Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 12th, 2017

8th Floor AEP Offices – Dallas, TX

• SUMMARY OF ACTIONS TAKEN •

1. Approve the SPP staff recommendation to standardize percentages of load and/or generation for each utility by state to calculate renewable [policy] Mandates and Goals, where applicable.
2. Approved the SPP staff recommendation to standardize development of the external renewable resource expansion plan.
3. Approved using the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities.
4. Approved the testing all 10 benefit metrics on the final recommended plan of a given ITP study in each of the approved futures.

Southwest Power Pool

ECONOMIC STUDIES WORKING GROUP

January 12th, 2017

8th Floor AEP Offices – Dallas, TX

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

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

There were 18 in-person participants and 45 web conference participants, representing 15 of 17 ESWG members. (Attachment 1 – January 12th, 2017 Attendance List)

Agenda Item 1b – Receipt of Proxies

Alan Myers (ITC Great Plains) asked for any proxy statements; one proxy was identified. Bethany King (EMDE) named David Busse (EMDE) as her proxy. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC Great Plains) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – January 12th, 2017 ESWG Agenda).

> **It was moved by Tim Owens (NPPD) and seconded by Kurt Stradley (LES) to approve the agenda as read. The agenda was approved by unanimous vote.**

Agenda Item 2 – Review of Past Action Items

Kelsey Allen (SPP Staff) reviewed the list of past action items and asked for any comments or questions. (Attachment 4 – Past Action Items)

Agenda Item 3 – 2017 ITP10 Study Schedule

Juliano Freitas (SPP Staff) gave updates on the ITP10 study schedule. The study is complete and will be going to the MOPC on January 17th and the Board of Directors on January 31st for final consideration. (Attachment 5 – 2017 ITP10 Study Schedule)

Agenda Item 4 – 2017 ESWG Meeting Schedule Update

Kelsey Allen (SPP Staff) reviewed the meeting schedule and asked the group if they would prefer the quarterly meetings in conjunction with the TWG to be one full day or two half days, as the TWG will be shortening their meetings from a day and a half to one full day. The group preferred to stay with the as planned two half days. It was pointed out that the November ESWG Face to Face meeting should be on the schedule for November 8th-9th, 2017. (Attachment 6 – 2017 ESWG Meeting Schedule)

Agenda Item 5 – ITP Scope Standardization

Agenda Item 5a – Wind Pricing

Josh Ross (SPP Staff) began the discussion for the standardization of wind pricing with a discussion on curtailment pricing. He noted the current price used and described how that price impacts the economic model simulations. Discussion centered on whether the curtailment price should reflect a production tax credit (PTC) or not. This would result in a negative price or a zero dollar offer price. Considering a PTC could be complicated due to when the PTC expires for each farm and additional pricing differences by state. Scott Benson (LES) made some suggestions on how to standardize a curtailment pricing methodology for the SPP footprint and agreed to work offline with SPP staff to develop a recommendation for future consideration.

Josh Ross (SPP Staff) then started discussion on variable operation and maintenance (VOM) pricing and how it impacts the economic model simulations and results. This discussion centered on whether the VOM price should be reflective of an actual VOM price experienced by the generator owner or, due to the nature of renewable construction and contracts, the power purchase agreement price that an entity would pay. Because this input only affects adjusted production cost calculations, some in the group argued that this should be reflective of the PPA price so as to not overestimate the benefits an entity would receive. Others argued that using the PPA price would underestimate the benefits to the SPP market as a whole. Scott Benson (LES) suggested that he and SPP staff work together to standardize a VOM pricing methodology for the SPP footprint in the event the group decides to use the PPA price. Discussion will continue at the next meeting.

(Attachment 7 – Wind Pricing)

Agenda Item 5b – Policy Survey

Liz Gephardt (SPP Staff) reviewed the methodology for the standardization of the renewable policy survey and relayed some of the discussion that had taken place from presenting this item at the CAWG meeting. SPP staff recommended standardizing percentages of load and/or generation for each utility by state to calculate Mandates and Goals. These percentages would be based on historical values used and member feedback, and would be used as a standard proxy for future renewable energy standards.

> **It was moved by Bennie Weeks (Xcel/SPS) and seconded by Kurt Stradley (LES) to approve the SPP staff recommendation to standardize percentages of load and/or generation for each utility by state to calculate renewable [policy] Mandates and Goals. A friendly amendment from Gayle Nansel (WAPA) to add "where applicable" to the end of the motion was accepted. The recommendation was approved by unanimous vote.**

The percentages to be used for each utility by state will be determined upon further review by the stakeholders. (Attachment 8 – Policy Survey)

Agenda Item 5c – Resource Expansion Plan

Josh Ross (SPP Staff) reviewed the methodology for modeling renewable additions or developing a renewable resource expansion plan for external regions.

> **It was moved by Tim Owens (NPPD) and seconded by Kurt Stradley (LES) to approve SPP staff recommendation standardize development of the external renewable resource expansion plan. The recommendation was approved by unanimous vote.**

Josh then reviewed a methodology to develop a conventional expansion plan absent resource planning software for a "traditional" Future. A non-traditional future would require software simulations to properly assess the impact of large changes in input assumptions. After much discussion on the criteria the group determined that due to the reasonably low incremental work that would be needed to develop a model to simulate a traditional future if a non-traditional future model were to be developed, that software should be continue to be used moving forward. Josh also reviewed a methodology for modeling conventional additions or developing a conventional resource expansion plan for external regions. The group asked that language for implementing the conventional resource plans be firmed up for the next meeting. (Attachment 9 – Resource Planning)

Agenda Item 5d – Resource Siting Plan

Chris Jamieson (SPP Staff) began the discussion on the methodology for siting both conventional and renewable resources within the SPP footprint. Steve Gaw (Wind Coalition) expressed concern about the latest methodology for wind siting relying solely on the SPP generation interconnection queue, stating that building new transmission to sites of greater potential might be better for accommodating future proxy wind. It was also requested that resource siting be included in the overall discussion of ITP data confidentiality. (Attachment 10 – Resource Siting Plan)

Agenda Item 5e – Hurdle Rates

Nikki Roberts (SPP Staff) went over three different approaches to hurdle rates that have been utilized or considered in the past. SPP Staff recommended using the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities. (Attachment 11 – Hurdle Rates)

> **It was moved by Kurt Stradley (LES) and seconded by Pat McCool (KCPL) to approve SPP staff's recommendation to the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities. The recommendation was approved by unanimous vote.**

Agenda Item 5f – Benefit Metrics

Amber Greb (SPP Staff) went over the ten metrics that are currently in the ITP process. SPP staff recommended testing all 10 benefit metrics on the final portfolio of a given ITP study in each of the approved futures. For the ITP manual, Staff recommended softening the language to allow flexibility for varying numbers of final portfolios and futures. (Attachment 12 – Benefit Metrics)

> **It was moved by Don Le (NEET) and seconded by Tim Owens (NPPD) to approved SPP staff's recommendation to test the 10 benefit metrics on the final recommended plan of a given ITP study in each of the approved futures. The recommendation was approved by unanimous vote.**

Agenda Item 5g – Sensitivity Analysis

[This item was not covered]

Agenda Item 5f – Benefit Metrics

[This item was not covered]

Agenda Item 5f – Benefit Metrics

[This item was not covered]

Closing Items

Juliano Freitas (SPP Staff) informed the group that he would like to begin having conference calls related to the ITP Scope Standardization items at the end of each month in order to support the ITP Manual Task Force in order to expedite this process from now through April.

The meeting was adjourned at 3:00 PM.

Respectfully Submitted,

Kelsey Allen

ESWG Secretary

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

January 12, 2017

AEP Office/Dallas, TX

• ATTENDANCE LIST •

Name	Company
Kelsey Allen	SPP
Jarrod Walford	Northeast Texas Electric Coop
Tim Owens	NPPD
Kurt Spyder	LES
Josh Ross	SPP
Don Le	NEET
Jason Davis	SPP
Sam Loudenslager	SPP Staff
Gayle Nansel	WAPA
Alan Myers	ITC
Bonnie Weeks	Xcel Energy/SPS
Adam McKinnie	MO PSC
BRIAN JOHNSON	AEP
ZAC HAGER	OG+E
Tim Jacoby	AEP
Jody Holland	SCMCN
Eric Burkey	SCMCN
JULIANO ENDRIAS	SPP

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Zac Hager	

Company	Attendance
MO PSC	In Person
	Webex
ITC	In Person
	Webex
	Webex
	Webex
	Webex
Xcel Energy/SPS	In Person
	Webex
	Webex
AEP	In Person
	Webex
	Webex
	Webex
	Webex
NEET	In Person
	Webex
	Webex
SCMCN	In Person
WAPA	In Person
	Webex
	Webex
Northeast Texas Electric Coop	In Person
SPP	In Person
	Webex
	Webex
	Webex
	Webex
AEP	In Person
SCMCN	In Person
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
SPP	In Person
	Webex
SPP	In Person
SPP	In Person
	Webex
	Webex
LES	In Person
	Webex
	Webex
	Webex

	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
	Webex
SPP Staff	In Person
	Webex
	Webex
	Webex
NPPD	In Person
	Webex
OGE	In Person

ESWG Proxy Statements

1. Bethany King proxy to David Busse

From: King. Bethany
Sent: Thursday, January 12, 2017 7:39 AM
To: Myers, Alan; Kelsey Allen
Cc: Busse, David
Subject: **External Email** Today's ESWG Meeting

Hey Alan and Kelsey,

I will not be able to participate in the meeting today. I would like to pass my proxy to David Busse.

Thank you!

Bethany King | **Empire District – Liberty Utilities Central** | Manager of Strategic Planning
P: 417-625-4244 | C: 417-825-8042 | E: bking@empiredistrict.com

Southwest Power Pool, Inc.

ECONOMIC STUDIES WORKING GROUP

Pending Action Items Status Report

January 12th, 2016

	Action Item	Date Originated	Status	Comments
057	SPP staff will write a straw-man procedure or portion of the ITP manual that deals with conventional and wind generation planning and siting within the ITP process. The process should be in place by the Spring of 2015.	August 23rd, 2012	In Progress Staff	A draft resource siting whitepaper will be developed for review mid-2016.
151	Staff to look into optional software tools for use in ITP studies.	May 20th, 2015	In Progress Staff	Staff is meeting with software vendors and users and expects to have a recommendation on any potential resource planning software changes by 4th quarter 2016.
160	SPP Staff and the ESWG are to formalize standard procedures for data requests and member review of information related to ITP studies.	January 21st, 2016	In Progress Staff/ESWG	Combined item representative of AI148 and AI149.
161	Staff to report on carbon emissions as the 2017 ITP10 study moves forward through the different milestones.	February 24th-25th, 2016	~~In Progress~~Complete Staff	
163	SPP Staff and members to prepare for discussion on scope standardization and prioritization of discussion items.	April 21st, 2016	In Progress Staff/Members	
165	ESWG to review the assumed benefit of mandated reliability projects	May 13th, 2016 RARTF	In Progress ESWG	
166	ESWG to review the impacts of using the system reconfiguration hybrid approach for the Assumed Benefit of Mandated Reliability Projects	May 13th, 2016 RARTF	In Progress ESWG	
167	ESWG to review the classification of projects in the ITP process	May 13th, 2016 RARTF	In Progress ESWG	

168	Staff and the ESWG to evaluate the issues seen in the DC to AC model conversion process.	May 18th-19th, 2016	In Progress Staff/ESWG	
172	Staff to develop examples and language for tackling synergies of powerflow and economic generation data.	June 16th, 2016	In Progress Staff	October 20th: ESWG approved a methodology for the ITP standard scope. Discussions should continue with SAWG for coordination of methodology, as appropriate.
173	Staff to develop a process for annual update of the economic model with vendor data.	June 16th, 2016	In Progress Staff	
174	Staff to develop criteria and methodology to developing resource plans absent a software tool.	June 16th, 2016	In Progress Staff	
183	SPP Staff to perform the outage analysis to determine the appropriate APC benefit % to utilize in the mitigation of transmission outages benefit metric in the first part of 2017.	September 15th, 2016	In Progress Staff	


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

2017 ITP10 Schedule

ESWG

January 12th, 2017

Final Approvals

- MOPC
  - January 17th – 18th, 2017
- BOD
  - January 31st, 2017

2017 Meeting Schedule

ESWG

January 12th, 2017

Schedule – 1st Semester

January

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

February

S	M	T	W	T	F	S
			1	2	3	4
5	6	9	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

March

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

May

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	10	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

June

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Month	Day	Location
January	12	Dallas (AEP)
February	15	San Antonio
March	16	Dallas (AEP)
April	20	Dallas (AEP)
May	17	St. Louis
June	15	Dallas (AEP)

- BOD
- RSC
- MOPC
- PCWG
- SPCWG
- CAWG
- TWG
- ESWG
- MDWG
- SSC
- SPC
- SAWG
- SPP Holiday

Combination Dates
- ESWG/TWG
- ESWG/SSC
- ESWG/PCWG
- SSC/CAWG
- PCWG/TWG/SSC
- PCWG/SSC
- SAWG/TWG
- ESWG/SAWG

Schedule – 2nd Semester

July

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

August

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	9	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

December

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Month	Day	Location
July	20	Dallas (AEP)
August	16	Denver
September	14	Dallas (AEP)
October	12	Dallas (AEP)
November	8-9	Little Rock (SPP)
December	14	Dallas (AEP)

BOD
RSC
MOPC
PCWG
SPCWG

CAWG
TWG
ESWG
MDWG

SSC
SPC
SAWG

SPP Holiday

Combination Dates
ESWG/TWG
ESWG/SSC
ESWG/PCWG
SSC/CAWG
PCWG/TWG/SSC
PCWG/SSC
SAWG/TWG
ESWG/SAWG

ITP Scope Standardization – Wind Pricing

ESWG

January 12, 2017

Wind Modeling – Economic Parameters

- PROMOD has two primary economic modeling parameters impacting wind dispatch, curtailment, and production cost
  - Curtailment price
  - Variable O&M
- SPP currently uses $8/MWh for both of these, for all wind units

Wind Curtailment Price

- Defines the trigger price at which wind will curtail
- If curtailment price is $8/MWh, wind will curtail if the LMP at the unit drops to $7/MWh
  - If the LMP stays above $8/MWh, the wind dispatch will follow the defined hourly profile for that unit
  - The curtailment price impacts dispatch/curtailment, but does not impact unit production costs
- Staff analyzed historical offer prices in the Integrated Marketplace, 2014 – 2016
  - After removing extreme outliers, -$23/MWh was the average offer price
  - There is some variability; some prices are higher, even above zero, while many offers are around -$60/MWh, due to the PTC + PPA price
- Option 1: Use -$23/MWh for curtailment price, which would account for a PTC
- Option 2: Use $0/MWh for curtailment price, which does not account for a PTC
  - ABB recommendation
  - Staff recommendation

Wind Variable O&M

- Defines the operating cost per MWh
- Does not impact dispatch/curtailment, but directly impacts production cost and APC benefit
- Three ideas for defining this
  - Use approximate operating cost (~$0/MWh)
  - Use approximate PPA price
  - Use some kind of a compromise between the operating cost and PPA price (such as $8/MWh, or higher)
- Staff recommends using $8/MWh as variable O&M for wind

Renewable Hourly Profiles

- Use publicly available data, preferably NREL toolkit
- We are requesting ABB to incorporate NREL data in the ABB Reference Case data, to help facilitate the use of this data

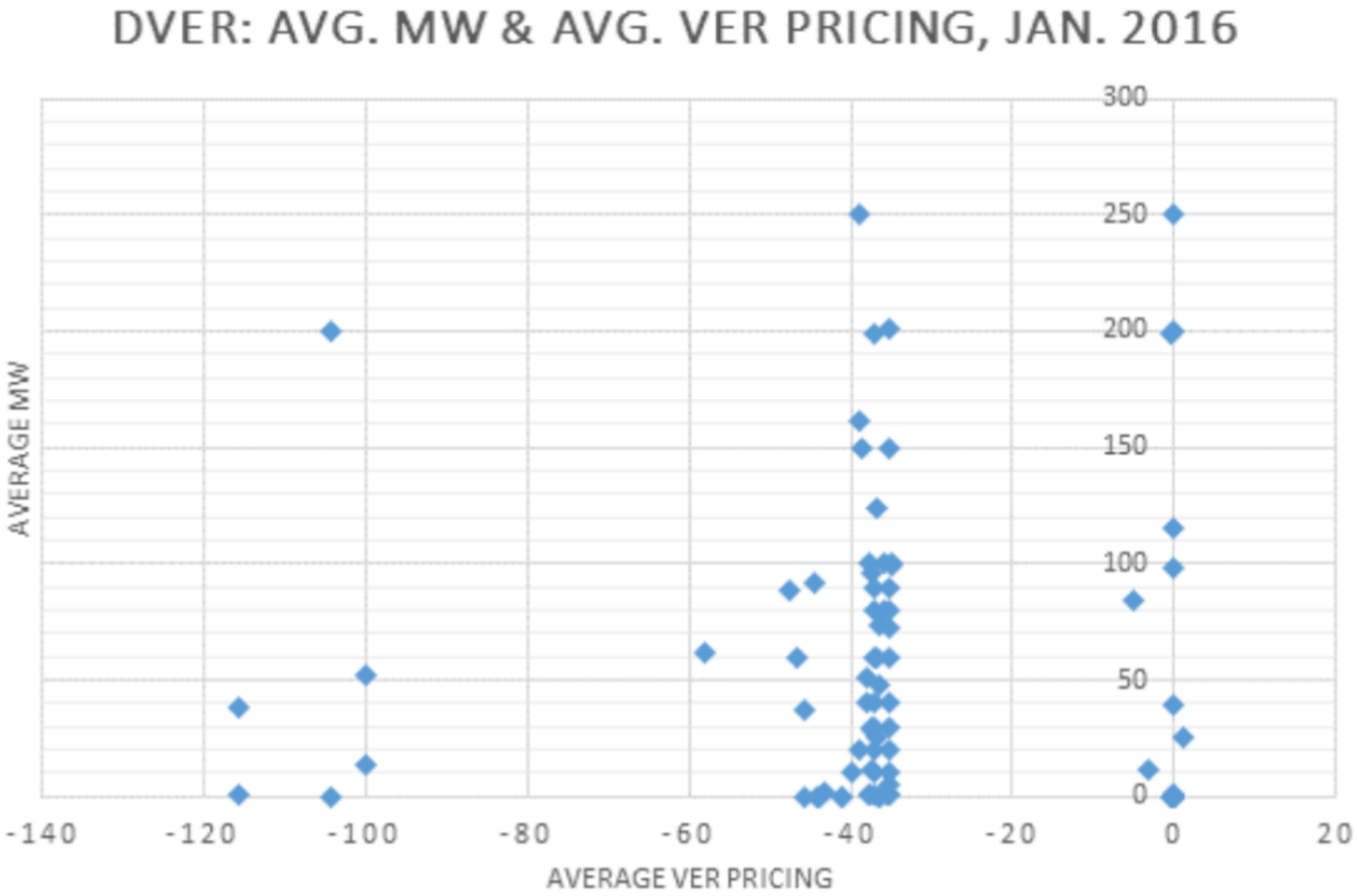
Appendix

PTC ($/MWh)

Current Year	PTC %	ITC %	Wind Farm Construction (In-Service Year)														
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Jan. 1, 2020
2006	100%		$ 23														
2007	100%		$ 23	$ 23													
2008	100%		$ 23	$ 23	$ 23												
2009	100%		$ 23	$ 23	$ 23	$ 23											
2010	100%		$ 23	$ 23	$ 23	$ 23	$ 23										
2011	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23									
2012	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23								
2013	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23							
2014	100%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23						
2015	100%	30%	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23					
2016	100%	30%		$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23				
2017	80%	24%			$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18			
2018	60%	18%				$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14		
2019	40%	12%					$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	
2020	0%	10%						$ 23	$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2021	0%								$ 23	$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2022	0%									$ 23	$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2023	0%										$ 23	$ 23	$ 23	$ 18	$ 14	$ 9	-
2024	0%											$ 23	$ 23	$ 18	$ 14	$ 9	-
2025	0%												$ 23	$ 18	$ 14	$ 9	-
2026	0%													$ 18	$ 14	$ 9	-
2027	0%														$ 14	$ 9	-
2028	0%															$ 9	-
2029	0%																-

NOTE: After construction begins the tax payer has 4 years to complete construction, e.g. a wind facility starting construction in 2019 could begin operation in 2023, and the PTC would expire in 2033.
https://www.irs.gov/irb/2016-23_IRB/ar07.html

Historical Wind Offer Pricing, Jan 2016



Source: Strategic Planning Committee background materials, 12/1/16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TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

ITP Scope Standardization – Policy Survey

Liz Gephardt

ITP Policy Survey

- ITP Scope Standardization
- Process
  - Survey to members for Regulatory/Statutory Mandates and Goals in staging and study years
  - Feeds into Resource Plan and Policy Needs Assessment
- 2017 ITP10
  - 7 week time frame
    - 3 weeks SPP staff prep and processing results
    - 4 weeks of member review/feedback
  - Resource Time
    - 48.5 SPP staff hours
    - Unknown utility contact hours
  - Results
    - <400 MW of renewables
    - No Policy Needs

Policy Survey Standardization

- Survey has minimal impacts to study, yet necessary
- Amounts for renewables are fairly standard
- Standardize percentages of load or generation for renewables for reasonable proxy
- SPP staff to calculate internally and post for review and vetting
- Decreases time frame in schedule and resource hours for SPP staff and stakeholders
- CAWG generally ok with methodology, some concerns:
  - Deliverability
  - Nebraska
  - Consideration of RECs
  - Texas input

ITP Standard Policy Survey Recommendation

- SPP staff recommends standardizing percentages of load and/or generation for each utility by state to calculate Mandates and Goals, where applicable. These percentages would be based on historical values used and member feedback, and would be used as a standard proxy for future renewable energy standards.

Proposed Standard Values

- States not included in the table would have no standard percentage

State	RPS Type	Capacity- or Energy-Based	Gen- or Load-Oriented	Year 2 %	Year 5 %	Year 10 %
Kansas	Goal	Capacity	Load	20	20	20
Minnesota	Mandate	Energy	Load	20	20	25
Missouri	Mandate	Energy	Load	15	15	15
Montana	Mandate	Energy	Load	15	15	15
North Dakota	Goal	Energy	Load	10	10	10
New Mexico	Mandate	Energy	Load	20	20	20
Oklahoma	Goal	Capacity	Gen	15	15	15
South Dakota	Goal	Energy	Load	10	10	10
Texas	Mandate	Capacity	Load	5	5	5

ITP Scope Standardization – Resource Planning

ESWG

January 12, 2017

Renewable Additions

Approved 10/20/16

SPP Renewable Additions

- Renewable additions will be identified prior to conventional additions
- Wind and solar additions shall be computed using criteria that can be applied uniformly across zones
  - In order to have consistency across the region and to maintain some simplicity, renewable additions will not include surveying different members for each's expected additions in 5-10 years
  - Criteria for proposed additions in each study will consider factors such as government regulations, historical trends, NG prices, installation trends, and IRP projections
- Hydro, Biomass, Other – RAR process

Renewable Additions – External

- MISO – use renewable resource additions from the most current MTEP model (future-specific)
  - If the MTEP does not have a comparable future to the ITP, MISO renewable additions would be determined consistent with the process used for other regions (below)
- AECI, TVA, SaskPower, Manitoba, any others
  - Wind and solar additions shall be determined based on consideration of factors such as government regulations, historical trends, NG prices, installation trends (nation-wide and location-specific), IRP projections, and feedback from external entities

Conventional Additions

Conventional Additions – SPP

- Identify conventional generation prototype parameters using publicly available data
- Assess resource shortfall by pricing zone, based on reserve margin
  - Account for existing load, existing generation, new wind and solar additions, and renewable accreditations
- Traditional futures (No radical change in public policy or gas prices)
  - No software simulations, but leverage previous resource planning simulations to develop criteria
- Non-traditional futures
  - Resource expansion tool(s) will be utilized
- No siting involved in conventional additions process

Conventional Additions – Traditional Futures

- Develop zonal targets for **peaking gen/total gen** ratios, after all resource additions
  - These zonal ratios were similar between our last two studies for Reference Case/BAU models (see table to the right). This gives us some confidence that these ratios won't change significantly in traditional futures in later studies
- The 2017 ITP10 F3 peaking gen/total gen ratios will be used as a historical reference point in future studies:

Reference Cases for last two studies - Peaking Gen/Total Gen Ratios After Resource Additions

Zone	2015ITP10_F1	2017ITP10_F3	Difference
AEPW	42.0%	35.7%	**6.2%**
BPU	46.3%	43.4%	**2.8%**
CUS	32.7%	24.0%	**8.7%**
EMDE	27.0%	22.4%	**4.6%**
GMO	45.4%	50.7%	**-5.3%**
GRDA	1.3%	2.5%	**-1.3%**
INDN	54.4%	42.8%	**11.6%**
KCPL	18.4%	19.0%	**-0.6%**
LES	31.9%	27.0%	**4.9%**
MIDW	54.0%	27.8%	**26.3%**
MKEC	86.2%	77.6%	**8.7%**
NPPD	22.6%	13.6%	**9.0%**
OKGE	31.8%	42.5%	**-10.8%**
OPPD	33.6%	31.8%	**1.8%**
SPA	5.2%	5.9%	**-0.7%**
SPS	43.9%	30.9%	**13.0%**
SUNC	51.5%	28.4%	**23.0%**
WFEC	37.1%	23.3%	**13.8%**
UMZ	21.0%	18.2%	**2.8%**
WERE	45.1%	30.8%	**14.3%**
TOTAL	**35.1%**	**29.4%**	**5.7%**

Target Peaking Gen/Total Gen Ratio =

$$\frac{\text{Historical LF}}{\text{New study LF}} * \text{Historical Peaking Gen/Total Gen Ratio}$$

Conventional Additions – Traditional Futures

- CCs and/or CTs will be added to zones with shortfall in order to pull the zonal peaking gen/total gen ratio closer to the target
  - Zones keep a similar resource mix to what we have shown in previous studies
  - If a zonal load factor changes from one study to the next, the target peaking gen/total gen ratio changes with it
  - This should keep the region equipped with adequate peaking resources and baseload resources for serving load
  - Resource additions will not result in hitting the target ratios, but rather getting closer to the target ratios

Conventional Additions – Traditional Futures Calculations

- 2017 ITP10 used as historical reference point
  - Load Factor (LF) by zone
  - Peaking Gen/Total Gen Ratio by zone
- In future studies, zonal target ratios would be calculated as:

$$\text{Target Peaking Gen/Total Gen Ratio} = \frac{\text{Historical LF}}{\text{New study LF}} * \text{Historical Peaking Gen/Total Gen Ratio}$$

- Zones keep a similar resource mix to what was included in the 2017 ITP10, adjusted for updated load factors

Conventional Additions – Traditional Futures Example

- In future study, AEPW has new load factor of 40%
  - Because of the LF reduction, AEPW additions would include more peaking resources
- AEPW target peaking gen/total gen ratio =
  $\frac{53.2\%}{40\%}$ * (35.7%) = **47.5%**
- CC and CT resources are added to AEPW as needed to reach reserve margin requirements, while aiming for a target peaking gen/total gen ratio of 47.5%
  - Resource additions will not result in hitting the target ratios, but rather getting closer to the target ratios
- This should keep the region equipped with adequate peaking resources and baseload resources for serving load

2017 ITP10 Future 3

Zone	Peaking Gen/Total Gen Ratio After Resource Additions	Load Factor
AEPW	35.7%	53.2%
BPU	43.4%	56.9%
CUS	24.0%	47.4%
EMDE	22.4%	53.0%
GMO	50.7%	54.0%
GRDA	2.5%	58.1%
INDN	42.8%	45.8%
KCPL	19.0%	51.0%
LES	27.0%	53.6%
MIDW	27.8%	52.3%
MKEC	77.6%	56.1%
NPPD	13.6%	53.6%
OKGE	42.5%	56.8%
OPPD	31.8%	53.0%
SPA	5.9%	54.3%
SPS	30.9%	63.9%
SUNC	28.4%	61.3%
WFEC	23.3%	53.9%
UMZ	18.2%	64.8%
WERE	30.8%	53.9%
TOTAL	29.4%	56.1%

Conventional Additions – Non-Traditional Futures

- If a future scenario is fundamentally different from a traditional future, such that the addition of only CCs and CTs might not be the best option, then resource expansion software will be used to identify the optimum mix of new conventional resources to add
  - Unit additions selected by software will be allocated to zones in order to satisfy reserve margin requirements for all zones
- Non-Traditional Futures Examples
  - Significant change in NG price forecast
  - New public policy that results in carbon constrained modeling
  - Other new public policy
- Resource expansion software will not be utilized to identify new renewable resources
  - These additions identified through renewable additions process

Conventional Additions – External

- MISO – use conventional resource additions from the most current MTEP model (future-specific)
  - If the MTEP does not have a comparable future to the ITP, MISO renewable additions would be determined consistent with the process used for other regions (below)
- AECI, TVA, SaskPower, Manitoba, any others – calculate resource additions by spreadsheet for all types of futures
  - Start with capacity shortfall calculations
  - Add conventional units with a resource mix that is as close as possible to the SPP resource addition mix for that future
    - For example, if SPP additions include 60% CCs and 40% CTs, use as close as possible to a 60/40 ratio for additions in these external regions

Other Considerations

Resource Additions Proposal – Baseline

- In order to better reflect the resource expansion plans of individual members in the ITP resource plan, a baseline phase will take place in which members can submit expected future generation (conventional/renewable) through the MDWG model development process
  - May be reflective of company IRP, or other company expectations not included in IRP
  - Examples would include expected technology type of new generation; however, no siting considerations at this stage
  - Members submit baseline additions through the load and generation review, with member explanations of expected additions included
- Use member-submitted generation parameters
  - If member is unable to provide parameters, ABB Reference Case data for that technology type would be used

Resource Plan – Years 2, 5, 10

- Year 2
  - High Certainty for any planned resource additions
  - Ensure region meets reserve margin requirements
    - SPP will not identify resource additions
    - IPP resources assigned to resource deficient zones
- Years 5 and 10
  - Could have Less Certainty for forecasted resource additions
  - Wind and solar unit additions based on uniform criteria (approved October)
  - Add conventional resource plan units as needed to meet reserve margin requirements in these years


SPP
75th Anniversary
75
SEVENTY-FIVE YEARS OF
RELIABILITY THROUGH RELATIONSHIPS

ITP Resource Siting Plan

October 20th, 2016

ESWG

Chris Jamieson

Resource Siting Plan - Conventional

- Investigating process questions and details for members to add publicly available Integrated Resource Planning resources with siting into Model on Demand
  - Applicability to planning models
  - Requirement for Resource Addition Requests
- Leverage conventional generation siting repository
  - Collection of sites from GI Queue, previous studies, staff and member alternatives
  - Includes retirement dates of existing resources for replacement
  - Includes transmission interconnection capability screening
  - Provided to members for new site updates and ranking at beginning of milestone
  - Rank sites by zone
  - Tracking of study to study resource plans
- Assignment by Zone

Resource Siting Plan - Wind

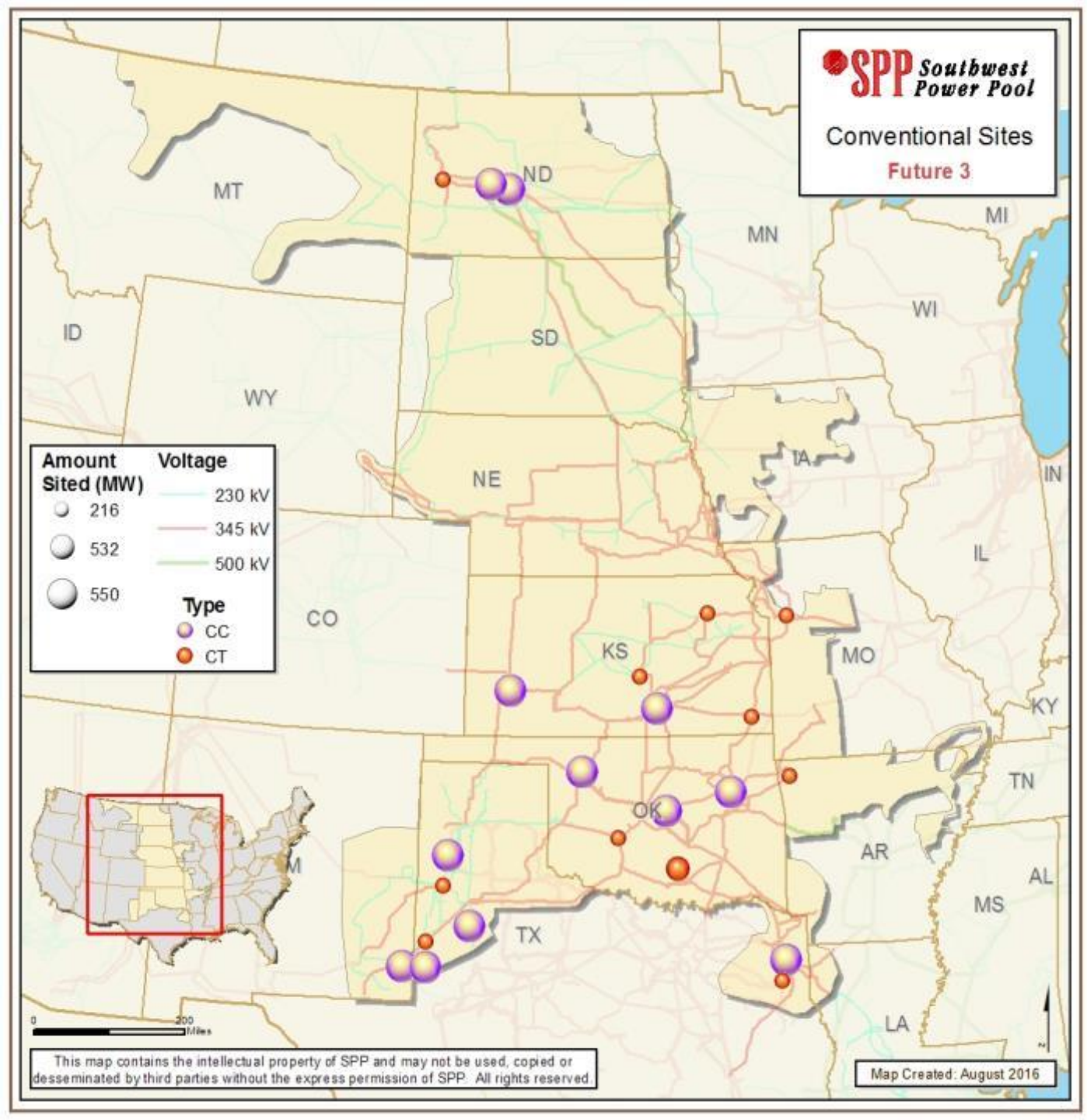
- Leverage Generation Interconnection queue until such time the resources plan additions exceed ranked statuses
- Ranked generation interconnection queue statuses
  - IA on-schedule
  - IA on-suspension
  - IA commercial operation not fully on-line
  - IA Pending
  - Facility Study
- Additional rankings by capacity factor by interconnection costs
- Assignment by Zone by State by Region

Resource Siting Plan - Solar

- Leverage Generation Interconnection queue then supplement using NREL comprehensive data set
- Additional rankings by capacity factor by interconnection costs or interconnection capability screening
- Assignment by Zone by State by Region

2017 ITP10 Siting Plan

Conventional Maps



Future 3

Unit Additions

Combine Cycle: 12

Combustion Turbine: 12

MW Additions

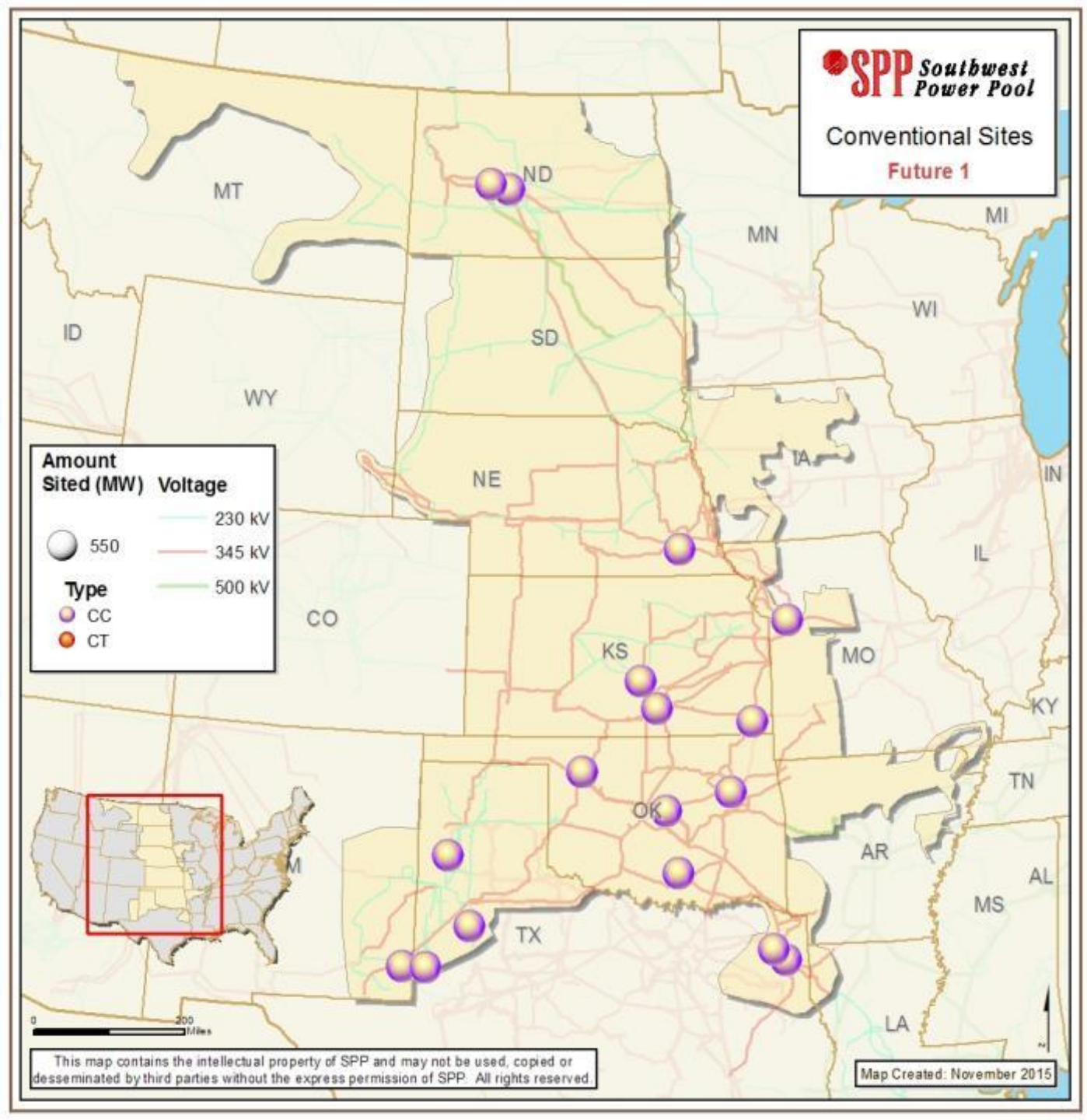
Combine Cycle: 6,600

Combustion Turbine: 2,592

Totals

Units: 24

MW: 9,192



Future 1

Unit Additions

Combine Cycle: 17

Combustion Turbine: 0

MW Additions

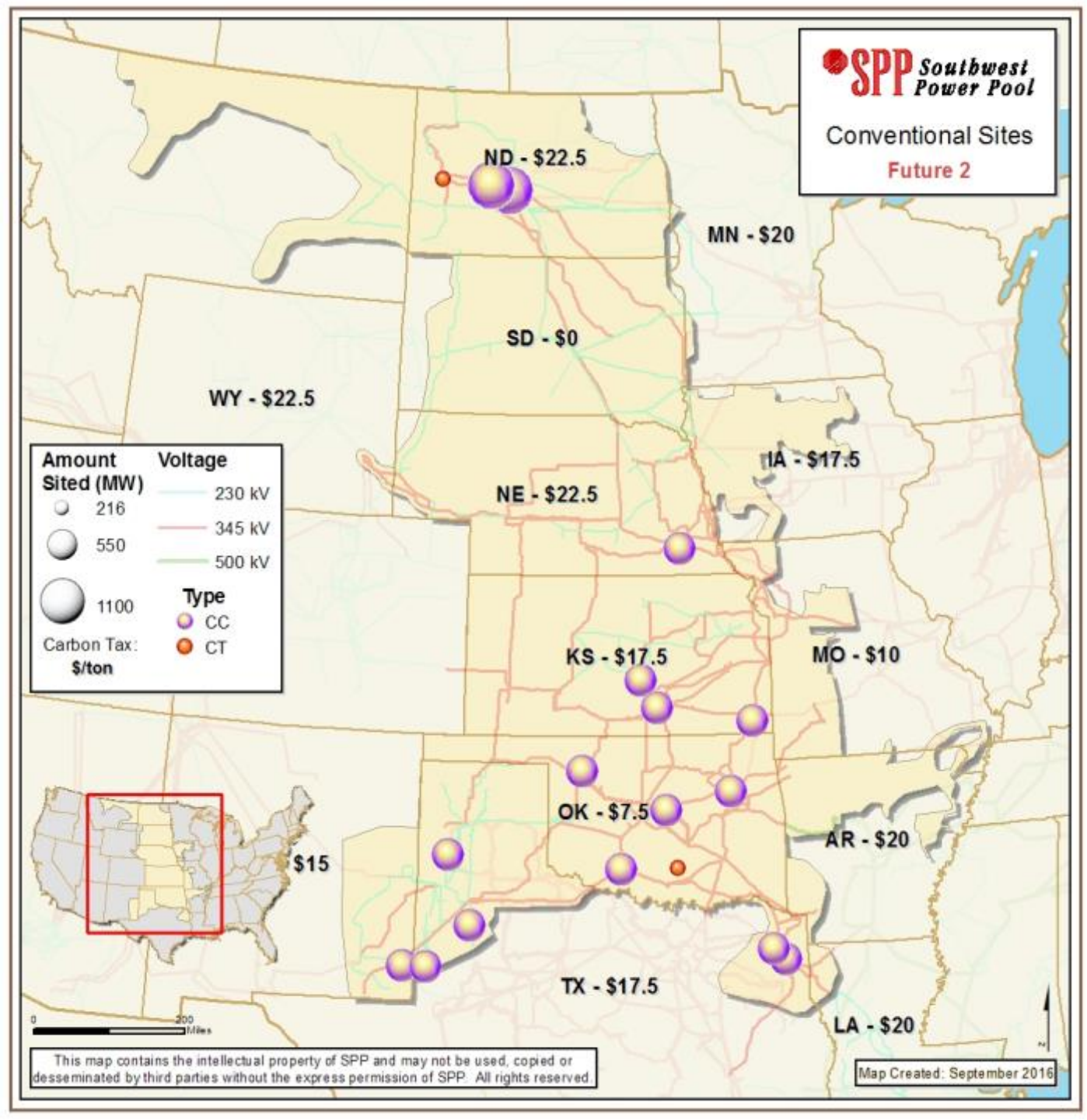
Combine Cycle: 9,350

Combustion Turbine: 0

Totals

Units: 17

MW: 9,350



Future 2

Unit Additions

Combine Cycle: 18

Combustion Turbine: 2

MW Additions

Combine Cycle: 9,900

Combustion Turbine: 432

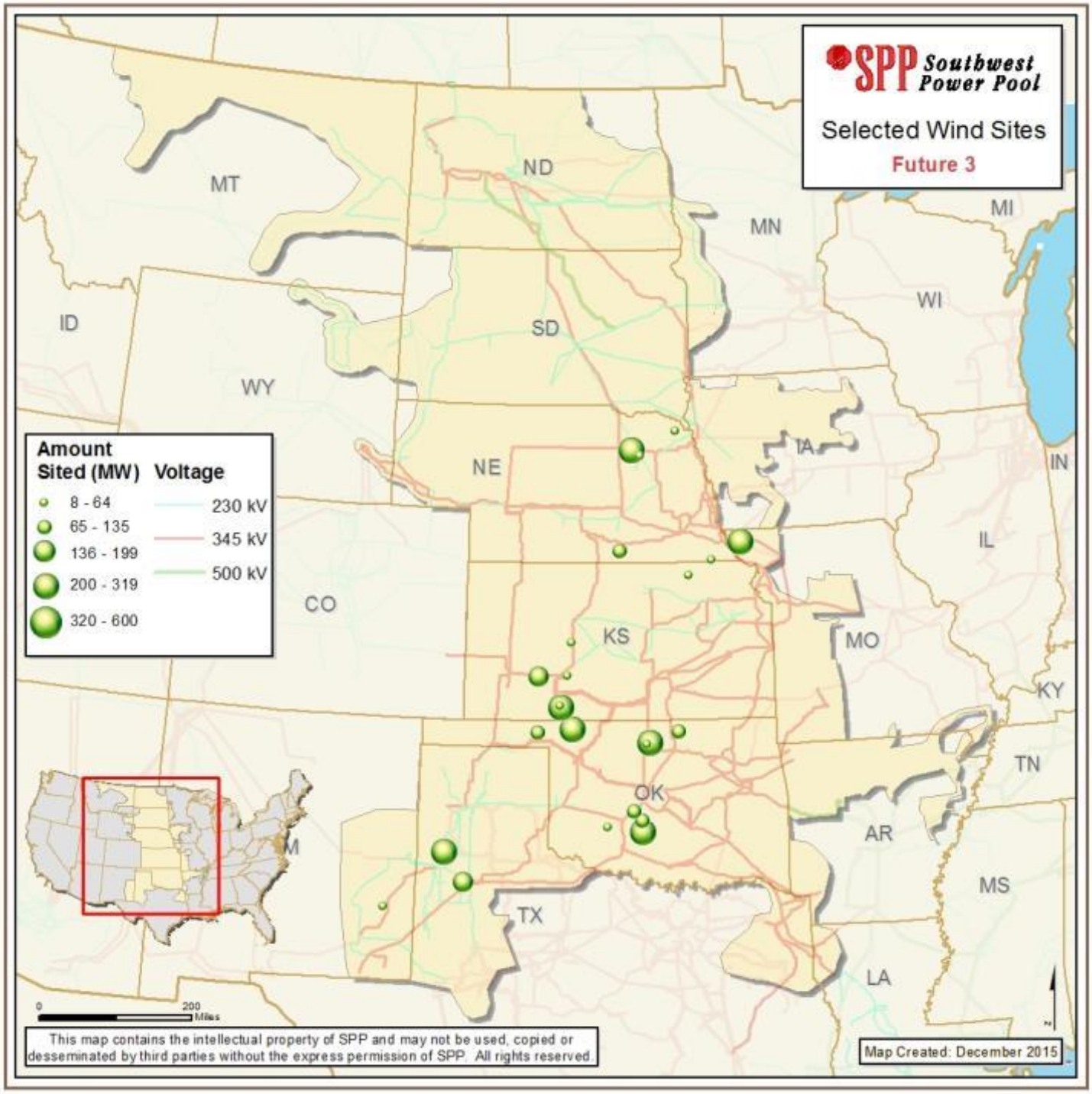
Totals

Units: 20

MW: 10,332

2017 ITP10 Siting Plan

Wind Maps



Future 3

Sites

2020: 25

2025: 1

MW Additions

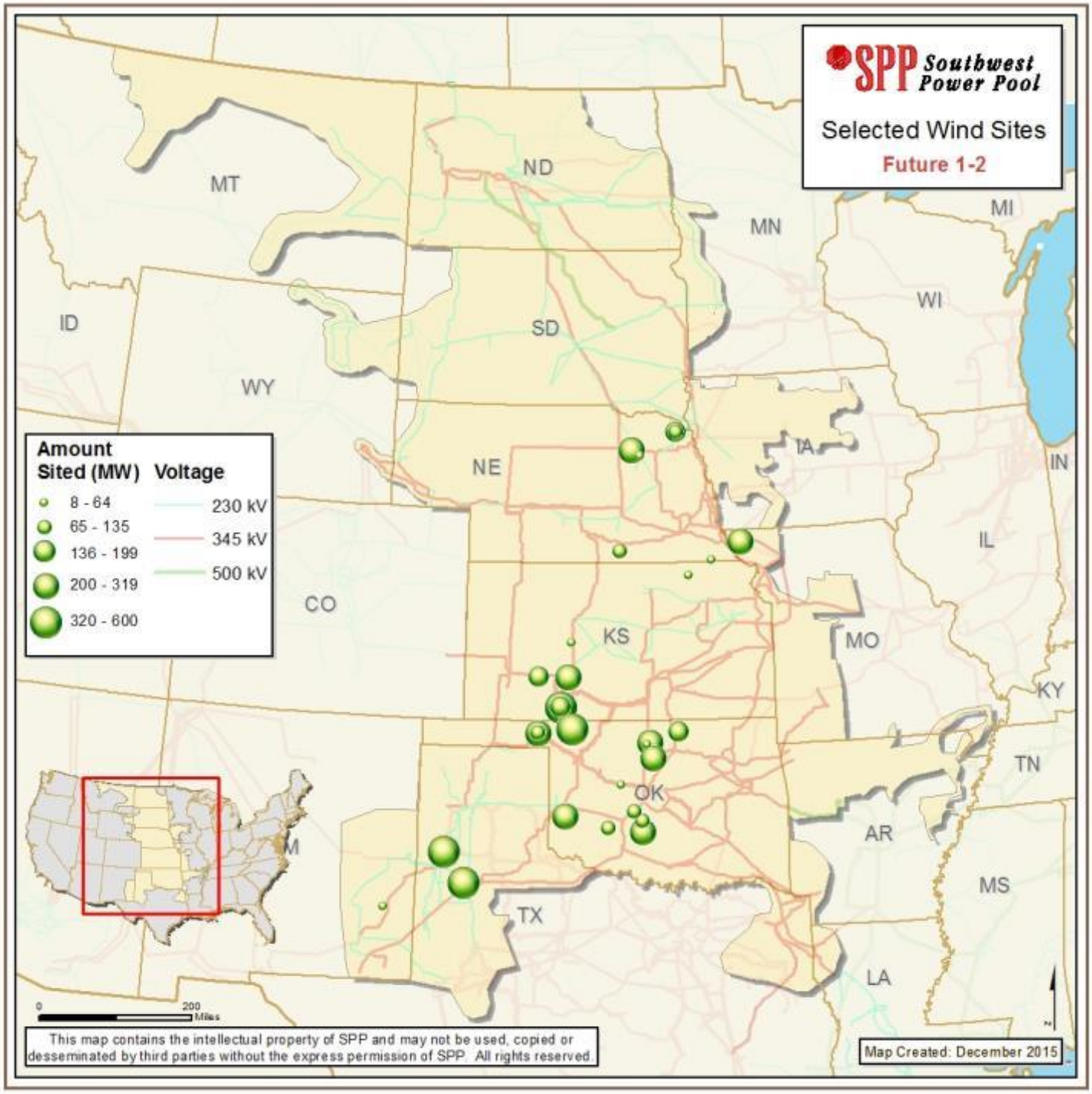
2020: 2,752 MW

2025: 420 MW

Totals

Sites: 27

MW: 3,172



Futures 1 and 2

Sites

2020: 29

2025: 0

MW Additions

2020: 4,721 MW

2025: 544 MW

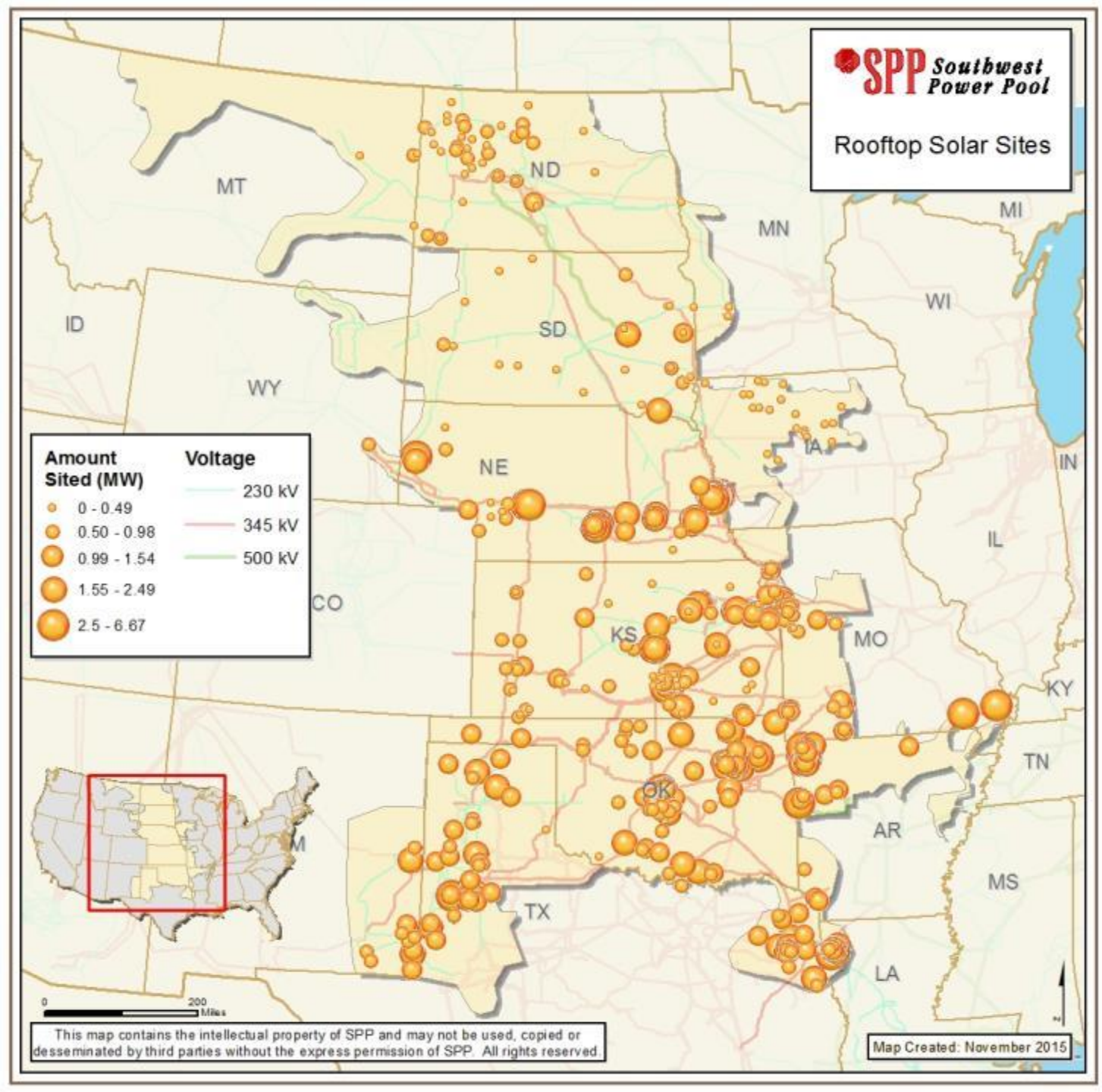
Totals

Sites: 29

MW: 5,265

2017 ITP10 Siting Plan

Solar Maps



Future 3

Sites

2020: 550

2025: 0

2035: 0

MW Additions

2020: 299 MW

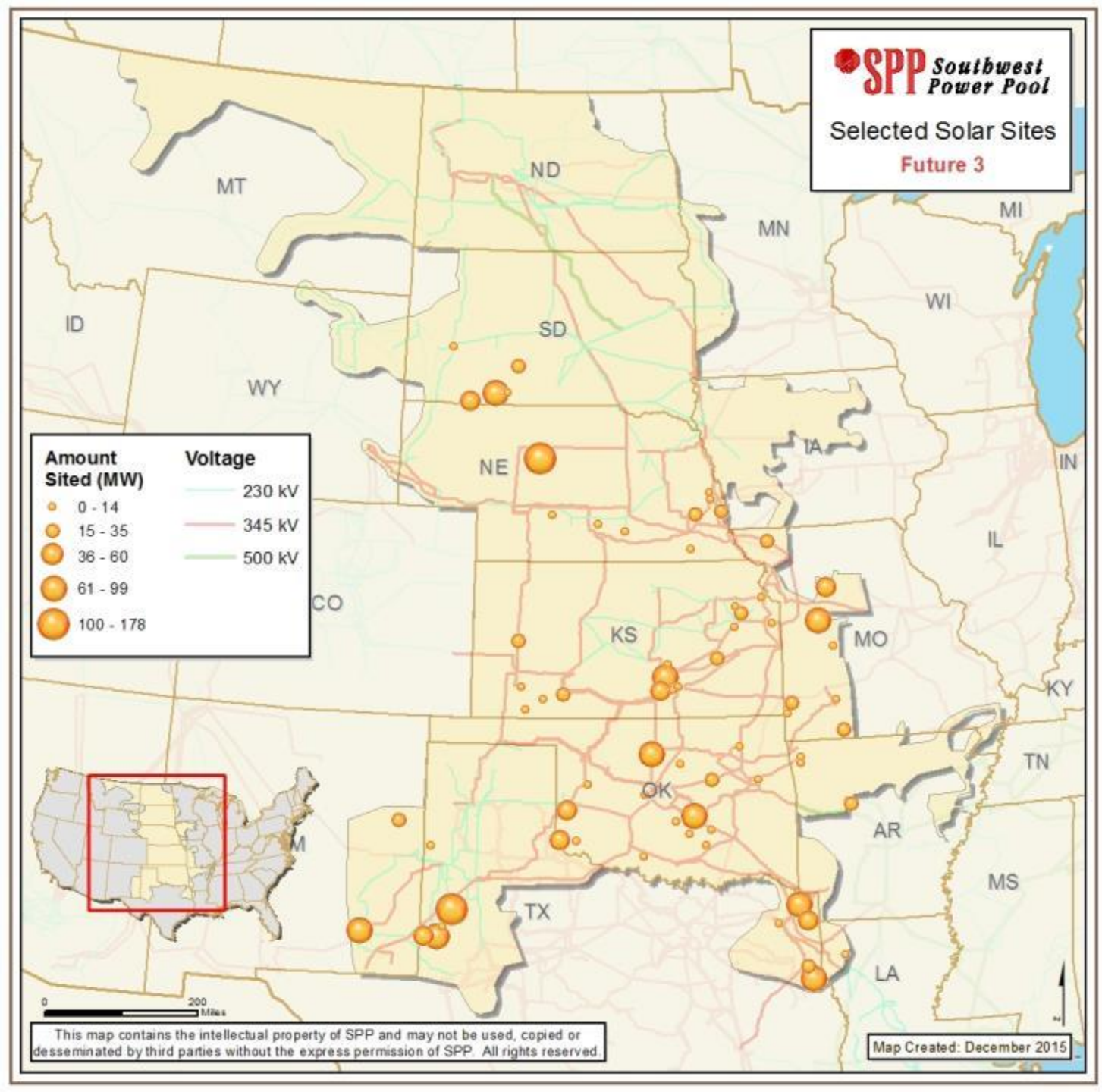
2025: 316 MW

2035: 1,067 MW

Totals

Sites: 550

MW: 1,383 MW



Future 3

Sites

2020: 25

2025: 26

2035: 25

MW Additions

2020: 581 MW

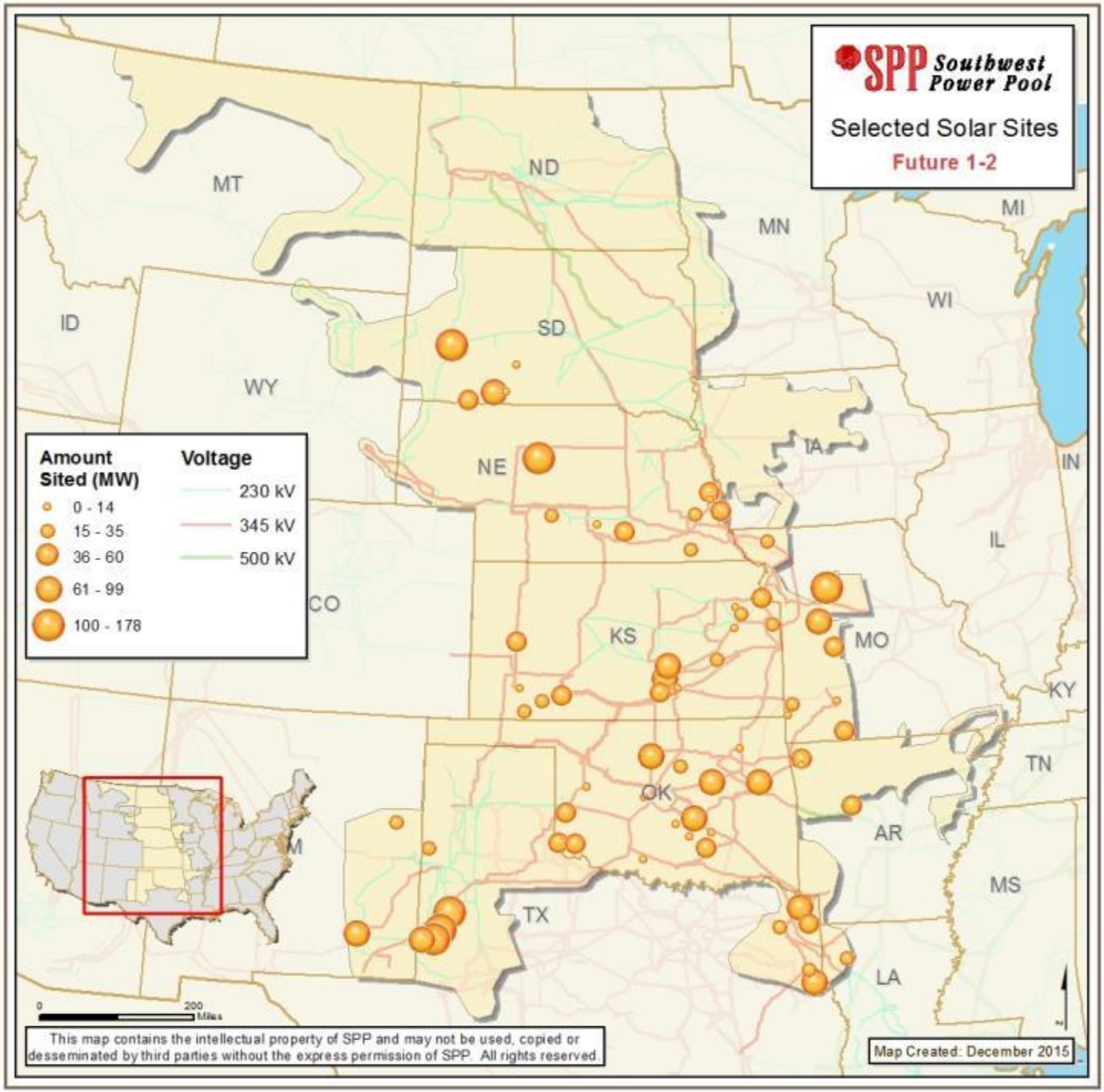
2025: 1,287 MW

2035: 1,602 MW

Totals

Sites: 76

MW: 3,470 MW



Futures 1 and 2

Sites

2020: 49

2025: 22

MW Additions

2020: 1,751 MW

2025: 1,380 MW

Totals

Sites: 71

MW: 3,131

ITP Scope Standardization – Hurdle Rates

ESWG

1/12/2017

SPP Staff

What is a hurdle rate?

- Mechanism to account for impacts of market friction
- Typically modeled as a transmission through-and-out rate plus a friction adder
- Utilized to limit interchange between pools

Approaches to Hurdle Rates

- Utilize the nodal hurdle rates in the latest ABB reference case
  - Leverage ABB years of research and modeling of hurdle rates
  - These nodal hurdle rates have simply been developed over time in various nodal studies
- Monitor interchange to determine hurdle rates between pools
  - Generation and Load Balance
  - Tie-line flows
  - Time intensive with inconclusive results
- Utilize the zonal hurdle rates as calculated by ABB for the ITP study area structure
  - Leverage ABB years of research and modeling of hurdle rates
  - These zonal hurdle rates have been developed from the bottom up using published Oasis tariffs and a friction adder

Recommendation

SPP Staff recommends using the nodal hurdle rates provided in ABB simulation ready data with the ability to make any necessary adjustments based on feedback from neighboring entities.


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

ITP Scope Standardization – Benefit Metrics

Amber Greb

ITP Benefit Metrics

- Current Process
  - Ten benefit metrics are calculated on the final portfolio of projects
    - Adjusted Production Cost (APC)
      - Reduction of Emission Rates and Values (Included in APC)
      - Savings due to Lower Ancillary Service Needs and Production Costs (Included in APC)
    - Avoided or Delayed Reliability Projects
    - Capacity Cost Savings due to Reduced On-Peak Transmission Losses
    - Assumed Benefit of Mandated Reliability Projects
    - Public Policy Benefits
    - Increased Wheeling Through and Out Revenues
    - Marginal Energy Losses Benefit
    - Mitigation of Transmission Outage Costs

ITP Standard Benefit Metrics Recommendation

SPP staff recommends testing all 10 benefit metrics on the final recommended plan of a given ITP study in each of the approved futures.

For the ITP manual, Staff recommends softening the language to allow flexibility for varying numbers of final portfolios and futures. For example, "Generally, the process will be to test a single portfolio in the approved futures."