



INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-130
(IFS-2016-002-21)

Published August 2022

By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
09/25/2020	SPP	Initial draft report issued.
10/06/2020	SPP	Updated Table 2 Upgrade Description and ILTCR Eligibility.
10/26/2020	SPP	Updated final report issued.
07/29/2021	SPP	Updated final report issued. Updated Tables 3, 4, 5 and 6 based on DISIS Power Flow Reposting and MISO AFS Addendum
10/01/2021	SPP	Updated Tables 5 and 6 based on MISO AFS Addendum
06/06/2022	SPP	Updated Contingent Facilities and Affected Systems Upgrades based on updated report postings
08/03/2022	SPP	Updated TOIF and NU Costs

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-130/IFS-2016-002-21 is for a 202 MW generating facility located in Mercer, ND. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). This request was restudied in the DISIS-2016-002-2 Impact Study for ERIS. The Interconnection Customer's requested in-service date is December 31st, 2019.

The interconnecting Transmission Owner, Basin Electric Power Cooperative (BEPC), 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 one-hundred one (101) GE 2.0 MW Wind Turbine Generation Systems for a total generating nameplate capacity of 202 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 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One 345/34.5 kV 138/184/230 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A 10 mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at existing Transmission Owner substation ("Leland Olds 345 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 Turbine 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>GEN-2016-130 Interconnection (TOIF) (BEPC) - 122668:</u> Build out of a new line terminal for the new interconnection including one (1) 345 kV Line Take-Off Structure, one and a half (1.5) 345 kV breakers.	\$878,699	100%	\$878,699	15 Months
Total	\$878,699		\$878,699	

Non-Shared Network Upgrades Description	ILTCR	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Leland Olds 345kV Substation Reconfiguration (DISIS-2016- 002-2) – 122669:</u> Build out of a new line terminal for the new interconnection including one (1) 345 kV PT, one (1) 345 kV CT, three (3) line disconnect switches, one (1) 345 kV surge arrestors, protection and control package, revenue metering, and all communication upgrades required.	Ineligible	\$2,649,135	15 Months
Total		\$2,649,135	

*Table 2: Non-Shared Network Upgrade(s)***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 (\$)	Estimate Lead Time
<u>None</u>	N/A	\$0	N/A	\$0	N/A
Total		\$0		\$0	

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
None	\$0	N/A

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 MISO 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 Share (%)	Allocated Cost Estimate (\$)
<u>MISO Affected System Study:</u> Install 1 (one) 20 MVAR 115 kV capacitor bank, 2 (two) 115kV SF6 breakers, 3 (three) 115kV gang operated switches, 3 (three) 115kV CCVT, and support foundations.	\$808,145	28.7%	\$231,937
Total	\$808,145		\$231,937

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 202 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 TOIF, non-shared NU, and affected systems that are required for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilitie Upgrade(s)	\$878,699
Non-Shared Network Upgrade(s)	\$2,649,135
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$231,937
Total	\$3,759,771

*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).

Basin Electric Power Cooperative Interconnection Facilities Study GEN-2016-130

1. Background:

- 1.1 Per SPP Generation Interconnection Process 2019 revision¹, BasinElectric Power Cooperative (Basin Electric) received a request to perform an Interconnection Facility Study Analysis for the following InterconnectionRequests:

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type	Comments
GEN-2016-130	Leland Olds 345 kV	202	Wind	Please provide interconnection upgrades and costs estimates needed to interconnection into the POI (SCERT UIDs# 122668 and 122669). DISIS cluster interconnection cost estimates was \$2,853,562*.

¹ SPP Tariff Attachment V Generator Interconnection Procedures (GIP) Section 8.4.4

2. Study Requirements:

Basin Electric has performed this Interconnection Facility Study Analysis in accordance with SPP Tariff Attachment V, Generator Interconnection Procedures (GIP) Section 8.4.4 for the Interconnection Request(s) as described in Section 1.

2.1. The Interconnection Facility Study Analysis includes an evaluation of the following:

- 2.1.1. Perform/develop a substation layout, perform a preliminary bus design, determine all electrical equipment requirements, and if required determine a suitable site location to accommodate the Request. Develop/compile cost estimates for all Basin Electric labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
- 2.1.2. Develop an overall construction schedule for completion of the necessary additions and/or modifications.
- 2.1.3. Point Of Change of Ownership. For the purposes of this Study Analysis, the Point of Change of Ownership location is defined as the take-off structure(s) at the Basin Electric Substation/Switching Station where the Interconnection Customer's transmission line(s) connects to the take-off structure(s). Interconnection Customer will furnish and install the conductor jumper and insulator assembly to the take-off structure(s).
- 2.1.4. Other Interconnection/Metering Requirements. Basic indication, metering, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. Basin Electric's generation metering requirements, as an SPP Transmission Owner, must be met. A list of specific needs will be provided by Basin Electric once design has progressed.

3. Study Results for GEN-2016-130:

3.1. The following results document the analysis of the required facilities for this Interconnection Request as outlined in Section 1 for a new 345kV line terminal at the Leland Olds 345kV Substation. Basin Electric has determined that the following additions and improvements are required to maintain a safe and reliable interconnection to Basin Electric's transmission system.

3.2 Substation/Switchyard

A 345kV terminal addition will be built to accommodate the new generation resource interconnection. This terminal will be added to the existing breaker and a half substation. Reference Figures A1 and A2. All equipment will follow Basin Electric's internal design standards for minimum BIL, ampacity, and fault capabilities.

The associated work for the new 345kV line terminal includes the following major additions:

- (2) 345kV Line Take-Off Structures
- (1) 345kV Breaker
- (2) 345kV Breaker Disconnect Switches
- (1) Sets of Line Potential Transformers
- (1) Set of Current Transformers
- (3) Sets of Line Surge Arrestors
- The line terminal built out for GEN-2016-130 will be used for the Leland Olds Unit 2 generator connection. The existing Leland Olds Unit 2 terminal will then be used for GEN-2016-130. This will be done to provide better transmission access for GEN-2016-130.

Additional associated work will include a review and update to relay/protection schemes and SCADA RTU configurations at the current facility and the Leland Olds Unit 2 line terminal.

3.3 Environmental Requirements

Compliance with all applicable federal, state and local regulations will be strictly adhered to. Additionally, all applicable and required permits and approvals will be obtained prior to construction. For the purposes of this Study, it is anticipated that this new 345kV line terminal will require incidental minor local permitting.

3.4 Cost Estimate

GEN-2016-130 Estimated Costs Non Shared Network Upgrades	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$528,000
Construction Labor	\$923,469
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$650,992
Right of Way	\$0
Station Sub Total	\$2,102,461
AFUDC	\$0
Contingency	\$674,366
Non - Shared Network Upgrades total	\$2,776,827

GEN-2016-130 Transmission Owner Interconnect Facilities	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$200,000
Construction Labor	\$404,243
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$483,667
Right of Way	\$0
Station Sub Total	\$1,087,910
AFUDC	\$0
Contingency	\$327,570
TOIF Subtotal	\$1,415,480

Total Interconnection Cost	\$4,192,307
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3.5 Construction Schedule

The preliminary project schedule provided is for planning level purposes only and will be adjusted with additional project definition. If it is determined that NEPA and/or ROW condemnation is required, 12-18 months will be added to the In-Service date.

Activity	Duration	Estimated Start	Estimated Finish
Executed GIA-Notice To Proceed Letter	--	Month 0	--
Project Planning	1 Month	Month 0	Month 1
Engineering Design	4-6 Months	Month 1	Month 7
Equipment Procurement	8-10 Months	Month 2	Month 12
Advertise and Award Construction Contracts	2-3 Months	Month 7	Month 10
Construction	4 Months	Month 10	Month 14
Energize and In-Service Date	1 Month	Month 14	Month 15

Figure A1: Proposed Switching Diagram

FIGURE A1
GEN-2016-130

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS
- INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER
- INTERCONNECTION FACILITIES
- FUTURE

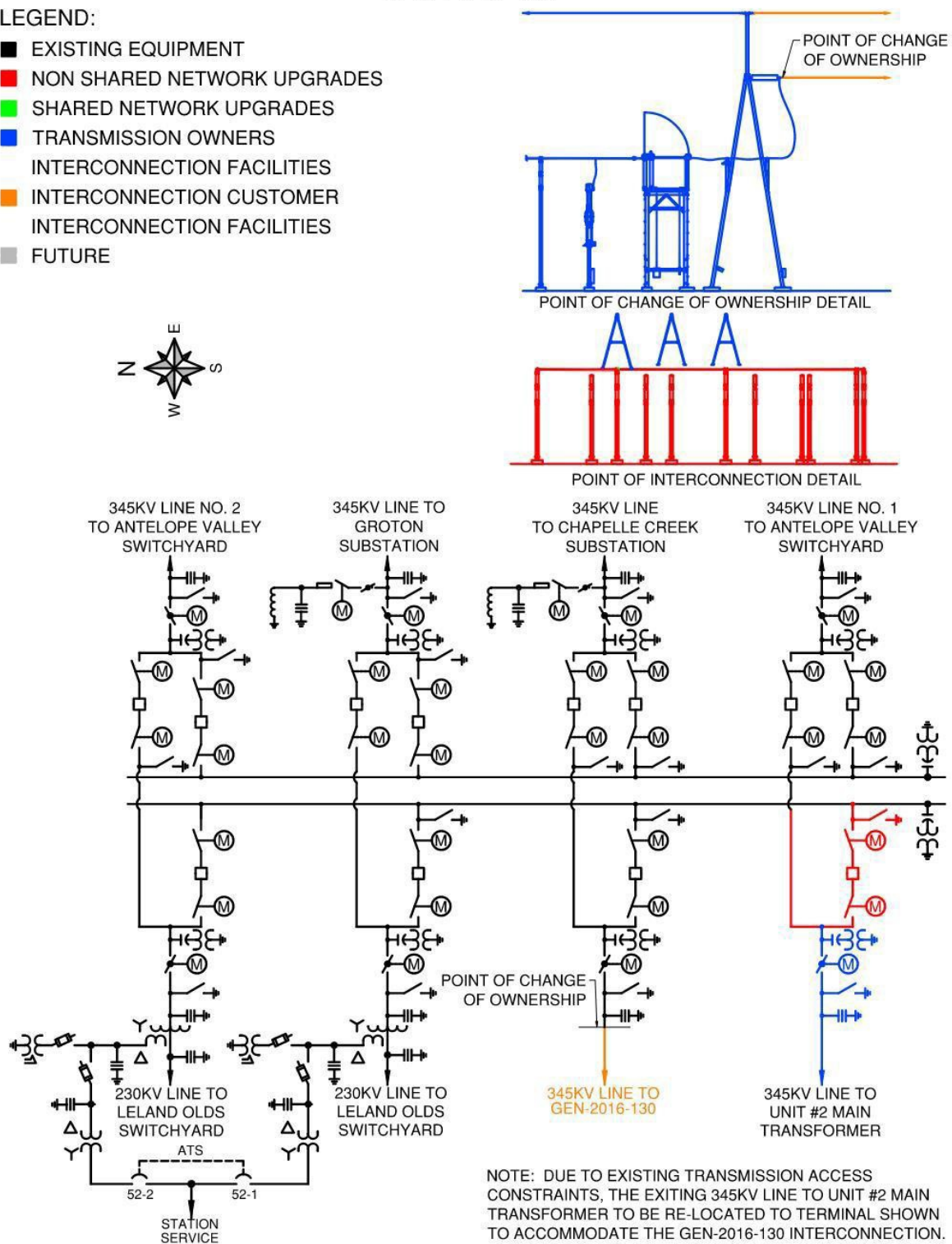
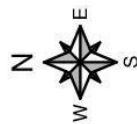
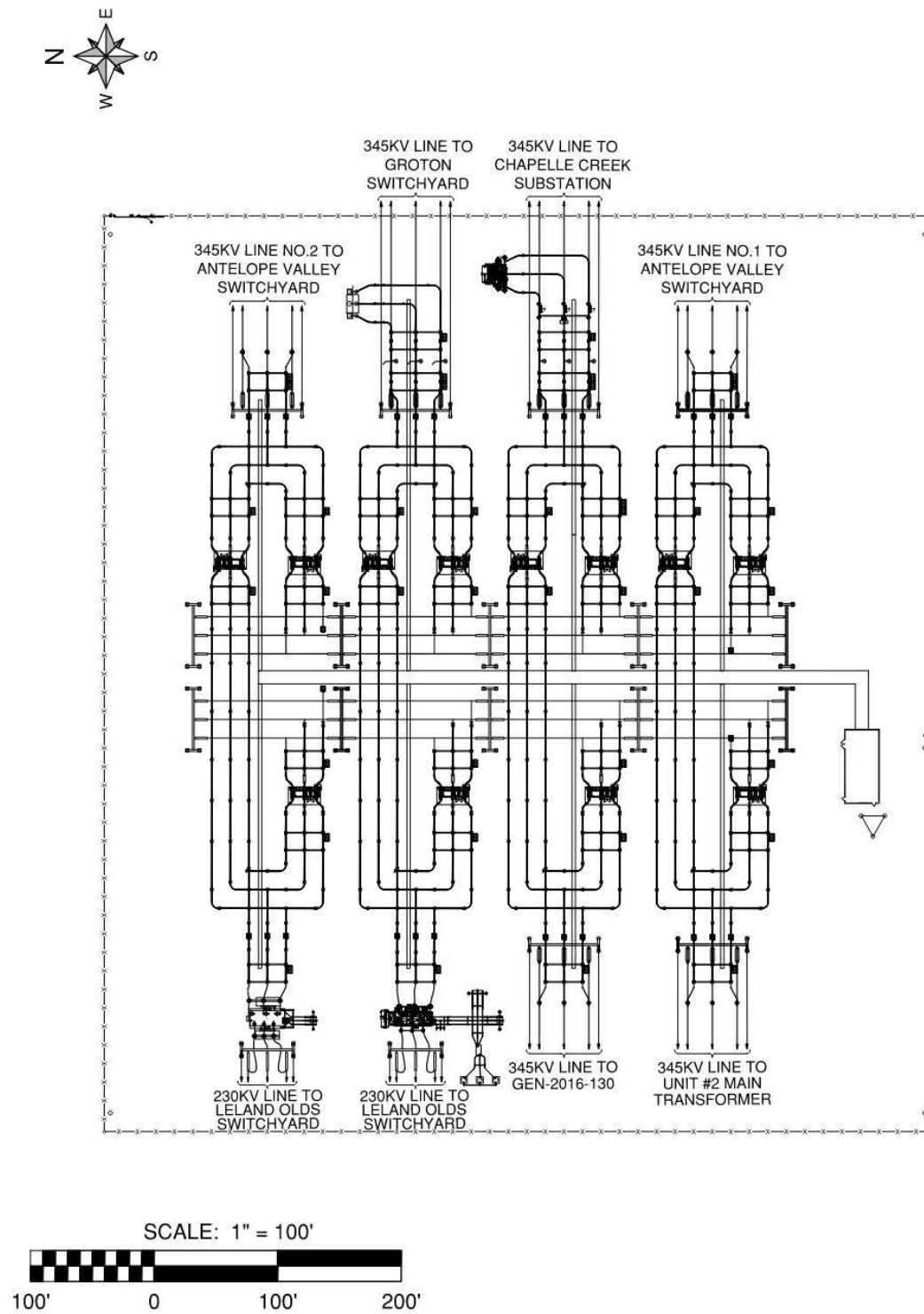


Figure A2: Proposed General Arrangement

FIGURE A2
GEN-2016-130



ATTACHMENT A
SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

ATTACHMENT A



HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE

February 11, 2020

Subject: Interconnection Facilities Study (IFS) for GI Cluster Impact Study DISIS-2016-002

Dear Mr. Trester:

Per the SPP Generator Interconnection Procedures (GIP)¹, SPP requests that Basin Electric Power Cooperative (BEPC) perform facilities study in accordance with the Scope of Interconnection Facilities Study GIP Section 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP Section 8.11 for the following Interconnection Request(s):

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type	Comments
GEN-2016-130	Leland Olds 345 kV	202	Wind	Please provide interconnection upgrades and costs estimates needed to interconnection into the POI (SCERT UIDs# 122668 and 122669). DISIS cluster interconnection cost estimates was \$2,853,562*.

** If the interconnection costs studied is higher than 20% of DISIS estimates, please provide justification in the facility report.*

The scope of the Interconnection Facilities Study is to determine interconnection related costs of upgrades for the addition of the SPP-GI Interconnection Request(s) mentioned above.

Identified upgrades and cost estimates should include:

- Costs estimates of equipment, engineering, procurement, and construction
- Associated lead times

If applicable, the DISIS Facilities Analysis conducted during DISIS impact study stage by BEPC can be used for the cost estimated and identified upgrades. If the DISIS Facilities Analysis is no longer applicable, please provide an updated cost estimate and lead time of upgrades needs.

Per GIP Section 8.11, SPP requests that BEPC provide an Interconnection Facilities Study grade estimate (+/-20%) and lead time necessary for the construction within ninety (90) calendar days of the receipt of this letter.

If any Interconnection Requests (not limited to the Interconnection Requests mentioned above) require BEPC assigned Network Upgrades in the DISIS-2016-002 Impact study, then a separate

¹ SPP Tariff Attachment V Generator Interconnection Procedures (GIP) Section 8.10 and 8.11 are to be referred to in the SPP Tariff Attachment V prior to 7/1/2019.

Interconnection Facilities Study Request Letter will be sent for those in the near future. The ninety (90) days for completion for those networks upgrade facility studies will start on the date the letters are received.

For the completion of the Interconnection Facilities Study, please provide an Interconnection Facilities Study report to SPP within ninety (90) calendar days. If the DISIS Facilities Analysis upgrades and costs are no longer applicable, please provide an updated and completed Standardized Cost Estimate Reporting Template (SCERT) in accordance with SPP Business Practice 7060².

Please find attached to this Interconnection Facilities Study Request Letter, the Interconnection Customer executed Interconnection Facilities Study Agreement along with the supporting documentation.

If you have any questions, please feel free to contact SPP GI Department @ GIStudies@spp.org

Sincerely,

SPP Generator Interconnection Department
201 Worthen Drive
Little Rock, AR 72223-4936

² Business Practice Link

<https://www.spp.org/documents/37750/spp%20oatt%20business%20practices%2020160412.pdf>

Basin Electric Power Cooperative Interconnection Facilities Study GEN-2016-130

1. Background:

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- (1) 345kV Line Take-Off Structures
- (1.5) 345kV Breakers
- (3) 345kV Breaker Disconnect Switches
- (1) Set of Line Potential Transformers
- (1) Set of Current Transformers
- (1) Set of Line Surge Arrestors

3.3 Environmental Requirements

Compliance with all applicable federal, state and local regulations will be strictly adhered to. Additionally, all applicable and required permits and approvals will be obtained prior to construction. For the purposes of this Study, it is anticipated that this new 345kV line terminal will require incidental minor local permitting.

3.4 Cost Estimate

GEN-2016-130 Estimated Costs Non Shared Network Upgrades	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$73,444
Construction Labor	\$1,017,155
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$1,159,061
Right of Way	\$0
Station Sub Total	\$2,249,660
AFUDC	\$0
Contingency	\$399,475
Non - Shared Network Upgrades total	\$2,649,135

GEN-2016-130 Transmission Owner Interconnect Facilities	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$50,000
Construction Labor	\$321,743
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$384,629
Right of Way	\$0
Station Sub Total	\$756,372
AFUDC	\$0
Contingency	\$122,327
TOIF Subtotal	\$878,699

Total Interconnection Cost	\$3,527,834
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3.5 Construction Schedule

The preliminary project schedule provided is for planning level purposes only and will be adjusted with additional project definition. If it is determined that NEPA and/or ROW condemnation is required, 12-18 months will be added to the In-Service date.

Activity	Duration	Estimated Start	Estimated Finish
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Construction	4 Months	Month 10	Month 14
Energize and In-Service Date	1 Month	Month 14	Month 15

Figure A1: Proposed Switching Diagram

FIGURE A1
GEN-2016-130

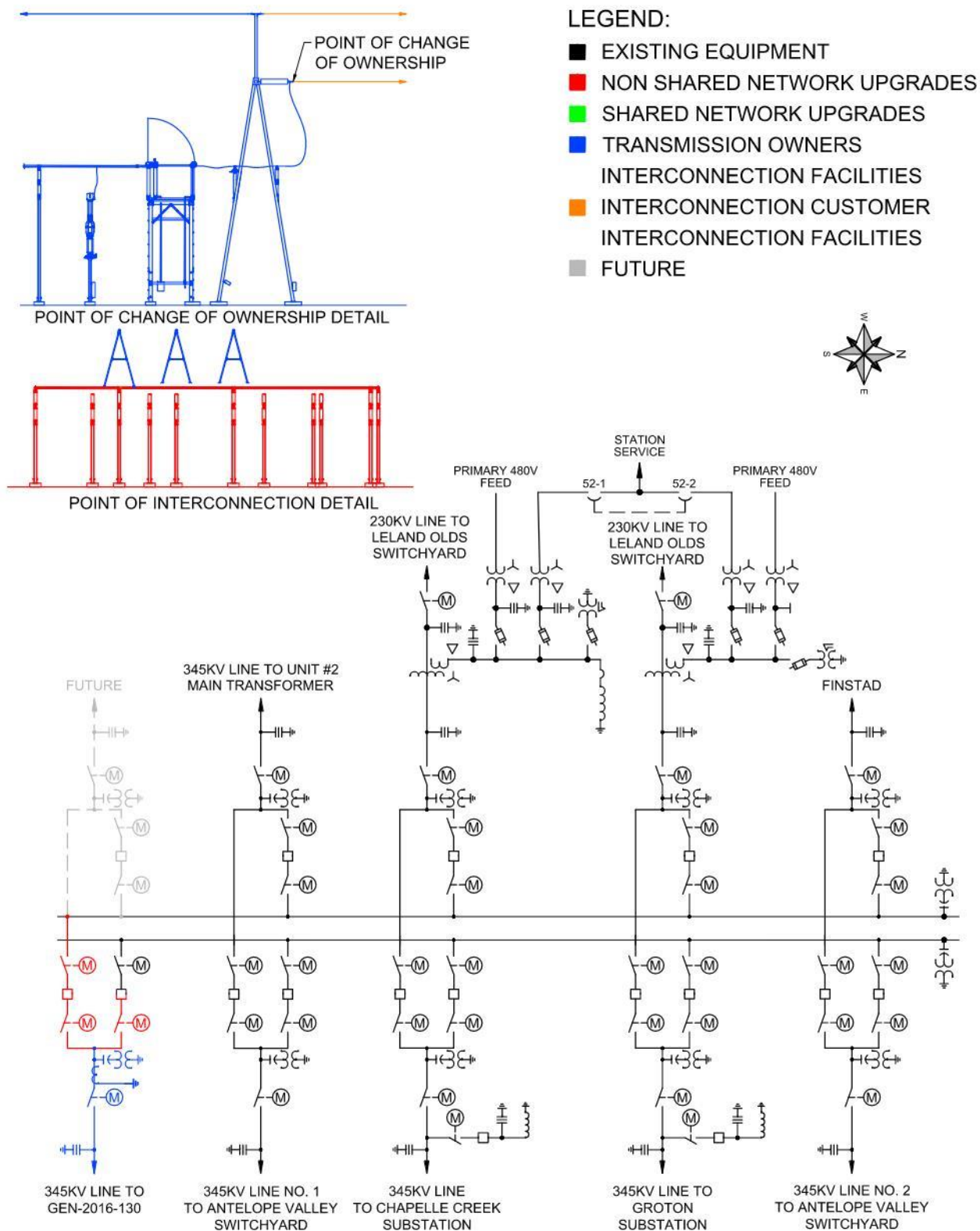
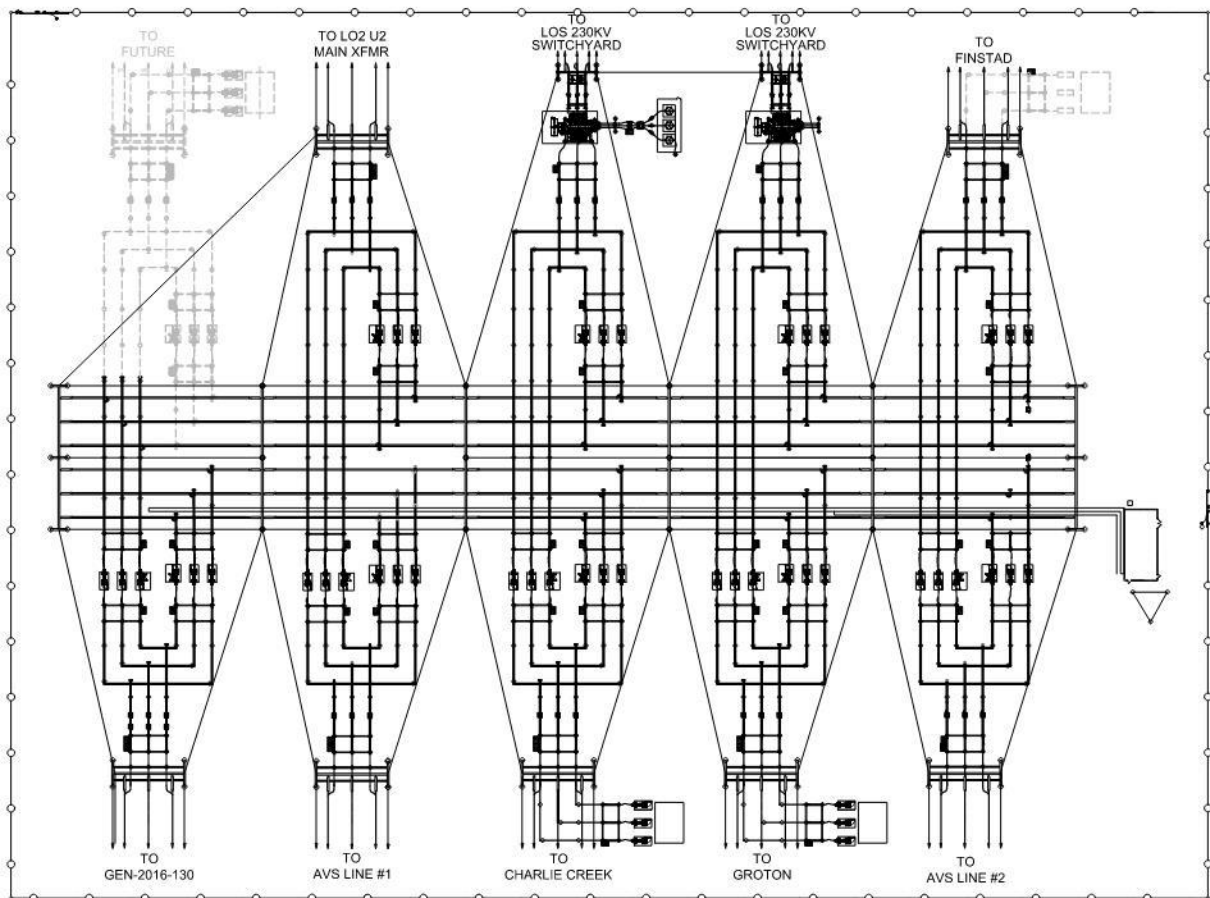
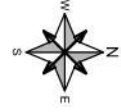


Figure A2: Proposed General Arrangement

FIGURE A2
GEN-2016-130



ATTACHMENT A
SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

ATTACHMENT A



HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE

February 11, 2020

Subject: Interconnection Facilities Study (IFS) for GI Cluster Impact Study DISIS-2016-002

Dear Mr. Trester:

Per the SPP Generator Interconnection Procedures (GIP)¹, SPP requests that Basin Electric Power Cooperative (BEPC) perform facilities study in accordance with the Scope of Interconnection Facilities Study GIP Section 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP Section 8.11 for the following Interconnection Request(s):

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type	Comments
GEN-2016-130	Leland Olds 345 kV	202	Wind	Please provide interconnection upgrades and costs estimates needed to interconnection into the POI (SCERT UIDs# 122668 and 122669). DISIS cluster interconnection cost estimates was \$2,853,562*.

** If the interconnection costs studied is higher than 20% of DISIS estimates, please provide justification in the facility report.*

The scope of the Interconnection Facilities Study is to determine interconnection related costs of upgrades for the addition of the SPP-GI Interconnection Request(s) mentioned above.

Identified upgrades and cost estimates should include:

- Costs estimates of equipment, engineering, procurement, and construction
- Associated lead times

If applicable, the DISIS Facilities Analysis conducted during DISIS impact study stage by BEPC can be used for the cost estimated and identified upgrades. If the DISIS Facilities Analysis is no longer applicable, please provide an updated cost estimate and lead time of upgrades needs.

Per GIP Section 8.11, SPP requests that BEPC provide an Interconnection Facilities Study grade estimate (+/-20%) and lead time necessary for the construction within ninety (90) calendar days of the receipt of this letter.

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¹ SPP Tariff Attachment V Generator Interconnection Procedures (GIP) Section 8.10 and 8.11 are to be referred to in the SPP Tariff Attachment V prior to 7/1/2019.



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Please find attached to this Interconnection Facilities Study Request Letter, the Interconnection Customer executed Interconnection Facilities Study Agreement along with the supporting documentation.

If you have any questions, please feel free to contact SPP GI Department @ GIStudies@spp.org

Sincerely,

SPP Generator Interconnection Department
201 Worthen Drive
Little Rock, AR 72223-4936

² Business Practice Link

<https://www.spp.org/documents/37750/spp%20oatt%20business%20practices%2020160412.pdf>