Southwest Power Pool

TRANSMISSION WORKING GROUP MEETING

December 20, 2017

Net Conference – Little Rock, AR

• Summary of Action Items •

1. Approved the 2017 TPL Assessment
2. Approved the Brookline high voltage models for use in the 2018 ITPNT
3. Approved a Sponsored Upgrade for Central Power

Southwest Power Pool

TRANSMISSION WORKING GROUP MEETING

December 20th, 2017

Net Conference – Little Rock, AR

• M I N U T E S •

Agenda Item 1 – Administrative Items

Call to Order

TWG Chair Travis Hyde called the meeting to order at 9:01 am. The following members were in attendance (Attachment 1a – Attendance).

Travis Hyde (Chair), Oklahoma Gas & Electric
Daniel Benedict, City of Independence
Scott Benson, Lincoln Electric System
John Fulton, Southwestern Public Service Company
Joe Fultz, Grand River Dam Authority
James Ging, Kansas Power Pool
Kalun Kelley, Western Farmers Electric Cooperative
John Knofczynski, East River Electric Power Cooperative
Dan Lenihan, Omaha Public Power District
Randy Lindstrom, Nebraska Public Power District
Matt McGee, American Electric Power
Nathan McNeil, Midwest Energy Inc.
Michael Mueller, Arkansas Electric Cooperative Corporation
Gayle Nansel, Western Area Power Authority
Jason Shook, GDS Associates, Inc.
Matthew Stoltz, Basin Electric Power Cooperative
Harold Wyble, Kansas City Power & Light

Proxies

Kirk Hall, SPP staff, identified the following proxies (Attachment 1b – Proxies):

- Michael Wegner (ITC Great Plains) proxy for Alan Myers (ITC Great Plains)
- Jerry Bradshaw (CUS) proxy for John Boshears (CUS)
- Jody Holland (SCMCN) proxy for Noman Williams (SCMCN)

Kirk Hall, SPP staff, informed the Chair of a quorum.

Agenda Item 2 – 2017 TPL Assessment

Charles Hendrix, SPP staff, presented SPP's final 2017 TPL-001 Report (Attachment 2 – CAS Dec 20 Update) to the TWG and requested the TWG approve the report. The TWG had no comments on the report.

Motion: Daniel Benedict made a motion to approve the 2017 SPP TPL-001 Report. Kalun Kelley seconded the motion, which passed with no opposition.

Agenda Item 3 – Brookline Model Approval

Kirk discussed the Brookline high voltage models posted the previous week and asked the TWG to approve them for use in 2018 ITPNT. Kirk explained that two occurrences of high voltage from

Operations were provided with the system reconfiguration applied to mitigate the high voltage issues at Brookline. Two separate models of the system occurrences were also posted with the system reconfiguration removed to show the high voltage. Kirk also mentioned that solutions submitted by stakeholders during the DPP window should tested against the models with the system reconfiguration removed as these are the models that staff will be using during solution development to ensure that the solution/mitigation completely removes the need for the system reconfiguration.

Motion: John Knofczynski made a motion to approve the Brookline high voltage models. Jason Shook seconded the motion, which was approve unanimously.

Agenda Item 4 – CPEC Sponsored Upgrade

Josh Ross, SPP staff, presented a Sponsored Upgrade study requested by Central Power (Attachment 3a, 3b – CPEC Sponsored Upgrade Presentation, CPEC Sponsored Upgrade Report. TWG members requested those that participated agree that the upgrade is in the best interest of the system. Matthew Stoltz (Basin) informed the TWG that Basin supports the project.

Motion: John Knofczynski made a motion to approve the Central Power Sponsored Upgrade Study. Jason Shook seconded the motion which passed with no opposition.

Agenda Item 5 – Criteria 5.3.3

Michael Odom, SPP staff, presented the latest results for the SPP Criteria 5.3.3 (Attachment 4 – Criteria 5.3.3) load comparison between planning models and real-time values. Stakeholders asked for some additional clarification of data, such as splitting some loads from larger areas. Settlements data was suggested as a potential source for data in the comparison. Michael received additional suggestions from the members and informed the TWG he would work to incorporate them.

Kirk reminded the TWG of staff's request for stakeholder feedback on the 2019 ITP Scope. He also mentioned the 2018 ITPNT Needs Assessment is expected to be posted on January 2nd and the DPP window would open at 12:00 am on January 3rd.

Respectfully Submitted,

Kirk Hall
Secretary

Southwest Power Pool, Inc.

TWG NET CONFERENCE

December 20, 2017

SPP Corporate Campus – Little Rock, AR

• A G E N D A •

9:00 am – 11:00 am

1. Administrative Items ..... Travis Hyde (5 min.)
    a. Call to Order
    b. Proxies
2. 2017 TPL Assessment[1] (Approval Item) ..... Charles Hendrix (40 min.)
3. Brookline Model Approval[1] (Approval Item)..... Kirk Hall (5 min.)
4. CPEC Sponsored Upgrade Study (Approval Item) ..... Josh Ross (20 min.)
5. Criteria 5.3.3 ..... Michael Odom (20 min.)
6. 2019 ITP Scope ..... Kirk Hall (10 min.)

[1] Materials Posted to TrueShare or GlobalScape

All sessions in Central Standard Time (Chicago, GMT-06:00)
Session detail for 'TWG Net Conference':

Participant	Name	Email
1	Scott Benson (LES)	sbenson@les.com
2	Jeff Hanson	jhanson@csu.org
3	Daniel Benedict (INDN)	dbenedict@indepmo.org
4	Sherri Maxey	smaxey@spp.org
5	Kevin Foflygen (SPRM)	kevin.foflygen@cityutilities.net
6	Chenal WebEx	awhite@spp.org
7	Bob Tallman, OG&E	tallmarj@oge.com
8	Gayle Nansel (WAPA)	nansel@wapa.gov
9	MOSES ROTICH	mrotich@spp.org
10	Melanie Hill	mhill@spp.org
11	Joe Fultz	jfultz@grda.com
12	Dan Lenihan	djlenihan@oppd.com
13	Dona Parks (GRDA)	dparks@grda.com
14	Scott Mijin	scott.mijin@swpa.gov
15	James Ging (KPP)	jging@kpp.agency
16	Derek Johnson (SPP)	jjohnson@spp.org
17	John Knofczynski	jknofczynski@eastriver.coop
18	Michael Odom (SPP)	modom@spp.org
19	John Fulton	john.fulton@xcelenergy.com
20	Kelsey Allen	kallen@spp.org
21	Ryan Yokley	ryokley@sunflower.net
22	Jason Mazigian	jmazigian@bepc.com
23	Harold Wyble (KCPL)	harold.wyble@kcpl.com
24	Jeremy Severson (BEPC)	jseverson@bepc.com
25	Josh Ross	jross@spp.org
26	chris giles	CGiles@tcec.coop
27	Alex Crawford	acrawford@spp.org
28	Josh Verzal	jverzal@oppd.com
29	Kalen Coleman	kcoleman@spp.org
30	Matt McGee	mcmcgee@aep.com
31	Jason Speer	jspeer@spp.org
32	Jason Shook	jason.shook@gdsassociates.com
33	Randy Lindstrom	rrlinds@nppd.com
34	Steve Gaw	rsgaw1@gmail.com
35	Marisa Choate	mchoate@spp.org
36	Calvin Daniels (WFEC)	calvin.daniels@wfec.com
37	Shawnee Claiborn-Pinto	shawnee.claiborn-pinto@puc.texas.gov
38	Derek Brown (Westar)	derek.brown@westarenergy.com
39	Ross Hohlt	dhohlt@ameren.com
40	Travis Hyde	hydetd@oge.com
41	Brooke McMillan	bmcmillan@spp.org
42	matthew stoltz	mstoltz@bepc.com
43	Chris Cranford (SPP)	ccranford@spp.org
44	Pat Hayes	phayes@lspower.com

45	Jerry Bradshaw (SPRM)	jerry.bradshaw@cityutilities.net
46	Heather Starnes (MJMEUC/KMEA	heather@healylawoffices.com
47	Dee Edmondson	dedmondson@spp.org
48	Andy Berg (MRES)	andrew.berg@mrenergy.com
49	Scott Jordan	sjordan@spp.org
50	Hagen Boehmer (SPP)	hboehmer@spp.org
51	Jeff Knottek (SPRM)	jeff.knottek@cityutilities.net
52	Nathan McNeil	nmcneil@mwenergy.com
53	Brian Rounds (AESL)	brian.rounds@aeslconsulting.com
54	Kalun Kelley (WFEC)	k_kelley@wfec.com
55	Steve Hohman	shohman@oppd.com
56	Michael Mueller	michael.mueller@aecc.com
57	Robert Safuto (Customized Energ	rsafuto@ces-ltd.com

Compliance and Advanced Studies

TPL-001-4 Approval
CIP-002-5 Notice

Transmission Working Group

December 20, 2017

Agenda

1. TPL-001-4/FAC-014-2 Approval
2. CIP-002-5 Notice

TPL-001-4 Assessment

1. TPL-001-4 Planning Assessment consists of three sub-parts.
   a) Steady State
   b) Stability
   c) Short Circuit

2. TPL-001-4 Planning Assessment was completed in accordance with the study scope approved by the TWG.

TPL-001-4 Assessment

3. 2017 TPL-001-4 Planning Assessment includes all three sub-parts in the comprehensive assessment.

4. All potential violations of planning criteria were mitigated with Corrective Action Plans developed and tested by the Transmission Planners and Planning Coordinator.

FAC-014-2 Assessment

1. FAC-014-2 Assessment was performed to establish System Operating Limits (SOLs) and Interconnection Reliability Operating Limits (IROLs) in the Planning Horizon
2. SPP MDWG models set all facility SOLs as the facility ratings given in the models.
3. Results from the TPL-001-4 Planning Assessment were used to determine if any SOLs should be reduced from their model ratings.
4. Corrective Action Plans can be applied to mitigate any potential reduction in SOLs.

FAC-014-2 Assessment

5. In accordance with SPP Planning Criteria, potential IROLs are to be investigated if a facility is found to be loaded greater than 120% of its SOL, or if a contingency results in three buses with less than 0.90 pu voltage.
6. IROLs are to be established if it is found that the loss of the potential IROL facility results in additional facilities being loaded greater than 120% of their SOLs or an additional three buses experience post-contingent voltages less than 0.90 pu
7. Corrective Action Plans can be applied to mitigate potential IROLs.

FAC-014-2 Assessment

8. In the TPL-001-4 Assessment, all potential SOL reductions and IROLs were mitigated with Corrective Action Plans.
9. The Planning Horizon SOL of any facility is its facility rating in the MDWG planning models.
10. No IROLs were identified.

IRO-017-1 Implications

- IRO-017-1 R4 requires coordination with the RC to develop joint solutions for issues identified associated with planned outages
- Outages associated with planned outages were denoted by SPP in the TPL-001-4 workbook and provided to the RC for joint solution development
- The PC and RC agreed upon the solutions provided to the TPs in the workbook.

Staff Recommendation

Approve the 2017 TPL-001-4 and FAC-014-2 Comprehensive Planning Assessment

CIP-002-5 Notice

1. Criterion 2.3 – Identify Generation Facilities that are required to avoid an Adverse Reliability Impact.
2. Criterion 2.6 – Identify generation or transmission that is critical to the derivation of Interconnection Criteria Operating Limits (IROLs)
3. SPP has performed the assessment and will provide notice to registered GOs, GOPs, TOs, and TOPs as appropriate.

CPEC Sponsored Upgrade Study

SUS-002 North Bismarck Breaker

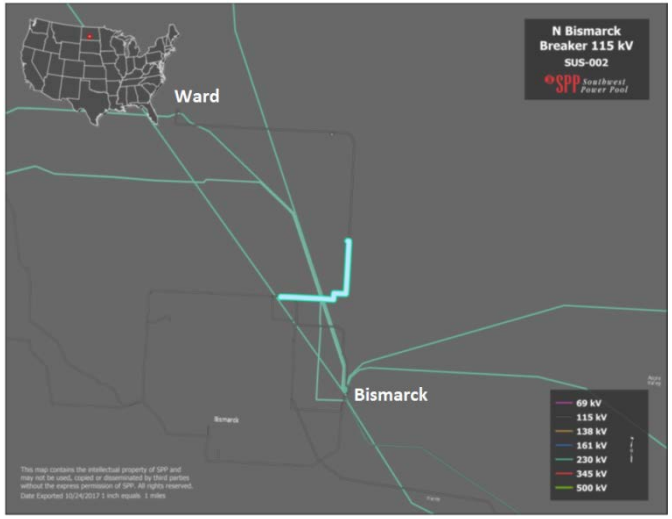
TWG, 12/20/2017

Background

- SPP performed a Sponsored Upgrade Study for Central Power Electric Cooperatives (CPEC) in UMZ
  - Sponsored Upgrade Studies described in Attachment O, Section IV.1
  - Evaluate reliability impacts of proposed upgrade
- SPP completed the study and issued preliminary study report to CPEC on 11/17/2017
- Per Attachment O, Section IV.1, the Sponsored Upgrade shall be "submitted to the proper stakeholder working group for their review as a part of the transmission planning process."

Proposed Sponsored Upgrade

- CPEC proposes changing North Bismarck 115 kV breaker status from "normally open" to "normally closed", completing a 115 kV loop between WAPA's Bismarck and Ward 230 kV substations
  - Proposed ISD of November 2018
  - Evaluated thermal/voltage violations resulting from the change in topology
  - Brief short circuit and dynamics analysis



Results of Analysis

- Thermal violation in 2026 Summer models:

Season	Scenario	Facility Name	Contingency Name	RATE A (MVA)	RATE B (MVA)	FLOW	Current Loading (%)
26S	0	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	83.9	106.2
26S	5	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	84.5	106.9
26S	BA	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	84.1	106.5

- No voltage violations

Mitigation

- Attachment O Section IV.1: Sponsor must be willing to assume "any cost associated with such necessary mitigation."

Mitigation Upgrade	Comments	Date Needed	Estimated Cost*
Upgrade CTs at WAPA Bismarck 230 kV sub	Bismarck - East Bismarck 115 kV must achieve Emergency Rating of at least 85 MVA	6/1/2024	$84,639

Next Steps

- After TWG approval, seek MOPC/BOD approval per Schedule 1 to Attachment J
- Sponsor executes Schedule 1 to Attachment J, financially committing to pay for the upgrade
- Obtain SCERT estimate from TO
- Per BP 7060 Section 3.2, an NTC is issued at this point
  - Proposed Sponsored Upgrade
  - Mitigation upgrade
  - Costs assigned to Sponsor

Approval

- SPP recommends the TWG endorse the Sponsored Upgrade Study work evaluating the North Bismarck breaker configuration change, the associated upgrade required for mitigation, and the study report

SPONSORED UPGRADE STUDY

SUS-002 CPEC North Bismarck Breaker

Published on 11/30/2017

By SPP Engineering, Transmission Services

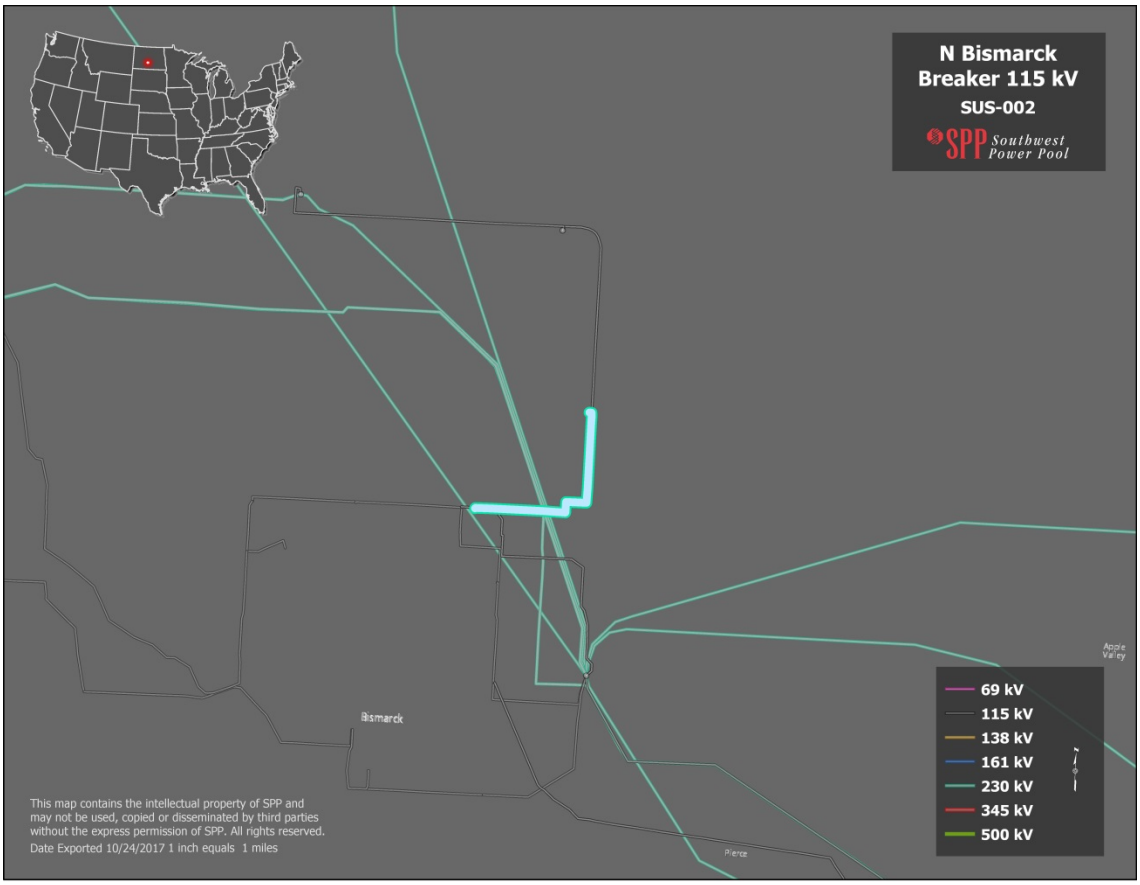
REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
11/17/2017	SPP	Original	
11/30/2017	SPP	Revised to correct Ward contingency name and make other minor modifications	

CONTENTS

INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts within the SPP footprint of the proposed North Bismarck Breaker 115 kV Sponsored Upgrade. Central Power Electric Cooperatives (CPEC) would like to change the operational status of the 115 kV breaker 262 within the North Bismarck substation from a "normally open" device to a "normally closed" device, which will loop Central Power's 115 kV transmission line between WAPA's Bismarck 230 kV and Ward 230 kV substations. The change in configuration is being studied as a Sponsored Upgrade in order to evaluate the reliability impacts of the change.



The load flow models used for the evaluation were 2017 ITPNT models with all April 2016 Board-approved upgrade projects included except for the re-evaluated NTC projects. SPP performed an AC contingency analysis on these models using PSS®E.

STUDY METHODOLOGY

OBJECTIVE

The purpose of this study was to determine the regional transmission system impacts within the SPP footprint due to a change in the operational status of the 115 kV breaker 262 within the North Bismarck substation from a "normally open" device to a "normally closed" device. This change in configuration results in a 115 kV loop between WAPA's Bismarck and Ward 230 kV substations. SPP performed a Sponsored Upgrade Study to evaluate the reliability impacts of the change and to assess any required mitigation needed for reliability in accordance with Attachment O, Section IV.1 of the SPP Open Access Transmission Tariff ("Tariff"). The proposed in-service date for the Sponsored Upgrade is November 2018.

STUDY PROCESS

- Model Assumptions
  - 2017 ITPNT models with all April 2016-Board approved upgrade projects included
    - Model years 2018, 2021, 2026
    - Summer Peak (2021, 2026), Winter Peak (2018, 2021, 2026), and Light Load (2021 only)
    - Scenarios for projected transactions, all firm transactions, and Balancing Authority (0, 5, BA)
    - Total of 15 models
  - Base case models include the North Bismarck 115 kV breaker in a "normally open" configuration, and change case models include the breaker in a "normally closed" configuration. Results from the base and change case models were compared to determine the impact of the configuration change on the reliability of the system.

Case #	Study Year	Season	Scenario	N. Bismarck 115 kV Breaker Configuration
2017ITPNTFINAL-18W0.sav	2018	Winter Peak	Scenario 0	Open
2017ITPNTFINAL-18W0_002.sav	2018	Winter Peak	Scenario 0	Closed
2017ITPNTFINAL-18W0_BA_FINAL.sav	2018	Winter Peak	BA	Open
2017ITPNTFINAL-18W0_BA_FINAL_002.sav	2018	Winter Peak	BA	Closed
2017ITPNTFINAL-18W5.sav	2018	Winter Peak	Scenario 5	Open
2017ITPNTFINAL-18W5_002.sav	2018	Winter Peak	Scenario 5	Closed
2017ITPNTFINAL-21L0_BA_FINAL.sav	2021	Light Load	BA	Open
2017ITPNTFINAL-21L0_BA_FINAL_002.sav	2021	Light Load	BA	Closed
2017ITPNTFINAL-21S0.sav	2021	Summer Peak	Scenario 0	Open
2017ITPNTFINAL-21S0_002.sav	2021	Summer Peak	Scenario 0	Closed
2017ITPNTFINAL-21S0_BA_FINAL.sav	2021	Summer Peak	BA	Open
2017ITPNTFINAL-21S0_BA_FINAL_002.sav	2021	Summer Peak	BA	Closed

Case #	Study Year	Season	Scenario	N. Bismarck 115 kV Breaker Configuration
2017ITPNTFINAL-21S5.sav	2021	Summer Peak	Scenario 5	Open
2017ITPNTFINAL-21S5_002.sav	2021	Summer Peak	Scenario 5	Closed
2017ITPNTFINAL-21W0.sav	2021	Winter Peak	Scenario 0	Open
2017ITPNTFINAL-21W0_002.sav	2021	Winter Peak	Scenario 0	Closed
2017ITPNTFINAL-21W0_BA_FINAL.sav	2021	Winter Peak	BA	Open
2017ITPNTFINAL-21W0_BA_FINAL_002.sav	2021	Winter Peak	BA	Closed
2017ITPNTFINAL-21W5.sav	2021	Winter Peak	Scenario 5	Open
2017ITPNTFINAL-21W5_002.sav	2021	Winter Peak	Scenario 5	Closed
2017ITPNTFINAL-26S0.sav	2026	Summer Peak	Scenario 0	Open
2017ITPNTFINAL-26S0_002.sav	2026	Summer Peak	Scenario 0	Closed
2017ITPNTFINAL-26S0_BA_FINAL.sav	2026	Summer Peak	BA	Open
2017ITPNTFINAL-26S0_BA_FINAL_002.sav	2026	Summer Peak	BA	Closed
2017ITPNTFINAL-26S5.sav	2026	Summer Peak	Scenario 5	Open
2017ITPNTFINAL-26S5_002.sav	2026	Summer Peak	Scenario 5	Closed
2017ITPNTFINAL-26W0.sav	2026	Winter Peak	Scenario 0	Open
2017ITPNTFINAL-26W0_002.sav	2026	Winter Peak	Scenario 0	Closed
2017ITPNTFINAL-26W5.sav	2026	Winter Peak	Scenario 5	Open
2017ITPNTFINAL-26W5_002.sav	2026	Winter Peak	Scenario 5	Closed

Table 2-1: Study Models

- Reliability Analysis
  - Assumptions
    - AC contingency analysis (N-1) on all load flow models using PSS®E
    - Contingencies
      - Single element (N-1) outages of:
        - SPP facilities 69 kV and above
        - SPP generators
        - First-tier companies 100 kV and above
      - Multi-terminal outages as provided for the 2017 ITPNT by SPP members and first-tier companies
    - Monitored Elements
      - SPP facilities 69 kV and above
      - First-tier companies 100 kV and above
    - Apply SPP Criteria, NERC reliability standards and Transmission Owner local planning criteria
  - Compare thermal overloads and voltage violations that occur with the breaker open and with the breaker closed to determine what overloads and voltage violations result from the closing of the breaker.

- Short Circuit Analysis
  - Assumptions

        - Used 2016 Final MDWG Short Circuit models (Max Fault)
            - Placed all available facilities in service
                - Generation
                - Transmission lines
                - Transformers
                - Buses
            - Short Circuit Output
                - Physical
            - Short Circuit Coordinates
                - Polar
            - Short Circuit Parameters
                - 3 Phase
            - FLAT – classical fault analysis conditions
    - Analyses
        - Three-phase fault

RESULTS OF ANALYSIS

POTENTIAL THERMAL OVERLOADS AND VOLTAGE VIOLATIONS

The analysis identified potential thermal violations resulting from the configuration change as shown in Table 3-1. A single thermal violation is present in multiple 2026 summer scenarios.

Season	Scenario	Facility Name	Contingency Name	RATE A (MVA)	RATE B (MVA)	FLOW	Current Loading (%)
26S	0	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	83.9	106.2
26S	5	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	84.5	106.9
26S	BA	BIS EXPR-CP7115.00 - BISMARK7 115KV CKT Z	WARD (KW1A 100) 230/115/12.47KV TRANSFORMER CKT 1	79	79	84.1	106.5

Table 3-1: Thermal Violations

No potential voltage violations were identified.

SHORT CIRCUIT

Short circuit analysis was performed for the 2021 Summer Peak model with the North Bismarck 115 kV breaker closed. The short circuit analysis identified the currents as listed in Table 3-2.

Season	Model	Fault	Bus	Current (Amps)
21SP	Max Fault	Three Phase	NBISMRCK-CP7115.00	15,117
21SP	Max Fault	Three Phase	BISCNTRY-CP7115.00	15,158
21SP	Max Fault	Three Phase	GVPINES -CP7115.00	12,287
21SP	Max Fault	Three Phase	BIS EXPR-CP7115.00	16,065
21SP	Max Fault	Three Phase	BISMARK7 115.00	16,065
21SP	Max Fault	Three Phase	CIRCLE K-CP7115.00	11,104
21SP	Max Fault	Three Phase	CENTURY7 115.00	14,174
21SP	Max Fault	Three Phase	NE BISM7 115.00	14,442
21SP	Max Fault	Three Phase	BISMARK9 12.470	28,446
21SP	Max Fault	Three Phase	BISMARK4 230.00	13,053
21SP	Max Fault	Three Phase	BISMARK29 12.470	28,446
21SP	Max Fault	Three Phase	BIS WARD-CP7115.00	10,901
21SP	Max Fault	Three Phase	BISM NW7 115.00	13,598
21SP	Max Fault	Three Phase	ESTBMRK7 115.00	16,030
21SP	Max Fault	Three Phase	STEIN 7 115.00	14,323

Season	Model	Fault	Bus	Current (Amps)
21SP	Max Fault	Three Phase	WARD 4 230.00	12,005
21SP	Max Fault	Three Phase	JAMESTN4 230.00	7,897
21SP	Max Fault	Three Phase	WASHBRN4 230.00	9,798
21SP	Max Fault	Three Phase	HILKEN 4 230.00	7,551
21SP	Max Fault	Three Phase	CAMPBELL 4 230.00	3,586
21SP	Max Fault	Three Phase	WARDTERT-CP912.470	20,220
21SP	Max Fault	Three Phase	WEBER 4 230.00	4,742
21SP	Max Fault	Three Phase	BISEXP 7 115.00	13,316
21SP	Max Fault	Three Phase	LINTON 7 115.00	1,336
21SP	Max Fault	Three Phase	TRNPIKE7 115.00	13,458
21SP	Max Fault	Three Phase	26TH&D 7 115.00	14,544
21SP	Max Fault	Three Phase	JAMEST29 13.200	20,245
21SP	Max Fault	Three Phase	JAMEST19 13.200	20,301
21SP	Max Fault	Three Phase	WASHBRN9 41.800	3,156
21SP	Max Fault	Three Phase	FARGO 4 230.00	9,488
21SP	Max Fault	Three Phase	GARRISN4 230.00	10,449
21SP	Max Fault	Three Phase	JAMESTN7 115.00	9,199
21SP	Max Fault	Three Phase	PICKERT4 230.00	4,194
21SP	Max Fault	Three Phase	LELANDO4 230.00	21,900
21SP	Max Fault	Three Phase	BALDWIN 4230.00	6,505
21SP	Max Fault	Three Phase	CAMPBLCNTY 4230.00	3,337
21SP	Max Fault	Three Phase	COLLINS7 115.00	13,895
21SP	Max Fault	Three Phase	GLENHAM4 230.00	3,541
21SP	Max Fault	Three Phase	STH9TH 7 115.00	11,836
21SP	Max Fault	Three Phase	MANDAN 4 230.00	14,321

Table 3-2: Short Circuit Results

STABILITY

SPP performed a Fast Fault Screening (FFS) study between the base case and the change case models that included the configuration change. The FFS was performed for 2021 Summer Peak, 2021 Winter Peak, and 2026 Summer Peak. There were no significant differences in the critical clearing times between the two cases. Therefore, a transient stability analysis was not performed.

MITIGATION UPGRADES REQUIRED

Attachment O, Section IV.1 of the SPP Tariff requires SPP to evaluate the impact of the proposed Sponsored Upgrade on the Transmission System reliability and identify any necessary mitigation of these impacts. The metering CTs associated with the Bismarck to East Bismarck 115 kV transmission line circuit were overloaded in the 2026 summer models. The CTs at the WAPA Bismarck substation limit this facility's Normal and Emergency Ratings to 79 MVA. Upgrading the terminal equipment by replacing the CTs will result in facility ratings higher than the 85 MVA needed to mitigate the thermal violation.

Mitigation Upgrade	Comments	Date Needed	Estimated Cost*
Upgrade CTs at WAPA Bismarck 230 kV sub	Bismarck - East Bismarck 115 kV must achieve Emergency Rating of at least 85 MVA	6/1/2024	$84,639

Table 4-1: Mitigation Upgrade

*Note the estimated cost provided in this report is a Conceptual Cost Estimate only; this is preliminary, and more refined cost estimates will be developed by the Host Transmission Owner for both the Sponsored Upgrade and the mitigation upgrade after issuance of this report through a Standardized Cost Estimate Report Template (SCERT).

In order to complete the Sponsored Upgrade modifying the North Bismarck 115 kV breaker from "normally open" status to "normally closed" status, the mitigation upgrade listed in Table 4-1 will need to be completed by 6/1/2024. The need date was determined by interpolating between the 2026 summer scenario 5 flow (overloaded) and the 2021 summer scenario 5 flow (within limits) to determine a projected year in which summer loading would first exceed 100%. If CPEC moves forward with the Sponsored Upgrade, CPEC will be responsible for any costs associated with the identified mitigation upgrade listed in Table 4-1 in accordance with Attachment O Section IV.1 of the SPP Tariff.

CONCLUSION

The AC analysis revealed potential thermal violations associated with the North Bismarck Breaker 115 kV Sponsored Upgrade. Changing the operational status of the 115 kV breaker to "normally closed" results in an overload of the metering CTs associated with the Bismarck – East Bismarck 115 kV transmission line circuit for the loss of the Ward 230/115 kV transformer. In order for CPEC to move forward with the Sponsored Upgrade, CTs will need to be upgraded at the WAPA Bismarck 230 kV substation by 6/1/2024.

Upon endorsement of the Sponsored Upgrade and mitigation upgrade from the appropriate working groups, the Project Sponsor and SPP may execute the "Agreement For Sponsored Upgrade" found in Schedule 1 to Attachment J of the SPP OATT, financially committing the Project Sponsor to pay for the Sponsored Upgrade and the identified mitigation upgrade. The Project Sponsor must execute the Agreement on or before November 30, 2018 in order for SPP to issue an NTC for the Sponsored Upgrade and the mitigation upgrade.

The Sponsored Upgrade and mitigation upgrade will both be Creditable Upgrades eligible for cost recovery through Attachment Z2 revenue crediting or ILTCRs. The Sponsor has expressed intention to pursue Attachment Z2 revenue crediting.


SPP
Southwest
Power Pool
HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

SPP Southwest Power Pool

2017 SPP Planning Criteria 5.3.3 Benchmark

SPP Engineering Modeling

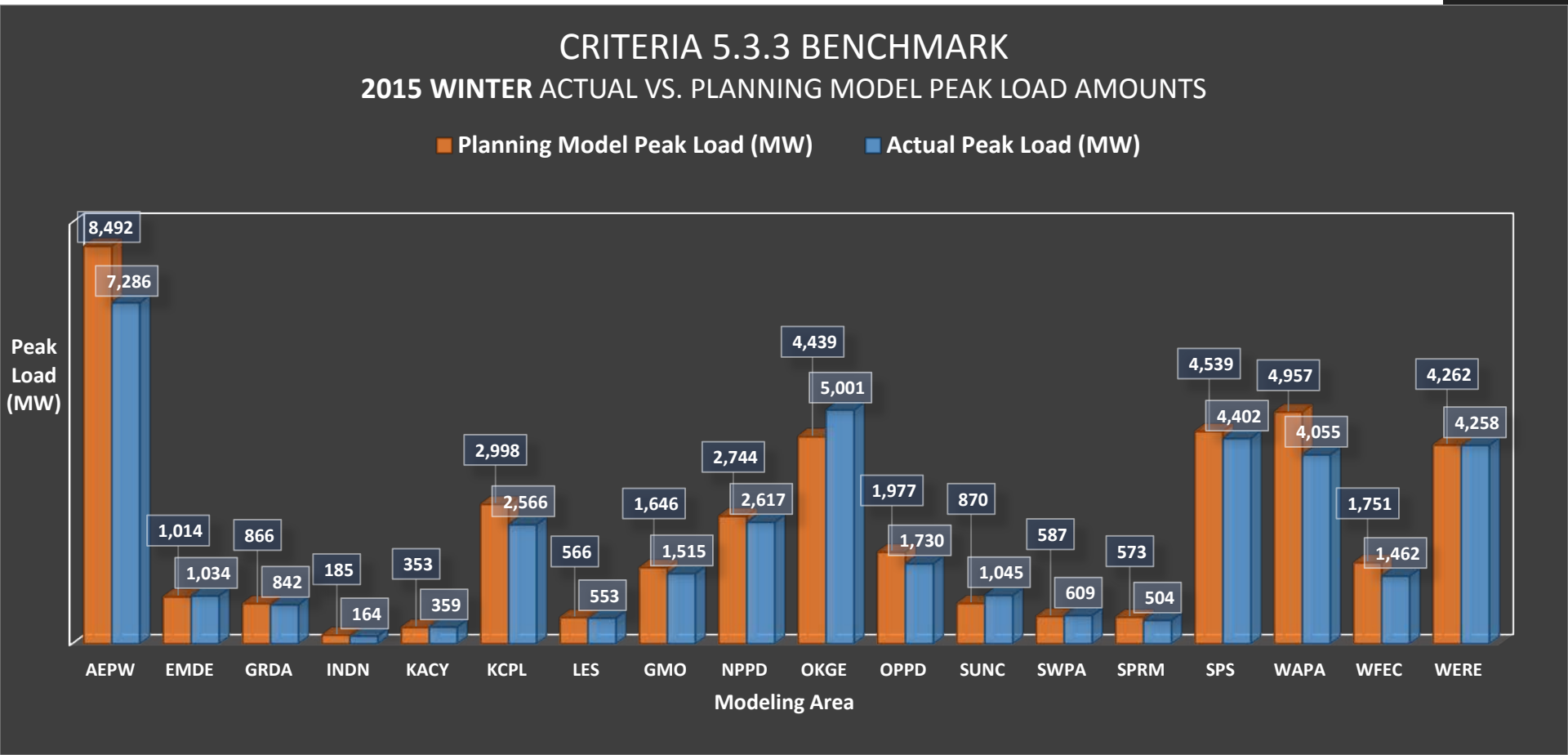
Michael Odom

SPP Criteria 5.3.3

- SPP staff shall benchmark model data against actual SPP system conditions
- Comparison of SPP Summer (April – September) and Winter (October – March) peak load real-time values against correlating SPP Planning model Summer and Winter peak load values
- 2015 Winter, 2016 Summer, 2016 Winter

2015 Winter Peak Load

- 2015 Actual Winter Peak Load vs. 2015 Series MDWG 2015 Winter Peak Planning Model Peak Load



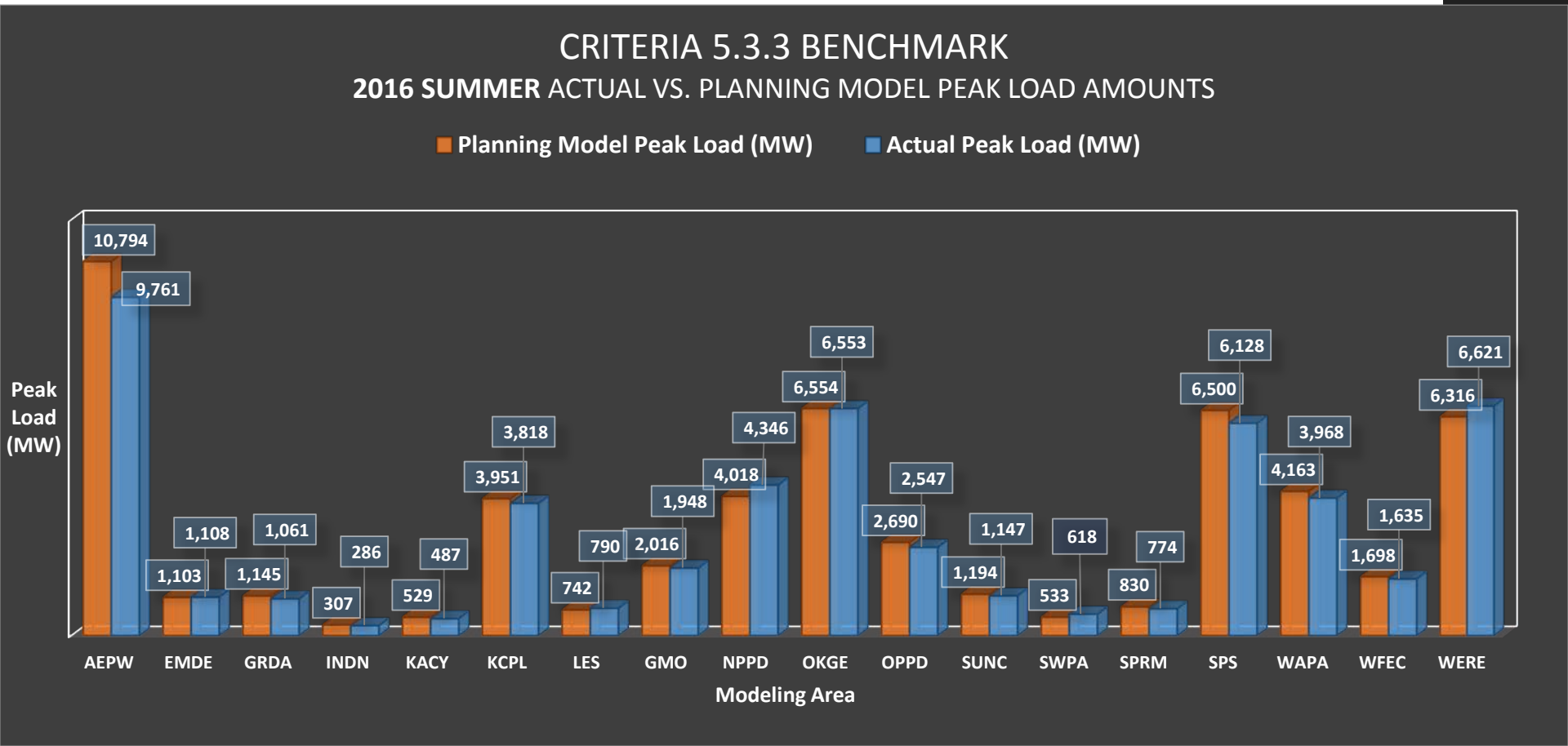
2015 Winter Peak Load

- 2015 Actual Winter Peak Load vs. 2015 Series MDWG 2015 Winter Peak Planning Model Peak Load

Entity	Peak Date / Hour	Planning Model Peak	Actual Peak	MW Difference Actual to Planning	% Difference Actual to Planning
AEPW	11-Jan-16 07:18:32	8,492	7,286	-1,207	-14.2%
EMDE	18-Jan-16 07:54:48	1,014	1,034	20	1.9%
GRDA	10-Feb-16 00:00:00	866	842	-24	-2.8%
INDN	19-Jan-16 17:39:25	185	164	-21	-11.3%
KACY	19-Jan-16 17:53:40	353	359	6	1.8%
KCPL	18-Jan-16 07:17:53	2,998	2,566	-432	-14.4%
LES	18-Jan-16 05:50:53	566	553	-13	-2.2%
GMO	18-Jan-16 07:34:49	1,646	1,515	-131	-8.0%
NPPD	18-Jan-16 07:24:00	2,744	2,617	-128	-4.7%
OKGE	15-Oct-15 16:56:48	4,439	5,001	562	12.7%
OPPD	28-Dec-15 17:48:00	1,977	1,730	-247	-12.5%
SUNC	10-Feb-16 05:35:12	870	1,045	176	20.2%
SWPA	18-Jan-16 07:26:00	587	609	22	3.7%
SPRM	19-Jan-16 17:44:21	573	504	-69	-12.0%
SPS	01-Oct-15 16:01:00	4,539	4,402	-137	-3.0%
WAPA	18-Jan-16 08:15:17	4,957	4,055	-901	-18.2%
WFEC	10-Jan-16 08:35:24	1,751	1,462	-289	-16.5%
WERE	08-Oct-15 16:22:20	4,262	4,258	-4	-0.1%

2016 Summer Peak Load

- 2016 Actual Summer Peak Load vs. 2016 Series MDWG 2016 Summer Peak Planning Model Peak Load



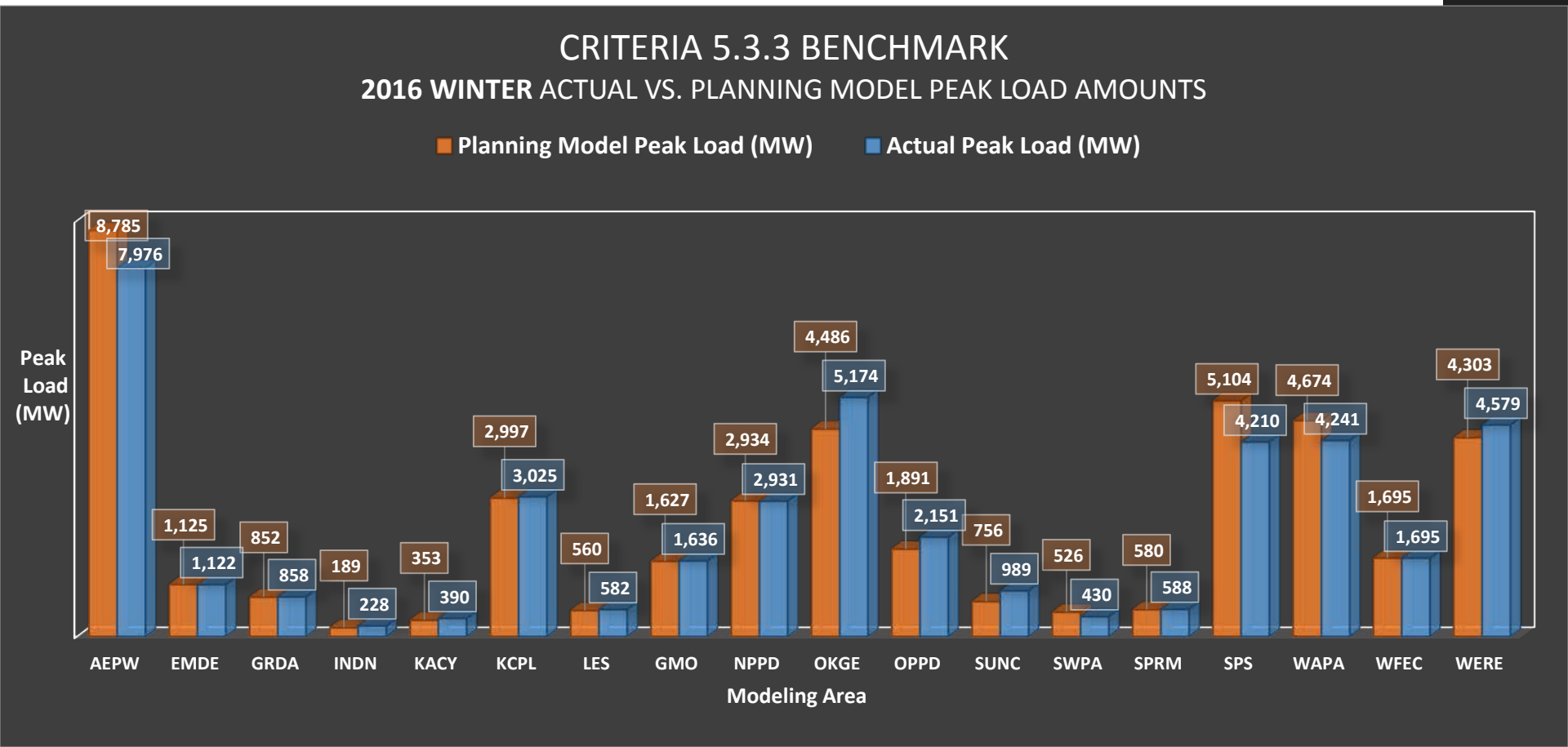
2016 Summer Peak Load

- 2016 Actual Summer Peak Load vs. 2016 Series MDWG 2016 Summer Peak Planning Model Peak Load

Entity	Peak Date / Hour	Planning Model Peak	Actual Peak	MW Difference Actual to Planning	% Difference Actual to Planning
AEPW	04-Aug-16 16:21:48	10,794	9,761	-1,033	-9.6%
EMDE	11-Aug-16 16:28:48	1,103	1,108	5	0.4%
GRDA	17-Jun-16 15:45:53	1,145	1,061	-84	-7.3%
INDN	11-Aug-16 16:52:24	307	286	-21	-6.8%
KACY	04-Aug-16 14:54:16	529	487	-42	-7.9%
KCPL	04-Aug-16 16:24:44	3,951	3,818	-132	-3.3%
LES	21-Jul-16 17:25:44	742	790	49	6.5%
GMO	11-Aug-16 16:27:16	2,016	1,948	-67	-3.3%
NPPD	28-Jul-16 14:42:08	4,018	4,346	328	8.2%
OKGE	11-Aug-16 16:24:24	6,554	6,553	-1	0.0%
OPPD	11-Aug-16 17:28:20	2,690	2,547	-143	-5.3%
SUNC	21-Jul-16 13:52:56	1,194	1,147	-47	-3.9%
SWPA	02-Aug-16 13:49:20	533	618	85	16.0%
SPRM	11-Aug-16 15:25:08	830	774	-56	-6.7%
SPS	13-Jul-16 16:22:16	6,500	6,128	-372	-5.7%
WAPA	20-Jul-16 13:46:28	4,163	3,968	-195	-4.7%
WFEC	11-Aug-16 18:02:12	1,698	1,635	-63	-3.7%
WERE	21-Jul-16 16:57:40	6,316	6,621	305	4.8%

2016 Winter Peak Load

- 2016 Actual Winter Peak Load vs. 2016 Series MDWG 2016 Winter Peak Planning Model Peak Load



2016 Winter Peak Load

- 2016 Actual Winter Peak Load vs. 2016 Series MDWG 2016 Winter Peak Planning Model Peak Load

Entity	Peak Date / Hour	Planning Model Peak	Actual Peak	MW Difference Actual to Planning	% Difference Actual to Planning
AEPW	19-Dec-16 07:27:08	8,785	7,976	-809	-9.2%
EMDE	19-Dec-16 07:09:32	1,125	1,122	-2	-0.2%
GRDA	06-Jan-17 07:12:52	852	858	6	0.7%
INDN	23-Mar-17 10:04:13	189	228	40	20.9%
KACY	05-Jan-17 17:42:20	353	390	37	10.5%
KCPL	17-Oct-16 14:16:28	2,997	3,025	28	0.9%
LES	17-Dec-16 17:43:12	560	582	22	4.0%
GMO	13-Jan-17 07:25:49	1,627	1,636	9	0.5%
NPPD	06-Jan-17 07:13:20	2,934	2,931	-3	-0.1%
OKGE	19-Dec-16 08:00:44	4,486	5,174	688	15.3%
OPPD	19-Dec-16 09:16:44	1,891	2,151	260	13.8%
SUNC	22-Mar-17 13:54:24	756	989	233	30.8%
SWPA	21-Mar-17 13:08:57	526	430	-97	-18.4%
SPRM	03-Oct-16 09:15:20	580	588	9	1.5%
SPS	05-Jan-17 18:50:36	5,104	4,210	-895	-17.5%
WAPA	15-Dec-16 07:48:20	4,674	4,241	-433	-9.3%
WFEC	07-Jan-17 07:56:12	1,695	1,695	0	0.0%
WERE	17-Oct-16 16:01:08	4,303	4,579	276	6.4%