



2005 Access Initiative Transfer Capability and Project Packages

Dale Burmester

July 21st, 2005



Modeling Variability

- Modeling the future ATC system depends on assumptions that have some uncertainty
 - Load growth projections
 - Generation additions and retirements
 - Planned transmission expansion
- Increased uncertainty for all of these components for the system external to ATC
- All analysis is performed using the best information available at the time of the study
 - Engineering judgment to develop appropriate models



Optimization of Cost / Benefit

- **(See Project Package Selection.PDF)**



PROMOD Analysis March vs. July

(July 13, 2005)

AMERICAN TRANSMISSION COMPANY ACCESS INITIATIVE - DECISION MATRIX COMPARISON													
Category	Measure	Access Alternatives											
		Base Case		Paddock - Rockdale		Salem - North Madison		Lower Voltage		Byron - North Madison		Prairie Island - Columbia	
		2004 Data ³	July 6 th Analysis	March 25 th Filing	July 6 th Analysis	March 25 th Filing	July 6 th Analysis	March 25 th Filing	July 6 th Analysis	March 25 th Filing	July 6 th Analysis	2004 Data ³	July 6 th Analysis
Estimated Cost of Package ¹	\$Millions			64.0	69.1	267.5	352.3	21.4	33.0	137.3	186.1	244.4	639.7
Annual Capital Carrying Cost	\$Millions per year			5.8	6.2	24.1	31.7	1.9	3.0	12.4	16.7	22.0	57.6
Average Market Savings ²	\$Millions per year			10.2	9.0	14.6	9.2	10.0	8.5	14.6	10.6	10.7	9.0
Annual Net Savings				4.4	2.8	-9.4	-22.5	8.0	5.5	2.3	-6.2	-11.3	-48.6
FCTTC	MW	3462	1913	4756	2789	4766	3342	3648	3166	4787	3094	4085	3118
Annual Capital Carrying Charge	9%												
List of HV Projects Included with Package in March 25th Filing:													
Paddock - Rockdale	Des Plaines - Lombard 345 kV (CE); Lore - Turkey River - Cassville - Nelson Dewey 161 kV												
Salem - North Madison	Salem - Maquoketa 161 kV; PAD 2nd Xfmr; Des Plaines - Lombard 345 kV (CE)												
Lower Voltage	Lore - Turkey River - Cassville - Nelson Dewey 161 kV; PAD 2nd Xfmr												
Byron - North Madison	Des Plaines - Lombard 345 kV (CE); Lore - Turkey River - Cassville - Nelson Dewey 161 kV												
Prairie Island - Columbia	McGulpin - Straits 138 kV; PAD 2nd Xfmr												
List of HV Projects Included with Package in July 6th Analysis:													
Paddock - Rockdale	Potosi - Hillman 138 kV; Cassville - Nelson Dewey 161 kV; Hazelton - Dundee 161 kV												
Salem - North Madison	Salem - Maquoketa 161 kV; Davenport - East Calamus 161 kV; Hazelton - Dundee 161 kV												
Lower Voltage	Potosi - Hillman 138 kV; PAD 2nd Xfmr + PAD-TLR Double Circuit; Hazelton - Dundee 161 kV												
Byron - North Madison	Potosi - Hillman 138 kV; Hazelton - Dundee 161 kV												
Prairie Island - Columbia	PAD 2nd Xfmr + PAD-TLR Double Circuit; Potosi - Hillman 138 kV; Cassville - Nelson Dewey 161 kV												
Notes:													
1. Capital Costs are presented in 2005 dollars.													
2. The estimated PROMOD Market Savings are based on generator production costs for 2013 and were converted to 2005 dollars using a 3% inflation factor. Using bid costs, which are not available yet, instead of production costs may show somewhat higher savings.													
3. Base Case and the Prairie Island - Columbia 345 kV project were not included in the Decision Matrix filed on March 25th with the PSCW.													



What Happened to 5K?

- Most recent “base case” transfer capability (TTC) is lower than previous analysis
 - 1913 MW (July) vs. 3462 MW (March)
 - Factors external to ATC impacting imports
 - Loop flow on sensitive lines
- The approach used in July to identify supporting facilities was modified from the approach used in March
 - “PROMOD packages” were optimized for cost/benefit of energy
 - March 25th analysis was optimized for transfer capability
- Additional analysis performed to simulate optimizing transfer capability by determining what would be required to attain 5,000 MW TTC
 - Iterative process similar to PROMOD optimization



Projects required for 5,000 MW TTC

- Low Voltage (4374 MW):
 - Lore-Turkey River-Cassville-Nelson Dewey rebuild
 - 138kV Phase Shifter at Straits
 - 2nd Paddock 345/138kV transformer + 2nd 138kV circuit from Paddock to Town Line Road
 - Install new (2nd) 345kV circuit between Byron and Wempletown
- Alternative Low Voltage (used Phase Shifter instead of 161kV rebuild) (4279 MW):
 - 161kV Phase Shifter at Nelson Dewey
 - 2nd Paddock 345/138kV transformer + 2nd 138kV circuit from Paddock to Town Line Road
 - 138kV Phase Shifter at Straits
 - Install new (2nd) 345kV circuit between Byron and Wempletown
- Salem-NMA (5344 MW):
 - 138kV Phase Shifter at Straits
 - Rebuild Cassville-Nelson Dewey 161kV
 - 2nd Paddock 345/138kV transformer + 2nd 138kV circuit from Paddock to Town Line Road



Projects required for 5,000 MW TTC

- Byron-NMA (5359 MW):
 - 161kV Phase Shifter at Nelson Dewey
 - 138kV Phase Shifter at Straits
- Prairie Island-COL (5250 MW):
 - 161kV Phase Shifter at Nelson Dewey
 - 138kV Phase Shifter at Straits
 - 2nd Paddock 345/138kV transformer + 2nd 138kV circuit from Paddock to Town Line Road
 - Install new (2nd) 345kV circuit between Byron and Wempletown
- PAD-ROE #2 (3628 MW):
 - 161kV Phase Shifter at Nelson Dewey
 - 138kV Phase Shifter at Straits
 - Note: Not able to go above 3628 MW without significant 345 kV improvements



Transfer Capability Caveats

- No voltage analysis performed on TTC iterations
 - Results are based on thermal analysis only
- Packages for PROMOD optimization and TTC optimization do not necessarily line up
 - Conflicting objectives



Other Measures of Import

- VSAT Transfer Capability Results
 - Limits due to low voltage or voltage collapse
 - For the PROMOD optimized package, not the TTC package
 - Additional iterations required to achieve full 5K to address voltage security
- Highest PROMOD Import Level
 - Highest level of import PROMOD utilized for the alternative
- Max Imports (PROMOD)
 - Sensitivity case (50% adder)

Scenario/Category	Measure	Weighting %	Economic Component	Access Alternatives					
				Base Case	Paddock - Rockdale	Salem - North Madison	Lower Voltage	Byron - North Madison	Prairie Island - Columbia
System Performance				Ranking of 1 to 10 (best)					
First Contingency Total Transfer Capability	MW			1913	2789	3342	3166	3094	3118
FCTTC Ranking		21.0%			6.1	10.0	8.8	8.3	8.4
VSAT Transfer Capability Results	Transfer Level (MW)			2465	3715	3862	2493	3834	3056
Type of VSAT Limit	Due to Voltage Collapse			LV	VC	VC	LV	VC	LV
Highest PROMOD Import Level	MW			3339	3871	3609	3740	3907	3916
Maximum Imports (PROMOD)	MW			4424	4996	4960	4747	5101	5189
ATC System Losses	MW			425	412	409	427	406	427