Southwest Power Pool

Economic Studies Working Group

September 12-13, 2018

41st Floor AEP Office – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

SPP-MISO Study:

1. Approved a recommendation for SPP to utilize the current JOA language and use 20 year benefits for the purposes of calculating benefit for SPP-MISO CSP study
2. Approved a motion that SPP shall use an equal weighting of each ITP future for calculating benefit for the SPP-MISO CSP study unless, through the applicable SPP stakeholder process, the SPP formally adopts a different weighting that shall then be used instead of the equal weighting for the CSP scope development

2020 ITP Futures:

3. Approved the projected wind and solar amounts in futures 1 and 2 of the 2020 ITP assessment as shown in the presentation

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

September 12-13, 2018

41st Floor AEP Office – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

There were 20 in-person participants and 48 web conference participants, representing 15 of 17 ESWG members. (Attachment 1 – September 12-13, 2018 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC) asked for any proxy statements; two proxies were identified. (Attachment 2 – Proxy Statements)

- Al Tamimi (SUNC) named Cliff Franklin (SUNC) as his proxy
- Natasha Henderson (GSEC) names John Olsen (Evergy) as her proxy

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – September 12-13, 2018 ESWG Agenda).

Anita Sharma (AEP) made a motion; seconded by John Olsen (Evergy) to adopt the agenda. The motion was approved unanimously.

Agenda Item 1d – Antitrust Reminder

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

Agenda Item 2 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. Action Items 185 and 186 are set to complete in late October. (Attachment 4 – Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – July 26-27th, 2018 (Attachment 5 - 20180726 ESWG Minutes)

The Consent Agenda was approved unanimously.

The minutes for August 15-16th, 2018 were removed from the consent agenda for a correction.

Agenda Item 4 – 2019 ITP Items

Agenda Item 4a – Schedule

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

Agenda Item 4b – MOPC Update: Resource Siting Plan Adjustment

SPP Staff gave a brief update of the MOPC call that ended right before the ESWG meeting began. The MOPC approved the ESWG recommendation to remove the wind sited at Riverside 345 kV (Tulsa Area) from the 2019 ITP assessment. This change addresses the recent cancelation of the Wind Catcher project.

Agenda Item 4c – Economic Model Build

Clayton Mayfield (SPP) gave a brief update on the economic model build. He reviewed updates to the economic model for pass 6, including Riverside siting adjustments and external resource expansion plan adjustments. Staff will be requesting an email vote to approve the BA Economic Model the first week of October. (Attachment 6b – BA Economic Model Build)

Agenda Item 4d – Constraint Assessment

Clayton Mayfield (SPP) updated the ESWG on the status of the 2019 constraint assessment. Staff has determined the peak and off-peak hours and is currently validating constraints. Staff will be requesting an email vote to approve the constraint assessment the first week of October. (Attachment 6c – Constraint Assessment)

Agenda Item 4d – 2019 ITP Assessment Report Card

Juliano Freitas (SPP) went over the 2019 ITP assessment report card. He reviewed the schedule for the study, all milestones completed since the last report card, current milestones in progress, and upcoming approvals. (Attachment 6d – 2019 ITP Quarterly Report Card)

Agenda Item 5 – SPP/MISO CSP Enhancements

Adam Bell (SPP) presented potential enhancements to the SPP/MISO study process. He explained some of the issues this study has experienced historically, such as the amount of time it takes to build a joint model and inconsistencies between the joint model and the regional models. He also described the inconsistencies in the calculation of benefit metrics between SPP and MISO. SPP and MISO staff have collaborated and proposed removing the joint model, each region will use their own model for the joint study. They are also proposing to expand the benefit metrics to include both adjusted production costs and avoided costs. The benefits determined by utilizing SPP and MISO regional models would be used to calculate the Interregional Cost Allocation, SPP will determine SPP's benefit using SPP regional models and MISO will determine MISO's benefit using MISO regional Models. The interregional planning team is seeking input from the ESWG for two items in the Joint Operating Agreement (JOA). Currently the JOA prescribes using project benefit for the first 20 years of the project life while the SPP regional process utilizes 40 year benefits. For the purpose of calculating SPP's benefit for the SPP-MISO CSP should SPP utilize 20 year or 40 year benefits?

> **Tim Owens (NPPD) made a motion; seconded by Kurt Stradley (LES) to approve SPP utilizing the current JOA language and use 20 year benefits for the purposes of calculating benefit for SPP-MISO CSP process. The motion was approved unanimously.**

MISO utilizes a weighting system when considering projects in multiple futures in their regional process, this would be used in determining MISO regional benefit for purposes of Interregional Cost Allocation. SPP studies multiple futures, but does not utilize a specific weighting system rather evaluating projects on a project by project basis (this can vary from study to study). Which future or combination of regional futures makes the most sense to use in calculating SPP's benefit for the SPP-MISO CSP? (Attachment 7 – SPP/MISO CSP Enhancement)

> **Tim Owens (NPPD) made a motion; seconded by Kurt Stradley (LES) to approve SPP staff's recommendation that if the regional process does not specify a weighting system for SPP's regional futures, SPP will use an equal weight between all futures for the purposes of calculating benefit for the SPP-MISO CSP process. Unless, directed otherwise by the ESWG during the CSP scoping process. The motion was approved unanimously.**

Agenda Item 6 – 2020 ITP Items

Agenda Item 6a – Schedule

Juliano Freitas (SPP) reviewed a presentation on 2020 ITP schedule. He reviewed on-going and up-coming milestones. (Attachment 8 – 2020 ITP Schedule)

Agenda Item 6b – Scope Development

Agenda Item 6bi – Futures

Kirk Hall (SPP) presented on the 2020 ITP futures. He reviewed the renewable trends in the GI queue versus what has been installed over the past 5 and 10 years. Kirk then reviewed the framework for the 2020 ITP Futures, stakeholders discussed the key assumptions for each future. Keith Collins from the SPP Market Monitoring Unit (MMU), provided comments to the group on the following scope topics, coal and gas-fired generators' retirement age and renewable accreditation levels for new wind and solar resources. Keith pointed out that Energy Information Administration (EIA) data shows that the historic average retirement age is 56 years for coal and 50 years for natural gas, from 2013-2017. For the renewable accreditation levels, the MMU performed capacity analysis using the average historic peak hour performance in July and August over the last 3 years. They calculated an average capacity factor for wind between 23-24% and for solar between 38-64%.

Chad Burnett (AEP) presented to the group explaining AEP's approach to electric vehicles in their load forecast. Their analysis focused on location, how many, and how much electricity they are using. Chad showed some different projections, but said that for the submitted load forecast, they include the existing electric vehicles in their footprint with a very small growth rate. Other stakeholders stated that this was consistent with their processes as well. The conversation then shifted back to the charts detailing the different assumptions for Futures 1 & 2. Stakeholders were comfortable with lowering the retirement age, as long as we have an exceptions process. Most felt that an increase in energy demand growth rates was consistent with an emerging technology future. Staff was directed to bring back information on the correlation between battery storage and solar generation requests. Stakeholders began discussing the renewable amounts for futures 1 & 2, after the lengthy discussions during the 2019 ITP scope development, most stated that their position hadn't changed over the past year.

> **Jody Holland (SCMCN) made a motion; seconded by Jeremy Severson (Basin) to approve the projected wind and solar amounts as presented (shown below). The motion carried with one opposed, Bennie Weeks (Xcel/SPS).**

	Future 1: Year 5	Year 10	Future 2: Year 5	Year 10
Solar	**3GW**	**5GW**	**4GW**	**7GW**
Wind	**26GW**	**28GW**	**30GW**	**33GW**

Stakeholders began discussing the drivers for a potential 3rd Future, Kirk presented 2 options to get a feel for stakeholders thought on where we should be headed. One option centered on a carbon adder and accelerated retirements based on capacity factor. The other option focused on an increase in projected renewables. Stakeholders asked for a 3rd option combining the two futures and will vote at the next meeting. (Attachment 9a – 2020 ITP Futures, AEP-SPP EV Scenarios, & MMU_2020ITP_ScopeComments)

Agenda Item 6bii – 2020 ITP Scope – Conventional Generator Prototypes

Did not cover agenda item

Agenda Item 6biii – 2020 ITP Scope – Must Run Units

Did not cover agenda item

Agenda Item 6biv – Load Forecast for Resource Planning

Did not cover agenda item

Agenda Item 6bv – Consolidation

Amber Greb (SPP) began discussions for the 2020 ITP consolidation. She reminded the group of where consolidation falls in the ITP process. Amber provided the following overview after establishing a portfolio for each future; we consolidate those two or three portfolios (depending on the number of futures) into one final portfolio for the assessment. Amber reviewed different methodologies that have been used in the past and reminded the group of the decision made for the 2019 ITP assessment, to review each project individually based on a calculation score. Stakeholders reviewed the different scenarios for projects coming out of the future portfolios, and how points might be calculated in each scenario. Amber asked for feedback on the following questions:

- Do stakeholders still agree with the considerations, or criteria for scoring?
- Are the considerations weighted properly (do they have the correct points possible)?
- Are the thresholds appropriate?
- Should we change the minimum point requirements?

Stakeholders brought up that we do not yet know how we will calculate ARR points and would like to understand that better. They also requested a definition of each consideration. The group will continue discussing consolidation after receiving direction from MOPC and SPC on the number of futures for the 2020 ITP assessment. (Attachment 10 – Portfolio Consolidation – Scope)

Agenda Item 6c – Load and Generation

Theva Coleman (SPP) provided an update on the 2020 ITP Generation and Load reviews. She talked about the schedule and stakeholder review periods, changes to the workbooks, and submission deadlines. Theva also reviewed the process for submitting a waiver or resource addition request (RAR). These will be presented to the ESWG in November. (Attachment 11 – Load and Generation Review Update)

Agenda Item 6d – Generation Retirements Consistency

Did not cover agenda item

Agenda Item 10 – 2019 Meeting Locations

Did not cover agenda item

Closing Items

There were no action items from the meeting.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Name	Email	Attendance
Alan Myers	ITC	In Person
Amber Greb	SPP	In Person
Anita Sharma	AEP	In Person
Bennie Weeks	Xcel/SPS	In Person
Bill Leung	NPRB	In Person
Brian Johnson	AEP	In Person
Calvin Daniels (WFEC)	WFEC	In Person
Chad Burnett	AEP	In Person
Cliff Franklin	SUNC	In Person
Jason Davis	SPP	In Person
John Olsen	Evergy	In Person
Jon Iverson	OPPD	In Person
Juliano Freitas	SPP	In Person
Keith Collins	SPPMMU	In Person
Kurt Stradley	LES	In Person
Laura Cummings	Energy Exemplar	In Person
Michael Wegner (ITC)	ITC	In Person
Ryan Yokley	SUNC	In Person
Steve Gaw	Wind Coalition	In Person
Tim Owens	NPPD	In Person
Adam Bell	abell@spp.org	Webex
Andy Berg	andrew.berg@mrenergy.com	Webex
Antonio Barber	abarber@spp.org	Webex
Brad Schwarz	bschwarz@huntpower.com	Webex
Brian Rounds (AESL)	brian.rounds@aeslconsulting.com	Webex
Charles Shue (ITCGP)	cshue@itctransco.com	Webex
Chenal WebEx	awhite@spp.org	Webex
Chris Matthes	camatthes@aep.com	Webex
Clayton Mayfield (SPP)	cmayfield@spp.org	Webex
D Diaz	ddiaz@stonepigman.com	Webex
Dee Edmondson	dedmondson@spp.org	Webex
Derek Johnson (SPP)	jjohnson@spp.org	Webex
Ellen Bailey (SPP)	ebailey@spp.org	Webex
Eric Rodriguez	eric.rodriguezreyes@nee.com	Webex
Gayle Nansel	nansel@wapa.gov	Webex
James Bailey (SPP)	jbailey@spp.org	Webex
Jason Mazigian (BEPC)	jmazigian@bepc.com	Webex
Jason Schmidt (NextEra)	jason.schmidt@nee.com	Webex
Jay Caspary	jcaspary@spp.org	Webex
Jeff Knottek	jeff.knottek@cityutilities.net	Webex
Jeremy Harris (Westar|Evergy	jeremy.harris@westarenergy.com	Webex
Jeremy Severson	jseverson@bepc.com	Webex
Jody Holland	jholland@gridliance.com	Webex
Joe Dan Wilson (GSEC)	jwilson@gsec.coop	Webex
Joe Fultz	jfultz@grda.com	Webex
John Boshears	john.boshears@cityutilities.net	Webex

Josh Norton	jnorton@spp.org	Webex
Josie Daggett	daggett@wapa.gov	Webex
Kelsey Allen	kallen@spp.org	Webex
Kenny Hale	kenny.hale@cityutilities.net	Webex
Kevin Foflygen	Kevin.Foflygen@cityutilities.net	Webex
Kirk Hall	khall@spp.org	Webex
Lane Sisung	lane@sisung.com	Webex
Liz Gephardt (SPP)	lgephardt@spp.org	Webex
Matthew Rudy	mrudy@itctransco.com	Webex
matthew stoltz	mstoltz@bepc.com	Webex
Michael Watt (OMPA)	mwatt@ompa.com	Webex
Nikki Roberts	nroberts@spp.org	Webex
Phil Westby (BEPC)	pwestby@bepc.com	Webex
Randy Collier (CUS)	randy.collier@cityutilities.net	Webex
Rodney Massman	Rodney.Massman@psc.mo.gov	Webex
Ryan Baysinger	ryan.baysinger@kcpl.com	Webex
Shawnee Claiborn-Pinto	shawnee.claiborn-pinto@puc.texas.gov	Webex
Steve Hohman	shohman@oppd.com	Webex
Steve Rowley	srowley@bhetransmission.com	Webex
Theva Coleman (SPP)	tchanthaseny@spp.org	Webex
Yohan Sutjandra (TEA)	ysutjandra@teainc.org	Webex
Zach Quintero	z.quintero@occemail.com	Webex

John Olsen for Natasha Henderson

From: Tamimi, Al [mailto:atamimi@sunflower.net]
Sent: Wednesday, September 12, 2018 3:20 PM
To: Franklin, Clifford <cfranklin@sunflower.net>; Myers, Alan K. <amyers@Itctransco.com>
Subject: [EXT] Re: Did you send Alan Meyer an email providing your proxy vote at ESWG?

Cliff Franklin has my proxy for this week ESWG meeting

Sent from my iPhone

On Sep 12, 2018, at 2:12 PM, Franklin, Clifford <cfranklin@sunflower.net> wrote:

Cliff Franklin
Strategy Planning Engineering Supervisor
SEPC - Sunflower Electric Power Corporation
Work Cell: 443-226-7787
Work: 316-689-3589
Work email: cfranklin@sunflower.net

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

September 12-13, 2018

	Action Item	Date Originated	Status	Comments
151	SPP staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress SPP Staff	Staff is compiling information from multiple tools used for economic analysis and resource planning.
183	SPP staff to perform transmission outage analysis in the first part of 2017 to determine the appropriate APC benefit percentage to utilize for the mitigation of transmission outages benefit metric.	September 15th, 2016	In Progress SPP Staff	ESWG Approved the methodology and staff to begin analysis
185	ESWG to continue working on and finalize the Resource Siting Manual	June 29th, 2017	In Progress ESWG	SPP Staff drafting language for stakeholder review; anticipated approval October 2018
186	Formalize the economic model data guidelines and submission process	July 20th, 2017	In Progress SPP staff	First draft posted on August 8, 2018. Staff is implementing feedback and reviewing the document for consistency with first pass of the 2020 ITP Load and Generation Review. Document with applied changes will be posted for ESWG review and approval in October.
187	Address the objections raised to the approved renewable VOM modeling detailed in the ITP manual	July 20th, 2017	In Progress SPP staff/ESWG	
190	SPP staff to perform a full transmission outage analysis before the next RCAR	October 12th, 2017	SPP Staff	
193	Discuss separate load forecasts for resource planning purposes, and how to incorporate into the ITP process	January 22nd, 2018	SPP Staff	
194	Continue researching/discussing curtailment pricing for future studies	April 25th, 2018	SPP Staff	

195	Provide an APC education Session, including VOM and PPAs and how they impact	April 25th, 2018	SPP Staff In Progress	

Southwest Power Pool

Economic Studies Working Group

July 26-27, 2018

2CC Milan-ITC Office, 27175 Energy Way, Novi, MI

• SUMMARY OF ACTIONS TAKEN •

1. Approved moving the POI of the resource originally sited at Tulsa North 345 kV to Riverside 345 kV
2. The ESWG approved using the Pass 5 Economic Models in the constraint assessment milestone with the application of the planned changes detailed in today's presentation
3. Approved Revision Request 317 (Operational Model Development and Economic Operational Needs)

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

July 26-27, 2018

2CC Milan-ITC Office, 27175 Energy Way, Novi, MI

• MINUTES •

Day 1

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 9:00 a.m., welcomed those in attendance, and asked for introductions.

There were 15 in-person participants and 51 web conference participants, representing 16 of 17 ESWG members. (Attachment 1 – July 26-27, 2018 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC) asked for any proxy statements; two proxies were identified. (Attachment 2 – Proxy Statements)

- Natasha Henderson (GSEC) named Evan Racine-Johnson (GSEC) as her proxy
- Jody Holland (SCMCN) named Rachel Hulett (SCMCN) as hid proxy

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – July 26-27, 2018 ESWG Agenda).

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

Agenda Item 1d – Antitrust Reminder

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

Agenda Item 2 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. The group agreed that the ESWG should continue having lessons learned meeting going forward, but that the action item can be closed. (Attachment 4 – Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – May 31st, 2018 (Attachment 5 - 20180531 ESWG Minutes)
b. Meeting Minutes – June 14th, 2018 (Attachment 5 - 20180614 ESWG Minutes)
c. Meeting Minutes – June 29th, 2018 (Attachment 5 - 20180629 ESWG Minutes)

The Consent Agenda was approved unanimously.

Agenda Item 4 – APC Education Session

James Bailey (SPP) presented on Adjusted Production Costs (APC) Calculation Fundamentals. This was the third in a series of presentation on this topic. During this presentation, James built upon his previous presentation by calculating Locational Marginal Prices (LMPs) and Adjusted Production Costs (APC) for a network with a wind unit added. James focused on showing how the calculations are impacted by the

assignment of the wind. He showed an example with merchant wind and an example where the wind was assign to one of the zones. Stakeholders requested that staff add wind to a current model and show actual results at a future meeting. This item will stay on the agenda. (Attachment 6 - APC Education Session)

Agenda Item 5 – 2019 ITP Items

Agenda Item 5a – Schedule

Juliano Freitas (SPP) reviewed a presentation on 2019 ITP schedule. Juliano reviewed on-going and up-coming milestones. It was noted that the Lubbock sensitivity was not included in the schedule, staff will bring an updated presentation when it is available. (Attachment 7a – 2019 ITP Schedule)

Agenda Item 5b – Generator Outlet Facilities (GOFs)

Kirk Hall (SPP) gave an overview of the GOF process. Staff will look at the GI queue as well as the siting availability compared to the sited resource amount. Kirk then informed the group of a change in the GI queue that may impact study results. Between 855-2000 MW was sited at Tulsa North 345 kV between the futures and years. The requested interconnection was moved to Riverside 345 kV (South Tulsa) in the GI queue. Due to the magnitude of this change and the timing, allowing for a change with minimal schedule impact, staff recommended moving the point of interconnection from Tulsa North to Riverside. (Attachment 7b – GOF presentation)

> **John Olsen (Evergy) made a motion; seconded by Anita Sharma (AEP) to approve moving the POI of the resource originally sited at Tulsa North 345 kV to Riverside 345 kV. The motion was approved with two abstentions, Evan Racine-Johnson (GSEC) and Alan Myers (ITC).**
>
> Rationale for abstention
>
> ITC abstained due to lack of information. They would have like to have seen the impact this change would have made had it been included in the original siting plan.

Kirk continued with his presentation showing stakeholders results of the GOF process. He reviewed the GOFs for wind resources, Solar and Conventional.

Agenda Item 5c – Economic Model Build

Clayton Mayfield (SPP) reviewed the economic model pass 5 updates with the ESWG. He gave an overview of the past review periods and results. Clayton explained the upcoming model changes such as adding the generator outlet facilities that were approved, Board approved upgrades, the siting adjustment and requested approval to begin the constraint assessment using the pass 5 models, with understanding that the model will be coming back for final approval. (Attachment 7c – Economic Model Build)

> **Evan Racine-Johnson (GSEC) made a motion; seconded by Kurt Stradley (LES) to approve using the Pass 5 Economic Models in the constraint assessment milestone with the application of the planned changes detailed in today's presentation. The motion was approved with one abstention, Jon Iverson (OPPD).**
>
> Rationale for abstention
>
> OPPD abstained on the recommendation to approve "using the Pass 5 Economic models" based on the economic model and supporting data not being made available to all ESWG stakeholders for review.

Agenda Item 5d – Constraint Assessment

Clayton Mayfield (SPP) provided an overview of the background and methodology for the constraint assessment milestone. He reviewed the governing language for the process and detailed the steps in a flowchart. Clayton informed stakeholders of the upcoming review periods an planned approval dates. Stakeholders can expect to see results at the end of August. (Attachment 7d – Constraint Assessment)

Agenda Item 5e – Operational Project Evaluation

Will Tootle (SPP) reviewed the revision request to update the ITP manual based on the changes to the methodology for evaluating operational projects, which were approved at the July face to face meeting. There were no questions from stakeholders. (Attachment 7e – Operational Model Development RR)

Gayle Nansel (WAPA) made a motion; seconded by Kurt Stradley (LES) to approve Revision Request 317 (Operational Model Development and Economic Operational Needs). The motion was approved unanimously.

Day 2

Chair Alan Myers (ITC) called the meeting of the Economic Studies Working Group (ESWG) back to order at 8:00 a.m. and welcomed those in attendance.

Agenda Item 6 – Lessons Learned

Amber Greb (SPP) led a discussion with the ESWG to review the completed 2019 ITP milestones. The discussion covered the following milestones: Scope, Load and Generation Review, Renewable Policy Review, and Resource Plan Phases 1 and 2. Stakeholders discussed three questions with regard to each milestone. What worked well for this milestone? What didn't work well for this milestone? What could be changed or done differently in future studies? Notes from the robust discussion are included in the minute attachments. (Attachment 8 – 2019 ITP Lessons Learned)

Agenda Item 7 – Resource Siting Manual Update

Juliano Freitas (SPP) presented and asked the ESWG for direction to address action item 185, completing the resource siting manual. The manual documents siting guidelines and details on how sited will be prioritized and ranked. Juliano reviewed additional details that need to be documented in the manual. Staff will send out draft language for the manual and bring it to the September meeting for approval. (Attachment 9 – Resource Siting Manual Update)

Agenda Item 8 – 2020 ITP Items

Agenda Item 8a – 2020 ITP Schedule

Juliano Freitas (SPP) reviewed a presentation on 2020 ITP schedule. Juliano gave an overview of the assessment with projected hours, number of milestones, working group involvement, and projected completion date. Stakeholders reviewed the timelines and schedule for the on-going and up-coming milestones. (Attachment 10a – 2020 ITP Schedule)

Agenda Item 8b – 2020 ITP Scope and Futures Introduction

Kirk Hall (SPP) reviewed the process for developing the 2019 ITP Scope, and went over the draft schedule for the 2020 ITP Scope development. Kirk also presented an introduction to the 2020 ITP futures discussion. He reviewed the futures used in previous studies, the MTEP 2019 futures, and requested feedback from stakeholders on next steps. Stakeholders felt that the futures used in the 2019 ITP study would be a good starting point. Staff will send out a survey to stakeholders to gather potential futures drivers. Results will be reviewed during the August face to face meeting. (Attachment 10b – 2020 ITP Scope and Futures Introduction)

Agenda Item 8c – Load and Generation

Clayton Mayfield (SPP) gave an overview of the Load and Generation milestone that staff has begun working on for the 2020 ITP assessment. The objective of the milestone is to acquire an accurate representation of load and generation within and outside of the SPP footprint, the data will utilized in the ITP Powerbase model. (Attachment 10c – 2020 ITP Load and Generation Review)

Closing Items

There were no action items from the meeting.

The meeting was adjourned at 11:00 AM.

Respectfully Submitted,

Amber Greb

ESWG Secretary


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

SPP Southwest Power Pool

2019 ITP Schedule

Juliano Freitas

October 11, 2018

Powerflow Model (Complete)

- Start: 7/17/2017
- End: 9/12/2018 (Final Approval)
- Member Review Time:
  - Pass 0 – Trial 1: 7/21/2017 – 8/4/2017 (10 days)
  - Pass 0 – Trial 2: 8/11/2017 – 8/25/2017 (10 days)
  - Pass 0 – Trial 3: 9/1/2017 – 9/15/2017 (10 days)
  - Pass 1 – Trial 1: 9/22/2017 – 10/6/2017 (10 days)
  - Pass 1 – Trial 2: 10/13/2017 – 10/20/2017 (5 days)
  - Pass 2: 11/7/2017 – 11/20/2017 (9 days)
  - Pass 3: 12/5/2017 – 12/22/2017 (13 days)
  - Pass 4: 1/19/2018 – 2/1/2018 (10 days)
  - Pass 5: 2/23/2018 – 3/1/2018 (5 days)
  - Pass 5a: Critical idevs approved 3/9/2018 by TWG; updated models posted 3/30/2018 and updated posting 4/02/2018 (5 days)
  - Pass 5b: 157 idev changes; 2 critical updates; updated models posted 5/08/2018 (5 days); Pass 5b approved by TWG 6/1/2018
  - Pass 5c: Inclusion of 2017-AG1 aggregate transmission service study; updated models posted 6/28/2018; Pass 5c approved by TWG 7/11/2018
  - Updated Final BR models posted 7/31/18; pending TWG approval 9/12/2018
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Short Circuit Model (Complete)

- Start: 11/20/2017
- End: 9/12/2018
- Member Review Time:
  - Pass 1: 12/8/2017 – 12/29/2017 (15 days)
  - Pass 2: 1/25/2018 – 2/1/2018 (5 days)
  - Pass 3: 3/1/2018 – 3/9/2018 for MDWG Approval
  - Final ITP posted 8/17/2018; pending Final TWG Approval with model updates 9/12/2018
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG

Economic Model Building

- Start: 7/3/2017
- End: 10/09/2018 (Member's Final Approval)
- Member Review Time:
  - Post 1: 2/12/2018 – 2/23/2018 (10 days)
  - Post 2: 5/8/2018 – 5/22/2018 (10 days)
  - Post 3: 6/6/2018 (informational only)
  - Post 4: 6/29/2018 – 7/16/2018 (10 days)
  - Post 5: 7/19/2018 – 7/26/2018 (5 days)
  - Final Post for Approval: 9/28/2018 – 10/09/2018 (7 days)
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: ESWG

Constraint Assessment

- Start: 8/2/2018
- End: 10/09/2018 (Member's Final Approval)
- Member Review Time:
  - 9/17/2018 – 9/21/2018 (5 days)
  - 9/26/2018 – 10/05/2018 (7 days)
  - Final Post for Approval: 9/28/2018 – 10/09/2018 (7 days)
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: TWG

Economic Model Conversion to Powerflow (BA Models)

- Start: 8/2/2018
- End: 10/31/2018 (Member's Final Approval)
- Member Review Time:
  - Reactive Settings Review: 10/12/2018 – 10/18/2018 (5 days)
  - TWG Review: 10/24/2018 – 10/30/2018 (5 days)
- Staff Leader: Kelsey Allen (kallen@spp.org)
- Working Group Approval: TWG

Base Reliability Needs Assessment

- Start: 8/2/2018
- End: 11/5/2018
- Staff Leader: Jason Speer (jspeer@spp.org)

BA Reliability Needs Assessment

- Start: 10/31/2018
- End: 1/7/2019
- Staff Leader: Jason Speer (jspeer@spp.org)

Economic Needs Assessment

- Start: 11/1/2018
- End: 1/7/2019
- Staff Leader: Nikki Roberts (nroberts@spp.org)

Policy Needs Assessment

- Start: 11/1/2018
- End: 1/7/2019
- Staff Leader: Nikki Roberts (nroberts@spp.org)

Operational Needs Assessment

- Start: 11/1/2018
- End: 1/7/2019
- Staff Leader: Will Tootle (wtootle@spp.org)

Short Circuit Needs Assessment

- Start: 11/1/2018
- End: 1/7/2019
- Staff Leader: Jason Terhune (jterhune@spp.org)

DPP Window

- Start: 1/8/2019
- End: 2/6/2019
- Member Review Time:
  - Transmission-planning response window (30 calendar days)
- Staff Leader: Ellen Bailey (ebailey@spp.org)

Staff Solutions Development

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

DPP/Solutions Evaluations

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

Initial Reliability Portfolio Development

- Start: 2/7/2019
- End: 3/20/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

Project Grouping – Phase 1
(Conceptual Cost Estimate)

- Start: 1/18/2019
- End: 4/23/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)

Study Cost Estimates – Round 1

- Start: 4/24/2019
- End: 5/16/2019
- Member Response Time:
  - 4/24/2019 – 5/16/2019 (16 days)
- Staff Leader: John O'Dell (jodell@spp.org)

Project Grouping – Phase 2
(Study Cost Estimate – Re-rank)

- Start: 5/15/2019
- End: 5/16/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)

Planning Summit

- Start: 5/17/2019
- End: 6/6/2019
- Member Review Time:
  - Summit Materials (7 days prior to meeting)
- Staff Leader: Ellen Bailey (ebailey@spp.org)

Project Grouping – Phase 3
(Conceptual + Study Cost Estimates using Summit Feedback)

- Start: 6/5/2019
- End: 6/19/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)

Study Cost Estimates – Round 2

- Start: 6/20/2019
- End: 6/26/2019
- Member Response Time:
  - 6/20/2019 – 6/26/2018 (5 days)
- Staff Leader: John O'Dell (jodell@spp.org)

Final Reliability Portfolios Development

- Start: 6/26/2019
- End: 8/5/2019
- Staff Leader: Kelsey Allen (kallen@spp.org)

Project Grouping – Phase 4
(Study Cost Estimate II – Final Re-rank)

- Start: 6/27/2019
- End: 7/8/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)

Project Grouping – Final Determination

- Start: 6/28/2019
- End: 7/8/2019
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)

Optimization

- Start: 7/9/2019
- End: 7/17/2019
- Staff Leader: James Bailey (jbailey@spp.org)

Portfolio Consolidation

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

Staging

- Start: 8/5/2019
- End: 8/15/2019
- Staff Leader: Kirk Hall (khall@spp.org)

Benefit Metrics Calculation

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

Stability Analysis

- Start: 8/5/2019
- End: 8/26/2019
- Staff Leader: Derek Johnson (djohnson@spp.org)

Sensitivity Analysis

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

Final Reliability Assessment

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

Rate Impacts/ATRR

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

Final Report

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

TWG/ESWG Final Approvals

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

MOPC and SPP Board

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


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BA Economic Model Build

Clayton Mayfield

September 12-13, 2018

Objective

- Review BA Economic model Pass 6 updates
  - Riverside siting adjustments
  - External resource expansion plan adjustments
  - Other updates
- Next Steps

BA Economic Model Pass 6 Updates

Riverside Siting Adjustments

- Removal of wind units at Riverside in Future 1 and Future 2 year 5 and 10
- Removal of Riverside GOF in the Future 2 BA powerflow models
  - Updated winter ratings in the BA Economic model to reflect change
- Updated conventional resource expansion units in both futures

External Resource Plan – TVA Adjustments

- TVA Resource expansion plan sited on SPP wires:
  - Interruptible Loads had no change due to $300 curtailment price keeping them from generating
  - MRES shared resource had no change due to load being shared between SPP and MISO and MW of unit is small
  - Solar and Wind units that where mapped to SPP and MISO wires:
    - SPP owned buses mappings removed
    - MISO owned buses were assigned full allocation
  - Solar and Wind units that where mapped *only* to SPP wires:
    - Set applicable units to inactive
    - Increased existing wind farms max capacity (MW) while also adjusting the annual energy (GWh)

External Resource Plan – Interpolation Methodology

- MTEP18 study years do not align with the 2019 ITP study years
- Interpolation methodology was not incorporated in Pass 5 BA Economic model
- Wind units with PMAX (MW) increases after in-service date were modeled as multiple units to implement curtailment price criteria
- Added solar profile for a MISO solar unit

BA Economic Model – Other Updates

- Area structure:
  - Public Service Company of Oklahoma moved to AEPW ALL
  - Deleted Entergy Gulf States
- Pass 5d Powerflow updates:
  - Demand Group load mappings
  - Load updates
  - Future 2 Energy (GWh) increase
  - Specific weighted load hub (APC methodology)
  - Topology update to reflect Keeyask hydro plant in service date (Y2 update only)
- Updated external Phase Shifting Transformers to match MTEP18 modeling
  - Lower and upper angle limits
  - Retirements
- Adjusted Scaling groups

BA Economic Model – Other Updates II

- Updated DC Line limit (MW)
- Applied winter ratings for all scenarios
- BA Powerflow model updates:
  - Turned off external service station loads
  - Turned off external industrial loads
  - Updated Entergy Arkansas Peak Load (MW) and Peak Energy (GWh)
  - Removed duplicate Peace Garden – Glenbor 230kV line
  - Deactivated Powerflow area 108

Next Steps

BA Economic Model Next Steps

- Apply potential constraint assessment updates to the BA Powerflow and BA Economic models
- 2019 ITP BA Economic model Review Period:
  - ESWG Review Period: 9/17/2018 – 9/21/2018
  - ESWG Approval Review: 9/26/2018 – 10/04/2018
  - SPP request motion for approval: 10/03/2018
  - ESWG Approval voting closes: 10/05/2018
- Build Lubbock Exit Analysis BA Economic models


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Constraint Assessment

Clayton Mayfield

September 12-13, 2018

Objective

- Update on the current status of the constraint assessment process

Constraint Assessment Update

Milestone Update

- Processed PROMOD runs and determined SPP Peak and Off-Peak hours
- Validating PAT identified constraints
- Solicited Stakeholders for 69kV constraints

SCENARIO	OFF-PEAK			PEAK		
	DATE	HOUR (AM)	WIND PENETRATION	DATE	HOUR (PM)	LOAD (MW)
Future 1 Year 2	Sunday, April 4, 2021	4	79.5%	Tuesday, August 3, 2021	5	52,958
Future 1 Year 5	Monday, April 1, 2024	3	100.9%	Tuesday, July 30, 2024	4	52,642
Future 2 Year 5	Monday, April 1, 2024	3	111.3%	Tuesday, July 16, 2024	4	52,882
Future 1 Year 10	Sunday, April 1, 2029	4	100.9%	Wednesday, August 1, 2029	4	54,470
Future 2 Year 10	Sunday, April 1, 2029	4	122.2%	Tuesday, July 17, 2029	4	54,844

Stakeholder Review Period

- Constraint Review Period: 9/17/2018 – 9/21/2018
- TWG Approval Review: 9/26/2018 – 10/04/2018
- SPP requests motion for approval: 10/03/2018
- TWG Approval voting closes: 10/05/2018


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2019 ITP Assessment Report Card

SPP Staff

September 12-13, 2018

Overview

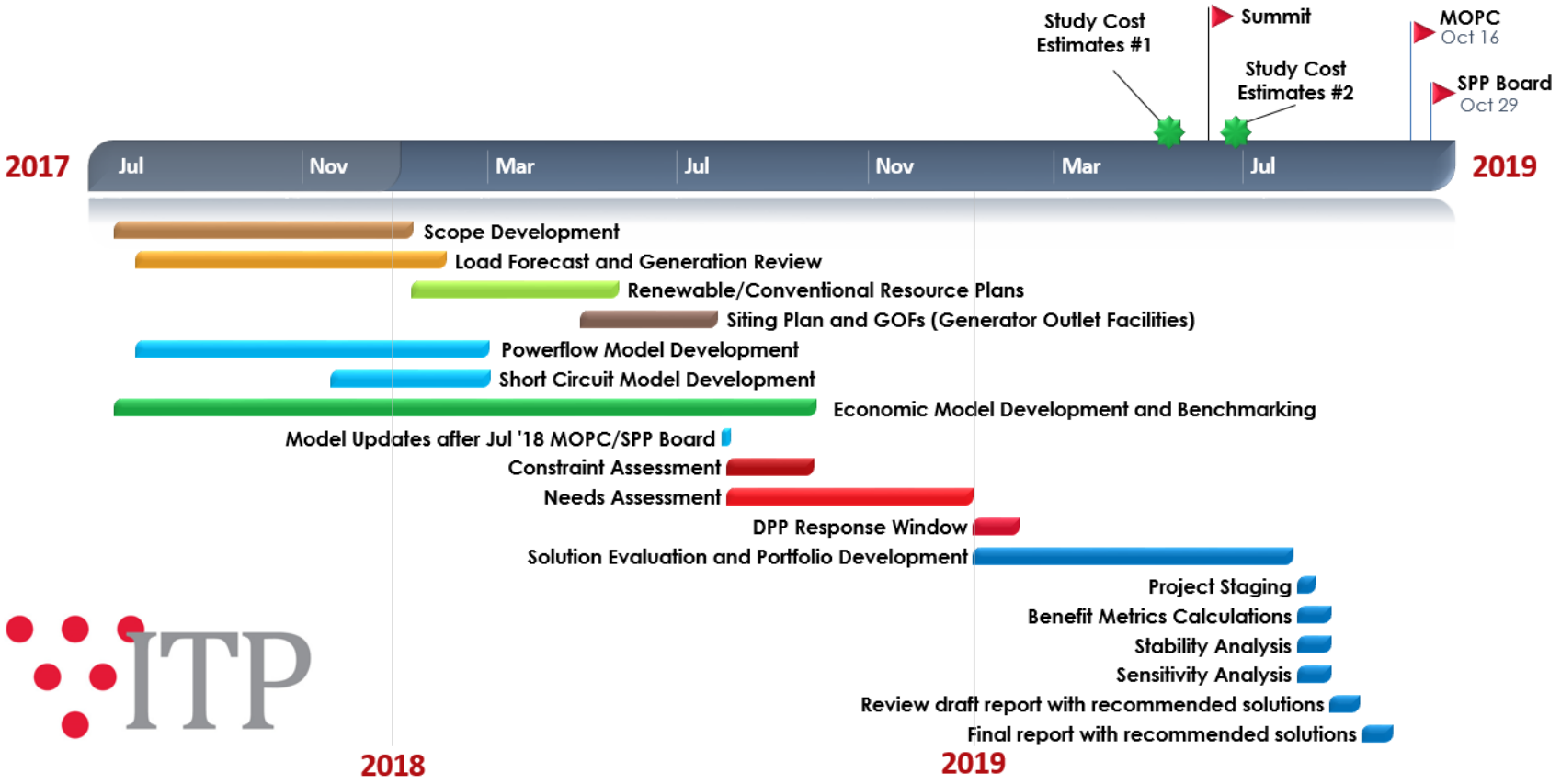
- ITP Manual
- 2019 ITP Timeline
- Summary of Current Milestones
- Milestones In Progress
- Milestone Details
- Appendix

ITP Manual, Section 9.4

SECTION 9.4 MOPC REPORT

- SPP will provide a quarterly report to MOPC highlighting the assessment milestones from the preceding quarter. Updates will be given on adherence to milestone timelines in regard to data review and submittal, scheduled reviews and approvals, and on issues that may have required mitigation for the process to remain on schedule.
- A summary of the participation of SPP and stakeholders will inform MOPC of the importance of the successful completion of milestones and adherence to deadlines critical to produce a complete, high quality, and timely report and portfolio. Issues requiring mitigation, as mentioned previously in this section, whether through the actions of SPP or stakeholders will be presented in sufficient detail to give MOPC a clear picture of the issue and remedies put in place to avoid potential impacts to the process schedule.

2019 ITP Timeline



2019 ITP Milestones – Completed since last report

Milestone	Scheduled End Date	Actual End Date
Generator Outlet Facilities (GOFs)	**7/25/18**	**7/25/18**

2019 ITP Milestones – In Progress

Milestone	Scheduled End Date
Powerflow Model Benchmarking – *Rebaselined*	**10/15/18**
• *Details on slide 8*	
Powerflow Models with updates – Final Approvals	**9/12/18**
• *Details on Slides 9-10*	
Short Circuit Models – Final Approval – *Rebaselined*	**9/12/18**
• *Short Circuit models posted for stakeholder review 8/17/18; ready for TWG approval; no schedule impact*	
Economic Model Build – *Rebaselined*	**10/05/18**
• *Pass 4 posted 6/29/18* • *Pass 5 posted 7/19/18* • *Final Posting for Approval: 9/26/18 – 10/05/2018*	
Constraint Assessment – *Rebaselined*	**10/05/18**
• *Pass 1 scheduled to post: 9/17/18 – 9/21/18* • *Final Posting for Approval: 9/26/18 – 10/05/2018*	
Needs Assessment	**1/07/19**
• *Preliminary work in progress*	

Powerflow Model Benchmarking

- Scheduled Completion: 10/15/18
- Model Benchmarking schedule rebaselined so final 2019 ITP Models could be utilized; no impact to schedule or study results; no additional cost

2019 ITP Powerflow Model – Final Approvals

- Scheduled Approval Date: 9/12/18
  - The changes covered by this Report Card were received and/or implemented after the previous Report Card presented
    - Powerflow model data change requests received were evaluated and resolved following the ITP Manual Section 9.3 process
    - Pending TWG approval of final powerflow models

Appendix

2019 ITP Milestones - Completed

Milestone	Member Review Time	End Date
Powerflow Model - Pass 0 - Trial 1 (posted 7/21/17)	*12 days*	*8/4/17*
Powerflow Model - Pass 0 - Trial 2 (posted 8/11/17)	*12 days*	*8/25/17*
Powerflow Model - Pass 0 - Trial 3 (posted 9/1/17)	*12 days*	*9/1/17*
Powerflow Model - Pass 1 - Trial 1 (posted 9/22/17)	*12 days*	*9/22/17*
Powerflow Model - Pass 1 - Trial 2 (posted 10/13/17)	*12 days*	*10/13/17*
Powerflow Model - Pass 2 (posted 11/7/17)	*12 days*	*11/17/17*
Powerflow Model - Pass 3 (posted 12/3/17)	*17 days*	*12/22/17*
Powerflow Model - Pass 4 (posted 1/19/18)	*12 days*	*2/1/18*
Powerflow Model - Pass 5 (posted 2/22/18)	*12 days*	*2/1/18*
Powerflow Model - Pass 5a (posted 3/30/18) Approved by TWG 3/9/18	*7 days*	*3/9/18*
Powerflow Model - Pass 5b (posted 5/08/18) Approved by TWG 6/1/18	*7 days*	*6/1/18*
Powerflow Model - Pass 5c (posted 6/15/18)	*7 days*	*6/22/18*

2019 ITP Milestones – Completed (cont.)

Milestone	Member Review Time	End Date
Powerflow Model - Pass 5c Final (posted 7/31/18)	*7 days*	*9/12/18*
MDWG Short Circuit Model – Pass 1 (posted 12/8/17)	*12 days*	*12/8/17*
MDWG Short Circuit Model – Pass 2 (posted 1/25/18)	*12 days*	*1/25/18*
MDWG Short Circuit Model – Pass 3 (posted 3/1/18)	*7 days*	*3/1/18*
Scope (Approved Jan. 2018 MOPC)	*7 days*	*1/16/18*
Load/Generation Review (Approved 2/22/18)	*14 days*	*2/22/18*
Renewable Policy Review (Approved 2/22/18)	*7 days*	*2/22/18*
Resource Plan Phase I (Approved 3/15/18)	*6 days*	*3/15/18*
Resource Plan Phase II	*7 days*	*5/23/18*
Siting Plan	*35 days*	*6/14/18*
Generator Outlet Facilities	6 days	7/25/18
Economic Benchmarking	10 days	7/12/18

2019 ITP Upcoming Milestones

Milestone	Member Review Time	End Date
Powerflow Benchmarking	10 days	10/15/18
Powerflow Model Updates/Finalization	7 days	9/12/18
Short Circuit Model Finalization	7 days	9/12/18
Constraint Assessment	12 days	10/05/18
Economic Model Build	42 days	10/05/18
Economic Model Conversion to Powerflow (DC-to-AC) for BA Models	10 days	10/31/18
Needs Assessments (Reliability, Economic, Policy, Operational, Short Circuit)	12 days (Short Circuit)	1/7/2019
DPP Window	7 days	2/6/2019

SPP-MISO CSP Enhancements

Adam Bell abell@spp.org

Background

SPP-MISO CSP Experiences

- Performed two large scale multi-year joint studies
  - 2014 and 2016
- No projects were ultimately approved out of either study
  - Several mutually beneficial projects were initially identified
- Through two iterations of the current study process several lessons learned and barriers to interregional projects were identified
- Additional information in Appendix

SPP-MISO CSP Issues / Project Barriers

- Joint Model Requirement and Approval Process
  - SPP-MISO JOA prescribes the use of a Joint Model for the CSP and a separate Regional Review process resulting in 3 separate approval processes
  - Inconsistencies in the Joint Model and Regional Models are unavoidable unless each region agrees on all model assumptions
  - The timing of building a joint model rarely aligns with SPP or MISO's regional model builds
  - The approval process lacks clarity and consistency between RTOs
- Length of Study Process
  - From the time a study is decided to be performed to potential approval of projects is a very lengthy process (potentially 30 months)

SPP-MISO CSP Issues / Project Barriers cont.

- Benefit Metrics
  - Benefit metrics used to determine cost allocation under the JOA are limited to APC and/or Avoided Cost, depending on project driver
  - Inconsistencies in the calculation of benefit metrics between SPP and MISO
    - SPP and MISO calculate APC differently
- SPP-MISO JOA Interregional Project Criteria
  - JOA Criteria to be eligible for an Interregional Project has limited potentially beneficial projects from moving forward
    - $5M Cost Threshold
- MISO Regional Voltage Threshold
  - MISO tariff requires Economic Interregional Projects with SPP to be 300+ kV to be eligible for regional cost allocation within MISO making projects below 300 kV ineligible

Process Enhancements

SPP-MISO CSP Enhancements Effort

- Based on stakeholder feedback, SPP and MISO staff have collaborated on a proposal for which process enhancements to implement
- SPP and MISO presented proposals at regional and interregional stakeholder groups
  - SPP's Seams Steering Committee (SSC)
  - MISO's Planning Advisory Committee (PAC)
  - Interregional Planning Advisory Committee (IPSAC)

Staff Proposed SPP-MISO CSP Changes

- **Removal of Joint Model Requirement**
  - **Utilize SPP and MISO Regional Planning Processes**
- **Expand Interregional Benefit Metrics**
  - **Include APC and Avoided Cost for all project drivers as determined by each region to determine cost allocation**
- Amend JOA stated Interregional Project Criteria
  - Remove $5M Cost Threshold
- Drafting JOA and Tariff Amendments to Implement the Process Changes
- Other items being considered
  - Increase coordination between Operations and Joint Studies
  - Market-to-Market Impacts (Potentially a Separate Process)
  - MISO Voltage Threshold for Interregional Projects with SPP (MISO Regional Issue)
- Additional Information in Appendix

Interregional Cost Allocation

SPP-MISO CSP Enhancements

- The proposed SPP-MISO CSP Enhancements will impact how the Interregional Cost Allocation between SPP and MISO is determined
  - Removal of Joint Model
  - Additional Benefit Metrics for all Project Drivers
    - Avoided Cost
    - Adjusted Production Cost (APC)

Current SPP-MISO CSP Interregional Cost Allocation

- Benefits determined by utilizing a Joint CSP Model which are used to calculate Interregional Cost Allocation
  - Economic Project → APC
  - Reliability Project → Avoided Cost and APC
  - Public Policy Project → Avoided Cost
- SPP and MISO's % of the projects total 20yr benefit received in joint model is equal to their % of the cost

Proposed SPP-MISO CSP Interregional Cost Allocation

- Benefits determined by utilizing SPP and MISO regional models which would be used to calculate Interregional Cost Allocation
  - SPP will determine SPP's benefit using SPP regional models
  - MISO will determine MISO's benefit using MISO regional Models
- APC and Avoided Cost for all potential Interregional Projects regardless of driver

Proposed SPP-MISO CSP Interregional Cost Allocation cont.

- SPP and MISO's % of the projects total benefit as determined by adding the benefit calculated out of each regional model is equal to their % of the cost
  - *MISO Cost = (MISO Benefit)/(MISO Benefit + SPP Benefit) * Total Cost*
    - *MISO Benefit = NPV of MISO's benefits as calculated in MISO's MTEP process*
  - *SPP Cost = (SPP Benefit)/(MISO Benefit + SPP Benefit) * Total Cost*
    - *SPP Benefit = NPV of SPP's benefits as calculated in SPP's ITP process.*

NPV: Net Present Value

Hypothetical Interregional Project X

- Project X Total Benefit - $70M
  - SPP Benefit - $22M (31.4%)
    - Calculated by SPP in SPP's ITP Process
      - APC – $15M
      - Avoided Cost - $7M
  - MISO Benefit - $48M (68.6%)
    - Calculated by MISO in MISO's MTEP Process
      - APC - $48M
      - Avoided Cost – $0
- Project X Total Cost - $19M
  - SPP Cost Responsibility - $5.97M
  - MISO Cost Responsibility - $13.03M

ESWG Consideration

20yr vs. 40yr

- Currently the JOA prescribes using project benefit for the first 20 years of the project life
  - The SPP regional process utilizes 40yr benefits
  - The MISO regional process utilizes 20yr benefits

RTO Benefit Calculation

- MISO utilizes a weighting system when considering projects in multiple futures in their regional process
  - This would be used in determining MISO regional benefit for purposes of Interregional Cost Allocation
- SPP studies multiple futures but does not utilize a specific weighting system rather evaluating projects on a project by project basis
  - This can vary from study to study

Questions for the ESWG

- For the purpose of calculating SPP's benefit for the SPP-MISO CSP should SPP utilize 20yr or 40yr benefits?
- Which future or combination of regional futures makes the most sense to use in calculating SPP's benefit for the SPP-MISO CSP?

Recommendation

- 20yr vs. 40yr
  - SPP staff recommends, SPP utilize the current JOA language and use 20yr benefits for the purposes of calculating benefit for SPP-MISO CSP process
- Futures
  - SPP staff recommends, If the regional process does not specify a weighting system for SPP's regional futures, SPP will use an equal weight between all futures for the purposes of calculating benefit for the SPP-MISO CSP process. Unless, directed otherwise by the ESWG during the CSP scoping process.

Recommendation-Updated

- Futures
  - SPP shall use an equal weighting of each ITP future for calculating benefit for the SPP-MISO CSP process unless, through the applicable SPP stakeholder process, the SPP formally adopts a different weighting that shall then be used instead of the equal weighting for the CSP scope development.

Appendix

2014 SPP-MISO CSP

- Economic and reliability assessment was performed
- Joint models were built by merging SPP and MISO regional models
- Economic analysis identified three potential projects based on APC benefit calculated in the joint model and approve by the Joint Planning Committee (JPC)
  - Elm Creek to NSUB 345 kV
  - Alto Series Reactor
  - South Shreveport to Wallace Lake 138 kV Rebuild
- The Elm Creek to NSUB and Alto Series Reactor projects were not approved by either RTO out of their respective regional reviews
- South Shreveport to Wallace Lake was approved by the SPP Board of Directors but was not approved out of the MISO regional review

2014 SPP-MISO CSP Lessons Learned

- Building a joint model is very time consuming and presents a lot of challenges
- Identified inconsistencies between the joint model and regional model
  - Joint model inputs must be agreed upon and can divert from the inputs in the RTO's regional models
  - Due to challenges in building joint models only one future was studied and regional reviews could study multiple futures
- Identified inconsistencies in how each region calculates Adjusted Production Cost (APC)
  - SPP and MISO have different methods for calculating APC
- Benefit metrics allowed by the JOA is limited to APC only for economic projects
  - South Shreveport project also provided SPP reliability benefit but could not be accounted for in cost allocation between SPP and MISO due to the limitations of the JOA

2014 SPP-MISO CSP Lessons Learned Cont.

- Process lacked flexibility in the approval of projects
  - JOA does not allow for further negotiation of cost allocation after the regional reviews
    - Example: negotiation would potentially allow for additional benefit metrics to be considered
- Timing of regional and interregional studies does not align
  - Creates problems in weighing regional projects vs. interregional projects
- No clarity of approval process out of the regional review processes
  - No requirement for projects under regional review go to each RTO's Board of Directors for an up or down vote

2016 SPP-MISO CSP

- Economic assessment was performed studying needs identified in SPP and MISO's regional processes
- Joint models were built by merging SPP and MISO regional models
- Economic analysis identified one potential project based on APC benefit calculated in the joint model and approve by the Joint Planning Committee (JPC)
  - Loop One Split Rock to Lawrence 115 kV circuit into Sioux Falls (I18)
- The I18 project was not approved out of the MISO regional review as the most efficient solution after a robust evaluation
- SPP stakeholders endorsed the report as closure to the study process due to the projects inability to move forward

2016 SPP-MISO CSP Lessons Learned

- Known inconsistencies in how each region calculates Adjusted Production Cost (APC) still exist
- Model building effort was less complicated but still proved to be inconsistent with regional models
- Lacked consistency between regional review analysis and joint study
  - Projects were included in the regional review that weren't fully evaluated in the joint study
- No clarity of approval process out of the regional reviews
  - SPP pursued a process enhancement of requiring the projects to be presented to each RTO's Board of Directors for an up or down vote which was not agreed to by MISO
- JOA Interregional Process Criteria limited potentially beneficial projects from moving forward
  - Cost threshold

Joint Model

Proposal

- Remove Joint Model requirement
- Leverage SPP and MISO regional processes for the evaluation of interregional projects
  - SPP's ITP
  - MISO's MTEP

Rationale

- Removes inconsistencies in the Joint Model and Regional Models
- Shortens the lengthy study process by eliminating the joint model build
- Eliminates the perceived "triple hurdle"
- Ability to study more potential projects under more futures
- The RTOs' regional models reflect regional differences and assumptions acceptable to stakeholders in each region
- JOA changes will reflect clear timelines and touchpoints

Benefit Metrics

Proposal

- Evaluate Adjusted Production Cost (APC) and Avoided Cost for all Interregional Project types
  - Utilize SPP and MISO's respective regional calculations of each metric
- Both APC and Avoided Cost metrics to be used for interregional cost allocation
- Explore the potential of a Market-to-Market benefit metric

Rationale

- Broadens the current JOA prescribed benefit metrics used for Economic and Public Policy projects
- MISO and SPP will ensure rigor of avoided reliability projects
- Continue to explore additional metrics that make sense for Interregional Projects

JOA Interregional Project Criteria

Proposal

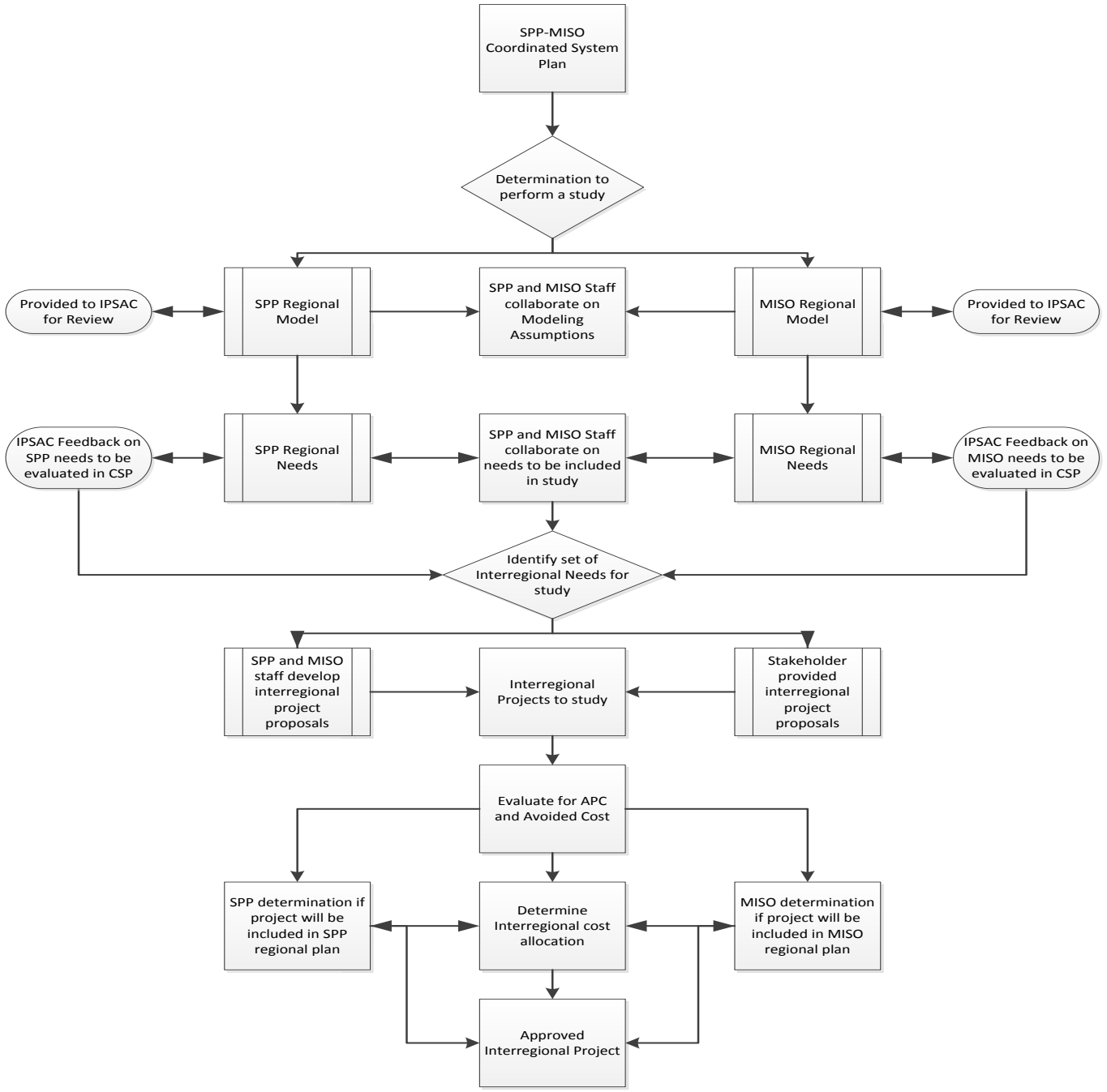
- Remove the cost threshold requirement of $5,000,000
- Do not change the other existing criteria
  - 5% benefit
  - In-service within 10 years
  - Not required to be a tie-line
  - Approved by both SPP and MISO

Rationale

- Expands the solution options which can be evaluated and pursued
- Past studies have identified mutually beneficial projects that have not met this criteria
- Projects will still need to meet the respective RTO's regional metrics

Study Process

- Determination to initiate/perform a study
- Regional model review
- Regional needs review / Determination of interregional needs
- Interregional project proposals
  - Staff and Stakeholders
- Interregional Project evaluation
  - APC and Avoided Cost
- Determine interregional cost allocation
- Regional approval
- Approved Interregional Project


SPP-MISO Coordinated System Plan
Determination to perform a study
Provided to IPSAC for Review
SPP Regional Model
SPP and MISO Staff collaborate on Modeling Assumptions
MISO Regional Model
Provided to IPSAC for Review
IPSAC Feedback on SPP needs to be evaluated in CSP
SPP Regional Needs
SPP and MISO Staff collaborate on needs to be included in study
MISO Regional Needs
IPSAC Feedback on MISO needs to be evaluated in CSP
Identify set of Interregional Needs for study
SPP and MISO staff develop interregional project proposals
Interregional Projects to study
Stakeholder provided interregional project proposals
Evaluate for APC and Avoided Cost
SPP determination if project will be included in SPP regional plan
Determine Interregional cost allocation
MISO determination if project will be included in MISO regional plan
Approved Interregional Project


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

SPP Southwest Power Pool

2020 ITP Schedule

Juliano Freitas

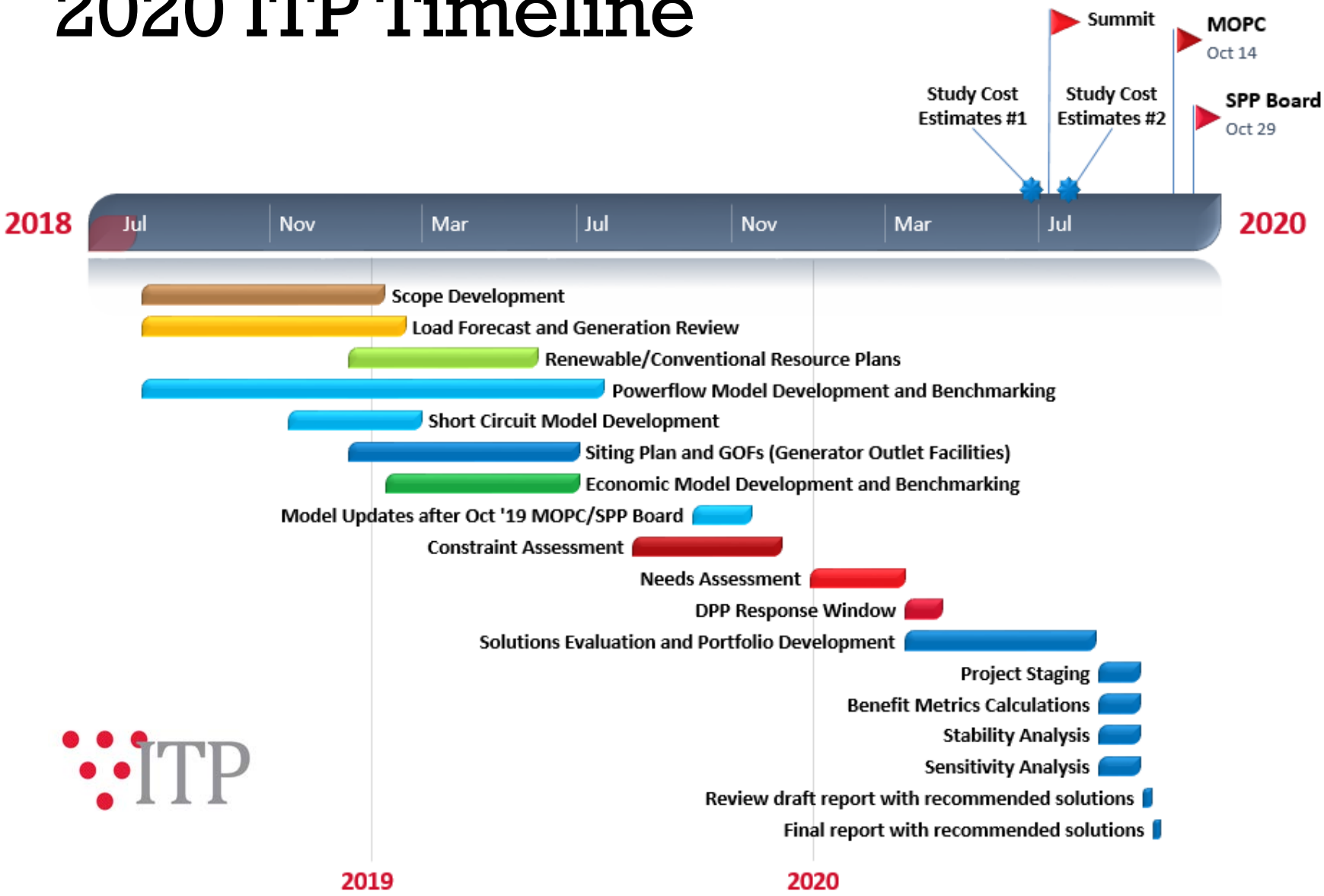
September 12-13, 2018

General Information

- Projected Amount of Hours: 28,000*
- Number of Milestones: 53
- Working Groups Involved: ESWG, TWG and MDWG
- Finishing Date: October 2020

* Based on 2 Futures

2020 ITP Timeline



Scope Development

- Start: 7/23/2018
- End: 1/16/2019 (Member's Final Approval)
  - MOPC Approval: 1/16/2019
- Member Review Time:
  - 12/15/2018 – 12/27/2018 (8 days)
- Staff Leader: Kirk Hall (khall@spp.org)
- Working Group Approvals: ESWG and TWG

Powerflow Model

- Start: 7/09/2018
- End: 2/15/2019 (Final Approval)
- Member Review Time:
  - Pass 0 – Trial 1: 7/13/2018 – 7/20/2018 (5 days)
  - Pass 0 – Trial 2: 8/03/2018 – 8/24/2018 (15 days)
  - Pass 1: 9/14/2018 – 9/21/2018 (5 days)
  - Pass 2: 10/05/2018 – 10/26/2018 (15 days)
  - Pass 3: 11/16/2018 – 12/07/2018 (15 days)
  - Pass 4: 12/21/2018 – 1/11/2019 (15 days)
  - **Final Data Submission Deadline: 1/11/2019**
  - Final Initial ITP: 2/02/2019 – 2/08/2019 (5 days)
  - **Final Initial ITP Approval: 2/15/2019**
  - **Final ITP Approval with Oct. 2019 Board approved projects in Nov. 2019**
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Short Circuit Model

- Start: 11/14/2018
- End: 2/28/2019
- Member Review Time:
  - Pass 1: 12/14/2018 – 12/21/2018 (5 days)
  - Pass 2: 1/17/2019 – 2/01/2019 (10 days)
  - Pass 3: 2/21/2019 – 2/28/2019 (5 days) (MDWG Approval)
  - **Final ITP Approval with Oct. 2019 Board approved projects in Nov. 2019**
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG

Load Review

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

Generation Review

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

Renewable Policy Review

- Start: 1/02/2019
- End: 2/06/2019 (Member's Final Approval)
- Member Review Time:
  - 1/21/2019 – 1/24/2018 (4 days)
  - 1/25/2019 – 2/6/19 (8 days)

- Staff Leader: Joshua Norton (jnorton@spp.org)
- Working Group Approval: ESWG

Policy Renewable Resource Plan – Phase I

- Start: 1/16/2019
- End: 3/15/2018 (Member's Final Approval)
- Member Review Time:
  - 3/08/2019 – 3/15/2019 (5 days)
- Staff Leader: Joshua Norton (jnorton@spp.org)
- Working Group Approval: ESWG

SPP Southwest Power Pool

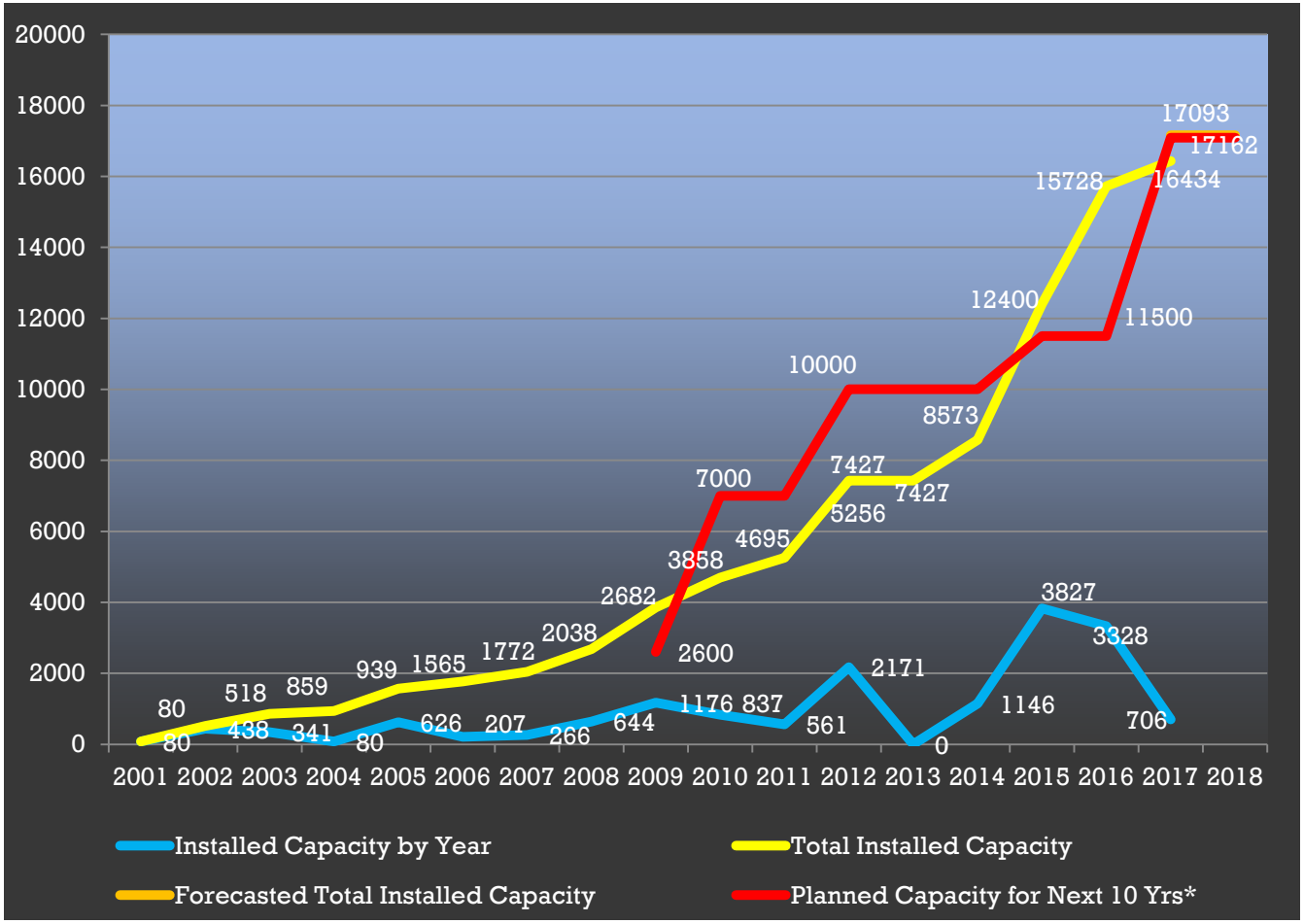
2020 ITP Futures

Kirk Hall

Overview

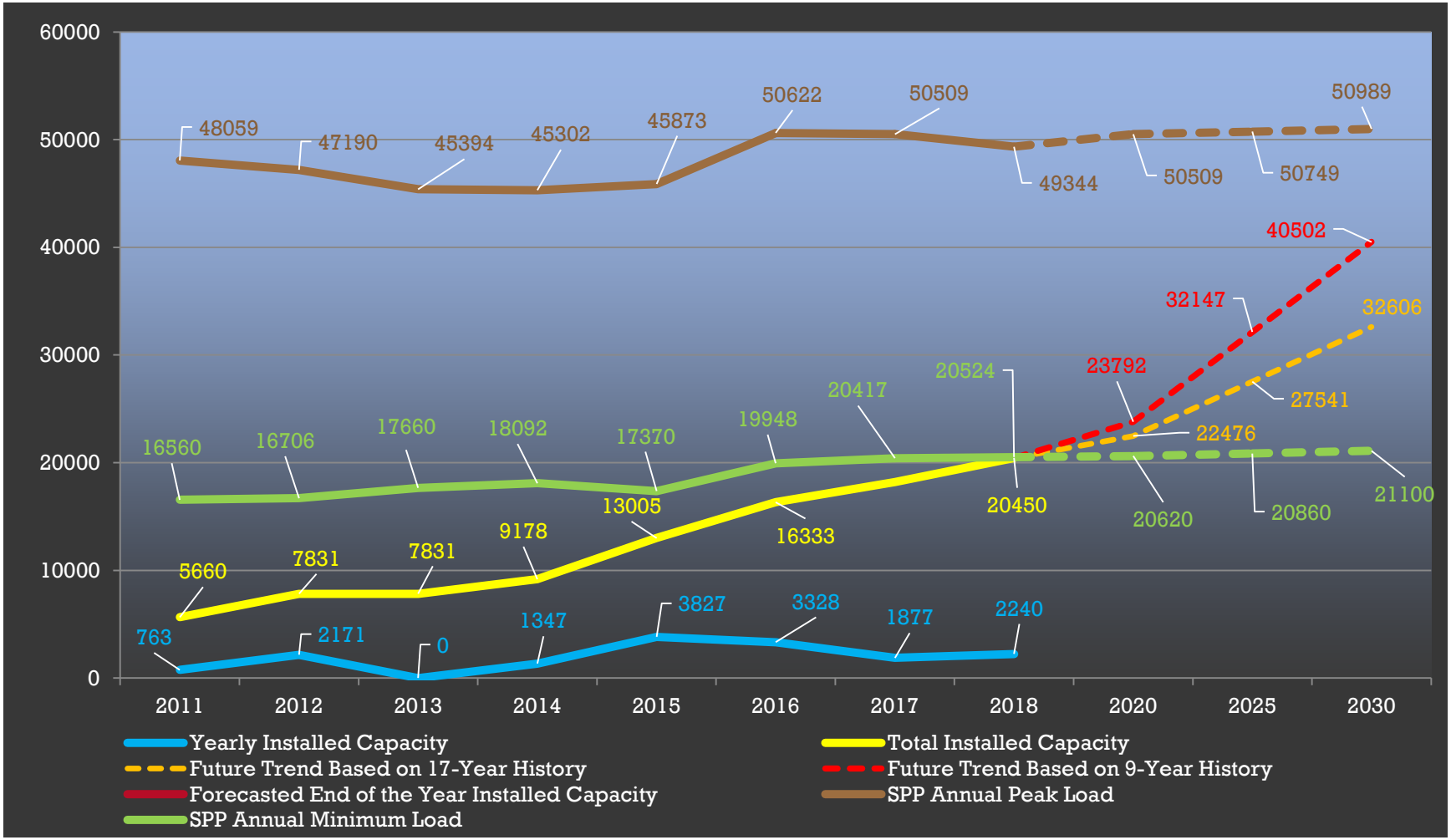
- Objective
  - Renewable Trends (GI Queue vs Installed)
  - Review 2020 ITP Futures framework

Wind Planning vs Wind Development (8/16/2017)



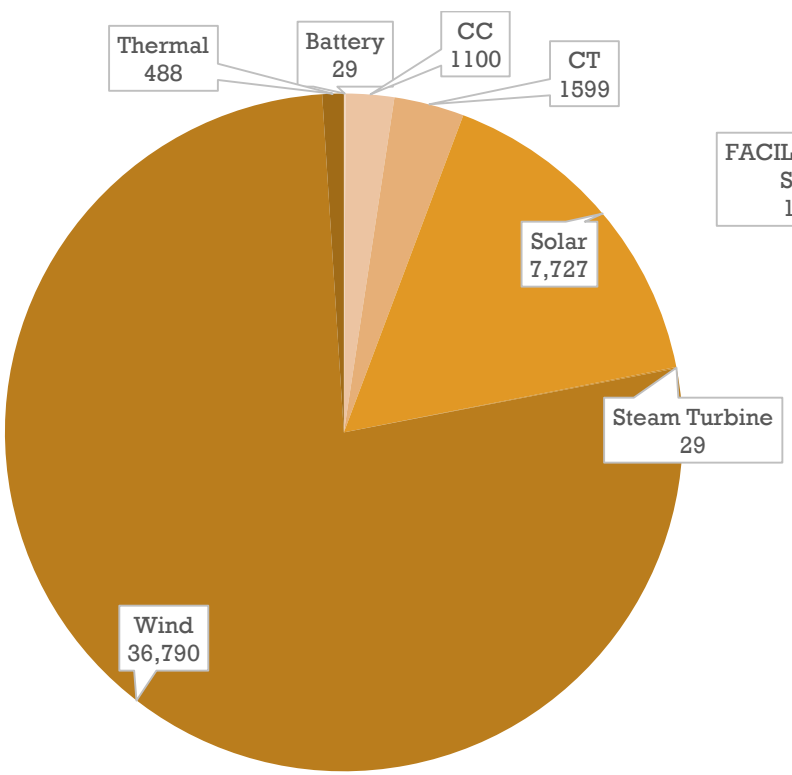
*Business as Usual/Reference Case for Economic Studies Only. Sensitivity case wind levels not included.

Wind Capacity Installed by Year (9/2/2019)

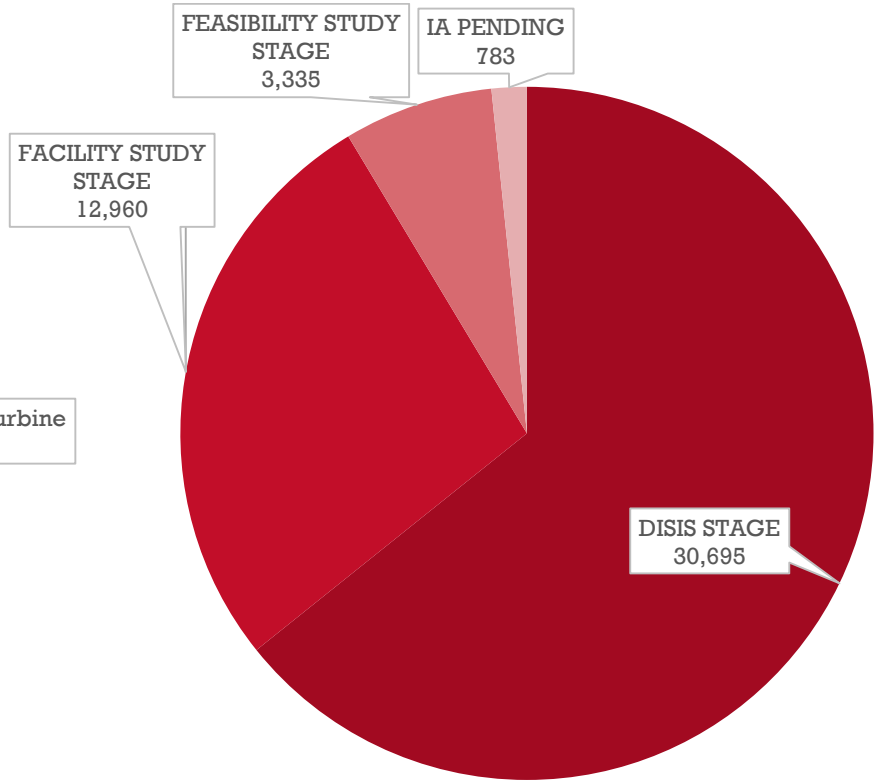


Note: Expected ~21 GW by 12/31/2018

Pending GI Requests by Generator Type & Study Stage 08/2017

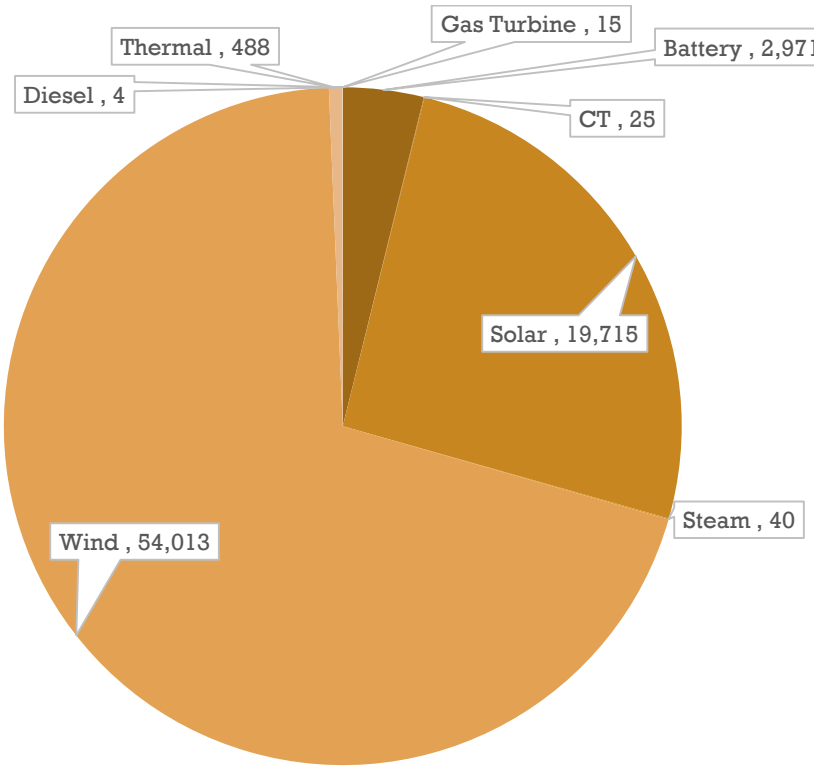


MW Requested by Generation Type

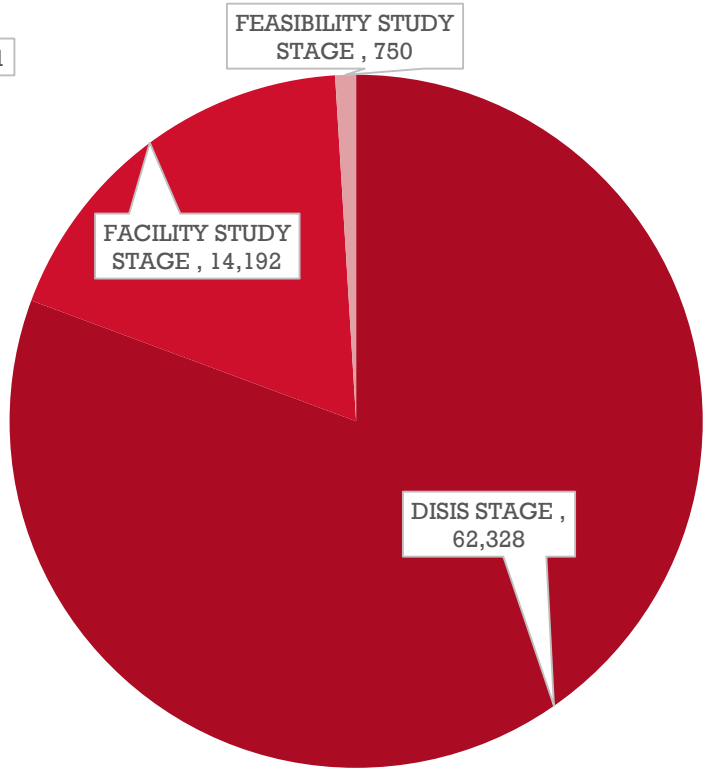


MW Requested by Study Stage

Pending GI Requests by Generator Type & Study Stage 07/2018



MW Requested by Generation Type



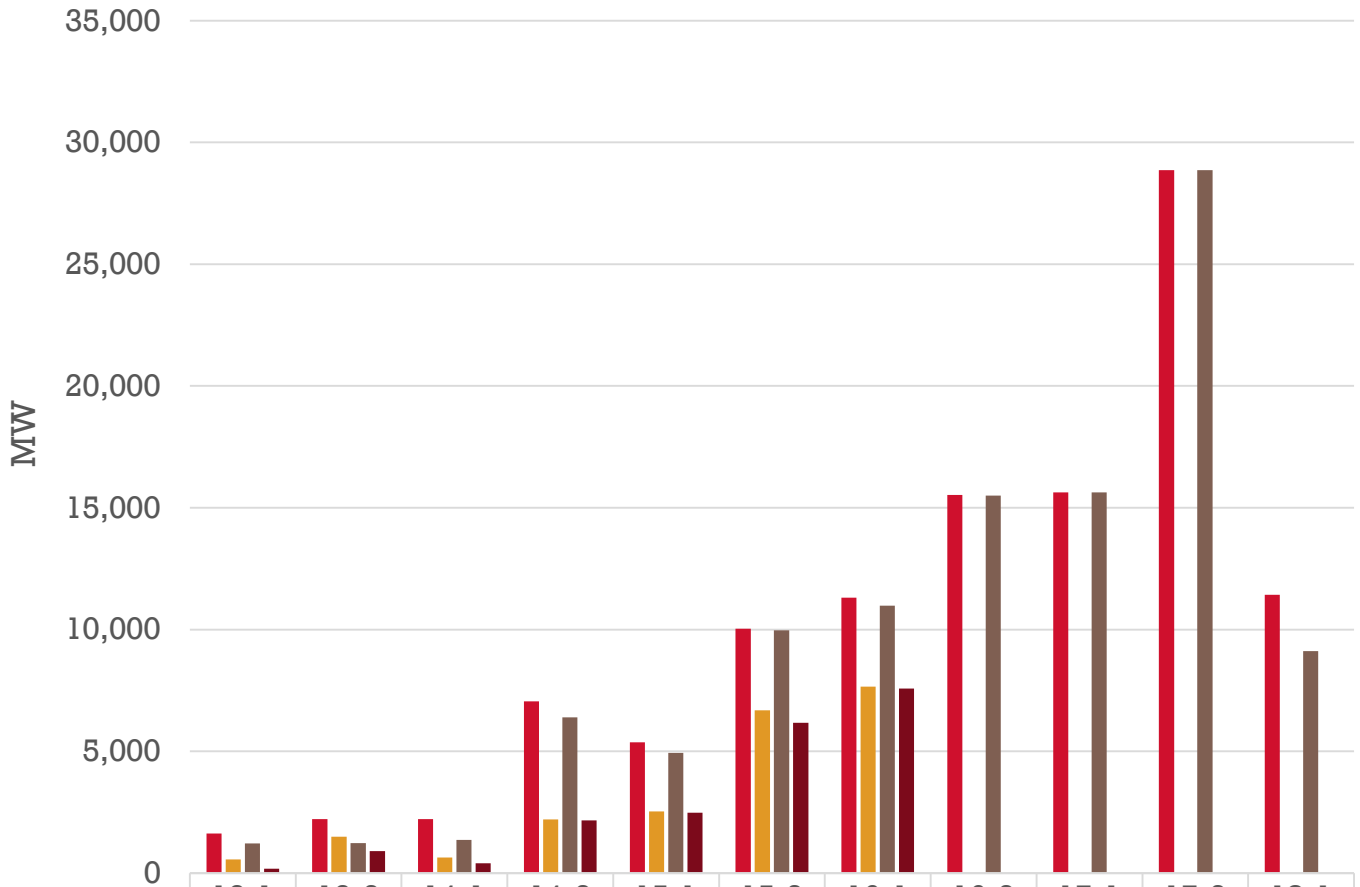
MW Requested by Study Stage

GI Requests by Gen Type and Study Stage

Status	Wind	Solar	Comb. Turbine	Comb. Cycle	Steam Turbine	Thermal	Battery	Total
Feasibility Study	685		1,550	1,100				3,335 (7%)
Preliminary Impact				***August 16, 2017***				0
Definitive Impact	23,559	6,628				488	20	30,695 (64%)
Facilities Study	11,763	1,099	49		29		20	12,960 (27%)
Agreement Pending	783							783 (2%)
TOTAL	**36,790 (77%)**	**7,727 (16%)**	**1,599 (3%)**	**1,100 (2%)**	**29 (0%)**	**488 (1%)**	**40 (0%)**	**47,773**

Status	Wind	Solar	Comb. Turb.	Thermal	Battery	Steam	Diesel	Gas Turb.	Total
Feasibility Study		750							750
Preliminary Impact				***July 24, 2018***					
Definitive Impact	40,829	18,002		488	2951	40	4	15	62,328
Facilities Study	13,184	963	25		20				14,192
TOTAL	**54,012 (69.9%)**	**19,715 (25.5%)**	**25 (.05%)**	**488 (.6%)**	**2971 (3.8%)**	**40 (.05%)**	**4 (<.01%)**	**15 (.2%)**	**77,270**

GI DISIS Studies Since 2013



	13-1	13-2	14-1	14-2	15-1	15-2	16-1	16-2	17-1	17-2	18-1
Original Total MW	1,629	2,213	2,211	7,055	5,366	10,028	11,307	15,522	15,631	28,856	11,421
Latest Restudy Total MW	558	1,490	635	2,205	2,536	6,688	7,656				
Original Wind & Solar Total MW	1,213	1,231	1,361	6,396	4,931	9,963	10,975	15,502	15,631	28,856	9,117
Latest Restudy Wind & Solar Total MW	178	903	410	2,170	2,473	6,177	7,572				

Impact Study

August 16, 2017

Wind Capacity Install Trends

- Current installed capacity ~20.5 GW
  - SPP Ops expect at least 500 MW by 2019
  - ~21 GW of wind
  - Average installed capacity (2015-2018) = ~2950
- PTC set to expire at the end of 2019
  - If installed capacity trend continues, 24 GW of wind by 2020 (i.e. Year 0)
- 2019 ITP Year 2 includes ~18 GW wind, based 2017 totals
  - Due to goal of baselining Year 2 against operations as closely as possible

Reference Case

The reference case will reflect the current trends of the power system industry. Natural gas and coal prices follow current long term forecasts. In the reference case, new environmental regulations are not anticipated. Coal and gas retirements will be based on average lifespan. Renewable generation (Solar and Wind) additions will exceed current Renewable Portfolio Standard Requirements (RPS) due to economics, public appeal, and the potential for future policy changes, as reflected in historical renewable installations.

- Demand and energy growth rates as submitted
- Natural gas prices are consistent with industry long-term reference forecasts
- Renewable additions continue following current GI queue trends
- Renewable resources continue to be competitive
- Coal and gas units will be retired reflecting average lifespan
- No nuclear unit retirements

Emerging Technologies

The emerging technology future is driven primarily by the assumption that distributed generation, demand response, energy efficiency, and storage will have a major impact on load and energy growth rates. Distributed generation, demand response, energy efficiency will decrease load and energy growth rates. A low adoption rate of electric vehicles and rapid increase deployment in of electric storage resources in the SPP footprint will provide some offset the decrease, but overall load and energy growth rates will see a decline. Coal retirements will be based on average lifespan and economics. New technologies will increase the capacity factor at new or re-built wind farms.

- Natural gas prices are consistent with industry long-term reference forecasts
- New technologies will increase the capacity factor at new or re-built wind farms
- A rapid increase in deployment of energy storage devices
- Coal units will be retired reflecting average lifespan and economics
- No nuclear unit retirements

Drivers

Key Assumptions	Reference Case			Emerging Technologies	
	Year 2 (2022)	Year 5 (2025)	Year 10 (2030)	Year 5 (2025)	Year 10 (2030)
Peak Demand Growth Rates	As Submitted in Load Forecast			As Submitted in LF	
Energy Demand Growth Rates	As Submitted in LF			Increase	
Natural Gas Prices	Current Forecast			Current Forecast	
Coal Prices	Current Industry Forecast			Current Forecast	
Emissions Prices	Current Industry Forecast			Current Forecast	
Fossil Fuel Retirements	None	Age-Based-56 yr for coal, 50 yr for gas/oil, subject to GO review		Age-Based-56 for coal, 50 for gas/oil, subject to repowering or emissions upgrades exceptions	
Environmental Regulations	Current Regulations			Current Regulations	
Demand Response	As Submitted in LF			As Submitted in LF	
Distributed Generation (Solar)	Assumed in LF			+300 MW	+500 MW
Energy Efficiency	As Submitted in LF			As Submitted in LF	
Export Lines	No			No	
New/Re-powered Renewables	Increased capacity factor			Increased capacity factor	
Storage	Additions based on RAR	X% of projected solar			
Total Renewable Capacity					
Solar (GW)	Existing + RAR	3	5	4	7
Wind (GW)	21 + RAR	26	28	30	33

Future 3 Options

ITP 2020

Key Assumptions	Drivers			
	Option A		Option B	
	Year 5 (2025)	Year 10 (2030)	Year 5 (2025)	Year 10 (2030)
Peak Demand Growth Rates	As Submitted in Load Forecast		As Submitted in LF	
Energy Demand Growth Rates	As submitted in LF		Increased	
Natural Gas Prices	Increased		Current Forecast	
Coal Prices	Current Industry Forecast		Current Forecast	
Emissions Prices	Current Industry Forecast		Current Forecast	
Fossil Fuel Retirements	Accelerated, based on capacity factor		Age-Based-56 for coal, 50 for gas/oil, subject to repowering or emissions upgrades exceptions	
Environmental Regulations	$22 Carbon Adder		Current Regulations	
Demand Response	As Submitted in LF		As Submitted in LF	
Distributed Generation (Solar)	Increased		More increased	
Energy Efficiency	As Submitted in LF		Increased	
Storage	Increased		More Increased	
Total Renewable Capacity				
Solar (GW)	4	7	Higher	Higher
Wind (GW)	30	33	Higher	Higher

Third Future (Option A)

The third future is driven primarily by the assumption that environmental regulations will be implemented due to a shift in the current political climate. The main driver for this future will be the implementation of a carbon tax. Along with a carbon tax, production tax credits (PTCs)for wind generation will be re-instated, including consideration of solar generation as well. The combination of a carbon tax and re-instatement of PTCs will lead to an even greater increase in renewable generation. Additionally, an increase in coal retirements, energy storage, and distributed generation will be observed. Due to the coal retirements and available renewable energy, gas prices will increase. New technologies will increase the capacity factor at new or re-built wind farms.

- Carbon Tax adder*
- Distributed generation will decrease load and energy growth rates
- Natural gas prices increase slightly due to regulations on fracking
- Accelerated coal unit retirements due to the economics of the carbon tax
- Increased deployment of energy storage devices and distributed generation
- New technologies will increase the capacity factor at new or re-built wind farms

*$22 adder discussed for 2019 Futures

Third Future (Option B)

The third future is intended to be an accelerated emerging technologies future driven primarily by the assumption that electric vehicles, and storage will have a major impact on load and energy growth rates. Distributed generation, demand response, energy efficiency will have a slightly negative effect on load and energy growth rates. A higher than expected adoption rate of electric vehicles and rapid increase deployment of electric storage resources in the SPP footprint will provide an overall load and energy growth rates increase. Coal retirements will be based on average lifespan and economics. New technologies will increase the capacity factor at new or re-built wind farms along with a renewable resource plan forecast higher than the emerging technologies future.

- Natural gas prices are consistent or slightly higher than industry long-term reference forecasts
- A rapid increase in deployment of energy storage devices and adoption rate of electric vehicles
- Overall increase in peak demand and energy growth rates
- New technologies will increase the capacity factor at new or re-built wind farms
- Renewable penetration higher than expected in Future 2
- Coal units will be retired reflecting average lifespan and economics
- No nuclear unit retirements

AEP's Electric Vehicle (EV) Scenarios

Overview of Methodology and Assumptions for
SPP ESWG Meeting

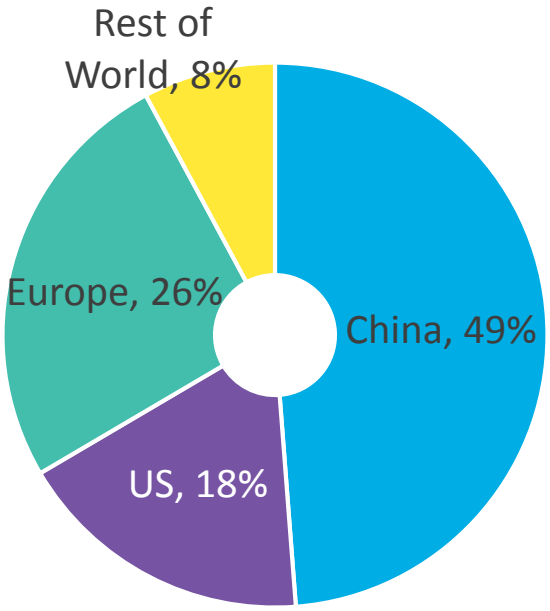
September 13, 2018

BOUNDLESS ENERGY℠

AEP's Electric Vehicle Approach

- ❑ Where Are EV's Located? (Geography)
- ❑ How Many EV's? (Fleet Size)
- ❑ What Kind of EV's? (Fleet Mix)
- ❑ How Much Electricity? (MWh)
- ❑ How Much Capacity? (MW)

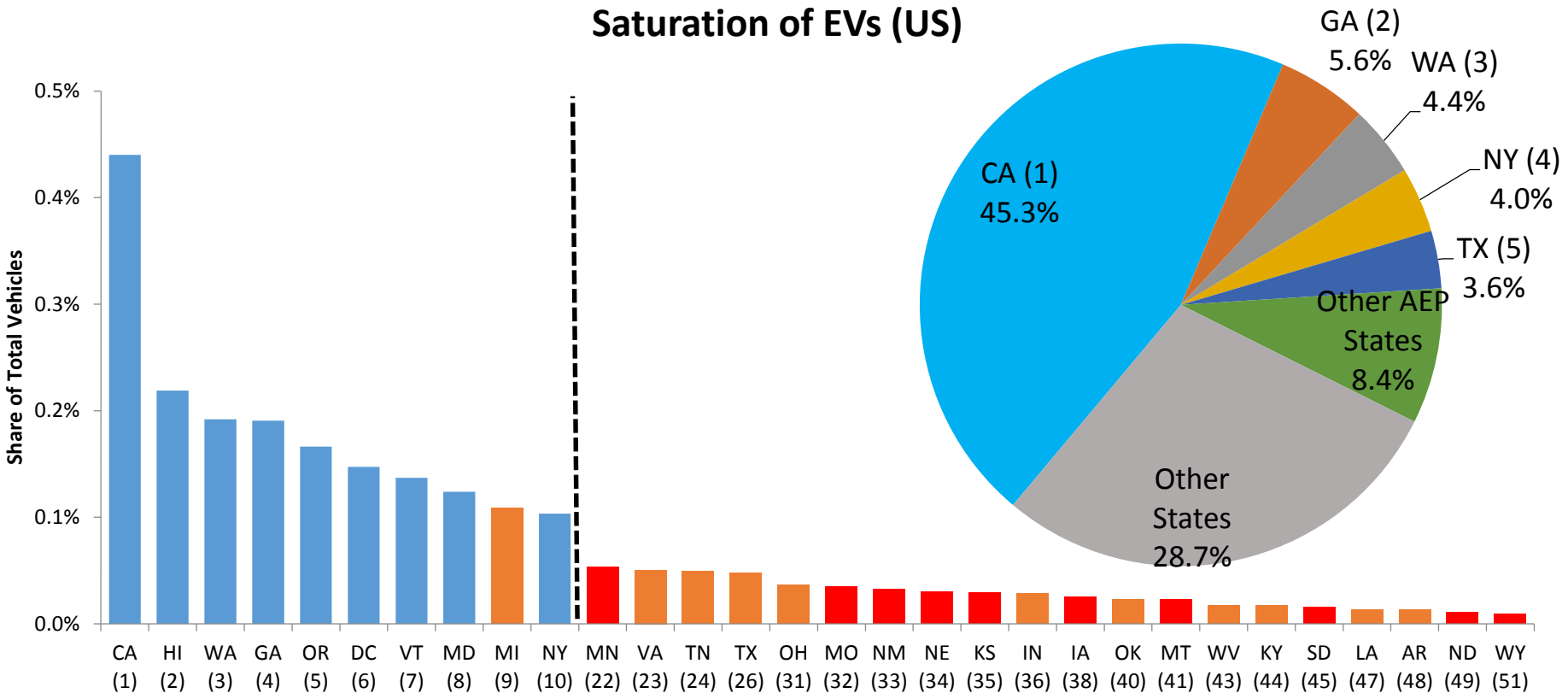
Where Are EV's Going?



Source: Bloomberg New Energy Finance

- 49% of all Electric Vehicles sold in 2017 were in China. 18% of EV's were sold in the US.

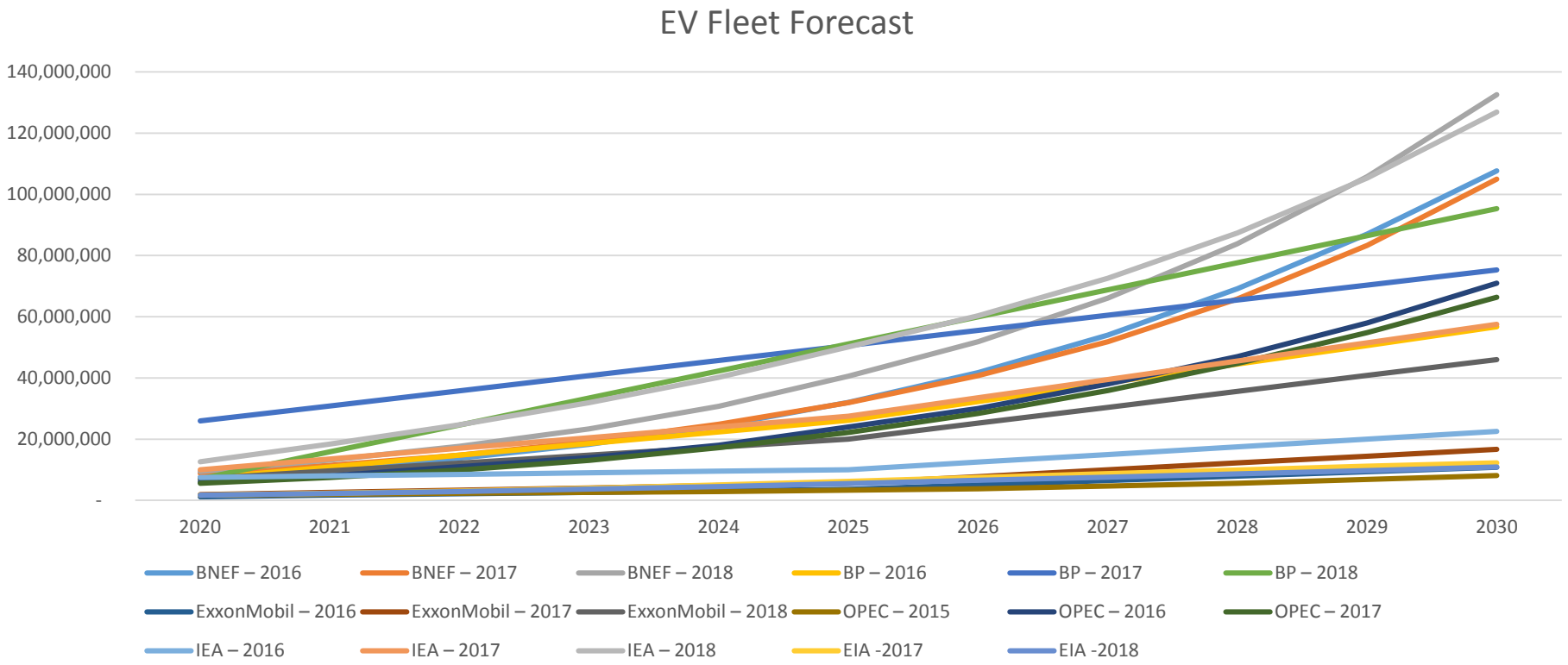
Where Are EV's Located?



Source: US Department of Energy, Vehicle Technology Office

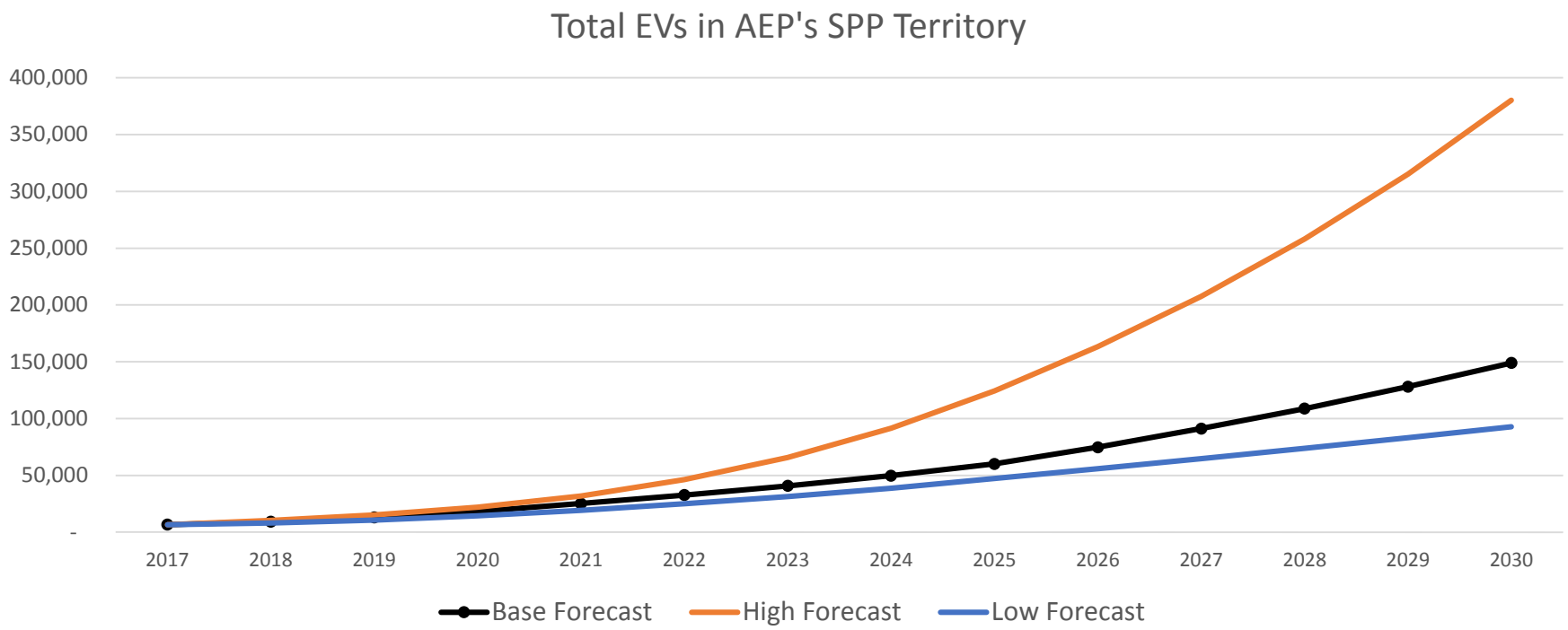
- 45% of all Electric Vehicles in the US are located in California.
- 12% of all EVs are located in AEP states, although AEP doesn't serve many of the metro areas in those states.
- SPP's 14 states make up approximately 7.6% of all EVs, however SPP doesn't cover all of those states either (i.e. Texas).

AEP's EV Scenario Approach



- AEP developed a range of forecasted growth rates based on various EV projections (Bloomberg, BP, EIA, IEA, OPEC, Exxon Mobile, etc.)

EV Adoption Scenarios



- Electric vehicle registration data by zip code was matched with AEP's customer billing system to determine the starting value from which to apply the various growth rates for the scenarios.
- 3 Scenarios: High (40%/yr growth), Medium (30%/yr growth), and Low (25%/yr growth) were developed.

The Mix of EV's

2017 Actuals			
	BEV	PHEV	Total EV
Arkansas	86	182	268
Louisiana	3	4	7
Oklahoma	275	382	657
Texas	7	20	27
Total	371	588	959
% of Total	39%	61%	

2030 Medium Forecast			
	BEV	PHEV	Total EV
Arkansas	2,422	3,632	6,054
Louisiana	63	95	158
Oklahoma	5,937	8,905	14,842
Texas	253	380	633
Total	8,675	13,012	21,687

2030 High Forecast			
	BEV	PHEV	Total EV
Arkansas	6,181	9,271	15,452
Louisiana	161	242	404
Oklahoma	15,152	22,729	37,881
Texas	646	969	1,614
Total	22,140	33,211	55,351

2030 Low Forecast			
	BEV	PHEV	Total EV
Arkansas	1,506	2,259	3,766
Louisiana	39	59	98
Oklahoma	3,693	5,539	9,231
Texas	157	236	393
Total	5,396	8,093	13,489

- Current mix of Electric Vehicles for AEP's SPP region was roughly 60% PHEV and 40% BEV. The current PHEV/BEV mix was projected to continue into the forecast horizon.

Electric Consumption by Vehicle Type

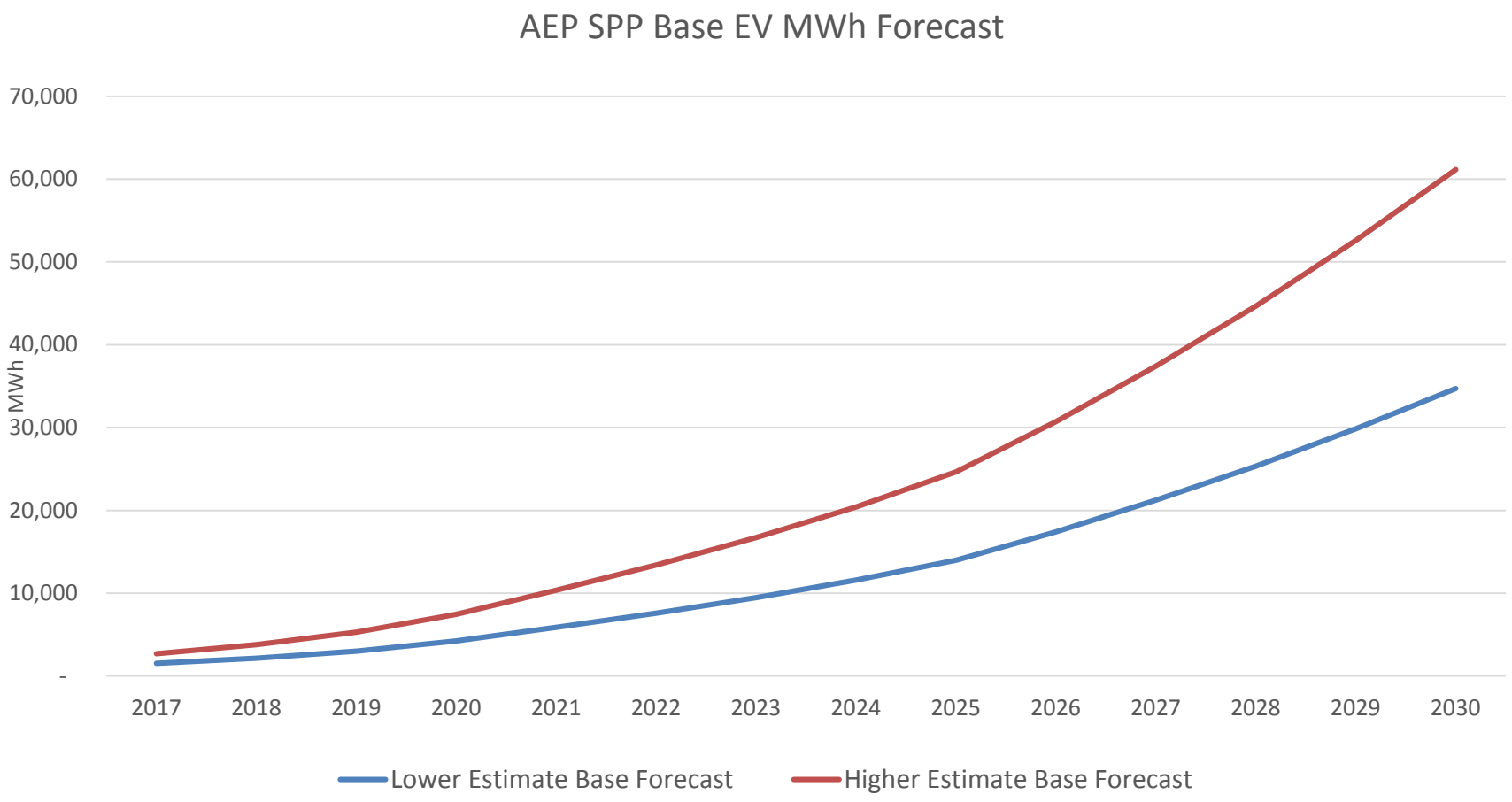
Make	Model	kWh/100 miles
BMW	i3	27
Scion	iQ	28
Chevrolet	Spark	28
Honda	Fit	29
Volkswagen	e-Golf	29
Fiat	500e	29
Nissan	Leaf	33
Mitsubishi	i-MiEV	30
Smart	fortwo	32
Kia	sould electric	32
Ford	Focus electric	32
Tesla	model S	33
BMW	Active E	33
Mini	MiniE	34
Tesla	Model X	36
Mercedes	B Class	40
Toyota	Rav4	43
Nissan	Hyper-Mini	45

BEV		PHEV	
Avg eMiles Driven total	Annual kWh	Avg eMiles Driven total	Avg eMiles Driven total
9600	2,592	3500	945
9600	2,688	3500	980
9600	2,688	3500	980
9600	2,784	3500	1015
9600	2,784	3500	1015
9600	2,784	3500	1015
9600	3,168	3500	1155
9600	2,880	3500	1050
9600	3,072	3500	1120
9600	3,072	3500	1120
9600	3,072	3500	1120
9600	3,168	3500	1155
9600	3,168	3500	1155
9600	3,264	3500	1190
9600	3,456	3500	1260
9600	3,840	3500	1400
9600	4,128	3500	1505
9600	4,320	3500	1575

- Different makes/models have different electricity efficiencies.
- PHEV's typically use less electricity compared to BEV's.

Assumptions		Annual kWh Range	
	eMiles Driven	*Lower*	*Higher*
BEV	9,600	2,500	4,500
PHEV	3,500	1,000	1,700

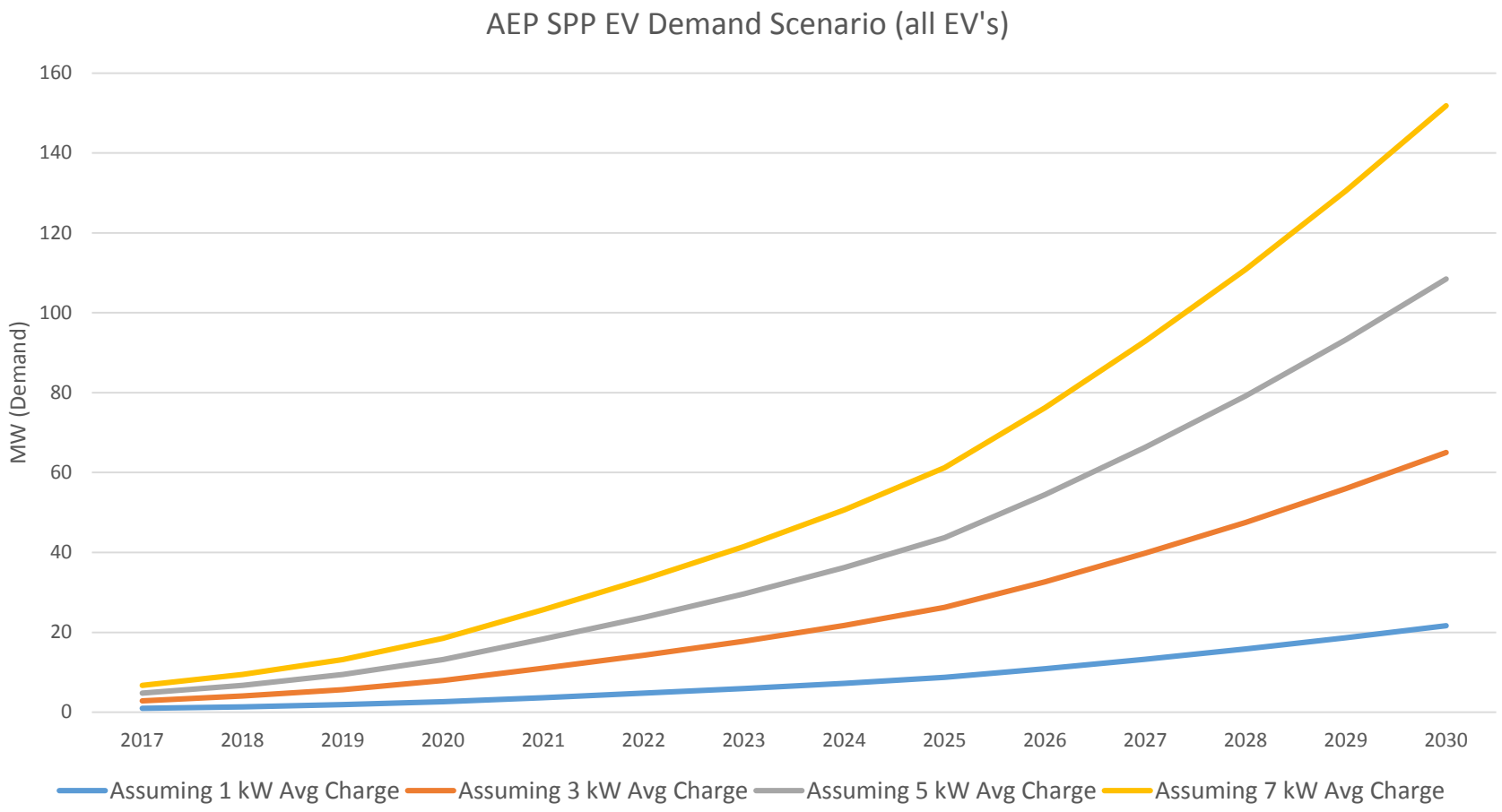
Base EV Forecast Scenario



AEP SPP EV Forecast

	Fleet Size														
	Base Forecast	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**CAGR 2017-30**
Total EVs	Arkansas	268	376	526	737	1,024	1,327	1,655	2,022	2,441	3,039	3,705	4,420	5,206	6,054	30%
	Louisiana	7	10	14	19	27	35	43	53	64	79	97	115	136	158	30%
	Oklahoma	657	922	1,289	1,808	2,511	3,253	4,058	4,957	5,983	7,451	9,082	10,835	12,762	14,842	30%
	Texas	28	39	55	77	107	139	173	211	255	318	387	462	544	633	30%
	Total Evs	**960**	**1,347**	**1,883**	**2,642**	**3,669**	**4,753**	**5,929**	**7,243**	**8,742**	**10,887**	**13,270**	**15,832**	**18,648**	**21,687**	30%
	Electric Consumption (MWh)															
Low End	**Annual MWh**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**CAGR 2017-30**
Total EVs	Arkansas	429	601	841	1,180	1,639	2,123	2,648	3,235	3,905	4,863	5,927	7,072	8,329	9,687	30%
	Louisiana	11	16	22	31	43	55	69	85	102	127	155	185	218	253	30%
	Oklahoma	1,051	1,475	2,062	2,893	4,017	5,205	6,493	7,931	9,573	11,921	14,531	17,336	20,419	23,747	30%
	Texas	45	63	88	123	171	222	277	338	408	508	619	739	870	1,012	30%
	Total Evs	**1,536**	**2,155**	**3,014**	**4,227**	**5,870**	**7,605**	**9,487**	**11,589**	**13,988**	**17,419**	**21,233**	**25,331**	**29,836**	**34,698**	30%
High End	**Annual MWh**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**CAGR 2017-30**
Total EVs	Arkansas	756	1,060	1,483	2,080	2,888	3,742	4,668	5,702	6,882	8,571	10,447	12,464	14,680	17,073	30%
	Louisiana	20	28	39	54	75	98	122	149	180	224	273	326	383	446	30%
	Oklahoma	1,853	2,599	3,635	5,098	7,081	9,173	11,443	13,978	16,872	21,011	25,611	30,554	35,989	41,854	30%
	Texas	79	111	155	217	302	391	488	596	719	895	1,091	1,302	1,534	1,784	30%
	Total Evs	**2,707**	**3,797**	**5,311**	**7,449**	**10,346**	**13,404**	**16,721**	**20,425**	**24,653**	**30,701**	**37,423**	**44,646**	**52,587**	**61,156**	30%

AEP SPP EV Demand Scenario



Questions?

Additional Sources Used:

- https://www.fhwa.dot.gov/ohim/onh00/bar8.htm
- https://insideevs.com/annual-electric-miles-traveled-varies-widely-8-plug-electric-cars/
- https://www.fueleconomy.gov/feg/PowerSearch.do?action=noform&pageno=1&path=1&rowLimit=200&sortBy=Comb&tabView=0&vtype=Electric&year1=1984&year2=2016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Market Monitoring Unit Comments on 2020 ITP Scope

Keith Collins
Executive Director, Market Monitoring Unit, SPP
ESWG Meeting
September 12-13, 2018

MMU's general view

- As noted at the August 2018 ESWG meeting, the MMU would like to provide input to the ITP process as appropriate and as requested.
- The MMU hopes to provide value to this process primarily because the MMU has:
  - Comprehensive market information
  - Data and tools to analyze market issues from different perspectives
- Accordingly, we would like to comment on the 2020 ITP scope which lays out:
  - Parameters and assumptions of the planning process through its futures that will shape results and conclusions

Comments on the 2020 ITP scope

- We understand that the 2020 ITP scope will carry forward the 2019 ITP futures of:
  - Reference Case (Future 1)
  - Emerging Technologies Case (Future 2)
  - Possibility of including a third future
- MMU comments focus on the following two topics:
  - Coal and gas-fired generators' retirement age
  - Renewable accreditation levels for new wind and solar resources
- The values for these two items will play an important role in shaping the futures cases.

Coal and gas-fired generators' retirement age

- The 2019 ITP scope accepted for both 2020 ITP futures assumes coal and gas-fired generators over the age of 60 will retire.
- This assumption appears to underestimate future retirements in the SPP market.
  - Energy Information Administration (EIA) data reveal that the historic average retirement age is:
    - 56 years for coal
    - 50 years for natural gas
  - The 2018 trend in coal and gas retirements is consistent with prevailing market economics suggesting even lower retirement ages going forward over the next 10 years.
    - MMU net revenue analysis shows that at current prevailing market prices, a new coal resource cannot cover fixed O&M costs.

Average age of retirement lower than model assumptions

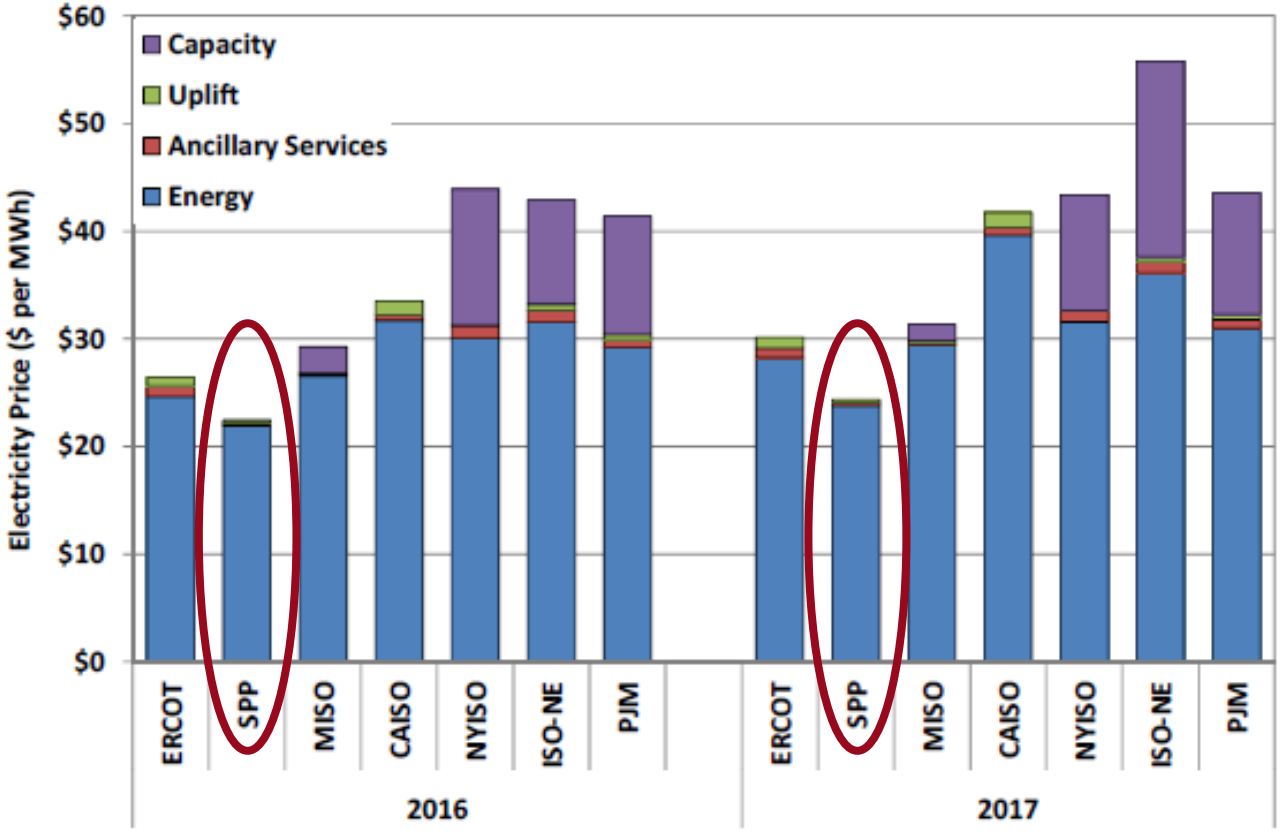
Year	Coal	Gas
2008	53	43
2009	48	52
2010	54	53
2011	64	49
2012	54	48
2013	54	51
2014	56	52
2015	58	48
2016	56	46
2017	56	52
2018*	45	41

Source: EIA-860 Electric Utility Retirements
*2018 data through June 2018

Period	Coal	Gas
2013-2017	56	50
2008-2017	55	49
2002-2017	55	47

Source: EIA-860 Electric Utility Retirements

Low SPP prices make economics of coal unfavorable



Source: ERCOT IMM (Potomac Economics), 2017 Annual Report, Figure 6, p. 8: https://www.potomaceconomics.com/wp-content/uploads/2018/05/2017-State-of-the-Market-Report.pdf.

Conclusion and recommendation on retirement age

- The 2019 ITP scope assumption of 60 years will likely underestimate retirement levels going forward.
- Recommend updating the 2020 ITP assumption on retirement to no more than the prevailing EIA averages for last 5 years for coal and gas resources.

Renewable accreditation levels for new wind and solar resources

- The 2019 ITP scope document used the following accreditation levels:
  - 20 percent for new wind
  - 70 percent for new solar
- Further, accredited renewable capacity will be capped at 12 percent of a load-serving entity's total load.
- No consistent accreditation approach across RTO markets:
  - Some use peak or super-peak hours
  - Some use performance during small set of highest load hours
  - Some use the incremental effect of the loss of load without resource
  - Some differentiate by location or type (coastal v. non-coastal, fixed versus tracking)

Renewable accreditation levels for new wind and solar - SPP

- SPP's 2019 ITP process used the following figures

SPP RTO Wind and Solar Capacity Factors	
Source/Type	**Capacity Factor**
ITP-Wind	20.0%
ITP-Solar	70.0%

- MMU's capacity analysis used average historic peak hour performance in July and August over 3 years

SPP MMU Wind and Solar Capacity Factors	
Type	**Capacity Factor**
Wind- peak hour Wind- super-peak hour	24% 23%
Solar- peak hour Solar- super-peak hour	38% - 45% 53% - 64%

Renewable accreditation levels for new wind and solar - PJM

- PJM uses peak hour average capacity factors

PJM- Wind Class Average Capacity Factors	
Wind Farm Location	**Capacity Factor**
In Mountainous Terrain	14.7%
In Open/Flat Terrain	17.6%

PJM- Solar Class Average Capacity Factors	
Solar Installation Type	**Capacity Factor**
Ground Mounted Fixed	42.0%
Ground Mounted Tracking	60.0%
Other Than Ground Mounted	38.0%

Summary of renewable capacity factors (percent)

Market	Wind*		Solar		Note
	Winter	Summer	Winter	Summer	
SPP	20		70		
PJM	14.7-17.6		38-42, 60		60 for tracking not for fixed
NYISO	30	10	0-2	28-43	Solar fixed only
MISO	15.2		50		
CAISO	8.4-18.3	26.5-47.5	0-44.8		Solar utility scale
ERCOT	20	14	9.8	75	Only 20 observations
ISO-NE	39	14		43	

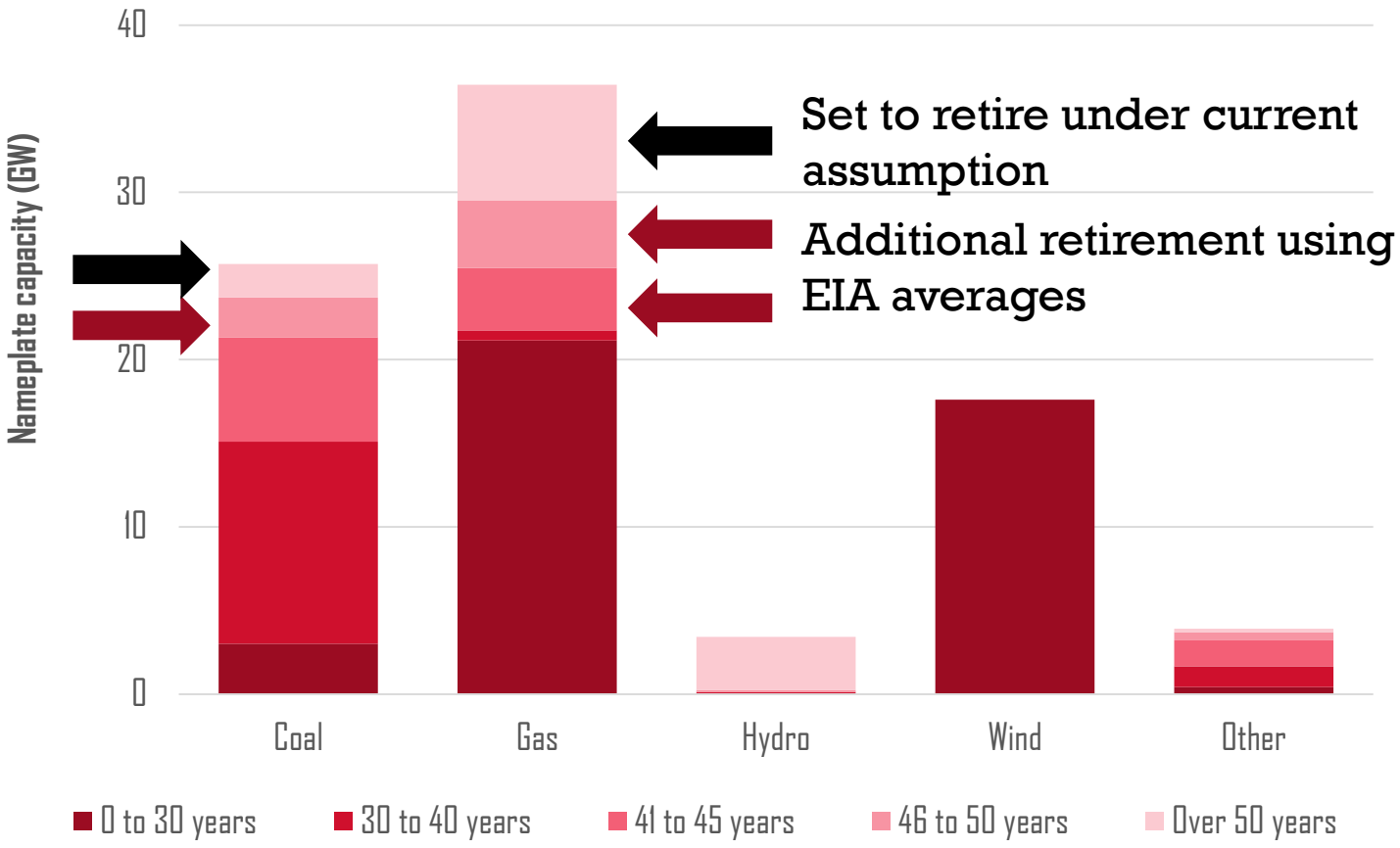
*Excluded off-shore/coastal wind

Conclusion and recommendation on renewable accreditation values

- Comparing the SPP accreditation numbers with historical performance suggests that the wind may be understated and solar accreditation numbers may be overstated in the 2020 ITP.
- Recommend updating the 2020 ITP with wind and solar accreditation numbers that are more consistent with historic performance.
- In parallel, develop a documented and dynamic approach.
  - Similar to how other RTOs document their dynamic approaches.
  - Stakeholders would provide input on approach.

Appendix

Average age of generators in the SPP market



Source: Derived from the SPP MMU 2017 Annual Report, Figure 2-12, p. 27: https://www.spp.org/documents/57928/spp_mmu_asom_2017.pdf.

Renewable accreditation levels for new wind and solar - NYISO

- NYISO uses seasonal capacity factors

NYISO Wind Capacity Factors	
Season/Type	**Capacity Factor**
Summer- Land	10.0%
Summer-Off shore	38.0%
Winter- Land	30.0%
Winter-Off shore	38.0%

NYISO Solar Capacity Factors	
Season/Type	**Capacity Factor**
Summer- Fixed	28.0%-43.0%
Summer-Tilt	46.0%
Winter- Fixed	0.0%-2.0%%
Winter-Tilt	2.0%

Renewable accreditation levels for new wind and solar - MISO

- MISO studies the Effective Load Carrying Capability (ELCC) method for wind and peak (276) hours for solar

MISO Wind-Solar Capacity Factors	
Type	**Capacity Factor**
Wind	15.2%
Solar	50.0%

Renewable accreditation levels for new wind and solar - CAISO

- CAISO uses a monthly Effective Load Carrying Capability (ELCC) method

CAISO Wind-Solar Capacity Factors	
Type	**Capacity Factor**
Wind (Summer)	26.5%-47.5%
Wind (Winter)	8.4%-18.5%
Solar-RPS Utility Scale	0.0% (Jan/Dec)-44.8% (June)
Solar-RPS behind the meter	0.0% (Jan/Dec)-33.5%(June)

Renewable accreditation levels for new wind and solar - ERCOT

- ERCOT uses highest 20 peak load hours – this approach creates an outlier in solar capacity factors

ERCOT Wind-Solar Capacity Factors	
Type	**Capacity Factor**
Wind-Land (Summer)	14.0%
Wind-Land (Winter)	20.0%
Wind-Offshore	59.0%
Solar (Summer)	75.0%
Solar (Winter)	9.8%

Renewable accreditation levels for wind and solar – ISO-NE

- ISO-NE uses capacity factors during super-peak hours

ISO-NE Wind Capacity Factors	
Month	**Capacity Factor**
Summer	14.0%
Winter	39.0%

ISO-NE Solar Capacity Factors	
Month	**Capacity Factor**
Summer	43.0%

Source: Values confirmed with ISO-NE internal MMU.

References

- https://www.pjm.com/~/media/planning/res-adeq/class-average-wind-capacity-factors.ashx
- https://cdn.misoenergy.org/2018%20Wind%20Capacity%20Report97278.pdf
- https://ccaps.umn.edu/documents/CPE-Conferences/MIPSYCON-PowerPoints/2017/GenTheEvolutionoftheGridintheMidcontinentIndependentSystemOperator(MISO)Region.pdf
- http://www.nyiso.com/public/webdocs/markets_operations/documents/Manuals_and_Guides/Manuals/Operations/icap_mnl.pdf
- http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/DemandModeling/R.14-10-010%20Revised%20Monthly%20LOLE%20and%20ELCC%20Proposal%202-24-17.pdf
- http://www.ercot.com/content/wcm/lists/143976/SARA-FinalSummer2018.xlsx
- http://www.ercot.com/content/wcm/lists/114797/SARA-FinalWinter2017-18.xlsx
- https://www.iso-ne.com/static-assets/documents/2015/12/vrwg_intermittent_resource_qual_tool_status_update_12072015.pdf
- https://www.iso-ne.com/static-assets/documents/2016/03/vrwg_intermittent_resource_qual_tool_status_update_030716.pdf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2020 ITP Portfolio Consolidation-Scope

Amber Greb

Objective

- Review previous consolidation methodologies
- Discuss direction for the 2020 Consolidation

Goal of the Final Portfolio:

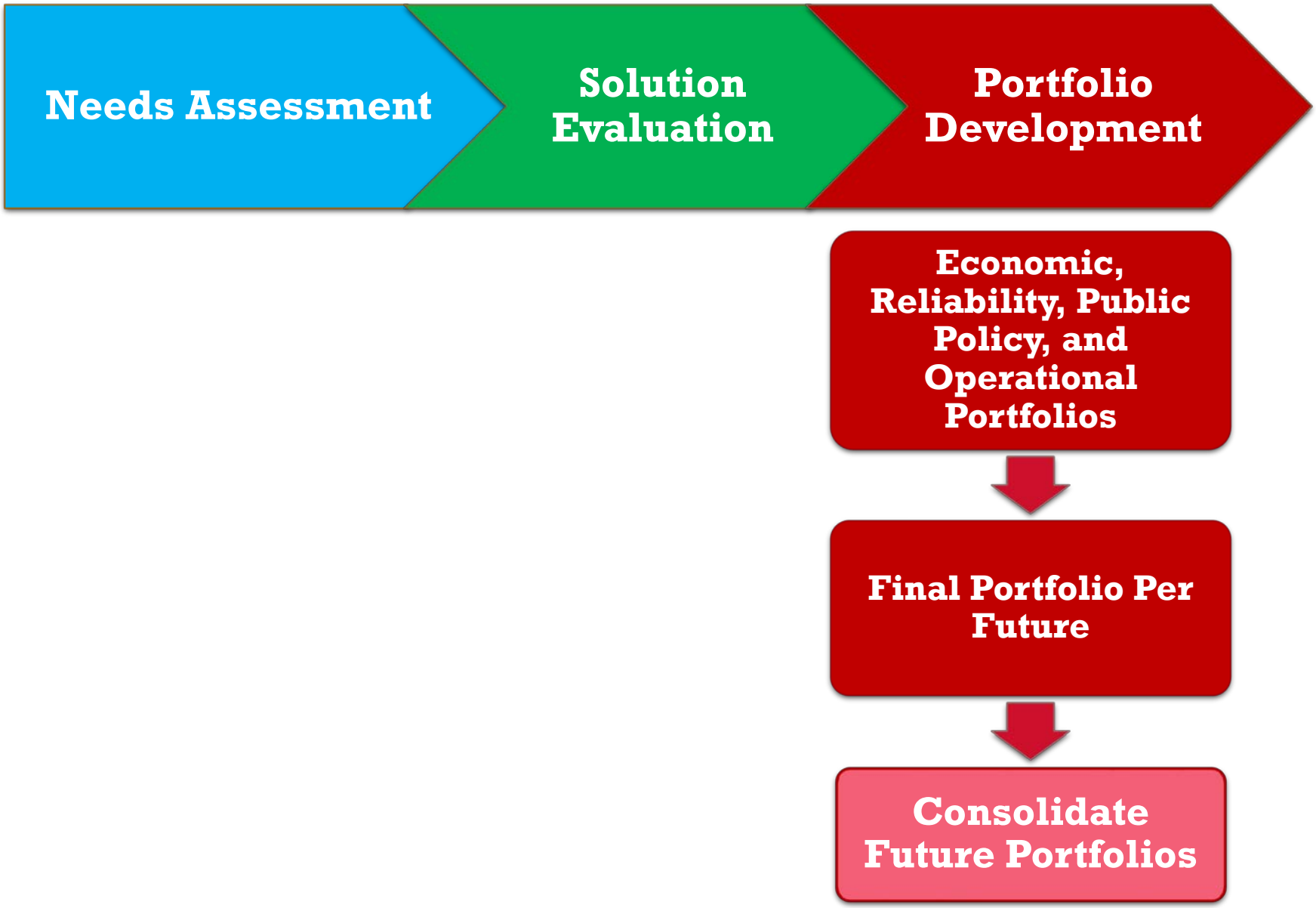
- *Develop a regional plan that provides reliable and economic delivery of energy and facilitates achievement of public policy objectives, while maximizing benefits to the end-use customer*

ITP Manual Language

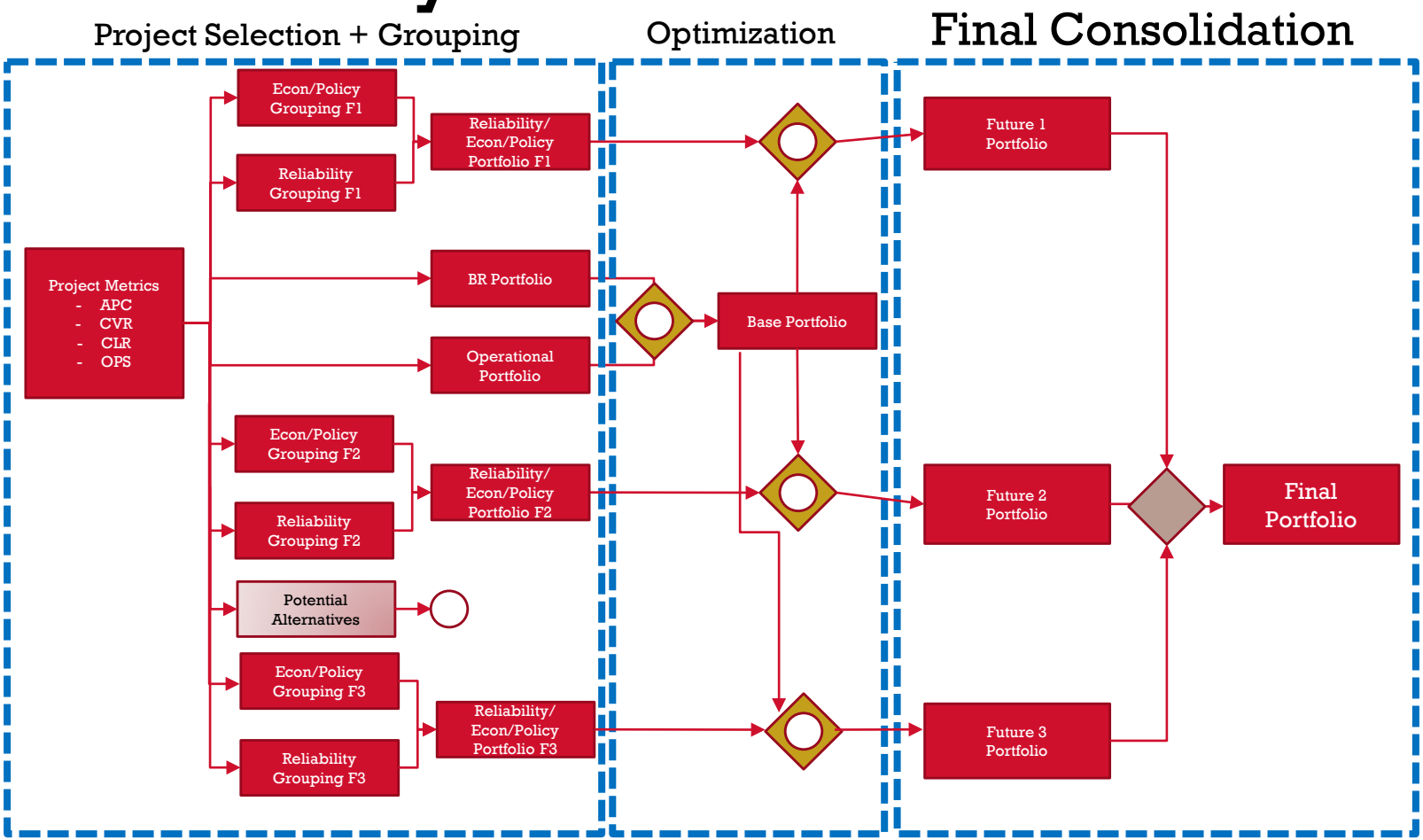
Section 6.2 Portfolio Consolidation

To determine a recommended plan, the portfolios of potential projects must be consolidated. SPP and stakeholders will discuss, determine and document details of the study-specific consolidation criteria during each study scope development.

Process Overview



Portfolio Development Summary



Historical Consolidation Concepts

- Coupling Criteria
  - Generally gives more emphasis to one future over the other and allows projects from other future to be included if additional criteria is met
- Weighted Futures
  - Weighting of futures determined based on confidence in each future
  - Project selected if weighted sum of B/C ratios from futures exceeds threshold
- Individual Project Review
  - Review project drivers and benefits if B/C ratio exceeds certain threshold and present the project and justification to the appropriate stakeholder groups for approval

Coupling Criteria

- Economic projects use a coupling criteria
  - Future 1 projects with a 1-year B/C ratio greater than 0.9 are included in the consolidated portfolio
  - Future 2 projects with a 1-year B/C ratio greater than 0.7 in Future 1 and with a 1-year B/C ratio greater than 0.9 in Future 2 are included in the consolidated portfolio
- Used in the 2015 ITP10

Weighted Futures

- Economic projects use a weighted sum of 1-year APC B/C ratios to develop the portfolio
  - The projects performance in Future 1 contributes 75% of the weighting.
  - The projects performance in Future 2 contributes 25% of the weighting.
  - The sum of the weighted B/C ratios must meet the 0.9 threshold.
- Used in the 2017 ITP10

Individual Project Review

2019 ITP Portfolio Consolidation

- ESWG direction to look at projects on an individual basis
- Futures considered equal
- Developed six considerations to evaluate projects
  - First time to look beyond APC in initial project selection

2019 ITP Portfolio Consolidation

Scenarios

Scenarios	F1	F2	Should we build?	What should we build?
Same project in each future	Project A	Project A	✓	✓
Competing projects	Project B	Project C	✓	?
Projects in one future	N/A	Project D	?	✓

2020 – 3 Futures

Scenarios	F1	F2	F3	Should we build?	What should we build?
1. Same project in each future	Project A	Project A	Project A	✓	✓
2. Competing projects	Project A	Project B	Project C	✓	?
3. Blended Competing/same project	Project A	Project A	Project B	✓	?
4. Same project in two futures	Project A	Project A	N/A	?	✓
5. Blended competing/No project	Project A	Project B	N/A	?	?
6. Projects in one future	Project A	N/A	N/A	?	✓

Considerations

No.	Considerations	Possible Points	Threshold
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A
2	Congestion Relieved in Selected Future (by need(s), all years)	10	N/A
	Congestion Relieved in Opposite Future (by need(s), all years)	10	N/A
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0
4	New EHV	7.5	Y/N
5	Mitigate Non-Thermal Issues	7.5	Y/N
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N
Total Points Possible (70 point Threshold in Scenario 4-6)		**100**	

2020 – 3 Futures

- Are these the appropriate considerations to look at?
- Are they weighted correctly? (Points possible)
- Should we change the thresholds?
- Should we change the minimum point requirements?

2020 Consolidation Recommendations

- No changes to Considerations
  - We have not gone through the consolidation process for 2019 and we do not have any new information since the previous scope development
- No changes to Possible Points
  - Adding a third future does not change the weight of the individual considerations
- Thresholds
  - A third future could trigger a change to the thresholds. Is it realistic to expect a project to pass a .8 B/C threshold in all three futures
- No change to Minimum Point Requirement

Appendix

Consolidation Calculations

Consideration 1

Scenario 2 (Competing Projects)

1. Test B/C Thresholds in Opposite Future
   - If project has less than 0.8 40-year B/C in opposite future, zero points will be awarded
   - If project meets 0.8 40-year B/C threshold in opposite future, continue calculations
2. Calculate Net APC Benefits
   - $Net\ APC\ Benefit_{P1,AVE} = \frac{Net\ APC\ Benefit_{P1,F1} + Net\ APC\ Benefit_{P1,F2}}{2}$
   - $Net\ APC\ Benefit_{P2,AVE} = \frac{Net\ APC\ Benefit_{P2,F1} + Net\ APC\ Benefit_{P2,F2}}{2}$
   - $Net\ APC\ Benefit_{Max} = Maximum(Net\ APC\ Benefit_{P1,AVE}, Net\ APC\ Benefit_{P2,AVE})$
3. Calculate Points Awarded
   - $Points\ Awarded_{P1} = 50 \times \frac{Net\ APC\ Benefit_{P1,AVE}}{Net\ APC\ Benefit_{Max}}$
   - $Points\ Awarded_{P2} = 50 \times \frac{Net\ APC\ Benefit_{P2,AVE}}{Net\ APC\ Benefit_{Max}}$

Consolidation Calculations

Consideration 1

Scenario 3 (Projects in one future's portfolio)

1. Test B/C Threshold in Opposing Future
   - If project has less than 0.8 40-year B/C in opposing future, zero points will be awarded
   - If project has at least 1.0 40-year B/C in opposing future, 50 points will be awarded
   - If project meets 0.8 40-year B/C threshold in opposing future, but is less than 1.0, continue calculations
2. Calculate Net APC Benefits
   - $Net\ APC\ Benefit_{P1,AVE}$
   - $Net\ APC\ Benefit_{P1',AVE} = Net\ APC\ Benefit_{P1,AVE}\ with 1.0\ B/C\ in\ opposing\ future$
3. Calculate Points Awarded
   - $Points\ Awarded_{P1,\%} = 50 \times \frac{Net\ APC\ Benefit_{P1,AVE}}{Net\ APC\ Benefit_{P1',AVE}}$

Consolidation Calculations

Consideration 1

Scenario 3 (Projects in one future's portfolio)

	Project 1	Project 1'
Total Project Cost ($M)	**10.3**	**10.3**
40-yr APC B/C in Selected Future	1.9	1.9
40-yr APC B/C in Opposite Future	0.9	1.0
40-yr APC Net Benefit in Selected Future ($M)	9.3	9.3
40-yr APC Net Benefit in Opposite Future ($M)	-1.0	0.0

1. Test B/C Threshold in Opposing Future
2. Calculate Net APC Benefits
   - $Net\ APC\ Benefit_{P1',AVE} = \frac{\$9.3M - \$1.0M}{2} = \$4.1M$
   - $Net\ APC\ Benefit_{P1',AVE} = \frac{\$9.3M + \$0.0M}{2} = \$4.6M$
3. Calculate Points Awarded
   - $Points\ Awarded_{P1,\%} = 50 \times \frac{\$4.1M}{\$4.6M} = \mathbf{44.4}$

Consolidation Calculations

- Consideration 2
  - Percent of congestion relieved on targeted needs multiplied by the number of possible points
- Consideration 3
  - Points awarded based on any associated operational issues' percentage of the operational needs criteria ($10M in congestion cost over last 24 months or system reconfiguration at 25% of year), capped at points possible
- Consideration 4*
  - All possible points awarded if new EHV
- Consideration 5*
  - All possible points awarded if expected to mitigate non-thermal issues
- Consideration 6*
  - All possible points awarded if in SPP long-term study

*No points awarded if criteria not met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2020 ITP Load and Generation Review Update

September 12-13, 2018

Theva Coleman

Objective

- Provide update on the current status of the Load and Generation Review process.

Stakeholder Review

- Generation and Load Workbooks – Post on 9/14/2018
- Stakeholder Review Period – Pass 1
  - Begins - 9/17/2018
  - Ends – 9/28/2018
  - Duration – 10 Days

Stakeholder Review

- Guidelines for workbooks
  - Yellow tabs are open for stakeholders to make edits
    - Highlight changes
  - Green tabs are vendor data and stakeholders ***do not*** need to make updates
    - Stakeholders can provide updates to green tabs but with justification
    - SPP staff will consider utilizing provided updates if specific units are found to not operate as expected

Stakeholder Review

- Resource Addition Request (RAR) and Waiver Request – Post on 9/21/2018
  - Inclusion Criteria Outline
    - Base Reliability Models – ITP Manual Section 2.1.1.1
    - Economic Models – ITP Manual Section 2.2.1.4
- Stakeholder Review Period
  - Begins - 9/24/2018
  - Ends – 10/26/2018
  - Duration – 26 Days

Stakeholder Data Submission

- All stakeholder feedback is to be submitted to SPP via the Request Management System (RMS)
- SPP Staff Contact:
  - Theva Coleman
    - Phone: 501-482-2336
    - Email: tchanthaseny@spp.org or tcoleman@spp.org