Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

July 30th, 2015

Net Conference

• SUMMARY OF ACTIONS TAKEN •

1. Approved the updates to the renewable survey and resource plan – phase 1 for the 2017 ITP10 as presented and modified
2. Approved SPP Staff's recommendation for the use of the parameters associated with the low end levelized cost of energy from the Lazard prototypes

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

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• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

There were 2 telephone participants and 41 web conference participants, representing 13 of 13 ESWG members. (Attachment 1 – July 30, 2015 Attendance)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements. Two proxies were identified; Don Le (NextEra) named Brian Gedrich (NextEra) as his proxy, Kip Fox (AEP-Transource) named Jim Jacoby (AEP) as his proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – July 30, 2015 Agenda)

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

Agenda Item 2 – 2017 ITP10 Resource Plan

Agenda Item 2a – Resource Plan Phase 1

Liz Gephardt (SPP Staff) reminded the group that phase 1 of the resource plan was posted on July 15. There has been one change to the posting: Empire's Kansas goal was reduced from 230 MW to 14 MW, which leaves them with no additional needs. Paul Dietz (Westar) requested that Westar's Biomass mandate be changed to a goal. There were no further adjustments. Staff recommended that the ESWG approve the resource plan – Phase 1 as presented and modified. (Attachment 4 – Resource Plan – Phase 1) (Attachment 5 – 2017 ITP10 RP1 Calculations_07232015)

> **Al Tamimi (SUNC) made a motion; seconded by Kurt Stradley (LES) to approve the updates to the renewable survey and resource plan – phase 1 for the 2017 ITP10 as presented and modified. The motion was approved unanimously.**

Agenda Item 2b – Data Request Update

Kelsey Allen (SPP Staff) reminded the group that historical data for renewable accreditations is due back August 3rd. Wind farms that do not have 3 years of data will use the approved SPP criteria of 5% accreditation.

Agenda Item 3 – RCAR Modeling Discussion

Josh Ross (SPP Staff) reviewed the RCAR II modeling issues that are currently being researched for alternative solutions. Juliano Freitas (SPP Staff) asked the group for input on the direction to take on the decision made in February, and asked if members want Staff to continue working on the approaches already approved. This item will stay on the agenda as a discussion item while SPP Staff continues to investigate solutions. Members did not provide any additional solutions to solve the issue at this point, the

deadline recommended by Staff for members to present alternative solutions is October 2015. (Attachment 6 – RCAR Modeling Discussion)

Agenda Item 4 – 2017 ITP10 Scope

Agenda Item 4a – Data Inputs and Methodology

Kelsey Allen (SPP Staff) reminded the group of the decisions points that have already been discussed. The main topics to be discussed in the meeting are resource plan inputs and futures assumptions. Kelsey turned the floor over to Josh Ross (SPP Staff) to discuss Lazard generation prototypes. Josh presented the ranges of input parameters by resource type such as capital costs, O&M, heat rates, etc. Staff was able to contact Lazard, and found that the ranges typically reflect different technologies for the different prototypes. The input data associated with each column of the overall Levelized Cost of Energy (LCOE) typically corresponds to a different technology assumption. Lazard did not recommend taking a mid-point, but rather choosing the technology that fits best for us. Staff recommended that the parameters associated with the low end LCOE be used for all prototypes.

> **Tim Owens (NPPD) made a motion; seconded by Kurt Stradley (LES) to approve staff's recommendation for the use of the parameters associated with the low end levelized cost of energy from the Lazard prototypes. The motion was approved with one abstention, Natasha Henderson (GSEC). Natasha abstained from the vote for the following reason: The CT low end levelized cost of energy appears to be in line with current technology and associated costs while the CC low end levelized cost of energy appears to be newer technology with lower than current costs.**

Kelsey Allen (SPP Staff) reminded the group that conventional machine minimum capacity was not surveyed as part of the generation review, and asked if a reduction of minimum base capacity could be used as a modeling tool. Members wanted to know if there would be any legal ramifications of potentially modeling units differently than they are operating and offered into the market. Staff will check with the legal department. Members also questioned if this change in operation would make a difference in the amount of retirements needed to meet the needs of the Clean Power Plan futures. (Attachment 7 – Data Inputs and Methodology)

ACTION ITEM: SPP staff will look into whether or not a reduction in minimum capacity would change the amount of coal retirements needed to comply with the Clean Power Plan.

Agenda Item 4b – Futures Assumptions

Chris Jamieson (SPP Staff) presented to the group, he asked members if energy efficiency is the most cost effective way of meeting CPP compliance. The group also discussed how much energy efficiency is already baked into the model. When we go into the resource planning milestone, we need to know how much energy efficiency is incorporated in the model, so that we can take credit to meet are EPA targets. SPP staff will send a request to stakeholders to gather this information. (Attachment 8 – Futures Assumptions)

ACTION ITEM: SPP staff to work with ESWG members to create a data request to gather the energy efficiency amount included in the base load forecasts.

Kelsey Allen (SPP Staff) showed the group the results of retirements using an age based approach versus a size based approach, with the current generation review data. The group discussed that we do not necessarily need to use the same retirements for both CPP futures. There were questions on what would be included in the emissions goal computation on a state-by-state and regional basis..

ACTION ITEM: Staff to provide a summary of the emissions goal computation from SPP's CPP analysis in a future meeting.

Agenda Item 4c – Portfolio Consolidation Methodology

Kelsey Allen (SPP Staff) began the discussion for the portfolio consolidation methodology. He recapped the discussion from the past two meetings. With the final CPP ruling coming out, we will continue this

discussion at the next meeting. Staff will review the discussion notes and come back with a recommendation. (Attachment 9 – Portfolio Consolidation)

Closing Items

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

Kelsey Allen (SPP Staff) updated the group on upcoming meetings and locations:

August 19th – 20th, 2015: Magnolia Hotel, Denver, CO

September 23rd, 2015: 8th Floor AEP Offices, Dallas, TX

List of action items from the meeting:

1. SPP staff will look into whether or not a reduction in minimum capacity would change the amount of coal retirements needed to comply with the Clean Power Plan
2. SPP staff to work with ESWG members to create a data request to gather the energy efficiency amount included in the model.
3. Staff to provide a summary of the emissions goal computation from SPP's CPP analysis in a future meeting.

The meeting was adjourned at 10:59 AM.

Respectfully Submitted,

Kelsey Allen
ESWG Secretary

Name	Attendance	Company
agreb	Webex	
Al Tamimi	Webex	
Alan Myers	Webex	
Bary/Empire	Webex	
Bennie Weeks	Webex	
Brian Gedrich	Webex	
Chris Giles	Webex	
Clayton Mayfield	Webex	
Gimod Olapurayil	Webex	
H. Lao	Webex	
Jason Shook (GDS/ETEC)	Webex	
Jeremy Harris (WERE)	Webex	
Jerry Bradshaw (SPRM)	Webex	
jim jacoby	Webex	
Jody Holland	Webex	
Joe Fultz GRDA	Webex	
John Bell (KCC)	Webex	
John Knofczynski	Webex	
Jon Iverson	Webex	
Jon Shipman	Webex	
Jordan Schmick	Webex	
Jordan Schmick	Webex	
Kevin Foflygen (SPRM)	Webex	
Kirk Hall	Webex	
Kurt Stradley (LES)	Webex	
Leon Howell	Webex	
Liz Gephardt (SPP)	Webex	
Lori Frisk-Thompson (BEPC	Webex	
Meena	Webex	
Michael Massery (AECC)	Webex	
Michael Odom (SPP)	Webex	
Michael Watt (OMPA)	Webex	
Natasha	Webex	
Noumvi Ghomsi	Webex	
Paul Dietz	Webex	
Randy Collier (CUS)	Webex	
Ross Hohlt	Webex	
Shawnee Claiborn-pinto	Webex	
Steve Gaw	Webex	
Tim Owens (NPPD)	Webex	
Tim Soles (Occidental)	Webex	
Deral Danis	Telephone	Clean Line
Pat McCool	Telephone	KCPL

Email
agreb@spp.org
atamimi@sunflower.net
amyers@itctransco.com
bwarren@empiredistrict.com
bennie.weeks@xcelenergy.com
brian.gedrich@nexteraenergy.com
cgiles@tcec.coop
cmayfield@spp.org
golapurayil@itctransco.com
hlao@aep.com
jason.shook@gdsassociates.com
jeremy.harris@westarenergy.com
jerry.bradshaw@cityutilities.net
jwjacoby@aep.com
jholland@gridliance.com
jfultz@grda.com
j.bell@kcc.ks.gov
jknofczynski@eastriver.coop
jiverson@oppd.com
jeshipman@oppd.com
jordan.h.schmick@xcelenergy.com
jordan.h.schmick@xcelenergy.com
kevin.foflygen@cityutilities.net
khall@spp.org
kstradley@les.com
howelllc@oge.com
lgephardt@spp.org
lorift@bepc.com
meena.thomas@puc.texas.gov
michael.massery@aecc.com
modom@spp.org
mwatt@ompa.com
nhenderson@gsec.coop
noumvi.ghomsi@psc.mo.gov
paul.dietz@westarenergy.com
randy.collier@cityutilities.net
dhohlt@ameren.com
shawnee.claiborn-pinto@puc.state.tx.us
rsgaw1@gmail.com
tjowens@nppd.com
tim_soles@oxy.com

1. **Don Le proxy to Brian Gedrich**

Kelsey,

I'm unable to make the 7/30 ESWG Meeting. Therefore, Brian Gedrich will be my proxy.

Don Le
System Planning Manager
Lone Star Transmission, LLC
NextEra Energy Transmission, LLC
(M) 713-366-6105
(O) 512-236-3144
Don.Le@NextEraEnergy.com

2. **Kip Fox proxy to Jim Jacoby**

Please allow this email for Jim Jacoby to serve as my proxy for ESWG on Thursday 7/30. Thank you - Kip

Sent from my iPhone
Kip Fox

972-400-1384 cell

ECONOMIC STUDIES WORKING GROUP

July 30th, 2015

Net Conference

• A G E N D A •

8:30am – 11:30am

1. Administrative items
    a. Call to Order, Introductions ..... Alan Myers (5 minutes)
    b. Receipt of Proxies ..... Kelsey Allen (1 minute)
    c. Review of Agenda[1] ..... Alan Myers (1 minute)
2. 2017 ITP10 Resource Plan ..... SPP Staff (30 minutes)
    a. Resource Plan Phase 1[1] (Approval Item)
        i. Renewable Survey Updates
    b. Data Request Update
        i. PPA Data Review
        ii. Renewable Accreditation
3. RCAR Modeling Discussion[1] ..... All (45 minutes)
4. 2017 ITP10 Scope ..... SPP Staff (90 minutes)
    a. Data Inputs and Methodology[1]
    b. Futures Assumptions[1]
    c. Portfolio Consolidation Methodology[1]
5. Closing Items ..... All (5 minutes)
        a. Summary of Action Items (Kelsey Allen)
        b. Future Meetings
            i. August 19th – 20th, 2015: Magnolia Hotel, Denver, CO
            ii. September 23rd, 2015: 8th Floor AEP Offices, Dallas, TX

[1] Background Material Included

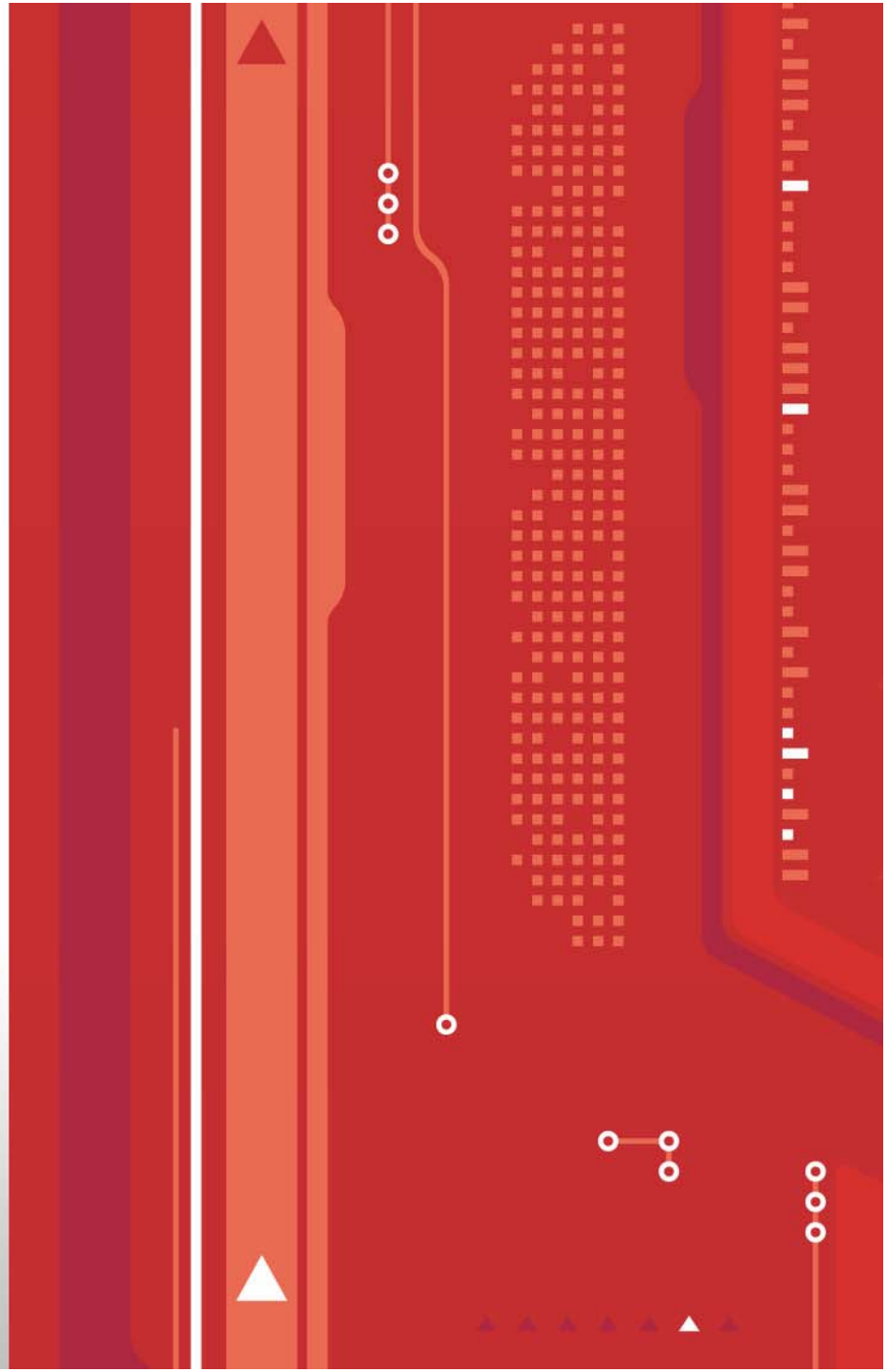
2017 ITP10 Resource Plan – Phase 1

July 30th, 2015

ESWG

Liz Gephardt

SPP Southwest Power Pool



Staff Recommendation

SPP recommends the ESWG approve the Resource Plan – Phase 1 for the 2017 ITP10 as posted.

Recommendation Summary

Renewable Type	2020 Capacity Additions (MW)	2025 Capacity Additions (MW)	Comments
Wind	219.9	324.1	
Solar	21.4	38.1	
Biomass	9.1	11.6	
Any	12.6	13.0	Addition to Wind
Total	**262.9**	**386.8**	

Utility	Renewable Type	2020 Capacity Shortfall (MW)	2025 Capacity Shortfall (MW)
Empire District Electric Co.	Solar	3.4	5.1
Greater Missouri Operations Company	Wind	0.0	81.8
~~Greater Missouri Operations Company~~	~~Solar~~	~~7.1~~	~~10.4~~
Independence Power & Light Dept.	Wind	12.6	13.0
~~Kansas City Power & Light Co.~~	~~Solar~~	~~7.4~~	~~11.2~~
Kansas Electric Power Coop. Inc. in WERE	Wind	16.8	16.8
Midwest Energy Inc.	Wind	31.1	36.3
~~Missouri River Energy Services in SPP~~	~~Wind~~	~~1.3~~	~~1.5~~
~~Missouri River Energy Services in SPP~~	~~Wind~~	~~3.0~~	~~5.2~~
Southwestern Public Service Company	Solar	18.0	33.0
Southwestern Public Service Company	Biomass	9.1	11.6
~~Sunflower Electric Power Corp.~~	~~Wind~~	~~4.0~~	~~4.0~~
Western Farmers Electric Cooperative	Wind	110.9	110.9
Western Farmers Electric Cooperative	Wind	36.1	36.1
Nebraska Public Power District	Wind	25.0	42.1

Changes to recommended additions:

Corrected allocation of units previously set to meet NPPD Wind Goal.

Removed KCPL and GMO's need for solar, which are met through solar rebates netted out in load projection

Capacity Factor	Mandate/Goal Information
28.3%	To meet MO Mandate
46.8%	To meet MO Mandate
~~28.3%~~	~~To meet MO Mandate~~
46.8%	To meet INDN Goal
~~28.3%~~	~~To meet MO Mandate~~
46.8%	To meet KS Goal
46.8%	To meet KS Goal
~~46.8%~~	~~To meet ND Goal~~
~~46.8%~~	~~To meet SD Goal~~
28.3%	To meet TX Goal; site in TX (near NM)
85.0%	To meet NM Mandate; site in NM
~~46.8%~~	~~To meet KS Goal~~
48.2%	To meet OK Goal; site in OK
41.2%	To meet NM Goal; site in NM
47.4%	To meet NPPD Goal; site in NPPD

s.

SPP Staff Comments
Met by solar rebates; reflected in load projections
Met by solar rebates; reflected in load projections
Small amount of wind: Recommend removing from RP1
Small amount of wind: Recommend removing from RP1
Use Kulm Waste unit parameters
Small amount of wind: Recommend removing from RP1

RCAR Modeling Discussion

July 30th, 2015

ESWG

SPP Southwest Power Pool

Helping our members work together to keep the lights on... today and in the future

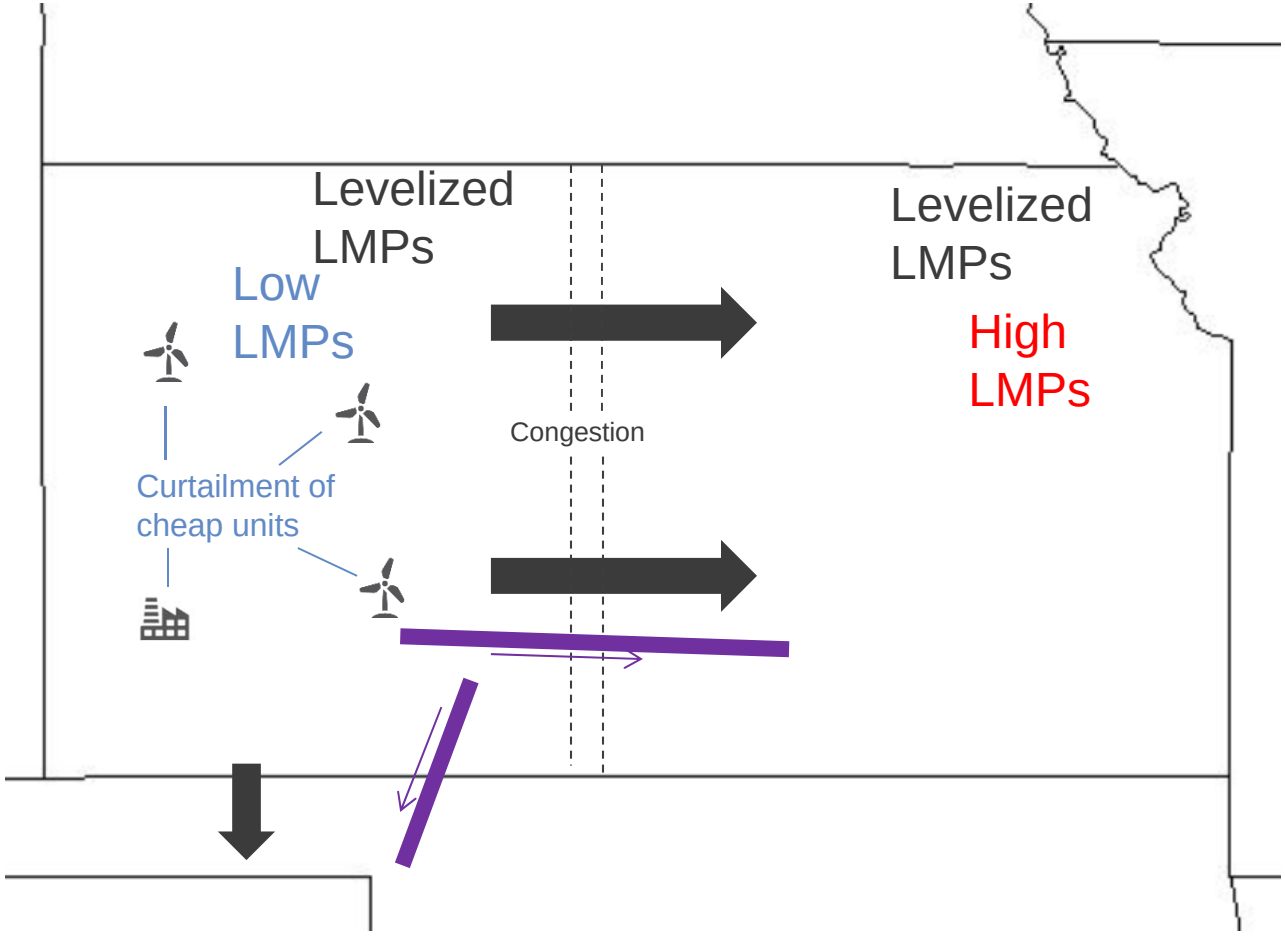
Economic Modeling Issues – Previous Discussion

- Jan – Feb 2015: Discussed two technical modeling issues with RCAR base model, and approaches were approved to address them
- It was noted this was a short-term approach for the RCAR schedule at that time and that the group would like more time to develop long-term approaches to these issues

Economic Modeling Issues

- With the change in RCAR timeline, we have more time to work on these issues
- Today
  - Review prior work and ideas
  - Present a little bit of new material
  - New ideas are welcome
- Future meetings
  - Further refinement and discussion
  - Finalize approaches

Issue #1: Trapped Generation Pockets



Load and gen are identical
between base and change cases

Base Case

Lack of transmission ->
Curtailment of cheap units ->
Large LMP differential ->
Low LMP purchase prices in west KS ->
Low APC

Change Case

Robust transmission ->
Cheap units generate more->
Levelized LMPs ->
Moderate LMP purchase prices in west KS ->
Moderate APC

Under current approach:

- APC savings is negative for west KS zones, even though the new transmission unleashes more of their cheap generation.
- Conversely, APC savings for zones to the east will be inflated due to artificially high LMPs in the base case

Issue #1: Trapped Generation Pockets

- West KS zones are showing negative APC savings, even though their more expensive generation is being displaced with cheaper generation in the change case
  - This issue is created due to the modeling approach adopted in the RCAR process
  - When the economic models are transmission-deficient, current modeling practices overstate the separation of prices between zones
    - Impact more pronounced in smaller zones
  - Model does not recognize that wind interconnection was granted subject to transmission upgrades

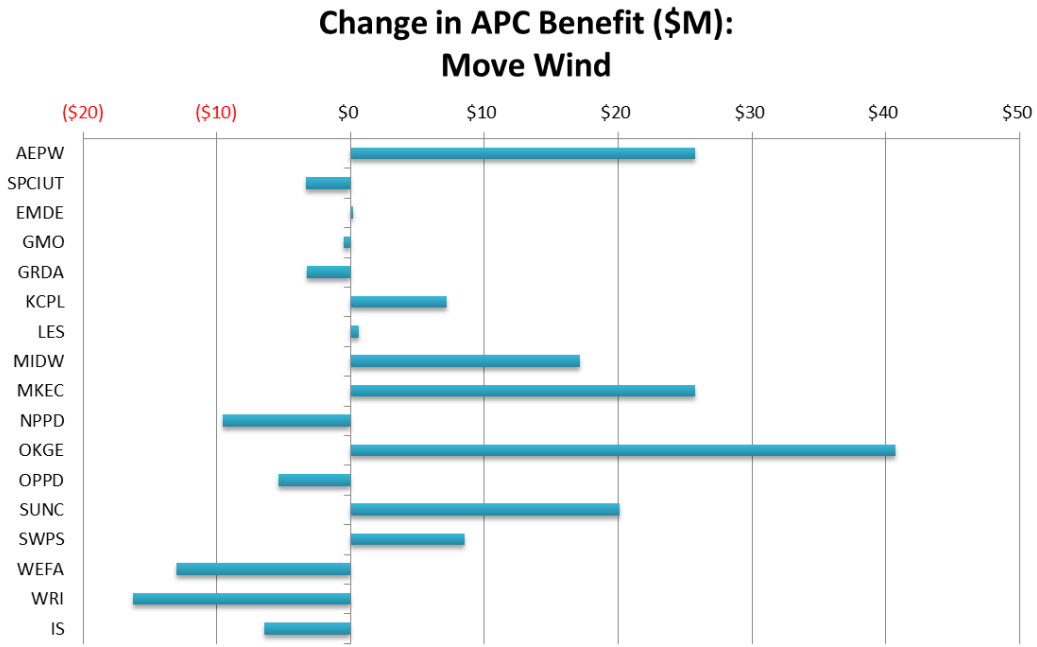
Issue #1: Solutions

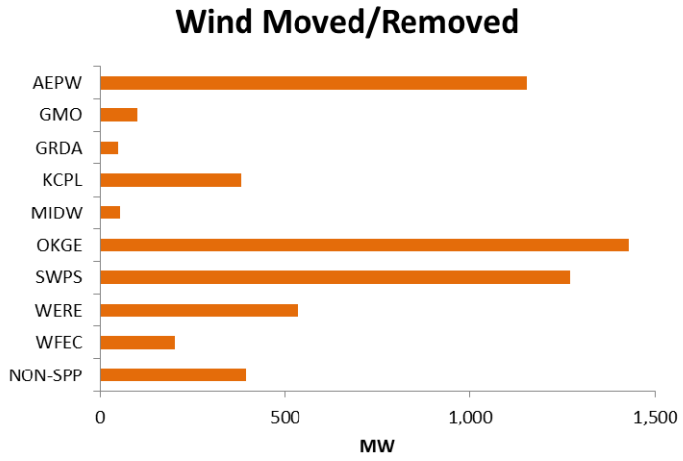
- Option 1a: Status Quo
- Option 1b: Move Wind to Zonal Load Centers
- Option 1c: Remove Wind
- **Option 1d: Hybrid Approach**
  - **Approved by ESWG**
- Option 1e: Incremental Approach
  - New results for this approach

- All results are 1-year APC savings, 2034 $

Option 1b: Move Wind to Zonal Load Centers

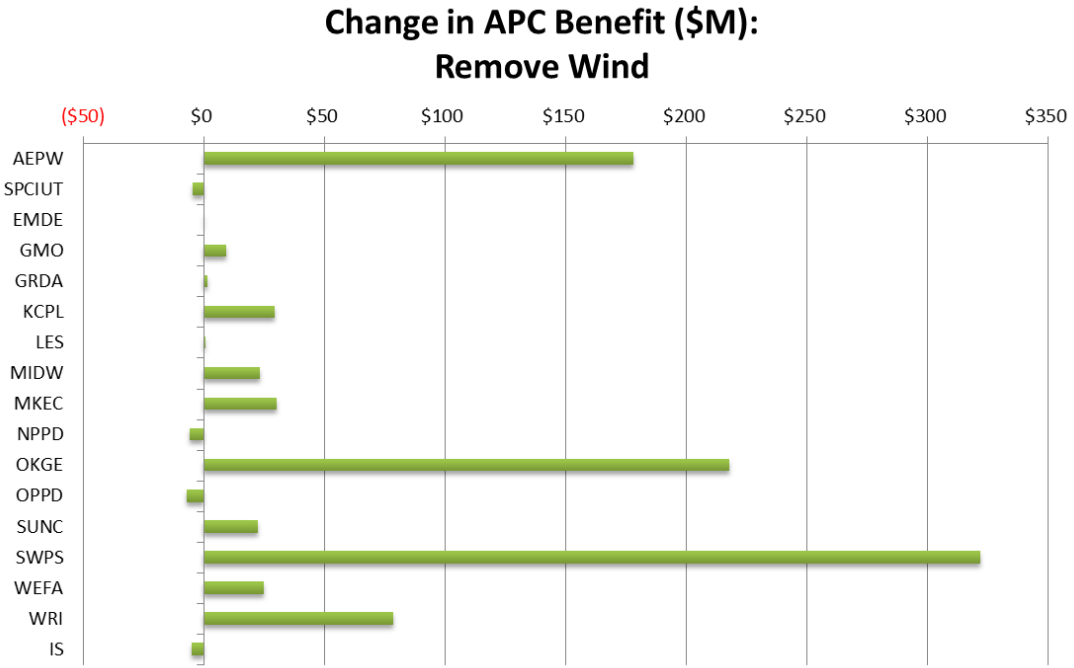
- Move wind only if it is dependent on the HWBW transmission (5.0 GW)
- Decreases capacity factors
- Zones would still need to meet their public policy mandates/goals

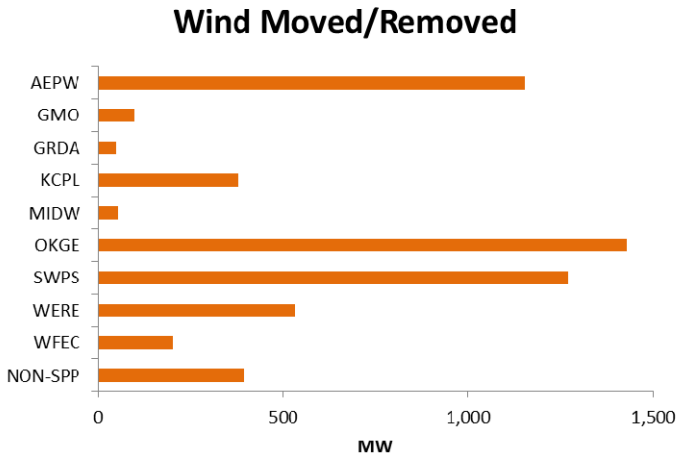




Option 1c: Remove Wind

- Remove wind only if it is dependent on the HWBW transmission (5.0 GW)
- These numbers do not account for capital cost of wind



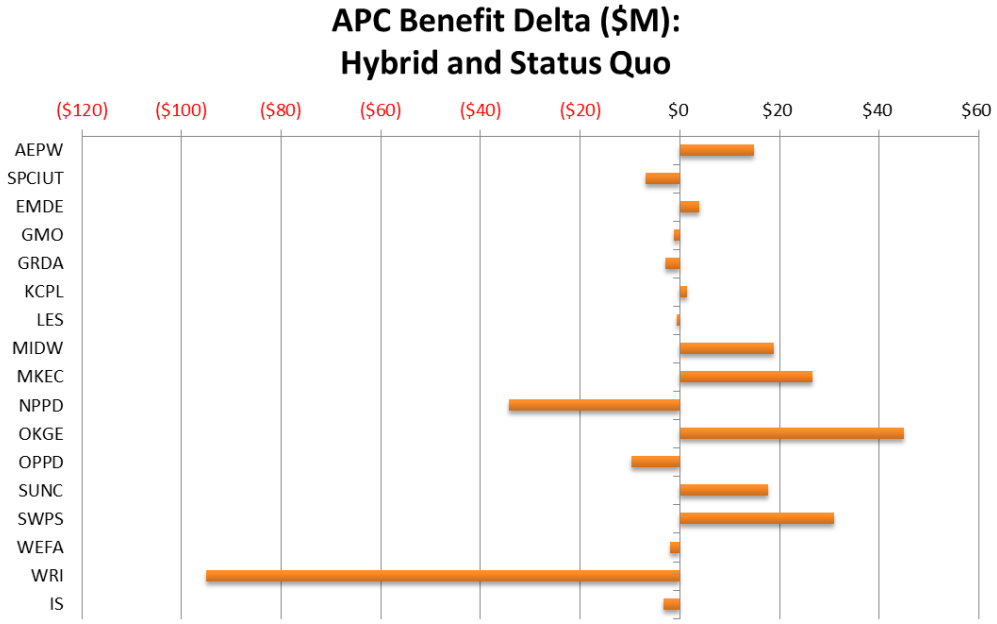


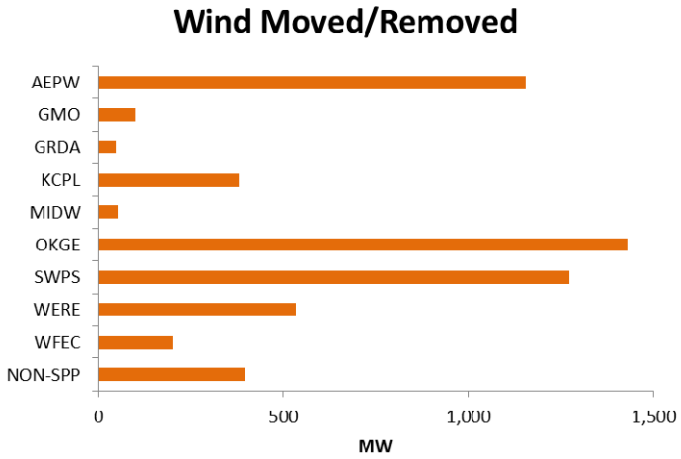
Option 1d: Hybrid Approach

- Approach 1 (A1): Status Quo, wind in both base and change cases
  - Good for analyzing regional benefit
  - Problematic for analyzing zonal benefits
- Approach 2 (A2): Remove Wind, wind is taken out of base case
  - Problematic for analyzing regional benefit
  - Good for analyzing zonal benefits, as % share of regional benefits
- Calculate X by zone as the APC benefit:

$$\frac{\text{Zonal APC Benefit}_{A2}}{\text{Regional APC Benefit}_{A2}} = \frac{X}{\text{Regional APC Benefit}_{A1}}$$

Option 1d: Hybrid Approach

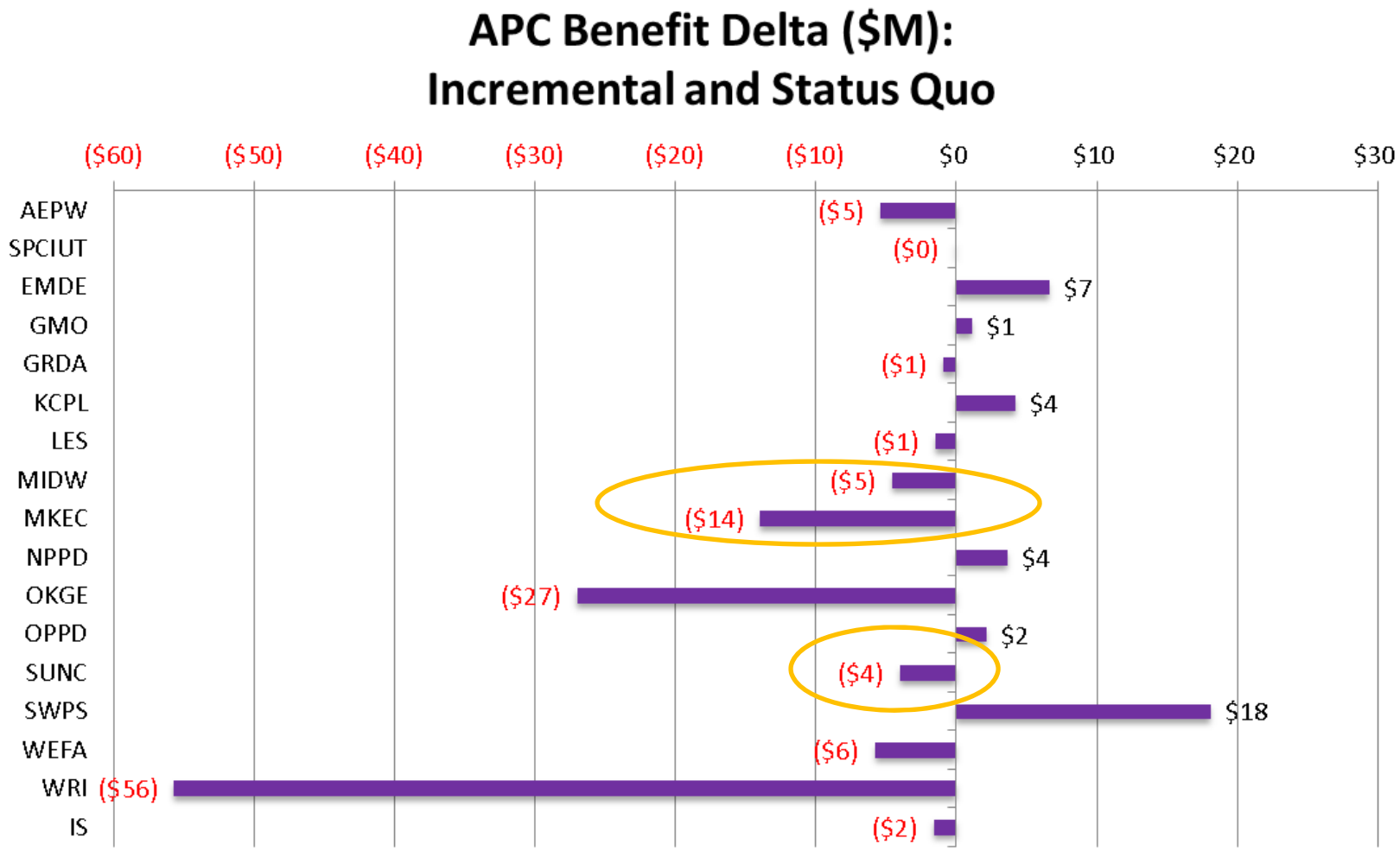




Option 1e: Incremental Approach

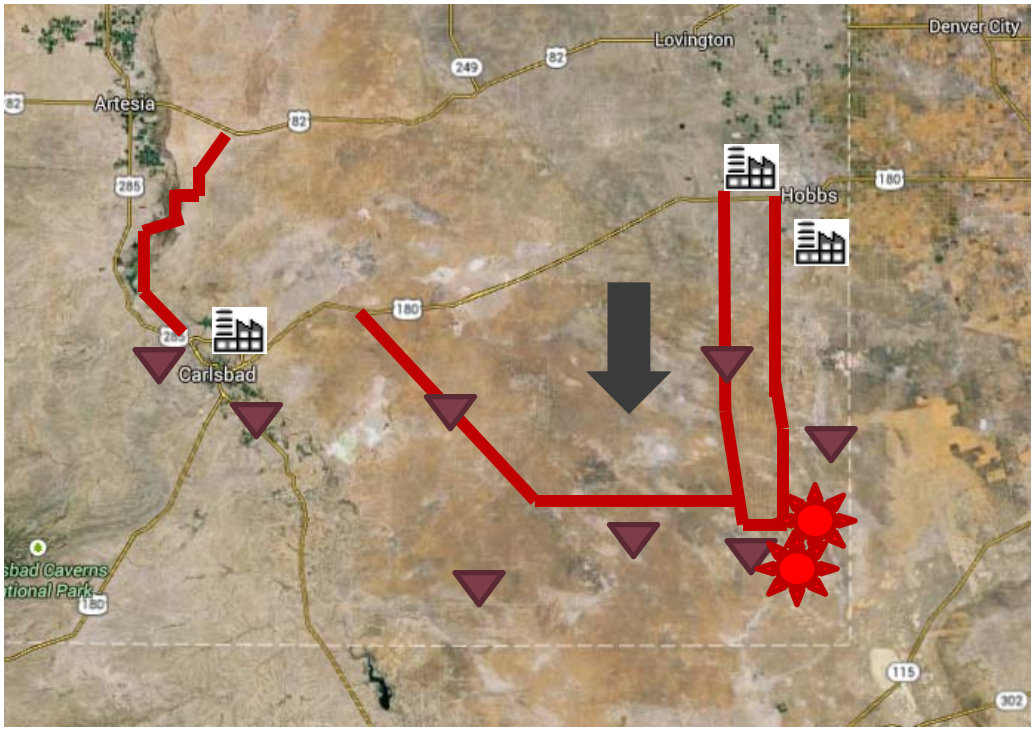
- Identify the specific projects creating the bulk of the problem with wind (wind projects)
  - Base B1: Include the wind projects, no other HWBW
  - Change C1: Include all HWBW
  - Change C2: Include all HWBW except for the wind projects
- APC Benefit 1 = B1 – C1
- APC Benefit 2 = C2 – C1
- Total APC Benefit = APC Benefit 1 + APC Benefit 2
- **Results show that APC Benefit 2 and Total Benefit are negative for west KS zones, and approach does not address the problem**

Option 1e: Incremental Approach



Issue #2: Load Pockets

- Load pocket does not have enough transmission to serve load in base case
- Excessive emergency gen and breaching constraints are causing high LMPs in the base case, resulting in high APC

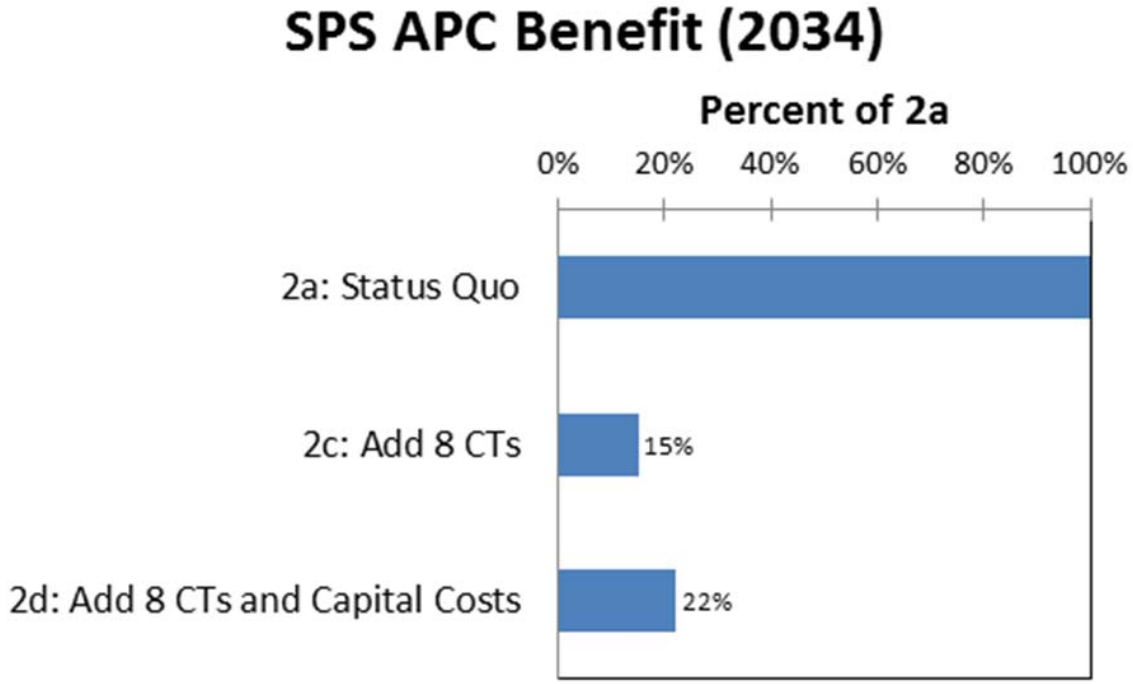


Issue #2: Solutions

- Option 2a: Status Quo
- Option 2b: Add load pocket upgrades to base case
  - No results at this time
- **Option 2c: Add CTs in base/change case, make non-dispatchable in change case**
  - **Added 8 CTs, 1,680 MW**
  - **Approved by ESWG**
- Option 2d: Add CTs in base/change case, make non-dispatchable in change case, include CT capital costs
  - Added 8 CTs, 1,680 MW

Issue #2: Solutions

- Options 2c and 2d effectively address the emergency generation and breaching constraint problems
- **ESWG approved Option 2c**



2017 ITP10 Data Inputs & Study Methodology

SPP Staff

July 30th, 2015

Data Inputs & Study Methodology

- Load & Gen Review
- Renewable Survey
- System Topology
- Fuel Prices
- Emissions Prices
- DC Ties
- Hourly Load Profiles
- Hourly Renewable Profiles
- Resource Plan
  - Capacity accreditation
  - Capacity margin
- Needs Assessments (Economic & Policy)

*Complete Discussing Today Reference

Approved Assumptions

- Status quo hourly load profiles
- Maintain a 13.6% reserve margin for resource planning (As currently outlined in SPP criteria)
- Use actual calculated values for accreditation of wind resources with 3 years of historical data and follow SPP criteria for accreditation of future wind resources
- Follow SPP criteria for accreditation of solar resources

Approved Assumptions

- Utilize the status quo methodology for modeling of fuel, wind, and emissions prices. (Ventyx Reference Case for coal, oil, uranium and emissions prices. NYMEX futures and DOE growth rates for natural gas prices. $8/MWh VOM and curtailment price for wind)
- Remove PROMOD must run flag on all base load units except nuclear for all futures

Approved Assumptions

- Approved the use of new “Other GI Firm” resources [not designated to a utility] to meet any potential renewable Mandate or Goal shortfalls
- Approved the use of prototypes from Lazard’s 2014 Levelized Cost of Energy Study (Version 8)
- Approved the use of 2012 hourly wind profiles from the NREL 2012 WIND toolkit dataset

Other Assumptions Discussed

- **Wind capacity factors for Phase 1 Resource Plan (Policy driven additions)**
  - **Utilize Regional, State, Zonal, or bus information provided for siting considerations in renewable survey**
    - **Use average of SPP capacity factors for each siting consideration type (existing modeled wind, NREL data)**
    - **Site specific NREL data for supplied bus level data**

Approved Assumptions

- Approved to define up to 25 congested constraints with greater than $50,000 in annual congestion cost as economic needs
- Approved the status quo methodology for identifying policy needs
  - Shortfall of deliverable energy mandates or goals by utility, by state

Approved Assumptions

- Approved to define up to 25 congested constraints with greater than $50,000 in annual congestion cost as economic needs
- Approved the status quo methodology for identifying policy needs
  - Shortfall of deliverable energy mandates or goals by utility, by state

Approved Assumptions

- Approved recommendation for benchmarking
  - Focus Benchmarking efforts toward quality assurance and validation of the study year economic model
    - No development of current year model
  - Develop new methodology to determine one set of hurdle rates for the SPP region

Data Inputs & Study Methodology

- Benchmarking
- Resource plan
  - Prototypes
- Conventional minimum capacity
- Siting
- Generator Outlet Facilities
- Constraint Assessment
- Project Selection
- Project Grouping
- Portfolio Consolidation
- Project Staging
- Benefit Metrics
- Sensitivities

*Complete Discussing Today Reference

2017 ITP10 Data Inputs

LAZARD GENERATION PROTOTYPES

Generation Prototype Data

- June 3rd ESWG
  - Group approved use of Lazard LCOE Analysis v8.0 for generation prototype parameters in the 2017 ITP10 resource plan
  - Lazard data provides ranges of data for some parameters, such as capital costs, O&M, etc.
- Today
  - Address how to select data within these ranges

	Units	Gas Combined Cycle
Net Facility Output	MW	550
EPC Cost	$/kW	$743 – $1,004
Capital Cost During Construction	$/kW	$107 – $145
Other Owner's Costs	$/kW	$156 – $170
Total Capital Cost[a]	$/kW	$1,006 – $1,318
Fixed O&M	$/kW-yr	$6.20 – $5.50
Variable O&M	$/MWh	$3.50 – $2.00
Heat Rate	Btu/kWh	6,700 – 6,900
Capacity Factor	%	70% – 40%
Fuel Price	$/MMBtu	$4.50
Construction Time	Months	36
Facility Life	Years	20
CO_2 Emissions	lb/MMBtu	117
Investment Tax Credit[b]	%	—
Production Tax Credit[b]	$/MWh	—
Levelized Cost of Energy[b]	$/MWh	$61 – $87

Generation Prototype Data

- **Lazard feedback:**
  - **Ranges reflect different technologies, or different models, for the same unit type**
  - **Parameters on left reflect one technology, parameters on right reflect another**
  - **Recommend using one end or the other, and not taking the midpoint**

	Units	Wind
Net Facility Output	MW	100
EPC Cost	$/kW	$1,100 – $1,400
Capital Cost During Construction	$/kW	included
Other Owner's Costs	$/kW	$300 – $400
Total Capital Cost[a]	$/kW	$1,400 – $1,800
Fixed O&M	$/kW-yr	$35.00 – $40.00
Variable O&M	$/MWh	—
Heat Rate	Btu/kWh	—
Capacity Factor	%	52% – 30%
Fuel Price	$/MMBtu	—
Construction Time	Months	12
Facility Life	Years	20
CO_2 Emissions	lb/MMBtu	—
Investment Tax Credit[b]	%	—
Production Tax Credit[b]	$/MWh	—
Levelized Cost of Energy[b]	$/MWh	$37 – $81

Recommendation

- **Staff recommends ESWG approve use of the parameters associated with the low-end levelized cost of energy for Lazard prototypes.**

Conventional Machine Minimum Capacity

- Not surveyed as a part of the generation review
- Discuss reduction of minimum capacity for base load units CPP Futures (or all futures)

Solution Development Recommendation

- Solicit stakeholders for solutions for all identified needs
- Policy projects: mitigate renewable curtailment to meet the regulatory/statutory mandates and goals
- Economic projects: B/C > .75 for one year
- Seams projects
  - Identified based on benefits to other regions
  - 80/20 cost sharing

Economic Project B/C Threshold

- 2015 ITP10 consolidated portfolio
  - APC only B/C was 3.05
  - Total benefit metric B/C was 4.1
  - Additional benefits increased B/C by 34%
- 2015 ITP10 consolidated portfolio individual projects
  - No consistent correlation between 1-year and 40-year B/C
  - Dependent on the staging year and need date
  - Many 40-year B/C's saw a decrease over the 1-year B/C

Economic B/C threshold recommendation

- Staff recommends setting an APC based 1-year individual project B/C threshold > 0.6 to pass phase 1 screening
- Staff recommends setting an APC based 1-year individual project B/C threshold > 0.8 for inclusion in a final portfolio

Phase 1 – Individual Project Testing Recommendation

- Projects will move on to Phase 2 for further testing if they meet the following criteria
  - The project must meet the need for which it was submitted and
    - Projects to address economic needs must provide a 1-year B/C ratio greater than 0.75 by reducing the congestion.
    - Policy Projects must allow the utilities to meet the regulatory/statutory mandates and goals.

Project Grouping Methodology Recommendation

- Reliability, policy, and economic projects will be combined into project groupings for each future and evaluated for redundancies
- Project groupings will be developed considering:
  - Project's Phase 1 performance
  - 70% congestion relief per need to address locality of constraint and solution
- Groupings per Future:
  - Cost Effective
  - Highest Gross APC benefit
  - Highest Net APC benefit
  - Multi-Variable Grouping

Phase 2 – Combined Project Testing Recommendation

- **Cost-Effective Rank** - Total Project Cost / Flowgate Congestion Cost Mitigated
- **Highest Gross APC benefit** - Highest APC benefit, not considering the cost of the projects
  - Projects will be ranked based on the gross benefit when considering mitigation of each individual constraint
- **Highest Net APC benefit** - The cost of the projects will be subtracted from the APC benefit provided
  - Projects will be ranked based on the net benefit when considering mitigation of each individual constraint
- **Multi-Variable Grouping (Optional)** – Allows SPP staff to layer multiple criteria. The experience gained from analyzing projects for the first three groups will be utilized to determine projects

Project Staging Criteria

- 2010 ITP20 and 2013 ITP20
  - All projects staged for year 20
- 2012 ITP10 Economic Projects
  - B/C ratios interpolated between 5 years out & 10 years out to identify when it exceeds 1.0 in Future 1
- 2012 ITP10 Policy Project
  - Staged for 5 years out due to the 5 years out renewable goals from renewable survey

Project Staging Criteria – 2015 ITP10

- Single project classification
  - Economic – based on a linear interpolation of B/C ratios from 2020 to 2025
  - Reliability - based on linear interpolation of thermal loadings from 2020 to 2025
  - Policy – staged to meet renewable requirement
- Multiple project classification
  - Staged to meet the earliest need date established through the Single Project Classification
  - Economic projects must cross the 1.0 B/C ratio threshold

Project Staging Recommendation

- **Staff recommends utilizing the 2015 ITP10 project staging methodology**

Benefit Metrics

Metric Description
APC Savings
Avoided or Delayed Reliability Projects
Marginal Energy Losses
Reduced Capacity Costs Due to Reduction of On Peak Losses
Increased Wheeling Through and Out Revenues
Public Policy Benefits
Assumed Benefit of Mandated Reliability Projects
Mitigation of Transmission Outage Costs

Benefit Metrics

- **Recommendation**
  - **Calculate 8 approved benefit metrics on the final consolidated portfolio in Future 3**

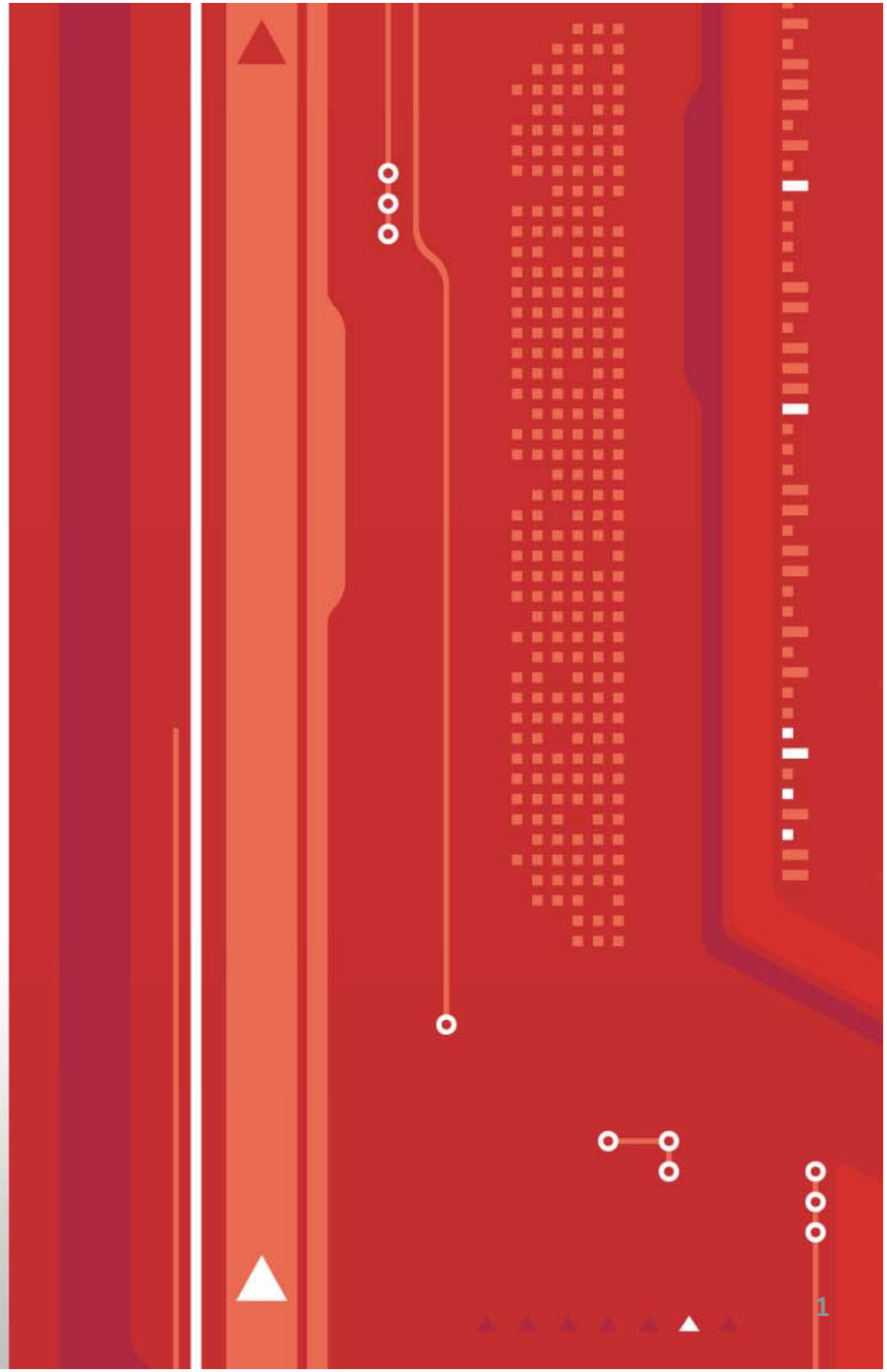
Sensitivities

- In the 2015 ITP10 (BAU Future)
  - Natural Gas Price
  - Demand Levels
  - Tres Amigas and Clean Line Plains & Eastern
  - Increased Input Prices
- Recommendation
  - Perform Natural Gas Price and Demand Levels sensitivities on final consolidated portfolio in Future 3

2017 ITP10 Futures Assumptions

SPP Staff

July 9th, 2015



2017 ITP10 Futures

CPP IMPLEMENTATION

Potential Scenario Analysis – Key Drivers

Scenario 1

Input	Low Range	Mid Range	High Range
Renewables	X		
Energy Efficiency		X	
Retirements			X
Dispatch (CO2 Cost)	Slider	Slider	Slider

Scenario 2

Input	Low Range	Mid Range	High Range
Renewables			X
Energy Efficiency	X		
Retirements	X		
Dispatch (CO2 Cost)	Slider	Slider	Slider

Potential Scenario Analysis – Key Drivers

Scenario 3

Input	Low Range	Mid Range	High Range
Renewables	X		
Energy Efficiency		X	
Retirements		X	
Dispatch (CO2 Cost)	Slider	Slider	Slider

Scenario 4

Input	Low Range	Mid Range	High Range
Renewables		X	
Energy Efficiency		X	
Retirements		X	
Dispatch (CO2 Cost)	Slider	Slider	Slider

Unit Retirements

- Input approach
  - Age/sized based
- Output approach
  - Strategist directed retirements
    - Annual capacity factor threshold
- Other criteria?

Energy Efficiency

- Current expectation of energy efficiency in member submitted load forecasts
  - How to capture the impacts in the analysis?
- Blanket peak and/or energy reduction in CPP Futures
  - Utilize varying levels projected by EPA
  - Allow for zonal exceptions?

Other Modeling Assumptions

- Conventional unit operation
  - Must run removal (approved)
  - Minimum capacity assumptions (discussed today)
  - Seasonal outages instead of retirements
  - Others?
- Solar
  - Utility-scale (F1-F3)
    - Strategist
    - Assumed
  - Distributed (F3)

2017 ITP10 Portfolio Consolidation

SPP Staff

July 30th, 2015

Consolidation Methodology

- 2010 ITP20
  - Consolidated plan most resembles the plan from high wind & carbon constraint future
- 2012 ITP10 - Criteria
  - Policy projects: Included if appears in either future
  - Economic projects: Included if B/C > 1.0 in Future 1
  - Reliability projects:
    - Included if the overload exceeded 100% in one future and exceeded 95% in the other future, OR,
    - Included if the voltage violation occurred in both futures.

Consolidation in the 2013 ITP20

- **2013 ITP20 – Weighting**

Portfolio	Weighting	Threshold	Project X	Project Y
Future 1	50%		✓	✗
Future 2	15%		✗	✓
Future 3	10%		✓	✓
Future 4	15%		✗	✓
Future 5	10%		✓	✗
Total	100%		70%	40%
Consolidated		60%	✓	✗

SPP

Consolidation in the 2015 ITP10

- Economic projects with a 1-year B/C ratio greater than 0.9 in Future 1
- Economic projects with a 1-year B/C ratio greater than 0.7 in Future 1, but that also had a 1-year B/C ratio greater than 0.9 in Future 2
- Policy projects were be included in the consolidated portfolio if they meet a policy need in Future 1.
- Reliability projects were included if they mitigated a thermal/voltage violation in Future 1
- A Future 2 reliability project was included if it mitigated a thermal violation in Future 2 and mitigated loading above a 90% threshold in Future 1. A Future 2 project that mitigates a voltage limit violation in Future 2 and voltage below 0.92 pu in Future 1 was also included.

Consolidation Discussion – 6/18

- Develop a methodology flexible enough to allow high value projects from each future
- Develop methodologies to determine 2 sets of projects
  - "no regrets" set of projects
    - Projects that are projected to produce value independent of what happens in the future
  - "value" set of projects
    - Projects that produce value within the context of the study
- Is F3 just a base case to compare to? (not weighted)
- MISO methodology
  - % weighting per future
  - Project selection based on product of performance and weighting summed across all futures

Consolidation Discussion – 7/9

- "No regrets" set of projects
  - Projects in all 3 futures in consolidated
- Bifurcation of projects in CPP futures from F3
  - Project selected in F3 and one of CPP futures, no regrets?
    - Which CPP future is more probable?
  - Project selected in both CPP futures and not F3, no regrets?
- Potential weighted sum APC benefit performance methodology
  - What are the weights?
  - What is the threshold?