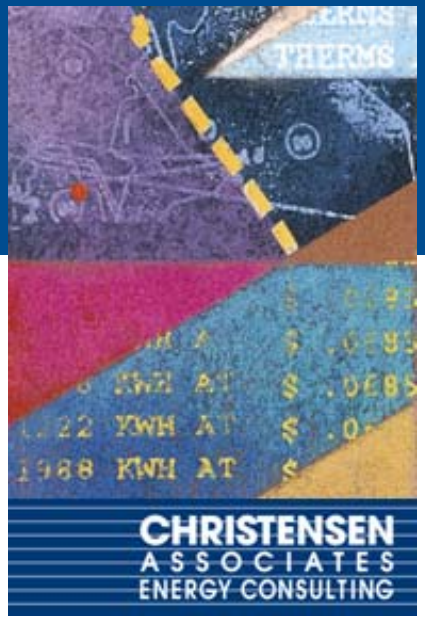
Initial Findings



Assessment of Other Factors, ATC's Access Initiative

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Topics

- Transmission planning and uncertainty
- Dimensions of net benefits (and costs)
  - direct and indirect effects
- Methodology to assess *Other Factors*
  - quantitative indicators of performance (benefits)
  - merit scoring
- Initial findings
- Closing comments

Determining Transmission Plans

- Net benefits (and costs) of transmission assume numerous dimensions
  - direct effects
    - lower energy costs and (thus) reduced retail prices
    - **improved reliability, increased transfer capability***
    - **risk mitigation, and expanded optionality and choice***
  - indirect effects
    - **economic development, societal impacts, environmental externalities***
    - **accommodation of preferred resources – renewables***

areas considered as Other Factors

Determining Transmission Plans (2)

- Power markets/systems possess network externalities
  - inherent to transmission and power supply
  - events at one location (Δ in load, generation, topology) convey benefits and costs to participants elsewhere

- Assessment of candidate plans, then, involves an adequate representation of power networks, and the behavior of markets
  - large-scale modeling
  - *network models, however, cannot readily capture the full range of net benefit flows*

Determining Transmission Plans (3)

- The problem of uncertainty
  - net benefits are realized over many years and locations
    - 345 kV projects have useful lives of from 40 to 60 years
  - *uncertainty assumes several key aspects*
    - structure of regulation, including FERC and PSCW, and of electricity markets
    - primary fuel prices
    - generator operating performance and bidding behavior
    - unknown future generator additions/retirements
    - electricity demands and weather patterns
    - transmission branch availability

Other Factors

Reduced Operating Risks

- Fuel diversity
- Technology diversity

Reliability Benefits

- Capacity cost savings through reduced reserve requirements
- Reduced Expected Unserved Energy (EUE)
- Improved system reliability attributable to voltage

Power System Externalities

- Benefits realized by neighboring systems
- Improved value of other planned projects
- Increased transfer capability attributable to higher thermal limits

Other Factors (2)

Environmental Benefits and Costs

- Societal impacts
- Environmental externalities
- Access to renewable resources

Benefits Related to Economic Development

- Local and state economic development
- Backbone infrastructure
- Geographic diversity of high voltage system

Fairness and Equity Aspects

- LMP comparability

Assessment of Other Factors

- Principles:
  - *monetize, where methods and resources allow*
    - additively incorporate within the assessment of plans
  - *quantify and merit score using observable attributes*, where monetization is not readily feasible but quantitative rating is appropriate
  - *analyze other relevant attributes and make an informed policy judgment*

- One possible approach
  - ***Multi-Criteria Analysis (MCA)***

Multi Criteria Analysis (MCA)

- A general class of methods (tools) that facilitate the incorporation of non-monetized factors into structured decision making
- Analysis steps:
  - *identify observable attributes that best capture benefits*
    - attributes should align with benefits, to the degree possible
  - *quantify observable attributes (as surrogates for measurable benefits)*
  - *merit score the **differences** in observable attributes*
    - proportional scoring across project options, for each of the identified Other Factors
  - *weight merit scores for each project of the Access Initiative*

Technology Diversity Benefits

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
Value of Risk Reduction ($m 2005)	$48.30	$55.80	$74.90	$52.90	
Merit Score	6.4	7.4	10.0	7.1	

Benefits Realized by Neighboring Systems

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
Performance Objective/Criterion					
1. Direct Improvement in Transfer Capability		X	X	X	X
2. Direct Reduction in Chronic Transfer Constraints	X		X	X	X
3. Mitigation of Chronic Transfer Limits		X		X	X
4. Potential Improvement In Stability Response		X	X		X
5. Increased Backbone Infrastructure		X	X	X	X
Total Points	1	4	4	4	5
Merit Score	2	8	8	8	10

Benefits from Reduced Expected Unserved Energy

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
ΔEUE vs. Base (MWh)	-3,948	-25,018	-25,249	-7,644	-3,583
Gains Realized by Consumers ($M)	$40.50	$256.80	$259.20	$78.50	$36.80

Societal Impacts

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
Miles of New Right-of-Way	0	56	6	8	159
Merit Score	10.0	6.5	9.6	9.5	0.0

Access to Renewable Resources

Project	**Western Bias**	**Southwest-ern Bias**	**Southern Bias**	**Wisconsin Bias**	***Merit Score***
Low-Voltage	2.38	1.94	5.06	10.00	4.80
Byron	2.38	1.94	10.00	4.64	4.70
Salem	7.02	10.00	5.57	4.76	6.80
Paddock	2.38	1.94	10.00	4.64	4.70
Prairie	10.00	3.88	2.53	2.38	4.70

Expanded Infrastructure

Benefits of Greater 345 kV Backbone

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
Miles	0	97	149	35	275
Merit Score	0.0	3.5	5.4	1.3	10.0

Geographic Diversity of ATC's HV Network

Project	Low-Voltage	Byron	Salem	Paddock	Prairie
Approximate Miles	0	25	75	0	75
Merit Score	0.0	3.3	10.0	0.0	10.0

Reduction in LMP Variability

Project	Base Case	Low-Voltage	Byron	Salem	Paddock	Prairie
Average Std. Dev.	0.837	0.641	0.600	0.609	0.672	0.745
Reduction in Avg. S.D.		0.196	0.237	0.228	0.164	0.092
Merit Score		8.3	10.0	9.6	6.9	3.9