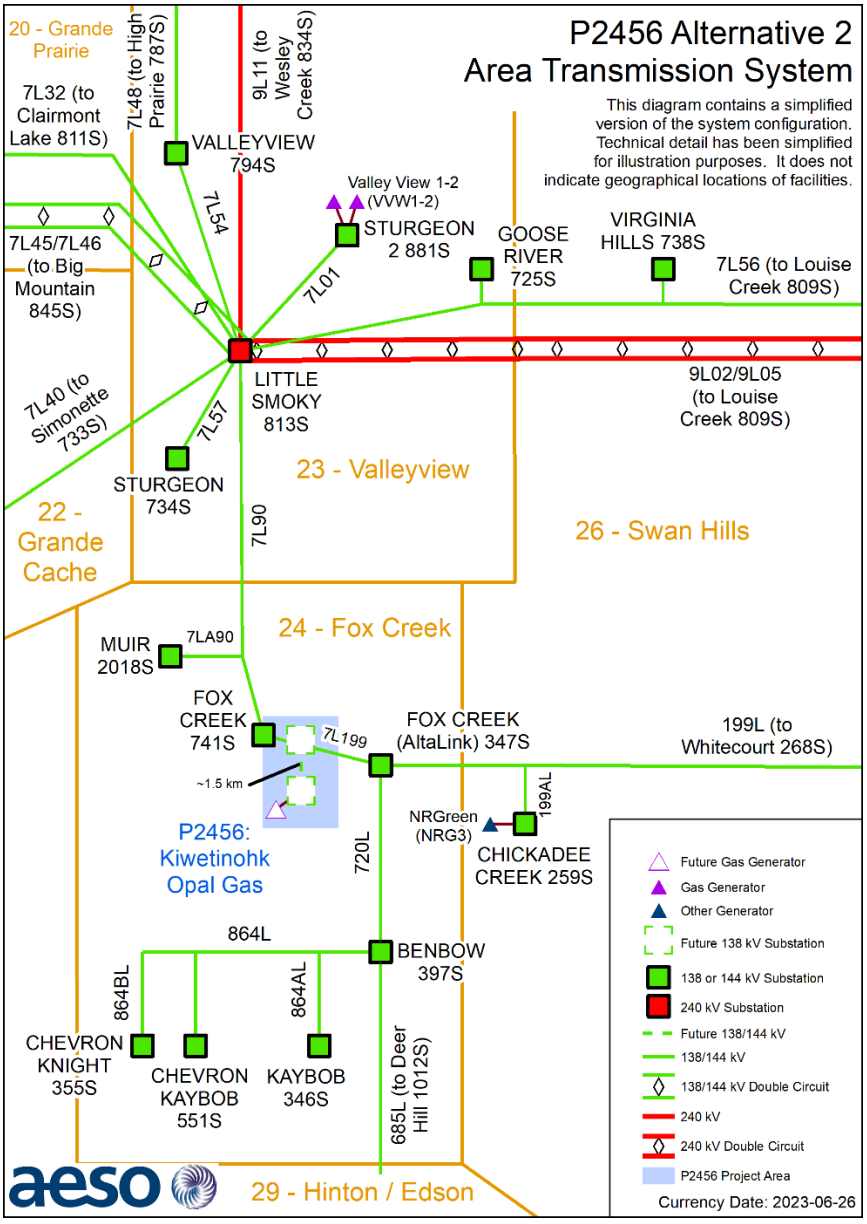
This alternative includes the following developments:

- Add a new 144 kV substation, including three 144 kV circuit breakers, connected to the existing 144 kV transmission line 7L199 (between the existing Fox Creek 741S and Fox Creek 347S substations) using an in-and-out configuration;
- Add one 144 kV circuit, approximately 1.5 km in length,[2] to connect the Facility to the proposed substation; and
- Add or modify associated equipment as required for the above transmission developments.

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

[2] Exact line length to be determined by TFO

Figure 3-2: Connection Alternative 2



Alternative 3 – Radial 144 kV connection to Fox Creek 741S substation

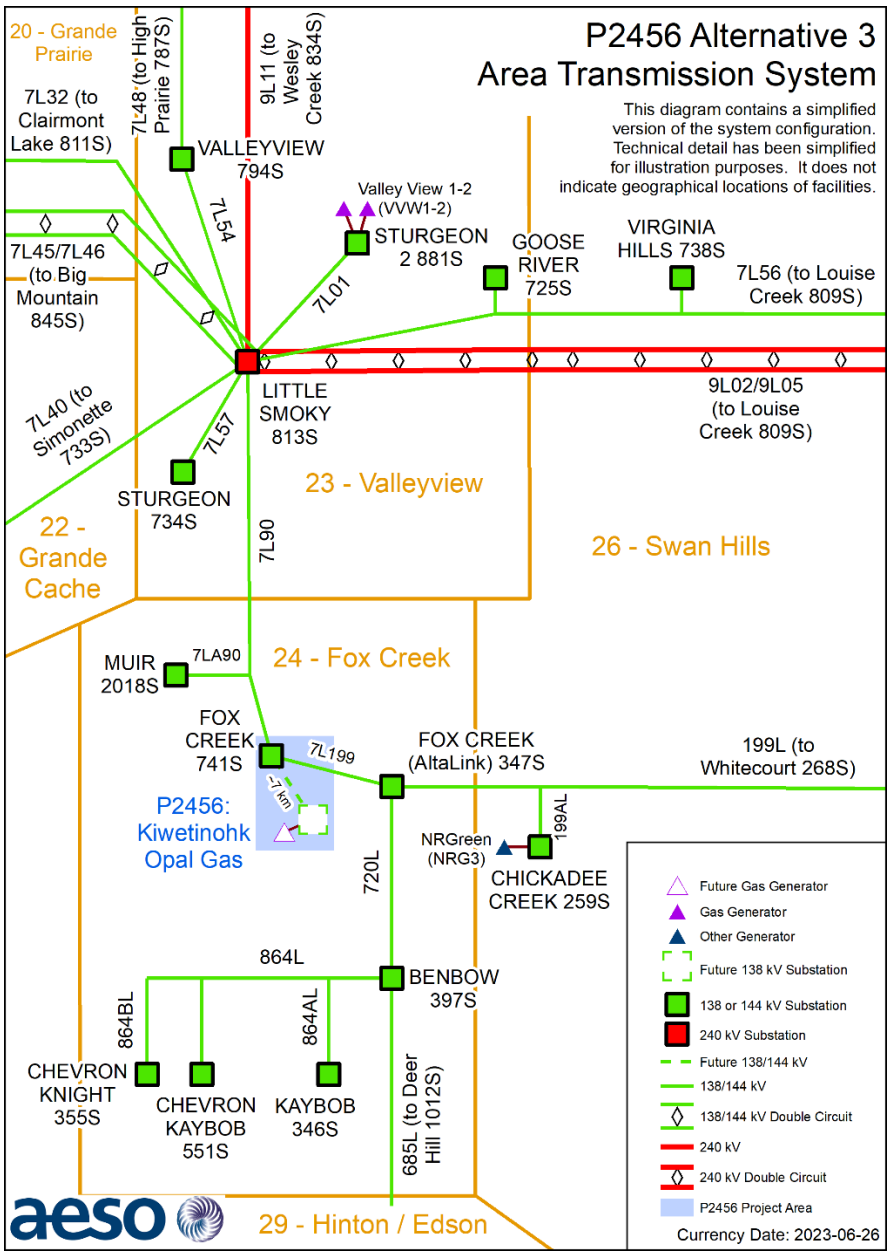
This alternative includes the following developments:

- Add one 144 kV circuit, approximately 7 km in length,[3] to connect the Facility to the existing Fox Creek 741S substation using a radial configuration;
- Modify Fox Creek 741S substation, including adding one 144 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

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

[3] Exact line length to be determined by TFO

Figure 3-3: Connection Alternative 3



Alternative 4 – T-tap connection to the 240 kV transmission line 9L05

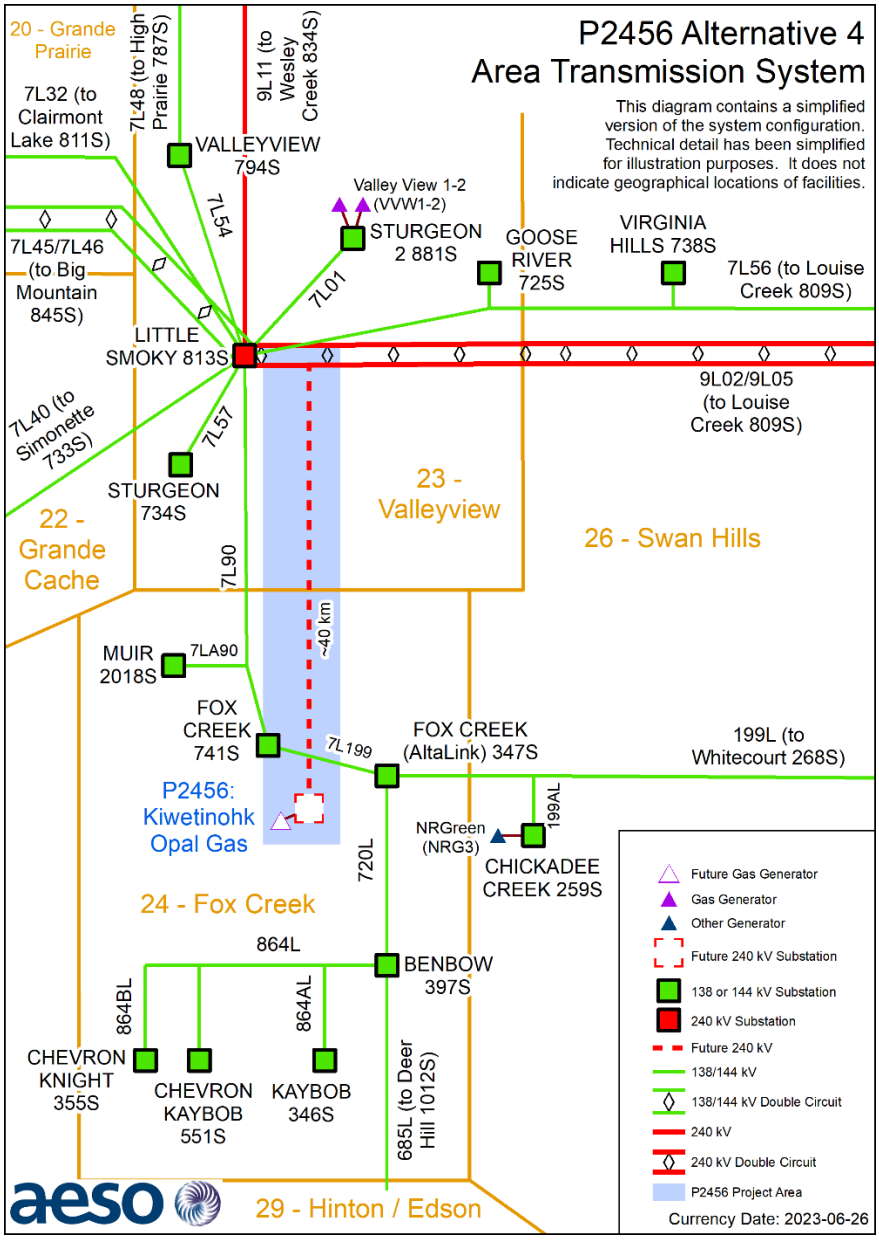
This alternative includes the following developments:

- Add one 240 kV circuit, approximately 40 km in length,[4] to connect the Facility to the existing 240 kV transmission line 9L05 (between the existing Little Smoky 813S and Louise Creek 809S substations) using a T-tap configuration; and
- Add or modify associated equipment as required for the above transmission developments.

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

[4] Exact line length to be determined by TFO

Figure 3-4: Connection Alternative 4



Alternative 5 – Radial 138 kV connection to Fox Creek 347S substation

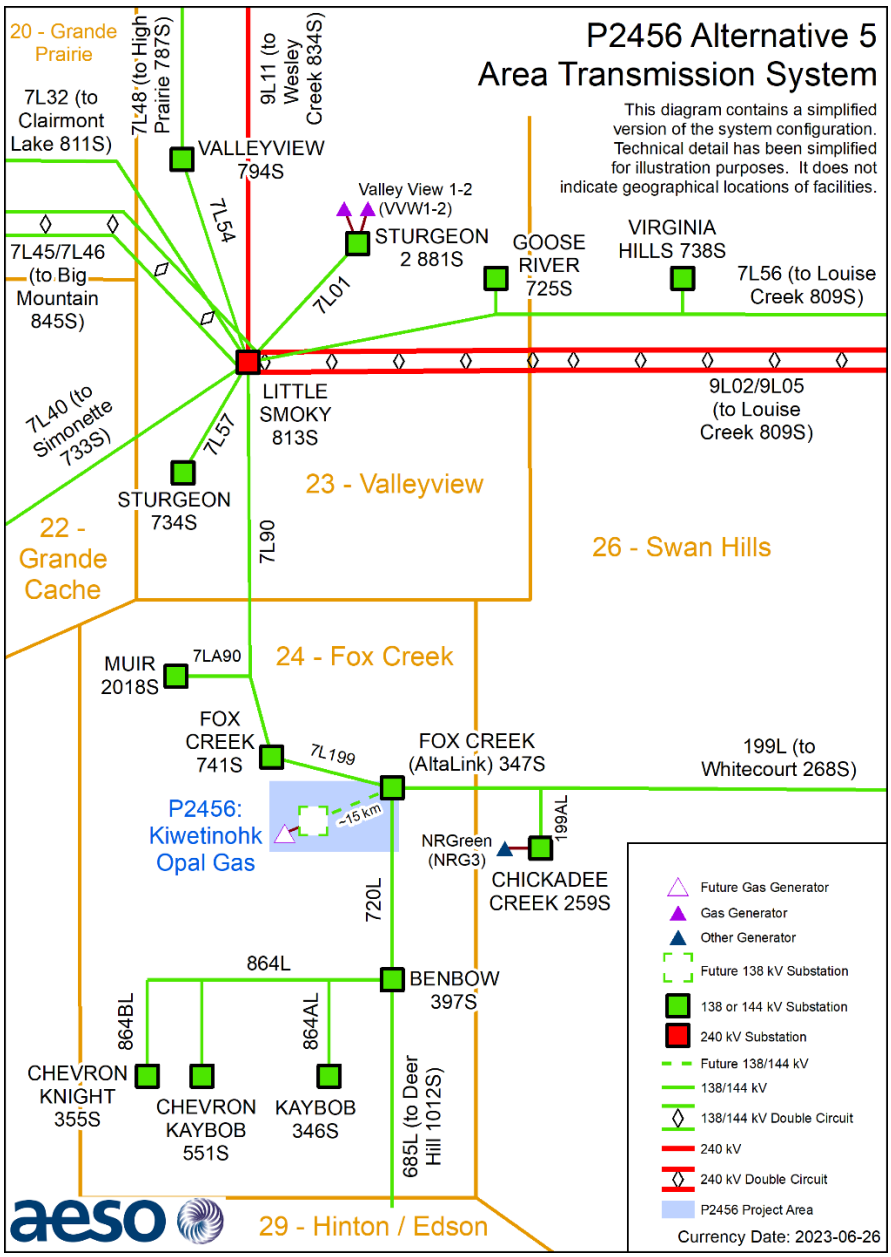
This alternative includes the following developments:

- Add one 138 kV circuit, approximately 15 km in length,[5] to connect the Facility to the existing Fox Creek 347S substation using a radial configuration;
- Modify Fox Creek 347S substation, including adding one 138 kV circuit breaker; and
- Add or modify associated equipment as required for the above transmission developments.

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

[5] Exact line length to be determined by TFO

Figure 3-5: Connection Alternative 5



3.3 Connection Alternatives Selected for Further Study

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

3.4 Connection Alternatives Not Selected for Further Study

Alternatives 2, 4, and 5 would involve increased transmission development, and hence, increased cost compared to Alternative 1. Therefore, Alternatives 2, 4, and 5 were not selected for further study.

Alternative 3 is expected to have similar cost[6] and system performance compared to Alternative 1, however the TFO has advised that Alternative 3 would involve a greater potential impact on land and environment, compared to Alternative 1.[7] Therefore, Alternative 3 was not selected for further study.

[6] Cost information is provided in the TFO's Cost Estimates, which are provided under separate cover.

[7] This information is provided in the TFO's Environmental and Land Use Effects report provided under a separate cover.

4 Assessment Approach

4.1 Standards, Criteria and Assumptions

A detailed description of the standards, criteria, and assumptions that were used for the connection assessment is provided in Attachment A (see Attachment A1).

4.2 Studies Performed

At the time of study, the scheduled ISD for the Project was October 1, 2023. Therefore, studies were performed using scenarios for 2023 Summer Light, 2023 Summer Peak and 2023 Winter Peak. After the completion of the majority of the studies, the ISD of the Project was changed from October 1, 2023 to December 1, 2024. The AESO determined that the ISD change would not have a material impact on the connection alternative, the mitigation measures and the conclusions for the scenario studies conducted.

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

Table 4-1 lists the study scenarios. Post-Project scenarios reflect the requested Rate STS contract capacity of 98.5 MW at the Gemini 1008S substation.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
Pre-Project					
1	2023 Summer Light (SL)	High Generation (HG)	2023 SL HG Pre-Project	0	0
2	2023 Summer Peak (SP)	HG	2023 SP HG Pre-Project	0	0
3	2023 Winter Peak (WP)	HG	2023 WP HG Pre-Project	0	0
4	2023 SP	Low Generation (LG)	2023 SP LG Pre-Project	0	0
5	2023 WP	LG	2023 WP LG Pre-Project	0	0
Post-Project					
6	2023 SL	HG	2023 SL HG Post-Project	0.4	98.5
7	2023 SP	HG	2023 SP HG Post-Project	0.4	98.5
8	2023 WP	HG	2023 WP HG Post-Project	0.4	98.5
9	2023 SP	LG	2023 SP LG Post-Project	0.4	98.5
10	2023 WP	LG	2023 WP LG Post-Project	0.4	98.5
11	2031 WP	All generators in the study area will be turned on	2031 WP Post-Project	0.4	98.5

The AESO Planning Region load forecasts used for the connection studies were based on the AESO's *2021 Long-term Outlook (2021 LTO).*

4.2.1 Power Flow Studies

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

In addition, power flow studies are also used to identify point of delivery (POD) low voltage bus voltage deviations beyond the limits listed in Table 3-1 of Attachment A1.[8]

Power flow studies were performed for 2023 SL, 2023 SP and 2023 WP pre-Project scenarios, and for 2023 SL, 2023 SP and 2023 WP post-Project scenarios.

4.2.2 Transient Stability Studies

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

Transient stability studies were performed for 2023 SL and 2023 WP HG post-Project scenarios.

4.2.3 Short-Circuit Current Level Studies

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

Short circuit studies were performed for the 2023 WP HG pre-Project scenario and for 2023 WP HG and 2031 WP post-Project scenarios.

4.3 Mitigation Measure Development and Evaluation

As explained in Section 6 of Attachment A1, mitigation measures were developed to address system performance issues that were identified in the post-Project scenarios. Studies performed to assess the effectiveness of mitigation measures are briefly outlined below.

4.3.1 Post-Mitigation Studies

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

4.3.2 Constraint Effective Factor Studies

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

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

5 Interpretation of Results

5.1 Results Overview

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

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

Detailed study results are provided in Attachment A.

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

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
2023SL HG	Thermal - above emergency rating	Thermal - above emergency rating	671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RAS 188	RAS 188
2023SL HG	None	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	New violation	None	Real-time Operational Practices (RTOPs)
2023SL HG	None	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	New violation	None	RTOPs
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RAS 188	RAS 188
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RAS 185	RAS 185
2023SP HG	Thermal - above normal rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RAS 189
2023SP HG	Thermal - above normal rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RTOPs	RAS 188
2023SP HG	None	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	New violation	None	RTOPs
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP HG	Thermal - above normal rating	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023SP HG	Thermal - above normal rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RAS 189
2023SP HG	Thermal - above normal rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RTOPs	RAS 188
2023SP HG	None	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	New violation	None	RTOPs
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP HG	Thermal - above normal rating	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023SP HG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP HG	Thermal - above normal rating	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above emergency rating	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RTOPs	RAS 185
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T1)	39S Bickerdike (T2)	Materially reduced violation	RAS 186	RAS 186
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T2)	39S Bickerdike (T1)	Materially reduced violation	RAS 186	RAS 186
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RAS 188	RAS 188
2023WP HG	None	Thermal - above normal rating	685L (397S Benbow to 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	New violation	None	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RTOPs
2023WP HG	None	Thermal - above normal rating	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	New violation	None	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RTOPs	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above emergency rating	890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RAS 189
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RAS 189	RAS 189
2023WP HG	None	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	New violation	None	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	Materially increased violation	RTOPs	RTOPs
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RAS 189	RAS 189
2023WP HG	None	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	New violation	None	RTOPs
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	Materially increased violation	RTOPs	RTOPs
2023WP HG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023WP HG	Thermal - above normal rating	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023SP LG	None	Thermal - above normal rating	System Normal	7L199 (P2456 T-tap point to Fox Creek 741S)	New violation	None	Increase 7L199 line rating

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
2023SP LG	None	Thermal - above emergency rating	199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	New RAS 611
2023SP LG	None	Thermal - above normal rating	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T1)	39S Bickerdike (T2)	Materially reduced violation	RAS 186	RAS 186
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T2)	39S Bickerdike (T1)	Materially reduced violation	RAS 186	RAS 186
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RAS 188	RAS 188
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RAS 185	RAS 185
2023SP LG	None	Thermal - above normal rating	741S Fox Creek (Load Drop - 1T)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	741S Fox Creek (Load Drop - 2T)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above emergency rating	797L (268S Whitecourt to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	New RAS 611
2023SP LG	None	Thermal - above normal rating	798L (77S Sagitawah to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	813S Little Smoky (T1)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	813S Little Smoky (T2)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RAS 185	RAS 185
2023SP LG	None	Thermal - above normal rating	890L (58S Edson to 207S Pinedale)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	919L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	Thermal - above normal rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RTOPs	RAS 188
2023SP LG	None	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	New RAS 611
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP LG	None	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	New violation	None	RTOPs
2023SP LG	Thermal - above normal rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	Materially increased violation	RTOPs	RAS 188
2023SP LG	None	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	New RAS 611
2023SP LG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023SP LG	None	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	989L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	9L02 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	9L05 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	9L938 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023SP LG	None	Thermal - above normal rating	9L939 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	New violation	None	RTOPs
2023WP LG	Thermal - above normal rating	Thermal - above normal rating	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RTOPs	RTOPs
2023WP LG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T1)	39S Bickerdike (T2)	Materially reduced violation	RAS 186	RAS 186
2023WP LG	Thermal - above emergency rating	Thermal - above emergency rating	39S Bickerdike (T2)	39S Bickerdike (T1)	Materially reduced violation	RAS 186	RAS 186
2023WP LG	Thermal - above emergency rating	Thermal - above emergency rating	671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	Marginally increased violation	RAS 188	RAS 188
2023WP LG	Thermal - above normal rating	Thermal - above normal rating	685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RTOPs	RTOPs
2023WP LG	Thermal - above normal rating	Thermal - above normal rating	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	Marginally reduced violation	RTOPs	RTOPs
2023WP LG	None	Thermal - above normal rating	890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	New violation	None	RTOPs
2023WP LG	Thermal - above normal rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RAS 189

Scenario	Type of Reliability Criteria Violation		Contingency (System Element Lost)	Details of Violation	Project Impact	Pre-Project Mitigation Measures	Post-Project Mitigation Measures
	Pre-Project	Post-Project					
2023WP LG	None	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	New violation	None	RTOPs
2023WP LG	Thermal - above emergency rating	Thermal - above emergency rating	973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023WP LG	Thermal - above normal rating	Thermal - above normal rating	973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs
2023WP LG	Thermal - above normal rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	Materially increased violation	RTOPs	RAS 189
2023WP LG	None	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	New violation	None	RTOPs
2023WP LG	Thermal - above emergency rating	Thermal - above emergency rating	974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	Materially increased violation	RAS 185	RAS 185
2023WP LG	Thermal - above normal rating	Thermal - above normal rating	974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	Materially increased violation	RTOPs	RTOPs

Notes:

- Marginally increased (or marginally reduced) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) between 0% and 3% (or -3%).
- Materially increased (or materially reduced) refers to a percent loading difference (post-Project percent loading minus pre-Project percent loading) above or equal to 3% (or below or equal to -3%).
- RAS 185, 186, 188, and 189 were all proposed for the approved P2032 Cascade Power Plant Connection. These RASs are referred to herein as “Planned RAS 185, 186, 188, and 189”.
- RAS 611 is a new proposed RAS for P2456 to mitigate overload on 7L90. P2456 is included in RAS 611 and will trip the Project upon activation.

5.2 Pre-Project Study Results

5.2.1 Category A Conditions

No Reliability Criteria violations were observed under the Category A conditions (i.e., all elements in service) for any of the pre-Project scenarios. The short-circuit fault levels were found to be within the typical capabilities of the nearby facilities.

5.2.2 Category B Conditions

The pre-Project power flow studies identified a number of thermal violations under Category B conditions (i.e., loss of a single system element).

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

5.3 Post-Project Study Results

5.3.1 Category A Conditions

With the addition of the Project, power flow studies identified a thermal criteria violation under the Category A condition. A thermal criteria violation on 7L199 (between the Project T-tap point and Fox Creek 741S) was observed under Category A conditions for the 2023 SP LG scenario.

Post-Project short-circuit fault levels were not significantly higher than pre-Project levels.

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

5.3.2 Category B Conditions

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

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

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

5.4 Mitigation Measures

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

5.4.1 Pre-Project

Prior to connection of the Project, some of the observed thermal criteria violations can be managed by using real-time operational practices. The remaining thermal criteria violations can be mitigated with the planned RASs 185, 186, 188, and 189.

5.4.2 Post-Project

After connection of the Project, the observed Category A thermal violations on the 144 kV transmission line 7L199 will be mitigated by increasing the line rating of 7L199 (between the Project T-tap point and Fox Creek 741S) to a minimum rating of 171/215 MVA (Summer/Winter). This line rating increase is a component of the Project and has an ISD of December 1, 2024. Costs for increasing the rating of 7L199 have been allocated as system-related cost, in accordance with the ISO tariff.

The Category B thermal criteria violations below emergency ratings observed can be mitigated by using real-time operational practices. The remaining thermal criteria violations can be mitigated by planned RASs 185, 186, 188 and 189. A new RAS is required to mitigate some of the new thermal criteria violations observed under Category B conditions on 7L90. A new RAS, hereafter referred to as RAS 611 is required to mitigate thermal criteria violations on the 144 kV transmission line 7L90 under certain Category B conditions. P2456 is included in RAS 611 and will trip the Project upon activation.

5.4.3 Post-Project Mitigation Study Results

Under Category A conditions, the observed thermal Reliability Criteria violations on the 144 kV transmission line 7L199 were mitigated by increasing the line rating on 7L199.

Under Category B conditions, all of the observed Reliability Criteria violations requiring RAS were mitigated.

6 Project Dependencies

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

7 Conclusions and Recommendations

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

Study results identified a new Category A criteria violation on the 144 kV transmission line 7L199. The Category A violation on 7L199 can be mitigated by increasing the line rating on a section of 7L199 which will be completed as part of this Project. The thermal criteria violations under Category B conditions can be mitigated through the use of planned RASs 185, 186, 188, 189, new RAS 611 and real-time operational practices, alone or in combination, as appropriate. With the implementation of these mitigation measures, connecting the project with the preferred alternative does not adversely affect the performance of the AIES.

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

Alternative 1 involves adding a 144 kV circuit, approximately 1.5 km in length, to connect the Facility to the existing 144 kV transmission line 7L199 through a T-tap configuration, and increasing the line rating of 7L199 between the Project T-tap point and Fox Creek 741S. Costs for increasing the rating of 7L199 have been allocated as system-related cost, in accordance with the ISO tariff.

The conductor used for the 144 kV circuit between the approved Gemini 1008S and the Project T-tap point should have a minimum thermal rating of 157 MVA. The conductor used for the 7L199 line upgrade should have a minimum rating of171/215 MVA (Summer/Winter).

Attachment A:
Engineering Connection Assessment Results

Engineering Connection Assessment: Study Results

P2456 Kiwetinohk Opal Gas

Kiwetinohk Energy Corp.

Date: July 4, 2023

Version: Final – Rev1

Role	Name	Date	Signature
Prepared	Pablo Argeñal, P.Eng.	July 4, 2023	Pablo Argeñal

PROFESSIONAL ENGINEER ALBERTA
PABLO ARGENAL

Pablo Argeñal
July 4, 2023.

APEGA Member ID:53180

Permit to Practice

Pablo Argenal

Signature: Pablo Argeñal

Date: July 4, 2023

PERMIT NUMBER: P7821

The Association of Professional Engineers and Geoscientists of Alberta

Contents

Tables

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Table 1: Revision History

Date	Comment
July 4, 2023	Added Registered Member ID to APEGA stamp

1 Introduction

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

The power system network analysis tool that was used for the studies in this connection assessment was PowerWorld version 22.

2 Pre-Project Study Results

This section describes the results of the pre-Project power flow studies listed in Table 2-1.

Table 2-1: Pre-Project Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Condition	Scenario Name
1	2023 Summer Light (SL)	NW High Generation (HG)	2023 SL (HG) Pre-Project
2	2023 Summer Peak (SP)	NW High Generation (HG)	2023 SP (HG) Pre-Project
3	2023 Winter Peak (WP)	NW High Generation (HG)	2023 WP (HG) Pre-Project
4	2023 Summer Peak (SP)	NW Low Generation (LG)	2023 SP (LG) Pre-Project
5	2023 Winter Peak (WP)	NW Low Generation (LG)	2023 WP (LG) Pre-Project

2.1 Power Flow Studies

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

2.1.1 Scenario 1: 2023 SL (HG) Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

Category B Conditions

Thermal Criteria Violations

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

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

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings[a] (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow[b] (MVA)	% Loading[c]
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96	106	117.9	122.8

Notes[1]:
[a] The facility ratings shown in Attachment A1 have been adjusted from a [72/144] kV voltage base to a [69/138] kV voltage base, as is used by the power system network analysis tool.
[b] Power flow (MVA) is current expressed as MVA (i.e., $S = \sqrt{3} \times V_{base} \times I_{actual}$)
[c] Reported as a percentage of the power flow (in MVA, i.e., $S = \sqrt{3} \times V_{base} \times I_{actual}$) relative to the transmission line's Normal Rating (also in MVA), as shown in Attachment A1.
*These notes apply to all table summarizing thermal violations.

[1] This specific note is applicable to all thermal violation tables in the report.

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

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

2.1.2 Scenario 2: 2023 SP (HG) Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

Category B Conditions

Thermal Criteria Violations

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

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

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.1	107.4
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	133.2	138.8
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	71.3	103.4
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	90.7	106.6
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	105.5	109.9
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.6	121.1
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	351.4	105.5
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	90.6	106.5
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	105.4	109.8
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.5	121.0
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	351.6	105.6

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No point of delivery (POD) bus voltage deviations were observed.

2.1.3 Scenario 3: 2023 WP (HG) Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

Category B Conditions

Thermal Criteria Violations

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

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

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	79.0	87.0	85.2	107.9
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	303.9	113.0
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	309.1	114.9
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	163.2	124.6
744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)	202L (58S Edson to 178S Cynthia)	90.1	99.0	90.2	100.1
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	80.4	101.7
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	90.1	99.0	93.7	104.0
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	105.2	116.7
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	79.9	100.9
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	93.0	117.8
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	368.9	110.8
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	105.1	116.7
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	79.8	100.8
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	92.9	117.7
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	369.2	110.9

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No point of delivery (POD) bus voltage deviations were observed.

2.1.4 Scenario 4: 2023 SP (LG) Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

Category B Conditions

Thermal Criteria Violations

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

Table 2-5: Thermal Criteria Violations under Category B Conditions for Scenario 4

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	70.3	101.9
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	303.5	112.8
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	308.8	114.8
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	122.2	127.3
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.1	107.3
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	70.6	102.4
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	97.0	101.1
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.3	116.3
973L (39S Bickerdike to 310P Sundance)	720L (347S Fox Creek to 397S Benbow)	120	132	128.4	107.0
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	97.0	101.1
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.3	116.3
974L (39S Bickerdike to 310P Sundance)	720L (347S Fox Creek to 397S Benbow)	120	132	128.4	107.0

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No point of delivery (POD) bus voltage deviations were observed.

2.1.5 Scenario 5: 2023 WP (LG) Pre-Project

Category A Conditions

No Reliability Criteria (as defined in Section 3.1 of Attachment A1) violations were observed under Category A conditions.

Category B Conditions

Thermal Criteria Violations

Thermal criteria violations were observed under certain Category B conditions as shown in Table 2-6.

Table 2-6: Thermal Criteria Violations under Category B Conditions for Scenario 5

Contingency (System Element Lost)	Violation Location Details	Thermal Ratings (MVA)		Pre-Project Results	
		Normal Rating	Emergency Rating	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	79.0	87.0	82.2	104.1
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	336.7	125.2
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	341.3	126.9
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	154.3	117.8
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	83.8	106.1
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	84.6	107.1
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	94.9	105.3
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	90.0	114.0
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	342.8	102.9
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	94.8	105.2
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	89.9	113.8
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	343.0	103.0

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No point of delivery (POD) bus voltage deviations were observed.

3 Post-Project Study Results

This section describes the results of the post-Project power flow studies, studies transient stability studies Table 3-1.

Table 3-1: Post-Project Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Condition	Scenario Name
6	2023 Summer Light (SL)	NW High Generation (HG)	2023 SL (HG) Post-Project
7	2023 Summer Peak (SP)	NW High Generation (HG)	2023 SP (HG) Post-Project
8	2023 Winter Peak (WP)	NW High Generation (HG)	2023 WP (HG) Post-Project
9	2023 Summer Peak (SP)	NW Low Generation (LG)	2023 SP (LG) Post-Project
10	2023 Winter Peak (WP)	NW Low Generation (LG)	2023 WP (LG) Post-Project

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

3.1 Power Flow Studies

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

3.1.1 Scenario 6: 2023 SL (HG) Post-Project Alternative 1

Category A Conditions

No Reliability Criteria violations were observed under Category A conditions.

Category B Conditions

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

Table 3-2: Thermal Criteria Violations under Category B Conditions for Scenario 6

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	117.9	122.8	127.2	132.5	9.7
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	84.7	99.6	92.8	109.1	9.5
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	84.6	99.5	92.7	109.0	9.5

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

3.1.2 Scenario 7: 2023 SP (HG) Post-Project Alternative 1

Category A Conditions

No Reliability Criteria violations were observed under Category A conditions.

Category B Conditions

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

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

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.1	107.4	77.1	111.7	4.3
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	133.2	138.8	144.9	151.0	12.2
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	71.3	103.4	69.5	100.7	-2.7
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	90.7	106.6	94.9	111.5	4.9
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	105.5	109.9	113.7	118.5	8.6
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	75.1	83.0	73.5	97.9	77.2	102.9	4.9
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.6	121.1	87.2	126.4	5.3
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	351.4	105.5	370.1	111.2	5.6
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	90.6	106.5	94.8	111.4	4.9
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	105.4	109.8	113.6	118.4	8.6
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	75.1	83.0	73.4	97.8	77.1	102.7	5.0
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.5	121.0	87.1	126.3	5.3
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	351.6	105.6	370.4	111.2	5.7

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

3.1.3 Scenario 8: 2023 WP (HG) Post-Project Alternative 1

Category A Conditions

No Reliability Criteria violations were observed under Category A conditions.

Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-4.

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

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	79.0	87.0	85.2	107.9	89.7	113.6	5.7
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	303.9	113.0	281.7	104.7	-8.3
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	309.1	114.9	286.3	106.4	-8.5
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	163.2	124.6	172.2	131.5	6.9
685L (397S Benbow to 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	90.1	99.0	88.4	98.1	90.9	100.9	2.8
744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)	202L (58S Edson to 178S Cynthia)	90.1	99.0	90.2	100.1	97.2	107.9	7.8
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	90.1	99.0	89.1	98.9	91.7	101.7	2.8
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	80.4	101.7	79.5	100.7	-1.1
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	90.1	99.0	93.7	104.0	100.8	111.8	7.8
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	105.2	116.7	112.9	125.3	8.5
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	124.4	95.0	131.1	100.1	5.1
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	79.9	100.9	84.3	106.6	5.6
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	93.0	117.8	97.5	123.4	5.6
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	368.9	110.8	386.6	116.1	5.3
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	105.1	116.7	112.8	125.2	8.5
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	124.3	94.9	131.0	100.0	5.1
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	79.8	100.8	84.2	106.5	5.6
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	92.9	117.7	97.4	123.3	5.6
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	369.2	110.9	386.9	116.2	5.3

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No point of delivery (POD) bus voltage deviations were observed.

3.1.4 Scenario 9: 2023 SP (LG) Post-Project Alternative 1

Category A Conditions

Line 7L199, which connects P2459 Tap and Fox Creek 741S, is scheduled to be upgraded as part of an ongoing capital project program before the commissioning of the Project. Prior to the upgrade, a single thermal violation was observed for Category A conditions during light generation in the Northwest region of Alberta.

If there are any delays to the upgrade, the Category A violation on 7L199 can be managed with the phase shifting transformer (PST) located at the 939S Livock station. The performance of line 7L199, under Category A, pre-upgrade, is detailed in Table 3-5, which illustrates the effects of the PST. On the other hand, Table 3-6 provides the expected performance of line 7L199 after the upgrade, with the PST adjusted to its expected setting (i.e., PST = 0°).

It is worth noting that Category A thermal violations, pre-upgrade and without PST maneuvering, are only experienced for Scenario 9. Overall, the upgrades to line 7L199 are expected to be completed before the commissioning of the Project, thereby resolving any potential reliability issues.

Table 3-5: PST Loading Effect on Line 7L199 (pre-Line Upgrade)

PST (Deg)	Line	Base Rating (MVA)	Flow (MVA)	Loading %	Flow (MVA)	Loading %[2]	Post-Pre
			Pre-Project		Post-Project		
0° (normal operation)	7L199 (Tap To Fox Creek 741S)	123.6	100.9	81.6	129.8	105.0	23.4
-21.998°	7L199 (Tap To Fox Creek 741S)	123.6	91.0	73.6	120.1	97.2	23.6

Table 3-6: Post Upgrade Loading on 7L199

PST (Deg)	Line	Base Rating (MVA)	Flow (MVA)	Loading %
0°	7L199 (Tap To Fox Creek 741S)	179.0	129.7	74.1

[2] Percentage loading is based on line ampacity.

Category B Conditions

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

Table 3-7: Thermal Criteria Violations under Category B Conditions for Scenario 9 (Post Upgrade on Line 7L199 and PST = 0°)

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project		Post-Project		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	79.4	73.3	118.0	109.0	35.7
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.1	75.8	108.6	100.3	24.5
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	70.3	101.9	73.0	105.8	3.9
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	302.1	112.3	287.6	106.9	-5.4
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	307.8	114.4	287.6	106.9	-7.5
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	122.2	127.3	136.4	142.1	14.8
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.1	107.3	72.1	104.5	-2.8
741S Fox Creek (Load Drop - 1T)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.8	76.5	111.3	102.7	26.3
741S Fox Creek (Load Drop - 2T)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.8	76.5	111.3	102.8	26.3
797L (268S Whitecourt to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	81.8	75.6	118.4	109.4	33.8
798L (77S Sagitawah to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	77.3	71.4	113.1	104.4	33.0
7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	83.1	76.7	109.1	100.8	24.0
813S Little Smoky (T1)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	85.9	79.3	111.8	103.2	23.9
813S Little Smoky (T2)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.1	79.5	112.0	103.4	23.9
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.8	108.4	72.8	105.6	-2.8
890L (58S Edson to 207S Pinedale)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.0	75.7	108.5	100.1	24.4
919L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	85.0	78.5	110.5	102.0	23.5
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	97.0	101.1	106.7	111.1	10.0
973L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	92.6	85.5	119.3	110.2	24.7
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.3	116.3	83.5	121.0	4.7
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	326.1	97.9	346.9	104.2	6.2
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	96.9	101.0	106.6	111.0	10.1
974L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	92.5	85.4	119.3	110.1	24.7
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.2	116.2	83.4	120.9	4.8
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	326.3	98.0	347.1	104.2	6.3
989L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	84.6	78.1	110.1	101.7	23.6
9L02 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	89.6	82.7	115.0	106.2	23.5
9L05 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	89.6	82.7	115.0	106.2	23.5
9L938 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.3	79.7	112.4	103.8	24.1
9L939 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.3	79.7	112.4	103.8	24.1

For completeness of analysis, the pre-Upgrade performance of line 7L199 is shown on Table 3-8 which outlines the thermal criteria violations observed under certain Category B following the PST flow shifting to clear and manage the initial Category A thermal violations observed.

Table 3-8: Thermal Criteria Violations under Category B Conditions for Scenario 9 (Pre 7L199 Upgrade and PST= -21.998)

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
1012S Deer Hill (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.5	82.1	133.3	107.8	25.7
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	100.4	81.3	144.8	117.2	35.9
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	79.4	73.3	118.0	109.0	35.7
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	103.7	83.9	135.4	109.6	25.7
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.1	75.8	108.6	100.3	24.5
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	70.3	101.9	73.0	105.8	3.9
346S Kaybob (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.6	82.2	133.5	108.0	25.8
355S Chevron Knight (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.5	82.1	133.4	107.9	25.8
355S Chevron Knight (Load Drop - T2)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.5	82.1	133.4	107.9	25.8
397S Benbow (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	102.1	82.6	134.0	108.4	25.8
397S Benbow (Load Drop - T2)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	102.7	83.1	134.7	109.0	25.9
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	303.5	112.8	287.6	106.9	-5.9
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	308.8	114.8	287.6	106.9	-7.9
526L/520L/6L126/907L (268S Whitecourt Tap 887S Mobil Oil Carson Creek Tap Tap 659S Pegasus Lake Tap Tap Tap 638S Esso Judy Creek Tap Tap 515S Fedpipe Judycreek Tap 743S Sarah Lake)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.9	82.5	133.9	108.3	25.9
58S Edson (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.4	82.0	133.2	107.8	25.7
602S Cold Creek (Load Drop - T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	102.2	82.7	133.9	108.4	25.7
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	122.2	127.3	136.4	142.1	14.8
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.1	107.3	72.1	104.5	-2.8
741S Fox Creek (Load Drop - 1T)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.8	76.5	111.3	102.7	26.3
741S Fox Creek (Load Drop - 2T)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.8	76.5	111.3	102.8	26.3
744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	103.1	83.4	134.7	109.0	25.6
745L / 1150L (39S Bickerdike to Obed tap to 602S Cold Creek)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.6	82.2	133.3	107.9	25.7
797L (268S Whitecourt to 364S Whitecourt Industrial)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	103.9	84.0	145.4	117.6	33.6
797L (268S Whitecourt to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	81.8	75.6	118.4	109.4	33.8
798L (77S Sagitawah to 364S Whitecourt Industrial)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	98.7	79.9	139.9	113.2	33.3
798L (77S Sagitawah to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	77.3	71.4	113.1	104.4	33.0
7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	104.9	84.8	135.9	110.0	25.2
7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	83.1	76.7	109.1	100.8	24.0
813S Little Smoky (T1)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	108.0	87.4	138.6	112.1	24.8
813S Little Smoky (T1)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	85.9	79.3	111.8	103.2	23.9
813S Little Smoky (T2)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	108.2	87.6	138.8	112.3	24.7
813S Little Smoky (T2)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.1	79.5	112.0	103.4	23.9
825L (77S Sagitawah to 484S Millar Western)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	101.6	82.2	133.6	108.1	25.9
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	74.8	108.4	72.8	105.6	-2.8
864L (397S Benbow Tap 346S Kaybob Tap Tap 551S Chevron Kaybob Tap Tap 355S Chevron Knight)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	103.0	83.3	135.1	109.3	26.0
890L (58S Edson to 207S Pinedale)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	103.6	83.9	135.2	109.4	25.6
890L (58S Edson to 207S Pinedale)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	82.0	75.7	108.5	100.1	24.4
919L (77S Sagitawah to 310P Sundance)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	106.5	86.2	137.2	111.0	24.8
919L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	85.0	78.5	110.5	102.0	23.5
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	97.0	101.1	106.6	111.1	10.0
973L (39S Bickerdike to 310P Sundance)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	114.3	92.5	146.0	118.1	25.7
973L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	92.6	85.5	119.3	110.2	24.7
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.3	116.3	83.5	121.0	4.7
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	326.1	97.9	346.9	104.2	6.3
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	96.9	101.0	106.6	111.0	10.0
974L (39S Bickerdike to 310P Sundance)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	114.2	92.4	145.9	118.1	25.7
974L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	92.5	85.4	119.3	110.1	24.7
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	80.2	116.2	83.4	120.9	4.8
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	326.3	98.0	347.1	104.2	6.3
989L (77S Sagitawah to 310P Sundance)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	106.1	85.9	136.9	110.7	24.9
989L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	84.6	78.1	110.1	101.7	23.6
9L02 (809S Louise Creek to 813S Little Smoky)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	111.6	90.3	141.8	114.7	24.4
9L02 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	89.6	82.7	115.0	106.2	23.5
9L05 (809S Louise Creek to 813S Little Smoky)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	111.6	90.3	141.8	114.7	24.4
9L05 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	89.6	82.7	115.0	106.2	23.5
9L938 (77S Sagitawah to 809S Louise Creek)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	108.1	87.5	139.1	112.6	25.1
9L938 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.3	79.7	112.4	103.8	24.1
9L939 (77S Sagitawah to 809S Louise Creek)	7L199 (Project Tap to 741S Fox Creek)	123.6	132.3	108.1	87.5	139.1	112.6	25.1
9L939 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	86.3	79.7	112.4	103.8	24.1

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

3.1.5 Scenario 10: 2023 WP (LG) Post-Project Alternative 1

Category A Conditions

No Reliability Criteria violations were observed under Category A conditions. Unlike Scenario 9, notwithstanding the low generation dispatch in the Northwest region, this scenario does not rely on PST maneuvering to resolve Category A thermal violations.

Category B Conditions

Thermal criteria violations were observed under certain Category B conditions as shown in Table 3-9

Table 3-9: Thermal Criteria Violations under Category B Conditions for Scenario 10 (Post 7L199 Upgrade)

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Normal Rating (MVA)	Emergency Rating (MVA)	Pre-Project Results		Post-Project Results		% Loading Difference (Post-Pre)
				Observed Power Flow (MVA)	% Loading	Observed Power Flow (MVA)	% Loading	
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	79.0	87.0	82.2	104.1	86.5	109.6	5.5
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	336.7	125.2	309.4	115.0	-10.2
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	341.3	126.9	315.1	117.1	-9.8
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	154.3	117.8	157.1	119.9	2.2
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	83.8	106.1	82.8	104.8	-1.3
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	79.0	87.0	84.6	107.1	83.6	105.8	-1.3
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	90.1	99.0	85.1	94.5	92.5	102.7	8.2
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	94.9	105.3	103.2	114.5	9.3
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	77.1	97.5	81.8	103.4	5.9
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	90.0	114.0	94.5	119.6	5.7
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	333.0	499.0	342.8	102.9	363.9	109.3	6.3
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	94.8	105.2	103.1	114.5	9.3
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	79.1	87.0	77.0	97.4	81.7	103.2	5.9
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	89.9	113.8	94.4	119.5	5.7
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	333.0	499.0	343.0	103.0	364.1	109.3	6.3

Voltage Criteria Violations

No voltage criteria violations were observed under Category B conditions.

POD Bus Voltage Deviations

No POD bus voltage deviations were observed.

3.2 Transient Stability Studies

Transient stability studies were completed for Scenario 6 / 2023SL (HG) and Scenario 8 / 2023WP.

The results did not indicate any transient stability concerns, and the system showed acceptable dynamic response to all Category B conditions studied, as shown in Table 3-10. The post-Project transient stability plots are provided in Attachment A4. The dynamic data and assumptions of all equipment proposed for the Facility are provided in Attachment A5.

Table 3-10: Transient Stability Study Results under Category B Conditions for Scenario 6 and Scenario 8

Studied Contingency	Fault Description and Location	Results
685L (Benbow 397S – Deer Hill 1012S)	Benbow 397S	Stable
	Deer Hill 1012S	Stable
720L (Benbow 397S – Fox Creek 347S)	Benbow 397S	Stable
	Fox Creek 347S	Stable
7L199 (Fox Creek 741S – Fox Creek 347S)	Fox Creek 741S	Stable
	Fox Creek 347S	Stable
199L (Fox Creek 347S – Whitecourt 268S)	Fox Creek 347S	Stable
	Whitecourt 268S	Stable
7L46 (Little Smoky 813S – Big Mountain 845S)	Little Smoky 813S	Stable
	Big Mountain 845S	Stable
7L90 (Fox Creek 741S – Little Smoky 813S)	Fox Creek 741S	Stable
	Little Smoky 813S	Stable
9L02 (Little Smoky 913S – Louise Creek 809S)	Little Smoky 813S	Stable
	Louise Creek 809S	Stable

4 Short Circuit Studies

4.1 Pre-Project Results

4.1.1 Scenario 3: 2023 WP (HG) Pre-Project Results

Pre-Project short-circuit current levels are provided in Table 4-1[3].

Table 4-1: Pre-Project Short-Circuit Current Levels for 2023WP

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Fox Creek 741S	138	146.95	4.52	0.03944 +j0.09039	4.13	0.02289 +j0.12621
Fox Creek 347S	138	145.97	5.14	0.03091 +j0.08029	4.16	0.03472 +j0.14332
Muir 2018	138	146.62	3.72	0.0484 +j0.10919	3.43	0.02464 +j0.1513
Little Smoky 813S	240	261.44	6.96	0.00776 +j0.03684	8.21	0.00205 +j0.02044
Little Smoky 813S	138	150.45	12.24	0.00882 +j0.03619	16.07	0.00158 +j0.01055
Benbow 397S	138	145.08	4.73	0.02763 +j0.0887	3.30	0.05594 +j0.2071
Whitecourt 268S	138	144.55	6.71	0.01993 +j0.06223	5.18	0.02304 +j0.12121
Chickadee Creek 259S	138	145.22	4.69	0.0325 +j0.08815	3.74	0.03034 +j0.16353

4.2 Post-Project Results

4.2.1 Scenario 8: 2023 WP HG Post-Project

Post-Project short-circuit current levels for Scenario 8 are provided in Table 4-2.

Table 4-2: Post-Project Short-Circuit Current Levels for 2023WP

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Gemini 1008S	138	146.78	5.89	0.02269 +j0.07228	6.33	0.00715 +j0.06008
Fox Creek 741S	138	146.27	5.64	0.02578 +j0.07446	5.76	0.01392 +j0.07337
Fox Creek 347S	138	145.80	6.16	0.02192 +j0.06853	5.47	0.02556 +j0.09595
Muir 2018	138	146.02	4.37	0.03601 +j0.09488	4.12	0.02228 +j0.11957
Little Smoky 813S	240	262.14	7.04	0.00767 +j0.03667	8.27	0.00207 +j0.02073
Little Smoky 813S	138	151.62	12.47	0.00872 +j0.03583	16.33	0.00159 +j0.01065
Benbow 397S	138	144.82	5.12	0.02398 +j0.08234	3.61	0.05308 +j0.18589
Whitecourt 268S	138	143.84	6.88	0.01913 +j0.06065	5.27	0.02314 +j0.12005
Chickadee Creek 259S	138	144.58	5.05	0.02862 +j0.08236	4.02	0.02976 +j0.15209

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

4.2.2 Scenario 11: 2031 WP HG Post-Project

Post-Project short-circuit current levels for Scenario 11 are provided in Table 4-3.

Table 4-3: Post-Project Short-Circuit Current Levels for 2031WP

Substation Name and Number	Base Voltage (kV)	Pre-Fault Voltage (kV)	3-Φ Fault (kA)	Positive Sequence Thevenin Source Impedance (R1+jX1) (pu)	1-Φ Fault (kA)	Zero Sequence Thevenin Source Impedance (R0+jX0) (pu)
Gemini 1008S	138	146.78	5.90	0.02277 +j0.07185	6.34	0.00713 +j0.06005
Fox Creek 741S	138	146.27	5.66	0.02588 +j0.07395	5.76	0.0139 +j0.07333
Fox Creek 347S	138	145.80	6.17	0.02195 +j0.06816	5.47	0.02554 +j0.09587
Muir 2018	138	146.02	4.38	0.03608 +j0.09437	4.12	0.02227 +j0.11954
Little Smoky 813S	240	262.14	7.18	0.00738 +j0.03585	8.40	0.00205 +j0.02065
Little Smoky 813S	138	151.62	12.71	0.00847 +j0.03515	16.62	0.00155 +j0.01061
Benbow 397S	138	144.82	5.13	0.024 +j0.08216	3.61	0.05306 +j0.18585
Whitecourt 268S	138	143.84	6.94	0.0189 +j0.0599	5.38	0.02215 +j0.11589
Chickadee Creek 259S	138	144.58	5.05	0.02856 +j0.08189	4.02	0.02964 +j0.15135

5 Mitigation Measure Development and Evaluation

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

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

5.1 Pre-Project

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

Table 5-1: Pre-Project Mitigation Measures

Mitigation Measure	Location of Observed Violation	Contingency
Planned RAS 185	890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)
		685L (397S Benbow to 1012S Deer Hill)
		854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
		973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)
Planned RAS 186	39S Bickerdike (T1)	39S Bickerdike (T2)
	39S Bickerdike (T2)	39S Bickerdike (T1)
Planned RAS 188	740L (39S Bickerdike to 58S Edson)	671L (39S Bickerdike to 58S Edson)
Planned RAS 189	202L (58S Edson to 178S Cynthia)	973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)

Notes:

[a] RAS No.: 185, 186, 188 and 189 are proposed for the planned P2032 Cascade Combined Cycle project.

5.2 Post-Project / Post Upgrade

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

Table 5-2: Post-Project / Post Upgrade Mitigation Measures

Mitigation Measure	Location of Observed Violation	Contingency
Planned RAS 185	890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)
		202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)
		685L (397S Benbow to 1012S Deer Hill)
		854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
		973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)
Planned RAS 186	39S Bickerdike (T1)	39S Bickerdike (T2)
	39S Bickerdike (T2)	39S Bickerdike (T1)
Planned RAS 188	740L (39S Bickerdike to 58S Edson)	671L (39S Bickerdike to 58S Edson)
		973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)
Planned RAS 189	202L (58S Edson to 178S Cynthia)	890L (58S Edson to 207S Pinedale)
		973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)
NEW RAS P2456	7L90 (741S Fox Creek to 2018S Muir Tap)	199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)
		797L (268S Whitecourt to 364S Whitecourt Industrial)
		973L (39S Bickerdike to 310P Sundance)
		974L (39S Bickerdike to 310P Sundance)
Proposed Line Upgrade, or PST (on a temporary basis)	7L90 (741S Fox Creek to 2018S Muir Tap)	N-0

Notes:

[a] RAS No.: 185, 186, 188 and 189 are proposed for the planned P2032 Cascade Combined Cycle project.
[b] NEW RAS P2456 is a RAS proposed for the planned P2456 Kiwetinohk Opal MPC Gas project.

5.3 Evaluation of Mitigation Measures

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

The post-mitigation measures studies were performed under Category B conditions for Scenario 6: 2023 SL (HG) Post-Project, Scenario 7: 2023 SP (HG) Post-Project, Scenario 8: 2023 WP (HG) Post-Project, Scenario 9: 2023 SP (LG) Post-Project, and Scenario 10: 2023 WP (LG) Post-Project using Alternative 1 Post Upgrade and the RASs described in the previous section.

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

5.3.1 Scenario 6: 2023 SL (HG) Post-Project Alternative 1

Category B Conditions

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

Table 5-3: Post-RAS Power Flow Study Results for Scenario 6

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	127.2	132.5	82.6	86.0

5.3.2 Scenario 7: 2023 SP (HG) Post-Project Alternative 1

Category B Conditions

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

Table 5-4: Post-RAS Power Flow Study Results for Scenario7

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	77.1	111.7	43.2	62.6
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	144.9	151.0	84.7	88.3
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	69.5	100.7	39.9	57.8
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	94.9	111.5	41.4	48.7
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	113.7	118.5	62.0	64.6
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	87.2	126.4	47.1	68.2
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	85.1	94.0	94.8	111.4	40.5	48.6
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	113.6	118.4	62.0	64.6
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	87.1	126.3	47.0	68.2

5.3.3 Scenario 8: 2023 WP (HG) Post-Project Alternative 1

Category B Conditions

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

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

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	79.0	87.0	89.7	113.6	53.2	67.4
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	281.7	104.7	184.4	68.6
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	286.3	106.4	188.5	70.1
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	172.2	131.5	107.1	81.7
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	90.1	99.0	100.8	111.8	53.5	59.4
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	112.9	125.3	55.0	61.1
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	97.5	123.4	54.4	68.9
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	90.1	99.0	112.8	125.2	55.0	61.0
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	97.4	123.3	54.3	68.8

5.3.4 Scenario 9: 2023 SP (LG) Post-Project Alternative 1

Category B Conditions

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

Table 5-6: Post-RAS Power Flow Study Results for Scenario 9[4]

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	118.0	109.0	97.0	89.6
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	69.0	69.0	73.0	105.8	39.3	56.9
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	287.6	106.9	198.9	73.93
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	287.6	106.9	198.9	73.93
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	136.4	142.1	76.5	79.7
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	72.1	104.5	42.7	61.9
797L (268S Whitecourt to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	118.4	109.4	98.8	91.2
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	69.0	69.0	72.8	105.6	43.4	62.9
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	106.7	111.1	55.3	57.6
973L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	119.3	110.2	104.4	96.4
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.5	121.0	43.5	63.1
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	96.0	106.0	106.6	111.0	55.2	57.5
974L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	108.3	116.9	119.3	110.1	104.4	96.4
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	69.0	69.0	83.4	120.9	43.5	63.1

[4] RAS results analyzed are based on the expected Post Upgrade scenario for line 7L199

5.3.5 Scenario 10: 2023 WP (LG) Post-Project Alternative 1

Category B Conditions

Thermal criteria violations observed under certain Category B conditions in the post-Project studies were mitigated by RASs as shown in Table 5-7.

Table 5-7: Post-RAS Power Flow Study Results for Scenario 10

Contingency (System Element Lost)	Details of Violation (Violation Observed On)	Seasonal Continuous Rating (MVA)	Short-term (Emergency) Rating (MVA)	Post-Project Results		Post-RAS Action Results	
				Power Flow (MVA)	% Loading	Power Flow (MVA)	% Loading
39S Bickerdike (T1)	39S Bickerdike (T2)	269.0	269.0	309.4	115.0	214.4	79.7
39S Bickerdike (T2)	39S Bickerdike (T1)	269.0	269.0	315.1	117.1	219.7	81.7
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	131.0	144.0	157.1	119.9	92.5	70.6
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	94.5	119.6	51.4	65.0
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	79.0	87.0	94.4	119.5	51.3	65.0

5.4 Constraint Effective Factor Studies

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

Attachment A1
Engineering Connection Assessment: Study Scope

Engineering Connection Assessment: Study Scope

P2456 Kiwetinohk Opal Gas

Kiwetinohk Energy Corp.

Date: Feb 23, 2023

Version: V1Final

Classification: Public

Company Name	Name and Credentials	Date	Signature
NICAN International Consulting Ltd. (Study Consultant)	Pablo Argenal, P.Eng.	Feb. 24, 2023	
AESO	Jian Shang, P. Eng.	Feb 27, 2023	
Transmission Facility Owner	Vijitha Wijetilleke	Feb 27, 2023	
Market Participant (Kiwetinohk Resources Corp.)	Dobromir Filip, PhD, P.Eng	Feb. 26, 2023	

Contents

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1 Introduction

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

1.1 Project Overview

Kiwetinohk Energy Corp. (Market Participant) has submitted a request for system access service to the Alberta Electric System Operator (AESO) to connect its proposed Opal Gas (Facility) to the AIES.

The Facility includes a proposed collector substation, to be designated the Gemini 1008S.

The Market Participant's request includes: a request for a new system access service in the area, with a Rate STS, *Supply Transmission Service*, contract capacity of 98.5 MW and a Rate DTS, *Demand Transmission Service*, contract capacity of 0.4 MW; and a request for transmission development (collectively, the Project).

The Project in-service date (ISD) used for the purpose of the studies is December 1, 2024.

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

Table 1-1: Project Load and Generation Details

Project Component		Description
Load	Existing Rate DTS, *Demand Transmission Service,* contract capacity	No existing contract
	Requested Rate DTS	0.4 MW
	Type	station service
	Motors (number and size)	Not applicable
	Power factor	0.9 pf
	Future load expansion plans	No
Generation	Generation type	Simple Cycle Gas
	Existing Rate STS, *Supply Transmission Service,* contract capacity	0 MW
	Requested Rate STS	98.5 MW
	Number and size of generating units	Nine (9) reciprocating generating units, and MARP of each unit is 11.235 MW
	Maximum authorized real power (MARP)	101.115 MW
	Maximum capability (MC)	98.5 MW
	Reactive power capability	0.95 pf absorbing
		0.9 pf producing

Project Component		Description
	Future generation expansion plans	No

Note:

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

1.2 Existing System Overview

1.2.1 Study Area

Geographically, the Project is located in the AESO planning area of Fox Creek (Area 24).

The Study Area consists of the AESO planning areas of Fox Creek (Area 24), Valleyview (Area 23), Swan Hills (Area 26), and Hinton/Edson (Area 29), including the tie lines connecting these planning areas to the rest of the AIES.

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

1.2.2 Existing Constraints

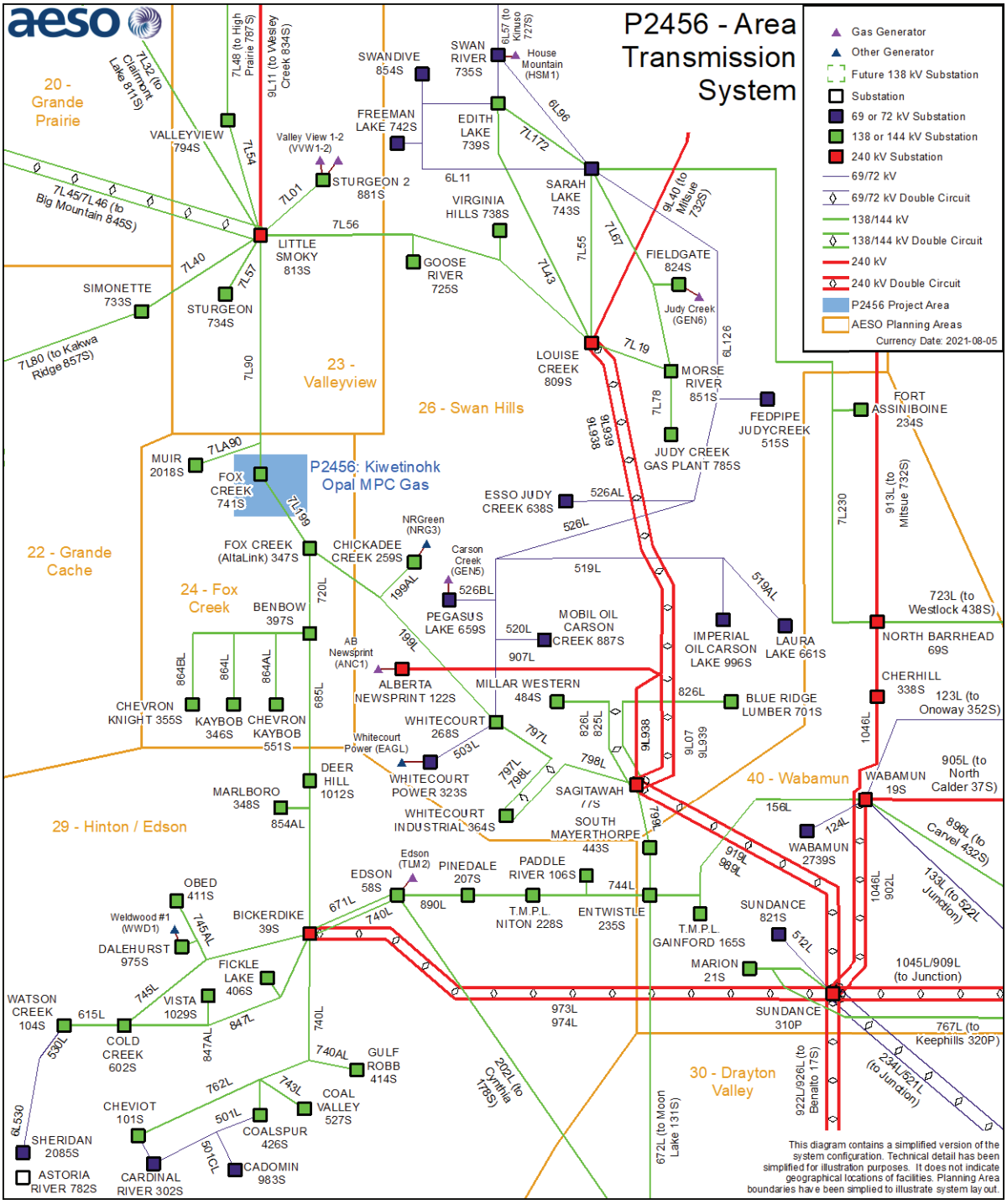
Existing constraints in the Study Area are managed in accordance with the procedures set out in Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* (TCM Rule).

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

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

- RAS 46: Bickerdike 39s - 740L Load Trip Scheme
- RAS 47: Obed Mountain Coal 411s - Load Trip Scheme
- RAS 142: 799L Overload and 77S Low Voltage Mitigation
- RAS 163: Vista 1029S Under Voltage Mitigation Scheme

Figure 1-1: Transmission System in the Study Area



2 Connection Alternative

The following alternative will be studied:

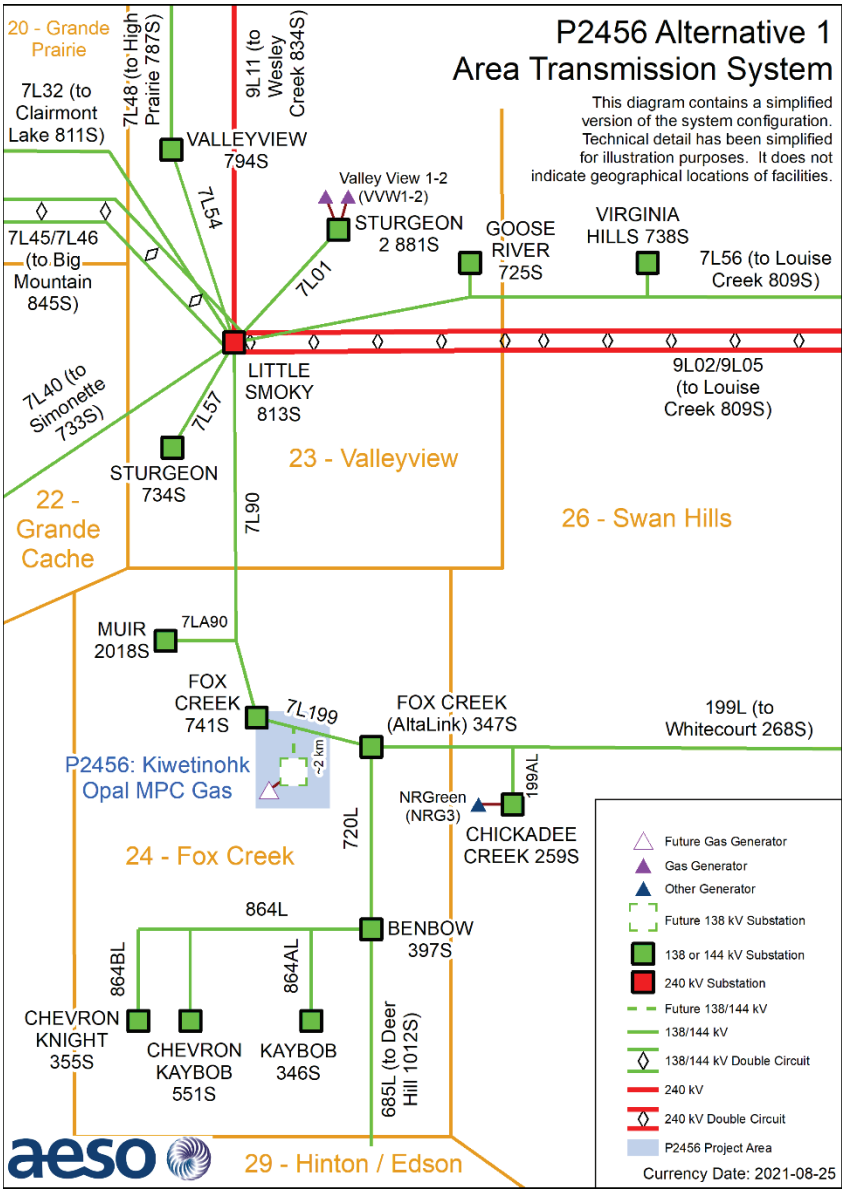
2.1 Alternative 1 – T-tap connection to the existing 144 kV transmission line 7L199

This alternative included the following developments:

- Add one 144 kV transmission circuit, approximately 1.5 km in length, to connect Market Participant's proposed facility to the existing 144 kV transmission line 7L199 between Fox Creek (ATCO) 741S and Fox Creek (AML) 347S using a T-tap configuration;
- Add or modify associated equipment as required for the above transmission developments.

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

Figure 2-1: Connection Alternative 1



3 Criteria, Standards and Requirements

3.1 AESO Reliability Criteria

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

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

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

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

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

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

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

3.2 ISO Rules and Information Documents

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

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

- The AESO's *Connection Study Requirements*;
- Section 502.5 of the ISO rules *Generating Unit Technical Requirements*;
- Section 502.6 of the ISO rules *Generating Unit Operating Requirements*;

4 Scenarios and Assumptions

4.1 Scenarios

The following section describes the scenarios to be studied and the assumptions to be used in the studies.

Please note that the Year 2023 forecast data is used for the engineering studies despite that the ISD of the Project has been delayed from 2023 to 2024, the use of Year 2023 forecast data will not materially impact the study results and recommendation given the difference of forecast data is insignificant.

Connection scenarios must be studied as outlined in Table 4-1.

Table 4-1: Connection Study Scenarios

Scenario No.	Year/Season	System Generation Dispatch Conditions	Scenario Name	Project Load (MW)	Project Generation (MW)
Pre-Project					
1	2023 Summer Light (SL)	High Generation (HG)	2023 SL HG Pre-Project	0	0
2	2023 Summer Peak (SP)	HG	2023 SP HG Pre-Project	0	0
3	2023 Winter Peak (WP)	HG	2023 WP HG Pre-Project	0	0
4	2023 Summer Peak (SP)	Low Generation (LG)	2023 SP LG Pre-Project	0	0
5	2023 Winter Peak (WP)	LG	2023 WP LG Pre-Project	0	0
Post-Project					
6	2023 SL	HG	2023 SL HG Post-Project	0.4	98.5
7	2023 SP	HG	2023 SP HG Post-Project	0.4	98.5
8	2023 WP	HG	2023 WP HG Post-Project	0.4	98.5
9	2023 SP	LG	2023 SP LG Post-Project	0.4	98.5
10	2023 WP	LG	2023 WP LG Post-Project	0.4	98.5
11	2031 WP	All machines in the study area will be turned on	2031 WP Post-Project	0.4	98.5

4.2 Assumptions

4.2.1 System Project Assumptions

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

4.2.2 Connection Project Assumptions

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

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

AESO Project No.	AESO Project Name	AESO Planning Area No.	Generation (MW)	Load (MW)	Scheduled ISD
P2032	Cascade Combined Cycle	29	900	12	Mar 25, 2022

4.2.3 Load Assumptions

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

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

AESO Planning Region Name	Forecast Peak Load by Year/Season (MW)		
	2023 SL	2023 SP	2023 WP
Northwest Planning Region	808	1116	1226

Note:
[1] The Northwest Region comprises the following AESO planning areas: Rainbow Lake (Area 17), High Level (Area 18), Peace River (Area 19), Grande Prairie (Area 20), High Prairie (Area 21), Grande Cache (Area 22), Valleyview (Area 23), Fox Creek (Area 24), and Swan Hills (Area 26).

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

4.2.4 Generation Assumptions

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

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

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

Facility Name	Bus No.	MC (MW)	AESO Planning Area No.	Unit Net Generation[a] (MW) by Scenario				
				High Generation			Low Generation	
				2023 SL	2023 SP	2023 WP	2023 SP	2023 WP
Whitecourt Power (EAGL)	408	25	26	25	25	25	22	22

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

Facility Name	Bus No.	MC (MW)	AESO Planning Area No.	Unit Net Generation[a] (MW) by Scenario				
				High Generation			Low Generation	
				2023 SL	2023 SP	2023 WP	2023 SP	2023 WP
NRGreen (NRG3)	2674	16	26	12	11	13	7	3
AB Newsprint (ANC1)	2296, 4296	63	26	57	63	62	48	32
Judy Creek (GEN6)	19272	15	26	9	10	12	5	0
Carson Creek (GEN5)	2335	15	26	11	10	11	9	8
House Mountain (HSM1)	1171	6	26	3	3	3	0	0
Valley View 1 (VVW1)	1173	50	23	13	10	22	0	0
Valley View 2 (VVW2)	2674	50	23	15	28	26	0	0
P2032 Cascade Combined Cycle	557014, 558014	900	29	561	751	810	751	810

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

4.2.5 Intertie Flow Assumptions

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

4.2.6 HVDC Power Order Assumptions

The Western Alberta Transmission Line (WATL) and the Eastern Alberta Transmission Line (EATL) are high-voltage direct current (HVDC) transmission lines. WATL and EATL are not expected to have a material impact on the connection assessment. Therefore, the HVDC assumptions shall be the same as in the AESO planning base cases and will not be adjusted for the studies.

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

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

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

4.2.7 Transmission Facility Ratings

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

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

Line ID	Line Description	Voltage Class (kV)	Normal Rating (MVA)		Emergency Rating (MVA)	
			Summer	Winter	Summer	Winter
671L	Bickerdike 39S - Edson 58S	138	172	212	189	233
685L	Benbow 397S - Deer Hill 1012S	138	167 M	201 M	184 M	218 M
740L	Bickerdike 39S - Edson 58S	138	96 TD-L	131 TD-L	106 TD-L	144 TD-L
744L	Pinedale 207S - T.M.P.L Niton 228S	138	75	79	83	87
744L	T.M.P.L Niton 228S - Entwistle 235S	138	75	79	83	87
797L	Whitecourt 268S - Whitecourt Industrial 364S	138	93 LTD-L	129 LTD-L	102 LTD-L	142 LTD-L
798L	Whitecourt Industrial 364S - Sagitawah 77S	138	119	132 LTD-L	131	145 LTD-L
799L	Sagitawah 77S - South Mayerthorpe 443S	138	85	90	94	99
799L	South Mayerthorpe 443S - Entwistle 235S	138	85	90	94	99
825L	Sagitawah 77S - Millar Western 484S	138	121	127	133	140
826L	Sagitawah 77S - Blue Ridge Lumber 701S	138	94 LTD-L	131 LTD-L	103 LTD-L	144 LTD-L
854L	Deer Hill 1012S - Bickerdike 39S	138	163 TD-L	263 CT	179 TD-L	344 TD-L
890L	Edson 58S - Pinedale 207S	138	63	79 LTD-L	69	87 LTD-L
919L	Sagitawah 77S - Sundance 310P	240	489	599 M	587	648 M
973L	Bickerdike 39S - Sundance 310P	240	333 CT	333 CT	499 CT	499 CT
974L	Bickerdike 39S - Sundance 310P	240	333 CT	333 CT	499 CT	499 CT
989L	Sagitawah 77S - Sundance 310P	240	489	599 M	587	648 M
907L	Sagitawah 77S - Alberta Newsprint 122S	240	578	624	654 M	773 M
720L	Fox Creek 347S - Benbow 397S	138	120	148	132	163
199L	Fox Creek 347S - Whitecourt 268S	138	119	122	131	134
7L199	Fox Creek 741S - Gemini 1008S Tap	138	123.6*	143.8 GS*	132.3*	143.8 GS*
7L199	Gemini 1008S Tap – Fox Creek 347S	138	119	146	131	161
7L90	Little Smoky 813S - Fox Creek 741S	138	108.3	143.8 GS	116.9	143.8 GS
7L01	Little Smoky 813S - Sturgeon 2 881S	138	160	190.7 P	175.4	190.7 P
7L55	Louise Creek 809S - Sarah Lake 743S	138	107.3	115	115	115
7L19	Louise Creek 809S - Morse River 851S	138	108.3	119.8 CT	119.8 CT	119.8 CT
7L230	Sarah Lake 743S - North Barrhead 69S	138	109.3	144.7	119.8	164.8
7L32	Little Smoky 813S - Clairmont Lake 811S	138	109.3	144.7	115	156.2

Line ID	Line Description	Voltage Class (kV)	Normal Rating (MVA)		Emergency Rating (MVA)	
			Summer	Winter	Summer	Winter
7L40	Little Smoky 813S - Simonette 733S	138	123.6	155.3	128.4	171.5
7L43	Louise Creek 809S - Edith Lake 739S	138	107.3	127.5 CT	119.8	127.5 CT
7L45	Little Smoky 813S - Big Mountain 845S	138	139	186.9	159.1	219.5
7L46	Little Smoky 813S - Big Mountain 845S	138	139	186.9	159.1	219.5
7L54	Little Smoky 813S - Valleyview 794S	138	111.2	148.5	123.6	169.6
7L56	Little Smoky 813S - Goose River 725S	138	107.3	127.5 CT	117.9	127.5 CT
7L57	Little Smoky 813S - Sturgeon 734S	138	110.2	147.6 CT	123.6	168.7 CT
9L02	Louise Creek 809S - Little Smoky 813S	240	499 GS	499 GS	499 GS	499 GS
9L05	Louise Creek 809S - Little Smoky 813S	240	499 GS	499 GS	499 GS	499 GS
9L11	Little Smoky 813S - Wesley Creek 834S	240	499 GS	499 GS	499 GS	499 GS
9L938	Sagitawah 77S - Louise Creek 809S	240	500	644	642	663 CT
9L939	Sagitawah 77S - Louise Creek 809S	240	500	644	614 BC	663 CT

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

"L" indicates that the transmission line rating is limited by the line

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

* These are the existing ratings. The anticipated ratings after the 7L199 line section (between ATCO Fox Creek 741S and Gemini 2008S T-tap) upgrade work (as identified on P2456 Kiwetinohk Opal FS, dated Feb.07, 2023) is complete, are going to be not less than 186.77 / 235.2 MVA (based on 144 kV) Summer/Winter. The final ratings will be confirmed by ATCO, after the 7L199 line section re-build work is complete.

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

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

Substation Name and Number	Transformer ID	Transformer Voltages (kV)	Transformer Rating (MVA)
Whitecourt 268S	T1	69/138	42
Sagitawah 77S	T1 & T2	138/240	200
Bickerdike 39S	T1 & T2	138/240	269
Little Smoky 813S	T1 & T2	138/240	200
Sturgeon 734S	T1	69/138	25
Louise Creek 809S	T1 & T2	138/240	200

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

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

Substation Name and Number	Voltage Class (kV)	Capacitors		Reactors		SVC
		Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)	Number of Switched Shunt Blocks	Total at Nominal Voltage (MVAr)	Total at Nominal Voltage (MVAr)
Little Smoky 813S	138	3 x 27.54	82.62	-	-	
	34.5	-	-	-	-	± 100
	25	-	-	1 x 20	20	
	25	-	-	1 x 20	20	
Fox Creek 347S	138	1 x 36.74	36.74	-	-	
	25	1 x 4.8	4.8	-	-	
Louise Creek 809S	138	1 x 48.49	48.49	-	-	
	25	-	-	1 x 20 + 1 x 10	30	
Cold Creek 602S	138	1 x 32.48	32.48	-	-	
Edson 58S	138	1 x 27	27	-	-	

4.2.8 Protection Fault Clearing Times

The transient stability studies will be performed using the actual fault clearing times for the selected contingencies, as provided by the TFOs and as shown in Table 4-9. Only those contingencies shown in Table 4-9 will be studied for transient stability studies. If the TFOs did not specify the fault clearing times (e.g. for new transmission lines) for a selected contingency, then the studies for that contingency will be performed using the standard fault clearing times that are specified in Table 2-3 of the AESO's *Transmission Planning Criteria – Basis and Assumptions*.

Table 4-9: Protection Fault Clearing Times

Contingency (System Element Lost)	Fault Location	Clearing Times (Cycles)	
		Near End	Far End
685L (Benbow 397S – Deer Hill 1012S)	Benbow 397S	9	30
	Deer Hill 1012S	9	30
720L (Benbow 397S – Fox Creek 347S)	Benbow 397S	9	30
	Fox Creek 347S	9	30
7L199 (Fox Creek 741S – Fox Creek 347S)	Fox Creek 741S	6	27
	Fox Creek 347S	6	24
199L (Fox Creek 347S – Whitecourt 268S)	Fox Creek 347S	9	30
	Whitecourt 268S	9	30
7L46 (Little Smoky 813S – Big Mountain 845S)	Little Smoky 813S	6	8
	Big Mountain 845S	6	8
7L90 (Fox Creek 741S – Little Smoky 813S)	Fox Creek 741S	6	24
	Little Smoky 813S	6	42
9L02 (Little Smoky 913S – Louise Creek 809S)	Little Smoky 813S	5	6
	Louise Creek 809S	5	6

4.2.9 Project Dynamic Data

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

4.2.10 Voltage Profile Assumption

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

5 Study Methodology

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

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

Scenario No. and Name		Power Flow		Voltage Stability		Transient Stability		Motor Starting		Short Circuit
		Category		Category		Category		Category		Category A
		A	B	A	B	A	B	A	B	
Pre-Project										
1	2023 SL HG	X	X							
2	2023 SP HG	X	X							
3	2023 WP HG	X	X							X
4	2023 SP LG	X	X							
5	2023 WP LG	X	X							
Post-Project										
6	2023 SL HG	X	X			X	X			
7	2023 SP HG	X	X							
8	2023 WP HG	X	X			X	X			X
9	2023 SP LG	X	X							
10	2023 WP LG	X	X							
11	2031 WP									X

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

5.1 Power Flow Studies

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

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

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

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

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

5.1.1 Contingencies to be Studied

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

5.2 Transient Stability Studies

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

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

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

5.2.1 Contingencies to be Studied

Transient stability studies will be performed for the contingencies shown in Table 4-9

5.3 Short-Circuit Current Level Studies

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

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

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

- Fox Creek 741S
- Fox Creek 347S
- Muir 2018S
- Little Smoky 813S (240 and 144 kV)

- Benbow 397S
- Whitecourt 268S
- Chickadee Creek 259S
- Gemini 1008S (including in post-Project studies only)

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

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

6 Mitigation Measures

6.1 Development

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

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

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

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

6.2 Evaluation

6.2.1 Post-Mitigation Studies

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

6.2.2 Constraint Effective Factor Studies

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

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

7 Changes to Study Assumptions

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

Attachment A: Transmission Planning Criteria – Basis and Assumptions

Transmission Planning Criteria – Basis and Assumptions

Date: July 9, 2019

Version: V1.2

Alberta Electric System Operator

Calgary Place, 2500, 330-5th Avenue SW Calgary, AB T2P 0L4

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1. Introduction

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

2. Transmission Reliability Standards and Criteria[1]

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

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

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

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

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

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

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

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

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

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

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

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

2.1 Thermal Loading Criteria

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

2.2 Voltage Range and Voltage Stability Criteria

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

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

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

Table 2-2: Voltage Stability Criteria

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

2.3 Transient Stability Analysis Assumptions

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

Table 2-3: Fault Clearing Times

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

Table 2-4: Stuck Breaker Clearing Times for Lines

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

Table 2-5: Stuck Breaker Clearing Times for Transformers

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

Attachment A2
Pre-Project Power Flow Diagrams

2023 SUMMER LIGHT

Single Line Diagrams
P2456 - PRE-PROJECT POWER
FLOW SC01

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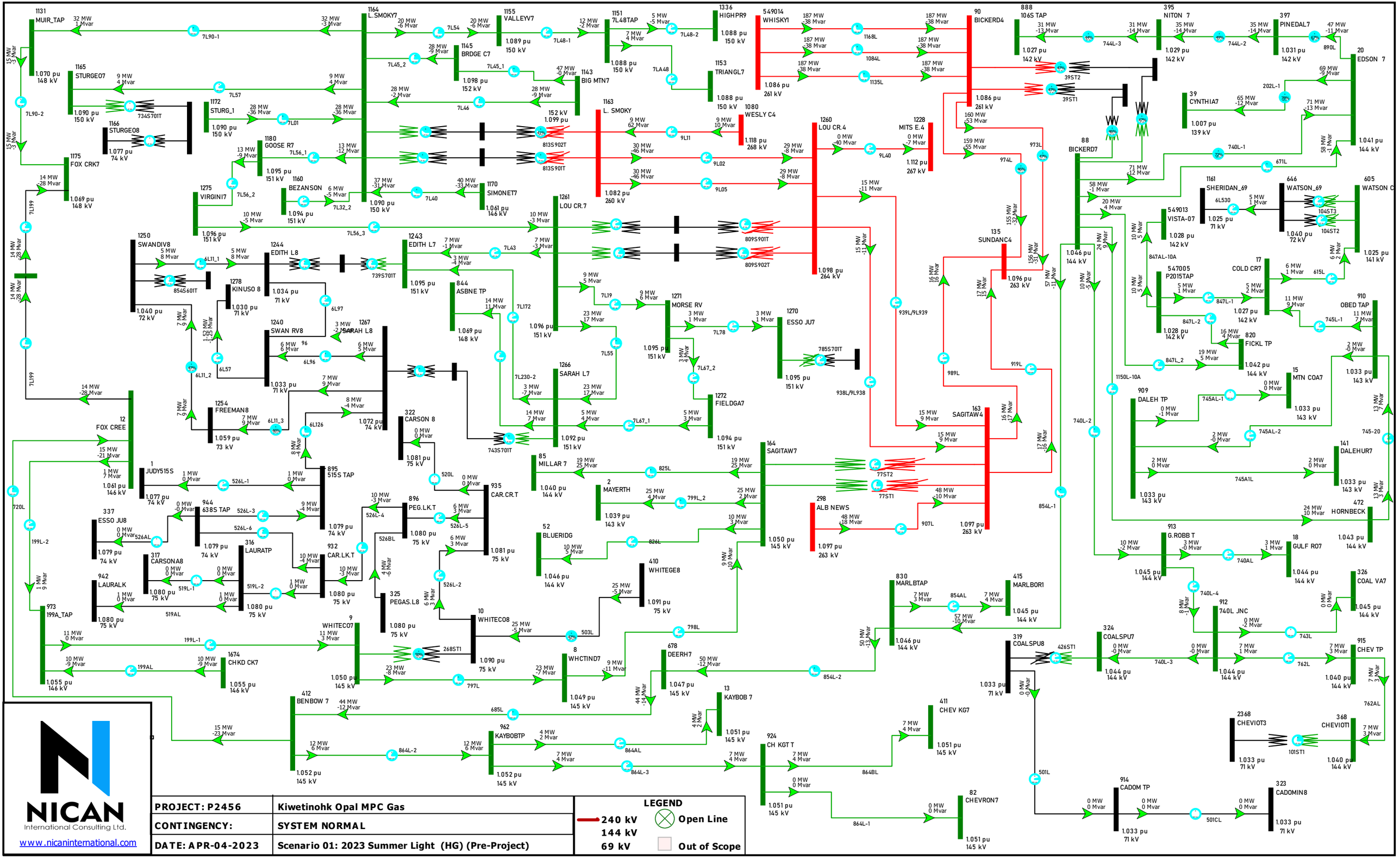

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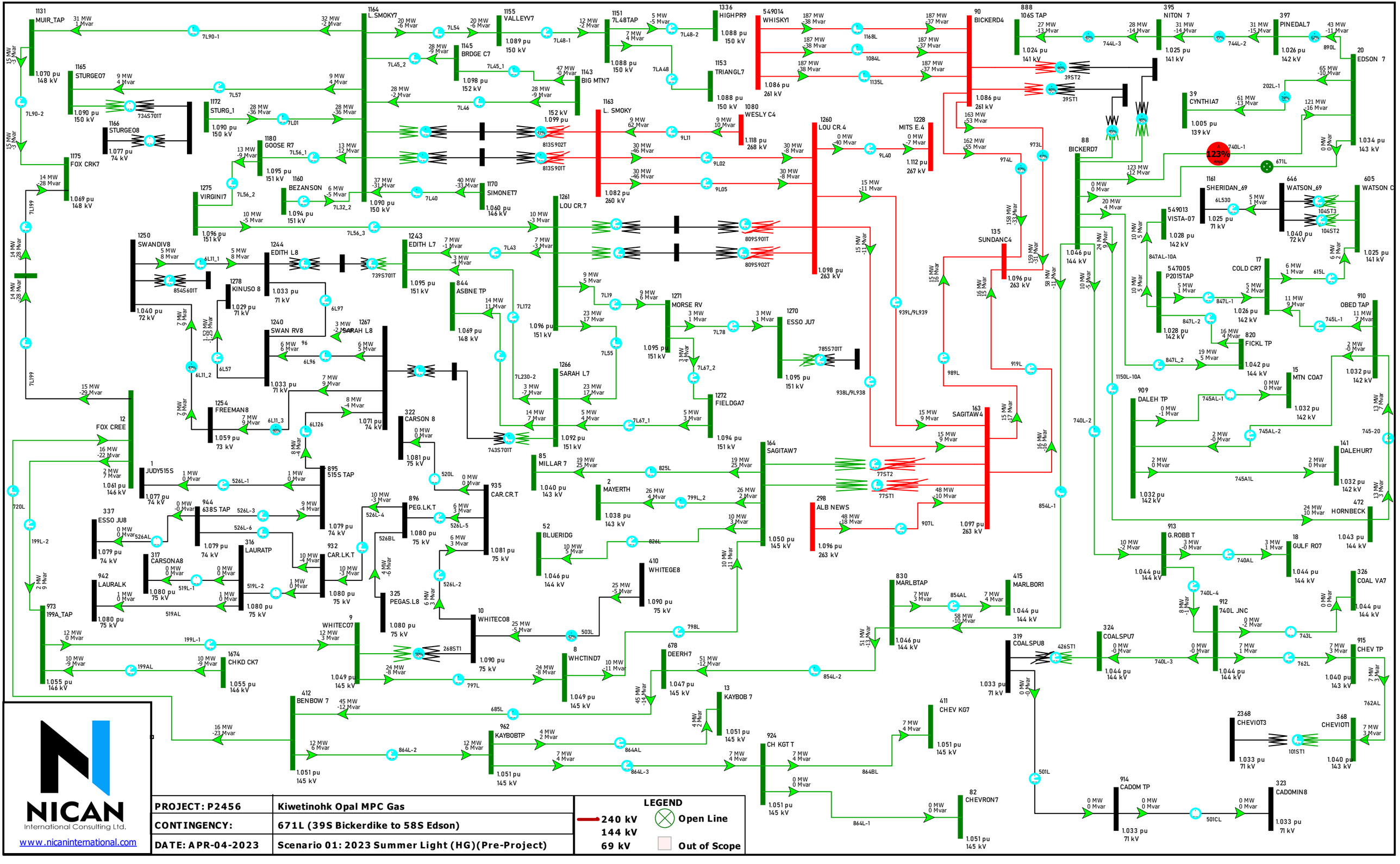
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 01: 2023 Summer Light (HG) (Pre-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



NICAN
International Consulting Ltd.
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PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**671L (39S Bickerdike to 58S Edson)**
DATE: APR-04-2023	**Scenario 01: 2023 Summer Light (HG)(Pre-Project)**

LEGEND

240 kV
144 kV
69 kV

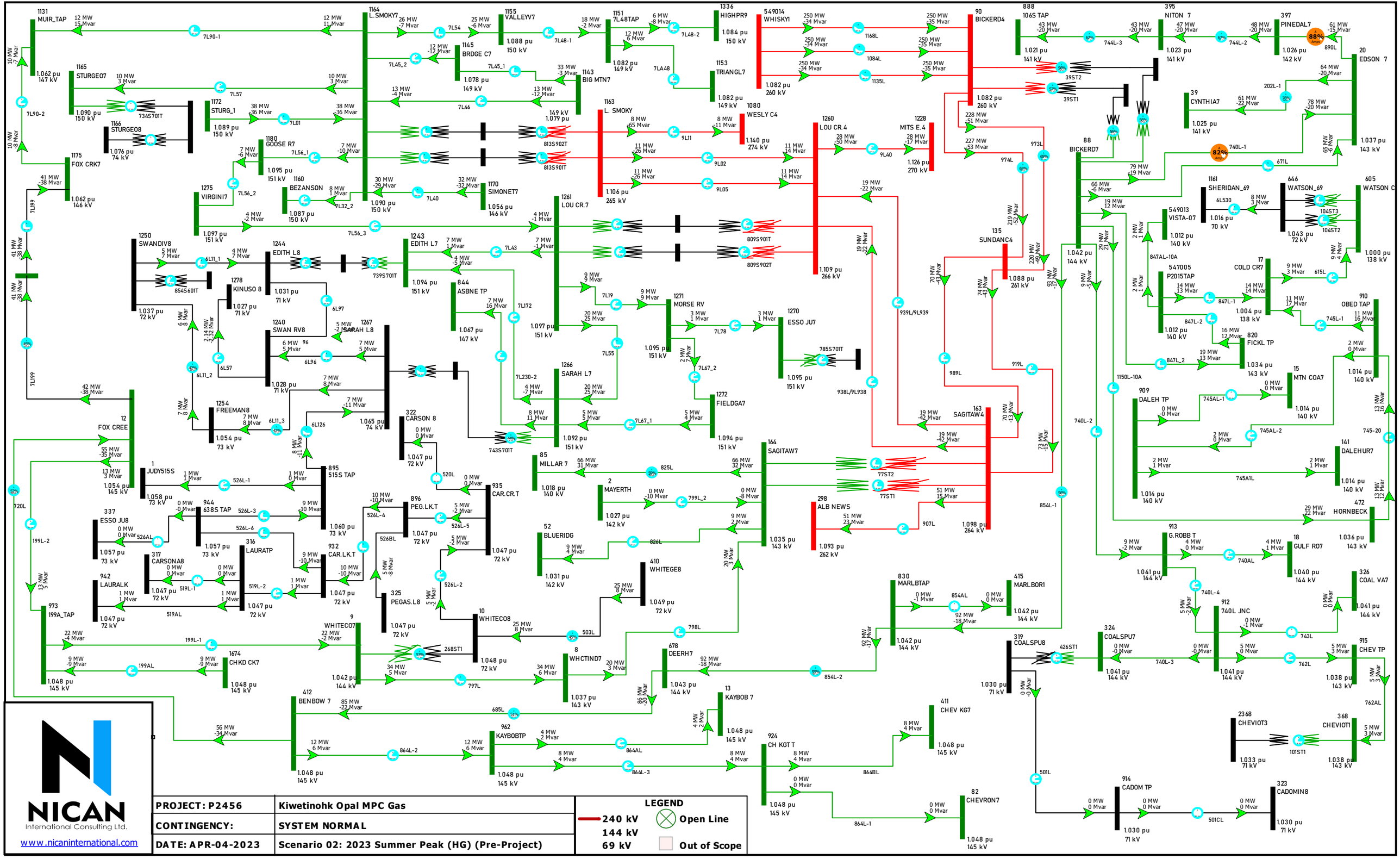
Open Line

Out of Scope

2023 SUMMER PEAK

Single Line Diagrams
P2456 - PRE-PROJECT POWER
FLOW SC02

NICAN


1131 MUIR_TAP
1.062 pu 147 kV
1165 STURGE07
1.090 pu 150 kV
1166 STURGE08
1.076 pu 74 kV
1175 FOX CRK7
1.062 pu 146 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.088 pu 150 kV
1145 BRDGE C7
1.078 pu 149 kV
1143 BIG MTN7
149 kV 1.079 pu
1172 STURG_1
1.089 pu 150 kV
1180 GOOSE R7
1.095 pu 151 kV
1160 BEZANSON
1.087 pu 150 kV
1275 VIRGINI7
1.097 pu 151 kV
1170 SIMONET7
1.056 pu 146 kV
1163 L. SMOKY
1.106 pu 265 kV
1336 HIGHPR9
1.084 pu 150 kV
1151 7L48TAP
1.082 pu 149 kV
1153 TRIANGL7
1.082 pu 149 kV
549014 WHISKY1
1.082 pu 260 kV
1080 WESLY C4
1.140 pu 274 kV
1260 LOU CR.4
1.109 pu 266 kV
1228 MITS E.4
1.126 pu 270 kV
90 BICKERD4
1.082 pu 260 kV
888 106S TAP
1.021 pu 141 kV
395 NITON 7
1.023 pu 141 kV
397 PINEDAL7
1.026 pu 142 kV
20 EDSON 7
1.037 pu 143 kV
39 CYNTHIA7
1.025 pu 141 kV
88 BICKERD7
1.042 pu 144 kV
1261 LOU CR.7
1.097 pu 151 kV
1243 EDITH L7
1.094 pu 151 kV
1244 EDITH L8
1.031 pu 71 kV
1250 SWANDIV8
1.037 pu 72 kV
1278 KINUSO 8
1.027 pu 71 kV
1240 SWAN RV8
1.028 pu 71 kV
1267 SARAH L8
1.065 pu 74 kV
1254 FREEMAN8
1.054 pu 73 kV
322 CARSON 8
1.047 pu 72 kV
844 ASBNE TP
1.067 pu 147 kV
1266 SARAH L7
1.092 pu 151 kV
1271 MORSE RV
1.095 pu 151 kV
1270 ESSO JU7
1.095 pu 151 kV
1272 FIELDGA7
1.094 pu 151 kV
1088 pu 261 kV
135 SUNDANC4
1.088 pu 261 kV
939L/9L939
938L/9L938
989L
919L
163 SAGITAW4
164 SAGITAW7
1.035 pu 143 kV
1.098 pu 264 kV
1.093 pu 262 kV
298 ALB NEWS
85 MILLAR 7
1.018 pu 140 kV
2 MAYERTH
1.027 pu 142 kV
52 BLUERIDG
1.031 pu 142 kV
410 WHITEGE8
1.049 pu 72 kV
10 WHITEC08
1.048 pu 72 kV
8 WHCTIND7
1.037 pu 143 kV
678 DEERH7
1.043 pu 144 kV
9 WHITEC07
1.042 pu 144 kV
412 BENBOW 7
1.048 pu 145 kV
962 KAYBOBTP
1.048 pu 145 kV
13 KAYBOB 7
1.048 pu 145 kV
924 CH KGT T
1.048 pu 145 kV
411 CHEV KG7
1.048 pu 145 kV
82 CHEVRON7
1.048 pu 145 kV
12 FOX CREE
1.054 pu 145 kV
1 JUDY515S
1.058 pu 73 kV
337 ESSO JU8
1.057 pu 73 kV
944 638S TAP
1.057 pu 73 kV
317 CARSONA8
1.047 pu 72 kV
316 LAURATP
1.047 pu 72 kV
942 LAURALK
1.047 pu 72 kV
895 515S TAP
1.060 pu 73 kV
896 PEG.LK.T
1.047 pu 72 kV
935 CAR.CR.T
1.047 pu 72 kV
932 CAR.LK.T
1.047 pu 72 kV
325 PEGAS.L8
1.047 pu 72 kV
973 199A_TAP
1.048 pu 145 kV
1674 CHKD CK7
1.048 pu 145 kV
1336 HIGHPR9
1.084 pu 150 kV
1153 TRIANGL7
1.082 pu 149 kV
1080 WESLY C4
1.140 pu 274 kV
1260 LOU CR.4
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1228 MITS E.4
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90 BICKERD4
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888 106S TAP
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395 NITON 7
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397 PINEDAL7
1.026 pu 142 kV
20 EDSON 7
1.037 pu 143 kV
39 CYNTHIA7
1.025 pu 141 kV
88 BICKERD7
1.042 pu 144 kV
1161 SHERIDAN_69
1.016 pu 70 kV
646 WATSON_69
1.043 pu 72 kV
605 WATSON C
1.000 pu 138 kV
549013 VISTA-07
1.012 pu 140 kV
17 COLD CR7
1.004 pu 138 kV
547005 P2015TAP
1.012 pu 140 kV
910 OBED TAP
1.014 pu 140 kV
820 FICKL TP
1.034 pu 143 kV
15 MTN COA7
1.014 pu 140 kV
909 DALEH TP
1.014 pu 140 kV
141 DALEHUR7
1.014 pu 140 kV
472 HORNBECK
1.036 pu 143 kV
18 GULF RO7
1.040 pu 144 kV
913 G.ROBB T
1.041 pu 144 kV
912 740L JNC
1.041 pu 144 kV
915 CHEV TP
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1.030 pu 71 kV
914 CADOM TP
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323 CADOMIN8
1.030 pu 71 kV
2368 CHEVIOT3
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368 CHEVIOTI
1.038 pu 143 kV
830 MARLBTAP
1.042 pu 144 kV
415 MARLBOR1
1.042 pu 144 kV
7L90-1
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7L99
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7L01
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PROJECT: P2456
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CONTINGENCY:
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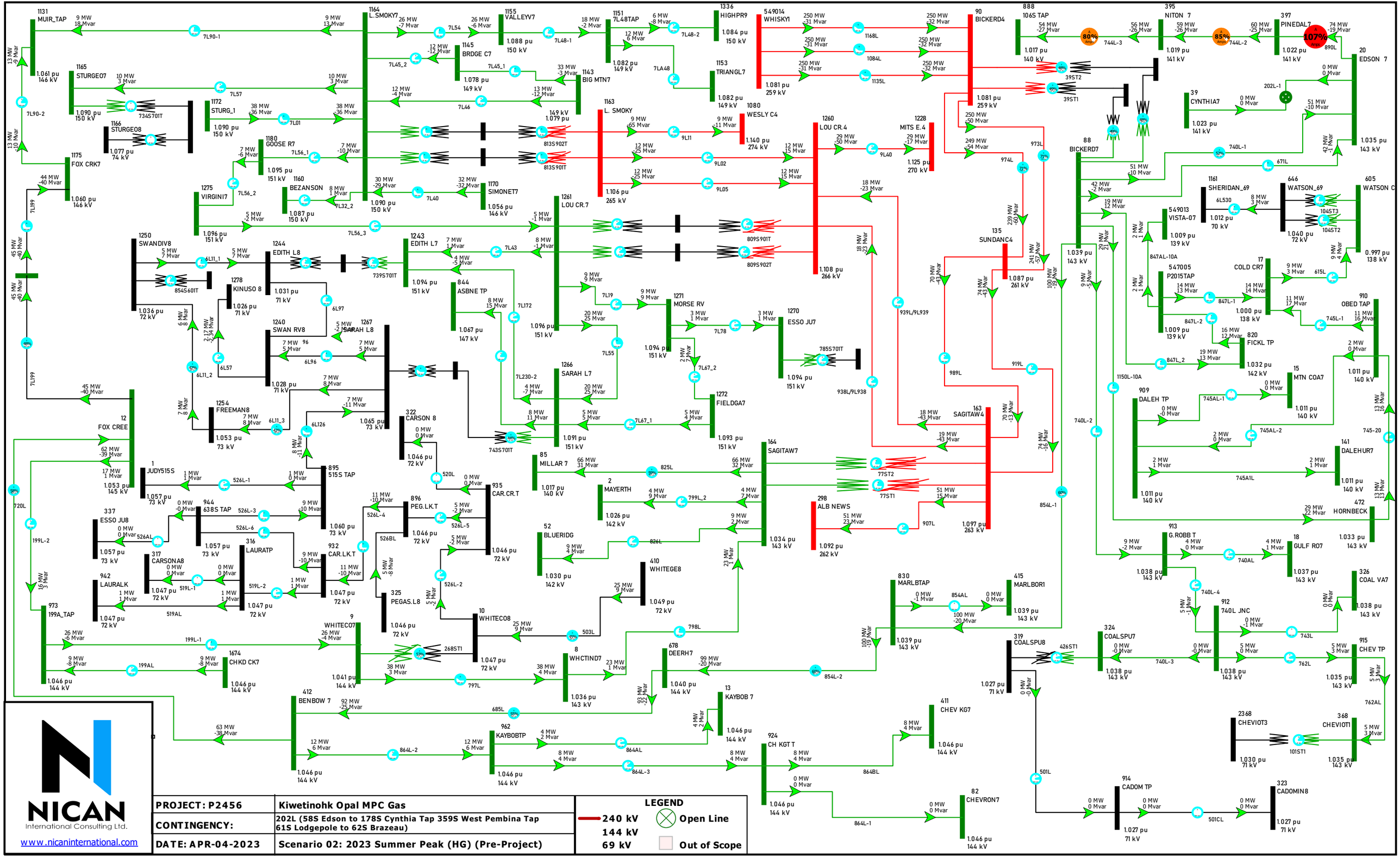
Out of Scope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895 515S TAP
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85 MILLAR 7
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410 WHITEGE8
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1.036 pu 143 kV
678 DEERH7
1.040 pu 144 kV
13 KAYBOB 7
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924 CH KGT T
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164 SAGITAW7
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163 SAGITAW4
1.097 pu 263 kV
298 ALB NEWS
1.092 pu 262 kV
82 CHEVRON7
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411 CHEV KG7
1.046 pu 144 kV
830 MARLBTAP
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415 MARLBOR1
1.039 pu 143 kV
135 SUNDANC4
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324 COALSPU7
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326 COAL VA7
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913 G.ROBB T
1.038 pu 143 kV
18 GULF RO7
1.037 pu 143 kV
472 HORNBECK
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368 CHEVIOTI
1.035 pu 143 kV
915 CHEV TP
1.035 pu 143 kV
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646 WATSON_69
1.040 pu 72 kV
605 WATSON C
0.997 pu 138 kV
547005 P2015TAP
1.000 pu 138 kV
17 COLD CR7
1.009 pu 139 kV
910 OBED TAP
1.011 pu 140 kV
820 FICKL TP
1.032 pu 142 kV
909 DALEH TP
1.011 pu 140 kV
15 MTN COA7
1.011 pu 140 kV
141 DALEHUR7
1.011 pu 140 kV
549013 VISTA-07
1.009 pu 139 kV
80% Amps
85% Amps
107% Amps
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L56_3
7L40
7L32_2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48A
7L11
9L11
9L02
9L05
9L40
809S901T
809S902T
813S902T
813S901T
7L43
7L19
7L55
7L78
7L67_2
7L67_1
7L230-2
7L172
739S701T
743S701T
785S701T
6L11_1
6L11_2
6L11_3
6L97
6L96
6L57
6L126
854S601T
939L/9L939
938L/9L938
989L
919L
1168L
1084L
1135L
77ST2
77ST1
39ST2
39ST1
744L-3
744L-2
890L
202L-1
740L-1
671L
615L
847AL-10A
847L-1
847L-2
847L_2
745L-1
745AL-1
745AL-2
745A1L
1150L-10A
740L-2
854L-1
199L-1
199L-2
199AL
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
720L
685L
797L
798L
799L_2
825L
826L
864L-1
864L-2
864L-3
864AL
864BL
854L-2
503L
268ST1
744L-1
744L-2
744L-3
762L
762AL
745-20
740AL
743L
501L
501CL
101ST1
426ST1
907L
854AL
100 MW -20 Mvar
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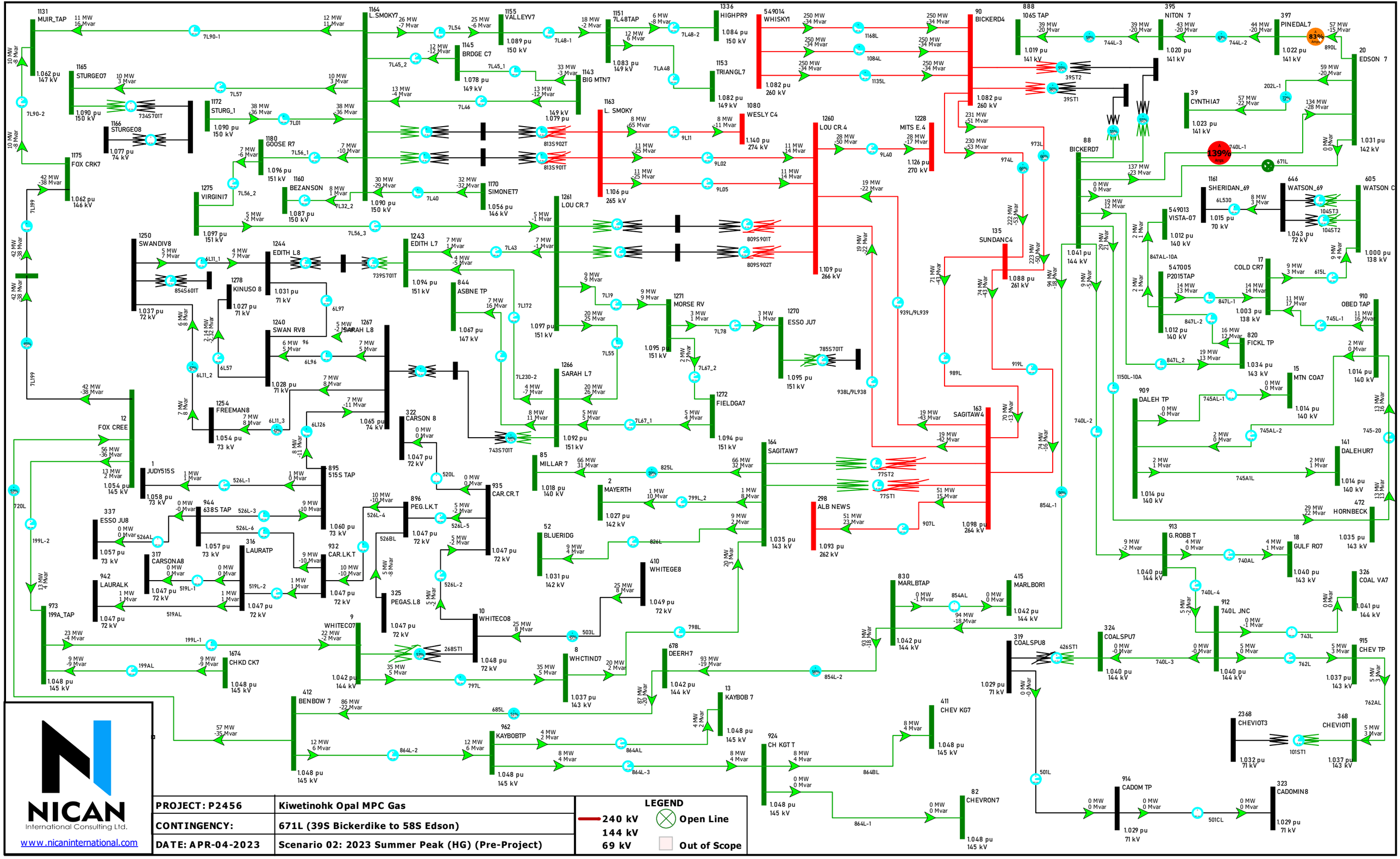
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap
61S Lodgepole to 62S Brazeau)
DATE: APR-04-2023
Scenario 02: 2023 Summer Peak (HG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.062 pu 147 kV
1165 STURGE07
1.090 pu 150 kV
1166 STURGE08
1.077 pu 74 kV
1175 FOX CRK7
1.062 pu 146 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.089 pu 150 kV
1145 BRDGE C7
1.078 pu 149 kV
1143 BIG MTN7
1.079 pu 149 kV
1151 7L48TAP
1.083 pu 149 kV
1336 HIGHPR9
1.084 pu 150 kV
1153 TRIANGL7
1.082 pu 149 kV
549014 WHISKY1
1.082 pu 260 kV
90 BICKERD4
1.082 pu 260 kV
888 106S TAP
1.019 pu 141 kV
395 NITON 7
1.020 pu 141 kV
397 PINEDAL7
1.022 pu 141 kV
20 EDSON 7
1.031 pu 142 kV
39 CYNTHIA7
1.023 pu 141 kV
88 BICKERD7
1.041 pu 144 kV
1172 STURG_1
1.090 pu 150 kV
1180 GOOSE R7
1.096 pu 151 kV
1160 BEZANSON
1.087 pu 150 kV
1170 SIMONET7
1.056 pu 146 kV
1163 L. SMOKY
1.106 pu 265 kV
1080 WESLY C4
1.140 pu 274 kV
1260 LOU CR.4
1.109 pu 266 kV
1228 MITS E.4
1.126 pu 270 kV
1275 VIRGINI7
1.097 pu 151 kV
1261 LOU CR.7
1.097 pu 151 kV
1250 SWANDIV8
1.037 pu 72 kV
1244 EDITH L8
1.031 pu 71 kV
1243 EDITH L7
1.094 pu 151 kV
844 ASBNE TP
1.067 pu 147 kV
1278 KINUSO 8
1.027 pu 71 kV
1240 SWAN RV8
1.028 pu 71 kV
1267 SARAH L8
1.065 pu 74 kV
1266 SARAH L7
1.092 pu 151 kV
1271 MORSE RV
1.095 pu 151 kV
1270 ESSO JU7
1.095 pu 151 kV
1272 FIELDGA7
1.094 pu 151 kV
1254 FREEMAN8
1.054 pu 73 kV
322 CARSON 8
1.047 pu 72 kV
12 FOX CREE
1.054 pu 145 kV
1 JUDY515S
1.058 pu 73 kV
895 515S TAP
1.060 pu 73 kV
896 PEG.LK.T
1.047 pu 72 kV
935 CAR.CR.T
1.047 pu 72 kV
932 CAR.LK.T
1.047 pu 72 kV
325 PEGAS.L8
1.047 pu 72 kV
316 LAURATP
1.047 pu 72 kV
317 CARSONA8
1.047 pu 72 kV
337 ESSO JU8
1.057 pu 73 kV
944 638S TAP
1.057 pu 73 kV
942 LAURALK
1.047 pu 72 kV
973 199A_TAP
1.048 pu 145 kV
1674 CHKD CK7
1.048 pu 145 kV
412 BENBOW 7
1.048 pu 145 kV
962 KAYBOBTP
1.048 pu 145 kV
85 MILLAR 7
1.018 pu 140 kV
2 MAYERTH
1.027 pu 142 kV
52 BLUERIDG
1.031 pu 142 kV
10 WHITECO8
1.048 pu 72 kV
8 WHCTIND7
1.037 pu 143 kV
678 DEERH7
1.042 pu 144 kV
164 SAGITAW7
1.035 pu 143 kV
298 ALB NEWS
1.093 pu 262 kV
163 SAGITAW4
1.098 pu 264 kV
13 KAYBOB 7
1.048 pu 145 kV
924 CH KGT T
1.048 pu 145 kV
411 CHEV KG7
1.048 pu 145 kV
82 CHEVRON7
1.048 pu 145 kV
135 SUNDANC4
1.088 pu 261 kV
830 MARLBTAP
1.042 pu 144 kV
415 MARLBOR1
1.042 pu 144 kV
319 COALSPU8
1.029 pu 71 kV
324 COALSPU7
1.040 pu 144 kV
326 COAL VA7
1.041 pu 144 kV
915 CHEV TP
1.037 pu 143 kV
2368 CHEVIOT3
1.032 pu 71 kV
368 CHEVIOTI
1.037 pu 143 kV
323 CADOMIN8
1.029 pu 71 kV
914 CADOM TP
1.029 pu 71 kV
912 740L JNC
1.040 pu 144 kV
913 G.ROBB T
1.040 pu 144 kV
18 GULF RO7
1.040 pu 143 kV
472 HORNBECK
1.035 pu 143 kV
141 DALEHUR7
1.014 pu 140 kV
15 MTN COA7
1.014 pu 140 kV
909 DALEH TP
1.014 pu 140 kV
820 FICKL TP
1.034 pu 143 kV
910 OBED TAP
1.014 pu 140 kV
17 COLD CR7
1.003 pu 138 kV
1161 SHERIDAN_69
1.015 pu 70 kV
646 WATSON_69
1.043 pu 72 kV
605 WATSON C
1.000 pu 138 kV
547005 P2015TAP
1.012 pu 140 kV
549013 VISTA-07
1.012 pu 140 kV
671L
83%
139%
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L56_3
7L40
7L32_2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48A
7L199
7L11_1
7L11_2
7L11_3
7L57
7L96
7L97
6L126
739S701T
743S701T
7L43
7L172
7L19
7L55
7L78
7L67_2
7L67_1
7L230-2
785S701T
938L/9L938
939L/9L939
809S901T
809S902T
813S902T
813S901T
9L11
9L02
9L05
9L40
1168L
1084L
1135L
77ST2
77ST1
39ST2
39ST1
744L-3
744L-2
890L
202L-1
740L-1
973L
974L
989L
919L
1150L-10A
740L-2
854L-1
745AL-1
745AL-2
745A1L
745-20
847AL-10A
847L-1
847L-2
847L_2
615L
762L
762AL
743L
740L-4
740L-3
501L
501CL
101ST1
426ST1
268ST1
199L-1
199L-2
199AL
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
720L
685L
797L
798L
799L_2
825L
826L
854AL
864L-1
864L-2
864L-3
864AL
864BL
503L
907L
6L530
6L56
6L530
104ST3
104ST2
854S601T
855S701T
734S701T
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 02: 2023 Summer Peak (HG) (Pre-Project)
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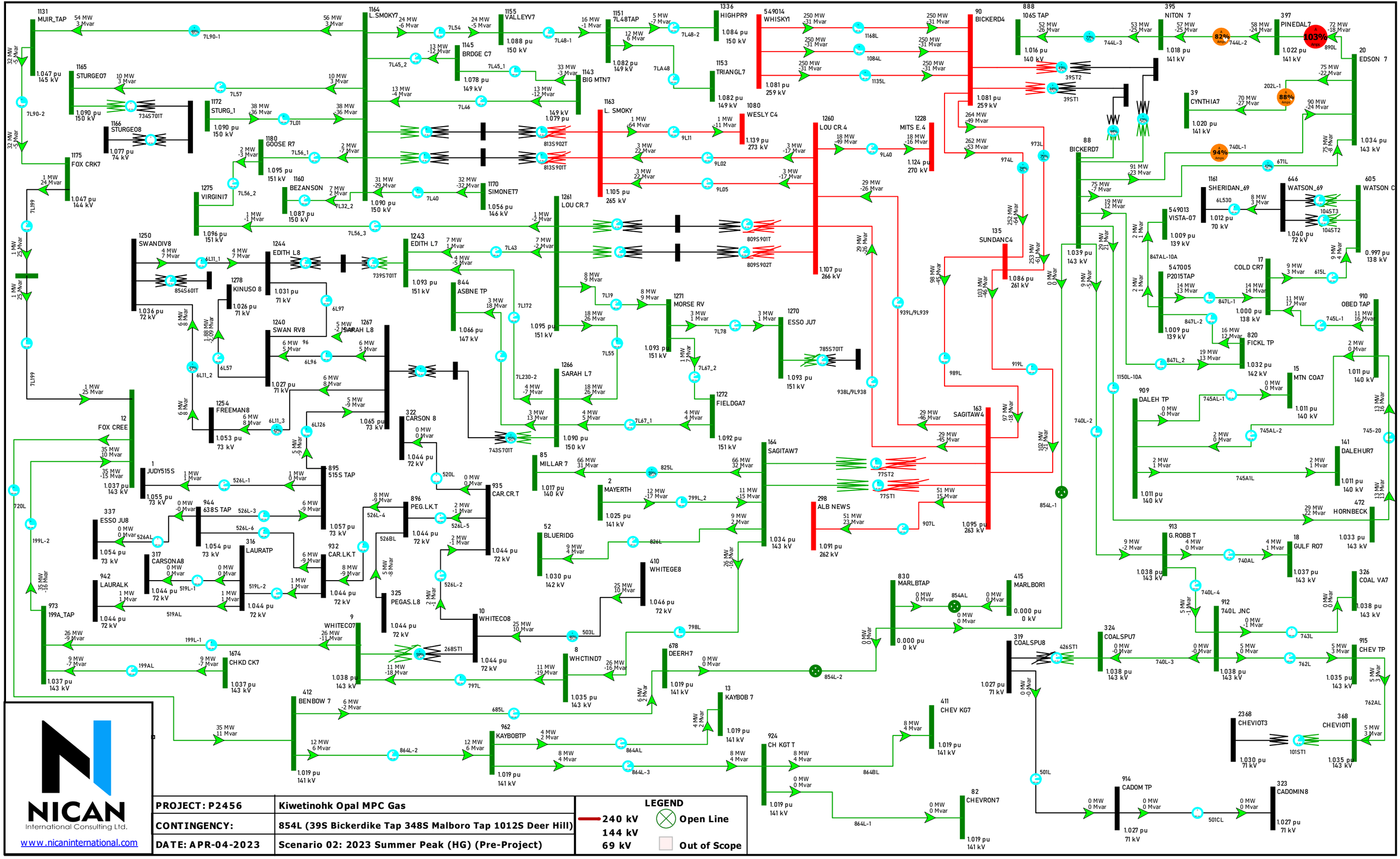

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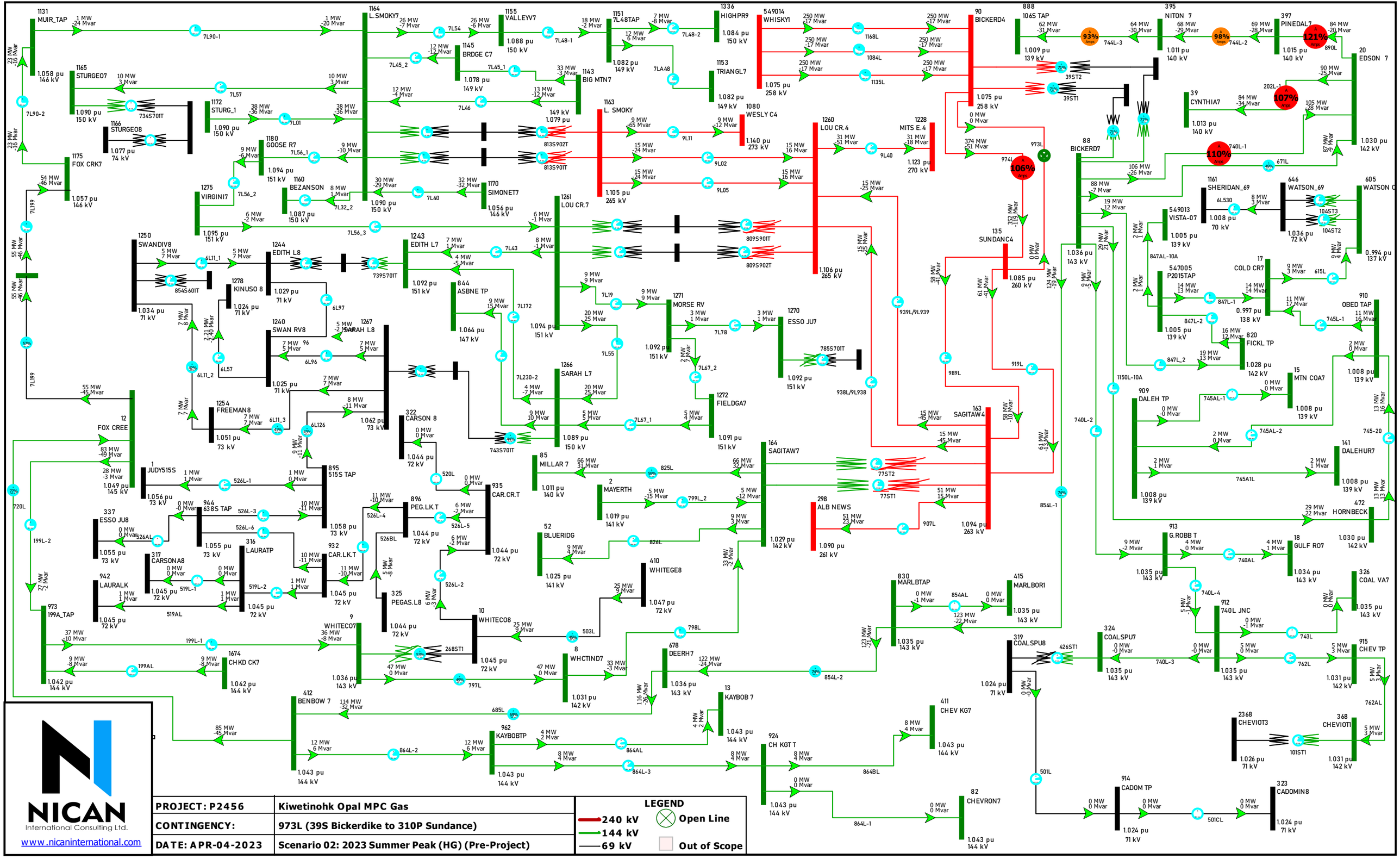
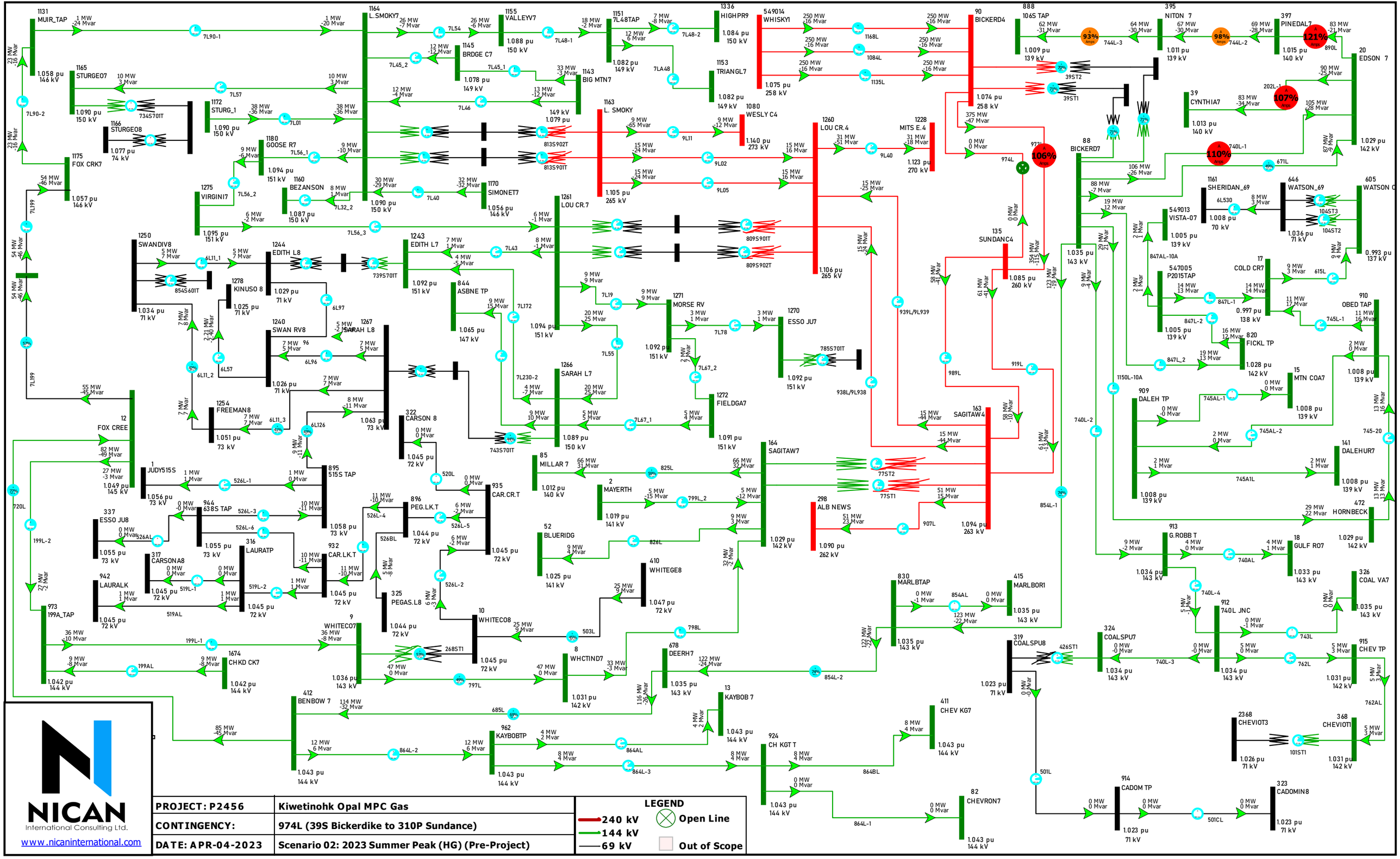
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
DATE: APR-04-2023	Scenario 02: 2023 Summer Peak (HG) (Pre-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1164 L.SMOKY7
1155 VALLEYV7
1151 7L48TAP
1336 HIGHPR9
549014 WHISKY1
90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
1165 STURGEO7
1172 STURG_1
1166 STURGEO8
1145 BRDGE C7
1143 BIG MTN7
1153 TRIANGL7
1080 WESLY C4
1163 L. SMOKY
1260 LOU CR.4
1228 MITS E.4
39 CYNTHIA7
202L-1
1175 FOX CRK7
1180 GOOSE R7
1160 BEZANSON
1170 SIMONET7
1275 VIRGINI7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
549013 VISTA-07
847AL-10A
547005 P2015TAP
17 COLD CR7
910 OBED TAP
820 FICKL TP
1250 SWANDIV8
1244 EDITH L8
1243 EDITH L7
1261 LOU CR.7
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
844 ASBNE TP
1271 MORSE RV
1270 ESSO JU7
1266 SARAH L7
1272 FIELDGA7
322 CARSON 8
1254 FREEMAN8
12 FOX CREE
1 JUDY515S
895 515S TAP
944 638S TAP
337 ESSO JU8
317 CARSONA8
316 LAURATP
942 LAURALK
932 CAR.LK.T
896 PEG.LK.T
935 CAR.CR.T
325 PEGAS.L8
10 WHITEC08
9 WHITEC07
973 199A_TAP
1674 CHKD CK7
412 BENBOW 7
962 KAYBOBTP
85 MILLAR 7
2 MAYERTH
52 BLUERIDG
410 WHITEGE8
164 SAGITAW7
163 SAGITAW4
298 ALB NEWS
924 CH KGT T
411 CHEV KG7
82 CHEVRON7
13 KAYBOB 7
678 DEERH7
8 WHCTIND7
319 COALSPU8
324 COALSPU7
912 740L JNC
915 CHEV TP
914 CADOM TP
323 CADOMIN8
2368 CHEVIOT3
368 CHEVIOTI
909 DALEH TP
15 MTN COA7
141 DALEHUR7
472 HORNBECK
913 G.ROBB T
18 GULF RO7
830 MARLBTAP
415 MARLBOR1
135 SUNDANC4
1150L-10A
740L-2
745AL-1
745AL-2
745A1L
740L-1
740L-3
740L-4
847L-1
847L-2
847L_2
7L90-1
7L90-2
7L199
7L54
7L45_2
7L45_1
7L48-1
7L48-2
7L48A
7L57
7L46
7L01
7L56_1
7L56_2
7L32_2
7L40
7L56_3
7L43
7L19
7L55
7L172
7L78
7L67_2
7L67_1
7L230-2
6L11_1
6L11_2
6L11_3
6L57
6L96
6L97
6L126
739S701T
743S701T
854S601T
813S902T
813S901T
809S901T
809S902T
785S701T
938L/9L938
939L/9L939
989L
919L
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
973L
974L
671L
6L530
104ST3
104ST2
615L
762L
743L
501L
501CL
101ST1
426ST1
268ST1
797L
685L
798L
503L
864L-1
864L-2
864L-3
864AL
864BL
854L-1
854L-2
907L
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
519L-1
519L-2
519AL
199L-1
199L-2
199AL
720L
740AL
1.058 pu 146 kV
1.090 pu 150 kV
1.077 pu 74 kV
1.057 pu 146 kV
1.090 pu 150 kV
1.078 pu 149 kV
1.082 pu 149 kV
1.075 pu 258 kV
1.079 pu 149 kV
1.105 pu 265 kV
1.140 pu 273 kV
1.106 pu 265 kV
1.123 pu 270 kV
1.085 pu 260 kV
1.009 pu 139 kV
1.011 pu 140 kV
1.015 pu 140 kV
1.013 pu 140 kV
1.030 pu 142 kV
1.087 pu 150 kV
1.056 pu 146 kV
1.095 pu 151 kV
1.090 pu 150 kV
1.036 pu 143 kV
1.008 pu 70 kV
1.005 pu 139 kV
1.036 pu 72 kV
0.994 pu 137 kV
0.997 pu 138 kV
1.005 pu 139 kV
1.028 pu 142 kV
1.008 pu 139 kV
1.034 pu 71 kV
1.024 pu 71 kV
1.029 pu 71 kV
1.092 pu 151 kV
1.064 pu 147 kV
1.094 pu 151 kV
1.092 pu 151 kV
1.089 pu 150 kV
1.091 pu 151 kV
1.092 pu 151 kV
1.062 pu 73 kV
1.051 pu 73 kV
1.044 pu 72 kV
1.056 pu 73 kV
1.049 pu 145 kV
1.055 pu 73 kV
1.055 pu 73 kV
1.045 pu 72 kV
1.045 pu 72 kV
1.045 pu 72 kV
1.044 pu 72 kV
1.044 pu 72 kV
1.044 pu 72 kV
1.045 pu 72 kV
1.036 pu 143 kV
1.042 pu 144 kV
1.043 pu 144 kV
1.011 pu 140 kV
1.019 pu 141 kV
1.025 pu 141 kV
1.047 pu 72 kV
1.029 pu 142 kV
1.090 pu 261 kV
1.094 pu 263 kV
1.043 pu 144 kV
1.043 pu 144 kV
1.043 pu 144 kV
1.036 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.024 pu 71 kV
1.026 pu 71 kV
1.031 pu 142 kV
1.024 pu 71 kV
1.008 pu 139 kV
1.035 pu 143 kV
1.034 pu 143 kV
1.031 pu 142 kV
93% Amps
98% Amps
121% Amps
107% Amps
110% Amps
106% Amps
NICAN
International Consulting Ltd.
www.nicaninternational.com
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 02: 2023 Summer Peak (HG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1164 L.SMOKY7
1155 VALLEYV7
1151 7L48TAP
1336 HIGHPR9
549014 WHISKY1
90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
1165 STURGEO7
1166 STURGEO8
1172 STURG_1
1145 BRDGE C7
1143 BIG MTN7
1153 TRIANGL7
1080 WESLY C4
1163 L. SMOKY
1260 LOU CR.4
1228 MITS E.4
39 CYNTHIA7
1175 FOX CRK7
1180 GOOSE R7
1160 BEZANSON
1170 SIMONET7
1275 VIRGINI7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
1261 LOU CR.7
1250 SWANDIV8
1244 EDITH L8
1243 EDITH L7
549013 VISTA-07
135 SUNDANC4
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
844 ASBNE TP
1271 MORSE RV
1270 ESSO JU7
17 COLD CR7
547005 P2015TAP
910 OBED TAP
820 FICKL TP
1266 SARAH L7
1272 FIELDGA7
1254 FREEMAN8
322 CARSON 8
12 FOX CREE
1 JUDY515S
895 515S TAP
85 MILLAR 7
2 MAYERTH
164 SAGITAW7
163 SAGITAW4
298 ALB NEWS
15 MTN COA7
909 DALEH TP
141 DALEHUR7
472 HORNBECK
913 G.ROBB T
18 GULF RO7
337 ESSO JU8
316 LAURATP
317 CARSONA8
942 LAURALK
973 199A_TAP
932 CAR.LK.T
896 PEG.LK.T
935 CAR.CR.T
325 PEGAS.L8
52 BLUERIDG
410 WHITEGE8
10 WHITECO8
9 WHITECO7
1674 CHKD CK7
412 BENBOW 7
962 KAYBOBTP
13 KAYBOB 7
678 DEERH7
8 WHCTIND7
830 MARLBTAP
415 MARLBOR1
912 740L JNC
326 COAL VA7
319 COALSPU8
324 COALSPU7
915 CHEV TP
411 CHEV KG7
924 CH KGT T
82 CHEVRON7
914 CADOM TP
323 CADOMIN8
2368 CHEVIOT3
368 CHEVIOT
1150L-10A
847AL-10A
740L-1
740L-2
745L-1
745AL-1
745AL-2
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740L-3
740L-4
740AL
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854L-2
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7L90-2
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199L-1
199L-2
199AL
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7L48-2
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7L56_2
7L56_3
7L32_2
7L40
9L11
9L02
9L05
9L40
7L43
7L19
7L55
7L172
7L78
7L67_2
7L67_1
7L230-2
6L11_1
6L11_2
6L11_3
6L57
6L96
6L97
6L126
739S701T
743S701T
785S701T
854S601T
734S701T
813S902T
813S901T
809S901T
809S902T
939L/9L939
938L/9L938
989L
919L
77ST2
77ST1
39ST2
39ST1
104ST3
104ST2
101ST1
426ST1
268ST1
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
720L
671L
615L
530L
526AL
854AL
864L-1
864L-2
864L-3
864AL
864BL
825L
826L
798L
797L
799L_2
685L
503L
907L
501L
501CL
762L
762AL
745-20
745L-20
890L
202L-1
744L-2
744L-3
1.058 pu 146 kV
1.090 pu 150 kV
1.077 pu 74 kV
1.057 pu 146 kV
1.094 pu 151 kV
1.087 pu 150 kV
1.095 pu 151 kV
1.090 pu 150 kV
1.056 pu 145 kV
1.079 pu 149 kV
1.078 pu 149 kV
1.082 pu 149 kV
1.105 pu 265 kV
1.140 pu 273 kV
1.106 pu 265 kV
1.123 pu 270 kV
1.075 pu 258 kV
1.074 pu 258 kV
1.085 pu 260 kV
1.009 pu 139 kV
1.011 pu 139 kV
1.015 pu 140 kV
1.013 pu 140 kV
1.029 pu 142 kV
1.035 pu 143 kV
1.008 pu 70 kV
1.005 pu 139 kV
1.036 pu 71 kV
0.993 pu 137 kV
0.997 pu 138 kV
1.028 pu 142 kV
1.008 pu 139 kV
1.034 pu 71 kV
1.092 pu 151 kV
1.029 pu 142 kV
1.033 pu 143 kV
1.034 pu 143 kV
1.031 pu 142 kV
1.026 pu 71 kV
1.023 pu 71 kV
1.034 pu 143 kV
1.035 pu 143 kV
1.042 pu 144 kV
1.043 pu 144 kV
1.044 pu 72 kV
1.045 pu 72 kV
1.046 pu 73 kV
1.051 pu 73 kV
1.055 pu 73 kV
1.056 pu 73 kV
1.063 pu 73 kV
1.065 pu 147 kV
1.094 pu 151 kV
1.089 pu 150 kV
1.091 pu 151 kV
1.012 pu 140 kV
1.019 pu 141 kV
1.025 pu 141 kV
1.047 pu 72 kV
1.090 pu 262 kV
1.094 pu 263 kV
1.045 pu 72 kV
1.026 pu 71 kV
1.023 pu 71 kV
1.031 pu 142 kV
1.034 pu 143 kV
1.035 pu 143 kV
1.042 pu 144 kV
1.043 pu 144 kV
1.044 pu 72 kV
1.045 pu 72 kV
1.046 pu 73 kV
1.051 pu 73 kV
1.055 pu 73 kV
1.056 pu 73 kV
1.063 pu 73 kV
1.065 pu 147 kV
1.094 pu 151 kV
1.089 pu 150 kV
1.091 pu 151 kV
1.012 pu 140 kV
1.019 pu 141 kV
1.025 pu 141 kV
1.047 pu 72 kV
1.090 pu 262 kV
1.094 pu 263 kV
1.045 pu 72 kV
1.026 pu 71 kV
1.023 pu 71 kV
1.031 pu 142 kV
1.034 pu 143 kV
1.035 pu 143 kV
1.042 pu 144 kV
1.043 pu 144 kV
1.044 pu 72 kV
1.045 pu 72 kV
93% Amps
98% Amps
121% Amps
107% Amps
110% Amps
106% Amps
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 02: 2023 Summer Peak (HG) (Pre-Project)
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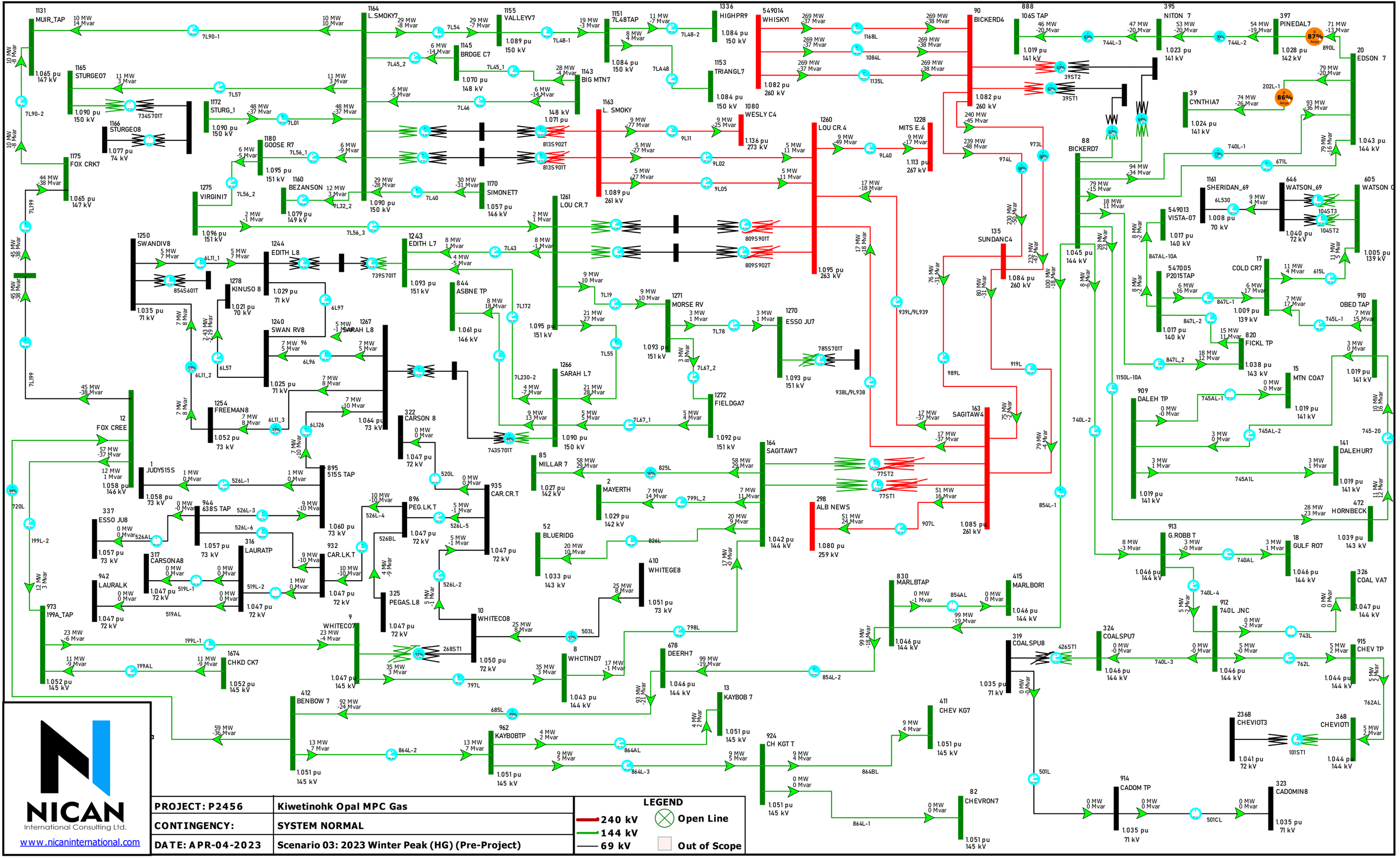
2023 WINTER PEAK

Single Line Diagrams
P2456 - PRE-PROJECT POWER
FLOW SC03

NICAN



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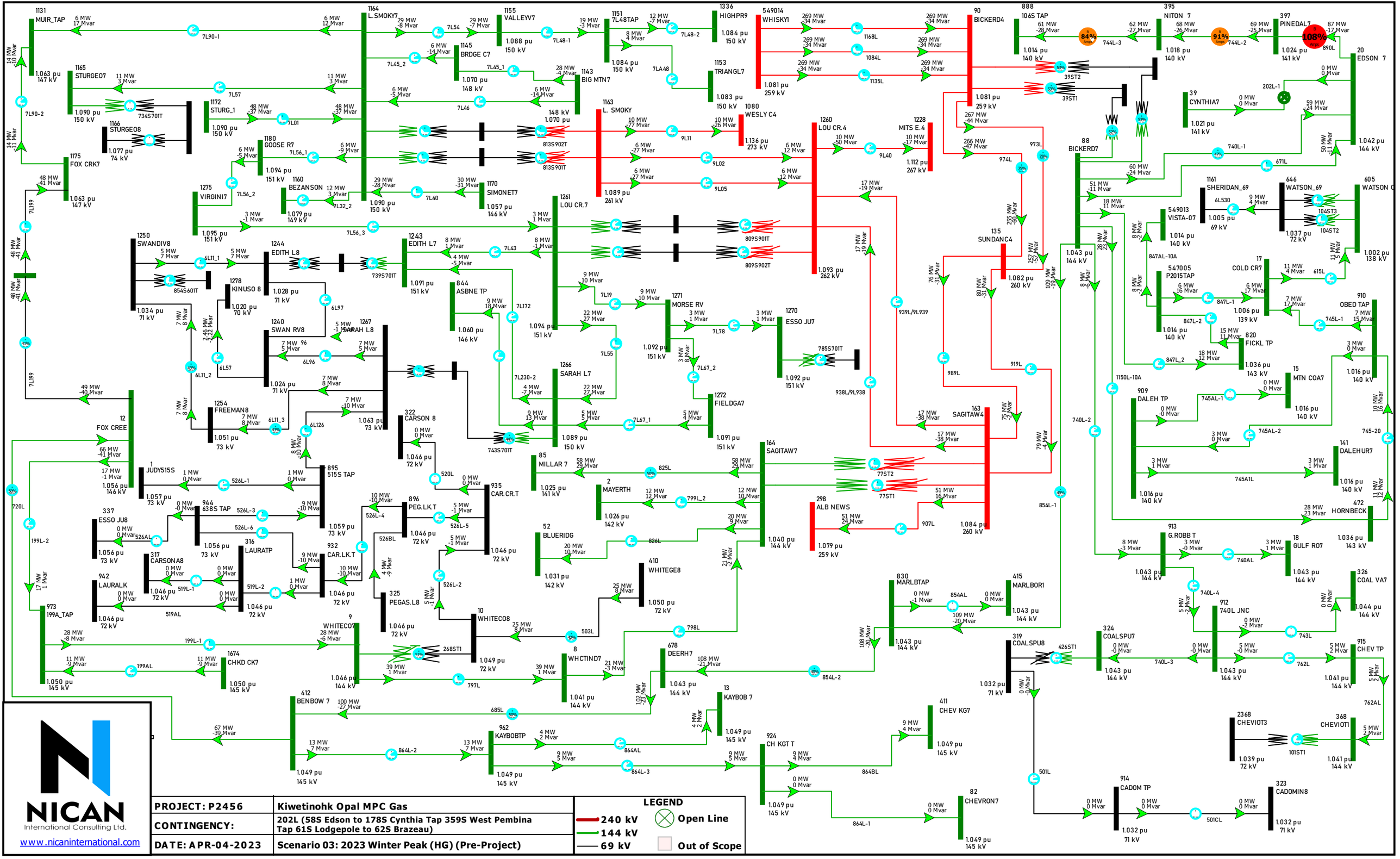
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 03: 2023 Winter Peak (HG) (Pre-Project)



PROJECT: P2456 | **Kiwetinohk Opal MPC Gas**

CONTINGENCY: | **202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**

DATE: APR-04-2023 | **Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

- 🟥 **240 kV**
- 🟩 **144 kV**
- **69 kV**
- ⊗ **Open Line**
- ☐ **Out of Scope**

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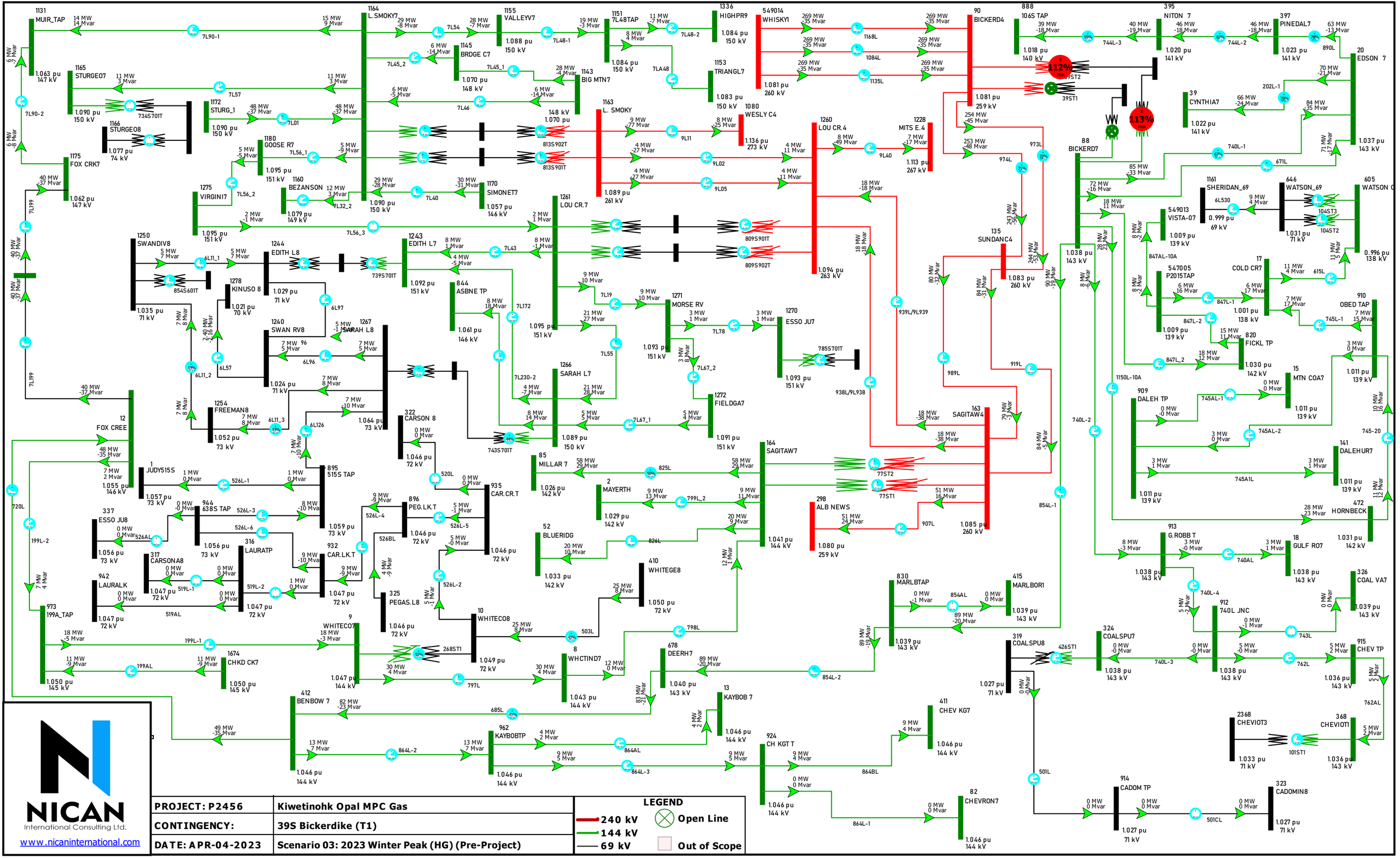

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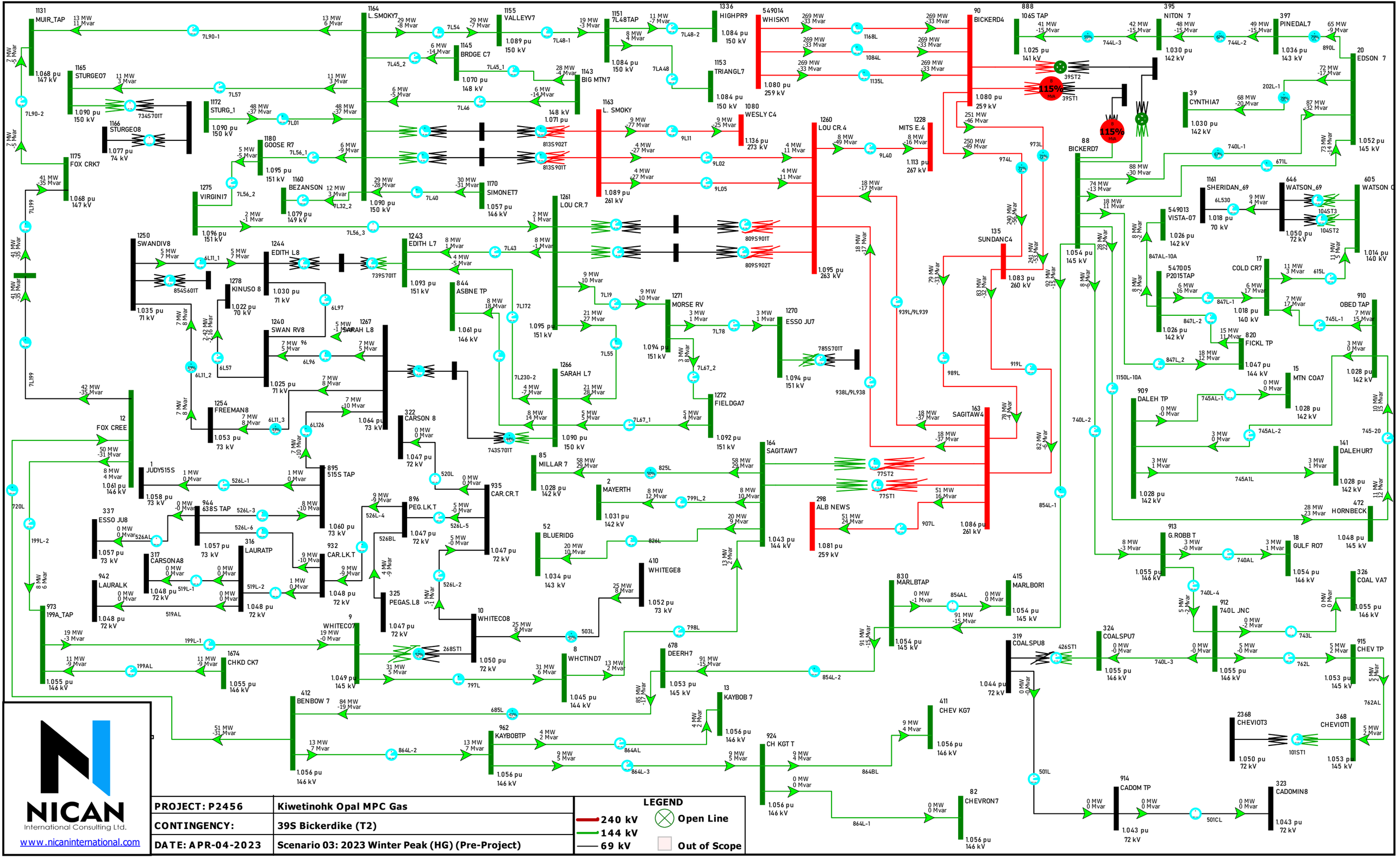
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**39S Bickerdike (T1)**
DATE: APR-04-2023	**Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

240 kV	⊗ Open Line
144 kV	☐ Out of Scope
69 kV	



PROJECT: P2456 | **Kiwetinohk Opal MPC Gas**

CONTINGENCY: | **39S Bickerdike (T2)**

DATE: APR-04-2023 | **Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

🟥 **240 kV**
🟩 **144 kV**
— **69 kV**
⊗ **Open Line**
☐ **Out of Scope**

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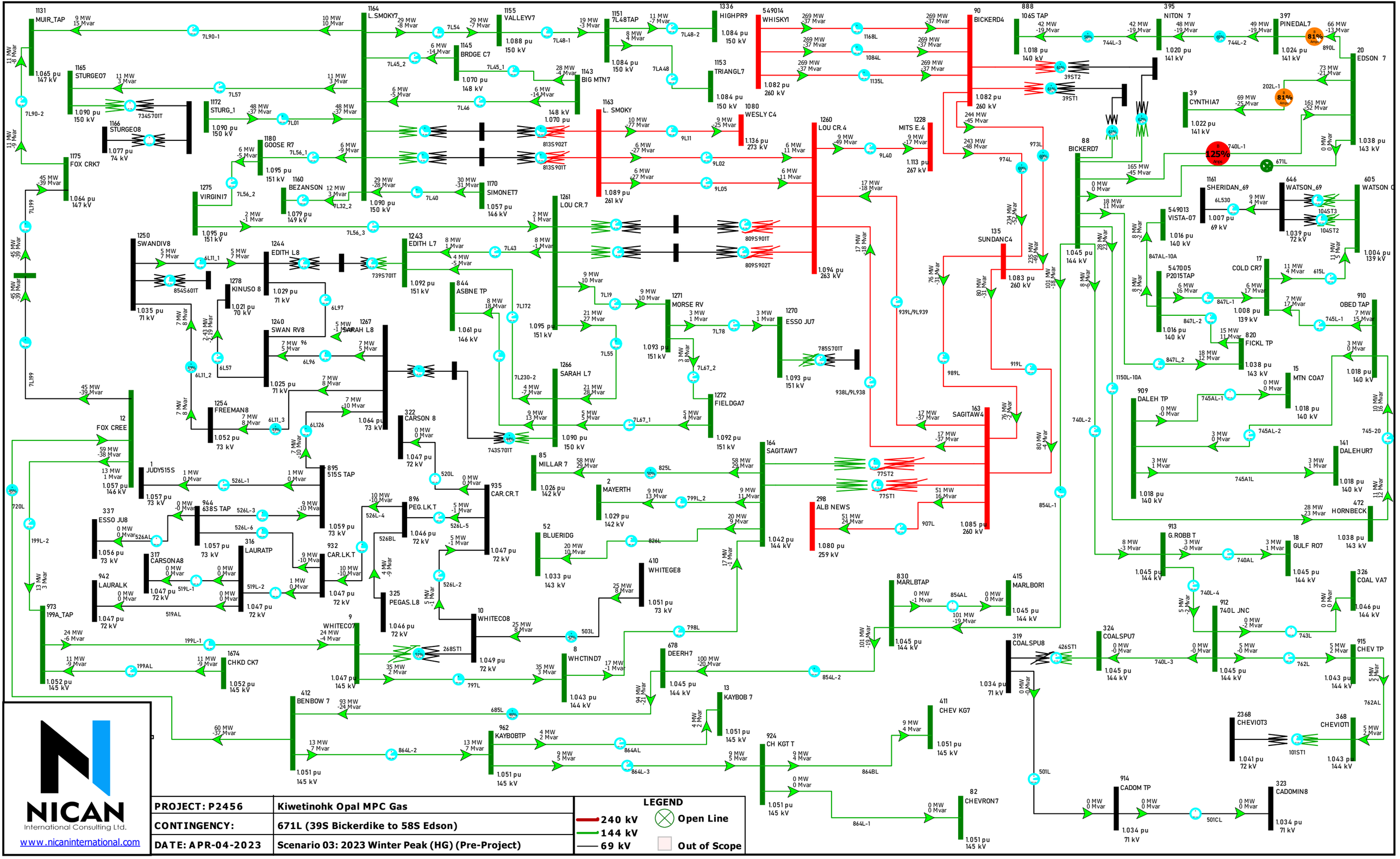

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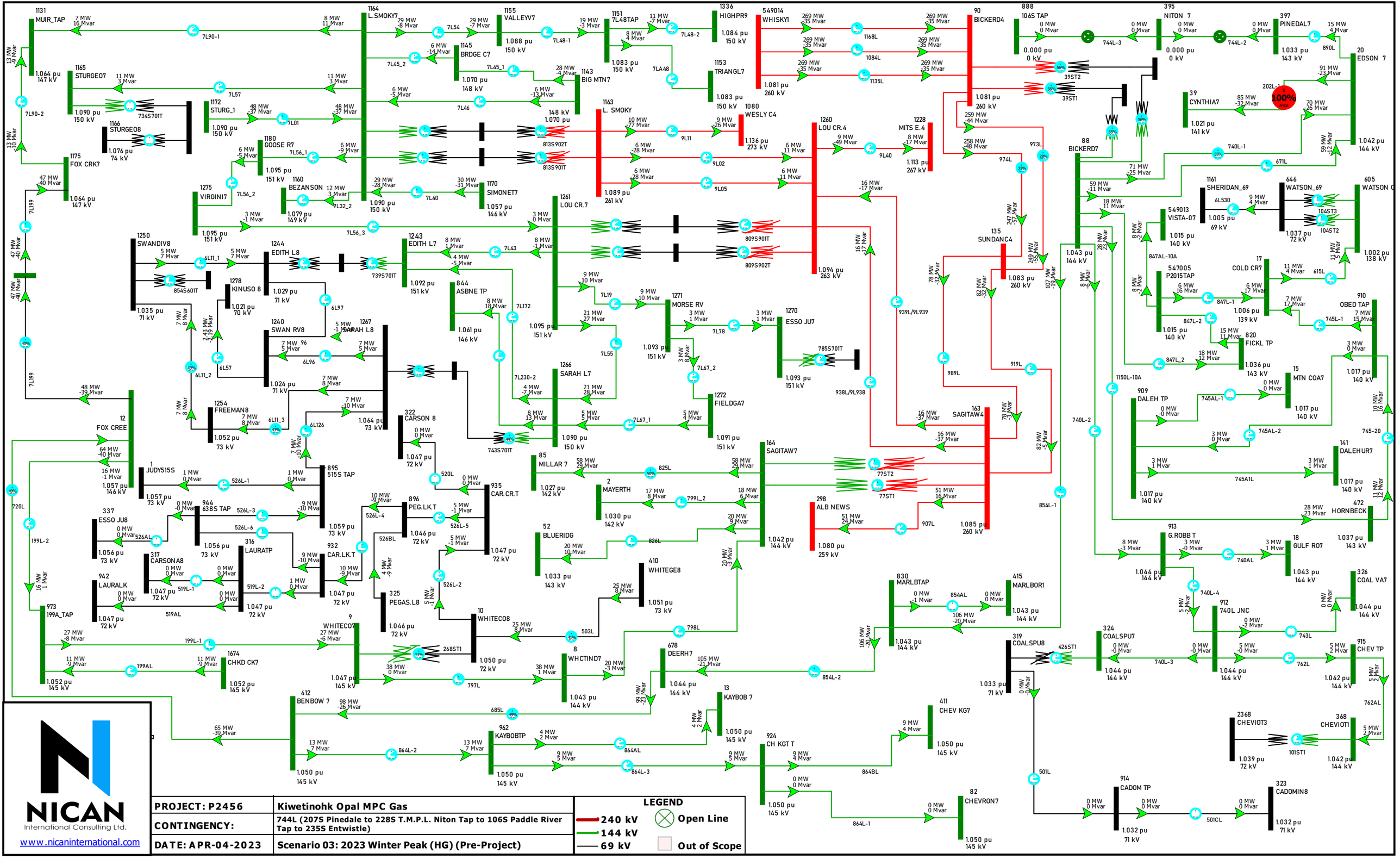
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023	Scenario 03: 2023 Winter Peak (HG) (Pre-Project)

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



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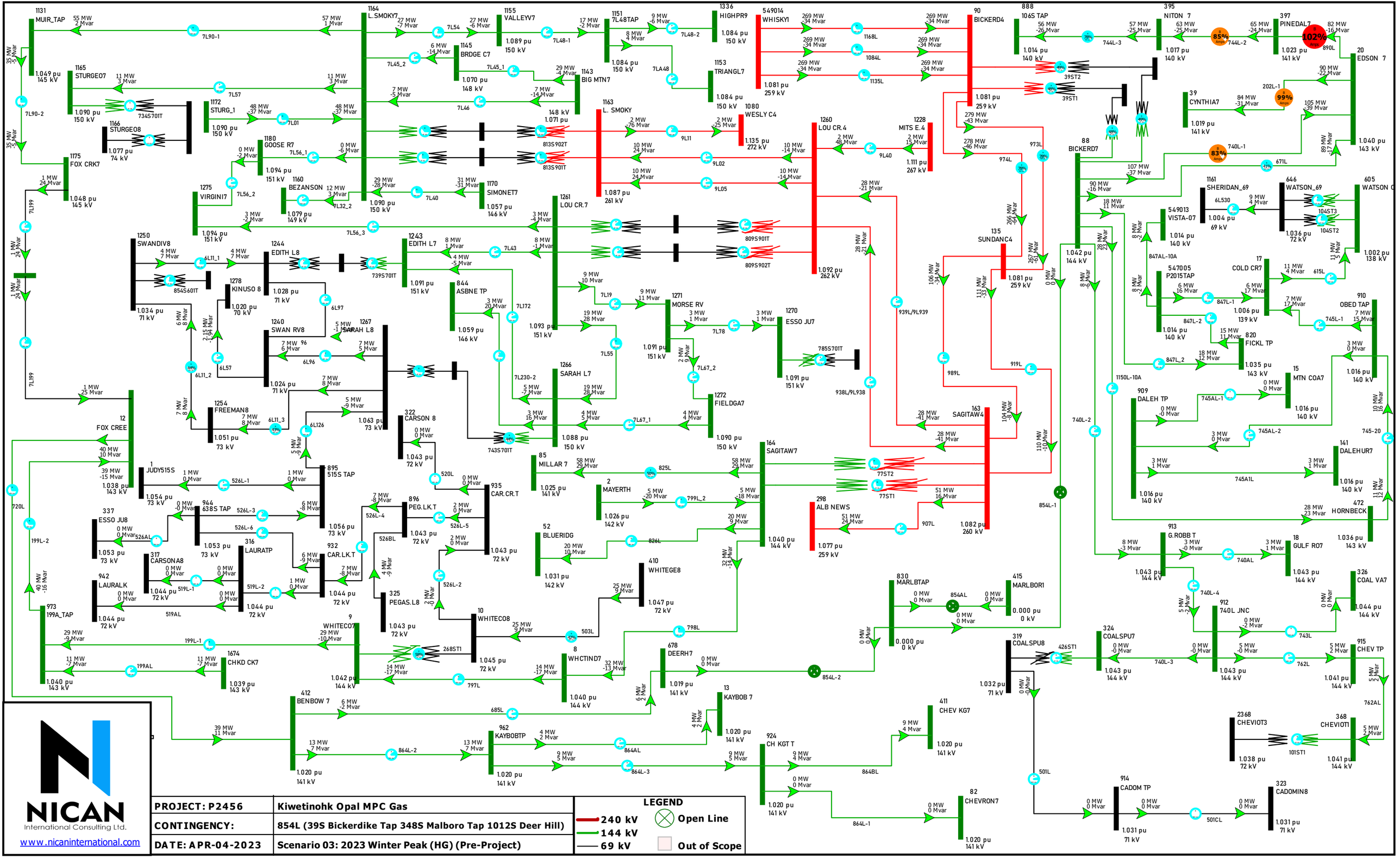
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)
DATE: APR-04-2023	Scenario 03: 2023 Winter Peak (HG) (Pre-Project)


1131 MUIR_TAP
1049 pu 145 kV
1165 STURGEO7
1090 pu 150 kV
1166 STURGEO8
1077 pu 74 kV
1175 FOX CRK7
1048 pu 145 kV
1164 L.SMOKY7
1090 pu 150 kV
1155 VALLEYV7
1089 pu 150 kV
1145 BRDGE C7
1070 pu 148 kV
1143 BIG MTN7
1151 7L48TAP
1084 pu 150 kV
1336 HIGHPR9
1084 pu 150 kV
1153 TRIANGL7
1084 pu 150 kV
549014 WHISKY1
1081 pu 259 kV
1172 STURG_1
1090 pu 150 kV
1180 GOOSE R7
1094 pu 151 kV
1160 BEZANSON
1079 pu 149 kV
1275 VIRGINI7
1094 pu 151 kV
1163 L. SMOKY
1087 pu 261 kV
1080 WESLY C4
1135 pu 272 kV
1260 LOU CR.4
1092 pu 262 kV
1228 MITS E.4
1111 pu 267 kV
1170 SIMONET7
1057 pu 146 kV
1261 LOU CR.7
1093 pu 151 kV
1250 SWANDIV8
1034 pu 71 kV
1244 EDITH L8
1028 pu 71 kV
1278 KINUSO 8
1020 pu 70 kV
1243 EDITH L7
1091 pu 151 kV
844 ASBNE TP
1059 pu 146 kV
1240 SWAN RV8
1024 pu 71 kV
1267 SARAH L8
1063 pu 73 kV
1254 FREEMAN8
1051 pu 73 kV
322 CARSON 8
1043 pu 72 kV
1266 SARAH L7
1088 pu 150 kV
1271 MORSE RV
1091 pu 151 kV
1270 ESSO JU7
1091 pu 151 kV
1272 FIELDGA7
1090 pu 150 kV
85 MILLAR 7
1025 pu 141 kV
2 MAYERTH
1026 pu 142 kV
52 BLUERIDG
1031 pu 142 kV
410 WHITEGE8
1047 pu 72 kV
10 WHITEC08
1045 pu 72 kV
9 WHITEC07
1042 pu 144 kV
8 WHCTIND7
1040 pu 144 kV
678 DEERH7
1019 pu 141 kV
164 SAGITAW7
1040 pu 144 kV
163 SAGITAW4
1082 pu 260 kV
298 ALB NEWS
1077 pu 259 kV
90 BICKERD4
1081 pu 259 kV
135 SUNDANC4
1081 pu 259 kV
1042 pu 144 kV
88 BICKERD7
888 106S TAP
1014 pu 140 kV
395 NITON 7
1017 pu 140 kV
397 PINEDAL7
1023 pu 141 kV
20 EDSON 7
1040 pu 143 kV
39 CYNTHIA7
1019 pu 141 kV
1161 SHERIDAN_69
1004 pu 69 kV
646 WATSON_69
1036 pu 72 kV
605 WATSON C
1002 pu 138 kV
549013 VISTA-07
1014 pu 140 kV
547005 P2015TAP
1014 pu 140 kV
17 COLD CR7
1006 pu 139 kV
910 OBED TAP
1016 pu 140 kV
820 FICKL TP
1035 pu 143 kV
15 MTN COA7
1016 pu 140 kV
909 DALEH TP
1016 pu 140 kV
141 DALEHUR7
1016 pu 140 kV
472 HORNBECK
1036 pu 143 kV
913 G.ROBB T
1043 pu 144 kV
18 GULF RO7
1043 pu 144 kV
326 COAL VA7
1044 pu 144 kV
912 740L JNC
1043 pu 144 kV
915 CHEV TP
1041 pu 144 kV
324 COALSPU7
1043 pu 144 kV
319 COALSPU8
1032 pu 71 kV
2368 CHEVIOT3
1038 pu 72 kV
368 CHEVIOTI
1041 pu 144 kV
914 CADOM TP
1031 pu 71 kV
323 CADOMIN8
1031 pu 71 kV
82 CHEVRON7
1020 pu 141 kV
411 CHEV KG7
1020 pu 141 kV
924 CH KGT T
1020 pu 141 kV
13 KAYBOB 7
1020 pu 141 kV
962 KAYBOBTP
1020 pu 141 kV
412 BENBOW 7
1020 pu 141 kV
1674 CHKD CK7
1039 pu 143 kV
1 JUDY515S
1054 pu 73 kV
1038 pu 143 kV
337 ESSO JU8
1053 pu 73 kV
944 638S TAP
1053 pu 73 kV
316 LAURATP
1044 pu 72 kV
317 CARSONA8
1044 pu 72 kV
942 LAURALK
1044 pu 72 kV
973 199A_TAP
1040 pu 143 kV
12 FOX CREE
1038 pu 143 kV
895 515S TAP
1056 pu 73 kV
896 PEG.LK.T
1043 pu 72 kV
935 CAR.CR.T
1043 pu 72 kV
932 CAR.LK.T
1044 pu 72 kV
325 PEGAS.L8
1043 pu 72 kV
830 MARLBTAP
0.000 pu 0 kV
415 MARLBOR1
0.000 pu 0 kV
102%
85%
99%
83%
Amps
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
DATE: APR-04-2023
Scenario 03: 2023 Winter Peak (HG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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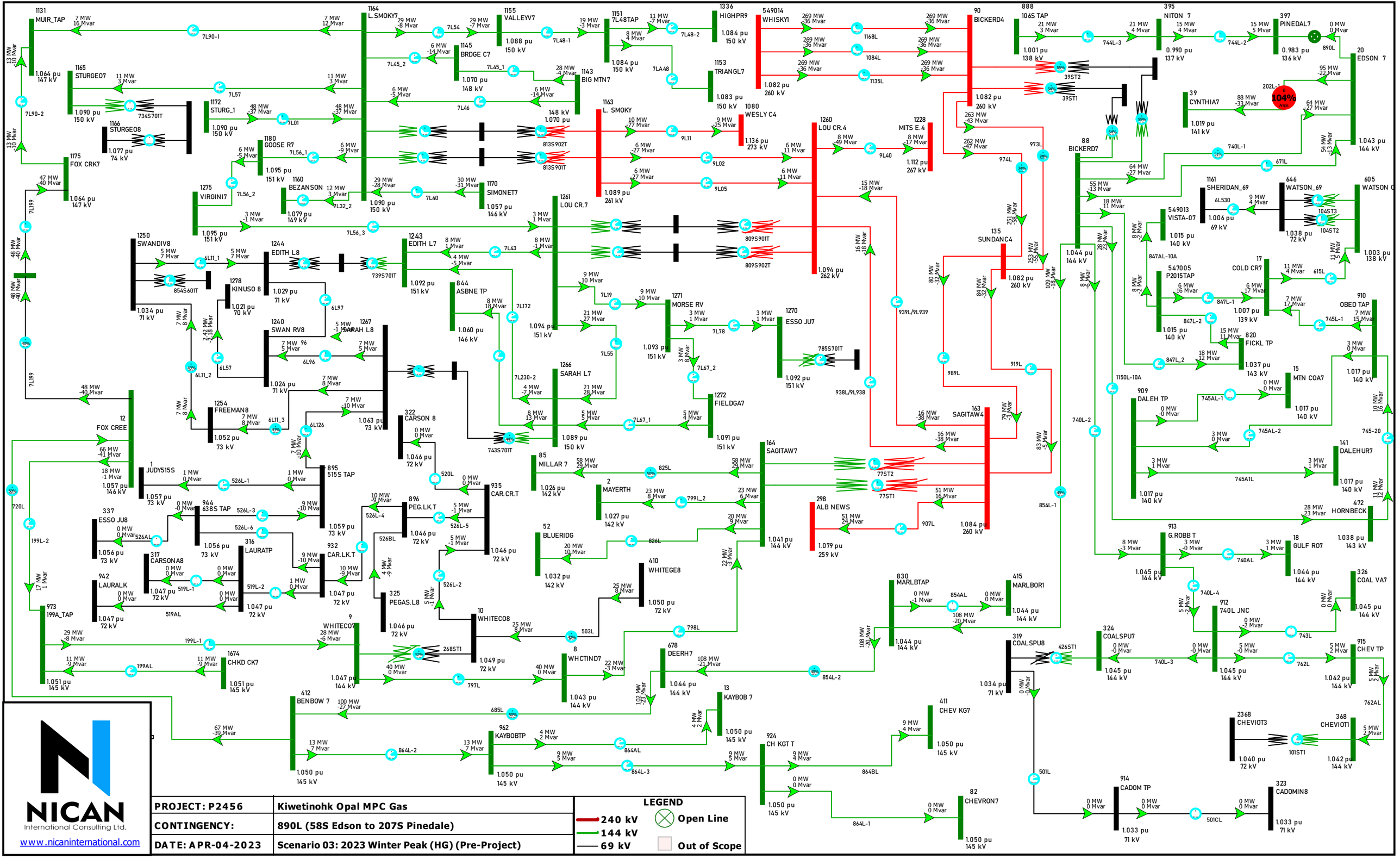

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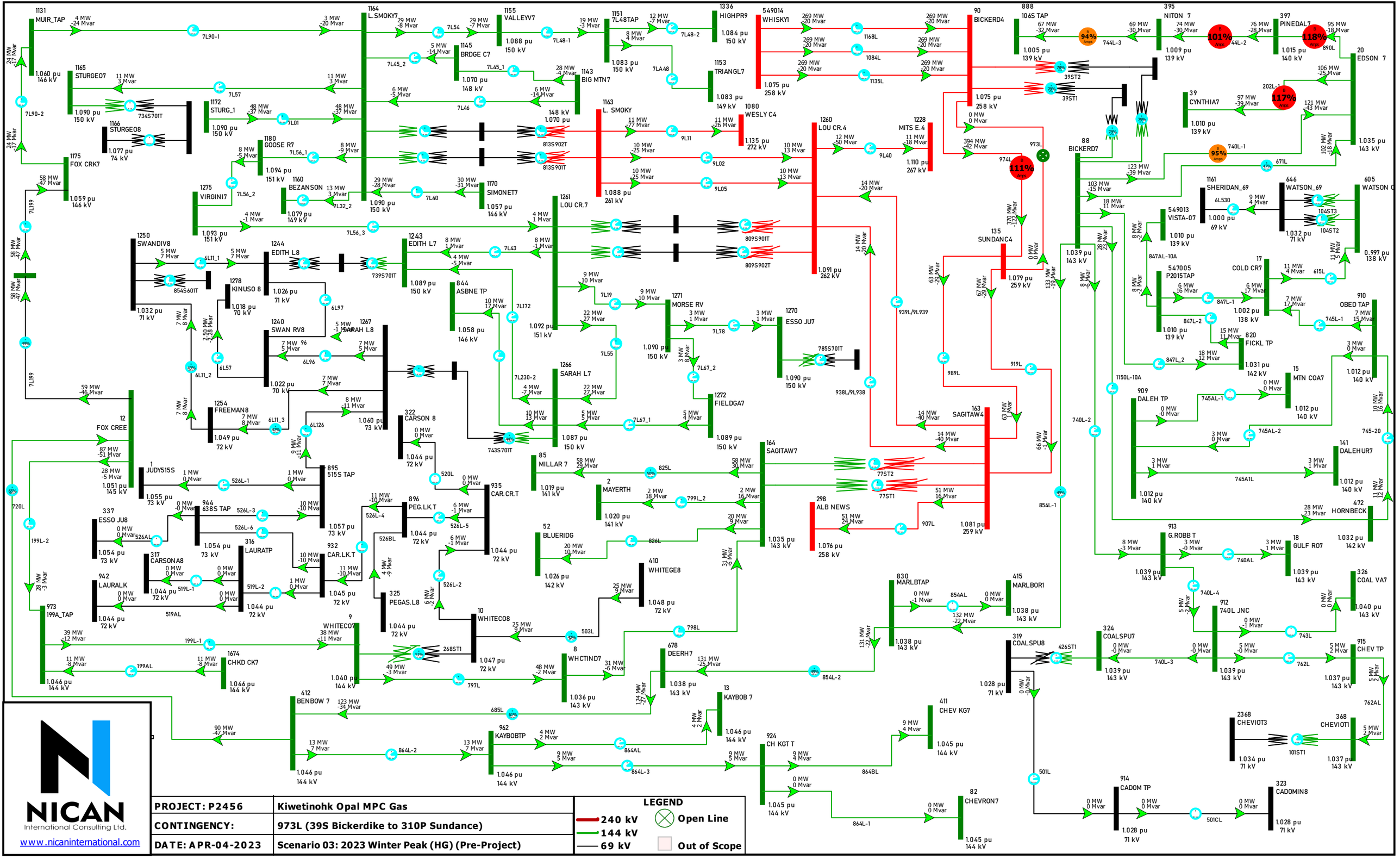
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**890L (58S Edson to 207S Pinedale)**
DATE: APR-04-2023	**Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



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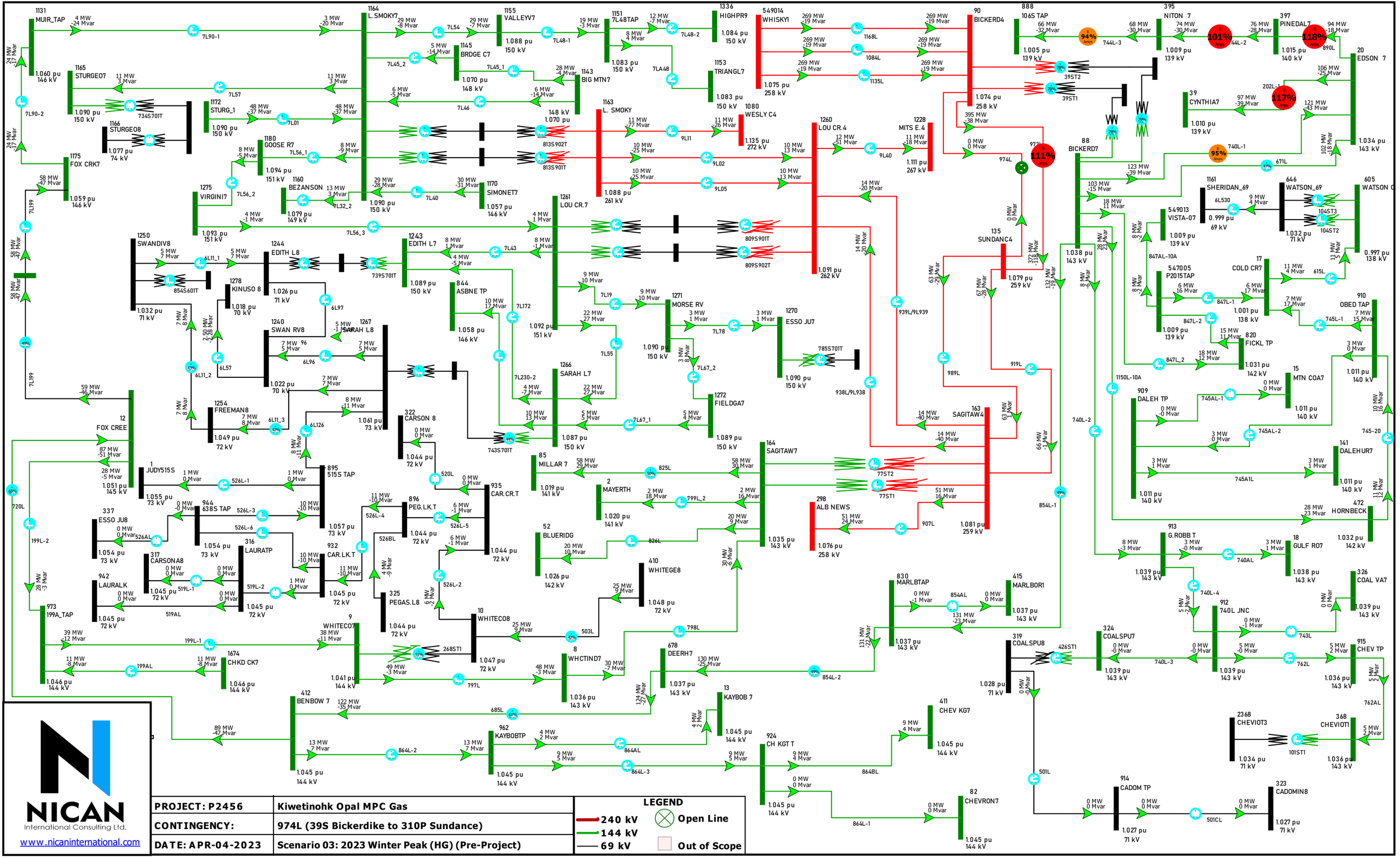
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**973L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



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PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**974L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 03: 2023 Winter Peak (HG) (Pre-Project)**

LEGEND

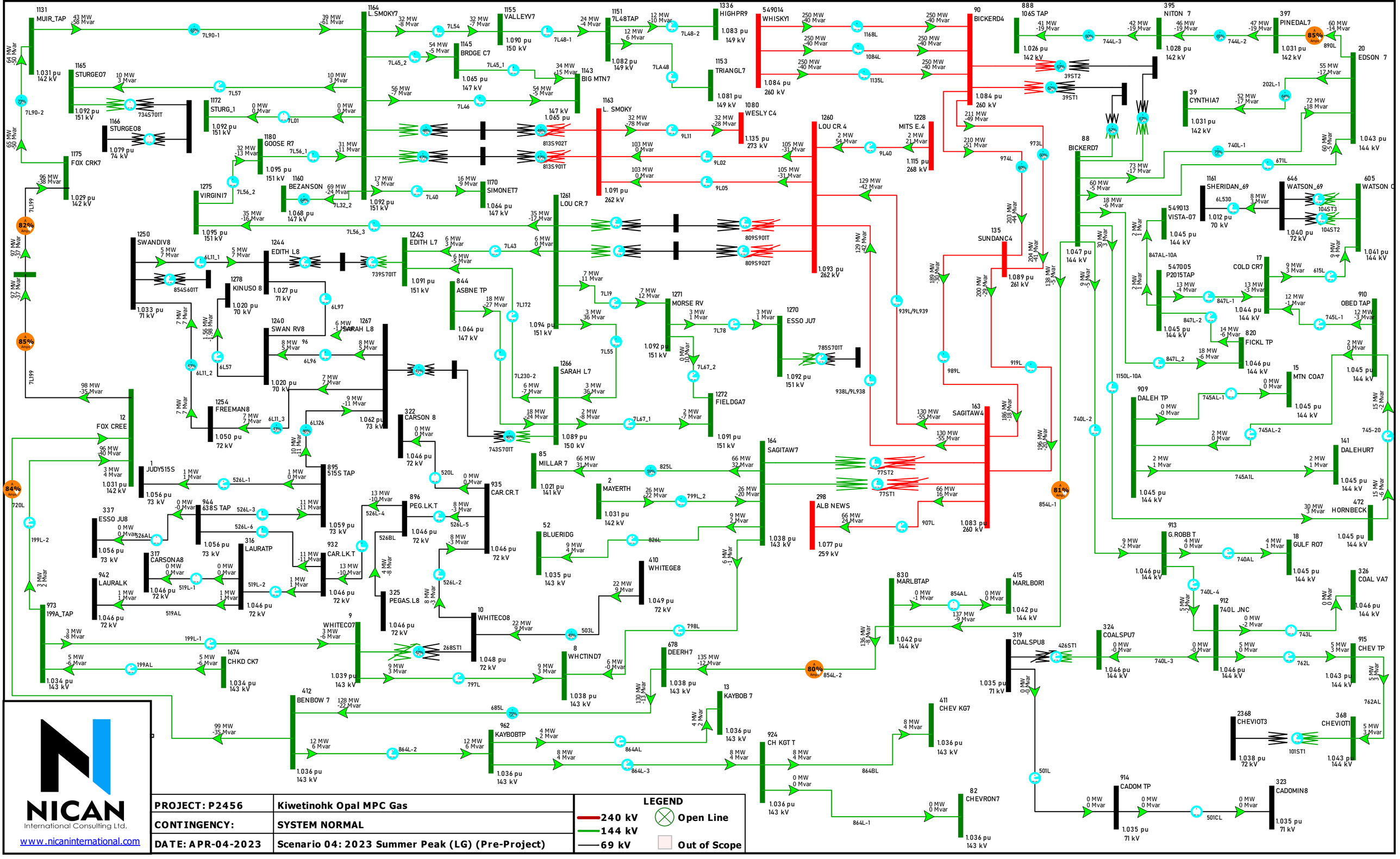
- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

2023 SUMMER PEAK

(Low Generation)

Single Line Diagrams
P2456 - PRE-PROJECT POWER
FLOW SC04

NICAN



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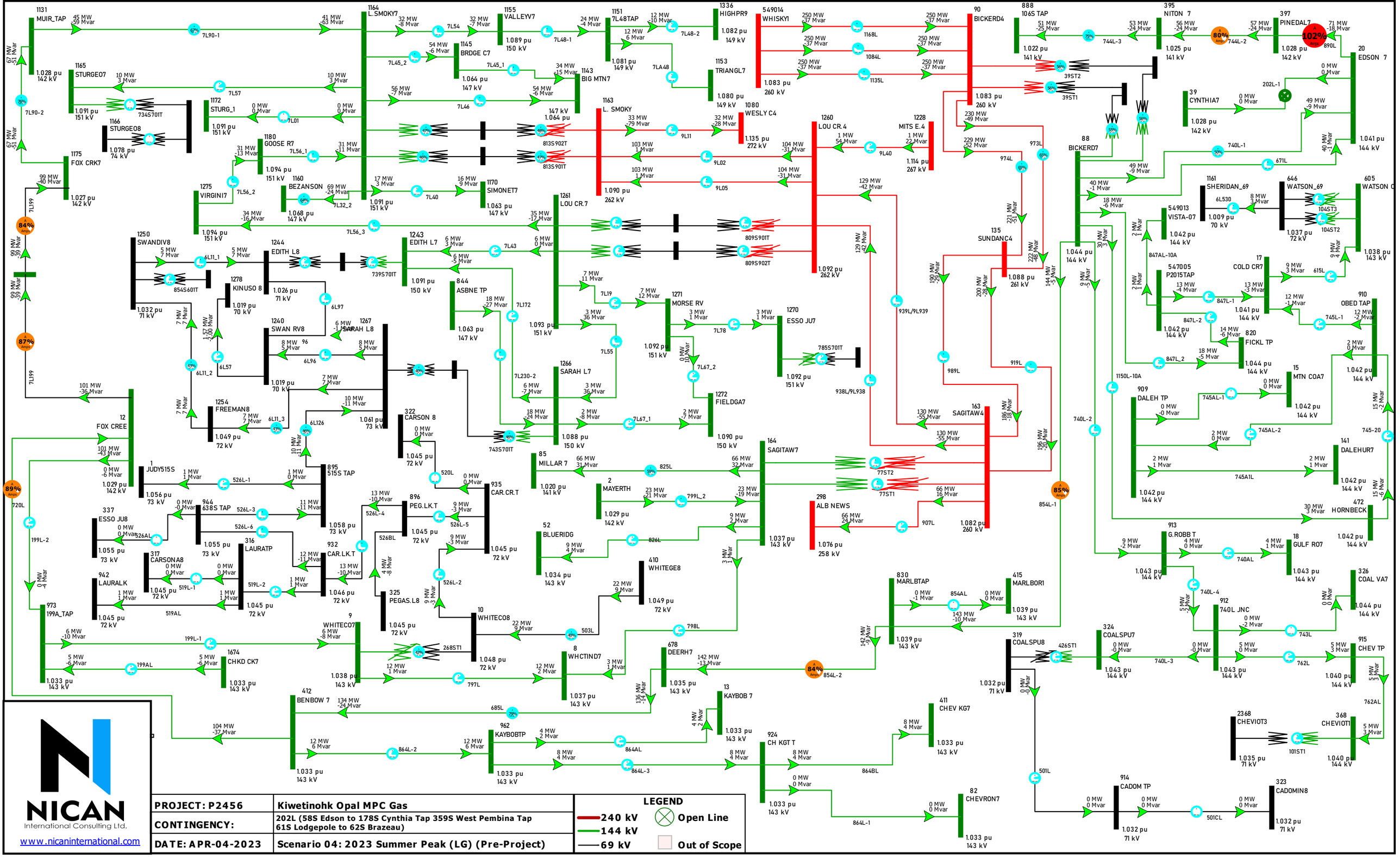
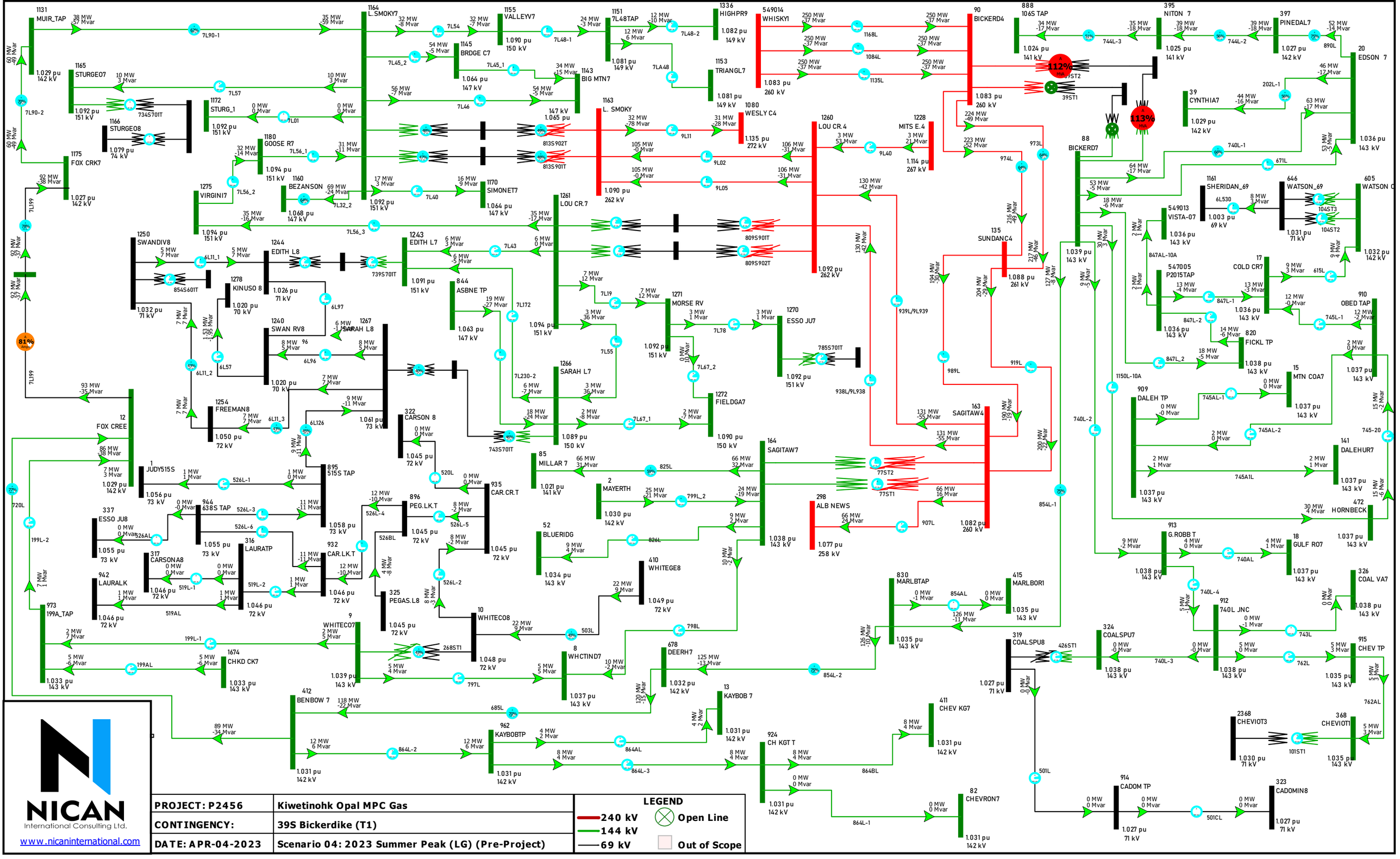
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 04: 2023 Summer Peak (LG) (Pre-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP 45 MW -59 Mvar 1.028 pu 142 kV
1165 STURGE07 10 MW 3 Mvar 1.091 pu 151 kV
1166 STURGE08 1.078 pu 74 kV
1175 FOX CRK7 99 MW -40 Mvar 1.027 pu 142 kV
1275 VIRGINI7 1.094 pu 151 kV
1250 SWANDIV8 1.032 pu 71 kV
1278 KINUSO 8 1.019 pu 70 kV
1244 EDITH L8 1.026 pu 71 kV
1240 SWAN RV8 1.019 pu 70 kV
1267 SARAH L8
1254 FREEMAN8 1.049 pu 72 kV
12 FOX CREE 101 MW -43 Mvar 1.029 pu 142 kV
1 JUDY515S 1.056 pu 73 kV
337 ESSO JU8 1.055 pu 73 kV
317 CARSONA8 1.045 pu 72 kV
942 LAURALK 1.045 pu 72 kV
944 638S TAP 1.055 pu 73 kV
316 LAURATP 1.045 pu 72 kV
973 199A_TAP 1.033 pu 143 kV
1674 CHKD CK7 1.033 pu 143 kV
1166 L.SMOKY7 1.091 pu 151 kV
1172 STURG_1 1.091 pu 151 kV
1180 GOOSE R7 1.094 pu 151 kV
1160 BEZANSON 1.068 pu 147 kV
1170 SIMONET7 1.063 pu 147 kV
1155 VALLEYV7 1.089 pu 150 kV
1145 BRDGE C7 1.064 pu 147 kV
1143 BIG MTN7 147 kV 1.064 pu
1151 7L48TAP 1.081 pu 149 kV
1336 HIGHPR9 1.082 pu 149 kV
1153 TRIANGL7 1.080 pu 149 kV
549014 WHISKY1 1.083 pu 260 kV
1163 L. SMOKY 1.090 pu 262 kV
1080 WESLY C4 1.135 pu 272 kV
1260 LOU CR.4 1.092 pu 262 kV
1228 MITS E.4 1.114 pu 267 kV
1261 LOU CR.7 1.093 pu 151 kV
1243 EDITH L7 1.091 pu 150 kV
844 ASBNE TP 1.063 pu 147 kV
1271 MORSE RV 1.092 pu 151 kV
1270 ESSO JU7 1.092 pu 151 kV
1266 SARAH L7 1.088 pu 150 kV
1272 FIELDGA7 1.090 pu 150 kV
322 CARSON 8 1.045 pu 72 kV
85 MILLAR 7 1.020 pu 141 kV
2 MAYERTH 1.029 pu 142 kV
164 SAGITAW7 1.037 pu 143 kV
298 ALB NEWS 1.076 pu 258 kV
90 BICKERD4 1.083 pu 260 kV
163 SAGITAW4 1.082 pu 260 kV
135 SUNDANC4 1.088 pu 261 kV
88 BICKERD7 1.044 pu 144 kV
888 106S TAP 1.022 pu 141 kV
395 NITON 7 1.025 pu 141 kV
397 PINEDAL7 1.028 pu 142 kV
20 EDSON 7 1.041 pu 144 kV
39 CYNTHIA7 1.028 pu 142 kV
1161 SHERIDAN_69 1.009 pu 70 kV
646 WATSON_69 1.037 pu 72 kV
605 WATSON C 1.038 pu 143 kV
549013 VISTA-07 1.042 pu 144 kV
547005 P2015TAP 1.042 pu 144 kV
17 COLD CR7 1.041 pu 144 kV
910 OBED TAP 1.042 pu 144 kV
820 FICKL TP 1.044 pu 144 kV
15 MTN COA7 1.042 pu 144 kV
909 DALEH TP 1.042 pu 144 kV
141 DALEHUR7 1.042 pu 144 kV
472 HORNBECK 1.042 pu 144 kV
913 G.ROBB T 1.043 pu 144 kV
18 GULF RO7 1.043 pu 144 kV
326 COAL VA7 1.044 pu 144 kV
912 740L JNC 1.043 pu 144 kV
915 CHEV TP 1.040 pu 144 kV
324 COALSPU7 1.043 pu 144 kV
319 COALSPU8 1.032 pu 71 kV
2368 CHEVIOT3 1.035 pu 71 kV
368 CHEVIOTI 1.040 pu 144 kV
914 CADOM TP 1.032 pu 71 kV
323 CADOMIN8 1.032 pu 71 kV
830 MARLBTAP 1.039 pu 143 kV
415 MARLBOR1 1.039 pu 143 kV
411 CHEV KG7 1.033 pu 143 kV
82 CHEVRON7 1.033 pu 143 kV
924 CH KGT T 1.033 pu 143 kV
13 KAYBOB 7 1.033 pu 143 kV
962 KAYBOBTP 1.033 pu 143 kV
412 BENBOW 7 1.033 pu 143 kV
8 WHCTIND7 1.037 pu 143 kV
678 DEERH7 1.035 pu 143 kV
10 WHITECO8 1.048 pu 72 kV
410 WHITEGE8 1.049 pu 72 kV
52 BLUERIDG 1.034 pu 143 kV
896 PEG.LK.T 1.045 pu 72 kV
325 PEGAS.L8 1.045 pu 72 kV
935 CAR.CR.T 1.045 pu 72 kV
932 CAR.LK.T 1.046 pu 72 kV
9 WHITECO7 1.038 pu 143 kV
1038 L.SMOKY4 1.091 pu 151 kV
1039 L.SMOKY5 1.091 pu 151 kV
1040 L.SMOKY6 1.091 pu 151 kV
1041 L.SMOKY8 1.091 pu 151 kV
1042 L.SMOKY9 1.091 pu 151 kV
1043 L.SMOKY10 1.091 pu 151 kV
1044 L.SMOKY11 1.091 pu 151 kV
1045 L.SMOKY12 1.091 pu 151 kV
1046 L.SMOKY13 1.091 pu 151 kV



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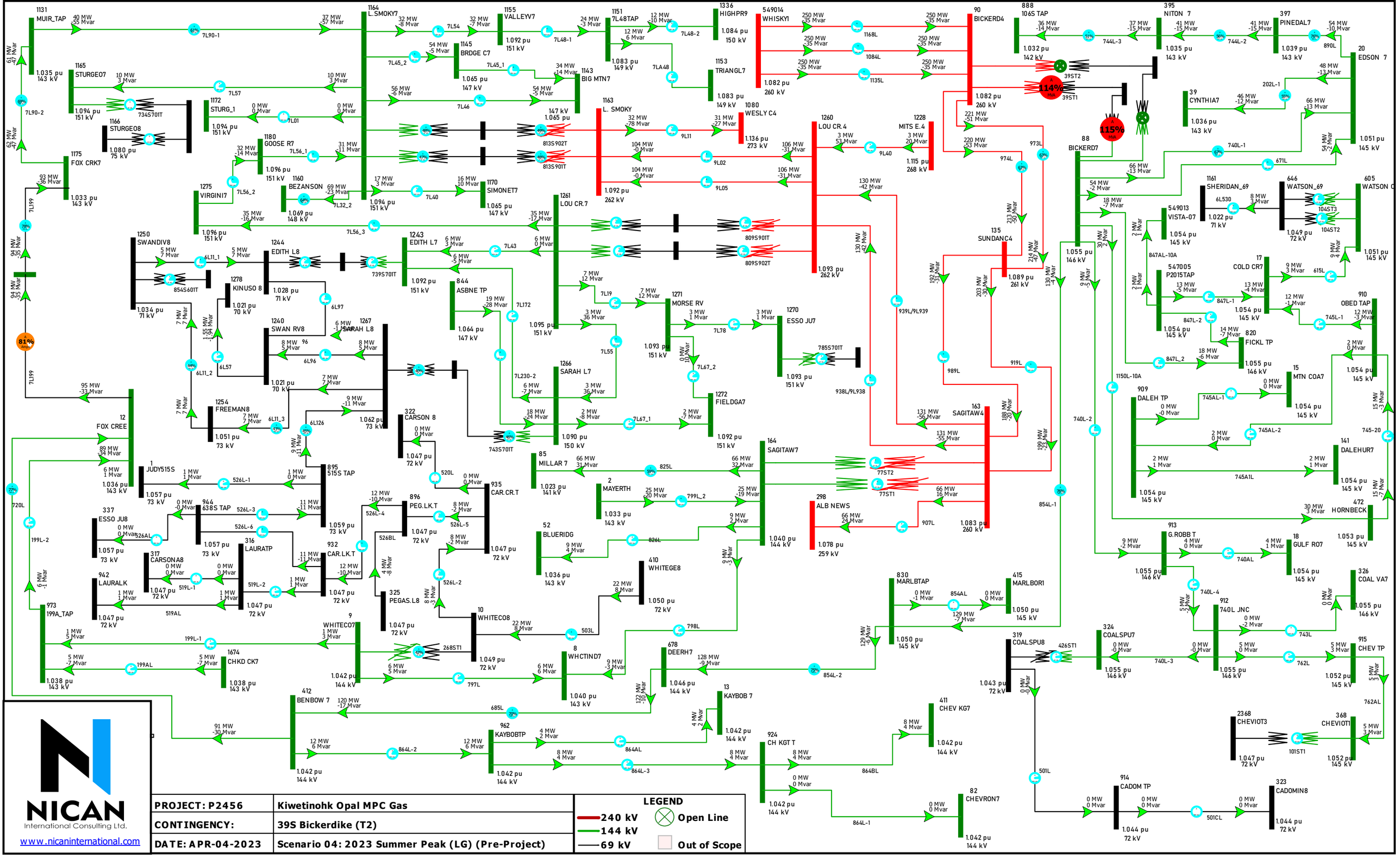
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**39S Bickerdike (T1)**
DATE: APR-04-2023	**Scenario 04: 2023 Summer Peak (LG) (Pre-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



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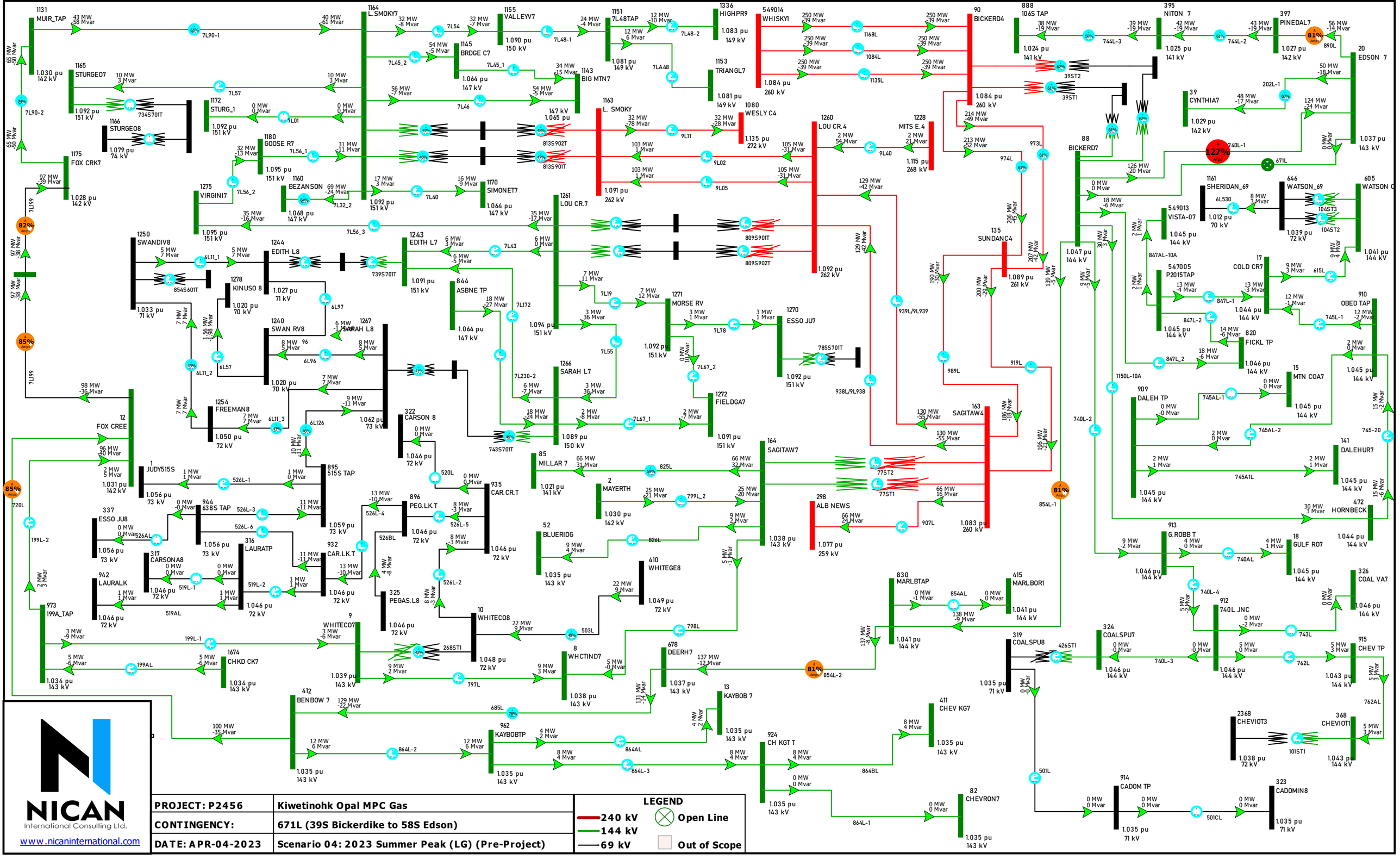
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	39S Bickerdike (T2)
DATE: APR-04-2023	Scenario 04: 2023 Summer Peak (LG) (Pre-Project)


1131 MUIR_TAP
1.030 pu 142 kV
1165 STURGEO7
1.092 pu 151 kV
1166 STURGEO8
1.079 pu 74 kV
1175 FOX CRK7
1.028 pu 142 kV
1166 L.SMOKY7
1.092 pu 151 kV
1172 STURG_1
1.092 pu 151 kV
1180 GOOSE R7
1.095 pu 151 kV
1275 VIRGINI7
1.095 pu 151 kV
1160 BEZANSON
1.068 pu 147 kV
1170 SIMONET7
1.064 pu 147 kV
1155 VALLEYV7
1.090 pu 150 kV
1145 BRDGE C7
1.064 pu 147 kV
1143 BIG MTN7
147 kV 1.065 pu
1151 7L48TAP
1.081 pu 149 kV
1336 HIGHPR9
1.083 pu 149 kV
1153 TRIANGL7
1.081 pu 149 kV
549014 WHISKYI
1.084 pu 260 kV
1163 L. SMOKY
1.091 pu 262 kV
1080 WESLY C4
1.135 pu 272 kV
1260 LOU CR.4
1.092 pu 262 kV
1228 MITS E.4
1.115 pu 268 kV
90 BICKERD4
1.084 pu 260 kV
888 106S TAP
1.024 pu 141 kV
395 NITON 7
1.025 pu 141 kV
397 PINEDAL7
1.027 pu 142 kV
20 EDSON 7
1.037 pu 143 kV
39 CYNTHIA7
1.029 pu 142 kV
88 BICKERD7
1.047 pu 144 kV
1161 SHERIDAN_69
1.012 pu 70 kV
646 WATSON_69
1.039 pu 72 kV
605 WATSON C
1.041 pu 144 kV
549013 VISTA-07
1.045 pu 144 kV
135 SUNDANC4
1.089 pu 261 kV
547005 P2015TAP
1.045 pu 144 kV
17 COLD CR7
1.044 pu 144 kV
910 OBED TAP
820 FICKL TP
1.046 pu 144 kV
15 MTN COA7
1.045 pu 144 kV
909 DALEH TP
1.045 pu 144 kV
141 DALEHUR7
1.045 pu 144 kV
472 HORNBECK
1.044 pu 144 kV
913 G.ROBB T
1.046 pu 144 kV
18 GULF RO7
1.045 pu 144 kV
326 COAL VA7
1.046 pu 144 kV
912 740L JNC
1.046 pu 144 kV
915 CHEV TP
1.043 pu 144 kV
1250 SWANDIV8
1.033 pu 71 kV
1244 EDITH L8
1.027 pu 71 kV
1278 KINUSO 8
1.020 pu 70 kV
1240 SWAN RV8
1.020 pu 70 kV
1267 SARAH L8
1.062 pu 73 kV
1254 FREEMAN8
1.050 pu 72 kV
12 FOX CREE
1.031 pu 142 kV
1 JUDY515S
1.056 pu 73 kV
322 CARSON 8
1.046 pu 72 kV
1243 EDITH L7
1.091 pu 151 kV
844 ASBNE TP
1.064 pu 147 kV
1261 LOU CR.7
1.094 pu 151 kV
1271 MORSE RV
1.092 pu 151 kV
1270 ESSO JU7
1.092 pu 151 kV
1266 SARAH L7
1.089 pu 150 kV
1272 FIELDGA7
1.091 pu 151 kV
85 MILLAR 7
1.021 pu 141 kV
2 MAYERTH
1.030 pu 142 kV
164 SAGITAW7
1.038 pu 143 kV
163 SAGITAW4
1.083 pu 260 kV
298 ALB NEWS
1.077 pu 259 kV
337 ESSO JU8
1.056 pu 73 kV
317 CARSONA8
1.046 pu 72 kV
316 LAURATP
1.046 pu 72 kV
942 LAURALK
1.046 pu 72 kV
944 638S TAP
1.056 pu 73 kV
896 PEG.LK.T
1.046 pu 72 kV
932 CAR.LK.T
1.046 pu 72 kV
935 CAR.CR.T
1.046 pu 72 kV
325 PEGAS.L8
1.046 pu 72 kV
52 BLUERIDG
1.035 pu 143 kV
410 WHITEGE8
1.049 pu 72 kV
10 WHITEC08
1.048 pu 72 kV
9 WHITEC07
1.039 pu 143 kV
8 WHCTIND7
1.038 pu 143 kV
973 199A_TAP
1.034 pu 143 kV
1674 CHKD CK7
1.034 pu 143 kV
412 BENBOW 7
1.035 pu 143 kV
962 KAYBOBTP
1.035 pu 143 kV
13 KAYBOB 7
1.035 pu 143 kV
678 DEERH7
1.037 pu 143 kV
924 CH KGT T
1.035 pu 143 kV
411 CHEV KG7
1.035 pu 143 kV
82 CHEVRON7
1.035 pu 143 kV
830 MARLBTAP
1.041 pu 144 kV
415 MARLBOR1
1.041 pu 144 kV
319 COALSPU8
1.035 pu 71 kV
324 COALSPU7
1.046 pu 144 kV
914 CADOM TP
1.035 pu 71 kV
323 CADOMIN8
1.035 pu 71 kV
2368 CHEVIOT3
1.038 pu 72 kV
368 CHEVIOTI
1.043 pu 144 kV
101ST1
77ST2
77ST1
39ST2
39ST1
743S701T
739S701T
785S701T
809S901T
809S902T
813S902T
813S901T
734S701T
854S601T
268ST1
426ST1
101CL
501CL
501L
685L
762AL
762L
743L
740L-1
740L-2
740L-3
740L-4
740AL
745AL-1
745AL-2
745A1L
744L-2
744L-3
847L-1
847L-2
847L_2
847AL-10A
854L-1
854L-2
939L/9L939
938L/9L938
989L
919L
973L
974L
907L
1168L
1084L
1135L
671L
890L
615L
1150L-10A
745-20
7L90-1
7L90-2
7L199
7L57
7L01
7L56_1
7L56_2
7L56_3
7L32_2
7L40
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48
9L11
9L02
9L05
9L40
7L43
7L19
7L55
7L78
7L67_2
7L67_1
7L230-2
7L172
6L11_1
6L11_2
6L11_3
6L57
6L97
6L96
6L126
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
519L-1
519L-2
519AL
199L-1
199L-2
199AL
503L
798L
797L
799L_2
826L
825L
864L-1
864L-2
864L-3
864AL
864BL
720L
1.030 pu 142 kV
1.092 pu 151 kV
1.079 pu 74 kV
1.028 pu 142 kV
1.095 pu 151 kV
1.068 pu 147 kV
1.064 pu 147 kV
1.090 pu 150 kV
1.064 pu 147 kV
1.081 pu 149 kV
1.083 pu 149 kV
1.081 pu 149 kV
1.084 pu 260 kV
1.092 pu 262 kV
1.135 pu 272 kV
1.092 pu 262 kV
1.115 pu 268 kV
1.084 pu 260 kV
1.024 pu 141 kV
1.025 pu 141 kV
1.027 pu 142 kV
1.037 pu 143 kV
1.029 pu 142 kV
1.047 pu 144 kV
1.012 pu 70 kV
1.039 pu 72 kV
1.041 pu 144 kV
1.045 pu 144 kV
1.089 pu 261 kV
1.045 pu 144 kV
1.044 pu 144 kV
1.046 pu 144 kV
1.045 pu 144 kV
1.045 pu 144 kV
1.045 pu 144 kV
1.044 pu 144 kV
1.046 pu 144 kV
1.046 pu 144 kV
1.043 pu 144 kV
1.033 pu 71 kV
1.027 pu 71 kV
1.020 pu 70 kV
1.020 pu 70 kV
1.062 pu 73 kV
1.050 pu 72 kV
1.031 pu 142 kV
1.056 pu 73 kV
1.046 pu 72 kV
1.091 pu 151 kV
1.064 pu 147 kV
1.094 pu 151 kV
1.092 pu 151 kV
1.092 pu 151 kV
1.089 pu 150 kV
1.091 pu 151 kV
1.021 pu 141 kV
1.030 pu 142 kV
1.038 pu 143 kV
1.083 pu 260 kV
1.077 pu 259 kV
1.056 pu 73 kV
1.046 pu 72 kV
1.046 pu 72 kV
1.046 pu 72 kV
1.059 pu 73 kV
1.046 pu 72 kV
1.046 pu 72 kV
1.035 pu 143 kV
1.049 pu 72 kV
1.048 pu 72 kV
1.039 pu 143 kV
1.038 pu 143 kV
1.034 pu 143 kV
1.034 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.037 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.035 pu 143 kV
1.041 pu 144 kV
1.041 pu 144 kV
1.035 pu 71 kV
1.046 pu 144 kV
1.035 pu 71 kV
1.035 pu 71 kV
1.038 pu 72 kV
1.043 pu 144 kV
82% Amps
85% Amps
81% Amps
127% Amps
81% Amps
81% Amps
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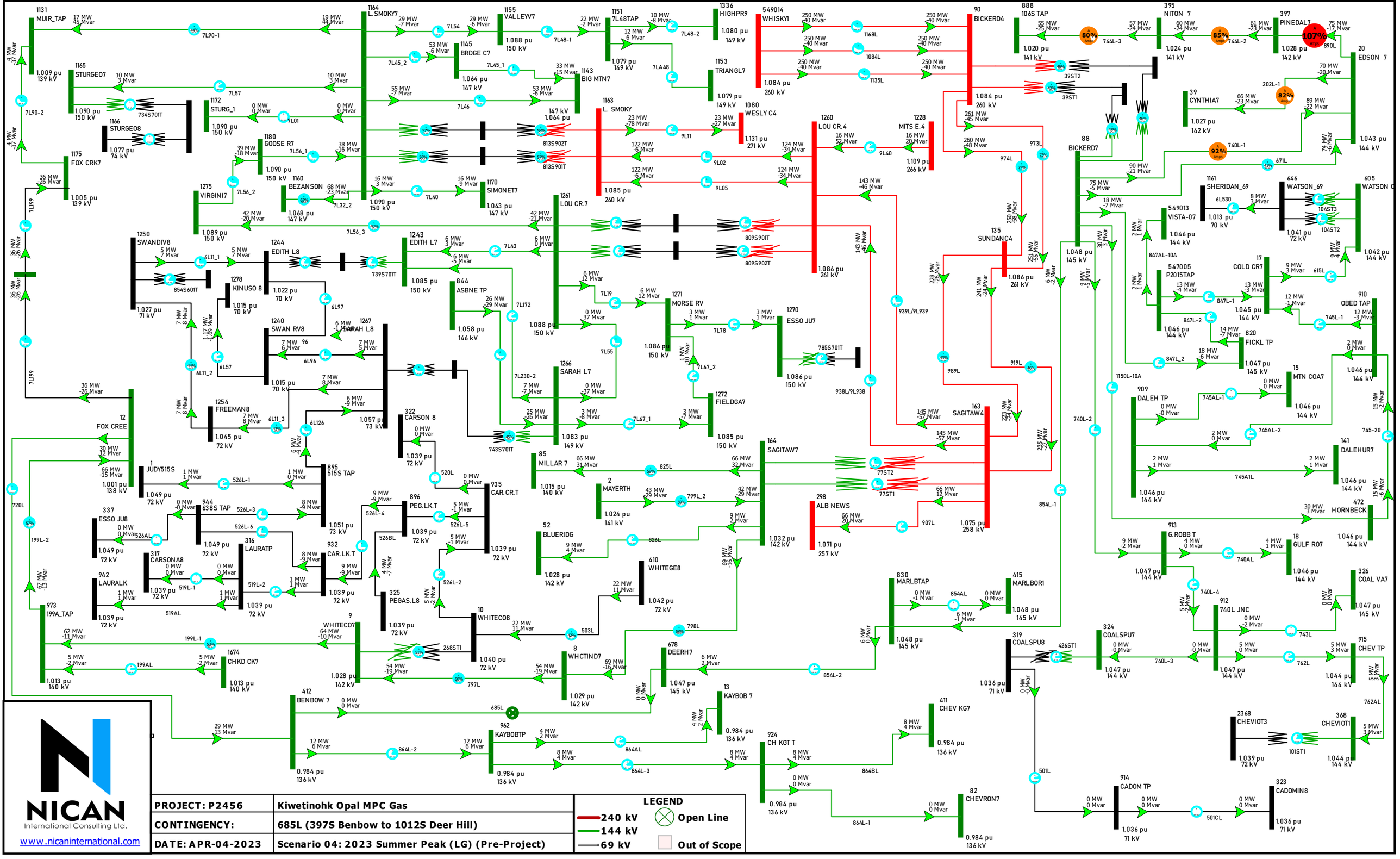
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 04: 2023 Summer Peak (LG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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International Consulting Ltd.
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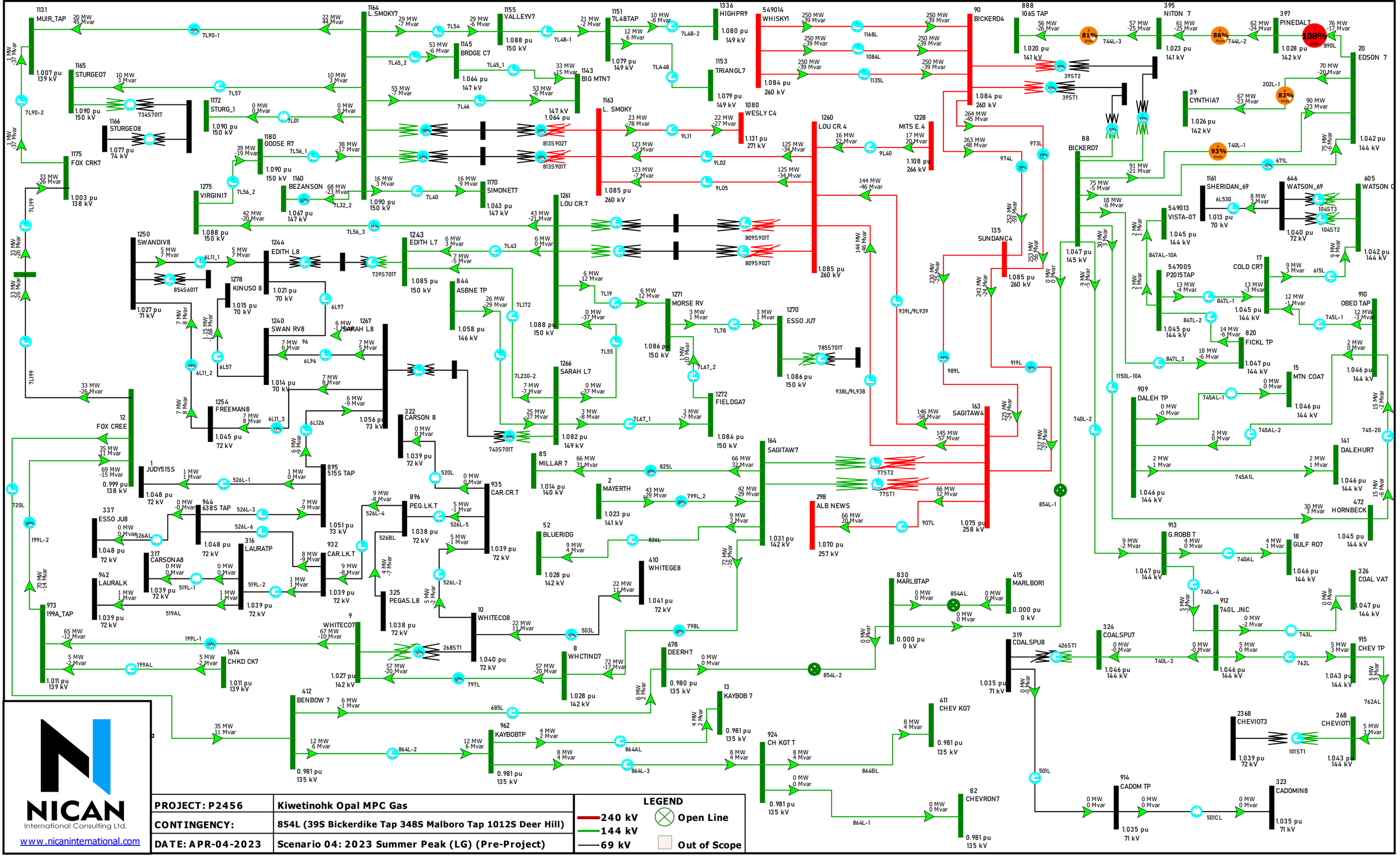
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	685L (397S Benbow to 1012S Deer Hill)
DATE: APR-04-2023	Scenario 04: 2023 Summer Peak (LG) (Pre-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.007 pu 139 kV
1165 STURGEO7
1.090 pu 150 kV
1166 STURGEO8
1.077 pu 74 kV
1175 FOX CRK7
1.003 pu 138 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.088 pu 150 kV
1145 BRDGE C7
1.064 pu 147 kV
1143 BIG MTN7
1151 7L48TAP
1.079 pu 149 kV
1336 HIGHPR9
1.080 pu 149 kV
1153 TRIANGL7
1.079 pu 149 kV
549014 WHISKYI
1.084 pu 260 kV
90 BICKERD4
1.084 pu 260 kV
888 106S TAP
1.020 pu 141 kV
395 NITON 7
1.023 pu 141 kV
397 PINEDAL7
1.028 pu 142 kV
20 EDSON 7
1.042 pu 144 kV
39ST2
39ST1
202L-1
39 CYNTHIA7
1.026 pu 142 kV
740L-1
671L
88 BICKERD7
1.047 pu 145 kV
1161 SHERIDAN_69
1.013 pu 70 kV
646 WATSON_69
1.040 pu 72 kV
605 WATSON C
1.042 pu 144 kV
104ST3
104ST2
549013 VISTA-07
1.045 pu 144 kV
847AL-10A
547005 P2015TAP
1.045 pu 144 kV
847L-1
847L-2
17 COLD CR7
615L
910 OBED TAP
745L-1
820 FICKL TP
1.047 pu 144 kV
847L_2
1150L-10A
909 DALEH TP
1.046 pu 144 kV
745AL-1
15 MTN COA7
1.046 pu 144 kV
745AL-2
745-20
141 DALEHUR7
1.046 pu 144 kV
745A1L
472 HORNBECK
1.045 pu 144 kV
740L-2
740AL
913 G.ROBB T
1.047 pu 144 kV
18 GULF RO7
1.046 pu 144 kV
740L-4
912 740L JNC
1.046 pu 144 kV
326 COAL VA7
1.047 pu 144 kV
743L
915 CHEV TP
1.043 pu 144 kV
762L
762AL
2368 CHEVIOT3
1.039 pu 72 kV
101ST1
368 CHEVIOTI
1.043 pu 144 kV
1260 LOU CR.4
1.085 pu 260 kV
1228 MITS E.4
1.108 pu 266 kV
1080 WESLY C4
1.131 pu 271 kV
1163 L. SMOKY
1.085 pu 260 kV
1261 LOU CR.7
1.088 pu 150 kV
809S901T
809S902T
939L/9L939
938L/9L938
973L
974L
919L
989L
135 SUNDANC4
1.085 pu 260 kV
1271 MORSE RV
1.086 pu 150 kV
1270 ESSO JU7
1.086 pu 150 kV
785S701T
1272 FIELDGA7
1.084 pu 150 kV
1266 SARAH L7
1.082 pu 149 kV
1267 SARAH L8
1.056 pu 73 kV
1243 EDITH L7
1.085 pu 150 kV
739S701T
844 ASBNE TP
1.058 pu 146 kV
1244 EDITH L8
1.021 pu 70 kV
1240 SWAN RV8
1.014 pu 70 kV
1250 SWANDIV8
1.027 pu 71 kV
854S601T
1278 KINUSO 8
1.015 pu 70 kV
1254 FREEMAN8
1.045 pu 72 kV
322 CARSON 8
1.039 pu 72 kV
743S701T
85 MILLAR 7
1.014 pu 140 kV
2 MAYERTH
1.023 pu 141 kV
52 BLUERIDG
1.028 pu 142 kV
410 WHITEGE8
1.041 pu 72 kV
10 WHITECO8
1.040 pu 72 kV
8 WHCTIND7
1.028 pu 142 kV
678 DEERH7
0.980 pu 135 kV
13 KAYBOB 7
0.981 pu 135 kV
962 KAYBOBTP
0.981 pu 135 kV
412 BENBOW 7
0.981 pu 135 kV
9 WHITECO7
1.027 pu 142 kV
268ST1
1 JUDY515S
0.999 pu 138 kV
895 515S TAP
1.051 pu 73 kV
896 PEG.LK.T
1.038 pu 72 kV
935 CAR.CR.T
1.039 pu 72 kV
932 CAR.LK.T
1.039 pu 72 kV
325 PEGAS.L8
1.038 pu 72 kV
944 638S TAP
1.048 pu 72 kV
337 ESSO JU8
1.048 pu 72 kV
317 CARSONA8
1.039 pu 72 kV
316 LAURATP
1.039 pu 72 kV
942 LAURALK
1.039 pu 72 kV
973 199A_TAP
1.011 pu 139 kV
1674 CHKD CK7
1.011 pu 139 kV
1180 GOOSE R7
1.090 pu 150 kV
1160 BEZANSON
1.067 pu 147 kV
1170 SIMONET7
1.063 pu 147 kV
1275 VIRGINI7
1.088 pu 150 kV
1172 STURG_1
1.090 pu 150 kV
1172 STURG_1
1.090 pu 150 kV
813S902T
813S901T
734S701T
1228 MITS E.4
1.108 pu 266 kV
1075 pu 258 kV
298 ALB NEWS
1.070 pu 257 kV
907L
77ST2
77ST1
164 SAGITAW7
1.031 pu 142 kV
163 SAGITAW4
1.075 pu 258 kV
924 CH KGT T
0.981 pu 135 kV
411 CHEV KG7
0.981 pu 135 kV
82 CHEVRON7
0.981 pu 135 kV
864BL
864L-1
864L-2
864L-3
864AL
825L
799L_2
826L
830 MARLBTAP
0.000 pu 0 kV
854AL
415 MARLBOR1
0.000 pu 0 kV
854L-1
854L-2
798L
503L
319 COALSPU8
1.035 pu 71 kV
426ST1
324 COALSPU7
1.046 pu 144 kV
740L-3
914 CADOM TP
1.035 pu 71 kV
501L
501CL
323 CADOMIN8
1.035 pu 71 kV
7L90-1
7L90-2
7L199
199L-1
199L-2
199AL
7L57
7L01
7L56_1
7L56_2
7L32_2
7L56_3
7L40
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48
9L11
9L02
9L05
9L40
1168L
1084L
1135L
7L43
7L19
7L55
7L172
7L230-2
7L78
7L67_2
7L67_1
7L97
6L11_1
6L11_2
6L11_3
6L57
6L96
6L126
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
526AL
519L-1
519L-2
519AL
720L
685L
797L
1039L
1040L
1041L
1042L
1043L
1044L
1045L
1046L
1047L
1048L
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1050L
1051L
1052L
1053L
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1056L
1057L
1058L
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1061L
1062L
1063L
1064L
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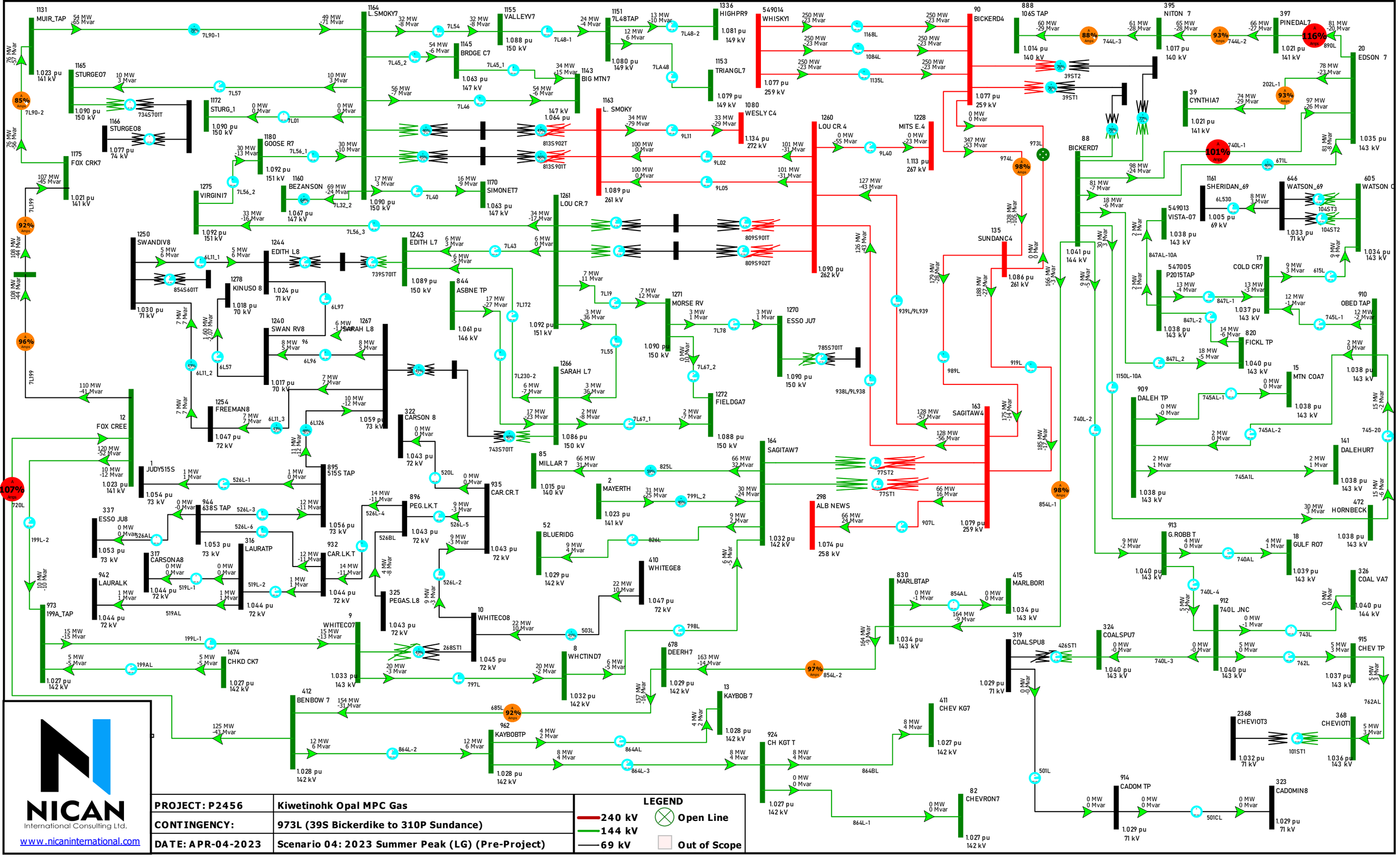
1078L


1131 MUIR_TAP
1023 pu 141 kV
1165 STURGEO7
1090 pu 150 kV
1166 STURGEO8
1077 pu 74 kV
1175 FOX CRK7
1021 pu 141 kV
1164 L.SMOKY7
1090 pu 150 kV
1172 STURG_1
1090 pu 150 kV
1180 GOOSE R7
1092 pu 151 kV
1160 BEZANSON
1067 pu 147 kV
1275 VIRGINI7
1092 pu 151 kV
1155 VALLEYV7
1088 pu 150 kV
1145 BRDGE C7
1063 pu 147 kV
1143 BIG MTN7
147 kV 1.064 pu
1151 7L48TAP
1080 pu 149 kV
1336 HIGHPR9
1081 pu 149 kV
1153 TRIANGL7
1079 pu 149 kV
1163 L. SMOKY
1089 pu 261 kV
1080 WESLY C4
1134 pu 272 kV
1170 SIMONET7
1063 pu 147 kV
549014 WHISKYI
1077 pu 259 kV
1260 LOU CR.4
1090 pu 262 kV
1228 MITS E.4
1113 pu 267 kV
1261 LOU CR.7
1092 pu 151 kV
1250 SWANDIV8
1030 pu 71 kV
1244 EDITH L8
1024 pu 71 kV
1278 KINUSO 8
1018 pu 70 kV
1240 SWAN RV8
1017 pu 70 kV
1267 SARAH L8
1254 FREEMAN8
1047 pu 72 kV
322 CARSON 8
1043 pu 72 kV
1243 EDITH L7
1089 pu 150 kV
844 ASBNE TP
1061 pu 146 kV
1266 SARAH L7
1086 pu 150 kV
1271 MORSE RV
1090 pu 150 kV
1270 ESSO JU7
1090 pu 150 kV
1272 FIELDGA7
1088 pu 150 kV
85 MILLAR 7
1015 pu 140 kV
2 MAYERTH
1023 pu 141 kV
52 BLUERIDG
1029 pu 142 kV
410 WHITEGE8
1047 pu 72 kV
10 WHITEC08
1045 pu 72 kV
8 WHCTIND7
1032 pu 142 kV
678 DEERH7
1029 pu 142 kV
13 KAYBOB 7
1028 pu 142 kV
962 KAYBOBTP
1028 pu 142 kV
412 BENBOW 7
1028 pu 142 kV
164 SAGITAW7
1032 pu 142 kV
163 SAGITAW4
1079 pu 259 kV
298 ALB NEWS
1074 pu 258 kV
924 CH KGT T
1027 pu 142 kV
411 CHEV KG7
1027 pu 142 kV
82 CHEVRON7
1027 pu 142 kV
90 BICKERD4
1077 pu 259 kV
888 106S TAP
1014 pu 140 kV
39ST2
39ST1
88 BICKERD7
1041 pu 144 kV
135 SUNDANC4
1086 pu 261 kV
830 MARLBTAP
1034 pu 143 kV
415 MARLBOR1
1034 pu 143 kV
319 COALSPU8
1029 pu 71 kV
395 NITON 7
1017 pu 140 kV
397 PINEDAL7
1021 pu 141 kV
20 EDSON 7
1035 pu 143 kV
39 CYNTHIA7
1021 pu 141 kV
1161 SHERIDAN_69
1005 pu 69 kV
646 WATSON_69
1033 pu 71 kV
605 WATSON C
1034 pu 143 kV
549013 VISTA-07
1038 pu 143 kV
547005 P2015TAP
1038 pu 143 kV
17 COLD CR7
1037 pu 143 kV
910 OBED TAP
820 FICKL TP
1040 pu 143 kV
1038 pu 143 kV
15 MTN COA7
1038 pu 143 kV
909 DALEH TP
1038 pu 143 kV
141 DALEHUR7
1038 pu 143 kV
472 HORNBECK
1038 pu 143 kV
913 G.ROBB T
1040 pu 143 kV
18 GULF RO7
1039 pu 143 kV
912 740L JNC
1040 pu 143 kV
326 COAL VA7
1040 pu 144 kV
324 COALSPU7
1040 pu 143 kV
915 CHEV TP
1037 pu 143 kV
2368 CHEVIOT3
1032 pu 71 kV
368 CHEVIOTI
1036 pu 143 kV
914 CADOM TP
1029 pu 71 kV
323 CADOMIN8
1029 pu 71 kV
973 199A_TAP
1027 pu 142 kV
1674 CHKD CK7
1027 pu 142 kV
1 JUDY515S
1054 pu 73 kV
337 ESSO JU8
1053 pu 73 kV
944 638S TAP
1053 pu 73 kV
316 LAURATP
1044 pu 72 kV
317 CARSONA8
1044 pu 72 kV
942 LAURALK
1044 pu 72 kV
932 CAR.LK.T
1044 pu 72 kV
325 PEGAS.L8
1043 pu 72 kV
896 PEG.LK.T
1043 pu 72 kV
935 CAR.CR.T
1043 pu 72 kV
895 515S TAP
1056 pu 73 kV
12 FOX CREE
1023 pu 141 kV
734S701T
743S701T
739S701T
809S901T
809S902T
813S902T
813S901T
785S701T
268ST1
77ST2
77ST1
101ST1
939L/9L939
938L/9L938
854L-2
854L-1
107% Amps
92% Amps
96% Amps
85% Amps
116% Amps
101% Amps
93% Amps
88% Amps
98% Amps
97% Amps
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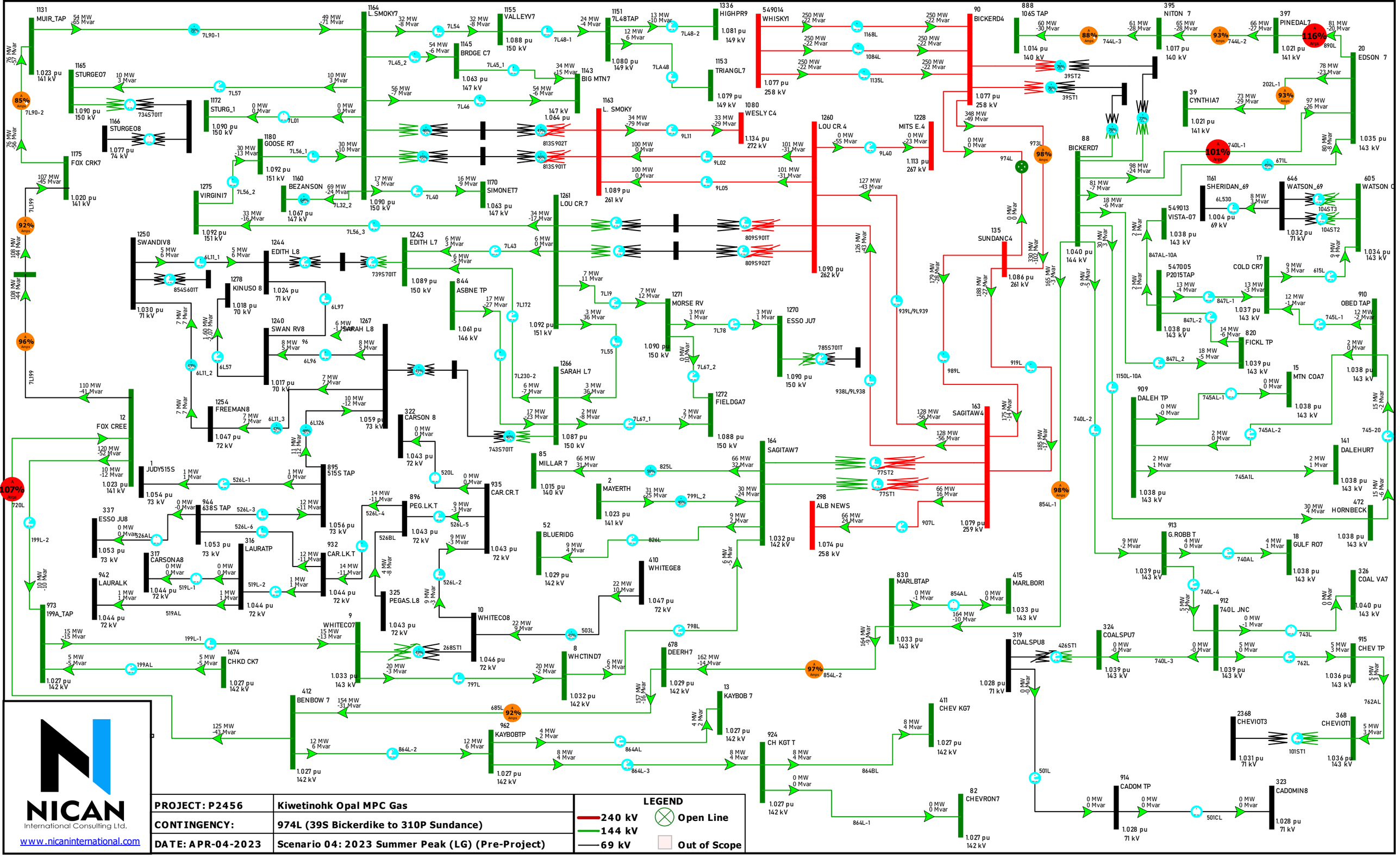
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 04: 2023 Summer Peak (LG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 04: 2023 Summer Peak (LG) (Pre-Project)

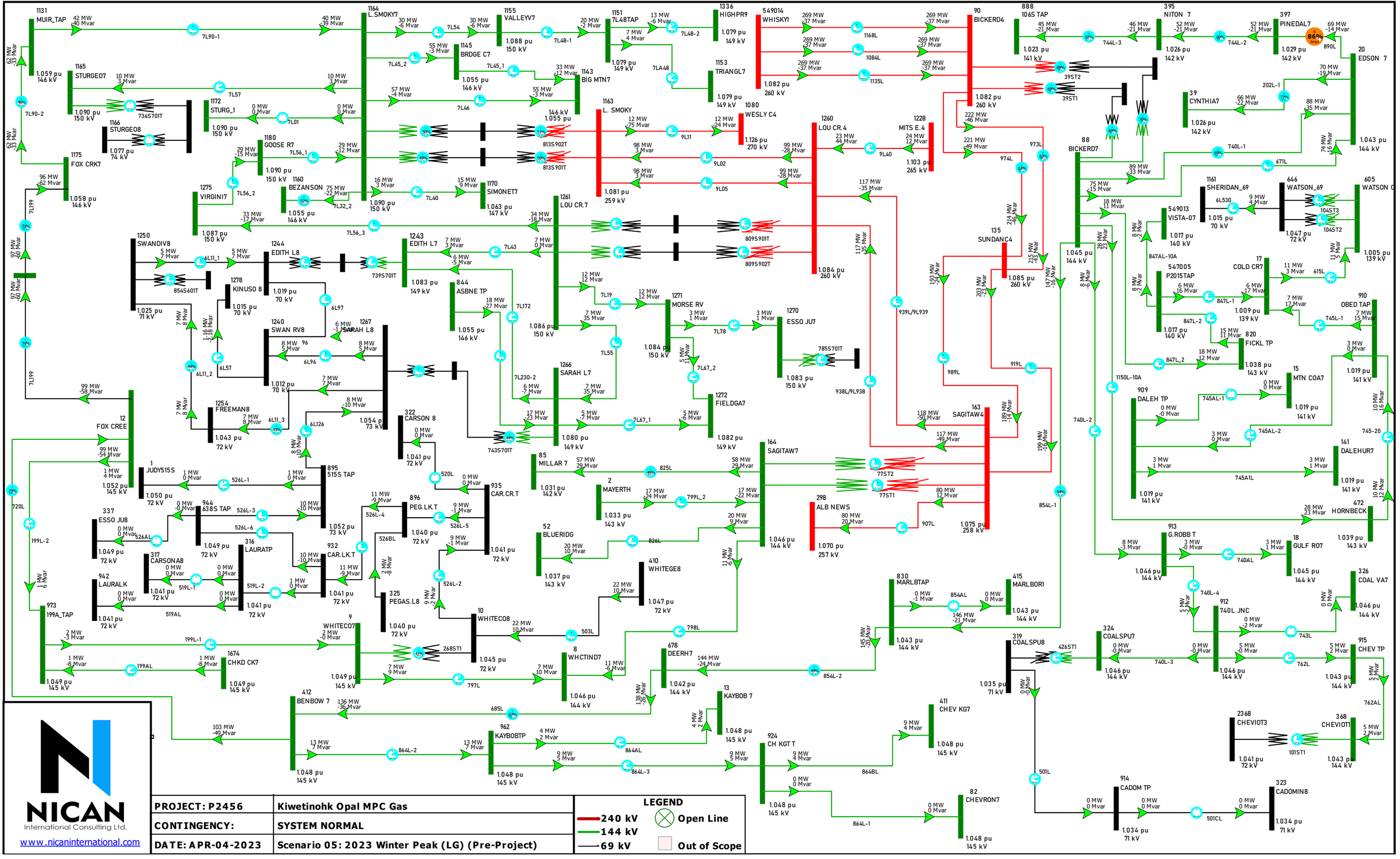
LEGEND
240 kV
144 kV
69 kV
⊗ Open Line
☐ Out of Scope

2023 WINTER PEAK

(Low Generation)

Single Line Diagrams
P2456 - PRE-PROJECT POWER
FLOW SC05

NICAN



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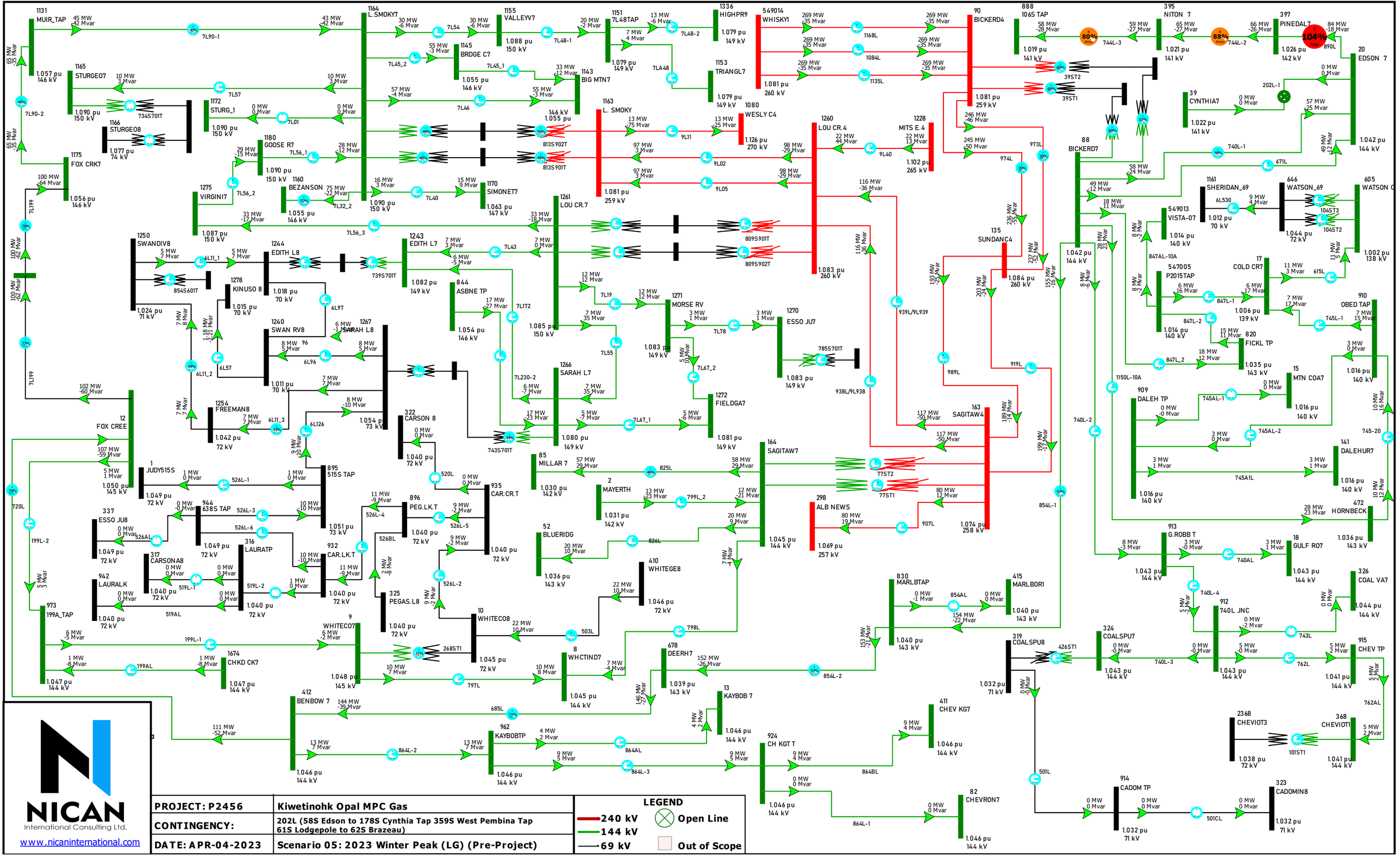
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 05: 2023 Winter Peak (LG) (Pre-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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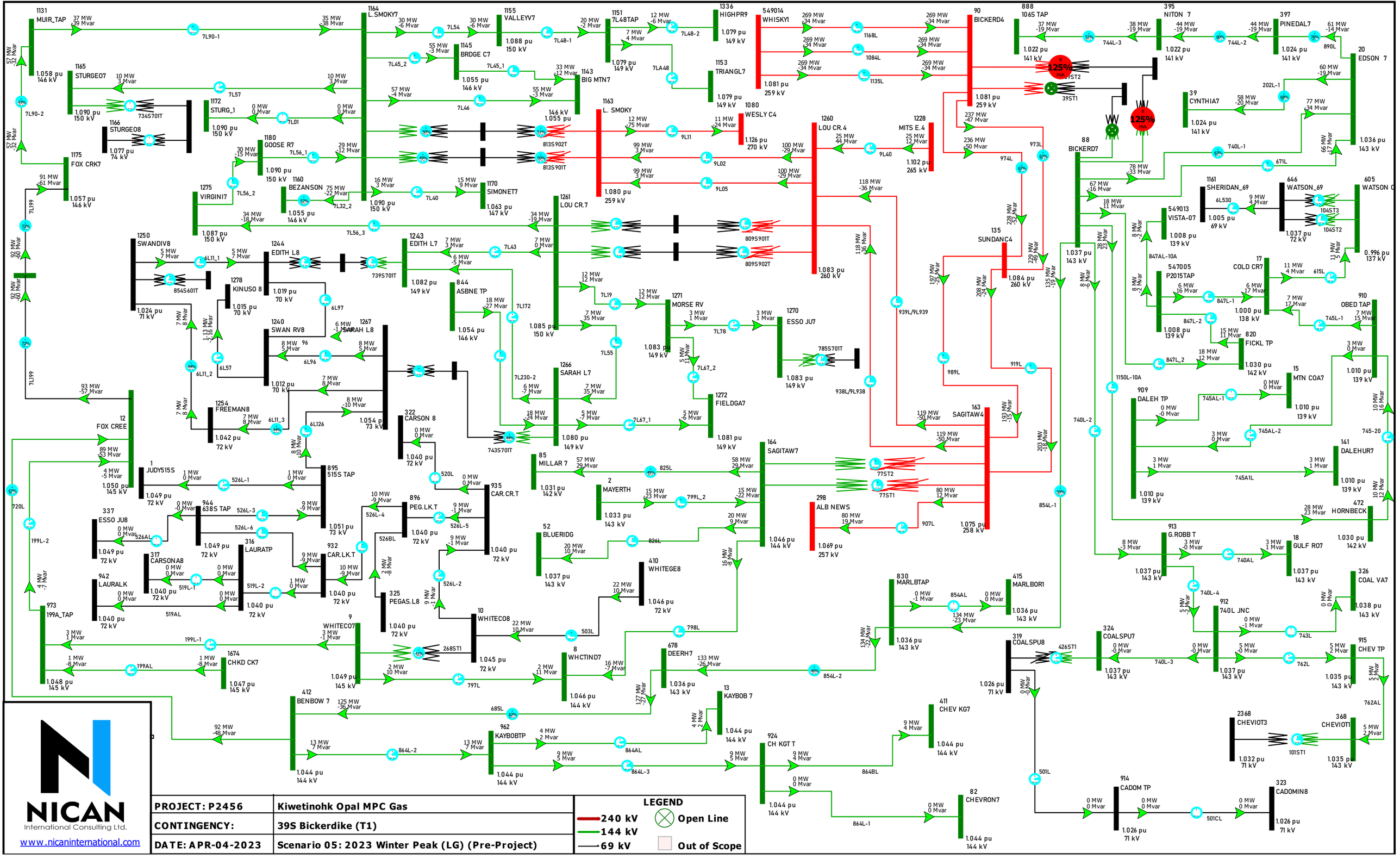
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**
DATE: APR-04-2023	**Scenario 05: 2023 Winter Peak (LG) (Pre-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope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1165 STURGEO7
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1057 pu 146 kV
1164 L.SMOKY7
1090 pu 150 kV
1172 STURG_1
1090 pu 150 kV
1180 GOOSE R7
1090 pu 150 kV
1160 BEZANSON
1055 pu 146 kV
1275 VIRGINI7
1087 pu 150 kV
1155 VALLEYV7
1088 pu 150 kV
1145 BRDGE C7
1055 pu 146 kV
1143 BIG MTN7
146 kV 1.055 pu
1151 7L48TAP
1079 pu 149 kV
1336 HIGHPR9
1079 pu 149 kV
1153 TRIANGL7
1079 pu 149 kV
549014 WHISKY1
1081 pu 259 kV
1163 L. SMOKY
1080 pu 259 kV
1080 WESLY C4
1126 pu 270 kV
1260 LOU CR.4
1083 pu 260 kV
1228 MITS E.4
1102 pu 265 kV
90 BICKERD4
1081 pu 259 kV
888 106S TAP
1022 pu 141 kV
39ST2
39ST1
395 NITON 7
1022 pu 141 kV
397 PINEDAL7
1024 pu 141 kV
20 EDSON 7
1036 pu 143 kV
39 CYNTHIA7
1024 pu 141 kV
88 BICKERD7
1037 pu 143 kV
1161 SHERIDAN_69
1005 pu 69 kV
646 WATSON_69
1037 pu 72 kV
605 WATSON C
0.996 pu 137 kV
549013 VISTA-07
1008 pu 139 kV
135 SUNDANC4
1084 pu 260 kV
547005 P2015TAP
1008 pu 139 kV
1000 pu 138 kV
17 COLD CR7
820 FICKL TP
1030 pu 142 kV
910 OBED TAP
1010 pu 139 kV
15 MTN COA7
1010 pu 139 kV
909 DALEH TP
1010 pu 139 kV
141 DALEHUR7
1010 pu 139 kV
472 HORNBECK
1030 pu 142 kV
913 G.ROBB T
1037 pu 143 kV
18 GULF RO7
1037 pu 143 kV
326 COAL VA7
1038 pu 143 kV
912 740L JNC
1037 pu 143 kV
915 CHEV TP
1035 pu 143 kV
324 COALSPU7
1037 pu 143 kV
319 COALSPU8
1026 pu 71 kV
2368 CHEVIOT3
1032 pu 71 kV
368 CHEVIOTI
1035 pu 143 kV
914 CADOM TP
1026 pu 71 kV
323 CADOMIN8
1026 pu 71 kV
1250 SWANDIV8
1024 pu 71 kV
1278 KINUSO 8
1015 pu 70 kV
1244 EDITH L8
1019 pu 70 kV
1240 SWAN RV8
1012 pu 70 kV
1267 SARAH L8
1054 pu 73 kV
1254 FREEMAN8
1042 pu 72 kV
322 CARSON 8
1040 pu 72 kV
1243 EDITH L7
1082 pu 149 kV
844 ASBNE TP
1054 pu 146 kV
1261 LOU CR.7
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1266 SARAH L7
1080 pu 149 kV
1271 MORSE RV
1083 pu 149 kV
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1083 pu 149 kV
1272 FIELDGA7
1081 pu 149 kV
85 MILLAR 7
1031 pu 142 kV
2 MAYERTH
1033 pu 143 kV
52 BLUERIDG
1037 pu 143 kV
410 WHITEGE8
1046 pu 72 kV
164 SAGITAW7
1046 pu 144 kV
298 ALB NEWS
1069 pu 257 kV
163 SAGITAW4
1075 pu 258 kV
830 MARLBTAP
1036 pu 143 kV
415 MARLBOR1
1036 pu 143 kV
678 DEERH7
1036 pu 143 kV
13 KAYBOB 7
1044 pu 144 kV
962 KAYBOBTP
1044 pu 144 kV
924 CH KGT T
1044 pu 144 kV
411 CHEV KG7
1044 pu 144 kV
82 CHEVRON7
1044 pu 144 kV
412 BENBOW 7
1044 pu 144 kV
1 JUDY515S
1049 pu 72 kV
1050 pu 145 kV
337 ESSO JU8
1049 pu 72 kV
944 638S TAP
1049 pu 72 kV
317 CARSONA8
1040 pu 72 kV
942 LAURALK
1040 pu 72 kV
316 LAURATP
1040 pu 72 kV
895 515S TAP
1051 pu 73 kV
896 PEG.LK.T
1040 pu 72 kV
935 CAR.CR.T
1040 pu 72 kV
932 CAR.LK.T
1040 pu 72 kV
325 PEGAS.L8
1040 pu 72 kV
10 WHITEC08
1045 pu 72 kV
9 WHITEC07
1049 pu 145 kV
973 199A_TAP
1048 pu 145 kV
1674 CHKD CK7
1047 pu 145 kV
12 FOX CREE
1050 pu 145 kV
7L90-1
7L90-2
7L199
7L54
7L45_2
7L45_1
7L46
7L01
7L57
7L56_1
7L56_2
7L56_3
7L32_2
7L40
7L43
7L48-1
7L48-2
7L48
7L11
7L02
7L05
7L40
7L19
7L55
7L67_1
7L67_2
7L78
7L172
7L230-2
7L97
6L96
6L57
6L11_1
6L11_2
6L11_3
6L126
854S601T
739S701T
743S701T
734S701T
813S902T
813S901T
809S901T
809S902T
785S701T
268ST1
77ST2
77ST1
101ST1
104ST3
104ST2
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938L/9L938
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919L
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1135L
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974L
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740L-3
740L-4
740AL
740L-5
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202L-1
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847L-2
847L_2
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745AL-2
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501CL
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526BL
519L-1
519L-2
519AL
825L
826L
799L_2
798L
797L
685L
503L
864L-1
864L-2
864L-3
864AL
864BL
907L
854L-1
854L-2
854AL
134 MW -23 Mvar
127 MW -25 Mvar
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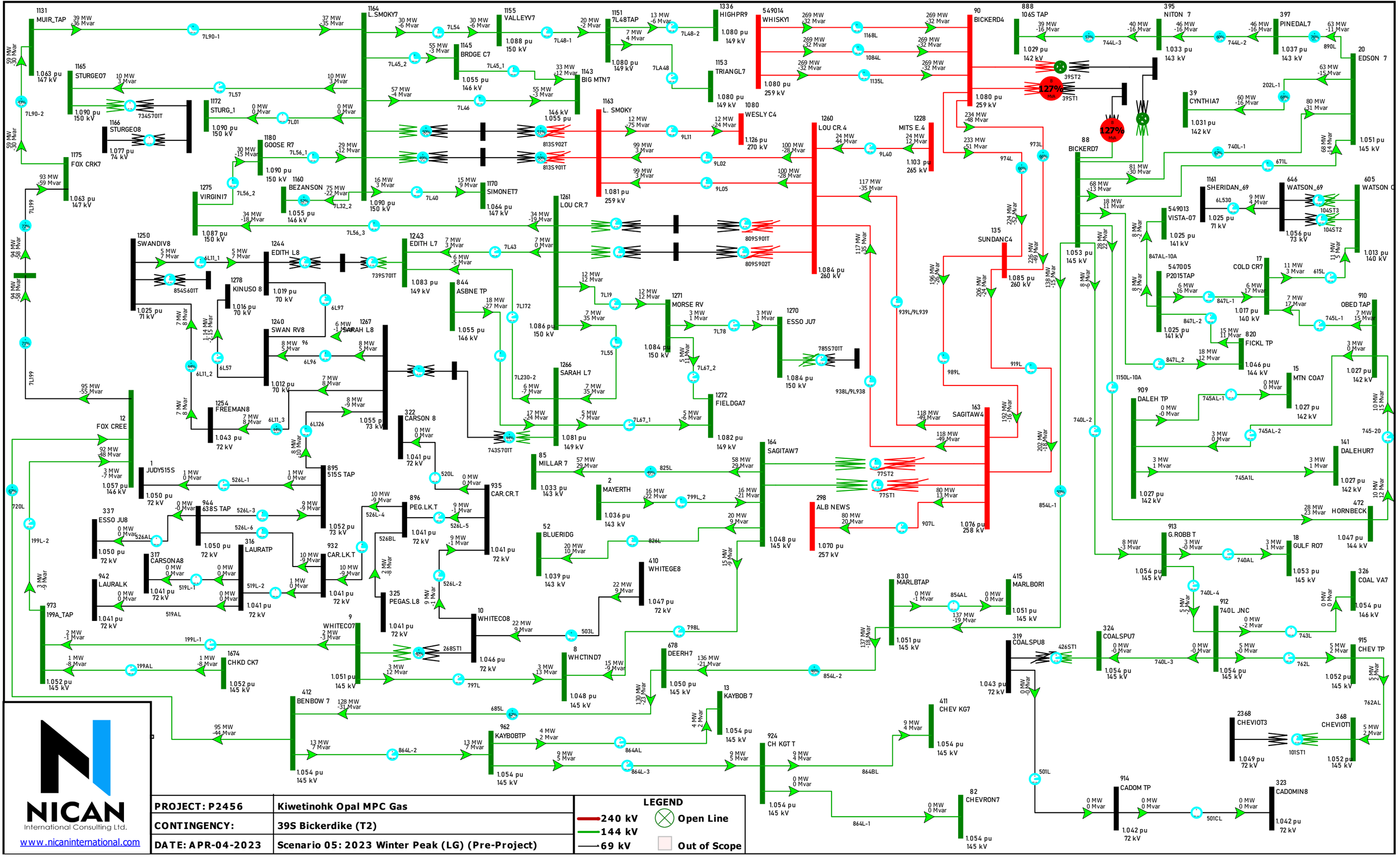
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
39S Bickerdike (T1)
DATE: APR-04-2023
Scenario 05: 2023 Winter Peak (LG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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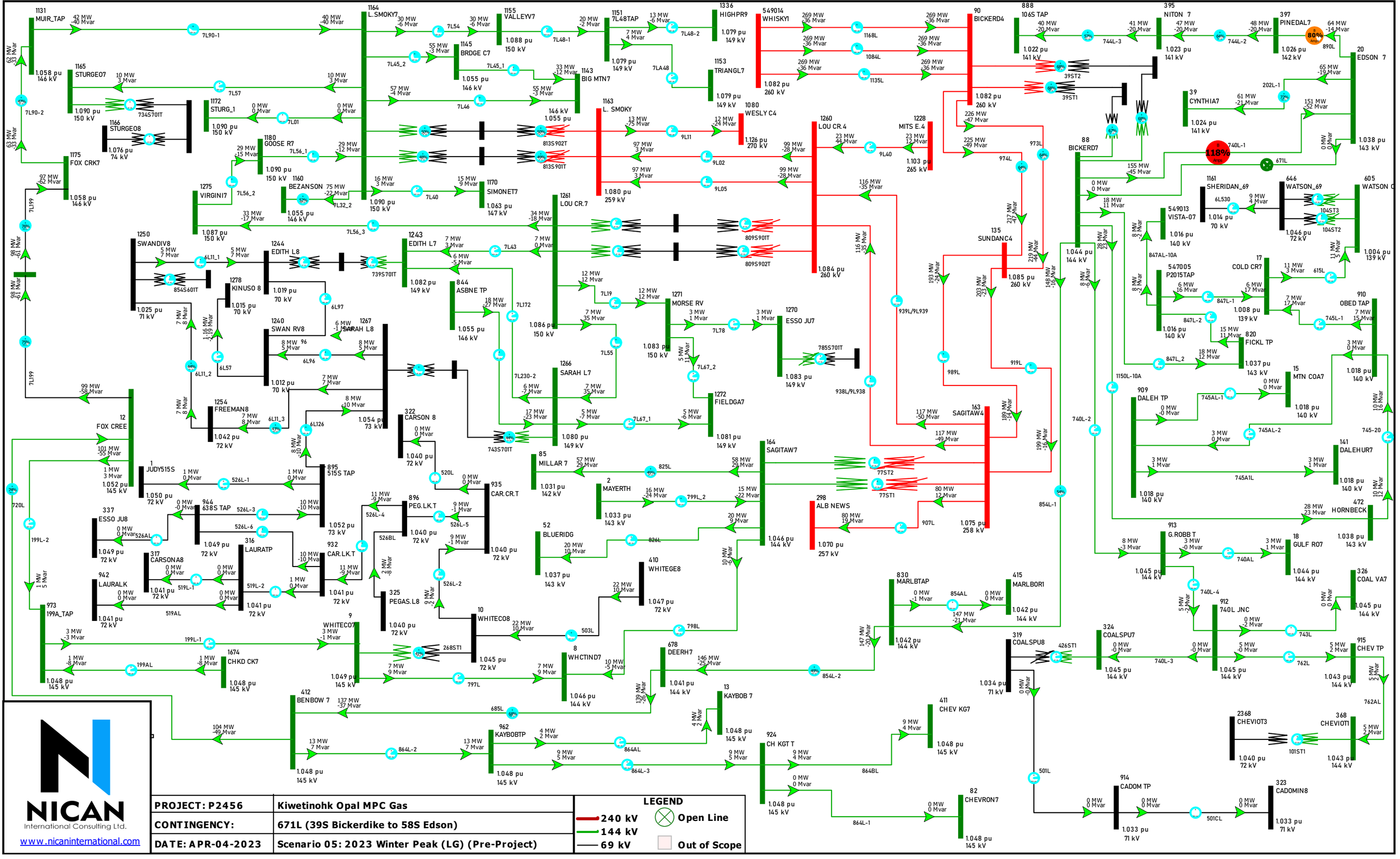
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	39S Bickerdike (T2)
DATE: APR-04-2023	Scenario 05: 2023 Winter Peak (LG) (Pre-Project)



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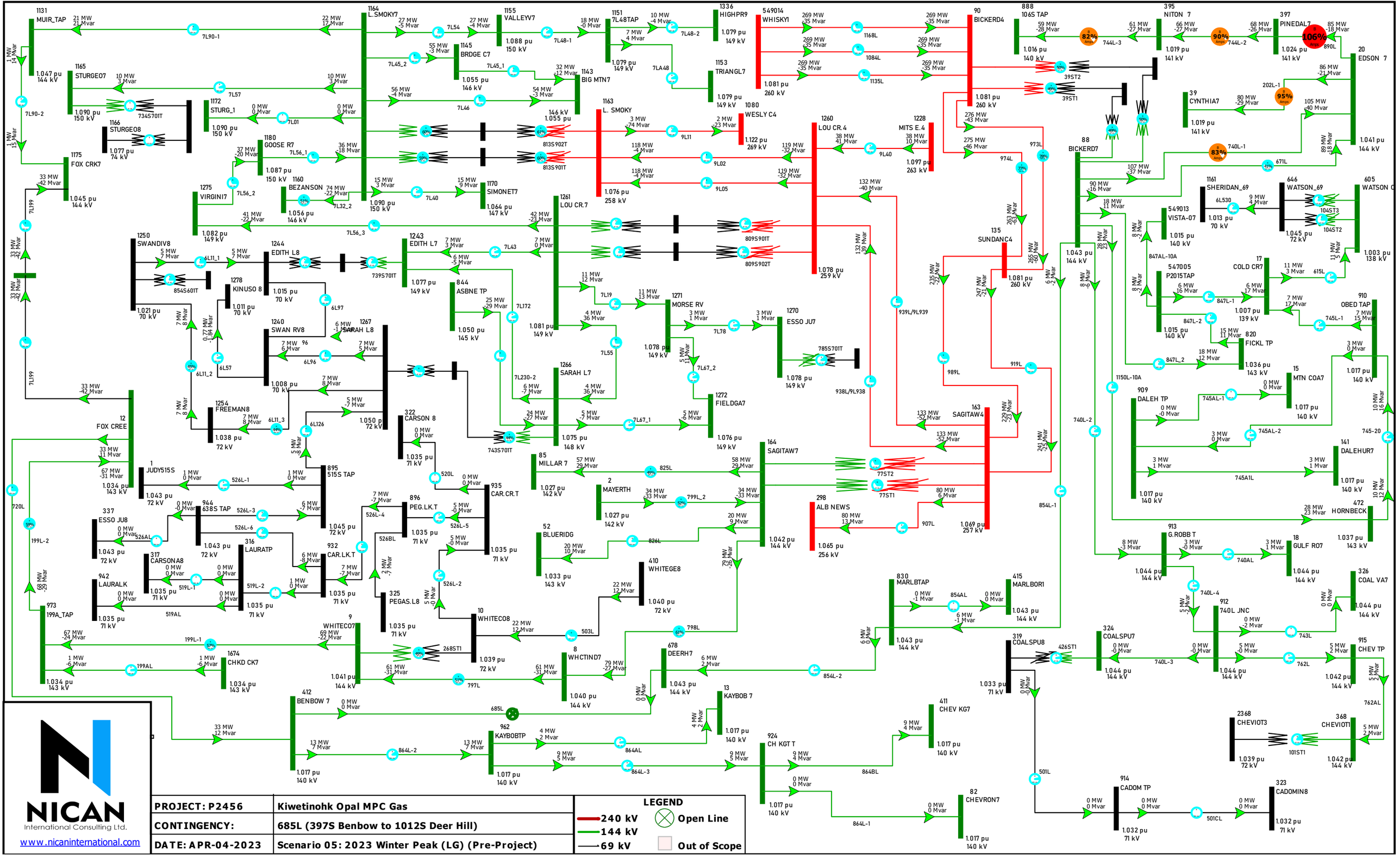
PROJECT: P2456	Kiwetinohk Opal MPC Gas	LEGEND	
CONTINGENCY:	671L (39S Bickerdike to 58S Edson)	240 kV	Open Line
DATE: APR-04-2023	Scenario 05: 2023 Winter Peak (LG) (Pre-Project)	144 kV 69 kV	Out of Scope


1131 MUIR_TAP
1.047 pu 144 kV
1165 STURGEO7
1.090 pu 150 kV
1166 STURGEO8
1.077 pu 74 kV
1175 FOX CRK7
1.045 pu 144 kV
1164 L.SMOKY7
1.090 pu 150 kV
1172 STURG_1
1.090 pu 150 kV
1180 GOOSE R7
1.087 pu 150 kV
1160 BEZANSON
1.056 pu 146 kV
1275 VIRGINI7
1.082 pu 149 kV
1155 VALLEYV7
1.088 pu 150 kV
1145 BRDGE C7
1.055 pu 146 kV
1143 BIG MTN7
146 kV 1.055 pu
1163 L. SMOKY
1.076 pu 258 kV
1170 SIMONET7
1.064 pu 147 kV
1151 7L48TAP
1.079 pu 149 kV
1336 HIGHPR9
1.079 pu 149 kV
1153 TRIANGL7
1.079 pu 149 kV
549014 WHISKY1
1.081 pu 260 kV
1080 WESLY C4
1.122 pu 269 kV
1260 LOU CR.4
1228 MITS E.4
1.097 pu 263 kV
1261 LOU CR.7
1.078 pu 259 kV
90 BICKERD4
1.081 pu 260 kV
888 106S TAP
1.016 pu 140 kV
395 NITON 7
1.019 pu 141 kV
397 PINEDAL7
1.024 pu 141 kV
20 EDSON 7
1.041 pu 144 kV
39 CYNTHIA7
1.019 pu 141 kV
88 BICKERD7
1.043 pu 144 kV
135 SUNDANC4
1.081 pu 260 kV
1161 SHERIDAN_69
1.013 pu 70 kV
646 WATSON_69
1.045 pu 72 kV
605 WATSON C
1.003 pu 138 kV
549013 VISTA-07
1.015 pu 140 kV
547005 P2015TAP
1.015 pu 140 kV
17 COLD CR7
1.007 pu 139 kV
910 OBED TAP
1.017 pu 140 kV
820 FICKL TP
1.036 pu 143 kV
15 MTN COA7
1.017 pu 140 kV
909 DALEH TP
1.017 pu 140 kV
141 DALEHUR7
1.017 pu 140 kV
472 HORNBECK
1.037 pu 143 kV
913 G.ROBB T
1.044 pu 144 kV
18 GULF RO7
1.044 pu 144 kV
912 740L JNC
1.044 pu 144 kV
326 COAL VA7
1.044 pu 144 kV
915 CHEV TP
1.042 pu 144 kV
324 COALSPU7
1.044 pu 144 kV
319 COALSPU8
1.033 pu 71 kV
2368 CHEVIOT3
1.039 pu 72 kV
368 CHEVIOTI
1.042 pu 144 kV
914 CADOM TP
1.032 pu 71 kV
323 CADOMIN8
1.032 pu 71 kV
1250 SWANDIV8
1.021 pu 70 kV
1278 KINUSO 8
1.011 pu 70 kV
1244 EDITH L8
1.015 pu 70 kV
1240 SWAN RV8
1.008 pu 70 kV
1267 SARAH L8
1.050 pu 72 kV
1254 FREEMAN8
1.038 pu 72 kV
12 FOX CREE
1.034 pu 143 kV
1 JUDY515S
1.043 pu 72 kV
337 ESSO JU8
1.043 pu 72 kV
317 CARSONA8
1.035 pu 71 kV
316 LAURATP
1.035 pu 71 kV
942 LAURALK
1.035 pu 71 kV
944 638S TAP
1.043 pu 72 kV
895 515S TAP
1.045 pu 72 kV
973 199A_TAP
1.034 pu 143 kV
1674 CHKD CK7
1.034 pu 143 kV
322 CARSON 8
1.035 pu 71 kV
896 PEG.LK.T
1.035 pu 71 kV
935 CAR.CR.T
1.035 pu 71 kV
932 CAR.LK.T
1.035 pu 71 kV
325 PEGAS.L8
1.035 pu 71 kV
1243 EDITH L7
1.077 pu 149 kV
844 ASBNE TP
1.050 pu 145 kV
1266 SARAH L7
1.075 pu 148 kV
1271 MORSE RV
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1270 ESSO JU7
1.078 pu 149 kV
1272 FIELDGA7
1.076 pu 149 kV
85 MILLAR 7
1.027 pu 142 kV
2 MAYERTH
1.027 pu 142 kV
52 BLUERIDG
1.033 pu 143 kV
10 WHITEC08
1.039 pu 72 kV
9 WHITEC07
1.041 pu 144 kV
8 WHCTIND7
1.040 pu 144 kV
410 WHITEGE8
1.040 pu 72 kV
678 DEERH7
1.043 pu 144 kV
412 BENBOW 7
1.017 pu 140 kV
962 KAYBOBTP
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13 KAYBOB 7
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164 SAGITAW7
1.042 pu 144 kV
163 SAGITAW4
1.069 pu 257 kV
298 ALB NEWS
1.065 pu 256 kV
924 CH KGT T
1.017 pu 140 kV
411 CHEV KG7
1.017 pu 140 kV
82 CHEVRON7
1.017 pu 140 kV
830 MARLBTAP
1.043 pu 144 kV
415 MARLBOR1
1.043 pu 144 kV
7L90-1
7L90-2
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7L01
7L46
7L45_1
7L45_2
7L54
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7L48-2
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7L40
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7L56_2
7L56_3
7L32_2
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7L11
7L02
7L05
7L43
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7L67_1
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7L11_3
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785S701T
809S901T
809S902T
813S902T
813S901T
734S701T
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77ST2
39ST1
39ST2
101ST1
104ST2
104ST3
268ST1
426ST1
854S601T
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1135L
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938L/9L938
989L
919L
973L
907L
685L
671L
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745AL-2
745A1L
745-20
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762AL
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847L-2
847L_2
847AL-10A
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501L
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854L-2
720L
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1L501CL
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82%
90%
106%
95%
83%
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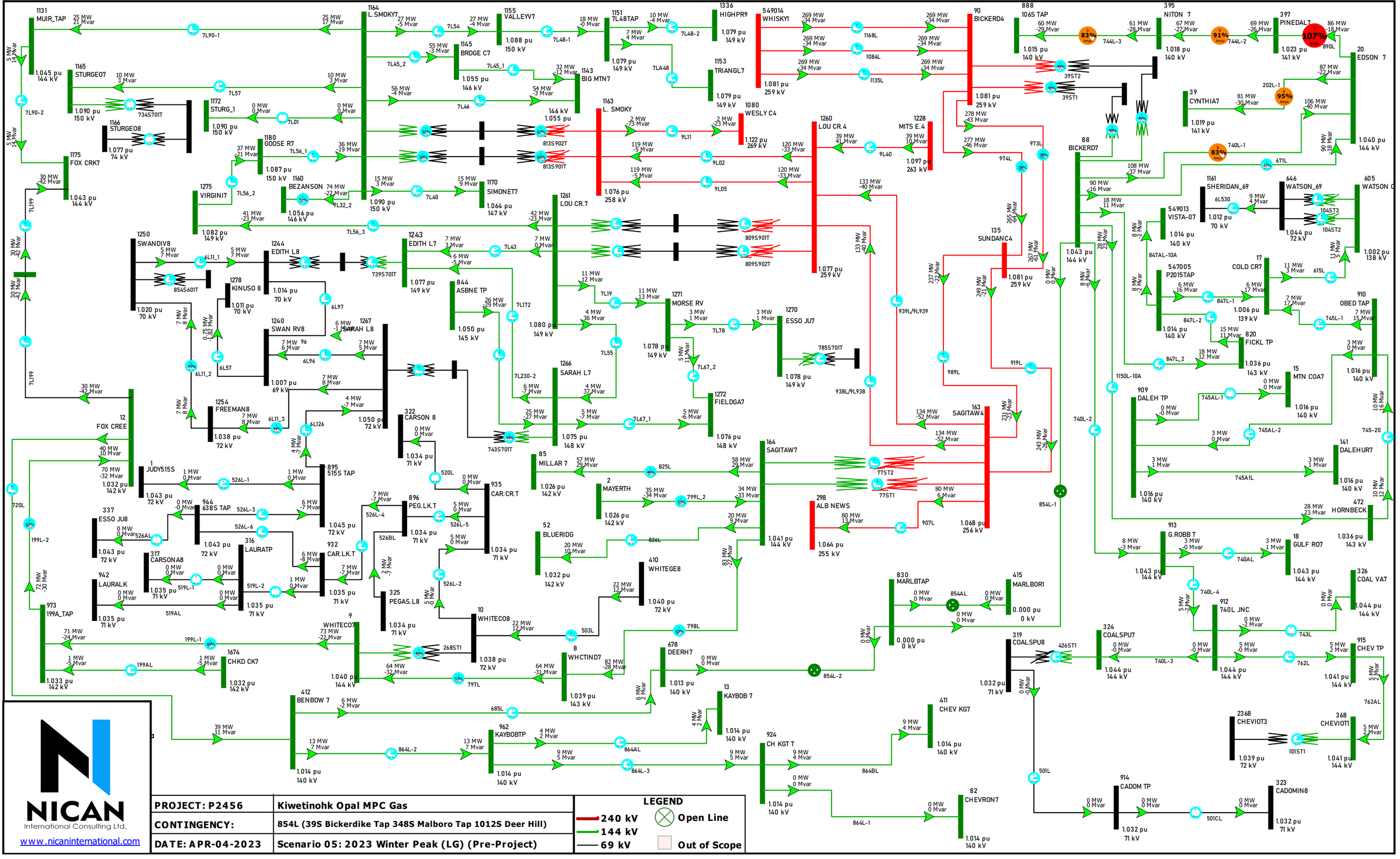
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
685L (397S Benbow to 1012S Deer Hill)
DATE: APR-04-2023
Scenario 05: 2023 Winter Peak (LG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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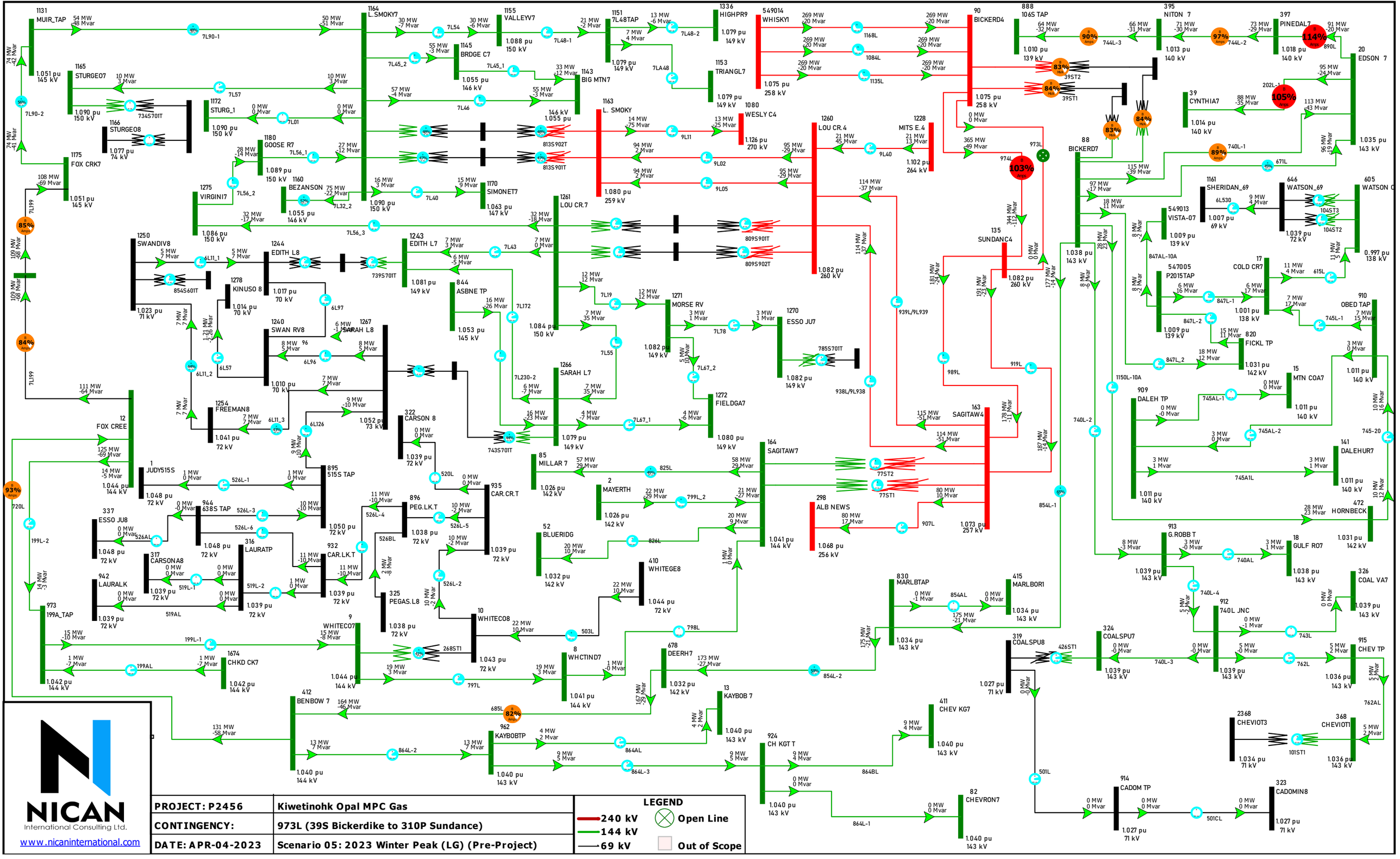
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)**
DATE: APR-04-2023	**Scenario 05: 2023 Winter Peak (LG) (Pre-Project)**

LEGEND

240 kV	Open Line
144 kV	
69 kV	Out of Scope


1131 MUIR_TAP
1.051 pu 145 kV
1165 STURGEO7
1.090 pu 150 kV
1166 STURGEO8
1.077 pu 74 kV
1175 FOX CRK7
1.051 pu 145 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.088 pu 150 kV
1145 BRDGE C7
1.055 pu 146 kV
1143 BIG MTN7
146 kV 1.055 pu
1172 STURG_1
1.090 pu 150 kV
1180 GOOSE R7
1.089 pu 150 kV
1160 BEZANSON
1.055 pu 146 kV
1275 VIRGINI7
1.086 pu 150 kV
1170 SIMONET7
1.063 pu 147 kV
1163 L. SMOKY
1.080 pu 259 kV
1151 7L48TAP
1.079 pu 149 kV
1336 HIGHPR9
1.079 pu 149 kV
1153 TRIANGL7
1.079 pu 149 kV
1080 WESLY C4
1.126 pu 270 kV
549014 WHISKY1
1.075 pu 258 kV
1260 LOU CR.4
1.082 pu 260 kV
1228 MITS E.4
1.102 pu 264 kV
90 BICKERD4
1.075 pu 258 kV
888 106S TAP
1.010 pu 139 kV
395 NITON 7
1.013 pu 140 kV
397 PINEDAL7
1.018 pu 140 kV
20 EDSON 7
1.035 pu 143 kV
39 CYNTHIA7
1.014 pu 140 kV
88 BICKERD7
1.038 pu 143 kV
1261 LOU CR.7
1.084 pu 150 kV
1243 EDITH L7
1.081 pu 149 kV
1244 EDITH L8
1.017 pu 70 kV
1250 SWANDIV8
1.023 pu 71 kV
1278 KINUSO 8
1.014 pu 70 kV
1240 SWAN RV8
1.010 pu 70 kV
1267 SARAH L8
1.052 pu 73 kV
1254 FREEMAN8
1.041 pu 72 kV
12 FOX CREE
1.044 pu 144 kV
1 JUDY515S
1.048 pu 72 kV
322 CARSON 8
1.039 pu 72 kV
844 ASBNE TP
1.053 pu 145 kV
1266 SARAH L7
1.079 pu 149 kV
1271 MORSE RV
1.082 pu 149 kV
1270 ESSO JU7
1.082 pu 149 kV
1272 FIELDGA7
1.080 pu 149 kV
85 MILLAR 7
1.026 pu 142 kV
2 MAYERTH
1.026 pu 142 kV
52 BLUERIDG
1.032 pu 142 kV
410 WHITEGE8
1.044 pu 72 kV
10 WHITECO8
1.043 pu 72 kV
9 WHITECO7
1.044 pu 144 kV
8 WHCTIND7
1.041 pu 144 kV
678 DEERH7
1.032 pu 142 kV
13 KAYBOB 7
1.040 pu 143 kV
962 KAYBOBTP
1.040 pu 143 kV
412 BENBOW 7
1.040 pu 144 kV
164 SAGITAW7
1.041 pu 144 kV
924 CH KGT T
1.040 pu 143 kV
411 CHEV KG7
1.040 pu 143 kV
82 CHEVRON7
1.040 pu 143 kV
163 SAGITAW4
1.073 pu 257 kV
298 ALB NEWS
1.068 pu 256 kV
135 SUNDANC4
1.082 pu 260 kV
830 MARLBTAP
1.034 pu 143 kV
415 MARLBOR1
1.034 pu 143 kV
319 COALSPU8
1.027 pu 71 kV
324 COALSPU7
1.039 pu 143 kV
912 740L JNC
1.039 pu 143 kV
326 COAL VA7
1.039 pu 143 kV
915 CHEV TP
1.036 pu 143 kV
2368 CHEVIOT3
1.034 pu 71 kV
368 CHEVIOTI
1.036 pu 143 kV
914 CADOM TP
1.027 pu 71 kV
323 CADOMIN8
1.027 pu 71 kV
1161 SHERIDAN_69
1.007 pu 69 kV
646 WATSON_69
1.039 pu 72 kV
605 WATSON C
0.997 pu 138 kV
547005 P2015TAP
1.001 pu 138 kV
17 COLD CR7
1.009 pu 139 kV
820 FICKL TP
1.031 pu 142 kV
910 OBED TAP
1.011 pu 140 kV
15 MTN COA7
1.011 pu 140 kV
909 DALEH TP
1.011 pu 140 kV
141 DALEHUR7
1.011 pu 140 kV
472 HORNBECK
1.031 pu 142 kV
913 G.ROBB T
1.039 pu 143 kV
18 GULF RO7
1.038 pu 143 kV
973 199A_TAP
1.042 pu 144 kV
1674 CHKD CK7
1.042 pu 144 kV
337 ESSO JU8
1.048 pu 72 kV
942 LAURALK
1.039 pu 72 kV
317 CARSONA8
1.039 pu 72 kV
316 LAURATP
1.039 pu 72 kV
944 638S TAP
1.048 pu 72 kV
895 515S TAP
1.050 pu 72 kV
896 PEG.LK.T
1.038 pu 72 kV
935 CAR.CR.T
1.039 pu 72 kV
932 CAR.LK.T
1.039 pu 72 kV
325 PEGAS.L8
1.038 pu 72 kV
1038S902T
1038S901T
809S901T
809S902T
743S701T
268ST1
734S701T
854S601T
739S701T
785S701T
938L/9L938
939L/9L939
973L
974L
989L
919L
685L
720L
199L-2
854L-1
907L
864L-1
864L-2
864L-3
864AL
864BL
825L
799L_2
798L
797L
503L
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
7L90-1
7L90-2
7L199
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48
7L57
7L01
7L56_1
7L56_2
7L56_3
7L32_2
7L40
7L43
7L19
7L55
7L78
7L67_2
7L67_1
7L172
7L230-2
7L97
6L96
6L57
6L11_1
6L11_2
6L11_3
6L126
9L11
9L02
9L05
9L40
744L-3
744L-2
890L
202L-1
740L-1
671L
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
101ST1
104ST3
104ST2
6L530
615L
847AL-10A
847L-1
847L-2
847L_2
745L-1
745AL-1
745AL-2
745A1L
1150L-10A
740L-2
740AL
740L-4
740L-3
762L
762AL
501L
501CL
854AL
854L-2
745-20
426ST1
175 MW -21 Mvar
114 MW -37 Mvar
114 MW -27 Mvar
191 MW -24 Mvar
191 MW -23 Mvar
177 MW -14 Mvar
344 MW -112 Mvar
365 MW -49 Mvar
115 MW -39 Mvar
97 MW -17 Mvar
18 MW 11 Mvar
28 MW 23 Mvar
8 MW -2 Mvar
8 MW -6 Mvar
11 MW -7 Mvar
111 MW -64 Mvar
125 MW -69 Mvar
14 MW -5 Mvar
131 MW -58 Mvar
164 MW -46 Mvar
167 MW -29 Mvar
175 MW -21 Mvar
187 MW -14 Mvar
178 MW -11 Mvar
80 MW 10 Mvar
58 MW 29 Mvar
57 MW 29 Mvar
108 MW -69 Mvar
109 MW -68 Mvar
74 MW -43 Mvar
71 MW -41 Mvar
14 MW -3 Mvar
199L-1
199AL
739S701T
743S701T
268ST1
809S901T
809S902T
1038S902T
1038S901T
813S902T
813S901T
734S701T
854S601T
785S701T
938L/9L938
939L/9L939
973L
974L
989L
919L
685L
720L
854L-1
907L
864L-1
864L-2
864L-3
864AL
864BL
825L
799L_2
798L
797L
503L
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
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7L90-2
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7L45_2
7L45_1
7L46
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7L56_2
7L56_3
7L32_2
7L40
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7L19
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7L78
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7L67_1
7L172
7L230-2
7L97
6L96
6L57
6L11_1
6L11_2
6L11_3
6L126
9L11
9L02
9L05
9L40
744L-3
744L-2
890L
202L-1
740L-1
671L
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
101ST1
104ST3
104ST2
6L530
615L
847AL-10A
847L-1
847L-2
847L_2
745L-1
745AL-1
745AL-2
745A1L
1150L-10A
740L-2
740AL
740L-4
740L-3
762L
762AL
501L
501CL
854AL
854L-2
745-20
426ST1
85% 109 MW -68 Mvar
84% 111 MW -64 Mvar
93% 720L
82% 685L
103% 974L
90% 744L-3
97% 744L-2
114% 890L
105% 202L-1
89% 740L-1
83% 39ST2
84% 39ST1
83% 77ST2
84% 77ST1
44% 6L11_2
43% 6L11_3
49% 813S902T
47% 813S901T
52% 7L32_2
41% 268ST1
44% 743S701T
69% 854L-1
52% 671L
NICAN
International Consulting Ltd.
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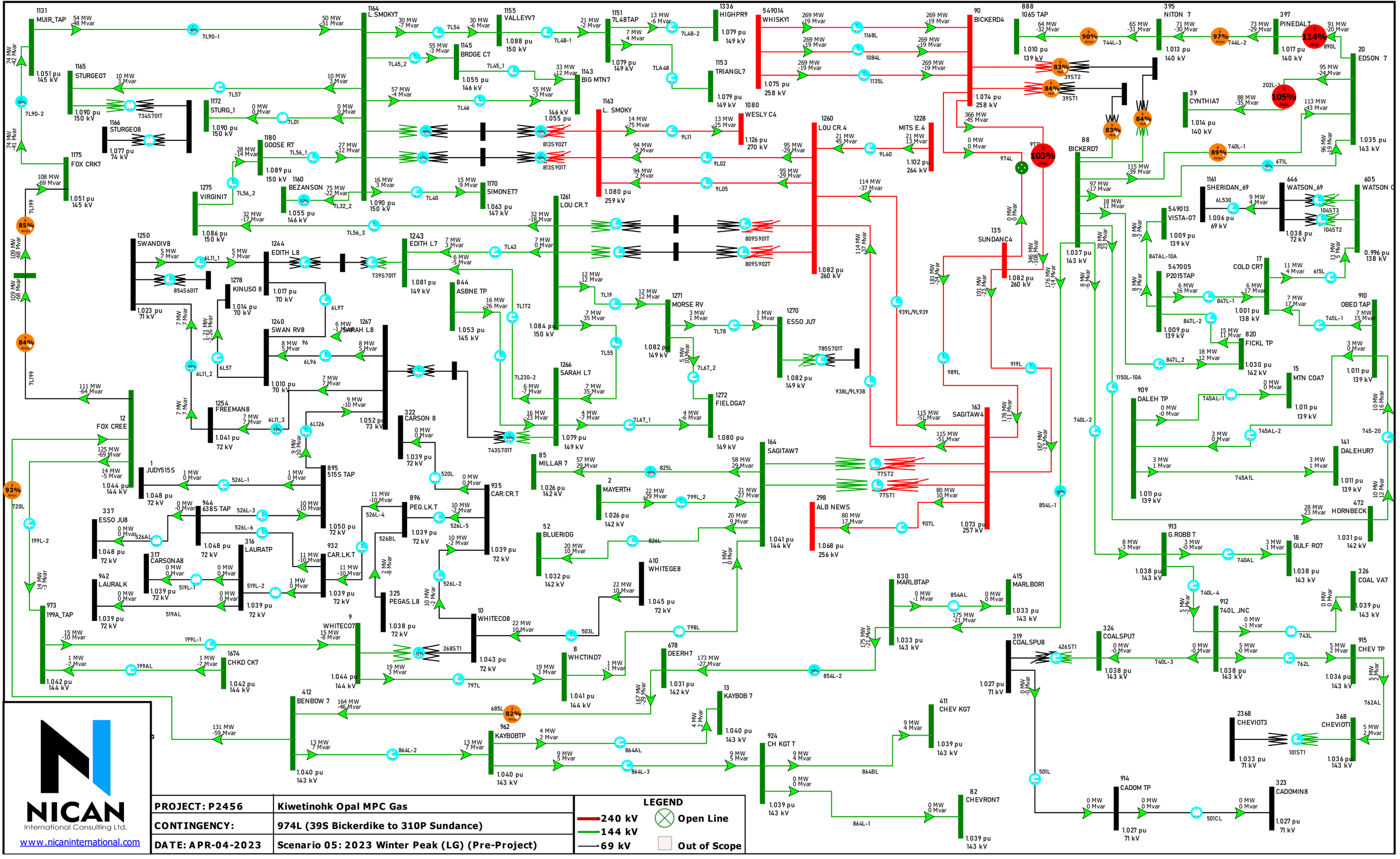
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 05: 2023 Winter Peak (LG) (Pre-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope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1.051 pu 145 kV
1165 STURGEO7
1.090 pu 150 kV
1166 STURGEO8
1.077 pu 74 kV
1175 FOX CRK7
1.051 pu 145 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.088 pu 150 kV
1145 BRDGE C7
1.055 pu 146 kV
1143 BIG MTN7
146 kV 1.055 pu
1172 STURG_1
1.090 pu 150 kV
1180 GOOSE R7
1.089 pu 150 kV
1160 BEZANSON
1.055 pu 146 kV
1275 VIRGINI7
1.086 pu 150 kV
1170 SIMONET7
1.063 pu 147 kV
1163 L. SMOKY
1.080 pu 259 kV
1151 7L48TAP
1.079 pu 149 kV
1336 HIGHPR9
1.079 pu 149 kV
1153 TRIANGL7
1.079 pu 149 kV
1080 WESLY C4
1.126 pu 270 kV
549014 WHISKY1
1.075 pu 258 kV
1260 LOU CR.4
1.082 pu 260 kV
1228 MITS E.4
1.102 pu 264 kV
90 BICKERD4
1.074 pu 258 kV
888 106S TAP
1.010 pu 139 kV
395 NITON 7
1.013 pu 140 kV
397 PINEDAL7
1.017 pu 140 kV
20 EDSON 7
1.035 pu 143 kV
39 CYNTHIA7
1.014 pu 140 kV
88 BICKERD7
1.037 pu 143 kV
1161 SHERIDAN_69
1.006 pu 69 kV
646 WATSON_69
1.038 pu 72 kV
605 WATSON C
0.996 pu 138 kV
549013 VISTA-07
1.009 pu 139 kV
17 COLD CR7
1.001 pu 138 kV
547005 P2015TAP
1.009 pu 139 kV
910 OBED TAP
1.011 pu 139 kV
820 FICKL TP
1.030 pu 142 kV
15 MTN COA7
1.011 pu 139 kV
909 DALEH TP
1.011 pu 139 kV
141 DALEHUR7
1.011 pu 139 kV
472 HORNBECK
1.031 pu 142 kV
913 G.ROBB T
1.038 pu 143 kV
18 GULF RO7
1.038 pu 143 kV
326 COAL VA7
1.039 pu 143 kV
912 740L JNC
1.038 pu 143 kV
915 CHEV TP
1.036 pu 143 kV
324 COALSPU7
1.038 pu 143 kV
319 COALSPU8
1.027 pu 71 kV
914 CADOM TP
1.027 pu 71 kV
323 CADOMIN8
1.027 pu 71 kV
2368 CHEVIOT3
1.033 pu 71 kV
368 CHEVIOTI
1.036 pu 143 kV
1250 SWANDIV8
1.023 pu 71 kV
1244 EDITH L8
1.017 pu 70 kV
1278 KINUSO 8
1.014 pu 70 kV
1240 SWAN RV8
1.010 pu 70 kV
1267 SARAH L8
1.052 pu 73 kV
1254 FREEMAN8
1.041 pu 72 kV
322 CARSON 8
1.039 pu 72 kV
1243 EDITH L7
1.081 pu 149 kV
844 ASBNE TP
1.053 pu 145 kV
1261 LOU CR.7
1.084 pu 150 kV
1266 SARAH L7
1.079 pu 149 kV
1271 MORSE RV
1.082 pu 149 kV
1270 ESSO JU7
1.082 pu 149 kV
1272 FIELDGA7
1.080 pu 149 kV
85 MILLAR 7
1.026 pu 142 kV
2 MAYERTH
1.026 pu 142 kV
52 BLUERIDG
1.032 pu 142 kV
410 WHITEGE8
1.045 pu 72 kV
10 WHITEC08
1.043 pu 72 kV
9 WHITEC07
1.044 pu 144 kV
8 WHCTIND7
1.041 pu 144 kV
678 DEERH7
1.031 pu 142 kV
13 KAYBOB 7
1.040 pu 143 kV
962 KAYBOBTP
1.040 pu 143 kV
412 BENBOW 7
1.040 pu 143 kV
164 SAGITAW7
1.041 pu 144 kV
163 SAGITAW4
1.073 pu 257 kV
298 ALB NEWS
1.068 pu 256 kV
924 CH KGT T
1.039 pu 143 kV
411 CHEV KG7
1.039 pu 143 kV
82 CHEVRON7
1.039 pu 143 kV
135 SUNDANC4
1.082 pu 260 kV
830 MARLBTAP
1.033 pu 143 kV
415 MARLBOR1
1.033 pu 143 kV
973 199A_TAP
1.042 pu 144 kV
1674 CHKD CK7
1.042 pu 144 kV
1 JUDY515S
1.048 pu 72 kV
895 515S TAP
1.050 pu 72 kV
944 638S TAP
1.048 pu 72 kV
337 ESSO JU8
1.048 pu 72 kV
317 CARSONA8
1.039 pu 72 kV
316 LAURATP
1.039 pu 72 kV
942 LAURALK
1.039 pu 72 kV
932 CAR.LK.T
1.039 pu 72 kV
896 PEG.LK.T
1.039 pu 72 kV
935 CAR.CR.T
1.039 pu 72 kV
325 PEGAS.L8
1.038 pu 72 kV
1.040 pu 143 kV
1.044 pu 144 kV
1.042 pu 144 kV
1.039 pu 72 kV
1.048 pu 72 kV
1.039 pu 72 kV
1.039 pu 72 kV
1.039 pu 72 kV
1.039 pu 72 kV
1.038 pu 72 kV
1.043 pu 72 kV
1.041 pu 144 kV
1.031 pu 142 kV
1.040 pu 143 kV
1.040 pu 143 kV
1.041 pu 144 kV
1.073 pu 257 kV
1.068 pu 256 kV
1.039 pu 143 kV
1.039 pu 143 kV
1.039 pu 143 kV
1.033 pu 143 kV
1.033 pu 143 kV
1.038 pu 143 kV
1.038 pu 143 kV
1.036 pu 143 kV
1.033 pu 71 kV
1.027 pu 71 kV
1.027 pu 71 kV
1.027 pu 71 kV
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L56_3
7L32_2
7L40
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7LA48
9L11
9L02
9L05
9L40
974L
939L/9L939
989L
919L
938L/9L938
7L43
7L19
7L55
7L78
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7L67_1
7L172
7L230-2
7L97
7L96
6L97
6L57
6L11_1
6L11_2
6L11_3
6L126
7L199
199L-1
199L-2
199AL
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
6L530
854L-1
854L-2
854AL
864L-1
864L-2
864L-3
864AL
864BL
825L
799L_2
826L
798L
797L
503L
685L
740L-1
740L-2
740L-3
740L-4
740AL
745L-1
745L-2
745AL-1
745AL-2
745A1L
847L-1
847L-2
847L_2
847AL-10A
1150L-10A
671L
615L
762L
762AL
743L
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501L
501CL
744L-3
744L-2
890L
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
101ST1
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743S701T
739S701T
809S901T
809S902T
813S902T
813S901T
734S701T
854S601T
268ST1
104ST3
104ST2
202L-1
720L
90%
97%
114%
105%
103%
89%
85%
84%
83%
82%
93%
Amps
MVA
Kiwetinohk Opal MPC Gas
PROJECT: P2456
974L (39S Bickerdike to 310P Sundance)
CONTINGENCY:
Scenario 05: 2023 Winter Peak (LG) (Pre-Project)
DATE: APR-04-2023
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
NICAN
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Attachment A3
Post-Project Power Flow Diagrams

2023 SUMMER LIGHT

Single Line Diagrams
P2456 - POST-PROJECT
POWER FLOW SC06

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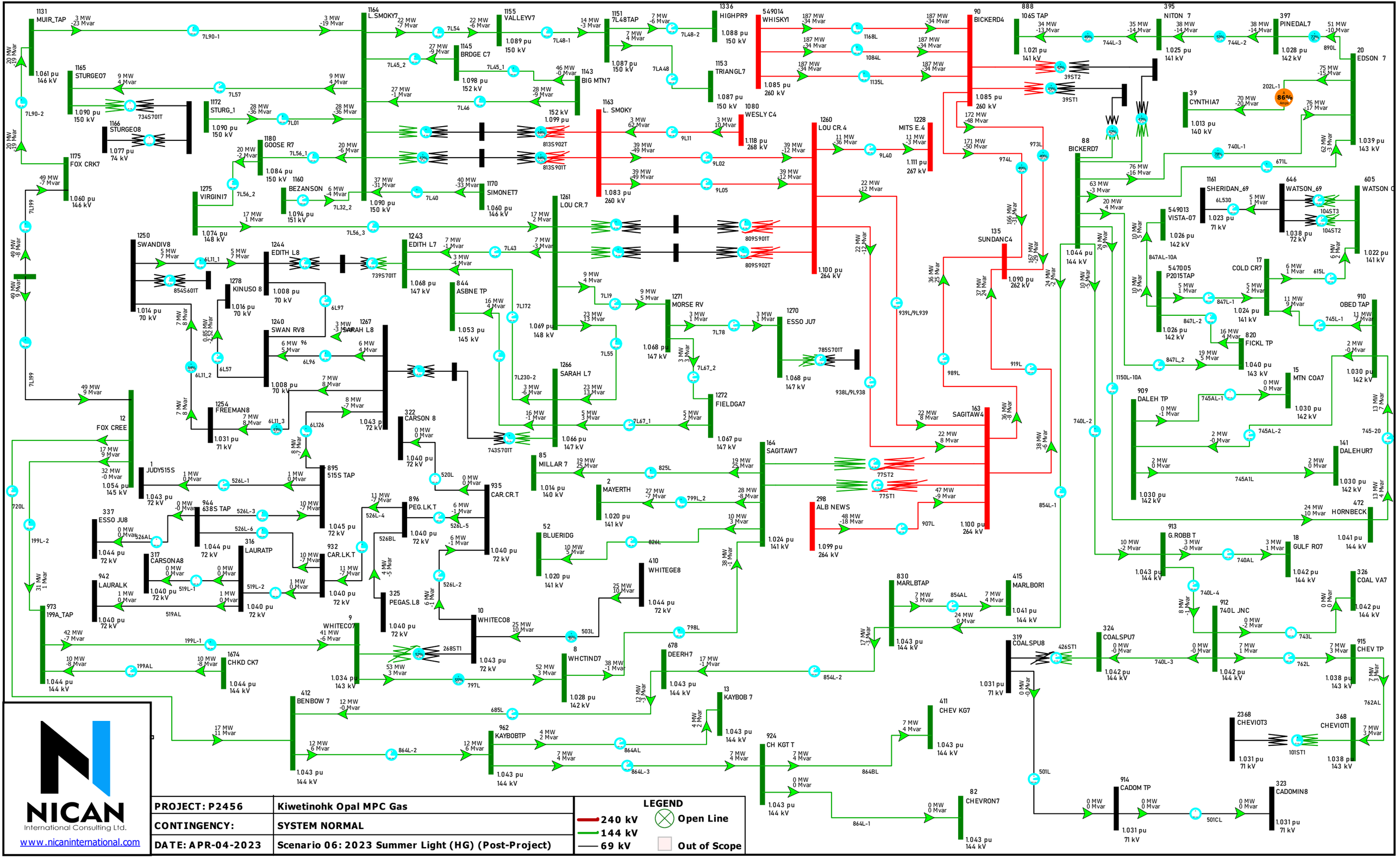

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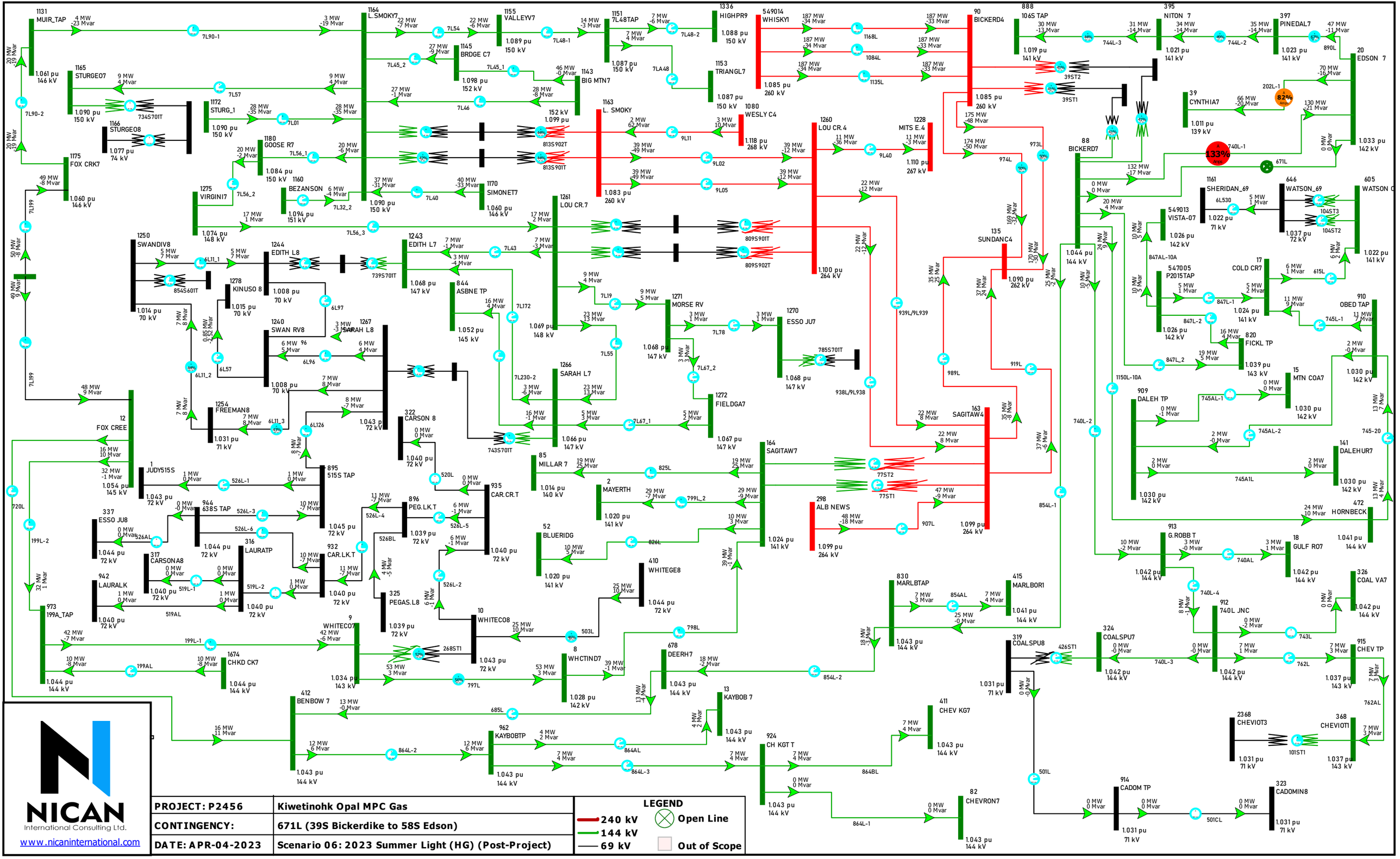
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 06: 2023 Summer Light (HG) (Post-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.061 pu 146 kV
1165 STURGEO7
1.090 pu 150 kV
1166 STURGEO8
1.077 pu 74 kV
1175 FOX CRK7
1.060 pu 146 kV
1164 L.SMOKY7
1.090 pu 150 kV
1155 VALLEYV7
1.089 pu 150 kV
1145 BRDGE C7
1.098 pu 152 kV
1143 BIG MTN7
152 kV 1.099 pu
1151 7L48TAP
1.087 pu 150 kV
1336 HIGHPR9
1.088 pu 150 kV
1153 TRIANGL7
1.087 pu 150 kV
549014 WHISKY1
1.085 pu 260 kV
90 BICKERD4
1.085 pu 260 kV
888 106S TAP
1.019 pu 141 kV
395 NITON 7
1.021 pu 141 kV
397 PINEDAL7
1.023 pu 141 kV
20 EDSON 7
1.033 pu 142 kV
39 CYNTHIA7
1.011 pu 139 kV
202L-1
82% Amps
740L-1
133% Amps
671L
88 BICKERD7
1.044 pu 144 kV
1172 STURG_1
1.090 pu 150 kV
1180 GOOSE R7
1.084 pu 150 kV
1160 BEZANSON
1.094 pu 151 kV
1275 VIRGINI7
1.074 pu 148 kV
1163 L. SMOKY
1.083 pu 260 kV
1080 WESLY C4
1.118 pu 268 kV
1260 LOU CR.4
1.100 pu 264 kV
1228 MITS E.4
1.110 pu 267 kV
1170 SIMONET7
1.060 pu 146 kV
1261 LOU CR.7
1.069 pu 148 kV
1250 SWANDIV8
1.014 pu 70 kV
1244 EDITH L8
1.008 pu 70 kV
1278 KINUSO 8
1.015 pu 70 kV
1243 EDITH L7
1.068 pu 147 kV
844 ASBNE TP
1.052 pu 145 kV
1240 SWAN RV8
1.008 pu 70 kV
1267 SARAH L8
1266 SARAH L7
1.066 pu 147 kV
1271 MORSE RV
1.068 pu 147 kV
1270 ESSO JU7
1.068 pu 147 kV
1272 FIELDGA7
1.067 pu 147 kV
1254 FREEMAN8
1.031 pu 71 kV
322 CARSON 8
1.040 pu 72 kV
1.043 pu 72 kV
85 MILLAR 7
1.014 pu 140 kV
2 MAYERTH
1.020 pu 141 kV
164 SAGITAW7
1.024 pu 141 kV
163 SAGITAW4
1.099 pu 264 kV
298 ALB NEWS
1.099 pu 264 kV
1161 SHERIDAN_69
1.022 pu 71 kV
646 WATSON_69
1.037 pu 72 kV
605 WATSON C
1.022 pu 141 kV
549013 VISTA-07
1.026 pu 142 kV
135 SUNDANC4
1.090 pu 262 kV
1.044 pu 144 kV
847AL-10A
547005 P2015TAP
1.026 pu 142 kV
17 COLD CR7
1.024 pu 141 kV
910 OBED TAP
1.030 pu 142 kV
820 FICKL TP
1.039 pu 143 kV
15 MTN COA7
1.030 pu 142 kV
909 DALEH TP
1.030 pu 142 kV
141 DALEHUR7
1.030 pu 142 kV
472 HORNBECK
1.041 pu 144 kV
913 G.ROBB T
1.042 pu 144 kV
18 GULF RO7
1.042 pu 144 kV
912 740L JNC
1.042 pu 144 kV
326 COAL VA7
1.042 pu 144 kV
915 CHEV TP
1.037 pu 143 kV
324 COALSPU7
1.042 pu 144 kV
319 COALSPU8
1.031 pu 71 kV
2368 CHEVIOT3
1.031 pu 71 kV
368 CHEVIOTI
1.037 pu 143 kV
914 CADOM TP
1.031 pu 71 kV
323 CADOMIN8
1.031 pu 71 kV
830 MARLBTAP
1.043 pu 144 kV
415 MARLBOR1
1.041 pu 144 kV
411 CHEV KG7
1.043 pu 144 kV
82 CHEVRON7
1.043 pu 144 kV
924 CH KGT T
1.043 pu 144 kV
12 FOX CREE
1.054 pu 145 kV
1 JUDY515S
1.043 pu 72 kV
944 638S TAP
1.044 pu 72 kV
895 515S TAP
1.045 pu 72 kV
337 ESSO JU8
1.044 pu 72 kV
316 LAURATP
1.040 pu 72 kV
317 CARSONA8
1.040 pu 72 kV
942 LAURALK
1.040 pu 72 kV
973 199A_TAP
1.044 pu 144 kV
1674 CHKD CK7
1.044 pu 144 kV
412 BENBOW 7
1.043 pu 144 kV
962 KAYBOBTP
1.043 pu 144 kV
13 KAYBOB 7
1.043 pu 144 kV
678 DEERH7
1.043 pu 144 kV
8 WHCTIND7
1.028 pu 142 kV
10 WHITEC08
1.043 pu 72 kV
9 WHITEC07
1.034 pu 143 kV
896 PEG.LK.T
1.039 pu 72 kV
325 PEGAS.L8
1.039 pu 72 kV
932 CAR.LK.T
1.040 pu 72 kV
935 CAR.CR.T
1.040 pu 72 kV
410 WHITEGE8
1.044 pu 72 kV
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 06: 2023 Summer Light (HG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
NICAN
International Consulting Ltd.
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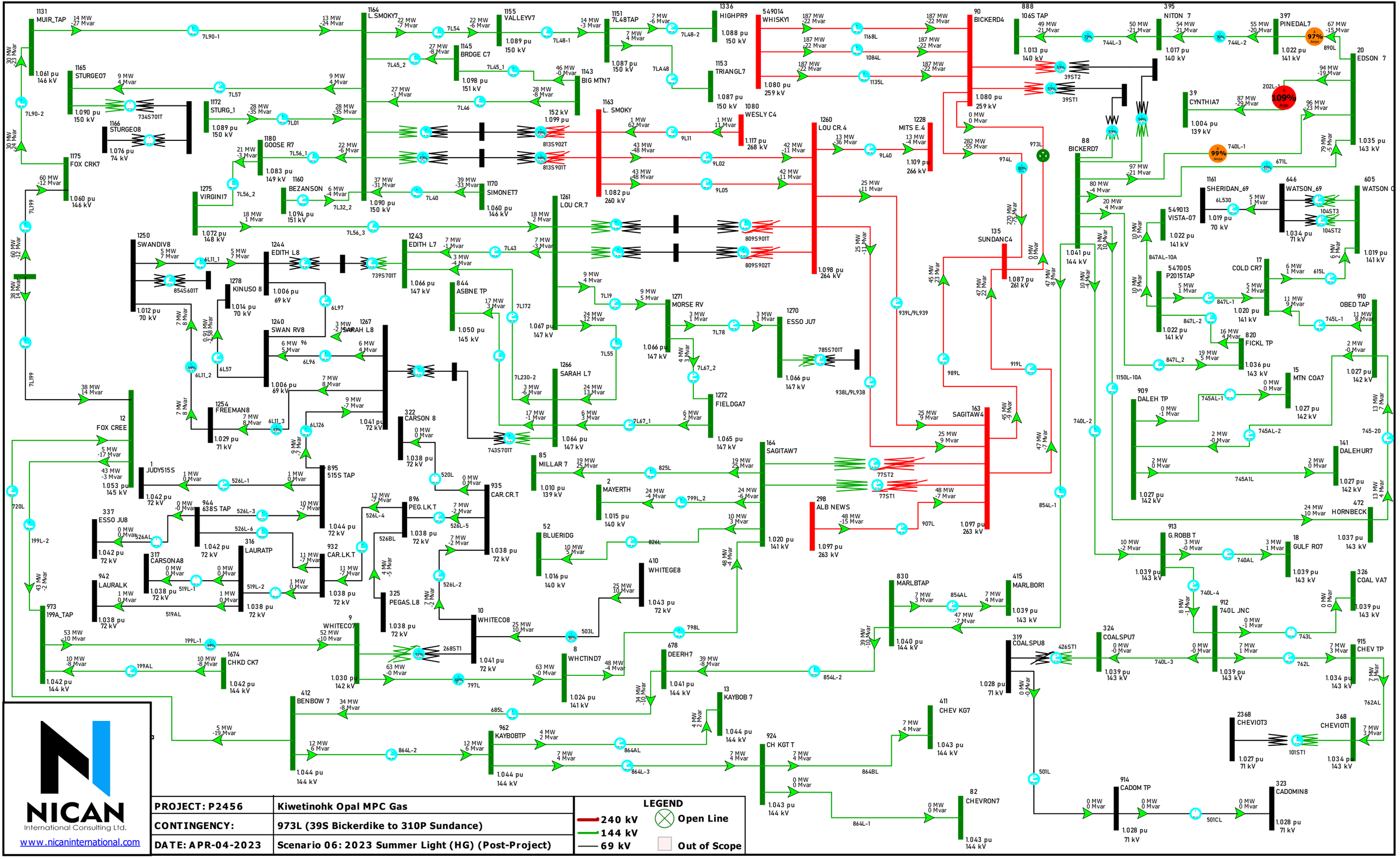

PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**973L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 06: 2023 Summer Light (HG) (Post-Project)**

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope

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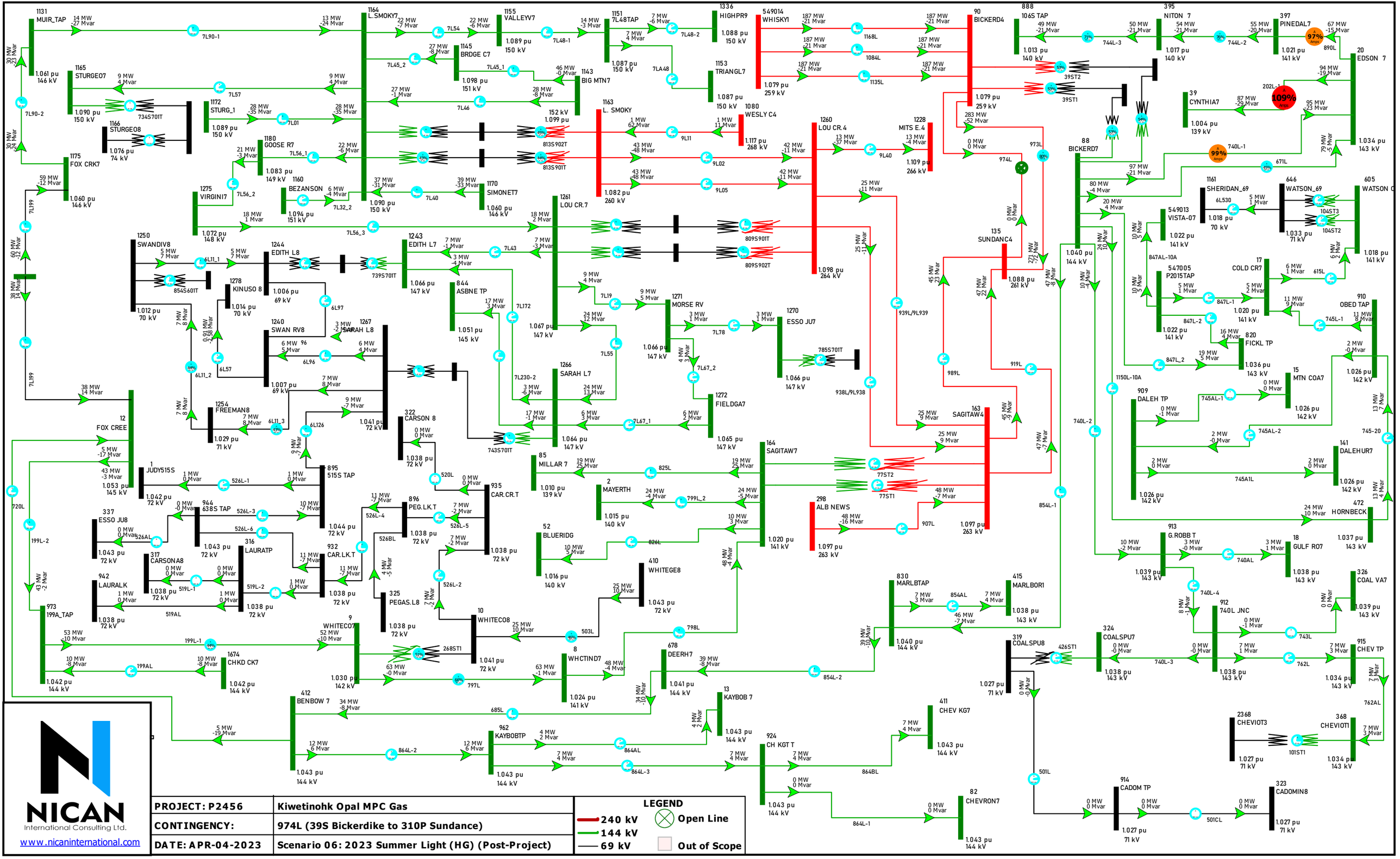

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PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 06: 2023 Summer Light (HG) (Post-Project)

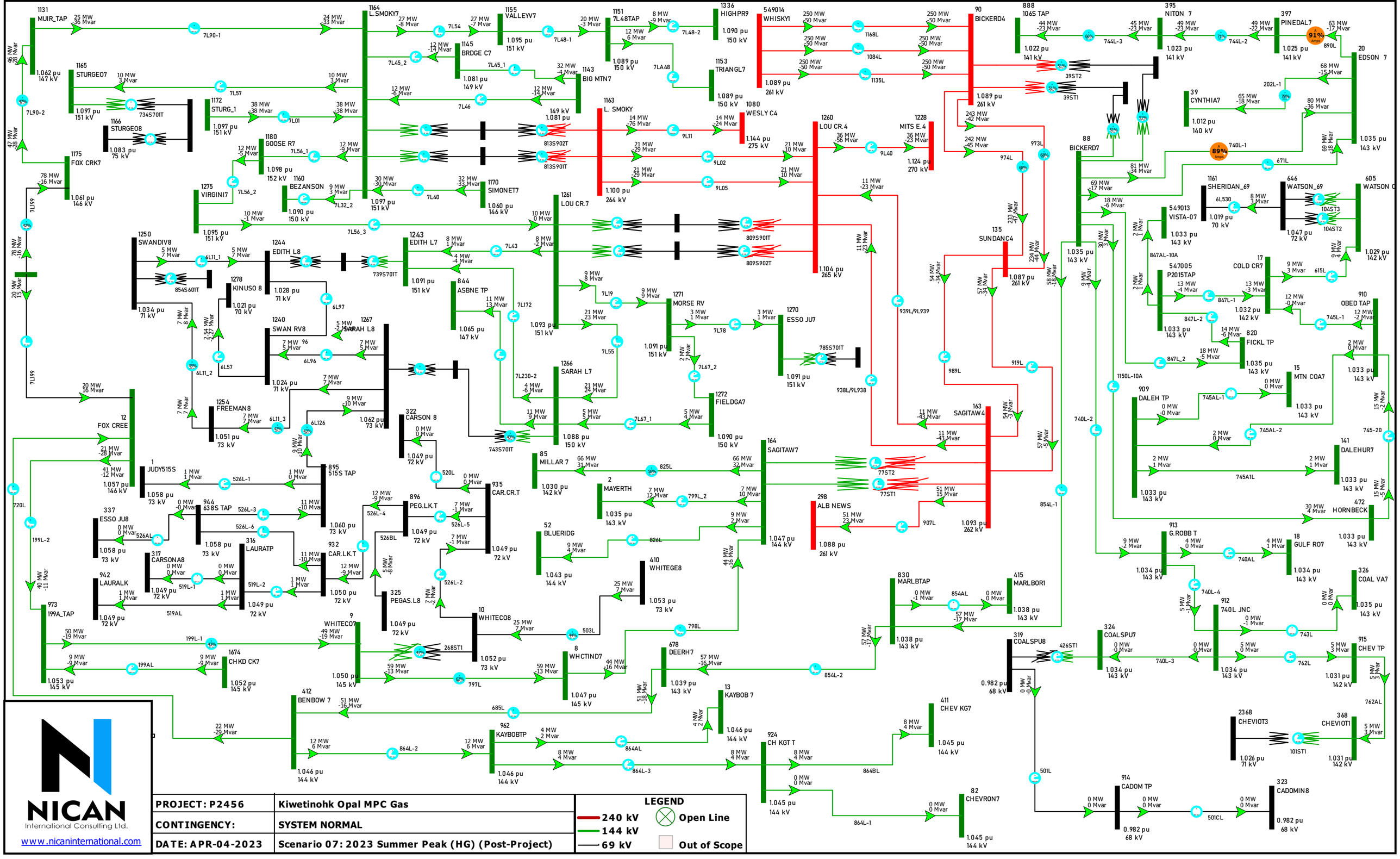
LEGEND

240 kV	⊗ Open Line
144 kV	
69 kV	☐ Out of Scope

2023 SUMMER PEAK

Single Line Diagrams
P2456 - POST-PROJECT
POWER FLOW SC07

NICAN



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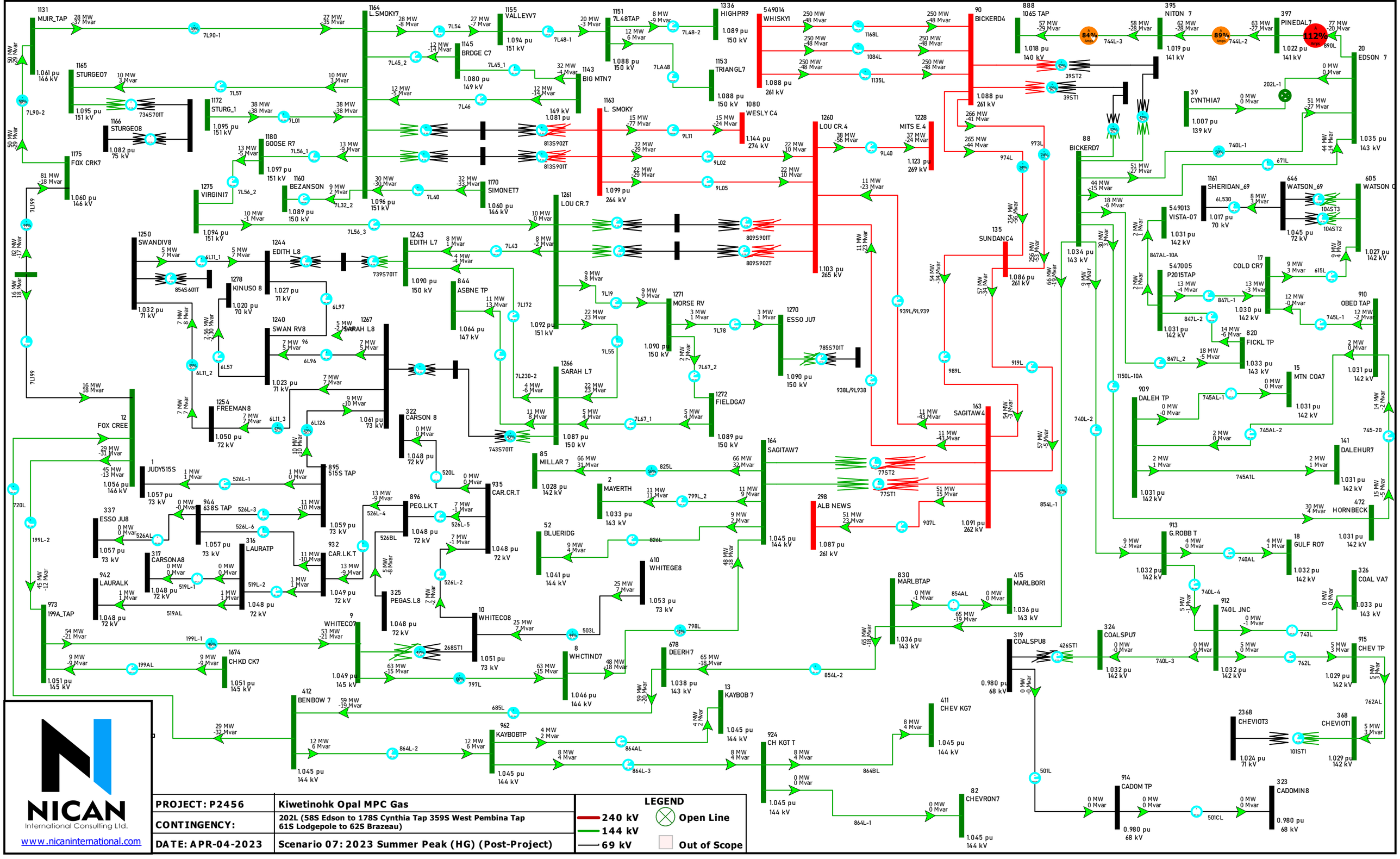
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 07: 2023 Summer Peak (HG) (Post-Project)

LEGEND

240 kV
144 kV
69 kV
⊗ Open Line
☐ Out of Scope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1165 STURGEO7 1.095 pu 151 kV
1166 STURGEO8 1.082 pu 75 kV
1175 FOX CRK7 1.060 pu 146 kV
1164 L.SMOKY7 1.096 pu 151 kV
1155 VALLEYV7 1.094 pu 151 kV
1145 BRDGE C7 1.080 pu 149 kV
1143 BIG MTN7 149 kV 1.081 pu
1151 7L48TAP 1.088 pu 150 kV
1336 HIGHPR9 1.089 pu 150 kV
549014 WHISKY1 1.088 pu 261 kV
1153 TRIANGL7 1.088 pu 150 kV
1080 WESLY C4 1.144 pu 274 kV
1163 L. SMOKY 1.099 pu 264 kV
1260 LOU CR.4 1.103 pu 265 kV
1228 MITS E.4 1.123 pu 269 kV
90 BICKERD4 1.088 pu 261 kV
888 106S TAP 1.018 pu 140 kV
395 NITON 7 1.019 pu 141 kV
397 PINEDAL7 1.022 pu 141 kV
20 EDSON 7 1.035 pu 143 kV
39 CYNTHIA7 1.007 pu 139 kV
88 BICKERD7 1.034 pu 143 kV
1161 SHERIDAN_69 1.017 pu 70 kV
646 WATSON_69 1.045 pu 72 kV
605 WATSON C 1.027 pu 142 kV
549013 VISTA-07 1.031 pu 142 kV
547005 P2015TAP 1.030 pu 142 kV
1031 pu 142 kV
17 COLD CR7 1.033 pu 143 kV
820 FICKL TP 1.033 pu 143 kV
910 OBED TAP 1.031 pu 142 kV
15 MTN COA7 1.031 pu 142 kV
909 DALEH TP 1.031 pu 142 kV
141 DALEHUR7 1.031 pu 142 kV
472 HORNBECK 1.031 pu 142 kV
913 G.ROBB T 1.032 pu 142 kV
18 GULF RO7 1.032 pu 142 kV
326 COAL VA7 1.033 pu 143 kV
912 740L JNC 1.032 pu 142 kV
915 CHEV TP 1.029 pu 142 kV
324 COALSPU7 1.032 pu 142 kV
319 COALSPU8 0.980 pu 68 kV
914 CADOM TP 0.980 pu 68 kV
323 CADOMIN8 0.980 pu 68 kV
2368 CHEVIOT3 1.024 pu 71 kV
368 CHEVIOTI 1.029 pu 142 kV
1250 SWANDIV8 1.032 pu 71 kV
1244 EDITH L8 1.027 pu 71 kV
1278 KINUSO 8 1.020 pu 70 kV
1240 SWAN RV8 1.023 pu 71 kV
1267 SARAH L8 1.061 pu 73 kV
1254 FREEMAN8 1.050 pu 72 kV
322 CARSON 8 1.048 pu 72 kV
1243 EDITH L7 1.090 pu 150 kV
844 ASBNE TP 1.064 pu 147 kV
1261 LOU CR.7 1.092 pu 151 kV
1266 SARAH L7 1.087 pu 150 kV
1271 MORSE RV 1.090 pu 150 kV
1270 ESSO JU7 1.090 pu 150 kV
1272 FIELDGA7 1.089 pu 150 kV
85 MILLAR 7 1.028 pu 142 kV
2 MAYERTH 1.033 pu 143 kV
52 BLUERIDG 1.041 pu 144 kV
410 WHITEGE8 1.053 pu 73 kV
10 WHITEC08 1.051 pu 73 kV
9 WHITEC07 1.049 pu 145 kV
8 WHCTIND7 1.046 pu 144 kV
678 DEERH7 1.038 pu 143 kV
13 KAYBOB 7 1.045 pu 144 kV
962 KAYBOBTP 1.045 pu 144 kV
412 BENBOW 7 1.045 pu 144 kV
924 CH KGT T 1.045 pu 144 kV
411 CHEV KG7 1.045 pu 144 kV
82 CHEVRON7 1.045 pu 144 kV
164 SAGITAW7 1.045 pu 144 kV
163 SAGITAW4 1.091 pu 262 kV
298 ALB NEWS 1.087 pu 261 kV
135 SUNDANC4 1.086 pu 261 kV
830 MARLBTAP 1.036 pu 143 kV
415 MARLBOR1 1.036 pu 143 kV
1 JUDY515S 1.057 pu 73 kV
944 638S TAP 1.057 pu 73 kV
337 ESSO JU8 1.057 pu 73 kV
317 CARSONA8 1.048 pu 72 kV
316 LAURATP 1.048 pu 72 kV
942 LAURALK 1.048 pu 72 kV
896 PEG.LK.T 1.048 pu 72 kV
325 PEGAS.L8 1.048 pu 72 kV
932 CAR.LK.T 1.049 pu 72 kV
935 CAR.CR.T 1.048 pu 72 kV
895 515S TAP 1.059 pu 73 kV
973 199A_TAP 1.051 pu 145 kV
1674 CHKD CK7 1.051 pu 145 kV
1172 STURG_1 1.095 pu 151 kV
1180 GOOSE R7 1.097 pu 151 kV
1160 BEZANSON 1.089 pu 150 kV
1275 VIRGINI7 1.094 pu 151 kV
1170 SIMONET7 1.060 pu 146 kV
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L32_2
7L40
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48
7L11
9L11
9L02
9L05
9L40
1168L
1084L
1135L
39ST2
39ST1
202L-1
740L-1
671L
973L
974L
254 MVar -56 MVar
256 MVar -53 MVar
939L/9L939
989L
919L
938L/9L938
785S701T
809S901T
809S902T
813S902T
813S901T
739S701T
743S701T
268ST1
797L
685L
503L
798L
825L
826L
799L_2
77ST2
77ST1
907L
854L-1
854L-2
864L-2
864AL
864L-3
864BL
864L-1
501L
501CL
745L-1
745AL-1
745AL-2
745A1L
762L
762AL
743L
740L-2
740L-3
740L-4
740AL
854AL
7L199
199L-1
199L-2
199AL
720L
7L97
7L96
7L57
6L11_1
6L11_2
6L11_3
6L126
7L230-2
7L172
7L19
7L55
7L67_1
7L67_2
7L78
7L43
7L56_3
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
6L530
6L615
847L-1
847L-2
847L_2
847AL-10A
1150L-10A
1 MW 1 Mvar
2 MW 1 Mvar
4 MW 2 Mvar
5 MW 3 Mvar
7 MW 5 Mvar
8 MW 4 Mvar
9 MW 6 Mvar
10 MW 7 Mvar
11 MW 8 Mvar
12 MW 6 Mvar
13 MW 9 Mvar
14 MW 10 Mvar
15 MW 11 Mvar
18 MW 12 Mvar
22 MW 15 Mvar
25 MW 17 Mvar
29 MW 20 Mvar
30 MW 21 Mvar
32 MW 23 Mvar
38 MW 27 Mvar
45 MW 32 Mvar
51 MW 36 Mvar
54 MW 38 Mvar
59 MW 42 Mvar
63 MW 45 Mvar
66 MW 47 Mvar
81 MW 57 Mvar
82 MW 58 Mvar
84%
89%
112%
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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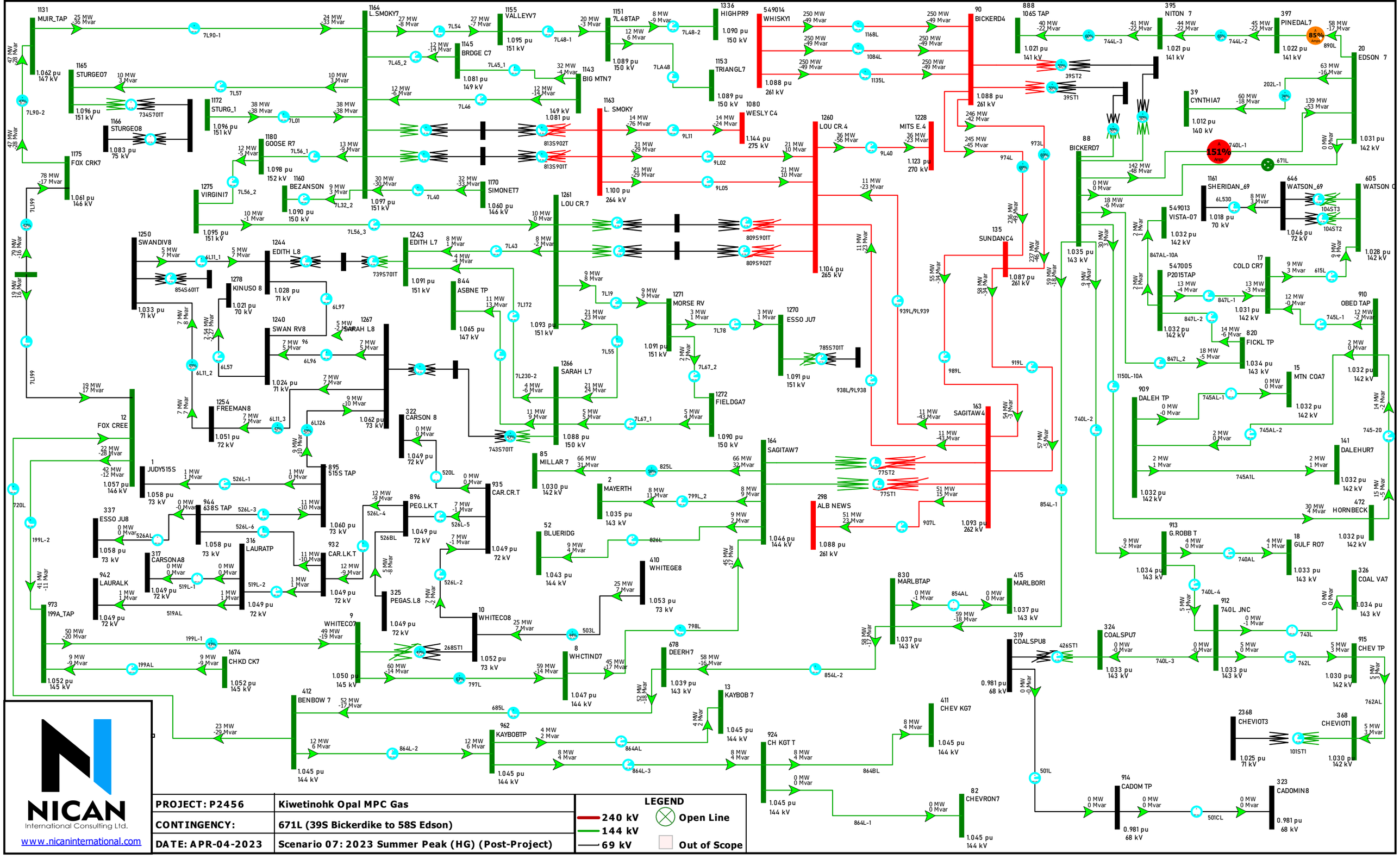
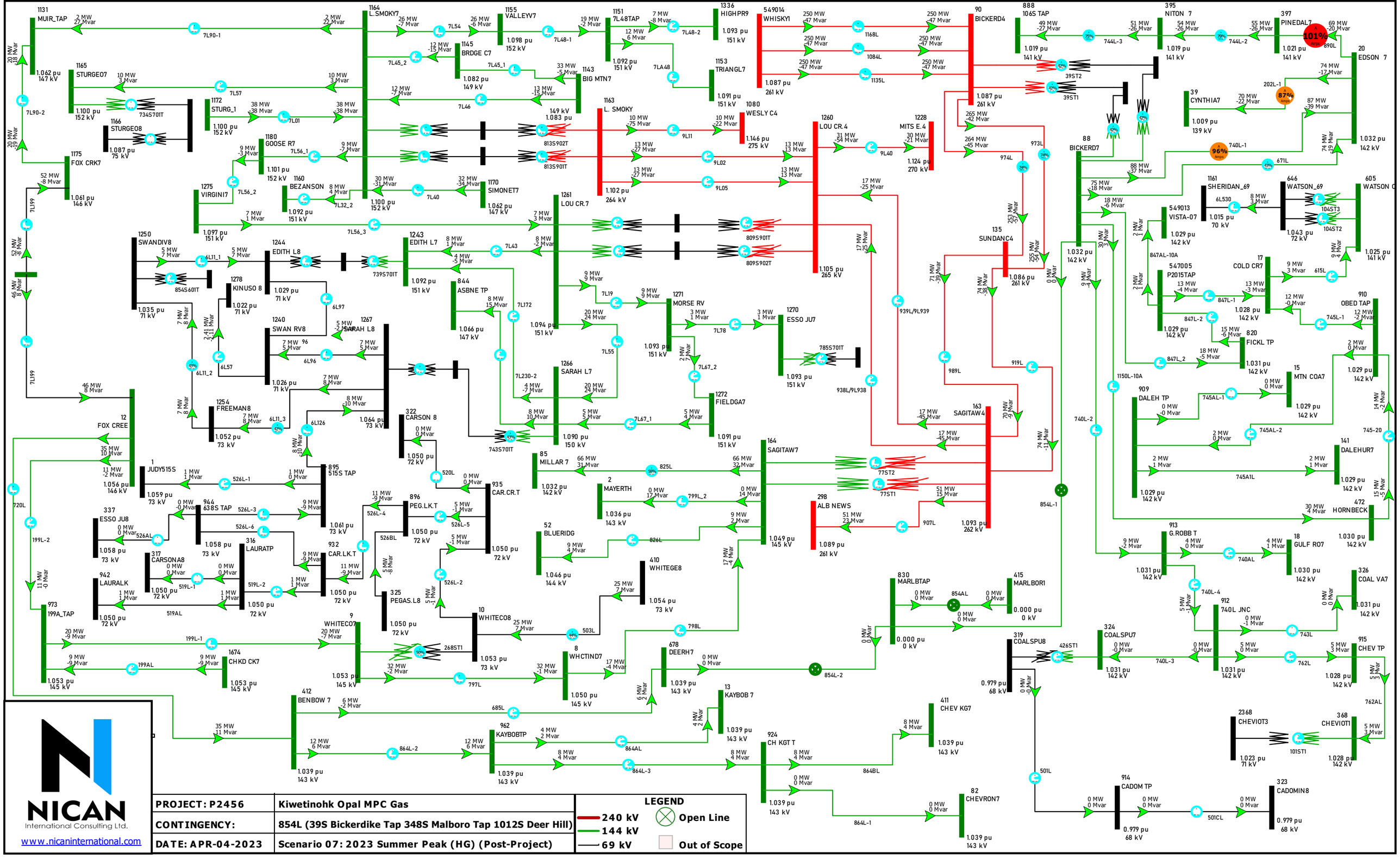
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap
61S Lodgepole to 62S Brazeau)
DATE: APR-04-2023
Scenario 07: 2023 Summer Peak (HG) (Post-Project)


1131 MUIR_TAP 25 MW -36 Mvar 1.062 pu 147 kV
7L90-1
7L90-2
1165 STURGEO7 10 MW 3 Mvar 1.096 pu 151 kV
7L57
734S701T
1166 STURGEO8 1.083 pu 75 kV
1175 FOX CRK7 78 MW -17 Mvar 1.061 pu 146 kV
7L199
1164 L.SMOKY7 24 MW -33 Mvar 1.097 pu 151 kV
7L54
7L45_2
7L45_1
7L46
7L01
7L56_1
7L56_2
7L32_2
7L40
1155 VALLEYV7 1.095 pu 151 kV
7L48-1
1145 BRDGE C7 1.081 pu 149 kV
1143 BIG MTN7 149 kV 1.081 pu
813S902T
813S901T
1151 7L48TAP 1.089 pu 150 kV
7L48-2
7LA48
1336 HIGHPR9 1.090 pu 150 kV
1153 TRIANGL7 1.089 pu 150 kV
1172 STURG_1 1.096 pu 151 kV
1180 GOOSE R7 1.098 pu 152 kV
1160 BEZANSON 1.090 pu 150 kV
1170 SIMONET7 1.060 pu 146 kV
1275 VIRGINI7 1.095 pu 151 kV
1163 L. SMOKY 1.100 pu 264 kV
9L11
9L02
9L05
1080 WESLY C4 1.144 pu 275 kV
549014 WHISKY1 1.088 pu 261 kV
1168L
1084L
1135L
1260 LOU CR.4 1.104 pu 265 kV
9L40
1228 MITS E.4 1.123 pu 270 kV
939L/9L939
938L/9L938
90 BICKERD4 1.088 pu 261 kV
246 MW -42 Mvar
245 MW -45 Mvar
974L
973L
135 SUNDANC4 1.087 pu 261 kV
236 MW -46 Mvar
237 MW -46 Mvar
55 MW -34 Mvar
58 MW -34 Mvar
59 MW -18 Mvar
989L
919L
163 SAGITAW4 1.093 pu 262 kV
54 MW -33 Mvar
57 MW -5 Mvar
907L
77ST2
77ST1
51 MW 15 Mvar
888 106S TAP 1.021 pu 141 kV
39ST2
39ST1
744L-3
744L-2
395 NITON 7 1.021 pu 141 kV
397 PINEDAL7 1.022 pu 141 kV
890L
20 EDSON 7 1.031 pu 142 kV
740L-1
671L
39 CYNTHIA7 1.012 pu 140 kV
202L-1
88 BICKERD7 1.035 pu 143 kV
1161 SHERIDAN_69 1.018 pu 70 kV
6L530
646 WATSON_69 1.046 pu 72 kV
104ST3
104ST2
605 WATSON G 1.028 pu 142 kV
549013 VISTA-07 1.032 pu 142 kV
847AL-10A
547005 P2015TAP 1.032 pu 142 kV
847L-1
847L-2
17 COLD CR7 1.031 pu 142 kV
615L
910 OBED TAP 1.032 pu 142 kV
745L-1
820 FICKL TP 1.034 pu 143 kV
847L_2
1150L-10A
909 DALEH TP 1.032 pu 142 kV
745AL-1
745AL-2
745A1L
15 MTN COA7 1.032 pu 142 kV
141 DALEHUR7 1.032 pu 142 kV
745-20
472 HORNBECK 1.032 pu 142 kV
740L-2
913 G.ROBB T 1.034 pu 143 kV
740AL
18 GULF RO7 1.033 pu 143 kV
740L-4
912 740L JNC 1.033 pu 143 kV
743L
326 COAL VA7 1.034 pu 143 kV
915 CHEV TP 1.030 pu 142 kV
762L
762AL
740L-3
324 COALSPU7 1.033 pu 143 kV
319 COALSPU8 0.981 pu 68 kV
426ST1
501L
501CL
914 CADOM TP 0.981 pu 68 kV
323 CADOMIN8 0.981 pu 68 kV
2368 CHEVIOT3 1.025 pu 71 kV
101ST1
368 CHEVIOTI 1.030 pu 142 kV
1250 SWANDIV8 1.033 pu 71 kV
6L11_1
854S601T
1244 EDITH L8 1.028 pu 71 kV
6L97
1278 KINUSO 8 1.021 pu 70 kV
1240 SWAN RV8 1.024 pu 71 kV
6L96
6L57
6L11_2
1267 SARAH L8 1.062 pu 73 kV
1254 FREEMAN8 1.051 pu 72 kV
6L11_3
6L126
895 515S TAP 1.060 pu 73 kV
1243 EDITH L7 1.091 pu 151 kV
739S701T
844 ASBNE TP 1.065 pu 147 kV
7L43
7L172
1261 LOU CR.7 1.093 pu 151 kV
7L19
7L55
1271 MORSE RV 1.091 pu 151 kV
7L78
7L67_2
1270 ESSO JU7 1.091 pu 151 kV
785S701T
1272 FIELDGA7 1.090 pu 150 kV
7L67_1
1266 SARAH L7 1.088 pu 150 kV
7L230-2
743S701T
322 CARSON 8 1.049 pu 72 kV
520L
935 CAR.CR.T 1.049 pu 72 kV
896 PEG.LK.T 1.049 pu 72 kV
526L-4
526L-5
526BL
932 CAR.LK.T 1.049 pu 72 kV
325 PEGAS.L8 1.049 pu 72 kV
526L-2
10 WHITEC08 1.052 pu 73 kV
503L
410 WHITEGE8 1.053 pu 73 kV
825L
85 MILLAR 7 1.030 pu 142 kV
2 MAYERTH 1.035 pu 143 kV
799L_2
52 BLUERIDG 1.043 pu 144 kV
826L
164 SAGITAW7 1.046 pu 144 kV
298 ALB NEWS 1.088 pu 261 kV
907L
830 MARLBTAP 1.037 pu 143 kV
854AL
415 MARLBOR1 1.037 pu 143 kV
854L-1
854L-2
678 DEERH7 1.039 pu 143 kV
798L
797L
268ST1
9 WHITEC07 1.050 pu 145 kV
8 WHCTIND7 1.047 pu 144 kV
685L
962 KAYBOBTP 1.045 pu 144 kV
864AL
864L-2
864L-3
13 KAYBOB 7 1.045 pu 144 kV
924 CH KGT T 1.045 pu 144 kV
864BL
864L-1
411 CHEV KG7 1.045 pu 144 kV
82 CHEVRON7 1.045 pu 144 kV
412 BENBOW 7 1.045 pu 144 kV
1 JUDY515S 1.058 pu 73 kV
526L-1
944 638S TAP 1.058 pu 73 kV
526L-3
526L-6
337 ESSO JU8 1.058 pu 73 kV
526AL
316 LAURATP 1.049 pu 72 kV
317 CARSONA8 1.049 pu 72 kV
519L-1
519L-2
519AL
942 LAURALK 1.049 pu 72 kV
12 FOX CREE 1.057 pu 146 kV
973 199A_TAP 1.052 pu 145 kV
199L-1
199L-2
199AL
1674 CHKD CK7 1.052 pu 145 kV
720L
1 MW 1 Mvar
2 MW 1 Mvar
2 MW 0 Mvar
0 MW 0 Mvar
0 MW -0 Mvar
0 MW -1 Mvar
0 MW -2 Mvar
0 MW -3 Mvar
0 MW -4 Mvar
0 MW -5 Mvar
0 MW -6 Mvar
0 MW -7 Mvar
0 MW -8 Mvar
0 MW -9 Mvar
0 MW



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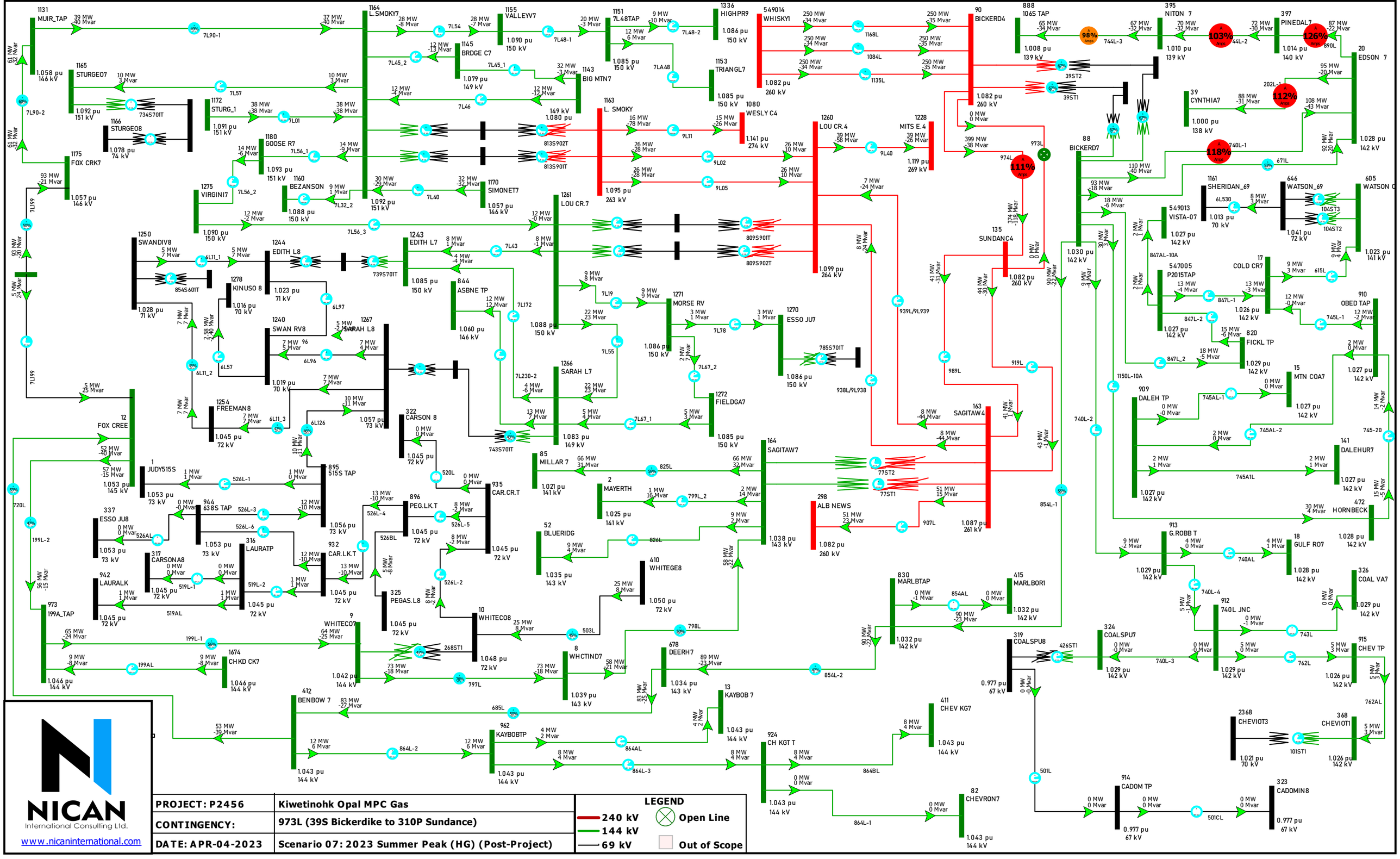
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
DATE: APR-04-2023	Scenario 07: 2023 Summer Peak (HG) (Post-Project)



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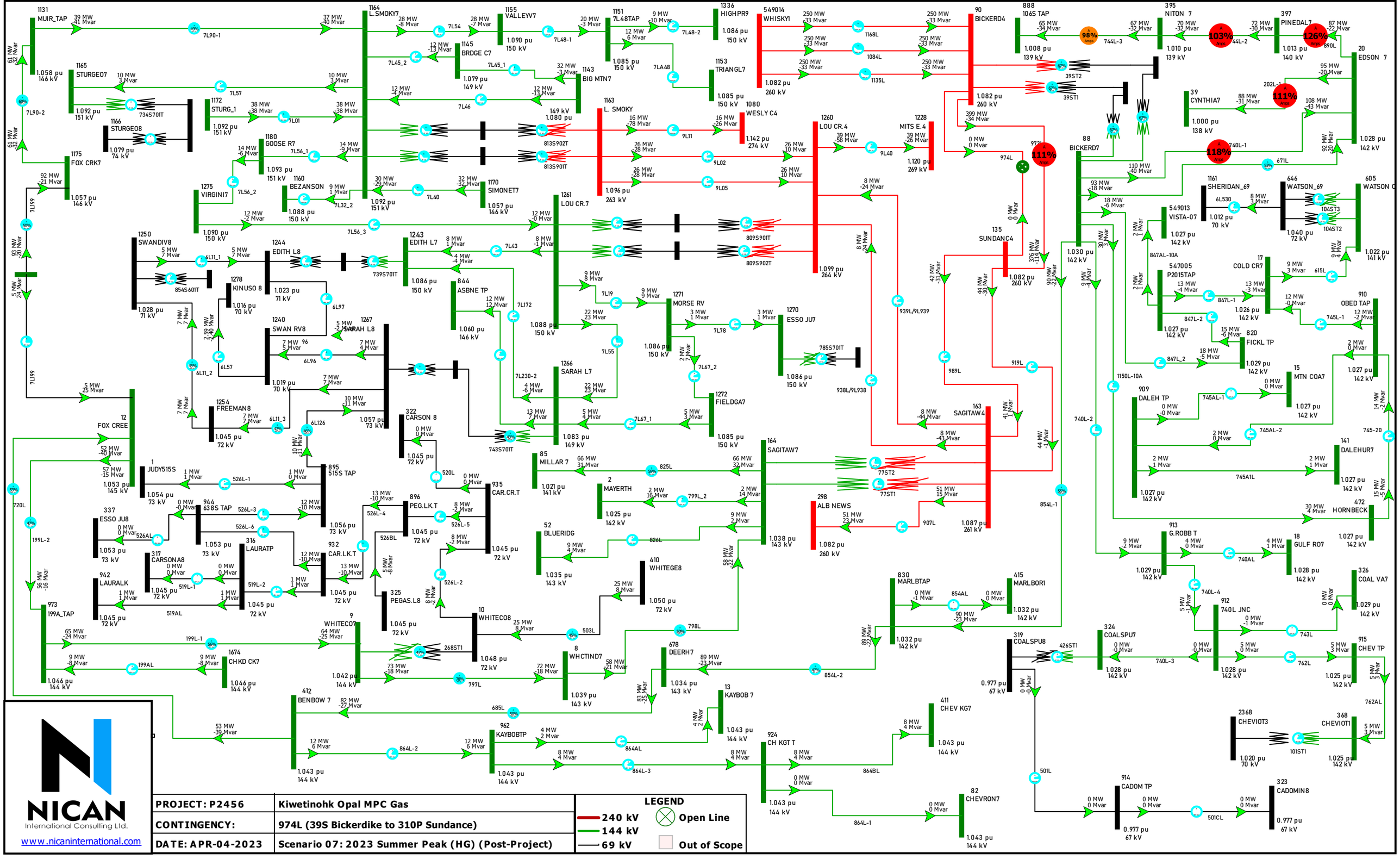
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 07: 2023 Summer Peak (HG) (Post-Project)



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PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 07: 2023 Summer Peak (HG) (Post-Project)

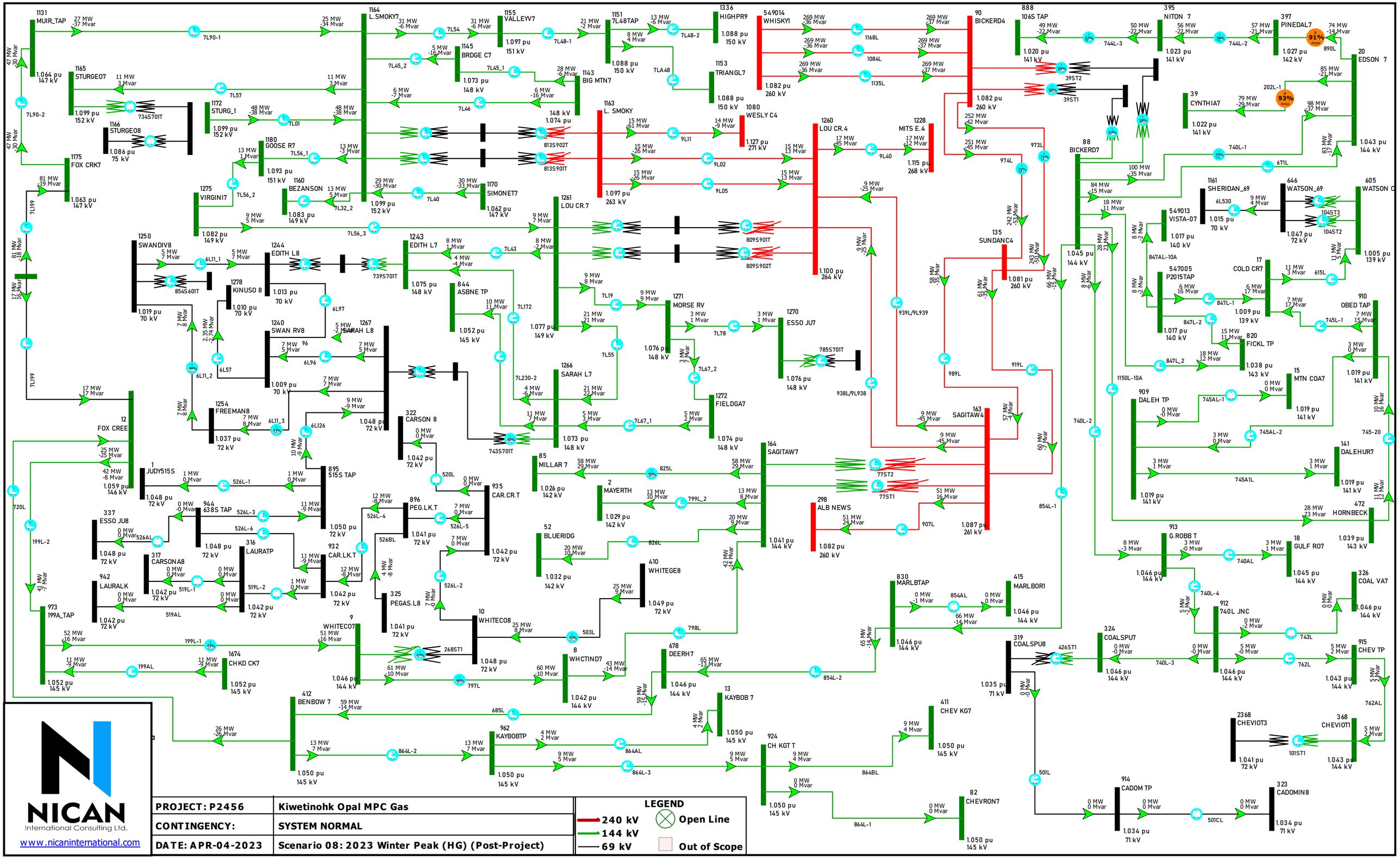
LEGEND

240 kV	Open Line
144 kV	
69 kV	Out of Scope

2023 WINTER PEAK

Single Line Diagrams
P2456 - POST-PROJECT
POWER FLOW SC08

NICAN



PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**SYSTEM NORMAL**
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (Post-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

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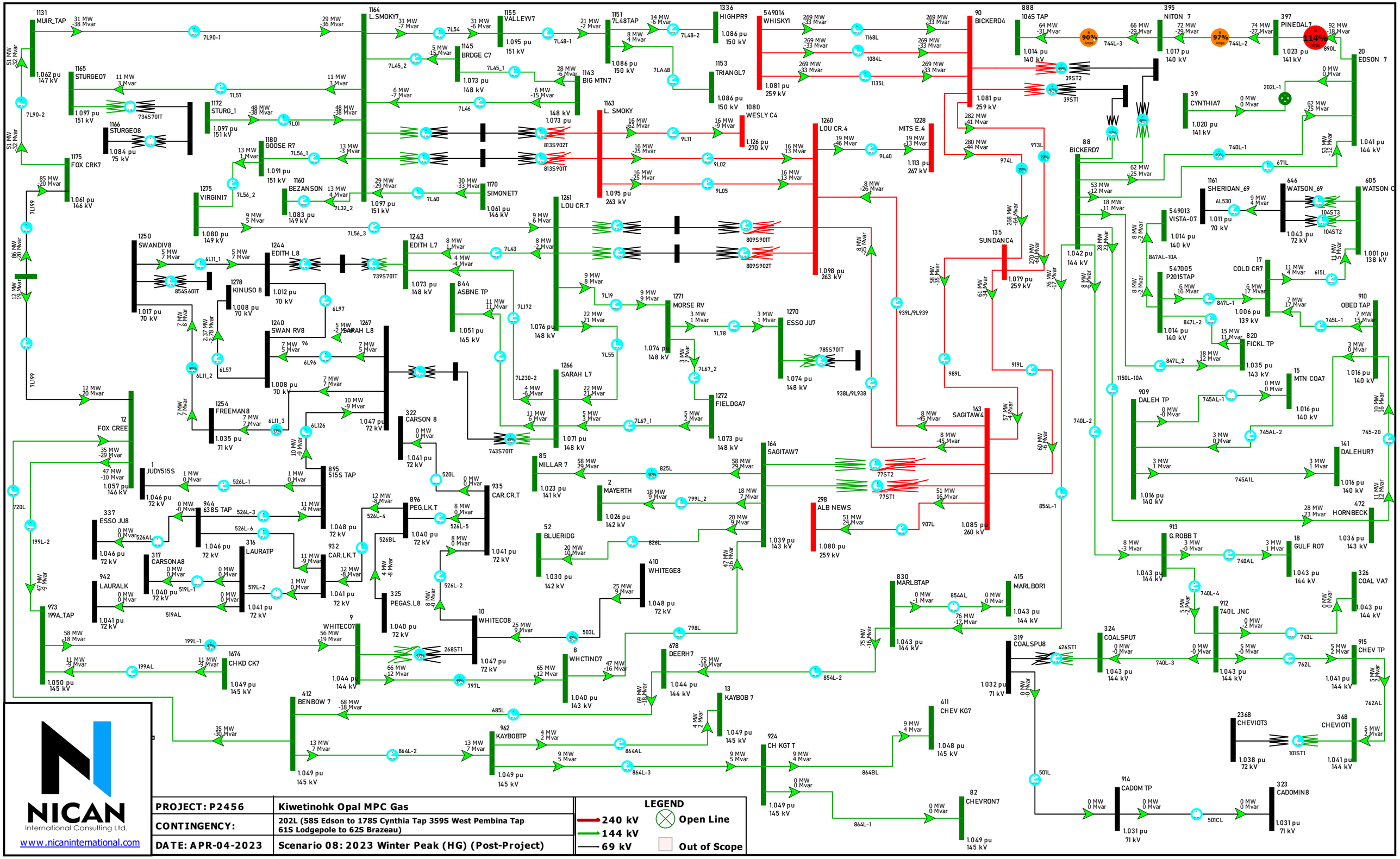

PROJECT: P2456	**Kiwetinohk Opal MPC Gas**	**LEGEND**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**	**240 kV** — **Open Line** ⊗
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (Post-Project)**	**144 kV** — **Out of Scope**
		69 kV

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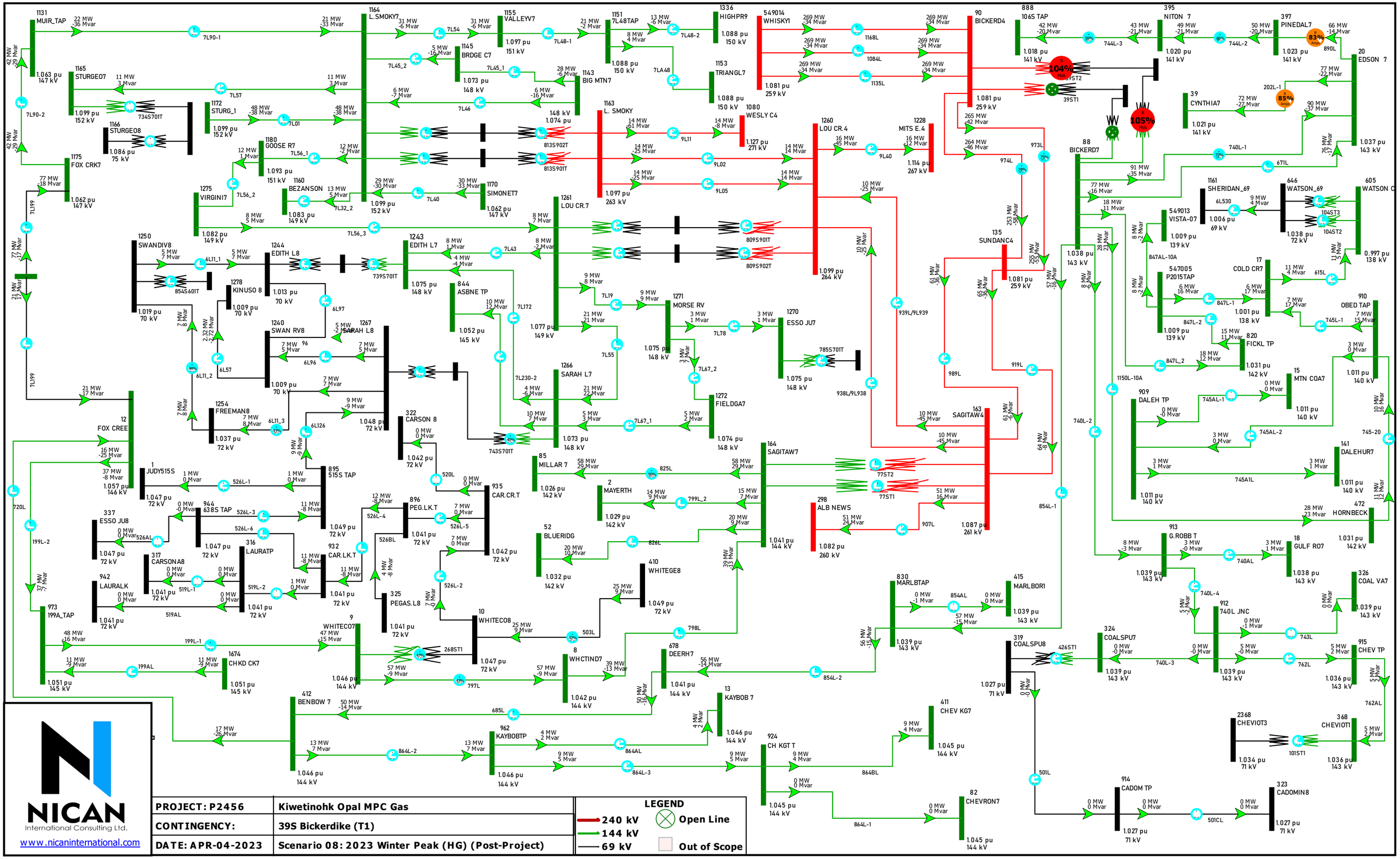

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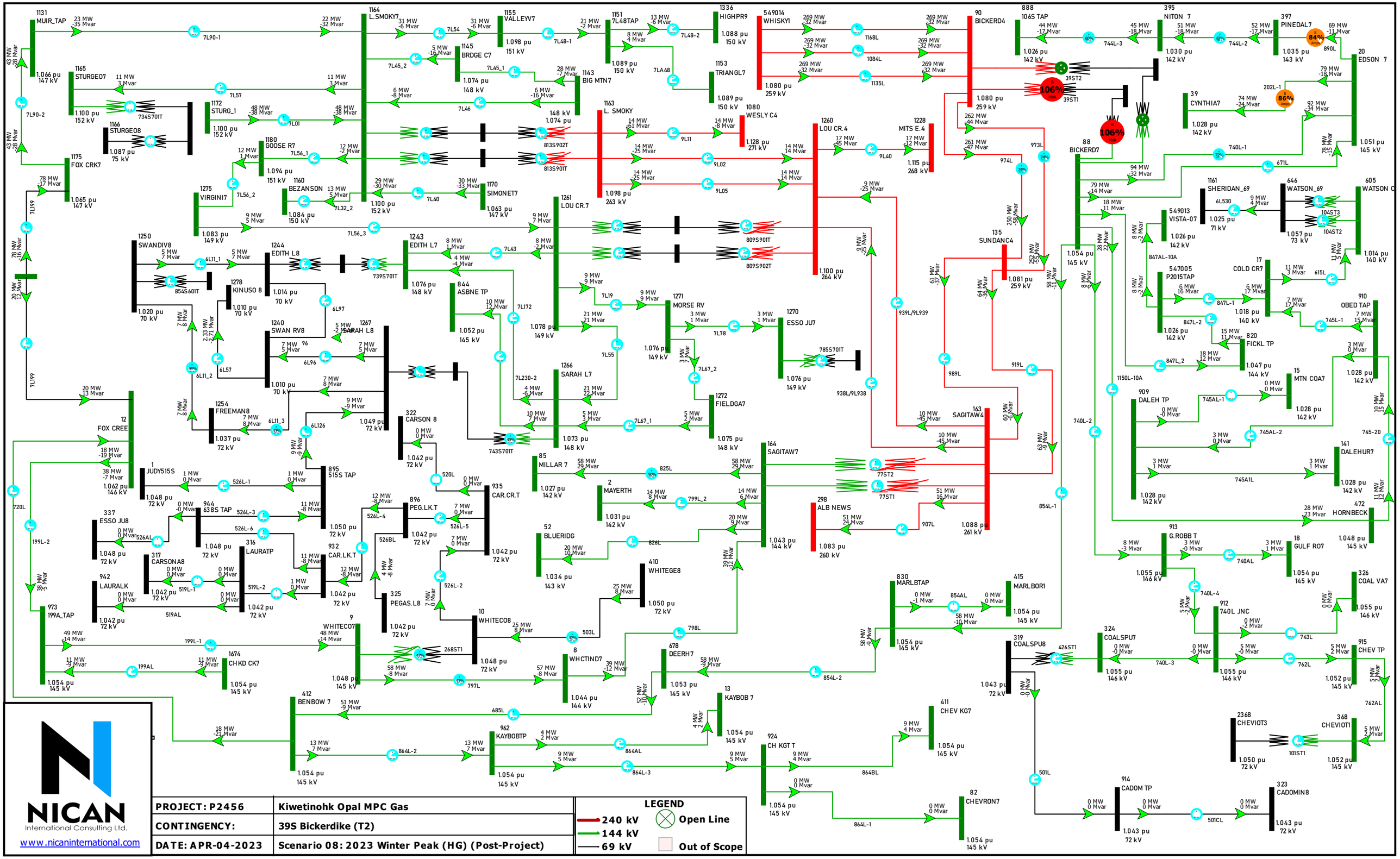
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	39S Bickerdike (T1)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (Post-Project)

LEGEND

🟥 240 kV
🟩 144 kV
— 69 kV
⊗ Open Line
☐ Out of Scope



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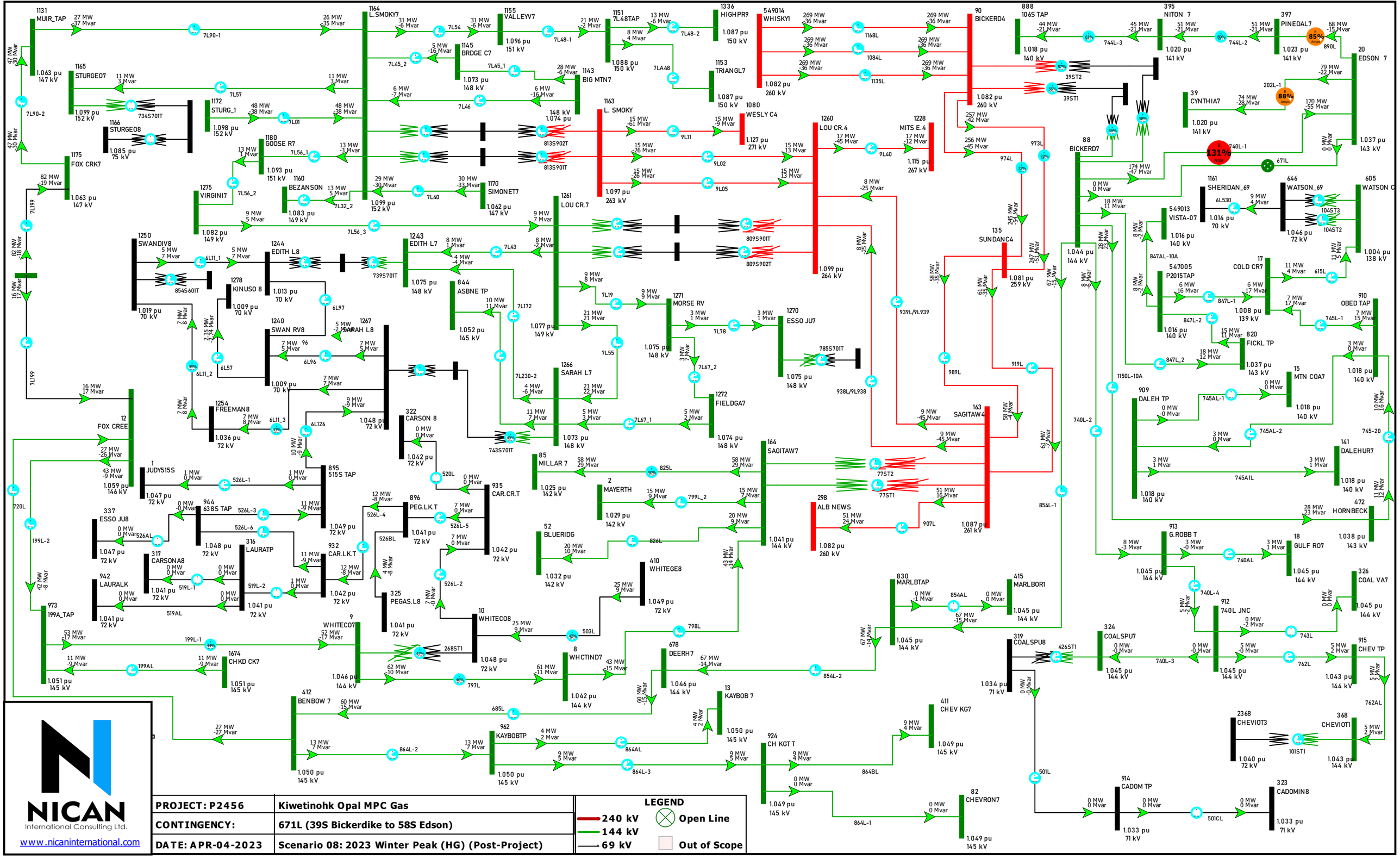
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	39S Bickerdike (T2)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (Post-Project)


1131 MUIR_TAP 1.063 pu 147 kV
1165 STURGEO7 1.099 pu 152 kV
1166 STURGEO8 1.085 pu 75 kV
1175 FOX CRK7 1.063 pu 147 kV
1164 L.SMOKY7 1.099 pu 152 kV
1172 STURG_1 1.098 pu 152 kV
1180 GOOSE R7 1.093 pu 151 kV
1160 BEZANSON 1.083 pu 149 kV
1275 VIRGINI7 1.082 pu 149 kV
1155 VALLEYV7 1.096 pu 151 kV
1145 BRDGE C7 1.073 pu 148 kV
1143 BIG MTN7 148 kV 1.074 pu
1163 L. SMOKY 1.097 pu 263 kV
1170 SIMONET7 1.062 pu 147 kV
1151 7L48TAP 1.088 pu 150 kV
1336 HIGHPR9 1.087 pu 150 kV
1153 TRIANGL7 1.087 pu 150 kV
1080 WESLY C4 1.127 pu 271 kV
549014 WHISKY1 1.082 pu 260 kV
1260 LOU CR.4 1.099 pu 264 kV
1228 MITS E.4 1.115 pu 267 kV
90 BICKERD4 1.082 pu 260 kV
888 106S TAP 1.018 pu 140 kV
395 NITON 7 1.020 pu 141 kV
397 PINEDAL7 1.023 pu 141 kV
20 EDSON 7 1.037 pu 143 kV
39 CYNTHIA7 1.020 pu 141 kV
88 BICKERD7 1.044 pu 144 kV
135 SUNDANC4 1.081 pu 259 kV
1261 LOU CR.7 1.077 pu 149 kV
1243 EDITH L7 1.075 pu 148 kV
1244 EDITH L8 1.013 pu 70 kV
1250 SWANDIV8 1.019 pu 70 kV
1278 KINUSO 8 1.009 pu 70 kV
1240 SWAN RV8 1.009 pu 70 kV
1267 SARAH L8 1.048 pu 72 kV
1254 FREEMAN8 1.036 pu 72 kV
322 CARSON 8 1.042 pu 72 kV
844 ASBNE TP 1.052 pu 145 kV
1266 SARAH L7 1.073 pu 148 kV
1271 MORSE RV 1.075 pu 148 kV
1270 ESSO JU7 1.075 pu 148 kV
1272 FIELDGA7 1.074 pu 148 kV
85 MILLAR 7 1.025 pu 142 kV
2 MAYERTH 1.029 pu 142 kV
52 BLUERIDG 1.032 pu 142 kV
410 WHITEGE8 1.049 pu 72 kV
164 SAGITAW7 1.041 pu 144 kV
298 ALB NEWS 1.082 pu 260 kV
163 SAGITAW4 1.087 pu 261 kV
1 JUDY515S 1.047 pu 72 kV
895 515S TAP 1.049 pu 72 kV
935 CAR.CR.T 1.042 pu 72 kV
896 PEG.LK.T 1.041 pu 72 kV
932 CAR.LK.T 1.042 pu 72 kV
325 PEGAS.L8 1.041 pu 72 kV
10 WHITEC08 1.048 pu 72 kV
9 WHITEC07 1.046 pu 144 kV
8 WHCTIND7 1.042 pu 144 kV
962 KAYBOBTP 1.050 pu 145 kV
13 KAYBOB 7 1.050 pu 145 kV
412 BENBOW 7 1.050 pu 145 kV
678 DEERH7 1.046 pu 144 kV
924 CH KGT T 1.049 pu 145 kV
411 CHEV KG7 1.049 pu 145 kV
82 CHEVRON7 1.049 pu 145 kV
830 MARLBTAP 1.045 pu 144 kV
415 MARLBOR1 1.045 pu 144 kV
337 ESSO JU8 1.047 pu 72 kV
944 638S TAP 1.048 pu 72 kV
316 LAURATP 1.041 pu 72 kV
317 CARSONA8 1.041 pu 72 kV
942 LAURALK 1.041 pu 72 kV
973 199A_TAP 1.051 pu 145 kV
1674 CHKD CK7 1.051 pu 145 kV
12 FOX CREE 1.059 pu 146 kV
1161 SHERIDAN_69 1.014 pu 70 kV
646 WATSON_69 1.046 pu 72 kV
605 WATSON C 1.004 pu 138 kV
549013 VISTA-07 1.016 pu 140 kV
547005 P2015TAP 1.016 pu 140 kV
17 COLD CR7 1.008 pu 139 kV
910 OBED TAP 1.018 pu 140 kV
820 FICKL TP 1.037 pu 143 kV
15 MTN COA7 1.018 pu 140 kV
909 DALEH TP 1.018 pu 140 kV
141 DALEHUR7 1.018 pu 140 kV
472 HORNBECK 1.038 pu 143 kV
913 G.ROBB T 1.045 pu 144 kV
18 GULF RO7 1.045 pu 144 kV
326 COAL VA7 1.045 pu 144 kV
912 740L JNC 1.045 pu 144 kV
915 CHEV TP 1.043 pu 144 kV
324 COALSPU7 1.045 pu 144 kV
319 COALSPU8 1.034 pu 71 kV
914 CADOM TP 1.033 pu 71 kV
323 CADOMIN8 1.033 pu 71 kV
2368 CHEVIOT3 1.040 pu 72 kV
368 CHEVIOTI 1.043 pu 144 kV
131% Amps
85% Amps
88% Amps
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 08: 2023 Winter Peak (HG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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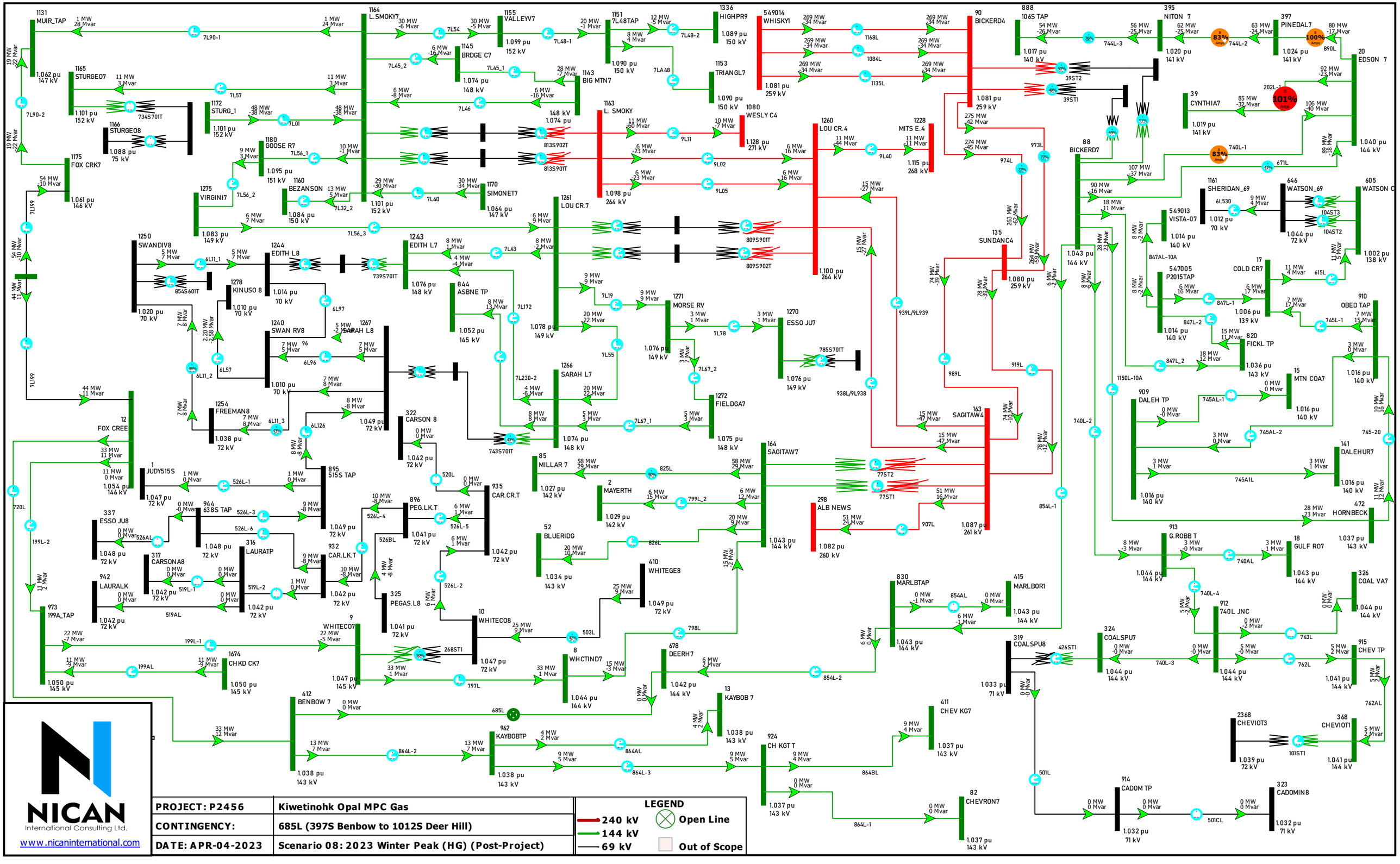

PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**685L (397S Benbow to 1012S Deer Hill)**
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (Post-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

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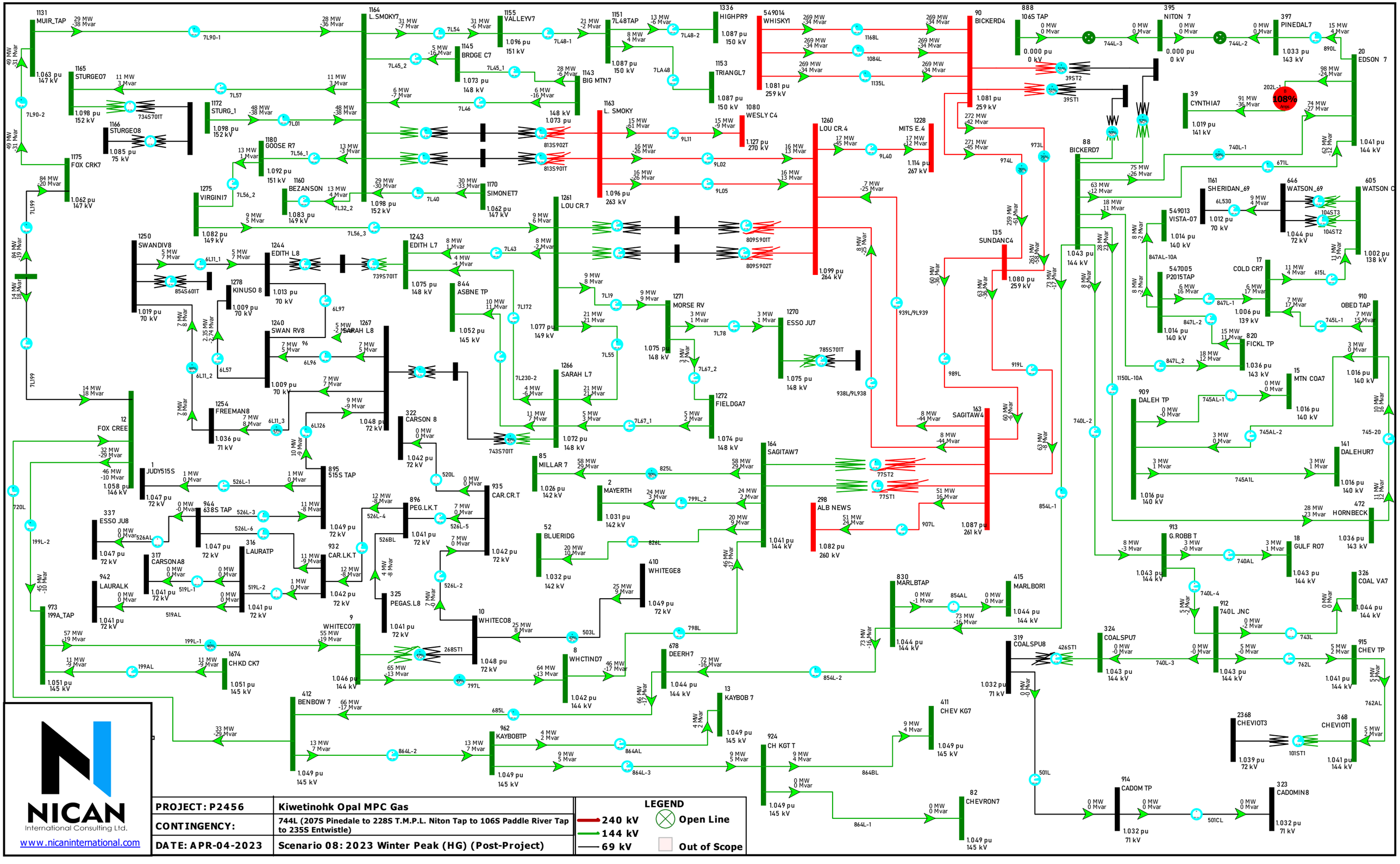

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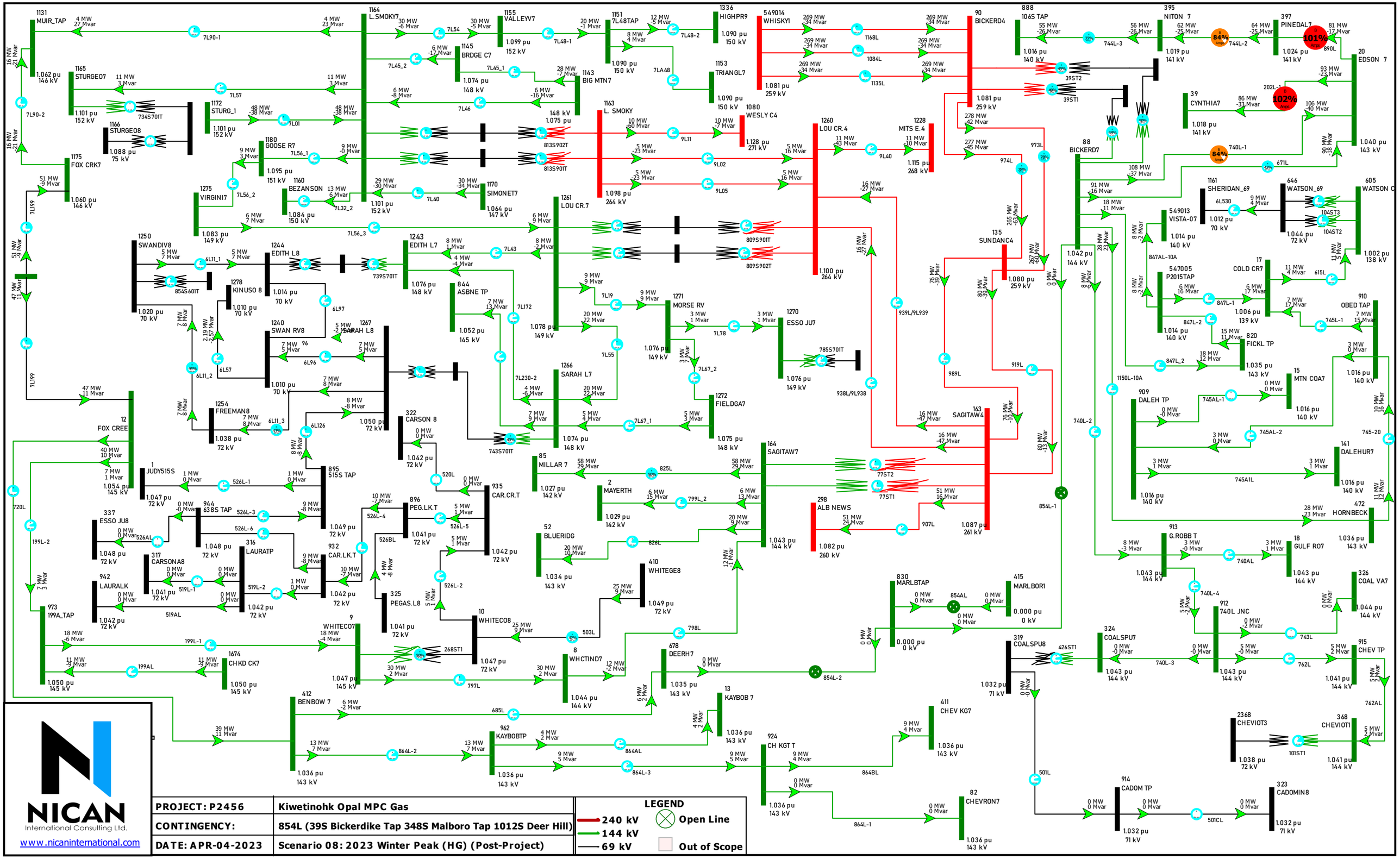
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (Post-Project)

LEGEND

🟥 240 kV	⊗ Open Line
🟩 144 kV	
— 69 kV	☐ Out of Scope



NICAN
International Consulting Ltd.
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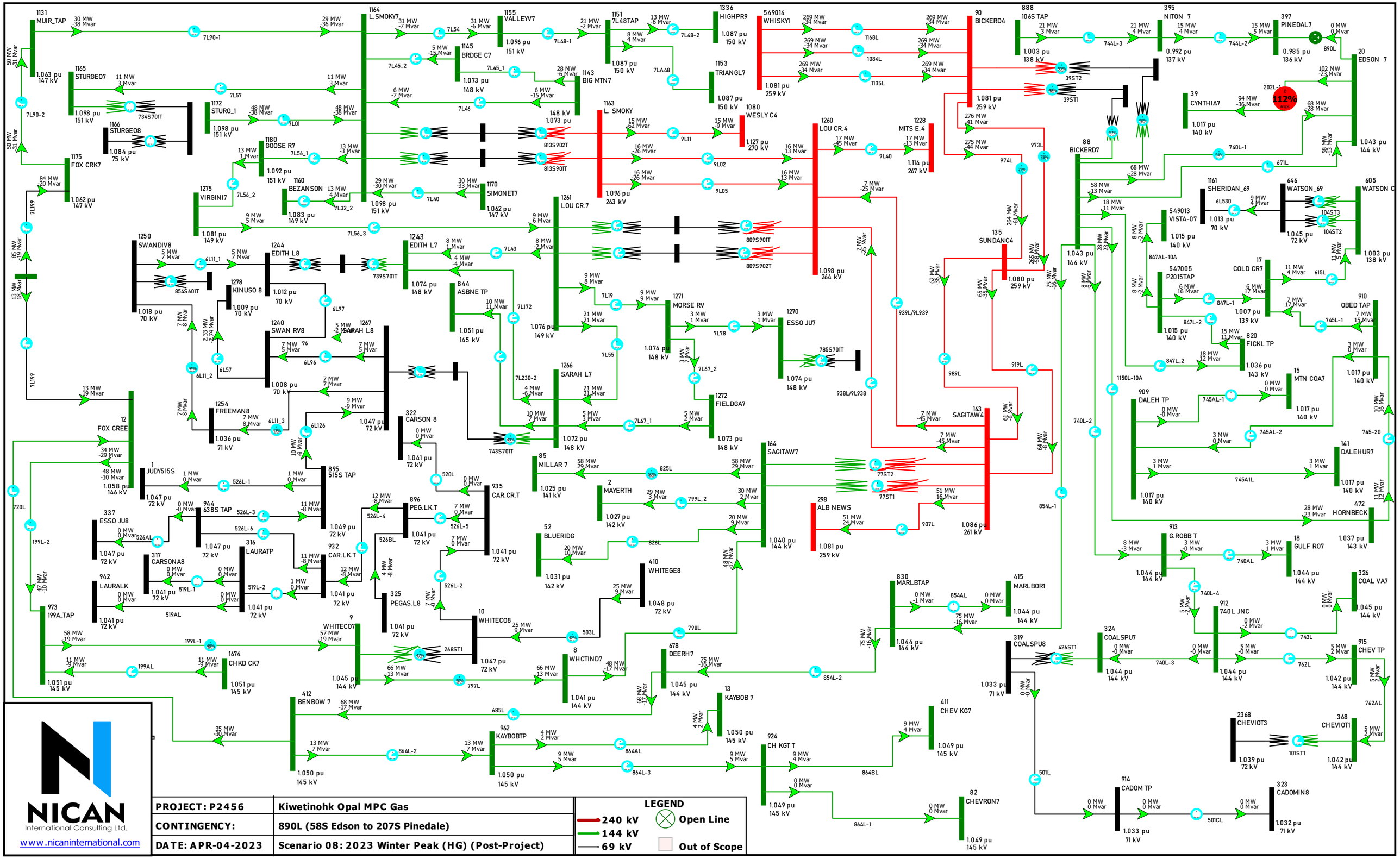
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (Post-Project)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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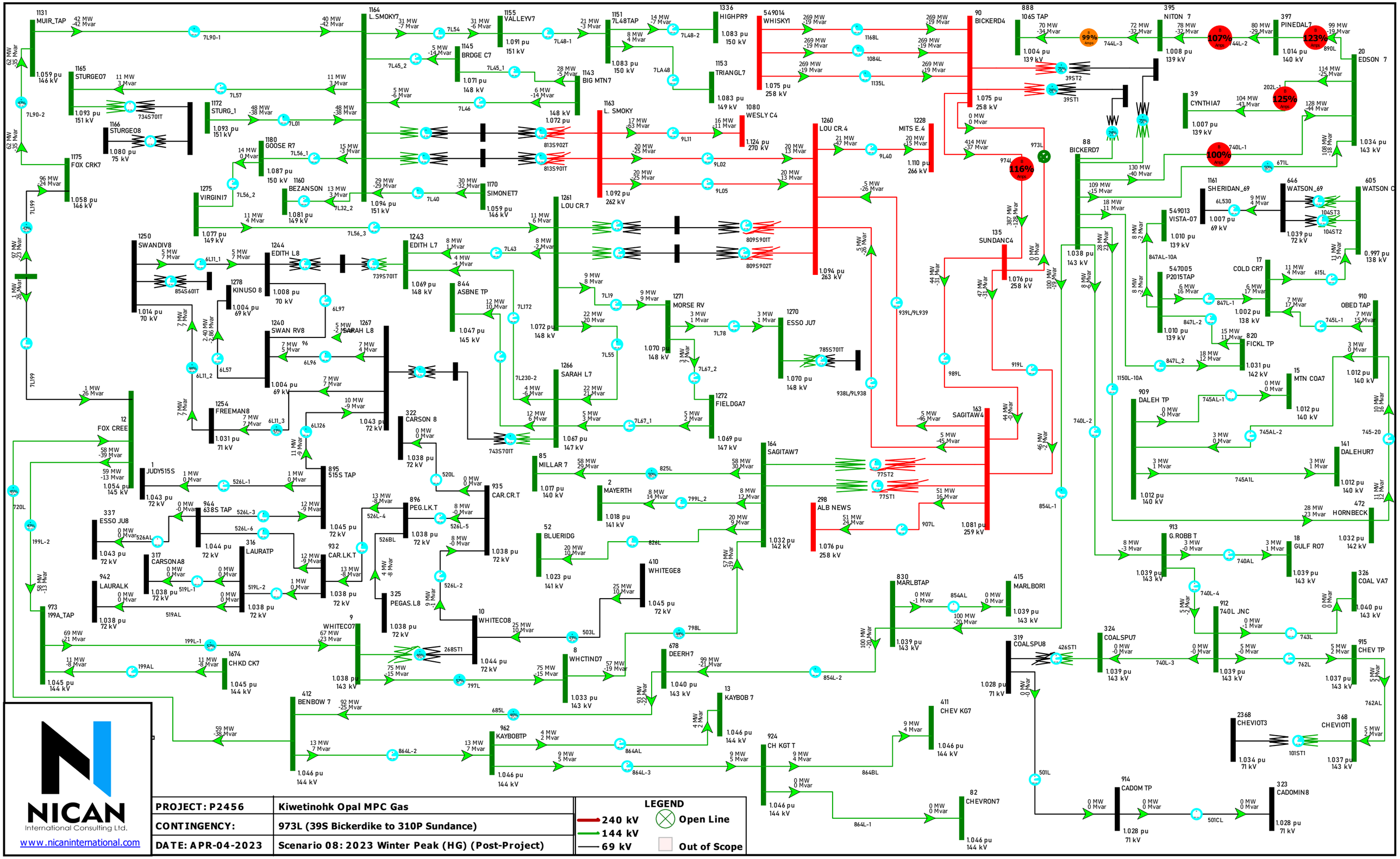
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	890L (58S Edson to 207S Pinedale)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (Post-Project)

LEGEND

240 kV	⊗ Open Line
144 kV	
69 kV	☐ Out of Scope



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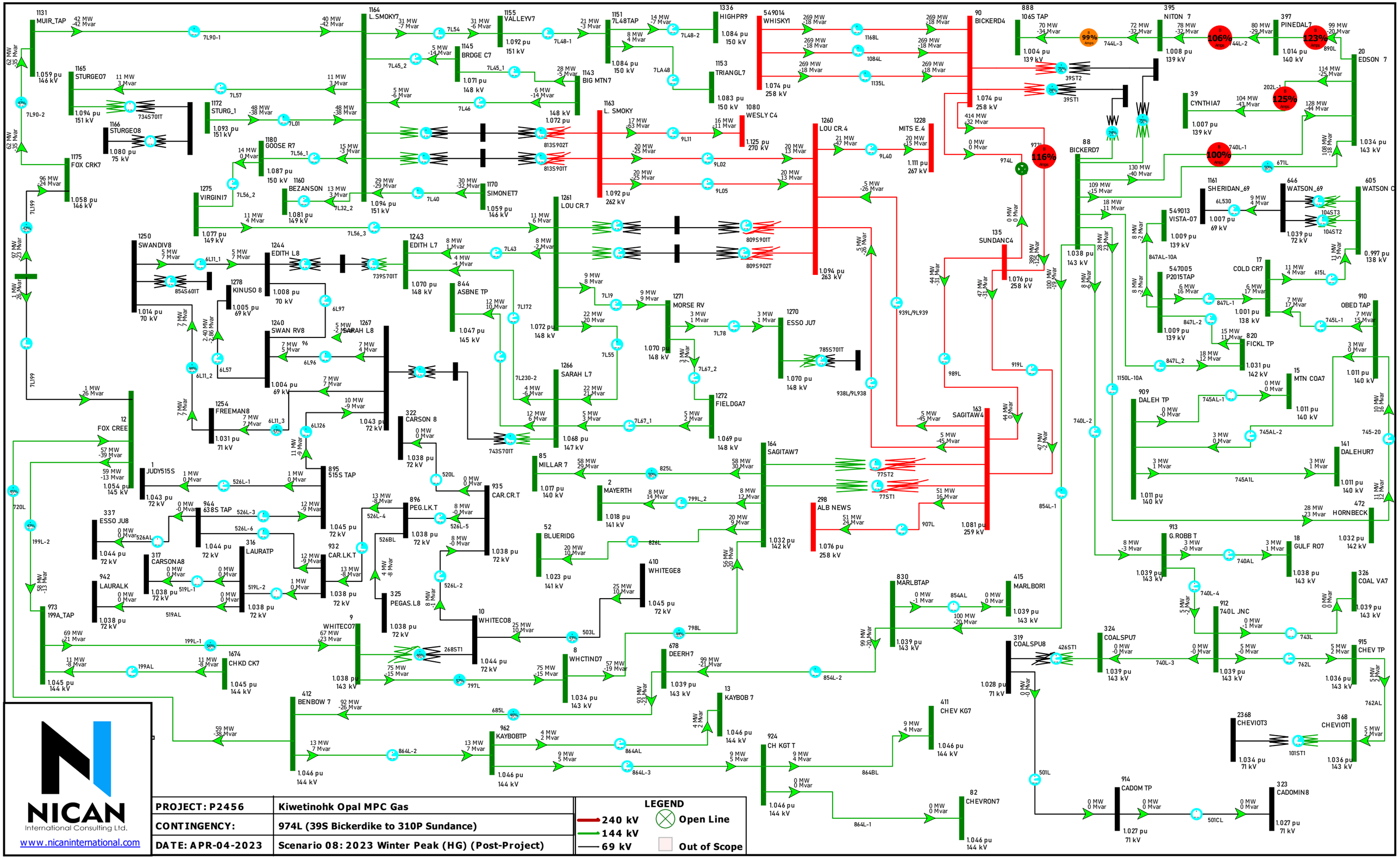
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**973L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (Post-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



NICAN
International Consulting Ltd.
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PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**974L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (Post-Project)**

LEGEND

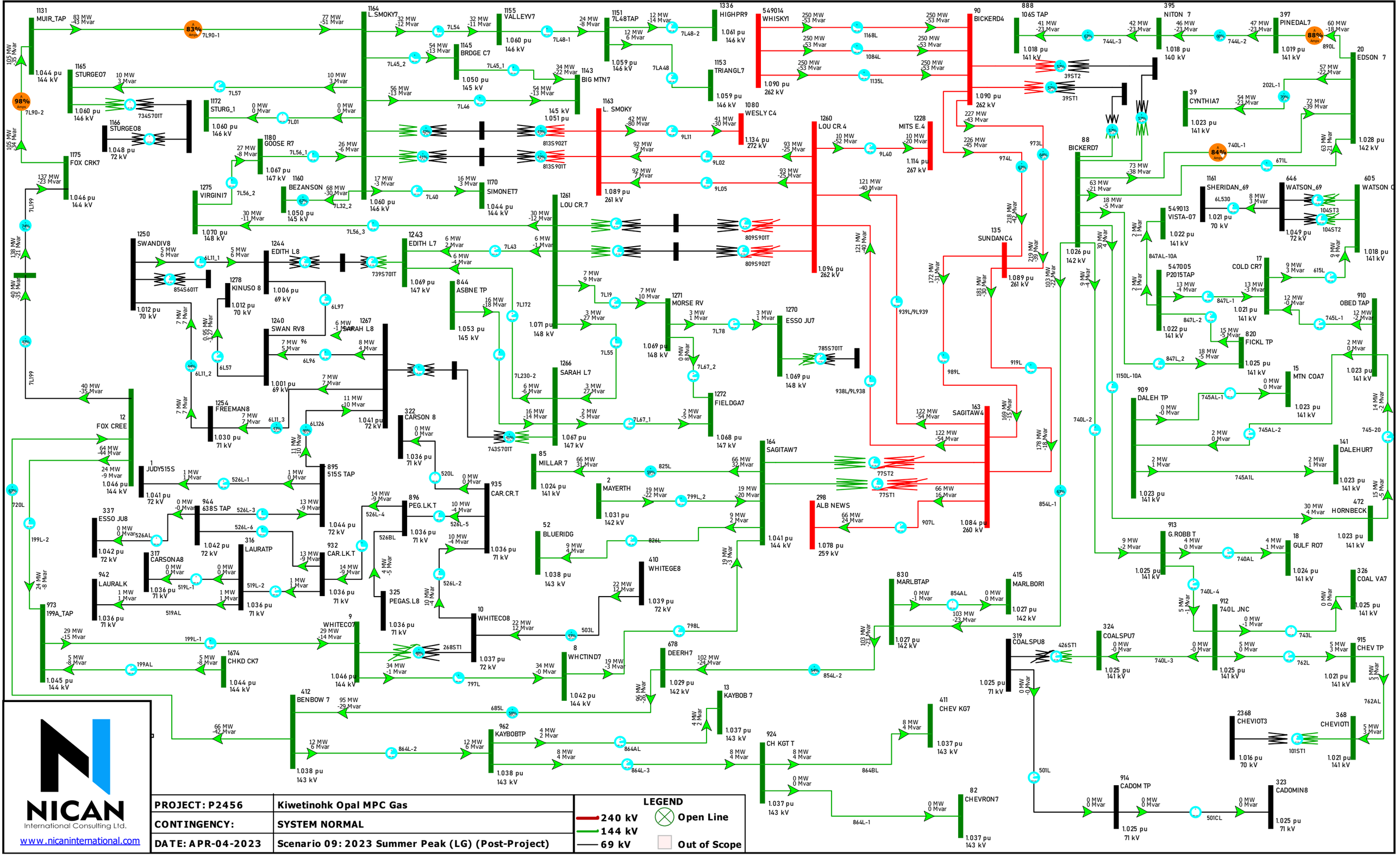
- 🟥 **240 kV**
- 🟩 **144 kV**
- **69 kV**
- ⊗ **Open Line**
- ☐ **Out of Scope**

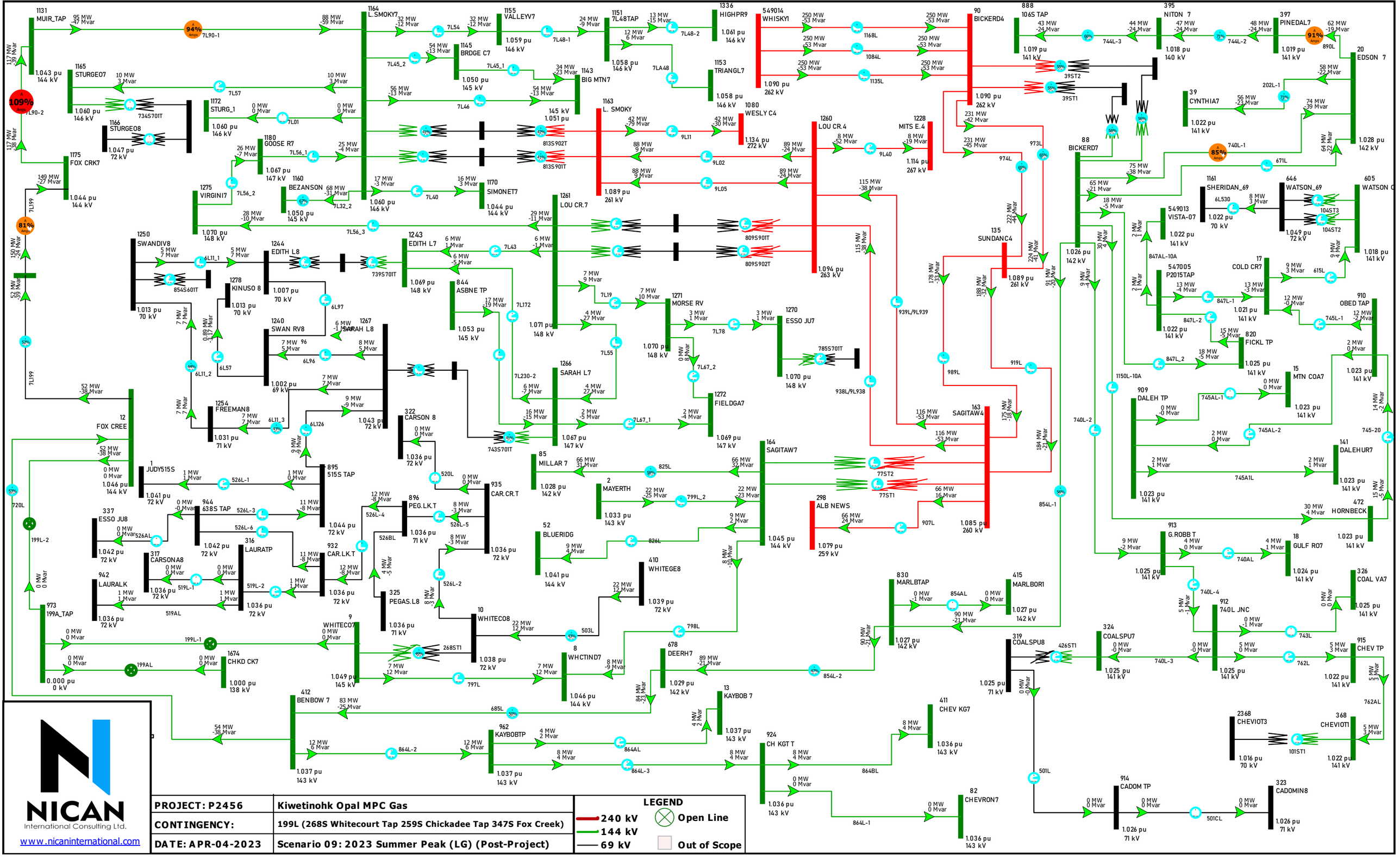
2023 SUMMER PEAK

(Low Generation)

Single Line Diagrams
P2456 - POST-PROJECT
POWER FLOW SC09

NICAN


1131 MUIR_TAP
1.044 pu 144 kV
1165 STURGEO7
1.060 pu 146 kV
1166 STURGEO8
1.048 pu 72 kV
1175 FOX CRK7
1.046 pu 144 kV
1275 VIRGINI7
1.070 pu 148 kV
1164 L.SMOKY7
1.060 pu 146 kV
1172 STURG_1
1.060 pu 146 kV
1180 GOOSE R7
1.067 pu 147 kV
1160 BEZANSON
1.050 pu 145 kV
1170 SIMONET7
1.044 pu 144 kV
1155 VALLEYV7
1.060 pu 146 kV
1145 BRDGE C7
1.050 pu 145 kV
1143 BIG MTN7
145 kV 1.051 pu
1151 7L48TAP
1.059 pu 146 kV
1336 HIGHPR9
1.061 pu 146 kV
1153 TRIANGL7
1.059 pu 146 kV
549014 WHISKYI
1.090 pu 262 kV
1163 L. SMOKY
1.089 pu 261 kV
1080 WESLY C4
1.134 pu 272 kV
1260 LOU CR.4
1.094 pu 262 kV
1228 MITS E.4
1.114 pu 267 kV
90 BICKERD4
1.090 pu 262 kV
888 106S TAP
1.018 pu 141 kV
395 NITON 7
1.018 pu 140 kV
397 PINEDAL7
1.019 pu 141 kV
20 EDSON 7
1.028 pu 142 kV
88 BICKERD7
1.026 pu 142 kV
39 CYNTHIA7
1.023 pu 141 kV
1161 SHERIDAN_69
1.021 pu 70 kV
646 WATSON_69
1.049 pu 72 kV
605 WATSON C
1.018 pu 141 kV
549013 VISTA-07
1.022 pu 141 kV
547005 P2015TAP
1.022 pu 141 kV
17 COLD CR7
1.021 pu 141 kV
910 OBED TAP
1.023 pu 141 kV
820 FICKL TP
1.025 pu 141 kV
15 MTN COA7
1.023 pu 141 kV
909 DALEH TP
1.023 pu 141 kV
141 DALEHUR7
1.023 pu 141 kV
472 HORNBECK
1.023 pu 141 kV
913 G.ROBB T
1.025 pu 141 kV
18 GULF RO7
1.024 pu 141 kV
326 COAL VA7
1.025 pu 141 kV
912 740L JNC
1.025 pu 141 kV
915 CHEV TP
1.021 pu 141 kV
2368 CHEVIOT3
1.016 pu 70 kV
368 CHEVIOT1
1.021 pu 141 kV
914 CADOM TP
1.025 pu 71 kV
323 CADOMIN8
1.025 pu 71 kV
135 SUNDANC4
1.089 pu 261 kV
163 SAGITAW4
1.084 pu 260 kV
164 SAGITAW7
1.041 pu 144 kV
298 ALB NEWS
1.078 pu 259 kV
319 COALSPU8
1.025 pu 71 kV
324 COALSPU7
1.025 pu 141 kV
830 MARLBTAP
1.027 pu 142 kV
415 MARLBOR1
1.027 pu 142 kV
411 CHEV KG7
1.037 pu 143 kV
82 CHEVRON7
1.037 pu 143 kV
924 CH KGT T
1.037 pu 143 kV
1250 SWANDIV8
1.012 pu 70 kV
1278 KINUSO 8
1.012 pu 70 kV
1244 EDITH L8
1.006 pu 69 kV
1243 EDITH L7
1.069 pu 147 kV
844 ASBNE TP
1.053 pu 145 kV
1240 SWAN RV8
1.001 pu 69 kV
1267 SARAH L8
1.041 pu 72 kV
322 CARSON 8
1.036 pu 71 kV
1254 FREEMAN8
1.030 pu 71 kV
1261 LOU CR.7
1.071 pu 148 kV
1271 MORSE RV
1.069 pu 148 kV
1270 ESSO JU7
1.069 pu 148 kV
1266 SARAH L7
1.067 pu 147 kV
1272 FIELDGA7
1.068 pu 147 kV
85 MILLAR 7
1.024 pu 141 kV
2 MAYERTH
1.031 pu 142 kV
52 BLUERIDG
1.038 pu 143 kV
410 WHITEGE8
1.039 pu 72 kV
10 WHITECO8
1.037 pu 72 kV
8 WHCTIND7
1.042 pu 144 kV
678 DEERH7
1.029 pu 142 kV
13 KAYBOB 7
1.037 pu 143 kV
962 KAYBOBTP
1.038 pu 143 kV
412 BENBOW 7
1.038 pu 143 kV
12 FOX CREE
1.046 pu 144 kV
1 JUDY515S
1.041 pu 72 kV
895 515S TAP
1.044 pu 72 kV
944 638S TAP
1.042 pu 72 kV
337 ESSO JU8
1.042 pu 72 kV
317 CARSONA8
1.036 pu 71 kV
316 LAURATP
1.036 pu 71 kV
942 LAURALK
1.036 pu 71 kV
973 199A_TAP
1.045 pu 144 kV
1674 CHKD CK7
1.044 pu 144 kV
896 PEG.LK.T
1.036 pu 71 kV
935 CAR.CR.T
1.036 pu 71 kV
932 CAR.LK.T
1.036 pu 71 kV
325 PEGAS.L8
1.036 pu 71 kV
9 WHITECO7
1.046 pu 144 kV
7L90-1
7L90-2
7L57
7L01
7L46
7L45_1
7L45_2
7L54
7L40
7L56_1
7L56_2
7L56_3
7L32_2
7L199
7L48-1
7L48-2
7LA48
9L11
9L02
9L05
9L40
7L43
7L19
7L55
7L78
7L67_2
7L67_1
7L172
7L230-2
7L97
6L96
6L57
6L11_1
6L11_2
6L11_3
6L126
854S601T
739S701T
743S701T
809S901T
809S902T
813S902T
813S901T
785S701T
268ST1
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
104ST3
104ST2
101ST1
426ST1
939L/9L939
938L/9L938
989L
919L
973L
974L
6L530
615L
847AL-10A
847L-1
847L-2
847L_2
745L-1
745AL-1
745AL-2
745A1L
740L-1
740L-2
740L-3
740L-4
740AL
671L
762L
762AL
1150L-10A
501L
501CL
854L-1
854L-2
720L
199L-1
199L-2
199AL
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
685L
797L
798L
799L_2
825L
826L
864L-1
864L-2
864L-3
864AL
864BL
503L
907L
202L-1
890L
744L-2
744L-3
744L-4
740AL
745-20
745AL
745A1L
NICAN
International Consulting Ltd.
www.nicaninternational.com
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
SYSTEM NORMAL
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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International Consulting Ltd.
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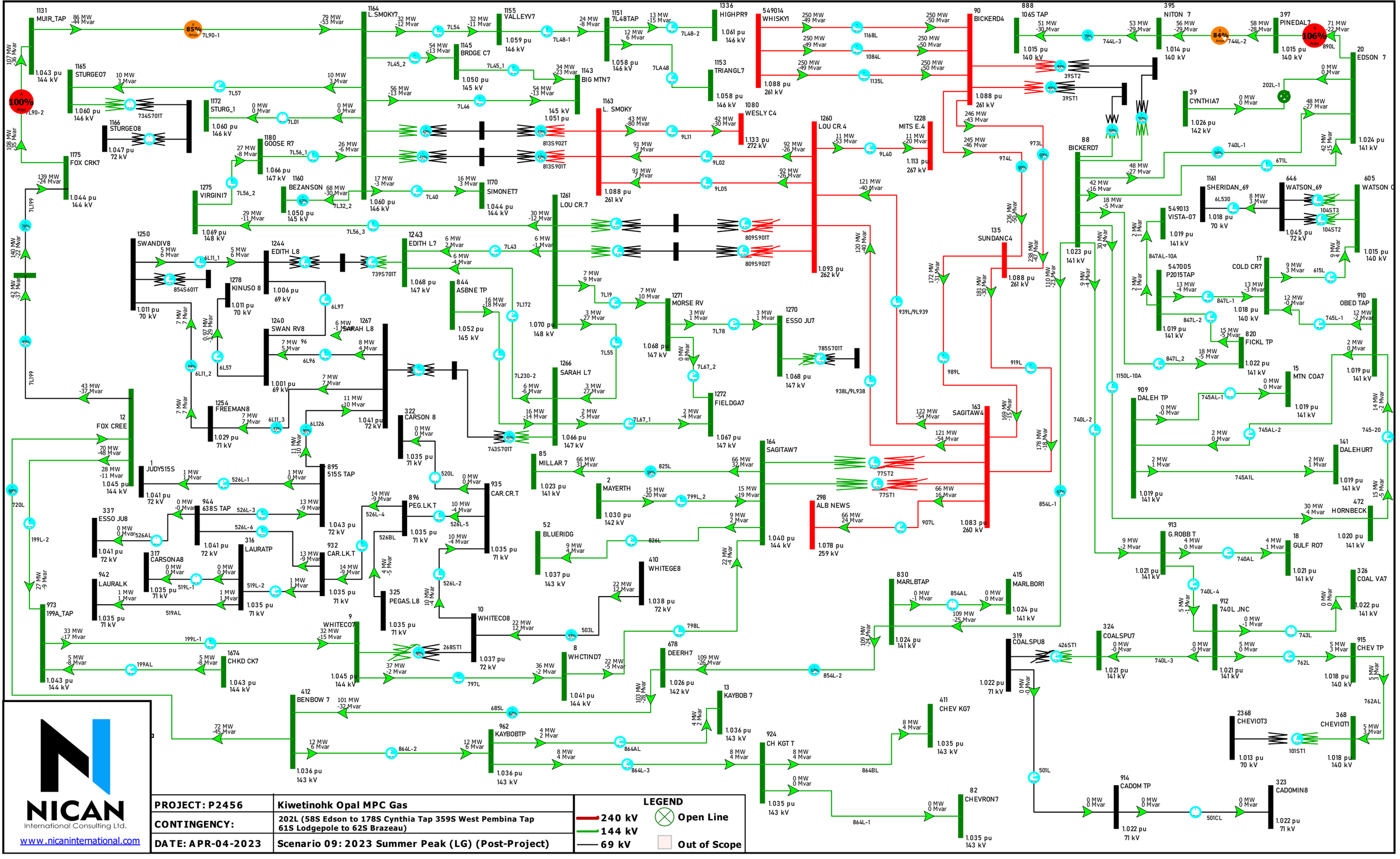
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND
- 🟥 240 kV
- 🟩 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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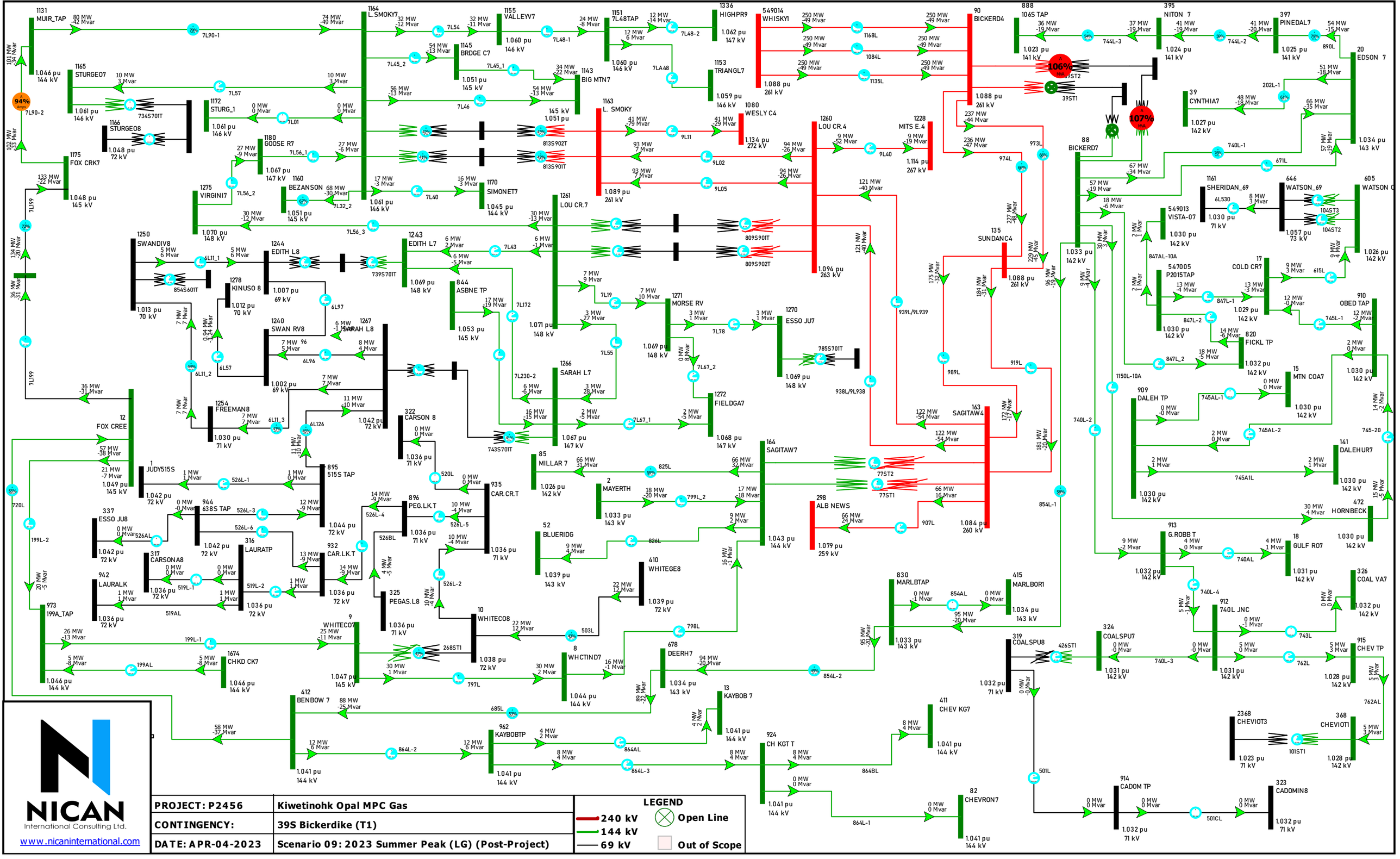
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (Post-Project)**

LEGEND

🟥 **240 kV**	⊗ **Open Line**
🟩 **144 kV**	
▬ **69 kV**	☐ **Out of Scope**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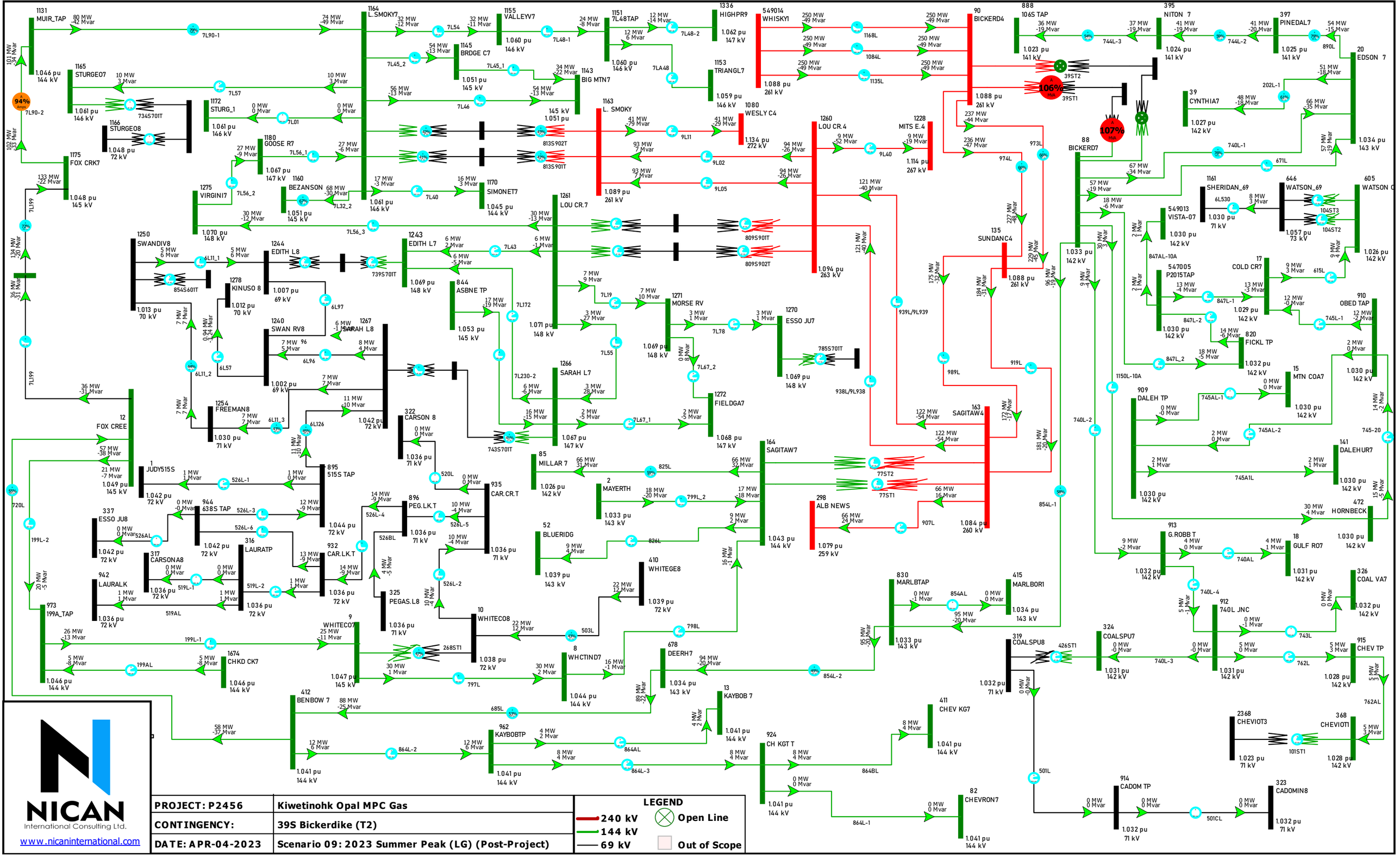
1165 STURGEO7
1166 STURGEO8
1172 STURG_1
1175 FOX CRK7
1180 GOOSE R7
1160 BEZANSON
1275 VIRGINI7
1164 L.SMOKY7
1145 BRDGE C7
1155 VALLEYV7
1151 7L48TAP
1143 BIG MTN7
1336 HIGHPR9
1153 TRIANGL7
549014 WHISKYI
1163 L. SMOKY
1080 WESLY C4
1260 LOU CR.4
1228 MITS E.4
90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
39 CYNTHIA7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
549013 VISTA-07
135 SUNDANC4
547005 P2015TAP
17 COLD CR7
910 OBED TAP
820 FICKL TP
1032 pu 142 kV
15 MTN COA7
1030 pu 142 kV
909 DALEH TP
141 DALEHUR7
1030 pu 142 kV
472 HORNBECK
1030 pu 142 kV
913 G.ROBB T
1032 pu 142 kV
18 GULF RO7
1031 pu 142 kV
326 COAL VA7
1032 pu 142 kV
1261 LOU CR.7
1250 SWANDIV8
1244 EDITH L8
1243 EDITH L7
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
844 ASBNE TP
1271 MORSE RV
1270 ESSO JU7
1266 SARAH L7
1272 FIELDGA7
322 CARSON 8
1254 FREEMAN8
12 FOX CREE
1 JUDY515S
895 515S TAP
337 ESSO JU8
944 638S TAP
317 CARSONA8
316 LAURATP
942 LAURALK
973 199A_TAP
1674 CHKD CK7
412 BENBOW 7
85 MILLAR 7
2 MAYERTH
52 BLUERIDG
896 PEG.LK.T
935 CAR.CR.T
932 CAR.LK.T
325 PEGAS.L8
10 WHITEC08
9 WHITEC07
8 WHCTIND7
678 DEERH7
13 KAYBOB 7
962 KAYBOBTP
924 CH KGT T
164 SAGITAW7
163 SAGITAW4
298 ALB NEWS
410 WHITEGE8
830 MARLBTAP
415 MARLBOR1
411 CHEV KG7
82 CHEVRON7
319 COALSPU8
324 COALSPU7
912 740L JNC
914 CADOM TP
323 CADOMIN8
2368 CHEVIOT3
368 CHEVIOTI
101ST1
106% MVA
107% MVA
94% Amps
72% Amps
NICAN
International Consulting Ltd.
www.nicaninternational.com
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
39S Bickerdike (T1)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.046 pu 144 kV
1165 STURGEO7
1.061 pu 146 kV
1166 STURGEO8
1.048 pu 72 kV
1175 FOX CRK7
1.048 pu 145 kV
1164 L.SMOKY7
1.061 pu 146 kV
1172 STURG_1
1.061 pu 146 kV
1180 GOOSE R7
1.067 pu 147 kV
1160 BEZANSON
1.051 pu 145 kV
1275 VIRGINI7
1.070 pu 148 kV
1155 VALLEYV7
1.060 pu 146 kV
1145 BRDGE C7
1.051 pu 145 kV
1143 BIG MTN7
145 kV 1.051 pu
1151 7L48TAP
1.060 pu 146 kV
1336 HIGHPR9
1.062 pu 147 kV
1153 TRIANGL7
1.059 pu 146 kV
549014 WHISKYI
1.088 pu 261 kV
1163 L. SMOKY
1.089 pu 261 kV
1080 WESLY C4
1.134 pu 272 kV
1260 LOU CR.4
1.094 pu 263 kV
1228 MITS E.4
1.114 pu 267 kV
90 BICKERD4
1.088 pu 261 kV
888 106S TAP
1.023 pu 141 kV
395 NITON 7
1.024 pu 141 kV
397 PINEDAL7
1.025 pu 141 kV
20 EDSON 7
1.034 pu 143 kV
39 CYNTHIA7
1.027 pu 142 kV
106%
107%
88 BICKERD7
1.033 pu 142 kV
135 SUNDANC4
1.088 pu 261 kV
1161 SHERIDAN_69
1.030 pu 71 kV
646 WATSON_69
1.057 pu 73 kV
605 WATSON C
1.026 pu 142 kV
549013 VISTA-07
1.030 pu 142 kV
547005 P2015TAP
1.029 pu 142 kV
1.030 pu 142 kV
17 COLD CR7
910 OBED TAP
820 FICKL TP
1.032 pu 142 kV
15 MTN COA7
1.030 pu 142 kV
909 DALEH TP
1.030 pu 142 kV
141 DALEHUR7
1.030 pu 142 kV
472 HORNBECK
1.030 pu 142 kV
913 G.ROBB T
1.032 pu 142 kV
18 GULF RO7
1.031 pu 142 kV
326 COAL VA7
1.032 pu 142 kV
912 740L JNC
1.031 pu 142 kV
915 CHEV TP
1.028 pu 142 kV
324 COALSPU7
1.031 pu 142 kV
319 COALSPU8
1.032 pu 71 kV
2368 CHEVIOT3
1.023 pu 71 kV
368 CHEVIOTI
1.028 pu 142 kV
914 CADOM TP
1.032 pu 71 kV
323 CADOMIN8
1.032 pu 71 kV
1250 SWANDIV8
1.013 pu 70 kV
1244 EDITH L8
1.007 pu 69 kV
1278 KINUSO 8
1.012 pu 70 kV
1240 SWAN RV8
1.002 pu 69 kV
1267 SARAH L8
1.042 pu 72 kV
1254 FREEMAN8
1.030 pu 71 kV
12 FOX CREE
1.049 pu 145 kV
1 JUDY515S
1.042 pu 72 kV
322 CARSON 8
1.036 pu 71 kV
895 515S TAP
1.044 pu 72 kV
337 ESSO JU8
1.042 pu 72 kV
944 638S TAP
1.042 pu 72 kV
316 LAURATP
1.036 pu 72 kV
317 CARSONA8
1.036 pu 72 kV
942 LAURALK
1.036 pu 72 kV
973 199A_TAP
1.046 pu 144 kV
1674 CHKD CK7
1.046 pu 144 kV
1243 EDITH L7
1.069 pu 148 kV
844 ASBNE TP
1.053 pu 145 kV
1261 LOU CR.7
1.071 pu 148 kV
1266 SARAH L7
1.067 pu 147 kV
1271 MORSE RV
1.069 pu 148 kV
1270 ESSO JU7
1.069 pu 148 kV
1272 FIELDGA7
1.068 pu 147 kV
85 MILLAR 7
1.026 pu 142 kV
2 MAYERTH
1.033 pu 143 kV
52 BLUERIDG
1.039 pu 143 kV
410 WHITEGE8
1.039 pu 72 kV
10 WHITEC08
1.038 pu 72 kV
9 WHITEC07
1.047 pu 145 kV
8 WHCTIND7
1.044 pu 144 kV
678 DEERH7
1.034 pu 143 kV
13 KAYBOB 7
1.041 pu 144 kV
962 KAYBOBTP
1.041 pu 144 kV
412 BENBOW 7
1.041 pu 144 kV
896 PEG.LK.T
1.036 pu 71 kV
935 CAR.CR.T
1.036 pu 71 kV
932 CAR.LK.T
1.036 pu 72 kV
325 PEGAS.L8
1.036 pu 71 kV
164 SAGITAW7
1.043 pu 144 kV
298 ALB NEWS
1.079 pu 259 kV
163 SAGITAW4
1.084 pu 260 kV
411 CHEV KG7
1.041 pu 144 kV
924 CH KGT T
1.041 pu 144 kV
82 CHEVRON7
1.041 pu 144 kV
830 MARLBTAP
1.033 pu 143 kV
415 MARLBOR1
1.034 pu 143 kV
825L
526L-1
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
526AL
199L-1
199L-2
199AL
720L
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L56_3
7L32_2
7L40
7L54
7L45_1
7L45_2
7L46
7L48-1
7L48-2
7L48
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7L19
7L55
7L172
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9L05
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1135L
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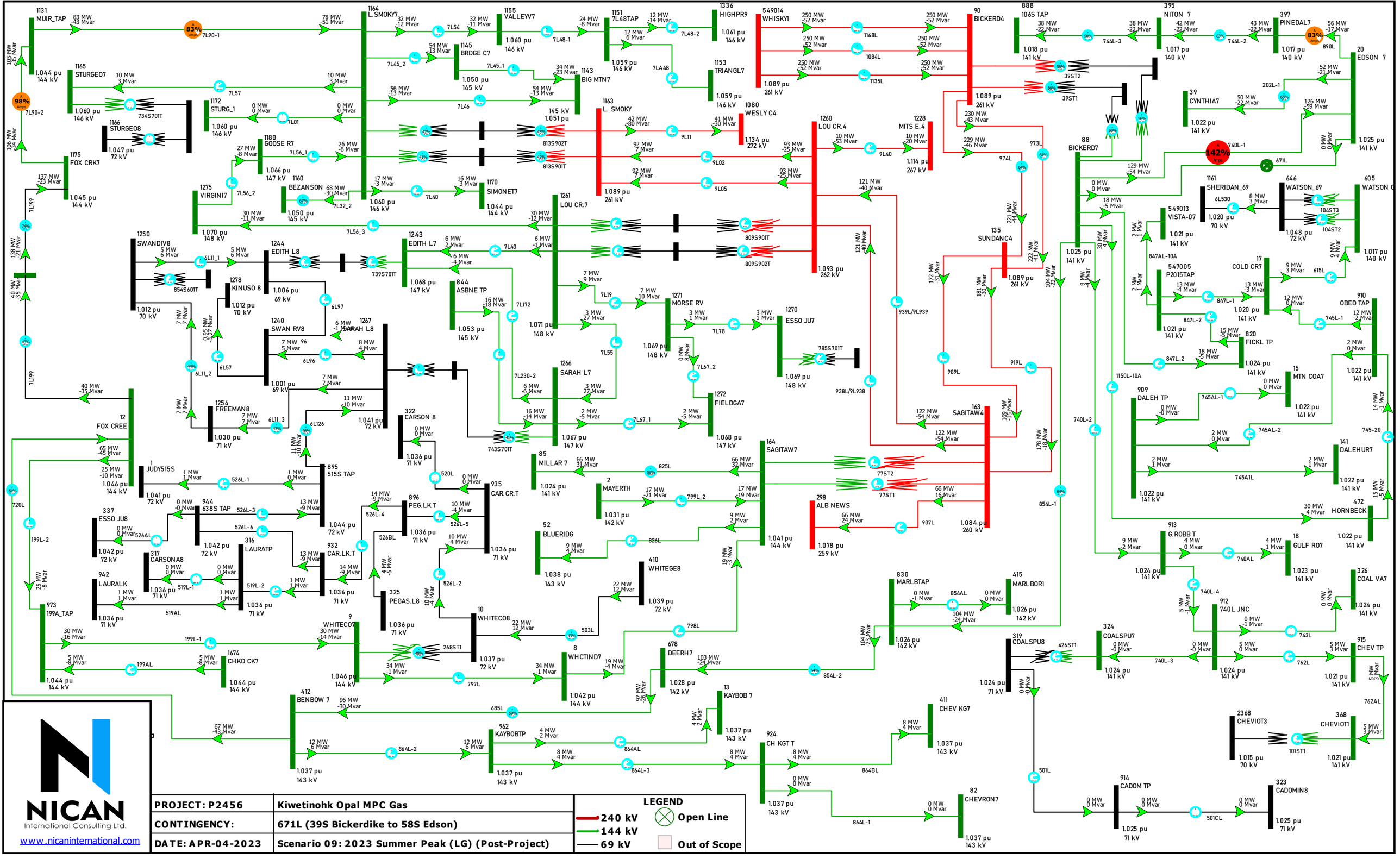
NICAN
International Consulting Ltd.
www.nicaninternational.com
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
39S Bickerdike (T2)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope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1164 L.SMOKY7
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1160 BEZANSON
1275 VIRGINI7
1155 VALLEYV7
1145 BRDGE C7
1143 BIG MTN7
1151 7L48TAP
1336 HIGHPR9
1153 TRIANGL7
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1080 WESLY C4
1163 L. SMOKY
1260 LOU CR.4
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90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
39 CYNTHIA7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
549013 VISTA-07
135 SUNDANC4
17 COLD CR7
547005 P2015TAP
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820 FICKL TP
15 MTN COA7
909 DALEH TP
141 DALEHUR7
472 HORNBECK
913 G.ROBB T
18 GULF RO7
326 COAL VA7
912 740L JNC
915 CHEV TP
1250 SWANDIV8
1244 EDITH L8
1243 EDITH L7
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
1261 LOU CR.7
844 ASBNE TP
1271 MORSE RV
1270 ESSO JU7
1266 SARAH L7
1272 FIELDGA7
322 CARSON 8
1254 FREEMAN8
12 FOX CREE
1 JUDY515S
895 515S TAP
944 638S TAP
337 ESSO JU8
317 CARSONA8
316 LAURATP
942 LAURALK
973 199A_TAP
1674 CHKD CK7
896 PEG.LK.T
935 CAR.CR.T
932 CAR.LK.T
325 PEGAS.L8
2 MAYERTH
52 BLUERIDG
85 MILLAR 7
10 WHITECO8
9 WHITECO7
8 WHCTIND7
678 DEERH7
13 KAYBOB 7
962 KAYBOBTP
412 BENBOW 7
164 SAGITAW7
163 SAGITAW4
298 ALB NEWS
411 CHEV KG7
924 CH KGT T
82 CHEVRON7
830 MARLBTAP
415 MARLBOR1
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324 COALSPU7
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368 CHEVIOT1
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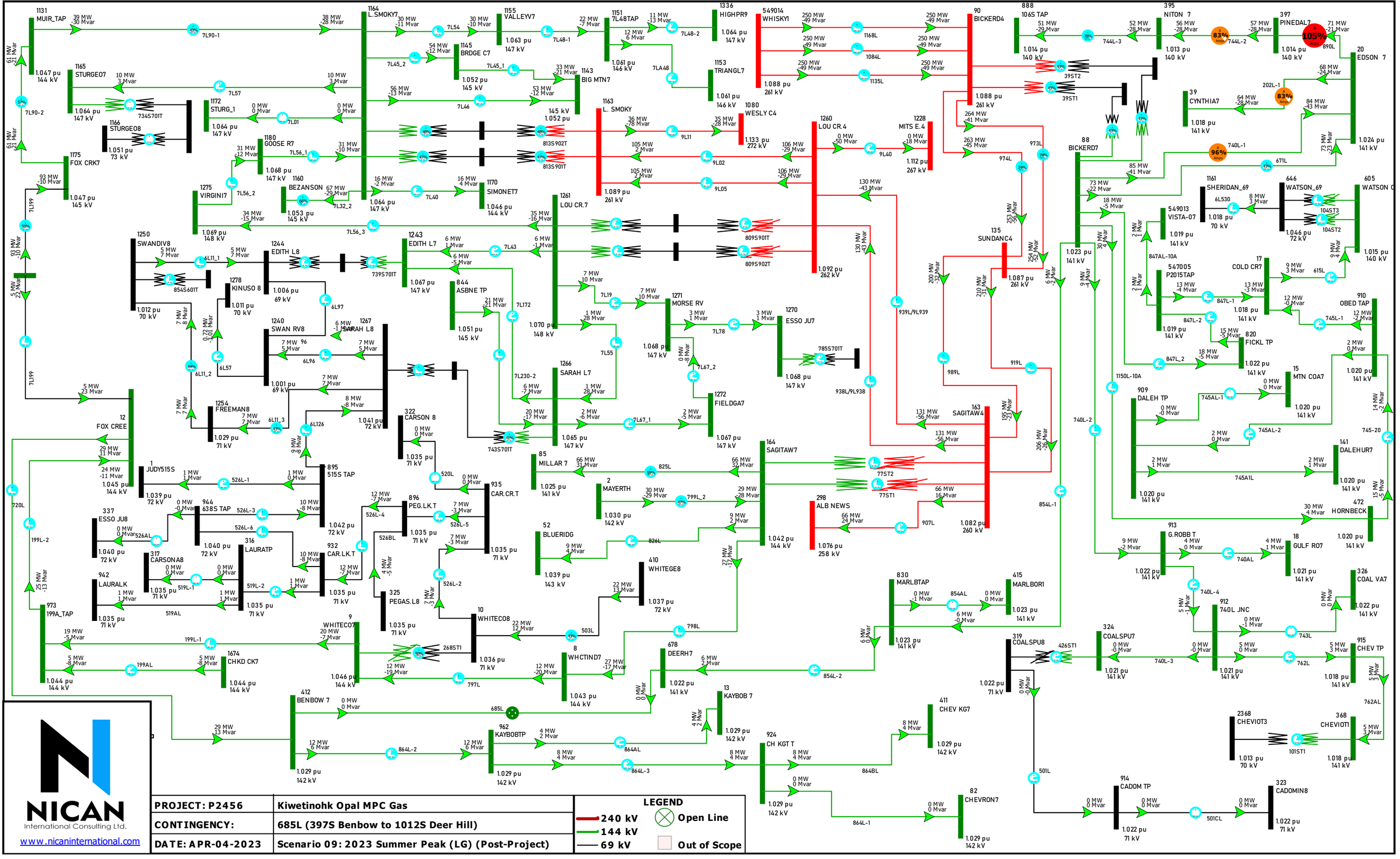
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1.047 pu 145 kV
1164 L.SMOKY7
1.064 pu 147 kV
1155 VALLEYV7
1.063 pu 147 kV
1145 BRDGE C7
1.052 pu 145 kV
1143 BIG MTN7
145 kV 1.052 pu
1151 7L48TAP
1.061 pu 146 kV
1336 HIGHPR9
1.064 pu 147 kV
1153 TRIANGL7
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549014 WHISKYI
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90 BICKERD4
1.088 pu 261 kV
888 106S TAP
1.014 pu 140 kV
395 NITON 7
1.013 pu 140 kV
397 PINEDAL7
1.014 pu 140 kV
20 EDSON 7
1.024 pu 141 kV
39 CYNTHIA7
1.018 pu 141 kV
88 BICKERD7
1.023 pu 141 kV
1163 L. SMOKY
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1080 WESLY C4
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1.092 pu 262 kV
1228 MITS E.4
1.112 pu 267 kV
135 SUNDANC4
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1261 LOU CR.7
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1180 GOOSE R7
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1160 BEZANSON
1.053 pu 145 kV
1170 SIMONET7
1.046 pu 144 kV
1275 VIRGINI7
1.069 pu 148 kV
1172 STURG_1
1.064 pu 147 kV
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1244 EDITH L8
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1278 KINUSO 8
1.011 pu 70 kV
1243 EDITH L7
1.067 pu 147 kV
844 ASBNE TP
1.051 pu 145 kV
1240 SWAN RV8
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1267 SARAH L8
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322 CARSON 8
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1266 SARAH L7
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9 WHITEC07
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10 WHITEC08
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13 KAYBOB 7
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7L48-2
7L48A
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7L199-2
7L199-1
6L11_1
6L11_2
6L11_3
6L57
6L97
6L96
6L126
7L43
7L19
7L55
7L172
7L230-2
7L67_1
7L67_2
7L78
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9L02
9L05
9L40
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809S902T
813S902T
813S901T
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743S701T
734S701T
785S701T
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854S601T
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104ST3
104ST2
744L-3
744L-2
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39ST2
39ST1
973L
974L
919L
989L
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938L/9L938
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1084L
1135L
202L-1
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615L
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847L-1
847L-2
847L_2
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745AL-1
745AL-2
745A1L
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740L-3
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762L
762AL
743L
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426ST1
501L
501CL
101ST1
77ST2
77ST1
685L
720L
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519AL
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503L
520L
825L
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797L
798L
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864AL
864L-3
864L-1
864BL
854L-1
854L-2
907L
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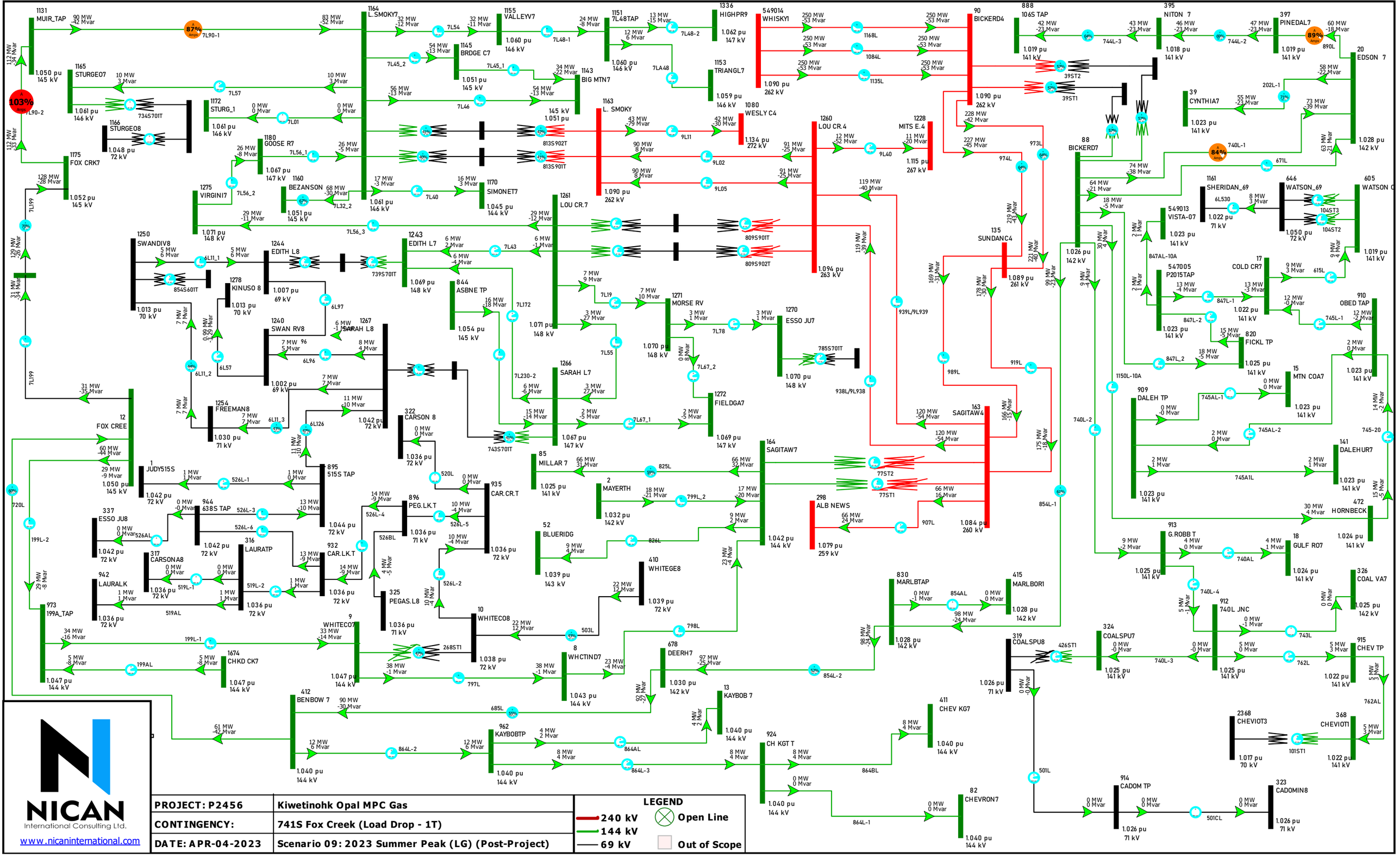
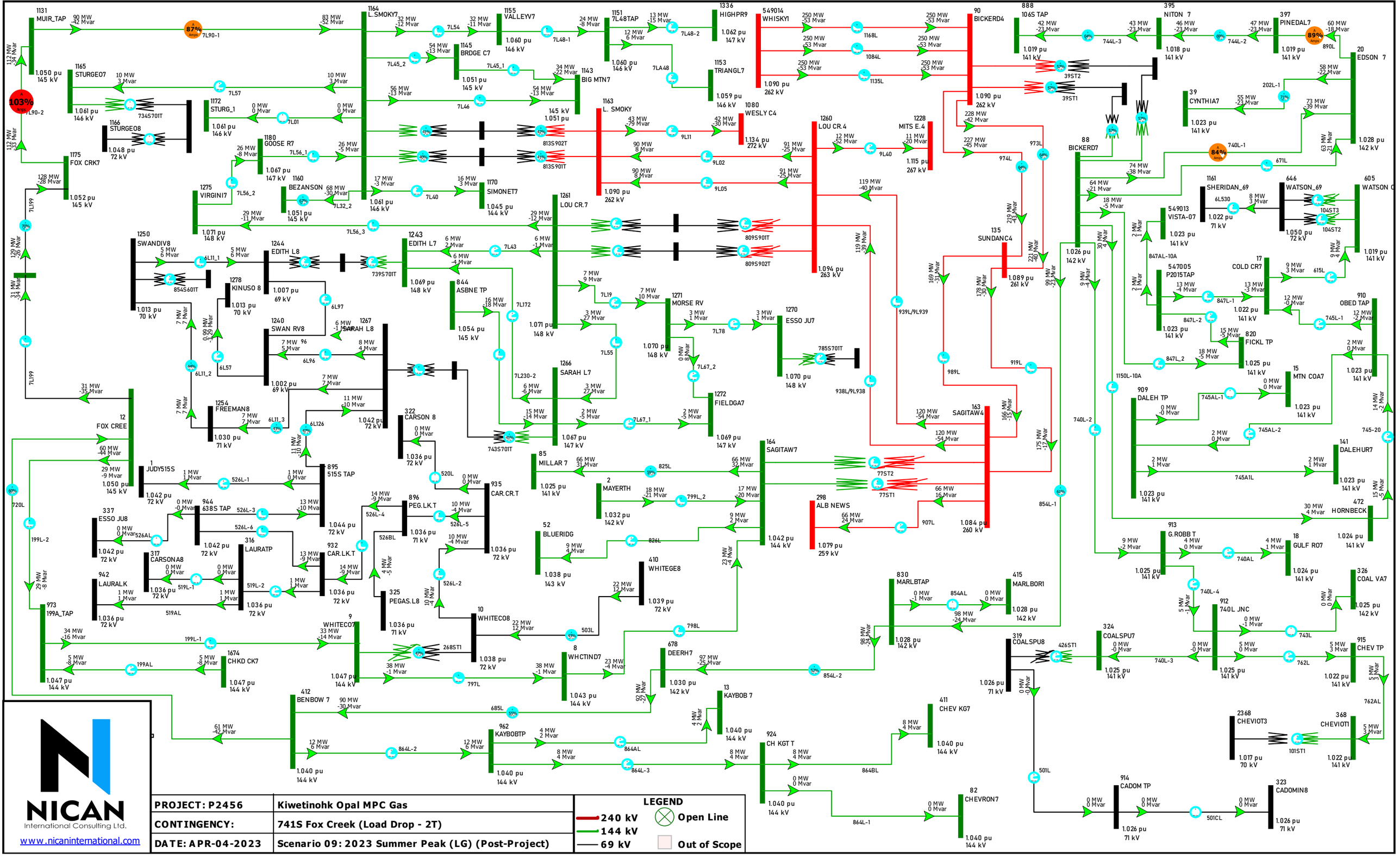
6L178



PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**741S Fox Creek (Load Drop - 1T)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (Post-Project)**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1.050 pu 145 kV
1165 STURGEO7
1.061 pu 146 kV
1166 STURGEO8
1.048 pu 72 kV
1175 FOX CRK7
1.052 pu 145 kV
1164 L.SMOKY7
1.061 pu 146 kV
1155 VALLEYV7
1.060 pu 146 kV
1145 BRDGE C7
1.051 pu 145 kV
1143 BIG MTN7
145 kV 1.051 pu
1151 7L48TAP
1.060 pu 146 kV
1336 HIGHPR9
1.062 pu 147 kV
1153 TRIANGL7
1.059 pu 146 kV
549014 WHISKY1
1.090 pu 262 kV
1168L
1084L
1135L
90 BICKERD4
1.090 pu 262 kV
888 106S TAP
1.019 pu 141 kV
395 NITON 7
1.018 pu 141 kV
397 PINEDAL7
1.019 pu 141 kV
20 EDSON 7
1.028 pu 142 kV
39 CYNTHIA7
1.023 pu 141 kV
88 BICKERD7
1.026 pu 142 kV
1172 STURG_1
1.061 pu 146 kV
1180 GOOSE R7
1.067 pu 147 kV
1160 BEZANSON
1.051 pu 145 kV
1170 SIMONET7
1.045 pu 144 kV
1163 L. SMOKY
1.090 pu 262 kV
1080 WESLY C4
1.134 pu 272 kV
1260 LOU CR.4
1.094 pu 263 kV
1228 MITS E.4
1.115 pu 267 kV
1275 VIRGINI7
1.071 pu 148 kV
1261 LOU CR.7
1.071 pu 148 kV
1161 SHERIDAN_69
1.022 pu 71 kV
646 WATSON_69
1.050 pu 72 kV
605 WATSON C
1.019 pu 141 kV
549013 VISTA-07
1.023 pu 141 kV
135 SUNDANC4
1.089 pu 261 kV
1250 SWANDIV8
1.013 pu 70 kV
1244 EDITH L8
1.007 pu 69 kV
1278 KINUSO 8
1.013 pu 70 kV
1243 EDITH L7
1.069 pu 148 kV
844 ASBNE TP
1.054 pu 145 kV
1271 MORSE RV
1.070 pu 148 kV
1270 ESSO JU7
1.070 pu 148 kV
785S701T
1240 SWAN RV8
1.002 pu 69 kV
1267 SARAH L8
1.042 pu 72 kV
322 CARSON 8
1.036 pu 72 kV
1266 SARAH L7
1.067 pu 147 kV
1272 FIELDGA7
1.069 pu 147 kV
743S701T
85 MILLAR 7
1.025 pu 141 kV
825L
66 MW 31 Mvar
66 MW 32 Mvar
164 SAGITAW7
1.042 pu 144 kV
163 SAGITAW4
1.084 pu 260 kV
77ST2
77ST1
298 ALB NEWS
1.079 pu 259 kV
907L
2 MAYERTH
1.032 pu 142 kV
799L_2
52 BLUERIDG
1.038 pu 143 kV
826L
410 WHITEGE8
1.039 pu 72 kV
830 MARLBTAP
1.028 pu 142 kV
854AL
415 MARLBOR1
1.028 pu 142 kV
809S901T
809S902T
1254 FREEMAN8
1.030 pu 71 kV
6L11_3
6L126
895 515S TAP
1.042 pu 72 kV
520L
935 CAR.CR.T
1.036 pu 72 kV
896 PEG.LK.T
1.036 pu 71 kV
526L-4
526L-5
526BL
944 638S TAP
1.042 pu 72 kV
526L-3
526L-6
337 ESSO JU8
1.042 pu 72 kV
526AL
316 LAURATP
1.036 pu 72 kV
317 CARSONA8
1.036 pu 72 kV
519L-1
519L-2
519AL
942 LAURALK
1.036 pu 72 kV
932 CAR.LK.T
1.036 pu 72 kV
325 PEGAS.L8
1.036 pu 71 kV
526L-2
10 WHITECO8
1.038 pu 72 kV
9 WHITECO7
1.047 pu 144 kV
268ST1
503L
8 WHCTIND7
1.043 pu 144 kV
678 DEERH7
1.030 pu 142 kV
798L
854L-2
973 199A_TAP
1.047 pu 144 kV
199L-1
199AL
1674 CHKD CK7
1.047 pu 144 kV
412 BENBOW 7
1.040 pu 144 kV
685L
797L
962 KAYBOBTP
1.040 pu 144 kV
864L-2
864AL
864L-3
13 KAYBOB 7
1.040 pu 144 kV
924 CH KGT T
1.040 pu 144 kV
864L-1
864BL
411 CHEV KG7
1.040 pu 144 kV
82 CHEVRON7
1.040 pu 144 kV
319 COALSPU8
1.026 pu 71 kV
426ST1
501L
324 COALSPU7
1.025 pu 141 kV
740L-3
912 740L JNC
1.025 pu 141 kV
743L
762L
915 CHEV TP
1.022 pu 141 kV
762AL
2368 CHEVIOT3
1.017 pu 70 kV
101ST1
368 CHEVIOT1
1.022 pu 141 kV
914 CADOM TP
1.026 pu 71 kV
501CL
323 CADOMIN8
1.026 pu 71 kV
847AL-10A
547005 P2015TAP
1.022 pu 141 kV
847L-1
847L-2
17 COLD CR7
910 OBED TAP
745L-1
820 FICKL TP
1.025 pu 141 kV
847L_2
909 DALEH TP
1.023 pu 141 kV
745AL-1
745AL-2
745A1L
15 MTN COA7
1.023 pu 141 kV
141 DALEHUR7
1.023 pu 141 kV
913 G.ROBB T
1.025 pu 141 kV
740AL
18 GULF RO7
1.024 pu 141 kV
472 HORNBECK
1.024 pu 141 kV
740L-4
326 COAL VA7
1.025 pu 142 kV
740L-1
671L
1150L-10A
939L/9L939
938L/9L938
973L
974L
919L
989L
720L
854L-1
6L1
6L2
6L3
6L4
6L5
6L6
6L7
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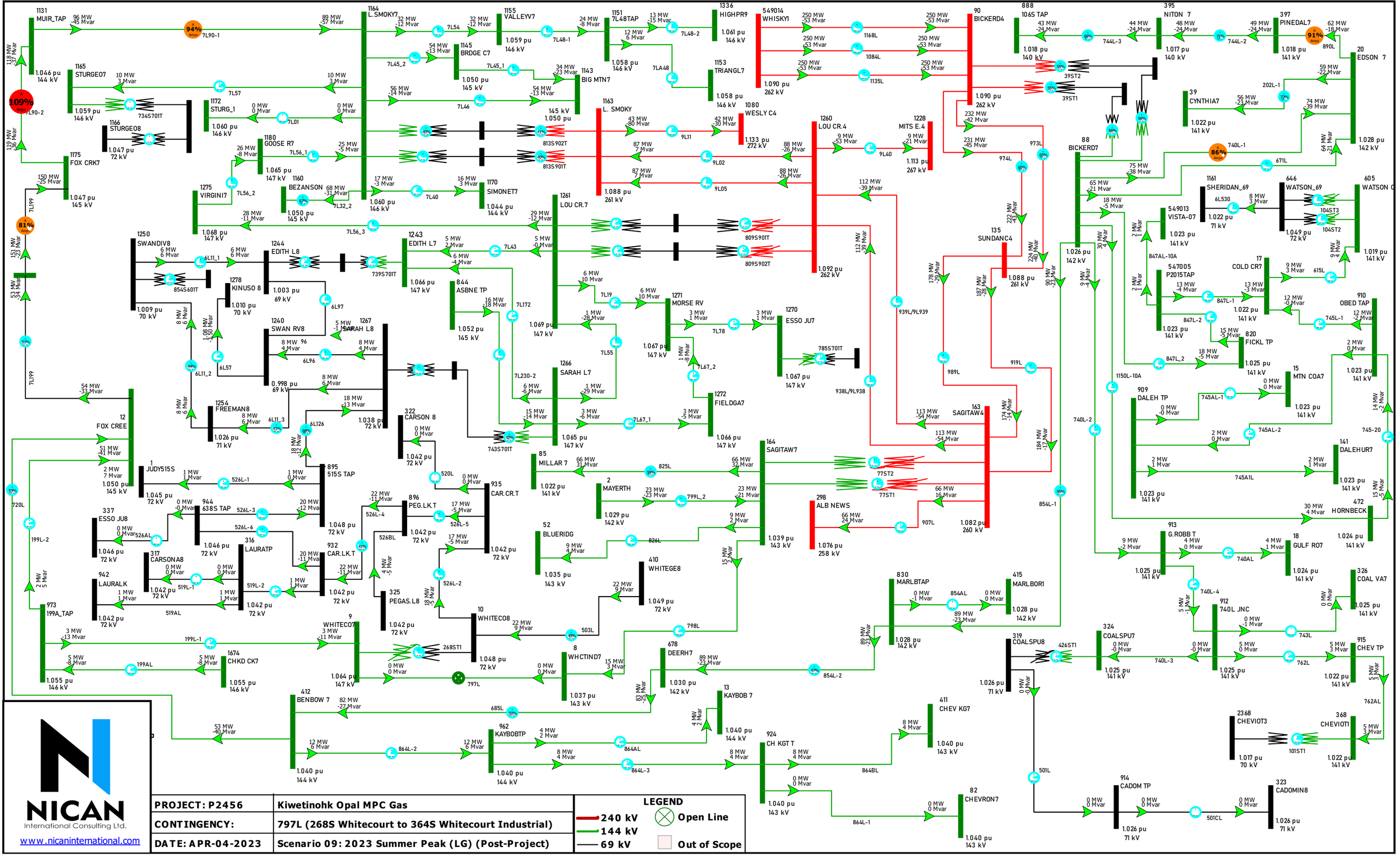
6L40



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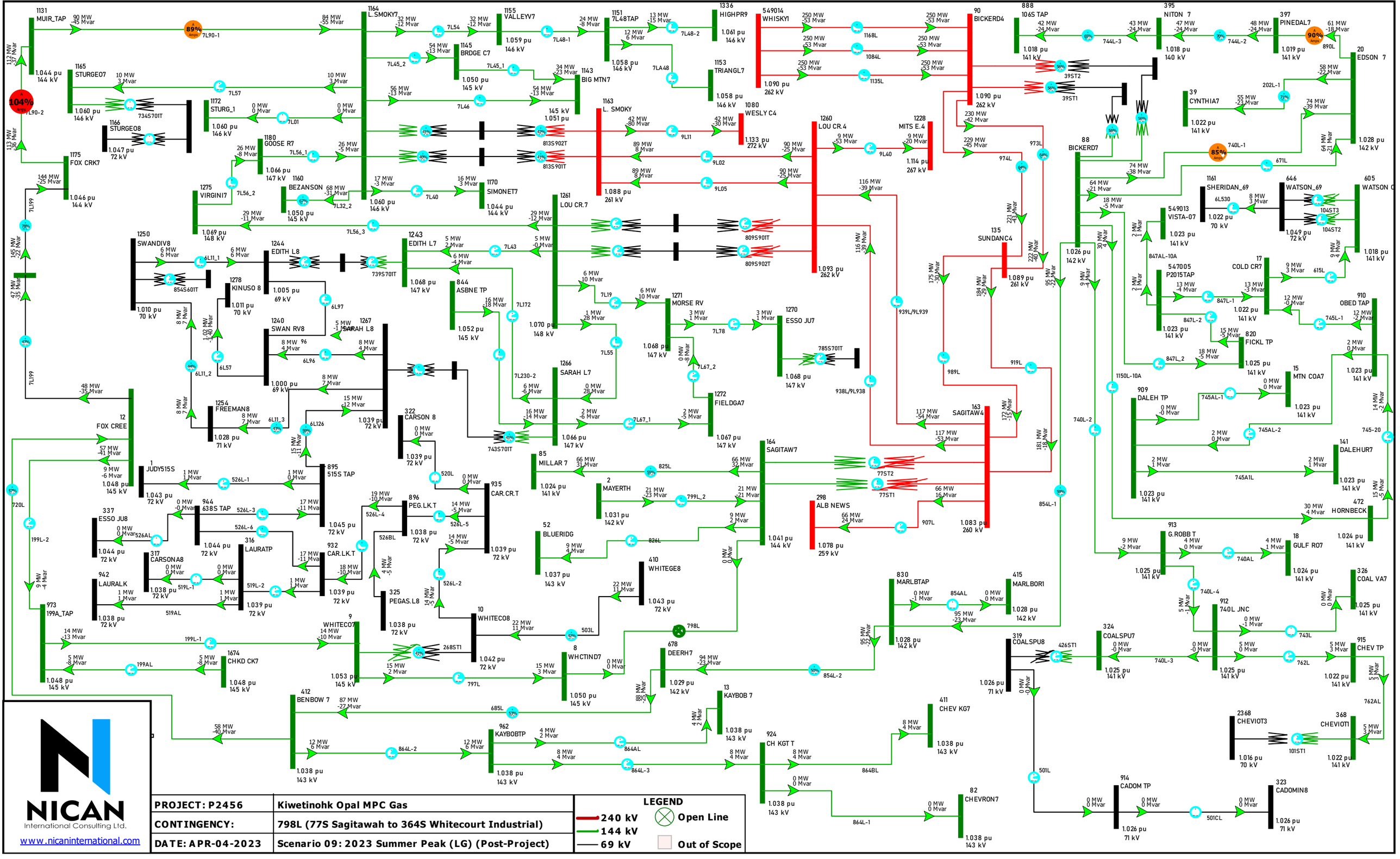
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	797L (268S Whitecourt to 364S Whitecourt Industrial)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

240 kV	Open Line
144 kV	
69 kV	Out of Scope



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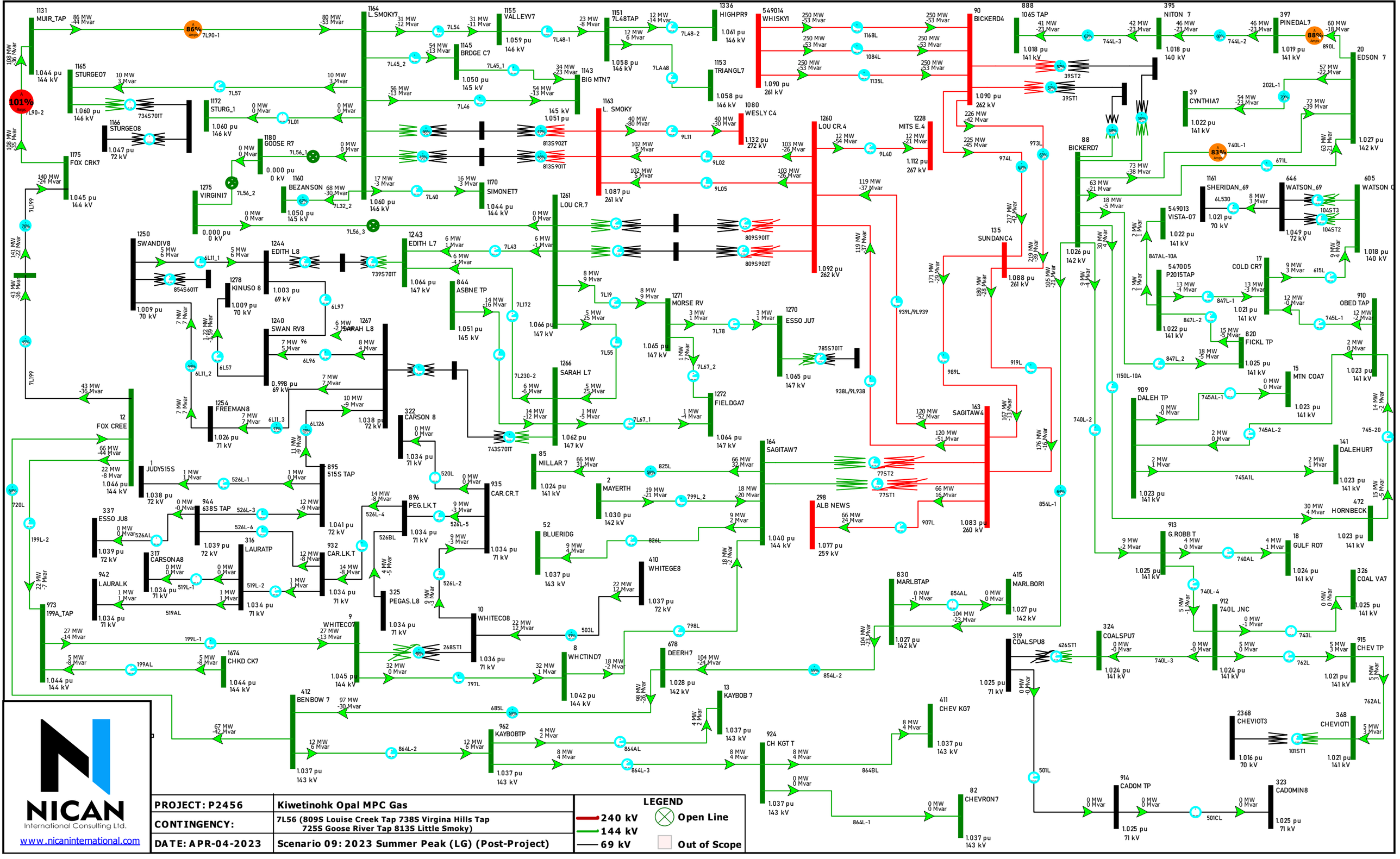
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	798L (77S Sagitawah to 364S Whitecourt Industrial)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND
- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope



NICAN
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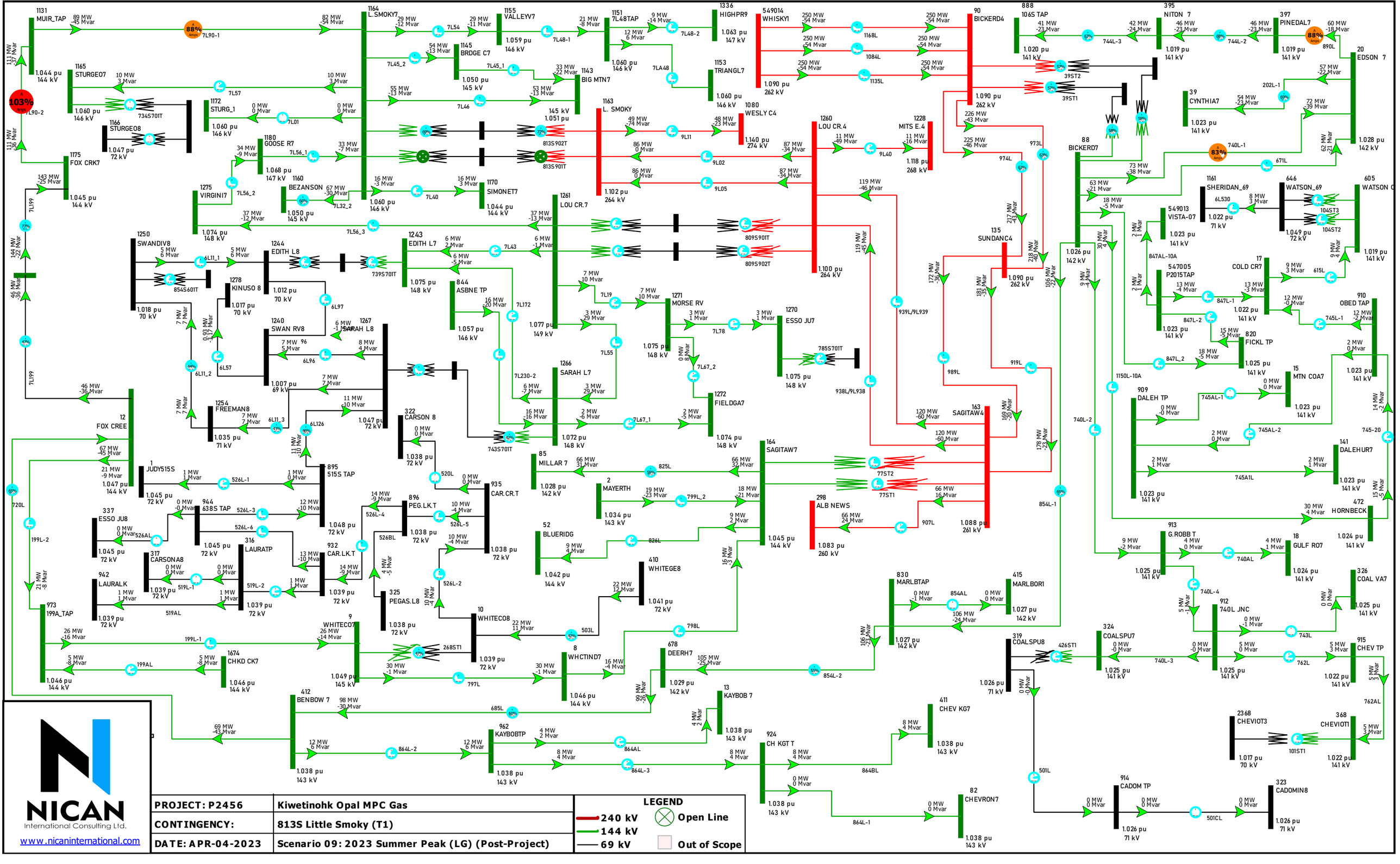
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.044 pu 144 kV
1165 STURGE07
1.060 pu 146 kV
1166 STURGE08
1.047 pu 72 kV
1175 FOX CRK7
1.045 pu 144 kV
1164 L.SMOKY7
1.060 pu 146 kV
1155 VALLEYV7
1.059 pu 146 kV
1151 7L48TAP
1.060 pu 146 kV
1336 HIGHPR9
1.063 pu 147 kV
1145 BRDGE C7
1.050 pu 145 kV
1143 BIG MTN7
145 kV 1.051 pu
1153 TRIANGL7
1.060 pu 146 kV
549014 WHISKYI
1.090 pu 262 kV
1172 STURG_1
1.060 pu 146 kV
1180 GOOSE R7
1.068 pu 147 kV
1160 BEZANSON
1.050 pu 145 kV
1163 L. SMOKY
1.102 pu 264 kV
1080 WESLY C4
1.140 pu 274 kV
1260 LOU CR.4
1.100 pu 264 kV
1228 MITS E.4
1.118 pu 268 kV
1275 VIRGINI7
1.074 pu 148 kV
1170 SIMONET7
1.044 pu 144 kV
1261 LOU CR.7
1.077 pu 149 kV
90 BICKERD4
1.090 pu 262 kV
888 106S TAP
1.020 pu 141 kV
395 NITON 7
1.019 pu 141 kV
397 PINEDAL7
1.019 pu 141 kV
20 EDSON 7
1.028 pu 142 kV
39 CYNTHIA7
1.023 pu 141 kV
88 BICKERD7
1.026 pu 142 kV
1161 SHERIDAN_69
1.022 pu 71 kV
646 WATSON_69
1.049 pu 72 kV
605 WATSON C
1.019 pu 141 kV
549013 VISTA-07
1.023 pu 141 kV
135 SUNDANC4
1.090 pu 262 kV
547005 P2015TAP
1.022 pu 141 kV
17 COLD CR7
1.023 pu 141 kV
910 OBED TAP
1.023 pu 141 kV
820 FICKL TP
1.025 pu 141 kV
15 MTN COA7
1.023 pu 141 kV
909 DALEH TP
1.023 pu 141 kV
141 DALEHUR7
1.023 pu 141 kV
472 HORNBECK
1.024 pu 141 kV
913 G.ROBB T
1.025 pu 141 kV
18 GULF RO7
1.024 pu 141 kV
326 COAL VA7
1.025 pu 141 kV
912 740L JNC
1.025 pu 141 kV
915 CHEV TP
1.022 pu 141 kV
324 COALSPU7
1.025 pu 141 kV
319 COALSPU8
1.026 pu 71 kV
2368 CHEVIOT3
1.017 pu 70 kV
368 CHEVIOT1
1.022 pu 141 kV
914 CADOM TP
1.026 pu 71 kV
323 CADOMIN8
1.026 pu 71 kV
1250 SWANDIV8
1.018 pu 70 kV
1244 EDITH L8
1.012 pu 70 kV
1278 KINUSO 8
1.017 pu 70 kV
1243 EDITH L7
1.075 pu 148 kV
844 ASBNE TP
1.057 pu 146 kV
1240 SWAN RV8
1.007 pu 69 kV
1267 SARAH L8
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1254 FREEMAN8
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322 CARSON 8
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1266 SARAH L7
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1271 MORSE RV
1.075 pu 148 kV
1270 ESSO JU7
1.075 pu 148 kV
1272 FIELDGA7
1.074 pu 148 kV
85 MILLAR 7
1.028 pu 142 kV
2 MAYERTH
1.034 pu 143 kV
52 BLUERIDG
1.042 pu 144 kV
410 WHITEGE8
1.041 pu 72 kV
164 SAGITAW7
1.045 pu 144 kV
163 SAGITAW4
1.088 pu 261 kV
298 ALB NEWS
1.083 pu 260 kV
830 MARLBTAP
1.027 pu 142 kV
415 MARLBOR1
1.027 pu 142 kV
411 CHEV KG7
1.038 pu 143 kV
924 CH KGT T
1.038 pu 143 kV
82 CHEVRON7
1.038 pu 143 kV
678 DEERH7
1.029 pu 142 kV
13 KAYBOB 7
1.038 pu 143 kV
962 KAYBOBTP
1.038 pu 143 kV
412 BENBOW 7
1.038 pu 143 kV
1 JUDY515S
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337 ESSO JU8
1.045 pu 72 kV
317 CARSONA8
1.039 pu 72 kV
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316 LAURATP
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944 638S TAP
1.045 pu 72 kV
895 515S TAP
1.048 pu 72 kV
896 PEG.LK.T
1.038 pu 72 kV
935 CAR.CR.T
1.038 pu 72 kV
932 CAR.LK.T
1.039 pu 72 kV
325 PEGAS.L8
1.038 pu 72 kV
10 WHITECO8
1.039 pu 72 kV
9 WHITECO7
1.049 pu 145 kV
8 WHCTIND7
1.046 pu 144 kV
973 199A_TAP
1.046 pu 144 kV
1674 CHKD CK7
1.046 pu 144 kV
12 FOX CREE
1.047 pu 144 kV
88% 7L90-1
103% 7L90-2
82% 7L54
29% 7L45_2
54% 7L46
55% 7L57
0% 7L01
69% 7L40
37% 7L56_3
34% 7L56_1
33% 7L56_2
16% 7L32_2
49% 9L11
86% 9L02
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11% 9L40
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1.026 pu 142 kV
1.090 pu 262 kV
1.045 pu 144 kV
1.047 pu 144 kV
1.039 pu 72 kV
1.038 pu 72 kV
1.046 pu 144 kV
1.049 pu 145 kV
1.077 pu 149 kV
1.075 pu 148 kV
1.072 pu 148 kV
1.074 pu 148 kV
1.007 pu 69 kV
1.035 pu 71 kV
1.038 pu 72 kV
1.045 pu 72 kV
1.048 pu 72 kV
1.039 pu 72 kV
1.038 pu 143 kV
1.045 pu 144 kV
1.088 pu 261 kV
1.083 pu 260 kV
1.027 pu 142 kV
1.038 pu 143 kV
1.029 pu 142 kV
1.046 pu 144 kV
1.026 pu 71 kV
1.017 pu 70 kV
1.022 pu 141 kV
1.025 pu 141 kV
1.023 pu 141 kV
1.024 pu 141 kV
1.019 pu 141 kV
1.028 pu 142 kV
1.023 pu 141 kV
1.026 pu 71 kV
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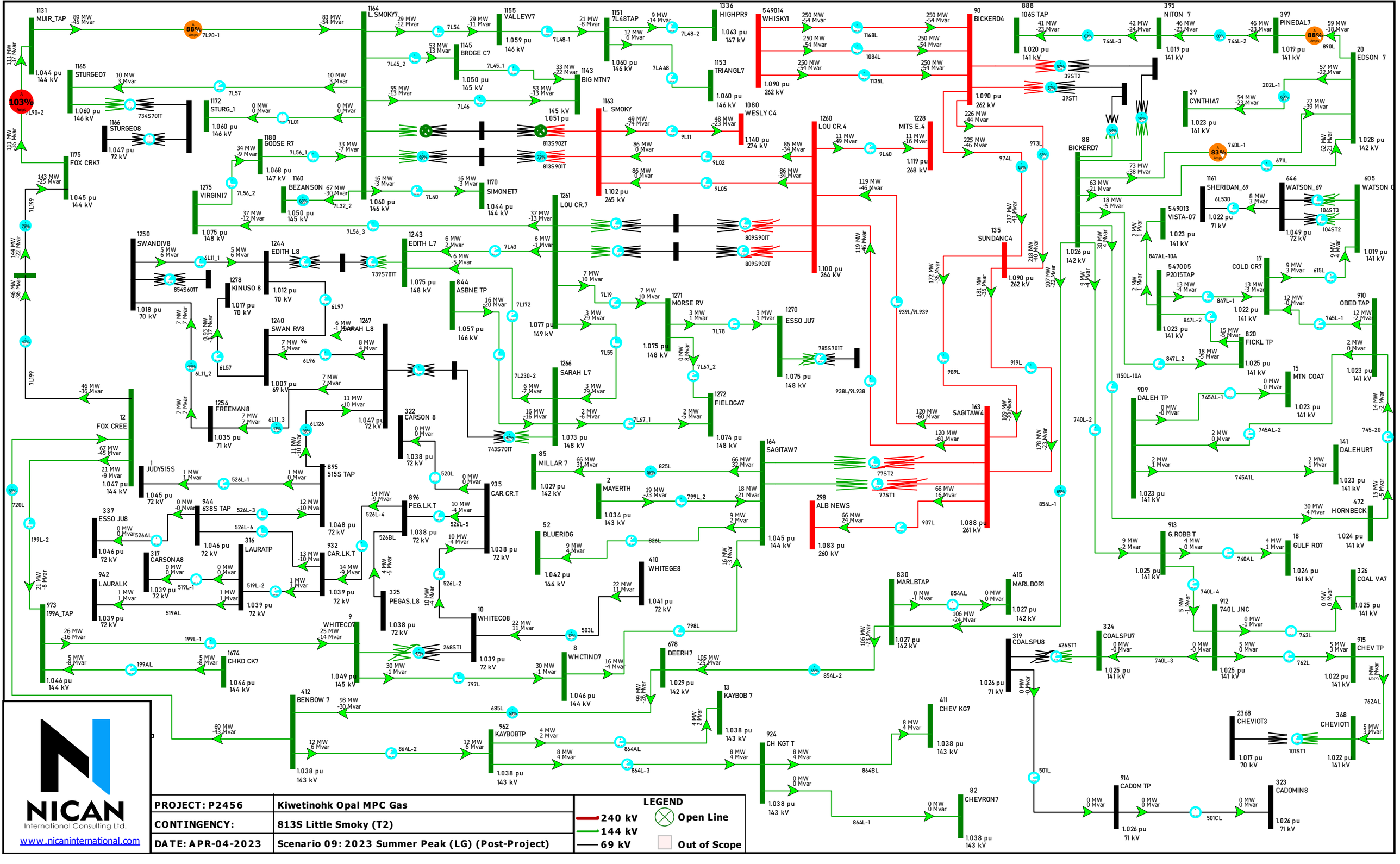
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
813S Little Smoky (T1)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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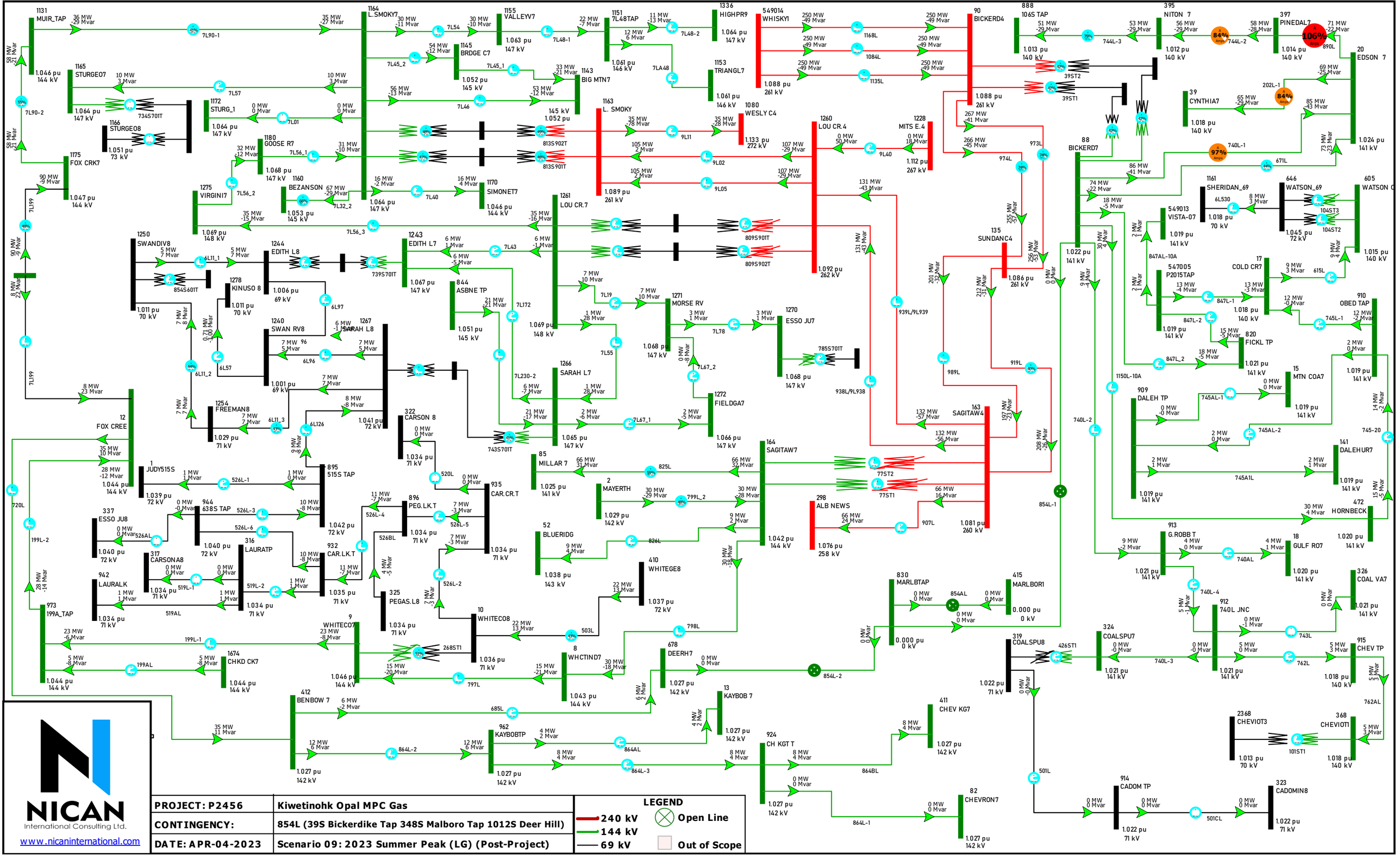
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**813S Little Smoky (T2)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (Post-Project)**

LEGEND

- **240 kV**
- **144 kV**
- **69 kV**
- ⊗ **Open Line**
- ☐ **Out of Scope**


1131 MUIR_TAP
1165 STURGEO7
1166 STURGEO8
1175 FOX CRK7
1172 STURG_1
1180 GOOSE R7
1160 BEZANSON
1275 VIRGINI7
1164 L.SMOKY7
1155 VALLEYV7
1145 BRDGE C7
1143 BIG MTN7
1151 7L48TAP
1336 HIGHPR9
1153 TRIANGL7
549014 WHISKYI
90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
39 CYNTHIA7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
549013 VISTA-07
135 SUNDANC4
17 COLD CR7
547005 P2015TAP
910 OBED TAP
820 FICKL TP
15 MTN COA7
909 DALEH TP
141 DALEHUR7
472 HORNBECK
1163 L. SMOKY
1080 WESLY C4
1260 LOU CR.4
1228 MITS E.4
1261 LOU CR.7
1250 SWANDIV8
1244 EDITH L8
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
1243 EDITH L7
844 ASBNE TP
1266 SARAH L7
1271 MORSE RV
1270 ESSO JU7
1272 FIELDGA7
322 CARSON 8
1254 FREEMAN8
12 FOX CREE
1 JUDY515S
337 ESSO JU8
944 638S TAP
316 LAURATP
317 CARSONA8
942 LAURALK
973 199A_TAP
1674 CHKD CK7
85 MILLAR 7
2 MAYERTH
52 BLUERIDG
896 PEG.LK.T
935 CAR.CR.T
932 CAR.LK.T
325 PEGAS.L8
10 WHITECO8
9 WHITECO7
412 BENBOW 7
962 KAYBOBTP
13 KAYBOB 7
164 SAGITAW7
298 ALB NEWS
163 SAGITAW4
411 CHEV KG7
924 CH KGT T
82 CHEVRON7
830 MARLBTAP
415 MARLBOR1
678 DEERH7
410 WHITEGE8
319 COALSPU8
324 COALSPU7
912 740L JNC
914 CADOM TP
323 CADOMIN8
2368 CHEVIOT3
368 CHEVIOTI
7L90-1
7L90-2
7L57
7L01
7L56_1
7L56_2
7L32_2
7L56_3
7L40
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7LA48
1168L
1084L
1135L
39ST2
39ST1
202L-1
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671L
973L
974L
744L-3
744L-2
890L
7L99
7L199
6L11_1
6L11_2
6L11_3
6L57
6L97
6L96
6L126
739S701IT
743S701IT
7L43
7L172
7L19
7L55
7L78
7L67_2
7L67_1
785S701IT
7L230-2
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809S902T
813S902T
813S901T
9L11
9L02
9L05
9L40
939L/9L939
938L/9L938
989L
919L
7L199-2
7L199-1
199AL
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
268ST1
503L
797L
798L
799L_2
825L
826L
685L
864L-1
864L-2
864L-3
864AL
864BL
907L
77ST2
77ST1
854L-1
854L-2
720L
739S701IT
854S601T
734S701T
6L530
104ST3
104ST2
847AL-10A
847L-1
847L-2
847L_2
615L
745L-1
745AL-1
745AL-2
745A1L
1150L-10A
740L-2
740L-3
740L-4
740AL
743L
762L
762AL
745-20
426ST1
501L
501CL
101ST1
854AL
855AL
1.046 pu 144 kV
1.064 pu 147 kV
1.051 pu 73 kV
1.047 pu 144 kV
1.064 pu 147 kV
1.068 pu 147 kV
1.053 pu 145 kV
1.069 pu 148 kV
1.064 pu 147 kV
1.046 pu 144 kV
1.063 pu 147 kV
1.052 pu 145 kV
1.061 pu 146 kV
145 kV 1.052 pu
1.089 pu 261 kV
1.133 pu 272 kV
1.112 pu 267 kV
1.092 pu 262 kV
1.088 pu 261 kV
1.013 pu 140 kV
1.012 pu 140 kV
1.014 pu 140 kV
1.018 pu 140 kV
1.024 pu 141 kV
1.022 pu 141 kV
1.086 pu 261 kV
1.045 pu 72 kV
1.015 pu 140 kV
1.019 pu 141 kV
1.018 pu 140 kV
1.021 pu 141 kV
1.019 pu 141 kV
1.019 pu 141 kV
1.020 pu 141 kV
1.011 pu 70 kV
1.006 pu 69 kV
1.011 pu 70 kV
1.001 pu 69 kV
1.041 pu 72 kV
1.029 pu 71 kV
1.034 pu 71 kV
1.044 pu 144 kV
1.039 pu 72 kV
1.040 pu 72 kV
1.040 pu 72 kV
1.034 pu 71 kV
1.034 pu 71 kV
1.034 pu 71 kV
1.035 pu 71 kV
1.034 pu 71 kV
1.034 pu 71 kV
1.036 pu 71 kV
1.046 pu 144 kV
1.043 pu 144 kV
1.044 pu 144 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.027 pu 142 kV
1.076 pu 258 kV
1.081 pu 260 kV
1.042 pu 144 kV
1.038 pu 143 kV
1.037 pu 72 kV
1.036 pu 71 kV
1.065 pu 147 kV
1.066 pu 147 kV
1.068 pu 147 kV
1.051 pu 145 kV
1.067 pu 147 kV
1.069 pu 148 kV
1.000 pu 0 kV
1.022 pu 71 kV
1.021 pu 141 kV
1.013 pu 70 kV
1.018 pu 140 kV
1.022 pu 71 kV
1.034 pu 71 kV
106%
84%
97%
84%
84%
42%
49%
47%
55%
44%
43%
40%
24%
14%
22%
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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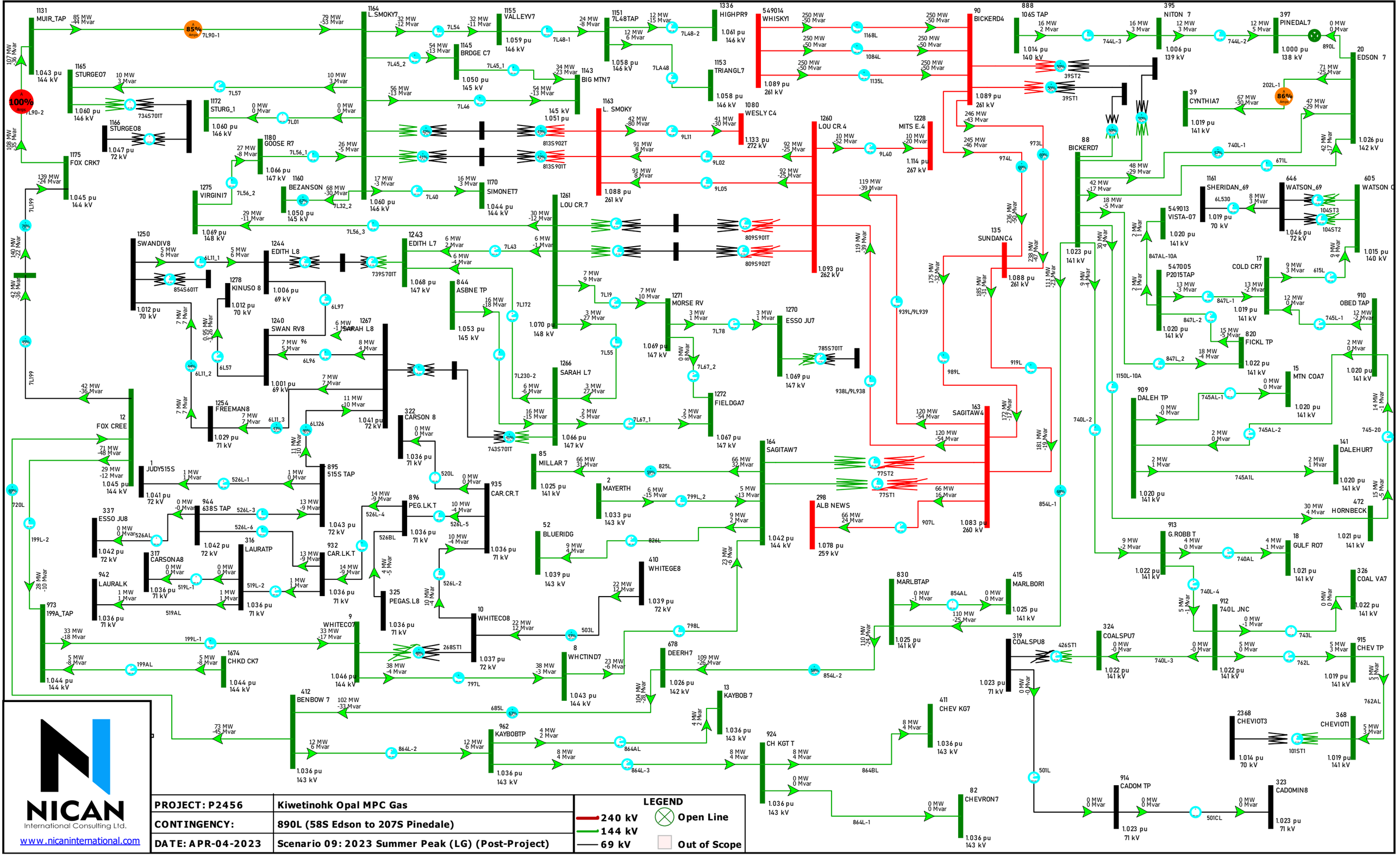

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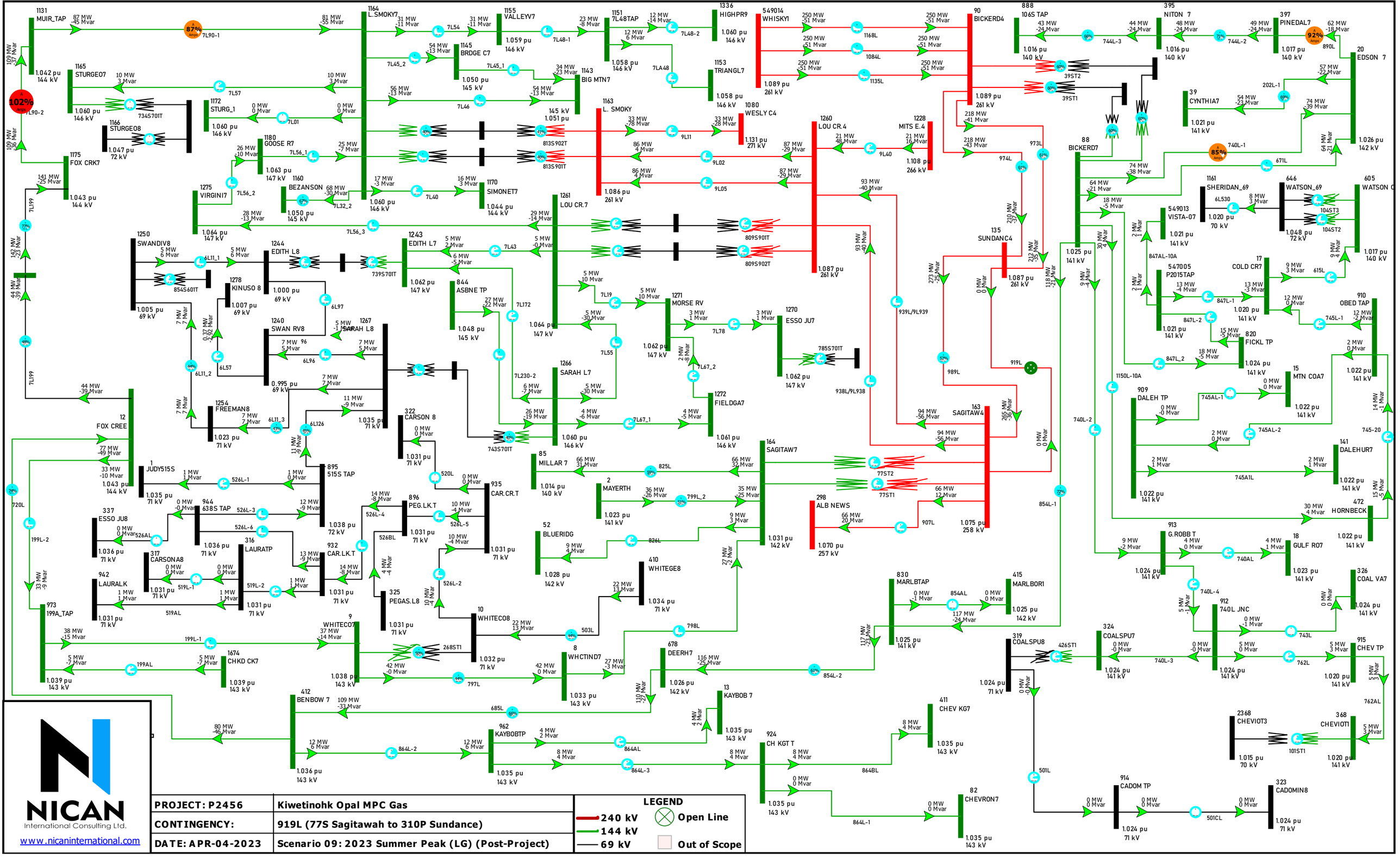
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	890L (58S Edson to 207S Pinedale)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

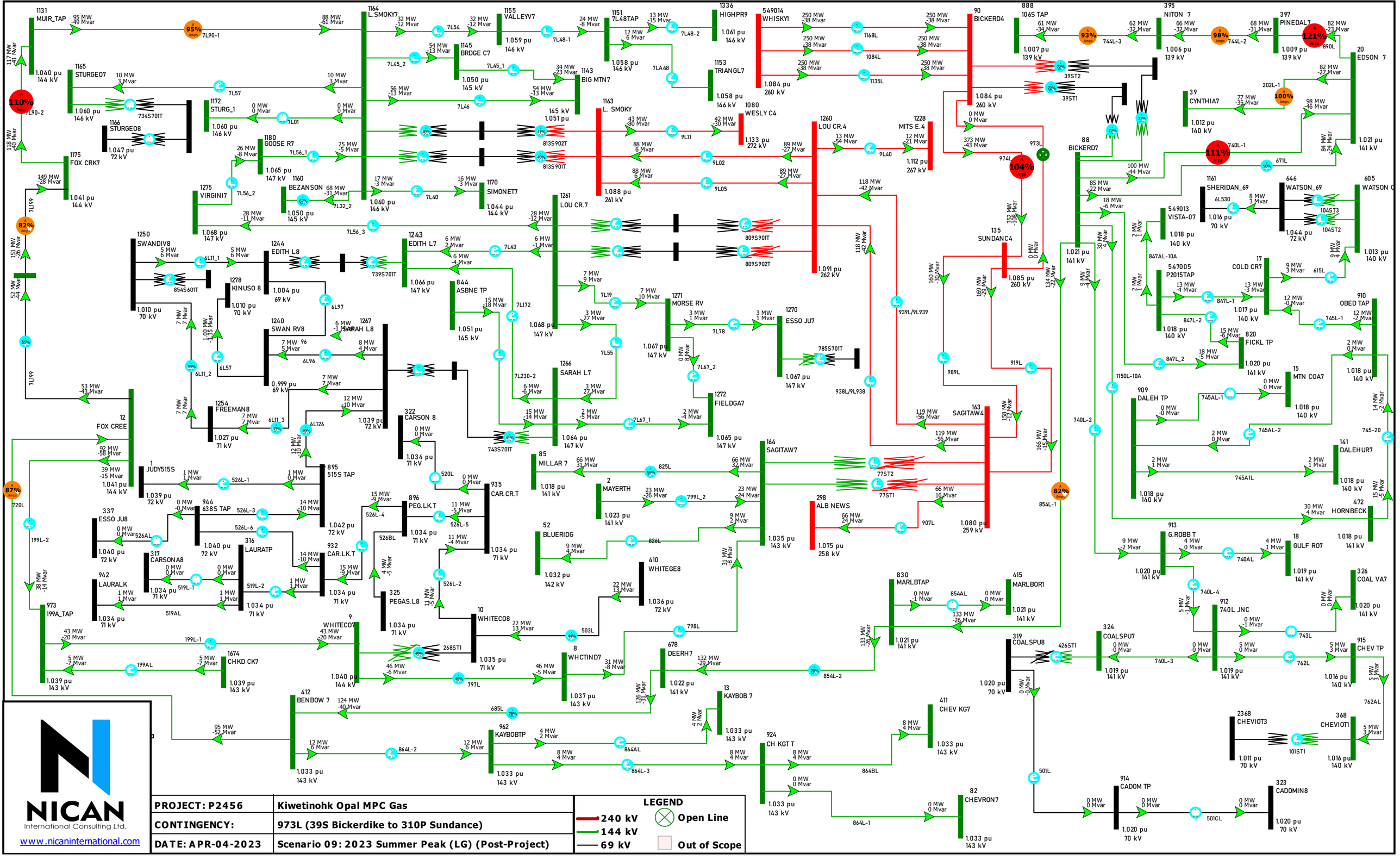
240 kV
144 kV
69 kV
Open Line
Out of Scope



PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	919L (77S Sagitawah to 310P Sundance)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope


1131 MUIR_TAP
1165 STURGEO7
1166 STURGEO8
1175 FOX CRK7
1164 L.SMOKY7
1172 STURG_1
1180 GOOSE R7
1160 BEZANSON
1275 VIRGINI7
1155 VALLEYV7
1145 BRDGE C7
1143 BIG MTN7
1151 7L48TAP
1336 HIGHPR9
1153 TRIANGL7
549014 WHISKY1
1163 L. SMOKY
1080 WESLY C4
1170 SIMONET7
1261 LOU CR.7
1260 LOU CR.4
1228 MITS E.4
90 BICKERD4
888 106S TAP
395 NITON 7
397 PINEDAL7
20 EDSON 7
39 CYNTHIA7
88 BICKERD7
1161 SHERIDAN_69
646 WATSON_69
605 WATSON C
549013 VISTA-07
135 SUNDANC4
547005 P2015TAP
17 COLD CR7
910 OBED TAP
820 FICKL TP
1150L-10A
909 DALEH TP
15 MTN COA7
141 DALEHUR7
472 HORNBECK
913 G.ROBB T
18 GULF RO7
326 COAL VA7
912 740L JNC
915 CHEV TP
324 COALSPU7
319 COALSPU8
2368 CHEVIOT3
368 CHEVIOT1
914 CADOM TP
323 CADOMIN8
1250 SWANDIV8
1244 EDITH L8
1278 KINUSO 8
1240 SWAN RV8
1267 SARAH L8
1243 EDITH L7
844 ASBNE TP
1266 SARAH L7
1271 MORSE RV
1270 ESSO JU7
1272 FIELDGA7
322 CARSON 8
85 MILLAR 7
2 MAYERTH
52 BLUERIDG
410 WHITEGE8
10 WHITECO8
9 WHITECO7
8 WHCTIND7
678 DEERH7
13 KAYBOB 7
962 KAYBOBTP
412 BENBOW 7
164 SAGITAW7
163 SAGITAW4
298 ALB NEWS
411 CHEV KG7
924 CH KGT T
82 CHEVRON7
12 FOX CREE
1 JUDY515S
337 ESSO JU8
317 CARSONA8
942 LAURALK
316 LAURATP
944 638S TAP
896 PEG.LK.T
932 CAR.LK.T
935 CAR.CR.T
325 PEGAS.L8
1674 CHKD CK7
973 199A_TAP
830 MARLBTAP
415 MARLBOR1
895 515S TAP
1131 MUIR_TAP 95 MW -49 Mvar
1165 STURGEO7 10 MW 3 Mvar
1166 STURGEO8 1.047 pu 72 kV
1175 FOX CRK7 1.041 pu 144 kV
1164 L.SMOKY7 88 MW -61 Mvar
1172 STURG_1 0 MW 0 Mvar
1180 GOOSE R7 26 MW -8 Mvar
1160 BEZANSON 68 MW -31 Mvar
1275 VIRGINI7 1.068 pu 147 kV
1155 VALLEYV7 1.059 pu 146 kV
1145 BRDGE C7 1.050 pu 145 kV
1143 BIG MTN7 145 kV 1.051 pu
1151 7L48TAP 1.058 pu 146 kV
1336 HIGHPR9 1.061 pu 146 kV
1153 TRIANGL7 1.058 pu 146 kV
549014 WHISKY1 1.084 pu 260 kV
1163 L. SMOKY 1.088 pu 261 kV
1080 WESLY C4 1.133 pu 272 kV
1170 SIMONET7 1.044 pu 144 kV
1261 LOU CR.7 1.068 pu 147 kV
1260 LOU CR.4 1.091 pu 262 kV
1228 MITS E.4 1.112 pu 267 kV
90 BICKERD4 1.084 pu 260 kV
888 106S TAP 1.007 pu 139 kV
395 NITON 7 1.006 pu 139 kV
397 PINEDAL7 1.009 pu 139 kV
20 EDSON 7 1.021 pu 141 kV
39 CYNTHIA7 1.012 pu 140 kV
88 BICKERD7 1.021 pu 141 kV
1161 SHERIDAN_69 1.016 pu 70 kV
646 WATSON_69 1.044 pu 72 kV
605 WATSON C 1.013 pu 140 kV
549013 VISTA-07 1.018 pu 140 kV
135 SUNDANC4 1.085 pu 260 kV
547005 P2015TAP 1.018 pu 140 kV
17 COLD CR7 1.017 pu 140 kV
910 OBED TAP 1.018 pu 140 kV
820 FICKL TP 1.020 pu 141 kV
1150L-10A 1.018 pu 140 kV
909 DALEH TP 1.018 pu 140 kV
15 MTN COA7 1.018 pu 140 kV
141 DALEHUR7 1.018 pu 140 kV
472 HORNBECK 1.018 pu 141 kV
913 G.ROBB T 1.020 pu 141 kV
18 GULF RO7 1.019 pu 141 kV
326 COAL VA7 1.020 pu 141 kV
912 740L JNC 1.019 pu 141 kV
915 CHEV TP 1.016 pu 140 kV
324 COALSPU7 1.019 pu 141 kV
319 COALSPU8 1.020 pu 70 kV
2368 CHEVIOT3 1.011 pu 70 kV
368 CHEVIOT1 1.016 pu 140 kV
914 CADOM TP 1.020 pu 70 kV
323 CADOMIN8 1.020 pu 70 kV
1250 SWANDIV8 1.010 pu 70 kV
1244 EDITH L8 1.004 pu 69 kV
1278 KINUSO 8 1.010 pu 70 kV
1240 SWAN RV8 0.999 pu 69 kV
1267 SARAH L8 1.039 pu 72 kV
1243 EDITH L7 1.066 pu 147 kV
844 ASBNE TP 1.051 pu 145 kV
1266 SARAH L7 1.064 pu 147 kV
1271 MORSE RV 1.067 pu 147 kV
1270 ESSO JU7 1.067 pu 147 kV
1272 FIELDGA7 1.065 pu 147 kV
322 CARSON 8 1.034 pu 71 kV
85 MILLAR 7 1.018 pu 141 kV
2 MAYERTH 1.023 pu 141 kV
52 BLUERIDG 1.032 pu 142 kV
410 WHITEGE8 1.036 pu 72 kV
10 WHITECO8 1.035 pu 71 kV
9 WHITECO7 1.040 pu 144 kV
8 WHCTIND7 1.037 pu 143 kV
678 DEERH7 1.022 pu 141 kV
13 KAYBOB 7 1.033 pu 143 kV
962 KAYBOBTP 1.033 pu 143 kV
412 BENBOW 7 1.033 pu 143 kV
164 SAGITAW7 1.035 pu 143 kV
163 SAGITAW4 1.080 pu 259 kV
298 ALB NEWS 1.075 pu 258 kV
411 CHEV KG7 1.033 pu 143 kV
924 CH KGT T 1.033 pu 143 kV
82 CHEVRON7 1.033 pu 143 kV
12 FOX CREE 1.041 pu 144 kV
1 JUDY515S 1.039 pu 72 kV
337 ESSO JU8 1.040 pu 72 kV
317 CARSONA8 1.034 pu 71 kV
942 LAURALK 1.034 pu 71 kV
316 LAURATP 1.034 pu 71 kV
944 638S TAP 1.040 pu 72 kV
896 PEG.LK.T 1.034 pu 71 kV
932 CAR.LK.T 1.034 pu 71 kV
935 CAR.CR.T 1.034 pu 71 kV
325 PEGAS.L8 1.034 pu 71 kV
1674 CHKD CK7 1.039 pu 143 kV
973 199A_TAP 1.039 pu 143 kV
830 MARLBTAP 1.021 pu 141 kV
415 MARLBOR1 1.021 pu 141 kV
895 515S TAP 1.042 pu 72 kV
95% 7L90-1
110% 7L90-2
82% 720L
7L57
7L01
7L56_1
7L56_2
7L32_2
7L56_3
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48A
7L40
7L199
7L56_4
7L43
7L19
7L55
7L172
7L230-2
7L67_1
7L67_2
7L78
7L11_1
7L11_2
7L11_3
6L96
6L97
6L57
6L126
739S701IT
743S701IT
785S701IT
809S901T
809S902T
813S902T
813S901T
854S601T
734S701T
9L11
9L02
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7L01
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919L
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974L
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1084L
1135L
744L-3
744L-2
890L
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39ST1
77ST2
77ST1
101ST1
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104ST2
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426ST1
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740L-4
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762AL
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854L-2
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199L-2
199AL
519L-1
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526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
520L
503L
685L
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864L-3
864AL
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2 MW -0 Mvar
2 MW -1 Mvar
2 MW -4 Mvar
2 MW -5 Mvar
4 MW 2 Mvar
4 MW 1 Mvar
4 MW 0 Mvar
5 MW 3 Mvar
5 MW 0 Mvar
5 MW -7 Mvar
6 MW 2 Mvar
6 MW -1 Mvar
6 MW -4 Mvar
6 MW -6 Mvar
7 MW 9 Mvar
7 MW 10 Mvar
7 MW 7 Mvar
7 MW 5 Mvar
8 MW 4 Mvar
9 MW 3 Mvar
9 MW -2 Mvar
9 MW 4 Mvar
10 MW 3 Mvar
11 MW -5 Mvar
11 MW -4 Mvar
12 MW 6 Mvar
12 MW -10 Mvar
13 MW -15 Mvar
13 MW -54 Mvar
14 MW -10 Mvar
15 MW -18 Mvar
15 MW -9 Mvar
15 MW -14 Mvar
16 MW 3 Mvar
17 MW -3 Mvar
18 MW -6 Mvar
22 MW 13 Mvar
23 MW -26 Mvar
23 MW -24 Mvar
24 MW -8 Mvar
25 MW -5 Mvar
26 MW -8 Mvar
28 MW -11 Mvar
28 MW -12 Mvar
30 MW 4 Mvar
31 MW -8 Mvar
32 MW -12 Mvar
34 MW -23 Mvar
36 MW -12 Mvar
39 MW -15 Mvar
42 MW -30 Mvar
43 MW -80 Mvar
43 MW -20 Mvar
43 MW -43 Mvar
46 MW -5 Mvar
46 MW 6 Mvar
53 MW -43 Mvar
54 MW -13 Mvar
56 MW -13 Mvar
62 MW -32 Mvar
66 MW 31 Mvar
66 MW 32 Mvar
66 MW 16 Mvar
68 MW -31 Mvar
68 MW -31 Mvar
82 MW -23 Mvar
84 MW -24 Mvar
85 MW -22 Mvar
88 MW -61 Mvar
88 MW 6 Mvar
89 MW -27 Mvar
92 MW -58 Mvar
94 MW -35 Mvar
95 MW -52 Mvar
98 MW -46 Mvar
100 MW -44 Mvar
118 MW -42 Mvar
119 MW -56 Mvar
124 MW -40 Mvar
126 MW -31 Mvar
132 MW -29 Mvar
133 MW -26 Mvar
134 MW -22 Mvar
144 MW -44 Mvar
148 MW -48 Mvar
149 MW -28 Mvar
151 MW -26 Mvar
158 MW -12 Mvar
160 MW -30 Mvar
166 MW -15 Mvar
169 MW -28 Mvar
250 MW -38 Mvar
373 MW -43 Mvar
352 MW -108 Mvar
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
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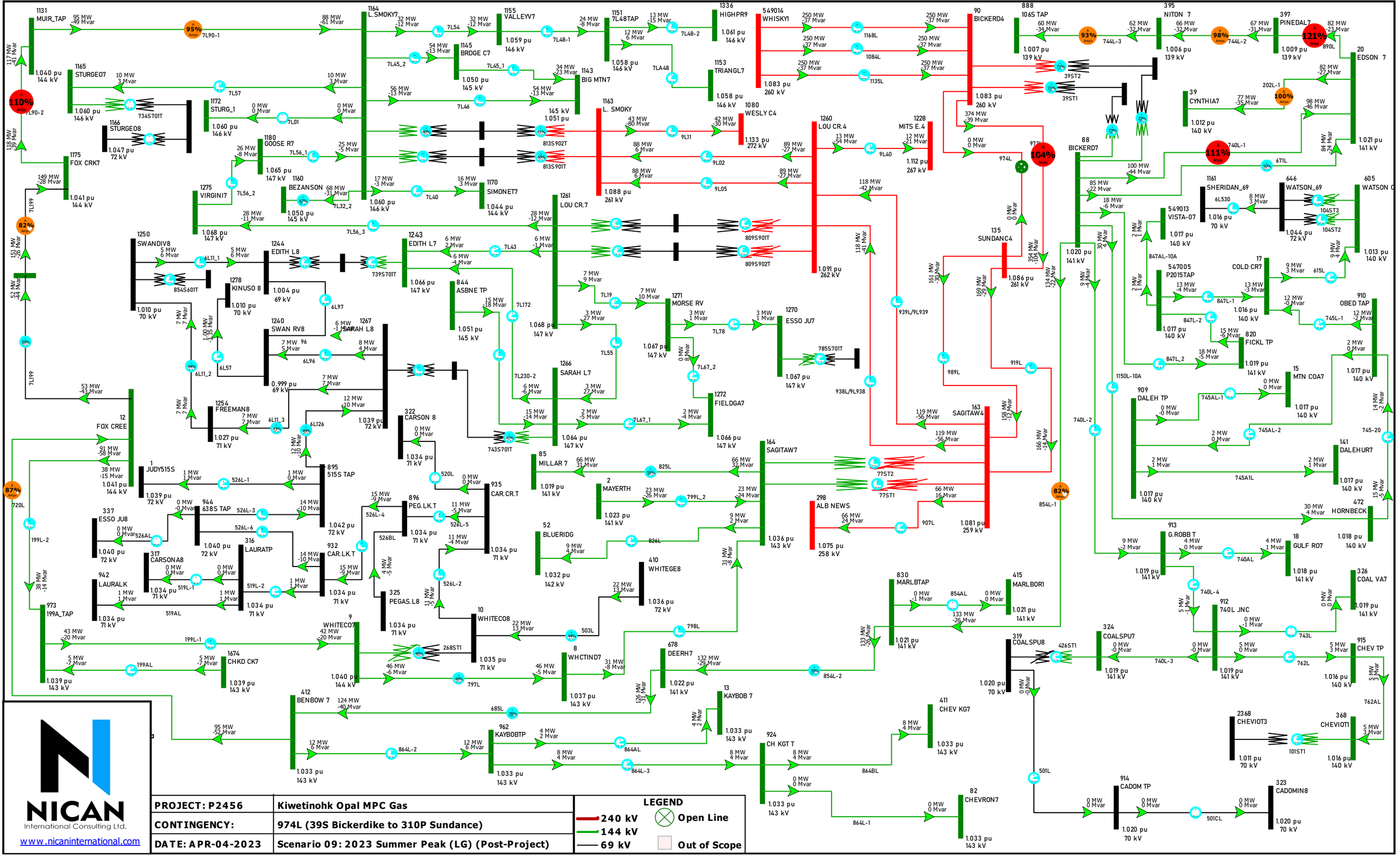

PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**974L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (Post-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

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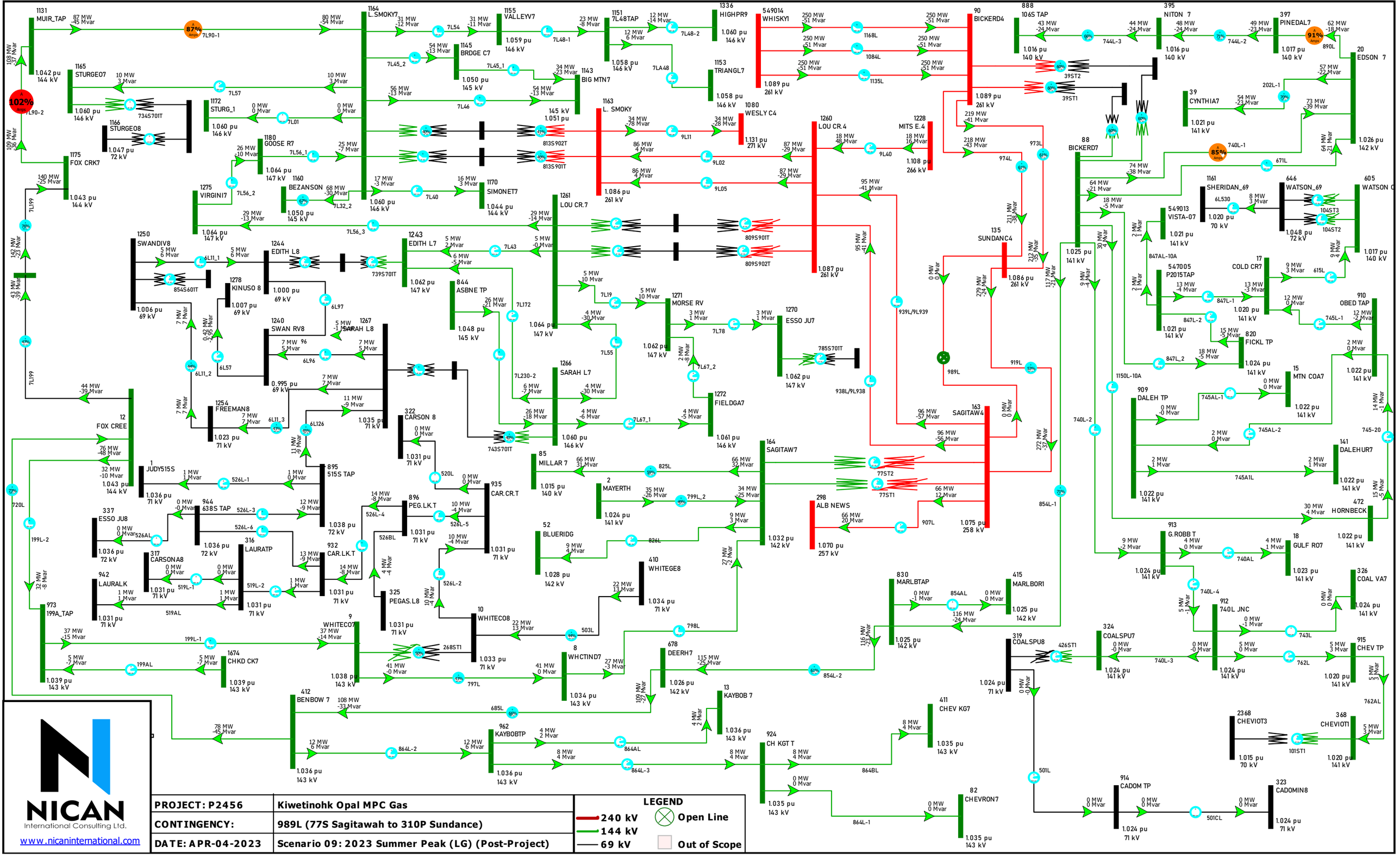
1131 MUIR_TAP
1042 pu 144 kV
1165 STURGEO7
1060 pu 146 kV
1166 STURGEO8
1047 pu 72 kV
1175 FOX CRK7
1043 pu 144 kV
1164 L.SMOKY7
1060 pu 146 kV
1172 STURG_1
060 pu 146 kV
1180 GOOSE R7
064 pu 147 kV
1160 BEZANSON
050 pu 145 kV
1275 VIRGINI7
064 pu 147 kV
1155 VALLEYV7
059 pu 146 kV
1145 BRDGE C7
050 pu 145 kV
1143 BIG MTN7
145 kV 051 pu
1163 L. SMOKY
086 pu 261 kV
1151 7L48TAP
058 pu 146 kV
1336 HIGHPR9
060 pu 146 kV
1153 TRIANGL7
058 pu 146 kV
1080 WESLY C4
131 pu 271 kV
549014 WHISKYI
089 pu 261 kV
1260 LOU CR.4
087 pu 261 kV
1228 MITS E.4
108 pu 266 kV
90 BICKERD4
089 pu 261 kV
888 106S TAP
016 pu 140 kV
395 NITON 7
016 pu 140 kV
397 PINEDAL7
017 pu 140 kV
20 EDSON 7
026 pu 142 kV
39 CYNTHIA7
021 pu 141 kV
88 BICKERD7
025 pu 141 kV
1161 SHERIDAN_69
020 pu 70 kV
646 WATSON_69
048 pu 72 kV
605 WATSON C
017 pu 140 kV
549013 VISTA-07
021 pu 141 kV
135 SUNDANC4
086 pu 261 kV
547005 P2015TAP
021 pu 141 kV
17 COLD CR7
020 pu 141 kV
910 OBED TAP
022 pu 141 kV
820 FICKL TP
024 pu 141 kV
15 MTN COA7
022 pu 141 kV
909 DALEH TP
022 pu 141 kV
141 DALEHUR7
022 pu 141 kV
472 HORNBECK
022 pu 141 kV
913 G.ROBB T
024 pu 141 kV
18 GULF RO7
023 pu 141 kV
912 740L JNC
024 pu 141 kV
326 COAL VA7
024 pu 141 kV
915 CHEV TP
020 pu 141 kV
1250 SWANDIV8
006 pu 69 kV
1244 EDITH L8
000 pu 69 kV
1278 KINUSO 8
007 pu 69 kV
1240 SWAN RV8
995 pu 69 kV
1267 SARAH L8
035 pu 71 kV
1254 FREEMAN8
023 pu 71 kV
322 CARSON 8
031 pu 71 kV
1243 EDITH L7
062 pu 147 kV
844 ASBNE TP
048 pu 145 kV
1261 LOU CR.7
064 pu 147 kV
1266 SARAH L7
060 pu 146 kV
1271 MORSE RV
062 pu 147 kV
1270 ESSO JU7
062 pu 147 kV
1272 FIELDGA7
061 pu 146 kV
85 MILLAR 7
015 pu 140 kV
2 MAYERTH
024 pu 141 kV
52 BLUERIDG
028 pu 142 kV
410 WHITEGE8
034 pu 71 kV
10 WHITECO8
033 pu 71 kV
9 WHITECO7
038 pu 143 kV
8 WHCTIND7
034 pu 143 kV
678 DEERH7
026 pu 142 kV
164 SAGITAW7
032 pu 142 kV
163 SAGITAW4
075 pu 258 kV
298 ALB NEWS
070 pu 257 kV
77ST2
77ST1
830 MARLBTAP
025 pu 142 kV
415 MARLBOR1
025 pu 142 kV
411 CHEV KG7
035 pu 143 kV
82 CHEVRON7
035 pu 143 kV
924 CH KGT T
035 pu 143 kV
962 KAYBOBTP
036 pu 143 kV
13 KAYBOB 7
036 pu 143 kV
412 BENBOW 7
036 pu 143 kV
1674 CHKD CK7
039 pu 143 kV
973 199A_TAP
039 pu 143 kV
12 FOX CREE
043 pu 144 kV
1 JUDY515S
036 pu 71 kV
895 515S TAP
038 pu 72 kV
337 ESSO JU8
036 pu 72 kV
944 638S TAP
036 pu 72 kV
316 LAURATP
031 pu 71 kV
317 CARSONA8
031 pu 71 kV
942 LAURALK
031 pu 71 kV
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015 pu 70 kV
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020 pu 141 kV
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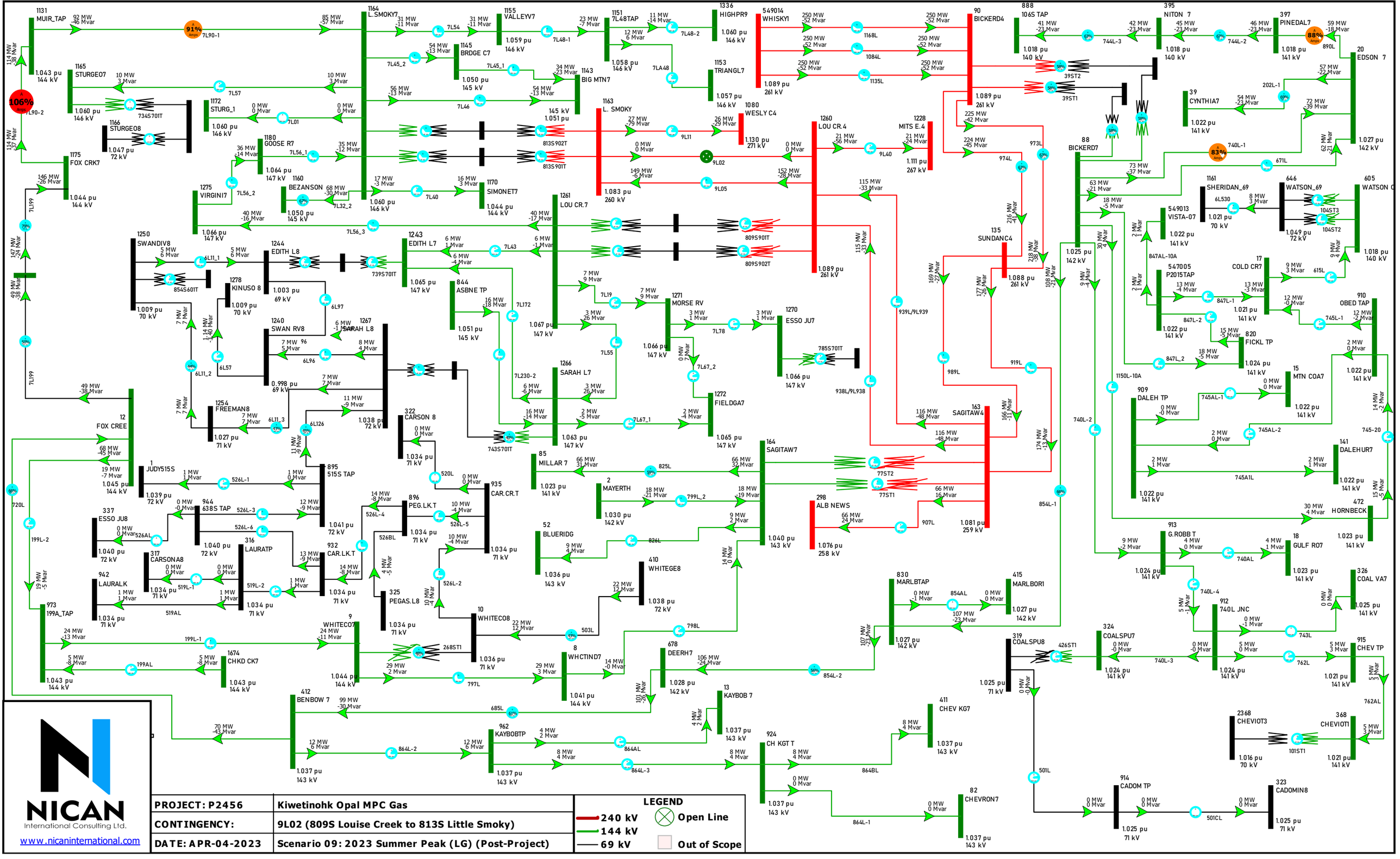
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
989L (77S Sagitawah to 310P Sundance)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	9L02 (809S Louise Creek to 813S Little Smoky)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

240 kV — Open Line

144 kV

69 kV — Out of Scope

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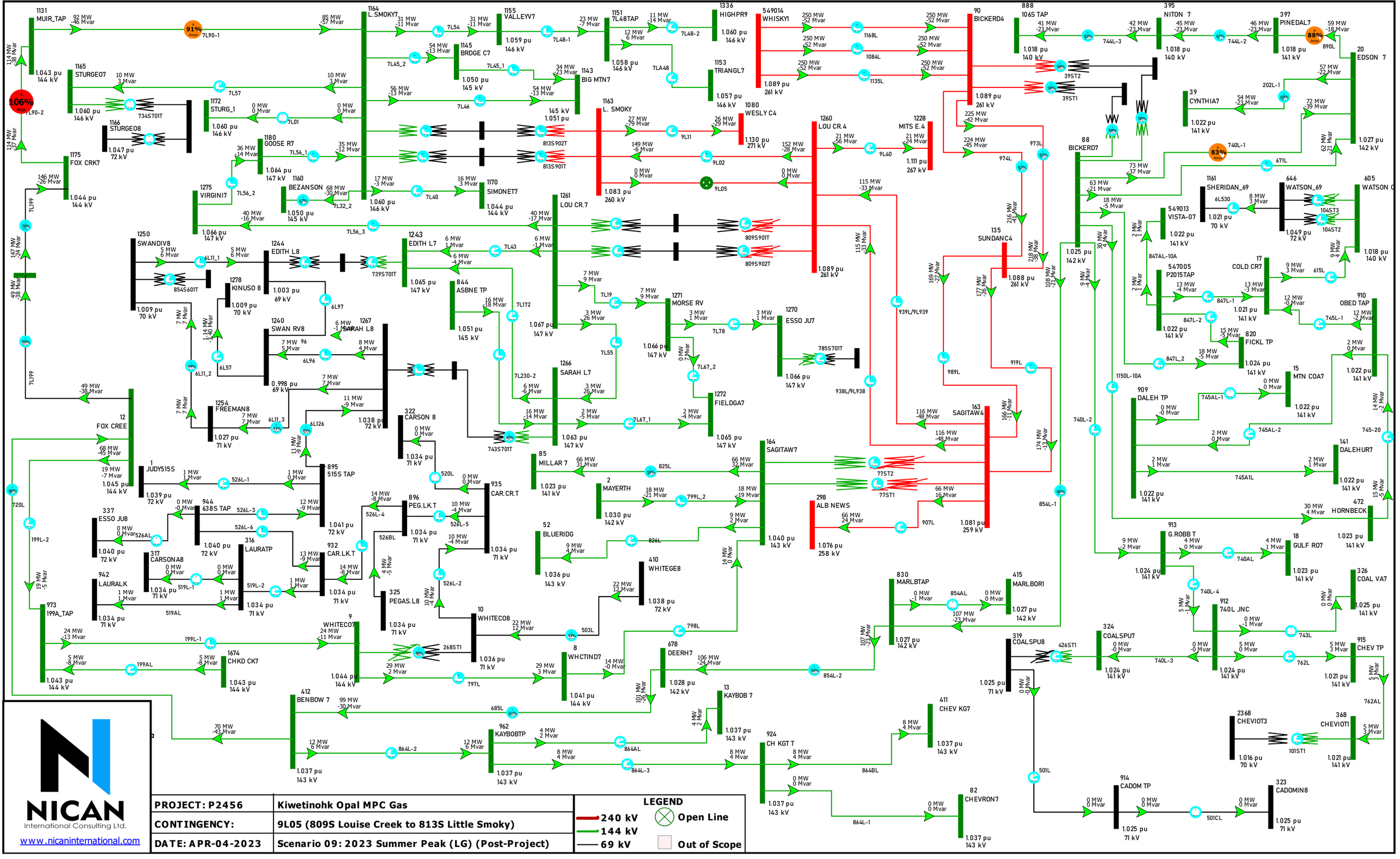

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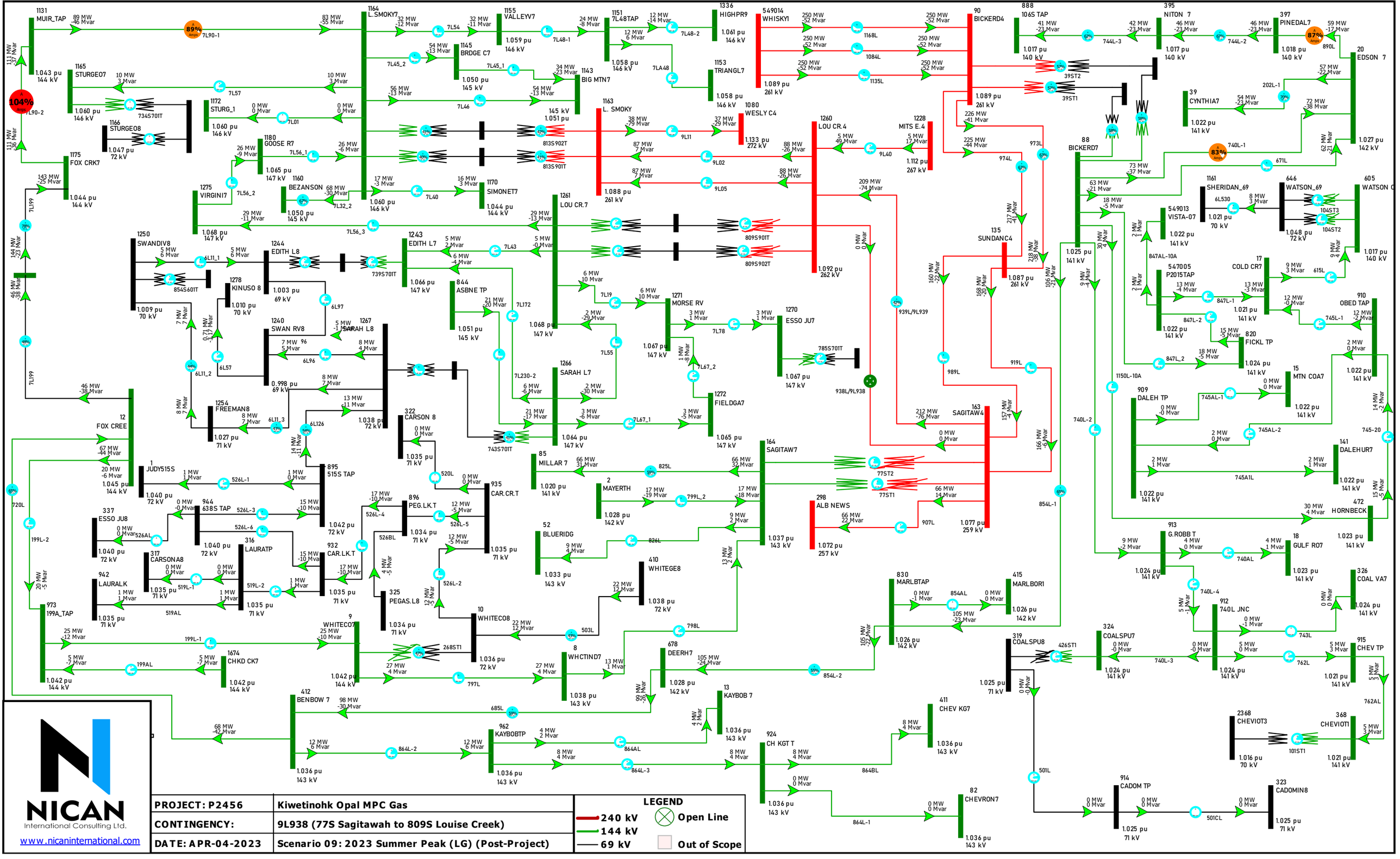
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	9L05 (809S Louise Creek to 813S Little Smoky)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope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1165 STURGE07
1.060 pu 146 kV
1166 STURGE08
1.047 pu 72 kV
1175 FOX CRK7
1.044 pu 144 kV
1164 L.SMOKY7
1.060 pu 146 kV
1155 VALLEYV7
1.059 pu 146 kV
1145 BRDGE C7
1.050 pu 145 kV
1151 7L48TAP
1.058 pu 146 kV
1143 BIG MTN7
145 kV 1.051 pu
1336 HIGHPR9
1.061 pu 146 kV
1153 TRIANGL7
1.058 pu 146 kV
549014 WHISKYI
1.089 pu 261 kV
1168L
1084L
1135L
90 BICKERD4
1.089 pu 261 kV
888 106S TAP
1.017 pu 140 kV
39ST2
39ST1
395 NITON 7
1.017 pu 140 kV
397 PINEDAL7
1.018 pu 140 kV
890L
20 EDSON 7
1.027 pu 142 kV
39 CYNTHIA7
1.022 pu 141 kV
202L-1
740L-1
671L
62 MW -21 Mvar
1172 STURG_1
1.060 pu 146 kV
1180 GOOSE R7
1.065 pu 147 kV
1160 BEZANSON
1.050 pu 145 kV
1170 SIMONET7
1.044 pu 144 kV
1275 VIRGINI7
1.068 pu 147 kV
1163 L. SMOKY
1.088 pu 261 kV
1080 WESLY C4
1.133 pu 272 kV
1260 LOU CR.4
1.092 pu 262 kV
1228 MITS E.4
1.112 pu 267 kV
973L
974L
225 MW -44 Mvar
226 MW -41 Mvar
73 MW -37 Mvar
63 MW -21 Mvar
88 BICKERD7
1.025 pu 141 kV
1161 SHERIDAN_69
1.021 pu 70 kV
646 WATSON_69
1.048 pu 72 kV
104ST3
104ST2
605 WATSON C
1.017 pu 140 kV
549013 VISTA-07
1.022 pu 141 kV
847AL-10A
547005 P2015TAP
1.022 pu 141 kV
847L-1
847L-2
17 COLD CR7
1.021 pu 141 kV
615L
910 OBED TAP
745L-1
820 FICKL TP
1.024 pu 141 kV
847L_2
15 MTN COA7
1.022 pu 141 kV
745AL-1
909 DALEH TP
1.022 pu 141 kV
745A1L
141 DALEHUR7
1.022 pu 141 kV
745-20
745AL-2
740L-2
1150L-10A
30 MW 4 Mvar
472 HORNBECK
1.023 pu 141 kV
740AL
18 GULF RO7
1.023 pu 141 kV
913 G.ROBB T
1.024 pu 141 kV
740L-4
912 740L JNC
1.024 pu 141 kV
743L
326 COAL VA7
1.024 pu 141 kV
762L
915 CHEV TP
1.021 pu 141 kV
762AL
1250 SWANDIV8
1.009 pu 70 kV
854S601T
1244 EDITH L8
1.003 pu 69 kV
1278 KINUSO 8
1.010 pu 70 kV
739S701T
1243 EDITH L7
1.066 pu 147 kV
844 ASBNE TP
1.051 pu 145 kV
1261 LOU CR.7
1.068 pu 147 kV
809S901T
809S902T
1271 MORSE RV
1.067 pu 147 kV
1270 ESSO JU7
1.067 pu 147 kV
785S701T
938L/9L938
939L/9L939
989L
919L
1240 SWAN RV8
0.998 pu 69 kV
1267 SARAH L8
1.038 pu 72 kV
322 CARSON 8
1.035 pu 71 kV
1266 SARAH L7
1.064 pu 147 kV
743S701T
1272 FIELDGA7
1.065 pu 147 kV
1254 FREEMAN8
1.027 pu 71 kV
12 FOX CREE
1.045 pu 144 kV
1 JUDY515S
1.040 pu 72 kV
895 515S TAP
1.042 pu 72 kV
85 MILLAR 7
1.020 pu 141 kV
825L
164 SAGITAW7
1.037 pu 143 kV
163 SAGITAW4
1.077 pu 259 kV
77ST2
77ST1
907L
298 ALB NEWS
1.072 pu 257 kV
2 MAYERTH
1.028 pu 142 kV
799L_2
896 PEG.LK.T
1.034 pu 71 kV
935 CAR.CR.T
1.035 pu 71 kV
932 CAR.LK.T
1.035 pu 71 kV
337 ESSO JU8
1.040 pu 72 kV
944 638S TAP
1.040 pu 72 kV
317 CARSONA8
1.035 pu 71 kV
316 LAURATP
1.035 pu 71 kV
942 LAURALK
1.035 pu 71 kV
325 PEGAS.L8
1.034 pu 71 kV
52 BLUERIDG
1.033 pu 143 kV
826L
410 WHITEGE8
1.038 pu 72 kV
973 199A_TAP
1.042 pu 144 kV
1674 CHKD CK7
1.042 pu 144 kV
9 WHITEC07
1.042 pu 144 kV
10 WHITEC08
1.036 pu 72 kV
8 WHCTIND7
1.038 pu 143 kV
678 DEERH7
1.028 pu 142 kV
412 BENBOW 7
1.036 pu 143 kV
962 KAYBOBTP
1.036 pu 143 kV
13 KAYBOB 7
1.036 pu 143 kV
924 CH KGT T
1.036 pu 143 kV
411 CHEV KG7
1.036 pu 143 kV
82 CHEVRON7
1.036 pu 143 kV
830 MARLBTAP
1.026 pu 142 kV
854AL
415 MARLBOR1
1.026 pu 142 kV
319 COALSPU8
1.025 pu 71 kV
426ST1
324 COALSPU7
1.024 pu 141 kV
914 CADOM TP
1.025 pu 71 kV
501CL
323 CADOMIN8
1.025 pu 71 kV
2368 CHEVIOT3
1.016 pu 70 kV
101ST1
368 CHEVIOT1
1.021 pu 141 kV
501L
854L-1
854L-2
864L-1
864L-2
864L-3
864AL
864BL
685L
797L
798L
503L
268ST1
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
519L-1
519L-2
519AL
199L-1
199L-2
199AL
720L
7L90-1
7L90-2
7L199
7L57
7L01
7L32_2
7L40
7L46
7L45_1
7L45_2
7L48-1
7L48-2
7L48
7L54
7L56_1
7L56_2
7L56_3
7L43
7L172
7L230-2
7L19
7L55
7L78
7L67_1
7L67_2
9L11
9L02
9L05
9L40
6L11_1
6L11_2
6L11_3
6L57
6L97
6L96
6L126
734S701T
813S902T
813S901T
739S701T
743S701T
785S701T
809S901T
809S902T
939L/9L939
938L/9L938
77ST2
77ST1
39ST2
39ST1
104ST3
104ST2
268ST1
101ST1
426ST1
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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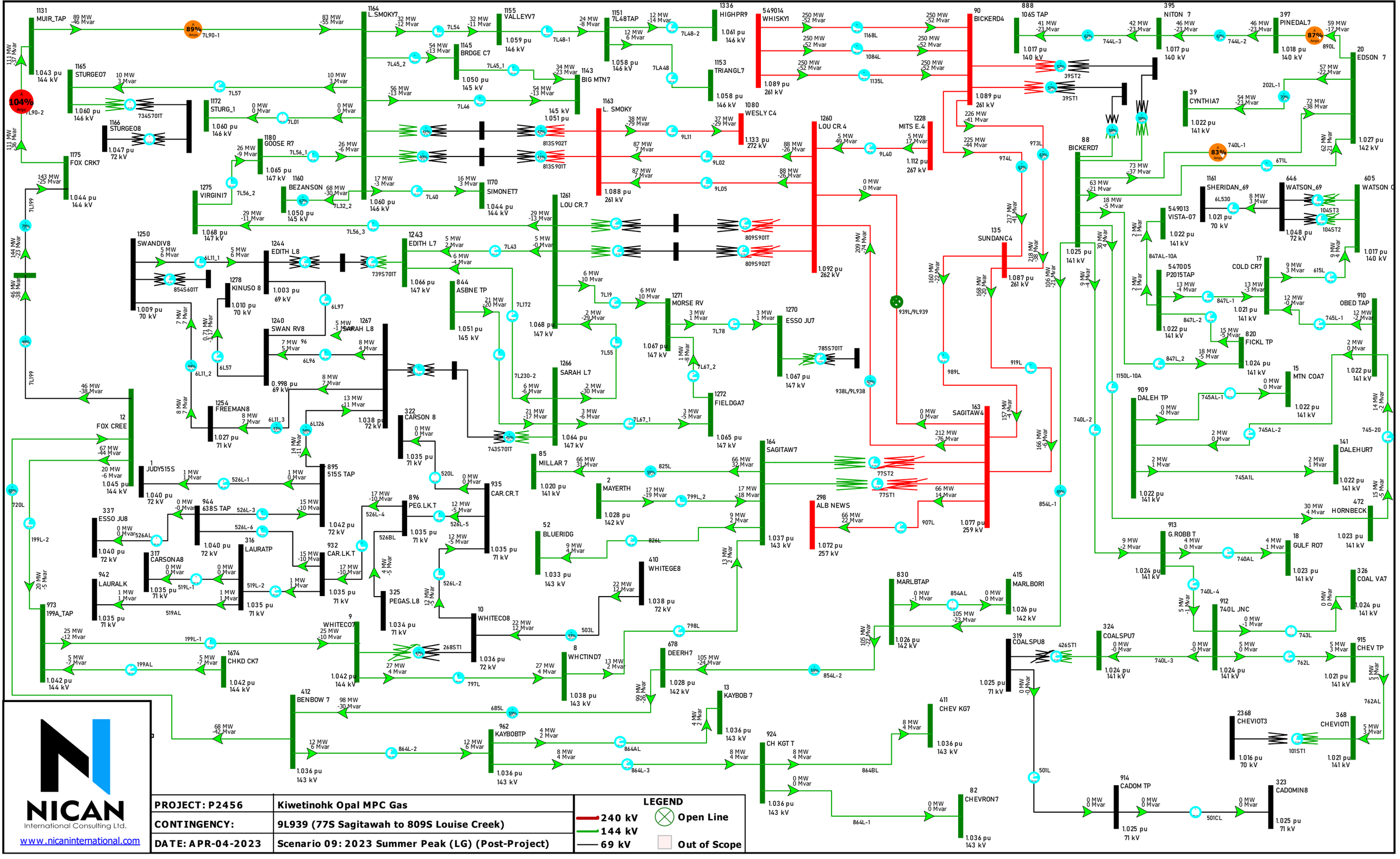
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
9L938 (77S Sagitawah to 809S Louise Creek)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (Post-Project)



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PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	9L939 (77S Sagitawah to 809S Louise Creek)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (Post-Project)

LEGEND

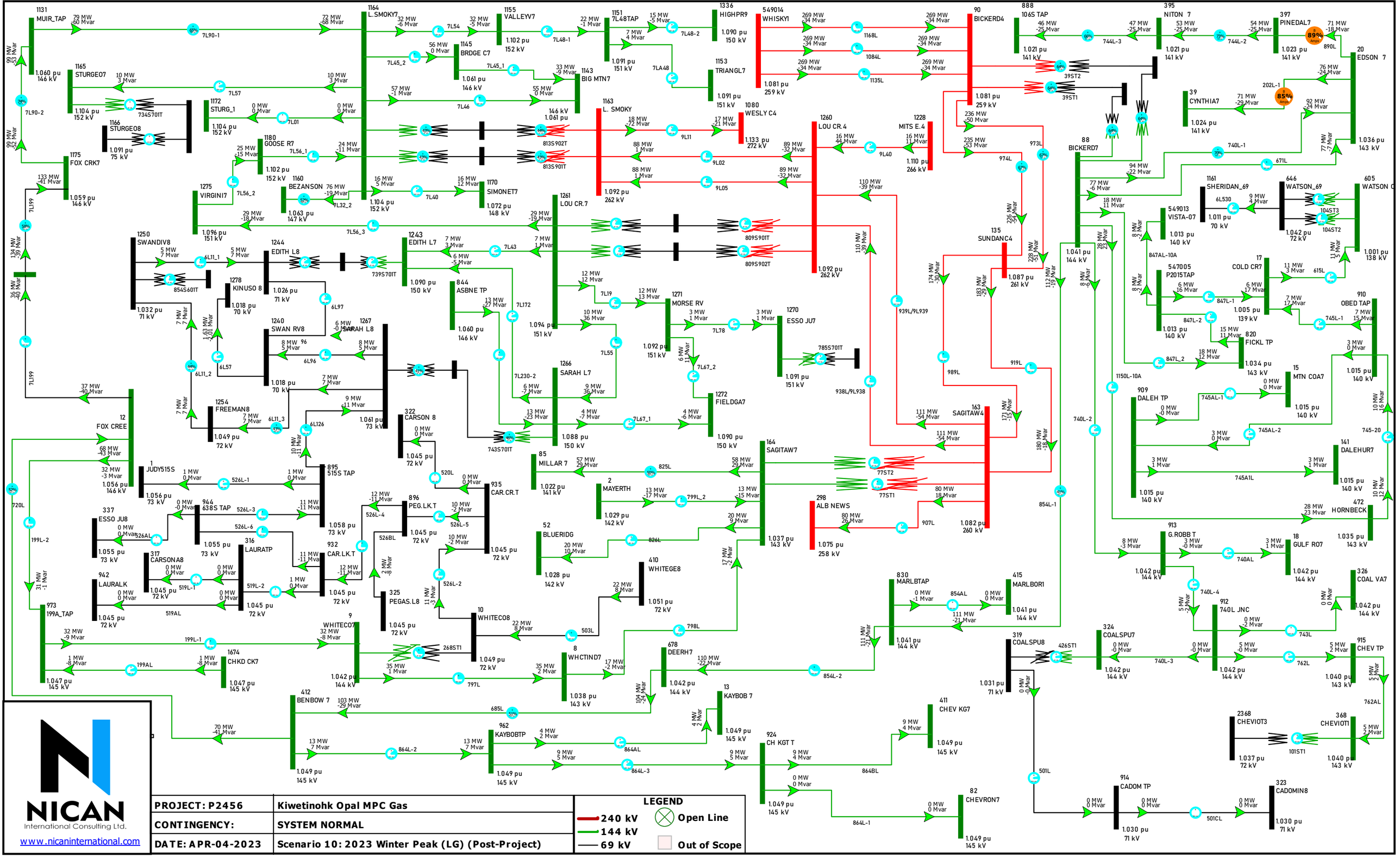
🟥 240 kV	⊗ Open Line
🟩 144 kV	
69 kV	☐ Out of Scope

2023 WINTER PEAK

(Low Generation)

Single Line Diagrams
P2456 - POST-PROJECT
POWER FLOW SC10

NICAN



PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	SYSTEM NORMAL
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (Post-Project)

LEGEND

- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope

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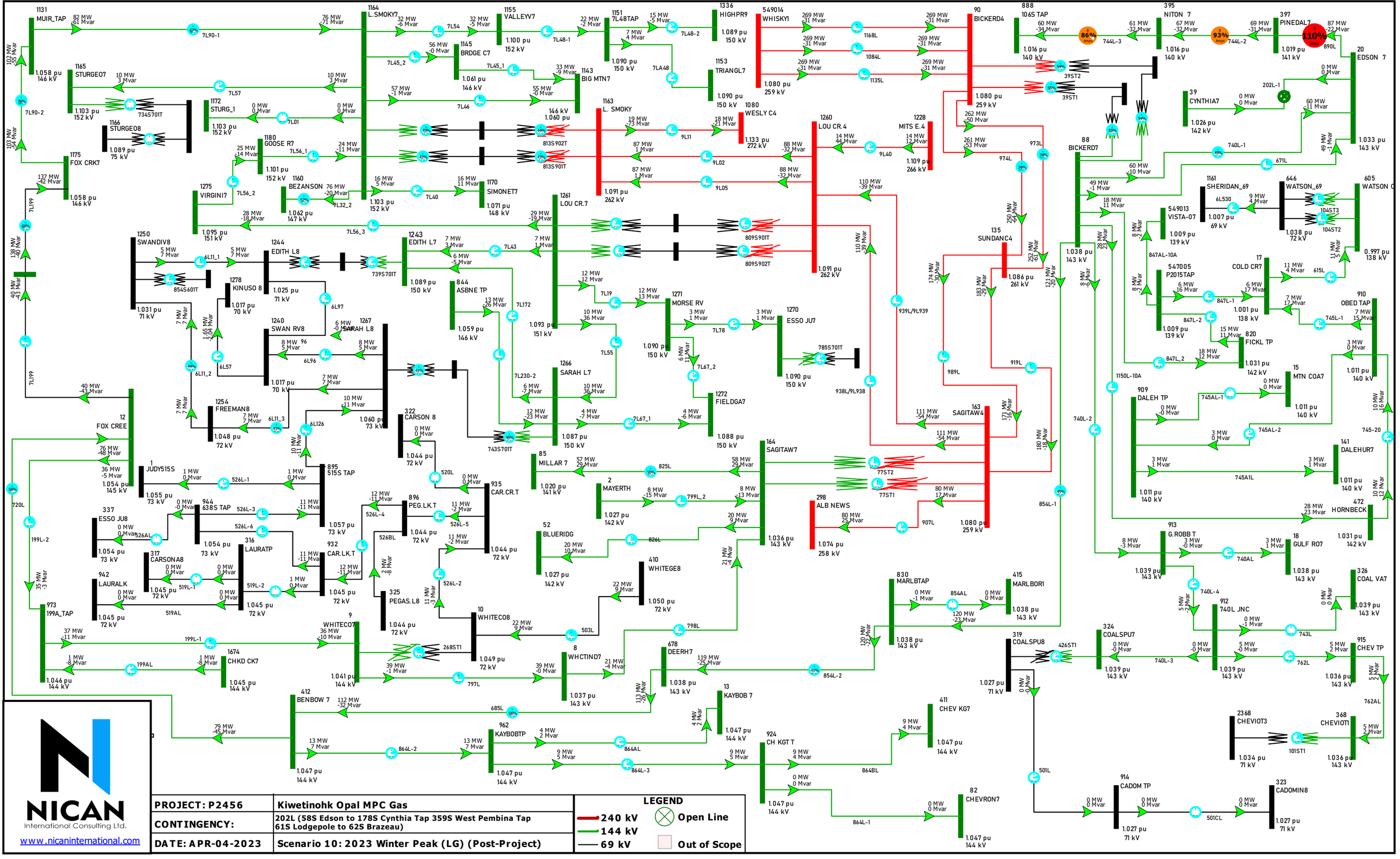
1131 MUIR_TAP 82 MW 61 Mvar 1.058 pu 146 kV
7L90-1
1164 L.SMOKY7 76 MW -71 Mvar 1.103 pu 152 kV
1165 STURGE07 10 MW 3 Mvar 1.103 pu 152 kV
734S701T
1166 STURGE08 1.089 pu 75 kV
7L90-2
7L57
1172 STURG_1 0 MW 0 Mvar 1.103 pu 152 kV
7L01
1175 FOX CRK7 137 MW -42 Mvar 1.058 pu 146 kV
7L199
1180 GOOSE R7 25 MW -14 Mvar 1.101 pu 152 kV
7L56_1
24 MW -11 Mvar
1275 VIRGINI7 28 MW -18 Mvar 1.095 pu 151 kV
7L56_2
1160 BEZANSON 76 MW -20 Mvar 1.062 pu 147 kV
7L32_2
7L56_3
16 MW 5 Mvar
16 MW 11 Mvar
1170 SIMONET7 1.071 pu 148 kV
7L40
32 MW -6 Mvar
7L54
32 MW -5 Mvar
1155 VALLEYV7 1.100 pu 152 kV
7L48-1
56 MW -0 Mvar
7L45_2
1145 BRDGE C7 1.061 pu 146 kV
7L45_1
33 MW -9 Mvar
1143 BIG MTN7 146 kV 1.060 pu
57 MW -1 Mvar
55 MW -0 Mvar
7L46
813S902T
813S901T
1151 7L48TAP 1.090 pu 150 kV
22 MW -2 Mvar
15 MW -5 Mvar
7 MW 4 Mvar
7L48-2
7LA48
1336 HIGHPR9 1.089 pu 150 kV
1153 TRIANGL7 1.090 pu 150 kV
549014 WHISKYI 1.080 pu 259 kV
269 MW -31 Mvar
1168L
1084L
1135L
90 BICKERD4 1.080 pu 259 kV
262 MW -50 Mvar
261 MW -53 Mvar
888 106S TAP 1.016 pu 140 kV
744L-3
395 NITON 7 1.016 pu 140 kV
744L-2
397 PINEDAL7 1.019 pu 141 kV
890L
20 EDSON 7 1.033 pu 143 kV
39ST2
39ST1
202L-1
39 CYNTHIA7 1.026 pu 142 kV
740L-1
671L
973L
974L
250 MW -64 Mvar
252 MW -61 Mvar
135 SUNDANC4 1.086 pu 261 kV
174 MW -30 Mvar
183 MW -26 Mvar
939L/9L939
989L
919L
938L/9L938
121 MW -20 Mvar
163 SAGITAW4 111 MW -54 Mvar
111 MW -16 Mvar
171 MW -16 Mvar
180 MW -18 Mvar
854L-1
1080 WESLY C4 1.133 pu 272 kV
9L11
9L02
9L05
1163 L. SMOKY 1.091 pu 262 kV
19 MW -73 Mvar
18 MW -21 Mvar
87 MW 1 Mvar
88 MW -32 Mvar
1260 LOU CR.4 1.091 pu 262 kV
1228 MITS E.4 14 MW 12 Mvar 1.109 pu 266 kV
9L40
14 MW 44 Mvar
110 MW -39 Mvar
1261 LOU CR.7 1.093 pu 151 kV
809S901T
809S902T
1250 SWANDIV8 5 MW 7 Mvar 1.031 pu 71 kV
6L11_1
854S601T
1244 EDITH L8 1.025 pu 71 kV
739S701T
1243 EDITH L7 1.089 pu 150 kV
7L43
7 MW 3 Mvar
6 MW -5 Mvar
7 MW 1 Mvar
1278 KINUSO 8 1.017 pu 70 kV
6L97
844 ASBNE TP 1.059 pu 146 kV
13 MW -26 Mvar
7L172
1240 SWAN RV8 1.017 pu 70 kV
6L96
8 MW 5 Mvar
96
1267 SARAH L8 1.060 pu 73 kV
6L57
6L11_2
1.65 MW -2.04 Mvar
7 MW 7 Mvar
12 MW 12 Mvar
7L19
10 MW 36 Mvar
7L55
1271 MORSE RV 1.090 pu 150 kV
12 MW 13 Mvar
3 MW 1 Mvar
7L78
1270 ESSO JU7 1.090 pu 150 kV
785S701T
6 MW 11 Mvar
7L67_2
1272 FIELDGA7 1.088 pu 150 kV
7L67_1
4 MW -6 Mvar
1266 SARAH L7 1.087 pu 150 kV
7L230-2
6 MW -7 Mvar
12 MW -23 Mvar
4 MW -7 Mvar
743S701T
322 CARSON 8 1.044 pu 72 kV
0 MW 0 Mvar
520L
935 CAR.CR.T 1.044 pu 72 kV
11 MW -2 Mvar
526L-5
896 PEG.LK.T 1.044 pu 72 kV
526L-4
12 MW -11 Mvar
526BL
2 MW -8 Mvar
325 PEGAS.L8 1.044 pu 72 kV
526L-2
11 MW -3 Mvar
932 CAR.LK.T 1.045 pu 72 kV
526L-3
526L-6
944 638S TAP 1.054 pu 73 kV
895 515S TAP 1.057 pu 73 kV
6L126
10 MW -11 Mvar
1254 FREEMAN8 1.048 pu 72 kV
6L11_3
7 MW 7 Mvar
10 MW -11 Mvar
1 JUDY515S 1.055 pu 73 kV
526L-1
1 MW 0 Mvar
337 ESSO JU8 1.054 pu 73 kV
526AL
317 CARSONA8 1.045 pu 72 kV
519L-1
316 LAURATP 1.045 pu 72 kV
519L-2
942 LAURALK 1.045 pu 72 kV
519AL
12 FOX CREE 1.054 pu 145 kV
76 MW -48 Mvar
36 MW -5 Mvar
720L
199L-2
973 199A_TAP 1.046 pu 144 kV
37 MW -11 Mvar
199L-1
199AL
1674 CHKD CK7 1.045 pu 144 kV
1 MW -8 Mvar
9 WHITEC07 1.041 pu 144 kV
36 MW -10 Mvar
268ST1
39 MW -1 Mvar
797L
10 WHITEC08 1.049 pu 72 kV
22 MW 9 Mvar
503L
410 WHITEGE8 1.050 pu 72 kV
22 MW 9 Mvar
8 WHCTIND7 1.037 pu 143 kV
39 MW -0 Mvar
21 MW -4 Mvar
678 DEERH7 1.038 pu 143 kV
798L
119 MW -25 Mvar
113 MW -26 Mvar
854L-2
13 KAYBOB 7 1.047 pu 144 kV
4 MW 2 Mvar
412 BENBOW 7 1.047 pu 144 kV
112 MW -32 Mvar
685L
962 KAYBOBTP 1.047 pu 144 kV
4 MW 2 Mvar
9 MW 5 Mvar
864L-2
864AL
864L-3
85 MILLAR 7 1.020 pu 141 kV
57 MW 29 Mvar
825L
58 MW 29 Mvar
2 MAYERTH 1.027 pu 142 kV
8 MW -15 Mvar
799L_2
8 MW -13 Mvar
164 SAGITAW7 1.036 pu 143 kV
20 MW 9 Mvar
826L
52 BLUERIDG 1.027 pu 142 kV
20 MW 10 Mvar
21 MW -3 Mvar
298 ALB NEWS 1.074 pu 258 kV
80 MW 25 Mvar
907L
77ST2
77ST1
80 MW 17 Mvar
82 CHEVRON7 1.047 pu 144 kV
924 CH KGT T 1.047 pu 144 kV
9 MW 4 Mvar
0 MW 0 Mvar
864BL
864L-1
411 CHEV KG7 1.047 pu 144 kV
9 MW 4 Mvar
830 MARLBTAP 1.038 pu 143 kV
0 MW -1 Mvar
854AL
120 MW -23 Mvar
0 MW 0 Mvar
415 MARLBOR1 1.038 pu 143 kV
120 MW -22 Mvar
319 COALSPU8 1.027 pu 71 kV
426ST1
0 MW -0 Mvar
501L
501CL
914 CADOM TP 1.027 pu 71 kV
0 MW 0 Mvar
323 CADOMIN8 1.027 pu 71 kV
2368 CHEVIOT3 1.034 pu 71 kV
101ST1
368 CHEVIOT1 1.036 pu 143 kV
5 MW 2 Mvar
762AL
762L
915 CHEV TP 1.036 pu 143 kV
5 MW 2 Mvar
324 COALSPU7 1.039 pu 143 kV
740L-3
912 740L JNC 1.039 pu 143 kV
0 MW -1 Mvar
743L
326 COAL VA7 1.039 pu 143 kV
0 MW 0 Mvar
740AL
18 GULF RO7 1.038 pu 143 kV
3 MW 1 Mvar
913 G.ROBB T 1.039 pu 143 kV
8 MW -3 Mvar
3 MW -0 Mvar
740L-4
5 MW -2 Mvar
472 HORNBECK 1.031 pu 142 kV
28 MW 23 Mvar
10 MW 12 Mvar
740L-2
909 DALEH TP 1.011 pu 140 kV
745AL1
745A1L
745AL-2
141 DALEHUR7 1.011 pu 140 kV
3 MW 1 Mvar
15 MTN COA7 1.011 pu 140 kV
0 MW 0 Mvar
745-20
745-21
910 OBED TAP 1.001 pu 138 kV
7 MW 15 Mvar
745L-1
820 FICKL TP 1.031 pu 142 kV
15 MW 11 Mvar
847L-2
847L_2
18 MW 12 Mvar
17 COLD CR7 1.009 pu 139 kV
11 MW 4 Mvar
615L
847L-1
6 MW 17 Mvar
547005 P2015TAP 1.009 pu 139 kV
6 MW 16 Mvar
847AL-10A
8 MW -2 Mvar
549013 VISTA-07 1.009 pu 139 kV
1161 SHERIDAN_69 1.007 pu 69 kV
6L530
9 MW 4 Mvar
646 WATSON_69 1.038 pu 72 kV
104ST3
104ST2
605 WATSON C 0.997 pu 138 kV
11 MW 4 Mvar
1038 pu 143 kV
49 MW -1 Mvar
60 MW -10 Mvar
671L
88 BICKERD7 1.038 pu 143 kV
49 MW -1 Mvar
18 MW 11 Mvar
28 MW 23 Mvar
1150L-10A
740L-2
854L-1
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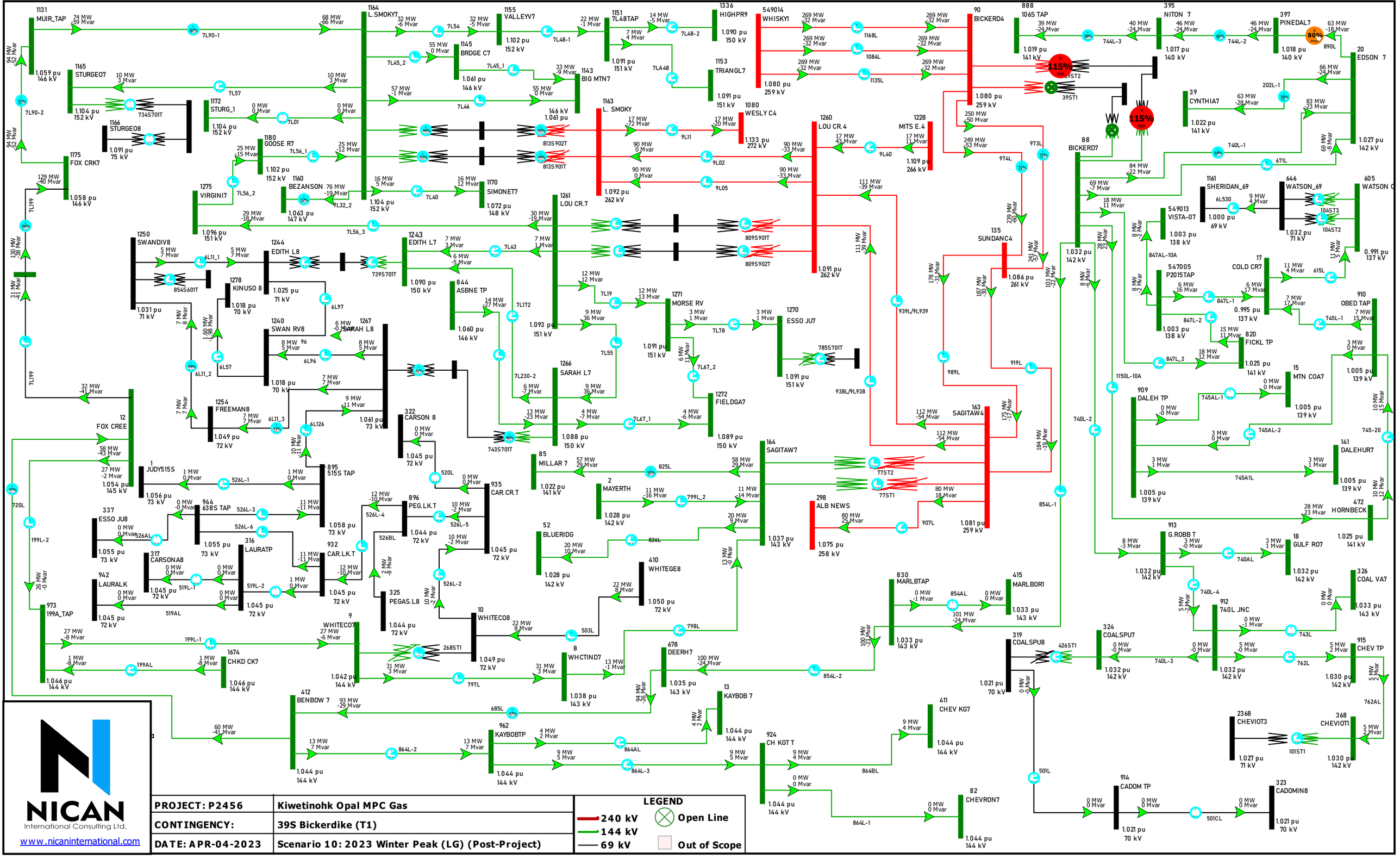
PROJECT: P2456
Kiwetinohk Opal MPC Gas
CONTINGENCY:
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)
DATE: APR-04-2023
Scenario 10: 2023 Winter Peak (LG) (Post-Project)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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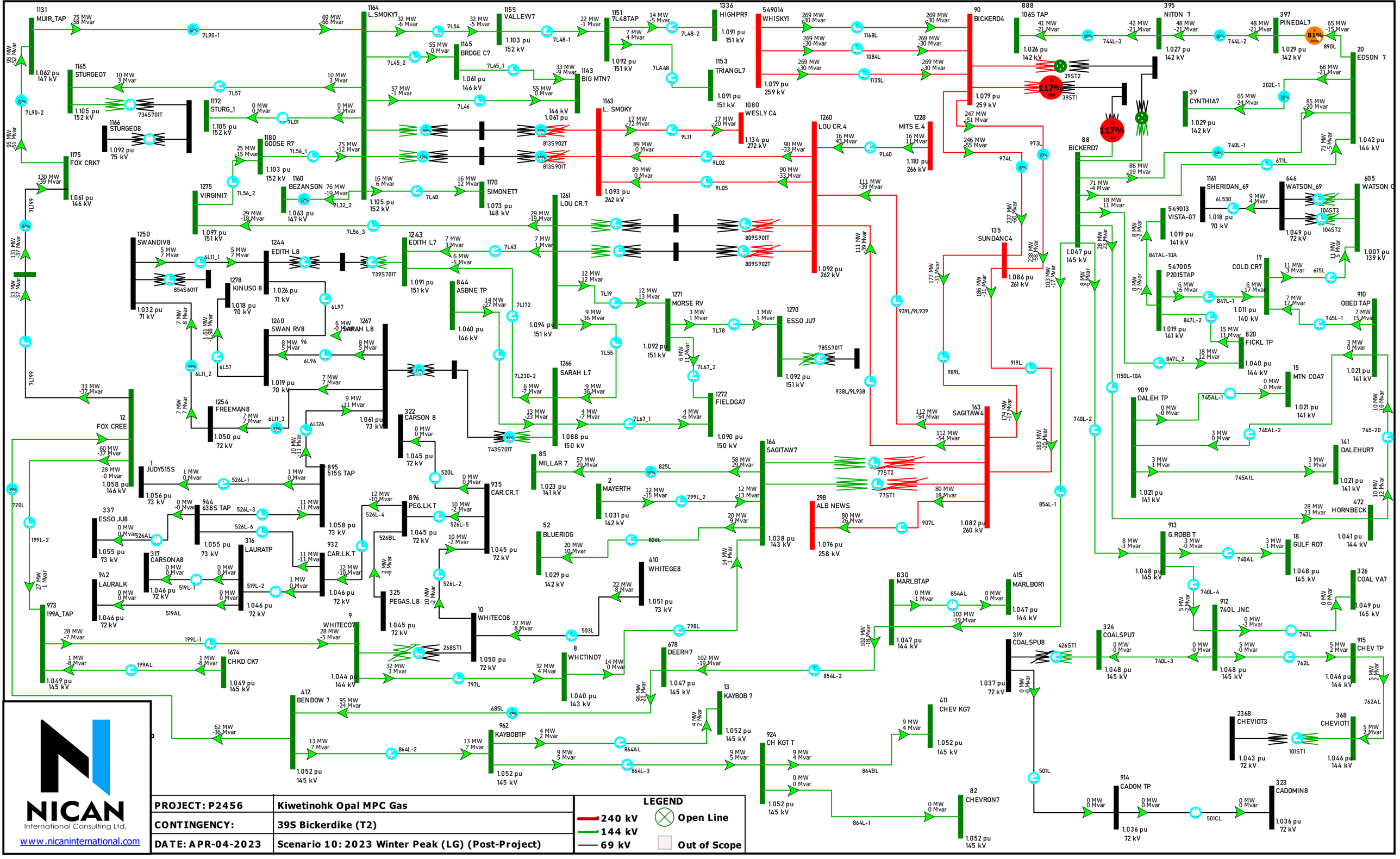
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**39S Bickerdike (T1)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (Post-Project)**

LEGEND

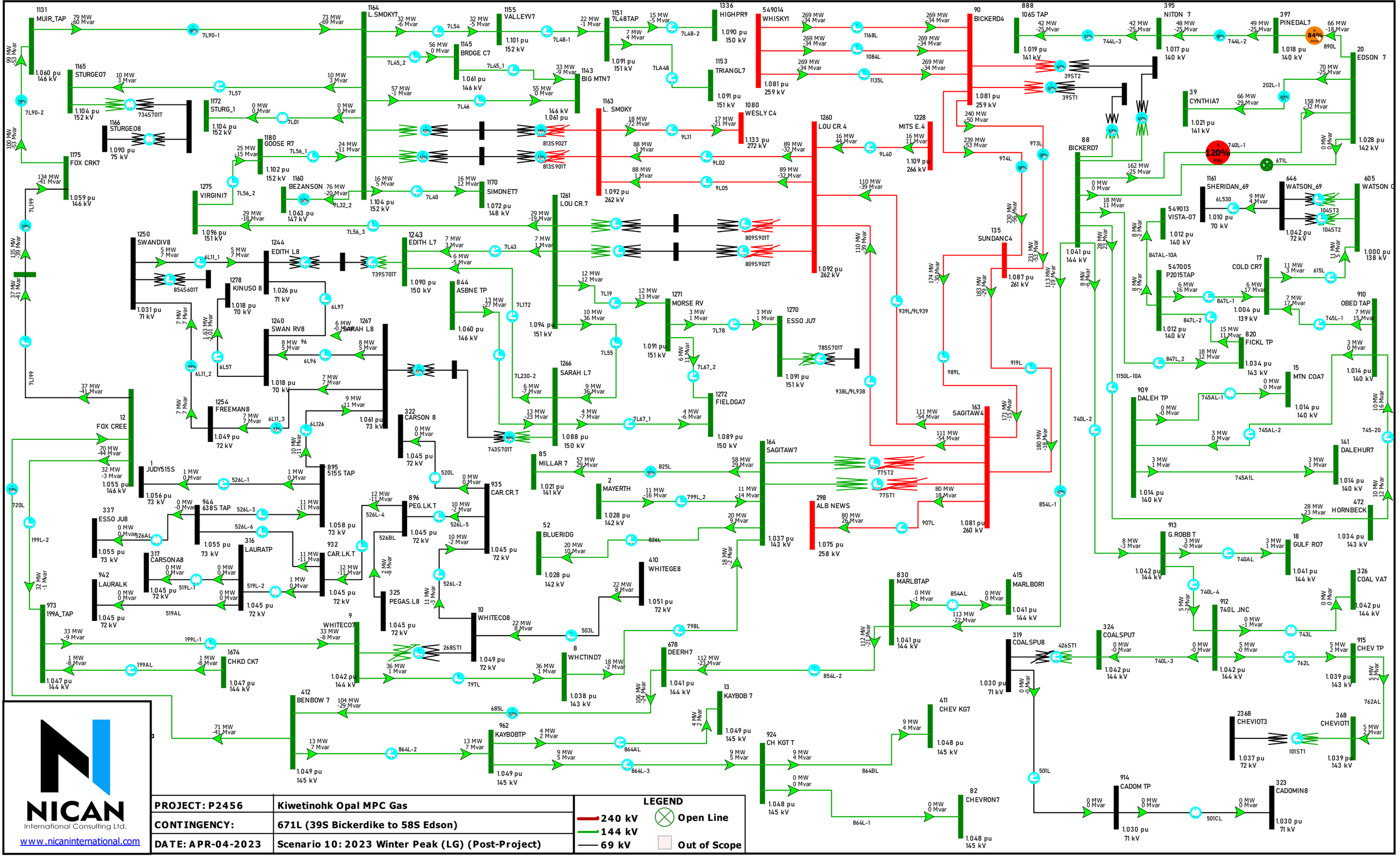
- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**39S Bickerdike (T2)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (Post-Project)**

LEGEND

- **240 kV**
- **144 kV**
- **69 kV**
- ⊗ **Open Line**
- ☐ **Out of Scope**



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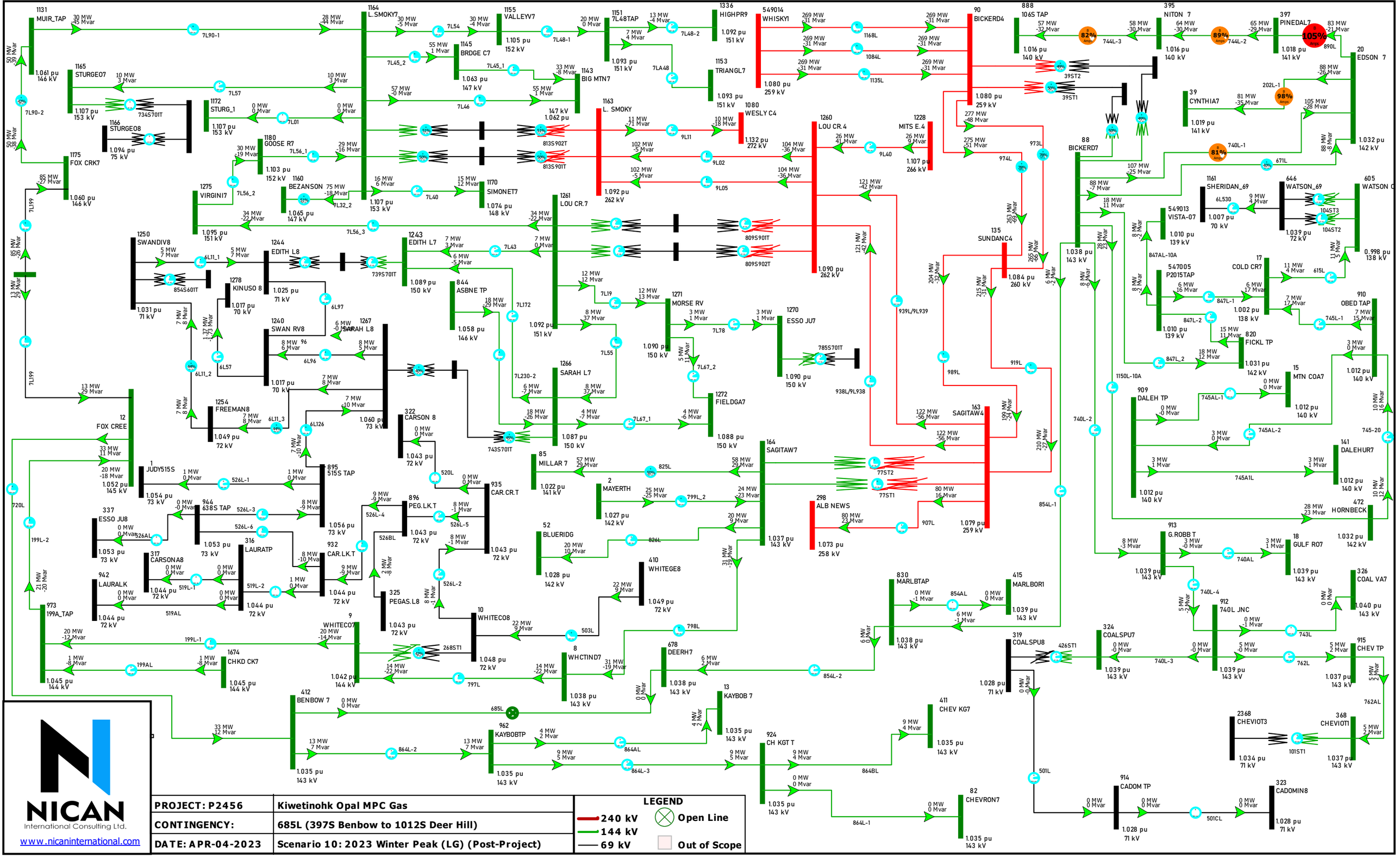
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (Post-Project)

LEGEND
- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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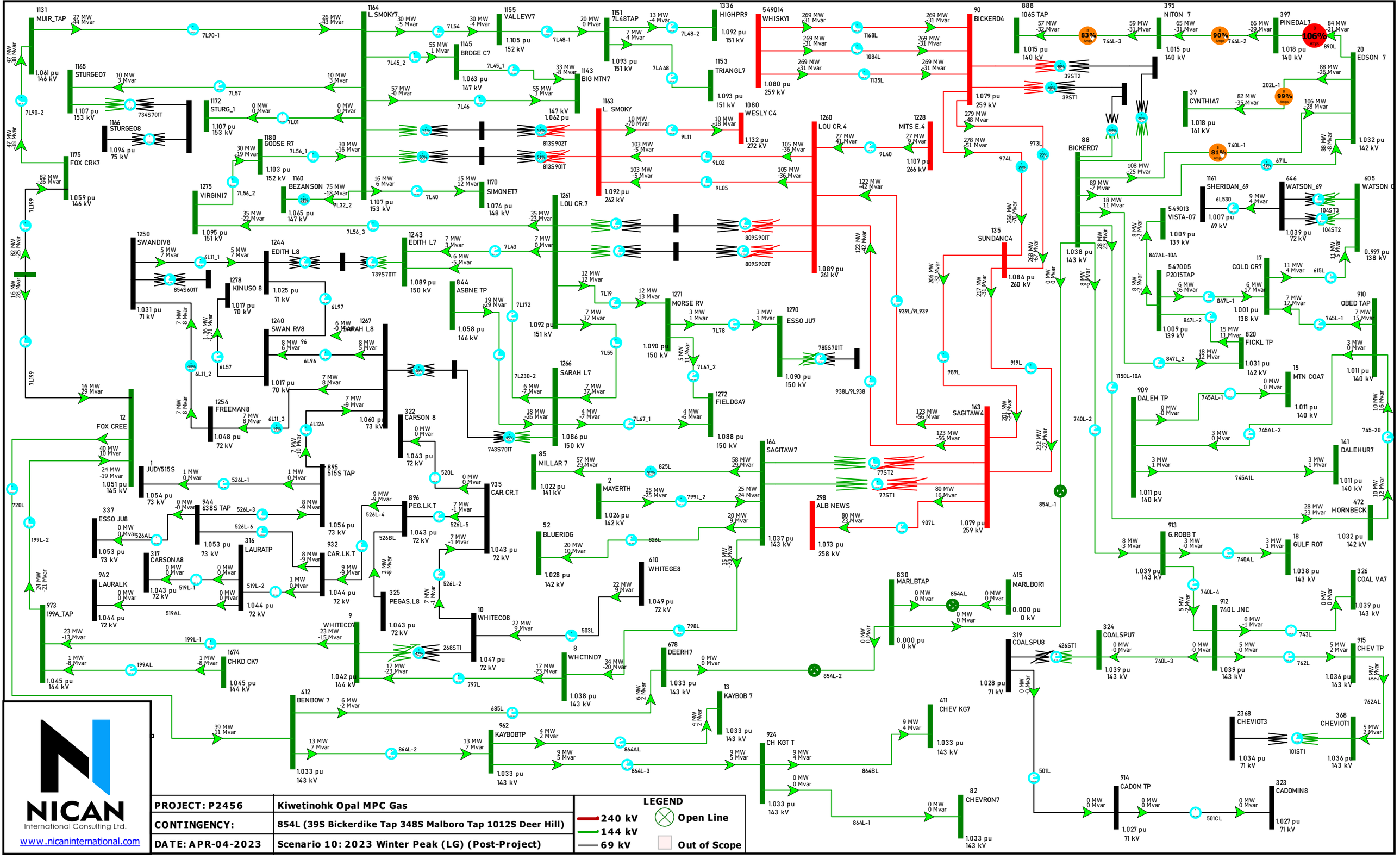
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	685L (397S Benbow to 1012S Deer Hill)
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (Post-Project)



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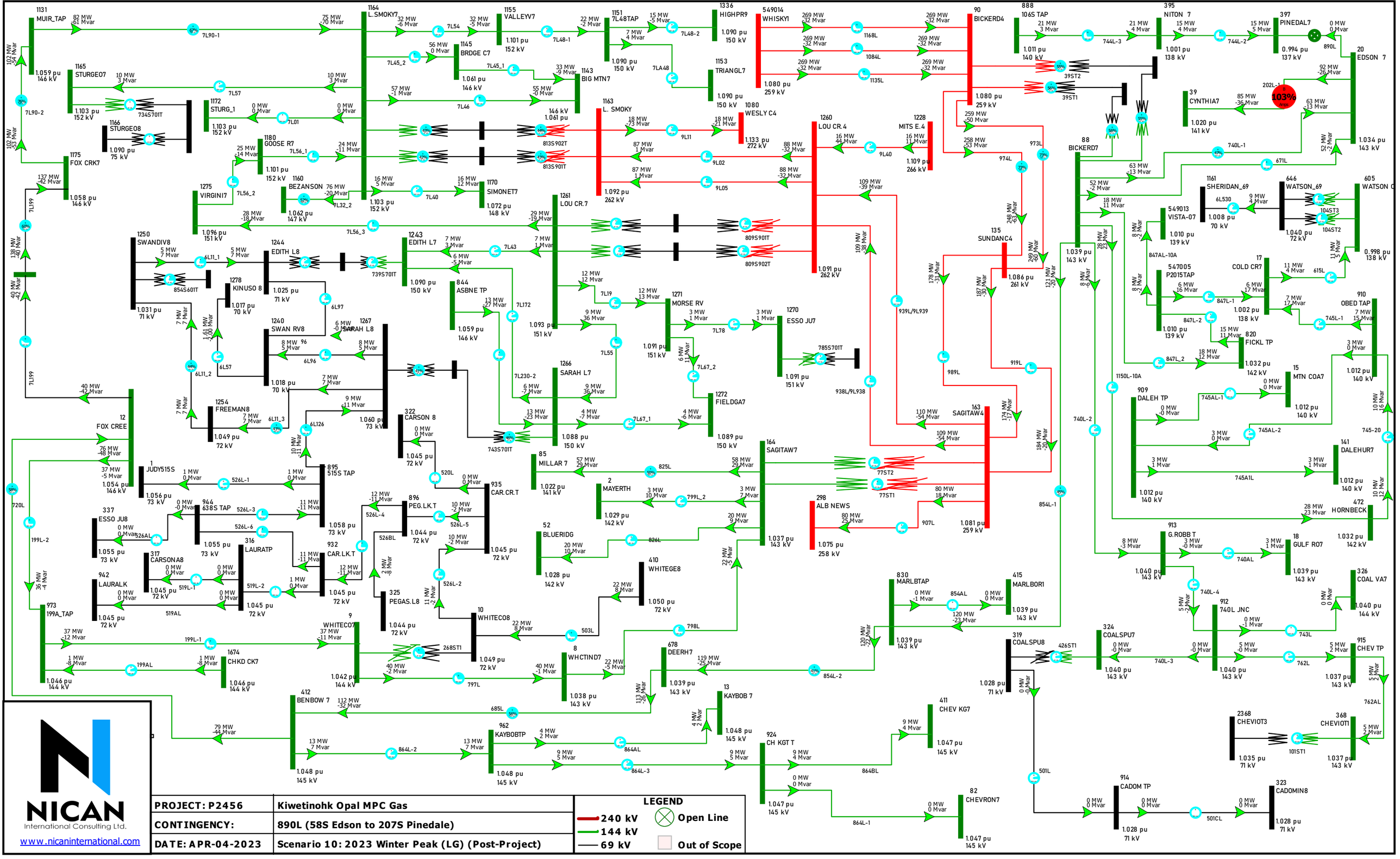
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (Post-Project)**

LEGEND

- 🟥 240 kV
- 🟩 144 kV
- — 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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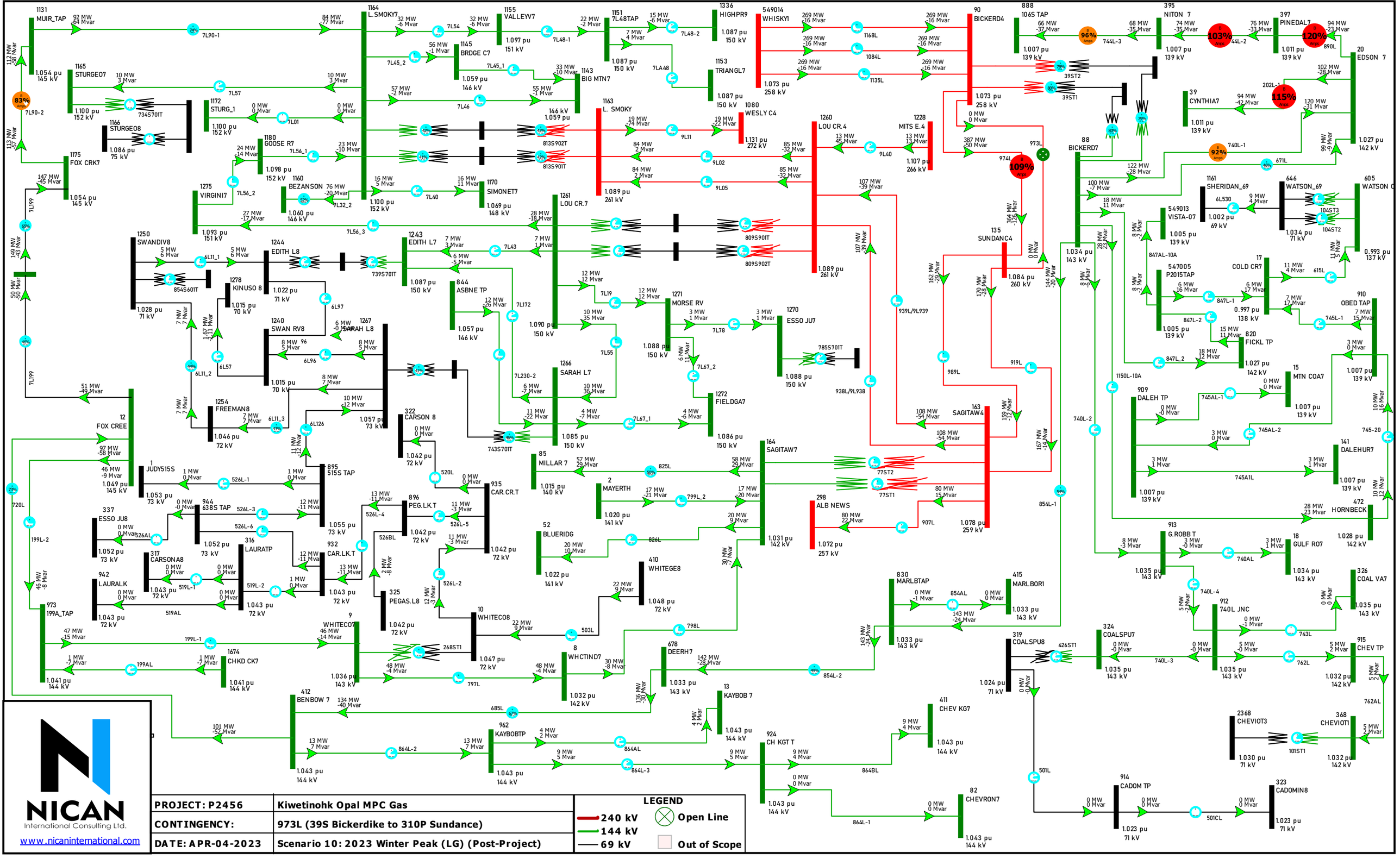
PROJECT: P2456	Kiwetinohk Opal MPC Gas
CONTINGENCY:	890L (58S Edson to 207S Pinedale)
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (Post-Project)



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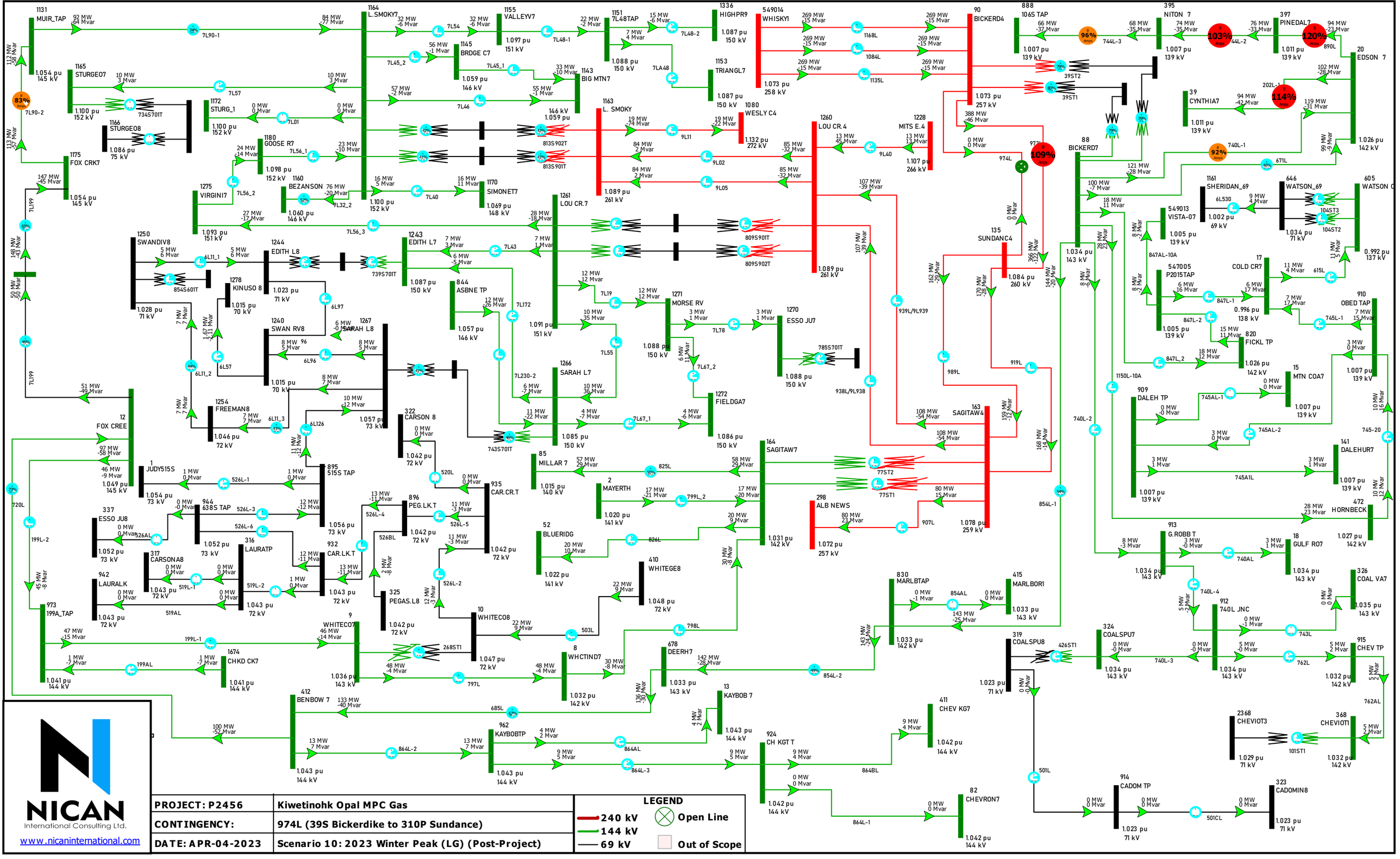
PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**973L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (Post-Project)**

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope



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PROJECT: P2456	**Kiwetinohk Opal MPC Gas**
CONTINGENCY:	**974L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (Post-Project)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope

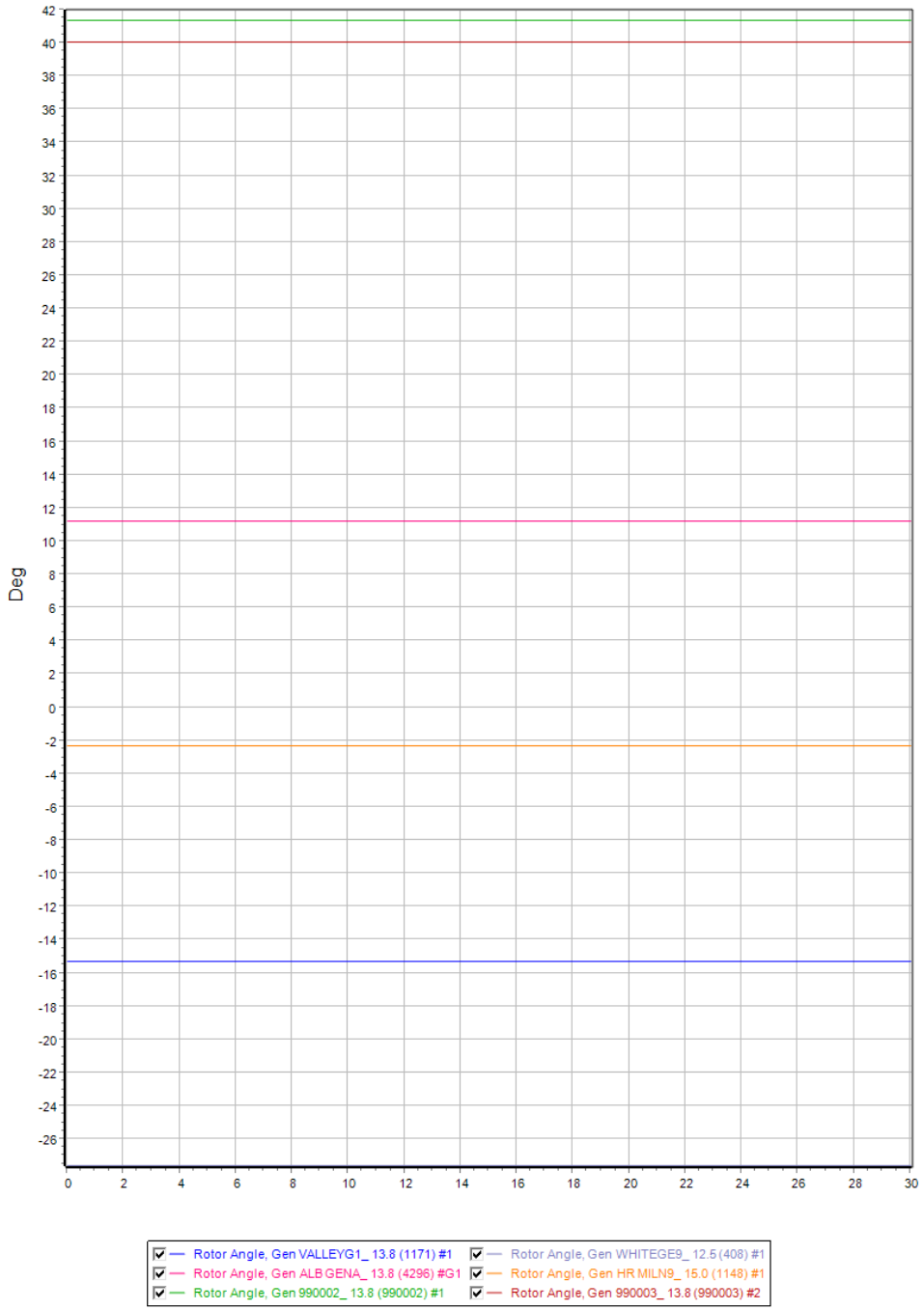
Attachment A4
Post-Project Transient Stability Diagrams

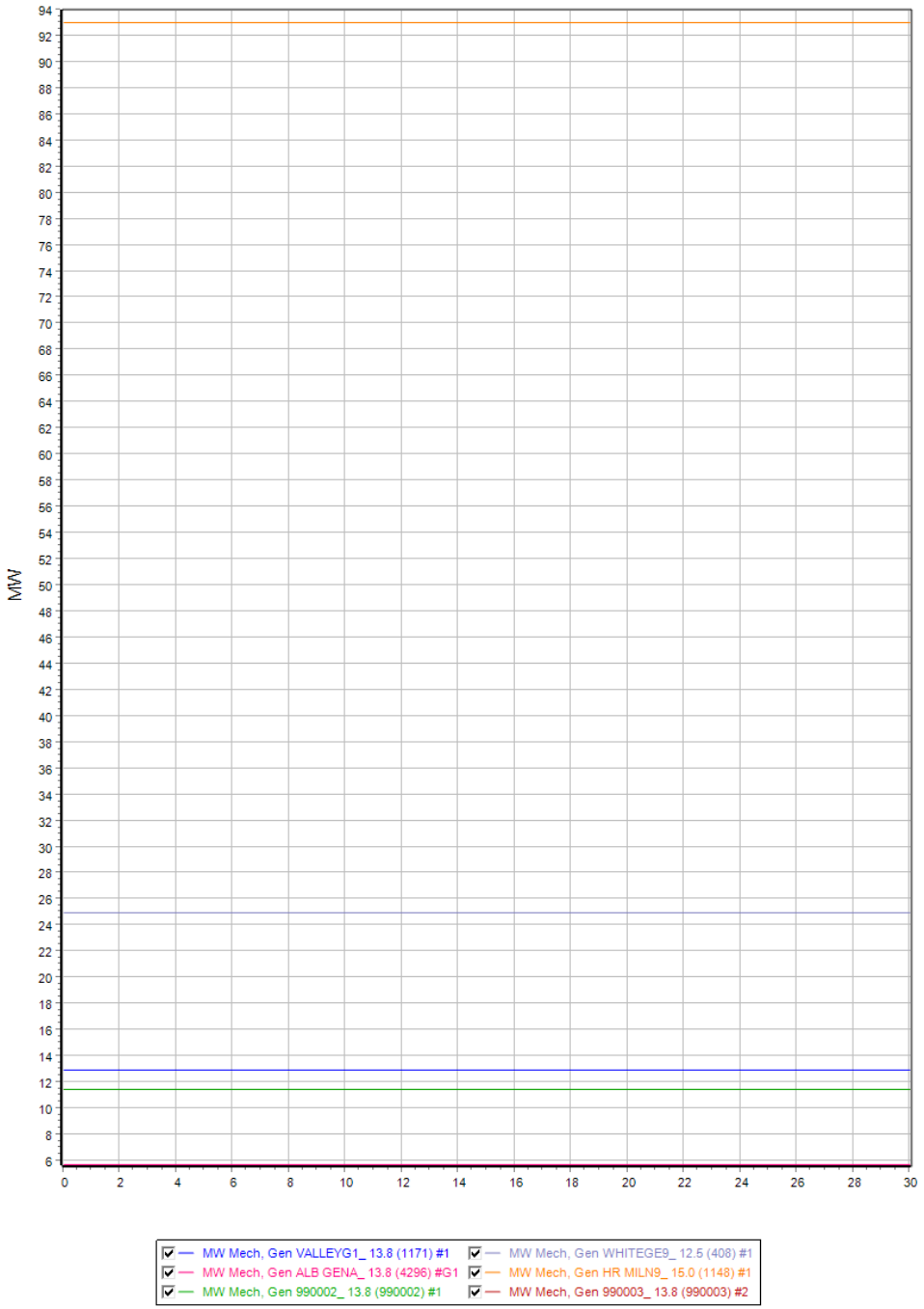
2023 SUMMER LIGHT

PLOTS
P2456 - POST-PROJECT
TRANSIENT STABILITY
SC06

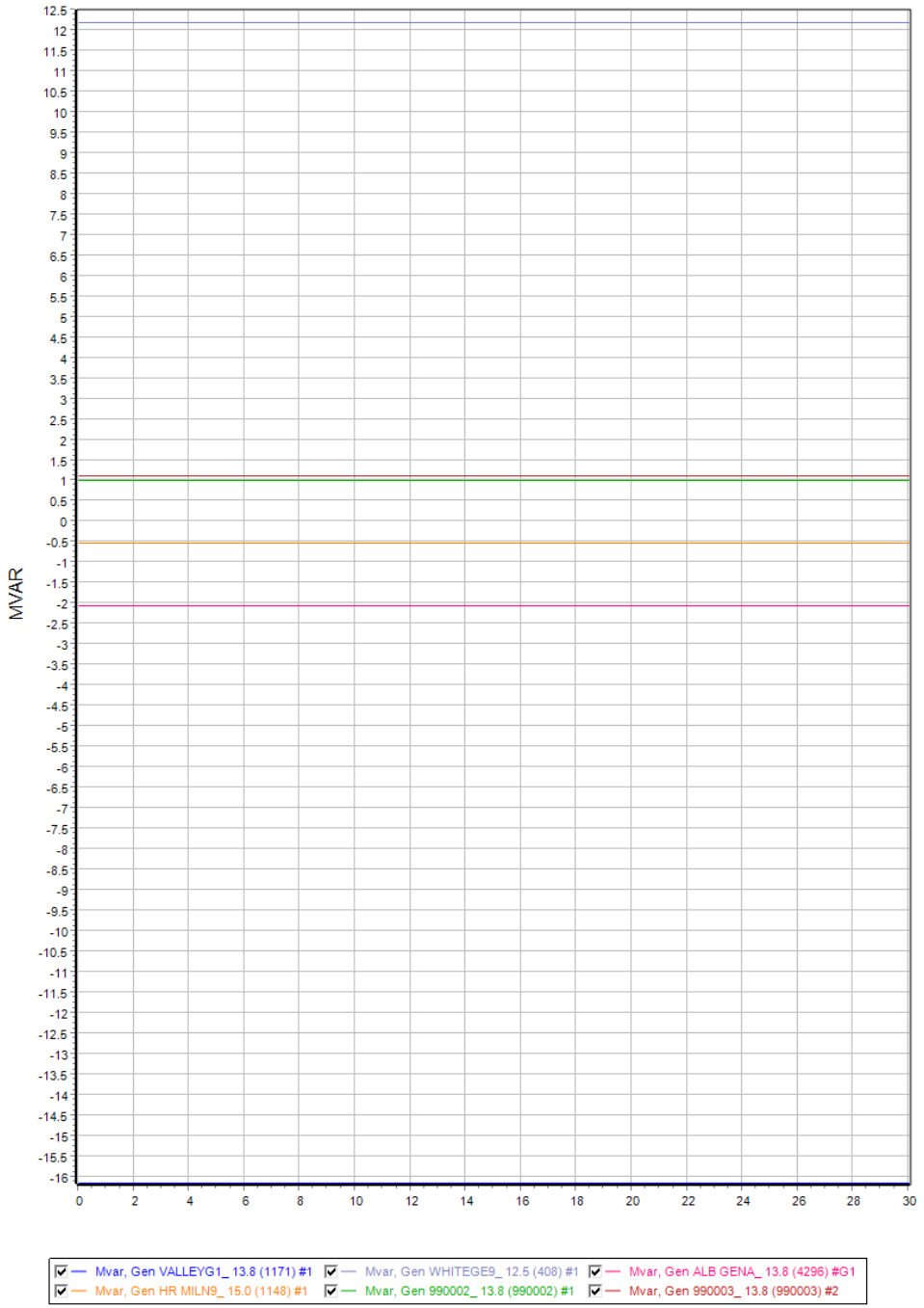
NICAN

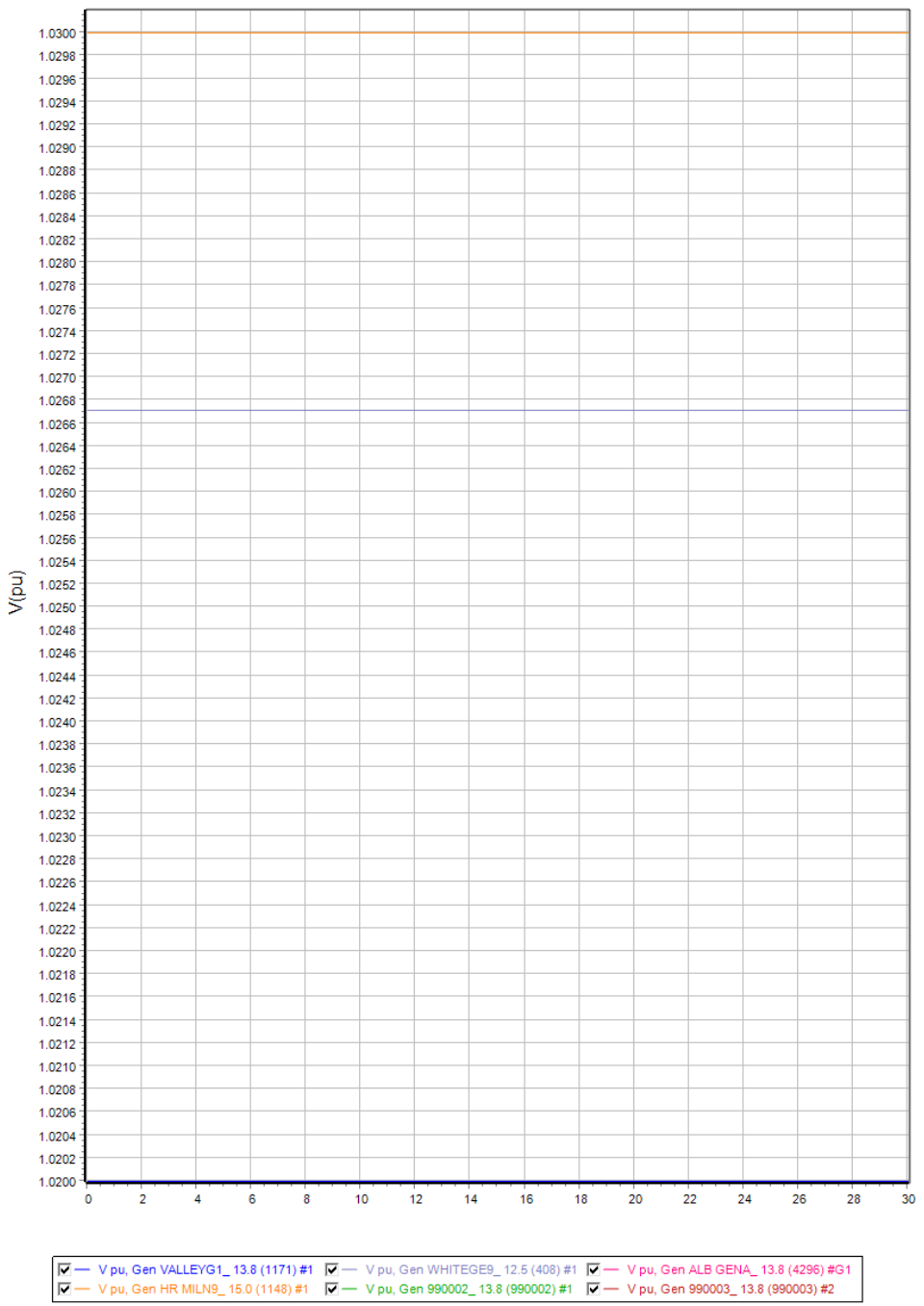
Monitor Gens. Q1



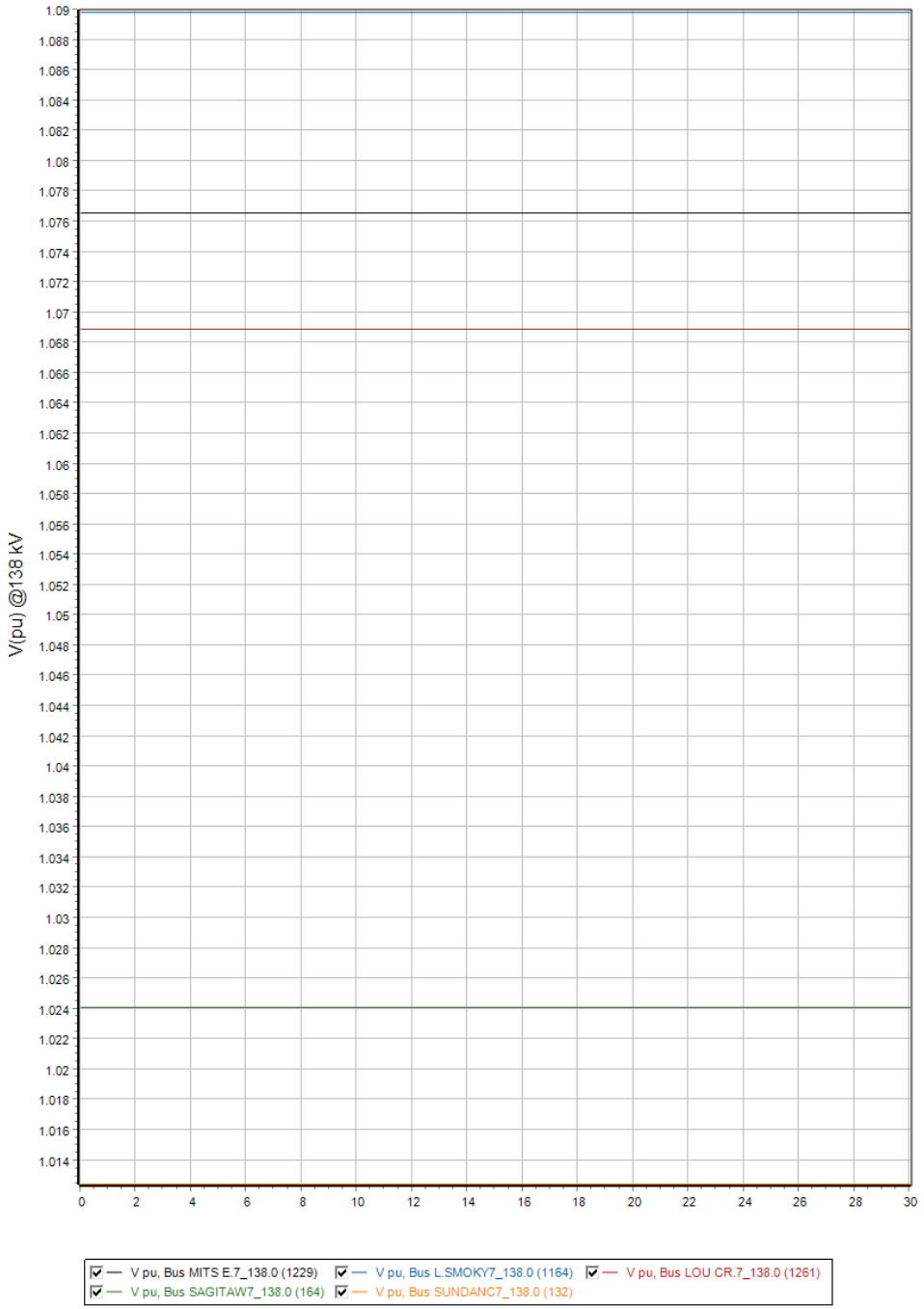


Monitor Gens. Q2

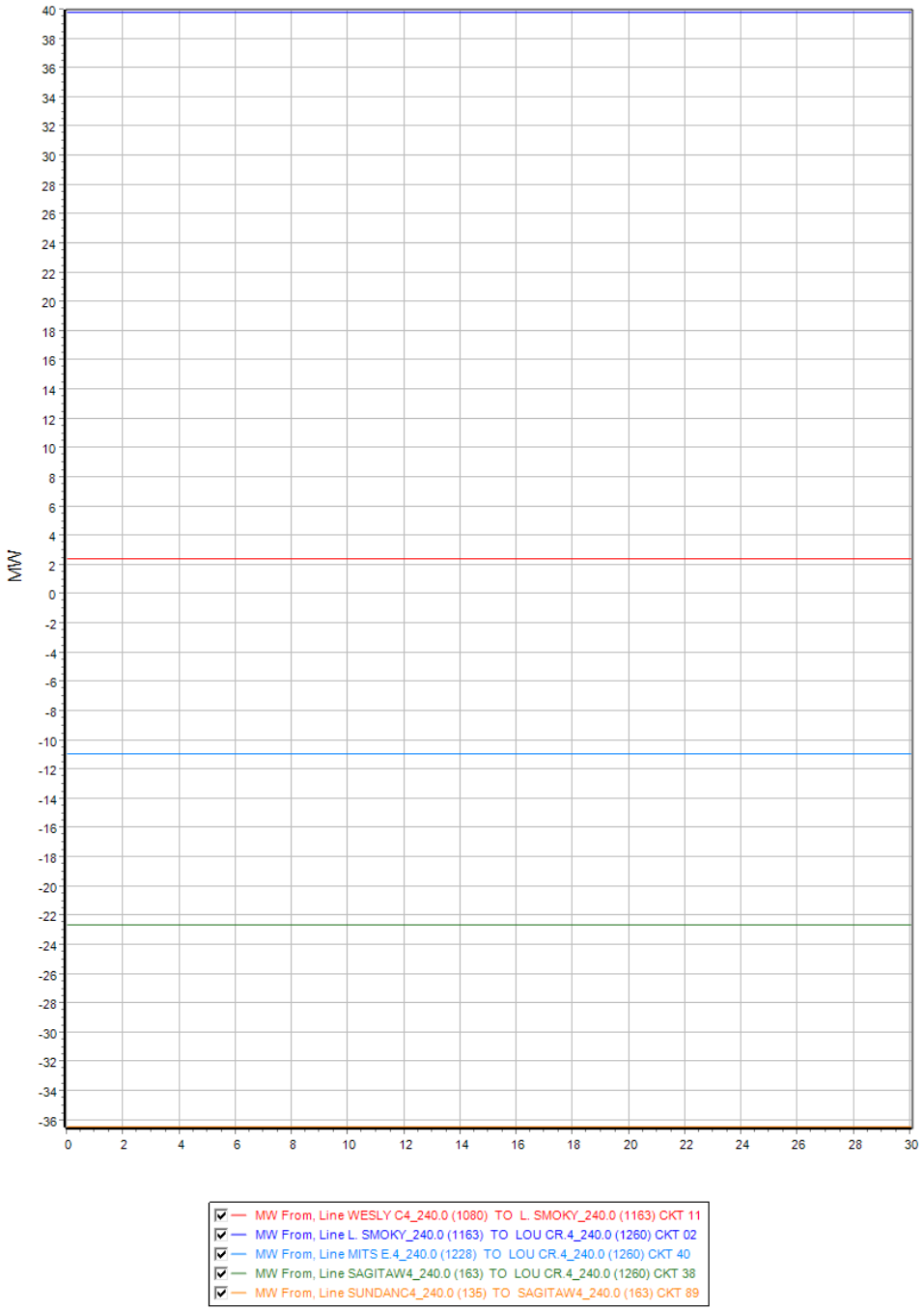


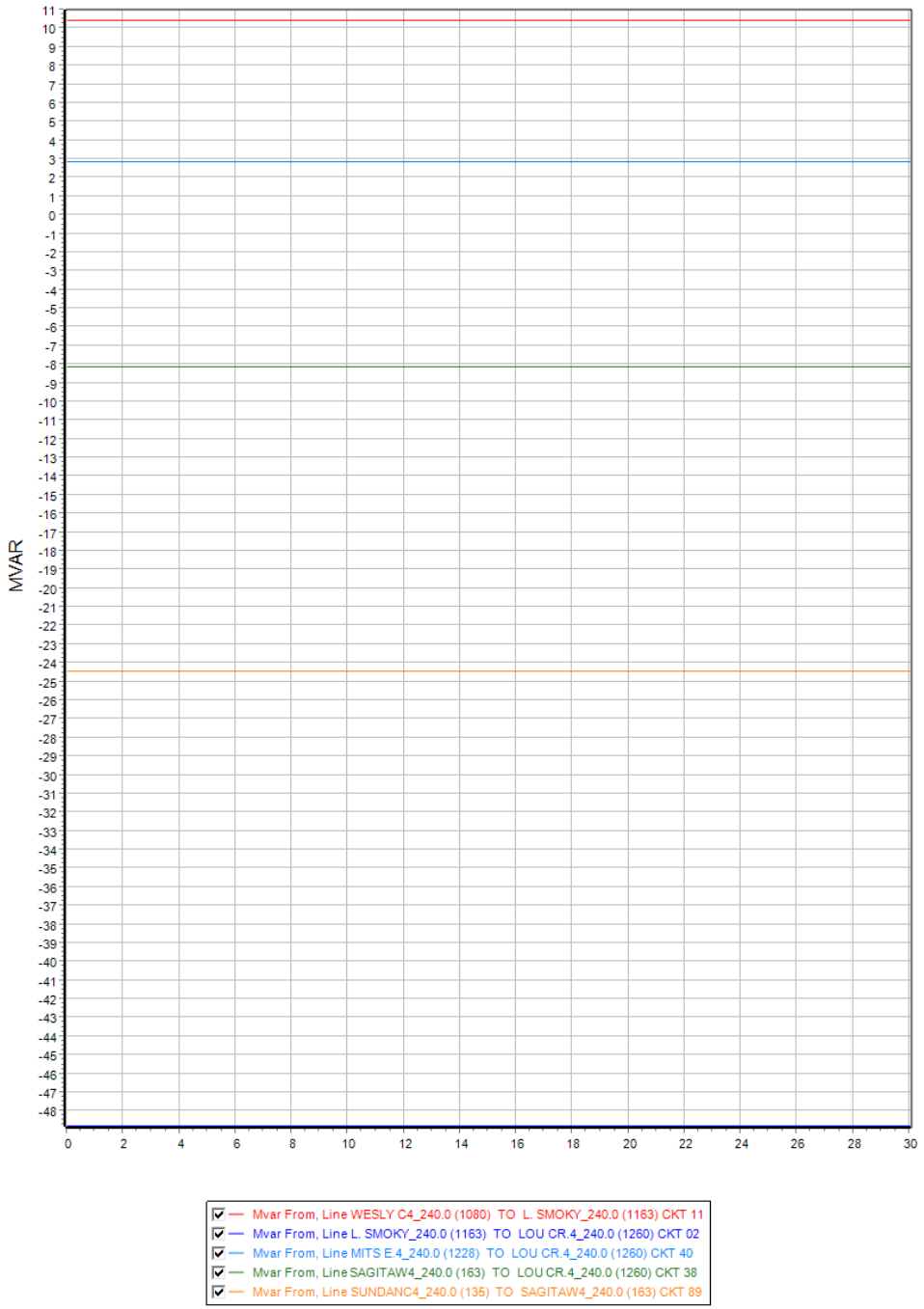


Monitor Bus Volts Q3

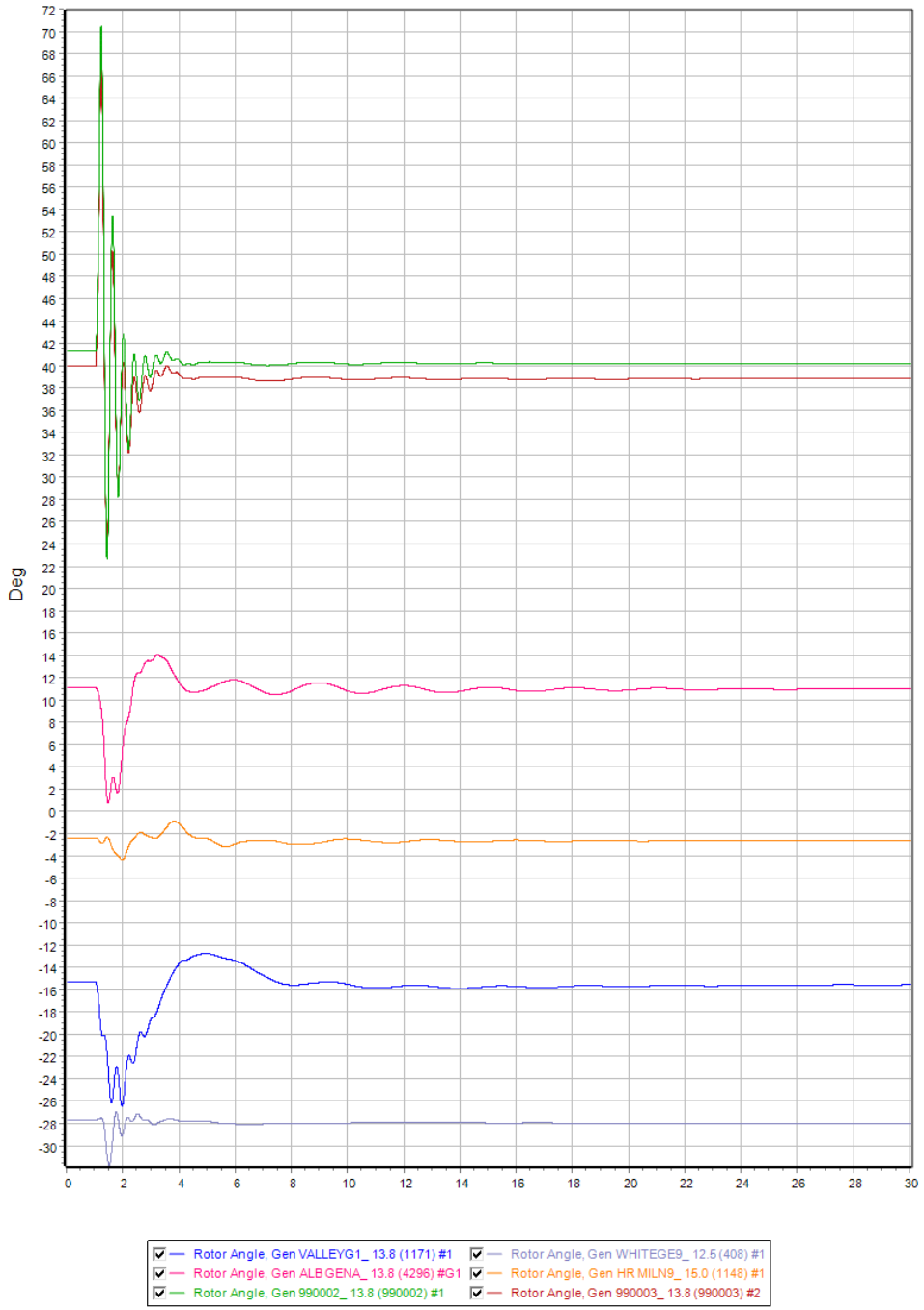


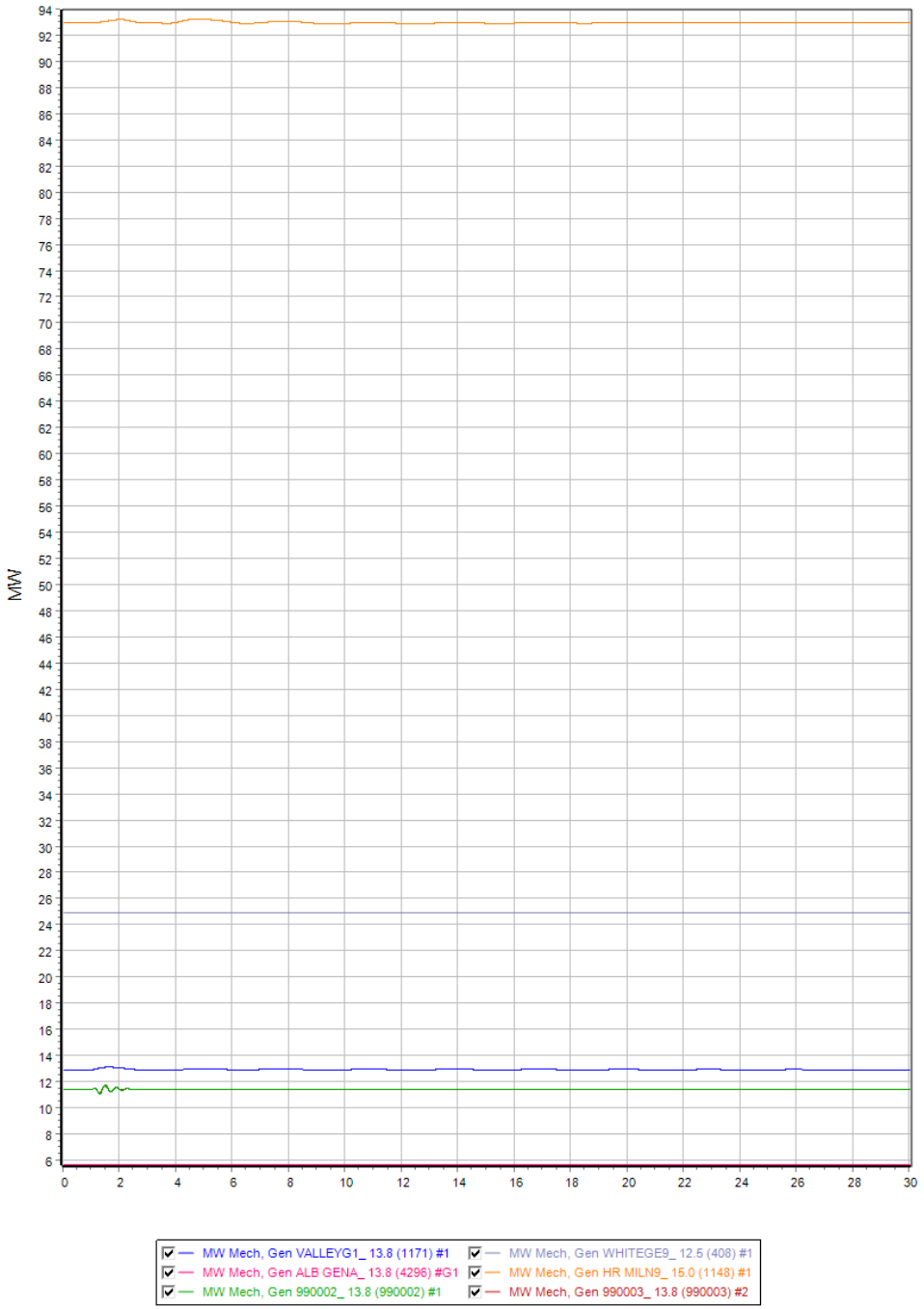
Monitor Line MW & MVAR. Q4



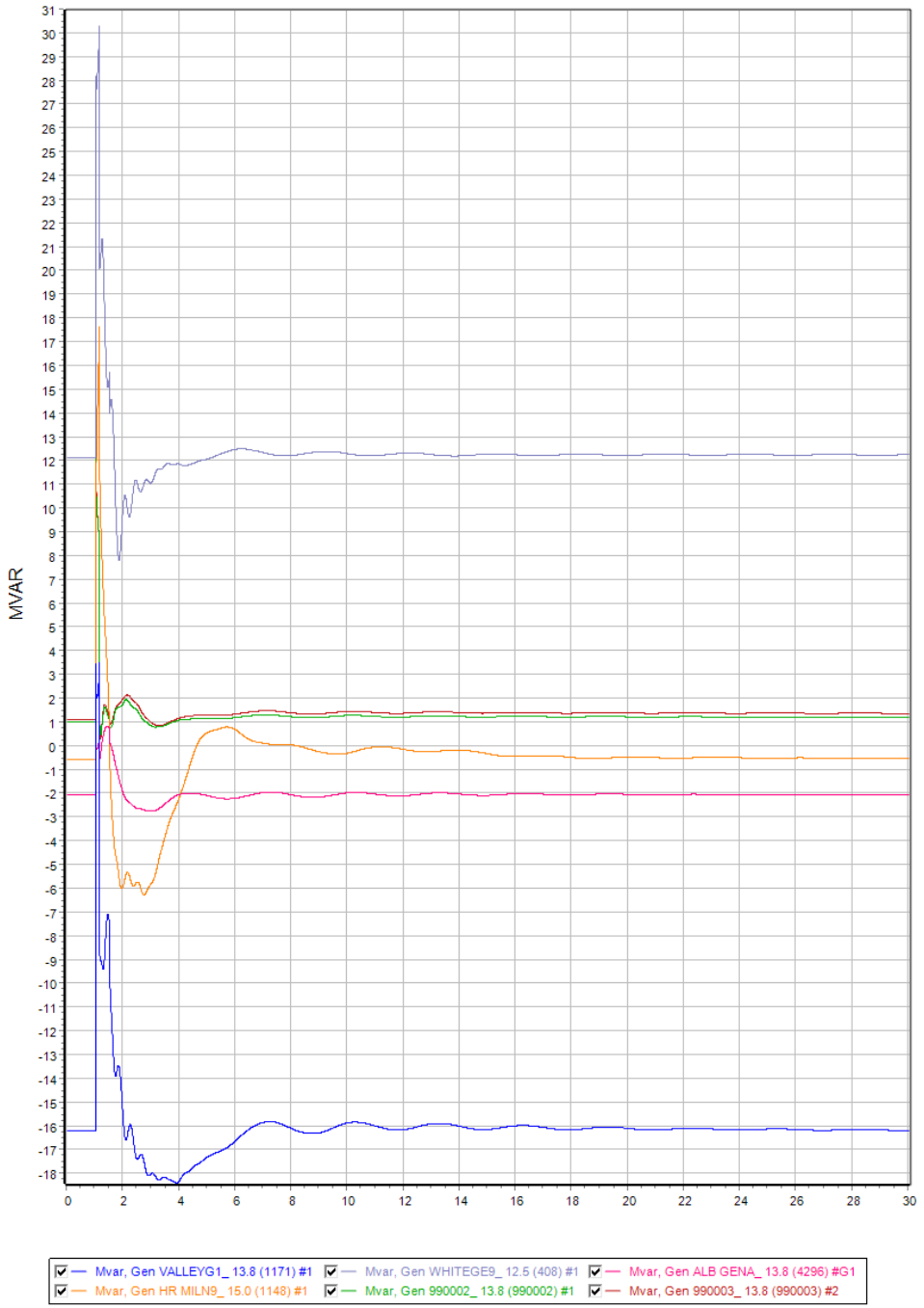


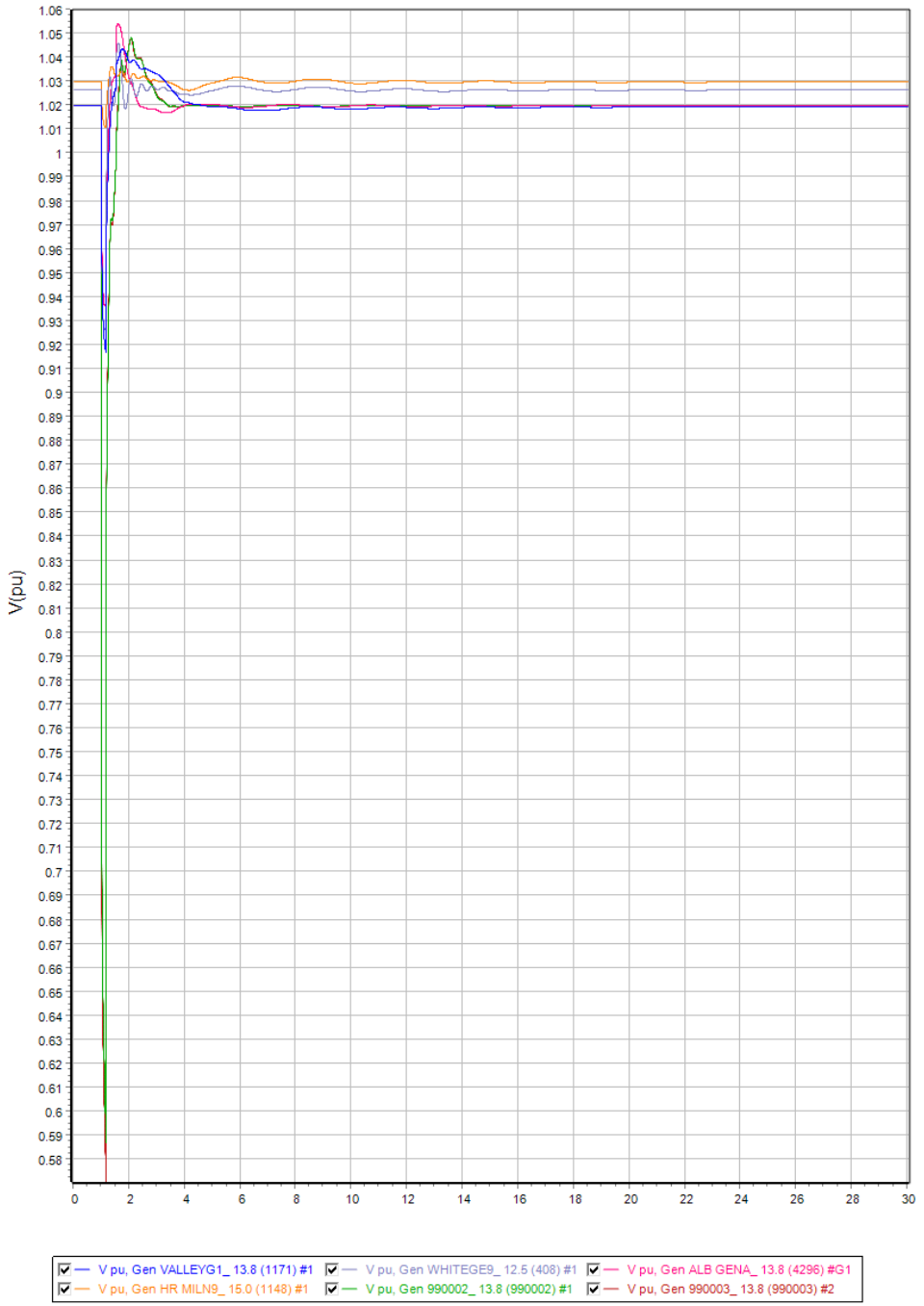
Monitor Gens. Q1





Monitor Gens. Q2





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 01A - 685L (Benbow 397S – Deer Hill 1012S) @ Benbow 397S

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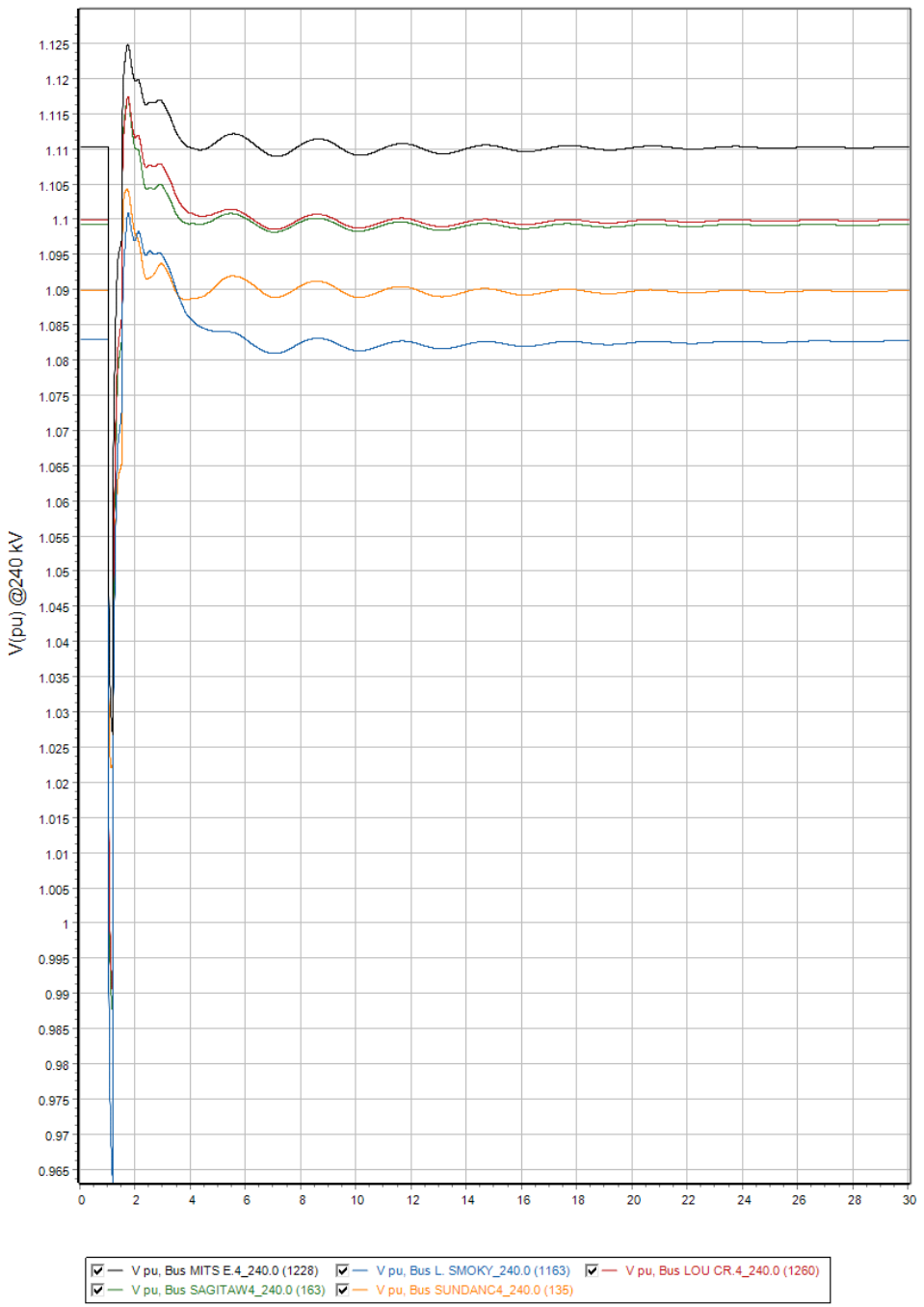
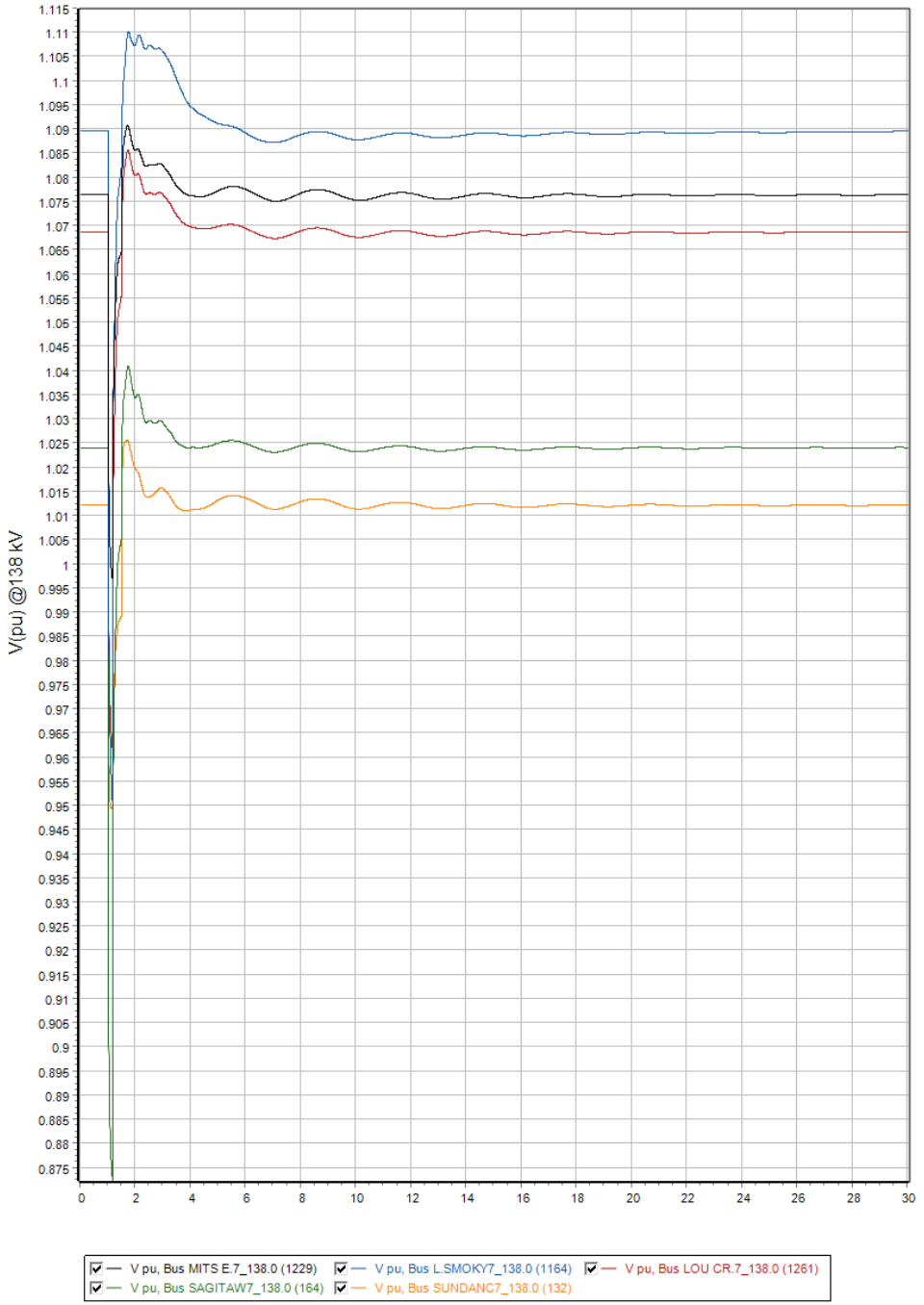
Monitor Bus Volts Q3





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 01A - 685L (Benbow 397S – Deer Hill 1012S) @ Benbow 397S

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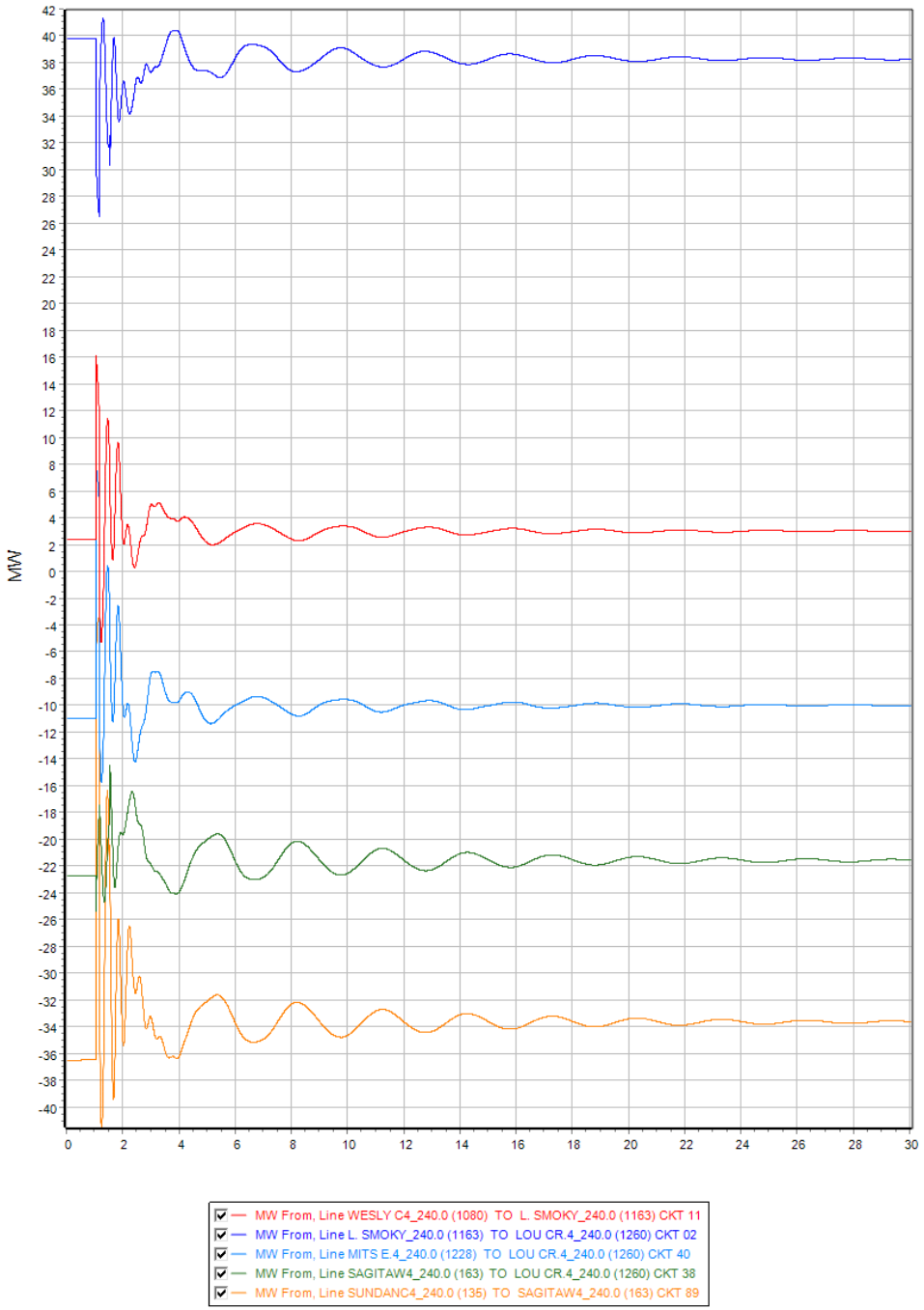
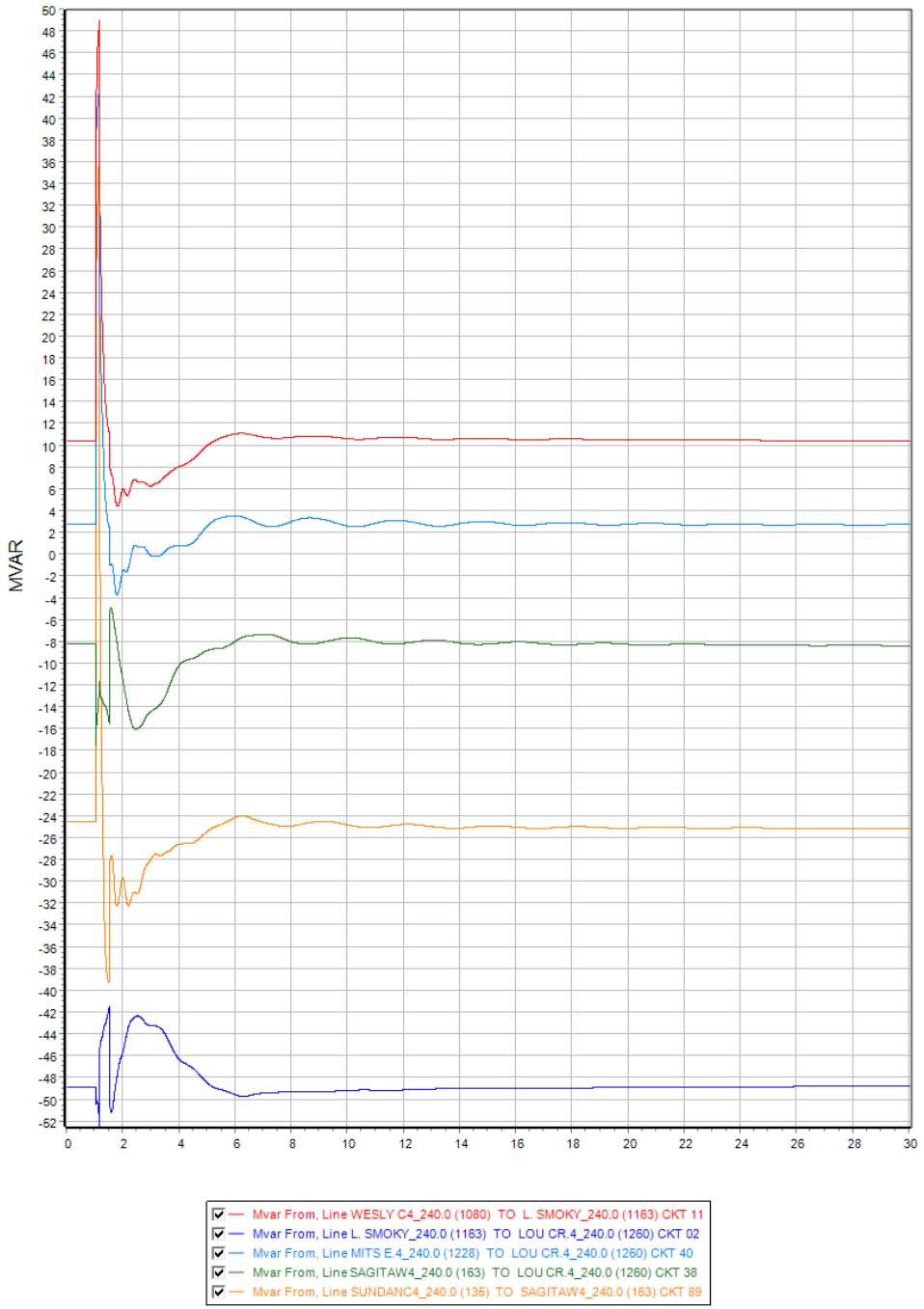
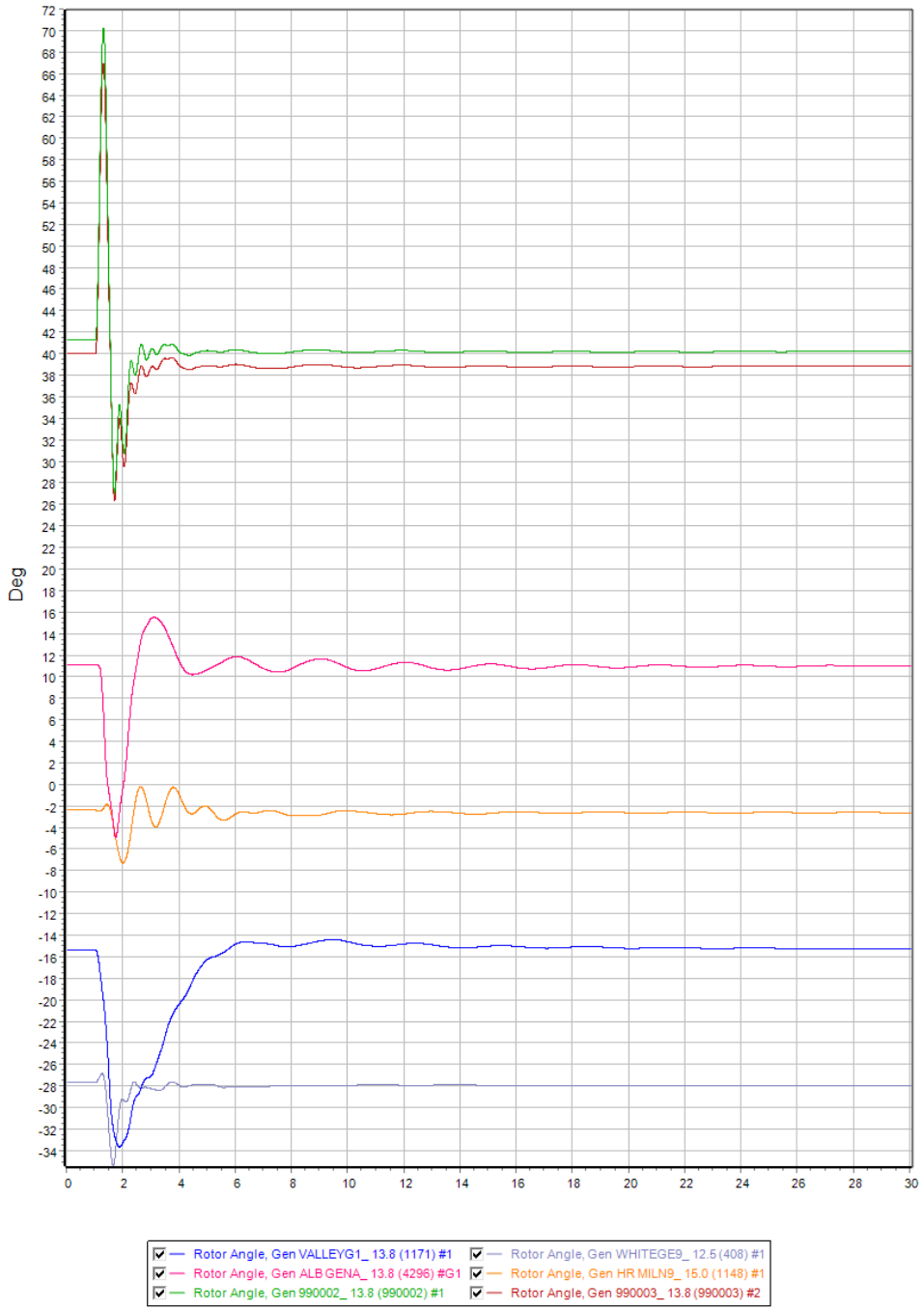
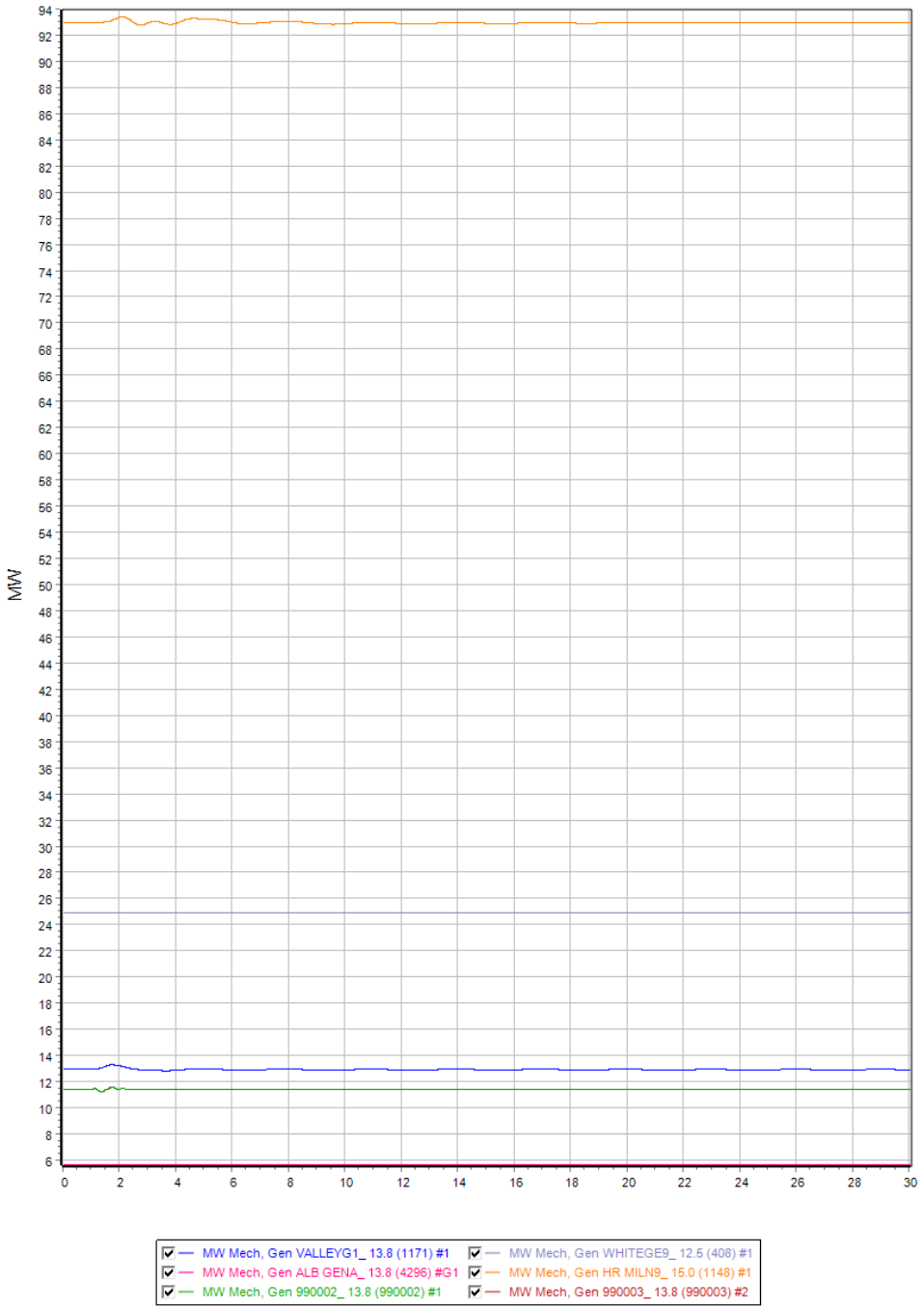
Monitor Line MW & MVAR. Q4



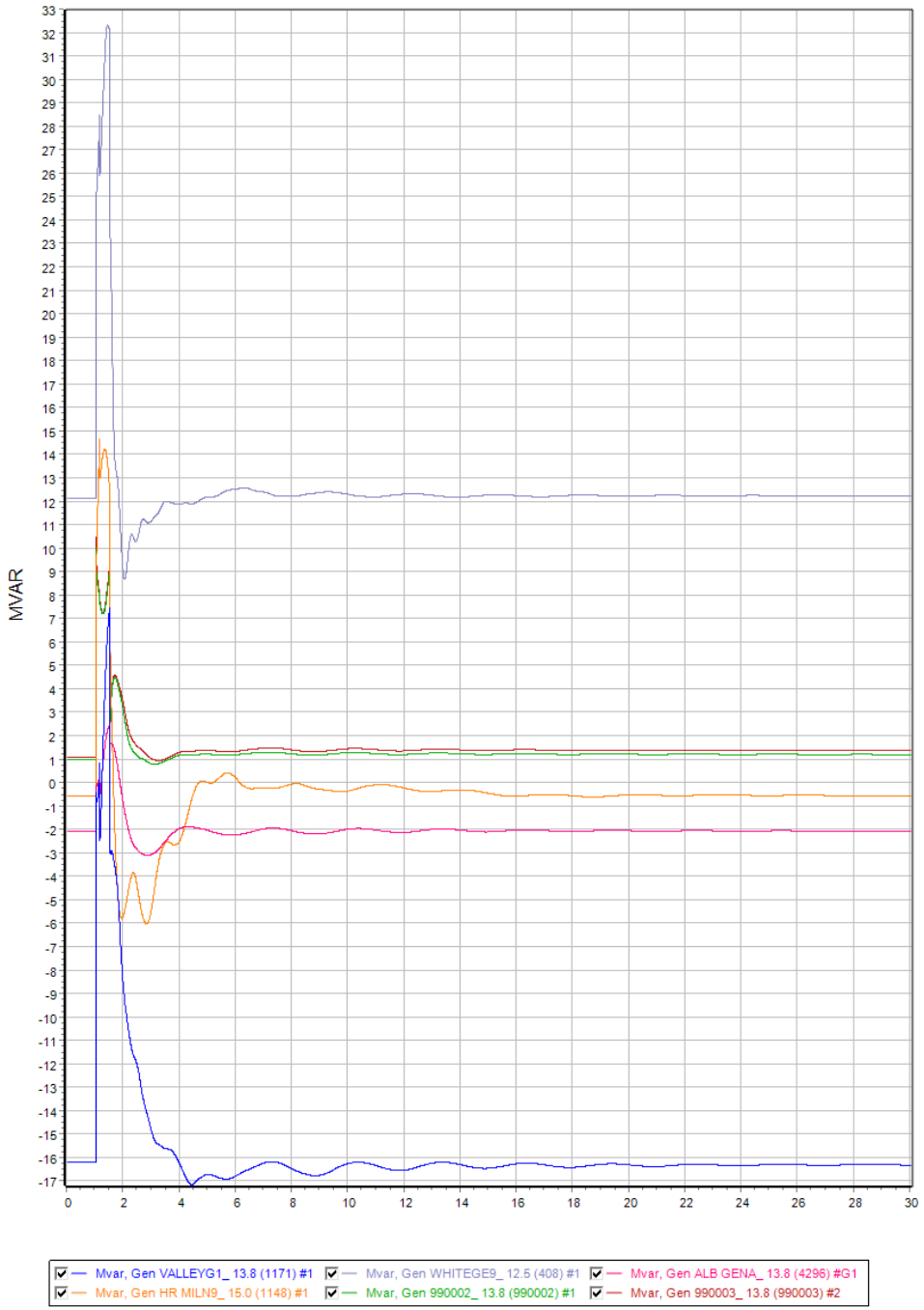


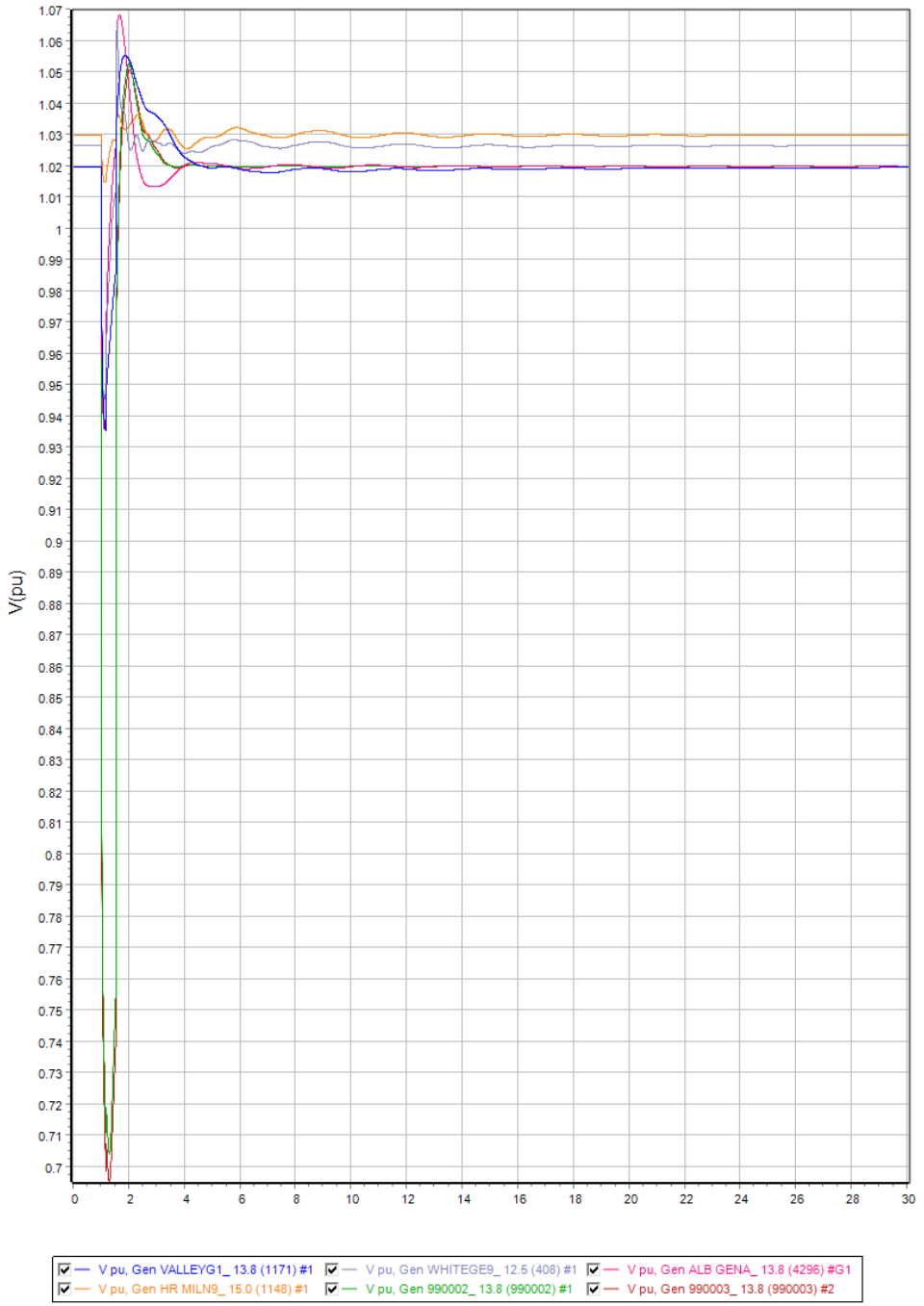
Monitor Gens. Q1





Monitor Gens. Q2





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 01B - 685L (Benbow 397S – Deer Hill 1012S) @ Deer Hill 1012S

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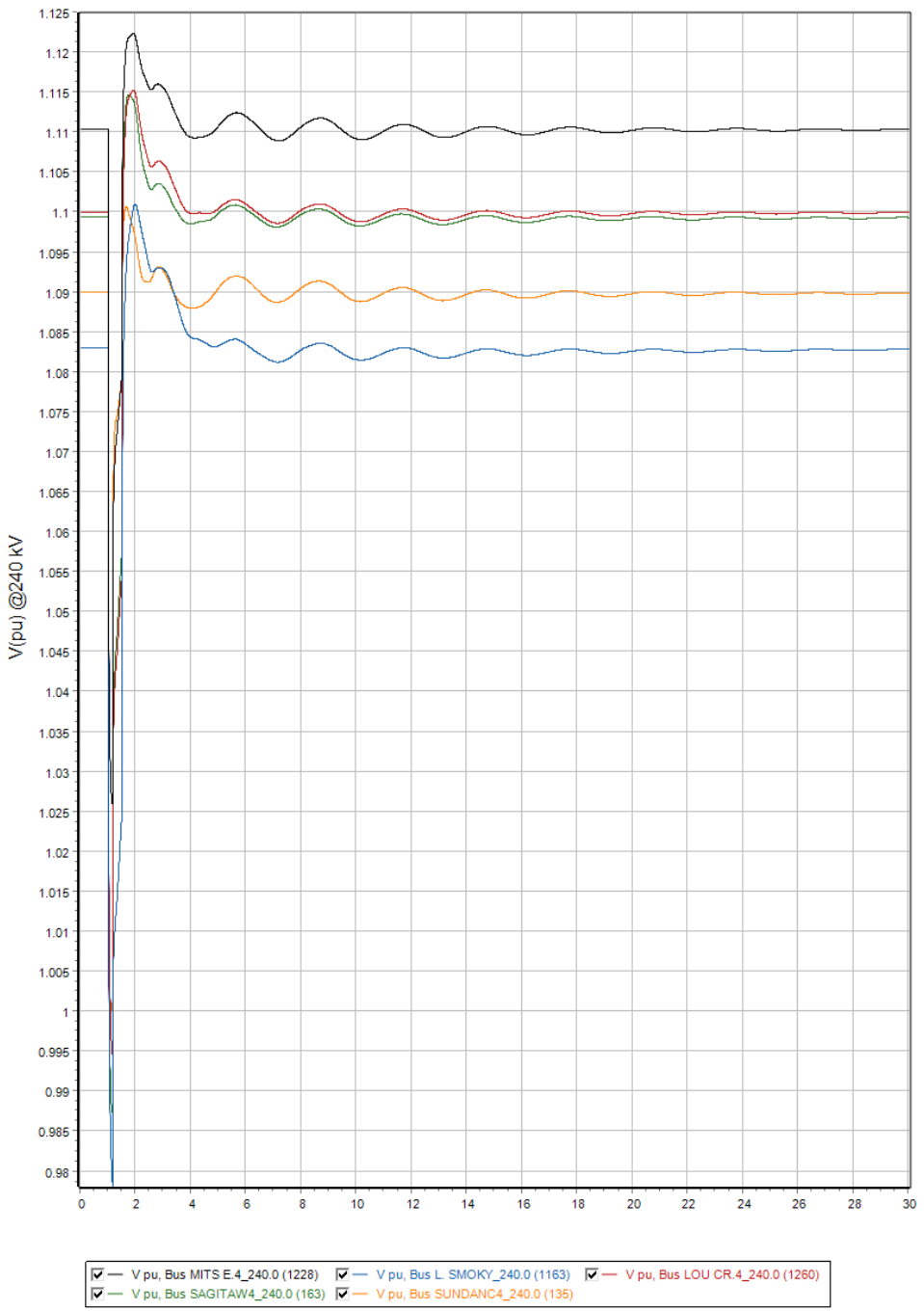
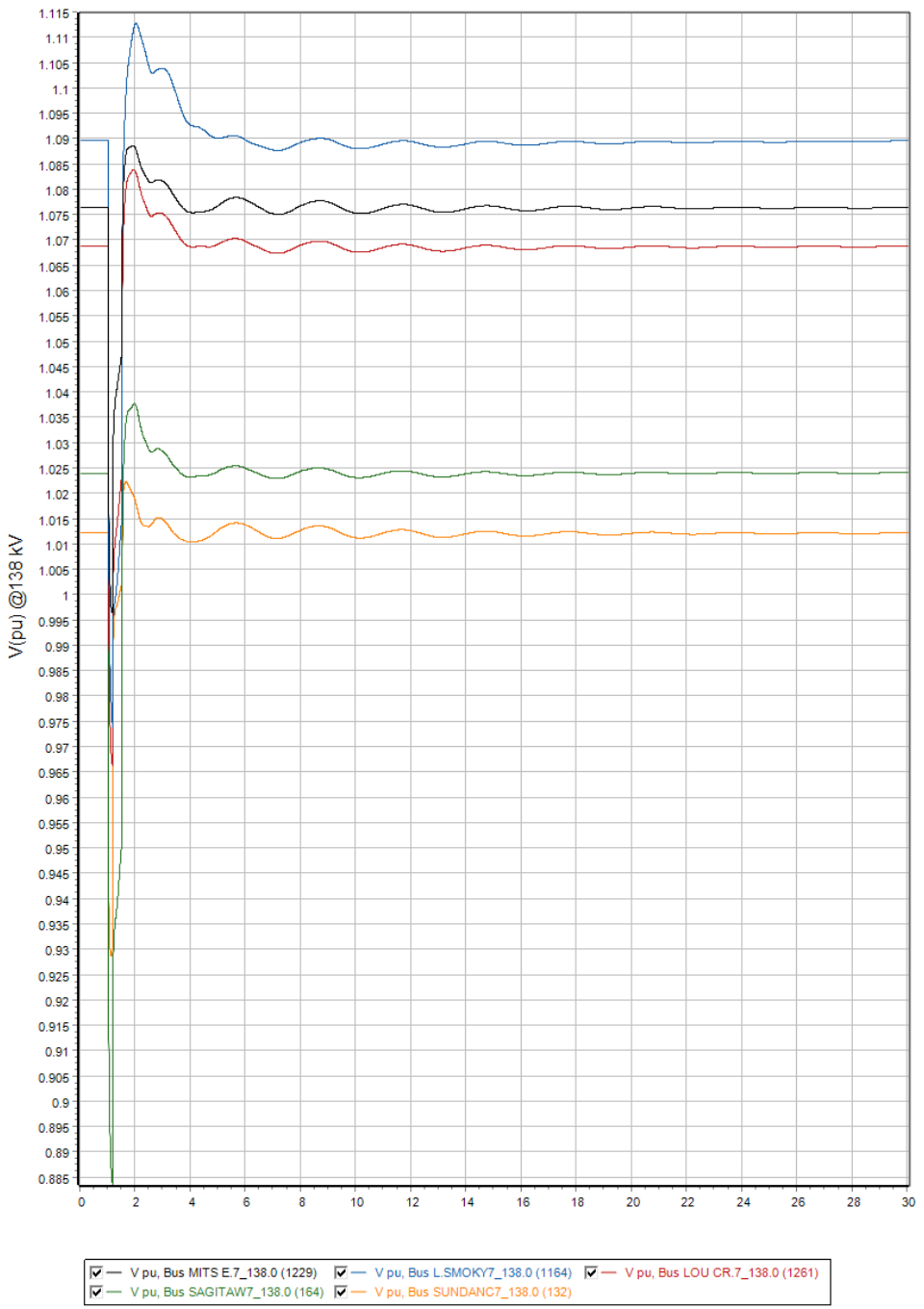
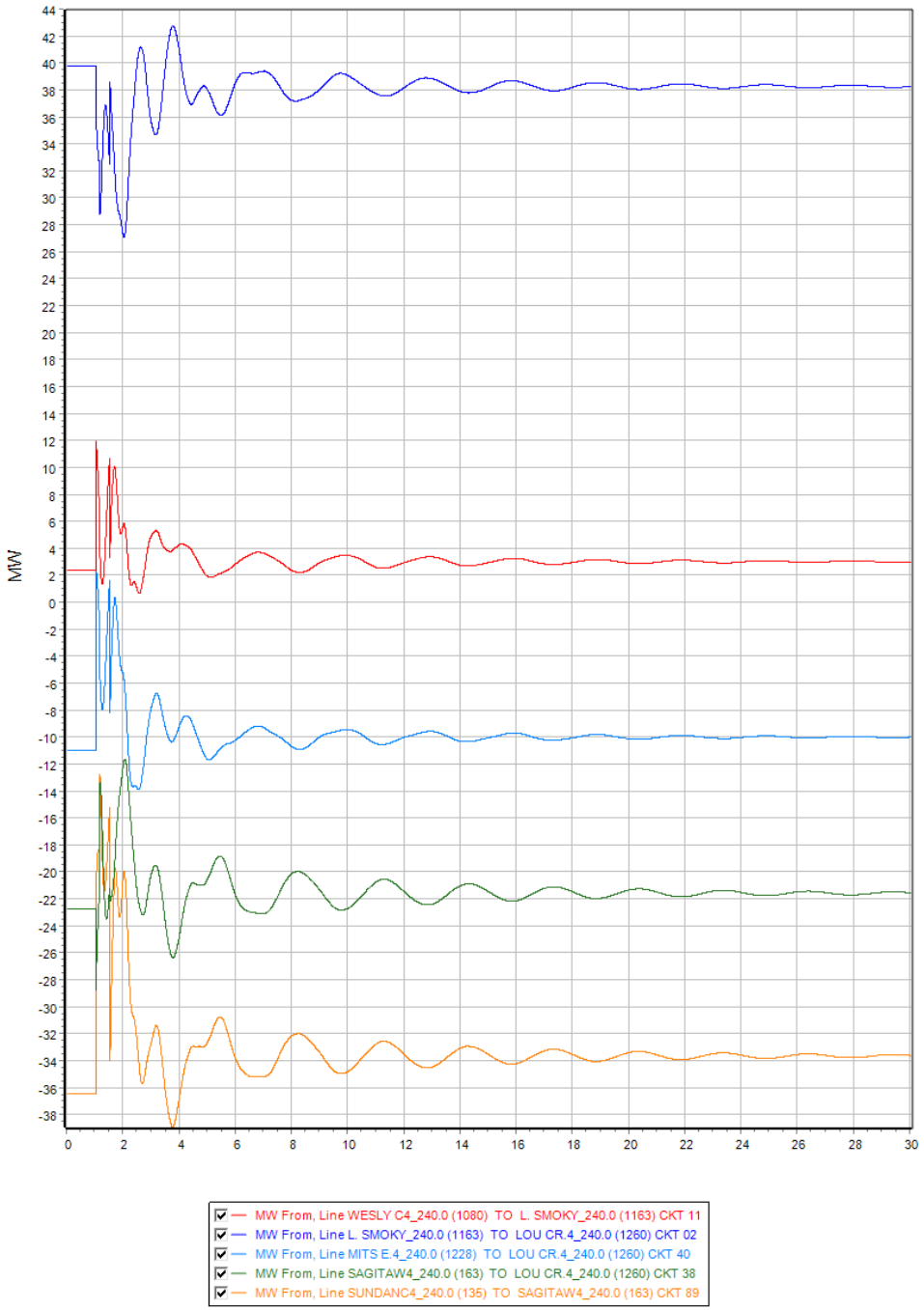
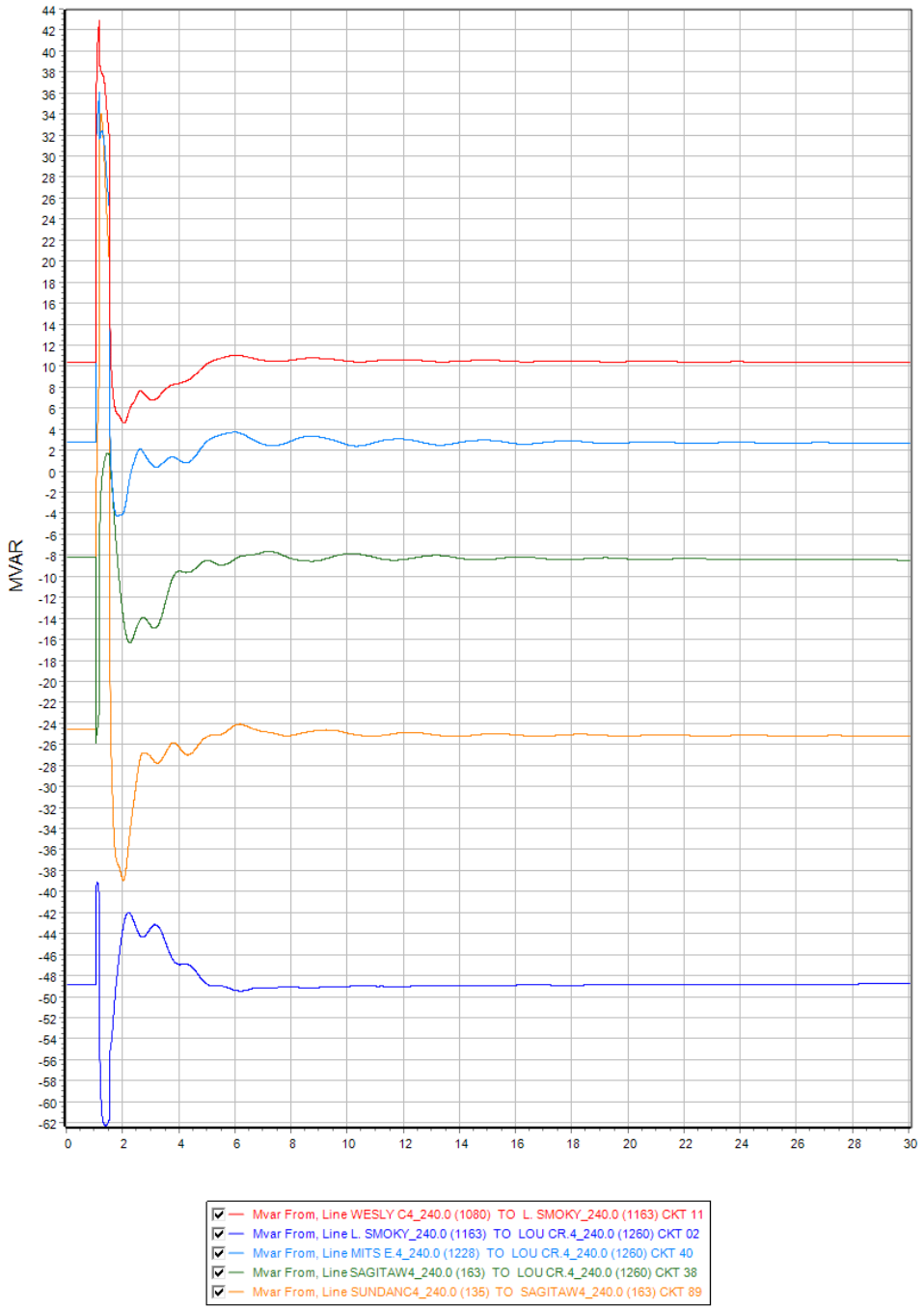
Monitor Bus Volts Q3



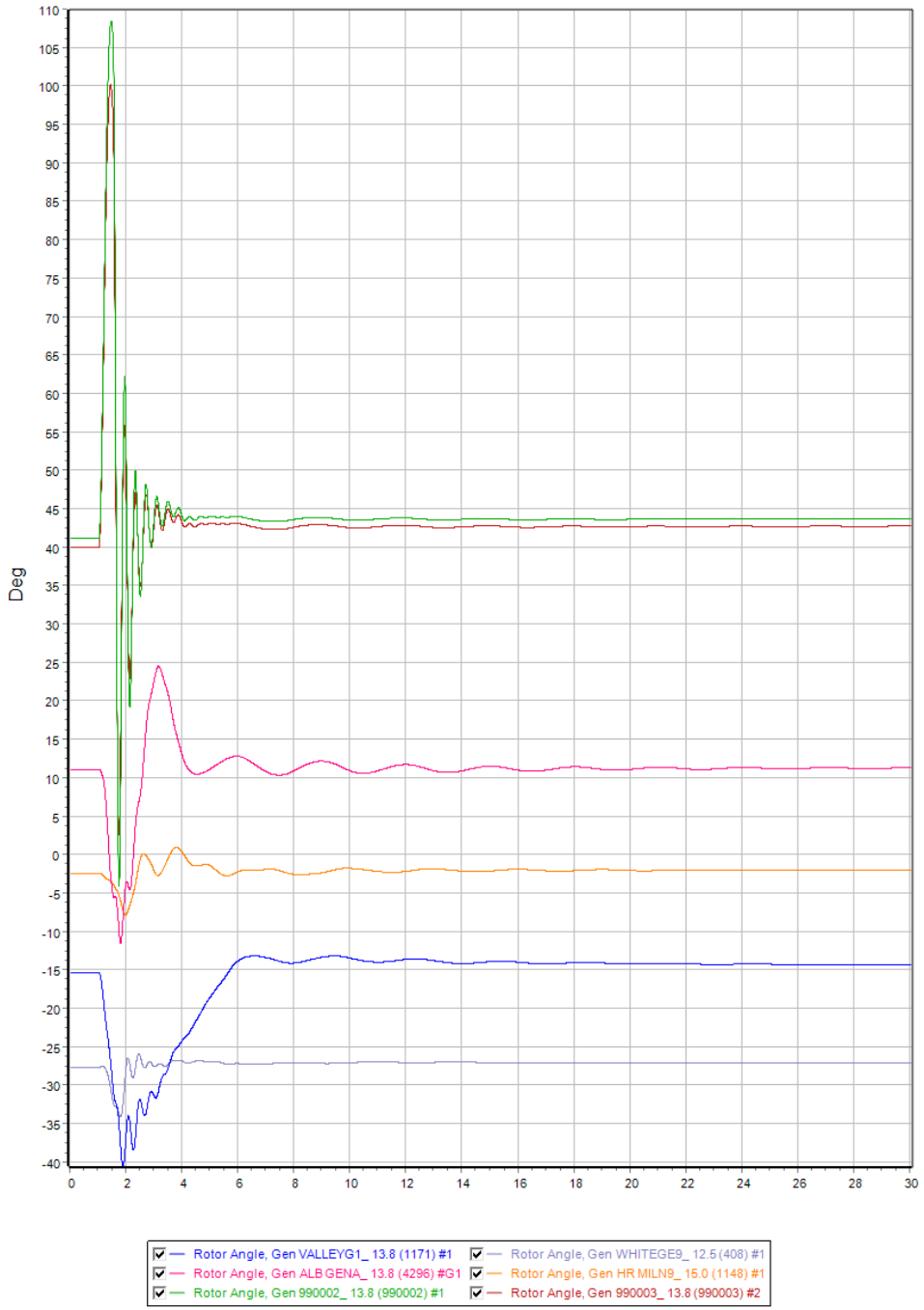


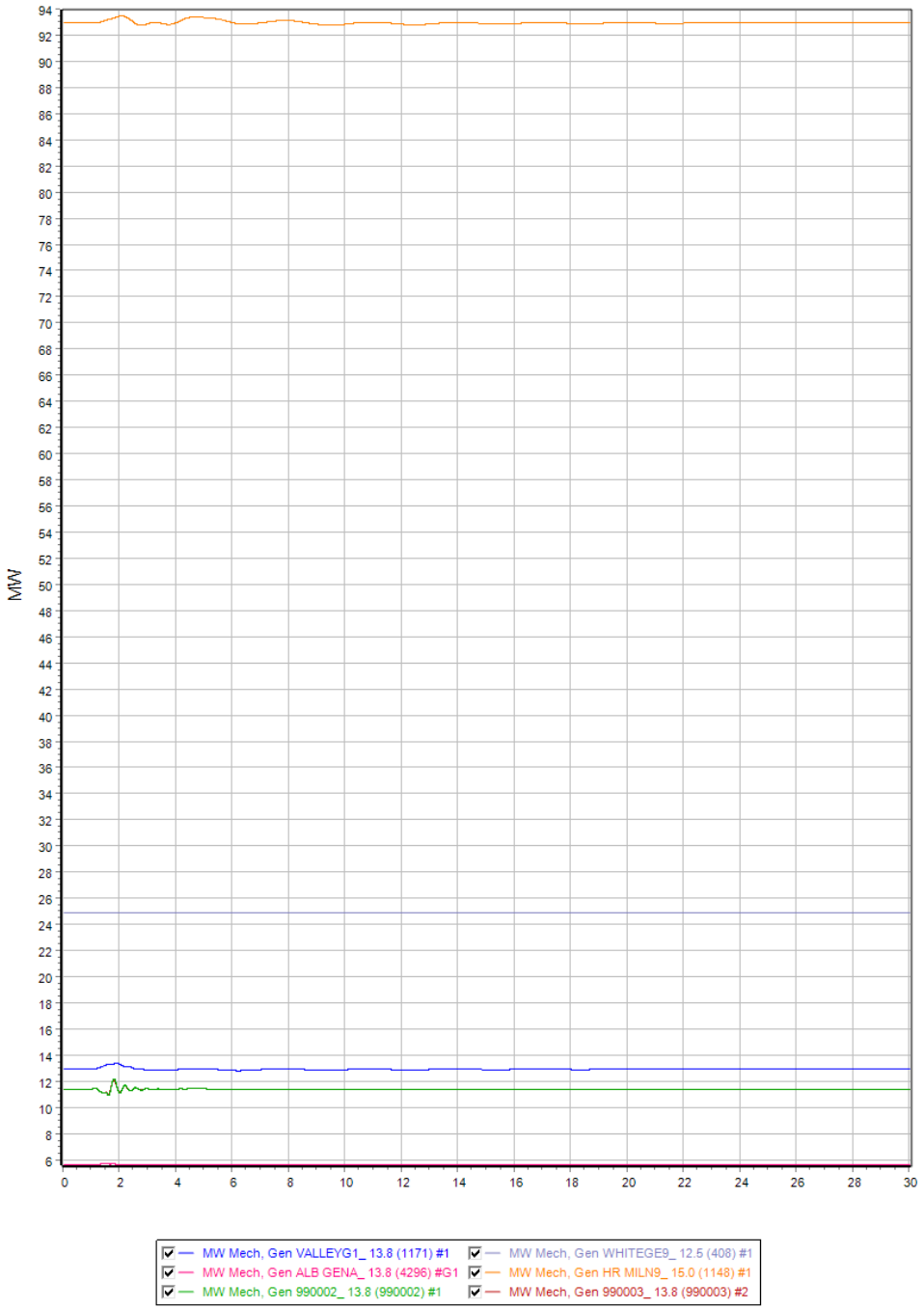
Monitor Line MW & MVAR. Q4



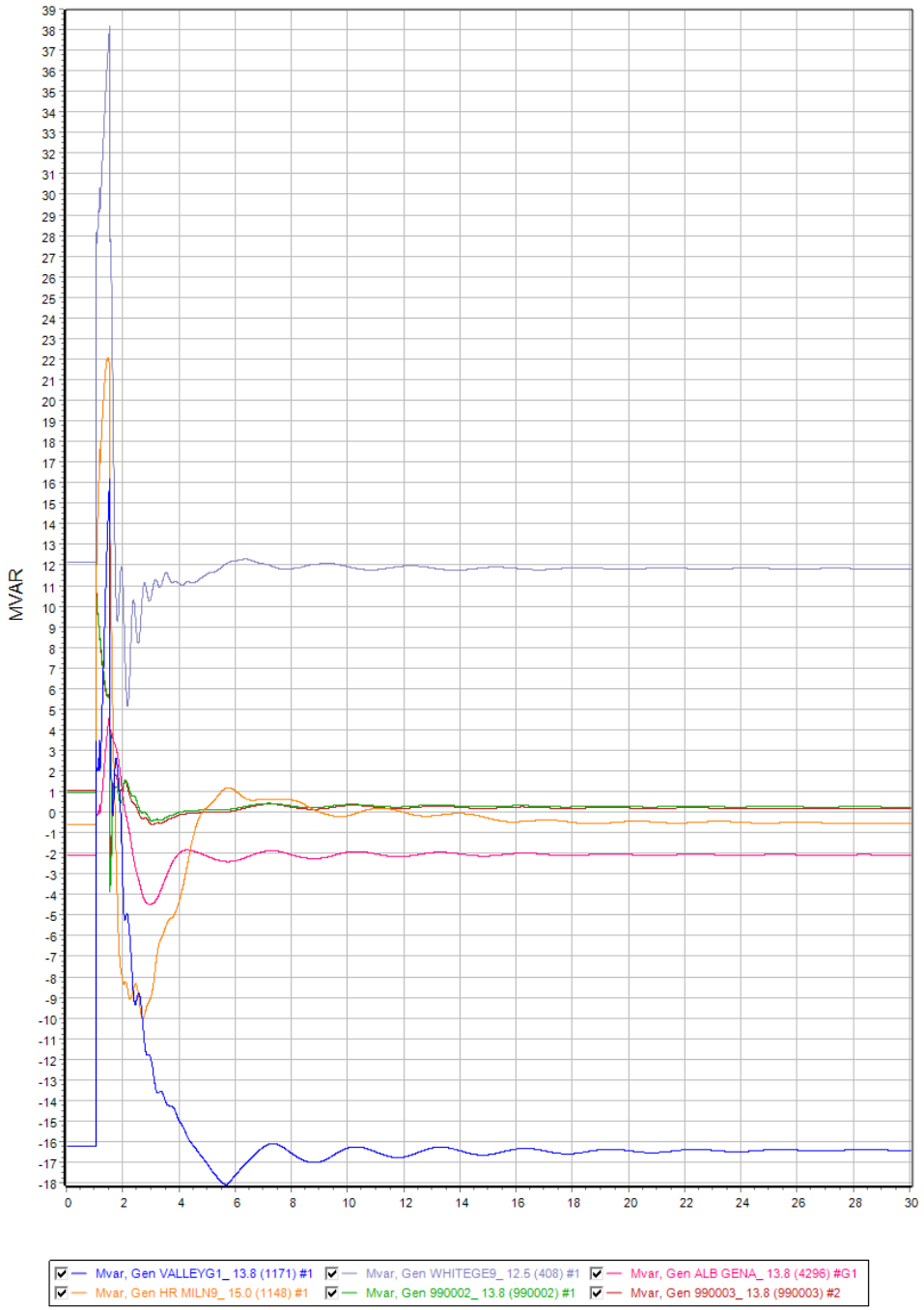


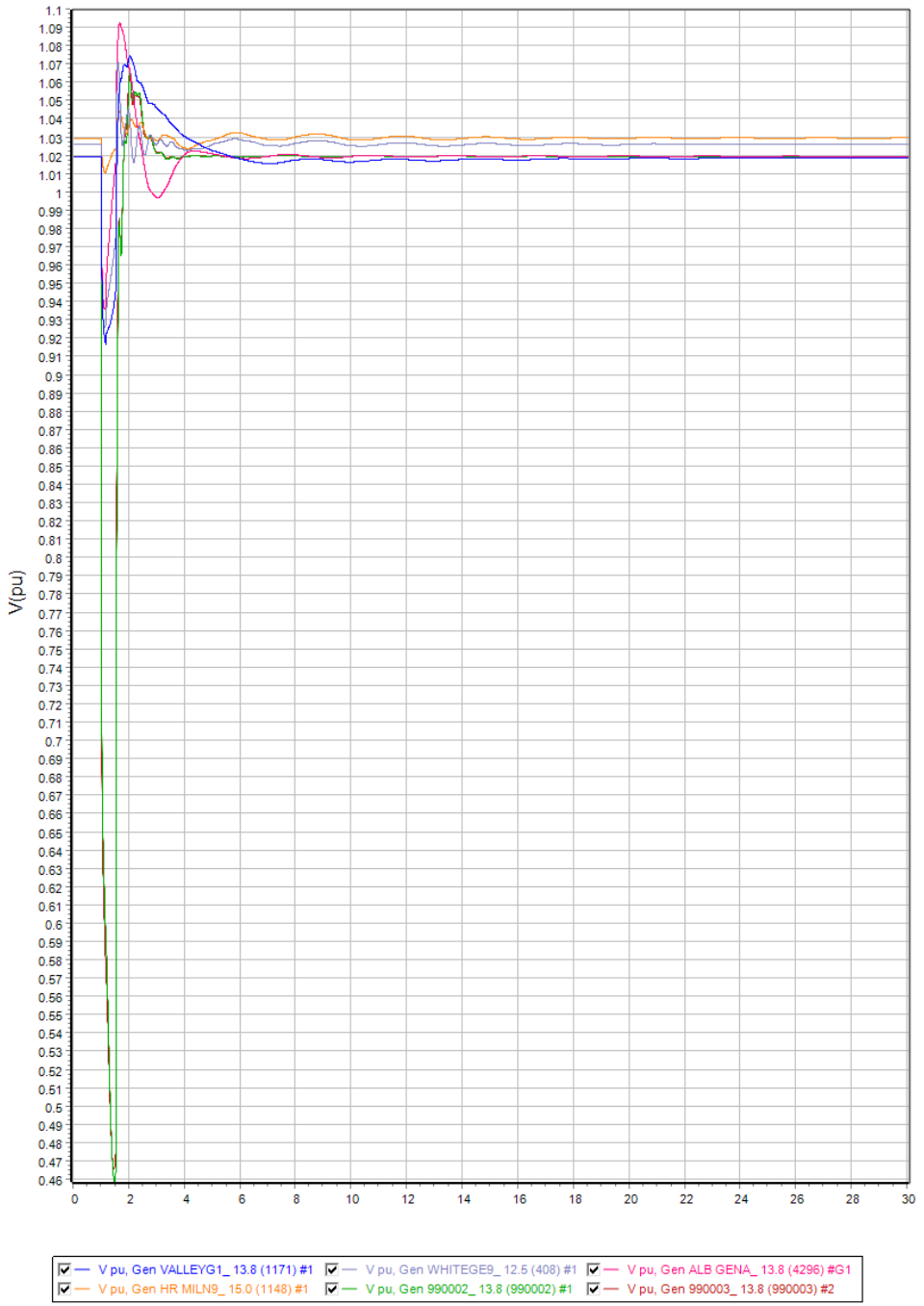
Monitor Gens. Q1





Monitor Gens. Q2

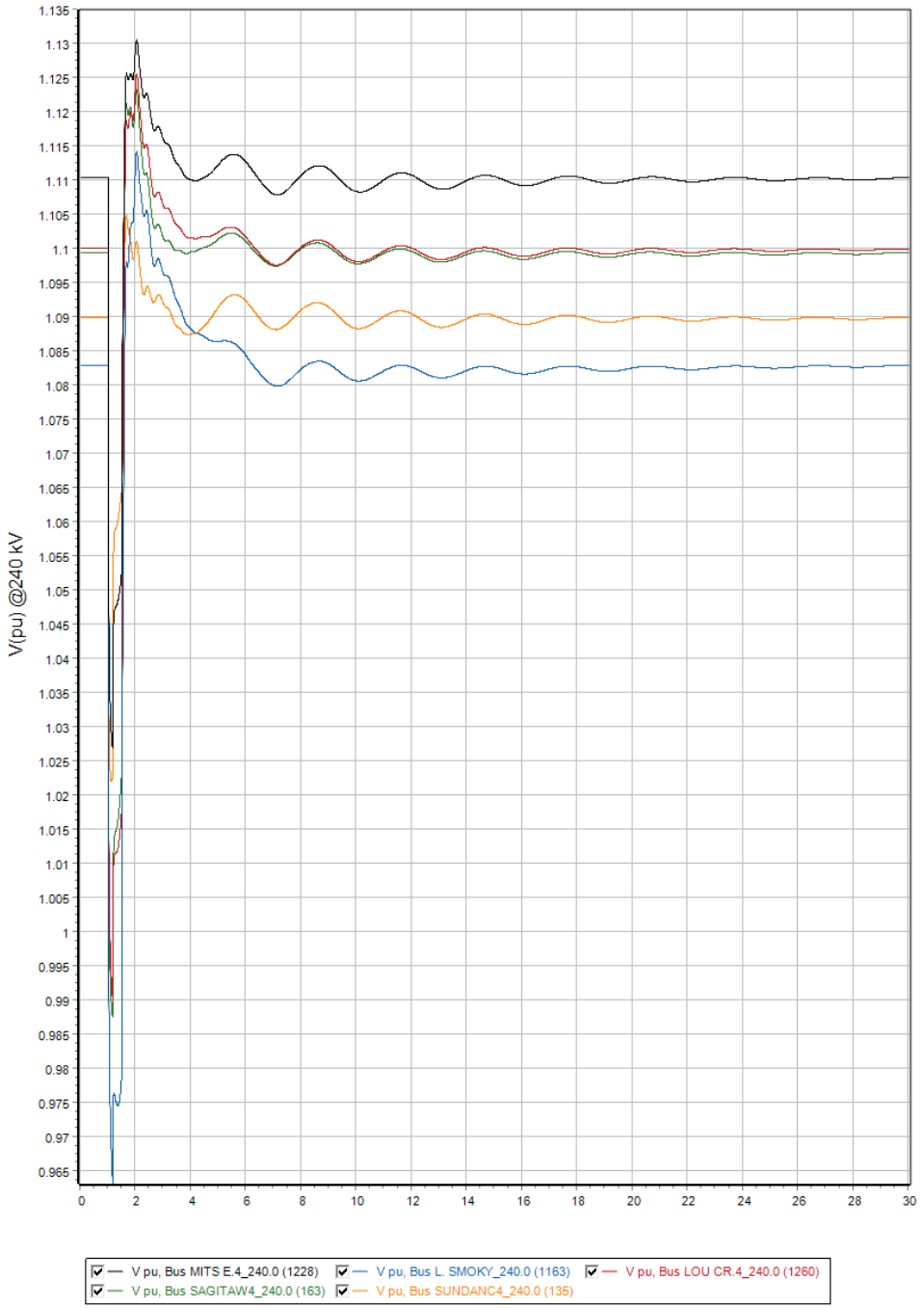


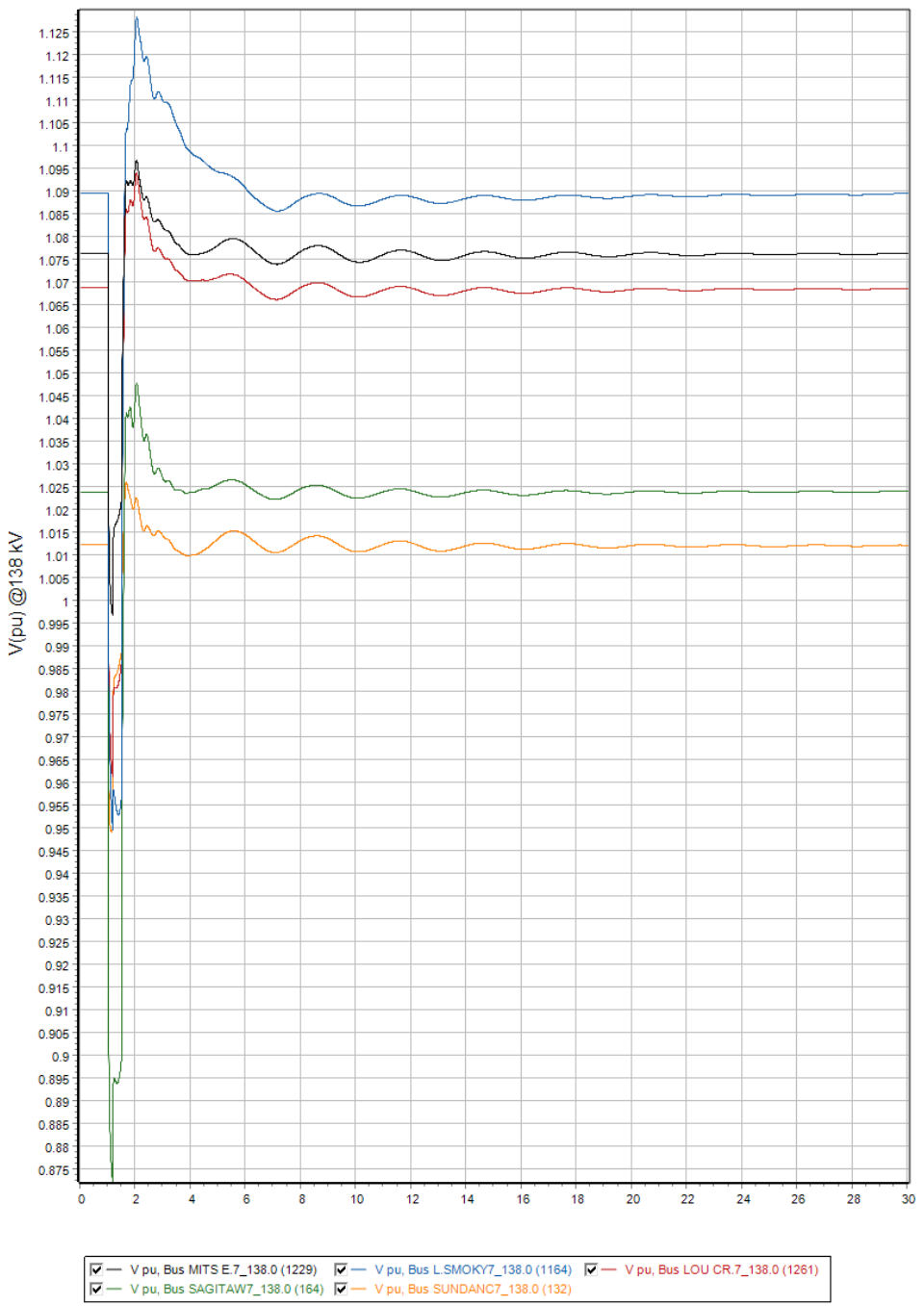


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 02A - 720L (Benbow 397S – Fox Creek 347S) @ Benbow 397S

Monitor Bus Volts Q3

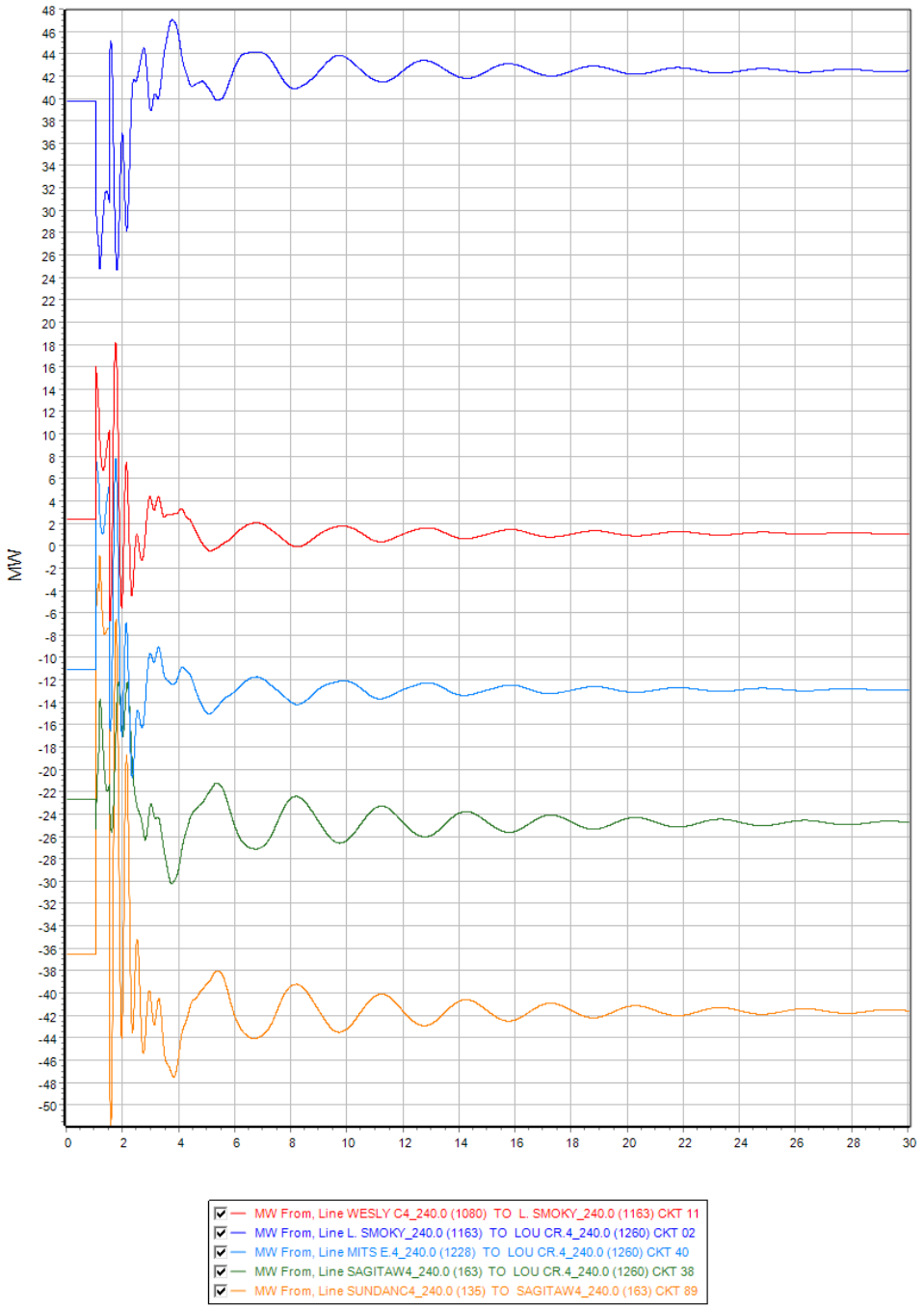


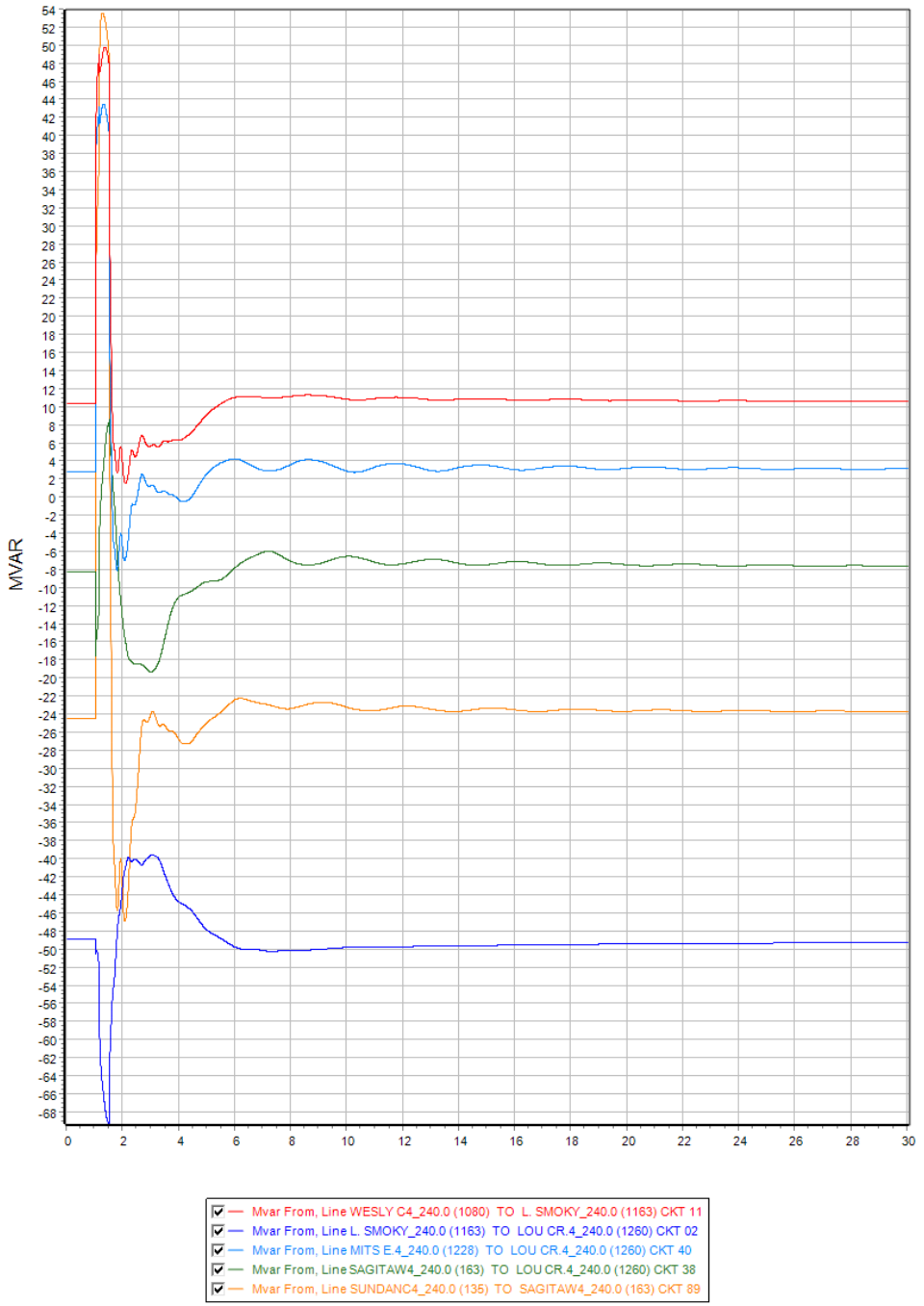


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

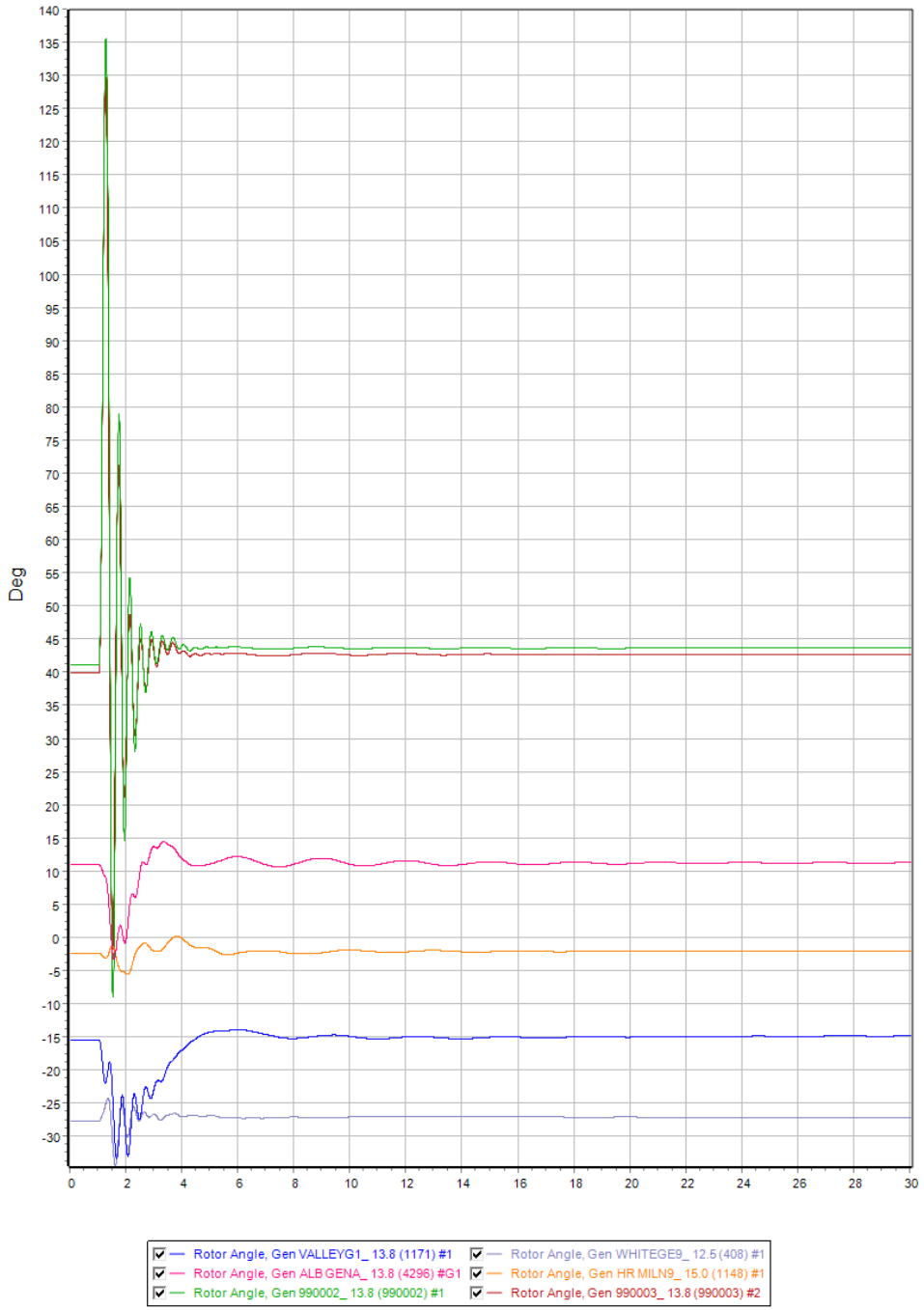
Contingency: 02A - 720L (Benbow 397S – Fox Creek 347S) @ Benbow 397S

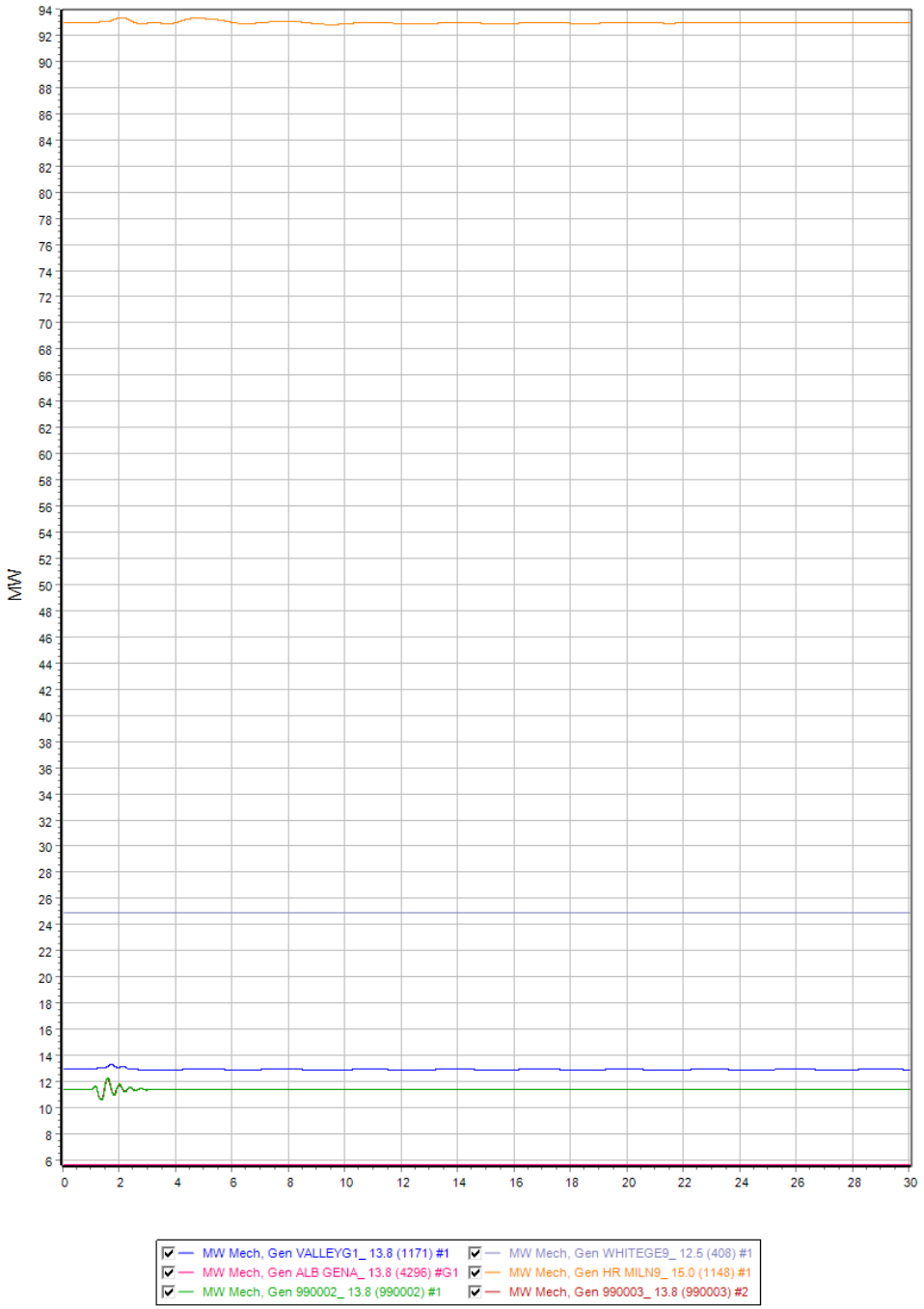
Monitor Line MW & MVAR. Q4



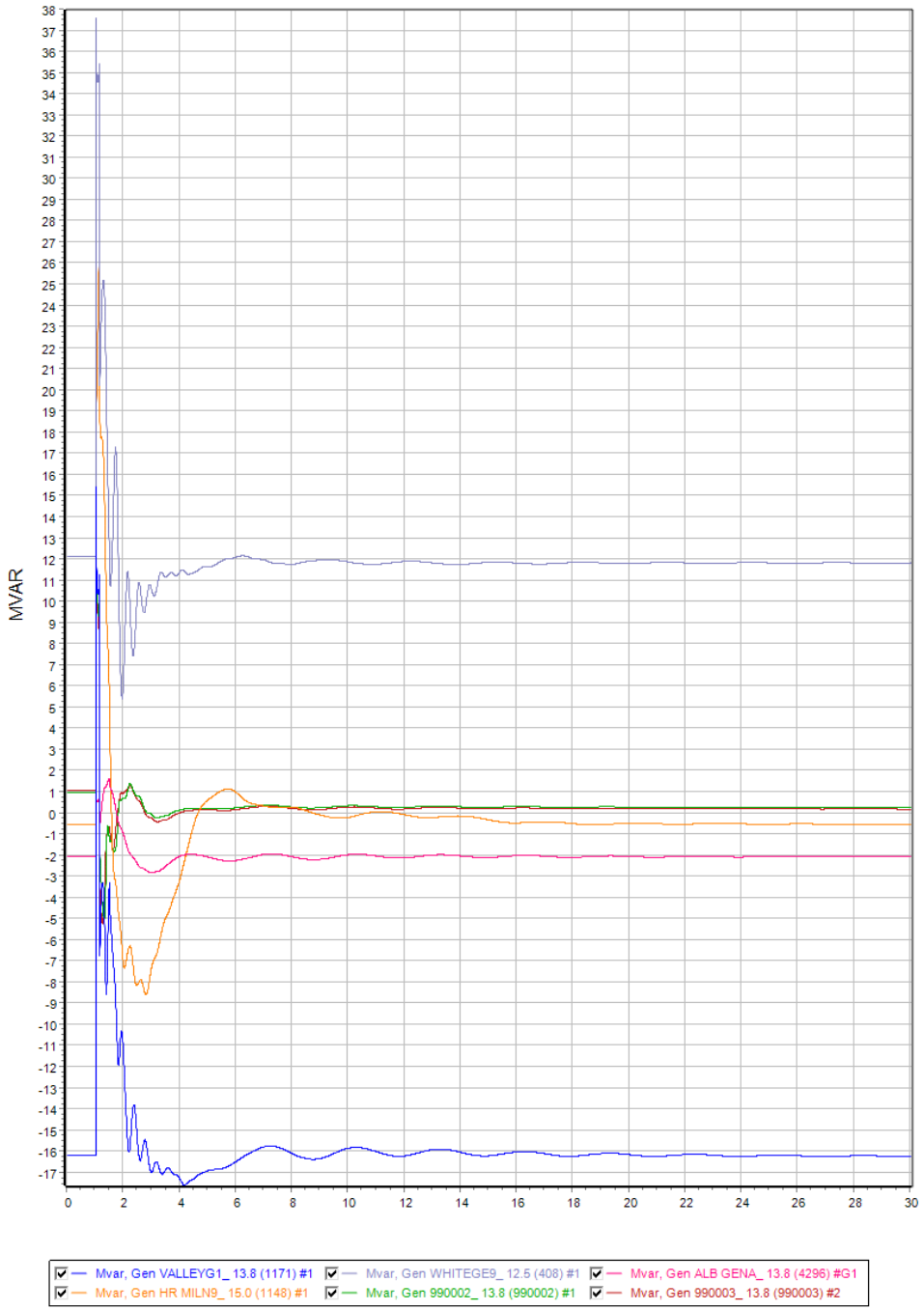


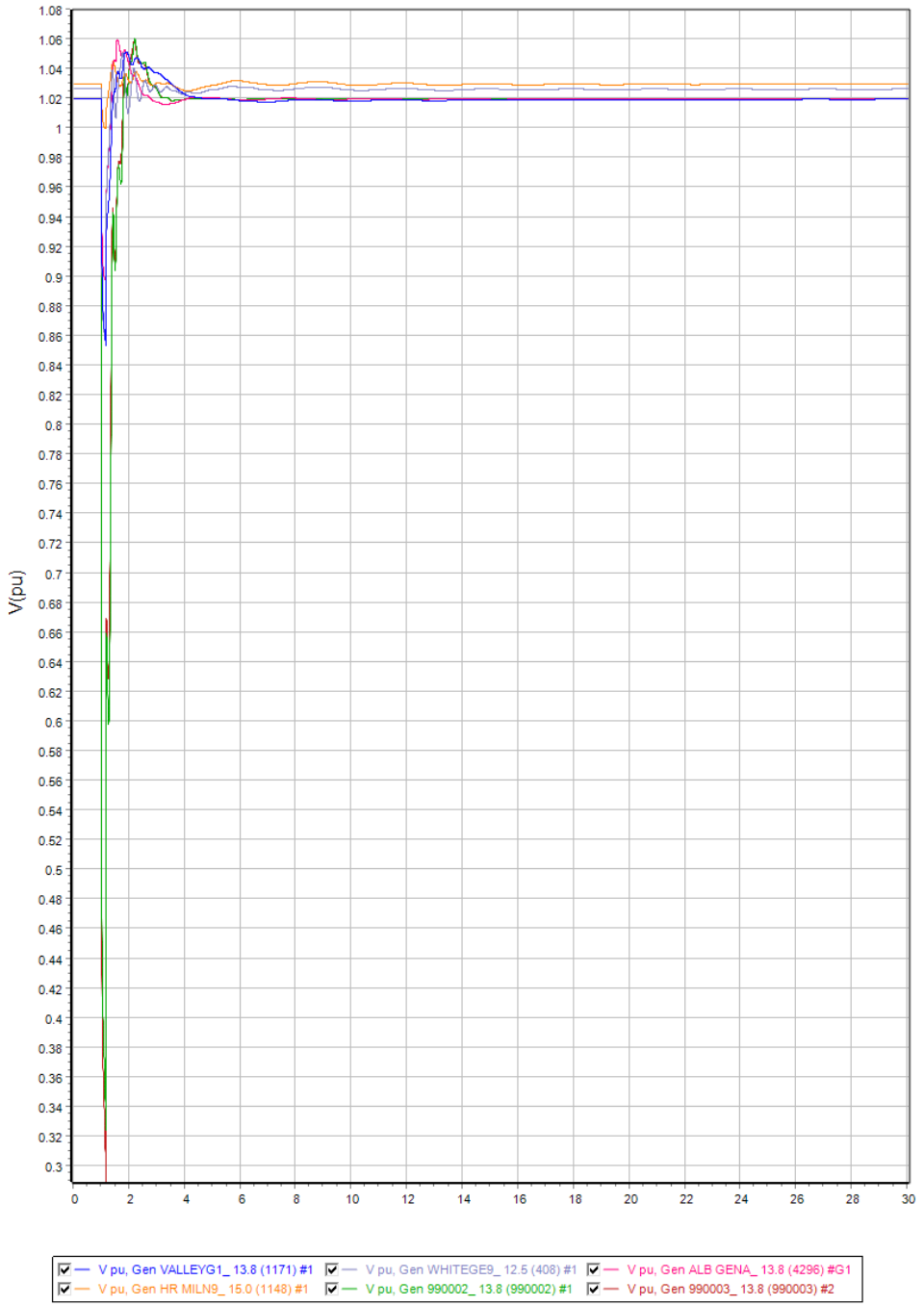
Monitor Gens. Q1



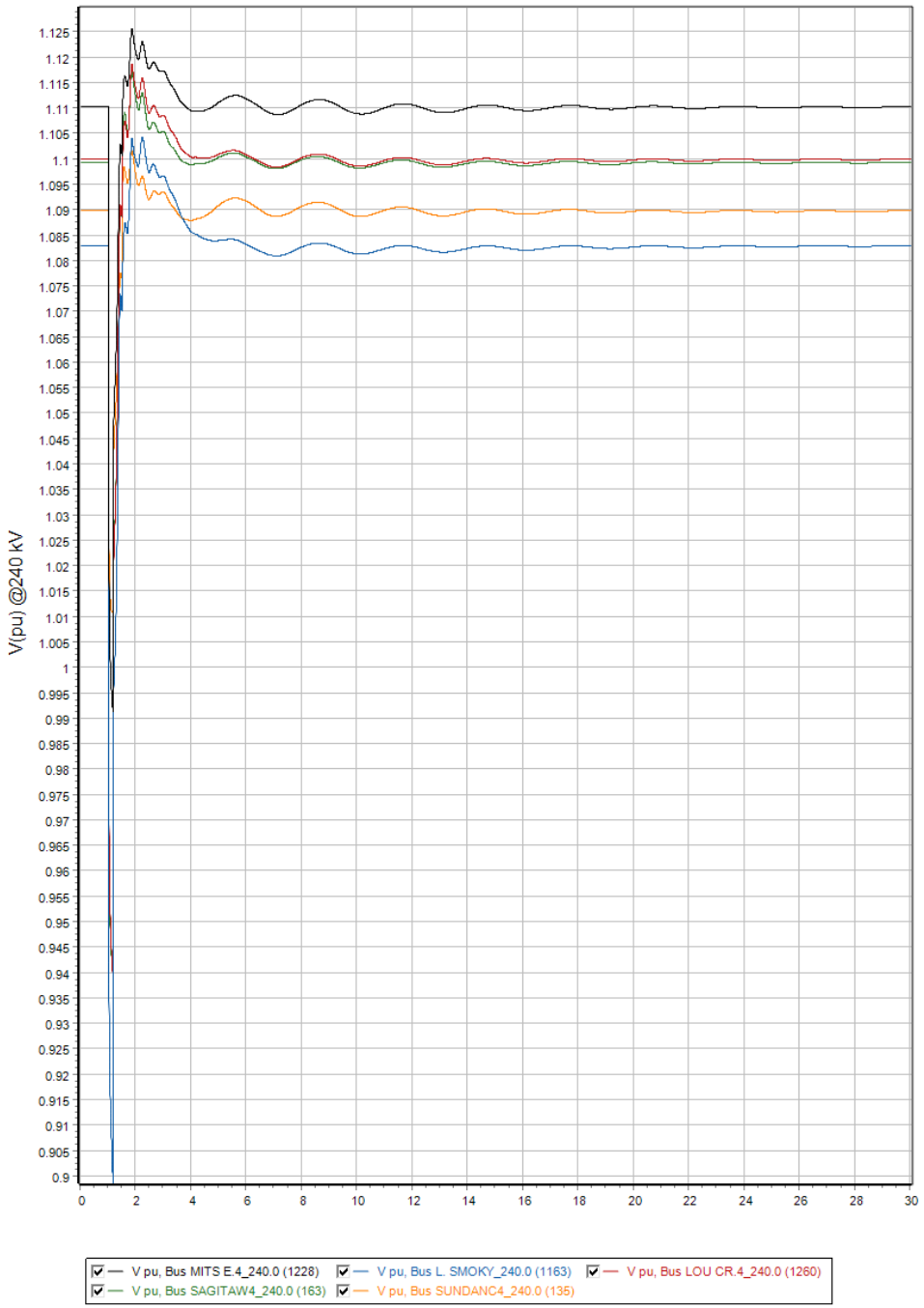


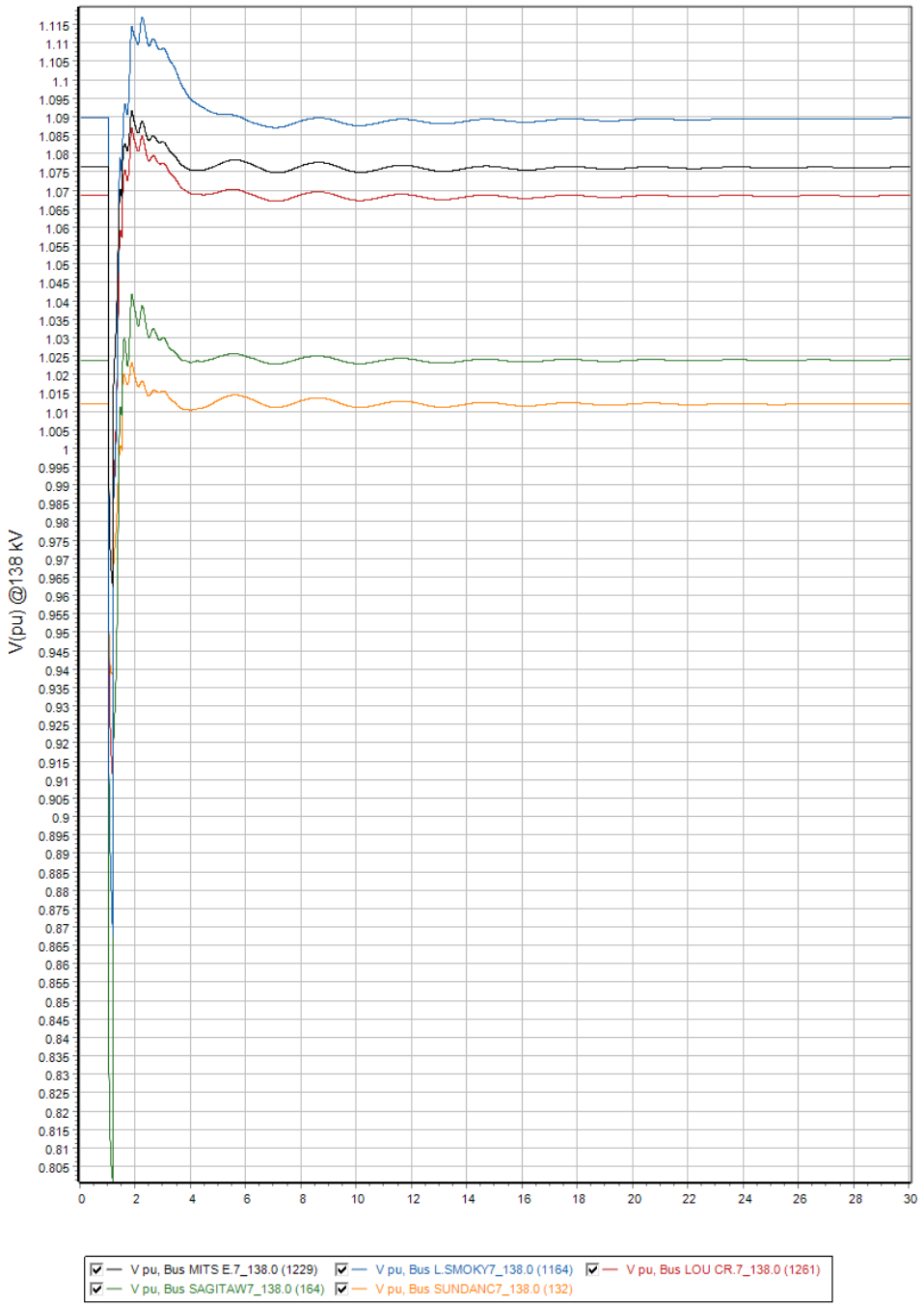
Monitor Gens. Q2





Monitor Bus Volts Q3

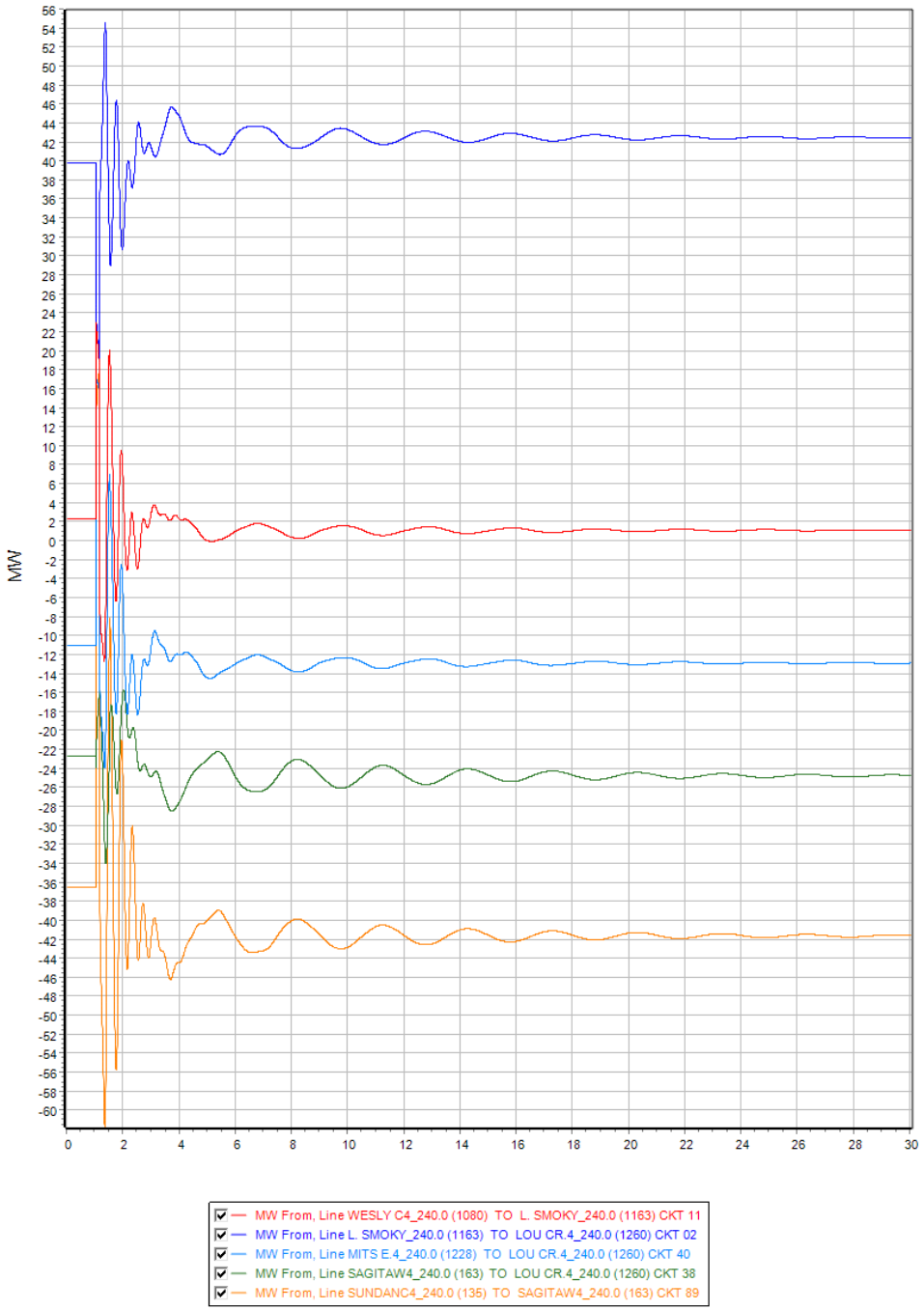


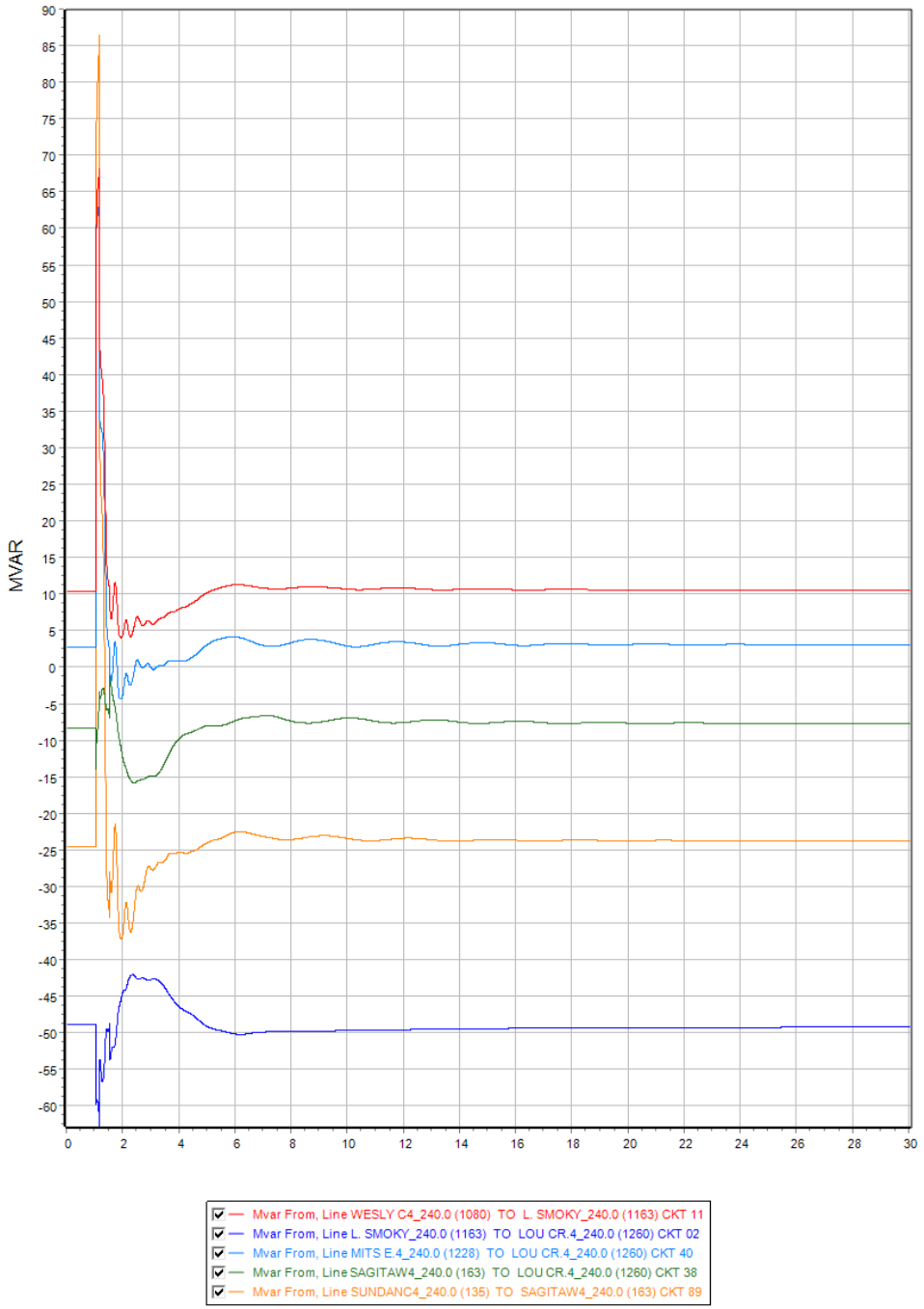


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 02B - 720L (Benbow 397S – Fox Creek 347S) @ Fox Creek 347S

Monitor Line MW & MVAR. Q4

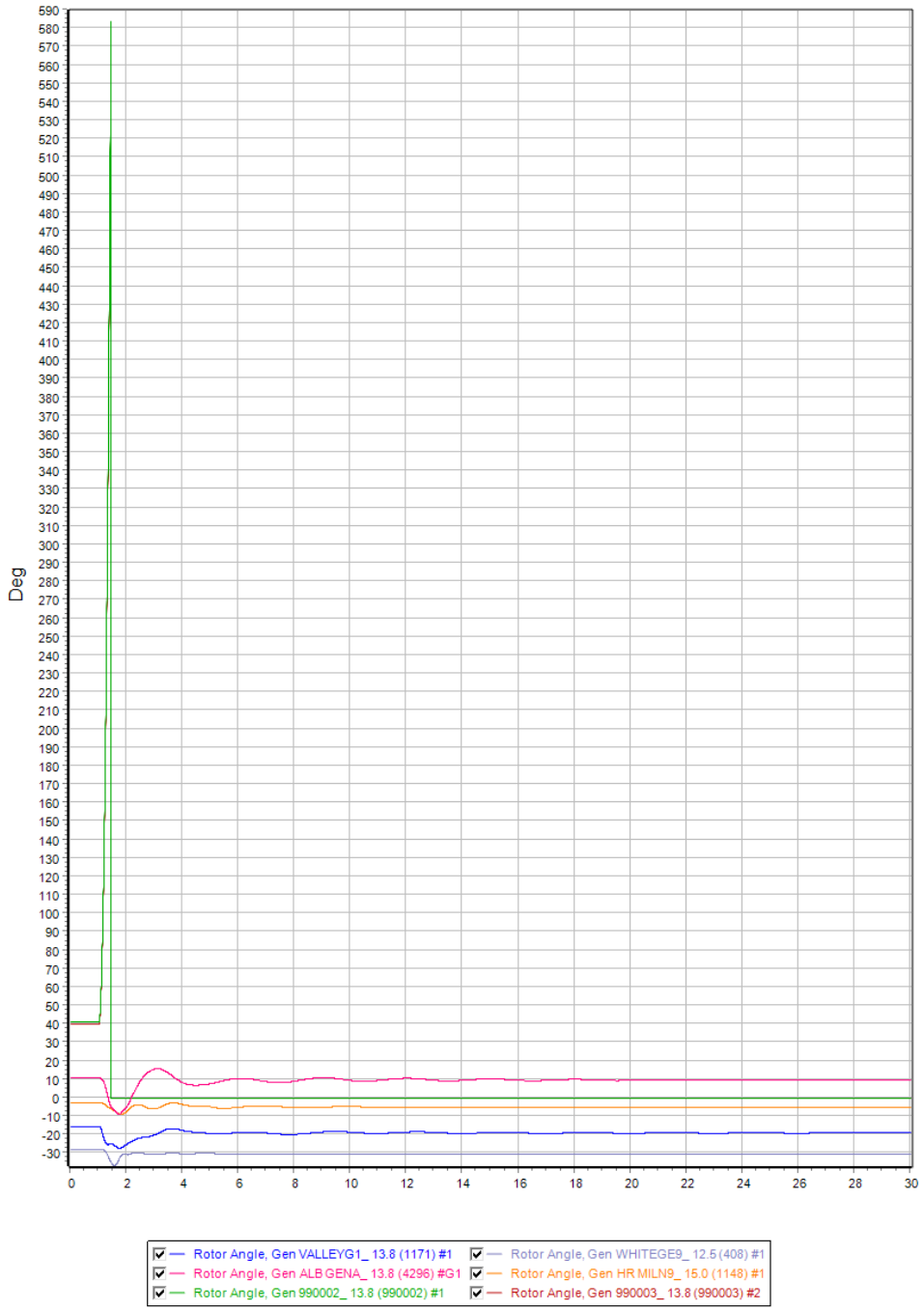


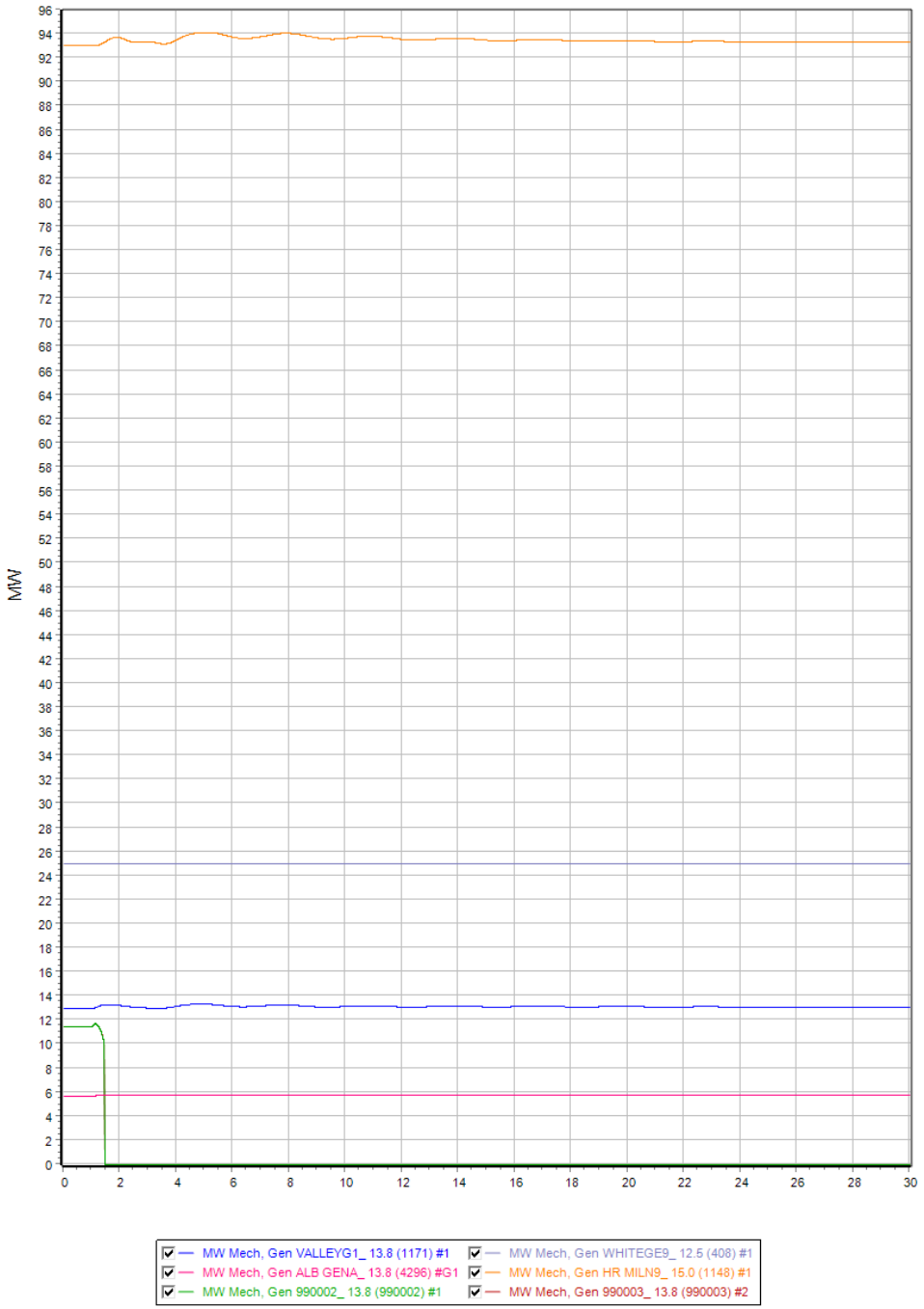


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

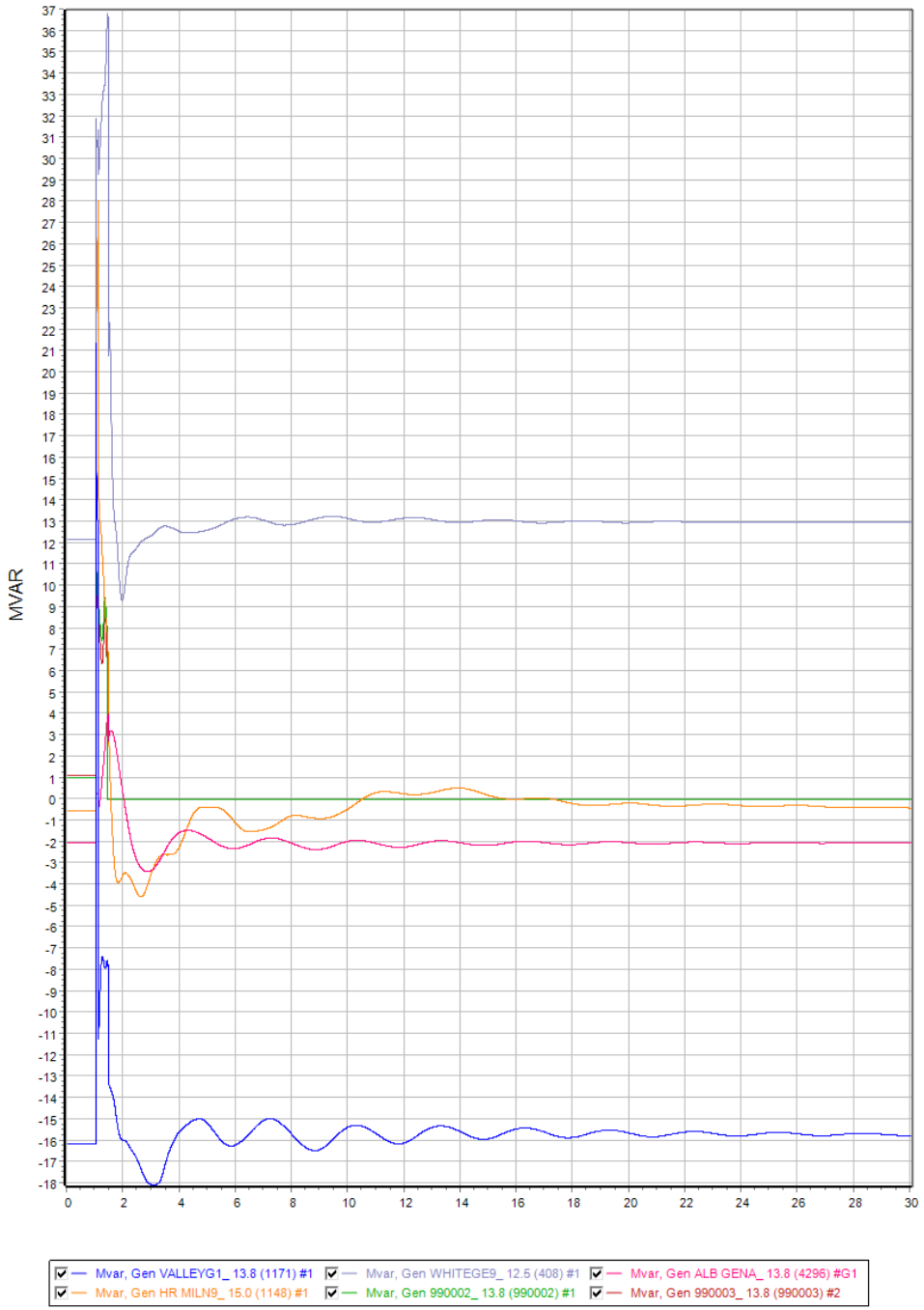
Contingency: 02B - 720L (Benbow 397S – Fox Creek 347S) @ Fox Creek 347S

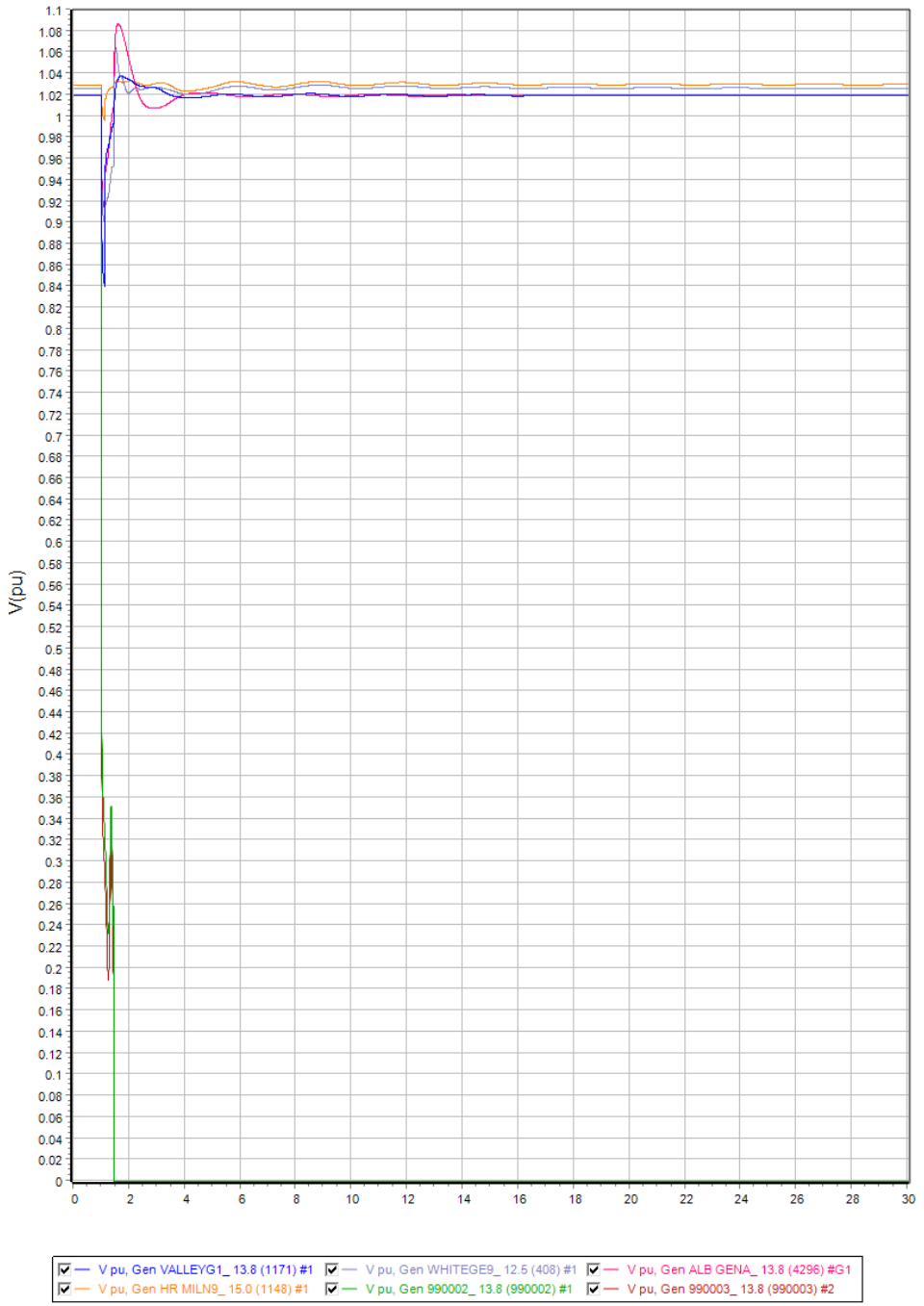
Monitor Gens. Q1





Monitor Gens. Q2





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 03A - 7L199 (Fox Creek 741S – Fox Creek 347S) @ Fox Creek 741S

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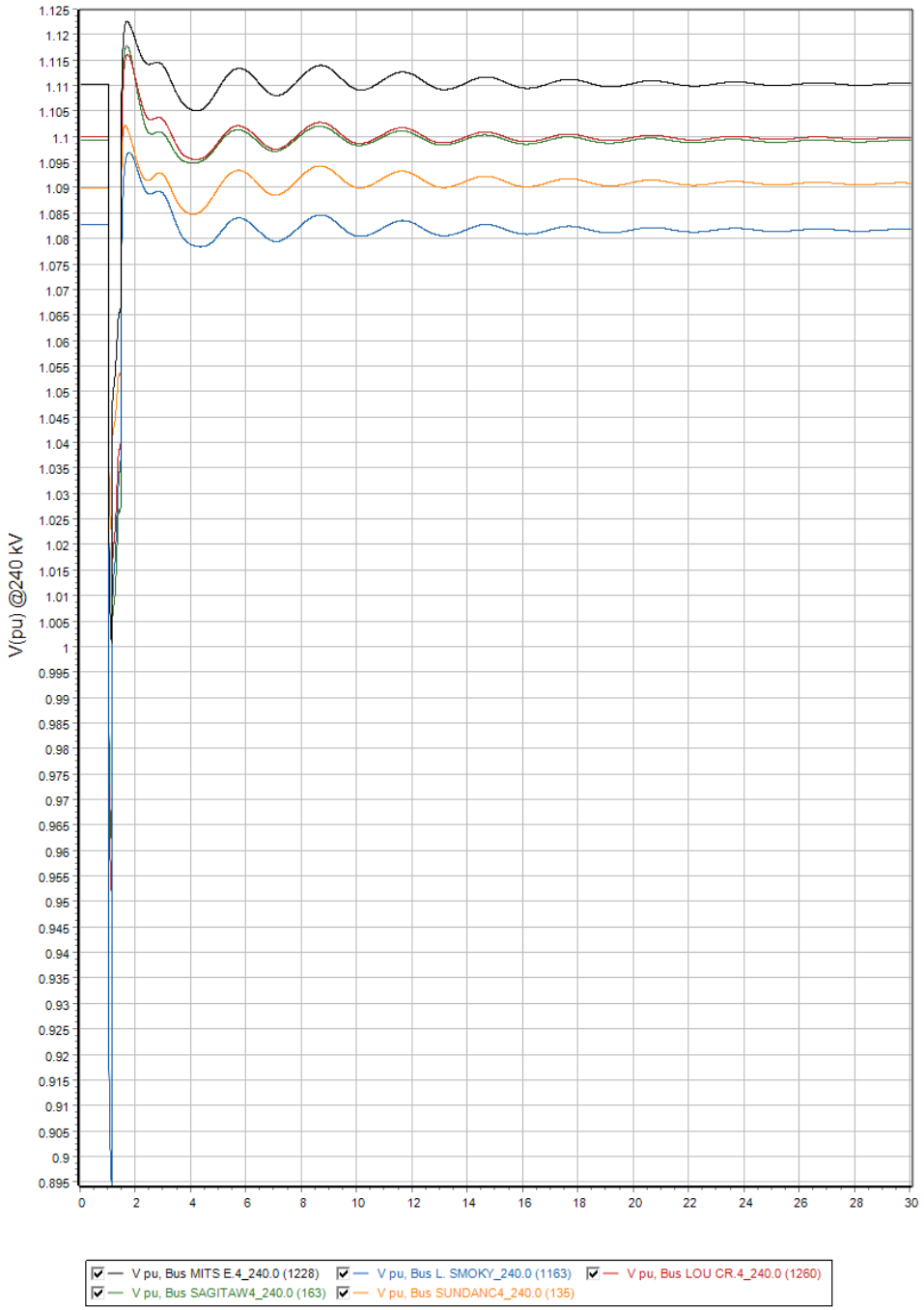
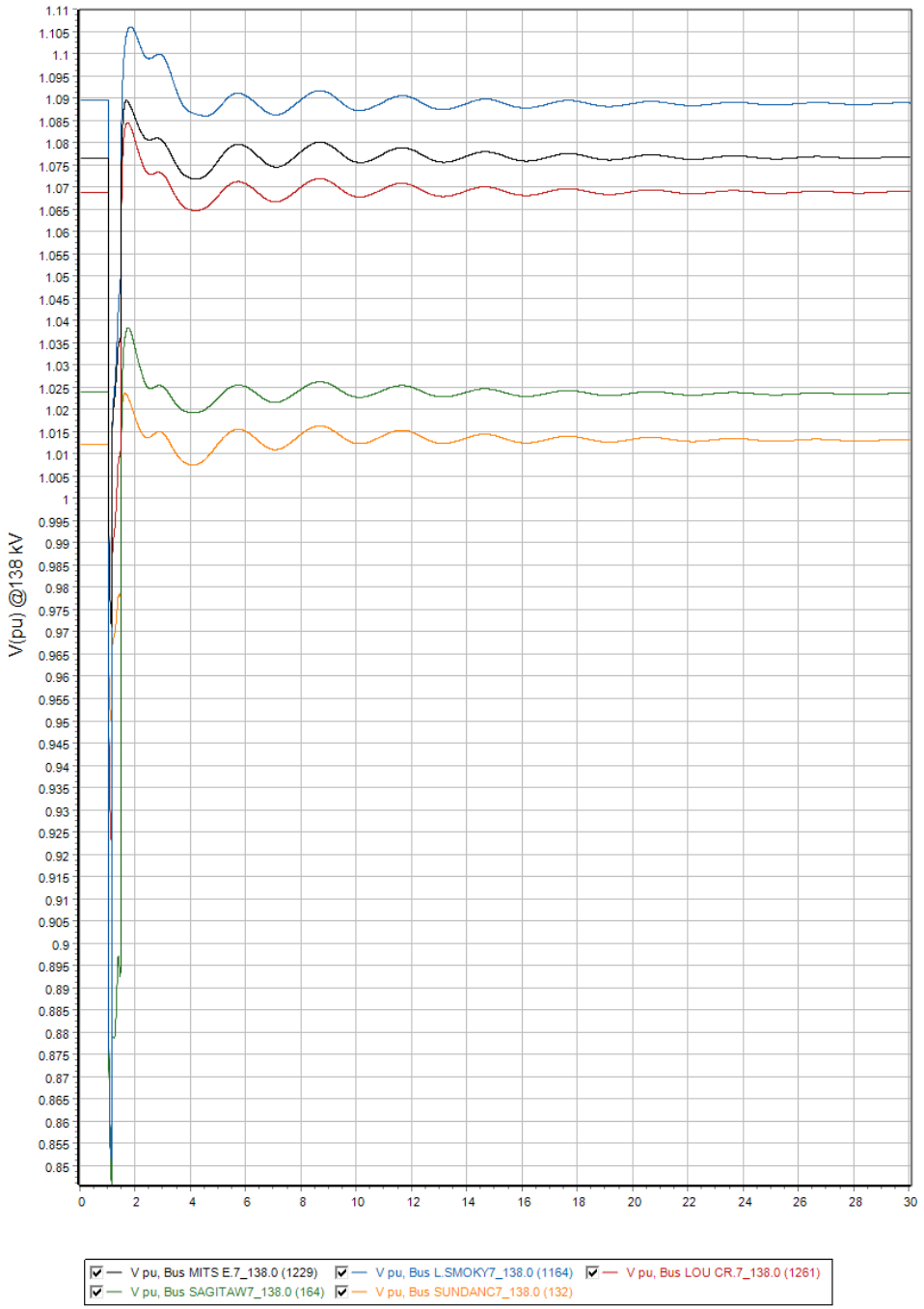
Monitor Bus Volts Q3

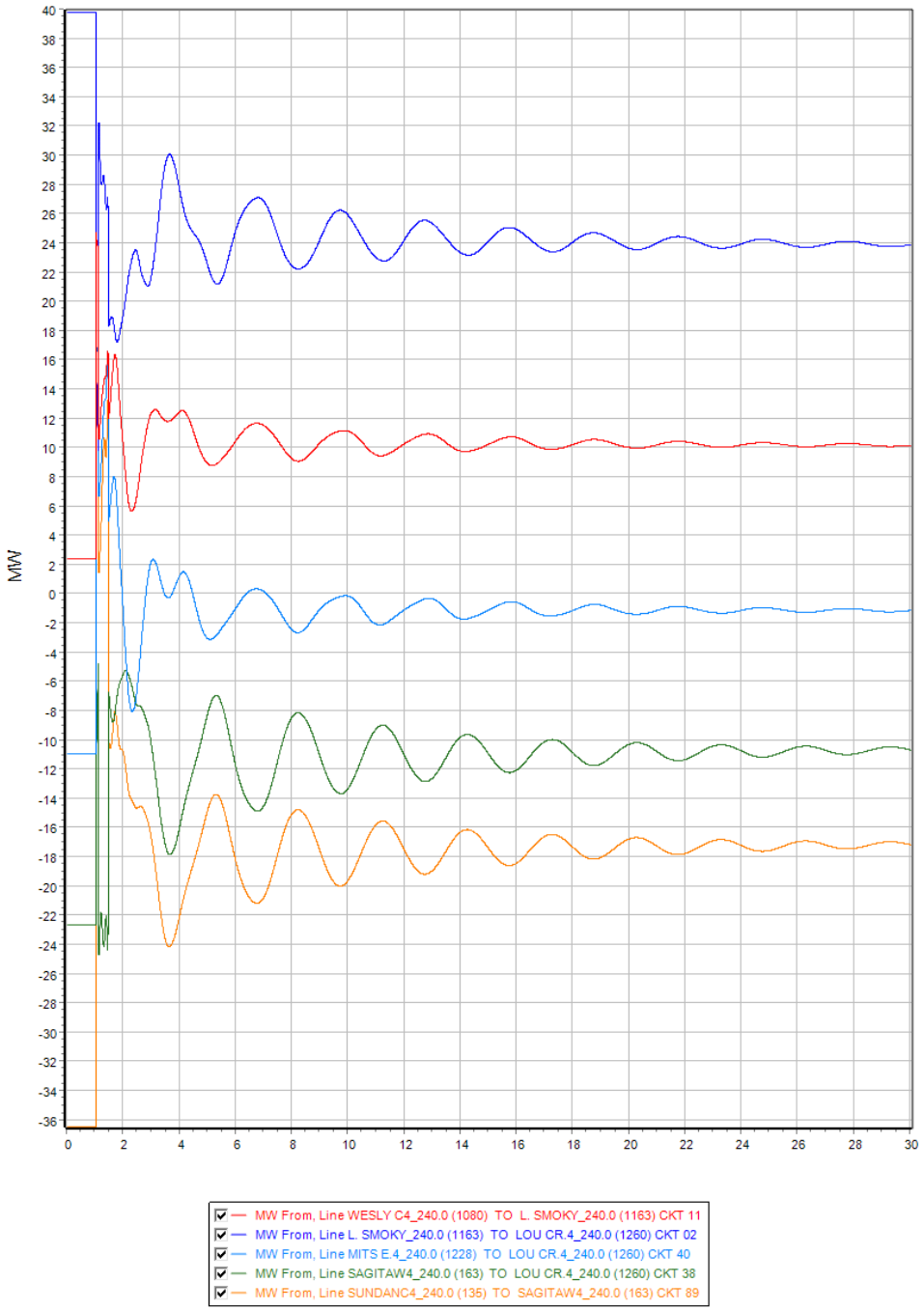


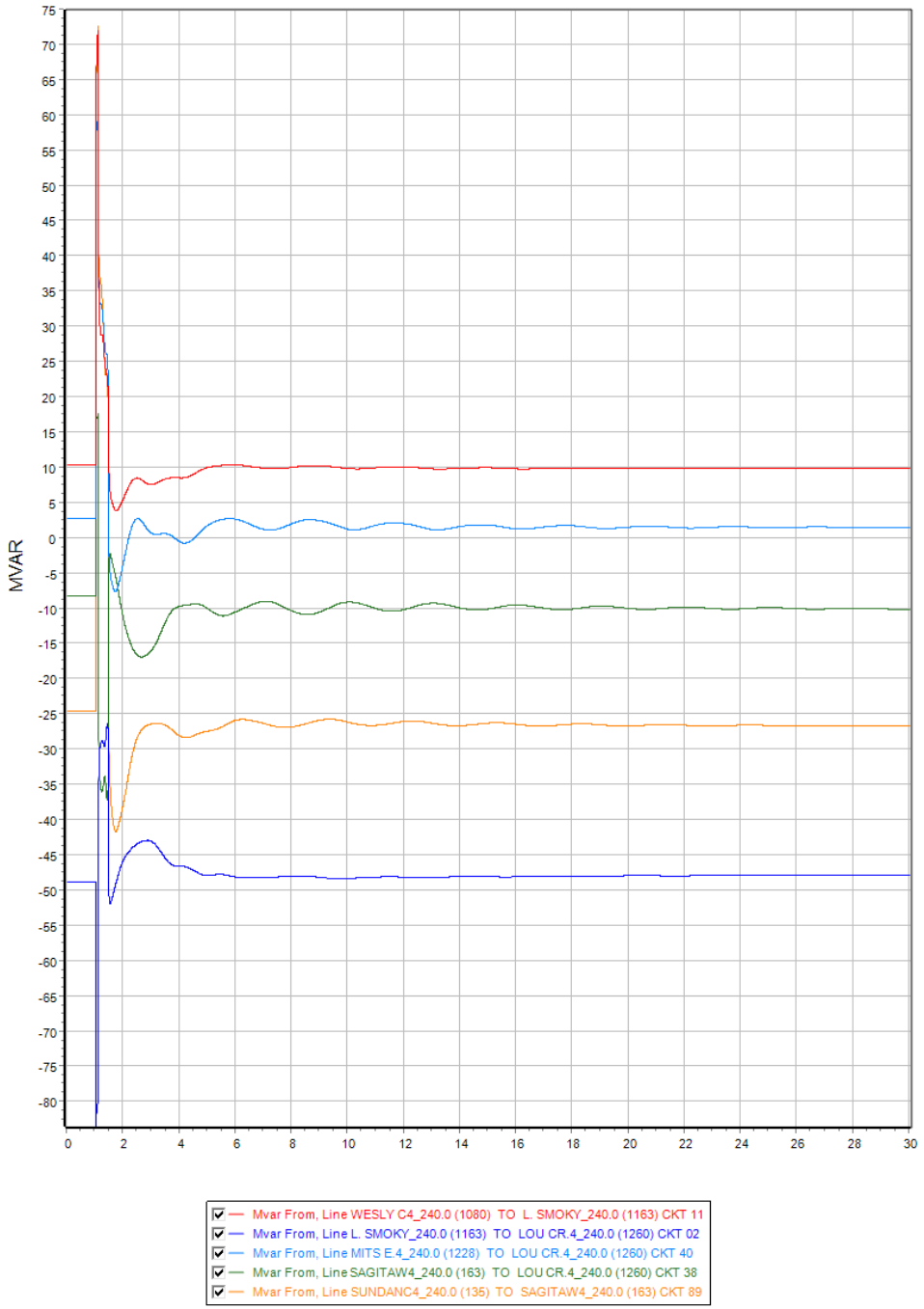


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

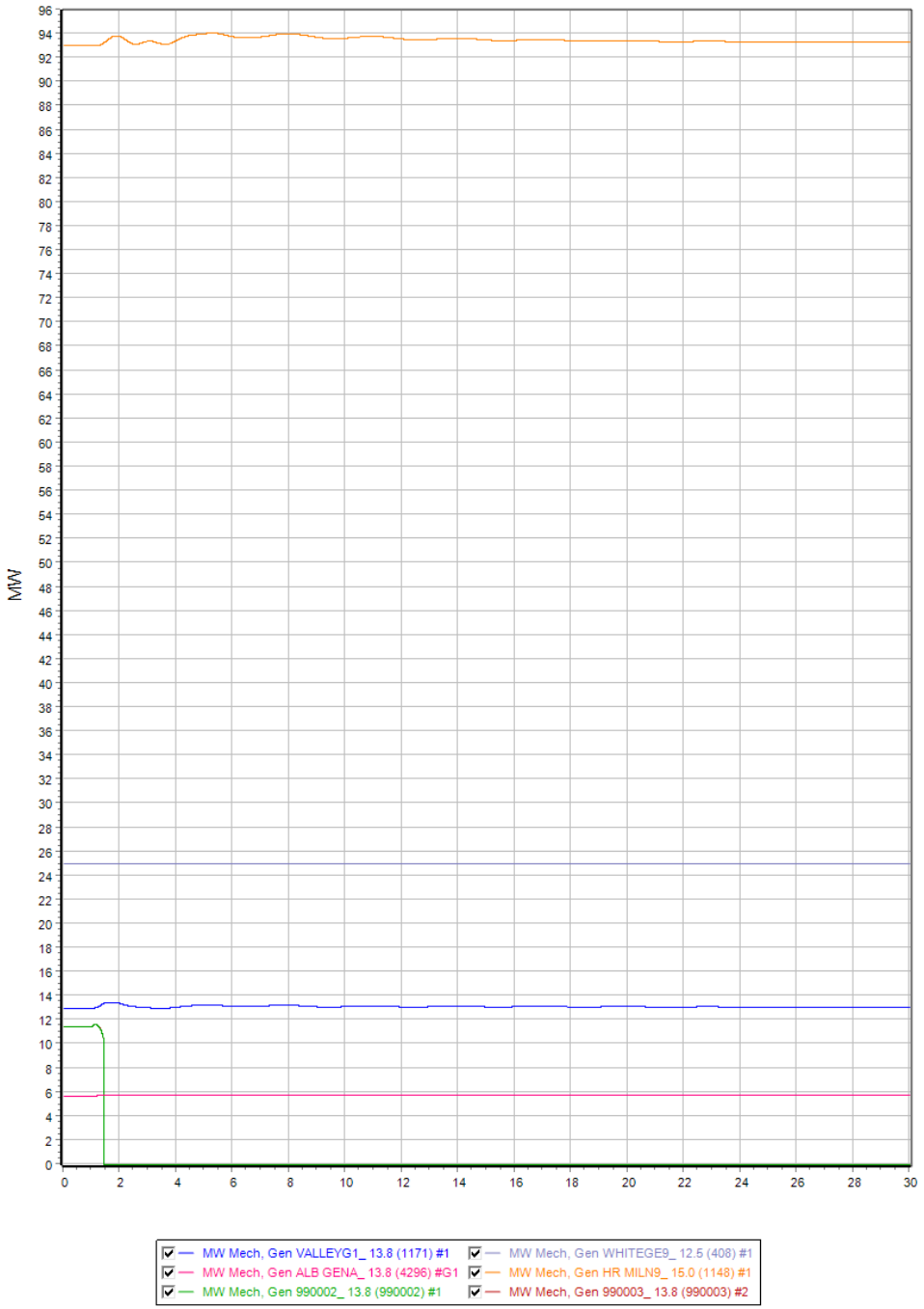
Contingency: 03A - 7L199 (Fox Creek 741S – Fox Creek 347S) @ Fox Creek 741S

Monitor Line MW & MVAR. Q4

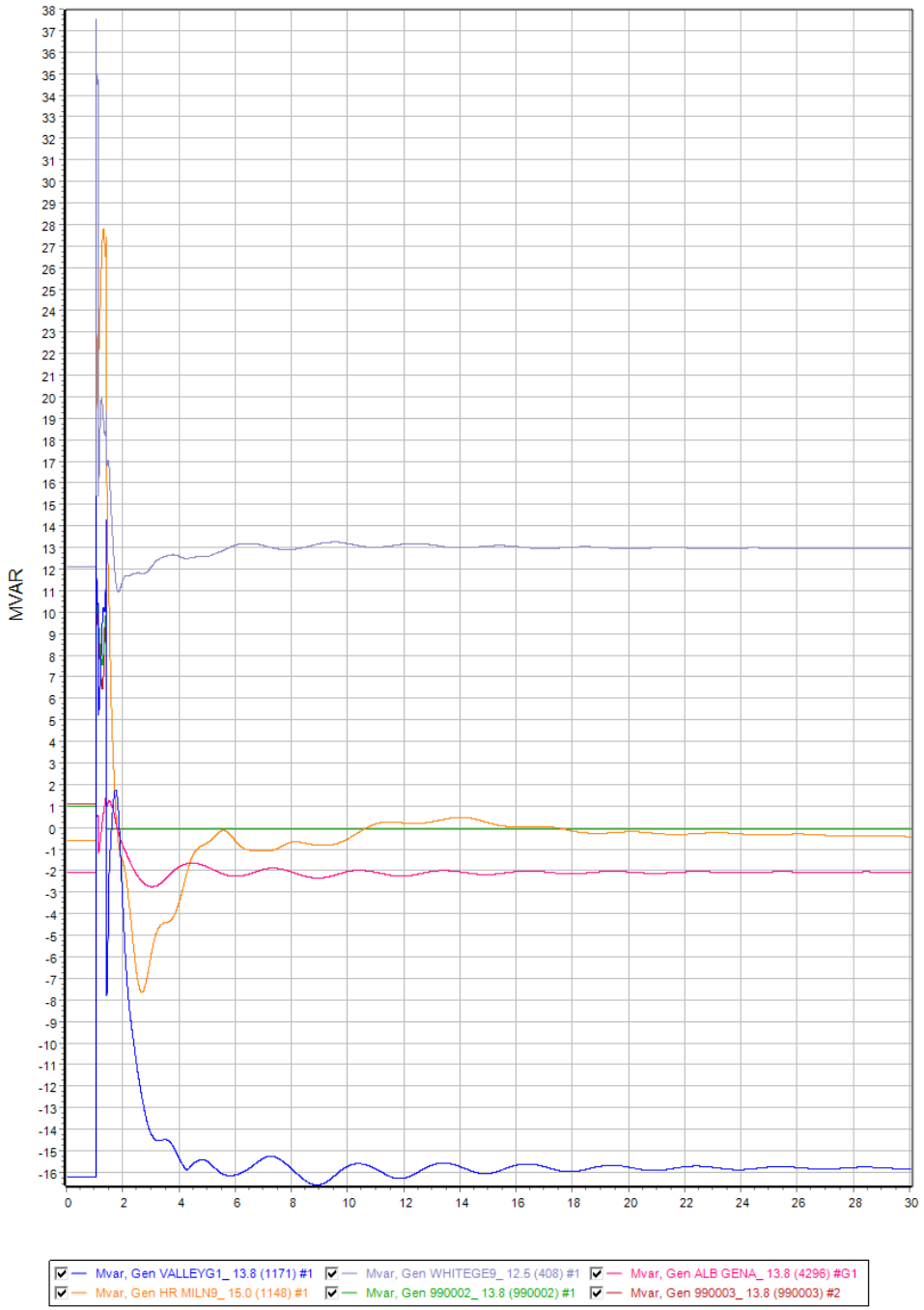


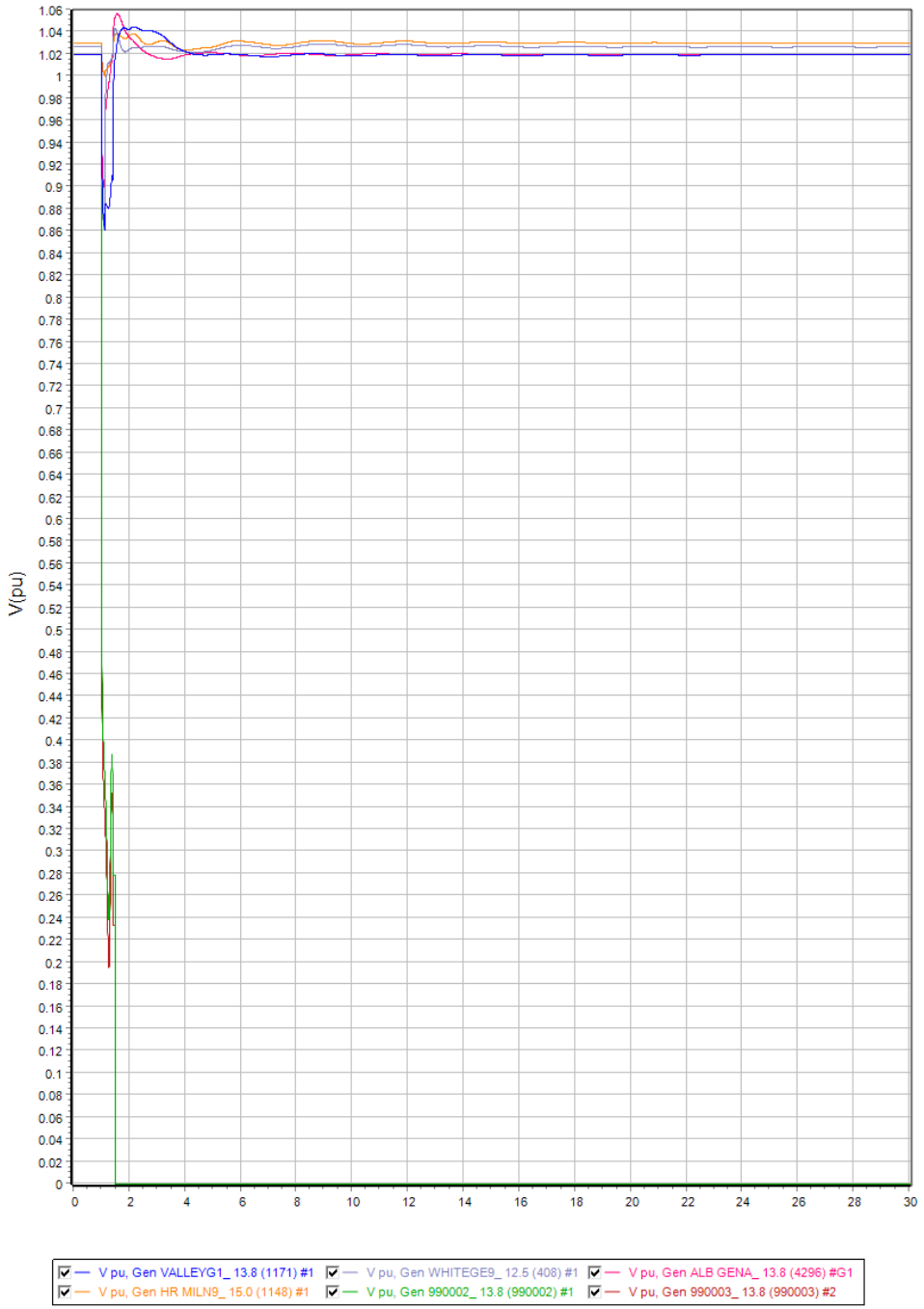


Monitor Gens. Q1



Monitor Gens. Q2

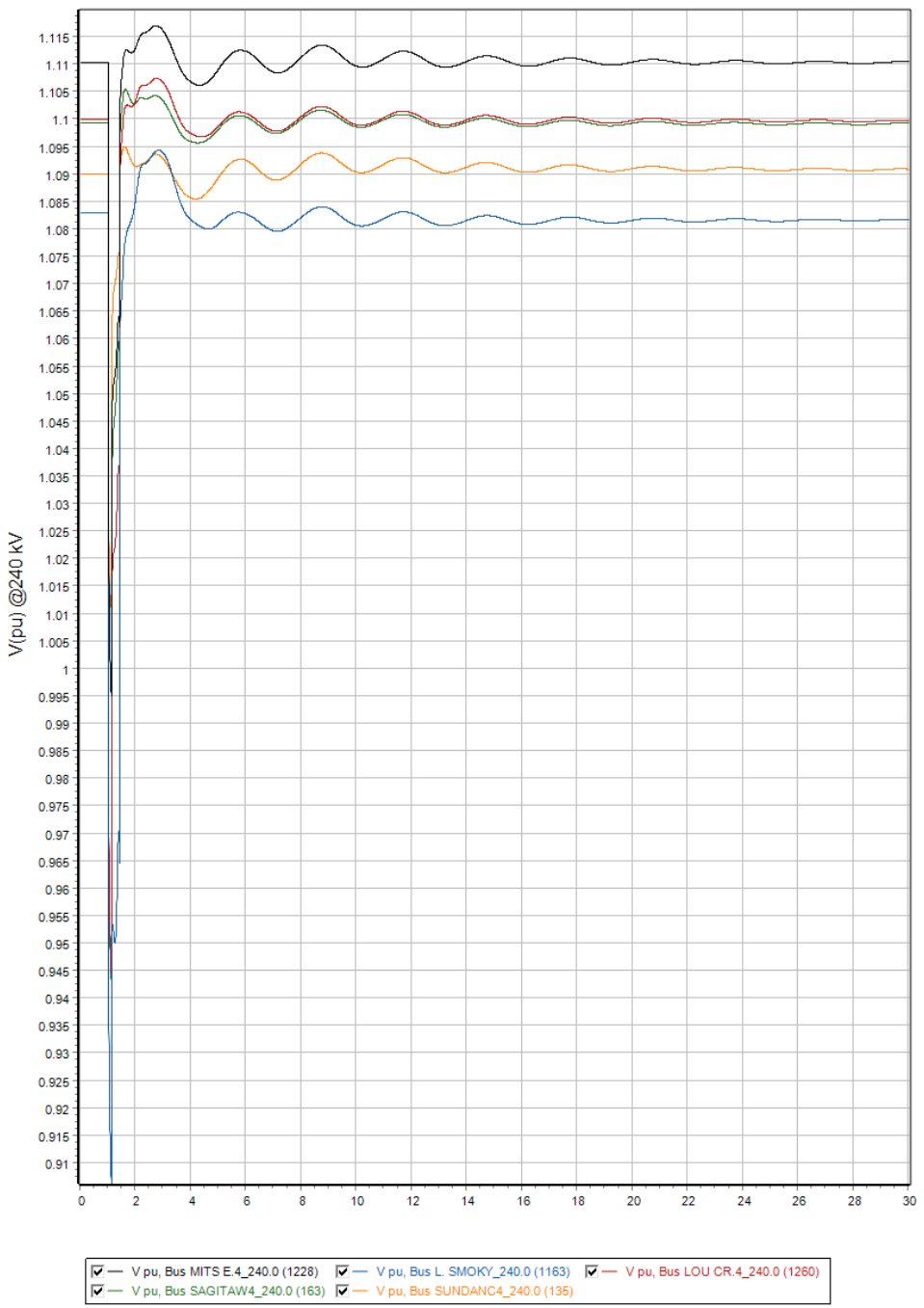


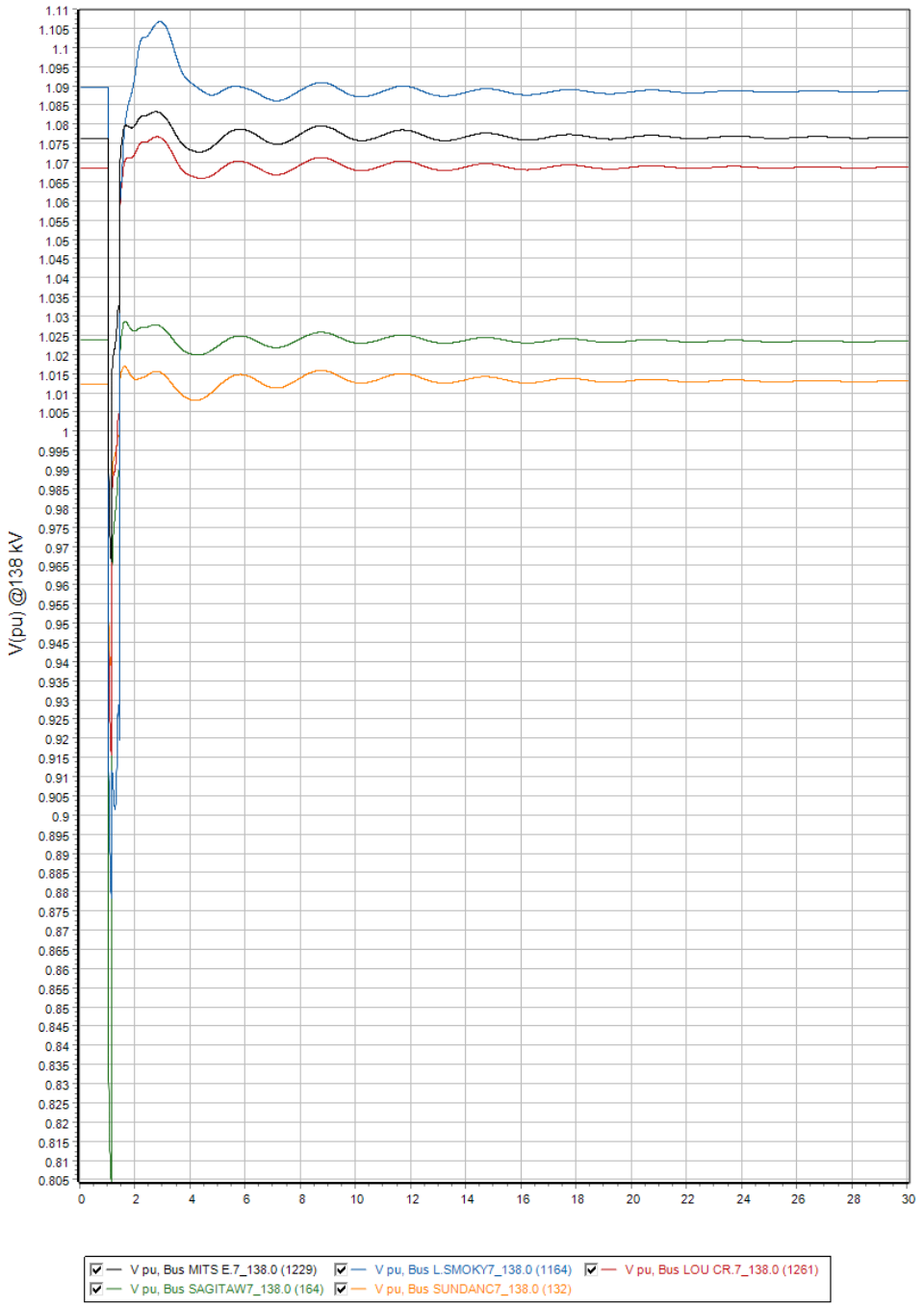


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 03B - 7L199 (Fox Creek 741S – Fox Creek 347S) @ Fox Creek 347S

Monitor Bus Volts Q3





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 03B - 7L199 (Fox Creek 741S – Fox Creek 347S) @ Fox Creek 347S

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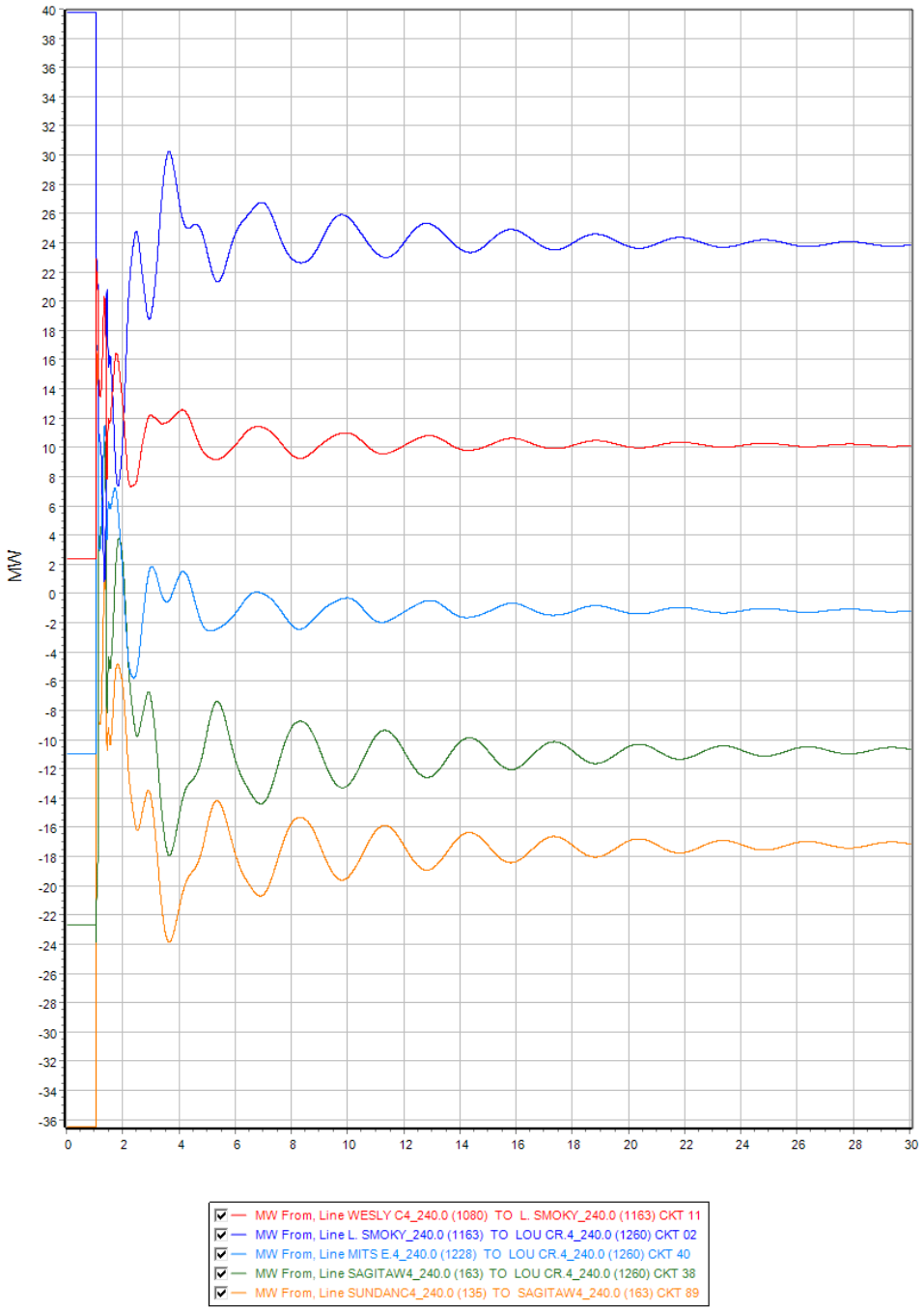
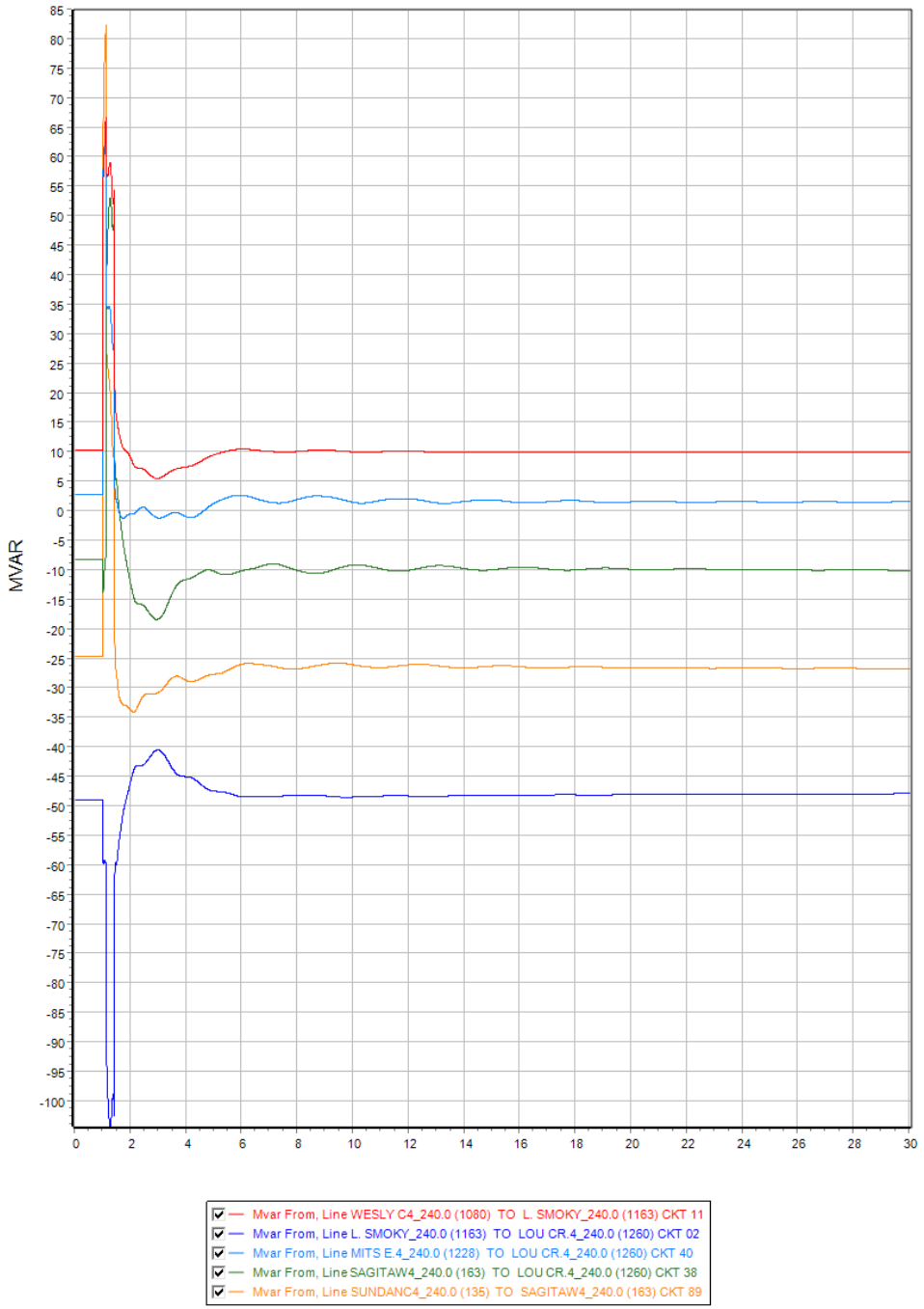
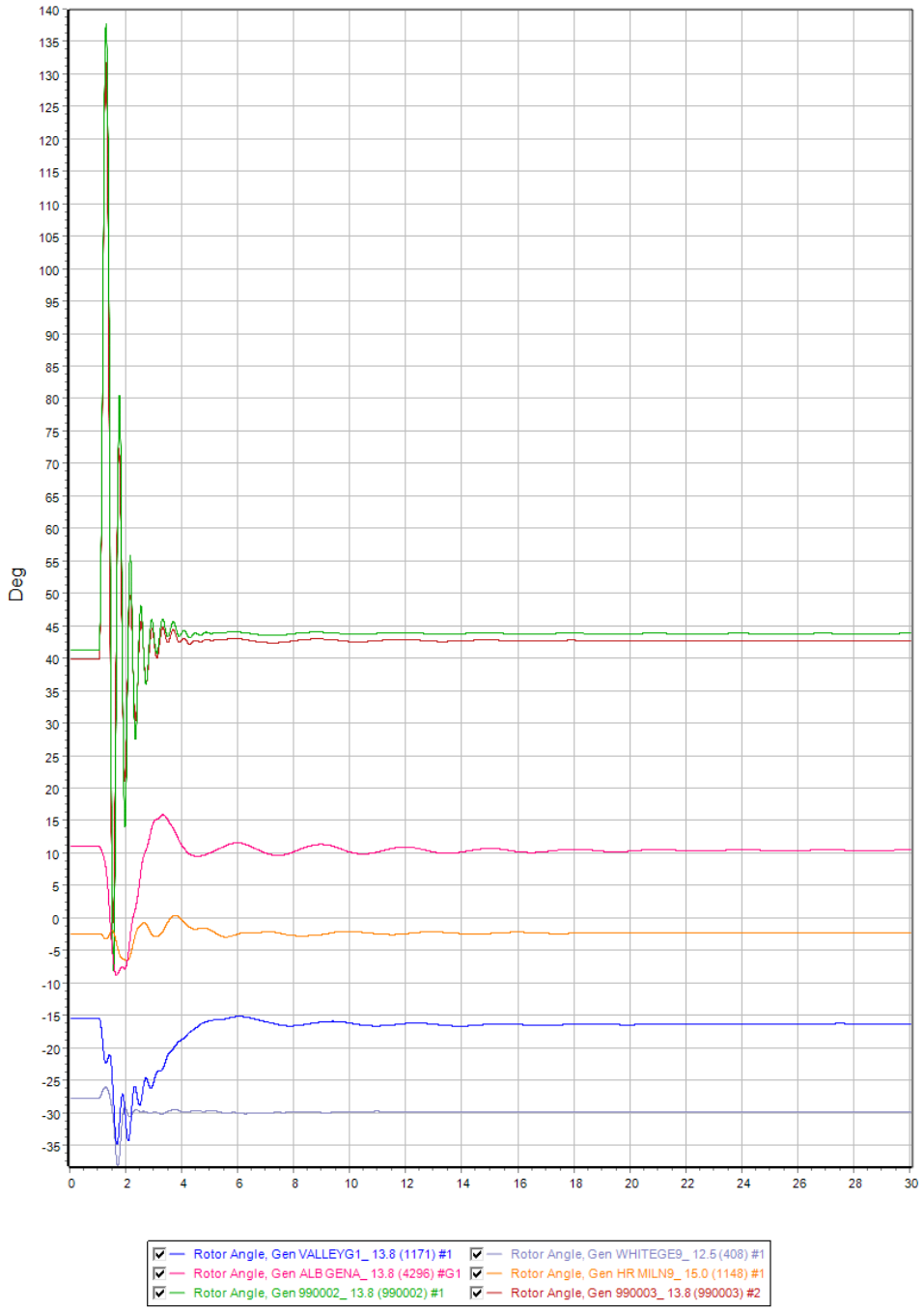
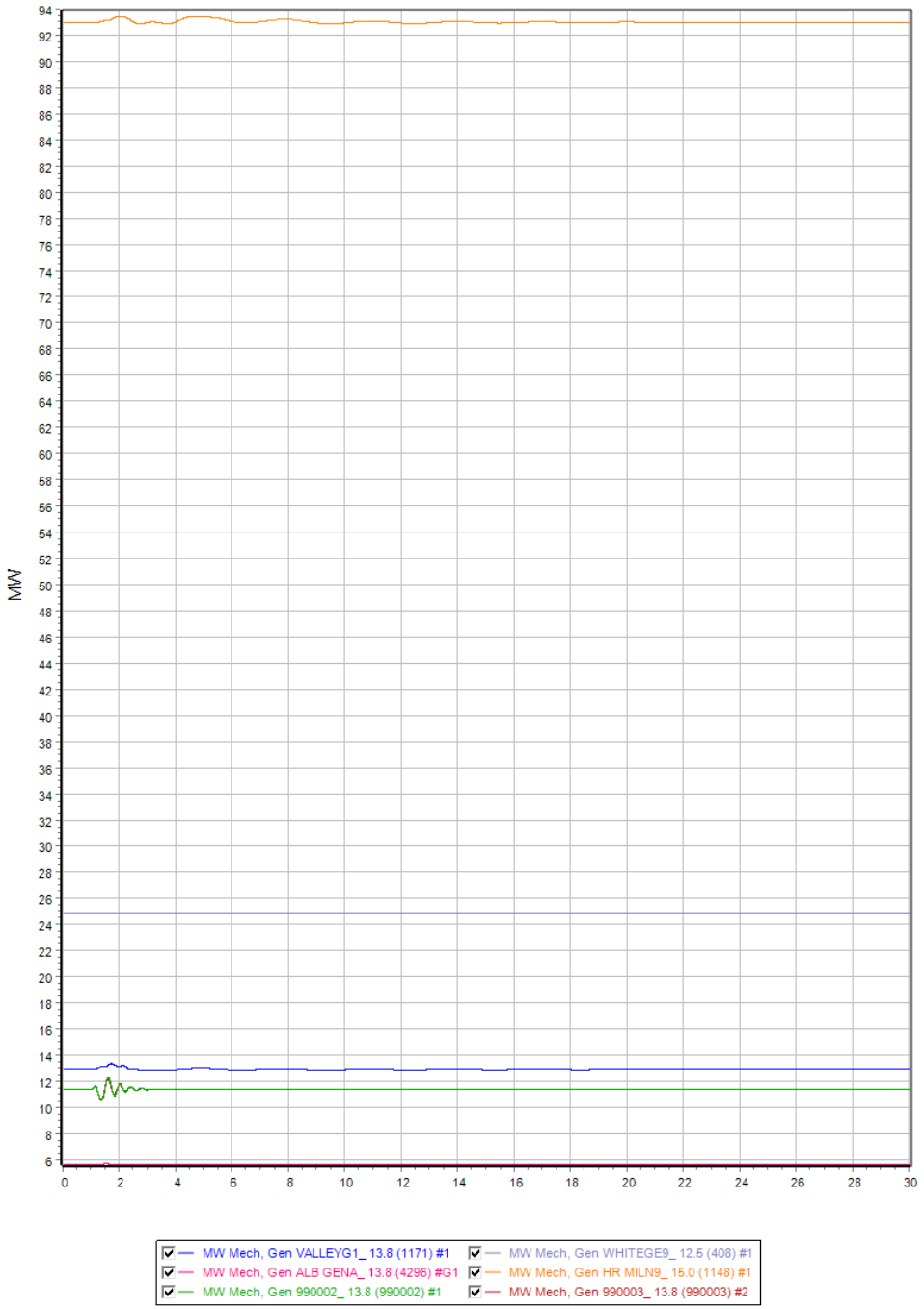
Monitor Line MW & MVAR. Q4



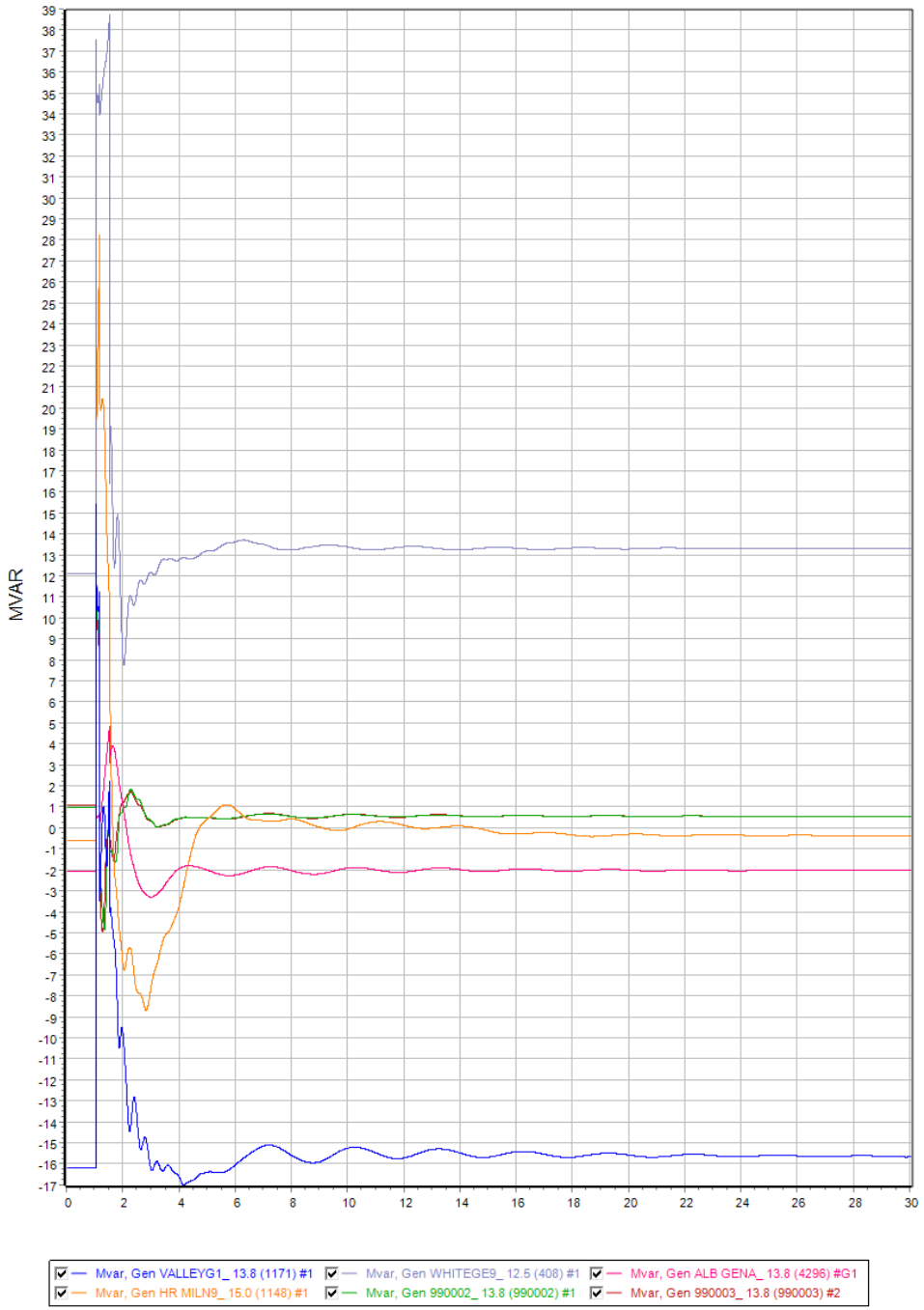


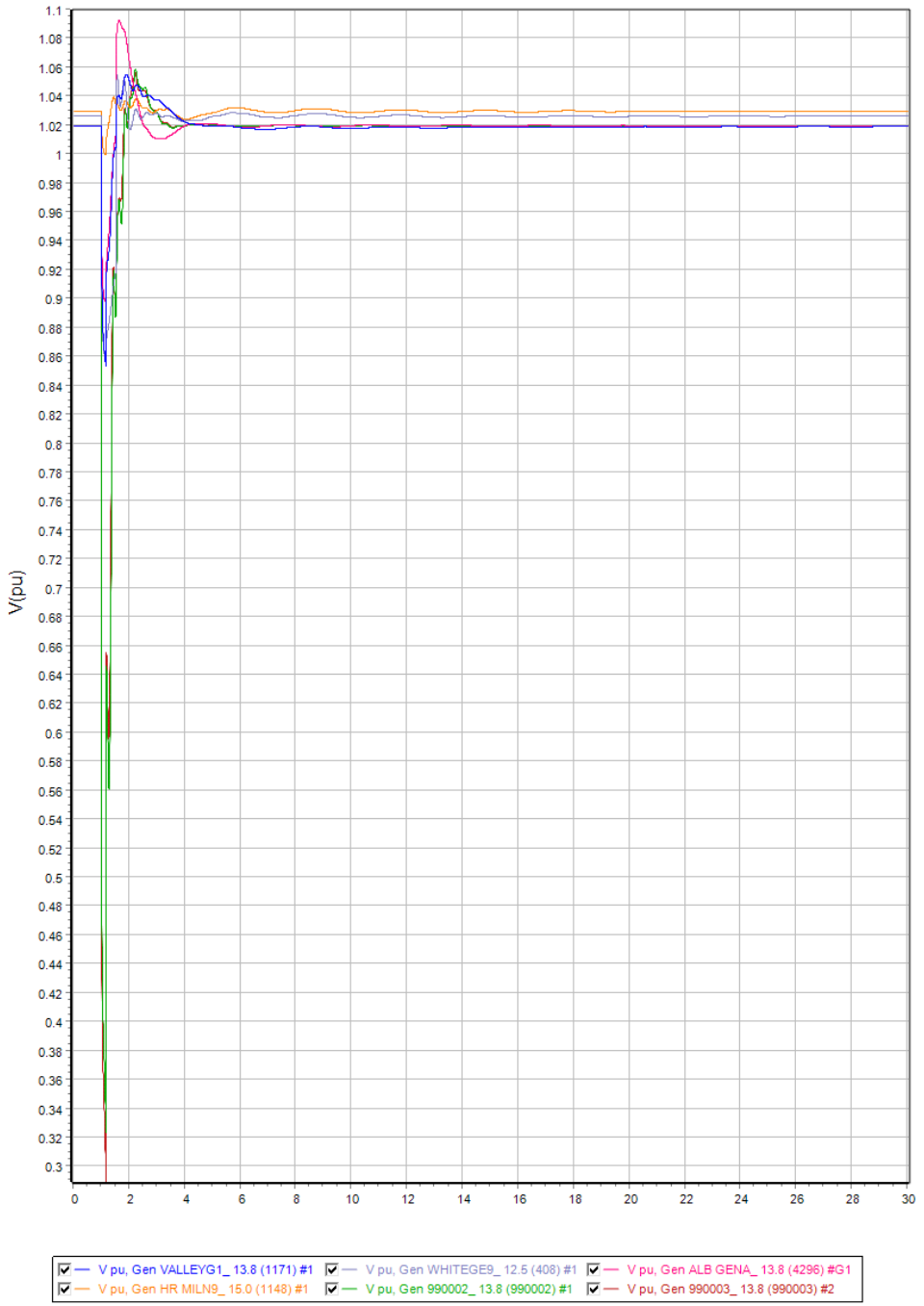
Monitor Gens. Q1



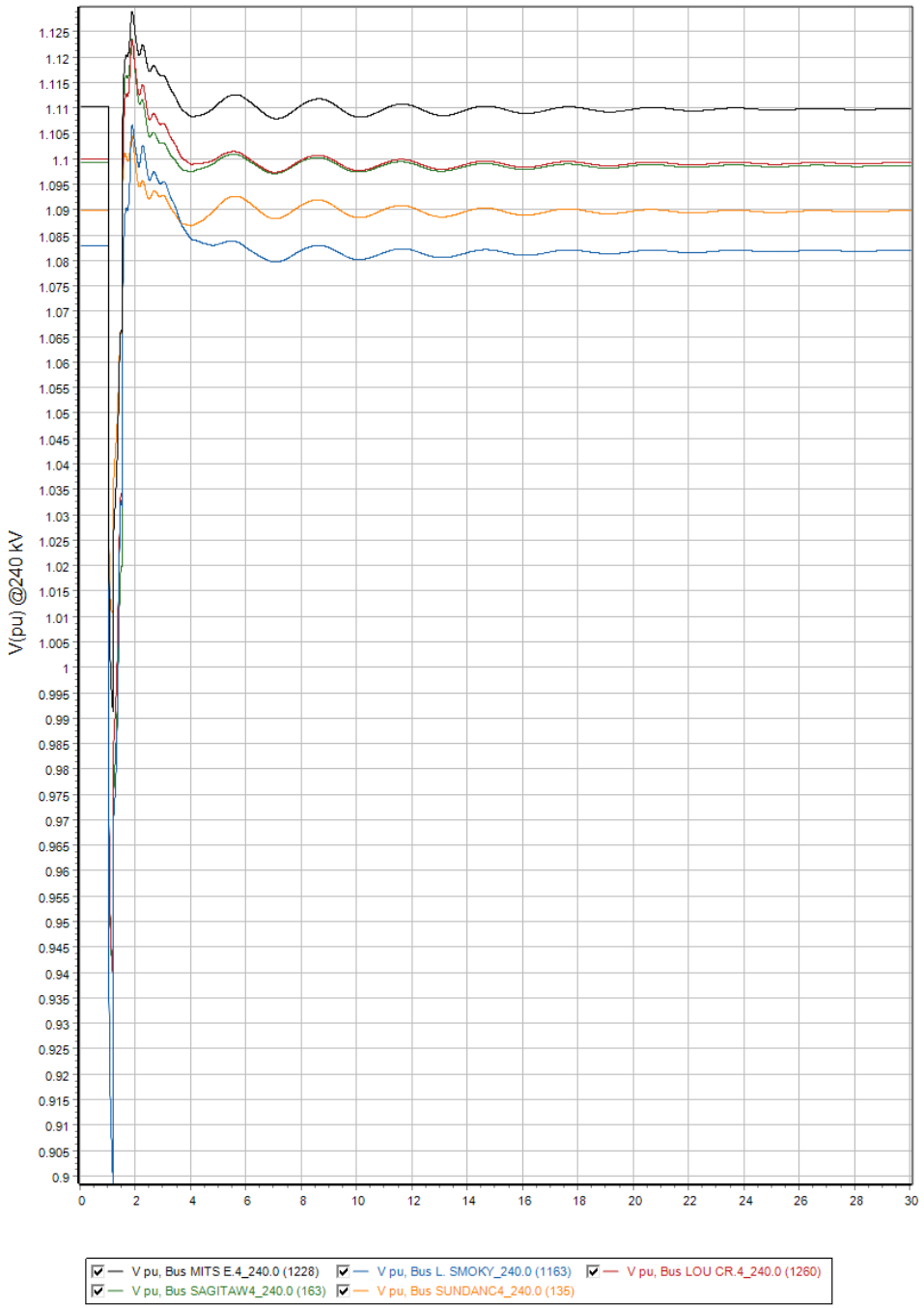


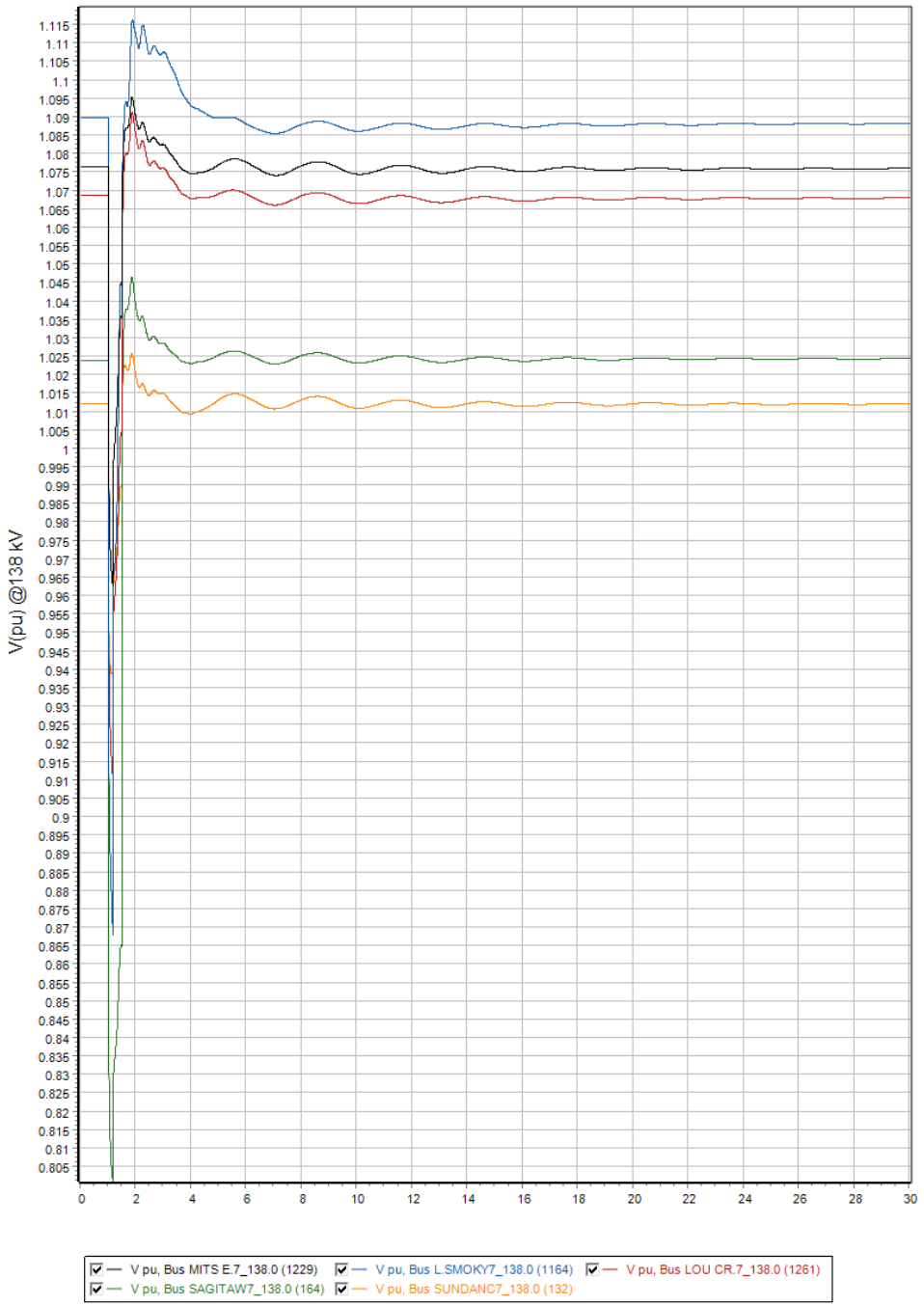
Monitor Gens. Q2



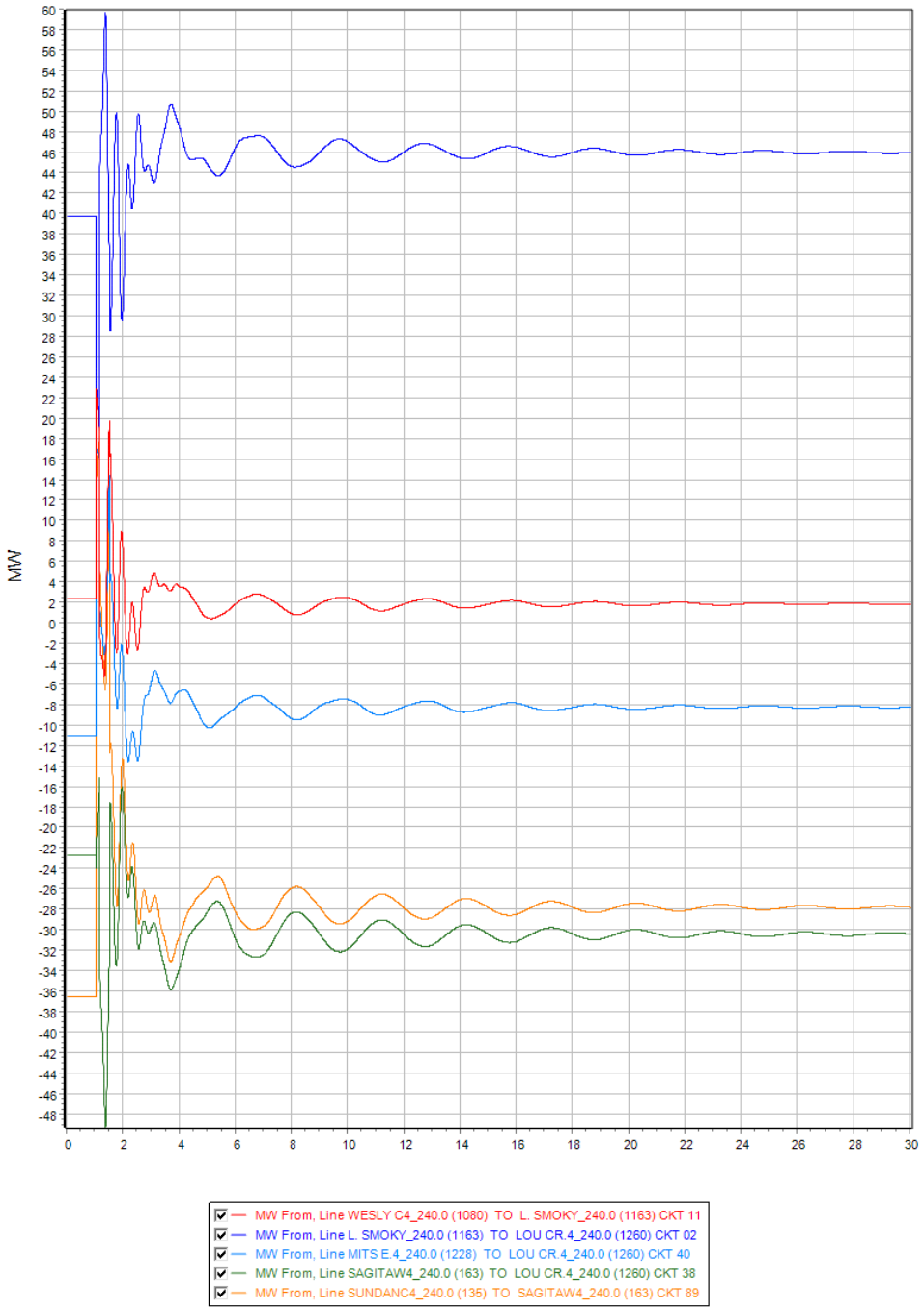


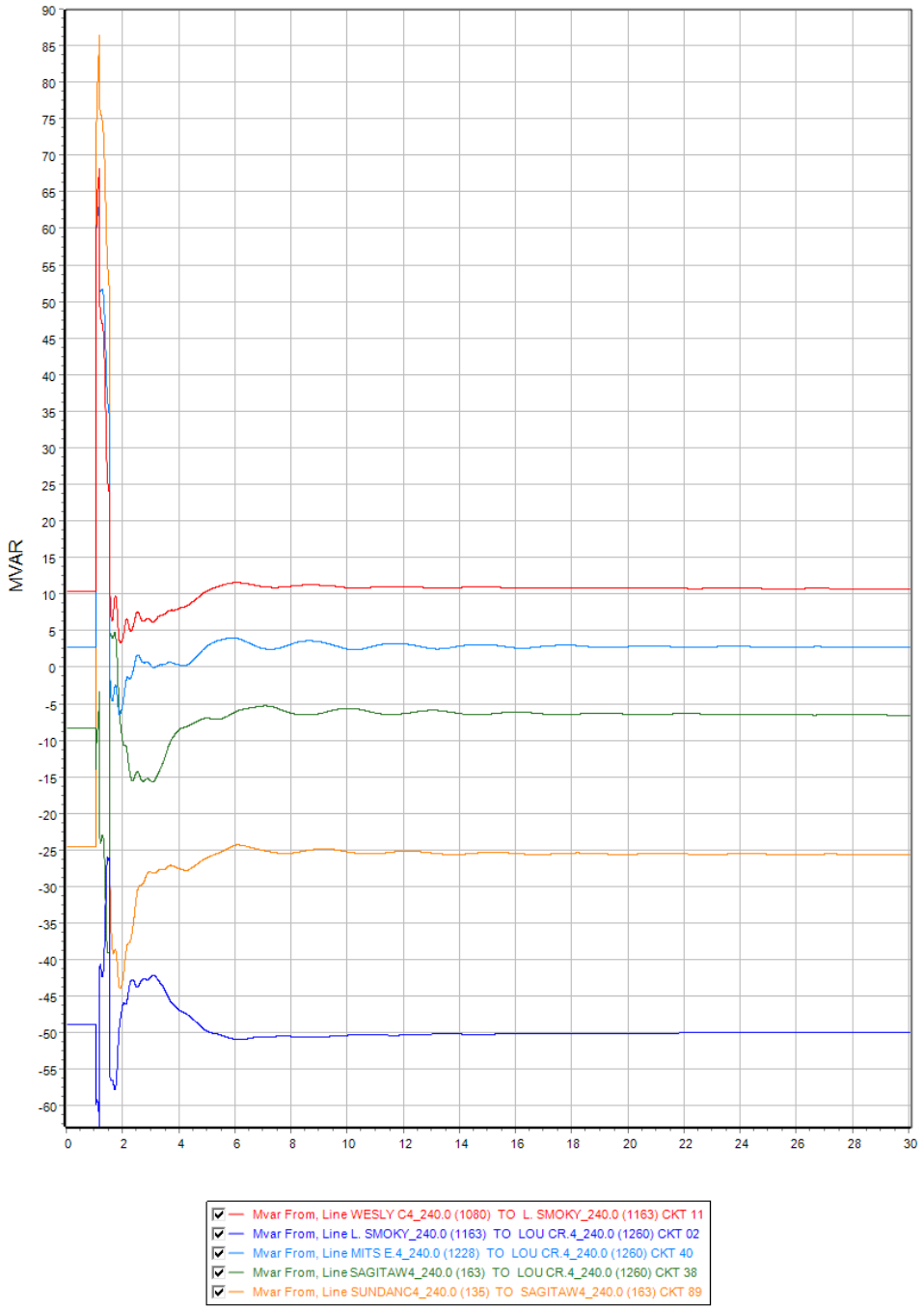
Monitor Bus Volts Q3



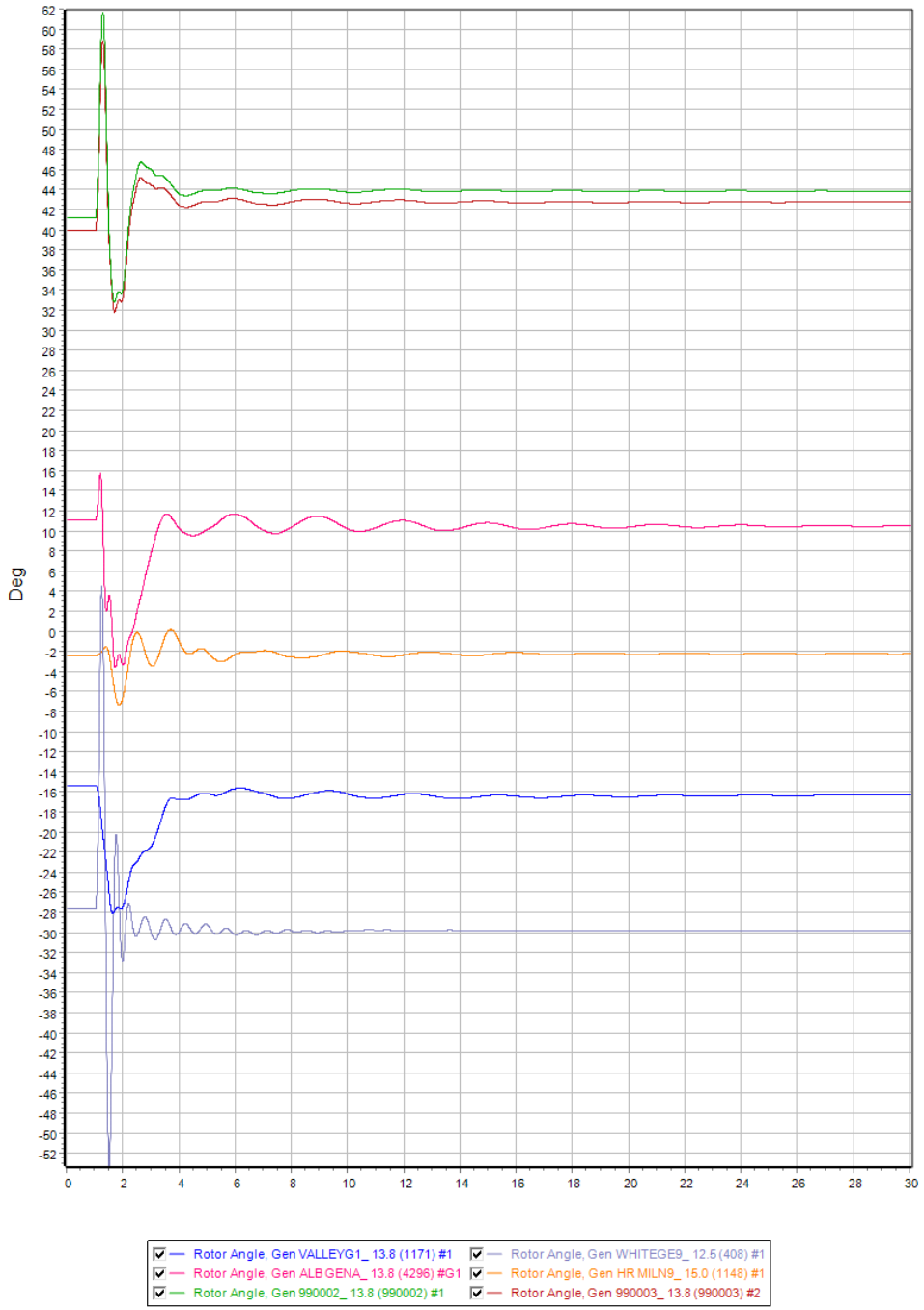


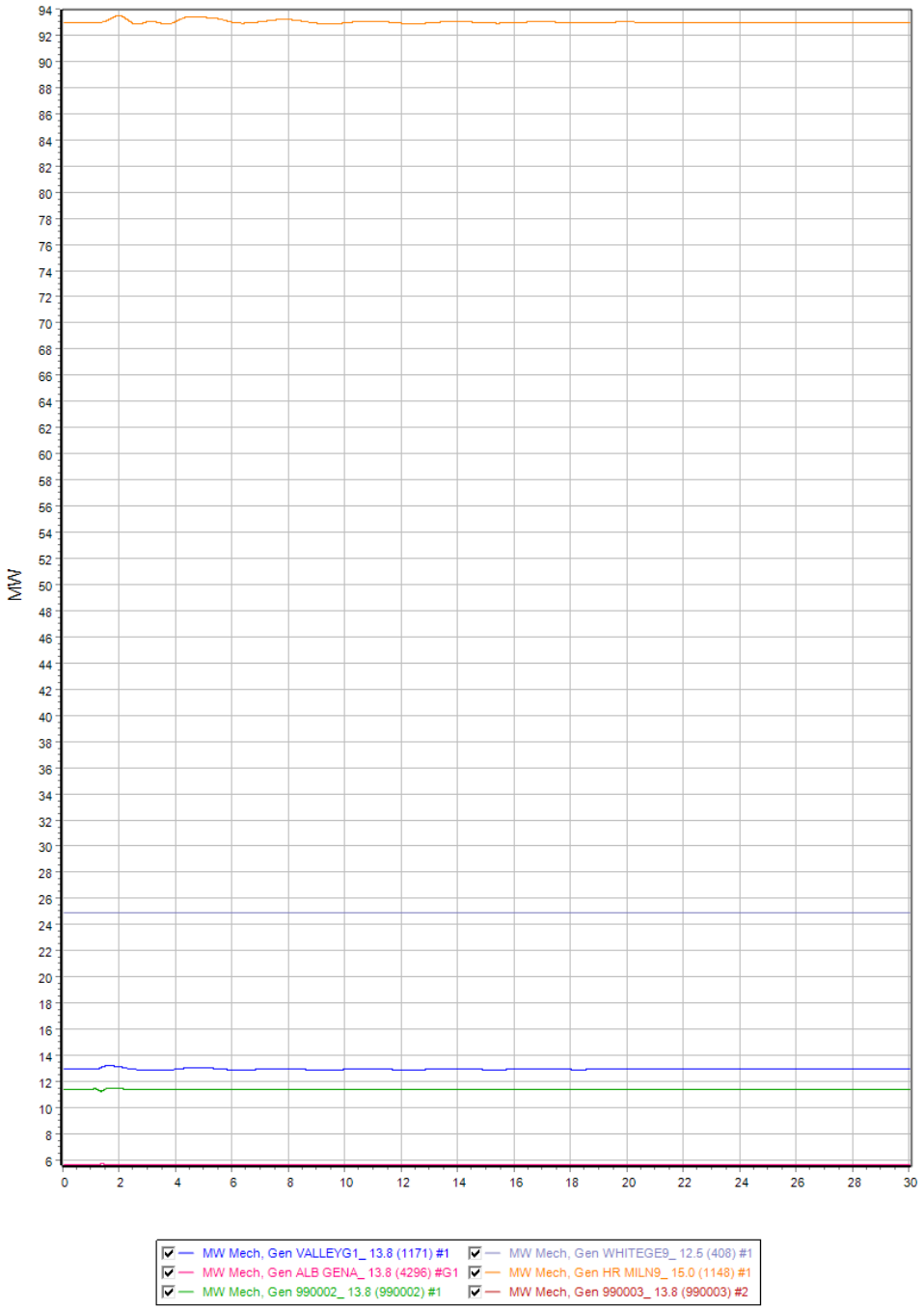
Monitor Line MW & MVAR. Q4



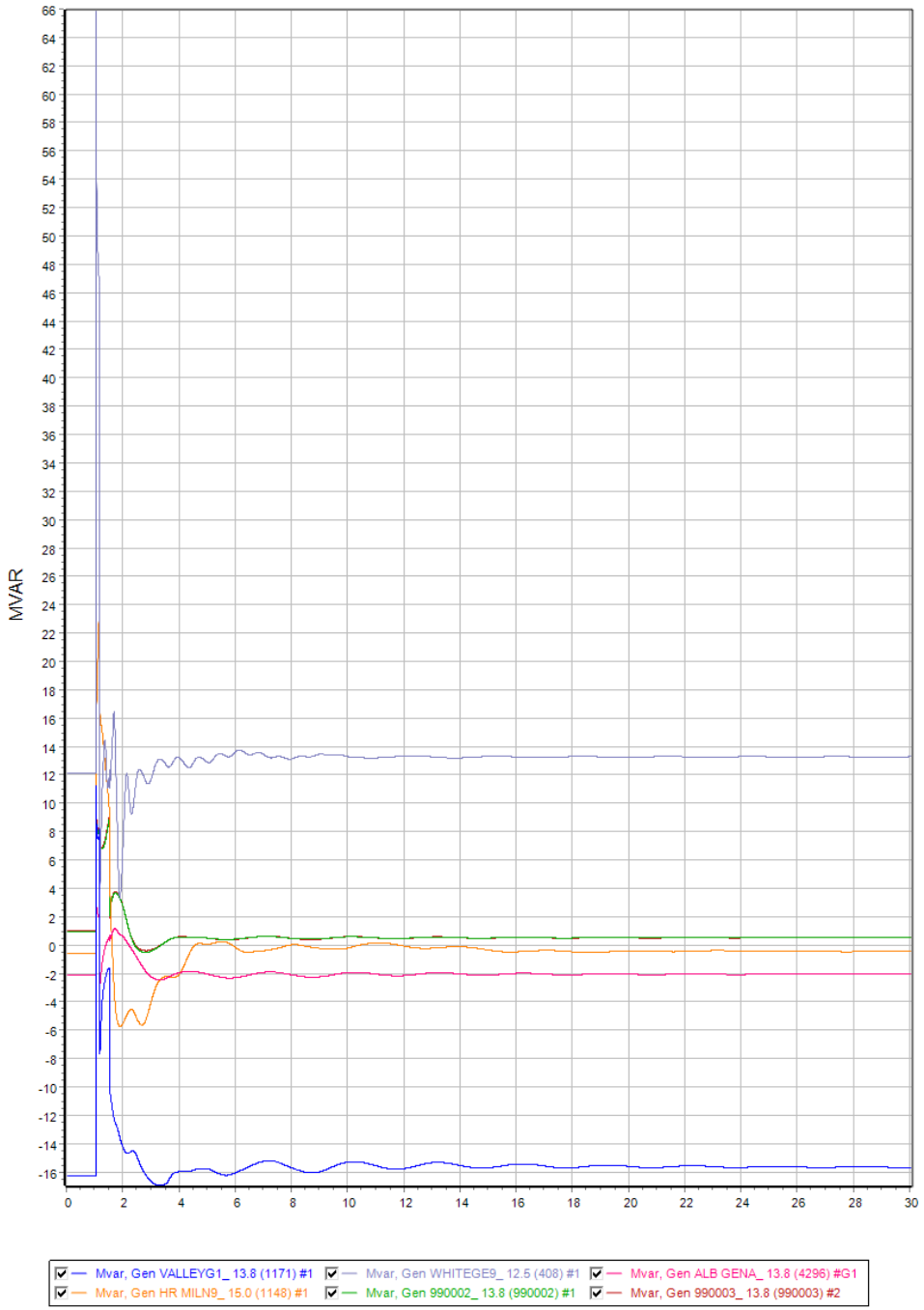


Monitor Gens. Q1

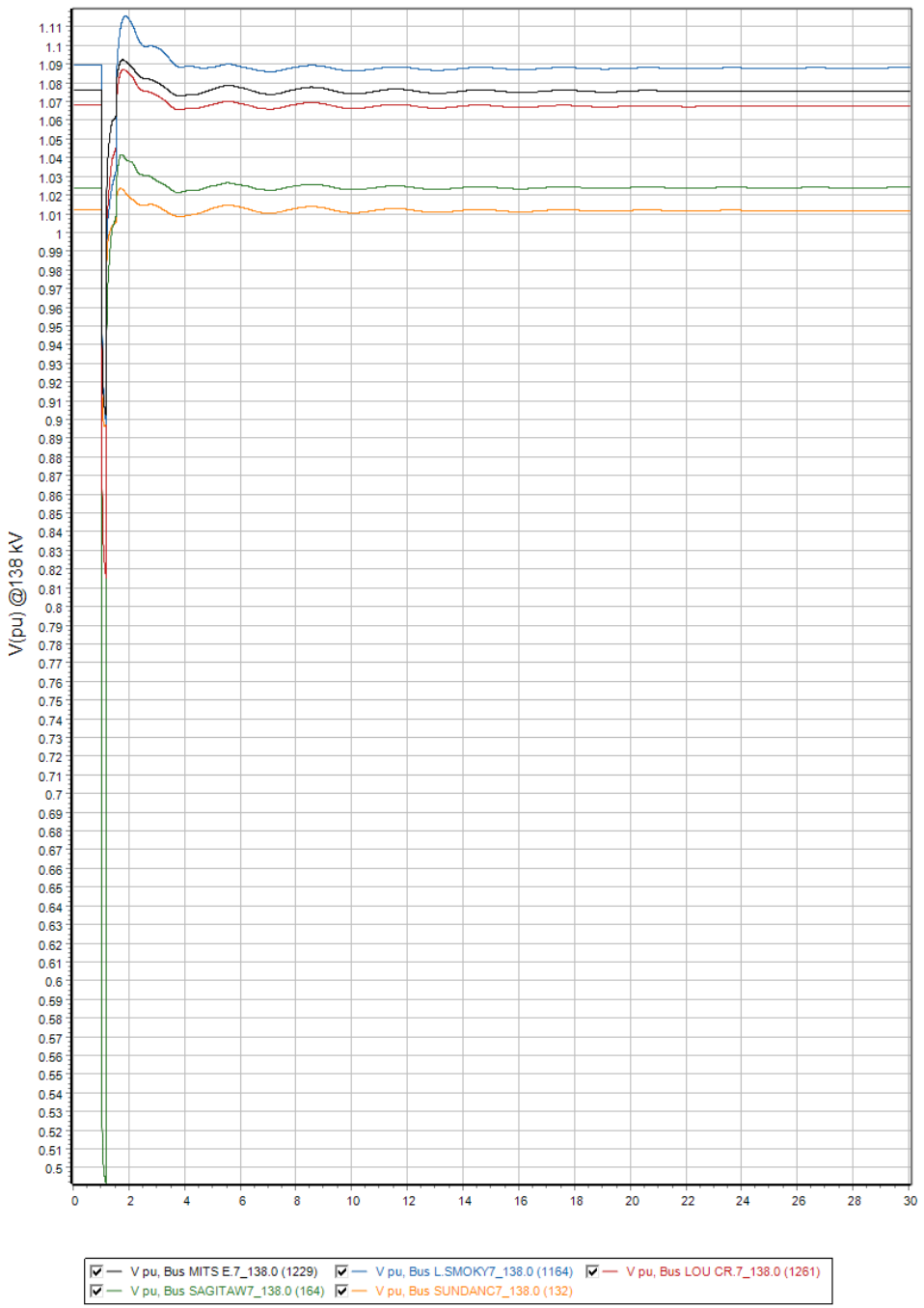




Monitor Gens. Q2



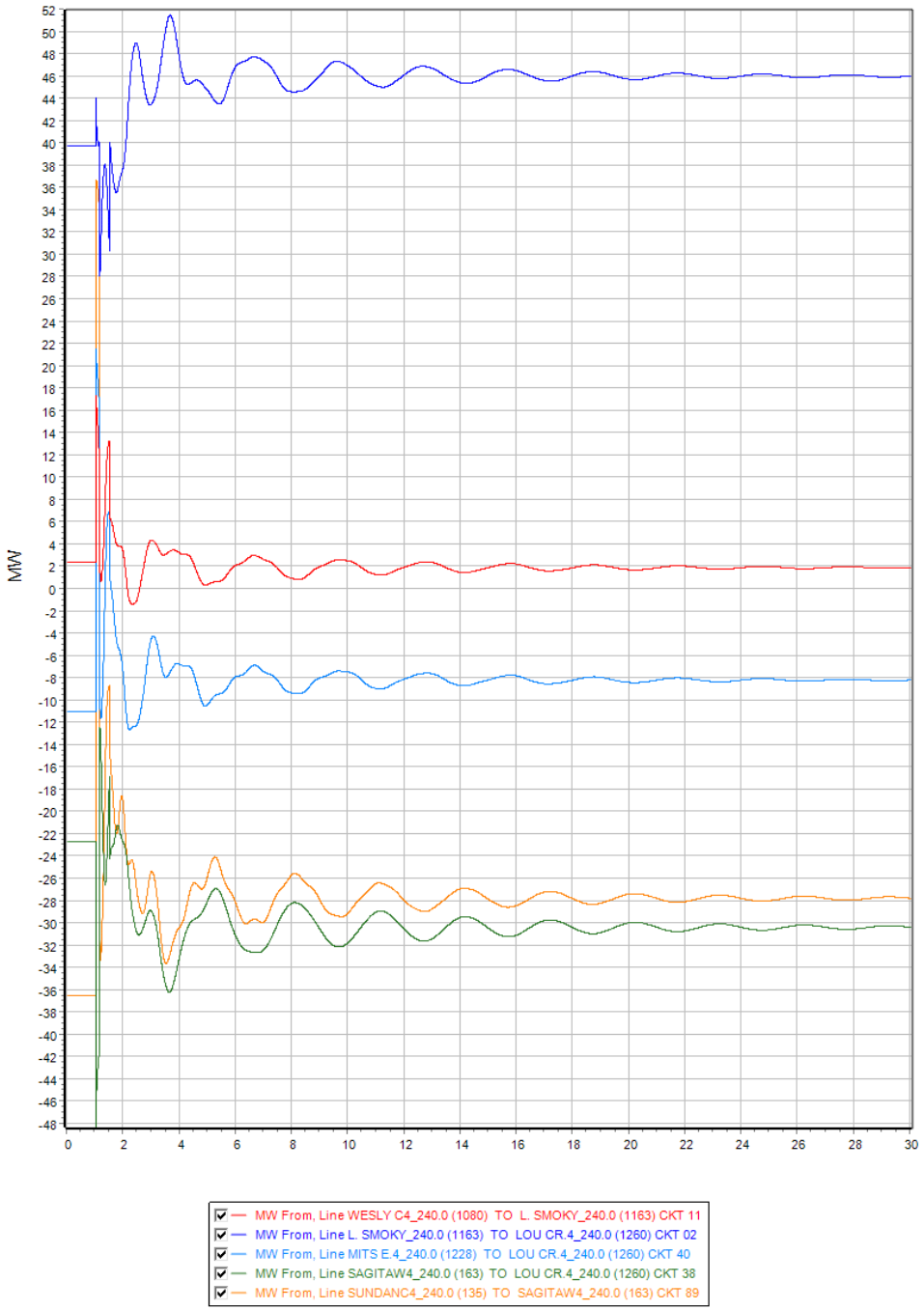
Monitor Bus Volts Q3

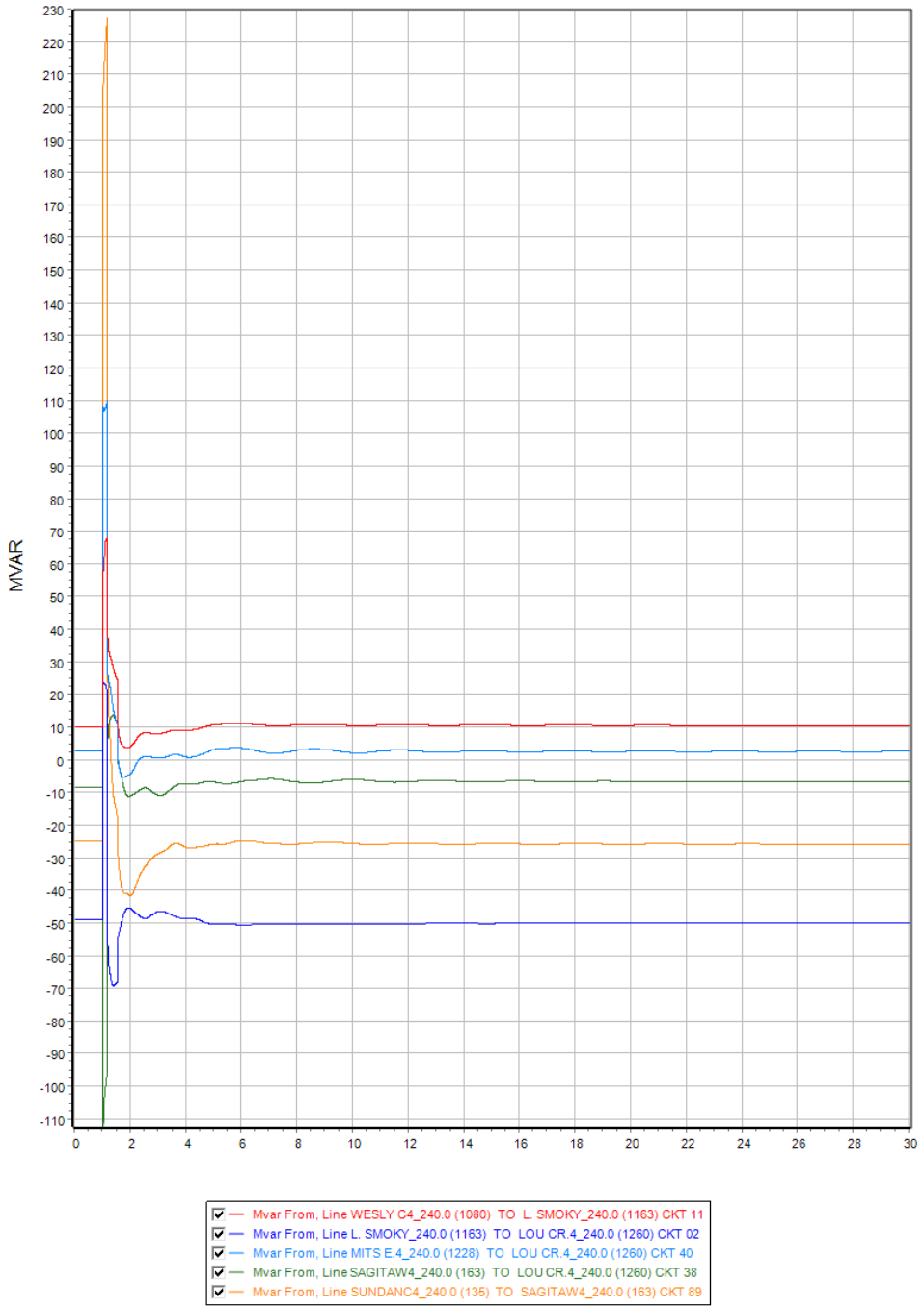


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

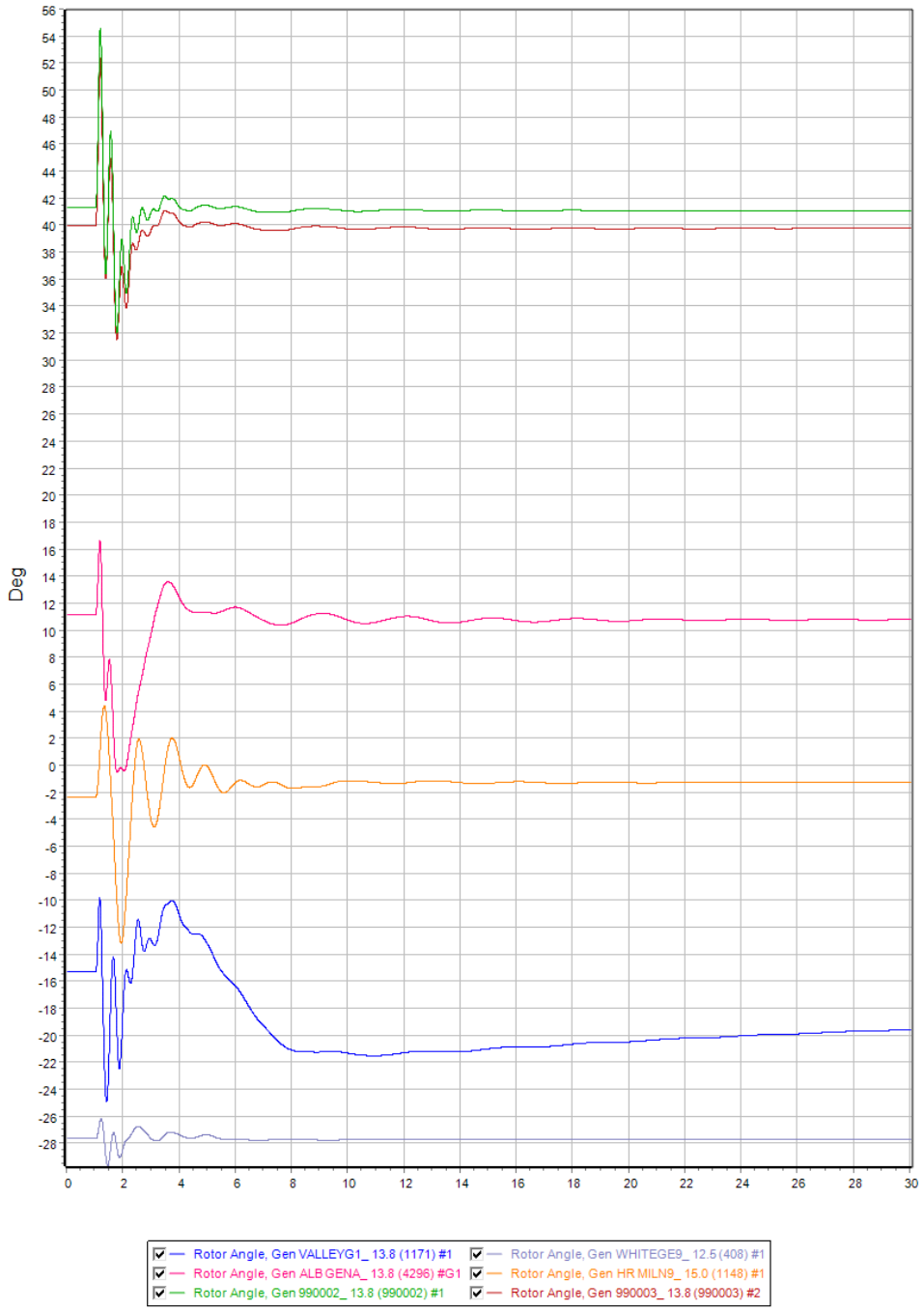
Contingency: 04B - 199L (Fox Creek 347S – Whitecourt 268S) @ Whitecourt 268S

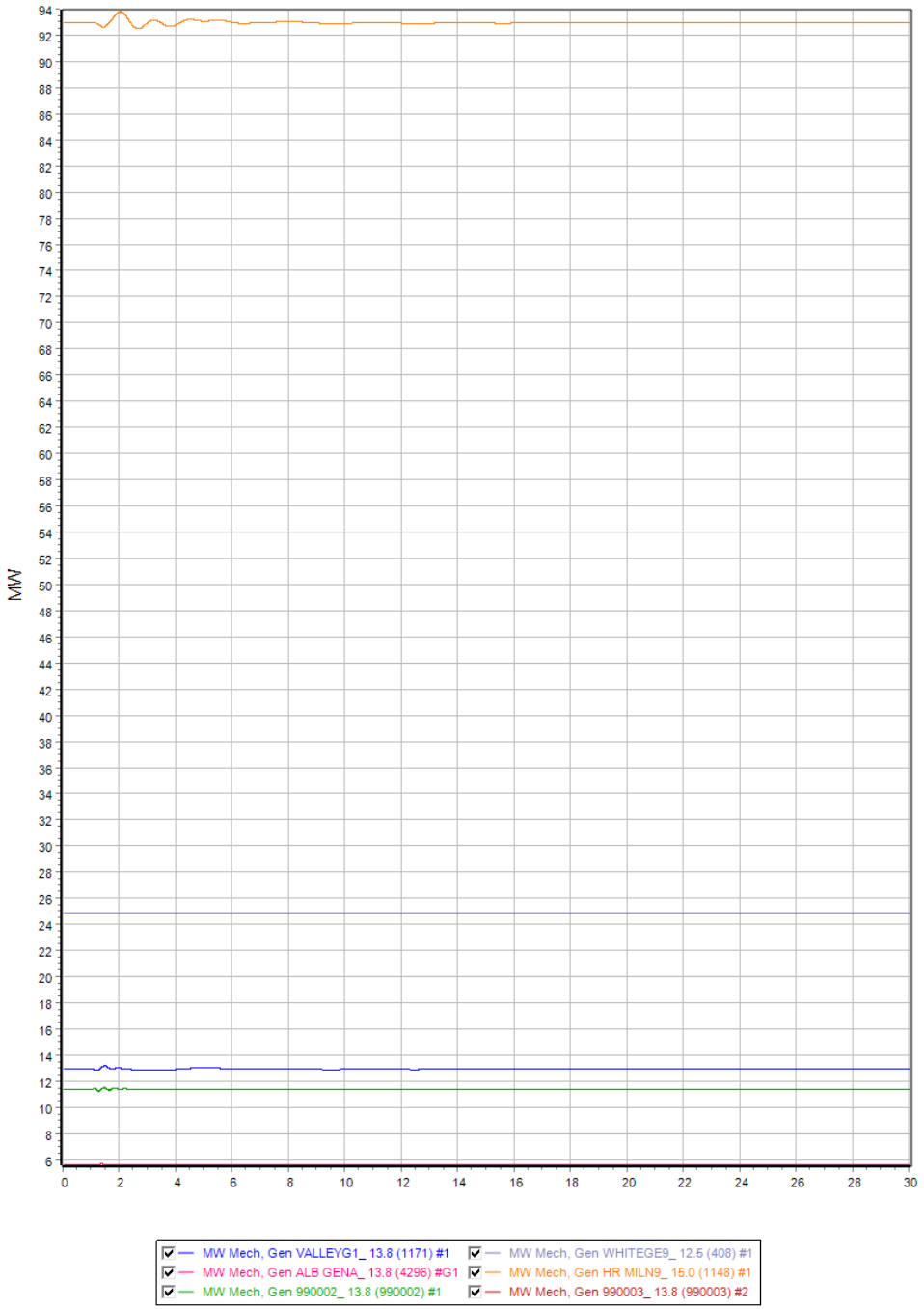
Monitor Line MW & MVAR. Q4



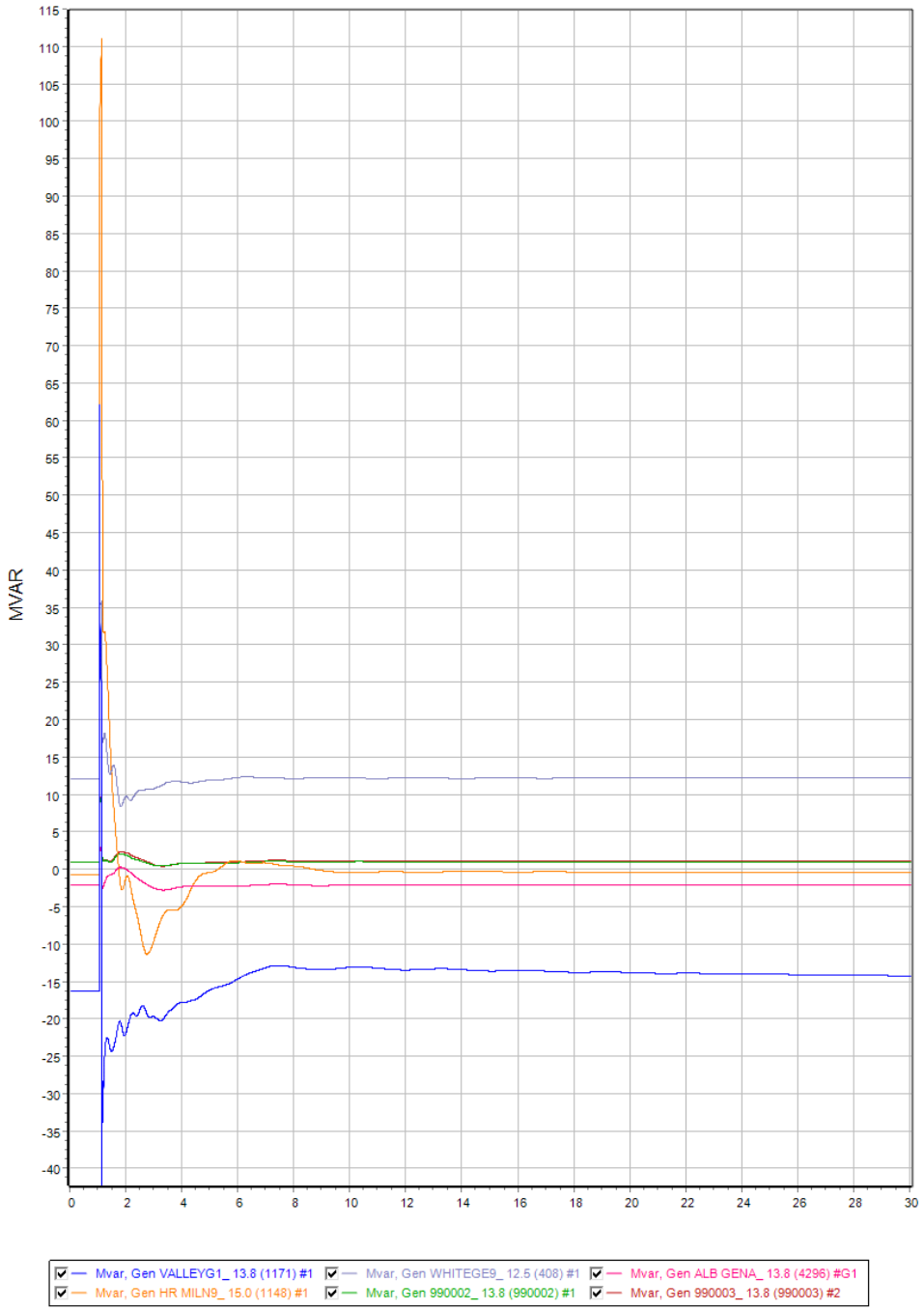


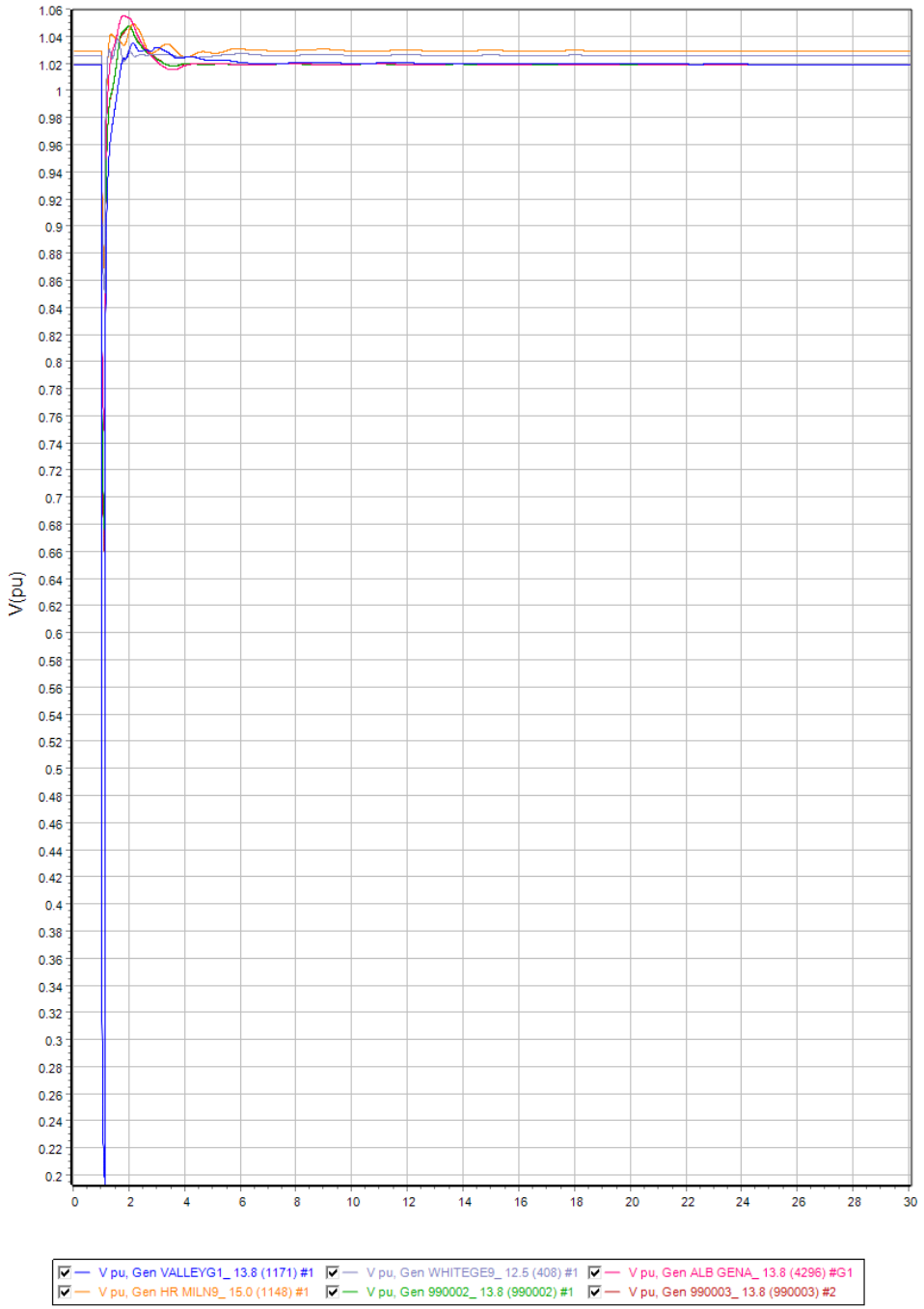
Monitor Gens. Q1



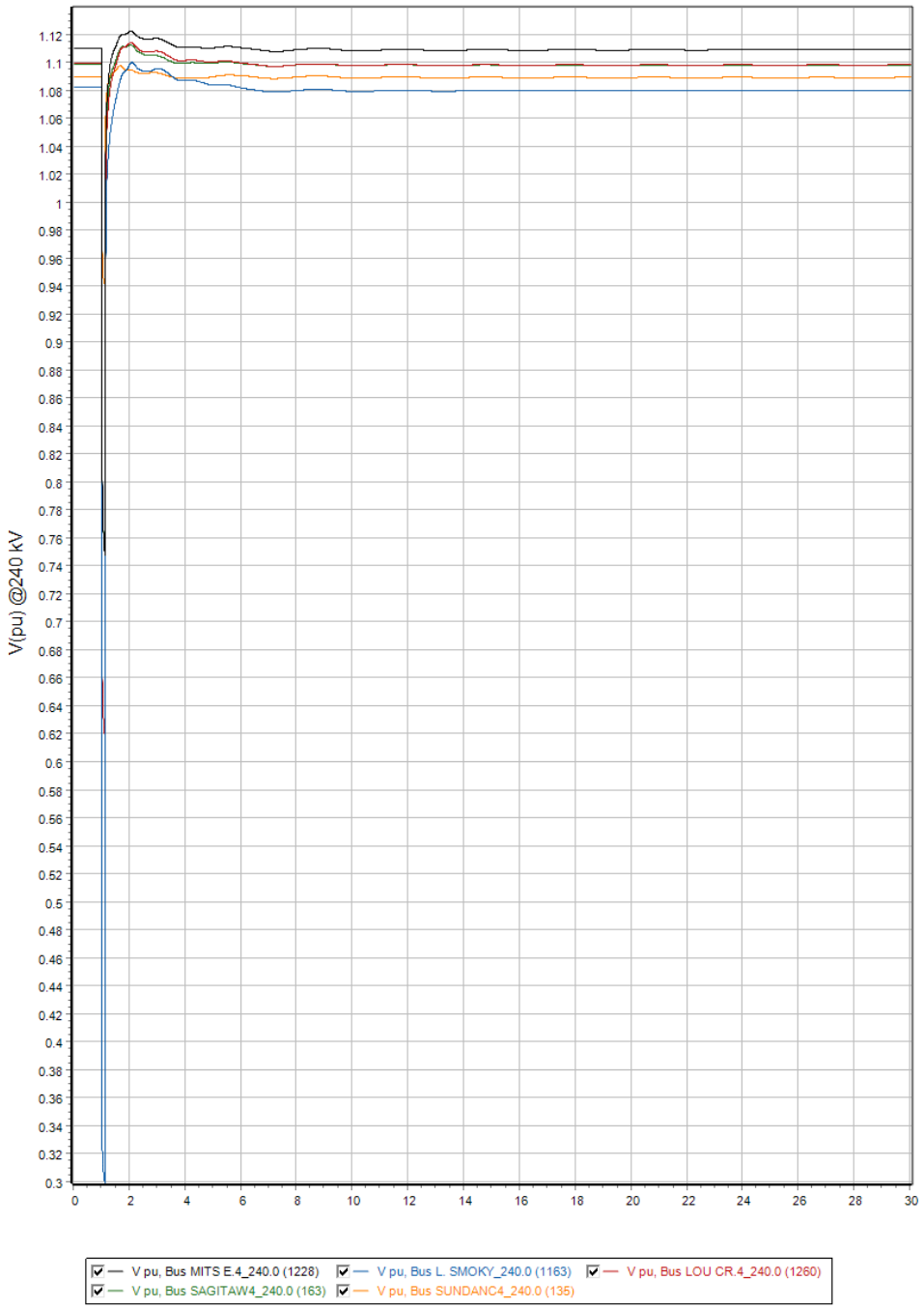


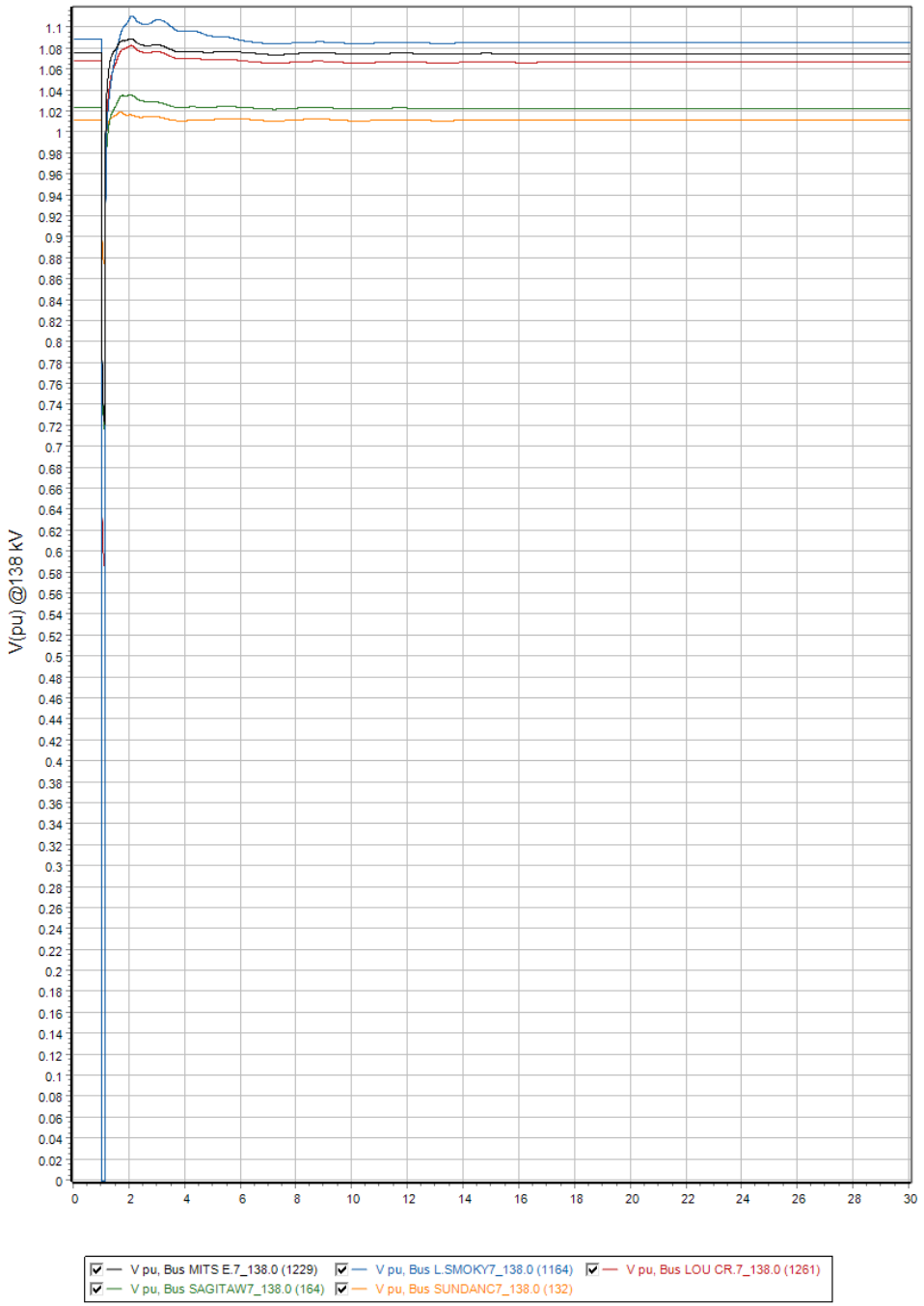
Monitor Gens. Q2



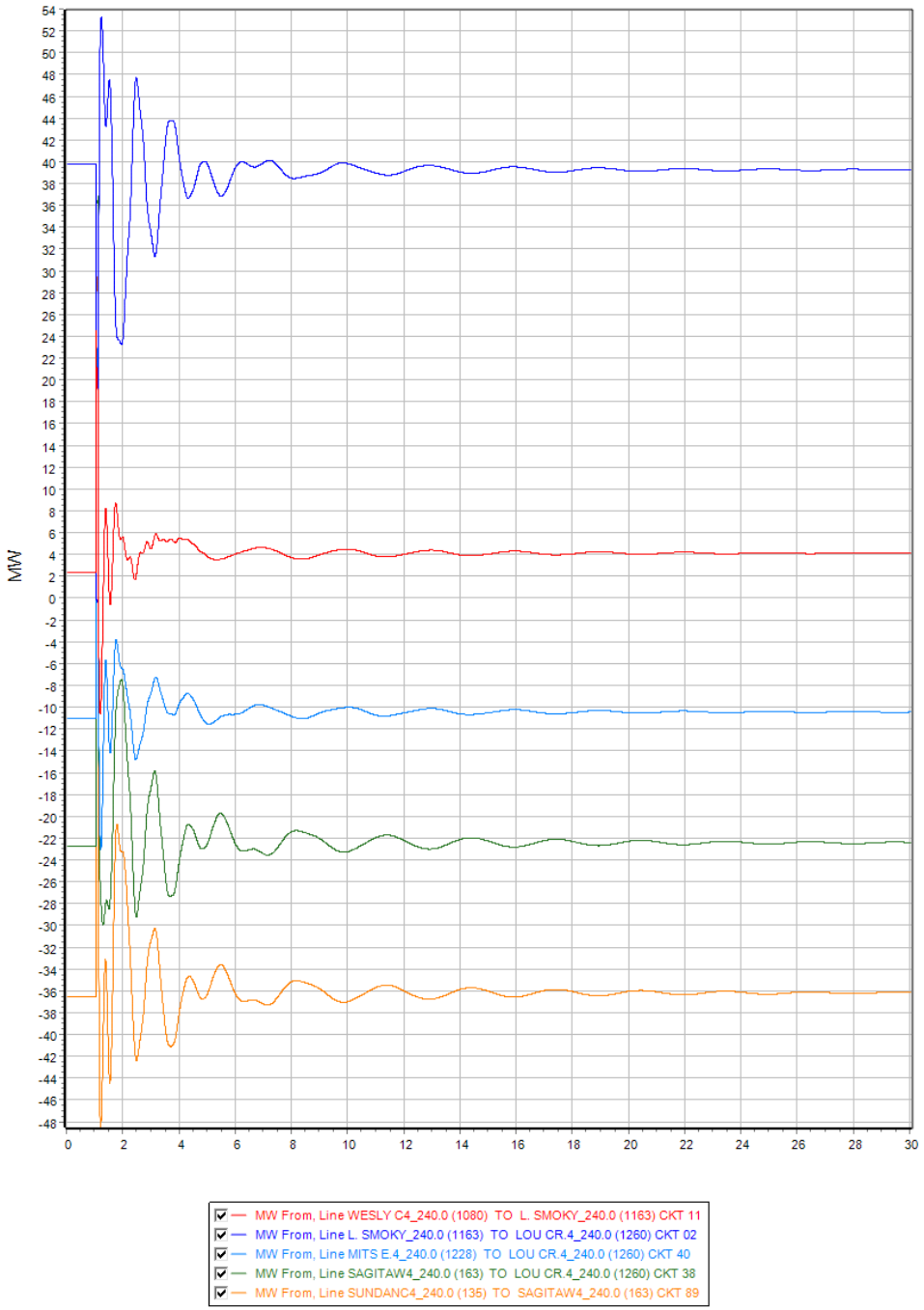


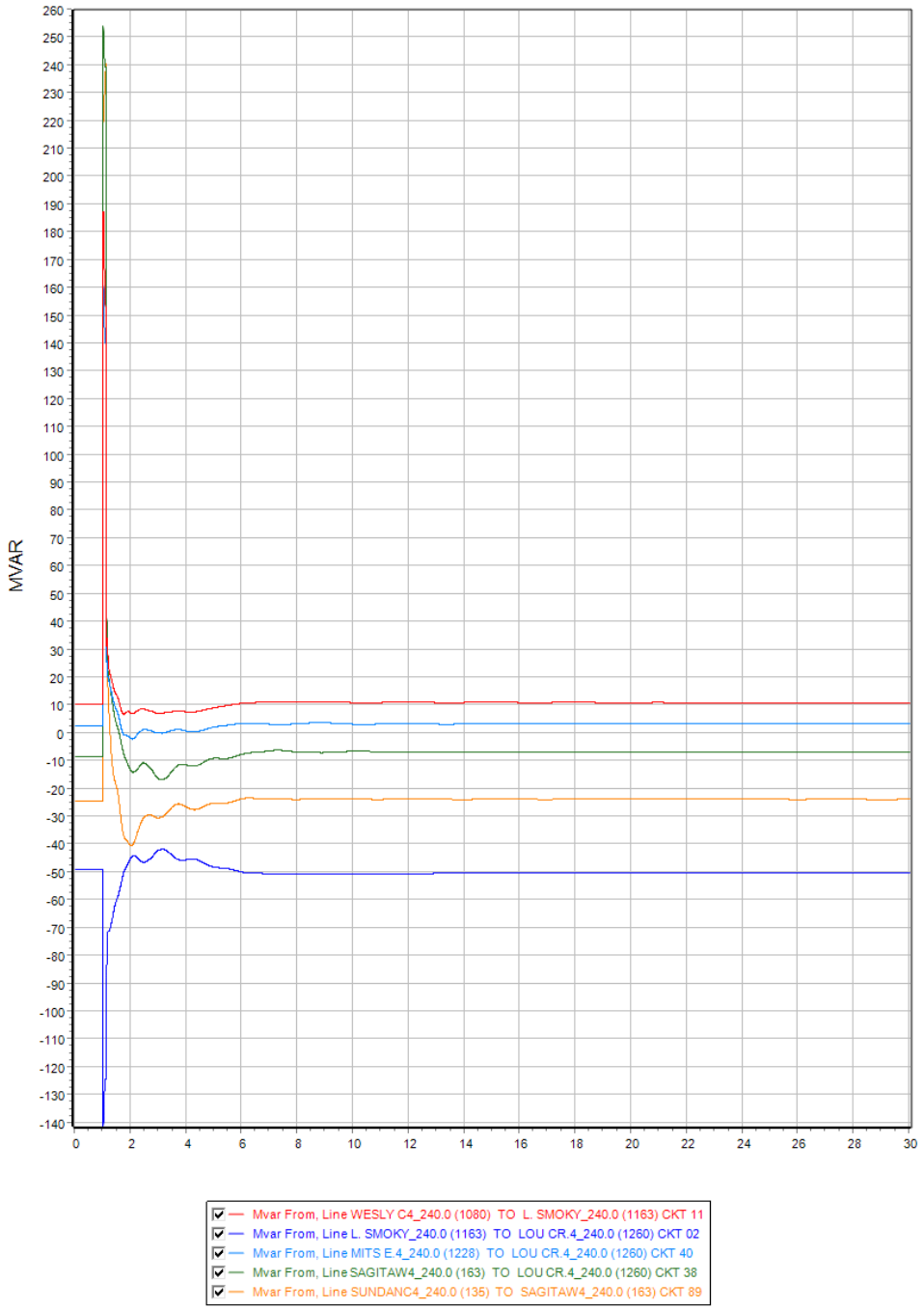
Monitor Bus Volts Q3



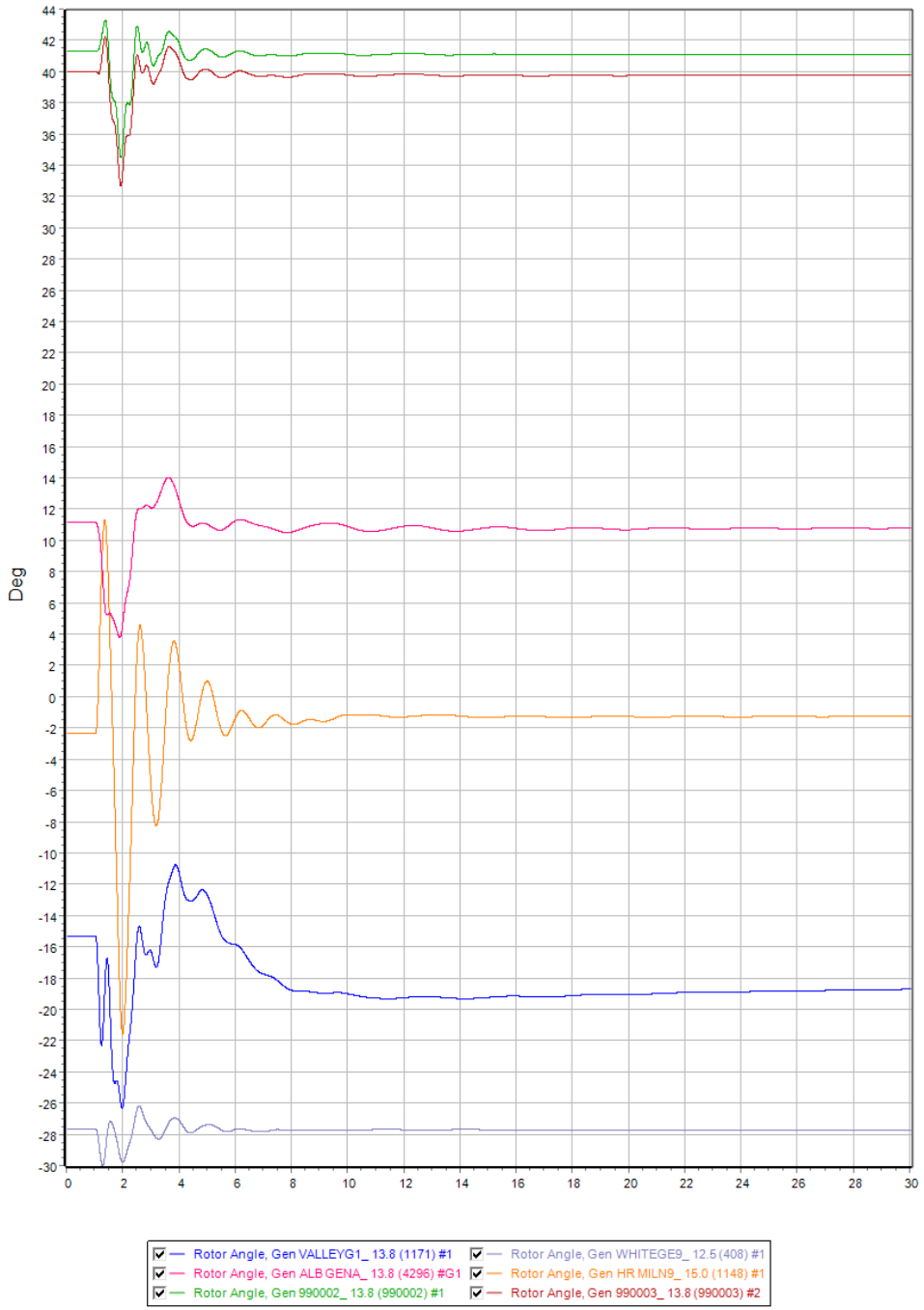


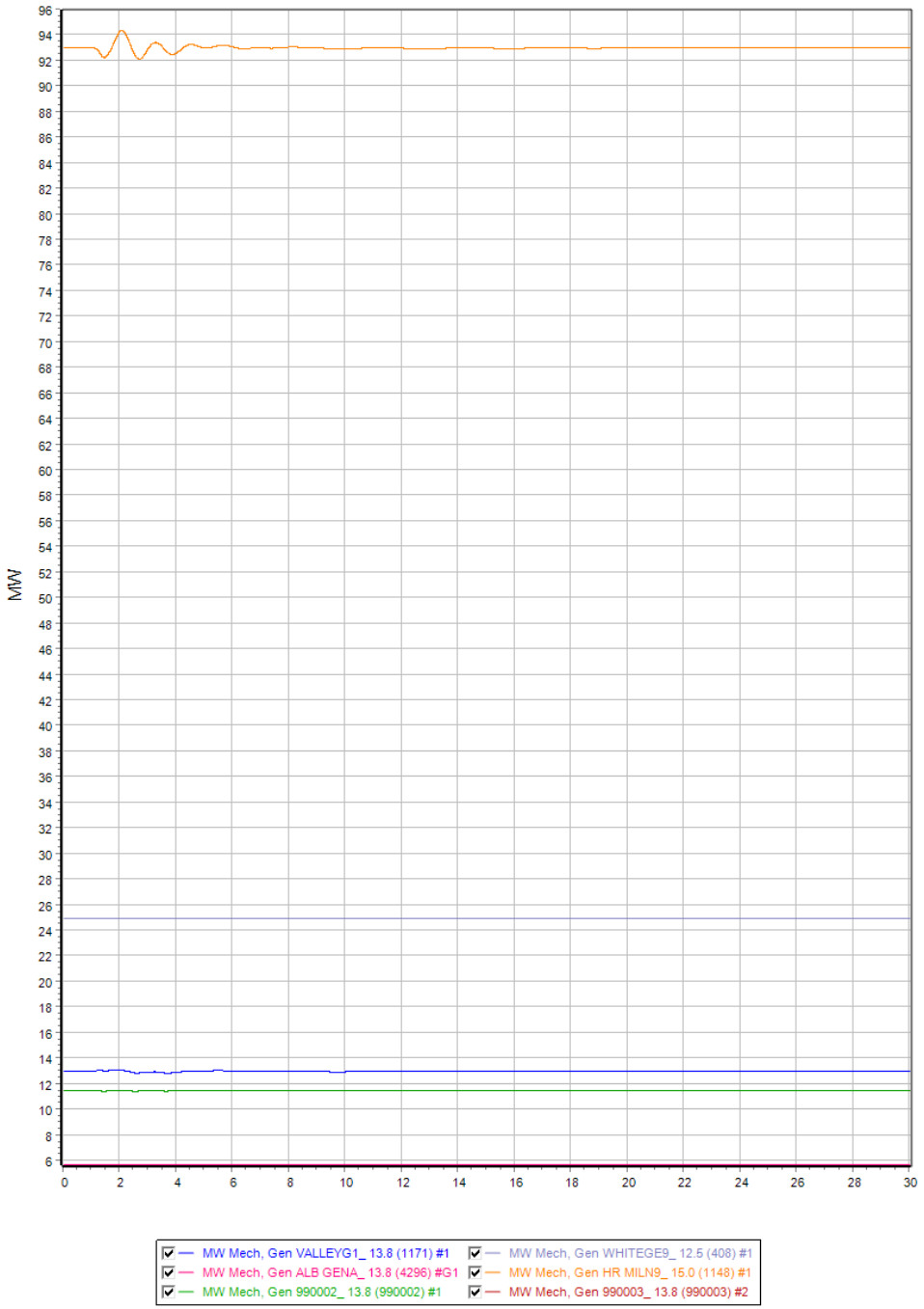
Monitor Line MW & MVAR. Q4



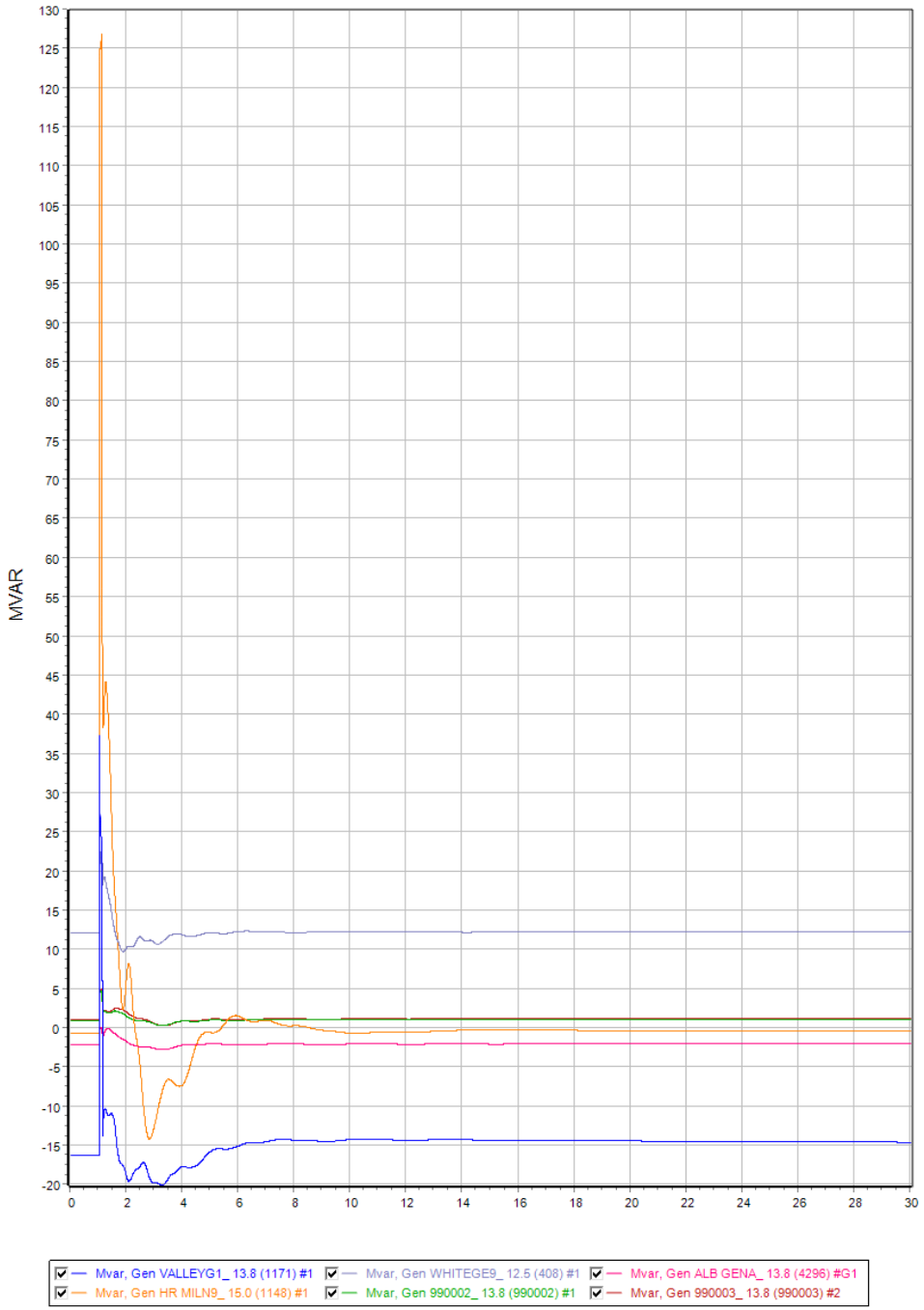


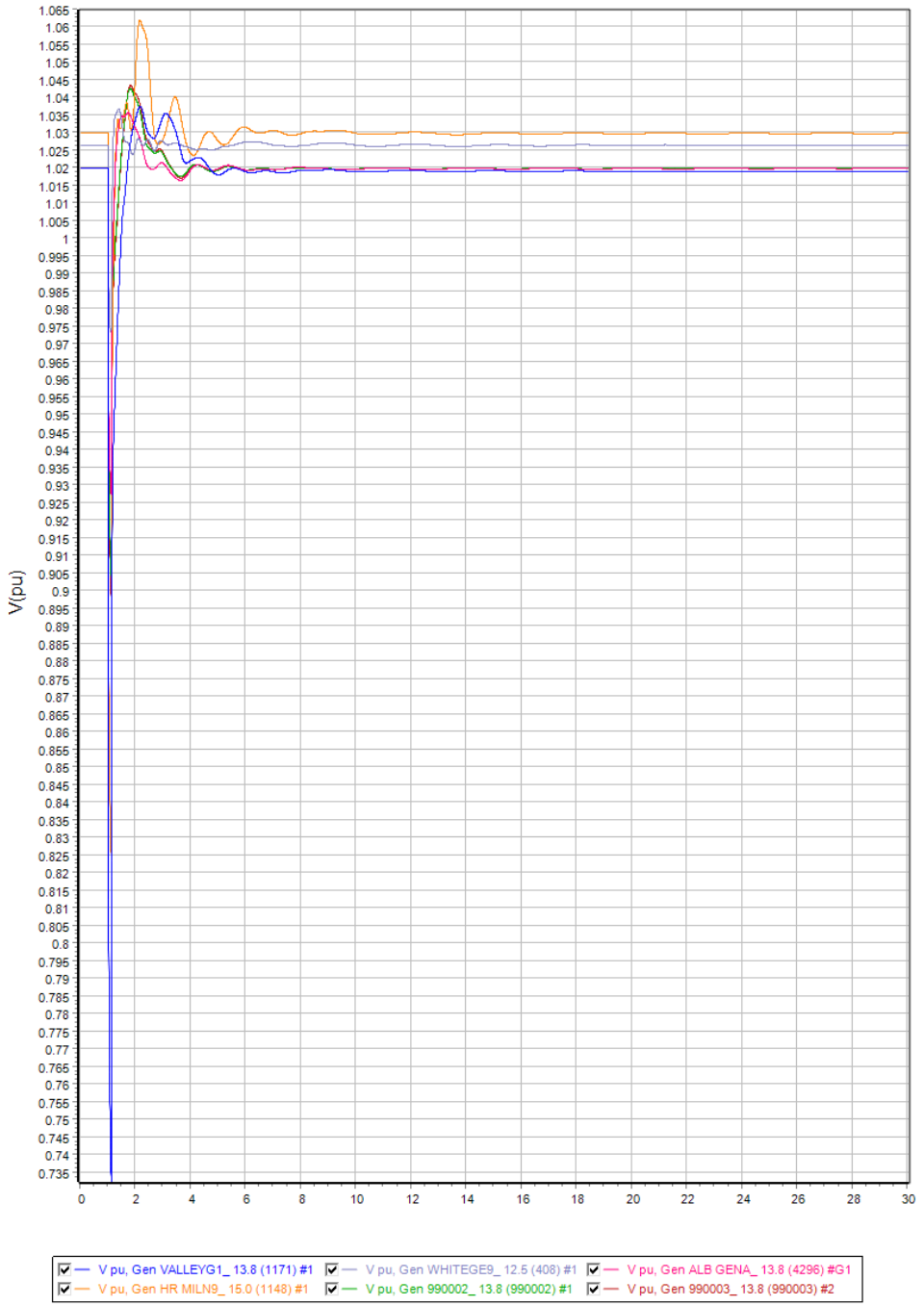
Monitor Gens. Q1





Monitor Gens. Q2





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 05B - 7L46 (Little Smoky 813S – Big Mountain 845S) @ Big Mountain 845S

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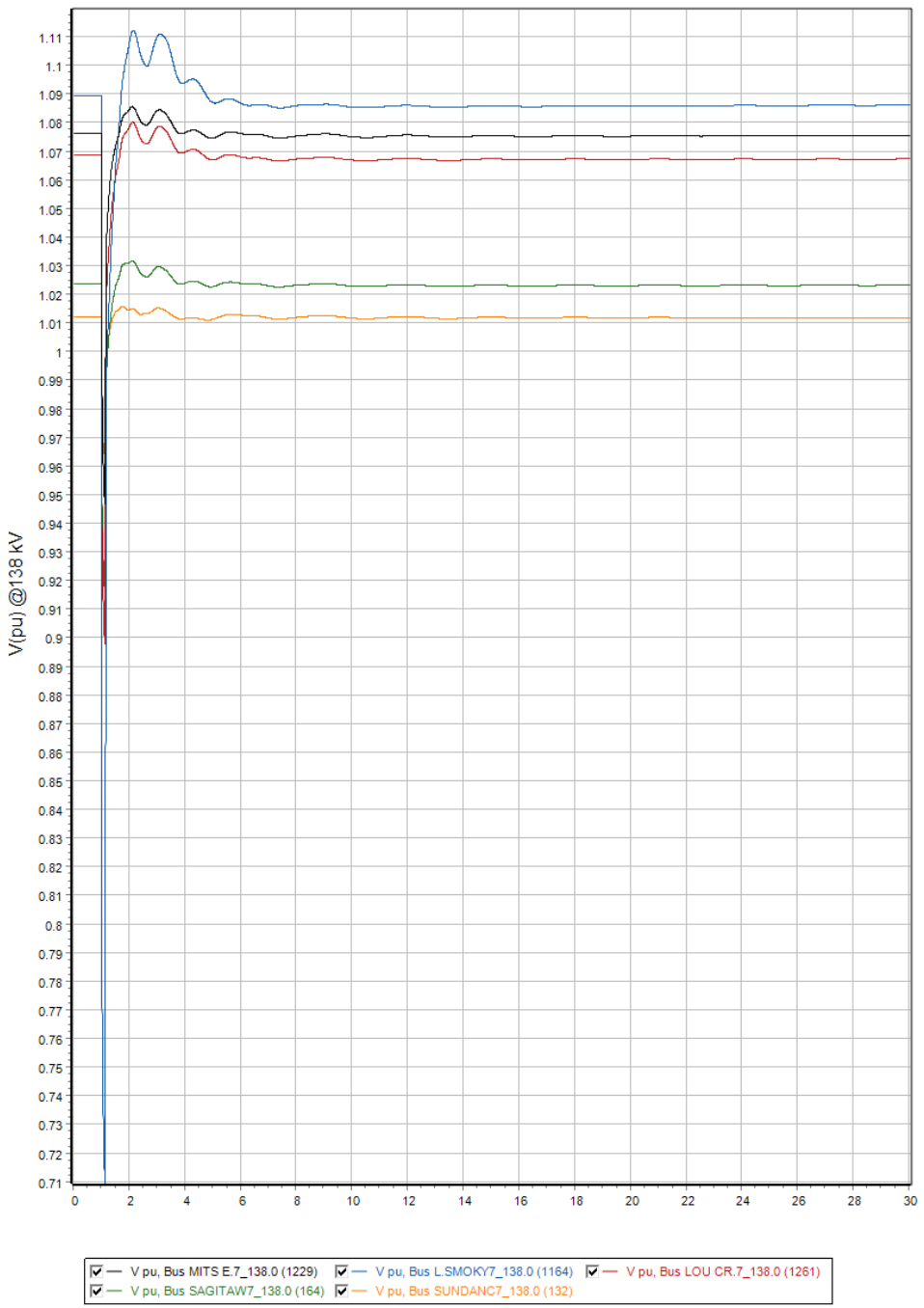
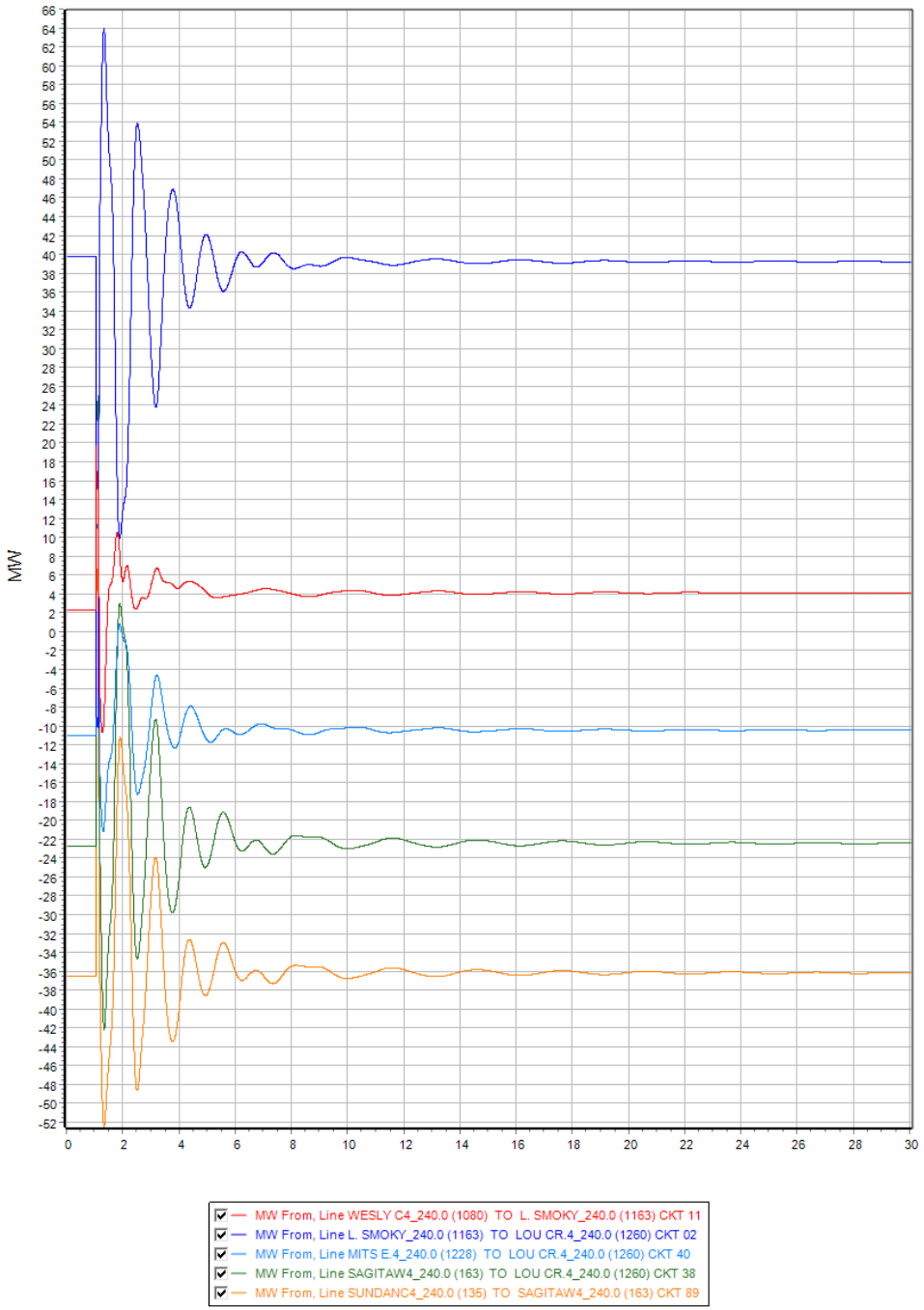
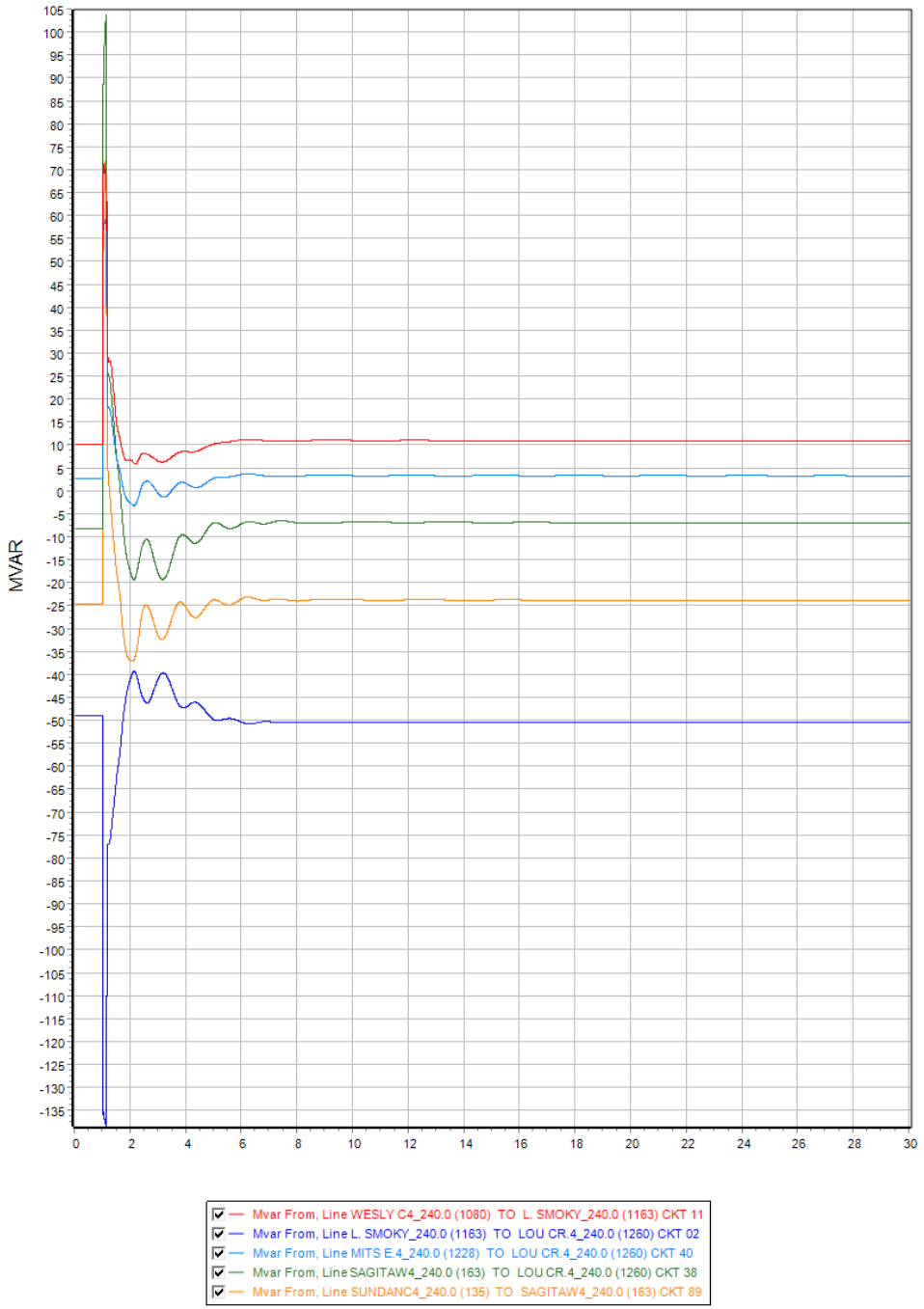
Monitor Bus Volts Q3

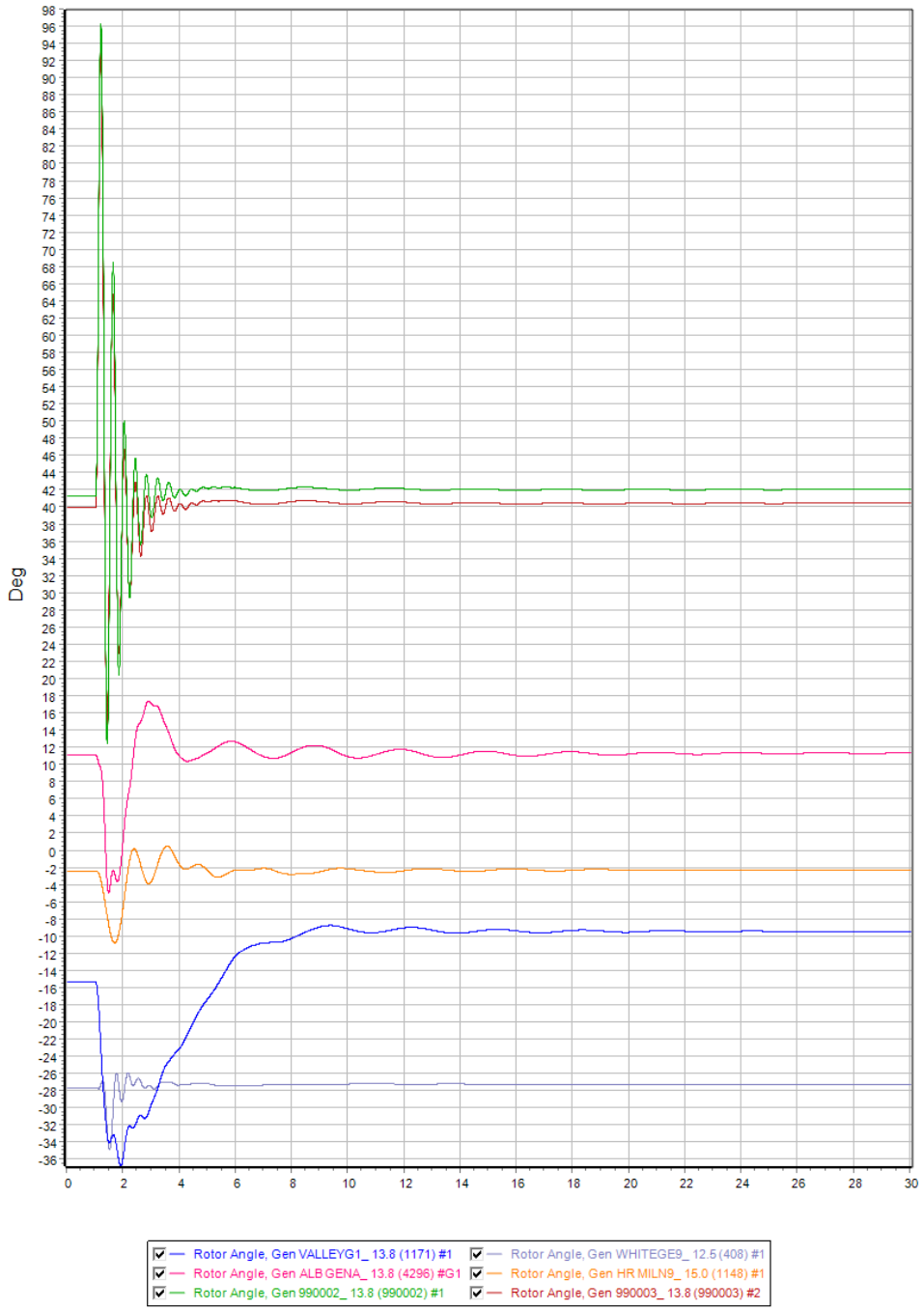


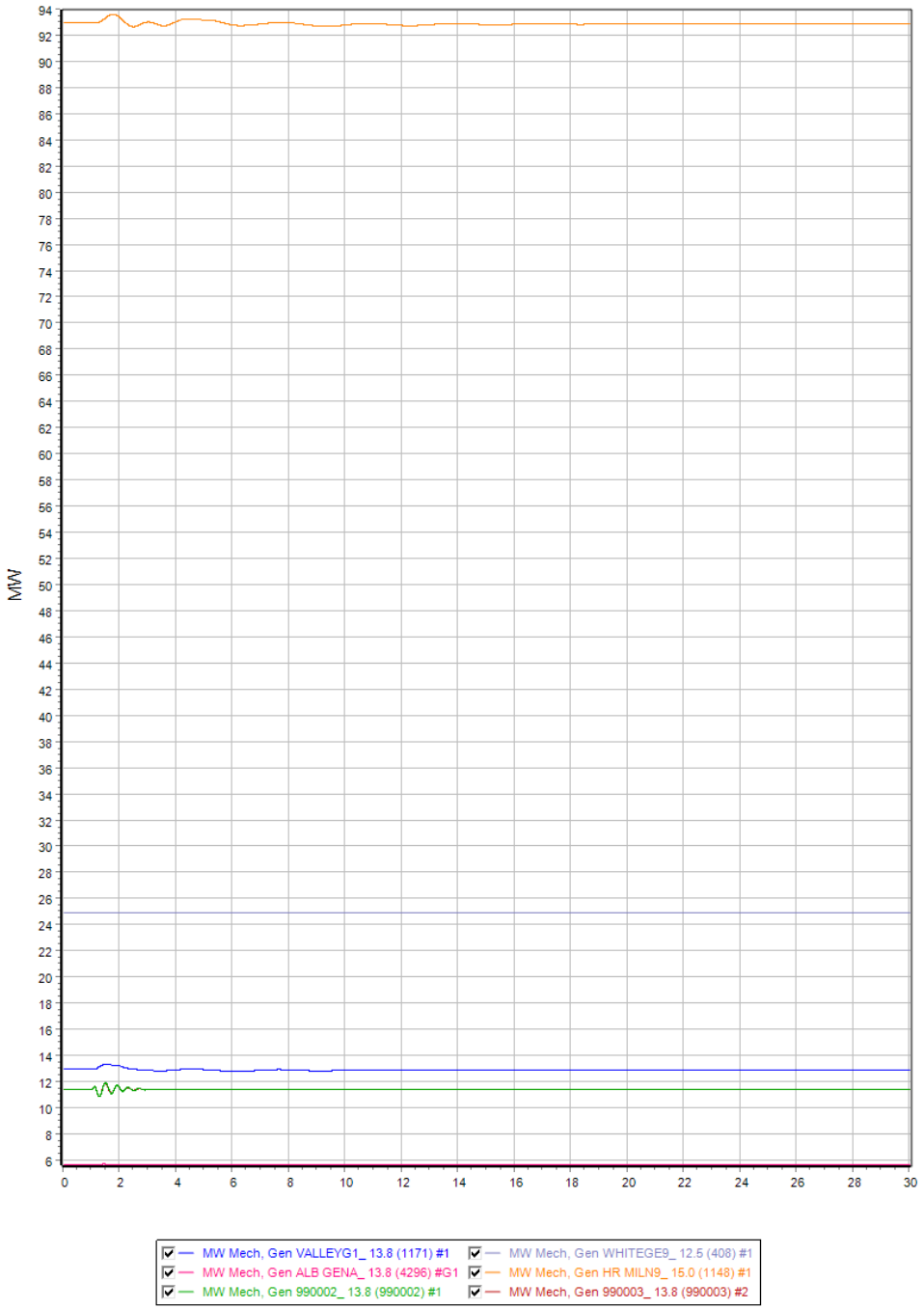
Monitor Line MW & MVAR. Q4



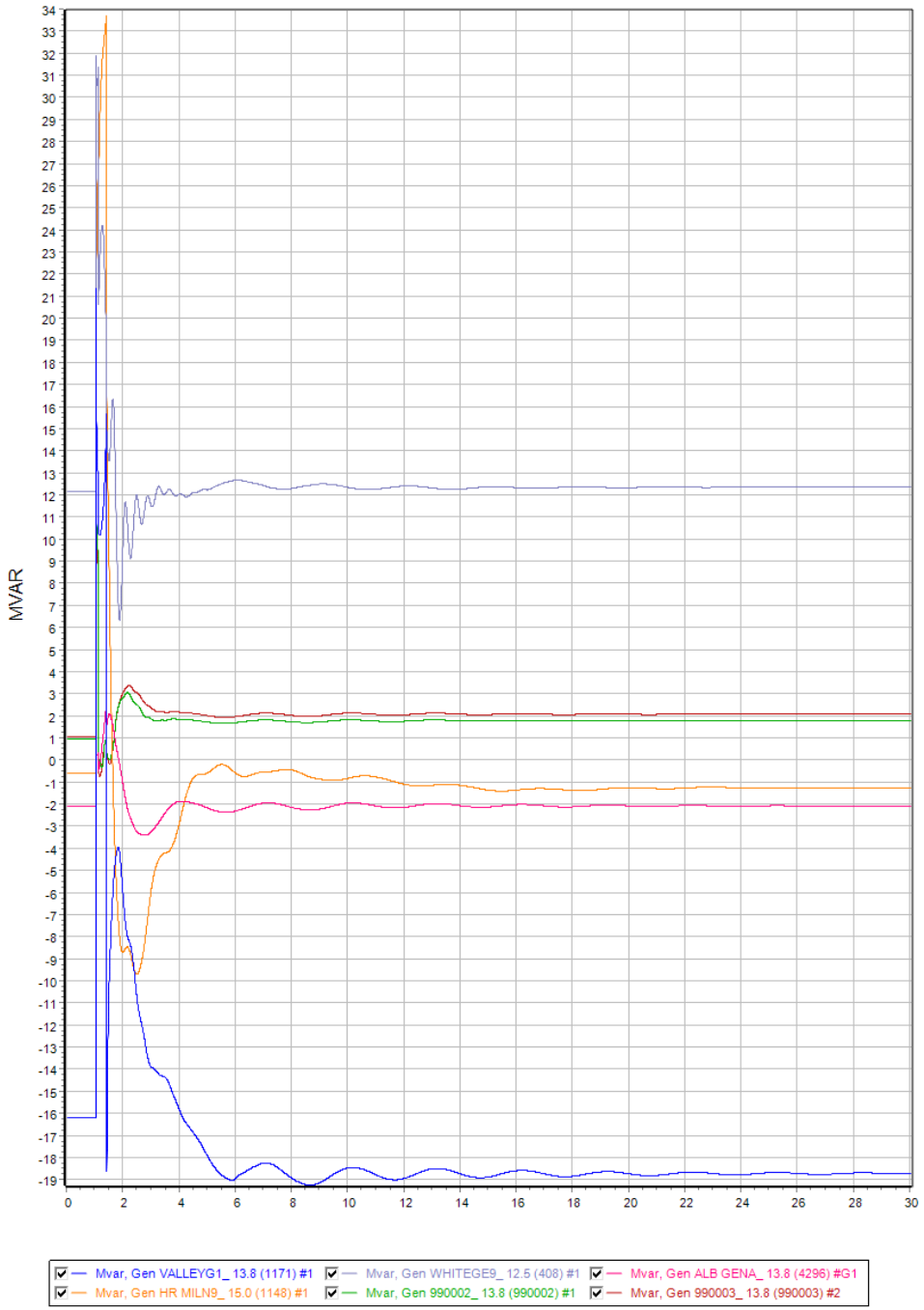


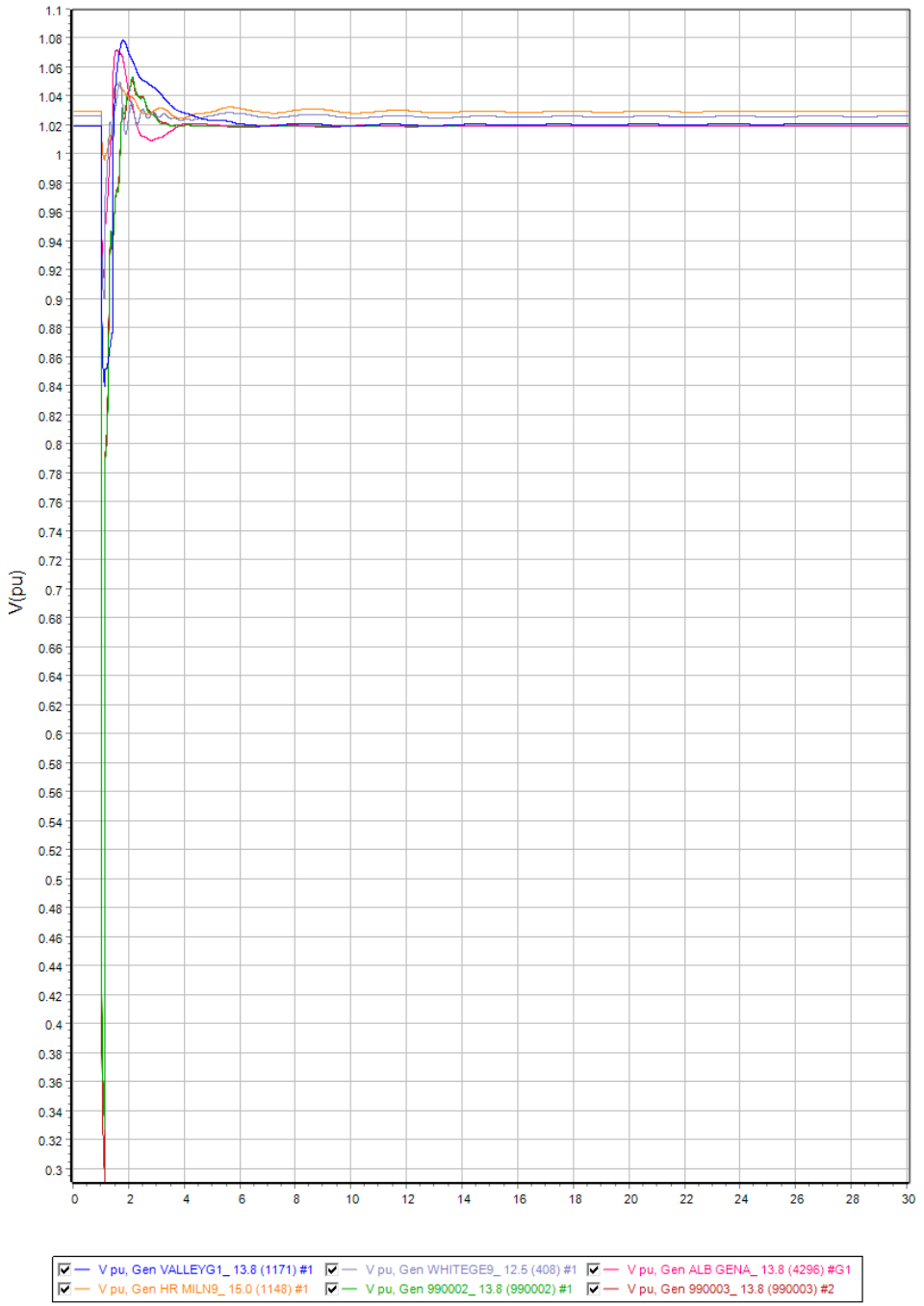
Monitor Gens. Q1



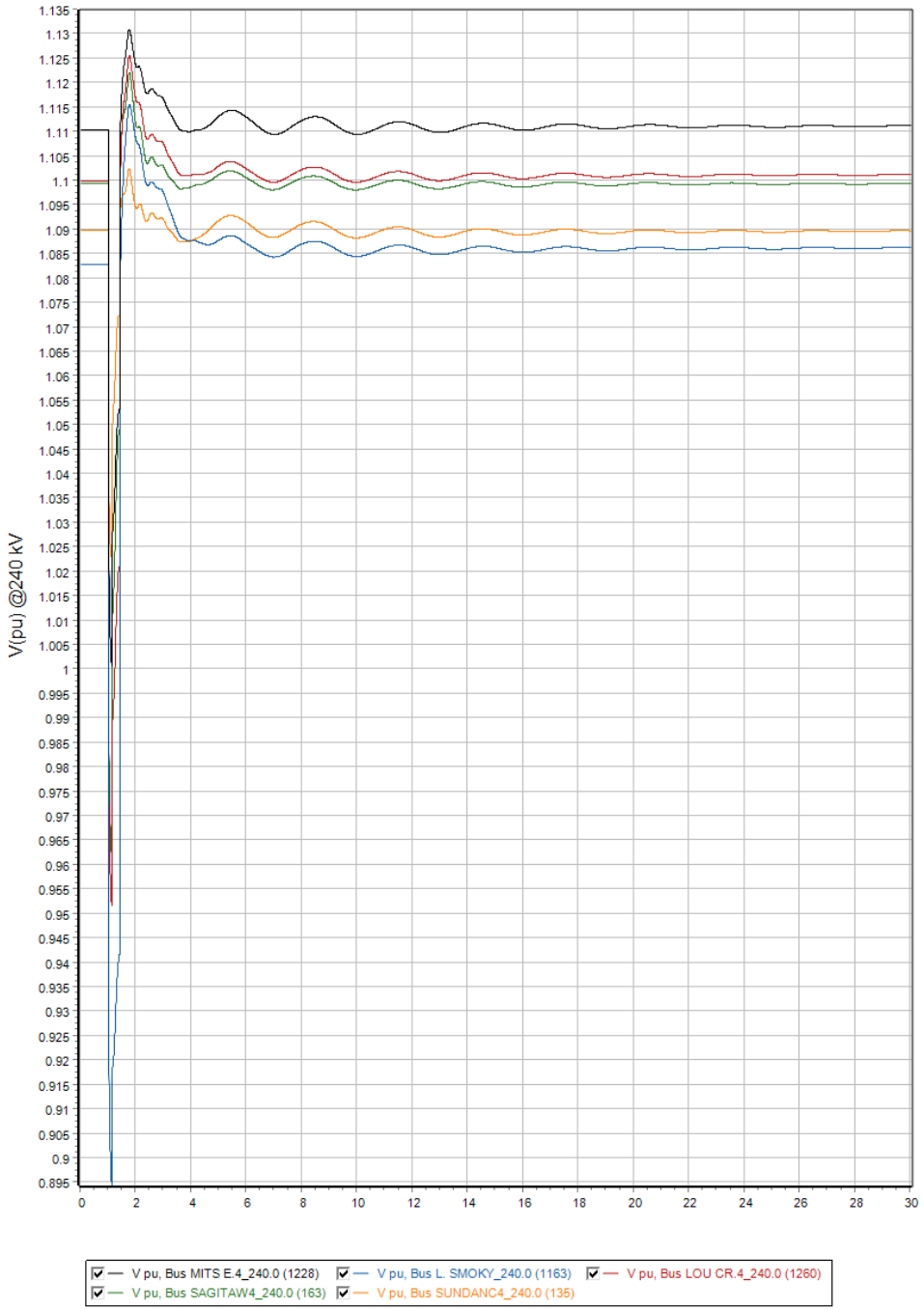


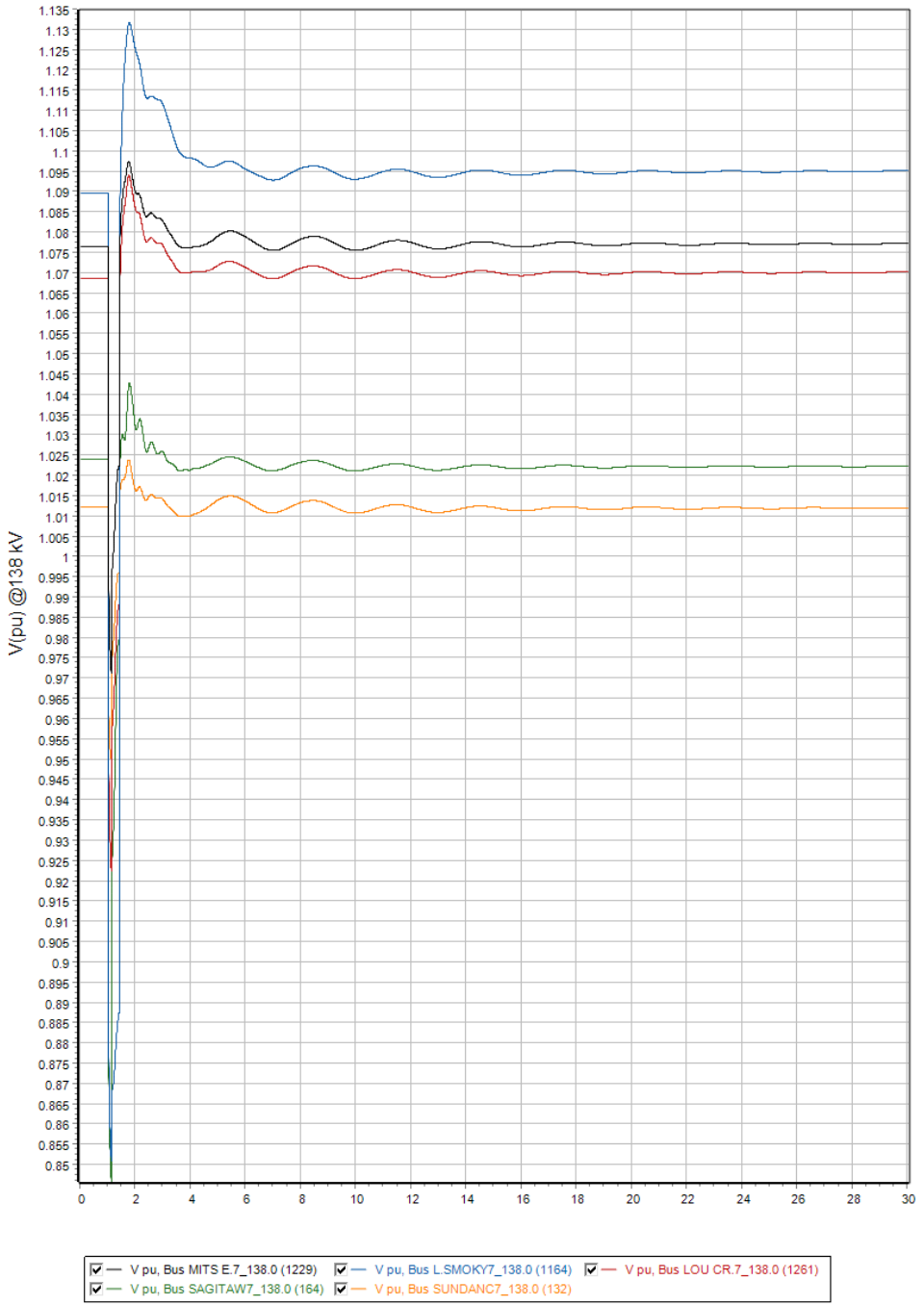
Monitor Gens. Q2



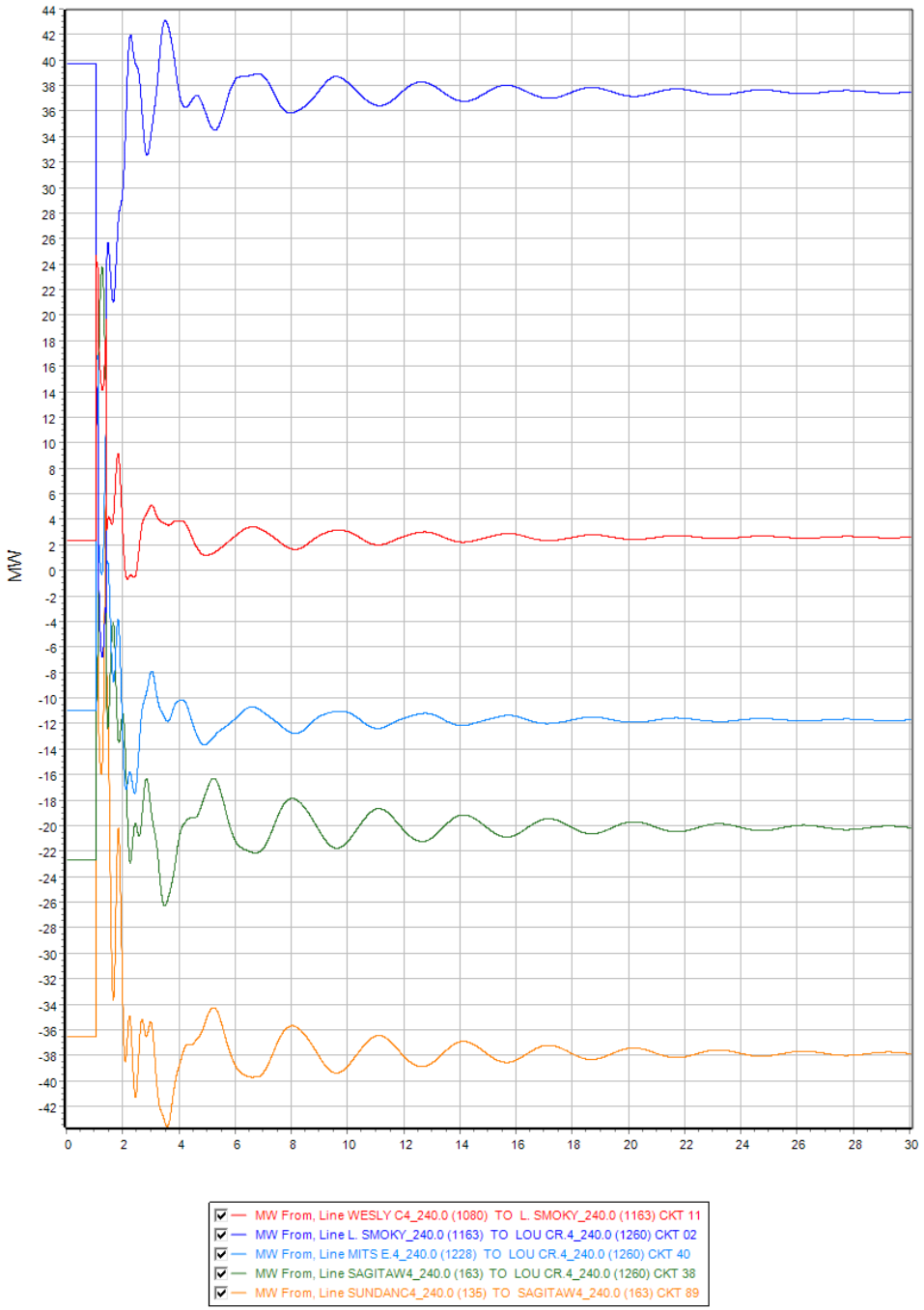


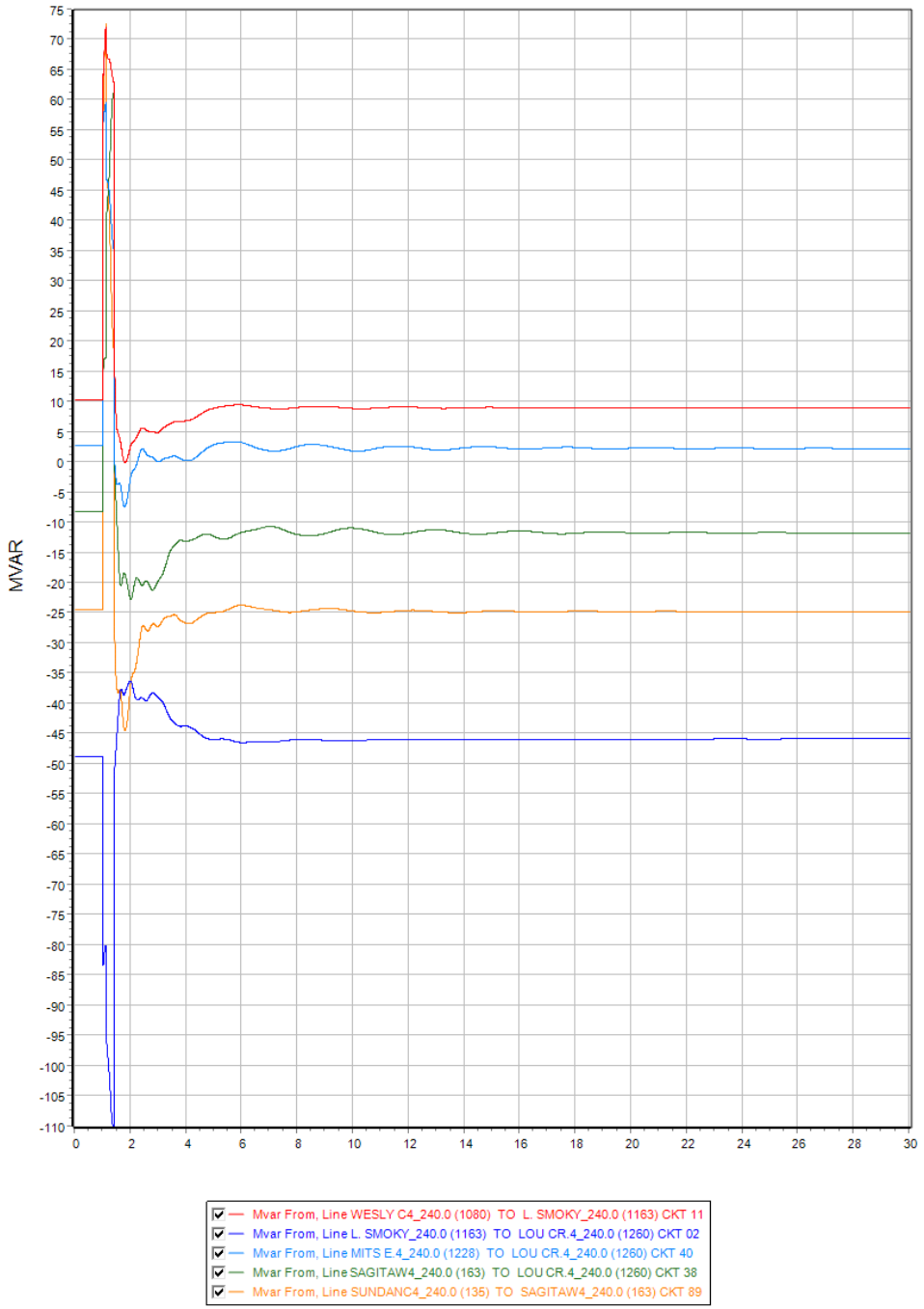
Monitor Bus Volts Q3



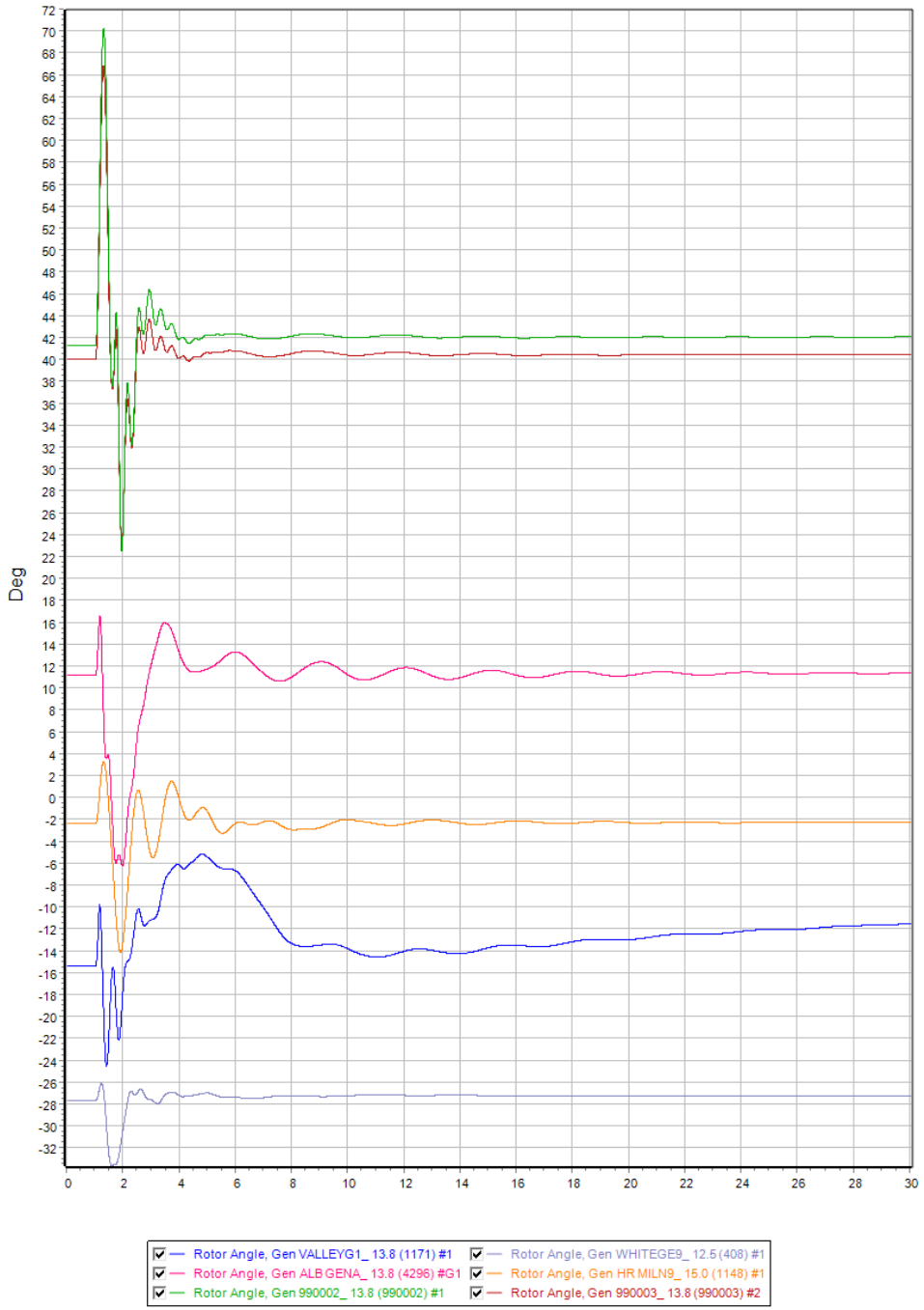


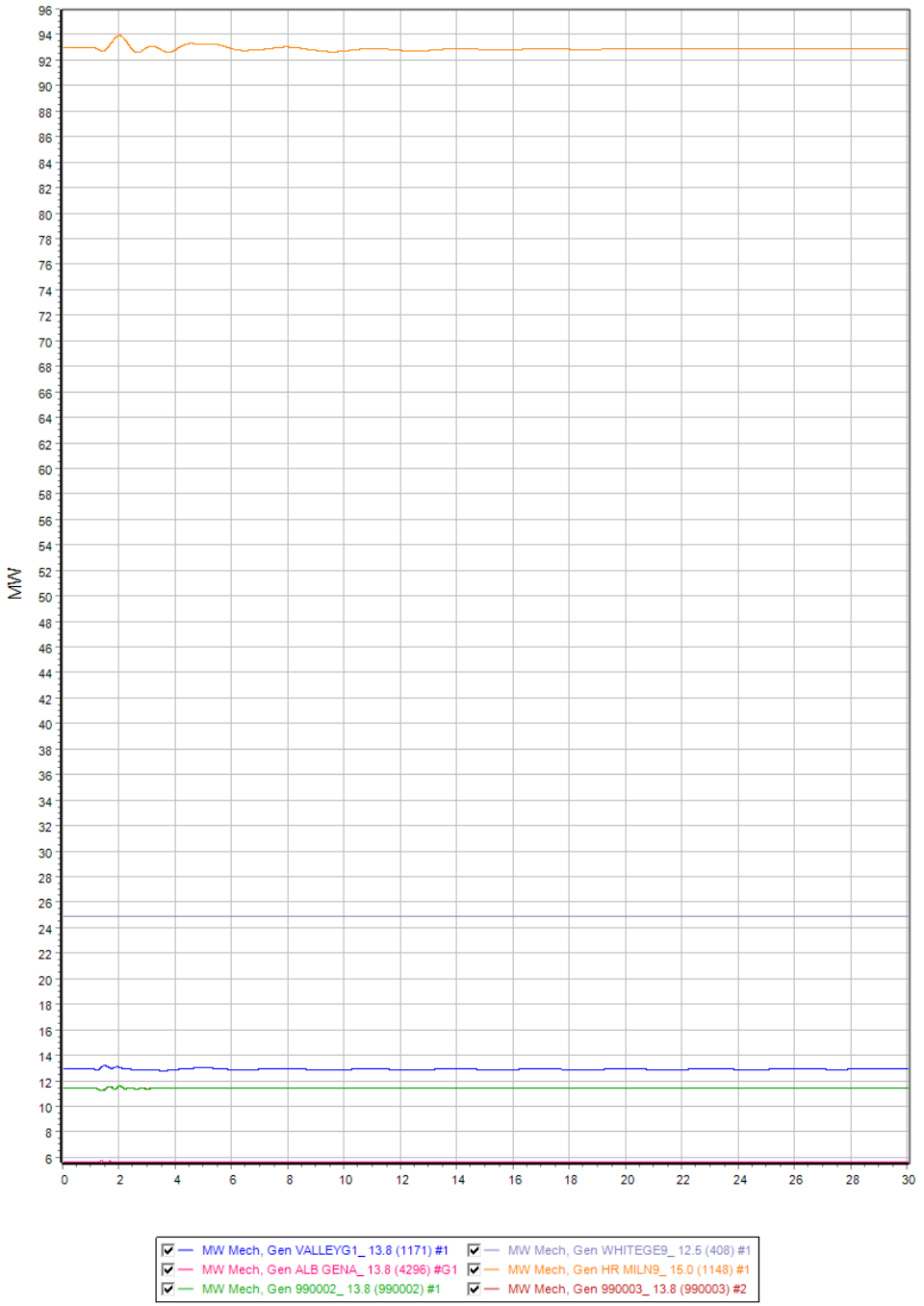
Monitor Line MW & MVAR. Q4



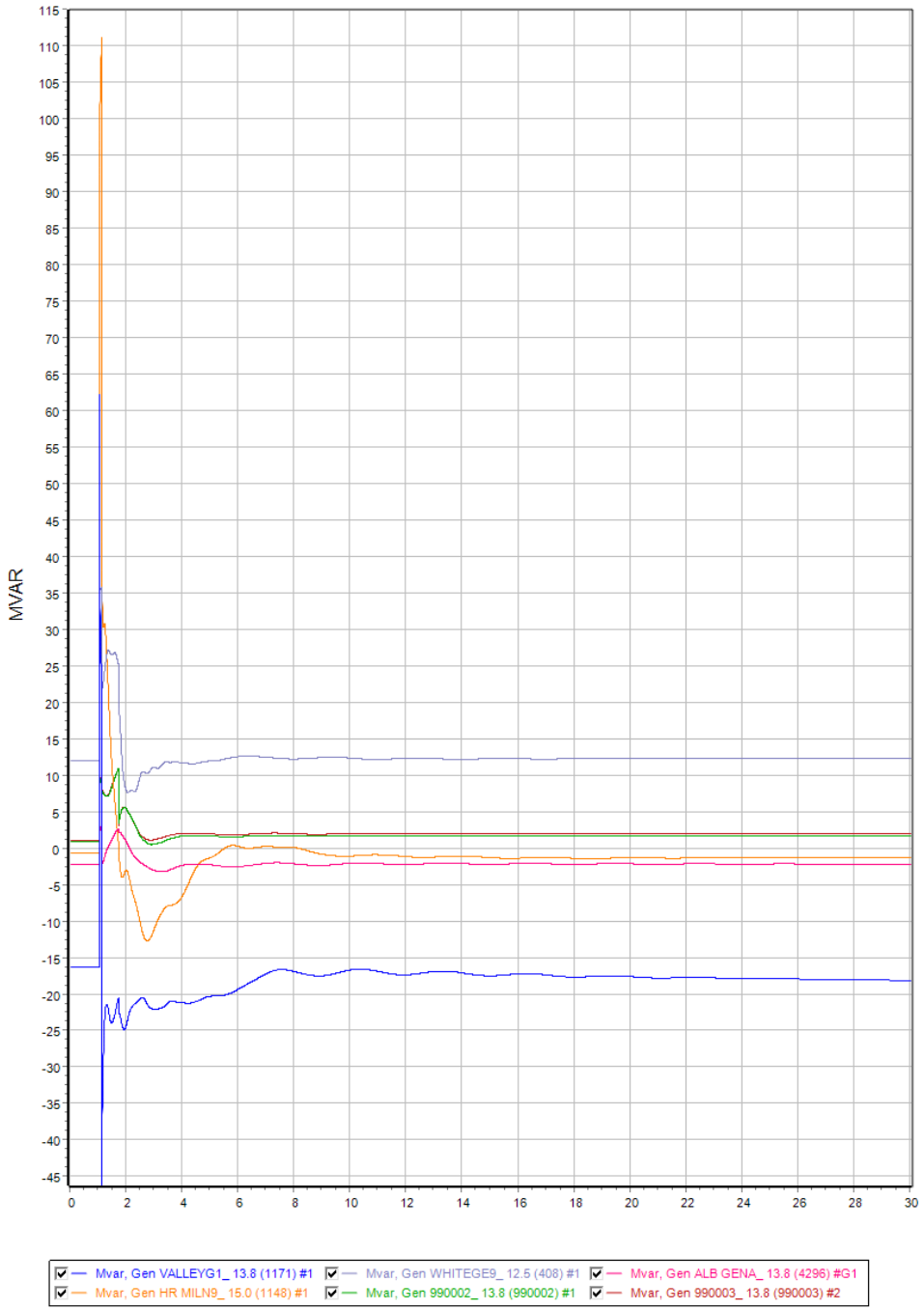


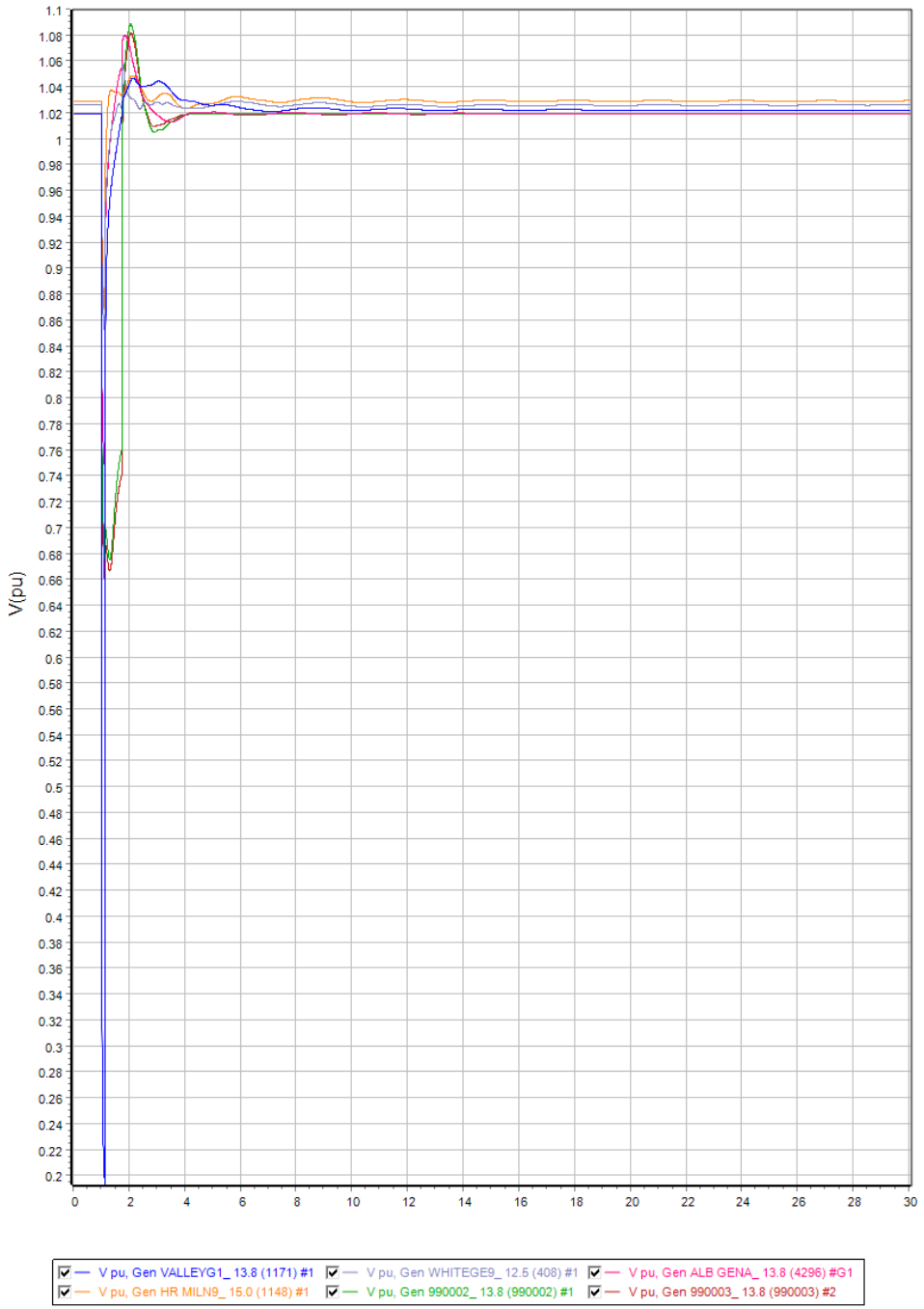
Monitor Gens. Q1





Monitor Gens. Q2

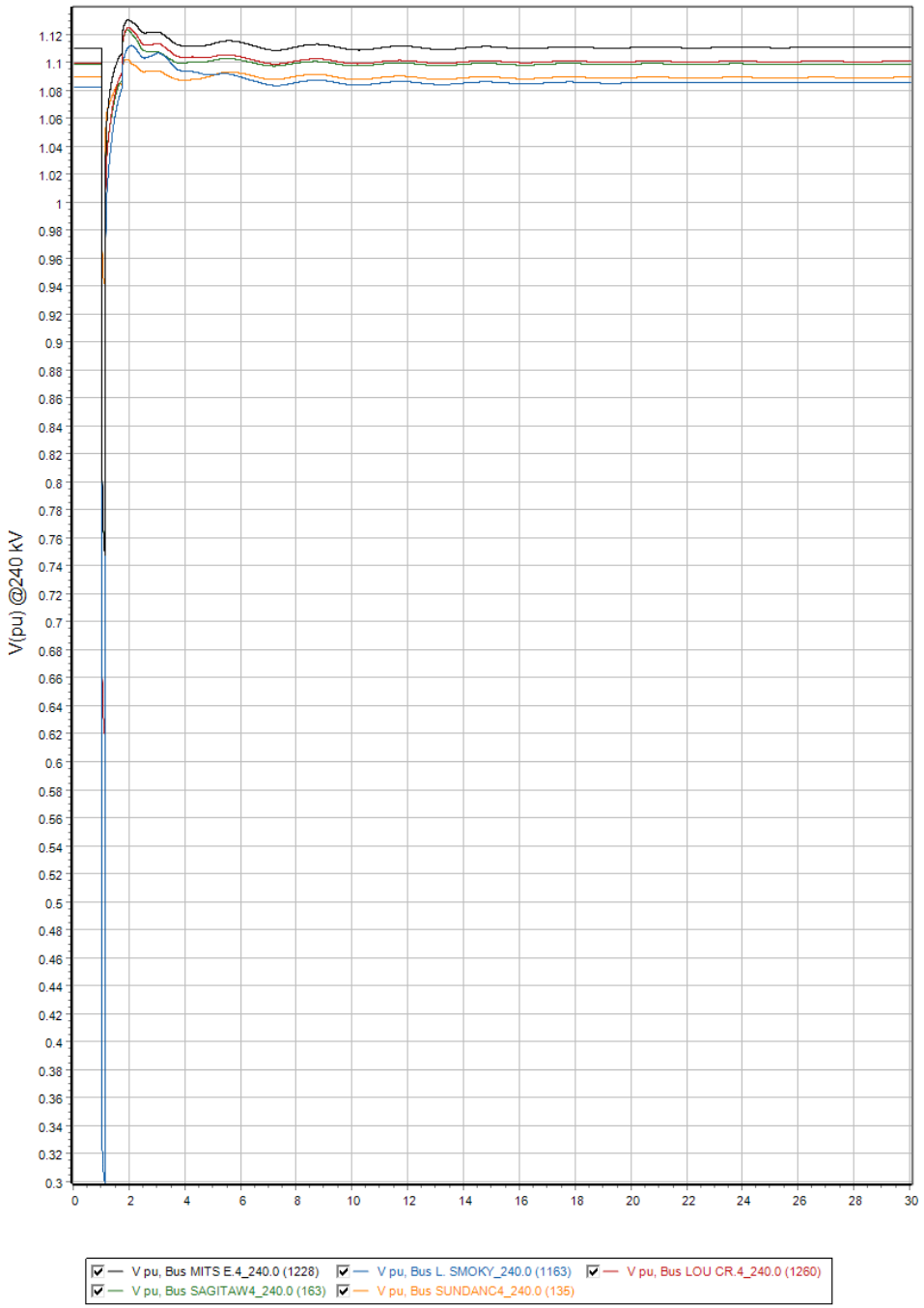


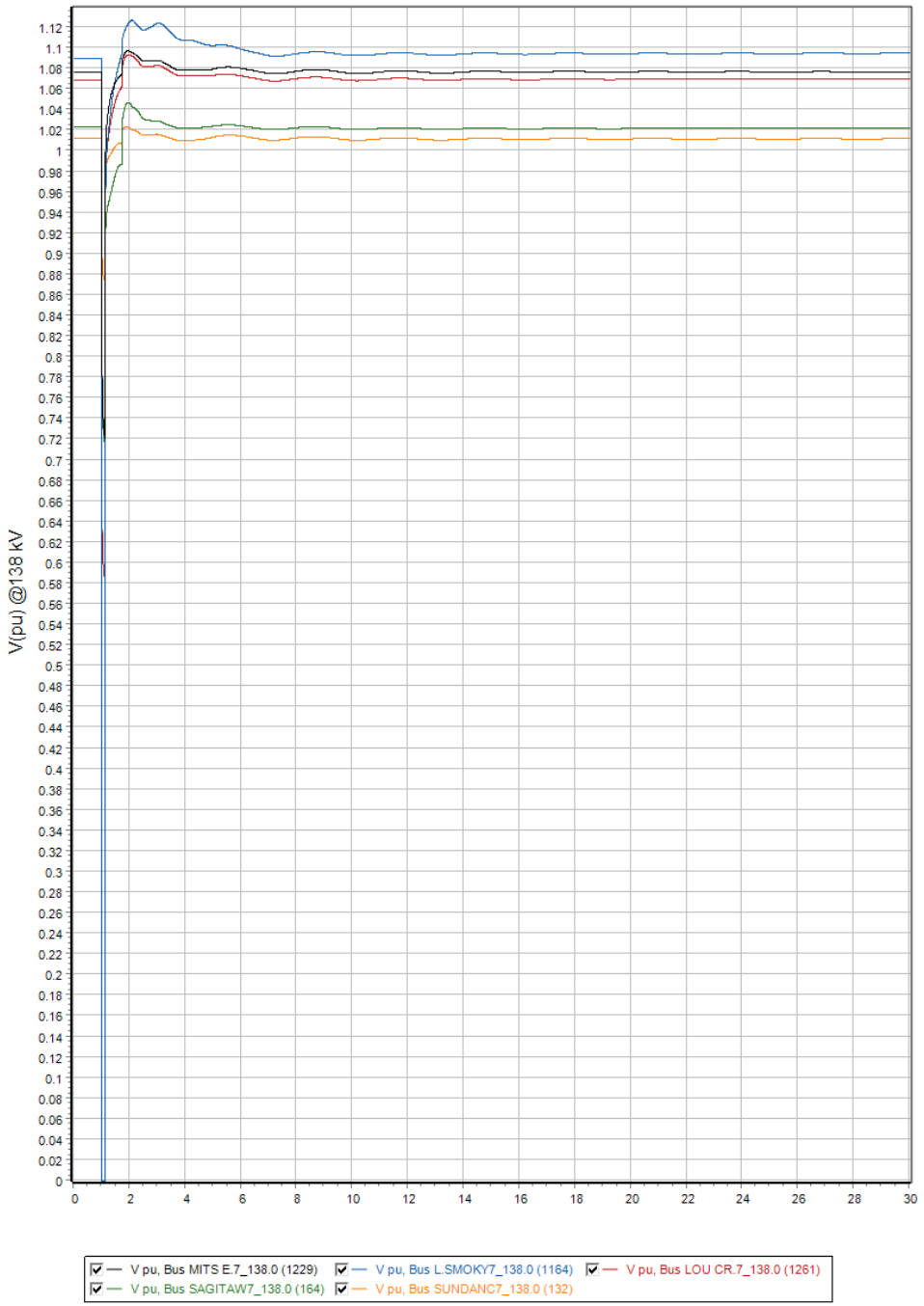


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 06B - 7L90 (Fox Creek 741S – Little Smoky 813S) @ Little Smoky 813S

Monitor Bus Volts Q3

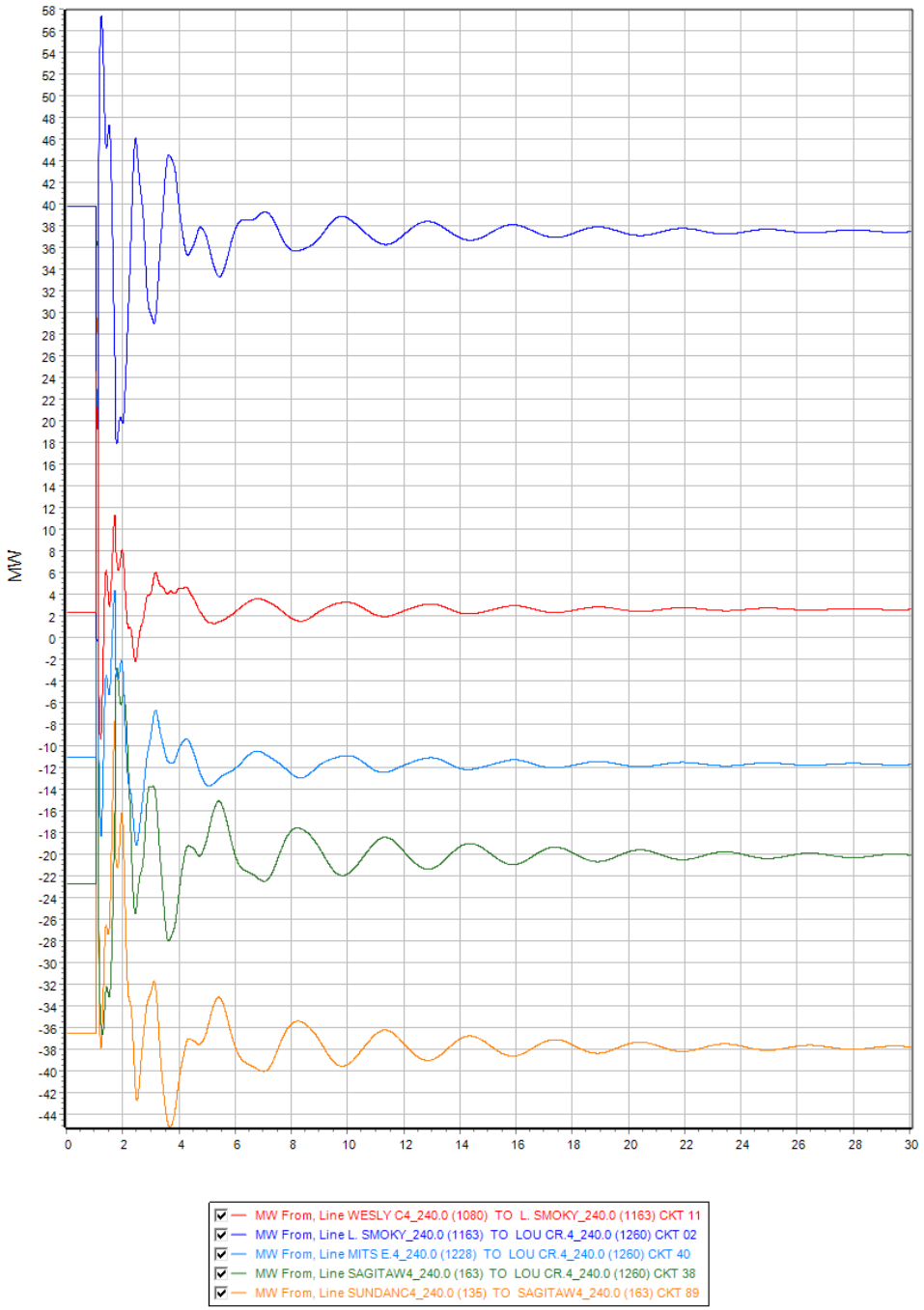


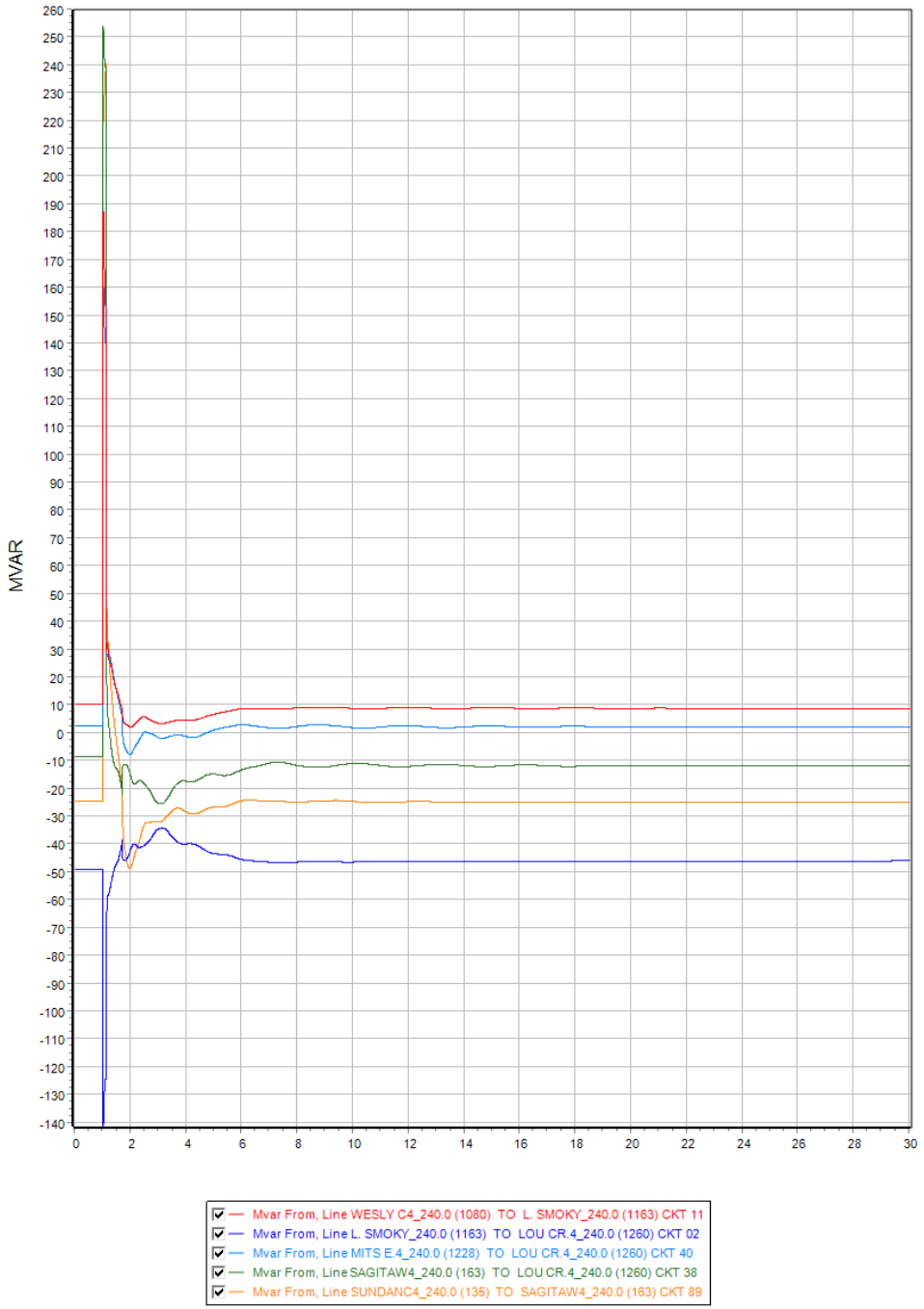


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

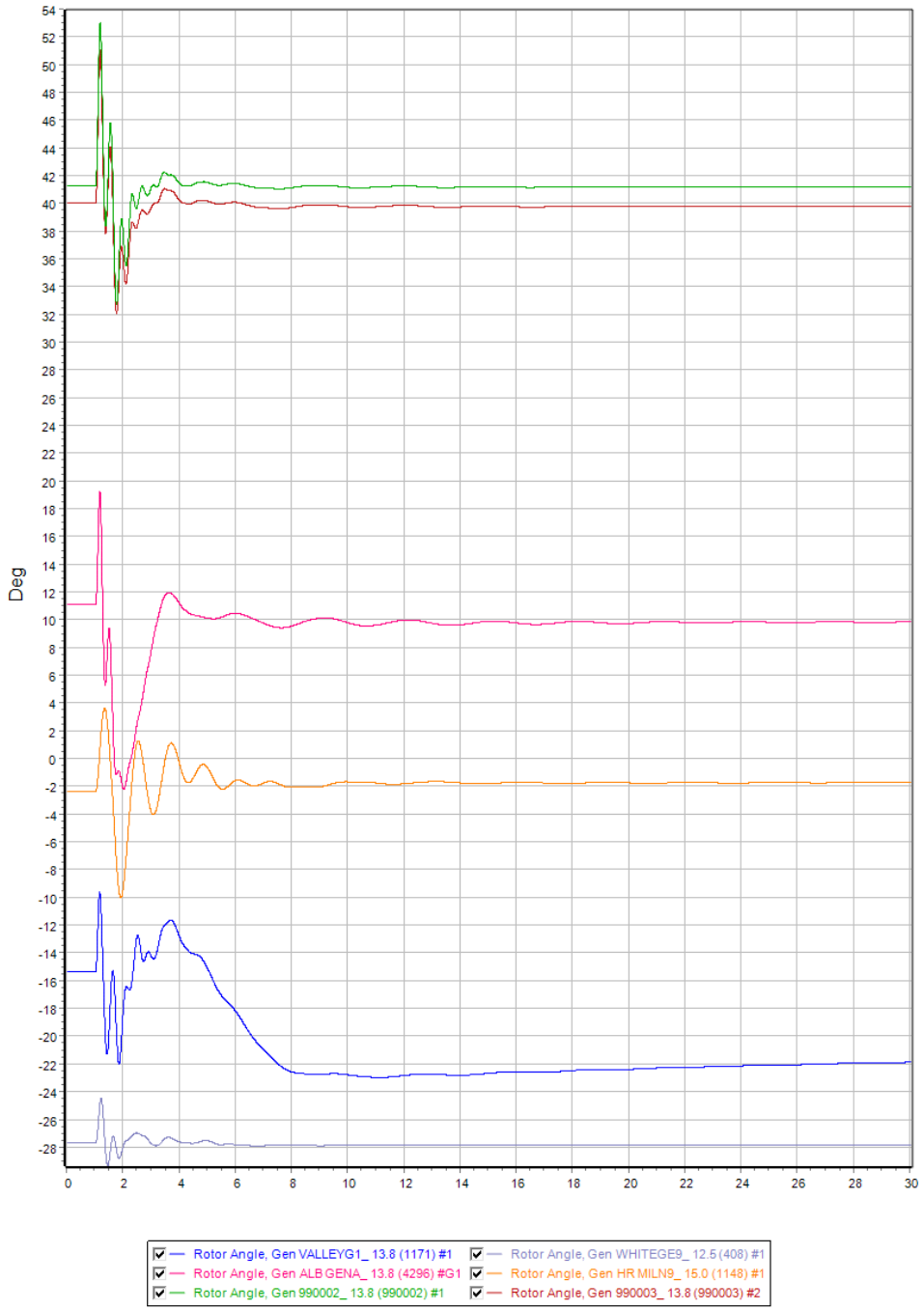
Contingency: 06B - 7L90 (Fox Creek 741S – Little Smoky 813S) @ Little Smoky 813S

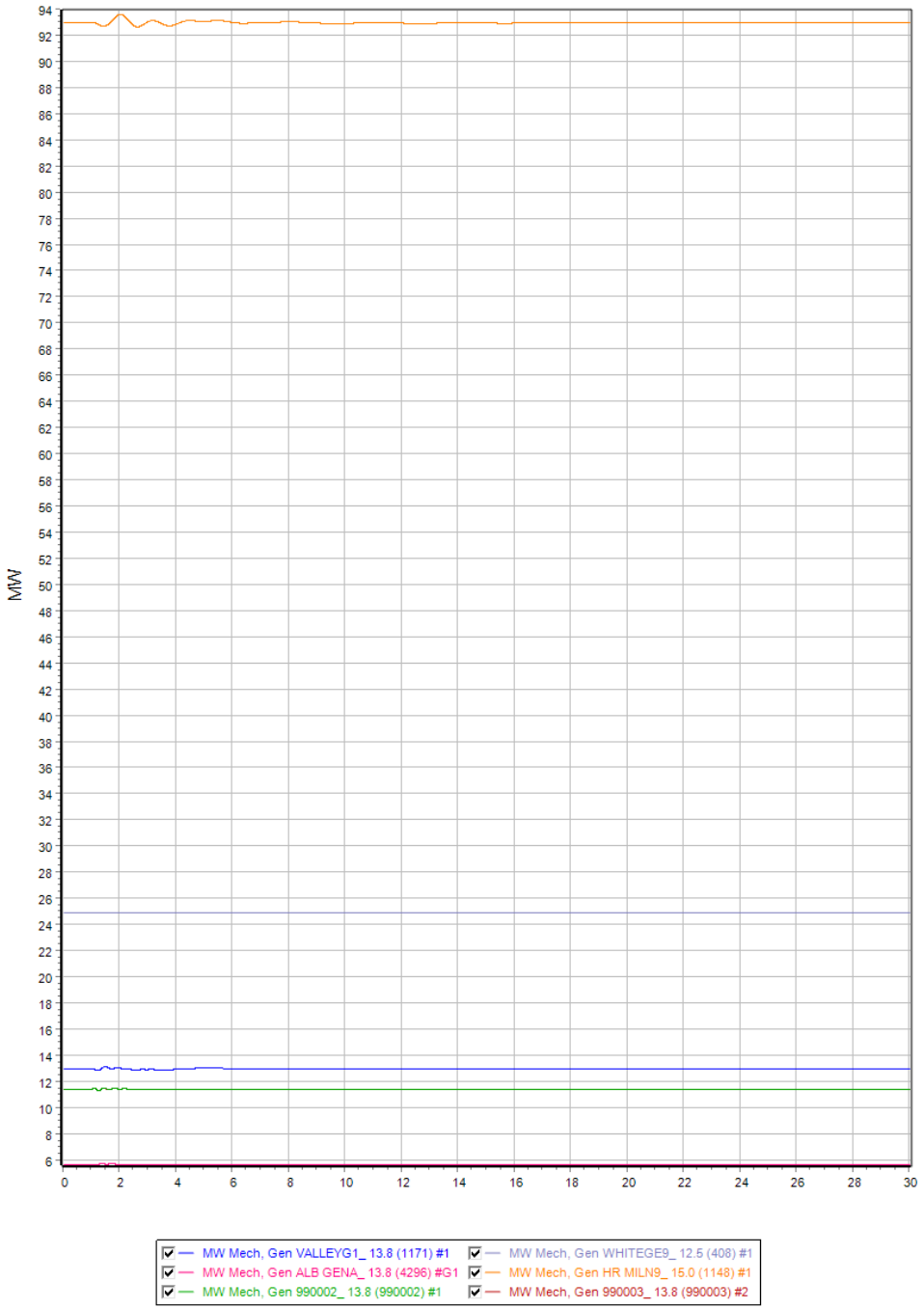
Monitor Line MW & MVAR. Q4



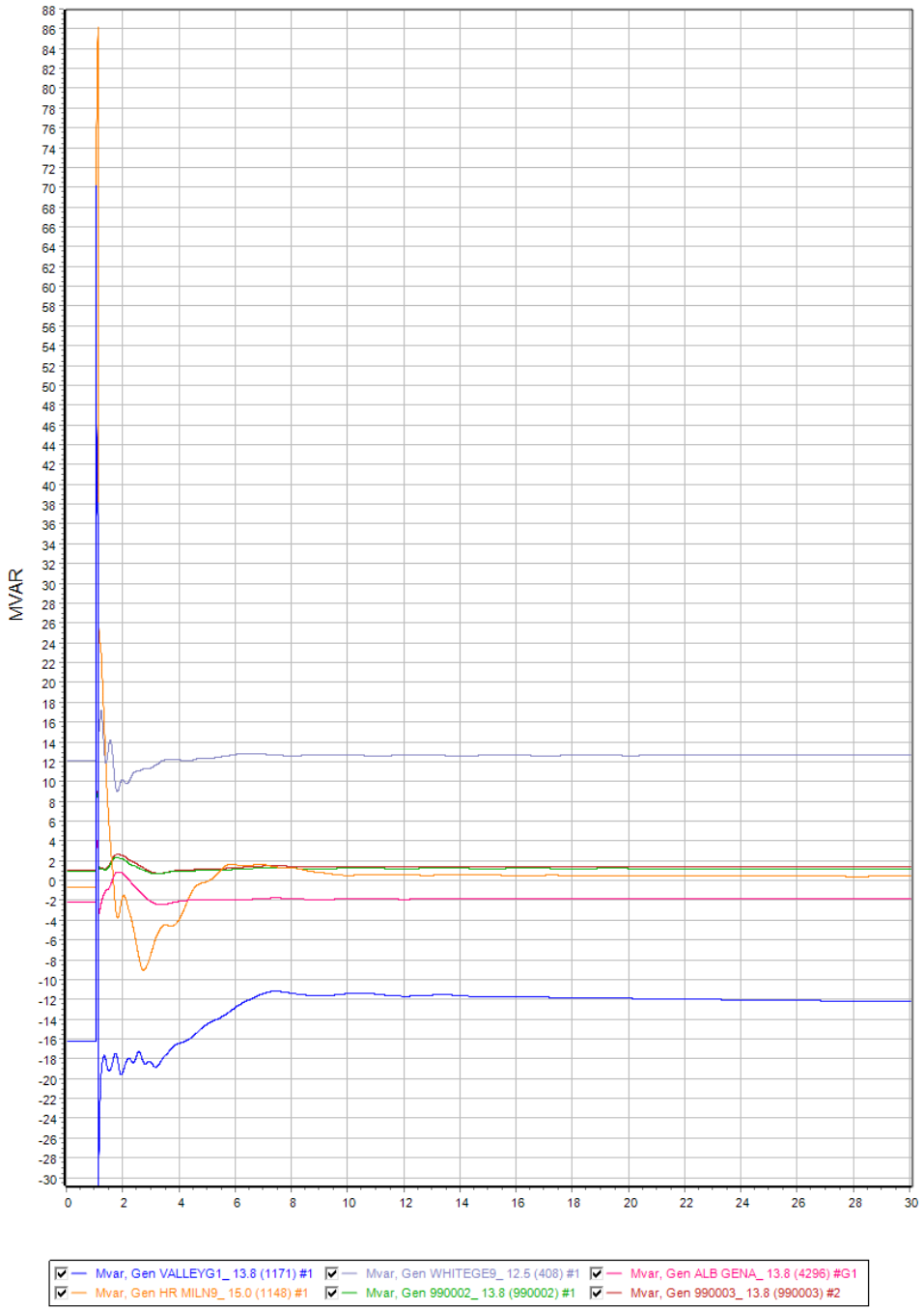


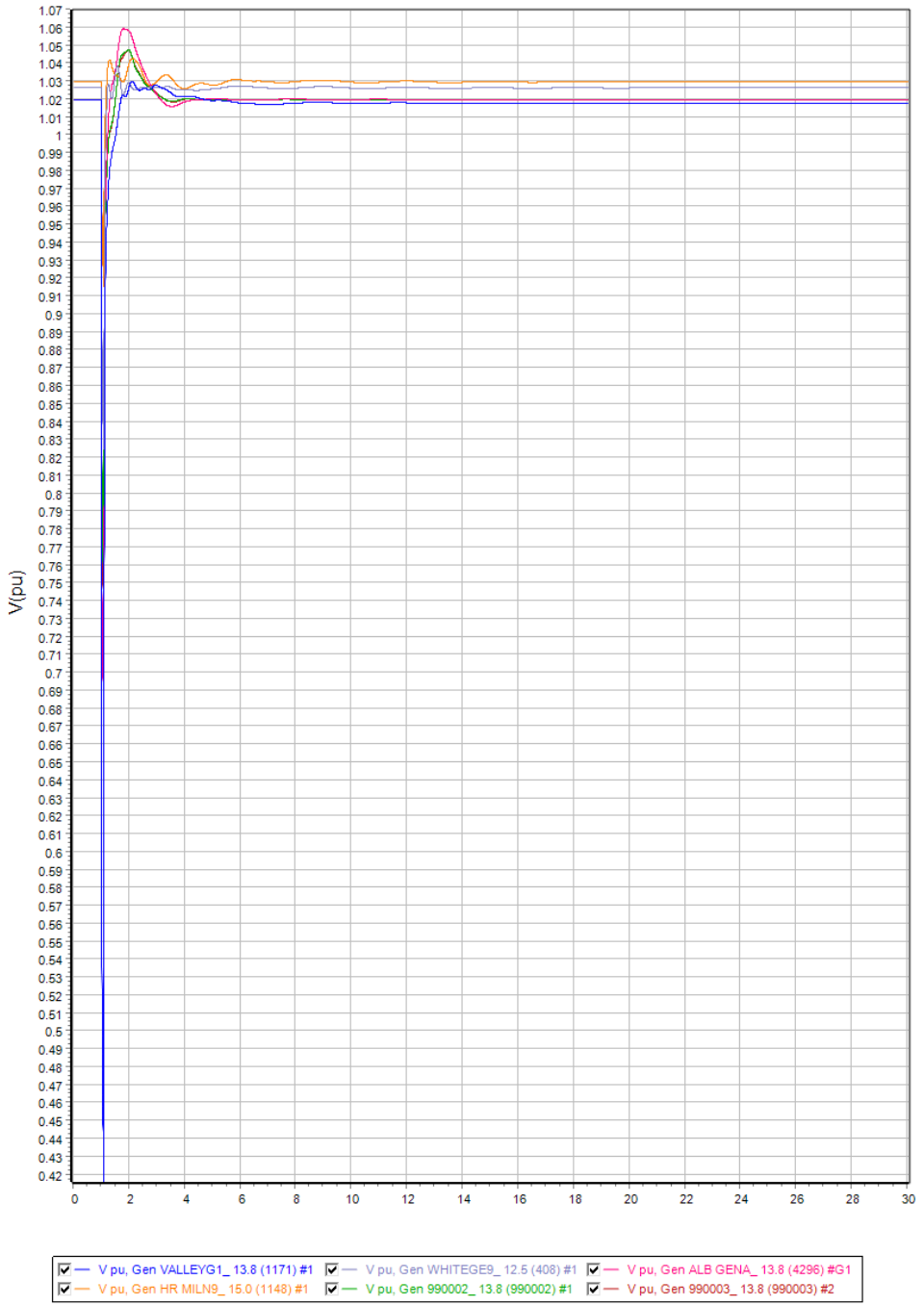
Monitor Gens. Q1



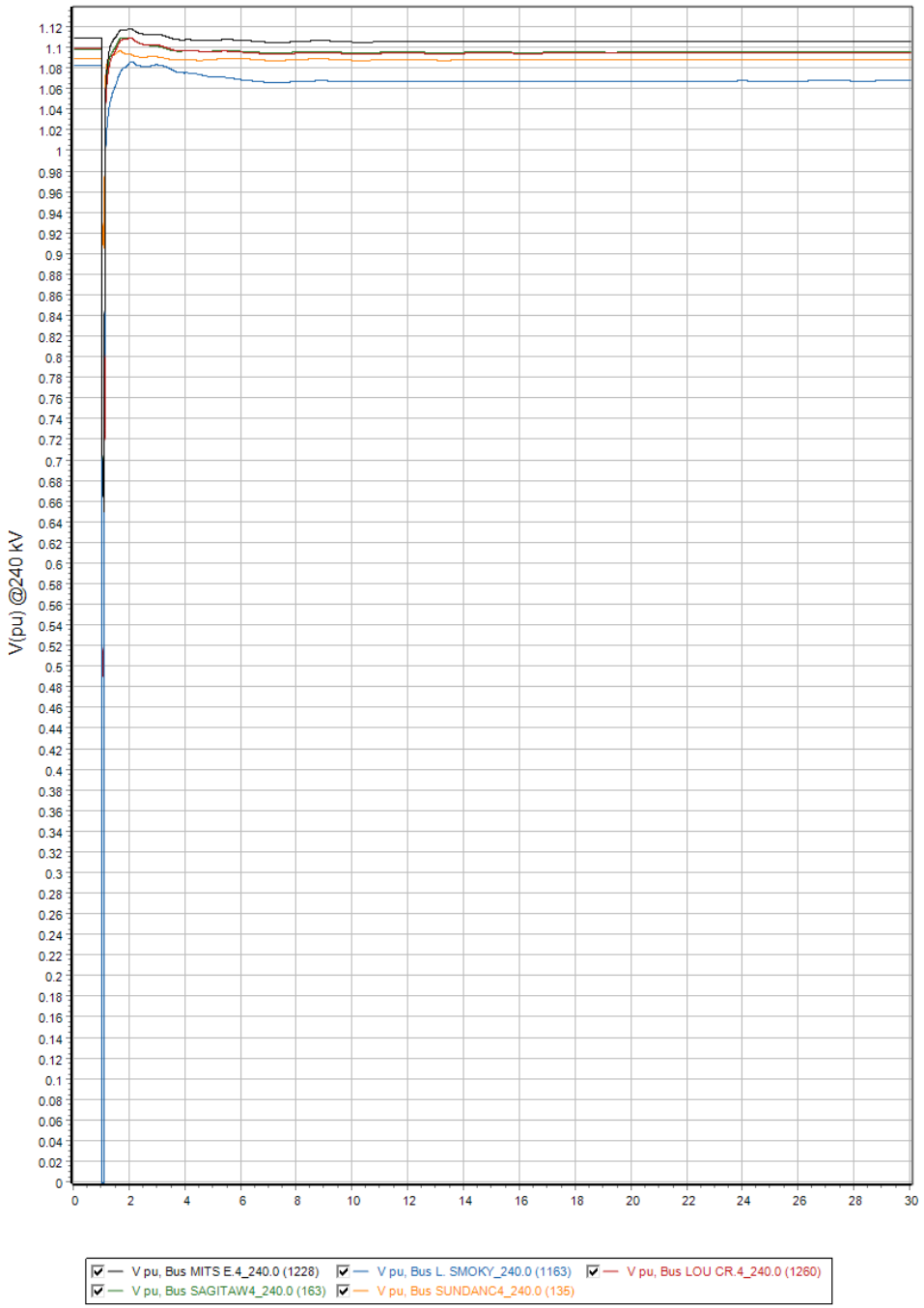


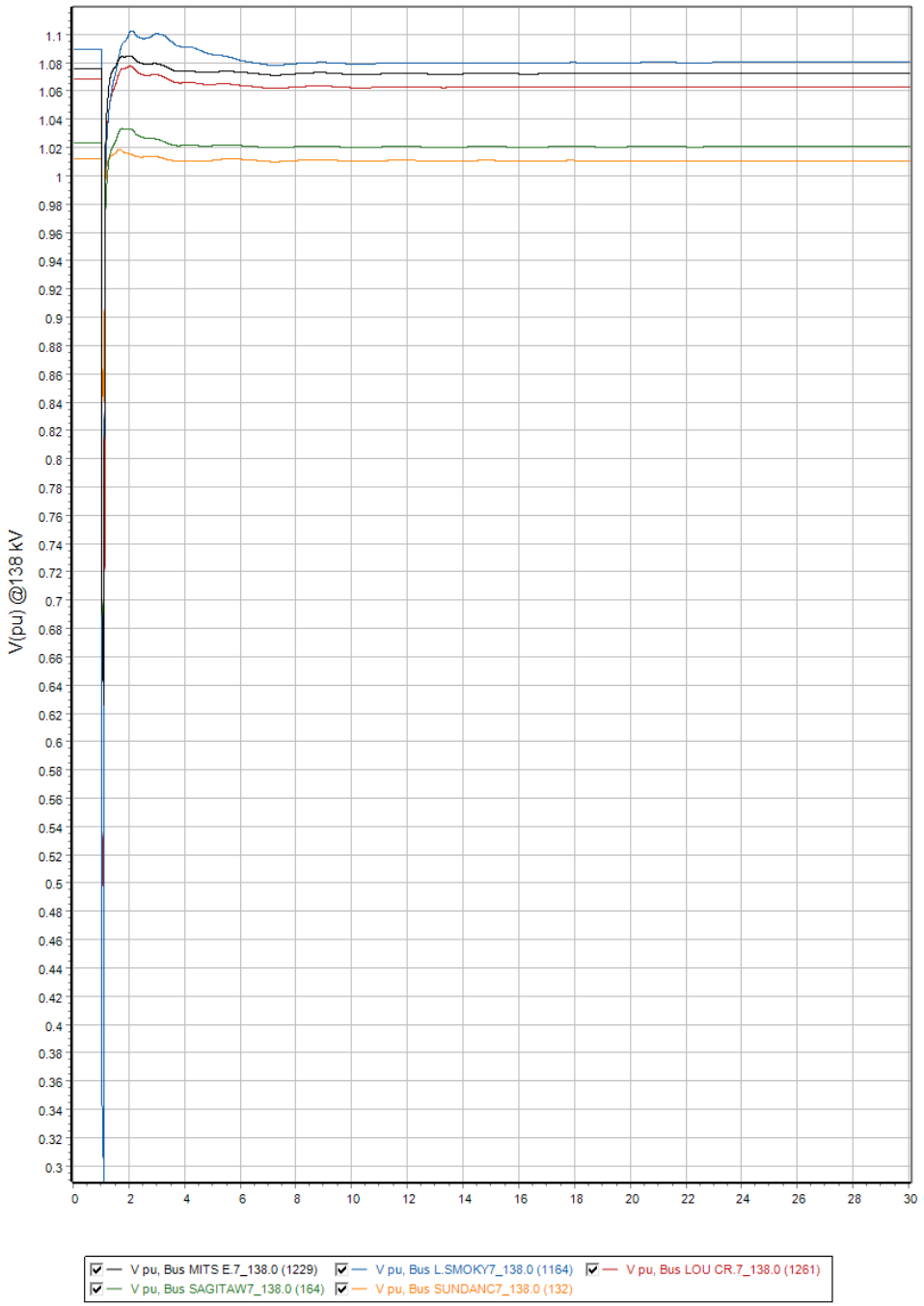
Monitor Gens. Q2



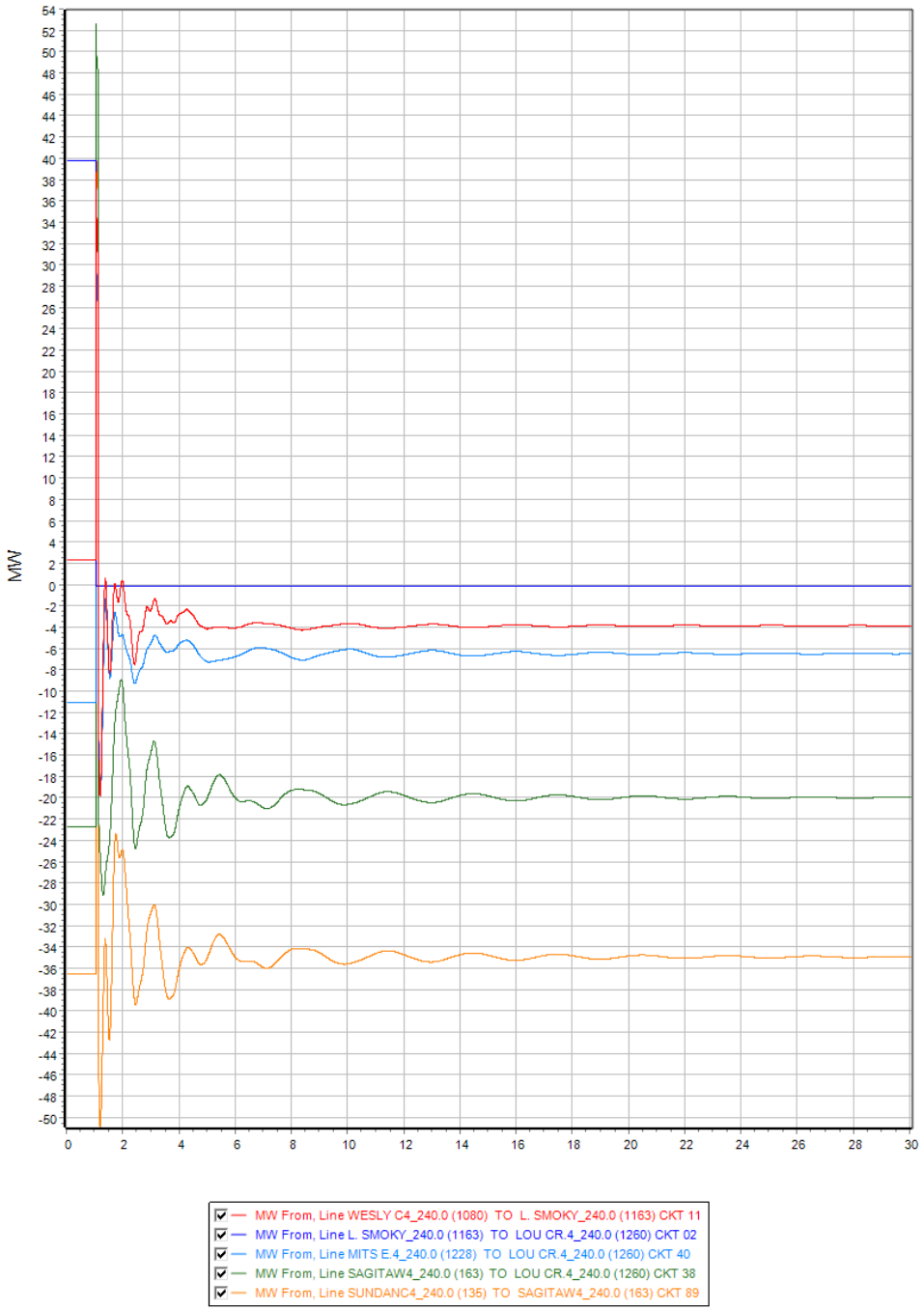


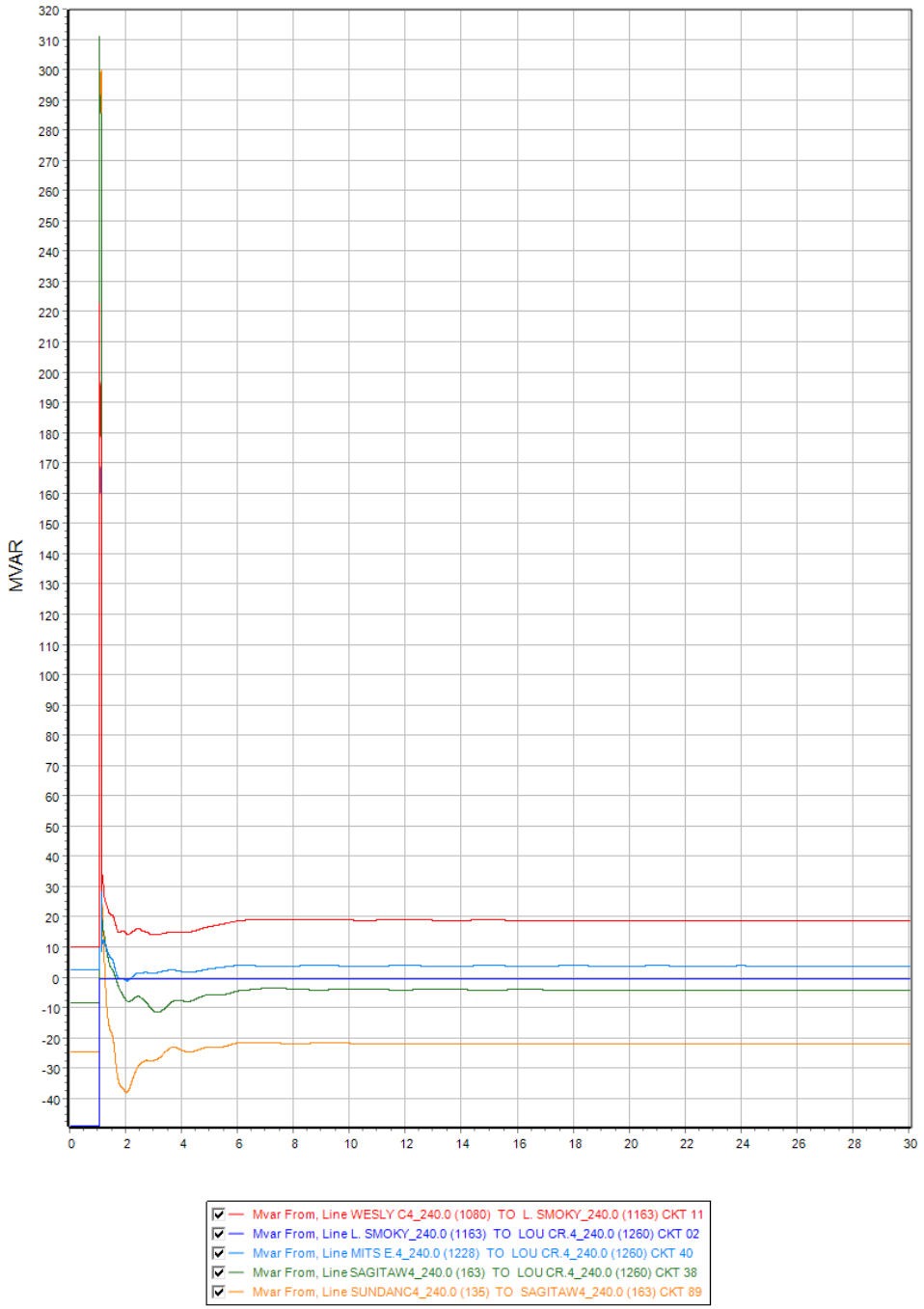
Monitor Bus Volts Q3



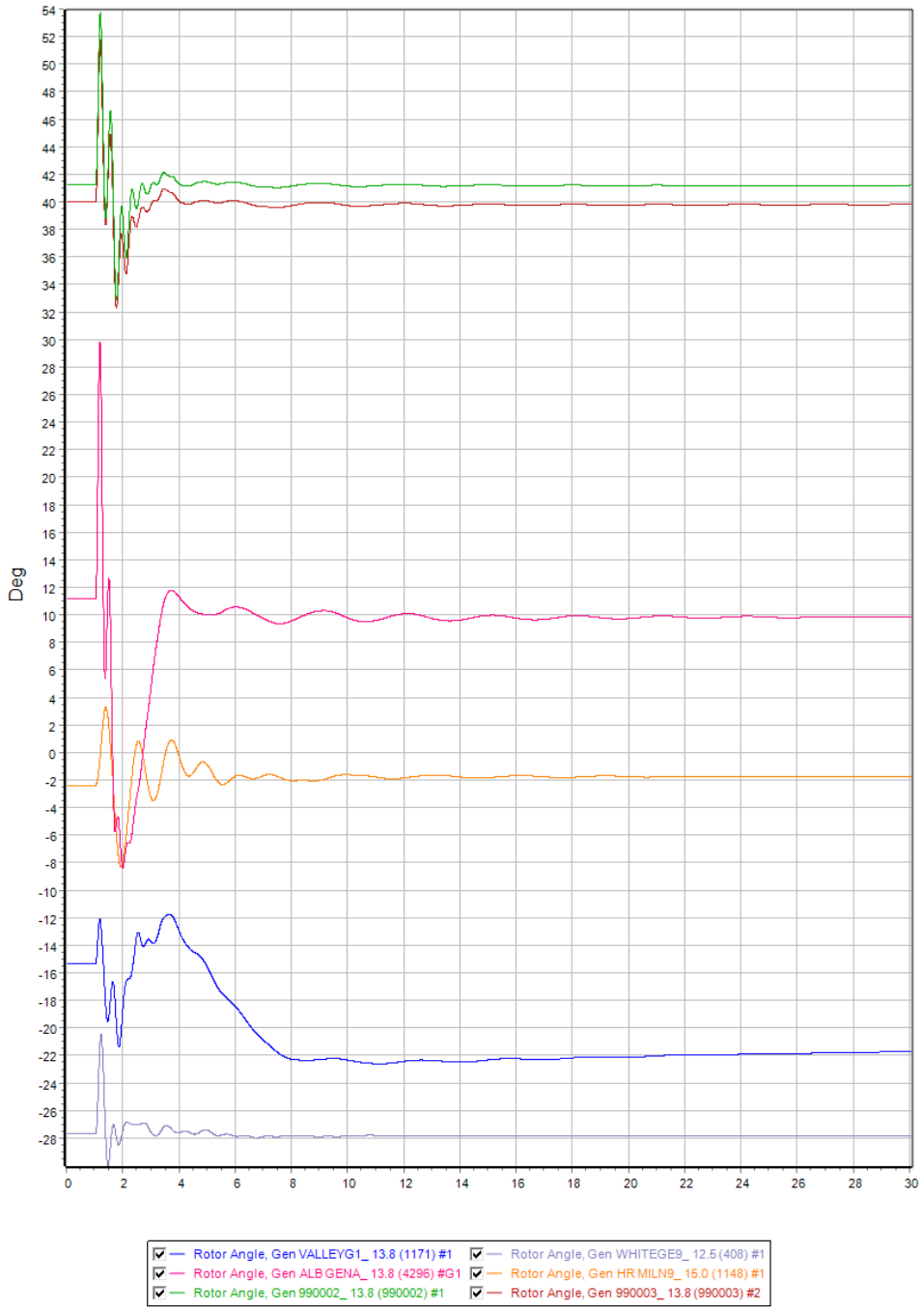


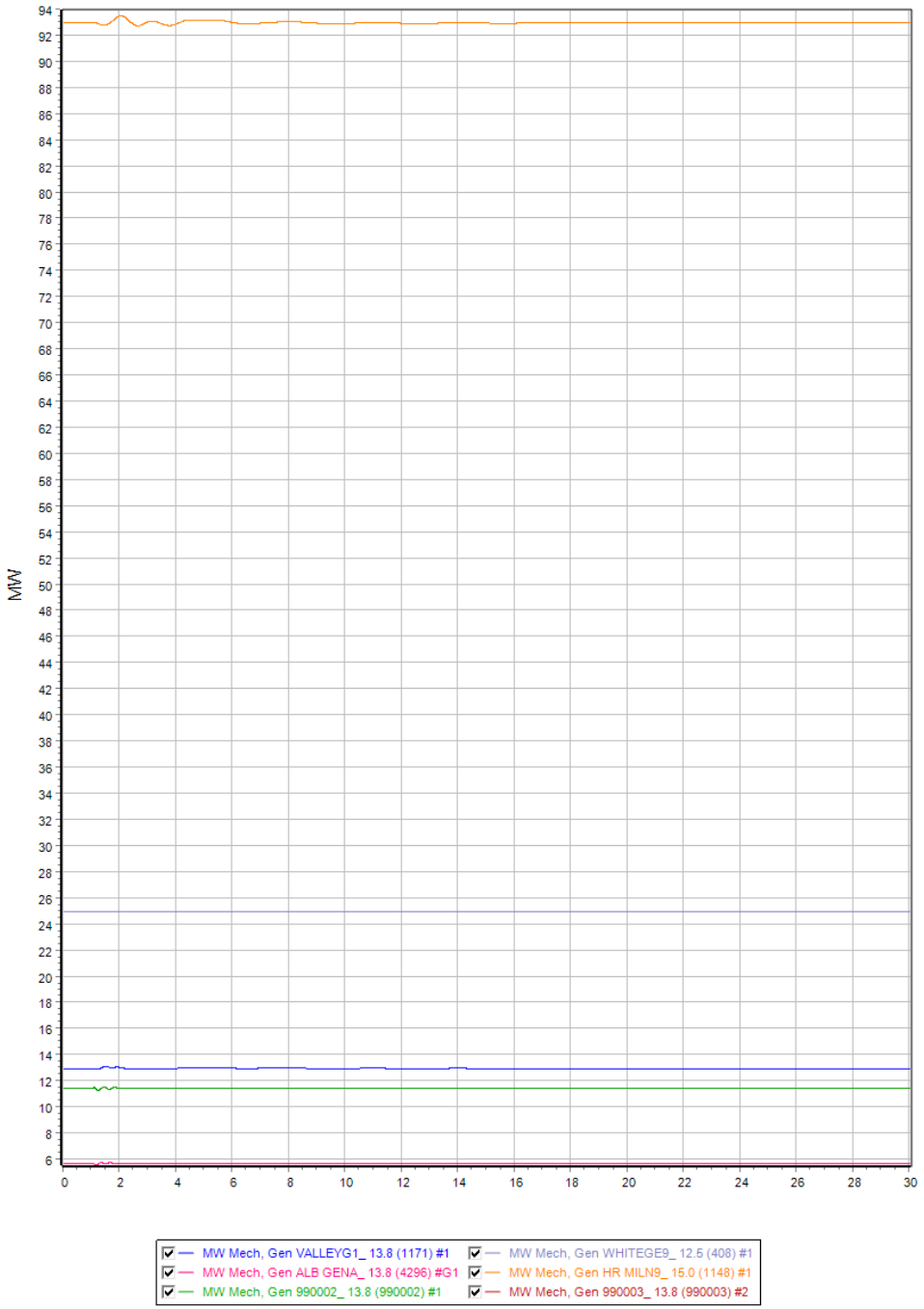
Monitor Line MW & MVAR. Q4



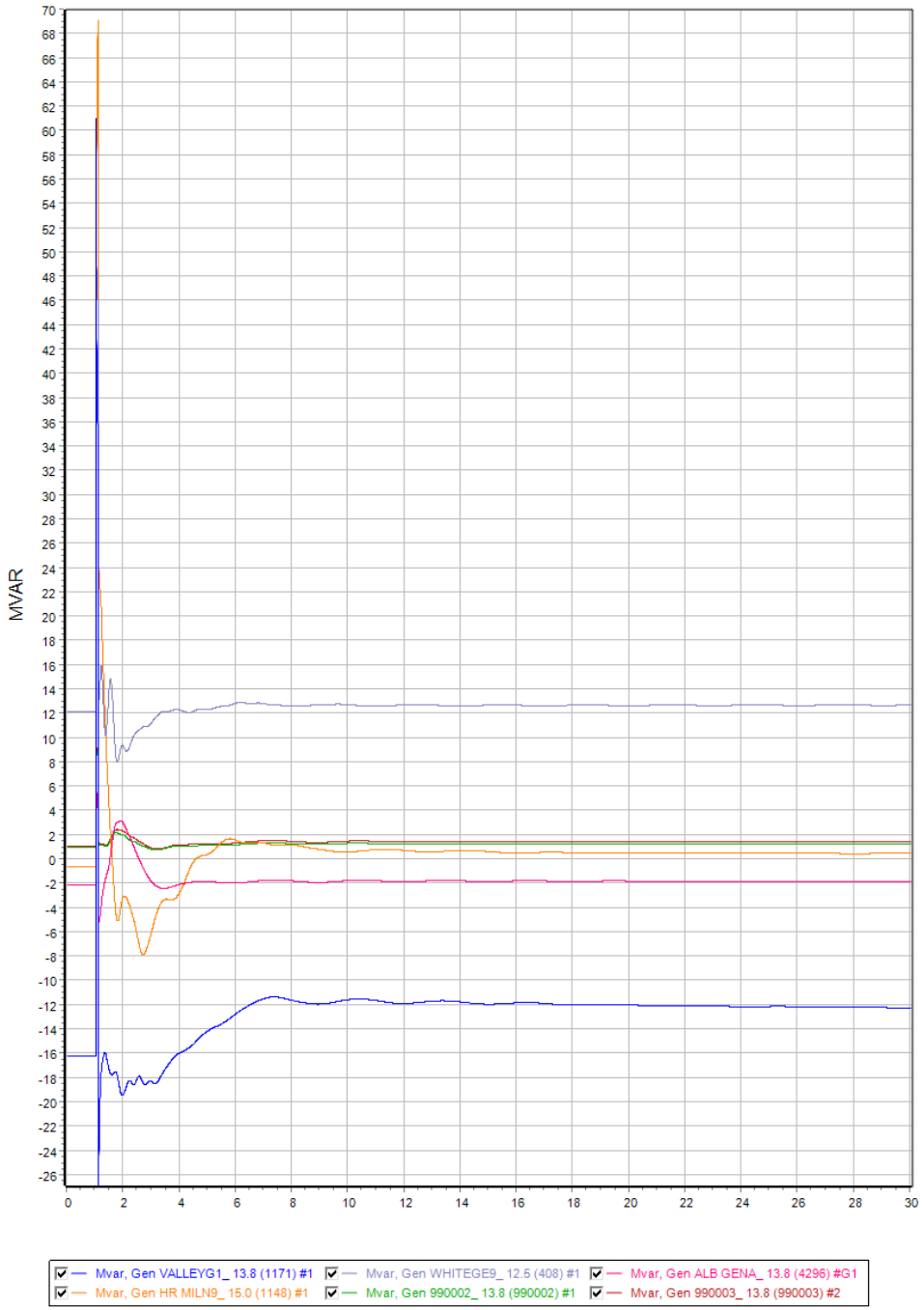


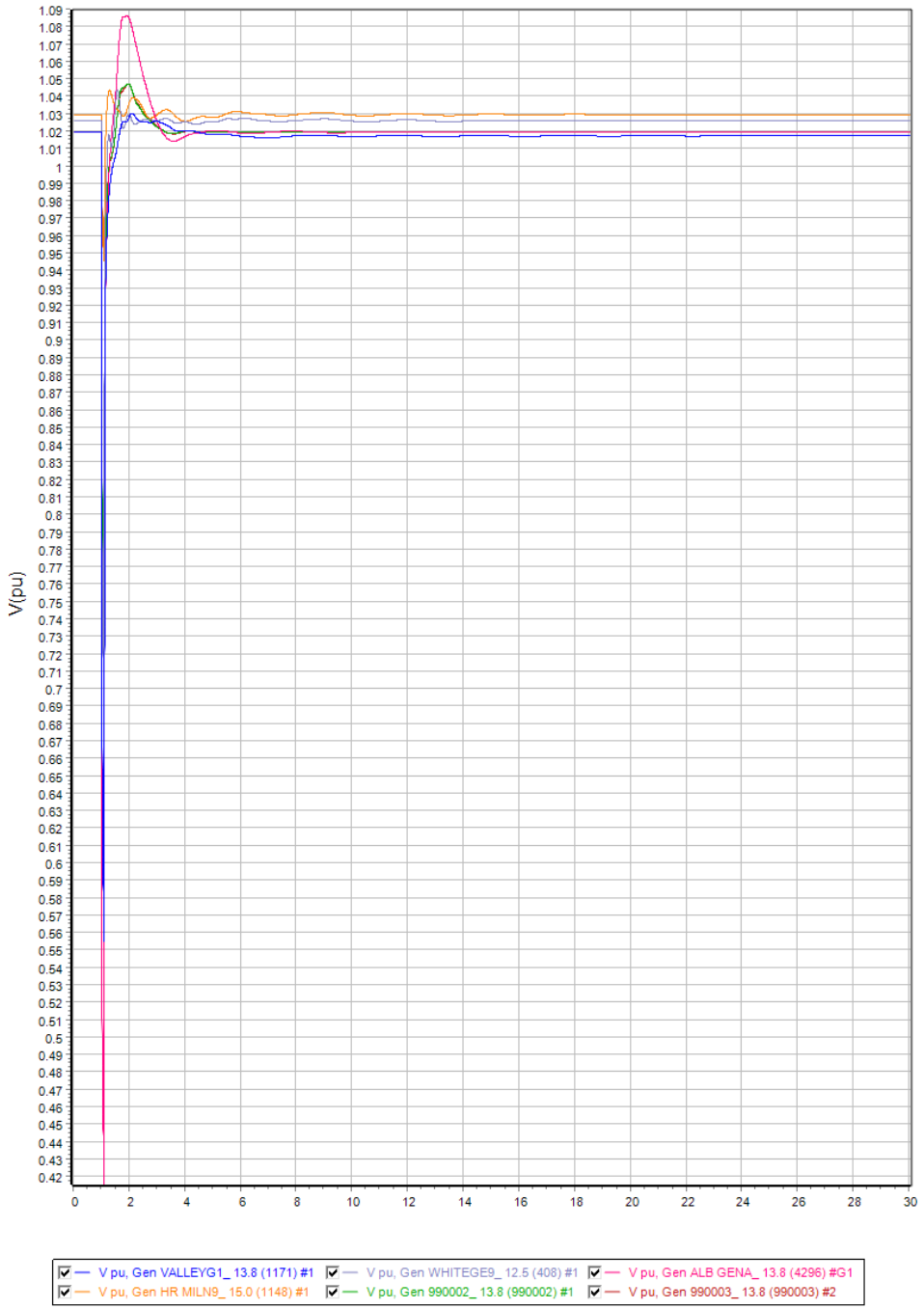
Monitor Gens. Q1



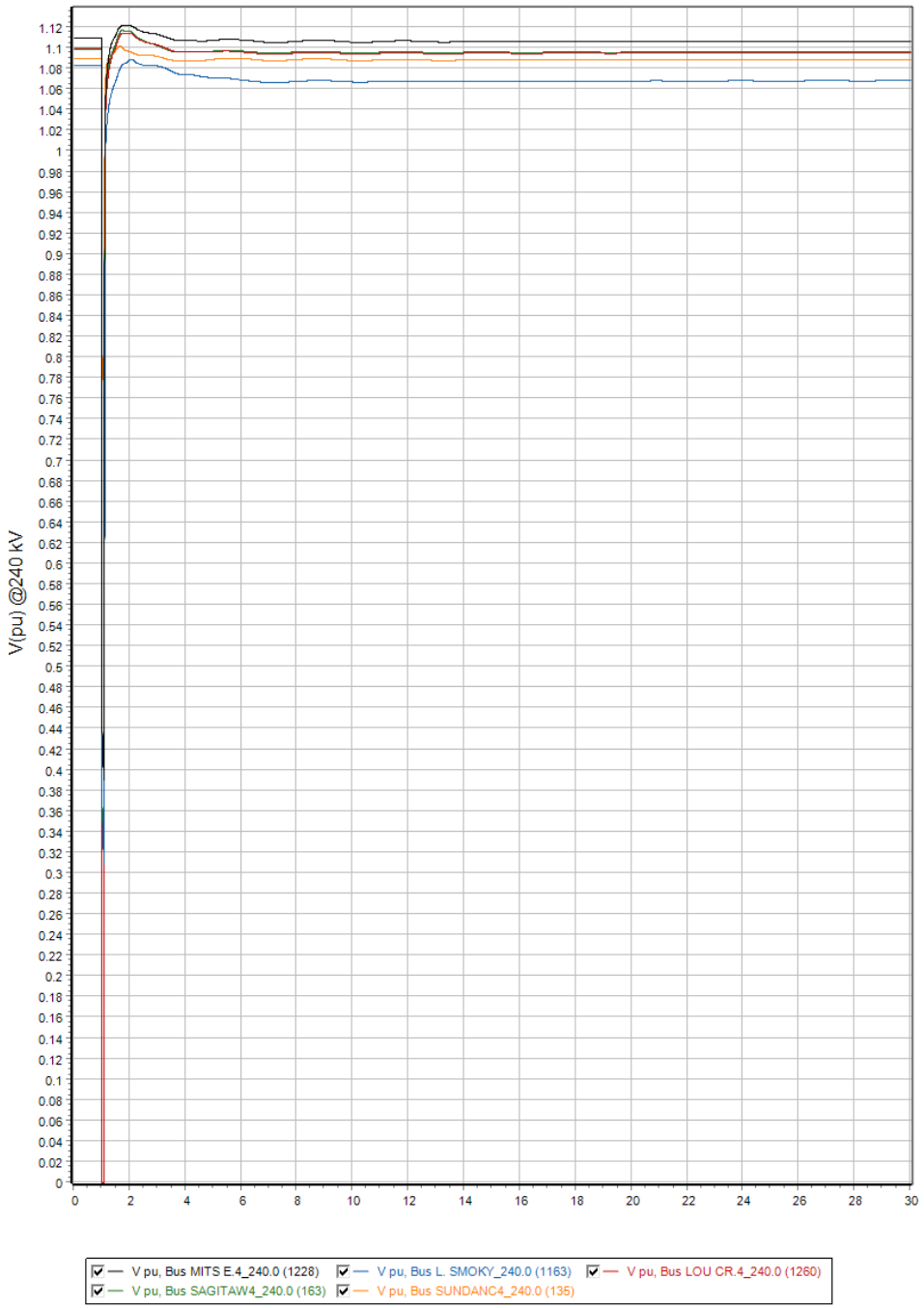


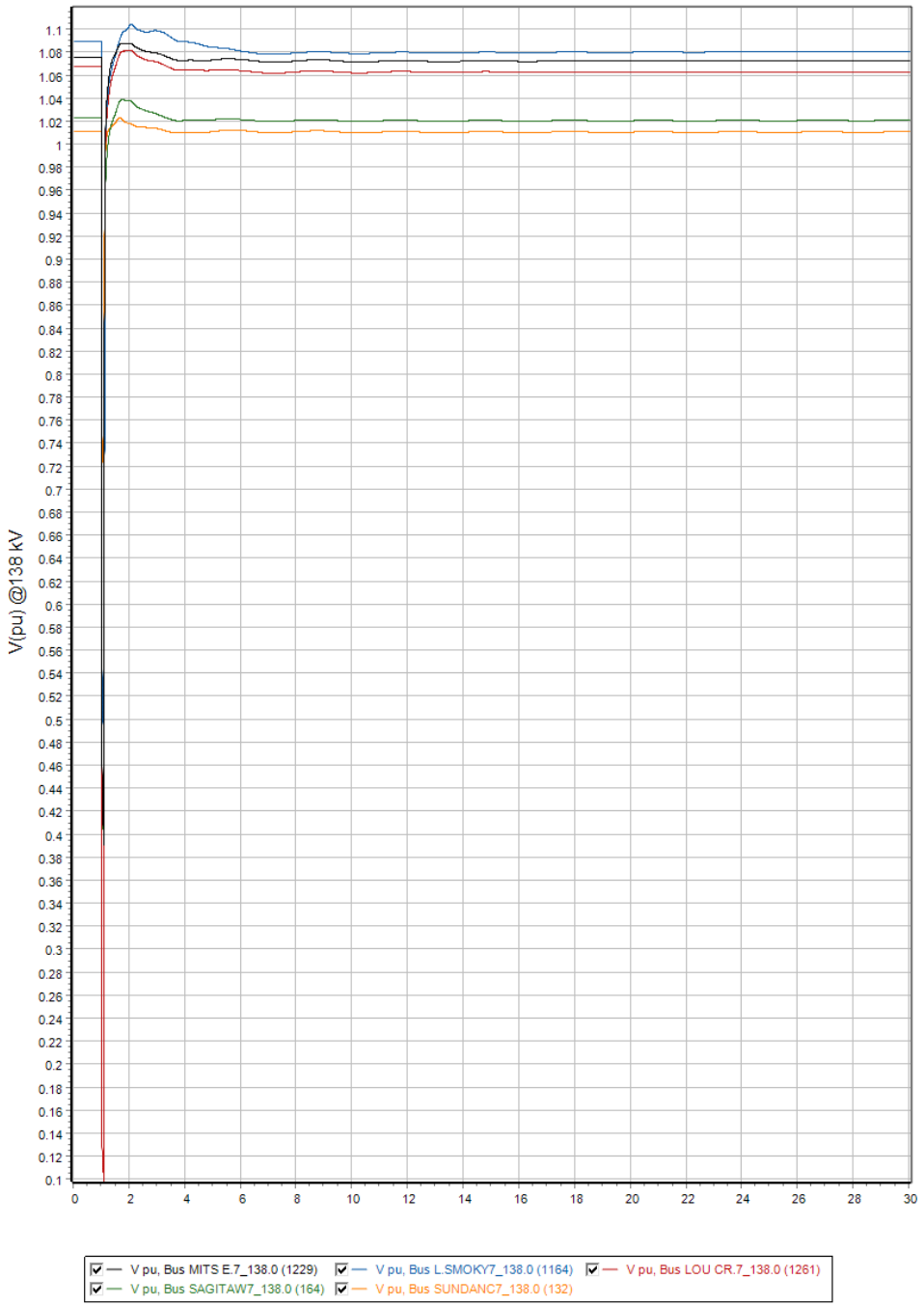
Monitor Gens. Q2



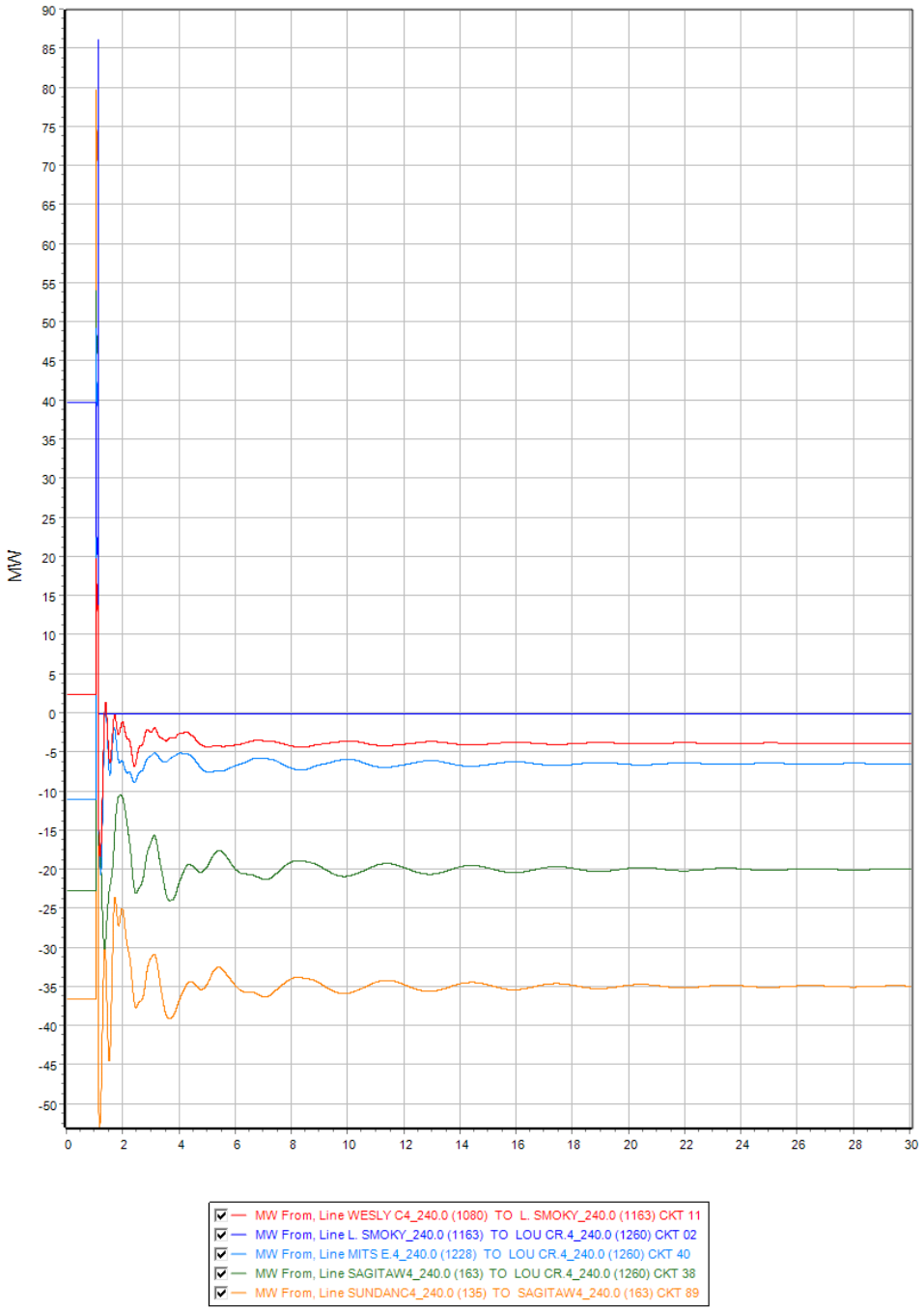


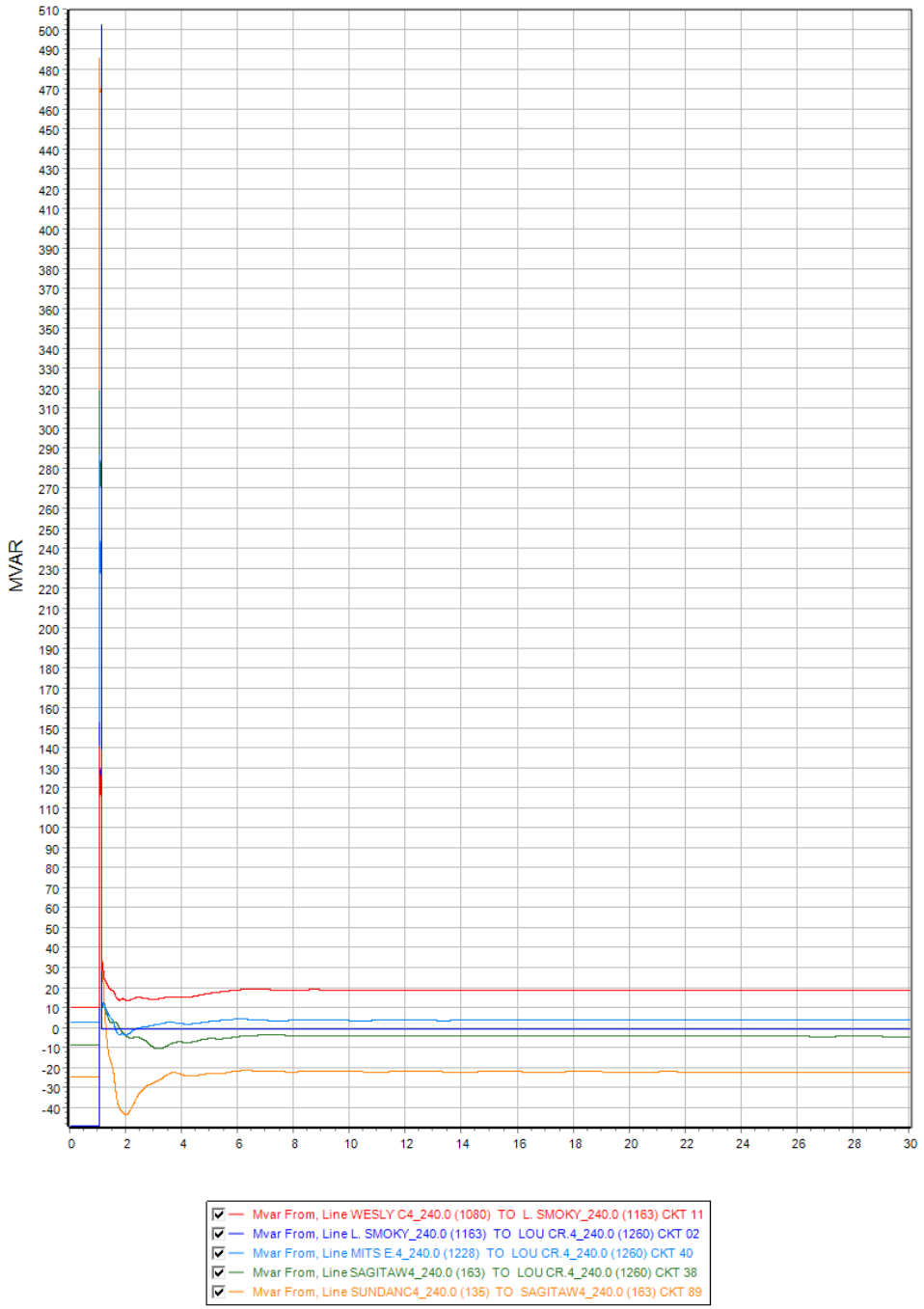
Monitor Bus Volts Q3



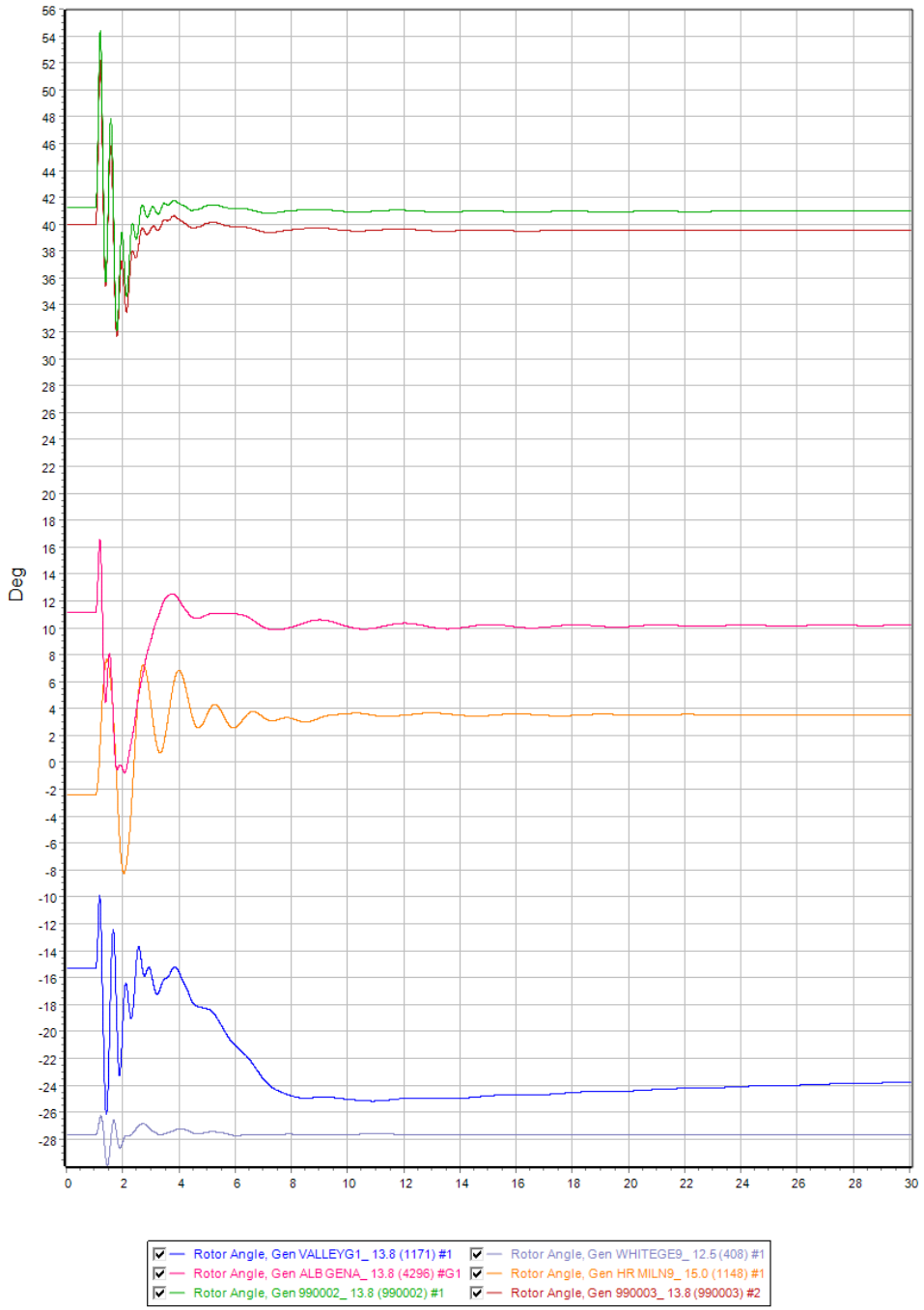


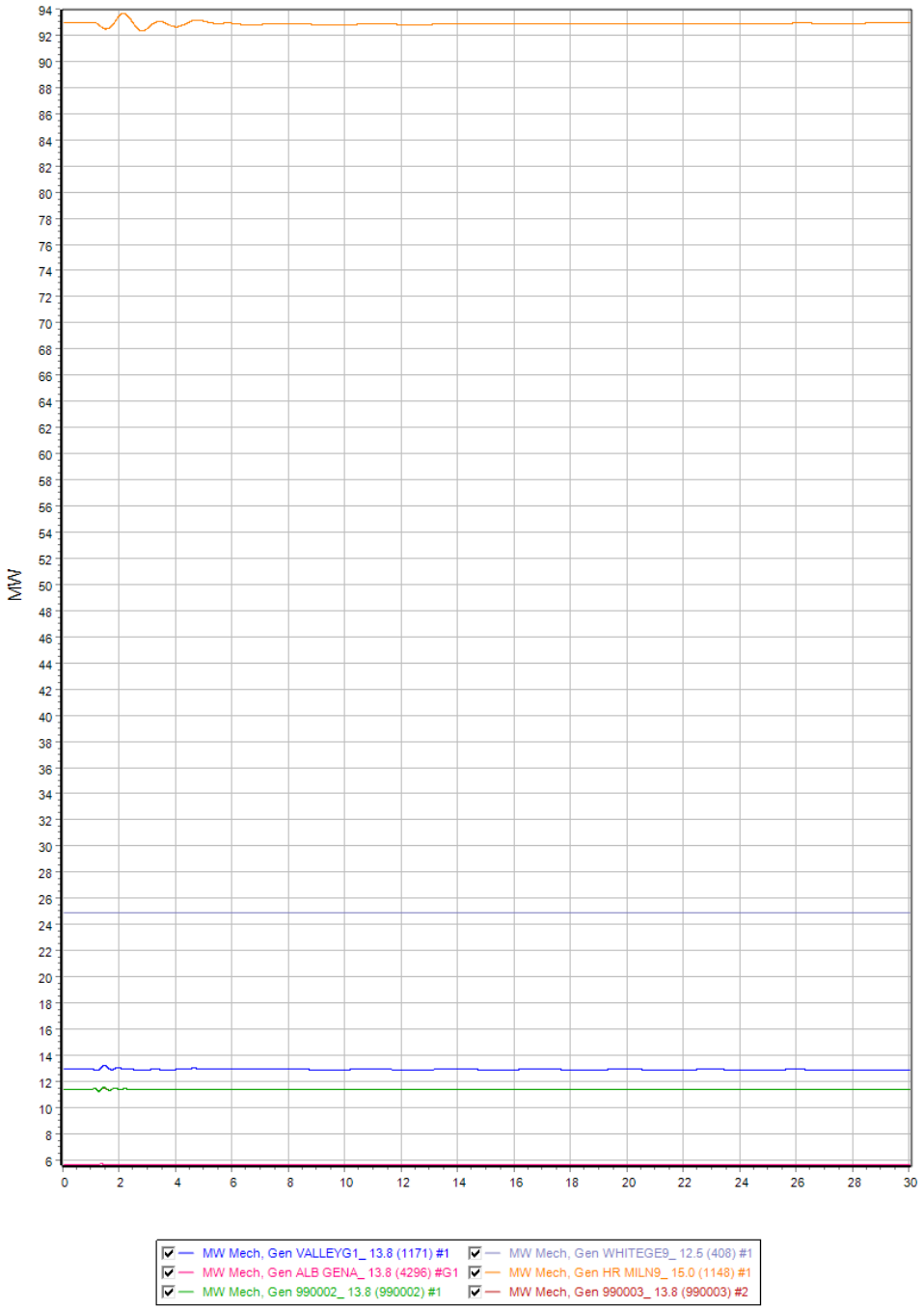
Monitor Line MW & MVAR. Q4



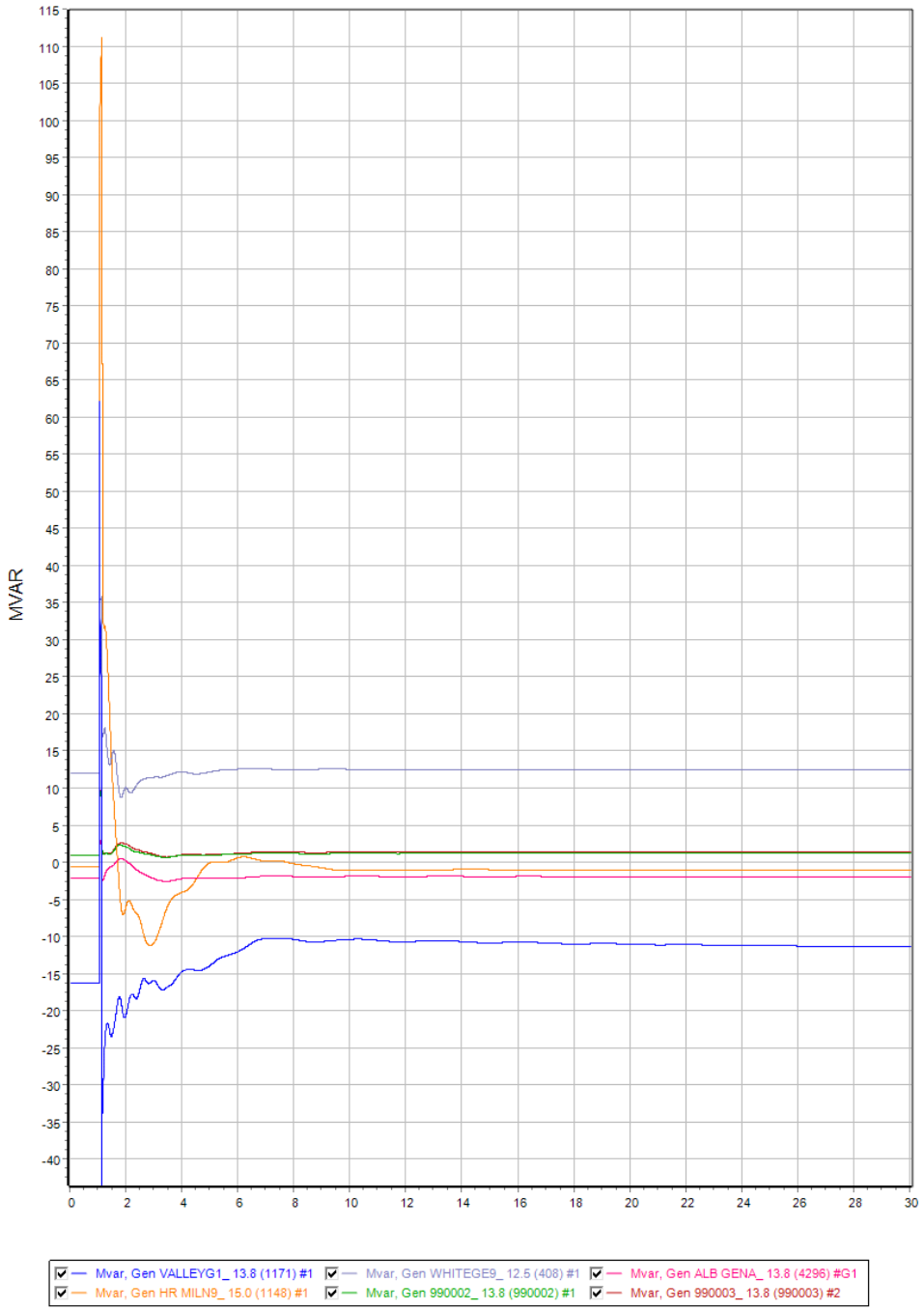


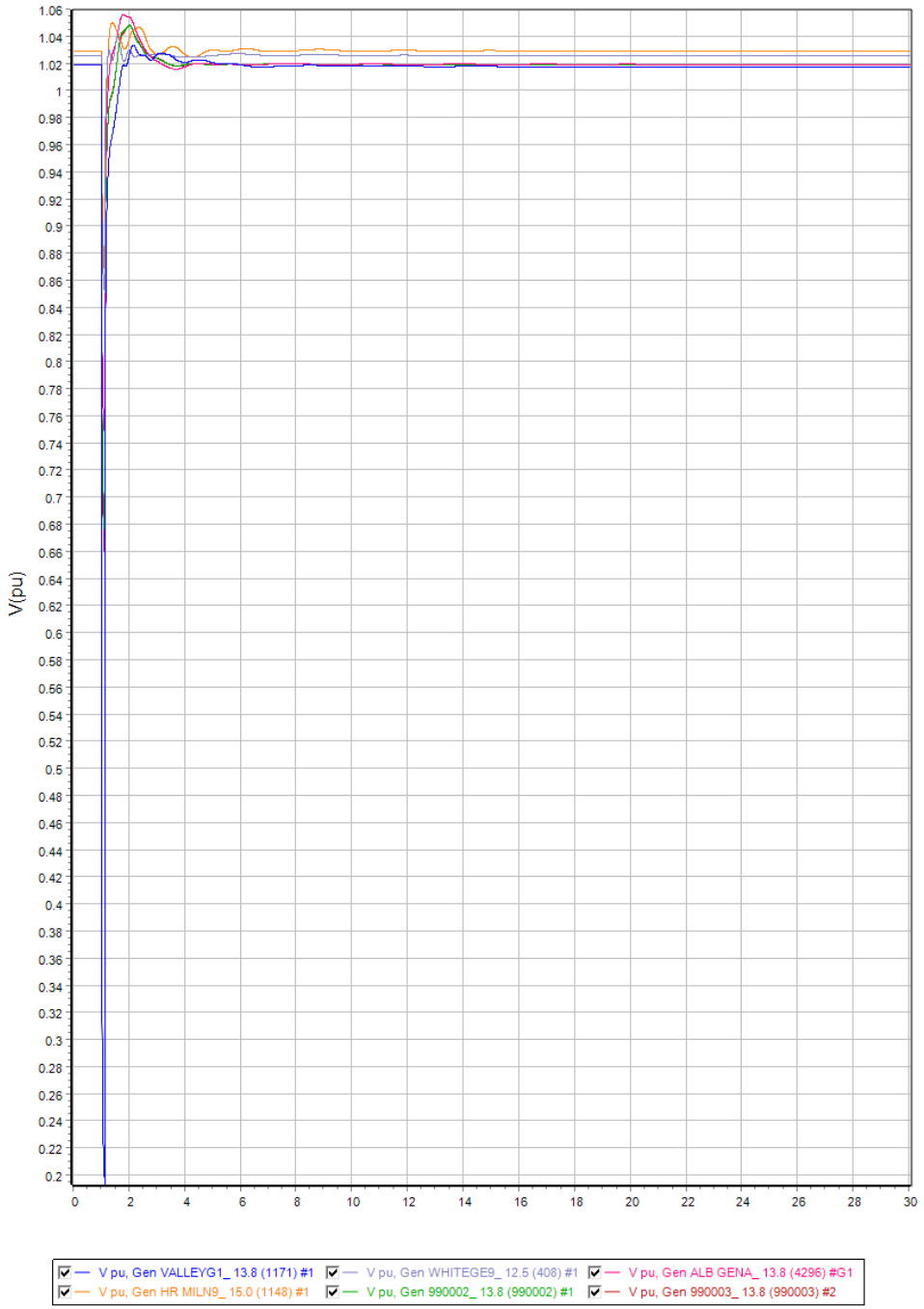
Monitor Gens. Q1





Monitor Gens. Q2





SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 08A - C5 - 7L45/7L46 (Little Smoky 813S – Big Mountain 845S) @ Little Smoky 813S

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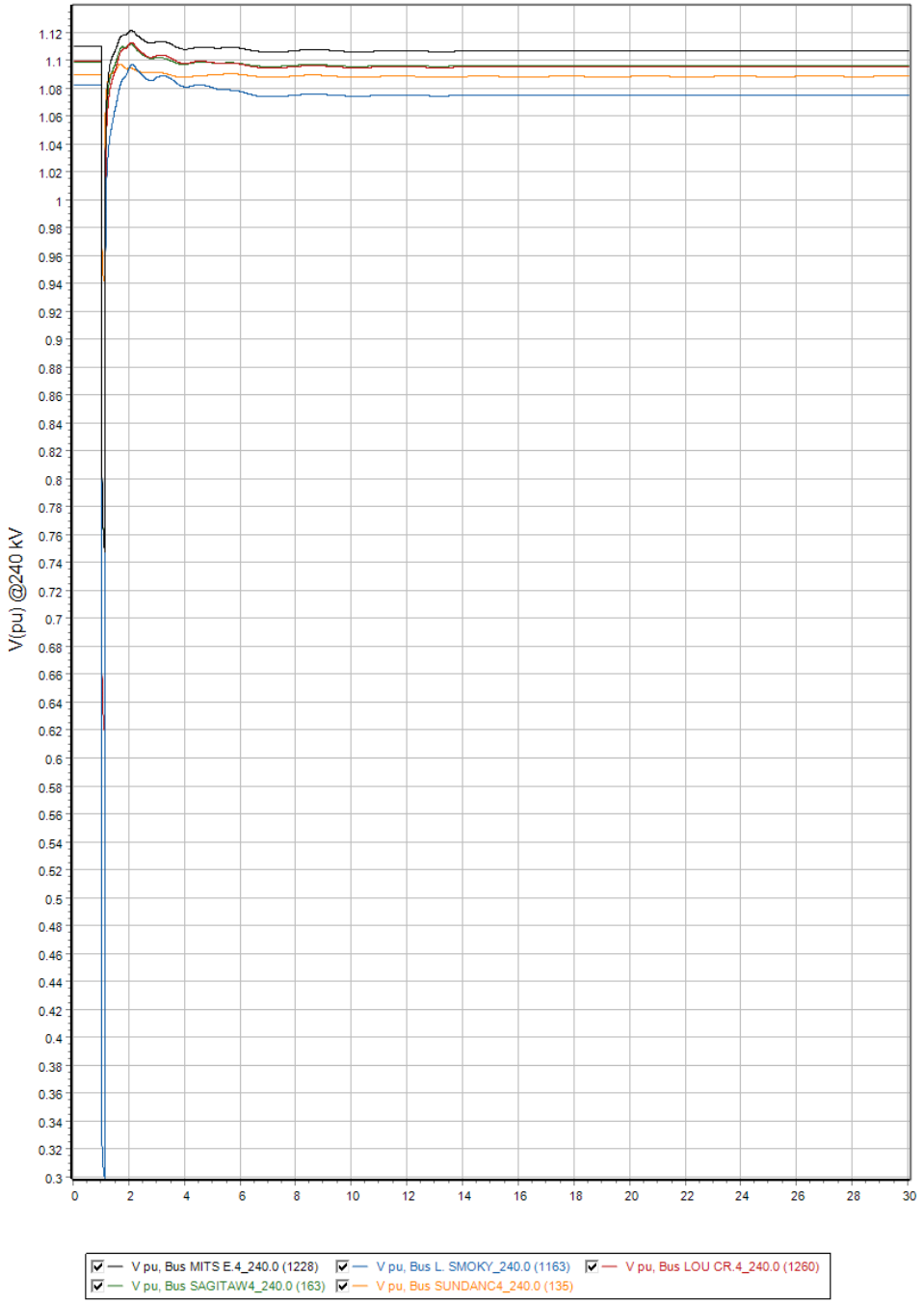
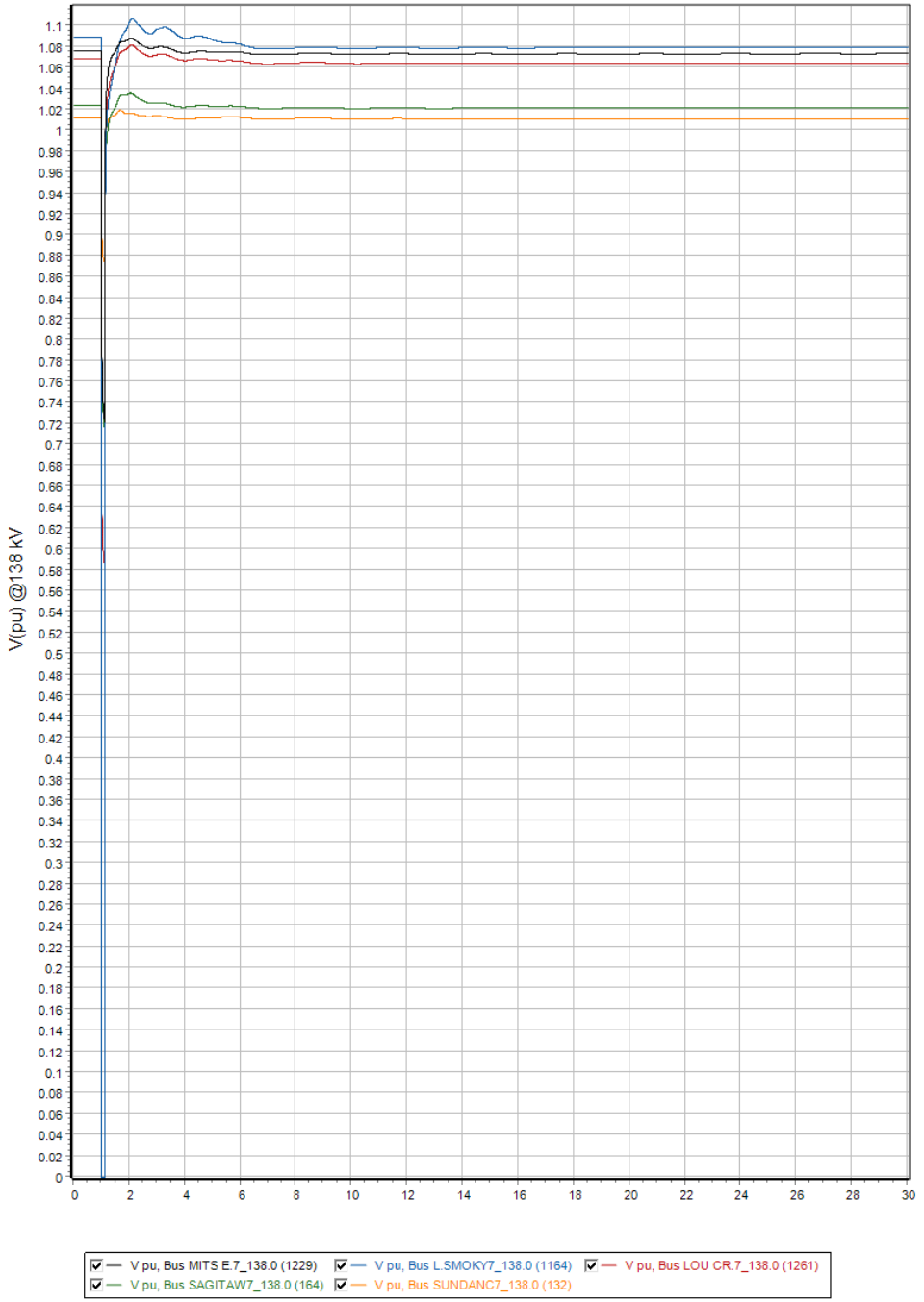
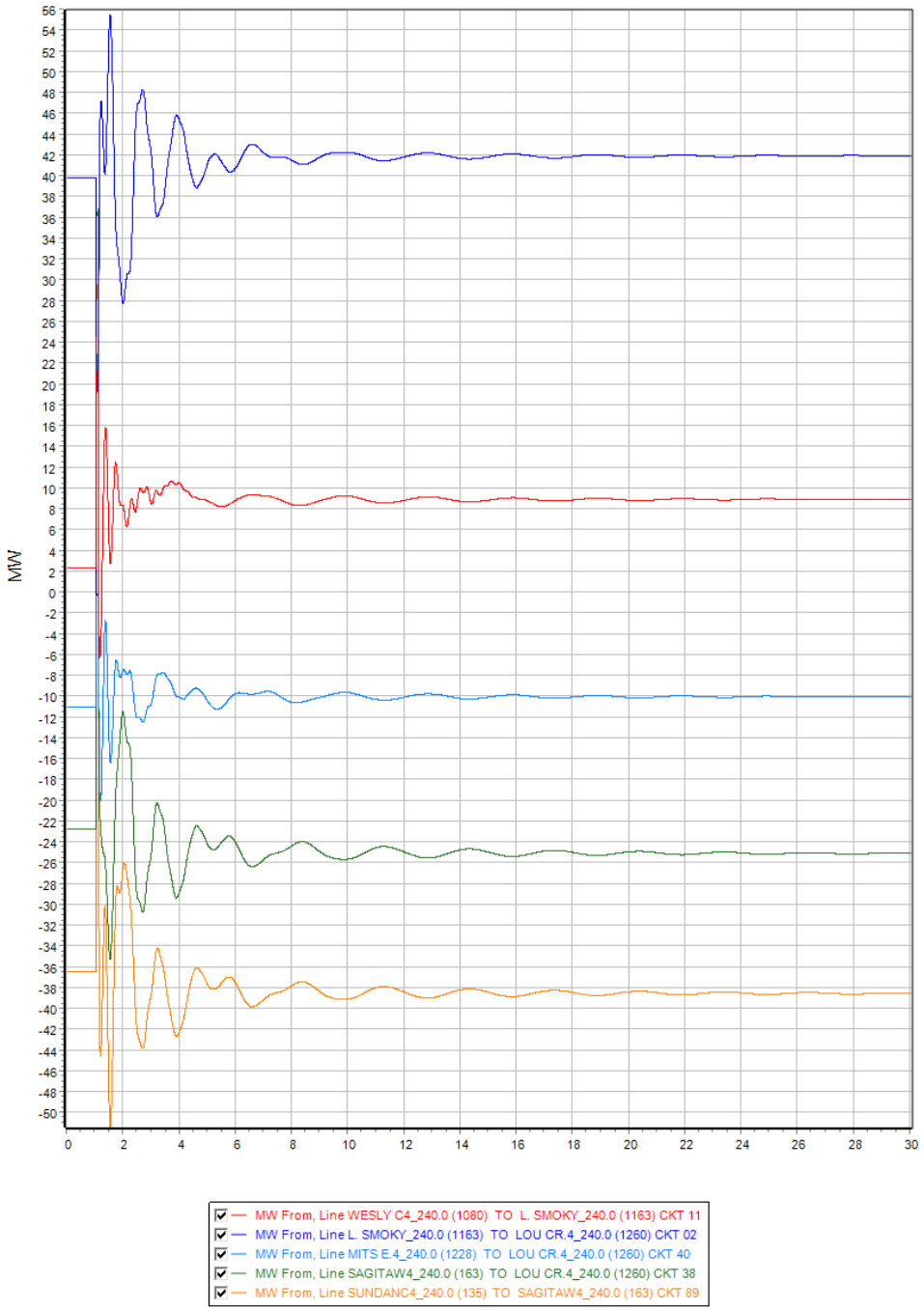
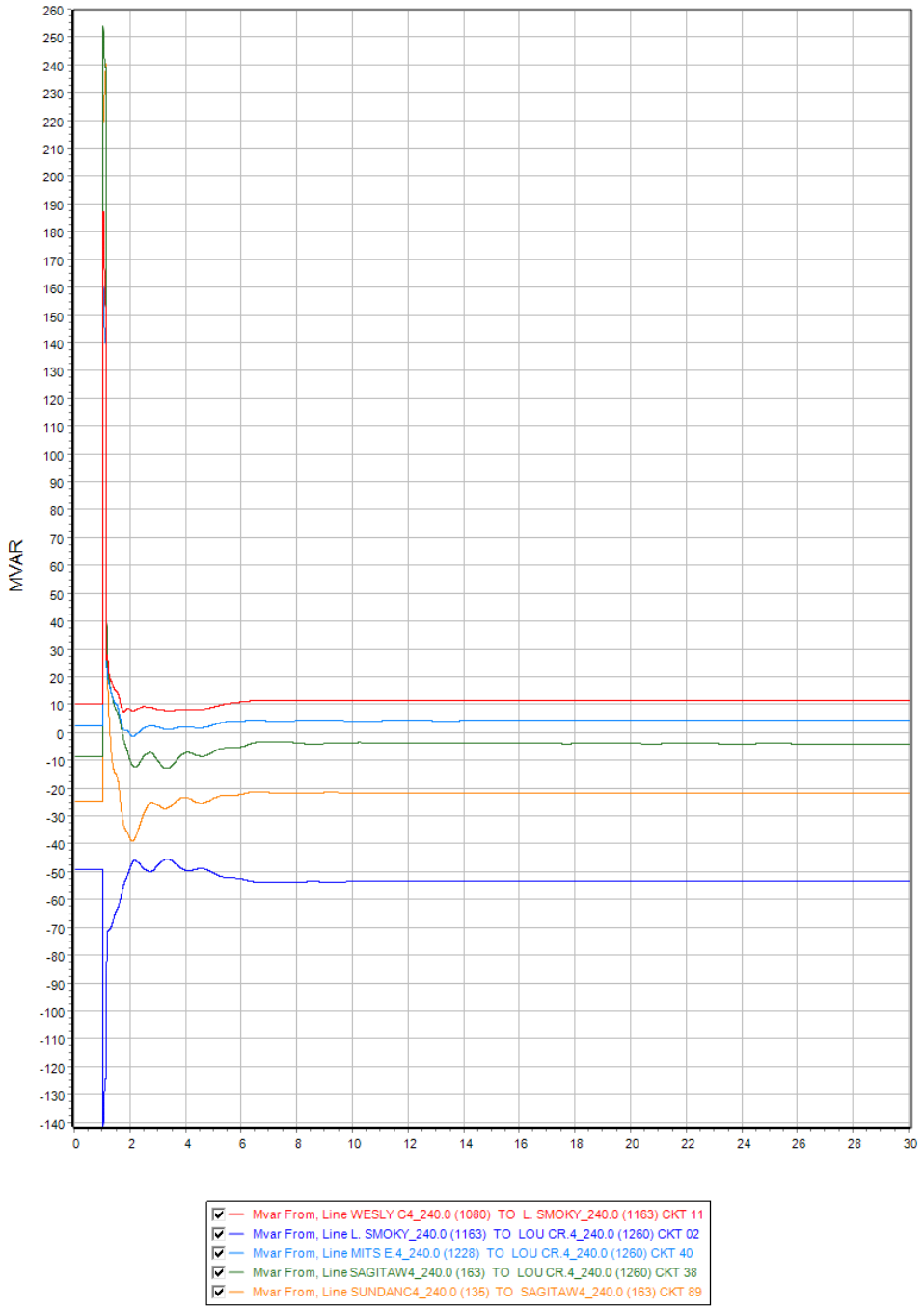
Monitor Bus Volts Q3



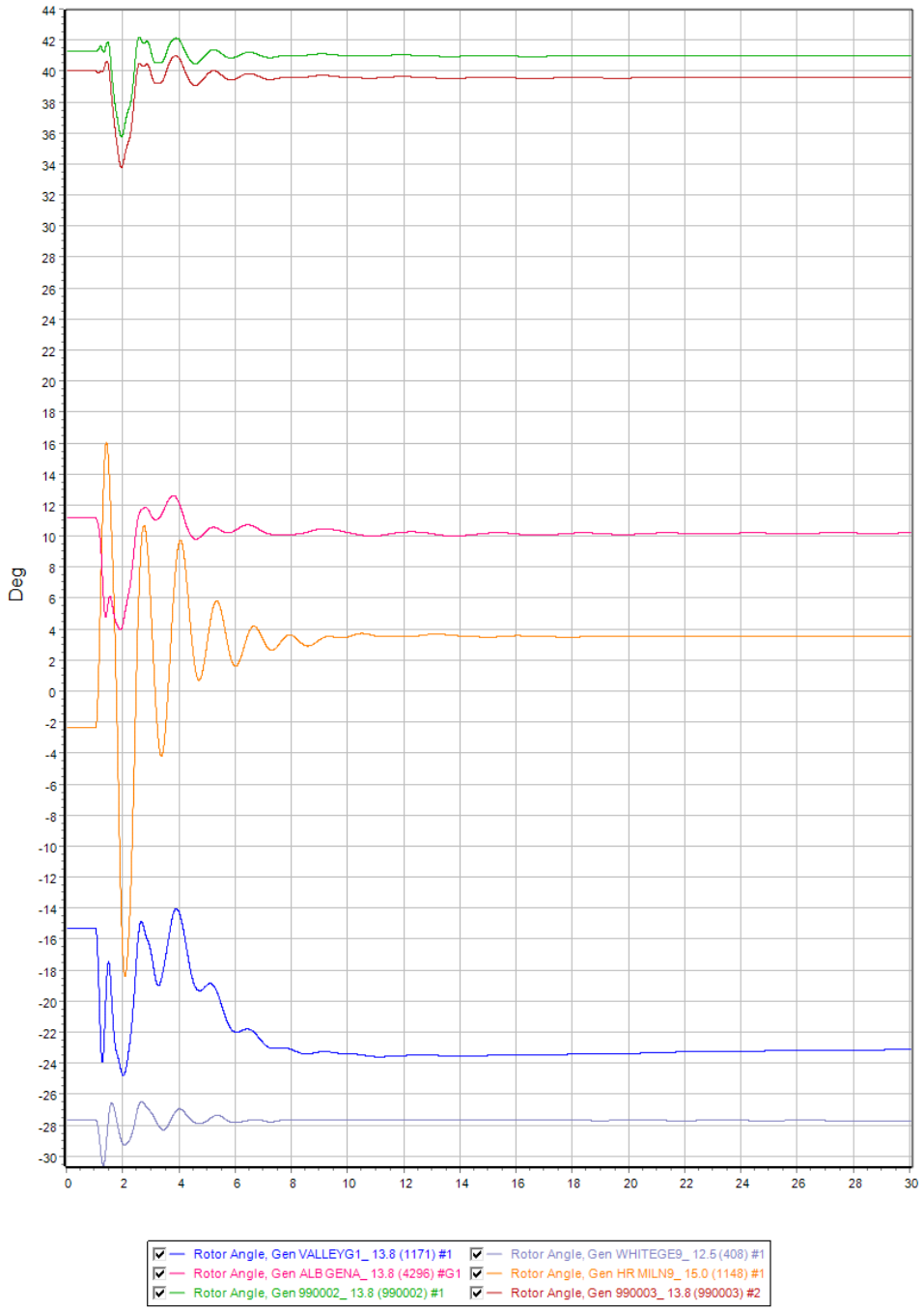


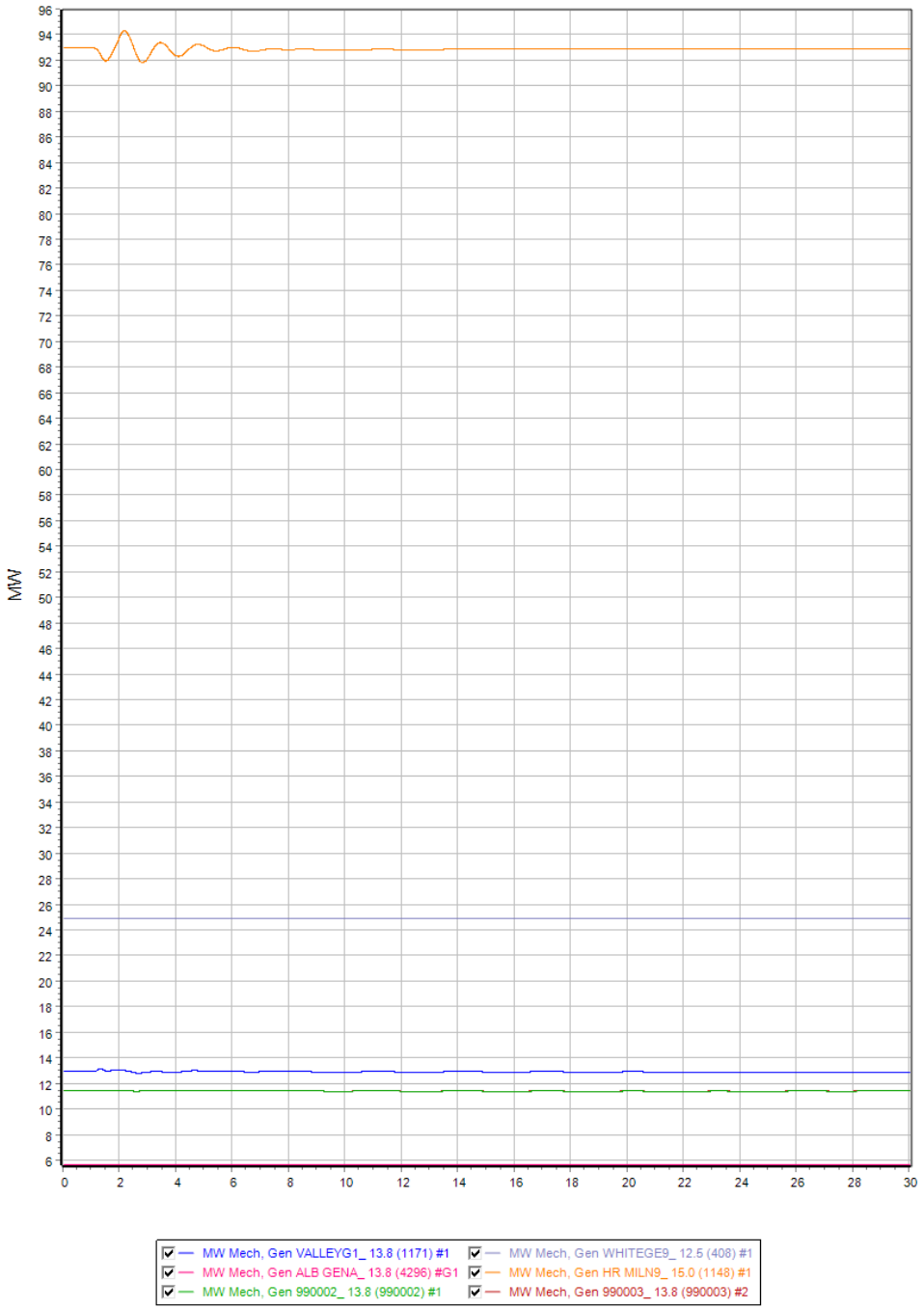
Monitor Line MW & MVAR. Q4





Monitor Gens. Q1

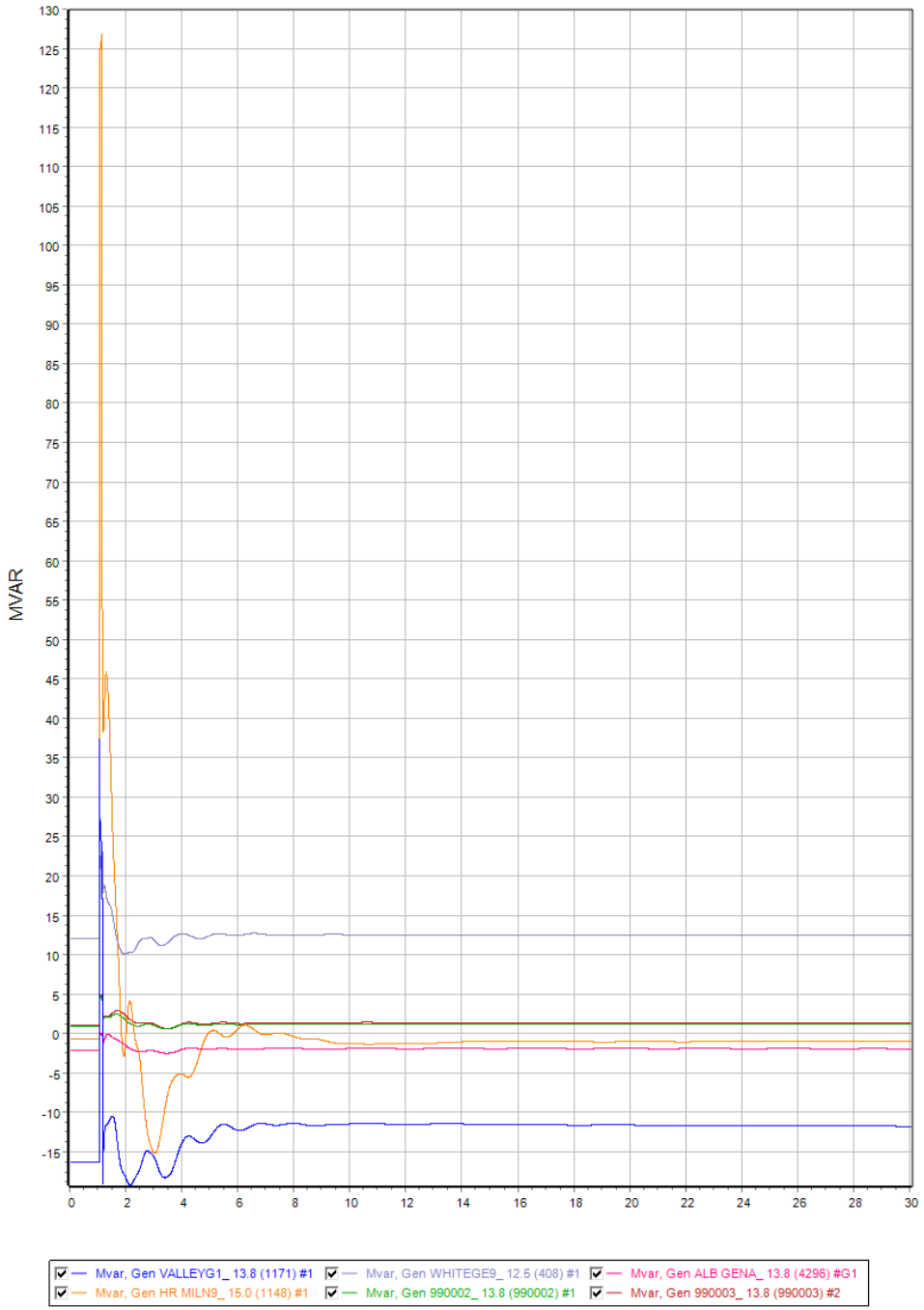


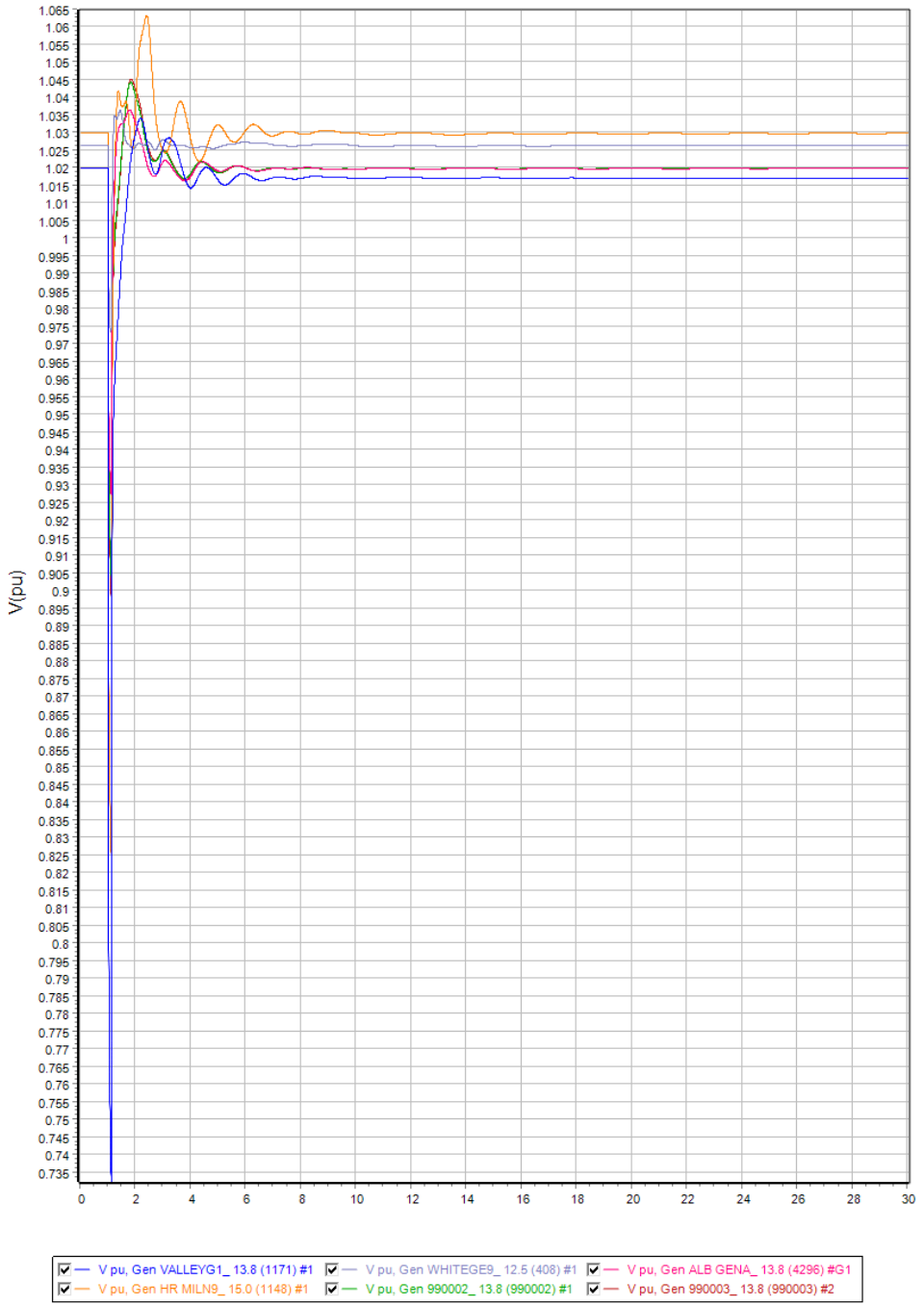


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 08B - C5 - 7L45/7L46 (Little Smoky 813S – Big Mountain 845S) @ Big Mountain 845S

Monitor Gens. Q2

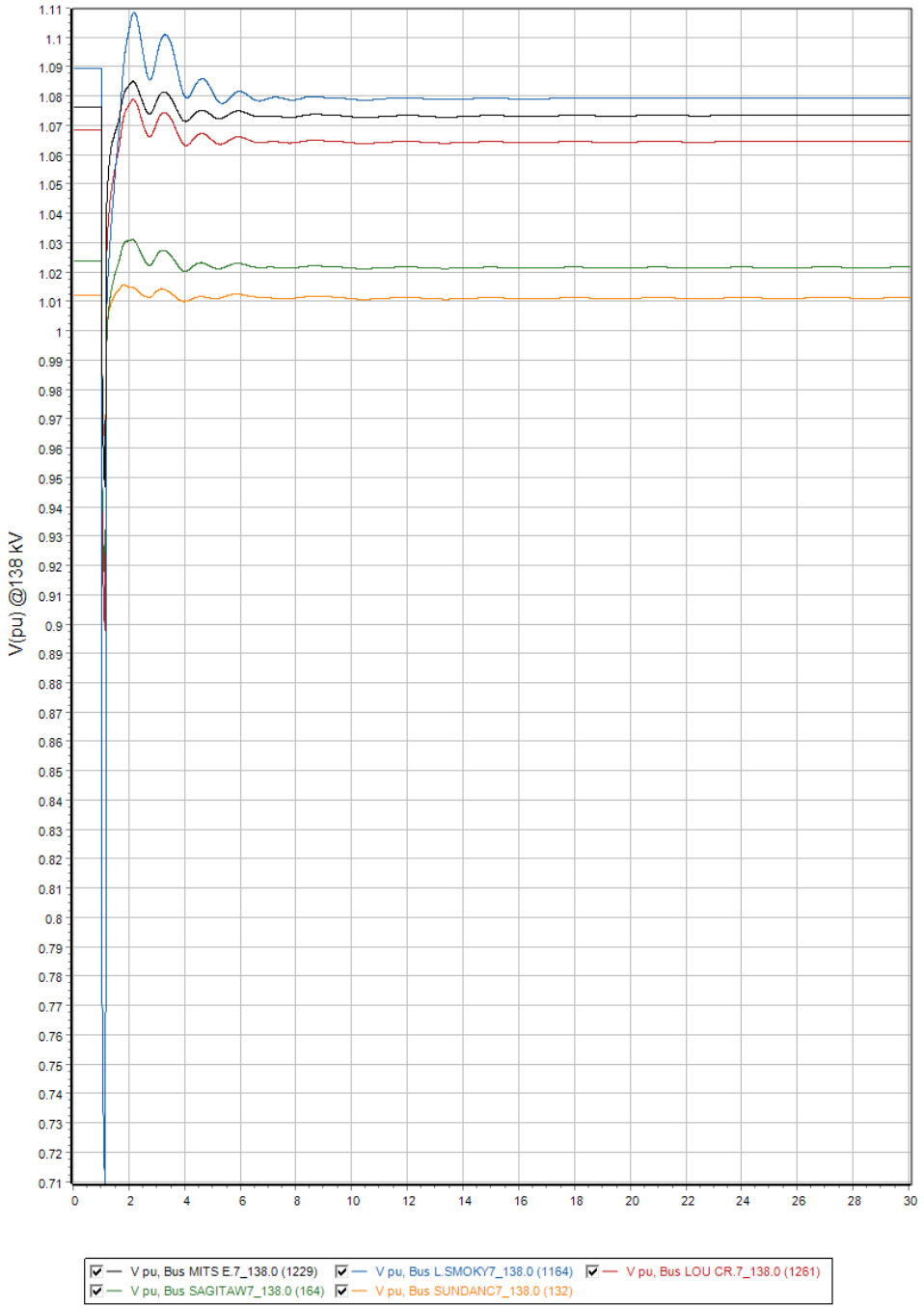




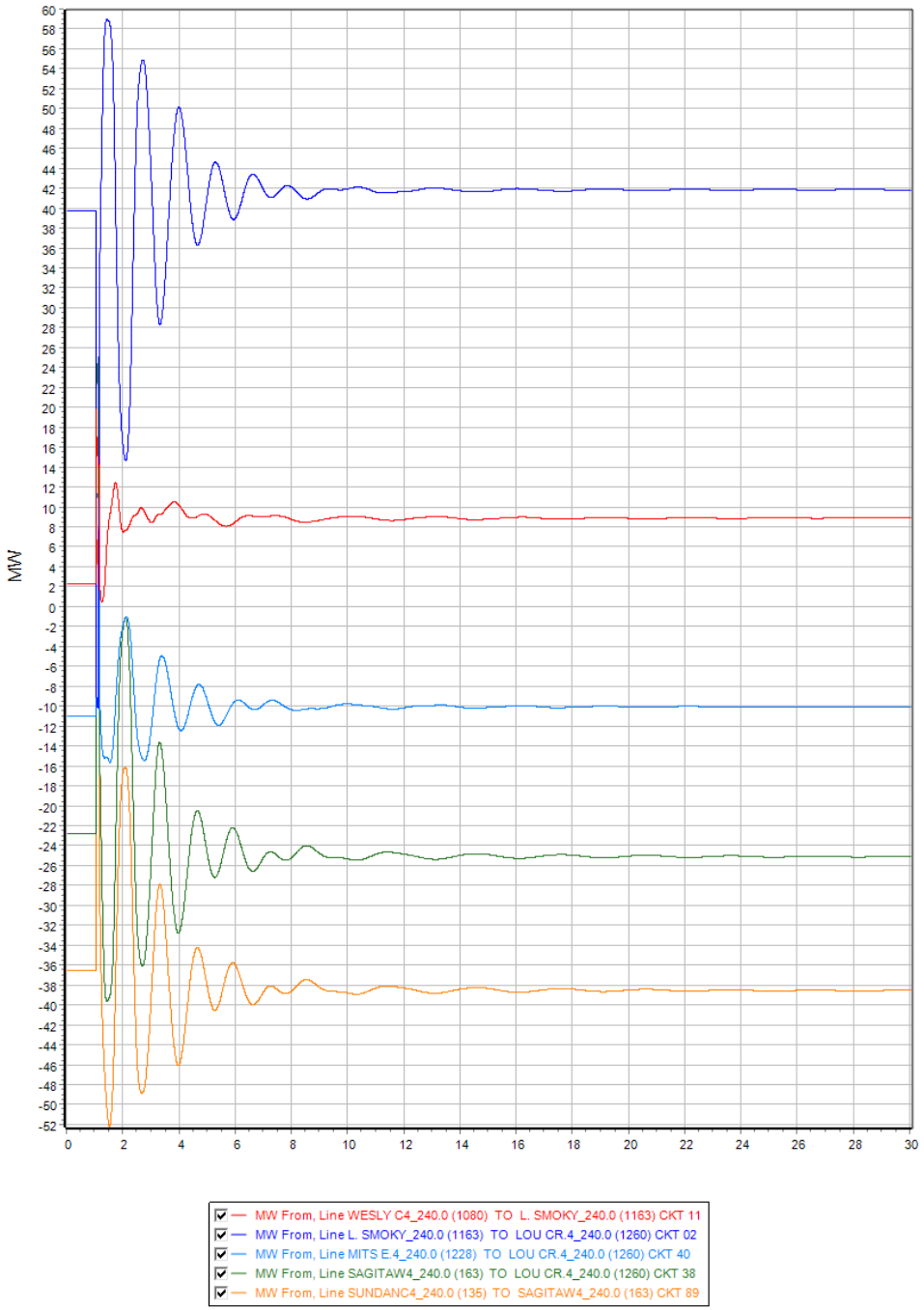
SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

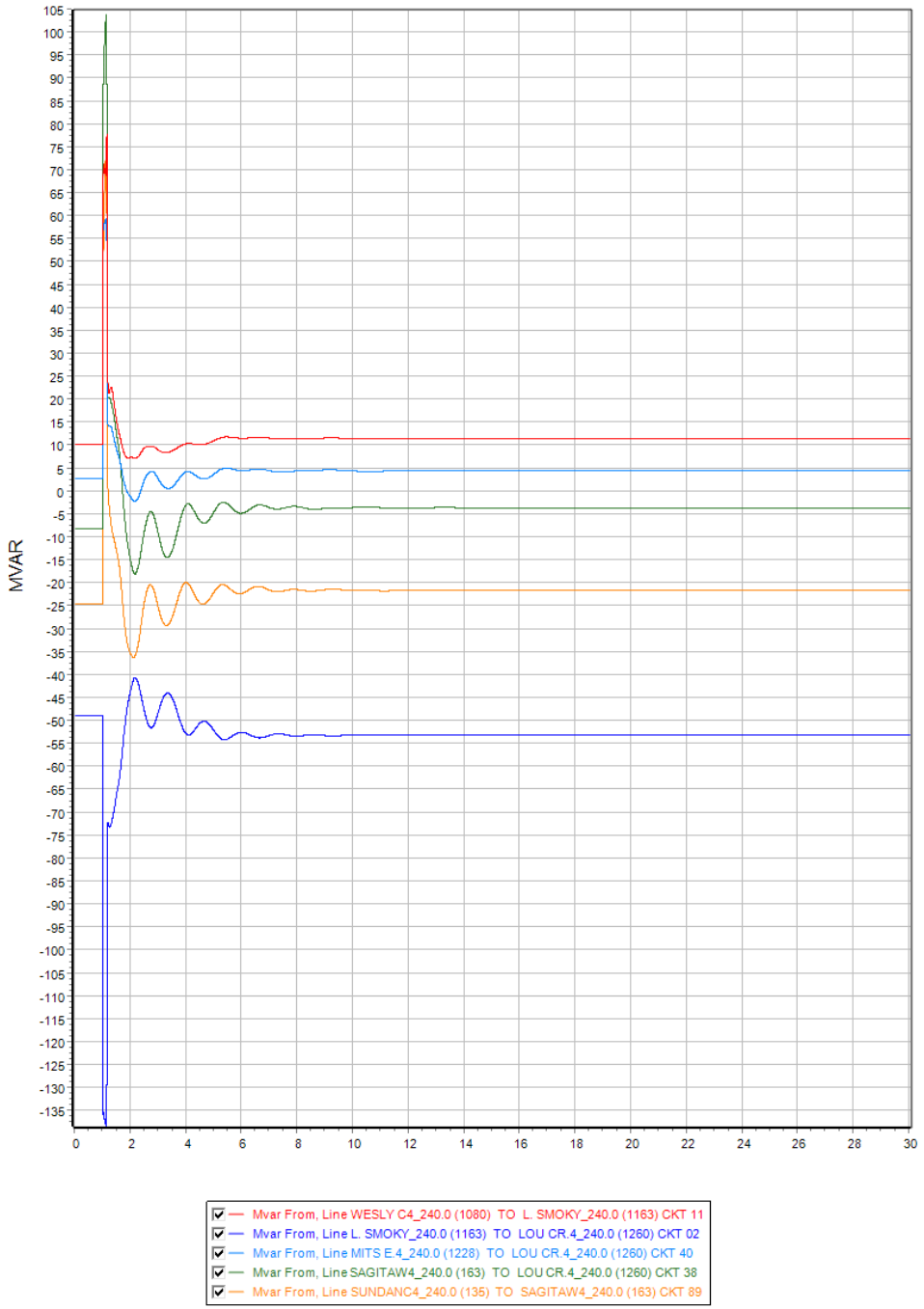
Contingency: 08B - C5 - 7L45/7L46 (Little Smoky 813S – Big Mountain 845S) @ Big Mountain 845S

Monitor Bus Volts Q3

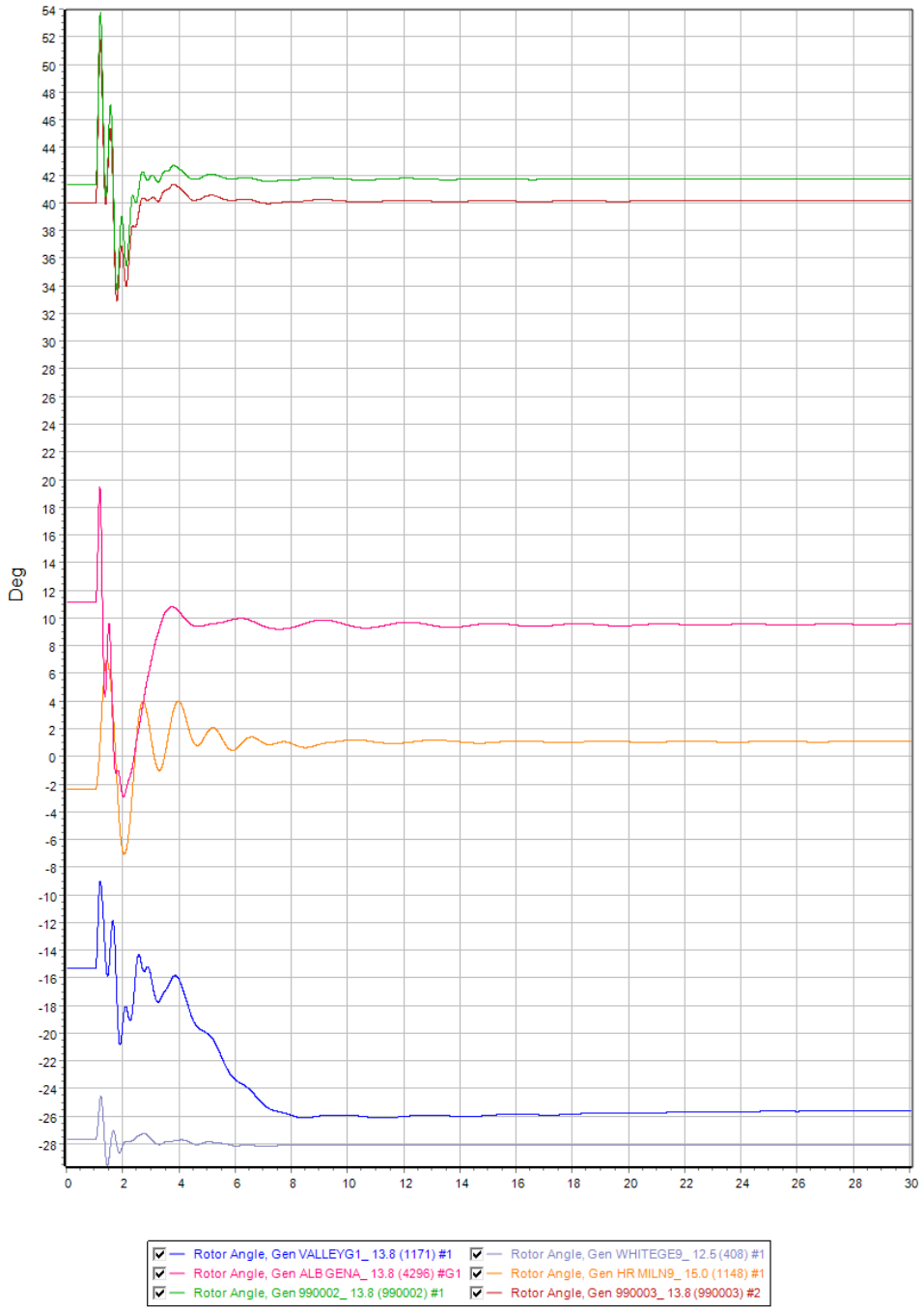


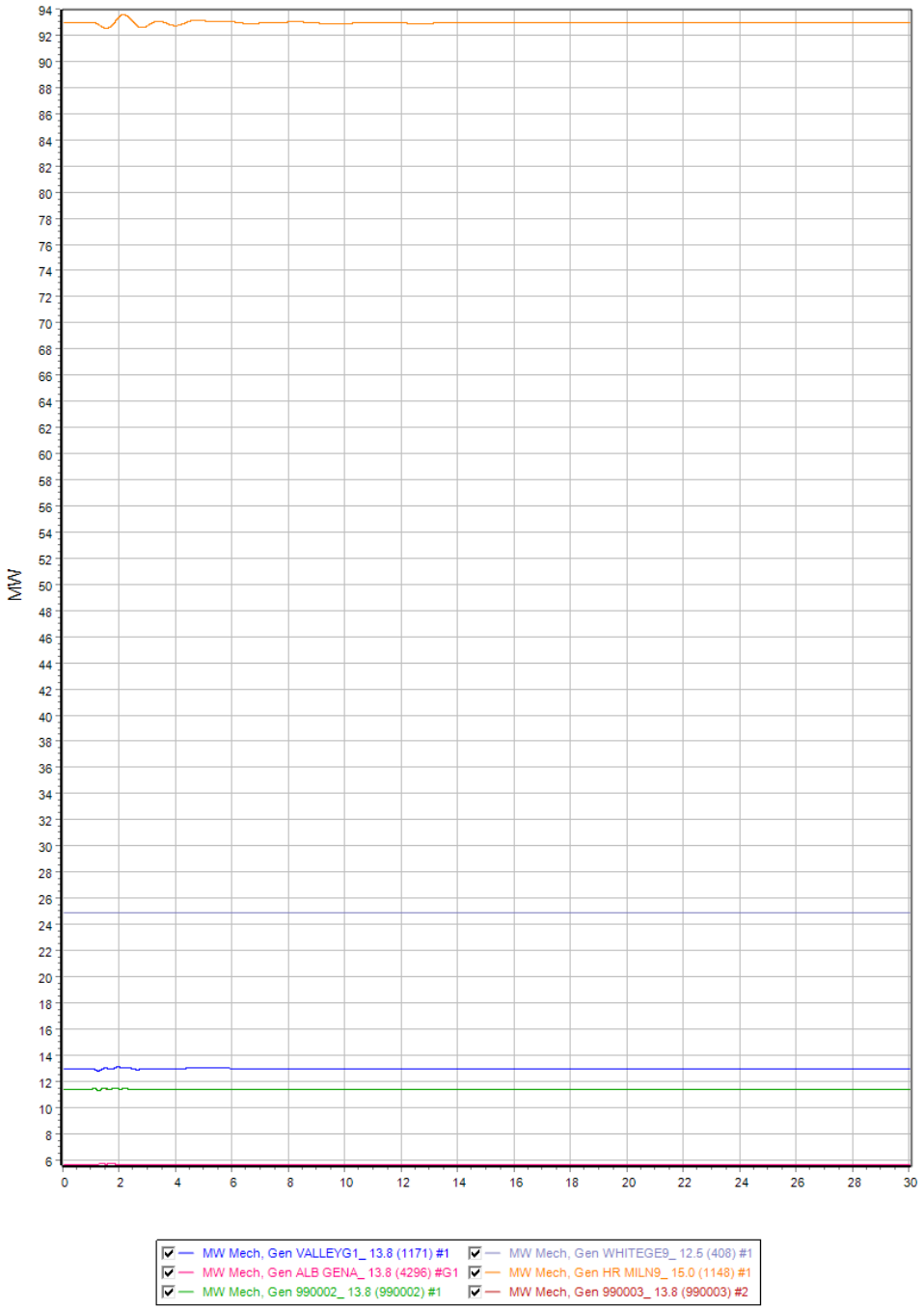
Monitor Line MW & MVAR. Q4



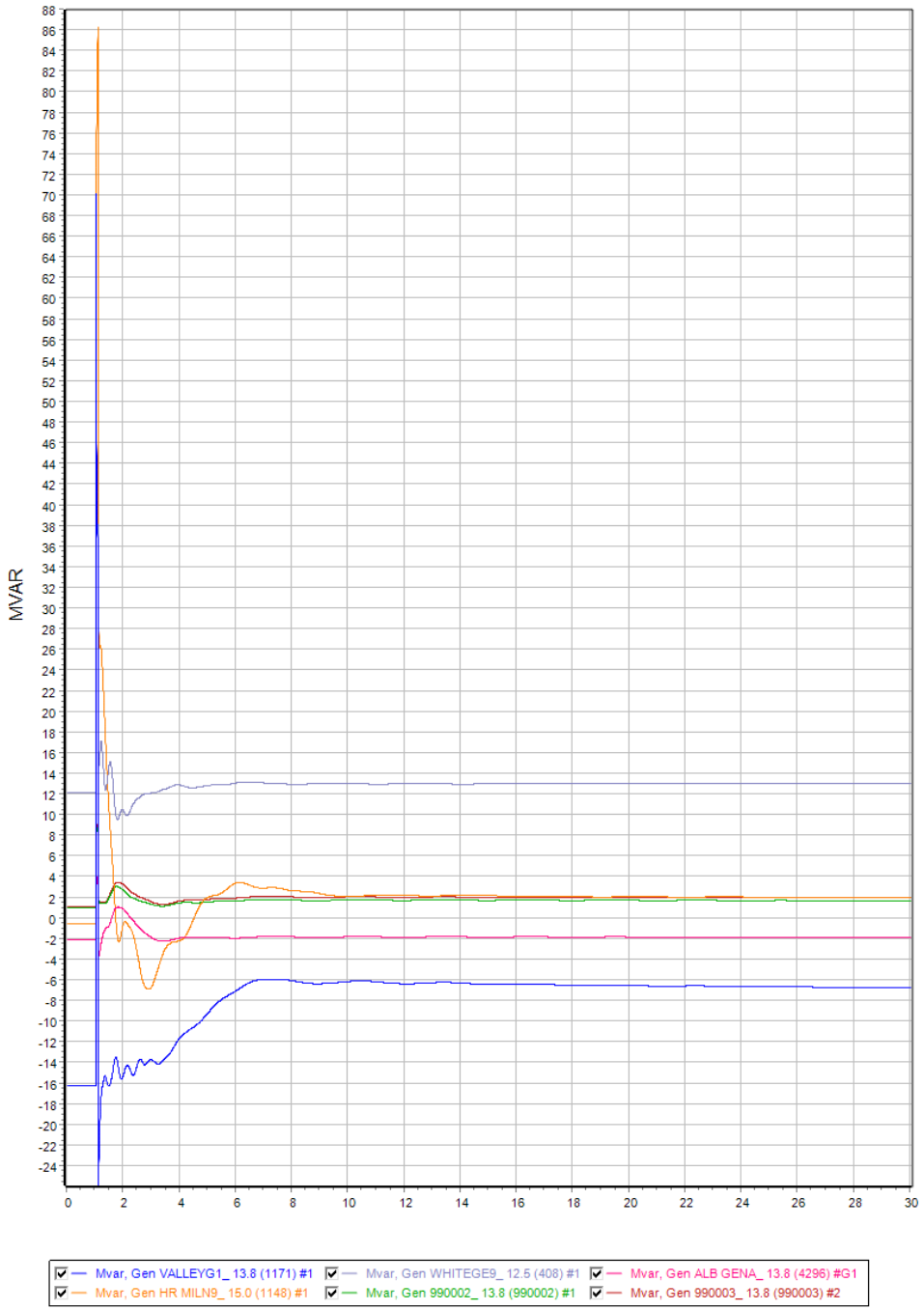


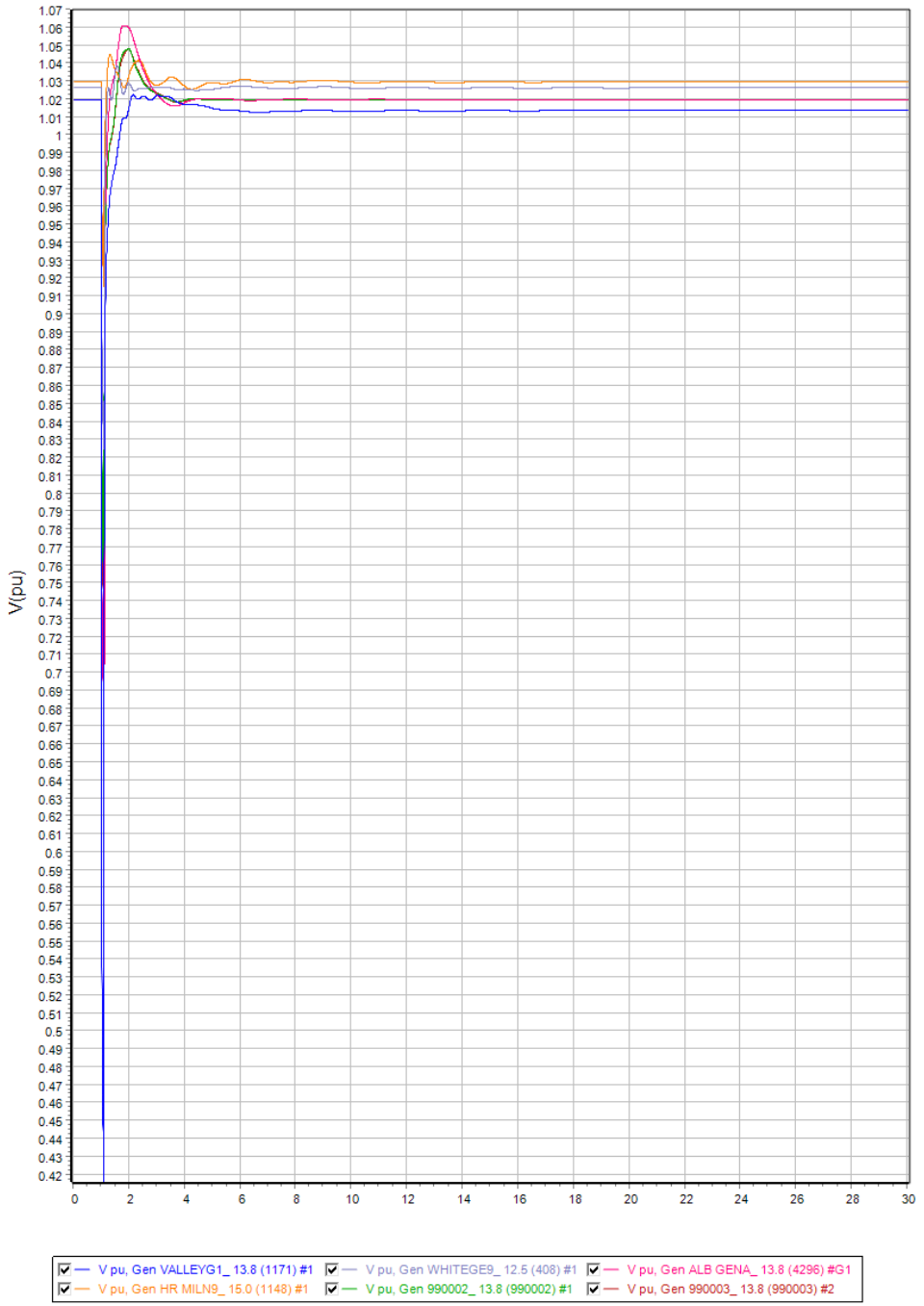
Monitor Gens. Q1





Monitor Gens. Q2

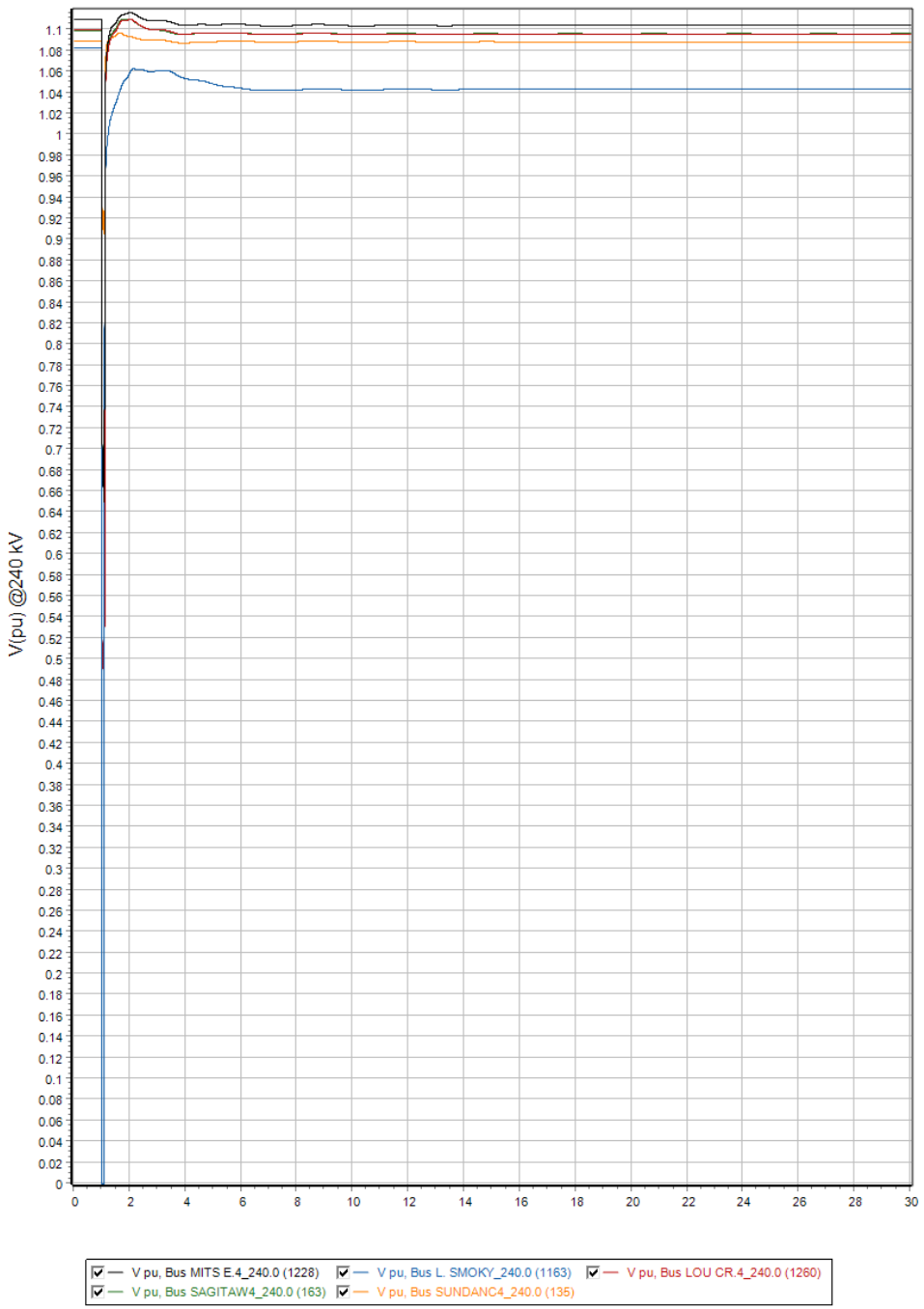


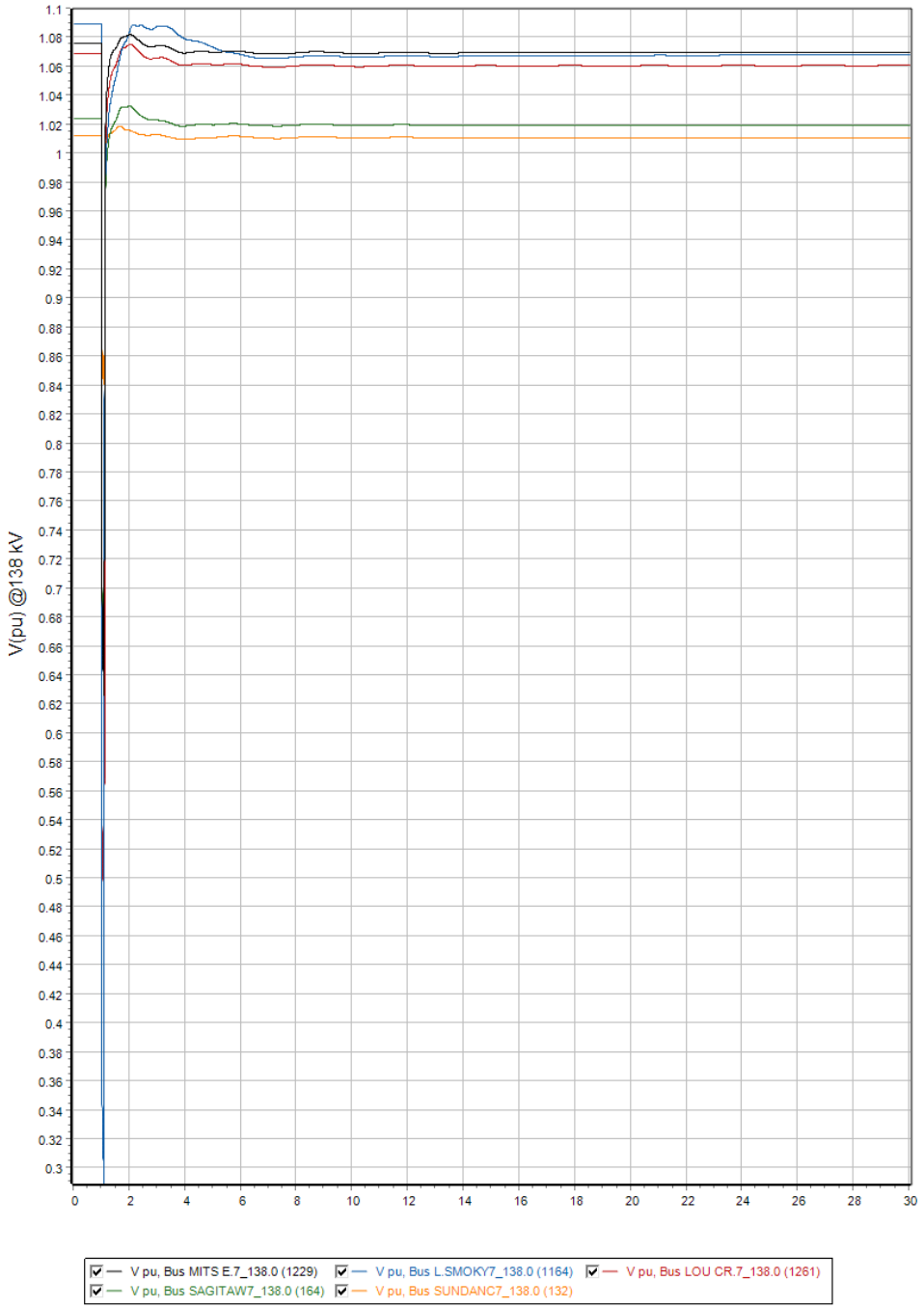


SC06 - 2021RC_2023SL_NW-High_Tie-Econ_Wind-0.23_p-REV6 Alta1-Post-Proj-TSTAB.pwb

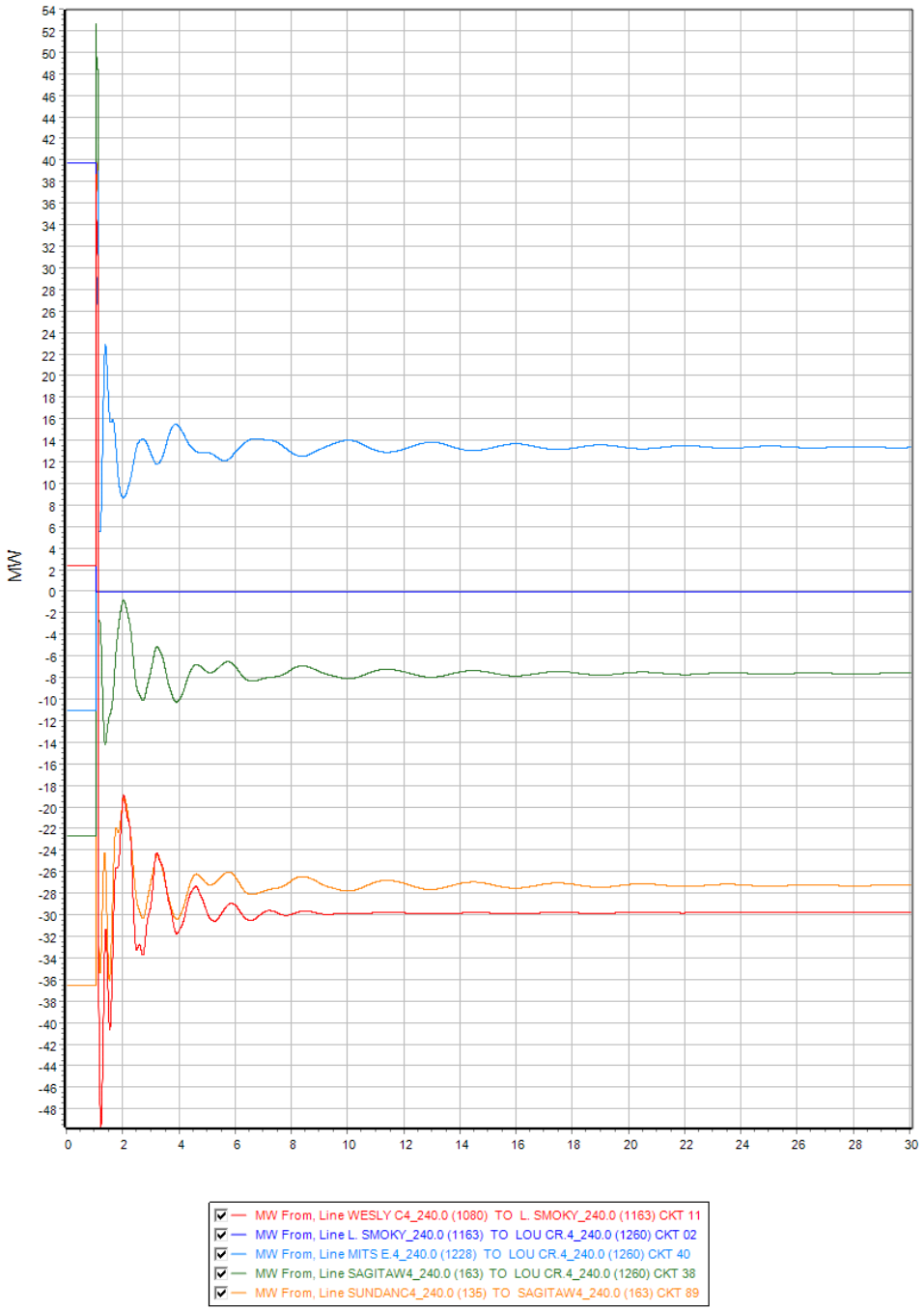
Contingency: 09A - C5 - 9L02/9L05 (Little Smoky 913S – Louise Creek 809S) @ Little Smoky 813S

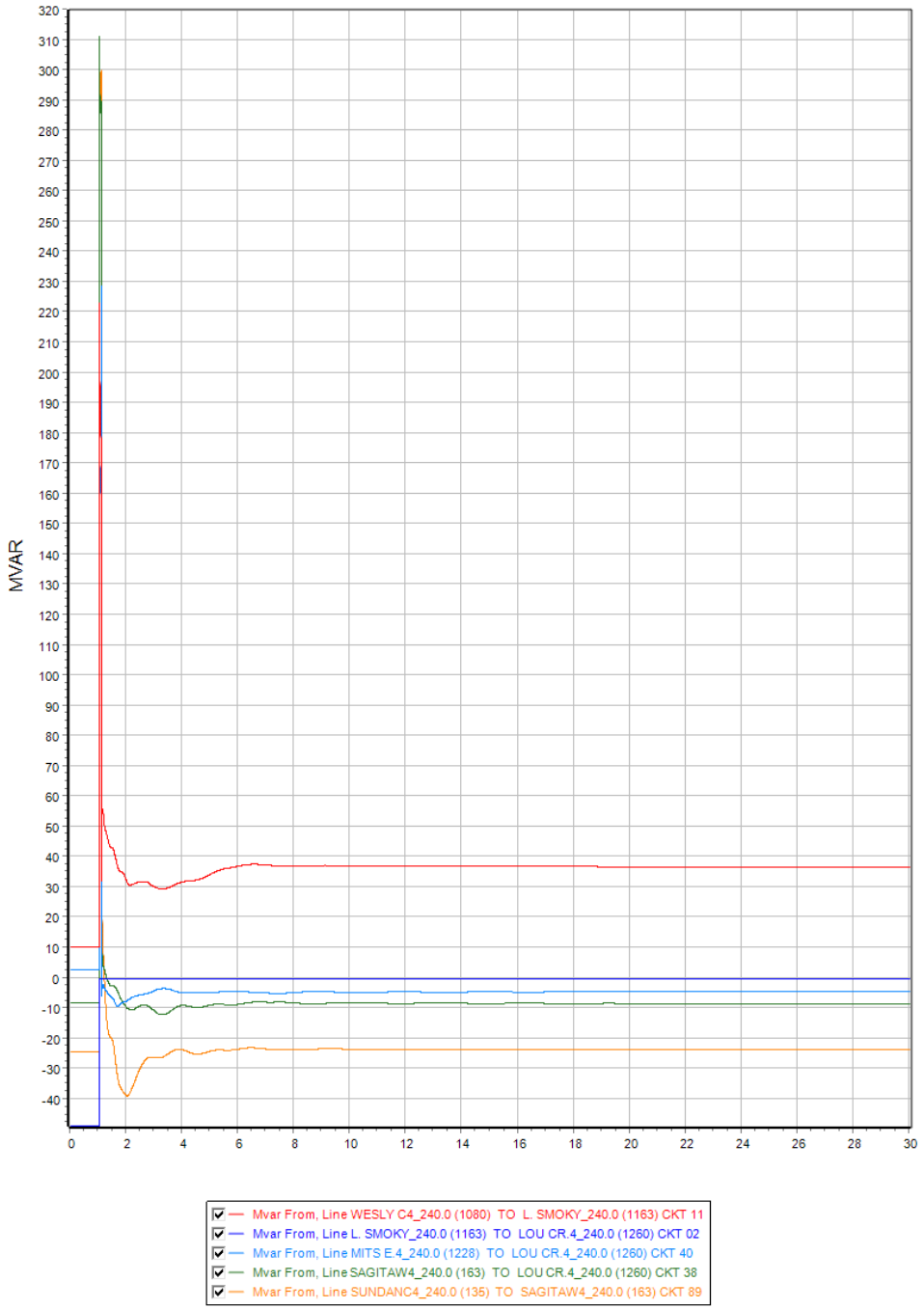
Monitor Bus Volts Q3



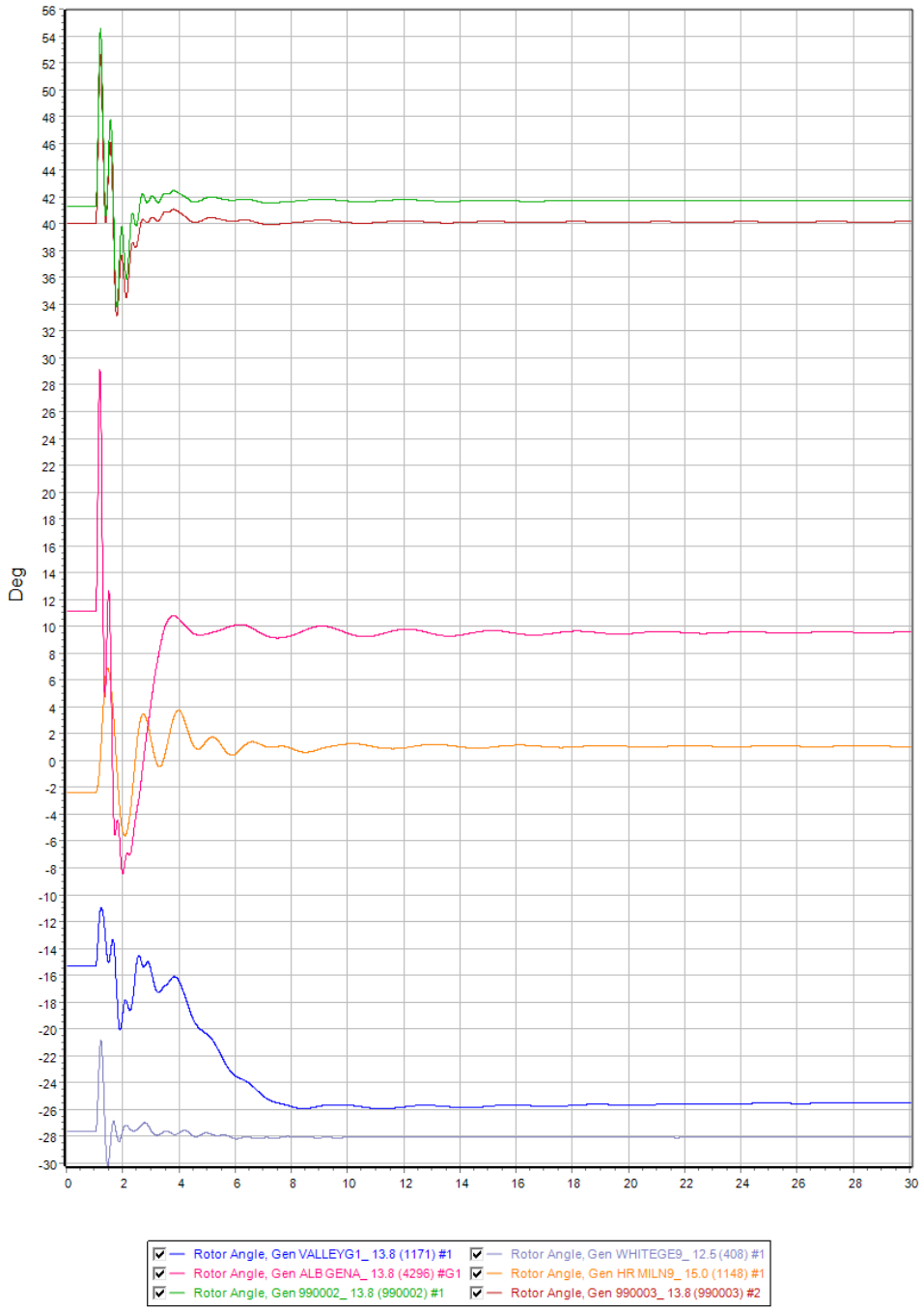


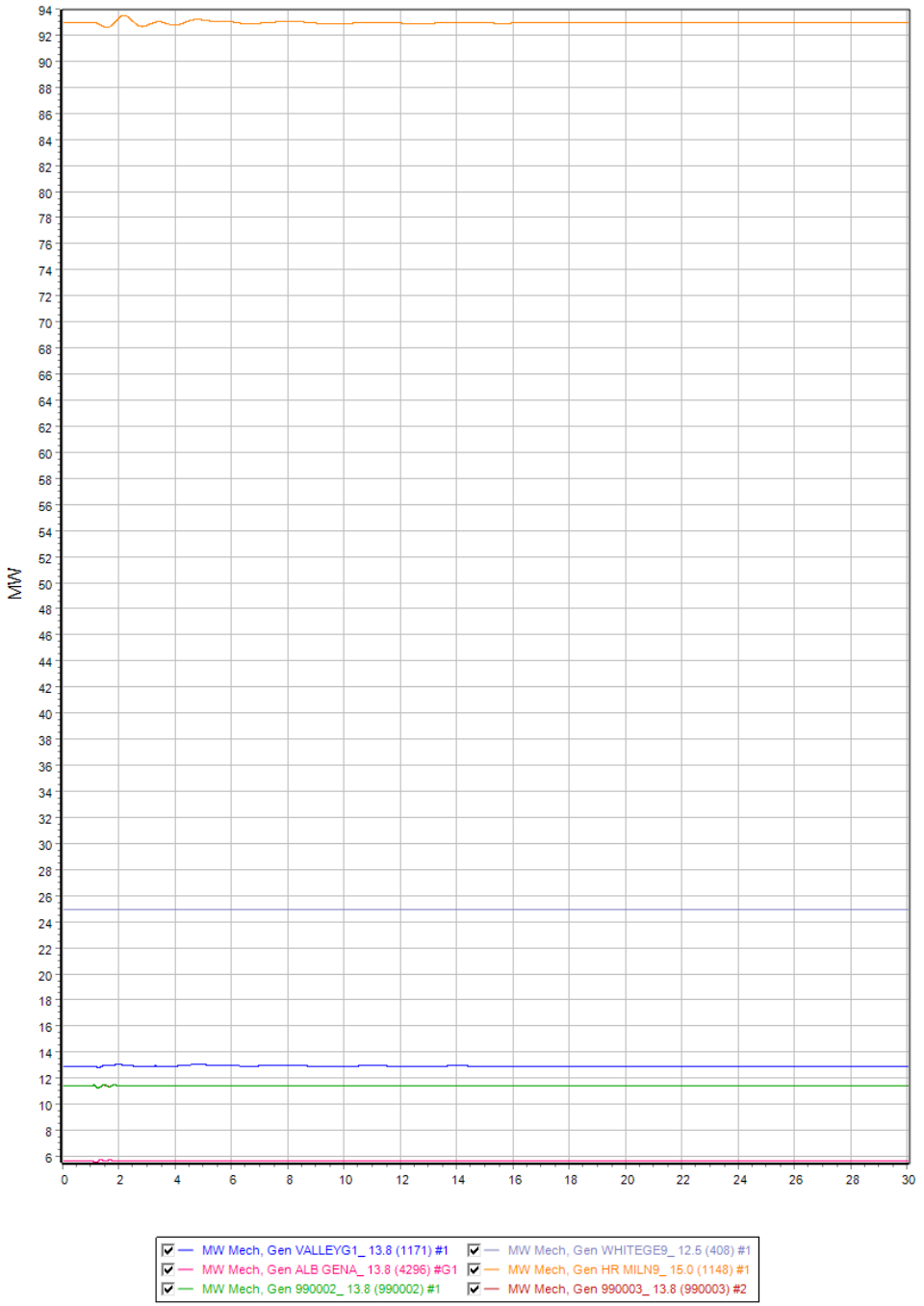
Monitor Line MW & MVAR. Q4



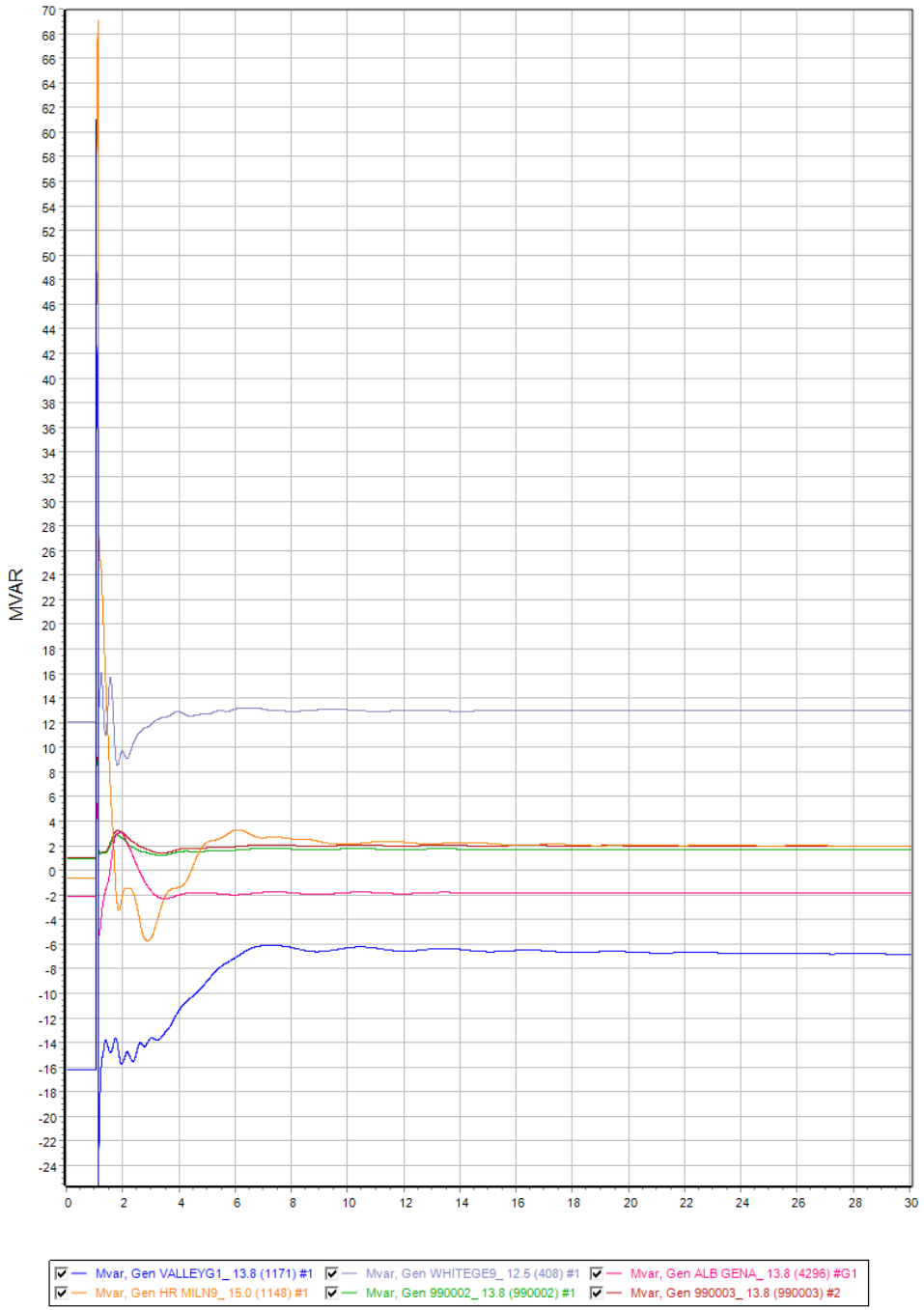


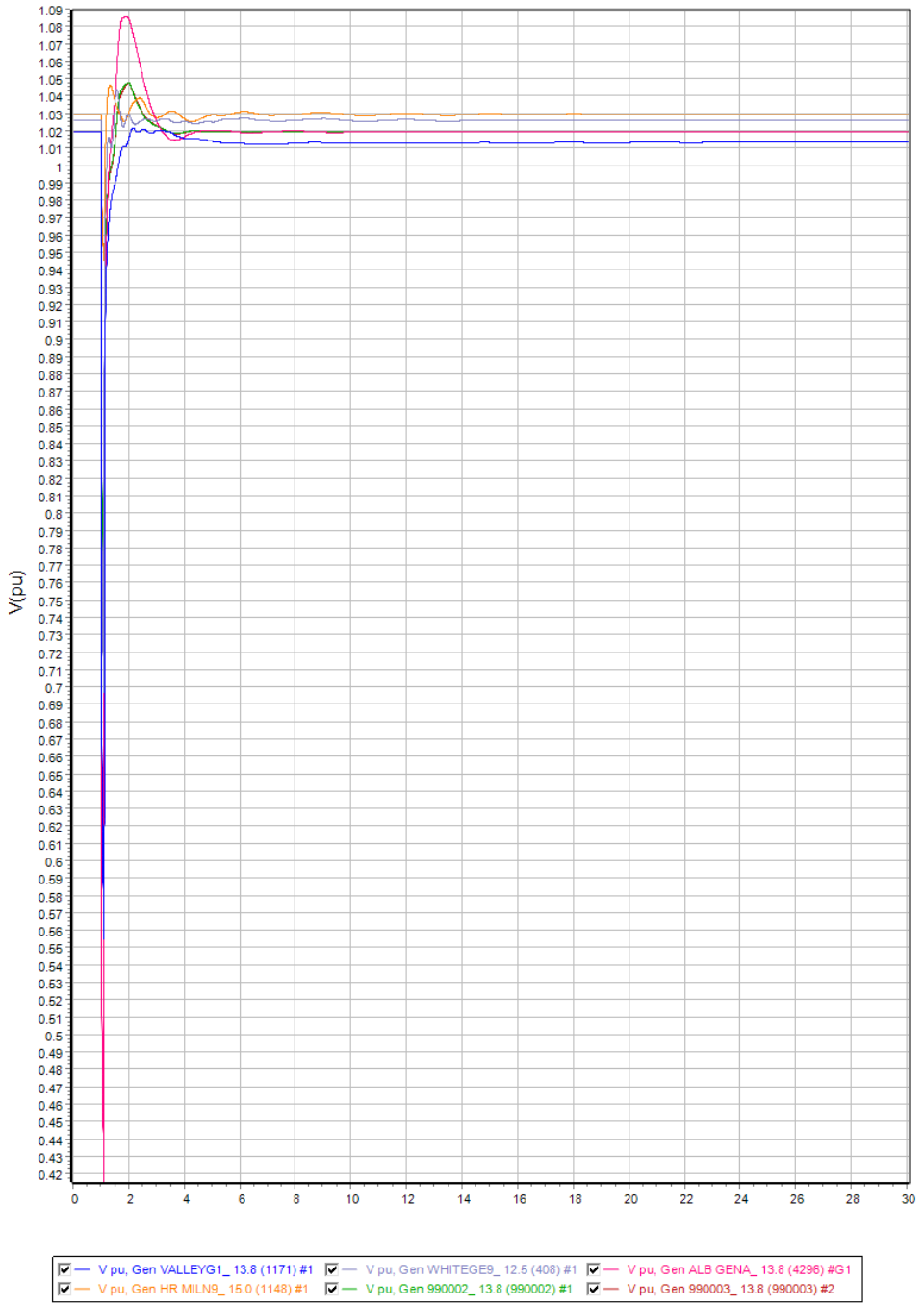
Monitor Gens. Q1



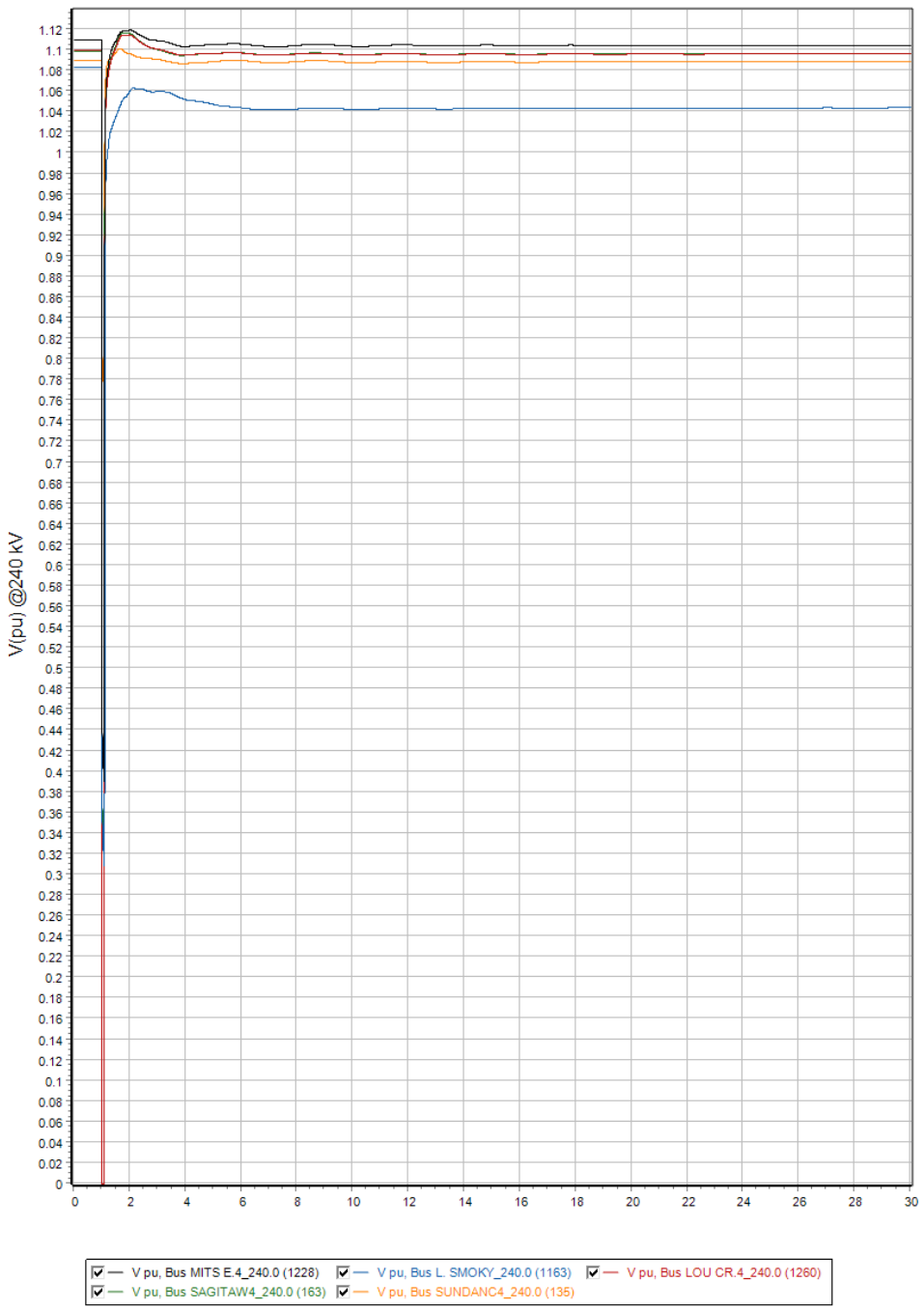


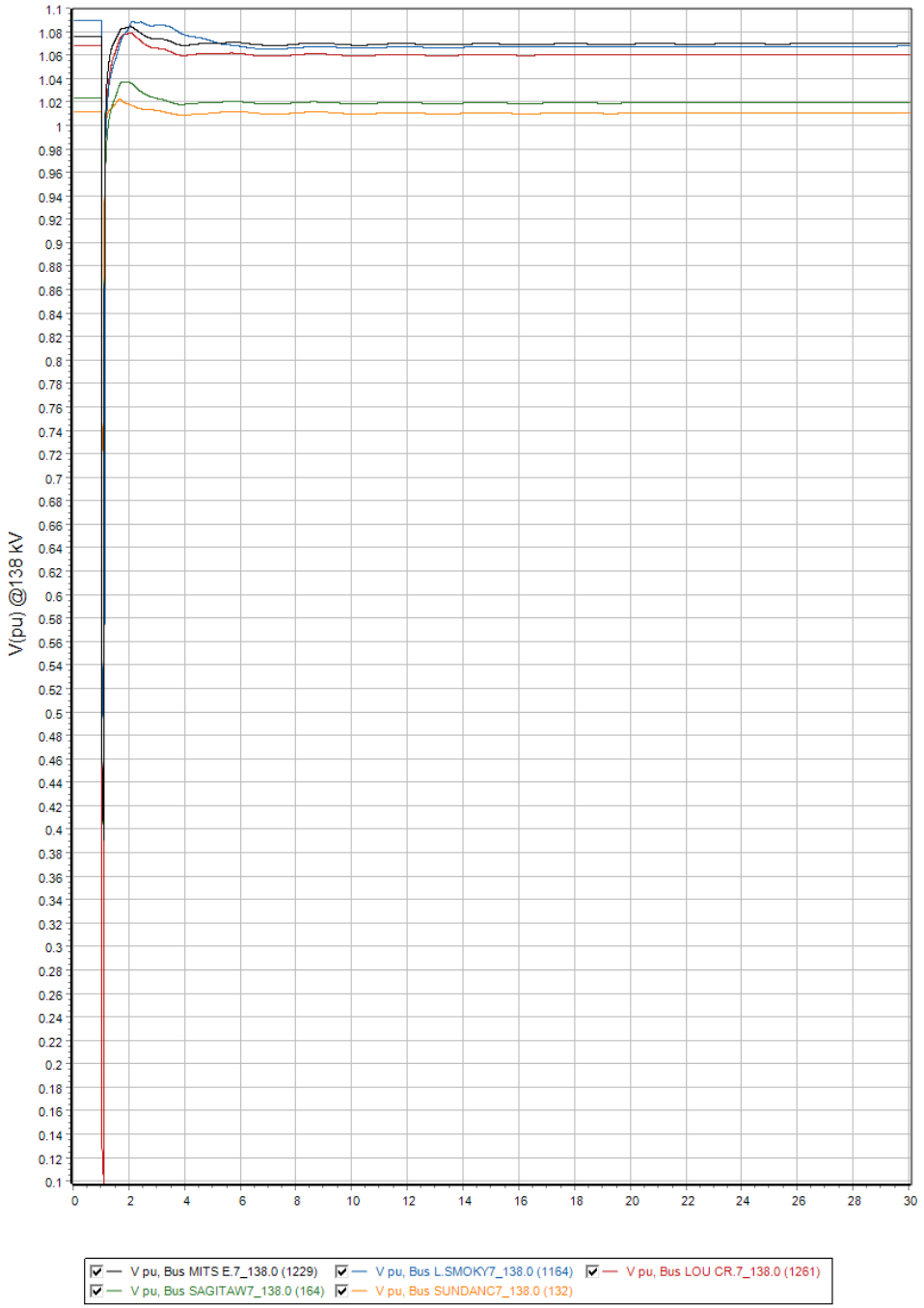
Monitor Gens. Q2



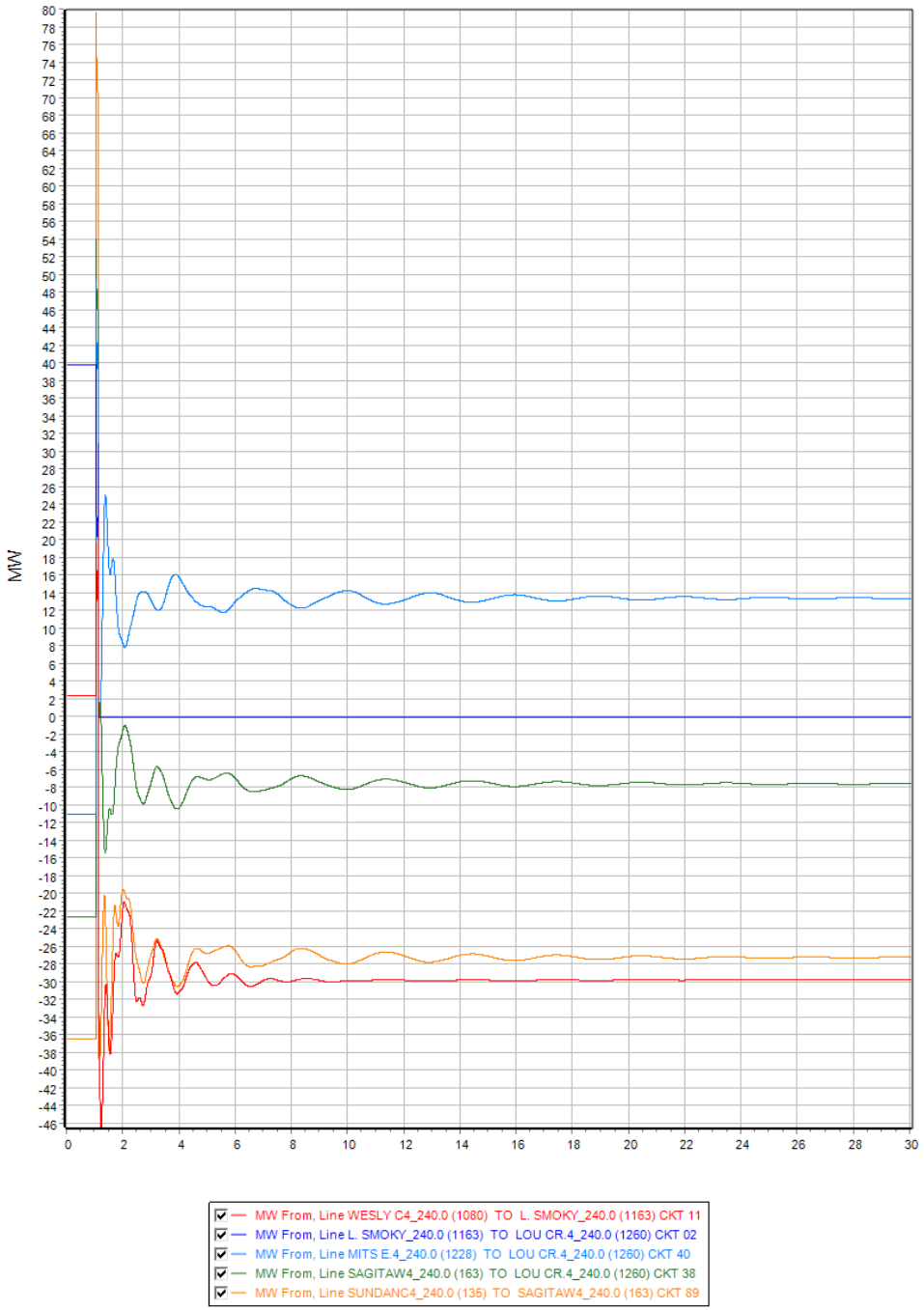


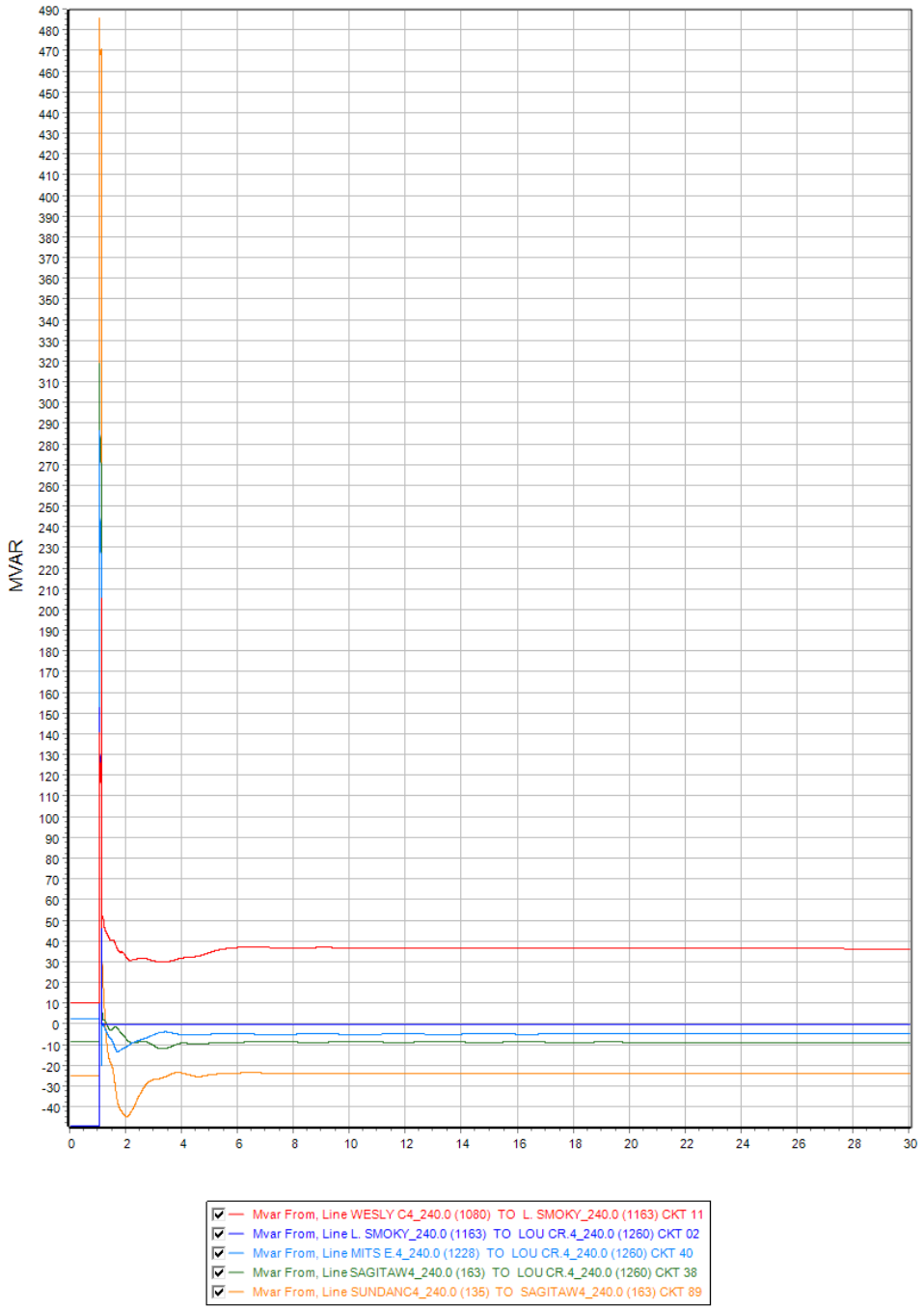
Monitor Bus Volts Q3





Monitor Line MW & MVAR. Q4





2023 WINTER PEAK

PLOTS
P2456 - POST-PROJECT
TRANSIENT STABILITY
SC08

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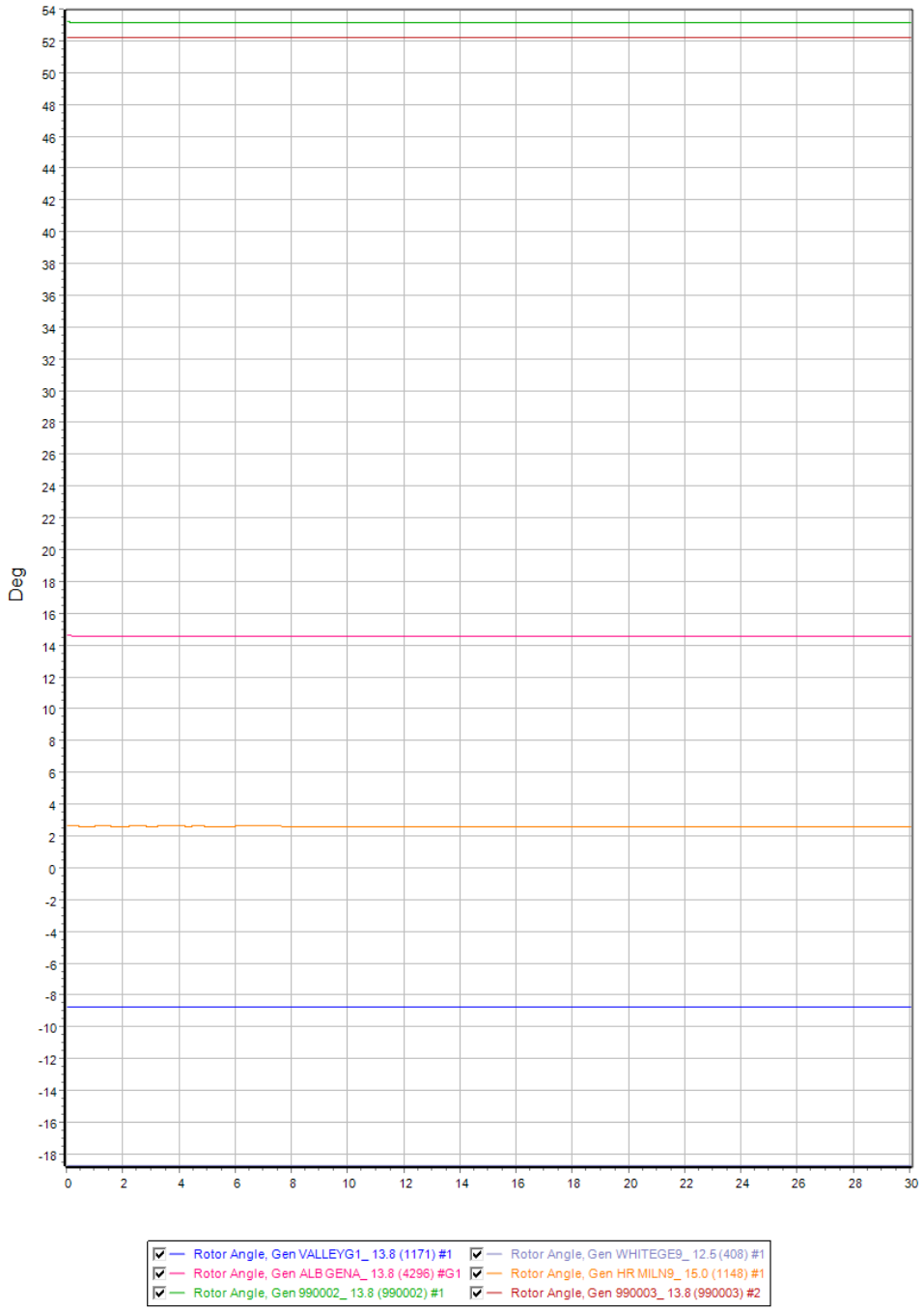
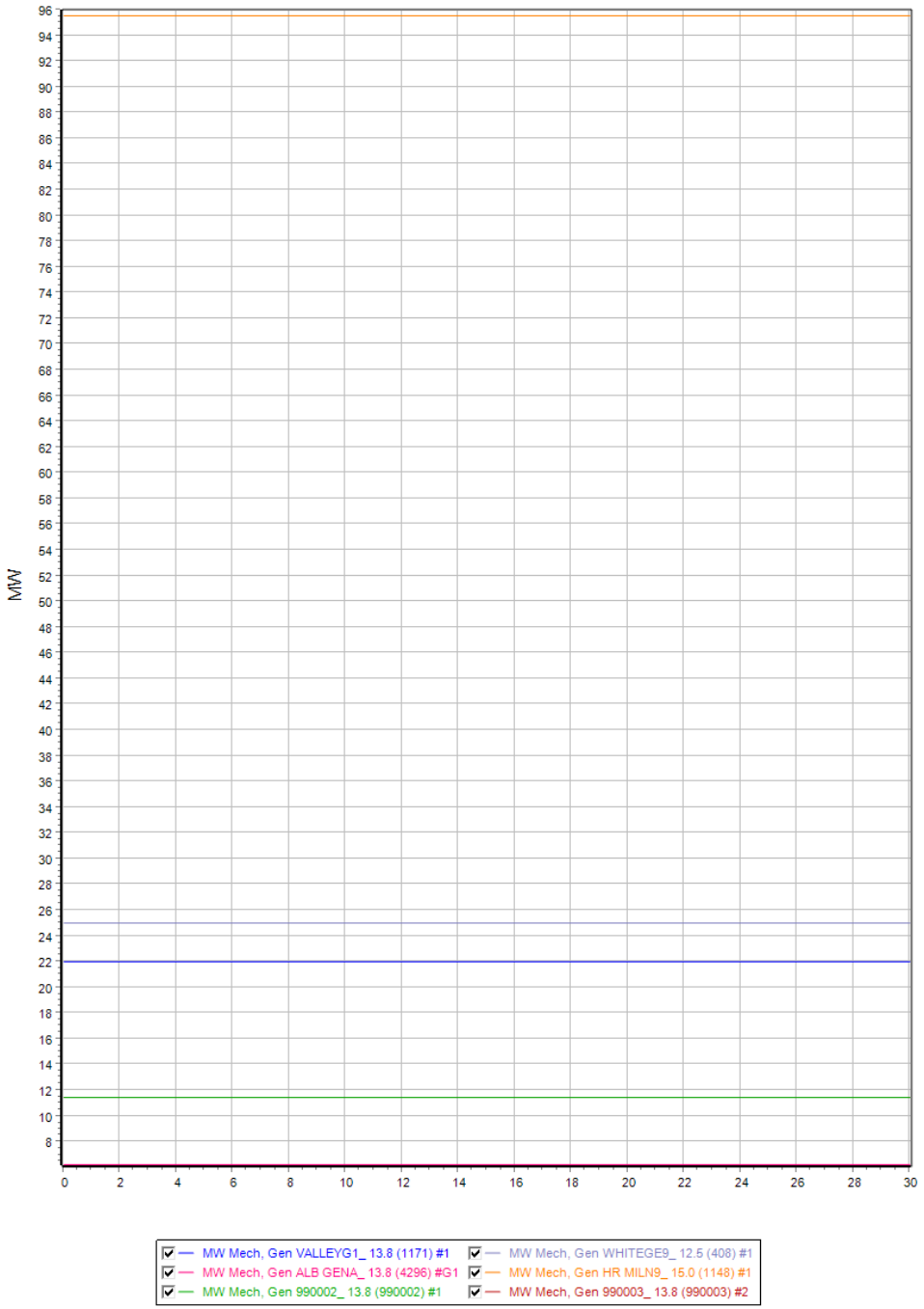
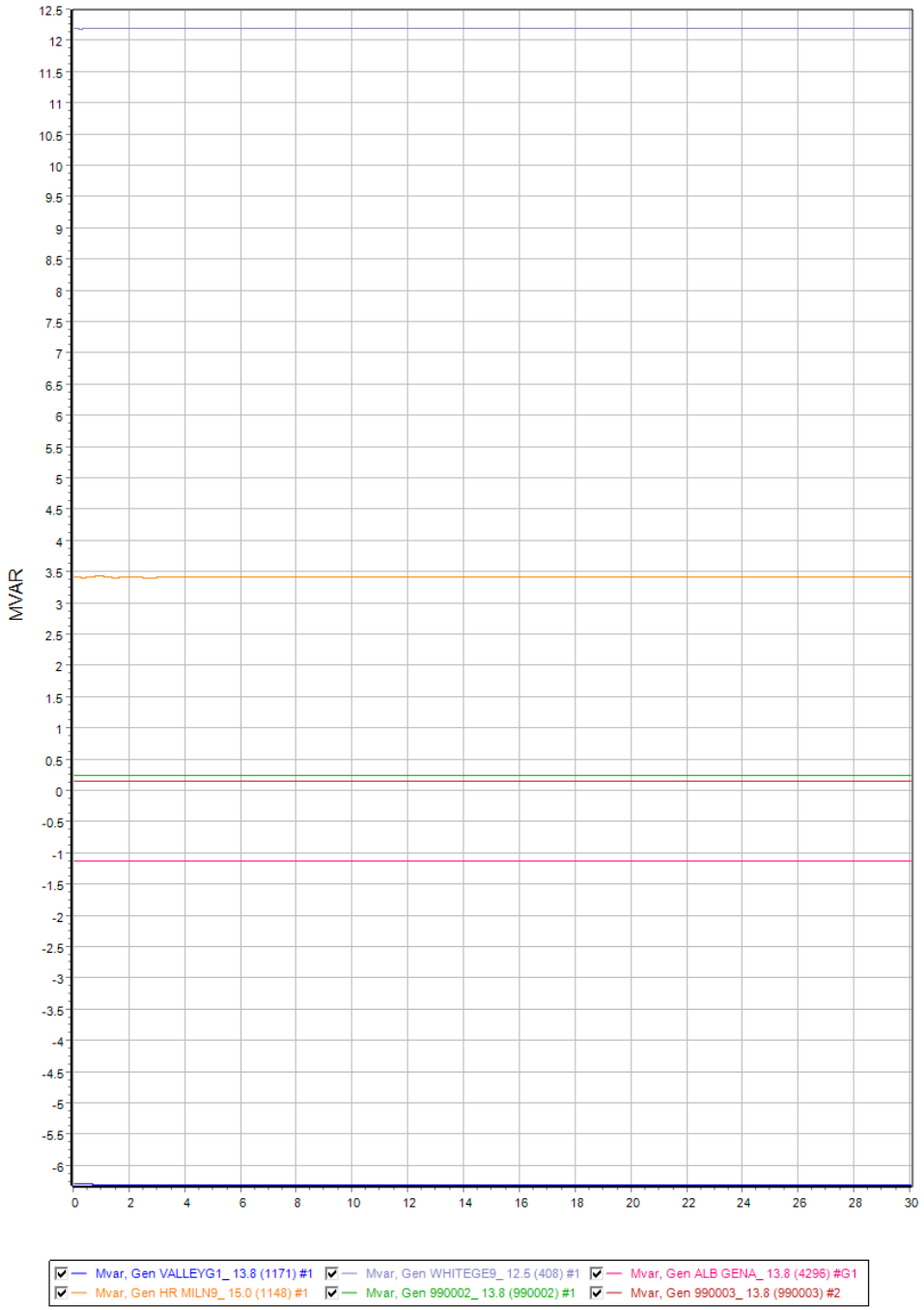
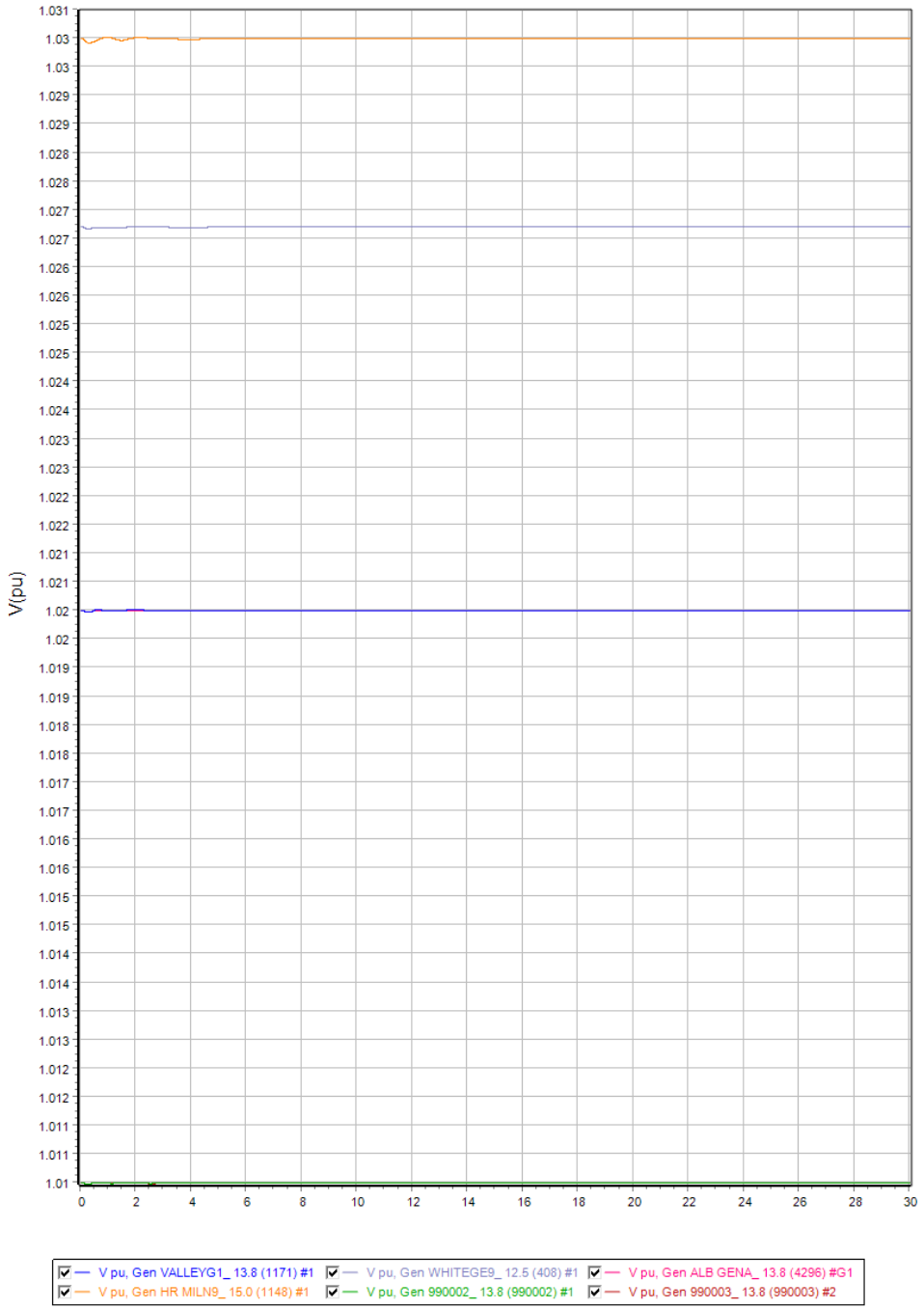
Monitor Gens. Q1



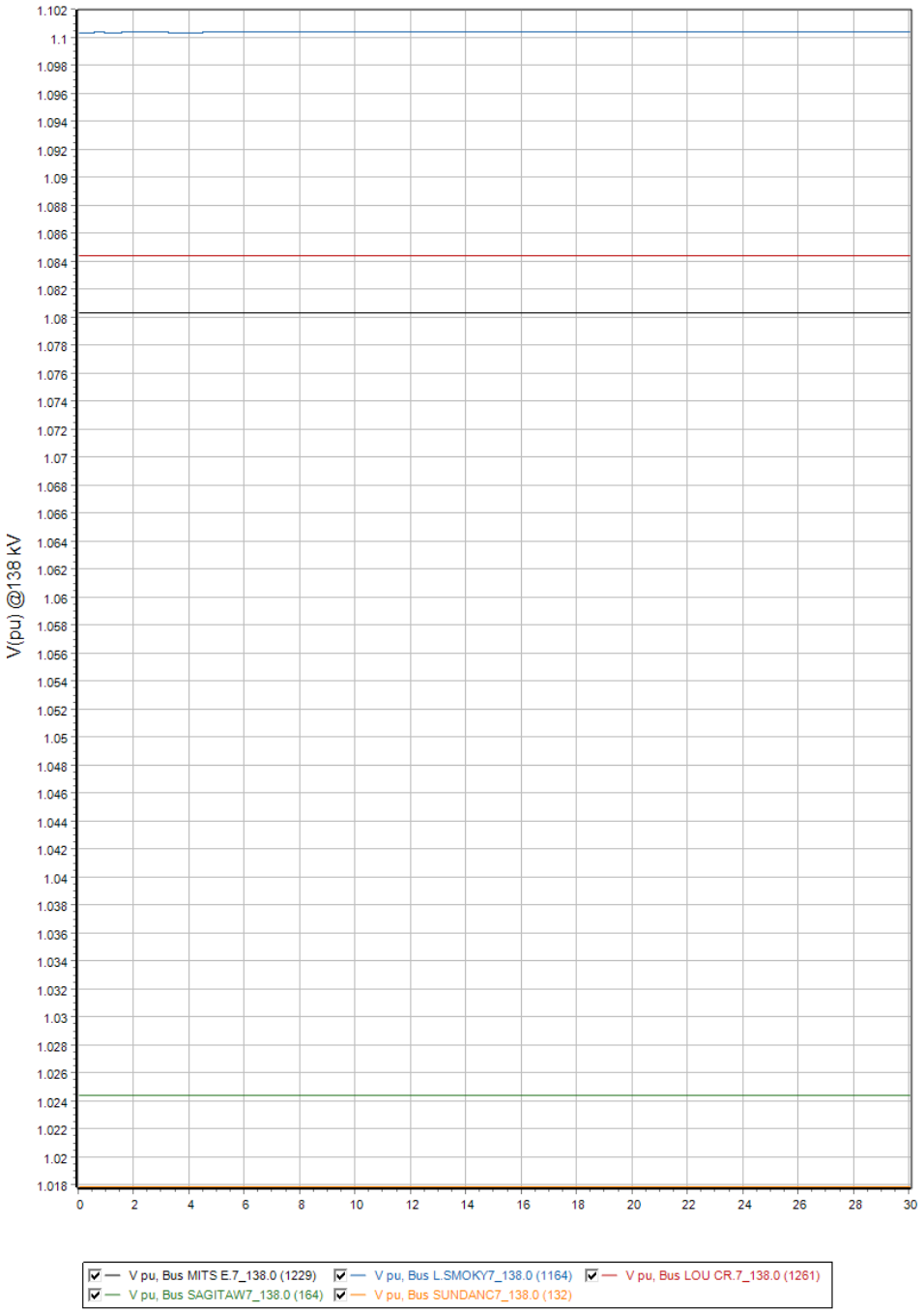


Monitor Gens. Q2

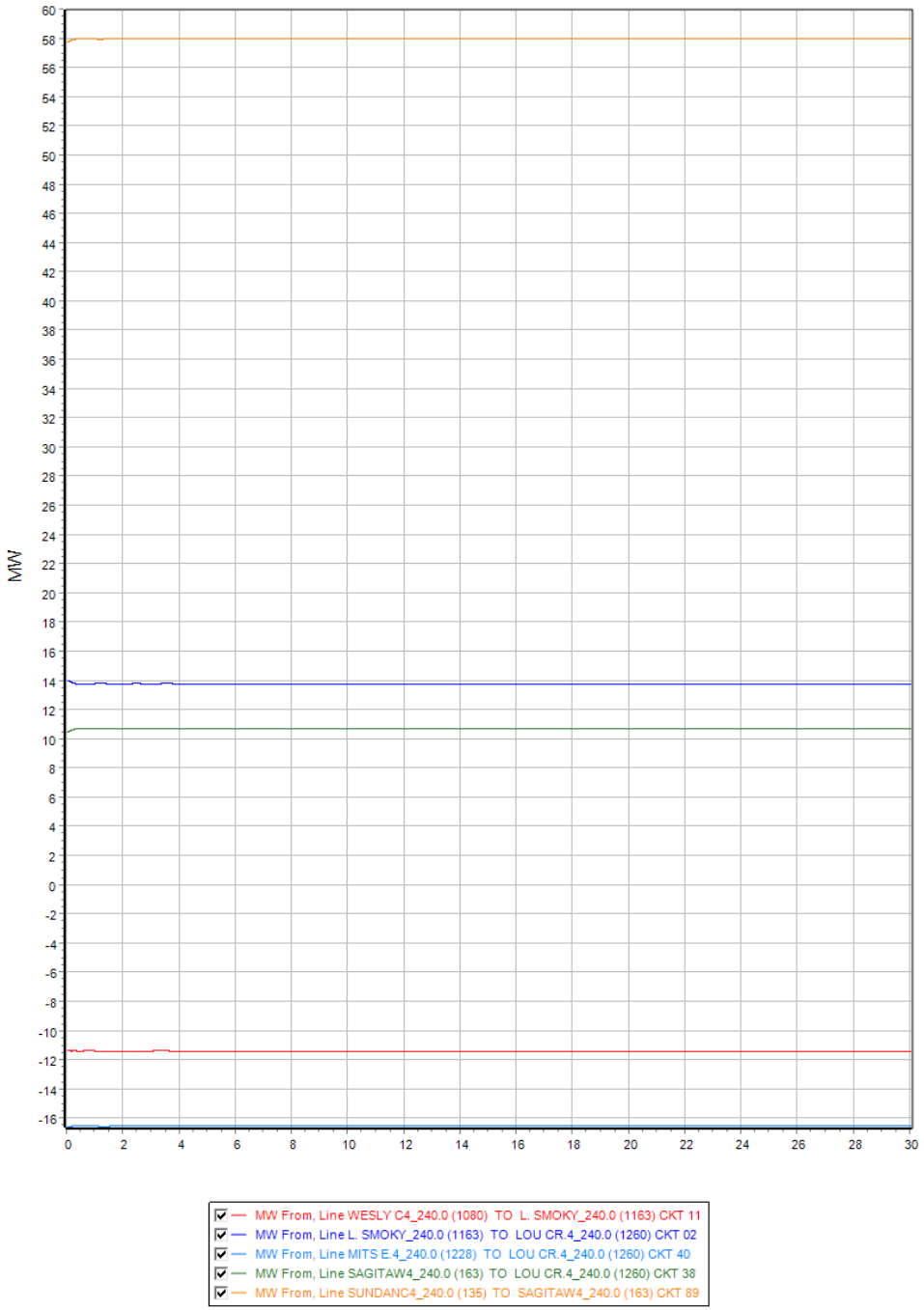


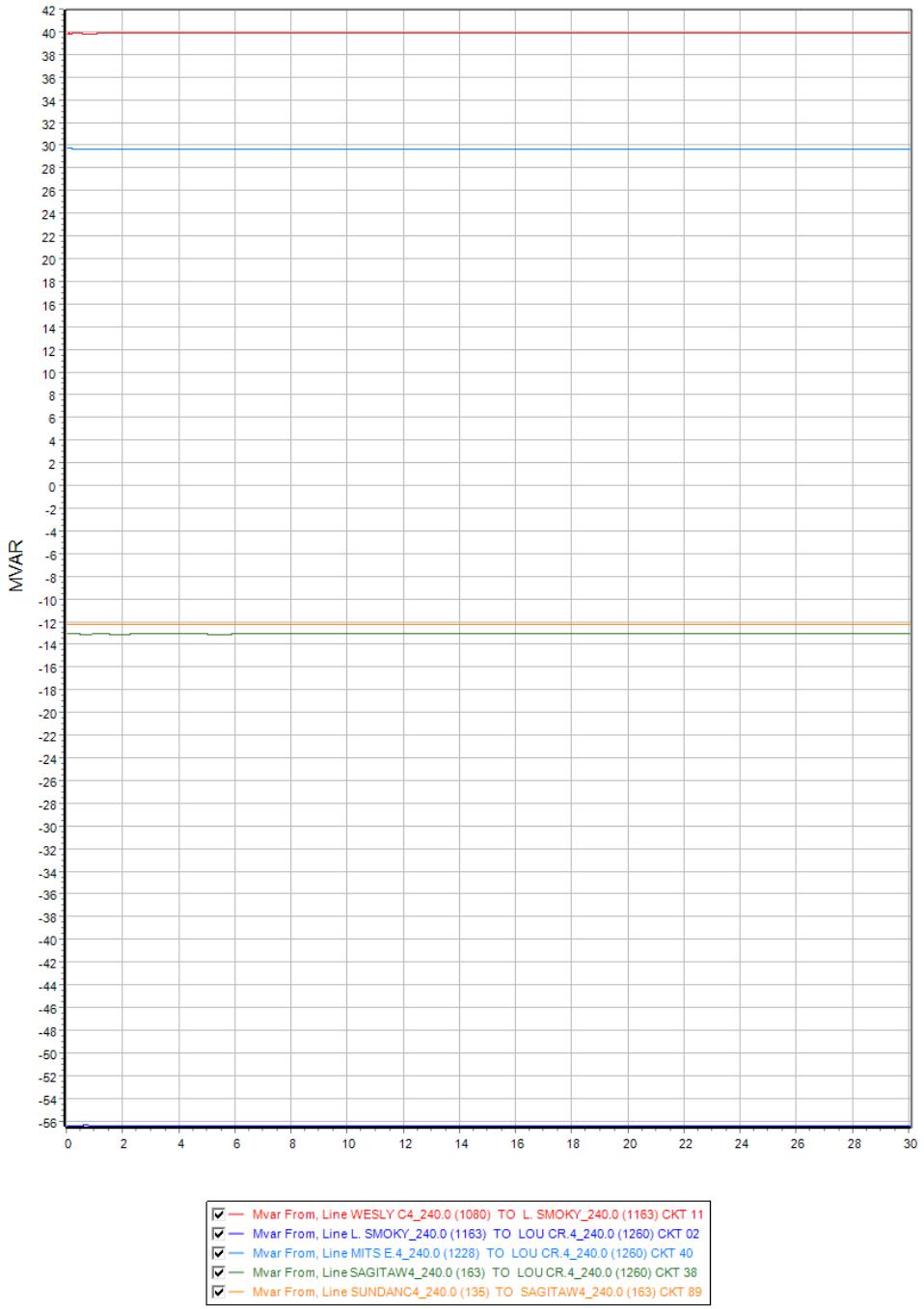


Monitor Bus Volts Q3

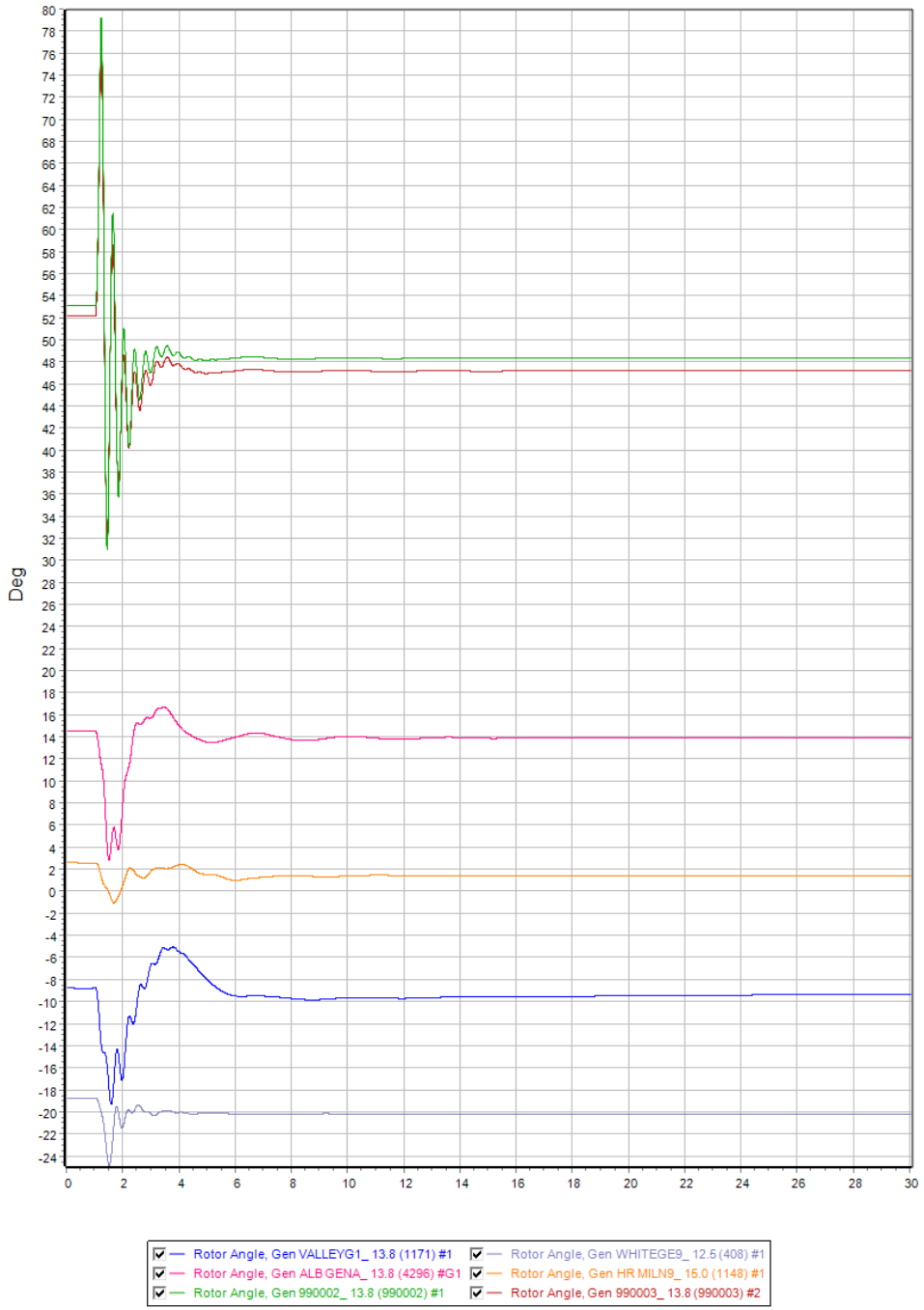


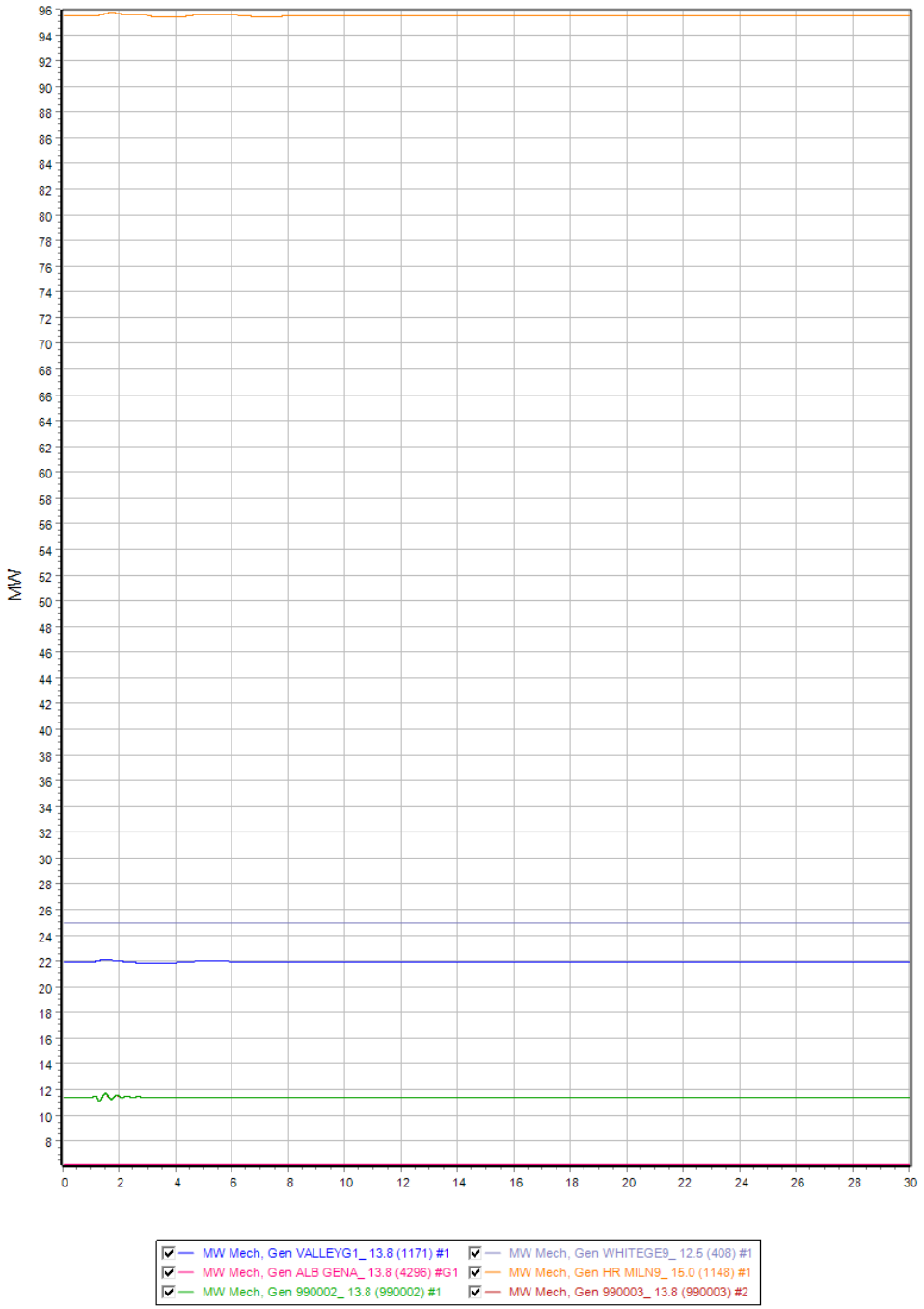
Monitor Line MW & MVAR. Q4



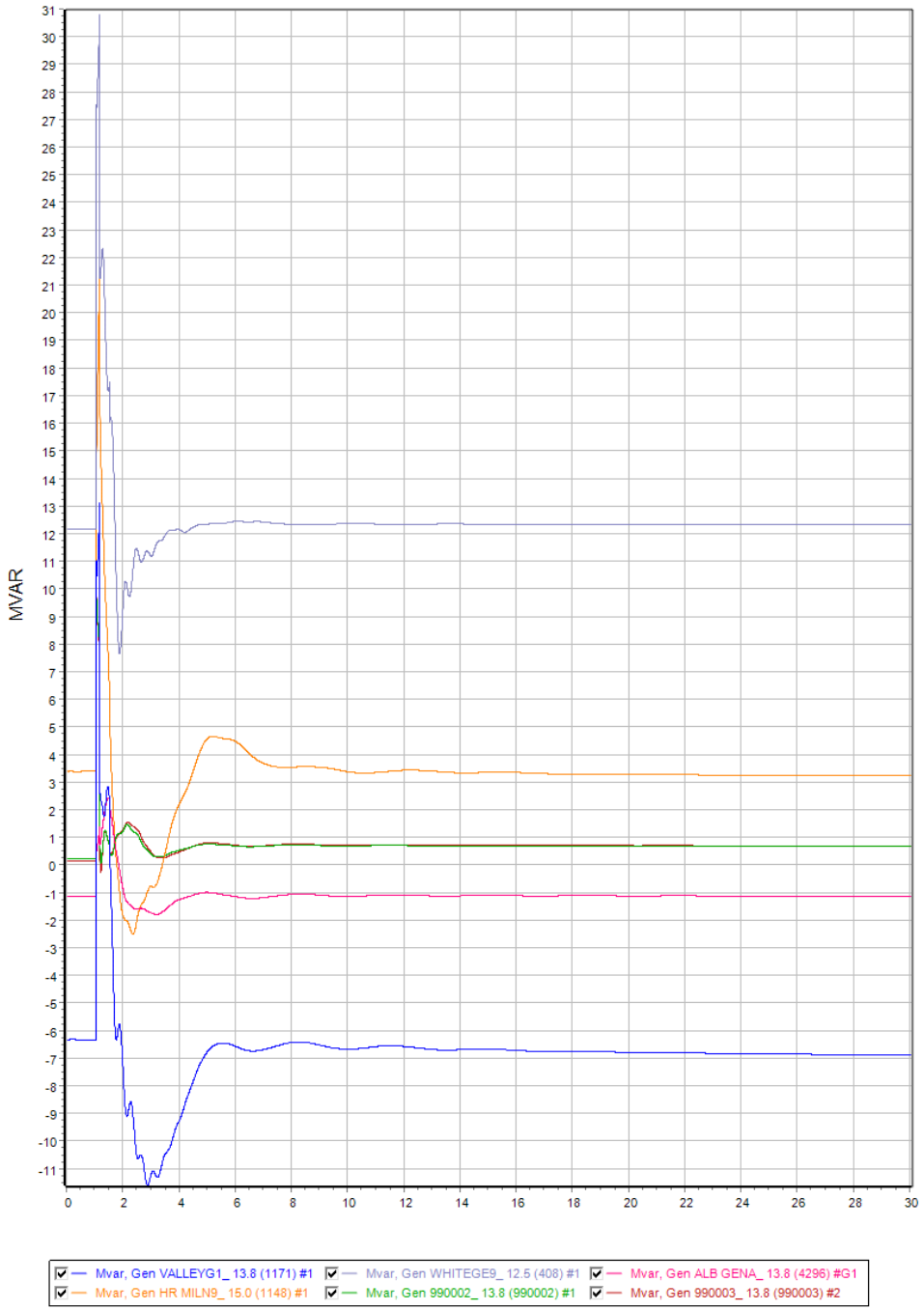


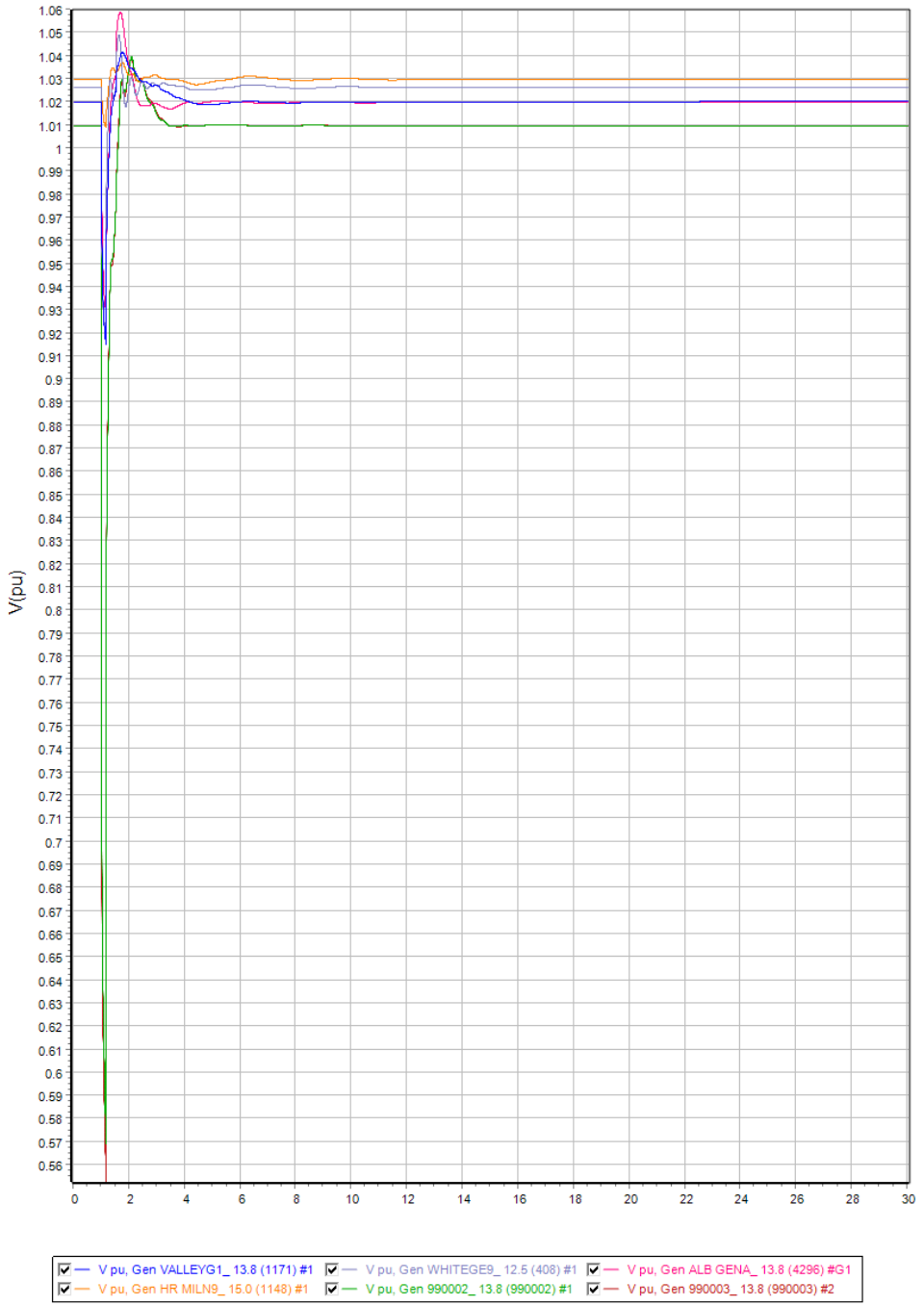
Monitor Gens. Q1



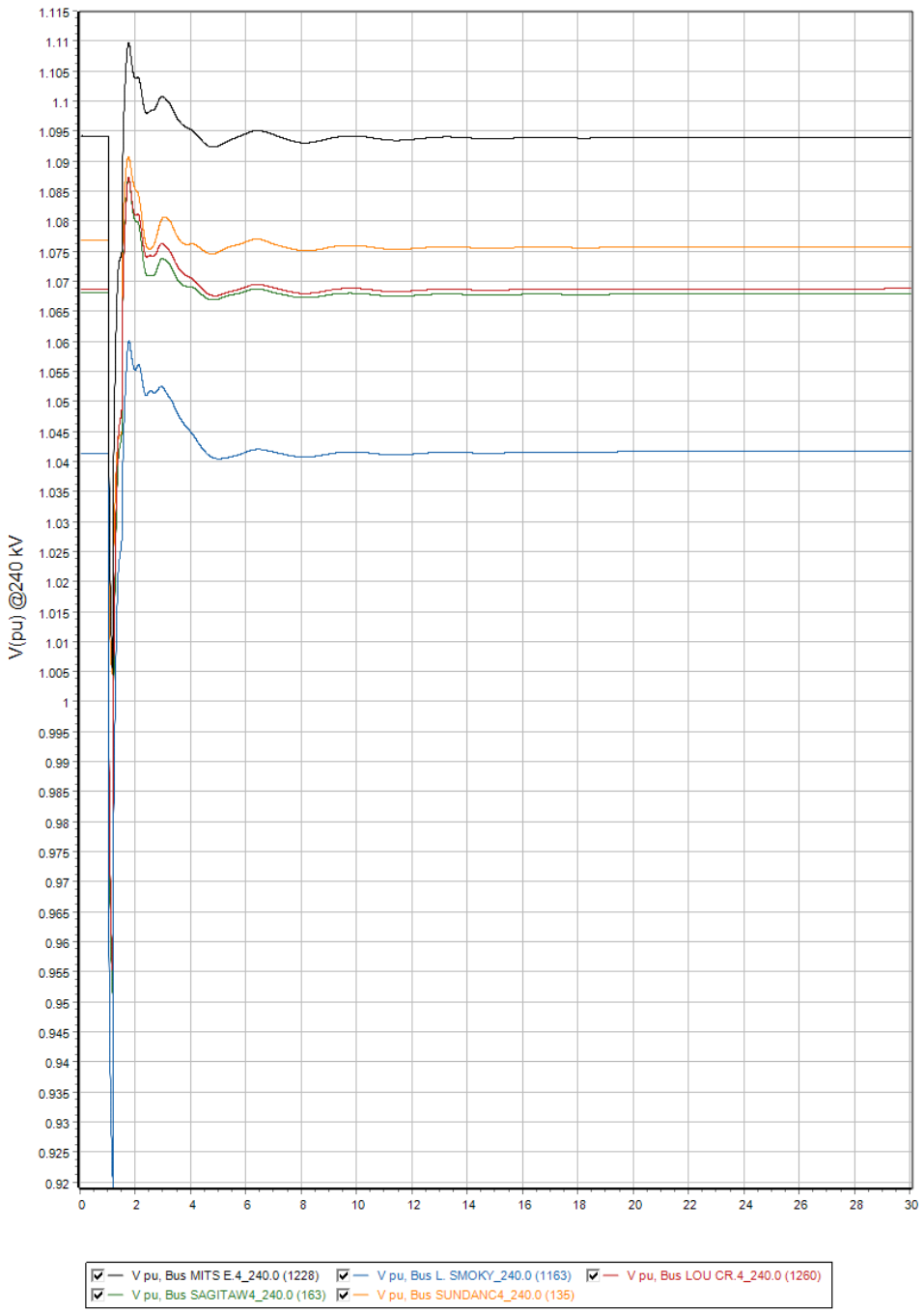


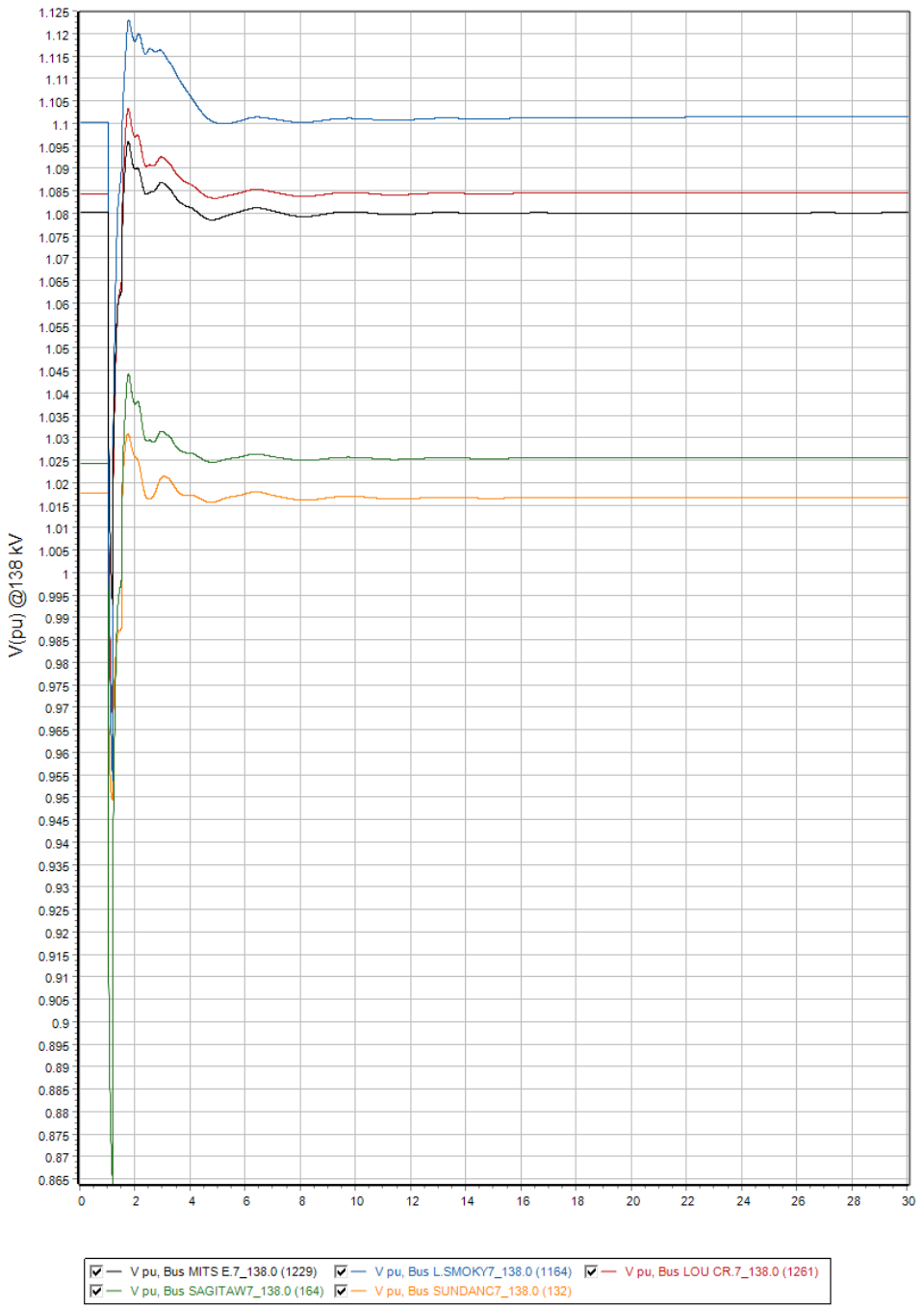
Monitor Gens. Q2





Monitor Bus Volts Q3





SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 01A - 685L (Benbow 397S – Deer Hill 1012S) @ Benbow 397S

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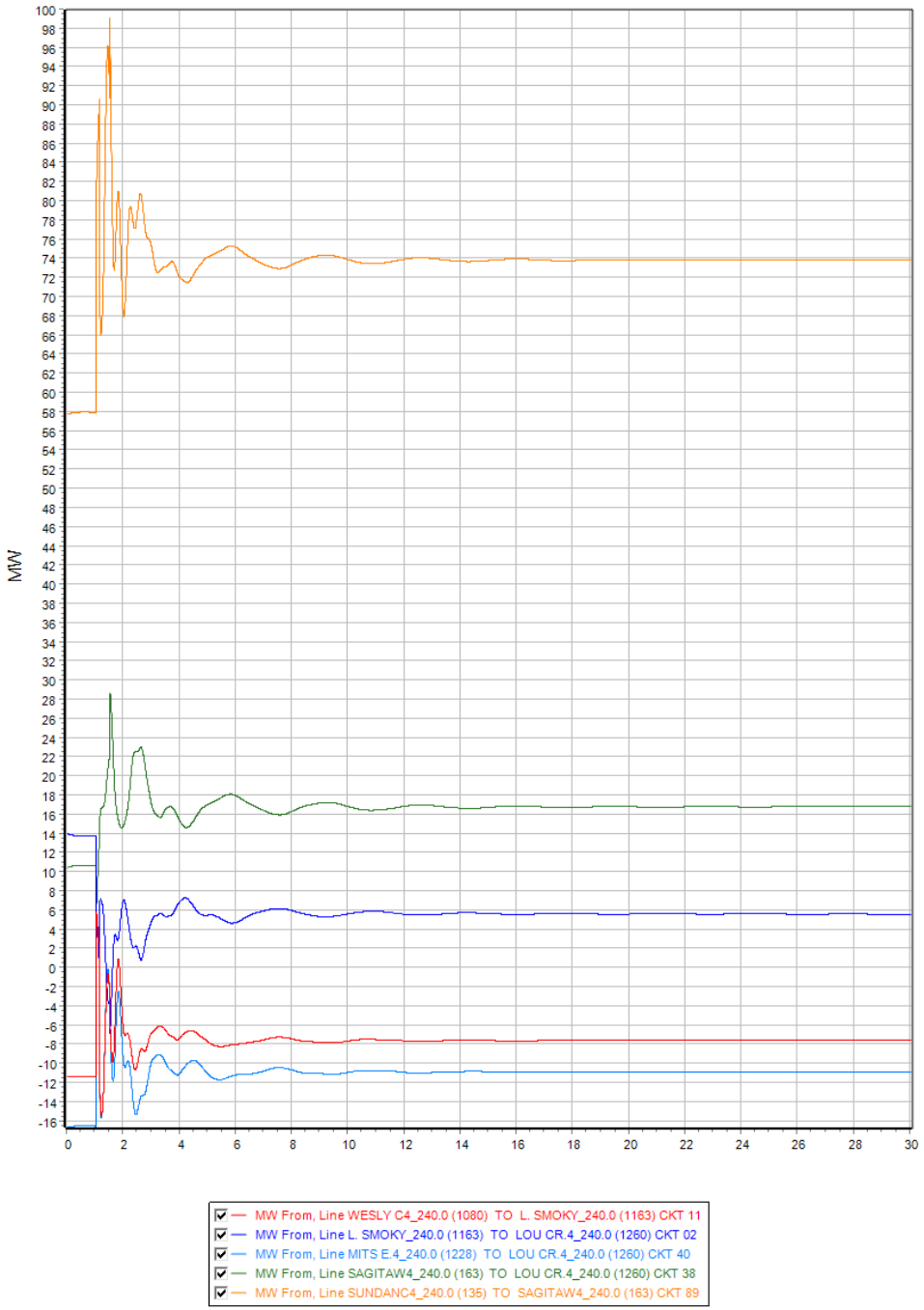
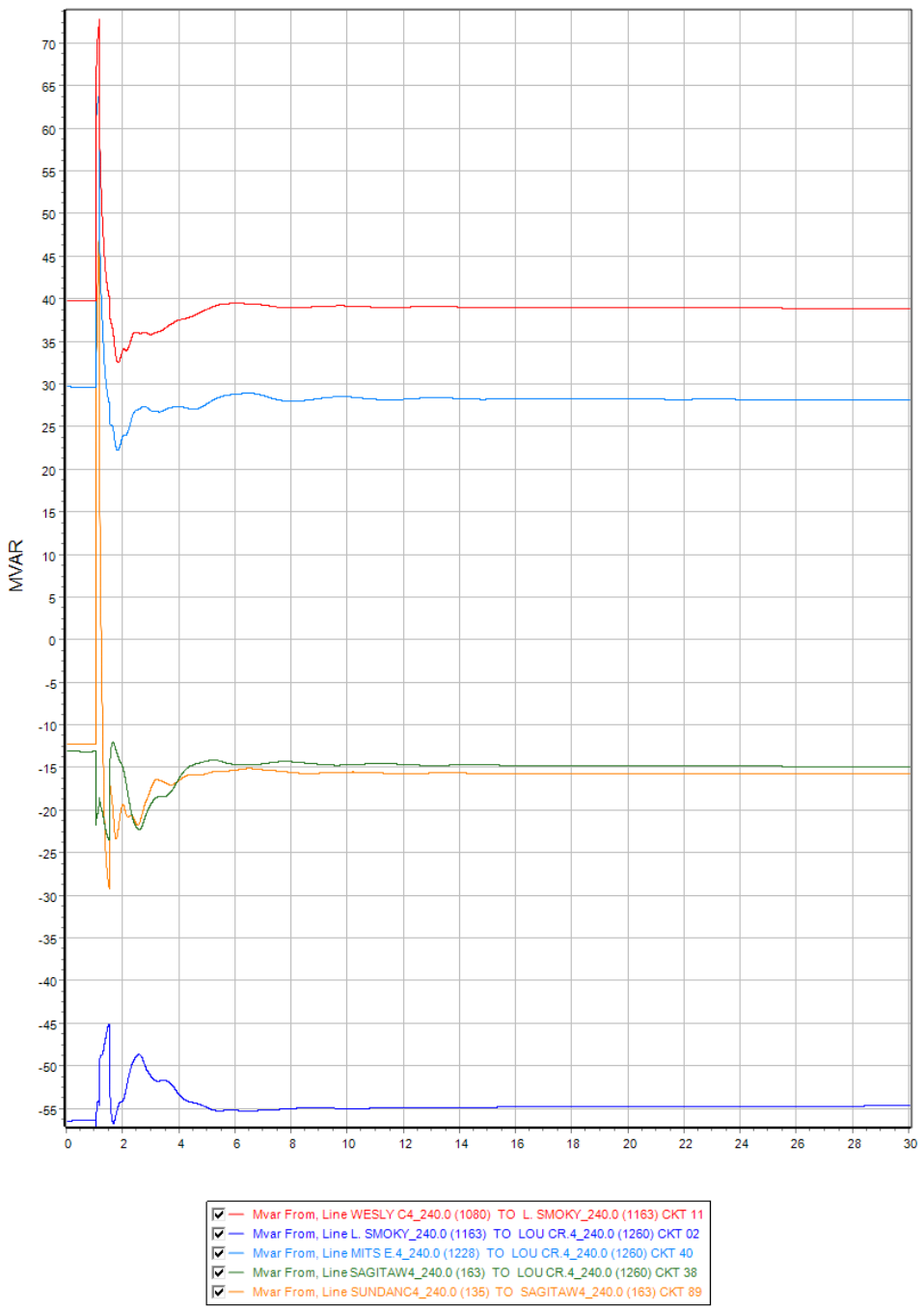
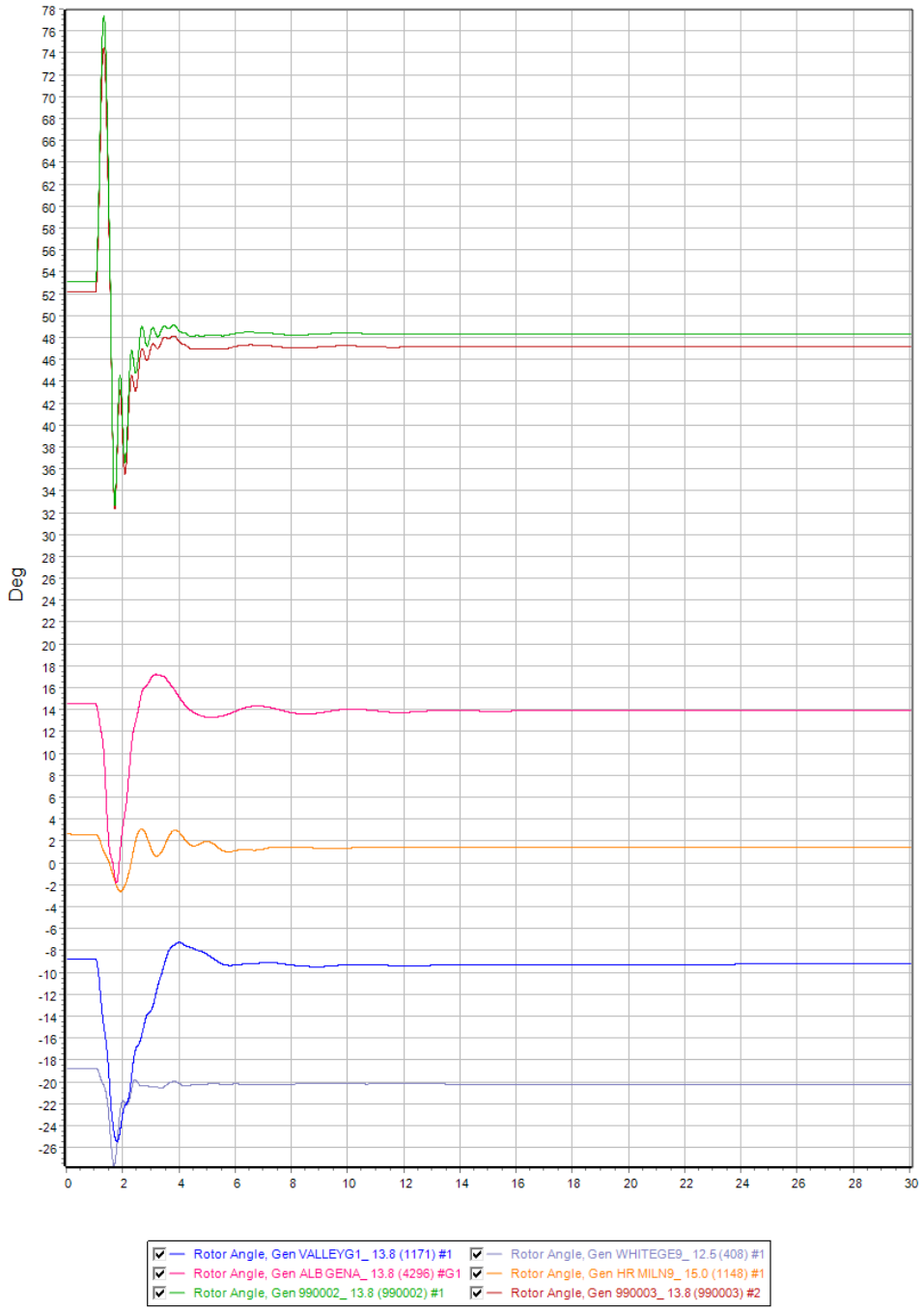
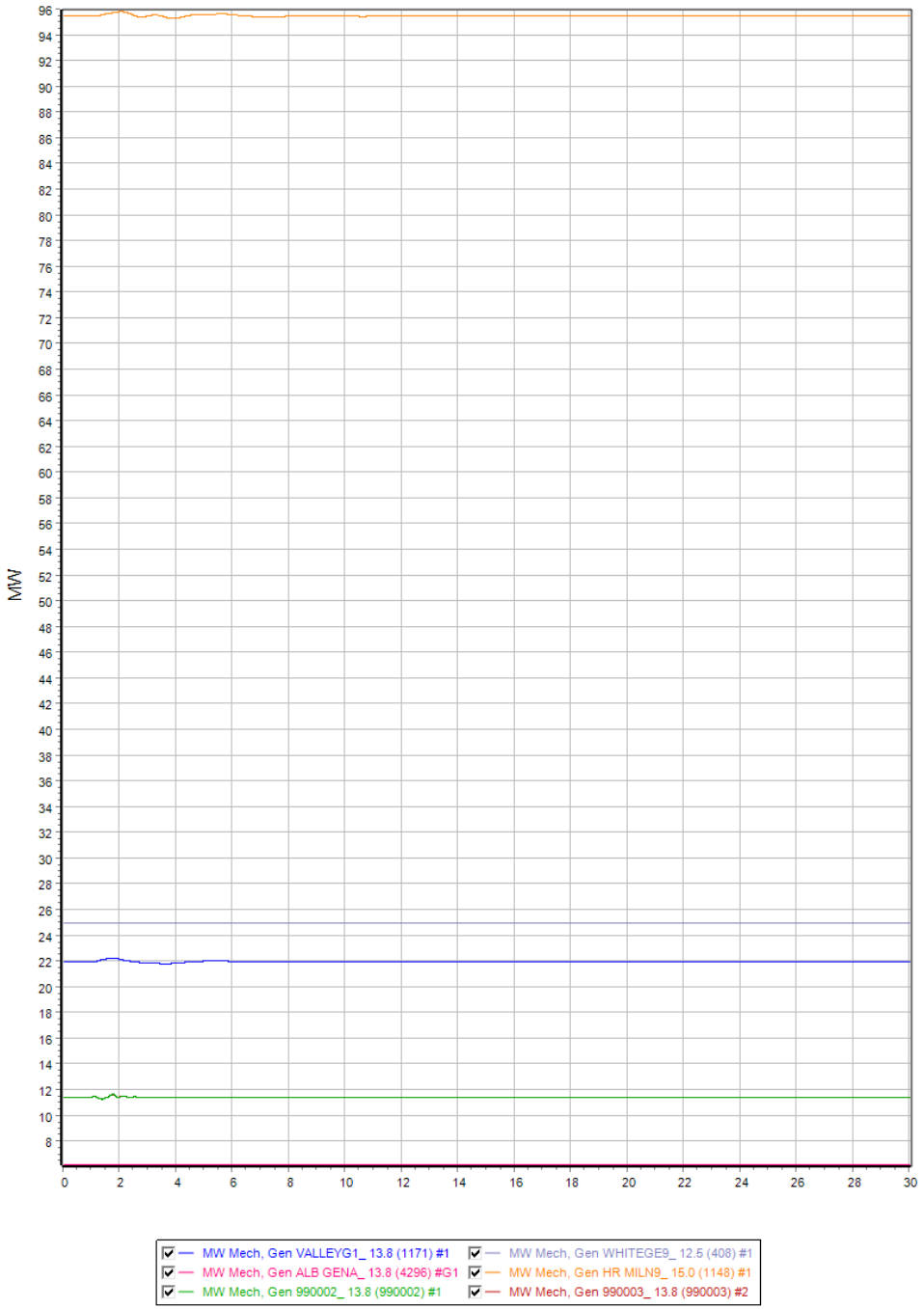
Monitor Line MW & MVAR. Q4



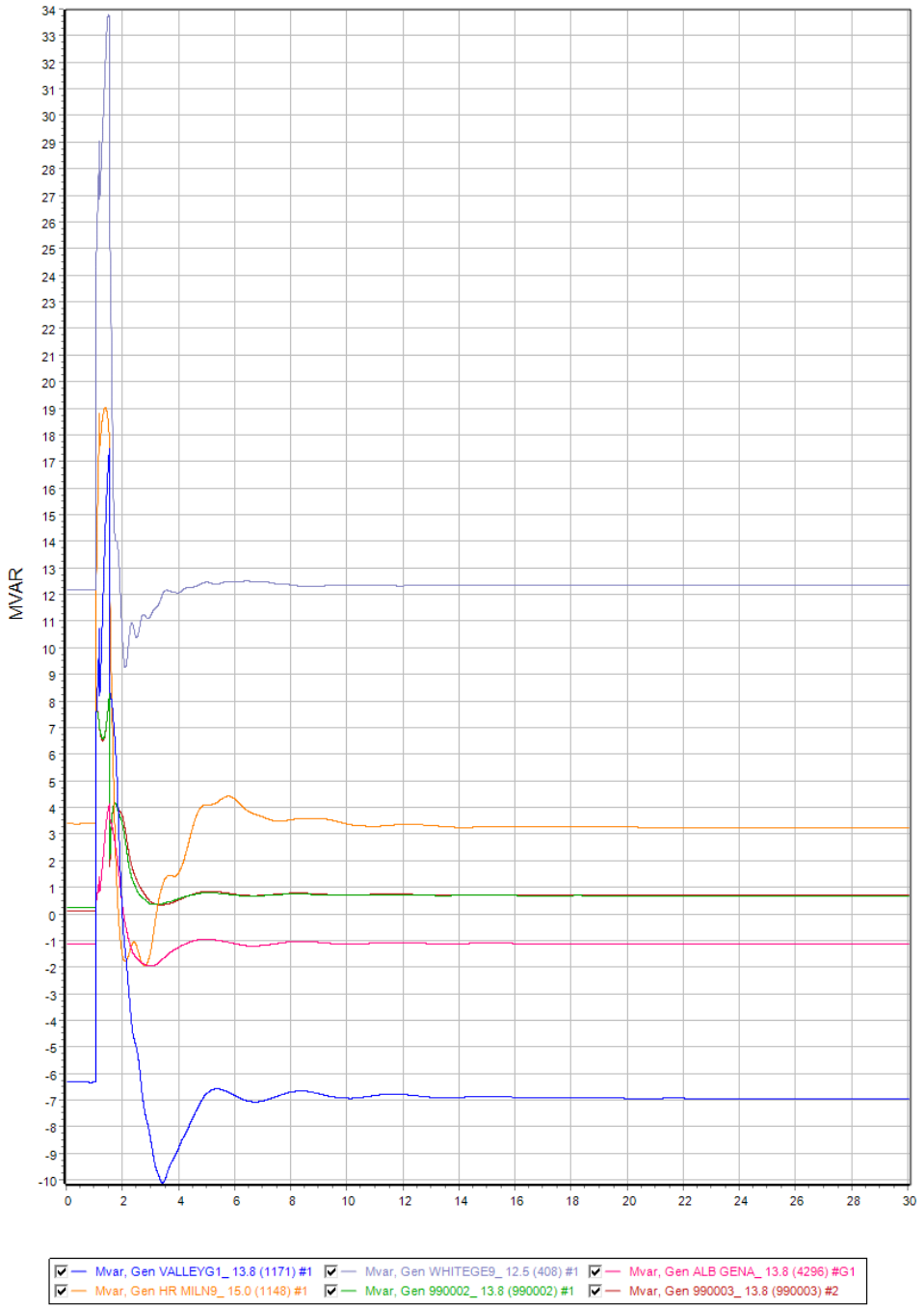


Monitor Gens. Q1





Monitor Gens. Q2



SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 01B - 685L (Benbow 397S – Deer Hill 1012S) @ Deer Hill 1012S

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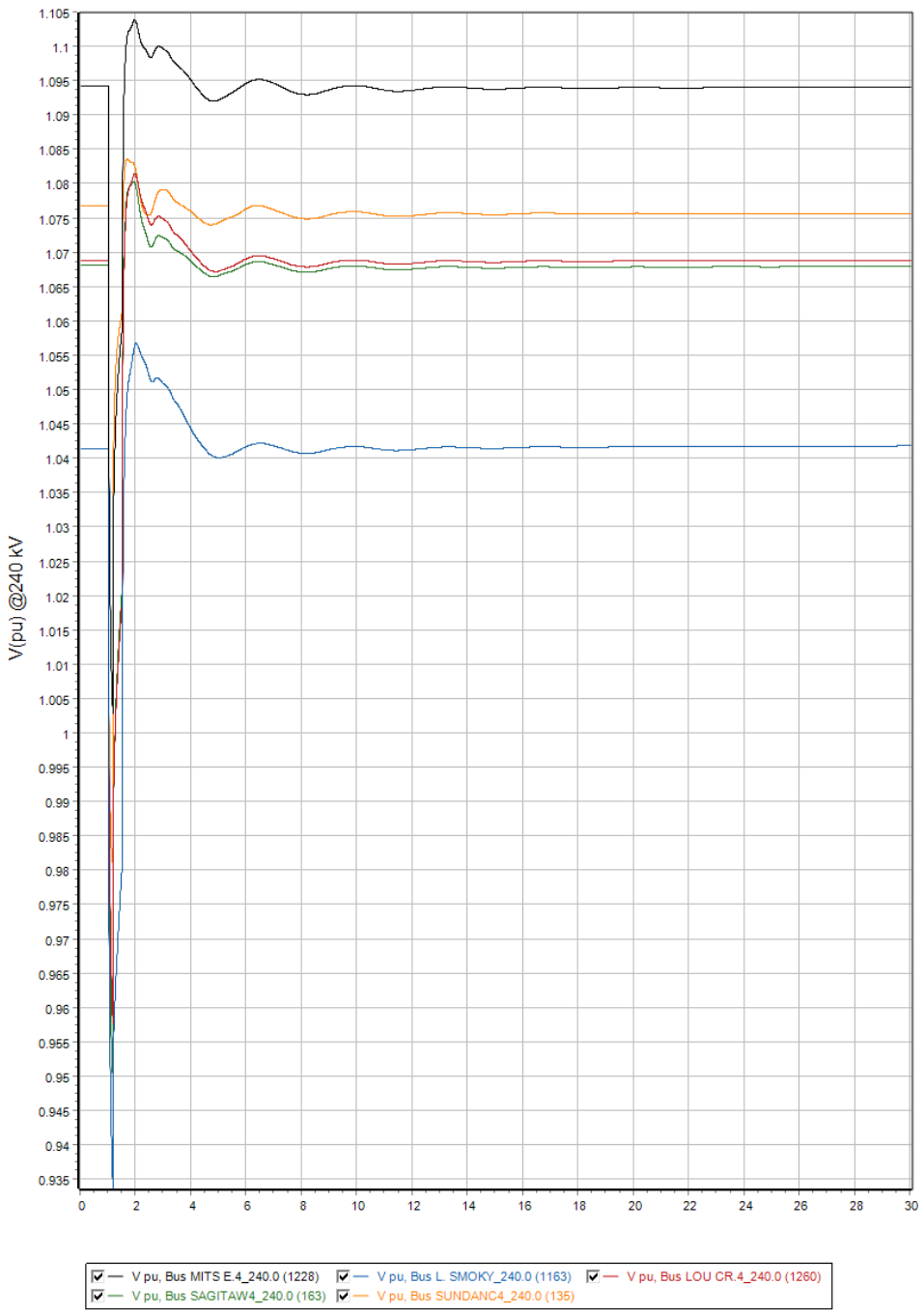
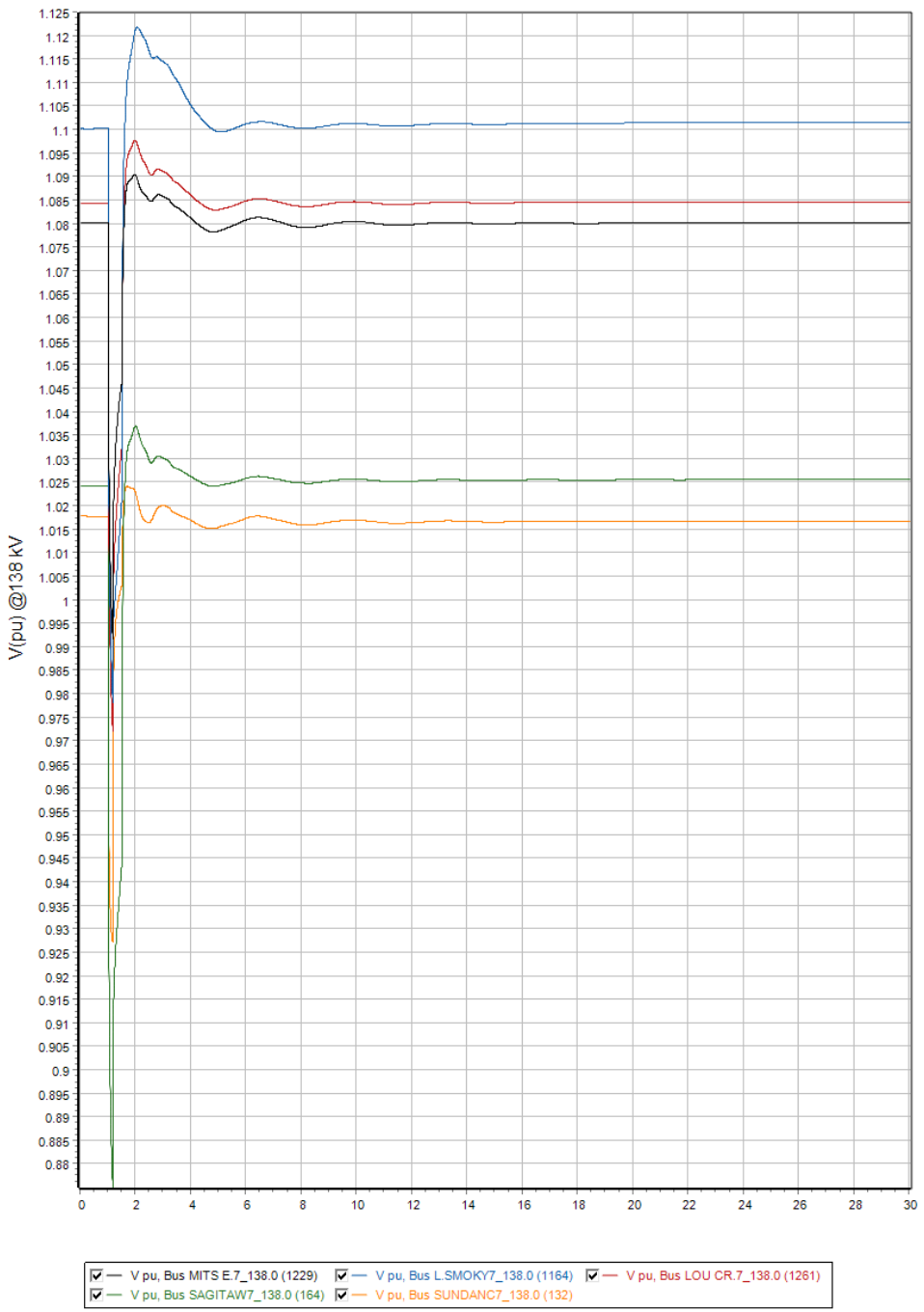
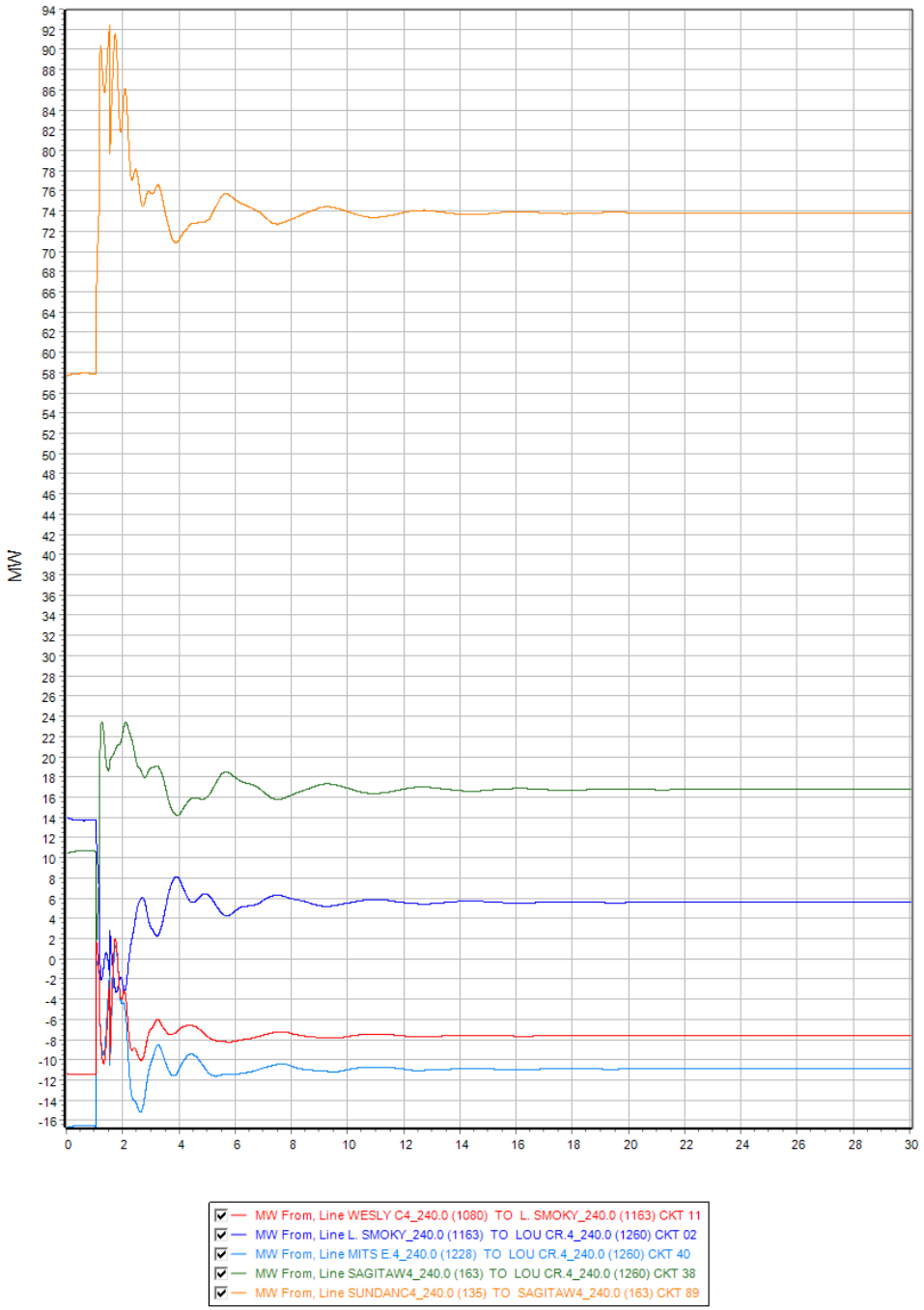
June 22, 2022 13:36:24

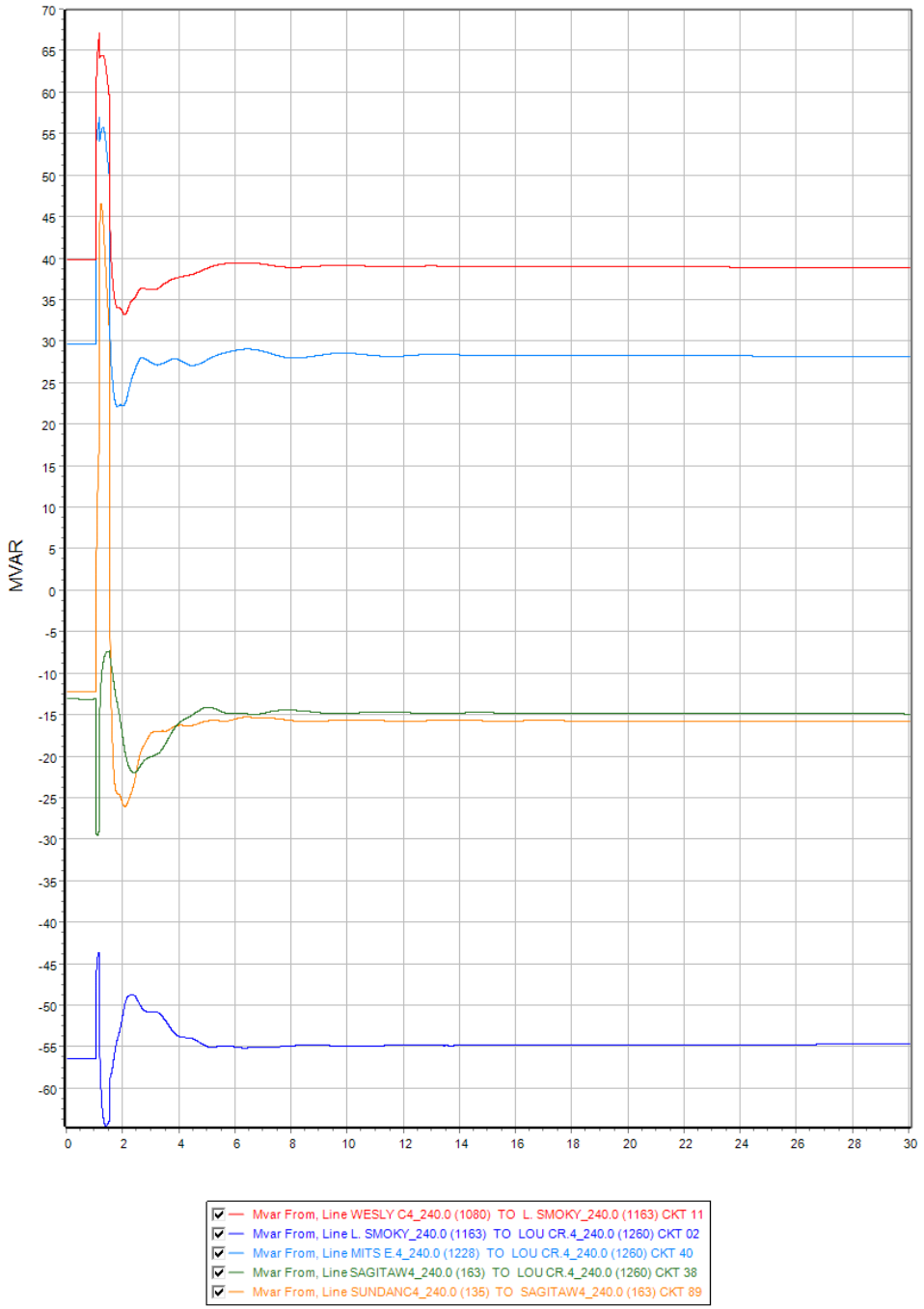
Monitor Bus Volts Q3



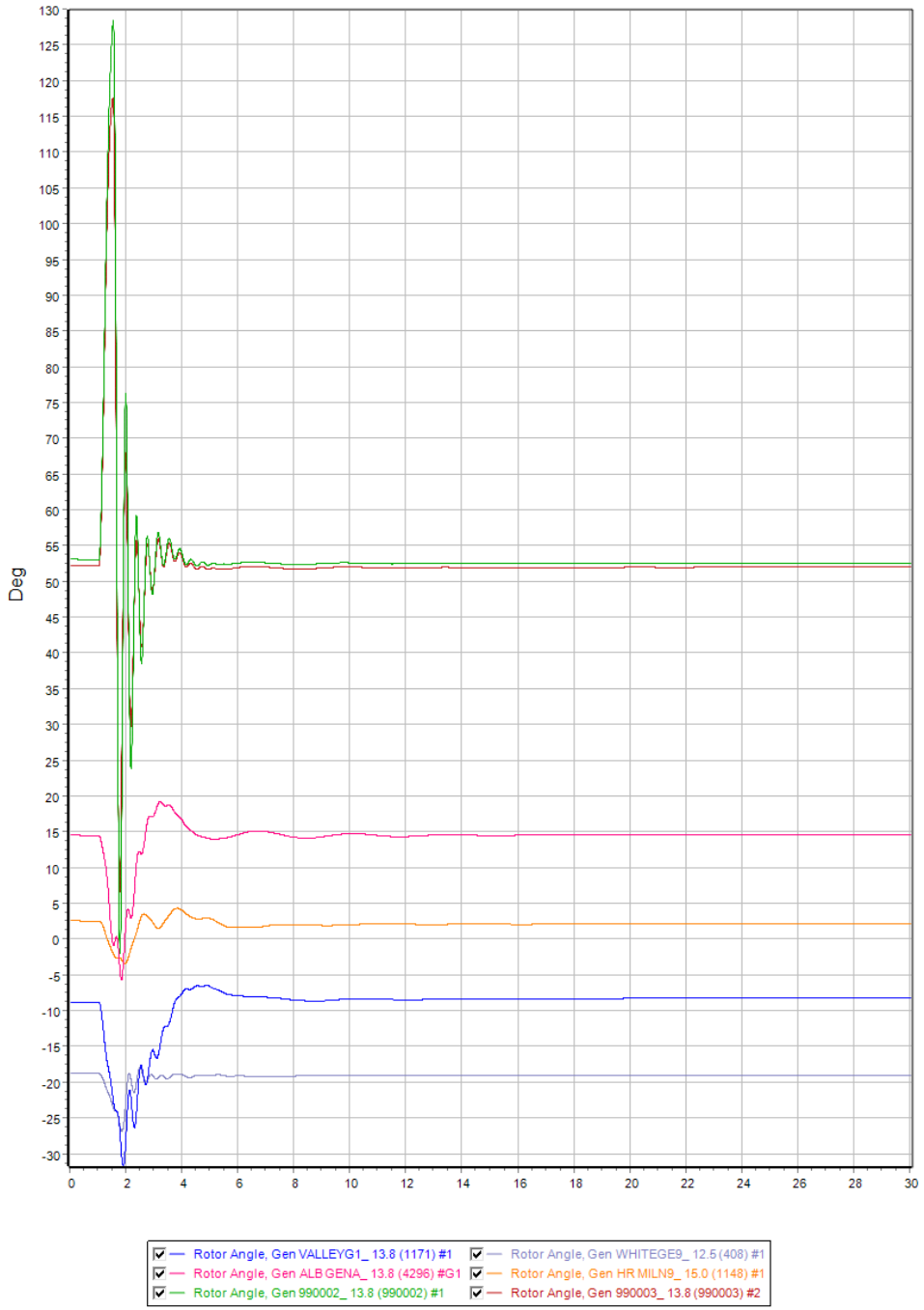


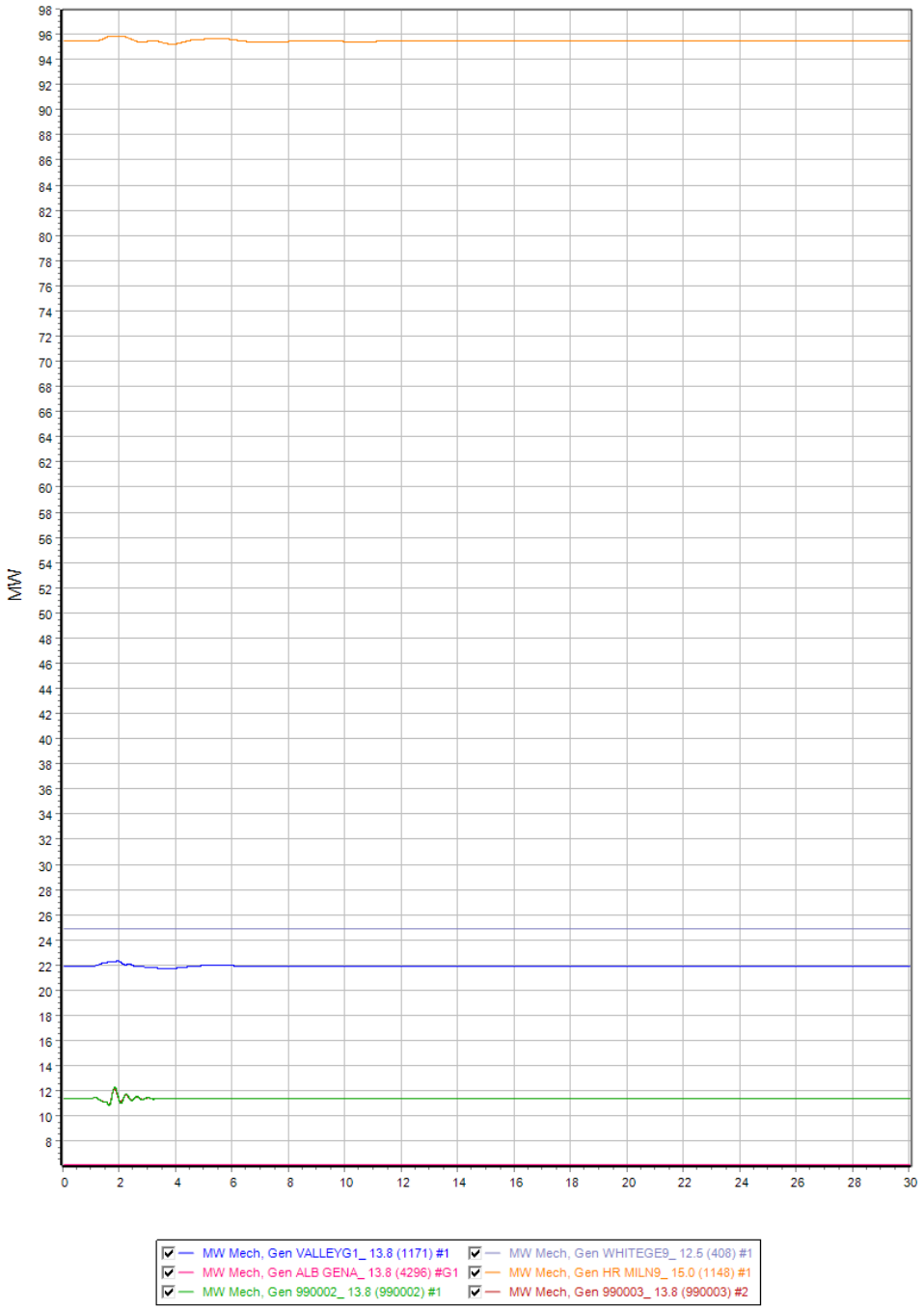
Monitor Line MW & MVAR. Q4





Monitor Gens. Q1





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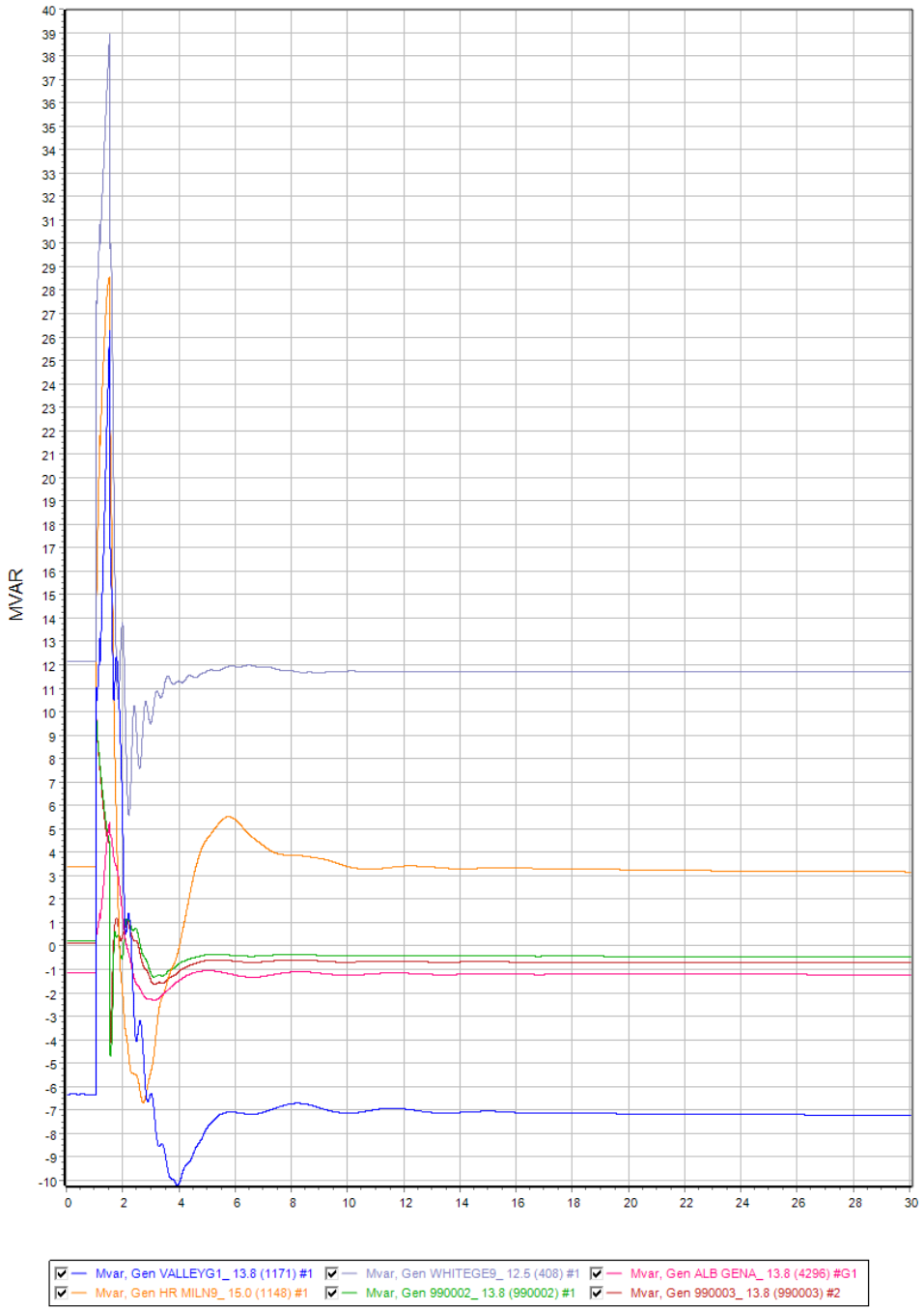
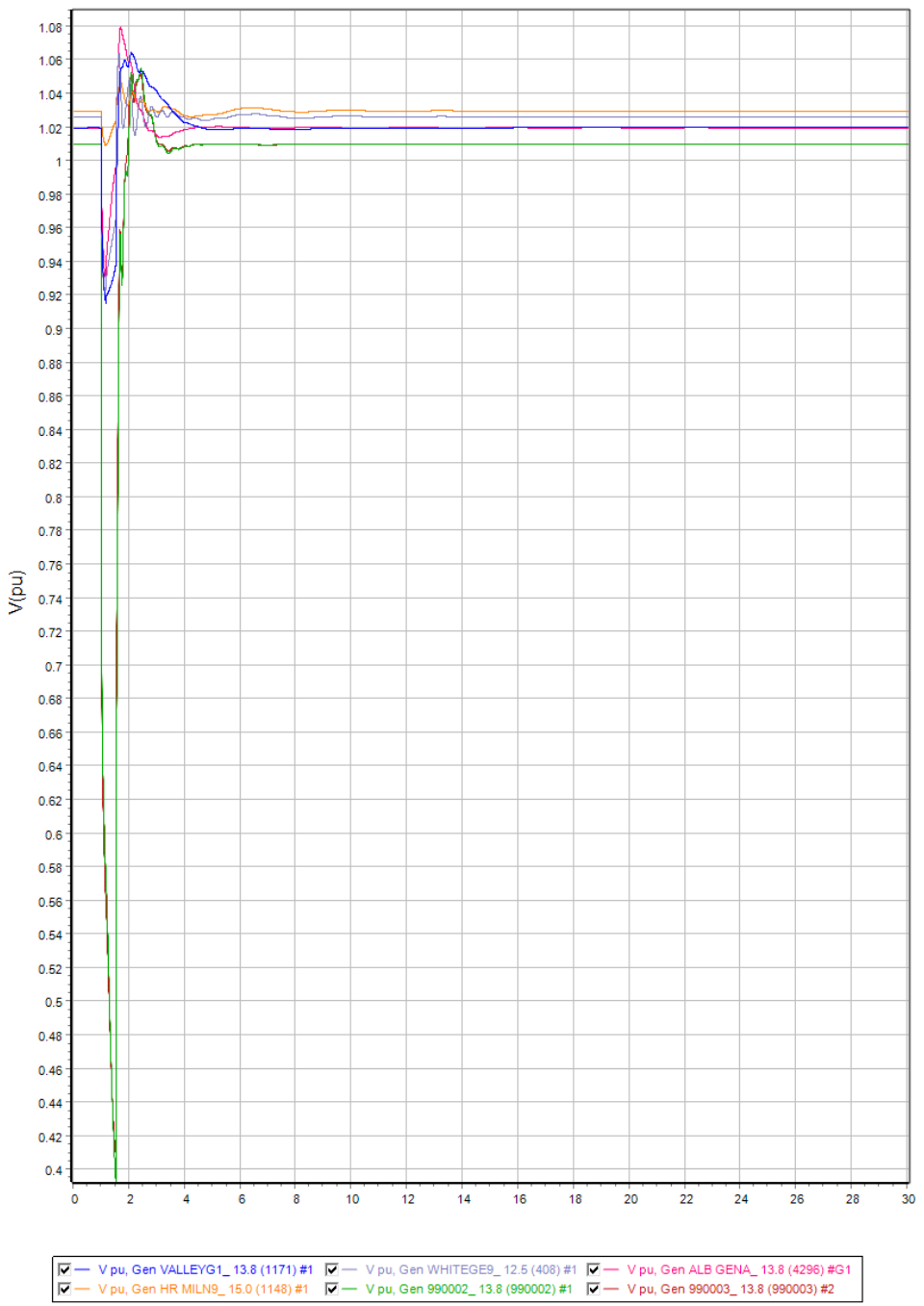
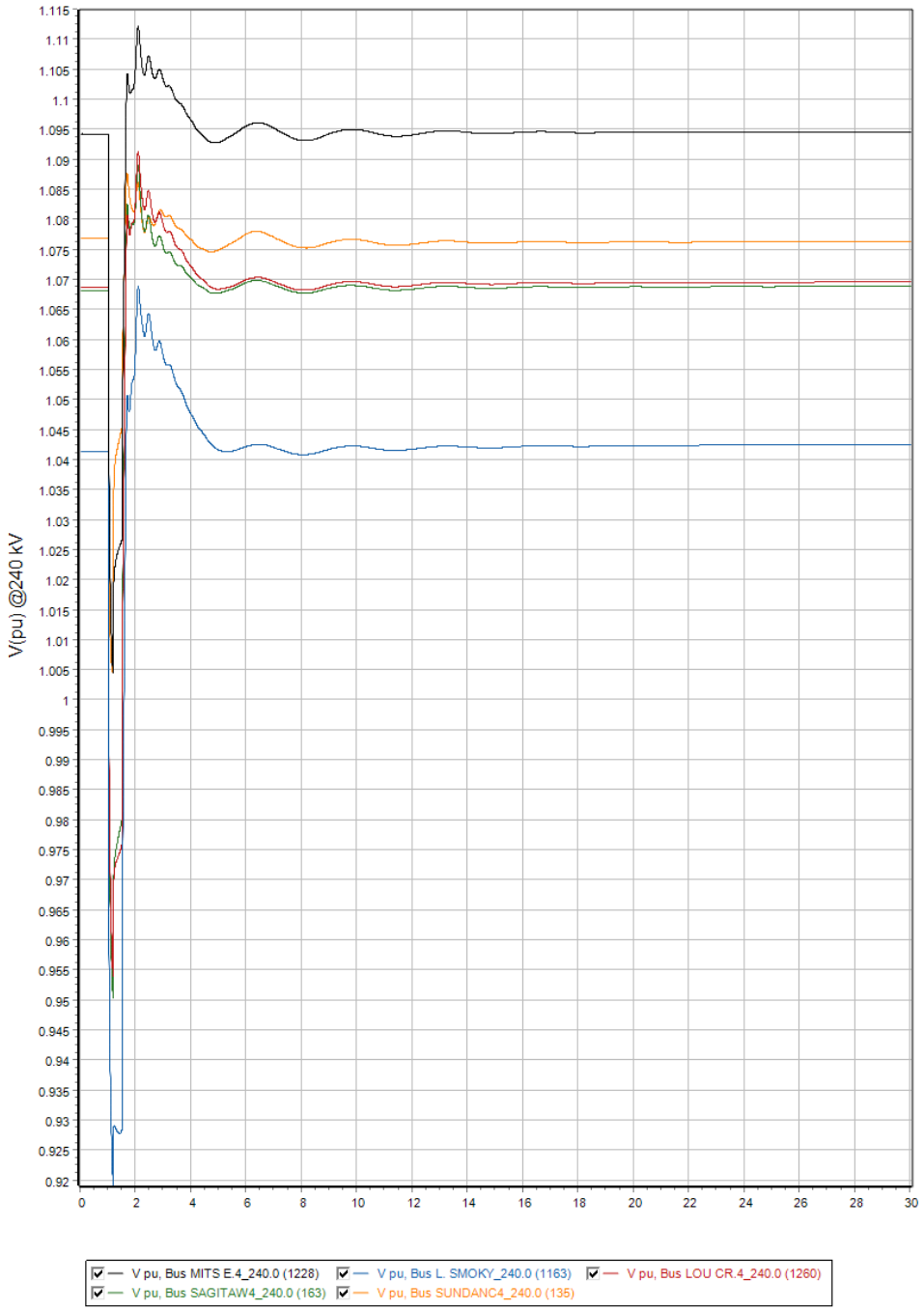
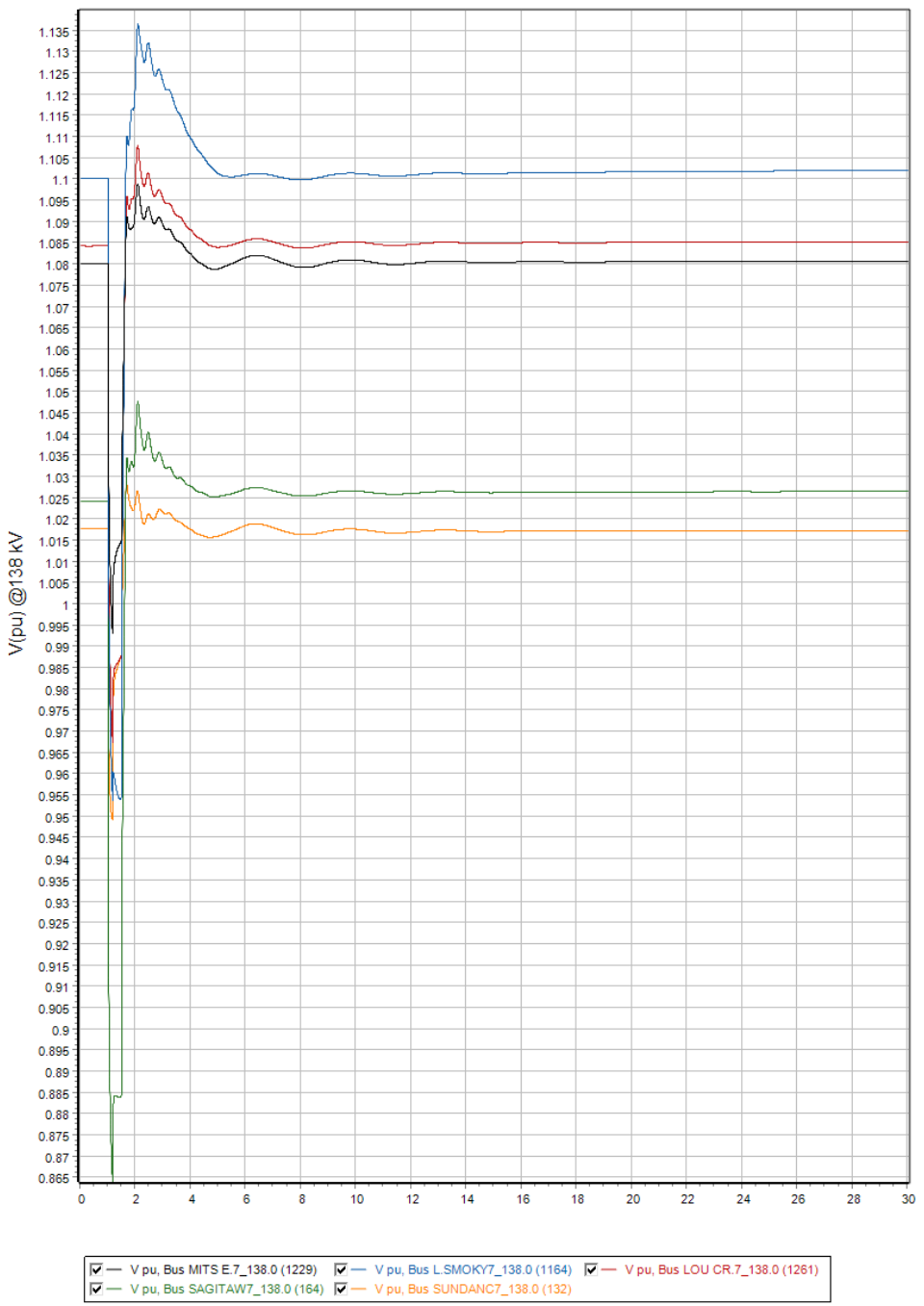


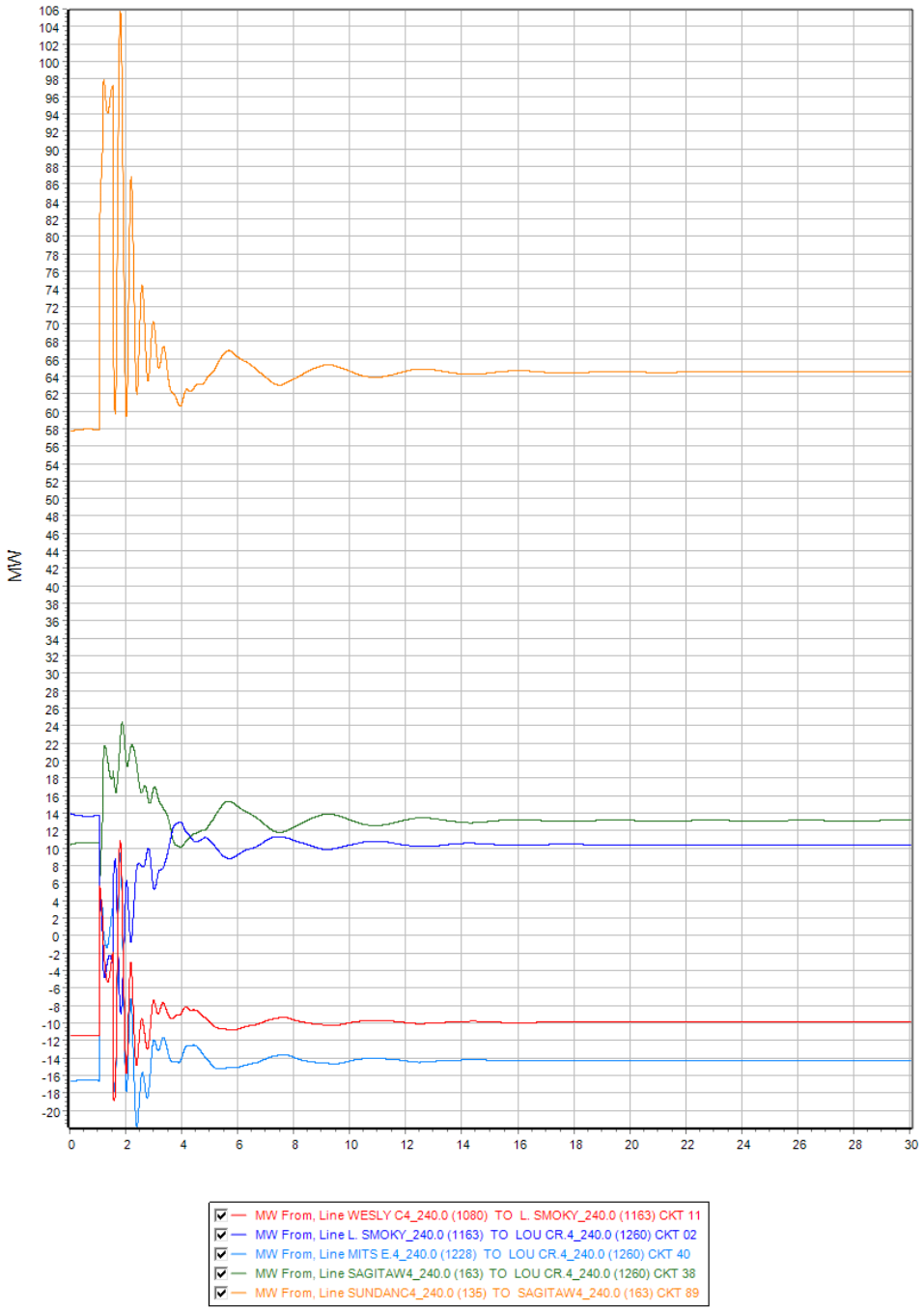


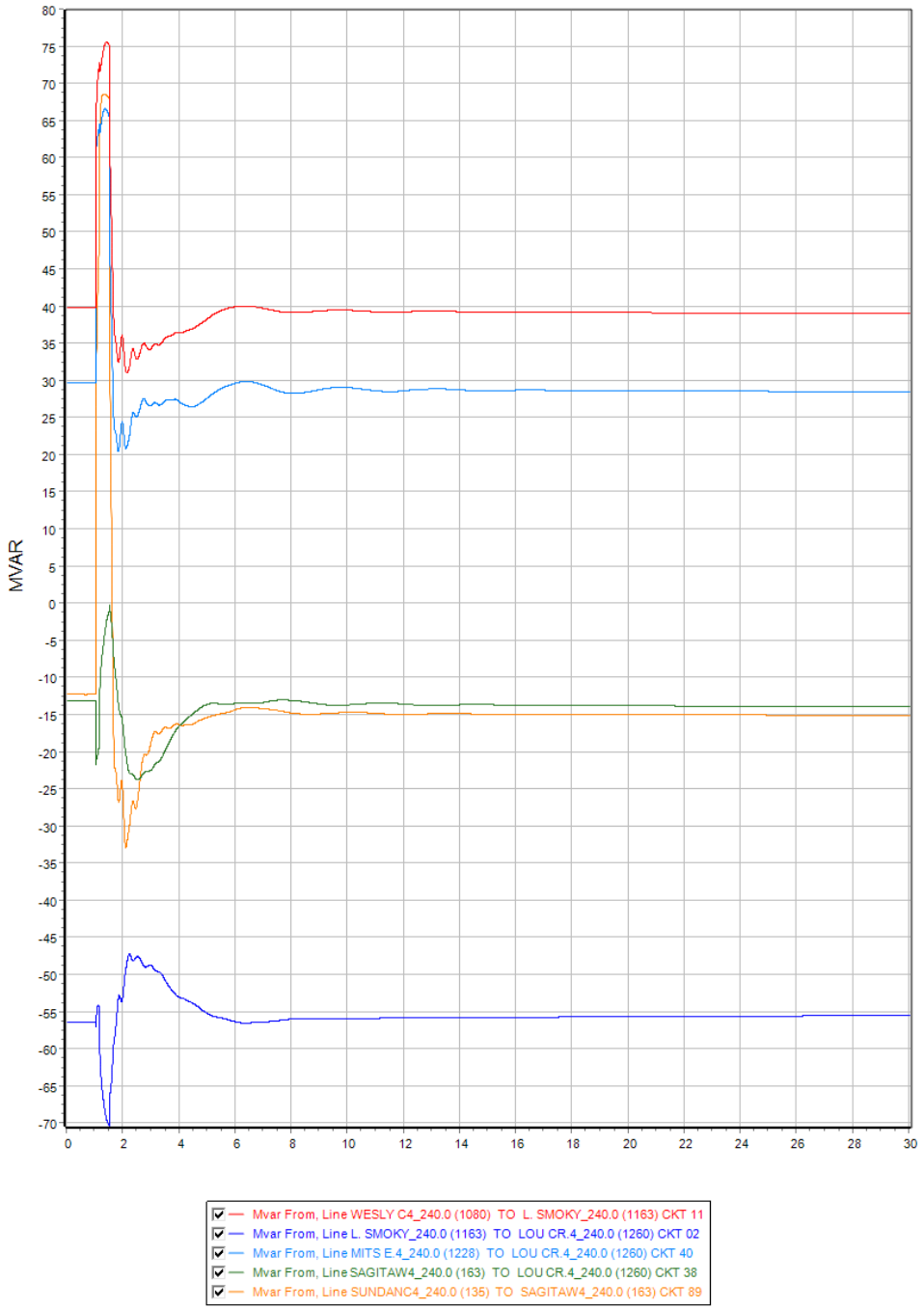
Monitor Bus Volts Q3



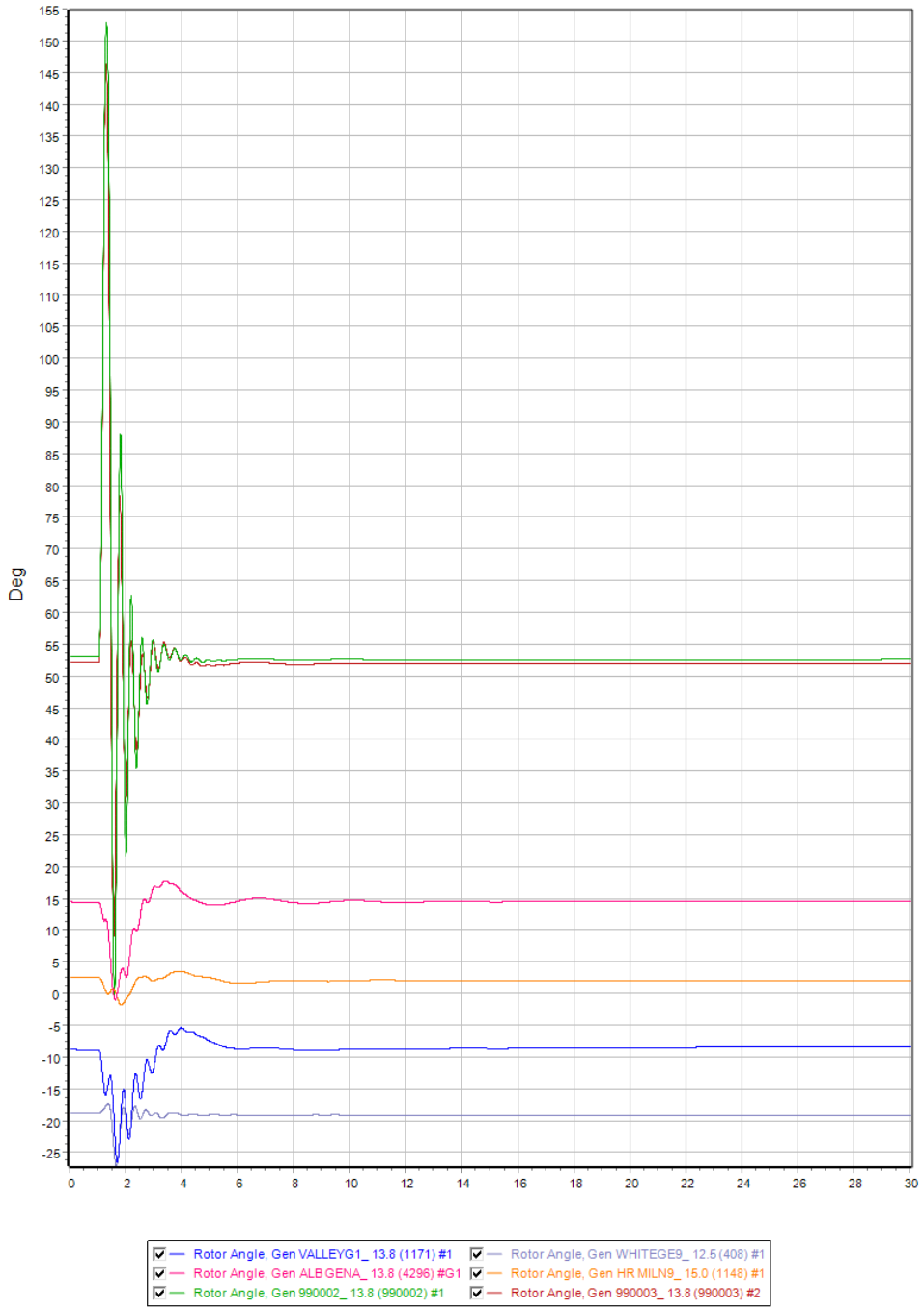


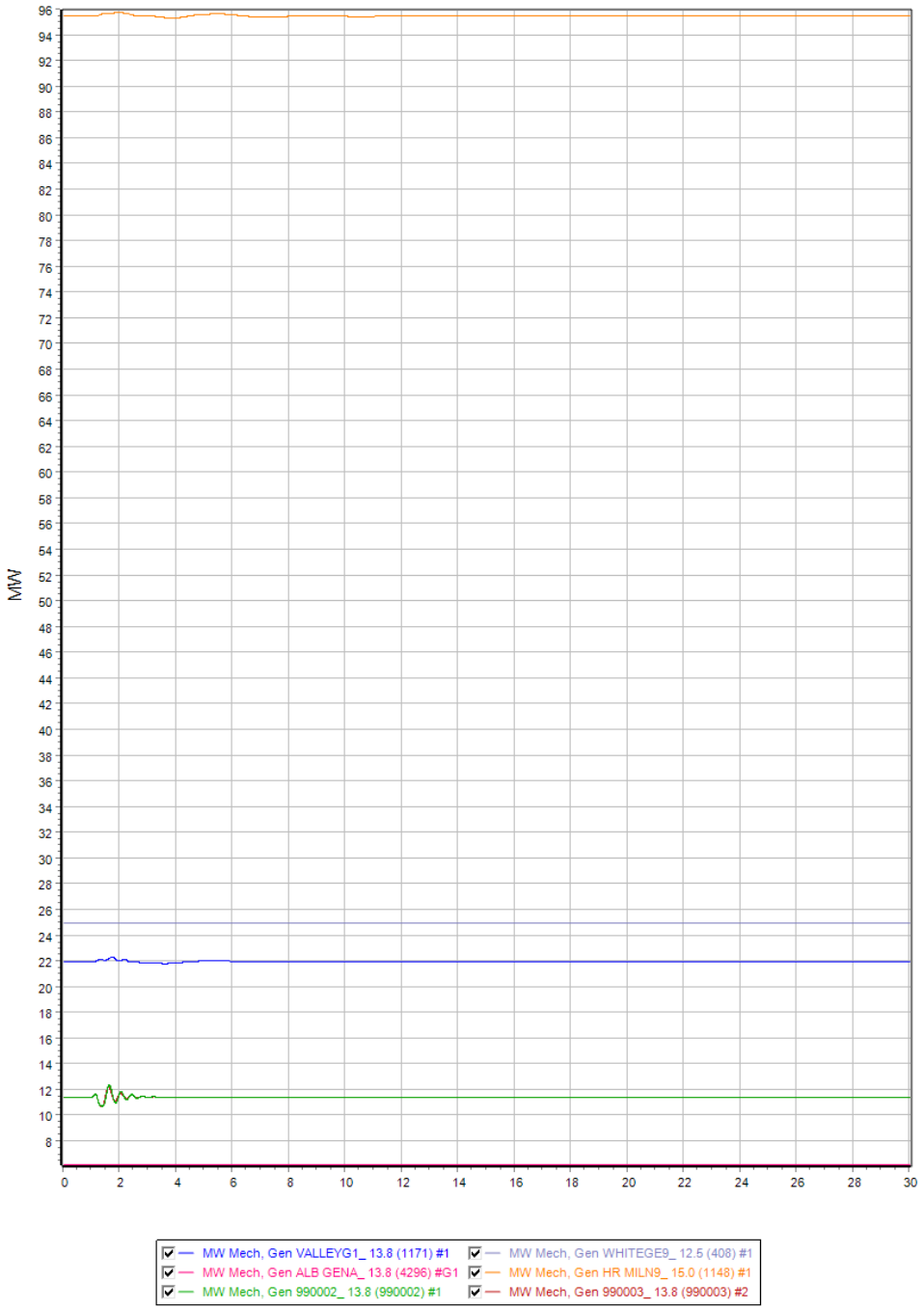
Monitor Line MW & MVAR. Q4



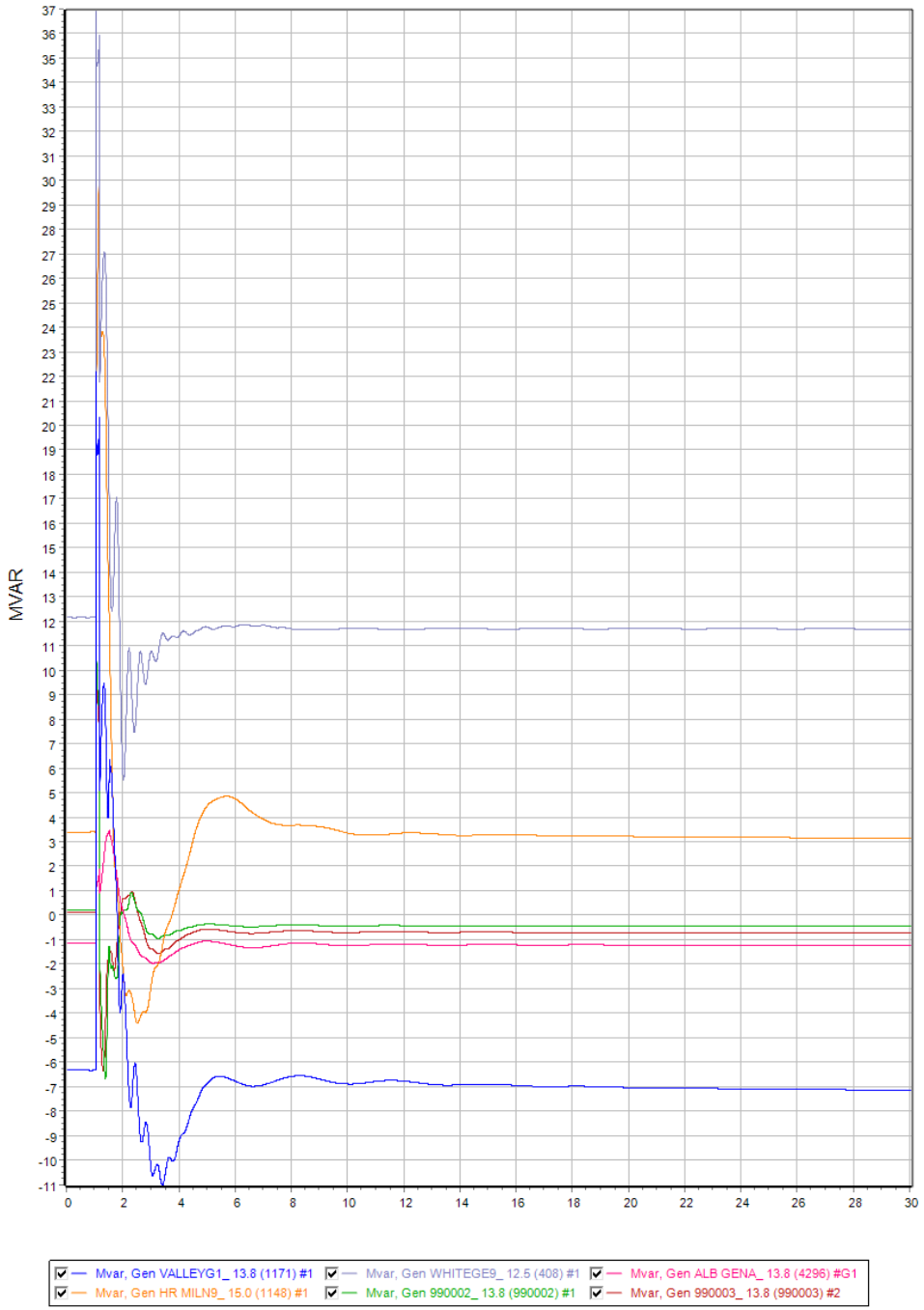


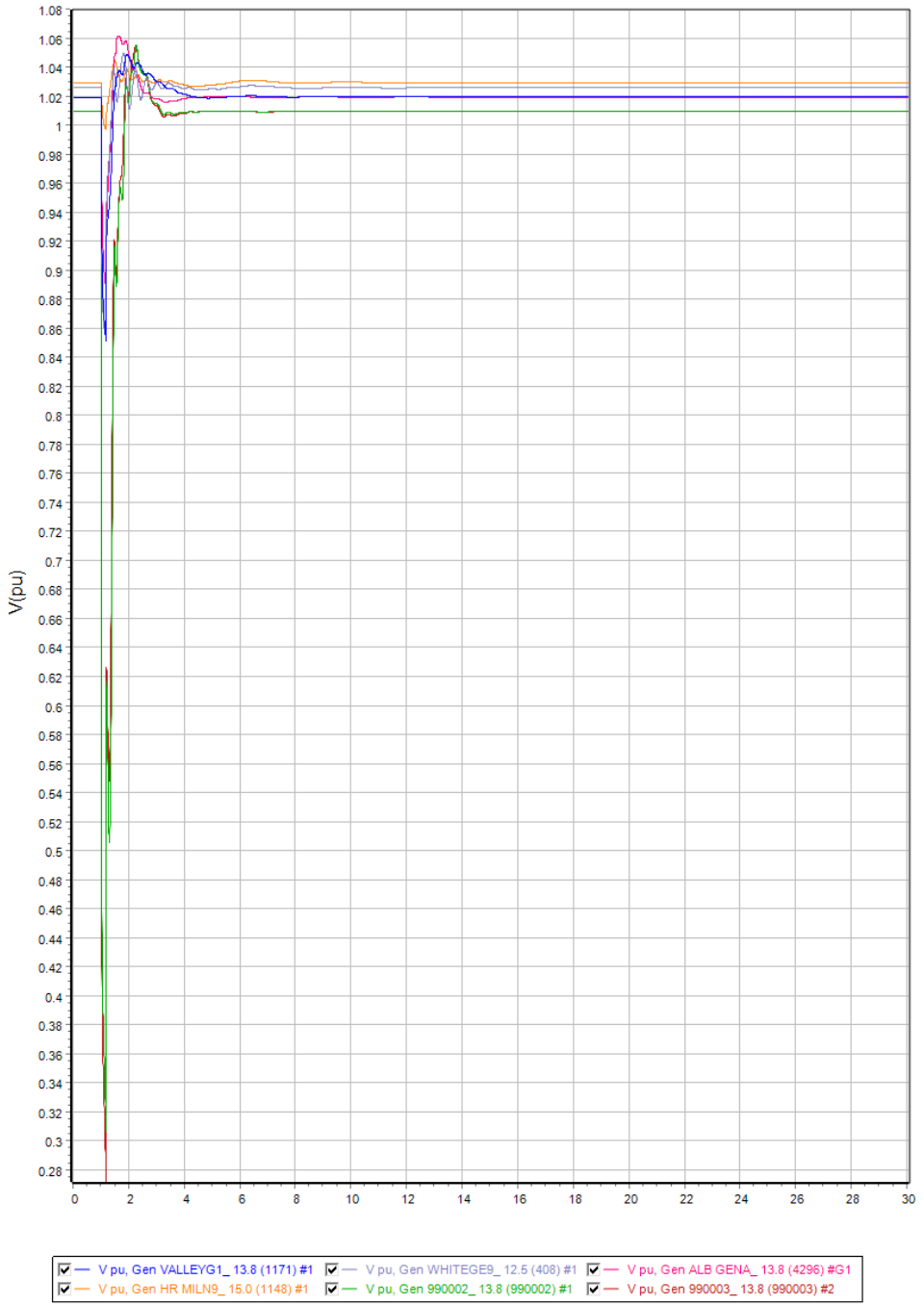
Monitor Gens. Q1



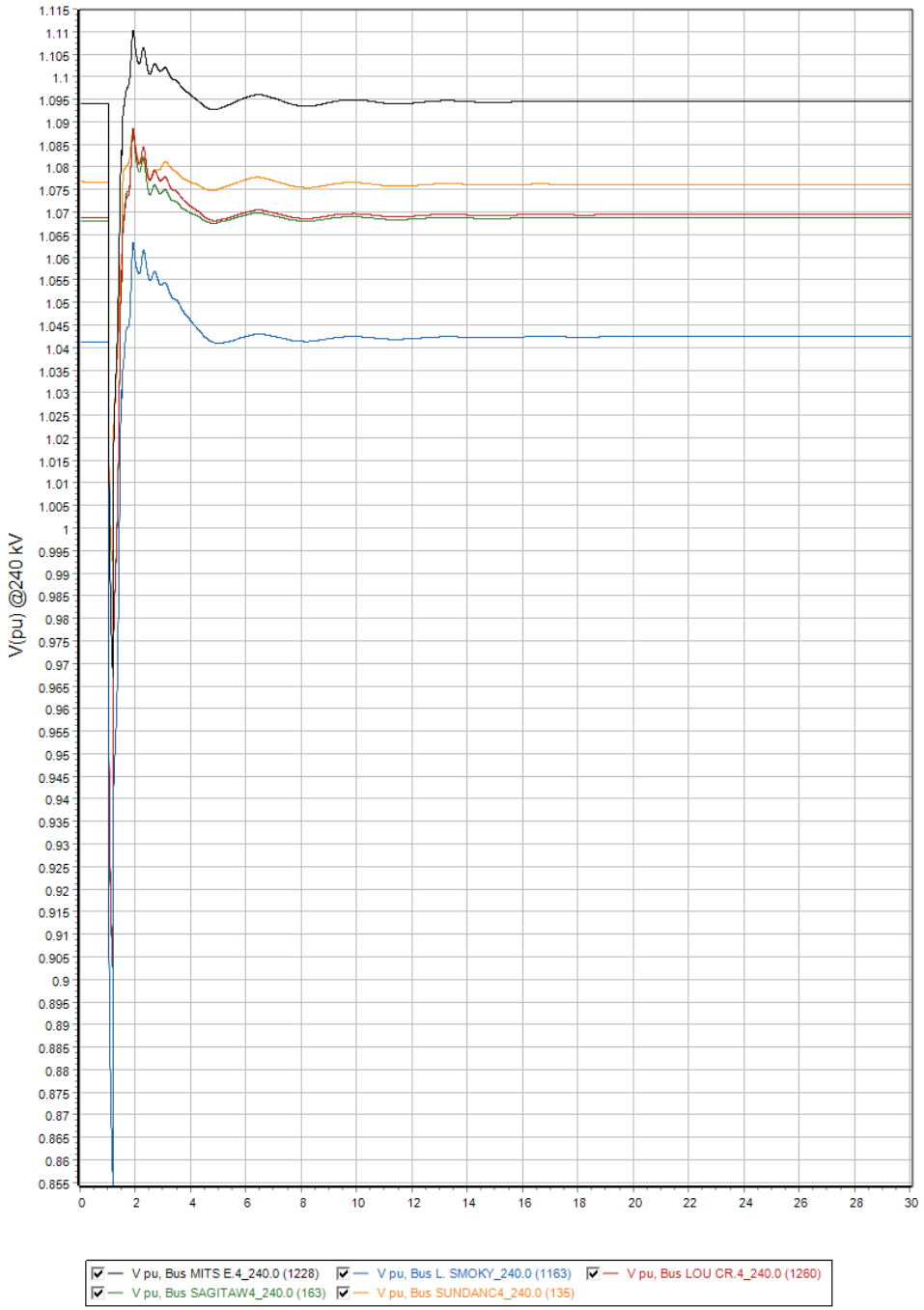


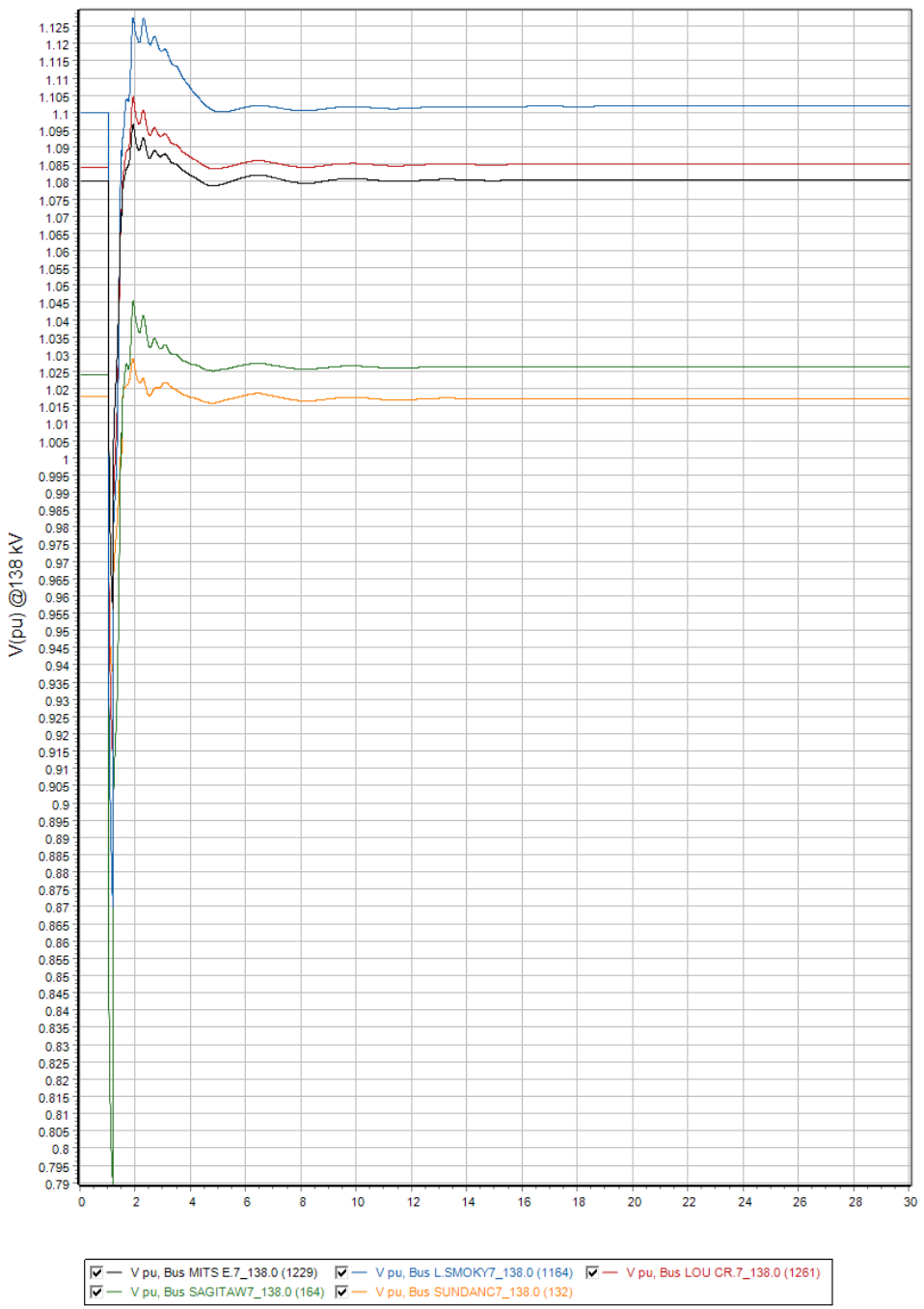
Monitor Gens. Q2



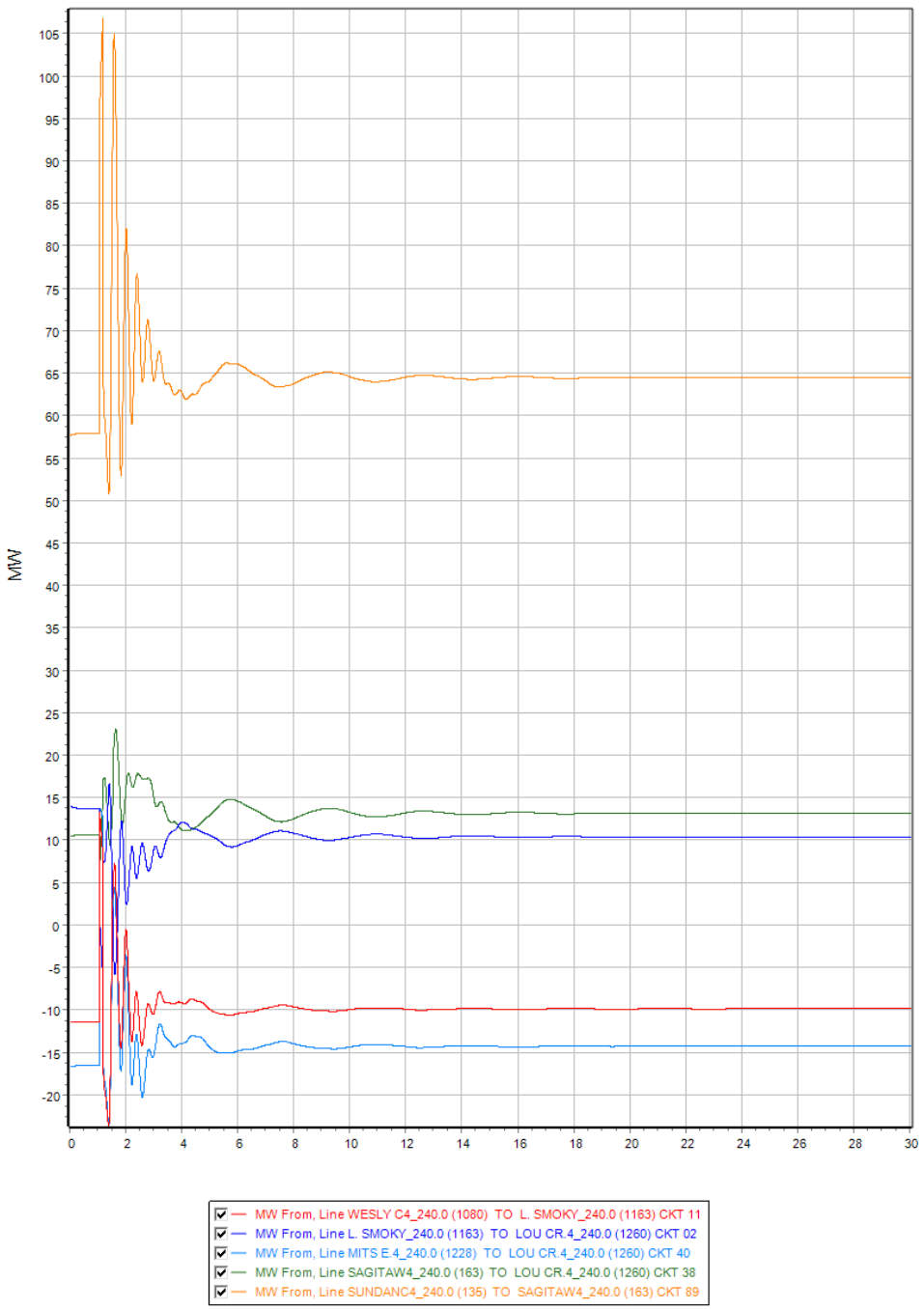


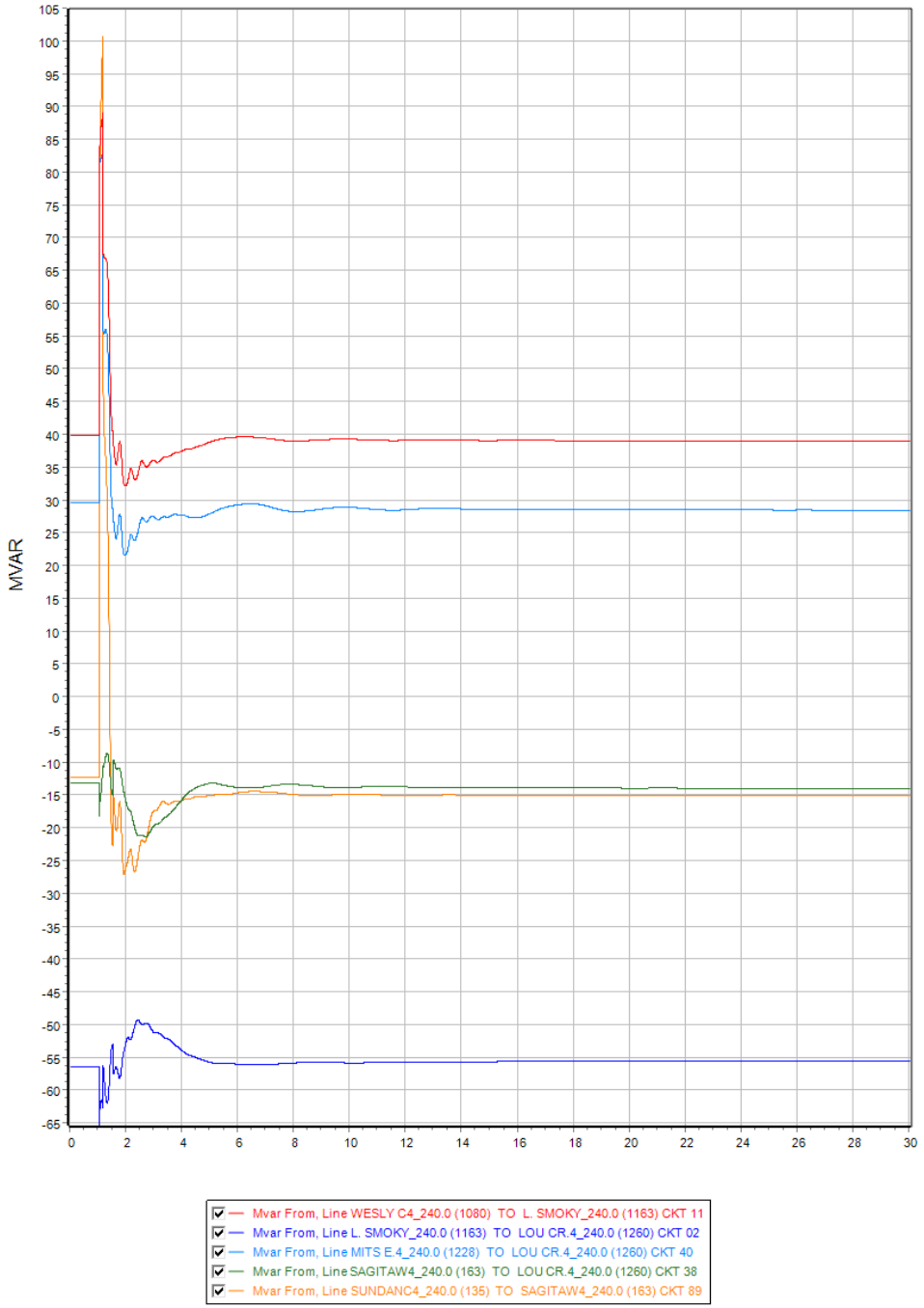
Monitor Bus Volts Q3



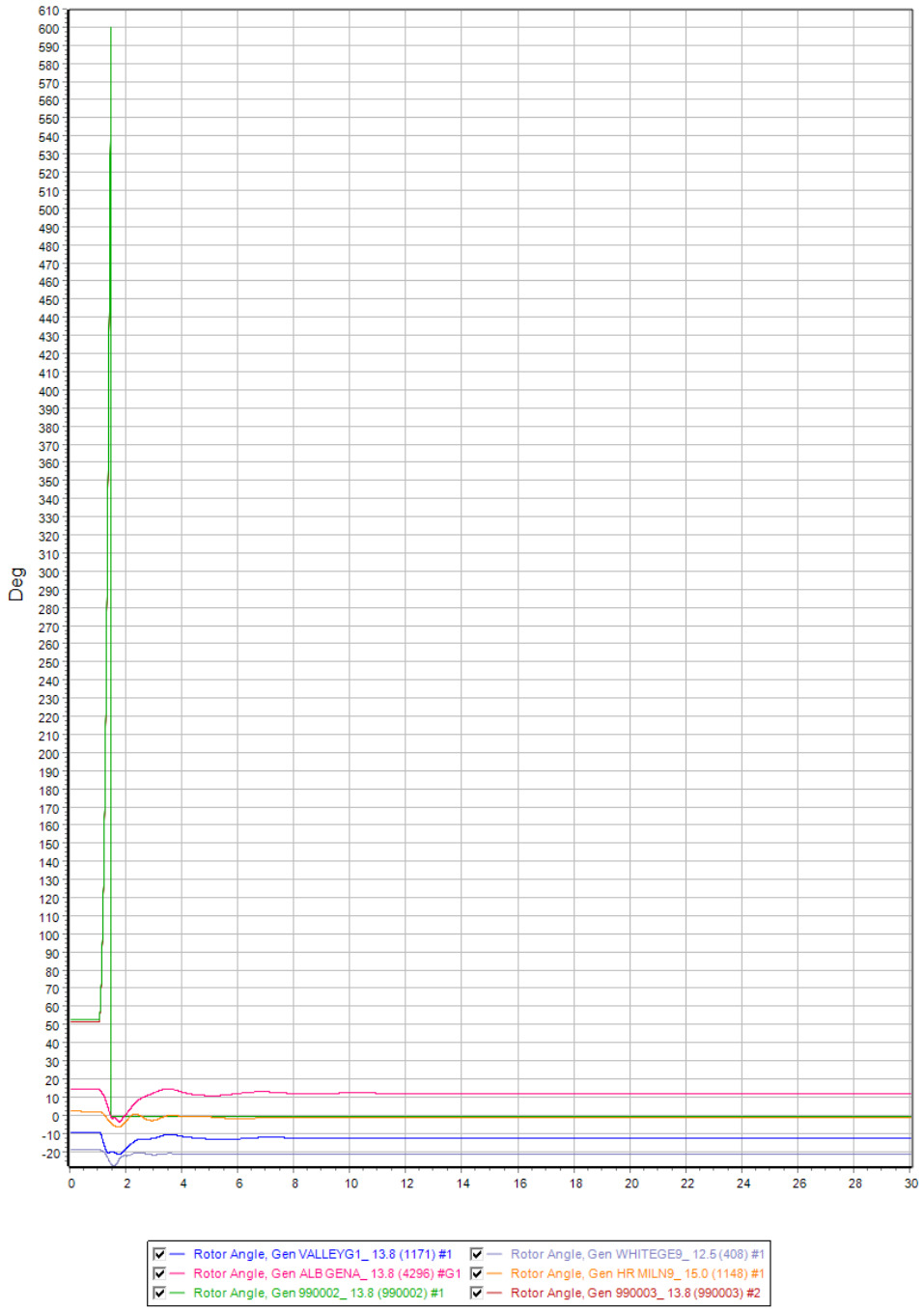


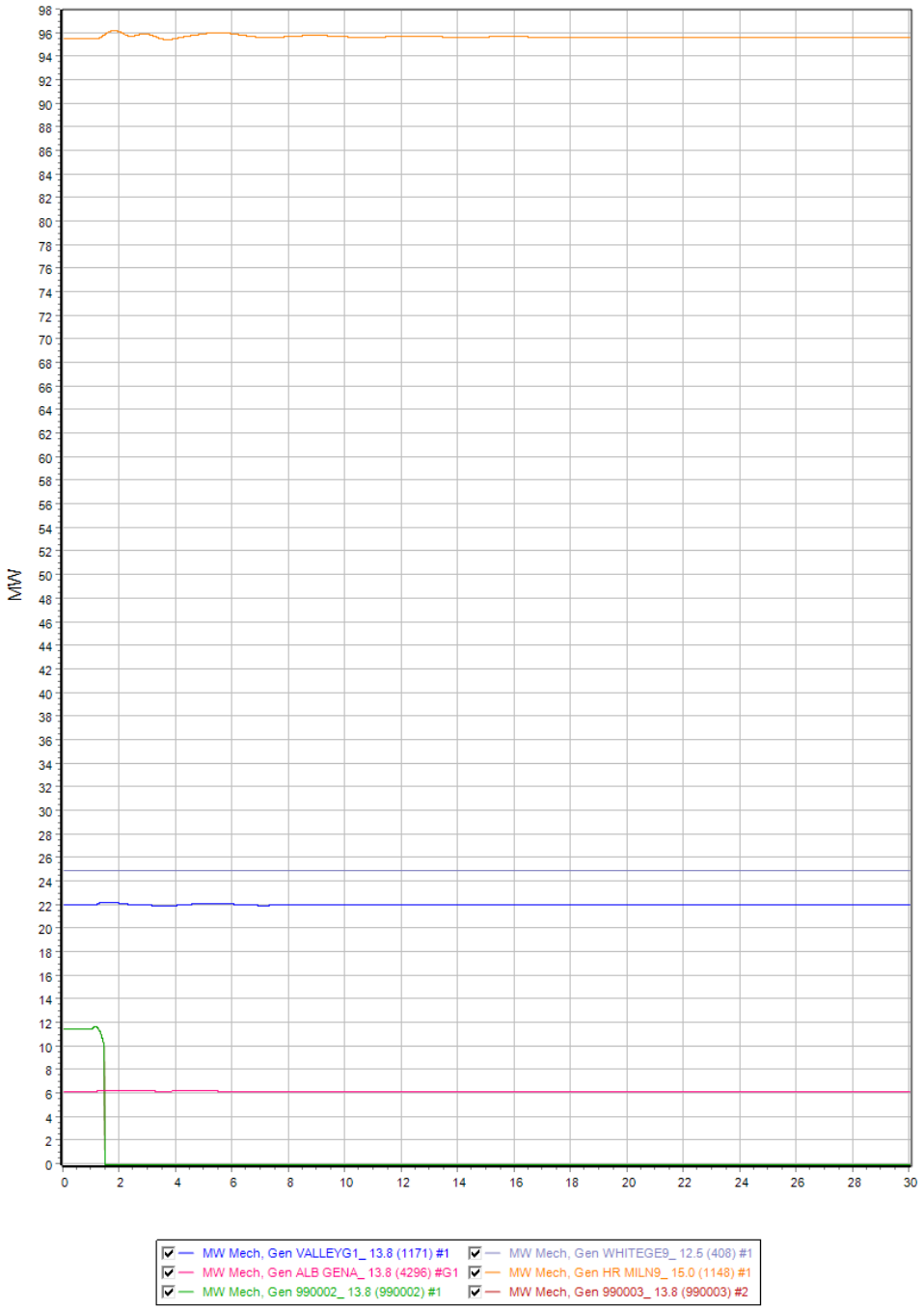
Monitor Line MW & MVAR. Q4



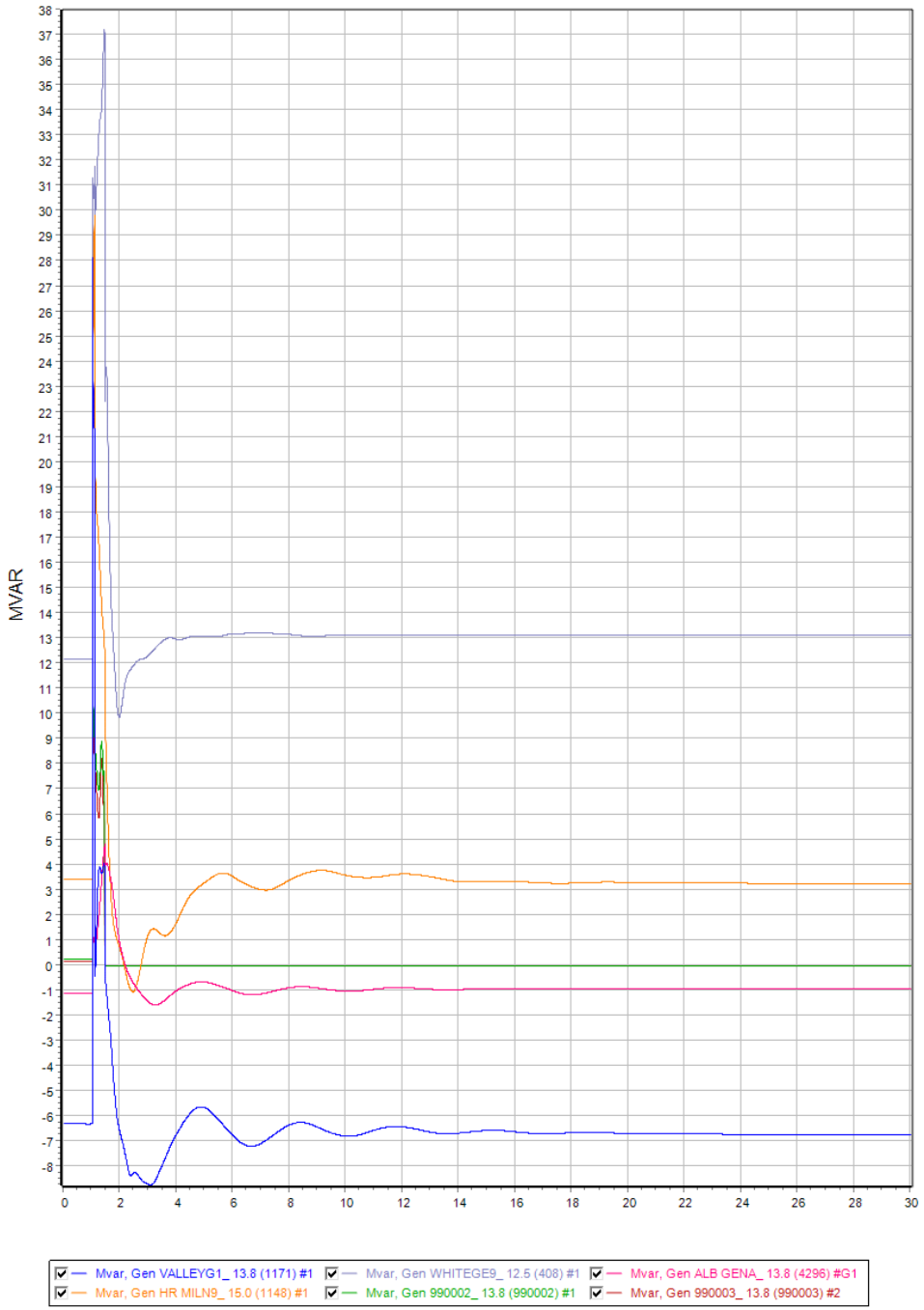


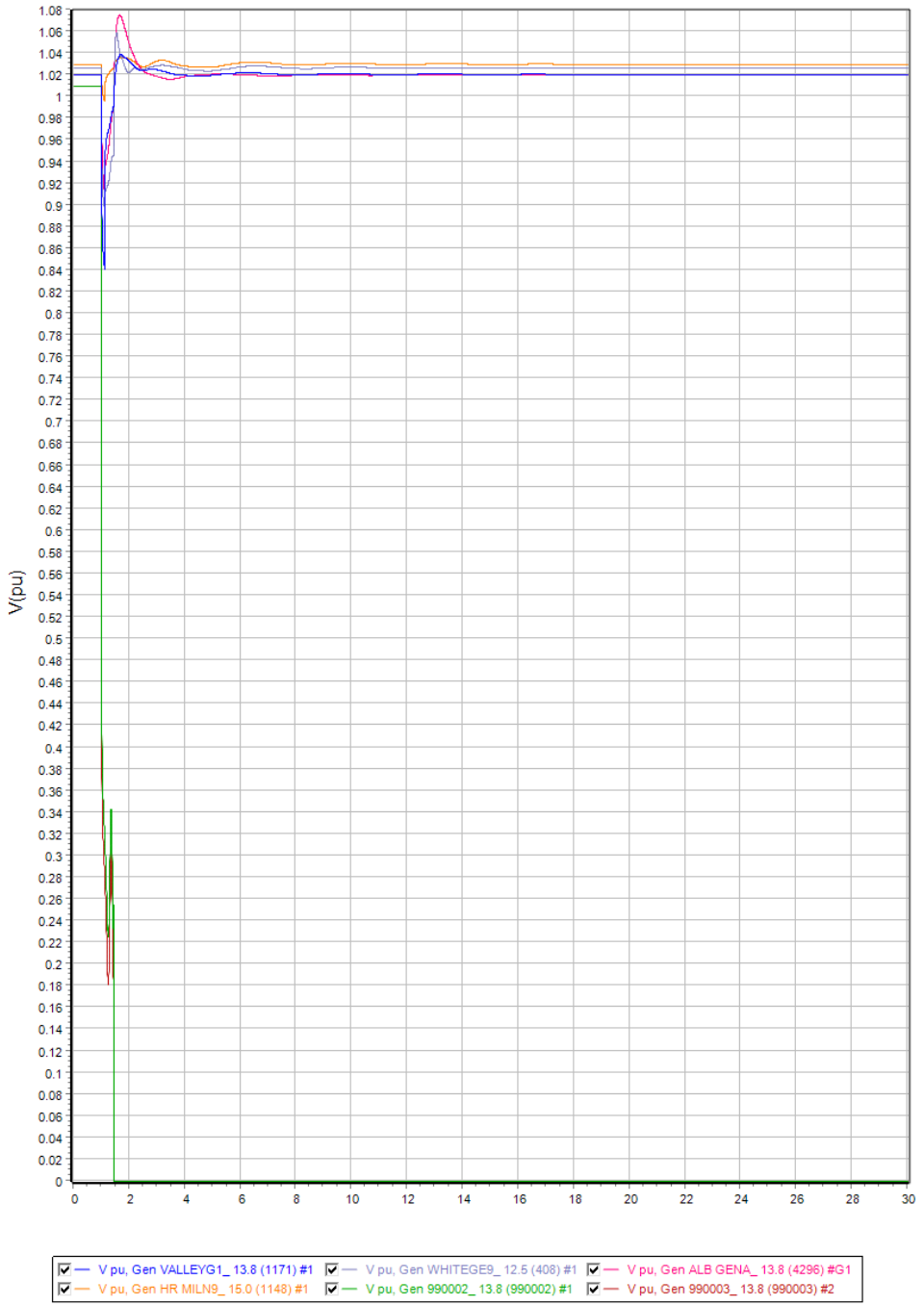
Monitor Gens. Q1



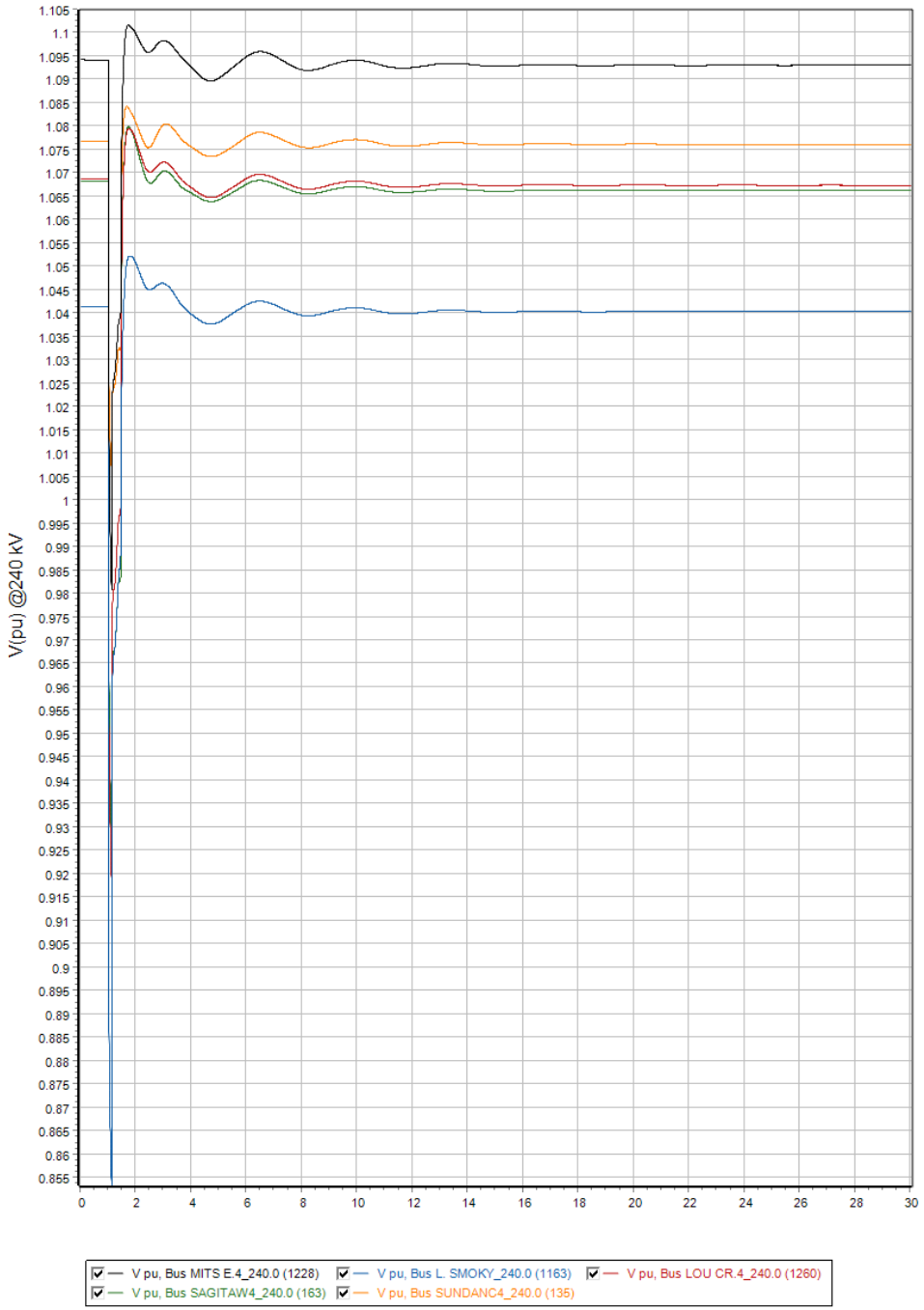


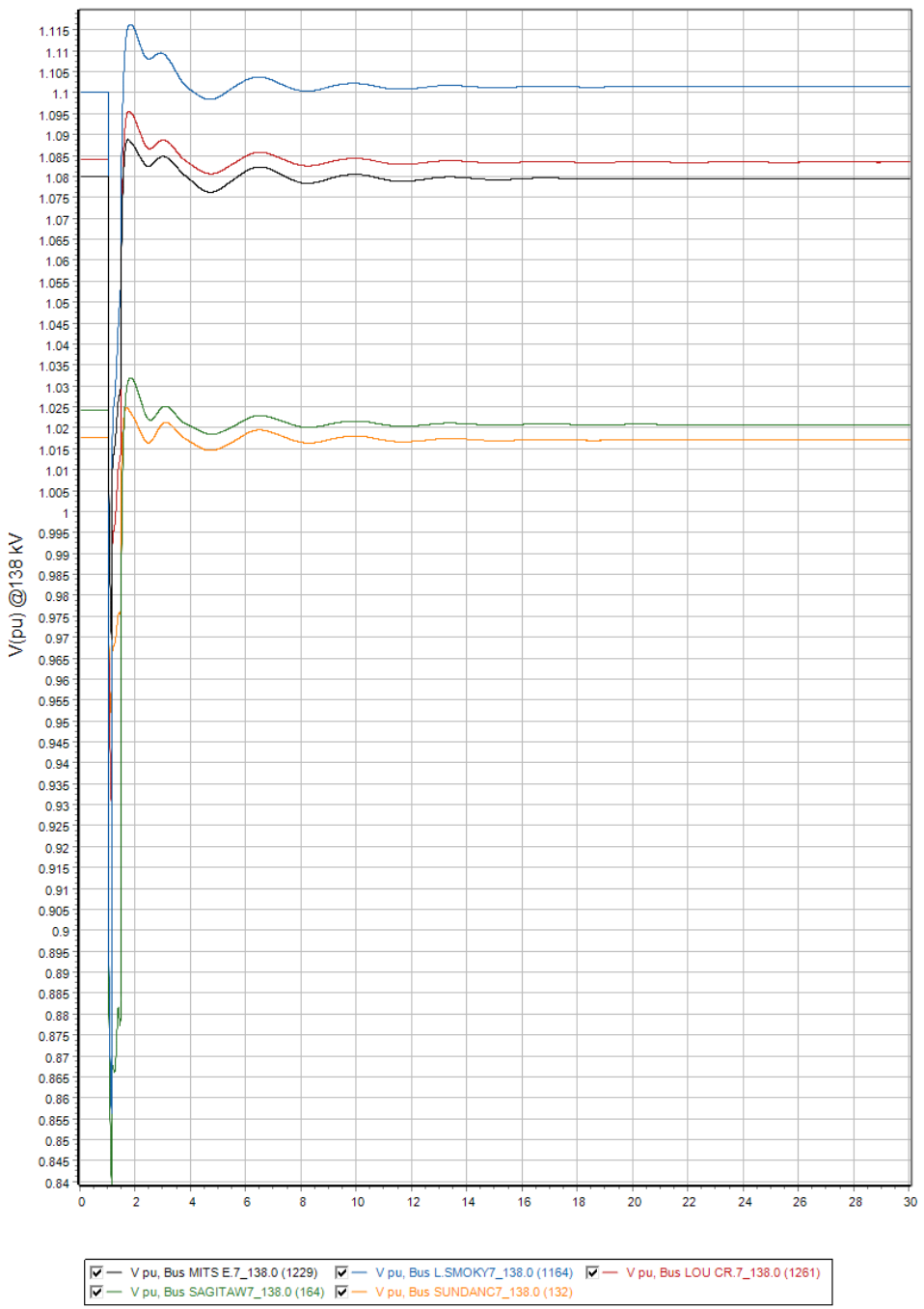
Monitor Gens. Q2



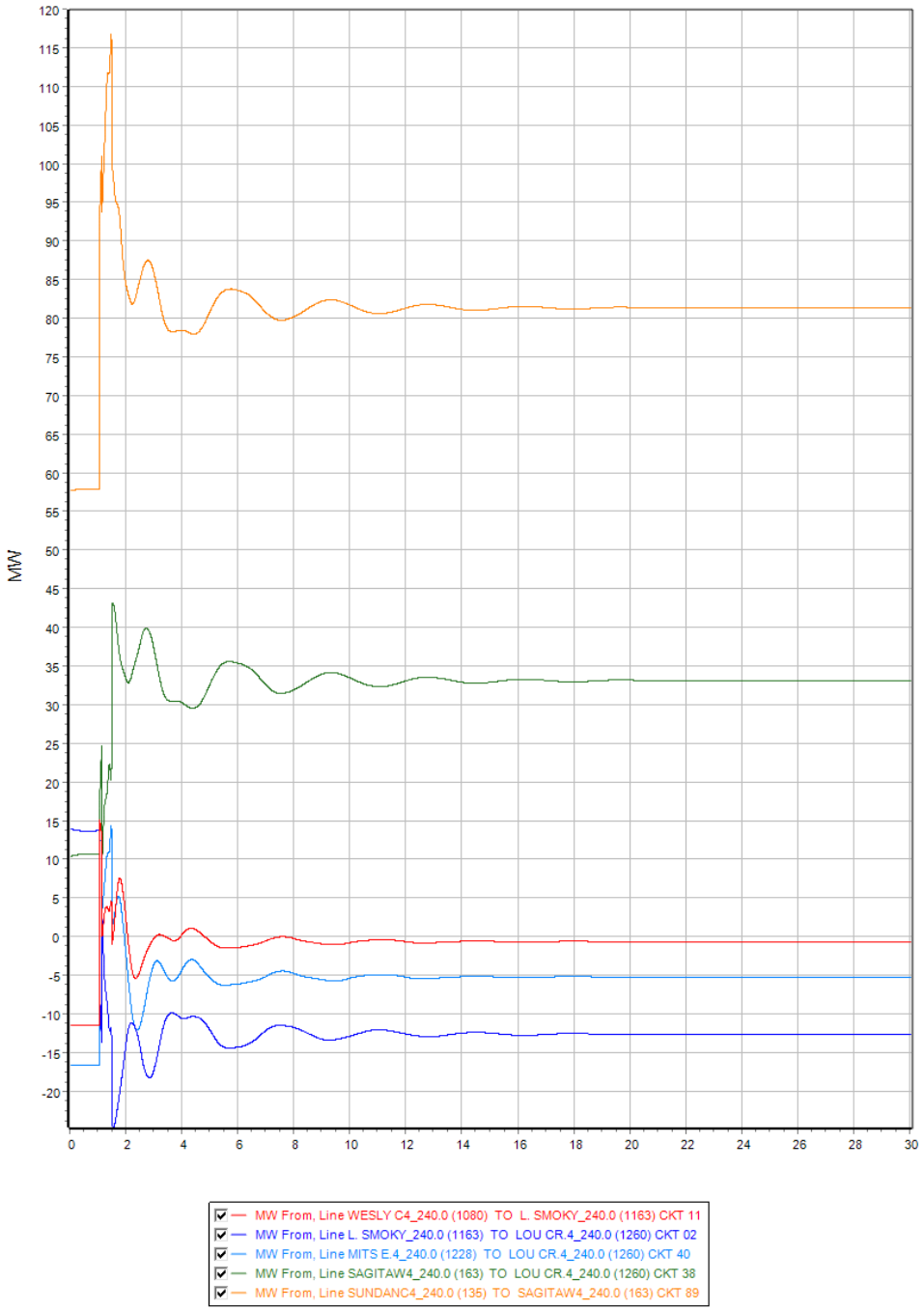


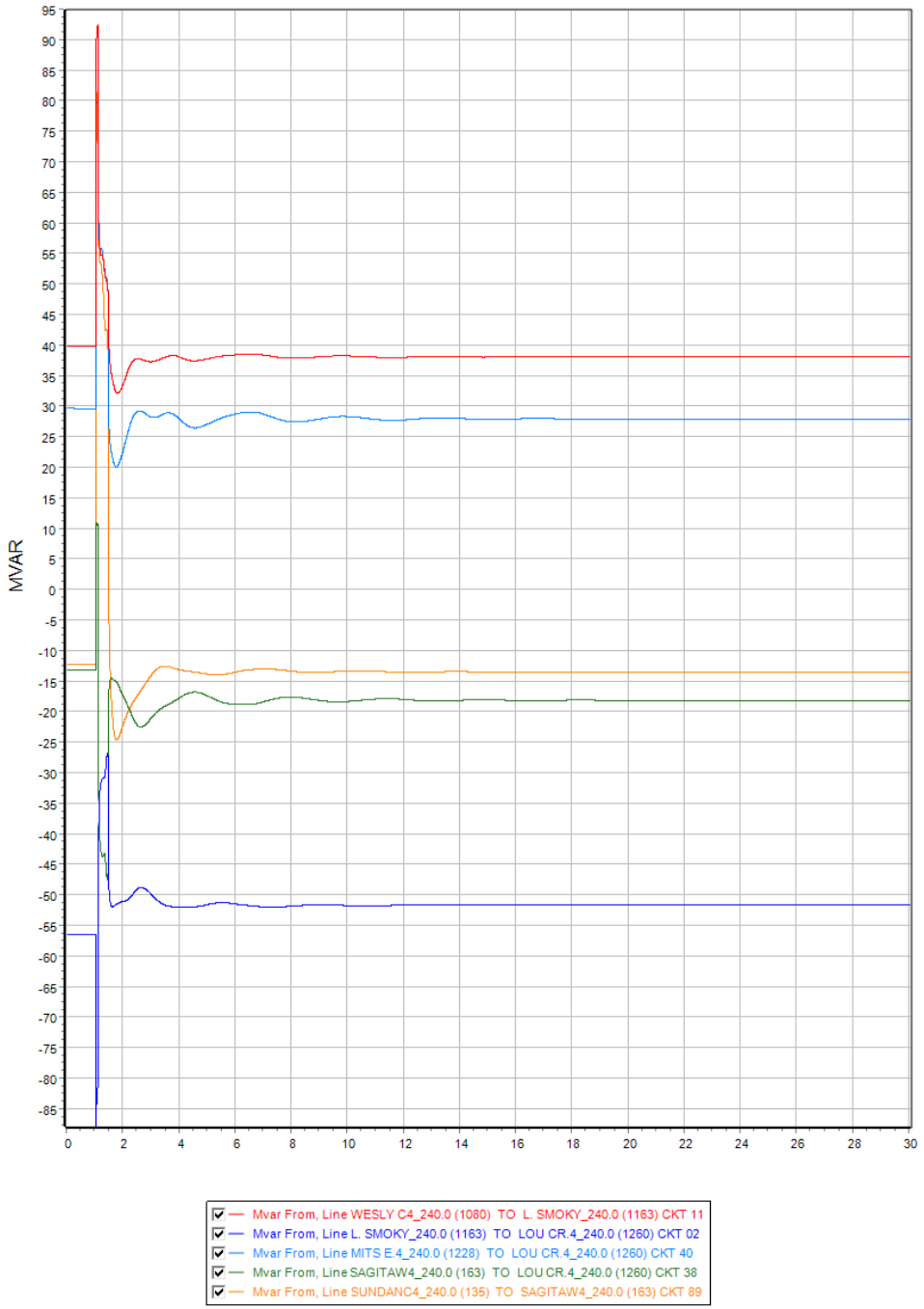
Monitor Bus Volts Q3



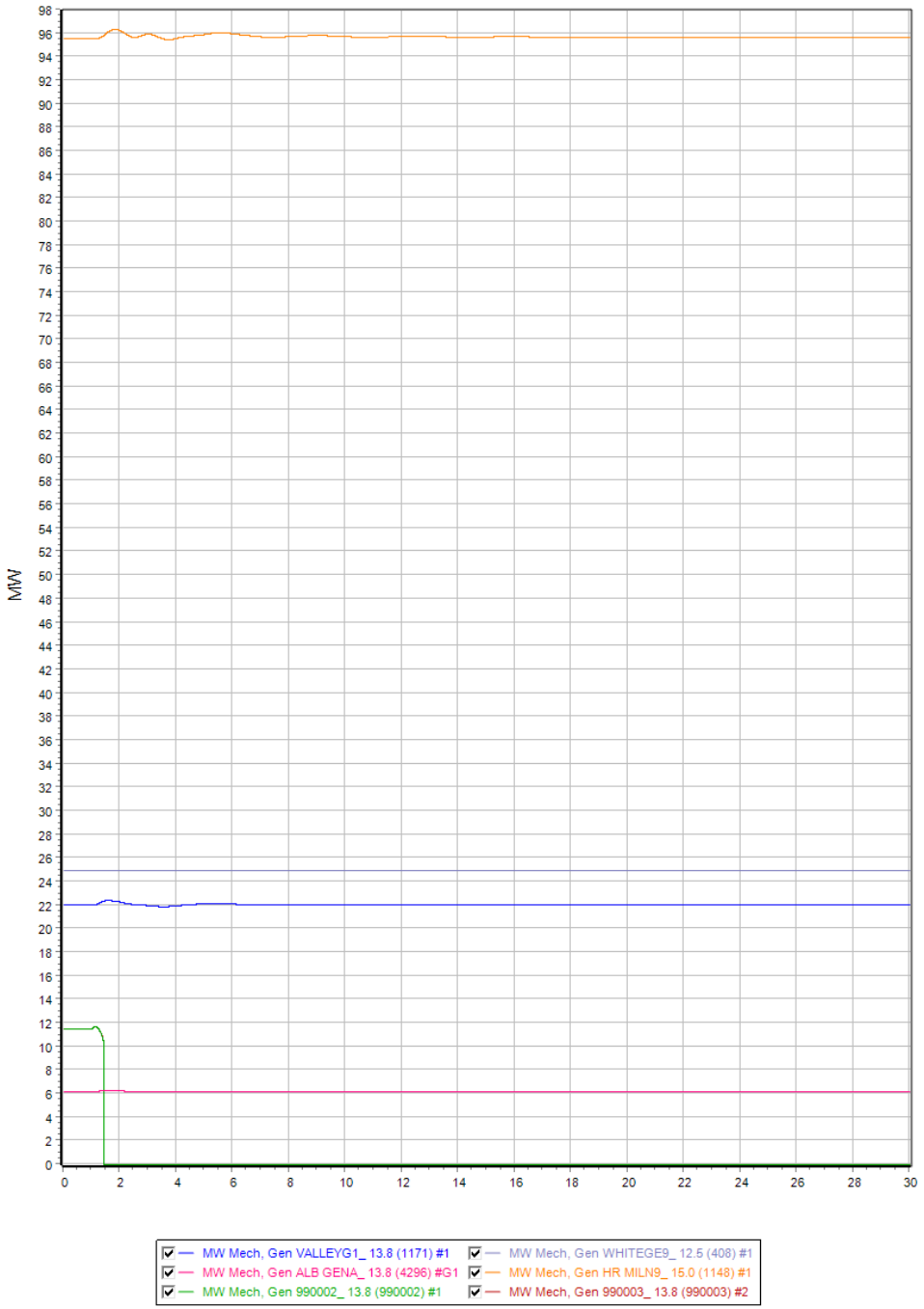


Monitor Line MW & MVAR. Q4

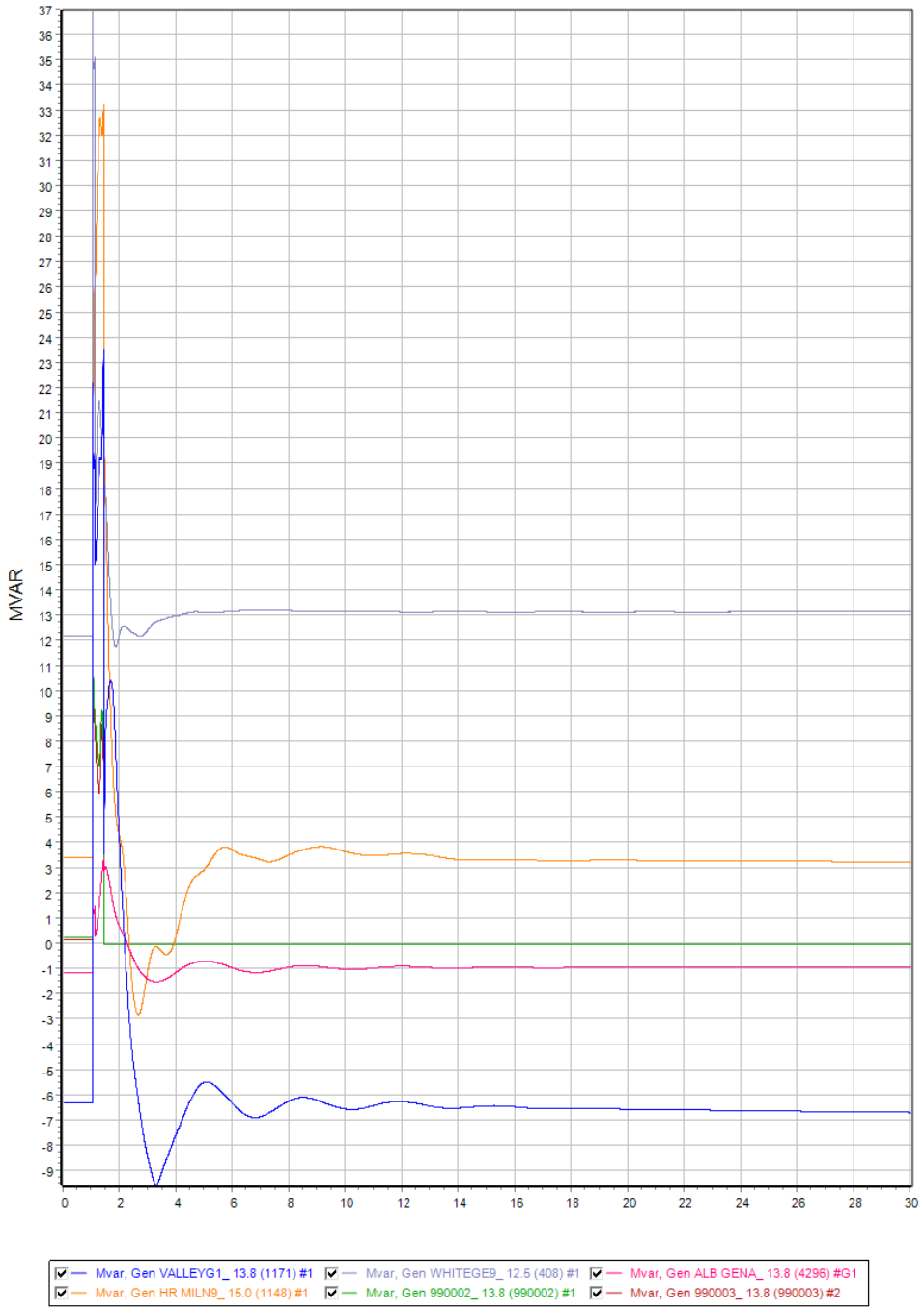


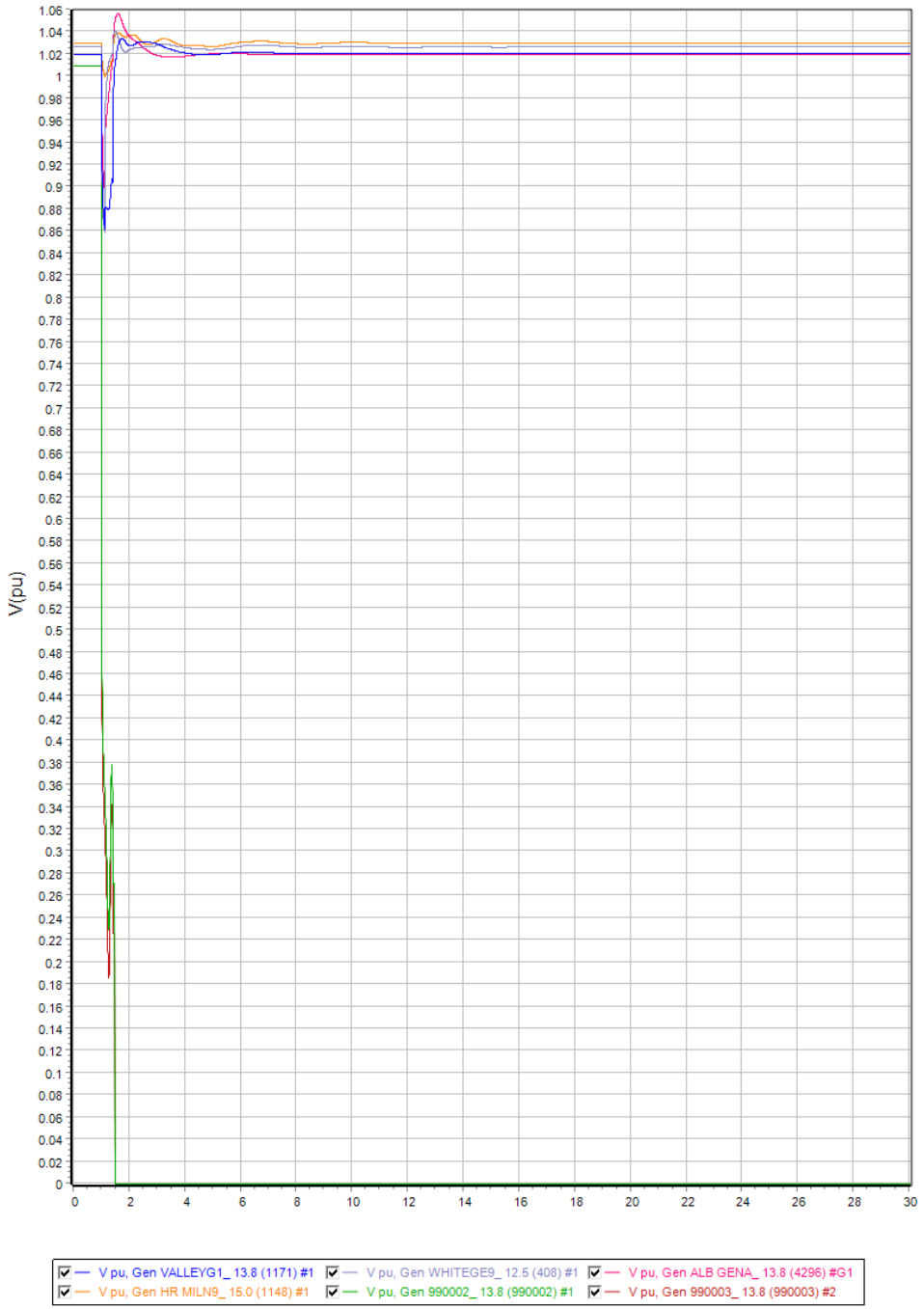


Monitor Gens. Q1

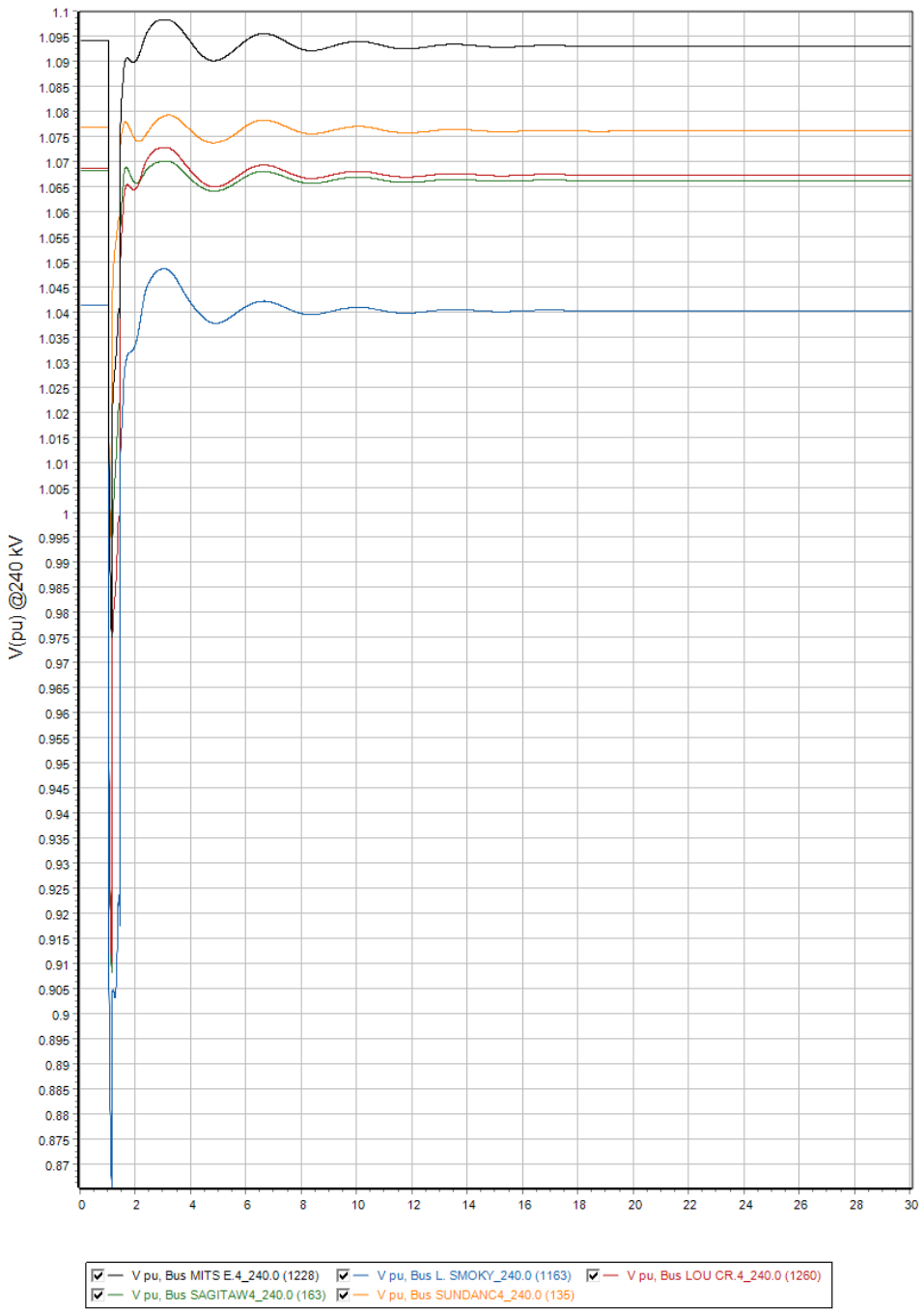


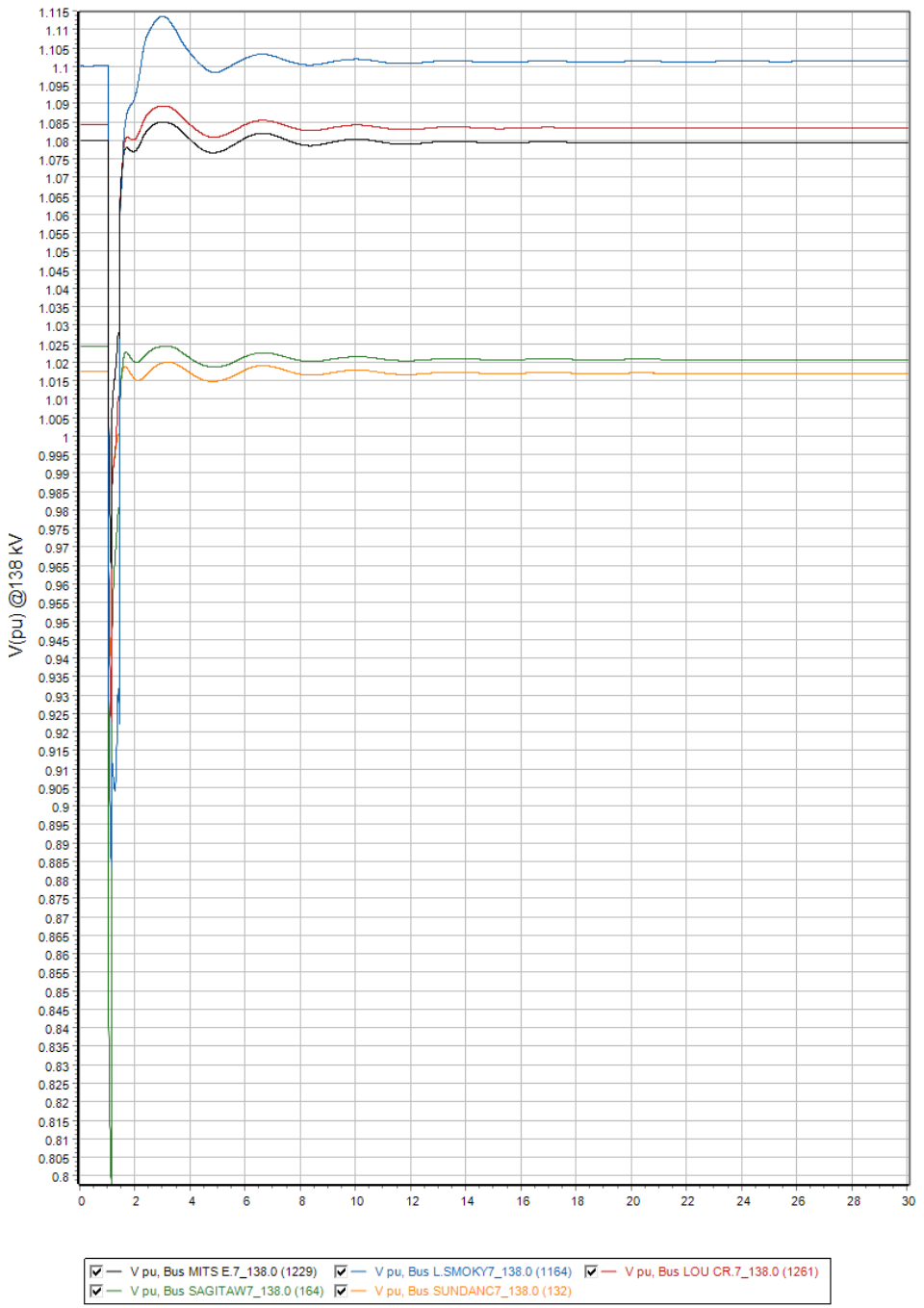
Monitor Gens. Q2



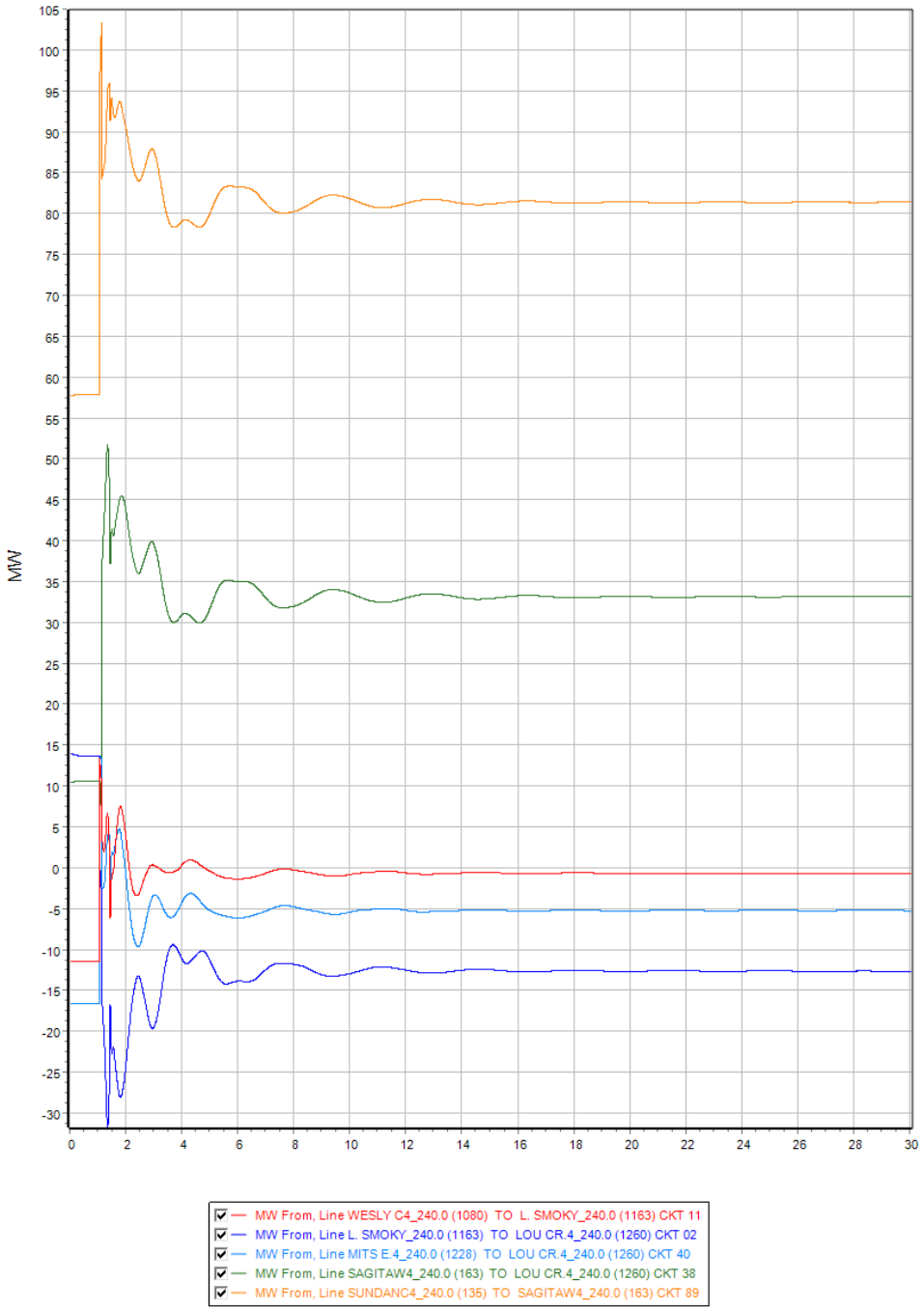


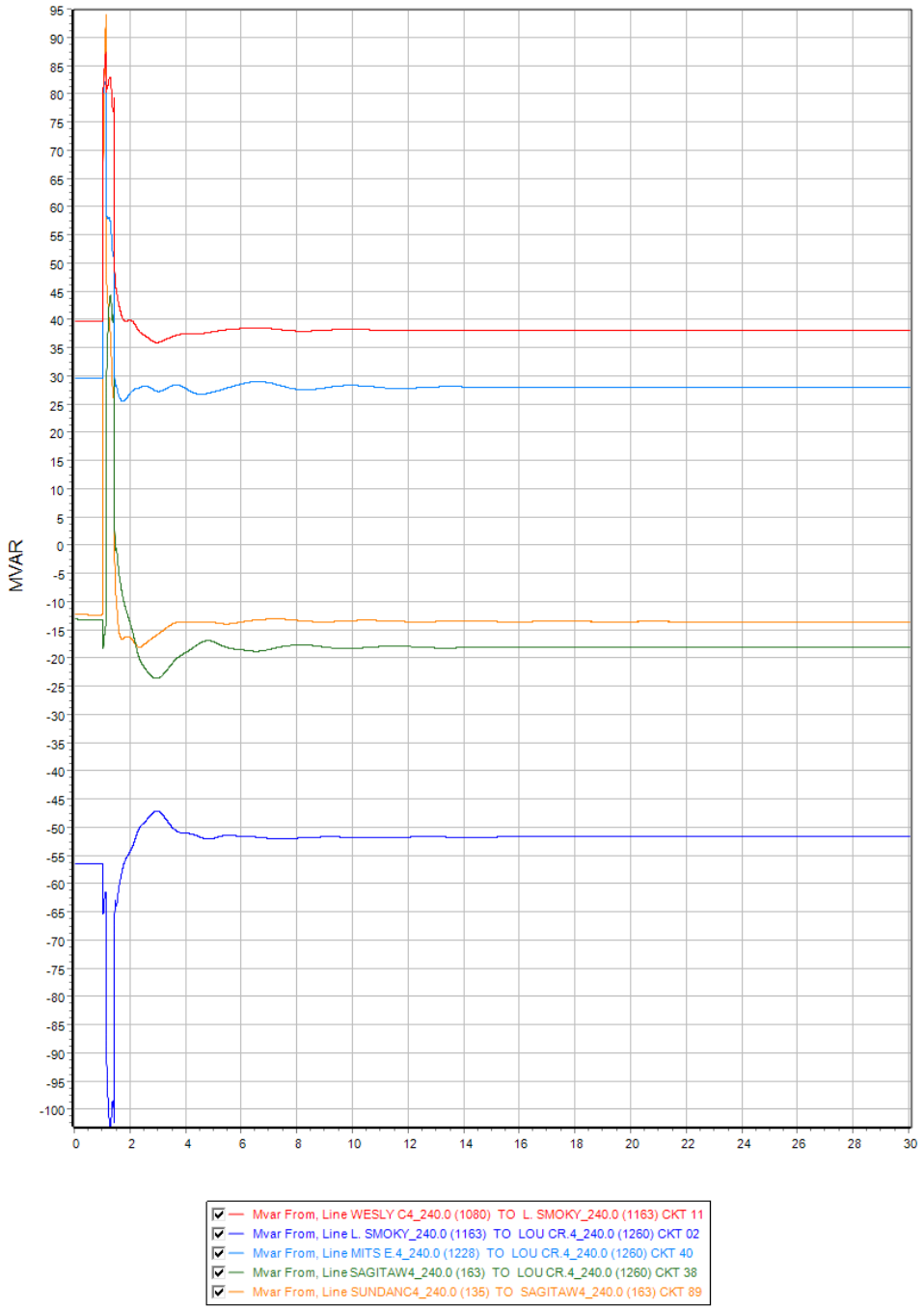
Monitor Bus Volts Q3



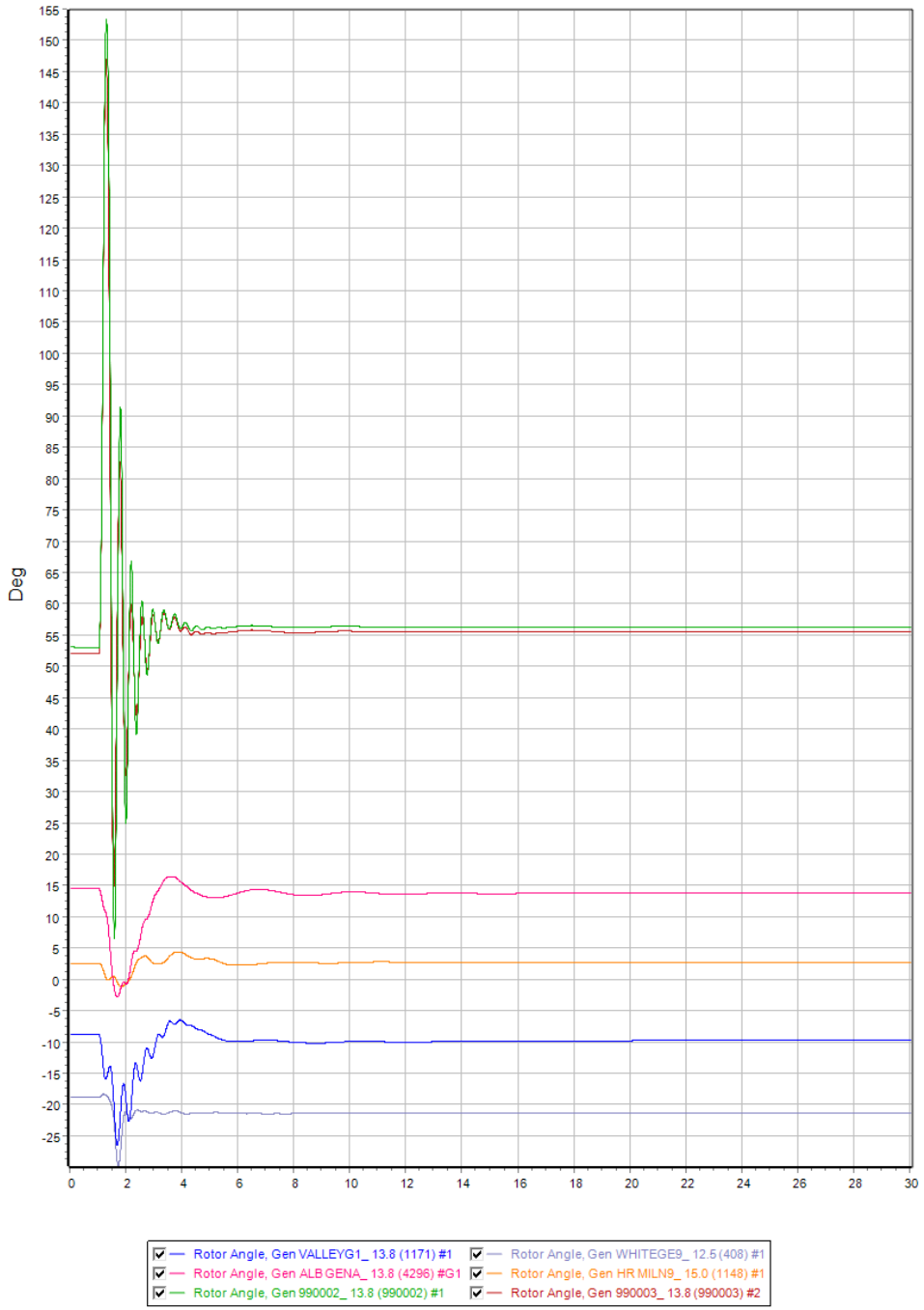


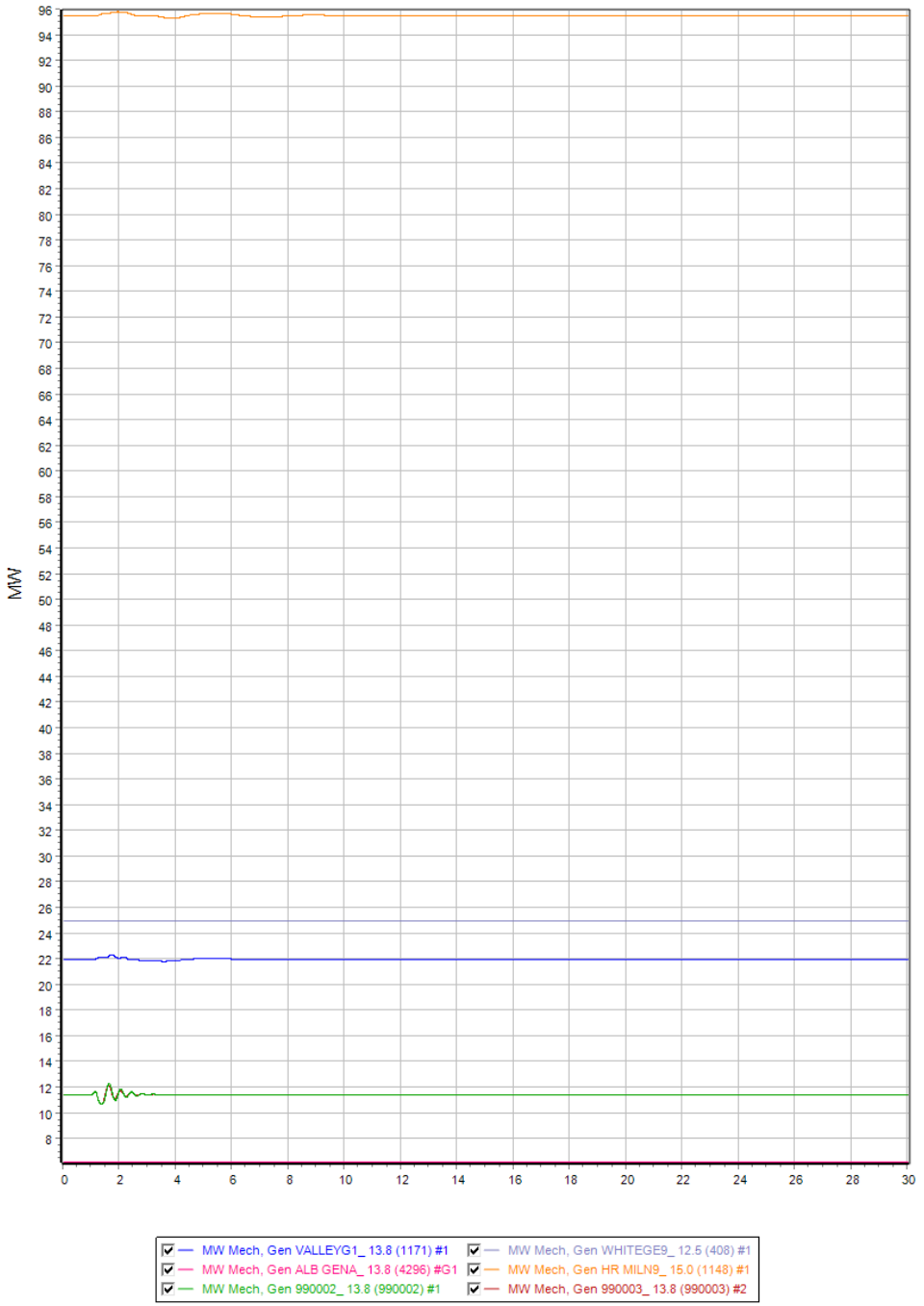
Monitor Line MW & MVAR. Q4



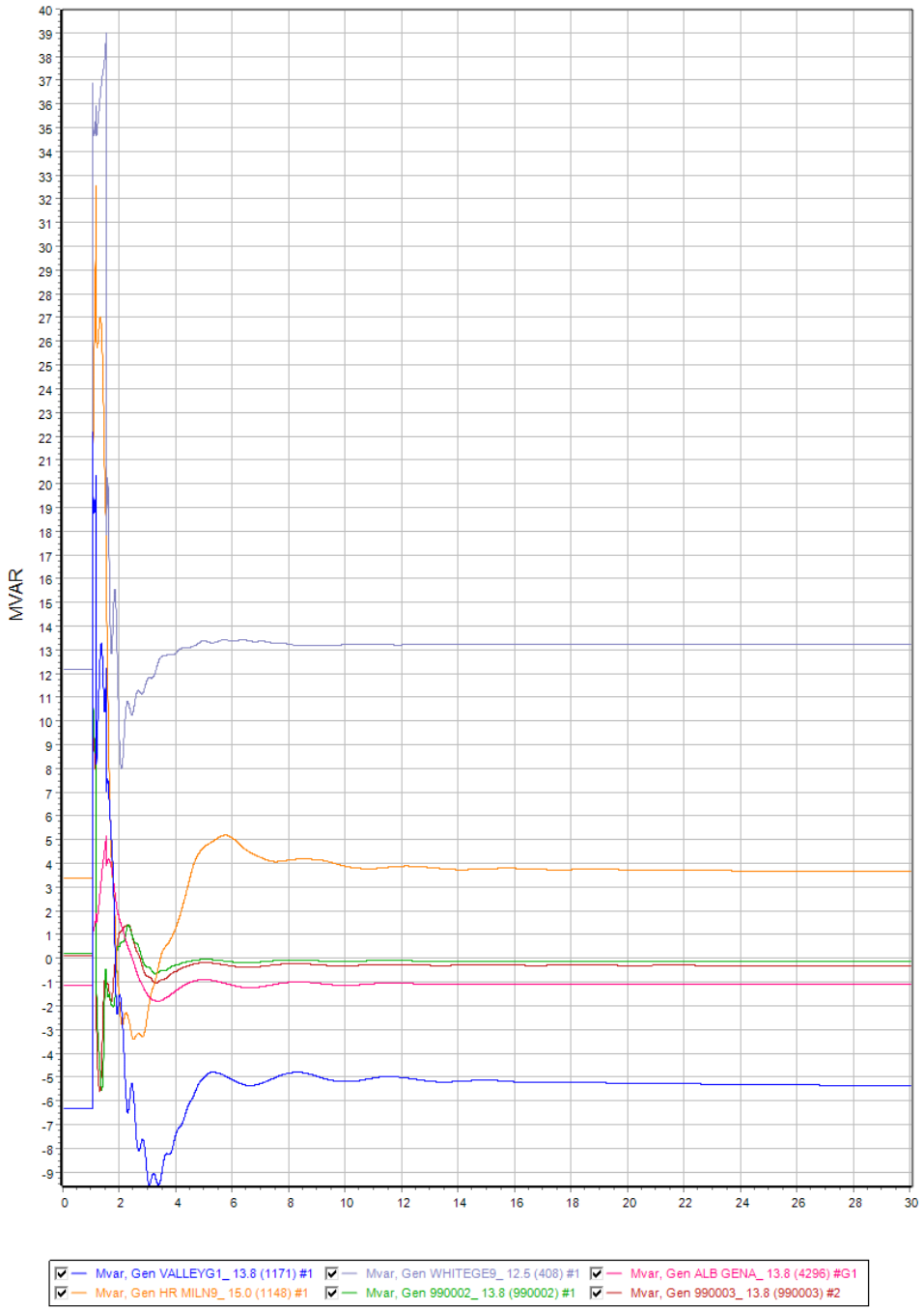


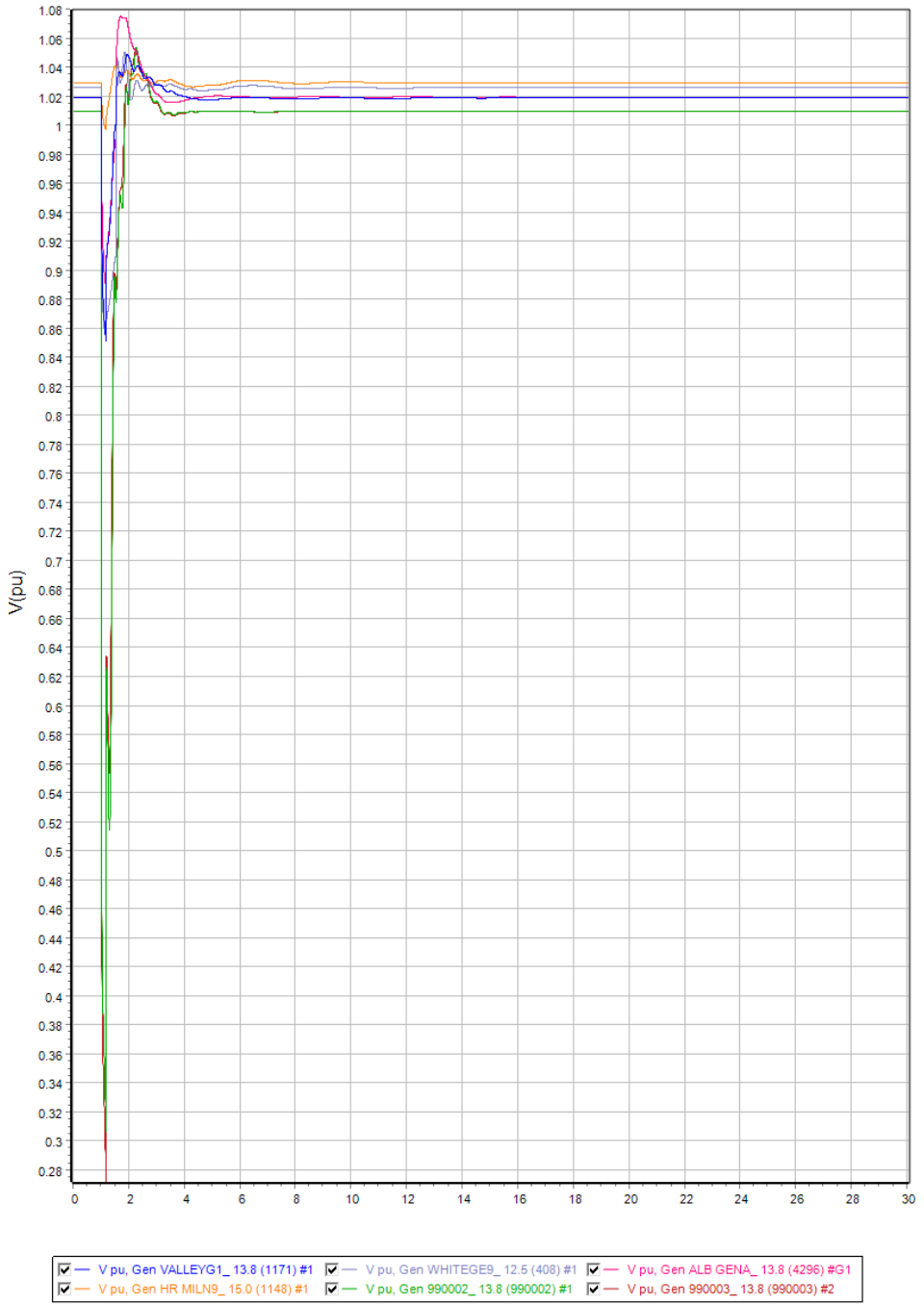
Monitor Gens. Q1



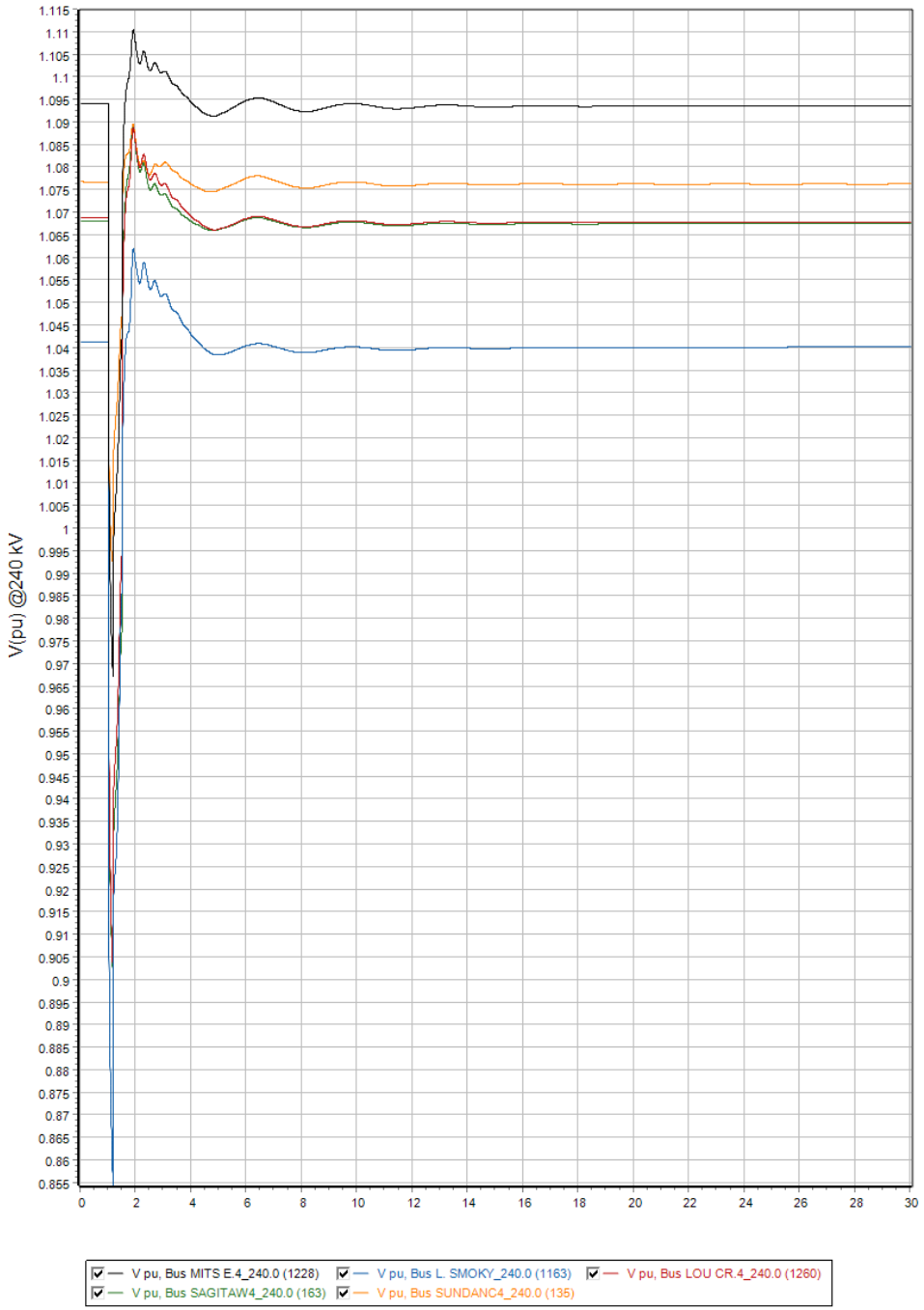


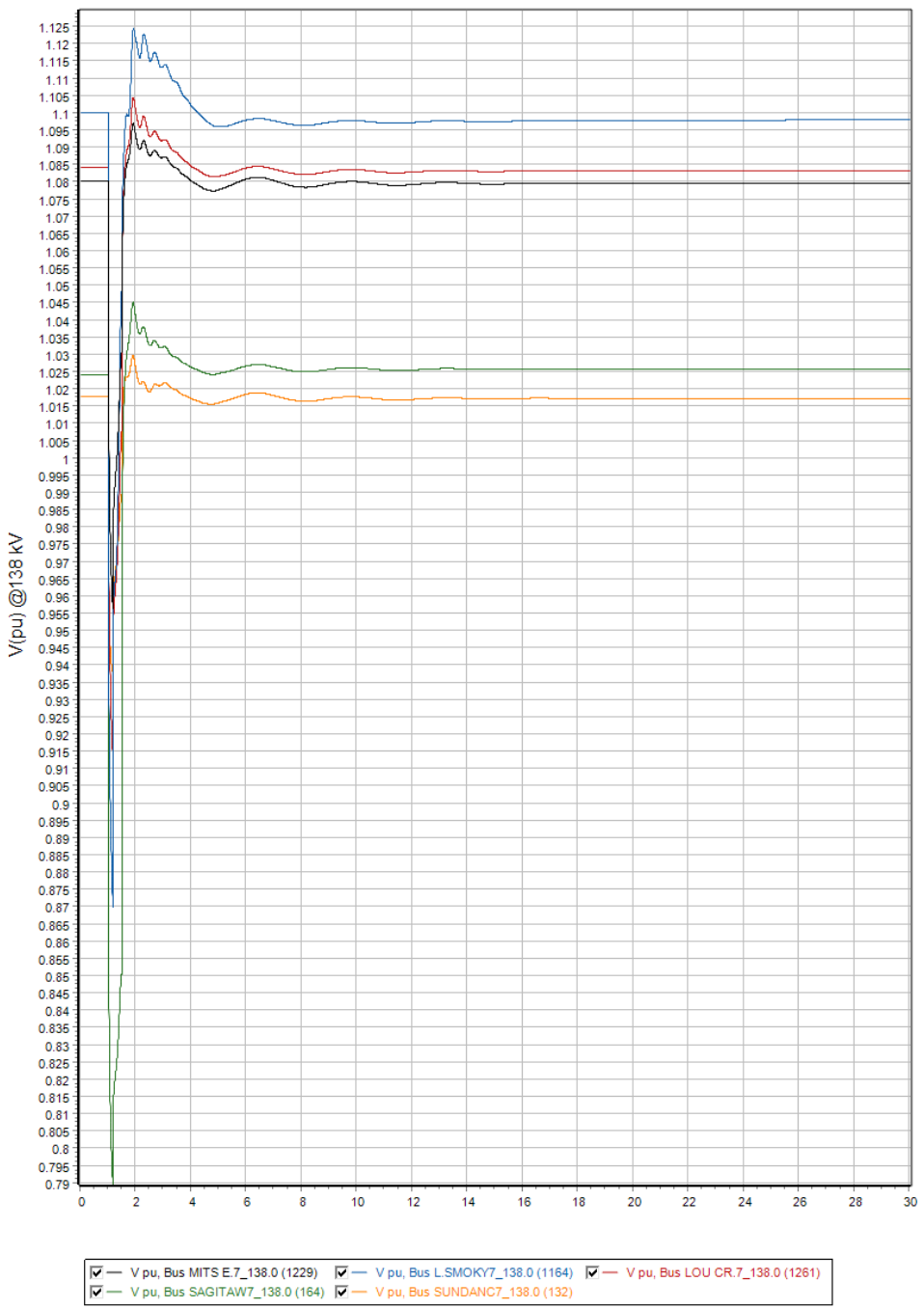
Monitor Gens. Q2



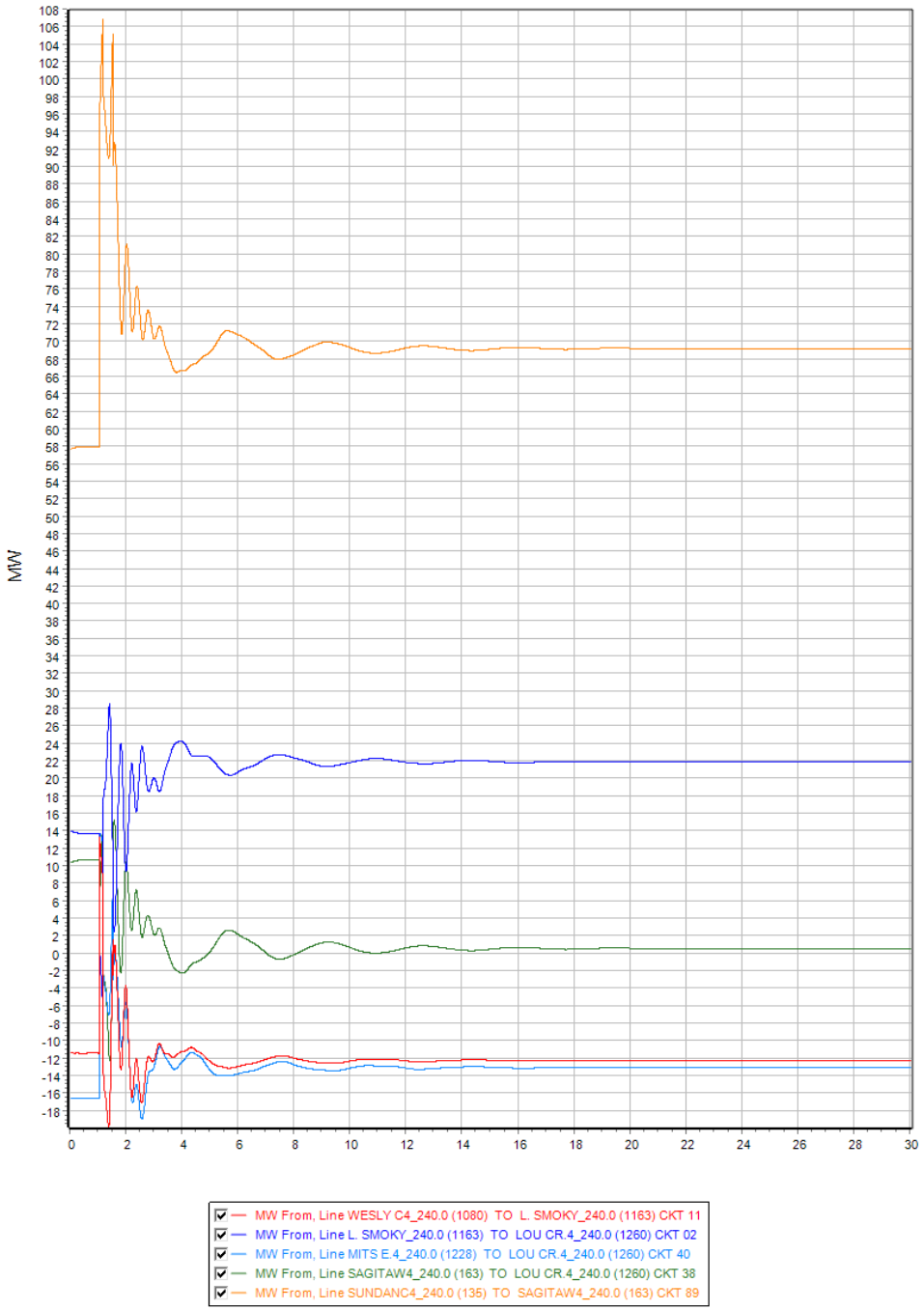


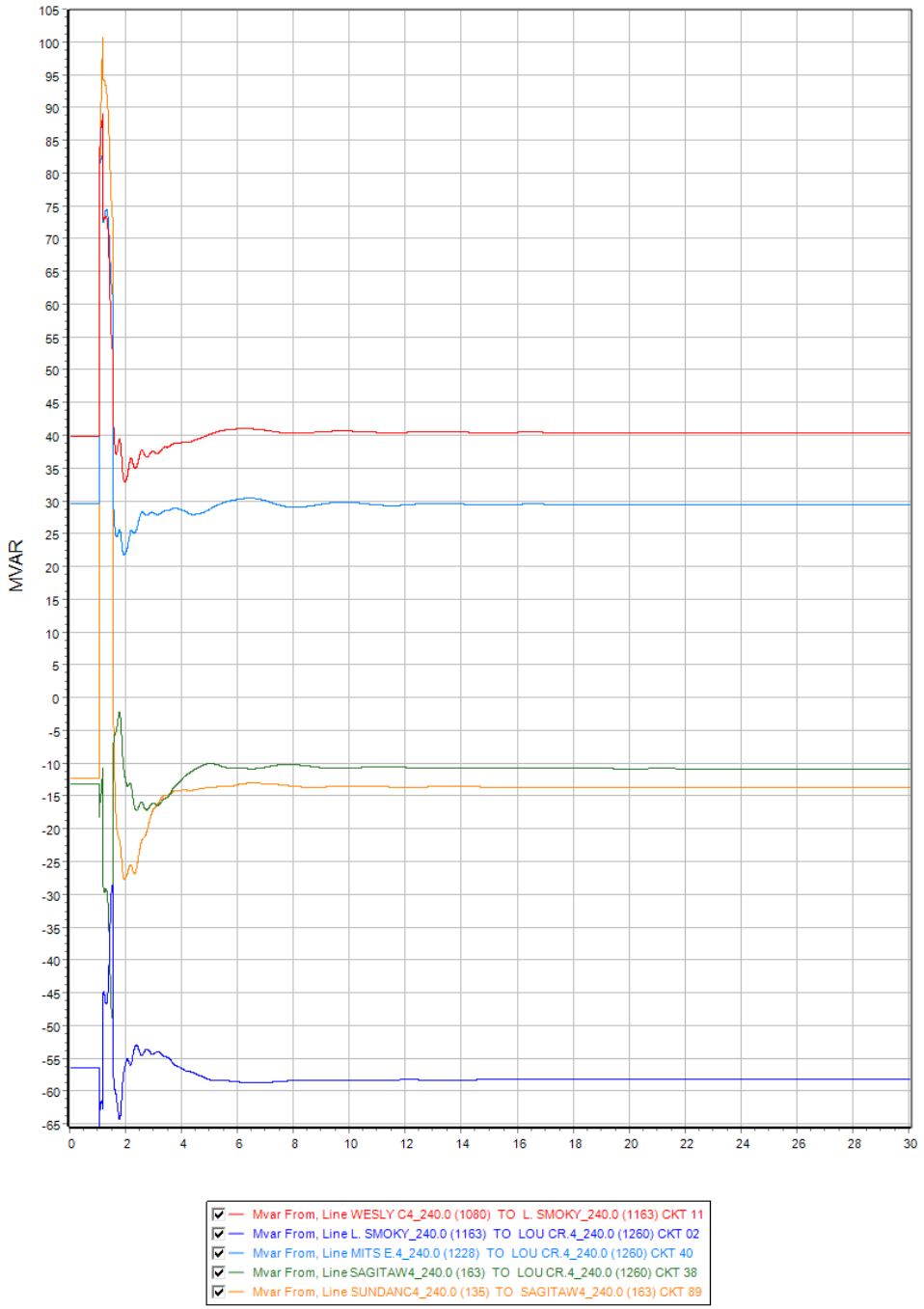
Monitor Bus Volts Q3



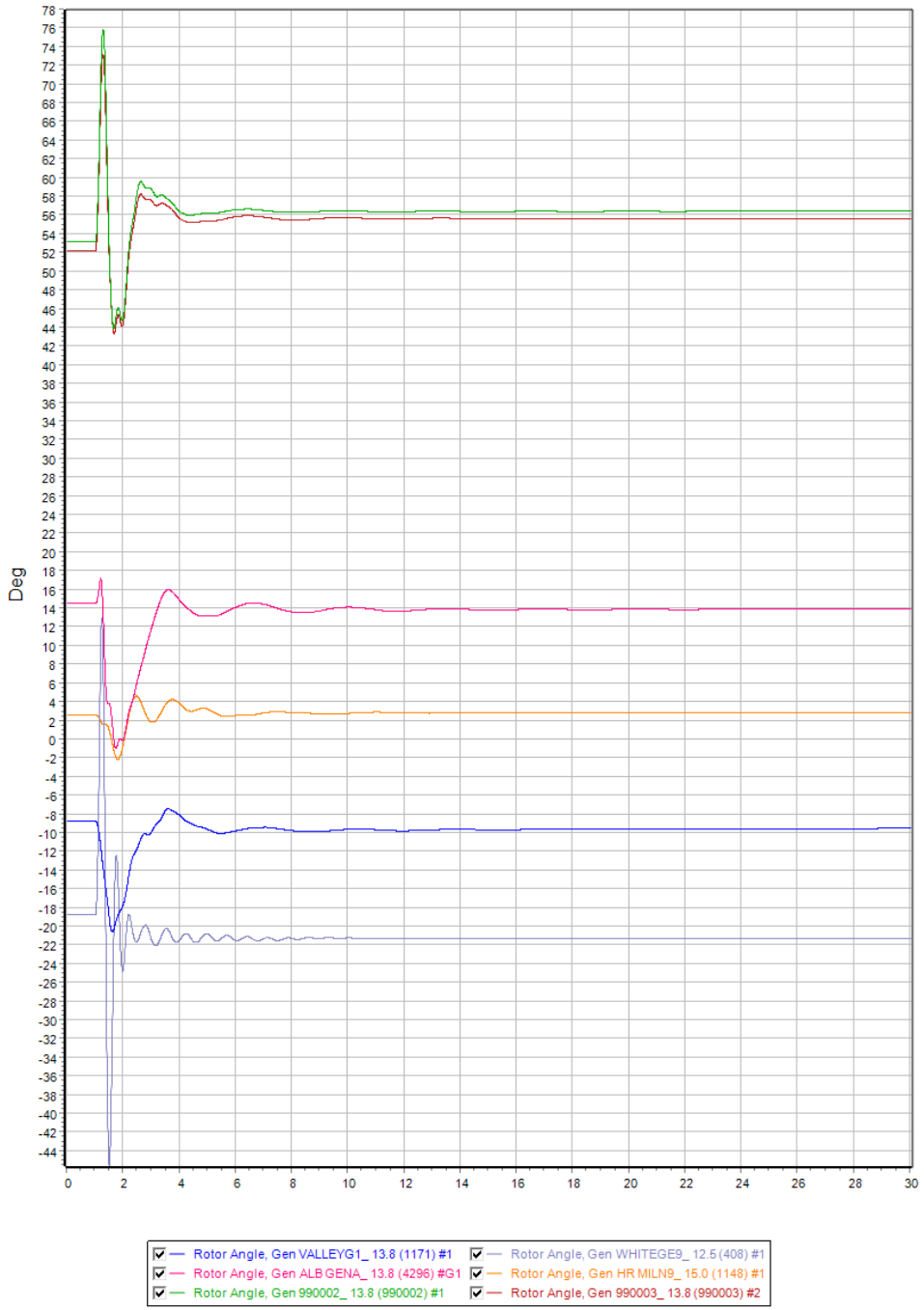


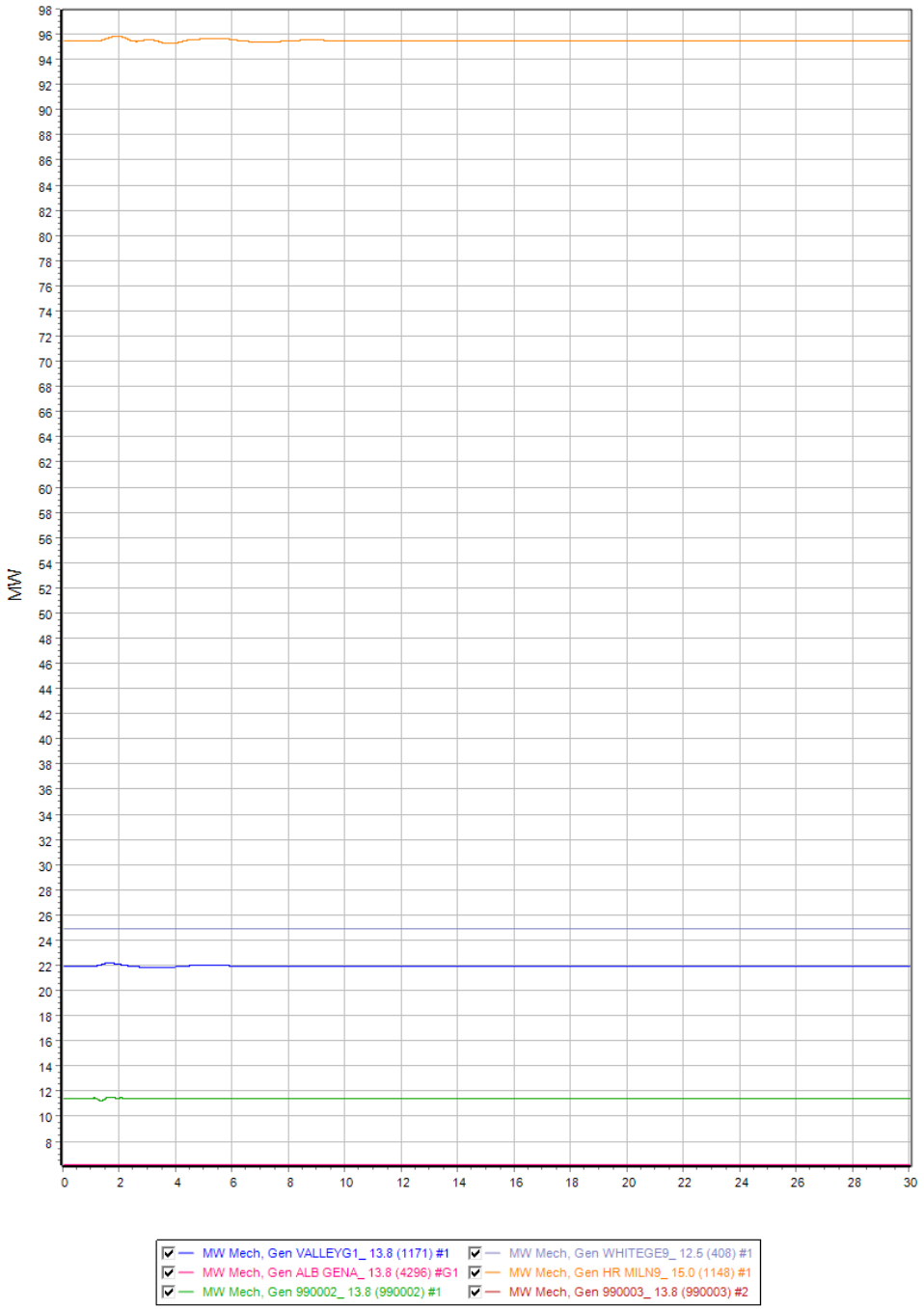
Monitor Line MW & MVAR. Q4



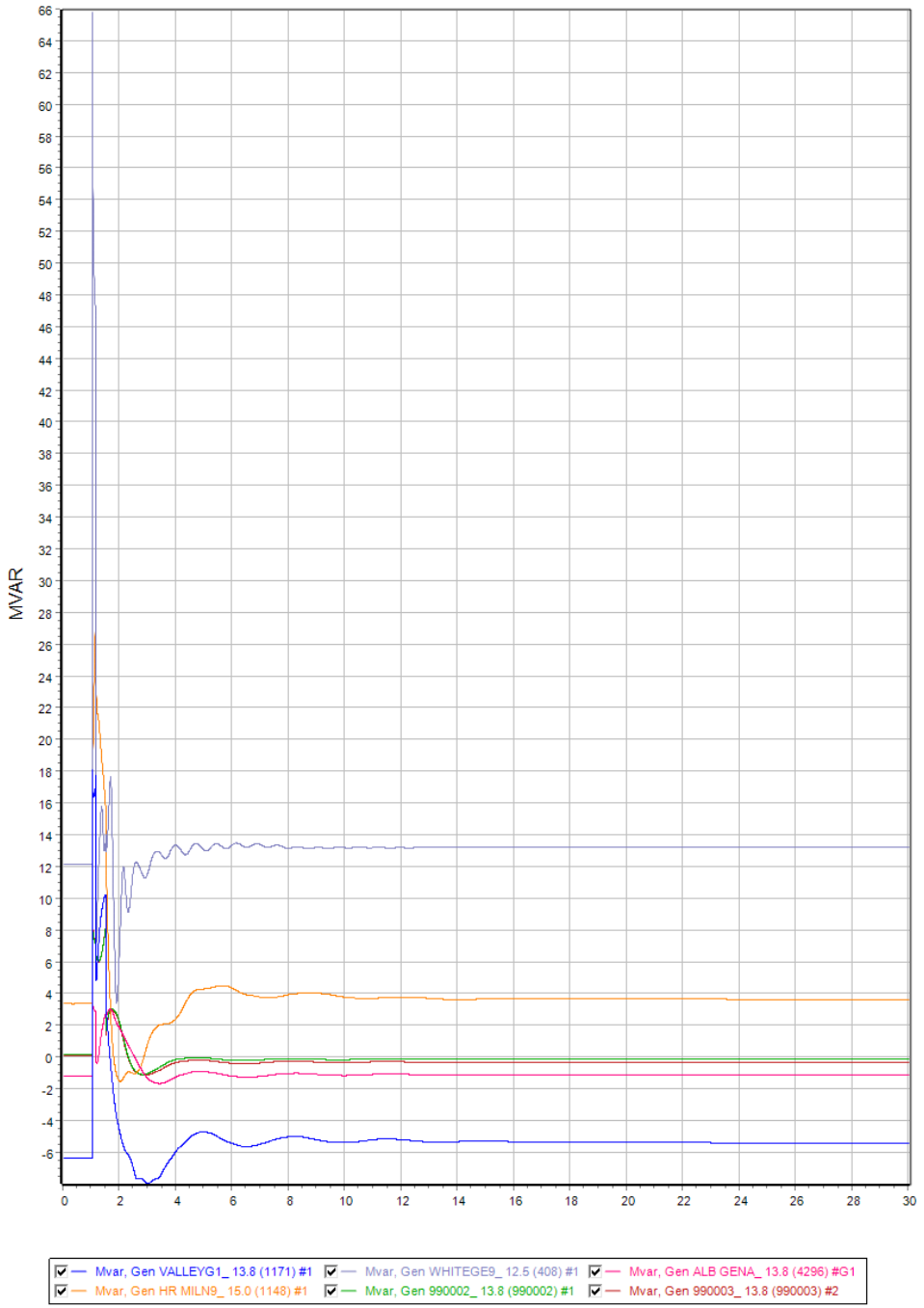


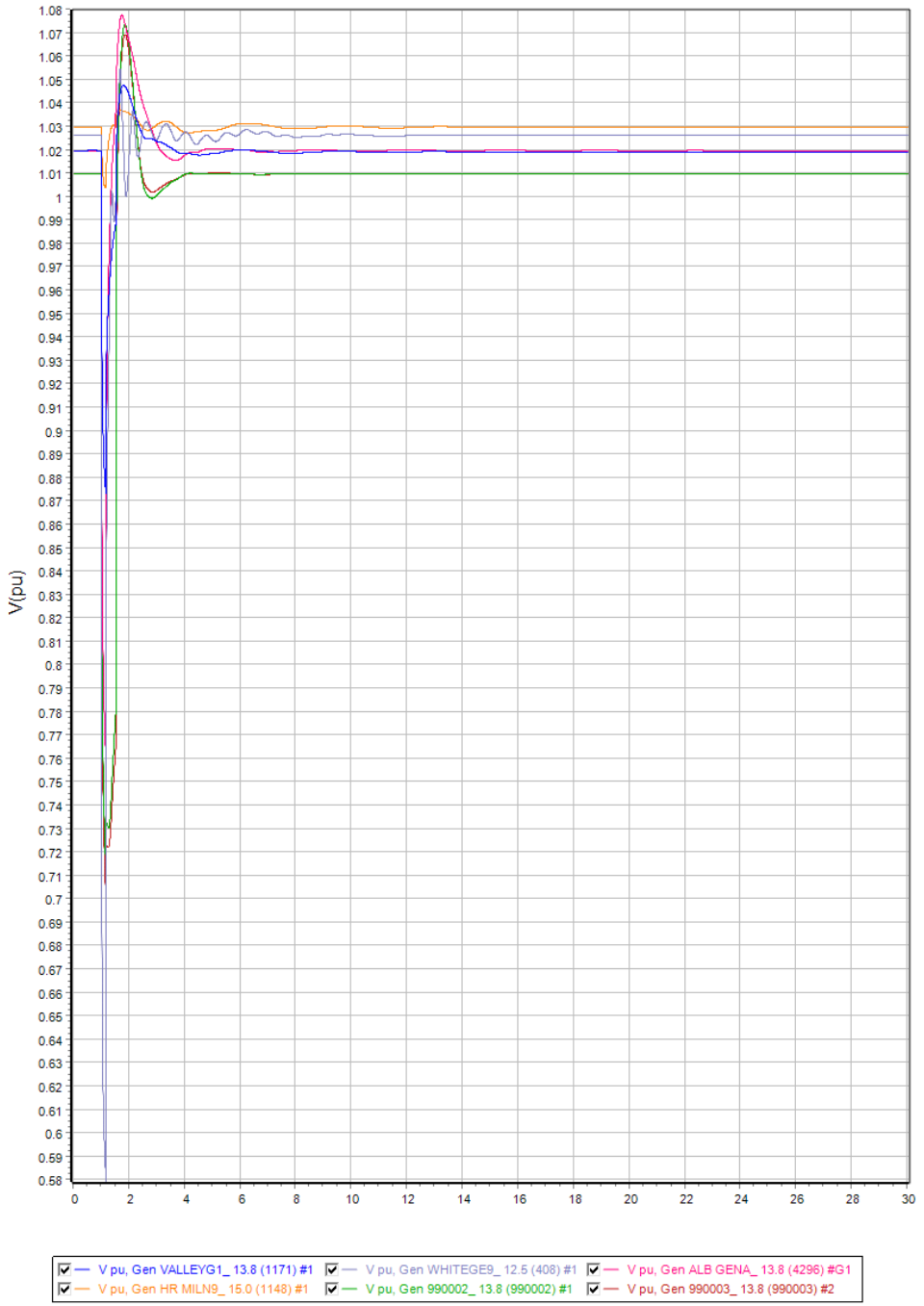
Monitor Gens. Q1



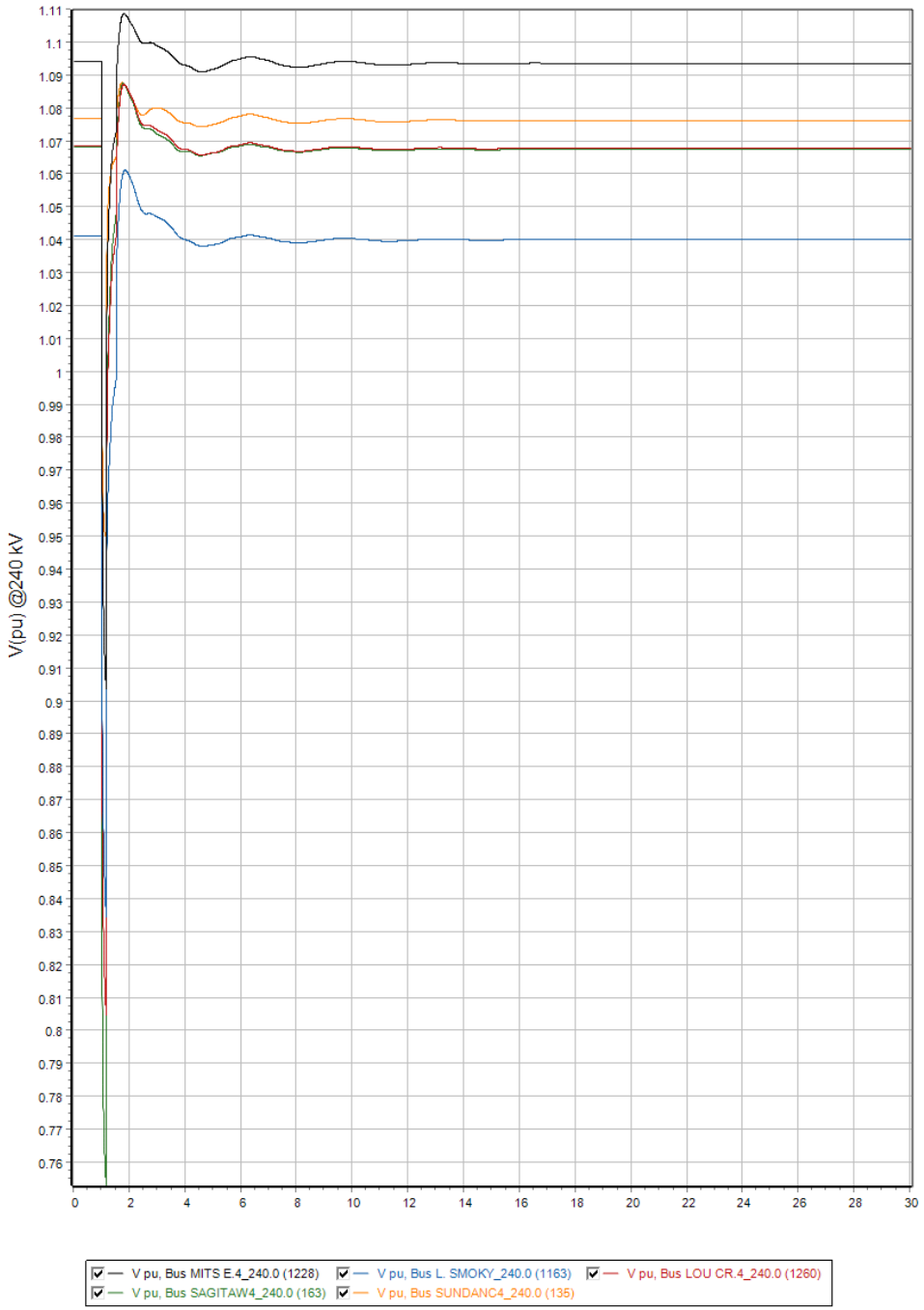


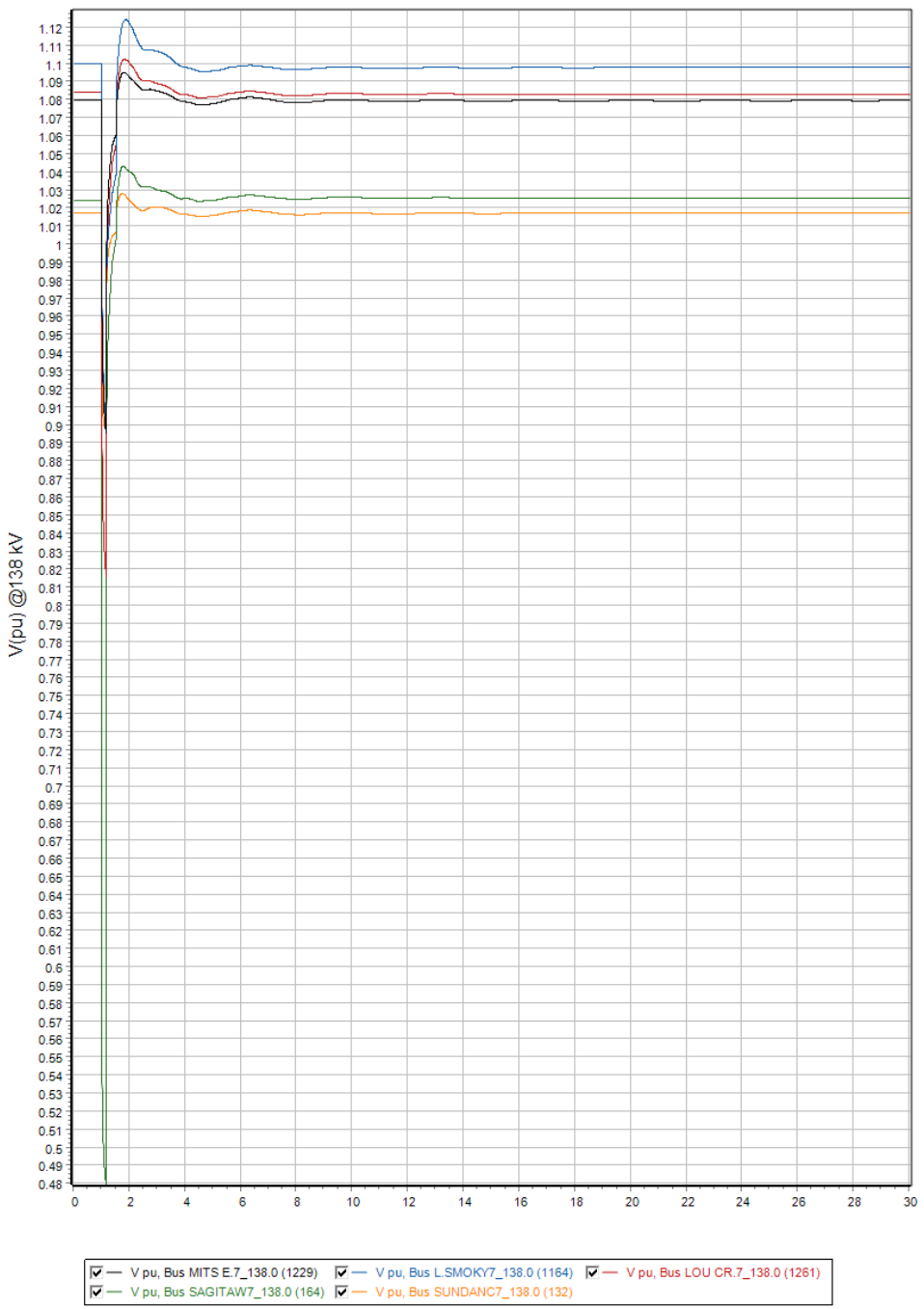
Monitor Gens. Q2



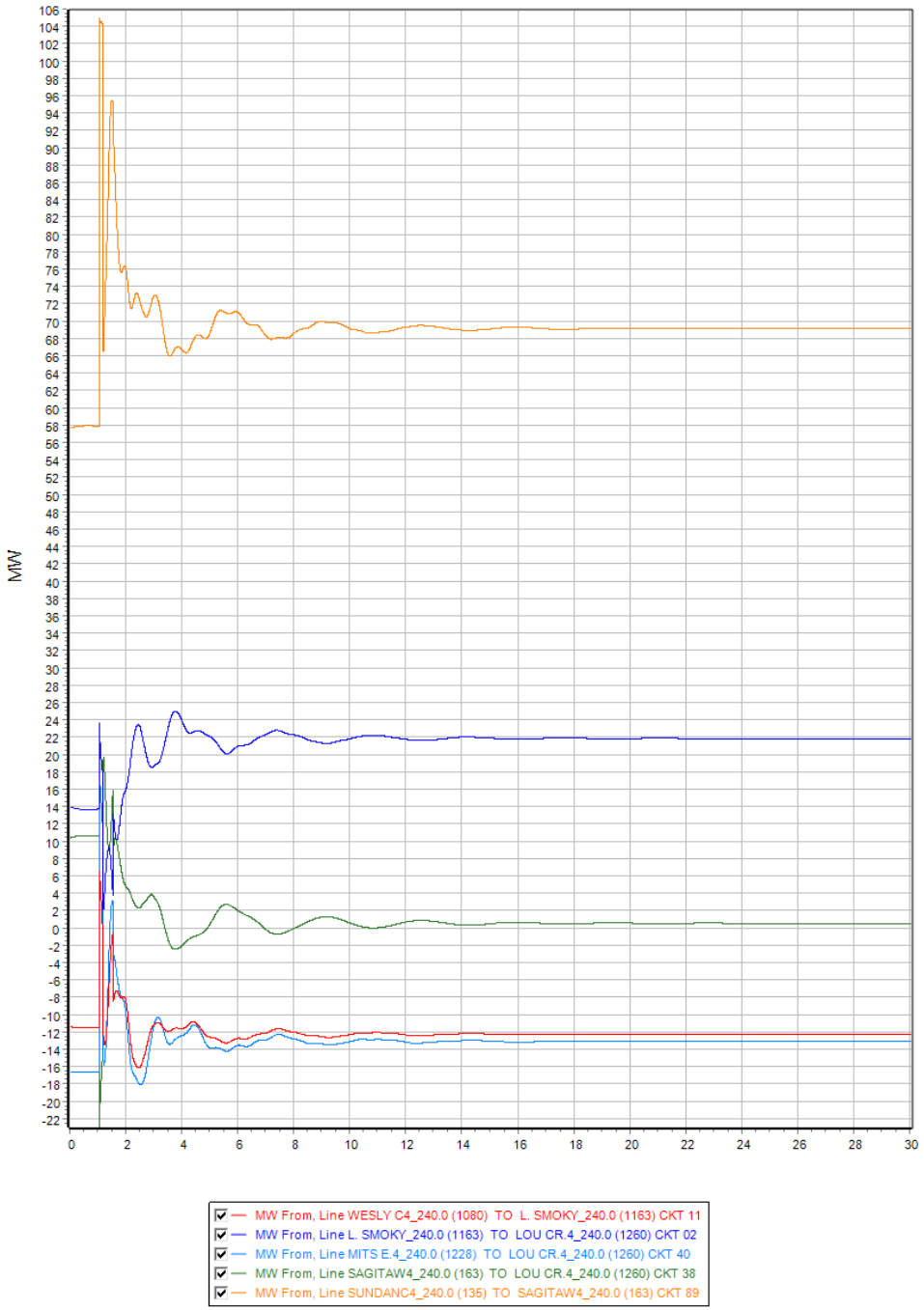


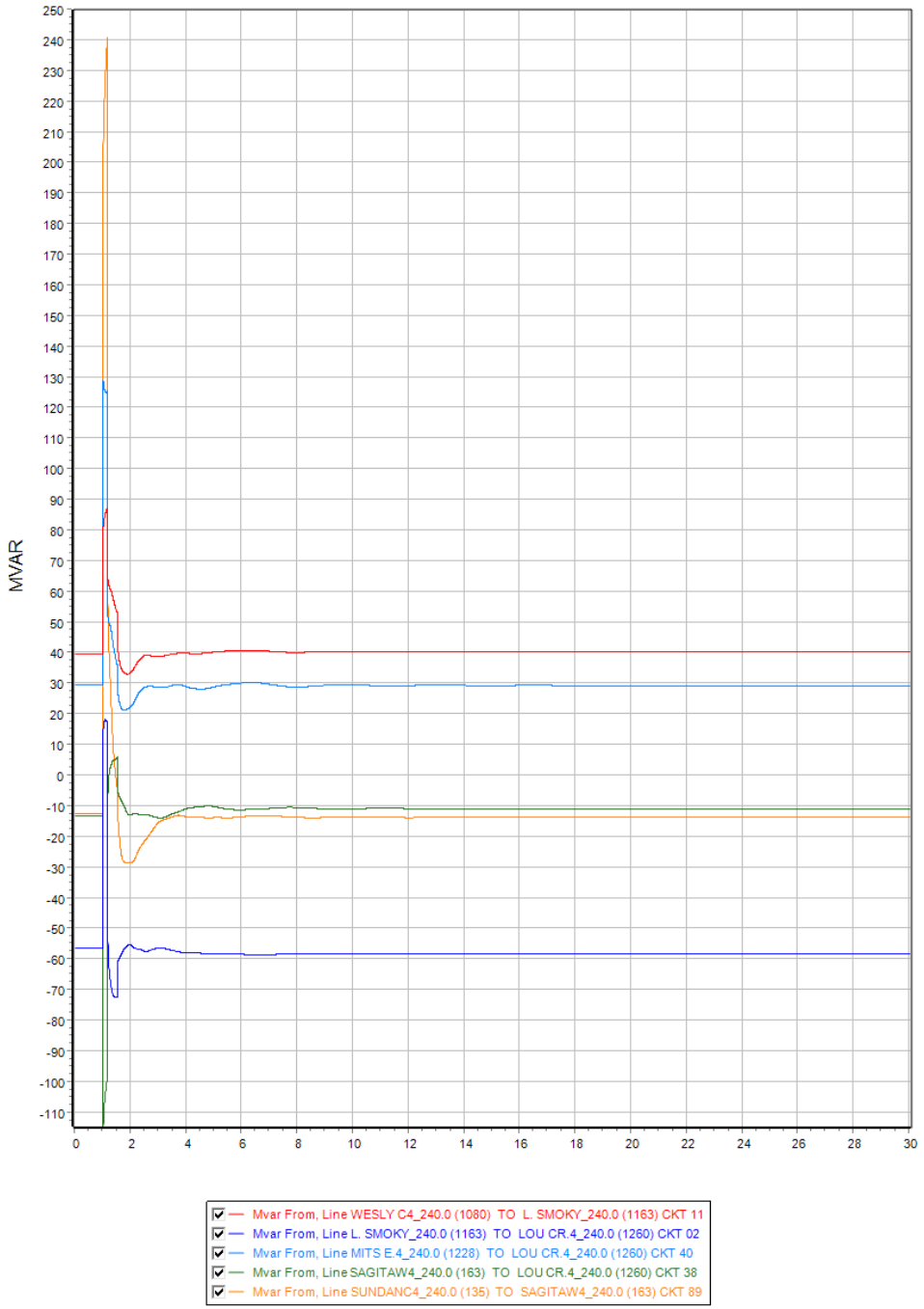
Monitor Bus Volts Q3



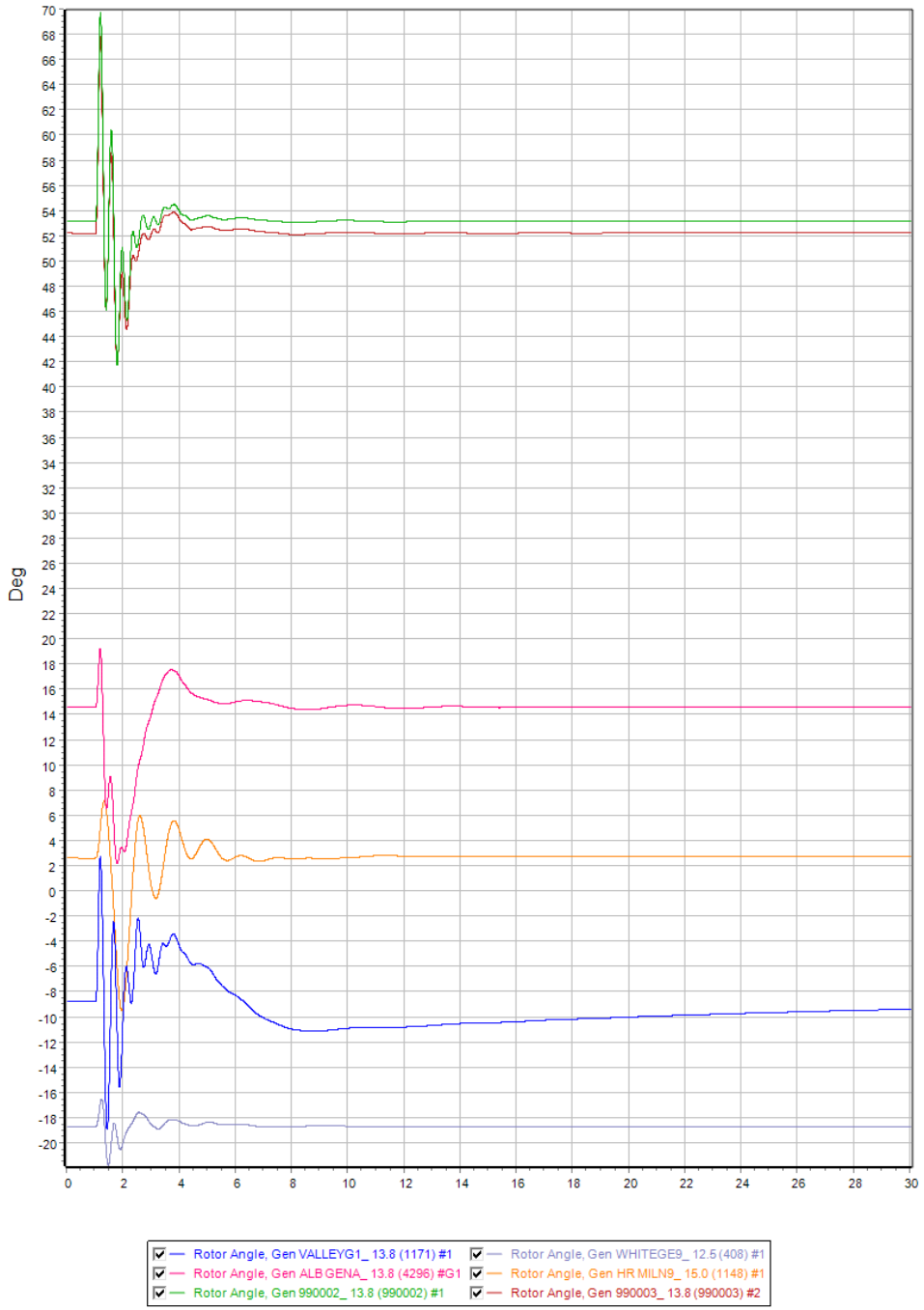


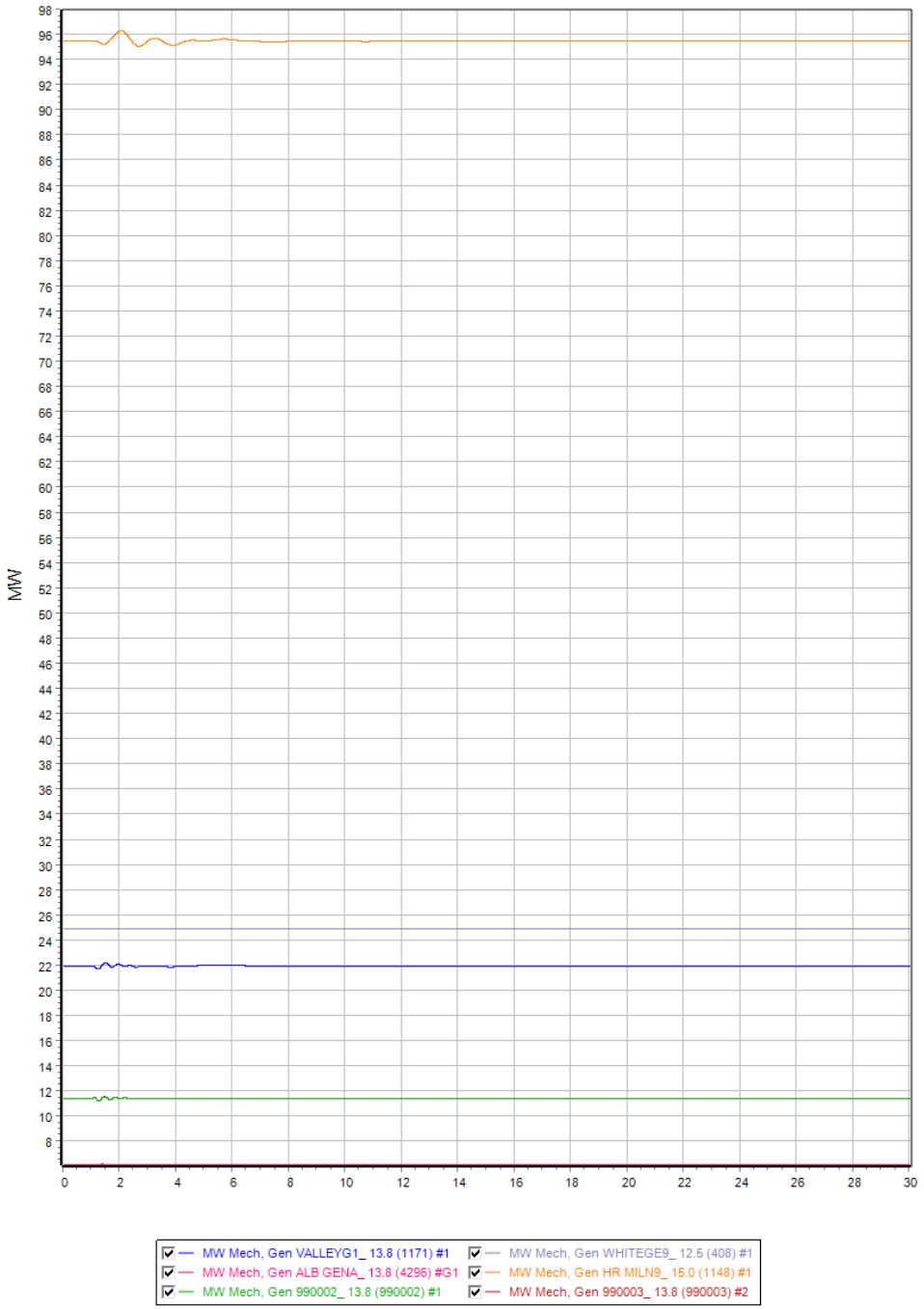
Monitor Line MW & MVAR. Q4



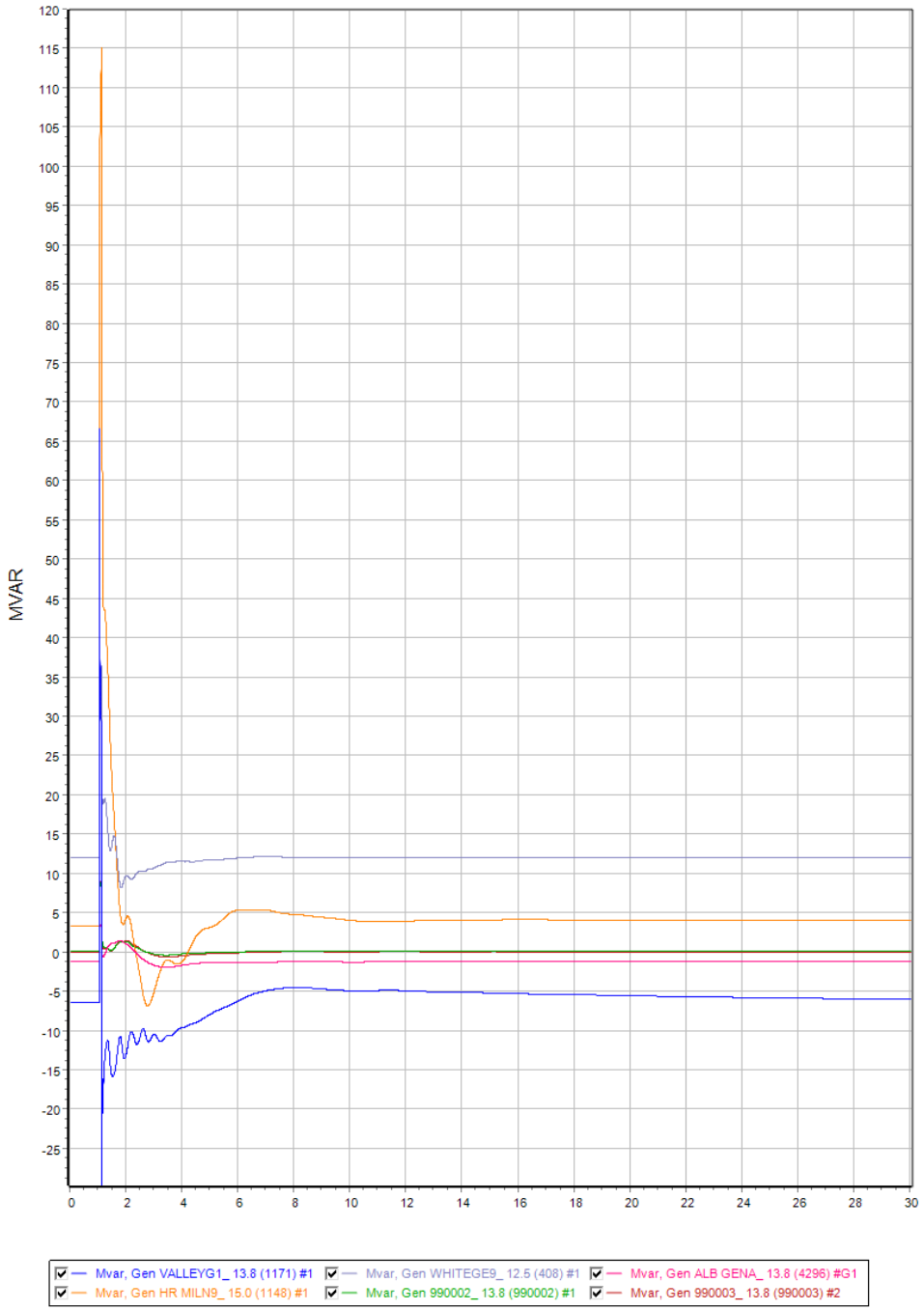


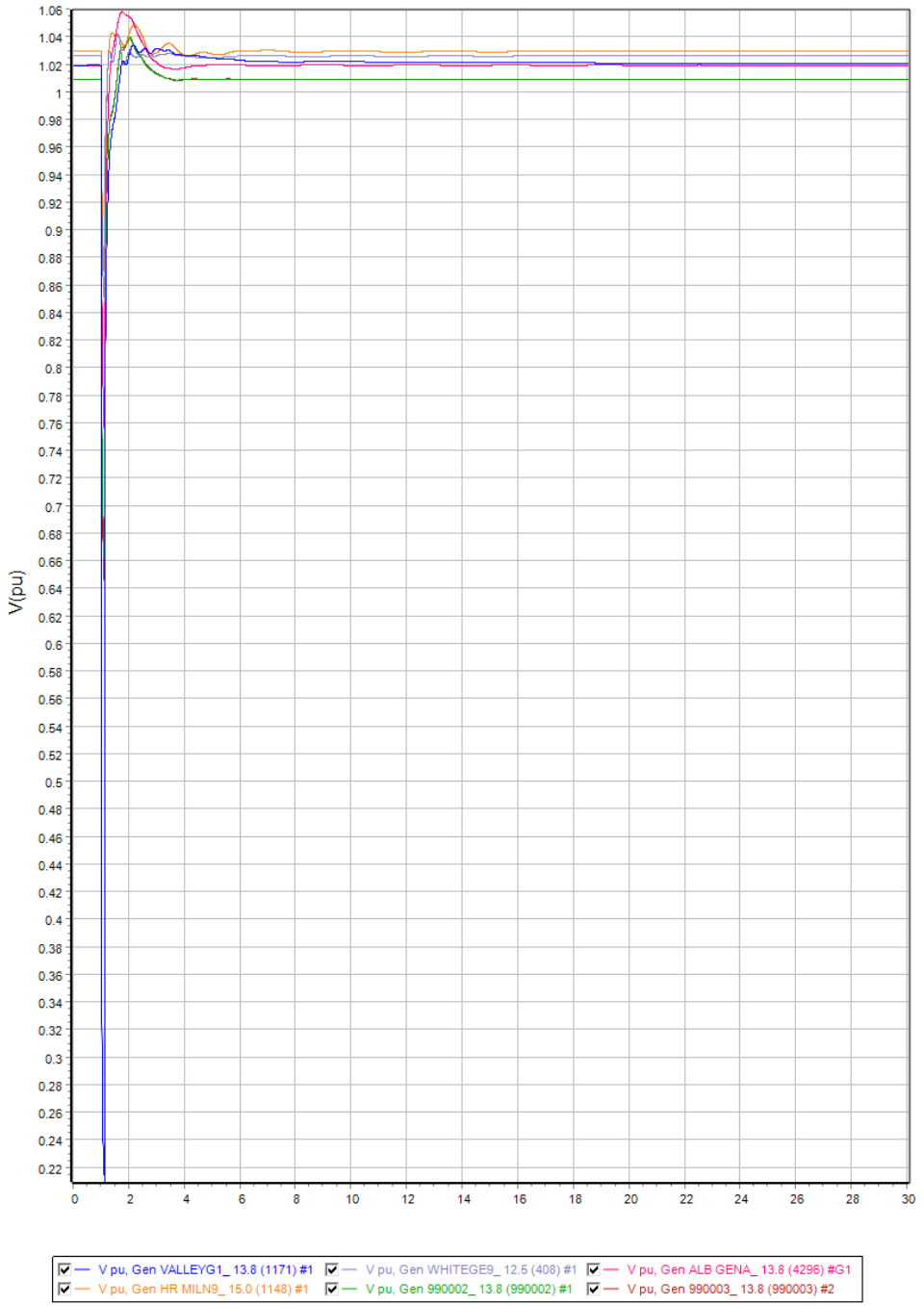
Monitor Gens. Q1





Monitor Gens. Q2





SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

Contingency: 05A - 7L46 (Little Smoky 813S – Big Mountain 845S) @ Little Smoky 813S

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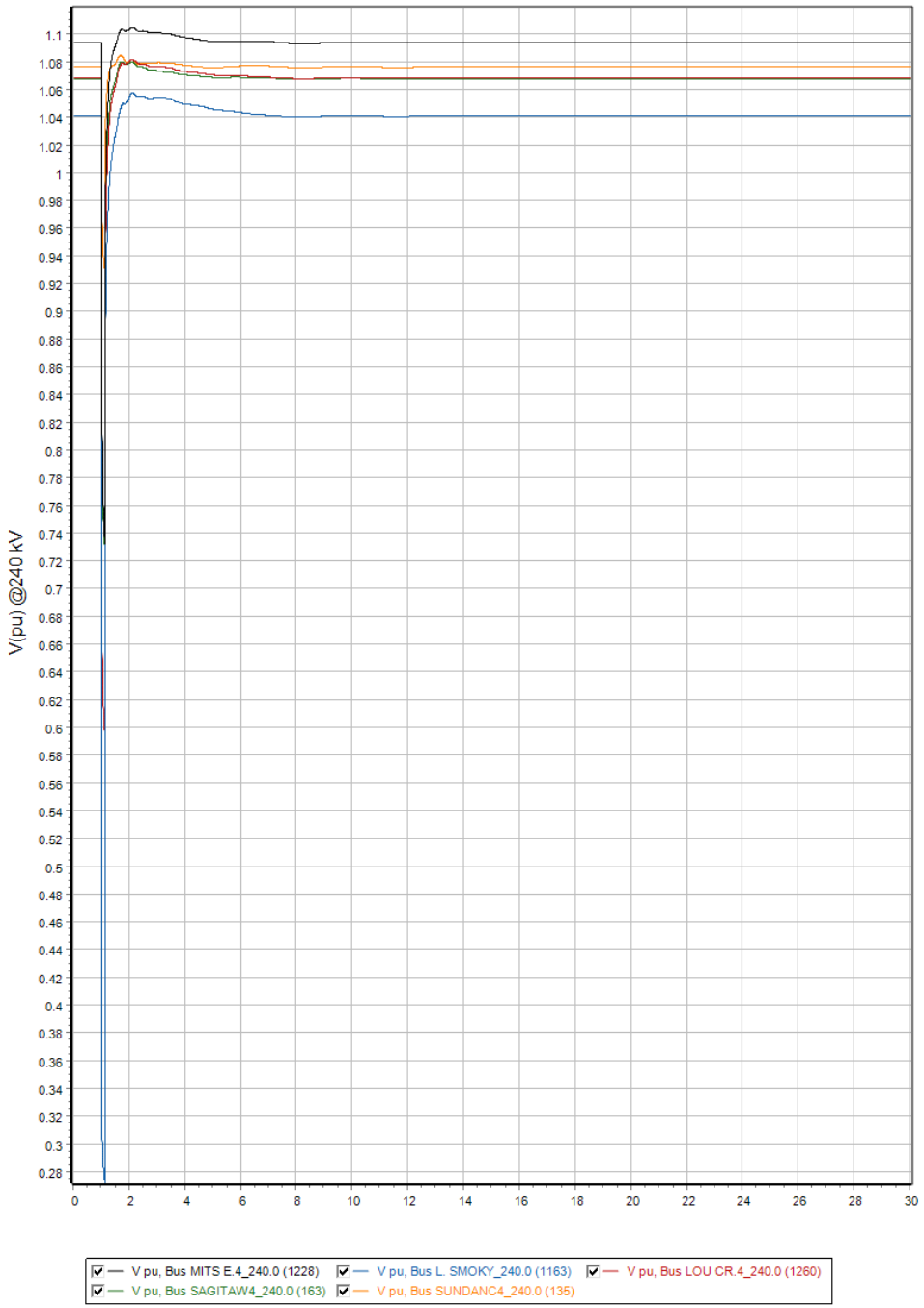
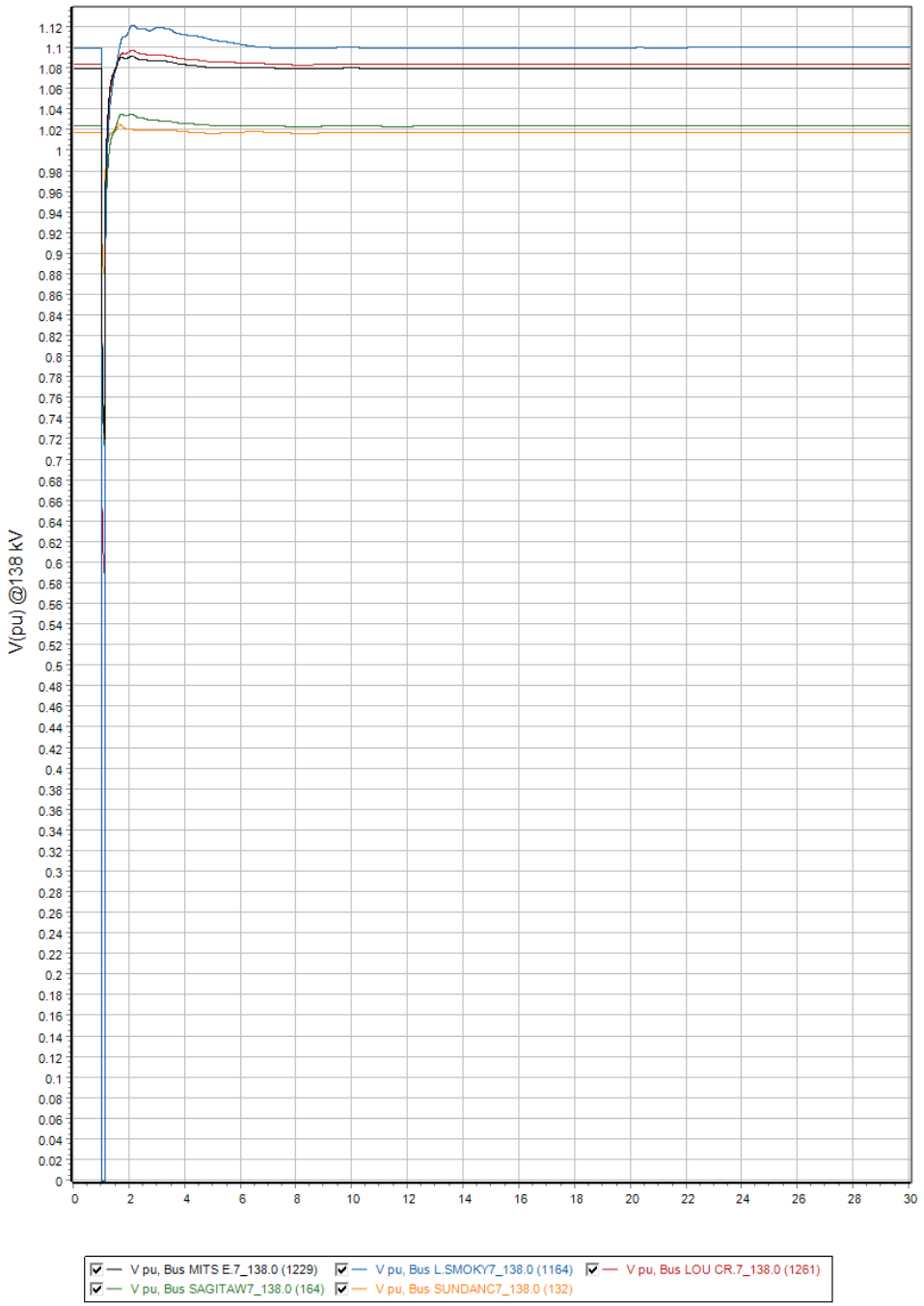
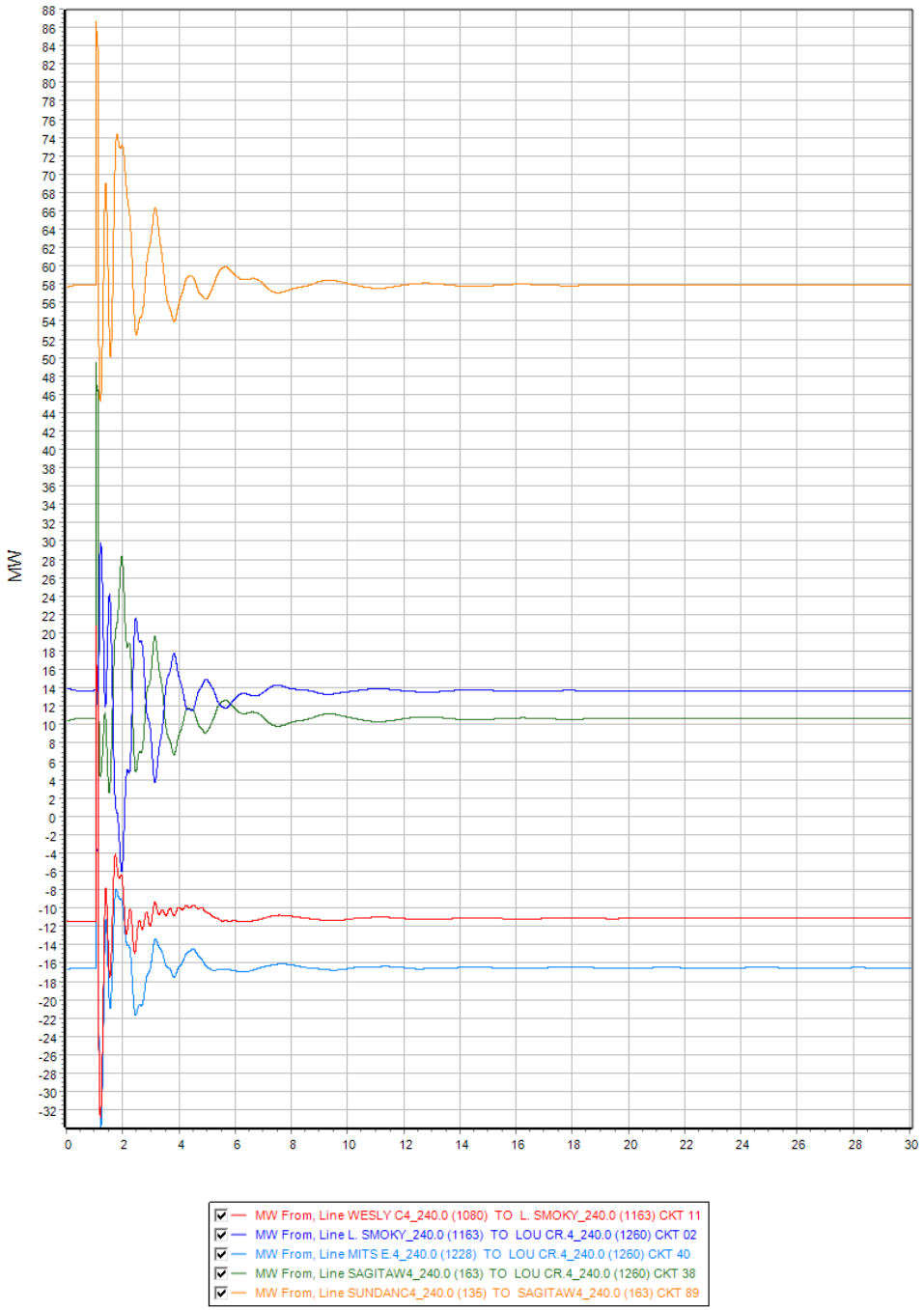
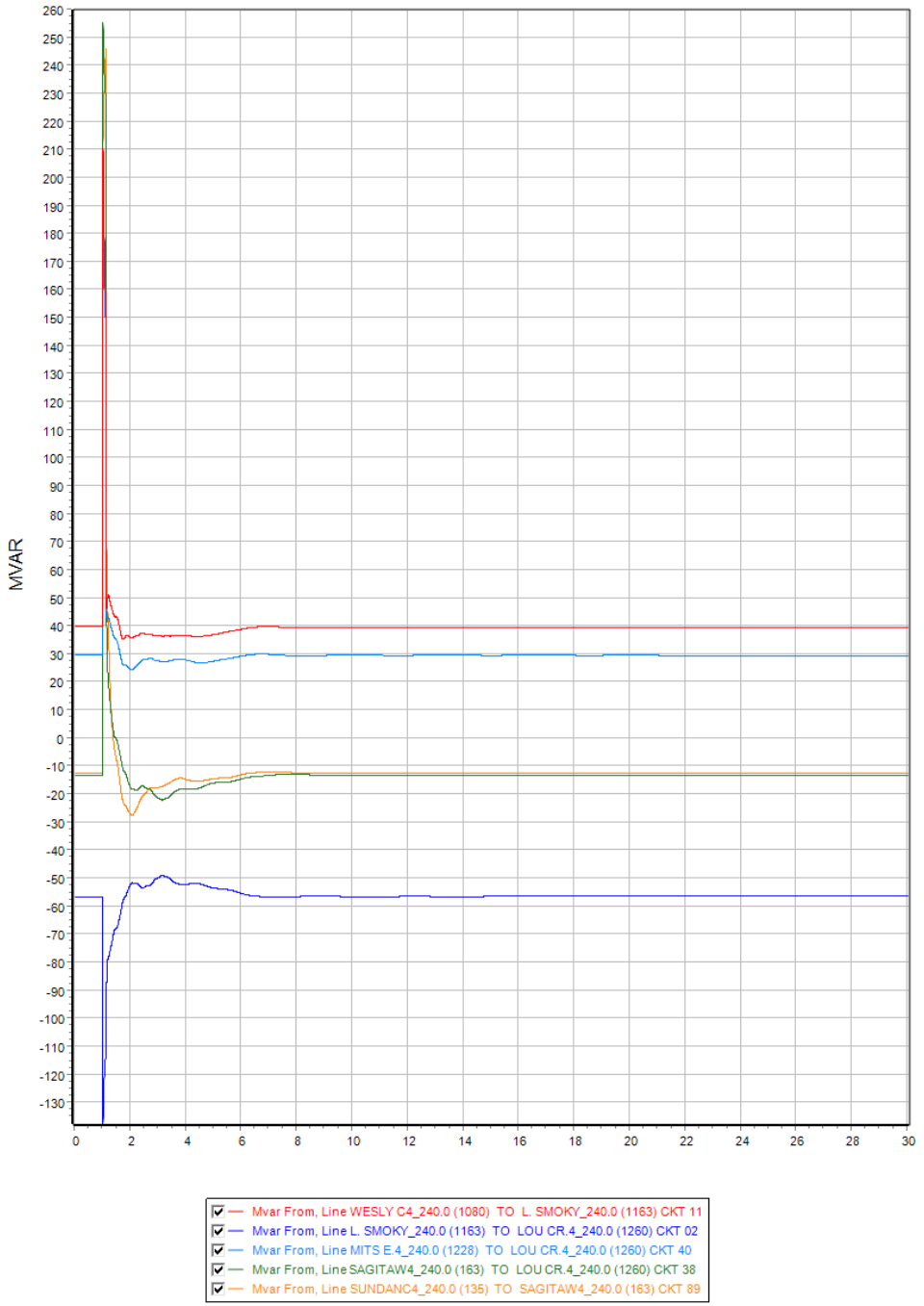
Monitor Bus Volts Q3



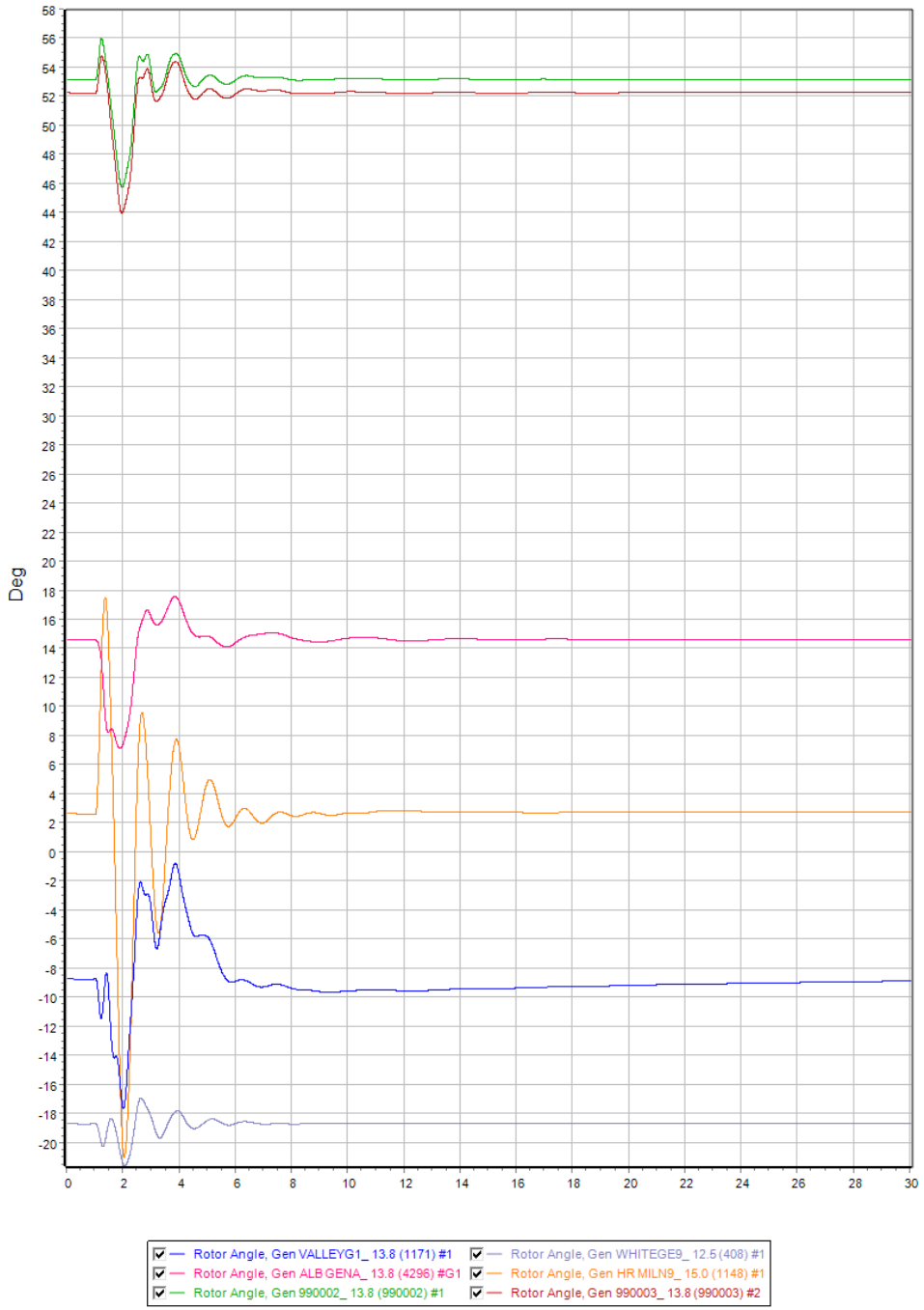


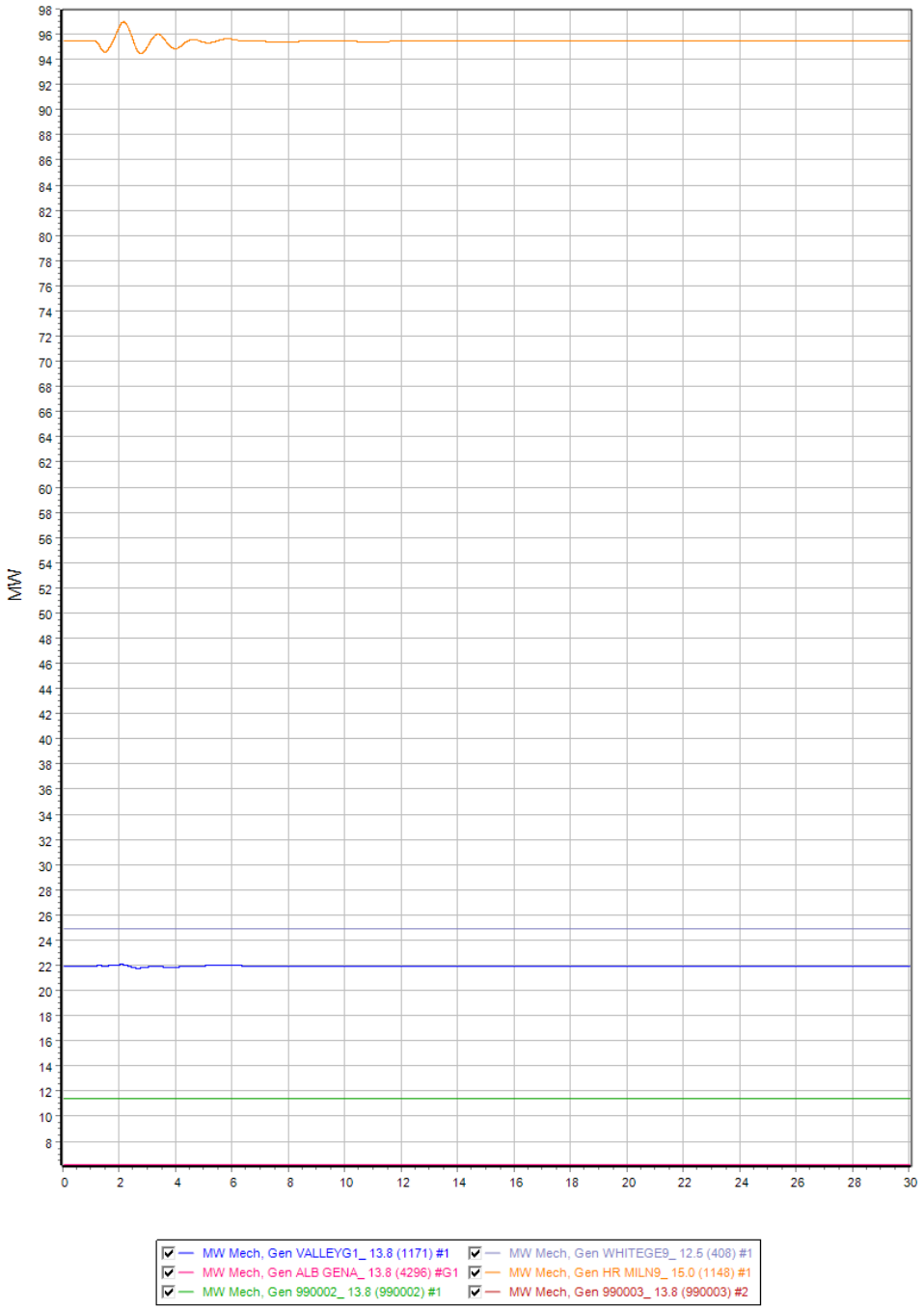
Monitor Line MW & MVAR. Q4



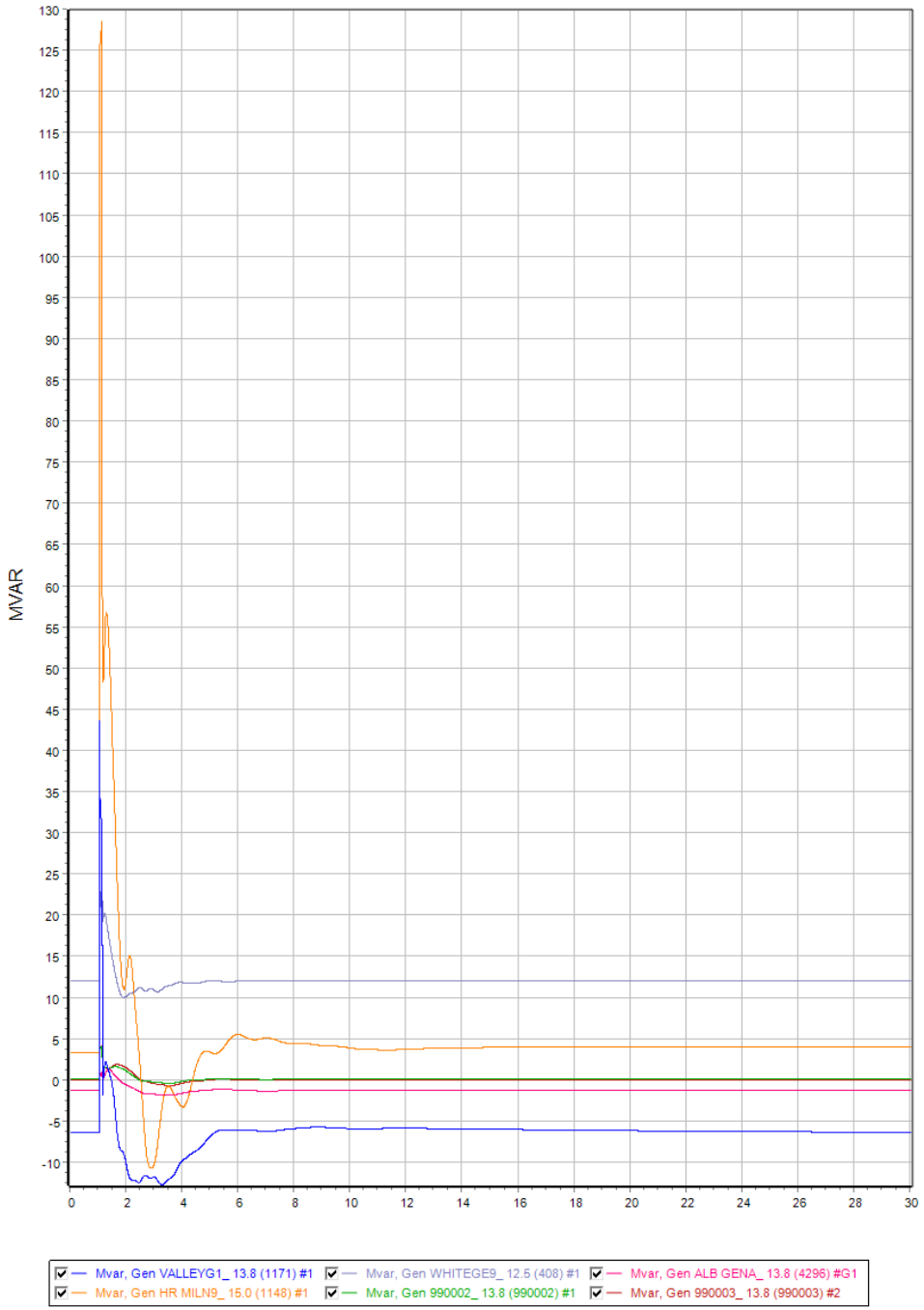


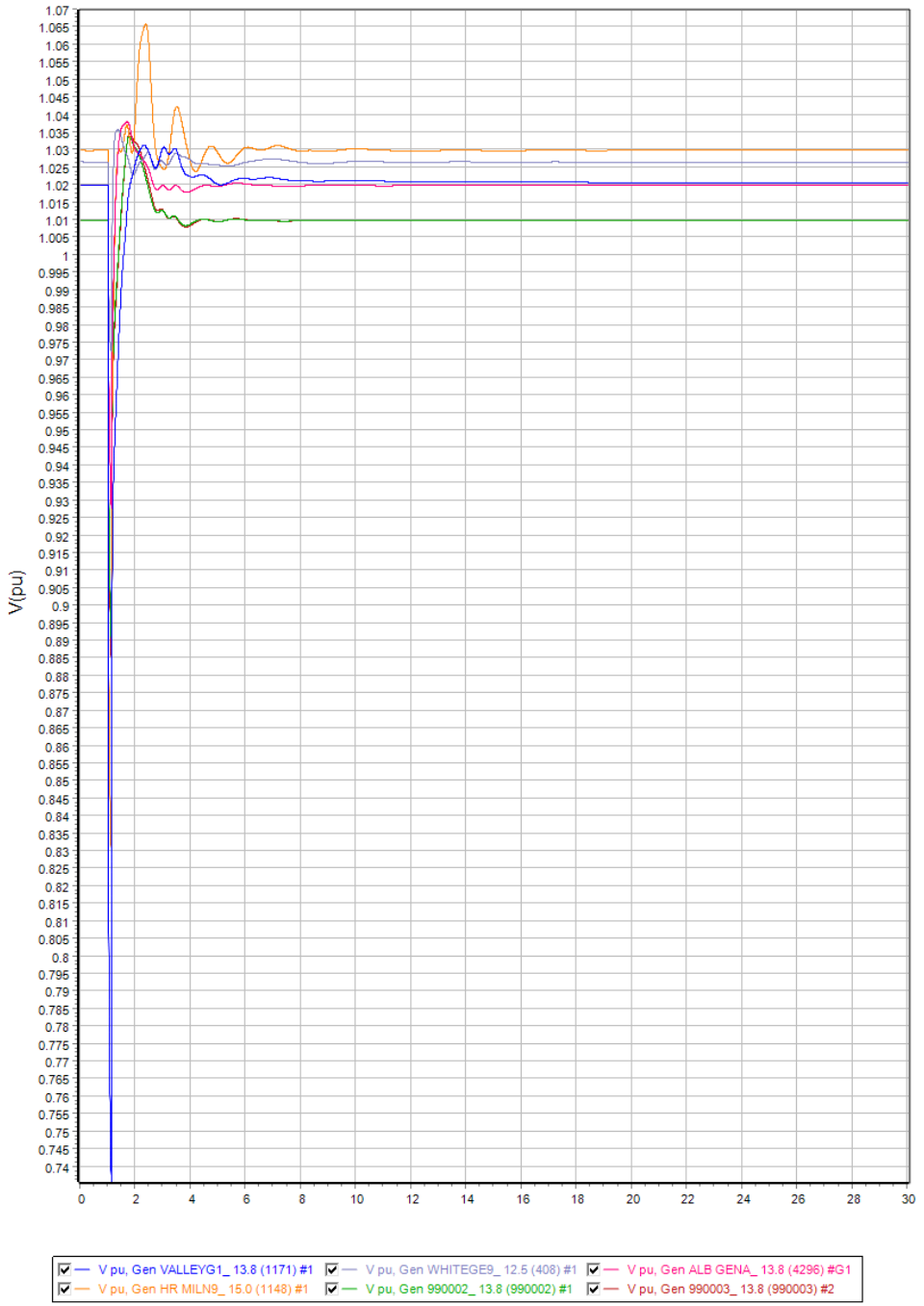
Monitor Gens. Q1





Monitor Gens. Q2

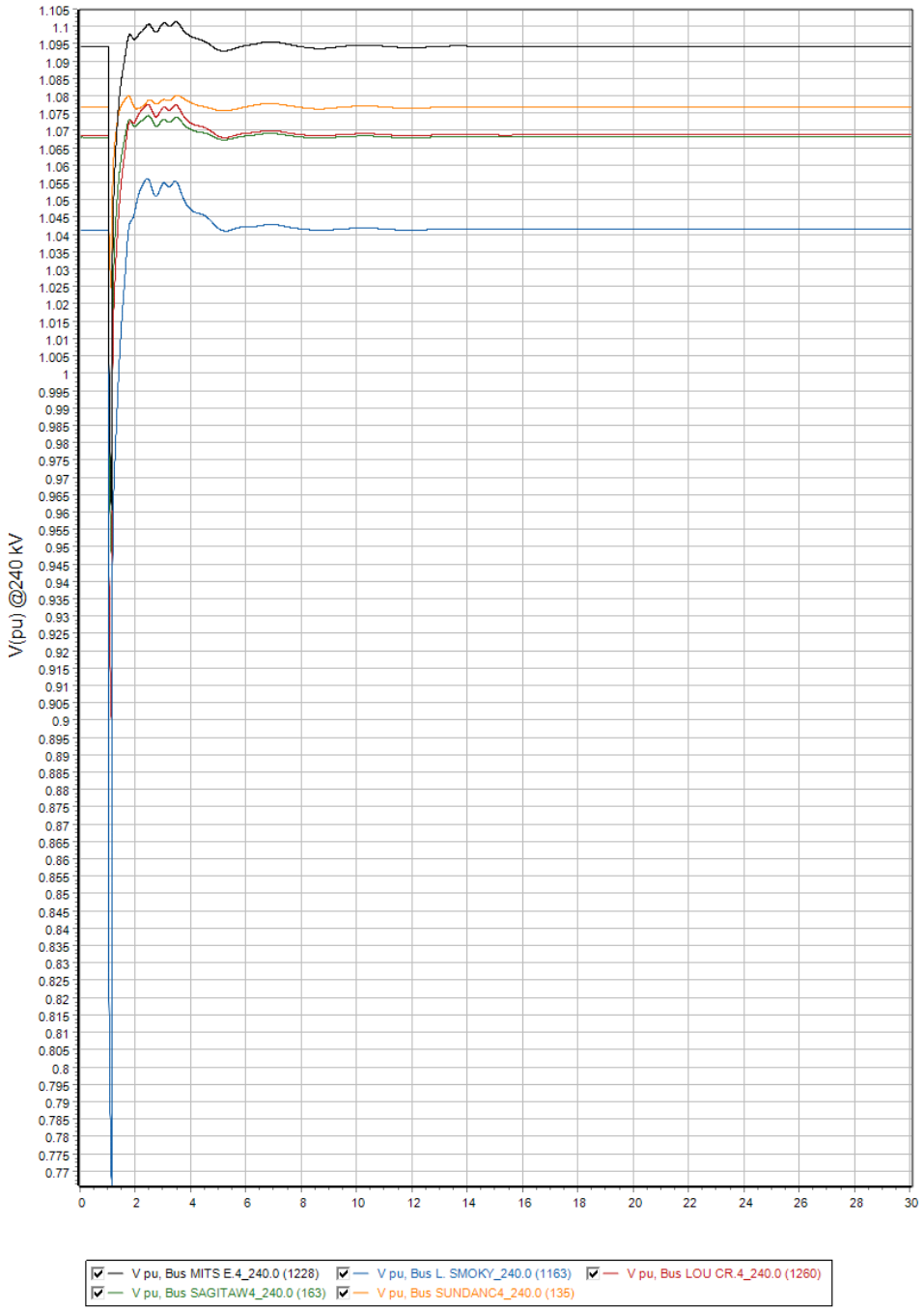


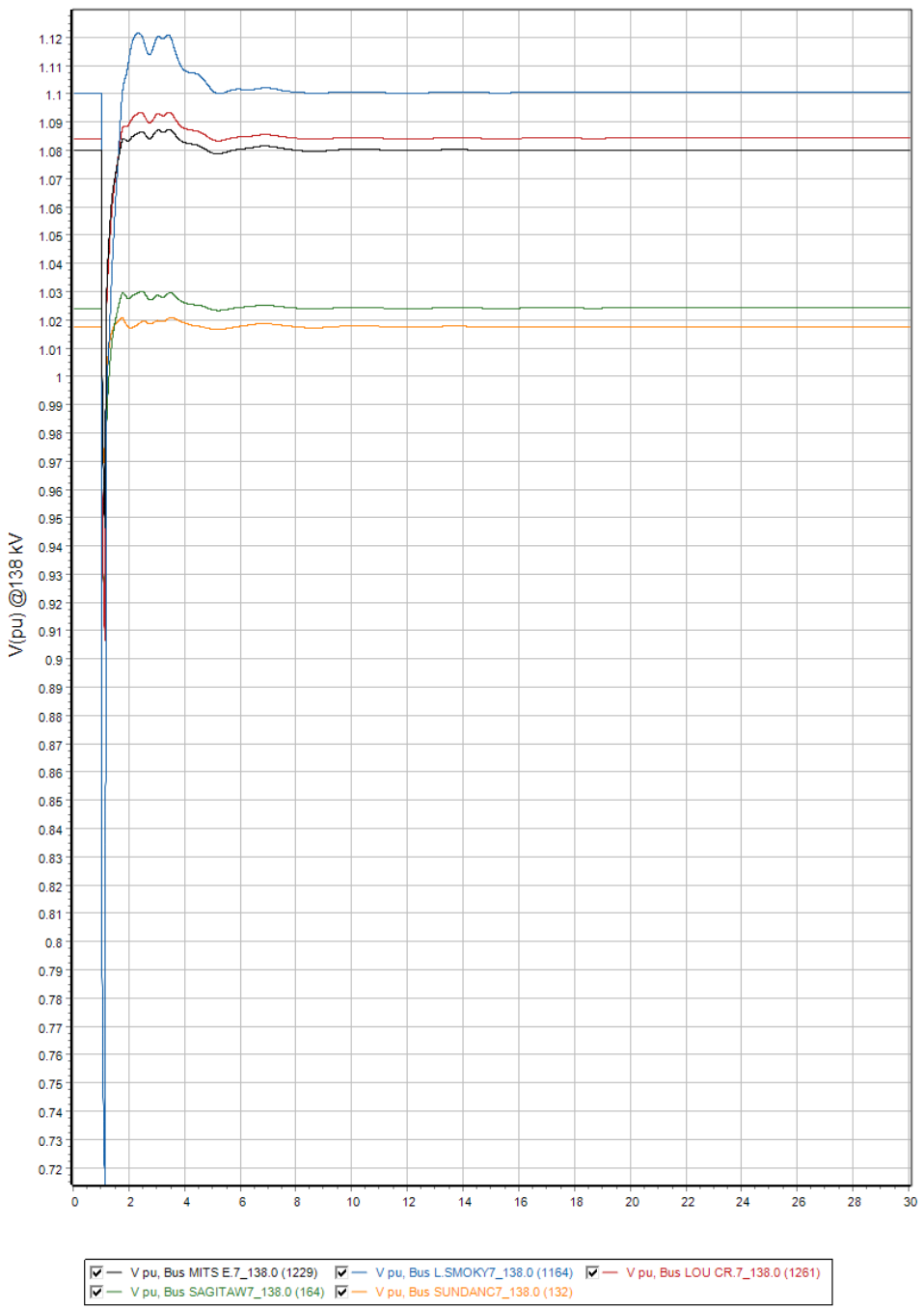


SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

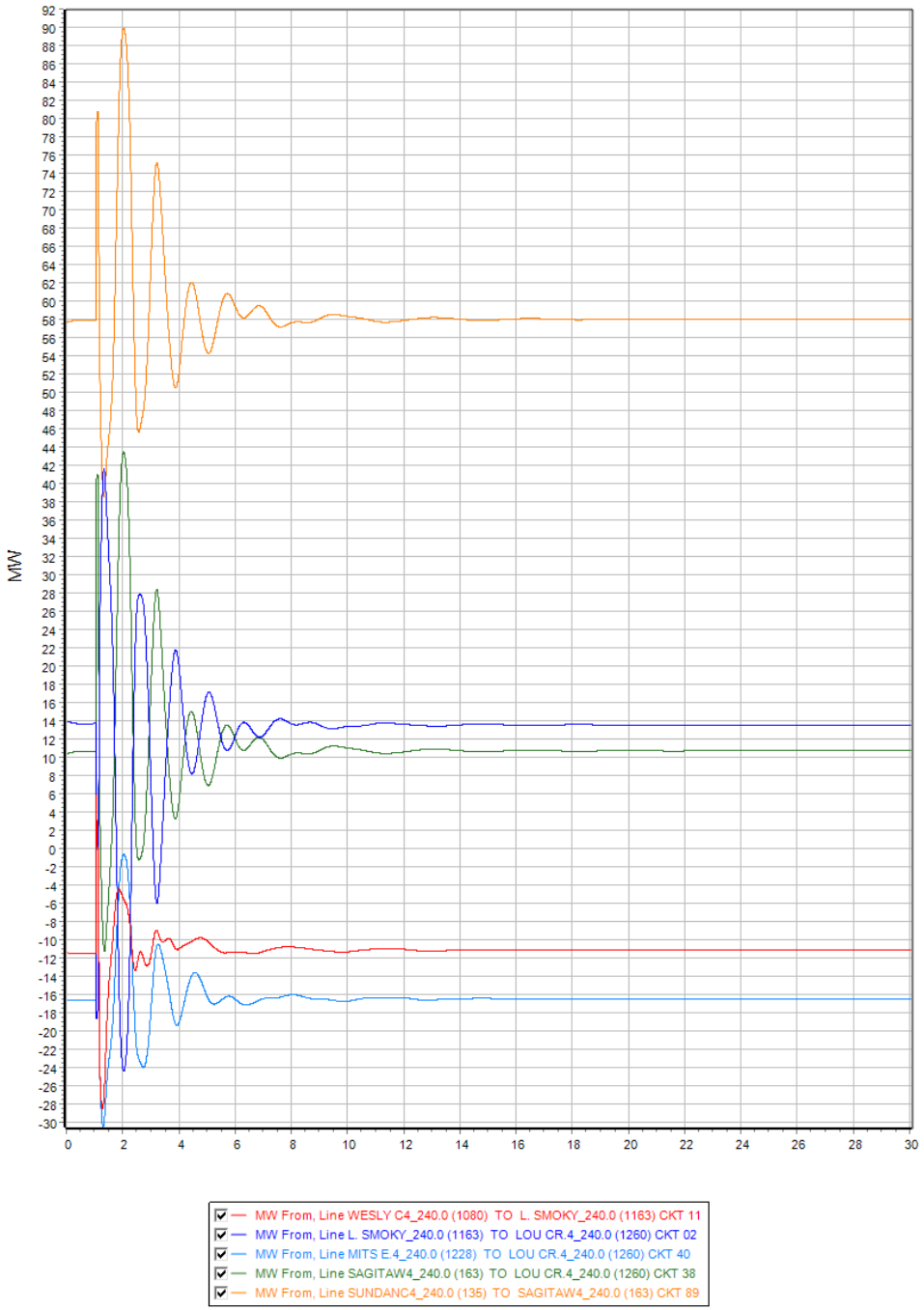
Contingency: 05B - 7L46 (Little Smoky 813S – Big Mountain 845S) @ Big Mountain 845S

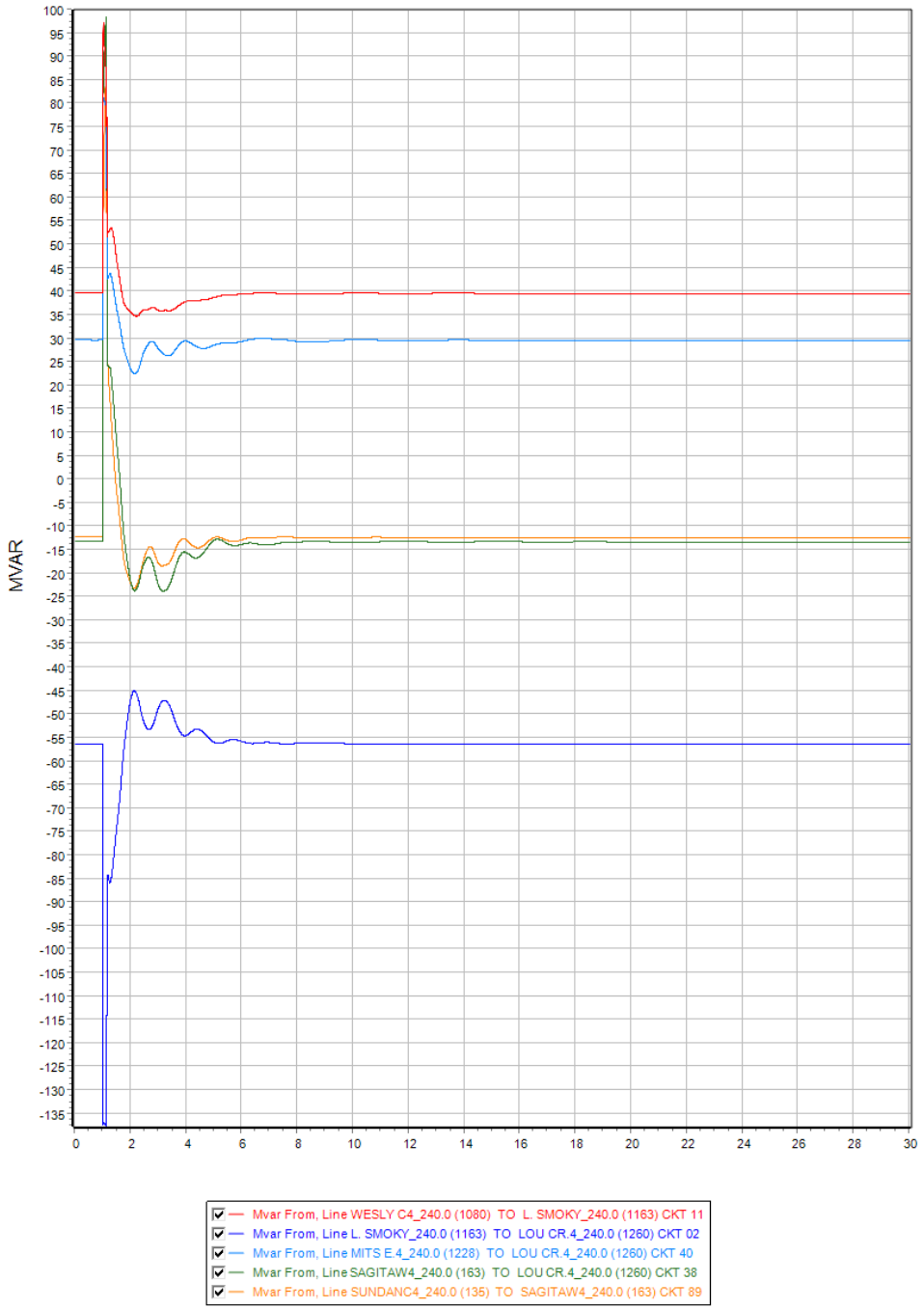
Monitor Bus Volts Q3



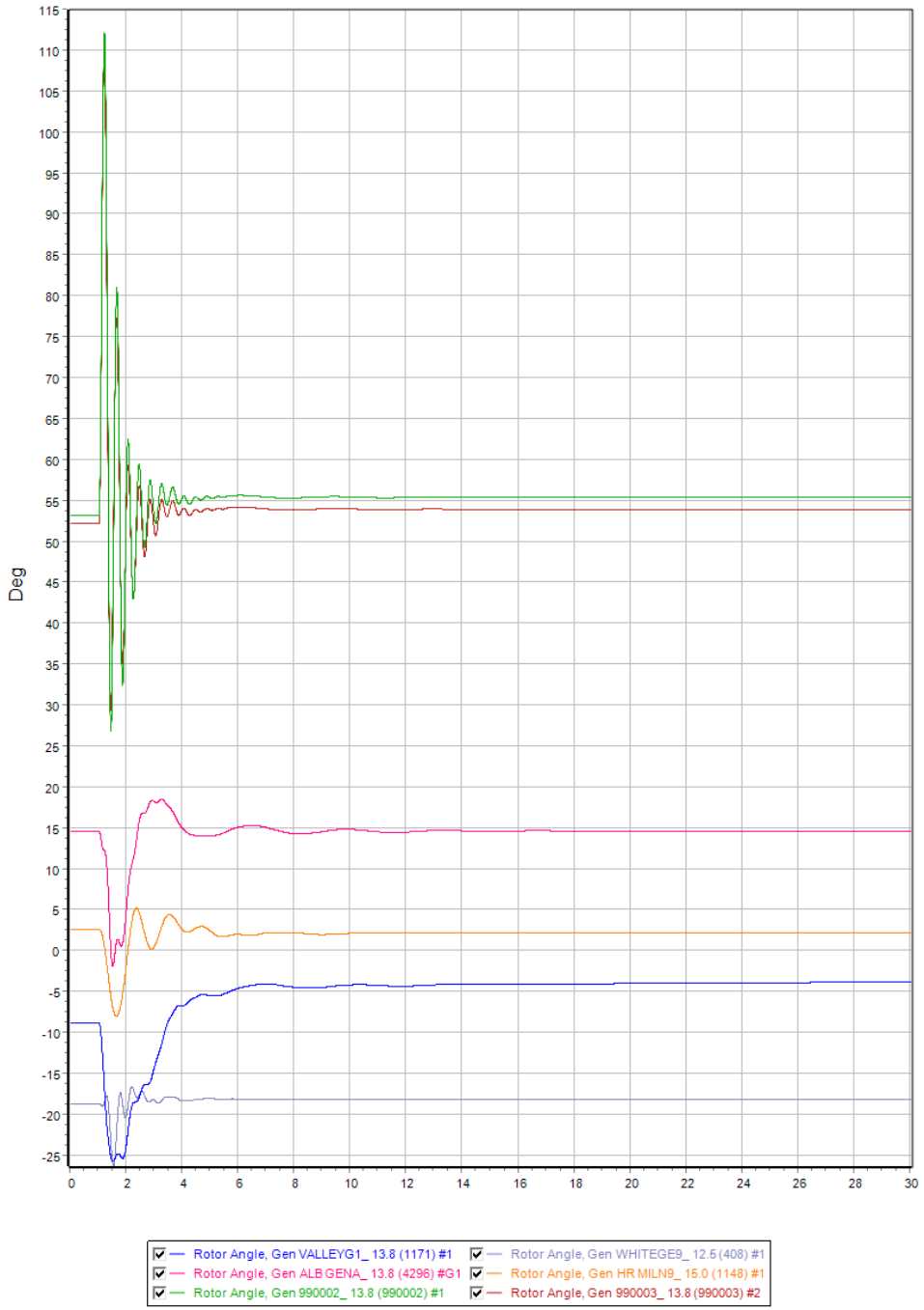


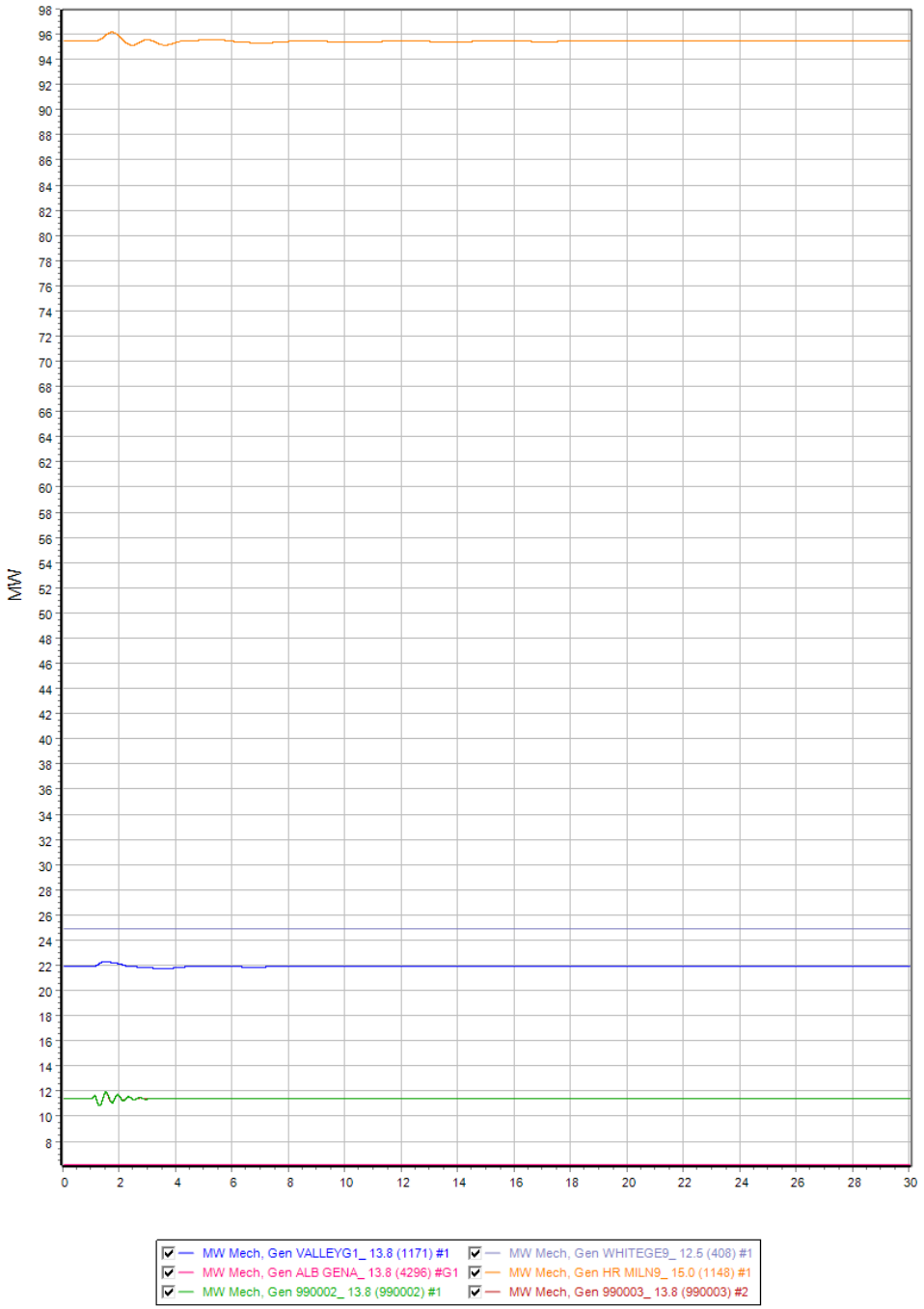
Monitor Line MW & MVAR. Q4



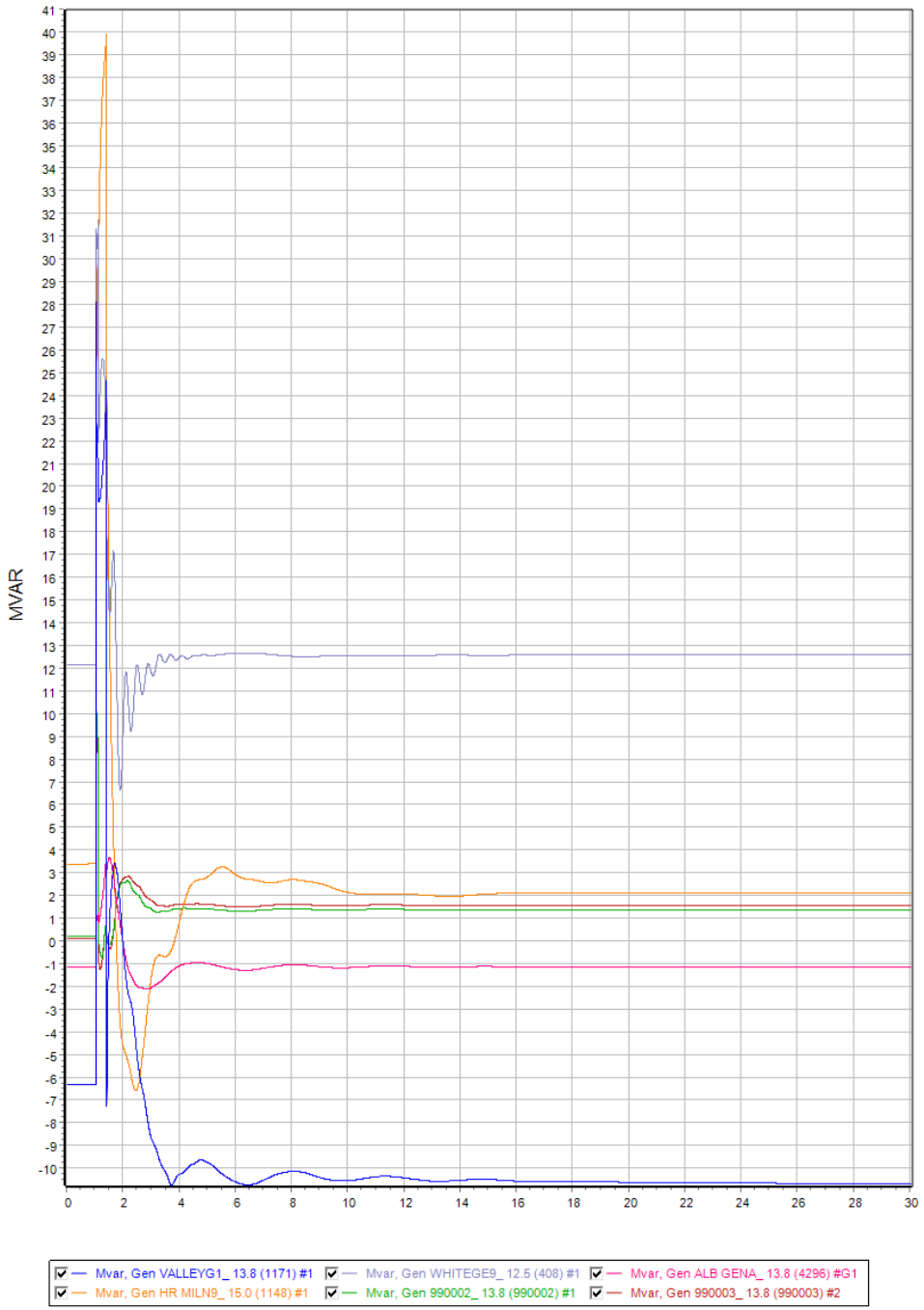


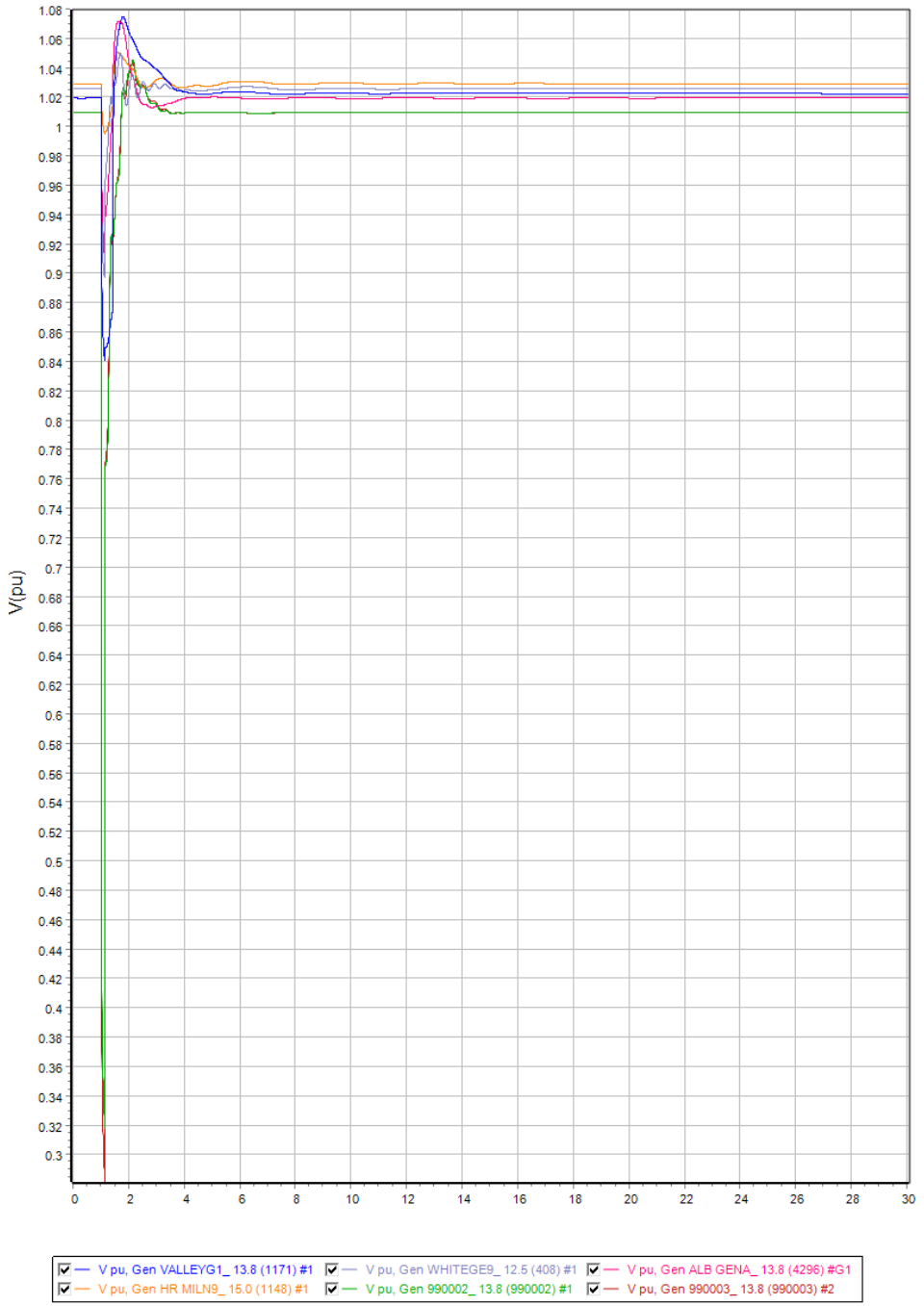
Monitor Gens. Q1



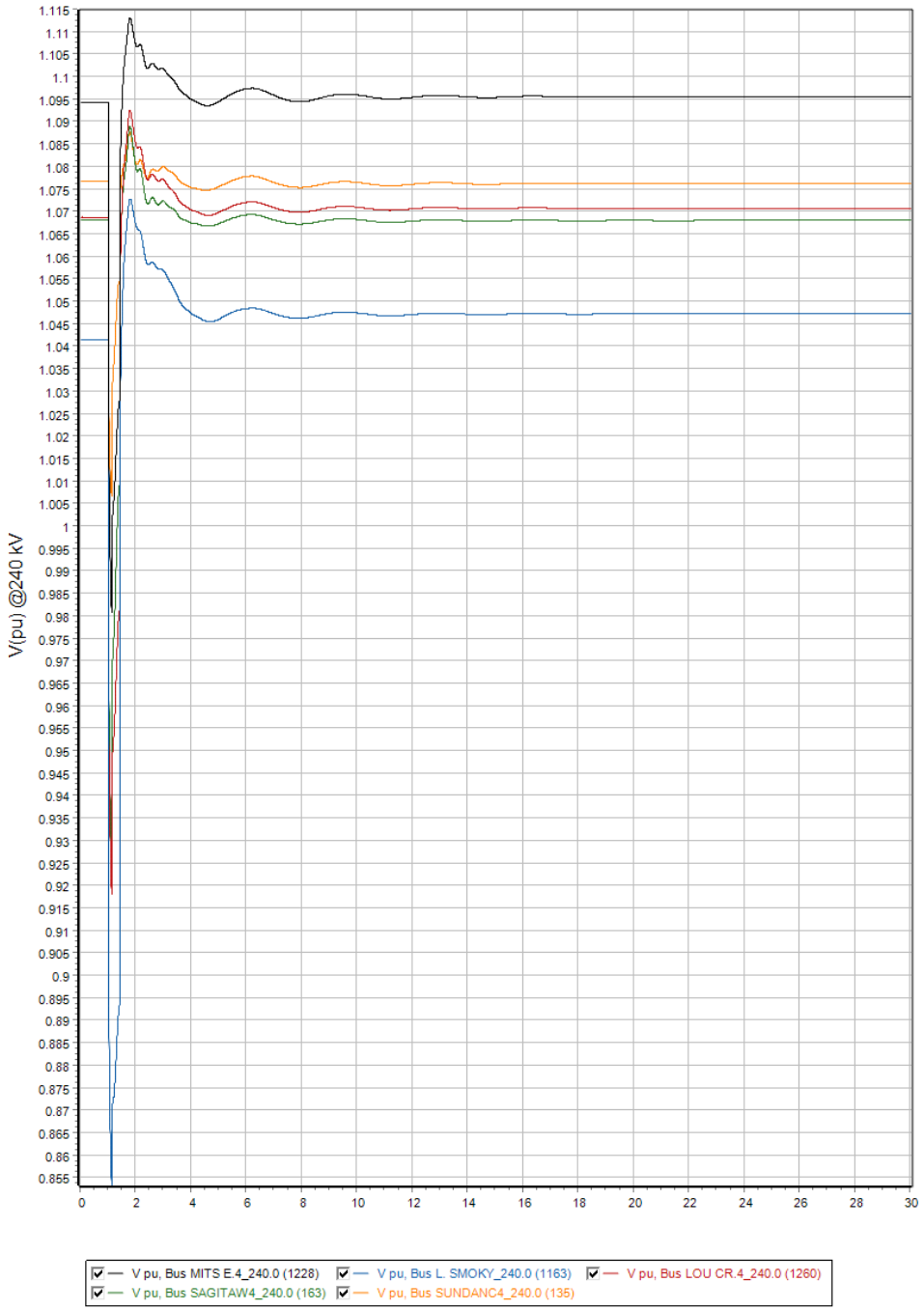


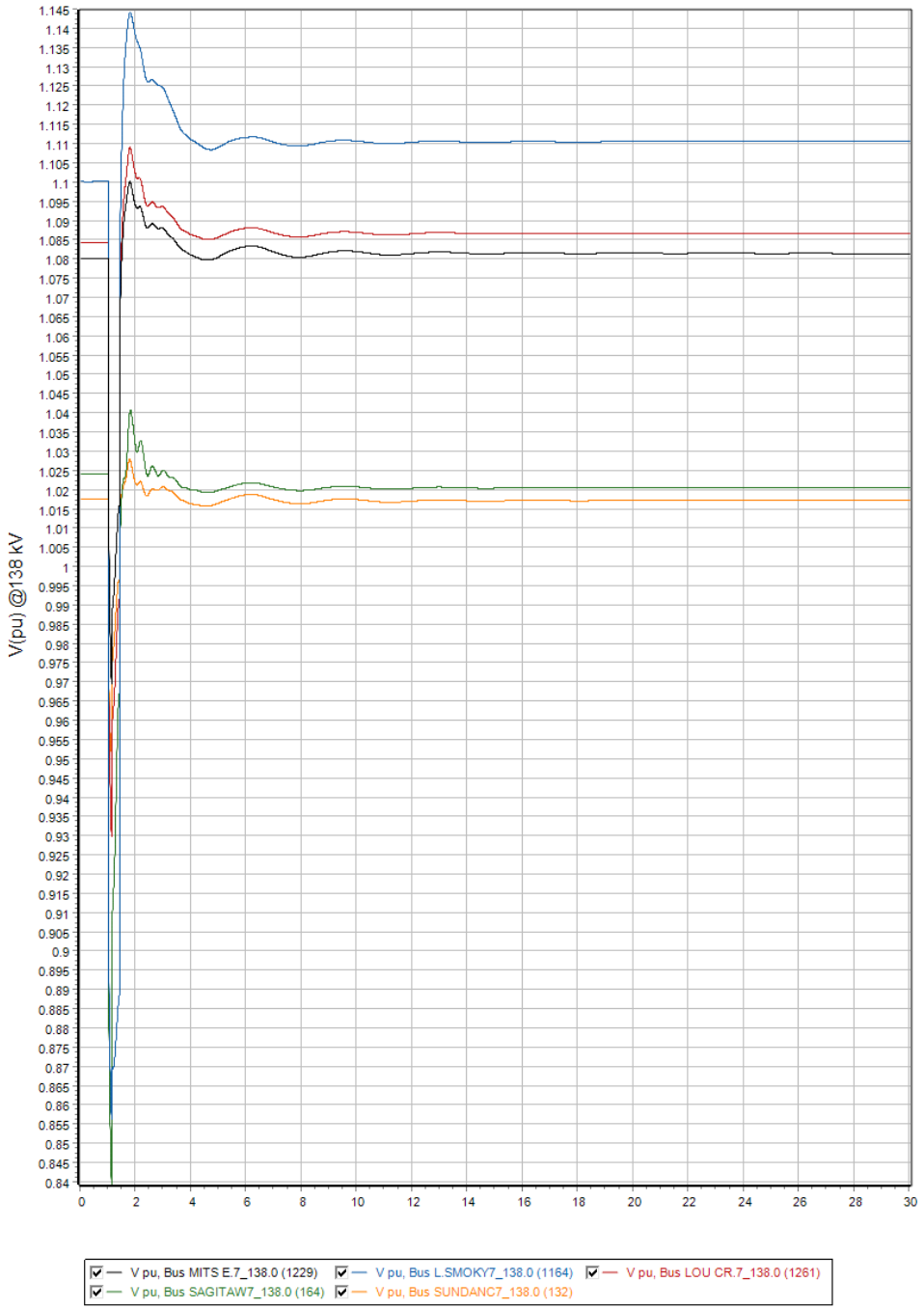
Monitor Gens. Q2



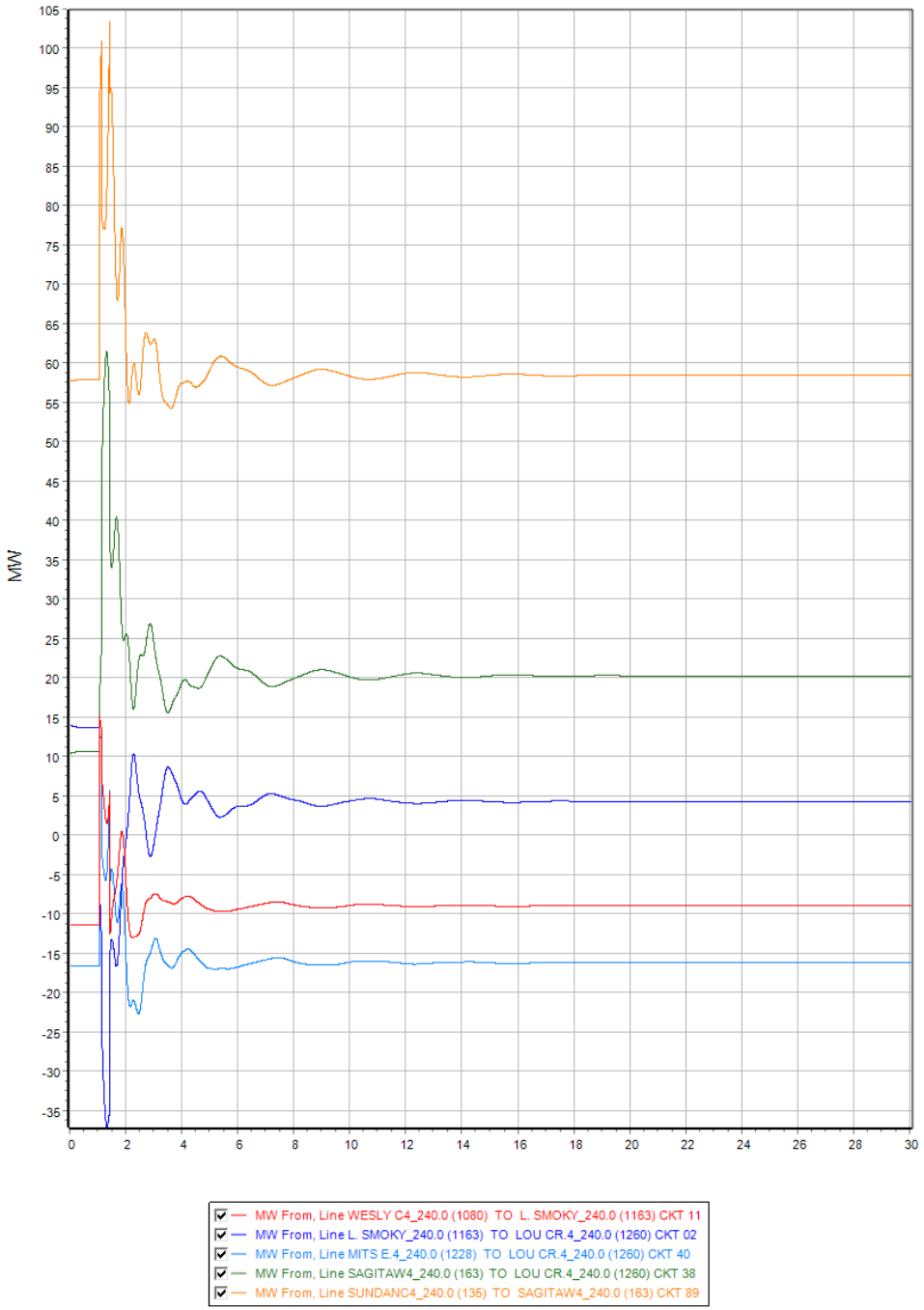


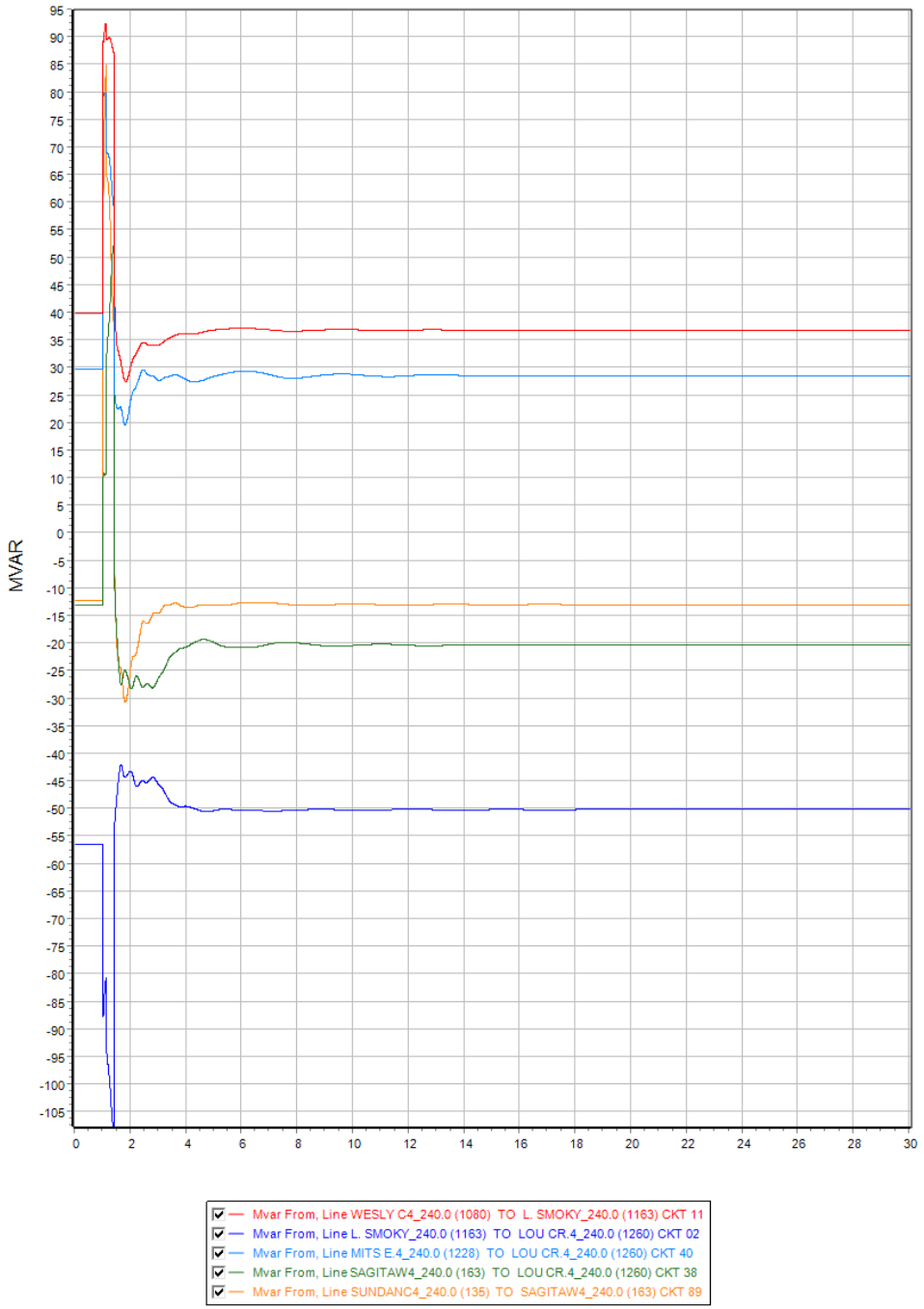
Monitor Bus Volts Q3



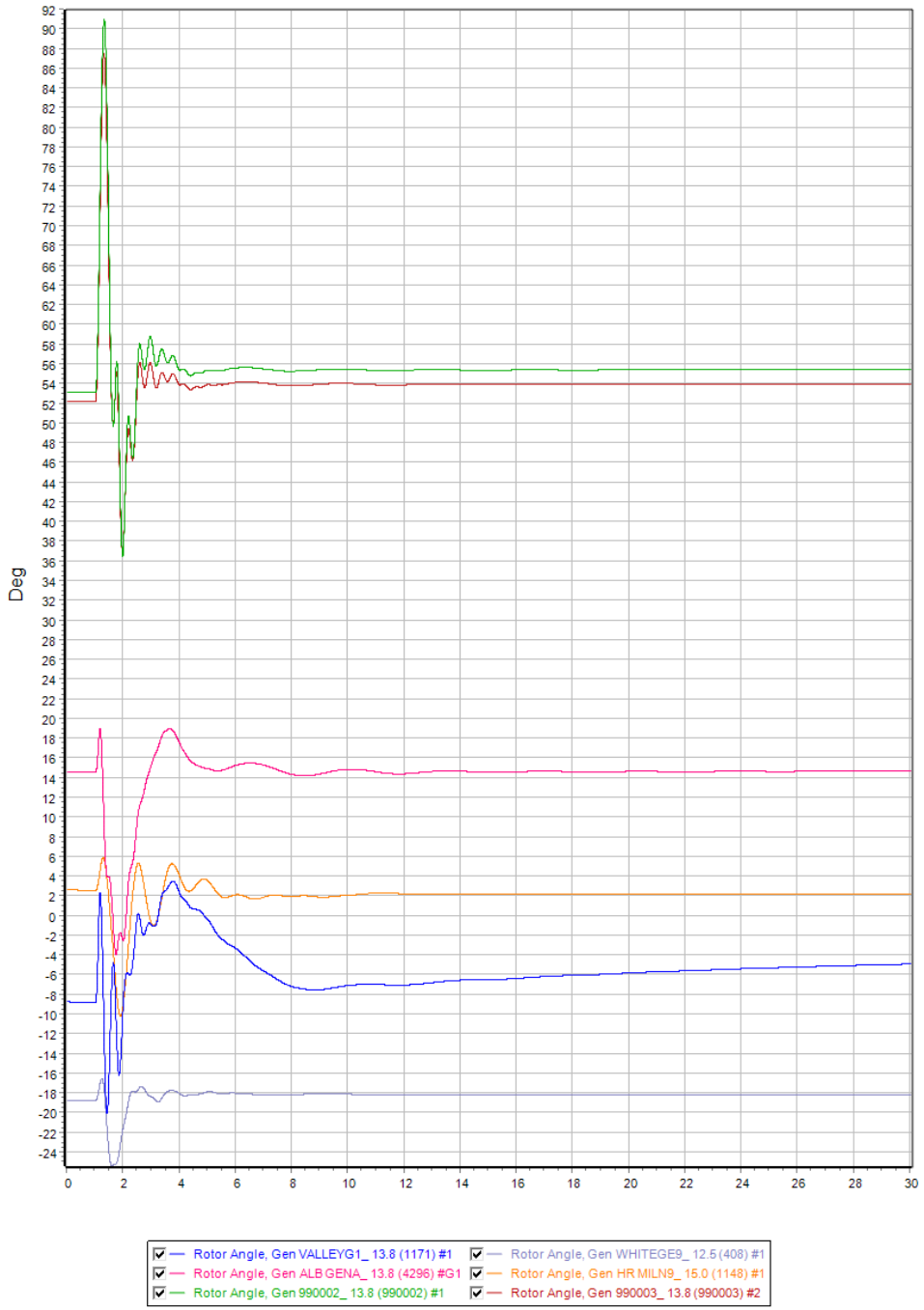


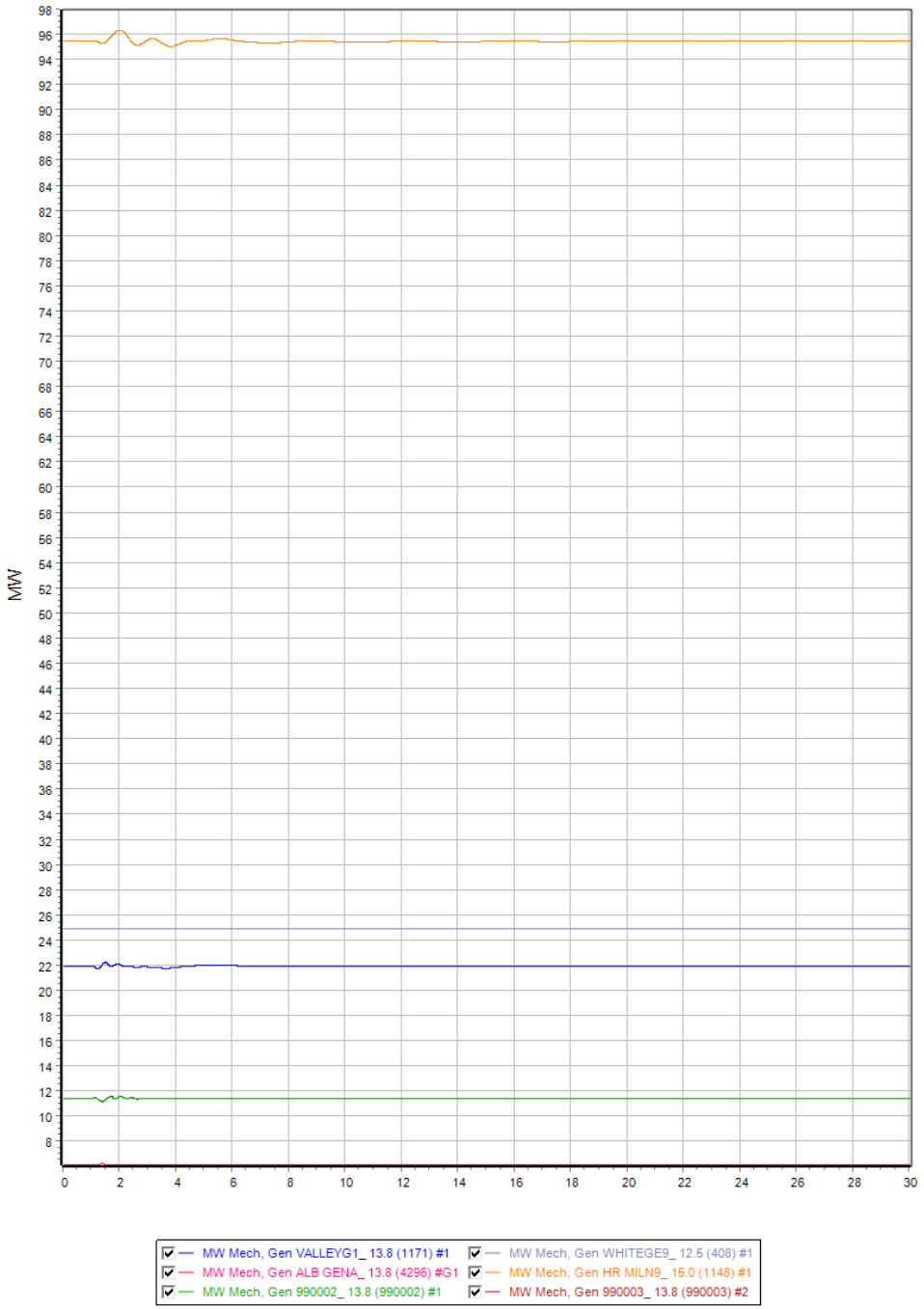
Monitor Line MW & MVAR. Q4



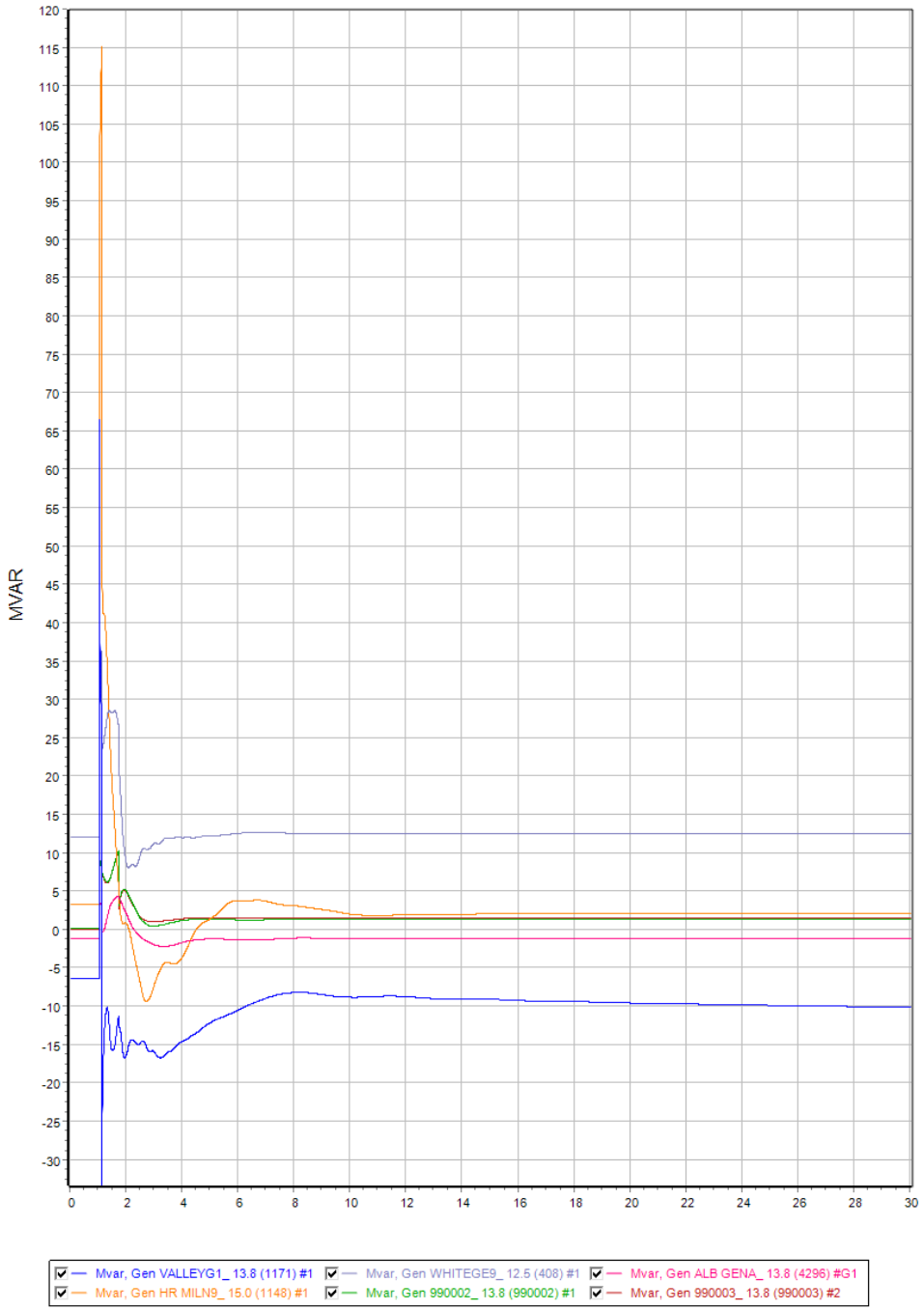


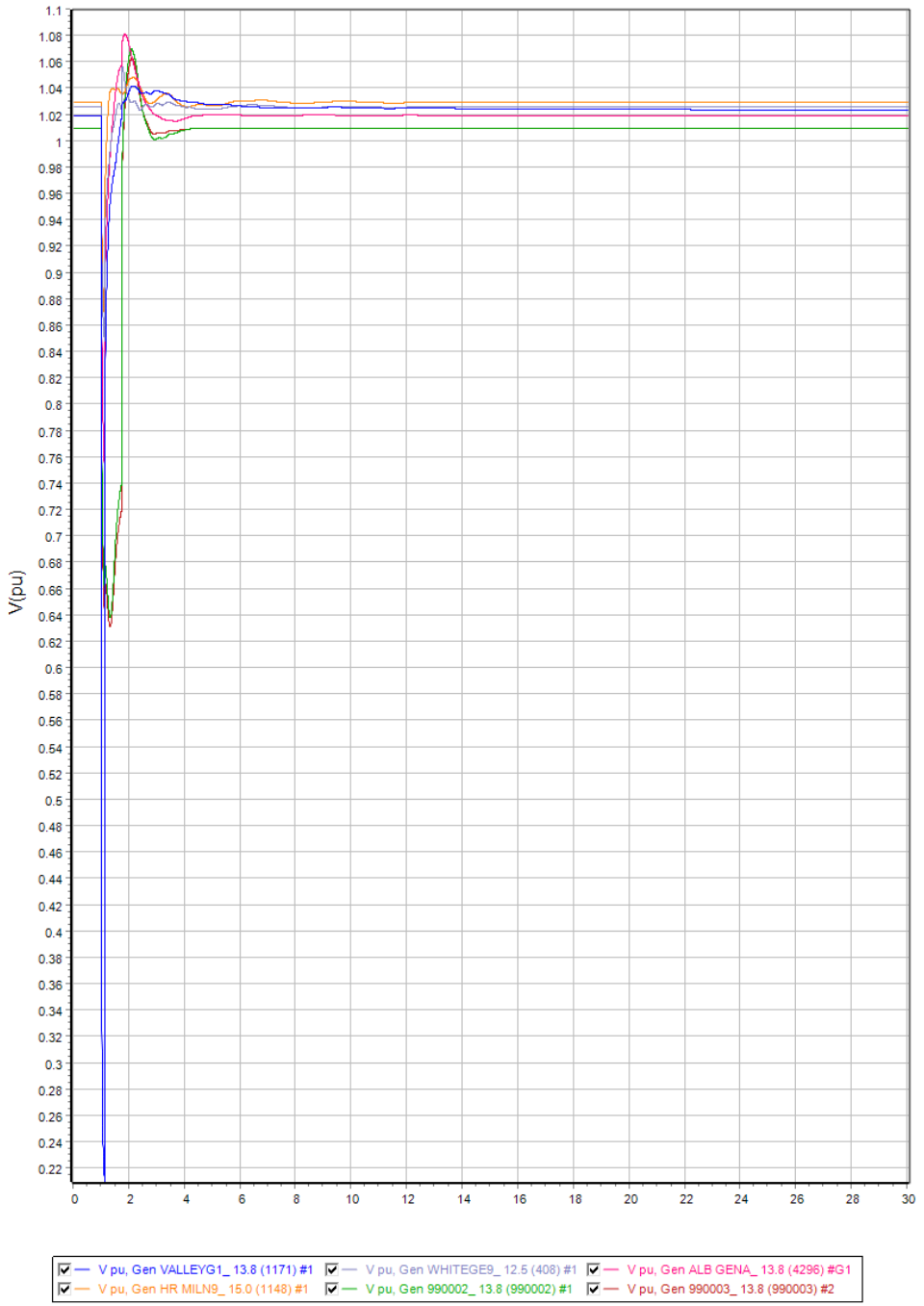
Monitor Gens. Q1





Monitor Gens. Q2

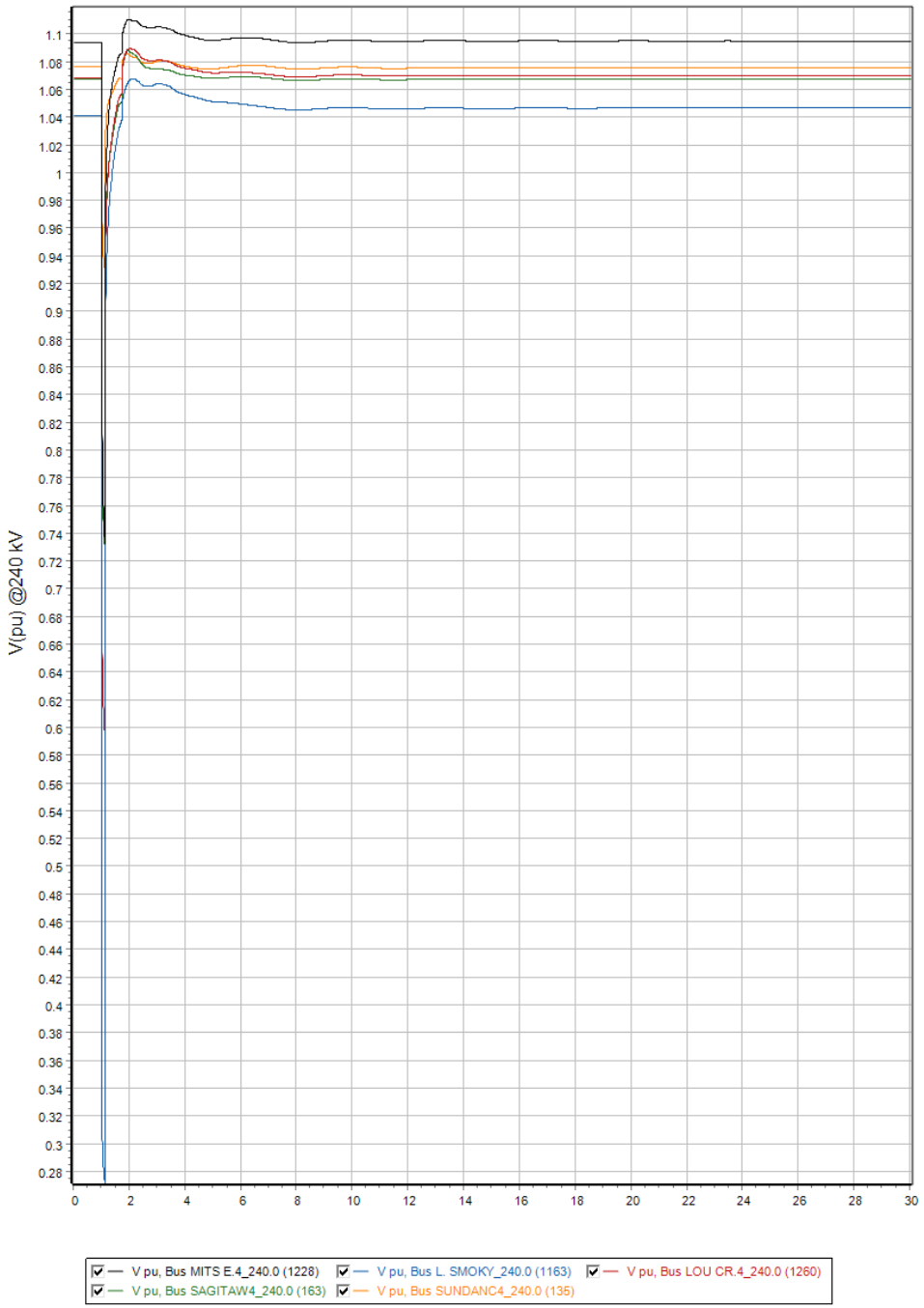


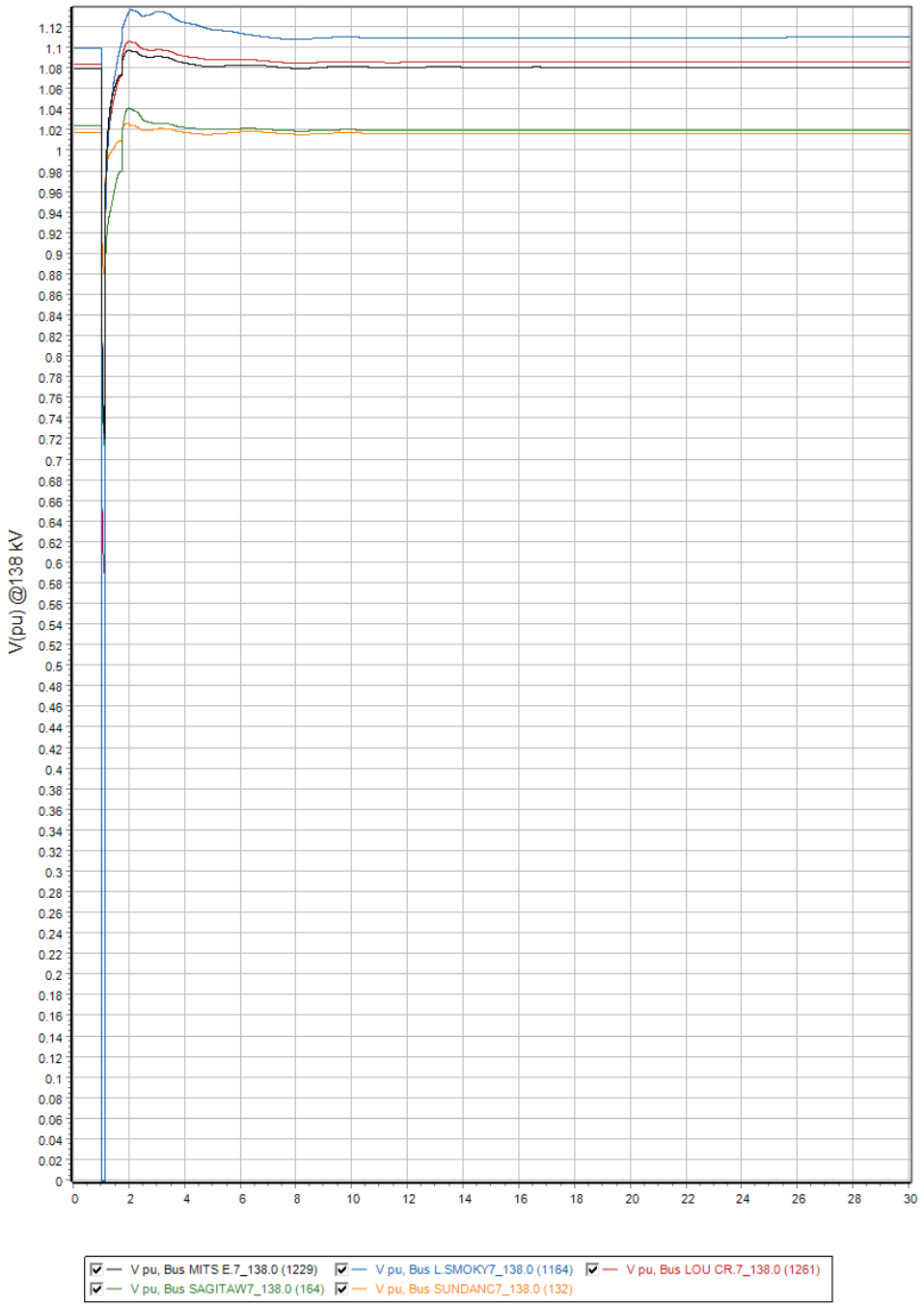


SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

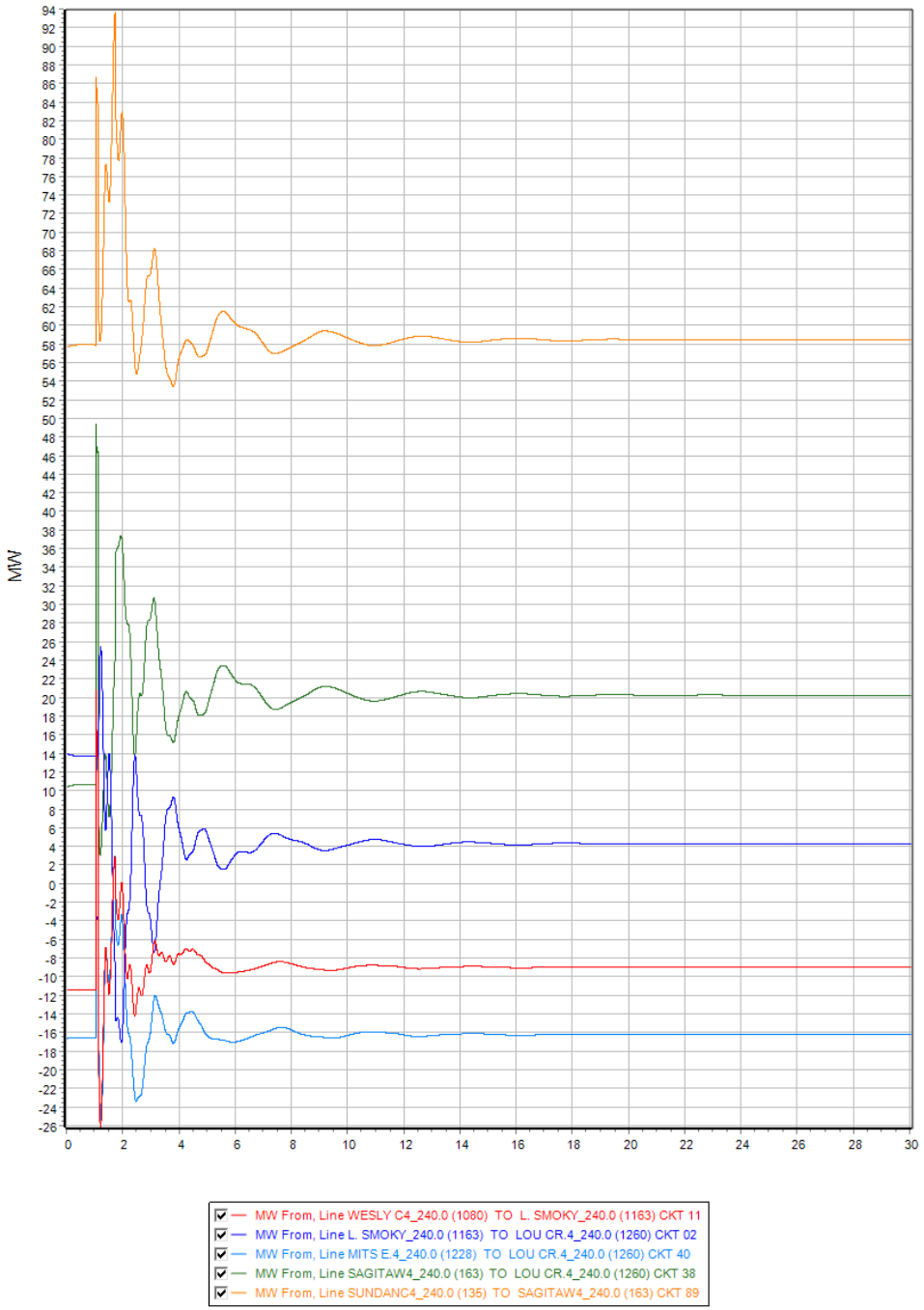
Contingency: 06B - 7L90 (Fox Creek 741S – Little Smoky 813S) @ Little Smoky 813S

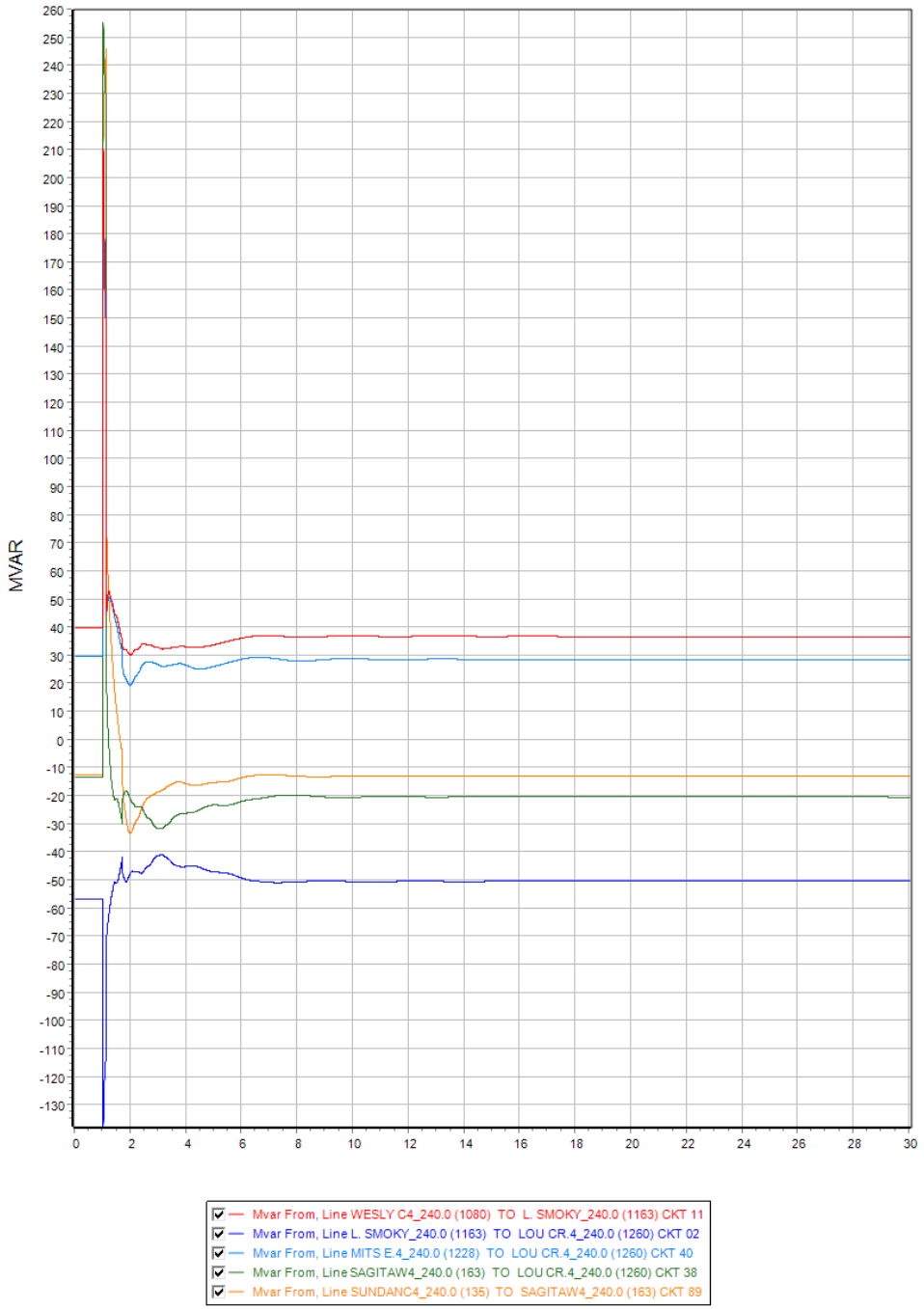
Monitor Bus Volts Q3



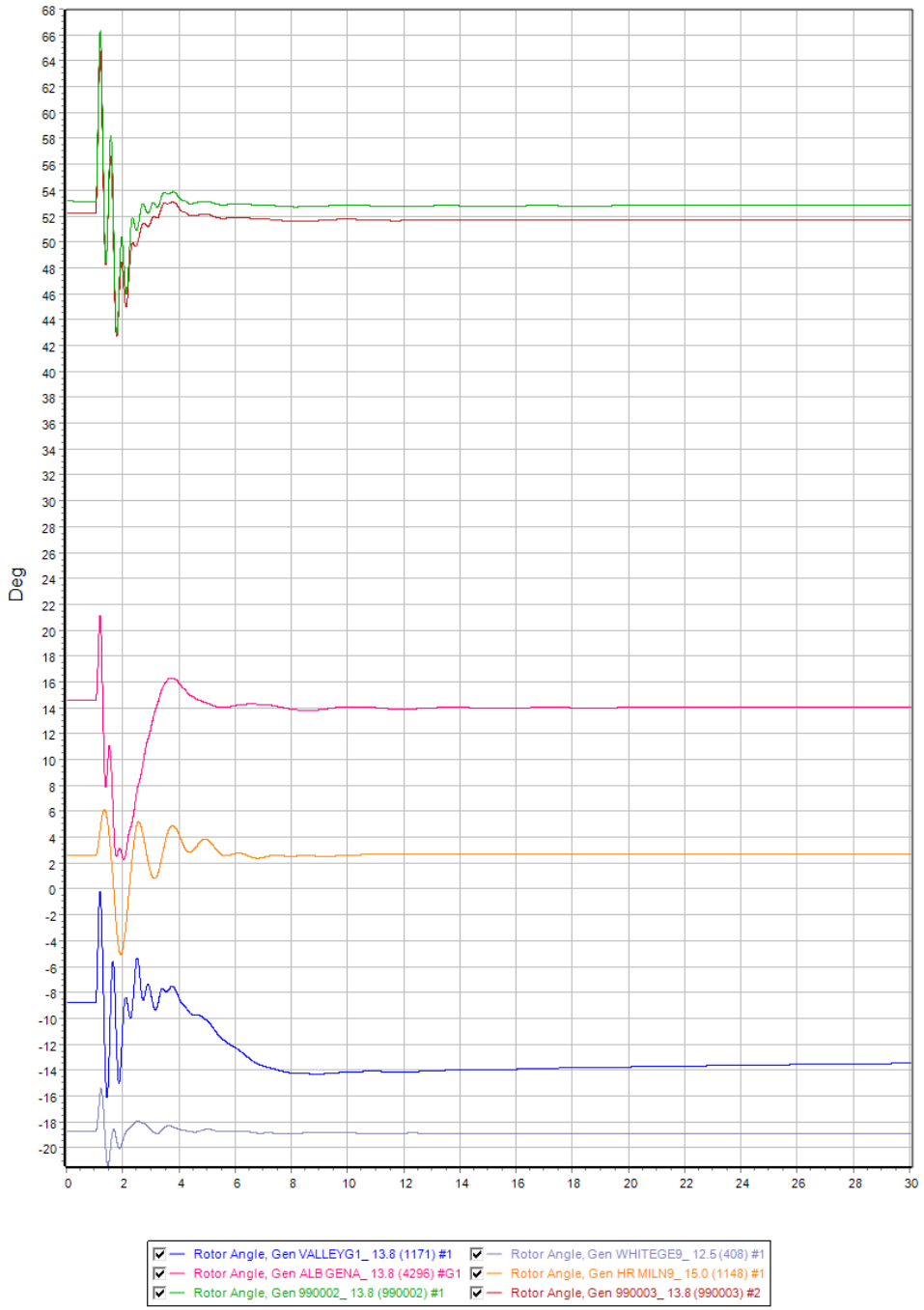


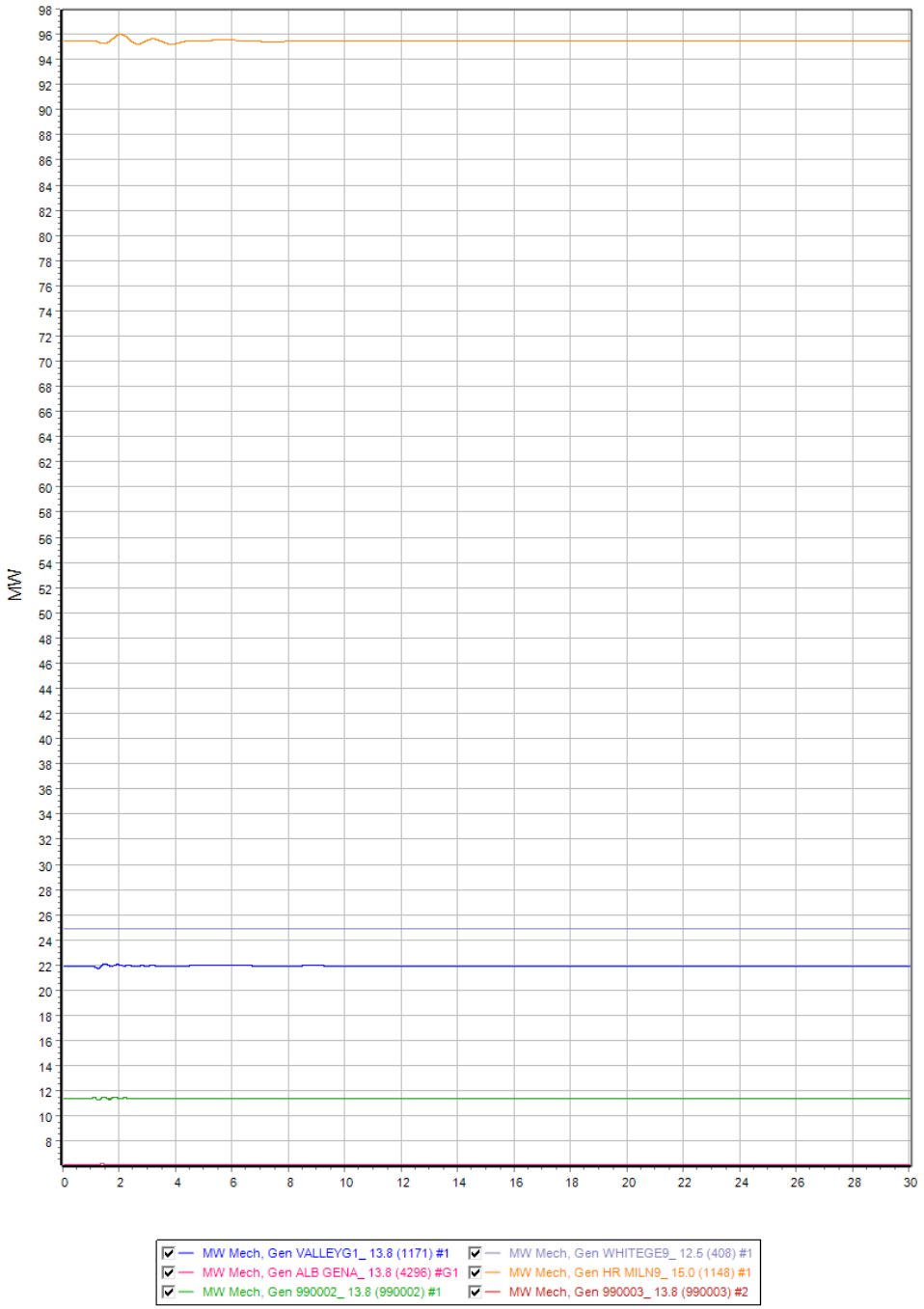
Monitor Line MW & MVAR. Q4



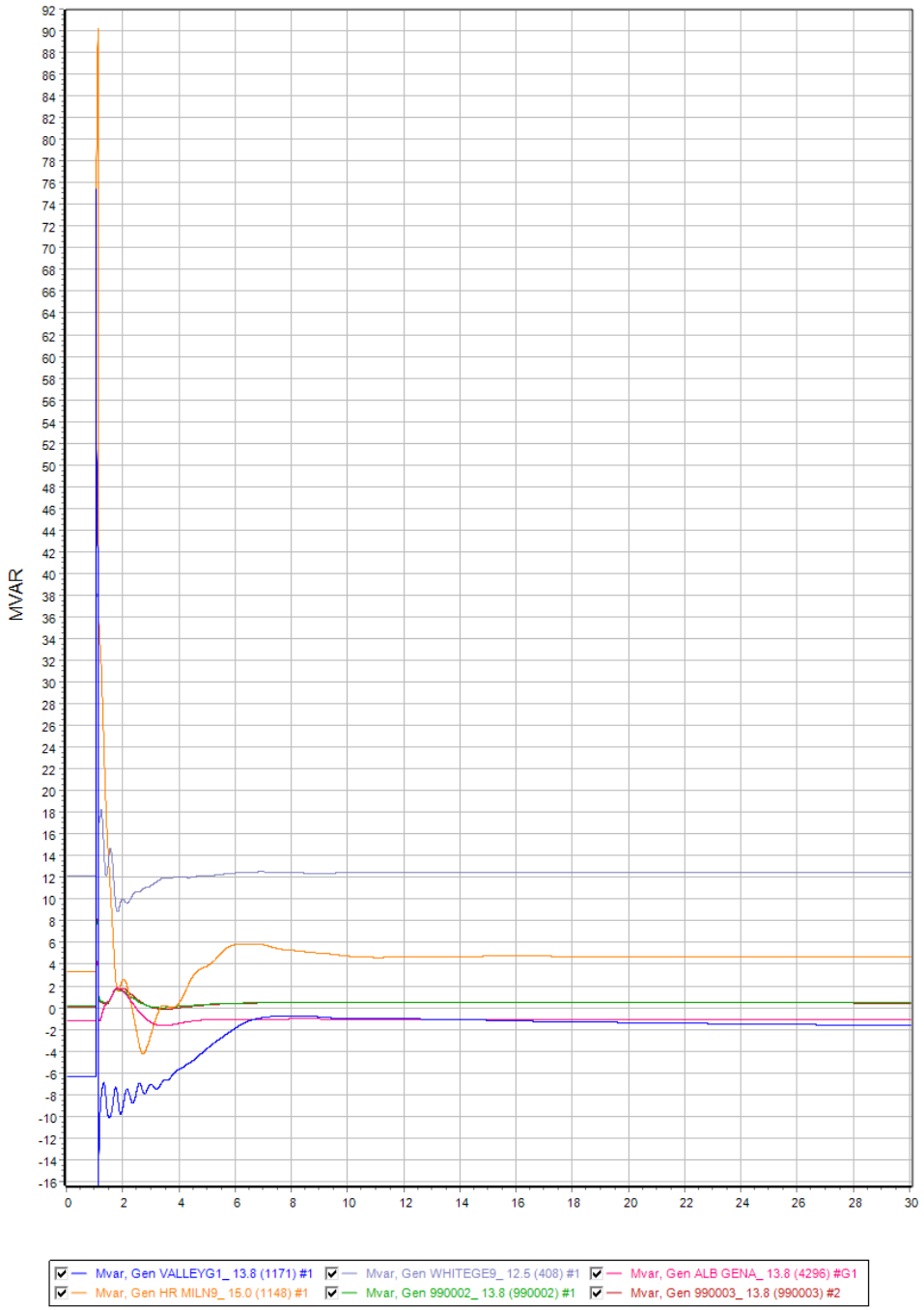


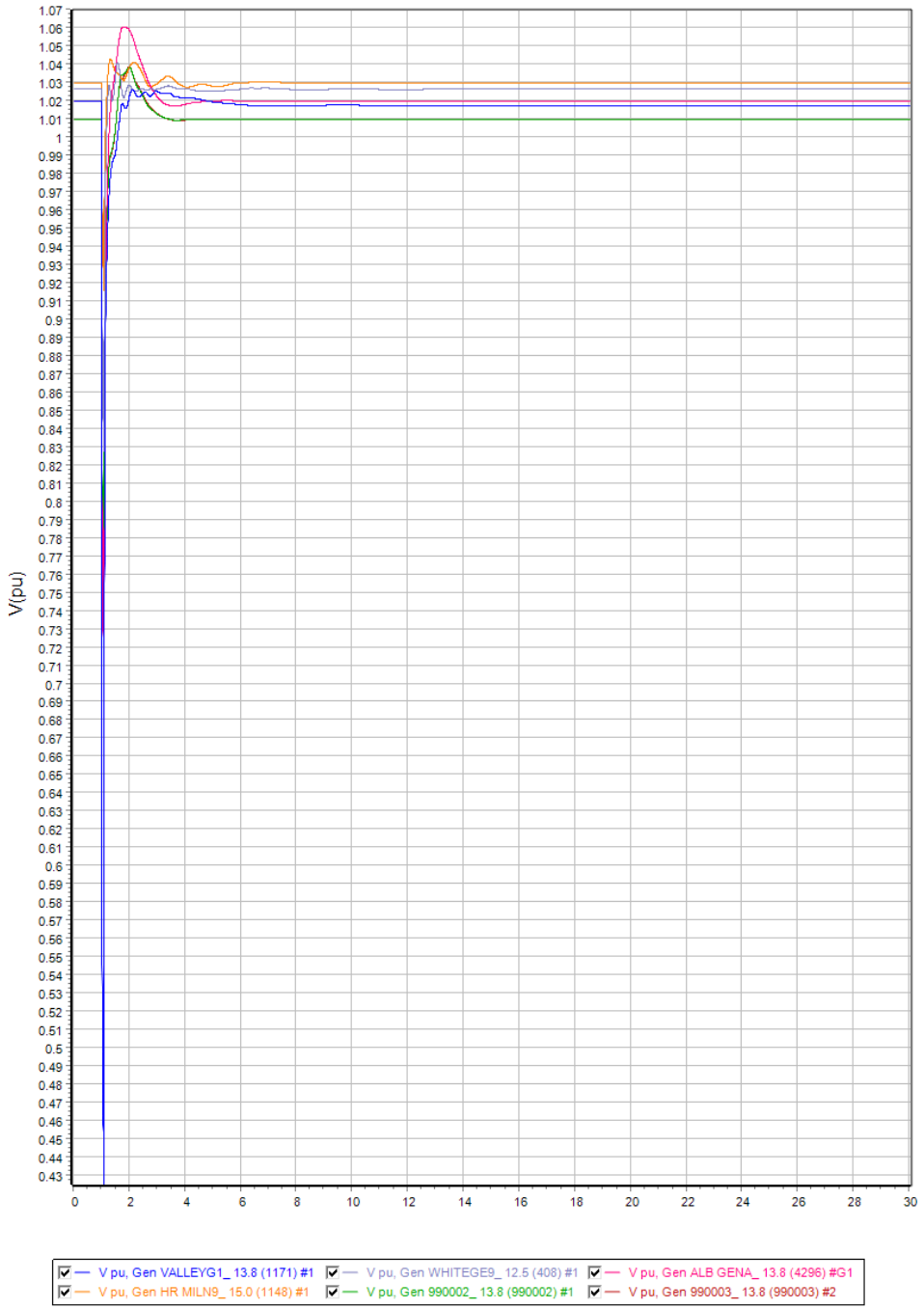
Monitor Gens. Q1



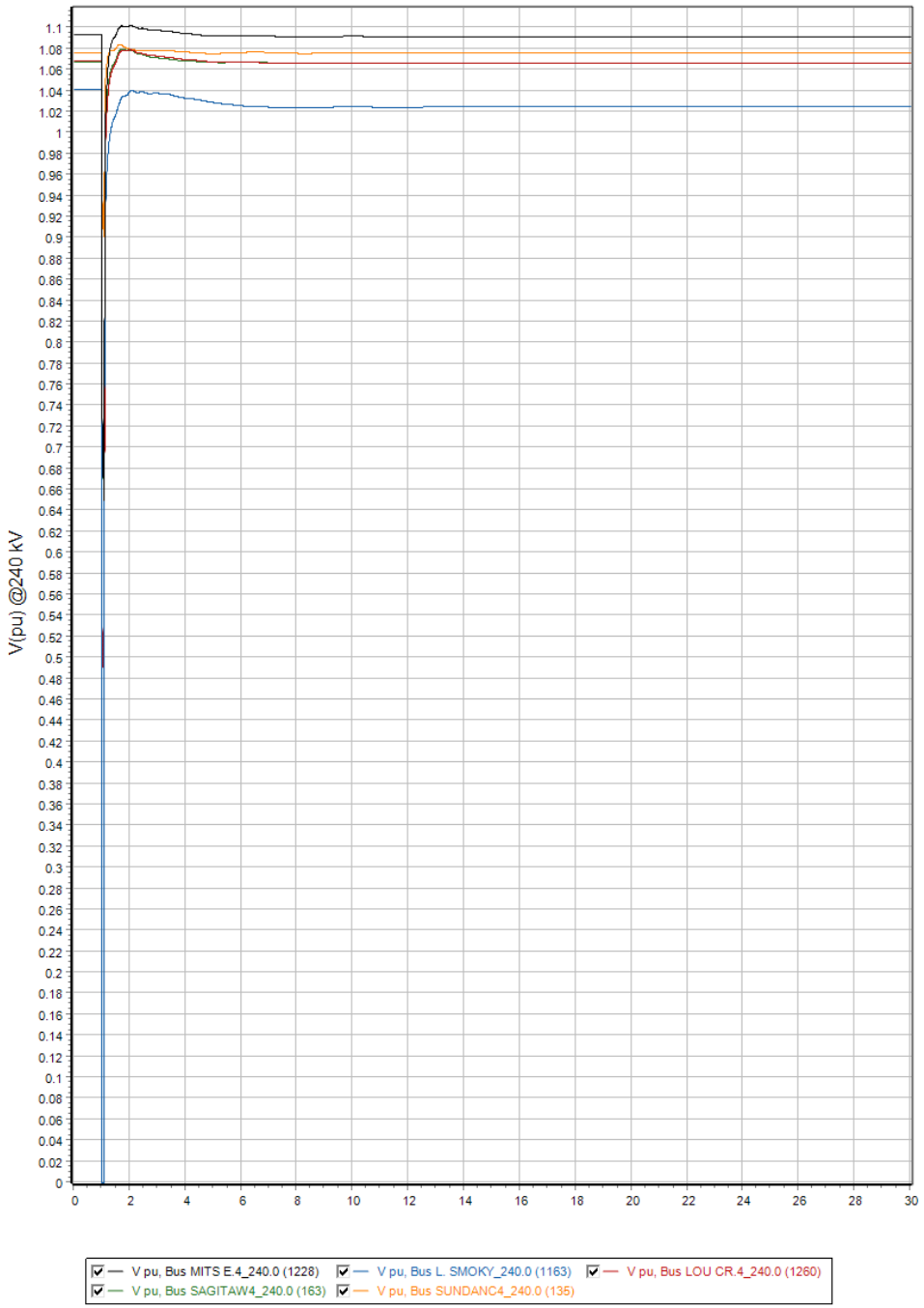


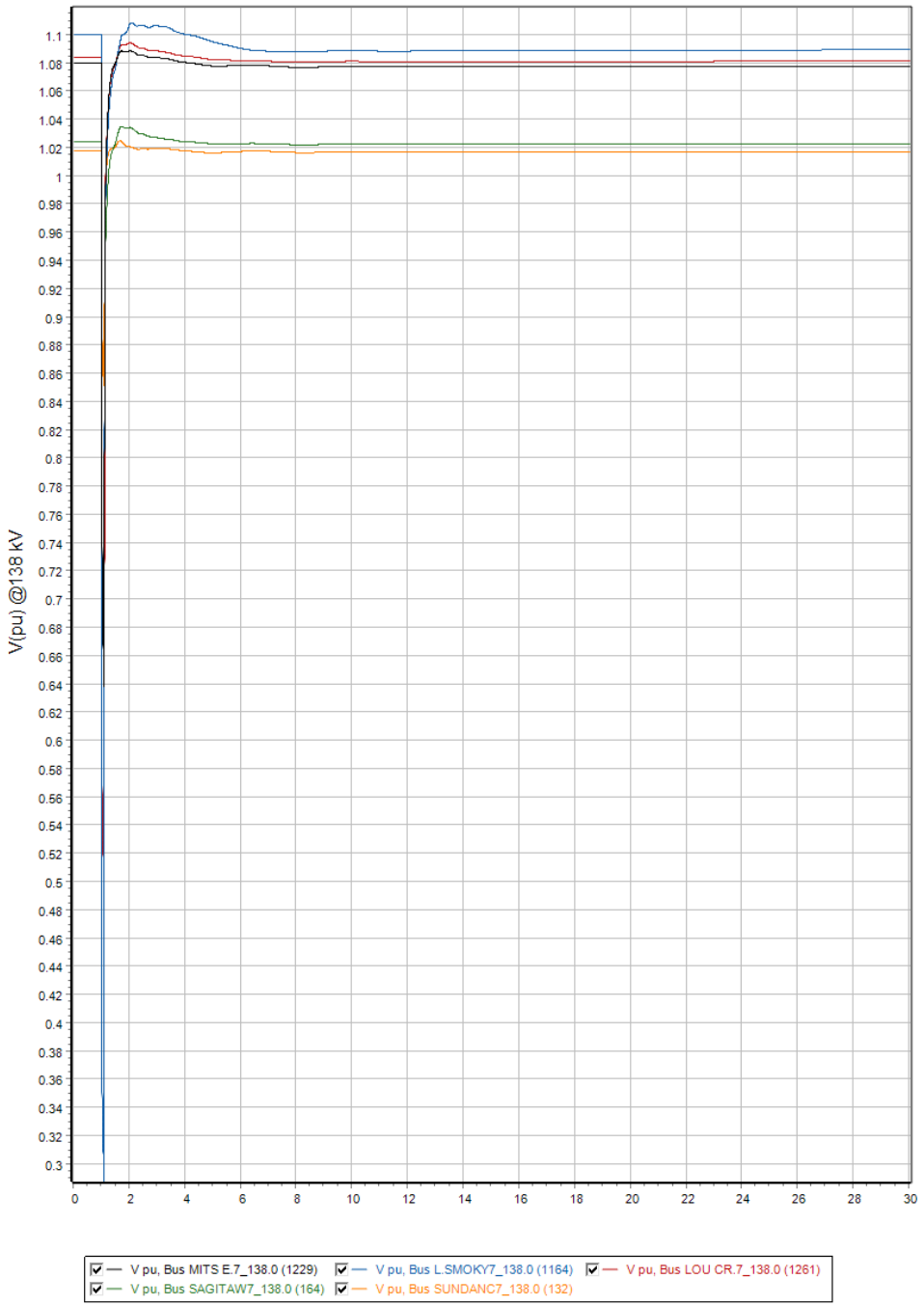
Monitor Gens. Q2



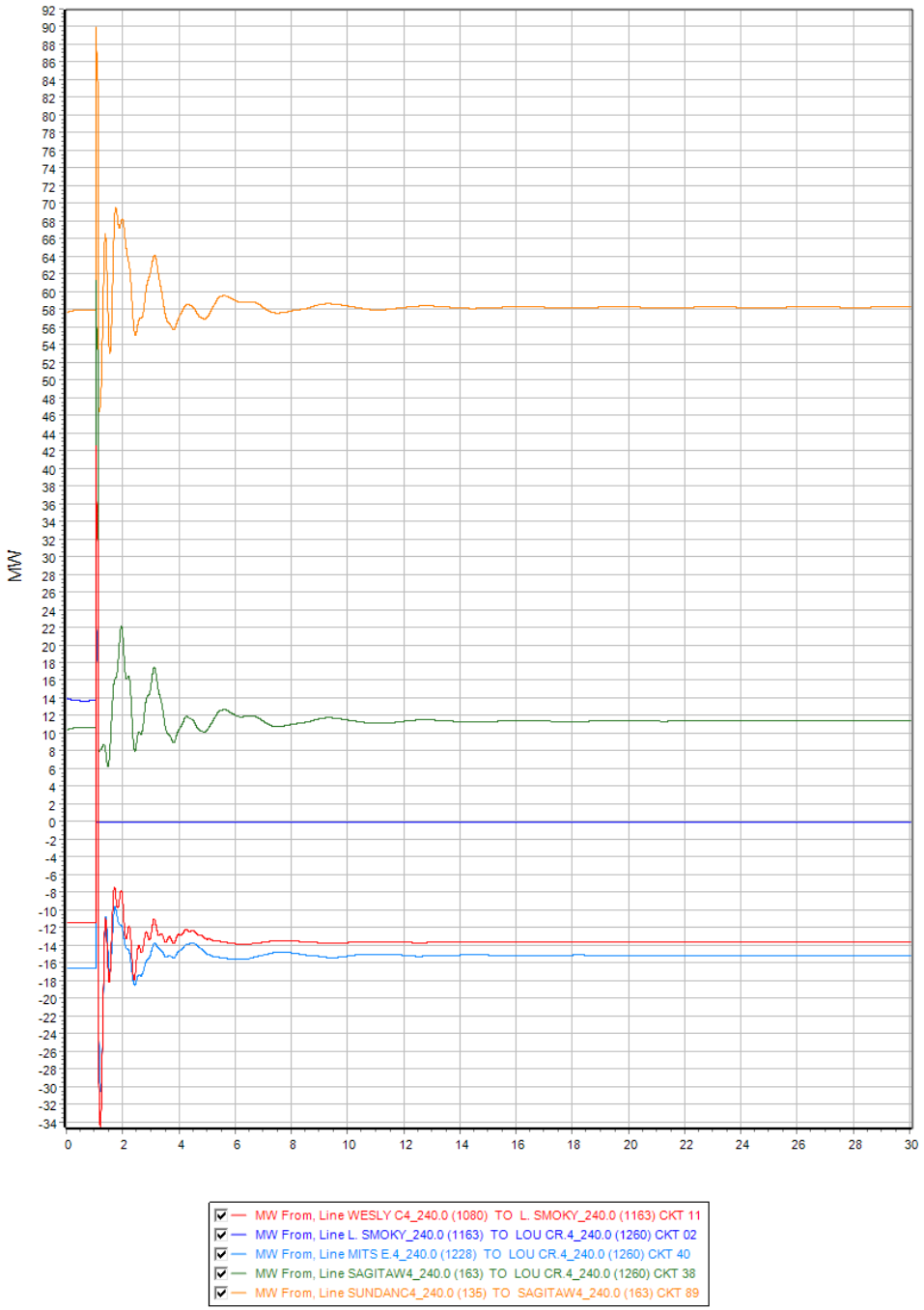


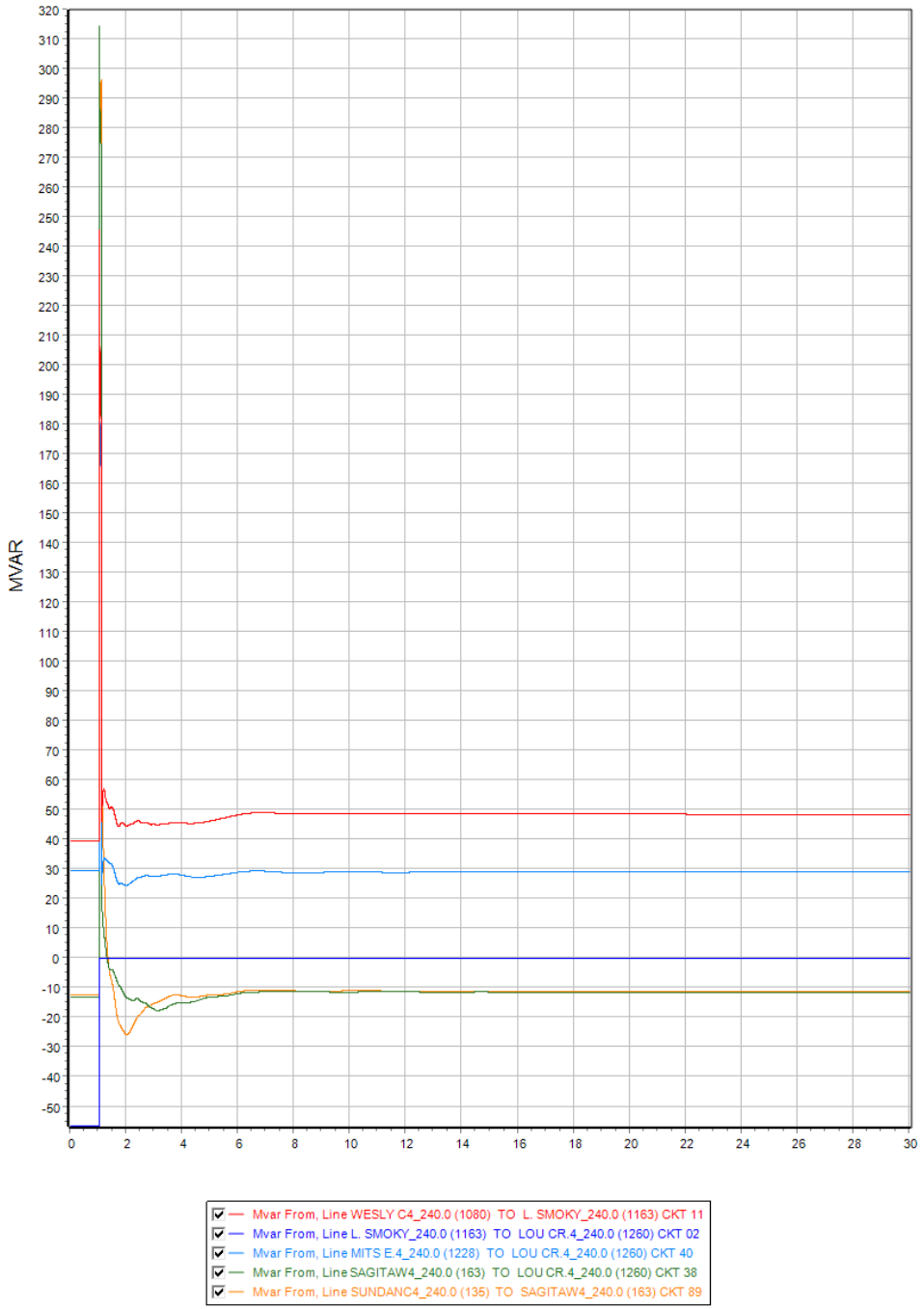
Monitor Bus Volts Q3



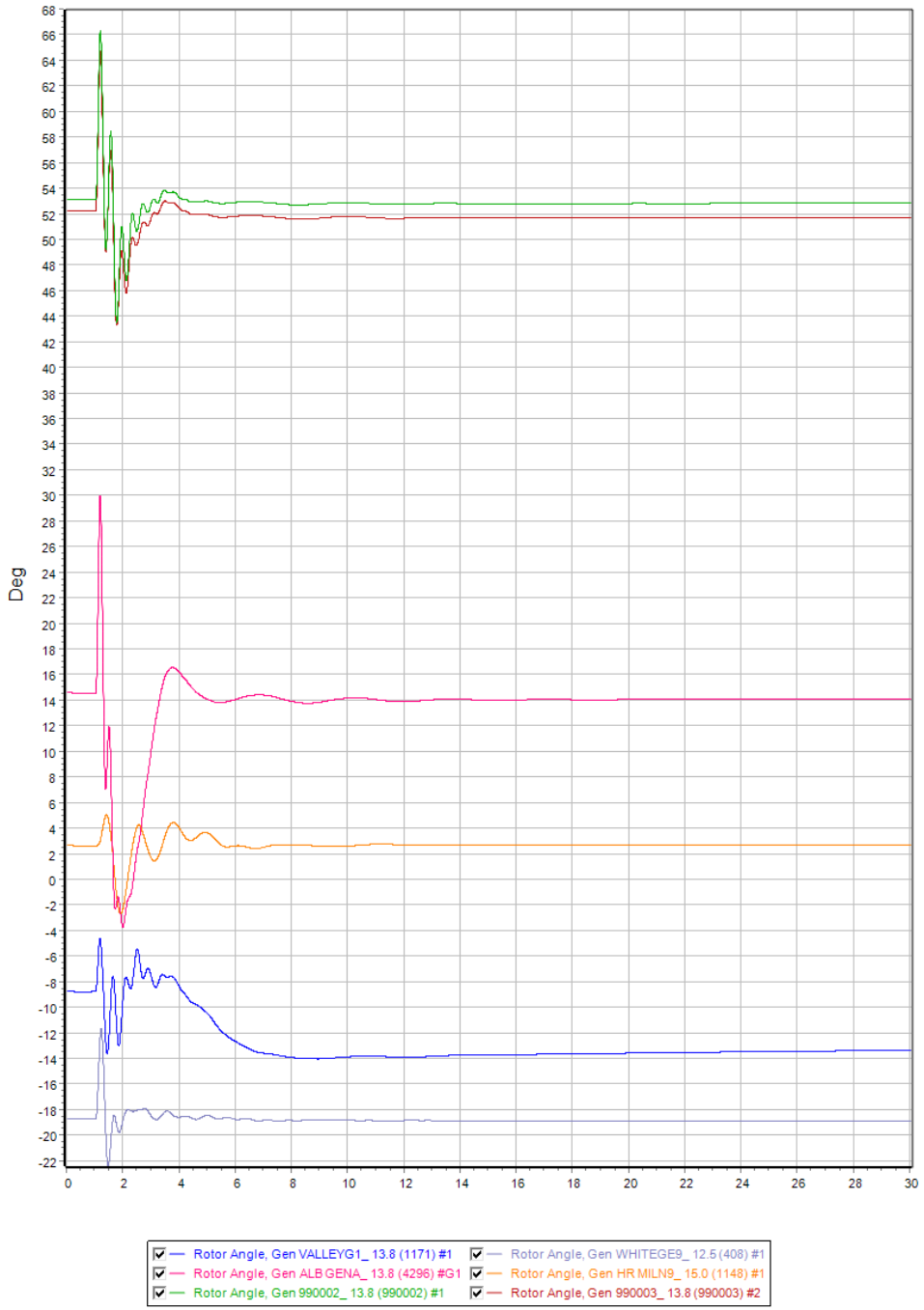


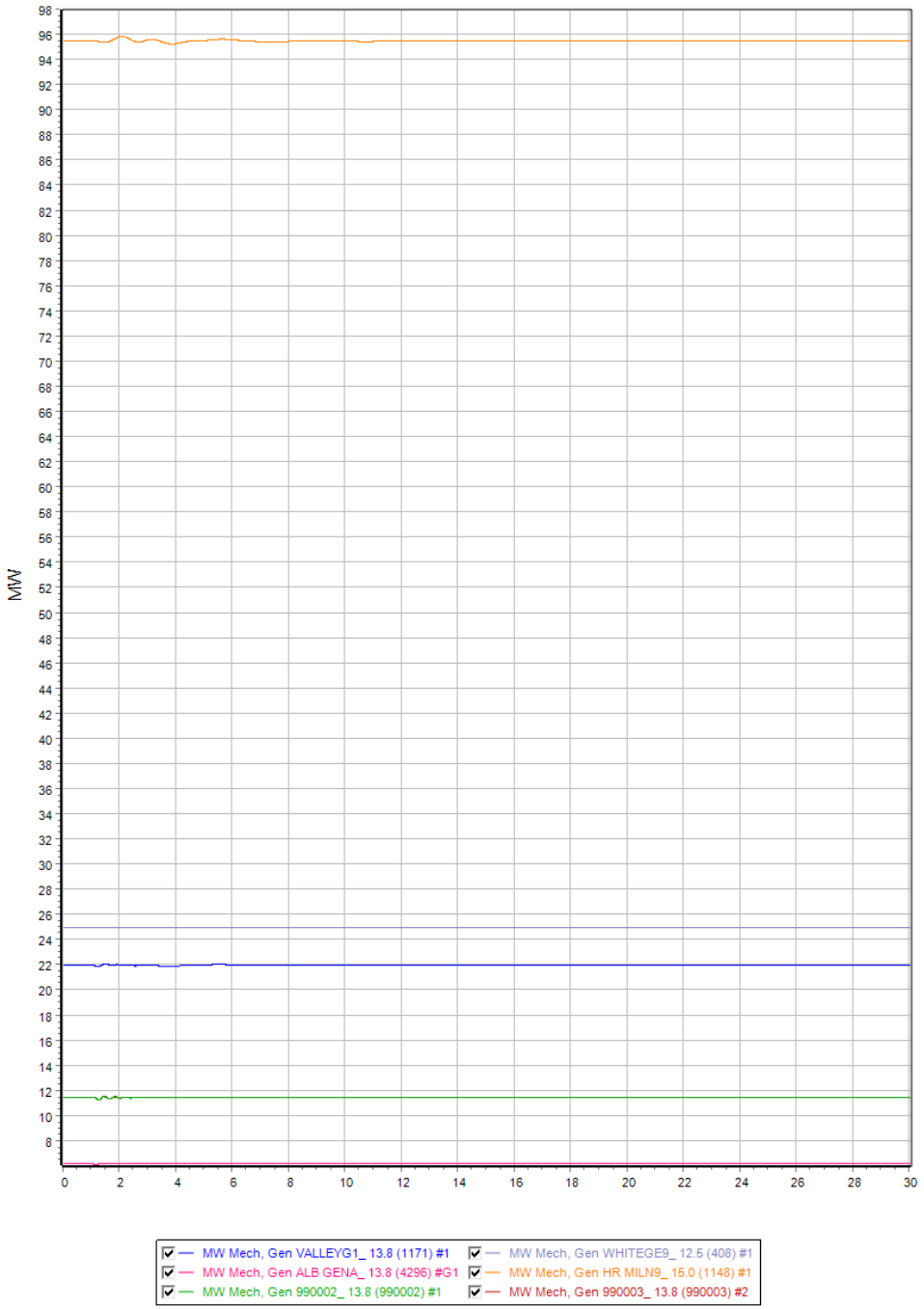
Monitor Line MW & MVAR. Q4



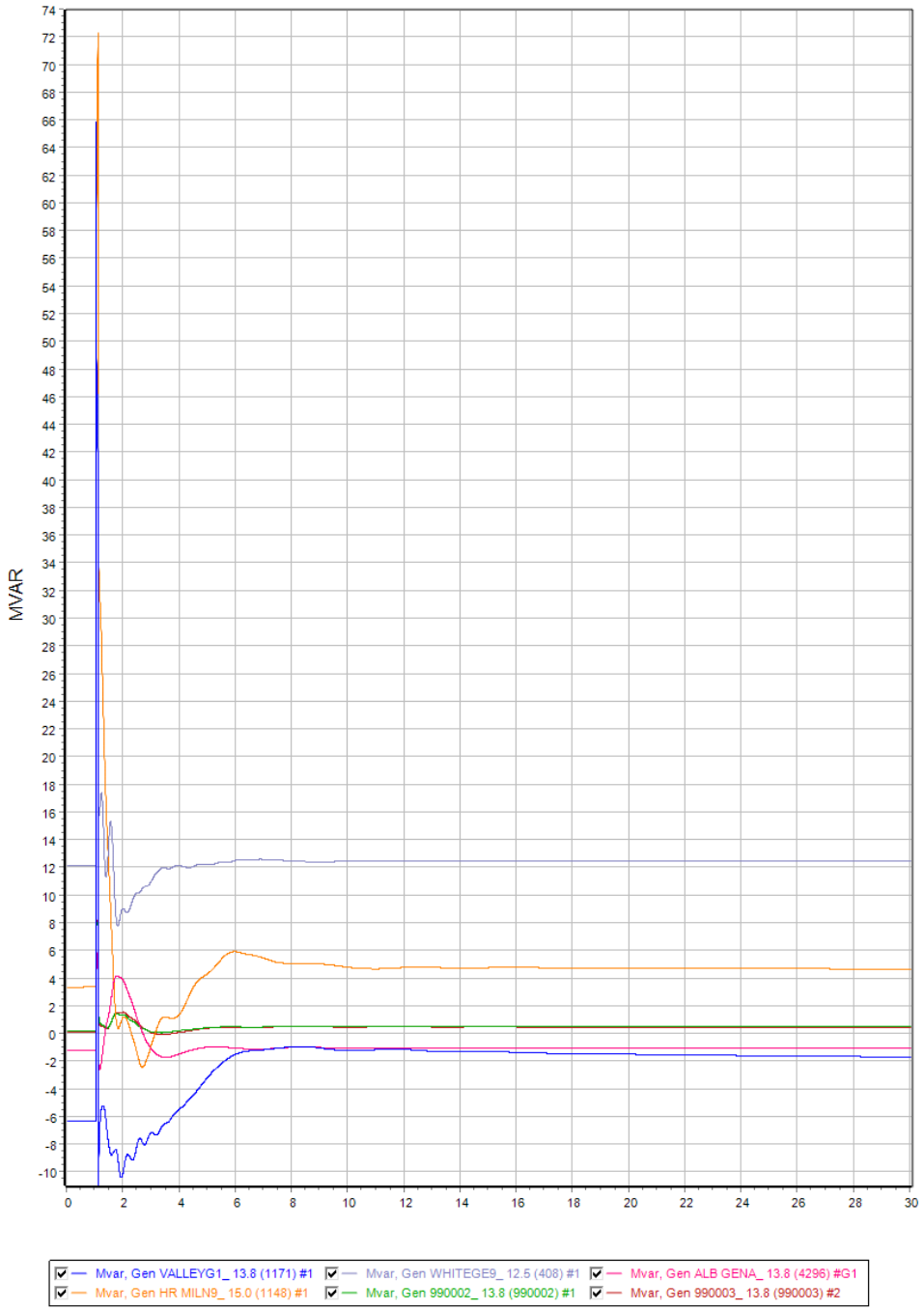


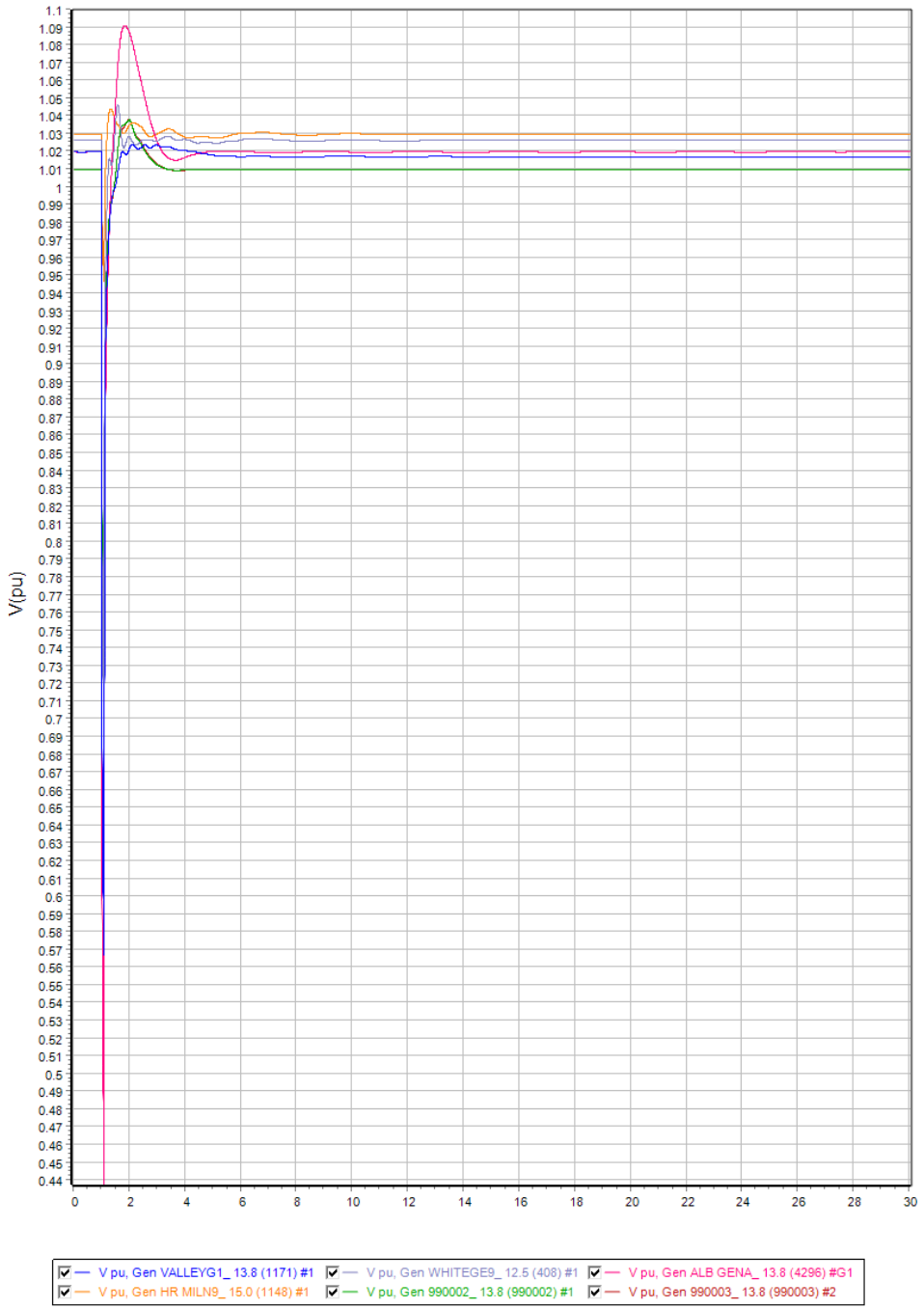
Monitor Gens. Q1



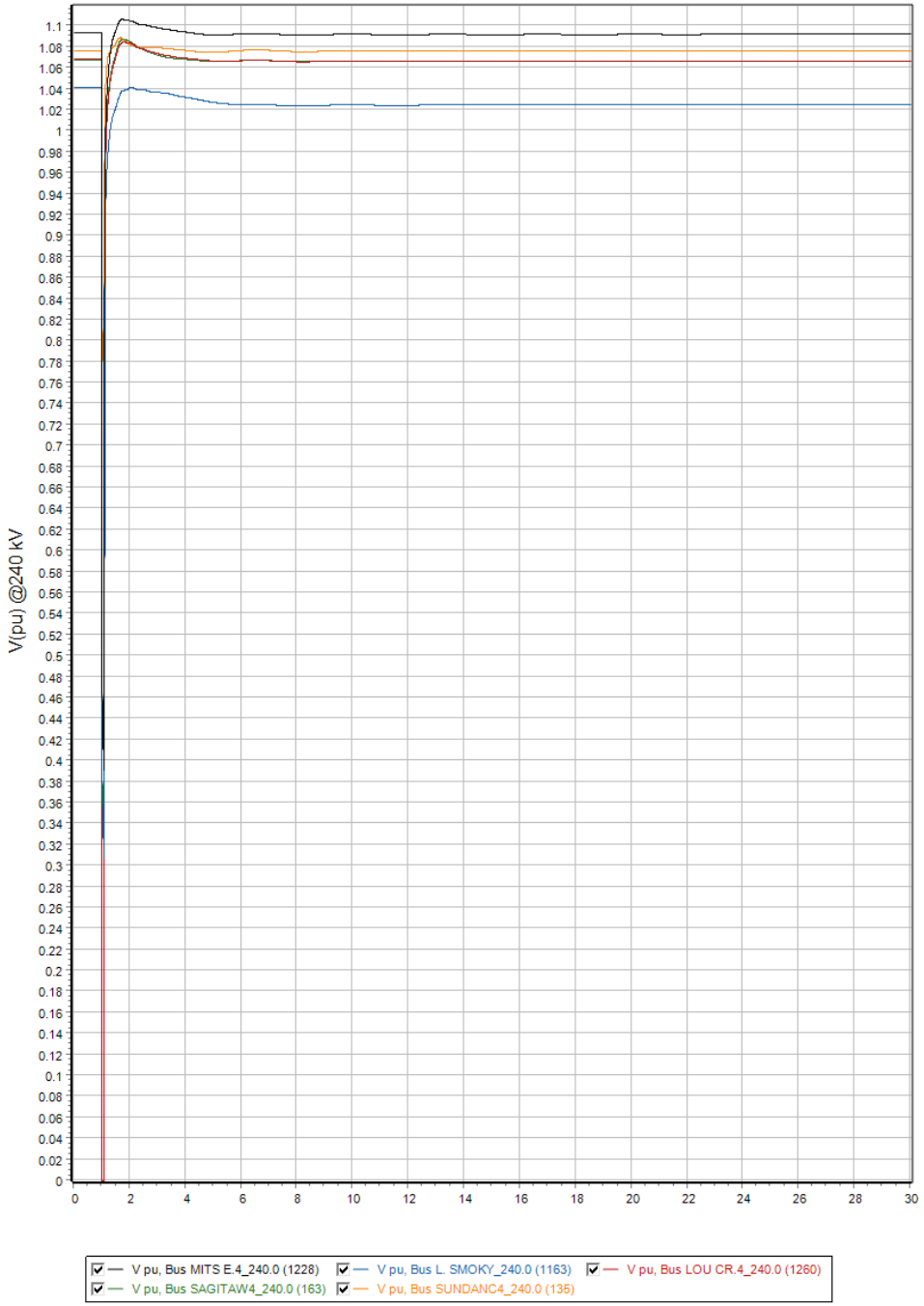


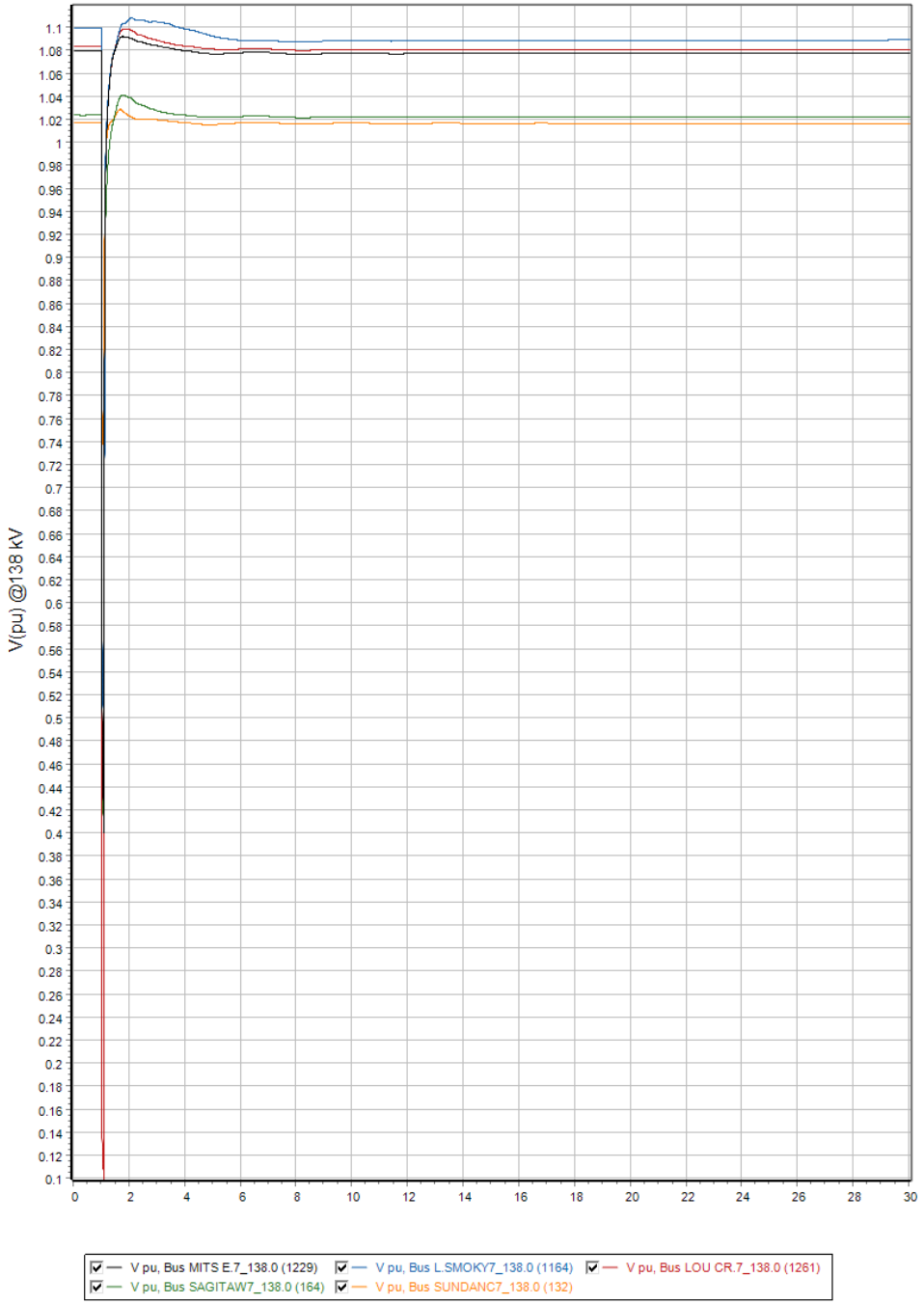
Monitor Gens. Q2



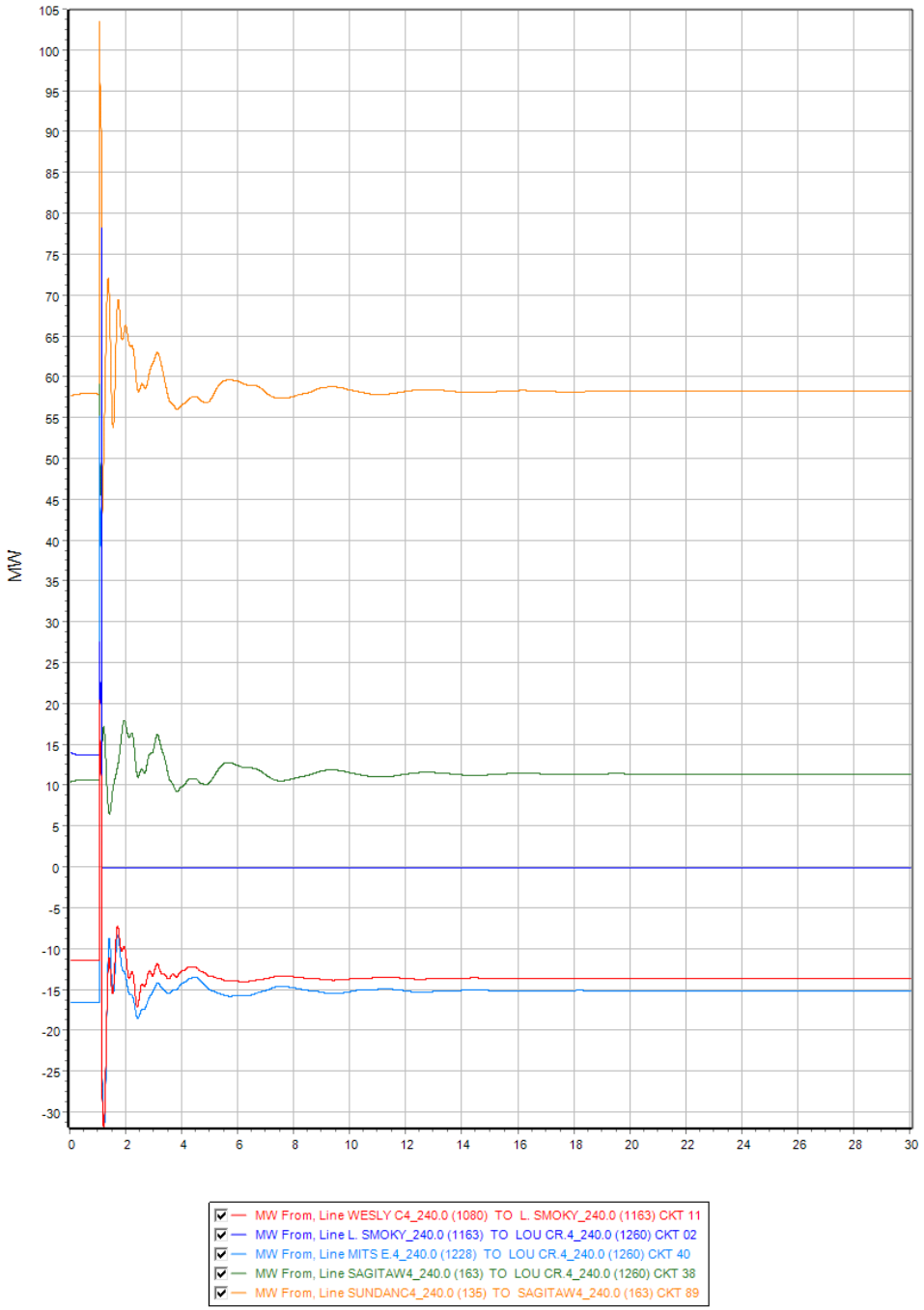


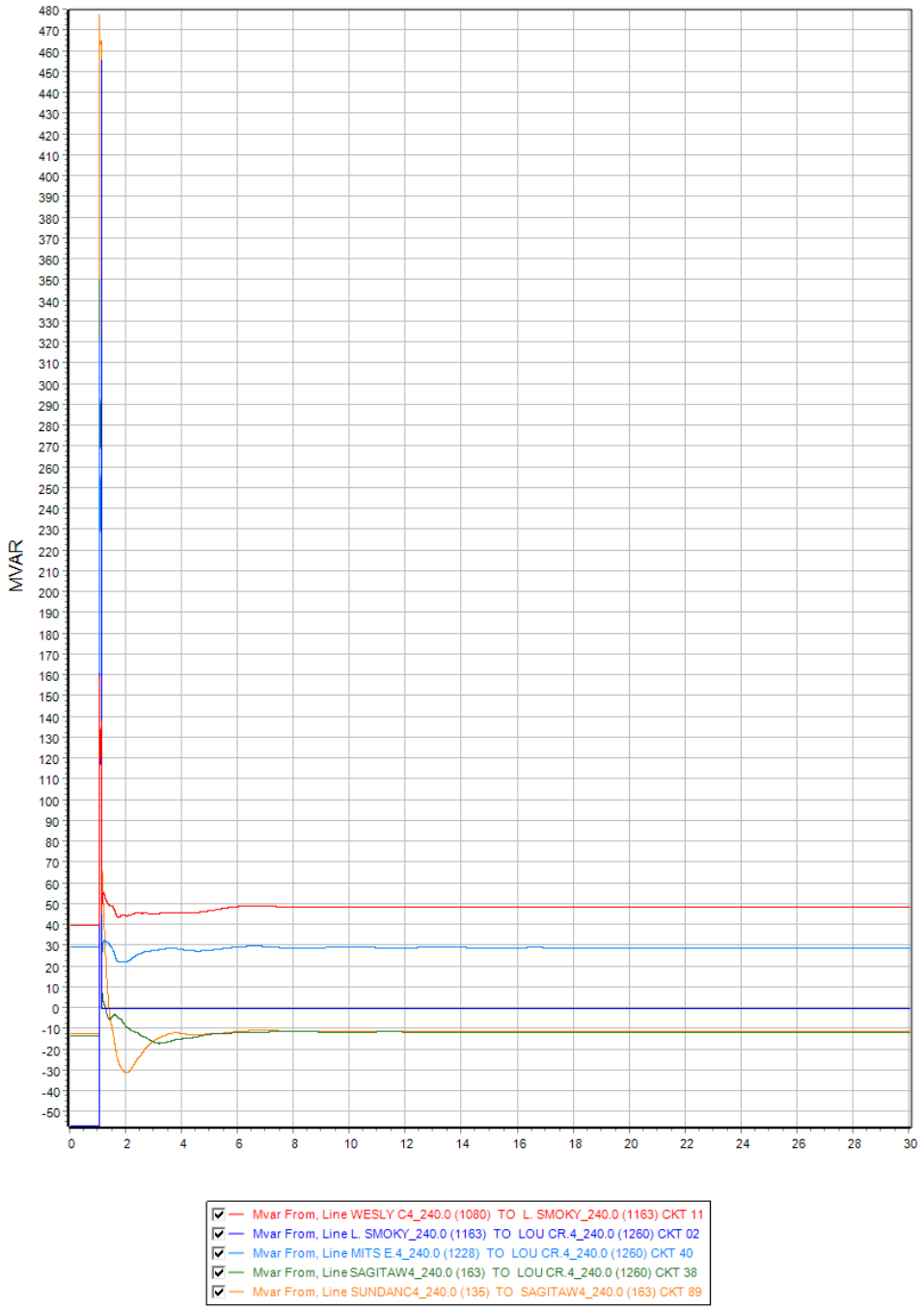
Monitor Bus Volts Q3



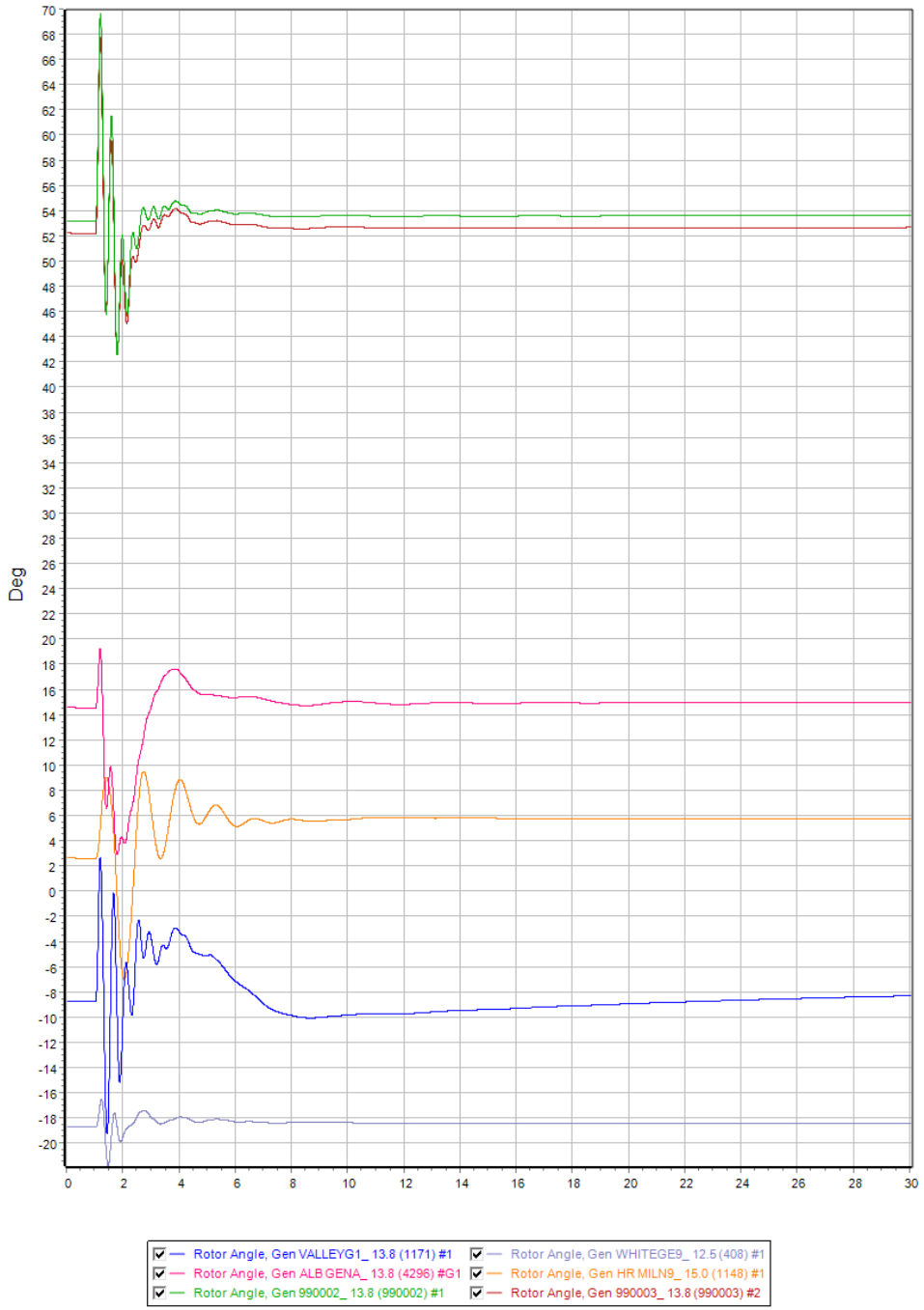


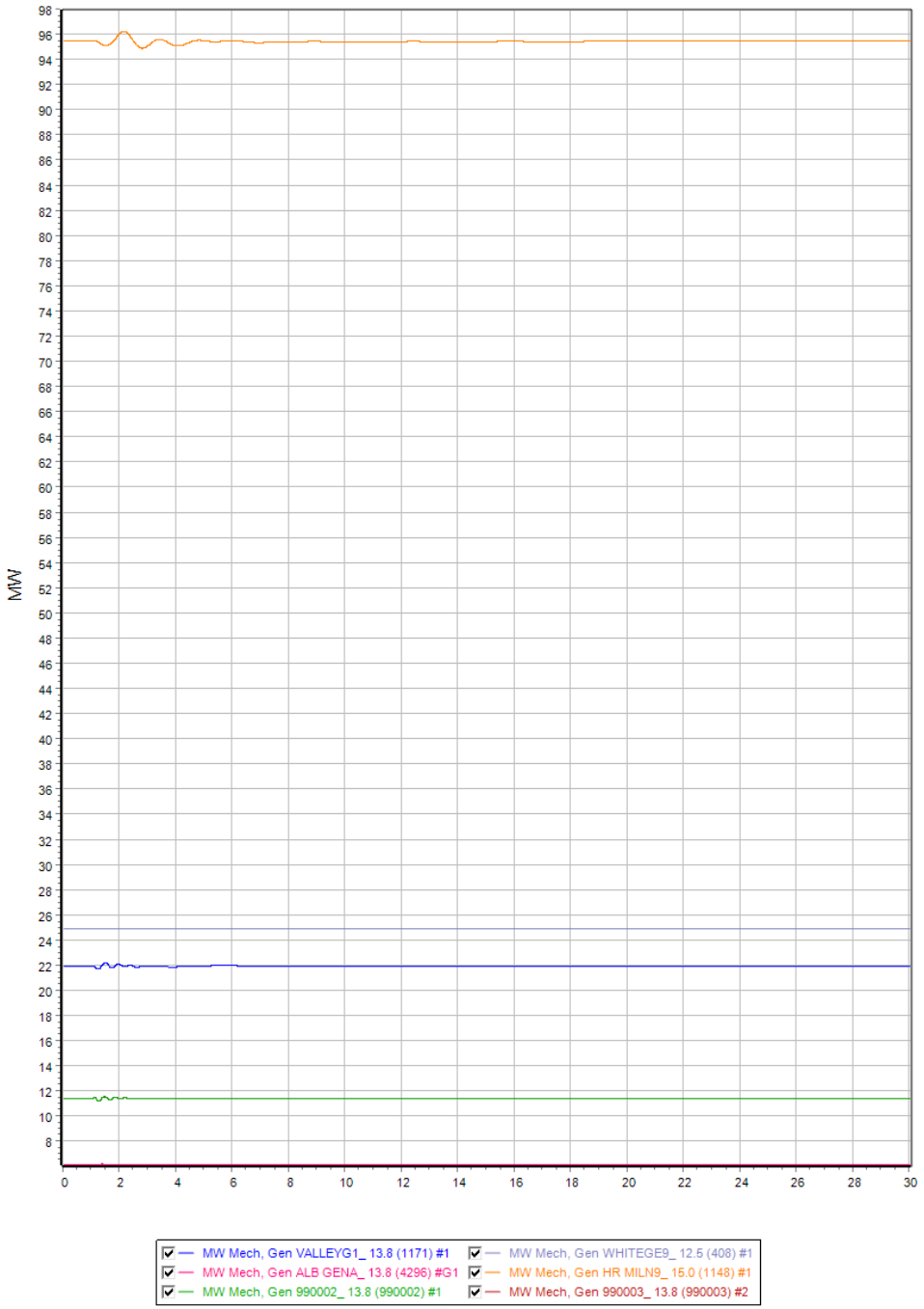
Monitor Line MW & MVAR. Q4



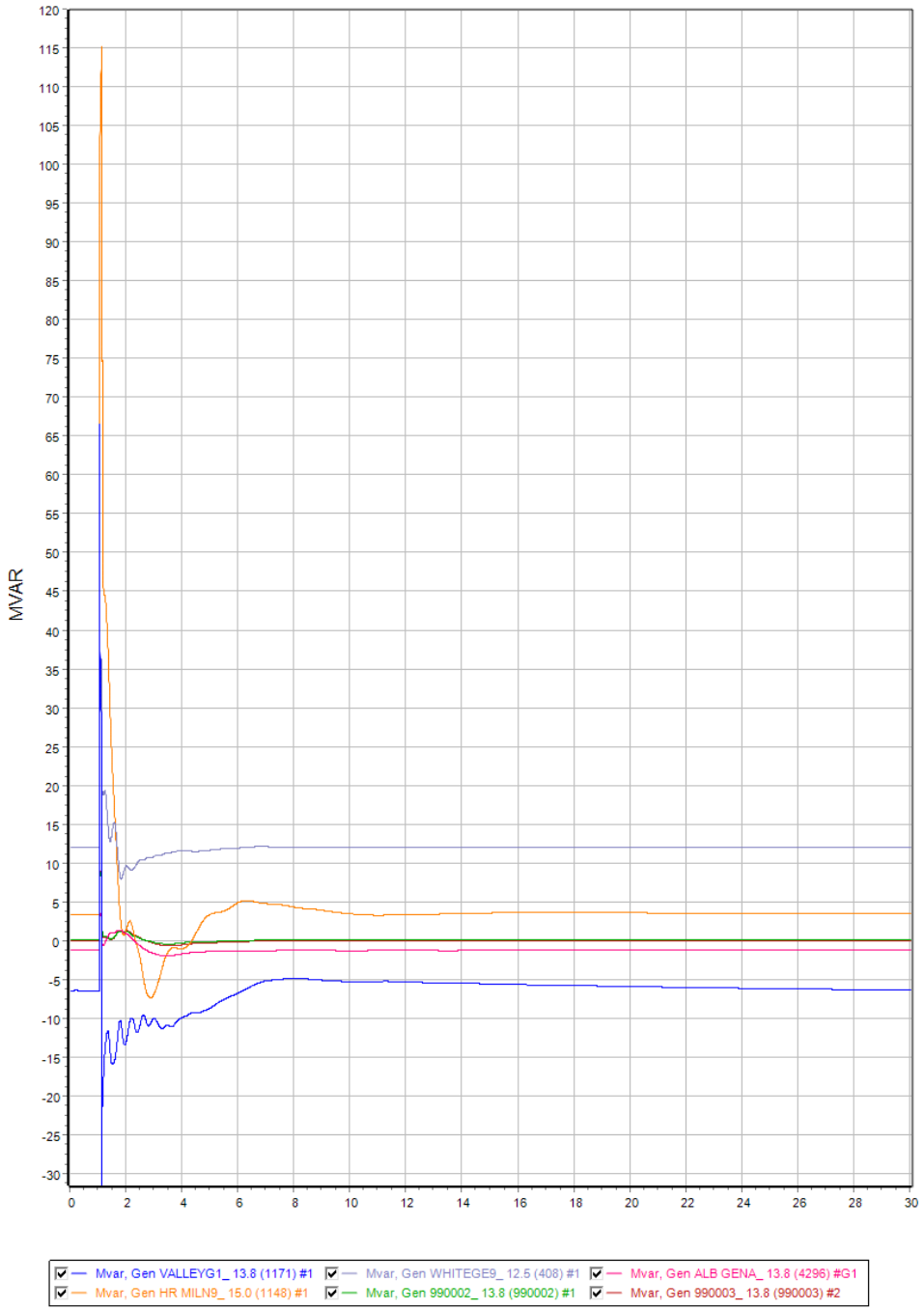


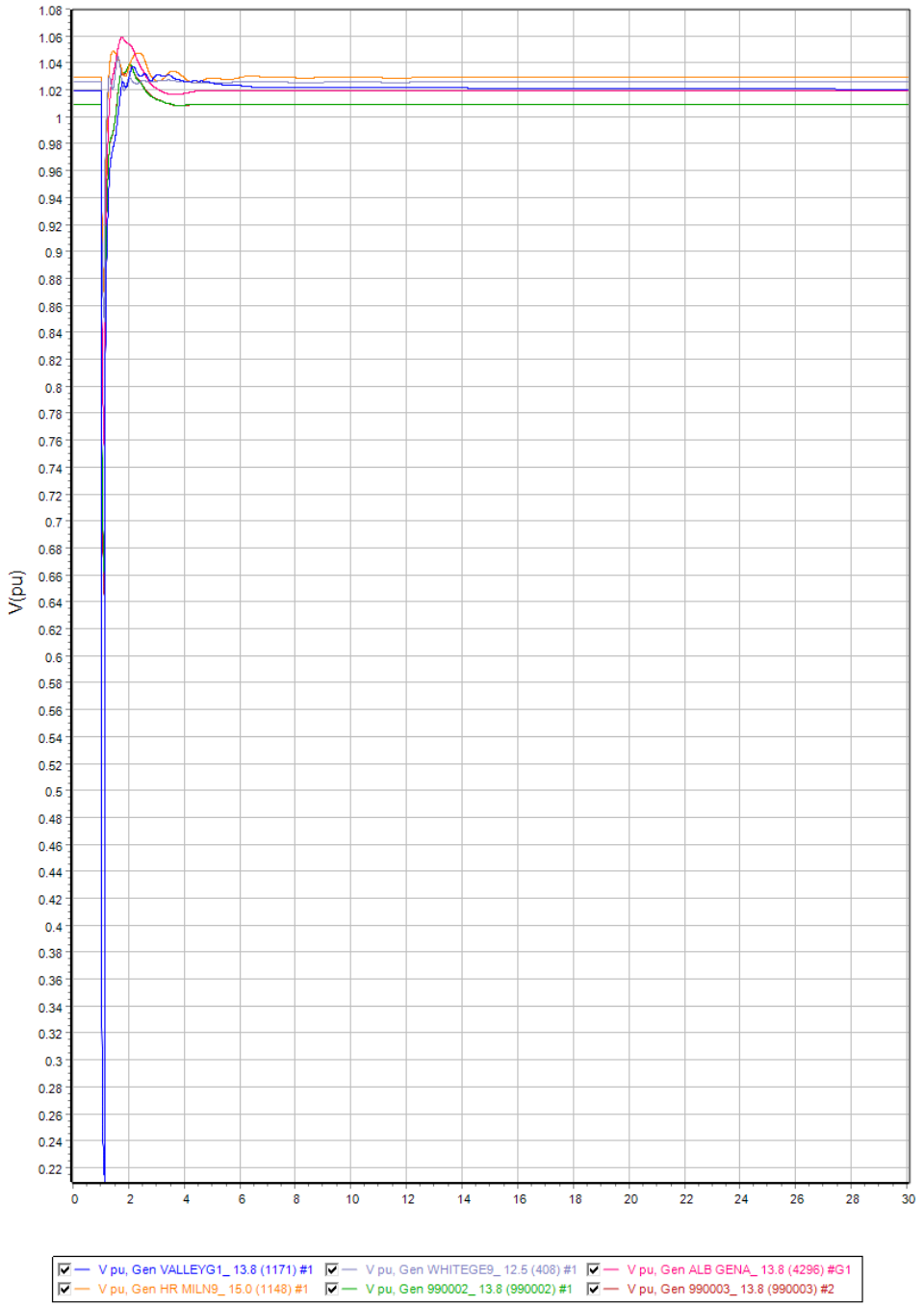
Monitor Gens. Q1



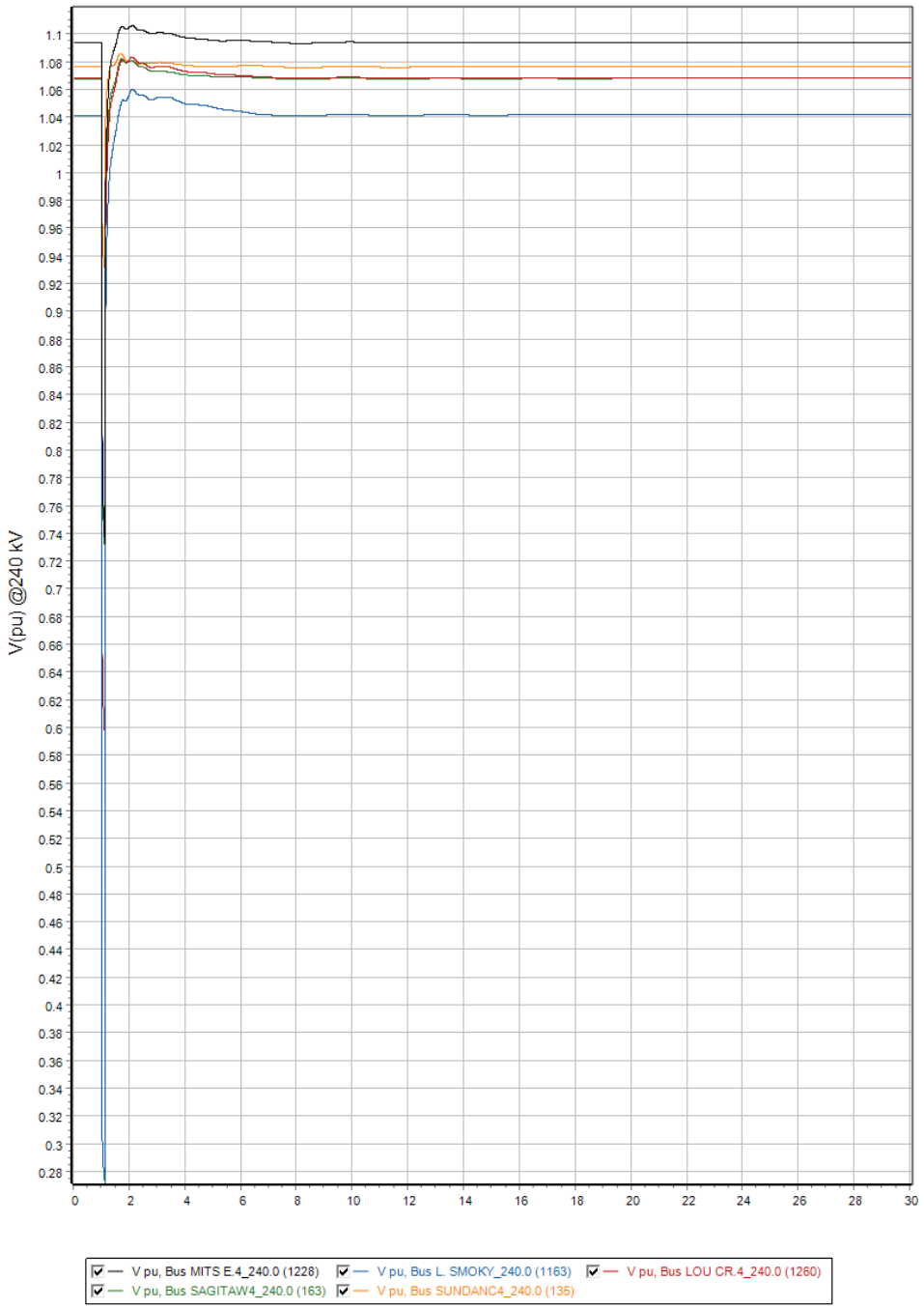


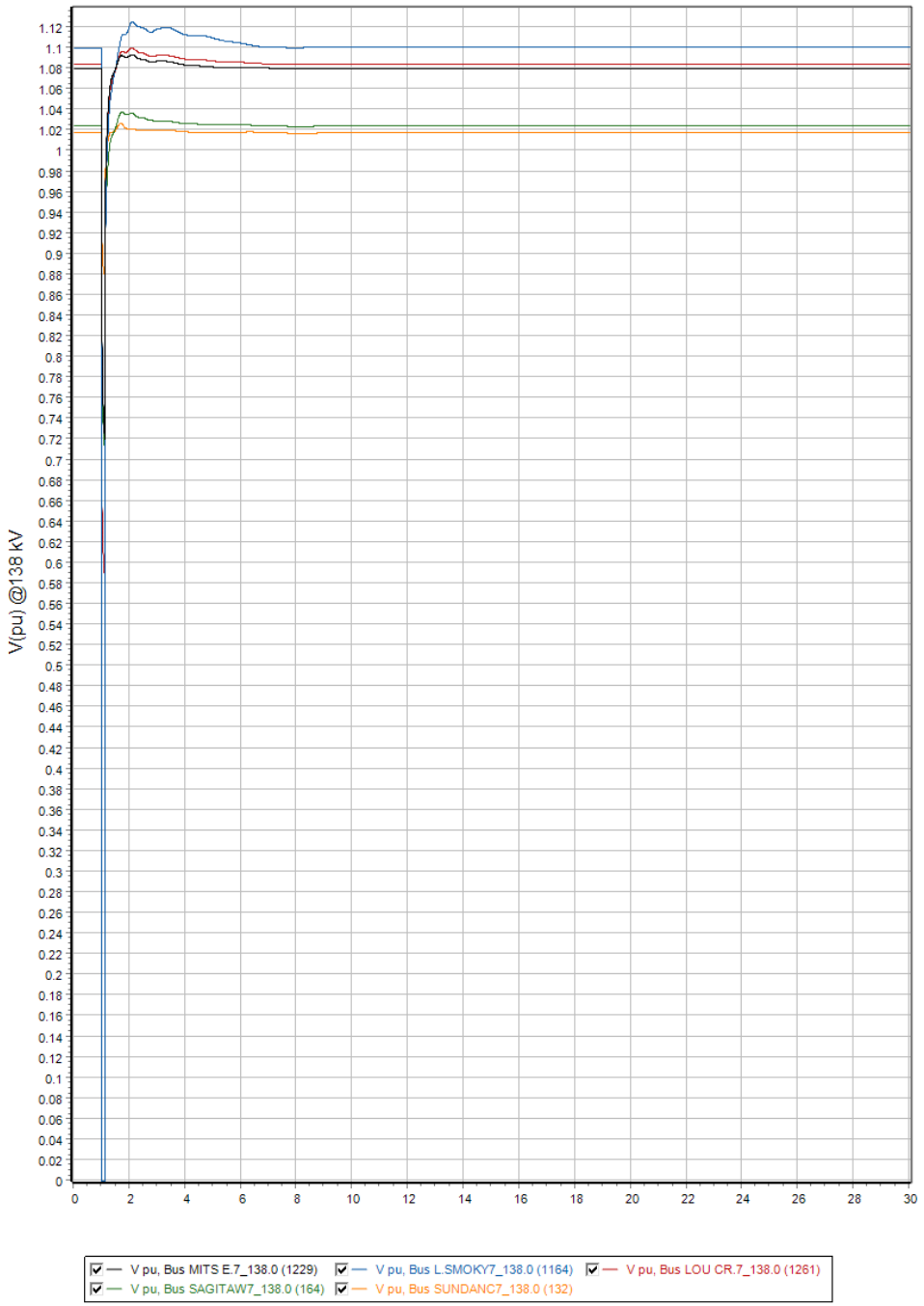
Monitor Gens. Q2



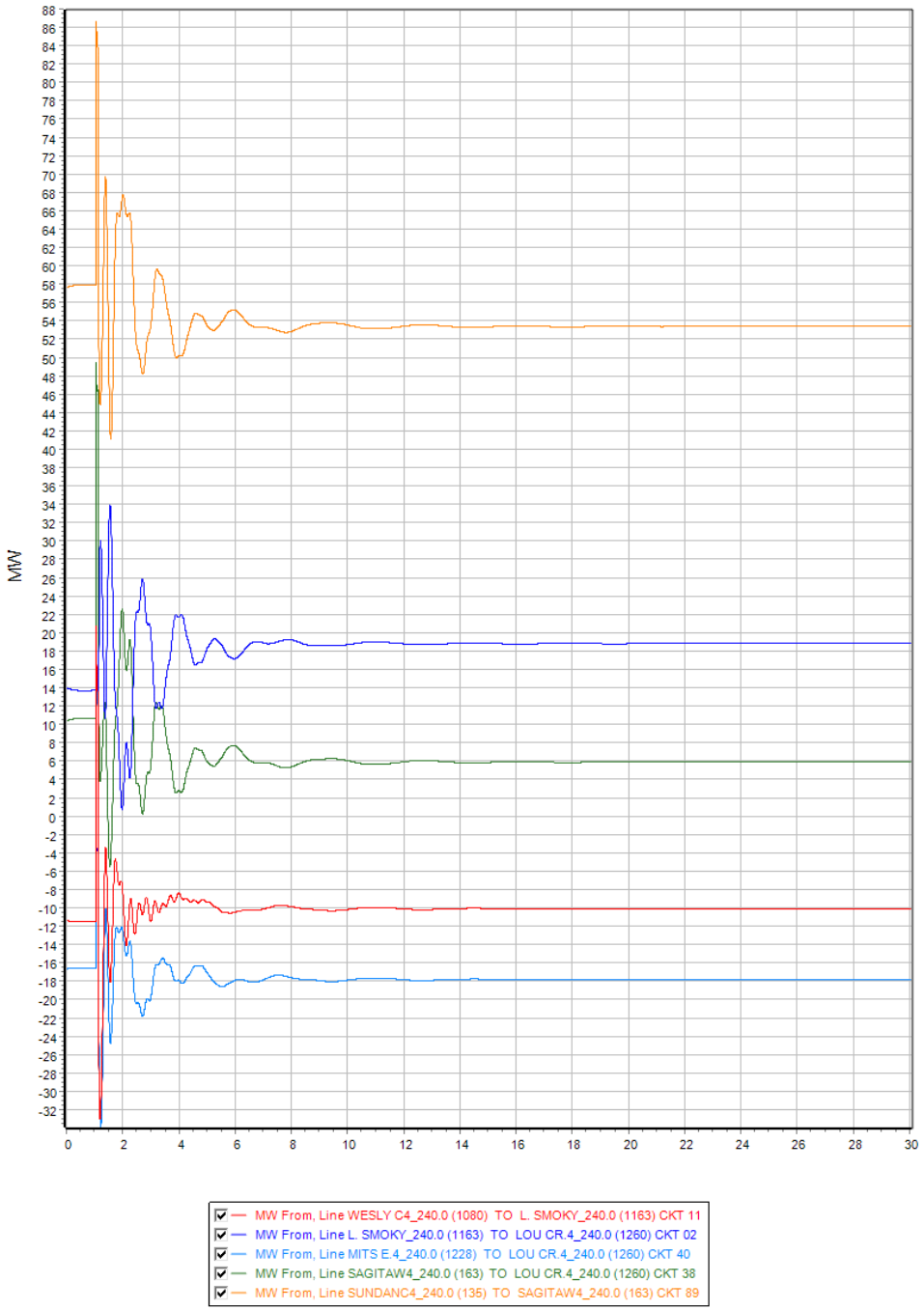


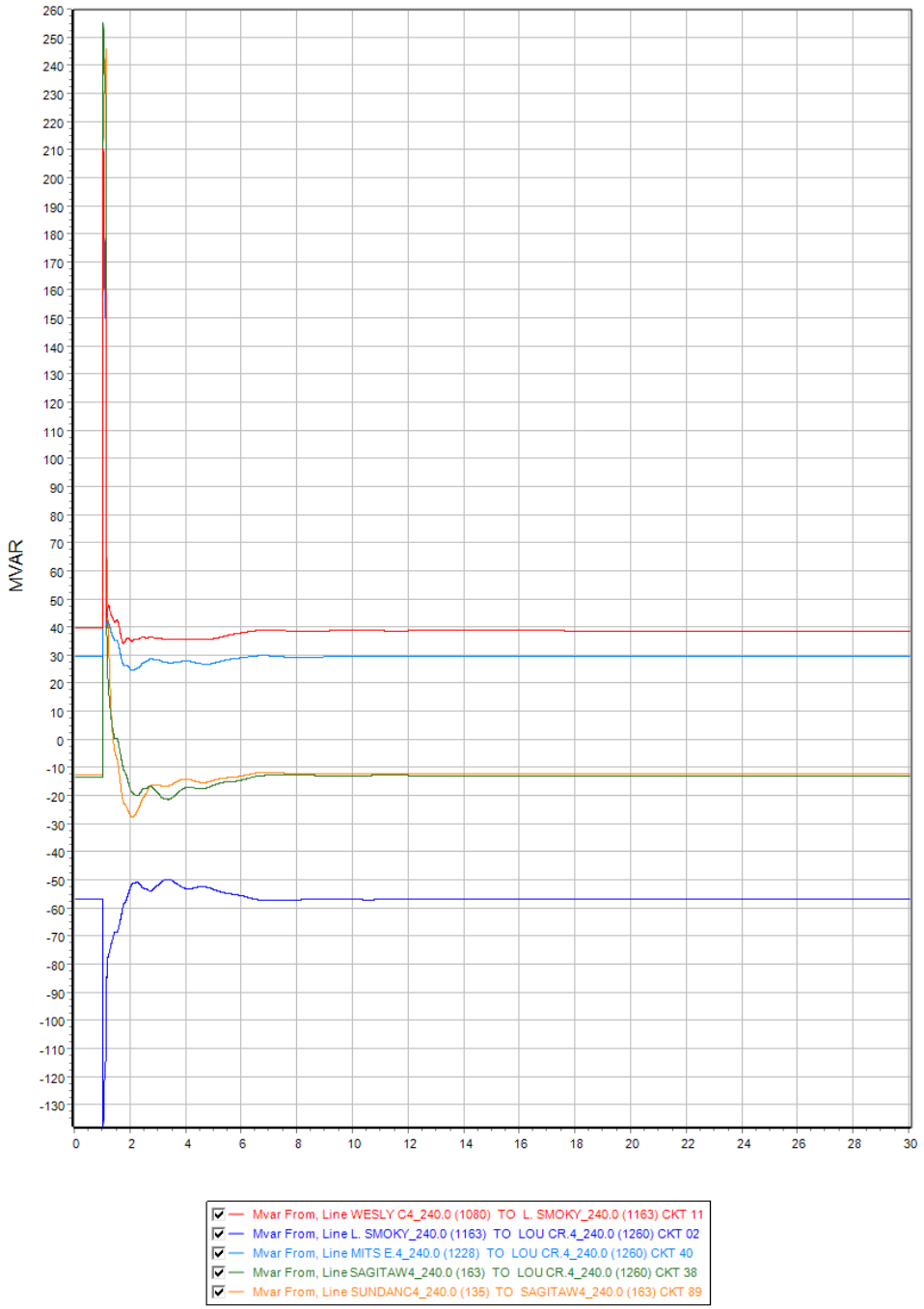
Monitor Bus Volts Q3



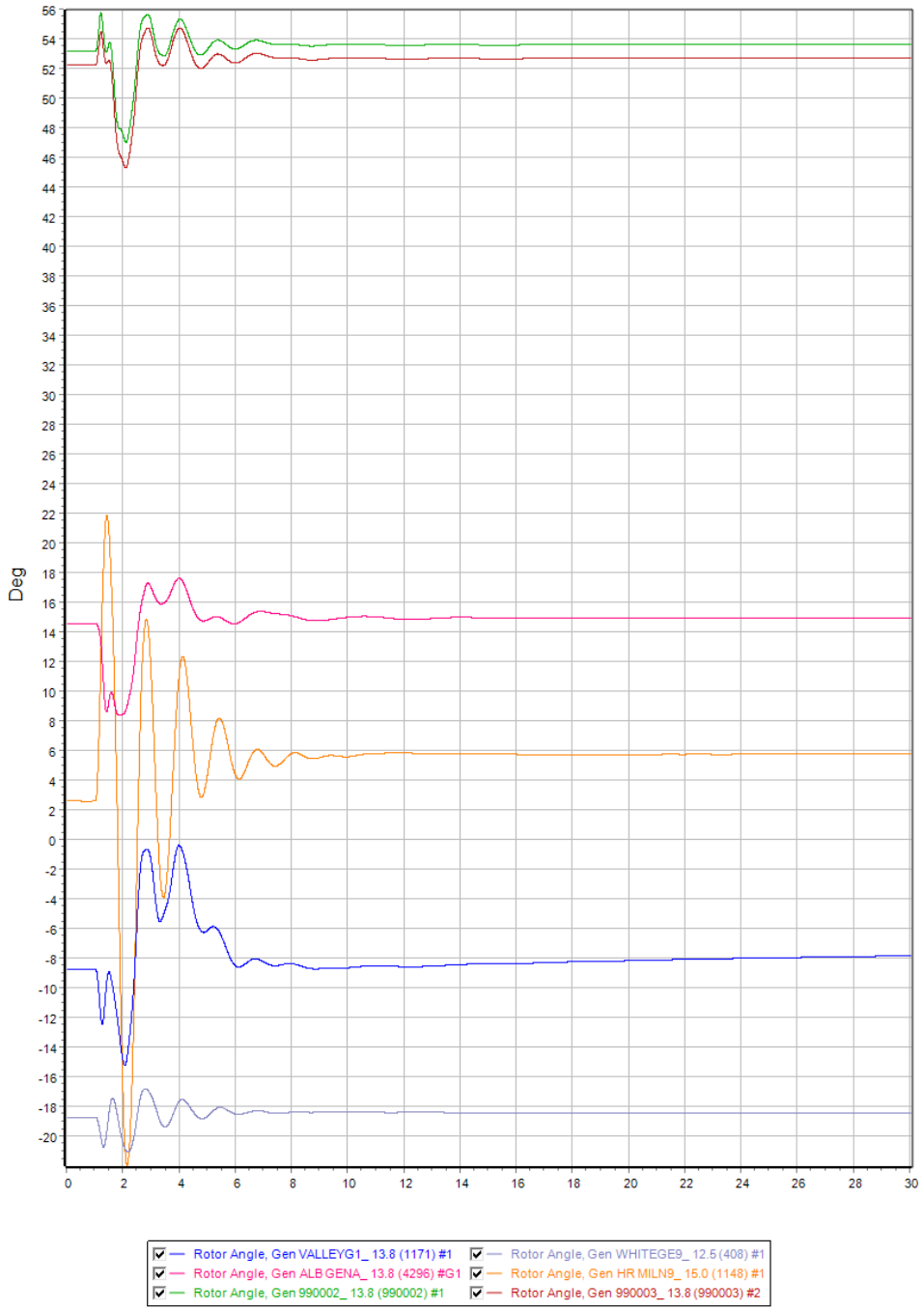


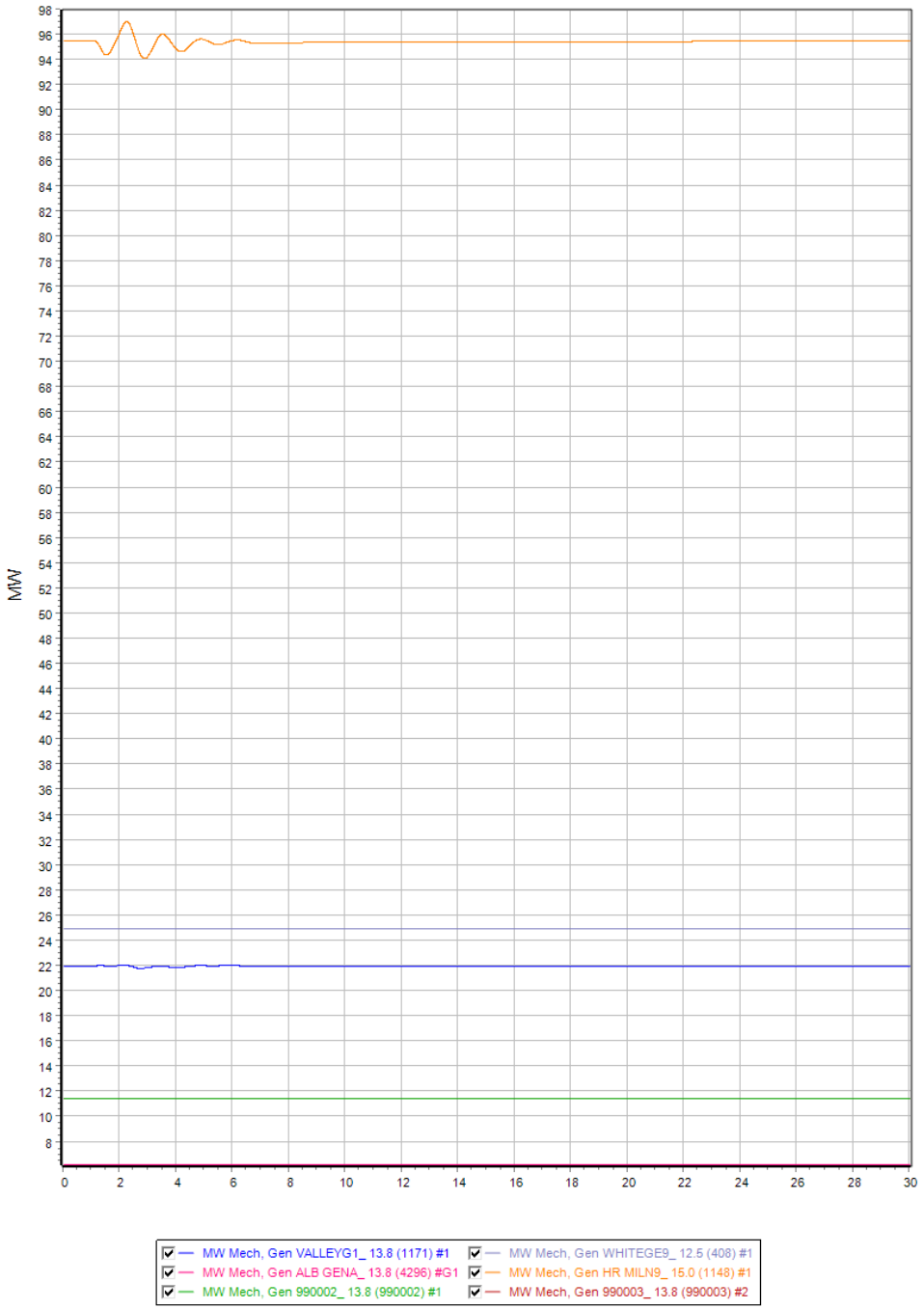
Monitor Line MW & MVAR. Q4



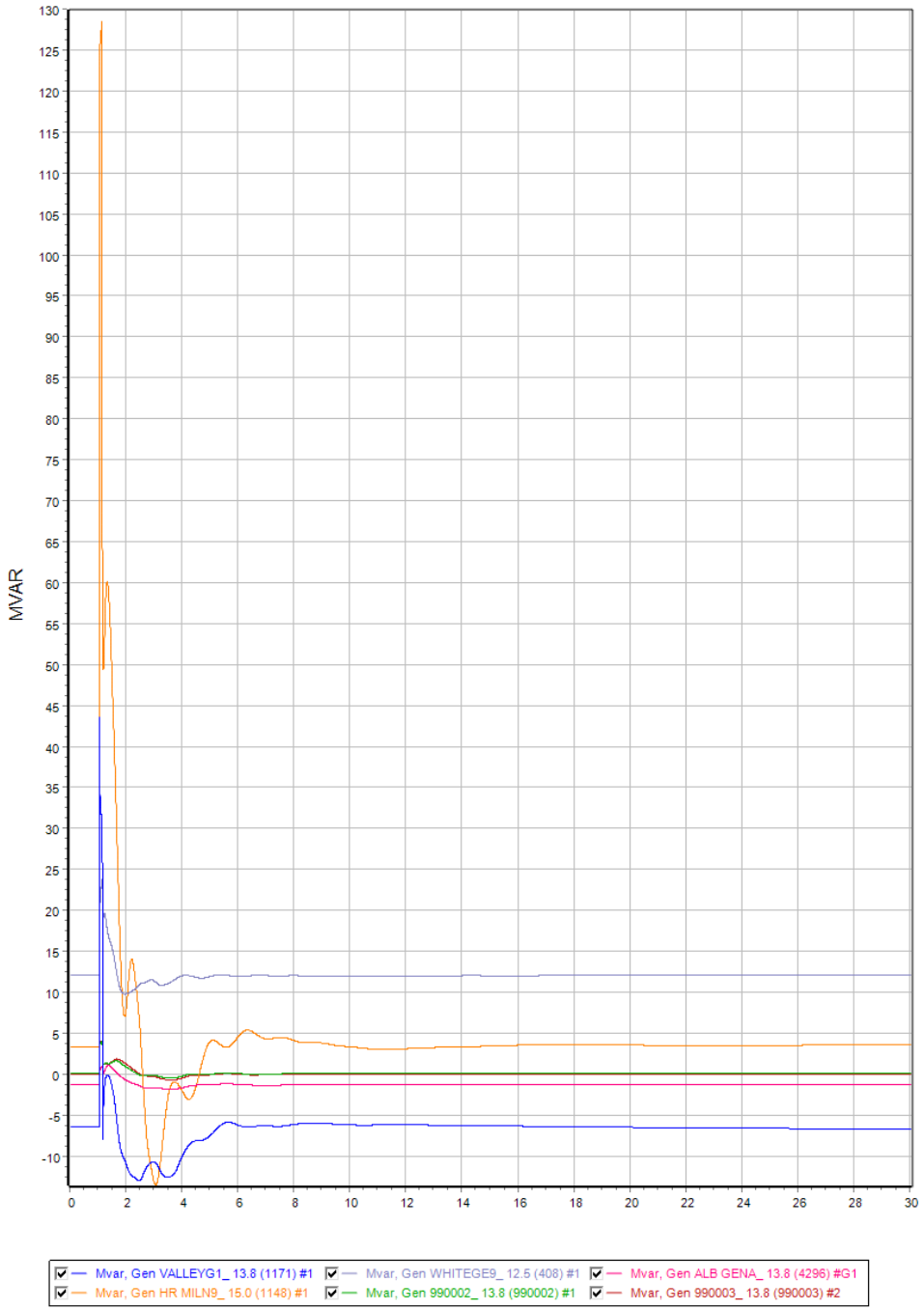


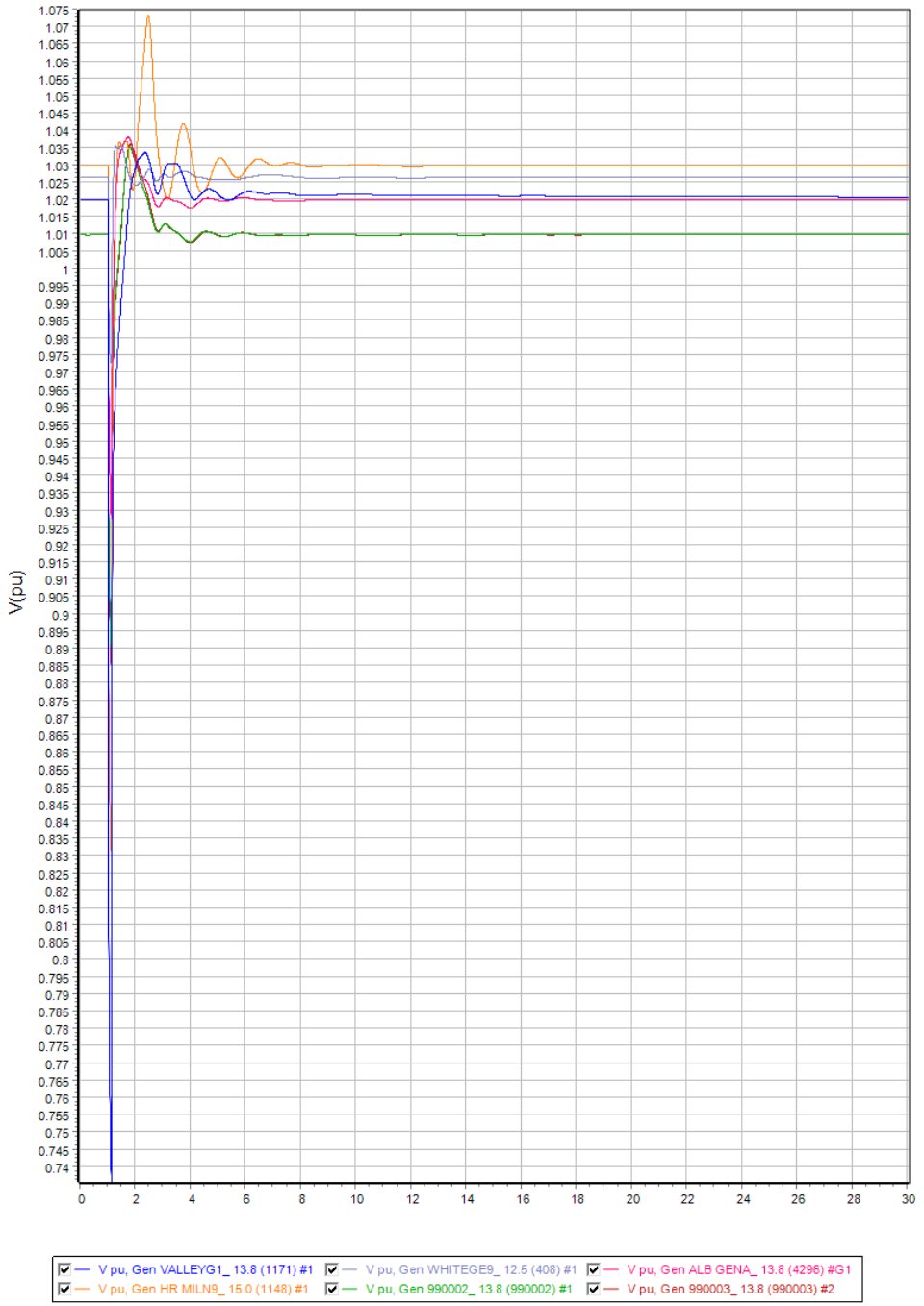
Monitor Gens. Q1





Monitor Gens. Q2

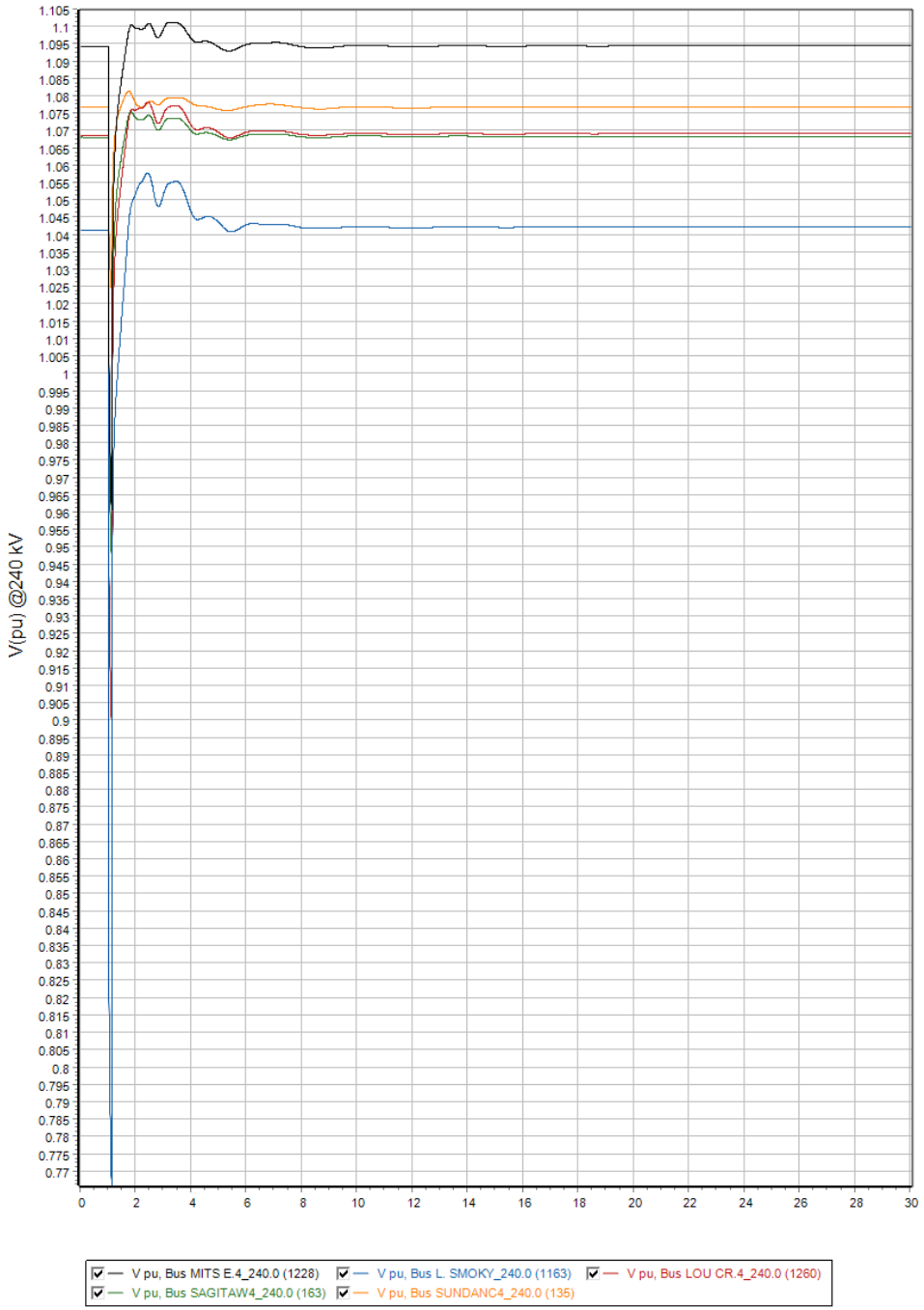


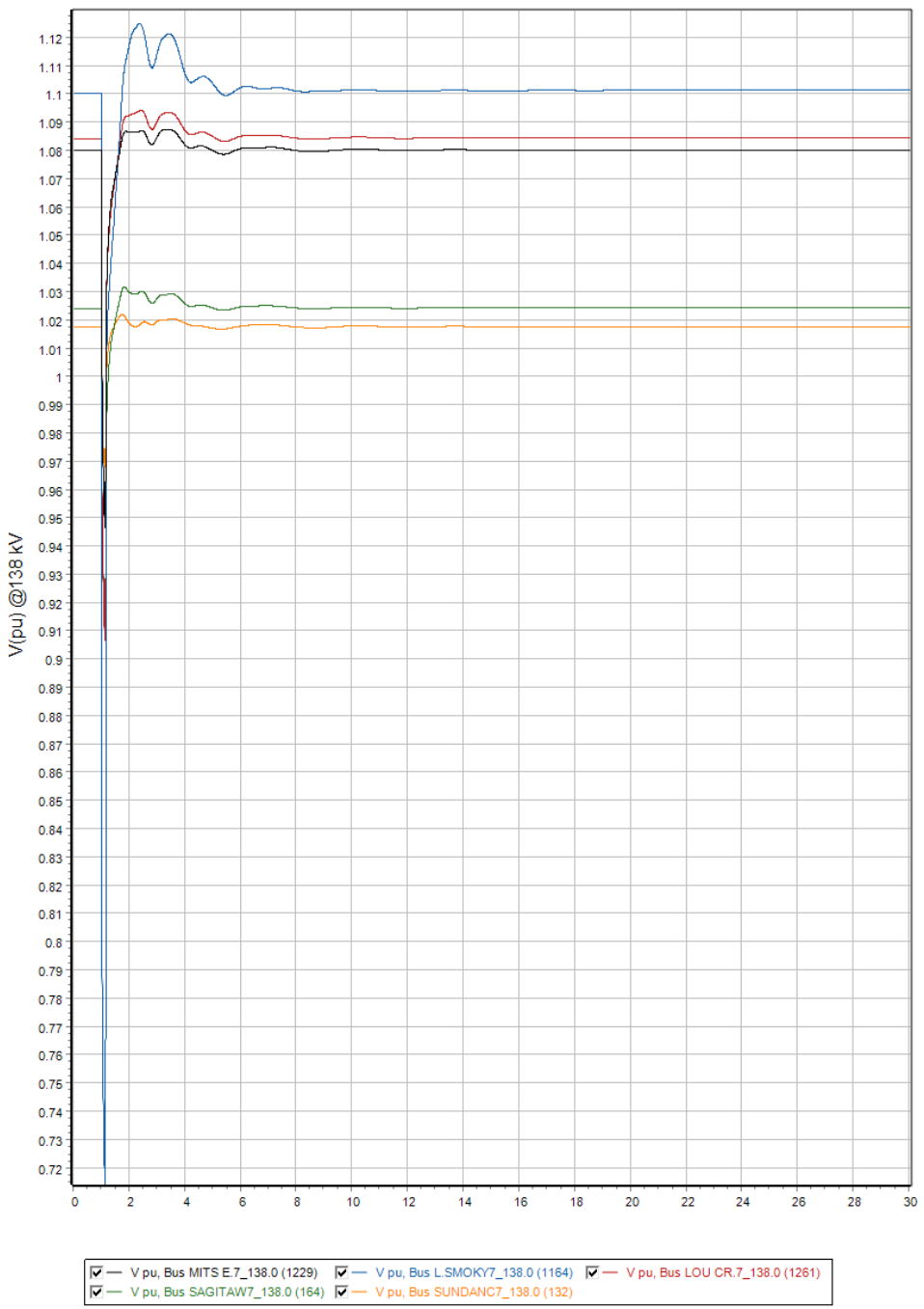


SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

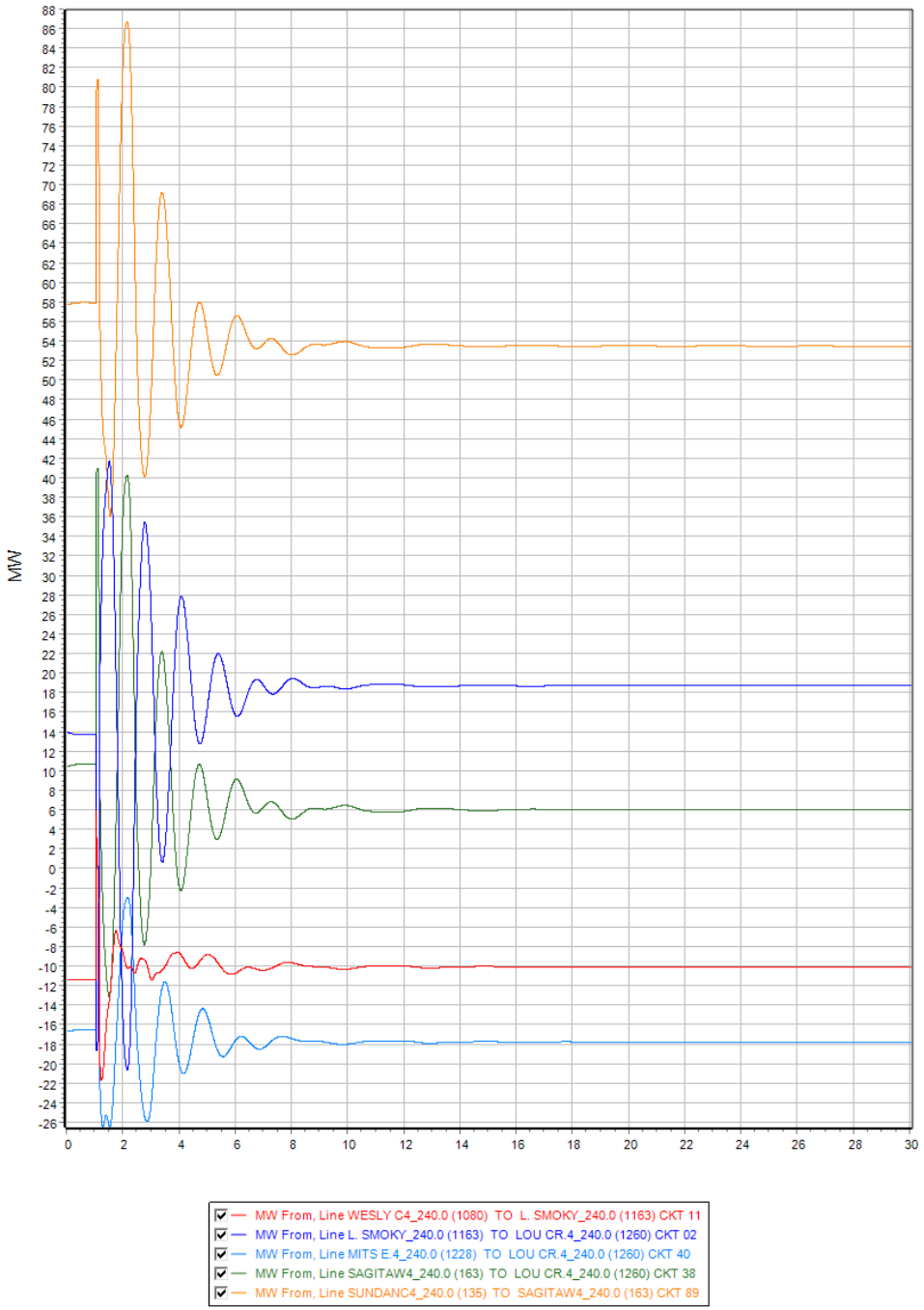
Contingency: 08B - C5 - 7L45/7L46 (Little Smoky 813S – Big Mountain 845S) @ Big Mountain 845S

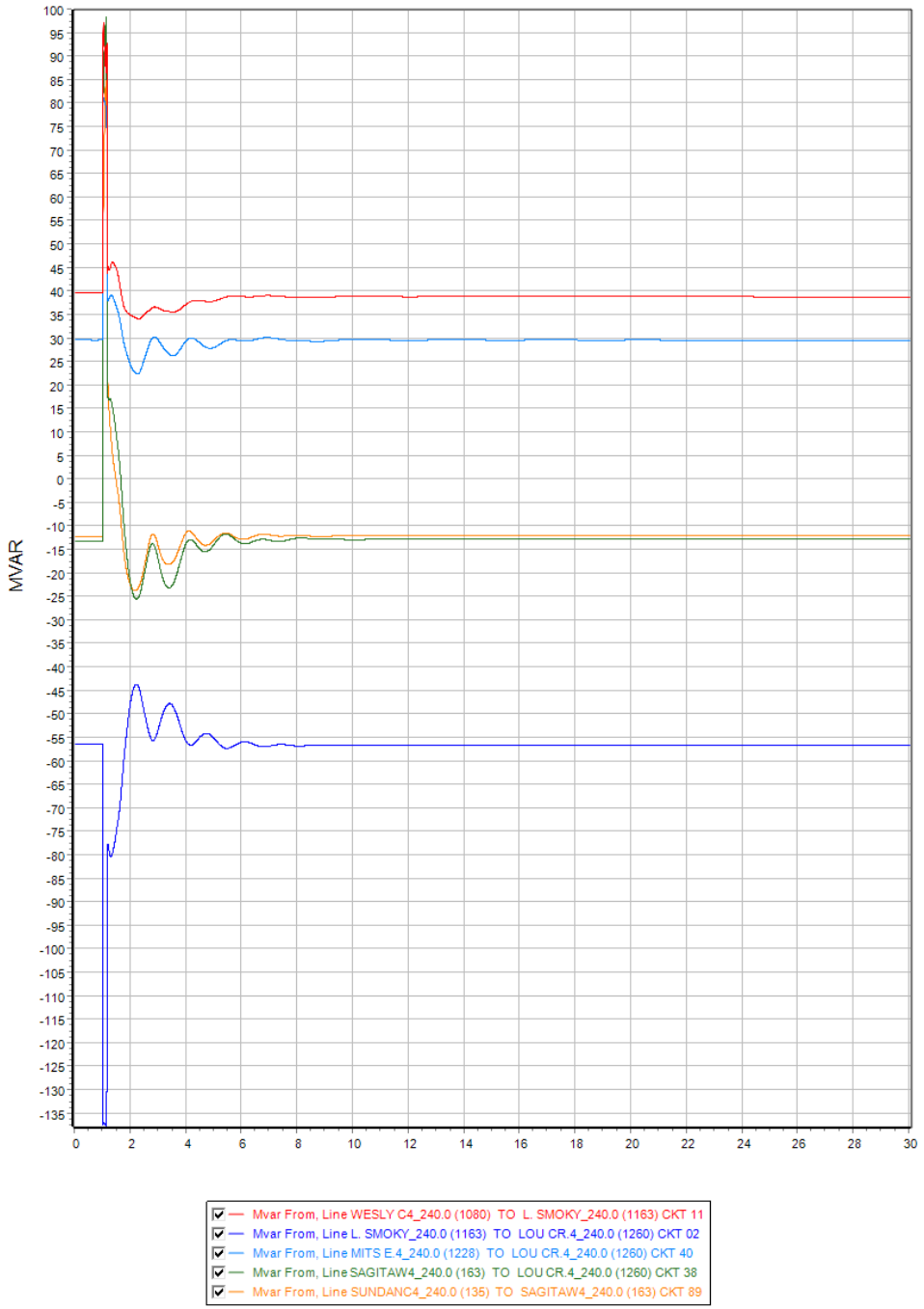
Monitor Bus Volts Q3



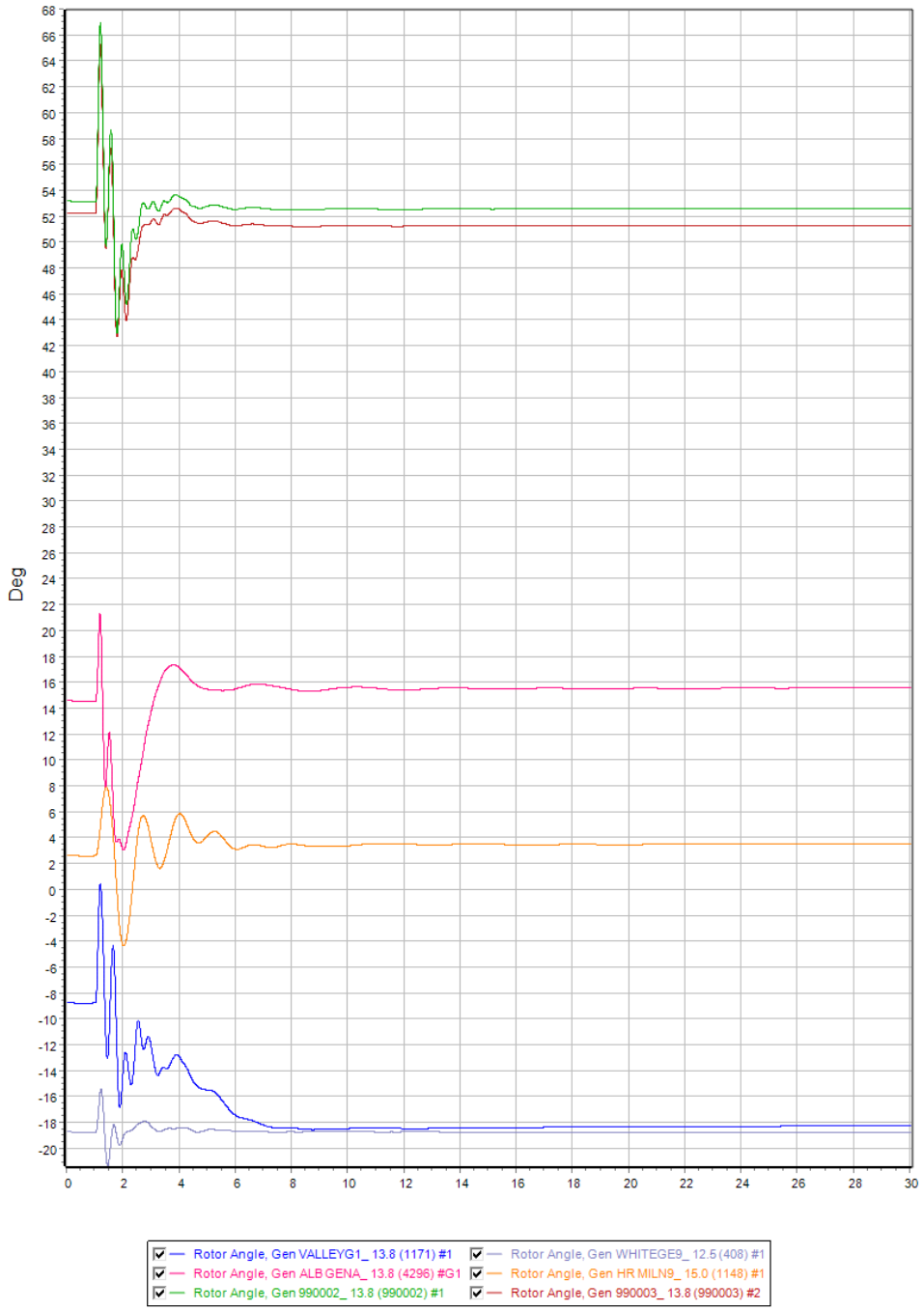


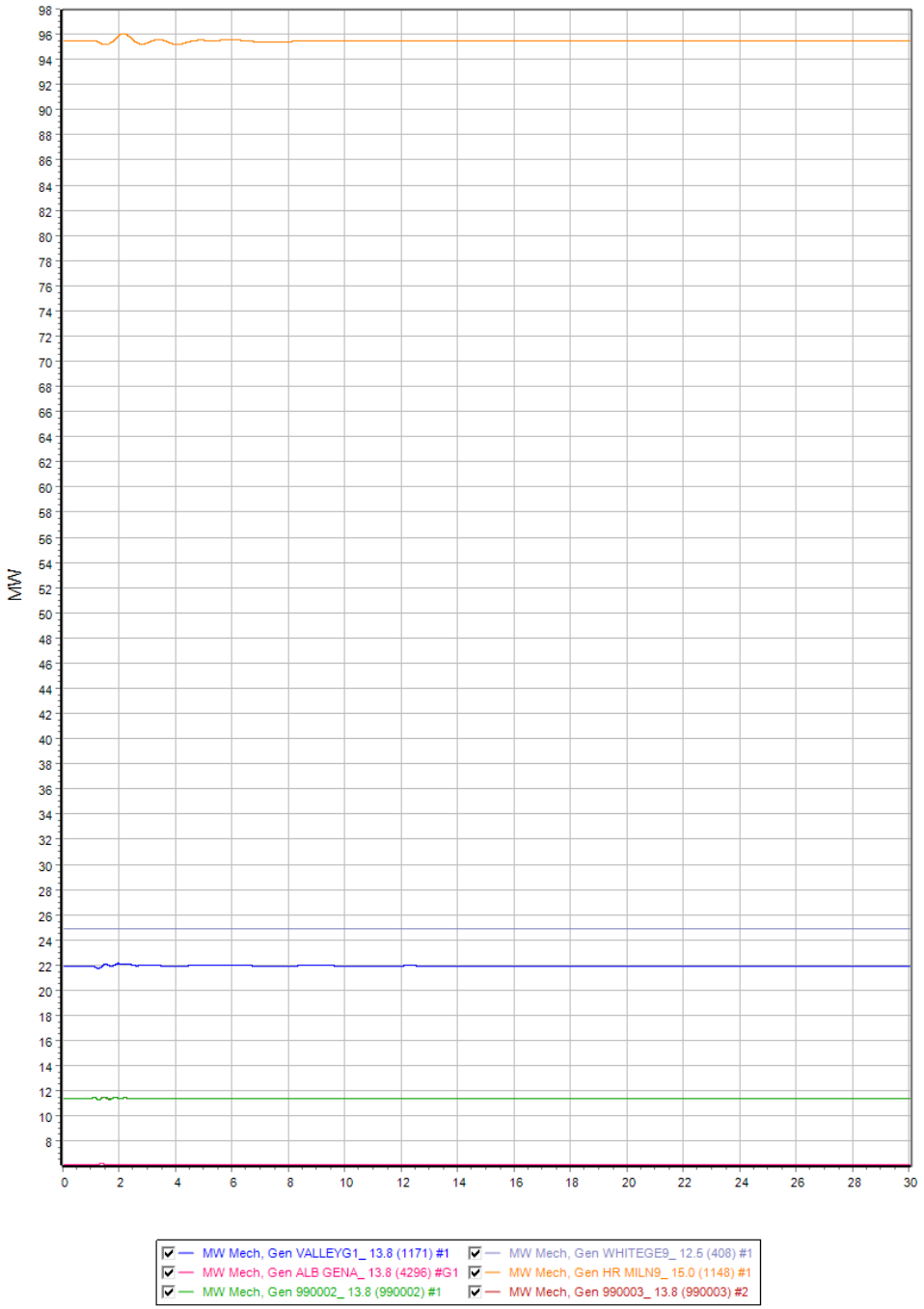
Monitor Line MW & MVAR. Q4





Monitor Gens. Q1





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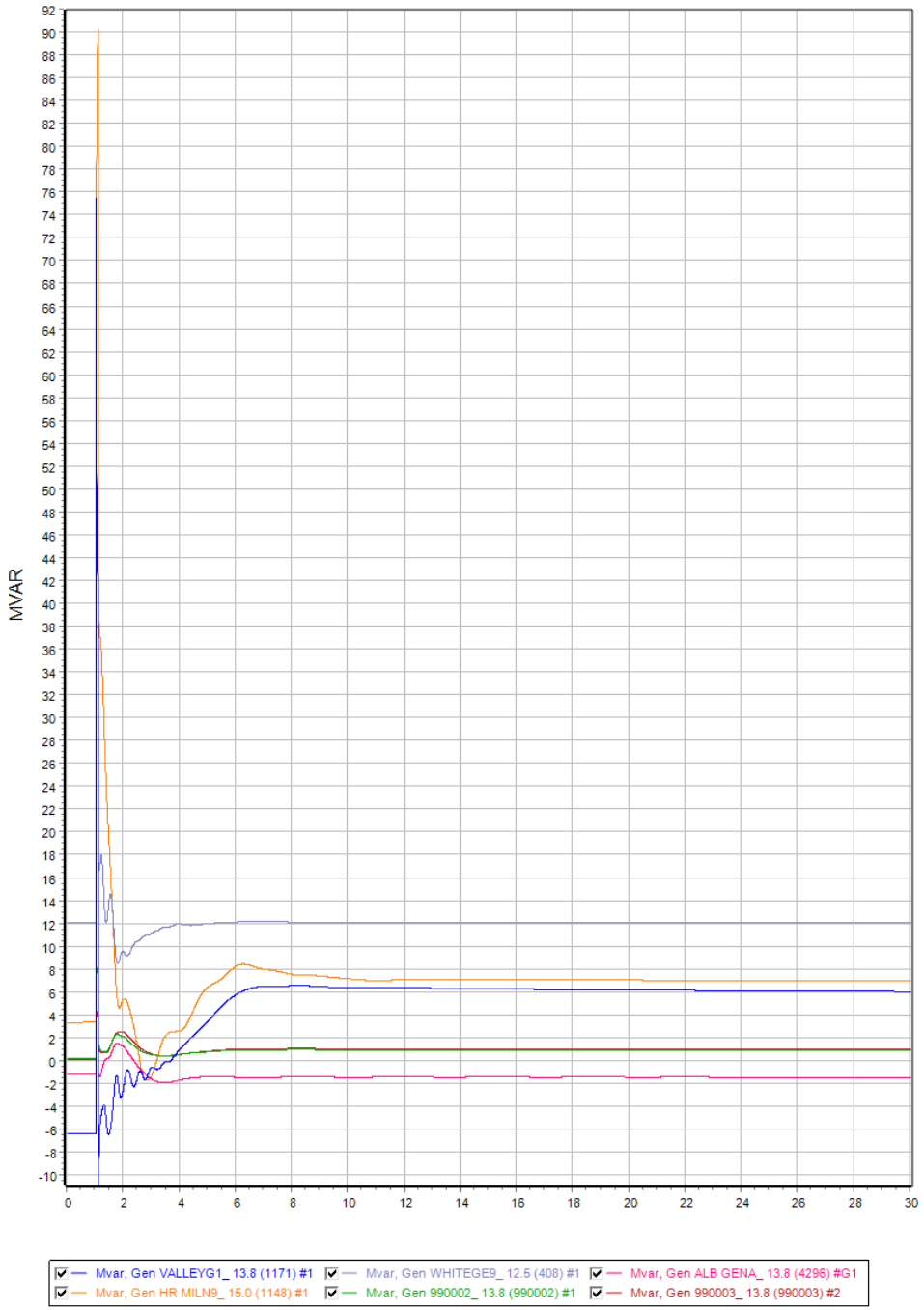
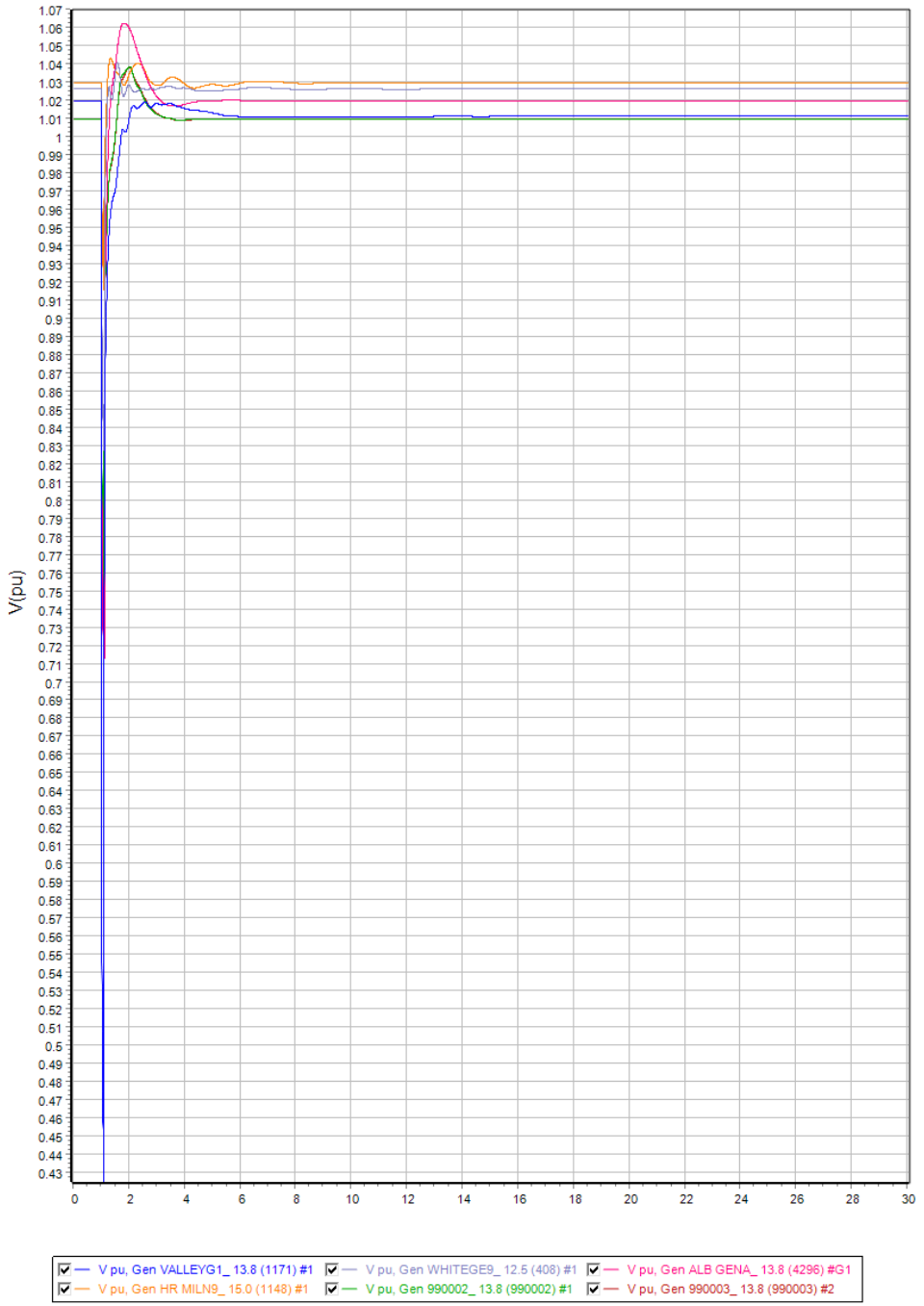
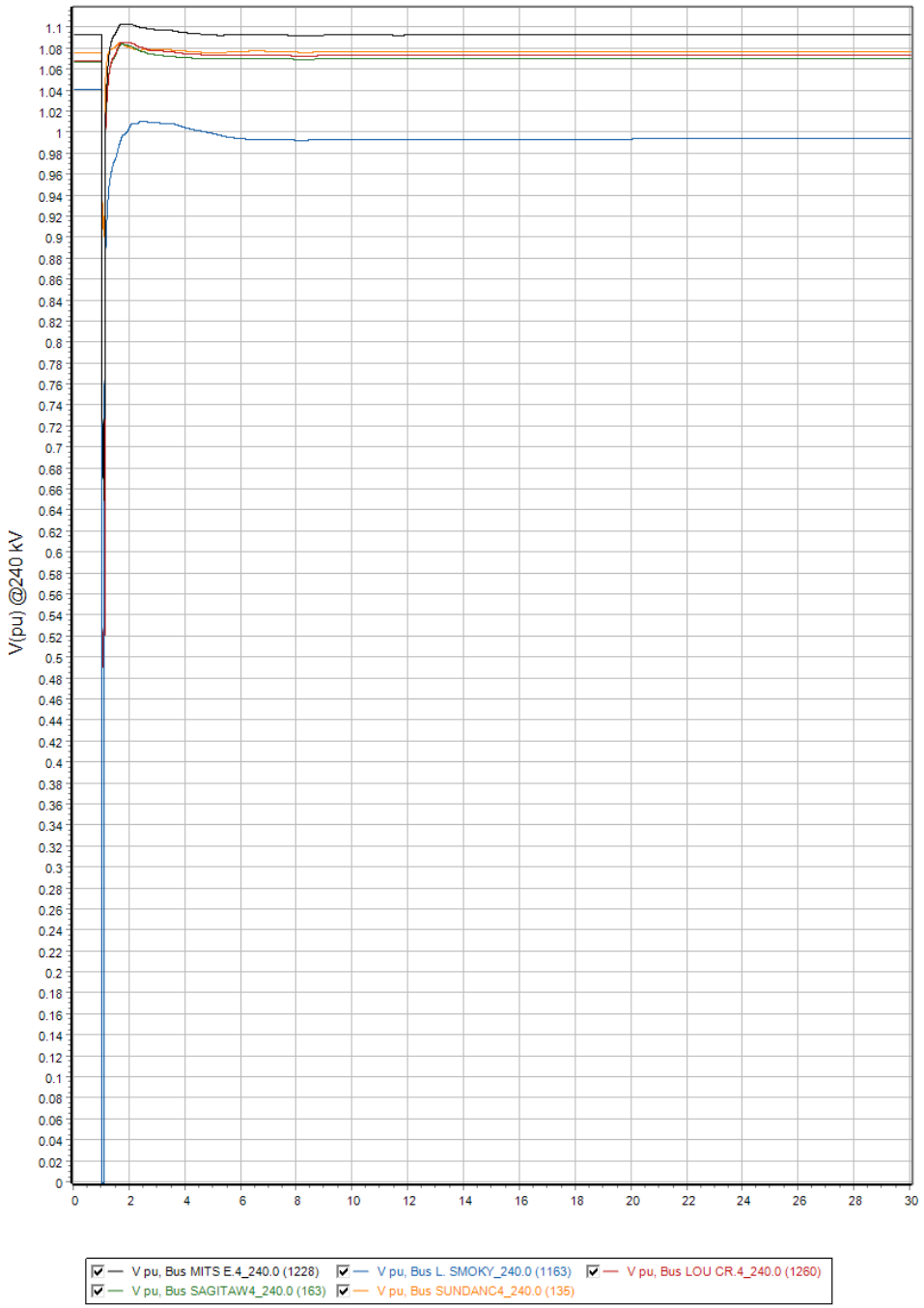
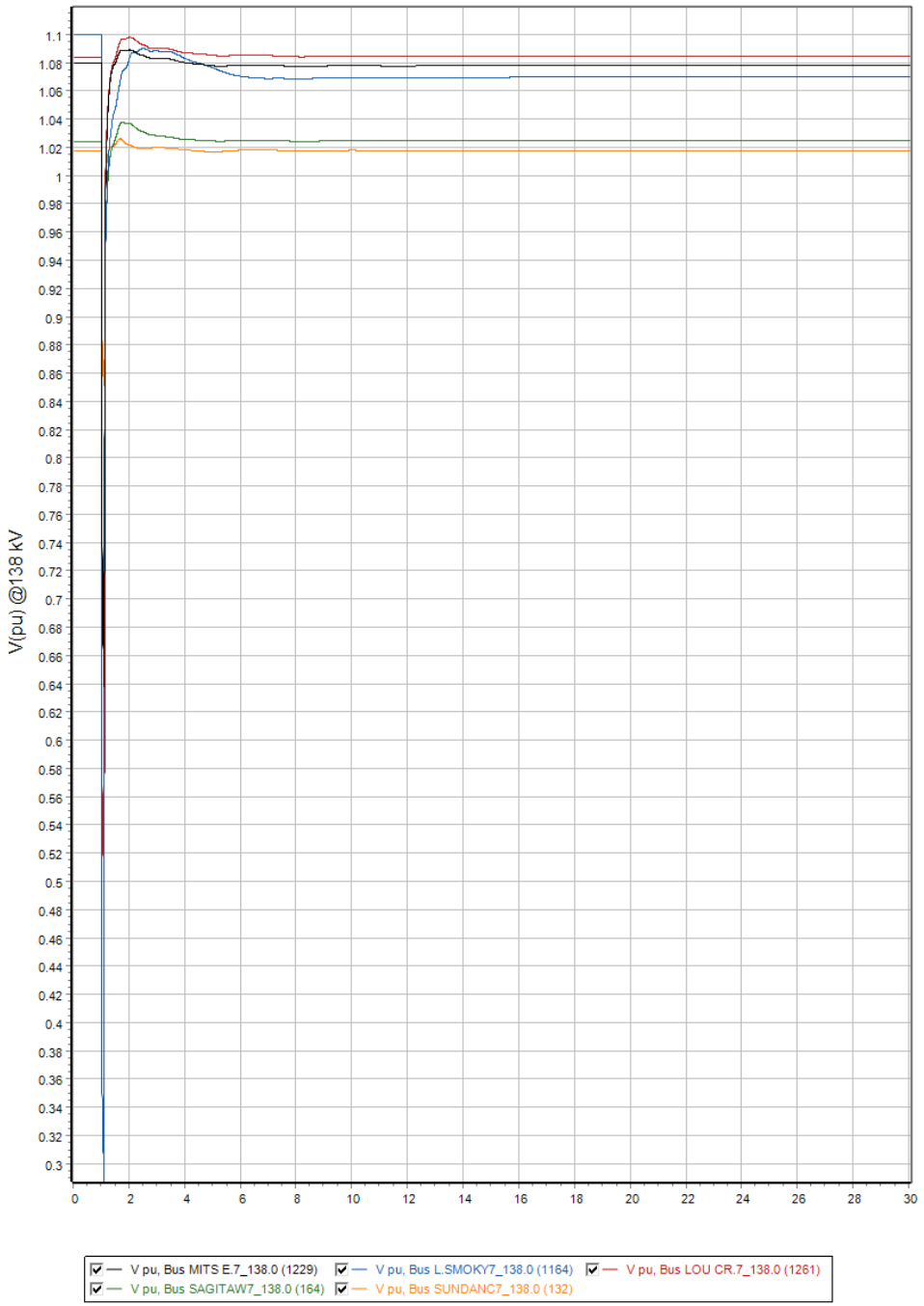


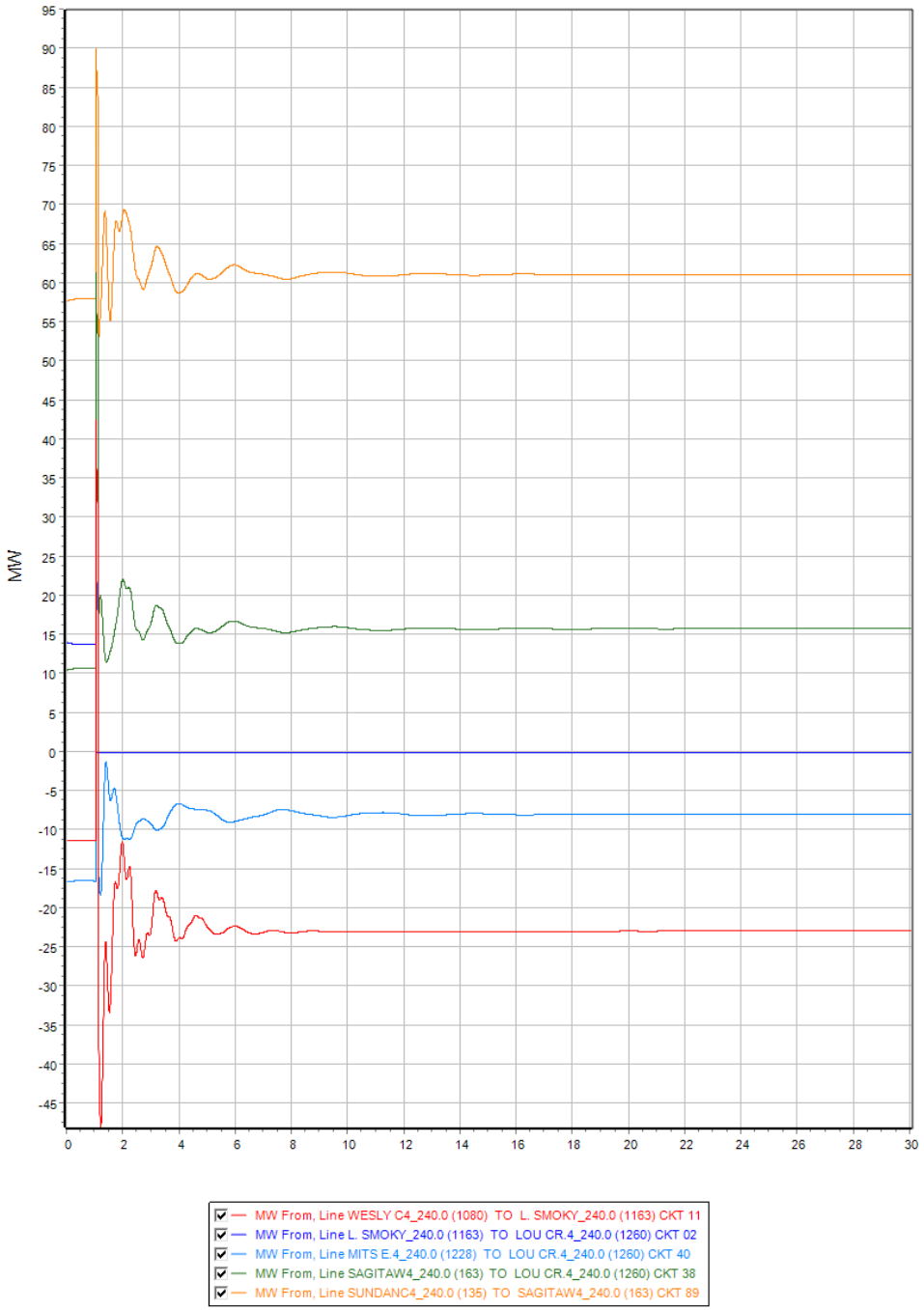


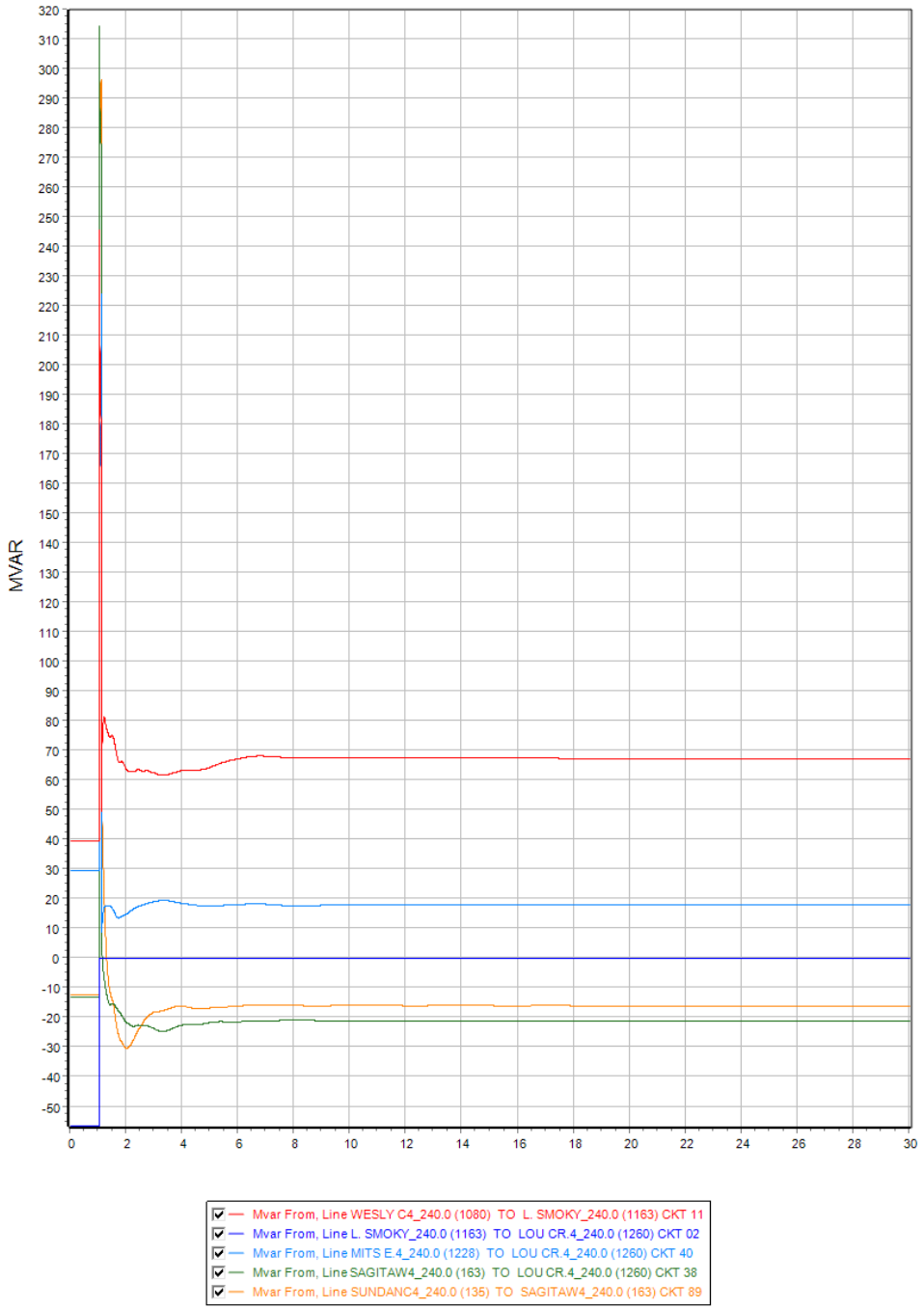
Monitor Bus Volts Q3



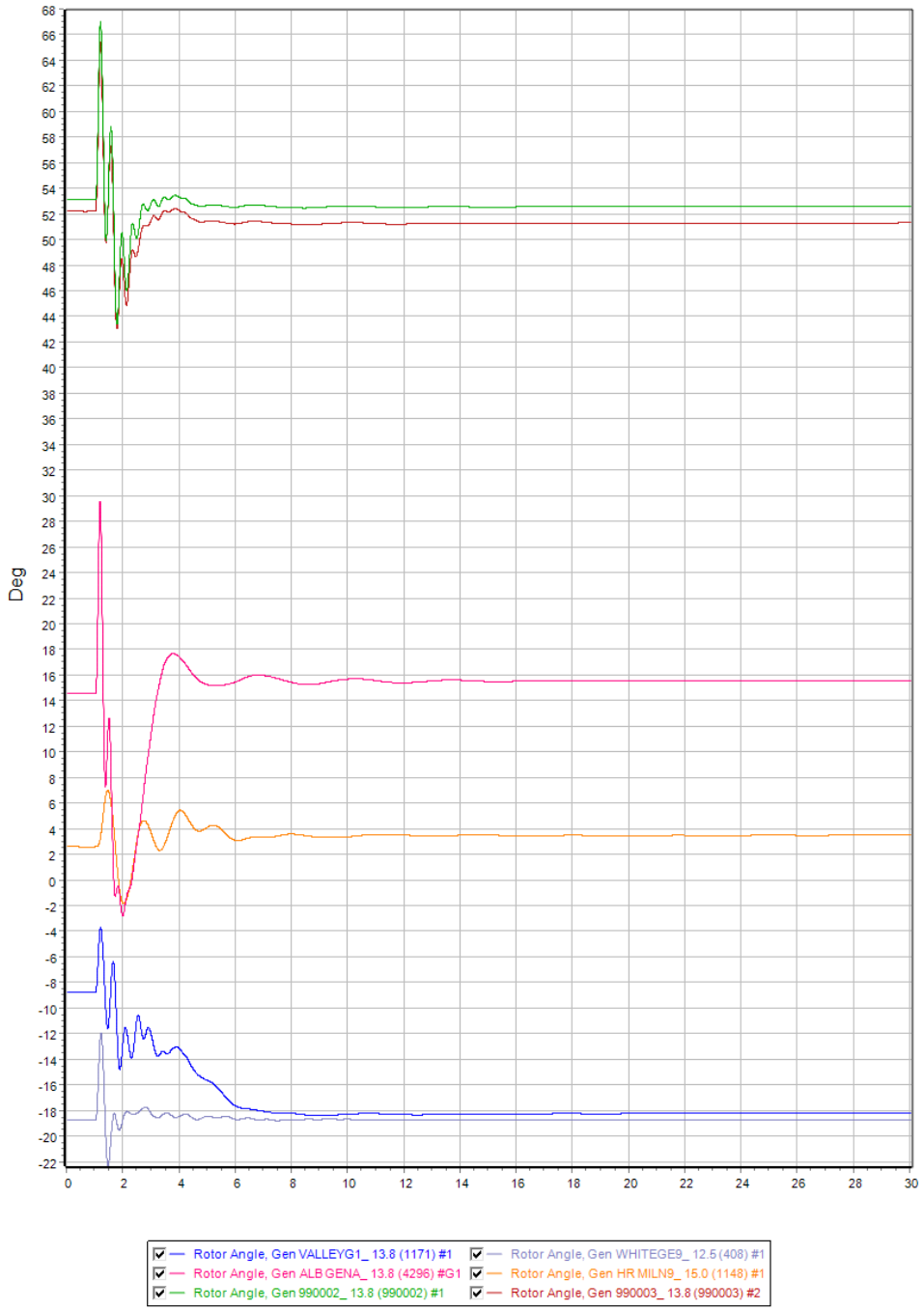


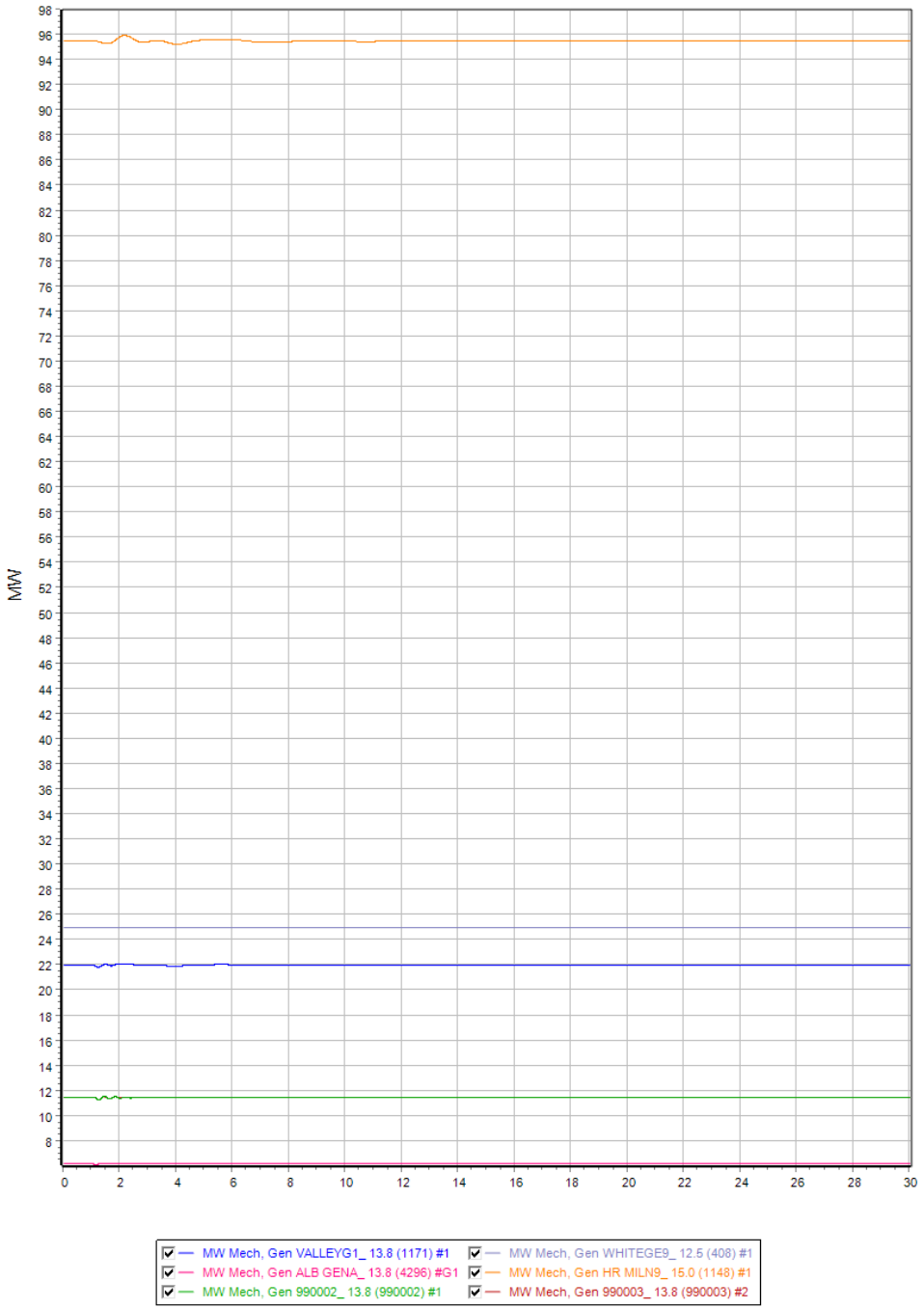
Monitor Line MW & MVAR. Q4





Monitor Gens. Q1





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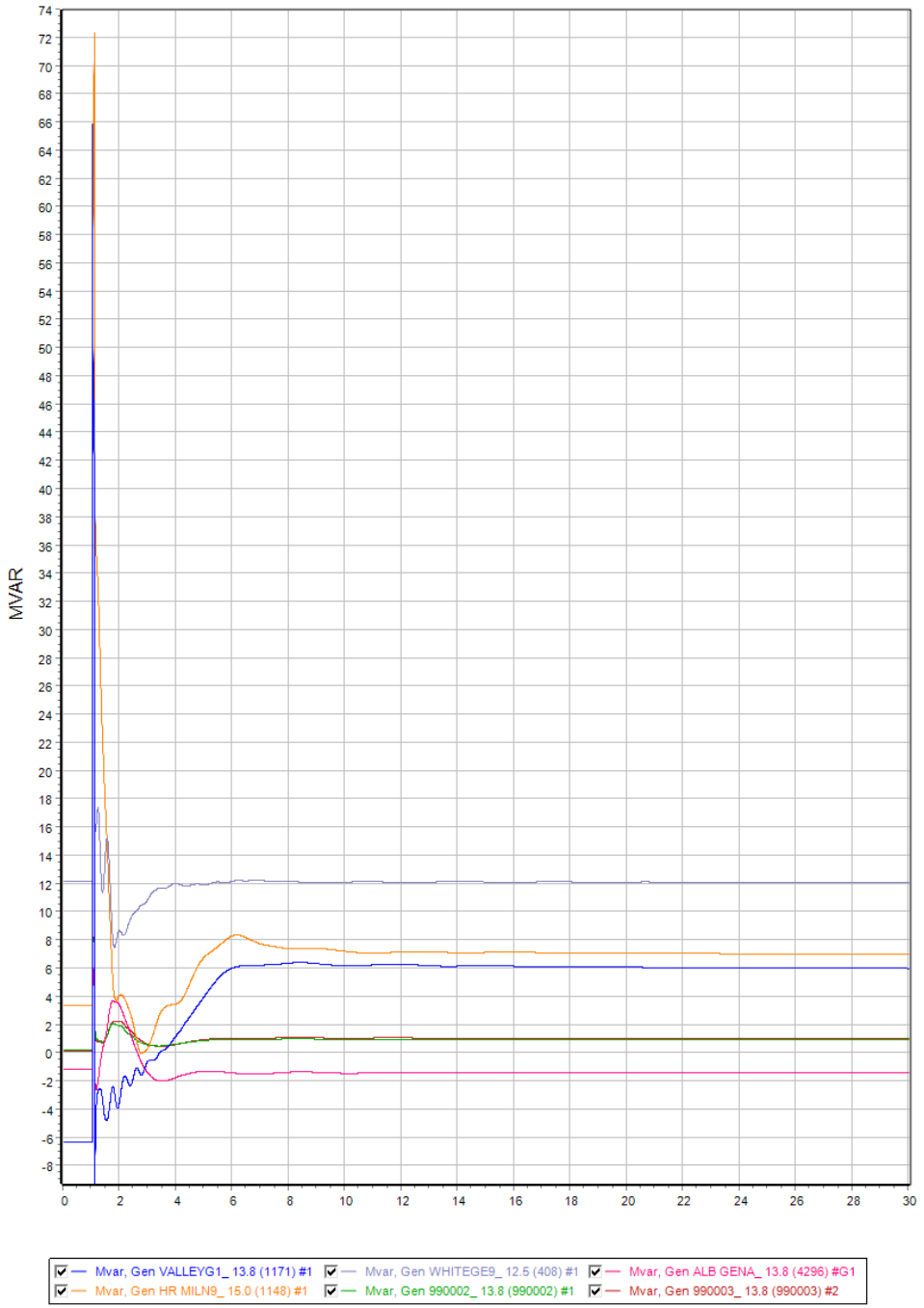
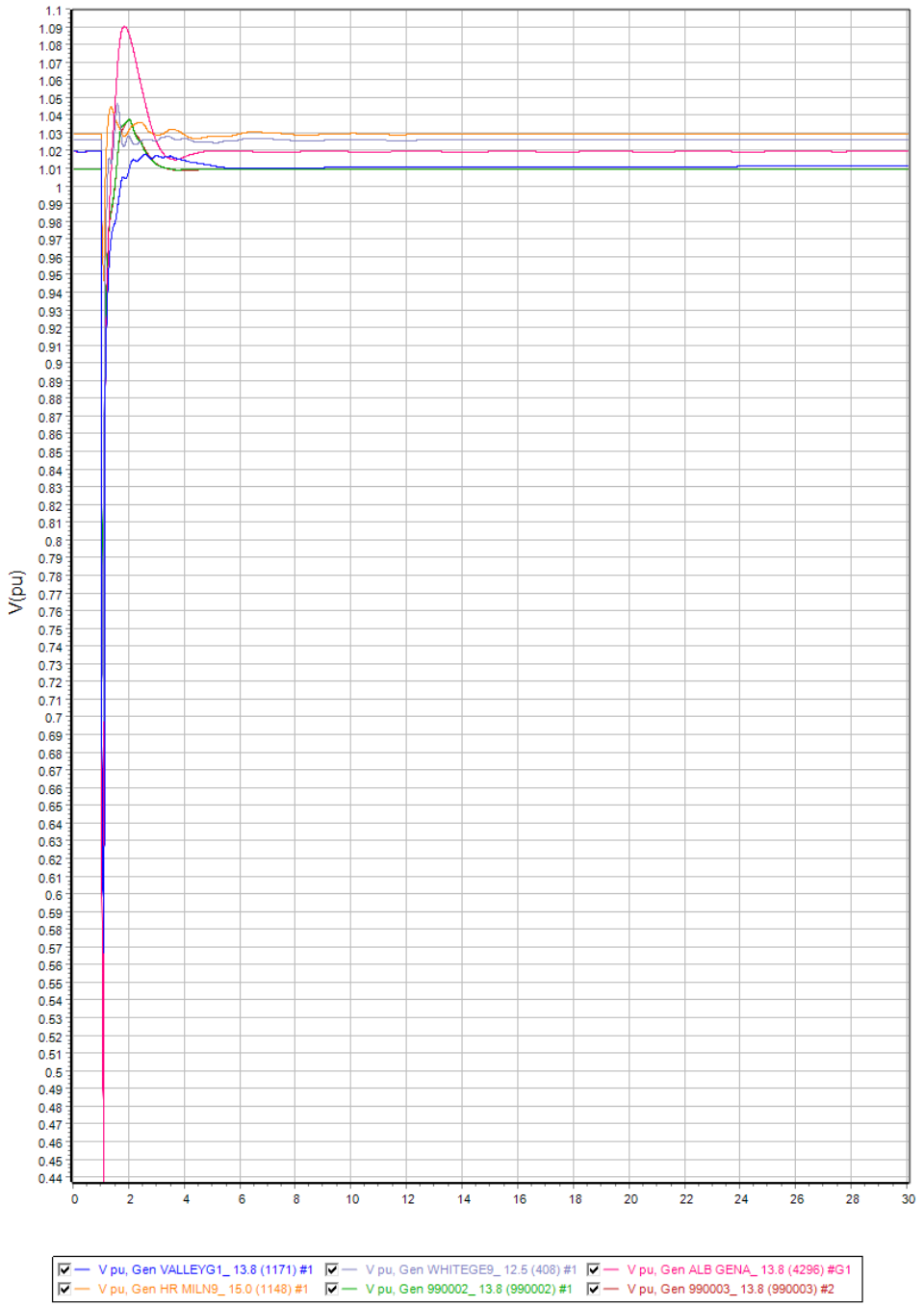
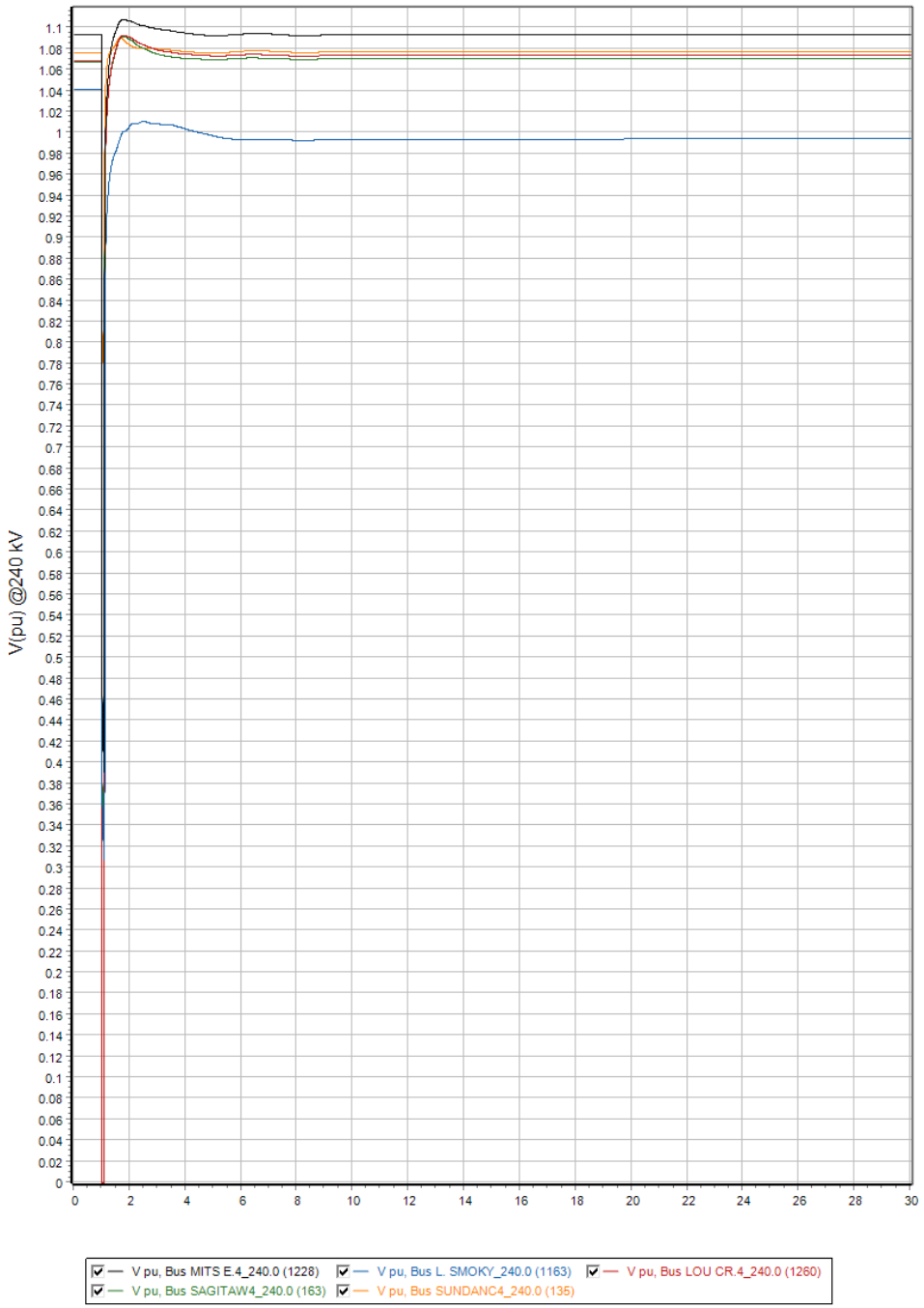


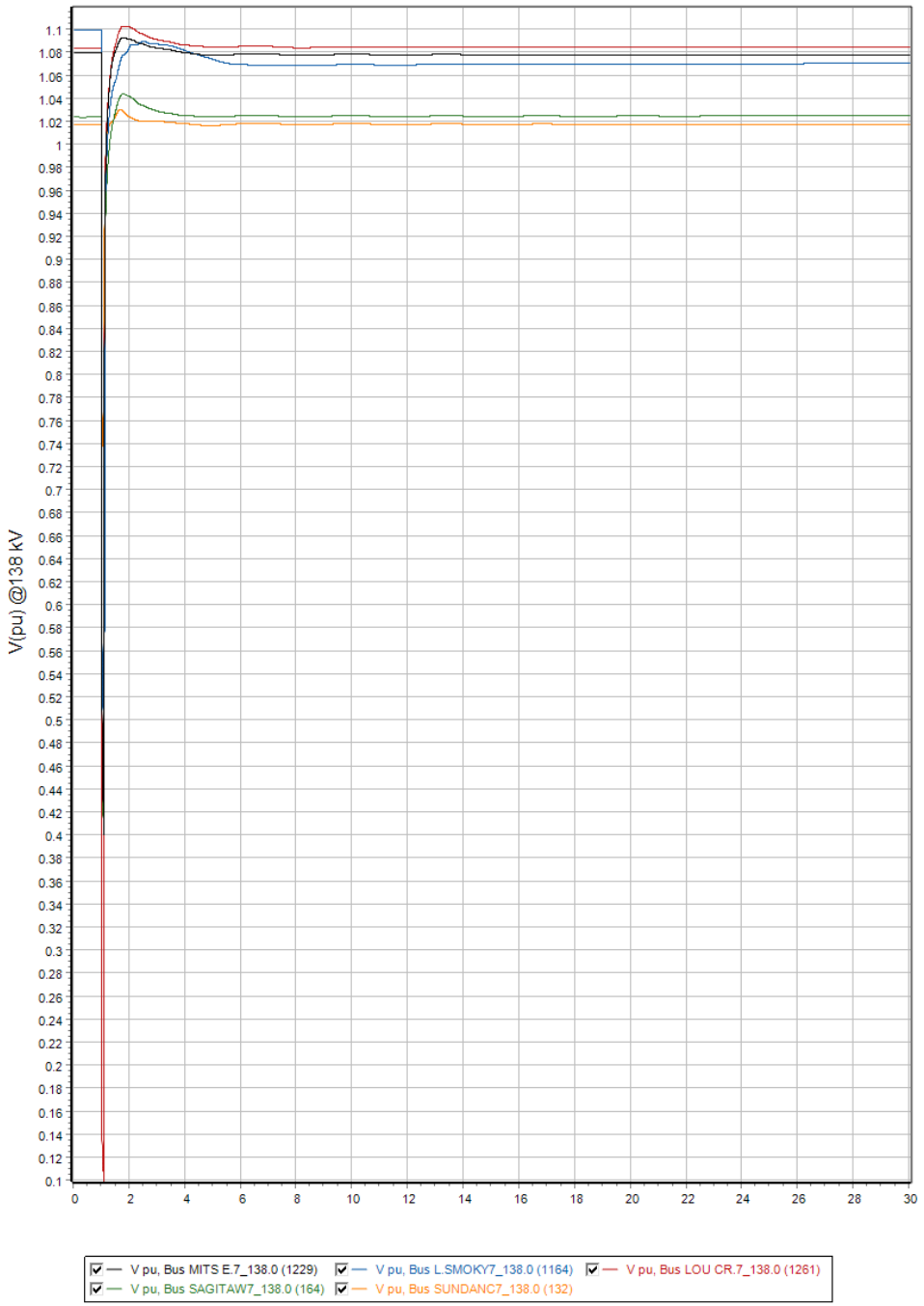


SC08 - 2021RC_2023WP_NW-High_Tie-Econ_Wind-0.36_p-REV6 Alta1-Post-Proj-TSTAB.pwb

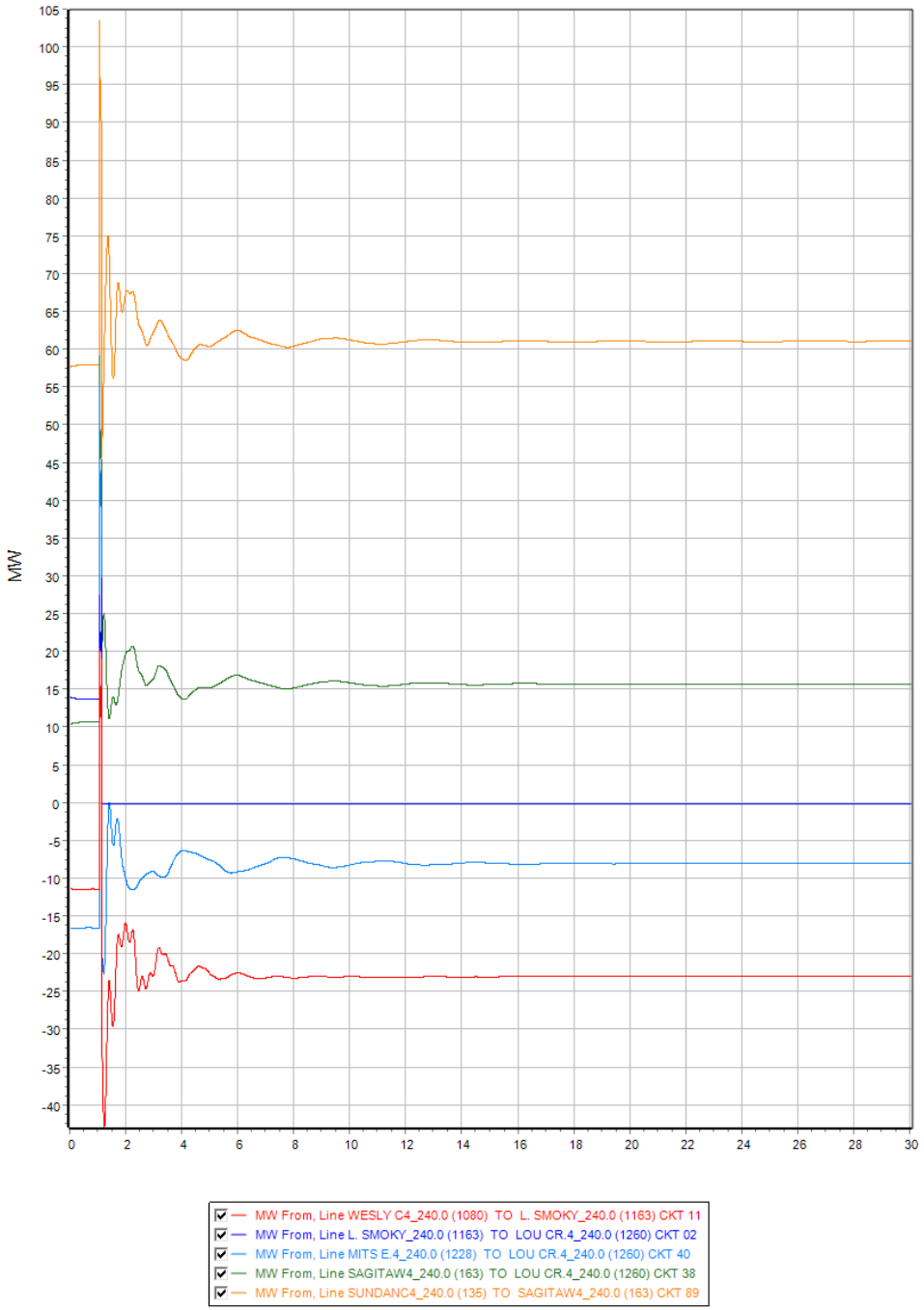
Contingency: 09B - C5 - 9L02/9L05 (Little Smoky 913S – Louise Creek 809S) @ Louise Creek 809S

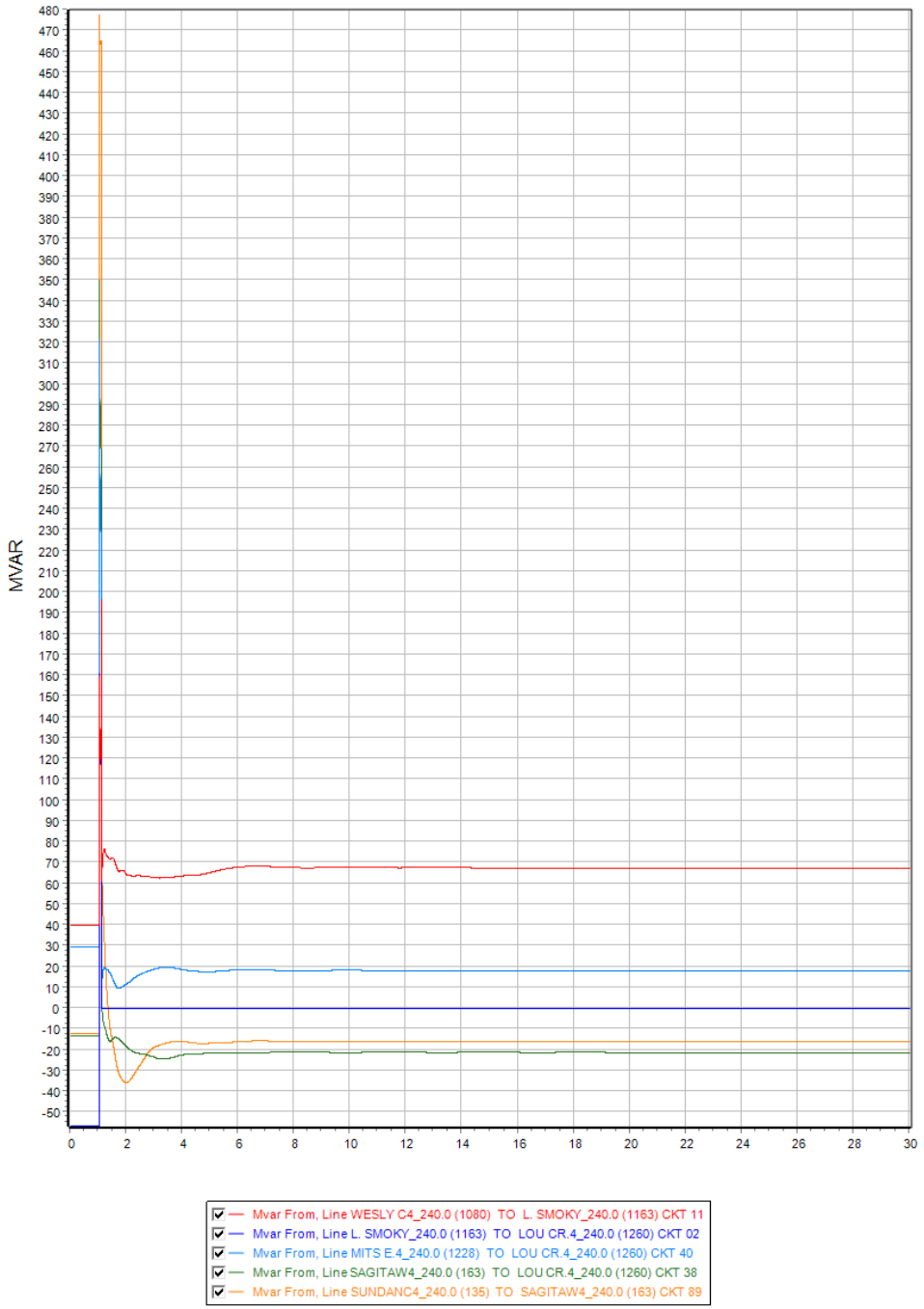
Monitor Bus Volts Q3





Monitor Line MW & MVAR. Q4





Attachment A5
Dynamic Data and Assumptions

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

Table A-1: Transient Stability Analysis Load Representation

Planning Areas	% of load specified as Large Motors	% of load specified as Small Motors	The Remainder of the Load (excluding Motor loads)	
			Active Power	Reactive Power
			Constant Current	Constant Impedance
RAINBOW - 17	40	30	100	100
HIGH LEV - 18	40	30	100	100
PEACE RI - 19	40	30	100	100
GRANDE P - 20	40	30	100	100
HIGH PRA - 21	40	30	100	100
GRANDE C - 22	40	30	100	100
VALLEYVI - 23	40	30	100	100
FOX CREE - 24	40	30	100	100
FORT MCM - 25	40	30	100	100
SWAN HIL - 26	40	30	100	100
ATHABASC - 27	40	30	100	100
FORT SAS - 33	40	30	100	100

Table A-2: Generator Dynamic

Generator Dynamic Data (GENTPJ model - Units 1 to 9)											
H	**D**	**Ra**	**Xd**	**Xq**	**Xdp**	**Xqp**	**Xdpp**	**Xqpp**	**Xl**	**Tdop**	**Tqop**
1.37	0.062	0	1.372	0.887	0.292	0.887	0.248	0.248	0.1226	2.65	0
Tdopp	**Tqopp**	**S(1.0)**	**S(1.2)**	**RComp**	**XComp**	**Kis**					
0.03	0.138	0.0209	0.18	0	0	0.11					

Table A-3: Exciter Dynamic Data

Exciter Dynamic Data (AC8B model - Units 1 to 9)											
Tr	**Kpr**	**Kir**	**Kdr**	**Tdr**	**Vpidmax**	**Vpidmin**	**Ka**	**Ta**	**Vrmax**	**Vrmin**	**Kc**
0.02	124	173.6	24.2	0.01667	6.7	0	1	0	15	0	0.227
Kd	**Ke**	**Te**	**Vfemax**	**Vemin**	**E1**	**S(E1)**	**E2**	**S(E2)**			
0.384	1	0.51	6.7	0	3.225	0.0019	4.3	0.017			

Table A-4: Stabilizer Dynamic Data

Stabilizer Dynamic Data (PSS2B model - Units 1 to 9)											
Ics1	**Ics2**	**M**	**N**	**Tw1**	**Tw2**	**T6**	**Tw3**	**Tw4**	**T7**	**Ks2**	**Ks3**
1	3	5	1	10	10	0	10	0	10	1.47	1
T8	**T9**	**Ks1**	**T1**	**T2**	**T3**	**T4**	**T10**	**T11**	**Vsi1max**	**Vsi1min**	**Vsi2max**
0.5	0.1	4	0.16	0.02	0.16	0.02	0.02	0.02	0.02	0.02	0.02
Vsi2min	**Vstmax**	**Vstmin**									
0.02	0.1	-0.1									

Table A-5: Governor Dynamic Data

Governor Dynamic Data (DEGOV1 model - Units 1 to 9)											
T1	**T2**	**T3**	**K**	**T4**	**T5**	**T6**	**Td**	**Tmax**	**Tmin**	**Droop**	**Te**
0.2	0	2.2	1.54	0	0	0	0.05	1.03	-0.1	0.03	2.5
Droop Control											
1											

Attachment A6
Post-Mitigation Power Flow Diagrams

2023 SUMMER LIGHT

Single Line Diagrams
P2456 - POST-PROJECT
POST-RAS
POWER FLOW SC06

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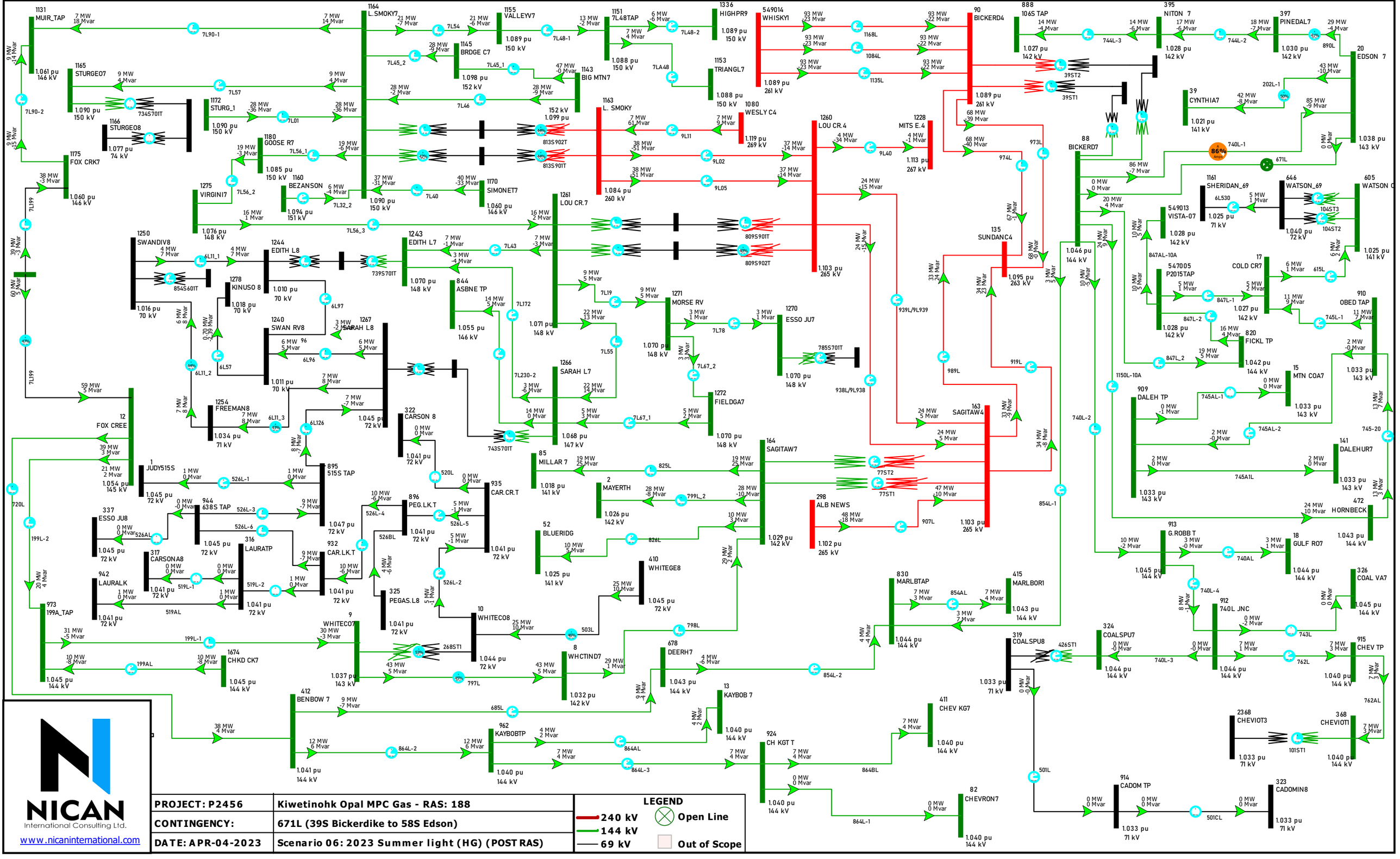
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7L90-1
1164 L.SMOKY7 7 MW 14 Mvar
1165 STURGE07 9 MW 4 Mvar 1.090 pu 150 kV
734S701T
1166 STURGE08 1.077 pu 74 kV
7L90-2
1172 STURG_1 28 MW -36 Mvar 1.090 pu 150 kV
7L01
1175 FOX CRK7 38 MW -3 Mvar 1.060 pu 146 kV
7L199
1180 GOOSE R7 19 MW -3 Mvar 1.085 pu 150 kV
7L56_1
1275 VIRGINI7 16 MW 1 Mvar 1.076 pu 148 kV
7L56_2
1160 BEZANSON 6 MW -4 Mvar 1.094 pu 151 kV
7L32_2
7L57
7L45_2
7L54
1155 VALLEYV7 1.089 pu 150 kV
7L48-1
1145 BRDGE C7 1.098 pu 152 kV
7L45_1
1151 7L48TAP 13 MW -2 Mvar 7 MW 4 Mvar 1.088 pu 150 kV
7L48-2
1143 BIG MTN7 47 MW -0 Mvar
7L46
7L48A
1336 HIGHPR9 1.089 pu 150 kV
1153 TRIANGL7 1.088 pu 150 kV
549014 WHISKY1 93 MW 23 Mvar 1.089 pu 261 kV
1168L
1084L
1135L
90 BICKERD4 93 MW 22 Mvar 1.089 pu 261 kV
68 MW 39 Mvar
68 MW 40 Mvar
888 106S TAP 14 MW -4 Mvar 1.027 pu 142 kV
39ST2
39ST1
744L-3
395 NITON 7 14 MW -6 Mvar 17 MW -6 Mvar 1.028 pu 142 kV
744L-2
397 PINEDAL7 18 MW -7 Mvar 29 MW -4 Mvar 1.030 pu 142 kV
890L
20 EDSON 7 1.038 pu 143 kV
43 MW -10 Mvar
85 MW -9 Mvar
0 MW 0 Mvar
202L-1
39 CYNTHIA7 42 MW -8 Mvar 1.021 pu 141 kV
740L-1
671L
974L
973L
1163 L. SMOKY 7 MW 61 Mvar 38 MW -51 Mvar 38 MW -51 Mvar 1.084 pu 260 kV
9L11
9L02
9L05
1080 WESLY C4 7 MW 9 Mvar 1.119 pu 269 kV
1260 LOU CR.4 -4 MW -34 Mvar 37 MW -14 Mvar 37 MW -14 Mvar 1.103 pu 265 kV
9L40
1228 MITS E.4 4 MW -1 Mvar 1.113 pu 267 kV
813S902T
813S901T
88 BICKERD7 0 MW 0 Mvar 20 MW 4 Mvar 1.046 pu 144 kV
86 MW -7 Mvar
24 MW 9 Mvar
10 MW 5 Mvar
1161 SHERIDAN_69 6L530 5 MW 1 Mvar 1.025 pu 71 kV
646 WATSON_69 104ST3 104ST2 1.040 pu 72 kV
605 WATSON G 1.025 pu 141 kV
6 MW 2 Mvar
549013 VISTA-07 1.028 pu 142 kV
847AL-10A
547005 P2015TAP 5 MW 1 Mvar 1.027 pu 142 kV
847L-1
847L-2
17 COLD CR7 6 MW 1 Mvar 5 MW 2 Mvar 11 MW 9 Mvar
615L
910 OBED TAP 11 MW 7 Mvar
745L-1
16 MW 4 Mvar
820 FICKL TP 19 MW 5 Mvar 1.042 pu 144 kV
847L_2
2 MW -0 Mvar
1.033 pu 143 kV
1150L-10A
909 DALEH TP 0 MW -1 Mvar 2 MW -0 Mvar 2 MW 0 Mvar 1.033 pu 143 kV
745AL-1
745AL-2
745A1L
15 MTN COA7 0 MW 0 Mvar 1.033 pu 143 kV
745-20
141 DALEHUR7 2 MW 0 Mvar 1.033 pu 143 kV
13 MW 3 Mvar
472 HORNBECK 24 MW 10 Mvar 1.043 pu 144 kV
740L-2
913 G.ROBB T 10 MW -2 Mvar 3 MW -0 Mvar 1.045 pu 144 kV
740AL
18 GULF RO7 3 MW 1 Mvar 1.044 pu 144 kV
740L-4
912 740L JNC 0 MW -2 Mvar 0 MW -0 Mvar 1.044 pu 144 kV
743L
326 COAL VA7 0 MW 0 Mvar 1.045 pu 144 kV
915 CHEV TP 7 MW 3 Mvar 1.040 pu 144 kV
762L
762AL
2368 CHEVIOT3 1.033 pu 71 kV
101ST1
368 CHEVIOT 7 MW 3 Mvar 1.040 pu 144 kV
914 CADOM TP 0 MW 0 Mvar 0 MW 0 Mvar 1.033 pu 71 kV
501CL
323 CADOMIN8 0 MW 0 Mvar 1.033 pu 71 kV
501L
1033 pu 71 kV
0 MW -0 Mvar
1250 SWANDIV8 4 MW 7 Mvar 1.016 pu 70 kV
6L11_1
854S601T
1278 KINUSO 8 1.018 pu 70 kV
1244 EDITH L8 1.010 pu 70 kV
6L97
739S701T
1243 EDITH L7 7 MW -1 Mvar 3 MW -4 Mvar 1.070 pu 148 kV
7L43
844 ASBNE TP 14 MW 5 Mvar 1.055 pu 146 kV
7L172
1240 SWAN RV8 6 MW 5 Mvar 1.011 pu 70 kV
6L96
1267 SARAH L8 6 MW 5 Mvar
6L57
6L11_2
1254 FREEMAN8 7 MW 8 Mvar 1.034 pu 71 kV
6L11_3
6L126
1045 pu 72 kV
322 CARSON 8 0 MW 0 Mvar 1.041 pu 72 kV
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895 515S TAP 1.047 pu 72 kV
1 JUDY515S 1 MW 0 Mvar 1.045 pu 72 kV
526L-1
12 FOX CREE 39 MW 3 Mvar 21 MW 2 Mvar 1.054 pu 145 kV
720L
199L-2
944 638S TAP 0 MW -0 Mvar 1.045 pu 72 kV
526L-3
526L-6
337 ESSO JU8 0 MW 0 Mvar 1.045 pu 72 kV
526AL
316 LAURATP 1.041 pu 72 kV
317 CARSONA8 0 MW 0 Mvar 0 MW 0 Mvar 1.041 pu 72 kV
519L-1
519L-2
519AL
942 LAURALK 1 MW 0 Mvar 1 MW 0 Mvar 1.041 pu 72 kV
973 199A_TAP 31 MW -5 Mvar 10 MW -8 Mvar 1.045 pu 144 kV
199L-1
199AL
1674 CHKD CK7 10 MW -8 Mvar 1.045 pu 144 kV
9 WHITEC07 30 MW -3 Mvar 1.037 pu 143 kV
268ST1
526L-4
526BL
896 PEG.LK.T 10 MW -6 Mvar 1.041 pu 72 kV
4 MW -0 Mvar
325 PEGAS.L8 1.041 pu 72 kV
526L-5
935 CAR.CR.T 5 MW -1 Mvar 1.041 pu 72 kV
932 CAR.LK.T 9 MW -7 Mvar 10 MW -6 Mvar 1.041 pu 72 kV
526L-2
5 MW -1 Mvar
10 WHITEC08 25 MW 10 Mvar 1.044 pu 72 kV
503L
1261 LOU CR.7 16 MW 2 Mvar 1.071 pu 148 kV
809S901T
809S902T
7L19
7L55
9 MW 5 Mvar
22 MW 13 Mvar
1271 MORSE RV 3 MW 1 Mvar 1.070 pu 148 kV
7L78
7L67_2
1270 ESSO JU7 1.070 pu 148 kV
785S701T
1272 FIELDGA7 1.070 pu 148 kV
7L67_1
7L230-2
1266 SARAH L7 22 MW 14 Mvar 1.068 pu 147 kV
743S701T
85 MILLAR 7 19 MW 25 Mvar 1.018 pu 141 kV
825L
2 MAYERTH 28 MW -8 Mvar 1.026 pu 142 kV
799L_2
52 BLUERIDG 10 MW 5 Mvar 1.025 pu 141 kV
826L
410 WHITEGE8 25 MW 10 Mvar 1.045 pu 72 kV
798L
797L
8 WHCTIND7 43 MW 5 Mvar 29 MW 1 Mvar 1.032 pu 142 kV
678 DEERH7 4 MW -6 Mvar 1.043 pu 144 kV
854L-2
164 SAGITAW7 19 MW 25 Mvar 1.029 pu 142 kV
77ST2
77ST1
298 ALB NEWS 48 MW -18 Mvar 1.102 pu 265 kV
907L
1.103 pu 265 kV
135 SUNDANC4 1.095 pu 263 kV
939L/9L939
938L/9L938
989L
919L
163 SAGITAW4 24 MW 5 Mvar 33 MW -9 Mvar
854L-1
830 MARLBTAP 7 MW 3 Mvar 3 MW 7 Mvar 1.044 pu 144 kV
854AL
415 MARLBOR1 7 MW 4 Mvar 1.043 pu 144 kV
4 MW 4 Mvar
319 COALSPU8 1.033 pu 71 kV
426ST1
324 COALSPU7 0 MW -0 Mvar 1.044 pu 144 kV
740L-3
412 BENBOW 7 9 MW -7 Mvar 1.041 pu 144 kV
685L
962 KAYBOBTP 4 MW 2 Mvar 7 MW 4 Mvar 1.040 pu 144 kV
864L-2
864AL
864L-3
13 KAYBOB 7 1.040 pu 144 kV
924 CH KGT T 7 MW 4 Mvar 0 MW 0 Mvar 1.040 pu 144 kV
864BL
864L-1
411 CHEV KG7 7 MW 4 Mvar 1.040 pu 144 kV
82 CHEVRON7 0 MW 0 Mvar 1.040 pu 144 kV
38 MW 4 Mvar
PROJECT: P2456
Kiwetinohk Opal MPC Gas - RAS: 188
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 06: 2023 Summer light (HG) (POST RAS)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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2023 SUMMER PEAK

Single Line Diagrams
P2456 - POST-PROJECT
POST-RAS
POWER FLOW SC07

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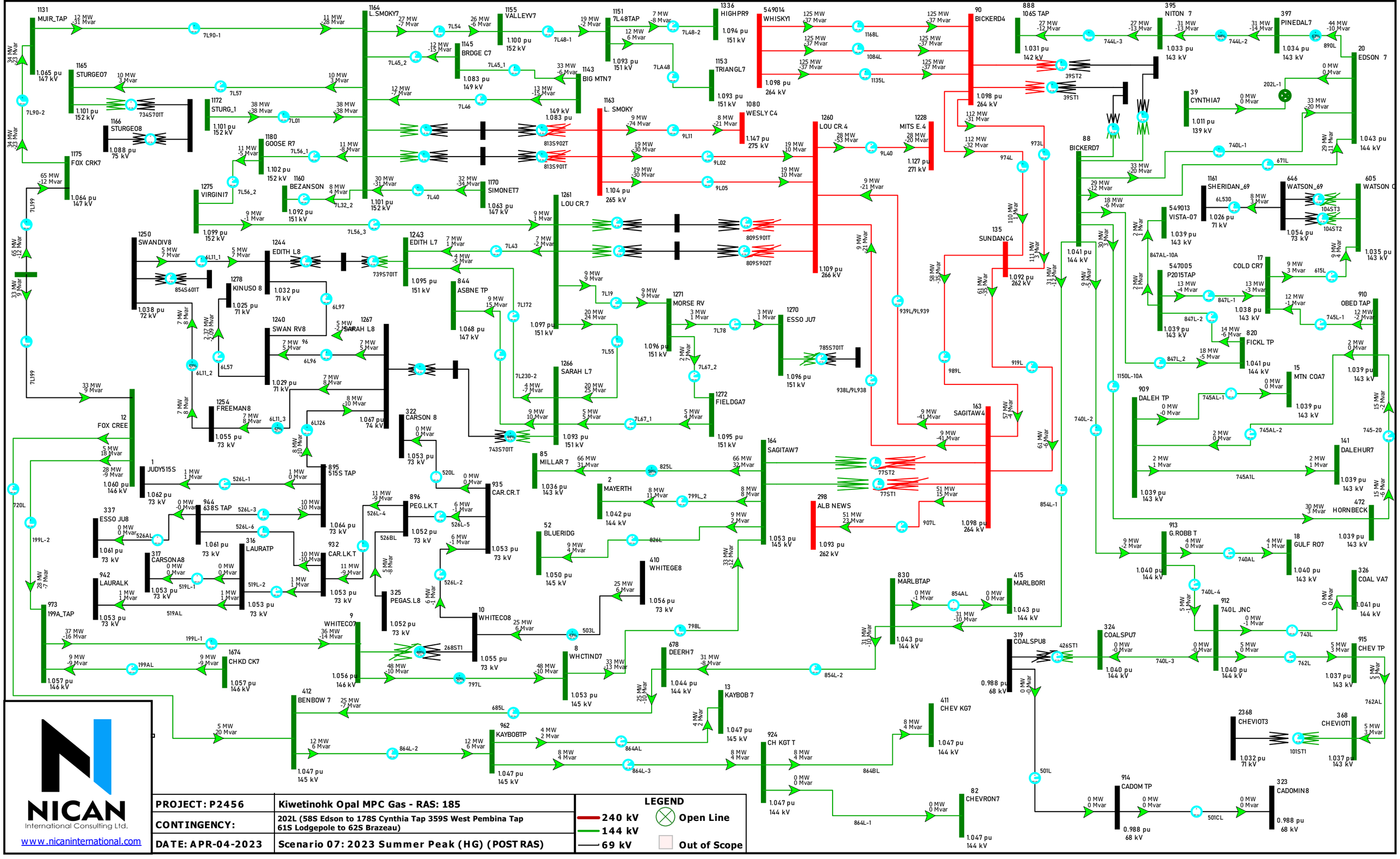

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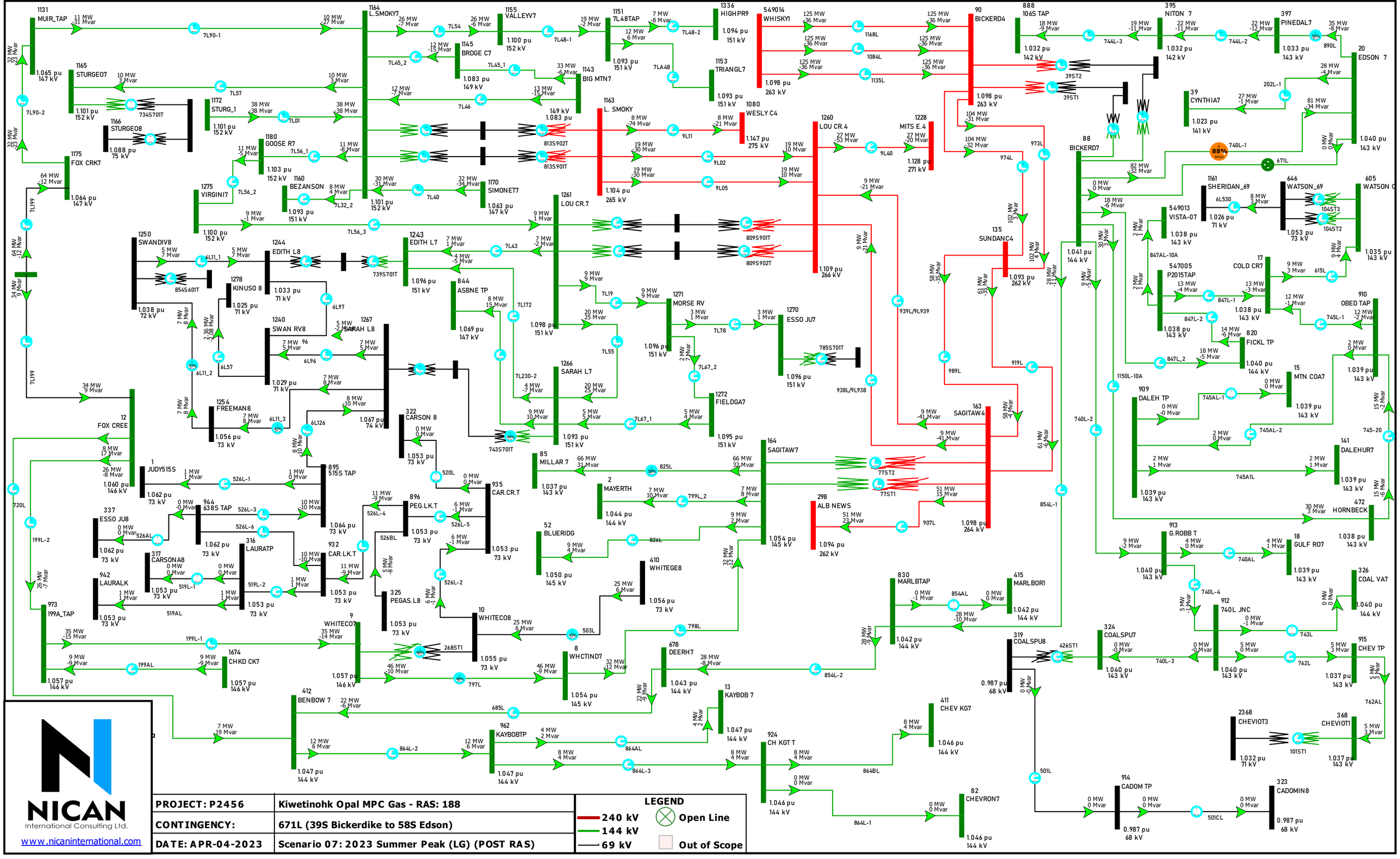
PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 185**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**
DATE: APR-04-2023	**Scenario 07: 2023 Summer Peak (HG) (POST RAS)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 188**
CONTINGENCY:	**671L (39S Bickerdike to 58S Edson)**
DATE: APR-04-2023	**Scenario 07: 2023 Summer Peak (LG) (POST RAS)**

LEGEND

- **240 kV**
- **144 kV**
- **69 kV**
- ⊗ **Open Line**
- ☐ **Out of Scope**

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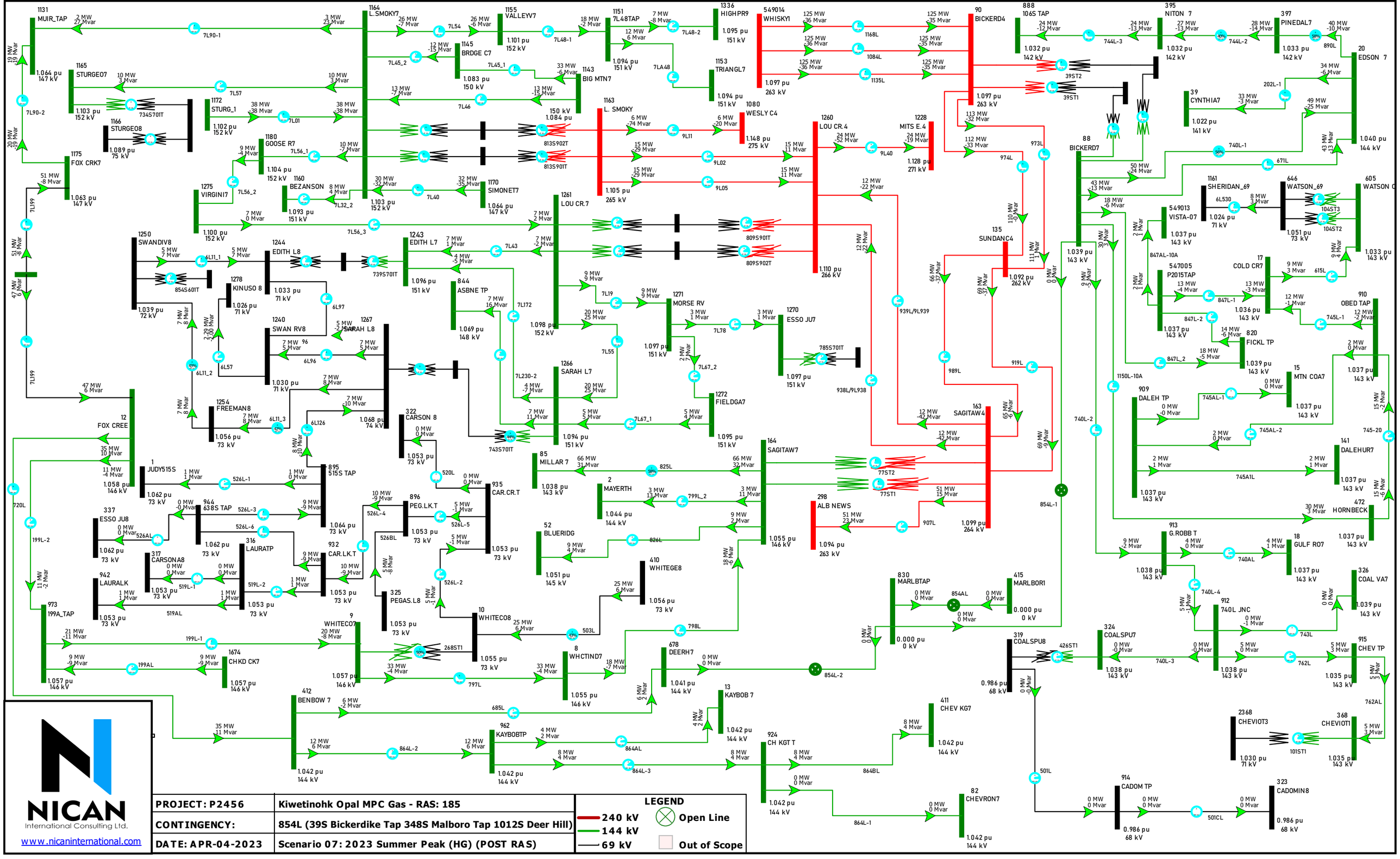

PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 185	LEGEND
CONTINGENCY:	854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	240 kV 144 kV 69 kV Open Line Out of Scope
DATE: APR-04-2023	Scenario 07: 2023 Summer Peak (HG) (POST RAS)	

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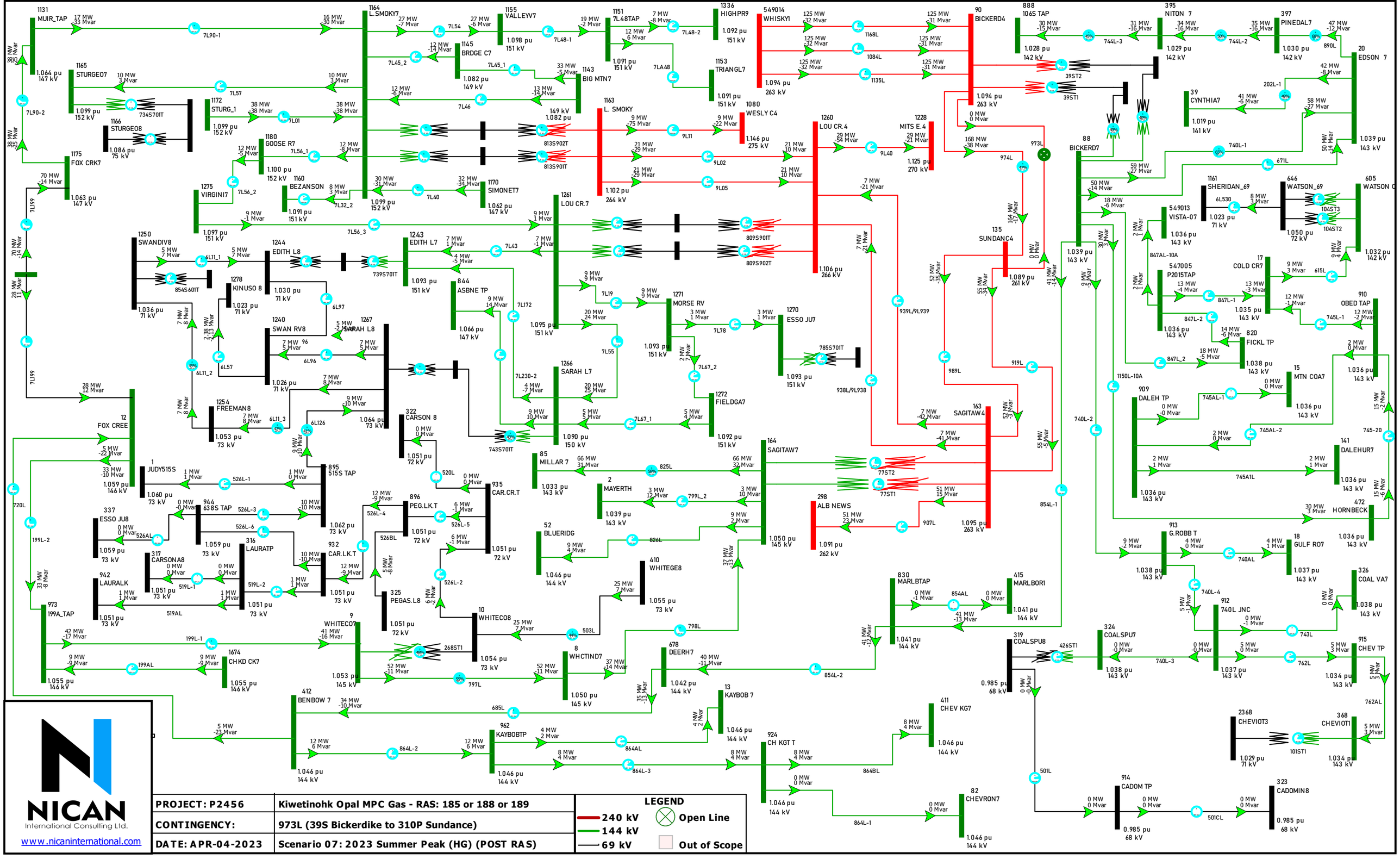
1131 MUIR_TAP 17 MW -33 Mvar 1.064 pu 147 kV
1165 STURGEO7 10 MW 3 Mvar 1.099 pu 152 kV
1166 STURGEO8 1.086 pu 75 kV
1175 FOX CRK7 70 MW -14 Mvar 1.063 pu 147 kV
1275 VIRGINI7 9 MW -1 Mvar 1.097 pu 151 kV
1164 L.SMOKY7 16 MW 30 Mvar 27 MW -7 Mvar 12 MW -6 Mvar 12 MW -14 Mvar 38 MW 38 Mvar 12 MW -8 Mvar 30 MW -31 Mvar 1.099 pu 152 kV
1155 VALLEYV7 27 MW -6 Mvar 1.098 pu 151 kV
1145 BRDGE C7 1.082 pu 149 kV
1143 BIG MTN7 33 MW -5 Mvar 13 MW -14 Mvar 149 kV 1.082 pu
1151 7L48TAP 19 MW -2 Mvar 12 MW 6 Mvar 1.091 pu 151 kV
1336 HIGHPR9 7 MW -8 Mvar 1.092 pu 151 kV
1153 TRIANGL7 1.091 pu 151 kV
549014 WHISKY1 125 MW -32 Mvar 125 MW -32 Mvar 125 MW -32 Mvar 1.094 pu 263 kV
1168L 1084L 1135L
125 MW -31 Mvar 125 MW -31 Mvar 125 MW -31 Mvar
90 BICKERD4 1.094 pu 263 kV 0 MW 0 Mvar 168 MW -38 Mvar
888 106S TAP 30 MW -15 Mvar 1.028 pu 142 kV
744L-3 744L-2
395 NITON 7 31 MW -16 Mvar 34 MW -16 Mvar 1.029 pu 142 kV
397 PINEDAL7 35 MW -16 Mvar 1.030 pu 142 kV
890L
20 EDSON 7 47 MW -12 Mvar 42 MW -8 Mvar 1.039 pu 143 kV
39ST2 39ST1
39 CYNTHIA7 41 MW -6 Mvar 1.019 pu 141 kV
202L-1
58 MW 27 Mvar
740L-1
671L
50 MW -14 Mvar
59 MW -27 Mvar
88 BICKERD7 1.039 pu 143 kV
973L 974L
1161 SHERIDAN_69 6L530 8 MW 3 Mvar 1.023 pu 71 kV
646 WATSON_69 104ST3 104ST2 1.050 pu 72 kV
605 WATSON C 1.032 pu 142 kV
549013 VISTA-07 1.036 pu 143 kV
847AL-10A
547005 P2015TAP 13 MW -4 Mvar 1.036 pu 143 kV
847L-1 847L-2
17 COLD CR7 9 MW 3 Mvar 13 MW 3 Mvar 12 MW -1 Mvar 1.035 pu 143 kV
615L
910 OBED TAP 12 MW -2 Mvar
745L-1
820 FICKL TP 14 MW -6 Mvar 18 MW -5 Mvar 1.038 pu 143 kV
847L_2
2 MW 0 Mvar 1.036 pu 143 kV
15 MTN COA7 0 MW 0 Mvar 1.036 pu 143 kV
745AL-1
745-20
909 DALEH TP 0 MW -0 Mvar 2 MW 0 Mvar 2 MW 1 Mvar 1.036 pu 143 kV
745AL-2
745A1L
141 DALEHUR7 2 MW 1 Mvar 1.036 pu 143 kV
15 MW -6 Mvar
472 HORNBECK 30 MW 3 Mvar 1.036 pu 143 kV
913 G.ROBB T 9 MW -2 Mvar 4 MW 0 Mvar 1.038 pu 143 kV
740AL
4 MW 1 Mvar 18 GULF RO7 1.037 pu 143 kV
740L-4
912 740L JNC 0 MW -1 Mvar 1.037 pu 143 kV
743L
326 COAL VA7 0 MW 0 Mvar 1.038 pu 143 kV
740L-3
5 MW -1 Mvar
915 CHEV TP 5 MW 3 Mvar 1.034 pu 143 kV
762L
762AL
2368 CHEVIOT3 1.029 pu 71 kV
101ST1
368 CHEVIOTI 5 MW 3 Mvar 1.034 pu 143 kV
914 CADOM TP 0 MW 0 Mvar 0 MW 0 Mvar 0.985 pu 68 kV
501CL
323 CADOMIN8 0 MW 0 Mvar 0.985 pu 68 kV
501L
854L-1
1228 MITS E.4 29 MW -21 Mvar 1.125 pu 270 kV
9L40
1260 LOU CR.4 29 MW -54 Mvar 21 MW 10 Mvar 1.106 pu 266 kV
9L11 9L02 9L05
1080 WESLY C4 9 MW -22 Mvar 1.146 pu 275 kV
1163 L. SMOKY 9 MW -75 Mvar 21 MW -29 Mvar 21 MW -29 Mvar 1.102 pu 264 kV
813S902T 813S901T
1261 LOU CR.7 9 MW 1 Mvar 7 MW -1 Mvar 1.095 pu 151 kV
809S901T 809S902T
7 MW -21 Mvar
939L/9L939
938L/9L938
919L 989L
135 SUNDANC4 1.089 pu 261 kV 0 MW 0 Mvar 164 MW -17 Mvar 55 MW -34 Mvar 52 MW -35 Mvar 41 MW -14 Mvar
1170 SIMONET7 32 MW -34 Mvar 1.062 pu 147 kV
1160 BEZANSON 8 MW 3 Mvar 1.091 pu 151 kV
1180 GOOSE R7 12 MW -5 Mvar 12 MW -8 Mvar 1.100 pu 152 kV
1172 STURG_1 38 MW 38 Mvar 1.099 pu 152 kV
734S701T
7L90-1 7L90-2 7L57 7L01 7L54 7L45_2 7L45_1 7L48-1 7L48-2 7L48 7L46 7L56_1 7L56_2 7L32_2 7L40 7L56_3 7L199 7L199-2
1250 SWANDIV8 5 MW 7 MW 5 MW 7 MW 1.036 pu 71 kV
854S601T
6L11_1
1244 EDITH L8 1.030 pu 71 kV
1278 KINUSO 8 1.023 pu 71 kV
1240 SWAN RV8 7 MW 5 MW 1.026 pu 71 kV
1267 SARAH L8 7 MW 5 MW 1.064 pu 73 kV
6L96 6L97 6L57 6L11_2 6L11_3 6L126
1254 FREEMAN8 7 MW 8 Mvar 1.053 pu 73 kV
12 FOX CREE 28 MW 12 Mvar 5 MW -22 Mvar 33 MW -10 Mvar 1.059 pu 146 kV
1 JUDY515S 1 MW 1 Mvar 1.060 pu 73 kV
526L-1
895 515S TAP 1 MW 0 Mvar 1.062 pu 73 kV
337 ESSO JU8 0 MW 0 Mvar 1.059 pu 73 kV
526AL
944 638S TAP 0 MW -0 Mvar 1.059 pu 73 kV
526L-3 526L-6
316 LAURATP 10 MW -10 Mvar 1.051 pu 73 kV
317 CARSONA8 0 MW 0 Mvar 1.051 pu 73 kV
519L-1
942 LAURALK 1 MW 1 Mvar 1.051 pu 73 kV
519AL 519L-2
932 CAR.LK.T 12 MW -9 Mvar 1.051 pu 73 kV
973 199A_TAP 42 MW -17 Mvar 9 MW -9 Mvar 1.055 pu 146 kV
199L-1 199AL
1674 CHKD CK7 9 MW -9 Mvar 1.055 pu 146 kV
199L-2 720L
322 CARSON 8 0 MW 0 Mvar 1.051 pu 72 kV
743S701T
896 PEG.LK.T 12 MW -9 Mvar 6 MW -1 Mvar 1.051 pu 72 kV
526L-4 526BL
935 CAR.CR.T 6 MW -1 Mvar 1.051 pu 72 kV
526L-5
325 PEGAS.L8 1.051 pu 72 kV
526L-2
10 WHITEC08 25 MW 7 Mvar 1.054 pu 73 kV
503L
9 WHITEC07 41 MW -16 Mvar 1.053 pu 145 kV
268ST1
797L
844 ASBNE TP 9 MW 14 Mvar 1.066 pu 147 kV
7L172
1266 SARAH L7 20 MW 25 Mvar 5 MW 5 Mvar 1.090 pu 150 kV
7L230-2 7L55 7L67_1
1271 MORSE RV 3 MW 1 Mvar 1.093 pu 151 kV
7L78
1270 ESSO JU7 1.093 pu 151 kV
785S701T
7L67_2
1272 FIELDGA7 1.092 pu 151 kV
1243 EDITH L7 7 MW 1 Mvar 4 MW -5 Mvar 1.093 pu 151 kV
739S701T
7L43
85 MILLAR 7 66 MW 31 Mvar 1.033 pu 143 kV
825L
2 MAYERTH 3 MW 12 Mvar 1.039 pu 143 kV
799L_2
52 BLUERIDG 9 MW 4 Mvar 1.046 pu 144 kV
826L
410 WHITEGE8 25 MW 7 Mvar 1.055 pu 73 kV
164 SAGITAW7 66 MW 32 Mvar 37 MW -13 Mvar 1.050 pu 145 kV
77ST2 77ST1
51 MW 15 Mvar 7 MW -41 Mvar 7 MW -42 Mvar 1.095 pu 263 kV
163 SAGITAW4 52 MW -3 Mvar
298 ALB NEWS 51 MW 23 Mvar 1.091 pu 262 kV
907L
830 MARLBTAP 0 MW -1 Mvar 41 MW -13 Mvar 1.041 pu 144 kV
854AL
415 MARLBOR1 0 MW 0 Mvar 1.041 pu 144 kV
41 MW -12 Mvar
319 COALSPU8 0.985 pu 68 kV
426ST1
324 COALSPU7 0 MW -0 Mvar 1.038 pu 143 kV
1039 pu 143 kV 30 MW 3 Mvar
1150L-10A
411 CHEV KG7 8 MW 4 Mvar 1.046 pu 144 kV
924 CH KGT T 8 MW 4 Mvar 0 MW 0 Mvar 1.046 pu 144 kV
864BL 864L-1
82 CHEVRON7 0 MW 0 Mvar 1.046 pu 144 kV
678 DEERH7 40 MW -11 Mvar 1.042 pu 144 kV
854L-2
798L
13 KAYBOB 7 4 MW 2 Mvar 1.046 pu 144 kV
962 KAYBOBTP 4 MW 2 Mvar 8 MW 4 Mvar 1.046 pu 144 kV
864AL 864L-3
412 BENBOW 7 34 MW -10 Mvar 5 MW -23 Mvar 12 MW 6 Mvar 1.046 pu 144 kV
685L 864L-2
8 WHCTIND7 37 MW -14 Mvar 52 MW -11 Mvar 1.050 pu 145 kV
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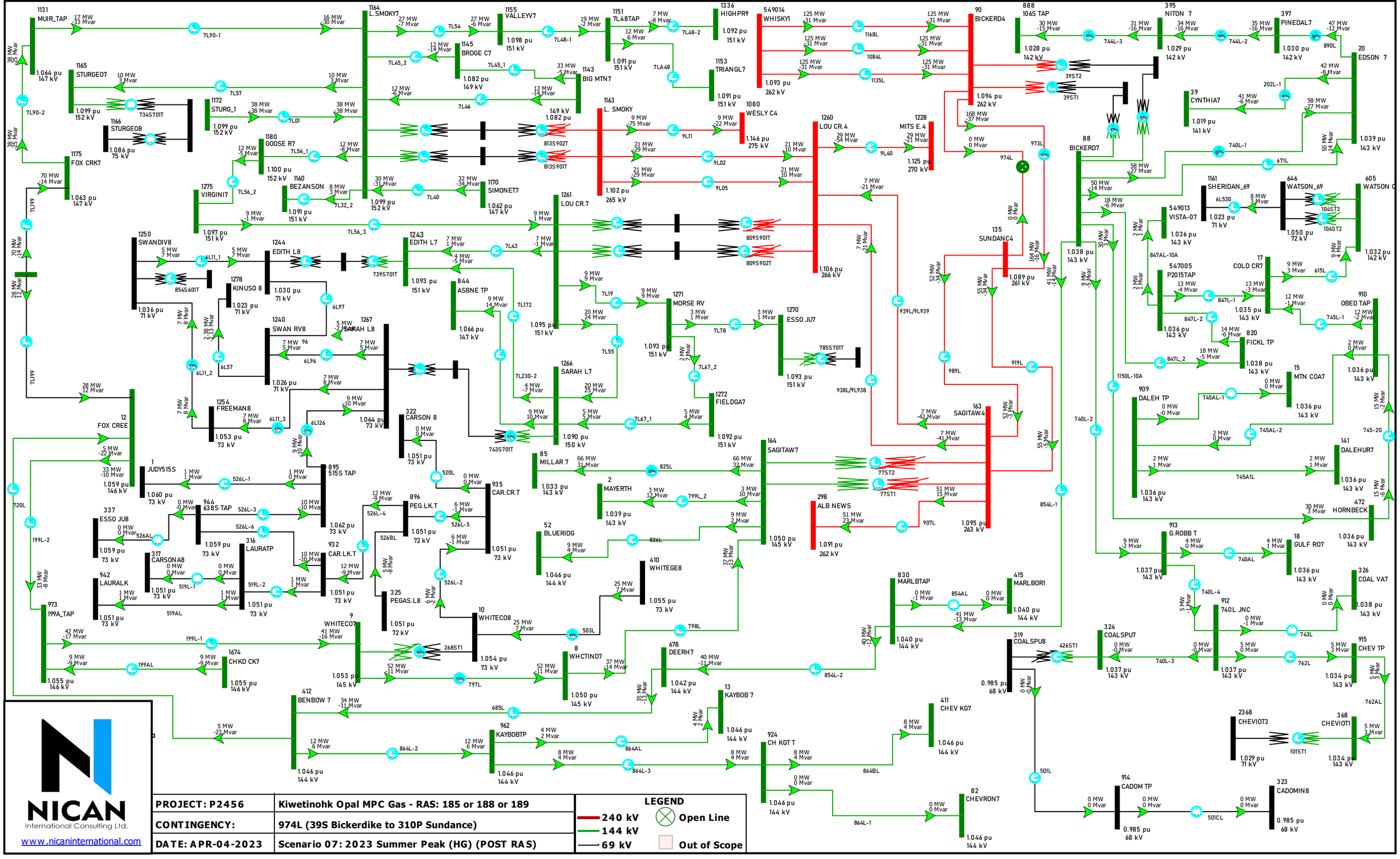

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PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 185 or 188 or 189**
CONTINGENCY:	**974L (39S Bickerdike to 310P Sundance)**
DATE: APR-04-2023	**Scenario 07: 2023 Summer Peak (HG) (POST RAS)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

2023 WINTER PEAK

Single Line Diagrams
P2456 - POST-PROJECT
POST-RAS
POWER FLOW SC08

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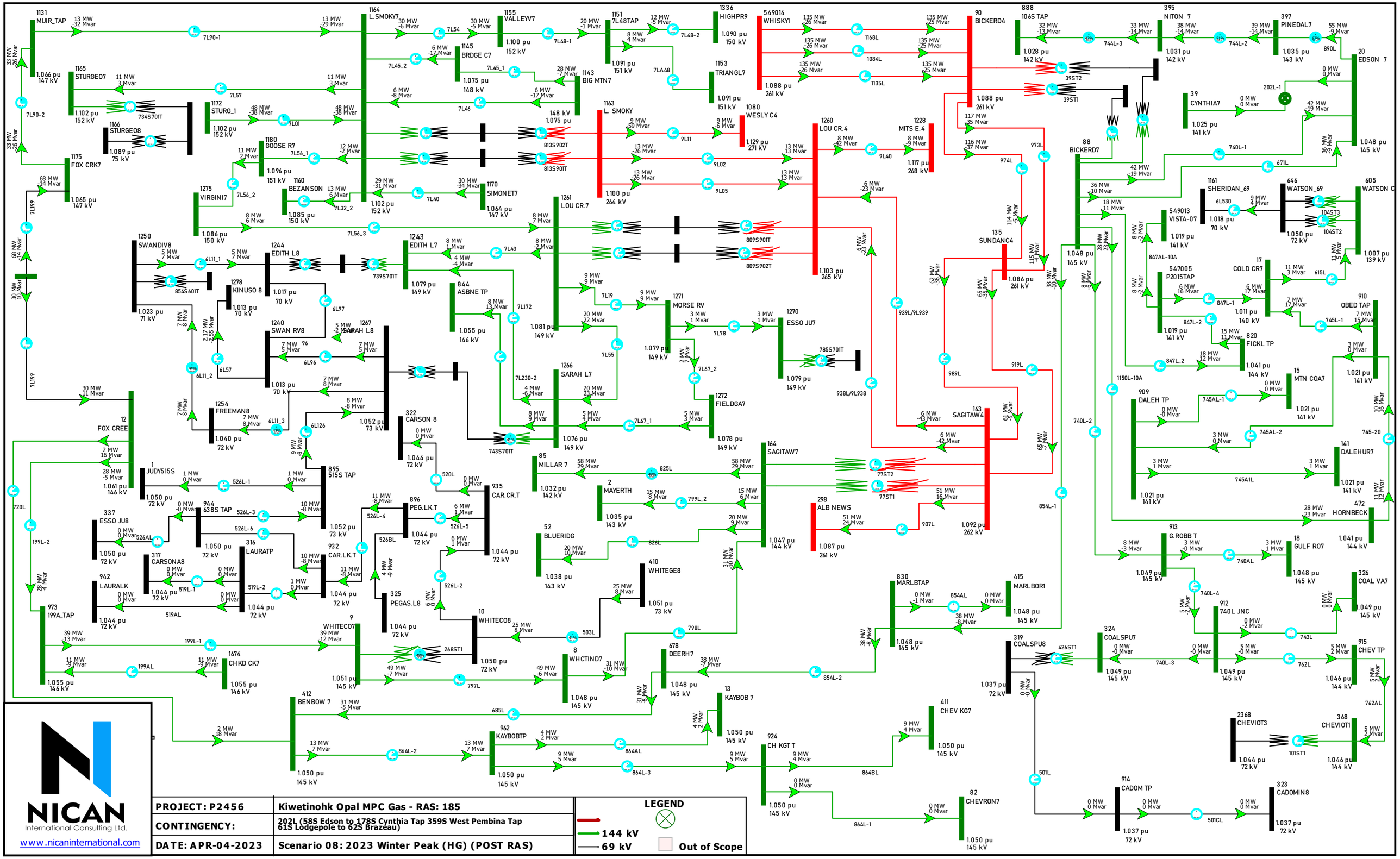

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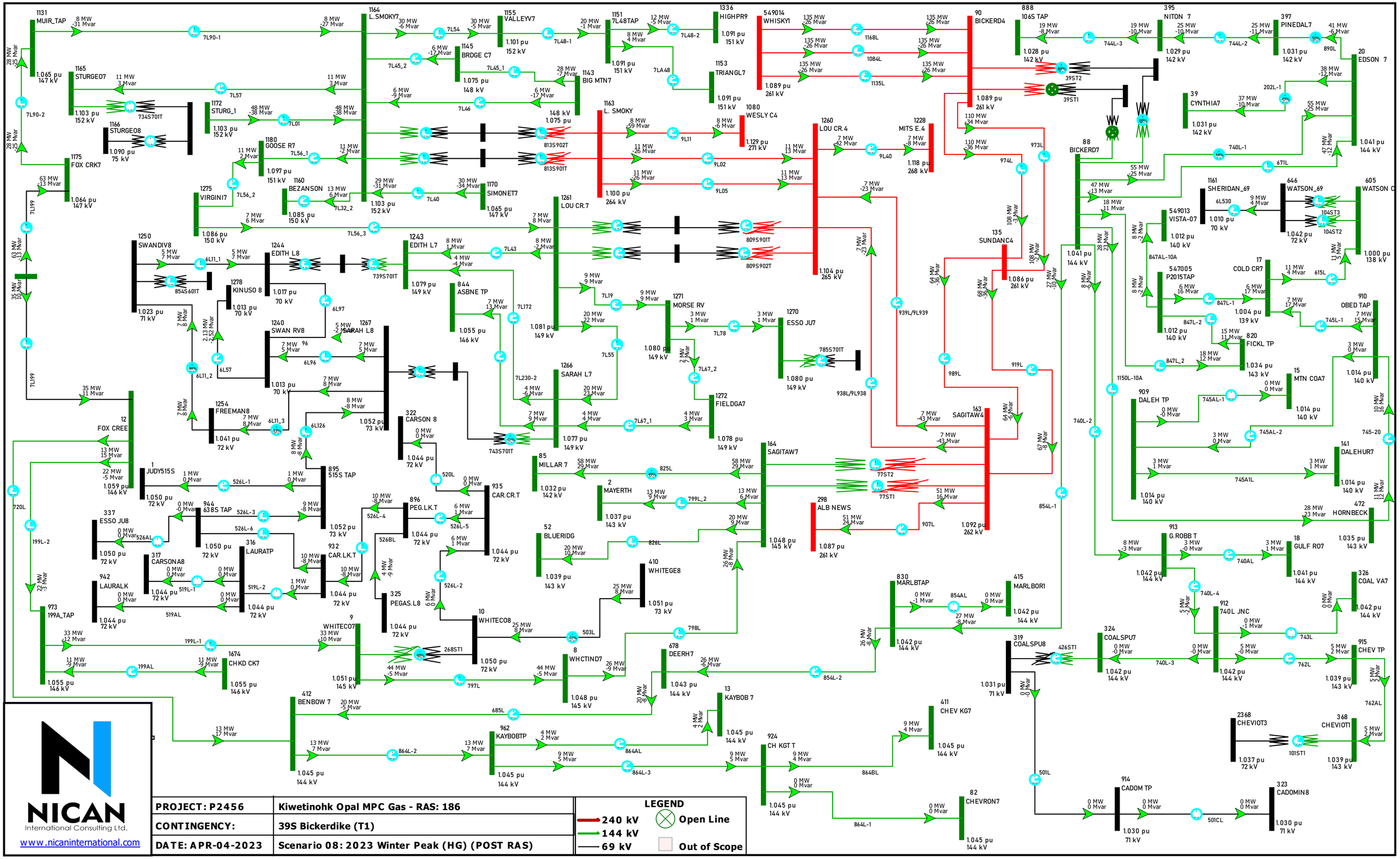
PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 185**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**
DATE: APR-04-2023	**Scenario 08: 2023 Winter Peak (HG) (POST RAS)**

LEGEND

144 kV
69 kV
Out of Scope


1131 MUIR_TAP
1.065 pu 147 kV
1165 STURGEO7
1.103 pu 152 kV
1166 STURGEO8
1.090 pu 75 kV
1175 FOX CRK7
1.064 pu 147 kV
1164 L.SMOKY7
1.103 pu 152 kV
1155 VALLEYV7
1.101 pu 152 kV
1145 BRDGE C7
1.075 pu 148 kV
1143 BIG MTN7
1.075 pu 148 kV
1151 7L48TAP
1.091 pu 151 kV
1336 HIGHPR9
1.091 pu 151 kV
1153 TRIANGL7
1.091 pu 151 kV
549014 WHISKY1
1.089 pu 261 kV
90 BICKERD4
1.089 pu 261 kV
888 106S TAP
1.028 pu 142 kV
39ST2
39ST1
395 NITON 7
1.029 pu 142 kV
397 PINEDAL7
1.031 pu 142 kV
20 EDSON 7
1.041 pu 144 kV
39 CYNTHIA7
1.031 pu 142 kV
1172 STURG_1
1.103 pu 152 kV
1180 GOOSE R7
1.097 pu 151 kV
1160 BEZANSON
1.085 pu 150 kV
1170 SIMONET7
1.065 pu 147 kV
1163 L. SMOKY
1.100 pu 264 kV
1080 WESLY C4
1.129 pu 271 kV
1260 LOU CR.4
1.104 pu 265 kV
1228 MITS E.4
1.118 pu 268 kV
88 BICKERD7
1.041 pu 144 kV
1161 SHERIDAN_69
1.010 pu 70 kV
646 WATSON_69
1.042 pu 72 kV
605 WATSON C
1.000 pu 138 kV
549013 VISTA-07
1.012 pu 140 kV
135 SUNDANC4
1.086 pu 261 kV
17 COLD CR7
1.004 pu 139 kV
910 OBED TAP
1.014 pu 140 kV
547005 P2015TAP
1.012 pu 140 kV
820 FICKL TP
1.034 pu 143 kV
15 MTN COA7
1.014 pu 140 kV
909 DALEH TP
1.014 pu 140 kV
141 DALEHUR7
1.014 pu 140 kV
472 HORNBECK
1.035 pu 143 kV
913 G.ROBB T
1.042 pu 144 kV
18 GULF RO7
1.041 pu 144 kV
326 COAL VA7
1.042 pu 144 kV
912 740L JNC
1.042 pu 144 kV
915 CHEV TP
1.039 pu 143 kV
324 COAL SPU7
1.042 pu 144 kV
319 COAL SPU8
1.031 pu 71 kV
914 CADOM TP
1.030 pu 71 kV
323 CADOMIN8
1.030 pu 71 kV
2368 CHEVIOT3
1.037 pu 72 kV
368 CHEVIOTI
1.039 pu 143 kV
1250 SWANDIV8
1.023 pu 71 kV
1244 EDITH L8
1.017 pu 70 kV
1278 KINUSO 8
1.013 pu 70 kV
1243 EDITH L7
1.079 pu 149 kV
844 ASBNE TP
1.055 pu 146 kV
1261 LOU CR.7
1.081 pu 149 kV
1271 MORSE RV
1.080 pu 149 kV
1270 ESSO JU7
1.080 pu 149 kV
1240 SWAN RV8
1.013 pu 70 kV
1267 SARAH L8
1.052 pu 73 kV
1254 FREEMAN8
1.041 pu 72 kV
1266 SARAH L7
1.077 pu 149 kV
1272 FIELDGA7
1.078 pu 149 kV
322 CARSON 8
1.044 pu 72 kV
85 MILLAR 7
1.032 pu 142 kV
2 MAYERTH
1.037 pu 143 kV
52 BLUERIDG
1.039 pu 143 kV
164 SAGITAW7
1.048 pu 145 kV
163 SAGITAW4
1.092 pu 262 kV
298 ALB NEWS
1.087 pu 261 kV
77ST2
77ST1
410 WHITEGE8
1.051 pu 73 kV
830 MARLBTAP
1.042 pu 144 kV
415 MARLBOR1
1.042 pu 144 kV
12 FOX CREE
1.059 pu 146 kV
1 JUDY515S
1.050 pu 72 kV
944 638S TAP
1.050 pu 72 kV
337 ESSO JU8
1.050 pu 72 kV
316 LAURATP
1.044 pu 72 kV
317 CARSONA8
1.044 pu 72 kV
942 LAURALK
1.044 pu 72 kV
896 PEG.LK.T
1.044 pu 72 kV
932 CAR.LK.T
1.044 pu 72 kV
935 CAR.CR.T
1.044 pu 72 kV
325 PEGAS.L8
1.044 pu 72 kV
895 515S TAP
1.052 pu 73 kV
973 199A_TAP
1.055 pu 146 kV
1674 CHKD CK7
1.055 pu 146 kV
9 WHITEC07
1.051 pu 145 kV
10 WHITEC08
1.050 pu 72 kV
8 WHCTIND7
1.048 pu 145 kV
678 DEERH7
1.043 pu 144 kV
412 BENBOW 7
1.045 pu 144 kV
962 KAYBOBTP
1.045 pu 144 kV
13 KAYBOB 7
1.045 pu 144 kV
924 CH KGT T
1.045 pu 144 kV
411 CHEV KG7
1.045 pu 144 kV
82 CHEVRON7
1.045 pu 144 kV
7L90-1
7L90-2
7L54
7L45_2
7L45_1
7L48-1
7L48-2
7LA48
7L46
7L57
7L01
7L56_1
7L56_2
7L32_2
7L40
7L56_3
7L99
7L43
7L172
7L19
7L55
7L78
7L67_2
7L67_1
7L230-2
7L96
7L97
6L11_1
6L11_2
6L11_3
6L57
6L126
739S701T
854S701T
743S701T
809S901T
809S902T
813S902T
813S901T
785S701T
939L/9L939
938L/9L938
989L
919L
973L
974L
9L11
9L02
9L05
9L40
7L230-1
7L56_4
7L56_5
7L56_6
7L56_7
7L56_8
7L56_9
7L56_10
7L56_11
7L56_12
7L56_13
7L56_14
7L56_15
7L56_16
7L56_17
7L56_18
7L56_19
7L56_20
7L56_21
7L56_22
7L56_23
7L56_24
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7L56_33
7L56_34
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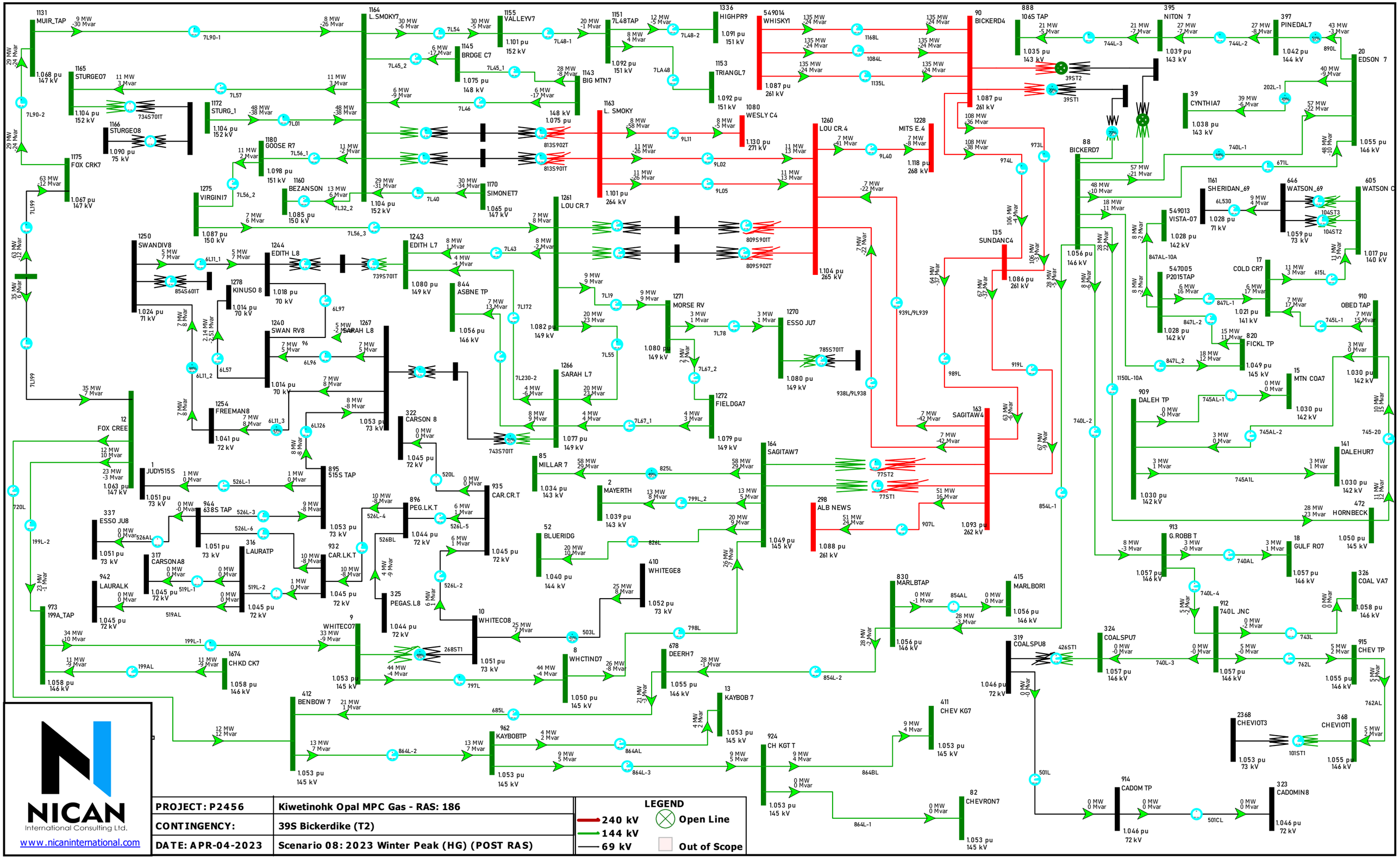
7L56_42
7L56_43


1131 MUIR_TAP
1.068 pu 147 kV
1165 STURGEO7
1.104 pu 152 kV
1166 STURGEO8
1.090 pu 75 kV
1175 FOX CRK7
1.067 pu 147 kV
1164 L.SMOKY7
1.104 pu 152 kV
1155 VALLEYV7
1.101 pu 152 kV
1145 BRDGE C7
1.075 pu 148 kV
1143 BIG MTN7
148 kV 1.075 pu
1151 7L48TAP
1.092 pu 151 kV
1336 HIGHPR9
1.091 pu 151 kV
1153 TRIANGL7
1.092 pu 151 kV
549014 WHISKY1
1.087 pu 261 kV
1080 WESLY C4
1.130 pu 271 kV
1163 L. SMOKY
1.101 pu 264 kV
1260 LOU CR.4
1.104 pu 265 kV
1228 MITS E.4
1.118 pu 268 kV
90 BICKERD4
1.087 pu 261 kV
888 106S TAP
1.035 pu 143 kV
395 NITON 7
1.039 pu 143 kV
397 PINEDAL7
1.042 pu 144 kV
20 EDSON 7
1.055 pu 146 kV
39 CYNTHIA7
1.038 pu 143 kV
88 BICKERD7
1.056 pu 146 kV
1161 SHERIDAN_69
1.028 pu 71 kV
646 WATSON_69
1.059 pu 73 kV
605 WATSON C
1.017 pu 140 kV
549013 VISTA-07
1.028 pu 142 kV
135 SUNDANC4
1.086 pu 261 kV
547005 P2015TAP
1.028 pu 142 kV
17 COLD CR7
1.021 pu 141 kV
820 FICKL TP
1.049 pu 145 kV
910 OBED TAP
1.030 pu 142 kV
15 MTN COA7
1.030 pu 142 kV
909 DALEH TP
1.030 pu 142 kV
141 DALEHUR7
1.030 pu 142 kV
472 HORNBECK
1.050 pu 145 kV
913 G.ROBB T
1.057 pu 146 kV
18 GULF RO7
1.057 pu 146 kV
326 COAL VA7
1.058 pu 146 kV
912 740L JNC
1.057 pu 146 kV
915 CHEV TP
1.055 pu 146 kV
324 COALSPU7
1.057 pu 146 kV
319 COALSPU8
1.046 pu 72 kV
2368 CHEVIOT3
1.053 pu 73 kV
368 CHEVIOTI
1.055 pu 146 kV
914 CADOM TP
1.046 pu 72 kV
323 CADOMIN8
1.046 pu 72 kV
1250 SWANDIV8
1.024 pu 71 kV
1244 EDITH L8
1.018 pu 70 kV
1243 EDITH L7
1.080 pu 149 kV
1278 KINUSO 8
1.014 pu 70 kV
1240 SWAN RV8
1.014 pu 70 kV
1267 SARAH L8
1.053 pu 73 kV
1254 FREEMAN8
1.041 pu 72 kV
322 CARSON 8
1.045 pu 72 kV
844 ASBNE TP
1.056 pu 146 kV
1261 LOU CR.7
1.082 pu 149 kV
1271 MORSE RV
1.080 pu 149 kV
1270 ESSO JU7
1.080 pu 149 kV
1266 SARAH L7
1.077 pu 149 kV
1272 FIELDGA7
1.079 pu 149 kV
85 MILLAR 7
1.034 pu 143 kV
2 MAYERTH
1.039 pu 143 kV
52 BLUERIDG
1.040 pu 144 kV
410 WHITEGE8
1.052 pu 73 kV
164 SAGITAW7
1.049 pu 145 kV
163 SAGITAW4
1.093 pu 262 kV
298 ALB NEWS
1.088 pu 261 kV
77ST1
77ST2
1160 BEZANSON
1.085 pu 150 kV
1180 GOOSE R7
1.098 pu 151 kV
1172 STURG_1
1.104 pu 152 kV
1275 VIRGINI7
1.087 pu 150 kV
1170 SIMONET7
1.065 pu 147 kV
896 PEG.LK.T
1.044 pu 72 kV
935 CAR.CR.T
1.045 pu 72 kV
932 CAR.LK.T
1.045 pu 72 kV
316 LAURATP
1.045 pu 72 kV
337 ESSO JU8
1.051 pu 73 kV
317 CARSONA8
1.045 pu 72 kV
944 638S TAP
1.051 pu 73 kV
942 LAURALK
1.045 pu 72 kV
325 PEGAS.L8
1.044 pu 72 kV
1 JUDY515S
1.051 pu 73 kV
895 515S TAP
1.053 pu 73 kV
12 FOX CREE
1.063 pu 147 kV
973 199A_TAP
1.058 pu 146 kV
1674 CHKD CK7
1.058 pu 146 kV
9 WHITEC07
1.053 pu 145 kV
10 WHITEC08
1.051 pu 73 kV
8 WHCTIND7
1.050 pu 145 kV
678 DEERH7
1.055 pu 146 kV
412 BENBOW 7
1.053 pu 145 kV
962 KAYBOBTP
1.053 pu 145 kV
13 KAYBOB 7
1.053 pu 145 kV
924 CH KGT T
1.053 pu 145 kV
411 CHEV KG7
1.053 pu 145 kV
82 CHEVRON7
1.053 pu 145 kV
830 MARLBTAP
1.056 pu 146 kV
415 MARLBOR1
1.056 pu 146 kV
7L90-1
7L90-2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7L48A
7L57
7L01
7L56_1
7L56_2
7L32_2
7L40
7L56_3
7L99
7L43
7L19
7L78
7L67_2
7L67_1
7L55
7L172
7L230-2
7L97
7L96
6L11_1
6L11_2
6L11_3
6L57
6L126
854S701T
739S701T
743S701T
785S701T
809S901T
809S902T
813S902T
813S901T
734S701T
7L01
9L11
9L02
9L05
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938L/9L938
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740L-2
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847AL-10A
847L-1
847L-2
847L_2
615L
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762L
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720L
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199AL
268ST1
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685L
864L-2
864AL
864L-3
864BL
864L-1
825L
799L_2
826L
798L
503L
854L-1
854L-2
907L
519L-1
519L-2
519AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526BL
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501CL
740AL
740L-3
740L-4
743L
101ST1
426ST1
39ST1
39ST2
1168L
1084L
1135L
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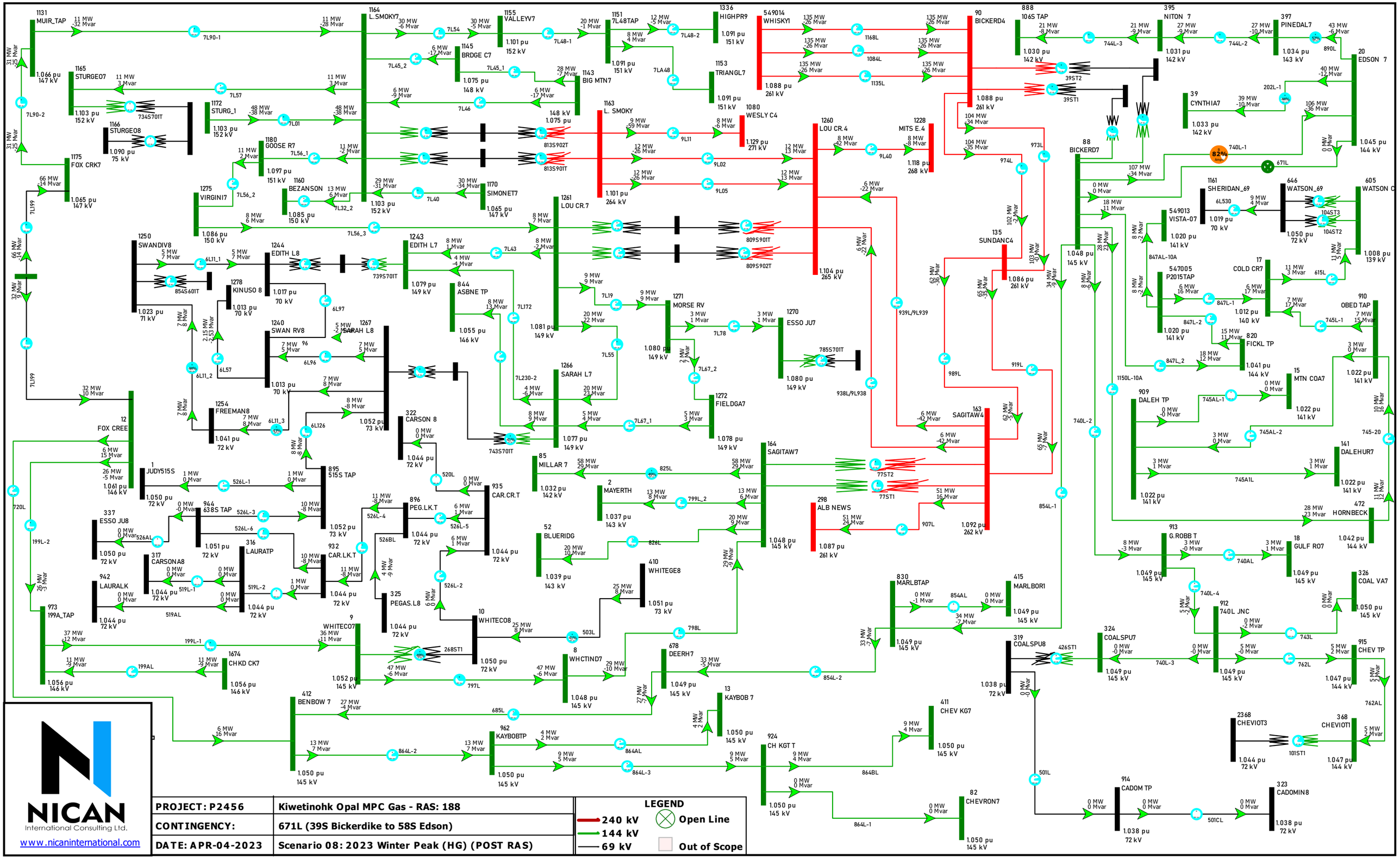
PROJECT: P2456
Kiwetinohk Opal MPC Gas - RAS: 186
CONTINGENCY:
39S Bickerdike (T2)
DATE: APR-04-2023
Scenario 08: 2023 Winter Peak (HG) (POST RAS)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope


1131 MUIR_TAP
1.066 pu 147 kV
1165 STURGEO7
1.103 pu 152 kV
1166 STURGEO8
1.090 pu 75 kV
1175 FOX CRK7
1.065 pu 147 kV
1164 L.SMOKY7
1.103 pu 152 kV
1155 VALLEYV7
1.101 pu 152 kV
1145 BRDGE C7
1.075 pu 148 kV
1143 BIG MTN7
1.075 pu 148 kV
1151 7L48TAP
1.091 pu 151 kV
1336 HIGHPR9
1.091 pu 151 kV
1153 TRIANGL7
1.091 pu 151 kV
549014 WHISKY1
1.088 pu 261 kV
90 BICKERD4
1.088 pu 261 kV
888 106S TAP
1.030 pu 142 kV
395 NITON 7
1.031 pu 142 kV
397 PINEDAL7
1.034 pu 143 kV
20 EDSON 7
1.045 pu 144 kV
39 CYNTHIA7
1.033 pu 142 kV
88 BICKERD7
1.048 pu 145 kV
1172 STURG_1
1.103 pu 152 kV
1180 GOOSE R7
1.097 pu 151 kV
1160 BEZANSON
1.085 pu 150 kV
1275 VIRGINI7
1.086 pu 150 kV
1163 L. SMOKY
1.101 pu 264 kV
1080 WESLY C4
1.129 pu 271 kV
1260 LOU CR.4
1.104 pu 265 kV
1228 MITS E.4
1.118 pu 268 kV
1170 SIMONET7
1.065 pu 147 kV
1261 LOU CR.7
1.081 pu 149 kV
1250 SWANDIV8
1.023 pu 71 kV
1278 KINUSO 8
1.013 pu 70 kV
1244 EDITH L8
1.017 pu 70 kV
1243 EDITH L7
1.079 pu 149 kV
844 ASBNE TP
1.055 pu 146 kV
1240 SWAN RV8
1.013 pu 70 kV
1267 SARAH L8
1.052 pu 73 kV
1254 FREEMAN8
1.041 pu 72 kV
1266 SARAH L7
1.077 pu 149 kV
1271 MORSE RV
1.080 pu 149 kV
1270 ESSO JU7
1.080 pu 149 kV
1272 FIELDGA7
1.078 pu 149 kV
322 CARSON 8
1.044 pu 72 kV
12 FOX CREE
1.061 pu 146 kV
1 JUDY515S
1.050 pu 72 kV
337 ESSO JU8
1.050 pu 72 kV
944 638S TAP
1.051 pu 72 kV
316 LAURATP
1.044 pu 72 kV
317 CARSONA8
1.044 pu 72 kV
942 LAURALK
1.044 pu 72 kV
973 199A_TAP
1.056 pu 146 kV
1674 CHKD CK7
1.056 pu 146 kV
895 515S TAP
1.052 pu 73 kV
896 PEG.LK.T
1.044 pu 72 kV
932 CAR.LK.T
1.044 pu 72 kV
325 PEGAS.L8
1.044 pu 72 kV
935 CAR.CR.T
1.044 pu 72 kV
10 WHITECO8
1.050 pu 72 kV
9 WHITECO7
1.052 pu 145 kV
8 WHCTIND7
1.048 pu 145 kV
678 DEERH7
1.049 pu 145 kV
85 MILLAR 7
1.032 pu 142 kV
2 MAYERTH
1.037 pu 143 kV
52 BLUERIDG
1.039 pu 143 kV
410 WHITEGE8
1.051 pu 73 kV
164 SAGITAW7
1.048 pu 145 kV
298 ALB NEWS
1.087 pu 261 kV
163 SAGITAW4
1.092 pu 262 kV
135 SUNDANC4
1.086 pu 261 kV
830 MARLBTAP
1.049 pu 145 kV
415 MARLBOR1
1.049 pu 145 kV
319 COALSPU8
1.038 pu 72 kV
324 COALSPU7
1.049 pu 145 kV
912 740L JNC
1.049 pu 145 kV
915 CHEV TP
1.047 pu 144 kV
326 COAL VA7
1.050 pu 145 kV
1161 SHERIDAN_69
1.019 pu 70 kV
646 WATSON_69
1.050 pu 72 kV
605 WATSON C
1.008 pu 139 kV
549013 VISTA-07
1.020 pu 141 kV
547005 P2015TAP
1.020 pu 141 kV
17 COLD CR7
1.012 pu 140 kV
820 FICKL TP
1.041 pu 144 kV
910 OBED TAP
1.022 pu 141 kV
15 MTN COA7
1.022 pu 141 kV
909 DALEH TP
1.022 pu 141 kV
141 DALEHUR7
1.022 pu 141 kV
913 G.ROBB T
1.049 pu 145 kV
18 GULF RO7
1.049 pu 145 kV
472 HORNBECK
1.042 pu 144 kV
914 CADOM TP
1.038 pu 72 kV
323 CADOMIN8
1.038 pu 72 kV
2368 CHEVIOT3
1.044 pu 72 kV
368 CHEVIOTI
1.047 pu 144 kV
411 CHEV KG7
1.050 pu 145 kV
924 CH KGT T
1.050 pu 145 kV
82 CHEVRON7
1.050 pu 145 kV
962 KAYBOBTP
1.050 pu 145 kV
13 KAYBOB 7
1.050 pu 145 kV
412 BENBOW 7
1.050 pu 145 kV
82%
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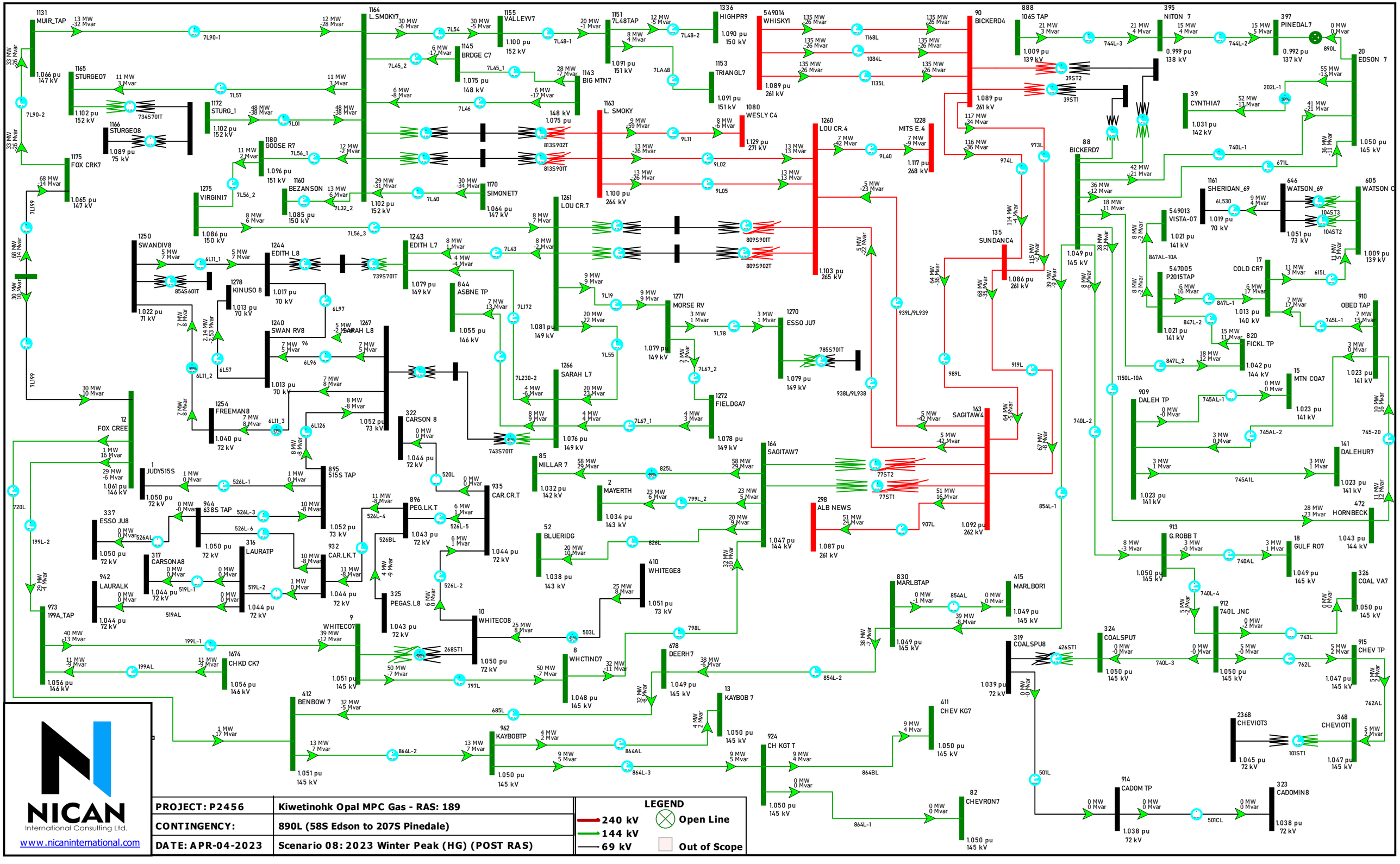
PROJECT: P2456
Kiwetinohk Opal MPC Gas - RAS: 188
CONTINGENCY:
671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023
Scenario 08: 2023 Winter Peak (HG) (POST RAS)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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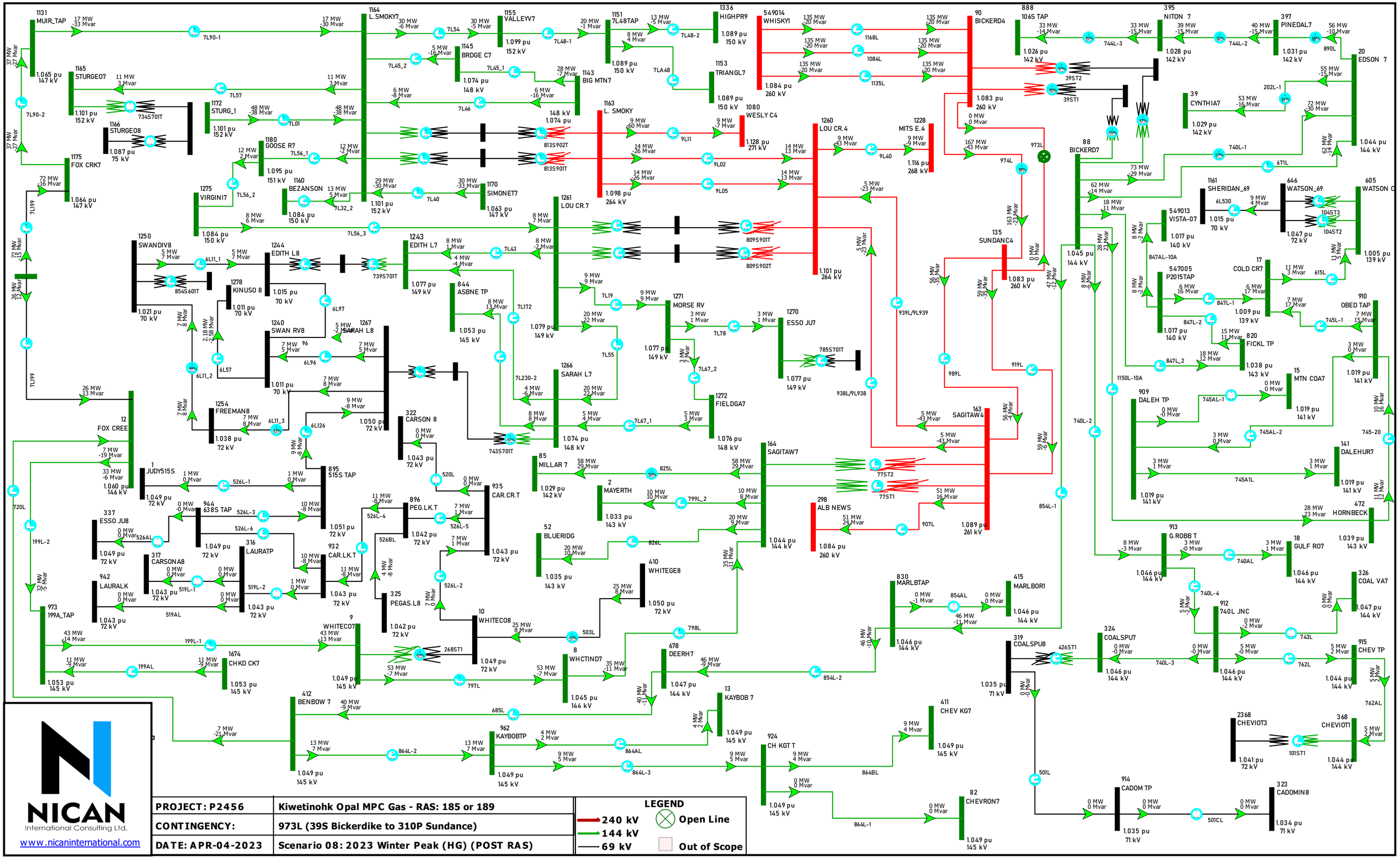
PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 189
CONTINGENCY:	890L (58S Edson to 207S Pinedale)
DATE: APR-04-2023	Scenario 08: 2023 Winter Peak (HG) (POST RAS)

LEGEND
- 🟥 240 kV
- 🟩 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope


1131 MUIR_TAP
1.065 pu 147 kV
1165 STURGEO7
1.101 pu 152 kV
1166 STURGEO8
1.087 pu 75 kV
1175 FOX CRK7
1.064 pu 147 kV
1164 L.SMOKY7
1.101 pu 152 kV
1155 VALLEYV7
1.099 pu 152 kV
1145 BRDGE C7
1.074 pu 148 kV
1143 BIG MTN7
1151 7L48TAP
1.089 pu 150 kV
1336 HIGHPR9
1.089 pu 150 kV
1153 TRIANGL7
1.089 pu 150 kV
549014 WHISKY1
1.084 pu 260 kV
1163 L. SMOKY
1.098 pu 264 kV
1080 WESLY C4
1.128 pu 271 kV
1260 LOU CR.4
1228 MITS E.4
1.116 pu 268 kV
90 BICKERD4
1.083 pu 260 kV
888 106S TAP
1.026 pu 142 kV
39ST2
39ST1
395 NITON 7
1.028 pu 142 kV
397 PINEDAL7
1.031 pu 142 kV
20 EDSON 7
1.044 pu 144 kV
39 CYNTHIA7
1.029 pu 142 kV
88 BICKERD7
1.045 pu 144 kV
1161 SHERIDAN_69
1.015 pu 70 kV
646 WATSON_69
1.047 pu 72 kV
605 WATSON C
1.005 pu 139 kV
549013 VISTA-07
1.017 pu 140 kV
135 SUNDANC4
1.083 pu 260 kV
547005 P2015TAP
1.017 pu 140 kV
17 COLD CR7
1.009 pu 139 kV
820 FICKL TP
1.038 pu 143 kV
910 OBED TAP
1.019 pu 141 kV
15 MTN COA7
1.019 pu 141 kV
909 DALEH TP
1.019 pu 141 kV
141 DALEHUR7
1.019 pu 141 kV
472 HORNBECK
1.039 pu 143 kV
18 GULF RO7
1.046 pu 144 kV
913 G.ROBB T
1.046 pu 144 kV
912 740L JNC
1.046 pu 144 kV
326 COAL VA7
1.047 pu 144 kV
915 CHEV TP
1.044 pu 144 kV
2368 CHEVIOT3
1.041 pu 72 kV
368 CHEVIOTI
1.044 pu 144 kV
914 CADOM TP
1.035 pu 71 kV
323 CADOMIN8
1.034 pu 71 kV
319 COALSPU8
1.035 pu 71 kV
324 COALSPU7
1.046 pu 144 kV
830 MARLBTAP
1.046 pu 144 kV
415 MARLBOR1
1.046 pu 144 kV
1250 SWANDIV8
1.021 pu 70 kV
1278 KINUSO 8
1.011 pu 70 kV
1244 EDITH L8
1.015 pu 70 kV
1243 EDITH L7
1.077 pu 149 kV
1240 SWAN RV8
1.011 pu 70 kV
1267 SARAH L8
1.050 pu 72 kV
1254 FREEMAN8
1.038 pu 72 kV
322 CARSON 8
1.043 pu 72 kV
844 ASBNE TP
1.053 pu 145 kV
1261 LOU CR.7
1.079 pu 149 kV
1271 MORSE RV
1.077 pu 149 kV
1270 ESSO JU7
1.077 pu 149 kV
1266 SARAH L7
1.074 pu 148 kV
1272 FIELDGA7
1.076 pu 148 kV
85 MILLAR 7
1.029 pu 142 kV
2 MAYERTH
1.033 pu 143 kV
52 BLUERIDG
1.035 pu 143 kV
410 WHITEGE8
1.050 pu 72 kV
164 SAGITAW7
1.044 pu 144 kV
163 SAGITAW4
1.089 pu 261 kV
298 ALB NEWS
1.084 pu 260 kV
77ST2
77ST1
1.045 pu 144 kV
1674 CHKD CK7
1.053 pu 145 kV
412 BENBOW 7
1.049 pu 145 kV
962 KAYBOBTP
1.049 pu 145 kV
13 KAYBOB 7
1.049 pu 145 kV
411 CHEV KG7
1.049 pu 145 kV
924 CH KGT T
1.049 pu 145 kV
82 CHEVRON7
1.049 pu 145 kV
678 DEERH7
1.047 pu 144 kV
8 WHCTIND7
1.045 pu 144 kV
9 WHITEC07
1.049 pu 145 kV
10 WHITEC08
1.049 pu 72 kV
1 JUDY515S
1.049 pu 72 kV
895 515S TAP
1.051 pu 72 kV
944 638S TAP
1.049 pu 72 kV
896 PEG.LK.T
1.042 pu 72 kV
935 CAR.CR.T
1.043 pu 72 kV
932 CAR.LK.T
1.043 pu 72 kV
325 PEGAS.L8
1.042 pu 72 kV
316 LAURATP
1.043 pu 72 kV
337 ESSO JU8
1.049 pu 72 kV
317 CARSONA8
1.043 pu 72 kV
942 LAURALK
1.043 pu 72 kV
973 199A_TAP
1.053 pu 145 kV
1275 VIRGINI7
1.084 pu 150 kV
1180 GOOSE R7
1.095 pu 151 kV
1172 STURG_1
1.101 pu 152 kV
1160 BEZANSON
1.084 pu 150 kV
1170 SIMONET7
1.063 pu 147 kV
12 FOX CREE
1.060 pu 146 kV
7L90-1
7L90-2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7LA48
7L57
7L01
7L56_1
7L56_2
7L32_2
7L40
7L56_3
7L43
7L19
7L78
7L67_2
7L67_1
7L55
7L230-2
7L172
7L97
7L96
6L11_1
6L11_2
6L11_3
6L57
6L126
854S701T
739S701T
743S701T
734S701T
785S701T
809S901T
809S902T
813S902T
813S901T
9L11
9L02
9L05
9L40
939L/9L939
938L/9L938
973L
974L
989L
919L
7L99
199L-1
199L-2
199AL
720L
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
519L-1
519L-2
519AL
685L
797L
798L
799L_2
825L
826L
864L-1
864L-2
864L-3
864AL
864BL
907L
503L
268ST1
1168L
1084L
1135L
744L-3
744L-2
202L-1
890L
671L
740L-1
740L-2
740L-3
740L-4
740AL
745AL-1
745AL-2
745A1L
745-20
847AL-10A
847L-1
847L-2
847L_2
615L
745L-1
762L
762AL
1150L-10A
854L-1
854L-2
501L
501CL
101ST1
104ST3
104ST2
6L530
6L515
6L530
PROJECT: P2456
Kiwetinohk Opal MPC Gas - RAS: 185 or 189
CONTINGENCY:
973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023
Scenario 08: 2023 Winter Peak (HG) (POST RAS)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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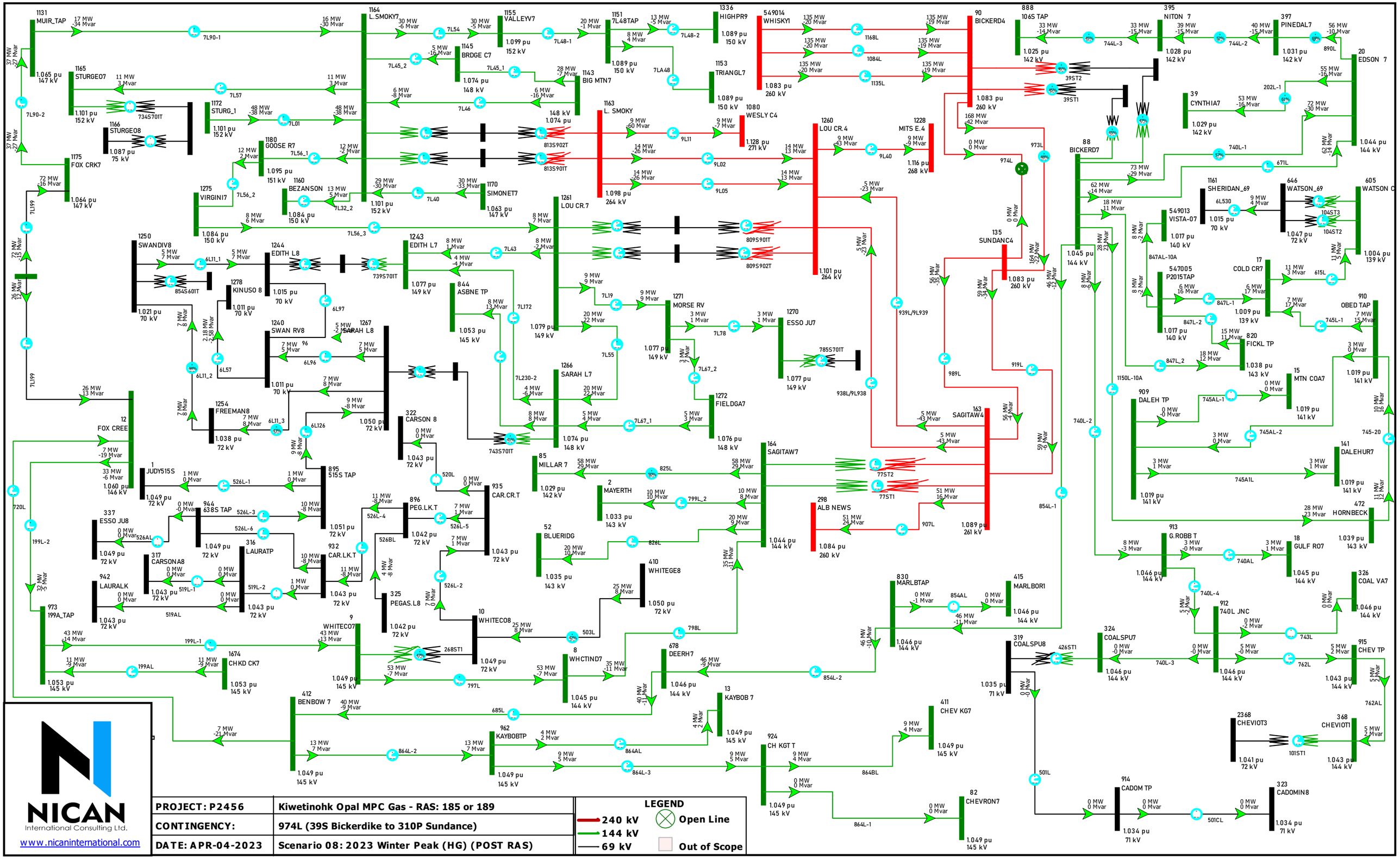
1131 MUIR_TAP
1.065 pu 147 kV
1165 STURGEO7
1.101 pu 152 kV
1166 STURGEO8
1.087 pu 75 kV
1175 FOX CRK7
1.064 pu 147 kV
1164 L.SMOKY7
1.101 pu 152 kV
1155 VALLEYV7
1.099 pu 152 kV
1145 BRDGE C7
1.074 pu 148 kV
1143 BIG MTN7
1.074 pu 148 kV
1151 7L48TAP
1.089 pu 150 kV
1336 HIGHPR9
1.089 pu 150 kV
1153 TRIANGL7
1.089 pu 150 kV
549014 WHISKY1
1.083 pu 260 kV
1080 WESLY C4
1.128 pu 271 kV
1163 L. SMOKY
1.098 pu 264 kV
1260 LOU CR.4
1.101 pu 264 kV
1228 MITS E.4
1.116 pu 268 kV
90 BICKERD4
1.083 pu 260 kV
888 106S TAP
1.025 pu 142 kV
39ST2
39ST1
395 NITON 7
1.028 pu 142 kV
397 PINEDAL7
1.031 pu 142 kV
20 EDSON 7
1.044 pu 144 kV
39 CYNTHIA7
1.029 pu 142 kV
88 BICKERD7
1.045 pu 144 kV
1161 SHERIDAN_69
1.015 pu 70 kV
646 WATSON_69
1.047 pu 72 kV
605 WATSON C
1.004 pu 139 kV
549013 VISTA-07
1.017 pu 140 kV
547005 P2015TAP
1.017 pu 140 kV
17 COLD CR7
1.009 pu 139 kV
820 FICKL TP
1.038 pu 143 kV
910 OBED TAP
1.019 pu 141 kV
15 MTN COA7
1.019 pu 141 kV
909 DALEH TP
1.019 pu 141 kV
141 DALEHUR7
1.019 pu 141 kV
472 HORNBECK
1.039 pu 143 kV
18 GULF RO7
1.045 pu 144 kV
913 G.ROBB T
1.046 pu 144 kV
912 740L JNC
1.046 pu 144 kV
326 COAL VA7
1.046 pu 144 kV
915 CHEV TP
1.043 pu 144 kV
135 SUNDANC4
1.083 pu 260 kV
319 COALSPU8
1.035 pu 71 kV
324 COALSPU7
1.046 pu 144 kV
914 CADOM TP
1.034 pu 71 kV
323 CADOMIN8
1.034 pu 71 kV
2368 CHEVIOT3
1.041 pu 72 kV
368 CHEVIOTI
1.043 pu 144 kV
1250 SWANDIV8
1.021 pu 70 kV
1278 KINUSO 8
1.011 pu 70 kV
1244 EDITH L8
1.015 pu 70 kV
1243 EDITH L7
1.077 pu 149 kV
844 ASBNE TP
1.053 pu 145 kV
1240 SWAN RV8
1.011 pu 70 kV
1267 SARAH L8
1.050 pu 72 kV
1254 FREEMAN8
1.038 pu 72 kV
322 CARSON 8
1.043 pu 72 kV
1266 SARAH L7
1.074 pu 148 kV
1271 MORSE RV
1.077 pu 149 kV
1270 ESSO JU7
1.077 pu 149 kV
1272 FIELDGA7
1.076 pu 148 kV
1261 LOU CR.7
1.079 pu 149 kV
1180 GOOSE R7
1.095 pu 151 kV
1160 BEZANSON
1.084 pu 150 kV
1170 SIMONET7
1.063 pu 147 kV
1275 VIRGINI7
1.084 pu 150 kV
1172 STURG_1
1.101 pu 152 kV
1175 FOX CRK7
1.064 pu 147 kV
12 FOX CREE
1.060 pu 146 kV
1 JUDY515S
1.049 pu 72 kV
337 ESSO JU8
1.049 pu 72 kV
317 CARSONA8
1.043 pu 72 kV
942 LAURALK
1.043 pu 72 kV
944 638S TAP
1.049 pu 72 kV
316 LAURATP
1.043 pu 72 kV
895 515S TAP
1.051 pu 72 kV
896 PEG.LK.T
1.042 pu 72 kV
932 CAR.LK.T
1.043 pu 72 kV
935 CAR.CR.T
1.043 pu 72 kV
325 PEGAS.L8
1.042 pu 72 kV
973 199A_TAP
1.053 pu 145 kV
1674 CHKD CK7
1.053 pu 145 kV
9 WHITEC07
1.049 pu 145 kV
10 WHITEC08
1.049 pu 72 kV
8 WHCTIND7
1.045 pu 144 kV
85 MILLAR 7
1.029 pu 142 kV
2 MAYERTH
1.033 pu 143 kV
52 BLUERIDG
1.035 pu 143 kV
410 WHITEGE8
1.050 pu 72 kV
412 BENBOW 7
1.049 pu 145 kV
962 KAYBOBTP
1.049 pu 145 kV
13 KAYBOB 7
1.049 pu 145 kV
678 DEERH7
1.046 pu 144 kV
164 SAGITAW7
1.044 pu 144 kV
298 ALB NEWS
1.084 pu 260 kV
163 SAGITAW4
1.089 pu 261 kV
924 CH KGT T
1.049 pu 145 kV
411 CHEV KG7
1.049 pu 145 kV
82 CHEVRON7
1.049 pu 145 kV
830 MARLBTAP
1.046 pu 144 kV
415 MARLBOR1
1.046 pu 144 kV
1 JUDY515S
1.049 pu 72 kV
720L
199L-2
7L90-2
7L90-1
7L199
199L-1
199AL
519AL
526AL
526L-1
526L-3
526L-6
519L-1
519L-2
526L-4
526BL
526L-5
526L-2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7LA48
7L57
7L01
7L56_1
7L56_2
7L32_2
7L40
7L56_3
7L43
7L172
7L230-2
7L19
7L55
7L78
7L67_2
7L67_1
7L97
7L96
6L57
6L11_1
6L11_2
6L11_3
6L126
7L99
7L01
7L40
7L32_2
7L56_3
7L43
7L172
7L19
7L78
7L67_2
7L55
7L67_1
7L230-2
7L48-1
7L48-2
7LA48
7L54
7L45_2
7L45_1
7L46
7L57
7L56_1
7L56_2
7L99
7L90-1
7L90-2
6L97
6L96
6L57
6L11_1
6L11_2
6L11_3
6L126
9L11
9L02
9L05
9L40
9L39
938L/9L938
939L/9L939
989L
919L
974L
973L
1168L
1084L
1135L
744L-3
744L-2
890L
202L-1
740L-1
671L
615L
847AL-10A
847L-1
847L-2
847L_2
745L-1
745AL-1
745AL-2
745A1L
1150L-10A
740L-2
740L-3
740AL
740L-4
743L
762L
762AL
745-20
501L
501CL
854L-1
854L-2
854AL
907L
825L
826L
799L_2
798L
797L
685L
864L-1
864L-2
864L-3
864AL
864BL
503L
268ST1
743S701T
739S701T
854S601T
813S902T
813S901T
809S901T
809S902T
734S701T
785S701T
77ST2
77ST1
101ST1
104ST3
104ST2
6L530
6L15_1
6L15_2
6L15_3
6L15_4
6L15_5
6L15_6
6L15_7
6L15_8
6L15_9
6L15_10
6L15_11
6L15_12
6L15_13
6L15_14
6L15_15
6L15_16
6L15_17
6L15_18
6L15_19
6L15_20
6L15_21
6L15_22
6L15_23
6L15_24
6L15_25
6L15_26
6L15_27
6L15_28
6L15_29
6L15_30
6L15_31
6L15_32
6L15_33
6L15_34
6L15_35
6L15_36
6L15_37
6L15_38
6L15_39
6L15_40

2023 SUMMER PEAK

(Low Generation)

Single Line Diagrams
P2456 - POST-PROJECT
POST-RAS
POWER FLOW SC09

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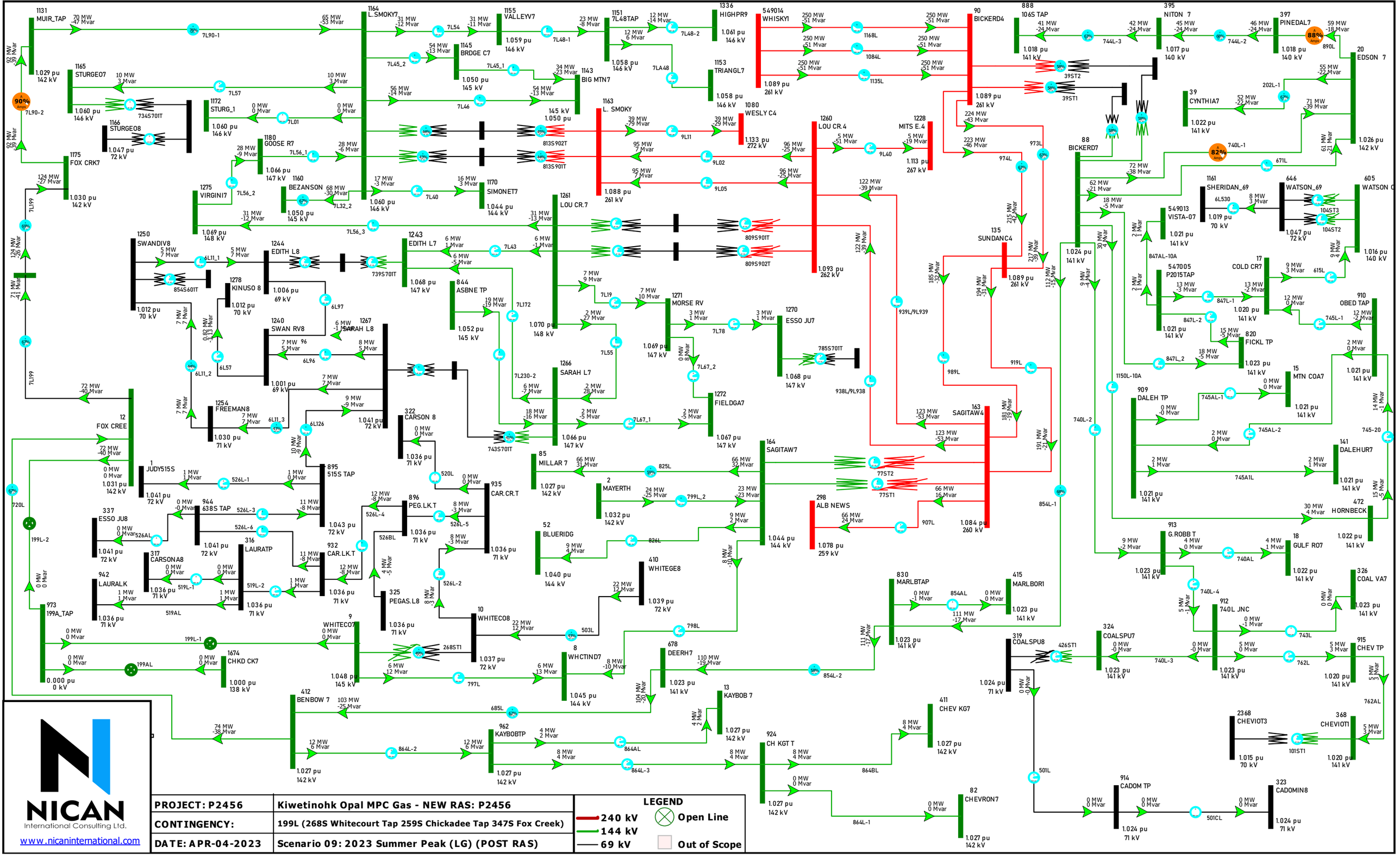
1131 MUIR_TAP
1.029 pu 142 kV
1165 STURGE07
1.060 pu 146 kV
1166 STURGE08
1.047 pu 72 kV
1175 FOX CRK7
1.030 pu 142 kV
1164 L.SMOKY7
1.060 pu 146 kV
1172 STURG_1
1.060 pu 146 kV
1180 GOOSE R7
1.066 pu 147 kV
1160 BEZANSON
1.050 pu 145 kV
1275 VIRGINI7
1.069 pu 148 kV
1155 VALLEYV7
1.059 pu 146 kV
1145 BRDGE C7
1.050 pu 145 kV
1143 BIG MTN7
145 kV 1.050 pu
1163 L. SMOKY
1.088 pu 261 kV
1170 SIMONET7
1.044 pu 144 kV
1151 7L48TAP
1.058 pu 146 kV
1336 HIGHPR9
1.061 pu 146 kV
1153 TRIANGL7
1.058 pu 146 kV
1080 WESLY C4
1.133 pu 272 kV
549014 WHISKYI
1.089 pu 261 kV
1260 LOU CR.4
1.093 pu 262 kV
1228 MITS E.4
1.113 pu 267 kV
90 BICKERD4
1.089 pu 261 kV
888 106S TAP
1.018 pu 141 kV
395 NITON 7
1.017 pu 140 kV
397 PINEDAL7
1.018 pu 140 kV
20 EDSON 7
1.026 pu 142 kV
88 BICKERD7
1.024 pu 141 kV
39 CYNTHIA7
1.022 pu 141 kV
1161 SHERIDAN_69
1.019 pu 70 kV
646 WATSON_69
1.047 pu 72 kV
605 WATSON C
1.016 pu 140 kV
549013 VISTA-07
1.021 pu 141 kV
547005 P2015TAP
1.020 pu 141 kV
17 COLD CR7
1.021 pu 141 kV
910 OBED TAP
1.021 pu 141 kV
820 FICKL TP
1.023 pu 141 kV
15 MTN COA7
1.021 pu 141 kV
909 DALEH TP
1.021 pu 141 kV
141 DALEHUR7
1.021 pu 141 kV
472 HORNBECK
1.022 pu 141 kV
913 G.ROBB T
1.023 pu 141 kV
18 GULF RO7
1.022 pu 141 kV
326 COAL VA7
1.023 pu 141 kV
912 740L JNC
1.023 pu 141 kV
915 CHEV TP
1.020 pu 141 kV
135 SUNDANC4
1.089 pu 261 kV
1250 SWANDIV8
1.012 pu 70 kV
1244 EDITH L8
1.006 pu 69 kV
1278 KINUSO 8
1.012 pu 70 kV
1240 SWAN RV8
1.001 pu 69 kV
1267 SARAH L8
1.041 pu 72 kV
1254 FREEMAN8
1.030 pu 71 kV
322 CARSON 8
1.036 pu 71 kV
1243 EDITH L7
1.068 pu 147 kV
844 ASBNE TP
1.052 pu 145 kV
1261 LOU CR.7
1.070 pu 148 kV
1266 SARAH L7
1.066 pu 147 kV
1271 MORSE RV
1.069 pu 147 kV
1270 ESSO JU7
1.068 pu 147 kV
1272 FIELDGA7
1.067 pu 147 kV
85 MILLAR 7
1.027 pu 142 kV
2 MAYERTH
1.032 pu 142 kV
164 SAGITAW7
1.044 pu 144 kV
163 SAGITAW4
1.084 pu 260 kV
298 ALB NEWS
1.078 pu 259 kV
12 FOX CREE
1.031 pu 142 kV
1 JUDY515S
1.041 pu 72 kV
895 515S TAP
1.043 pu 72 kV
944 638S TAP
1.041 pu 72 kV
337 ESSO JU8
1.041 pu 72 kV
317 CARSONA8
1.036 pu 71 kV
316 LAURATP
1.036 pu 71 kV
942 LAURALK
1.036 pu 71 kV
932 CAR.LK.T
1.036 pu 71 kV
896 PEG.LK.T
1.036 pu 71 kV
935 CAR.CR.T
1.036 pu 71 kV
325 PEGAS.L8
1.036 pu 71 kV
973 199A_TAP
0.000 pu 0 kV
1674 CHKD CK7
1.000 pu 138 kV
9 WHITEC07
1.048 pu 145 kV
10 WHITEC08
1.037 pu 72 kV
8 WHCTIND7
1.045 pu 144 kV
678 DEERH7
1.023 pu 141 kV
412 BENBOW 7
1.027 pu 142 kV
962 KAYBOBTP
1.027 pu 142 kV
13 KAYBOB 7
1.027 pu 142 kV
924 CH KGT T
1.027 pu 142 kV
411 CHEV KG7
1.027 pu 142 kV
82 CHEVRON7
1.027 pu 142 kV
830 MARLBTAP
1.023 pu 141 kV
415 MARLBOR1
1.023 pu 141 kV
319 COALSPU8
1.024 pu 71 kV
324 COALSPU7
1.023 pu 141 kV
914 CADOM TP
1.024 pu 71 kV
323 CADOMIN8
1.024 pu 71 kV
2368 CHEVIOT3
1.015 pu 70 kV
368 CHEVIOT1
1.020 pu 141 kV
7L90-1
7L90-2
7L57
734S701T
7L01
7L56_1
7L56_2
7L32_2
7L56_3
7L40
7L54
7L45_2
7L45_1
7L46
813S902T
813S901T
7L48-1
7L48-2
7LA48
9L11
9L02
9L05
1168L
1084L
1135L
9L40
39ST2
39ST1
973L
974L
740L-1
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7L97
739S701T
7L43
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938L/9L938
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919L
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7L230-2
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7L67_2
7L78
785S701T
743S701T
825L
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799L_2
826L
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740L-2
745AL-1
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745A1L
740AL
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762L
762AL
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501CL
101ST1
426ST1
744L-3
744L-2
890L
202L-1
847AL-10A
847L-1
847L-2
847L_2
615L
745L-1
854AL
111 MW -17 Mvar
PROJECT: P2456
Kiwetinohk Opal MPC Gas - NEW RAS: P2456
CONTINGENCY:
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)
DATE: APR-04-2023
Scenario 09: 2023 Summer Peak (LG) (POST RAS)
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope
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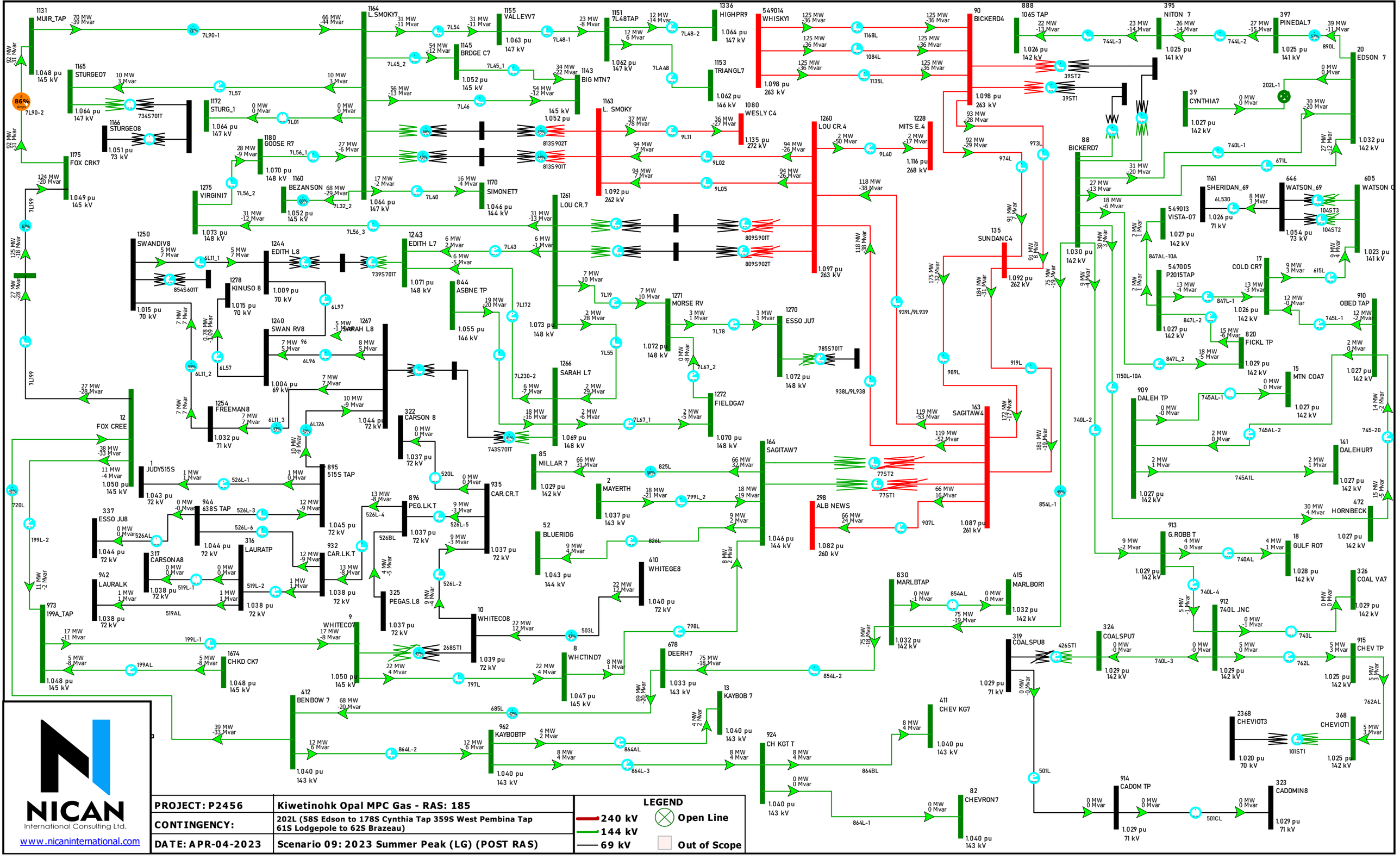

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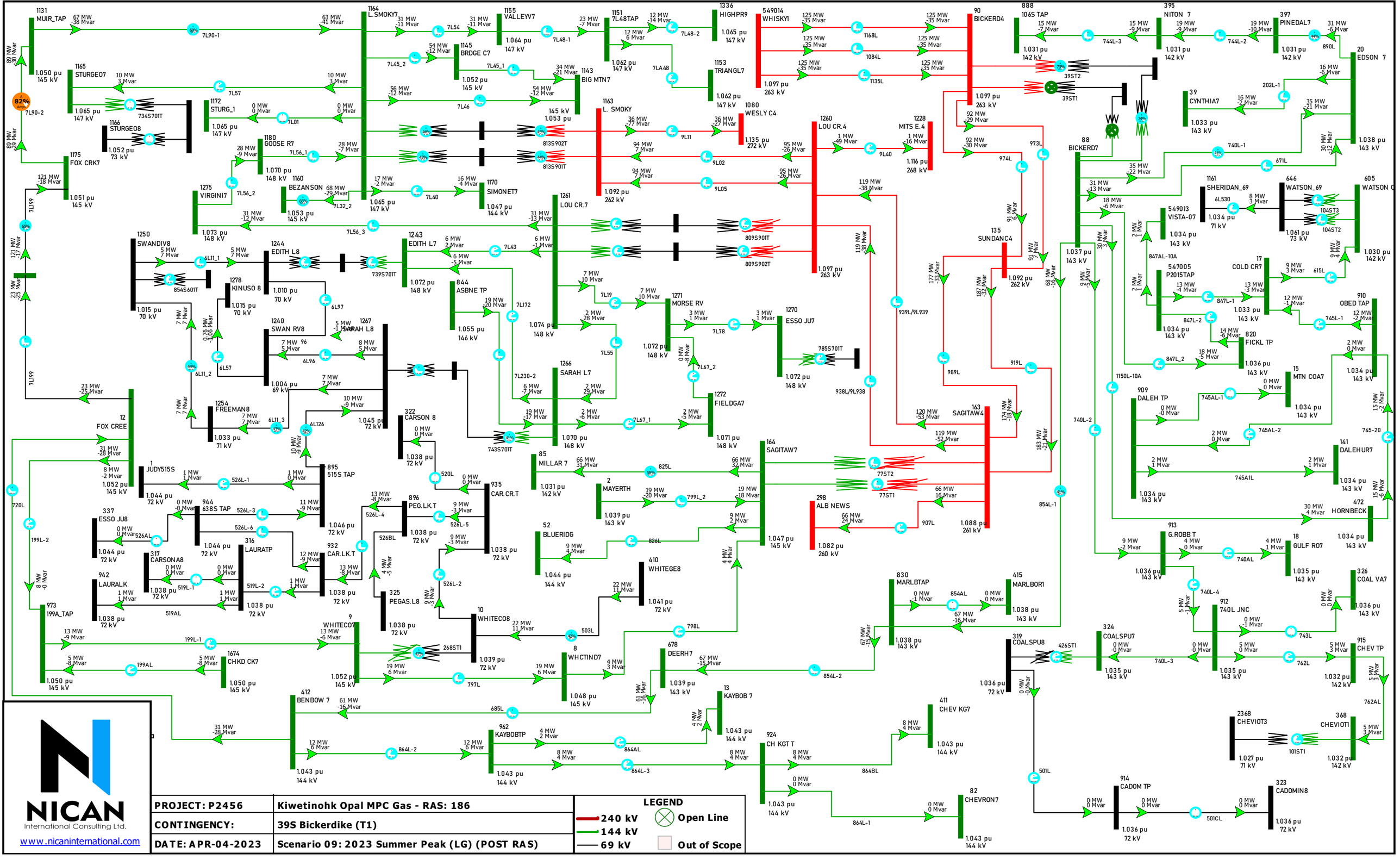
PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 185**
CONTINGENCY:	**202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (POST RAS)**

LEGEND

240 kV	**Open Line**
144 kV	
69 kV	**Out of Scope**



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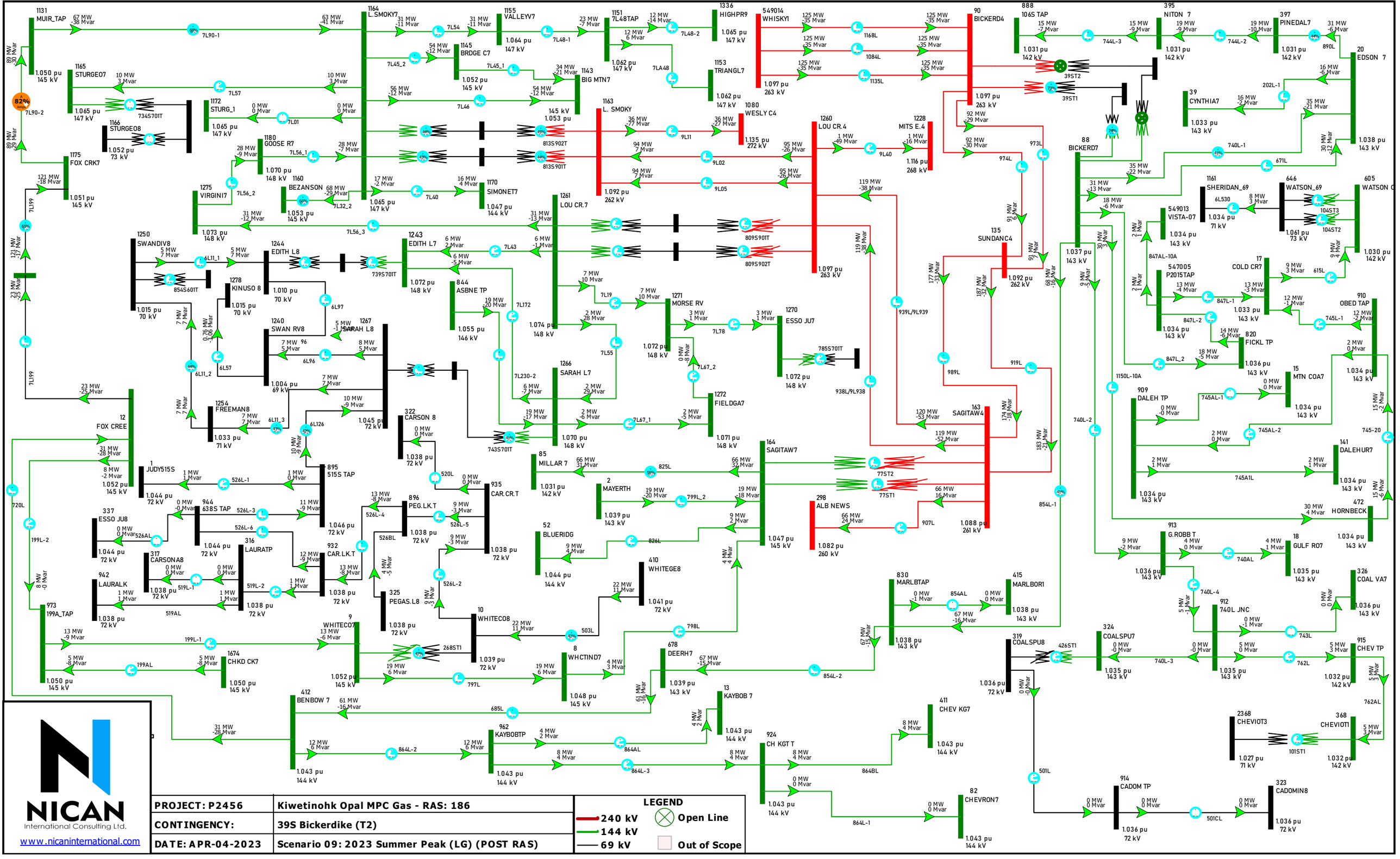
PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 186
CONTINGENCY:	39S Bickerdike (T1)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope



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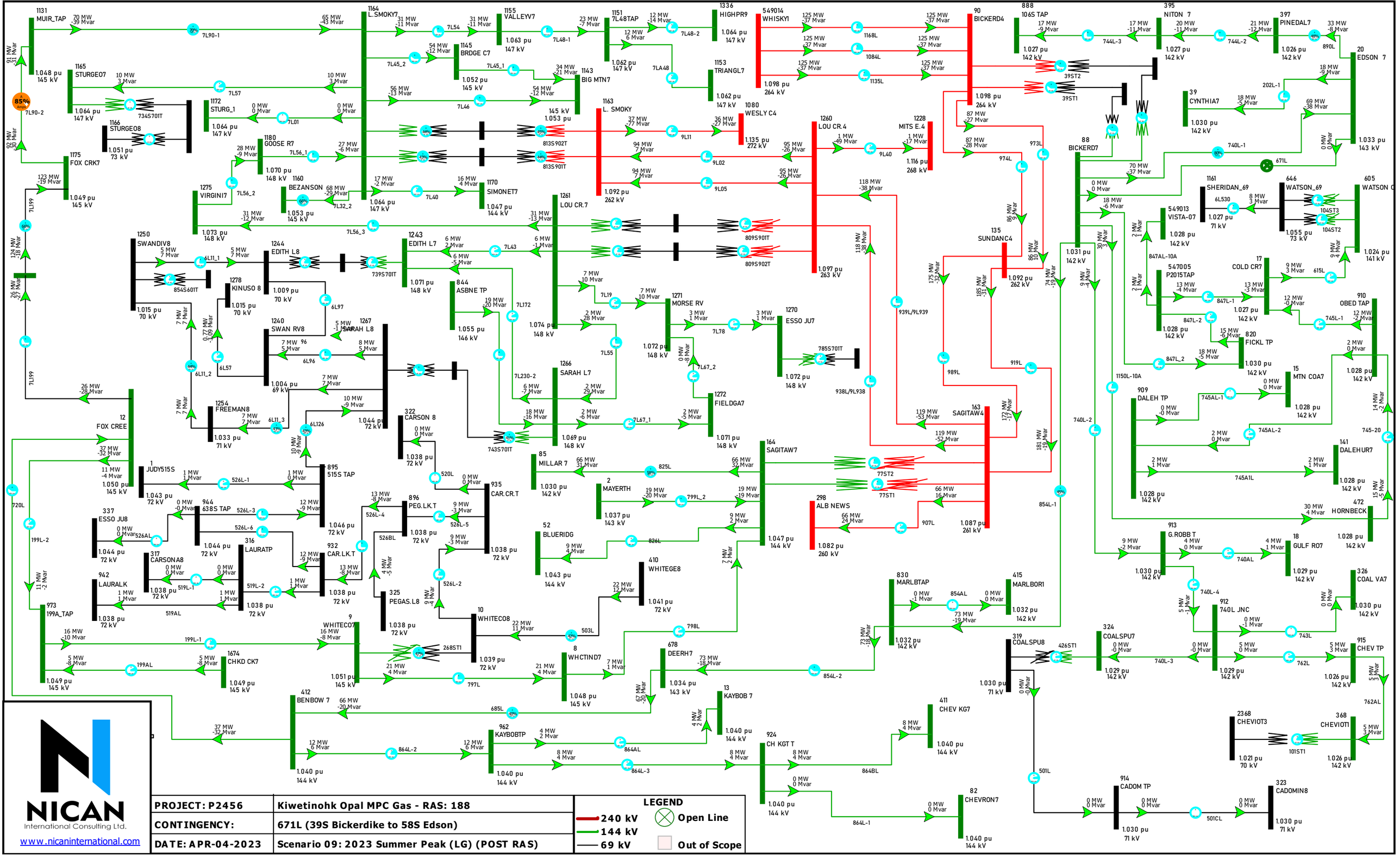
PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 186**
CONTINGENCY:	**39S Bickerdike (T2)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (POST RAS)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



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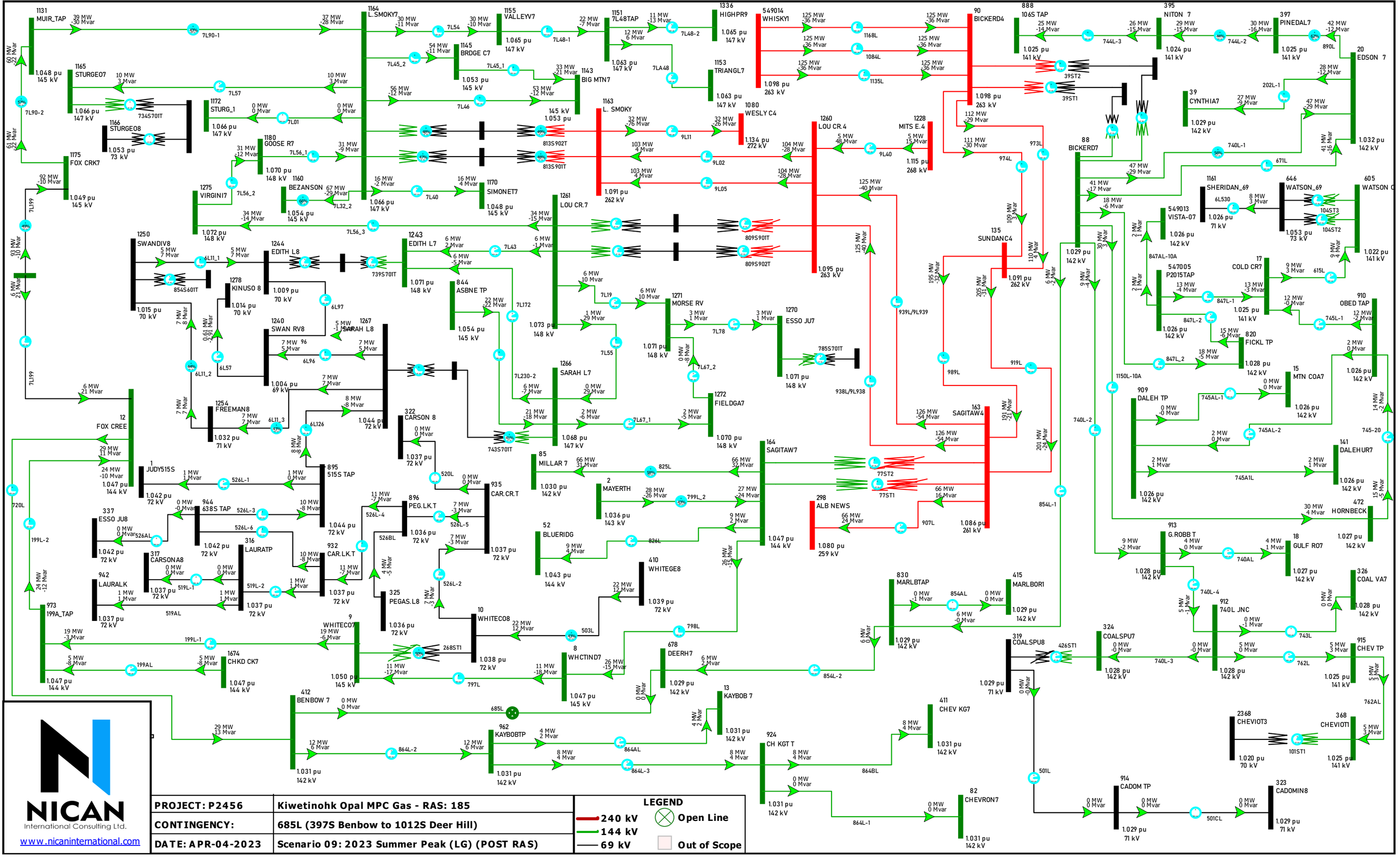
PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 188
CONTINGENCY:	671L (39S Bickerdike to 58S Edson)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope



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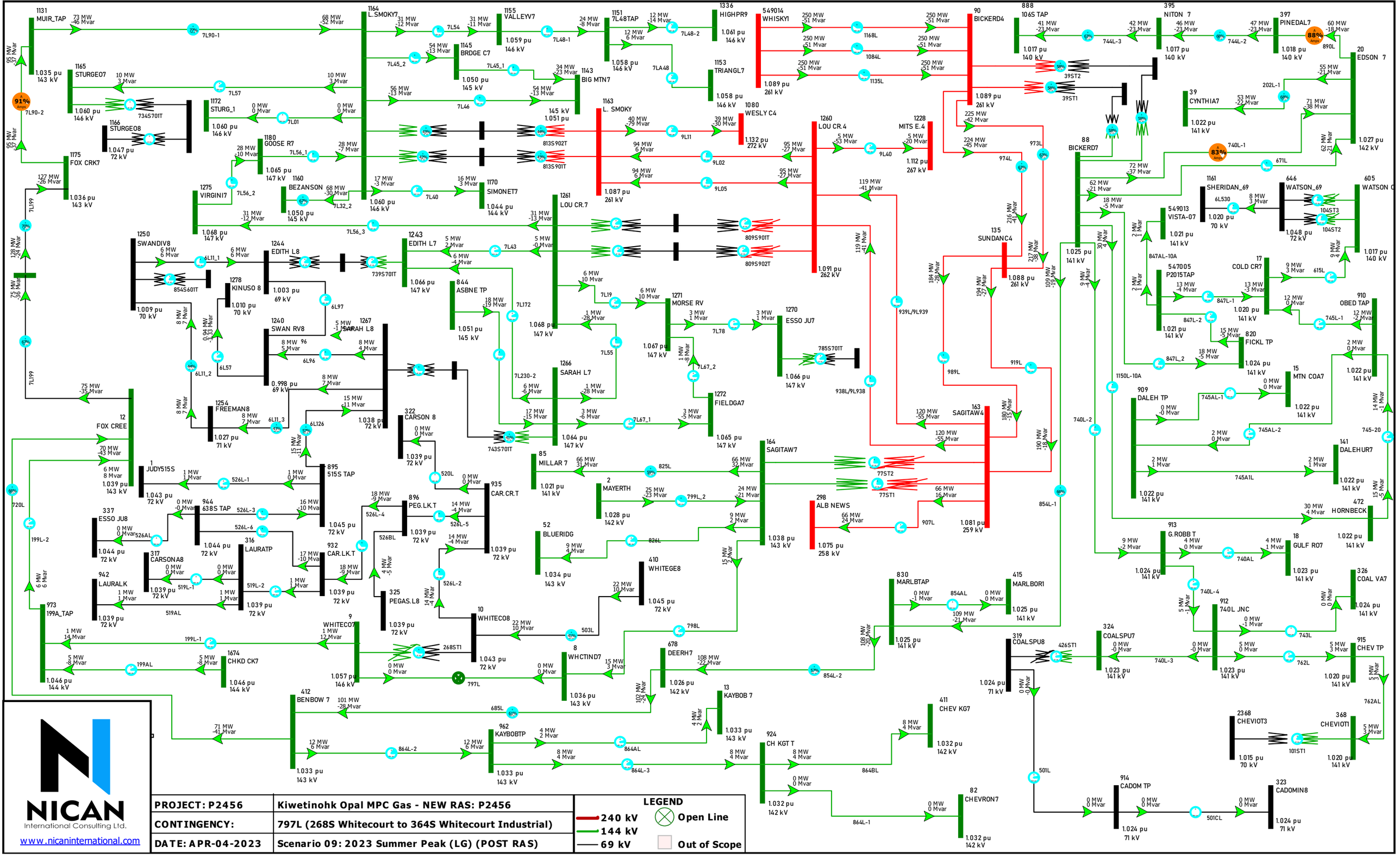
PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 185
CONTINGENCY:	685L (397S Benbow to 1012S Deer Hill)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

LEGEND

- 🟥 240 kV
- 🟩 144 kV
- ― 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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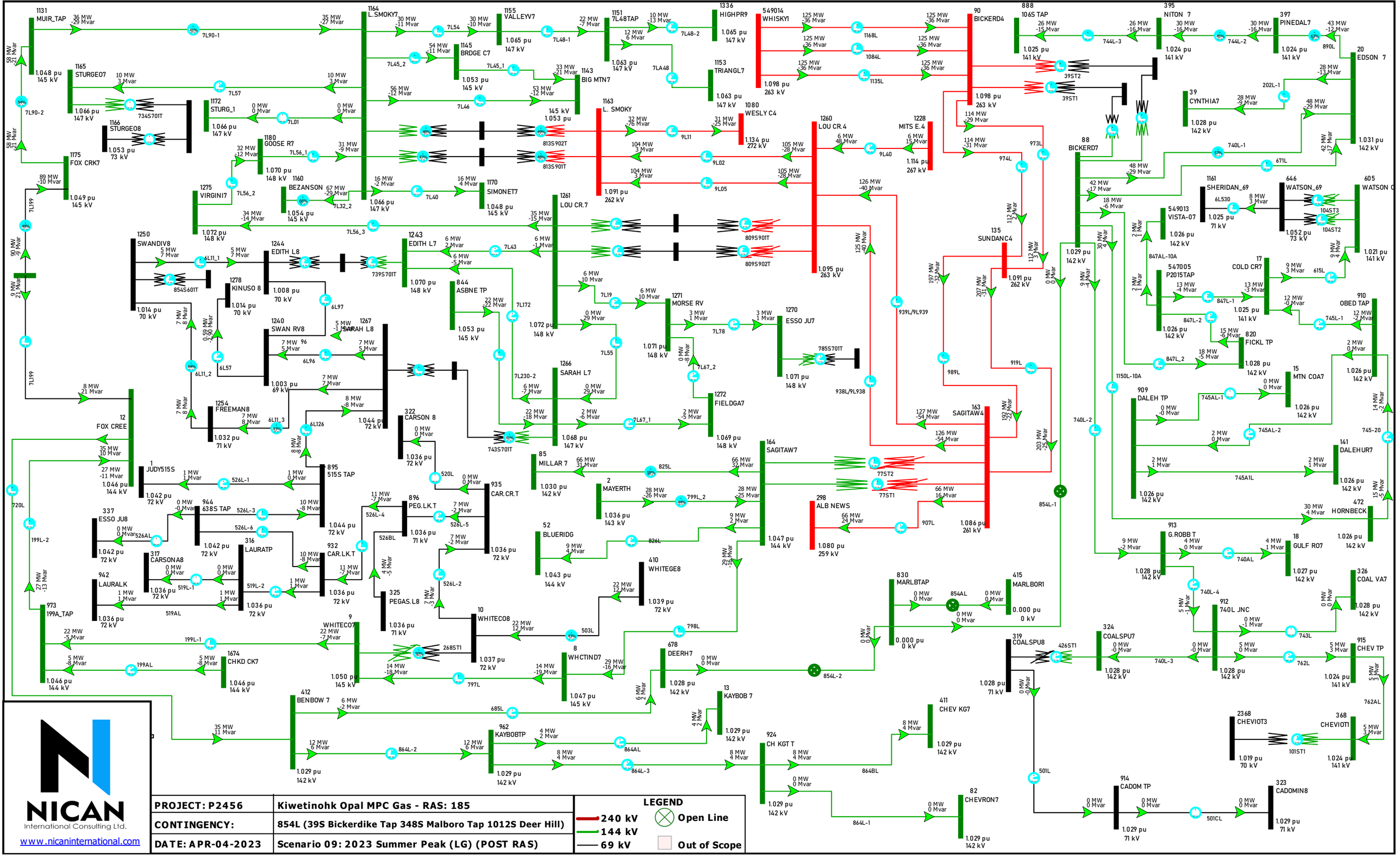
PROJECT: P2456	Kiwetinohk Opal MPC Gas - NEW RAS: P2456
CONTINGENCY:	797L (268S Whitecourt to 364S Whitecourt Industrial)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

LEGEND

🟥 240 kV	⊗ Open Line
🟩 144 kV	
69 kV	☐ Out of Scope



PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 185**
CONTINGENCY:	**854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)**
DATE: APR-04-2023	**Scenario 09: 2023 Summer Peak (LG) (POST RAS)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope

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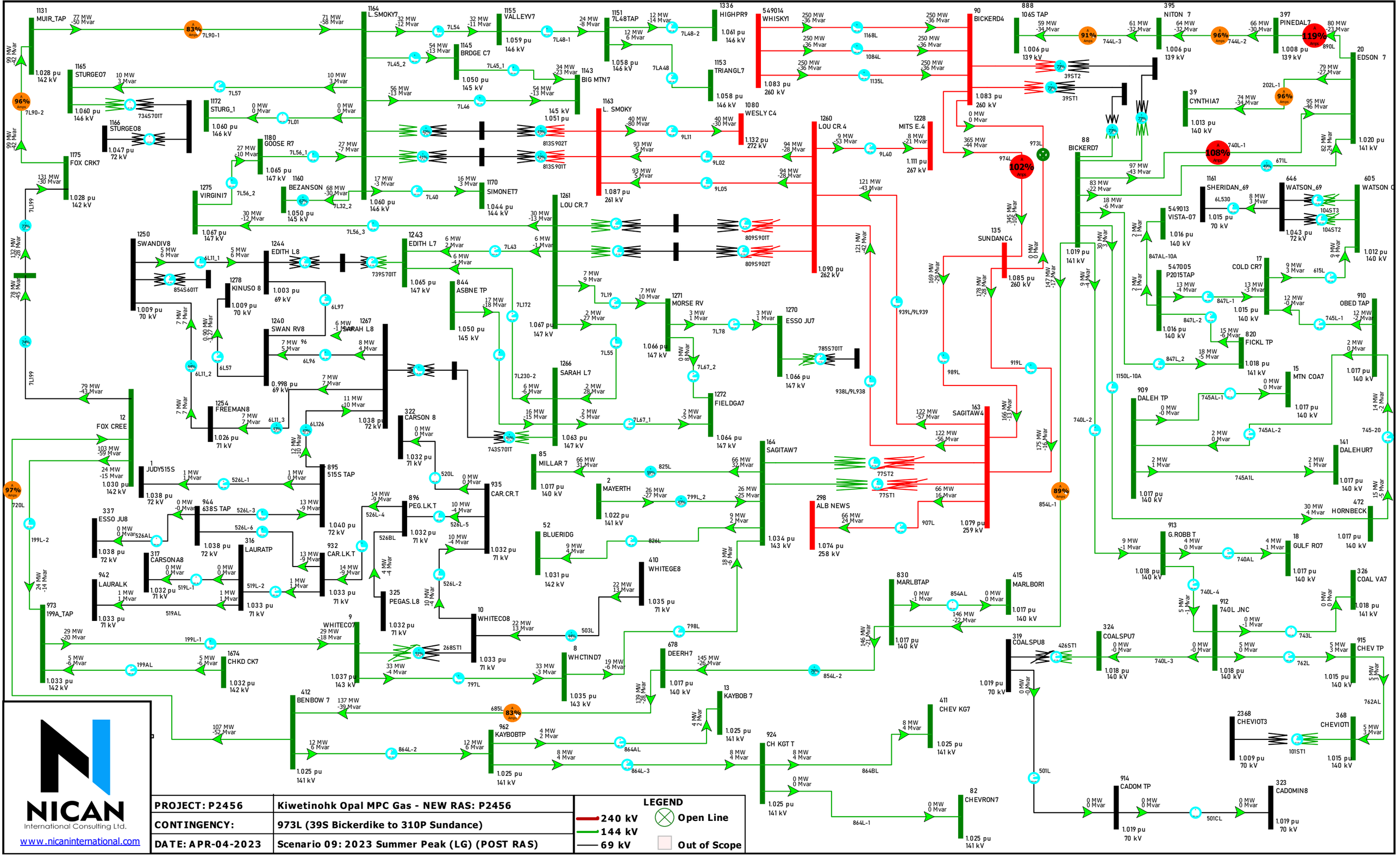
1131 MUIR_TAP
1028 pu 142 kV
1165 STURGEO7
1060 pu 146 kV
1166 STURGEO8
1047 pu 72 kV
1175 FOX CRK7
1028 pu 142 kV
1164 L.SMOKY7
1060 pu 146 kV
1172 STURG_1
1060 pu 146 kV
1180 GOOSE R7
1065 pu 147 kV
1160 BEZANSON
1050 pu 145 kV
1275 VIRGINI7
1067 pu 147 kV
1155 VALLEYV7
1059 pu 146 kV
1145 BRDGE C7
1050 pu 145 kV
1143 BIG MTN7
145 kV 1.051 pu
1163 L. SMOKY
1087 pu 261 kV
1170 SIMONET7
1044 pu 144 kV
1151 7L48TAP
1058 pu 146 kV
1336 HIGHPR9
1061 pu 146 kV
1153 TRIANGL7
1058 pu 146 kV
549014 WHISKY1
1083 pu 260 kV
1080 WESLY C4
1132 pu 272 kV
1260 LOU CR.4
1090 pu 262 kV
1228 MITS E.4
1111 pu 267 kV
90 BICKERD4
1083 pu 260 kV
888 106S TAP
1006 pu 139 kV
395 NITON 7
1006 pu 139 kV
397 PINEDAL7
1008 pu 139 kV
20 EDSON 7
1020 pu 141 kV
39 CYNTHIA7
1013 pu 140 kV
88 BICKERD7
1019 pu 141 kV
1161 SHERIDAN_69
1015 pu 70 kV
646 WATSON_69
1043 pu 72 kV
605 WATSON C
1012 pu 140 kV
549013 VISTA-07
1016 pu 140 kV
135 SUNDANC4
1085 pu 260 kV
547005 P2015TAP
1016 pu 140 kV
17 COLD CR7
1015 pu 140 kV
820 FICKL TP
1018 pu 141 kV
910 OBED TAP
1017 pu 140 kV
15 MTN COA7
1017 pu 140 kV
909 DALEH TP
1017 pu 140 kV
141 DALEHUR7
1017 pu 140 kV
472 HORNBECK
1017 pu 140 kV
913 G.ROBB T
1018 pu 140 kV
18 GULF RO7
1017 pu 140 kV
326 COAL VA7
1018 pu 141 kV
912 740L JNC
1018 pu 140 kV
915 CHEV TP
1015 pu 140 kV
1250 SWANDIV8
1009 pu 70 kV
1278 KINUSO 8
1009 pu 70 kV
1244 EDITH L8
1003 pu 69 kV
1240 SWAN RV8
0998 pu 69 kV
1267 SARAH L8
1038 pu 72 kV
1254 FREEMAN8
1026 pu 71 kV
322 CARSON 8
1032 pu 71 kV
1243 EDITH L7
1065 pu 147 kV
844 ASBNE TP
1050 pu 145 kV
1261 LOU CR.7
1067 pu 147 kV
1266 SARAH L7
1063 pu 147 kV
1271 MORSE RV
1066 pu 147 kV
1270 ESSO JU7
1066 pu 147 kV
1272 FIELDGA7
1064 pu 147 kV
85 MILLAR 7
1017 pu 140 kV
2 MAYERTH
1022 pu 141 kV
52 BLUERIDG
1031 pu 142 kV
896 PEG.LK.T
1032 pu 71 kV
325 PEGAS.L8
1032 pu 71 kV
935 CAR.CR.T
1032 pu 71 kV
932 CAR.LK.T
1033 pu 71 kV
10 WHITEC08
1033 pu 71 kV
9 WHITEC07
1037 pu 143 kV
410 WHITEGE8
1035 pu 71 kV
8 WHCTIND7
1035 pu 143 kV
678 DEERH7
1017 pu 140 kV
13 KAYBOB 7
1025 pu 141 kV
962 KAYBOBTP
1025 pu 141 kV
412 BENBOW 7
1025 pu 141 kV
164 SAGITAW7
1034 pu 143 kV
163 SAGITAW4
1079 pu 259 kV
298 ALB NEWS
1074 pu 258 kV
924 CH KGT T
1025 pu 141 kV
411 CHEV KG7
1025 pu 141 kV
82 CHEVRON7
1025 pu 141 kV
830 MARLBTAP
1017 pu 140 kV
415 MARLBOR1
1017 pu 140 kV
319 COALSPU8
1019 pu 70 kV
324 COALSPU7
1018 pu 140 kV
2368 CHEVIOT3
1009 pu 70 kV
368 CHEVIOTI
1015 pu 140 kV
914 CADOM TP
1019 pu 70 kV
323 CADOMIN8
1019 pu 70 kV
1 JUDY515S
1038 pu 72 kV
337 ESSO JU8
1038 pu 72 kV
944 638S TAP
1038 pu 72 kV
316 LAURATP
1033 pu 71 kV
317 CARSONA8
1032 pu 71 kV
942 LAURALK
1033 pu 71 kV
973 199A_TAP
1033 pu 142 kV
1674 CHKD CK7
1032 pu 142 kV
895 515S TAP
1040 pu 72 kV
1030 pu 142 kV
83% 7L90-1
96% 7L90-2
91% 744L-3
96% 744L-2
119% 890L
96% 202L-1
108% 740L-1
102% 974L
973L
671L
97% 720L
89% 854L-1
83% 685L
7L54
7L48-1
7L48-2
7LA48
7L45_1
7L45_2
7L46
7L01
7L40
7L57
7L56_1
7L56_2
7L56_3
7L32_2
9L11
9L02
9L05
9L40
7L43
7L19
7L55
7L172
7L230-2
7L78
7L67_1
7L67_2
7L97
7L96
7L199
7L199-1
7L199-2
6L11_1
6L11_2
6L11_3
6L57
6L126
199AL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
519L-1
519L-2
519AL
743S701T
739S701T
854S601T
734S701T
813S902T
813S901T
809S901T
809S902T
785S701T
268ST1
939L/9L939
938L/9L938
989L
919L
1168L
1084L
1135L
39ST2
39ST1
77ST2
77ST1
104ST3
104ST2
101ST1
426ST1
7L599
7L599-1
7L599-2
7L599-3
7L599-4
7L599-5
7L599-6
7L599-7
7L599-8
7L599-9
7L599-10
7L599-11
7L599-12
7L599-13
7L599-14
7L599-15
7L599-16
7L599-17
7L599-18
7L599-19
7L599-20
7L599-21
7L599-22
7L599-23
7L599-24
7L599-25
7L599-26
7L599-27
7L599-28
7L599-29
7L599-30
7L599-31
7L599-32
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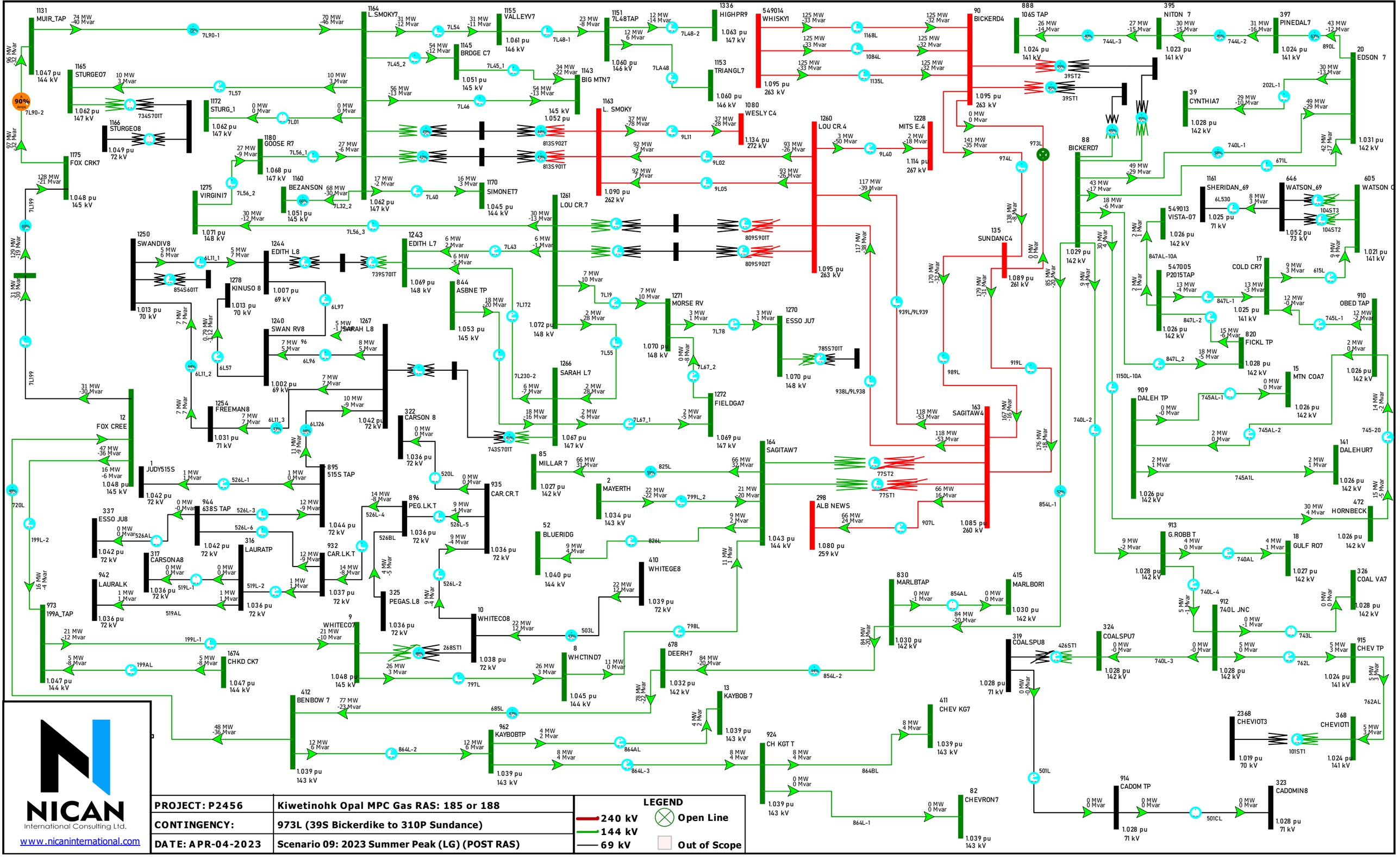
7L599-38
7L599-39
7L599-40


1131 MUIR_TAP
1.047 pu 144 kV
1165 STURGE07
1.062 pu 147 kV
1166 STURGE08
1.049 pu 72 kV
1175 FOX CRK7
1.048 pu 145 kV
1164 L.SMOKY7
1.062 pu 147 kV
1155 VALLEYV7
1.061 pu 146 kV
1145 BRDGE C7
1.051 pu 145 kV
1143 BIG MTN7
145 kV 1.052 pu
1151 7L48TAP
1.060 pu 146 kV
1336 HIGHPR9
1.063 pu 147 kV
1153 TRIANGL7
1.060 pu 146 kV
549014 WHISKYI
1.095 pu 263 kV
90 BICKERD4
1.095 pu 263 kV
888 106S TAP
1.024 pu 141 kV
39ST2
39ST1
395 NITON 7
1.023 pu 141 kV
397 PINEDAL7
1.024 pu 141 kV
20 EDSON 7
1.031 pu 142 kV
39 CYNTHIA7
1.028 pu 142 kV
88 BICKERD7
1.029 pu 142 kV
1163 L. SMOKY
1.090 pu 262 kV
1080 WESLY C4
1.134 pu 272 kV
1260 LOU CR.4
1.095 pu 263 kV
1228 MITS E.4
1.114 pu 267 kV
135 SUNDANC4
1.089 pu 261 kV
1161 SHERIDAN_69
1.025 pu 71 kV
646 WATSON_69
1.052 pu 73 kV
605 WATSON C
1.021 pu 141 kV
549013 VISTA-07
1.026 pu 142 kV
547005 P2015TAP
1.025 pu 141 kV
17 COLD CR7
1.026 pu 142 kV
910 OBED TAP
1.026 pu 142 kV
820 FICKL TP
1.028 pu 142 kV
15 MTN COA7
1.026 pu 142 kV
909 DALEH TP
1.026 pu 142 kV
141 DALEHUR7
1.026 pu 142 kV
472 HORNBECK
1.026 pu 142 kV
913 G.ROBB T
1.028 pu 142 kV
18 GULF RO7
1.027 pu 142 kV
326 COAL VA7
1.028 pu 142 kV
912 740L JNC
1.028 pu 142 kV
915 CHEV TP
1.024 pu 141 kV
324 COALSPU7
1.028 pu 142 kV
319 COALSPU8
1.028 pu 71 kV
914 CADOM TP
1.028 pu 71 kV
323 CADOMIN8
1.028 pu 71 kV
2368 CHEVIOT3
1.019 pu 70 kV
368 CHEVIOT1
1.024 pu 141 kV
1261 LOU CR.7
1.072 pu 148 kV
1095 pu 263 kV
1250 SWANDIV8
1.013 pu 70 kV
1244 EDITH L8
1.007 pu 69 kV
1278 KINUSO 8
1.013 pu 70 kV
1243 EDITH L7
1.069 pu 148 kV
844 ASBNE TP
1.053 pu 145 kV
1240 SWAN RV8
1.002 pu 69 kV
1267 SARAH L8
1.042 pu 72 kV
322 CARSON 8
1.036 pu 72 kV
1254 FREEMAN8
1.031 pu 71 kV
12 FOX CREE
1.048 pu 145 kV
1 JUDY515S
1.042 pu 72 kV
895 515S TAP
1.044 pu 72 kV
944 638S TAP
1.042 pu 72 kV
337 ESSO JU8
1.042 pu 72 kV
317 CARSONA8
1.036 pu 72 kV
316 LAURATP
1.036 pu 72 kV
942 LAURALK
1.036 pu 72 kV
973 199A_TAP
1.047 pu 144 kV
1674 CHKD CK7
1.047 pu 144 kV
1180 GOOSE R7
1.068 pu 147 kV
1160 BEZANSON
1.051 pu 145 kV
1275 VIRGINI7
1.071 pu 148 kV
1170 SIMONET7
1.045 pu 144 kV
1266 SARAH L7
1.067 pu 147 kV
1271 MORSE RV
1.070 pu 148 kV
1270 ESSO JU7
1.070 pu 148 kV
1272 FIELDGA7
1.069 pu 147 kV
85 MILLAR 7
1.027 pu 142 kV
2 MAYERTH
1.034 pu 143 kV
896 PEG.LK.T
1.036 pu 72 kV
935 CAR.CR.T
1.036 pu 72 kV
932 CAR.LK.T
1.037 pu 72 kV
325 PEGAS.L8
1.036 pu 72 kV
52 BLUERIDG
1.040 pu 144 kV
410 WHITEGE8
1.039 pu 72 kV
10 WHITEC08
1.038 pu 72 kV
9 WHITEC07
1.048 pu 145 kV
8 WHCTIND7
1.045 pu 144 kV
678 DEERH7
1.032 pu 142 kV
13 KAYBOB 7
1.039 pu 143 kV
962 KAYBOBTP
1.039 pu 143 kV
412 BENBOW 7
1.039 pu 143 kV
164 SAGITAW7
1.043 pu 144 kV
163 SAGITAW4
1.085 pu 260 kV
298 ALB NEWS
1.080 pu 259 kV
924 CH KGT T
1.039 pu 143 kV
411 CHEV KG7
1.039 pu 143 kV
82 CHEVRON7
1.039 pu 143 kV
830 MARLBTAP
1.030 pu 142 kV
415 MARLBOR1
1.030 pu 142 kV
90% A Amps
7L90-1
7L90-2
7L57
7L01
7L46
7L45_1
7L45_2
7L54
7L48-1
7L48-2
7LA48
7L40
7L56_1
7L56_2
7L56_3
7L32_2
9L11
9L02
9L05
9L40
7L43
7L172
7L19
7L55
7L78
7L67_2
7L67_1
7L230-2
7L199
7L199-1
7L199-2
6L11_1
6L11_2
6L11_3
6L97
6L96
6L57
6L126
739S701IT
734S701IT
743S701IT
785S701IT
854S601IT
809S901T
809S902T
813S902T
813S901T
268ST1
939L/9L939
938L/9L938
973L
974L
989L
919L
1168L
1084L
1135L
744L-3
744L-2
745L-1
745AL-1
745AL-2
745A1L
740L-1
740L-2
740L-3
740L-4
740AL
671L
615L
890L
202L-1
847L-1
847L-2
847L_2
847AL-10A
1150L-10A
745-20
762L
762AL
743L
739L
501L
501CL
526L-1
526L-2
526L-3
526L-4
526L-5
526L-6
526AL
526BL
519L-1
519L-2
519AL
520L
685L
720L
825L
826L
799L_2
797L
798L
503L
864L-1
864L-2
864L-3
864AL
864BL
854L-1
854L-2
854AL
907L
6L530
104ST3
104ST2
101ST1
77ST2
77ST1
426ST1
6L139
6L140
6L141
6L142
6L143
6L144
6L145
6L146
6L147
6L148
6L149
6L150
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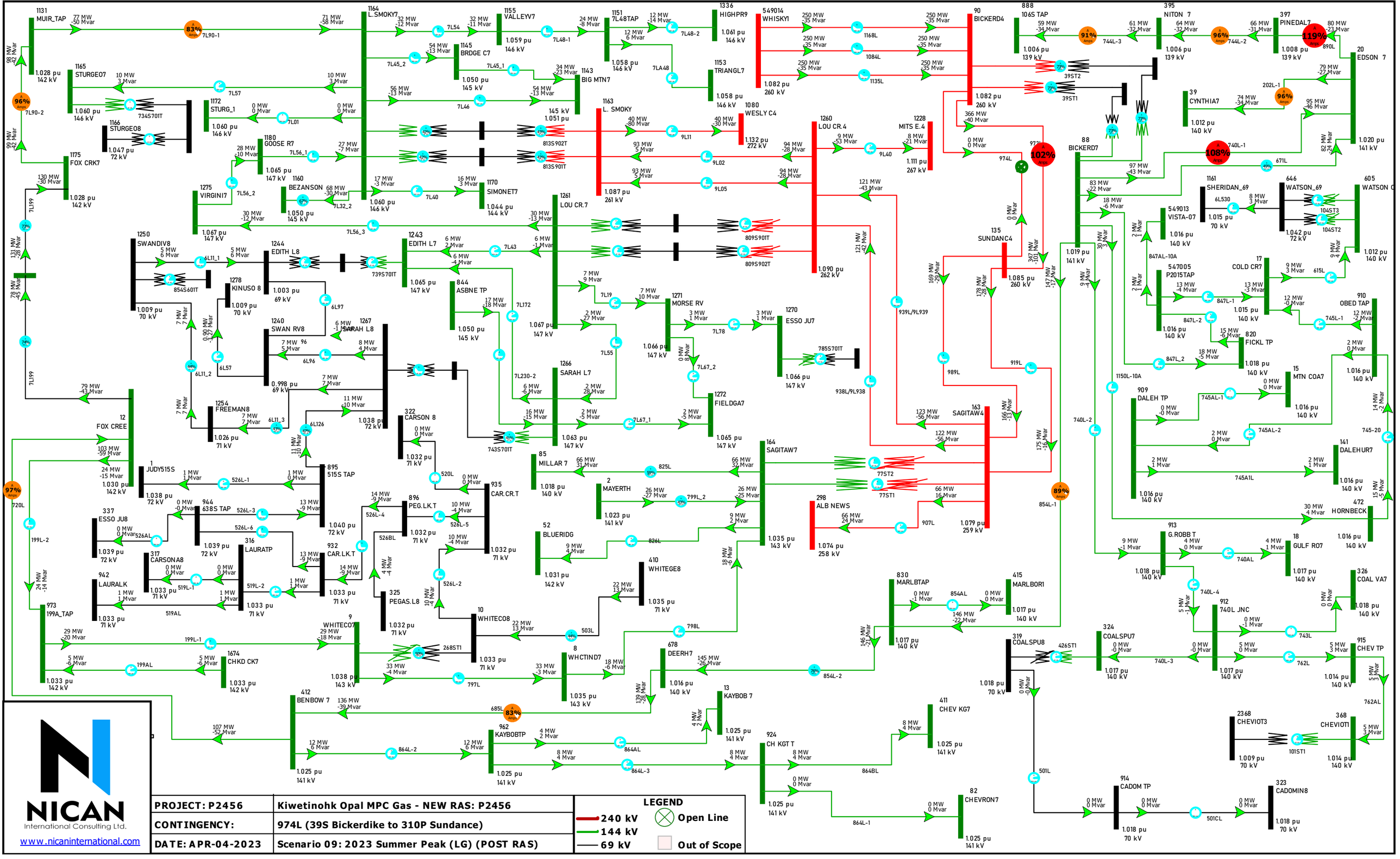
6L178



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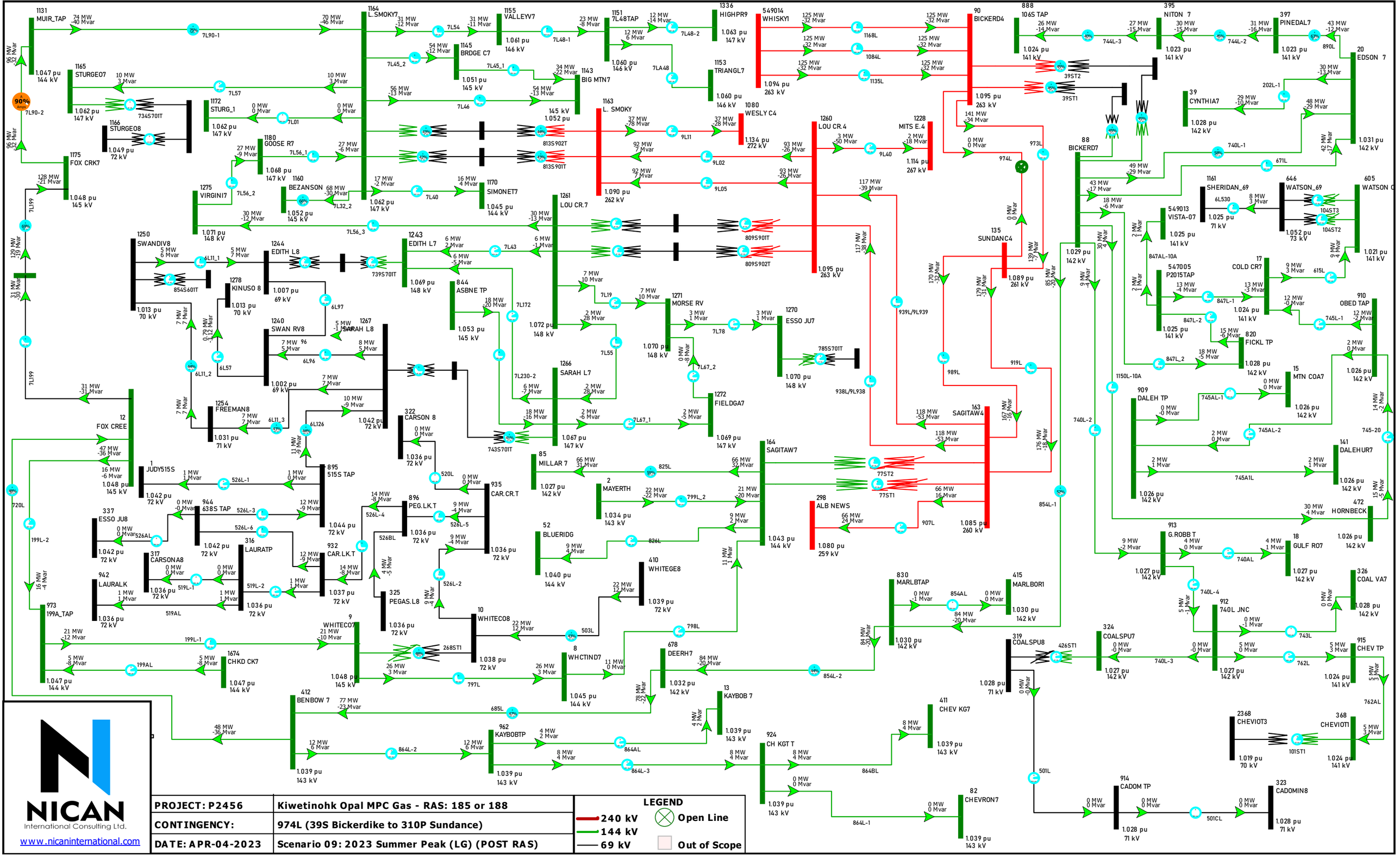
PROJECT: P2456	Kiwetinohk Opal MPC Gas - NEW RAS: P2456
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

LEGEND
- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 185 or 188
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 09: 2023 Summer Peak (LG) (POST RAS)

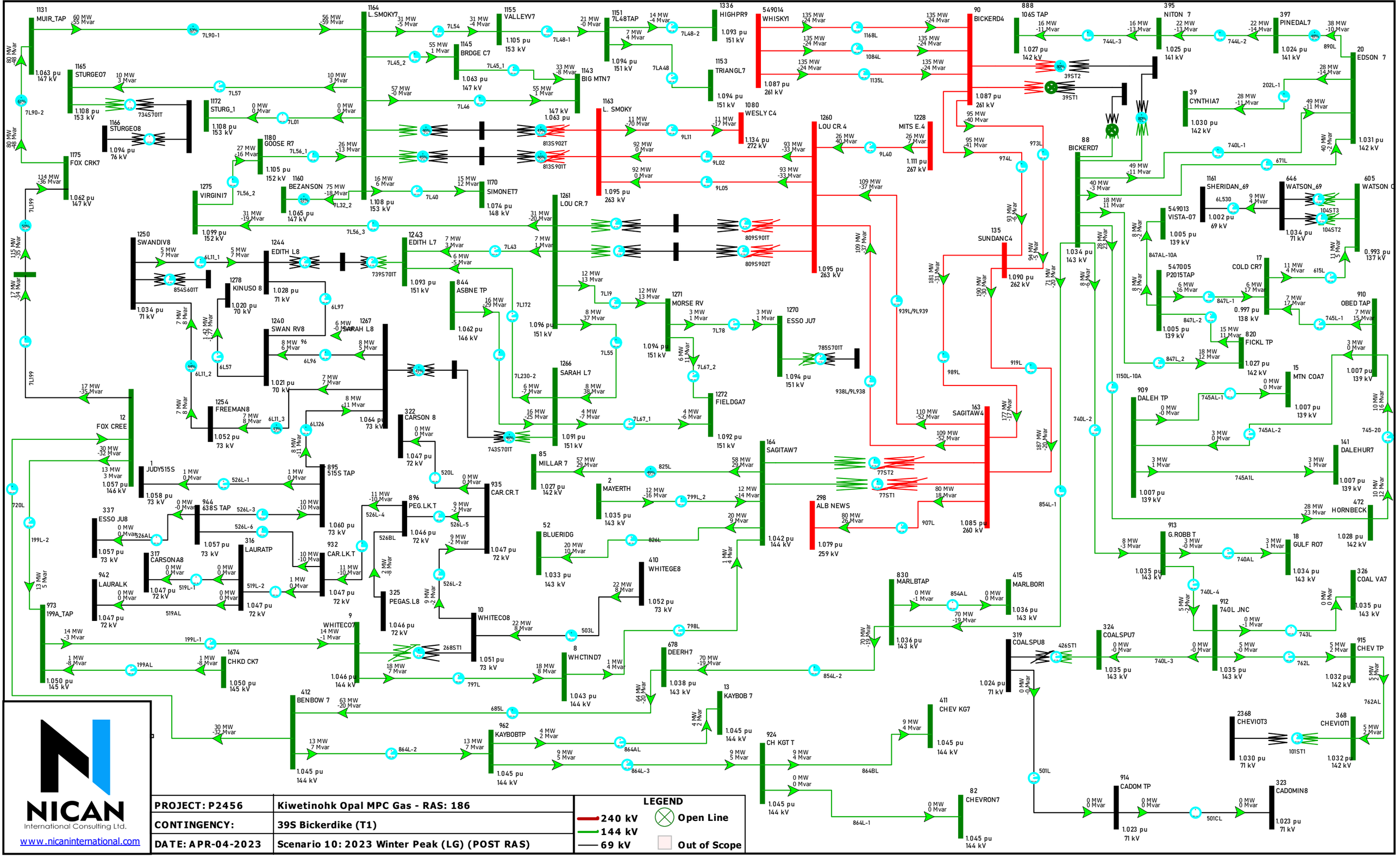
LEGEND
240 kV
144 kV
69 kV
Open Line
Out of Scope

2023 WINTER PEAK

(Low Generation)

Single Line Diagrams
P2456 - POST-PROJECT
POST-RAS
POWER FLOW SC10

NICAN



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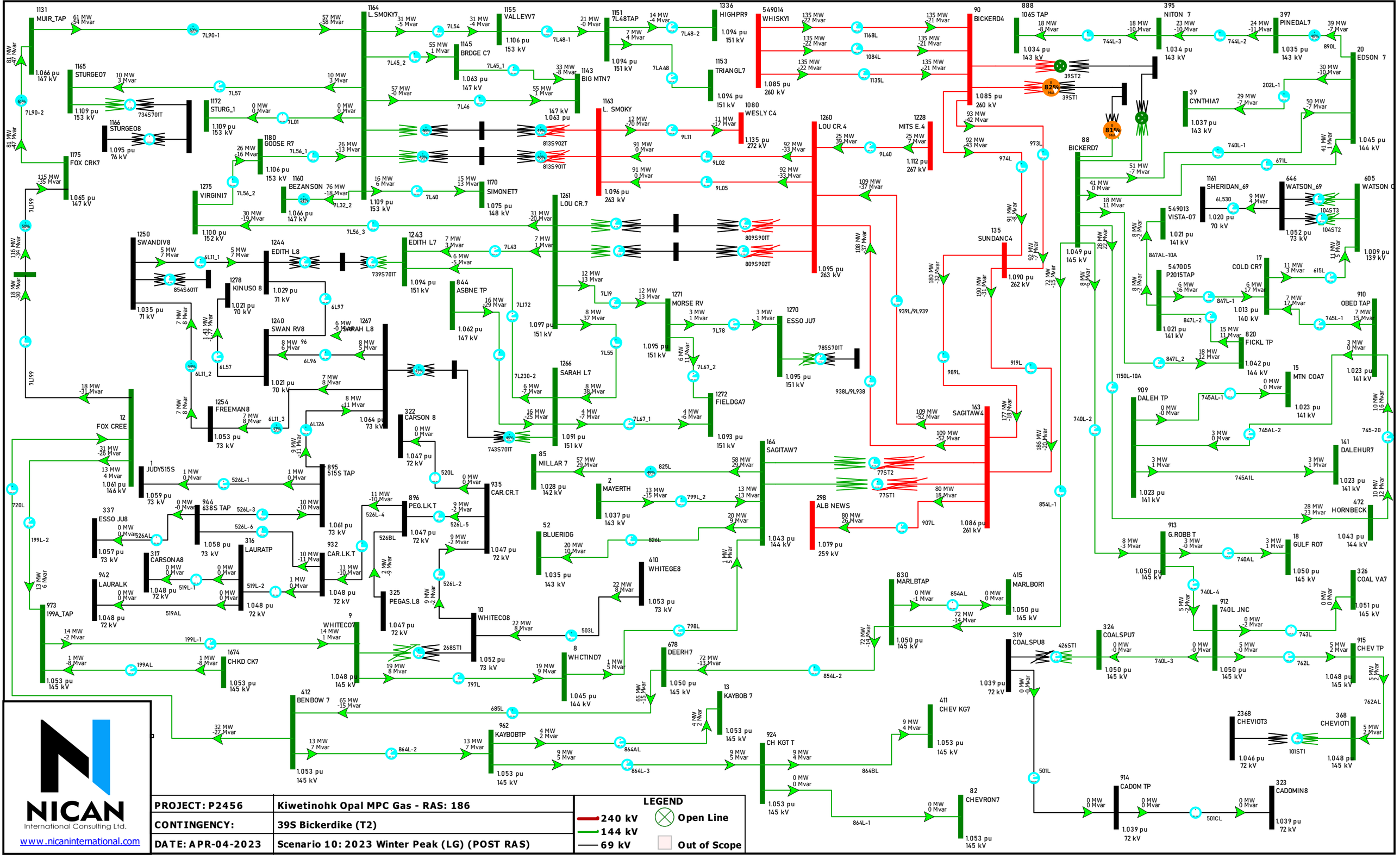
PROJECT: P2456	**Kiwetinohk Opal MPC Gas - RAS: 186**
CONTINGENCY:	**39S Bickerdike (T1)**
DATE: APR-04-2023	**Scenario 10: 2023 Winter Peak (LG) (POST RAS)**

LEGEND

- 240 kV
- 144 kV
- 69 kV
- Open Line
- Out of Scope



PROJECT: P2456 | Kiwetinohk Opal MPC Gas - RAS: 186

CONTINGENCY: | 39S Bickerdike (T2)

DATE: APR-04-2023 | Scenario 10: 2023 Winter Peak (LG) (POST RAS)

LEGEND
- 240 kV
- 144 kV
- 69 kV
- ⊗ Open Line
- ☐ Out of Scope

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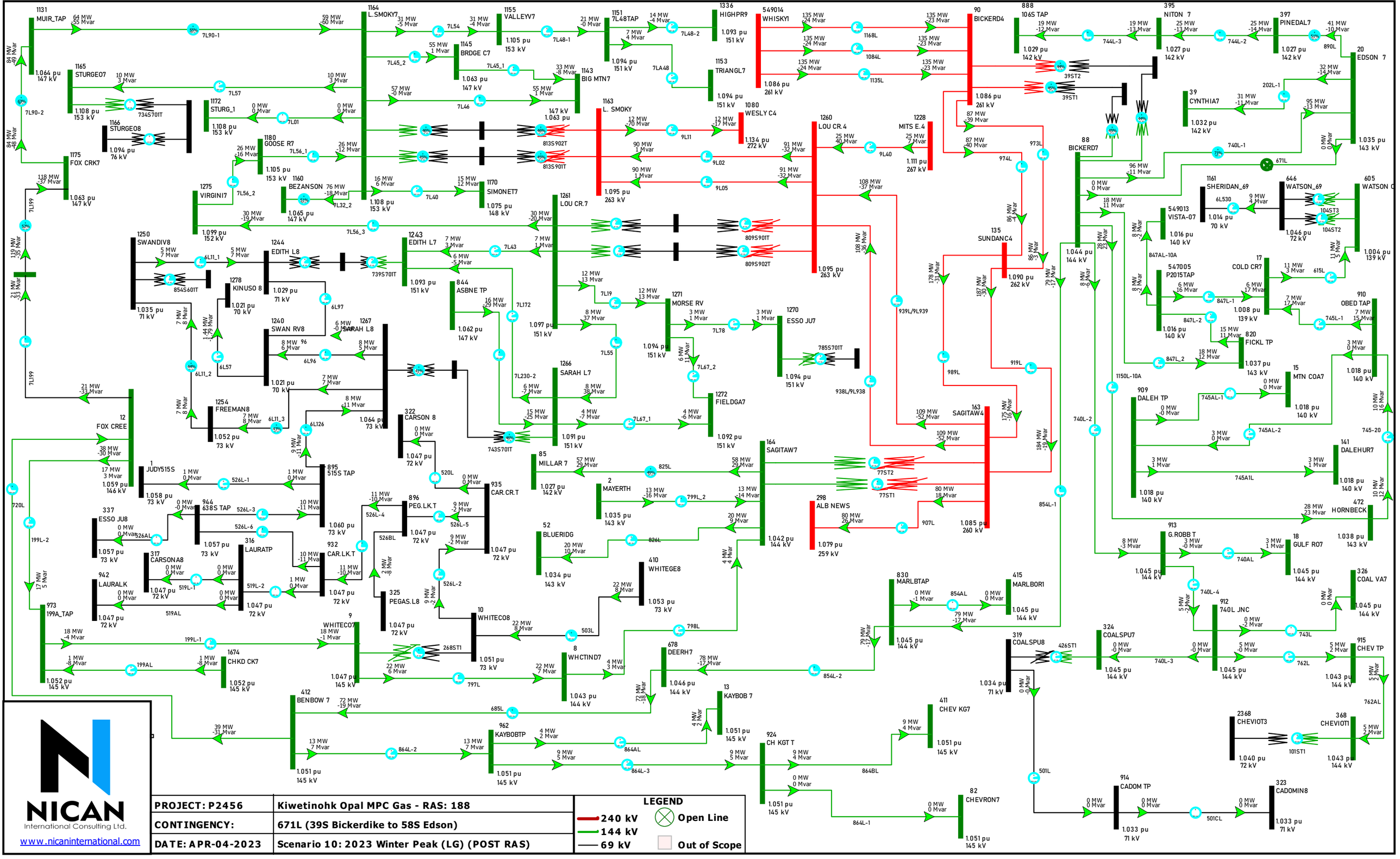
1131 MUIR_TAP
1.064 pu 147 kV
1165 STURGEO7
1.108 pu 153 kV
1166 STURGEO8
1.094 pu 76 kV
1175 FOX CRK7
1.063 pu 147 kV
1164 L.SMOKY7
1.108 pu 153 kV
1155 VALLEYV7
1.105 pu 153 kV
1145 BRDGE C7
1.063 pu 147 kV
1143 BIG MTN7
147 kV 1.063 pu
1151 7L48TAP
1.094 pu 151 kV
1336 HIGHPR9
1.093 pu 151 kV
1153 TRIANGL7
1.094 pu 151 kV
549014 WHISKYI
1.086 pu 261 kV
1168L
1084L
1135L
90 BICKERD4
1.086 pu 261 kV
888 106S TAP
1.029 pu 142 kV
39ST2
39ST1
395 NITON 7
1.027 pu 142 kV
397 PINEDAL7
1.027 pu 142 kV
890L
20 EDSON 7
1.035 pu 143 kV
39 CYNTHIA7
1.032 pu 142 kV
202L-1
744L-3
744L-2
740L-1
671L
973L
974L
96 MW -11 Mvar
87 MW -39 Mvar
87 MW -40 Mvar
88 BICKERD7
1.044 pu 144 kV
1161 SHERIDAN_69
1.014 pu 70 kV
6L530
646 WATSON_69
1.046 pu 72 kV
104ST3
104ST2
605 WATSON G
1.004 pu 139 kV
549013 VISTA-07
1.016 pu 140 kV
847AL-10A
547005 P2015TAP
1.016 pu 140 kV
847L-1
1.008 pu 139 kV
847L-2
17 COLD CR7
615L
910 OBED TAP
745L-1
820 FICKL TP
1.037 pu 143 kV
847L_2
15 MTN COA7
1.018 pu 140 kV
745AL-1
745AL-2
745-20
909 DALEH TP
1.018 pu 140 kV
745A1L
141 DALEHUR7
1.018 pu 140 kV
472 HORNBECK
1.038 pu 143 kV
740AL
18 GULF RO7
1.045 pu 144 kV
913 G.ROBB T
1.045 pu 144 kV
740L-4
912 740L JNC
1.045 pu 144 kV
743L
326 COAL VA7
1.045 pu 144 kV
762L
915 CHEV TP
1.043 pu 144 kV
762AL
368 CHEVIOT1
1.043 pu 144 kV
2368 CHEVIOT3
1.040 pu 72 kV
101ST1
740L-2
740L-3
1150L-10A
1228 MITS E.4
1.111 pu 267 kV
9L40
1260 LOU CR.4
1.095 pu 263 kV
9L11
9L02
9L05
1080 WESLY C4
1.134 pu 272 kV
1163 L. SMOKY
1.095 pu 263 kV
813S902T
813S901T
809S901T
809S902T
1261 LOU CR.7
1.097 pu 151 kV
939L/9L939
938L/9L938
785S701T
1270 ESSO JU7
1.094 pu 151 kV
1271 MORSE RV
1.094 pu 151 kV
1272 FIELDGA7
1.092 pu 151 kV
1266 SARAH L7
1.091 pu 151 kV
743S701T
1243 EDITH L7
1.093 pu 151 kV
739S701T
1244 EDITH L8
1.029 pu 71 kV
1250 SWANDIV8
1.035 pu 71 kV
854S601T
1278 KINUSO 8
1.021 pu 70 kV
1240 SWAN RV8
1.021 pu 70 kV
1267 SARAH L8
1.064 pu 73 kV
1254 FREEMAN8
1.052 pu 73 kV
322 CARSON 8
1.047 pu 72 kV
844 ASBNE TP
1.062 pu 147 kV
1.044 pu 151 kV
1172 STURG_1
1.108 pu 153 kV
1180 GOOSE R7
1.105 pu 153 kV
1160 BEZANSON
1.065 pu 147 kV
1275 VIRGINI7
1.099 pu 152 kV
1170 SIMONET7
1.075 pu 148 kV
734S701T
12 FOX CREE
1.059 pu 146 kV
1 JUDY515S
1.058 pu 73 kV
526L-1
895 515S TAP
1.060 pu 73 kV
337 ESSO JU8
1.057 pu 73 kV
526AL
944 638S TAP
1.057 pu 73 kV
526L-3
526L-6
316 LAURATP
1.047 pu 72 kV
317 CARSONA8
1.047 pu 72 kV
519L-1
519L-2
519AL
942 LAURALK
1.047 pu 72 kV
932 CAR.LK.T
1.047 pu 72 kV
896 PEG.LK.T
1.047 pu 72 kV
526L-4
526L-5
526BL
935 CAR.CR.T
1.047 pu 72 kV
325 PEGAS.L8
1.047 pu 72 kV
526L-2
973 199A_TAP
1.052 pu 145 kV
199L-1
199L-2
199AL
1674 CHKD CK7
1.052 pu 145 kV
9 WHITEC07
1.047 pu 145 kV
10 WHITEC08
1.051 pu 73 kV
268ST1
720L
7L199
7L90-1
7L90-2
7L54
7L45_2
7L45_1
7L46
7L48-1
7L48-2
7LA48
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7L01
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7L230-2
7L19
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7L78
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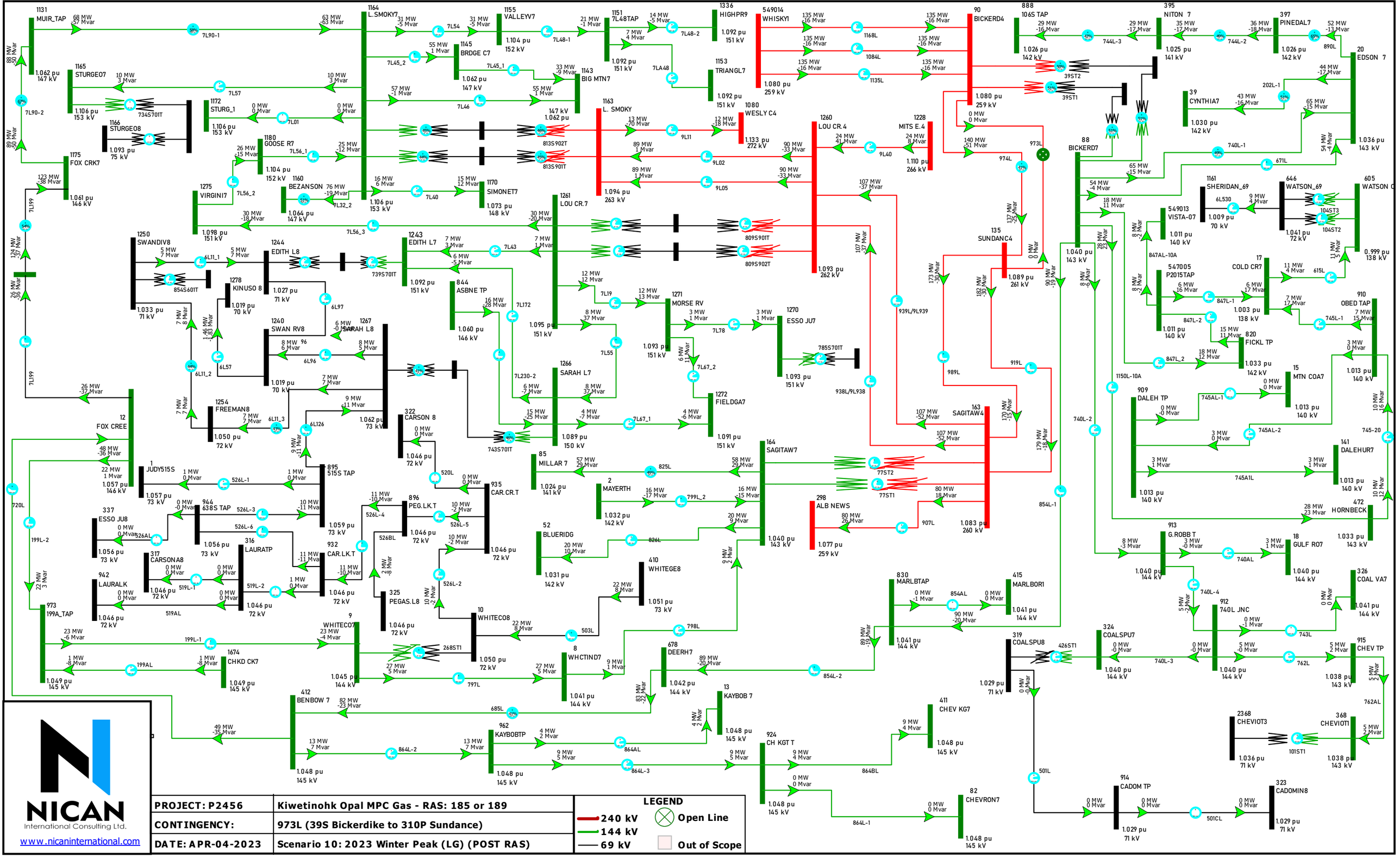

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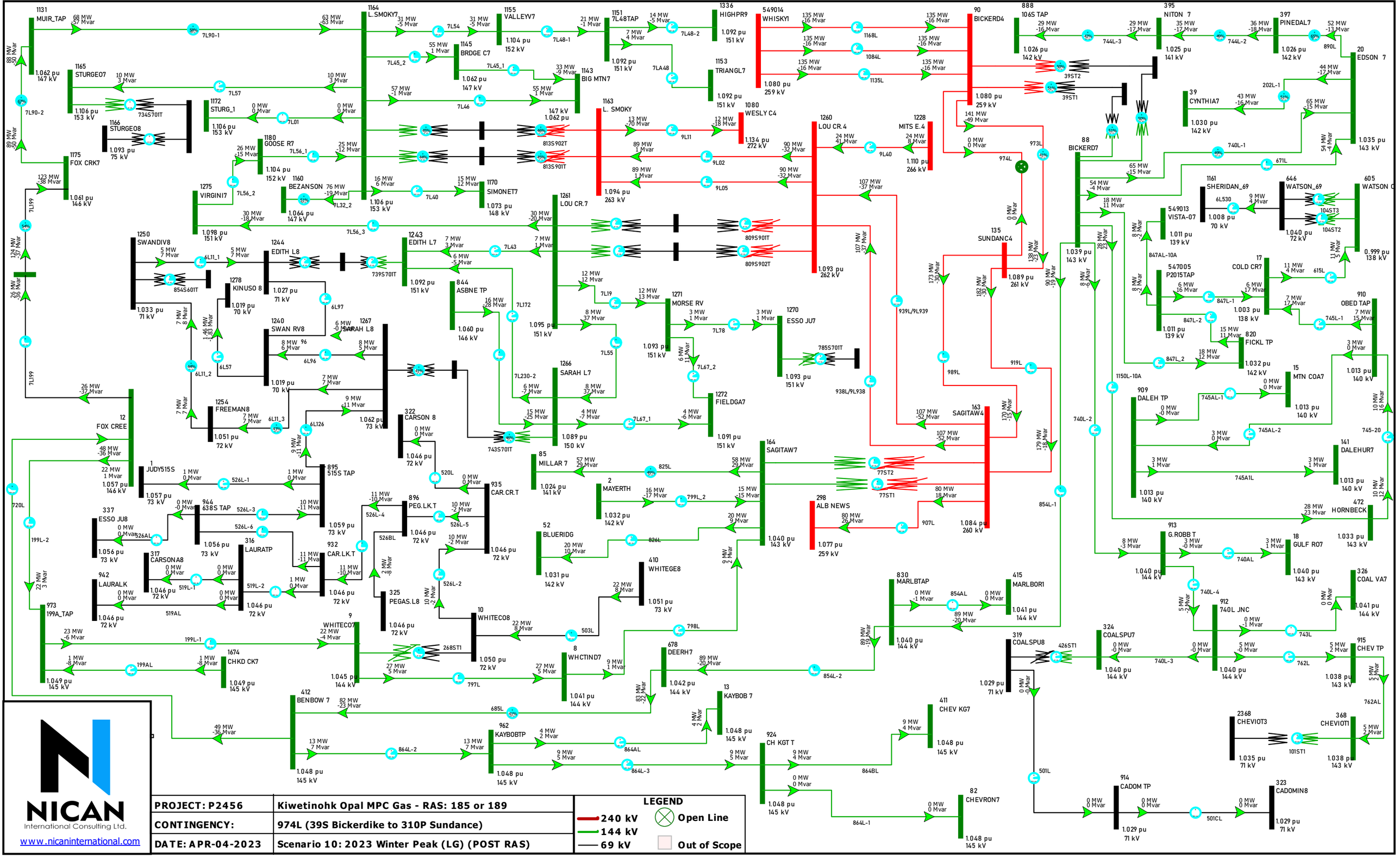
PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 185 or 189
CONTINGENCY:	973L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (POST RAS)

LEGEND
- 🟥 240 kV
- 🟩 144 kV
- ― 69 kV
- ⊗ Open Line
- ☐ Out of Scope



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PROJECT: P2456	Kiwetinohk Opal MPC Gas - RAS: 185 or 189
CONTINGENCY:	974L (39S Bickerdike to 310P Sundance)
DATE: APR-04-2023	Scenario 10: 2023 Winter Peak (LG) (POST RAS)

LEGEND

240 kV
144 kV
69 kV
Open Line
Out of Scope

Attachment A7
Constraint Effective Factors Table

Scenario 6: 2023 Summer Light (High Generation)		Opal Gas	Alberta Newsprint	Blue Ridge	Chickade Creek	Cold Creek	Edson	Fieldgate	Hope Creek	Millar Wester	Swan River	Valley View	Cascade	Whitecourt
Contingency	**Violation**													
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	0.0873	0.0323	0.0212	0.0699	0.2172	-0.6697	0.0349	0.0361	0.0214	0.0355	0.0435	0.1655	0.0369
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0758	0.0333	0.0356	0.0655	0.1692	0.2054	0.0343	0.0396	0.0355	0.0351	0.0411	0.1445	0.042
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0757	0.0333	0.0356	0.0654	0.1691	0.2053	0.0343	0.0396	0.0355	0.0351	0.0411	0.1444	0.042
Scenario 7: 2023 Summer Peak (High Generation)		**Opal Gas**	**Alberta Newsprint**	**Blue Ridge**	**Chickade Creek**	**Cold Creek**	**Edson**	**Fieldgate**	**Hope Creek**	**Millar Wester**	**Swan River**	**Valley View**	**Cascade**	**Whitecourt**
Contingency	**Violation**													
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	0.042	0.0077	-0.0032	0.029	0.1245	0.1676	0.0103	0.0085	-0.0032	0.0105	0.0159	0.0916	0.008
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	0.0861	0.0327	0.0223	0.068	0.2142	-0.6314	0.0353	0.0354	0.0224	0.0361	0.044	0.1619	0.036
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0108	-0.0052	-0.0193	-0.0141	0.1096	0.1434	-0.0042	-0.0113	-0.0194	-0.0046	-0.0053	0.0795	-0.0141
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0762	0.0346	0.0368	0.0657	0.1679	0.2043	0.0355	0.0406	0.0371	0.0363	0.0428	0.1423	0.043
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0643	0.0199	0.0163	0.0508	0.1644	-0.3419	0.0221	0.0244	0.0164	0.0226	0.0296	0.1379	0.0257
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.038	0.0017	-0.0066	0.0247	0.1238	0.1544	0.0044	0.0032	-0.0067	0.0048	0.0103	0.1029	0.0031
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0403	0.0013	-0.0075	0.0264	0.1292	0.1625	0.0042	0.0037	-0.0076	0.0044	0.0107	0.1066	0.0036
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	0.1884	0.0137	0.0452	0.1488	0.5382	0.4856	0.0209	0.0497	0.0453	0.0239	0.0507	0.5993	0.0618
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0762	0.0345	0.0367	0.0657	0.168	0.2043	0.0354	0.0406	0.037	0.0362	0.0426	0.1424	0.043
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0643	0.0199	0.0163	0.0508	0.1644	-0.3417	0.022	0.0244	0.0163	0.0226	0.0295	0.1378	0.0257
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.038	0.0017	-0.0066	0.0246	0.1237	0.1543	0.0044	0.0032	-0.0067	0.0048	0.0104	0.1029	0.0031
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0402	0.0013	-0.0075	0.0264	0.1291	0.1624	0.0042	0.0037	-0.0076	0.0044	0.0107	0.1065	0.0036
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	0.1886	0.0137	0.0452	0.149	0.5392	0.4864	0.0208	0.0497	0.0453	0.0239	0.0509	0.6003	0.0619
Scenario 8: 2023 Winter Peak (High Generation)		**Opal Gas**	**Alberta Newsprint**	**Blue Ridge**	**Chickade Creek**	**Cold Creek**	**Edson**	**Fieldgate**	**Hope Creek**	**Millar Wester**	**Swan River**	**Valley View**	**Cascade**	**Whitecourt**
Contingency	**Violation**													
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	0.043	0.0078	-0.0034	0.03	0.1224	0.1692	0.0105	0.009	-0.0033	0.0106	0.0164	0.0924	0.0085
39S Bickerdike (T1)	39S Bickerdike (T2)	-0.2174	-0.0127	-0.0484	-0.1711	-0.6171	-0.5473	-0.0217	-0.0576	-0.0484	-0.0239	-0.0581	0.2384	-0.071
39S Bickerdike (T2)	39S Bickerdike (T1)	-0.2197	-0.0131	-0.0497	-0.1732	-0.617	-0.5504	-0.0221	-0.0582	-0.0493	-0.0245	-0.0587	0.2416	-0.072
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	0.0882	0.0332	0.0229	0.07	0.2135	-0.6444	0.0361	0.0364	0.0228	0.037	0.0452	0.1644	0.0371
685L (397S Benbow to 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	0.0257	0.0285	0.0252	0.0255	0.1429	0.1827	0.0275	0.0258	0.0253	0.0278	0.0268	0.1119	0.0255
744L (207S Pinedale to 228S T.M.P.L. Niton Tap to 106S Paddle River Tap to 235S Entwistle)	202L (58S Edson to 178S Cynthia)	0.0707	0.0342	0.0315	0.0602	0.1515	0.2007	0.0353	0.0378	0.0316	0.036	0.0415	0.1185	0.0392
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	202L (58S Edson to 178S Cynthia)	0.0258	0.0285	0.0252	0.0256	0.1428	0.1827	0.0275	0.0258	0.0253	0.0278	0.0268	0.1118	0.0255
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0108	-0.0057	-0.0203	-0.0142	0.1074	0.1446	-0.0046	-0.0115	-0.0201	-0.0052	-0.0056	0.0798	-0.0143
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	0.0709	0.0343	0.0315	0.0605	0.1516	0.2009	0.0354	0.038	0.0318	0.0361	0.0416	0.1186	0.0394
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0769	0.0349	0.0375	0.0664	0.1658	0.2053	0.0359	0.0411	0.0374	0.0368	0.0432	0.1427	0.0435
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0658	0.0202	0.0168	0.0521	0.1637	-0.3465	0.0225	0.0251	0.0166	0.0231	0.0303	0.1394	0.0264
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.0383	0.0015	-0.0064	0.025	0.1217	0.1545	0.0043	0.0032	-0.007	0.0047	0.0104	0.1026	0.0032
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0409	0.001	-0.0078	0.027	0.127	0.1636	0.0041	0.0038	-0.0079	0.0042	0.0108	0.1067	0.0038
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	0.1881	0.0139	0.0469	0.1489	0.5355	0.4827	0.0213	0.0501	0.0455	0.0246	0.0514	0.5941	0.0622
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0769	0.0348	0.0374	0.0663	0.1658	0.2053	0.0359	0.041	0.0374	0.0368	0.0432	0.1427	0.0434
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0658	0.0201	0.0167	0.0521	0.1636	-0.3464	0.0224	0.025	0.0166	0.023	0.0302	0.1393	0.0264
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.0383	0.0015	-0.0064	0.025	0.1217	0.1545	0.0043	0.0032	-0.007	0.0047	0.0104	0.1025	0.0032
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0409	0.001	-0.0079	0.027	0.127	0.1636	0.0041	0.0038	-0.0079	0.0042	0.0108	0.1066	0.0038
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	0.1884	0.0138	0.0468	0.1491	0.5365	0.4836	0.0212	0.0501	0.0455	0.0245	0.0514	0.5952	0.0623
Scenario 9: 2023 Summer Peak (Low Generation)		**Opal Gas**	**Alberta Newsprint**	**Blue Ridge**	**Chickade Creek**	**Cold Creek**	**Edson**	**Fieldgate**	**Hope Creek**	**Millar Wester**	**Swan River**	**Valley View**	**Cascade**	**Whitecourt**
Contingency	**Violation**													
199L (268S Whitecourt Tap 259S Chickadee Tap 347S Fox Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.5346	-0.0292	-0.0253	0	0.0803	0.0713	-0.0506	-0.0371	-0.0256	-0.0485	-0.1227	0.0562	-0.0323
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3877	-0.0109	0.024	0.2084	0.0584	0.0553	-0.0435	0.0269	0.0239	-0.0373	-0.1487	0.0418	0.0525
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	0.0425	0.0085	-0.0022	0.0291	0.1222	0.166	0.0113	0.0089	-0.0023	0.0118	0.018	0.0903	0.0083
39S Bickerdike (T1)	39S Bickerdike (T2)	-0.2055	-0.0109	-0.045	-0.1575	-0.5778	-0.529	-0.0195	-0.0535	-0.0454	-0.0217	-0.0548	0.2331	-0.0661
39S Bickerdike (T2)	39S Bickerdike (T1)	-0.2055	-0.0109	-0.045	-0.1575	-0.5778	-0.529	-0.0195	-0.0535	-0.0454	-0.0217	-0.0548	0.2331	-0.0661
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	0.087	0.0348	0.0249	0.0684	0.2105	-0.6108	0.0381	0.0366	0.0249	0.0396	0.0493	0.1589	0.037
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0115	-0.0054	-0.0192	-0.0146	0.1078	0.1426	-0.0045	-0.0115	-0.0193	-0.0049	-0.0059	0.0784	-0.0142

741S Fox Creek (Load Drop - 1T)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3844	-0.0132	0.0219	0.2058	0.0533	0.0479	-0.0463	0.0249	0.0218	-0.0404	-0.1537	0.0374	0.0505
741S Fox Creek (Load Drop - 2T)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3844	-0.0132	0.0219	0.2058	0.0533	0.0479	-0.0463	0.0249	0.0218	-0.0404	-0.1537	0.0374	0.0505
797L (268S Whitecourt to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.4923	-0.0259	-0.0217	0.4008	0.0725	0.0644	-0.0366	0.1897	-0.022	-0.017	-0.1276	0.0507	0.2712
798L (77S Sagitawah to 364S Whitecourt Industrial)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.4932	-0.0256	-0.0216	0.4046	0.0723	0.0642	-0.0362	0.1925	-0.0218	-0.0163	-0.1269	0.0505	0.2757
7L56 (809S Louise Creek Tap 738S Virgina Hills Tap 725S Goose River Tap 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3788	-0.0124	0.0221	0.2027	0.0523	0.0469	-0.037	0.0278	0.022	-0.032	-0.167	0.0367	0.0515
813S Little Smoky (T1)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3723	-0.0125	0.0211	0.1986	0.0512	0.0459	-0.0464	0.0234	0.021	-0.0408	-0.1801	0.0359	0.0484
813S Little Smoky (T2)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3719	-0.0125	0.021	0.1983	0.0511	0.0459	-0.0464	0.0233	0.0209	-0.0408	-0.1811	0.0359	0.0483
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0115	-0.0054	-0.0192	-0.0147	0.1077	0.1426	-0.0045	-0.0115	-0.0193	-0.0049	-0.0059	0.0784	-0.0142
890L (58S Edson to 207S Pinedale)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3857	-0.0127	0.0217	0.2061	0.0562	0.0527	-0.0452	0.025	0.0216	-0.0392	-0.1507	0.04	0.0504
919L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3804	-0.0216	0.0152	0.2009	0.052	0.0465	-0.0522	0.0188	0.015	-0.0459	-0.1574	0.0366	0.0443
973L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0645	0.0213	0.0179	0.0507	0.1613	-0.3344	0.0238	0.025	0.0179	0.0249	0.0328	0.1355	0.0262
973L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3935	-0.0114	0.0249	0.2126	0.0702	0.0636	-0.0433	0.0276	0.0247	-0.0368	-0.1457	0.0574	0.0536
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0405	0.002	-0.0066	0.0262	0.1274	0.161	0.0051	0.0039	-0.0068	0.0055	0.0122	0.1054	0.0038
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	0.1911	0.0177	0.0488	0.15	0.5455	0.487	0.0261	0.0521	0.0488	0.0302	0.0596	0.6034	0.0638
974L (39S Bickerdike to 310P Sundance)	740L (39S Bickerdike to 58S Edson)	0.0645	0.0213	0.0179	0.0506	0.1612	-0.3342	0.0238	0.025	0.0179	0.0248	0.0327	0.1355	0.0261
974L (39S Bickerdike to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3935	-0.0115	0.0248	0.2126	0.0701	0.0635	-0.0433	0.0276	0.0247	-0.0368	-0.1457	0.0574	0.0536
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0405	0.0019	-0.0067	0.0262	0.1273	0.1609	0.005	0.0039	-0.0068	0.0054	0.0122	0.1053	0.0038
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	0.1913	0.0176	0.0487	0.1501	0.5464	0.4878	0.0259	0.0521	0.0488	0.0301	0.0595	0.6043	0.0639
989L (77S Sagitawah to 310P Sundance)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3806	-0.021	0.0157	0.2013	0.0521	0.0466	-0.0517	0.0192	0.0155	-0.0455	-0.157	0.0367	0.0448
9L02 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3738	-0.0109	0.0227	0.2004	0.0518	0.0465	-0.0448	0.0256	0.0226	-0.0399	-0.1798	0.0365	0.0505
9L05 (809S Louise Creek to 813S Little Smoky)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3738	-0.0109	0.0227	0.2004	0.0518	0.0465	-0.0448	0.0256	0.0226	-0.0399	-0.1798	0.0365	0.0505
9L938 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3807	-0.0076	0.0261	0.2052	0.0531	0.0478	-0.061	0.02	0.026	-0.0541	-0.1651	0.0375	0.0489
9L939 (77S Sagitawah to 809S Louise Creek)	7L90 (741S Fox Creek to 2018S Muir Tap)	0.3807	-0.0076	0.0261	0.2052	0.0531	0.0478	-0.061	0.02	0.026	-0.0541	-0.1651	0.0375	0.0489

Scenario 10: 2023 Winer Peak(Low Generation)		**Opal Gas**	**Alberta Newsprint**	**Blue Ridge**	**Chickade Creek**	**Cold Creek**	**Edson**	**Fieldgate**	**Hope Creek**	**Millar Wester**	**Swan River**	**Valley View**	**Cascade**	**Whitecourt**
Contingency	**Violation**													
202L (58S Edson to 178S Cynthia Tap 359S West Pembina Tap 61S Lodgepole to 62S Brazeau)	890L (58S Edson to 207S Pinedale)	0.0434	0.0085	-0.0021	0.03	0.1213	0.1676	0.0116	0.0094	-0.0023	0.0119	0.0183	0.0914	0.0088
39S Bickerdike (T1)	39S Bickerdike (T2)	-0.2156	-0.0153	-0.0523	-0.1689	-0.6247	-0.5534	-0.0261	-0.0585	-0.0513	-0.0292	-0.0636	0.2359	-0.0718
39S Bickerdike (T2)	39S Bickerdike (T1)	-0.2179	-0.0167	-0.0534	-0.1688	-0.6187	-0.5538	-0.0269	-0.059	-0.0523	-0.0301	-0.0649	0.238	-0.0725
671L (39S Bickerdike to 58S Edson)	740L (39S Bickerdike to 58S Edson)	0.0912	0.0347	0.0241	0.0724	0.2139	-0.6635	0.0384	0.0383	0.0241	0.0395	0.0501	0.1643	0.0388
685L (397S Benbow to 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0116	-0.0057	-0.0198	-0.0149	0.107	0.144	-0.0049	-0.0118	-0.0198	-0.0054	-0.0063	0.0794	-0.0145
854L (39S Bickerdike Tap 348S Malboro Tap 1012S Deer Hill)	890L (58S Edson to 207S Pinedale)	-0.0116	-0.0057	-0.0197	-0.0149	0.1069	0.144	-0.0049	-0.0118	-0.0198	-0.0054	-0.0063	0.0794	-0.0145
890L (58S Edson to 207S Pinedale)	202L (58S Edson to 178S Cynthia)	0.0713	0.0355	0.0329	0.0606	0.1495	0.1975	0.0371	0.0387	0.0328	0.0382	0.0451	0.1168	0.0397
973L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.077	0.0361	0.0387	0.0663	0.1636	0.2017	0.0377	0.0417	0.0385	0.039	0.0467	0.1409	0.0438
973L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.0386	0.0022	-0.0049	0.0252	0.1214	0.1534	0.0057	0.0041	-0.0058	0.0061	0.0124	0.1023	0.0039
973L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.041	0.0017	-0.0066	0.0268	0.1263	0.1623	0.0051	0.0042	-0.007	0.0054	0.0123	0.1061	0.0041
973L (39S Bickerdike to 310P Sundance)	974L (36S Bickerdike to 310P Sundance)	0.1873	0.0158	0.0489	0.1473	0.5348	0.4808	0.0261	0.0518	0.0475	0.0295	0.0583	0.5946	0.0632
974L (39S Bickerdike to 310P Sundance)	202L (58S Edson to 178S Cynthia)	0.0769	0.036	0.0386	0.0662	0.1634	0.2017	0.0376	0.0417	0.0384	0.0389	0.0466	0.141	0.0437
974L (39S Bickerdike to 310P Sundance)	744L (207S Pinedale to 228S Niton T.M.P.L)	0.0386	0.0022	-0.005	0.0251	0.1212	0.1534	0.0056	0.004	-0.0058	0.006	0.0123	0.1023	0.0039
974L (39S Bickerdike to 310P Sundance)	890L (58S Edson to 207S Pinedale)	0.0409	0.0016	-0.0067	0.0267	0.1259	0.1623	0.005	0.0041	-0.007	0.0053	0.0122	0.1061	0.0041
974L (39S Bickerdike to 310P Sundance)	973L (36S Bickerdike to 310P Sundance)	0.1878	0.0158	0.049	0.1477	0.5371	0.4817	0.0261	0.0519	0.0476	0.0295	0.0585	0.5951	0.0634