 SPP

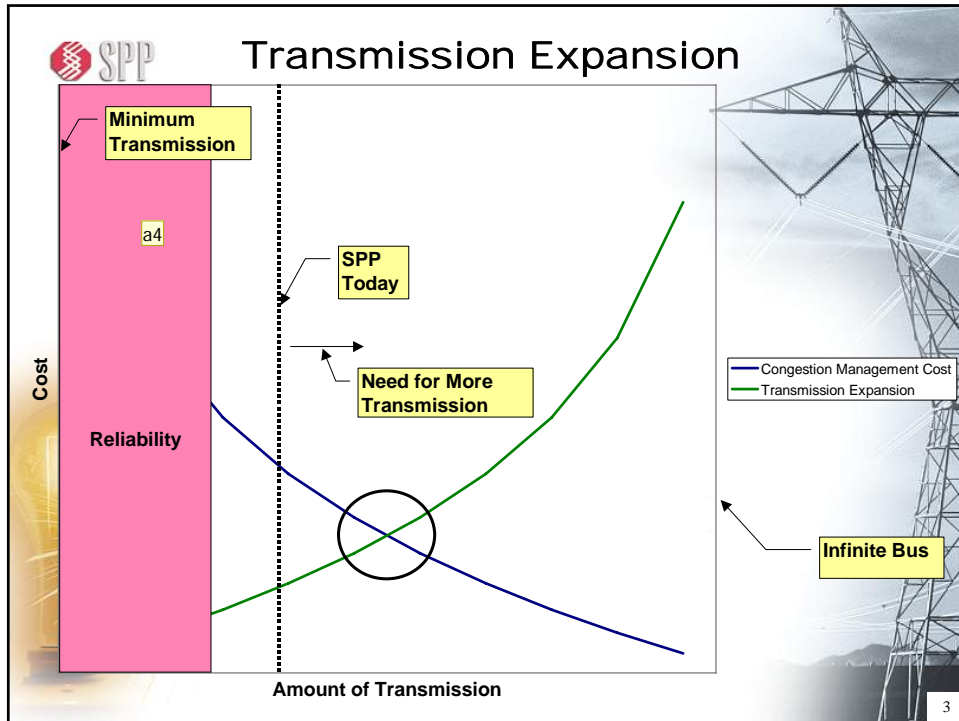
Potential
Expansion
Projects for
Kansas

Charles Cates & Alex Lau

WebEx

January 25th, 2006

2



SPP Economic Upgrades

- ❖ **Projects not needed for reliability, but part of the SPP RTO Expansion Plan**
- ❖ **Voluntary, not mandatory**
- ❖ **Uncertainty regarding revenue credits associated with incremental usage**

The slide features the SPP logo in the top left corner. The background includes a faint image of a lightbulb on the left and a transmission tower on the right. A small box with the number **4** is in the bottom right corner.

Slide 3

a4 Remove shading on Reliability
all0601, 5/23/2005



Top Flowgates/Constraints

Constraint/Flowgate Monitored Element	Total MWs Curtailed	Firm MWs Curtailed	Firm Refused Requests	Non-Firm Refused Requests	Anticipated Request Refusals
Creswell-Kildare 138 kV	27793	315	41.4%	12.8%	
Valliant-Lydia 345 kV	1488	0	17.4%		
Hugo Power Plant-Valliant 138 kV	22979	1106	15.0%	2.7%	X
Craig Junction-Ashdown West 138 kV			11.7%	3.3%	X
Lone Oak-Sardis 138 kV	7667	100	8.6%		
Montrose-Clinton Gravius 161 kV			7.1%		
Bristol-Keystone West 138 kV			5.4%	0.8%	
Bartlesville SE-N. Bartlesville 138 kV	2235	0	4.4%	0.7%	X
S. Coffeyville-Dearing 138 kV	6806	110	4.3%	0.9%	X
Pittsburg-Seminole 345 kV	2471	396	3.7%		
Elk City 230/138 kV Transformer			3.2%		

5



Kansas Studies (Presented)

- ❖ Kansas Expansion
 - ◆ Focused on increasing east-west transfers
- ❖ Kansas-Nebraska Study
 - ◆ Focused on increasing north-south transfers

6



Kansas Expansion Background

- ❖ **Initial project studied: Lincoln-Circle**
- ❖ **Many lessons learned –**
 - ◆ **Caution must be exercised to accurately model operating guides and flowgates**
 - ◆ **New flowgates may be required**
 - ◆ **Reliability Must Run units must be modeled**
- ❖ **Led to the development of the EMMTF to address modeling data, solution techniques, procedures to document assumptions and presentation of study results and sensitivities.**

7



Kansas Expansion Background (cont)

- ❖ **Potential transmission expansion that will increase import into Western Kansas**
- ❖ **July 2005 Meeting**
 - ◆ **Joint meeting with Westar, Aquila, SECI, MIDW and SPP**
 - ◆ **SPP presented preliminary screening of potential expansion projects**
 - ◆ **Developed a refined list of projects for further analysis**

8



Kansas Expansion Study

- ❖ Twelve projects and combinations screened for production cost savings and incremental transfer capability increase into Western Kansas
- ❖ Two projects stand out for potential economic expansion
 - ◆ Spearville–Knoll–(Phillipsburg)–Axtell 345 kV
 - ◆ Wichita–Reno Co.–Summit 345 kV

9



Projects Screened

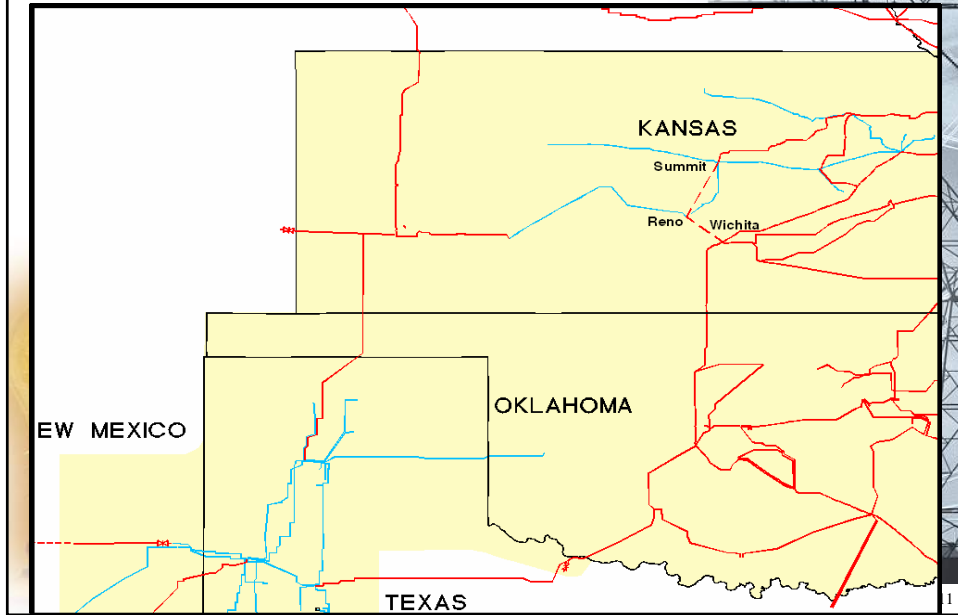
One-Week Seasonal Runs

Project	Project Cost	2010 Summer Production Cost Savings	2010 Spring Production Cost Savings	Estimated 2010 Benefit	Estimated 10 Year Benefit	Ratio
Spearville-Knoll-Phillipsburg-Axtell	\$ 114,680,000	\$ 3,790,301	\$ 479,736	\$ 8,540,074	\$ 57,304,591	0.50
Spearville-K-P-Axtell and Phillipsburg-Concordia	\$ 157,455,000	\$ 3,850,680	\$ 1,565,421	\$ 10,832,202	\$ 72,684,956	0.46
Wichita-Circle-Summit	\$ 68,000,000	\$ 1,427,564	\$ 788,188	\$ 4,431,505	\$ 29,735,756	0.44
Concordia-Lincoln-Circle with Morris-Summit 50% Compensation	\$ 55,500,000	\$ 635,445	\$ 755,776	\$ 2,782,442	\$ 18,670,413	0.34
Concordia-Lincoln-Circle	\$ 55,000,000	\$ 632,387	\$ 722,308	\$ 2,709,391	\$ 18,180,235	0.33
Concordia-Summit-Lincoln-Circle	\$ 54,500,000	\$ 470,335	\$ 628,860	\$ 2,198,390	\$ 14,751,373	0.27
Concordia-Lincoln-Circle & Wichita-Circle	\$ 95,000,000	\$ 815,455	\$ 325,691	\$ 2,282,292	\$ 15,314,368	0.16
Concordia-Lincoln-Circle & Wichita-Circle with Morris-Summit 50% Compensation	\$ 118,000,000	\$ 827,273	\$ 317,344	\$ 2,289,235	\$ 15,360,952	0.13
Spearville-Circle	\$ 48,700,000	\$ (92,359)	\$ 375,033	\$ 565,349	\$ 3,793,536	0.08
Wichita-Circle	\$ 40,000,000	\$ 269,197	\$ (72,259)	\$ 393,875	\$ 2,642,936	0.07
Concordia-Summit	\$ 23,000,000	\$ 51,541	\$ 44,926	\$ 192,933	\$ 1,294,597	0.06
Stevens Co-ELiberal	\$ 19,800,000	\$ (210,525)	\$ (4,584)	\$ (430,219)	\$ (2,886,802)	-0.15
Knoll-Mingo	\$ 57,480,000	\$ (847,724)	\$ (805,404)	\$ (3,306,257)	\$ (22,185,252)	-0.39
Morris-Summit 50% Compensation	\$ 500,000	\$ (14,293)	\$ (21,151)	\$ (70,889)	\$ (475,674)	-0.95

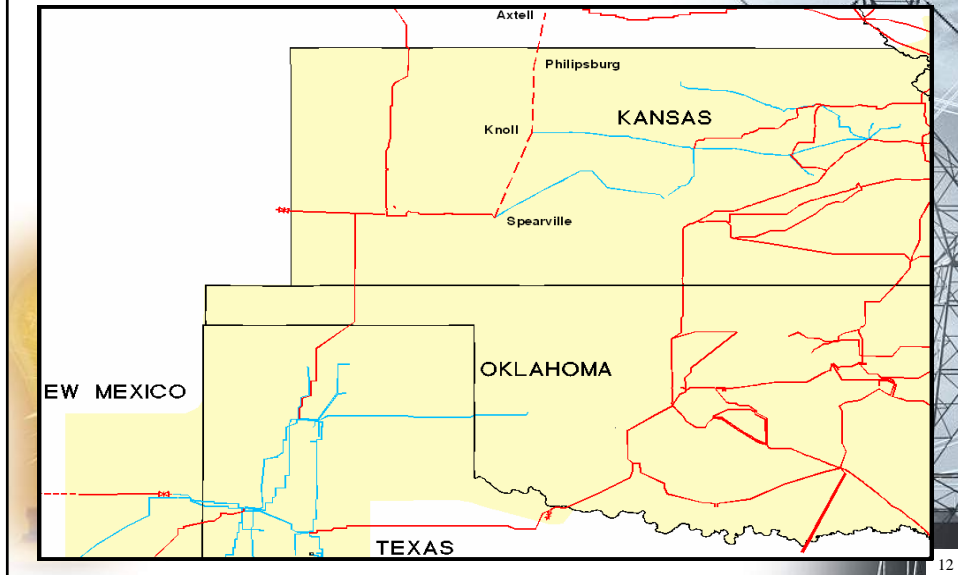
10



Wichita-Reno-Summit



Spearville-Knoll-Phillipsburg-Axtell





Kansas Expansion Results

Production Cost Savings vs. Project Cost

Project	Project Cost	2010 Summer Production Cost Savings	2010 Spring Production Cost Savings	2010 Fall Production Cost Savings	2010 Winter Production Cost Savings	Estimated 2010 Benefit	Estimated 10 Year Benefit	Ratio
Spearville-Knoll-Phillipsburg-Axtell	\$ 114,680,000	\$ 3,679,386	\$ 441,223	\$ 2,546,879	\$ 1,442,548	\$ 8,110,037	\$ 54,418,351	0.475
Wichita-Circle-Summit	\$ 68,000,000	\$ 1,249,858	\$ 1,281,394	\$ 1,596,662	\$ 1,244,435	\$ 5,372,349	\$ 36,048,461	0.530

"Higher Fuel" Sensitivity (\$8/MmBTU gas)

Project	Project Cost	2010 Summer Production Cost Savings	Increase in Benefit
Spearville-Knoll-Phillipsburg-Axtell	\$ 114,680,000	\$ 4,608,931	25%
Wichita-Circle-Summit	\$ 68,000,000	\$ 1,702,463	36%



Wichita-Reno-Circle Sensitivity

Sensitivity for no HEC commitment and Double Circle/Double Transformer at Reno

Scenario	2010 Summer Production Cost Savings	Increase
2010 Summer	\$ 1,249,858	-
2010 Summer, Dbl Ckt	\$ 1,514,700	21%
2010 Summer, Dbl Ckt No HEC Commitment	\$ 2,132,679	71%

- ❖ Double Circuit Configuration includes two step down transformers at Reno Co., with a double circle to configuration from Reno Co. to Circle (New Assumption, made after original runs)
- ❖ No HEC Commitment assumes that HEC can be removed from modeling as a RMR unit



Benefit Allocation

Percent Allocation of Benefits

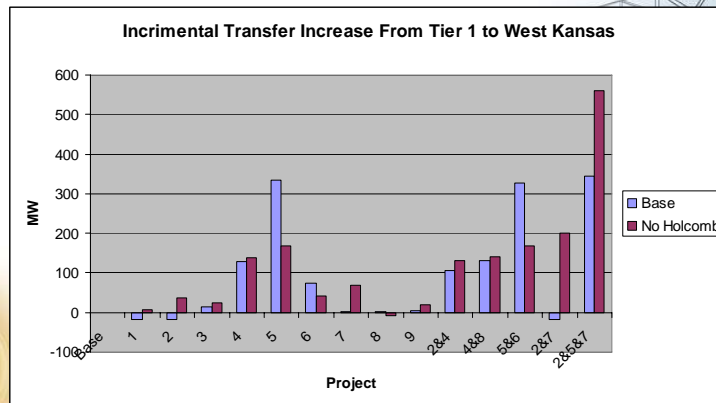
Area	Wichita-Reno-Circle	Spearville-Knoll-Philipsburg-Axtell
CELE	0%	0%
EMDE	2%	0%
GRRD	0%	0%
INDN	0%	0%
KACP	1%	3%
KACY	0%	0%
Lafa	1%	0%
LEPA	0%	0%
MIDW	0%	0%
MIPU	1%	2%
OKGE	4%	9%
PSOK	9%	10%
SOEP	10%	4%
SPIPP	0%	0%
SPRM	1%	0%
SUNC	1%	10%
SWPA	0%	0%
SWPS	9%	15%
WEPL	0%	2%
WERE	53%	16%
WFEC	0%	2%
AECI	0%	0%
IOWA	0%	5%
MAINS	0%	0%
NEBR	2%	13%
EES	6%	6%
EESIPP	0%	0%
Totals	100.00%	100.00%

Benefits Summary

	Wichita-Reno-Circle	Spearville-Knoll-Philipsburg-Axtell
Benefits to Tier 1	8%	25%
Benefits to Kansas	55%	31%
Benefits to SPP	92%	75%



FCITC Summary



1. WICHITA – RENO CO 345kV and 345/115kV
2. WICHITA – RENO CO - SUMMIT 345kV
3. CONCORDIA – SUMMIT 230kV
4. CONCORDIA – LINCOLN – CIRCLE 230kV
5. SPEARVILLE – KNOLL – PHILLIPSBURG – AXTELL 345kV with PHILLIPSBURG - CONCORDIA 230kV
6. KNOLL – MINGO 345kV with SPEARVILLE - KNOLL
7. SPEARVILLE – RENO CO 230kV
8. MORRIS CO – SUMMIT 230kV 50% Series Compensation
9. STEVENS CO – E LIBERAL 345kV



Kansas Expansion Summary

- ❖ **Wichita-Reno Co.-Summit**
 - ◆ Eliminates existing flowgate of S. Philips to W. McPherson and 'next limit' (Junction City)
 - ◆ 55% of benefits to Kansas
 - ◆ Estimated payback of 25-30 years using \$5/MMBtu gas

- ❖ **Spearville-Knoll-(Phillipsburg)-Axtell**
 - ◆ Increases import into Western Kansas from Nebraska
 - ◆ Solves voltage problems around the Plainville area, if accompanied by step down at Phillipsburg (Rhodes – Phillipsburg?)
 - ◆ 31% of benefits to Kansas
 - ◆ Estimated payback of 25-30 years using \$5/MMBtu gas

17



Kansas-Nebraska Background

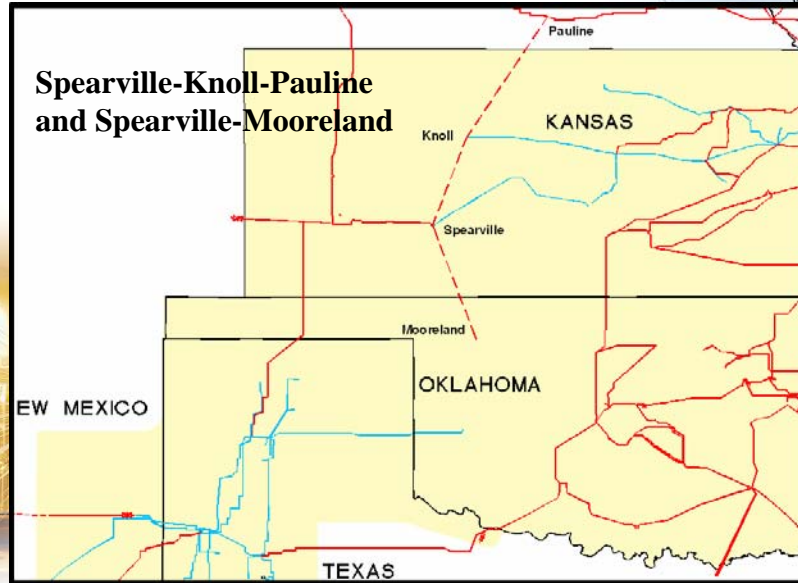
- ❖ **Potential transmission expansion that will benefit both Kansas & Nebraska**

- ❖ **November 2005 Meeting**
 - ◆ **SPP presented results of additional screening requested during the August meeting**
 - * FCITCs & Economic screening for different variations to Project 1 & 5
 - * Detailed economic analysis of top two projects
 - * Breakout of potential benefits
 - * Gas price sensitivities
 - ◆ **Additional FCITCs to be assessed (E-W, W-E, S-N)**

18



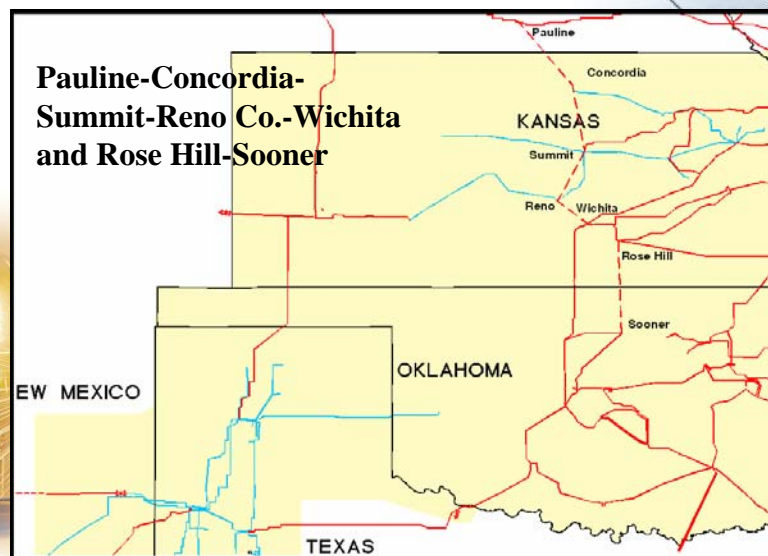
Map of Project 1d



19



Map of Project 5e



20

Production Cost Savings

Typical Week Runs

PROJECT	DESCRIPTION	EST COST (\$M)	10 Year Savings	Benefit/Cost
1	Spearville-Knoll-Pauline, step down at Knoll	124.0	59.15	0.48
1b	Route (1) to Axtell instead of Pauline	124.0	62.55	0.50
1c	Additional to (1) Spearville-Wichita	198.5	80.38	0.40
1d	Additional to (1) Spearville-Mooreland	181.0	110.66	0.61
2	Moore-Jeffrey Energy-Swissvalle	76.5	32.62	0.43
3	Jeffrey-Concordia-Pauline, step down at Concordia	97.5	21.17	0.22
4	Red Willow-Pauline	77.0	-6.60	-0.09
5	Pauline-Summit-Wichita	114.0	73.79	0.65
5b	Pauline-Concordia-Summit-Reno-Wichita, step down at Concordia and Reno Co.	140.5	80.11	0.57
5c	Additional to (5b) Jeffrey-Concordia	195.0	88.83	0.46
5d	Additional to (5b) Rose Hill-Sooner and Sonner-Cleveland	202.0	140.86	0.70
5e	Additional to (5b) Rose Hill-Sooner	184.0	133.69	0.73
6	Combine 1 & 5b	244.5	104.95	0.43

10 year savings based on (Spring+Summer) x 2 x 0.671 (8% discount rate)

Detailed market analysis

Detailed Seasonal Runs

PROJECT	DESCRIPTION	EST COST (\$M)	Seasonal Savings		10 Year Savings (8% Discount)	Benefit/Cost
			Spring (\$M)	Summer (\$M)		
1d	Spearville-Knoll-Pauline + Spearville-Mooreland, step down at Knoll & Mooreland	181.0	Spring (\$M)	Summer (\$M)	102.03	0.56
			3.44	5.55		
			Fall (\$M)	Winter (\$M)		
			3.45	2.77		
5e	Pauline-Concordia-Summit-Reno-Wichita + RoseHill-Sooner, step down at Concordia and Reno Co.	184.0	Spring (\$M)	Summer (\$M)	131.33	0.71
			4.34	7.14		
			Fall (\$M)	Winter (\$M)		
			4.70	3.40		



Kansas-Nebraska Results

- ❖ **Project 1d – Spearville-Knoll-Pauline & Spearville-Mooreland 345 kV lines**
 - ◆ Estimated payback of 30 years with \$5/MMBtu gas
 - ◆ 21% of benefits in Kansas
 - ◆ 21% of benefits in Nebraska
 - ◆ 10% SOEP, 10% SPPIPP, 12% EES, 10% MAINS, remaining rest of SPP
- ❖ **Project 5e – Pauline-Concordia-Summit-Reno Co.-Wichita and Rose Hill-Sooner 345 kV lines**
 - ◆ Estimated payback of 18 years with \$5/MMBtu gas
 - ◆ 28% of benefits in Kansas
 - ◆ 9% of benefits in Nebraska
 - ◆ 15% OKGE, 11% SPS, remaining rest of SPP

23



Gas Price Sensitivity

- ❖ **Mooreland-Spearville-Knoll-Pauline**
 - ◆ \$6/MMBtu – 46% increase in savings
 - ◆ \$8/MMBtu – 79% increase in savings
- ❖ **Pauline-Concordia-Summit-Reno Co.-Wichita & Rose Hill-Sooner**
 - ◆ \$6/MMBtu – 10% increase in savings
 - ◆ \$8/MMBtu – 28% increase in savings

24



Additional FCITC Screens

❖ Transfer Directions

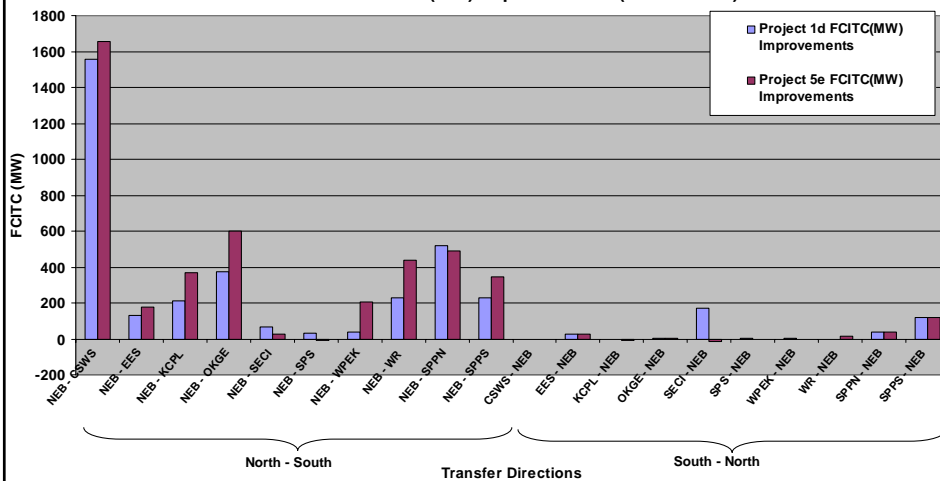
- ◆ N-S (Nebraska to SPP)
- ◆ S-N (SPP to Nebraska)
- ◆ E-W (SPP East to West)
- ◆ W-E (SPP West to East)

❖ Slight modification to Project 5e

- ◆ Transformer at Concordia and Reno Co. is changed to step down at 115 kV instead of 230 kV to provide more transfer capability

N-S & S-N

2010 Summer Peak FCITC(MW) Improvements (N-S and S-N)





N-S & S-N Summary

❖ North-South (NEB to SPP)

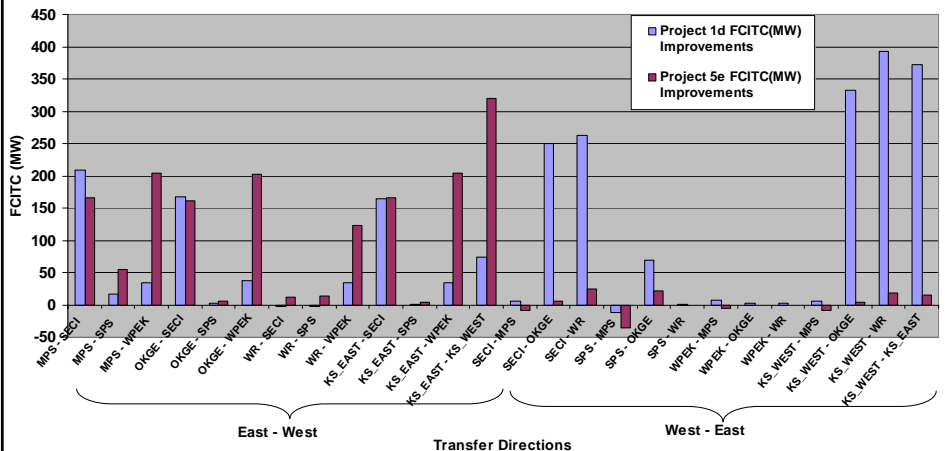
- ◆ Overall FCITC improved for transfer directions studied (200-500 MW)
- ◆ Kelly-Seneca 115 kV limit fixed by Project 5e
- ◆ Reduce loading on WNE-WKS interface
- ◆ Project 5e has slightly higher FCITC improvements over Project 1d

❖ South-North (SPP-NEB)

- ◆ FCITC minimal impact
- ◆ Medicine Lodge-Sun City 115 kV limit fixed by Project 1d

E-W & W-E

2010 Summer Peak FCITC(MW) Improvements (E-W and W-E)





E-W & W-E Summary

- ❖ **East-West (MPS+KCPL+WR -> SECI+WEPL)**
 - ◆ East-West FCITCs improved, but not all directions
 - ◆ Kelly-Seneca 115 kV limit fixed by Project 5e
 - ◆ Reduce loading on Knoll 230/115 kV XF (Base Overloaded with transfers)
 - ◆ Project 5e is better for East-West transfers
- ❖ **West-East (SECI+WEPL -> MPS+KCPL+WR)**
 - ◆ Medicine Lodge-Sun City 115 kV limit fixed by Project 1d
 - ◆ Project 1d is better for West-East transfers

29



April Minimum Case

- ❖ **FCITC on 2006 April minimum case**
 - ◆ **N-S & S-N**
 - * Most limits identified are above generation test levels
 - ◆ **E-W & W-E**
 - * Minimal or no impact
 - * Pile-Scot City 115 kV, Pile-Dobson 115 kV, Judson Large-Greenburg 115 kV, Sun City-Medicine Lodge 115 kV

30



**SPP FCITC on 2006 Series MDWG
(2011 SP)**

- ❖ **Quick look on new models**
- ❖ **Includes West Kansas Upgrades**
 - ◆ **New 115 kV line between Phillipsburg-Rhoades**
 - ◆ **Convert Heizer-Knoll 115 kV to 230 kV & 230/115 kV XF at S.Hays**
 - ◆ **S.Hays-Hays 115 kV line closed**

31



FCITC Impacts

- ❖ **FCITCs reduced**
 - ◆ **Limits around Iatan (New Iatan 2) for N-S and S-N transfers**
 - ◆ **Iatan 2 fully dispatched in model, 345/161 kV XF near N-1 overload**
- ❖ **For East-West, Kelly-Seneca 115 kV limit still fixed by Project 5e**
- ❖ **For West-East, Judson Large-Greensburg 115 kV fixed by Project 1d**

32



Conclusion

- ❖ **Both studies shows similar results**
- ❖ **Summit-Reno Co.-Wichita project is a subset of Project 5e**
 - ◆ **Kelly-Seneca is still a limit with Summit-Reno Co.-Wichita**
 - ◆ **Addition of Summit-Concordia-Pauline will increase east-west transfers**
- ❖ **Project 5e (Pauline-Concordia-Summit-Reno Co.-Wichita) has better N-S and E-W transfers and has higher benefit/cost ratio among all the projects studied**
- ❖ **Project 1d (Mooreland-Spearville-Knoll-Pauline) has better W-E transfers**

33



Next Steps

- ❖ **Jan 30th Kansas and SPP meeting to discuss**
 - ◆ **How to “trigger” a project – what does SPP need**
 - ◆ **Who pays and cost recovery – what do TOs and ITCs need**
 - ◆ **Role of Transmission dependent utilities and Wind Developers – how do they signal a willingness to commit resources, rights received**
 - ◆ **Role for Independent Transmission Companies**
 - ◆ **Role for Kansas Electric Transmission Authority (KETA)**

34

planning@spp.org



Lighting the past...powering the future!

<http://www.spp.org>

General Inquiries: 501-614-3200

