



**FEASIBILITY CLUSTER
STUDY FOR GENERATOR
INTERCONNECTION
REQUESTS**

FCS-2018-002

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CONTENTS

Revision History	i
1 Introduction.....	4
2 Model Development (Study Assumptions)	6
2.1 Interconnection Requests Included in the Cluster	6
2.2 Affected System Interconnection Request	6
2.3 Previously Queued Interconnection Requests	6
2.4 Development of Base Cases.....	6
2.5 Development of Analysis Cases	12
3 Identification of Network Constraints (System Performance)	13
3.1 Thermal Overloads	13
3.2 Voltage.....	13
3.3 Dynamic Stability.....	13
3.4 Upgrades Assigned.....	14
4 Determination of Cost Allocated Network Upgrades	15
4.1 Credits/Compensation for Amounts Advanced for Network Upgrades	15
5 Required Interconnection Facilities.....	16
5.1 Facilities Analysis	17
5.2 Environmental Review.....	17
6 Affected Systems Coordination	18
7 Power Flow Analysis.....	19
7.1 Power Flow Analysis Methodology	19
7.2 Power Flow Analysis.....	19
8 Power Flow Results	20
8.1 Cluster Scenario	20
8.2 Stand-Alone Scenario.....	25
8.3 Curtailment and System Reliability.....	25
9 Stability & Short Circuit Analysis	26
10 Conclusion	27
11 Appendices	28
11.1 A: Generation Interconnection Requests Considered for Impact Study	29
11.2 B: Prior-Queued Interconnection Requests.....	30
11.3 C: Study Groupings	31
11.4 D: Proposed Point of Interconnection One-Line Diagrams	32
11.5 E: Cost Allocation per Interconnection Request (Including Prior Queued Upgrades)	37
11.6 F: Cost Allocation per Proposed Study Network Upgrade	38
11.7 G: Power Flow Analysis (Constraints Requiring Transmission Reinforcement)	39
11.8 H: Power Flow Analysis (Other Constraints Not Requiring Transmission Reinforcement).....	40

11.9 H-AS: Power Flow Analysis (Other Constraints Potentially requiring Affected System Mitigation) 41

11.10 I: Short Circuit Analysis42

1 INTRODUCTION

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Feasibility Cluster Study (FCS) for generation interconnection requests received during the FCS Queue Cluster Window, which closed on May 29, 2018. The customers will be referred to in this study as the FCS Interconnection Customers. This FCS analyzes the impact of interconnecting new generation totaling **750.0 MW** to the SPP Transmission System. The interconnecting SPP Transmission Owners include:

- American Electric Power West (AEPW)
- The Empire District Electric Company (EMDE)
- Oklahoma Gas & Electric Company (OKG&E)

The generation interconnection requests included in this System Impact Study are listed in Appendix A by queue number, amount, requested interconnection service type, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

Within the study scope of the Feasibility Cluster Studies, each request was analyzed based on the following number of POI assumptions.

Table 1-1: POI Assumptions

Interconnection Requests	Number of POIs
GEN-2018-003	1 primary (P) & 1 secondary (S)
GEN-2018-005	1 primary (P), 1 secondary (S), & 1 tertiary (T)
GEN-2018-006	1 primary (P), 1 secondary (S), & 1 tertiary (T)

A First Contingency Incremental Transfer Capability (FCITC) analysis of each transfer was performed.

Table 1-2 displays the scenarios that were performed. Interconnection Requests dispatching is explained in further detail in the Model Development Section.

Table 1-2: Scenario Analysis Assumptions

Interconnection Request	Scenario Number	Scenario Description	Point of Interconnection (POI) Requested	Point of Interconnection (POI) Studied
GEN-2018-003	Scenario #1	Group 03 ERIS & Group 03 NRIS	New Boston 69 kV	New substation adjacent to New Boston 69 kV (no room for new terminal at existing New Boston 69 kV)
	Scenario #2	Group 03 ERIS & Group 03 NRIS	North New Boston 138 kV	New substation adjacent to North New Boston 138 kV (no room for new terminal at existing North New Boston 138 kV)

GEN-2018-005	Scenario #1	Group 08 ERIS & Group 08 NRIS	Woodring 345 kV	Woodring 345 kV
	Scenario #2	Group 08 ERIS & Group 08 NRIS	Woodring 138 kV	Woodring 138 kV
	Scenario #3	Group 08 ERIS & Group 08 NRIS	Tap Hunters – Woodring 345 kV	Not a viable POI. No new EHV substation will be built on this line as long as Woodring or Hunter can be expanded.
GEN-2018-006	Scenario #1	Group 12 ERIS & Group 12 NRIS	Monett 161 kV	Monett 161 kV
	Scenario #2	Group 12 ERIS & Group 12 NRIS	Monett 69 kV	Monett 69 kV
	Scenario #3	Group 12 ERIS & Group 12 NRIS	Tap Aurora – Monett 161 kV	Tap Aurora – Monett 161 kV

Please note that since the DISIS-2017-001 and DISIS-2017-002 have not been completed, only higher queued requests through DISIS-2016-002 were included in this analysis.

The primary objective of this Feasibility Cluster Study is to identify the system constraints associated with connecting the generation to the area transmission system. The Feasibility and other subsequent Interconnection Studies are designed to identify attachment facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at each specific interconnection receipt point.

If any Interconnection Requests are withdrawn from the higher queued studies including DISIS-2016-002, then potential upgrades tentatively assigned to those Interconnection Requests may be assigned to the Interconnection Requests in this FCS-2018-002 study once these Interconnection Requests execute a Definitive Interconnection System Impact Study Agreement.

2 MODEL DEVELOPMENT (STUDY ASSUMPTIONS)

2.1 INTERCONNECTION REQUESTS INCLUDED IN THE CLUSTER

This FCS includes all interconnection requests that were submitted during the FCS Queue Cluster Window that met all of the requirements of the Generator Interconnection Procedures (GIP) that were in effect at the time this study commenced. [Appendix A](#) lists the interconnection requests that are included in this study.

2.2 AFFECTED SYSTEM INTERCONNECTION REQUEST

Affected System Interconnection Requests included in this study are listed in [Appendix A](#) with the “ASGI” prefix. Affected System Interconnection Requests were only studied in “cluster” scenarios.

2.3 PREVIOUSLY QUEUED INTERCONNECTION REQUESTS

The previous-queued requests included in this study are listed in [Appendix B](#). In addition to the Base Case Upgrades, the previous-queued requests and associated upgrades were assumed to be in-service and added to the Base Case models. These requests were dispatched as Energy Resource Interconnection Service (ERIS) resources with equal distribution across the SPP footprint. Prior-queued requests that requested Network Resource Interconnection Service (NRIS) were also dispatched in separate NRIS scenarios sinking into the area of the interconnecting transmission owner.

2.4 DEVELOPMENT OF BASE CASES

2.4.1 POWER FLOW

The power flow models used for this study are based on the 2016-series Integrated Transmission Planning models used for the 2017 ITP-Near Term analysis. These models include:

- Year 1 2017 winter peak (17WP)
- Year 2 2018 spring (18G)
- Year 2 2018 summer peak (18SP)
- Year 5 2021 summer (21SP)
- Year 5 2021 light (21L)
- Year 5 2021 winter peak (21WP)
- Year 10 2026 summer peak (26SP)

2.4.2 DYNAMIC STABILITY

Dynamic stability studies performed as part of the PISIS and DISIS Cluster Studies will provide additional guidance as to whether required reactive compensation can be static or a portion must be dynamic (such as a SVC).

2.4.3 SHORT CIRCUIT

The Year 2 and Year 10 dynamic stability summer peak models were used for short-circuit analysis.

2.4.4 BASE CASE UPGRADES

The facilities listed in the table below are part of the current SPP Transmission Expansion Plan, the Balanced Portfolio, or recently approved Priority Projects. These facilities have an approved Notification to Construct (NTC) or are in construction stages and were assumed to be in-service at the time of dispatch and added to the base case models. The DISIS Interconnection Customers have not been assigned advancement costs for the projects listed below.

The FCS Interconnection Customers' Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades. In some cases, the in-service date is beyond the allowable time a customer can delay. If the requests proceed forward into the DISIS then in this case, the Interconnection Customer may move forward after the DISIS with Limited Operation or remain in the DISIS Queue for additional study cycles. If, for some reason, construction on these projects is discontinued, additional restudies will be needed to determine the interconnection needs of the Interconnection Customers during the DISIS.

SPP Notification to Construct (NTC) ID	Project Owner	Upgrade Name	Estimated Date of Upgrade Completion (EOC)
200223	OGE	Tatonga - Woodward District EHV 345 kV Ckt 2	7/1/2018
200223	OGE	Matthewson - Tatonga 345 kV Ckt 2	7/1/2018
200240	OGE	Chisholm - Gracemont 345 kV Ckt 1 (OGE)	3/1/2018
200255	AEP	Chisholm - Gracemont 345kV Ckt 1 (AEP)	3/1/2018
200255	AEP	Chisholm 345/230 kV Substation	3/1/2018
200255	AEP	Chisholm 230 kV	3/1/2018
200360	SPS	IMC #1 Tap - Livingston Ridge 115 kV Ckt 1 Rebuild	11/16/2018
200360	SPS	Intrepid West - Potash Junction 115 kV Ckt 1 Rebuild	11/16/2018
200360	SPS	IMC #1 Tap - Intrepid West 115 kV Ckt 1 Rebuild	11/16/2018
200360	SPS	Cardinal - Targa 115 kV Ckt 1 Rebuild	5/31/2018
200360	SPS	National Enrichment Plant - Targa 115 kV Ckt 1	8/15/2017
200391	OGE	DeGrasse 345 kV Substation	6/1/2017 (RTO Determined Need Date)
200391	OGE	DeGrasse 345/138 kV Transformer	6/1/2017 (RTO Determined Need Date)
200391	OGE	DeGrasse - Knob Hill 138 kV New Line	6/1/2017 (RTO Determined Need Date)
200391	OGE	DeGrasse 138 kV Substation (OGE)	6/1/2017 (RTO Determined Need Date)
200220	NPPD	Cherry Co. (Thedford) - Gentleman 345 kV Ckt 1	10/1/2019
200220	NPPD	Cherry Co. (Thedford) Substation 345 kV	10/1/2019
200220	NPPD	Cherry Co. (Thedford) - Holt Co. 345 kV Ckt 1	10/1/2019

SPP Notification to Construct (NTC) ID	Project Owner	Upgrade Name	Estimated Date of Upgrade Completion (EOC)
200220	NPPD	Holt Co. Substation 345 kV	10/1/2019
200253	NPPD	Neligh 345/115 kV Substation	6/1/2017
200309	SPS	Hobbs 345/230 kV Ckt 1 Transformer	6/1/2018
200309	SPS	Hobbs - Yoakum 345 kV Ckt 1	6/1/2020
200395	SPS	Tuco - Yoakum 345 kV Ckt 1	6/1/2020
200395	SPS	Yoakum 345/230 kV Ckt 1 Transformer	6/1/2020
200256	SPS	Chaves - Price 115 kV Ckt 1 Rebuild	12/30/2017
200256	SPS	CV Pines - Price 115 kV Ckt 1 Rebuild	12/30/2017
200256	SPS	Capitan - CV Pines 115 kV Ckt 1 Rebuild	12/30/2017
200282	SPS	China Draw - Yeso Hills 115 kV Ckt 1	6/1/2018
200282	SPS	Dollarhide - Toboso Flats 115 kV Ckt 1	6/1/2018
200309	SPS	Hobbs - Kiowa 345 kV Ckt 1	6/1/2018
200309	SPS	Kiowa 345 kV Substation	6/1/2018
200309	SPS	Kiowa - North Loving 345 kV Ckt 1	6/1/2018
200309	SPS	North Loving 345 kV Terminal Upgrades	6/1/2018
200309	SPS	China Draw - North Loving 345 kV Ckt 1	6/1/2018
200309	SPS	China Draw 345 kV Ckt 1 Terminal Upgrades	6/1/2018
200309	SPS	China Draw 345/115 kV Ckt 1 Transformer	6/1/2018
200309	SPS	North Loving 345/115 kV Ckt 1 Transformer	6/1/2018
200309	SPS	Kiowa 345/115 kV Ckt 1 Transformer	6/1/2018
200395	SPS	Livingston Ridge 115 kV Substation Conversion	8/31/2017
200411	SPS	Livingston Ridge - Sage Brush 115 kV Ckt 1	6/1/2018
200309	SPS	Sage Brush 115 kV Substation	12/16/2016
200309	SPS	Largarto - Sage Brush 115 kV Ckt 1	12/15/2016
200309	SPS	Lagarto 115 kV Substation	6/1/2018
200309	SPS	Cardinal - Lagarto 115 kV Ckt 1	12/15/2016
200309	SPS	Cardinal 115 kV Substation	12/15/2016
200411	SPS	Ponderosa - Ponderosa Tap 115 kV Ckt 1	6/1/2017
20097	TSMO	Sibley - Mullin Creek 345 kV	12/31/2016
200365	SPS	South Jal - Teague 115kV CKT 1 Rebuild/Re-conductor	6/1/2021
200365	SPS	Teague - National Enrichment Plant 115kV CKT 1	6/1/2018
20097	TSMO	Nebraska City - Mullin Creek 345 kV (GMO)	12/31/2016
20098	OPPD	Nebraska City - Mullin Creek 345 kV (OPPD)	12/31/2016
200395	SPS	Canyon West - Dawn - Panda - Deaf Smith 115kV Ckt 1	12/15/2018
200369	SPS	Canyon East Sub - Randall County Interchange 115kV Ckt 1	12/31/2020
200359	SPS	Carlisle 230/115kV transformer replacement	12/31/2017
200309	SPS	Hobbs - Yoakum - TUCO 345kV project	6/1/2018
200395	SPS	Terry County - Wolfforth 115kV Ckt 1 terminal equipment replacement	6/1/2018
200391	OGE	DeGrasse 345/138kV project	6/1/2017
200396	WFEC	DeGrasse 345/138kV project	6/1/2017
200395	SPS	Harrington East - Potter 230kV Ckt 1 terminal equipment replacement	6/1/2019
200228	WERE	Viola 345/138kV project	6/1/2018
200228	MKEC	Viola 345/138kV project	6/1/2018
200395	SPS	Seminole 230/115kV transformer Ckt 1 & 2 replacement	5/15/2018
200262	SPS	Yoakum County Interchange 230/115kV transformer Ckt 1 & 2 replacement	6/1/2019

2.4.5 CONTINGENT UPGRADES

The following facilities do not yet have approval. These facilities have been assigned to higher-queued interconnection customers. These facilities have been included in the models for this study and are assumed to be in service. This list may not be all-inclusive. The FCS Interconnection Customers, at this time, do not have cost responsibility for these facilities but may later be assigned cost if higher-queued customers terminate their Generation Interconnection Agreement or withdraw from the interconnection queue. The FCS Interconnection Customer Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades.

Assigned Study	Upgrade Name	Estimated Date of Upgrade Completion (EOC)
DISIS-2010-002	Twin Church - Dixon County 230kV Line Upgrade	11/1/2018
DISIS-2010-002	Buckner - Spearville 345 kV Ckt 1 Terminal Upgrades	Complete 7/20/2017
DISIS-2011-001	Hoskins - Dixon County 230kV Line Upgrade	11/1/2018
DISIS-2014-002	Plant X - Tolk 230kV rebuild circuit #1	5/31/2018
DISIS-2014-002	Plant X - Tolk 230kV rebuild circuit #2	5/31/2018
DISIS-2014-002	TUCO Interchange 345/230kV CKT 1 Replacement	6/1/2018
DISIS-2015-001	Kress Interchange – Swisher 115kV circuit #1 replace terminal equipment.	TBD
DISIS-2015-001	(NRIS Only) Potter County Interchange 345/230/13kV Transformer circuit #2, build.	TBD
DISIS-2015-001	(NRIS Only) Renfrow – Renfrow 138kV circuit #1 rebuild.	9/25/2017
DISIS-2015-001	(NRIS Only) Crawfish Draw Substation 345/230kV	TBD
DISIS-2015-001	Build new 345/230kV substation along TUCO – Border 345kV and TUCO – Swisher 230kV. Tie in and Terminate TUCO 345kV, Border 345kV, TUCO 230kV, and Swisher 230kV at Crawfish Draw (TUCO 2). Build 345/230/13kV transformer	TBD
DISIS-2015-002	Beaver County 345kV Reactive Power Support Install +100Mvar SVC at Beaver County Substation.	TBD
DISIS-2015-002	Border - Chisholm 345kV CKT 2	TBD
DISIS-2015-002	Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	TBD
DISIS-2015-002	Chisholm Substation Upgrade 345kV	TBD
DISIS-2015-002	Cleo Corner - Cleo Plant Tap 138kV CKT 1	TBD
DISIS-2015-002	Cleveland - Silver City 138kV CKT 1	TBD
DISIS-2015-002	Cornville Tap - Naples Tap 138kV CKT 1	TBD
DISIS-2015-002	Crawfish Draw - Border 345kV CKT 2	TBD
DISIS-2015-002	Daglum - Dickinson 230kV CKT 1	TBD
DISIS-2015-002	Dickinson 230/115/13.8kV CKT 2	TBD
DISIS-2015-002	Gavins Point - Yankton Junction 115kV CKT 1	TBD
DISIS-2015-002	GEN-2015-063 Tap - Mathewson 345kV CKT 1	TBD
DISIS-2015-002	Grapevine - Nichols 230kV CKT 1	TBD
DISIS-2015-002	Grapevine - Wheeler 230kV CKT 1	TBD
DISIS-2015-002	Naples Tap - Payne 138kV CKT 1	TBD
DISIS-2015-002	Norge - Southwest Station 138kV CKT 1	TBD
DISIS-2015-002	Oklauinion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklauinion	TBD
DISIS-2015-002	Albion - Petersburg - North Petersburg 115kV CKT 1	TBD
DISIS-2015-002	Wheeler - Sweetwater 230kV CKT 1	TBD
DISIS-2015-002	Woodward 345/138/13kV Transformer CKT 3	TBD
DISIS-2016-001	Andrews 345/115/13kV Transformer CKT 1	TBD

Assigned Study	Upgrade Name	Estimated Date of Upgrade Completion (EOC)
	Replace 230/115kV transformer CKT 1 with 345/115kV transformer	
DISIS-2016-001	Andrews 345/115/13kV Transformer CKT 2 Replace 230/115kV transformer CKT 2 with 345/115kV transformer	TBD
DISIS-2016-001	Andrews Substation Voltage Conversion Convert Andrews 230kV to 345kV	TBD
DISIS-2016-001	Atwood Capacitive Reactive Power Support Install 10 Mvars of Capacitor Bank(s)	TBD
DISIS-2016-001	Banner County - Keystone 345kV CKT 1 Build approximately 140 of new 345kV from Banner County to Keystone. Banner County and Keystone Substation Work.	TBD
DISIS-2016-001	Beaver County - Clark County 345kV CKT 1 Build approximately 125 miles of new 345kV from Grapevine - Chisholm	TBD
DISIS-2016-001	BEPC Laramie Stability Limit Potential mitigation for BEPC Laramie Stability Limit	TBD
DISIS-2016-001	Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	TBD
DISIS-2016-001	Cleveland - Cleveland 138kV CKT Z1 NRIS only required upgrade: Replace bus tie breaker with a three breaker ring	TBD
DISIS-2016-001	Cleveland 345/138/13kV Transformer CKT 2 NRIS only required upgrade: Install second 345/138kV Transformer	TBD
DISIS-2016-001	Crawfish Draw 230/115/13kV Transformer CKT 1 NRIS only required upgrade: Build 115kV yard, re-terminate Hale County - TUCO 115kV, build 230/115/13kV transformer 1	TBD
DISIS-2016-001	Drinkard - Drinkard Tap 115kV CKT 1 Rebuild approximately 2 miles from Drinkard to Drinkard Tap	TBD
DISIS-2016-001	Drinkard Tap - West Hobbs 115kV CKT 1 Rebuild approximately 12.5 miles from Drinkard Tap to West Hobbs	TBD
DISIS-2016-001	Fairfax Tap - Shidler 138kV CKT 1 NRIS only required upgrade: Rebuild approximately 2.4 miles of 138kV	TBD
DISIS-2016-001	Farber - Belle Plains 138kV CKT 1 Rebuild approximately 10.3 miles of 138kV from Farber to Belle Plains	TBD
DISIS-2016-001	Gerald Gentleman Station Flowgate Stability Limit Mitigation Potential Mitigation for GGS Flowgate Stability Limit. TBD in the Facilities Study with NPPD.	TBD
DISIS-2016-001	Glenham - Mound City 230kV CKT 1 Upgrade CT	TBD
DISIS-2016-001	Hitchland 345/230/13kV Transformer CKT 3 NRIS only required upgrade: Build third 345/230/13kV Transformer	TBD
DISIS-2016-001	Jamestown - Center 345kV CKT 1 MPC mitigation for Jamestown - Center 345kV	TBD
DISIS-2016-001	Keystone - Gentleman 345kV CKT 2 Build approximately 30 miles of new 345kV. Gentleman and Keystone Substation Work.	TBD
DISIS-2016-001	Kildare - White Eagle 138kV CKT 1 Rebuild approximately 11 miles of 138kV from Kildare to White Eagle	TBD
DISIS-2016-001	Kinsley - Pawnee 115kV CKT 1 Increase conductor clearance	TBD
DISIS-2016-001	Kinze - McElroy 138kV CKT 1 Rebuild approximately 2 miles of 138kV from Kinze to McElroy	TBD
DISIS-2016-001	Lubbock Holly 230/69/13kV CKT 2 NRIS only required upgrade: Install second Lubbock Holly 230/69/13kV Transformer	TBD

Assigned Study	Upgrade Name	Estimated Date of Upgrade Completion (EOC)
DISIS-2016-001	Middleton Tap - Chilocco 138kV CKT 1 Rebuild approximately 3.45 miles of 138kV from Middleton to Chilocco	TBD
DISIS-2016-001	National Enrichment Plant - Drinkard 115kV CKT 1 Rebuild approximately 7.5 miles from NEF Plant to Drinkard	TBD
DISIS-2016-001	Neosho - Riverton 161kV CKT 1 Rebuild approximately 28 miles of 161kV	TBD
DISIS-2016-001	Northwest - Spring Creek 345kV CKT 1 Replace terminal equipment	TBD
DISIS-2016-001	Oklaunion 345kV Reactive Power Support Incremental Upgrade Install 150Mvar capacitor banks and +/-100Mvar SVC at Oklaunion	TBD
DISIS-2016-001	Osage - Webb Tap 138kV CKT 1 Rebuild approximately 22 miles of 138kV from Osage to Webb City	TBD
DISIS-2016-001	Osage - White Eagle 138kV CKT 1 Rebuild approximately 3 miles of 138kV from Osage to White Eagle	TBD
DISIS-2016-001	Potter - Chisholm 345kV CKT 1 Build approximately 140 miles of new 345kV from Potter County – Chisholm	TBD
DISIS-2016-001	Shamrock 115kV Capacitor Bank Add 20Mvar of Capacitor Bank(s) at Shamrock 115kV	TBD
DISIS-2016-001	Tolk - Crawfish Draw 345kV CKT 1 Build approximately 64 miles of 345kV from Tolk - Crawfish Draw.	TBD
DISIS-2016-001	Tolk - Potter County 345kV CKT 1 Build approximately 115 miles of 345kV from Tolk - Potter County	TBD
DISIS-2016-001	Tolk 345/230/13kV Transformer CKT 2 Build second 345/230/13kV transformer at Tolk	TBD
DISIS-2016-001	Webb City Tap - Fairfax Tap 138kV CKT 1 NRIS only required upgrade: Rebuild approximately 0.3 miles of 138kV. Costs included in Fairfax Tap - Shilder Upgrade	TBD
DISIS-2016-002	Group 8, 10, & 12 upgrades required for DISIS-2016-002 study may be required for the requests in this Feasibility Study.	TBD

2.4.6 POTENTIAL UPGRADES NOT IN THE BASE CASE

Any potential upgrades that do not have a Notification to Construct (NTC) and are not explicitly listed within this report have not been included in the base case. These upgrades include any identified in the SPP Extra-High Voltage (EHV) overlay plan, or any other SPP planning study other than the upgrades listed above in the previous section.

2.4.7 REGIONAL GROUPINGS

The interconnection requests listed in [Appendix A](#) are grouped into active regional groups based on geographical and electrical impacts. These groupings are shown in [Appendix C](#).

To determine interconnection impacts, two (2) different generation dispatch scenarios of the spring, summer, and winter base case models are developed to accommodate the regional groupings.

2.5 DEVELOPMENT OF ANALYSIS CASES

2.5.1 POWER FLOW

For Variable Energy Resources (VER) (solar/wind) in each power flow case, Energy Resource Interconnection Service (ERIS), is evaluated for the generating plants within a geographical area of the interconnection request(s) for the VERs dispatched at 100% nameplate of maximum generation. The VERs in the remote areas are dispatched at 20% nameplate of maximum generation. These projects are dispatched across the SPP footprint using load factor ratios.

Peaking units are not dispatched in the spring case, or in the “High VER” summer and winter peak cases. To study peaking units’ impacts, the Year 1 winter peak and Year 2 summer peak, Year 5 summer and winter peaks, and Year 10 summer peak models are developed with peaking units dispatched at 100% of the nameplate rating and VERs dispatched at 20% of the nameplate rating. Each interconnection request is also modeled separately at 100% nameplate for certain analyses.

All generators (VER and peaking) that requested Network Resource Interconnection Service (NRIS) are dispatched in an additional analysis into the interconnecting Transmission Owner’s (T.O.) area at 100% nameplate with Energy Resource Interconnection Service (ERIS) only requests at 80% nameplate. This method allows for identification of network constraints that are common between regional groupings to have affecting requests share the mitigating upgrade costs throughout the cluster.

2.5.2 DYNAMIC STABILITY

Dynamic stability studies performed as part of the PISIS and DISIS Cluster Studies will provide additional guidance as to whether required reactive compensation can be static or a portion must be dynamic (such as a SVC).

2.5.3 SHORT CIRCUIT

The dynamic stability models are used for this analysis.

3 IDENTIFICATION OF NETWORK CONSTRAINTS (SYSTEM PERFORMANCE)

3.1 THERMAL OVERLOADS

Network constraints are found by using PSS/E MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels previously described.

For Energy Resource Interconnection Service (ERIS), thermal overloads are determined for system intact (n-0) greater than 100% of Rate A - normal and for contingency (n-1) greater than 100% of Rate B - emergency conditions.

The overloads are then screened to determine which interconnection requests have at least

- 3% Distribution Factor (DF) for system intact conditions (n-0),
- 20% DF upon outage-based conditions (n-1),
- or 3% DF on contingent elements that resulted in a non-converged solution.

Appropriate transmission reinforcements are identified to mitigate the constraints.

Interconnection Requests that requested Network Resource Interconnection Service (NRIS) are also studied in a separate NRIS analysis to determine if any constraint measured greater than or equal to a 3% DF. If so, these constraints are also assigned transmission reinforcements to mitigate the impacts.

3.2 VOLTAGE

Steady State Voltage analysis is performed as part of the PISIS and DISIS Cluster Studies will provide additional guidance as to whether required reactive compensation. Monitored facilities and transmission reinforcement criteria for this analysis will be provided during the PISIS and/or DISIS report

3.3 DYNAMIC STABILITY

Dynamic stability studies performed as part of the PISIS and DISIS Cluster Studies will provide additional guidance as to whether required reactive compensation can be static or a portion must be dynamic (such as a SVC). During the PISIS and/or DISIS Stability issues are considered for transmission reinforcement under ERIS. Generators that fail to meet low voltage ride-through requirements (FERC Order #661-A) or SPP's stability criteria for damping or dynamic voltage recovery are assigned upgrades such that these requirements can be met.

3.4 UPGRADES ASSIGNED

Thermal overloads that require transmission support to mitigate are discussed in Section 8 and listed in [Appendix G](#). All of these upgrades are cost assigned in [Appendix E](#) and [Appendix F](#).

Other network constraints not requiring transmission reinforcements are shown in [Appendix H](#). With a defined source and sink in a Transmission Service Request, this list of network constraints can be refined and expanded to account for all Network Upgrade requirements for firm transmission service.

In no way does the list of constraints in [Appendix G](#) identify all potential constraints that guarantee operation for all periods of time. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

4 DETERMINATION OF COST ALLOCATED NETWORK UPGRADES

Cost Allocated Network Upgrades of Variable Energy Resources (VER) (solar/wind) generation interconnection requests are determined using the Year 2 spring model. Cost Allocated Network Upgrades of peaking units are determined using the Year 5 summer peak model. A PSS/E and MUST sensitivity analysis is performed to determine the Distribution Factors (DF), a distribution factor with no contingency that each generation interconnection request has on each new upgrade. The impact each generation interconnection request has on each upgrade project is weighted by the size of each request. Finally, the costs due by each request for a particular project are then determined by allocating the portion of each request's impact over the impact of all affecting requests.

For example, assume that there are three Generation Interconnection requests, X, Y, and Z that are responsible for the costs of Upgrade Project '1'. Given that their respective PTDF for the project have been determined, the cost allocation for Generation Interconnection request 'X' for Upgrade Project 1 is found by the following set of steps and formulas:

Determine an impact factor for a given project for all responsible GI requests:

$$\text{Request X Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(X) \times \text{MW}(X) = X1$$

$$\text{Request Y Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(Y) \times \text{MW}(Y) = Y1$$

$$\text{Request Z Impact Factor on Upgrade Project 1} = \text{PTDF}(\%)(Z) \times \text{MW}(Z) = Z1$$

Determine each request's Allocation of Cost for that particular project:

$$\text{Request X's Project 1 Cost Allocation (\$)} = \frac{\text{Network Upgrade Project 1 Cost (\$)} \times X1}{X1 + Y1 + Z1}$$

Repeat previous for each responsible GI request for each Project.

The cost allocation of each needed Network Upgrade is determined by the size of each request and its impact on the given project. This allows for the most efficient and reasonable mechanism for sharing the costs of upgrades.

4.1 CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADES

Interconnection Customer shall be entitled to either credits or potentially incremental Long Term Congestion Rights (iLTCR), otherwise known as compensation, in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

5 REQUIRED INTERCONNECTION FACILITIES

The requirement to interconnect the requested generation into the existing and proposed transmission systems in the affected areas of the SPP transmission footprint consist of the necessary cost allocated shared facilities listed in [Appendix F](#) by upgrade. The interconnection requirements for the cluster total are listed in **Table 5-1**, not including the following costs.

- **Costs Not Included** – Costs on Affected Systems for Associated Electric Cooperative Inc. (AECI), Mid-Continent Independent System Operator (MISO), and Minnkota Power Cooperative, Inc (MPC). Impacts to affected systems will be coordinated with the Affected System operators if the Interconnection Request(s) enter into the Definitive Interconnection System Impact Study (DISIS) Queue. Constraints identified to affected system during this analysis are in [Appendix H-AS](#).
- **Costs Not Included** – Potential upgrades required for AC voltage or transient stability constraints. Impacts to AC voltage and transient stability analysis are evaluated during the Preliminary Interconnection System Impact Study (PISIS) or DISIS Queue.

Table 5-1: Estimated Interconnection Costs per Scenario

Request ID	Scenario Number	POI Description	Interconnection Costs	Network Upgrade Cost	Total Estimated Cost
GEN-2018-003	Scenario 1	New Boston 69 kV	\$13,700,000	\$11,580,000	\$25,280,000
	Scenario 2	North New Boston 138 kV	\$12,000,000	\$0	\$12,000,000
GEN-2018-005	Scenario 1	Woodring 345 kV	\$2,000,000	\$0	\$2,000,000
	Scenario 2	Woodring 138 kV	\$1,000,000	\$86,755	\$1,086,755
	Scenario 3	Tap Hunters – Woodring 345 kV	N/A	N/A	N/A
GEN-2018-006	Scenario 1	Monett 161 kV	\$10,250,000	\$0	\$10,250,000
	Scenario 2	Monett 69 kV	\$13,250,000	\$0	\$13,250,000
	Scenario 3	Tap Aurora – Monett 161 kV	\$4,250,000	\$0	\$4,250,000

Interconnection Facilities specific to each interconnection request are listed in [Appendix E](#). A preliminary one-line diagram for each request is listed in [Appendix D](#).

For an explanation of how required Network Upgrades and Interconnection Facilities were determined, refer to the section on “Identification of Network Constraints.”

5.1 FACILITIES ANALYSIS

If requests proceed to the DISIS queue, the interconnecting Transmission Owner for each Interconnection Request will provide its preliminary analysis of required Transmission Owner Interconnection Facilities and the associated Network Upgrades, shown in [Appendix D](#). This analysis will be limited only to the expected facilities to be constructed by the Transmission Owner at the Point of Interconnection.

5.2 ENVIRONMENTAL REVIEW

For Interconnection Requests that result in an interconnection to, or modification to, the transmission facilities of the Western-UGP, a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute an Environmental Review Agreement per Section 8.6.1 of the GIP.

6 AFFECTED SYSTEMS COORDINATION

Impacts to affected systems will be coordinated with the Affected System operators if the Interconnection Request(s) enter into the DISIS Queue.

The following procedures are in place to coordinate with Affected Systems.

- Impacts on Associated Electric Cooperative Inc. (AECI) – For any observed violations of thermal overloads on AECI facilities, AECI has been notified by SPP to evaluate the violations for impacts on its transmission system. AECI has instructed SPP to notify the affected Interconnection Customers after posting of this study to contact AECI for an Affected System Study Agreement to study further impacts on the AECI system.
- Impacts on Mid Continent Independent System Operation (MISO) – Per SPP’s agreement with MISO, MISO will be contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MISO will then evaluate the Interconnection Requests for impacts and will be in contact with affected Interconnection Customers. For potential impacts, see [Appendix H – Affected System](#).
- Impacts on Minnkota Power Cooperative, Inc (MPC) – MPC will be contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MP will then evaluate the Interconnection Requests for impacts. For potential impacts, see [Appendix H – Affected System](#).
- Impacts to other affected systems – For any observed violations of thermal overloads or voltage constraints, SPP will contact the owner of the facility for further information.

7 POWER FLOW ANALYSIS

7.1 POWER FLOW ANALYSIS METHODOLOGY

The Direct Current (DC) FCITC function of PSS® MUST was used to simulate single element and special (i.e., breaker-to-breaker, multi-element, etc.) contingencies in portions or all of the modeled control areas of SPP, as well as, other control areas external to SPP and the resulting scenarios analyzed. Single element and multi-element contingencies are evaluated.

7.2 POWER FLOW ANALYSIS

A power flow analysis is conducted for each Interconnection Customer's facility using modified versions of the Year 1 winter peak season, the Year 2 spring, Year 2 summer peak season, Year 5 summer and winter peak seasons, and Year 10 summer peak seasonal models. The output of the Interconnection Customer's facility is offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource Interconnection Service request (ERIS). Certain requests that are also pursuing Network Resource Interconnection Service (NRIS) have an additional analysis conducted for displacing resources in the interconnecting Transmission Owner's balancing area.

8 POWER FLOW RESULTS

8.1 CLUSTER SCENARIO

The Cluster Scenario considers the Base Case as well as all Interconnection Requests in the DISIS Study Queue and all generating facilities (and with respect to (3) below, any identified Network Upgrades associated with such higher-queued interconnection) that, on the date the DISIS is commenced:

1. are directly connected to the Transmission System;
2. are interconnection to Affected Systems and may have an impact on the Interconnection Request;
3. have a pending higher-queued Interconnection Request to interconnect to the Transmission System; and
4. have no Interconnection Queue Position but have executed a GIA or requested that an unexecuted GIA be filed with FERC.

Constraints and associated mitigations for each Interconnection Request are summarized below. Details are contained in [Appendix G](#). Cost allocation for the Cluster Scenario is found in [Appendix E](#).

8.1.1 CLUSTER GROUP 1 (WOODWARD AREA)

In addition to the 6,112.80 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.2 CLUSTER GROUP 2 (HITCHLAND AREA)

In addition to the 4,094.50 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.3 CLUSTER GROUP 3 (SPEARVILLE AREA)

In addition to the 3,560.33 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.4 CLUSTER GROUP 4 (NORTHWEST KANSAS AREA)

In addition to the 3,047.20 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.5 CLUSTER GROUP 6 (SOUTH TEXAS PANHANDLE/NEW MEXICO AREA)

In addition to the 8,304.45 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.6 CLUSTER GROUP 7 (SOUTHWESTERN OKLAHOMA AREA)

In addition to the 3,257.10 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.7 CLUSTER GROUP 8 (NORTH OKLAHOMA/SOUTH CENTRAL KANSAS AREA)

In addition to the 13,868.06 MW of previously queued generation in the area, 500.0 MW of new interconnection service was studied.

POI Scenario 1 Results: Woodring 345 kV (GEN_1805_P)

Table 8-1: Scenario 1 GEN-2018-005 Primary POI ERS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
None incremental to DISIS-2016-002				

Table 8-2: Scenario 1 GEN-2018-005 Primary POI NRIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC %Loading (%MVA)	Contingency	Mitigation
None incremental to DISIS-2016-002				

POI Scenario 2 Results: Woodring 138 kV (GEN_1805_S)

Table 8-3: Scenario 2 GEN-2018-005 Secondary POI ERS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
'FAIRMONT TAP - WOODRING 138KV CKT 1'	287	135.7457	'WAUKOMIS TAP - WOODRING 138KV CKT 1'	\$86,755 to upgrade CT at Woodring to 2000A
'WAUKOMIS TAP - WOODRING 138KV CKT 1'	286.4	133.97	'FAIRMONT TAP - WOODRING 138KV CKT 1'	

Table 8-4: Scenario 2 Group 08 Cluster Secondary POI NRIS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

POI Scenario 3 Results: Not a viable POI. See OKGE comments in Section 1.

8.1.8 CLUSTER GROUP 9 (NEBRASKA AREA)

In addition to the 10,554.90 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.9 CLUSTER GROUP 10 (SOUTHEAST OKLAHOMA/NORTHEAST TEXAS AREA)

In addition to the 73.50 MW of previously queued generation in the area, 150.0 MW of new interconnection service was studied. AEPW has commented that neither point of interconnection (New Boston 69 kV or North New Boston 138 kV) has the ability to add a terminal to the existing bus. New substations would need to be built for either point of interconnection.

POI Scenario 1 Results: New Boston 69 kV (GEN_1803_P)

Table 8-5: Scenario 1 GEN-2018-003 Primary POI ERS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
'HOOKS - RED RIVER 69KV CKT 1'	84	107.2934	'P13:138-13.8:AEPW:S.W.S.-4'	Rebuild 4.02 miles of 69 kV, \$4,824,000
'NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	101	114.9713	'NEW BOSTON - RED RIVER 69KV CKT 1'	Rebuild 1.3 miles of 69 kV, \$1,560,000
'NEW BOSTON - RED RIVER 69KV CKT 1'	52	101.7211	System Intact	Rebuild 4.33 miles of 69 kV, \$5,196,000
'NEW BOSTON - RED RIVER 69KV CKT 1'	78	136.8289	'P13:138-13.8:AEPW:S.W.S.-4'	

Table 8-6: Scenario 1 GEN-2018-003 Primary POI NRIS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
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Rate A/B (MVA)				
None observed in this analysis.				

POI Scenario 2 Results: North New Boston 138 kV (GEN_G1803_S)

Table 8-7: Scenario 2 GEN-2018-003 Secondary POI ERIIS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
None constraints identified in this analysis.				

Table 8-8: Scenario 2 GEN-2018-003 Secondary POI NRIS Constraints

Monitored Element	DC Limiting Rate A/B (MVA)	DC TC %Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

8.1.10 CLUSTER GROUP 12 (NORTHWEST ARKANSAS AREA)

In addition to the 85.50 MW of previously queued generation in the area, 100.0 MW of new interconnection service was studied.

POI Scenario 1 Results: Monett 161 kV (GEN_1806_P)

Table 8-9: Scenario 1 GEN-2018-006 Primary POI ERIIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC %Loading (%MVA)	Contingency	Mitigation
None constraints identified in this analysis.				

Table 8-10: Scenario 1 GEN-2018-006 Primary POI NRIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC %Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

POI Scenario 2 Results: Monett 69 kV (GEN_1806_S)

Table 8-11: Scenario 2 GEN-2018-006 Secondary POI ERIIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC %Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

Table 8-12: Scenario 2 GEN-2018-006 Secondary POI NRIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC % Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

POI Scenario 3 Results: Tap Aurora – Monett 161 kV (GEN_1806_T)

Table 8-13: Scenario 3 GEN-2018-006 Secondary POI ERIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC %Loading (%MVA)	Contingency	Mitigation
None constraints identified in this analysis				

Table 8-14: Scenario 3 GEN-2018-006 Secondary POI NRIS Constraints

Monitored Element	Limiting Rate A/B (MVA)	TC % Loading (%MVA)	Contingency	Mitigation
None observed in this analysis.				

8.1.11 CLUSTER GROUP 13 (NORTHEAST KANSAS/NORTHWEST MISSOURI AREA)

In addition to the 4,117.90 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. The following constraints were found in this area:

8.1.12 CLUSTER GROUP 14 (SOUTH CENTRAL OKLAHOMA AREA)

In addition to the 2,124.57 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.13 CLUSTER GROUP 15 (EASTERN SOUTH DAKOTA)

In addition to approximately 7,373.35 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.14 CLUSTER GROUP 16 (WESTERN NORTH DAKOTA)

In addition to approximately 5,174.70 MW of previously queued generation in the area, 320.0 MW of new interconnection service was studied. The following constraints were found in this area:

8.1.15 CLUSTER GROUP 17 (WESTERN SOUTH DAKOTA)

In addition to approximately 873.90 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.1.16 CLUSTER GROUP 18 (EASTERN NORTH DAKOTA)

In addition to approximately 1,559.70 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

8.2 STAND-ALONE SCENARIO

Not applicable to the FCS queue, however if requests proceed to the DISIS Queue the following Stand-Alone Scenario will be evaluated.

The Stand-Alone Scenario considers the Base Case as well as all generating facilities (and with respect to (3) below, any identified Network Upgrades associated with such higher-queued interconnection) that, on the date the DISIS is commenced:

1. are directly connected to the Transmission System;
2. are interconnection to Affected Systems and may have an impact on the Interconnection Request;
3. have a pending higher-queued Interconnection Request to interconnect to the Transmission System; and
4. have no Interconnection Queue Position but have executed a GIA or requested that an unexecuted GIA be filed with FERC.

8.3 CURTAILMENT AND SYSTEM RELIABILITY

In no way does this study guarantee operation for all periods of time. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

9 STABILITY & SHORT CIRCUIT ANALYSIS

Stability is not applicable to the FCS queue. Short Circuit Analysis was performed for each generator's POI. The Short Circuit Analysis results are in I: Short Circuit Analysis.

10 CONCLUSION

The minimum cost of interconnecting all new generation interconnection requests included in this FCS is listed in Table 10-1, not including the exceptions noted in Section 5.

Table 10-1 Total Cluster Costs per POI Scenario

Request	Scenario Number	POI Description	Total Estimated Cost
GEN-2018-003	Scenario #1	New Boston 69 kV	\$25,280,000
	Scenario #2	North New Boston 138 kV	\$12,000,000
GEN-2018-005	Scenario #3	Woodring 345 kV	\$2,000,000
	Scenario #4	Woodring 138 kV	\$1,086,755
	Scenario #5	Tap Hunters – Woodring 345 kV	N/A
GEN-2018-006	Scenario #6	Monett 161 kV	\$10,250,000
	Scenario #7	Monett 69 kV	\$13,250,000
	Scenario #8	Tap Aurora – Monett 161 kV	\$4,250,000

Allocated costs for Network Upgrades and Transmission Owner Interconnection Facilities are listed in Appendix E and F. For Interconnection Requests that result in an interconnection to, or modification of, the transmission facilities of the Western-UGP (WAPA), a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute an Environmental Review Agreement per Section 8.6.1 of the GIP.

These costs do not include the cost of upgrades of other transmission facilities listed in Appendix H, which are Network Constraints. These interconnection costs do not include any cost of any Network Upgrades that are identified as required through the short circuit analysis. Potential over-duty circuit breakers capability will be identified by the Transmission Owner in the Interconnection Facilities Study.

Further refinement of total estimated interconnection costs will be provided, should the Interconnection Customer meet the requirements for acceptance and choose to move into the Interconnection Facilities Study following the posting of this FCS. The Interconnection Facilities Study may include additional study analysis, additional facility upgrades not yet identified by this FCS, such as circuit breaker replacements and affected system facilities, and further refinement of existing cost estimates.

The required interconnection costs listed in Appendices E, and F, and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request (TSR) through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP Open Access Transmission Tariff (OATT).

11 APPENDICES

***11.1 A: GENERATION INTERCONNECTION REQUESTS CONSIDERED FOR
IMPACT STUDY***

Please refer to Table 11-1: Scenario Analysis Assumptions

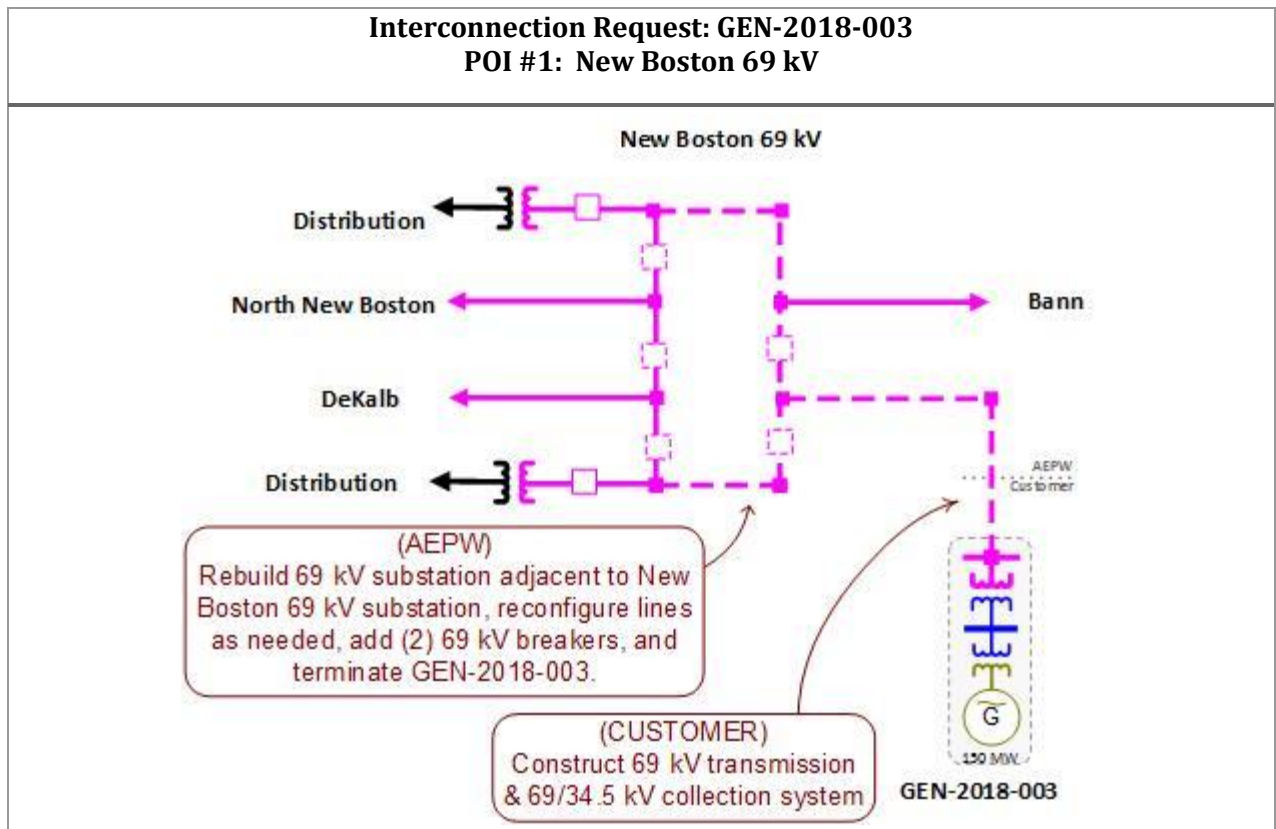
11.2 B: PRIOR-QUEUED INTERCONNECTION REQUESTS

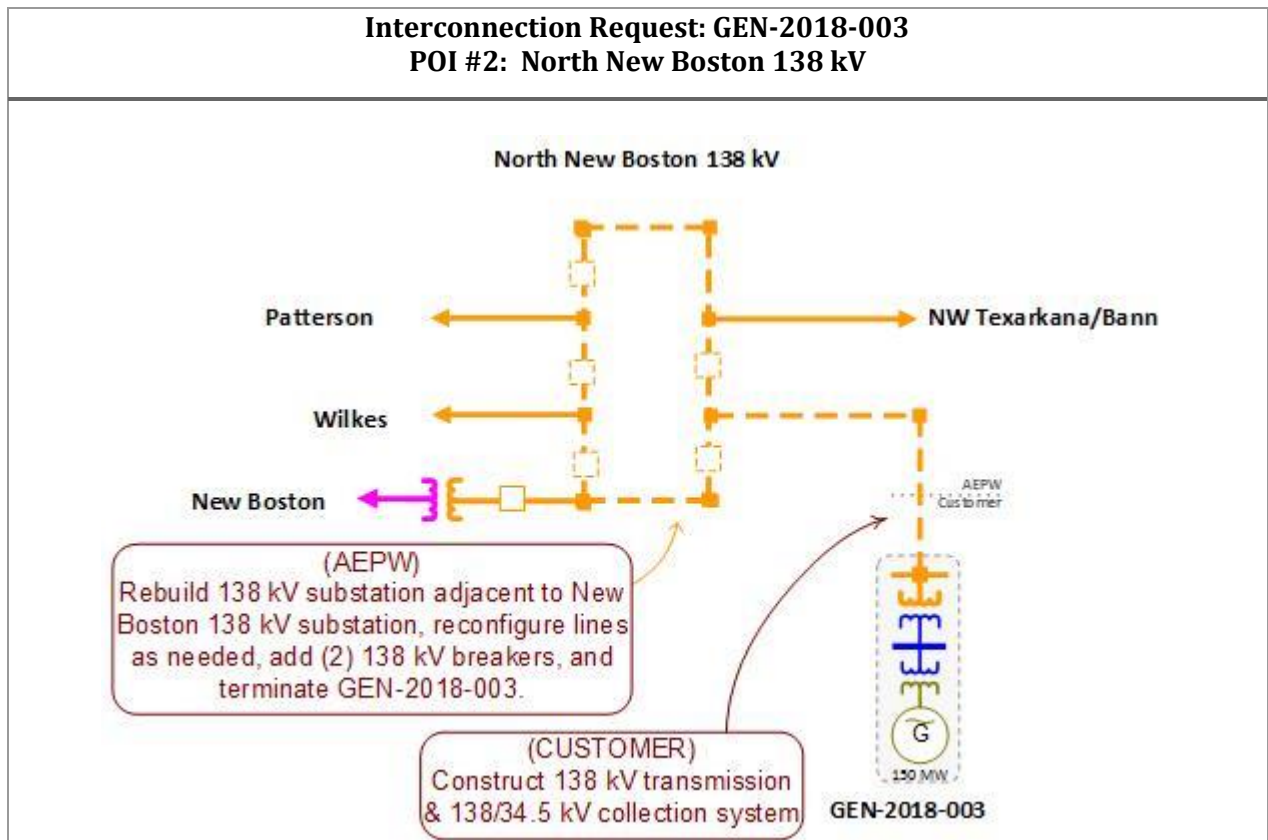
Please refer to Table 11-2: Scenario Analysis Assumptions

11.3 C: STUDY GROUPINGS

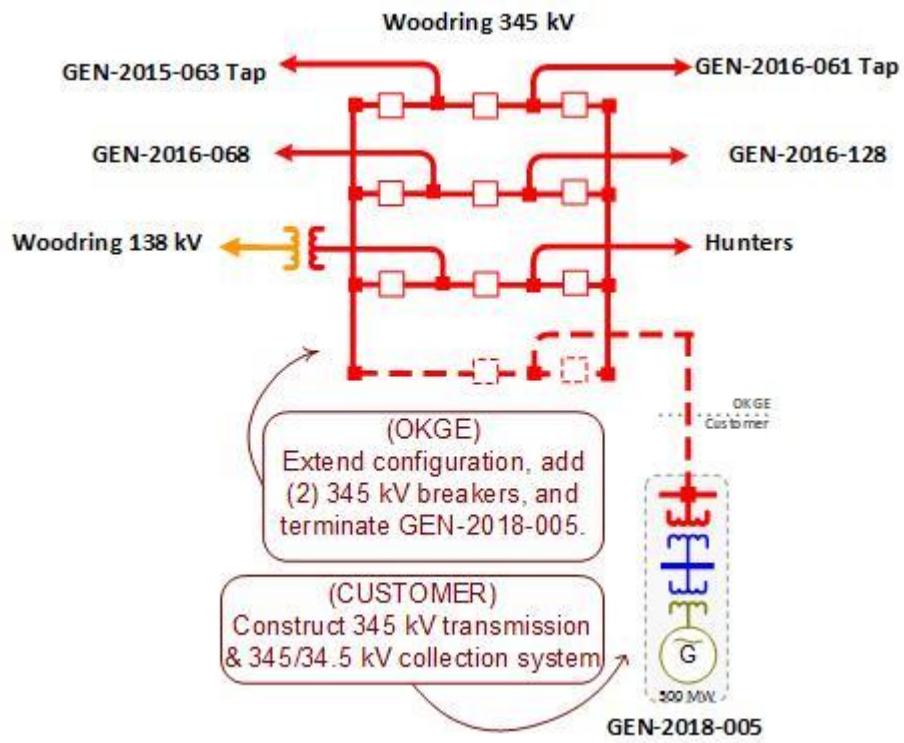
Please refer to Table 11-3: Scenario Analysis Assumptions

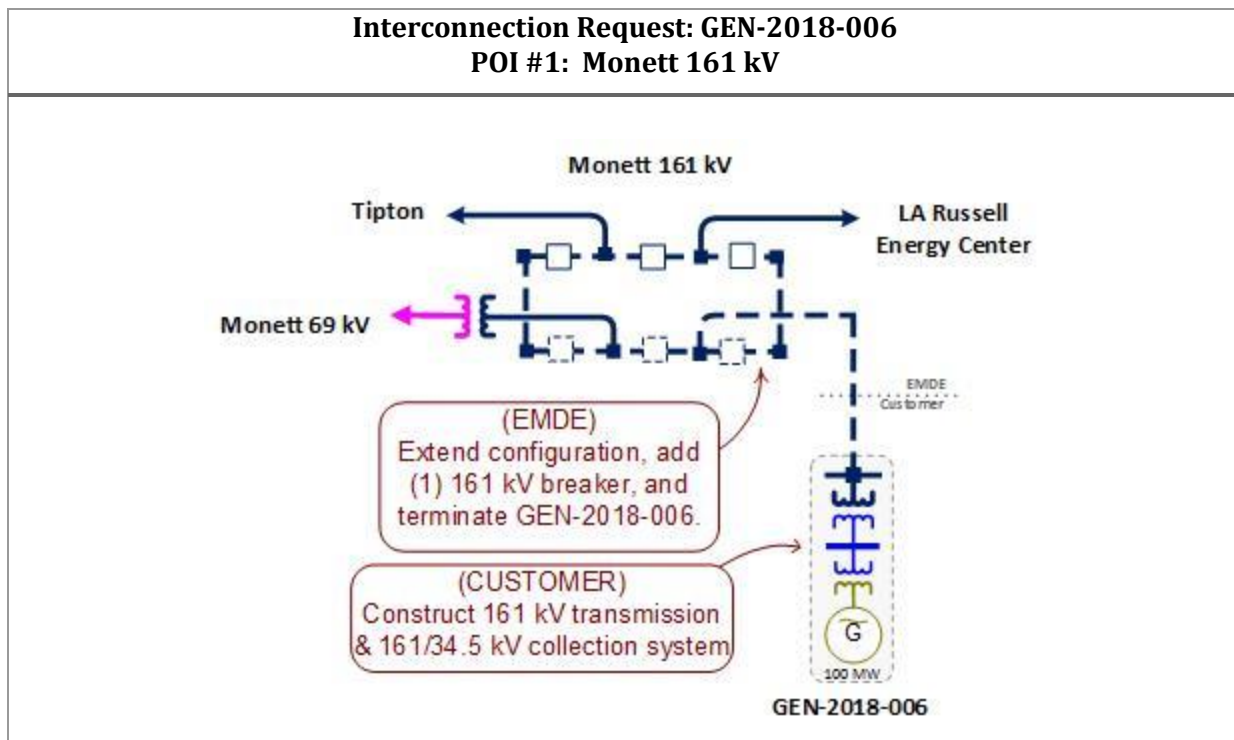
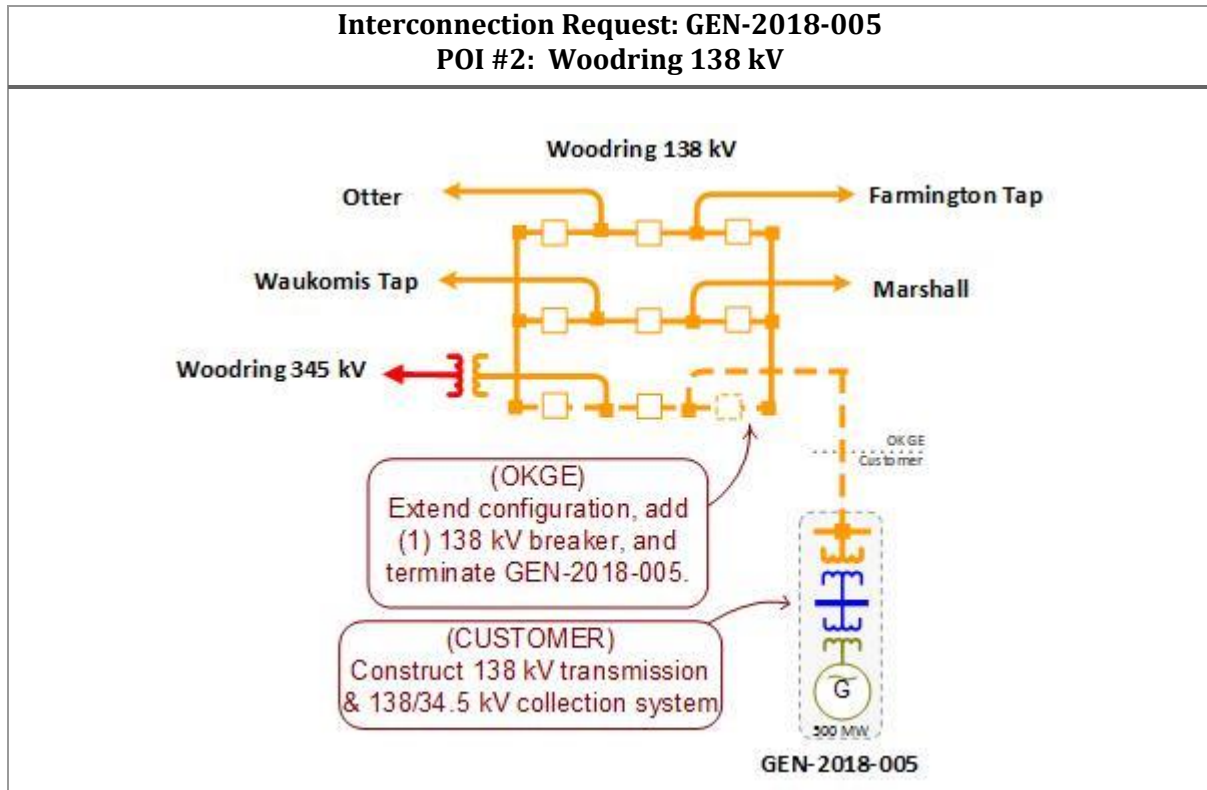
11.4 D: PROPOSED POINT OF INTERCONNECTION ONE-LINE DIAGRAMS



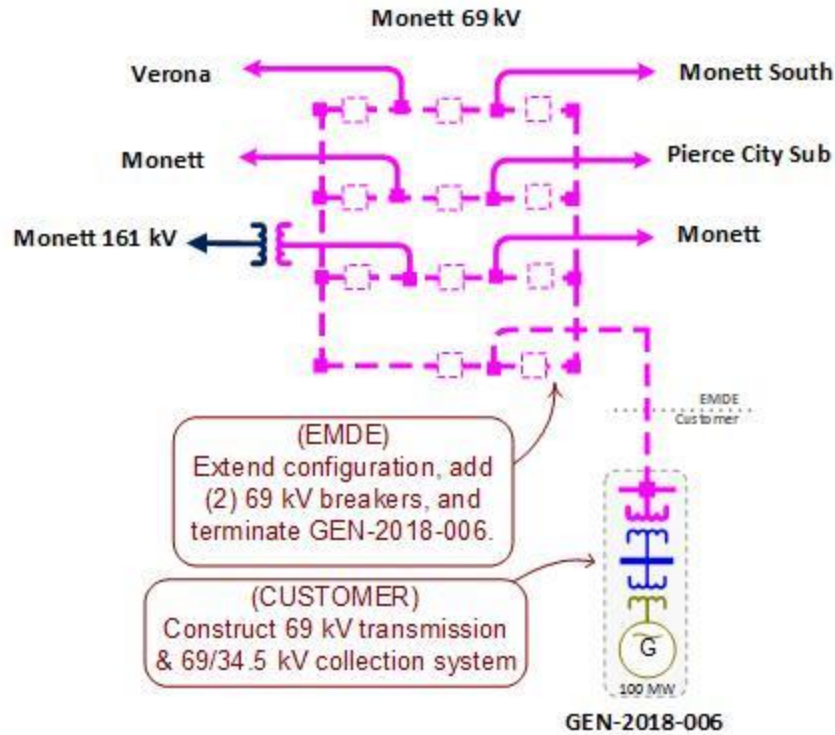


Interconnection Request: GEN-2018-005
POI #1: Woodring 345 kV

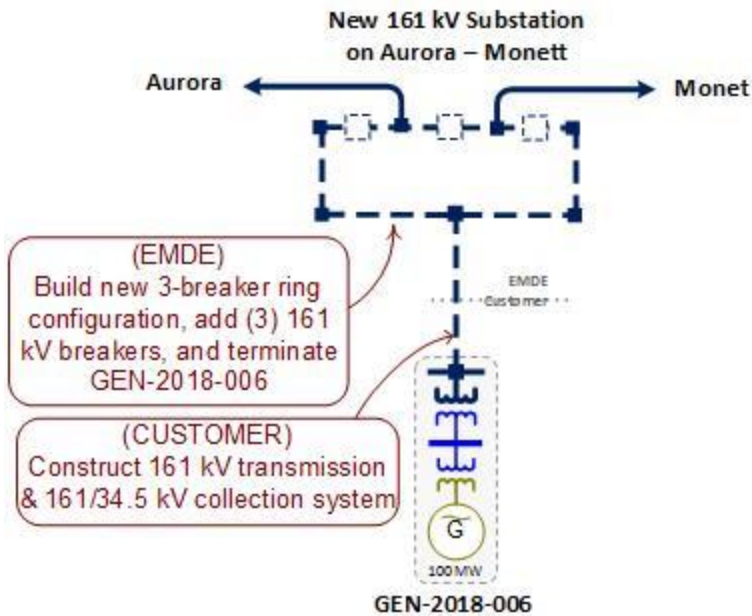




**Interconnection Request: GEN-2018-006
POI #2: Monett 69 kV**



**Interconnection Request: GEN-2018-006
POI #3: Aurora - Monett 161 kV**



11.5 E: COST ALLOCATION PER INTERCONNECTION REQUEST (INCLUDING PRIOR QUEUED UPGRADES)

Important Note:

****WITHDRAWAL OF HIGHER QUEUED PROJECTS WILL CAUSE A RESTUDY
AND MAY RESULT IN HIGHER INTERCONNECTION COSTS****

This section shows each Generator Interconnection Request Customer, their current study impacted Network Upgrades, and the previously allocated upgrades upon which they rely to accommodate their interconnection to the transmission system.

The costs associated with the current study Network Upgrades are allocated to the Customers shown in this report.

In addition should a higher queued request, defined as one this study includes as a prior queued request, withdraw, the Network Upgrades assigned to the withdrawn request may be reallocated to the remaining requests that have an impact on the Network Upgrade under a restudy. Also, should an Interconnection Request choose to go into service prior to the operation date of any necessary Network Upgrades, the costs associated with those upgrades may be reallocated to the impacted Interconnection Request. The actual costs allocated to each Generator Interconnection Request Customer will be determined at the time of a restudy.

The required interconnection costs listed do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP OATT. In addition, costs associated with a short circuit analysis will be allocated should the Interconnection Request Customer choose to execute a Interconnection Facilities Study Agreement.

Appendix E. Cost Allocation Per Request

(Including Previously Allocated Network Upgrades*)

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2018-003_P			
GEN-2018-003_P Interconnection Costs See One-Line Diagram.	Current Study	\$13,700,000	\$13,700,000
Hooks - Red River 69 kV Ckt 1 Rebuild 4.02 miles of 69 kV from Hooks to Red River 69 kV Ckt 1	Current Study	\$4,824,000	\$4,824,000
New Boston - North New Boston 69 kV Ckt 1 Rebuild 1.3 miles of 69 kV from New Boston to North New Boston 69 kV Ckt 1	Current Study	\$1,560,000	\$1,560,000
New Boston - Red River 69 kV ckt 1 Rebuild 4.33 miles of 69 kV from New Boston to Red River 69 kV Ckt 1	Current Study	\$5,196,000	\$5,196,000
	Current Study Total	\$25,280,000	
GEN-2018-003_S			
GEN-2018-003_S Interconnection Costs See One-Line Diagram.	Current Study	\$12,000,000	\$12,000,000
	Current Study Total	\$12,000,000	
GEN-2018-005_P			
GEN-2018-005_P Interconnection Costs See One-Line Diagram.	Current Study	\$2,000,000	\$2,000,000
	Current Study Total	\$2,000,000	
GEN-2018-005_S			
GEN-2018-005_S Interconnection Costs See One-Line Diagram.	Current Study	\$1,000,000	\$1,000,000
Woodring 138 kV Upgrade CT at Woodring 138 kV	Current Study	\$86,755	\$86,755
	Current Study Total	\$1,086,755	
GEN-2018-006_P			
GEN-2018-006_P Interconnection Costs See One-Line Diagram.	Current Study	\$10,250,000	\$10,250,000
	Current Study Total	\$10,250,000	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2018-006_S			
GEN-2018-006_S Interconnection Costs See One-Line Diagram.	Current Study	\$13,250,000	\$13,250,000
	Current Study Total	\$13,250,000	
GEN-2018-006_T			
GEN-2018-006_T Interconnection Costs See One-Line Diagram.	Current Study	\$4,250,000	\$4,250,000
	Current Study Total	\$4,250,000	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

11.6 F: COST ALLOCATION PER PROPOSED STUDY NETWORK UPGRADE

Important Note:

****WITHDRAWAL OF HIGHER QUEUED PROJECTS WILL CAUSE A RESTUDY
AND MAY RESULT IN HIGHER INTERCONNECTION COSTS****

This section shows each Direct Assigned Facility and Network Upgrade and the Generator Interconnection Request Customer(s) which have an impact in this study assuming all higher queued projects remain in the queue and achieve commercial operation.

The required interconnection costs listed do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP OATT. In addition, costs associated with a short circuit analysis will be allocated should the Interconnection Request Customer choose to execute a Facility Study Agreement.

There may be additional costs allocated to each Customer. See Appendix E for more details.

Appendix F. Cost Allocation by Upgrade

GEN-2018-003_P Interconnection Costs		\$13,700,000
See One-Line Diagram.		
	GEN-2018-003_P	\$13,700,000
	Total Allocated Costs	\$13,700,000
GEN-2018-003_S Interconnection Costs		\$12,000,000
See One-Line Diagram.		
	GEN-2018-003_S	\$12,000,000
	Total Allocated Costs	\$12,000,000
GEN-2018-005_P Interconnection Costs		\$2,000,000
See One-Line Diagram.		
	GEN-2018-005_P	\$2,000,000
	Total Allocated Costs	\$2,000,000
GEN-2018-005_S Interconnection Costs		\$1,000,000
See One-Line Diagram.		
	GEN-2018-005_S	\$1,000,000
	Total Allocated Costs	\$1,000,000
GEN-2018-006_P Interconnection Costs		\$10,250,000
See One-Line Diagram.		
	GEN-2018-006_P	\$10,250,000
	Total Allocated Costs	\$10,250,000
GEN-2018-006_S Interconnection Costs		\$13,250,000
See One-Line Diagram.		
	GEN-2018-006_S	\$13,250,000
	Total Allocated Costs	\$13,250,000
GEN-2018-006_T Interconnection Costs		\$4,250,000
See One-Line Diagram.		
	GEN-2018-006_T	\$4,250,000
	Total Allocated Costs	\$4,250,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Hooks - Red River 69 kV Ckt 1		\$4,824,000
Rebuild 4.02 miles of 69 kV from Hooks to Red River 69 kV Ckt 1		
	GEN-2018-003_P	\$4,824,000
	Total Allocated Costs	\$4,824,000
New Boston - North New Boston 69 kV Ckt 1		\$1,560,000
Rebuild 1.3 miles of 69 kV from New Boston to North New Boston 69 kV Ckt 1		
	GEN-2018-003_P	\$1,560,000
	Total Allocated Costs	\$1,560,000
New Boston - Red River 69 kV ckt 1		\$5,196,000
Rebuild 4.33 miles of 69 kV from New Boston to Red River 69 kV Ckt 1		
	GEN-2018-003_P	\$5,196,000
	Total Allocated Costs	\$5,196,000
Woodring 138 kV		\$86,755
Upgrade CT at Woodring 138 kV		
	GEN-2018-005_S	\$86,755
	Total Allocated Costs	\$86,755

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

11.7 G: POWER FLOW ANALYSIS (CONSTRAINTS REQUIRING TRANSMISSION REINFORCEMENT)

GROUP	SCENARIO	SEASON	SOURCE	MONITORED ELEMENT	TDF	Rating (MVA)	Contingency Loading %	CONTINGENCY
10ALLP	0	18SP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.3173	52	101.7211	System Intact
10ALLP	0	26SP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.31734	52	101.1558	System Intact
10ALLP	0	21L	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76551	78	136.8289	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	21SP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.26878	287	135.7457	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
08ALLS	0	18SP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.26214	287	135.007	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
08ALLS	0	21SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25798	286.4	133.97	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	21SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25621	286.4	133.8006	'P14:13.2:SPS:POTTER_TR'
08ALLS	0	18SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25187	286.6	133.3339	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	18SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.2501	286.6	133.1996	'P14:13.2:SPS:POTTER_TR'
10ALLP	0	18SP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76512	68	129.5118	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21SP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76546	68	125.6162	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	26SP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76541	68	125.164	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	18G	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.262	286.9	117.8459	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
08ALLS	0	18G	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.24991	286.4	117.617	'P14:13.2:SPS:POTTER_TR'
08ALLS	0	18G	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25169	286.4	117.6135	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	17WP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25052	286.2	116.3382	'P14:13.2:SPS:POTTER_TR'
08ALLS	0	17WP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.2523	286.2	116.3347	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	17WP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.26267	286.8	116.1907	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
10ALLP	0	21L	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85414	101	114.9713	'NEW BOSTON - RED RIVER 69KV CKT 1'
10ALLP	0	21L	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85414	101	114.7733	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	21WP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.26826	286.8	113.5739	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
08ALLS	0	26SP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.26826	286.8	113.5739	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
08ALLS	0	21WP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25742	286.3	113.1715	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	26SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25742	286.3	113.1715	'FAIRMONT TAP - WOODRING 138KV CKT 1'
08ALLS	0	21WP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25565	286.3	113.1069	'P14:13.2:SPS:POTTER_TR'
08ALLS	0	26SP	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25565	286.3	113.1069	'P14:13.2:SPS:POTTER_TR'
10ALLP	0	18G	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76528	78	111.1436	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	17WP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76525	78	109.7276	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21L	GEN_1803_P	HOOKS - RED RIVER 69KV CKT 1'	0.76551	84	107.2934	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	21L	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25383	286.4	106.9536	'P14:13.2:SPS:POTTER_TR'
08ALLS	0	21L	GEN_1805_S	WAUKOMIS TAP - WOODRING 138KV CKT 1'	0.25568	286.4	106.8575	'FAIRMONT TAP - WOODRING 138KV CKT 1'
10ALLP	0	18SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85387	86	106.0238	'NEW BOSTON - RED RIVER 69KV CKT 1'
10ALLP	0	18SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85387	86	105.7913	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	21L	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.267	287	105.7491	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
10ALLP	0	18SP	GEN_1803_P	HOOKS - RED RIVER 69KV CKT 1'	0.76512	68	105.1	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21WP	GEN_1803_P	NEW BOSTON - RED RIVER 69KV CKT 1'	0.76545	78	104.6378	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85409	86	102.6901	'NEW BOSTON - RED RIVER 69KV CKT 1'
10ALLP	0	21SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85409	86	102.3413	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	21SP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.2116	287	101.8119	'P14:115:SPS:FLOYD_CNTY'
10ALLP	0	26SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85403	86	101.7494	'NEW BOSTON - RED RIVER 69KV CKT 1'
10ALLP	0	26SP	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85403	86	101.4006	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21SP	GEN_1803_P	HOOKS - RED RIVER 69KV CKT 1'	0.76546	68	101.0574	'P13:138-13.8:AEPW:S.W.S.-4'
08ALLS	0	18SP	GEN_1805_S	FAIRMONT TAP - WOODRING 138KV CKT 1'	0.20503	287	101.0505	'P14:115:SPS:FLOYD_CNTY'
10ALLP	0	26SP	GEN_1803_P	HOOKS - RED RIVER 69KV CKT 1'	0.76541	68	100.7522	'P13:138-13.8:AEPW:S.W.S.-4'
10ALLP	0	21L	GEN_1803_P	NEW BOSTON - NORTH NEW BOSTON 69KV CKT 1'	0.85414	101	100.7139	'HOOKS - RED RIVER 69KV CKT 1'

***11.8 H: POWER FLOW ANALYSIS (OTHER CONSTRAINTS NOT REQUIRING
TRANSMISSION REINFORCEMENT)***

Available upon request

*11.9 H-AS: POWER FLOW ANALYSIS
(OTHER CONSTRAINTS
POTENTIALLY REQUIRING
AFFECTED SYSTEM
MITIGATION)*

Available upon request

11.10 I: SHORT CIRCUIT ANALYSIS

GEN-2018-003 POI at New Boston 69 kV Substation:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT CURRENTS FRI, AUG 24 2018 16:07
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X	/I+/	AN(I+)
504029 [SFOREMAN 4 138.00] AMP	8194.9	-79.78
504030 [SFORE_1 2 69.000] AMP	2804.3	-88.26
504123 [LOCKSBRG 4 138.00] AMP	5743.8	-79.61
504124 [ASHDWN_W 4 138.00] AMP	9619.7	-83.04
507402 [ASHDWNR4 138.00] AMP	9915.7	-83.67
507429 [PATTERS2 69.000] AMP	13815.8	-83.39
507431 [PATTERS4 138.00] AMP	12605.9	-82.87
507434 [SNASHVL4 138.00] AMP	3101.6	-74.97
508049 [NASH 4 138.00] AMP	19036.9	-84.86
508050 [ANDRSNC4 138.00] AMP	7164.0	-79.00
508053 [BANN 2 69.000] AMP	19752.0	-84.95
508054 [BANN 4 138.00] AMP	19889.9	-84.51
508056 [BRYANML4 138.00] AMP	6466.9	-79.16
508057 [HOOKS 2 69.000] AMP	8245.7	-84.07
508061 [KINGHWY2 69.000] AMP	11710.1	-81.11
508063 [LSORDTP2 69.000] AMP	9024.0	-84.23
508067 [NEWBOST2 69.000] AMP	8666.1	-82.78
508068 [NNBOSTN2 69.000] AMP	9105.1	-83.17
508069 [NNBOSTN4 138.00] AMP	10420.2	-79.03
508070 [NWT-BNT4 138.00] AMP	23442.4	-85.49
508071 [NWTXARK4 138.00] AMP	24420.1	-85.63
508072 [NWTXARK7 345.00] AMP	13111.2	-85.79
508073 [REDLICK2 69.000] AMP	16635.9	-83.15
508074 [REDRVR-2 69.000] AMP	7664.8	-83.62
508075 [REDSPRG4 138.00] AMP	13613.0	-83.53
508078 [SETEXAR4 138.00] AMP	10540.5	-84.17
508080 [SUGARHL4 138.00] AMP	12064.1	-84.62
508093 [LSORD 2 69.000] AMP	7334.2	-75.62
508104 [RIFFIN REC4 138.00] AMP	9786.5	-79.02
508287 [BUFORDER2 69.000] AMP	3341.1	-63.61
508288 [DAINGER2 69.000] AMP	6432.0	-73.95
508289 [DEKALB 2 69.000] AMP	3722.9	-76.91

508305 [MTPLEAS2 69.000] AMP	9713.2	-79.17
508307 [NAPLES 2 69.000] AMP	2368.5	-65.21
508309 [PETTY 2 69.000] AMP	11149.5	-80.84
508331 [COOKVIL2 69.000] AMP	3654.2	-64.19
508338 [COOKVTP2 69.000] AMP	4223.6	-64.57
508371 [CITYLAKE 269.000] AMP	8779.2	-79.96
917190 [GEN-2018-00369.000] AMP	8666.1	-82.78

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT CURRENTS FRI, AUG 24 2018 16:07
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X	/I+/	AN(I+)
504029 [SFOREMAN 4 138.00] AMP	8195.9	-79.78
504030 [SFORE_1 2 69.000] AMP	2804.3	-88.26
504123 [LOCKSBRG 4 138.00] AMP	5744.4	-79.61
504124 [ASHDWN_W 4 138.00] AMP	9621.3	-83.03
507402 [ASHDWNR4 138.00] AMP	9917.2	-83.67
507429 [PATTERS2 69.000] AMP	13817.3	-83.39
507431 [PATTERS4 138.00] AMP	12608.7	-82.87
507434 [SNASHVL4 138.00] AMP	3102.5	-74.97
508049 [NASH 4 138.00] AMP	19041.2	-84.85
508050 [ANDRSNC4 138.00] AMP	7164.7	-79.00
508053 [BANN 2 69.000] AMP	19754.3	-84.95
508054 [BANN 4 138.00] AMP	19894.7	-84.51
508056 [BRYANML4 138.00] AMP	6467.4	-79.16
508057 [HOOKS 2 69.000] AMP	8246.1	-84.07
508061 [KINGHWY2 69.000] AMP	11711.0	-81.11
508063 [LSORDTP2 69.000] AMP	9024.5	-84.23
508067 [NEWBOST2 69.000] AMP	8666.6	-82.78
508068 [NNBOSTN2 69.000] AMP	9105.7	-83.18
508069 [NNBOSTN4 138.00] AMP	10421.7	-79.03
508070 [NWT-BNT4 138.00] AMP	23449.0	-85.49
508071 [NWTXARK4 138.00] AMP	24427.3	-85.63
508072 [NWTXARK7 345.00] AMP	13116.2	-85.79
508073 [REDLICK2 69.000] AMP	16637.6	-83.15
508074 [REDRVR-2 69.000] AMP	7665.1	-83.62
508075 [REDSPRG4 138.00] AMP	13615.3	-83.53
508078 [SETEXAR4 138.00] AMP	10541.8	-84.17
508080 [SUGARHL4 138.00] AMP	12065.7	-84.62

508093 [LSORD 2 69.000] AMP 7334.6 -75.62
 508104 [RIFFIN REC4 138.00] AMP 9787.8 -79.02
 508287 [BUFORDR2 69.000] AMP 3337.2 -63.79
 508288 [DAINGER2 69.000] AMP 6438.4 -74.92
 508289 [DEKALB 2 69.000] AMP 3723.0 -76.94
 508305 [MTPLEAS2 69.000] AMP 9580.1 -80.00
 508307 [NAPLES 2 69.000] AMP 2366.4 -65.33
 508309 [PETTY 2 69.000] AMP 10942.5 -81.89
 508331 [COOKVIL2 69.000] AMP 3646.4 -64.45
 508338 [COOKVTP2 69.000] AMP 4212.9 -64.88
 508371 [CITYLAKE 269.000] AMP 8666.5 -80.71
 917190 [GEN-2018-00369.000] AMP 8666.6 -82.78

507440 [FOREMAG2 69.000] AMP 3136.4 -58.95
 507454 [TURK 4 138.00] AMP 24424.2 -86.68
 507455 [TURK 7 345.00] AMP 8997.5 -86.02
 507456 [TURK 3 115.00] AMP 16596.3 -86.56
 507461 [GORDON TAP 4138.00] AMP 2587.9 -79.88
 507463 [BARITERDTP 4138.00] AMP 3553.0 -77.16
 508049 [NASH 4 138.00] AMP 19036.9 -84.86
 508050 [ANDRSNC4 138.00] AMP 7164.0 -79.00
 508051 [ASHDOWN2 69.000] AMP 11579.2 -82.41
 508053 [BANN 2 69.000] AMP 19751.9 -84.95
 508054 [BANN 4 138.00] AMP 19889.9 -84.51
 508056 [BRYANML4 138.00] AMP 6466.9 -79.16
 508057 [HOOKS 2 69.000] AMP 8245.6 -84.07
 508059 [IPC T 4 138.00] AMP 7778.3 -82.37
 508060 [IPC-DOM4 138.00] AMP 8280.6 -82.51
 508061 [KINGHWY2 69.000] AMP 11710.1 -81.11
 508063 [LSORDTP2 69.000] AMP 9023.9 -84.23
 508064 [MUNZCTY4 138.00] AMP 6500.4 -79.21
 508065 [NEKOOSA2 69.000] AMP 6185.1 -83.24
 508066 [NEKOSAT2 69.000] AMP 10535.5 -81.04
 508067 [NEWBOST2 69.000] AMP 8666.0 -82.78
 508068 [NNBOSTN2 69.000] AMP 9105.0 -83.17
 508069 [NNBOSTN4 138.00] AMP 10420.3 -79.03
 508070 [NWT-BNT4 138.00] AMP 23442.4 -85.49
 508071 [NWTXARK4 138.00] AMP 24420.1 -85.63
 508072 [NWTXARK7 345.00] AMP 13111.2 -85.79
 508073 [REDLICK2 69.000] AMP 16635.9 -83.15
 508074 [REDRVR-2 69.000] AMP 7664.7 -83.62
 508075 [REDSRPG4 138.00] AMP 13613.0 -83.53
 508076 [RICHMND2 69.000] AMP 14247.6 -81.60
 508077 [SETEXAR2 69.000] AMP 14607.4 -82.91
 508078 [SETEXAR4 138.00] AMP 10540.5 -84.17
 508079 [SUGARHL2 69.000] AMP 17178.6 -83.27
 508080 [SUGARHL4 138.00] AMP 12064.1 -84.62
 508081 [SUGHLET2 69.000] AMP 16412.4 -82.93
 508082 [SUGHLWT2 69.000] AMP 16354.6 -82.83
 508086 [TEXARK 2 69.000] AMP 14985.4 -82.47
 508087 [TEXOPER2 69.000] AMP 11415.7 -80.92
 508091 [ALUMAX 4 138.00] AMP 16890.3 -83.25
 508093 [LSORD 2 69.000] AMP 7334.2 -75.62
 508104 [RIFFIN REC4 138.00] AMP 9786.6 -79.02
 508105 [MANDEVILTP4 138.00] AMP 9204.1 -84.68
 508287 [BUFORDR2 69.000] AMP 3341.1 -63.61
 508289 [DEKALB 2 69.000] AMP 3722.9 -76.91
 508298 [LYDIA 7 345.00] AMP 12656.8 -85.55
 508307 [NAPLES 2 69.000] AMP 2368.5 -65.21
 508338 [COOKVTP2 69.000] AMP 4223.6 -64.57
 508359 [WELSH 7 345.00] AMP 21003.0 -86.84
 508832 [DIANA 7 345.00] AMP 18872.3 -86.50
 508840 [WILKES 4 138.00] AMP 30249.2 -85.80
 508841 [WILKES 7 345.00] AMP 15338.2 -86.50
 510888 [B.BOWTP4 138.00] AMP 7143.3 -81.49
 510890 [CRAIGJT4 138.00] AMP 8650.8 -81.63
 510907 [PITTSB-7 345.00] AMP 13588.4 -84.58
 510911 [VALIANT7 345.00] AMP 13340.4 -85.39
 510918 [VALIANT4 138.00] AMP 14816.6 -85.92
 521004 [MTRIVER4 138.00] AMP 8327.7 -81.76
 521157 [HUGO 7 345.00] AMP 11162.9 -86.04
 588200 [GEN-2016-129345.00] AMP 5262.8 -84.95
 917190 [GEN-2018-00369.000] AMP 20840.6 -79.03

GEN-2018-003 POI at North New Boston 138 kV Substation:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT CURRENTS FRI, AUG 24 2018 16:07
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+/ AN(I+)
 337672 [4MURFBORO 138.00] AMP 1550.9 -79.92
 337673 [3MURFBORO.S!115.00] AMP 2032.5 -78.44
 504029 [SFOREMAN 4 138.00] AMP 8194.9 -79.78
 504030 [SFORE_1 2 69.000] AMP 2804.3 -88.26
 504123 [LOCKSBRG 4 138.00] AMP 5743.8 -79.61
 504124 [ASHDWN_W 4 138.00] AMP 9619.7 -83.04
 504363 [NE-TEXARK2 69.000] AMP 5285.3 -88.47
 504379 [BARITE-RD 4 138.00] AMP 3242.3 -76.47
 505614 [BRKN BW4 138.00] AMP 7378.6 -81.66
 507402 [ASHDWN_R 4 138.00] AMP 9915.7 -83.67
 507407 [FORMANR2 69.000] AMP 3524.9 -61.37
 507419 [DEQUEEN4 138.00] AMP 4115.5 -75.08
 507421 [FOREMAN2 69.000] AMP 3644.9 -61.47
 507427 [OKAY 2 69.000] AMP 7413.5 -84.18
 507428 [OKAY 4 138.00] AMP 10111.3 -84.26
 507429 [PATTERS2 69.000] AMP 13815.8 -83.39
 507431 [PATTERS4 138.00] AMP 12605.9 -82.87
 507433 [SDIERKS4 138.00] AMP 3549.7 -77.15
 507434 [SNASHVL4 138.00] AMP 3101.6 -74.97

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
CURRENTS FRI, AUG 24 2018 16:08
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+/ AN(I+)
337672 [4MURFBORO 138.00] AMP 1559.1 -79.87
337673 [3MURFBORO.S!115.00] AMP 2045.2 -78.37
504029 [SFOREMAN 4 138.00] AMP 8195.9 -79.78
504030 [SFORE_1 2 69.000] AMP 2804.3 -88.26
504123 [LOCKSBRG 4 138.00] AMP 5744.4 -79.61
504124 [ASHDWN_W 4 138.00] AMP 9621.3 -83.03
504363 [NE-TEXARK2 69.000] AMP 5285.4 -88.47
504379 [BARITE-RD 4 138.00] AMP 3242.4 -76.47
505614 [BRKN BW4 138.00] AMP 7380.7 -81.66
507402 [ASHDWN4 138.00] AMP 9917.2 -83.67
507407 [FORMANR2 69.000] AMP 3525.0 -61.37
507419 [DEQUEEN4 138.00] AMP 4115.9 -75.08
507421 [FOREMAN2 69.000] AMP 3645.0 -61.47
507427 [OKAY 2 69.000] AMP 7413.8 -84.18
507428 [OKAY 4 138.00] AMP 10112.5 -84.26
507429 [PATTERS2 69.000] AMP 13817.3 -83.39
507431 [PATTERS4 138.00] AMP 12608.7 -82.87
507433 [SDIERKS4 138.00] AMP 3549.9 -77.15
507434 [SNASHVL4 138.00] AMP 3102.5 -74.97
507440 [FOREMAG2 69.000] AMP 3136.5 -58.95
507454 [TURK 4 138.00] AMP 24429.1 -86.67
507455 [TURK 7 345.00] AMP 8999.4 -86.02
507456 [TURK 3 115.00] AMP 16599.3 -86.56
507461 [GORDON TAP 4138.00] AMP 2588.0 -79.88
507463 [BARITERDTP 4138.00] AMP 3553.2 -77.16
508049 [NASH 4 138.00] AMP 19041.2 -84.85
508050 [ANDRSNC4 138.00] AMP 7164.7 -79.00
508051 [ASHDOWN2 69.000] AMP 11580.3 -82.41
508053 [BANN 2 69.000] AMP 19754.3 -84.95
508054 [BANN 4 138.00] AMP 19894.7 -84.51
508056 [BRYANML4 138.00] AMP 6467.4 -79.16
508057 [HOOKS 2 69.000] AMP 8246.1 -84.07
508059 [IPC T 4 138.00] AMP 7779.1 -82.37
508060 [IPC-DOM4 138.00] AMP 8281.5 -82.51

508061 [KINGHWY2 69.000] AMP 11710.9 -81.11
508063 [LSORDTP2 69.000] AMP 9024.4 -84.23
508064 [MUNZCTY4 138.00] AMP 6500.9 -79.21
508065 [NEKOOSA2 69.000] AMP 6185.4 -83.24
508066 [NEKOSAT2 69.000] AMP 10536.3 -81.04
508067 [NEWBOST2 69.000] AMP 8666.4 -82.78
508068 [NNBOSTN2 69.000] AMP 9105.5 -83.18
508069 [NNBOSTN4 138.00] AMP 10421.7 -79.03
508070 [NWT-BNT4 138.00] AMP 23449.0 -85.49
508071 [NWTXARK4 138.00] AMP 24427.3 -85.63
508072 [NWTXARK7 345.00] AMP 13116.2 -85.79
508073 [REDLICK2 69.000] AMP 16637.6 -83.15
508074 [REDVR-2 69.000] AMP 7665.1 -83.62
508075 [REDSRPG4 138.00] AMP 13615.3 -83.53
508076 [RICHMND2 69.000] AMP 14248.8 -81.59
508077 [SETEXAR2 69.000] AMP 14608.7 -82.91
508078 [SETEXAR4 138.00] AMP 10541.8 -84.17
508079 [SUGARHL2 69.000] AMP 17180.4 -83.26
508080 [SUGARHL4 138.00] AMP 12065.7 -84.62
508081 [SUGHLET2 69.000] AMP 16414.1 -82.93
508082 [SUGHLWT2 69.000] AMP 16356.2 -82.83
508086 [TEXARK 2 69.000] AMP 14986.8 -82.47
508087 [TEXOPER2 69.000] AMP 11416.5 -80.92
508091 [ALUMAX 4 138.00] AMP 16893.7 -83.25
508093 [LSORD 2 69.000] AMP 7334.6 -75.62
508104 [RIFFIN REC4 138.00] AMP 9787.9 -79.02
508105 [MANDEVILTP4 138.00] AMP 9204.9 -84.68
508287 [BUFORDR2 69.000] AMP 3337.2 -63.79
508289 [DEKALB 2 69.000] AMP 3723.0 -76.94
508298 [LYDIA 7 345.00] AMP 12661.9 -85.55
508307 [NAPLES 2 69.000] AMP 2366.4 -65.33
508338 [COOKVTP2 69.000] AMP 4212.9 -64.88
508359 [WELSH 7 345.00] AMP 21019.2 -86.84
508832 [DIANA 7 345.00] AMP 18892.5 -86.50
508840 [WILKES 4 138.00] AMP 30242.7 -85.86
508841 [WILKES 7 345.00] AMP 15348.5 -86.50
510888 [B.BOWTP4 138.00] AMP 7144.7 -81.48
510890 [CRAIGJT4 138.00] AMP 8653.0 -81.63
510907 [PITTSB-7 345.00] AMP 13599.2 -84.60
510911 [VALIANT7 345.00] AMP 13348.4 -85.40
510918 [VALIANT4 138.00] AMP 14824.9 -85.92
521004 [MTRIVER4 138.00] AMP 8329.7 -81.76
521157 [HUGO 7 345.00] AMP 11169.5 -86.05
588200 [GEN-2016-129345.00] AMP 5263.9 -84.95
917190 [GEN-2018-00369.000] AMP 20843.5 -79.03

GEN-2018-005 POI at Woodring 345 kV:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
CURRENTS FRI, AUG 24 2018 16:08
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT

- SET TRANSFORMER TAP RATIOS=1.0 PU AND
 PHASE SHIFT ANGLES=0.0
 - SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
 - SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND
 TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN
 +/-0 SEQUENCES
 - SET LOAD=0.0 IN +/- SEQUENCES
 - DC LINES AND FACTS DEVICES BLOCKED
 - IMPEDANCE CORRECTIONS APPLIED TO
 TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+ AN(I+)
 509852 [T.NO.--7 345.00] AMP 24470.9 -86.30
 511425 [TUTCONT4 138.00] AMP 10607.9 -80.81
 512694 [CLEVLND7 345.00] AMP 15107.6 -86.36
 512729 [CLEVLND 4 138.00] AMP 16795.8 -85.60
 514642 [BRCKWND4 138.00] AMP 7463.3 -81.50
 514701 [BUNCHCK4 138.00] AMP 6609.4 -73.10
 514704 [MILLERT4 138.00] AMP 20383.1 -85.56
 514705 [COWCRK 2 69.000] AMP 4051.7 -86.75
 514706 [COWCRK 4 138.00] AMP 11365.1 -83.00
 514707 [PERRY 4 138.00] AMP 11051.5 -83.29
 514708 [OTTER 4 138.00] AMP 9722.3 -82.43
 514709 [FRMNTAP4 138.00] AMP 18717.2 -83.16
 514710 [WAUKOMI4 138.00] AMP 10366.7 -80.99
 514711 [WAUKOTPA 138.00] AMP 16013.8 -82.02
 514712 [FAIRMON4 138.00] AMP 14330.6 -82.41
 514713 [WRVALLY4 138.00] AMP 8752.9 -82.14
 514714 [WOODRNG4 138.00] AMP 20098.8 -83.63
 514715 [WOODRNG7 345.00] AMP 22956.1 -85.15
 514718 [VANCE 2 69.000] AMP 7030.6 -72.18
 514721 [IMO 2 69.000] AMP 11995.7 -82.47
 514722 [CLEVETP2 69.000] AMP 11778.2 -81.99
 514727 [ENID 2 69.000] AMP 10923.1 -78.48
 514730 [SO4TH 2 69.000] AMP 13846.0 -82.50
 514731 [SO4TH 4 138.00] AMP 15703.0 -81.42
 514733 [MARSHL 4 138.00] AMP 8401.5 -80.81
 514734 [GLENWD 4 138.00] AMP 10418.1 -80.89
 514737 [OTOE 4 138.00] AMP 16252.0 -83.24
 514743 [OSAGE 4 138.00] AMP 16670.7 -81.58
 514774 [HENESEY4 138.00] AMP 8703.7 -80.41
 514789 [MENOTAP4 138.00] AMP 7137.6 -79.82
 514790 [IMO 4 138.00] AMP 12090.3 -80.96
 514798 [SNRPMPT4 138.00] AMP 20430.4 -85.53
 514799 [SNRPMP 4 138.00] AMP 11263.9 -80.52
 514801 [MINCO 7 345.00] AMP 17320.9 -85.16
 514802 [SOONER 4 138.00] AMP 31600.4 -86.78
 514803 [SOONER 7 345.00] AMP 25593.7 -86.58
 514815 [BRECKNR4 138.00] AMP 14125.1 -81.10
 514819 [EL-RENO4 138.00] AMP 15382.3 -80.00
 514820 [JENSENT4 138.00] AMP 15318.2 -79.47
 514825 [KAYWIND7 345.00] AMP 12247.7 -86.76
 514827 [CTNWOOD4 138.00] AMP 17955.5 -80.80
 514828 [KETCHTP4 138.00] AMP 26742.4 -84.56
 514829 [PINE ST4 138.00] AMP 12229.7 -78.16
 514854 [BRADEN 4 138.00] AMP 31814.5 -85.16
 514863 [HAYMAKR4 138.00] AMP 26507.7 -82.39
 514864 [PIEDMNT4 138.00] AMP 22586.5 -84.45
 514873 [LNEOAK 4 138.00] AMP 27224.3 -84.58

514879 [NORTWST4 138.00] AMP 44865.1 -86.02
 514880 [NORTWST7 345.00] AMP 33800.7 -86.03
 514881 [SPRNGCK7 345.00] AMP 26716.9 -85.54
 514894 [CZECHAL4 138.00] AMP 28268.5 -82.84
 514895 [SARA 4 138.00] AMP 18764.1 -84.07
 514898 [CIMARON4 138.00] AMP 43427.3 -85.02
 514901 [CIMARON7 345.00] AMP 33335.7 -85.93
 514907 [ARCADIA4 138.00] AMP 42411.9 -85.68
 514908 [ARCADIA7 345.00] AMP 26597.1 -86.50
 514909 [REDBUD 7 345.00] AMP 25565.1 -86.84
 514933 [DRAPER 4 138.00] AMP 39341.0 -85.12
 514934 [DRAPER 7 345.00] AMP 20974.0 -85.07
 515006 [MORRISN4 138.00] AMP 13881.5 -83.04
 515011 [STILWTR4 138.00] AMP 13943.9 -80.57
 515045 [SEMINOL7 345.00] AMP 26608.1 -86.11
 515373 [LBRTYLK4 138.00] AMP 14054.9 -81.12
 515375 [WWRDEHV7 345.00] AMP 18894.8 -86.03
 515376 [WWRDEHV4 138.00] AMP 22606.5 -85.98
 515377 [CRESENT4 138.00] AMP 7962.7 -79.88
 515383 [ENIDINT4 138.00] AMP 13204.3 -81.05
 515407 [TATONGA7 345.00] AMP 15851.2 -86.53
 515412 [DMNCRKT4 138.00] AMP 13758.3 -84.29
 515444 [MCNOWND7 345.00] AMP 17268.9 -85.15
 515447 [MORISNT4 138.00] AMP 13913.0 -83.05
 515448 [CRSRDSW7 345.00] AMP 11065.0 -85.53
 515456 [CHSTNTT2 69.000] AMP 11581.0 -79.63
 515458 [BORDER 7345.00] AMP 5275.8 -86.16
 515476 [HUNTERS7 345.00] AMP 17396.0 -84.91
 515477 [CHSHLMV7 345.00] AMP 17361.9 -84.91
 515497 [MATHWSN7 345.00] AMP 32654.4 -86.08
 515543 [RENFROW7 345.00] AMP 14346.5 -84.78
 515544 [RENFROW4 138.00] AMP 14468.6 -85.17
 515546 [GRANTCO4 138.00] AMP 6442.1 -81.19
 515549 [MNCWND37 345.00] AMP 11799.4 -84.87
 515569 [MDFRDTP4 138.00] AMP 11497.2 -83.59
 515576 [RANCHRD7 345.00] AMP 13195.1 -86.83
 515582 [SLNGWND7 345.00] AMP 7215.2 -85.22
 515585 [MAMTHPW7 345.00] AMP 12534.0 -85.99
 515599 [G07621119-20345.00] AMP 12833.3 -85.54
 515600 [KNGFSHR7 345.00] AMP 11379.3 -84.88
 515605 [CANADN7 345.00] AMP 11770.7 -84.82
 515610 [FSHRTAP7 345.00] AMP 16786.1 -85.10
 515621 [OPENSKY7 345.00] AMP 12280.4 -86.79
 515641 [PLNSMEN4 138.00] AMP 14167.1 -82.19
 515646 [GRNTWD 7 345.00] AMP 12349.6 -84.69
 515688 [FRNTWND7 345.00] AMP 10534.2 -85.73
 515800 [GRACMNT7 345.00] AMP 16663.7 -85.42
 515875 [REDNGTN7 345.00] AMP 24051.5 -85.13
 515877 [REDDIRT7 345.00] AMP 23467.2 -85.03
 515894 [THUNDER7 345.00] AMP 10592.3 -83.59
 520409 [RENFROW4 138.00] AMP 10403.7 -83.25
 520882 [DOVERSW4 138.00] AMP 9574.9 -80.23
 521006 [MARSHAL4 138.00] AMP 8359.3 -80.75
 521100 [WARREN 4 138.00] AMP 8752.9 -82.14
 529200 [OMCDLEC7 345.00] AMP 13171.7 -86.83
 532796 [WICHITA7 345.00] AMP 25985.7 -86.24
 532798 [VIOLA 7 345.00] AMP 14431.1 -85.31
 533075 [VIOLA 4 138.00] AMP 18772.8 -85.93
 539801 [THISTLE7 345.00] AMP 16163.2 -85.72
 560053 [G15-052T 345.00] AMP 13081.7 -86.53

560056 [G15-066T 345.00] AMP 18429.0 -86.59
 560071 [G16-003-TAP 345.00] AMP 14665.1 -86.29
 560077 [G16-032-TAP 345.00] AMP 4164.0 -80.92
 560084 [G16-061-TAP 345.00] AMP 16825.5 -85.06
 560086 [G16-072-TAP 345.00] AMP 14952.9 -84.83
 584170 [GEN-2014-064138.00] AMP 9646.7 -82.40
 584690 [GEN-2015-030345.00] AMP 19301.9 -85.97
 584700 [GEN-2015-029345.00] AMP 9575.4 -84.60
 584770 [GEN-2015-034345.00] AMP 11191.5 -86.39
 585040 [GEN-2015-066345.00] AMP 18255.5 -86.57
 587160 [GEN-2016-022345.00] AMP 10658.2 -86.37
 587210 [GEN-2016-032138.00] AMP 8802.9 -81.53
 587300 [G16-045-SUB1345.00] AMP 1558.0 -85.29
 587304 [G16-045-SUB2345.00] AMP 1518.5 -85.34
 587380 [G16-057-SUB1345.00] AMP 1534.9 -85.31
 587384 [G16-057-SUB2345.00] AMP 1466.4 -85.40
 587410 [GEN-2016-061345.00] AMP 16451.0 -85.02
 587460 [GEN-2016-068345.00] AMP 6886.5 -84.90
 587490 [GEN-2016-072345.00] AMP 11120.4 -84.14
 587800 [GEN-2016-100345.00] AMP 12236.9 -84.79
 587804 [G16-100-TAP 345.00] AMP 16483.2 -85.18
 587950 [GEN-2016-119345.00] AMP 10309.1 -86.01
 587955 [GEN2016-119B345.00] AMP 8884.5 -85.39
 588190 [GEN-2016-128345.00] AMP 8513.9 -84.81
 588364 [G16-153-TAP 345.00] AMP 7861.2 -85.64
 917200 [GEN-2018-005345.00] AMP 22956.1 -85.15

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+ AN(I+)
 509852 [T.NO.--7 345.00] AMP 23615.1 -86.20
 511425 [TUTCONT4 138.00] AMP 10633.8 -80.80
 512694 [CLEVLND7 345.00] AMP 14994.5 -86.34
 512729 [CLEVLND 4 138.00] AMP 16789.9 -85.59
 514642 [BRCKWND4 138.00] AMP 7472.7 -81.48
 514701 [BUNCHCK4 138.00] AMP 6653.1 -73.05
 514704 [MILLERT4 138.00] AMP 20603.4 -85.60
 514705 [COWCRK 2 69.000] AMP 4055.3 -86.76

514706 [COWCRK 4 138.00] AMP 11422.6 -83.00
 514707 [PERRY 4 138.00] AMP 11103.8 -83.29
 514708 [OTTER 4 138.00] AMP 9736.5 -82.42
 514709 [FRMNTAP4 138.00] AMP 18760.4 -83.14
 514710 [WUKOMI4 138.00] AMP 10393.9 -80.99
 514711 [WUKOTP4 138.00] AMP 16052.3 -82.00
 514712 [FAIRMON4 138.00] AMP 14362.7 -82.38
 514713 [WRVALLY4 138.00] AMP 8777.5 -82.14
 514714 [WOODRNG4 138.00] AMP 20145.4 -83.61
 514715 [WOODRNG7 345.00] AMP 22975.2 -85.15
 514718 [VANCE 2 69.000] AMP 7034.4 -72.17
 514721 [IMO 2 69.000] AMP 12008.0 -82.45
 514722 [CLEVETP2 69.000] AMP 11789.7 -81.98
 514727 [ENID 2 69.000] AMP 10932.6 -78.46
 514730 [SO4TH 2 69.000] AMP 13861.5 -82.49
 514731 [SO4TH 4 138.00] AMP 15740.2 -81.40
 514733 [MARSHL 4 138.00] AMP 8405.0 -80.81
 514734 [GLENWD 4 138.00] AMP 10435.8 -80.87
 514737 [OTOE 4 138.00] AMP 16392.1 -83.25
 514743 [OSAGE 4 138.00] AMP 17548.9 -81.85
 514774 [HENESEY4 138.00] AMP 8748.4 -80.45
 514789 [MENOTAP4 138.00] AMP 7148.0 -79.79
 514790 [IMO 4 138.00] AMP 12114.0 -80.94
 514798 [SNRPMPT4 138.00] AMP 20677.2 -85.58
 514799 [SNRPM 4 138.00] AMP 11338.7 -80.52
 514801 [MINCO 7 345.00] AMP 17398.3 -85.17
 514802 [SOONER 4 138.00] AMP 31956.6 -86.82
 514803 [SOONER 7 345.00] AMP 25585.5 -86.58
 514815 [BRECKNR4 138.00] AMP 14160.9 -81.06
 514819 [EL-RENO4 138.00] AMP 15377.5 -80.03
 514820 [JENSENT4 138.00] AMP 15307.9 -79.48
 514825 [KAYWIND7 345.00] AMP 12249.7 -86.76
 514827 [CTNWOOD4 138.00] AMP 17933.6 -80.81
 514828 [KETCHTP4 138.00] AMP 26568.7 -84.57
 514829 [PINE ST4 138.00] AMP 12220.9 -78.16
 514854 [BRADEN 4 138.00] AMP 31608.2 -85.19
 514863 [HAYMAKR4 138.00] AMP 26335.1 -82.46
 514864 [PIEDMNT4 138.00] AMP 22486.2 -84.48
 514873 [LNEOAK 4 138.00] AMP 27072.8 -84.60
 514879 [NORTWST4 138.00] AMP 44555.5 -86.03
 514880 [NORTWST7 345.00] AMP 33699.9 -86.02
 514881 [SPRNGCK7 345.00] AMP 26674.8 -85.54
 514894 [CZECHAL4 138.00] AMP 27793.3 -82.83
 514895 [SARA 4 138.00] AMP 18698.2 -84.07
 514898 [CIMARON4 138.00] AMP 43119.6 -85.03
 514901 [CIMARON7 345.00] AMP 33266.8 -85.92
 514907 [ARCADIA4 138.00] AMP 42122.3 -85.72
 514908 [ARCADIA7 345.00] AMP 26706.2 -86.53
 514909 [REBUD 7 345.00] AMP 25910.1 -86.81
 514933 [DRAPER 4 138.00] AMP 39105.7 -85.11
 514934 [DRAPER 7 345.00] AMP 20905.3 -85.06
 515006 [MORRISN4 138.00] AMP 14070.2 -83.08
 515011 [STILWTR4 138.00] AMP 14531.3 -80.68
 515045 [SEMINOL7 345.00] AMP 26575.9 -86.11
 515373 [LBRTYLK4 138.00] AMP 14029.2 -81.13
 515375 [WWRDEHV7 345.00] AMP 18943.6 -86.02
 515376 [WWRDEHV4 138.00] AMP 22701.9 -85.95
 515377 [CRESENT4 138.00] AMP 7971.4 -79.89
 515383 [ENIDINT4 138.00] AMP 13235.3 -81.02
 515407 [TATONGA7 345.00] AMP 15861.3 -86.52

515412 [DMNCRKT4 138.00] AMP	13964.5	-84.35
515444 [MCNOWND7 345.00] AMP	17345.8	-85.16
515447 [MORISNT4 138.00] AMP	14103.0	-83.09
515448 [CRSRDSW7 345.00] AMP	11069.9	-85.52
515456 [CHSTNTT2 69.000] AMP	11592.0	-79.61
515458 [BORDER 7345.00] AMP	5303.1	-86.15
515476 [HUNTERS7 345.00] AMP	17422.9	-84.91
515477 [CHSHLMV7 345.00] AMP	17388.7	-84.91
515497 [MATHWSN7 345.00] AMP	32601.2	-86.08
515543 [RENFROW7 345.00] AMP	14402.9	-84.79
515544 [RENFROW4 138.00] AMP	14500.1	-85.14
515546 [GRANTCO4 138.00] AMP	6450.5	-81.16
515549 [MNCWND37 345.00] AMP	11833.5	-84.87
515569 [MDFRDTP4 138.00] AMP	11524.9	-83.55
515576 [RANCHRD7 345.00] AMP	13195.6	-86.83
515582 [SLNGWND7 345.00] AMP	7217.1	-85.22
515585 [MAMTHPW7 345.00] AMP	12540.2	-85.98
515599 [G07621119-20345.00] AMP	12853.2	-85.53
515600 [KNGFSHR7 345.00] AMP	11372.7	-84.88
515605 [CANADN7 345.00] AMP	11763.2	-84.82
515610 [FSHRTAP7 345.00] AMP	16770.6	-85.10
515621 [OPENSKY7 345.00] AMP	12282.4	-86.79
515641 [PLNSMEN4 138.00] AMP	14199.3	-82.17
515646 [GRNTWD 7 345.00] AMP	12390.8	-84.69
515688 [FRNTWND7 345.00] AMP	10534.5	-85.73
515800 [GRACMNT7 345.00] AMP	16882.4	-85.46
515875 [REDNGTN7 345.00] AMP	24048.2	-85.13
515877 [REDDIRT7 345.00] AMP	23464.0	-85.03
515894 [THUNDER7 345.00] AMP	10591.0	-83.59
520409 [RENFROW4 138.00] AMP	10420.3	-83.23
520882 [DOVERSW4 138.00] AMP	9651.0	-80.29
521006 [MARSHAL4 138.00] AMP	8362.8	-80.75
521100 [WARREN 4 138.00] AMP	8777.5	-82.14
529200 [OMCDLEC7 345.00] AMP	13172.3	-86.83
532796 [WICHITA7 345.00] AMP	26227.4	-86.26
532798 [VIOLA 7 345.00] AMP	14672.1	-85.37
533075 [VIOLA 4 138.00] AMP	20642.1	-85.76
539801 [THISTLE7 345.00] AMP	16219.9	-85.70
560053 [G15-052T 345.00] AMP	13089.3	-86.53
560056 [G15-066T 345.00] AMP	18393.0	-86.59
560071 [G16-003-TAP 345.00] AMP	14688.2	-86.28
560077 [G16-032-TAP 345.00] AMP	4163.4	-80.92
560084 [G16-061-TAP 345.00] AMP	16829.1	-85.06
560086 [G16-072-TAP 345.00] AMP	14997.3	-84.84
584170 [GEN-2014-064138.00] AMP	9660.6	-82.39
584690 [GEN-2015-030345.00] AMP	19297.2	-85.97
584700 [GEN-2015-029345.00] AMP	9579.0	-84.59
584770 [GEN-2015-034345.00] AMP	11191.9	-86.39
585040 [GEN-2015-066345.00] AMP	18220.2	-86.56
587160 [GEN-2016-022345.00] AMP	10658.5	-86.37
587210 [GEN-2016-032138.00] AMP	8801.9	-81.54
587300 [G16-045-SUB1345.00] AMP	1558.0	-85.29
587304 [G16-045-SUB2345.00] AMP	1518.5	-85.34
587380 [G16-057-SUB1345.00] AMP	1534.8	-85.31
587384 [G16-057-SUB2345.00] AMP	1466.3	-85.40
587410 [GEN-2016-061345.00] AMP	16454.5	-85.02
587460 [GEN-2016-068345.00] AMP	6888.0	-84.90
587490 [GEN-2016-072345.00] AMP	11143.3	-84.14
587800 [GEN-2016-100345.00] AMP	12233.8	-84.79
587804 [G16-100-TAP 345.00] AMP	16477.3	-85.19

587950 [GEN-2016-119345.00] AMP	10307.3	-86.01
587955 [GEN2016-119B345.00] AMP	8883.2	-85.39
588190 [GEN-2016-128345.00] AMP	8516.4	-84.81
588364 [G16-153-TAP 345.00] AMP	7914.6	-85.66
917200 [GEN-2018-005345.00] AMP	22975.2	-85.15

GEN-2018-005 POI at Woodring 138 kV:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
CURRENTS FRI, AUG 24 2018 16:08
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X	/I+/ AN(I+)		
512694 [CLEVLND7 345.00] AMP	15107.6	-86.36	
514642 [BRCKWND4 138.00] AMP	7463.4	-81.50	
514701 [BUNCHCK4 138.00] AMP	6609.4	-73.10	
514704 [MILLERT4 138.00] AMP	20383.1	-85.56	
514705 [COWCRK 2 69.000] AMP	4051.7	-86.75	
514706 [COWCRK 4 138.00] AMP	11365.1	-83.00	
514707 [PERRY 4 138.00] AMP	11051.5	-83.29	
514708 [OTTER 4 138.00] AMP	9722.3	-82.43	
514709 [FRMNTAP4 138.00] AMP	18717.4	-83.16	
514710 [WAUKOMI4 138.00] AMP	10366.8	-80.99	
514711 [WAUKOTPA 138.00] AMP	16014.0	-82.02	
514712 [FAIRMONT4 138.00] AMP	14330.7	-82.41	
514713 [WRVALLY4 138.00] AMP	8752.9	-82.14	
514714 [WOODRNG4 138.00] AMP	20099.1	-83.63	
514715 [WOODRNG7 345.00] AMP	22956.1	-85.15	
514718 [VANCE 2 69.000] AMP	7030.7	-72.18	
514721 [IMO 2 69.000] AMP	11995.8	-82.47	
514722 [CLEVETP2 69.000] AMP	11778.2	-81.99	
514723 [CLEVLND2 69.000] AMP	9286.7	-80.28	
514725 [HEMLKTP2 69.000] AMP	11438.1	-79.55	
514726 [CHSTNUT2 69.000] AMP	11296.7	-79.46	
514727 [ENID 2 69.000] AMP	10923.1	-78.48	
514730 [SO4TH 2 69.000] AMP	13846.0	-82.50	
514731 [SO4TH 4 138.00] AMP	15703.1	-81.42	
514733 [MARSHL 4 138.00] AMP	8401.5	-80.81	
514734 [GLENWD 4 138.00] AMP	10418.2	-80.89	
514768 [WF KAY 2 69.000] AMP	2953.7	-81.29	

514769 [NE ENID4 138.00] AMP 10263.4 -80.96
 514774 [HENESEY4 138.00] AMP 8703.7 -80.41
 514789 [MENOTAP4 138.00] AMP 7137.6 -79.82
 514790 [IMO 4 138.00] AMP 12090.4 -80.96
 514798 [SNRPMPT4 138.00] AMP 20430.4 -85.53
 514801 [MINCO 7 345.00] AMP 17320.9 -85.16
 514802 [SOONER 4 138.00] AMP 31600.4 -86.78
 514803 [SOONER 7 345.00] AMP 25593.7 -86.58
 514815 [BRECKNR4 138.00] AMP 14125.2 -81.10
 514827 [CTNWOOD4 138.00] AMP 17955.5 -80.80
 514829 [PINE ST4 138.00] AMP 12229.7 -78.16
 514830 [FITZGRD4 138.00] AMP 9104.0 -77.13
 514831 [WATRLOO4 138.00] AMP 14461.3 -81.45
 514879 [NORTWST4 138.00] AMP 44865.1 -86.02
 514880 [NORTWST7 345.00] AMP 33800.7 -86.03
 514881 [SPRNGCK7 345.00] AMP 26716.9 -85.54
 514898 [CIMARON4 138.00] AMP 43427.3 -85.02
 514901 [CIMARON7 345.00] AMP 33335.7 -85.93
 514906 [JNSKAMO4 138.00] AMP 20790.9 -81.88
 514907 [ARCADIA4 138.00] AMP 42411.9 -85.68
 514908 [ARCADIA7 345.00] AMP 26597.1 -86.50
 514934 [DRAPER 7 345.00] AMP 20974.0 -85.07
 515006 [MORRISN4 138.00] AMP 13881.5 -83.04
 515373 [LBRTYLK4 138.00] AMP 14054.9 -81.12
 515375 [WWRDEHV7 345.00] AMP 18894.8 -86.03
 515377 [CRESENT4 138.00] AMP 7962.7 -79.88
 515383 [ENIDINT4 138.00] AMP 13204.4 -81.05
 515407 [TATONGA7 345.00] AMP 15851.2 -86.53
 515447 [MORISNT4 138.00] AMP 13913.0 -83.05
 515448 [CRSRDSW7 345.00] AMP 11065.0 -85.53
 515456 [CHSTNTT2 69.000] AMP 11581.1 -79.63
 515461 [RNDDBARN4 138.00] AMP 40267.4 -85.60
 515465 [LGARBER4 138.00] AMP 21378.6 -82.35
 515476 [HUNTERS7 345.00] AMP 17396.0 -84.91
 515477 [CHSHLMV7 345.00] AMP 17361.9 -84.91
 515493 [GOLTYTP2 69.000] AMP 3543.9 -68.20
 515497 [MATHWSN7 345.00] AMP 32654.4 -86.08
 515543 [RENFROW7 345.00] AMP 14346.5 -84.78
 515544 [RENFROW4 138.00] AMP 14468.6 -85.17
 515552 [NRTHSTR4 138.00] AMP 12685.7 -81.05
 515562 [CLEOPLT4 138.00] AMP 6464.7 -77.89
 515576 [RANCHRD7 345.00] AMP 13195.1 -86.83
 515582 [SLNGWND7 345.00] AMP 7215.2 -85.22
 515585 [MAMTHPW7 345.00] AMP 12534.0 -85.99
 515610 [FSHRTAP7 345.00] AMP 16786.1 -85.10
 515621 [OPENSKY7 345.00] AMP 12280.4 -86.79
 515635 [BLLNGTP4 138.00] AMP 6601.8 -73.07
 515641 [PLNSMEN4 138.00] AMP 14167.2 -82.19
 515646 [GRNTWD 7 345.00] AMP 12349.6 -84.69
 515688 [FRNTWND7 345.00] AMP 10534.2 -85.73
 515737 [ENIDIND4 138.00] AMP 9891.7 -80.78
 515875 [REDNGTN7 345.00] AMP 24051.5 -85.13
 515877 [REDDIRT7 345.00] AMP 23467.2 -85.03
 515894 [THUNDER7 345.00] AMP 10592.3 -83.59
 520603 [NKNGFSH 138.00] AMP 5960.2 -78.82
 520879 [DOVER 4 138.00] AMP 6593.1 -78.97
 520881 [DOVERSW2 69.000] AMP 6580.0 -83.24
 520882 [DOVERSW4 138.00] AMP 9574.9 -80.23
 521006 [MARSHAL4 138.00] AMP 8359.3 -80.75
 521016 [OKEENE 4 138.00] AMP 4970.8 -75.16

521073 [TWNLAKE4 138.00] AMP 7180.4 -79.55
 521100 [WARREN 4 138.00] AMP 8752.9 -82.14
 529200 [OMCDLEC7 345.00] AMP 13171.7 -86.83
 532798 [VIOLA 7 345.00] AMP 14431.1 -85.31
 560056 [G15-066T 345.00] AMP 18429.0 -86.59
 560077 [G16-032-TAP 345.00] AMP 4164.0 -80.92
 560084 [G16-061-TAP 345.00] AMP 16825.5 -85.06
 560086 [G16-072-TAP 345.00] AMP 14952.9 -84.83
 584170 [GEN-2014-064138.00] AMP 9646.7 -82.40
 584690 [GEN-2015-030345.00] AMP 19301.9 -85.97
 584700 [GEN-2015-029345.00] AMP 9575.4 -84.60
 584770 [GEN-2015-034345.00] AMP 11191.5 -86.39
 585040 [GEN-2015-066345.00] AMP 18255.5 -86.57
 587160 [GEN-2016-022345.00] AMP 10658.2 -86.37
 587210 [GEN-2016-032138.00] AMP 8802.9 -81.53
 587300 [G16-045-SUB1345.00] AMP 1558.0 -85.29
 587304 [G16-045-SUB2345.00] AMP 1518.5 -85.34
 587380 [G16-057-SUB1345.00] AMP 1534.9 -85.31
 587384 [G16-057-SUB2345.00] AMP 1466.4 -85.40
 587410 [GEN-2016-061345.00] AMP 16451.0 -85.02
 587460 [GEN-2016-068345.00] AMP 6886.5 -84.90
 587490 [GEN-2016-072345.00] AMP 11120.4 -84.14
 587800 [GEN-2016-100345.00] AMP 12236.9 -84.79
 587804 [G16-100-TAP 345.00] AMP 16483.2 -85.18
 587940 [GEN-2016-118138.00] AMP 7352.5 -83.26
 587950 [GEN-2016-119345.00] AMP 10309.1 -86.01
 588190 [GEN-2016-128345.00] AMP 8513.9 -84.81
 917200 [GEN-2018-005138.00] AMP 20099.1 -83.63

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+ AN(I+)
 512694 [CLEVLND7 345.00] AMP 14994.5 -86.34
 514642 [BRCKWND4 138.00] AMP 7472.7 -81.48
 514701 [BUNCHCK4 138.00] AMP 6653.2 -73.05
 514704 [MILLERT4 138.00] AMP 20603.4 -85.60
 514705 [COWCRK 2 69.000] AMP 4055.3 -86.76
 514706 [COWCRK 4 138.00] AMP 11422.6 -83.00

514707 [PERRY 4 138.00] AMP 11103.8 -83.29
 514708 [OTTER 4 138.00] AMP 9736.5 -82.42
 514709 [FRMNTAP4 138.00] AMP 18760.6 -83.14
 514710 [WAUKOMI4 138.00] AMP 10393.9 -80.99
 514711 [WAUKOTPA 138.00] AMP 16052.4 -82.00
 514712 [FAIRMON4 138.00] AMP 14362.8 -82.38
 514713 [WRVALLY4 138.00] AMP 8777.6 -82.14
 514714 [WOODRNG4 138.00] AMP 20145.7 -83.61
 514715 [WOODRNG7 345.00] AMP 22975.1 -85.15
 514718 [VANCE 2 69.000] AMP 7034.4 -72.17
 514721 [IMO 2 69.000] AMP 12008.0 -82.45
 514722 [CLEVETP2 69.000] AMP 11789.7 -81.98
 514723 [CLEVLND2 69.000] AMP 9293.8 -80.27
 514725 [HEMLKTP2 69.000] AMP 11448.7 -79.54
 514726 [CHSTNUT2 69.000] AMP 11307.1 -79.45
 514727 [ENID 2 69.000] AMP 10932.7 -78.46
 514730 [SO4TH 2 69.000] AMP 13861.6 -82.49
 514731 [SO4TH 4 138.00] AMP 15740.3 -81.40
 514733 [MARSHL 4 138.00] AMP 8405.0 -80.81
 514734 [GLENWD 4 138.00] AMP 10435.9 -80.87
 514768 [WF KAY 2 69.000] AMP 2955.6 -81.29
 514769 [NE ENID4 138.00] AMP 10281.3 -80.94
 514774 [HENESEY4 138.00] AMP 8748.4 -80.45
 514789 [MENOTAP4 138.00] AMP 7148.0 -79.79
 514790 [IMO 4 138.00] AMP 12114.0 -80.94
 514798 [SNRPMPT4 138.00] AMP 20677.2 -85.58
 514801 [MINCO 7 345.00] AMP 17398.3 -85.17
 514802 [SOONER 4 138.00] AMP 31956.6 -86.82
 514803 [SOONER 7 345.00] AMP 25585.5 -86.58
 514815 [BRECKNR4 138.00] AMP 14160.9 -81.06
 514827 [CTNWOOD4 138.00] AMP 17933.6 -80.81
 514829 [PINE ST4 138.00] AMP 12220.9 -78.16
 514830 [FITZGRD4 138.00] AMP 9101.3 -77.12
 514831 [WATRLOO4 138.00] AMP 14427.3 -81.46
 514879 [NORTWST4 138.00] AMP 44555.5 -86.03
 514880 [NORTWST7 345.00] AMP 33699.9 -86.02
 514881 [SPRNGCK7 345.00] AMP 26674.8 -85.54
 514898 [CIMARON4 138.00] AMP 43119.6 -85.03
 514901 [CIMARON7 345.00] AMP 33266.8 -85.92
 514906 [JNSKAMO4 138.00] AMP 20510.0 -81.90
 514907 [ARCADIA4 138.00] AMP 42122.3 -85.72
 514908 [ARCADIA7 345.00] AMP 26706.2 -86.53
 514934 [DRAPER 7 345.00] AMP 20905.3 -85.06
 515006 [MORRISN4 138.00] AMP 14070.2 -83.08
 515373 [LBRTYLK4 138.00] AMP 14029.2 -81.13
 515375 [WWRDEHV7 345.00] AMP 18943.6 -86.02
 515377 [CRESENT4 138.00] AMP 7971.4 -79.89
 515383 [ENIDINT4 138.00] AMP 13235.4 -81.02
 515407 [TATONGA7 345.00] AMP 15861.3 -86.52
 515447 [MORISNT4 138.00] AMP 14103.0 -83.09
 515448 [CRSRDSW7 345.00] AMP 11069.9 -85.52
 515456 [CHSTNTT2 69.000] AMP 11592.0 -79.61
 515461 [RNDBARN4 138.00] AMP 40002.1 -85.64
 515465 [LGARBER4 138.00] AMP 21212.6 -82.36
 515476 [HUNTERS7 345.00] AMP 17422.9 -84.91
 515477 [CHSHLMV7 345.00] AMP 17388.7 -84.91
 515493 [GOLTYTP2 69.000] AMP 3545.6 -68.19
 515497 [MATHWSN7 345.00] AMP 32601.2 -86.08
 515543 [RENFROW7 345.00] AMP 14402.9 -84.79
 515544 [RENFROW4 138.00] AMP 14500.1 -85.14

515552 [NRTHSTR4 138.00] AMP 12714.2 -81.02
 515562 [CLEOPLT4 138.00] AMP 6478.1 -77.84
 515576 [RANCHRD7 345.00] AMP 13195.6 -86.83
 515582 [SLNGWND7 345.00] AMP 7217.1 -85.22
 515585 [MAMTHPW7 345.00] AMP 12540.2 -85.98
 515610 [FSHRTAP7 345.00] AMP 16770.6 -85.10
 515621 [OPENSKY7 345.00] AMP 12282.4 -86.79
 515635 [BLLNGTP4 138.00] AMP 6647.7 -73.02
 515641 [PLNSMEN4 138.00] AMP 14199.4 -82.17
 515646 [GRNTWD 7 345.00] AMP 12390.8 -84.69
 515688 [FRNTWND7 345.00] AMP 10534.5 -85.73
 515737 [ENIDIND4 138.00] AMP 9909.0 -80.75
 515875 [REDNGTN7 345.00] AMP 24048.1 -85.13
 515877 [REDDIRT7 345.00] AMP 23464.0 -85.03
 515894 [THUNDER7 345.00] AMP 10591.0 -83.59
 520603 [NKNGFSH 138.00] AMP 5985.6 -78.85
 520879 [DOVER 4 138.00] AMP 6617.4 -78.99
 520881 [DOVERSW2 69.000] AMP 6744.3 -83.29
 520882 [DOVERSW4 138.00] AMP 9651.0 -80.29
 521006 [MARSHAL4 138.00] AMP 8362.8 -80.75
 521016 [OKEENE 4 138.00] AMP 5003.7 -75.23
 521073 [TWNLAKE4 138.00] AMP 7195.9 -79.56
 521100 [WARREN 4 138.00] AMP 8777.6 -82.14
 529200 [OMCDLEC7 345.00] AMP 13172.3 -86.83
 532798 [VIOLA 7 345.00] AMP 14672.1 -85.37
 560056 [G15-066T 345.00] AMP 18393.0 -86.59
 560077 [G16-032-TAP 345.00] AMP 4163.4 -80.92
 560084 [G16-061-TAP 345.00] AMP 16829.1 -85.06
 560086 [G16-072-TAP 345.00] AMP 14997.3 -84.84
 584170 [GEN-2014-064138.00] AMP 9660.6 -82.39
 584690 [GEN-2015-030345.00] AMP 19297.2 -85.97
 584700 [GEN-2015-029345.00] AMP 9579.0 -84.59
 584770 [GEN-2015-034345.00] AMP 11191.9 -86.39
 585040 [GEN-2015-066345.00] AMP 18220.2 -86.56
 587160 [GEN-2016-022345.00] AMP 10658.5 -86.37
 587210 [GEN-2016-032138.00] AMP 8802.0 -81.54
 587300 [G16-045-SUB1345.00] AMP 1558.0 -85.29
 587304 [G16-045-SUB2345.00] AMP 1518.5 -85.34
 587380 [G16-057-SUB1345.00] AMP 1534.8 -85.31
 587384 [G16-057-SUB2345.00] AMP 1466.3 -85.40
 587410 [GEN-2016-061345.00] AMP 16454.5 -85.02
 587460 [GEN-2016-068345.00] AMP 6888.0 -84.90
 587490 [GEN-2016-072345.00] AMP 11143.3 -84.14
 587800 [GEN-2016-100345.00] AMP 12233.8 -84.79
 587804 [G16-100-TAP 345.00] AMP 16477.3 -85.19
 587940 [GEN-2016-118138.00] AMP 7384.2 -83.30
 587950 [GEN-2016-119345.00] AMP 10307.3 -86.01
 588190 [GEN-2016-128345.00] AMP 8516.4 -84.81
 917200 [GEN-2018-005138.00] AMP 20145.7 -83.61

GEN-2018-006 POI at Monet 161 kV:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2018S WITH MMWG 2017S

OPTIONS USED:
 - SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00
 PU AT 0 PHASE SHIFT ANGLE

- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE
 POWER OUTPUTS TO P=0.0, Q=0.0
 - SET GENERATOR POSITIVE SEQUENCE
 REACTANCES TO SUBTRANSIENT
 - SET TRANSFORMER TAP RATIOS=1.0 PU AND
 PHASE SHIFT ANGLES=0.0
 - SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
 - SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND
 TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN
 +/-0 SEQUENCES
 - SET LOAD=0.0 IN +/- SEQUENCES
 - DC LINES AND FACTS DEVICES BLOCKED
 - IMPEDANCE CORRECTIONS APPLIED TO
 TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+/ AN(I+)
 300045 [7MORGAN 345.00] AMP 10846.0 -84.33
 300089 [5JAMESV 161.00] AMP 15838.9 -81.63
 300095 [5MANSFD 161.00] AMP 8891.8 -77.62
 300101 [5MORGAN 161.00] AMP 9936.8 -77.59
 300129 [5WASHBRN 161.00] AMP 7724.4 -80.96
 300348 [5BTLFD 161.00] AMP 22342.1 -83.47
 300649 [2JASPER 69.000] AMP 4720.6 -66.53
 300651 [2LAMR 69.000] AMP 9535.2 -75.54
 300653 [2MEDOC 69.000] AMP 2375.9 -60.72
 300657 [2ASHGRV 69.000] AMP 3823.9 -59.59
 300658 [2BILLNG 69.000] AMP 6324.8 -63.09
 300659 [2BOWRML 69.000] AMP 5801.4 -59.98
 300660 [2BRNSPG 69.000] AMP 3313.1 -58.96
 300665 [2CLEVER 69.000] AMP 3884.8 -59.54
 300667 [2CRANE 69.000] AMP 3022.3 -59.45
 300669 [2ELWOOD 69.000] AMP 5159.7 -62.18
 300670 [2EPURDY 69.000] AMP 3405.2 -62.31
 300673 [2JAMESV 69.000] AMP 11696.4 -79.31
 300677 [2MTVRN 69.000] AMP 7899.3 -69.28
 300678 [5NIXA-1 161.00] AMP 19256.6 -82.42
 300679 [2PRDYTP 69.000] AMP 4814.3 -65.40
 300680 [2VERONA 69.000] AMP 6098.4 -71.94
 300681 [2BUTRFLD 69.000] AMP 4801.5 -64.53
 300684 [2MIDWYTP 69.000] AMP 7766.3 -68.77
 300718 [5CLEVCOV 161.00] AMP 11565.7 -81.27
 300719 [5COMPTN 161.00] AMP 10929.3 -81.12
 300720 [2GRTNA 69.000] AMP 5201.8 -71.23
 300722 [2LAKE-K 69.000] AMP 9649.0 -75.17
 300725 [2REEDSP 69.000] AMP 9606.1 -77.66
 300726 [5RIVRDL 161.00] AMP 11294.3 -80.80
 300744 [2DMNDGR 69.000] AMP 2501.2 -58.04
 300745 [2DMNDTP 69.000] AMP 5425.7 -61.72
 300748 [2NEOSAC 69.000] AMP 9754.4 -78.15
 300750 [2NEOSHO 69.000] AMP 8376.8 -70.65
 300751 [2REEDS 69.000] AMP 6348.3 -62.43
 300753 [2SIMS 69.000] AMP 3521.8 -69.93
 300758 [2SWTWT 69.000] AMP 4112.1 -67.99
 300762 [2WNTWRT 69.000] AMP 4598.8 -60.23
 300763 [2WASHBRN 69.000] AMP 6423.8 -77.44
 300782 [2MORGAN 69.000] AMP 6264.4 -74.50
 300823 [2NCASVL 69.000] AMP 5310.7 -66.09
 300824 [2SELIGM 69.000] AMP 5846.8 -74.60
 301161 [5LOGAN 161.00] AMP 14285.4 -80.93

338099 [5GRANDVIEW% 161.00] AMP 8468.4 -81.17
 504000 [AVOCA 5 161.00] AMP 8693.9 -83.11
 505472 [TABLE R5 161.00] AMP 14234.0 -81.49
 505474 [TABLE R2 69.000] AMP 11392.7 -82.46
 505480 [BEAVER 5 161.00] AMP 10116.8 -82.35
 505486 [NEO SPA5 161.00] AMP 14958.5 -81.18
 505488 [CARTHAG5 161.00] AMP 15709.4 -80.51
 505490 [CARTHG 2 69.000] AMP 14375.9 -79.97
 505492 [SPRGFLD5 161.00] AMP 27789.8 -83.76
 505494 [SPRGFLD2 69.000] AMP 15621.8 -85.41
 505496 [NIXA 5 161.00] AMP 12401.3 -81.88
 505498 [STOCKTN5 161.00] AMP 8366.4 -77.81
 505501 [NIXA 2 69.000] AMP 9795.7 -82.80
 505543 [NX ESPY2 69.000] AMP 9634.7 -81.52
 506932 [EUREKA 5 161.00] AMP 8968.7 -81.44
 506935 [FLINTCR7 345.00] AMP 14642.3 -86.24
 510411 [GROVE 5 161.00] AMP 5583.4 -80.69
 532937 [NEOSHO 5 161.00] AMP 20933.4 -84.24
 547400 [MON376]2 69.000] AMP 3884.4 -69.80
 547401 [MON376 2 69.000] AMP 6255.7 -71.80
 547402 [MON416]2 69.000] AMP 3425.8 -65.73
 547403 [MON416 2 69.000] AMP 3337.7 -65.75
 547404 [PUR390 2 69.000] AMP 1705.3 -51.59
 547405 [MON352]2 69.000] AMP 7375.6 -72.78
 547406 [MON352 2 69.000] AMP 7091.5 -72.55
 547407 [MON311]2 69.000] AMP 6333.6 -71.88
 547408 [MON311 2 69.000] AMP 6255.7 -71.80
 547430 [SAR362 2 69.000] AMP 1926.5 -64.51
 547436 [CUPTAP 2 69.000] AMP 5487.7 -67.77
 547438 [EXP449T2 69.000] AMP 8441.6 -67.50
 547439 [EXP4492 69.000] AMP 7035.7 -65.33
 547449 [PRC460 2 69.000] AMP 5410.7 -62.88
 547459 [WWR477 161.00] AMP 21928.4 -83.84
 547462 [SVRCK469 5 161.00] AMP 13877.0 -82.41
 547463 [KOD471 2 69.000] AMP 11331.7 -75.47
 547464 [BOL 73 5 161.00] AMP 4027.5 -76.81
 547466 [ATL109 5 161.00] AMP 15605.4 -80.98
 547467 [ORO110 5 161.00] AMP 18914.5 -82.05
 547468 [AUR124 5 161.00] AMP 9392.9 -78.32
 547469 [RIV4525 161.00] AMP 23375.9 -83.36
 547470 [JOP145 5 161.00] AMP 17193.9 -82.25
 547471 [NEO184 5 161.00] AMP 13798.8 -80.89
 547472 [TIP292 5 161.00] AMP 16972.3 -82.33
 547473 [RDS295 5 161.00] AMP 7382.8 -76.78
 547475 [BRN331 5 161.00] AMP 9196.0 -78.42
 547476 [ASB349 5 161.00] AMP 11715.9 -82.44
 547478 [DAD368 5 161.00] AMP 9761.2 -77.51
 547479 [LAR382 5 161.00] AMP 12500.3 -80.68
 547480 [MON383 5 161.00] AMP 10796.6 -79.71
 547483 [JOP389 5 161.00] AMP 19473.3 -83.21
 547484 [DEC392 5 161.00] AMP 14812.6 -82.59
 547485 [CAR395 5 161.00] AMP 11888.6 -80.75
 547487 [HOC404 5 161.00] AMP 12847.7 -81.27
 547488 [BRN412 5 161.00] AMP 9481.5 -78.71
 547491 [PUR421 5 161.00] AMP 9541.8 -81.30
 547492 [RDS424 5 161.00] AMP 7945.6 -77.23
 547493 [BOL431 5 161.00] AMP 4776.5 -77.48
 547494 [OAK432 5 161.00] AMP 17144.6 -81.31
 547495 [GRT433 5 161.00] AMP 9445.0 -79.37

547496 [NOL435 5 161.00] AMP 9613.0 -80.85
 547497 [RVS438 5 161.00] AMP 11584.7 -80.48
 547498 [STL439 5 161.00] AMP 24039.0 -84.11
 547499 [CPK446 5 161.00] AMP 7293.8 -78.13
 547500 [RNM393 5 161.00] AMP 13854.5 -82.06
 547503 [RIV452T 5 161.00] AMP 22972.5 -83.44
 547525 [JOP 59 2 69.000] AMP 13861.4 -76.29
 547532 [CAR108 2 69.000] AMP 8089.6 -56.75
 547533 [ATL109 2 69.000] AMP 20166.4 -78.24
 547536 [ASH121 2 69.000] AMP 6854.2 -69.29
 547537 [AUR124 2 69.000] AMP 11298.4 -75.57
 547538 [DIA131 2 69.000] AMP 4995.8 -70.61
 547539 [JOP145 2 69.000] AMP 20538.6 -78.39
 547540 [MON152 2 69.000] AMP 10126.2 -74.45
 547541 [RIV167 2 69.000] AMP 16922.9 -76.10
 547543 [NEO184 2 69.000] AMP 11401.4 -76.48
 547544 [WEN205 2 69.000] AMP 4294.7 -61.73
 547545 [FRP217 2 69.000] AMP 4137.1 -63.52
 547546 [BIL221 2 69.000] AMP 6727.6 -62.22
 547551 [GAT258 2 69.000] AMP 10629.7 -72.34
 547556 [OAK280 2 69.000] AMP 15421.3 -77.40
 547559 [TIP292 2 69.000] AMP 9458.1 -71.41
 547560 [ROC296 2 69.000] AMP 8556.4 -72.76
 547563 [LIN314 2 69.000] AMP 9708.9 -73.99
 547564 [SOL315 2 69.000] AMP 13750.7 -74.24
 547565 [SOL315T2 69.000] AMP 19858.5 -78.01
 547566 [AND322 2 69.000] AMP 5507.0 -70.46
 547571 [NEO332 2 69.000] AMP 7630.9 -70.61
 547577 [MTV351 2 69.000] AMP 6632.0 -67.56
 547578 [AUR355 2 69.000] AMP 8712.9 -72.24
 547580 [REP359 2 69.000] AMP 5585.6 -62.63
 547581 [JOP360 2 69.000] AMP 13340.1 -74.31
 547582 [SAR362T2 69.000] AMP 4172.9 -62.44
 547585 [DAD368 2 69.000] AMP 8529.6 -74.66
 547589 [RAC375 2 69.000] AMP 5931.7 -62.43
 547591 [MON383 2 69.000] AMP 11645.7 -76.50
 547592 [JOP389 2 69.000] AMP 13932.6 -79.27
 547593 [JOP391 5 161.00] AMP 13027.9 -82.10
 547595 [RNM393 2 69.000] AMP 17874.2 -77.16
 547606 [MTV420 2 69.000] AMP 6566.9 -67.85
 547607 [JOP422 5 161.00] AMP 12877.8 -82.18
 547608 [JOP430 2 69.000] AMP 12717.6 -76.90
 547610 [NOL435 2 69.000] AMP 8118.4 -77.44
 547611 [MAR437 2 69.000] AMP 5253.8 -60.93
 547618 [CPK446 2 69.000] AMP 8896.9 -73.03
 547685 [PLB447 2 69.000] AMP 11064.2 -72.73
 549911 [GOLDEN 269.000] AMP 20539.7 -80.31
 549913 [DAYTON 269.000] AMP 19508.3 -80.22
 549918 [MILL 269.000] AMP 22855.4 -81.15
 549921 [MAIN STREET269.000] AMP 25864.2 -82.37
 549954 [JTEC 5161.00] AMP 27976.5 -84.45
 549955 [JUNCTION 5161.00] AMP 20882.9 -83.23
 549956 [NICHOLS 5161.00] AMP 19017.6 -83.01
 549957 [WEST BELT 5161.00] AMP 18784.3 -83.01
 549958 [MAIN STREET5161.00] AMP 19059.8 -83.02
 549959 [BATTLEFIELD5161.00] AMP 27151.5 -83.65
 549960 [SW DISP PLT5161.00] AMP 26077.3 -83.92
 549961 [JAMES RIVERS161.00] AMP 16086.2 -83.75
 549962 [MILL 5161.00] AMP 15693.6 -82.00
 549963 [MENTOR 5161.00] AMP 14964.8 -82.11

549968 [MC CARTNEY 5161.00] AMP 14160.1 -81.82
 549969 [BROOKLINE 5161.00] AMP 28857.3 -84.26
 549970 [CLAY 5161.00] AMP 18435.3 -81.75
 549971 [PIC WEST 5161.00] AMP 17005.7 -82.83
 549979 [BATTLEFIELD269.000] AMP 20929.0 -81.07
 549984 [BROOKLINE 7345.00] AMP 11080.0 -85.22
 917210 [GEN-2018-006161.00] AMP 10796.6 -79.71

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2026S WITH MMWG 2026S

OPTIONS USED:
 - SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00
 PU AT 0 PHASE SHIFT ANGLE
 - SET SYNCHRONOUS/ASYNCHRONOUS MACHINE
 POWER OUTPUTS TO P=0.0, Q=0.0
 - SET GENERATOR POSITIVE SEQUENCE
 REACTANCES TO SUBTRANSIENT
 - SET TRANSFORMER TAP RATIOS=1.0 PU AND
 PHASE SHIFT ANGLES=0.0
 - SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
 - SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND
 TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN
 +/-0 SEQUENCES
 - SET LOAD=0.0 IN +/- SEQUENCES
 - DC LINES AND FACTS DEVICES BLOCKED
 - IMPEDANCE CORRECTIONS APPLIED TO
 TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT
 X----- BUS -----X /I+/ AN(I+)
 300045 [7MORGAN 345.00] AMP 10883.5 -84.33
 300089 [5JAMESV 161.00] AMP 15939.0 -81.62
 300095 [5MANSFD 161.00] AMP 9020.2 -77.62
 300101 [5MORGAN 161.00] AMP 9937.2 -77.57
 300129 [5WASHBRN 161.00] AMP 7772.7 -80.95
 300348 [5BTLFD 161.00] AMP 22526.0 -83.47
 300649 [2JASPER 69.000] AMP 4720.2 -66.52
 300651 [2LAMR 69.000] AMP 9529.3 -75.54
 300653 [2MEDOC 69.000] AMP 2375.8 -60.72
 300657 [2ASHGRV 69.000] AMP 3826.0 -59.58
 300658 [2BILLNG 69.000] AMP 6327.6 -63.08
 300659 [2BOWRML 69.000] AMP 5802.3 -59.98
 300660 [2BRNSPG 69.000] AMP 3313.9 -58.95
 300665 [2CLEVER 69.000] AMP 3885.9 -59.53
 300667 [2CRANE 69.000] AMP 3022.9 -59.44
 300669 [2ELWOOD 69.000] AMP 5163.9 -62.17
 300670 [2EPURDY 69.000] AMP 3406.3 -62.30
 300673 [2JAMESV 69.000] AMP 11723.5 -79.31
 300677 [2MTVRN 69.000] AMP 7902.8 -69.27
 300678 [5NIXA-1 161.00] AMP 19411.4 -82.42
 300679 [2PRDYTP 69.000] AMP 4816.4 -65.39
 300680 [2VERONA 69.000] AMP 6101.4 -71.93
 300681 [2BUTRFLD 69.000] AMP 4804.1 -64.52
 300684 [2MIDWYTP 69.000] AMP 7769.6 -68.76
 300718 [5CLEVCOV 161.00] AMP 11607.0 -81.25
 300719 [5COMPTN 161.00] AMP 10965.6 -81.10
 300720 [2GRTNA 69.000] AMP 5205.5 -71.21

300722 [2LAKE-K 69.000] AMP	9661.1	-75.15	547473 [RDS295 5 161.00] AMP	7395.6	-76.76
300725 [2REEDSP 69.000] AMP	9617.9	-77.64	547475 [BRN331 5 161.00] AMP	9219.2	-78.39
300726 [5RIVRDL 161.00] AMP	11342.3	-80.79	547476 [ASB349 5 161.00] AMP	11728.6	-82.45
300744 [2DMNDGR 69.000] AMP	2501.5	-58.04	547478 [DAD368 5 161.00] AMP	9762.2	-77.49
300745 [2DMNDTP 69.000] AMP	5427.0	-61.72	547479 [LAR382 5 161.00] AMP	12517.3	-80.66
300748 [2NEOSAC 69.000] AMP	9765.2	-78.15	547480 [MON383 5 161.00] AMP	10811.8	-79.69
300750 [2NEOSHO 69.000] AMP	8383.7	-70.64	547483 [JOP389 5 161.00] AMP	19504.9	-83.20
300751 [2REEDS 69.000] AMP	6349.6	-62.43	547484 [DEC392 5 161.00] AMP	15299.0	-82.49
300753 [2SIMS 69.000] AMP	3524.2	-69.93	547485 [CAR395 5 161.00] AMP	11901.8	-80.74
300758 [2SWTWT 69.000] AMP	4114.1	-67.98	547487 [HOC404 5 161.00] AMP	12854.7	-81.27
300762 [2WNTWRT 69.000] AMP	4599.9	-60.23	547488 [BRN412 5 161.00] AMP	9506.0	-78.68
300763 [2WASHBRN 69.000] AMP	6433.2	-77.44	547491 [PUR421 5 161.00] AMP	9549.7	-81.30
300782 [2MORGAN 69.000] AMP	6265.1	-74.50	547492 [RDS424 5 161.00] AMP	7961.3	-77.20
300823 [2NCASVL 69.000] AMP	5314.4	-66.08	547493 [BOL431 5 161.00] AMP	4777.6	-77.47
300824 [2SELIGM 69.000] AMP	5853.9	-74.60	547494 [OAK432 5 161.00] AMP	17164.5	-81.30
301161 [5LOGAN 161.00] AMP	14454.2	-80.96	547495 [GRT433 5 161.00] AMP	9469.7	-79.34
338099 [5GRANDVIEW% 161.00] AMP	8514.0	-81.15	547496 [NOL435 5 161.00] AMP	9707.0	-80.80
504000 [AVOCA 5 161.00] AMP	8892.2	-83.22	547497 [RVS438 5 161.00] AMP	11623.4	-80.45
505472 [TABLE R5 161.00] AMP	14294.4	-81.46	547498 [STL439 5 161.00] AMP	24069.3	-84.10
505474 [TABLE R2 69.000] AMP	11411.3	-82.45	547499 [CPK446 5 161.00] AMP	7299.8	-78.11
505480 [BEAVER 5 161.00] AMP	10231.4	-82.35	547500 [RNM393 5 161.00] AMP	13880.1	-82.05
505486 [NEO SPA5 161.00] AMP	15019.7	-81.16	547503 [RIV452T 5 161.00] AMP	23018.7	-83.41
505488 [CARTHAG5 161.00] AMP	15734.0	-80.50	547525 [JOP 59 2 69.000] AMP	13898.5	-76.25
505490 [CARTHG 2 69.000] AMP	14383.2	-79.97	547532 [CAR108 2 69.000] AMP	8095.1	-56.72
505492 [SPRGFLD5 161.00] AMP	28122.8	-83.78	547533 [ATL109 2 69.000] AMP	20217.9	-78.19
505494 [SPRGFLD2 69.000] AMP	15665.8	-85.42	547536 [ASH121 2 69.000] AMP	6858.0	-69.28
505496 [NIXA 5 161.00] AMP	12460.5	-81.87	547537 [AUR124 2 69.000] AMP	11306.3	-75.55
505498 [STOCKTN5 161.00] AMP	8322.3	-77.78	547538 [DIA131 2 69.000] AMP	4999.3	-70.60
505501 [NIXA 2 69.000] AMP	9811.5	-82.79	547539 [JOP145 2 69.000] AMP	20701.8	-78.28
505543 [NX ESPY2 69.000] AMP	9649.9	-81.52	547540 [MON152 2 69.000] AMP	10132.7	-74.44
506932 [EUREKA 5 161.00] AMP	9032.7	-81.43	547541 [RIV167 2 69.000] AMP	17920.1	-76.76
506935 [FLINTCR7 345.000] AMP	15497.8	-86.35	547543 [NEO184 2 69.000] AMP	11419.6	-76.46
510411 [GROVE 5 161.00] AMP	5609.4	-80.66	547544 [WEN205 2 69.000] AMP	4296.2	-61.72
532937 [NEOSHO 5 161.00] AMP	20855.5	-84.22	547545 [FRP217 2 69.000] AMP	4137.7	-63.52
547400 [MON376]2 69.000] AMP	3885.3	-69.80	547546 [BIL221 2 69.000] AMP	6731.1	-62.20
547401 [MON376 2 69.000] AMP	6258.2	-71.79	547551 [GAT258 2 69.000] AMP	10700.7	-72.30
547402 [MON416]2 69.000] AMP	3426.5	-65.73	547556 [OAK280 2 69.000] AMP	15456.2	-77.36
547403 [MON416 2 69.000] AMP	3338.4	-65.74	547559 [TIP292 2 69.000] AMP	9472.7	-71.38
547404 [PUR390 2 69.000] AMP	1705.4	-51.58	547560 [ROC296 2 69.000] AMP	8566.3	-72.74
547405 [MON352]2 69.000] AMP	7379.0	-72.77	547563 [LIN314 2 69.000] AMP	9721.6	-73.97
547406 [MON352 2 69.000] AMP	7094.6	-72.54	547564 [SOL315 2 69.000] AMP	13774.0	-74.20
547407 [MON311]2 69.000] AMP	6336.1	-71.88	547565 [SOL315T2 69.000] AMP	19908.3	-77.96
547408 [MON311 2 69.000] AMP	6258.2	-71.79	547566 [AND322 2 69.000] AMP	5515.2	-70.43
547430 [SAR362 2 69.000] AMP	1926.9	-64.51	547571 [NEO332 2 69.000] AMP	7639.4	-70.59
547436 [CUPTAP 2 69.000] AMP	5487.9	-67.77	547577 [MTV351 2 69.000] AMP	6634.4	-67.56
547438 [EXP449T2 69.000] AMP	8447.4	-67.48	547578 [AUR355 2 69.000] AMP	8717.5	-72.23
547439 [EXP4492 69.000] AMP	7039.6	-65.31	547580 [REP359 2 69.000] AMP	5588.5	-62.62
547449 [PRC460 2 69.000] AMP	5412.6	-62.87	547581 [JOP360 2 69.000] AMP	13370.0	-74.27
547459 [WWR477 161.00] AMP	21953.6	-83.82	547582 [SAR362T2 69.000] AMP	4174.5	-62.43
547462 [SVRCK469 5 161.00] AMP	13896.0	-82.40	547585 [DAD368 2 69.000] AMP	8531.4	-74.65
547463 [KOD471 2 69.000] AMP	11355.3	-75.44	547589 [RAC375 2 69.000] AMP	5934.8	-62.41
547464 [BOL 73 5 161.00] AMP	4028.6	-76.80	547591 [MON383 2 69.000] AMP	11654.3	-76.48
547466 [ATL109 5 161.00] AMP	15625.2	-80.97	547592 [JOP389 2 69.000] AMP	13948.8	-79.25
547467 [ORO110 5 161.00] AMP	18936.7	-82.04	547593 [JOP391 5 161.00] AMP	13048.8	-82.08
547468 [AUR124 5 161.00] AMP	9405.5	-78.30	547595 [RNM393 2 69.000] AMP	17936.6	-77.12
547469 [RIV4525 161.00] AMP	23424.3	-83.33	547606 [MTV420 2 69.000] AMP	6569.2	-67.84
547470 [JOP145 5 161.00] AMP	17213.8	-82.24	547607 [JOP422 5 161.00] AMP	12896.3	-82.17
547471 [NEO184 5 161.00] AMP	13857.2	-80.86	547608 [JOP430 2 69.000] AMP	12741.7	-76.87
547472 [TIP292 5 161.00] AMP	17012.0	-82.31	547610 [NOL435 2 69.000] AMP	8146.1	-77.41
			547611 [MAR437 2 69.000] AMP	5255.6	-60.92

547618 [CPK446 2 69.000] AMP 8901.4 -73.02
 547685 [PLB447 2 69.000] AMP 11131.7 -72.69
 549911 [GOLDEN 269.000] AMP 20619.1 -80.30
 549913 [DAYTON 269.000] AMP 19580.5 -80.21
 549918 [MILL 269.000] AMP 23040.2 -81.20
 549921 [MAIN STREET269.000] AMP 26033.5 -82.39
 549954 [JTEC 5161.00] AMP 28263.4 -84.46
 549955 [JUNCTION 5161.00] AMP 21122.7 -83.26
 549956 [NICHOLS 5161.00] AMP 19205.6 -83.03
 549957 [WEST BELT 5161.00] AMP 18964.6 -83.03
 549958 [MAIN STREET5161.00] AMP 19242.2 -83.05
 549959 [BATTLEFIELD5161.00] AMP 27468.1 -83.67
 549960 [SW DISP PLT5161.00] AMP 26334.6 -83.93
 549961 [JAMES RIVER5161.00] AMP 16198.5 -83.76
 549962 [MILL 5161.00] AMP 16024.4 -82.10
 549963 [MENTOR 5161.00] AMP 15117.5 -82.14
 549968 [MC CARTNEY 5161.00] AMP 14717.5 -82.09
 549969 [BROOKLINE 5161.00] AMP 29191.4 -84.28
 549970 [CLAY 5161.00] AMP 18719.1 -81.81
 549971 [PIC WEST 5161.00] AMP 17203.0 -82.86
 549979 [BATTLEFIELD269.000] AMP 21011.7 -81.07
 549984 [BROOKLINE 7345.00] AMP 11160.6 -85.23
 917210 [GEN-2018-006161.00] AMP 10811.8 -79.69

300670 [2EPURDY 69.000] AMP 3405.2 -62.31
 300677 [2MTVRN 69.000] AMP 7899.3 -69.28
 300678 [5NIXA-1 161.00] AMP 19256.6 -82.42
 300679 [2PRDYTP 69.000] AMP 4814.3 -65.40
 300680 [2VERONA 69.000] AMP 6098.5 -71.94
 300681 [2BUTRFLD 69.000] AMP 4801.5 -64.53
 300725 [2REEDSP 69.000] AMP 9606.1 -77.66
 300745 [2DMNDTP 69.000] AMP 5425.7 -61.72
 300748 [2NEOSAC 69.000] AMP 9754.4 -78.15
 300751 [2REEDS 69.000] AMP 6348.3 -62.43
 300763 [2WASHBRN 69.000] AMP 6423.8 -77.44
 300819 [2CASSVL 69.000] AMP 5927.9 -68.20
 300823 [2NCASVL 69.000] AMP 5310.7 -66.09
 301161 [5LOGAN 161.00] AMP 14285.4 -80.93
 505472 [TABLE R5 161.00] AMP 14234.0 -81.49
 505480 [BEAVER 5 161.00] AMP 10116.8 -82.35
 505486 [NEO SPA5 161.00] AMP 14958.5 -81.18
 505488 [CARTHAG5 161.00] AMP 15709.4 -80.51
 505490 [CARTHG 2 69.000] AMP 14375.9 -79.97
 505492 [SPRGFLD5 161.00] AMP 27789.8 -83.76
 505494 [SPRGFLD2 69.000] AMP 15621.8 -85.41
 505496 [NIXA 5 161.00] AMP 12401.3 -81.88
 505501 [NIXA 2 69.000] AMP 9795.7 -82.80
 547400 [MON376]2 69.000] AMP 3884.4 -69.80
 547401 [MON376 2 69.000] AMP 6255.8 -71.80
 547402 [MON416]2 69.000] AMP 3425.8 -65.73
 547403 [MON416 2 69.000] AMP 3337.7 -65.75
 547404 [PUR390 2 69.000] AMP 1705.3 -51.59
 547405 [MON352]2 69.000] AMP 7375.7 -72.78
 547406 [MON352 2 69.000] AMP 7091.5 -72.55
 547407 [MON311]2 69.000] AMP 6333.6 -71.88
 547408 [MON311 2 69.000] AMP 6255.8 -71.80
 547421 [GNB347]2 69.000] AMP 4117.4 -64.80
 547430 [SAR362 2 69.000] AMP 1926.5 -64.51
 547438 [EXP449T2 69.000] AMP 8441.6 -67.50
 547449 [PRC460 2 69.000] AMP 5410.7 -62.88
 547459 [WWR477 161.00] AMP 21928.4 -83.84
 547462 [SVRCK469 5 161.00] AMP 13877.0 -82.41
 547463 [KOD471 2 69.000] AMP 11331.7 -75.47
 547466 [ATL109 5 161.00] AMP 15605.4 -80.98
 547468 [AUR124 5 161.00] AMP 9392.9 -78.32
 547469 [RIV4525 161.00] AMP 23375.9 -83.36
 547470 [JOP145 5 161.00] AMP 17193.9 -82.25
 547471 [NEO184 5 161.00] AMP 13798.8 -80.89
 547472 [TIP292 5 161.00] AMP 16972.3 -82.33
 547473 [RDS295 5 161.00] AMP 7382.8 -76.78
 547478 [DAD368 5 161.00] AMP 9761.2 -77.51
 547479 [LAR382 5 161.00] AMP 12500.3 -80.68
 547480 [MON383 5 161.00] AMP 10796.6 -79.71
 547483 [JOP389 5 161.00] AMP 19473.3 -83.21
 547485 [CAR395 5 161.00] AMP 11888.6 -80.75
 547488 [BRN412 5 161.00] AMP 9481.5 -78.71
 547491 [PUR421 5 161.00] AMP 9541.8 -81.30
 547492 [RDS424 5 161.00] AMP 7945.6 -77.23
 547493 [BOL431 5 161.00] AMP 4776.5 -77.48
 547494 [OAK432 5 161.00] AMP 17144.6 -81.31
 547496 [NOL435 5 161.00] AMP 9613.0 -80.85
 547498 [STL439 5 161.00] AMP 24039.0 -84.11
 547499 [CPK446 5 161.00] AMP 7293.8 -78.13
 547500 [RNM393 5 161.00] AMP 13854.5 -82.06

GEN-2018-006 POI at Monet 69 kV:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+/ AN(I+)
 300089 [5]JAMESV 161.00] AMP 15838.9 -81.63
 300101 [5MORGAN 161.00] AMP 9936.8 -77.59
 300129 [5WASHBRN 161.00] AMP 7724.4 -80.96
 300649 [2]JASPER 69.000] AMP 4720.6 -66.53
 300658 [2BILLNG 69.000] AMP 6324.8 -63.09
 300660 [2BRNSPG 69.000] AMP 3313.1 -58.96
 300665 [2CLEVER 69.000] AMP 3884.8 -59.54
 300667 [2CRANE 69.000] AMP 3022.3 -59.45
 300669 [2ELWOOD 69.000] AMP 5159.7 -62.18

547533 [ATL109 2 69.000] AMP 20166.4 -78.24
 547537 [AUR124 2 69.000] AMP 11298.4 -75.57
 547538 [DIA131 2 69.000] AMP 4995.8 -70.61
 547540 [MON152 2 69.000] AMP 10126.3 -74.45
 547543 [NEO184 2 69.000] AMP 11401.4 -76.48
 547544 [WEN205 2 69.000] AMP 4294.7 -61.73
 547546 [BIL221 2 69.000] AMP 6727.6 -62.22
 547559 [TIP292 2 69.000] AMP 9458.1 -71.41
 547577 [MTV351 2 69.000] AMP 6632.0 -67.56
 547578 [AUR355 2 69.000] AMP 8713.0 -72.24
 547580 [REP359 2 69.000] AMP 5585.6 -62.63
 547582 [SAR362T2 69.000] AMP 4172.9 -62.44
 547585 [DAD368 2 69.000] AMP 8529.6 -74.66
 547591 [MON383 2 69.000] AMP 11645.7 -76.50
 547592 [JOP389 2 69.000] AMP 13932.6 -79.27
 547593 [JOP391 5 161.00] AMP 13027.9 -82.10
 547595 [RNM393 2 69.000] AMP 17874.2 -77.16
 547606 [MTV420 2 69.000] AMP 6566.9 -67.85
 547607 [JOP422 5 161.00] AMP 12877.8 -82.18
 547608 [JOP430 2 69.000] AMP 12717.6 -76.90
 547611 [MAR437 2 69.000] AMP 5253.8 -60.93
 547618 [CPK446 2 69.000] AMP 8896.9 -73.03
 547685 [PLB447 2 69.000] AMP 11064.2 -72.73
 549954 [JTEC 5161.00] AMP 27976.5 -84.45
 549955 [JUNCTION 5161.00] AMP 20882.9 -83.23
 549958 [MAIN STREET5161.00] AMP 19059.8 -83.02
 549959 [BATTLEFIELD5161.00] AMP 27151.5 -83.65
 549960 [SW DISP PLT5161.00] AMP 26077.3 -83.92
 549962 [MILL 5161.00] AMP 15693.6 -82.00
 549963 [MENTOR 5161.00] AMP 14964.8 -82.11
 549969 [BROOKLINE 5161.00] AMP 28857.3 -84.26
 549970 [CLAY 5161.00] AMP 18435.3 -81.75
 549979 [BATTLEFIELD269.00] AMP 20929.0 -81.07
 549984 [BROOKLINE 7345.00] AMP 11080.0 -85.22
 917210 [GEN-2018-00669.000] AMP 11645.7 -76.50

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
 CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
 MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X /I+/ AN(I+)
 300089 [5]JAMESV 161.00] AMP 15939.0 -81.62
 300101 [5]MORGAN 161.00] AMP 9937.2 -77.57
 300129 [5]WASHBRN 161.00] AMP 7772.7 -80.95
 300649 [2]JASPER 69.000] AMP 4720.2 -66.52
 300658 [2]BILLNG 69.000] AMP 6327.6 -63.08
 300660 [2]BRNSPG 69.000] AMP 3313.9 -58.95
 300665 [2]CLEVER 69.000] AMP 3885.9 -59.53
 300667 [2]CRANE 69.000] AMP 3022.9 -59.44
 300669 [2]ELWOOD 69.000] AMP 5163.9 -62.17
 300670 [2]EPURDY 69.000] AMP 3406.3 -62.30
 300677 [2]MTVRN 69.000] AMP 7902.8 -69.27
 300678 [5]NIXA-1 161.00] AMP 19411.4 -82.42
 300679 [2]PRDYTP 69.000] AMP 4816.4 -65.39
 300680 [2]VERONA 69.000] AMP 6101.4 -71.93
 300681 [2]BUTRFLD 69.000] AMP 4804.1 -64.52
 300725 [2]REEDSP 69.000] AMP 9617.9 -77.64
 300745 [2]DMNDTP 69.000] AMP 5427.0 -61.72
 300748 [2]NEOSAC 69.000] AMP 9765.2 -78.15
 300751 [2]REEDS 69.000] AMP 6349.6 -62.43
 300763 [2]WASHBRN 69.000] AMP 6433.2 -77.44
 300819 [2]CASSVL 69.000] AMP 5932.7 -68.19
 300823 [2]NCASVL 69.000] AMP 5314.4 -66.08
 301161 [5]LOGAN 161.00] AMP 14454.2 -80.96
 505472 [TABLE R5 161.00] AMP 14294.4 -81.46
 505480 [BEAVER 5 161.00] AMP 10231.4 -82.35
 505486 [NEO SPA5 161.00] AMP 15019.7 -81.16
 505488 [CARTHAG5 161.00] AMP 15734.0 -80.50
 505490 [CARTHG 2 69.000] AMP 14383.2 -79.97
 505492 [SPRGFLD5 161.00] AMP 28122.8 -83.78
 505494 [SPRGFLD2 69.000] AMP 15665.8 -85.42
 505496 [NIXA 5 161.00] AMP 12460.5 -81.87
 505501 [NIXA 2 69.000] AMP 9811.5 -82.79
 547400 [MON376]2 69.000] AMP 3885.3 -69.80
 547401 [MON376 2 69.000] AMP 6258.2 -71.79
 547402 [MON416]2 69.000] AMP 3426.5 -65.73
 547403 [MON416 2 69.000] AMP 3338.4 -65.74
 547404 [PUR390 2 69.000] AMP 1705.4 -51.58
 547405 [MON352]2 69.000] AMP 7379.1 -72.77
 547406 [MON352 2 69.000] AMP 7094.7 -72.54
 547407 [MON311]2 69.000] AMP 6336.1 -71.88
 547408 [MON311 2 69.000] AMP 6258.2 -71.79
 547421 [GNB347]2 69.000] AMP 4119.7 -64.79
 547430 [SAR362 2 69.000] AMP 1926.9 -64.51
 547438 [EXP449T2 69.000] AMP 8447.4 -67.48
 547449 [PRC460 2 69.000] AMP 5412.7 -62.87
 547459 [WWR477 161.00] AMP 21953.6 -83.82
 547462 [SVRCK469 5 161.00] AMP 13896.0 -82.40
 547463 [KOD471 2 69.000] AMP 11355.3 -75.44
 547466 [ATL109 5 161.00] AMP 15625.2 -80.97
 547468 [AUR124 5 161.00] AMP 9405.5 -78.30
 547469 [RIV4525 161.00] AMP 23424.3 -83.33
 547470 [JOP145 5 161.00] AMP 17213.8 -82.24
 547471 [NEO184 5 161.00] AMP 13857.2 -80.86
 547472 [TIP292 5 161.00] AMP 17012.0 -82.31
 547473 [RDS295 5 161.00] AMP 7395.6 -76.76
 547478 [DAD368 5 161.00] AMP 9762.2 -77.49
 547479 [LAR382 5 161.00] AMP 12517.3 -80.66
 547480 [MON383 5 161.00] AMP 10811.8 -79.69
 547483 [JOP389 5 161.00] AMP 19504.9 -83.20

547485	[CAR395 5	161.00] AMP	11901.8	-80.74
547488	[BRN412 5	161.00] AMP	9506.0	-78.68
547491	[PUR421 5	161.00] AMP	9549.7	-81.30
547492	[RDS424 5	161.00] AMP	7961.3	-77.20
547493	[BOL431 5	161.00] AMP	4777.6	-77.47
547494	[OAK432 5	161.00] AMP	17164.5	-81.30
547496	[NOL435 5	161.00] AMP	9707.0	-80.80
547498	[STL439 5	161.00] AMP	24069.3	-84.10
547499	[CPK446 5	161.00] AMP	7299.8	-78.11
547500	[RNM393 5	161.00] AMP	13880.1	-82.05
547533	[ATL109 2	69.000] AMP	20217.9	-78.19
547537	[AUR124 2	69.000] AMP	11306.3	-75.55
547538	[DIA131 2	69.000] AMP	4999.3	-70.60
547540	[MON152 2	69.000] AMP	10132.8	-74.44
547543	[NEO184 2	69.000] AMP	11419.6	-76.46
547544	[WEN205 2	69.000] AMP	4296.2	-61.72
547546	[BIL221 2	69.000] AMP	6731.1	-62.20
547559	[TIP292 2	69.000] AMP	9472.7	-71.38
547577	[MTV351 2	69.000] AMP	6634.4	-67.56
547578	[AUR355 2	69.000] AMP	8717.5	-72.23
547580	[REP359 2	69.000] AMP	5588.5	-62.62
547582	[SAR362T2	69.000] AMP	4174.5	-62.43
547585	[DAD368 2	69.000] AMP	8531.4	-74.65
547591	[MON383 2	69.000] AMP	11654.4	-76.48
547592	[JOP389 2	69.000] AMP	13948.8	-79.25
547593	[JOP391 5	161.00] AMP	13048.8	-82.08
547595	[RNM393 2	69.000] AMP	17936.6	-77.12
547606	[MTV420 2	69.000] AMP	6569.2	-67.84
547607	[JOP422 5	161.00] AMP	12896.3	-82.17
547608	[JOP430 2	69.000] AMP	12741.7	-76.87
547611	[MAR437 2	69.000] AMP	5255.6	-60.92
547618	[CPK446 2	69.000] AMP	8901.4	-73.02
547685	[PLB447 2	69.000] AMP	11131.7	-72.69
549954	[JTEC 5161.00]	AMP	28263.4	-84.46
549955	[JUNCTION 5161.00]	AMP	21122.7	-83.26
549958	[MAIN STREET5161.00]	AMP	19242.2	-83.05
549959	[BATTLEFIELD5161.00]	AMP	27468.1	-83.67
549960	[SW DISP PLT5161.00]	AMP	26334.6	-83.93
549962	[MILL 5161.00]	AMP	16024.4	-82.10
549963	[MENTOR 5161.00]	AMP	15117.5	-82.14
549969	[BROOKLINE 5161.00]	AMP	29191.4	-84.28
549970	[CLAY 5161.00]	AMP	18719.1	-81.81
549979	[BATTLEFIELD269.000]	AMP	21011.7	-81.07
549984	[BROOKLINE 7345.00]	AMP	11160.6	-85.23
917210	[GEN-2018-00669.000]	AMP	11654.4	-76.48

GEN-2018-006 POI at Tap Monet-Aurora 161 kV:

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT CURRENTS FRI, AUG 24 2018 16:08
 2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL MDWG 2018S WITH MMWG 2017S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0

- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X-----	BUS -----X	/I+/ AN(I+)		
300089	[5JAMESV 161.00]	AMP	15838.9	-81.63
300101	[5MORGAN 161.00]	AMP	9936.8	-77.59
300129	[5WASHBRN 161.00]	AMP	7724.4	-80.96
300649	[2JASPER 69.000]	AMP	4720.6	-66.53
300658	[2BILLNG 69.000]	AMP	6324.8	-63.09
300660	[2BRNSPG 69.000]	AMP	3313.1	-58.96
300665	[2CLEVER 69.000]	AMP	3884.8	-59.54
300667	[2CRANE 69.000]	AMP	3022.3	-59.45
300669	[2ELWOOD 69.000]	AMP	5159.7	-62.18
300670	[2EPURDY 69.000]	AMP	3405.2	-62.31
300677	[2MTVRN 69.000]	AMP	7899.3	-69.28
300678	[5NIXA-1 161.00]	AMP	19256.6	-82.42
300679	[2PRDYTP 69.000]	AMP	4814.3	-65.40
300680	[2VERONA 69.000]	AMP	6098.4	-71.94
300681	[2BUTRFLD 69.000]	AMP	4801.5	-64.53
300684	[2MIDWYTP 69.000]	AMP	7766.3	-68.77
300720	[2GRTNA 69.000]	AMP	5201.8	-71.23
300722	[2LAKE-K 69.000]	AMP	9649.0	-75.17
300725	[2REEDSP 69.000]	AMP	9606.1	-77.66
300745	[2DMNDTP 69.000]	AMP	5425.7	-61.72
300748	[2NEOSAC 69.000]	AMP	9754.4	-78.15
300751	[2REEDS 69.000]	AMP	6348.3	-62.43
300763	[2WASHBRN 69.000]	AMP	6423.8	-77.44
300782	[2MORGAN 69.000]	AMP	6264.4	-74.50
301161	[5LOGAN 161.00]	AMP	14285.4	-80.93
505472	[TABLE R5 161.00]	AMP	14234.0	-81.49
505480	[BEAVER 5 161.00]	AMP	10116.8	-82.35
505486	[NEO SPA5 161.00]	AMP	14958.5	-81.18
505488	[CARTHAG5 161.00]	AMP	15709.4	-80.51
505490	[CARTHG 2 69.000]	AMP	14375.9	-79.97
505492	[SPRGFLD5 161.00]	AMP	27789.8	-83.76
505494	[SPRGFLD2 69.000]	AMP	15621.8	-85.41
505496	[NIXA 5 161.00]	AMP	12401.3	-81.88
505498	[STOCKTN5 161.00]	AMP	8366.4	-77.81
505501	[NIXA 2 69.000]	AMP	9795.7	-82.80
547400	[MON376J2 69.000]	AMP	3884.4	-69.80
547401	[MON376 2 69.000]	AMP	6255.7	-71.80
547402	[MON416J2 69.000]	AMP	3425.8	-65.73
547403	[MON416 2 69.000]	AMP	3337.7	-65.75
547404	[PUR390 2 69.000]	AMP	1705.3	-51.59
547405	[MON352J2 69.000]	AMP	7375.6	-72.78
547406	[MON352 2 69.000]	AMP	7091.5	-72.55
547407	[MON311J2 69.000]	AMP	6333.6	-71.88
547408	[MON311 2 69.000]	AMP	6255.7	-71.80
547436	[CUPTAP 2 69.000]	AMP	5487.7	-67.77

547438 [EXP449T2 69.000] AMP	8441.6	-67.50
547449 [PRC460 2 69.000] AMP	5410.7	-62.88
547459 [WWR477 161.00] AMP	21928.4	-83.84
547462 [SVRCK469 5 161.00] AMP	13876.9	-82.41
547463 [KOD471 2 69.000] AMP	11331.7	-75.47
547464 [BOL 73 5 161.00] AMP	4027.5	-76.81
547466 [ATL109 5 161.00] AMP	15605.4	-80.98
547468 [AUR124 5 161.00] AMP	9392.9	-78.32
547469 [RIV4525 161.00] AMP	23375.9	-83.36
547470 [JOP145 5 161.00] AMP	17193.9	-82.25
547471 [NEO184 5 161.00] AMP	13798.8	-80.89
547472 [TIP292 5 161.00] AMP	16972.3	-82.33
547473 [RDS295 5 161.00] AMP	7382.8	-76.78
547475 [BRN331 5 161.00] AMP	9196.0	-78.42
547478 [DAD368 5 161.00] AMP	9761.2	-77.51
547479 [LAR382 5 161.00] AMP	12500.3	-80.68
547480 [MON383 5 161.00] AMP	10796.6	-79.71
547483 [JOP389 5 161.00] AMP	19473.3	-83.21
547485 [CAR395 5 161.00] AMP	11888.6	-80.75
547488 [BRN412 5 161.00] AMP	9481.5	-78.71
547491 [PUR421 5 161.00] AMP	9541.8	-81.30
547492 [RDS424 5 161.00] AMP	7945.6	-77.23
547493 [BOL431 5 161.00] AMP	4776.5	-77.48
547494 [OAK432 5 161.00] AMP	17144.6	-81.31
547495 [GRT433 5 161.00] AMP	9445.0	-79.37
547496 [NOL435 5 161.00] AMP	9613.0	-80.85
547498 [STL439 5 161.00] AMP	24039.0	-84.11
547499 [CPK446 5 161.00] AMP	7293.8	-78.13
547500 [RNM393 5 161.00] AMP	13854.5	-82.06
547533 [ATL109 2 69.000] AMP	20166.4	-78.24
547536 [ASH121 2 69.000] AMP	6854.2	-69.29
547537 [AUR124 2 69.000] AMP	11298.4	-75.57
547540 [MON152 2 69.000] AMP	10126.2	-74.45
547543 [NEO184 2 69.000] AMP	11401.4	-76.48
547544 [WEN205 2 69.000] AMP	4294.7	-61.73
547545 [FRP217 2 69.000] AMP	4137.1	-63.52
547546 [BIL221 2 69.000] AMP	6727.6	-62.22
547559 [TIP292 2 69.000] AMP	9458.1	-71.41
547577 [MTV351 2 69.000] AMP	6632.0	-67.56
547578 [AUR355 2 69.000] AMP	8712.9	-72.24
547580 [REP359 2 69.000] AMP	5585.6	-62.63
547582 [SAR362T2 69.000] AMP	4172.9	-62.44
547585 [DAD368 2 69.000] AMP	8529.6	-74.66
547591 [MON383 2 69.000] AMP	11645.7	-76.50
547592 [JOP389 2 69.000] AMP	13932.6	-79.27
547593 [JOP391 5 161.00] AMP	13027.9	-82.10
547595 [RNM393 2 69.000] AMP	17874.2	-77.16
547606 [MTV420 2 69.000] AMP	6566.9	-67.85
547607 [JOP422 5 161.00] AMP	12877.8	-82.18
547608 [JOP430 2 69.000] AMP	12717.6	-76.90
547611 [MAR437 2 69.000] AMP	5253.8	-60.93
547618 [CPK446 2 69.000] AMP	8896.9	-73.03
547685 [PLB447 2 69.000] AMP	11064.2	-72.73
549954 [JTEC 5161.00] AMP	27976.5	-84.45
549955 [JUNCTION 5161.00] AMP	20882.9	-83.23
549958 [MAIN STREET5161.00] AMP	19059.8	-83.02
549959 [BATTLEFIELD5161.00] AMP	27151.5	-83.65
549960 [SW DISP PLT5161.00] AMP	26077.3	-83.92
549962 [MILL 5161.00] AMP	15693.6	-82.00
549963 [MENTOR 5161.00] AMP	14964.8	-82.11

549969 [BROOKLINE 5161.00] AMP	28857.3	-84.26
549970 [CLAY 5161.00] AMP	18435.3	-81.75
549979 [BATTLEFIELD269.000] AMP	20929.0	-81.07
549984 [BROOKLINE 7345.00] AMP	11080.0	-85.22
917210 [GEN-2018-006161.00] AMP	9412.9	-79.30
918063 [G18_006T_P3 161.00] AMP	9412.9	-79.30

PSS(R)E-33.7.0 ASCC SHORT CIRCUIT
CURRENTS FRI, AUG 24 2018 16:08
2016 MDWG FINAL WITH 2015 SERIES MMWG FINAL
MDWG 2026S WITH MMWG 2026S

OPTIONS USED:

- SET PRE-FAULT VOLTAGE ON ALL BUSES TO 1.00 PU AT 0 PHASE SHIFT ANGLE
- SET SYNCHRONOUS/ASYNCHRONOUS MACHINE POWER OUTPUTS TO P=0.0, Q=0.0
- SET GENERATOR POSITIVE SEQUENCE REACTANCES TO SUBTRANSIENT
- SET TRANSFORMER TAP RATIOS=1.0 PU AND PHASE SHIFT ANGLES=0.0
- SET LINE CHARGING=0.0 IN +/-0 SEQUENCES
- SET LINE/FIXED/SWITCHED SHUNTS=0.0 AND TRANSFORMER MAGNETIZING ADMITTANCE=0.0 IN +/-0 SEQUENCES
- SET LOAD=0.0 IN +/- SEQUENCES
- DC LINES AND FACTS DEVICES BLOCKED
- IMPEDANCE CORRECTIONS APPLIED TO TRANSFORMER ZERO SEQUENCE IMPEDANCES

THREE PHASE FAULT

X----- BUS -----X	/I+/	AN(I+)	
300089 [5JAMESV 161.00] AMP	15939.0	-81.62	
300101 [5MORGAN 161.00] AMP	9937.2	-77.57	
300129 [5WASHBRN 161.00] AMP	7772.7	-80.95	
300649 [2JASPER 69.000] AMP	4720.2	-66.52	
300658 [2BILLNG 69.000] AMP	6327.6	-63.08	
300660 [2BRNSPG 69.000] AMP	3313.9	-58.95	
300665 [2CLEVER 69.000] AMP	3885.9	-59.53	
300667 [2CRANE 69.000] AMP	3022.9	-59.44	
300669 [2ELWOOD 69.000] AMP	5163.9	-62.17	
300670 [2EPURDY 69.000] AMP	3406.3	-62.30	
300677 [2MTVRN 69.000] AMP	7902.8	-69.27	
300678 [5NIXA-1 161.00] AMP	19411.4	-82.42	
300679 [2PRDYTP 69.000] AMP	4816.4	-65.39	
300680 [2VERONA 69.000] AMP	6101.4	-71.93	
300681 [2BUTRFLD 69.000] AMP	4804.1	-64.52	
300684 [2MIDWYTP 69.000] AMP	7769.6	-68.76	
300720 [2GRTNA 69.000] AMP	5205.5	-71.21	
300722 [2LAKE-K 69.000] AMP	9661.1	-75.15	
300725 [2REEDSP 69.000] AMP	9617.9	-77.64	
300745 [2DMNDTP 69.000] AMP	5427.0	-61.72	
300748 [2NEOSAC 69.000] AMP	9765.2	-78.15	
300751 [2REEDS 69.000] AMP	6349.6	-62.43	
300763 [2WASHBRN 69.000] AMP	6433.2	-77.44	
300782 [2MORGAN 69.000] AMP	6265.1	-74.50	
301161 [5LOGAN 161.00] AMP	14454.2	-80.96	
505472 [TABLE R5 161.00] AMP	14294.4	-81.46	
505480 [BEAVER 5 161.00] AMP	10231.4	-82.35	
505486 [NEO SPA5 161.00] AMP	15019.7	-81.16	

505488 [CARTHAG5 161.00] AMP	15734.0	-80.50	547591 [MON383 2 69.000] AMP	11654.3	-76.48
505490 [CARTHG 2 69.000] AMP	14383.2	-79.97	547592 [JOP389 2 69.000] AMP	13948.8	-79.25
505492 [SPRGFLD5 161.00] AMP	28122.8	-83.78	547593 [JOP391 5 161.00] AMP	13048.8	-82.08
505494 [SPRGFLD2 69.000] AMP	15665.8	-85.42	547595 [RNM393 2 69.000] AMP	17936.6	-77.12
505496 [NIXA 5 161.00] AMP	12460.5	-81.87	547606 [MTV420 2 69.000] AMP	6569.2	-67.84
505498 [STOCKTN5 161.00] AMP	8322.3	-77.78	547607 [JOP422 5 161.00] AMP	12896.3	-82.17
505501 [NIXA 2 69.000] AMP	9811.5	-82.79	547608 [JOP430 2 69.000] AMP	12741.7	-76.87
547400 [MON376]2 69.000] AMP	3885.3	-69.80	547611 [MAR437 2 69.000] AMP	5255.6	-60.92
547401 [MON376 2 69.000] AMP	6258.2	-71.79	547618 [CPK446 2 69.000] AMP	8901.4	-73.02
547402 [MON416]2 69.000] AMP	3426.5	-65.73	547685 [PLB447 2 69.000] AMP	11131.7	-72.69
547403 [MON416 2 69.000] AMP	3338.4	-65.74	549954 [JTEC 5161.00] AMP	28263.4	-84.46
547404 [PUR390 2 69.000] AMP	1705.4	-51.58	549955 [JUNCTION 5161.00] AMP	21122.7	-83.26
547405 [MON352]2 69.000] AMP	7379.0	-72.77	549958 [MAIN STREET5161.00] AMP	19242.2	-83.05
547406 [MON352 2 69.000] AMP	7094.6	-72.54	549959 [BATTLEFIELD5161.00] AMP	27468.1	-83.67
547407 [MON311]2 69.000] AMP	6336.1	-71.88	549960 [SW DISP PLT5161.00] AMP	26334.6	-83.93
547408 [MON311 2 69.000] AMP	6258.2	-71.79	549962 [MILL 5161.00] AMP	16024.4	-82.10
547436 [CUPTAP 2 69.000] AMP	5487.9	-67.77	549963 [MENTOR 5161.00] AMP	15117.5	-82.14
547438 [EXP449T2 69.000] AMP	8447.4	-67.48	549969 [BROOKLINE 5161.00] AMP	29191.4	-84.28
547449 [PRC460 2 69.000] AMP	5412.6	-62.87	549970 [CLAY 5161.00] AMP	18719.1	-81.81
547459 [WWR477 161.00] AMP	21953.6	-83.82	549979 [BATTLEFIELD269.000] AMP	21011.7	-81.07
547462 [SVRCK469 5 161.00] AMP	13896.0	-82.40	549984 [BROOKLINE 7345.00] AMP	11160.6	-85.23
547463 [KOD471 2 69.000] AMP	11355.3	-75.44	917210 [GEN-2018-006161.00] AMP	9424.9	-79.29
547464 [BOL 73 5 161.00] AMP	4028.6	-76.80	918063 [G18_006T_P3 161.00] AMP	9424.9	-79.29
547466 [ATL109 5 161.00] AMP	15625.2	-80.97			
547468 [AUR124 5 161.00] AMP	9405.5	-78.30			
547469 [RIV4525 161.00] AMP	23424.3	-83.33			
547470 [JOP145 5 161.00] AMP	17213.8	-82.24			
547471 [NEO184 5 161.00] AMP	13857.2	-80.86			
547472 [TIP292 5 161.00] AMP	17012.0	-82.31			
547473 [RDS295 5 161.00] AMP	7395.6	-76.76			
547475 [BRN331 5 161.00] AMP	9219.2	-78.39			
547478 [DAD368 5 161.00] AMP	9762.2	-77.49			
547479 [LAR382 5 161.00] AMP	12517.3	-80.66			
547480 [MON383 5 161.00] AMP	10811.8	-79.69			
547483 [JOP389 5 161.00] AMP	19504.9	-83.20			
547485 [CAR395 5 161.00] AMP	11901.8	-80.74			
547488 [BRN412 5 161.00] AMP	9506.0	-78.68			
547491 [PUR421 5 161.00] AMP	9549.7	-81.30			
547492 [RDS424 5 161.00] AMP	7961.3	-77.20			
547493 [BOL431 5 161.00] AMP	4777.6	-77.47			
547494 [OAK432 5 161.00] AMP	17164.5	-81.30			
547495 [GRT433 5 161.00] AMP	9469.7	-79.34			
547496 [NOL435 5 161.00] AMP	9707.0	-80.80			
547498 [STL439 5 161.00] AMP	24069.3	-84.10			
547499 [CPK446 5 161.00] AMP	7299.8	-78.11			
547500 [RNM393 5 161.00] AMP	13880.1	-82.05			
547533 [ATL109 2 69.000] AMP	20217.9	-78.19			
547536 [ASH121 2 69.000] AMP	6858.0	-69.28			
547537 [AUR124 2 69.000] AMP	11306.3	-75.55			
547540 [MON152 2 69.000] AMP	10132.7	-74.44			
547543 [NEO184 2 69.000] AMP	11419.6	-76.46			
547544 [WEN205 2 69.000] AMP	4296.1	-61.72			
547545 [FRP217 2 69.000] AMP	4137.7	-63.52			
547546 [BIL221 2 69.000] AMP	6731.1	-62.20			
547559 [TIP292 2 69.000] AMP	9472.7	-71.38			
547577 [MTV351 2 69.000] AMP	6634.4	-67.56			
547578 [AUR355 2 69.000] AMP	8717.5	-72.23			
547580 [REP359 2 69.000] AMP	5588.5	-62.62			
547582 [SAR362T2 69.000] AMP	4174.5	-62.43			
547585 [DAD368 2 69.000] AMP	8531.4	-74.65			