Southwest Power Pool

Southwest Power Pool

ESWG/TWG JOINT MEETING

December 14, 2017

AEP Offices – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approved the Consolidation Methodology for the 2019 ITP.
2. Approved Resource Addition Requests.
3. Approved Hydro Modeling Methodology.
4. Approved Must Run Exceptions.

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ESWG/TWG JOINT MEETING

December 14, 2017

AEP Offices – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

ESWG Chair Alan Myers and TWG Chair Travis Hyde called the meeting to order at 1:00 p.m., welcomed those in attendance, and asked for introductions.

There were 18 in-person participants and 91 web conference participants, representing 17 of 17 ESWG members and 19 of 24 TWG members. (Attachment 1 – December 14, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers and Travis Hyde asked for any proxy statements; the following proxies were identified. (Attachment 2 – Proxy Statements)

ESWG

- Brad Schwarz (Hunt) named Alan Myers (ITC) as his proxy
- Randy Collier (CUS) named Kevin Foflygen (CUS) as his proxy
- Jon Iverson (OPPD) named Luke Haner (OPPD) as his proxy
- Anita Sharma (AEP) named Jim Jacoby (AEP) as his proxy

TWG

- Noman Williams (SCMCN) named Jody Holland (SCMCN) as his proxy
- John Boshears (CUS) named Kevin Foflygen (CUS) as his proxy

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – December 14th, 2017 ESWG Agenda).

ESWG: Kurt Stradley (LES) made a motion; seconded by Jeremy Severson (Basin) to adopt the agenda as amended. The motion was approved unanimously.

TWG: Jason Shook (GDS) made a motion; seconded by Daniel Benedict (INDN) to adopt the agenda as amended. The motion was approved unanimously.

Agenda Item 2 – 2019 ITP Scope Items

Agenda Item 2a – Consolidation

Amber Greb (SPP) presented on the 2019 ITP Portfolio Consolidation. She outlined the steps to get to a final portfolio for each future, before discussing the final portfolio consolidation. Consolidation of the two portfolios looks at three scenarios; 1) the same project was chosen for a group of needs in each future, in which case the project moves forward to the final portfolio 2) two different projects were chosen for a group of needs in each future, or 3) a project was chosen for a group of needs in one future, but no solution was chosen for the other future. In the second a third scenarios, a calculation methodology was developed to determine which projects move forward to the final portfolio. The calculation assigns up to 100 points per project based on a set of considerations and the points possible per threshold. During the November 30th meeting, stakeholders directed staff to remove two considerations and to determine if and how those points should be reallocated to the other considerations. Staff sent out options for reallocating the points and Stakeholders voted to reduce the points possible for new EHV projects and for projects that mitigate non-thermal issues (considerations 4 and 5 in the background materials), and to increase the points possible for projects that relieve congestions. Stakeholders reviewed each consideration, the points possible, any thresholds set for the considerations, and the project narrative that can alter the final project score. (Attachment 4 – 2019 ITP Portfolio Consolidation)

ESWG: John Olsen (Westar) made a motion; seconded by Natasha Henderson (GSEC) to approve consolidation methodology Option 2 as presented, including the consideration-specific minimum thresholds, points possible, calculation of points awarded, and scenario 3 total score threshold, with the addition of ARR project considerations for consideration 6. Project narratives may support or oppose the results of this systematic approach; in cases where a narrative opposes these results, associated materials will be brought to the ESWG and TWG for review and feedback. The motion was approved unanimously.

TWG: Harold Wyble (KCPL) made a motion; seconded by Nate Morris (EMDE) to approve consolidation methodology Option 2 as presented, including the consideration-specific minimum thresholds, points possible, calculation of points awarded, and scenario 3 total score threshold, with the addition of ARR project considerations for consideration 6. Project narratives may support or oppose the results of this systematic approach; in cases where a narrative opposes these results, associated materials will be brought to the ESWG and TWG for review and feedback. The motion was approved unanimously.

<u>Agenda Item 3 – Generation and Load Review</u>

Nikki Roberts (SPP) provided an update on Load and Generation Review. Nikki reminded the group that pass two has been posted and went over the review period and deadlines. (Attachment 5 - 2019 ITP Load and Generation Review)

<u>Agenda Item 3a – Resource Addition Request</u>

Aaron Vander Vorst (Trade Wind Energy) reviewed a presentation on RAR for Diamond Vista project. Aaron provided detailed information regarding the status of the project and reasoning for including this Resource Addition Request in year 2, 5, and 10 in the economic model. (Attachment 6 – RAR Request Diamond Vista)

ESWG: Leon Howell (OGE) made a motion; seconded by Jeremy Severson (Basin) to include Diamond Vista project in year 2, 5, and 10 in the economic model. The motion was approved unanimously.

TWG: Alan Myers (ITCGP) made a motion; seconded by Joe Fultz (GRDA) to include Diamond Vista project in year 2, 5, and 10 in the economic model. The motion was approved unanimously.

George Charles (EDPR) reviewed a presentation on RAR for Moran Gen project. George provided detailed information regarding the status of the project and reasoning for including this Resource Addition request in year 2 5, and 10 in the economic model. (Attachment 7 – RAR Request Moran)

ESWG: Kurt Stradley (LES) made a motion; seconded by Jim Jacoby (AEP) to include Moran project in year 2, 5, and 10 in the economic model. The motion was approved unanimously.

TWG: Harold Wyble (KCPL) made a motion; seconded by Daniel Benedict (INDN) to include Moran project in year 2, 5, and 10 in the economic model. The motion was approved unanimously.

Travis Hyde adjourned the TWG meeting at this time.

Agenda Item 4 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. (Attachment 8 – Past Action Items)

Agenda Item 5 – 2019 ITP Scope Items

Agenda Item 5a – 2019 ITP Schedule

Juliano Freitas (SPP) informed the ESWG that SPP staff is continuing to work towards finalizing the 2019 ITP schedule. The final schedule will be included in the study scope.

Agenda Item 5b – Hydro Modeling Methodology

James Bailey (SPP) reviewed a presentation on Hydro Modeling Methodology overview for the 2019 ITP study. James provided an ownership allocation example. Staff provided recommendation for hydro modeling methodology. (Attachment 8 – 2019 ITP Hydro Modeling Methodology)

> **Leon Howell (OGE) made a motion; seconded by Kurt Stradley (LES) to approve proposed hydro modeling methodology and must run exceptions for hydro units. The motion was approved unanimously.**

Agenda Item 5c – Must Run Exceptions

Nikki Roberts (SPP) reviewed a presentation on all Must Run Exceptions. Staff presented Holcomb and Plum Point as must run exceptions and provided a recommendation for submitted must run exceptions for the 2019 ITP study. (Attachment 9 – Must Run Exceptions)

> **Kurt Stradley (LES) made a motion; seconded by Natasha Henderson (GSEC) to approve submitted must run exceptions for the 2019 ITP study. The motion was approved with one abstention, Jim Jacoby (AEP).**

Agenda Item 5d – Renewable Resource Expansion Plan Mitigation

Chris Jamieson (SPP) reviewed a presentation on Renewable Resource Expansion Plan Mitigation. Chris provided details on staff mitigation recommendation. The group requested examples of demonstrating this mitigation. Staff advised to bring back examples and steps to walk through this topic. (Attachment 10 - Renewable Resource Expansion Plan Mitigation)

Agenda Item 5e – SPS Tolk Plant Future Operations

Bennie Weeks (SPS) reviewed a presentation on SPS Tolk Station Future Operations. (Attachment 11 – SPS_Tolk Plant Future Operations)

Agenda Item 5f – Renewable Pricing

SPP Staff reviewed a presentation on ITP Renewable Pricing. Staff discussed VOM modeling effects on APC benefit, SPP's recommendation to adopt industry standard renewable VOM modeling, and ITP Manual curtailment price methodology. Staff reviewed example of simple production cost calculation example compared to a PPA settlement. The group discussed staff drafting an RR for eight or Zero pricing. (Attachment 12 – Renewable Pricing)

Agenda Item 5g – Future 2 Energy Increase Implementation

Liz Gephardt (SPP) reviewed a presentation on 2019 ITP Future 2 Increase Energy. Liz discuss methodology for Future 2 Increase Energy. (Attachment 13 – 2019 ITP Future 2 Increased Energy Implementation)

Agenda Item 5h – Siting

Item not covered.

Agenda Item 5i – Wind and Solar Profiles

Item not covered.

Closing Items

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

List of action items from the meeting:

1. None

The meeting was adjourned at 11:20 A.M.

Respectfully Submitted,

Amber Greb

ESWG Secretary

Name	Email/company	Attendance
Alan Myers	ITC	In-Person
Amber Greb	SPP	In-Person
Anita Sharma	AEP	In-Person
Brian Johnson		In-Person
Chris Jamieson	SPP	In-Person
Don Frerking	KCP&L	In-Person
Jarrod Wolford	NTEC	In-Person
Jeremy Severson	Basin	In-Person
Jim Jacoby	AEP	In-Person
Juliano Freitas	SPP	In-Person
Kurt Stradley	LES	In-Person
Meena Thomas	Texas PUE	In-Person
Natasha Henderson		In-Person
Ryan Yokely		In-Person
Scott Benson (LES)	LES	In-Person
Steve Gaw	Wind Coalition	In-Person
Tim Owens	NPPD	In-Person
Wayne Penrod	SUNC	In-Person
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Wes	wes.pfaff@mrenergy.com	Web-ex
Yohan Sutjandra (TEA)	ysutjandra@teainc.org	Web-ex
Zac Hager	hagerzc@oge.com	Web-ex

Brad Schwarz to Alan Myers

Alan,

I won't be able to make tomorrow's meeting. I will give my proxy to you for the December 14, 2017 meeting.

Thank you,
Brad

Jon Iverson to Luke Haner

Alan, Amber, Tim,

Luke Haner will be OPPD’s proxy for the ESWG meeting today beginning at 8:30 a.m. through the lunch break.

I’ll be on the ESWG at 8:00 a.m. but will sign out at 8:30 a.m. so I can attend the SAWG meeting for the remainder of the morning.

I will be back on the ESWG this afternoon.

Thanks,

Jon

Jon Iverson, PE

Energy Marketing and Trading

Omaha Public Power District

444 South 16th Street Mall, 10E/EP-1, Omaha, NE 68102

402-514-1015

Randy Collier to Kevin Foflygen

Amber/Allen,

I will be unavailable for the first two hours of the ESWG meeting on 12/14/17. I give Kevin Foflygen my proxy from 8:00 a.m. to 10:00 a.m. on the December 14th meeting.

Thanks,

Randy Collier
Contract Manager-Electric Supply
O: 417.831.8323

PO Box 551 | Springfield, MO 65801-0551
cityutilities.net

Anita Sharma to Jim Jacoby

Hello Amber,

I am will be in and out of the ESWG meeting scheduled for tomorrow and assign my proxy to Jim Jacoby.

Thanks,

Anita Sharma

Principal Engineer

Regional Transmission Planning

American Electric Power

614-753-5908

ESWG/TWG JOINT MEETING

December 14th, 2017

8th Floor AEP Offices – Dallas, TX

• A G E N D A •

1. Administrative Items
   a. Call to Order, Introductions..Alan Myers/Travis Hyde (5 minutes)
   b. Receipt of Proxies ....Amber Greb/Kirk Hall (1 minute)
   c. Review of Agenda[1] .... Alan Myers/Travis Hyde (1 minute)
2. 2019 ITP Scope Items[1] .... Amber Greb (90 minutes)
   a. Consolidation[1] (Approval Item)
3. 2019 ITP Items .... Nikki Roberts (30 minutes)
   a. Generation and Load Review[1]
      i. Resource Addition Requests[1] (Approval Item)

ECONOMIC STUDIES WORKING GROUP MEETING

4. Review of Past Action Items[1] .... Amber Greb (10 minutes)
5. 2019 ITP Items .... SPP Staff (245 minutes)
   a. Schedule.. Juliano Freitas (5 minutes)
   b. Hydro Modeling Methodology[1] (Approval Item)............................... James Bailey (30 minutes)
   c. Must Run Exceptions[1] (Approval Item)... Nikki Roberts (15 minutes)
   d. Renewable Resource Expansion Plan Mitigation[1](Approval Item) Chris Jamieson (45 minutes)
   e. SPS Tolk Plant Future Operations[1] ....Bennie Weeks (30 minutes)
   f. Renewable Pricing[1](Approval Item)...Chris Jamieson (60 minutes)
   g. Future 2 Energy Increase Implementation[1] .... Liz Gephardt (30 minutes)
   h. Siting[1] .... Liz Gephardt (15 minutes)
   i. Wind and Solar Profiles[1].. James Bailey (15 minutes)

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[1] Background Material Included

6. 2018 ESWG Meeting Schedule[1] .... All (5 minutes)

7. Closing Items .... All (5 minutes)

   a. Summary of Action Items (Amber Greb)

   b. Future Meetings

      i. January 3rd, 2018: Potential Conference Call

      ii. January 11th, 2018: 41st Floor AEP Office, Dallas, TX

      iii. February 22nd, 2018: OG&E Office, Leadership Square, North Tower 14th Floor

      iv. March 15th, 2018: 41st Floor AEP Office, Dallas, TX

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

December 14th, 2017

	Action Item	Date Originated	Status	Comments
151	SPP staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress SPP Staff	February, 2017: Presentation on EGEAS. Hold on investigation of alternatives until EGEAS and ABB's new Capacity Expansion tool are able to be fully tested and compared.
173	SPP staff to develop a process for annual update of the economic model with vendor data.	June 16th, 2016	In Progress SPP Staff	
183	SPP staff to perform transmission outage analysis in the first part of 2017 to determine the appropriate APC benefit percentage to utilize for the mitigation of transmission outages benefit metric.	September 15th, 2016	In Progress SPP Staff	ESWG Approved the methodology and staff to begin analysis
184	ESWG to have a future agenda item for education and discussion of the derivation and use of the net plant carrying charge (NPCC) value used in the ITP process for project cost calculations.	April 20th, 2017	~~In Progress~~ ~~ESWG~~ Complete	This action Item was completed at the November meeting
185	ESWG to continue working on and finalize the Resource Siting Manual	June 29th, 2017	In Progress ESWG	
186	Formalize the economic model data guidelines and submission process	July 20th, 2017	In Progress SPP staff	Replaces action item 160
187	Address the objections raised to the approved renewable VOM modeling detailed in the ITP manual	July 20th, 2017	In Progress SPP staff/ESWG	
189	Discuss mitigation options for concerns with who pays for and who benefits from transmission coming from the ITP process and how it may circumvent the GI and Aggregate study processes	October 4th, 2017	In Progress SPP staff/ESWG	

190	SPP staff to perform a full transmission outage analysis before the next RCAR	October 12th, 2017	SPP Staff	
191	SPP staff create language for the individual project review option for consolidation	October 12th, 2017	In Progress, SPP Staff/ESWG	


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

2019 ITP Portfolio Consolidation

SPP Staff

November 30, 2017

Objective

Goal of the Final Portfolio:

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

Goal for today:

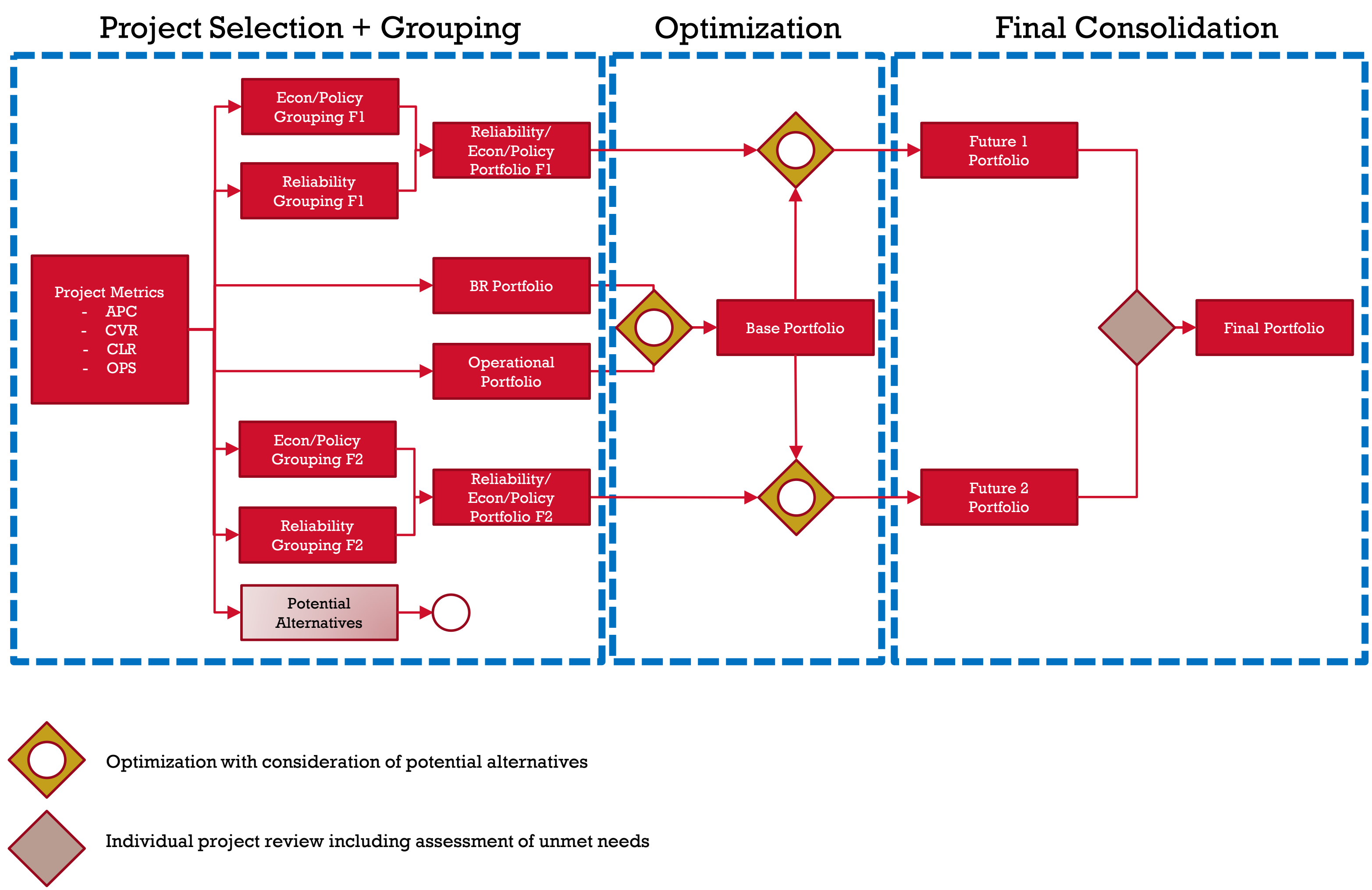
- Approve consolidation methodology

ITP Manual Language

Section 6.2 Portfolio Consolidation

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

Portfolio Development Summary



Portfolio Consolidation
Scenarios

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

SPP

Consolidation Considerations Survey Results

Consideration	Rank
40-year NPV project benefit or B/C	1
Larger-scale solutions that provide more robustness and additional qualitative benefits	2
The potential for a project to mitigate operational issues	3
Long-term viability	4
One-year project benefit or B/C	5
ARR Feasibility Issues	6
The potential for a project to address non-thermal issues	7
Congestion relief/Project overlap	8
Minimum design standards	9
Facility age	9

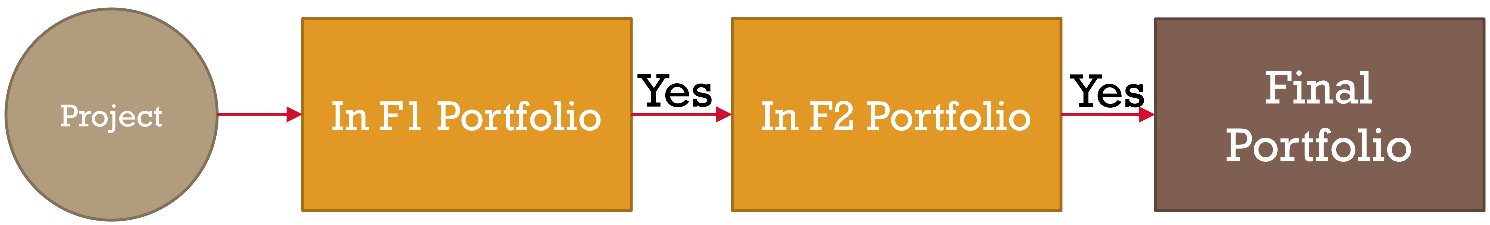
Note: SPP Staff has not yet determined the time and cost associated with each of these considerations

Consolidation Considerations Survey Results

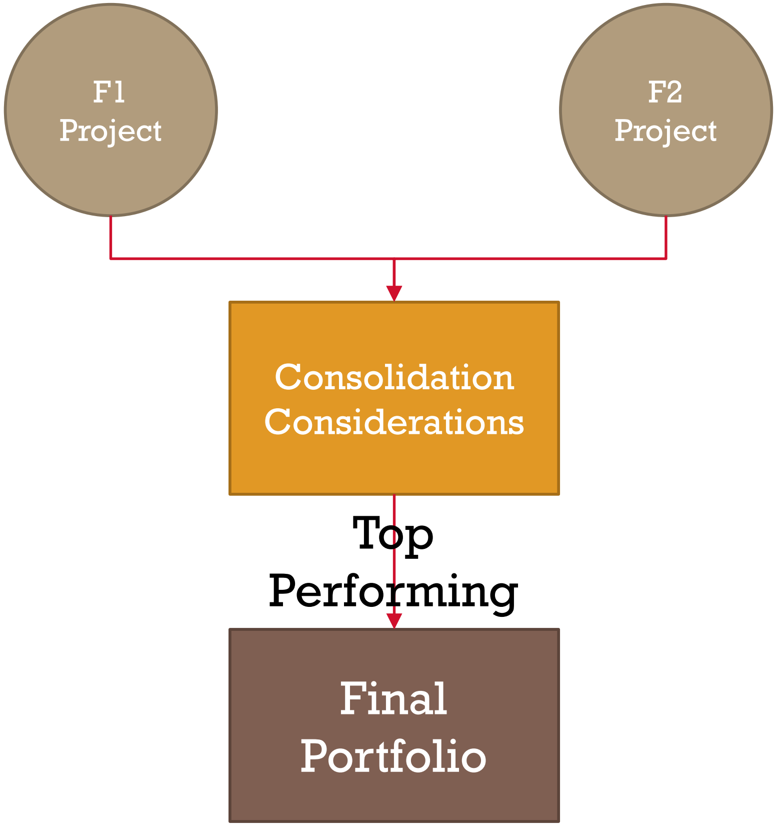
	Average Confidence Level (Scale of 0 to 5, with 5 being the most confident)
Future 1	3.06
Future 2	2.56

SPP

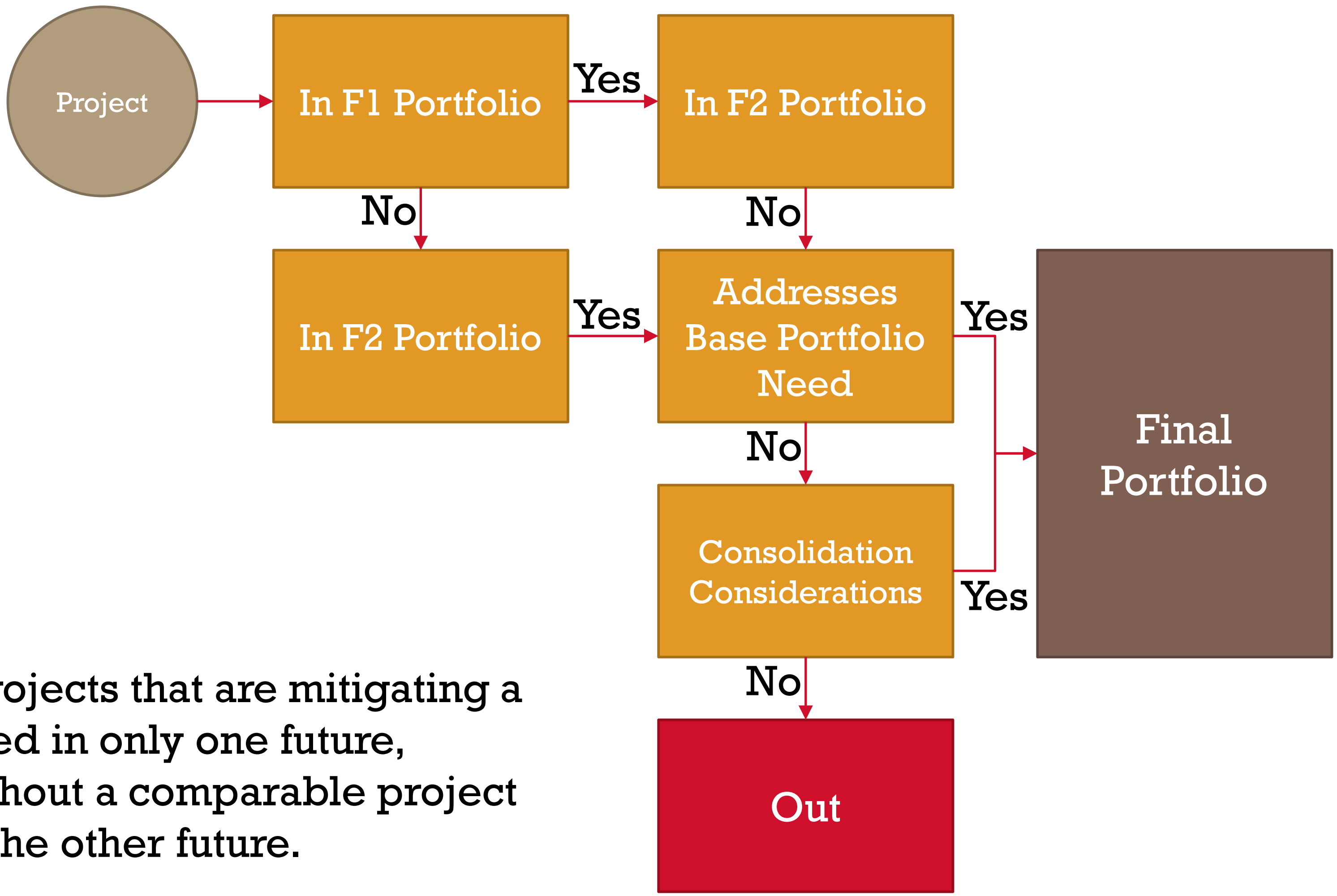
Portfolio Consolidation
Same project in both portfolios



Portfolio Consolidation
Competing Projects



Portfolio Consolidation
Projects in one future's portfolio



*Projects that are mitigating a need in only one future, without a comparable project in the other future.

Discussion of Considerations

- Systematic approach to begin determination of the final portfolio
  - Possible Points per consideration
  - Scenario 3 minimum score requirement
  - Awarding points per consideration
- Project narrative to support or oppose project scores

Consolidation Straw Poll

- Voting Options
  - Option 1: Reallocation of Removed Points
  - Option 2: Reduction and Reallocation of Points
  - Option 3: Simple Adjustment
- Results

	Option 1*	Option 2	Option 3
ESWG	4	4	2
TWG	2	3	2

*SPP recommendation

SPP

Option 1-Reallocation of Removed Points

No.	Scenario 2 (Competing Projects) Considerations	Possible Points	Threshold	138 kV Rebuild (P1)	New 345 kV line (P2)	P1 Score	P2 Score
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)	1.4	1.9	8.6	50.0
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)	1.6	0.9		
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A	4.1	67.5		
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A	6.2	-7.5		
2	Congestion Relieved in Selected Future (by need(s), all years)	7.5	N/A	100%	100%	7.5	7.5
	Congestion Relieved in Opposite Future (by need(s), all years)	7.5	N/A	90%	100%	6.8	7.5
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0	$3.7	$5.8	3.7	5.8
4	New EHV	10	Y/N	N	Y	0.0	10.0
5	Mitigate Non-Thermal Issues	10	Y/N	N	Y	0.0	10.0
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N	N	N	0.0	0.0
					Total Score	**26.5**	**90.8**

Option 1-Reallocation of Removed Points

				Example 1		Example 2	
No.	**Scenario 3 (Non-Competing Projects) Considerations**	**Possible Points**	**Threshold**	**138 kV Rebuild**	**Score**	**New 345 kV line**	**Score**
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)	1.9	0.0	1.9	44.4
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)	0.75		0.9	
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A	9.3		67.5	
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A	-2.6		-7.5	
2	Congestion Relieved in Selected Future (by need(s), all years)	7.5	N/A	80%	6.0	100%	7.5
	Congestion Relieved in Opposite Future (by need(s), all years)	7.5	N/A	30%	2.3	40%	3.0
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0	$4.5	4.5	$8.0	8.0
4	New EHV	10	Y/N	N	0.0	Y	10.0
5	Mitigate Non-Thermal Issues	10	Y/N	N	0.0	Y	10.0
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N	N	0.0	N	0.0
				Total Score (70 Pass)	**12.8**		**82.9**

SPP

Consolidation Calculations

Consideration 1

Scenario 2 (Competing Projects)

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

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Consolidation Calculations

Consideration 1 Example

Scenario 2 (Competing Projects)

	Project 1	Project 2
Total Project Cost ($M)	**10.3**	**75.0**
40-yr APC B/C in Selected Future	1.6	1.9
40-yr APC B/C in Opposite Future	1.4	0.9
40-yr APC Net Benefit in Selected Future ($M)	6.2	67.5
40-yr APC Net Benefit in Opposite Future ($M)	4.1	-7.5

1. Test B/C Thresholds in Opposite Future
2. Calculate Net APC Benefits
   - $Net\ APC\ Benefit_{P1,AVE} = \frac{\$6.2M + \$4.1M}{2} = \$5.2M$
   - $Net\ APC\ Benefit_{P2,AVE} = \frac{\$67.5M - \$7.5M}{2} = \$30.0M$
   - $Net\ APC\ Benefit_{Max} = Maximum(5.2,30) = 30.0$
3. Calculate Points Awarded
   - $Points\ Awarded_{P1} = 50 \times \frac{5.2}{30.0} = \mathbf{8.6}$
   - $Points\ Awarded_{P2} = 50 \times \frac{30.0}{30.0} = \mathbf{50}$

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Consolidation Calculations

Consideration 1

Scenario 3 (Projects in one future's portfolio)

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

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Consolidation Calculations

Consideration 1

Scenario 3 (Projects in one future's portfolio)

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

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

Consolidation Calculations

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

*No points awarded if criteria not met

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Consolidation Recommendation

- Consolidation methodology Option 2 as presented, including the consideration-specific minimum thresholds, points possible, calculation of points awarded, and scenario 3 total score threshold, with the addition of ARR project considerations for consideration 6
- Project narratives may support or oppose the results of this systematic approach; in cases where a narrative opposes these results, associated materials will be brought to the ESWG and TWG for review and feedback

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Appendix

Option 2-Reduction and Reallocation of Points

No.	Scenario 2 (Competing Projects) Considerations	Possible Points	Threshold	138 kV Rebuild (P1)	New 345 kV line (P2)	P1 Score	P2 Score
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)	1.4	1.9	8.6	50.0
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)	1.6	0.9		
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A	4.1	67.5		
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A	6.2	-7.5		
2	Congestion Relieved in Selected Future (by need(s), all years)	10	N/A	100%	100%	10.0	10.0
	Congestion Relieved in Opposite Future (by need(s), all years)	10	N/A	90%	100%	9.0	10.0
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0	$3.7	$5.8	3.7	5.8
4	New EHV	7.5	Y/N	N	Y	0.0	7.5
5	Mitigate Non-Thermal Issues	7.5	Y/N	N	Y	0.0	7.5
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N	N	N	0.0	0.0
					Total Score	**31.3**	**90.8**

Option 2-Reduction and Reallocation of Points

				Example 1		Example 2	
No.	Scenario 3 (Non-Competing Projects) Considerations	Possible Points	Threshold	138 kV Rebuild	Score	New 345 kV line	Score
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)	1.9	0.0	1.9	44.4
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)	0.75		0.9	
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A	9.3		67.5	
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A	-2.6		-7.5	
2	Congestion Relieved in Selected Future (by need(s), all years)	10	N/A	80%	8.0	100%	10.0
	Congestion Relieved in Opposite Future (by need(s), all years)	10	N/A	30%	3.0	40%	4.0
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0	$4.5	4.5	$8.0	8.0
4	New EHV	7.5	Y/N	N	0.0	Y	7.5
5	Mitigate Non-Thermal Issues	7.5	Y/N	N	0.0	Y	7.5
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N	N	0.0	N	0.0
				Total Score (70 Pass)	**15.5**		**81.4**

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Option 3-Simple Adjustment

No.	Scenario 2 (Competing Projects) Considerations	Possible Points	Threshold	138 kV Rebuild (P1)	New 345 kV line (P2)	P1 Score	P2 Score
1	40-yr (1-year) APC B/C in Selected Future	50	1.0 (0.9)	1.4	1.9	8.6	50.0
	40-yr (1-year) APC B/C in Opposite Future		0.8 (0.7)	1.6	0.9		
	40-yr (1-year) APC Net Benefit in Selected Future ($M)		N/A	4.1	67.5		
	40-yr (1-year) APC Net Benefit in Opposite Future ($M)		N/A	6.2	-7.5		
2	Congestion Relieved in Selected Future (by need(s), all years)	5	N/A	100%	100%	5.0	5.0
	Congestion Relieved in Opposite Future (by need(s), all years)	5	N/A	90%	100%	4.5	5.0
3	Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)	10	>0	$3.7	$5.8	3.7	5.8
4	New EHV	10	Y/N	N	Y	0.0	10.0
5	Mitigate Non-Thermal Issues	10	Y/N	N	Y	0.0	10.0
6	Long Term Viability (Eg 2013 ITP20)	5	Y/N	N	N	0.0	0.0
					Total Score	**21.8**	**85.8**

Option 3-Simple Adjustment

<table>
<tr><th colspan="4"></th><th colspan="2">Example 1</th><th colspan="2">Example 2</th></tr>
<tr><th>No.</th><th>Scenario 3 (Non-Competing Projects) Considerations</th><th>Possible Points</th><th>Threshold</th><th>138 kV Rebuild</th><th>Score</th><th>New 345 kV line</th><th>Score</th></tr>
<tr><td rowspan="4">1</td><td>40-yr (1-year) APC B/C in Selected Future</td><td rowspan="4">50</td><td>1.0 (0.9)</td><td>1.9</td><td rowspan="4">0.0</td><td>1.9</td><td rowspan="4">44.4</td></tr>
<tr><td>40-yr (1-year) APC B/C in Opposite Future</td><td>0.8 (0.7)</td><td>0.75</td><td>0.9</td></tr>
<tr><td>40-yr (1-year) APC Net Benefit in Selected Future ($M)</td><td>N/A</td><td>9.3</td><td>67.5</td></tr>
<tr><td>40-yr (1-year) APC Net Benefit in Opposite Future ($M)</td><td>N/A</td><td>-2.6</td><td>-7.5</td></tr>
<tr><td rowspan="2">2</td><td>Congestion Relieved in Selected Future (by need(s), all years)</td><td>5</td><td>N/A</td><td>80%</td><td>4.0</td><td>100%</td><td>5.0</td></tr>
<tr><td>Congestion Relieved in Opposite Future (by need(s), all years)</td><td>5</td><td>N/A</td><td>30%</td><td>1.5</td><td>40%</td><td>2.0</td></tr>
<tr><td>3</td><td>Operational Congestion Costs or Reconfiguration ($M/yr or hrs/yr)</td><td>10</td><td>>0</td><td>$4.5</td><td>4.5</td><td>$8.0</td><td>8.0</td></tr>
<tr><td>4</td><td>New EHV</td><td>10</td><td>Y/N</td><td>N</td><td>0.0</td><td>Y</td><td>10.0</td></tr>
<tr><td>5</td><td>Mitigate Non-Thermal Issues</td><td>10</td><td>Y/N</td><td>N</td><td>0.0</td><td>Y</td><td>10.0</td></tr>
<tr><td>6</td><td>Long Term Viability (Eg 2013 ITP20)</td><td>5</td><td>Y/N</td><td>N</td><td>0.0</td><td>N</td><td>0.0</td></tr>
<tr><td colspan="5">Total Score (67 Pass)</td><td>10.0</td><td></td><td>79.4</td></tr>
</table>

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2019 ITP Load and Generation Review

Nikki Roberts

December 14, 2017

Load Review Update

- Load Review Pass 2 posted on 11/3/2017
- Stakeholder Pass 2 review period ended 12/1/2017
- SPP Staff is incorporating all necessary changes and preparing for January working group approval.
- No load changes will be incorporated in the 2019 ITP after December 22, 2017.

Gen Review Update

- Generation Review Pass 2 posted on 11/3/2017
- Stakeholder Pass 2 review period ended on 12/1/2017
- SPP Staff is incorporating all necessary changes and preparing for January working group approval.
- No generation changes will be incorporated in the 2019 ITP after December 22, 2017.

RAR and Waiver Requests

- On November 30, the ESWG and TWG approved Southern Power's RAR request for a 200MW wind unit located within SPP to be included in the Year 5 & 10 models
- 2 additional presentations have been posted in background materials for stakeholder review.
  - 300 MW Wind Unit at Union Ridge 230kV
  - 200 MW Wind Unit at Centerville-Marmaton 161kV

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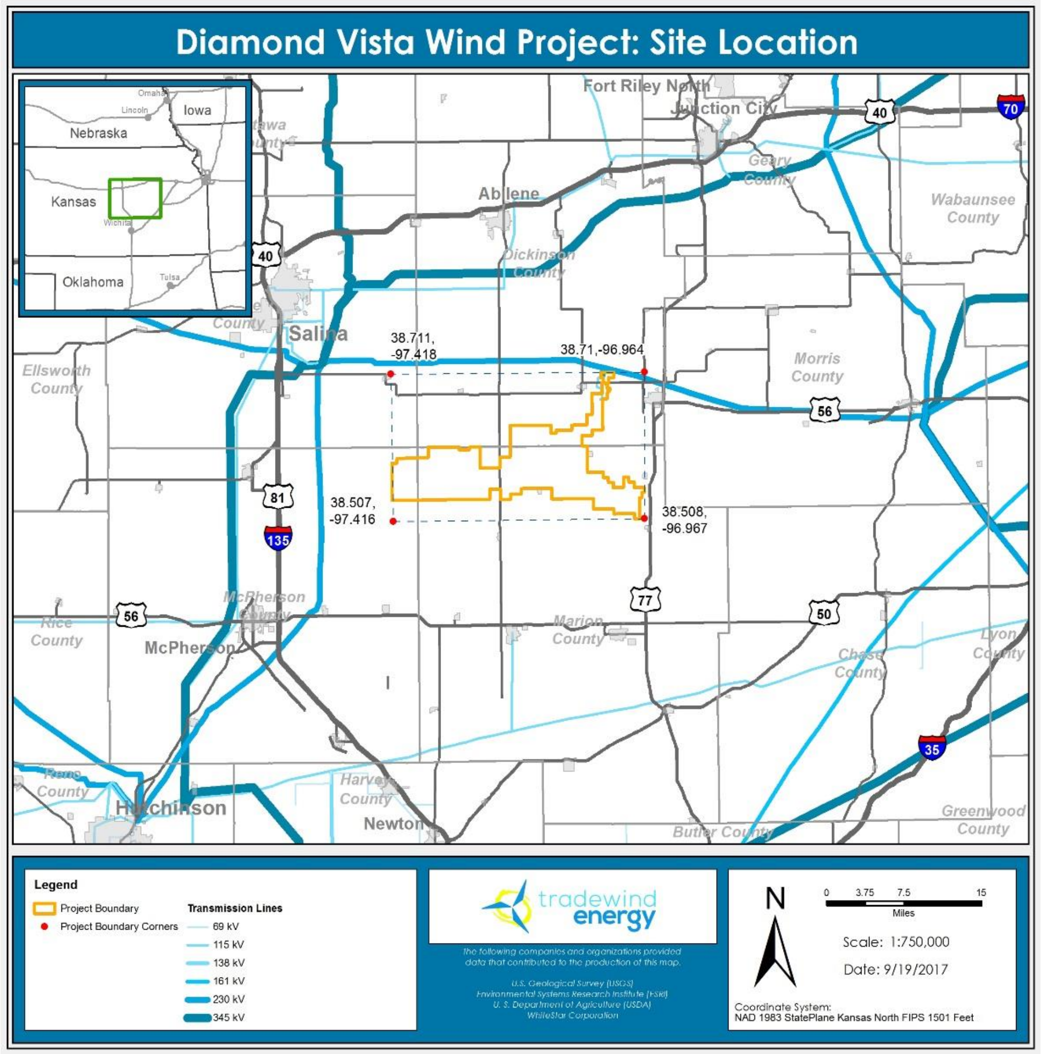
Diamond Vista Wind Project: Location



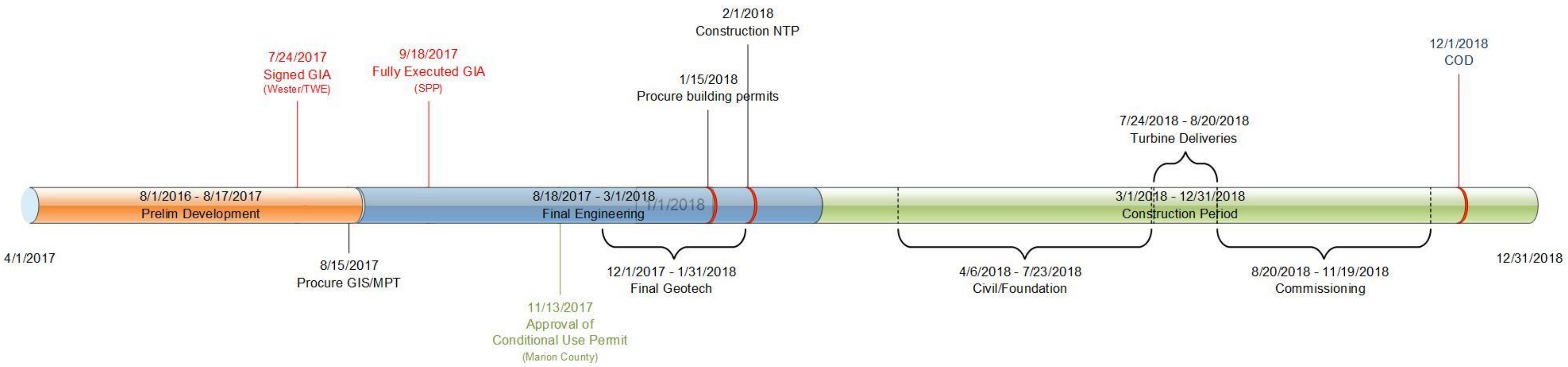
Diamond Vista – Interconnection Status

- **Interconnection**
  - 300 MW Wind Turbine Generators
  - POI: Westar’s Union Ridge 230 kV substation
  - No upgrades identified in DISIS studies
  - No dependencies on previous network upgrades
- **GIA Milestones**
  - Authorization to Proceed executed July 2017, including $1,000,000 payment
  - GIA executed, effective 9/28/2017
  - $2,200,000 has been funded to date toward TOIF and Network Upgrades
  - Final GIA milestone payment of ~$550,000 due January 15
  - Synchronization date September 2018
  - COD December 2018

Diamond Vista – Status Summary

- **Project Size**
  - 300 MW Total
- **Power Purchase Agreement**
  - PPA 1 83.6 MW (Executed)
  - PPA 2 118 MW (Executed)
  - PPA 3 97.65 MW (Complete, signing in process)
- **Land / Environmental**
  - Over 55,000 acres leased. 300 landowners included in the Project
  - Transmission line easement to POI is 100% secured
  - No significant permitting issues or material effects on Threatened or Endangered species
  - Conditional Use Permit has been secured
  - Strong local and community support

Diamond Vista: Development Schedule



Diamond Vista: Permitting

- Below is a list of the major permits required, along with dates the Project expects to obtain/complete the permits:
  - FAA – DNHs 1/1/2018 – No issues anticipated
  - Marion County CUP Approved 11/13/17
  - NPDES - Prepare SWPP plan, submit Notice of Intent; coverage under Kansas's Authorization to Discharge Stormwater Runoff from Construction Activities in accordance with the Kansas Water Pollution Control General Permit (S-MCST-0701-1) will be required because land disturbing activities will disturb more than 1 acre. Anticipate obtaining permit January 2018.
  - Road Use and Maintenance Agreement – RMA will be negotiated prior to construction start.
  - Right of Way Agreement – ROW Agreement negotiated prior to construction for right to cross public roads with underground collection, overhead transmission line, and driveways
- None of the above-referenced permits will create any problems in achieving the COD schedule mentioned above.

Diamond Vista: Milestone Schedule

Task	Milestone Date
Execute Interconnection Agreement	Complete
Initiate Detailed Engineering	Complete
Execute Power Purchase Agreement	11/15/2017-12/8/2017
Award GIS and Transformer Contract	1/1/2018
Complete Geotechnical Investigation	1/15/2018
Notice to Proceed	1/15/2018
Road Maintenance Agreement	1/31/2018
Construction Mobilization	2/1/2018
Begin Turbine Foundation Construction	4/6/2018
Begin Project Substation Construction	4/15/2018
Initial Turbine Receipt/Deliveries	7/24/2018
SCADA Installation and Testing	8/6/2018
Energize Interconnection and Back Feed	9/15/2018
Commissioning, Testing, and Test Energy	8/20/2018-11/19/2018
All Material Permits in Place	4/1/2018
Commercial Operation Date	12/1/2018

Moran- GEN-2015-016

- Size – 200 MW
- POI – Centerville – Marmaton 161 kV
- IA Fully Executed- Key Milestones
  - Financial Security ($6.84M made to KCPL)- 10/17/2017
  - Payment ($1.74M KCPL) – 02/15/2017
  - Construction started by TO, mid-November 2017
  - Main step-up transformer design underway, turbine components secured via safe harbor
  - County permit obtained
- PPA – Late Stage Negotiation underway
- Balance of Plant RFP to be released in coming weeks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Hydro Modeling Methodology

2019 ITP

James Bailey

Methodology Overview

- Utilize ABB hydro generation modeling
  - Peak shaving load modifier
  - Must run minimum generation requirement (run-of-river portion)
  - Monthly energy limits
- Calculate hydro fleet "ownership" per demand group to allocate monthly energy
  - Gather monthly energy allocations to contract customers
  - Aggregate energy allocations per demand group
  - Calculate percentage of demand group energy allocation to total of all energy allocations to use as ownership on a monthly basis

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Ownership Allocation Example

Demand Group	January Energy Allocation (GWh)	August Energy Allocation (GWh)	January Ownership	August Ownership
A	175	200	50%	50%
B	175	150	50%	37.5%
C	0	50	0%	12.5%
Total	**350**	**400**	**100%**	**100%**

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Recommendation

- SPP Staff recommends accepting the proposed hydro modeling methodology for the 2019 ITP study.
- SPP Staff recommends approving must run exceptions for hydro units as currently modeled in the ABB dataset for the 2019 ITP study.


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2019 ITP Must Run Exceptions

Nikki Roberts

December 14, 2017

Must Run Exceptions

- Methodology for must run units in the 2019 ITP Study approved at the September 14th ESWG meeting.
  - "Assign must-run designations to co-generation and nuclear units only, unless an exception is requested with pass 2 of the Gen review, and approved by the ESWG"
- Stakeholders were given the opportunity to provide exceptions to the must run status during the generation review milestone.

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Must Run Status Exceptions

- Plum Point
  - The portion of Plum Point sinking in SPP is not large enough to meet minimum load requirements for the plant to operate and allow SPP to make commitment decisions.
  - MISO models reflect the must run status, and the unit has been (and will likely continue to be) self-scheduled on a commitment basis.
  - Empire has a must take portion of 50 MW (out of total 100MW) when the plant is in online.

Must Run Status Exceptions

- Holcomb
  - Sunflower has unaffiliated confidential supply-chain contracts that require Holcomb to operate at an approximate 50% capacity factor thru the term of the 2019 ITP study period (term extends thru 2034). Economic study models, especially those that include winter and summer months, must identify that Holcomb is a must-run unit during non-shoulder periods.
  - Holcomb (350-MW) is our flagship unit, placed into service in 1983, and is the only EGU operated on a continuing basis by Sunflower.

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Recommendation

- SPP Staff recommends approving the submitted must run exceptions for the 2019 ITP study.


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Renewable Resource Expansion Plan Mitigation

Chris Jamieson

ESWG December 14th, 2017

Renewable Resource Expansion Plan Mitigation

- ESWG Action Item 189
  - Discuss mitigation options for concerns with who pays for and who benefits from transmission coming from the ITP process and how it may circumvent the GI and Aggregate study processes
- Staff recommended option:
  - Modeling changes to remove revenue to merchant generation from APC benefits
- Other considerations:
  - GOF assessment
    - No changes to approved ITP Manual processes recommended
  - Increasing B/C thresholds
    - No changes to approved ITP Manual processes recommended

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Mitigation Recommendation

- SPP staff recommends modeling changes to remove revenue of "energy resource" generation without firm service from SPP APC benefits to account for current "energy resource" trends
  - Assign existing and projected wind without firm service to OTHERSPP zones and remove the OTHERSPP zones from the transmission APC benefit
    - OTHERSPP zones will include wind and existing conventional generation without firm service regardless of PPA status
    - OTHERSPP zones do not include any native load assignment
    - These "energy resources" will not be used to meet reserve margin requirements
      - Recommend minor adjustment of scope language to remove new wind accreditation, making the 12% limit unnecessary at this time
  - Impact to zonal APC benefits
    - Emphasis on APC benefits of transmission to rate-paying customers
    - Excludes Unit Revenue ($) or Transaction Market Value ($) of "energy resources" that do not have firm service from APC benefit
    - Impact of "energy resources" to APC benefit will be based on the potential for each pricing zone to purchase from lower cost "energy resources"

- Solar additions
  - Assign solar additions to result in an equal percentage of nameplate capacity to load for each zone
  - Acknowledges stakeholder expectation that solar will be added for capacity purposes, therefore firm service will be acquired
  - Assume accredited capacity at 70% (approved scope language)

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Appendix

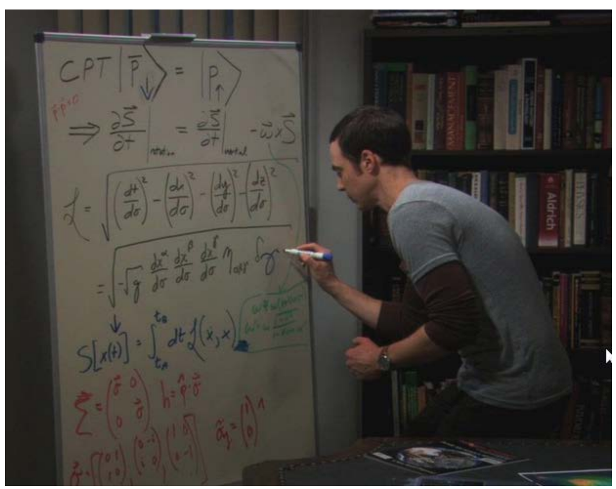
Adjusted Production Cost Calculations

SPP staff

ESWG October 12th, 2017

APC Calculation Background

- APC Benefit = Base APC – Change APC
- APC = Production Cost ($) + Purchases ($) – Sales ($)
  - Computed by zone, by hour
  - All hours summed to compute annual zonal APC
  - All zones summed to compute annual regional APC



APC Calculation Background

- Production Cost ($)
  - Production Cost ($) = Unit Cost ($) + Billing Cost ($)
  - Unit Cost is the cost of fuel and O&M (i.e. conventional generation)
  - Billing Cost is the O&M cost of transactions (i.e. renewable generation)
- Purchases ($)
  - APC ($) = Production Cost ($) + Purchases ($) – Sales ($)
  - Purchases ($) = Net Purchases (MWh) * LLMP ($/MWh)
  - Load weighted LMP accounts for all loads designated to a zone
- Sales ($)
  - APC ($) = Production Cost ($) + Purchases ($) – Sales ($)
  - Sales ($) = Net Sales (MWh) * GLMP
  - Gen weighted LMP accounts for conventional and renewable resources assigned ownership to a zone

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Purchase/Sale

- Purchase (\$) = Net Purchase (MW) * LLMP (\$/MW)
  - by hour, by zone
- Sale (\$) = Net Sale (MW) * GLMP (\$/MW)
  - by hour, by zone
- Net Purchase/Sale (MW) = ∑ zonal demand - ∑ zonal generation
  - i.e. only purchase or sale MW is subject to LMP price
  - LMP = MEC + MLC + MCC

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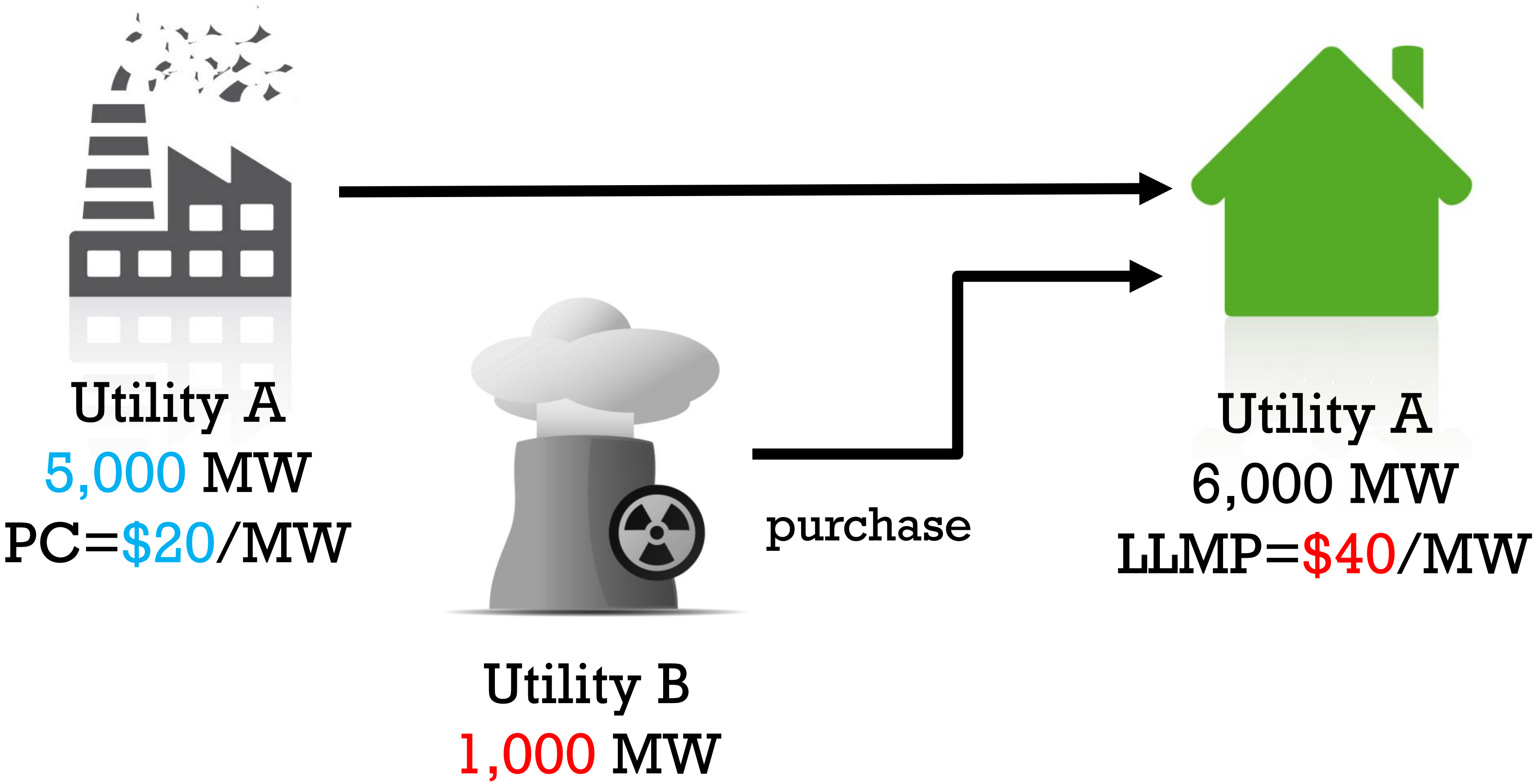
Adjusted Production Cost Example



$$
\begin{aligned}
APC_{\text{Utility A}} &= \$20/MW \cdot 5{,}000MW + \$40/MW \cdot 1{,}000MW \\
&= \$140{,}000
\end{aligned}
$$

SPP's Zones

Pricing Zones (SPPMAIN)

- AEPW
- CUS
- EMDE
- GMO
- GRDA
- IS
- KCPL
- LES
- MIDW
- MKEC
- NPPD
- OKGE
- OPPD
- SUNC
- SWPS
- WFEC
- WRI

Other Zones (SPPADDL)

- KACY
- OTHERSPP (with no load assigned APC = 100% revenues as sales to other zones)
- SWPA

$$APC_{SPP\ TOTAL} = \sum APC_{SPPMAIN} + \sum APC_{SPPADDL}$$

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APC and Transmission Service Assumptions

- Net purchase/sale approach assumes
  - Zonal generation serves zonal load at production cost
  - Excess load is served at zone's load LMP
  - Excess generation is sold at zone's generation LMP
- Zonal generation serving zonal load at production cost assumes
  - Load is not subject to marginal congestion (or losses) costs
- Owned and unit-specific purchases of generation assumed to have long-term firm transmission service which can convert that service to an ARR/TCR to receive a hedge to its load in the SPP market
- From the approved benefit metrics manual, APC calculation assumes congestion between owned generation and load can be fully hedged while none of market-based purchases would be hedged

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Resource Expansion Plan Proxy Generation

- Resource adequacy requires firm delivery and generally applies to non-intermittent resources
- Historically, proxy generation added for resource adequacy and economic energy has been assigned to pricing zones
- ITP Manual 2.2.2 Resource Plan
  - Renewable Resource Expansion Plan – "Renewable additions will be computed using criteria that can be applied uniformly across pricing zones"
  - "Each pricing zone shall be assessed for resource adequacy…"
    - "Ownership of conventional unit additions will be allocated to pricing zones such that each pricing zone approximately meets the reserve margin requirement."
- Through assignment to pricing zones, the APC calculation assumes that proxy generation will attain transmission service

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Transmission Service Trends

- Additional merchant wind resources are participating in the SPP Integrated Market without acquiring long-term firm transmission service
- Some LSE transmission customers are not pursuing long-term firm transmission service for long-term purchased wind resources

Alternative Approach Options

- Reflect current trends in modeling
  - Assign wind additions (energy resources) to OTHERSPP zone
  - Reassign existing wind resources without long-term transmission to OTHERSPP zone
- Impact to zonal APC
  - Utilities purchase energy resources at LMP price
- Consideration for SPP APC
  - Remove OTHERSPP zone from transmission benefit to cost ratio calculation

SPS Tolk Station Future Operations

December 2017

ESWG – Bennie Weeks

Tolk Power Plant Facts

- Two coal-powered steam turbine units
  - Located in southern part of service territory
  - Close proximity to S.E. New Mexico load
- Net capacity approximately 532 MW each
- Ogallala Aquifer is source for water cooling exclusively
- Majority of groundwater in the Panhandle is used to support irrigated agriculture (estimated 95% of the usage)
- Aquifer has declined 15.25 feet since 2007 with an estimated average saturated thickness of 49 feet in early 2017

Issues Due to Declining Aquifer

- Declining saturated thickness reduces the aggregate wellfield productivity
  - Diminishes ability for the aquifer to supply sufficient water to support peak generation demands
  - Saturated thickness will no longer support high capacity wells even though there is still water in the formation

- 40 foot depth generally regarded the range at which it becomes economically infeasible to access the remaining groundwater

Conclusion

- Business as Usual operation projections show an economic depletion range between years 2022-2024
- Developed multiple operating scenarios/sensitivities with the goal to keep the Tolk capacity for as long as possible
- Reduced life to 2032 (both units) with reduced operations
- 5th and 10th year ITP
  - **Zero operation in off-peak months and fully available summer months**
- Synchronous condensers will be installed for transmission stability


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ITP Renewable Pricing

SPP Staff

December 14th, 2017

Overview

- Action Item 187: Address the objections raised to the approved renewable VOM modeling detailed in the ITP manual
- Today's Goals
  - Review simple production cost example to determine how ITP manual VOM modeling affects APC benefit
  - Discuss SPP recommendation to adopt industry standard renewable VOM modeling for the 2019 ITP until PPA price modeling is more fully vetted
  - Discuss ITP Manual curtailment price methodology implementation and preliminary implementation
  - Review ESWG member requests from October meeting in Appendix as needed

Renewable Variable O&M Price

ITP Manual Language

2.2.1.10 Renewable Pricing

- Renewable VOM (energy cost to load) – Either Weighted Average of Fixed-Contract Prices $/MWh or $8/MWh
  - Does not impact LMPs, curtailment, and dispatch
  - Defines unit energy cost for production cost calculation
- Intention was to improve modeling accuracy

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Simple Production Cost Calculation Example Compared to a PPA Settlement

	Model Implementation		Example PPA Settlement
	ITP Manual 1.0 ($/MWhr)	ITP Manual 2.0 ($/MWhr)	Take or Pay Contract ($/MWhr)
Base Case Dispatch (Single Hour with Renewable Curtailment)	$40	$40	$40+$25**
Change Case Dispatch (Single hour without Renewable Curtailment due to adding Transmission)	$8	$25	$25
APC Benefit (Change Case minus Base Case)	$32	$15	$40

$40 is the replacement energy cost during renewable curtailment eg. CT at $40/MWhr cost
$8 is the energy cost of the renewable resource using renewable resource $8 VOM
$25 is the energy cost of the renewable resource using renewable resource $25 VOM reflective of PPA price
*Customer continues to pay the $25 PPA cost during economic curtailment of renewable resource based on take or pay contract

Comparison Observations

- Under a take or pay PPA, customer continues to pay PPA price when economic curtailment occurs (ie. PPA is a set price regardless of energy delivery)
- Approved modeling may not fully capture benefit of transmission added to reduce renewable curtailment
- Modeling VOM at $0 is closer to the expected benefit of transmission under a take or pay PPA

Other Regions

- What is the industry Standard for Solar and Wind energy pricing?
  - ABB, ERCOT, MISO, and PJM Use $0/MWh for solar and wind VOM
    - Model true variable cost of resource
    - EIA, NREL, Lazard show fixed cost and zero variable cost

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SPP Staff Recommendation

- Adopt $0/MWh solar and wind VOM for the 2019 ITP until PPA price modeling is more fully vetted
- Begin RR process to revise ITP Manual for April MOPC approval

Renewable Curtailment Price

ITP Manual Language

2.2.1.10 Renewable Pricing

- Curtailment price (Bid Price) – Either Negative $35/MWh or $0/MWh
  - Defines LMP price at which the resource will be curtailed
  - Impacts LMPs, curtailment, and dispatch
  - Including range is intended to improve market operation modeling

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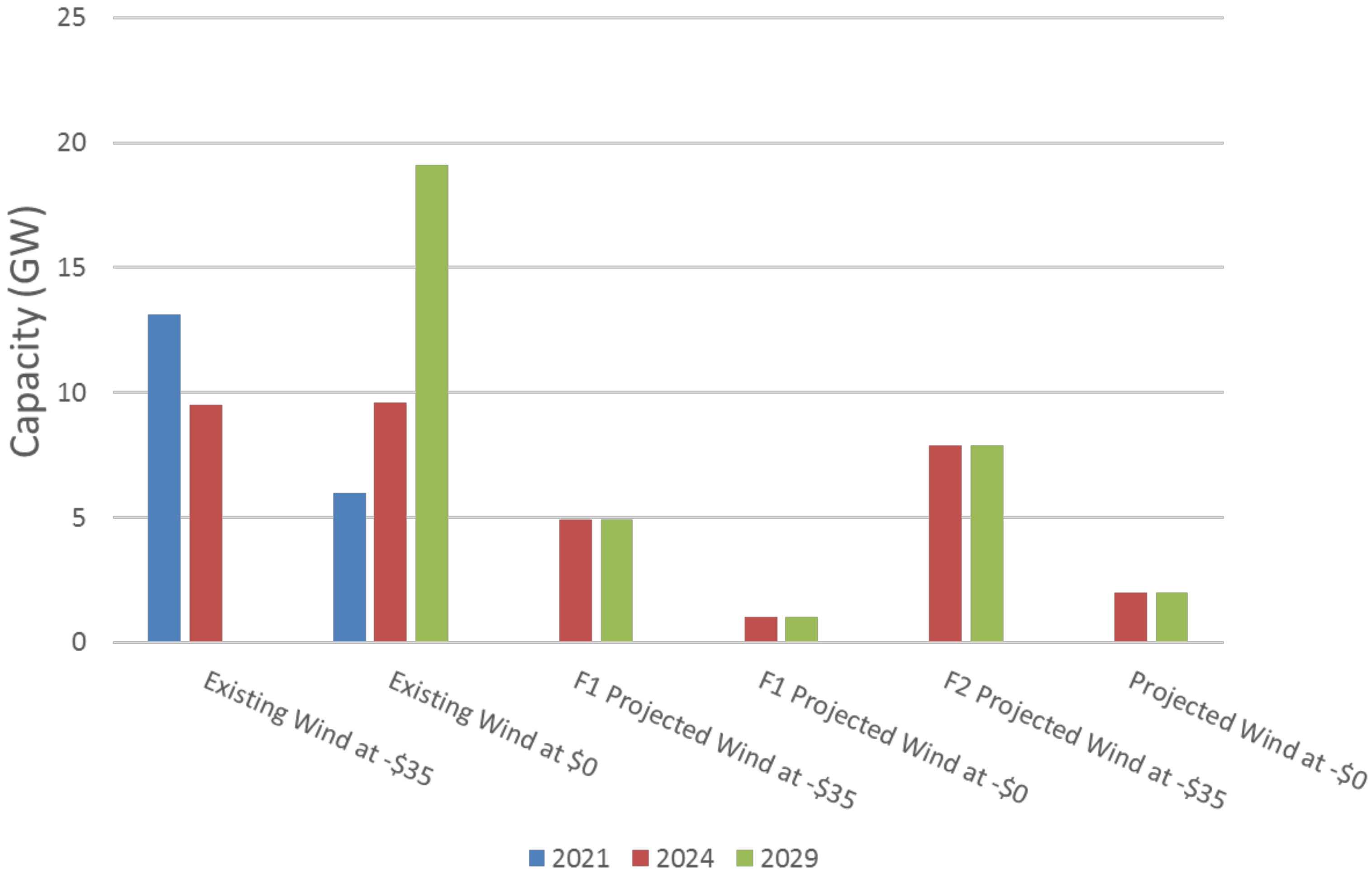
2019 ITP Curtailment Price Implementation

- Curtailment Price for Wind
  - $0/MWhr
    - In-service over 10 years prior to study years
    - Construction on the unit has not started prior to January 1, 2020
    - ITC applies (Only 80 MW identified via Gen Review)
  - Otherwise $-35/MWhr

- For purposes of applying manual language
  - Instead of using per year additions
  - For, F1 Projection: 24 GW by 1/1/2021* and F2 Projection: 27 GW by 1/1/2021*
    - Assume incremental amounts above the 18+GW to have a 1/1/2021 in-service date and assume construction was started prior to 1/1/2020
  - For, F1 and F2 Projections by 1/1/2024 and 1/1/2029
    - Assume incremental amounts above 1/1/2021* projections to have a 1/1/2024 and 1/1/2029 in-service date and assume construction was not started prior to 1/1/2020

*Only 18+GW of Wind included in Year 2 based on intent of the ITP manual not to forecast additional resource expansion and/or retirement forecasts above and beyond what is identified in the gen review

Existing and Projected Wind Capacity Totals by Curtailment Price (Preliminary)



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Other Considerations

- What do we do with the curtailment and price for external wind resources for modeling consistency?
- SPP staff recommends applying ITP Manual curtailment price methodology to external regions

Appendix

Stakeholder Concerns with PPA based Variable O&M

- Methodology may cause data gathering issues and inconsistency
- Methodology may not be representative of operating cost by definition
- Methodology may not be representative of real-time operations and settlements
- Methodology may be inconsistent
  - Utility owned versus merchant owned
  - Conventional versus renewable
- Reflecting PPA pricing in a renewable unit's cost may reduce the APC benefit of transmission investment to deliver existing and forecasted renewables

Historic Wind PPA Trends

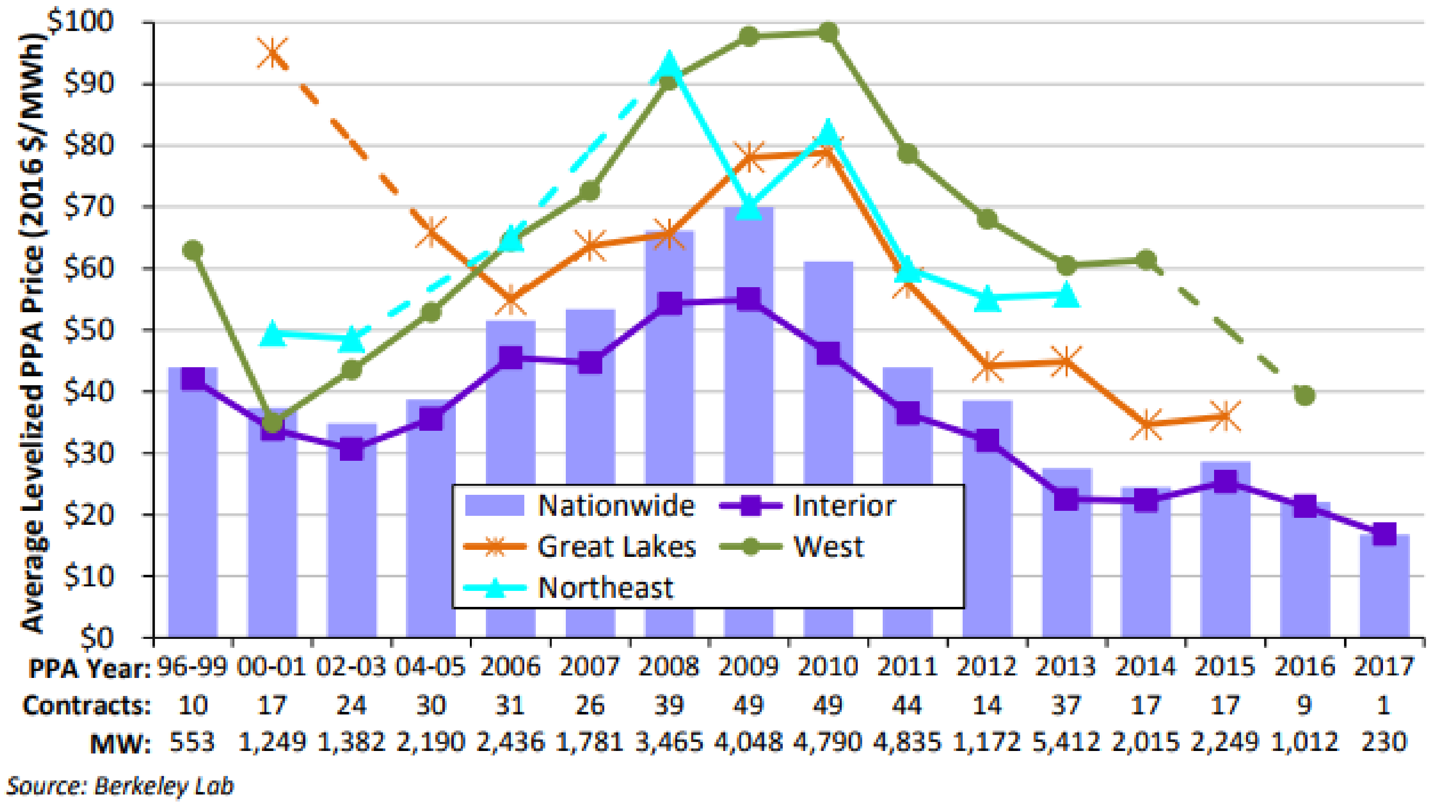

Figure 49. Generation-weighted average levelized wind PPA prices by PPA execution date and region

Source: https://energy.gov/eere/wind/downloads/2016-wind-technologies-market-report pages 57-64

Historic Solar PPA Trends

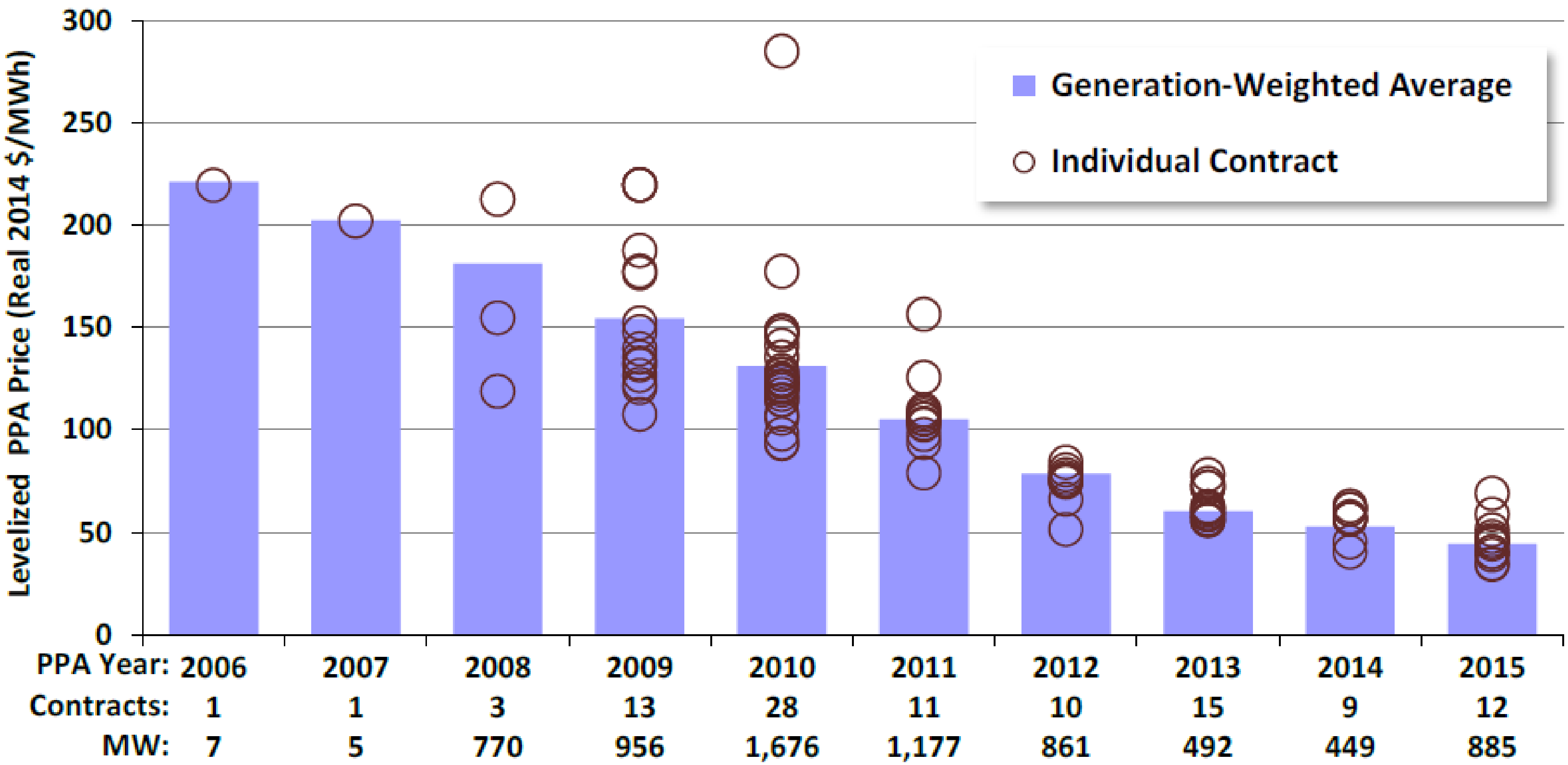

Figure 19. Levelized PV PPA Prices by Contract Vintage

Source: https://emp.lbl.gov/sites/all/files/lbnl-1000917.pdf pages 29-37

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2017 ITP10 Portfolio APC Benefit Impact of Modeling $0 Curtailment and VOM for Wind

2017 ITP10 Economic Model	2017 ITP10 Project Portfolio 1-year SPP Main APC Benefit for 2025 study year ($M)
Future 1 with $8/MWhr Curtailment and VOM	45.7
Future 1 with $0 /MWhr Curtailment and VOM	46.6
Future 3 with $8/MWhr Curtailment and VOM	61.1
Future 3 with $0/MWhr Curtailment and VOM	60.9

- Consistent Impacts of Adjusting Curtailment Price and Variable O&M Price on RCAR 2 Results presented February 2017

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2019 ITP Future 2 Increased Energy

Liz Gephardt

December 14, 2017

Background

- 2019 ITP Future 2 includes increased energy growth rates due to an increase in electric vehicle (EV) penetration
- Goal: Discuss options for implementation of Future 2 EV energy and known risks

Preferred Methodology

Determine and add EV energy to urban load centers based on population growth rates and EV conversion rates

- Challenges/Unknowns
  - Identification of urban load buses
  - Granularity of available population growth rates
  - Wide-range of EV projections
  - PROMOD implementation
    - Creation of EV demand groups per pricing zone
    - Load shape
    - Peak demand
    - Granularity of shapes

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3-Part Methodology

- Derivation of Total EV Energy
  - Issues noted in Preferred Methodology slide
- Allocation of Energy
  - Load-ratio share to pricing zones
- Model Implementation Options
  - Apply EV energy amounts to existing demand group structure with valley fill load shape adjustment
    - Valley Fill: Peak and Minimum hour preserved with adjustment distribution toward low loads
  - Create EV demand group per pricing zone
    - Issues noted in Preferred Methodology slide

Next Steps

- Staff recommendation on F2 EV energy
  - January 2018 ESWG
- Economic Model Build
  - December 2017-September 2018
- Renewable Policy Review
  - January-February 2018
- Resource Plan
  - February-May 2018

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