

#### Southwestern Public Service Company:

#### *10-Year Transmission Plan / 20-Year Scenario Assessment*

#### December 2009

This report contains transmission planning data that may be conceptual in nature and is subject to change. The transmission projects listed may change scope or not be constructed





# **Purpose and Scope**

- The purpose of this document is to present the transmission plans and needs on the Southwestern Public Service Company (SPS) transmission system looking forward 10-20 years
- Scope of work:
  - Perform an annual assessment and update of the SPS transmission requirements
    - NERC reliability standards compliance requirements
    - Load forecast, including wholesale loads (2009)
    - Resource plan (2009)
    - Applicable TX, NM Renewable Energy Standards
    - Sold firm transmission service from generation interconnection requests
- Stakeholder input
  - Input on needs and responsive plans are encouraged from stakeholders
  - SPS system plan rolls up to Southwest Power Pool (SPP) regional plan and SPP stakeholder process



# **Executive Summary**

- 10-Year Transmission Plan
  - Core Reliability Projects (2010 2014)
  - States Renewable Energy Standards
    - TX standard has been met
    - NM standard for wind, solar, and other renewables is being worked on through various initiatives
  - Significant SPP Regional and Sub-Regional Transmission Development Projects Ongoing
    - Balanced Portfolio Tuco-Woodward by 2014
    - Priority Projects SPP evaluation continuing
  - SPS Plan must ultimately be approved through SPP Transmission Expansion Plan (STEP) process



# **Executive Summary**

- 20-Year Transmission Scenarios
  - 20-year assessment is conceptual
  - Continuing renewable energy development
  - SPS-Quanta EHV study evaluated 16 GW wind and 345/765 KV alternatives as roadmap, not detailed plan
  - Support infrastructure has to be determined
  - Independent or Merchant transmission projects appear possible
    - Tres Amigas Project multigrid HVDC interconnection near Clovis, NM – 5GW to SPP, WECC and ERCOT simultaneously
  - Conclusion
    - More independent/non-utility proposals put into public media for support
    - Public policy mandate may change current perception of how much renewable energy and thus transmission is really needed



# Key Messages

#### 10-Year Plan

- Continued load growth
- Wind/solar development will continue
- Clarity on SPS resource plan could modify and lessen transmission capital requirements from this assessment

#### **20-Year Transmission Scenario Assessment**

- 20-year assessment is renewable energy growth based
- Independent or Merchant transmission developers likely to construct facilities
- Public policy clarifications could greatly affect these outcomes



# SPS System Statistics **2009**



- 6,677 Miles of Transmission
- 781 Substations Served
- 55 Generators Served (6,228 MW)
- 24 Wind Generators (845.9 MW)
- SPS Balancing Authority All-Time Peak Load 5,502 MW (August 5, 2008)
- SPS Balancing Authority Peak Load 5,459 MW (Actual) (July 14, 2009)





# **SPS Transmission System**

- SPS's transmission assets are in TX, NM, OK and KS
  - Under operational control of the Southwest Power Pool (SPP) RTO

#### Major Utility Interconnections

- American Electric Power
  - West Texas Utilities
  - Public Service Company of Oklahoma
- Sunflower Electric Corp.
- Public Service Company of New Mexico (HVDC)
- El Paso Electric Company (HVDC)
- Public Service Company of Colorado (HVDC)









# Planning Process Calendar 2009





#### **Drivers of Transmission Planning**

- Regulatory/Environmental Concerns
  - TX and NM mandates for renewable energy
- SPP Generator Interconnection Requests
  - Large amount of requests
- Transmission Service Requests
  - Internal and thru-transactions
- Wholesale and Retail Load Additions
  - Geographically diverse
  - Economically sensitive
  - Oil and gas commodity price sensitive
- NERC Reliability Standards



# **SPS BA Coincident Peaks**











#### State Renewable Energy Mandates

- TX Mandate for SPS Retail Loads
  - 5,880 MW by 2015, 10,000 MW by 2025. 2009 goal was increased by 2,000 MW. SPS has energy sales ratio share of total.

- SPS has met its allocated goal for 2009

- NM Mandate for SPS Retail Loads
  - 435,000 MWH (10% of NM retail sales) by 2011
  - 15% of NM retail sales by 2015
  - 20% of NM retail sales by 2020
  - Minimums required
    - Greater or equal to 20% wind, 20% solar, 10% biomass,
    - Distributed Generation 1.5% to 3% in 2015, and 48.5% from any category
  - SPS working on meeting its 2011 allocated goal



# **Generation Interconnection Requests**





#### **Generation Interconnection Requests**

- SPP GI queue for SPS area
  - ~ 14,000 MW total study queue
  - ~ 3,900 MW fossil based requests
  - ~ 9,900 MW wind based requests
  - ~ 70 MW solar based requests
- SPS has 845.9 MW connected wind generation
  - -Approximately 132 MW are on SPS distribution
- SPS has ~ 1,900 MW of projects with signed GIAs and in suspension, not included in above numbers



# **Transmission Congestion**

- SPP Flowgates
  - External SPPSPSTIES Flowgate
    - -Bisects all AC tielines with SPP
- SPS Internal Flowgates
  - North-South Flowgate
    - -Bisects SPS system south of Amarillo
      - Temporary Flowgate may limit ahead of N-S
      - Limiting behavior may be due to non-firm energy flows from north of Amarillo



## **Transmission Congestion Map**



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# **Economic Planning**

- SPS reviews studies by others and is actively involved in regional and sub-regional economic planning efforts such as:
  - The Department Energy (DOE) national transmission congestion studies
  - SPP Transmission Expansion Planning (STEP) process
  - Eastern Interconnection Planning Collaborative (EIPC)
  - Joint Coordinated System Planning (JCSP)



# **Economic Planning**

- Economic planning involves
  - Various resource scenario evaluations
  - Economic impact of market congestion on transmission elements
  - Energy and demand loss evaluation on transmission elements
- Benefits frequently not large enough to justify stand alone transmission investment
- Economic Benefits coupled with other benefits (reliability, local or regional policy, etc) together enter into transmission alternative evaluation







Zone 1 Western Kansas, Oklahoma Panhandle, & Texas North Area	
Zone 2 Amarillo Area: Adrian, Vega, Channing, Amarillo, Groom and McLean.	
Zone 3 Clovis, Hereford, and Canyon Area	
Zone 4 Central Plains and Lubbock Area	
Zone 5 Yoakum and Gaines Area	
Zone 6 Pecos Valley	
Zone 7 Hobbs/Jal Area	
Zone 8 Caprock Area	

#### Zone 1: Western Kansas, Oklahoma Panhandle, & Texas North Areas

![](_page_20_Figure_1.jpeg)

- Agricultural, large industrial, small residential loads
- Includes Oklahoma Panhandle Tri-County Electric Cooperative is retail provider
- Towns of Guymon, OK, Dalhart, TX, Perryton, TX
- 230 kV , 115 kV, and 69 kV transmission
- High wind energy potential
- Issues wind generation, load expansion in transmission remote areas, 69 kV capacity

![](_page_21_Picture_0.jpeg)

#### Zone 2: Amarillo Area

![](_page_21_Figure_2.jpeg)

- Industrial, oilfield, agricultural, residential, and commercial loads
- Cities of Amarillo and Channing
- 345-69 kV transmission
- Good growth in past years
- 230 kV interconnection with AEP
- Issues growth, Amarillo transmission upgrades needed

![](_page_22_Picture_0.jpeg)

#### Zone 3: Clovis, Hereford, and Canyon Area

![](_page_22_Figure_2.jpeg)

- Heavy agricultural and industrial area
- Cities of Portales, Clovis, Tucumcari, Muleshoe, Friona, Hereford, and Canyon
- 230, 115, and 69 kV transmission, Blackwater HVDC interconnection with PNM
- High wind energy potential
- Issues Clovis transmission system upgrading, Hereford area transmission loading

![](_page_23_Picture_0.jpeg)

#### **Zone 4: Central Plains and Lubbock Area**

![](_page_23_Figure_2.jpeg)

- Heavy agriculture, industrial, and residential loads
- Cities of Lubbock, Crosbyton, Post, Graham
- 345-69 kV transmission system. 345 kV interconnection with AEP
- Issues 69 kV transmission capacity, 230/115 kV interchange capacity

![](_page_24_Picture_0.jpeg)

#### **Zone 5: Yoakum and Gaines Area**

![](_page_24_Figure_2.jpeg)

- Heavy industrial and oilfield loads, residential and agricultural loads
- High load factor area
- 230-69 kV transmission system
- Issues continued industrial and oilfield load development, 69 kV transmission capacity

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#### Zone 6: Pecos Valley

![](_page_25_Figure_2.jpeg)

- Agricultural, industrial, oilfield, and residential loads
- Cities of Carlsbad, Roswell, Artesia, and Lovington
- Eddy Co HVDC interconnection with El Paso Electric
- 345-69 kV transmission system
- Issues Roswell 69 kV to 115 kV loop conversion, Carlsbad 69 kV capacity

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#### Zone 7: Hobbs/Jal Area

![](_page_26_Figure_2.jpeg)

- Industrial and oilfield, with residential loads
- Cities of Hobbs, Jal, and Eunice
- 230 and 115 kV transmission
- Issues upgrading the 115 kV system around Hobbs, variable generation dispatch

![](_page_27_Picture_0.jpeg)

#### Zone 8: Caprock Area

![](_page_27_Figure_2.jpeg)

- Industrial, oilfield, and residential load
- Serves only Caprock
- Caprock's 138 kV transmission system overlays ERCOT
- Issues rapid growth, voltage issues in lighter load periods

# **Current and Proposed Transmission Projects Zone 1:**

	#	Project	Est. ISD	Status	Drivers
Kerrick Pump III TEXAS	1	Hitchland – 345/230/115 kV Interchange	6/2010	Current	Reliability
383 Shinean Control V30 4 Stratford Perryton	2	Hitchland – Moore County Intg.230 kV line	12/2010	Current	Reliability
Wiginton Boost B Conlen Wiginton Boost Gruver Utor Spearman Gruver Cutor Spearman Gruver G	3	Hitchland – Texas Co 115 kV Lines (2)	6/2010	Current	Reliability
The Chambertain Wohlford 2 5	4	Hitchland – Spearman 115 kV line	6/2010	Current	Reliability
Image Unimare Unless Plant         VEA         Monton         In Glenn         Hovey Tapt         Tot         Tot           Nulltart         Cactus South         Cactus South         Cactus South         Dester Rural         N	5	Hitchland – Pringle 230 kV line	6/2011	Current	Reliability
HOCUE TAP Shampck Mc Kede Mc K	6	Hitchland – Ochiltree Intg. (Perryton) 230 kV Line	6/2011	Current	Reliability
Dumas Bouth Trian Street K43 Stinheit Street K43 Stinheit	7	NW Intg – Channing- Dallam Co 115 kV line	12/2010	Current	Reliability
Chan Ling Changing T27 CRMWA #2 CRMWA #	8	Dallam Co Intg – Sherman Co Intg. 115 kV Line	12/2010	Current	Reliability
V31 View V35	9	2 <sup>nd</sup> 115/69 kV transformer at Gray	6/2017	Proposed	Reliability
——— 345 kV Note: Project scope and timing subject to		County Interchange			<u> </u>
230 kV change					
———— 115 kV					

### **Current and Proposed Transmission Projects Zone 1:**

![](_page_29_Figure_1.jpeg)

2	2 <sup>nd</sup> 115/69 kV transformer at Kingsmill Interchange	12/2011	Proposed	Reliability
3	2 <sup>nd</sup> 115/69 kV transformer at Howard Interchange	6/2013	Proposed	Reliability
4	2 <sup>nd</sup> 115/69 kV transformer at Bowers Interchange	6/2018	Proposed 30	Reliability

![](_page_30_Picture_0.jpeg)

## **Current and Proposed Transmission Projects Zone 2:**

	#	Project	Est. ISD	Status	Drivers
K41 K32 K32 K59 K58 v28 X 4 4 v29 v02 v02 v93 K58 4 v28 x 4 v29 v02 v02 Pantex Sou	1	Re-terminate 115 kV (T3) into Deaf Smith Int.	6/2010	Proposed	Reliability
K59 AG AL (5) AG AL (5) AG AL (5) AG AL	2	Hillside Substation	6/2011	Current	Distribution
AG AN A A A A A A A A A A A A A A A A A	3	2 <sup>nd</sup> 230/115 kV auto at Randall County Int.	8/2011	Proposed	Reliability
$K^{59}$ V52 V52 $V52$ $V52$ $V52$ $V52$ $V52$	4	Cherry Street 230/115 kV Int.	8/2011	Proposed	Reliability
terfield $\square$	5	Cherry Street Int. – Hastings 115 kV line	8/2012	Proposed	Reliability
Spring Draw	6	Spring Draw – Canyon West 115 kV line.	12/2012	Proposed	Reliability
K11 $\blacksquare$ Palo Duro Pump $\square ake Tanglewood$ K11 $\frown$ Ouro Pump $\frown$ T66 K63	7	Randall Co. – Amarillo South 230 kV line.	12/2012	Proposed	Reliability
Canyon West Vos Palo Duro Canyon City WTSU	8	Convert the Hastings to East Plant 69 kV line to 115 kV	3/2013	Proposed	Reliability
Randall S	9	Amarillo South – Farmers 115 kV Re- conductor.	6/2015	Proposed	Reliability
<ul> <li>345 kV</li> <li>230 kV</li> <li>115 kV</li> <li>Note: Project scope and timing subject to change</li> </ul>	10	Georgia - Lawrence Park 115 kV UG Cable	6/2016	Proposed	Reliability
	11	Lawrence Park - Soncy 115 kV UG Cable	6/2016	Proposed	Reliability

See Page 39 for tieline project from this zone

![](_page_31_Picture_0.jpeg)

# Current and Proposed Transmission Projects Zone 3:

![](_page_31_Figure_2.jpeg)

![](_page_32_Picture_0.jpeg)

# Current and Proposed Transmission Projects Zone 4:

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#### **Current and Proposed Transmission Projects Zone 4:**

![](_page_33_Figure_2.jpeg)

#### **Current and Proposed Transmission Projects Zone 4:**

![](_page_34_Figure_1.jpeg)

#### **Current and Proposed Transmission Projects Zone 5:**

![](_page_35_Figure_1.jpeg)

# **Current and Proposed Transmission Projects Zone 6:**

![](_page_36_Figure_1.jpeg)

![](_page_37_Picture_0.jpeg)

# Current and Proposed Transmission Projects Zone 7:

![](_page_37_Figure_2.jpeg)

![](_page_38_Picture_0.jpeg)

#### **Current and Proposed Transmission Projects Tie Lines**

![](_page_38_Figure_2.jpeg)

Note: Project scope and timing subject to change

Zone 2 Project - Potter-Stateline 345 kV line

Zone 4 Project – Tuco-Midpoint 345 kV line

![](_page_39_Picture_0.jpeg)

- Assessment of independent transmission proposals for future development in SPS area
- Scenario I
  - SPS Quanta EHV Study
- Scenario II
  - High Plains Express Initiative
- Scenario III
  - Tres Amigas Grid Connection Proposal
- Scenario IV
  - Multiple Grid Overlays

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#### Scenario I:

#### SPS Quanta EHV Study

- Completed in 2009 by SPS
- Based on adding 16,000 MW of wind energy 10,000 exported to SPP, 3000 MW to WECC, and remainder consumed within SPS
- Evaluated 5 alternatives
- Study recommended Alternative 2 blend of 765 kV with supporting 345 kV infrastructure
- Total estimated cost \$ 4.2 billion: \$ 1.9 billion for 765 kV, \$ 2.3 billion for 345 kV infrastructure
- Not a construction plan a reference design to further discussion

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![](_page_41_Figure_2.jpeg)

SPS Quanta EHV Study – 2023 Alternate 2

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#### Scenario II - High Plains Express Initiative

- Two 1,280 mile, 500kV, AC lines through WY, CO, NM and AZ
- 3,500 4,000 MW of transmission capacity
- Connects Regional Projects
- 11 parties participating
- Under second phase feasibility studies

![](_page_42_Figure_8.jpeg)

![](_page_43_Picture_0.jpeg)

**Scenario III: Tres Amigas Multi-Grid Interconnection** 

- High capability 5,000 MW per grid
- Would connect east, west, and ERCOT grids
- Located 15 miles north of Clovis, NM
- Uses HVDC and superconducting cable technology
- Purpose is to enable movement of resources between all three grids as desired

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![](_page_44_Picture_1.jpeg)

![](_page_44_Figure_2.jpeg)

**Tres Amigas Conceptual Diagram** 

![](_page_45_Picture_0.jpeg)

#### Scenario IV – Multiple Grid Overlays

Important to understand potential cumulative impacts from these plans on SPS customers even though they may not directly serve SPS customers. Through these efforts, SPS can strive to minimize impacts.

![](_page_45_Figure_4.jpeg)

Purpose – to move renewable energy to load centers in central and eastern US regions 46

![](_page_46_Picture_0.jpeg)

#### **Scenario IV – Multiple Grid Overlays**

![](_page_46_Figure_3.jpeg)

**Overlays shown – Texas CREZ, SPP EHV, and SPS Quanta EHV Study – Alternative 2** 

![](_page_47_Picture_0.jpeg)

#### Summary

- SPS in strategic position for transmission development for renewable energy.
- Proposed transmission concepts must be evaluated to develop reliable transmission plans.
- Public policy must be clarified to provide framework for resolution.

# *Links to additional information on transmission Plans*

#### The Southwest Power Pool (SPP)

www.spp.org

#### SPS Study Plans and Results

 www.xcelenergy.com/Texas/Company/Transm ission/SPSLocalPlanning/Pages/StudyPlansan dResults.aspx

#### SPS Transmission Planning Points of Contact

 www.xcelenergy.com/Texas/Company/Transm ission/SPSLocalPlanning/Pages/Pointsofconta ct.aspx