SOUTHWEST POWER POOL

ECONOMIC STUDIES WORKING GROUP (ESWG) MEETING

March 2, 2022
Net Conference

SUMMARY OF MOTIONS AND ACTION ITEMS

- Approved February 2-3, 2022 ESWG meeting **minutes**
- Approved **RR 482**
- Approved the **2021 ITP Further Evaluation Scope**

SOUTHWEST POWER POOL
ECONOMIC STUDIES WORKING GROUP MEETING
March 2, 2022
Net Conference

MINUTES

AGENDA ITEM 1 – ADMINISTRATIVE ITEMS

Economic Studies Working Group (ESWG) Chair Alan Myers called the meeting to order at 8:00 a.m. The following members were in attendance or represented by proxy:

Al Tamimi, SUNC
Alan Myers, ITC
Anita Sharma, AEP
Calvin Daniels, WFEC
Derek Brown, Evergy
Gayle Nansel, WAPA
Jeremy Severson, BEPC
Jody Holland, GHP
Jordan Schmick, SPS
Kurt Stradley, LES
Kyle McKinney, GSEC
Michael Watt, OMPA
Randy Collier, CUS
Steve Gaw, APA
Steve Hohman, OPPD
Tim Owens, NPPD
Zac Hager, OGE

(Attachment 1 – Attendance) (Attachment 2 – Proxy)

Joshua Norton confirmed there was a quorum and provided the antitrust statement. Alan Myers reviewed the agenda for any changes. (Attachment 3 – Agenda)

> **Kurt Stradley made a motion, seconded by Steve Gaw to approve the agenda. The motion was approved unanimously.**

AGENDA ITEM 2 – CONSENT AGENDA

The consent agenda included the following items:

- Meeting Minutes – February 2-3, 2022 (Attachment 4 – February 2-3 2022 ESWG Minutes)

The consent agenda was approved unanimously.

AGENDA ITEM 3 – REVIEW OF ACTION ITEMS

Joshua Norton reviewed action items. The MOPC action item was added to the list. (Attachment 5 – Action Items)

AGENDA ITEM 4 – RR 482: RESOURCE ADDITION REQUEST (RAR) APPROVALS

Brooke Keene presented the changes TWG made to the RR and answered questions on how to keep the review of RARs efficient. (Attachment 6 – RR 482: RAR Approvals)

Steve Gaw made the motion, seconded by Tim Owens, to approve RR 482 as modified by TWG. The motion was approved unanimously.

AGENDA ITEM 5 – 2021 ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT SCOPE

Kirk Hall reviewed the scope of the 2021 ITP further evaluation. He detailed how resource plan and siting can be refreshed, reviewed model updates, and fielded questions form the group. Steve Gaw expressed concerns with reducing load in SPS as a long term projection. (Attachment 7 – 2021 ITP Further Evaluation Schedule) (Attachment 8 – 2021 ITP Further Evaluation Scope of Work presentation) (Attachment 9 – 2021 ITP Further Evaluation Scope of Work document)

Jeremy Severson made the motion, seconded by Kurt Stradley, to approve the 2021 ITP Further Evaluation Scope. The motion was approved unanimously.

AGENDA ITEM 6 – ITP REBASELINE / MOPC AI

Sherri Maxey presented an update on the ITP Rebaseline effort, and provided an overview of staff's approach to address the MOPC AI 314. Steve Gaw expressed concern with the market powerflow models (MPMs) being removed for all ITPs and reminded staff of his concern about the reliability only 2022 ITP. Sherri provided a high-level timeline for the ITP rebaseline, including the 2021 ITP Further Evaluation, the 2022 ITP reliability only assessment, the 2022 20-Year assessment (20YA), and the full 2023 and 2024 ITP assessments. Lastly, staff's approach to

address the MOPC action item 314 was reviewed. (Attachment 10 – 2022 ITP Scope v2.0) (Attachment 11 – ITP Rebaseline Update & MOPC AI 314)

AGENDA ITEM 7A – 2023 ITP: RESOURCE PLAN PHASE II

Antonio Barber presented an overview of the resource plan phase II milestone. Alan noted it would be worth checking that MISO LRTP is included in the external plan. (Attachment 12 – 2023 ITP Resource Planning)

AGENDA ITEM 7B – 2023 ITP: SITING PLAN

Greg Lampley presented an overview of the siting plan milestone. (Attachment 13 – 2023 ITP Siting Plan)

AGENDA ITEM 7C – 2023 ITP: GENERATOR OUTLET FACILITIES (GOF)

Spencer Magby presented an overview of the GOF milestone. (Attachment 14 – 2023 ITP GOFs)

AGENDA ITEM 8 – REGIONAL COST ALLOCATION REVIEW (RCAR) III

Kirk Hall reviewed the hybrid approach to RCAR, current progress and a draft schedule. (Attachment 15 – RCAR III Update)

AGENDA ITEM 9 – 20YA: SCOPE ACTION ITEMS

Sherri Maxey reviewed the 20YA scope action item list. (Attachment 16 – 20YA Scope Action Items)

AGENDA ITEM 10 – 20YA: FUTURES 3/4 EMISISONS TARGET SCOPE CHANGE

Ahmed Alazzawi updated the group on the 20YA Future 3/4 Emissions Target Analysis. He reviewed the scope and objective of analysis and presented the results of runs performed so far. There was discussion about how to handle battery storage in the models. Ahmed stated that staff is still working through the battery modeling issues, but that scope modifications are still likely needed. (Attachment 17 – 20YA Scope Action Items)

ECONOMIC STUDIES WORKING GROUP MINUTES
March 2, 2022

AGENDA ITEM 11 – CLOSING ITEMS

There were no action items taken.

AGENDA ITEM 12 – INORMATIONAL ITEMS

The 2022 ITP, 20YA, and 2023 ITP schedules were not able to be posted for information. Staff noted that these would be posted or emailed when they are ready and that they would be pulled back into future agendas as a standing item. (Attachment 18 – 2021 ITP Further Evaluation Schedule)

EMAIL ITEMS

February 7, 2022

A motion was solicited to approve the 2022 ITP Market Economic Model (MEM) Benchmarking results, as posted to GlobalScape on 01/21/2022.

> **Al Tamimi made a motion, seconded by Tim Owens, to approve the 2022 ITP MEM Benchmarking results, as posted to GlobalScape on 01/21/2022. The motion was approved unanimously.**

Respectfully Submitted,

Joshua Norton

Secretary

Name	Company/Email	Attendance
Aaron Dingmann	aaron.p.dingmann@xcelenergy.com	Webex
Adam Bell	abell@spp.org	Webex
Ahmed Alazzawi	aalazzawi@spp.org	Webex
Al Tamimi	atamimi@sunflower.net	Webex
Alan Myers	amyers@itctransco.com	Webex
Andrew Berg	andrew.berg@mrenergy.com	Webex
Anita Sharma	asharma@aep.com	Webex
Antonio Barber	abarber@spp.org	Webex
Benny Achenkunju	bachenkunju@aep.com	Webex
Bradley Cochran	cochrabs@oge.com	Webex
Brandon Hentschel	bhentschel@spp.org	Webex
Brenda Prokop	bprokop@lspower.com	Webex
Britt Runion	brunion@spp.org	Webex
Brooke Keene	bkeene@spp.org	Webex
Calvin Daniels	calvin.daniels@wfec.com	Webex
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Chris Matthes	camatthes@aep.com	Webex
Christopher Davis	cdavis@spp.org	Webex
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Eddie Watson	ewatson@spp.org	Webex
Eric Jones	eljones@oppd.com	Webex
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Jodi Walters	jodi@gabelassociates.com	Webex
Jodi Woods	jwoods@spp.org	Webex
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Joshua Norton	jnorton@spp.org	Webex
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Kelsey Allen	kallen@spp.org	Webex
Kirk Hall	khall@spp.org	Webex
Krishada Watson	kwatson@spp.org	Webex
Kurt Stradley	kstradley@les.com	Webex
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Mitch Pope	mjpope@burnsmcd.com	Webex
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Sherri Maxey	smaxey@spp.org	Webex
Spencer Magby	smagby@spp.org	Webex
Steve Gaw	rsgaw1@gmail.com	Webex

Steve Hohman (OPPD)	shohman@oppd.com	Webex
Sunny Raheem	sraheem@spp.org	Webex
Theo Brown	tbrown@spp.org	Webex
Tim Owens	tjowens@nppd.com	Webex
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Tyler Baxter	tyler.baxter@cbpower.coop	Webex
Zach Andera	zpandera@burnsmcd.com	Webex
Zach Sabey	zsabey@spp.org	Webex

Proxy Statements

Proxy	Member	Note
Aaron Dingmann	Jordan Schmick	
Brad Cochran	Zac Hager	

Hi Joshua,

Aaron will be Xcel Energy's proxy for the meeting tomorrow.

Thanks,

Jordan Schmick, P.E.

All,

Brad Cochran will be my proxy at next week's ESWG meeting.

Thanks,

Zac Hager

OG&E Resource Planning

SOUTHWEST POWER POOL, INC.
ECONOMIC STUDIES WORKING GROUP MEETING
March 2-3, 2022
Net Conference

AGENDA

Wednesday, 8:00a.m – 12:00p.m.
Thursday, 8:00a.m – 12:00p.m.

1. Administrative Items ..... Alan Myers 15
   - A. Call to Order, Introductions ..... Alan Myers
   - B. Receipt of Proxies ..... Joshua Norton
   - C. Review of Agenda[1] ..... Alan Myers
   - D. Antitrust Reminder ..... Joshua Norton
2. Consent Agenda[1]
   - A. February 2-3, 2022 ESWG minutes
3. Review of Action Items[1] ..... Joshua Norton 10
4. RR 482: RAR Approvals (Approval) [1] ..... Brooke Keene 10
5. 2021 ITP Further Evaluation Scope (Approval)[1] ..... Kirk Hall 60
6. ITP Rebaseline / MOPC AI[1] ..... Sherri Maxey 60
7. 2023 ITP
   - A. Resource Plan Phase II[1] ..... Antonio Barber 20
   - B. Siting Plan[1] ..... Greg Lampley 20
   - C. Generator Outlet Facilities[1] ..... Spencer Magby 20
8. RCAR III[1] ..... Kirk Hall 20

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[1] Background Material Included

9. 20-Year Assessment (20YA)

   A. Scope and Study Execution Action Items[1] ..... Sherri Maxey 30

   B. Future 3/4 Emissions Target Scope Change[1] ..... SPP Staff 60

Updates to background material for this item are likely to occur

10. Closing Items ..... All 10

    A. Summary of Action Items

    B. Upcoming Meeting Agenda Items

    C. Future Meetings

       i) March 10 – ESWG/TWG/MDAG
       ii) March 30-31 – Net Conference
       iii) May 4-5 – Kansas City, MO
       iv) June 1-2 – Irving, TX

11. Informational Items[1]

    A. 2021 ITP Further Evaluation Schedule
    B. 2022 ITP Schedule
    C. 20-Year Assessment Schedule
    D. 2023 ITP Schedule

SOUTHWEST POWER POOL
ECONOMIC STUDIES WORKING GROUP MEETING

February 2-3, 2022
Net Conference

SUMMARY OF MOTIONS AND ACTION ITEMS

- Approved January 4-5, 2022 Meeting **Minutes**
- Approved **RR 485** – Renewable Pricing
- Approved **20YA Siting Plan Scope Items**

SOUTHWEST POWER POOL
ECONOMIC STUDIES WORKING GROUP MEETING
February 2-3, 2022
Net Conference

MINUTES

AGENDA ITEM 1 – ADMINISTRATIVE ITEMS

Economic Studies Working Group (ESWG) Chair Alan Myers called the meeting to order at 8:00 a.m. The following members were in attendance or represented by proxy:

Al Tamimi, SUNC
Alan Myers, ITC
Anita Sharma, AEP
Calvin Daniels, WFEC
Derek Brown, Evergy
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Jeremy Severson, BEPC
Jody Holland, GHP
Jordan Schmick, SPS
Kurt Stradley, LES
Kyle McKinney, GSEC
Michael Watt, OMPA
Randy Collier, CUS
Steve Gaw, APA
Steve Hohman, OPPD
Tim Owens, NPPD
Zac Hager, OGE

(Attachment 1 – Attendance) (Attachment 2 – Proxy)

Joshua Norton confirmed there was a quorum and provided the antitrust statement. Alan Myers reviewed the agenda for any changes. (Attachment 3 – Agenda)

> **Tim Owens made a motion, seconded by Steve Gaw to approve the agenda. The motion was approved unanimously.**

AGENDA ITEM 2 – CONSENT AGENDA

The consent agenda included the following items:

- Meeting Minutes – January 4-5, 2021 (Attachment 4 – January 4-5, 2021 ESWG Minutes)
- RR 485 – Renewable Pricing (Attachment 5 – RR 485: Renewable Pricing)
- 20YA Siting Plan Scope Items (Attachment 6 – 20YA Siting Plan Scope Items)

The consent agenda was approved unanimously.

AGENDA ITEM 3 – REVIEW OF ACTION ITEMS

Joshua Norton reviewed past action items. (Attachment 7 – Action Items)

AGENDA ITEM 4 – COMPREHENSIVE ROADMAP PRIORITIZATION

Erin Cathey presented information on comprehensive roadmap prioritization. She mentioned that a joint meeting of TWG, ESWG, and MDWG may be needed soon for this initiative. (Attachment 8 – Comprehensive Roadmap Planning Prioritization)

AGENDA ITEM 5 – 2021 ITP FURTHER EVALUATION

Chris Davis presented information on the 2021 ITP further evaluation of the Crossroads-Phantom double circuit 345 kV project. Staff stated that no new needs would be listed and no new solutions would be requested for this further evaluation. (Attachment 9 – 2021 ITP Further Evaluation)

AGENDA ITEM 6 – ITP REBASELINE

Chris Davis presented information on the ITP rebaseline effort. He presented draft timelines and next steps. (Attachment 10 – ITP Rebaseline)

AGENDA ITEM 7A – 20-YEAR ASSESSMENT: SCOPE AND STUDY ECECUTION ACTION ITEMS

Sherri Maxey reviewed the list of 20YA action items, noting a few were on the agenda. (Attachment 11 – 20YA Scope Items)

AGENDA ITEM 8A – 2022 ITP: SPS 10.3 TRANSFORMERS REQUEST

Sunny Raheem presented the SPS 10.3 transformers request for information to the group. The Artesia and Roswell transformers changes are proposed changes from SPS for inclusion into the 2022 ITP Base Reliability models. Staff identified minimal impacts on the 2022 ITP models and schedules. The changes align with 2021 ITP portfolio decisions around Artesia and Roswell transformer. Basin Electric mentioned a potential Section 10.3 change to the 2022 ITP BR models due to more recent load addition and seams generation retirement activities since the model development's original deadline. (Attachment 12 – 2022 ITP 10.3 SPS Transformers Request)

AGENDA ITEM 9A– 2023 ITP: RENEWABLE POLICY REVIEW

Krishada Watson presented an overview of the upcoming milestone. (Attachment 13 – Renewable Policy Review)

AGENDA ITEM 9B – 2023 ITP: RESOURCE PLAN PHASE 1

Krishada Watson presented an overview of the milestone and asked for feedback from the group. (Attachment 14 – Resource Plan Phase I)

ECONOMIC STUDIES WORKING GROUP MINUTES

February 2-3, 2022

Net Conference

AGENDA ITEM 10 – CLOSING ITEMS

There were no action items taken.

AGENDA ITEM 11 – INORMATIONAL ITEMS

The ITP schedules were not able to be posted for information as they are still being reworked due to the recent MOPC approvals.

EMAIL ITEMS

There were no email items since the prior meeting.

Respectfully Submitted,

Joshua Norton

Secretary

SOUTHWEST POWER POOL, INC.
ECONOMIC STUDIES WORKING GROUP

Action Items Status Report
March 2-3, 2022

	Action Item	Date Originated	Status	Comments
190	Utilize the results from RCAR III to determine the ratio of APC benefit to Transmission Outages benefit to be applied in the ITP assessments.	10/12/17	On Hold	Working with SPP operations on additional APC benefit with outages included. Mar: Ops is planning to perform after RCAR III and Value of Transmission study. Sept 29: Estimated start date is 2022 Q2
201	Review the interchange methodology	07/01/19	On hold	Goal: To complete for the 2021 ITP Assessment Mar 2021: 2021 portion considered complete. Outstanding long-term items: • Transactions between simulated and non-simulated regions • Benchmarking of pseudo-ties Feb: This item is included in the Planning Roadmap for prioritization
210	Create list of 20YA items to review	01/07/21	In Progress	June: Continue review of list and discussion of items Feb: Siting plan items were approved **Mar:** Emissions target analysis being discussed
211	Revisit the SPP Other bucket and how we use those resources in Resource Plan Phase II Accreditation	05/19/21	On hold	July: Review process in upcoming meeting Sept 29: Resource Accreditation is being discussed as part of 2023 ITP Scope.

				Feb: To be discussed as part of 2024 ITP Scope development ~June 2022
212	Review ELCC Accreditation	11/03/21	On hold	Feb: To be discussed as part of 2024 ITP Scope development ~June 2022
213	Discuss incorporation of Utility Integrated Resource Plans in the ITP	11/03/21	On hold	Feb: To be discussed as part of 2024 ITP Scope development ~June 2022
214	Review the retirement exception process	11/03/21	On hold	Feb: To be discussed as part of 2024 ITP Scope development ~June 2022
215	Review the RAR process	11/03/21	On hold	Feb: To be discussed as part of 2024 ITP Scope development ~June 2022

MOPC Action Item		Date Originated	Status	Comments
314	As part of rebaselining ITP studies, staff to work with the ESWG and TWG to review Attachment O, the ITP Manual, and current ITP scope documents to look for further process improvements to ensure timely completion of current and future ITP assessments.	01/10/22	In Progress	Goal: bring update to April MOPC focused on identifying ways to improve the clarity of ITP timing/scheduling, either in the scope or other documents. This would be an update and not the end of this action item.

Revision Request Form

SPP STAFF TO COMPLETE THIS SECTION	
RR #: 0482	**Date:**
RR Title: ITP Manual - RAR Approvals	

System Changes ☒ No ☐ Yes

Process Changes? ☒ No ☐ Yes

Impact Analysis Required? ☒ No ☐ Yes | **If no, but system or process changes are expected please explain why an Impact Analysis will not be performed** (e.g. FERC Order, work included in another Impact Analysis for a related RR):

SUBMITTER INFORMATION

Name: Brooke Keene	**Company:** SPP
Email: bkeene@spp.org	**Phone:** 501-482-2081

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 *(i.e., revising erroneous language or language that needs clean-up for grammatical errors or inconsistency across governing documents - no changes to intent or policy)*

☒ Clarification *(i.e., revising language to better represent existing intent, no changes to functionality or policy)*

☐ Enhancement *(i.e., revising language to expand upon existing intent or functionality)*

☐ New Protocol, Business Practice, Criteria, Tariff *(i.e, new language to accommodate new functionality or policy not existing today)*

☐ 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): 2.2.1.4**	
☐ **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 ITP Manual language states that a request for incremental generation capacity can be made to ESWG and TWG for inclusion in the economic models. However, the ESWG is the working group that maintains the economic models. TWG is not responsible for the models and agrees that they should not have purview over capacity additions to be included in the economic model set.

Describe the benefits that will be realized from this revision.

This revision will reduce redundant stakeholder review of capacity additions for inclusion in the economic models.

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.

Integrated Transmission Planning (ITP) Manual

2.2.1.4 Generation Resource Inclusion

Generation resources included in the base reliability model will be incorporated into the economic model, as appropriate.[1] Resources identified by SPP as necessary to solve the base reliability model shall not be included in the economic and powerflow models, unless the resources meet the requirements of adding generation described in this section.

Incremental to the resources included in the base reliability models, a generator interconnection resource and its associated network upgrades will be included in the economic models if they meet all of the following requirements:

1. A formal request has been sent to SPP[2] requesting the generation capacity be included.
2. The generating resource has an effective GIA that is not on suspension or an effective interim GIA.

[1] Generally, smaller resources that are not included in the economic data supplied by the vendor but are modeled in the powerflow are not included in the economic model for consideration in the production cost simulation. Examples are units reported publically as behind-the-meter or small municipal generation.

[2] Submitted through SPP RMS

3. The generating resource will have a firm contract for delivery through ownership and operation of the resource or procurement of a purchase power agreement (PPA) from the generation owner.

If a generating resource does not meet all the above requirements, a request for generation capacity to be included in the economic models can be made to ESWG ~~and TWG on a case-by-case basis~~. TWG will review the requests and provide any feedback to ESWG prior to the ESWG's review. ESWG ~~and TWG~~ will, at a minimum, consider the following points:

1. A DISIS agreement for the generating resource has been executed, an interim GIA has been requested, and a GIA will be entered into, when applicable.
2. An RFP for the generating resource has been awarded, if applicable.

All other resource expansion needs will be determined through the SPP resource expansion planning process as detailed in the Resource Expansion Plan section.

SPP Southwest Power Pool

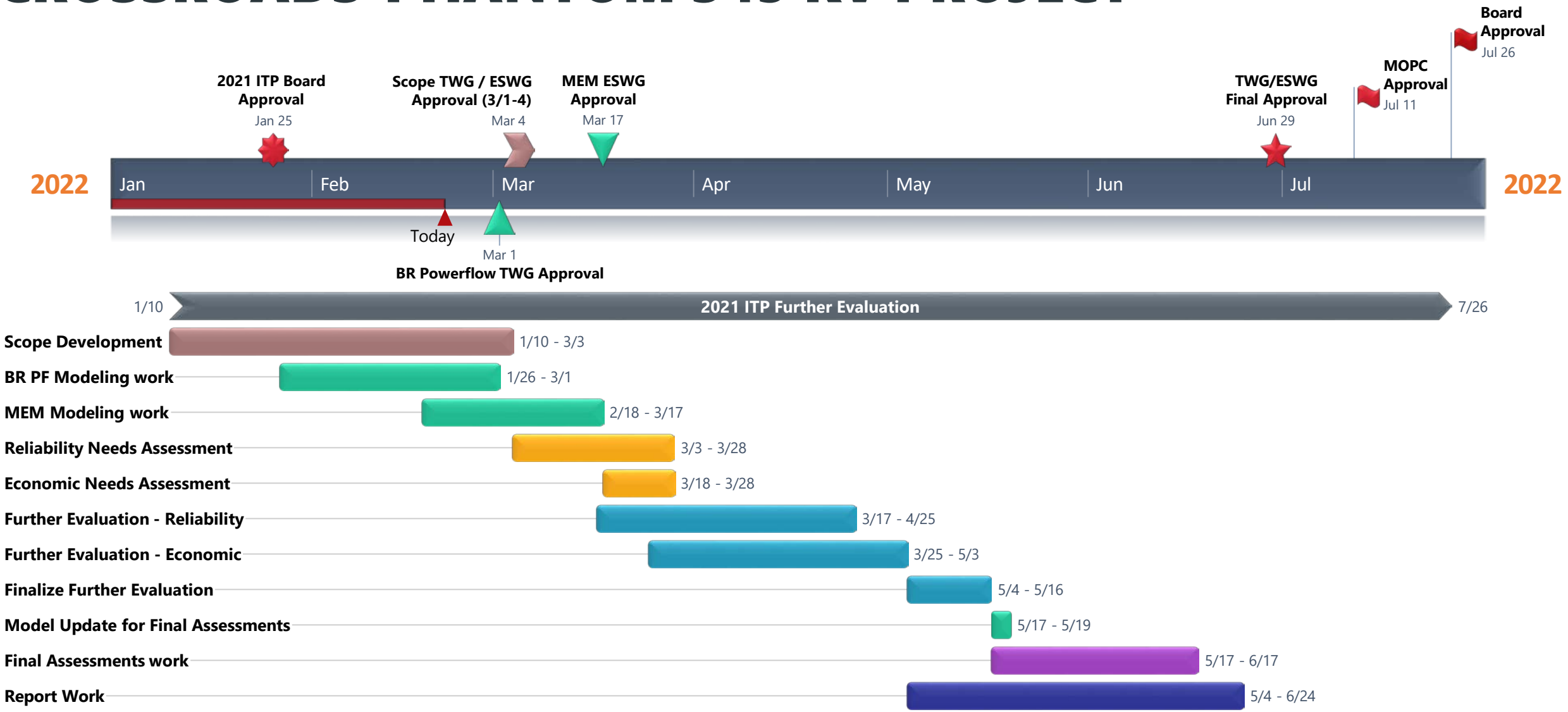
2021 ITP

ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT - SCHEDULE

DARA SOLOMON

MARCH 2022

2021 ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT



SCOPE DEVELOPMENT

- Start: 1/10/2022
- Finish: 3/03/2022 (Final Approval)

- Member Review Time:
  - Post for Review/Approval
    - 2/28-3/01 TWG (Posting: 2/21/2022): 2/22/2022 – 2/28/2022 (5 days)
    - 3/02-03 ESWG (Posting: 2/23/2022): 2/24/2022 – 3/01/2022 (5 days)

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

BASE RELIABILITY POWERFLOW MODELING WORK

- Start: 1/26/2022
- Finish: 3/01/2022 (Final Approval)

- Member Review Time:
  - Post for Review (Posting: 2/21/2022): 2/22/2022 – 2/28/2022 (5 days)
  - Request Approval at TWG on 2/28 – 3/01/2022

- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

MARKET ECONOMIC MODEL (MEM) WORK

- Start: 2/18/2022
- Finish: 3/17/2022 (Final Approval)

- Member Review Time:
  - Post for Review (Posting: 3/10/2022): 3/11/2022 – 3/17/2022 (5 days)
  - Request Approval via email starting 3/17/2022

- Staff Leaders: Charlton Hill (chill@spp.org) / Brooke Keene (bkeene@spp.org)
- Working Group Approval: ESWG

NEEDS ASSESSMENT UPDATES – RELIABILITY & ECONOMIC

- Start: 3/03/2022
- Finish Updates: 3/28/2022
- Finish Stakeholder Review: 4/06/2022

- Member Review Time:
  - Updated Needs Review (Posting: 3/30/2022): 3/31/2022 – 4/06/2022 (5 days)

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

FURTHER EVALUATION – RELIABILITY & ECONOMIC

- Start: 3/17/2022
- Finish: 5/18/2022

- Member Review Time:
  - June TWG / ESWG meetings:
    - 6/1-2 ESWG (Posting: 5/24/2022): 5/25/2022 – 6/01/2022 (5 days)
    - 6/7-8 TWG (Posting: 5/31/2022): 6/01/2022 – 6/07/2022 (5 days)

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

MODEL UPDATES FOR FINAL ASSESSMENT

- Start: 5/19/2022
- Finish: 5/23/2022

- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

FINAL ASSESSMENTS WORK
(STAGING, APC BENEFIT METRIC, FINAL RELIABILITY ASSESSMENT & SENSITIVITY ANALYSIS, IF NEEDED)

- Start: 5/19/2022
- Finish: 6/20/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

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

FINAL REPORT ADDENDUM

- Start: 5/17/2022
- End: 6/30/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

- Staff Leader: Tammy Bright (tbright@spp.org)
- Working Group Approval: TWG / ESWG

TWG/ESWG FINAL APPROVALS

- Start: 6/03/2022
- End: 6/30/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

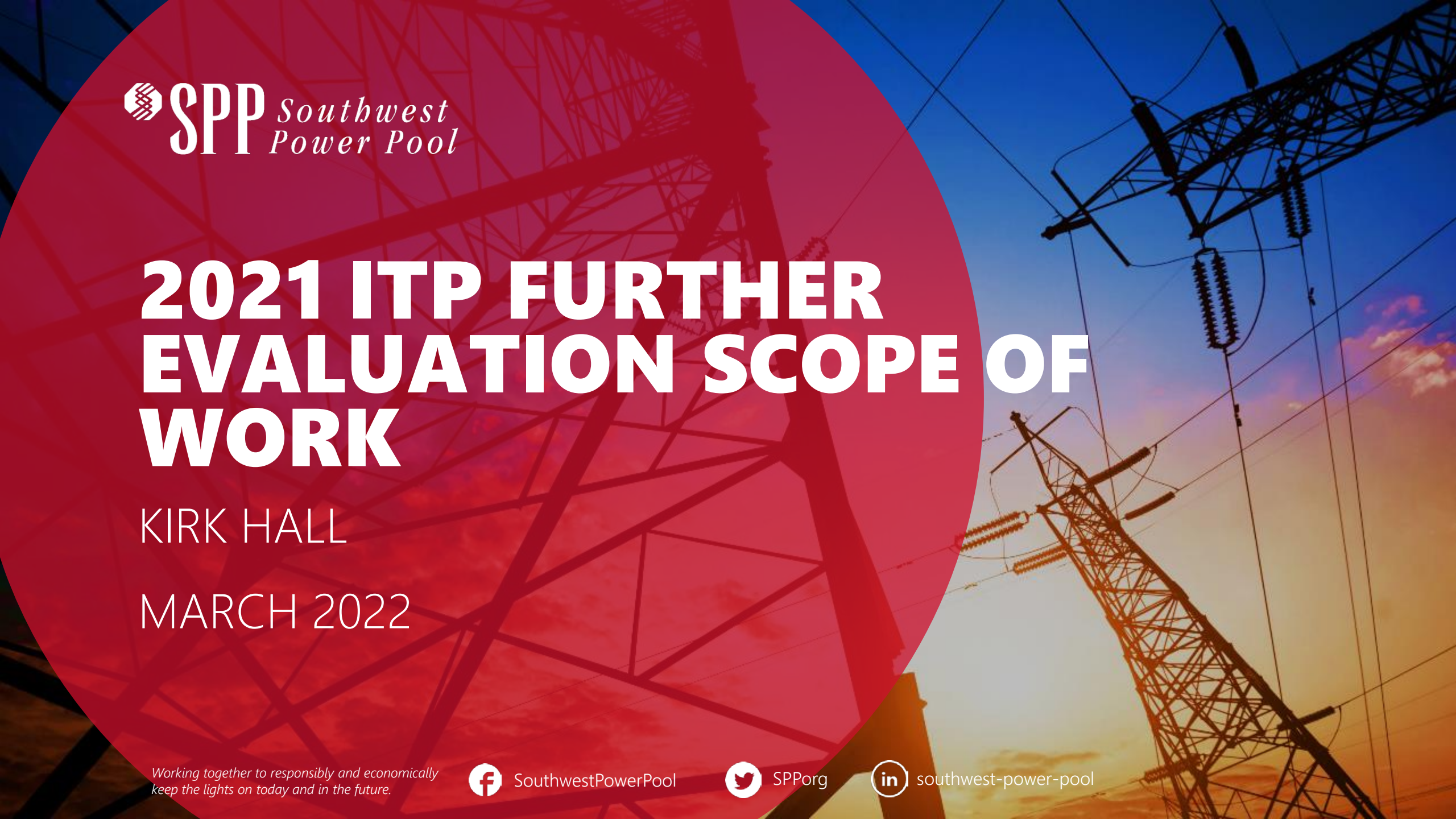
- Staff Leaders:
  - TWG – Adam Bell (abell@spp.org)
  - ESWG – Joshua Norton (jnorton@spp.org)

MARKET & OPERATIONS POLICY COMMITTEE (MOPC), STRATEGIC PLANNING COMMITTEE (SPC) & SPP BOARD OF DIRECTORS

- MOPC: July 11-12, 2022
- SPC: July 13, 2022
- Quarterly Joint Stakeholder Meeting: July 25, 2022
- SPP Board of Directors: July 26, 2022

CONTACT INFO

Dara Solomon, SPP Staff
dsolomon@spp.org



SPP Southwest Power Pool

2021 ITP FURTHER EVALUATION SCOPE OF WORK

KIRK HALL

MARCH 2022

Working together to responsibly and economically keep the lights on today and in the future.

GOALS

- Provide overview of scope of work document
- Review schedule
- Receive stakeholder feedback
- Approve technical scope of work

SCOPE OVERVIEW

- Broken down in four phases
  - Model updates
  - Assessment reviews
  - Solution development
  - Deliverables

MODEL UPDATES

- Relevant model updates discussed during Feb. 18 joint TWG/ESWG meeting (BR/MEM)
  - Includes resource retirement changes, load forecast reductions, transmission service updates, re-dispatch, AQ loads, etc.
- Resource plan phase 2 (RP2) updates (MEM only)
  - Conventional resource plan updated to account for load reductions and retirement changes
  - Milestone re-performed using same concepts as original work

ASSESSMENT UPDATES

- Constraint Assessment
  - Check for additional constraints in reliability hours only
- Needs Assessment
  - Re-run ACCC for SPS area to identify updated values for thermal and voltage needs
  - Identify any new contingencies causing violations for consideration with solution
  - Re-simulate MEM to identify updated congestion scores for economic constraints
  - Post updated values for members to review on GlobalScape

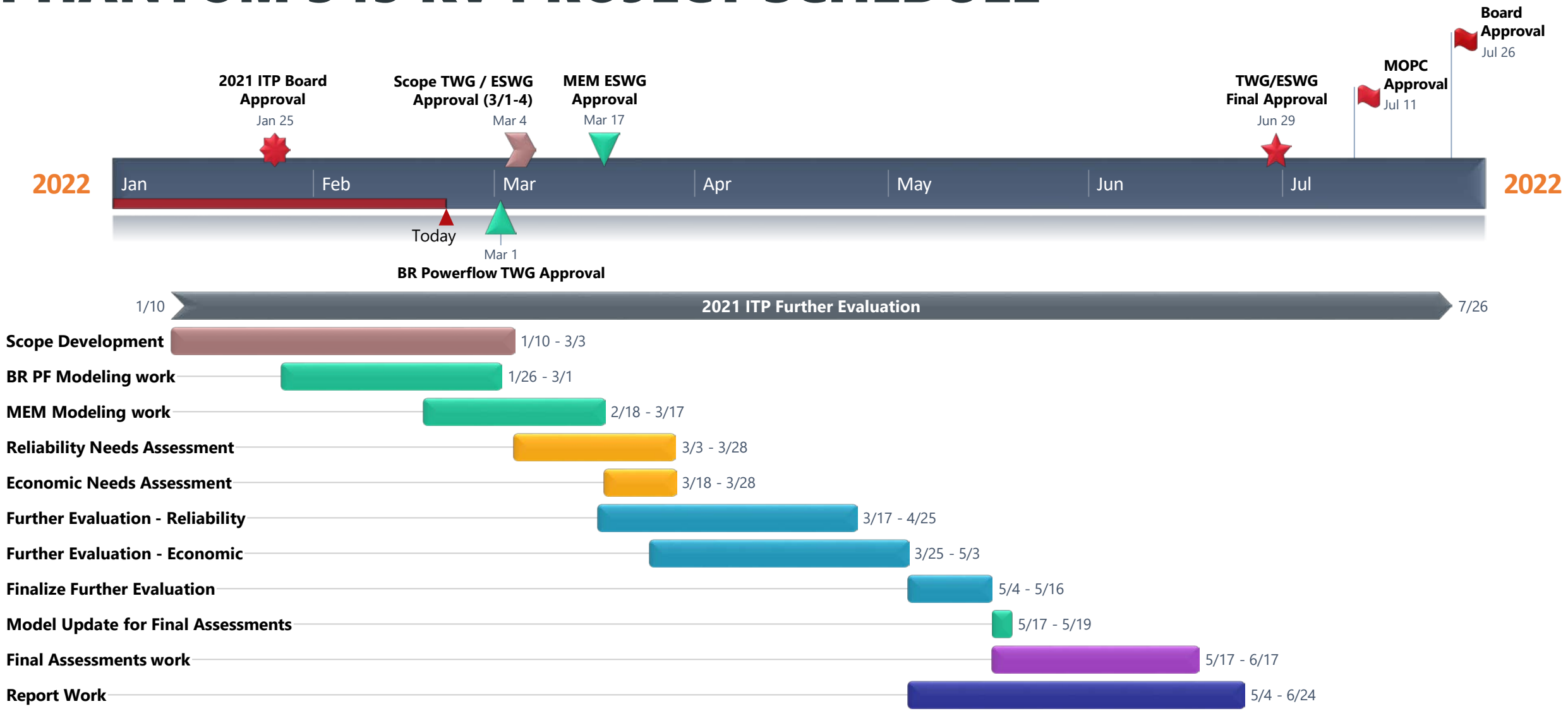
SOLUTION DEVELOPMENT

- Project evaluation
  - Test solutions using new models for screening metrics calculations (CLR, CVR, cost-effective & highest net)
  - Evaluation solutions consistent with the 2021 ITP and ITP Manual
  - Identify high-performing solutions for reliability and economics
- Additional analysis
  - Assess voltage stability, voltage support margins, and project longevity using VSAT or PSS®E PVQV analysis
- Sensitivity Analysis
  - Consider the impact of natural gas price and load changes as assessed in the 2021 ITP for use as qualitative information

DELIVERABLES

- Project recommendation for TWG, ESWG, MOPC & SPP board of directors' approval
- Addendum to the 2021 ITP report for TWG, ESWG, MOPC & the SPP board of directors' approval

2021 ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT SCHEDULE



2021 ITP FURTHER EVALUATION SCOPE OF WORK

SPP SYSTEM PLANNING

By SPP System Planning

Published on February 21, 2022

Version 0.1

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
02/21/2022 v0.1	SPP staff	Initial Document Creation	Posted for TWG/ESWG Review/Approval

CONTENTS

BACKGROUND

At the conclusion of the 2021 ITP assessment, SPP recommended the Crossroads-Phantom 345 kV double-circuit project (Crossroads-Phantom project) to address the system needs identified in the SPS South target area. Although SPP staff recommended the project should be approved for construction to the Transmission Working Group (TWG), the Economic Studies Working Group (ESWG), and the Markets and Operations Policy Committee (MOPC), the project was not approved for issuance of a Notification to Construct with Conditions (NTC-C). Instead, during the January 2022 MOPC meeting, the MOPC approved a motion to recommend further evaluation of the project due to significant changes observed in the area during the study timeline. At the subsequent SPP board of directors meeting, the same recommendation was approved. This scope document outlines the process used to further evaluate the Crossroads-Phantom project.

FURTHER EVALUATION OVERVIEW

The further evaluation of the Crossroads-Phantom project will require review and adjustment of major milestone work performed during the standard ITP assessment. This review will ensure a comprehensive evaluation of assumption changes in the SPS South target area are incorporated into the analysis. The further evaluation will consider updates to the base reliability (BR) and market economic models (MEM) prior to re-performing project evaluation work in order to determine the best project for the target area.

The process to evaluate the Crossroads-Phantom project is broken down into four stages:

1. Model Updates
    - Data updates (BR/MEM)
    - Resource plan updates (MEM)
2. Assessment Updates
    - Constraint assessment review (MEM)
    - Needs assessment update (BR/MEM)
3. Solution Development
    - Project evaluations (BR/MEM)
    - Sensitivity analysis (BR/MEM)
    - Additional analysis (BR/MEM)
4. Deliverables
    - Project recommendation(s)
    - 2021 ITP report addendum

STUDY METHODOLOGY

MODEL UPDATES

As noted in the 2021 ITP Report, the SPS South target area had a significant number of known changes to assumptions in the models approved for the needs assessment. Some changes were known prior to the Detailed Project Proposal (DPP) window opening, while others were not known until the study was near completion. Some changes to the models, such as a load forecast reduction for the SPS zone, will affect other milestones, such as the conventional resource plan developed for the economic models.

The following models will be updated with the data revisions identified later in this section:

- Base Reliability – Years 5 and 10, summer and winter seasons, Tolk retirement year 10 summer only
- Market Economic Models – Year 5 and 10, Future 1 and Future 2, Tolk retirement year 10 Future 1 and Future 2

The updated data submitted for this evaluation came from Southwestern Public Service Company (SPS), the incumbent transmission owner (TO), and are consistent with data and assumptions included in subsequent ongoing ITP assessments. The following subsections outline the modeling changes to be incorporated in the models used for the further evaluation of the Crossroads-Phantom project.

DATA UPDATES

SPS AREA PEAK LOAD REDUCTIONS

Late in the process of the 2021 ITP, SPS discovered an error in the load forecasts submitted in the 2021 and 2022 ITP. SPS requested the TWG and ESWG consider a revision to the 2022 ITP load data while also questioning the need for the Crossroads-Phantom project. These load reductions were approved for the 2022 ITP using the ITP Manual 10.3 process. For the purposes of the further evaluation, the load reductions have been resubmitted to ensure they the data is applied appropriately when incorporated into the 2021 ITP BR and MEM models.

SPS GENERATOR RETIREMENT UPDATES

SPS provided updated information on expected retirement dates and updated unit capacities based upon subsequent ITP generator reviews and recent generator testing results. These units all have long-term firm transmission service and will be dispatched in the updated cases in accordance with the ITP Manual.

GENERATOR	2021 ITP ORIGNAL RETIREMENT DATES	FURTHER EVALUATION RETIREMENT DATES	UNIT CAPACITY (MW)
Cunningham 2	12/31/2025	6/1/2099	192
Maddox 2	12/31/2025	6/1/2099	61
Nichols 1	12/31/2022	6/1/2099	112
Nichols 2	12/31/2023	6/1/2099	111
Plant X3	12/31/2024	9/30/2022	97.5
Plant X4	12/31/2027	6/1/2099	200
Jones 1	12/31/2031	6/1/2099	254

Table 1: SPS Generator Retirement Dates

DELIVERY POINT ADDITIONS (DPA)

Five (5) load additions were submitted for inclusion in the updated models. One additional load considered in the original 2021 ITP analysis was not included based upon a reduced confidence level that the load will be energized. These loads were determined to be impactful to the analysis because they are located within the SPS area or within the target area. A list of the delivery point additions is shown below:

- DPA-2020-Dec-1263 Red Hills (57 MW)
- DPA-2021-March-1295 Chevron Eddy (50 MW)
- DPA-2021-AUG-1358 Caveman (5 MW)
- DPA-2020-May-1206 Sisko (28.5 MW)
- DPA-2019-Oct-1126 Lynch (20 MW)

PHANTOM STATIC VAR COMPENSATOR REMOVAL

The original 2021 ITP BR models required a static var compensator (SVC) be located at the Phantom substation to provide reactive support and make it possible to converge the models. Largely due to the generation retirement assumption changes considered in the further evaluation, the SVC is no longer required.

LONG-TERM FIRM TRANSMISSION SERVICE

The Sagamore Wind Farm (522 MW) interconnecting near the Crossroads substation was awarded long-term firm transmission after the completion of the 2021 ITP BR models. For the purposes of this further evaluation, the Sagamore Wind Farm will be dispatched in accordance with the renewable dispatch methodology found in the ITP Manual. Topology updates necessary for the modeling of the Sagamore Wind Farm will also be added to the models. The Sagamore Wind Farm is already included in the 2021 ITP MEM.

LOCAL IN-LINE SHUNT REACTORS

As part of solution development, SPP analyzed a number of solution options including existing reactive setting adjustments. Included in these adjustments were a number of in-line shunt reactors that were switched off in coordination with high-performing transmission upgrades to provide additional voltage support. For the purposes of this further evaluation, these reactors will be modeled offline.

TOLK RETIREMENT SENSITIVITY

The Tolk coal plant (units 1 and 2, totaling 1,067 MW) is tentatively planned for retirement in 2033, which is just outside the study horizon of the 2021 ITP. Due to the plant's location and size, SPS discussed the potential impact this planned retirement may have on their area, which was not considered in the 2021 ITP assessment. For the purposes of the further evaluation of this area, a sensitivity model will be developed retiring Tolk units 1 and 2 in a year 10 summer BR case and the MEM year 10 Future 1 and Future 2.

2021 ITP PROJECTS APPROVED FOR CONSTRUCTION

The projects approved for construction by the SPP board of directors from the 2021 ITP recommended portfolio will be added to the BR and MEM models.

CONVENTIONAL RESOURCE PLAN REVIEW (MEM ONLY)

The conventional resource plan for SPS will be reviewed with consideration of the load and generation revisions in order to ensure reserve margins are still being met. Adjustments to the SPS resource plan will be made in accordance with the ITP Manual and 2021 ITP Scope.

An additional update to the resource plan will be made to account for the retirement of the Tolk units 1 and 2 for consideration in the sensitivity MEM.

ASSESSMENT UPDATES

Any significant model changes will require the constraint assessment and needs assessment to be updated. A description of the work required is described in the following sections.

CONSTRAINT ASSESSMENT (MEM ONLY)

The Constraint Assessment process is a significant milestone in the ITP as it identifies future system constraints based upon the assumptions in the economic model like the renewable resource plan and the siting of resources. The standard constraint assessment process is rigorous; however, an hourly scan will be done on the peak and off-peak cases to identify any additional constraints for those hours.

NEEDS ASSESSMENT

SPP will use the updated models and re-perform a portion of the needs assessment to identify updated thermal and per unit voltage values for SPS needs identified during the 2021 ITP needs assessment, including NERC TPL-001-4 P3 event violations. The need assessment list posted on a secure website will be reposted with the updated values for both the reliability needs assessment and the economic needs assessment. If any violations are mitigated as a result of the model updates, they will no longer be considered needs. To the extent the model changes result in any new violations impactful to the SPS South target area, these may be considered in solution development efforts to ensure the robustness of the project.

Additional P3 event contingencies may also be considered for units dispatched in the further evaluation BR models that were planned for retirement in the original 2021 ITP approved models.

SOLUTION DEVELOPMENT

PROJECT EVALUATION

SPP staff will reconsider the projects submitted in the 2021 ITP DPP window, as well as the staff solutions created during the solution development milestone, in an effort to identify the best project for the SPP region using the new and/or updated assumptions and model data for the SPS South target area. The projects will be evaluated in the same manner as described in the 2021 ITP report, including the use of the stakeholder-approved metrics such as the CLR and CVR metrics. Additionally, qualitative information may also guide SPP in the development of the recommended project(s). Adjusted Production Cost (APC) will be the only benefit metric calculated for project evaluation in accordance with the stakeholder-approved mitigation plan from the 2021 ITP assessment.

An additional DPP window will not be opened and SPP will not accept any project submissions for consideration in this further evaluation.

ADDITIONAL ANALYSIS

SPP may perform additional analysis in the SPS South target area to provide valuable qualitative information on high-ranking solutions. The intent of this analysis will be to assess voltage stability, voltage support margins, and project longevity. This analysis may be performed using the DSA Tools VSAT software used for the standard voltage stability assessment or the voltage adequacy and stability (PVQV) add-on for analysis in PSS®E which can solve multiple power flow solutions in order to generate a PV curve for a particular transfer or a QV curve at a given bus.

SENSITIVITY ANALYSIS

Staff will perform sensitivity analysis on high-ranking solutions to identify qualitative information on project performance under the natural gas and load changes assessed on the 2021 ITP portfolio.

DELIVERABLES

PROJECT RECOMMENDATION

SPP will present the recommended solution to the TWG, ESWG, MOPC, and SPP board of directors for the necessary endorsement and/or approval.

2021 ITP REPORT ADDENDUM

The 2021 ITP report will be updated with an addendum describing the efforts and results of this further evaluation. The addendum will be approved by the appropriate working groups and committees, and added to the previously approved 2021 ITP report.

WORKING GROUP COORDINATION

SPP staff will work in conjunction with the TWG and ESWG to review the model revisions are appropriate and applied correctly. The TWG and ESWG will also be given an opportunity to review the models used for this further evaluation, ensure updates are applied appropriately, and approve the set of updated models before analysis begins. The following list identifies the coordination points with SPP stakeholders and the topics which may require endorsement or approval:

- Relevant data updates to be allowed in the updated models (TWG/ESWG)
- Model review and approval (TWG/ESWG)
- Constraint assessment revisions (TWG approval only)
- Needs assessment updates
- Discussion of high-performing projects
- Analysis results and recommended solution
- Addendum to ITP Report (TWG/ESWG, MOPC, Board of Directors)
- Project Approval (TWG/ESWG, MOPC, Board of Directors)

SCHEDULE

The 2021 ITP further evaluation began following the SPP board of directors' decision on January 25, 2022, and will complete by the July 2022. The timeline and schedule are shown below in Figure 0.1 and Table 0.1.

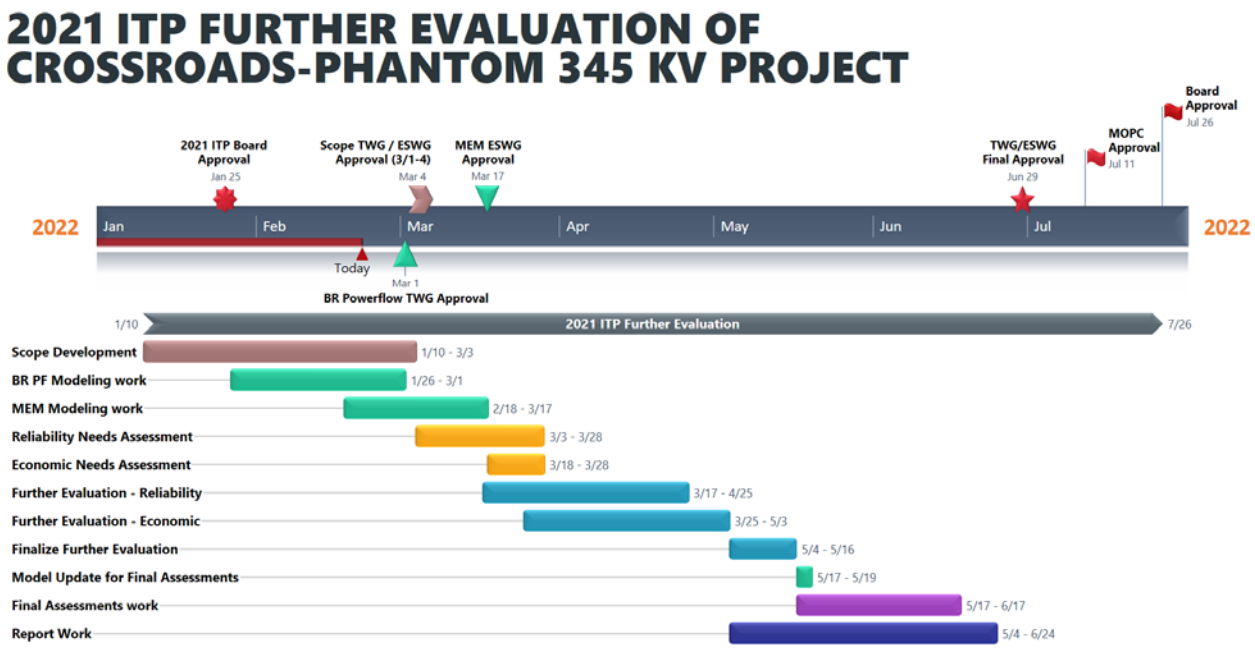


Figure 1: 2021 ITP Further Evaluation timeline

Task Name	Start	Finish
2021 ITP - Further Evaluation of the Crossroads-Phantom 345 kV Project	**January 2022**	**July 2022**
Scope Development	February 2022	March 2022
Base Reliability Powerflow Modeling updates	February 2022	March 2022
Market Economic Modeling updates	February 2022	March 2022
Reliability Needs Assessment	March 2022	March 2022
Economic Needs Assessment	March 2022	March 2022
Further Evaluation & Analysis - Reliability	March 2022	April 2022
Further Evaluation & Analysis - Economic	March 2022	May 2022
Finalize Further Evaluation & Analysis	May 2022	May 2022
Models Updates for Final Assessments	May 2022	May 2022
Final Assessments	May 2022	June 2022
Report work	May 2022	June 2022
Final TWG/ESWG Approval	July 2022	July 2022
MOPC	July 2022	July 2022
Strategic Planning Committee	July 2022	July 2022
SPP board of directors	July 2022	July 2022

Table 2: 2021 ITP Further Evaluation Schedule

2022 INTEGRATED TRANSMISSION PLANNING ASSESSMENT SCOPE

By SPP Engineering

Published on February 22, 2021

Version 2.0

REVISION HISTORY

Date or version number	Author	Change Description	Comments
11/25/2020 v0.1	SPP Staff	Initial Draft Scope	Posted for stakeholder review
01/04/2021 v0.2	SPP Staff	Final Draft Scope	ESWG/TWG approval received; posted for MOPC approval
01/11/2021 v0.2	SPP Staff	Final Scope	MOPC approval received
02/02/2021 v1.0	SPP Staff	Final Approved Scope	Posted to SPP.org
03/03/2021 v1.1	SPP Staff	Scope Modifications (2)	Scope modifications in Section 2: (1) Updates to remove reference to specific MTEP model to be utilized; for TWG approval on 03/02/2021 and ESWG approval on 03/03/2021. (2) Update to the renewable mix used for meeting policy shortfalls (50% wind/50% solar for policy additions) – ESWG approval on 03/03/2021.
03/25/2021 v1.2	SPP Staff	Scope Modification	Updated Section 5. Schedule
04/12/2021 v1.2	SPP Staff	Final Approved Scope Modifications	MOPC approved
06/18/2021 v1.2	SPP Staff	Final Approved Scope Modifications	Posted to SPP.org (updated to correctly reflect v1.1 and v1.2 modifications)
02/22/2022 v2.0	SPP Staff	Replacement Scope Document	Modified to reflect the 2022 ITP as reliability only

CONTENTS

SECTION 1: OVERVIEW

This document presents the scope and schedule of work for the 2022 Integrated Transmission Planning assessment (2022 ITP). The Economic Studies Working Group (ESWG) and Transmission Working Group (TWG) are responsible for the creation and review of this document with approvals from the Market Operations and Policy Committee (MOPC) and the board of directors (Board).

In January 2022, the MOPC approved the 2022 ITP to be performed as a reliability only assessment resulting in required modifications to this scope document.

OBJECTIVE

The objective of the 2022 ITP Assessment is to develop a regional transmission plan that provides reliable delivery of energy to the end-use customer. This 2022 ITP Assessment Scope contains assumptions to be utilized in the 2022 ITP Assessment that are not standardized in the ITP Manual. These documents should be reviewed together for a comprehensive view of the 2022 ITP process and assumptions.

SECTION 2: SCHEDULE

The 2022 ITP assessment began in July 2020 and will be completed by October 2022.[1] Figure 2 and Table 5 detail the updated study timeline based on the January 2022 MOPC approval for the 2022 ITP to be performed as a reliability only assessment.

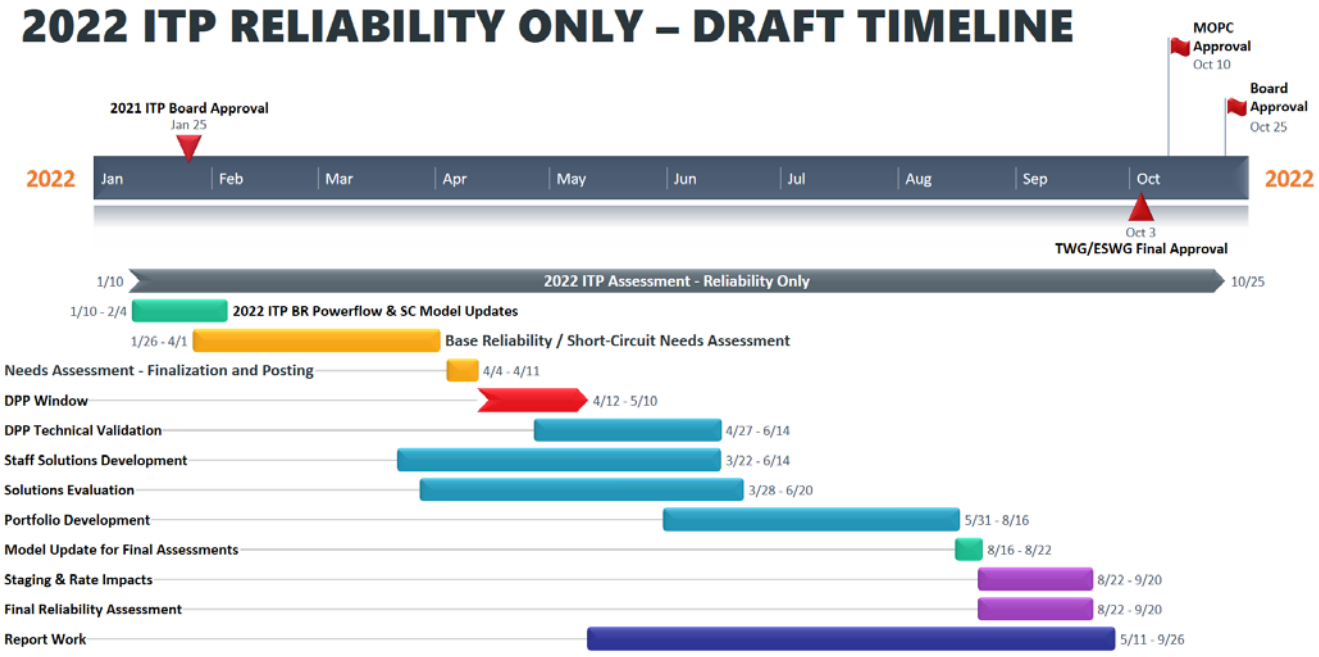


Figure 1: 2022 ITP Timeline

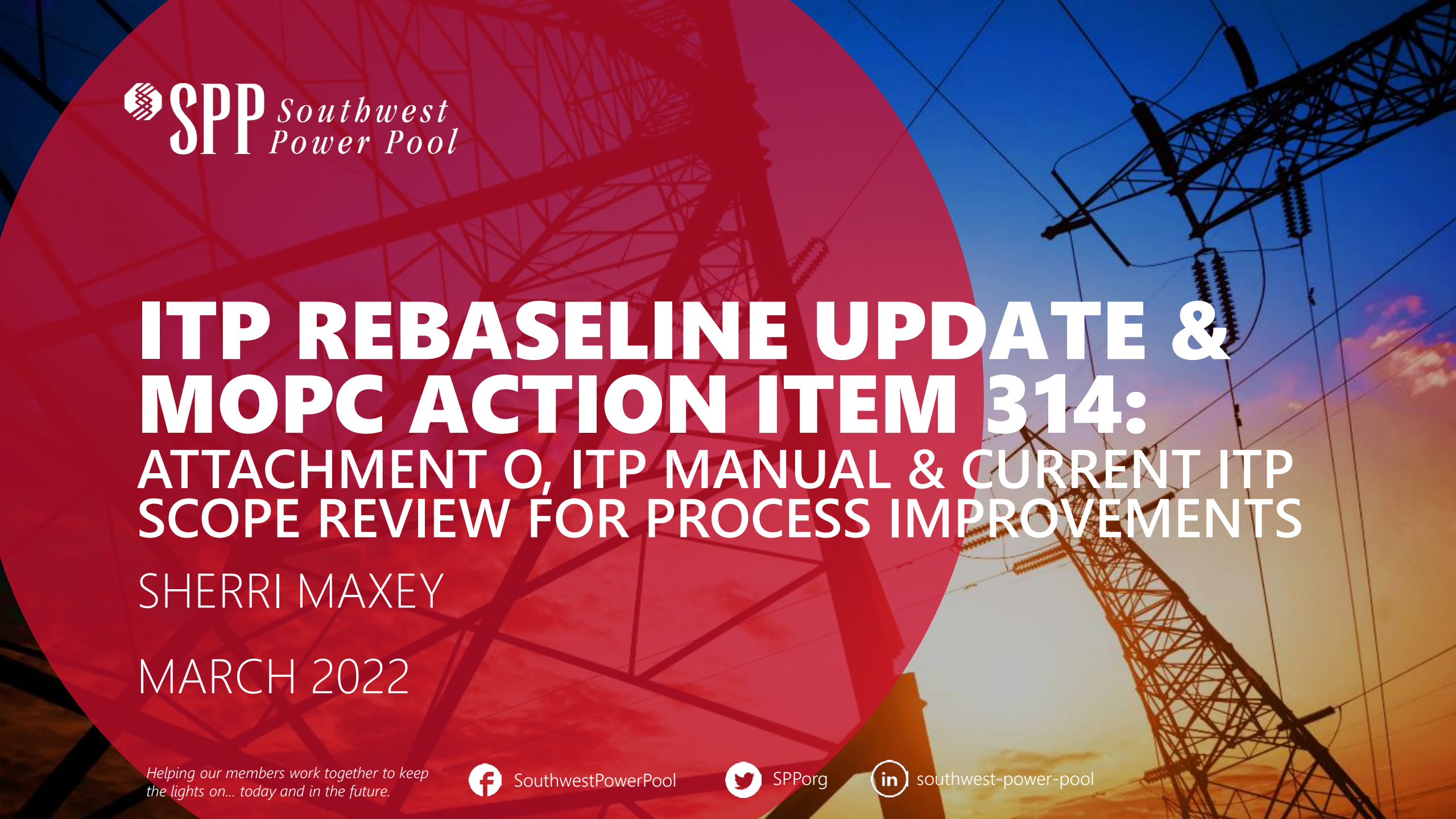
[1] Dates are subject to change.

Milestone Name	Group(s) to Review/Endorse	Start Date	Completion Date
Scope Development	ESWG, TWG, MOPC, SPC	Jul 2020	Jan 2021
Powerflow Model Development	TWG	Jul 2020	Mar 2021
Short Circuit Model Development	TWG	Jul 2020	Mar 2021
Updates to Base Reliability (BR) Powerflow and Short Circuit models following Jan. 2022 MOPC	***TWG***	***Jan 2022***	***Feb 2022***
BR Needs Assessments	TWG	Apr 2022	Apr 2022
Detailed Project Proposal (DPP) Window	TWG/ESWG	Apr 2022	May 2022
Reliability Solutions Development	TWG/ESWG	Mar 2022	Jun 2022
Reliability Solutions Evaluation	TWG/ESWG	Mar 2022	Jun 2022
Study Cost Estimates	TWG/ESWG	Jun 2022	Jul 2022
Summit	TWG/ESWG	Jul 2022	Jul 2022
Reliability Portfolio Development	TWG/ESWG	May 2022	Aug 2022
Final Reliability Portfolios	TWG/ESWG	Aug 2022	Aug 2022
Portfolio Optimization / Consolidation	TWG/ESWG	Aug 2022	Aug 2022
Project Staging	TWG/ESWG	Aug 2022	Sep 2022
Final Reliability Assessment	TWG	Aug 2022	Sep 2022
Review Draft Report with Recommended Solutions	TWG/ESWG	Aug 2022	Sep 2022
Final Report with Recommended Solutions	TWG/ESWG	Sep 2022	Sep 2022
	RSC, SPC, SSC	October 2022	
	MOPC, SPP Board		

Table 1: 2022 ITP Schedule

SECTION 3: CHANGES IN PROCESS AND ASSUMPTIONS

To protect against changes in process and assumptions that could present a significant risk to the completion of the 2022 ITP Assessment, any changes to this scope or assessment schedule must be appropriately vetted and follow the process outlined in the stakeholder accountability section of the ITP Manual.



SPP Southwest Power Pool

ITP REBASELINE UPDATE & MOPC ACTION ITEM 314:

ATTACHMENT O, ITP MANUAL & CURRENT ITP SCOPE REVIEW FOR PROCESS IMPROVEMENTS

SHERRI MAXEY

MARCH 2022

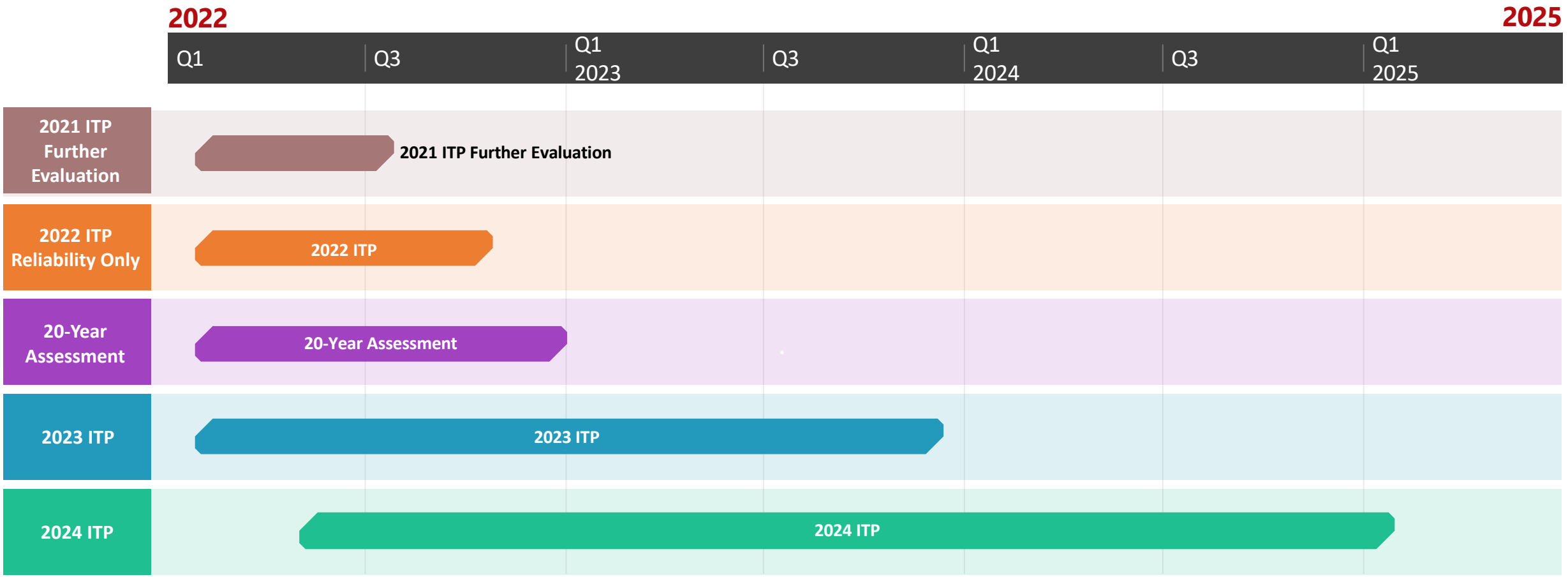
OVERVIEW

- ITP Rebaseline Update
  - 2021 ITP further evaluation of Crossroads-Phantom 345 kV project with updated data
  - 2022 ITP reliability only
  - 2022 20-Year Assessment
  - 2023 ITP
  - 2024 ITP
- MOPC Action Item 314
  - SPP staff to work with the ESWG and TWG to review Attachment O, the ITP Manual, and current ITP scope documents to look for further process improvements to ensure timely completion of current and future ITP assessments

ITP REBASELINE UPDATE

2022 ITP RELIABILITY ONLY ASSESSMENT, 20-YEAR ASSESSMENT & FULL 2023 & 2024 ITP ASSESSMENTS

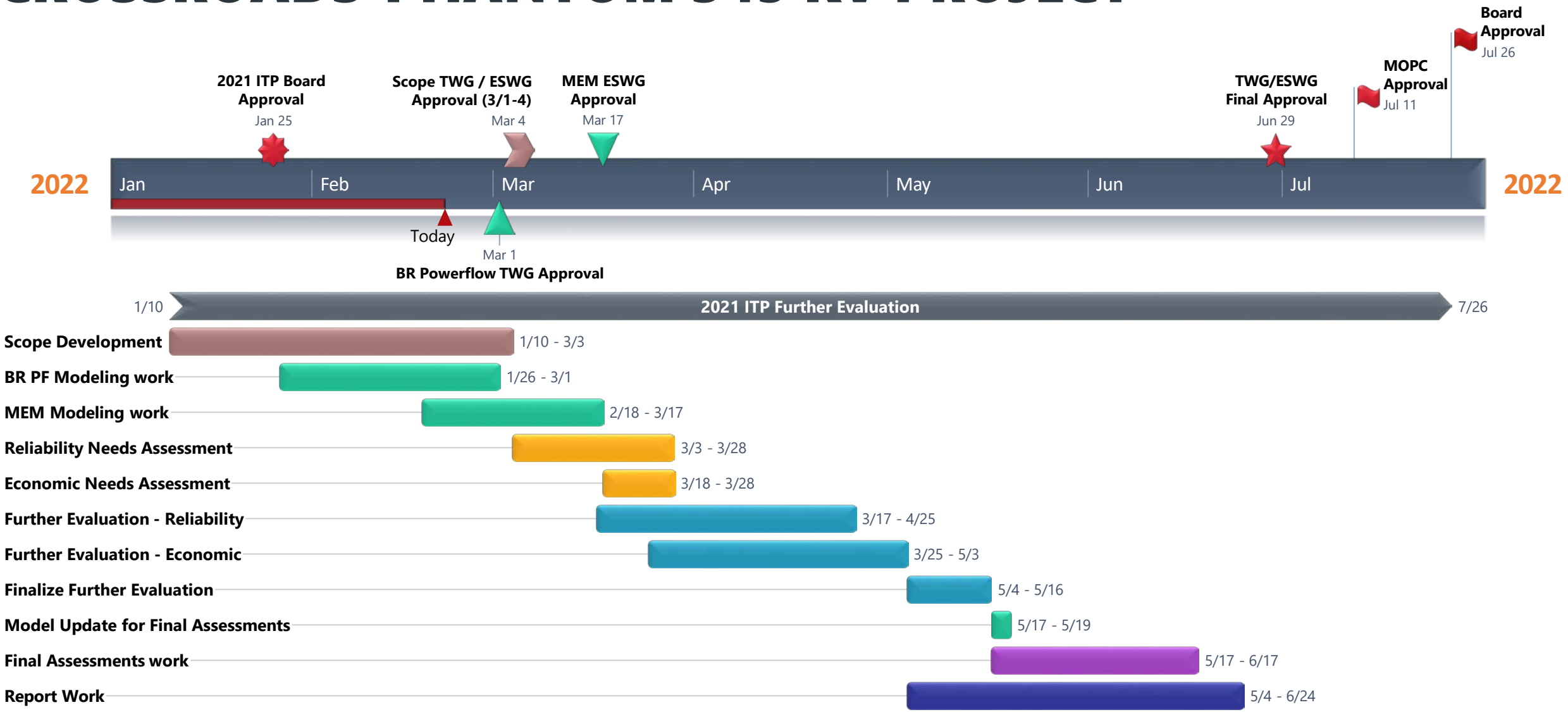
ITP REBASELINE



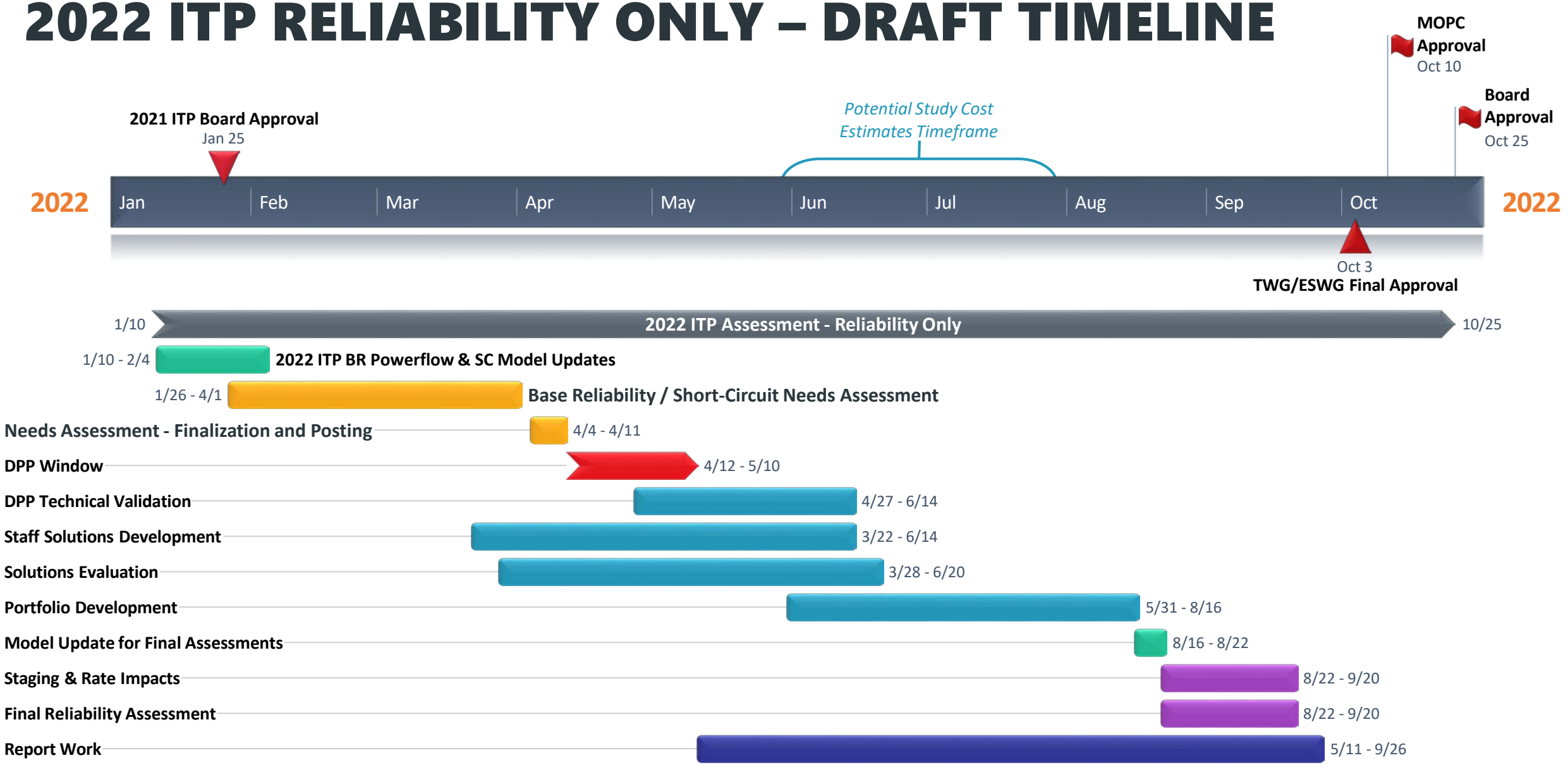
RECOMMENDATIONS

- Removal of the Market Powerflow Models (MPM) from the ITP
  - TPL sensitivity and Year 1 Deliverability Study models are being developed separately
- Recommend not utilizing target areas or no more than one

2021 ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT



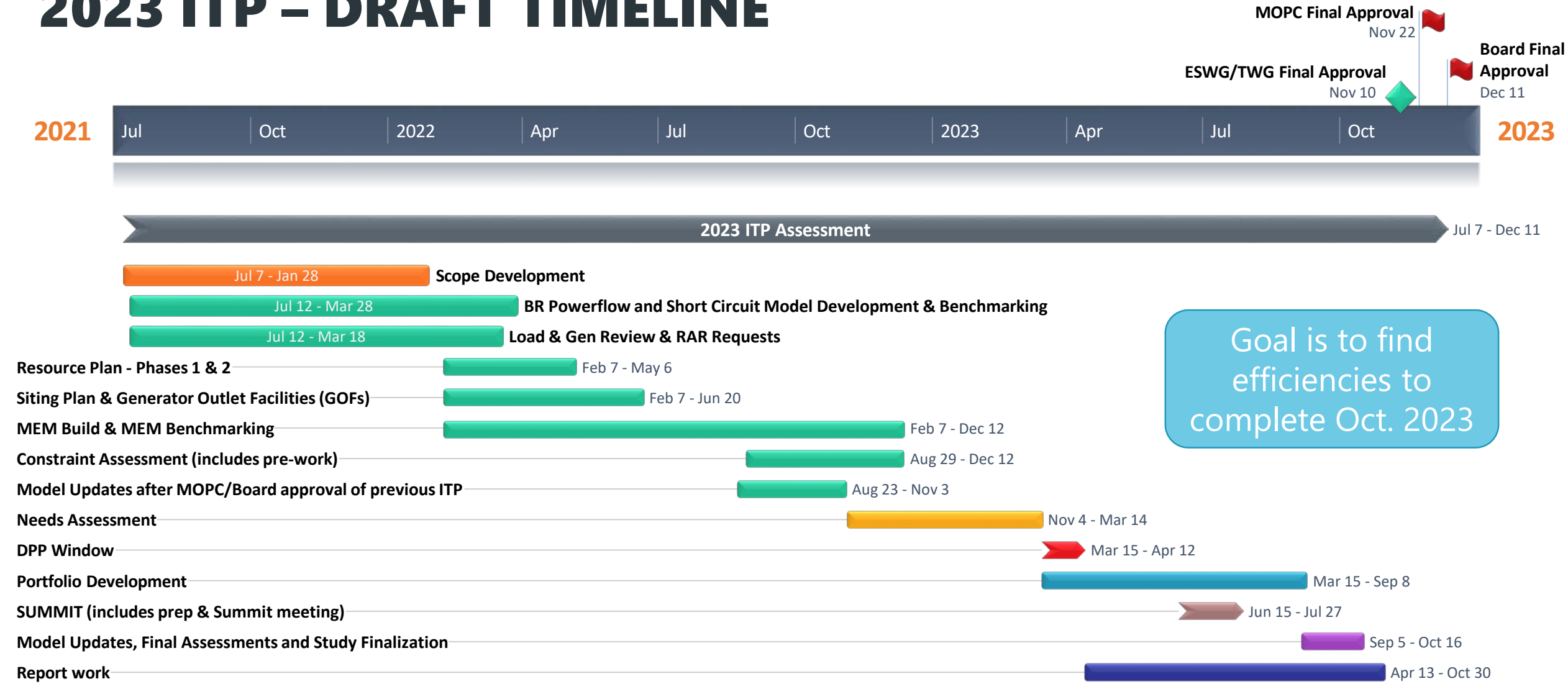
2022 ITP RELIABILITY ONLY – DRAFT TIMELINE



2022 ITP - SCOPE CHANGES & WAIVERS REQUIRED

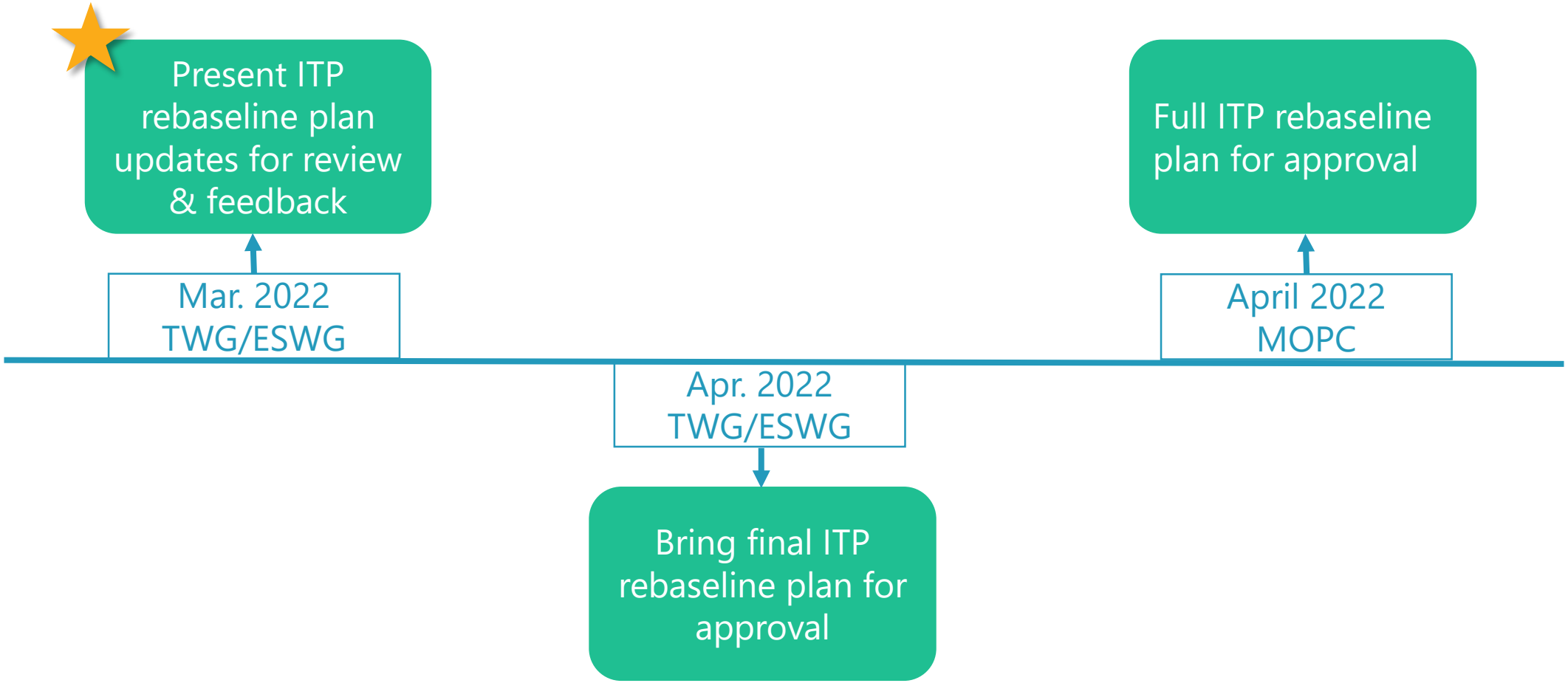
- Scope
  - Replacement Scope for reliability only
- Waiver
  - ITP Manual waiver to perform a reliability only 2022 ITP

2023 ITP – DRAFT TIMELINE



Goal is to find efficiencies to complete Oct. 2023

NEXT STEPS


Present ITP rebaseline plan updates for review & feedback
Mar. 2022 TWG/ESWG
Apr. 2022 TWG/ESWG
Bring final ITP rebaseline plan for approval
April 2022 MOPC
Full ITP rebaseline plan for approval

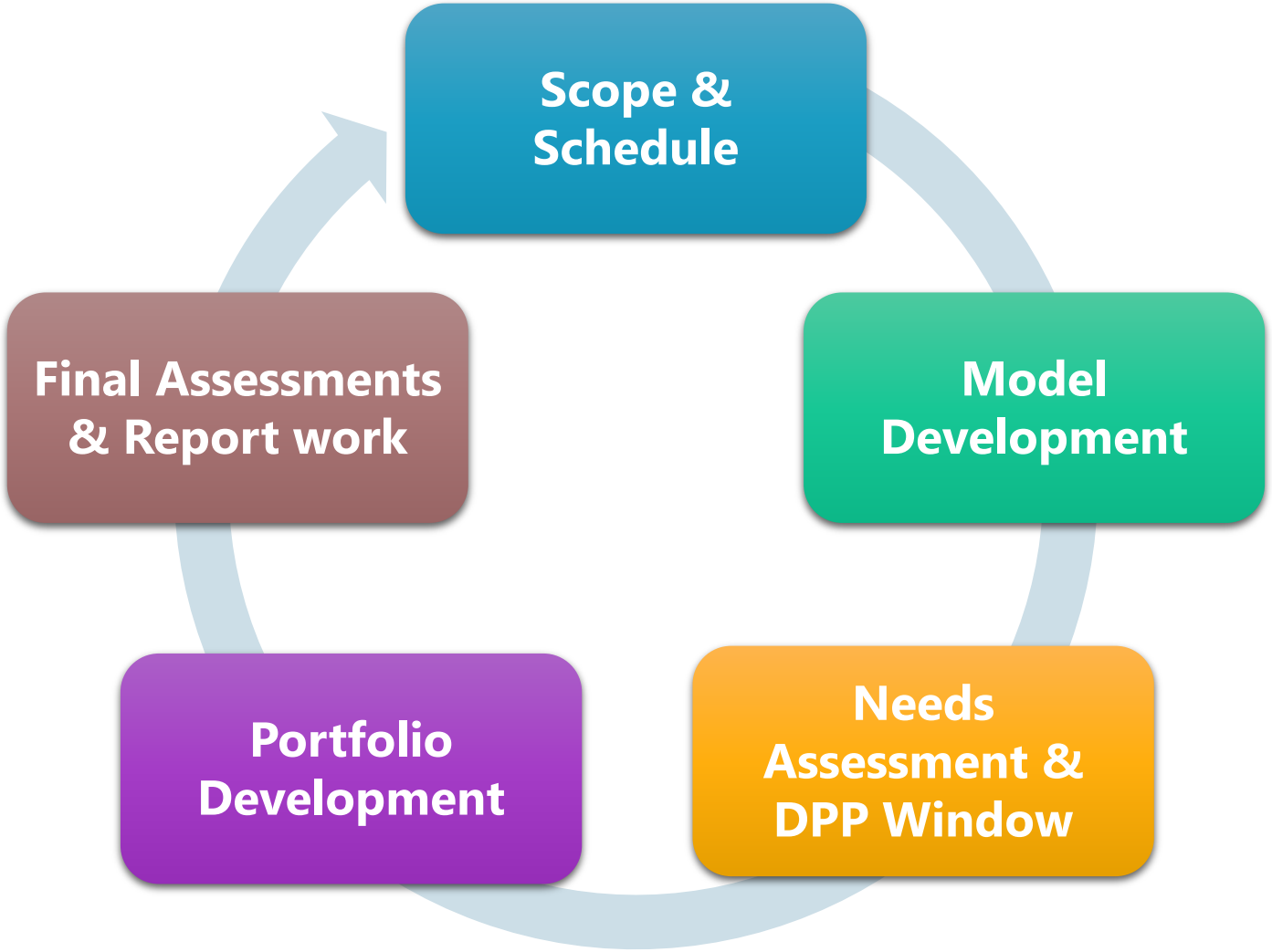
MOPC ACTION ITEM 314

REVIEW ATT. O, ITP MANUAL & CURRENT ITP SCOPE DOCUMENTS TO LOOK FOR FURTHER PROCESS IMPROVEMENTS TO ENSURE TIMELY COMPLETION OF CURRENT AND FUTURE ITP ASSESSMENTS

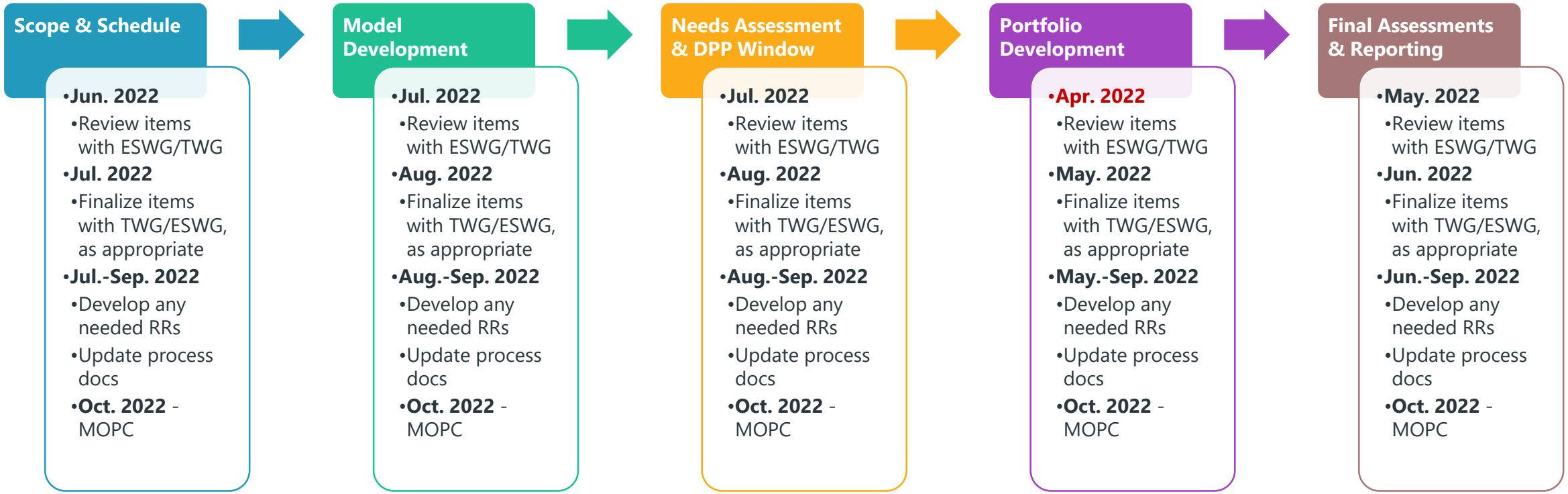
OVERVIEW

- **Review** Attachment O of the SPP tariff, the ITP Manual & scope documents to look for **efficiencies** and further **process improvements** to ensure timely completion of current and future ITP assessments
- **Phased Approach** by evaluating each ITP phase and then bring back with any recommendations
- **Identify** where possible revision requests may be required
- **Review and finalize** with TWG, ESWG and MOPC by October 2022

PHASED APPROACH



PRELIMINARY HIGH-LEVEL SCHEDULE & WORK APPROACH



Example

- *Model Development: Review Section 10.3 process for receiving modeling changes*

SPP Southwest Power Pool

2023 ITP

2023 ITP: RESOURCE PLAN

ANTONIO BARBER

ESWG

OBJECTIVE

- Review 2023 ITP : Resource Plan II scope items
  - Conventional Generator Prototypes
  - Accreditation
  - New Resource Allocation and Assignment
- Next Steps

CONVENTIONAL GENERATOR PROTOTYPES

- The Cost and Performance Characteristics of New Generating Technologies[1], Annual Energy Outlook 2021 – EIA (EIA-AEO).
- Multi-shaft combined cycle (CC) and industrial combustion turbine (CT) prototypes
- If any exceptions for the resource plan are requested, the multi-shaft CC prototype data will be used.

Generation Type	Data Source	Technology Type	Size (MW)	Total Capital Cost ($/kW)	Variable O&M ($/MWh)	Fixed O&M ($/kW-yr)	Heat Rate (Btu/kWh)
Combined Cycle (CC)	EIA-AEO 2020	Multi-Shaft	1,083	$957	$1.88	$12.26	6,370
Combustion Turbine (CT)	EIA-AEO 2020	Industrial	237	$709	$4.52	$7.04	9,905

[1] https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf

ACCREDITATION

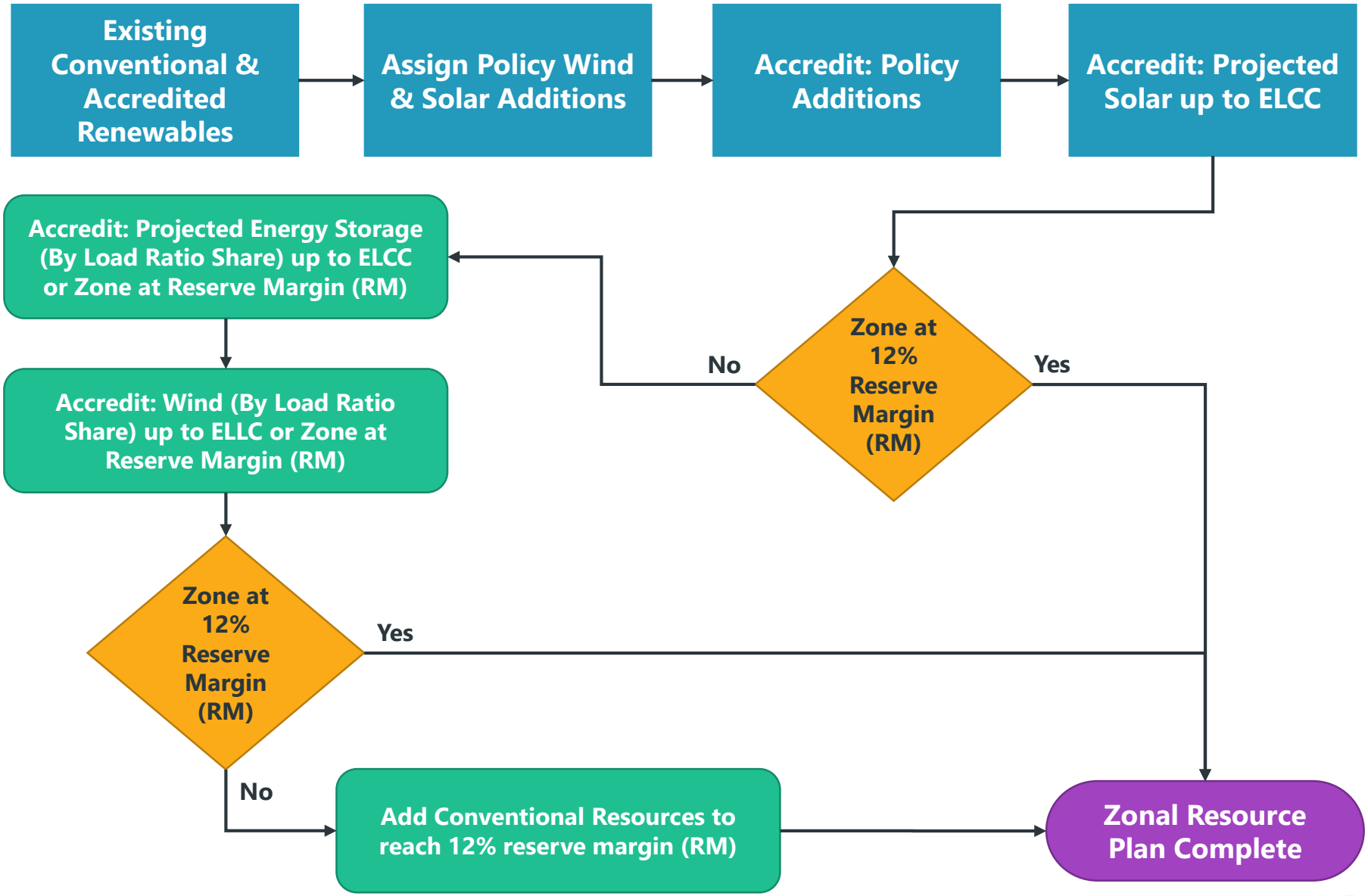
- Accreditation of existing renewable units will be determined by member data based on SPP Planning Criteria 7.1.6 (7)(8) submitted through the Generation Review.
- Total projected utility scale solar, wind, and storage will be accredited based on the approximate average effective load-carrying capability (ELCC) value for the respective resource.

NEW RESOURCE ALLOCATION AND ASSIGNMENT

	SOLAR	WIND	BATTERY STORAGE
ASSIGNED	Yes	No	No
ALLOCATED	Load-Ratio Share	Load-Ratio Share	Load-Ratio Share

- Projected utility scale solar will be assigned and allocated by load-ratio share.
- Projected wind will be unassigned and allocated by load-ratio share.
- Projected battery storage will be unassigned and allocated by load ratio share.

RENEWABLE ACCREDITATION DECISION TREE



NEXT STEPS

- Preliminary Resource Plan Phase II
  - Generation / Load Review incorporation
  - Renewable Allocation Results (Wind, Solar, & ESR)

SPP Southwest Power Pool

2023 **ITP**

2023 ITP SITING PLAN

GREG LAMPLEY

SITING PLAN OVERVIEW

- Detail, prioritization, and assignment of points of interconnection for units identified by resource expansion plan
  - Wind
  - Solar
  - Battery/Storage
  - Conventional Gas
  - Distributed Solar (F2)
- Feeds into
  - MEMs
  - GOF analysis which can feed back into siting plan

2023 ITP SITING PLAN HIGH LEVEL SCHEDULE

EXTERNAL SITING PLAN 2023 ITP

- External Siting Plans will be taken from 2022 ITP
  - No new MTEP data available for 2023 ITP
  - Adjustments made to match difference in scoped renewables

EXCEPTIONS TO INITIAL SITING PLAN

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

2023 **ITP**

APPENDIX

GOVERNING DOCUMENTS - SITING

- ITP Resource Siting Manual
  - Updates approved by ESWG and TWG except for the baseline sites
- ITP Resource Siting Whitepaper
  - Contains Lessons Learned and Process Improvements
- 2023 ITP Scope-MOPC Approved

GREG LAMPLEY

Engineer II, Transmission Planning

Please feel free to contact us at
glampley@spp.org

SPP Southwest Power Pool

2023 **ITP**

2023 ITP GENERATOR OUTLET FACILITIES

SPENCER MAGBY

OVERVIEW

- Milestone deliverable
- GOF development notes
- High-level schedule

MILESTONE DELIVERABLE

- Develop the proper set of upgrades to facilitate the integration of the siting plan into the 2023 ITP models
  - Ensure sited units do not cause issues on the system that would have been mitigated by Notifications to Construct (NTCs) had they gone through the GI process
  - Ensure minimal impact to existing congestion patterns
  - Avoid masking current issues on the system

GOF DEVELOPMENT NOTES

- The GOF process is intended to proxy the evaluation of a resource in the GI process to develop necessary upgrades
- Intent is to work closely with incumbent TO during development of potential upgrades
  - Keep stakeholders involved in the process
  - Use stakeholder feedback to ensure upgrades are modeled realistically
- Verify a potential GOF's effectiveness with a verification run, as needed

2023 ITP – GENERATOR OUTLET FACILITIES (GOFS)

2023 **ITP**

APPENDIX

HIGH-LEVEL PROCESS AS DETAILED IN THE ITP MANUAL, SECTION 2.2.2.3

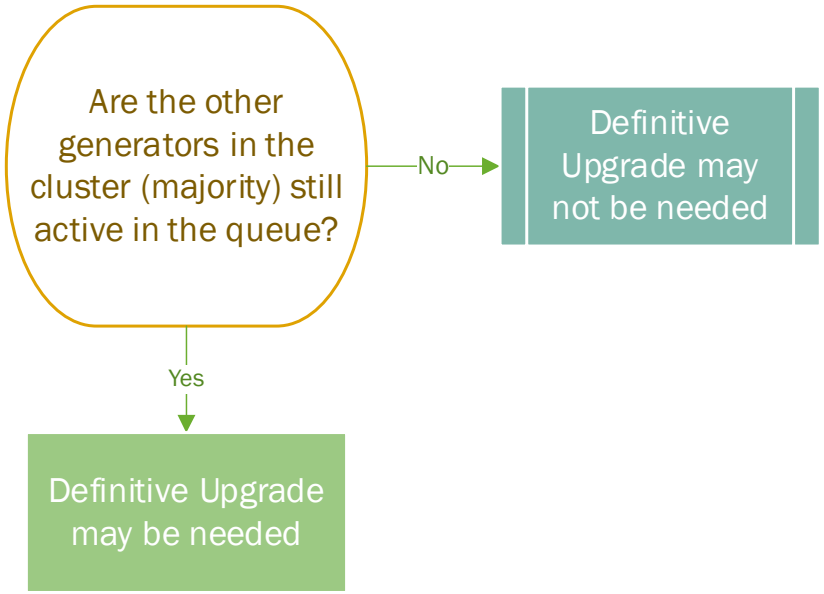
- Review the First Contingency Incremental Transfer Capability (FCITC) analysis completed during the siting process
- Transmission distribution factors (TDFs) will be calculated for each transmission facility with each generation resource at its full nameplate value under system intact and contingency conditions
- Overloaded lines with a TDF above the threshold used in the GI process will be used as an indicator that a GOF may be necessary
  - In the instance that multiple units are sited with electrically similar interconnection points, the TDFs will be calculated with each resource dispatched at maximum capacity simultaneously to ensure the final GOF is sized appropriately

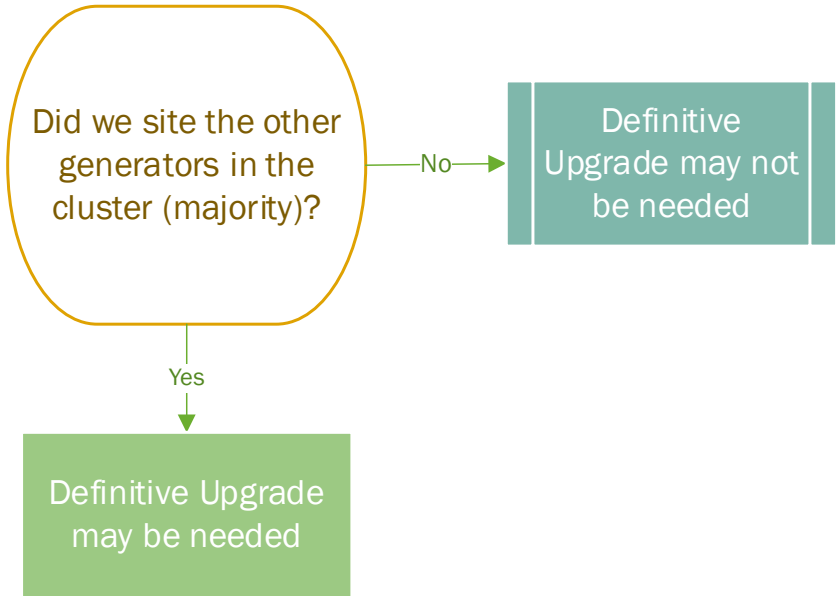
HIGH LEVEL PROCESS AS DETAILED IN THE ITP MANUAL, SECTION 2.2.2.3 - CONT.

- When TDFs on overloaded transmission facilities meet or exceed the minimum threshold, GOFs will not be guaranteed for inclusion in the ITP models
  - SPP will use engineering judgment, such as the consideration of a unit's expected dispatch and the impact a GOF may have on potential economic and/or reliability needs, to recommend GOF inclusion
- All GOFs recommended for inclusion in the models will be reviewed and approved by the TWG

DECISION POINTS FOR INCLUDING DEFINITIVE UPGRADE

- First, find the most recently studied GI report for the group in which the sited generator falls.



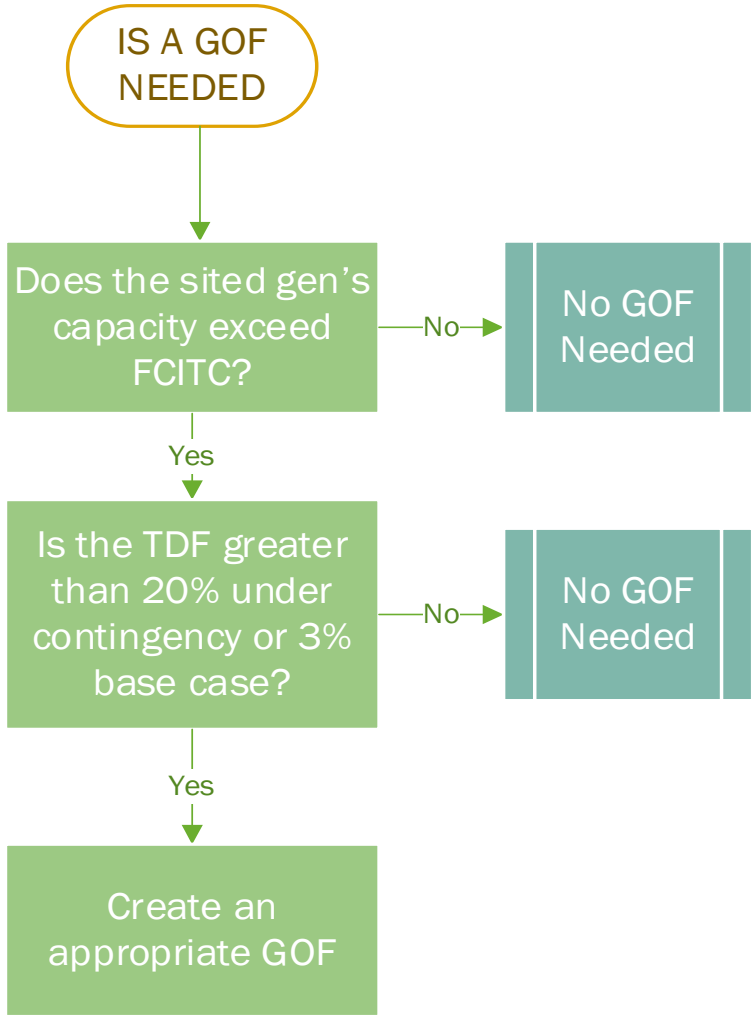


EXAMPLE

Keystone - Red Willow 345kV CKT 1			**$175,000,000**
Build Keystone - Red Willow 345kV CKT 1			
	GEN-2016-034	$20,200,894	
	GEN-2016-074	$16,221,864	
	GEN-2016-096	$8,669,539	
	GEN-2016-106	$57,961,033	
	GEN-2016-110	$32,800,050	
	GEN-2016-147	$8,167,736	
	GEN-2016-159	$18,830,286	
	GEN-2016-165	$12,148,598	
	Total Allocated Costs	**$175,000,000**	

- If we site 2016-034 that has the definitive upgrade, but over half have withdrawn from the queue, or we didn't site any of the others in the siting plan, we likely wouldn't need to include the definitive upgrade.

DECISION POINTS FOR FCITC/TDF CHECK



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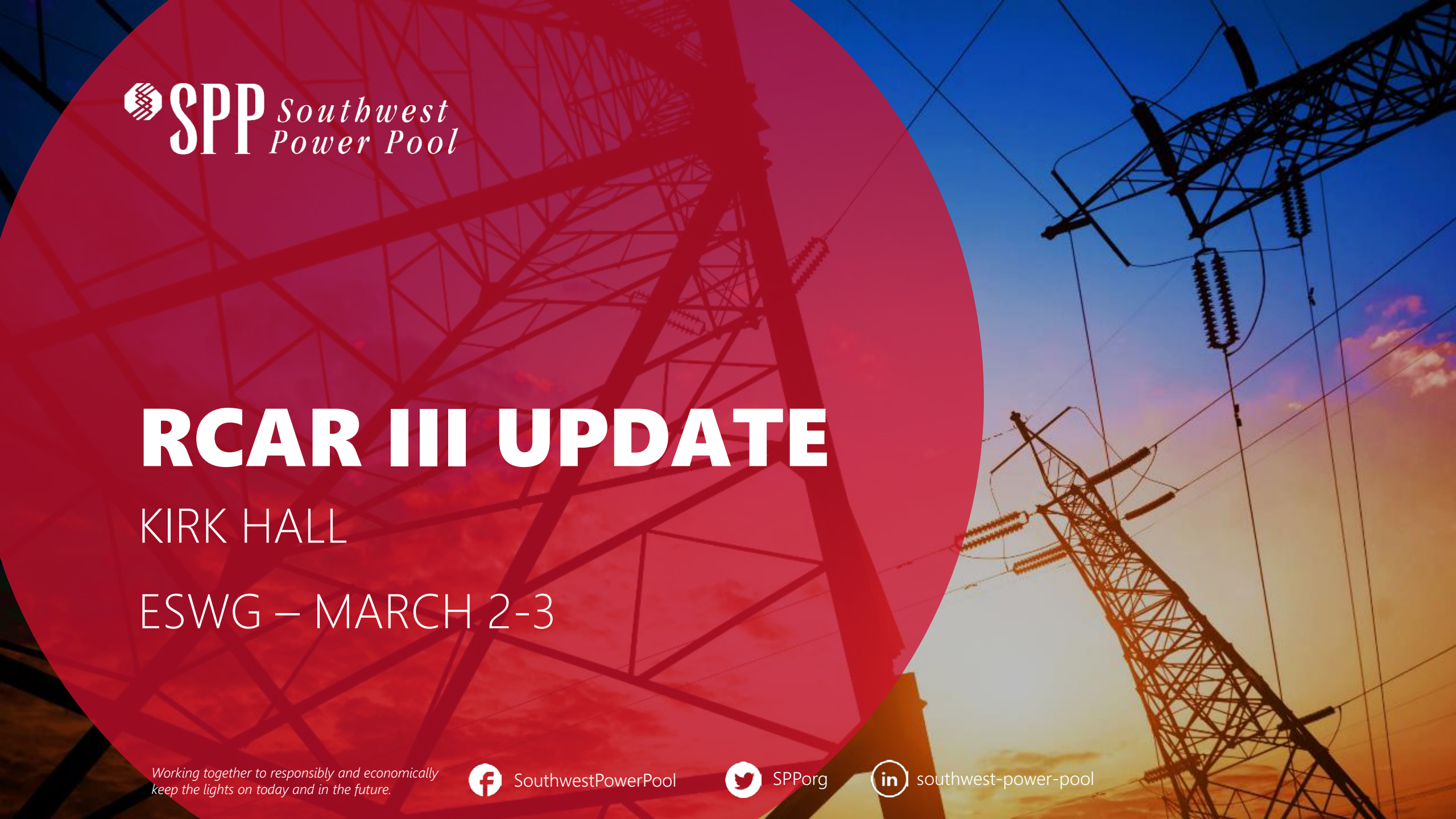


RCAR III UPDATE

KIRK HALL

ESWG – MARCH 2-3

Working together to responsibly and economically keep the lights on today and in the future.

SouthwestPowerPool SPPorg southwest-power-pool

OVERVIEW

- Hybrid Process
- Current progress
- Draft Schedule

HYBRID-BASED ANALYSIS APPROACH

Benefit Metric	Planning Effort
Adjusted Production Cost	Yes
Reduction of Emission Rates and Values	Yes
Savings due to Lower Ancillary Service Needs and Production Costs	Yes
Avoided or Delayed Reliability Projects	Existing ITP Data
Capacity Cost Savings due to Reduced On-Peak Transmission	Existing ITP Data
Mitigation of Transmission Outage Costs	Yes
Assumed Benefits of Mandated Reliability Projects	Technical Approach
Benefits from Meeting Public Policy Goals	No projects identified
Increased Wheeling Through and Out Revenue	Technical Approach
Marginal Energy Losses	Yes

CURRENT PROGRESS

- 2021 ITP models starting point for RCAR III analysis, but updates necessary to address known modeling issues
- Additional model updates necessary prior to handoff with consultant
  - 2021 ITP known model corrections
  - Planned retirement updates and load reductions in SPS
  - Possible resource plan changes
- Updates will more accurately capture benefits of the region
- Model updates currently underway in-house

UPDATED SCHEDULE AND IMPORTANT DATES

Task Name	Start	Finish
RCAR III Metrics Prep	2/1/2022	4/15/2022
RCAR III Model Development	2/22/2022	5/19/2022
Powerflow Model Development	2/22/2022	3/24/2022
Economic Model Development	2/25/2022	4/6/2022
Constraint Assessment	4/1/2022	5/19/2022
Benefit Metrics	5/16/2022	7/31/2022
Report Development	6/1/2022	8/30/2022
Project Management	1/1/2022	9/30/2022

- Economic Model Development 2/16-4/06
  - ESWG Review: 3/15-3/21
  - ESWG Approval: 3/31-4/06

WHAT IS NEEDED FROM ESWG

- Model review and feedback
  - Appropriate assumptions
  - Technical support if modeling problems arise
- Benefit metric calculations feedback

SPP Southwest Power Pool

20-YEAR ASSESSMENT

SCOPE AND STUDY EXECUTION ACTION ITEMS

SHERRI MAXEY

MARCH 2022

OVERVIEW

- Staff's Approach
- Action Items identified – Updates from February ESWG presentation shown in red; completed items in green
- Data source

STAFF'S APPROACH

- Purpose: Identify 20-Year Assessment scope and study execution items to be addressed with stakeholders
- Action: Take chronological approach by ITP study milestone
- Goal: Bring back 1-2 months prior to start of milestone work for stakeholder discussion and decision

ACTION ITEMS

ID	Description	Milestone(s)	Status Update
1	Load growth distribution and approach to non-conforming load (partial overlap with item 2)	Powerflow Models / Load Review	*Completed*
2	Implementing future drivers in generation and load review, and market economic model (MEM) Supply side items: ➢ Emissions target and gas retirements (F3/F4), modeling and monitoring ➢ Electric storage additions - transmission, energy or capacity asset, or all of the above? ✓ Distributed resource forecasts and modeling ✓ Fuel forecasts extrapolation and adjustments Demand side items: ✓ Load shape changes (will complete in MEM) ✓ General electrification (*e.g.*, 20YR - F3/F4) ✓ Electric vehicle growth and distribution ✓ Demand response ✓ Energy efficiency	Generation and Load Review / Resource Plan (RP2) / MEM	*In progress - partially complete:* ➢ Emission target and gas retirements (F3/F4), modeling and monitoring – *presented June 2021 ESWG; work in progress with goal to bring update in Mar. 2022* ➢ Electric storage additions - transmission, energy or capacity asset, or all of the above? – *dependent on outcome of emissions item* *Completed:* ✓ Load shape changes *(2042 peak load values will be determined during MEM build)* ✓ General electrification ✓ Electric vehicle growth and distribution ✓ Demand response ✓ Energy Efficiency ✓ Fuel forecasts extrapolation and adjustments
3	Renewable policy extrapolation	Renewable Policy Review	*Completed*

ACTION ITEMS - CONTINUED

ID	Description	Milestone(s)	Status Update
4	Renewable pricing and PTC assumptions/expirations for new and existing units	Gen Review / RP2 / Siting	*Completed – related language added to 2023 ITP Scope*
5	Wind methodology for aging wind fleet (repowering assumptions)	Gen Review	*Completed*
6	Possible use of resource planning software in 20-Year Assessment; or should we adjust the traditional resource additions?	RP2	*Completed – will be using resource planning software*
7	Resource Plan strategy for renewables: • Renewable and storage ownership~~, and accreditation assignment; CT-to-CC ratio; and~~ • ELCC implementation (renewable accreditation)	RP2	*In progress – presented at Nov. ESWG; pending emissions implementation, full resource plan methodology will be presented*
8	Identification of additional batteries beyond F1 and F2 scoped amounts (requires Scope change); including hybrid issues	RP2	*In progress – Will be addressed as part of item 2 (emissions)*
9	External region resource plan and siting approaches	RP2	*Completed – considered complete once Item #13 was approved (using MTEP 21)*

ACTION ITEMS - CONTINUED

ID	Description	Milestone(s)	Status Update
10	Review 12% cap on renewables for reserve margin requirements	RP2	*Completed*
11	Determine resource addition strategy	Siting / Generator Outlet Facilities (GOFs) / Constraint Assessment	*Completed – approved at Feb. ESWG*
12	EPRI transmission capacity hosting tool/SPP initiative for siting	Siting / GOFs / Constraint Assessment	*Completed – approved at Feb. ESWG*
13	MTEP Futures compatibility (2022 ITP & 20YA)	External (Load & Gen Review / RP2 / Siting)	*Completed*
14	Hybrid Solar/Renewable and Battery Modeling and GI Surplus Capacity	Siting / MEM	*Completed – approved at Feb. ESWG*
15	Generator outlet facilities (GOFs) decision on inclusion in 20-Year Assessment	GOFs	*Completed*
16	Constraint Assessment on each future; come up with EHV portfolio; monitor everything 100 kV and above? Bring methodology back for review.	Constraint Assessment	

ACTION ITEMS - CONTINUED

ID	Description	Milestone(s)	Status Update
17	20-Year objective function for developing portfolios by future • Approaches to non-SPP APC savings benefits (*e.g.*, SPP-Other, SPP economy export APC savings benefits to non-SPP regions) • Approach to seams issues and solutions	Portfolio Development	
18	HV and EHV needs versus HV and EHV solution tradeoffs	Portfolio Development	
19	Identification of sensitivities	Sensitivity Analysis	

20-YEAR ASSESSMENT FUTURES 3/4 – ACTION ITEM UPDATES: EMISSIONS TARGET ANALYSIS

AHMED

MARCH 2022

OUTLINE

- Updates since last discussion
- Review 20-Year futures scope assumptions & drivers
- Review 20-Year emissions target action items
- Emissions analysis objective
- Emissions analysis results and observations
- Scope modification options
- EIA prototypes table
- Next steps

UPDATES SINCE LAST DISCUSSION AT ESWG

- Initial work on emissions target analysis was put on hold after the June 2021 update
- 20-Year emissions target analysis work resumed earlier this year involving iterative simulations to meet scoped emissions

20-YEAR FUTURES SCOPE – KEY ASSUMPTIONS & DRIVERS

	DRIVERS			
KEY ASSUMPTIONS	**Future 1 (F1) - 2022 ITP Reference Case**	**Future 2 (F2) - 2022 ITP Emerging Technologies**	**Future 3 (F3) - Accelerated Decarbonization (New administration and aggressive energy/ environmental policy change)**	**Future 4 (F4) - Based on SPP F3 with hurdle rate of zero between MISO and SPP**
YEAR	**20**	**20**	**20**	**20**
Peak Demand Growth Rates	As submitted in load forecast	As submitted in load forecast	**Moderate increase due to switching to electric home heating and increased electric transportation, potential shift to a winter peaking SPP**	**Moderate increase due to switching to electric home heating and increased electric transportation, potential shift to a winter peaking SPP**
Energy Demand Growth Rates	As submitted in load forecast	Increase due to electrification growth	**Higher demand due to electrification compared to F2 due to aggressive policy**	**Higher demand due to electrification compared to F2 due to aggressive policy**
Natural Gas Prices	Current industry forecast	Current industry forecast	**Increase prices influenced by emissions pricing policy**	**Increase prices influenced by emissions pricing policy**
Coal Prices	Current industry forecast	Current industry forecast	**Increase prices influenced by emissions pricing policy**	**Increase prices influenced by emissions pricing policy**
Emissions Prices	Current industry forecast	Current industry forecast	**Emission prices based on new policy**	**Emission prices based on new policy**
Fossil Fuel Retirements	Coal age-based 56+, Gas/Oil age-based 50+, subject to generator owner (GO) review	Coal age-based 52+, Gas/Oil age-based 48+, subject to GO review and ESWG approval	**All Coal and Oil retired. More Gas retirements, driven by higher emission reduction levels relative to F2 driven by new policy**	**All Coal and Oil retired. More Gas retirements, driven by higher emission reduction levels relative to F2 driven by new policy**
Environmental Regulations	Current regulations	Current regulations	**Federal Policy, mandated carbon cuts, carbon tax**	**Federal Policy, mandated carbon cuts, carbon tax**
Demand Response[1]	As submitted in load forecast	As submitted in load forecast	**Increase from F2**	**Increase from F2**
Distributed Generation (Solar)	As submitted in load forecast	900MW	**Increase from F2 due to policy shift and significant incentives to behind-the-meter installation**	**Increase from F2 due to policy shift and significant incentives to behind-the-meter installation**
Energy Efficiency	As submitted in load forecast	As submitted in load forecast	**Increase in F2**	**Increase in F2**
Storage	20% of projected solar	35% of projected solar	**Increase from F2**	**Increase from F2**
			Total Renewable Capacity	
Solar (GWh)	19	27	**48**	**48**
Wind (GWh)	41	50	**65**	**65**
			Additional Assumptions	
Emissions Reduction Target	N/A	N/A	**93% to 95% Emissions Reductions Target in 2042 from 2017 Levels**	**93% to 95% Emissions Reductions Target in 2042 from 2017 Levels**
Hurdle Rate	N/A	N/A	**N/A**	**SPP-MISO and MISO-SPP Hurdle Rate set to $0**

Accelerated Decarbonization (New administration and aggressive energy/environmental policy change) (Future 3)

The accelerated decarbonization future is meant to reflect a new administration and an aggressive energy/environmental policy change. This is primarily reflected by all coal generators and oil generation being retired, driven by a 93 percent to 95 percent emission reductions target in 2042 from 2017 levels. The environmental regulations assumption will be based on changes in federal policy, mandated carbon cuts and a carbon tax. Natural gas prices will be determined per the ITP Manual. This future also assumes higher solar, wind, and energy storage resource additions than Futures 1 and 2 due to the change in environmental policy and changes in technology that decrease capital costs and increase energy conversion efficiency.

SPP-MISO Zero Hurdle Rate (Future 4)

The SPP-MISO Zero Hurdle Rate future is meant to focus on the potential benefit that can be realized by greater market efficiency between SPP and MISO. This future will set SPP-MISO and MISO-SPP hurdle rates to zero. All other input modeling assumptions will be held the same as Future 3.

20-YEAR ASSESSMENT

[1] As defined in the MDWG Model Development Procedure Manual: MDWG Manual

20-YEAR ACTION ITEMS – RELATED TO EMISSIONS TARGET ANALYSIS

- Action item # 2: Implementing future drivers in generation and load review, and market economic model (MEM)

  Supply side items:

  - Emissions target and gas retirements (F3/F4), modeling and monitoring
  - Electric storage additions - transmission, energy or capacity asset, or all of the above?

- Action item # 8: Identification of additional batteries beyond F1 and F2 scoped amounts

OBJECTIVE

- Determine if emissions reduction can be met with the current scope
- If unable, determine necessary scope changes

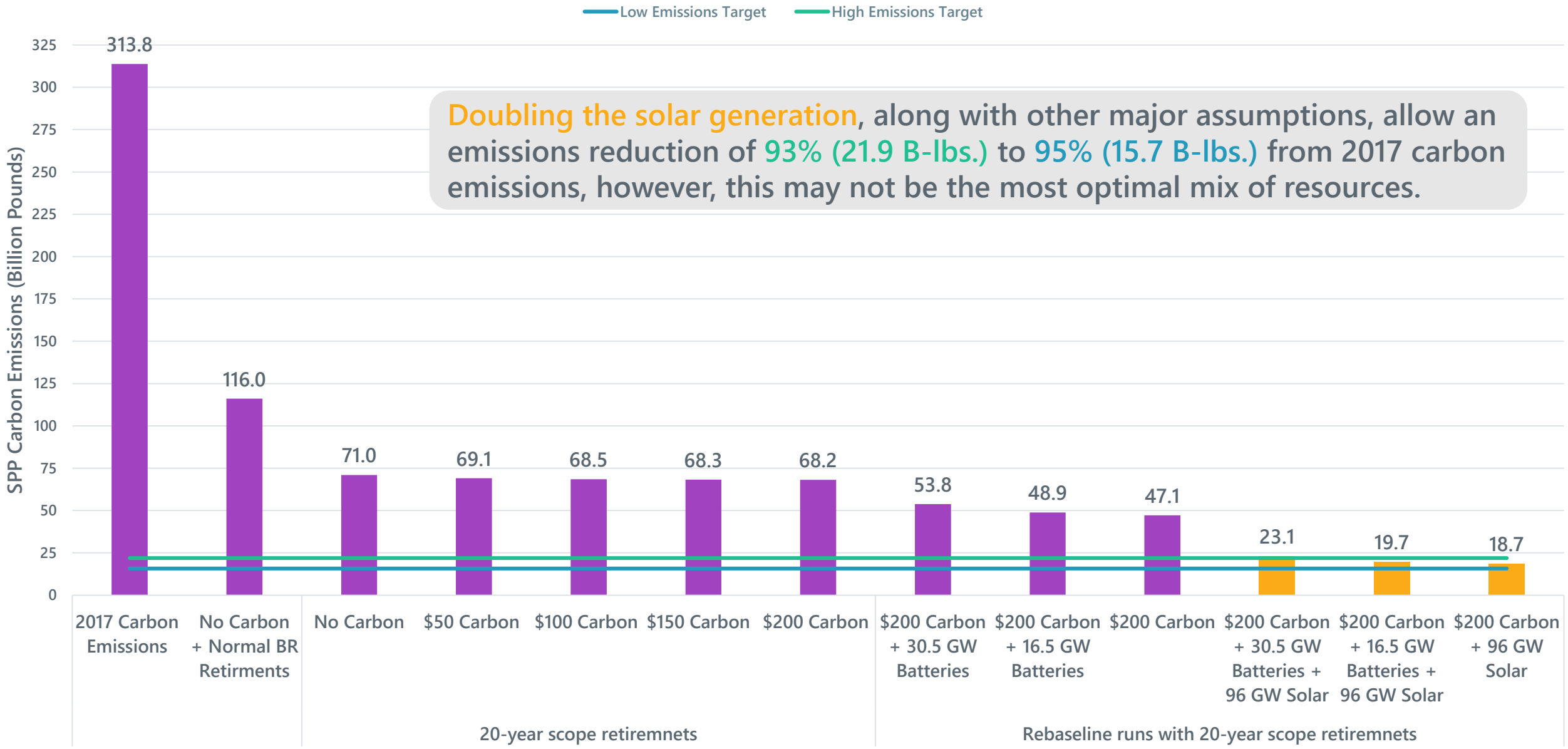
EMISSIONS ANALYSIS RESULTS AND OBSERVATIONS

PROMOD SIMULATION NOMENCLATURE LEGEND

- 20-Year F3/F4 PROMOD simulations are based on:
  - Year 2 2022 ITP MEM model
  - Proxy peak loads for 2042 (65 GWh annual peak, and 361,456 GWhh annual energy)
  - F3/F4 scope assumptions layered in
  - No transmission constraints

Event File Status	Retirments	Hurdle Rate	Carbon Tax Level	Storage Duration	Battery Capacity	Solar Capacity
Constrained or unconstrained via the use of an event file E = Event file NE = No Event File	Indicates the use of generator retirements CSV based on F3/F4 scope (All Coal and Oil retired) and F2 (Gas age-based 48+ retired) NRET = No Retirements (Normal BR Retirements) RET = Retirements included	LOW (current settings) or HI ($10,000/MWh) forwards/backwards tariffs on all links.	Tiered carbon tax NO = No Carbon Tax 50C = $50/ton Carbon Tax 100C = $100/ton Carbon Tax 150C = $150/ton Carbon Tax 200C = $200/ton Carbon Tax	4 = 4-hour storage duration 8 = 8-hour storage duration	(blank) = 9,450 MW 16.5 = 16,500 MW 30.5 = 30,500 MW	(blank) = 48,000 MW IncSolar = 96,000 MW
E or NE	**NRET or RET**	**HI or LOW**	**NOC/50C/100C/150C/200C**	**4 or 8**	**(blank)/16.5/30.5**	**(blank) or IncSolar**

20-Year Future 3 Carbon Emissions



Doubling the solar generation, along with other major assumptions, allow an emissions reduction of 93% (21.9 B-lbs.) to 95% (15.7 B-lbs.) from 2017 carbon emissions, however, this may not be the most optimal mix of resources.

20-YEAR ASSESSMENT

Rebaseline runs have the following changes: Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)

CARBON EMISSIONS NATCO2 (MILLION POUNDS)

Carbon tax has minimal impact on emissions once retirements are added. Longer battery durations are also ineffective in reducing total carbon emissions. Increasing the solar capacity allowed the carbon goal to be met

Project	CT Gas	Combined Cycle	ST Coal	IC Gas	IC Oil	CT Oil	ST Gas	ST Other	IGCC (Existing)	CT Other	Total
NE_NRET_HI_NOC_4	7,233	21,914	80,471	1,376	32	1	4,421	547	0	40	116,035
NE_RET_HI_NOC_4	24,836	35,947	0	2,342	0	0	7,779	32	0	55	70,991
NE_RET_HI_50C_4	26,423	35,944	0	2,334	0	0	4,321	32	0	39	69,094
NE_RET_HI_100C_4	26,892	35,784	0	2,326	0	0	3,472	32	0	25	68,530
NE_RET_HI_150C_4	27,073	35,669	0	2,294	0	0	3,177	31	0	14	68,256
NE_RET_HI_200C_4	27,254	35,606	0	2,282	0	0	2,992	29	0	9	68,171
NE_RET_HI_200C_8	26,598	35,369	0	2,272	0	0	2,964	29	0	8	67,241
NE_NRET_HI_200C_4*	12,806	28,352	4,363	1,621	34	1	2,382	92	0	3	49,655
NE_RET_HI_200C_4*	15,822	28,129	0	1,557	0	0	1,614	24	0	4	47,149
NE_RET_HI_200C_4_16.5*	17,642	27,839	0	1,662	0	0	1,678	23	0	5	48,850
NE_RET_HI_200C_4_30.5*	22,886	26,960	0	1,872	0	0	2,054	22	0	8	53,801
NE_RET_HI_200C_4_IncSol*	5,009	12,555	0	590	0	0	486	11	0	2	18,653
NE_RET_HI_200C_4_16.5_IncSol*	6,088	12,444	0	674	0	0	506	11	0	2	19,726
NE_RET_HI_200C_4_30.5_IncSol*	8,897	12,738	0	818	0	0	597	11	0	4	23,064

20-YEAR ASSESSMENT

**Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)*

EMERGENCY ENERGY (GWH) AND EMERGENCY ENERGY AS A % OF MONTHLY ENERGY DEMAND

Emergency energy almost zero with no retirements, but increases substantially in July-Sept and Dec, when the retirements are incorporated. Mostly just concerned that adding battery capacity increased emergency energy

	Month												
Project	1	2	3	4	5	6	7	8	9	10	11	12	Average
NE_NRET_HI_NOC_4	0	0	0	0	0	0	0	0	0	0	0	7 0.021%	7 0.002%
NE_RET_HI_NOC_4	0	0	0	0	0	0	221 0.516%	139 0.357%	25 0.074%	0	0	165 0.482%	551 0.139%
NE_NRET_HI_200C_4*	0	0	0	0	0	0	0	0	0	0	0	0 0.001%	0
NE_RET_HI_200C_4*	0	0	0	0	0	0	38 0.097%	15 0.042%	0 0.001%	0	0	87 0.277%	141 0.039%
NE_NRET_HI_200C_4_30.5*	16 0.052%	5 0.021%	11 0.041%	0	19 0.065%	8 0.023%	77 0.197%	62 0.174%	32 0.103%	12 0.044%	17 0.064%	35 0.112%	295 0.081%
NE_RET_HI_200C_4_30.5*	11 0.036%	23 0.093%	4 0.015%	0	28 0.096%	29 0.085%	546 1.389%	412 1.156%	146 0.468%	7 0.026%	0	124 0.395%	1,331 0.367%
NE_RET_HI_200C_4_16.5*	0	0	0	0	0	0	138 0.351%	20 0.056%	5 0.016%	0	0	83 0.262%	246 0.068%
NE_RET_HI_200C_4_IncSol*	0	0	0	0	0	0	0	0	0	0	0	36 0.114%	36 0.01%
NE_RET_HI_200C_4_16.5_IncSol*	0	0	0	0	0	0	2 0.004%	0	0	0	0	36 0.114%	37 0.01%
NE_RET_HI_200C_4_30.5_IncSol*	3 0.009%	23 0.091%	5 0.019%	0	0	0	105 0.267%	60 0.169%	90 0.289%	0	4 0.015%	61 0.192%	351 0.097%

**Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)*

DUMP ENERGY (GWH)

Dump generation is ~70% from hydro generation with the default 9.5 GWh of battery storage runs. We see some gas generation dumping; this could be due to spinning reserve requirements. As battery size increases to 16.5 or 30.5 GWh, more thermal generation runs, thus increasing dump energy from thermal resources.

	Month												
Project	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
NE_NRET_HI_NOC_4	13	6	3	1	8	24	13	21	5	2	8	4	109
NE_RET_HI_NOC_4	10	5	4	0	7	20	12	8	2	4	7	4	82
NE_NRET_HI_200C_4	10	18	57	62	64	13	0	1	0	25	13	3	265
NE_RET_HI_200C_4	5	9	31	34	40	7	1	0	1	14	11	3	157
NE_NRET_HI_200C_4*	8	9	4	6	4	6	4	4	3	2	8	5	64
NE_RET_HI_200C_4*	3	4	3	6	2	13	5	1	2	4	6	5	56
NE_RET_HI_200C_4_16.5*	10	6	8	8	15	7	14	3	3	8	11	9	103
NE_RET_HI_200C_4_30.5*	32	24	11	11	39	33	26	21	11	21	39	14	283
NE_RET_HI_200C_4_IncSol*	14	11	6	1	6	15	39	12	3	9	11	10	137
NE_RET_HI_200C_4_16.5_IncSol*	20	11	12	0	15	10	38	33	10	16	24	12	201
NE_RET_HI_200C_4_30.5_IncSol*	36	19	19	4	25	35	80	74	48	20	47	28	436

Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)

SOLAR CURTAILMENT (GWH) AND SOLAR TOTAL CURTAILMENTS AS A % OF TOTAL ENERGY

Solar curtailments are pretty minimal. Adding more solar capacity should further reduce emissions. Doubling solar generation, we are seeing pretty significant curtailments of solar than before, as expected with the decrease in load and double the solar capacity in the sensitivity case.

	Month												
Project	1	2	3	4	5	6	7	8	9	10	11	12	Annual
NE_RET_HI_NOC_4	18 0.07%	77 0.38%	306 1.24%	359 1.57%	438 1.9%	59 0.26%	45 0.24%	20 0.13%	11 0.07%	59 0.25%	29 0.13%	5 0.02%	1,426 0.65%
NE_RET_HI_200C_4	12 0.04%	69 0.34%	291 1.18%	349 1.53%	409 1.77%	33 0.15%	5 0.03%	7 0.04%	5 0.03%	52 0.22%	29 0.13%	3 0.01%	1,263 0.57%
NE_RET_HI_200C_4*	64 0.24%	171 0.84%	528 2.14%	641 2.81%	713 3.08%	128 0.57%	25 0.14%	16 0.1%	20 0.12%	175 0.74%	80 0.36%	5 0.02%	2,565 3.04%
NE_RET_HI_200C_4_16.5*	68 0.26%	199 0.98%	523 2.12%	654 2.87%	696 3.01%	122 0.54%	44 0.24%	21 0.13%	16 0.1%	190 0.8%	77 0.35%	9 0.04%	2,619 3.11%
NE_RET_HI_200C_4_30.5*	143 0.55%	297 1.47%	610 2.47%	700 3.07%	671 2.9%	188 0.84%	68 0.36%	58 0.36%	31 0.2%	257 1.09%	144 0.65%	53 0.23%	3,219 3.82%
NE_RET_HI_200C_4_IncSol*	929 3.58%	1,529 7.55%	3,820 15.47%	5,007 21.97%	5,616 24.28%	2,947 13.15%	897 4.8%	893 5.62%	1,032 6.5%	2,083 8.79%	1,288 5.88%	171 0.75%	26,212 15.59%
NE_RET_HI_200C_4_16.5_IncSol*	942 3.63%	1,519 7.5%	3,847 15.58%	5,027 22.06%	5,619 24.29%	2,892 12.9%	822 4.4%	885 5.57%	961 6.05%	2,057 8.68%	1,270 5.79%	175 0.77%	26,015 15.47%
NE_RET_HI_200C_4_30.5_IncSol*	999 3.85%	1,466 7.25%	3,754 15.2%	5,079 22.29%	5,532 23.92%	2,666 11.89%	1,008 5.4%	826 5.2%	975 6.15%	2,052 8.66%	1,325 6.04%	259 1.13%	25,942 15.43%

Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)

WIND CURTAILMENTS (GWH) AND WIND TOTAL CURTAILMENTS AS A % OF TOTAL ENERGY

Wind curtailments are high, especially in the spring and fall months. We see diminishing returns for wind, so we would not expect additional wind help reduce carbon emissions. Fixing the battery modeling issue can help remove wind curtailments. **Wind curtailments are quite a bit higher than before, as expected with the decrease in load and double the solar capacity in the sensitivity case.**

	Month												
Project	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Annual**
NE_RET_HI_NOC_4	3,751 14%	3,473 17%	6,333 26%	6,019 26%	6,233 27%	1,952 9%	454 2%	271 2%	657 4%	4,685 20%	3,898 18%	1,315 6%	39,042 15%
NE_RET_HI_200C_4	3,721 14%	3,468 17%	6,304 26%	5,994 26%	6,165 27%	1,912 9%	401 2%	259 2%	649 4%	4,672 20%	3,858 18%	1,296 6%	38,698 15%
NE_RET_HI_200C_4*	4,930 19%	4,430 22%	7,668 31%	7,323 32%	7,371 32%	2,985 13%	852 5%	512 3%	1,124 7%	5,994 25%	4,964 23%	2,020 9%	50,171 19%
NE_RET_HI_200C_4_16.5*	4,946 19%	4,410 22%	7,664 31%	7,322 32%	7,454 32%	3,142 14%	1,067 6%	627 4%	1,204 8%	6,070 26%	4,909 22%	2,061 9%	50,877 20%
NE_RET_HI_200C_4_30.5*	5,049 19%	4,436 22%	7,737 31%	7,396 32%	7,616 33%	3,362 15%	1,534 8%	945 6%	1,555 10%	6,255 26%	5,004 23%	2,364 10%	53,252 21%
NE_RET_HI_200C_4_IncSol*	7,183 28%	6,566 32%	10,723 43%	10,629 47%	10,840 47%	7,261 32%	3,151 17%	2,298 14%	3,027 19%	8,868 37%	7,181 33%	3,113 14%	80,839 31%
NE_RET_HI_200C_4_16.5_IncSol*	7,162 28%	6,588 33%	10,678 43%	10,632 47%	10,885 47%	7,400 33%	3,387 18%	2,337 15%	3,192 20%	8,892 38%	7,098 32%	3,136 14%	81,388 32%
NE_RET_HI_200C_4_30.5_IncSol*	7,301 28%	6,659 33%	10,738 43%	10,644 47%	10,956 47%	7,645 34%	3,672 20%	2,587 16%	3,543 22%	9,006 38%	7,161 33%	3,382 15%	83,293 32%

**Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)*

BATTERY STORAGE (GWH) AND BATTERY STORAGE GENERATION/CAPACITY FACTOR

Longer battery durations are also ineffective in reducing total carbon emissions. Battery utilization is not as much as we expect it, but that could be due to the seasonality and daily profiles of the renewables. We're considering other battery modeling options. **We're seeing diminishing returns for the carbon reduction enabled by doubling the storage capacity on the system**

	Month												
Project	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Annual**
NE_RET_HI_NOC_4	404 5.9%	348 5%	273 4%	260 3.8%	346 5%	367 5.3%	707 10.2%	559 8.1%	468 6.8%	399 5.8%	326 4.7%	461 6.7%	4,917 5.9%
NE_RET_HI_NOC_8	534 7.7%	524 7.6%	382 5.5%	360 5.2%	445 6.5%	522 7.6%	935 13.6%	719 10.4%	630 9.1%	530 7.7%	492 7.1%	680 9.9%	6,754 8.2%
NE_RET_HI_200C_4	400 5.8%	352 5.1%	280 4.1%	256 3.7%	343 5%	338 4.9%	704 10.2%	549 8%	463 6.7%	404 5.9%	330 4.8%	470 6.8%	4,890 5.9%
NE_RET_HI_200C_8	525 7.6%	536 7.8%	380 5.5%	360 5.2%	470 6.8%	493 7.1%	943 13.7%	707 10.2%	632 9.2%	526 7.6%	493 7.2%	691 10%	6,755 8.2%
NE_RET_HI_200C_4*	413 6%	367 5.3%	346 5%	290 4.2%	361 5.2%	337 4.9%	659 9.5%	503 7.3%	409 5.9%	391 5.7%	324 4.7%	451 6.5%	4,852 5.9%
NE_RET_HI_200C_4_16.5*	553 4.6%	560 4.6%	553 4.6%	432 3.6%	496 4.1%	507 4.2%	1,004 8.3%	754 6.3%	612 5.1%	520 4.3%	499 4.1%	697 5.8%	7,186 5%
NE_RET_HI_200C_4_30.5*	947 4.3%	1,058 4.8%	1,005 4.5%	811 3.6%	806 3.6%	753 3.4%	1,791 8%	1,463 6.6%	1,051 4.7%	878 3.9%	870 3.9%	1,028 4.6%	12,462 4.7%
NE_RET_HI_200C_4_IncSol*	336 4.9%	338 4.9%	384 5.6%	407 5.9%	442 6.4%	264 3.8%	462 6.7%	367 5.3%	331 4.8%	335 4.9%	324 4.7%	417 6%	4,407 5.3%
NE_RET_HI_200C_4_16.5_IncSol*	526 4.4%	536 4.4%	610 5.1%	555 4.6%	608 5%	357 3%	612 5.1%	615 5.1%	468 3.9%	464 3.9%	518 4.3%	626 5.2%	6,494 4.5%
NE_RET_HI_200C_4_30.5_IncSol*	973 4.4%	932 4.2%	1,174 5.3%	1,041 4.7%	1,044 4.7%	587 2.6%	1,080 4.9%	1,126 5.1%	890 4%	840 3.8%	909 4.1%	1,024 4.6%	11,619 4.3%

**Must runs units turned off, load corrected, emergency energy set to $10,000/MWh, no transfer from SPP to external zones)*

SCOPE MODIFICATION OPTIONS

- Resource planning software
  - Renewable mix updates only
  - Allow software to utilize other EIA prototypes
    - Nuclear options
    - Carbon capture/Sequestration gas
    - Others

EIA PROTOTYPES TABLE – ANNUAL ENERGY OUTLOOK 2021

Technology	First available year[1]	Size (MW)	Lead time (years)	Base overnight cost[2] (2020 $/kW)	Techno-logical optimism factor[3]	Total overnight cost[4,5] (2020 $/kW)	Variable O&M[6] (2020 $/MWh)	Fixed O&M (2020$/ kW-yr)	Heat rate[7] (Btu/kWh)
Ultra-supercritical coal (USC)	2024	650	4	3,672	1.00	3,672	4.52	40.79	8,638
USC with 30% carbon capture and sequestration (CCS)	2024	650	4	4,550	1.01	4,595	7.11	54.57	9,751
USC with 90% CCS	2024	650	4	5,861	1.02	5,978	11.03	59.85	12,507
Combined-cycle—single shaft	2023	418	3	1,082	1.00	1,082	2.56	14.17	6,431
Combined-cycle—multi shaft	2023	1,083	3	957	1.00	957	1.88	12.26	6,370
Combined-cycle with 90% CCS	2023	377	3	2,471	1.04	2,570	5.87	27.74	7,124
Internal combustion engine	2022	21	2	1,813	1.00	1,813	5.72	35.34	8,295
Combustion turbine—aeroderivative[8]	2022	105	2	1,169	1.00	1,169	4.72	16.38	9,124
Combustion turbine—industrial frame	2022	237	2	709	1.00	709	4.52	7.04	9,905
Fuel cells	2023	10	3	6,277	1.09	6,866	0.59	30.94	6,469
Nuclear—light water reactor	2026	2,156	6	6,034	1.05	6,336	2.38	122.26	10,455
Nuclear—small modular reactor	2028	600	6	6,183	1.10	6,802	3.02	95.48	10,455
Distributed generation—base	2023	2	3	1,560	1.00	1,560	8.65	19.46	8,935
Distributed generation—peak	2022	1	2	1,874	1.00	1,874	8.65	19.46	9,921
Battery storage	2021	50	1	1,165	1.00	1,165	0.00	24.93	NA
Biomass	2024	50	4	4,077	1.00	4,078	4.85	126.36	13,500
Geothermal[9,10]	2024	50	4	2,772	1.00	2,772	1.17	137.50	8,946
Municipal solid waste—landfill gas	2023	36	3	1,566	1.00	1,566	6.23	20.20	8,513
Conventional hydropower[10]	2024	100	4	2,769	1.00	2,769	1.40	42.01	NA
Wind[5]	2023	200	3	1,846	1.00	1,846	0.00	26.47	NA
Wind offshore[9]	2024	400	4	4,362	1.25	5,453	0.00	110.56	NA
Solar thermal[9]	2023	115	3	7,116	1.00	7,116	0.00	85.82	NA
Solar photovoltaic (PV) with tracking[5,9,11]	2022	150	2	1,248	1.00	1,248	0.00	15.33	NA
Solar PV with storage[9,11]	2022	150	2	1,612	1.00	1,612	0.00	32.33	NA

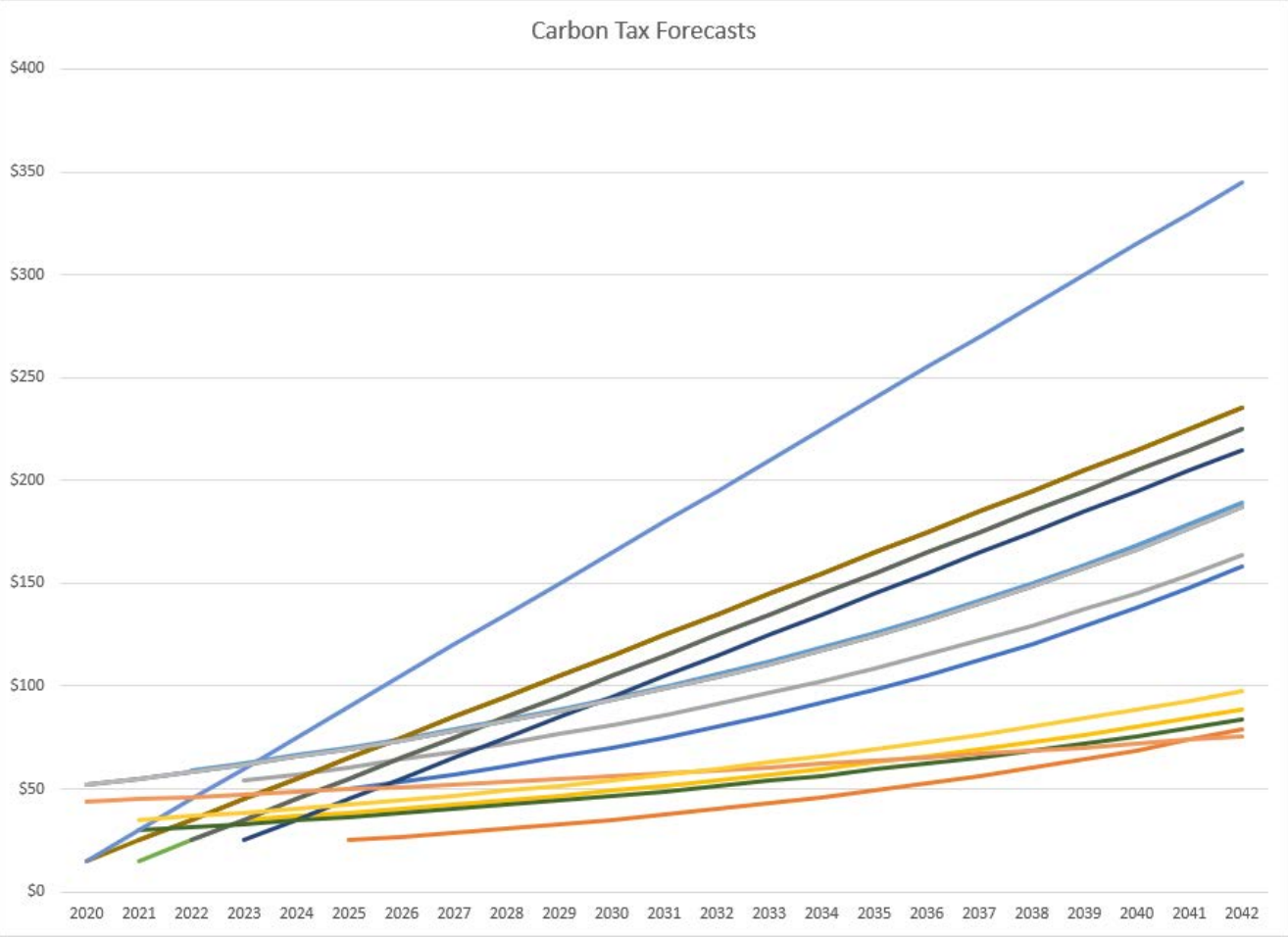
https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf

NEXT STEPS

- Research battery utilization issue
- Propose scope modifications

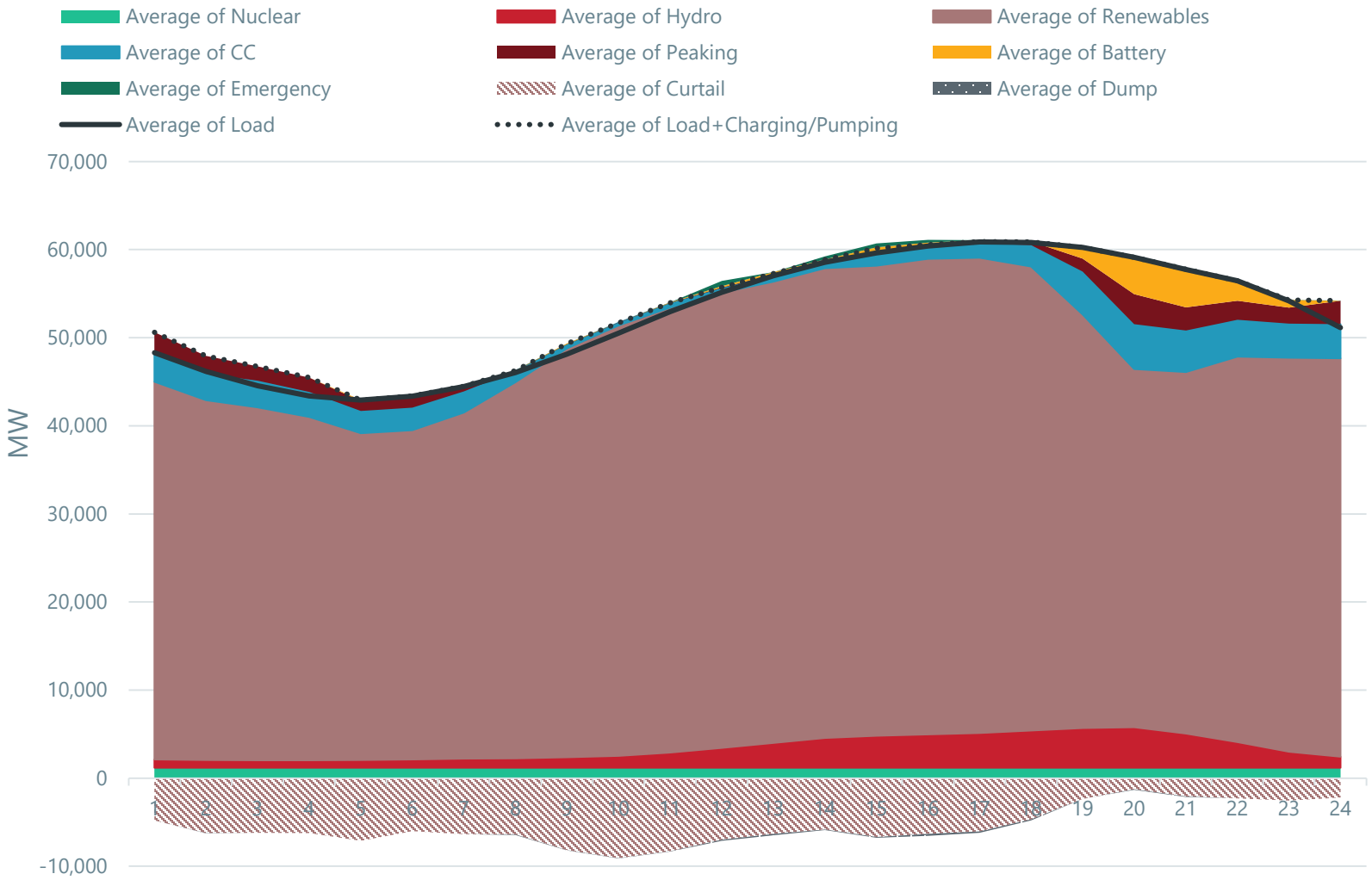
APPENDIX

CARBON TAX FORECASTS



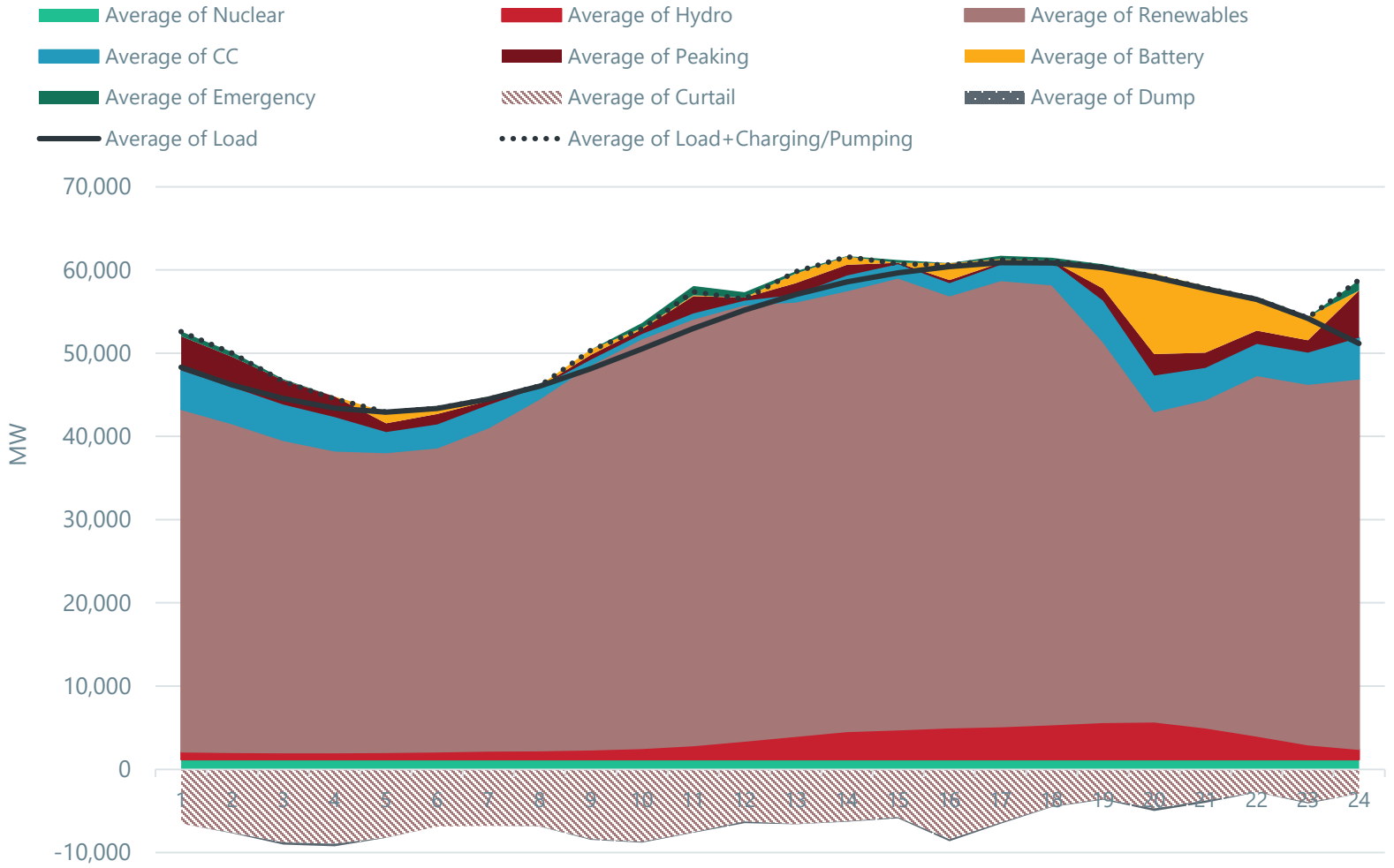
EPRI: Electrification and Renewable Penetration Scenarios for the U.S. Electric Sector" presentation. EPRI utilized $25/ton and $50/ton starting points in 2025$ and escalated by 7% annually. This would be $79/ton and $158/ton respectively in 2042

HOURLY AVERAGE OF JULY 2042 – REBASELINE RUN WITH 96 GWH SOLAR + 9 GWH BATTERY



Max battery MWh capacity is not being respected, but it isn't that far off. The end of the year has curtailments and emergency energy in same hour. There are hours where it is dumping/curtailing energy when it could be charging batteries and hours where it is using emergency energy to charge batteries.

HOURLY AVERAGE OF JULY 2042 – REBASELINE RUN WITH 96 GWH SOLAR + 30 GWH BATTERY



Max battery MWh capacity isn't far off. There are hours where it is dumping/curtailing energy when it could be charging batteries and hours where it is using emergency energy to charge batteries.
There are still hours where it looks like it is exporting emergency generation (less hours than we were seeing before, ~20 hours/year)

SPP Southwest Power Pool

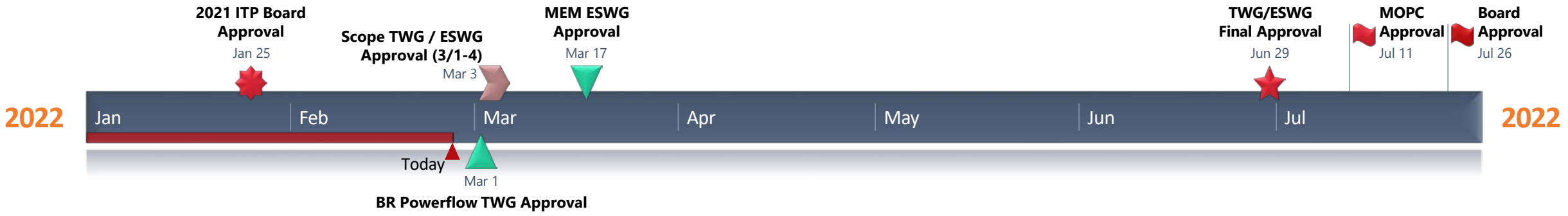
2021 ITP

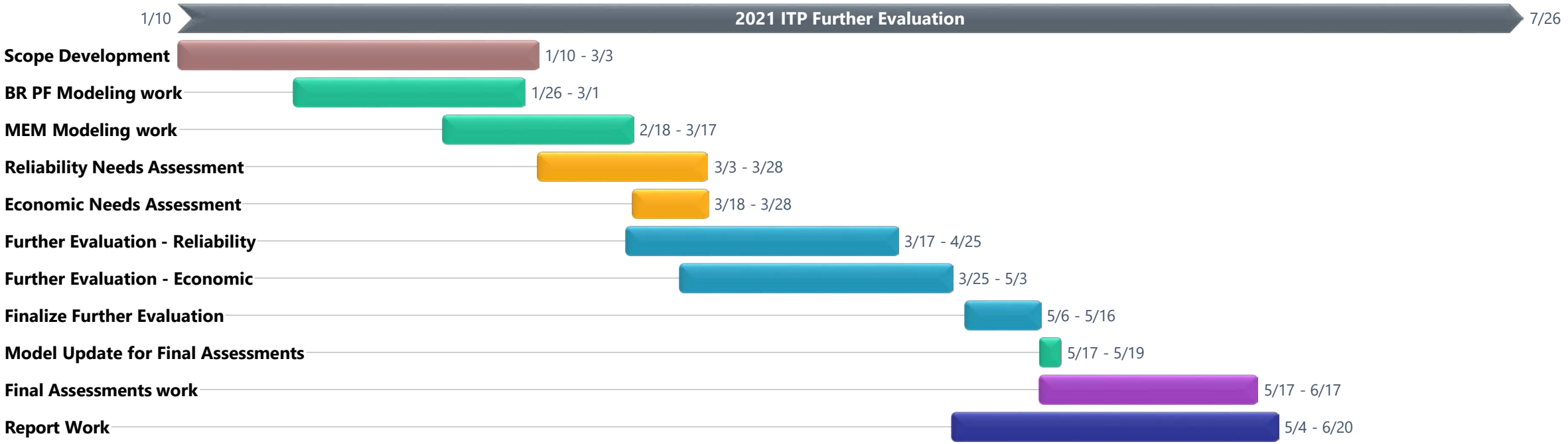
ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT - SCHEDULE

DARA SOLOMON

MARCH 2022

2021 ITP FURTHER EVALUATION OF CROSSROADS-PHANTOM 345 KV PROJECT





SCOPE DEVELOPMENT

- Start: 1/10/2022
- Finish: 3/03/2022 (Final Approval)

- Member Review Time:
  - Post for Review/Approval
    - 2/28-3/01 TWG (Posting: 2/21/2022): 2/22/2022 – 2/28/2022 (5 days)
    - 3/02-03 ESWG (Posting: 2/23/2022): 2/24/2022 – 3/01/2022 (5 days)

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

BASE RELIABILITY POWERFLOW MODELING WORK

- Start: 1/26/2022
- Finish: 3/01/2022 (Final Approval)

- Member Review Time:
  - Post for Review (Posting: 2/21/2022): 2/22/2022 – 2/28/2022 (5 days)
  - Request Approval at TWG on 2/28 – 3/01/2022

- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

MARKET ECONOMIC MODEL (MEM) WORK

- Start: 2/18/2022
- Finish: 3/17/2022 (Final Approval)

- Member Review Time:
  - Post for Review (Posting: 3/10/2022): 3/11/2022 – 3/17/2022 (5 days)
  - Request Approval via email starting 3/17/2022

- Staff Leaders: Charlton Hill (chill@spp.org) / Brooke Keene (bkeene@spp.org)
- Working Group Approval: ESWG

NEEDS ASSESSMENT UPDATES – RELIABILITY & ECONOMIC

- Start: 3/03/2022
- Finish Updates: 3/28/2022
- Finish Stakeholder Review: 4/04/2022

- Member Review Time:
  - Updated Needs Review (Posting: 3/28/2022): 3/29/2022 – 4/04/2022 (5 days)

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

FURTHER EVALUATION – RELIABILITY & ECONOMIC

- Start: 3/17/2022
- Finish: 5/16/2022

- Member Review Time:
  - June TWG / ESWG meetings:
    - 6/1-2 ESWG (Posting: 5/24/2022): 5/25/2022 – 6/01/2022 (5 days)
    - 6/7-8 TWG (Posting: 5/31/2022): 6/01/2022 – 6/07/2022 (5 days)

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

MODEL UPDATES FOR FINAL ASSESSMENT

- Start: 5/17/2022
- Finish: 5/19/2022

- Staff Leader: David Duhart (dduhart@spp.org)
- Working Group Approval: TWG

FINAL ASSESSMENTS WORK
(STAGING, APC BENEFIT METRIC, FINAL RELIABILITY ASSESSMENT & SENSITIVITY ANALYSIS, IF NEEDED)

- Start: 5/17/2022
- Finish: 6/30/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

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

FINAL REPORT ADDENDUM

- Start: 5/17/2022
- End: 6/30/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

- Staff Leader: Tammy Bright (tbright@spp.org)
- Working Group Approval: TWG / ESWG

TWG/ESWG FINAL APPROVALS

- Start: 6/03/2022
- End: 6/30/2022

- Member Review:
  - Final Approval (Posting Deadline: 6/22/2022): 6/23/2022 – 6/29/2021 (5 days)
  - Joint TWG / ESWG: 6/29-30/2022

- Staff Leaders:
  - TWG – Adam Bell (abell@spp.org)
  - ESWG – Joshua Norton (jnorton@spp.org)

MARKET & OPERATIONS POLICY COMMITTEE (MOPC), STRATEGIC PLANNING COMMITTEE (SPC) & SPP BOARD OF DIRECTORS

- MOPC: July 11-12, 2022
- SPC: July 13, 2022
- Quarterly Joint Stakeholder Meeting: July 25, 2022
- SPP Board of Directors: July 26, 2022

CONTACT INFO

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