Regional transmission access charge discussion

Some Benefits Assessment Principles & Tools

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Market Surveillance Committee Chair
General Session
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Benefit Category	Transmission Benefit
1. Traditional Production Cost Savings	Production cost savings as traditionally estimated
1a-1i. Additional Production Cost Savings	a. Reduced transmission energy losses
	b. Reduced congestion due to transmission outages
	c. Mitigation of extreme events and system contingencies
	d. Mitigation of weather and load uncertainty
	e. Reduced cost due to imperfect foresight of real-time system conditions
	f. Reduced cost of cycling power plants
	g. Reduced amounts and costs of operating reserves and other ancillary services
	h. Mitigation of reliability-must-run (RMR) conditions
	i. More realistic representation of system utilization in "Day-1" markets
2. Reliability and Resource Adequacy Benefits	a. Avoided/deferred reliability projects
	b. Reduced loss of load probability or c. Reduced planning reserve margin
3. Generation Capacity Cost Savings	a. Capacity cost benefits from reduced peak energy losses
	b. Deferred generation capacity investments
	c. Access to lower-cost generation resources
4. Market Benefits	a. Increased competition
	b. Increased market liquidity
5. Environmental Benefits	a. Reduced emissions of air pollutants
	b. Improved utilization of transmission corridors
6. Public Policy Benefits	Reduced cost of meeting public policy goals
7. Employment and Economic Development Benefits	Increased employment and economic activity; Increased tax revenues
8. Other Project-Specific Benefits	Examples: storm hardening, increased load serving capability, synergies with future transmission projects, increased fuel diversity and resource planning flexibility, increased wheeling revenues, increased transmission rights and customer congestion-hedging value, and HVDC operational benefits

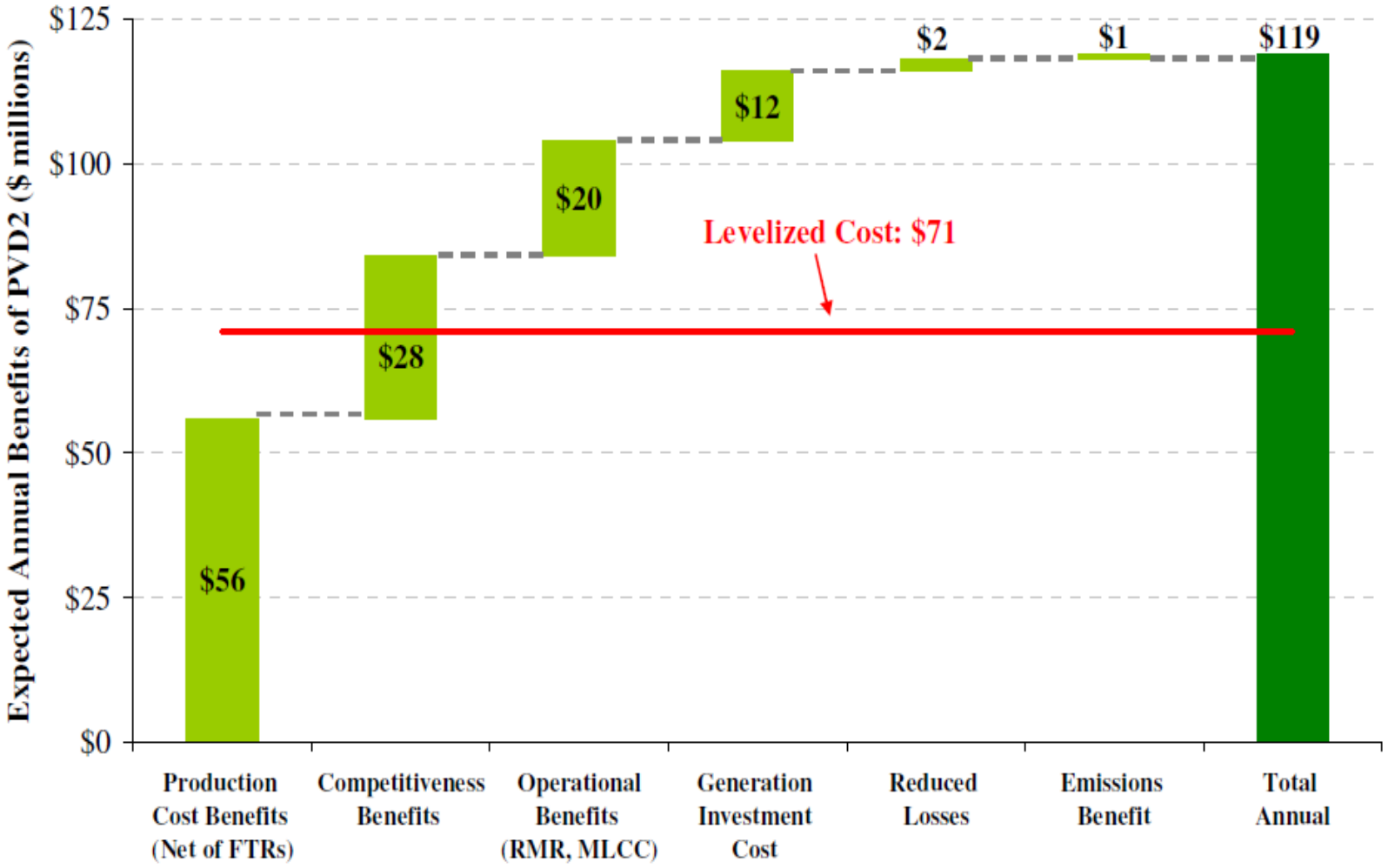
Benefit Categories

From: J.W. Chang, J.P. Pfeifenberger, J.M. Hagerty, *The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments*, WIRES Project, Brattle Group, July 2013.

Benefit Category	Transmission Benefit	Tools Avail?	Trustworthy?
1. Traditional Production Cost Savings	Production cost savings as traditionally estimated	√ √ √	Y TEAM
1a-1i. Additional Production Cost Savings	a. Reduced transmission energy losses	√ √	Y TEAM
	b. Reduced congestion due to transmission outages	√	? (probabilities)
	c. Mitigation of extreme events and system contingencies	√	?(probabilities) TEAM
	d. Mitigation of weather and load uncertainty	√ √	Y
	e. Reduced cost due to imperfect foresight of real-time system conditions		
	f. Reduced cost of cycling power plants	√	? (data)
	g. Reduced amounts and costs of operating reserves and other ancillary services	√	Y
	h. Mitigation of reliability-must-run (RMR) conditions	√ √	Y TEAM
	i. More realistic representation of system utilization in "Day-1" markets		
2. Reliability and Resource Adequacy Benefits	a. Avoided/deferred reliability projects	√ √	Y
	b. Reduced loss of load probability or c. Reduced planning reserve margin	√	N for LOLP
3. Generation Capacity Cost Savings	a. Capacity cost benefits from reduced peak energy losses	√ √	Y TEAM
	b. Deferred generation capacity investments	√ √	? (market response) TEAM
	c. Access to lower-cost generation resources	√ √	? (market response) TEAM
4. Market Benefits	a. Increased competition	√ √	? (market response) TEAM
	b. Increased market liquidity	√	N (transaction costs)
5. Environmental Benefits	a. Reduced emissions of air pollutants	√ √	Y (if capture caps)
	b. Improved utilization of transmission corridors	√ √	Y
6. Public Policy Benefits	Reduced cost of meeting public policy goals	√ √	? (market response) TEAM
7. Employment and Economic Development Benefits	Increased employment and economic activity; Increased tax revenues	√ √	N (economy-wide effects)
8. Other Project-Specific Benefits	Examples: storm hardening, increased load serving capability, synergies with future transmission projects, increased fuel diversity and resource planning flexibility, increased wheeling revenues, increased transmission rights and customer congestion-hedging value, and HVDC operational benefits		

TEAM Methodology

Total Benefits Quantified for Southern California Edison's Palo Verde-Devers 2 Project



Source: Chang et al. (from CAISO documentation)

Estimating Capacity Benefits Resulting from Gen Investment Response to Transmission

1. Judgment based on increased transfer capability
2. Market Response modeling
   - Assumes competitive markets make capacity decisions
   - Assumes risk neutrality
   - Assumes efficient transmission pricing
   - Can make a big difference in benefits

- NARUC/DOE project
  - A. Liu, B.F. Hobbs, J. Ho, J. McCalley, V. Krishnan, M. Shahidehpour, and Q. Zheng, *Co-optimization of Transmission and Other Supply Resources*, Prepared for the Eastern Interconnection States' Planning Council, National Association of Regulatory Utility Commissioners, Washington, DC, 20 Dec. 2013, pubs.naruc.org/pub/536D834A-2354-D714-51D6-AE55F431E2AA

Example of Capacity Response/Benefit Modeling (Liu, Hobbs et al.)

JHSMINE Stochastic Transmission Planning Model:

- *13 US regions*
- *Build & dispatch gen; build transmission*
- *Data from J. McCalley lab (Iowa State U)*

Results:

1. Gen-Only (with existing grid): $1846B PW

2. Trans-Only (with Gen-Only generation): $1766B

- ***$19B/$35B trans investment 2010-20/20-30***

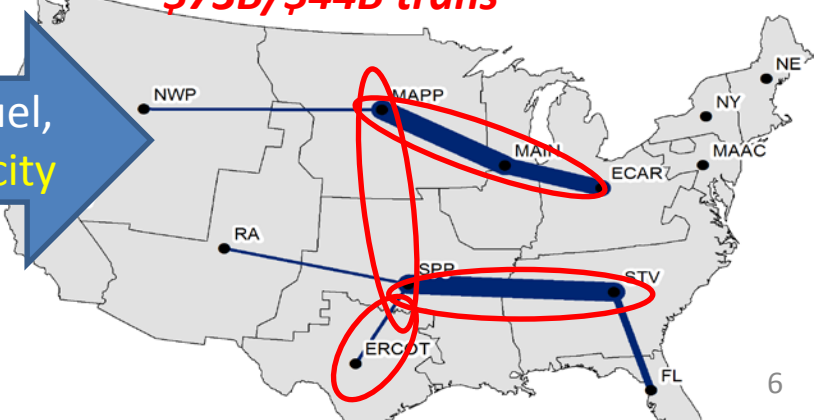
Savings: $88B Fuel, $62B Gen Capacity

New Transmission

10
20
30
40
50
60

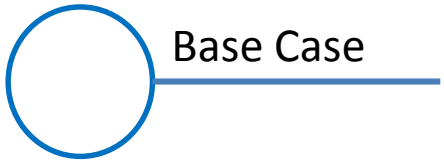
3. Co-op Simultaneous: $1679B

- ***$73B/$44B trans***

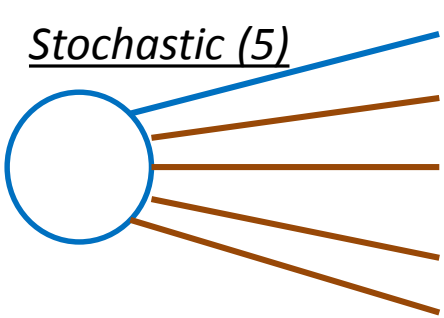


Insurance Benefit of Transmission: Consider Short-run Outages, Long-Run Uncertainties

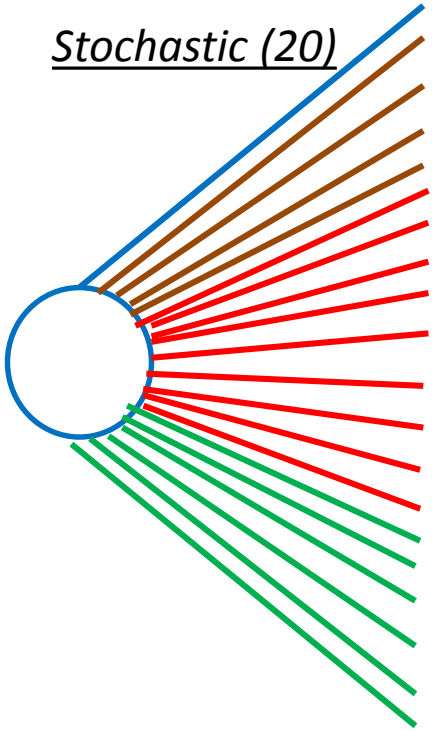
Deterministic



Stochastic (5)

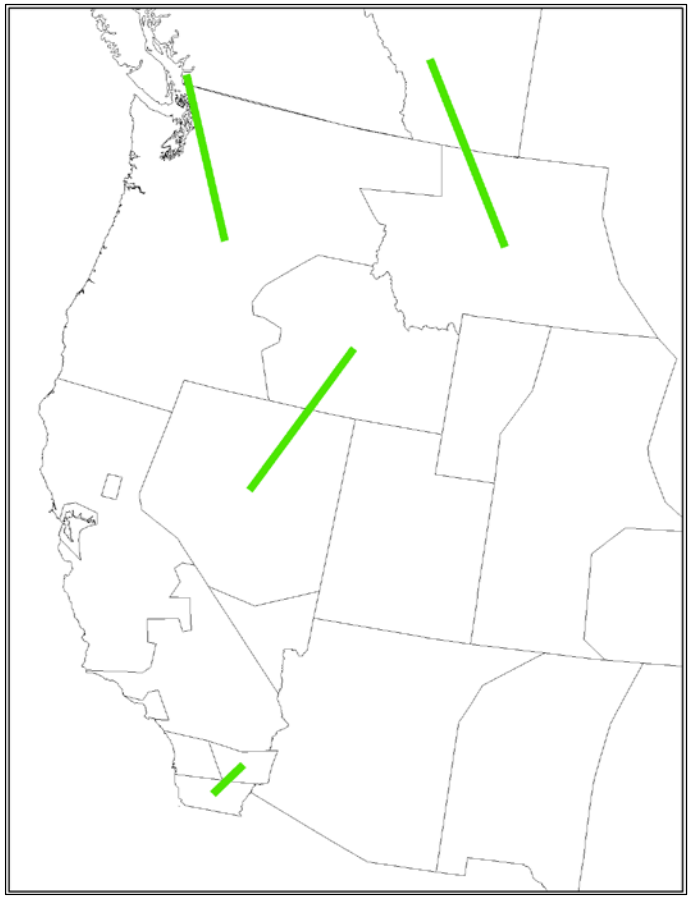


Stochastic (20)

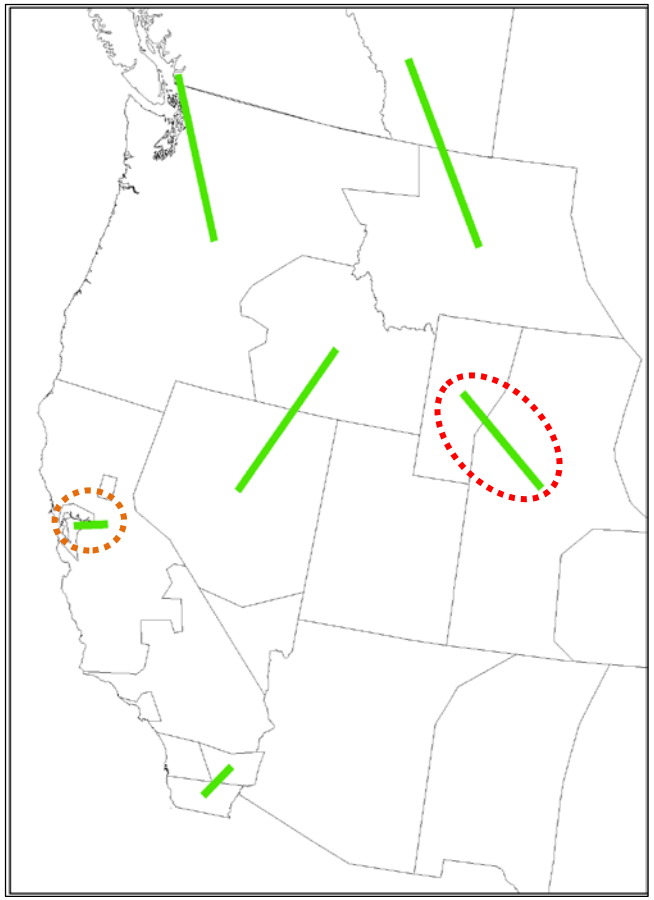


Considering Long-Run Uncertainties Changes: (1) Benefits of Lines & (2) Optimal Additions

(J.L. Ho, B.F. Hobbs, P. Donohoo-Vallett, Q. Xu, S. Kasina, S.W. Park, and Y. Ouyang, *Planning Transmission for Uncertainty: Applications and Lessons for the Western Interconnection*, Final Report, Johns Hopkins University, Prepared for the Western Electricity Coordinating Council, Jan. 2016, www.wecc.biz/Reliability/Planning-for-Uncertainty-Final-Report.pdf)



21-zone model, Base Case,
1st stage decisions



21-zone model, 5&20 Scenarios,
1st stage decisions

Tentative recommendations on policy/reliability lines

- Reliability lines:
  - If a firm reliability constraint must be met, benefit of a plan =
    - cost of the next best alternative
    - plus net market benefits relative to that alternative
  - If there are market benefits, reasonable to allocate some costs to beneficiaries
    - But due to uncertainty in benefit estimates and fairness considerations, don't set that cost allocation = market benefits

Tentative recommendations on policy/reliability lines

- Policy lines: calculate & allocate benefits to other regions if they benefit

Region A's Benefits		Region A Policy	
		No Policy	Policy
Build?	No Line:	0	-100
	Line:	10	-60

Region B's Benefits		Region A Policy	
		No Policy	Policy
Build?	No Line:	0	20
	Line:	5	50