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

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)

<u>Agenda Item 5 – 2019 ITP Items</u>

<u>Agenda Item 5a – Schedule</u>

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)

<u>Agenda Item 5b – Generator Outlet Facilities (GOFs)</u>

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).**
>
> <u>Rationale for abstention</u>
>
> 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.

<u>Agenda Item 5c – Economic Model Build</u>

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).**
>
> <u>Rationale for abstention</u>
>
> 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.

<u>Agenda Item 5d – Constraint Assessment</u>

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)

<u>Agenda Item 5e – Operational Project Evaluation</u>

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

Name	Email	Webex/In Person
Aatif Musani	ITC	In Person
Alan Myers	ITC	In Person
Anita Sharma	AEP	In Person
Ben Elsey	SPS	In Person
Bennie Weeks	Xcel	In Person
Cliff Franklin	SUNC	In Person
Jason Davis	SPP	In Person
John Olsen	Evergy	In Person
Juliano Freitas	SPP	In Person
Kurt Stradley	LES	In Person
Matthew Keenan	ITC	In Person
Raju Brahmandhabheri	ITC	In Person
Ryan Yokley	SUNC	In Person
Tim Ownes	NPPD	In Person
Amber Greb	SPP	In Person
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Chris Matthes	camatthes@aep.com	Webex
Clayton Mayfield (SPP)	cmayfield@spp.org	Webex
Derek Johnson (SPP)	jjohnson@spp.org	Webex
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Hunter Cooper	hcooper@spp.org	Webex
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Zac Hager	hagerzc@oge.com	Webex
Zachary Quintero	z.quintero@occemail.com	Webex

Evan Racine-Johnson for Natasha Henderson

From: Henderson, Natasha
Sent: Thursday, July 26, 2018 8:16 AM
To: Amber Greb <agreb@spp.org>; Myers, Alan <amyers@itctransco.com>
Cc: Evan Racine-Johnson <ERacine-Johnson@gsec.coop>
Subject: **External Email** Evan has my proxy for this ESWG meeting

Rachel Hulett for Jody Holland

From: Holland, Jody
Sent: Thursday, June 14, 2018 3:42 PM
To: Alan Myers (amyers@itcgreatplains.com) <amyers@itcgreatplains.com>; Amber Greb <agreb@spp.org>
Cc: Burkey Eric <eburkey@gridliance.com>; Hulett Rachel <rhulett@gridliance.com>
Subject: **External Email** FW: Economic Studies Working Group 7/26-27/18 Face to Face Meeting Registration Updates

Alan and Amber,
Rachel will be my proxy for this 7/26-27 meeting of the ESWG. Thanks.

Jody Holland
Vice President, Planning & Engineering
South Central MCN, LLC
Midcontinent MCN, LLC
MidAtlantic MCN, LLC
Gridliance West Transco, LLC
Cell: 501-681-5950
Office: 972-476-0111
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Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP MEETING

July 26-27th, 2018

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

• AGENDA •

1. Administrative Items
    a. Call to Order, Introductions....................Alan Myers (5 minutes)
    b. Receipt of Proxies....................Amber Greb (1 minute)
    c. Review of Agenda[1]....................Alan Myers (1 minute)
    d. Antitrust Reminder....................Amber Greb (1 minute)
2. Review of Past Action Items[1]....................Amber Greb (15 minutes)
3. Consent Agenda[1]....................Alan Myers (1 minute)
    a. Meeting Minutes – May 31st, 2018
    b. Meeting Minutes – June 14th, 2018
    c. Meeting Minutes – June 29th, 2018
4. APC Education Session[1]....................James Bailey (60 minutes)
5. 2019 ITP Items....................SPP Staff (195 minutes)
    a. Schedule[1]....................Juliano Freitas (15 minutes)
    b. GOF[1]....................Kirk Hall (60 minutes)
    c. Economic Model Build[1] (Approval Item)....................Clayton Mayfield (30 minutes)
    d. Constraint Assessment[1]....................Clayton Mayfield (60 minutes)
    e. Operational Project Evaluation[1]....................Will Tootle (30 minutes)
6. Lessons Learned[1]....................Amber Greb (180 minutes)
    a. Scope
    b. Load & Generation Review
    c. Renewable Policy Review & Resource Plan Phase 1
    d. Resource Planning Phase 2
7. Resource Siting Manual Update[1] (Approval Item)....................Liz Gephardt (20 minutes)

[1] Background Material Included

Antitrust: SPP strictly prohibits use of participation in SPP activities as a forum for engaging in practices or communications that violate the antitrust laws. Please avoid discussion of topics or behavior that would result in anti-competitive behavior, including but not limited to, agreements between or among competitors regarding prices, bid and offer practices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that might unreasonably restrain competition.

8. 2020 ITP Items .... SPP Staff (85 minutes)
   a. Schedule[1] .... Juliano Freitas (10 Minutes)
   b. Scope Kick-off...Kirk Hall (45 minutes)
   c. Load and Generation[1].. Clayton Mayfield (30 minutes)

9. August ESWG Agenda Items[1]... Amber Greb (10 minutes)

10. Closing Items... All (5 minutes)
   a. Summary of Action Items (Amber Greb)
   b. Future Meetings
      i. August 15-16th, 2018: Doubletree-Grand Ballrm A, 27 North 27th St., Billings, MT
      ii. September 13th, 2018: 41st floor AEP Office, Dallas Texas
      iii. October 11th, 2018: 41st floor AEP Office, Dallas Texas
      iv. November 14-15th, 2018: SPP Offices, Little Rock, AR
      v. December 3rd, 2018: 41st floor AEP Office, Dallas Texas

Antitrust: SPP strictly prohibits use of participation in SPP activities as a forum for engaging in practices or communications that violate the antitrust laws. Please avoid discussion of topics or behavior that would result in anti-competitive behavior, including but not limited to, agreements between or among competitors regarding prices, bid and offer practices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that might unreasonably restrain competition.

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

July 26, 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	Staff intends to finalize in September 2018
186	Formalize the economic model data guidelines and submission process	July 20th, 2017	In Progress SPP staff	Include the load updates for resource planning
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	Included in action Item 186
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
196	Schedule a Lessons Learned meeting prior to scope milestone for each Study	April 25th, 2018	SPP Staff	Scheduled for July 26-27th

Southwest Power Pool

Economic Studies Working Group

May 31, 2018

Webex / Conference Call

• SUMMARY OF ACTIONS TAKEN •

1. Motion to approve the renewable siting plan as posted.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

May 31, 2018

Webex / Conference Call

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

There were 48 web conference participants, representing 15 of 17 ESWG members. (Attachment 1 – May 31, 2018 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC) asked for any proxy statements; two proxies were identified:

- Leon Howell (OGE) named Zac Hager (OGE) as his proxy
- John Olsen (Westar) named Jeremy Harris (Westar) as his proxy.

(Attachment 1a – Proxy Statements)

Agenda Item 1c – Review of Agenda

Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 2 – May 31, 2018 ESWG Agenda).

The agenda was approved unanimously.

Agenda Item 1d – Antitrust Reminder

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

Agenda Item 2 – Renewable Siting Plan

Liz Gephardt (SPP) presented the 2019 ITP renewable siting plan, which included maps showing the wind and utility solar site locations for each study year in both futures. She began by giving an overview of how capacity was replaced by the exceptions that were approved earlier this month. Since solar is zonally allocated, exceptions replaced other sites within the zone, unless they were spoken for, and then within the state if there was nothing to replace within the zone. For wind, since siting was not on a zonal basis, exceptions replaced the bottom ranking sites regardless of zone. Liz informed the group that the additions for Policy requirements were appended to the original recommendation for Stakeholders to review on Tuesday, two days prior to the meeting. Staff will request approval of the ownership of policy wind additions at the June face-to-face meeting.

Stakeholders requested more information on the generator outlet capability metric. This was calculated using the 2019 ITP Pass 5 powerflows that were approved for siting use in March. Staff did a first contingency incremental transfer capability (FCITC) analysis to assess transfer capability from an Energy Resource Interconnection Service (ERIS) perspective (20% TDF impacts under contingency and 3% TDF under system intact conditions), consistent with the SPP GI process. SPP also considered existing capacity in this metric, when determining acceptable capacity amounts to site. Costs for transmission owner interconnection facilities and ERIS network upgrades that are allocated to a GI request are summed up and divided by the total MW requested in the GI request for the cost/MW metric. (Attachment 3 – 2019 ITP Siting plan)

Jeremy Severson (BEPC) made a motion; seconded by Kurt Stradley (LES) to approve the renewable siting plan. The motion was approved with one abstention. Alan Myers (ITC) abstained.

Agenda Item 3 – Generator Outlet Facilities

Kirk Hall (SPP) gave an overview of the generator outlet facilities (GOF) milestone. He reviewed the inputs to the process and went over the objective. The GOF process is used to develop the proper set of upgrades to facilitate the integration of the resource plan to the transmission system. Kirk gave an overview of the process and showed stakeholders the GOF schedule for the 2019 ITP. (Attachment 4 – generator outlet facilities)

Closing Items

There were no action items from the meeting.

The meeting was adjourned at 11:00 AM on May 31st.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Southwest Power Pool

Economic Studies Working Group

June 14, 2018

41st Floor AEP Office, Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approved the assignment of policy wind resources with respect to the approved siting plan
~~1.~~2. The ESWG approved the following exceptions to the conventional siting plan posted on May 24th:
   ~~2.~~a. GMO proposed exception: CT at Mullen Creek rather than at Sibley
   ~~3.~~b. OG&E proposed exceptions:
      ~~a.~~i. Future 1: CTs at Horseshoe~~show~~ Lake rather than Sooner and Redbud
      ~~b.~~ii. Future 2: CT at Horseshoe~~show~~ Lake rather than Redbud
   c. SPS Proposed exception: CT at Plant X rather than Gaines
3. Approved the resource and siting plan for AECI, as posted
4. Approved RR291 as presented and posted in the RR Recommendation Report

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Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

June 14, 2018

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 8:00 a.m., welcomed those in attendance, and asked for introductions.

There were 23 in-person participants and 50 web conference participants, representing 17 of 17 ESWG members. (Attachment 1 – June 14, 2018 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC) asked for any proxy statements; one proxy was identified. (Attachment 2 – Proxy Statements)

- Randy Collier (CUS) named John Boshears (CUS) as his 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 – June 14, 2018 ESWG Agenda).

Kurt Stradley (LES) made a motion; seconded by Bradley Schwarz (Hunt) 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. (Attachment 4 – Past Action Items)

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – May 23rd, 2018 (Attachment 5 - 20180523 ESWG Minutes)

The Consent Agenda was approved unanimously.

The minutes for May 16th, 2018 were removed from the consent agenda for a minor correction. (Attachment 6 - 20180516 ESWG Minutes)

Tim Owens (NPPD) made a motion; seconded by Kurt Stradley (LES) to approve the May 16th meeting minutes. The motion was approved unanimously.

Agenda Item 4 – APC Calculation Fundamentals

James Bailey (SPP) presented on Adjusted Production Costs (APC) Calculation Fundamentals. This was the second in a series of presentation on this topic. During this presentation, James focused on examples for calculating purchases and sales for APC. He then gave an overview of how Locational Marginal Prices (LMPs) are calculated at each bus in a network with and without constraints. James covered background on current the APC methodology and detailed components. Alan Myers (ITC) requested a call with staff to discuss the direction of the APC discussion for future meetings. This item will stay on the agenda. (Attachment 7 - APC Calculation Fundamentals)

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 through benchmarking. Juliano informed the group that staff plans to bring the report card for the completed milestones to the joint call at the end of the month. (Attachment 8a – 2019 ITP Schedule)

Agenda Item 5b – Operational Project Evaluation (Scope/Manual)

Will Tootle (SPP) reviewed a presentation on Operational Project Evaluation. Staff provided an overview of issues with the proposed solution analysis methodology for Persistent Operational Issues needs identified from flowgate congestion. Will informed the group that both the 2019 ITP Scope and the ITP Manual will need to be updated ~~to~~ due to staff inability to perform the proposed analysis. Stakeholders gave direction on changes they would like to see to the Manual and requested that staff bring back a final revision to the ESWG in July. The goal is to submit a Revision Request to take to the October MOPC. (Attachment 8b – Operational Project Evaluations)

Agenda Item 5c – Benchmarking

Nikki Roberts (SPP) provided the initial results of the Benchmarking milestone. She showed the group variances in data points between the 2017 IT~~TI~~P10 and the current 2019 ITP study. Some of the items ~~she~~ reviewed included capacity factors by unit type, renewable outputs, and generator outages. Staff has not completed vetting all of the results and plans to post additional information on July 5th. A request for an email vote will go out on July 12th. (Attachment 8c – 2019 ITP Benchmarking)

Agenda Item 5d – Economic Model Quality Assurance

Chris Jamieson (SPP) provided an update to the ESWG to inform the group that staff has done some additional quality assurance of the Year 2 model to determine that modeling the Tolk seasonal operation has not resulted in the need for emergency generation. Chris also pointed out that further analysis may be necessary for the year 5 and 10 models to account for load growth, retirement assumptions, and renewable additions. (Attachment 8d – Economic Model QA)

Agenda Item 5e – Siting Update

Liz Gephardt (SPP) presented the 2019 ITP siting plan for policy wind resources. The top ranking wind site within each zone with a policy wind need was proposed for assignment. (Attachment 8ei – 2019 ITP Policy Wind Siting)

> **Kurt Stradley (LES) made a motion; seconded by John Olsen (Evergy) to approve the assignment of policy wind resources with respect to the approved siting plan. The motion was approved unanimously.**

-Natasha Henderson (GSEC) named Evan Racine-Johnson (GSEC) as her proxy

The group reviewed maps displaying conventional siting locations for each. Staff reviewed siting schedule and upcoming deadlines. Stakeholders presented exceptions to the preliminary siting plan for ESWG approval. (Attachment 8eii – 2019 ITP Conventional Siting Plan)

The ESWG approved the following exceptions to the preliminary conventional siting plan posted on May 24th, these exceptions will be included as options to site conventional resources into the 2019 ITP Assessment:

- GMO proposed exception: CT at Mullen Creek rather than at Sibley

- OG&E proposed exceptions:
  - Future 1: CTs at Horseshoe~~show~~ Lake rather than Sooner and Redbud
  - Future 2: CT at Horseshoe~~show~~ Lake rather than Redbud
- SPS Proposed exception: CT at Plant X rather than Gaines

(Attachment 8eiii – KCPL_GMO Exception, OGE Exception, SPS Exception, SPS Exceptions)

After the ESWG reviewed each of the exceptions Liz reminded them that staff will send out updated maps the following week including the approved exceptions and that the ESWG will have a conference call at the end of the month to approve the conventional siting plan. Members felt comfortable with the information presented and felt ready to make a motion.

Bethany King (EDE) made a motion; seconded by Kurt Stradley (LES) to approve the conventional siting plan with the inclusion of the exceptions that were approved during the June 14th meeting. The motion was approved unanimously.

Agenda Item 5f – AECI Resource & Siting Plan

Nikki Roberts (SPP) presented the AECI resource and siting plan to the ESWG. Staff worked with AECI to develop the resource and siting plans. Some stakeholders felt that we should be creating our own plan that is consistent with the scope of the ITP, others saw the value in allowing AECI to provide input, so that we can support potential seems projects that may come out of the study. In future 1, no renewable additions or age based retirements are being proposed, only conventional additions of CTs are being added to cover capacity shortfalls. In Future 2, renewable additions are based on SPP Future 1 solar-to-load ratios and public wind announcements. Age based retirements are consistent with the 2019 ITP scope for Future 2 and conventional CT are added to meet capacity shortfalls. Nikki reviewed the siting locations by future with the group. (Attachment 9 – AECI Resource & Siting Plan)

John Olsen (Evergy) made a motion; seconded by Bethany King (EDE) to approve the resource and siting plan for AECI, as posted. The motion was approved unanimously.

Agenda Item 5g – Lubbock Sensitivity

Juliano Freitas (SPP) informed the group that staff is looking into a sensitivity to account for the Lubbock load leaving SPS, staff is following the ITP manual section 9.3 process. We will schedule a conference call to discuss the scope and schedule.

-Natasha Henderson (GSEC) returned to the meeting and resumed her proxy

Agenda Item 6 – RR291 – RR Process Language Update

Chris Cranford (SPP) reviewed Revision Request (RR) 291, which proposes a change to the RR process. The Current RR Process does not allow for an RR with normal status to move forward for Secondary Working Group review until an Impact Assessment has been completed and acted on by Primary WG. The current process can cause an undue delay in the approval process of an RR. The proposed language change will allow an approved normal status RR to progress through the Stakeholder process while the Primary WG is waiting on the Impact Assessment. (Attachment 10 – RR 291-RR Process Language Update)

Bennie Weeks (Xcel/SPS) made a motion; seconded by Leon Howell (OGE) to approve RR291 as presented and posted in the RR Recommendation Report. The motion was approved with two no votes, Tim Owens (NPPD) and Kurt Stradley (LES).

Rational for no votes:

NPPD voted against RR 291 because we believe secondary working groups should be aware of the results from an Impact Analysis, if requested by the primary working group, before acting on a revision request. There is a process in place for expediting RR, when required, that seems to be working, so RR 291 seems unnecessary.

LES opposed RR291 because, though classified as a clarification, RR291 represents a fundamental change to the established RR process. The RR process already has a mechanism in place for SPP to move RRs forward through the process when expedited or urgent action is required.

Agenda Item 7 – July ESWG Agenda Items

Amber Greb (SPP) opened a dialog to discuss preparations for upcoming meetings. Stakeholders agreed to add a half day to the July 26th meeting to allow time to discuss lessons learned from the 2019 ITP completed milestones before we begin the 2020 ITP. (Attachment 10 – 2019 ITP Approvals Summary)

Closing Items

There were no action items from the meeting.

The meeting was adjourned at 2:10 PM.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Southwest Power Pool

Economic Studies/Transmission Working Group Joint Meeting

June 29, 2018

Webex/Conference Call

• SUMMARY OF ACTIONS TAKEN •

1. Approved the 2019 ITP needs sensitivity scope to address study results impacted by potential LP&L system exit

Southwest Power Pool

Southwest Power Pool

ECONOMIC STUDIES/TRANSMISSION WORKING GROUP JOINT MEETING

June 29, 2018

WEBEX/CONFERENCE CALL

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

ESWG Chair Alan Myers (ITC) and TWG Vice-Chair Nathan McNeil (MIDW) called the meeting to order at 1:00 p.m., welcomed those in attendance, and asked for introductions.

There were 78 web conference participants, representing 16 of 17 ESWG members and 20 of 23 TWG members. (Attachment 1 – June 29, 2018 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers and Nathan McNeil asked for any proxy statements; five proxies were identified. (Attachment 2 – Proxy Statements)

ESWG

- Natasha Henderson (GSEC) named Evan Racine-Johnson (GSEC) as her proxy
- John Olsen (Evergy) named Don Frerking (Evergy) as his proxy

TWG

- Travis Hyde (OGE) named Steve Hardebeck (OGE) as his proxy
- Matthew Stoltz (Basin) named Jeremy Severson (Basin) as his proxy
- Joe Fultz (GRDA) named Dona Parks (GRDA) as his proxy

Agenda Item 1c – Review of Agenda

Alan Myers and Nathan McNeil presented the agenda for review and asked for any additions or corrections. (Attachment 3 – June 29, 2018 ESWG/TWG Agenda).

ESWG: Kurt Stradley (LES) made a motion; seconded by Tim Owens (NPPD) to adopt the agenda. The motion was approved unanimously.

TWG: Chris Pink (Tri-State) made a motion; seconded by Scott Benson (LES) to adopt the agenda as amended. The motion was approved unanimously.

Agenda Item 1d – Antitrust Reminder

Kirk Hall (SPP) provided an antitrust reminder to the group.

Agenda Item 2 – Lubbock Sensitivity

Juliano Freitas (SPP) reviewed a presentation discussing a proposal for a Lubbock sensitivity to determine what operational and planning reliability, economic, and policy needs could be mitigated or relieved resulting from the LP&L system moving to ERCOT. Bennie Weeks (SPS), explained the actions taken by SPS to mitigate the problem for the next ITP Assessment (2020 ITP). Juliano informed the group that performing the sensitivity could have a 500 hour and up to $37,000 impact to the ITP schedule. The group discussed several options, which staff will look into, and agreed to move forward with the sensitivity. (Attachment 4 – 2019 ITP Lubbock Sensitivity)

ESWG: Al Tamimi (SUNC) made a motion; seconded by Kurt Stradley (LES) to approve 2019 ITP needs sensitivity scope to address study results impacted by potential LP&L system exit. The motion was approved unanimously.

TWG: Derek Brown (Evergy) made a motion; seconded by Jason Shook (GDS) to approve 2019 ITP needs sensitivity scope to address study results impacted by potential LP&L system exit. The motion was approved unanimously.

Agenda Item 3 – 2019 Quarterly Report Card

Juliano Freitas (SPP) presented the Quarterly Report card to the ESWG and TWG. Per section 9.4 of the ITP Manual, SPP will provide a quarterly report to MOPC highlighting the assessment milestones from the preceding quarter. He discussed adherence to milestone timelines in regard to data review and submittal, scheduled reviews and approvals, and issues that have required mitigation for the process to remain on schedule. The report card will go to the MOPC in July. (Attachment 5 – 2019 Quarterly Report Card)

Closing Items

There were no action items from the meeting.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Kirk Hall

TWG Secretary


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APC Calculation Fundamentals: LMPs and APC

James Bailey

July 26, 2018

Objective

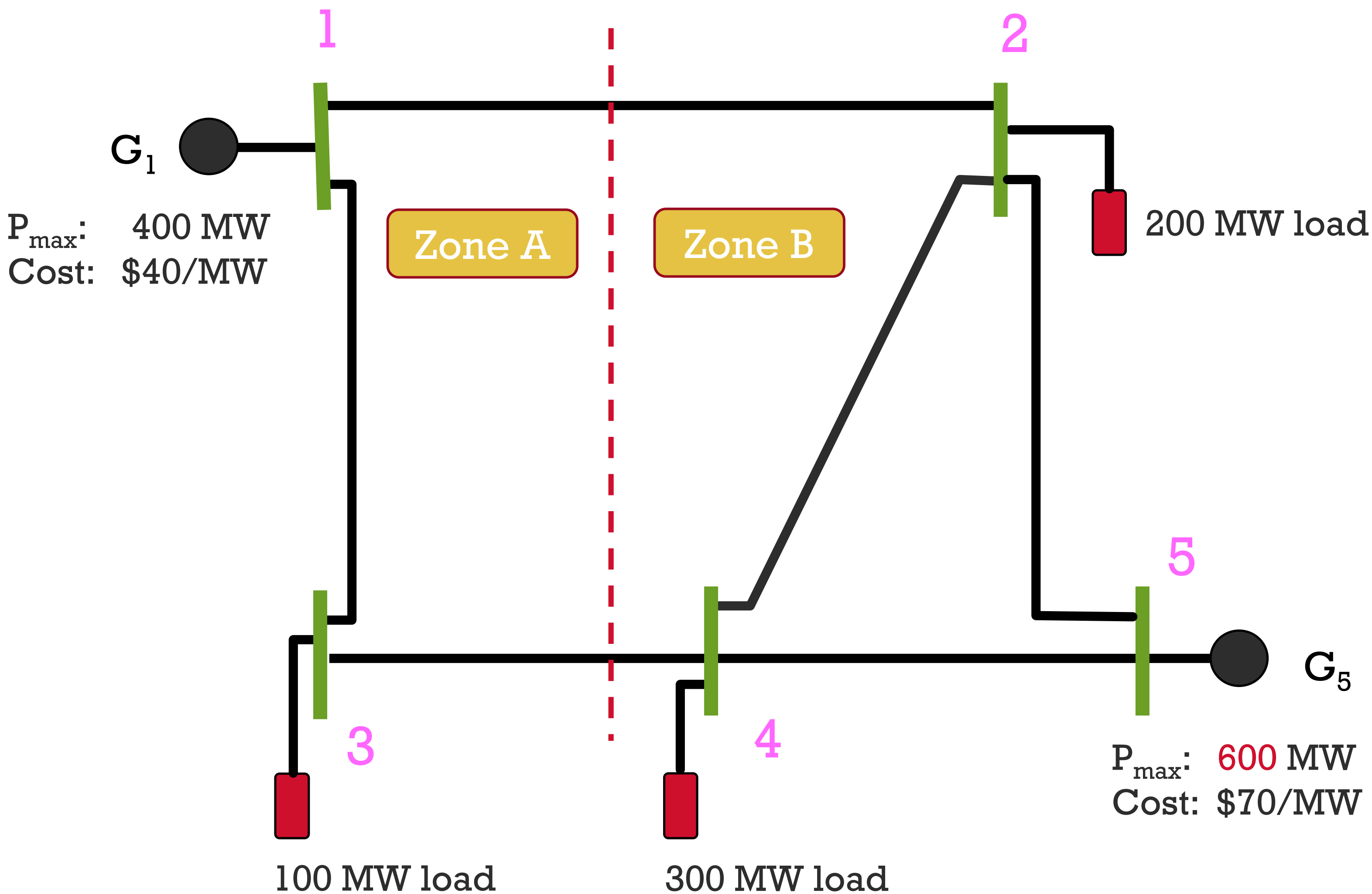
- Provide additional examples* illustrating how LMP calculations affect APC calculations
  - Zonal
  - Unassigned wind unit
  - Assigned wind unit

* Examples provided are not generally representative of overall system behavior

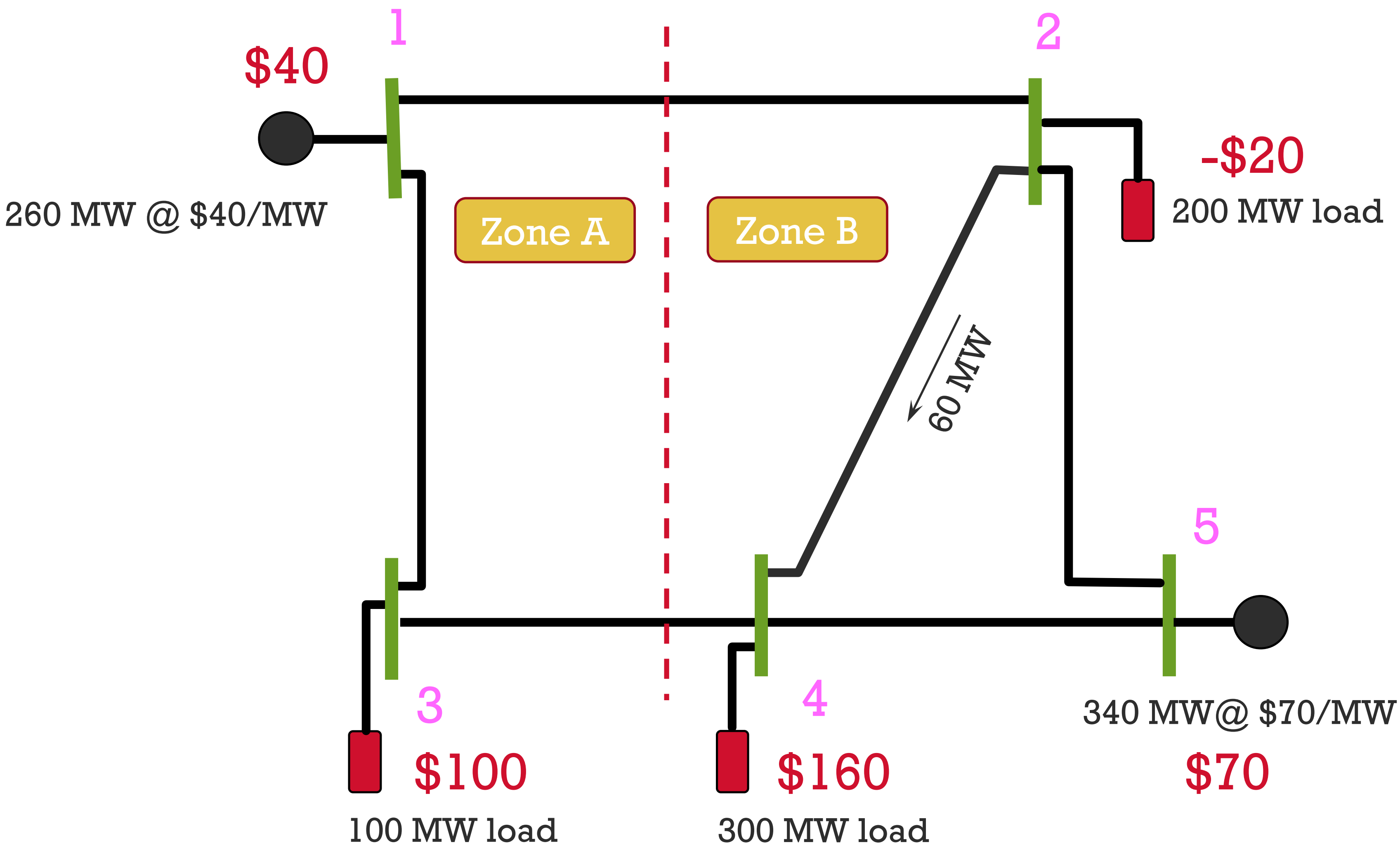
Example: Zonal APC

- Start with 5 bus LMP solution from previous session
- Assign generators and loads to two zones
- Calculate APC for each zone for a single hour
- Calculate APC benefit of an upgrade for a single hour

Example Network



Marginal Costs (Without Upgrade)



APC Calculation: Zone A (Without Upgrade)

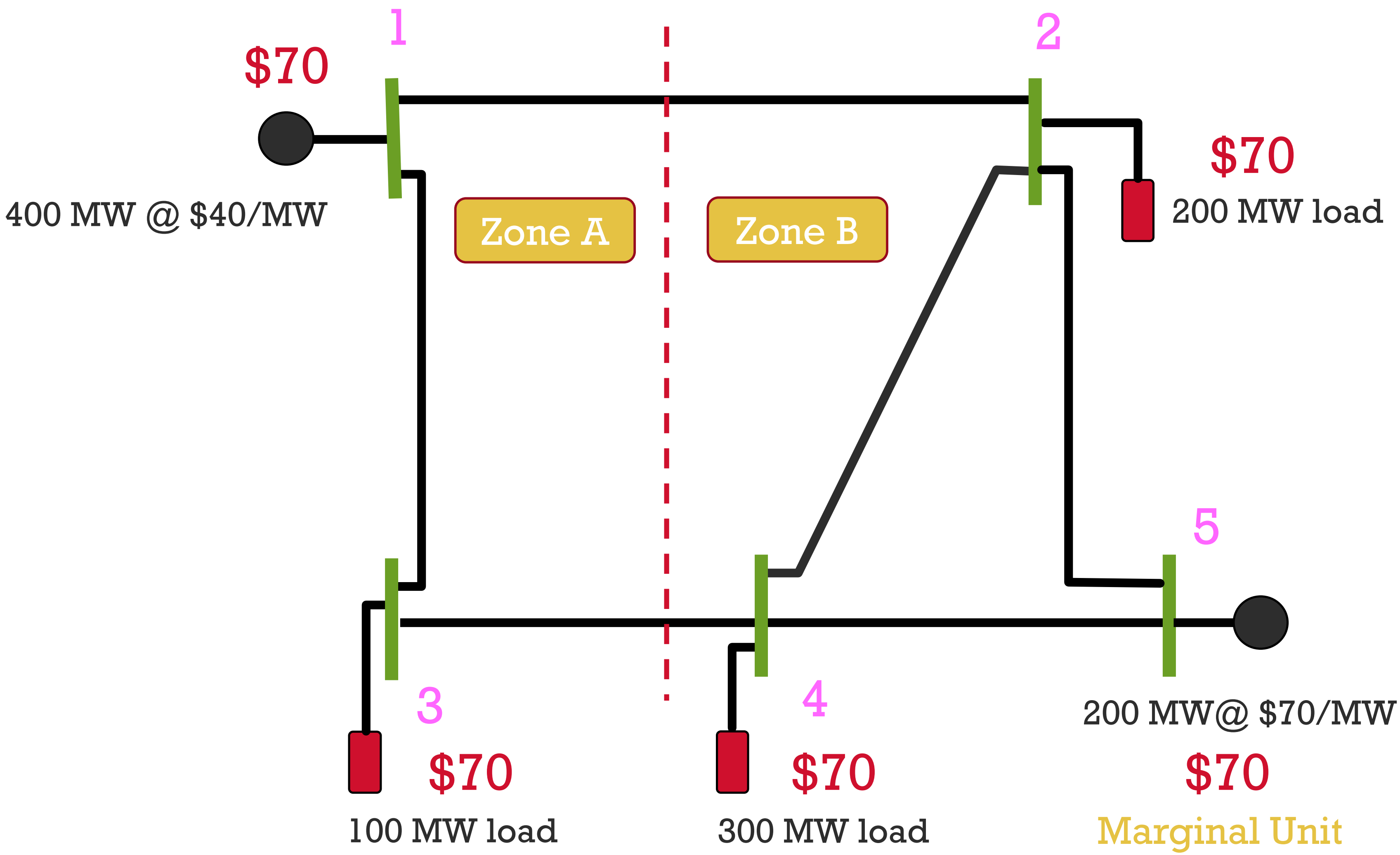
- APC = Production Cost + Purchases – Sales
- Production Cost = 260 MWh * $40/MWh = $10,400
- Purchases = $0
- Sales (MWh) = Unit Generation – Area Native Load
  - **160 MWh = 260 MWh – 100 MWh**
- $\text{GLMP} = \dfrac{\$40/\text{MWh} * 260\text{ MWh}}{260\text{ MWh}} = \$40/\text{MWh}$
- Sales ($) = Sales (MWh) * GLMP ($/MWh)
  - **$6,400 = 160 MWh * $40/MWh**
- APC = $10,400 + $0 - $6,400 = $4,000

APC Calculation: Zone B (Without Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 340 MWh * $70/MWh = $23,800
- Purchases (MWh) = Area Native Load – Unit Generation
  - **160 MWh = (200 MWh + 300 MWh) – 340 MWh**
- $\text{LLMP} = \dfrac{(-\$20/\text{MWh} * 200\ \text{MWh}) + (\$160/\text{MWh} * 300\ \text{MWh})}{200\ \text{MWh} + 300\ \text{MWh}} = \$88/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$14,080 = 160 MWh * $88/MWh**
- Sales = $0
- APC = $23,800 + $14,080 - $0 = $37,880

SPP

Marginal Costs (With Upgrade)



APC Calculation: Zone A (With Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 400 MWh * $40/MWh = $16,000
- Purchases = $0
- Sales (MWh) = Unit Generation – Area Native Load
  - **300 MWh = 400 MWh – 100 MWh**
- $\text{GLMP} = \frac{\$70/\text{MWh} * 400\ \text{MWh}}{400\ \text{MWh}} = \$70/\text{MWh}$
- Sales ($) = Sales (MWh) * GLMP ($/MWh)
  - **$21,000 = 300 MWh * $70/MWh**
- APC = $16,000 + $0 - $21,000 = -$5,000

APC Calculation: Zone B (With Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 200 MWh * $70/MWh = $14,000
- Purchases (MWh) = Area Native Load – Unit Generation
  - **300 MWh = (200 MWh + 300 MWh) – 200 MWh**
- $\text{LLMP} = \dfrac{(\$70/\text{MWh} * 200\ \text{MWh}) + (\$70/\text{MWh} * 300\ \text{MWh})}{200\ \text{MWh} + 300\ \text{MWh}} = \$70/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$21,000 = 300 MWh * $70/MWh**
- Sales = $0
- APC = $14,000 + $21,000 - $0 = $35,000

SPP

APC Benefit (Zone A)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Zone A benefits from increased sales at a higher value than its production costs

Scenario	Production Cost	Purchases	Sales	APC
Base	$10,400	$0	$6,400	$4,000
Change	$16,000	$0	$21,000	-$5,000
			Benefit	***$9,000***

SPP

APC Benefit (Zone B)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Zone B benefits from increased purchases at a lower cost than its production costs

Scenario	Production Cost	Purchases	Sales	APC
Base	$23,800	$14,080	$0	$37,880
Change	$14,000	$21,000	$0	$35,000
			Benefit	***$2,880***

SPP

APC Benefit (Regional)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Region benefits from production costs being offset by lower cost purchases and increased sales revenues

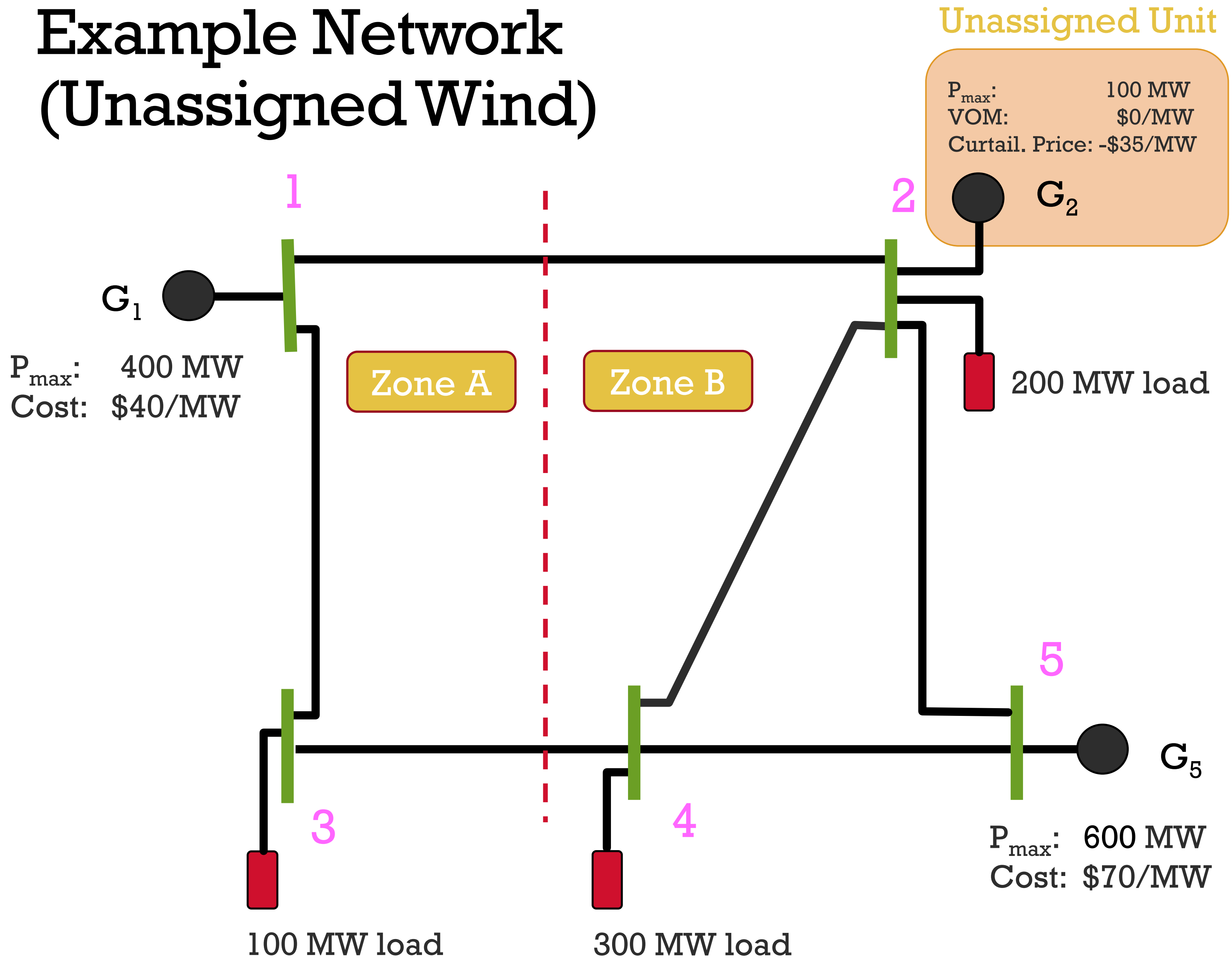
Scenario	Production Cost	Purchases	Sales	APC
Base	$34,200	$14,080	$6,400	$41,880
Change	$30,000	$21,000	$21,000	$30,000
			Benefit	***$11,880***

SPP

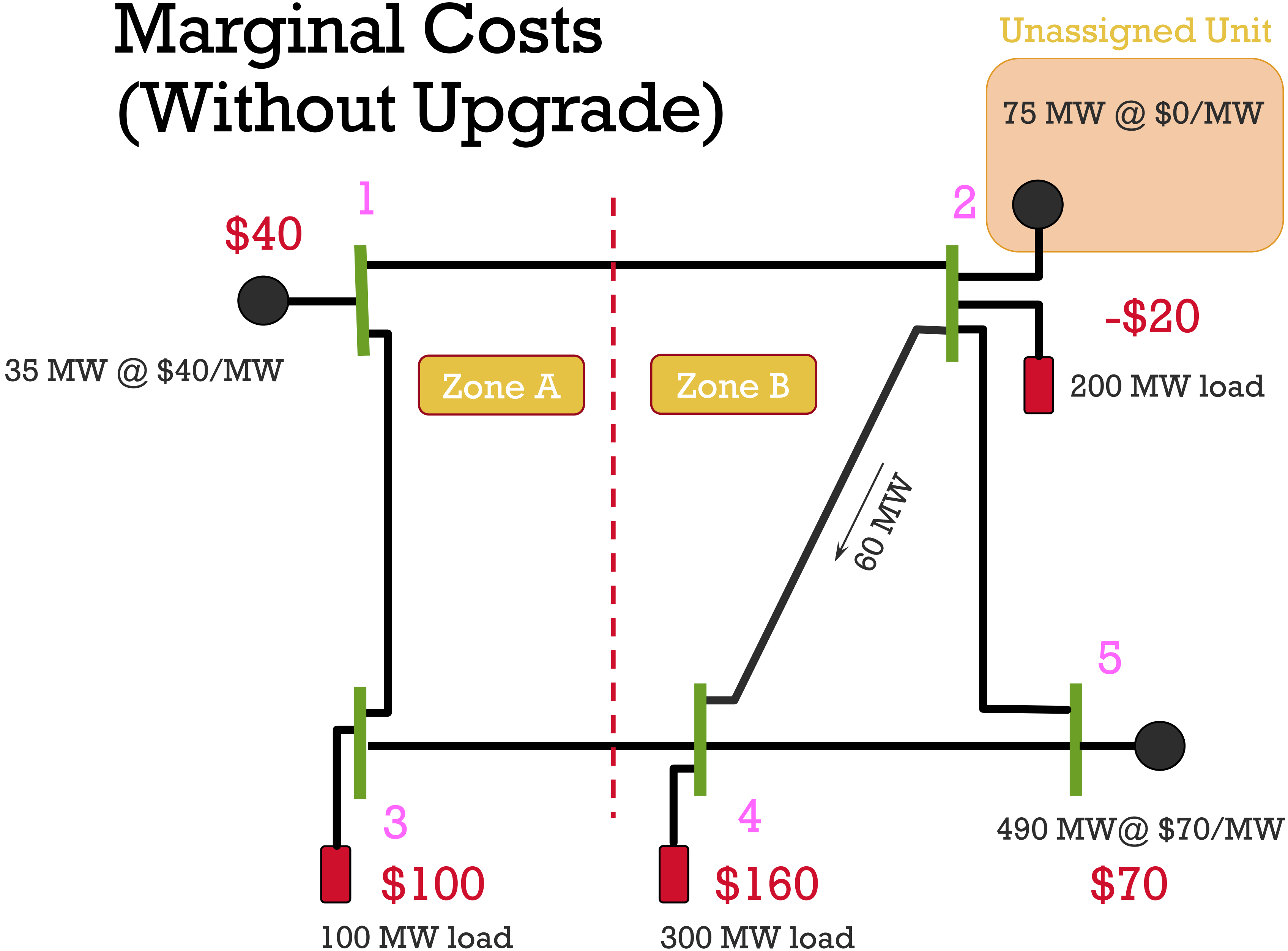
Example: Unassigned Wind

- Start with previous example
- Add wind unit to Bus 2
- **Do not assign** wind unit to either zone
- Calculate APC for each zone for a single hour
- Calculate APC benefit of an upgrade for a single hour

Example Network (Unassigned Wind)



Marginal Costs (Without Upgrade)



APC Calculation: Zone A (Without Upgrade)

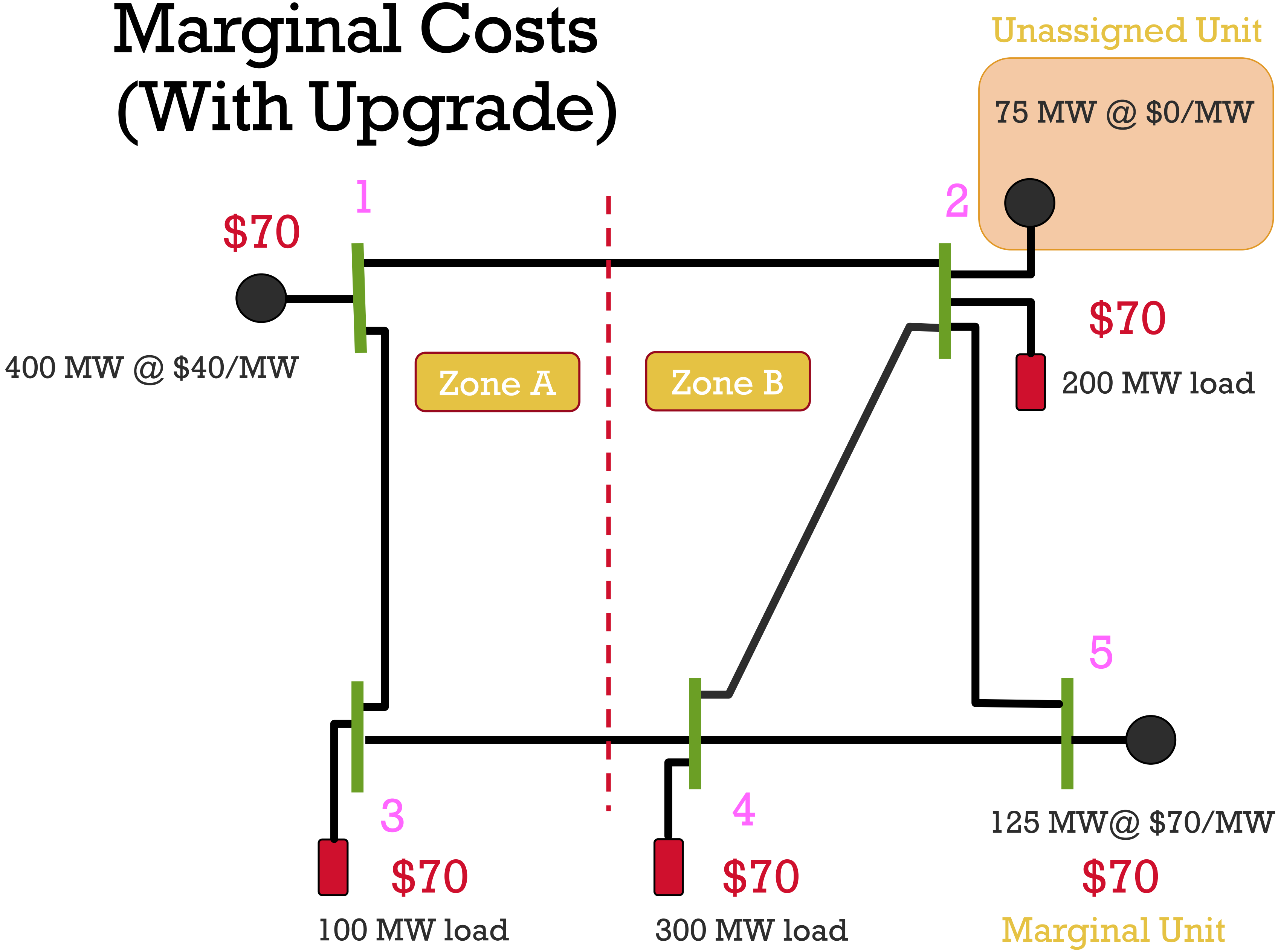
- APC = Production Cost + Purchases – Sales
- Production Cost = 35 MWh * $40/MWh = $1,400
- Purchases (MWh) = Area Native Load – Unit Generation
  - **65 MWh = 100 MWh – 35 MWh**
- $\text{LLMP} = \dfrac{\$100/\text{MWh} * 100\ \text{MWh}}{100\ \text{MWh}} = \$100/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$6,500 = 65 MWh * $100/MWh**
- Sales = $0
- APC = $1,400 + $6,500 - $0 = $7,900

APC Calculation: Zone B (Without Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 490 MWh * $70/MWh = $34,300
- Purchases (MWh) = Area Native Load – Unit Generation
  - **10 MWh = (200 MWh + 300 MWh) – 490 MWh**
- $\text{LLMP} = \frac{(-\$20/\text{MWh} * 200\ \text{MWh}) + (\$160/\text{MWh} * 300\ \text{MWh})}{200\ \text{MWh} + 300\ \text{MWh}} = \$88/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$880 = 10 MWh * $88/MWh**
- Sales = $0
- APC = $34,300 + $880 - $0 = $35,180

SPP

Marginal Costs (With Upgrade)



APC Calculation: Zone A (With Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 400 MWh * $40/MWh = $16,000
- Purchases = $0
- Sales (MWh) = Unit Generation – Area Native Load
  - **300 MWh = 400 MWh – 100 MWh**
- $\text{GLMP} = \frac{\$70/\text{MWh} * 400\ \text{MWh}}{400\ \text{MWh}} = \$70/\text{MWh}$
- Sales ($) = Sales (MWh) * GLMP ($/MWh)
  - **$21,000 = 300 MWh * $70/MWh**
- APC = $16,000 + $0 - $21,000 = -$5,000

APC Calculation: Zone B (With Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 125 MWh * $70/MWh = $8,750
- Purchases (MWh) = Area Native Load – Unit Generation
  - **375 MWh = (200 MWh + 300 MWh) – 125 MWh**
- $\text{LLMP} = \dfrac{(\$70/\text{MWh} * 200\ \text{MWh}) + (\$70/\text{MWh} * 300\ \text{MWh})}{200\ \text{MWh} + 300\ \text{MWh}} = \$70/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$26,250 = 375 MWh * $70/MWh**
- Sales = $0
- APC = $8,750 + $26,250 - $0 = $35,000

APC Benefit (Zone A)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Zone A benefits from increased sales at a higher value than its production costs

Scenario	Production Cost	Purchases	Sales	APC
Base	$1,400	$6,500	$0	$7,900
Change	$16,000	$0	$21,000	-$5,000
			Benefit	***$12,900***

SPP

APC Benefit (Zone B)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Zone B benefits from increased purchases at a lower cost than its production costs

Scenario	Production Cost	Purchases	Sales	APC
Base	$34,300	$880	$0	$35,180
Change	$8,750	$26,250	$0	$35,000
			Benefit	***$180***

SPP

APC Benefit (Regional)

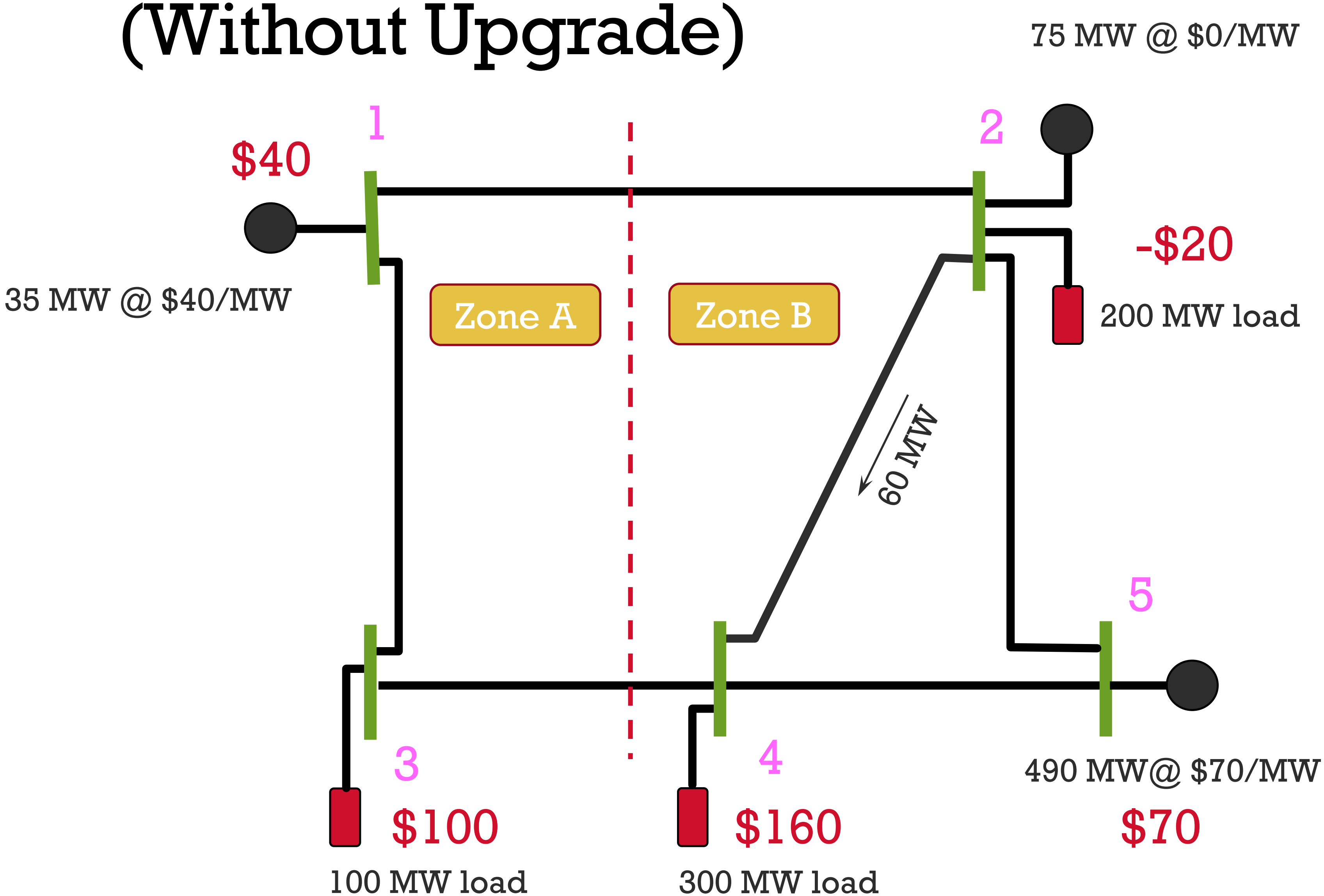
- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Region benefits from production costs being offset by lower cost purchases and increased sales revenues

Scenario	Production Cost	Purchases	Sales	APC
Base	$35,700	$7,380	$0	$43,080
Change	$24,750	$26,250	$21,000	$30,000
			Benefit	***$13,080***

Example: Assigned Wind

- Start with previous example
- Add wind unit to Bus 2
- **Assign** wind unit to Zone B (e.g. PPA)
- Calculate APC for each zone for a single hour
- Calculate APC benefit of an upgrade for a single hour

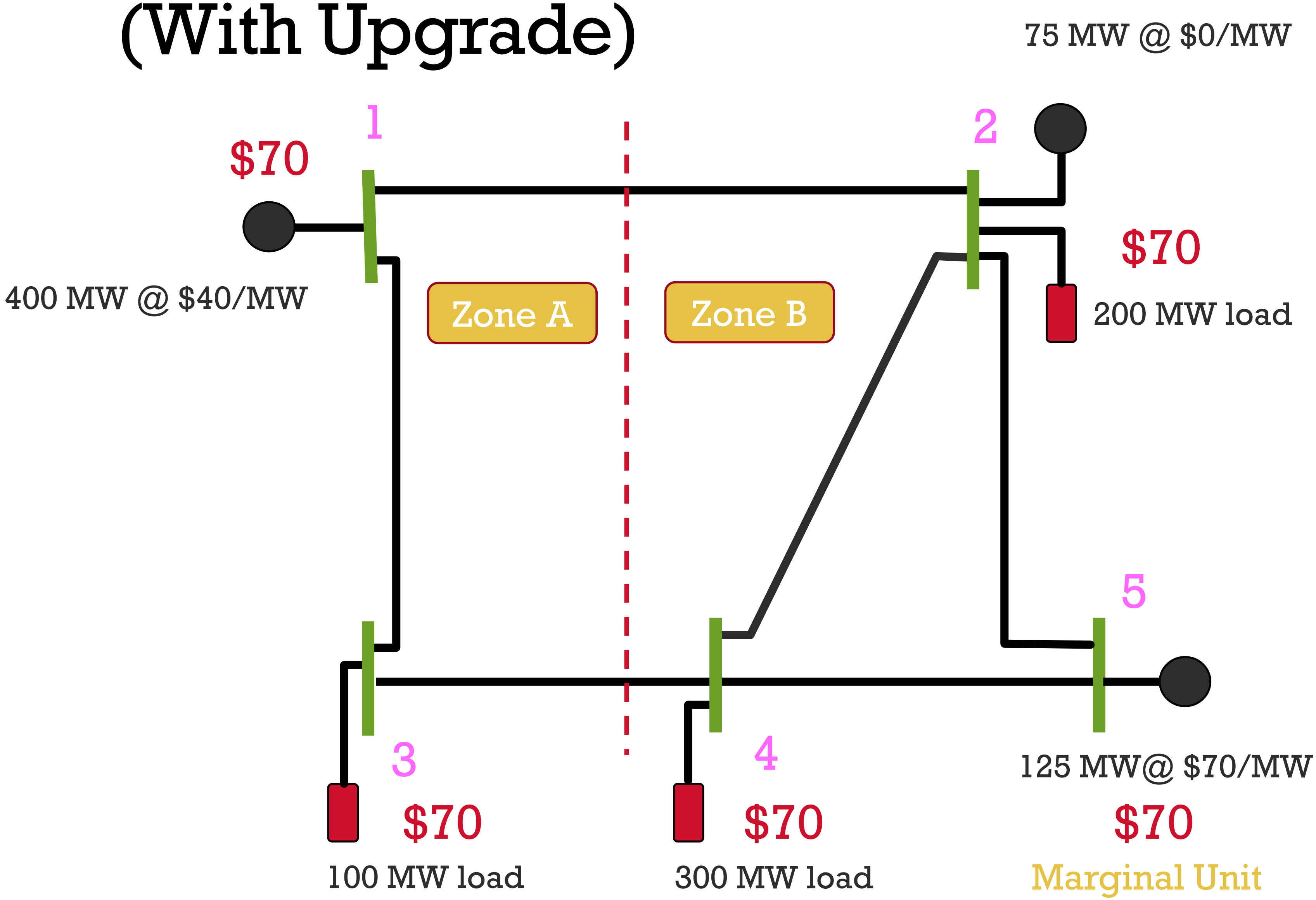
Marginal Costs (Without Upgrade)



APC Calculation: Zone B (Without Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 490 MWh * $70/MWh + 75 MWh * $0/MWh = $34,300
- Purchases = $0
- Sales (MWh) = Unit Generation – Area Native Load
  - **65 MWh = (490 MWh + 75 MWh) – (200 MWh + 300 MWh)**
- $\text{GLMP} = \dfrac{(\$70/\text{MWh} * 490\ \text{MWh}) + (-\$20/\text{MWh} * 75\ \text{MWh})}{490\ \text{MWh} + 75\ \text{MWh}} = \$58/\text{MWh}$
- Sales ($) = Sales (MWh) * GLMP ($/MWh)
  - **$3,770 = 65 MWh * $58/MWh**
- APC = $34,300 + $0 - $3,770 = $30,530

Marginal Costs (With Upgrade)



APC Calculation: Zone B (With Upgrade)

- APC = Production Cost + Purchases – Sales
- Production Cost = 125 MWh * $70/MWh + 75 MWh * $0/MWh = $8,750
- Purchases (MWh) = Area Native Load – Unit Generation
  - **300 MWh = (200 MWh + 300 MWh) – (125 MWh + 75 MWh)**
- $\text{LLMP} = \dfrac{(\$70/\text{MWh} * 200\ \text{MWh}) + (\$70/\text{MWh} * 300\ \text{MWh})}{200\ \text{MWh} + 300\ \text{MWh}} = \$70/\text{MWh}$
- Purchases ($) = Purchases (MWh) * LLMP ($/MWh)
  - **$21,000 = 300 MWh * $70/MWh**
- Sales = $0
- APC = $8,750 + $21,000 - $0 = $29,750

SPP

APC Benefit (Zone B – Assigned Wind)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Zone B benefits from increased purchases at a lower cost than its production costs

Scenario	Production Cost	Purchases	Sales	APC
Base	$34,300	$0	$3,770	$30,530
Change	$8,750	$21,000	$0	$29,750
			Benefit	***$780***

APC Benefit (Regional)

- Measure of change in APC from base case (constraint binding) to change case (constraint relieved by upgrade)
- Region benefits from production costs being offset by lower cost purchases and increased sales revenues

Scenario	Production Cost	Purchases	Sales	APC
Base	$35,700	$6,500	$3,770	$38,430
Change	$24,750	$21,000	$21,000	$24,750
			Benefit	***$13,680***

Key Observations

Unassigned Wind

- Indirectly impacts APC calculation of both zones due to change in dispatch costs and potential change in LMPs

Assigned Wind

- Indirectly impacts APC calculation of both zones due to change in dispatch costs and potential change in LMPs
- Directly impacts APC calculation of Zone B due to inclusion of wind unit in production cost, generation weighted average LMP, and generation/load balance

SPP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2019 ITP Schedule

Juliano Freitas

July 26, 2018

Powerflow Model

- Start: 7/17/2017
- End: 3/1/2018 (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 email approval in August 2018
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Short Circuit Model

- Start: 11/20/2017
- End: 3/9/2018
- 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
  - ITP Final Approval with Model Updates in August 2018
- Staff Leader: Zack Bearden (zbearden@spp.org)
- Working Group Approval: TWG

Siting Plan (Complete)

- Start: 12/1/2017
- End: 7/2/2018 (Member's Final Approval)
- Potential schedule updates contingent on Site Prioritization approval 4/25
- Member Review Time:
  - Site Repository: 2/22/2018 – 3/8/2018 (5 days)
  - Site Prioritization: 4/9/2018 – 4/13/2018 (5 days)
  - Site Prioritization: 4/20/2018 – 4/27/2018 (6 days)
  - Site Assignment Renewable: 4/27/2018 – 5/4/2018 (5 days)
  - Site Assignment Renewable: 5/24/2018 – 5/31/2018 (5 days)
  - Site Assignment Conventional: 5/24/2018 – 6/1/2018 (6 days)
  - Site Assignment Conventional: 6/25/2018 – 7/2/2018 (6 days)
  - Siting Plan Approval: 6/14/2018 (early)
- Staff Leader: Liz Gephardt (lgephardt@spp.org)
- Working Group Approval: ESWG

Generator Outlet Facilities (Complete)

- Start: 4/30/2018
- End: 7/25/2018 (Member's Final Approval)
- Member Review Time:
  - 7/19/2018 – 7/25/2018 (5 days)
- Staff Leader: Kirk Hall (khall@spp.org)
- Working Group Approval: TWG

Economic Model Building

- Start: 7/3/2017
- End: 9/28/2018 (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)*
  - ESWG Approval: 9/14/2018
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: ESWG

* Other postings may be needed if additional changes are accepted per ITP Manual, Section 9.3

Benchmarking (Complete)

- Start: 4/30/2018
- End: 7/12/2018 (Member's Final Approval)
- Member Review Time:
  - Economic - Pass 1: 6/7/2018 – 6/14/2018 (5 days)
  - Economic - Pass 2: 7/5/2018 – 7/12/2018 (5 days)
- Staff Leader: Nikki Roberts (nroberts@spp.org)
- Working Group Approval: ESWG

Model Updates

- Start: Pass 1 Powerflow Model (7/17/2017)
- End: 3/1/2018 (General topology changes)
- End: 8/6/2018 (New NTCs and withdrawals approved by the Board and NTC re-evaluations)
- Member Review Time:
  - Topology Lockdown: 3/1/2018
  - NTC/Re-Evaluations: 8/6/2018
- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

Constraint Assessment

- Start: 8/2/2018
- End: 9/14/2018 (Member's Final Approval)
- Member Review Time:
  - 8/24/2018 – 8/31/2018 (5 days)
  - 9/06/2018 – 9/13/2018 (5 days)
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: TWG

Economic model conversion to powerflow

- Start: 8/2/2018
- End: 10/10/2018 (Member's Final Approval)
- Member Review Time:
  - Reactive Settings Review: 9/20/2018 – 9/27/2018 (5 days)
  - 10/3/2018 – 10/9/2018 (5 days)
- Staff Leader: Zack Bearden (zbearden@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: 10/10/2018
- 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: Kelsey Allen (kallen@spp.org)
  - Economic: Nikki Roberts (nroberts@spp.org)
  - Policy: Nikki Roberts (nroberts@spp.org)
  - Operational: Will Tootle (wtootle@spp.org)
  - Short Circuit: Jason Terhune (jterhune@spp.org)

DPP Evaluations

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

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)

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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: 6/4/2019
- 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: Chris Jamieson (cjamieson@spp.org)

Sensitivity Analysis

- Start: 8/5/2019
- End: 8/26/2019
- Member Review Time:
  - 8/19/2019 – 8/23/2019 (5 days)
- Staff Leader: 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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2019 ITP Generator Outlet Facilities Review

Kirk Hall

July 25, 2018

Overview

- Process Review
- GOF Indicators
- Potential Siting Adjustment
- GOF Results
  - Wind
  - Conventional and Solar
  - Engineering Judgments
  - Potential GOF Updates
- Recommendation

Process Review

- Review site prioritization and Siting Availability results for potential need for GOFs
- Resources in GI Queue
  - Leverage GI Queue as appropriate
  - Review resource and GI Upgrade for right sizing of GOF
- Work closely with incumbent TO during development of potential upgrades
  - Keep stakeholders involved in the process
  - Use member feedback to ensure upgrades modeled realistically
- Validate potential GOF addresses the FCITC results with a verification run

GOF Indicators

- GI Queue
  - Definitive assigned network upgrade(s) identified in GI Queue
  - Identified network upgrades not yet assigned do not guarantee GOF is recommended
- Siting Availability < Sited Resource Amount and
  - N-0: 3% TDF
  - N-1: 20% TDF
  - FCITC results show transfer capability at a site
  - Siting Availability = FCITC – existing generation at a site
  - GOFs not recommended based upon limited Siting Availability alone

Potential Siting Adjustment

- Original Site at Tulsa North 345 kV
  - Requested interconnection moved to Riverside 345 kV (South Tulsa) in GI Queue
  - GI Queue has identified upgrades for ERIS, however not definitive results
- POI amounts by model
  - Future 1: 2024 → 855 MW, 2029 → 1357 MW
    Future 2: 2000 MW for both years
- Siting milestone owned by ESWG
  - Discussion will occur during 7/26 ESWG meeting to discuss possibility of siting adjustments
  - TWG requested to approve upgrades for either site contingent upon ESWG direction for Siting

Siting Adjustment Recommendation

- Staff recommends the ESWG approve moving the POI of the resource originally sited at Tulsa North 345 kV to Riverside 345 kV
  - Potential impact to study results
  - Point in time where it can be accommodated

GOFs for Wind Resources

GOF Description	Site	MW Sited*	GOF Source
2nd Tande – Neset 230 line, New 230/115 kV transformer at Neset	Tande 345 kV	604	Siting Availability
Terminal Upgrades Cleo Corner – Cleo Tap 138 kV (GI Queue)	Cleo Corner 138 kV	200	GI Queue
Terminal Upgrades Carl Jct – Asbury Plant – Purcell 161 kV line	Asbury Plant 161kV	250	Siting Availability
Terminal Upgrades Carthage – LaRussell – Monett 161 kV line	LaRussell Energy Center 161 kV	250	Siting Availability
2nd Tolk 345/230 kV Transformer	Crossroads 345 kV	522	GI Queue

*Sited amount for all futures/years, thus GOFs needed in 2024

GOF Description	Site	MW Sited	GOF Source
2nd Tulsa North 345/230 kV transformer (F2 2024 & 2029)	Tulsa North 345 kV	2000	Both
Rebuild 21st Street – Tulsa SE 138 kV line (F1 2029, F2 2024 & 2029)	Riverside 345 kV	1357/2000	Siting Availability

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Wind Resources with No GOFs Recommended

Site	MW Sited*	Reasons
Utica 230 kV	200	• Requests associated with definitive previously assigned upgrades withdrawn from GI Queue • Siting Availability > Resource size
Woodring 345 kV	250	• Raising structures to increase line rating (not definitive) • Siting Availability > Resource size
Cleo Corner 138 kV	200	• Short 69 kV lines around Cleo may show up as constraints • Potential for rebuilding in models as GOFs
Mooreland Windfarm 138 kV/Mooreland – Knob Hill 138 kV	150/176	• No definitive upgrades • Concerned with masking issues
Chisholm – Gracemont 345 kV	300	• GI study considering large cluster, study results not definitive • Siting Availability > Resource size

Solar and Conventional GOF

- No GOFs needed for Conventional or Solar Resource
  - Conventional Resource Plan showed no correlation to resources in the GI Queue
  - No site bus included more MW than Siting Availability results showed
  - Siting Availability results only measure for GOF need for individual resources
    - 3 Sites included resources on both sides of a transformer (Plant X, Hobbs, Nichols)
    - Siting Availability considers existing generators and FCITC results

Potential GOF Updates

- Staff may invalidate constraints or identify additional network upgrades that should be considered GOFs later in the study
  - Upon identification, staff will review justification with TWG/ESWG
- Milestones affected
  - Constraint Assessment
  - Solution Development

GlobalScape Data Paths

- ITP→ITP→CD (CEII)→NDA→2019 ITP →Siting Plan
- ITP→ITP→NCD (RSD,CEII)→NDA→2019 ITP→2019 ITP Siting Plan


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Economic Model Build

Clayton Mayfield

July 26 -27, 2018

Objective

- Review Economic model Pass 5 updates
- Review planned updates to Pass 5 Economic models
- Seek ESWG approval to use the Economic models as posted in the Constraint Assessment process

Economic Model Pass 5 Update

Pass 4 Review Period Updates

- Stakeholder review summary:
  - 4 inquiries on posted data, which did not result in any model updates
  - Issue in % ownership for RP2 designated solar units (F2 issue only)
  - Adjusted VOM for select IC Gas units in GSEC, SPS, and SWPA due to higher than typical capacity factors
  - Adjusted two units in AEP unit specific fuel price to reflect 2017 ITP10 fuel price to increase less than typical capacity factors
- Staff Economic model review summary:
  - Corrected the 2019ITP RP wind and solar Annual Energy (GWh) numbers for all units except AECI
  - Corrected % ownership for CT RP2 units (F2 issue only)
  - Corrected development status for units that come into service during study years
  - Corrected application of curtailment criteria

2019 ITP Economic Model Planned Updates

Planned Updates

- Final Powerflow updates:
  - Generator Outlet Facility additions
    - Will update Resource Plan Unit bus mappings
  - Board-approved Sponsored Upgrades
  - Board-approved NTCs
  - AG1 NTCs
  - AQ NTCs
  - Board-approved Interregional Projects
- Economic model updates
  - Final Powerflow model updates
  - Apply future specific winter ratings
    - For Constraint Assessment only
  - Potential adjustments identified during the Constraint Assessment Process

Staff Recommendation

Recommendation

Staff recommends using the Pass 5 Economic models in the Constraint Assessment Milestone with the application of the planned changes detailed in this presentation.


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Constraint Assessment

Clayton Mayfield

July 26-27, 2018

Objective

- Review Constraint Assessment background & methodology

Background

Constraint Assessment

Constraint Assessment Background

- Method of determining elements that limit the incremental transfer of power throughout the system both under system intact and contingency situations.
- SPP utilizes constraints to reliably manage the flow of energy across the physical bottlenecks of the transmission system in the least costly manner.
- Developing study-specific constraints plays a critical part in determining transmission needs, as the Constraint Assessment identifies future bottlenecks as well as fine tunes the PROMOD models
- Due to PROMOD limitations, it is not possible to monitor all combinations of transmission elements for issues, so the Constraint Assessment narrows constraint focus to most impactful as determined by ITP Future assumptions

Governing Language
ITP Manual

2.2.3 CONSTRAINT ASSESSMENT

SPP maintains a list of flowgates to monitor based on reliability and economic issues seen in real-time. The constraint assessment is used to identify potential future constraints for each future and year of study.

To create these additional constraints, SPP will perform economic simulations to identify additional or breaching elements in the system that occur during the reliability peak and off-peak hours[22]. System flows under two levels of constraint will be analyzed:

- Copper Plate: No defined constraints.
- Initial constraint list based on NERC and SPP flowgates.

Governing Language
ITP Manual

2.2.3.1 Contingency Screening

Due to software and time limitations, large contingency lists are not feasible. The contingency lists will be created with the goal of including the most impactful contingencies for constraint identification.

After the initial economic simulation dispatch results have been created, the resulting contingencies will be limited to the following types of planning events identified in the NERC Standard TPL-001 for the 100 kV-and-above transmission system:

- P1.2 and P1.3 single-branch contingencies on the 100 kV and above system exceeding 50 percent loading in the peak and off-peak hours under system intact conditions for the translated areas.
- P1.2 and P1.3 single-branch contingencies on the 200 kV and above system exceeding 25 percent loading in the peak and off-peak hours under system intact conditions for the SPP footprint.
- Contingencies included in the SPP permanent and temporary flowgates, including P7 events.
- Other P1, P2, P4 and P5 events as potential contingencies.

Contingencies meeting these criteria that are inconsistent with operation of the SPP Integrated Marketplace or create simulation anomalies may be excluded from further evaluation.

Governing Language
ITP Manual

2.2.3.2 Constraint Identification

Facilities exceeding their thermal limits under system intact and contingency conditions will be assessed for potential inclusion as constraints. Flow violations occurring in either of the reliability hours will be automatically included unless SPP and stakeholders deem otherwise during the constraint review. Flow violations occurring in the annual hourly simulations will be considered for inclusion based on the following information, at a minimum:

[22] Defined in the Base Reliability Model Overview section

- Number of violation hours and/or violation loading thresholds.
- The ability of the simulation to reach a valid[23] dispatch solution due to a given constraint[24].
- Preliminary economic model simulation results.
- Performance of constraints in prior SPP expansion plan studies.

The ESWG and TWG will be given the opportunity to review the resulting constraints. After the review is completed, TWG approval will be requested before completion of the milestone.

In addition to the approved list of constraints, some 69 kV constraints may be included in the constraint list as needed to properly control the dispatch of resources on the 69 kV system and capture congestion in developing 100 kV and above solutions. These constraints will be suggested or provided by SPP stakeholders.

SPP

PROMOD Analysis Tool (PAT)

- Primary tool utilized for Constraint Assessment
  - Includes a tool that develops outages and associated monitored branches utilizing PROMOD dispatch and other criteria
  - Includes a tool that creates and analyzes event files to reduce errors and PROMOD run times
- Software developed specifically for in-depth analysis of PROMOD results by utilizing the following output files generated by PROMOD
  - HRX, HRY, EVE, PFF, LIB

Methodology

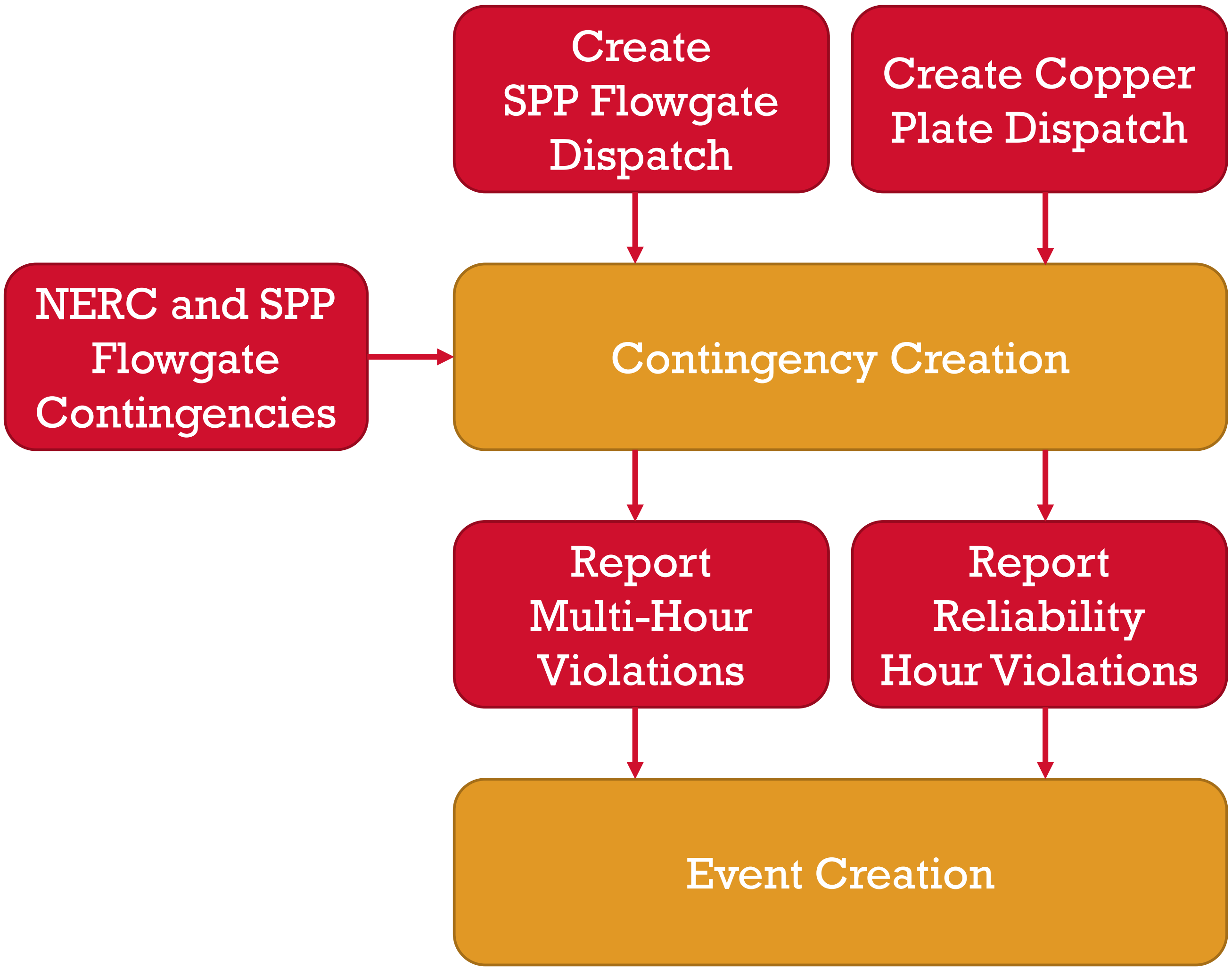
Constraint Assessment

Methodology Overview

- ITP Scenarios (5 total):
  - Future 1 Y2, Y5, Y10
  - Future 2 Y5, Y10
  - Assessment types:
    - Peak
    - Off-Peak
    - Annual (8760/8784)
  - Constraint files:
    - SPP Permanent Flowgates
    - Copper Plate (unconstrained)

Methodology Overview

By Scenario



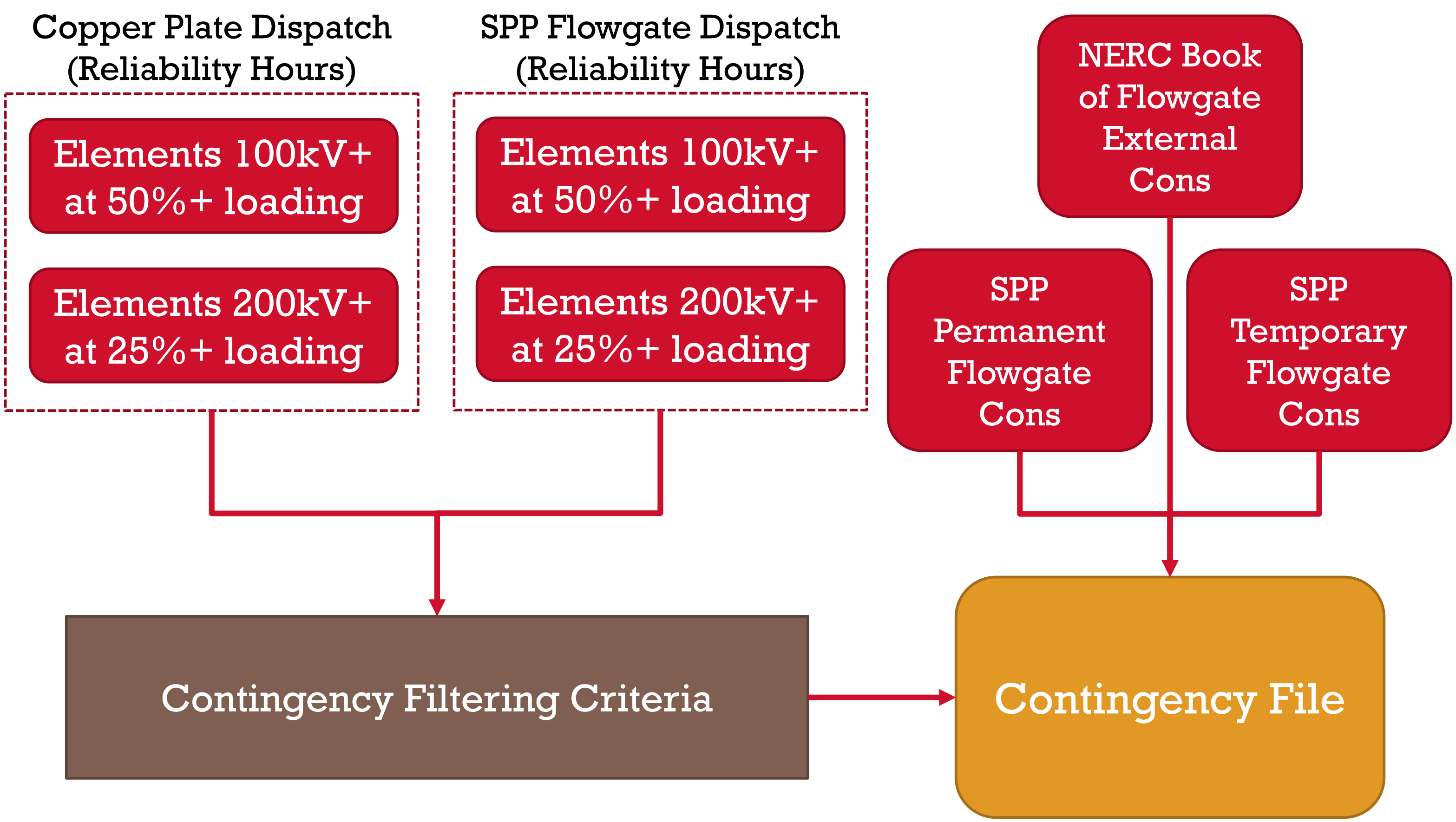
Initial Set-Up
By Scenario

- Create two PROMOD annual dispatches
  - Copper Plate Event File
  - Event file containing the SPP Permanent Flowgate events (as of July 3, 2018)
- Determine reliability hours
  - Peak: Highest load hour in SPP
  - Off-peak: Highest SPP wind to SPP load (wind penetration) in April or May between 12 AM and 6 AM

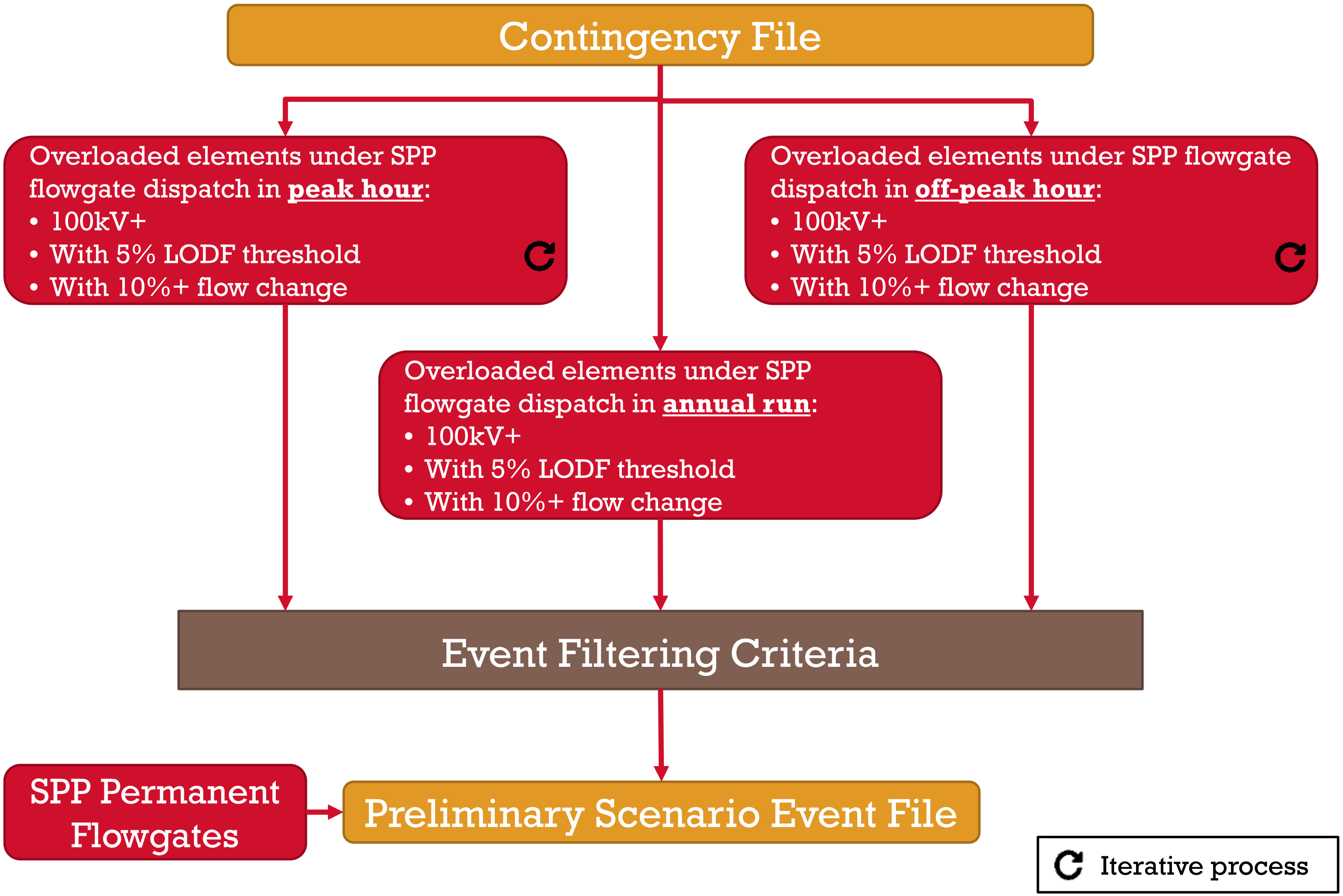
$$Wind\ Penetration_{hour,\%} = \frac{Contract\ Participation\ Energy\ (MW) + Contract\ Curtailed\ Energy\ (MW)}{Load\ (MW)}$$

SPP

Contingency Creation
By Scenario



Event Creation
By Scenario



Event Creation II
By Scenario

Preliminary Scenario Event File

↓

Create
Economic Dispatch

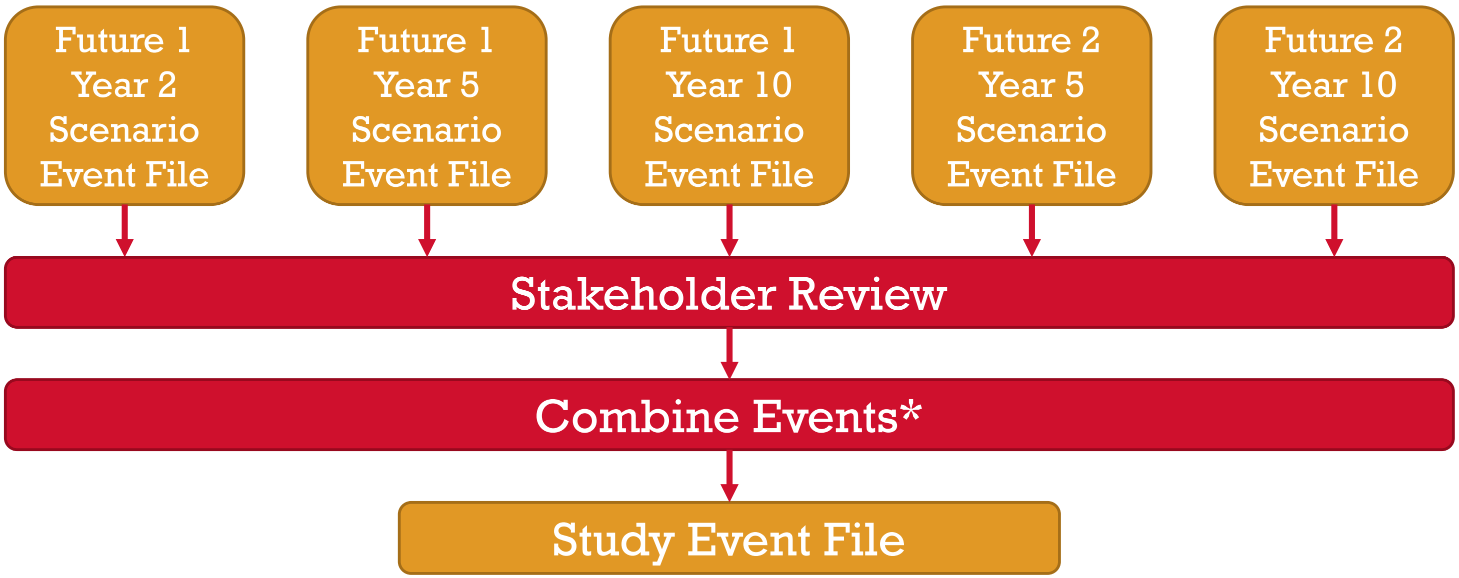
↓

1. Review events causing overloads, emergency energy, or dump energy
2. Review event congestion scores for potential exclusion in case of dimensioning issues

↓

Scenario Event File

Methodology Overview
Event Creation – Study-specific



*To the extent possible with topology changes amongst scenarios

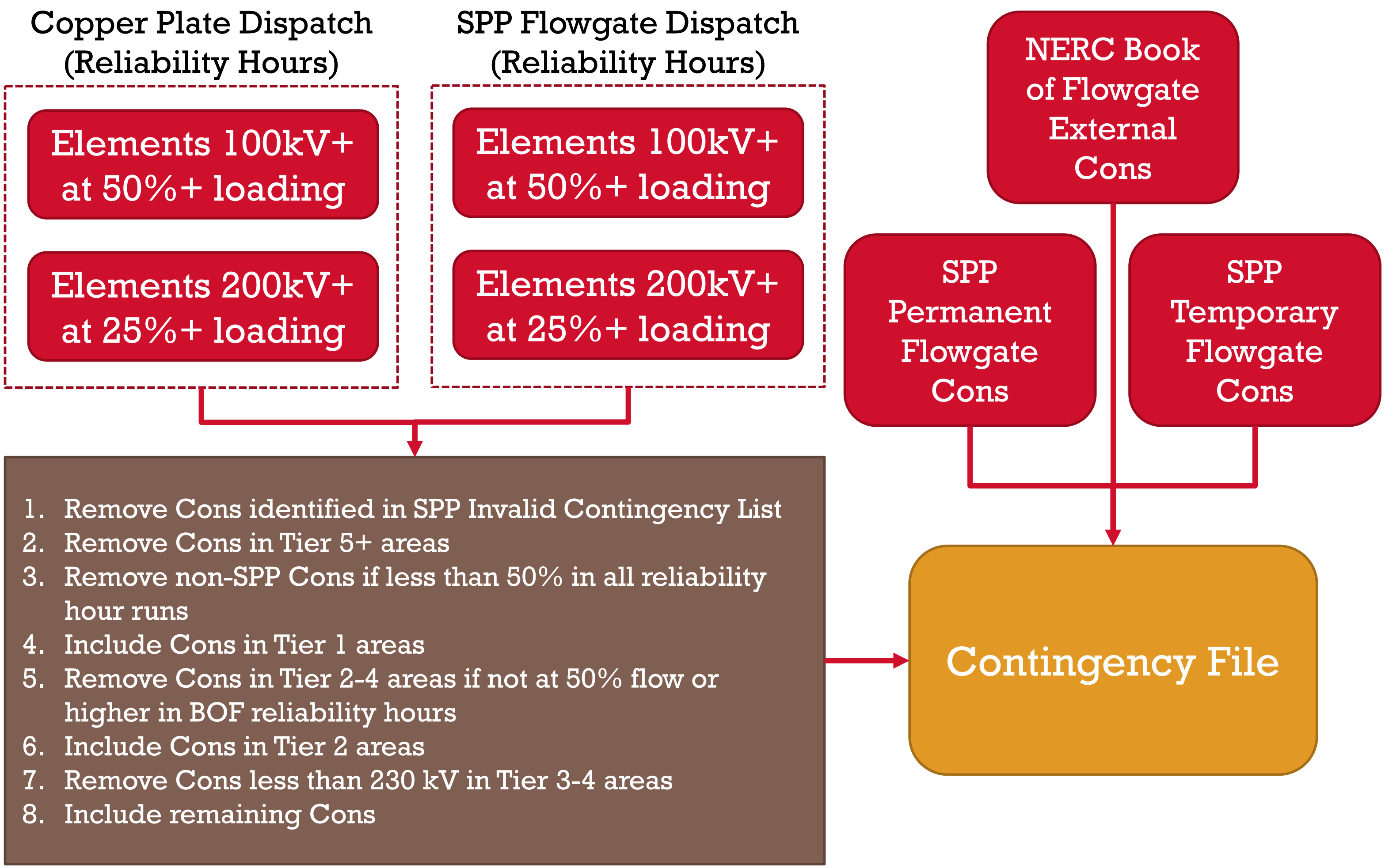
Stakeholder Review Period

- Review Period: 8/24/2018 – 8/31/2018
  - Consistent with the ITP Manual,
    - Events with following contingencies assumed included unless directed by stakeholders during this review:
      - P1.2 and P1.3 single-branch 100kV+ with 50% loading in peak or off-peak
      - P1.2 and P1.3 SPP single-branch 200kV+ with 25% loading in peak or off-peak
      - NERC, SPP permanent, and SPP temporary flowgates
    - Events with following contingencies assumed excluded unless directed by stakeholders during this review:
      - Other P1, P2, P4, and P5 events not included in NERC or SPP permanent flowgates
    - Solicit additional 69kV events
- TWG Approval Review: 9/06/2018 – 9/13/2018
- TWG Approval: 9/14/2018
  - Email or conference call

Appendix

Constraint Assessment

Contingency Creation
By Scenario



Event Creation
By Scenario

Contingency File

Overloaded elements under SPP flowgate dispatch in **peak hour**:
- 100kV+
- With 5% LODF threshold
- With 10%+ flow change

Overloaded elements under SPP flowgate dispatch in **off-peak hour**:
- 100kV+
- With 5% LODF threshold
- With 10%+ flow change

Overloaded elements under SPP flowgate dispatch in **annual run**:
- 100kV+
- With 5% LODF threshold
- With 10%+ flow change

1. Remove events with radial monitored lines under system intact and contingency conditions
2. Review events with 20%+ shift factor from existing and/or resource plan generation for potential exclusion
3. Review "null" events with no generation at least 1% shift factor for potential exclusion
4. Include SPP and Tier 1 Peak and Off-Peak constraints
5. Include SPP events violating 800+ hours, non-SPP events violating 1200+ hours
6. Include events with first occurrence of monitored element (regardless of violated hour threshold)
7. Remove events from annual run with monitored element occurrences of greater than 5
8. Potentially include MTEP18 and SPP Temp Flowgate constraints (includes 69kV)

SPP Permanent Flowgates

Preliminary Scenario Event File

Iterative process

Southwest Power Pool

Revision Request Form

SPP STAFF TO COMPLETE THIS SECTION	
RR #: 317####	**Date: 6/26/2018**
RR Title: Change to ITP Operational Model Development	
System Changes ☒ No ☐ Yes **Process Changes?** ☐ No ☒ Yes **Impact Analysis Required?** ☒ No ☐ Yes	

SUBMITTER INFORMATION	
Name: Will Tootle	**Company:** SPP
Email: wtootle@spp.org	**Phone:** 501-614-3515
Only Qualified Entities may submit Revision Requests. *Please select at least one applicable option below, as it applies to the named submitter(s).*	
☒ **SPP Staff** ☐ **SPP Market Participant** ☐ **SPP Member** ☐ **An entity designated by a Qualified Entity to submit a Revision Request "on their behalf"**	☐ **SPP Market Monitor** ☐ **Staff of government authority with jurisdiction over SPP/SPP member** ☐ **Rostered individual of SPP Committee, Task Force or Working Group** ☐ **Transmission Customers or other entities that are parties to transactions under the Tariff**

REVISION REQUEST DETAILS

Requested Resolution Timing: ☒ **Normal** ☐ **Expedited** ☐ **Urgent Action**

Reason for Expedited/Urgent Resolution:

Type of Revision (select all that apply):

☒ Correction

☐ Clarification

☐ Design Enhancement

☐ New Protocol, Business Practice, Criteria, Tariff

☐ NERC Standard Impact *(Specifically state if revision relates to/or impacts NERC Standards, list standard(s))*

☐ FERC Mandate *(List order number(s))*

REVISION REQUEST RISK DRIVERS

Are there existing risks to one or more SPP Members or the BES driving the need for this RR? ☐ Yes ☒ No

If yes, provided details to explain the risk and timelines associated:

☐ Compliance (Tariff, NERC, Other)

☐ Reliability/Operations

☐ Financial

SPP Documents Requiring Revision:
Please select your primary intended document(s) as well as all others known that could be impacted by the requested revision (e.g. a change to a protocol that would necessitate a criteria or business practice revision).

☐ **Market Protocols**	**Section(s):**	**Protocol Version:**
☐ **Operating Criteria**	**Section(s):**	**Criteria Date:**
☐ **Planning Criteria**	**Section(s):**	**Criteria Date:**
☐ **Tariff (OATT)**	**Section(s):**	
☐ **Business Practice**	**Business Practice Number:**	

☒ **Integrated Transmission Planning (ITP) Manual**	**Section(s): 2.4, 4.4.1**
☐ **Revision Request Process**	**Section(s):**
☐ **Minimum Transmission Design Standards for Competitive Upgrades (MTDS)**	**Section(s):**
☐ **Reliability Coordinator and Balancing Authority Data Specifications (RDS)**	**Section(s):**
☐ **SPP Communications Protocols**	**Section(s):**

OBJECTIVE OF REVISION

Objectives of Revision Request:
Describe the problem/issue this revision request will resolve.

The current method for evaluating solutions for flowgates classified as economic needs requires the use of day-ahead reliability unit commitment models to perform analysis. After thorough review it was determined that this method is not feasible. Software revisions made throughout the year prevent model building on historic time periods. The model building software is not backwards compatible to support comparative analysis of projects. SPP is working to develop a process to evaluate proposed solutions for these economic operational needs, and plans to update this document at a later time to incorporate said process.

Describe the benefits that will be realized from this revision.

The language will be updated to support current capabilities that are already in place. There will be not be any additional software or staff time required to support the update since the types of models that are being evaluated are being reduced.

REVISIONS TO SPP DOCUMENTS

In the appropriate sections below, please provide the language from the current document(s) for which you are requesting revision(s), with all edits redlined.

Market Protocols

SPP Tariff (OATT)

SPP Operating Criteria

SPP Planning Criteria

SPP Business Practices

2.4 OPERATIONAL MODEL DEVELOPMENT

After persistent operational needs are identified, SPP will identify the most extreme case(s) to evaluate whether the needs are addressed with proposed solutions. SPP will use an energy management system snapshot model for reliability operational ~~needs~~ and ~~the day-ahead reliability unit commitment (DA-RUC) model~~ for economic operational needs. Times with high loading or that require voltage mitigation for each operational need will be selected and the models converted to an ITP model format.

….

4.4 PERSISTENT OPERATIONAL NEEDS ASSESSMENT

Persistent operational needs may be either economic or reliability related. The criteria for identifying these needs is described in this section. SPP may propose additional needs to account for other problematic operational issues observed in operating the transmission system not fitting the given criteria. These additional needs will be presented to the ESWG and TWG for review and endorsement.

4.4.1 ECONOMIC OPERATIONAL NEEDS

SPP will classify flowgates meeting either of the following criteria as economic needs:

1. The flowgate was congested for at least 20 percent of the previous 24 months, either in a breached or binding state in the real-time balancing market solution, or
2. The flowgate had congestion costs totaling more than $10 million over the previous 24 months.

Periods of time when a flowgate's related congestion is deemed to be the result of prior outage conditions will be excluded from these criteria calculations. Congestion cost for outages will be provided for informational purposes.

Flowgates meeting either of these criteria will be identified as economic operational needs. These needs will not be subject to the evaluation process outlined in section 5.3.4. These needs will be reported for~~as~~ ~~the~~ informational purposes, as they could prove helpful when evaluating solutions to other needs identified in the Economic Needs Assessment.

SPP also will identify economic needs considering manual commitments of uneconomic generation for local area voltage support, according to either of the following criteria:

1. Manual commitment events that include startup and extension 25 percent of the year, or
2. Manual commitments that do not exceed 25 percent of the year, but cost over $1 million dollars over 24 months.

4.4.2 RELIABILITY OPERATIONAL NEEDS

SPP will classify facilities as reliability needs due to system reconfiguration using agreed upon (by SPP and the transmission operator) operational guides or load shed as a result of unsuccessful control of the system through re-dispatch if they meet the following criteria:

1. High- or low-voltage issues where system reconfiguration is implemented 10 percent of the year due to non-outage issues , or
2. Thermal loading issues where system reconfiguration through the use of an agreed upon operating guide has been implemented in real-time 25 percent of the year.

Revision Request Process

Minimum Transmission Design Standards for Competitive Upgrades (MTDS)

Reliability Coordinator and Balancing Authority Data Specifications (RDS)

SPP Communications Protocols

Southwest Power Pool

2019 ITP Milestone Lessons Learned

SPP Staff

July 26, 2018

Overview

- Lessons Learned – Milestones
  - Scope
  - Load/Generation Review
  - Renewable Policy Review
  - Resource Plan – Phase 1
  - Resource Plan – Phase 2
- Lessons Learned – Questions
  - What worked well?
  - What didn't work well?
  - What can be changed to help meet future goals?

SPP

Scope

- Objective
  - Develop a regional transmission plan that provides reliable and economic delivery of energy and facilitates achievement of public policy objectives, while maximizing benefits to the end-use customer
  - The ITP Scope contains assumptions to be utilized in the ITP Assessment that are not standardized in the ITP Manual
  - Approved by the ESWG/TWG

SPP

Lessons Learned
Scope

- What worked well?
  - ITP Manual being standardized with fewer scope items to negotiate
  - Incremental approvals of sections
  - Process for defining futures provided to stakeholders
  - Staff/Stakeholders planned for bi-weekly meetings during scope development, allowing more discussion on futures and consolidation
  - *What else worked well?*

Lessons Learned
Scope

- What didn't work well?
  - Renewable accreditation implementation not fully vetted; better documentation needed for future scopes
  - Research time for sensitivities not planned
  - Additional time spent on Consolidation and Optimization methodology
  - Operational solution development not fully evaluated
  - *What else did not work well?*

Lessons Learned
Scope

- What can be changed to help meet future goals?
  - For futures discussions, provide examples earlier in the process
  - Allow additional time for vetting/analyzing sensitivities
  - Standardization of consolidation and futures development
  - *What other changes might be needed?*

SPP

Load/Generation Review

- Allow stakeholders to review and provide feedback on initial load data in the ITP powerflow models and generation data in the vendor reference case.

Lessons Learned
Load/Generation Review

- What worked well?
  - Staff provided color-coding in spreadsheet to aide with stakeholder review of updated data
  - Developed a standard process for Resource Addition Requests (RARs)
  - Improved transparency to stakeholders to communicate and discuss issues to decisions within working group setting
  - Staff implemented new stakeholder-approved methodology allowing easier and more accurate modeling of hydro
  - *What else worked well?*

SPP

Lessons Learned
Load/Generation Review

- What didn't work well?
  - Staff miscommunication of deadline across working groups
  - Data consistency issues and lack of initial review as data received
  - Late data submitted by stakeholders
  - Staff changed between Net and Gross PMAX modeling between passes
  - Membership reported percent ownership of joint owned units
  - Separating external and internal generation and load review
  - *What else didn't work well?*

SPP

Lessons Learned
Load/Generation Review

- What can be changed to help meet future goals?
  - Clear communication both internally and externally on deliverable due dates and early discussion of any issues encountered
  - Limited adjustments of generation PMAX (MW)
  - Build Economic models at the same time to ensure purpose of Generation and Load Review is met
  - Implement a checklist for items stakeholders are requested to validate
  - Implement a checklist for Staff to follow before accepting stakeholder feedback
  - Reiterate common planning model parameters and identify where differences are acceptable
  - Perform internal and external load/generation review in parallel
  - Further improve standard process for Resource Addition Requests (RARs)
  - Central Point of Contact (CPOC) List

Renewable Policy Review & Resource Plan – Phase 1

- Objective
  - Renewable Policy Standards (RPS) are assessed for utilities within the SPP footprint
  - Ensure that policy mandates and goals can be met with existing and planned resources

Lessons Learned

Renewable Policy Review & Resource Plan – Phase 1

- What worked well?
  - Standardized renewable policy standard (RPS) percentages by state through ITP Manual development
  - Renewable policy standards (RPS) sent out for review rather than surveying stakeholders for requirements
  - *What else worked well?*

Lessons Learned
Renewable Policy Review & Resource Plan Phase 1

- What didn’t work well?
  - Milestone did not start on-time due to delay in load/generation review milestone
  - *What else did not work well?*

Lessons Learned
Renewable Policy Review & Resource Plan – Phase 1

- What can be changed to help meet future goals?
  - Discuss if a separate load forecast is needed for resource planning
  - Stakeholder education on pricing zones (*i.e.*, shortfall process, shared resources) – *or modify language in manual?*
  - Reiterate stakeholders to advise staff if they are not subject to the RPS
  - *What other changes might be needed?*

SPP

Resource Plan - Phase 2

- Objective
  - Develop a resource plan for years 5 and 10 for each future
  - Each zone must meet a 12% reserve margin from accredited resources
    - Each pricing zone shall be assessed for resource adequacy by accounting for load projections, existing generation, new wind and solar additions, capacity accreditation for all renewable units

Lessons Learned
Resource Plan – Phase 2

- What worked well?
  - Methodology established early and approved by ESWG
  - Results brought to Stakeholders at each step in the process
  - *What else worked well?*

Lessons Learned
Resource Plan – Phase 2

- What didn't work well?
  - External entity resource planning was delayed due to staff performing external load and generation review after internal reviews
  - *What else did not work well?*

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Lessons Learned
Resource Plan – Phase 2

- What can be changed to help meet future goals?
  - If decision is made to have separate load forecast, this data will need to be collected during Load/Generation Review milestone
  - Potentially change ITP manual so that we are not looking at pricing zones/recognition that pricing zones share resources
  - Look at all prototype parameters during scope development, comparing them to ABB data sources
  - *What other changes might be needed?*

SPP

Next Steps

- Incorporate feedback into the 2020 ITP process
- Setup next lessons learned meeting to cover
  - Siting
  - Generator Outlet Facilities (GOFs)
  - Benchmarking
  - Constraint Assessment
  - Economic Model Build

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Southwest Power Pool, Inc.

2019 ITP ASSESSMENT LESSON LEARNED

July 26-27th, 2018

Scope

What worked well for this milestone?

The bi-weekly meetings helped stakeholders stay more engaged, didn't have to restart each discussion because it was fresh.

Staff did a good job of being organized and laying out all the materials available so stakeholders could adequately review and be ready to discuss; more organized overall

Schedule presentation helped keeping what was in the forefront in front of stakeholders; better awareness

Meeting times-when we hash it out in one meeting and vote two weeks later it helps us to be prepared

Alan's famous straw polls in getting people's opinion on the table early and helped guide discussion/decisions

What didn't work well?

We need to put accreditation in the scope, but if we want to add in the attached items such as the firm/non-firm decisions, we need to have those discussion fleshed out before, or we won't be able to make that decision for the 2020 scope.

Definitely need more time on sensitivities discussion

Unintended consequences of the decision we made when defining the futures. Example, age-based retirements, future 2 was to have no exceptions. NPPD has a gen retiring in our model, but there is a load tied to that gen and so the load should be adjusted as well? We need to do a better job of thinking through these kinds of decisions and be mindful of unintended consequences or inconsistent assumptions.

Took a lot of time to finalize the renewable resource assumptions for each future.

Operational evaluations-what should we be doing here? The TPITF wants us to look at these, so we need to figure out how to get these evaluated.

What could be changed or done differently?

Could informational meetings be on a conference call?

Look into scheduling calls now so they are on the calendar

Make sure we are looking at other working groups meeting for conflicts

Comment: need to be careful what you simplify and do it intelligently (*eg.,* production cost models that combine units)

Have as many staff members come to the meeting in November as we can

CPOC list needs to be updated on an annual or bi-annual basis

Look to standardize more items to go from Scope to ITP Manual

Find efficiencies in our processes; consider effort to benefit when evaluating work to be done

We spent time on wind and solar, but didn't spend as much time on the increased energy amount, if we have items like that we should give them as much thought.

When discussing futures, be mindful that things that are controversial at ESWG may be at MOPC and SPC as well.

A modeling tool that utilizes energy/capacity resources in the gen model build-trying to find something to do this

When bringing methodologies to ESWG, start conversations sooner than later and be a little more direct in explaining what we are trying to accomplish and what direction/recommendation is needed; don't just say "what do you want to do?"

Note: There was a general discussion regarding staffing concerns and, with multiple studies going on, there will be divided attention, so both SPP staff and stakeholders will have to be prepared; emphasized the need for improvements and efficiencies.

Load/Generation Review

What worked well for this milestone?

What didn't work well?

Color coding didn't work well in pass 2, there was confusion about changes between the 2018 and 2019 ITP that were missed

Issues with how the data was coming from ABB. Broken Bow wind farms is an example. External transactions-

What could be changed or done differently?

Better internal and external communication of dates being communicated to MDWG and ESWG/TWG. Note: Theva is now handling Load/Gen Review and has aligned it with the model build schedule.

Figure out how to portray agreements with other entities. Provide instructions on how to provide a fleet PPA to SPP, so that we are correctly accounting resources

Need a tab for the minimum run times for unit. Stakeholders would like to see this

RAR-some developers put information in and others didn't. We need to create a template that has to be filled out by submitters. Work with stakeholders to find out what information they want to see.

Generation retirements-different request had to be sent for powerflow and another for economic model. Sometimes, stakeholders got a different answer from each team. We need to refine that process and maybe this is part of the CPOC discussion. Are there ramifications with TPL is we have age-based retirements in year 10 for the reference case. Juliano will sit down with Charles Hendrix to determine what he wants with retirements. Is this a policy discussion that needs to happen? What was the TPITF direction on retirements?

Renewable Policy Review & Resource Plan-Phase 1

What worked well for this milestone?

What didn't work well?

What could be changed or done differently?

Standardize the policy requirement request process that is lined out in the tariff and educate stakeholders of the process

Resource Plan-Phase 2

What worked well for this milestone?

What didn't work well?

Didn't like the assumption of allocation of all of the additional renewables in the resource plan

What could be changed or done differently?

Show preliminary results earlier in the process so that stakeholders can bring concerns

Jon Iverson's comments

We want to see the resource planning workbook, create a scrubbed non-confidential version

Siting

Make it clear that the siting repository workbook will be the main driver to determine siting priority

Stakeholders want to know shortfalls before they have to fill out the siting repository workbook. They don't want to go through the process of vetting all of the sites, if they are only going to have a 100mw shortfall, etc

Maps-earlier in the process and public

Collect feedback as we ask for approval of each milestone, so we can get lessons learned captured there and not have to have a separate discussion for it.


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Resource Siting Manual

Liz Gephardt

July 27, 2018

Objective

- Provide direction on addressing Action Item #185

Background

- ITP Manual
  - Siting guidelines are documented in the Resource Siting Manual
  - The Resource Siting Manual will detail how sites will be prioritized and ranked
- Resource Siting Manual
  - ESWG and TWG co-own Resource Siting Manual
  - Approved June 29, 2017
  - ESWG Action Item #185 to complete manual
  - 2019 ITP leveraged Resource Siting Manual, but additional details need to be documented

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Additional Details to be Documented

- Site Repository
  - Reliance on stakeholders to provide feasibility information during repository review
- Site Prioritization by Technology
  - Current Technologies
    - Utility-scale solar
    - Wind
    - Conventional
  - Exceptions

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Next Steps

- Staff seeking direction on Action Item #185
  - Recommend documentation of site repository and site prioritization items presented
- SPP to bring draft Resource Siting Manual language to ESWG/TWG in September 2018 for approval
- Close ESWG Action Item #185 upon Resource Siting Manual language approval by both working groups


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2020 ITP Schedule

Juliano Freitas

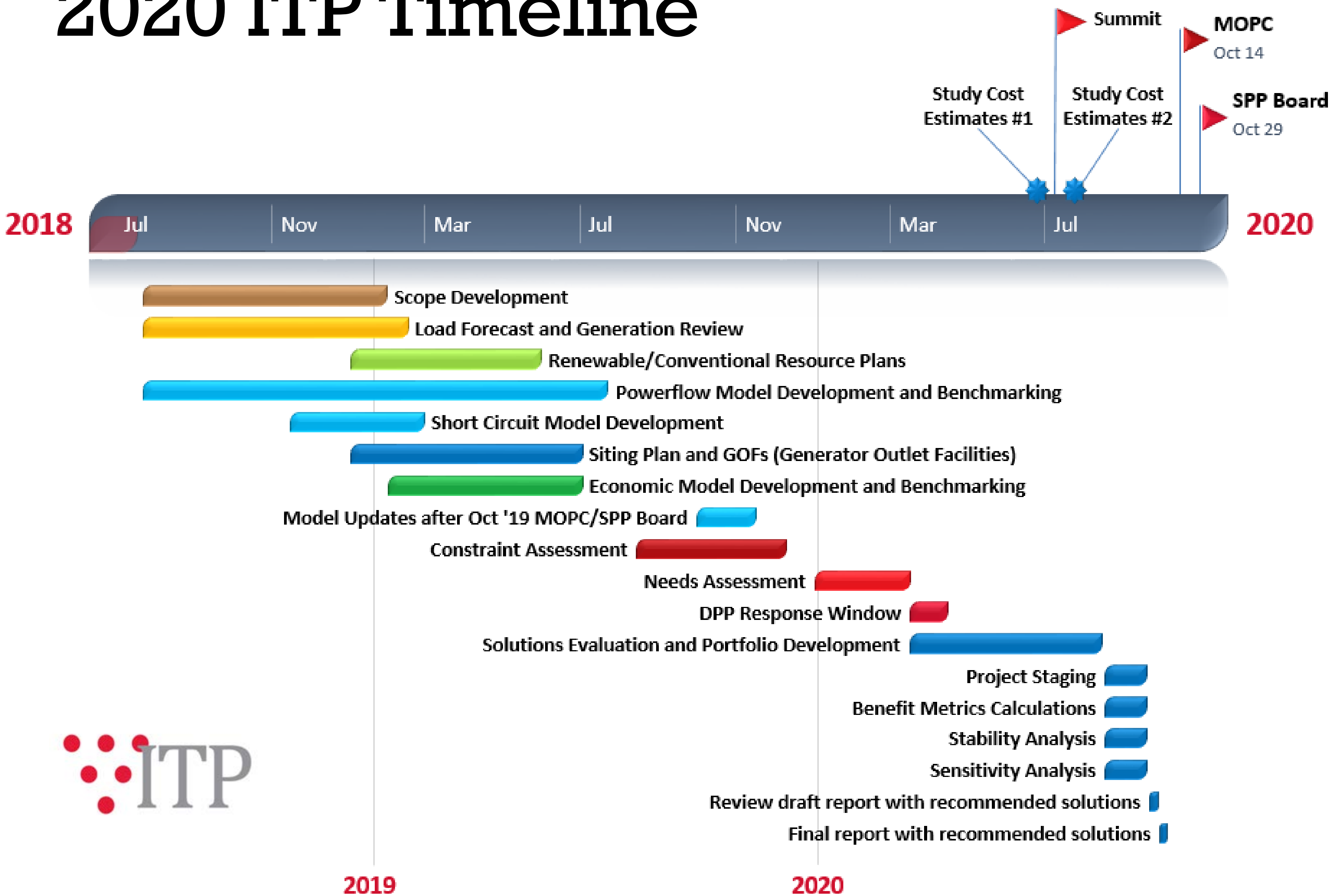
July 26, 2018

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



ITP

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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 – 2/08/2018 (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: Zack Bearden (zbearden@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)
  - 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 Posting for Approval: 2/08/2018 (7 days)
- Staff Leader: Theva Chanthaseny (tchanthaseny@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)
  - 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 Posting for Approval: 2/08/2018 (7 days)
- Staff Leader: Theva Chanthaseny (tchanthaseny@spp.org)
- Working Group Approval: TWG and ESWG


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2020 ITP Scope and Futures Introduction

Kirk Hall

July 26, 2018

Objective

- Review 2019 ITP Scope
- Introduce 2020 ITP Scope
- Early Futures Discussion

2020 ITP Scope Overview

Timeline:

- July-December 2018
- January 2019 MOPC Approval

Working Group Involvement:

- ESWG, TWG, ORWG, SPC, MOPC

Expected 2019 ITP Scope Items

- Futures
- Project Schedule*
- Fuel Price Adjustments
- Emission Price Adjustments
- Must Run Criteria
- Conventional Generator Prototypes
- Renewable Accreditation*
- Sensitivities
- Criteria for Operational Solutions*
- Operational Portfolio Development*
- Consolidation
- Stability Analysis*

*To be added in the ITP Manual in the future

Actual 2019 ITP Scope Items

- Overview
  - Objective
- Economic Model Overview
  - Futures
  - External Load Forecast
  - PST's
  - DC Ties
  - Must Run Units
- Resource Plan
  - Conventional Generator Prototypes
  - Renewable Accreditation
- Solution Evaluation
  - Persistent Operational Solution Evaluation
  - Consolidation
- Final Assessments
  - Sensitivities
  - Stability Analysis*
- Schedule
- Changes in Process and Assumptions

Items in red should move to ITP Manual

Expected 2020 ITP Scope Outline

- Overview
  - Objective
  - Schedule
- Economic Model Overview
  - Internal
    - Futures
    - Must Run Units
    - Unit-specific spinning reserve updates
    - Renewable Accreditation
  - External
    - Prototype parameters
    - PSTs
- Resource Plan
  - Conventional Generator Prototypes
  - Renewable Generator Modeling
- Solution Evaluation
  - Persistent Operational Solution Evaluation*
  - Consolidation
- Final Assessments
  - Sensitivities
  - Stability Analysis

*Work underway addressing this issue

Scope Items for ITP Manual

- PSTs
  - BA Models allow PSTs to adjust if auto adjust setting is enabled
  - BA Models fix PSTs if auto adjust setting is disabled
- DC Ties
  - Transactions fixed with no assumed curtailment price based upon hourly profiles from previous three years of historical flows, capped at long-term firm transmission service amounts
- Expectation for items that can be standardized should be added to the ITP Manual and removed from the scope

2020 ITP Working Group Scope Timeline

<table>
<tr><th>Topic</th><th>JUL</th><th>AUG</th><th>SEPT</th><th>OCT</th><th>NOV</th><th>DEC</th><th>JAN</th></tr>
<tr><td>Futures</td><td colspan="4">ESWG-TWG-ORWG</td><td></td><td></td><td></td></tr>
<tr><td>Project Schedule</td><td></td><td colspan="3">ESWG-TWG</td><td></td><td></td><td></td></tr>
<tr><td>Must Run Units</td><td></td><td></td><td></td><td colspan="2">ESWG</td><td></td><td></td></tr>
<tr><td>Renewable Accreditation</td><td></td><td></td><td></td><td colspan="3">ESWG</td><td></td></tr>
<tr><td>Unit Specific Spinning Reserve</td><td></td><td></td><td></td><td colspan="2">ESWG</td><td></td><td></td></tr>
<tr><td>External Prototype Parameters</td><td></td><td></td><td colspan="2">ESWG</td><td></td><td></td><td></td></tr>
<tr><td>Conventional Generator Prototypes</td><td></td><td colspan="2">ESWG</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Renewable Generator Modeling</td><td></td><td></td><td></td><td colspan="3">ESWG-TWG</td><td></td></tr>
<tr><td>Persistent Operational Solution Evaluation</td><td></td><td colspan="2">ESWG-TWG-ORWG</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Consolidation*</td><td></td><td></td><td colspan="4">ESWG-TWG</td><td></td></tr>
<tr><td>Sensitivities</td><td></td><td></td><td></td><td colspan="2">ESWG</td><td></td><td></td></tr>
<tr><td>Stability Assessment</td><td></td><td></td><td colspan="4">TWG</td><td></td></tr>
<tr><td>Final Scope Document</td><td></td><td></td><td></td><td></td><td colspan="2">ESWG-TWG</td><td>MOPC</td></tr>
</table>

*Consolidation dependent on Futures discussion

Futures Introduction

Futures Introduction

- Previous ITP futures review
- MTEP 19 Futures
- 2020 Futures Introduction/Feedback Request

Previous ITP Futures

2015 ITP10 Futures

Future 1: Business as Usual

- All statutory/regulatory renewable mandates and goals
- Other energy or capacity as identified in the Policy Survey
- Load growth projected by LSEs
  - Included the High Priority Incremental Loads
  - SPP member-identified generator retirement projections
- This future assumed no major changes to policies that are currently in place

Future 2: Decreased Base Load Capacity

- This future considered factors that could drive a reduction in existing generation
- Retired coal units less than 200 MW
- Reduced hydro capacity by 20%
- Utilized the Palmer Drought Severity to simulate a reduction in existing capacity affected by drought conditions
  - 10% under moderate
  - 15% under severe
  - 20% under extreme

2017 ITP10 Futures

Future 1: Regional Clean Power Plan Solution

- EPA CPP implemented at the regional level by meeting emission targets within the SPP footprint and each of its neighboring regions
- Increased large-scale solar development
- Minimal distributed solar development

Future 2: State-Level Clean Power Plan Solution

- EPA CPP implemented at the state level by meeting emissions targets within each state
- Increased large-scale solar development
- Minimal distributed solar development

Future 3: Reference Case

- No major policy changes
- Competitive wind
- High availability of natural gas
- Increased large-scale and distributed solar development

2019 ITP Futures

- Reference Case
  - Continuation of industry trends and environmental regulations
  - Age-Based coal and gas retirements
  - Higher than required RPS resource amounts
- Emerging Technologies Future
  - Technologies such as electric vehicles, DG/DR, and EE will drive energy growth rates
  - Current environmental regulations
  - Age-Based coal and gas retirements
  - Gas and coal prices consistent with long-term forecasts
  - Higher renewables than reference case due to emerging technologies

Key Assumptions	Drivers				
	Reference Case			Emerging Technologies	
	Year 2	Year 5	Year 10	Year 5	Year 10
Peak Demand Growth Rates	As Submitted in Load Forecast			As Submitted in Load Forecast	
Energy Demand Growth Rates	As Submitted in Load Forecast			Increase in Energy	
Natural Gas Prices	Current Industry Forecast			Current Industry Forecast	
Coal Prices	Current Industry Forecast			Current Industry Forecast	
Emissions Prices	Current Industry Forecast			Current Industry Forecast	
Fossil Fuel Retirements	Age-Based 60+, subject to stakeholder input			Age-based 60+	
Environmental Regulations	Current Regulations			Current Regulations	
Demand Response	As Submitted in Load Forecast			As Submitted in Load Forecast	
Distributed Generation (Solar)	As Submitted in Load Forecast			+300 MW	+500 MW
Energy Efficiency	As Submitted in Load Forecast			As Submitted in Load Forecast	
Export Lines	No			No	
New/Re-powered Renewables	Increased capacity Factor			Increased capacity Factor	
Storage	None			None	
Total Renewable Capacity					
Solar (GW)	~.25+	3	5	4	7
Wind (GW)	~18+	25	26	29	32

+Year 2 renewable levels include in-service facilities, plus submitted resource addition and waiver requests, as approved by the ESWG & TWG

MTEP Futures

MISO MTEP18 Futures

Limited Fleet Change

- Existing generation fleet remains relatively static
- Policy environment encourages coal generation to remain online
- Renewable additions are driven solely by current Renewable Portfolio Standards under low demand & energy growth rates
- Natural gas prices are low

Continued Fleet Change (Reference Case)

- Coal retirements reflect historical retirement levels based on average age of retirement
- Renewable additions continue to exceed current Renewable Portfolio Standard Requirements
- Natural gas prices are consistent with industry long-term reference forecasts

MISO MTEP18 Futures

Accelerated Fleet Change

- Increased demand & energy drives higher natural gas prices
- Carbon regulations targeting a 20% reduction from current levels are enacted
- Increased Renewable additions
- Natural gas reliance increases as a result of new capacity needs driven by the need to replace retired capacity

Distributed and Emerging Technology

- State level policies reflect desires for local reliability and optionality
- Mid-level coal retirements reflect economics and age limits
- Nuclear unit licenses are not renewed due to trends toward distributed resources and resulting economics
- Increased renewable additions
- High growth rate for demand & energy to reflect adoption of electric vehicle technology on a broader scale

MTEP 19 Futures

- No expected changes
  - Limited Fleet Change
  - Continued Fleet Change
  - Accelerated Fleet Change
  - Distributed and Emerging Technologies
- Enhancements
  - Model/cost assumptions for renewable resources
  - Capacity credit for solar resources
  - Minimum renewable penetration assumptions
  - Inclusion of units with CPCN or equivalent
  - DSM programs
  - Demand and energy growth rate bands

2020 ITP Futures Development

Stakeholder Feedback Request

- Preference on # of Futures (2 vs 3)
- Status quo for 2020 ITP Futures (consider updates to individual assumptions)
    - Renewable amounts
    - Age-Based Retirements
    - Peak demand or energy growth rates
    - Others
- Complete a new survey for future drivers
- Other suggested methods of future development?

Potential Future Drivers

- Natural Gas Supply
  - High or Low
- Emerging Public Policy
- Renewable Development
  - PTC and ITC
  - Technology learning curves
- Emerging Technology
  - Demand Response
  - Energy Efficiency
  - Storage
  - Distributed Generation
  - Large Number of Electric Vehicles
- Severe Weather
  - Winter Impacts
  - Drought
  - Catastrophic Events
- Physical/Cyber Security
  - Threat of attack
- Economic Development/Collapse
- WECC Connectivity
- Load Growth
- Changing Renewable Portfolio Standards

Impacted Modeling Inputs

- New generation capital costs
- Coal prices
- Meeting/Exceeding Renewable Portfolio Standards
- Energy efficiency

	Drivers			
Key Assumptions	BAU	Future A	Future B	Future C
Demand Growth Rates	XX%	+XX%	-XX%	XX%
Energy Growth Rates	XX%	+XX%	-XX%	XX%
Natural Gas Prices	Vendor Data	+XX%	-XX%	Vendor Data
Emissions Prices	Vendor Data	+XX%	-XX%	Vendor Data
Retirements	Age-Based	Age-Based +	Age-Based -	Age-Based
Other Assumptions				


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2020 ITP Load and Generation Review

Clayton Mayfield

July 26 -27, 2018

Objective

- Acquire an accurate representation of load and generation within and outside of the SPP footprint
- Data to be utilized in the ITP Powerbase Model

Vendor Powerbase ABB F17 (Base) + Select 2019 ITP Gen & Load Updates + ITP Manual, Gen & Load Review Updates = 2020 ITP Powerbase

Gen and Load Review Overview

- Timeline
  - July 2018 – February 2019
  - Stakeholder review starts in September
  - Working Group Final Approval in February
- Working Group Involvement
  - ESWG
  - TWG
  - MDWG
- Economic models built
  - Y2, Y5 & Y10

Gen and Load Review Overview

- 2017 Fall NERC Nodal Simulation Ready Model from ABB used as data source
- MTEP19[1] from MISO used as data source
- Machines and Peak Load from summer peak years 2, 5, & 10 of 2019 Series Powerflow models
- Internal and External Gen Review to be performed in parallel

[1] Adapt to MTEP19

2020 ITP Generation Review

Gen Review Overview

- ABB F17 base for ITP Economic models
- Items to be surveyed:
  - Unit Ownership percentages
  - Wind and Solar Accreditation
- ABB data parameters to be reviewed:
  - Generator name and short name
  - Category type
  - Conventional Fixed and Variable O&M Cost ($/MWh)
  - Heat rate and profiles
  - Physical state location
  - Annual Maintenance hours
  - Forced outage rate
  - Effluents (percentage removed)
  - Emission rates
  - Fuel forecast
  - Hydro energy limits
  - Season max capacity by year
  - Unit Commission & Retirement dates
  - Must-run designation

Gen Review Overview II

- MTEP 19[1] data parameters to be reviewed and utilized where applicable:
  - Generator name and short name
  - Category type
  - Variable O&M Cost ($/MWh)
  - Curtailment Prices
  - Fuel forecast
  - Annual max capacity (MW) by year
  - Unit Commission & Retirement dates
  - Must-run designation
  - Heat Rate Profiles
  - Renewable Profiles

[1] Adapt to MTEP19

2020 ITP Load Review

2020 ITP Load Review Overview

- Items to be surveyed:
  - Load factors by Demand Group
  - Loss factors by Demand Group
- Items to be reviewed:
  - Demand Group Mapping (Economic Load Ownership Legend)
  - Non-Scalable and Scalable Loads
  - Station Service Loads
- ABB and MTEP19[1] data to be reviewed:
  - Hourly Load Profiles
  - Monthly Peak & Energy Percentages
  - Station Service Loads – MTEP only
  - Demand Group Peak (MW) and Peak Energy (GWh) – MTEP only

[1] Adapt to MTEP19

2020 ITP Load and Generation Review Timeline

Load and Gen Review Timeline

Task	Start date	Duration (days)	End date
Post Load & Generation Review for Stakeholder Review	9/14/2018		9/14/2018
Stakeholder Review & Feedback Period	9/17/2018	10	9/28/2018
Send out RAR and Waiver Request to Stakeholder	9/21/2018		9/21/2018
Stakeholder RAR and Waiver Submittal Period	9/24/2018	25	10/26/2018
Working Group Meetings on RAR and Wavier Request	10/1/2018		11/30/2018
Post Load & Generation Review for Stakeholder Review	10/12/2018		10/12/2018
Stakeholder Review & Feedback Period	10/15/2018	10	10/26/2018
Post Load & Generation Review for Stakeholder Review	11/21/2018		11/21/2018
Stakeholder Review & Feedback Period	11/26/2018	10	12/7/2018
Working Group Meeting on Gen Review	12/3/2018		12/3/2018
Load & Generation Data Locked Down	1/11/2018		1/11/2018
Post Load & Generation Review for Stakeholder Approval	2/8/2019		2/8/2019
Working Group Milestone Approval	TBD*		

*Subject to change based on future working group meeting dates