Southwest Power Pool

Economic Studies Working Group

November 14-15, 2018

Southwest Power Pool – Little Rock, AR

• SUMMARY OF ACTIONS TAKEN •

Consent Agenda:

1. Approved the September 12-13th meeting minutes
2. Approved the 2019 ITP Lubbock Power and Light System Exit Analysis Economic Model

2019 ITP:

3. Approved staff's recommendation to continue with simplifying assumptions in the Benefit Metric Manual for the Adjusted Production Cost (APC) Savings Metric
4. Approved staff's recommendation of approving models as posted and proceeding with the SPP proposed mitigation plan

2020 ITP:

5. Approved the methodology for allocation and assignment of proxy wind and solar resources
6. Approved methodology to accredit proxy resources
7. Approved using the recommended Consolidation process
8. Approved staff's recommendation of using average Electric Vehicle (EV) energy correlating with the 25% EV growth (211.7 and 646.2 GWh for years 2025 and 2030, respectively)
9. Approved staff's recommendation of zonal allocation by load share and using valley fill for yearly profile of EV energy

Other Items:

10. Approved a motion for staff to create a Revision Request (RR) to incorporate the separate load forecast for resource plan development in the ITP Manual.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

November 14-15, 2018

Southwest Power Pool – Little Rock, AR

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

There were 32 in-person participants and 33 web conference participants, representing 15 of 16 ESWG members. (Attachment 1 – November 14-15, 2018 ESWG Attendance List)

Agenda Item 1b – Receipt of Proxies

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

- Leon Howell (OGE) named Zac Hager (OGE) as his proxy
- Jody Holland (SCMCN) named Rachel Ibuado (SCMCN) as his proxy
- Jeremy Severson (BEPC) named Matthew Stoltz (BEPC) 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 – November 14-15, 2018 ESWG Agenda).

> **Kurt Stradley (LES) made a motion; seconded by Zac Hager (OGE) to adopt the agenda. The motion was approved unanimously.**

Agenda Item 1d – Antitrust Reminder

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

Agenda Item 2 – ITP Team Introductions

While stakeholders were visiting the SPP offices in Little Rock, Amber Greb (SPP) took the opportunity to introduce the team of staff who will be working on the ITP assessments. The ITP Team consists of members from the economic planning, reliability planning, modeling, engineering support, operations, and advanced studies departments. SPP ITP Team took a few minutes to introduce themselves and give an overview of their ITP responsibilities.

Agenda Item 3 – Review of Past Action Items

Amber Greb (SPP) reviewed the list of past action items and asked for any comments or questions. The group was reminded that action item 193 needs to be incorporated in the ITP Manual. (Attachment 4 – Past Action Items)

> **Bennie Weeks (Xcel) made a motion, seconded by Zac Hager (OGE) to direct staff to create an RR to incorporate the separate load forecast for resource plan development in the ITP Manual. The motion was approved unanimously.**

Agenda Item 4 – Consent Agenda

The consent agenda included the following items:

a. Meeting Minutes – September 12-13th, 2018 (Attachment 5 - 20180912 ESWG Minutes)

b. 2019 ITP LPL System Exit Analysis Economic Model

The Consent Agenda was approved unanimously.

Agenda Item 5 – 2019 ITP Items

Agenda Item 5a – Schedule

Juliano Freitas (SPP) reviewed a presentation on 2019 ITP schedule. Juliano reviewed on-going and up-coming milestones. (Attachment 5a – 2019 ITP Schedule)

Agenda Item 5b – 2019 Target Area Analysis

Nikki Roberts (SPP) reviewed a presentation on the 2019 ITP Target Area Analysis. She reviewed economic assessment methodology and discussed Target Area identification and analysis considerations. (Attachment 5b - Economic Needs Assessment Target Areas)

Agenda Item 5c – 2019 APC Implementation Details

Chris Jamieson (SPP) presented on APC benefit calculations for the 2019 ITP Assessment. He discussed previously approved motions that impact APC and gave a recommendation on how staff would implement the approved motion that all generation without firm transmission service to load should be subject to generator Locational Marginal Price (LMP). He recommended that the 2019 ITP Assessment continue with simplifying assumptions in the approved Benefit Metric Manual for the Adjusted Production Cost Savings Metric regarding the extent to which congestion costs are hedged. Jim Jacoby (AEP) requested for staff to report the actual MW amount that is affected by this motion and bring back to ESWG showing exactly how it will be implemented going forward in the 2020 ITP. Chris then reviewed the APC Zones for SPP and the SPP Regional APC Benefit calculation. Staff will bring this information to a future meeting. (Attachment 5c – 2019 ITP APC Calculation)

Anita Sharma (AEP) made a motion, seconded by Kurt Stradley (LES) to approve staff's recommendation to continue with simplifying assumptions in the Benefit Metric Manual for the Adjusted Production Cost Savings Metric. The motion was approved unanimously.

Agenda Item 5d – 2019 Issues and Impacts

Juliano Freitas (SPP) presented on 2019 ITP Issues & Impacts, discussing some staff-identified issues with the study and proposing mitigation with TWG and ESWG. Juliano presented the issues, impacts, and mitigation strategies that would allow the Detailed Proposed Project (DPP) Window dates to remain the same. Discussion led to how staff can prevent these issues in the future and what is being done currently to avoid issues. Natasha Henderson (GSEC) asked for documentation of checklists to be used to avoid these issues and asked if that should be added to the ITP Manual. Juliano then presented staff's recommendation of approving models as posted and proceeding with the SPP proposed mitigation plan. (Attachment 5d - 2019 ITP Issues and Impacts)

Kurt Stradley (LES) made a motion, seconded by Zac Hager (OGE) to approve staff's recommendation of approving models as posted and proceeding with the SPP proposed mitigation plan. The motion was approved with one abstention, John Olsen (Evergy).

Agenda Item 6 – 2020 ITP Items

Agenda Item 6a – Schedule

Juliano Freitas (SPP) reviewed a presentation on 2020 ITP schedule. Juliano reviewed on-going and up-coming milestones. (Attachment 6a - 2020 ITP Schedule)

Agenda Item 6b – MOPC/SPC Update

Amber Greb (SPP) provided a recap of the recent MOPC and SPC meetings, both groups voted to approve two futures for the 2020 ITP assessment, the Reference Case and Emerging Technologies future.

Agenda Item 6c – Scope Development

Agenda Item 6ci – Conventional Generator Prototypes

Antonio Barber (SPP) presented on the 2020 ITP Conventional Generator Prototypes. The options for data sources were presented. Antonio reviewed a chart comparing the costs of different unit types between the data sources. He then showed busbar curves for combustion turbines and combines cycle units. Adjustments needed to be made to the graphs and were brought back to the group. He presented the SPP Staff recommendation to approve using Lazard High Combine Cycle (CC), Low Combustion Turbine (CT), and Low reciprocation engines prototypes and eliminating nuclear and coal as options. No motion was made but rather suggestions were given to bring back at December meeting with focus on EIA CC/CT and Lazard CC/CT. (Attachment 6ci – Conventional Generator Prototypes)

Agenda Item 6cii – 2020 ITP Scope – Renewable Allocation and Battery Storage

Joshua Norton (SPP) presented Renewable Allocation & Battery Storage. He presented rationale for recommending accreditation of battery storage at 48% of capacity that can last four hours. The SPP Market Monitoring Unit (MMU) presented reasons to accredit at a much higher value and suggested 100%. It was brought up that the SAWG is currently looking into this topic and It was suggested to delay a vote and for staff to bring back battery storage accreditation discussion with more information in December. Joshua then presented on Renewable Assignment and Allocation. (Attachment 6cii - Renewable Allocation & Battery Storage)

Natasha Henderson (GSEC) gave her proxy to Kyle McKinney (GSEC)

Kurt Stradley (LES) made a motion, seconded by Bennie Weeks (Xcel) to approve staff's recommendation to assign solar and allocate by load ratio share, to not assign wind unless needed for policy requirements and allocate based on zone reserve margin. The motion was approved unanimously.

Joshua then presented 2020 ITP Accreditation Methodology and recommended batteries (Attachment 6cii - Renewable Allocation & Battery Storage)

Kurt Stradley (LES) made a motion, seconded by Bennie Weeks (Xcel) to approve the methodology to accredit proxy resources, including the following:

- **To allocate projected wind additions to maximize accreditation to deficient zones, up to the zonal renewable cap for new resources**
- **To accredit resources in the following order: Existing, Policy wind/solar, projected solar, projected batteries, projected wind, and finally conventional**
- **For policy needs to be met with 80% wind and 20% solar resources**
- **For batteries to be unassigned**

The motion was approved unanimously.

Agenda Item 6ciii – Consolidation

Amber Greb (SPP) reviewed a presentation on 2020 ITP Portfolio Consolidation. She presented what has been done in the past as well as what is defined for the 2019 ITP Assessment. She made the recommendation that no changes be made to the process of Consolidation since it has not been tested. (Attachment 6ciii - 2020 ITP Portfolio Consolidation)

Zac Hager (OGE) made a motion, seconded by Kurt Stradley (LES) to approve using the recommended Consolidation process. The motion was approved unanimously.

Agenda Item 6civ – Natural Gas Prices and Sensitivities

Kirk Hall (SPP) presented on Natural Gas Forecast and Sensitivities. He recommended that SPP purchase the latest ABB Fundamental Forecast for the 2020 ITP Assessment and to utilize the same sensitivities as in 2019 ITP Assessment. The group decided for staff to bring back with more information for discussion at December meeting. (Attachment 6civ - 2020 ITP Scope - Natural Gas Prices and Sensitivities)

Agenda Item 6cv – Energy Growth Rates

Kirk Hall (SPP) presented on 2020 ITP Future 2 Increased Energy. He discussed some of the questions that remain around implementing electric vehicle growth into the study, specifically how much to add, how to allocate it to zones, and how the yearly load profile will look. He brought several options to the group on how much energy to add for electric vehicles. (Attachment 6cv - 2020 ITP Future 2 Increased Energy)

> **Zac Hager (OGE) made a motion, seconded by Anita Sharma (AEP) to approve staff's recommendation of using average EV energy correlating with the 25% EV growth (211.7 and 646.2 GWh for years 2025 and 2030, respectively). The motion was approved unanimously**

Kirk then brought the staff recommendation for allocation to zones and yearly profiles of electric vehicles. Jon Iverson (OPPD) requested that staff look into a better way of allocating the increased energy in future studies.

> **Kurt Stradley (LES) made a motion, seconded by John Olsen (Evergy) to approve staff's recommendation of zonal allocation by load share and using valley fill for yearly profile of EV energy. The motion was approved unanimously.**

Agenda Item 6d – Generation and Load

Theva Coleman (SPP) gave an update on the 2020 ITP Generation and Load Review showing the parameters to be reviewed for Pass 3. (Attachment 7c - Generation and Load Review Update)

Closing Items

There were no action items from the meeting

The meeting was adjourned at 1:15 PM

Respectfully Submitted,

Amber Greb

ESWG Secretary

Name	Company/Email	Attendance
Adam Swadley	SPP MMU	In Person
Amber Greb	SPP	In Person
Anita Sharma	AEP	In Person
Antonio Barber	SPP	In Person
Bennie Weeks	SPS/Xcel	In Person
Bill Leung	NPRB	In Person
Brad Schwarz	Hunt Transmission	In Person
Brian Johnson	AEP	In Person
Calvin Daniels (WFEC)	WFEC	In Person
Chris Jamieson	SPP	In Person
Don Greach	Paschall	In Person
Gayle Nansel	WAPA-UGPR	In Person
Jason Shook	GDS/ETEC	In Person
Jim Jacoby	AEP	In Person
Jodi Woods	SPP MMU	In Person
John Olsen	Evergy	In Person
Joshua Norton	SPP	In Person
Juliano Freitas	SPP	In Person
Kalun Kelley	WFEC	In Person
Keith Collins	SPP MMU	In Person
Kirk Hall	SPP	In Person
Kurt Stradley	LES	In Person
Laura Cummings	Energy Exemplar	In Person
Matthew Stoltz (BEPC)	BEPC	In Person
Michael Wegner (ITC)	ITC	In Person
Nikki Roberts (SPP)	SPP	In Person
Rachel Ibuado	Gridliance High Plains	In Person
Ryan Yokley	Sunflower	In Person
Serhat Guney	SPP MMU	In Person
Shawnee Claiborn-Pinto	PUCT	In Person
Steven Broad	Energy Exemplar	In Person
Tim Owens	NPPD	In Person
Aaron Stewart (SPP)	astewart@spp.org	Webex
Aaron Vander Vorst	avandervorst@tradewindenergy.com	Webex
Adam Mummert	amummert@burnsmcd.com	Webex
Alan Myers	amyers@itctransco.com	Webex
Andy Berg	andrew.berg@mrenergy.com	Webex
Ben Elsey (SPS)	ben.r.elsey@xcelenergy.com	Webex
Bryan Ramler (Xcel)	bryan.ramler@xcelenergy.com	Webex
Carrie Dixon (Xcel)	carrie.e.dixon@xcelenergy.com	Webex
Chris Hagman	chagman@atcllc.com	Webex
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Jeremy Harris (Evergy)	jeremy.harris@westarenergy.com	Webex
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Kyle McKinney (GSEC)	kmckinney@gsec.coop	Webex
Michael Watt (OMPA)	mwatt@ompa.com	Webex
Natasha Henderson_GSEC	nhenderson@gsec.coop	Webex
Raman Somayajulu	raman.somayajulu@enel.com	Webex
Randy Collier (CUS)	randy.collier@cityutilities.net	Webex
Ross Hohlt	dhohlt@ameren.com	Webex
Ryan Baysinger	ryan.baysinger@kcpl.com	Webex
Sherri Maxey	smaxey@spp.org	Webex
simon mahan	simon@southernwind.org	Webex
Steve Edburg	steve.edburg@energyexemplar.com	Webex
Steve Gaw	rsgaw1@gmail.com	Webex
Steve Hohman	shohman@oppd.com	Webex
Theva Coleman	tcoleman@spp.org	Webex

Member	Proxy
Leon Howell	Zac Hager
Jody Holland	Rachel Ibuado
Jeremy Severson	Matthew Stolz

Amber and Alan,

Please allow Zac Hager to act as my proxy for the November 14th and 15th ESWG as he will attend in person.

Thanks,

Leon

Alan/Amber,

I'll be unavailable on 11/14-15 for the ESWG in Little Rock, so I'm providing my proxy to Rachel Ibuado. Thank you.

Jody Holland

Vice President, Planning & Engineering

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SPP Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP MEETING

November 14-15th, 2018

Southwest Power Pool – Little Rock, AR

• A G E N D A •

Wednesday, 1:00p.m. - 5:00p.m.

Thursday, 8:00a.m. - 5:00p.m

1. Administrative Items
   a. Call to Order, Introductions....................Tim Owens (5 minutes)
   b. Receipt of Proxies.................... Amber Greb (1 minute)
   c. Review of Agenda[1]....................Tim Owens (1 minute)
   d. Antitrust Reminder.................... Amber Greb (1 minute)
2. ITP Team Introductions.................... SPP Staff (25 minutes)
3. Review of Past Action Items[1].................... Amber Greb (15 minutes)
4. Consent Agenda
   a. Meeting Minutes – September 12-13th, 2018
   b. 2019 ITP LPL System Exit Analysis Economic Model
5. 2019 ITP Items.................... SPP Staff (130 minutes)
   a. Schedule[1].................... Juliano Freitas (10 minutes)
   b. 2019 ITP Target Areas Analysis[1].................... Nikki Roberts (60 minutes)
   c. 2019 APC Implementation Details[1] (Approval Item)....................Chris Jamieson (30 minutes)
   d. 2019 Issues & Impacts[1] (Approval Item).................... Juliano Freitas (30 minutes)
6. 2020 ITP Items.................... SPP Staff (230 minutes)
   a. Schedule[1].................... Juliano Freitas (10 Minutes)
   b. MOPC/SPC Recap.................... Amber (10 minutes)
   c. Scope Development[1].................... SPP Staff
      i. Conventional Generator Prototypes[1] (Approval Item).......Antonio Barber (45 minutes)
      ii. Renewable Allocation & Battery Storage[1] (Approval Item).... Josh Norton (45 minutes)

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[1] Background Material Included

iii. Consolidation[1] (Approval Item) .... Amber Greb (20 minutes)

iv. Natural Gas Prices & Sensitivities[1](Approval Item)......................Kirk Hall (50 Minutes)

v. Energy Growth Rates[1] (Approval Item) ....Kirk Hall (30 minutes)

d. Generation and Load[1]... Theva Coleman (20 minutes)

7. Closing Items ....All (15 minutes)

a. Summary of Action Items (Amber Greb)

b. December ESWG Agenda Items

c. Future Meetings

i. December 3-4th, 2018: 41st floor AEP Office, Dallas Texas

ii. December 19th, 2018: 41st floor AEP Office, Dallas Texas

iii. January 9-10th, 2019: 41st floor AEP Office, Dallas Texas

iv. February 6-7th, 2019: 41st floor AEP Office, Dallas Texas

v. March 12-13th, 2019: 41st floor AEP Office, Dallas Texas

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

November 14-15, 2018

	Action Item	Date Originated	Status	Comments
151	SPP staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress SPP Staff	Staff is compiling information from multiple tools used for economic analysis and resource planning. Staff to bring an update in December
183	SPP staff to perform transmission outage analysis in the first part of 2017 to determine the appropriate APC benefit percentage to utilize for the mitigation of transmission outages benefit metric.	September 15th, 2016	In Progress SPP Staff	ESWG Approved the methodology and staff to begin analysis
185	ESWG to continue working on and finalize the Resource Siting Manual	June 29th, 2017	~~In Progress~~ ~~ESWG~~Complete 10/23/2018	SPP Staff drafting language for stakeholder review; seeking approval October 23rd
186	Formalize the economic model data guidelines and submission process	July 20th, 2017	~~In Progress~~ ~~SPP staff~~Complete 10/11/2018	First draft posted on August 8, 2018. Staff is implementing feedback and reviewing the document for consistency with first pass of the 2020 ITP Load and Generation Review; seeking approval October 23rd.
187	Address the objections raised to the approved renewable VOM modeling detailed in the ITP manual	July 20th, 2017	~~In Progress~~ ~~SPP staff/ESWG~~Complete 10/11/2018	Completed 10/11/2018
190	SPP staff to perform a full transmission outage analysis before the next RCAR	October 12th, 2017	SPP Staff	
193	Discuss separate load forecasts for resource planning purposes, and how to incorporate into the ITP process	January 22nd, 2018	SPP Staff	Has been incorporated into the Load review for 2020. Update the ITP Manual
194	Continue researching/discussing curtailment pricing for future studies	April 25th, 2018	SPP Staff	

195	Provide an APC education Session, including VOM and PPAs and how they impact	April 25th, 2018	~~SPP Staff~~ ~~In Progress~~Complete 10/11/2018	Completed 10/11/2018

Southwest Power Pool

Economic Studies Working Group

September 12-13, 2018

41st Floor AEP Office – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

SPP-MISO Study:

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

2020 ITP Futures:

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

Southwest Power Pool

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

September 12-13, 2018

41st Floor AEP Office – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

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

Agenda Item 1b – Receipt of Proxies

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

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

Agenda Item 1c – Review of Agenda

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

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

Agenda Item 1d – Antitrust Reminder

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

Agenda Item 2 – Review of Past Action Items

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

Agenda Item 3 – Consent Agenda

The consent agenda included the following items:

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

The Consent Agenda was approved unanimously.

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

Agenda Item 4 – 2019 ITP Items

Agenda Item 4a – Schedule

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

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

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

Agenda Item 4c – Economic Model Build

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

Agenda Item 4d – Constraint Assessment

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

Agenda Item 4d – 2019 ITP Assessment Report Card

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

Agenda Item 5 – SPP/MISO CSP Enhancements

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

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

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

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

Agenda Item 6 – 2020 ITP Items

Agenda Item 6a – Schedule

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

Agenda Item 6b – Scope Development

Agenda Item 6bi – Futures

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

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

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

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

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

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

Did not cover agenda item

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

Did not cover agenda item

Agenda Item 6biv – Load Forecast for Resource Planning

Did not cover agenda item

Agenda Item 6bv – Consolidation

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

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

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

<u>Agenda Item 6c – Load and Generation</u>

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

<u>Agenda Item 6d – Generation Retirements Consistency</u>

Did not cover agenda item

<u>Agenda Item 10 – 2019 Meeting Locations</u>

Did not cover agenda item

<u>Closing Items</u>

There were no action items from the meeting.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Amber Greb

ESWG Secretary


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2019 ITP Schedule

Juliano Freitas

November 13, 2018

Economic Model Building

- Start: 7/3/2017
- End: 11/13/2018 (Member's Final Approval)
- Member Review Time:
  - Post 1: 2/12/2018 – 2/23/2018 (10 days)
  - Post 2: 5/8/2018 – 5/22/2018 (10 days)
  - Post 3: 6/6/2018 (informational only)
  - Post 4: 6/29/2018 – 7/16/2018 (10 days)
  - Post 5: 7/19/2018 – 7/26/2018 (5 days)
  - Final Post for Approval: 9/28/2018 – 10/09/2018 (7 days)
  - Initial Member Approval: 10/11/2018
  - Updated for Review/Approval – 11/7 - 13/2018 (5 days)
    - Including Lubbock Sensitivity Models
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: ESWG

Constraint Assessment (Complete)

- Start: 8/2/2018
- End: 10/11/2018 (Member's Final Approval)
- Member Review Time:
  - 9/17/2018 – 9/21/2018 (5 days)
  - 9/26/2018 – 10/05/2018 (7 days)
  - Final Post for Approval: 9/28/2018 – 10/09/2018 (7 days)
- Staff Leader: Clayton Mayfield (cmayfield@spp.org)
- Working Group Approval: TWG

Economic Model Conversion to Powerflow (BA Reliability Models)

- Start: 8/2/2018
- End: 11/13/2018 (Member's Final Approval)
- LP&L End: 11/20/2018 (Member's Final Approval)
- Member Review Time:
  - Reactive Settings Review: 10/17/2018 – 10/24/2018 (5 days)
  - TWG Review/Approval: 11/07/2018 – 11/13/2018 (4 days)
  - LP&L – TWG Review/Approval: 11/14 – 20/2018 (4 days)
- Staff Leader: Kelsey Allen (kallen@spp.org)
- Working Group Approval: TWG

Base Reliability Needs Assessment

- Start: 8/2/2018
- End: 1/7/2019

- Staff Leader: Jason Speer (jspeer@spp.org)

BA Reliability Needs Assessment

- Start: 11/13/2018
- End: 1/7/2019
- Staff Leader: Jason Speer (jspeer@spp.org)

Economic Needs Assessment

- Start: 11/07/2018
- End: 1/7/2019
- Staff Leader: Nikki Roberts (nroberts@spp.org)

Public Policy Needs Assessment

- Start: 11/13/2018
- End: 1/7/2019
- Staff Leader: Nikki Roberts (nroberts@spp.org)

Operational Needs Assessment

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

Short Circuit Needs Assessment

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

DPP Window

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

Staff Solutions Development

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

DPP/Solutions Evaluations

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

Initial Reliability Portfolio Development

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

Project Grouping – Phase 1 (Conceptual Cost Estimate)

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

Study Cost Estimates – Round 1

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

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

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

Planning Summit

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

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

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

Study Cost Estimates – Round 2

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

Final Reliability Portfolios Development

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

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

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

Project Grouping – Final Determination

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

Optimization

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

Portfolio Consolidation

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

Project Staging

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

Benefit Metrics Calculation

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

Stability Analysis

- Start: 8/5/2019
- End: 8/26/2019
- Staff Leader: Chris Jamieson (cjamieson@spp.org)

Sensitivity Analysis

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

Final Reliability Assessment

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

Rate Impacts/ATRR

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

Final Report

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

TWG/ESWG Final Approvals

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

MOPC and SPP Board

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


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2019 ITP Target Area Analysis

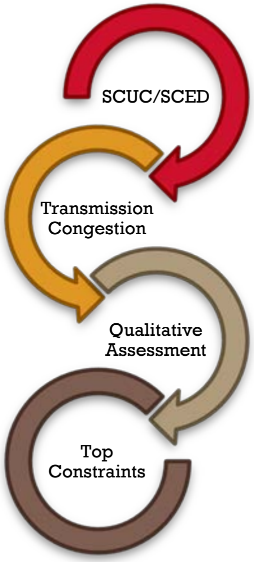
Nikki Roberts

Objective

- Review Economic Assessment methodology
- Discuss Target Area identification and analysis for the 2019 ITP Study
- ***Goal:*** Determine one Target Area to analyze in the 2019 ITP

Economic Needs Assessment Overview

- Identify the top areas of known or forecasted congestion for each future and study year
- Group/relate economic needs based on criteria in ITP Manual



Economic Needs Identification

1. Binding constraints will be ranked from highest to lowest congestion score.

2. Reduce binding constraint list to congested flowgates that have greater than $50k/MW in annual flowgate congestion score. Additional constraints may be included if SPP determines the inclusion would better define an economic need overall.

3. Constraints with monitored elements not interconnected with the SPP transmission system that provide less than $1 million in annual potential benefit to SPP will be removed unless SPP determines the constraints are related to a target area or a historically congested market-to-market flowgate and warrant further analysis.

ITP Manual: Target Areas

- ITP Manual section 4.1.2 describes potential analysis of "target areas", or areas of increased focus with additional analysis

Target Areas

- Top constraints will be evaluated based on criteria in ITP manual section 4.1.2 and may result in Target Area(s)
- High-Level Scopes for Target Areas will be developed, as needed, and posted with the Needs List. Scopes may include:
  - Additional benefit metrics
  - Economic and Reliability Sensitivities (resource plan impacts, load forecasts, fuel prices, etc)
  - Impact of Op Guides/Transmission Operating Directives (TOD)
  - Other analysis deemed necessary to realize potential benefits (e.g. stability analysis)
- Any additional analysis will be performed on top-ranking solutions identified as a result of project screening

Target Area Considerations

- Top Congested Flowgate
- Related to another flowgate(s)
- Identified as an Operational Issue or congested in Integrated Marketplace
- Identified as an RCAR Issue
- Identified as a Seams Issue
- Identified as an Operational, reliability, and/or Policy Need
- GI/TSS study queue limitations
- Located in limited capacity transmission corridor
- PTDF represents thermal, stability, or contractual limitations
- Facilities are thermally limited by terminal equipment

2017 ITP10 Alternative Project Analysis

- Certain transmission issues identified under scope and out of scope criteria were posted for informational purposes to allow for submittal and further evaluation of projects that may support SPP initiatives
  - RCAR II
  - Seams
  - Operational issues
- Two target areas for alternative project recommendations that included additional analysis on top-ranking solutions
  - Eastern Seams
    - Hydro Generation Dispatch Sensitivity Impact
    - FCITC sensitivity for CUS load growth
  - Texas Panhandle
    - Potential Avoided Reliability
    - Resource Plan, Load, and Fuel Sensitivities

2019 ITP Potential Target Area

- Southeast Kansas/Southwest Missouri
  - Stability concerns at Wolf Creek
  - Expected steady-state reliability violations
  - Congested flowgates in area
  - Active TWG Action Item to address issues in the area
  - Potential Economic and Stability analysis presented to TWG and ESWG in October
    - APC benefit savings through removal of Wolf Creek TOD, reduction of marginal energy losses, and mitigation of transmission outages
    - Avoided reliability cost savings
    - Angular stability analysis

Additional Candidates

- Central/Eastern Oklahoma
  - Cleveland 138 kV Tie
  - Kerr – Maid 161 kV
- Central Kansas
  - Lawrence Energy Center – Midland 115 kV
- Southeast Oklahoma
  - Hugo – Valiant 138 kV
  - South Brown - Russett 138 kV

- Staff has not determined the need for additional analysis for these areas.
- Staff is asking for feedback/discussion today

Next Steps

- Recommendation for 2019 ITP Target Area(s) will be presented at December working group meetings.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2019 ITP APC Implementation

Chris Jamieson

November 14-15, 2018

Objective

- Review March 2018 ESWG approved motions to address concerns regarding who benefits from and who pays for transmission through the ITP
- Review and Finalize 2019 ITP implementation of ESWG approved motions
- Review APC Zones and APC Zonal Calculation for 2019 ITP to post for stakeholders prior to DPP window
- Review Regional APC benefit calculation for 2019 ITP Economic Project Solution Development

Background:

- Adjusted Production Cost Savings Metric
  - Benefit Metrics Manual https://www.spp.org/Documents/44031/Benefit%20Metrics%20Manual.doc
    - Details APC Calculation for a Zone with example
    - Details quantifiable monetary savings captured by APC Calculation
    - Section 2.2.3 Covers Limitations of the Standard APC Benefit
      - "The calculation of APC is based on a number of simplifying assumptions regarding the extent to which congestion costs can be hedged through auction revenue rights (ARRs) in a day 2 market environment. For example, it assumes congestion between owned generations and load can be fully hedged while none of market-based purchases would be hedged."
    - Does not detail how production cost modeling tool outputs are used to calculate APC by Zone or by Region
- March 2018 ESWG approved motions impact Adjusted Production Cost Savings Metric

March 2018 ESWG Approved Motions

March 2018 ESWG approved motions

Approved motion	Implementation
1. Sales from generators that are included in the rates of a load serving entity should be included in the APC calculation of each zone	✓
2. To keep the assumption that future proxy wind will not have transmission service, based on current trends, and will not be included in a load serving entity's rates	✓
3. To apply the implementation of the following assumptions to all existing resources: Sales from generators that are included in the rates of a load serving entity should be included in the APC calculation of each zone	✓
4. To apply the implementation of the following assumptions to all existing resources: All generation without firm transmission service to load should be subject to generator LMP price	Discuss SPP Staff Recommendation for 2019 ITP
5. To assume that proxy conventional and solar generation will obtain transmission service and through those arrangements will be included in a load serving entity's rates	✓

ESWG Approved Motions Implementation

2019 ITP implementation of ESWG approved motions

- Motion:
  - 1. and 3. Approved a motion that sales from generators that are included in the rates of a load serving entity should be included in the APC calculation of each zone
- Implementation:
  - Economic model structure includes generator ownership records that assigns owned and purchased generation to APC zones with load
  - Economic model structure includes generator ownership records that assigns merchant generation to the SPP Other APC zone without load
- Motion:
  - 2. Approved a motion to keep the assumption that future proxy wind will not have transmission service, based on current trends, and will not be included in a load serving entity's rates
- Implementation:
  - Economic model structure includes generator ownership records that assigns proxy wind generation to the SPP Other APC zone without load

2019 ITP implementation of ESWG approved motions

- Motion:
  - 5. Approved a motion to assume that proxy conventional and solar generation will obtain transmission service and through those arrangements will be included in a load serving entity's rates
- Implementation:
  - Economic model structure includes generator ownership records to assign proxy conventional and solar generation to APC zones with load

2019 ITP implementation of ESWG approved motions

- Motion:
  - 4. Approved a motion to apply the implementation of the following assumptions to all existing resources:
    - All generation without firm transmission service to load should be subject to generator LMP price
- Implementation Cost versus Benefit Concerns:
  - Adds complexity to the calculation that will make it difficult for staff to maintain each cycle and stakeholders to replicate
  - Implementation needs to appropriately scoped and approved by ESWG then memorialized in the Benefit Metric Manual
  - Applies to a small percentage of load serving entities' owned and purchased generation
    - In general, subjecting low cost generation to LMP prices increases the SPP Regional benefit of transmission projects that relieve congestion
- SPP Staff Recommended Implementation for 2019 ITP:
  - Continue with simplifying assumptions in the approved Benefit Metric Manual for the Adjusted Production Cost Savings Metric regarding the extent to which congestion costs are hedged.
    - For example, assume owned and unit-specific purchased generation has or will have transmission service.

2019 ITP APC Zones and APC Zonal Calculation

SPP's APC Zones (Internal)

Pricing Zones (SPPMAIN)

- AEPWALL
- SPCIUT(CUS)
- EMDEALL
- GMOALL
- GRDA
- IS(UMZ)
- KCPLALL
- LES
- MIDWALL
- MKECALL
- NPPDALL
- OKGEALL
- OPPDALL
- SUNCALL
- SWPSALL
- SWPA
- WFECALL
- WESTALL(WR)

Other Zone with SPP Load

- KACY

SPP Other Zone with no SPP Load (SPPINFO)

- OTHSPP
  - Informational Zone Only
  - Includes Merchant Generation and Proxy Wind
  - APC = 100% production cost minus sales to other zones (revenue)

2019 ITP APC Zonal Calculation

- 2017 ITP10 Zonal APC Benefit Calculation posted here
  - Details how PROMOD production cost modeling tool outputs are used to calculate Zonal APC for stakeholders to replicate
- 2019 ITP Zonal and Regional APC Calculation will be posted prior to DPP window (See Background Materials- 6c. 2019 ITP APC Calculation_Draft.docx)

SPP

2019 ITP Regional APC Benefit Calculation

SPP Regional APC Benefit

- Used for Economic Project Solution Development
- SPP Regional APC Benefit of Transmission = SPP Regional APC Before Transmission Addition – SPP Regional APC After Transmission Addition
- SPP Regional APC = ∑ of APC Zones with Load
- ∑ of APC Zones with Load = $\sum APC_{SPPMAIN} + \sum APC_{KACY}$
- Excludes APC Informational Zone for Merchant Generation and Proxy Wind

Appendix

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

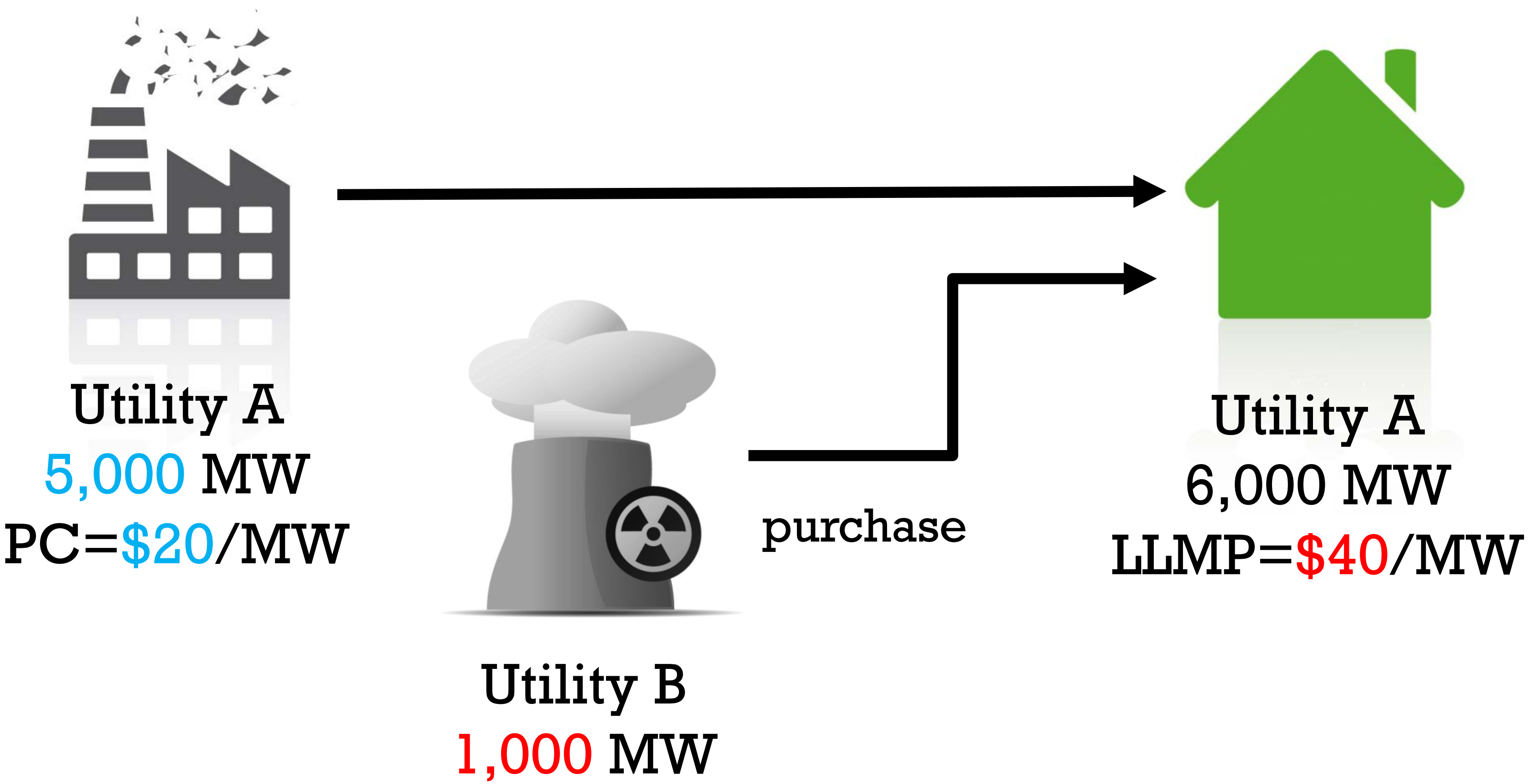
- Production Cost ($)
  - Production Cost ($) = Unit Cost ($) + Billing Cost ($)
  - Unit Cost is the cost of fuel and O&M (i.e. conventional generation)
  - Billing Cost is the cost of transactions (i.e. renewable generation)
- Purchases ($)
  - APC ($) = Production Cost ($) + Purchases ($) – Sales ($)
  - Purchases ($) = 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

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

Adjusted Production Cost Example



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

Southwest Power Pool

APC Zonal Calculation

This document details the APC fields and formulas used in the 2019 ITP study. The bolded parameters below are PROMOD output reporting parameters, with filters applied as indicated.

Adjusted Production Cost (APC) = Production Cost $ + Purchases $ - Sales $

- Production Cost $ = **Unit Cost ($)** + **Billing Cost ($)** + ($1000)* **Emergency Energy (MW)**, by hour, by zone
    - Remove "PowerBase Tariffs" from Billing Cost ($)
    - The $1000 is the soft constraint for emergency generation in the 2019 ITP
- Sales $ = Sales (MW) * GLMP, by hour, by zone
    - Sales (MW) = **Unit Gen (MW)** + **Contract Participation Energy1 (MW)** + **Emergency Energy (MW)** – **Area Native Load (MW)** – **Pumping Energy (MW)** – **Dump Energy (MW)**
        - Remove "PowerBase Tariffs" from Contract Participation Energy1 (MW)
        - If negative, set Sales (MW) to zero for that hour (net purchases).
    - GLMP = (**Unit Revenue ($)** + **Transaction Market Value ($)**) / (**Unit Gen (MW)** + **Contract Participation Energy2 (MW)**)
        - For Transaction Market Value ($), remove "PowerBase Tariffs", and include only "Purchases", exclude "Sales" (PurchSale is the name of the field in Report Agent)
        - For Contract Participation Energy2 (MW), remove "PowerBase Tariffs", and include only "Purchases", exclude "Sales" (PurchSale is the name of the field in Report Agent). *Note that this is different than the Contract Participation Energy1 from Sales MW calculation, though same query from PROMOD output files.*
    - $1000 is the soft constraint in PROMOD used for emergency energy. This is set equal to the safety-net energy offer cap in SPP's Integrated Marketplace.

- Purchases $ = Purchases (MW) * LLMP, by hour, by zone
    - Purchases (MW) = **Area Native Load (MW)** + **Pumping Energy (MW)** + **Dump Energy (MW)** – **Unit Gen (MW)** – **Contract Participation Energy1 (MW)** – **Emergency Energy (MW)**
        - Remove "PowerBase Tariffs" from Contract Participation Energy1 (MW)
        - If negative, set Purchases (MW) to zero for that hour (net sales).
    - LLMP is automatically calculated by PROMOD for each area – it is the hubs that begin with LS.

APC Calculation for SPP Region

SPP Economic Model Region	SPP APC Pricing Zone(s)	Other SPP APC Zone(s) with Load	SPP Information Zone(s) without Load
SPP	AEPWALL EMDEALL GMOALL GRDA IS (UMZ) KCPLALL LES MIDWALL MKECALL NPPDALL OKGEALL OPPDALL SPCIUT (CUS) SUNCALL SWPAALL SWPSALL WESTALL WFECALL	KACY	OTHSPP – Includes Merchant Generation without contractual arrangements with load serving entities and additional Renewable Resource Plan Wind Resources
SPP Regional APC Calculation = Sum of APC Pricing Zone(s) + Other APC Zone(s) with Load			

APC Calculation for External Regions

Economic Model Region	APC Zone(s)	Region APC Calculation
AECI	AECI	AECI Regional APC = AECI APC Zone
MISO	ALTWALL ATC BASINMSO DPC GRE MDU MEC MISOC MISOE MISOS MP MPC MPW MRESMISO NSP OTP SMP	MISO Regional APC = Sum of MISO APC Zones
MRO	MHEB	MRO Regional APC = MHEB APC Zone
TVA	TVA	TVA Regional APC = TVA APC Zone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2019 ITP Issues & Impacts

Juliano Freitas

November 14, 2018

Objective

- Discuss staff-identified issues
- Proposed mitigation with TWG and ESWG

Issue 1 - Station Service Load

- Revised load review used in Pass 4 economic model review incorrectly identified loads as station service loads
  - Process is to turn off station service loads due to economic model generation maximum capability based on net generation capability
  - Powerflow model based on gross generation capability
- Occurred after approved Gen and Load review and Resource Plan milestones
- Impacts:
  - Approved Economic Model Build and Constraint Assessment
  - BA Reliability Model (Market Powerflow) Build, BA Reliability Needs Assessment, Economic and Policy Needs Assessment
  - Lubbock Sensitivity models

SPP Proposed Mitigation for Issue 1 – Economic Model

- Revise Economic Models
  - Update load review to account for loads misidentified as station service loads
  - Adjust F2 increase energy for load changes
  - Adjust load specific hubs for re-instated load buses
- Keep approved Constraint Assessment results
  - Reliability hours did not change
  - Approved constraints already capture expected top congestion
  - BA Reliability (Market Powerflow) Model can be used as a substitute for on- and off-peak portion of Constraint Assessment by identifying BA Reliability Needs that can be reclassified as Economic Needs in accordance with the ITP Manual
- Restart BA Reliability (Market Powerflow) Model Build
- DPP Window remains the same

Issue 2 – Rayburn Country Electric Coop (RCEC) Load Forecast

- Forecasted load data supplied to the 2019 ITP powerflow models and load review for RCEC was zero MW
  - SPP staff deemed it to be a reasonable forecast before finalizing the 2019 ITP powerflow model and load review in January 2018, given:
    - Attachment AQ study had been completed to abandon delivery points
    - Public Utility Commission of Texas proceedings were underway to process RCEC exit from SPP and move to ERCOT
- Impacts:
  - Approved Base Reliability powerflow model, approved Gen and Load review, and approved Resource Plans, approved Market Economic Model, approved Constraint Assessment, and approved BA Reliability (Market Powerflow) Model
  - Base and Market Reliability Needs Assessment, Economic Policy Needs Assessment, and 2019 TPL assessment
  - Lubbock Sensitivity models
- Similar to Lubbock load forecast discussion and scope decisions

SPP

SPP Proposed Mitigation for Issue 2

- Based on tariff obligations to firm service, SPP staff has updated the Base Reliability powerflow with RCEC included and performed an ad hoc Base Reliability needs assessment sensitivity
  - No new criteria violations were identified
- Review and vet policy options regarding exiting loads for 2020 ITP study

SPP Recommendation

SPP recommends approving the models as posted and proceeding with the SPP proposed mitigation plan for Issue 1 (slide 5) and Issue 2 (slide 7) to allow the 2019 ITP DPP Window to stay on schedule to open January 8

Appendix

Issue 1 - Demand Group Load Impacts

Demand Group	21S (MW)	24S (MW)	29S (MW)
Golden Spread Electric Coop	10.6	10.6	10.5
Grand River Dam Authority	22	22	22
Kansas City Board of Public Utilities	5.3	5.4	5.4
Kansas City Power & Light Co.	12.5	11.6	12
Mid-Kansas Electric Co. LLC	63.5	63.9	64.5
Midwest Energy Inc.	6.9	7.2	7.6
Oklahoma Municipal Power Authority in AEPW	11.4	11.5	11.6
Oklahoma Municipal Power Authority in OKGE	13.7	14	14.6
Oklahoma Municipal Power Authority in WFEC	11.4	11.5	11.7
Southwestern Electric Power Company	15.9	16.3	16.8
Southwestern Power Administration	287.3	293	304
Southwestern Public Service Company	235	238	241.1
Sunflower Electric Power Corp.	14.7	14.9	15.1
Westar Energy	83.3	85.5	88.8
Total	793.5	805.4	825.7


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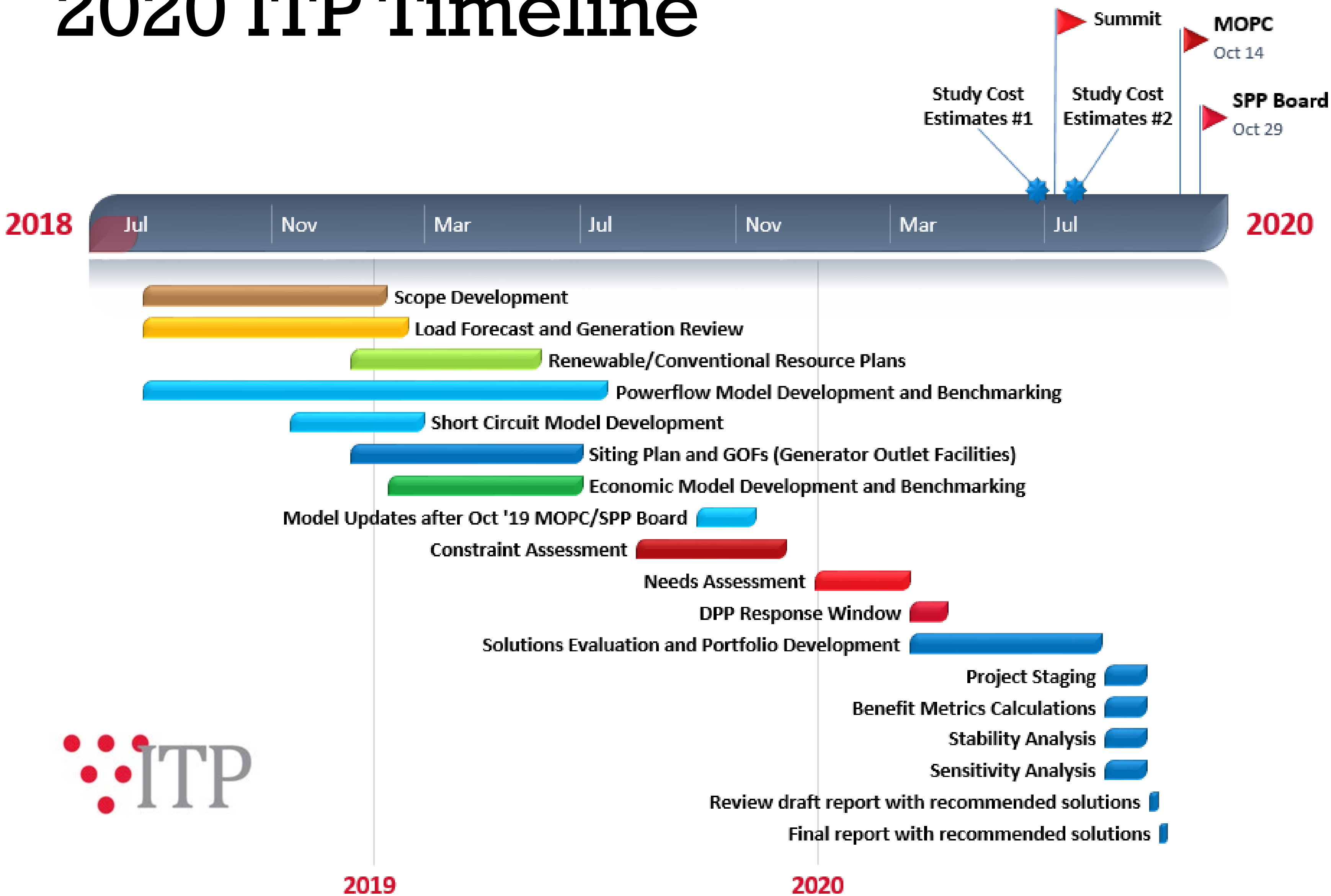
2020 ITP Schedule

Juliano Freitas

November 14, 2018

2020 ITP Timeline



Scope Development

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

Powerflow Model

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

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Short Circuit Model

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

Load Review

- Start: 7/23/2018
- End: 2/15/2019 (Member's Final Approval)
- Member Review Time:
  - *Load Pass 1: 9/17/2018 – 9/28/2018 (10 days)*
  - Load Pass 2: 10/15/2018 – 10/26/2018 (10 days)
  - Load Pass 2 Update*: 10/18/2018 – 10/31/2018 (10 days)
  - Load Pass 3: 11/26/2018 – 12/07/2018 (10 days)
  - **Final Data Submission Deadline: 1/11/2019**
  - Final Posting for Approval: 2/08/2019 (7 days)
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG and ESWG

* Posting based on approved ESWG items

Generation Review

- Start: 7/23/2018
- End: 2/15/2019 (Member's Final Approval)
- Member Review Time:
  - *Gen Pass 1: 9/17/2018 – 9/28/2018 (10 days)*
  - RAR & Waiver Request to Stakeholders: 9/21/2018 – 10/26/2018 (25 days)
  - Gen Pass 2: 10/15/2018 – 10/26/2018 (10 days)
  - Gen Pass 2 Update*: 10/18/2018 – 10/31/2018 (10 days)
  - Gen Pass 3: 11/26/2018 – 12/07/2018 (10 days)
  - **Final Data Submission Deadline: 1/11/2019**
  - Final Posting for Approval: 2/08/2019 (7 days)
- Staff Leader: Theva Coleman (tcoleman@spp.org)
- Working Group Approval: TWG and ESWG

* Posting based on approved ESWG items

Renewable Policy Review

- Start: 2/01/2019
- End: 2/22/2019 (Member's Final Approval)
- Member Review Time:
  - 2/08/2019 – 2/15/2018 (5 days)
  - 2/18/2019 – 2/22/19 (5 days)

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

Policy Renewable Resource Plan – Phase 1

- Start: 2/22/2019
- End: 3/12/2019 (Member's Final Approval)
- Member Review Time:
  - 3/05/2019 – 3/12/2019 (5 days)

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

Renewable & Conventional Resource Plan – Phase 2

- Start: 2/6/2018
- End: 5/23/2018 (Member's Final Approval)
- Member Review Time:
  - 5/15/2018 – 5/23/2018 (6 days)
- Staff Leader: Antonio Barber (abarber@spp.org)
- Working Group Approval: ESWG


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HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

Conventional Generation Prototypes

EWSG

November 14-15th, 2018

Antonio Barber

Objective

- Seek approval for Conventional Generation Prototypes for the 2020 ITP Scope.

Prototype Data Source Options

- EIA Annual Energy Outlook (AEO) Report
  - Option in 2019 ITP: July 2017 Data
  - March 2018 Data
- Lazard Levelized Cost of Energy Analysis
  - Used in 2019 ITP10: December 2016 data (Version 10.0)
  - November 2017 (Version 11.0)
  - November 2018 (Version 12.0)
- Staff Research
  - Publicly available Integrated Resource Plan (IRP) 2017-2019
  - Member submitted Data

Staff Research

- AEP System
  - AEP Staff
- Entergy Louisiana
  - 2019 Draft Integrated Resource Plan
- City of Dover, Delaware
  - The Energy Authority(TEA)
  - 2017 Integrated Resource Plan (2017 Dover IRP)
- Tucson Electric Power
  - 2017 Integrated Resource Plan
  - Annual Energy Outlook 2017 (August 2016)
  - Levelized Cost of Energy Analysis 10.0 (December 2016)

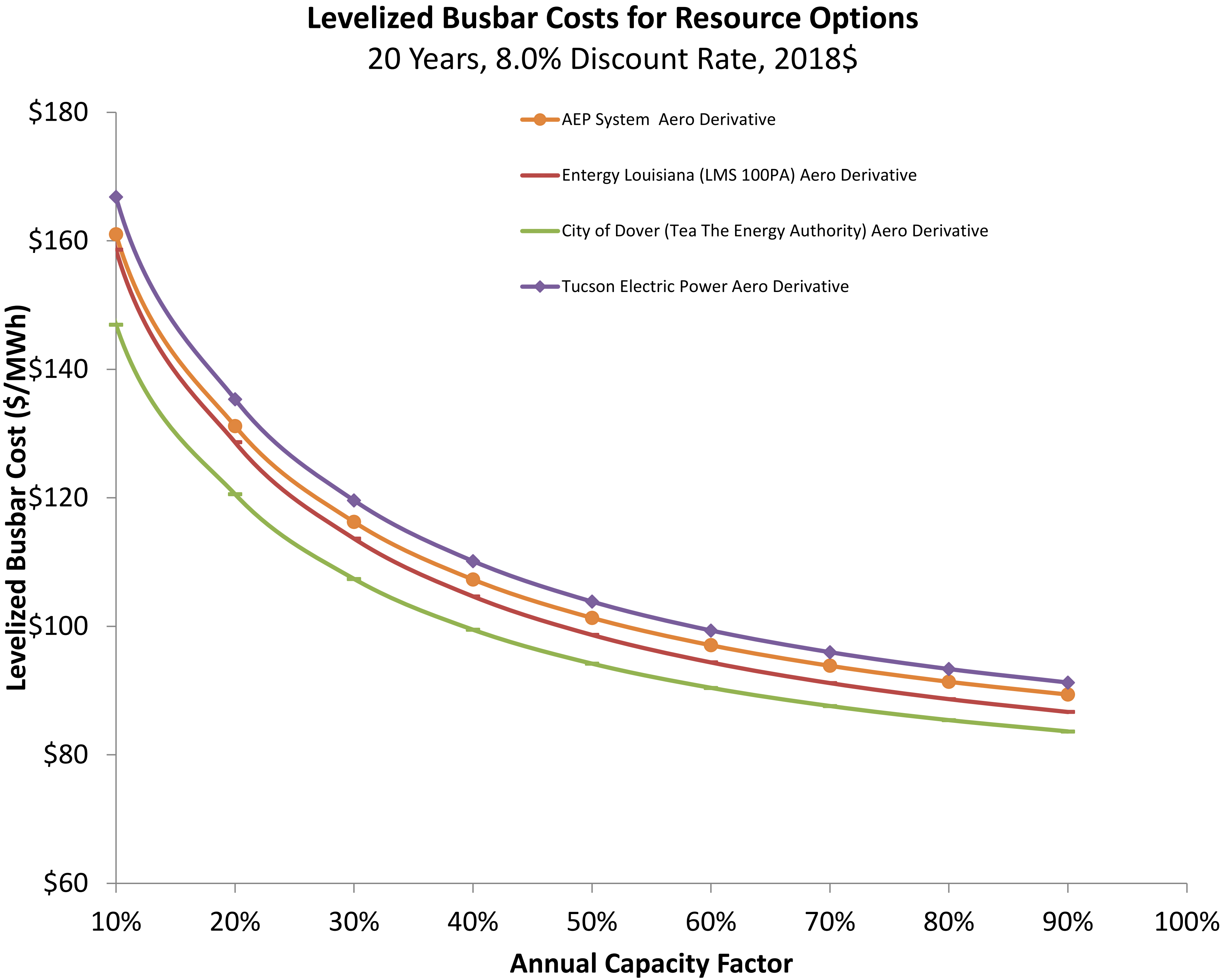
Staff Research

- Capacity short fall after renewables

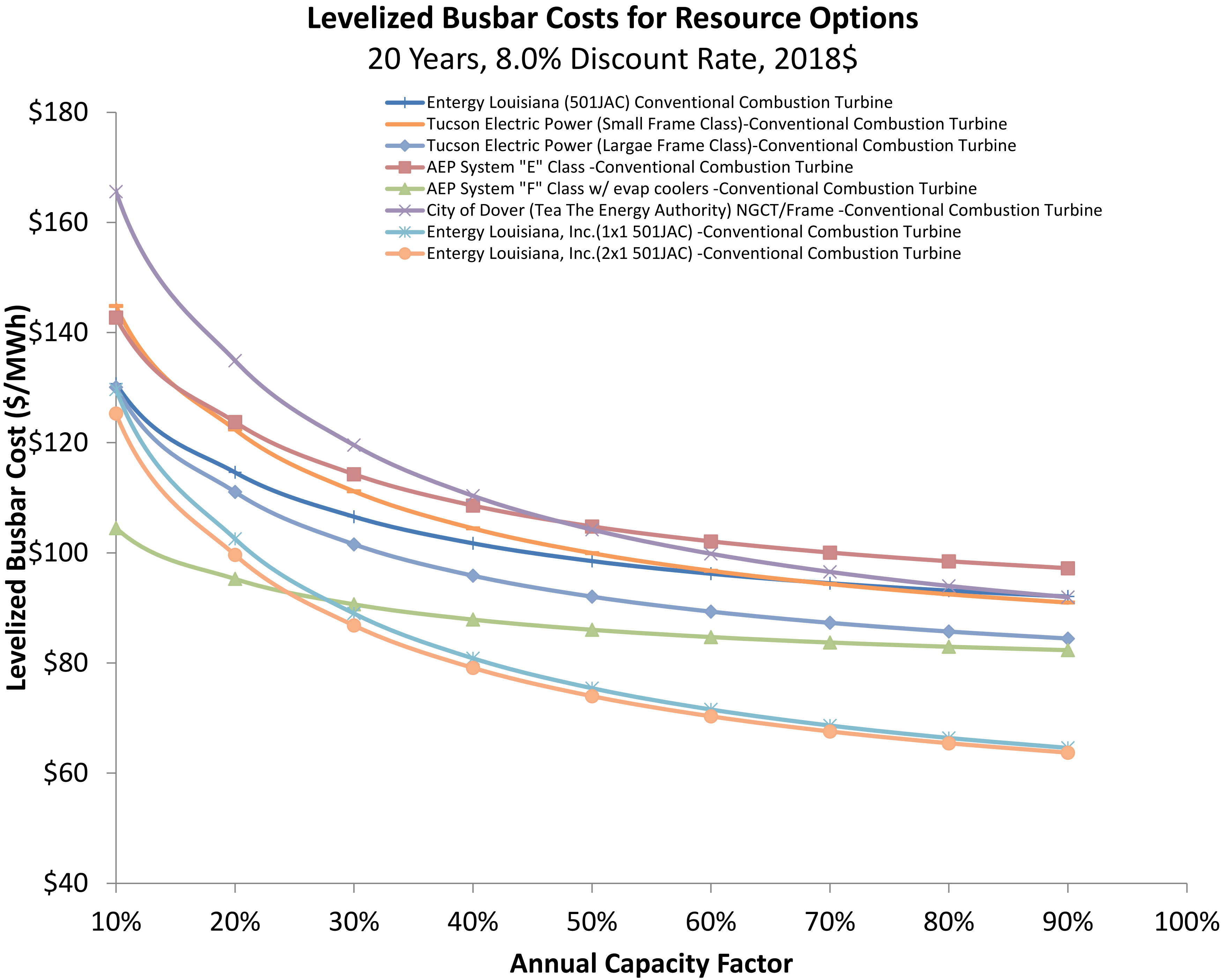
2019 ITP	F1 2025	F1 2030	F2 2025	F2 2030
Sub region (MW)	833	3,235	829	4,378

EIA / Lazard / Staff

Generation Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
Combined Cycle (CC)	EIA AEO'18	Adv.	429	1,136	2.07	10.35	6,300
	EIA AEO'18	Conv.	702	1,007	3.63	11.39	6,600
	Lazard	High	550	1,333	2.05	5.64	6,900
	Lazard	Low	550	718	3.59	6.36	6,133
	Lazard 18	High	550	1,300	2.00	5.50	6,900
	Lazard 18	Low	550	700	3.50	6.00	6,133
	Tucson Electric Power	NGCC	550	1,128	34.82	2.09	7,400
	AEP System	1x1 J Class	540	1,000	10.81	1.97	6,300
	AEP System	2x1 J Class	1080	800	9.16	1.73	6,300
	AEP System	2x1 H Class	1150	700	8.65	1.63	6,300
	City of Dover (Tea The Energy Authority)	NGCC	200	2,050	17.94	2.01	7,400
	City of Dover (Tea The Energy Authority)	HGCC - LMS 100	106	1,538	17.94	2.01	8,600
	Tucson Electric Power	NGCC	550	1,128	34.82	2.09	7,400
Combustion Turbine (CT)	EIA AEO'18	Adv.	237	697	11.08	7.04	9,800
	EIA AEO'18	Conv.	100	1,135	3.57	17.82	9,920
	Lazard	High	50	1,025	10.25	20.50	8,000
	Lazard	Low	241	769	4.82	5.13	9,804
	Lazard 18	High	50	950	10.00	20.00	8,000
	Lazard 18	Low	241	700	4.70	5.00	9,804
	Tucson Electric Power	Small Frame Class	75	820	31.42	3.93	10,500
	Tucson Electric Power	Largae Frame Class	220	666	28.75	3.66	9,900
	AEP System	2 - "E" Class	180	1,200	17.60	3.94	11,700
	AEP System	2 - "F" Class w/ evap coolers	490	718	15.77	6.07	10,000
	City of Dover (Tea The Energy Authority)	NGCT/Frame	100	1,025	17.55	3.51	10,000
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	1x1 501JAC	510	1,269	17.45	3.22	6,400
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	501JAC	300	854	2.91	13.68	9,400
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	2x1 501JAC	1020	1,117	11.40	3.23	6,400
Aero Derivative CT	AEP System	2 - Small Machines	120	1,400	18.93	2.44	9,900
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	LMS 100PA	102	1,582	6.01	2.97	9,397
	City of Dover (Tea The Energy Authority)	NGCT	50	1,281	13.50	4.42	9,000
	Tucson Electric Power	Aeroderivative	45	1,333	30.64	3.66	9,800
	Lazard	High	0.25	1,128	15.38	20.50	10,000
Reciprocating Engines	Lazard	Low	1	666	10.25	15.38	8,000
	AEP System	Recip Engine Farm	220	1,300	6.32	2.61	8,300
	Tucson Electric Power	RICE	100	1,230	12.55	4.70	8,000
	City of Dover (Tea The Energy Authority)	RICE	10	1,128	20.40	6.97	8,200
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	7x Wartsila 18V50SG	128	1,683	32.74	7.48	8,401

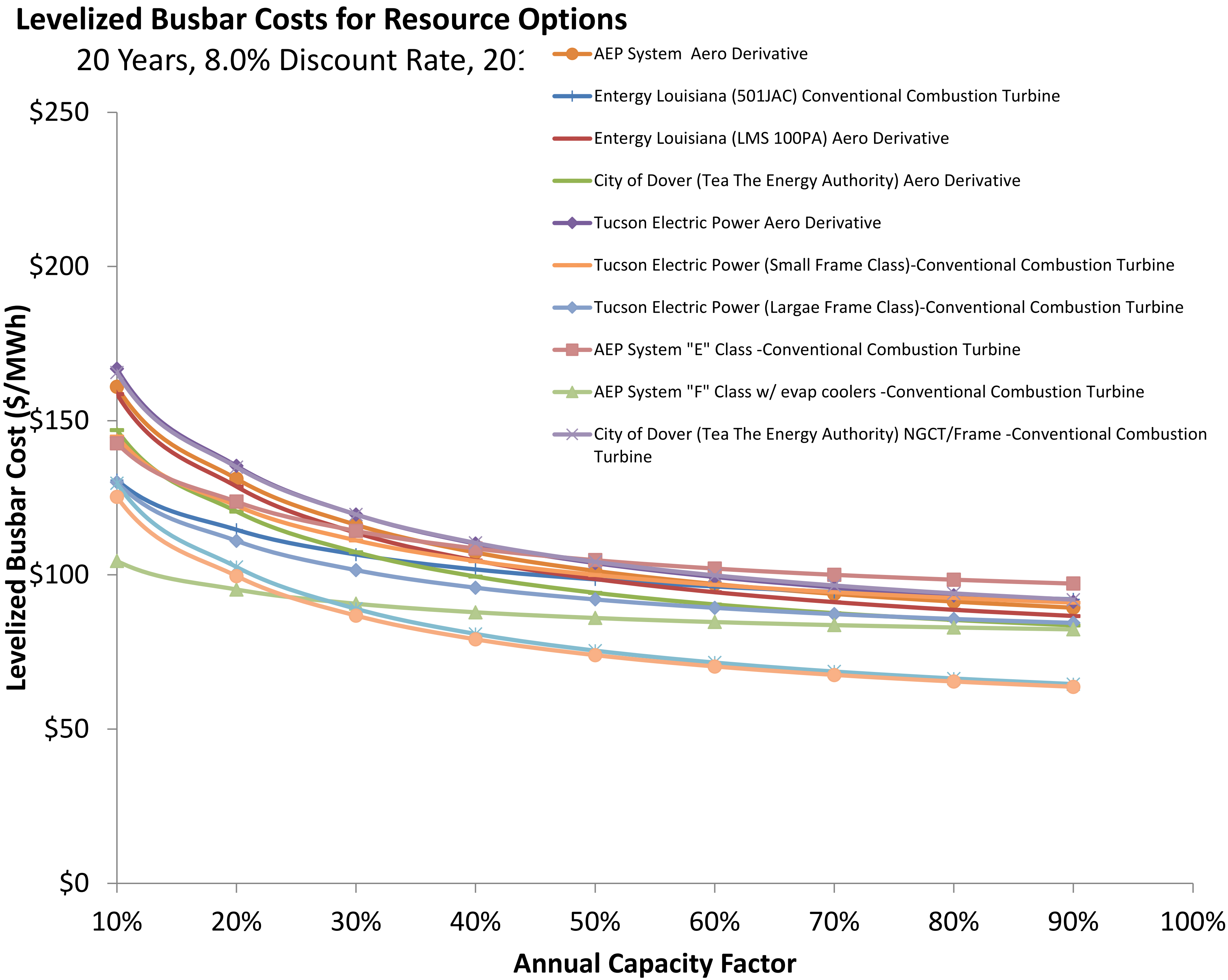


Staff Aero Derivative


Levelized Busbar Costs for Resource Options
20 Years, 8.0% Discount Rate, 2018$
Entergy Louisiana (501JAC) Conventional Combustion Turbine
Tucson Electric Power (Small Frame Class)-Conventional Combustion Turbine
Tucson Electric Power (Largae Frame Class)-Conventional Combustion Turbine
AEP System "E" Class -Conventional Combustion Turbine
AEP System "F" Class w/ evap coolers -Conventional Combustion Turbine
City of Dover (Tea The Energy Authority) NGCT/Frame -Conventional Combustion Turbine
Entergy Louisiana, Inc.(1x1 501JAC) -Conventional Combustion Turbine
Entergy Louisiana, Inc.(2x1 501JAC) -Conventional Combustion Turbine
Levelized Busbar Cost ($/MWh)
$180
$160
$140
$120
$100
$80
$60
$40
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Annual Capacity Factor

Staff CT

SPP



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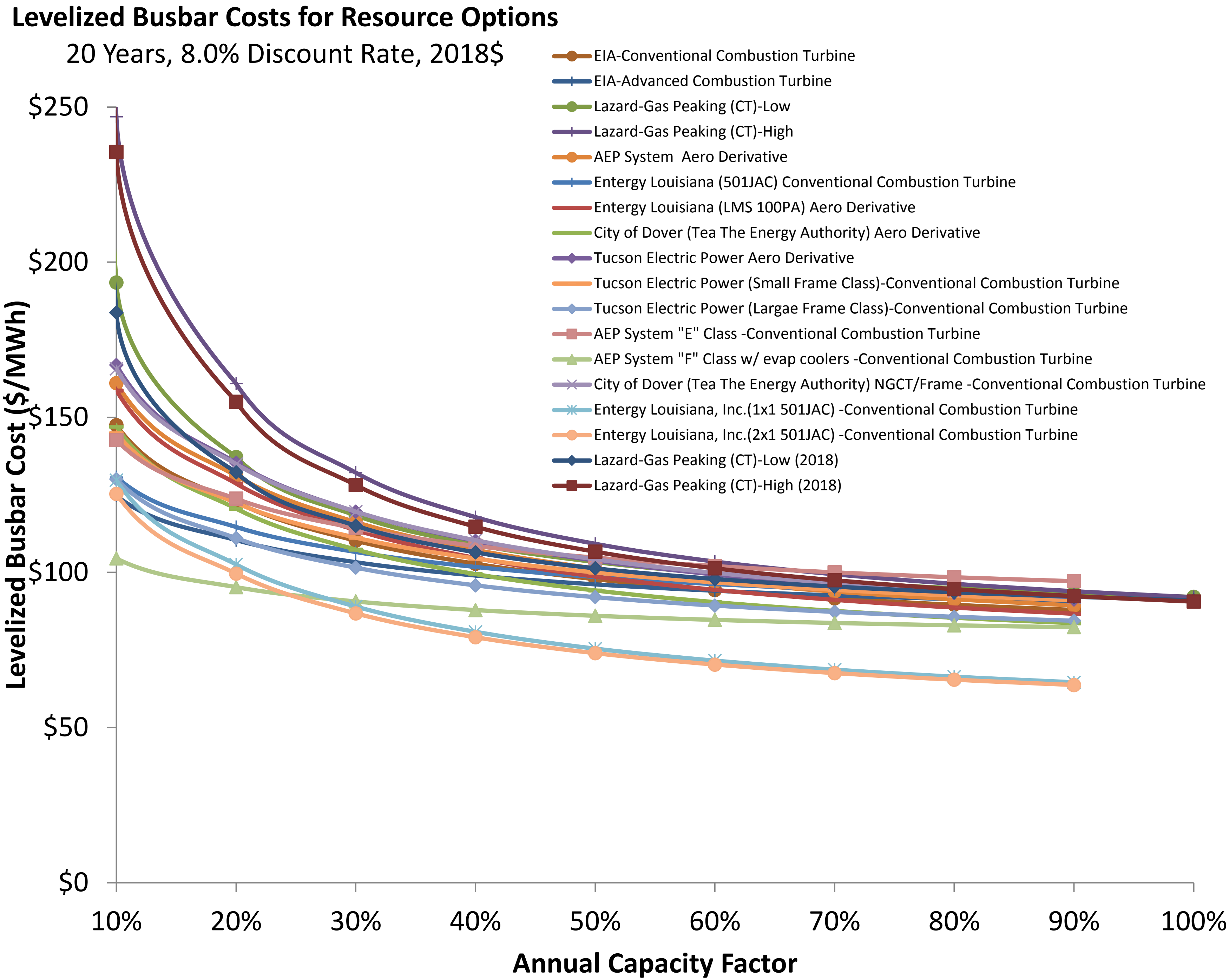
Staff CT / Aero Derivative

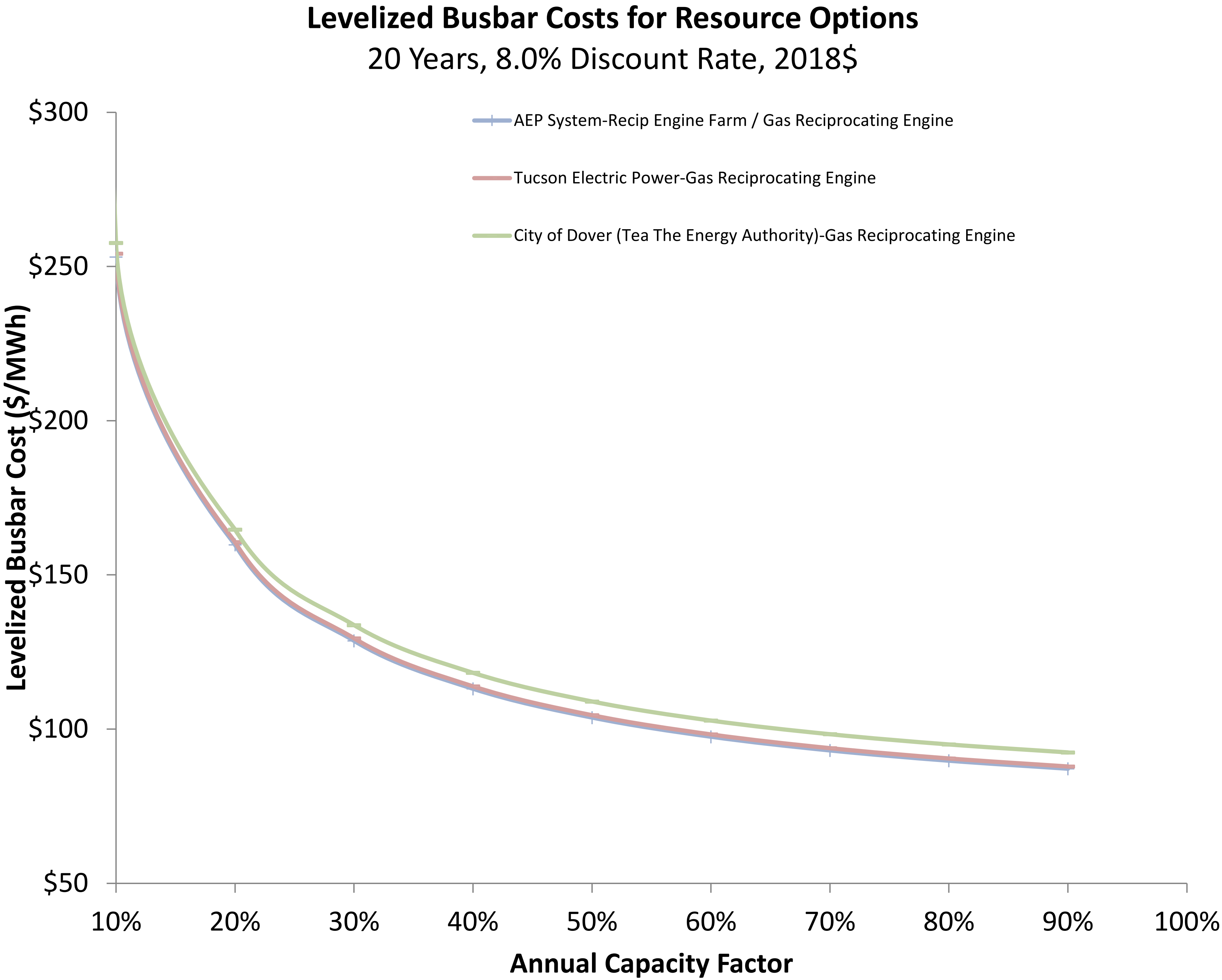
SPP



ITP 2020

ALL CT

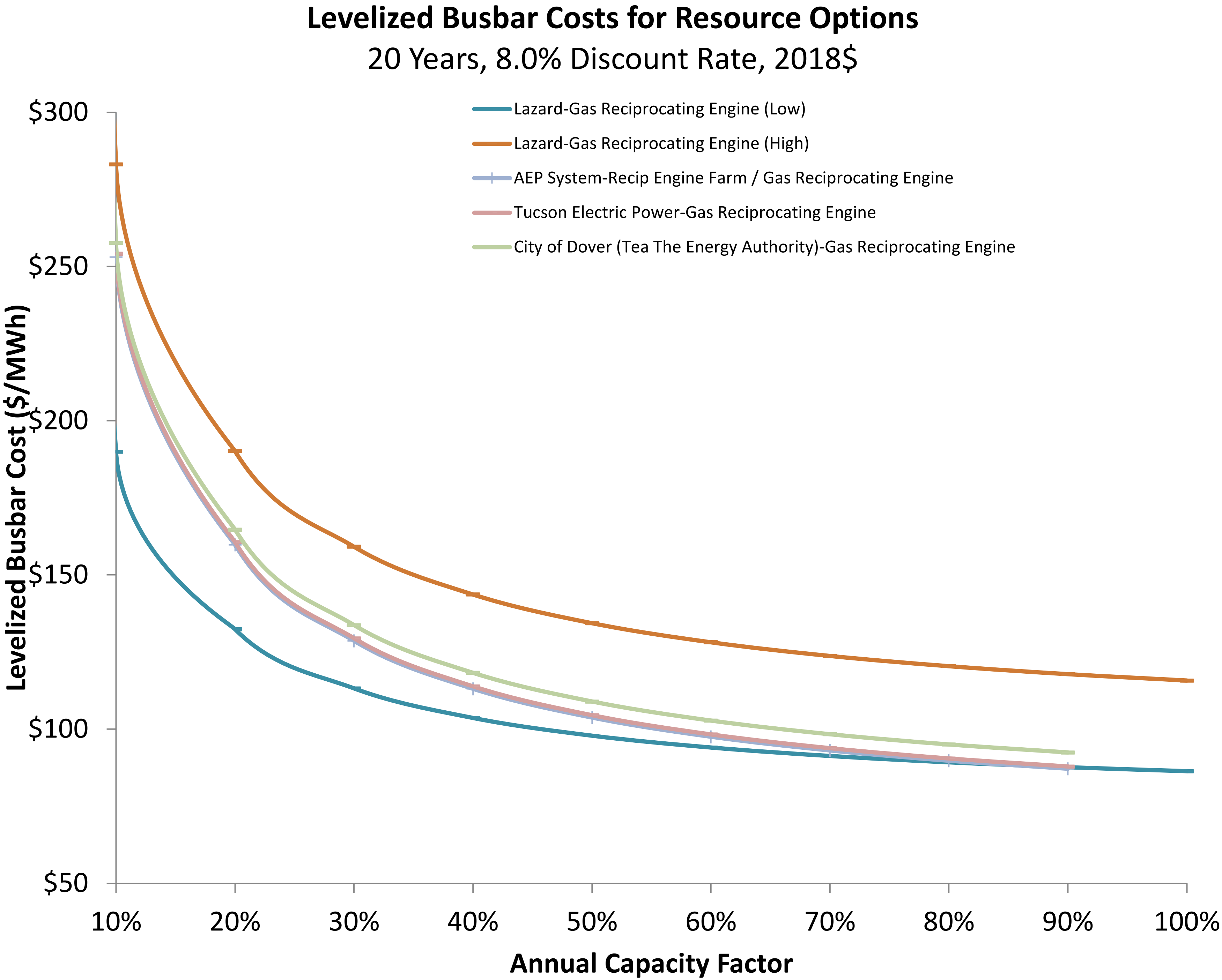
SPP



ITP 2020

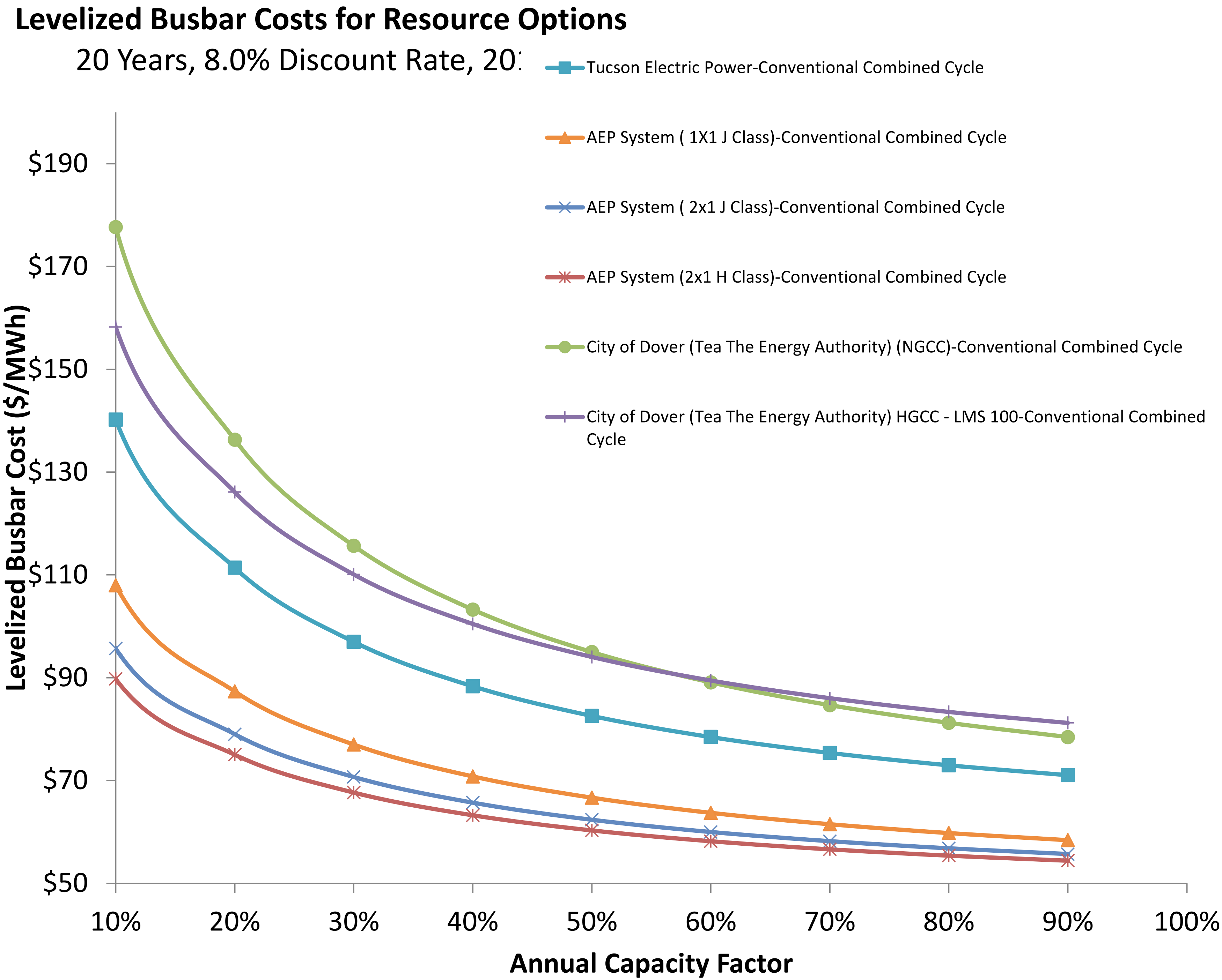
Staff Reciprocating Engines

SPP

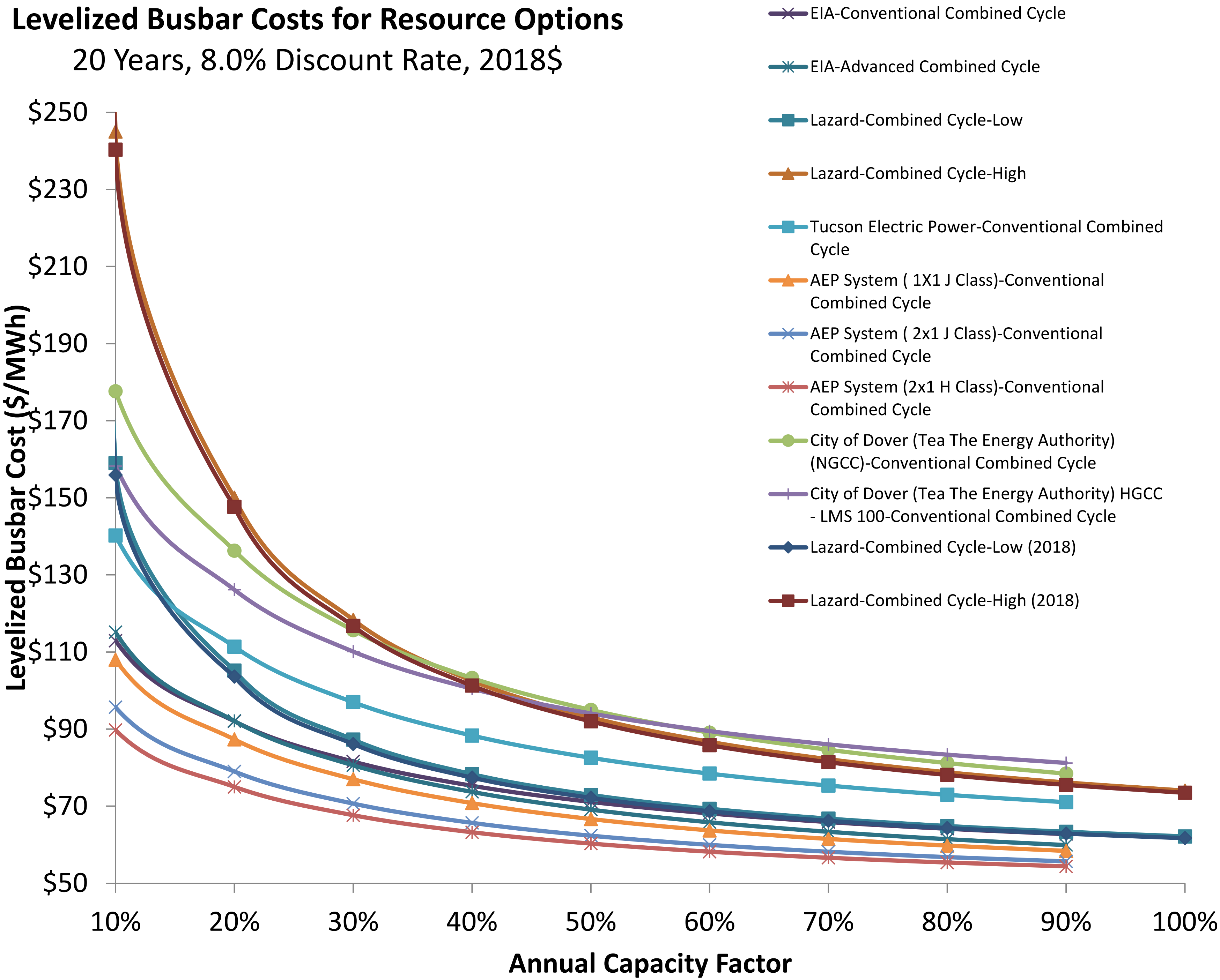


All Reciprocating Engines

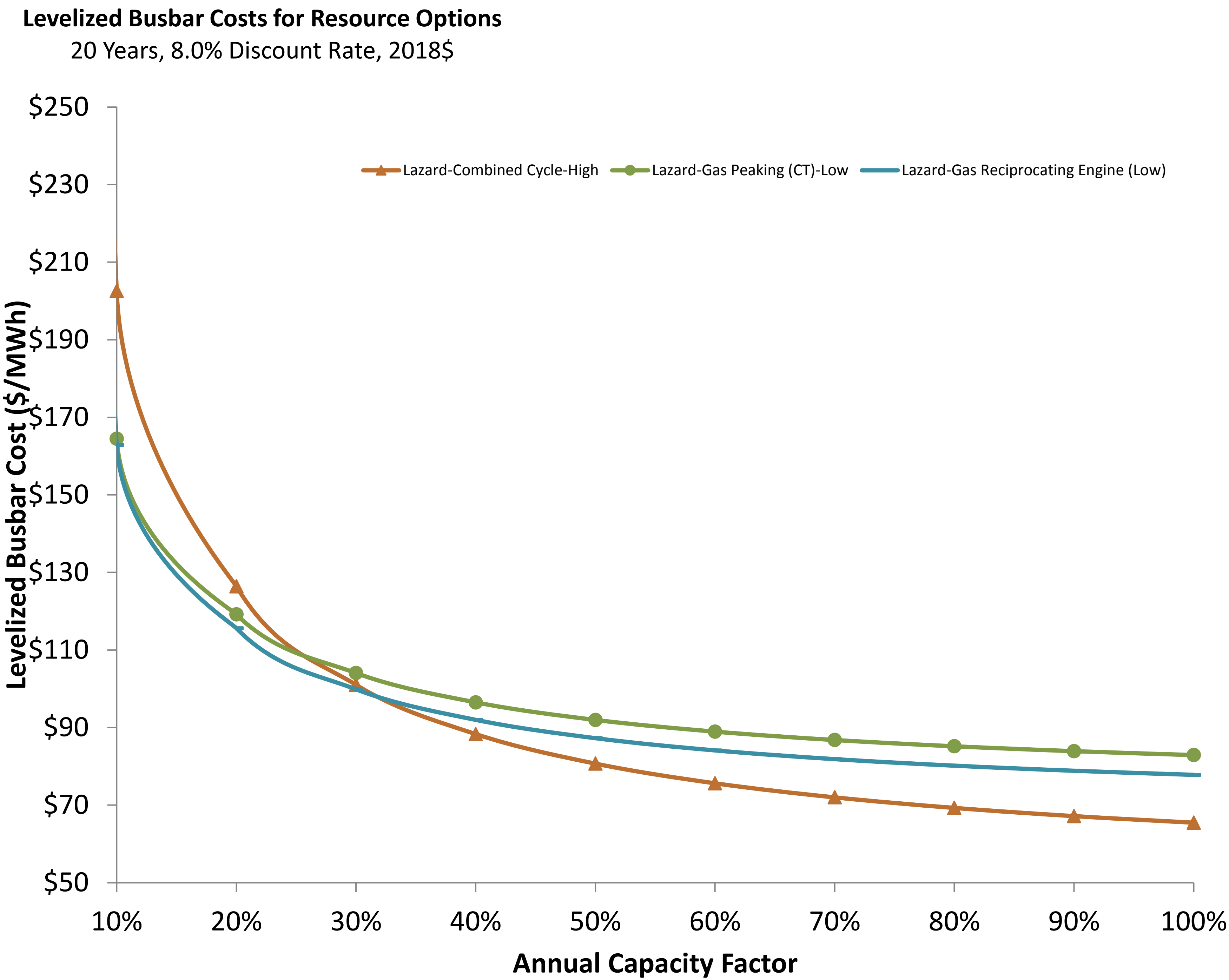
SPP



Staff Combined Cycle

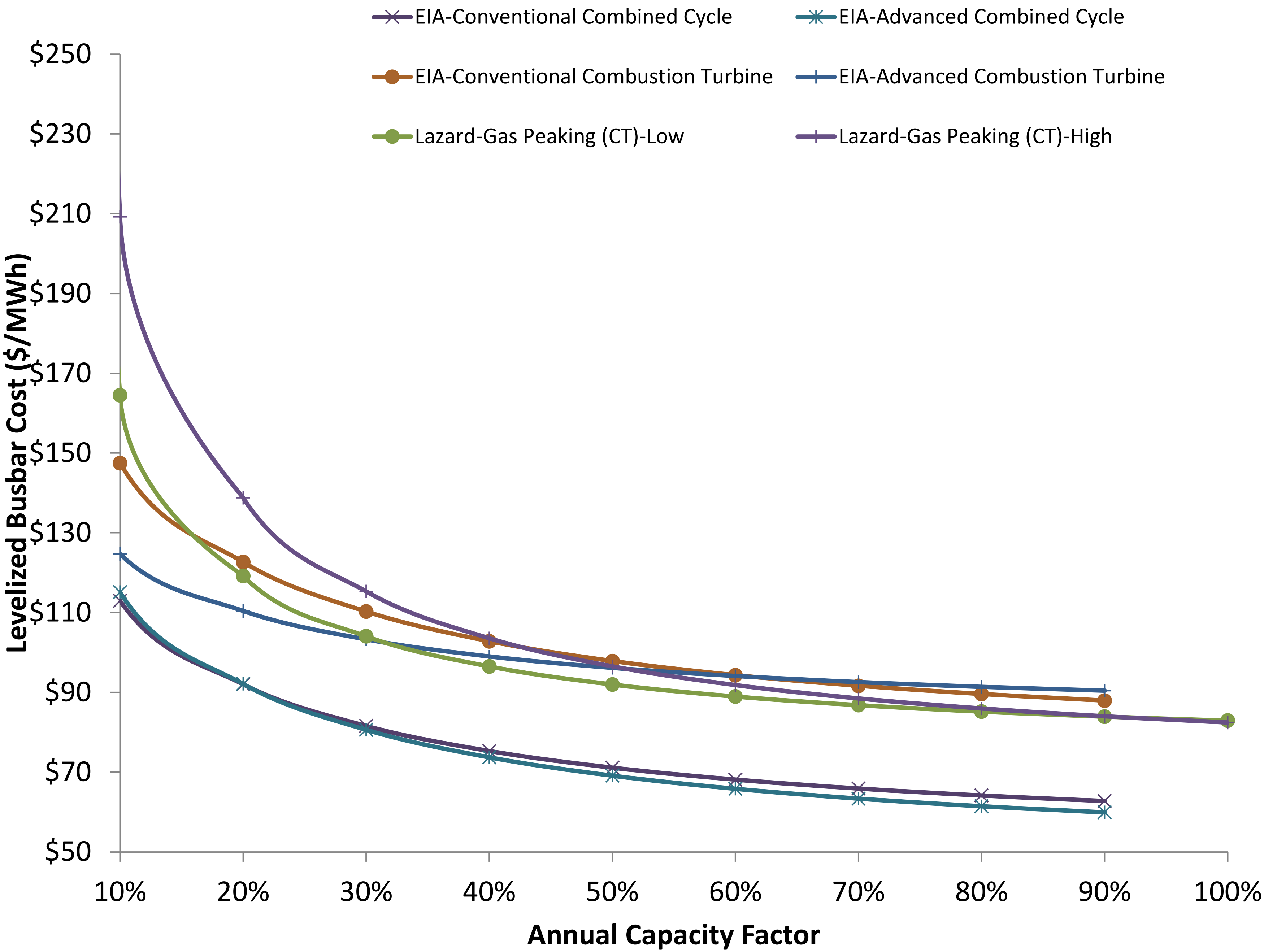


ALL Combined Cycle


Levelized Busbar Costs for Resource Options
20 Years, 8.0% Discount Rate, 2018$
Lazard-Combined Cycle-High
Lazard-Gas Peaking (CT)-Low
Lazard-Gas Reciprocating Engine (Low)
Levelized Busbar Cost ($/MWh)
$250
$230
$210
$190
$170
$150
$130
$110
$90
$70
$50
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Annual Capacity Factor

Levelized Busbar Costs for Resource Options

30 Years, 8.0% Discount Rate, 2018$



SPP

Recommendation

SPP Staff recommends the ESWG approve using Lazard **High** CC, **Low** CT, **Low** reciprocating engines prototypes and eliminating nuclear and coal as options.

Generation Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
Combined Cycle (CC)	Lazard	High	550	1,333	2.05	5.64	6,900
Combustion Turbine (CT)	Lazard	Low	241	769	4.82	5.13	9,804
Gas Recip Engine	Lazard	Low	50	666	10.25	15.38	8,000

Appendix

Gen Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
CC	EIA AEO'18	Adv.	429	1,136	2.07	10.35	6,300
	EIA AEO'18	Conv.	702	1,007	3.63	11.39	6,600
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	Tucson Electric Power	NGCC	550	1,128	34.82	2.09	7,400

Combined Cycle (CC)

SPP

Combustion Turbine / Aero Derivative

Gen Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
CT	EIA AEO'18	Adv.	237	697	11.08	7.04	9,800
	EIA AEO'18	Conv.	100	1,135	3.57	17.82	9,920
	Lazard	High	50	1,025	10.25	20.50	8,000
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	City of Dover (Tea The Energy Authority)	NGCT/Frame	100	1,025	17.55	3.51	10,000
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	City of Dover (Tea The Energy Authority)	NGCT	50	1,281	13.50	4.42	9,000
	Tucson Electric Power	Aeroderivative	45	1,333	30.64	3.66	9,800

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Reciprocating Engines

Gen Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
Recip. Engines	Lazard	High	0	1,128	15.38	20.50	10,000
	Lazard	Low	1	666	10.25	15.38	8,000
	AEP System	Recip Engine Farm	220	1,300	6.32	2.61	8,300
	Tucson Electric Power	RICE	100	1,230	12.55	4.70	8,000
	City of Dover (Tea The Energy Authority)	RICE	10	1,128	20.40	6.97	8,200
	Entergy Louisiana, Inc. 2019 Draft Integrated Resource Plan	7x Wartsila 18V50SG	128	1,683	32.74	7.48	8,401

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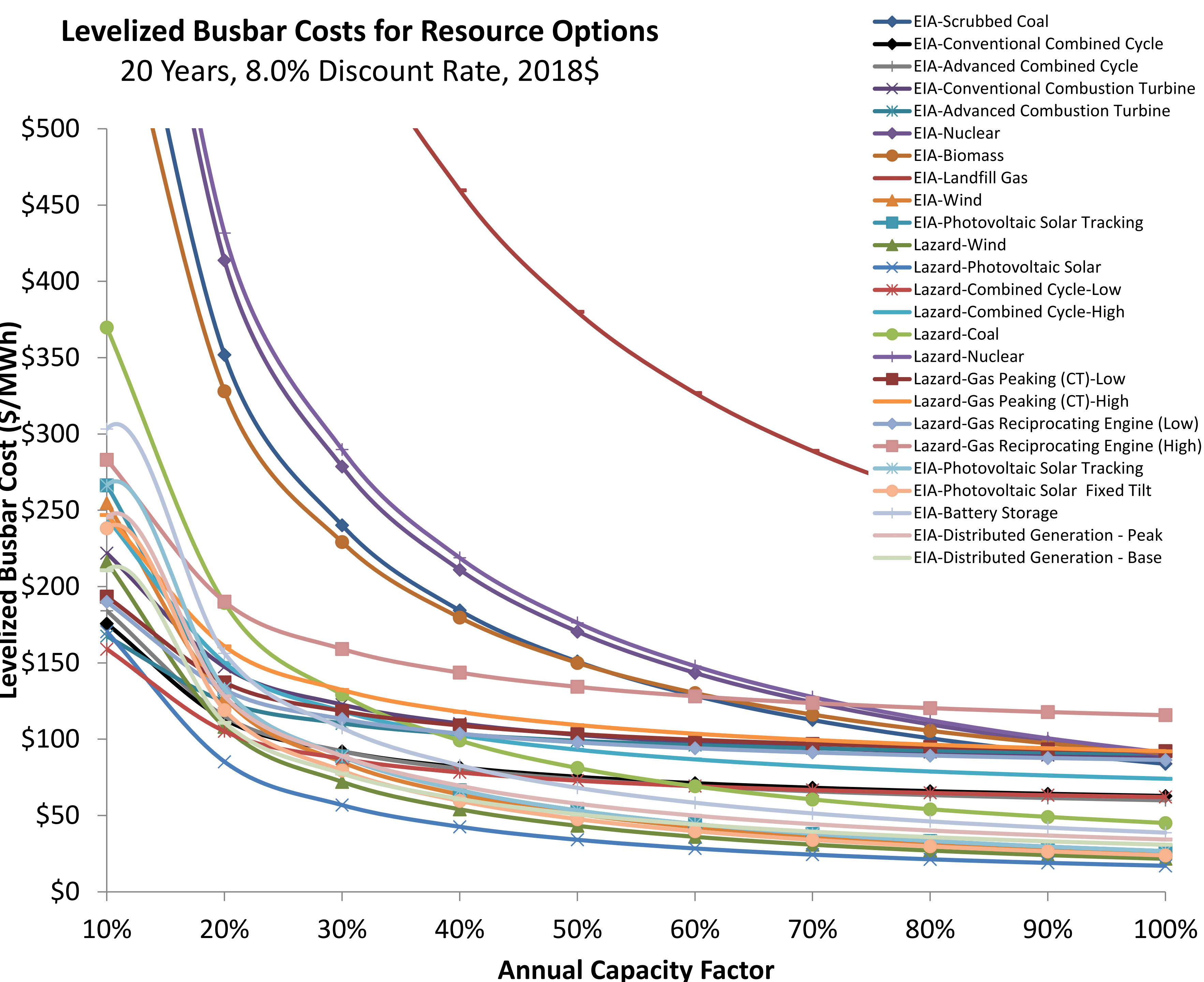
Generation Type	Data Source	Tech Type	Size (MW)	Total Capital Cost ($/kW)	V O&M ($/MWh)	F O&M ($/kW-yr)	Heat Rate (Btu/kWh)
Combined Cycle (CC)	EIA AEO'18	Adv.	429	1,136	2.07	10.35	6,300
	EIA AEO'18	Conv.	702	1,007	3.63	11.39	6,600
	Lazard	High	550	1,333	2.05	5.64	6,900
	Lazard	Low	550	718	3.59	6.36	6,133
Combustion Turbine (CT)	EIA AEO'18	Adv.	237	697	11.08	7.04	9,800
	EIA AEO'18	Conv.	100	1,135	3.57	17.82	9,920
	Lazard	High	50	1,025	10.25	20.50	8,000
	Lazard	Low	241	769	4.82	5.13	9,804
Coal	EIA AEO'18		650	5,216	7.35	72.47	9,750
	Lazard		600	3,075	2.05	41.00	8,750
Nuclear	EIA AEO'18		2,234	6,095	2.38	103.81	10,460
	Lazard		2,200	6,663	0.77	138.38	10,450
Wind	EIA AEO'18		100	1,698	0.00	48.66	N/A
	Lazard		100	1,230	0.00	30.75	N/A
Solar PV (Utility Scale)	Lazard		30	1,409	0.00	12.30	N/A
Solar PV - Tilt	EIA AEO'18		150	1,897	0.00	22.57	N/A
Solar PV - Tracking	EIA AEO'18		150	2,158	0.00	22.57	N/A
Gas Recip Engine	Lazard	High	0.25	1,128	15.38	20.50	10,000
	Lazard	Low	1	666	10.25	15.38	8,000
Battery	EIA AEO'18		30	2,224	7.30	36.49	N/A
Distributed Gen - Base	EIA AEO'18		2	1,592	8.44	18.98	8,969
Distributed Gen - Peak	EIA AEO'18		1	1,913	8.44	18.98	9,961

EIA and Lazard Data

SPP

ITP 2020

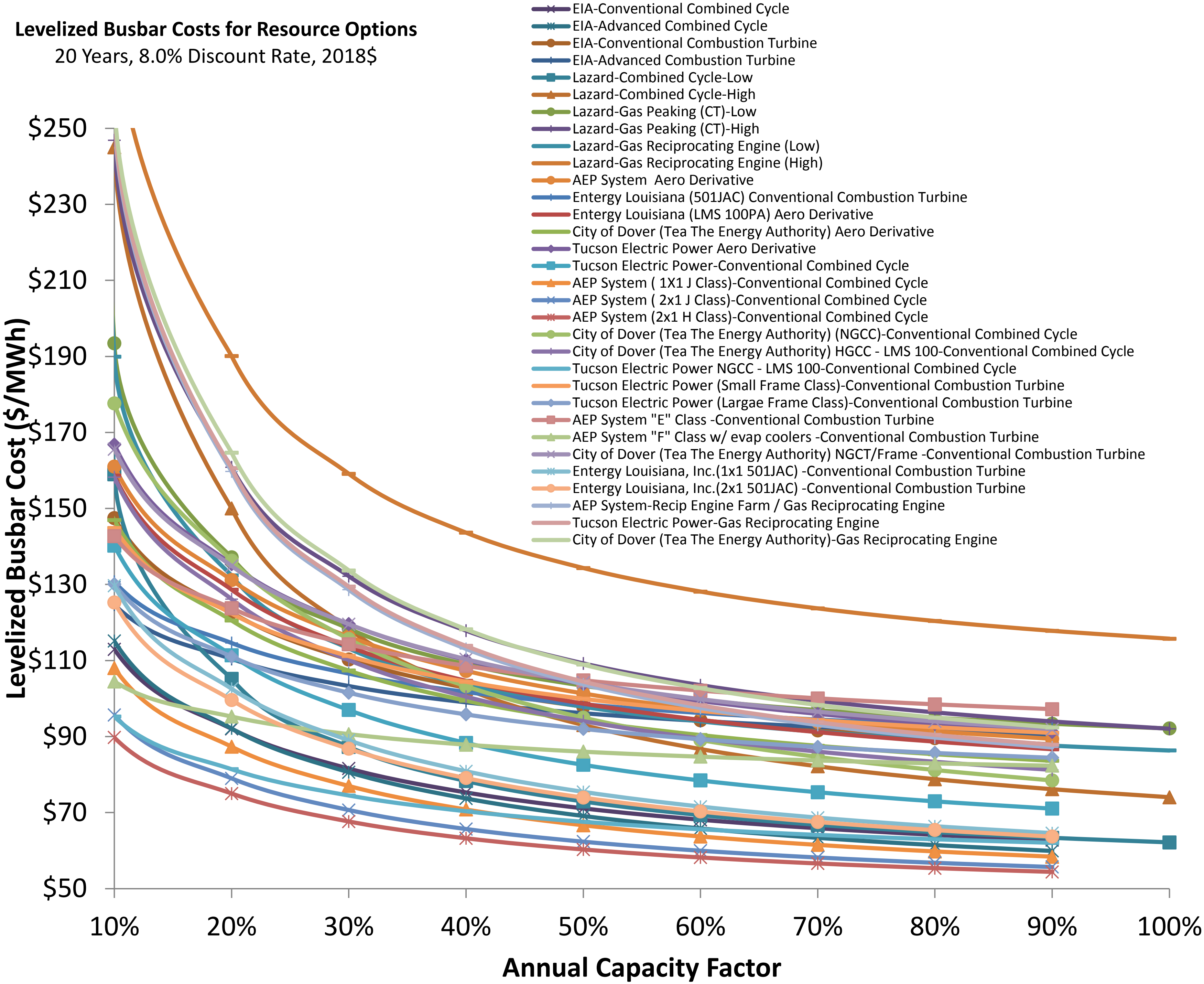
Busbar Curves – All Units



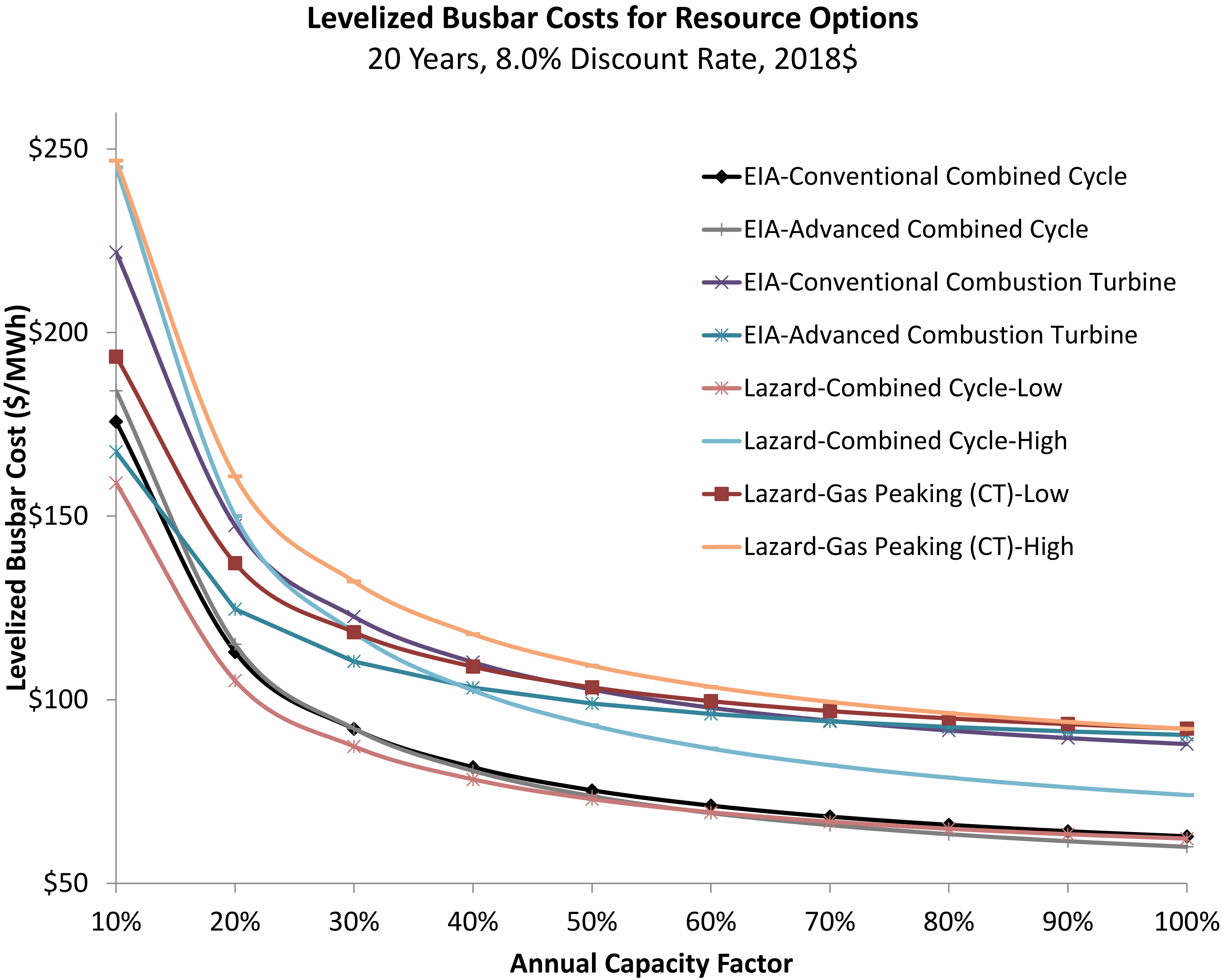
SPP

ITP 2020

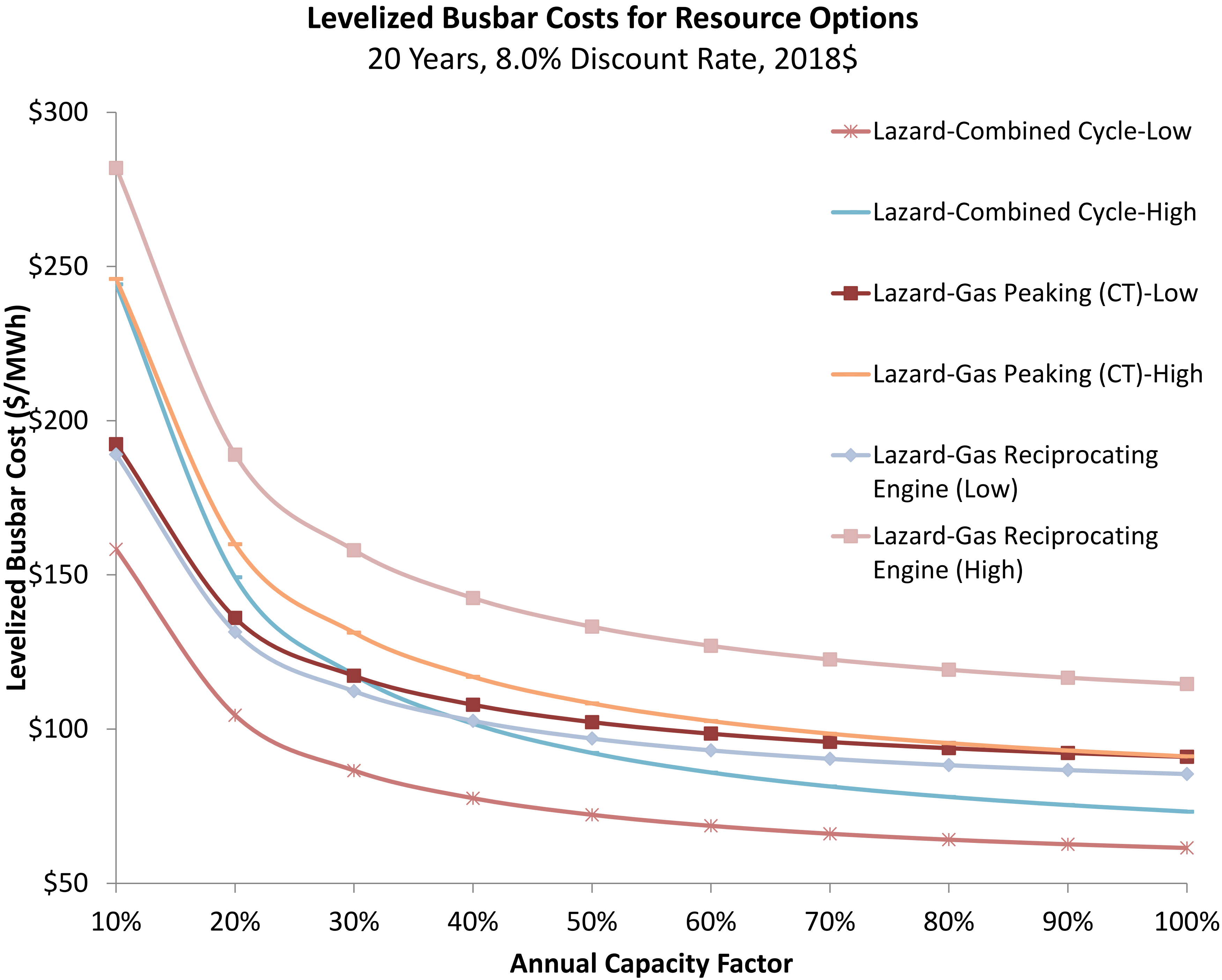
Busbar Curves – All Units w/ Staff Research



SPP



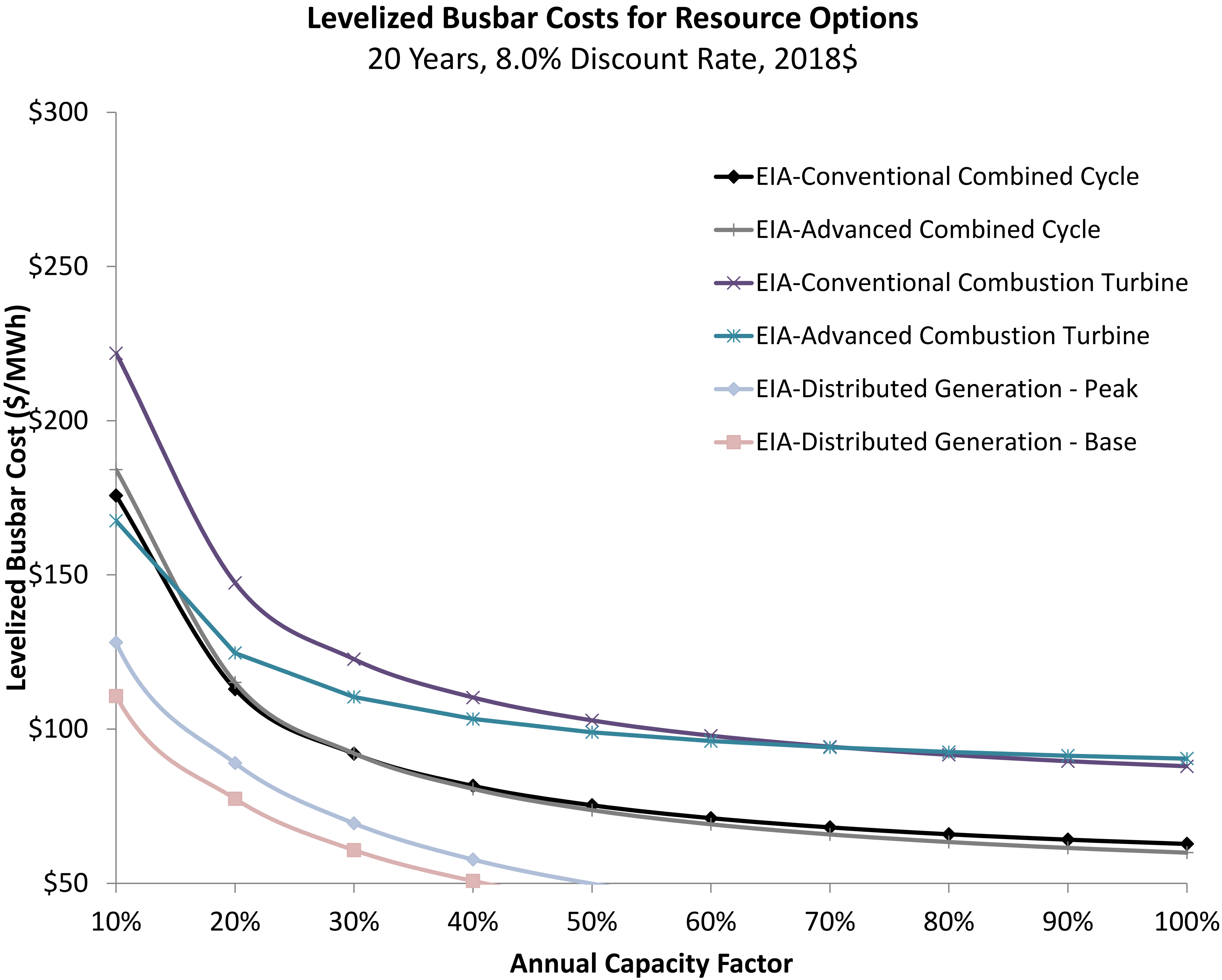
Busbar Curves – All CC & CT



ITP 2020

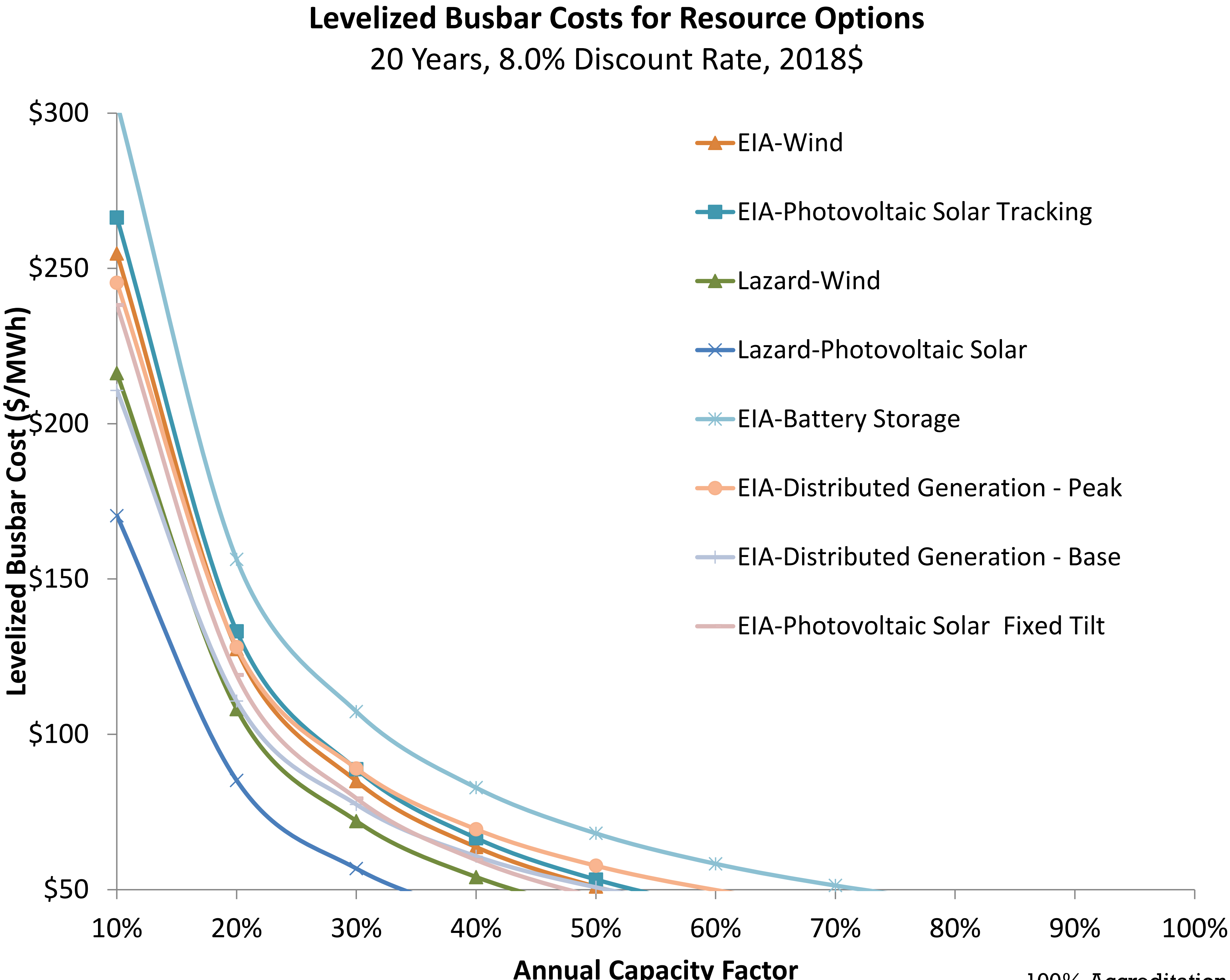
Busbar Curves – Lazard Gas Units

SPP



Busbar Curves – EIA Gas Units

SPP



100% Accreditation

ITP 2020

Busbar Curves – Alt Units

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

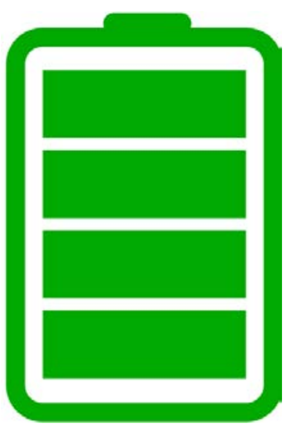
Renewable Allocation & Battery Storage

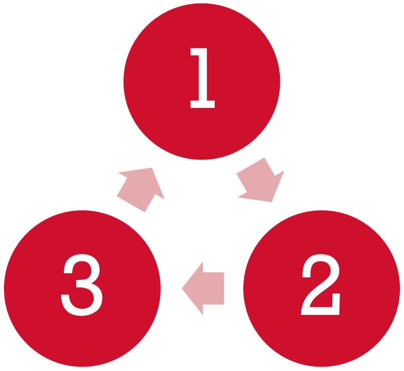
Joshua Norton

November 14-15th, 2018

Objective

- Approve
  - Battery storage accreditation
  - Renewable allocation and assignment
  - Methodology to allocate and accredit resource plan

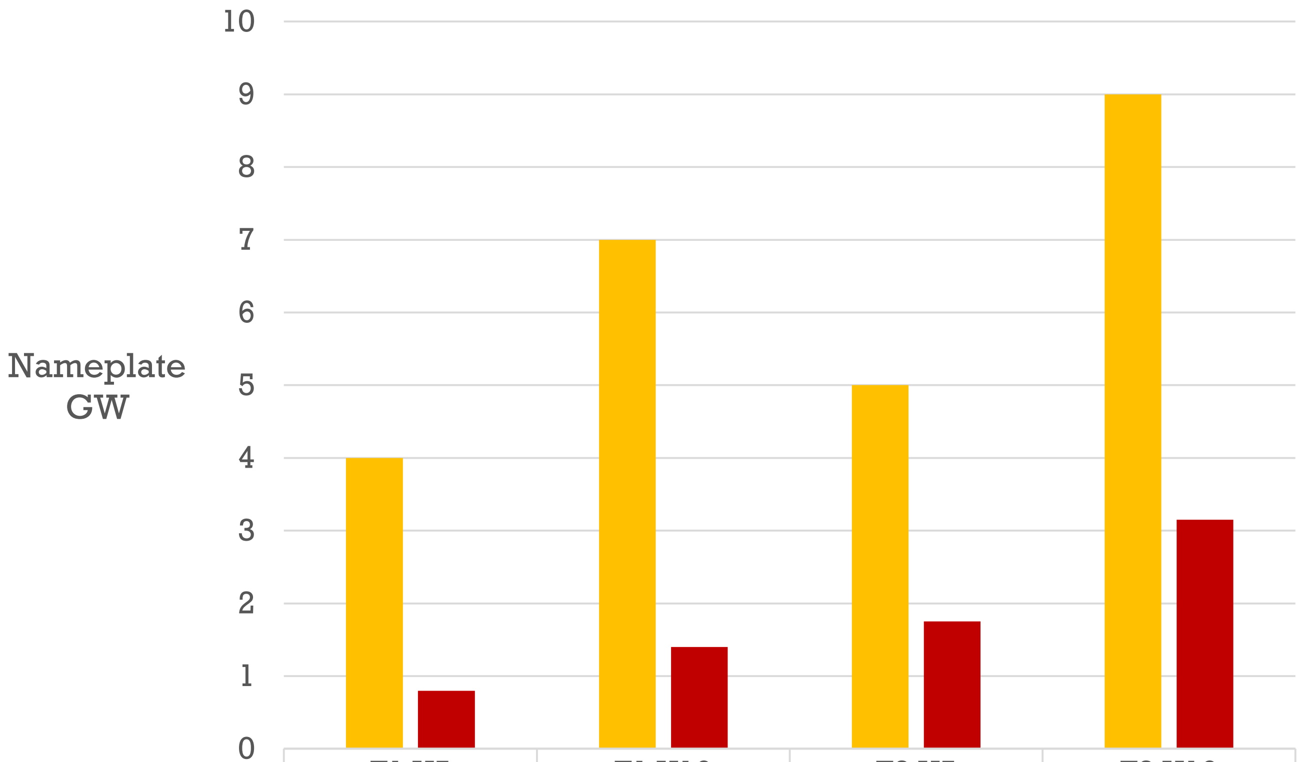




Recap of Approved Renewable Accreditation

- New Resource Accreditation
  - Accredit projected solar at 70%
  - Accredit projected wind at 20%
  - Accreditation cap on projected renewables of 12% of the total load for each zone

Approved Battery Storage



	F1 Y5	F1 Y10	F2 Y5	F2 Y10
Solar	4	7	5	9
Battery Storage	0.8	1.4	1.75	3.15

Approved 20% of projected solar for F1 and 35% for F2

General Resource Accreditation

- SPP Planning Criteria 7.1.5.2 (2):

  Shall be available for a minimum of four continuous hours

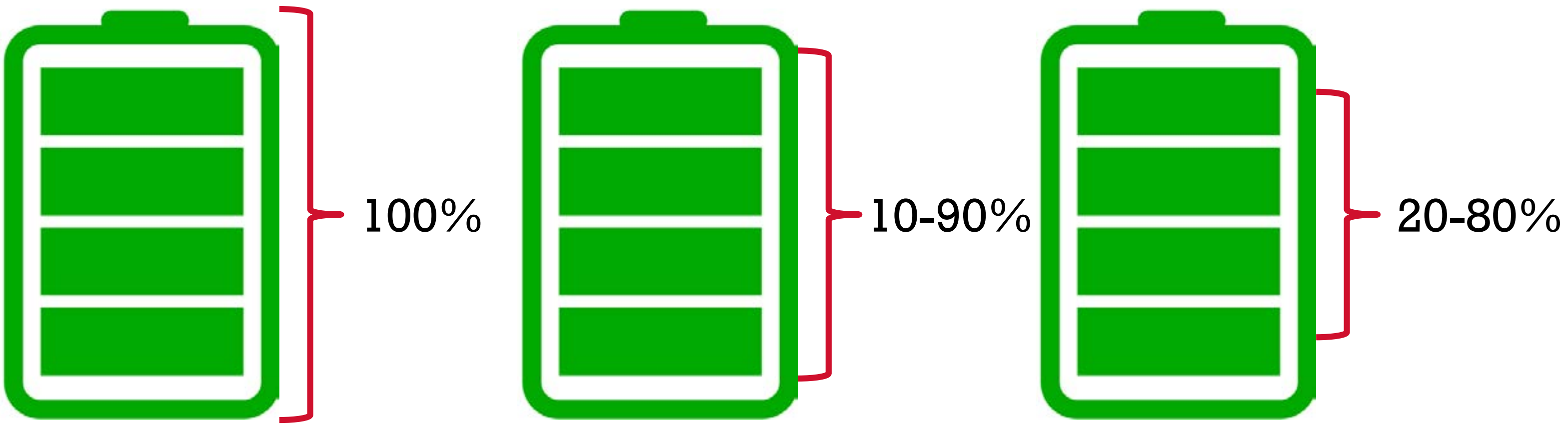
Battery Storage Accreditation

- MTEP Batteries
  - Duration = 4 hours
  - Capacity = 30 MW
  - Usable Energy = 120 MWh

	Peaker Replacement	Economic Operation
Possible Accreditation (MW)	30	30

Battery Storage Operation

- Battery Storage Operation to increase life

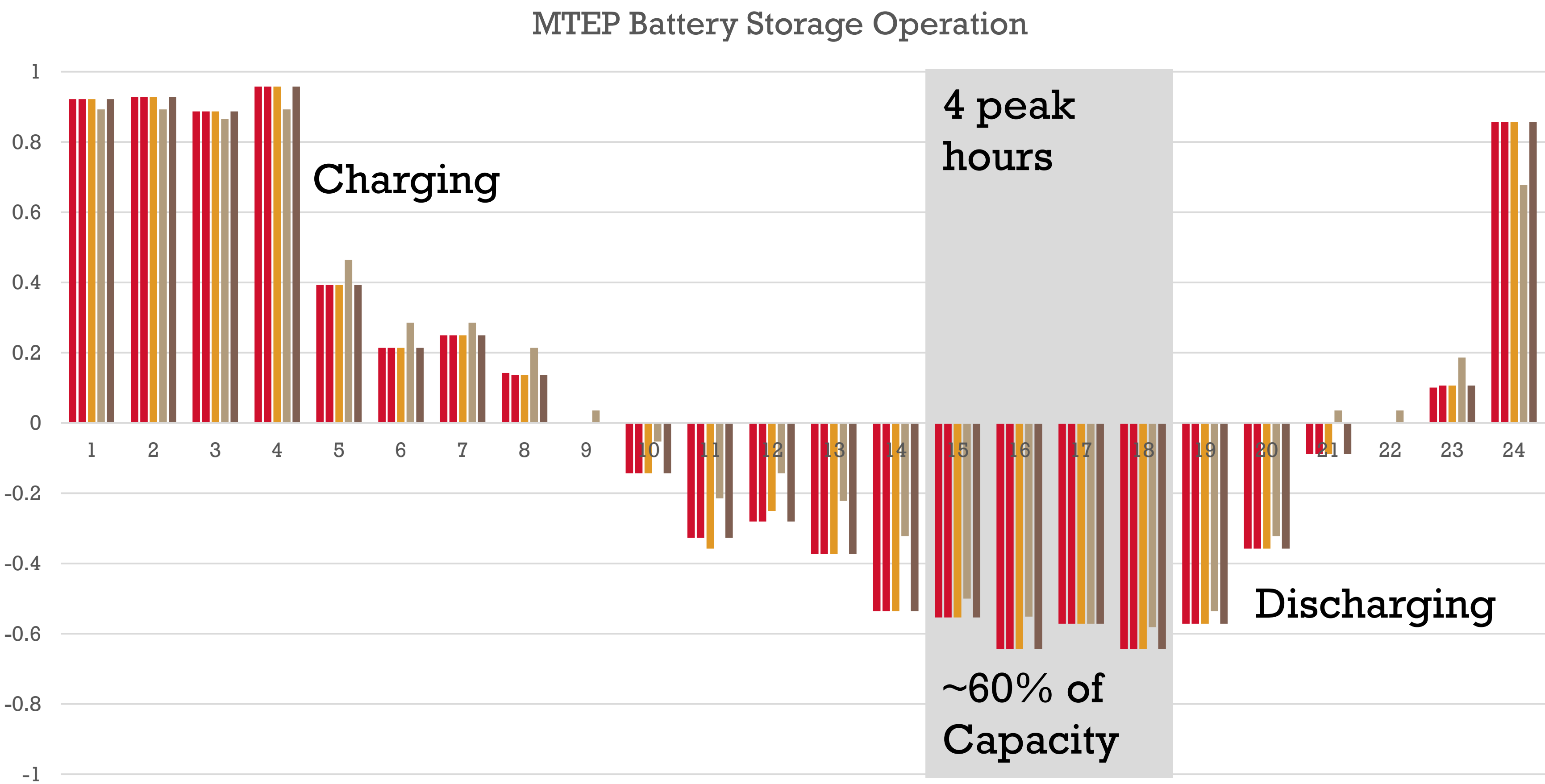


Battery Storage Accreditation

- MTEP Batteries
  - Duration = 4 hours
  - Capacity = 30 MW
  - Usable Energy = 120 MWh

	Peaker Replacement	Economic Operation
Possible Accreditation (MW)	30	30
Operating 10-90% (MW)	24	24

Promod Economic Operating Battery Storage



Battery Storage Accreditation

- MTEP Batteries
  - Duration = 4 hours
  - Capacity = 30 MW
  - Usable Energy = 120 MWh

	Peaker Replacement	Economic Operation
Possible Accreditation (MW)	30	30
Operating 10-90% (MW)	24	24
Economically Operating (MW)	N/A	14.4
Final Accreditation	**24 (80%)**	**14.4 (48%)**

  - SPP staff recommends accrediting battery storage 48% of capacity that can last 4 hours

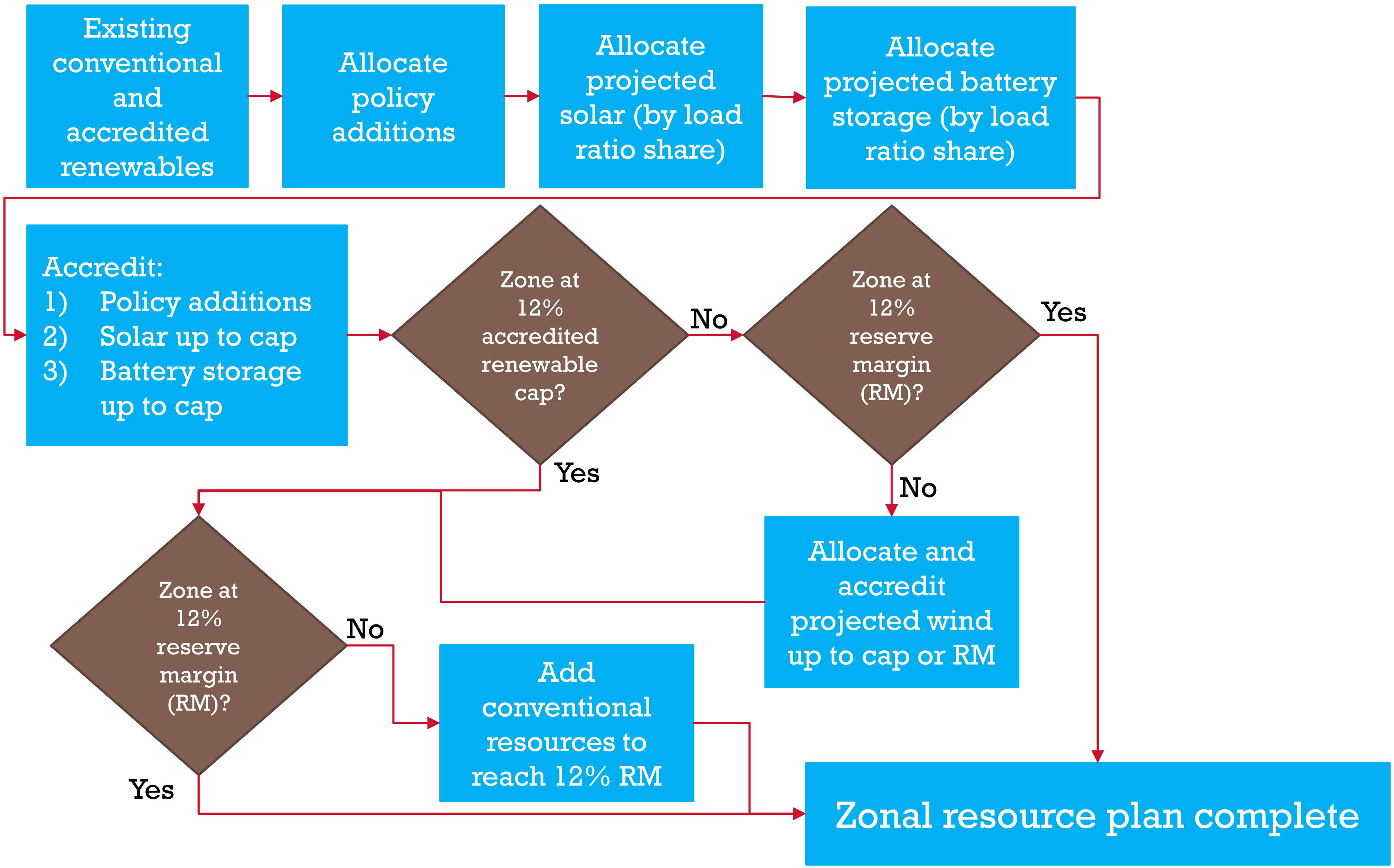
2020 ITP Renewable Assignment and Allocation

SPP staff recommends:

	Solar	Wind
Assigned	Yes	No
Allocation	Load Ratio Share	Based on zone RM

- Wind assigned when needed to meet renewable policy requirements

Allocation of Accredited Resources - Decision Tree



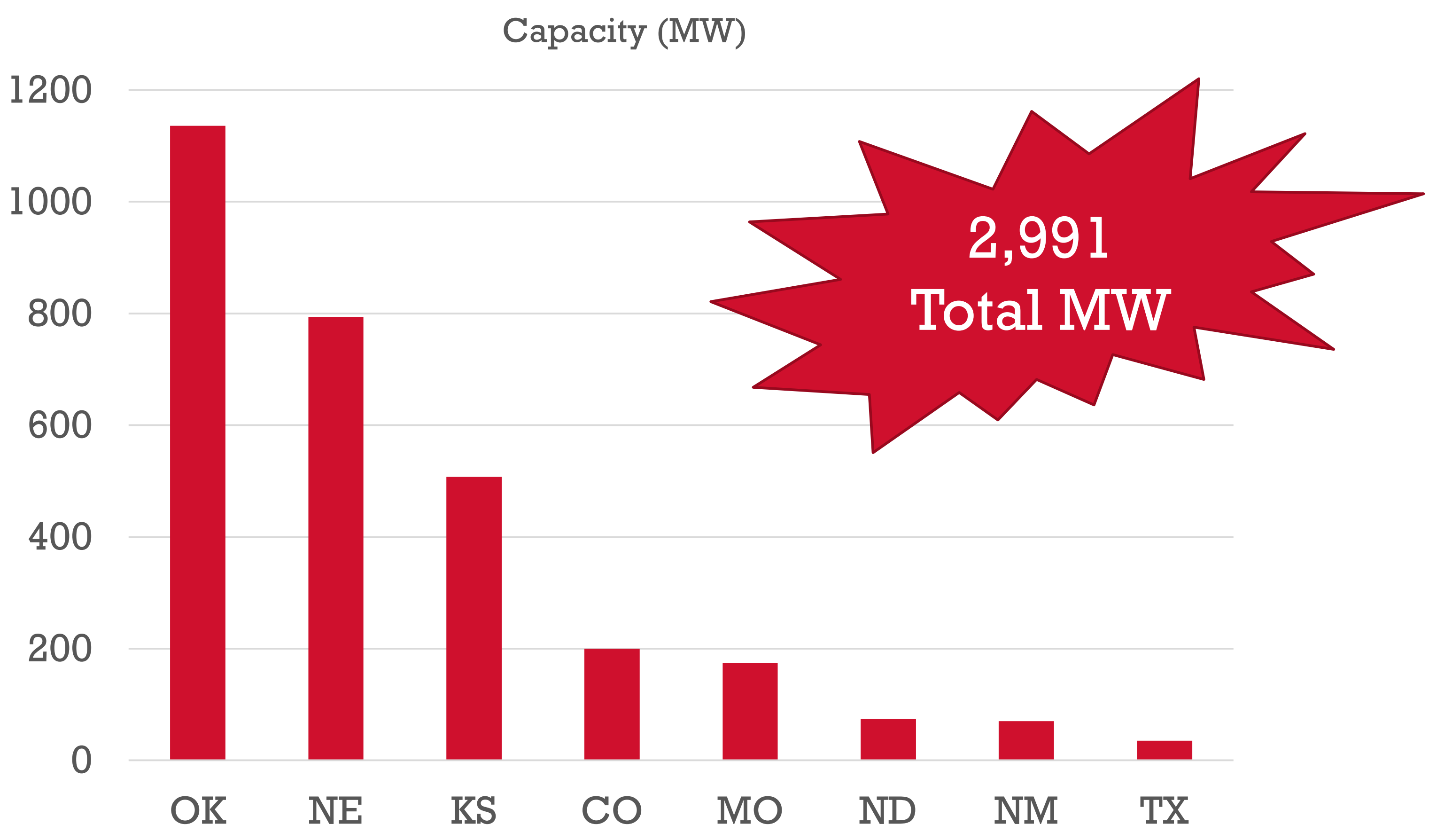
2020 ITP Accreditation Methodology

SPP staff recommends:

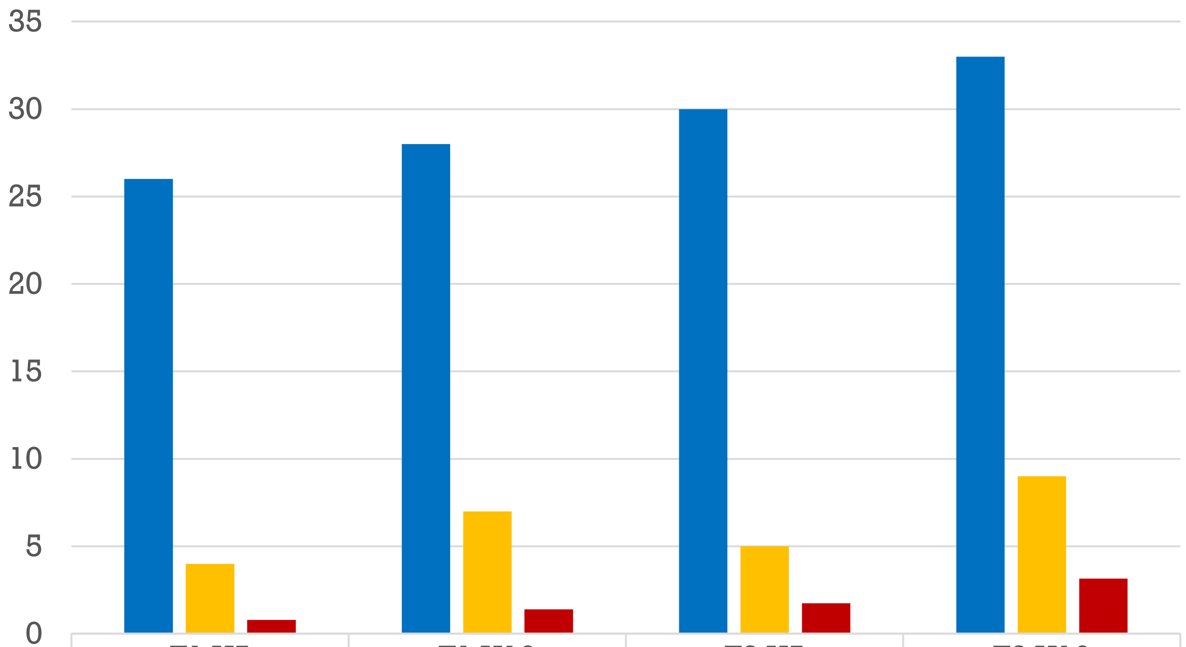
- Allocate projected wind additions to maximize accreditation to deficient zones, up to zonal renewable cap for new resources
  - Order of accreditation
    - Existing
    - Policy wind/solar
    - Projected solar
    - **Projected Batteries**
    - Projected wind
    - Conventional
- Policy needs are met with 80% wind and 20% solar
- Batteries do not get assigned

Appendix

Batteries in GI Queue



Approved Renewable and Battery Storage Amounts



	F1 Y5	F1 Y10	F2 Y5	F2 Y10
Wind	26	28	30	33
Solar	4	7	5	9
Batteries	0.8	1.4	1.75	3.15

Allocation of Accredited Resources

	Zone A	Zone B	Zone C	Zone D
Region Non-Coincident Load (MW)	50,000			
Peak Load (MW)	1,000	2,500	5,000	4,000
Load Ratio Share (LRS)	2%	5%	10%	8%
Renewable Accredited Cap (MW)	120	300	600	480
Existing Conventional Generation (MW)	1,250	2,400	4,300	4,100
Existing Accredited Renewables (MW)	25	50	500	500
Policy Additions (MW)	0	0	2000	1700
Accredited Policy Additions (MW)	0	0	600	480
Has Zone Met Cap?	No	No	Yes	Yes
Projected Solar Additions (MW)	100	250	500	400
Accredited Projected Solar Additions (MW)	70	175	0	0
Storage Additions (MW)	35	87.5	175	140
Accredited Storage Additions (MW)	14	35	70	56
Reserve Margin After Storage	35.9%	6.4%	9.4%	28.4%
Has Zone Met RM?	Yes	No	No	Yes
Accredited Projected Wind Additions (MW)	0	125	0	0
Reserve Margin Before Conventional	35.9%	11.4%	9.4%	28.4%
Conventional Additions (MW)	0	15	130	0
Reserve Margin After Conventional	35.9%	12.0%	12.0%	28.4%

>>>>>>>>>>>>>>>> Process flow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2020 ITP Portfolio Consolidation-Scope

Amber Greb

Objective

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

Goal of the Final Portfolio:

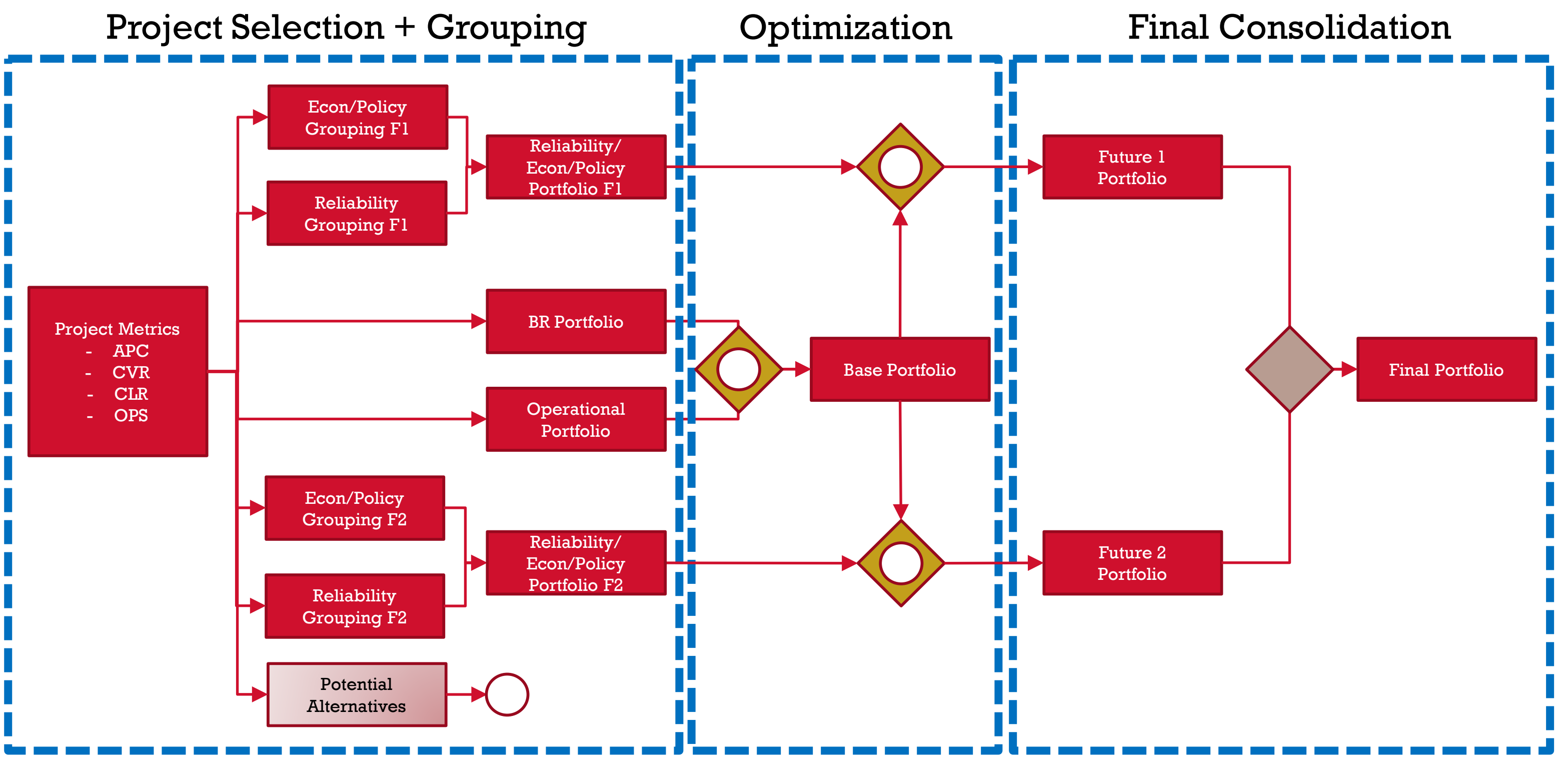
- *Develop a regional plan that provides reliable and economic delivery of energy and facilitates achievement of public policy objectives, while maximizing benefits to the end-use customer*

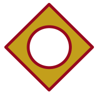
ITP Manual Language

Section 6.2 Portfolio Consolidation

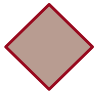
To determine a recommended plan, the portfolios of potential projects must be consolidated. SPP and stakeholders will discuss, determine and document details of the study-specific consolidation criteria during each study scope development.

Portfolio Development Summary





Optimization with consideration of potential alternatives



Individual project review including assessment of unmet needs

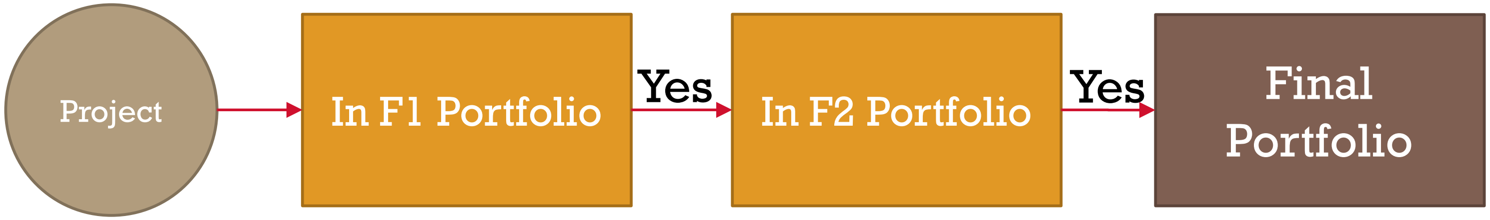
Historical Consolidation Concepts

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

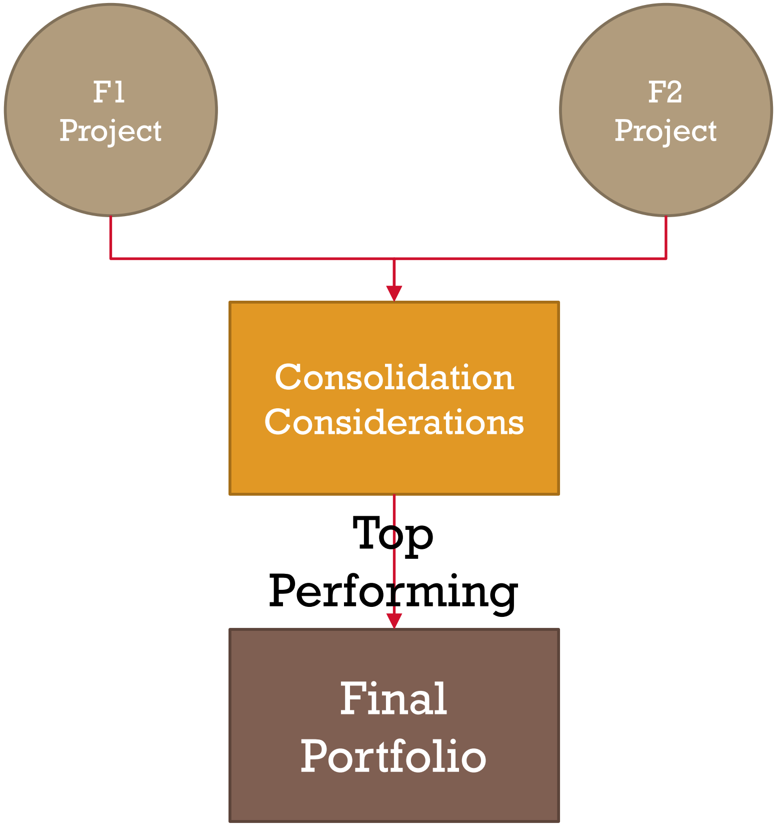
Portfolio Consolidation
Scenarios

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	?	✓

Portfolio Consolidation
Same project in both portfolios



Portfolio Consolidation
Competing Projects



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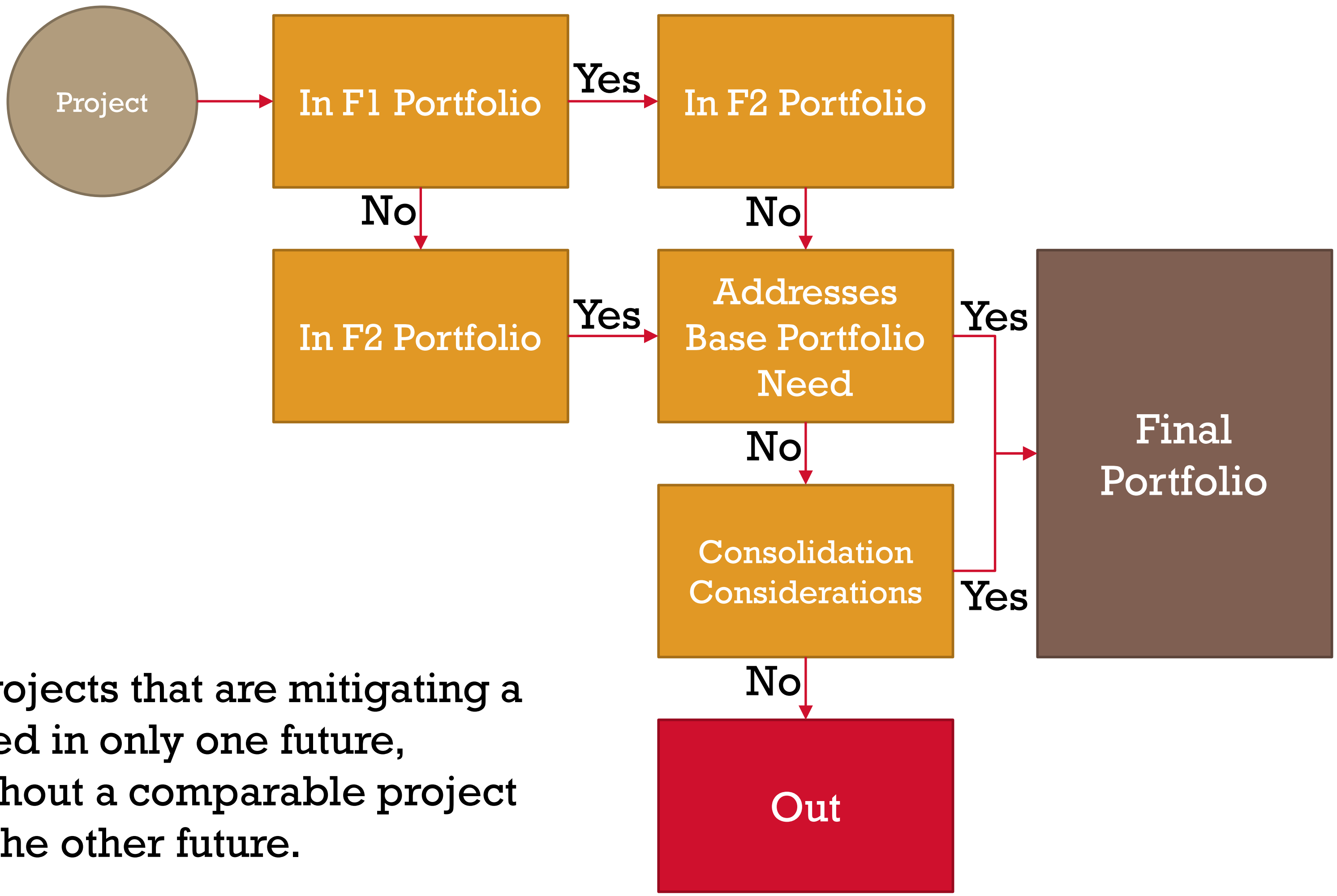
Portfolio Consolidation
Projects in one future's portfolio



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

Considerations for Scenarios 2 & 3

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

2020 Questions

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

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2020 Consolidation Recommendations

- No changes to Considerations
  - We have not gone through the consolidation process for 2019 and we do not have any new information since the previous scope development
- No changes to Possible Points
  - Adding a third future does not change the weight of the individual considerations
- No change to thresholds
- No change to Minimum Point Requirement

Appendix

Consolidation Calculations

Consideration 1

Scenario 2 (Competing Projects)

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

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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
   - $Points\ Awarded_{P1,\%} = 50 \times \frac{Net\ APC\ Benefit_{P1,AVE}}{Net\ APC\ Benefit_{P1',AVE}}$

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
  - Points for consideration two will be calculated as the percentage of total congestion relieved on the needs addressed by the project, multiplied by the points possible.

$$\begin{aligned}&\mathit{Points\ awarded}\\&= 10 \times \%\ \mathit{Congestion\ relieved}_{F1,addressed\ needs} + 10 \times \%\ \mathit{Congestion\ relieved}_{F2,addressed\ needs}\end{aligned}$$

- Consideration 3
  - Points for consideration three will be calculated based on the severity of an operational issue that the project is expected to address, as a percentage of the operational needs criteria multiplied by the points possible, up to 10.
  - $\mathit{Points\ awarded} = \left(\frac{\$\ \mathit{of\ congestion\ cost}_{24\ months}}{\$10M}\right) \times 10$
  - OR
  - $\mathit{Points\ awarded} = \left(\frac{\mathit{Hours\ of\ system\ reconfiguration}_{12\ months}}{X\% \times 8{,}760}\right) \times 10$
- Consideration 4*
  - All possible points awarded if new EHV
- Consideration 5*
  - All possible points awarded if expected to mitigate non-thermal issues
- Consideration 6*
  - All possible points awarded if in SPP long-term study

*No points awarded if criteria not met

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2020 ITP Scope Natural Gas Prices and Sensitivities

Kirk Hall

November 14-15, 2018

Objective

- Inform stakeholders regarding decision to purchase 2018 ABB Fundamental Forecast for increased accuracy of natural gas prices through study year
- Approve 2020 ITP Sensitivities

Natural Gas Prices

ITP Manual Language

Section 2.2.1.7 Fuel Prices

Fuel price forecasts for the reference case future, including natural gas, oil, uranium, coal, and associated transportation costs, will be based upon the latest vendor data set.

Potential adjustments to the fuel prices for the non-reference case future(s) will be determined by the ESWG to appropriately reflect each future and will be described in the ITP study scope document.

Natural Gas Forecasting Issues

- ABB simulation ready data for the 2020 ITP includes long term forecast to year 2022 and inflated at 2.5% thereafter
- NYMEX forecast only available through mid 2025
- Staff plans to purchase the latest ABB Fundamental Forecast for the 2020 ITP

Natural Gas Forecast

- Purchase ABB forecast for approximately $5k

Sensitivities

ITP Manual Language

Sensitivity analyses will be defined in the scope and conducted to measure the flexibility of the final portfolio in each ITP assessment. Generally, these sensitivities will not be used to select the proposed transmission projects, nor to filter out projects. The sensitivities to be performed on the final portfolio of each ITP assessment shall include, at a minimum:

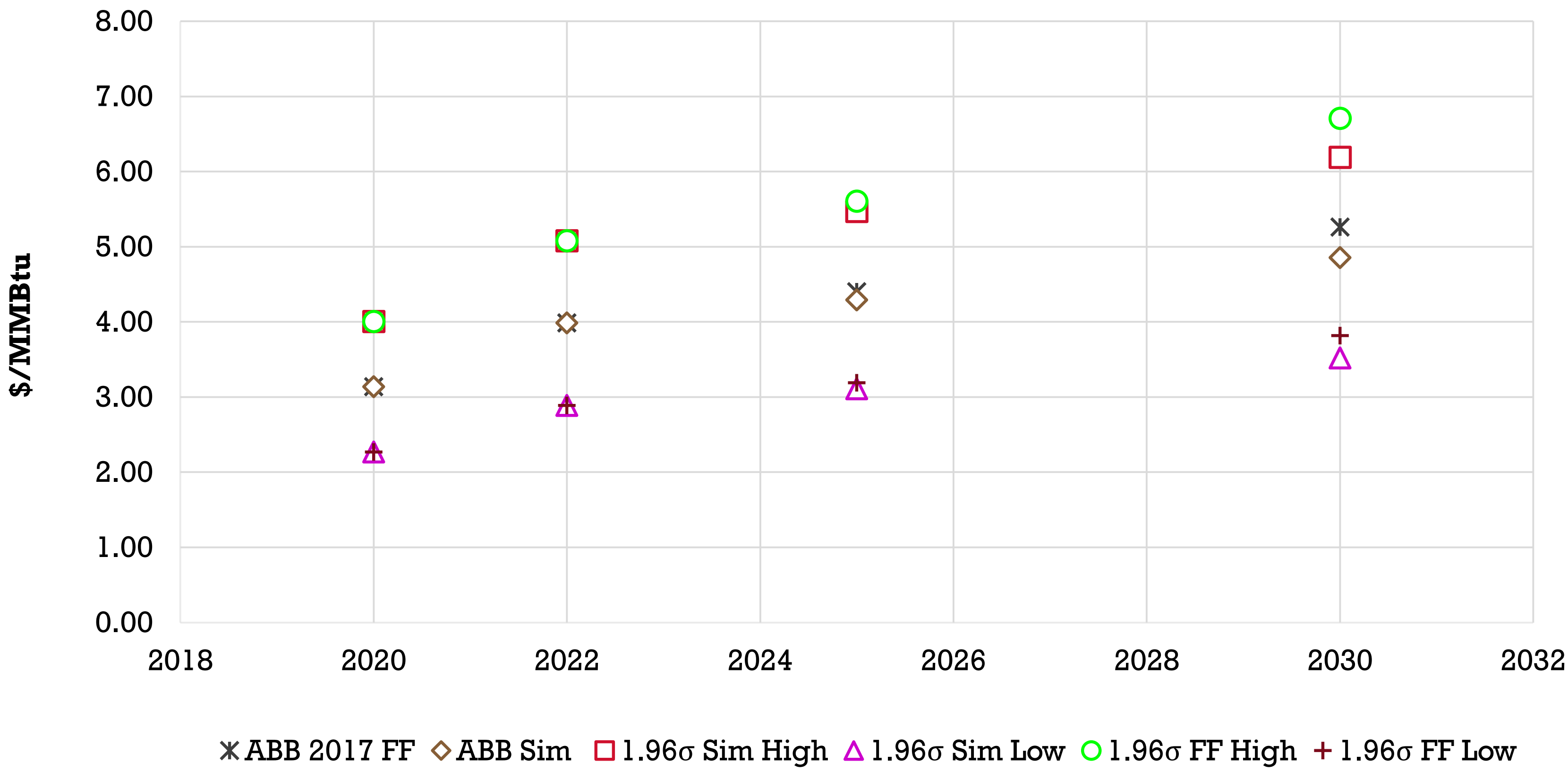
- High natural-gas price
- Low natural-gas price
- High demand
- Low demand

Typically, for the demand sensitivities, one standard deviation on either side of the expected values will be used, and for the natural gas price sensitivities, two standard deviations of expected values will be used.

2019 ITP Sensitivities

- ESWG recommended to follow ITP Manual and apply 2 std. dev. for high and low natural gas sensitivity and one standard deviation for demand sensitivity

Annual ABB Gas $ Sensitivities: ABB 2018 Sim. Ready vs. 2017 ABB FF



Year	ABB 2017 FF	ABB Sim	1.96σ Sim High	1.96σ Sim Low	1.96σ FF High	1.96σ FF Low
2020	3.14	3.14	4.01	2.27	4.01	2.27
2022	3.98	3.98	5.08	2.89	5.08	2.89
2025	4.40	4.29	5.47	3.11	5.61	3.19
2030	5.26	4.85	6.19	3.52	6.71	3.81

Recommendation

- Staff recommends the 2020 ITP study the same sensitivities used in the 2019 ITP using 2018 ABB fundamental forecast natural gas price data

Southwest Power Pool

2020 ITP Future 2 Increased Energy

Kirk Hall

November 14-15, 2018

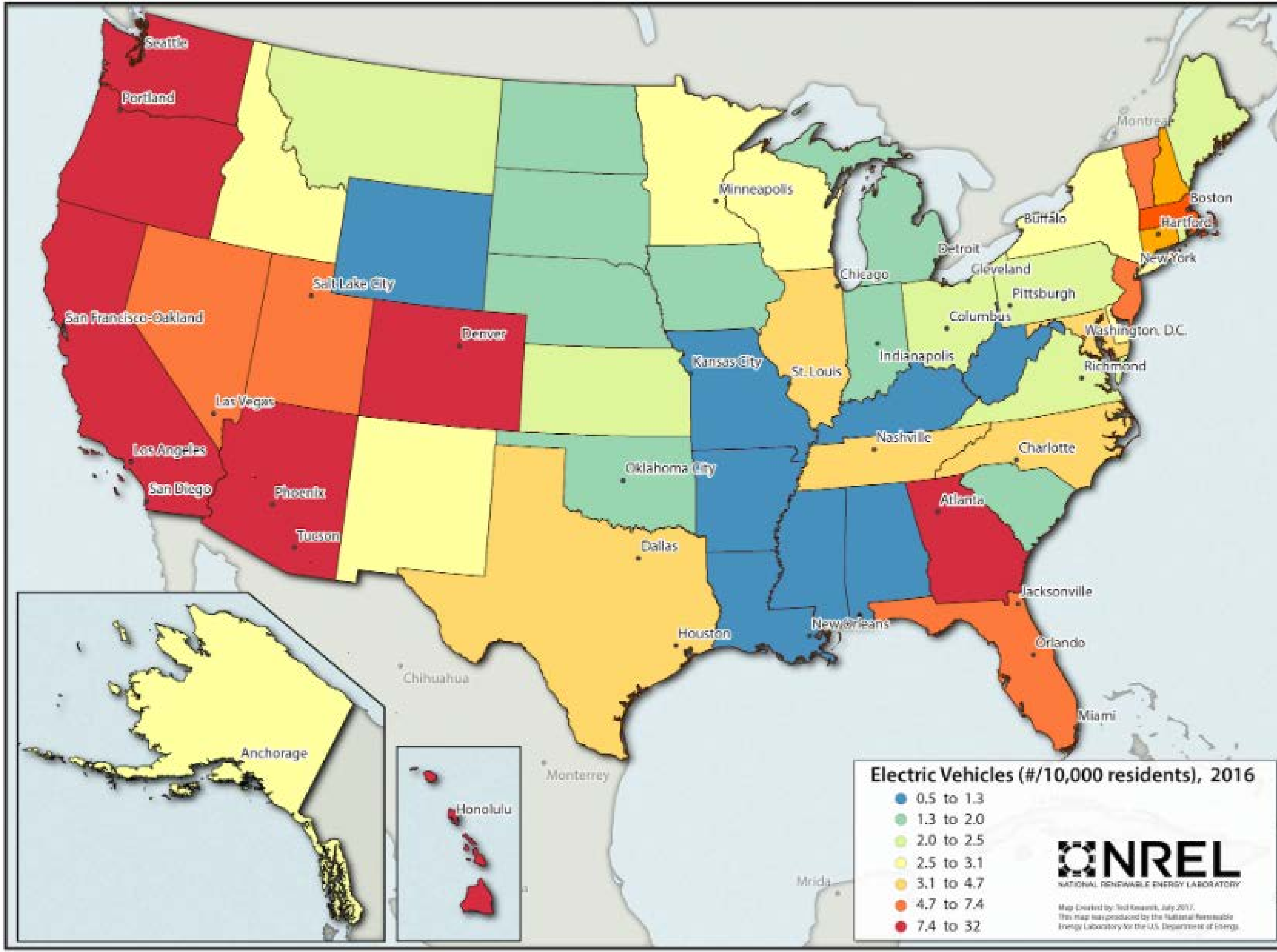
Background & Objective

- Background
  - Future 2 was approved with an increase in energy growth rates due to electric vehicles
- Objective
  - Discuss/approve Future 2 energy growth rates and its allocation through the model

Three Questions

- How much energy do we add?
- How do we allocate the energy to the zones?
- How do we allocate the energy throughout the year?

Electric Vehicle Ownership



Current Projection of EV's in SPP States

State	Low EVs/10k	Average Evs/10k	High EV/10k	Population	Low Total EVs	Average Total EV's	High Total EVs
Arkansas	.5	.9	1.3	3,004,279	391	496	601
Iowa	1.3	1.65	2	3,145,711	409	519	629
Kansas	2.5	2.8	3.1	2,913,123	728	816	903
Louisiana	0.5	0.9	1.3	4,684,333	234	422	609
Minnesota	2.5	2.8	3.1	5,576,606	1394	1561	1729
Missouri	0.5	0.9	1.3	6,113,532	306	550	795
Montana	2.5	2.8	3.1	1,050,493	263	294	326
Nebraska	1.3	1.65	2	1,920,076	250	317	384
New Mexico	2.5	2.8	3.1	2,088,070	522	585	647
North Dakota	1.3	1.65	2	755,393	98	125	151
Oklahoma	1.3	1.65	2	3,930,864	511	649	786
South Dakota	1.3	1.65	2	869,666	113	143	174
Texas	0.5	0.9	1.3	28,304,596	1415	2547	3680
Wyoming	0.5	0.9	1.3	579,315	29	52	75
					Total EV's in SPP		
				64,936,057	6663	9076	11489

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How much energy do we add?

- Assumptions:
  - 2018 SPP population: ~17.5M (~65M total across all 14 states)
  - Average U.S. annual population growth: 0.7%
  - Miles driven/person/year: 13,476 miles
  - Average kWh/100 miles: 29.79

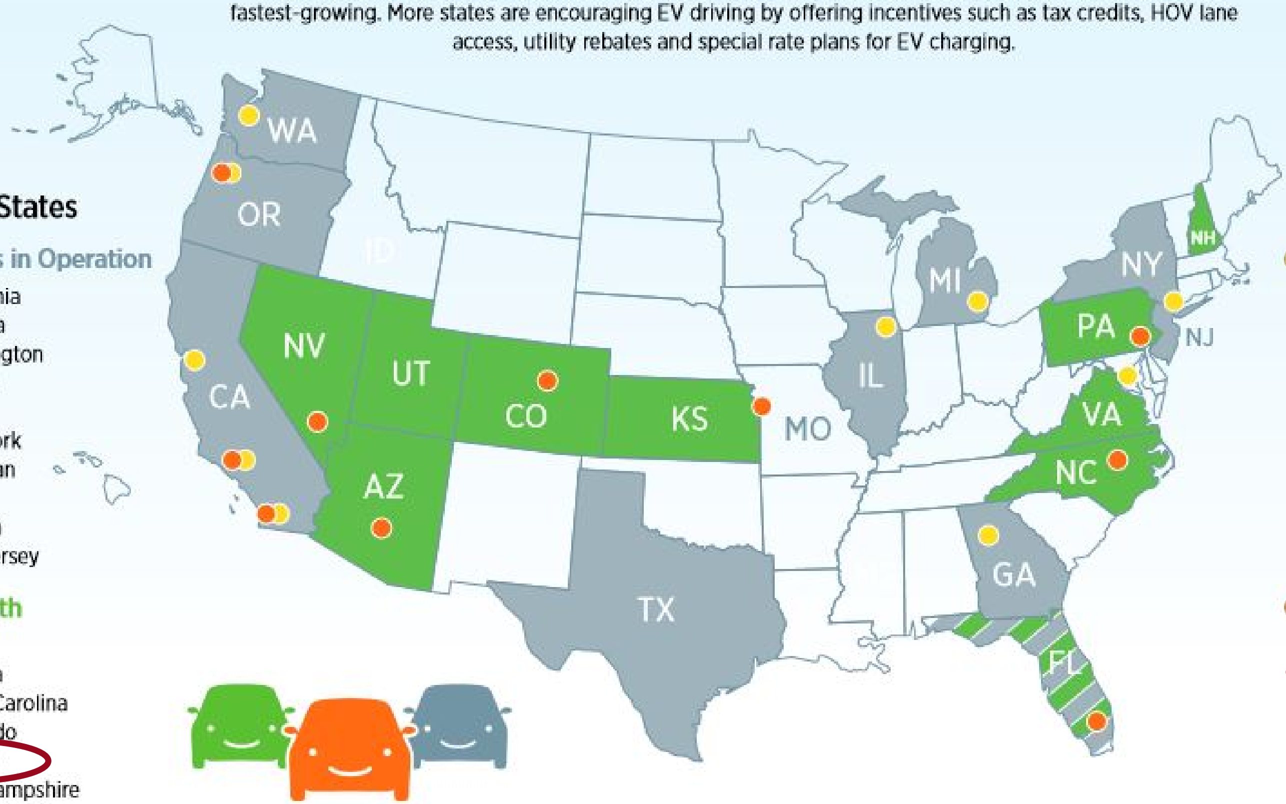
	2017			2025			2030		
Energy Added	Low EV (GWh)	Average EV (GWh)	High EV(GWh)	Low EV (GWh)	Average EV (GWh)	High EV (GWh)	Low EV (GWh)	Average EV (GWh)	High EV (GWh)
Current	25.8	35.5	45.3						
15% EV Growth				78.9	108.7	138.5	158.6	218.6	278.6
25% EV Growth				153.6	211.7	269.9	468.9	646.2	823.5
30% EV Growth				210.3	289.8	369.3	780.7	1,075.9	1,371.2

How do we allocate the energy to the zones?

- Load-ratio share basis
  - EV adoption could generally be correlated to population/load density, allocate accordingly
  - Charging stations in rural areas

Where Are EVs Taking Off?

While California remains the country's largest EV market in terms of cars on the road, it is no longer the fastest-growing. More states are encouraging EV driving by offering incentives such as tax credits, HOV lane access, utility rebates and special rate plans for EV charging.



Top 10 States

Total EVs in Operation

1. California
2. Georgia
3. Washington
4. Florida
5. Texas
6. New York
7. Michigan
8. Illinois
9. Oregon
10. New Jersey

EV Growth

1. Utah
2. Nevada
3. North Carolina
4. Colorado
5. Kansas
6. New Hampshire
7. Pennsylvania
8. Virginia
9. Florida
10. Arizona

Top 10 Metro Areas

Total EVs in Operation

1. Los Angeles
2. Bay Area
3. New York Metro
4. Atlanta
5. San Diego
6. Seattle
7. Chicago
8. Washington, D.C.
9. Detroit
10. Portland

EV Growth

1. Las Vegas
2. Kansas City
3. Raleigh/Durham
4. Denver
5. Miami
6. Phoenix
7. Philadelphia
8. Portland
9. San Diego
10. Los Angeles

- Top 10 states for total EVs in operation
- Top 10 states for EV growth
- Top 10 metro areas for total EVs in operation
- Top 10 metro areas for EV growth

Source: Compiled by ChargePoint with data provided by IHS Markit through Q3 2016. Growth figures represent growth over Q3 2015.

How do we allocate the energy throughout the year?

- 50/50 peak load amounts in Future 2
- Options
  1. Apply EV energy amounts to existing demand group structure with valley fill[1] load shape adjustment
     - Less granular approach
     - Loads driving needs will be investigated during needs assessment and portfolio development
  2. Create EV demand group per pricing zone
     - More granular approach
     - Significantly more SPP staff work and ESWG vetting
     - Many unknowns with methodology

[1]Valley fill: Peak and minimum hour preserved with adjustment distribution toward low loads

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Recommendation

SPP staff recommends

1. Approved-Using the Average EV Energy correlating with the 25% EV growth (shown in green on slide 6)
2. Approve the zonal allocation of that energy
3. Using option 1 (valley fill) presented for allocation of the energy throughout the year

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2020 ITP Generation and Load Review Update

November 14-15, 2018

Theva Coleman

Objective

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

Stakeholder Review

Stakeholder Review-Pass3

- Pass 3 Generation and Load Workbook – Post on 11/21/2018
- Pass 3 Stakeholder Review Period
  - Begins – 11/26/2018
  - Deadline – 12/07/2018

Stakeholder Gen Review-Pass 3

- Items to be surveyed:
  - Unit Ownership percentages
  - Wind and Solar Accreditation
  - Unit Retirement dates

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

Stakeholder Load Review-Pass 3

- Items to be surveyed:
  - Load factors by Demand Group
  - Loss factors by Demand Group
- Items to be reviewed:
  - Demand Group Mapping (Economic Load Ownership Legend)
  - Non-Scalable and Scalable Loads
  - Station Service Loads
- ABB F17 base data to be reviewed:
  - Hourly Load Profiles
  - Monthly Peak & Energy Percentages

Workbook updates

Pass 3 – Gen Review Workbook updates

- Instructions tab
  - Clarity in instructions
- Must Run tab
  - Must Run Exception Column