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to keep the lights on...  
today & in the future**



## EHV Transmission Expansion

IEEE  
April 23, 2008

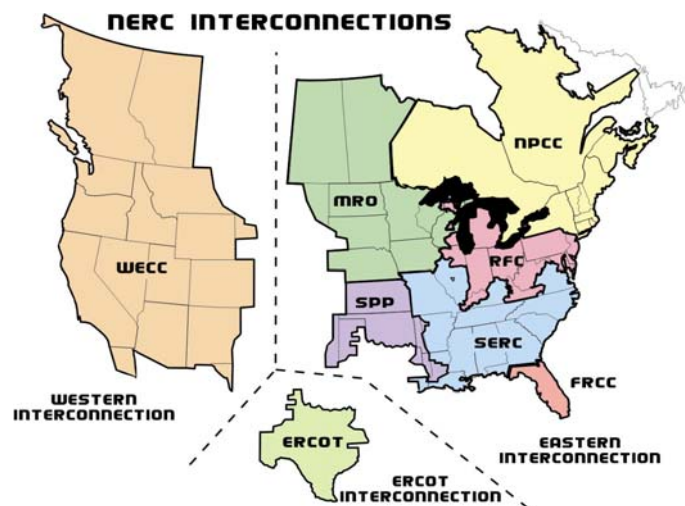
## Overview

- SPP Background
- Oklahoma Electric Power Transmission Task Force (OEPTTF)
- 2008 EHV Overlay Study
- Joint Coordinated System Plan (JCSP)

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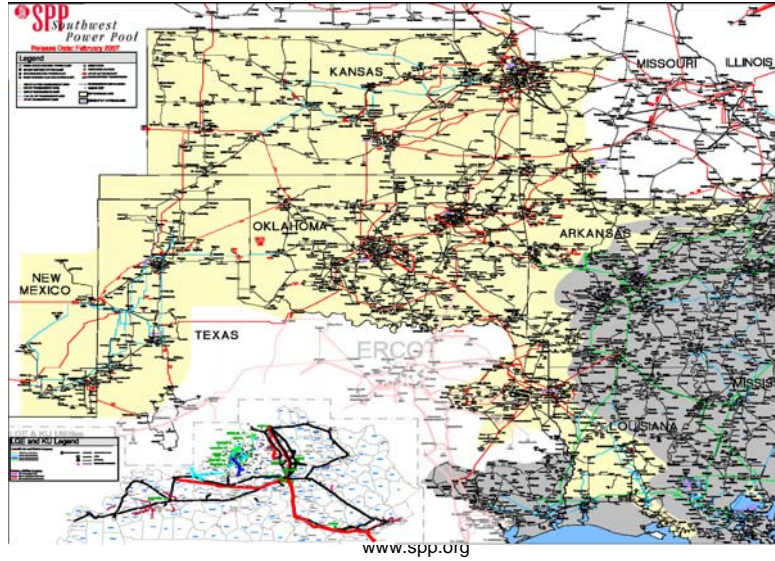
## 3 Interconnections / 8 NERC Regions



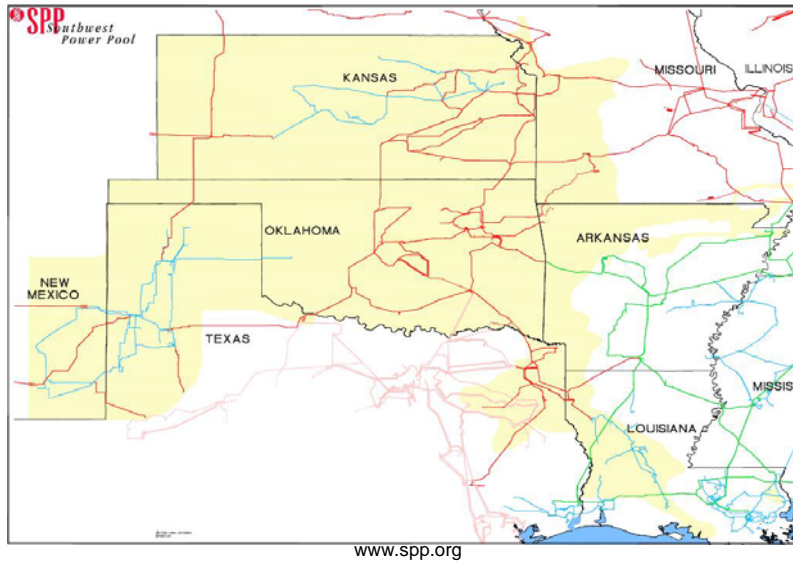
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# SPP Transmission Map



# SPP System: 230 kV and above



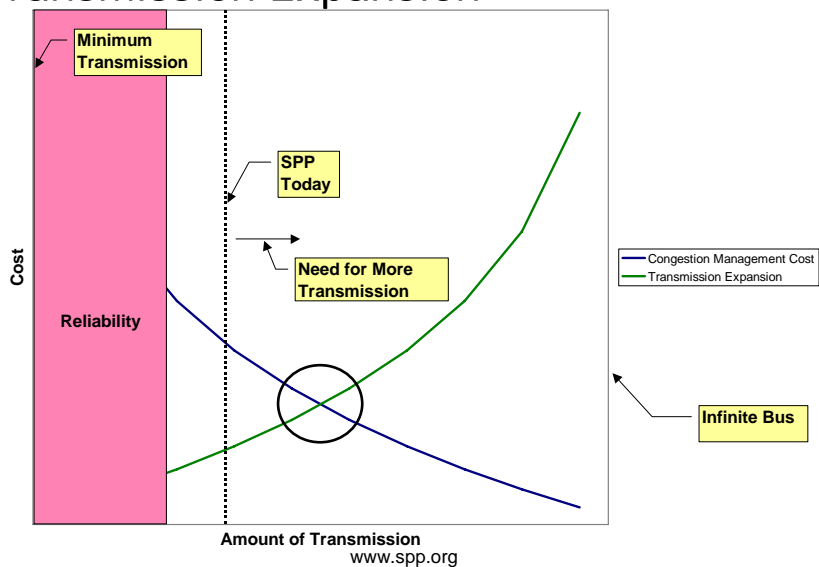
## SPP at a Glance

- Over 250,000 square miles of service territory
- About \$5 billion in transmission gross investment
- 52,000+ total miles of transmission lines
- 4.5 million customers served
- In excess of 42,000 MWs of peak demand
- Wind Farm statistics (nameplate capacities)
  - 1,800 MWs in-service
  - Another 1,000 MWs under construction
  - Another 2,000 MWs with signed IAs
  - Over 25,000 MWs under study

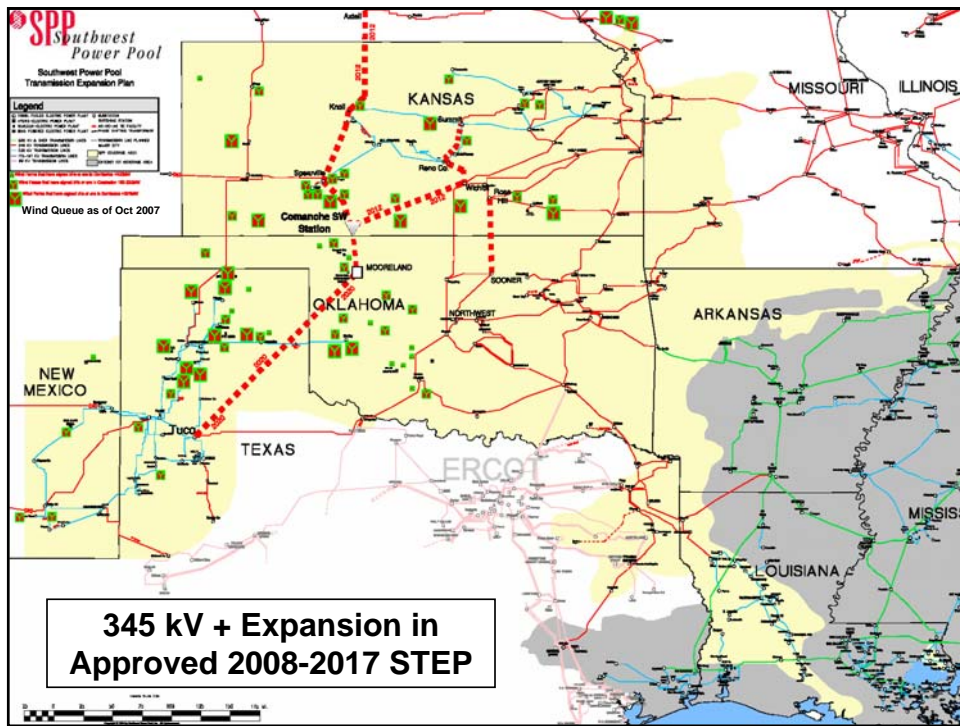
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## Transmission Expansion



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## OEPTTF Study

- Oklahoma Electric Power Transmission Task Force (OEPTTF) created by OK legislature
- Identify need for SPP study to identify transmission expansion needs for OK and beyond
- Scope and assumptions approved late December, 2007
- Final Report posted March 31, 2008

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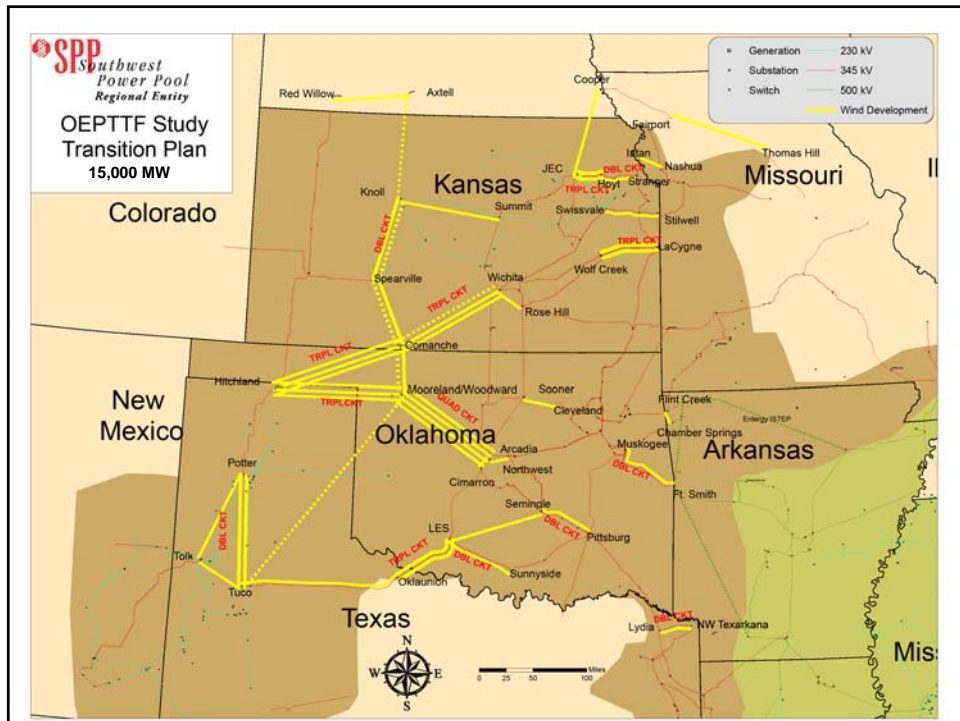
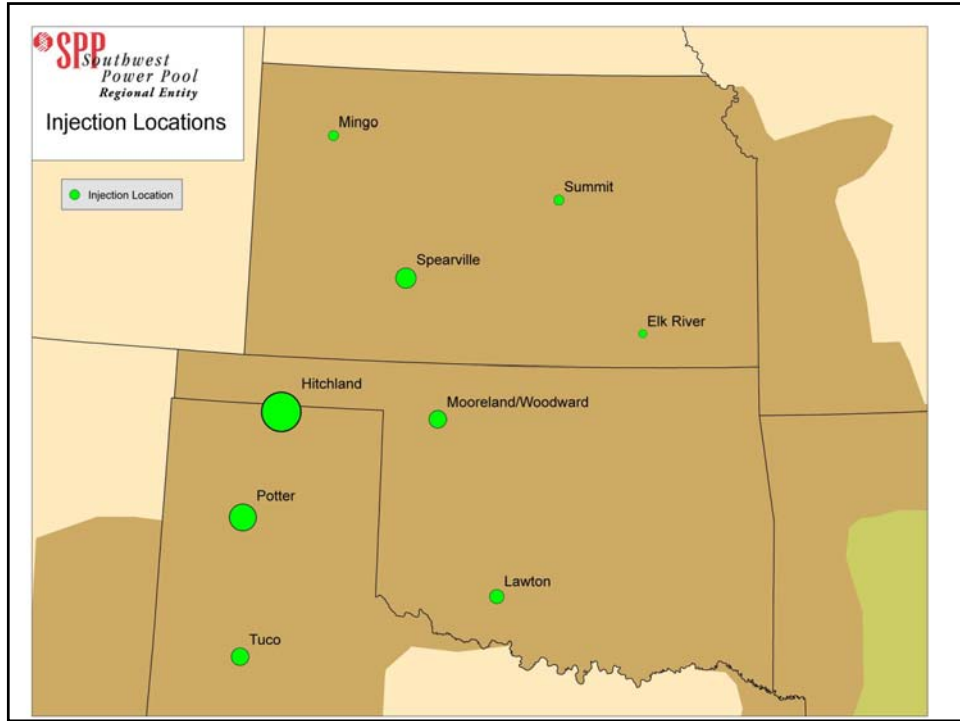
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## OEPTTF Base Wind Assumptions (MWs) In-Service + On Schedule + 50% Suspension

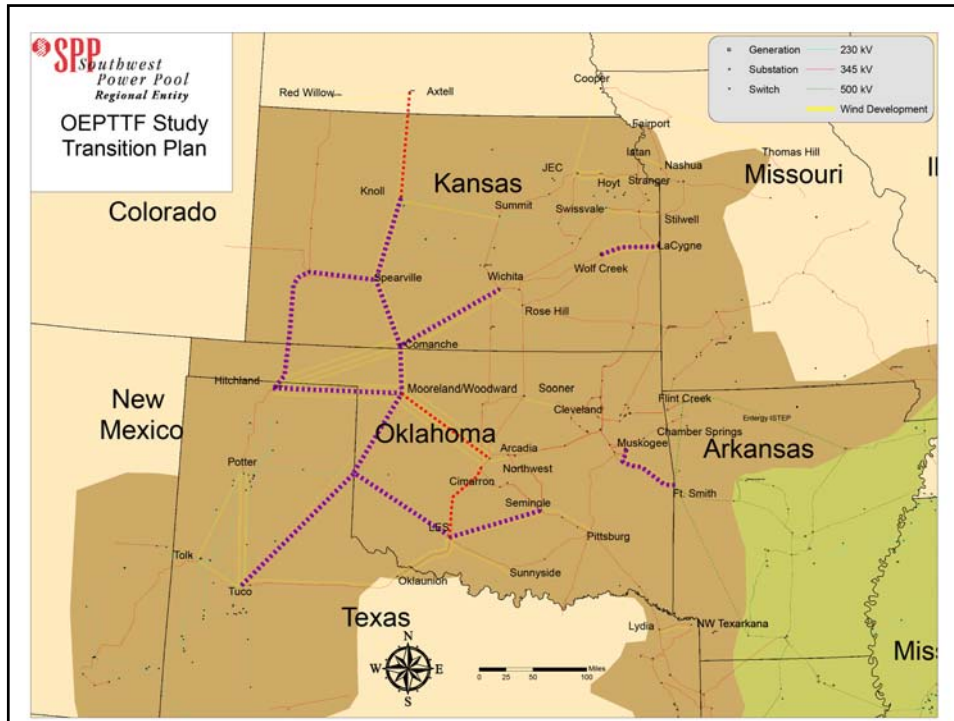
Wind Status	Base Wind
	2010
<b>Kansas</b>	<b>1,648</b>
In-Service	460
On Schedule	750
Suspension (50%)	438
<b>Oklahoma</b>	<b>903</b>
In-Service	698
On Schedule	20
Suspension (50%)	185
<b>N. Mexico / Texas</b>	<b>1,499</b>
In-Service	605
On Schedule	654
Suspension (50%)	240
<b>Total</b>	<b>4,050</b>


## OEPTTF Total Wind Assumptions (MWs)

	Nominal Wind		High Wind	
	2010	2020	2010	2020
In-Service + On Schedule + 50% Suspension	4,050	4,050	4,050	4,050
Additional Wind	3,500	7,000	4,500	11,000
<b>Grand Total Wind</b>	<b>7,550</b>	<b>11,050</b>	<b>8,550</b>	<b>15,050</b>







SOUTHWEST POWER POOL 

## OEPTTF Economic Analysis - Results

- **Transmission expansion required to provide firm deliveries for 345 kV build out virtually eliminate all existing flowgate constraints in SPP saving \$200 – 400 M / year in adjusted production costs**
- **Revenues for wind energy payments and collector system fees are remarkable**
  1. Wind Revenues for 15,000 MW = \$2.4B / year
  2. Collector System Fees are \$300 – 600M / year
- **765 kV alternative projected to cost \$3.4B compared to \$4.5B for 345 kV solution**

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## Updated EHV Overlay Study

- Quanta Technology Report posted at <http://www.spp.org/section.asp?group=1216&pageID=27>
- Analysis of Alternative 5 from original study does not support 345 kV build out
- Soliciting input from stakeholders on results to date, issues, concerns at [ehvoverlay@spp.org](mailto:ehvoverlay@spp.org)
- Results expected 2<sup>nd</sup> Quarter 2008

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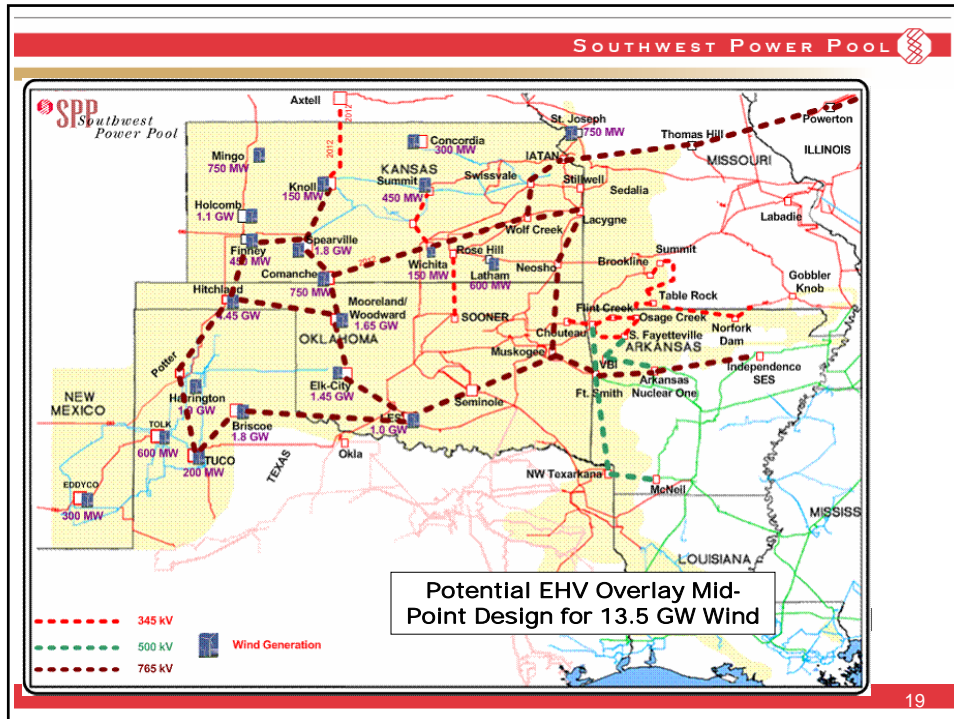
## New Wind in Updated EHV Overlay Study

<b>Kansas</b>	<b>6,600 MW</b>	<b>31.9%</b>
<b>Missouri</b>	<b>750 MW</b>	<b>3.6%</b>
<b>New Mexico</b>	<b>300 MW</b>	<b>1.4%</b>
<b>Oklahoma</b>	<b>8,550 MW*</b>	<b>41.3%</b>
<b>Texas</b>	<b>4,500 MW</b>	<b>21.7%</b>
<b>TOTAL</b>	<b>20,700 MW</b>	<b>100%</b>

\* Includes 4,450 MW in Oklahoma Panhandle

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## Updated EHV Overlay Study Findings

**Focus on midpoint designs to collect / deliver 13.5 GW of new wind in SPP**

- 5.5 GW to SPP
- 3 GW to WECC via HVDC
- 2.5 GW to northeast
- 2.5 GW to southeast

**\$8 billion at \$2 million / mile engineering and construction costs + \$65,000 / mile for Rights-of-Way**

- 2,250 miles of 765 and 500 kV in SPP
- Almost 600 miles of 765 kV in new interconnections and connectivity in neighboring systems

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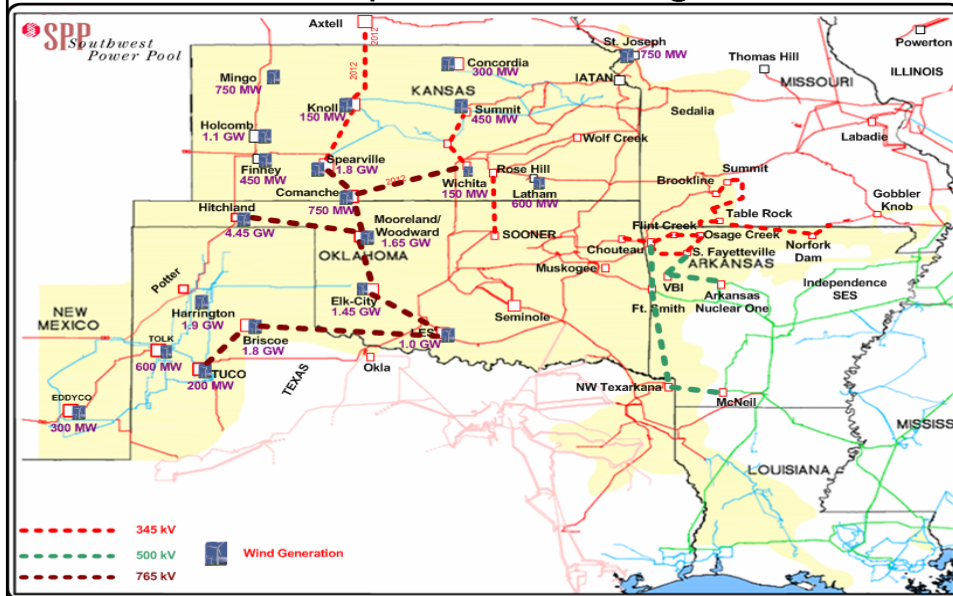
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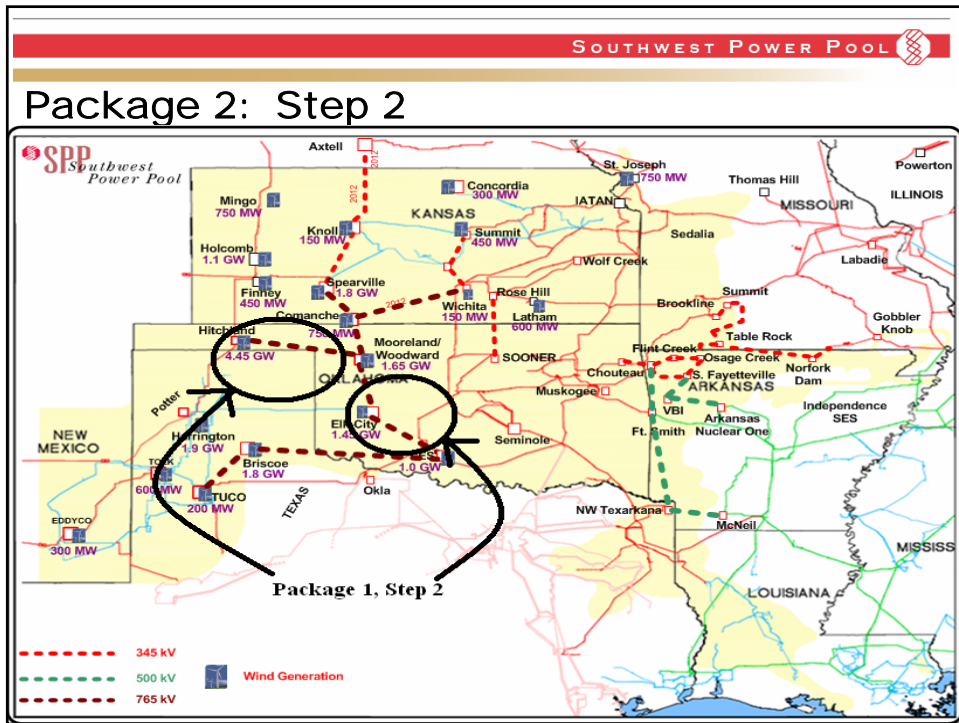
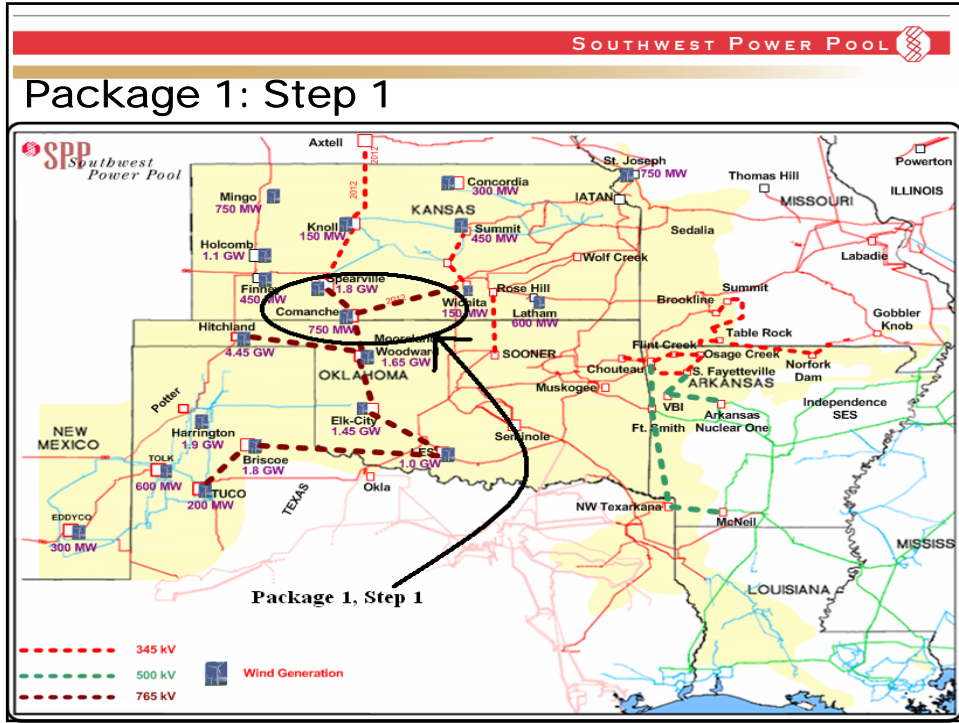
## Updated EHV Overlay Study Findings

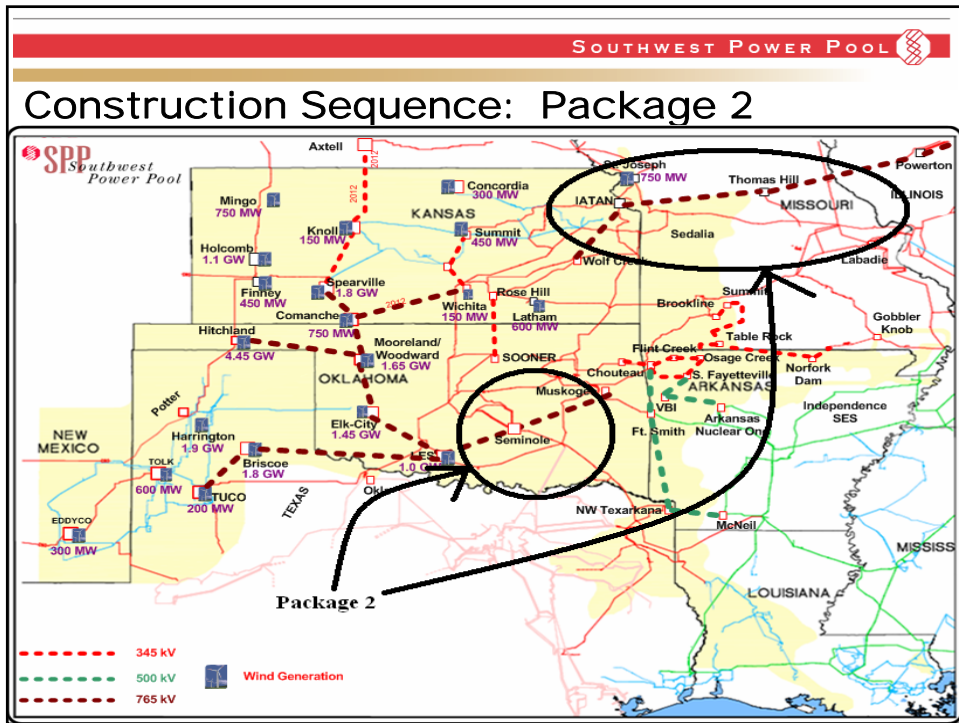
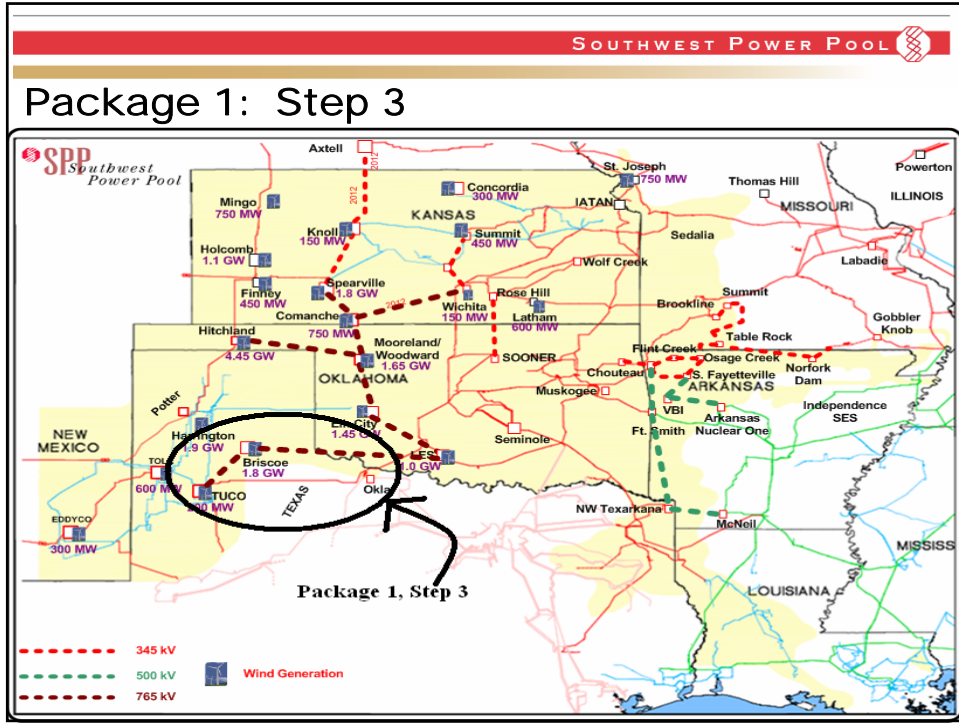
- Identifying phasing of build outs for alternatives
- Long term EHV Overlay needs to compliment interregional and coordinated planning efforts with:
  - Joint Coordinated System Plan (JCSP)
  - Entergy
  - Nebraska
  - Associated Electric Cooperative Inc
  - Electric Reliability Council of Texas
  - Western Electricity Coordinating Council

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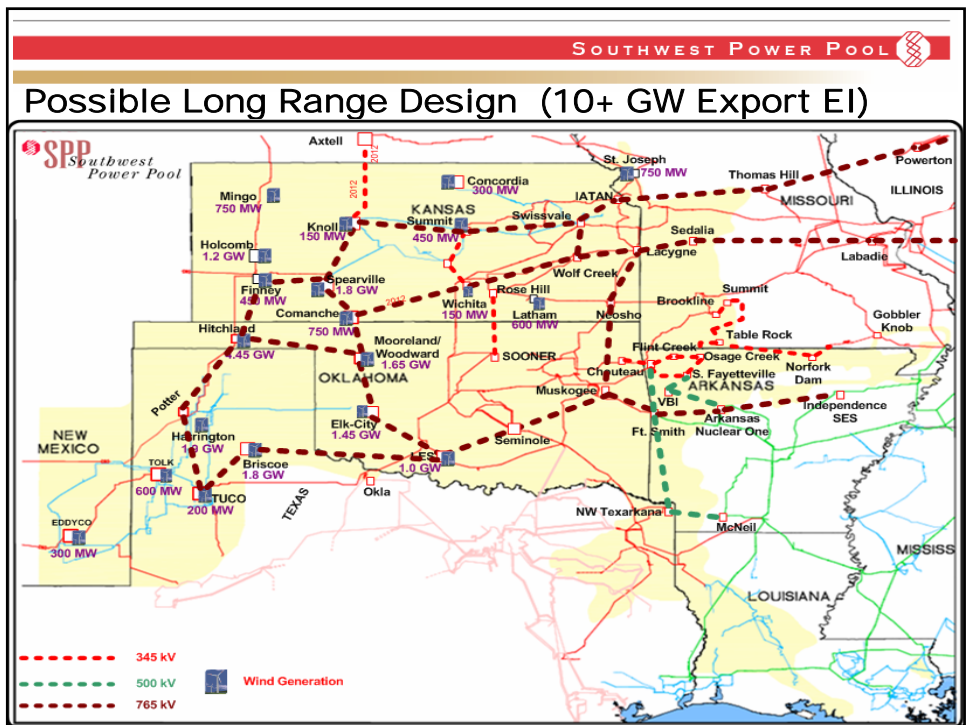
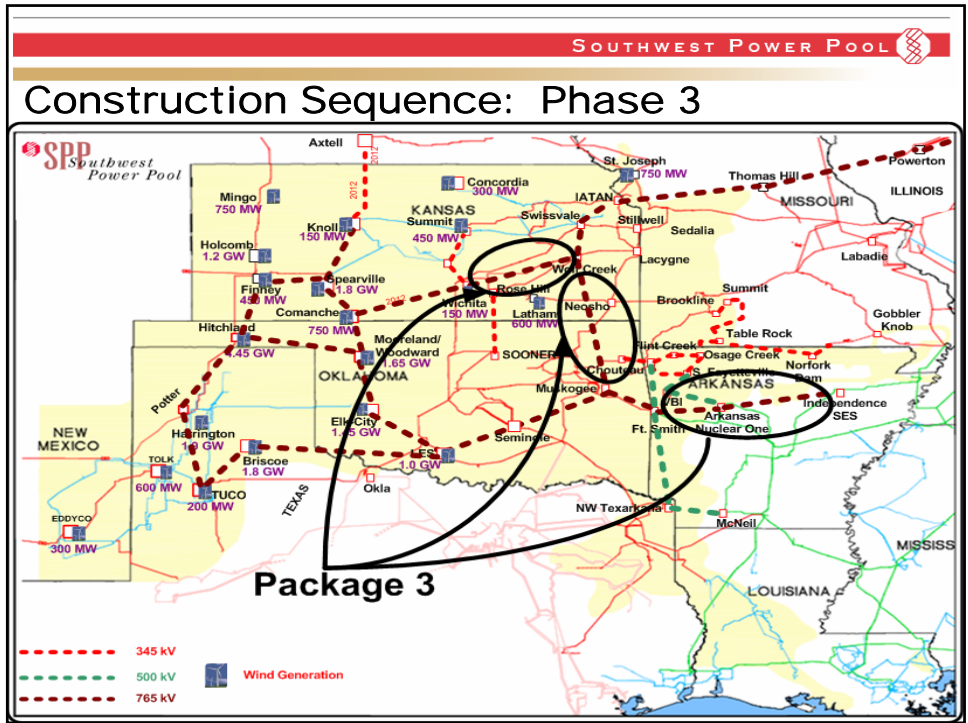
## Construction Sequence: Package 1













## Updated EHV Overlay Plan Next Steps

### Summit 3/28 - Oklahoma City Cox Convention Center

- Study materials posted at [www.spp.org](http://www.spp.org)

### Finalize alternatives

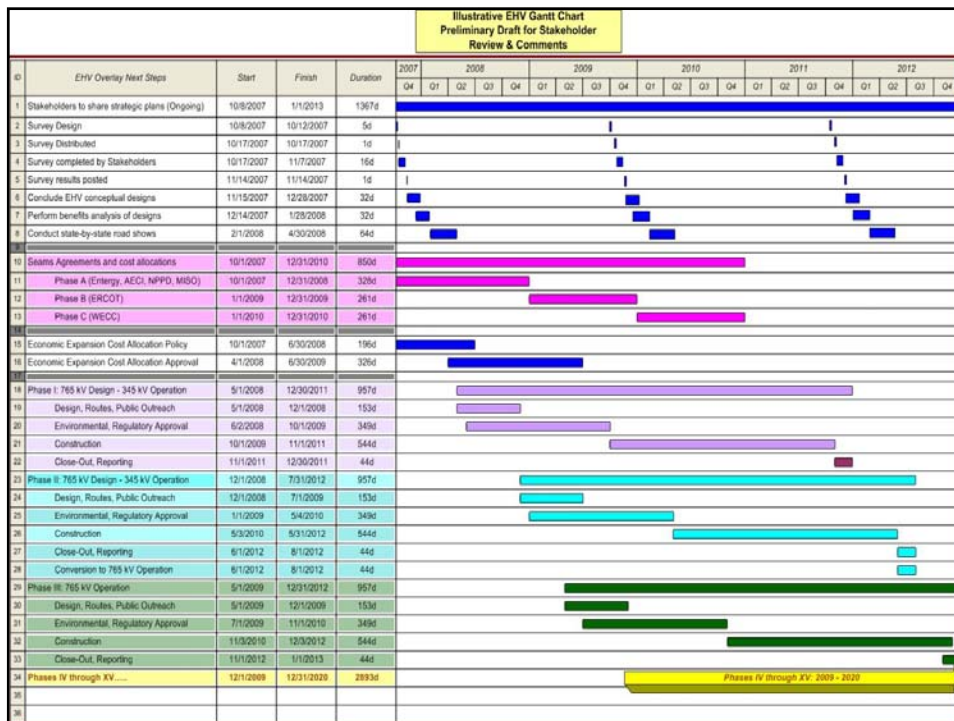
### Conclude economic analyses

### Complete Updated EHV Overlay Plan

### Obtain approvals on plan and address barriers to implementation

- Cost Allocations / Seams Agreements
- Communications Plan
- Determine 765 kV design standards
- Other?

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## Reconciling Long Range Plans

### **OEPTTF - \$3.4B**

- **765 kV alternative in 2020 focusing on SPP upgrades only assuming ICT Strategic Transmission Expansion Plan (ISTEP) in Entergy**

### **Updated EHV Overlay Study - \$8B**

- **765 and 500 kV in 2027 considering SPP plus Tier 1 and Tier 2 upgrades**

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## Wind Integration Issues

- **Operational issues / reliability concerns warrant further investigation to address wind integration challenges**
  - **Lower voltage injections / collector systems**
- **Further dynamics and reactive compensation analyses**
- **SPP staff / members involved in numerous industry initiatives on wind integration**
- **EHV build out, regardless of drivers, will require changes to power system planning and operations**

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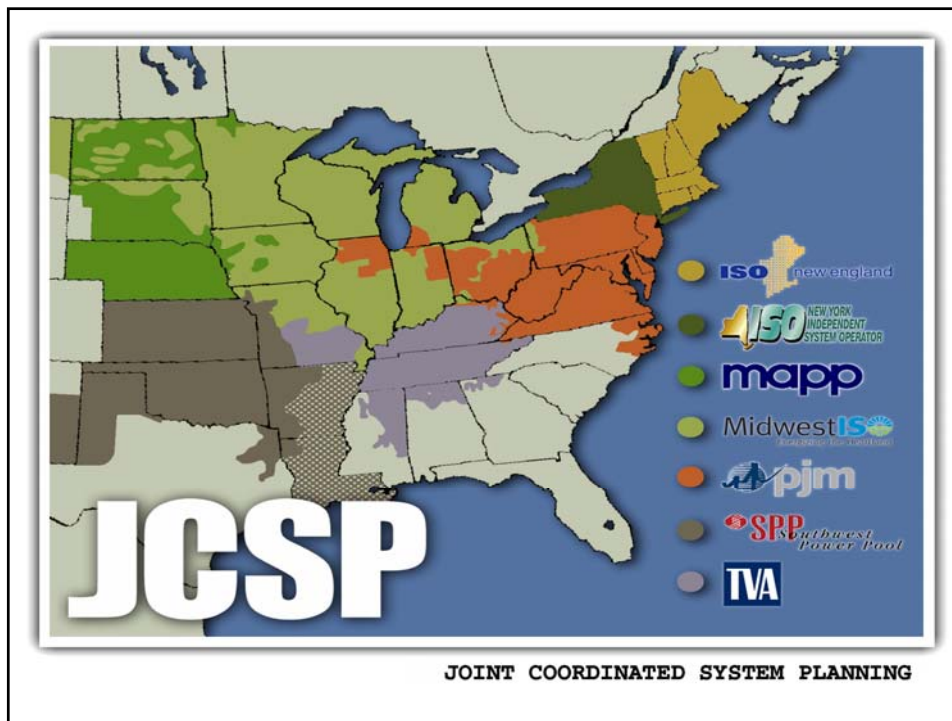
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## Joint Coordinated System Plan

- Collaborative effort by MISO, PJM, SPP and TVA initiated with kickoff meeting November 1 in Pittsburgh
- SPP representing RTO, plus Entergy ICT and LGE Energy ITO
- TVA representing Central Public Power Partners including AECl, BREC & EKPC
- NYISO and ISO-NE are engaged now
- Interested expressed by Duke and others at recent Southeast Inter-Regional Planning Process meetings in Charlotte

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## JCSP Next Steps

- **Economic Transmission Fundamentals Workshop April 29-30 Charleston SC**
- **Regional workshops to follow in June-July, tentative St Louis, Knoxville, Boston and Wilmington**
- **Evaluate 20% National RPS as part of 2008 NREL/DOE Eastern Wind Integration and Transmission Planning Study**
- **Foundation for NERC LTRA Scenario and next DOE Congestion Study due August 2009**

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## Questions?



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