Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

February 15th, 2017

Embassy Suites Riverwalk – Austin, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approved the criteria for defining chronic [persistent] operational issues.
2. Approved SPP staff's amended recommendation for renewable variable O&M pricing.

Southwest Power Pool

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ECONOMIC STUDIES WORKING GROUP

February 15th, 2017

Embassy Suites Riverwalk – Austin, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC Great Plains) called the meeting of the Economic Studies Working Group (ESWG) to order at 8:30a.m., welcomed those in attendance, and asked for introductions.

There were 21 in-person participants and 45 web conference participants, representing 15 of 17 ESWG members. (Attachment 1 – February 15th, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements; one proxy was identified. Kurt Stradley (LES) named Scott Benson (LES) as his proxy beginning 3:00pm. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – February 15th, 2017 ESWG Agenda).

Kurt Stradley (LES) made a motion; seconded by Pat McCool (KCPL) to adopt the agenda. The motion was approved unanimously.

Agenda Item 2 – Review of Past Action Items

Kelsey Allen (SPP Staff) reviewed the list of past action items and asked for any comments or questions. Action item 174 was removed due to the group's decision to move forward with the use of resource expansion planning software in the new ITP process. (Attachment 4 – Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

Meeting Minutes – November 16th-17th, 2016 (Attachment 5 – November 16th-17th, 2016 ESWG Minutes)

Meeting Minutes – December 8th, 2016 (Attachment 6 – December 8th, 2016 ESWG Minutes)

Meeting Minutes – December 14th, 2016 (Attachment 7 – December 14th, 2016 ESWG.TWG Minutes)

Meeting Minutes – January 5th, 2017 (Attachment 8 – January 5th, 2017 ESWG.TWG Minutes)

Meeting Minutes – January 12th, 2017 (Attachment 9 – January 12th, 2017 ESWG Minutes)

Alan Myers (ITC Great Plains) asked if any items should be removed from the consent agenda. The January 30th, 2017 minutes were removed to be considered separately.

The consent agenda was approved unanimously.

The January 30th, 2017 minutes were edited to reflect comments provided by Scott Benson (LES).

Kurt Stradley (LES) made a motion; seconded by Tim Owens (NPPD) to approve the January 30th, 2017 meeting minutes as modified. The motion was approved unanimously.

(Attachment 10 – January 30th, 2017 ESWG Minutes)

Agenda Item 4 – SPP-MISO CSP Study Update

Adam Bell (SPP Staff) gave an update to the ESWG on 2016 MISO CSP Study and reviewed the 7 needs being evaluated. Currently, SPP staff is finishing the preliminary project screening analysis and next will begin a robustness testing and the 20-year APC calculation. The study is expected to be completed by April 2017. The next IPSAC meeting is March 9th in Metairie, LA, where results of the 2016 CSP are expected to be presented. (Attachment 11 – ESWG Update SPP-MISO CSP)

Agenda Item 5 – Electric Generation Expansion Analysis System (EGEAS)

Juliano Freitas (SPP Staff) gave an overview of a modular production costing and generation expansion software package called EGEAS. EGEAS is primarily being used by MISO. Juliano gave a history of the company and the evolution of the software. The cost of the software is a one-time $30,000 fee, plus $9,000 per year for support services, including unlimited licenses per company. Currently, the software is not funded or maintained by its original developer, EPRI, but rather user funded, primarily by MISO.

Two of the main issues identified by SPP staff and stakeholders in SPP's resource expansion planning process were the amount of time and effort put into developing a model suitable for simulation and the lack of renewable generation resulting from the simulations compared to company expectations. In SPP's discussions with MISO, they have agreed to share automation to help with conversion of data from ABB's PROMOD database for use in the EGEAS software tool that could alleviate model building efforts. In terms of simulation results, EGEAS has many of the same drawbacks as ABB's Strategist, being a tool focused on minimizing costs of generation expansion.

Stakeholders reiterated the comments and concerns of SPP staff of switching to EGEAS; concerns that without user funding, the software will not be updated and the tool does not address the main issue regarding simulation results. Staff recommends waiting until ABB's Capacity Expansion tool is ready for testing, and then re-evaluating other options again. There was no opposition in the room. (Attachment 12 – EGEAS)

Agenda Item 5 – ITP Scope Standardization

Agenda Item 5a – Policy Survey

Liz Gephardt (SPP Staff) recapped the previous approvals for the policy survey and brought up some concerns raised by the CAWG to be discussed; consideration of deliverability, inclusion of Nebraska absent a state mandate or goal, consideration of renewable energy credits and addressing potential changes to current legislation. These items were discussed with no major changes to the current proposal and standard percentages. Some of the CAWG and ESWG members requested additional time to investigate internally and provide feedback on specific percentages that would be appropriate. SPP staff will develop language for consideration by the ITP Manual TF while the state percentages are being solidified. (Attachment 13 – Policy Survey)

Agenda Item 5b – Operational Issues Criteria

Will Tootle (SPP Staff) reviewed the changes to the Operational Issues Criteria document since it was last presented. The N-1-1 category was removed and a sub-bullet was added to the manual commitments section stating manual commitments that do not exceed 25% of the year, but cost over $1M over 24 months will be added to the ITP needs list. There was discussion regarding how SPP staff will evaluate solutions against these criteria and select the best of competing projects. Stakeholders requested that solutions developed from these criteria be designated as such.

> **Jeremy Severson (BEPC) made a motion; seconded by Natasha Henderson (GSEC) to approve the criteria for defining chronic [persistent] operational issues. The motion was approved with one abstention, Jon Iverson (OPPD).**
>
> > **Jon Iverson abstained for the following reasons: Referring to chronic operational needs on flowgates in either the binding or breached state 20% of time or with congestion costs totaling more than $10 million (both over 24 months) and manual commitment events 25% of the year or over $1 million over 24 months. I felt an additional attribute to the document would be to provide some economic basis for why these thresholds were chosen. For example, $10 million is x percent of the SPP market $ volume and is considered**

> **significant, or manual commitments above 25% of the year adds a step $ increase to SPP's operating area's expenses related to time and hardware. These are just examples of what these attributes may look like.**

(Attachment 14 – Chronic Operational Issues Criteria_Clean)

<u>Agenda Item 5c – Renewable Pricing</u>

Josh Ross (SPP Staff) continued discussion on renewable pricing from the last meeting. He discussed the benefits of both adding renewable resources and having a transmission system that enables those renewables. Josh gave the group example results of the impact of changing the two input variables independently, utilizing the Regional Cost Allocation Review 2 (RCAR 2) models. Adjustment of the curtailment price resulted in approximately a 3% change in adjusted production cost (APC) savings between the largest versus smallest curtailment prices tested. Josh stated that the presence of renewables in the model provides a benefit to the market because its low curtailment price (offer price) reduces LMPs. Transmission that relieves curtailment also provides a benefit to the market by levelizing LMPs. An assessment of VOM showed that the VOM has no impact on system LMPs or system dispatch, only backend APC calculations. Transmission that relieves wind curtailment typically provides APC benefit to zones with designated wind, through reduced production costs. This reduction is the difference between the cost of the previous marginal unit and the VOM price. Thus, the lower the VOM for renewables, the greater the differential between the cost of renewables and the marginal unit, and the greater the APC benefit. Much of the renewable energy in SPP is contracted under a power purchase agreement (PPA) between the generator owner and a load serving entity. Utilizing an approximate cost for these agreements as the VOM (defined as transaction energy cost in the model) more accurately reflects the price paid by the load for delivered energy.

SPP staff recommended that the SPP annual data request process for generation shall include reporting of the wind and solar units which have PPAs. Staff will request documentation of units reported as having PPAs; if documentation is provided, the variable O&M of the unit shall be based on approximate wind and solar PPA pricing, derived from publicly available data. A weighted average of the most recent 5 – 10 year period shall be used. For all wind and solar units in which documentation of a PPA is not provided, the variable O&M of the unit shall be $8/MWh, reflective of a low operating cost. For proxy wind and solar units identified through the resource expansion plan, the variable O&M of the new unit shall be equal to the variable O&M of the majority of existing wind or solar units in the model.

The group had a robust discussion regarding the use of a higher VOM price for those load serving companies that have contract agreements with generator owners. Those against the recommendation argued that when considering all generation technologies, the increased VOM price discriminates against renewable generation by mixing operating and capital costs for one technology type. Those for the recommendation argued that the VOM for renewables is different than conventional in that it is defined as a transaction energy cost and should be reflective of what utilities are actually paying.

> **Scott Benson (LES) made a motion; seconded by Pat McCool (KCPL) to approve SPP staff's recommendation for renewable variable O&M pricing. Natasha Henderson (GSEC) offered a friendly amendment to remove the specific reference to PPAs in the recommendation and replace with "fixed contract price". The motion was approved with one no vote, Alan Myers (ITC), and one abstention, Natasha Henderson (GSEC).**

(Attachment 15 – Renewable Pricing)

<u>Agenda Item 5d – 40-Year Financial Analysis</u>

[This item was not covered in the allotted time] (Attachment 16 – 40-Year Financial Analysis)

<u>Agenda Item 5e – Benchmarking</u>

[This item was not covered in the allotted time] (Attachment 17 – Benchmarking)

<u>Closing Items</u>

Chair Alan Myers (ITC Great Plains) requested other items meriting discussion.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Kelsey Allen

ESWG Secretary

SPP Southwest Power Pool

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP MEETING

February 15, 2017

Embassy Suites Riverwalk-Downtown – San Antonio, TX

• ATTENDANCE LIST •

Name	Company
Scott Benson	LES
Tim Owens	NPPD
Kurt Stradley	LES
Jordan Schmick	XE/SPS
Bennie Weeks	Xcel Energy/SPS
Natasha Henderson	GSEC
Michael Wegner	ITC
Brian Johnson	AEP
Amber Greb	SPP
Jason Davis	SPP
Juliano Freitas	SPP
Pat McCool	KCPL
Jason Shook	GDS/ETEC
Jarrod Wolford	Northeast Texas Electric Coop

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ECONOMIC STUDIES WORKING GROUP MEETING

February 15, 2017

Embassy Suites Riverwalk-Downtown – San Antonio, TX

• ATTENDANCE LIST •

Name	Company
Jayli Tamsel	Western Area Power
Jeremy Severson	Basin Electric Power Coop
Kirk Hall	SPP
Travis Hyde	OG+E
Kelsey Allen	SPP
Alan Myers	ITC
Meena Thomas	Texas PUC

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Zac Hager	hagerzc@oge.com

Company	Attendance
	Webex
	Webex
ITC	In Person
SPP	In Person
	Webex
	Webex
XcelEnergy/SPS	In Person
	Webex
	Webex
	Webex
AEP	In Person
	Webex
	Webex
	Webex
	Webex
	Webex
	Phone
	Webex
Western Area Power	In Person
	Webex
	Webex
	Webex
Northeast Texas Electric Coop	In Person
SPP	In Person
	Webex
	Webex
GDS/ETEC	In Person
	Webex
Basin Electric Power Coop	In Person
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
XE/SPS	In Person
	Webex
SPP	In Person
SPP	In Person
SPP	In Person
LES	In Person
	Webex
	Webex
	Webex
Texas PUC	In Person
	Webex

	Webex
ITC	In Person
GSEC	In Person
	Webex
KCPL	In Person
	Webex
	Webex
	Webex
	Webex
	Webex
LES	In Person
	Webex
	Webex
	Webex
	Webex
NPPD	In Person
OG&E	In Person
	Webex
	Webex
	Webex

ESWG Proxy Statements

1. Kurt Stradley proxy to Scott Benson

From: Stradley, Kurt
Sent: Monday, February 13, 2017 8:49 AM
To: Myers, Alan; Kelsey Allen
Cc: Benson, Scott
Subject: **External Email** Proxy for 1/15/17 ESWG Meeting

Alan/Kelsey –

Scott Benson will have my proxy vote when I leave the ESWG meeting for the airport at about 3:00 pm on February 15th, as he will be staying for the duration of the meeting.

Kurt

Kurt Stradley | Engineer III
Lincoln Electric System
Phone: 402-473-3376
Fax: 402-473-3208
Email: kstradley@les.com
PO Box 80869
Lincoln, NE 68501-0869
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ECONOMIC STUDIES WORKING GROUP

February 15th, 2017

Embassy Suites Riverwalk – San Antonio, TX

• A G E N D A •

1:00pm – 5:00pm

1. Administrative Items
    a. Call to Order, Introductions .... Alan Myers (5 minutes)
    b. Receipt of Proxies .... Kelsey Allen (1 minute)
    c. Review of Agenda[1] .... Alan Myers (1 minute)
2. Review of Past Action Items[1] .... Kelsey Allen (5 minutes)
3. Consent Agenda[1] (Approval Item) .... Alan Myers (1 minutes)
    a. Approval of Meeting Minutes – November 16th-17th, 2016
    b. Approval of Meeting Minutes – December 8th, 2016
    c. Approval of Meeting Minutes – December 14th, 2016
    d. Approval of Meeting Minutes – January 5th, 2017
    e. Approval of Meeting Minutes – January 12th, 2017
    f. Approval of Meeting Minutes – January 30th, 2017
4. SPP-MISO CSP Study Update[1] .... Adam Bell (15 minutes)
5. Electric Generation Expansion Analysis System (EGEAS)[1] .... Juliano Freitas (30 minutes)
6. ITP Scope Standardization .... SPP Staff (180 minutes)
    a. Policy Survey[1] (Liz Gephardt)
    b. Operational Issues Criteria[1] (Will Tootle)
    c. Renewable Pricing[1] (Josh Ross)
    d. 40-Year Financial Analysis[1] (Amber Greb)
    e. Benchmarking[1] (Nikki Roberts)
7. Closing Items .... All (5 minutes)
    a. Summary of Action Items (Kelsey Allen)
    b. Future Meetings

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[1] Background Material Included

i. March 16th, 2017: 8th Floor AEP Offices, Dallas, TX
ii. April 20th, 2017: 8th Floor AEP Offices, Dallas, TX
iii. May 17th-18th, 2017: Hilton at the Ballpark, St. Louis, MO
iv. June 15th, 2017: 8th Floor AEP Offices, Dallas, TX
v. July 20th, 2017: 8th Floor AEP Offices, Dallas, TX
vi. August 16th-17th, 2017: TBD, Denver, CO
vii. September 14th, 2017: 8th Floor AEP Offices, Dallas, TX
viii. October 12th, 2017: 8th Floor AEP Offices, Dallas, TX
ix. November 8th-9th, 2017: SPP Corporate Offices, Little Rock, AR
x. December 14th, 2017: 8th Floor AEP Offices, Dallas, TX

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

February 15th, 2016

	Action Item	Date Originated	Status	Comments
057	SPP staff will write a straw-man procedure or portion of the ITP manual that deals with conventional and wind generation planning and siting within the ITP process. The process should be in place by the Spring of 2015.	August 23rd, 2012	In Progress Staff	A draft resource siting whitepaper will be developed for review mid-2016.
151	Staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress Staff	Staff is meeting with software vendors and users and expects to have a recommendation on any potential resource planning software changes by 4th quarter 2016. February, 2017: Presentation on EGEAS. Hold on investigation of alternatives until EGEAS and ABB's new Capacity Expansion tool are able to be fully tested and compared.
160	SPP Staff and the ESWG are to formalize standard procedures for data requests and member review of information related to ITP studies.	January 21st, 2016	In Progress Staff/ESWG	Combined item representative of AI148 and AI149.
163	SPP Staff and members to prepare for discussion on scope standardization and prioritization of discussion items.	April 21st, 2016	In Progress Staff/Members	Ongoing.
165	ESWG to review the assumed benefit of mandated reliability projects	May 13th, 2016 RARTF	In Progress ESWG	
166	ESWG to review the impacts of using the system reconfiguration hybrid approach for the Assumed Benefit of Mandated Reliability Projects	May 13th, 2016 RARTF	In Progress ESWG	

167	ESWG to review the classification of projects in the ITP process	May 13th, 2016 RARTF	In Progress ESWG	
168	Staff and the ESWG to evaluate the issues seen in the DC to AC model conversion process.	May 18th-19th, 2016	In Progress Staff/ESWG	February, 2017: Provided an update on issues and potential solutions.
172	Staff to develop examples and language for tackling synergies of powerflow and economic generation data.	June 16th, 2016	In Progress Staff	October 20th: ESWG approved a methodology for the ITP standard scope. Discussions should continue with SAWG for coordination of methodology, as appropriate.
173	Staff to develop a process for annual update of the economic model with vendor data.	June 16th, 2016	In Progress Staff	
~~174~~	~~Staff to develop criteria and methodology to developing resource plans absent a software tool.~~	~~June 16th, 2016~~	~~In Progress~~ ~~Staff~~	
183	SPP Staff to perform the outage analysis to determine the appropriate APC benefit % to utilize in the mitigation of transmission outages benefit metric in the first part of 2017.	September 15th, 2016	In Progress Staff	

Commented [KA1]: The ESWG has approved the use of resource expansion software in the new ITP process.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

November 16th – 17th, 2016

SPP Corporate Offices – Little Rock, AR

• SUMMARY OF ACTIONS TAKEN •

1. None

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

November 16^{th} – 17^{th}, 2016

SPP Corporate Offices – Little Rock, AR

• 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 PM, welcomed those in attendance, and asked for introductions.

There were 27 in-person participants and 37 web conference participants, representing 17 of 17 ESWG members. (Attachment 1 – November 16^{th}-17^{th}, 2016 Attendance List)

Agenda Item 1b – Receipt of Proxies

Chair Alan Myers (ITC) asked for any proxy statements; one proxy was identified. Jody Holland (SCMCN) named Eric Burkey (SCMCN) as his proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – November 16^{th}-17^{th}, 2016 Agenda)

Kurt Stradley (LES) made a motion; seconded by Al Tamimi (Sunflower) to adopt the agenda as modified. The motion was approved unanimously.

Agenda Item 2 – Review of Past Action Items

Kelsey Allen (SPP Staff) reviewed the list of past action items and asked for any comments or questions. (Attachment 4 – Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

Meetings Minutes – October 20^{th}, 2016 (Attachment 5 – October 20^{th}, 2016 ESWG Minutes)

Alan Myers (ITC Great Plains) asked if any items should be removed from the consent agenda.

The consent agenda was approved unanimously.

Agenda Item 4 – 2017 ITP10 Study Schedule

Juliano Freitas (SPP) reviewed the 2017 ITP10 schedule with the group. Final assessments including benefit metric calculations are on track for completion by the December meeting. The group asked about the logistics of reviewing comments on the 2017 ITP10 report and agreed that a call to discuss and approve the first week in January, 2017 would work best. (Attachment 6 – 2017 ITP10 Schedule)

Agenda Item 5 – ITP Manual Task Force Update

Amber Greb (SPP Staff) gave an update on the activities of the ITP Manual Task Force (ITPMTF). The group is currently finalizing the new outline of the ITP manual and expects to begin reviewing language brought by SPP staff crafted based on working group approvals. Amber reminded the group that once the scope is standardized and the manual is complete it will become an official document that will become a part of the SPP Revision Request process. (Attachment 7 – ITPMTF Update)

Agenda Item 6 – 2017 ITP10 Portfolio Consolidation and Project Staging

Nikki Roberts (SPP Staff) presented the draft results of portfolio consolidation and staging of projects based on the criteria to create a CPP and a non-CPP portfolio of projects. Futures 1 and 2 economic projects were consolidated based on a weighted APC calculation of 75% of Future 1 benefit and 25% of Future 2 benefit. Projects were staged by interpolating benefits between the study (2025) and staging (2020) year, selecting the year the project's B/C was greater than 1.0. Portfolio benefit summaries were reported for economic project portfolio and reported in 1-year B/C ratios. Alan Myers (ITC) questioned the reliability project need date of 1/1/2020 because it was arbitrarily chosen based on the definition of the off-peak model (January 4th, 5am) and would bring the project into the short-term reliability window. (Attachment 8 – 2017 ITP10 Portfolio Consolidation and Project Staging)

Agenda Item 7 – Incorporating Additional Analysis in the 2017 ITP10

Chris Jamieson (SPP Staff) reviewed the additional analysis being performed by SPP staff for the 2017 ITP10. Chris started with a methodology to develop a set of recommended projects and need dates from the Future 1/Future 2 consolidated and Future 3 portfolios. Natasha Henderson (GSEC) requested that SPP staff report on the likelihood that a transmission project is being driven by proxy generation from the resource plan.

Chris Jamieson (SPP Staff) then gave an overview and preliminary results of the "sidebar" analysis that incorporated previously issued NTC projects and other model updates into an updated constraint assessment, economic assessment, and reliability assessment.

SPP staff was also made aware of an issue with the SPP wind profiles being represented in Coordinated Universal Time (UTC) rather than local time zones. SPP staff did an assessment of the impact of correcting the issue by reviewing changes generator capacity factors, reliability unit commitments, flowgate congestion, and reliability needs. SPP staff found that the needs remained very similar and will continue investigation by assessing the impact to the APC benefits provided by the selected projects. The updated profiles will be included in all future analysis.

Chris Jamieson (SPP Staff) then gave an overview of the drivers, background and analysis being performed to develop alternative project recommendations for two target areas, Eastern Seams and Texas Panhandle. Preliminary results were provided for the Texas Panhandle analysis.

(Attachment 9 - 2017 ITP10 Additional Analysis) (Attachment 10 - 20161117_2017 ITP10 Wind Profiles)

Agenda Item 8 – ITP Scope Standardization

Agenda Item 8a – Discussion Items Checklist and Schedule

Kelsey Allen (SPP Staff) briefly reviewed a checklist of discussion items being brought to the group for discussion and the proposed date the group should expect to see them on the agenda as well as an expected date of working group approval. (Attachment 11 – ITP Scope Standardization - WG Ownership and Timeline)

Agenda Item 8b – Chronic Operational Issues Criteria

Will Tootle (SPP Staff) reviewed the proposed criteria for defining operational needs in the new ITP process. The group had questions regarding some of the specifics of the criteria and the thresholds developed and requested general clarity. SPP operations staff developed most of these criteria through reviewing actual data over the last couple years and correlating that information to top pain points related to operating the system. Antoine Lucas (SPP Staff) reiterated that the request of the TPITF was to identify why current operation issues are not being identified in planning assessments and determine if the drivers are related to proxy study assumptions. These criteria would allow development of solutions to address current issues when that is the case. (Attachment 12 – TPITF - Chronic Operational Issues Criteria) (Attachment 13 – Chronic Issues Summary_October_2016)

Agenda Item 8c – Resource Expansion Plan

Josh Ross (SPP Staff) reviewed a proposal for standardizing development of SPP and external conventional resource expansion plans. Some members of the group suggested that the language in the manual be left open for SPP staff and the ESWG to make adjustments to the process and results as well as to look into better software coordination across SPP groups performing similar analysis. Josh then reviewed a proposal for including additional wind for export in ITP assessments. After discussion, the group determined that it was not appropriate to standardize this item at this time due to the implications it could have and the fact that other efforts at SPP to address those issues are currently underway. (Attachment 14 – ITP Resource Expansion Plan)

Agenda Item 8d – Resource Siting Plan

Chris Jamieson (SPP Staff) gave an overview of the resource siting plan utilized in the 2017 ITP10 for conventional, wind and solar generation. These methodologies would generally be the standard proposal for future ITP studies. (Attachment 15 – ITP Resource Siting Plan)

Agenda Item 8e – Policy Survey

Liz Gephardt (SPP Staff) reviewed a proposal for standardization of the renewable policy survey that would save both SPP staff and stakeholder time by standardizing percentages of load and/or generation by utility and state to add renewable generation. The exact percentages are to be worked out through continued discussions at ESWG and engagement of CAWG members as well. (Attachment 16 – ITP Policy Survey)

Agenda Item 8f – Wind Pricing

[This item was not covered in the allotted time] (Attachment 17 – ITP Wind Modeling)

Agenda Item 9 – 2017 ESWG Meeting Schedule

Kelsey Allen (SPP Staff) reviewed the proposed locations for the quarterly meetings in conjunction with TWG. The group expressed no concern with the proposal and encouraged SPP staff to look for opportunities to schedule joint ESWG/TWG meeting time when agenda items would warrant it. (Attachment 18 – ESWG.TWG Meeting Locations 2017)

Agenda Item 10 – EGEAS Overview and Discussion

[This item was not covered in the allotted time]

Agenda Item 11 – ESWG Charter Discussion (LOLE and SAWG)

Kelsey Allen (SPP Staff) briefly informed the group that the charter was bring brought to the group for review specifically to address the desire of the new Supply Adequacy Working Group (SAWG) to take over responsibility of reviewing the Loss of Load Expectation (LOLE) studies performed by SPP. The group agreed that the LOLE would be a better fit under purview of the SAWG and asked for the suggested edits to be made and sent out for review. (Attachment 19 – ESWG Charter)

Closing Items

Chair Alan Myers (ITC Great Plains) requested other items meriting discussion.

The meeting was adjourned at 12:00 PM.

Respectfully Submitted,

Kelsey Allen
ESWG Secretary

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

December 8th, 2016

SPP Corporate Offices – Little Rock, AR

• SUMMARY OF ACTIONS TAKEN •

1. None

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

December 8th, 2016

SPP Corporate Offices – Little Rock, AR

• 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 8:00 AM, welcomed those in attendance, and asked for introductions.

There were 24 in-person participants and 85 web conference participants, representing 17 of 17 ESWG members. (Attachment 1 – December 8th, 2016 Attendance List)

Agenda Item 1b – Receipt of Proxies

Chair Alan Myers (ITC) asked for any proxy statements; two proxies were identified. Don Le (NEET) named Eric Burkey (SCMCN) as his proxy and Jody Holland (SCMCN) named Eric Burkey (SCMCN) as his proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – December 8th, 2016 Agenda)

> **Tim Owens (NPPD) made a motion; seconded by Kurt Stradley (LES) to adopt the agenda as modified. The motion was approved unanimously.**

Agenda Item 2 – Chronic Operational Issues Criteria

Will Tootle (SPP Staff) reviewed the proposed chronic operational issues criteria with the ESWG, ORWG, and TWG attendees. Stakeholders comments have been captured in the attached redline document. (Attachment 4 – TPITF - Chronic Operational Issues Criteria_v2_Redline_OPPD Comments_rev)

Agenda Item 3 – 2017 ITP10 Study Schedule

Juliano Freitas (SPP) reviewed the 2017 ITP10 schedule with the ESWG and TWG attendees. SPP staff is reviewing results of the as scoped analysis and final assessments and reviewing the draft result of the model update impacts and additional analysis today. SPP staff will be seeking approvals during the upcoming joint conference call. (Attachment 5 – 2017 ITP10 Schedule)

Agenda Item 4 – 2017 ITP10 Update

Agenda Item 4a – Portfolio Consolidation and Project Staging (as Scoped)

Nikki Roberts (SPP Staff) presented the final results of portfolio consolidation and staging of projects based on the criteria to create a CPP (Reduced Carbon) and a non-CPP (Reference Case) portfolio of projects. Minor adjustments were made to the results based on feedback from the November meeting. (Attachment 6 - 2017 ITP10 Scope Portfolio Consolidation and Project Staging)

Agenda Item 4b – Sensitivity Analysis

Liz Gephardt (SPP Staff) reviewed the results of the sensitivity analysis performed on the Reduced Carbon and Reference Case portfolios. SPP staff tested the ability of the two portfolios to respond to high and low demand forecasts, high and low natural gas prices, an increase in wind and additional coal retirements (for the Reduced Carbon portfolio). These sensitivities showed the range in 1-year benefit-to-cost ratios that would be experienced under each change in assumption. (Attachment 7 – 2017 ITP10 Sensitivity Analysis)

Agenda Item 4c – Benefit Metrics

Amber Greb (SPP Staff) reviewed the results of 40-year benefit metric analysis on the Reduced Carbon portfolio in Future 1 and Reference Case portfolio in Future 3. (Attachment 8 – 2017 ITP10 Benefit Metrics)

Agenda Item 4d – Rate Impacts

Amber Greb (SPP Staff) reviewed the net impact each transmission portfolio would have to the average residential ratepayer in SPP. (Attachment 9 – 2017 ITP10 Rate Impacts)

Agenda Item 4e – Project Recommendations

Agenda Item 4ei – Model Update Impacts

Kelsey Allen (SPP Staff) reviewed the impact that the different model changes had to the congestion on the economic needs and the benefit-to-cost ratios of the Reduced Carbon and Reference Case projects. This included model corrections, wind profile updates, and sidebar model result comparisons to the approved base model. The group just requested that the different data is clearly defined moving forward. (Attachment 10 – 2017 ITP10 Model Update Impacts)

Agenda Item 4eii – Draft Project and Staging Recommendations

Kelsey Allen (SPP Staff) reviewed each of the projects in the two final portfolios and gave SPP staff's draft recommendation on whether the project should be included in a final recommended transmission plan as well as the suggested need date. This included evaluating each project's performance in the Future 1 and Future 3 base and sidebar models, consideration of current operational congestion cost and any other pertinent information. Generally, projects were recommended to move forward if they were shown to be beneficial in both Future 1 and Future 3 models, or one Future model and would resolve current operational issues. Bethany King (EDE) asked about the recommendation of terminal upgrades for the Neosho – Riverton 161 kV line and if a larger project was considered. Kelsey Allen (SPP Staff) stated that the rebuild of the line as well as larger EHV projects were tested but the main focus of the eastern seam analysis was the CUS area, specifically the Brookline transformer and there was no viable projects that could address both issues. In order to allow for the future potential to do more in depth analysis in the area, SPP staff is recommending a small terminal upgrade at this time. (Attachment 11 – 2017 ITP10 Project Recommendations)

Agenda Item 4eiii – Additional Analysis (of Target Areas)

Josh Ross (SPP Staff) began review of the additional analysis performed by SPP staff to develop alternative project recommendations for the eastern seam and Texas panhandle. Josh discussed the projects analyzed to resolve the Brookline transformer constraint and the different sensitivities performed. SPP staff currently has two top candidates, one that would involve potential cost sharing and negotiations with an SPP neighbor company, Associated Electric Cooperative.

Liz Gephardt (SPP Staff) presented the additional analysis performed to develop an alternative project recommendation in the Texas panhandle. This analysis focused on the potential to propose a 345 kV solution from Potter to Tolk substations over rebuild of the 115 kV system. SPP staff focused on uncertainties surrounding the proxy resource plan and the potential to avoid continuing to rebuild the lower voltage system.

(Attachment 12 – 2017 ITP10 Project Recommendations)

Agenda Item 5 – Review of Past Action Items

[This item was not covered in the allotted time]. (Attachment 13 – Past Action Items)

Agenda Item 6 – ESWG Charter

[This item was not covered in the allotted time]. (Attachment 14 – ESWG Charter_rev 11.30)

Agenda Item 7 – ITP Scope Standardization

Agenda Item 7a – Wind Pricing

[This item was not covered in the allotted time]. (Attachment 15 – ITP Wind Pricing)

Agenda Item 7b – Policy Survey

[This item was not covered in the allotted time]

Agenda Item 7c – Phase-Shifting Transformer and DC Line Modeling

[This item was not covered in the allotted time]

Agenda Item 8 – 2017 ESWG Meeting Schedule Update

[This item was not covered in the allotted time]

Agenda Item 9 – Resource Expansion Software Tools Discussion

[This item was not covered in the allotted time]

Closing Items

Chair Alan Myers (ITC Great Plains) requested other items meriting discussion.

The meeting was adjourned at 2:45 PM.

Respectfully Submitted,

Kelsey Allen
ESWG Secretary

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP/TRANSMISSION WORKING GROUP

December 14th, 2016

Net Conference

• SUMMARY OF ACTIONS TAKEN •

1. The ESWG and TWG approved the completion of the portfolio consolidation, project staging, sensitivity analysis, benefit metrics, and rate impacts milestones as outlined in the 2017 ITP10 scope.
2. The ESWG and TWG endorsed the merits of the technical work performed by SPP staff to develop a portfolio of recommended projects for consideration by the SPP MOPC and Board of Directors.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP/TRANSMISSION WORKING GROUP

December 14th, 2016

Net Conference

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC) and Vice-Chair Nathan McNeil (WERE) called the joint meeting of the Economic Studies Working Group (ESWG) and Transmission Working Group (TWG) to order at 3:00 PM, welcomed those in attendance, and asked for introductions.

There were 63 web conference participants. (Attachment 1 – December 14th, 2016 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC) asked for any proxy statements from ESWG members; two proxies were identified. Leon Howell (OGE) named Zac Hager (OGE) as his proxy and Jon Iverson (OPPD) named Jon Shipman (OPPD) as his proxy.

Nathan McNeil (WERE) asked for any proxy statements from TWG members; four proxies were identified. John Fulton (SPS) named Rene Miranda (SPS), Dan Lenihan (OPPD) named Josh Verzal (OPPD), Travis Hyde (OGE) named James Thomas (OGE), and Noman Williams (SCMCN) named Eric Burkey (SCMCN), as their proxies respectively

(Attachment 2 – Proxy Statements).

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – December 14th, 2016 ESWG/TWG Agenda). It was suggested that we simply continue with any item that was not reviewed at the previous meeting and items that needed further discussion.

Agenda Item 2 – 2017 ITP10 Assessment

Kelsey Allen (SPP Staff) and Liz Gephardt (SPP Staff) continued the discussion of the additional analysis conducted for the Texas Panhandle target area. During the discussion of the Texas Panhandle target area some stakeholders requested staff to identify the project type of the new Potter – Tolk 345 kV line. SPP staff informed the group that the Potter – Tolk 345 kV line is being recommended as an economic project.

SPP staff asked for approval from the ESWG and TWG for the completion of the portfolio consolidation, project staging, sensitivity analysis, benefit metrics, and rate impacts milestones as outlined in the 2017 ITP10 scope. In the discussion, Bethany King (EDE) shared her concern about the updated wind profiles not being used in the benefit metrics.

> **Jody Holland (SCMCN) made a motion accepting the SPP staff recommendation for completion of the 2017 ITP10 milestones as scoped for the ESWG; Tim Owens (NPPD) seconded. The ESWG approved the motion unanimously.**
>
> **John Boshears (CUS) made a motion accepting the SPP staff recommendation for completion of the 2017 ITP10 milestones as scoped for the TWG; Jason Shook (GDS) seconded. The TWG approved the motion unanimously.**

SPP staff also asked both working groups for their endorsement of the merits of the technical work performed by SPP staff to develop a portfolio of recommended projects for consideration by the SPP MOPC and Board of Directors. Staff received a request to explain why projects included in the

Consolidated Portfolio, between Futures 1 and 2, were not included in the staff Recommended Portfolio. SPP staff pointed out that the Consolidated Portfolio did not consider the knowledge and analysis from the side bar work or additional project analysis work, as well additional considerations of current operational issues and the expected firmness of the drivers of each project. SPP staff generally made recommendations considering the impact of model updates (including corrections and previously issued NTC projects), whether or not the project performed well in more than one scenario (Future 1, Future 3, or expected to relieve current operational issues), additional investigation of drivers that could be speculative, as well as recognizing the economic nature of some needs that were originally classified as reliability. In the discussion, Zac Hager (OGE) reiterated his initial concerns with recommending any project selected for Future 1 or 2 and his appreciation for the additional effort SPP staff took to make a recommendation on each project individually.

> **The motion for the ESWG was made by Jody Holland (SCMCN) and seconded by Kurt Stradley (LES) to endorse the technical merits of the work completed by SPP staff. The ESWG approved the motion unanimously.**
>
> **The motion for the TWG was made by John Boshears (CUS) and seconded by Richard Dahl (MRES). The TWG approved the motion with a unanimous vote.**

(Attachment 4 – 2017 ITP10 Recommended Portfolio).

Agenda Item 3 – 2017 ESWG/TWG Quarterly Meeting Schedule Update

There was an update to the February Joint Meeting, which will now be on Wednesday, February 15th, 2017 from 8:00 am to 12:00 pm.

Closing Items

It was suggested that SPP staff complete benefit metrics on the recommended portfolio prior to MOPC and BOD meetings.

The meeting was adjourned at 4:32 PM.

Respectfully Submitted,

Kelsey Allen
ESWG Secretary
Kirk Hall
TWG Secretary

Southwest Power Pool

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ECONOMIC STUDIES WORKING GROUP/TRANSMISSION WORKING GROUP

January 5th, 2017

Net Conference

• SUMMARY OF ACTIONS TAKEN •

1. Endorsement by the ESWG and TWG of the 2017 ITP10 Report as documentation of completion of the 10-Year Assessment of the ITP process specified in SPP OATT Attachment O Section III.
2. ESWG: Approval of the ESWG Charter revisions.
3. ESWG (1/10 via email): Approved the Recommended Portfolio in the 2017 ITP10 Report including the Recommended Projects and the Reaffirmed NTCs.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP/TRANSMISSION WORKING GROUP

January 5th, 2017

Net Conference

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC Great Plains) called the joint meeting of the Economic Studies Working Group (ESWG) and Transmission Working Group (TWG) to order at 8:34a.m., welcomed those in attendance, and asked for introductions of those who were not on the Webex.

There were 81 web conference participants and 9 phone participants representing 16 of 17 ESWG members and 20 of 24 TWG members. (Attachment 1 – January 5th, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements; two proxies were identified for the TWG. Dan Lenihan (OPPD) named Josh Verzal (OPPD) as his proxy and John Fulton (XCEL) named Rene Miranda (XCEL) as his proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – January 5th, 2017 ESWG/TWG Agenda). Kelsey Allen (SPP Staff) added time for the discussion of the ESWG Charter after the ESWG/TWG Joint Discussion.

Agenda Item 2 – 2017 ITP10 Report

Juliano (SPP Staff) emphasized that the focus of the meeting was the report which describes the process and shows the results of the process. He introduced some of the changes as not being material changes but rather additional information at the request of the working group.
Kelsey Allen (SPP Staff) began the overview with changes in the carbon pricing section, which was simply terminology adjustments (*Sections 3.5 and 7*), and additional information in the form of tables regarding benefits and distinguishing the benefits for the economic projects versus the benefits of the full portfolio (*Tables 10.1, 10.3, 10.5, 10.7, and 10.9*). He also noted the change of Scoped Portfolio benefit metrics from 2019$ to 2017$ based on corrected ATRRs (*Tables 12.11 through 12.14*). Additionally, staff added the Recommended Portfolio summary table to the Executive Summary and the glossary of terms. Lastly, were the added benefit metrics on the Recommended Portfolio per the request of members. These only included APC Savings, Marginal Energy Losses, and Mitigation of Transmission Outages being that they make up over 95 percent of the overall benefit.

Items of Concern – 2017 ITP10 Report:

- Tim Owens (NPPD): Interest in scanning carbon pricing language
  (Section 7 was shown for review)
- Jon Iverson (OPPD): Table 16.4 for review

Amber Greb (SPP Staff) reviewed the changes in benefits between the two final portfolios as scoped and the Recommended Portfolio as attributable to the changes in project selection (table shown: Zonal Summary of Benefits and Costs).

Questions and Comments – Changes in Benefits:

- Tim Owens (NPPD): What tables are the new tables in reference to?

Tables 12.11 and 12.12 for zonal benefits, Tables 12.15 and 12.16 for rate impacts
Juliano emphasized that the changes in benefit has no bearing on or didn't raise any concern as far as the project selection was concerned.

- Jeremy Severson (Basin): not all metrics were redone and would the changes be included in the report
- Jon Iverson (OPPD: voiced concerns regarding the avoided or delayed reliability metric that was not performed
  Juliano Freitas (SPP) re-emphasized that the three metrics that were performed make up over 95 percent of the overall benefit of the portfolio. Kelsey Allen (SPP) added that the avoided reliability metric was not included in the Recommended Plan benefit metrics because although some potential avoided project costs were identified in the Texas Panhandle alternative solution analysis, these were a combination of actual avoided projects and projects that SPP staff would expect to be avoided in the future, which does completely fit the criteria of the metric as defined in the ITP Manual.
- Jon Iverson (OPPD): What is the driver behind the change in APC benefits compared to the 2015 ITP10?
  Kelsey Allen (SPP) emphasized the new methodologies from an economic perspective, low cost upgrades and optimization of current assets which resulted in the portfolio cost being significantly smaller and the fact that there were little to no reliability projects.
- Jon Iverson (OPPD): How does MOPC go about debating projects?
  Alan Myers (ITC) notes that 90 minutes are allotted, but open for member discussion. However, the MOPC not well suited to have detailed technical discussion.
  Noman Williams (SCMCN) notes that the MOPC does not approve, but rather endorses.
- Jon Iverson (OPPD): He would vote NO because he feels that the additional analysis is too far outside of the scope
  Alan Myers (ITC) notes that it was already voted to pass the endorsement of the technical work and that this meeting was solely for the report or documentation of the work.
- Josh Verzal (OPPD): Does the additional analysis belong in the report since the report should be a reflection of the scoped process?

SPP staff asked for the ESWG and TWG endorsement of the 2017 ITP10 Report as documentation of completion of the 10-Year Assessment of the ITP process specified in SPP OATT Attachment O Section III.

The motion for the ESWG was moved by Natasha Henderson and seconded by Bennie Weeks to approve the report as documentation of completion of the milestones. The motion for the TWG was moved by Joe Fultz and seconded by John Boshears. Though the milestones were approved by both working groups, Jon Iverson(OPPD) from the ESWG and Josh Verzal(OPPD) from the TWG abstained.

Jon Iverson abstained for the following reasons:
OPPD acknowledges that SPP staff performed the 2017ITP10 study and that the report documents the completion of the study. However, OPPD chooses to abstain from the motion presented to the ESWG at the 1/5/17 ESWG/TWG meeting. OPPD believes the justifications used in the additional analysis were beyond, in extent what the 2017 ITP10 scope allows. Even if these justifications are deemed within the scope, it isn't clear that the philosophies were applied in an non-discriminate manner to other potential project considerations within the footprint. Additionally, although the APC benefit calculation is

based on many moving parts within the model it seems the desirable outcome would be the 2017 ITP10 report's recommended portfolio would provide more APC savings than the reduced carbon and reference case portfolios however this doesn't appear to be the case.

Josh Verzal abstained for the following reasons:
OPPD acknowledges that SPP staff performed the 2017ITP10 study and that the report documents the completion of the study. OPPD believes the justifications used in the additional analysis were beyond what the 2017 ITP10 scope allows. Even if these justifications are deemed within the scope, it isn't clear that the philosophies were applied in an indiscriminate manner to other project considerations within the footprint. OPPD does not believe that the Alternative analysis, and subsequent changes to the recommended portfolio, should be included in the 2017ITP10 report but instead should be documented in its own report and approved separate from the 2017ITP10 Scope driven study report. The need for an alternative analysis is understood, but The TWG was also not given the opportunity to give input into this alternative analysis.

*****ACTION ITEM: Send out minutes from December 15th joint meeting*****

<u>Agenda Item 3 – ESWG Charter</u>
Natasha Henderson (GSEC) shared concerns about making sure that third parties are getting correct and updated information as well as data disclosures. (More discussion on agenda for next face to face meeting)

Tim Owens shared concerns about the removing the representation structure for (balance of transmission users and transmission owners)

Leon Howell (OGE) sent comments regarding adding "economic modeling" into the categories of knowledge or experience under the requirements of a representative that were added to the document.

Alan Myers asked if anyone was uncomfortable with moving this on to the MOPC and voting via email on tomorrow (no response).

Document was emailed. Natasha Henderson moved and Leon Howell seconded that the ESWG approve the ESWG Charter as edited and sent to the ESWG on 1/5/2017. It was approved by unanimous decision.

<u>Closing Items</u>
Juliano Freitas (SPP) wants to begin having conference calls related to the ITP manual task force at the end of the month in order to expedite this process from now through April.

January 12th ESWG meeting agenda to be sent out today and deals mostly with scope standardization and resource expansion tools.

The meeting was adjourned at 9:42 AM.

Respectfully Submitted,

Kelsey Allen
ESWG Secretary
Kirk Hall
TWG Secretary

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 12th, 2017

8th Floor AEP Offices – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approve the SPP staff recommendation to standardize percentages of load and/or generation for each utility by state to calculate renewable [policy] Mandates and Goals, where applicable.
2. Approved the SPP staff recommendation to standardize development of the external renewable resource expansion plan.
3. Approved using the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities.
4. Approved the testing all 10 benefit metrics on the final recommended plan of a given ITP study in each of the approved futures.

Southwest Power Pool

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 12th, 2017

8th Floor AEP Offices – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC Great Plains) called the meeting of the Economic Studies Working Group (ESWG) to order at 8:30a.m., welcomed those in attendance, and asked for introductions.

There were 18 in-person participants and 45 web conference participants, representing 15 of 17 ESWG members. (Attachment 1 – January 12th, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements; one proxy was identified. Bethany King (EMDE) named David Busse (EMDE) as her proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – January 12th, 2017 ESWG Agenda).

> **It was moved by Tim Owens (NPPD) and seconded by Kurt Stradley (LES) to approve the agenda as read. The agenda was approved by unanimous vote.**

Agenda Item 2 – Review of Past Action Items

Kelsey Allen (SPP Staff) reviewed the list of past action items and asked for any comments or questions. (Attachment 4 – Past Action Items)

Agenda Item 3 – 2017 ITP10 Study Schedule

Juliano Freitas (SPP Staff) gave updates on the ITP10 study schedule. The study is complete and will be going to the MOPC on January 17th and the Board of Directors on January 31st for final consideration. (Attachment 5 – 2017 ITP10 Study Schedule)

Agenda Item 4 – 2017 ESWG Meeting Schedule Update

Kelsey Allen (SPP Staff) reviewed the meeting schedule and asked the group if they would prefer the quarterly meetings in conjunction with the TWG to be one full day or two half days, as the TWG will be shortening their meetings from a day and a half to one full day. The group preferred to stay with the as planned two half days. It was pointed out that the November ESWG Face to Face meeting should be on the schedule for November 8th-9th, 2017. (Attachment 6 – 2017 ESWG Meeting Schedule)

Agenda Item 5 – ITP Scope Standardization

Agenda Item 5a – Wind Pricing

Josh Ross (SPP Staff) began the discussion for the standardization of wind pricing with a discussion on curtailment pricing. He noted the current price used and described how that price impacts the economic model simulations. Discussion centered on whether the curtailment price should reflect a production tax credit (PTC) or not. This would result in a negative price or a zero dollar offer price. Considering a PTC could be complicated due to when the PTC expires for each farm and additional pricing differences by state. Scott Benson (LES) made some suggestions on how to standardize a curtailment pricing methodology for the SPP footprint and agreed to work offline with SPP staff to develop a recommendation for future consideration.

Josh Ross (SPP Staff) then started discussion on variable operation and maintenance (VOM) pricing and how it impacts the economic model simulations and results. This discussion centered on whether the VOM price should be reflective of an actual VOM price experienced by the generator owner or, due to the nature of renewable construction and contracts, the power purchase agreement price that an entity would pay. Because this input only affects adjusted production cost calculations, some in the group argued that this should be reflective of the PPA price so as to not overestimate the benefits an entity would receive. Others argued that using the PPA price would underestimate the benefits to the SPP market as a whole. Scott Benson (LES) suggested that he and SPP staff work together to standardize a VOM pricing methodology for the SPP footprint in the event the group decides to use the PPA price. Discussion will continue at the next meeting.

(Attachment 7 – Wind Pricing)

Agenda Item 5b – Policy Survey

Liz Gephardt (SPP Staff) reviewed the methodology for the standardization of the renewable policy survey and relayed some of the discussion that had taken place from presenting this item at the CAWG meeting. SPP staff recommended standardizing percentages of load and/or generation for each utility by state to calculate Mandates and Goals. These percentages would be based on historical values used and member feedback, and would be used as a standard proxy for future renewable energy standards.

> **It was moved by Bennie Weeks (Xcel/SPS) and seconded by Kurt Stradley (LES) to approve the SPP staff recommendation to standardize percentages of load and/or generation for each utility by state to calculate renewable [policy] Mandates and Goals. A friendly amendment from Gayle Nansel (WAPA) to add "where applicable" to the end of the motion was accepted. The recommendation was approved by unanimous vote.**

The percentages to be used for each utility by state will be determined upon further review by the stakeholders. (Attachment 8 – Policy Survey)

Agenda Item 5c – Resource Expansion Plan

Josh Ross (SPP Staff) reviewed the methodology for modeling renewable additions or developing a renewable resource expansion plan for external regions.

> **It was moved by Tim Owens (NPPD) and seconded by Kurt Stradley (LES) to approve SPP staff recommendation standardize development of the external renewable resource expansion plan. The recommendation was approved by unanimous vote.**

Josh then reviewed a methodology to develop a conventional expansion plan absent resource planning software for a "traditional" Future. A non-traditional future would require software simulations to properly assess the impact of large changes in input assumptions. After much discussion on the criteria the group determined that due to the reasonably low incremental work that would be needed to develop a model to simulate a traditional future if a non-traditional future model were to be developed, that software should be continue to be used moving forward. Josh also reviewed a methodology for modeling conventional additions or developing a conventional resource expansion plan for external regions. The group asked that language for implementing the conventional resource plans be firmed up for the next meeting. (Attachment 9 – Resource Planning)

Agenda Item 5d – Resource Siting Plan

Chris Jamieson (SPP Staff) began the discussion on the methodology for siting both conventional and renewable resources within the SPP footprint. Steve Gaw (Wind Coalition) expressed concern about the latest methodology for wind siting relying solely on the SPP generation interconnection queue, stating that building new transmission to sites of greater potential might be better for accommodating future proxy wind. It was also requested that resource siting be included in the overall discussion of ITP data confidentiality. (Attachment 10 – Resource Siting Plan)

Agenda Item 5e – Hurdle Rates

Nikki Roberts (SPP Staff) went over three different approaches to hurdle rates that have been utilized or considered in the past. SPP Staff recommended using the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities. (Attachment 11 – Hurdle Rates)

> **It was moved by Kurt Stradley (LES) and seconded by Pat McCool (KCPL) to approve SPP staff's recommendation to the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities. The recommendation was approved by unanimous vote.**

<u>Agenda Item 5f – Benefit Metrics</u>

Amber Greb (SPP Staff) went over the ten metrics that are currently in the ITP process. SPP staff recommended testing all 10 benefit metrics on the final portfolio of a given ITP study in each of the approved futures. For the ITP manual, Staff recommended softening the language to allow flexibility for varying numbers of final portfolios and futures. (Attachment 12 – Benefit Metrics)

> **It was moved by Don Le (NEET) and seconded by Tim Owens (NPPD) to approved SPP staff's recommendation to test the 10 benefit metrics on the final recommended plan of a given ITP study in each of the approved futures. The recommendation was approved by unanimous vote.**

<u>Agenda Item 5g – Sensitivity Analysis</u>

[This item was not covered]

<u>Agenda Item 5f – Benefit Metrics</u>

[This item was not covered]

<u>Agenda Item 5f – Benefit Metrics</u>

[This item was not covered]

<u>Closing Items</u>

Juliano Freitas (SPP Staff) informed the group that he would like to begin having conference calls related to the ITP Scope Standardization items at the end of each month in order to support the ITP Manual Task Force in order to expedite this process from now through April.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Kelsey Allen

ESWG Secretary

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 30th, 2017

Net Conference

• SUMMARY OF ACTIONS TAKEN •

1. Approved SPP staff's recommendation to standardize high and low demand and high and low natural gas price sensitivities, typically using 1-2 standard deviations, on which to test the final portfolio of a given ITP study
2. Approved SPP staff's recommendation to leverage operational practices, powerflow modeling, and firm transmission service restrictions to determine operating parameters of phase shifting transformers in the ITP economic study model
3. Approved SPP staff's proposal for conventional resource additions and the resource expansion planning approach for study years 2, 5, and 10.
4. Approved SPP staff's amended recommendation for renewable curtailment pricing.

Southwest Power Pool

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 30th, 2017

Net Conference

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC Great Plains) called the meeting of the Economic Studies Working Group (ESWG) to order at 8:38 a.m., welcomed those in attendance, and asked for introductions of those who were not on the Webex.

There were 51 web conference participants and two phone participants representing 15 of 17 ESWG members. (Attachment 1 – January 30th, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements; one proxy was identified. Leon Howell (OGE) named Zac Hager (OGE) as his proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – January 30th, 2017 ESWG Agenda)

> **Kurt Stradley (LES) moved and Tim Owens (NPPD) seconded the motion to accept the agenda as posted. The agenda was approved with a unanimous vote.**

Agenda Item 2 – ITP Scope Standardization

Agenda Item 2a – Policy Survey Update

Liz Gephardt (SPP Staff) gave a quick update on the policy survey stating that she wants to wait until after CAWG meets next month to discuss due to their input on the percentages used within the policy survey. SPP staff is also looking to schedule a potential joint call with CAWG to complete discussion on the policy survey.

Agenda Item 2b – Sensitivity Analysis

Liz Gephardt (SPP Staff) reviewed the purpose of the sensitivity analysis and some of the previously scope sensitivities that were analyzed. She suggested that the language in the manual reflect that the group is not restricted from including any additional sensitivity to each study's scope that would be beneficial. Zac Hager (OGE) notes that we need to specify what is considered high and low with Bethany King (EDE) adding that the language should reflect that we typically use 1-2 standard deviations in order to have a baseline. (Attachment 4 – Sensitivity Analysis)

> **Bethany King (EDE) moved and Kurt Stradley (LES) seconded the motion to approve SPP staff's recommendation to standardize high and low demand and high and low natural gas price sensitivities, typically using 1-2 standard deviations, on which to test the final portfolio of a given ITP study. The recommendation was approved with a unanimous vote.**

Agenda Item 2c – DC Line Modeling

Kelsey Allen (SPP Staff) discussed the modeling of DC lines in the economic model. Though there are no DC lines in the SPP footprint, the addition of the Integrated System (IS) makes some electrically closer and a need for more modeling criteria. Kelsey suggested some improvements to allow more use of the

DC line capacity in the economic simulations. This topic needs more discussion and the group suggested coordination with the TWG. (Attachment 5 – DC Line Modeling)

Agenda Item 2d – Phase Shifting Transformers

Liz Gephardt (SPP Staff) gave a background of PSTs noting that there are three within SPP's footprint that are all operated differently. She noted that currently PSTs are potentially operated up to their thermal ratings utilizing the full angle range in the economic simulations instead of the typically more limited range in which they are operated in the AC powerflow. From a modeling perspective, the goal is to be more realistic and model them on a case by case basis with correct operational parameters. This topic has an economic phase and a powerflow modeling phase. (Attachment 6 – Phase-Shifting Transformers)

> **Tim Owens (NPPD) moved and Jeremy Severson (BEPC) seconded the motion to approve SPP staff's recommendation to leverage operational practices, powerflow modeling, and firm transmission service restrictions to determine operating parameters of phase shifting transformers in the ITP economic study model. The recommendation was approved by a unanimous vote.**

Agenda Item 2e – Resource Expansion Planning

Josh Ross (SPP Staff) reviewed the conventional additions portion of the resource expansion plan noting that no siting is involved. He also noted that resource expansion software would be used in all futures for new conventional resources, but not for new renewable resources. Natasha Henderson (GSEC) referenced the SPP resource adequacy process and the ability for entities to transfer capacity to meet reserve margin requirements, noting that some entities may take that risk as opposed to installing new capacity even in years 5 and 10. Zac Hager (OGE) noted that SPP staff's process to calculate reserve shortfalls on a pricing zone level rather than an entity level may alleviate some concerns. As the SPP resource adequacy process matures, this may be revisited in the future for potential methodology adjustments. (Attachment 7 – Resource Expansion Plan)

> **Tim Owens (NPPD) moved and Kurt Stradley (LES) seconded the motion to approve SPP staff's proposal for conventional resource additions and the resource expansion planning approach for study years 2, 5, and 10. The recommendation was approved by a unanimous vote.**

Agenda Item 2f – Renewable Pricing

Josh Ross (SPP Staff) reviewed and summarized the previous discussions regarding renewable pricing noting the two separate items, curtailment price and variable O&M (VOM). The goal was to wrap up the curtailment pricing and continue discussion on the VOM. The SPP staff recommendation on wind curtailment pricing was clarified with inclusion of language in the third criterion differentiating the two curtailment prices based on whether the developer opted for an investment tax credit (ITC) or production tax credit (PTC).

> **Kurt Stradley (LES) moved and Bennie Weeks (Xcel/SPS) seconded the motion to approve SPP staff's amended recommendation for renewable curtailment pricing. The recommendation was approved by a unanimous vote.**

Josh Ross (SPP Staff) continued discussion with renewable VOM pricing. Scott Benson (LES) suggested a blended approach for wind in which farms would utilize an approximate PPA price for VOM unless the owner indicated they were not under a PPA, in which case they would use an operating cost of $8. The group asked for SPP staff's thoughts on the impacts and what the results would look like utilizing the different options. Kelsey Allen (SPP Staff) stated that the higher the VOM pricing is for renewables, the less APC benefit would be realized from a transmission project mitigating renewable curtailment. SPP staff will bring results from implementing the different options to the next meeting. Steve Gaw (Wind Coalition) also asked SPP staff to investigate how other regions are modeling renewable VOM. (Attachment 8 – Renewable Pricing)

Agenda Item 2g – 40-Year Financial Analysis

Amber Greb (SPP Staff) began the discussion regarding how we calculate 40-year benefits noting in multiple examples that our calculations via extrapolation have been driven more by the slope than the 1-year benefit data. She introduced using a third data point via year 15 or year 2 as options for improvement as well as capping extrapolated benefit when the slope crossed $0. Yohan Sutjandra (TEA) suggested consideration of capping extrapolation of benefits at a set year, prior to the 20-year currently being utilized and also asked if SPP staff had compared their methodology and the proposed changes to other RTOs. This discussion will continue during the next meeting. (Attachment 9 – 40-Year Financial Analysis)

Agenda Item 2h – Benchmarking
[This item was not covered]. (Attachment 10 – Benchmarking)

Agenda Item 3 – Resource Expansion Software Tools Discussion
[This item was not covered].

Closing Items
We will continue the discussion of ITP scope standardization items at the next meeting.

The meeting adjourned at 11:00 AM.

Respectfully Submitted,

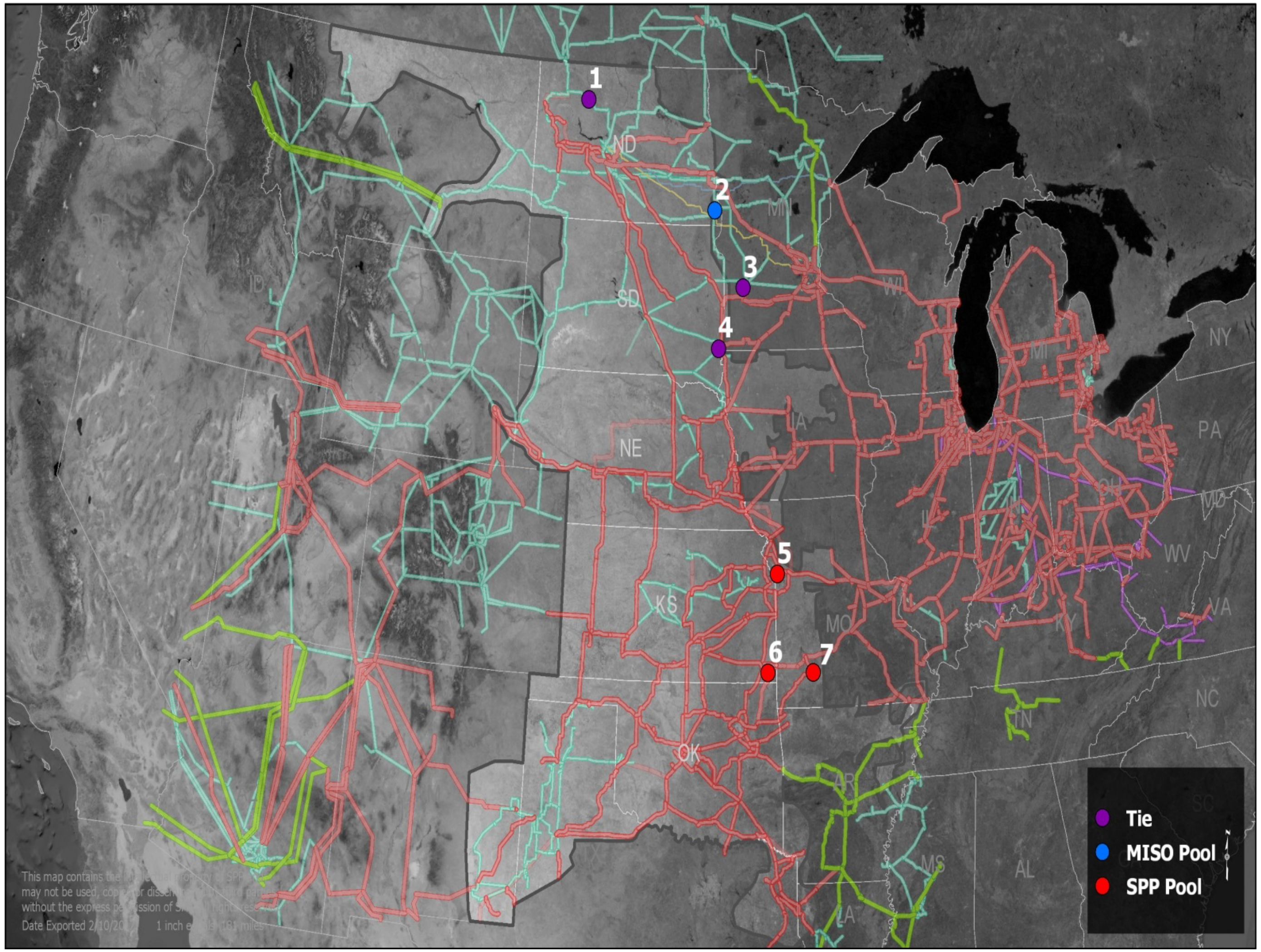
Kelsey Allen
ESWG Secretary

SPP-MISO CSP Update

February 2017

Adam Bell abell@spp.org

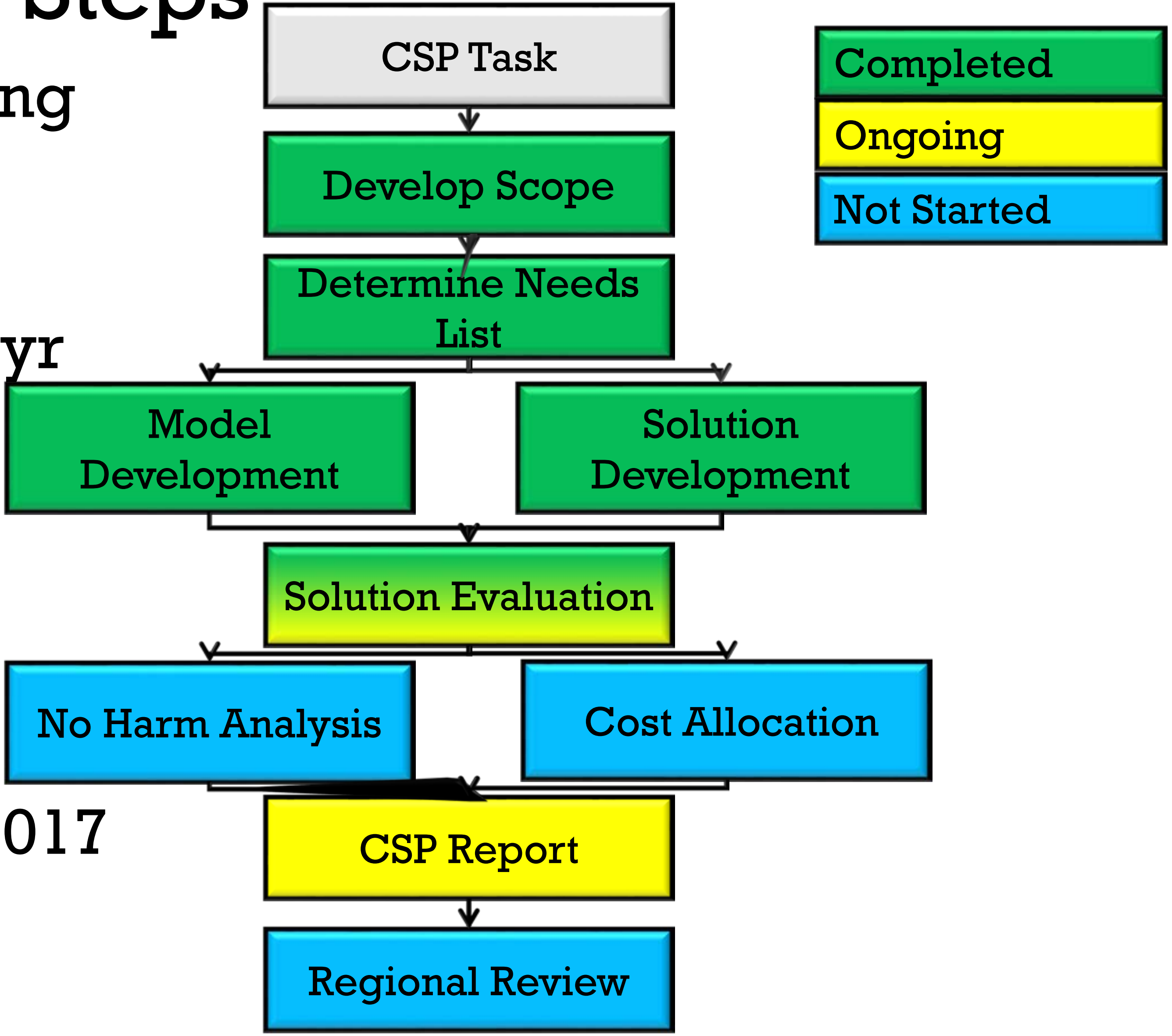
2016 CSP Needs



NEED ID	CONSTRAINT
1	Rugby WAUE-Rugby OTP Tie
2	Hankinson - Wahpeton 230kV FLO Jamestown - Buffalo 345kV
3	Sub3 - Granite Falls 115kV Ckt1 FLO Lyon Co. 345kV Ckt1
4	Sioux Falls - Lawrence 115kV FLO Sioux Falls - Split Rock 230kV
5	Northeast - Charlotte 161kV FLO Northeast - Grand Ave West 161kV
6	Neosho - Riverton 161kV FLO Neosho - Blackberry 345kV
7	Brookline 345/161kV Ckt 1 Transformer FLO Brookline 345/161kV Ckt 2 Transformer

Status and Next Steps

- Finish Preliminary Screening Analysis
  - 0.5 B/C ratio
- Robustness Testing and 20yr APC calculation
- 2016 SPP-MISO CSP Draft Report
- Develop final portfolio
- Complete study by April 2017



March 9th IPSAC Meeting

- SPP-MISO Interregional Planning Stakeholder Advisory Committee (IPSAC) Meeting
  - March 9th from 9:00am to 4:00pm CT
  - MISO Offices in Metairie, LA
  - Registration Link on MISO website
- Potential Agenda Items
  - 2016 CSP Results
  - 2017-2019 Joint Study Overview
  - Regional Coordination Improvements
  - MISO-PJM "TMEP" Study
  - Etc.

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

Eletric Generation Expansion Analysis System (EGEAS)

Juliano Freitas

EGEAS Overview

- EGEAS is a modular production costing and generation expansion software package.
- EGEAS is used by electric company planners and others to develop and evaluate integrated resource plans, avoided costs, plant life management plans, and environmental compliance plans.
- EGEAS accommodates dispatchable generation sources (e.g., coal, gas, nuclear), demand-side management (DSM) and renewable energy sources.
- EGEAS was the forerunner of the current generation planning simulation and optimization models, and continues to be used today by a number of electric companies and regional planning organizations (e.g., MISO).

EGEAS History

- EPRI originally developed EGEAS in 1983 as a research project. Key contractors included Stone & Webster Engineering Corp. and the MIT Energy Lab.
- In the 1990s, Stone & Webster Management Consultants Inc. developed a graphic user interface (GUI) to ease data input.
- In 2013, EPRI reactivated EGEAS v9.02.
- In April, 2014, EPRI released v10 – an updated and integrated version including a new GUI and improved "back end."
- In June 2015, EPRI released the current EGEAS v11.
- Q4 2017: EPRI plans to release EGEAS v12.
  - –Software development by NG Planning
  - –Financial support provided by MISO
- Q4 2018: EPRI plans to release EGEAS v13.
  - –Software development by NG Planning
  - –Financial support provided by MISO

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EGEAS History

- Version 1 – 1983 Initial release
- Version 2 – 1985 Storage optimization, Must-run, Spinning reserve
- Version 3 – 1986 Purchase & sale contracts, Incremental costs
- Version 4 – 1989 Financial constraints
- Version 5 – 1990 Fuel constraints, Multi-area modeling
- Version 6 – 1990 Emission Constraints, System average rate
- Version 7 – 1993 Revenues, Avoided costs, Risk analysis
- Version 8 – 1996 Multi-Parameter Gamma method
- Version 9 – 1997 Bid-based pricing
- Version 9.02 – 2007 Cost and Revenues report; Ability to change measurement units; increase # of plant types and load blocks
- Version 9.02 – 2013 Reactivated by EPRI
- Version 10.0 – 2014 Integrated GUI and underlying EGEAS code; removed Finance + and RISKMIN
- Version 11.0 – 2015 Added "dump energy " penalty and State RPS

EGEAS Key Enhancements

- One-stop software licensing via EPRI or EPRI software "commercializers," such as NG Planning LLC.
- Consolidated EGEAS, the Graphic User Interface (GUI), DSMLINK, and RPWorkstation programs
- Eliminated Finance+ and Riskmin programs which are no longer supported or used
- Updated all EGEAS users guides and manuals:
  1. Capabilities Manual
  2. Users Guide
  3. DSMLink Manual
  4. RPW Users Guide
- Two new features were added in v11:
  1. Dump Energy Penalty Factor
  2. Renewable Portfolio Standard (RPS) Constraint
- Updated to operate with Windows Vista, Windows 7 (32-bit and 64-bit), and Windows 8.

EGEAS Renewable Portfolio Standard

- EGEAS v11 includes new regional Renewable Portfolio Standard (RPS) constraints.
- EGEAS users can now create regional annual RPS constraints directly in EGEAS.
- EGEAS users now can develop optimized generation expansion plans that comply with the annual RPS requirements over the study period.

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EGEAS Version 11 – Current Pricing and Licensing

- EGEAS can be licensed from: (i) EPRI, or (ii) an EPRI licensed software "commercializer," such as NG Planning LLC

- EPRI charges $30,000 for a new EGEAS v11 user license

    – One-time license fee; no annual license maintenance fee

    - No limit on the amount of users in a single company

    – EPRI software commercializers may charge different fees than EPRI

- Members of EPRI research programs 178 and 178b receive an EGEAS v11 license at no additional cost beyond their program membership fees.

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EGEAS Version 11 – Current Pricing and Licensing

- V12 costed $400,000.00 to MISO and version 13 will cost $500,000.00. Basically EGEAS is customized to MISO, that is the benefit they get for funding it. They are open for partnerships to make it more friendly to RTOs in general.
- Training from NG Planning is based on company by company and depends the type of training
- NG consulting charges $9,000.00 per year, full support.

EGEAS Version 12

- MISO provided EPRI with funding to develop v12.
- Includes developing and testing of a pre-production "beta" v12 with MISO early in 2017.
- EPRI's Software Quality Assurance (QA) process to be completed for both the *beta* and *final production* versions.

EGEAS Version 12

- Remove existing numeric constraints and increase limits on key variables and basic plant and other quantities beyond the current numeric limit of 999 units.
- Inclusion of rate-based emissions constraints (e.g., lbs CO_2 / MWh) to facilitate Clean Power Plan related analyses.
- New output report showing all four types of generation capacities for EGUs (i.e. rated, operating, emergency, and reserve capacities).
- Planned to be released in Q4, 2017

EGEAS Version 13

- Add simultaneous rate-based and mass-based emission constraints.
- Allow "must-run" status to be changed by segments.
- Increase the maximum number of emission types.
- Increase the maximum number of NDTs.
- Increase maximum NDT units for a given NDT technology.
- Remove fatal error for excess non-dispatchable technology (NDT).
- Add copying and pasting data with tables in the graphic user interface (GUI).
- EPRI is in the process of working with MISO now to begin development of EGEAS v13 for delivery in Q4, 2018.


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ITP Scope Standardization – Policy Survey

Liz Gephardt

ITP Policy Survey

- ITP Scope Standardization
- Process
  - Survey to members for Regulatory/Statutory Mandates and Goals in staging and study years
  - Feeds into Resource Plan and Policy Needs Assessment
- 2017 ITP10
  - 7 week time frame
    - 3 weeks SPP staff prep and processing results
    - 4 weeks of member review/feedback
  - Resource Time
    - 48.5 SPP staff hours
    - Unknown utility contact hours
  - Results
    - <400 MW of renewables
    - No Policy Needs

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Policy Survey Standardization

- Survey has minimal impacts to study, yet necessary
- Amounts for renewables are fairly standard
- Standardize percentages of load or generation for renewables for reasonable proxy
- SPP staff to calculate internally and post for review and vetting
- Decreases time frame in schedule and resource hours for SPP staff and stakeholders

Working Group Feedback

- SPP staff recommended to standardize percentages of load and/or generation for each utility by state to calculate Mandates and Goals, where applicable. These percentages would be based on historical values used and member feedback, and would be used as a standard proxy for future renewable energy standards.
  - ESWG approved January 2017
  - CAWG approved February 2017
- Standard Values to be discussed between ESWG and CAWG
- Additional concerns to discuss:
  - Deliverability
  - Nebraska
  - Consideration of RECs
  - Future changes to legislation

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Proposed Standard Values

- States not included in the table would have no standard percentage

State	RPS Type	Capacity- or Energy-Based	Gen- or Load-Oriented	Year 2 %	Year 5 %	Year 10 %
Kansas	Goal	Capacity	Load	20	20	20
Minnesota	Mandate	Energy	Load	20	20	25
Missouri	Mandate	Energy	Load	15	15	15
Montana	Mandate	Energy	Load	15	15	15
North Dakota	Goal	Energy	Load	10	10	10
New Mexico	Mandate	Energy	Load	20	20	20
Oklahoma	Goal	Capacity	Gen	15	15	15
South Dakota	Goal	Energy	Load	10	10	10
Texas	Mandate	Capacity	Load	5	5	5

SPP

10/6/16

Objective:

The TPITF made several recommendations to the current planning process to improve the identification of projects and process timelines. Per the TPITF white paper recommendation SPP staff has developed strawman criteria in order to identify chronic operational events that need long term transmission solutions proposed. This criteria will be inserted into the ITP Manual. The identification of chronic operational issues will be performed in parallel of ITP process.

The needs identified by this criteria will be deemed either Economic or Reliability and will be included in the normal ITP DPP needs list that is posted. However, the needs identified by this criteria will be evaluated using operational models that captured the actual occurrences of the needs. These operational models will be approved by the applicable SPP stakeholder working groups to ensure consistency with the criteria established to designate the operational needs as chronic, rather than infrequent system needs. The evaluation criteria that will be used to determine if these operational needs require projects will be described in a separate document. The candidate projects and associated justification will be presented to the TWG, ESWG, and ORWG for their review and endorsement.

- Flowgate issues (Economic)
    - Flowgates must reference monitored elements under the SPP Tariff. Flowgates congested for at least 20% of the previous 24 months, either in a breached or binding state in the Real-Time Balancing Market solution, will be added to the ITP needs list. Periods of time when a flowgate's related congestion is deemed to be the result of an outage(s) will be excluded. (Economic)
    - Flowgates with congestion costs totaling more than $10 million over the previous twenty four months will also be added to the ITP needs list. Congestion costs will be calculated using the same methodology as the VRL Report process. Periods of time when a flowgate's related congestion is deemed to be the result of an outage(s) will be excluded . (Economic)
    - Congestion cost for outages will be provided for informational purposes.
- High/Low Voltage issues (Reliability)
    - Transmission Operating Guides that require reconfiguration, documenting mitigations for high and low voltage issues, will be reviewed from the last cycle and related voltage issues will be added to the ITP needs list. The mitigation to avoid the high/low voltage issue must be implemented 10% of the time of the year due to non-outage issues. Transmission Operating Guides that will be considered will only include transmission

reconfiguration or potential load shed events. Switched shunts and generator Mvar adjustments will be optimized prior to needs being identified.

        - If non-consequential load at risk is 100 MW or greater, the load risk would need to be present 1% of the time.

- Manual Commitments (Economic)
    - Generation that is dispatched uneconomically in order to support voltage in the local area. Manual commitment events which include startup and extension 25% of the year will be added to the ITP needs list. .
        - Manual commitments that do not exceed 25% of the year, but cost over $1 Million dollars over 24 months will be added to the ITP needs list.
- Required reconfigurations due to ineffective redispatch (Reliability)
    - Transmission capacity limitations can usually be controlled by flowgates. Applying a threshold to TDFs can leave some transmission paths overloaded with no way to control loading through redispatch. Reconfiguration will relieve the most limiting element, but it often degrades the robustness of the transmission system and increases risk due to the next contingency. The reconfiguration will require an agreed upon Operating Guide, and if it has been implemented in real time 25% of the time of the year the issue will be added to the ITP needs list.
- Operational Discretion (Economic/ Reliability)
    - Additional needs may be proposed by SPP Operations for issues that do not meet the criteria described above. Additional needs will be identified with discretion for pain points observed in operating the transmission system and presented to ESWG and TWG for review and endorsement.

Project Acceleration:

- Projects that have previously been identified by SPP Planning may be subject to Accelerated Need Dates based on issues identified per the Chronic Operational Issues Criteria.

ITP Scope Standardization – Renewable Pricing

ESWG

February 15th, 2017

Renewable Pricing

- "Renewable" in this case refers to wind and solar only
  - There is similar modeling between the two. Both follow an hourly profile for MWh output, unless the LMP goes lower than the curtailment price input
- Wind/solar curtailment price
  - Defines the trigger price at which the resource will curtail
  - Jan 2017: Approved -$35/MWh to $0/MWh curtailment price for renewables
- Wind/solar variable O&M
  - Defines the operating cost per MWh
- When there is negligible renewable curtailment (such as 2017 ITP10, 2015 ITP10 models), adjusting the curtailment price and VOM as we have done will have negligible impact on dispatch, curtailment, and APC
  - But future studies might not have negligible curtailment

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Curtailment Price

Curtailment Price

- Drives dispatch, curtailment, LMPs
- Similar to offer price
- Ran simulations that included significant wind increase in SPP
  - Wind curtailment price tested at $8/MWh and -$35/MWh
  - No constraints were included, resulting in single marginal unit
  - In high penetration hour, wind was the marginal unit. This resulted in wind setting the Marginal Energy Cost of the LMP.
- *If wind is the only marginal unit, the MEC is set by the curtailment price, not the variable O&M*

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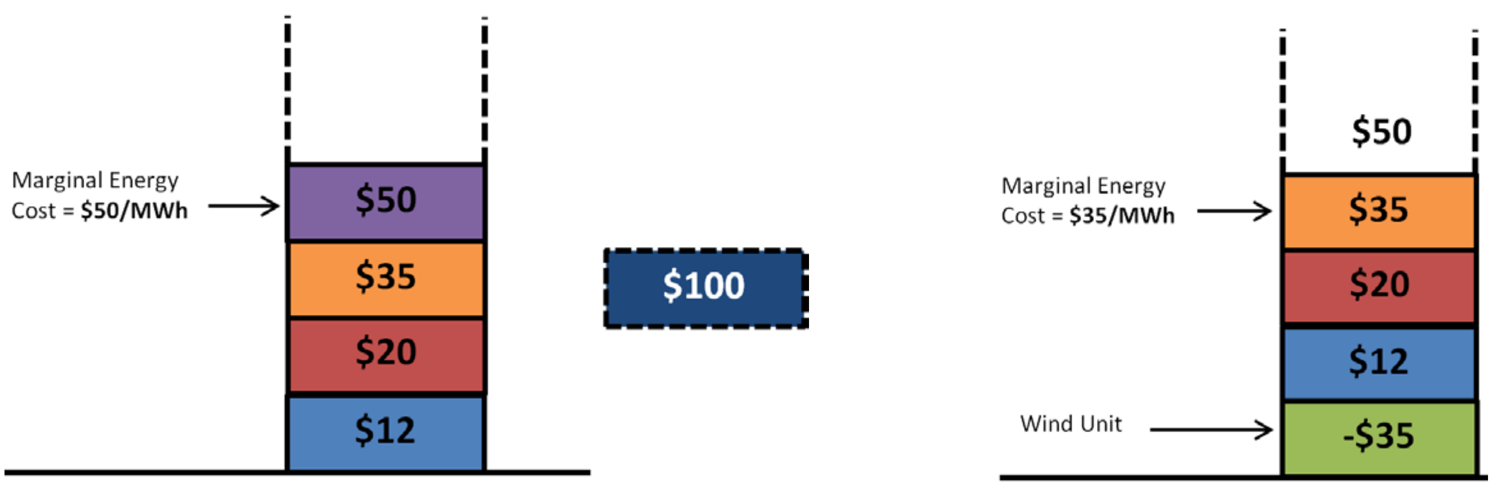
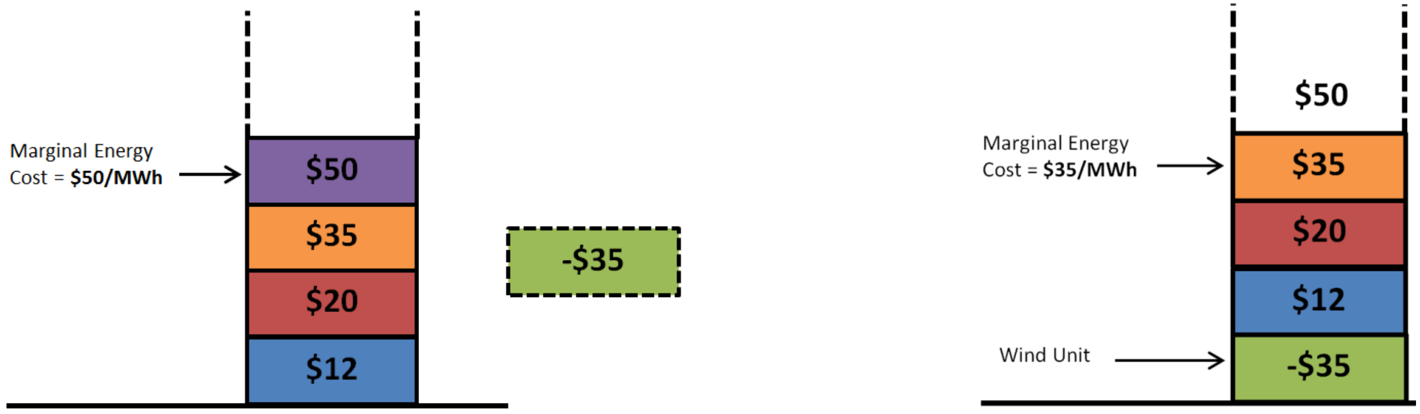
Benefit of Adding a Wind Resource to Market

- Simple conceptual example: minimal units, no congestion
- Add conventional unit with $100/MWh price:
  - MEC = $50/MWh
- Add wind with -$35/MWh curtailment price:
  - MEC = $35/MWh
- The low curtailment price for wind drives lower MEC/lower LMPs



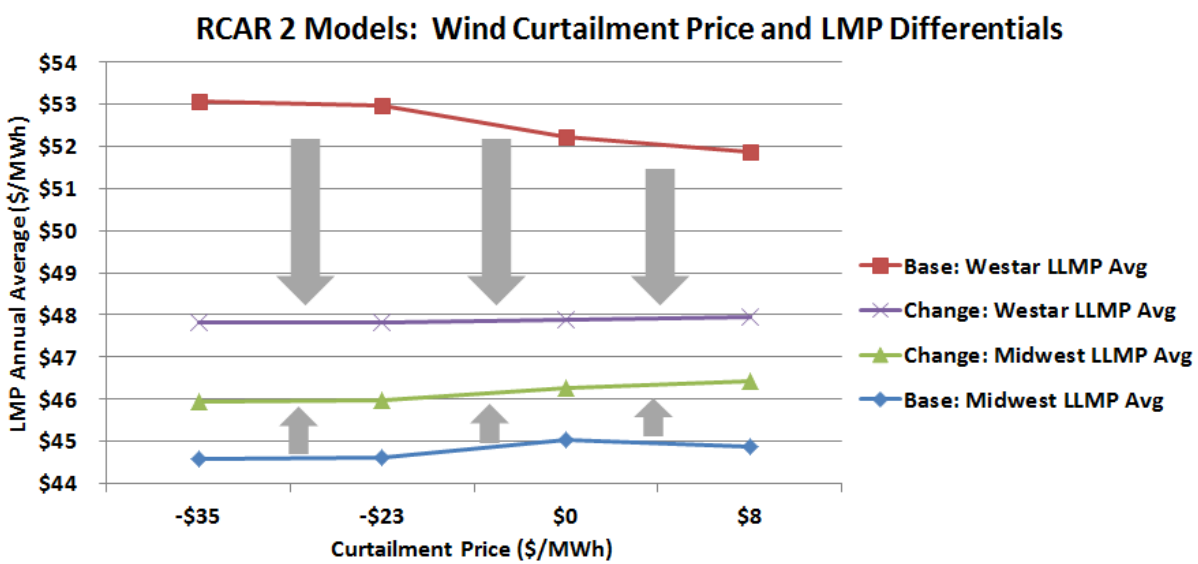
Benefit of Building Transmission that Unleashes Wind

- Simple conceptual example, minimal units
- Congestion results in wind curtailment
  - MEC = $50/MWh
- Transmission is added, wind is dispatched
  - MEC = $35/MWh
- When wind is "unleashed", the low curtailment price drives lower MEC/LMP
  - It also drives more uniform MCCs, not shown here
- Any reduction in production costs is additive to this benefit



Impact of Curtailment Price on LMP Differentials

- Midwest and Westar represent two zones separated by significant congestion in the RCAR 2 models
  - Adding transmission upgrades results in more levelized LMPs between the zones
  - *A lower curtailment price results in a slightly higher LMP differential split. But there is not a significant impact on APC from the change in curtailment price.*



RCAR 2 Results – Impacts of Adjusting Curtailment Price

- Lower curtailment prices:
  - Result in slightly less curtailment, which can lead to less benefit from transmission
  - Can lower system LMPs, providing more benefit to the region
  - In RCAR 2, the end result on APC was not significant, because all curtailment prices tested were low

	Wind Curtailment Price ($/MWh)	Wind VOM ($/MWh)	APC Benefit ($)	Centennial WF % dispatch
RCAR 2, F3 Base	$8	$8		18.3%
RCAR 2, F3 Change	$8	$8	$661,596,000	95.6%
RCAR 2, F3 Base	$0	$8		19.9%
RCAR 2, F3 Change	$0	$8	$659,914,000	98.5%
RCAR 2, F3 Base	($23)	$8		22.7%
RCAR 2, F3 Change	($23)	$8	$660,910,000	99.8%
RCAR 2, F3 Base	($35)	$8		25.1%
RCAR 2, F3 Change	($35)	$8	$678,485,000	99.9%

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Curtailment Price – Conclusions

- The presence of wind in the models at a low curtailment price provides a benefit to the market by lowering LMPs
- Transmission upgrades
  - With a low curtailment price of $8 or -$35, unleashing wind will help drive down LMPs, regardless of the VOM price, providing a benefit to the market
  - With either curtailment price, the benefit to the market is similar, because the MEC doesn't typically drop below $8
- The general impact of lowering the curtailment price:
  - Results in slightly less base case curtailment, which can lead to less benefit from transmission
  - Results in slightly higher base case LMP differentials, which can lead to more benefit from transmission
- In RCAR 2 models, lowering the curtailment price from $8 to –$35 does not change results significantly because both are low curtailment prices
  - Using a higher curtailment price such as $50/MWh results in a significant change in results

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Variable O&M Price

Variable O&M Price Impacts

- Changing the Variable O&M does not impact:
  - Dispatch
  - Curtailment
  - LMPs
- Changing the Variable O&M only impacts the operating cost of the unit in post-processing APC calculations
  - Reflects the price the LSE pays per MWh of delivered wind
- Tested RCAR 2 APC benefits with different VOM prices, to reflect use of operating price vs. PPA price:
  - $8/MWh
  - $30/MWh
  - $60/MWh

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VOM & APC Benefits

- Raising the VOM price results in less benefit from unleashing wind
  - $30/MWh: Benefit is 87% of original
  - $60/MWh: Benefit is 69% of original
- Zonal benefits do not appear erratic
  - Zones with the most reduction in benefit are zones with the most wind curtailment

Zonal APC Benefits Summary - RCAR 2, 2025, nominal $

	-$35 Curtailment, $8 VOM	-$35 Curtailment, $30 VOM	-$35 Curtailment, $60 VOM
AEPWALL	$17,905,000	$15,078,000	$11,225,000
EMDEALL	($3,175,000)	($3,115,000)	($3,034,000)
GMOALL	$6,791,000	$4,058,000	$333,000
GRDA	$7,369,000	$7,366,000	$7,361,000
IS	$37,924,000	$37,839,000	$37,721,000
KCPLALL	$23,201,000	$19,449,000	$14,334,000
LES	$8,147,000	$7,540,000	$6,712,000
MIDWALL	$9,185,000	$9,084,000	$8,947,000
MKECALL	($63,803,000)	($64,281,000)	($64,933,000)
NPPDALL	$74,481,000	$66,874,000	$56,501,000
OKGEALL	$114,629,000	$79,929,000	$32,610,000
OPPDALL	$17,470,000	$15,788,000	$13,494,000
SPCIUT	$1,239,000	$1,181,000	$1,101,000
SUNCALL	($20,446,000)	($20,513,000)	($20,603,000)
SWPSALL	$334,466,000	$318,998,000	$297,907,000
WESTALL	$82,593,000	$64,349,000	$39,471,000
WFECALL	$30,508,000	$29,622,000	$28,414,000
SPP TOTAL	**$678,484,000**	**$589,246,000**	**$467,561,000**
		87%	***69%***

VOM Impacts

- Due to the low curtailment price (offer price), unleashing wind provides benefit
  - <u>With higher VOM, however, there is less of this APC benefit</u>
- APC = Production Cost $ + Purchases $ (LMP-based) – Sales $ (LMP-based)
  - A lower VOM reduces the production cost of the system
  - A lower curtailment price reduces the LMPs of the system
- What about modeling of *conventional* units with PPAs?

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VOM Feedback from Others

- MISO
  - Uses $5 - $6/MWh for wind VOM, currently looking at reducing this
- PJM
  - Uses $0/MWh for wind VOM
  - Benefits for most projects are not calculated with a production cost savings component
- ABB

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Summary

- The presence of wind in the model provides a benefit to the market because it's low curtailment price (offer price) reduces LMPs
- Transmission that relieves wind curtailment provides a benefit to the market by reducing LMPs
- When VOM is lower, transmission that relieves wind curtailment provides more benefit to zones with designated wind, through reduced "production costs"
  - When most wind has a PPA, this low VOM doesn't reflect the cost of delivered wind for these zones; a PPA price more accurately reflects the price paid for delivered wind
- VOM Options
  - Low operating cost
  - PPA cost
  - PPA cost for wind with confirmed PPA, operating cost for wind without confirmed PPA

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Recommendation

- The SPP annual data request process for generation shall include reporting of the wind and solar units which have PPAs. Staff will request appropriate documentation of units reported; if documentation is provided, the variable O&M of the unit shall be based on approximate wind and solar PPA pricing, derived from publicly available data. A weighted average of the most recent 5 – 10 year period shall be used.

- For all wind and solar units in which appropriate documentation is not provided to Staff, the variable O&M of the unit shall be $8/MWh to reflect the low operating cost of the unit

- For wind or solar units identified through the resource expansion plan, the variable O&M of the new unit shall be equal to the variable O&M of the majority of existing wind or solar units in the model
  - Example: If 80% of existing wind units have a PPA cost for VOM, new wind units would use a PPA cost for VOM

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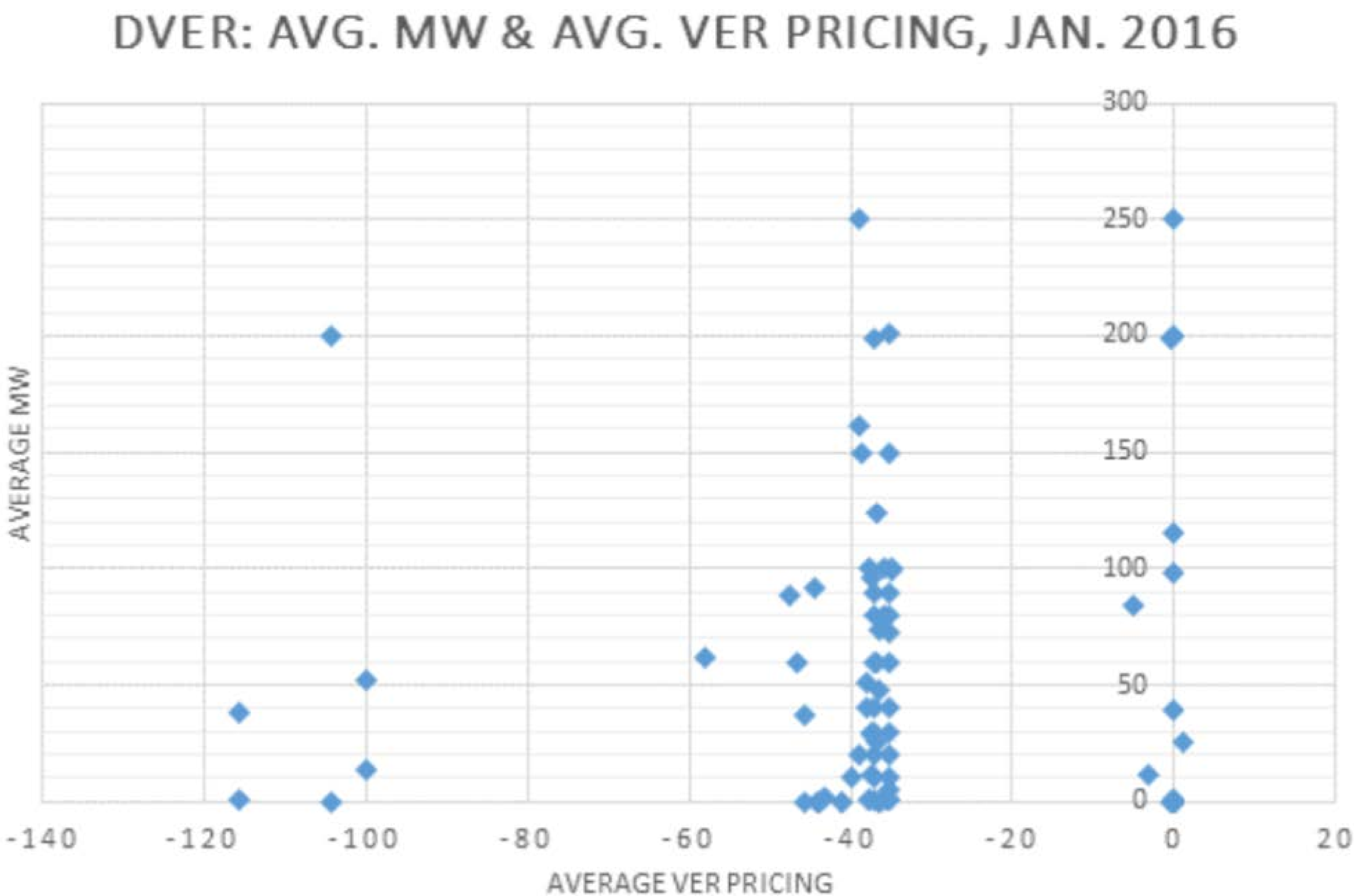
Appendix

PTC ($/MWh)

Current Year	PTC %	ITC %	Wind Farm Construction (In-Service Year)														
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Jan. 1, 2020
2006	100%		$ 23														
2007	100%		$ 23	$ 23													
2008	100%		$ 23	$ 23	$ 23												
2009	100%		$ 23	$ 23	$ 23	$ 23											
2010	100%		$ 23	$ 23	$ 23	$ 23	$ 23										
2011	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23									
2012	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23								
2013	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23							
2014	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23						
2015	100%	30%	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23					
2016	100%	30%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23				
2017	80%	24%			$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18			
2018	60%	18%				$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14		
2019	40%	12%					$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	
2020	0%	10%						$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2021	0%								$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2022	0%									$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2023	0%										$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2024	0%											$ 23	$ 23	$ 18	$ 14	$ 9	-
2025	0%												$ 23	$ 18	$ 14	$ 9	-
2026	0%													$ 18	$ 14	$ 9	-
2027	0%														$ 14	$ 9	-
2028	0%															$ 9	-
2029	0%																-

NOTE: After construction begins the tax payer has 4 years to complete construction, e.g. a wind facility starting construction in 2019 could begin operation in 2023, and the PTC would expire in 2033.
https://www.irs.gov/irb/2016-23_IRB/ar07.html

Historical Wind Offer Pricing, Jan 2016



Source: Strategic Planning Committee background materials, 12/1/16

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ITP Scope Standardization – 40-Year Financial Analysis

Amber Greb

ITP 40-Year Financial Analysis

Current Process

- Calculate 2 data points
- Interpolate between 2 points
- Use slope of 2 data points to extrapolate out to year 20
- Use terminal value (rate of inflation) for years 21-40
- Take NPV of 40 years of data

Issues with Current Methodology

	2020	2025	40-year Ben
Zone A	-$1.4M	$0.4M	$25.3
Zone B	$0.5M	$0.5M	$6.2
Zone C	$1.4M	$0.5M	-$3.9M
Zone D	-$0.9M	-$0.3M	$3.0

Does zone A or B have higher benefit in 2020?

Does zone A or B have higher benefit in 2025?

Which zone has higher 40-year benefit?

Zone C is showing positive benefit in both years.

Zone D is showing negative benefit in both years.

40-Year NPV is of opposite polarity.

Is 40-year benefit driven more by 1-year benefit data, or slope?

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Options for Improvement

- Use a third data point
  - Year 15
    - Same transmission, retirements, etc.
    - Includes only increased load and additional resources
    - Allocation and Siting of resources
  - Year 2
    - Model Available – No additional work
    - Assumes entire portfolio in year 2
    - Introduces uncertainty to trend line due to step changes
- Cap extrapolated benefit at zero if data points are all positive or all negative
- Terminal Value after final data point or five years after (Year 15)

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Methodology Comparison

Current	2020	2025	40-year Ben
Zone A	-$1.4M	$0.4M	$25.3M
Zone B	$0.5M	$0.5M	$6.2M
Zone C	$1.4M	$0.5M	-$3.9M
Zone D	-$0.9M	-$0.3M	$3.0M

What if we used a terminal value 5 years after the final data point (Year 15)

Year 15	40-year Ben
Zone A	$17.7M
Zone B	$6.7M
Zone C	$2.1M
Zone D	-$0.9M

What if we used a terminal value after the final data point (Year 10)

Year 10	40-year Ben
Zone A	$1.2M
Zone B	$7.2M
Zone C	$9.5M
Zone D	-$5.8M

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Methodology Comparison

Current

	2020	2025	40-year Ben
Zone A	$1.4M	$0.5M	-$3.9M
Zone B	-$0.9M	-$0.3M	$3.0M

Capping at Zero

	2020	2025	40-year Ben
Zone A	$1.4M	$0.5M	$4.0M
Zone B	-$0.9M	-$0.3M	-$3.0M

Recommendation

- SPP Staff recommends utilizing a terminal value (escalated at the rate of inflation) beginning no later than 5 years after the final data point


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ITP Scope Standardization – Benchmarking

ESWG

February 15th, 2017

SPP Staff

Why Benchmark?

- Assess reasonability of PROMOD simulations
- Catch errors and fine tune the results of PROMOD runs
- Build confidence in the model through comparisons to historical data

Approaches to Benchmarking

- Build a current year economic model, and validate outputs against historical data.
  - Requires building an additional economic model.
  - Closer comparison of historical data to simulated data.

- Compare current study year economic model to previous study year economic model and historical data.
  - Additional economic model build not required.
  - Study year model not easily compared to historical data.

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Benchmarking Considerations

- Follow a process from a previous ITP10 study.
- May not be necessary to benchmark the model with every study.
  - Benchmarking process could take place outside of the ITP process.
  - Incorporate reasonableness checks to take place during model build milestone.
- Possibly work with a consultant to develop an extensive process later on.
- SPP Staff periodically provide reports from economic model(s) to Stakeholders for review and feedback during model build process.

Recommendation

- SPP Staff recommends utilizing the year 2 study assessment model to validate modeling parameters to determine if operation is reflective of the SPP system.
  - Data validation may include the following:
    - Capacity Factor by Unit Type
    - Maintenance Outages
    - Operating and Spinning Reserves
    - Average Cost per MWH
    - System LMPs
    - Interchange (Import/Export)
    - APC comparison
    - Renewable Generation Profiles

  - This data will be compared to the most recent SPP operational data and previous study models as needed.