Southwest Power Pool

Economic Studies Working Group

April 10-11, 2019

GSEC Office – Lubbock, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approved the MTEP19 assumptions to use in the 2020 ITP Market Models

SPP Southwest Power Pool

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

April 10-11, 2019

GSEC Office – Lubbock, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC) called the meeting of the Economic Studies Working Group (ESWG) to order at 1:00 p.m., welcomed those in attendance, and asked for introductions.

There were 12 in-person participants and 68 web conference participants, representing 16 of 16 ESWG members. (Attachment 1a – April 10-11, 2019 ESWG Attendance)

Agenda Item 1b – Receipt of Proxies

Amber Greb (SPP) asked for any proxy statements; three proxies were identified. (Attachment 1b – Proxy Statements)

- Jeremy Severson (BEPC) named Tanner Broderick (BEPC) as his proxy for the first day of the meeting
- Natasha Henderson (GSEC) named Kyle McKinney (GSEC) as his proxy
- Anita Sharma (AEP) named Jim Jacoby (AEP) as her proxy

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 1c - April 10-11, 2019 ESWG Agenda)

Jim Jacoby (AEP) made a motion; seconded by Calvin Daniels (WFEC) to adopt the agenda. The motion was approved unanimously.

Agenda Item 1d – Antitrust Reminder

Amber Greb (SPP) provided an antitrust reminder to the group.

Agenda Item 2 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. Items 151, 183 and 190 will be presented in May. Some action items are on the agenda. (Attachment 2 - Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – March 12-13th, 2019 (Attachment 3 - 20190312 ESWG Minutes)

The consent agenda was approved unanimously.

Agenda Item 4 – GridLiance Local Planning Process

Brett Hooton (GHP) brought an ITP Manual Section 10.3 presentation to avoid overlap between the GridLiance High Plains Local Planning Process projects and the 2019 ITP Assessment potential projects. He requested to update the 2019 ITP Assessment reliability (BR) models to include the GridLiance transmission facilities in the Oklahoma panhandle. Kelsey Allen (SPP) presented SPP comments on the GHP ITP Manual Section 10.3 request. SPP will incrementally include the upgrades to models developed for the previous analysis to determine their impact to on existing ITP needs. Kelsey reviewed possible outcomes, schedule impacts, and reviewed next steps for initial efforts in evaluating this ITP Manual Section 10.3 request. (Attachment 4a - 2019_ITP_GHP 10.3 Request_SPP) (Attachment 4b - GHP 10.3 Waiver Request)

Agenda Item 5 – 2019/2020 ITP Report Card

Juliano Freitas (SPP) reviewed the 2019 and 2020 ITP Report Card which included hours spent for the 2019 ITP as well as the status of completed and upcoming milestones for each study. In his presentation, Juliano discussed the cost to date of keeping the 2019 and 2020 assessments on schedule. (Attachment 5 - 2019 and 2020 ITP Quarterly Report Card)

Agenda Item 6 – 2019 ITP Items

Agenda Item 6a – 2019 ITP Schedule

Juliano Freitas (SPP) reviewed a presentation on 2019 ITP schedule. He reviewed on-going and up-coming milestones. (Attachment 6a - 2019 ITP Schedule)

Agenda Item 6b – Grouping

Nikki Roberts (SPP) gave a presentation on the Economic Grouping milestone. She presented on portfolio determination and planning summit preparation, advising members of the importance to attend the meeting and provide feedback to SPP Staff in order to have an optimized set of projects at the end of the assessment. She gave dates to remember in relation to the cost estimate window and planning summit. (Attachment 6b - 2019 ITP Economic Grouping)

Agenda Item 6c – CSP Update

Adam Bell (SPP) gave an update on the SPP-MISO Coordinated System Plan (CSP) study. He reviewed the schedule and next steps. (Attachment 6c - SPP-MISO CSP Update - April 2019)

Agenda Item 6d – Target Area Additional Analysis Update

Kelsey Allen (SPP) provided an update on the analysis of the 2019 ITP Assessment Southeast Kansas/Southwest Missouri Target Area. He reviewed the drivers behind the selected target area and explained the implementation of Wolf Creek de-rate analysis. He presented conclusions and next steps for the target area additional analysis. Members had questions about MISO's use of the system and ability of projects to be part of CSP. (Attachment 6d - 2019 ITP Target Area Additional Analysis Update)

Agenda Item 7 – 2020 ITP Items

Agenda Item 7a – Schedule

Juliano Freitas (SPP) reviewed the schedule for the 2020 ITP Assessment. He reviewed on-going and up-coming milestones. (Attachment 7a - 2020 ITP Schedule)

Agenda Item 7b – Resource Planning Phase 2

Antonio Barber (SPP) presented preliminary zonal shortfalls and allocation of projected renewable and storage resources for the 2020 ITP Resource Planning. Antonio reviewed the equations behind the numbers presented to the ESWG, explaining to the members how staff calculates PPA obligations, summer load obligations and capacity shortfall post-renewable allocations. He presented the shortfall for each zone, per future, per year. Antonio also informed stakeholders of upcoming steps in the process. (Attachment 7b - 2020 ITP Resource Planning Phase 2)

Agenda Item 7c – Market Economic Model

Clayton Mayfield (SPP) gave an update on the building of the market economic model. (Attachment 7c - 2020 ITP Market Economic Model)

Agenda Item 7d – MTEP19 Economic Model Merger

Clayton Mayfield (SPP) informed the group of how MTEP19 economic model data will be merged into the 2020 ITP Market Models. He presented what data will be modified, pulled from third party vendor data, or kept same as in MTEP19. He recommended approval of the assumptions. (Attachment 7d - 2020 ITP – MTEP19 Economic Model Merger Overview)

Calvin Daniels (WFEC) made a motion; seconded by Jim Jacoby (AEP) to approve the MTEP19 assumptions as presented to use in the 2020 ITP Market Models. The motion was approved unanimously.

Agenda Item 7e – Siting Plan

Joshua Norton (SPP) gave an update on the siting plan and brought items to discuss as recommended from prior meeting. He reviewed the schedule and status of the siting plan and reviewed results for the load pocket analysis. He presented on battery siting prioritization, distributed solar siting methodology, and exceptions process for initial Siting Plans. Joshua will bring a recommendation associated with battery siting prioritization back in May 2019. (Attachment 7e - 2020 ITP Siting Plan)

Agenda Item 8 – Action Item 194: Curtailment Prices

Chris Jamieson (SPP) reviewed a presentation on the Renewable Curtailment Price. He recapped proposed ITP manual changes and reviewed options for determining the curtailment price for projected wind additions. In May 2019, Chris will bring a methodology, concepts and a draft Revision Request form with revised ITP Manual language to be reviewed and discussed with ESWG members. (Attachment 8 - Renewable Curtailment Price)

Closing Items

The ESWG had the following action items:

- Research and potentially update the 2.5% inflation rate used in ITP Assessments
- Finalize siting plan assumptions

The meeting was adjourned at 11:35 AM.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Name	Company/Email	Attendance
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Zac Hager	hagerzc@oge.com	Webex

Member	Proxy	Note
Jeremy Severson	Tanner Broderick	Until day 2
Anita Sharma	Jim Jacoby	
Natasha Henderson	Kyle McKinney	

SPP Southwest Power Pool

+ECONOMIC STUDIES WORKING GROUP MEETING

April 10-11th, 2019

GSEC Office – Lubbock, TX

• AGENDA •

Wednesday, 1:00p.m. - 5:00p.m.

Thursday, 8:00a.m. - 3:00p.m.

1. Administrative Items
   a. Call to Order, Introductions..Alan Myers (5 minutes)
   b. Receipt of Proxies..Amber Greb (1 minute)
   c. Review of Agenda[1]..Alan Myers (1 minute)
   d. Antitrust Reminder..Amber Greb (1 minute)
2. Review of Past Action Items[1]..Amber Greb (15 minutes)
3. Consent Agenda
   a. Meeting Minutes – March 12-13th, 2019
4. Gridliance Local Planning Process[1]..Brett Hooten (30 minutes)
5. 2019/2020 ITP Report Card[1]..Juliano Frietas (20 minutes)
6. 2019 ITP Items..SPP Staff (110 minutes)
   a. Schedule[1]..Juliano Freitas (10 minutes)
   b. Grouping[1]..Nikki Roberts (45 minutes)
   c. CSP Update..Adam Bell (10 minutes)
   d. Target Area Additional Analysis Update[1]................Chris Jamieson/Kelsey Allen (45 minutes)
7. 2020 ITP Items..SPP Staff (150 minutes)
   a. Schedule[1]..Juliano Freitas (10 Minutes)
   b. Resource Planning Phase 2[1]..Antonio Barber (30 minutes)
   c. Market Economic Model[1]..Clayton Mayfield (5 minutes)
   d. MTEP19 Economic Model Merger[1] (Approval Item)....................Clayton Mayfield (30 minutes)

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[1] Background Material Included

e. Siting Plan[1] .... Joshua Norton (60 minutes)

8. Action Item 194: Curtailment Prices[1] .... Chris Jamieson (60 minutes)

9. Closing Items .... All (10 minutes)

    a. Summary of Action Items (Amber Greb)
    b. May ESWG Agenda Items
    c. Future Meetings
        i. May 15-16, 2019: KCPL/Evergy Offices, KC Missouri
        ii. June 12-13, 2019: 41st floor AEP Office, Dallas Texas
        iii. July 17-18, 2019: Hilton Des Moines Downtown, IA
        iv. August 13-14, 2019: ITC Offices, Novi, MI
        v. September 5-6, 2019: 41st floor AEP Office, Dallas Texas
        vi. October 9-10, 2019: SPP Offices, Little Rock, AR
        vii. November 6-7, 2019: 41st floor AEP Office, Dallas Texas
        viii. December 11-12, 2019: 41st floor AEP Office, Dallas Texas

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

April 10-11, 2019

	Action Item	Date Originated	Status	Comments
151	SPP staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress SPP Staff	Staff is compiling information from multiple tools used for economic analysis and resource planning. Staff is working on the SOW for vendors.
183	SPP staff to perform transmission outage analysis in the first part of 2017 to determine the appropriate APC benefit percentage to utilize for the mitigation of transmission outages benefit metric.	September 15th, 2016	In Progress SPP Staff	ESWG Approved the methodology and staff to begin analysis. Staff to bring an update ~~to~~ by the May~~rch~~ ESWG meeting
190	SPP staff to perform a full transmission outage analysis before the next RCAR	October 12th, 2017	SPP Staff	
193	Discuss separate load forecasts for resource planning purposes, and how to incorporate into the ITP process	January 22nd, 2018 November 15th, 2018	SPP Staff	Has been incorporated into the Load review for 2020. Update the ITP Manual
194	Continue researching/discussing curtailment pricing for future studies	April 25th, 2018	SPP Staff	
196	From SSC: ESWG to look into including market to market payments/settlements in the ITP Planning Process	January 9th, 2019	In Progress SPP Staff	Staff presented an education session in February, bring additional information to March meeting
197	Research data sources for Fuel Prices and determine methodology for averaging/removing bias	March 13, 2019	SPP Staff	

Southwest Power Pool

Economic Studies Working Group

March 12-13, 2019

41st Floor AEP Office – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approved the 2020 ITP Renewable Policy Review
2. Approved the 2020 ITP Resource Plan Phase 1
3. Approved RR 351

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ECONOMIC STUDIES WORKING GROUP

March 12-13, 2019

41st Floor AEP Office – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Vice-Chair Tim Owens (NPPD) called the meeting of the Economic Studies Working Group (ESWG) to order at 10:00 a.m., welcomed those in attendance, and asked for introductions.

There were 16 in-person participants and 61 web conference participants, representing 17 of 17 ESWG members. (Attachment 1a – March 12-13, 2019 ESWG Attendance)

Agenda Item 1b – Receipt of Proxies

Amber Greb (SPP) asked for any proxy statements; two proxies were identified. (Attachment 1b – Proxy Statements)

- Jeremy Severson (BEPC) named Aaron Ramsdell (BEPC) as his proxy
- Natasha Henderson (GSEC) named Kyle McKinney (GSEC) as his proxy
- Anita Sharma (AEP) named Jim Jacoby (AEP) as her proxy until 1 p.m.

Agenda Item 1c – Review of Agenda

Vice-Chair Tim Owens (NPPD) presented the agenda for review and asked for any additions or corrections. (Attachment 1c – March 12-13, 2019 ESWG Agenda)

Kurt Stradley (LES) made a motion; seconded by Jim Jacoby (AEP) to adopt the agenda. The motion was approved unanimously.

Agenda Item 1d – Antitrust Reminder

Amber Greb (SPP) provided an antitrust reminder to the group.

Agenda Item 2 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. A couple of the action items are on the agenda. (Attachment 2 - Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – February 6-7th, 2018 (Attachment 3 - 20190206 ESWG Minutes)

The consent agenda was approved unanimously.

Agenda Item 4 – Action Item 196: Market to Market in ITP

Gerardo Ugalde (SPP) reviewed a presentation aimed at answering questions from the Market-to-Market (M2M) presentation given at the previous ESWG meeting. He provided a summary of the M2M payments, examples of cost incurred by SPP in relation to M2M congestion, and provided a comparison of historical M2M constraints verses what was identified in the 2019 ITP economic needs assessment. It was determined that it would be beneficial to see the total Day Ahead (DA) and Real Time (RT) congestion for the monitored elements. (Attachment 4 - AI 196-M2M Follow Up)

Agenda Item 5 – 2019 ITP Items

Agenda Item 5a – 2019 ITP Schedule

Juliano Freitas (SPP) reviewed a presentation on 2019 ITP schedule. He reviewed on-going and up-coming milestones. (Attachment 5a - 2019 ITP Schedule)

Agenda Item 5b – Cost Estimate Timelines

Juliano Freitas (SPP) presented an update on the DPP submissions and schedule for study cost estimates. (Attachment 5b - Cost Estimate Timelines Update)

Agenda Item 5c – Solution Validation

Nikki Roberts (SPP) gave an overview of the solution validation process. She reviewed the process and revealed that there was an approximate 60% return rate on DPP submittals. (Attachment 5c - 2019 ITP Solution Validation)

Agenda Item 5d – Solution Evaluation

Liz Gephardt (SPP) presented an overview of the solution evaluation process. She reviewed the assumptions, workflow, and project grouping thresholds. (Attachment 5d - 2019 ITP Solution Evaluation)

Agenda Item 5e – Grouping

Nikki Roberts (SPP) gave a presentation on economic grouping, discussing the process and reviewing the schedule. She explained the different phases of the grouping process as well as the definitions of the cost-effective, highest net APC benefit, and Multi-Variable groups. A final grouping determination methodology will be brought back in April. (Attachment 5e - 2019 ITP Economic Grouping)

Agenda Item 5f – SPP-MISO Solutions follow up

Tessie Kentner (SPP) and Adam Bell (SPP) brought a presentation to the group addressing questions on SPP-MISO CSP solutions. They discussed the coordination among the two RTO's regional processes and the CSP. They also reviewed the CSP and regional project approval process. (Attachment 5f - SPP-MISO Solutions Questions follow up)

Agenda Item 5g – CSP Projects/Final Portfolio

Adam Bell (SPP) presented on CSP Projects and ITP Final Portfolio. He reviewed SPP's methodology for treatment of potential SPP-MISO Coordinated System Plan (CSP) projects within the ITP. He explained how cost allocation between SPP and MISO would occur in the CSP and reviewed the schedule. (Attachment 5g - CSP Projects - ITP Final Portfolio)

Agenda Item 5h – CSP Update

Adam Bell (SPP) gave a recap of the SPP-MISO Interregional Planning Stakeholder Advisory Committee (IPSAC) meeting and reviewed economic needs and schedule for the CSP. (Attachment 5h - SPP-MISO CSP Update)

Agenda Item 5i – Multi-Variable

Kirk Hall (SPP) presented on avoided reliability projects and the multi-variable project grouping. He recapped a discussion on avoided reliability benefit metric in a prior meeting and explained how staff's approach is developing and reviewed the updated approach for the 2019 ITP Assessment. Kirk explained the different economic groupings for the 2019 ITP and the goals of the multi-variable grouping. He reviewed the process and timeline for developing the multi-variable grouping. (Attachment 5i - 2019 ITP Economic Grouping Multi-Variable)

Agenda Item 6 – 2020 ITP Items

Agenda Item 6a – Schedule

Juliano Freitas (SPP) reviewed the schedule for the 2020 ITP Assessment. He reviewed on-going and up-coming milestones. (Attachment 6a - 2020 ITP Schedule)

Agenda Item 6b – Powerflow & Load Review

David Duhart (SPP) reviewed updates made to load in the 2020 ITP Base Reliability powerflow model. (Attachment 6b - 2020 ITP Powerflow & Load Review Update)

Agenda Item 6c – Renewable Policy Review

Joshua Norton (SPP) presented the results of the Renewable Policy Review and recommended approval of the Renewable Policy Review as posted to the GlobalScape website. (Attachment 6c - 2020 ITP Renewable Policy Review)

> **Kurt Stradley (LES) made a motion; seconded by Calvin Daniels (WFEC) to approve the Renewable Policy Review as posted to GlobalScape. The motion was approved unanimously.**

Agenda Item 6d – Resource Plan Phase 1

Joshua Norton (SPP) reviewed the process and results for the Resource Plan Phase 1 of the 2020 ITP Assessment and recommended approval of the milestone. Josh showed the renewable shortfalls by utility by state, presenting the amount of wind and solar to be allocated based on the renewable policy review. The amount of renewables are part of the total amount included in each 2020 ITP Futures. (Attachment 6d - 2020 ITP Resource Plan Phase 1)

> **Calvin Daniels (WFEC) made a motion; seconded by Kurt Stradley (LES) to approve the Resource Plan Phase 1 as posted to GlobalScape. The motion was approved unanimously.**

Agenda Item 6e – Resource Planning Phase 2

Antonio Barber (SPP) gave an overview of the Resource Plan Phase 2 process and preliminary shortfall amounts. The preliminary results seemed to have an error. Staff will work with stakeholders and bring back to the next meeting. (Attachment 6e - 2020 ITP Resource Planning Phase 2)

Agenda Item 6f – Market Economic Model

Clayton Mayfield (SPP) gave an update on the Market Economic Model inputs to Strategist. (Attachment 6f - Market Economic Model)

Agenda Item 6g – 2020 ITP Siting Plan

Joshua Norton (SPP) reviewed the Siting Plan process with the group and sought discussion and recommendations on how to change the process for the 2020 ITP Assessment. He reviewed the repository development, site prioritization and site assignment processes. Stakeholders had questions on battery siting, limiting distributed solar sites to certain areas, the site exception process, and how the GI Queue is used for selecting wind and solar sites. Staff will bring back the answers in the April meeting. (Attachment 20 - 2020 ITP Siting Plan)

Agenda Item 7 – Action Item 194: Curtailment Prices

Chris Jamieson (SPP) reviewed a presentation on the Renewable Curtailment Price. He explained that the ITP Manual curtailment price methodology was intentional simplified to not account for Production Tax Credit (PTC) phase out. He reviewed operational data, MISO wind curtailment price methodology, and comparisons of the prices by years. He brought a proposal for ESWG to sponsor ITP Manual curtailment price methodology revisions for the 2020 ITP Assessment. Staff will bring back a proposal with more details and address if TWG needs to approve as well. (Attachment 21 - AI 194-Renewable Curtailment Price)

Agenda Item 8 – RR351: 351 RR Process Updating Withdrawal Process

Aaron Shipley (SPP) presented background on RR 351 and the modifications being made by the revision request and recommended approval by the group. (Attachment 8 - ESWG RR 351 RR Process Updating Withdrawal Process) (Attachment 8 - RR351_RR Withdrawal Process Update per MOPC Action Item 294)

John Olsen (Evergy) made a motion; seconded by Calvin Daniels (WFEC) to approve RR 351. The motion was approved unanimously.

Closing Items

The ESWG took an action item to research data sources for Fuel Prices and determine a methodology for averaging them and removing bias

The meeting was adjourned at 10:43 AM.

Respectfully Submitted,

Amber Greb

ESWG Secretary


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

Southwest Power Pool

SPP Comments on GHP 10.3 Request

2019 ITP

Comments

- GHP: Perform an evaluation on projects identified in the 2019 ITP to determine if those facilities negate the need for GridLiance's LPP projects
- SPP: This request could have minor or major impacts to schedule/staff resources
  - While GHP is not asking SPP to re-run the needs assessment, this task must be done in the local area in order to identify if 2019 ITP projects can mitigate the issues driving the GHP projects
    - None of the GHP requests can be accommodated without significant schedule impacts if new regional needs are identified in this assessment
  - If new regional needs are not identified, this request can be accommodated by a simplified version of the process
    - Using engineering judgement to identify projects in the area and performing one-off analysis

Comments

- GHP: Perform an evaluation to determine if the GridLiance LPP projects address any currently-identified ITP needs
- SPP: This request should have minor impact as an "enhanced no-harm" analysis
  - SPP will incrementally include the upgrades to models developed for the previous analysis to determine their impact to on existing ITP needs

Comments

- GridLiance is not requesting any economic analysis at this time but SPP deems it necessary to satisfy our Tariff obligations

1. Update economic models through project automation to include the impact of the new impedance network
2. Review congestion differences on surrounding ITP needs for impacts and potential project adjustments

NOTE: The OK Panhandle facilities are a radial 69 kV system with no generation and therefore would not be included as economic model constraints and not produce new needs

Next Steps/Conclusions

- Initial efforts can be reasonably done outside of the regional study process
  - This effort is not expected to cause impacts to the regional study based on preliminary review of data
- In the unexpected event regional issues are identified, GridLiance would need to continue with a 10.3 request in the 2019 ITP, wait for evaluation in the 2020 ITP or work with SPP to develop alternatives that do not have major study impacts

GRIDLIANCE

SPP Transmission Working Group

April 9, 2019

Overview

- Requesting SPP Staff utilize a subset of 2019 ITP models to ensure upgrades resulting from the GridLiance High Plains Local Planning Process (LPP) are not needed to address issues in the ITP and that projects approved in the 2019 ITP do not result in negating the need for the LPP projects.
- Needed to coordinate the output of GridLiance's LPP with SPP's regional planning process
  - GridLiance's 2018 LPP identified three upgrades in the Oklahoma Panhandle for which GridLiance is requesting coordination: two voltage support upgrades and one switching station
  - GridLiance provided these projects to SPP as 2019 DPP submittals in an effort to provide SPP all necessary information to evaluate the projects
- Not requesting a material change to the 2019 ITP

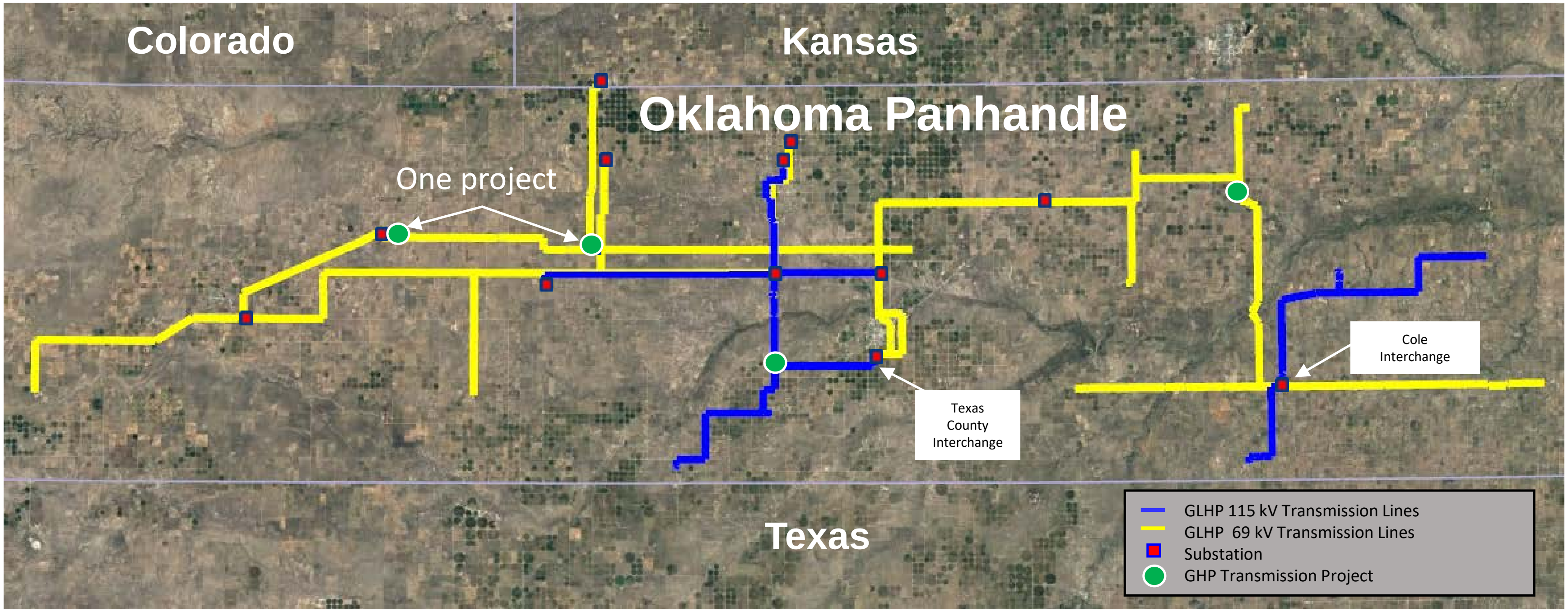
Reason for 10.3 Request

- GridLiance's Oklahoma Panhandle transmission facilities are not included in the 2019 ITP models
- GridLiance became an SPP transmission owner for facilities located in the Oklahoma Panhandle on November 1, 2018, well after the model build for the 2019 ITP
- Performing the needed coordination requires SPP to update 2019 ITP models

Request

- Update the 2019 ITP reliability (BR) models to include the GridLiance transmission facilities
- Perform an evaluation on projects identified in the 2019 ITP to determine if those facilities negate the need for GridLiance's LPP projects
- Perform an evaluation to determine if the GridLiance LPP projects address any currently-identified ITP needs
- Document the results in the 2019 ITP Report

Map of GridLiance system and LPP Projects



Not included in the Request

- Not asking SPP to re-run needs assessment
- Not asking SPP to update the economic models

Potential Impacts

- While unlikely, SPP's analysis could result in the following:
  - Selecting a GridLiance LPP project to address a regional SPP issue, or
  - A determination that an SPP regional project negates the need for one of the three GridLiance LPP projects


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

2019 and 2020 ITP Assessments Quarterly Report Card

Antoine Lucas

April 17, 2019

SouthwestPowerPool SPPorg southwest-power-pool

Status Legend

Status Indicator	Status	Milestone Tasks Are…
	Complete	Completed on-time
	On Track	In progress and on schedule
	Monitor/At Risk	Being monitored for potential schedule/ study impact(s)
	Late/Delayed	Completed late/behind schedule
	In Mitigation	Following mitigation process

2019 ITP

★ Complete

Completed Milestones

Milestone	Status	Start Date	End Date
DPP Transmission Planning Response Window	★	1/08/2019	2/06/2019
Solution Development & Evaluation (including DPP validation)	★	1/08/2019	3/20/2019

On Track

Current and Upcoming Milestones

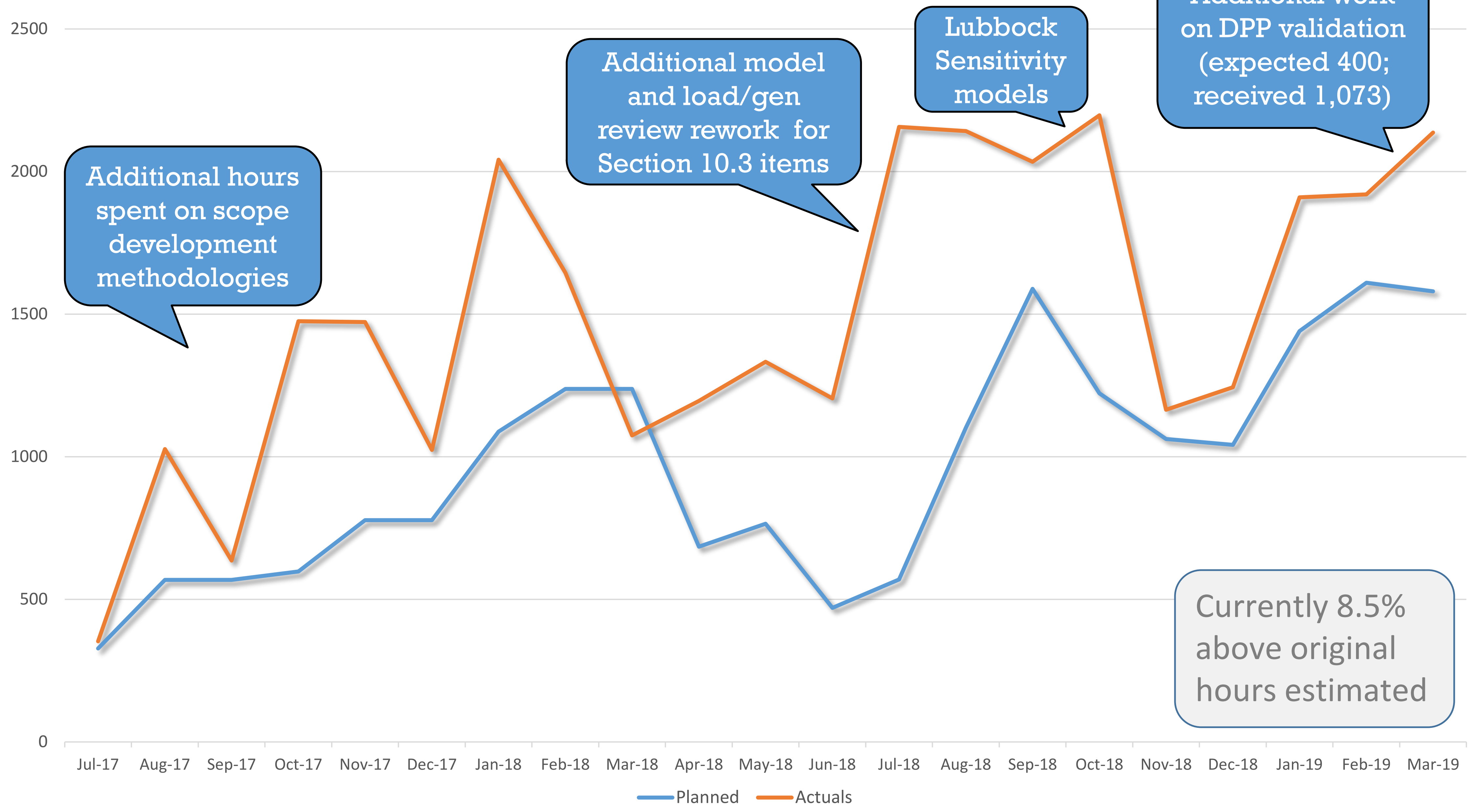
Milestone	Status	Start Date	End Date
Reliability Portfolio Development		3/21/2019	6/28/2019
Project Grouping		3/21/2019	6/28/2019
Study Cost Estimates – Round 1		4/11/2019	5/08/2019
Initial Portfolio Reliability Assessment		5/16/2019	7/02/2019
Planning Summit		5/29/2019	5/30/2019
Study Cost Estimates – Round 2		6/13/2019	6/26/2019

2019 ITP Plan to Actual as of 3/31/2019

Item	Amount
Staff Hours originally estimated	28,000 hrs.
Current estimate for Staff hours at study completion	38,400 hrs.
ITP Annual Consultant Budget*	$200,000
2019 ITP – Consultant budget spend year-to-date	$85,000
2019 ITP – Expected consultant budget spend to complete study	$100,000

* Annual Budget includes costs for 2019, 2020 and 2021 ITP spend during the calendar year

2019 ITP Planned vs. Actual Work



2020 ITP

★ Complete

Complete Milestones

Milestone	Status	Start Date	End Date
Base Reliability Powerflow Model Development	★	7/09/2018	2/22/2019
Load Review	★	7/23/2018	2/20/2019
Generation Review	★	7/23/2018	2/20/2019
Renewable Policy Review	★	2/01/2019	3/12/2019
Resource Plan – Phase 1	★	2/22/2019	3/12/2019

2020 ITP Powerflow Model - Entity Engagement

Essentially all data submitters participated in model build and submitted data by deadlines; however, additional corrections were submitted after deadline by some entities

Entities that provided data/changes after the Final Data Submission Deadline are listed below:

APPLICABLE ENTITIES			
AEP	BPU (KACY)	EMDE	NGP1 (GREAT PLAINS WIND)
OPPD	WAPA	SPP	

Note: SPP performed evaluations of all late requests/changes per Section 10.3 of the SPP ITP Manual

On Track

Current and Upcoming Milestones

Milestone	Status	Start Date	End Date
Resource Plan – Phase 2		2/01/2019	5/23/2019
Siting Plan & Generator Outlet Facilities (GOFs)		2/06/2019	7/10/2019
Market Economic Model (MEM) Build		2/01/2019	12/11/2019
MEM Benchmarking		4/30/2019	7/18/2019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Southwest Power Pool

2019 ITP Schedule

Juliano Freitas

April 10, 2019

Solutions Development & Validation (Complete)

- Start: 1/8/2019
- End: 3/20/2019
- Staff Leaders:
  - Reliability: Kelsey Allen (kallen@spp.org)
  - Economic/Policy: Nikki Roberts (nroberts@spp.org)
  - Operational: Will Tootle (wtootle@spp.org)
  - Short Circuit: Jason Terhune (jterhune@spp.org)

Solutions Evaluations (Complete)

- Start: 1/8/2019
- End: 3/20/2019
- Staff Leaders:
  - Reliability: Kelsey Allen (kallen@spp.org)
  - Economic: Liz Gephardt (lgephardt@spp.org)
  - Policy: Nikki Roberts (nroberts@spp.org)
  - Operational: Will Tootle (wtootle@spp.org)
  - Short Circuit: Jason Terhune (jterhune@spp.org)

Reliability Portfolio Development – Phase 1 (Complete)

- Start: 3/21/2019
- End: 4/03/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

Project Grouping – Phase 1
(Conceptual Costs) (Complete)

- Start: 3/21/2019
- End: 4/03/2019
- Staff Leader: Amber Greb (agreb@spp.org)

Study Cost Estimates – Round 1

- Start: 4/04/2019
- End: 5/08/2019
- Member Response Time:
  - 4/11/19 – 5/08/19 (20 days)
- Staff Leader: John O'Dell (jodell@spp.org)

Project Grouping – Phase 2
(Study Cost Estimates)

- Start: 5/08/2019
- End: 5/14/2019
- Staff Leader: Amber Greb (agreb@spp.org)

Reliability Portfolios Development – Phase 2

- Start: 5/09/2019
- End: 5/14/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

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Initial Final Reliability Assessments

- Start: 5/16/2019
- End: 5/28/2019
- Staff Leader: Dee Edmondson (dedmondson@spp.org)

Planning Summit

- Start: 5/10/2019
- End: 5/29/2019
- Member Review Time:
  - Summit Materials (7 days prior to meeting)
- Staff Leader: Ellen Bailey (ebailey@spp.org)

Reliability Portfolios Development – Phase 3

- Start: 5/30/2019
- End: 6/07/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

Project Grouping – Phase 3
(Summit Feedback)

- Start: 5/30/2019
- End: 6/07/2019
- Staff Leader: Amber Greb (agreb@spp.org)

Study Cost Estimates – Round 2

- Start: 6/10/2019
- End: 6/26/2019
- Member Response Time:
  - 6/13/2019 – 6/26/2018 (10 days)
- Staff Leader: John O'Dell (jodell@spp.org)

Final Reliability Portfolios Development

- Start: 6/27/2019
- End: 6/28/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

Final Reliability Assessments

- Start: 7/01/2019
- End: 7/02/2019
- Staff Leader: Dee Edmondson (dedmondson@spp.org)

Project Grouping – Phase 4 (Final)

- Start: 6/27/2019
- End: 6/28/2019
- Staff Leader: Amber Greb (agreb@spp.org)

Project Grouping – Final Determination

- Start: 7/01/2019
- End: 7/08/2019
- Staff Leader: Amber Greb (agreb@spp.org)

Optimization

- Start: 7/9/2019
- End: 7/17/2019
- Staff Leader: Kalen Coleman (kcoleman@spp.org)

Portfolio Consolidation

- Start: 7/18/2019
- End: 8/2/2019
- Staff Leader: Liz Gephardt (lgephardt@spp.org)

Project Staging

- Start: 8/5/2019
- End: 8/15/2019
- Staff Leader: Joshua Pilgrim (jpilgrim@spp.org)

Benefit Metrics Calculation

- Start: 8/2/2019
- End: 8/26/2019
- Staff Leader: Antonio Barber (abarber@spp.org)

Stability Analysis

- Start: 8/5/2019
- End: 8/26/2019
- Staff Leader: Chris Jamieson (cjamieson@spp.org)

Sensitivity Analysis

- Start: 8/5/2019
- End: 8/26/2019
- Member Review Time:
  - 8/19/2019 – 8/23/2019 (5 days)
- Staff Leader: Kirk Hall (khall@spp.org)

Final Reliability Assessment

- Start: 8/5/2019
- End: 8/27/2019
- Staff Leader: Dee Edmondson (dedmondson@spp.org)

Rate Impacts/ATRR

- Start: 8/15/2019
- End: 8/28/2019
- Staff Leader: Antonio Barber (abarber@spp.org)

Final Report

- Start: 8/1/2019
- End: 9/18/2019
- Staff Leader: Ellen Bailey (ebailey@spp.org)

TWG/ESWG Final Approvals

- Start: 9/26/2019
- End: 10/3/2019
- Member Review Time:
  - 9/26/2019 – 10/3/2019 (5 days)
- Staff Leaders:
  - TWG – Aaron Stewart (astewart@spp.org)
  - ESWG – Amber Greb (agreb@spp.org)

MOPC and SPP Board

- Start: 9/6/2019
- End: 10/29/2019
- Member Review Time:
  - MOPC: 10/7/2019 – 10/15/2019 (7 days)
  - SPP Board: 10/22/2019 – 10/29/2019 (5 days)


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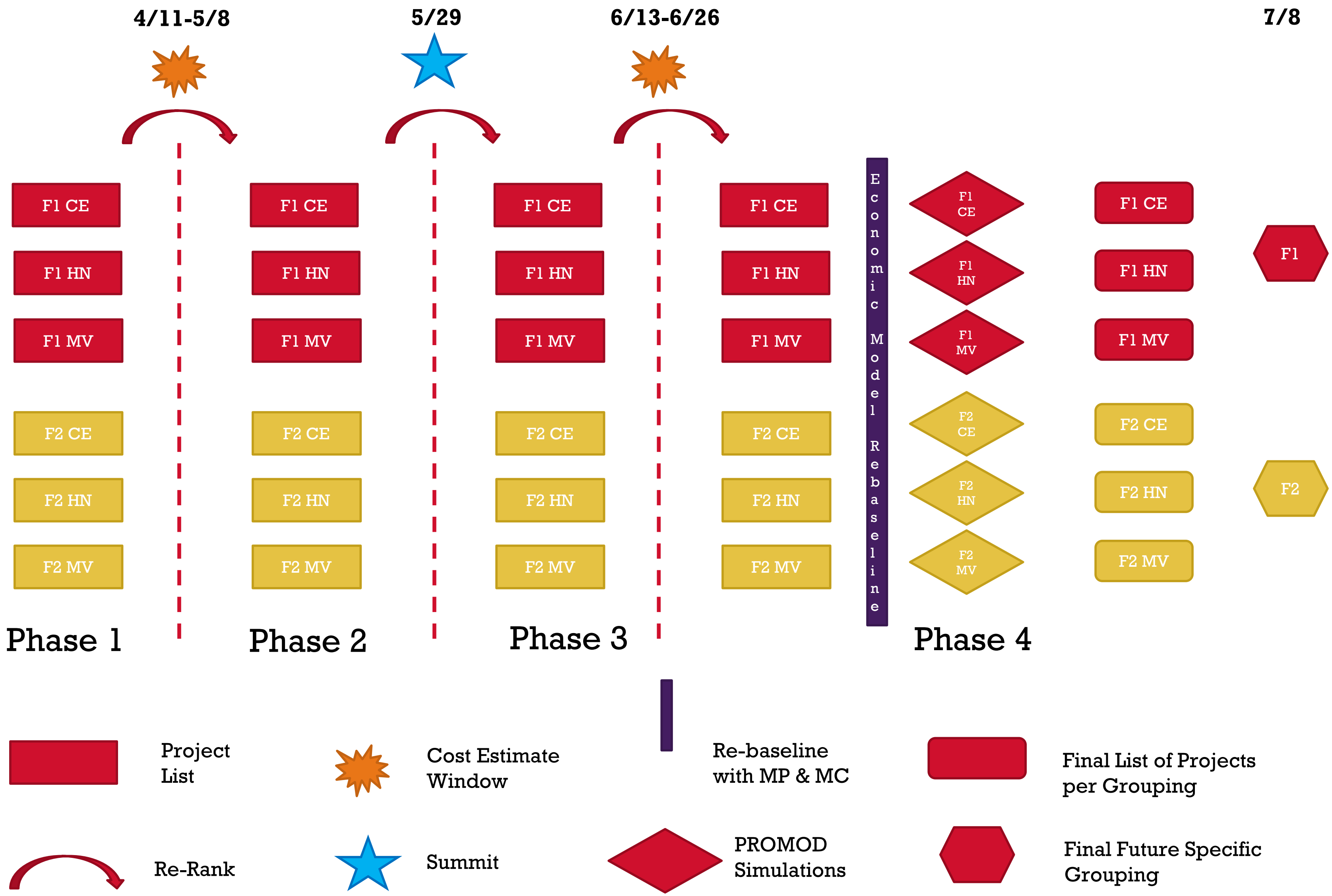
Economic Grouping

April 10, 2019

Objective

- Review Economic Portfolio Determination
- Review Details for Summit

Economic Grouping Process



Economic Portfolio Determination

Economic Portfolio Determination

- Goal of the Final Portfolio: *Develop a regional plan that provides reliable and economic delivery of energy and facilitates achievement of public policy objectives, while **maximizing benefits** to the end-use customer*
- The portfolio with the highest net benefit is the portfolio that will achieve this goal by providing the most cost savings to the region

SPP

Engineering Planning Summit Preparation

What to Expect

- Project List Posting with Cost Estimate Window
- Engineering Planning Summit presentation(s) to include detailed slides for all projects as related to each reliability and/or economic need
  - Cost estimates will reflect the study level estimates received during the first cost estimate window
  - Modified slides from previous summit presentations included as examples in this presentation.

Project List Posting

- A list of projects sent out for cost estimates will be posted on April 11th when the first cost estimate window opens.
- This project list posting will include the reliability portfolio and Future specific economic grouping information, as well as the conceptual cost estimates used for the first round of Grouping.

2019 ITP Project List Information Tab

A
Please utilize the following tabs for review.
ITP Project List
List of projects with description, cost estimates, project type, and portfolios for which they have been selected
Notes
Cost Estimates posted in this workbook on 4/11/2019 are Conceptual Cost Estimates only
Groupings:
CE - Cost Effective
HN - Highest Net APC Benefit
MV - Multi-Variable
"*" - Project sent out in for Round 1 for cost estimate
"0" - Project was initially selected for grouping, but fell out based on BCR criteria or infeasability
"1" - Project was selected for grouping and stayed in based on BCR criteria
"-" - Project did not get selected for grouping

2019 ITP Project List Example

				Reliability Portfolios			*Economic Groupings*								
General Description	Conceptual Cost Estima	Location (Zone)	Need ID	Base Reliability	F1 Market Powerflov	F2 Market Powerflov	F1 CE Groupin	F1 HN Groupin	F1 MV Groupin	F2 CE Groupin	F2 HN Groupin	F2 MV Groupin	F1 Final Portfolio	F2 Final Portfolio	Comments
Rebuild 161kV line from A - B	$1,000,000	AAA									*				
Build a new 345 kV line from C - D	$15,000,000	BBB						*							
Install a new 230/115 kV Transformer at Substation E	$9,000,000	CCC								*					
Upgrade any necessary terminal equipment on 138 kV line from F - G	$500,000	DDD					*			*					
Upgrade any necessary terminal equipment on 161 kV line from H - I															
Install a 12 MVAR capacitor bank at Substation J.	$500,000	DDD		*											

2017 ITP10 Solutions

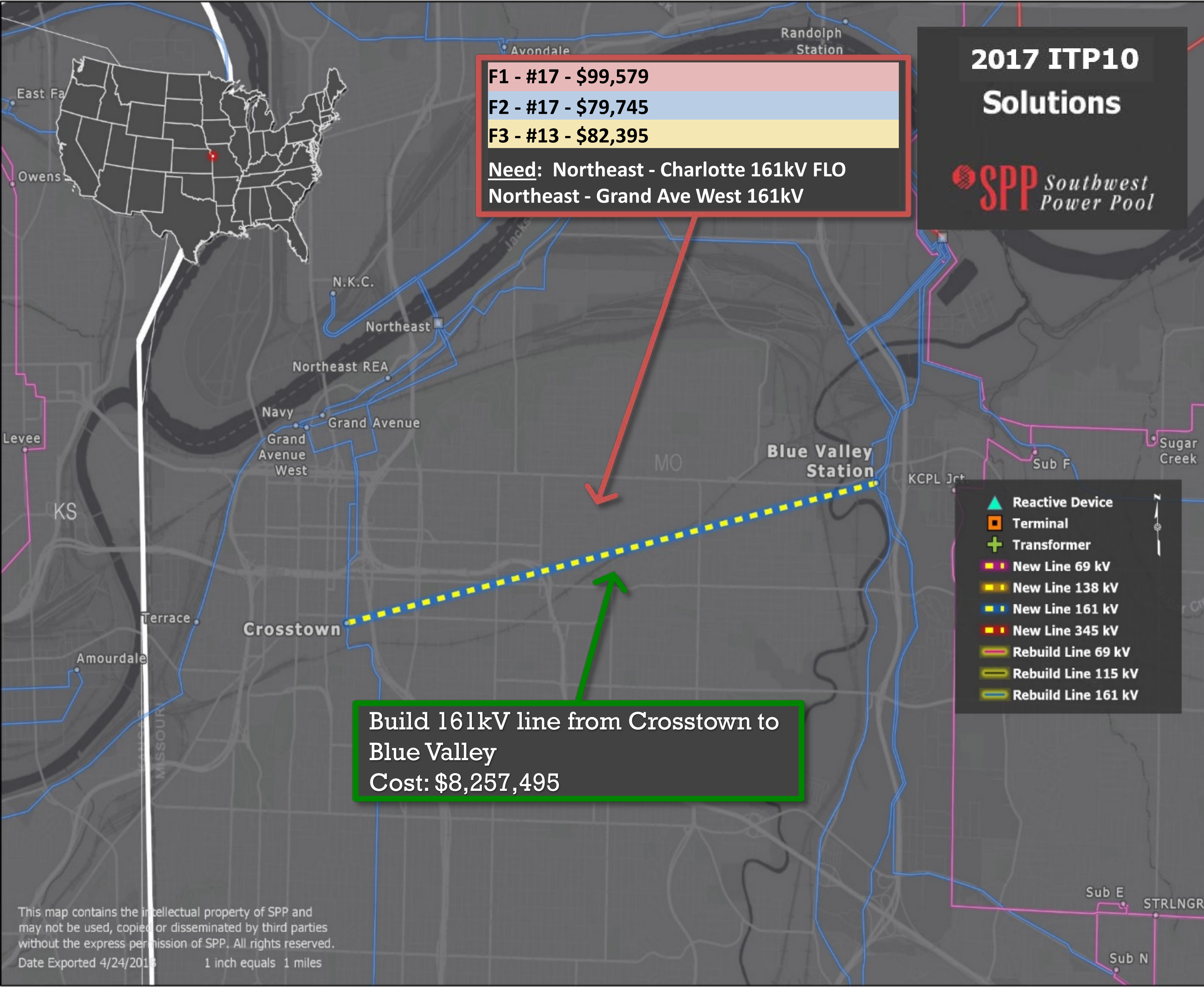
F1 - #17 - $99,579

F2 - #17 - $79,745

F3 - #13 - $82,395

<u>Need</u>: Northeast - Charlotte 161kV FLO
Northeast - Grand Ave West 161kV

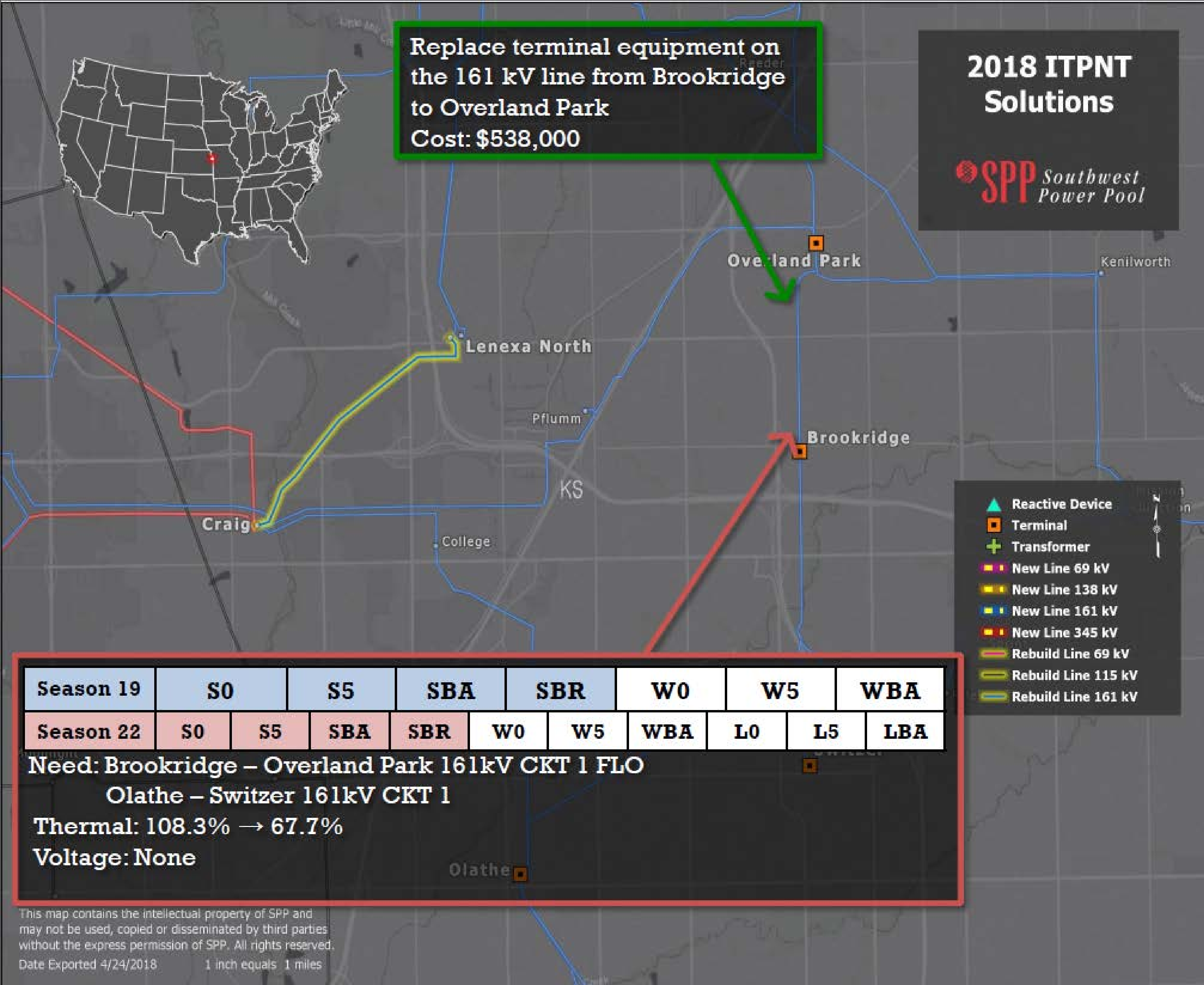
Build 161kV line from Crosstown to Blue Valley
Cost: $8,257,495



2018 ITPNT Solutions

SPP Southwest Power Pool

Replace terminal equipment on the 161 kV line from Brookridge to Overland Park
Cost: $538,000



Season 19	S0	S5	SBA	SBR	W0	W5	WBA

Season 22	S0	S5	SBA	SBR	W0	W5	WBA	L0	L5	LBA

Need: Brookridge – Overland Park 161kV CKT 1 FLO
Olathe – Switzer 161kV CKT 1

Thermal: 108.3% → 67.7%

Voltage: None

Dates to Remember

- First Cost Estimate Window closes on ***May 8th***
  - It is essential for stakeholders to provide study level estimates by this date, as this information will be used to update project cost information at the Summit. Conceptual cost information will be presented at the Summit if study level estimates are not received in time.
- Engineering Planning Summit will be held at SPP offices on ***May 29th***
  - It is important for stakeholders to provide valuable feedback during this meeting, as this information will be used to determine what additional projects need to be sent out during the second cost estimate window.

SPP

SPP-MISO CSP Update

ESWG – April 2019

Adam Bell abell@spp.org

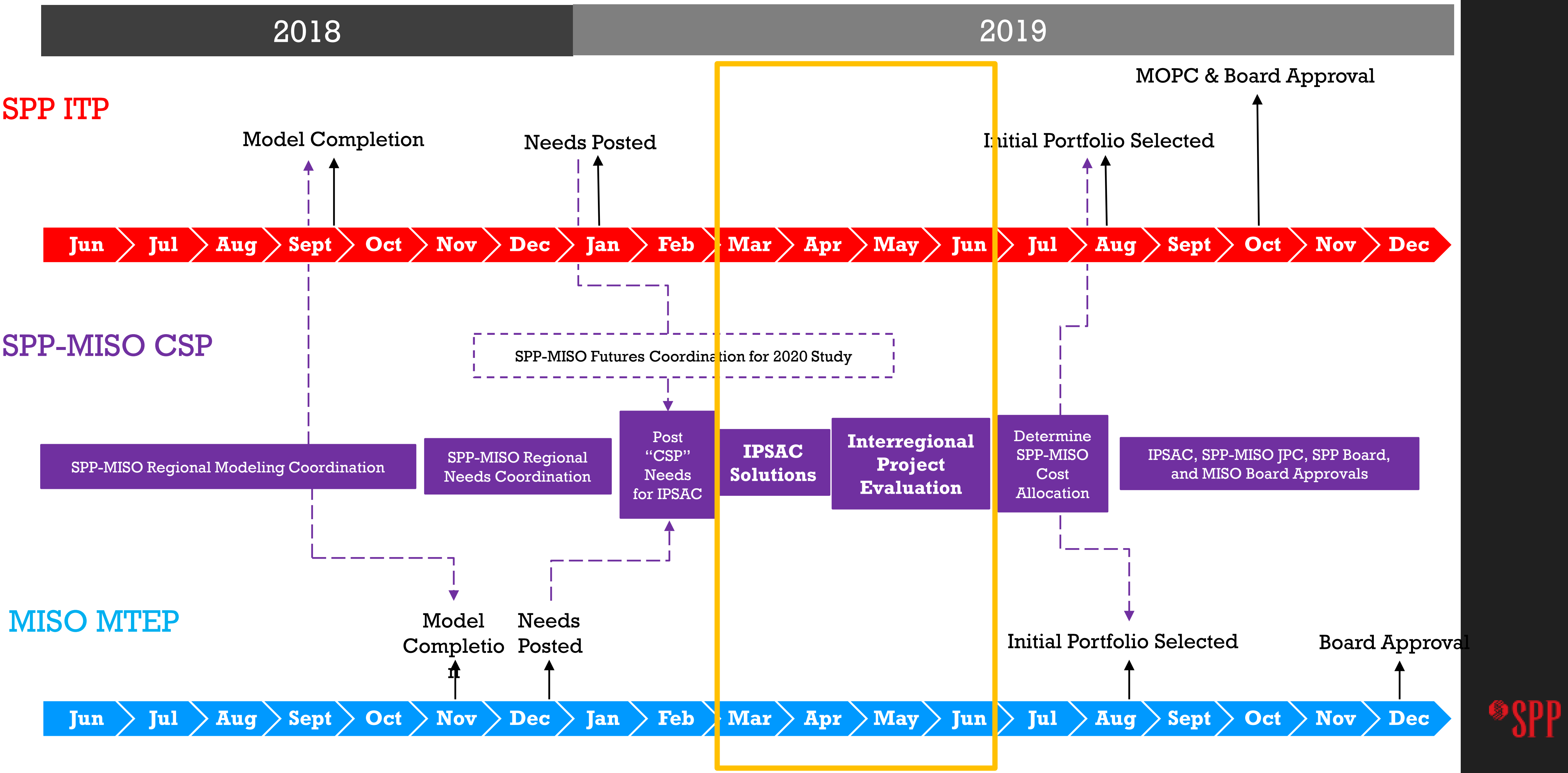
CSP Enhancements – SPP-MISO JOA Filing

- SPP and MISO are still working on making the filing at FERC
  - SPP and MISO staff are reviewing the draft transmittal letter
  - Legal staffs are finalizing their review of JOA language
  - Hopeful to make a filing in April of 2019

SPP

2019 SPP-MISO CSP Study

- SPP and MISO JPC officially voted to initiate a new CSP in 2019
- Project Coordination and Project Evaluation Stage
  - SPP and MISO planning staffs are exchanging solutions that were submitted into each RTO's regional processes for the CSP "Joint" Needs
  - Coordinating project details to ensure we are testing the same projects
- SPP and MISO staff are reviewing and finalizing a draft CSP study scope
- Next steps
  - Continue coordination on jointly addressing the CSP Needs
  - Share initial benefit results between SPP and MISO
  - Determine a list of the top Interregional Projects (if any)
  - Determine the appropriate time for the next SPP-MISO IPSAC meeting to share initial results with stakeholders
  - Share study scope with the IPSAC for their review



2018
2019
SPP ITP
Model Completion
Needs Posted
Initial Portfolio Selected
MOPC & Board Approval
Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec
SPP-MISO CSP
SPP-MISO Futures Coordination for 2020 Study
SPP-MISO Regional Modeling Coordination
SPP-MISO Regional Needs Coordination
Post "CSP" Needs for IPSAC
IPSAC Solutions
Interregional Project Evaluation
Determine SPP-MISO Cost Allocation
IPSAC, SPP-MISO JPC, SPP Board, and MISO Board Approvals
MISO MTEP
Model Completion
Needs Posted
Initial Portfolio Selected
Board Approval
Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec
SPP

Next Steps

Activity	Feb	Mar	Apr	May
Annual Issues Review				
Stakeholder solution submissions (Closed March 1)				
JPC Vote on CSP				
CSP Scope Development				
SPP and MISO solution evaluation and coordination				
Initial review of benefits				
IPSAC Meeting – CSP update (tentative)				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2019 ITP Target Area Additional Analysis Update

Kelsey Allen

April 10-11, 2019

Objective

- Recap analysis scope for the 2019 ITP Southeast Kansas/Southwest Missouri Target Area
- Provide update and next steps

ITP Manual: Target Areas

- ITP Manual section 4.1.2 describes potential analysis of "target areas", or areas of increased focus with additional analysis

2019 ITP Target Area

Southeast Kansas/Southwest Missouri

- Drivers
  - Unresolved transmission limits identified in numerous studies
  - Historic and projected congested flowgates in area
  - Steady-state reliability violations
  - Stability concerns at Wolf Creek
  - Active TWG direction to determine a path forward to properly evaluate issues around Wolf Creek
  - Helps meet study object in developing a regional plan that provides *Reliable and economic delivery of energy,* specifically for SPP eastern load centers

Southeast Kansas/Southwest Missouri Analysis

- Calculations per Benefit Metrics Manual
  - Adjusted production cost (APC) savings
  - Reduction of marginal energy losses
  - Avoided reliability cost savings*
- Wolf Creek TOD
  - Current operating directive to reduce output of plant under any 345 kV contingency reducing the number of transmission outlets
- Steady-state reliability
- Angular stability analysis
  - Consistent with SPP's process to meet TPL-001-4 R4
  - 2018 MDWG series (updated February 2019) stability base and sensitivity cases

*Modify to leverage issues/solutions identified during development of a Base Reliability portfolio

Wolf Creek TOD Implementation Status

- PROMOD implementation
  - Developed PROMOD nomogram approach
  - Implemented proxy nomogram
- Research into appropriate outage schedules
  - SPP CROW (2012-2018)
    - Includes all outage types, not just forced
    - Identify overlap of key transmission outages (any 345 kV path from WC plan) that drive op guide implementation
    - Identify overlap of transmission and plant outages
  - NERC TADS (2010-2018)
    - Summary of transmission forced outages
    - Event count and duration
  - NERC TFORD (2014)
    - Statistical analysis of typical forced outage rates and durations for transmission considering voltage class, mileage, sustained/momentary

TADS: Transmission Avaliability Data System

TFORD: Transmission Forced Outage Rate and Duration

Research Findings

- SPP CROW
  - Data somewhat unreliable when determining drivers (categories) of outages
  - Most transmission outages coincided with a generation outage, meaning no op guide implementation (plant derate) necessary
- NERC TADS
  - Sustained forced outage events minimal
  - Year of highest outage/duration was 2012 with 5 events lasting 22 hours
- NERC TFORD
  - 345 kV annual sustained forced outage rate
    - Per line: 0.43%
    - Per 100 miles: 1.22%
  - 345 kV average sustained forced outage duration:
    - Per event: 35.2 hours
    - Annual average: 15.2 hours

Conclusions

- Previous op guide implementation was overstated
  - Leveraged SPP CROW outage statuses
  - ~480 hours
- Research shows actual for 345 kV paths out of wolf creek should be:
  - 22 annual hours (liberal estimate of CROW and TADS)
  - 108 annual hours (NERC statistical averages for 345 kV)
- Potential benefit based on new research:
  - Assuming a 1-to-1 relationship of implementation hours to APC benefit and leveraging previous op guide implementation results
  - Low end (actuals): ~$230K
  - High end (industry averages): $1.125M

Status/Next Steps

- APC analysis ongoing (project screening complete)
- Recommend removing op guide implementation in PROMOD from scope of work
  - Requires relatively significant man hours for expected potential benefits
  - APC savings due to congestion relief showing cost beneficial to solutions that can potentially alleviate stability concerns at Wolf Creek
- Discuss need for quantification of reduction of marginal energy losses benefit (simple to quantify, involved to validate)
- Include avoided reliability project considerations in ongoing economic grouping (portfolio development) efforts
- Perform angular stability analysis on top candidate projects to inform narratives

Appendix

Wolf Creek TOD Implementation

- Previously implemented in 2015 and 2017 ITP10 as a base model assumption
  - Modeled Wolf Creek as 2 machines (800MW/405MW)
  - Included additional outages of 405MW machine consistent with historical transmission outages to simulate "derate"
  - Removed PROMOD case for analysis of new 345 kV outlet solutions
- 2019 ITP Proposal
  - Refine annual "derate" schedule through analysis of more historical transmission outage data
  - Include actual transmission outages along with reduced plant output
  - Include nomogram to implement derate schedule
  - Only implement during portfolio development

Wolf Creek TOD Modeling

- Nomogram
  - Assumes normal Wolf Creek output is always at maximum unless on outage
  - Reduce Wolf Creek minimum capacity to approved derate value (per TOD)
  - Model hourly transaction to force desired Wolf Creek output, minimize transaction impact
    - Max Capacity = 1/1000 of MW desired output
    - Map transaction to EHV bus near eastern border of translated system
  - Include new gen hub with bus of Wolf Creek unit
  - Force gen hub (Wolf Creek) and transaction schedule * -1000 to net 0 MW (+/- 1 margin)
  - NOMOGRAM 'WOLFCREEK DERATE' -1.0 1.0 -1.0 1.0
    - GENERATION HUB WCGENHUB 1.0
    - TRANSACTION WLFCRKDT -1000.0
  - END

NOMOGRAM 'WOLFCREEK DERATE' -1.0 1.0 -1.0 1.0
GENERATION HUB WCGENHUB 1.0
TRANSACTION WLFCRKDT -1000.0
END

- Additional constraint identification using engineering judgment


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Southwest Power Pool

2020 ITP Schedule

Juliano Freitas

April 10, 2019

Powerflow Model

- Start: 7/09/2018
- End: 2/22/2019 (Final Approval)
- Member Review Time:
  - *Pass 0 – Trial 1: 7/13/2018 – 7/20/2018 (5 days)*
  - *Pass 0 – Trial 2: 8/03/2018 – 8/24/2018 (15 days)*
  - *Pass 1: 9/14/2018 – 9/21/2018 (5 days)*
  - Pass 2: 10/05/2018 – 10/26/2018 (15 days)
  - Pass 3: 11/16/2018 – 12/07/2018 (15 days)
  - Pass 4: 12/21/2018 – 1/11/2019 (15 days)
  - **Final Data Submission Deadline: 1/11/2019**
  - Final Initial ITP: 2/11/2019 – 2/15/2019 (5 days)
  - **Final Initial ITP Approval: 2/22/2019**
  - **Final ITP Approval with Oct. 2019 Board approved projects in Nov. 2019**
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Short Circuit Model

- Start: 11/14/2018
- End: 2/28/2019
- Member Review Time:
  - Pass 1: 12/14/2018 – 1/11/2018 (6 days)
  - Pass 2: 2/08/2019 – 2/15/2019 (6 days)
  - Pass 3: 2/21/2019 – 2/28/2019 (6 days) (MDWG Approval) Complete
  - **Final ITP Approval with Oct. 2019 Board approved projects in Nov. 2019**
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG

Load Review (Complete)

- Start: 7/23/2018
- End: 2/20/2019 (Member's Final Approval)
- Member Review Time:
  - *Load Pass 1: 9/17/2018 – 9/28/2018 (10 days)*
  - Load Pass 2: 10/15/2018 – 10/26/2018 (10 days)
  - Load Pass 2 Update*: 10/18/2018 – 10/31/2018 (10 days)
  - Load Pass 3: 11/26/2018 – 12/07/2018 (10 days)
  - Final Posting for Approval: 2/08/2019 (7 days)
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: ESWG

* Posting based on approved ESWG items

Generation Review (Complete)

- Start: 7/23/2018
- End: 2/20/2019 (Member's Final Approval)
- Member Review Time:
  - *Gen Pass 1: 9/17/2018 – 9/28/2018 (10 days)*
  - RAR & Waiver Request to Stakeholders: 9/21/2018 – 10/26/2018 (25 days)
  - Gen Pass 2: 10/15/2018 – 10/26/2018 (10 days)
  - Gen Pass 2 Update*: 10/18/2018 – 10/31/2018 (10 days)
  - Gen Pass 3: 11/26/2018 – 12/07/2018 (10 days)
  - Final Posting for Approval: 2/08/2019 (7 days)
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: ESWG

* Posting based on approved ESWG items

Renewable Policy Review (Complete)

- Start: 2/01/2019
- End: 3/12/2019 (Member's Final Approval)
- Member Review Time:
  - 3/04/2019 – 3/08/2019 (5 days)
- Staff Leader: Joshua Norton (jnorton@spp.org)
- Working Group Approval: ESWG

Policy Renewable Resource Plan – Phase 1 (Complete)

- Start: 2/22/2019
- End: 3/12/2019 (Member's Final Approval)
- Member Review Time:
  - 3/04/2019 – 3/12/2019 (5 days)
- Staff Leader: Joshua Norton (jnorton@spp.org)
- Working Group Approval: ESWG

Renewable & Conventional Resource Plan – Phase 2

- Start: 2/6/2019
- End: 5/23/2019 (Member's Final Approval)
- Member Review Time:
  - 5/04/2019 – 5/14/2019 (7 days)
- Staff Leader: Antonio Barber (abarber@spp.org)
- Working Group Approval: ESWG

Siting Plan & Generator Outlet Facilities (GOFs)

- Start: 2/01/2019
- End: 7/10/2019 (Member's Final Approval)
- Member Review Time:
  - Siting Plan
    - Site Prioritization: 5/17/2019 – 5/23/2019 (6 days)
    - Site Assignment Renewable: 6/05/2019 – 6/11/2019 (6 days)
    - Site Assignment Storage: 6/05/2019 – 6/11/2019 (6 days)
    - Site Assignment Conventional: 6/05/2019 – 6/11/2019 (6 days)
    - Site Assignment External: 6/05/2019 – 6/11/2019 (6 days)
    - Siting Plan ESWG Approval: 6/13/2019
  - GOFs
    - GOFs: 7/02/2019 – 7/10/2019 (5 days)
    - GOFs TWG Approval: 7/10/2019
- Staff Leaders:
  - Siting Plan: Joshua Norton (jnorton@spp.org)
  - GOFs: Brooke Keene (bkeene@spp.org)
- Working Group Approval: ESWG (Siting Plan)/TWG (GOFs)

Market Economic Model Build

- Start: 2/01/2019
- End: 12/11/2019 (Member's Final Approval)
- Member Review Time:
  - Post 1: 5/08/2019 – 5/15/2019 (6 days)
  - Post 2: 8/05/2019 – 8/09/2019 (5 days)
  - Initial ESWG Member Approval: 8/14/2019
  - Post for Final Approval: 12/03/2019 – 12/10/2019 (6 days)
  - Final ESWG Member Approval: 12/11/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: ESWG

Market Economic Benchmarking

- Start: 4/30/2019
- End: 7/18/2019 (Member's Final Approval)
- Member Review Time:
  - Post for Review: 6/13/2019 – 6/20/2019 (6 days)
  - Post for Final Approval: 7/10/2019 – 7/17/2019 (6 days)
  - Final ESWG Member Approval: 7/18/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: ESWG

Model Updates

- Start: Pass 1 Powerflow Model (7/09/2018)
- Initial End: 2/15/2019
- Final End: 11/15/2019
  - (New NTCs and withdrawals approved by the Oct. 2019 MOPC/Board, and NTC re-evaluations)
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Constraint Assessment

- Start: 8/2/2019
- End: 10/30/2019 (Member's Final Approval)

- Staff Leader: Kirk Hall (khall@spp.org)
- Working Group Approval: TWG

Market Powerflow Models (BA Reliability)

- Start: 11/15/2019
- End: 1/15/2020 (Member's Final Approval)

- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG

Base Reliability Needs Assessment

- Start: 11/15/2019
- End: 3/14/2020

- Staff Leader: Jason Speer (jspeer@spp.org)

Market Powerflow Reliability Needs Assessment

- Start: 1/02/2020
- End: 3/14/2020

- Staff Leader: Jason Speer (jspeer@spp.org)

Economic Needs Assessment

- Start: 1/02/2020
- End: 3/14/2020

- Staff Leader: Liz Gephardt (lgephardt@spp.org)

Public Policy Needs Assessment

- Start: 1/02/2020
- End: 3/14/2020

- Staff Leader: Liz Gephardt (lgephardt@spp.org)

Operational Needs Assessment

- Start: 1/02/2020
- End: 3/14/2020

- Staff Leader: Will Tootle (wtootle@spp.org)

Short Circuit Needs Assessment

- Start: 1/02/2020
- End: 3/14/2020

- Staff Leader: Jason Terhune (jterhune@spp.org)

DPP Window

- Start: 3/15/2020 12:00 a.m.
- End: 4/13/2020 11:59 p.m.
- Member Review Time:
  - Transmission-planning response window (30 calendar days)
- Staff Leader: Ellen Bailey (ebailey@spp.org)

Solutions Development & Validation

- Start: 3/15/2020
- End: 6/10/2020

- Staff Leaders:
  - Reliability: Kelsey Allen (kallen@spp.org)
  - Economic: Liz Gephardt(lgephardt@spp.org)
  - Policy: Liz Gephardt(lgephardt@spp.org)
  - Operational: Will Tootle (wtootle@spp.org)
  - Short Circuit: Jason Terhune (jterhune@spp.org)

Solutions Evaluations

- Start: 3/15/2020
- End: 6/10/2020

- Staff Leaders:
  - Reliability: Aaron Stewart (astewart@spp.org)
  - Economic: Amber Greb (agreb@spp.org)
  - Policy: Amber Greb (agreb@spp.org)
  - Operational: Will Tootle (wtootle@spp.org)
  - Short Circuit: Jason Terhune (jterhune@spp.org)

Reliability Portfolio Development

- Start: 2/15/2020
- End: 6/10/2020

- Staff Leader: Kelsey Allen (kallen@spp.org)

Project Grouping & Ranking

- Start: 3/15/2020
- End: 8/14/2020

- Staff Leaders: Nikki Roberts (nroberts@spp.org)

Study Cost Estimates – Round 1

- Start: 6/10/2020
- End: 6/25/2020

- Staff Leader: John O'Dell (jodell@spp.org)

Planning Summit

- Start: 6/25/2020
- End: 7/10/2020
- Member Review Time:
  - Summit Materials (7 days prior to meeting)
- Staff Leader: Ellen Bailey (ebailey@spp.org)

Study Cost Estimates – Round 2

- Start: 7/10/2020
- End: 7/25/2020

- Staff Leader: John O'Dell (jodell@spp.org)

Final Reliability Portfolios Development

- Start: 7/26/2020
- End: 8/14/2020

- Staff Leader: Kelsey Allen (kallen@spp.org)

Optimization & Portfolio Consolidation

- Start: 8/16/2020
- End: 9/18/2020

- Staff Leaders:
  - Liz Gephardt (lgephardt@spp.org)
  - Amber Greb (agreb@spp.org)

Project Staging

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: Liz Gephardt (lgephardt@spp.org)

Benefit Metrics Calculation

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: Antonio Barber (abarber@spp.org)

Stability Analysis

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: Dee Edmondson (dedmondson@spp.org)

Sensitivity Analysis

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: James Bailey (jbailey@spp.org)

Final Reliability Assessment

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: Aaron Stewart (astewart@spp.org)

Rate Impacts/ATRR

- Start: 8/14/2020
- End: 9/18/2020

- Staff Leader: Antonio Barber (abarber@spp.org)

Final Report

- Start: 8/1/2020
- End: 9/18/2020

- Staff Leader: Ellen Bailey (ebailey@spp.org)

TWG/ESWG Final Approvals

- Start: 9/25/2020
- End: 10/2/2020

- Staff Leaders:
  - TWG – Aaron Stewart (astewart@spp.org)
  - ESWG – Amber Greb (agreb@spp.org)

MOPC and SPP Board

- Start: 9/6/2020
- End: 10/27/2020
- Member Review Time:
  - MOPC: 10/2/2020 – 10/13/2020 (7 days)
  - SPP Board: 10/20/2020 – 10/27/2020 (5 days)


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ITP Resource Planning Phase II

Antonio Barber

April 10-11th, 2019

Objective

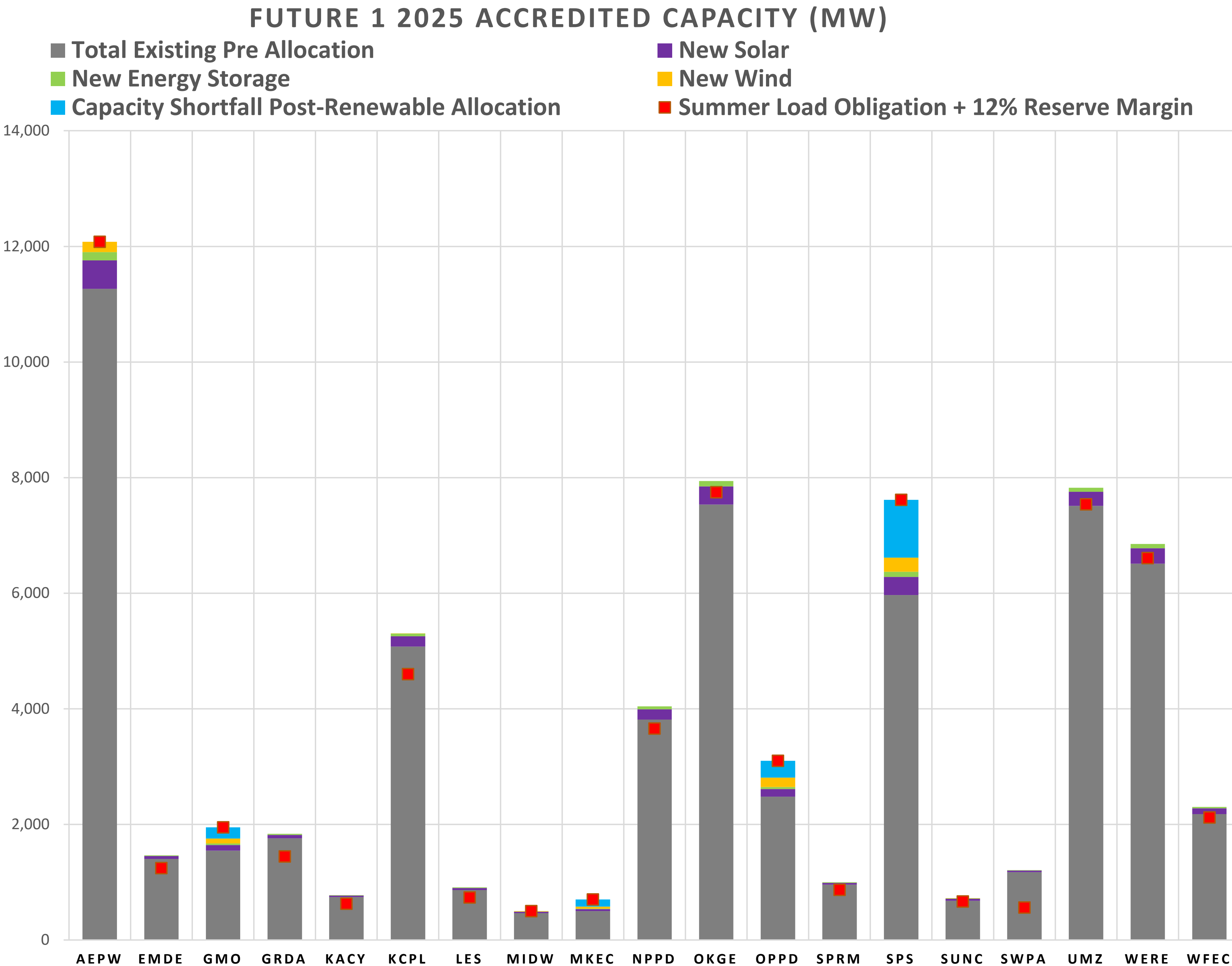
- Provide preliminary zonal shortfalls
- Allocation of projected solar, energy Storage, and wind
- Go over next steps

Inputs

- Renewables

Incremental Additions	Future 1: Reference Case		Future 2: Emerging Technologies	
	2025	2030	2025	2030
Solar MW	3,762	6,762	5,062	9,262
Wind MW	3,606	5,606	7,606	10,606
Energy Storage MW	752	1,352	1,667	3,067

Column Name	Description
Zone	Pricing Zone
Existing Conventional	Summation of Existing Conventional Accredited Capacity ***Source:*** 2020 ITP Generation Review.
Existing Solar	Summation of Existing Solar Accredited Capacity ***Source:*** 2020 ITP Generation Review.
Existing Wind	Summation of Existing Wind Accredited Capacity ***Source:*** 2020 ITP Generation Review.
Existing DC Ties & PPAs	Summation of Fleet PPAs's/DC Ties From 'Fleet PPAs and DC Ties. Summation of the "Capacity Accreditation" (PPA Source Capacity (MW) minus from PPA Sink Capacity (MW)) ***Source:*** 2020 ITP Generation Review
New Solar	Summation of Policy Solar (RP1) & New Solar Accredited Capacity From Renewable Allocation Results
New Wind	Summation of Policy Wind (RP1) & New Wind Accredited Capacity From Renewable Allocation Results
New Energy Storage	Summation of New Energy Storage Accredited Capacity From Renewable Allocation Results
Total Existing Pre Allocation	Summation of Existing Conventional, Existing Solar, Existing Wind, Existing DC Ties & PPAs
Summer Peak Demand	Summation of Peak Load with losses ***Source:*** 2020 ITP Load Review
PPA Obligations	Summation of Fleet PPAs's/DC Ties From 'Fleet PPAs and DC Ties. Summation of the "Load Obligation / Load Reduction" (PPA Source Capacity (MW) minus from PPA Sink Capacity (MW)) ***Source:*** 2020 ITP Generation Review
Summer Load Obligation	Summation of Peak Load and "Load Obligation / Load Reduction" (PPA's/DC Ties) (PPA Source Capacity (MW) minus from PPA Sink Capacity (MW)) ***Source:*** 2020 ITP Generation Review
Summer Load Obligation + 12% Reserve Margin	Summation of Summer Load Obligation + 12% Reserve Margin
Capacity Shortfall Post-Renewable Allocation	Summer Load Obligation + 12% Reserve Margin minus from Summation of (New Solar, New Wind, New Energy Storage, and Existing)


FUTURE 1 2025 ACCREDITED CAPACITY (MW)
Total Existing Pre Allocation
New Solar
New Energy Storage
New Wind
Capacity Shortfall Post-Renewable Allocation
Summer Load Obligation + 12% Reserve Margin
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
AEPW
EMDE
GMO
GRDA
KACY
KCPL
LES
MIDW
MKEC
NPPD
OKGE
OPPD
SPRM
SPS
SUNC
SWPA
UMZ
WERE
WFEC

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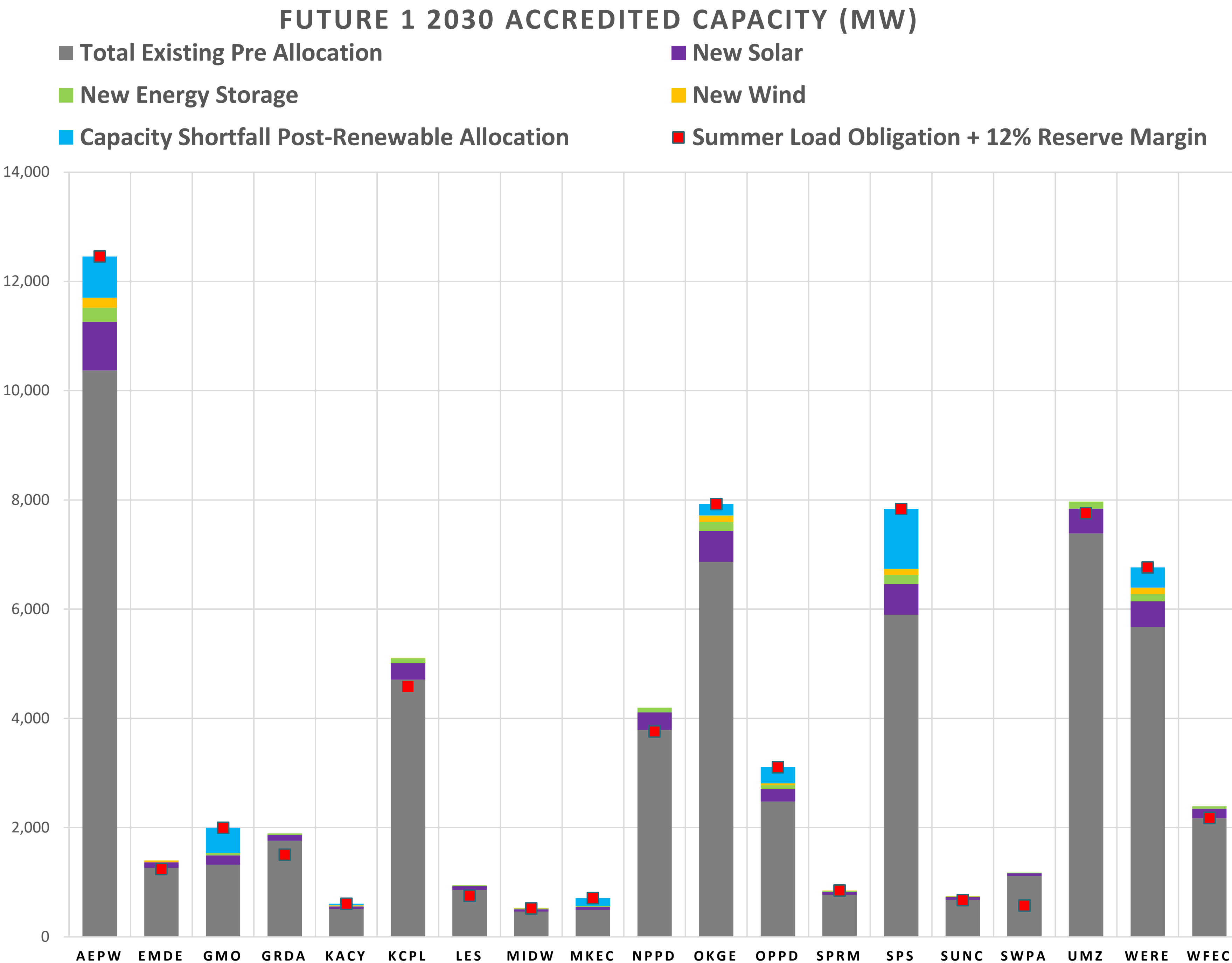
Future 1 2025 Accredited Capacity (MW)

Zone	Existing Conventional	Existing Solar	Existing Wind	Existing DC Ties & PPAs	New Solar	New Wind	New Energy Storage	Total Existing Pre Allocation	Summer Peak Demand	PPA Obligations	Summer Load Obligation	Summer Load Obligation + 12% Reserve Margin	Capacity Shortfall Post-Renewable Allocation
AEPW	10,157	0	501	607	493	179	142	11,265	10,763	22	10,785	12,079	0
EMDE	1,349	0	51	0	51	0	15	1,400	1,113	(4)	1,109	1,242	0
GMO	1,401	2	144	0	96	85	27	1,547	2,079	(340)	1,739	1,947	192
GRDA	2,163	0	53	(458)	59	0	17	1,758	1,291	0	1,291	1,446	0
KACY	653	0	50	39	26	0	7	742	561	0	561	628	0
KCPL	4,623	0	399	55	176	3	50	5,077	3,779	326	4,105	4,598	0
LES	844	0	17	0	36	0	10	862	785	(128)	657	736	0
MIDW	265	0	45	155	21	7	6	465	457	(11)	445	499	0
MKEC	444	0	31	25	33	33	9	500	716	(91)	626	701	126
NPPD	3,729	0	106	(24)	178	0	51	3,812	3,886	(619)	3,267	3,659	0
OKGE	6,963	0	138	431	316	0	91	7,532	6,896	21	6,917	7,748	0
OPPD	2,335	0	163	(20)	132	163	38	2,478	2,871	(105)	2,766	3,098	288
SPRM	821	0	78	55	33	0	9	955	719	56	775	868	0
SPS	5,045	151	417	355	312	245	90	5,968	6,820	(22)	6,799	7,614	999
SUNC	662	0	14	0	33	7	8	677	601	(5)	596	667	0
SWPA	2,760	6	0	(1,593)	28	0	8	1,172	607	(108)	499	559	0
UMZ	6,793	0	439	277	244	0	70	7,509	5,320	1,410	6,730	7,537	0
WERE	5,666	0	837	9	265	0	76	6,512	5,777	124	5,901	6,609	0
WFEC	1,691	18	138	330	101	0	25	2,176	1,871	20	1,891	2,117	0



FUTURE 1 2030 ACCREDITED CAPACITY (MW)
Total Existing Pre Allocation
New Solar
New Energy Storage
New Wind
Capacity Shortfall Post-Renewable Allocation
Summer Load Obligation + 12% Reserve Margin
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
AEPW
EMDE
GMO
GRDA
KACY
KCPL
LES
MIDW
MKEC
NPPD
OKGE
OPPD
SPRM
SPS
SUNC
SWPA
UMZ
WERE
WFEC

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	Future 1 2030 Accredited Capacity (MW)												
Zone	Existing Conventional	Existing Solar	Existing Wind	Existing DC Ties & PPAs	New Solar	New Wind	New Energy Storage	Total Existing Pre Allocation	Summer Peak Demand	PPA Obligations	Summer Load Obligation	Summer Load Obligation + 12% Reserve Margin	Capacity Shortfall Post-Renewable Allocation
AEPW	9,364	0	435	570	890	187	257	10,369	11,099	21	11,120	12,454	751
EMDE	1,265	0	0	0	102	31	0	1,265	1,114	(4)	1,110	1,244	0
GMO	1,175	2	144	0	171	1	42	1,321	2,125	(340)	1,785	1,999	463
GRDA	2,163	0	53	(458)	108	0	31	1,758	1,343	0	1,343	1,505	0
KACY	424	0	50	39	44	9	13	513	543	0	543	608	30
KCPL	4,255	0	399	55	305	3	87	4,709	3,766	326	4,092	4,583	0
LES	844	0	17	0	64	0	17	862	802	(128)	674	755	0
MIDW	265	0	45	155	38	7	11	465	478	(12)	466	522	1
MKEC	435	0	31	25	58	1	17	491	726	(92)	635	711	144
NPPD	3,710	0	106	(24)	319	0	84	3,792	3,979	(622)	3,357	3,759	0
OKGE	6,287	0	138	441	566	120	164	6,866	7,057	20	7,077	7,926	211
OPPD	2,335	0	163	(20)	231	35	67	2,478	2,876	(105)	2,771	3,104	293
SPRM	637	0	78	55	56	8	16	771	699	60	760	851	0
SPS	5,045	151	347	355	562	114	163	5,899	7,015	(21)	6,994	7,833	1,095
SUNC	662	0	14	0	55	7	11	677	608	(5)	602	675	0
SWPA	2,702	6	0	(1,593)	50	0	12	1,115	623	(111)	513	574	0
UMZ	6,672	0	439	277	451	0	130	7,388	5,625	1,300	6,925	7,756	0
WERE	4,823	0	837	9	474	114	137	5,669	5,914	126	6,040	6,765	371
WFEC	1,691	18	138	330	171	0	45	2,176	1,925	20	1,945	2,178	0

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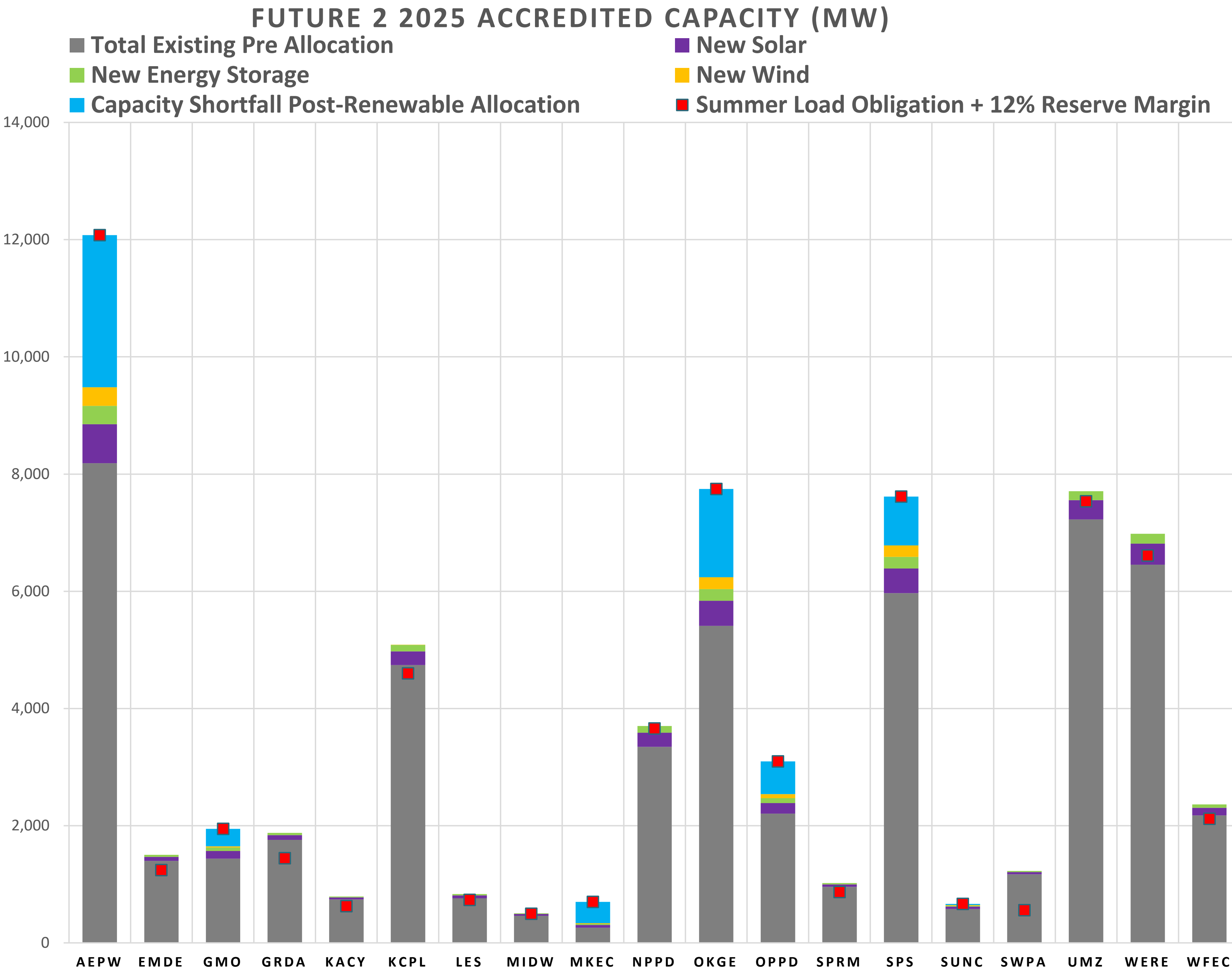
FUTURE 2 2025 ACCREDITED CAPACITY (MW)
Total Existing Pre Allocation
New Solar
New Energy Storage
New Wind
Capacity Shortfall Post-Renewable Allocation
Summer Load Obligation + 12% Reserve Margin
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
AEPW
EMDE
GMO
GRDA
KACY
KCPL
LES
MIDW
MKEC
NPPD
OKGE
OPPD
SPRM
SPS
SUNC
SWPA
UMZ
WERE
WFEC

	Future 2 2025 Accredited Capacity (MW)												
Zone	Existing Conventional	Existing Solar	Existing Wind	Existing DC Ties & PPAs	New Solar	New Wind	New Energy Storage	Total Existing Pre Allocation	Summer Peak Demand	PPA Obligations	Summer Load Obligation	Summer Load Obligation + 12% Reserve Margin	Capacity Shortfall Post-Renewable Allocation
AEPW	7,078	0	501	607	665	314	315	8,186	10,763	22	10,785	12,079	2,599
EMDE	1,349	0	51	0	69	0	33	1,400	1,113	(4)	1,109	1,242	0
GMO	1,293	2	144	0	129	19	61	1,439	2,079	(340)	1,739	1,947	300
GRDA	2,163	0	53	(458)	80	0	38	1,758	1,291	0	1,291	1,446	0
KACY	653	0	50	39	35	0	16	742	561	0	561	628	0
KCPL	4,285	0	399	55	236	3	111	4,740	3,779	326	4,105	4,598	0
LES	745	0	17	0	48	0	23	762	785	(128)	657	736	0
MIDW	265	0	45	155	28	0	13	465	457	(11)	445	499	0
MKEC	205	0	31	25	44	10	21	261	716	(91)	626	701	365
NPPD	3,265	0	106	(24)	240	0	114	3,347	3,886	(619)	3,267	3,659	0
OKGE	4,842	0	138	431	426	202	202	5,411	6,896	21	6,917	7,748	1,507
OPPD	2,065	0	163	(20)	177	71	84	2,208	2,871	(105)	2,766	3,098	558
SPRM	821	0	78	55	44	0	21	955	719	56	775	868	0
SPS	5,045	151	417	355	421	195	200	5,968	6,820	(22)	6,799	7,614	830
SUNC	562	0	14	0	43	11	18	576	601	(5)	596	667	19
SWPA	2,760	6	0	(1,593)	37	0	18	1,172	607	(108)	499	559	0
UMZ	6,508	0	439	277	329	0	156	7,225	5,320	1,410	6,730	7,537	0
WERE	5,610	0	837	9	357	0	169	6,455	5,777	124	5,901	6,609	0
WFEC	1,691	18	138	330	131	0	55	2,176	1,871	20	1,891	2,117	0

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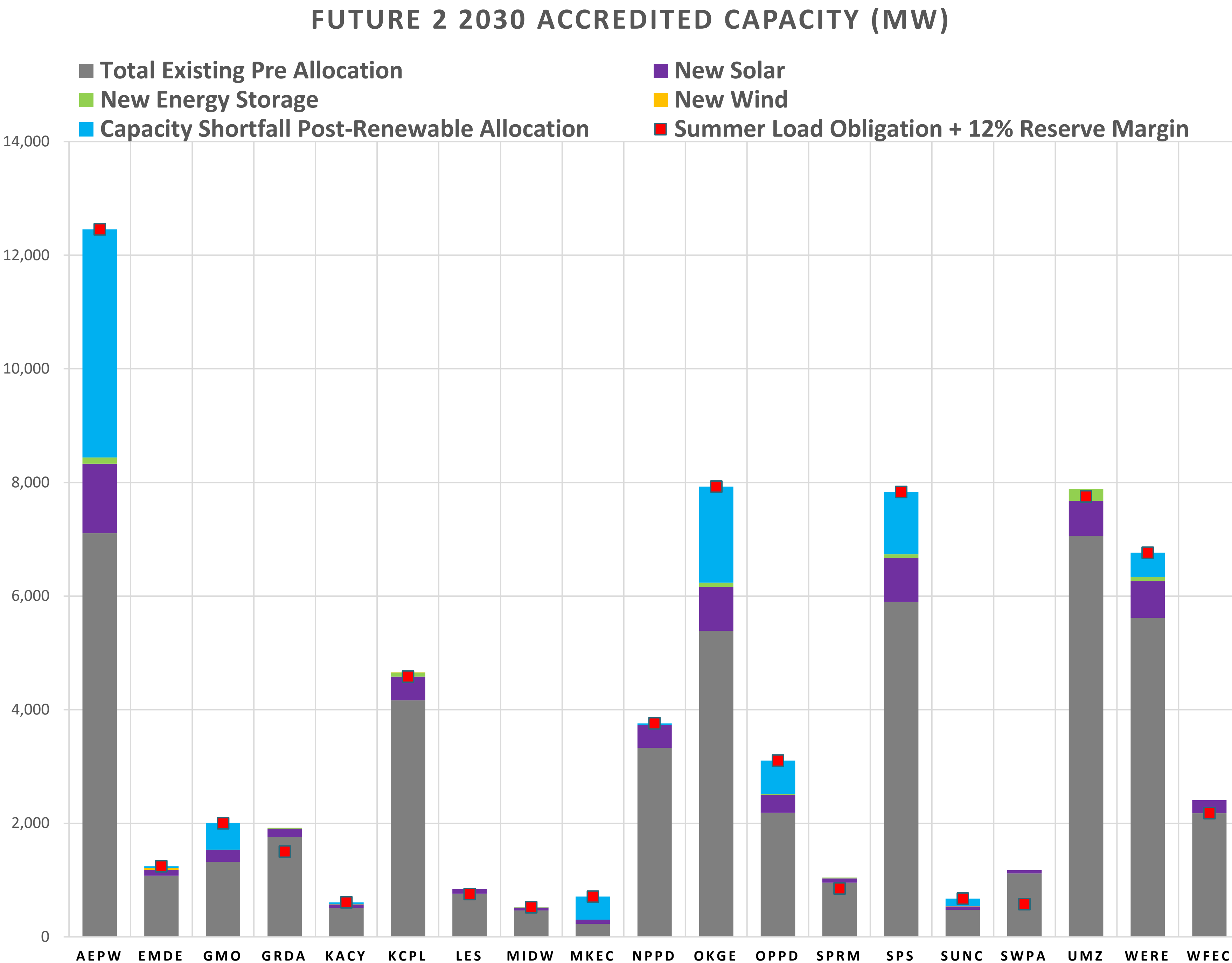
FUTURE 2 2030 ACCREDITED CAPACITY (MW)
Total Existing Pre Allocation
New Energy Storage
Capacity Shortfall Post-Renewable Allocation
New Solar
New Wind
Summer Load Obligation + 12% Reserve Margin
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
AEPW
EMDE
GMO
GRDA
KACY
KCPL
LES
MIDW
MKEC
NPPD
OKGE
OPPD
SPRM
SPS
SUNC
SWPA
UMZ
WERE
WFEC

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Zone	Future 2 2030 Accredited Capacity (MW)												
	Existing Conventional	Existing Solar	Existing Wind	Existing DC Ties & PPAs	New Solar	New Wind	New Energy Storage	Total Existing Pre Allocation	Summer Peak Demand	PPA Obligations	Summer Load Obligation	Summer Load Obligation + 12% Reserve Margin	Capacity Shortfall Post-Renewable Allocation
AEPW	6,101	0	435	570	1,223	0	112	7,106	11,099	21	11,120	12,454	4,014
EMDE	1,076	0	0	0	102	31	0	1,076	1,114	(4)	1,110	1,244	34
GMO	1,175	2	144	0	213	1	0	1,321	2,125	(340)	1,785	1,999	463
GRDA	2,163	0	53	(458)	148	0	13	1,758	1,343	0	1,343	1,505	0
KACY	424	0	50	39	60	0	5	513	543	0	543	608	30
KCPL	3,712	0	399	55	418	3	70	4,167	3,766	326	4,092	4,583	0
LES	745	0	17	0	81	0	0	762	802	(128)	674	755	0
MIDW	265	0	45	155	53	0	3	465	478	(12)	466	522	1
MKEC	172	0	31	25	76	0	0	228	726	(92)	635	711	407
NPPD	3,245	0	106	(24)	403	0	0	3,327	3,979	(622)	3,357	3,759	29
OKGE	4,808	0	138	441	777	0	72	5,386	7,057	20	7,077	7,926	1,690
OPPD	2,043	0	163	(20)	317	0	16	2,186	2,876	(105)	2,771	3,104	585
SPRM	821	0	78	55	77	0	14	955	699	60	760	851	0
SPS	5,045	151	347	355	773	0	66	5,899	7,015	(21)	6,994	7,833	1,095
SUNC	458	0	14	0	65	7	0	472	608	(5)	602	675	131
SWPA	2,702	6	0	(1,593)	62	0	0	1,115	623	(111)	513	574	0
UMZ	6,337	0	439	277	620	0	211	7,054	5,625	1,300	6,925	7,756	0
WERE	4,767	0	837	9	652	0	73	5,612	5,914	126	6,040	6,765	428
WFEC	1,691	18	138	330	229	0	5	2,176	1,925	20	1,945	2,178	0

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Next Steps

- Determine CC & CT additions through Strategist
- Allocate additions to zones
- Feeds into Siting Plan

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2020 ITP Market Economic Model

April 10, 2019

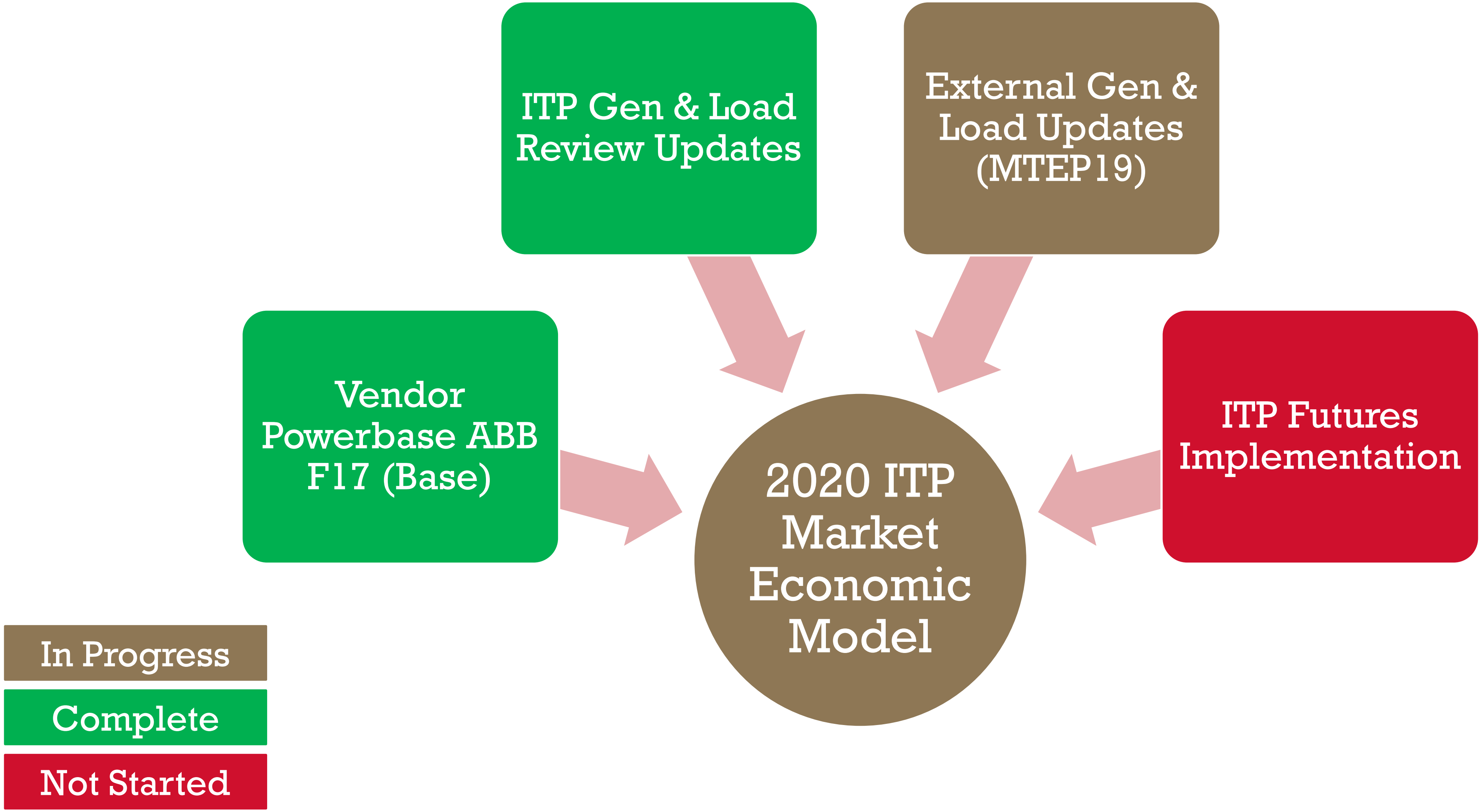
SouthwestPowerPool SPPorg southwest-power-pool

Objective

- Inform ESWG on the status of the 2020 ITP Market Economic Model (MEM)

Economic Model Status

2020 ITP MEM Build



Current Status

- Incorporated Items:
  - Internal and External Area Hierarchy
  - Internal and External Demand Group Structure
  - System Parameter and Scenario Properties Updates
  - Non-Future specific Generation and Load Review Updates
  - DC Tie Updates and Profiles
  - ABB Natural Gas Fundamental Forecast
  - Renewable Profiles for Existing Wind and Solar
- Upcoming Items:
  - External Generation and Load Review updates
  - MEM simulation process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2020 ITP – MTEP19 Economic Model Merger Overview

April 10, 2019

SouthwestPowerPool SPPorg southwest-power-pool

Objective

- Inform ESWG of how MTEP19 model data will be merged into the 2020 ITP Market Models
- Seek ESWG approval on merging process

MTEP19 Modified Study Assumptions

MTEP19 Modified Study Assumptions

- Must-Run criteria:
  - MTEP19 criteria similar to SPP with the exception of coal units greater than 150MW will be treated as Must-Run
  - SPP Recommendation: Utilize 2020 ITP criteria
- Curtailment price methodology:
  - Renewable units receive a maximum of -$36 PTC with continued reduction
    - 80% in 2021, 60% in 2022, 40% in 2023, 0% in 2024
  - SPP Recommendation: Utilize 2020 ITP criteria
- Natural gas forecast:
  - MTEP utilizes NYMEX for the first two years and an average of the EIA and Wood McKenzie forecasts for the out years
  - SPP Recommendation: Utilize ABB Fundamental Natural Gas price
- Interruptible Loads modeled as resources
  - MISO assigns a $300 dollar curtailment price to each unit to limit dispatch unless extreme event occurs
  - SPP Recommendation: Do not include in the 2020 ITP MEM

MTEP19 Modified Study Assumptions II

- Using the ITP Manual to create modeling consistency, SPP Recommendation is to use the third-party vendor data will be utilized for the following generation parameters:

- Generator name
- Conventional variable operation & maintenance
- Conventional fixed operation & maintenance
- Heat rate $ heat rate profile
- Annual maintenance hours
- Forced outage rates
- Effluents (% removed)
- Emission rates
- Fuel Forecast (does not include natural gas)
- Seasonal max capacity by year

MTEP19 Non-Modified Study Assumptions

MTEP19 Non-Modified Study Assumptions

- Station service load modeling
  - SPP and MISO's station service load modeling methodology is the same
  - SPP Recommendation: Utilize MTEP19 to identify station service loads for external areas and turn loads off in the MEM
- Industrial Loads
  - MISO models some loads as generation and in turn sets these loads as off in the MEM
  - SPP Recommendation: Utilize MTEP19 modeling practice
- Hourly Profiles and Annual Energy
  - MISO models utilize site latitude and longitude to determine data using 2012 NREL data
  - SPP Recommendation: Utilize MTEP19 data

MTEP19 Non-Modified Study Assumptions II

- SPP Recommendation is to utilize MTEP19 to update the following generation parameters:
  - Maximum capacities
  - Commission dates
  - Retirement dates
  - Area
  - Ownership %
  - Category type
  - Fuel Adders and Adjusters
    - For units with Category type changes
  - Unit specific data for ~~new~~ generation not found in ABB F17

SPP Recommendation

SPP recommends ESWG approving as noted on each slide in this presentation for the use in the 2020 ITP Market Models.


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TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

2020 ITP Siting Plan

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April 10-11, 2019

Objective

- Review Siting schedule and status
- Inform group of load pocket analysis results
- Discuss battery siting prioritization
- Review and approve distributed solar siting methodology
- Review exceptions process for initial Siting Plans

Siting Schedule and Status

High-level Schedule

April

- Stakeholder review and feedback on repository

May

- Site prioritization (ESWG review and approval)
- Renewable siting plan (ESWG review and approval)

June

- Battery siting plan (ESWG review and approval)
- Conventional siting plan (ESWG review and approval)
- External siting plan (ESWG review and approval)

Overview and Current Status

- Load Pocket Analysis
  - Objective: Identify any necessary resource and siting plan changes for top load pocket(s) based on load density, historical congestion, and SPP Annual State of the Market Report
  - Complete
- Repository development
  - Objective: Detail and organize list of all potential sites for wind, solar, batteries, and conventional units
  - Nearing Completion
- Pre-screening Sites
  - Objective: Identify transfer capability for all sites included in the site repository
  - In progress

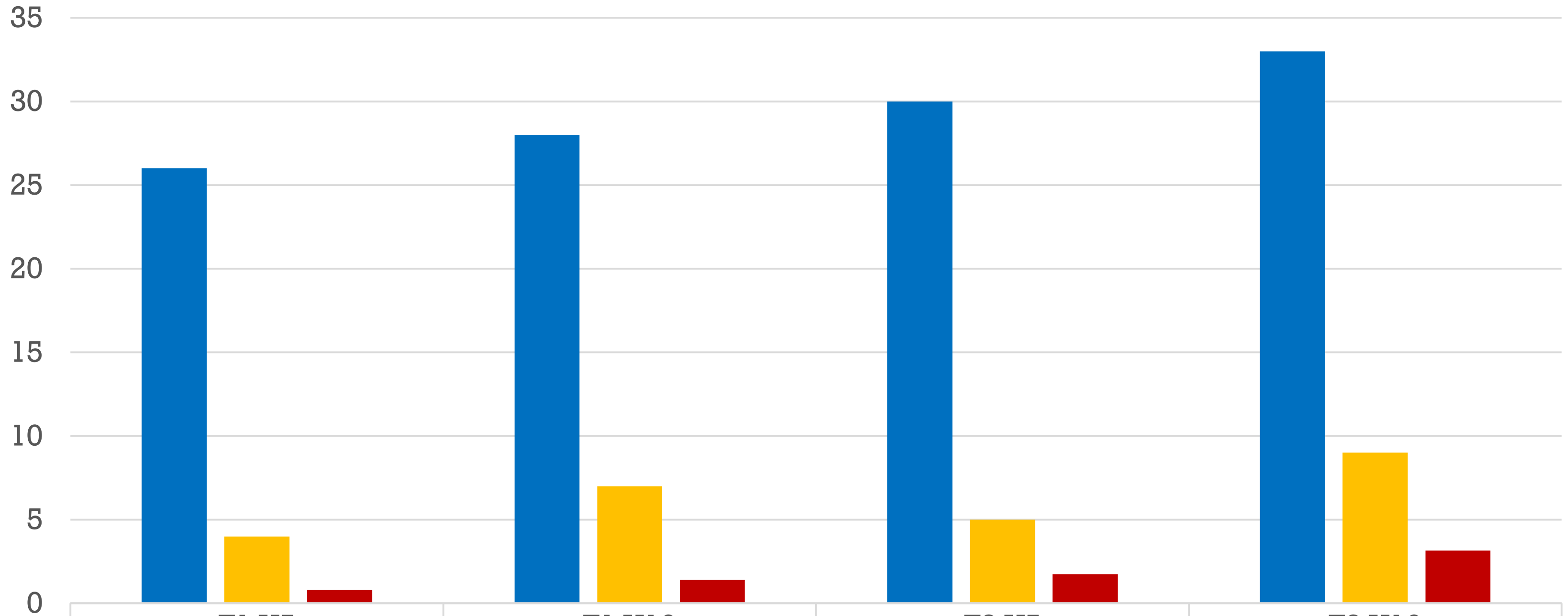
Load Pocket Analysis Results

Load Pocket Analysis Results

- Process
  - Mapped operational congestion to SPP load pockets
  - Identified approved NTCs to address that congestion
  - Identified load pockets with top congestion remaining
    - Kansas City
    - Oklahoma City
    - South SPS
- Anticipating no changes to siting plan based on load pocket analysis

Battery Siting

Renewables/Battery Scoped Amounts



	F1 Y5	F1 Y10	F2 Y5	F2 Y10
Wind	26	28	30	33
Solar	4	7	5	9
Batteries	0.8	1.4	1.75	3.15

Wind Solar Batteries

Battery Siting

- Order of site selection:
  - Solar
  - Wind
  - Batteries
  - Combined Cycle
  - Combustion Turbine

Distributed Solar

Distributed Solar Recommendation

- ESWG approved method for 2019 ITP
  - Top 10% load buses per demand group
  - Scoped amounts added on pro rata basis
  - Include stakeholder feedback from 2017 ITP10 and 2019 ITP
  - Stakeholder review window in May

Exceptions to Initial Siting Plans

Exceptions to Initial Siting Plans

- SPP to post preliminary look at siting plans
  - Stakeholders to confirm sites of interest selected for siting
  - Stakeholders to present sites not selected for siting as exceptions
  - Initial siting plan list will not ensure inclusion
  - Any capacity approved as an exception by ESWG removed from lowest ranked sites
- Stakeholder materials on requested exceptions **must** include:
  - Generation interconnection status
  - PPA, firm service, or utility ownership information
  - Status of necessary regulatory filings and/or approvals
  - Procurement of financing
  - PTC safe harbor eligibility
  - Additional supporting information (public announcements, etc.)
- Template to be sent with exception solicitation


SPP Southwest Power Pool
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Southwest Power Pool

ITP Manual - Renewable Curtailment Price

ESWG

April 10, 2019

SouthwestPowerPool SPPorg southwest-power-pool

Overview

- ESWG sponsored ITP manual revision request to adjust renewable curtailment price methodology for 2020 ITP and future ITP assessments
- Today's Goals
  - Recap proposed ITP manual changes
  - Review options and gather feedback for determining the curtailment price for projected wind additions
  - Discuss Next Steps

Proposed ITP Manual Changes

- Adjust manual language to account for change in federal corporate tax rate and future federal corporate tax rate changes
- Adjust manual language to account for PTC phase out and future PTC changes
- Adjust manual language to specify different curtailment price for distributed energy resource additions
  - Applies to a small amount of projected distributed solar which should have very negative curtailment price to avoid curtailments (F2 300 MW in Year 5 and 500 MW Year 10)
- Add method for determining the curtailment price for projected wind additions and external wind

Determining the curtailment price for projected wind additions

- Assumption requirements
  - Commencement Date/Commercial Operation Date of projected wind
  - Construction Start Date of projected wind
  - Applicable projected wind sites (Locational Aspect)
- Applies to existing language or revised language that accounts for PTC phase out
- Applies to wind projections modeled in Year 5 and 10 only

Strawman Option 1

- Commencement Date/Commercial Operation Date of projected wind
  - Use per year projections to determine a beginning of the year commencement date for previous year additions
    - In the absence of specified per year projections, per year projections will be determined by interpolating between the final ITP generation review nameplate capacity and future specific Year 5 and 10 projections
- Construction Start Date of projected wind
  - Use a 4 year lead time to determine construction start date for annual additions
    - The 4 years is understood to be the maximum time allowed to complete construction and still be eligible for the production tax credit
- Applicable projected wind sites (Locational Aspect)
  - Use projected wind site ranking from siting milestone to determine which sites assume earliest per year Commencement Dates
    - Siting exceptions may include expected commercial operation dates per site to be used in lieu of assumed Commencement Date
    - In absence of external wind site ranking, calculate and use site outlet capability to rank sites

Strawman Option 1 - Example

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Future 1	Wind Total Per Year (GW)	22	22.8	23.6	24.4	25.2	26	26.4	26.8	27.2	27.6	28
	Per Year Addition (GW)		0.8	0.8	0.8	0.8	0.8	0.4	0.4	0.4	0.4	0.4
Future 2	Wind Total Per Year (GW)	22	23.6	25.2	26.8	28.4	30	30.6	31.2	31.8	32.4	33
	Per Year Addition (GW)		1.6	1.6	1.6	1.6	1.6	0.6	0.6	0.6	0.6	0.6
	PTC % for 10 years	100	100	80	60	40	0	0	0	0	0	0

- To determine curtailment price for
  - Future 1 ~3.2 GW of projected wind additions which is ~11% of modeled wind
  - Future 2 ~6.4 GW of projected wind additions which is ~19% of modeled wind
- Curtailment price for individual ranked sites would be based whether majority of site falls within specific annual addition amount portion where sum of rank sites with non-zero curtailment prices may not exceed sum of annual additions to receive non-zero curtailment price
- Need to test proof of concept on external projected wind additions

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Strawman Option 2

- Given the locational aspect of implementing the existing language or revised language that accounts for PTC phase out
- An alternative option would be to use $0 curtailment price for projected wind additions modeled after PTC expiration do not have a expected Commercial Operation Date
  - Siting exceptions can include expected commercial operation and construction dates that may be used to determine site specific curtailment price

Strawman Option 2 - Example

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Future 1	Wind Total Per Year (GW)	22	22.8	23.6	24.4	25.2	26	26.4	26.8	27.2	27.6	28
	Per Year Addition (GW)		0.8	0.8	0.8	0.8	0.8	0.4	0.4	0.4	0.4	0.4
Future 2	Wind Total Per Year (GW)	22	23.6	25.2	26.8	28.4	30	30.6	31.2	31.8	32.4	33
	Per Year Addition (GW)		1.6	1.6	1.6	1.6	1.6	0.6	0.6	0.6	0.6	0.6
	PTC % for 10 years	100	0	0	0	0	0	0	0	0	0	0

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Next Steps

- May ESWG
  - Review and Approve Staff proposed methodology, concepts and draft Revision Request Form with revised ITP manual language
- June ESWG
  - Discuss Posted Revision Request and Comments
  - Approve Revision Request
- July MOPC
  - Approve Revision Request

Appendix

Background

- Curtailment price
  - Defines price at which a renewable resource will be curtailed
  - Impacts LMPs, curtailment, and dispatch of production cost simulations
- ITP Manual curtailment price methodology
  - Intended to improve market operation modeling
  - Simplified modeling approach to account for Production Tax Credit impacts

ITP Manual Language

2.2.1.10 Renewable Pricing

- To model a curtailment price for wind units that will reflect market operation, including projected production tax credit (PTC) impacts, the following criteria will be used for wind curtailment price modeling:
  - Wind units will have $0/MWh curtailment price if any of the following are true[17]:
    - The unit is placed in service over 10 years prior to the study year.
    - Construction on the unit has not started prior to January 1, 2020.
    - An entity associated with the unit has provided feedback that the investment tax credit (ITC), rather than PTC, is applicable.
  - Otherwise, wind units will have a negative $35/MWh curtailment price to reflect the "grossed-up" value of a PTC[18].
- To model a curtailment price for solar units that will reflect market operation, the curtailment price will be set at $0/MWh.

[17] Reflecting that the PTC is not a factor in its operation

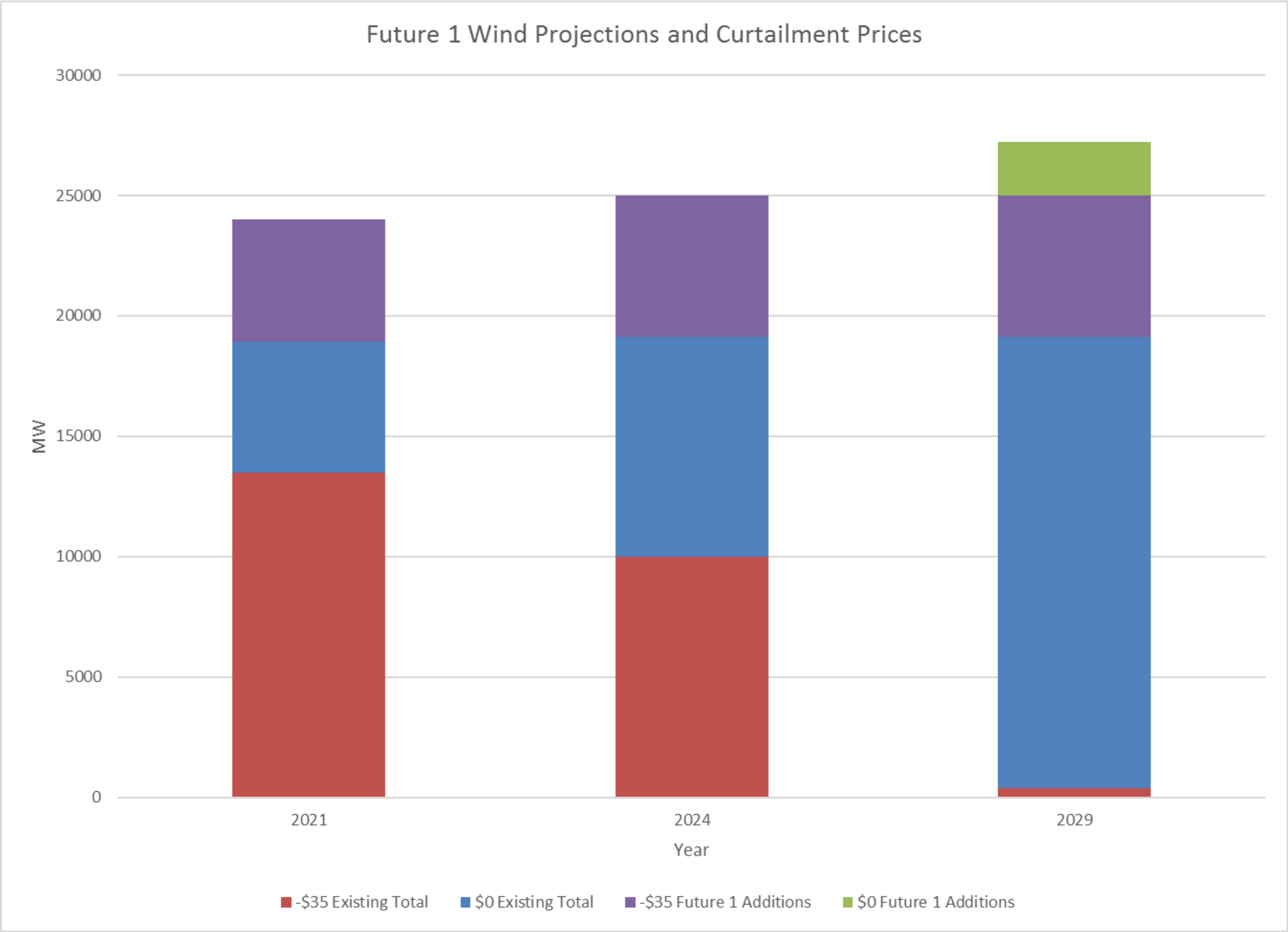
[18] Reflecting income tax compensation

2019 ITP Non-Zero Wind Curtailment Prices

Year	2016$	2017$	2018$	2019$	2020$	2021$	2022$	2023$	2024$	2025$	2026$	2027$	2028$	2029$
Wind Curtailment Prices	-35.00	-35.88	-36.77	-37.69	-38.63	-39.60	-40.59	-41.60	-42.64	-43.71	-44.80	-45.92	-47.07	-48.25

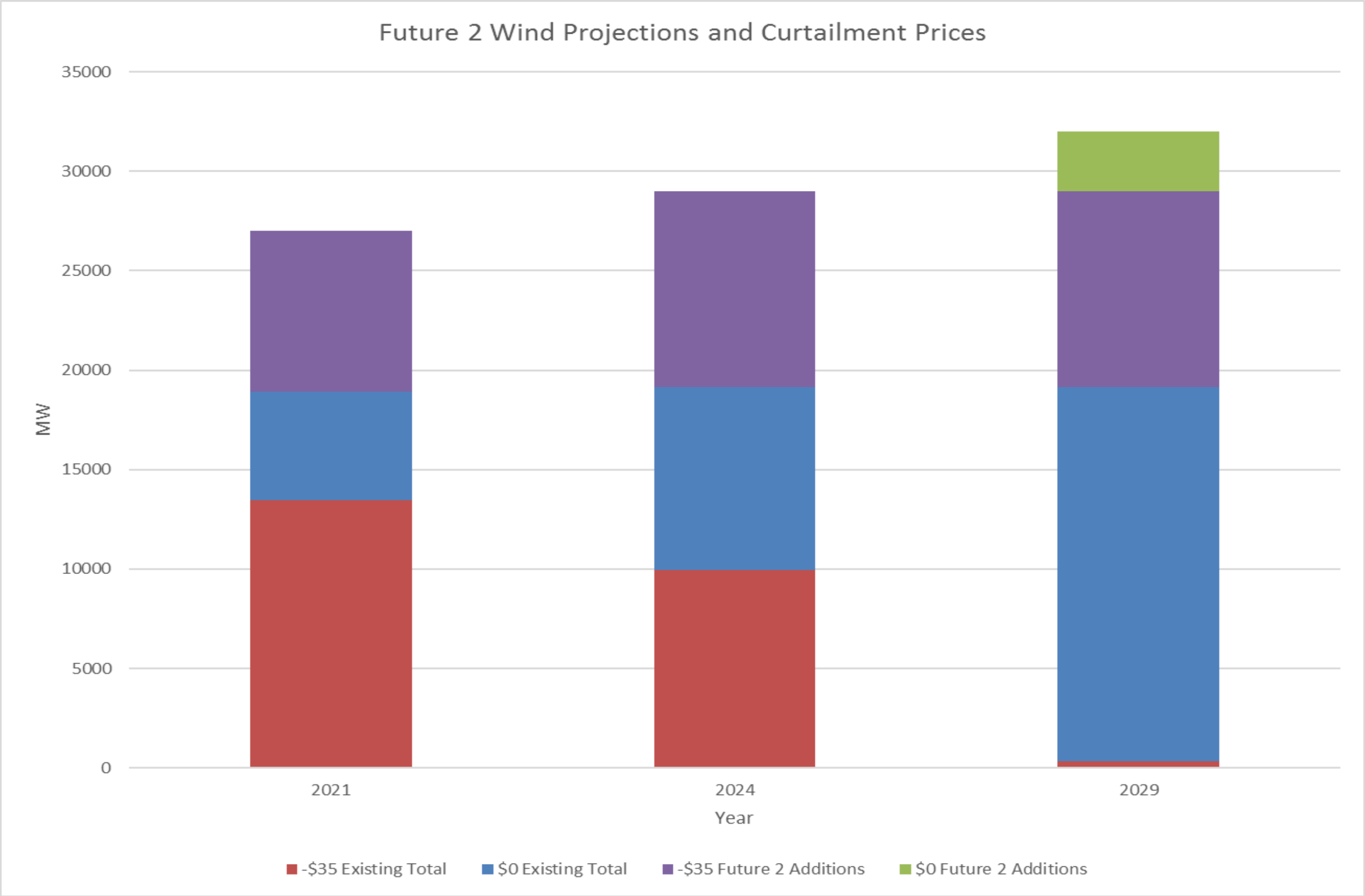
- Curtailment price for wind is adjusted for inflation using 2.5% annual inflation rate

2019 ITP Future 1 Implementation



Study Year 2 2021 Projection = 24,000 MW and Study Year 2 2021 per ITP Scope = 18,932 MW
Study Year 5 2024 Projection and per ITP Scope = 25,000 MW and Study Year 10 2029 Projection and per ITP Scope = 26,000 MW
Implementation assumes a 4 year lead time for each annual addition to determine if construction start date is prior to 1/1/2020

2019 ITP Future 2 Implementation



Study Year 2 2021 Projection = 27,000 MW and Study Year 2 2021 per ITP Scope = 18,932 MW
Study Year 5 2024 Projection and per ITP Scope = 29,000 MW and Study Year 10 2029 Projection and per ITP Scope = 32,000 MW
Implementation assumes a 4 year lead time for each annual addition to determine if construction start date is prior to 1/1/2020

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ITP Manual Discussion

- -$35/MWh curtailment price for wind is an approximation of the "grossed-up" PTC value using a $23/MWh (2016$) PTC and a federal corporate tax rate of 35%
  - PTC = $/MWh
  - "grossed-up" PTC value = PTC/(1-tax rate)
  - Curtailment price = -("grossed-up" PTC value)
  - Adjusted for inflation using 2.5% annual inflation rate
- The federal corporate tax rate was changed in early 2018 from 35% to 21% which may result in a "grossed-up" PTC value of $30/MWh
- ITP Manual curtailment price methodology was intentionally simplified to not account for PTC phase out where wind projects may only receive 80%, 60%, and 40% of the PTC depending on "construction start date" being after 2016 with the construction end date being no longer than 4 years

Operation Data

- Weighted Avg. Marginal Cost of Wind equates to curtailment price
  - Jan 2016 $-37/MWh
  - Jan 2017 $-37/MWh
  - Jan 2018 $-38/MWh
  - Jan 2019 $-35/MWh
  - Weighted Avg. Marginal Cost does not include wind farms with $0/MWh or greater Marginal Cost
- Trend Summary
  - Wind marginal costs have moved slightly less negative

MISO Wind Curtailment Price Methodology

- Uses PTC expiration after 10 years
- Use Federal Corporate Tax Rate of 21%(A) and Average State Corporate Tax Rate within MISO of 6.9%(B) to determine a Composite Federal and State Corporate Tax Rate of 26.4%(C)
  - C=A+(B*1-A))
- -$32.62/MWh curtailment price for wind is an approximation of the "grossed-up" PTC value using a $24/MWh (2018$) PTC and a composite tax rate of 26.4%
  - PTC Adjusted for inflation rounded to nearest dollar = $/MWh
  - "grossed-up" PTC value = PTC/(1-composit tax rate)
  - Curtailment price = -("grossed-up" PTC value)
- Account for PTC phase out where wind projects may only receive 80%, 60%, and 40% of the PTC depending on "construction start date" being after 2016 with the construction end date being no longer than 4 years

Model Representation	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Utility Wind PTC	100%	100%	100%	100%	100%	80%	60%	40%	0%	0%

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MISO versus SPP Non-Zero Wind Curtailment Price

Year	2018$	2019$	2020$	2021$	2022$	2023$	2024$	2025$	2026$	2027$	2028$	2029$	2030$
MISO Curtailment Price (100% PTC grossed up for taxes)	-32.61	-33.97	-33.97	-35.33	-36.68	-36.68	-38.04	-39.40	-39.40	-40.76	-42.12	-42.12	-43.48
MISO Curtailment Price (80% PTC grossed up for taxes)	-	-	-	-28.26	-29.35	-29.35	-30.43	-31.52	-31.52	-32.61	-33.70	-33.70	-34.78
MISO Curtailment Price (60% PTC grossed up for taxes)	-	-	-	-	-22.01	-22.01	-22.83	-23.64	-23.64	-24.46	-25.27	-25.27	-26.09
MISO Curtailment Price (40% PTC grossed up for taxes)	-	-	-	-	-	-14.67	-15.22	-15.76	-15.76	-16.30	-16.85	-16.85	-17.39
SPP Curtailment Price (100% PTC grossed up for taxes)	-36.77	-37.69	-38.63	-39.60	-40.59	-41.60	-42.64	-43.71	-44.80	-45.92	-47.07	-48.25	-49.45
SPP Operation (January Weighted Avg of Non-Zero Marginal Costs	-38	-35	-	-	-	-	-	-	-	-	-	-	-

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Schedule Discussion

- Milestones needing the curtailment price
  - Economic Benchmarking: May-July 2019
  - Constraint Assessment: August-November 2019