



ILTCR-2020AG1-BEPM-001
Study Report

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By SPP Transmission Services Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
04/14/2021	SPP	Initial report	

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1 INTRODUCTION

Incremental Long-Term Congestion Rights (ILTCRs) were made available by FERC Order 681 Guideline 3 as a reimbursement mechanism for sponsors of transmission upgrades. The guideline specifies that long-term firm transmission rights made feasible by transmission upgrades or expansions must be available upon request to any party that pays for such upgrades or expansions in accordance with the transmission organization's prevailing cost allocation methods for upgrades or expansions. Effective July 1, 2020, ILTCR is the default cost recovery mechanism for eligible Network Upgrades (NU) with Directly Assigned Upgrade Cost (DAUC) as a result of a Generation Interconnection Study (GIS), Aggregate Transmission Service Study (ATSS), or a Sponsored Upgrade Study in SPP.

The objective of the ILTCR analysis is to determine the incremental Available Transfer Capability (ATC) created on each of the Customer submitted source-to-sink paths over a ten-year period resulting from the construction of the upgrade. The Upgrade Sponsor may then have the option to use the results of this study to obtain candidate ILTCRs on the path selected.

The ILTCR study process was completed for Basin Electric Power Cooperative (BEPC) for Directly Assigned Upgrade Costs (DAUC) for the following network upgrades from the 2020-AG1 study:

- Greenwood 161 kV Terminal Upgrades
- Pleasant Hill 161kV and Lake Winnebago 161 kV Terminal Upgrades

2 STUDY INPUTS

MODEL BASIS

The 2020 ITP Base Reliability (BR) models from the 2020-AG1 were the starting point for the analysis. The following details specify the particular models utilized for this evaluation.

- Model years 2021, 2022, 2025, 2030
 - Summer Peak (2022SP, 2025SP, 2030SP)
 - Winter Peak (2021WP, 2022WP, 2025WP, 2030WP)
 - Light Load (2022LL, 2025LL, 2030LL)

MONITORED FACILITIES

The monitored elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier Non-SPP control area branches and ties 100 kV and above. NERC Power Transfer Distribution Flowgates for SPP and first tier Non-SPP control areas are monitored. Additional NERC Flowgates are monitored in second tier or greater Non-SPP control areas.

- All branches and ties within the following areas:
 - SPP Internal Areas for 60kV – 999kV facilities:
 - 515 – 546, 640 – 652, 659
- NERC, SPP, and Tier 1 Permanent Flowgates (thermal)

CONTINGENCY EVENTS

The contingency set includes all SPP control area branches and ties 69kV and above, first tier Non-SPP control area branches and ties 100 kV and above, any defined contingencies for these control areas, and generation unit outages for the SPP control areas with SPP reserve share program redispatch.

- All branches, ties, shunts, and generators within the following areas:
 - SPP Internal Areas for 60kV – 999kV facilities:
 - 515 – 546, 640 - 652, 659
 - SPP External Areas for 100kV – 999kV facilities:
- NERC, SPP, and Tier 1 Permanent Flowgates
- SPP T.O. Specific P1, P2, P4, and P5 TPL-004-1 Contingencies

TRANSFER PATHS

BEPC is eligible to select up to three (3) source-to-sink transfer paths for the Network Upgrades. The source-to-sink transfer paths selected by the BEPC are captured in the Results section.

3 STUDY METHODOLOGY

TRANSFER ANALYSIS

A DC transfer analysis was conducted to determine the limiting flowgates in each applicable case for the respective transfer paths provided by BEPC. Constraints were defined as any overloaded facility in which the transfer had a TDF of three (3) percent or greater for system intact or contingency conditions respectively.

Once the initial DC limiting flowgates were filtered to valid results, the top five (5) limiting flowgates in each applicable case for the respective transfer paths provided by BEPC were AC verified.

With the transfer limits AC verified, the deltas between the minimum AC transfer amounts across all analyzed cases for each path with and without the associated Network Upgrades were determined as follows:

- If $ATC_{post-NU} < 0$, then individual increment = 0
- If $ATC_{pre-NU} < 0$ and $ATC_{post-NU} > 0$, then individual increment = $ATC_{post-NU}$
- If $ATC_{pre-NU} > 0$ and $ATC_{post-NU} > 0$, then individual increment = $ATC_{post-NU} - ATC_{pre-NU}$

4 ILTCR STUDY RESULTS

Table 4-1 summarizes the minimum incremental ATC created across all seasons for each of the source-to-sink paths provided by BEPC for the Network Upgrades. No additional ATC was created for any of the source-to-sink paths.

Appendix A includes the detailed results of the top five (5) most limiting flowgates for each model and transfer path. Appendix B includes definitions of the contingencies specified in Appendix A.

Table 4-1: Minimum Incremental ATC Created by Upgrades

Source	Sink	Min Incremental ATC Created (MW)	Candidate ILTCR (MW)
BEPC.EDGELEY	WAUE.BEPC.NTWK	0	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	0	0
BEPC.LRS	WAUE.BEPC.NTWK	0	0

5 CONCLUSION

The ILTCR analysis determined no incremental ATC was created on the BEPC submitted source-to-sink paths due to the Network Upgrades. As a result, no candidate ILTCRs will be awarded. This data will be documented in BEPC's service agreement and executed before filing with FERC.

APPENDIX A

Source	Sink	Season	Limiting Constraint	Contingency	Base FCITC	Upgrade FCITC	ATC Increase
BEPC.EDGELEY	WAUE.BEPC.NTWK	21WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91352	155.8	155.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	21WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	157.2	155.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	21WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	171.7	171.8	0.1
BEPC.EDGELEY	WAUE.BEPC.NTWK	21WP	L:652432 EDGELEY7 115 B\$1312 ED KY6A 1.00 1	Base Case	171.8	171.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	21WP	L:652432 EDGELEY7 115 B\$1312 ED KY6A 1.00 1	C:106623	124.8	124.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91352	143.7	143.7	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	144.2	144.2	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	C:106150	170.5	170.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	C:91399	146.1	146.1	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22LP	L:652433 EDGELEY8 69.0 B\$1312 ED KY6A 1.00 1	C:106623	173.2	173.2	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22SP	L:615901 GRE-STANTON4 230 657756 SQBUTTE4 230 1	C:35816	148.7	148.7	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:91199	138.2	138.2	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	170.5	170.6	0.1
BEPC.EDGELEY	WAUE.BEPC.NTWK	22SP	L:652432 EDGELEY7 115 B\$1315 ED KY6A 1.00 1	C:37007	135.7	135.7	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22SP	L:652433 EDGELEY8 69.0 B\$1315 ED KY6A 1.00 1	C:94492	158.5	158.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22WP	L:615901 GRE-STANTON4 230 657756 SQBUTTE4 230 1	C:37359	178.9	178.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22WP	L:615901 GRE-STANTON4 230 657756 SQBUTTE4 230 1	C:35816	184.9	184.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	168.3	168.3	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	176.4	176.4	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	22WP	L:652432 EDGELEY7 115 B\$1312 ED KY6A 1.00 1	C:94492	185.5	185.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	163.6	163.6	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	163.6	163.6	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	C:106150	156.1	156.1	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25LP	L:652432 EDGELEY7 115 B\$1334 ED KY6A 1.00 1	C:106623	157.4	157.4	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	Base Case	90.5	90.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25SP	L:615901 GRE-STANTON4 230 657756 SQBUTTE4 230 1	C:37359	112.8	112.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:105778	142.4	142.4	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	163.1	163.1	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91399	163.1	163.1	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	186.3	186.3	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91352	153	153	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	153.1	153.1	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	159.4	159.4	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25WP	L:652433 EDGELEY8 69.0 B\$1338 ED KY6A 1.00 1	Base Case	182.5	182.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	25WP	L:652432 EDGELEY7 115 B\$1338 ED KY6A 1.00 1	C:94492	196.8	196.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91352	162.9	162.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30LP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:91399	162.9	162.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30LP	L:652432 EDGELEY7 115 B\$1334 ED KY6A 1.00 1	Base Case	167.8	167.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	C:106150	166.8	166.8	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30LP	L:652432 EDGELEY7 115 659310 ORDWAY_-BE7 115 1	C:106042	166.9	166.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30SP	L:615901 GRE-STANTON4 230 657756 SQBUTTE4 230 1	C:37359	103.2	103.2	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:6850	147.9	147.9	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	155.7	155.7	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	155.7	155.7	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30SP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	179.3	179.3	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106002	154.5	154.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	C:106042	154.5	154.5	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30WP	L:652432 EDGELEY7 115 652445 JAMESTN7 115 1	Base Case	161.3	161.3	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30WP	L:652432 EDGELEY7 115 B\$1336 ED KY6A 1.00 1	C:94492	187.4	187.4	0
BEPC.EDGELEY	WAUE.BEPC.NTWK	30WP	L:652433 EDGELEY8 69.0 B\$1336 ED KY6A 1.00 1	C:106623	187.6	187.6	0

Source	Sink	Season	Limiting Constraint	Contingency	Base FCITC	Upgrade FCITC	ATC Increase
BEPC.HYDEWIND	WAUE.BEPC.NTWK	21WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	81.2	81.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	21WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:93740	93.2	93.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	21WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:37359	61.6	61.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	21WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:37359	92.8	92.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	21WP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	Base Case	92.8	92.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22LP	L:652216 WATFORD4 230 659302 CHARL_CK-BE4 230 1	C:106529	78.2	78.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22LP	L:603012 LAWRENC7 115 652524 SIOUXFL7 115 1	C:36054	74.6	74.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22LP	L:603012 LAWRENC7 115 652524 SIOUXFL7 115 1	C:38429	74.6	74.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22LP	L:603012 LAWRENC7 115 652524 SIOUXFL7 115 1	C:37525	74.7	74.7	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22LP	L:652424 BELFELD3 345 B\$0862 BEF KU2A 1.00 1	C:106608	79.2	79.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:91199	85.6	85.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22SP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	C:7203	93.3	93.3	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	Base Case	92.6	92.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22SP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:93740	93	93	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22SP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:35817	93.9	93.9	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	81.2	81.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:93740	93	93	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:35817	92.8	92.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:37359	61.6	61.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	22WP	L:655765 WHITLOCK_-RM 230 661038 GLENHAM4 230 1	C:93740	93.5	93.5	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25LP	L:652216 WATFORD4 230 659302 CHARL_CK-BE4 230 1	C:106529	79.5	79.5	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	C:7203	78.6	78.6	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25LP	L:652424 BELFELD3 345 B\$0884 BEF KU2A 1.00 1	C:106612	79.2	79.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25LP	L:652424 BELFELD3 345 B\$0884 BEF KU2A 1.00 1	C:106608	79.2	79.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 2	C:94492	78.8	78.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:91199	88.2	88.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25SP	L:652507 FTTHOMP4 230 652514 HURON 4 230 2	C:7202	94.1	94.1	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	Base Case	61.8	61.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25SP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	85.9	85.9	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25SP	L:652507 FTTHOMP4 230 652509 FTRANDL4 230 1	C:91231	93	93	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25WP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:93740	94	94	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25WP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:37359	94.2	94.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	81	81	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:93740	93.5	93.5	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	25WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:37359	61.4	61.4	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	C:7203	80.1	80.1	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	C:94492	79.7	79.7	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 2	C:93740	79.3	79.3	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 2	Base Case	80	80	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30LP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	Base Case	80	80	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30SP	L:640304 OGALALANPPD7 115 659801 OGALALA_-TS7 115 Z	C:91199	91.7	91.7	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30SP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:35817	94	94	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30SP	L:652507 FTTHOMP4 230 652514 HURON 4 230 1	C:7203	93.9	93.9	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30SP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	85.8	85.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30SP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:35817	94.2	94.2	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30WP	L:652519 OAHE 4 230 655487 SULLYBT-ER4 230 1	C:35817	93.8	93.8	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:93740	81.1	81.1	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:35817	93	93	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30WP	L:655487 SULLYBT-ER4 230 655510 SB.LS-WK-ER4 230 Z	C:37359	61.5	61.5	0
BEPC.HYDEWIND	WAUE.BEPC.NTWK	30WP	L:655510 SB.LS-WK-ER4 230 655765 WHITLOCK_-RM 230 1	C:37359	93.6	93.6	0
BEPC.LRS	WAUE.BEPC.NTWK	21WP	L:640302 OGALALA4 230 659134 SIDNEY_TS4 230 1	C:91488	70	70	0
BEPC.LRS	WAUE.BEPC.NTWK	21WP	L:640302 OGALALA4 230 659134 SIDNEY_TS4 230 1	C:85249	114.8	114.7	0
BEPC.LRS	WAUE.BEPC.NTWK	21WP	L:659131 LARAMIE_-MB3 345 659135 STEGALL_-MB3 345 1	C:93743	124	124	0
BEPC.LRS	WAUE.BEPC.NTWK	21WP	L:659131 LARAMIE_-MB3 345 659135 STEGALL_-MB3 345 1	C:91489	190.8	190.8	0

Source	Sink	Season	Limiting Constraint	Contingency	Base FCITC	Upgrade FCITC	ATC Increase
BEPC.LRS	WAUE.BEPC.NTWK	21WP	L:659134 SIDNEY TS4 230 659210 SIDNEY -MB4 230 1	C:106130	266.4	266.4	0
BEPC.LRS	WAUE.BEPC.NTWK	22LP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:91489	260.2	260.2	0
BEPC.LRS	WAUE.BEPC.NTWK	22LP	L:640184 GENTLMN4 230 640302 OGALALA4 230 1	C:85242	305.3	305.3	0
BEPC.LRS	WAUE.BEPC.NTWK	22LP	L:640184 GENTLMN4 230 640302 OGALALA4 230 1	C:85249	335	335	0
BEPC.LRS	WAUE.BEPC.NTWK	22LP	L:659134 SIDNEY TS4 230 659210 SIDNEY -MB4 230 1	C:91488	405.2	405.2	0
BEPC.LRS	WAUE.BEPC.NTWK	22SP	L:653312 MORRILL7 115 659821 GERINGT -TS7 115 1	C:106623	97.3	97.3	0
BEPC.LRS	WAUE.BEPC.NTWK	22SP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:85249	108	108	0
BEPC.LRS	WAUE.BEPC.NTWK	22SP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:91488	108.7	108.6	0
BEPC.LRS	WAUE.BEPC.NTWK	22SP	L:653312 MORRILL7 115 659814 SNAKECK -TS7 115 1	C:106623	107.9	107.9	0
BEPC.LRS	WAUE.BEPC.NTWK	22SP	L:640338 SCOTBLF7 115 659821 GERINGT -TS7 115 1	C:106623	134.3	134.3	0
BEPC.LRS	WAUE.BEPC.NTWK	22WP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:106130	107.3	107.3	0
BEPC.LRS	WAUE.BEPC.NTWK	22WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:91489	190.6	190.6	0
BEPC.LRS	WAUE.BEPC.NTWK	22WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:93743	163.8	163.8	0
BEPC.LRS	WAUE.BEPC.NTWK	22WP	L:659134 SIDNEY TS4 230 659210 SIDNEY -MB4 230 1	C:106130	269.4	269.4	0
BEPC.LRS	WAUE.BEPC.NTWK	22WP	L:640184 GENTLMN4 230 640302 OGALALA4 230 1	C:85242	118.9	118.9	0
BEPC.LRS	WAUE.BEPC.NTWK	25LP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:106130	217.5	217.5	0
BEPC.LRS	WAUE.BEPC.NTWK	25LP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:85249	220.2	220.2	0
BEPC.LRS	WAUE.BEPC.NTWK	25LP	L:659134 SIDNEY TS4 230 659210 SIDNEY -MB4 230 1	C:106130	340.3	340.3	0
BEPC.LRS	WAUE.BEPC.NTWK	25LP	L:B\$2617 SDQ KV2A 1.00 659210 SIDNEY -MB4 230 1	C:106130	220.8	220.8	0
BEPC.LRS	WAUE.BEPC.NTWK	25LP	L:640068 B.SPRGS7 115 640091 BRULE 7 115 1	C:106623	272.1	207.4	0
BEPC.LRS	WAUE.BEPC.NTWK	25SP	L:640304 OGALALANPPD7 115 659801 OGALALA -TS7 115 Z	C:91199	97	97	0
BEPC.LRS	WAUE.BEPC.NTWK	25SP	L:653312 MORRILL7 115 659821 GERINGT -TS7 115 1	C:106623	90.8	90.8	0
BEPC.LRS	WAUE.BEPC.NTWK	25SP	L:640338 SCOTBLF7 115 659821 GERINGT -TS7 115 1	C:106623	128.8	128.8	0
BEPC.LRS	WAUE.BEPC.NTWK	25SP	L:653312 MORRILL7 115 659821 GERINGT -TS7 115 1	C:91491	178.9	178.9	0
BEPC.LRS	WAUE.BEPC.NTWK	25SP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:106131	76.4	76.4	0
BEPC.LRS	WAUE.BEPC.NTWK	25WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:93743	123.5	123.5	0
BEPC.LRS	WAUE.BEPC.NTWK	25WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:106131	189.9	189.9	0
BEPC.LRS	WAUE.BEPC.NTWK	25WP	L:640184 GENTLMN4 230 640302 OGALALA4 230 1	C:85242	338.5	338.5	0
BEPC.LRS	WAUE.BEPC.NTWK	30LP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:106130	172.8	172.8	0
BEPC.LRS	WAUE.BEPC.NTWK	30LP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:85249	157.5	157.5	0
BEPC.LRS	WAUE.BEPC.NTWK	30LP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:93743	172.2	172.2	0
BEPC.LRS	WAUE.BEPC.NTWK	30LP	L:640184 GENTLMN4 230 640302 OGALALA4 230 1	C:85249	156.2	165.6	9.4
BEPC.LRS	WAUE.BEPC.NTWK	30LP	L:659134 SIDNEY TS4 230 659210 SIDNEY -MB4 230 1	C:85249	166.3	166.3	0
BEPC.LRS	WAUE.BEPC.NTWK	30SP	L:653312 MORRILL7 115 659821 GERINGT -TS7 115 1	C:106623	89.3	89.3	0
BEPC.LRS	WAUE.BEPC.NTWK	30SP	L:653312 MORRILL7 115 659821 GERINGT -TS7 115 1	C:91491	141.7	141.7	0
BEPC.LRS	WAUE.BEPC.NTWK	30SP	L:653312 MORRILL7 115 659814 SNAKECK -TS7 115 1	C:106623	102.5	102.5	0
BEPC.LRS	WAUE.BEPC.NTWK	30SP	L:640338 SCOTBLF7 115 659821 GERINGT -TS7 115 1	C:106623	133.5	133.5	0
BEPC.LRS	WAUE.BEPC.NTWK	30SP	L:653312 MORRILL7 115 659814 SNAKECK -TS7 115 1	C:91491	96.2	96.2	0
BEPC.LRS	WAUE.BEPC.NTWK	30WP	L:640183 GENTLMN3 345 B\$1526 GGS T1 1.00 1	C:85242	19.3	19.3	0
BEPC.LRS	WAUE.BEPC.NTWK	30WP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:91488	137.3	137.3	0
BEPC.LRS	WAUE.BEPC.NTWK	30WP	L:640302 OGALALA4 230 659134 SIDNEY TS4 230 1	C:85249	141.5	141.5	0
BEPC.LRS	WAUE.BEPC.NTWK	30WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:106131	188.9	188.9	0
BEPC.LRS	WAUE.BEPC.NTWK	30WP	L:659131 LARAMIE -MB3 345 659135 STEGALL -MB3 345 1	C:93743	149.3	149.3	0

APPENDIX B

Contingency	Definition
C:105778	Open 659134 SIDNEY__TS4 230 B\$2617 SD KV1A 1.00 1 Open 653572 SIDNEY 7 115 B\$2617 SD KV1A 1.00 1 Open 659803 SIDNEY__TS813.8 B\$2617 SD KV1A 1.00 1
C:106002	Open 655625 DICKEYTP-CP869.0 655626 OMEGATAP-CP869.0 1 Open 652433 EDGELEY8 69.0 655625 DICKEYTP-CP869.0 1
C:106042	Open 655625 DICKEYTP-CP869.0 655626 OMEGATAP-CP869.0 1 Open 655626 OMEGATAP-CP869.0 655627 LAMOURTP-CP869.0 1 Open 652433 EDGELEY8 69.0 655625 DICKEYTP-CP869.0 1
C:106130	Open 659133 SIDNEY__-MB3 345 659425 SD.LS-KS-MB3 345 Z Open 640252 KEYSTON3 345 659425 SD.LS-KS-MB3 345 1
C:106131	Open 659133 SIDNEY__-MB3 345 659426 SD.LS-LR-MB3 345 Z Open 659131 LARAMIE_-MB3 345 659426 SD.LS-LR-MB3 345 1
C:106150	Open 652439 FORMAN 8 69.0 655630 COGSWELL-CP869.0 1 Open 652433 EDGELEY8 69.0 655625 DICKEYTP-CP869.0 1
C:106529	Open 659183 CHARL_CK-BE3 345 659390 PATENTGT-BE3 345 1 Open 659183 CHARL_CK-BE3 345 659384 ROUNDUP_-BE3 345 1
C:106608	Open 652425 BELFELD4 230 659309 S.HEART_-RR4 230 Z Open 652424 BELFELD3 345 B\$0861 BEF KU1A 1.00 1 Open 652425 BELFELD4 230 B\$0861 BEF KU1A 1.00 1 Open 652221 BELFELD9 13.8 B\$0861 BEF KU1A 1.00 1
C:106612	Open 652425 BELFELD4 230 659309 S.HEART_-RR4 230 Z Open 659306 S.HEART_-RR7 115 659309 S.HEART_-RR4 230 1 Open 652424 BELFELD3 345 B\$0883 BEF KU1A 1.00 1 Open 652425 BELFELD4 230 B\$0883 BEF KU1A 1.00 1 Open 652221 BELFELD9 13.8 B\$0883 BEF KU1A 1.00 1
C:106623	Open 659133 SIDNEY__-MB3 345 659135 STEGALL_-MB3 345 1 Open 640252 KEYSTON3 345 659425 SD.LS-KS-MB3 345 1 Open 659133 SIDNEY__-MB3 345 659425 SD.LS-KS-MB3 345 Z
C:35816	Remove unit 1 from bus 615001 GRE-COAL 41G22.0
C:35817	Remove unit 2 from bus 615002 GRE-COAL 42G22.0
C:36054	Open 602004 SPLT RK4 230 652523 SIOUXFL4 230 1
C:37007	Open 620362 OAKES 4 230 620363 FORMAN 4 230 1 Open 620362 OAKES 4 230 661098 ELLENDLMVP4 230 1
C:37359	Open 615002 GRE-COAL 42G22.0 615600 GRE-COAL CR4 230 1
C:37525	Open 602004 SPLT RK4 230 B\$0307 1.00 7 Open 603016 SPLT RK7 115 B\$0307 1.00 7 Open 605725 SPLT RK161 913.8 B\$0307 1.00 7
C:38429	Open 602004 SPLT RK4 230 B\$0307 1.00 7 Open 603016 SPLT RK7 115 B\$0307 1.00 7 Open 605725 SPLT RK161 913.8 B\$0307 1.00 7 Open 602004 SPLT RK4 230 652523 SIOUXFL4 230 1
C:6850	Open 659134 SIDNEY__TS4 230 B\$2617 SD KV1A 1.00 1 Open 653572 SIDNEY 7 115 B\$2617 SD KV1A 1.00 1 Open 659803 SIDNEY__TS813.8 B\$2617 SD KV1A 1.00 1
C:7202	Open 652507 FTTHOMP4 230 652514 HURON 4 230 1

Contingency	Definition
C:7203	Open 652507 FTTHOMP4 230 652514 HURON 4 230 2
C:85242	Open 640183 GENTLMN3 345 640252 KEYSTON3 345 1 Open 640184 GENTLMN4 230 B\$1506 GGS T2 1.00 2 Open 640183 GENTLMN3 345 B\$1506 GGS T2 1.00 2 Open 643066 GENTLEMANT2913.8 B\$1506 GGS T2 1.00 2
C:85249	Open 640252 KEYSTON3 345 659425 SD.LS-KS-MB3 345 1 Open 640183 GENTLMN3 345 640252 KEYSTON3 345 1 Open 640253 KEYSTON7 115 B\$1811 KEYSTONE T1 1.00 1 Open 640252 KEYSTON3 345 B\$1811 KEYSTONE T1 1.00 1 Open 640254 KEYSTON9 13.8 B\$1811 KEYSTONE T1 1.00 1 Open 659133 SIDNEY__-MB3 345 659425 SD.LS-KS-MB3 345 Z
C:91199	Open 659134 SIDNEY__TS4 230 B\$2609 SD KV1A 1.00 1 Open 653572 SIDNEY 7 115 B\$2609 SD KV1A 1.00 1 Open 659803 SIDNEY__-TS813.8 B\$2609 SD KV1A 1.00 1
C:91231	Open 652507 FTTHOMP4 230 655475 LAKPLAT-ER4 230 1
C:91352	Open 652433 EDGELEY8 69.0 655625 DICKEYTP-CP869.0 1 Open 655625 DICKEYTP-CP869.0 655626 OMEGATAP-CP869.0 1
C:91399	Open 655625 DICKEYTP-CP869.0 655626 OMEGATAP-CP869.0 1 Open 655626 OMEGATAP-CP869.0 655627 LAMOURTP-CP869.0 1 Open 652433 EDGELEY8 69.0 655625 DICKEYTP-CP869.0 1
C:91488	Open 640252 KEYSTON3 345 659425 SD.LS-KS-MB3 345 1 Open 659133 SIDNEY__-MB3 345 659425 SD.LS-KS-MB3 345 Z
C:91489	Open 659133 SIDNEY__-MB3 345 659426 SD.LS-LR-MB3 345 Z Open 659131 LARAMIE__-MB3 345 659426 SD.LS-LR-MB3 345 1
C:91491	Open 652573 STEGALL4 230 652873 STEGALL-LNX3 230 Z Open 640404 WAYSIDE4 230 652873 STEGALL-LNX3 230 1
C:93740	Open 652806 FTTHOM1-LNX3 345 659424 LO.LS-FT-BE3 345 1 Open 659105 LELAND_O-BE3 345 659424 LO.LS-FT-BE3 345 Z Open 659105 LELAND_O-BE3 345 659111 LELAND_2-BEG20.0 1 Open 652506 FTTHOMP3 345 652806 FTTHOM1-LNX3 345 Z
C:93743	Open 659133 SIDNEY__-MB3 345 B\$2611 SDQ KV2A 1.00 1 Open 659210 SIDNEY__-MB4 230 B\$2611 SDQ KV2A 1.00 1 Open 659168 SIDNEY__-MB913.8 B\$2611 SDQ KV2A 1.00 1 Open 659131 LARAMIE__-MB3 345 659426 SD.LS-LR-MB3 345 1 Open 659133 SIDNEY__-MB3 345 659426 SD.LS-LR-MB3 345 Z Open 659134 SIDNEY__TS4 230 659210 SIDNEY__-MB4 230 1
C:94492	Open 640510 HOLT.CO3 345 652832 GRPRAR1-LNX3 345 1 Open 652532 GR PRAIRIE 3 345 652832 GRPRAR1-LNX3 345 Z