



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2017-188

Published Jan 2023

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
January 20, 2023	SPP	Initial draft report issued.
February 28, 2023	SPP	Final report issued.
July 2, 2024	SPP	Revised to include contingent upgrade per latest study.

CONTENTS

Revision History	i
Summary	1
Introduction	1
Phase(s) of Interconnection Service	1
Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s)	3
Shared Network Upgrade(s)	5
Contingent Network Upgrade(s).....	6
Affected System Upgrade(s)	7
Conclusion.....	8
Appendices	9
A: Transmission Owner’s Interconnection Facilities Study Report and Network Upgrades Report(s)...	10

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-188 is for a 130 MW generating facility located in Barry County, MO. The Interconnection Request was studied in the DISIS-2017-002 Impact Study for ERIS. The Interconnection Customer's requested in-service date is December 15, 2025.

The interconnecting Transmission Owner, Liberty Utilities (EDE), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Contingent Network Upgrades, and Affected System Upgrades that are required for full interconnection service are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrades, other direct assigned upgrades, cost estimates, and associated upgrade lead times needed to grant the requested Interconnection Service.

PHASE(S) OF INTERCONNECTION SERVICE

It is not expected that Interconnection Service will occur in phases. However, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

FERC Order ER20-1687-000 eliminated the use of Attachment Z2 revenue crediting as an option for compensation. The Incremental Long Term Congestion Right (ILTCR) process will be the sole process to compensate upgrade sponsors as of July 1st, 2020.

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of forty-five (45) TMEIC 4.2 MVA inverters for a total generating nameplate capacity of 130 MW.

The Interconnection Customer's Interconnection Facilities to be designed, procured, constructed, installed, maintained, and owned by the Interconnection Customer at its sole expense include:

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 161 kV transformation substation with associated 34.5 kV and 161 kV switchgear;
- Two 161/34.5 kV 69/92/115 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- 75 mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 161 kV bus at existing Transmission Owner substation ("Asbury 161 kV") that is owned and maintained by Transmission Owner;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. The Interconnection Customer may use inverter manufacturing options for providing reactive power under no/reduced generation conditions. The Interconnection Customer will be required to provide documentation and design specifications demonstrating how the requirements are met; and,
- All necessary relay, protection, control and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control and communication systems.

TRANSMISSION OWNER INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADE(S)

To facilitate interconnection, the interconnecting Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities.

Table 1 and **Table 2** lists the Interconnection Customer’s estimated cost responsibility for Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Generator Interconnection Agreement has been fully executed.

Table 1: Transmission Owner Interconnection Facilities (TOIF)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Transmission Owner’s Asbury 161 kV GEN-2017-188 Interconnection (TOIF) (EDE) (143463)</u> Interconnect the following Interconnection Customer facility, GEN-2017-188 (170 MW/Solar), into the Point of Interconnection (POI) at Asbury 161 kV	\$0	100%	\$0	N/A
Total	\$0		\$0	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Transmission Owner’s Asbury 161 kV GEN-2017-188 Interconnection (Non-Shared NU) (EDE) (143462)</u> : Interconnect the following Interconnection Customer facility, GEN-2017-188 (170 MW/Solar), into the Point of Interconnection (POI) at Asbury 161 kV	Ineligible	\$1,520,000	100%	\$1,520,000	24 Months
<u>Asbury 161kV GEN-2017-188 Interconnection (Non-Shared NU) (WERE) (143567)</u> : Potential interconnection impacts from the following generating facility, GEN-2017-188 (170 MW/Solar), into the Point of Interconnection (POI) at Asbury 161kV	Ineligible	\$10,317	100%	\$10,317	36 Months

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
Total		\$1,530,317		\$1,530,317	

SHARED NETWORK UPGRADE(S)

The Interconnection Customer’s share of costs for Shared Network Upgrades is estimated in **Table 3** below.

Table 3: Interconnection Customer Shared Network Upgrade(s)

Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>N/A</u>	N/A	N/A	N/A	N/A	N/A
Total		N/A		N/A	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend or terminate service, the Interconnection Customer’s share of costs may be revised. Restudies, conducted at the customer’s expense, will determine the Interconnection Customer’s revised allocation of Shared Network Upgrades.

CONTINGENT NETWORK UPGRADE(S)

Certain Contingent Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Contingent Network Upgrade(s)

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
<p><u>Line - Wolf Creek - Blackberry 345 kV (UID: 112509/122598);</u> Build a new 345kV line from Wolf Creek to Blackberry with a summer emergency rating of 1792 MVA. Install terminal equipment at Wolf Creek to support 345kV line from Wolf Creek to Blackberry rated at 1792 MVA(NTC - 210592/210626)</p>	<p>\$0</p>	<p><u>1/1/2025</u></p>

Depending upon the status of higher- or equally-queued customers, the Interconnection Request’s in-service date is at risk of being delayed or Interconnection Service is at risk of being reduced until the in-service date of these Contingent Network Upgrades.

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities. **Table 5** displays the current impact study costs provided by either MISO or AECI as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer’s allocation responsibilities for the upgrades.

Table 5: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
<u>N/A</u>	N/A	N/A	N/A
Total	N/A		N/A

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 130 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Contingent NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities Upgrade(s)	\$0
Non-Shared Network Upgrade(s)	\$1,530,317
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$0
Total	\$1,530,317

Use the following link for Quarterly Updates on upgrades from this report: <https://spp.org/spp-documents-filings/?id=18641>

A draft Generator Interconnection Agreement will be provided to the Interconnection Customer consistent with the final results of this IFS report. The Transmission Owner and Interconnection Customer will have 60 days to negotiate the terms of the GIA consistent with the SPP Open Access Transmission Tariff (OATT).

APPENDICES

**A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY
REPORT AND NETWORK UPGRADES REPORT(S)**

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s).



**Generation Interconnection Facility
Study**

For

**Generation Interconnection Request
GEN-2017-188**

January 10, 2022

Introduction

This report summarizes the scope of the Generation Interconnection Facility Study for Evergy to evaluate the Generation Interconnection Request for GEN-2017-188. Evergy will need to perform network upgrades including relay settings review at Litchfield 161kV substation. GEN-2017-188 will be interconnecting at the Asbury 161kV substation via a 75-mile gen lead that the customer will construct.

Southwest Power Pool Generation Interconnection Request:

Southwest Power Pool (SPP) GI requested Evergy to perform an Interconnection Facility Study (IFS).

Upgrade Type	UID	Upgrade Name	DISIS Cost Estimate	DISIS Lead Time
Interconnection	143567	Asbury 161kV GEN-2017-188 Interconnection (Non-Shared NU) (WERE)	\$10,317	36 months

Estimated Costs for TOIF and Network Upgrades

Network Upgrade Cost Estimate

The Network Upgrades include relay settings review at the Litchfield 161kV substation.

AFUDC

Allowance for funds used during construction

The total cost estimate for the required Network Upgrades and the Transmission Owner Interconnection Facilities (TOIF).

\$	10,287	Network Upgrade Cost Estimate
\$	30	AFUDC
\$	10,317	Total

This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

Time Estimate

Time estimates are based on current version of the project schedule and some processes of each category run concurrently.

Engineering Time	11 Weeks
Procurement Time	4 Weeks
Construction Time	1 Weeks
Total Project Length	16 Weeks

Figure 1 – Litchfield Substation



The proposed project for the Network Upgrades is located at Litchfield Substation.

Results of Short Circuit Analysis

As a part of this Facility Study, a short circuit study was performed to determine the available fault current at the interconnection bus (GEN-2017-188 Interconnection 161 kV) using PSS/E's activity ASCC. The 2023 Summer Peak case from the 2022 Series MDWG Classical, Max Fault Short-Circuit models were used. The GEN-2017-188 wind farm generation facility was taken out of service for this analysis, and all other transmission facilities are in service. As a result, the numbers generated represent the available utility interconnection fault current:

2023 Summer:

3-PH FAULT		1-PH FAULT		THEVENIN IMPEDANCE (PU on 100 MVA and bus base KV)		
AMP	MVA	AMP	MVA	Positive Sequence	Negative Sequence	Zero Sequence
10907.2	3014.57	11588.8	3231.67	1.259+j8.429	1.287+j8.515	0.768+j6.890



Scope – Asbury POI

In its existing state, the Sub 349 Asbury ring-bus would be unable to accept the proposed injection without assuming greatly increased risk of the substation protection and system reliability. Accommodating the POI will require retirement of an existing generation position in the ring bus in order to allow the installation of a new position on the other side of the ring bus for the proposed line. The estimated upgrades of Sub 349 Asbury include the removal of an existing generation position/equipment on the ring bus and the addition of a new position to accommodate the POI request, as follows:

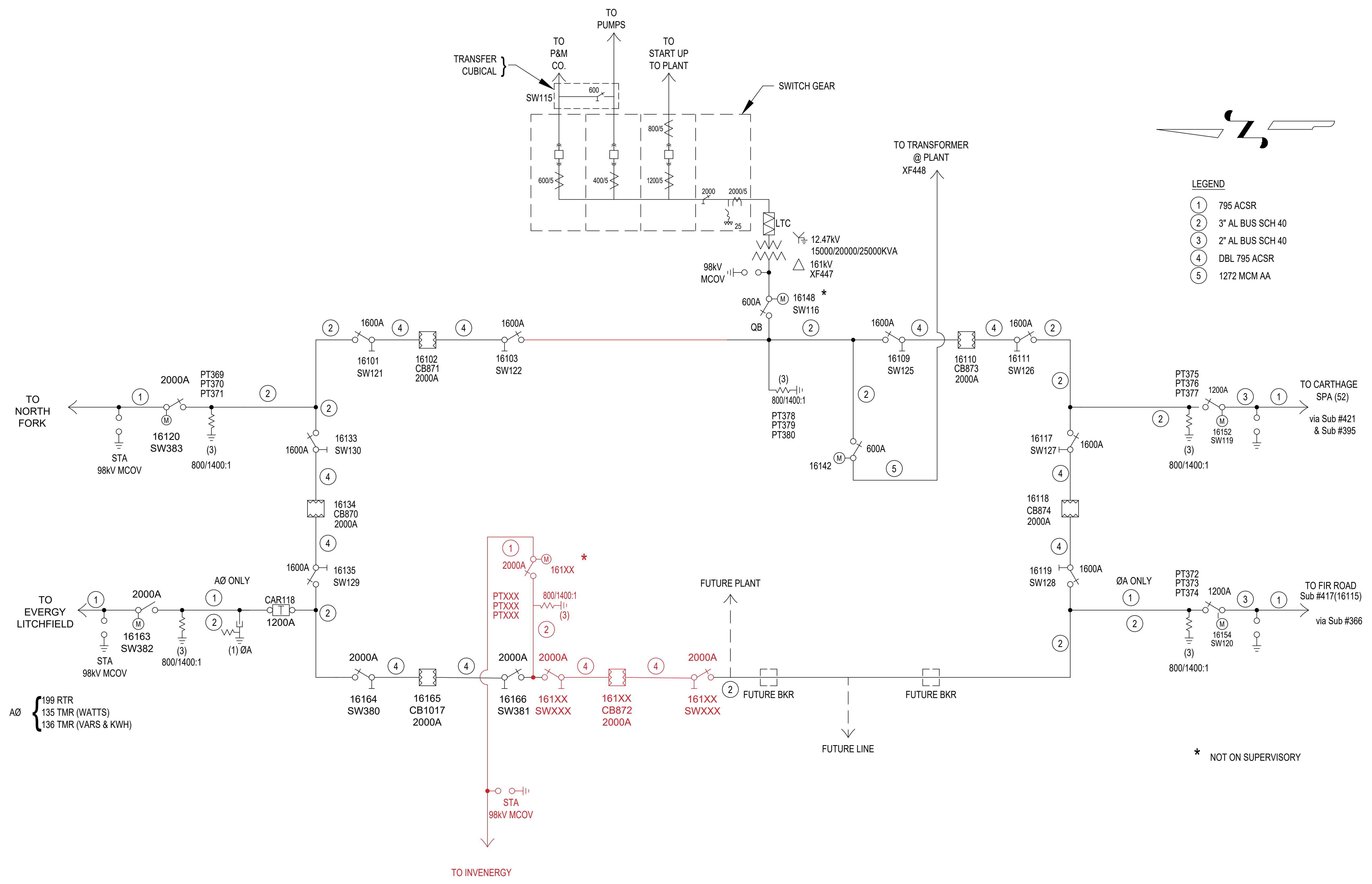
Removals:

- 161kV Motor Operated GOLB Switches
- (3) 161kV PTs
- (2) 161kV GOABs
- (1) Ring Bus Line panel and relays
- (1) 161kV Circuit Breaker
- All associated buswork, foundations, steel structures, insulators, control cable, and conduits.

Installs:

- 161kV Motor Operated GOLB Switches
- (3) 161kV Lightning Arresters
- (3) 161kV PTs
- (2) 161kV GOABs
- (1) Ring Bus Line panel and relays
- (1) 161kV Circuit Breaker
- All associated buswork, foundations, steel structures, insulators, control cable, and conduits.

REV	DESCRIPTION	ENGR	DATE	DFTR
004		NFP	2016/03/21	TBM
005	2017 BREAKER REPLACEMENT (4002108)	RJAM	2017/02/09	JRM/SOW
006	CHANGES PER OWNERS FIELD MARKS	RJAM	2017/12/15	DOB/GC
007	ADD NEW 161KV 16165 LINE TERMINAL	BMd	2019/11/06	BMd
008	CHANGES PER FIELD MARKS	BMd	2020/04/23	BMd



- LEGEND**
- ① 795 ACSR
 - ② 3" AL BUS SCH 40
 - ③ 2" AL BUS SCH 40
 - ④ DBL 795 ACSR
 - ⑤ 1272 MCM AA

* NOT ON SUPERVISORY

THIS DRAWING SUPERSEDES W95A46, G95A133



ONE-LINE DIAGRAM
ASBURY PLANT

LOCATION: ASBURY, MO		TYPE: 1-L	
ENGR:	DRAWN: JW	DATE: 1995/04/19	
SCALE: NO SCALE	SUB NO.:	DWG. NO.:	SH.
ID NO.:	349	349-0002	

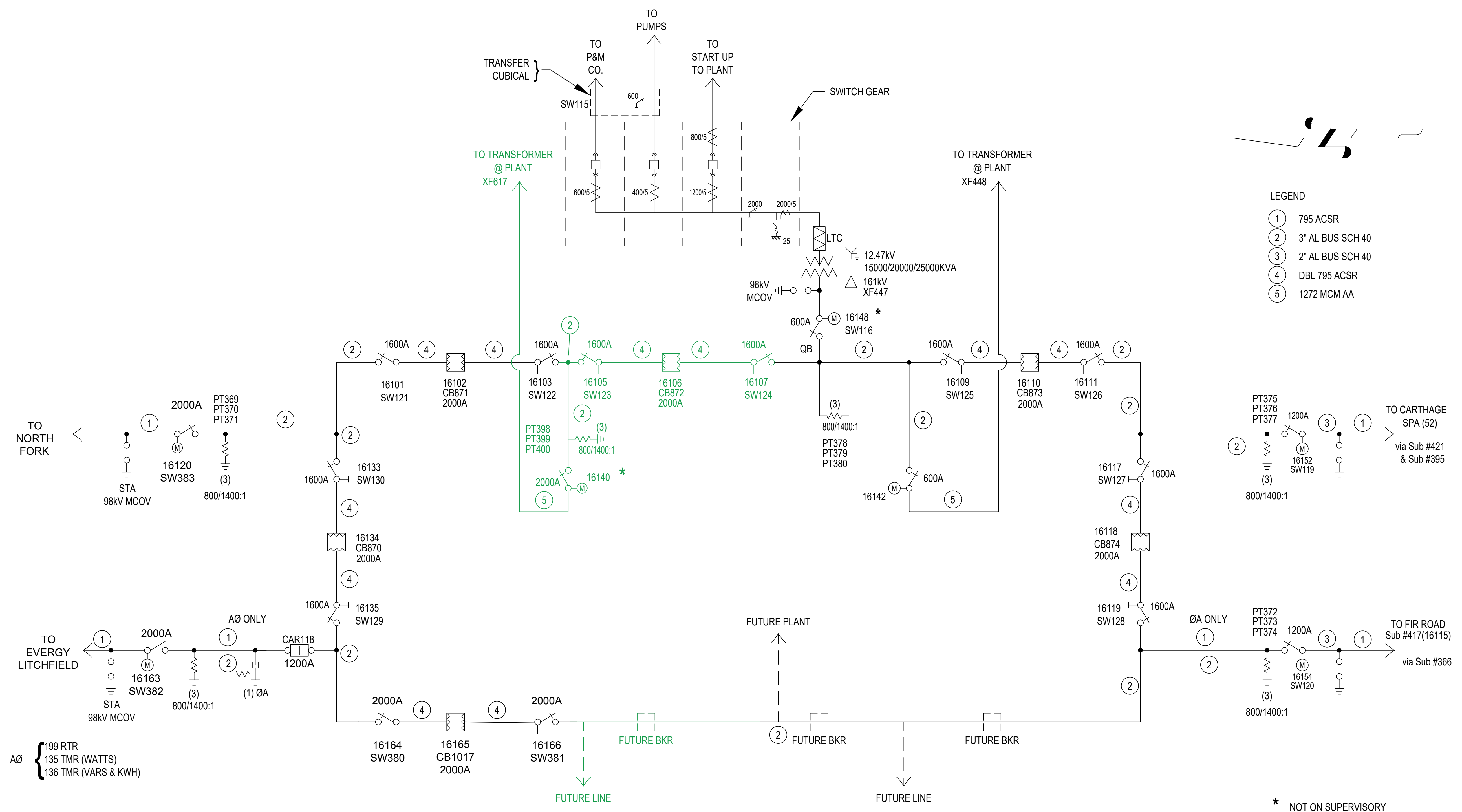
ADDITIONS

STAPLE EDGE

STAPLE EDGE

STAPLE EDGE

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004		NFP	2016/03/21	TBM
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ASBURY PLANT

LOCATION: ASBURY, MO		TYPE: 1-L	
ENGR:	DRAWN: JW	DATE: 1995/04/19	
SCALE: NO SCALE	SUB NO.:	DWG. NO.:	SH.
ID NO.:	349	349-0002	

REMOVALS

STAPLE EDGE