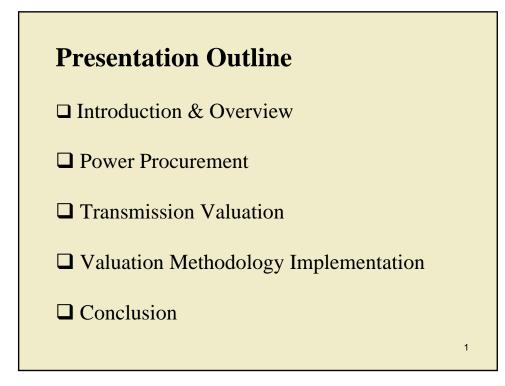
Developing a Comprehensive Methodology for Valuating Transmission Impacts for New Generation Developments

Bhaskar Ray, Southern California Edison

Presentation at Transmission Planning Technical Panel Session IEEE PES 2008 T&D Conference & Exposition, Chicago



Introduction

□ This paper describes a methodology which can be suitably employed by any load serving entity (LSE) in NERC region for including transmission costs in the Request For Offer (RFO) overall evaluation process for the procurement of new generation resources.

□ The merits of the methodology described in this paper solely reflect the views of the authors only and do not establish SCE position for RFO valuation purposes.

□ The Federal Energy Regulatory Commission (FERC) has established a standardized process for interconnecting new generation that should be applied by responsible planning coordinators (ISO/RTO/TO).

□ The process used by California Independent System Operator (CAISO) was filed with FERC in a document called the Large Generator Interconnection Procedure (LGIP).

2

LGIP Process in California

□ The LGIP was established to ensure non-discriminatory access to the transmission system by providing interconnection on a first-come, first-served basis.

□ As part of the current LGIP, a generation developer must establish a position on the interconnection queue of the CAISO to which their project will connect.

□ The developer will be required to fund any identified upgrades, but will be reimbursed by the Participating Transmission Owner (PTO) over five years.

□ The LGIP does not consider the economic value of new generation when determining the upgrades. The location of the uneconomic plant could increase the total transmission cost for the system.

□ There is no strong incentive for generators to select cost effective locations.

Power Procurement

□ The public utilities in general, and California IOUs in particular have established a fair RFO valuation process that treats all offers on the same and consistent way and takes into account all cost that will be borne on their customers.

□ The transmission network upgrade costs for the new generators must be incorporated to ensure that an offer's valuation reflects the relevant total wholesale cost of power to the consumer.

□ The cost estimates for transmission Network Upgrades can vary dramatically during the study process due to development schedule changes in the proposed generation projects.

4

Transmission Valuation

□ To help mitigate the cost uncertainty, adders are developed for various scenarios to better characterize the amount of uncertainty involved with the transmission interconnection costs.

□ Transmission adders can be developed using information from System Impact Studies (SIS) and Facility Studies (FAS) for various RFO projects as requested by the counterparties (CP) under LGIP process.

□ The transmission upgrade costs can be classified into:

➢Interconnection Facility costs

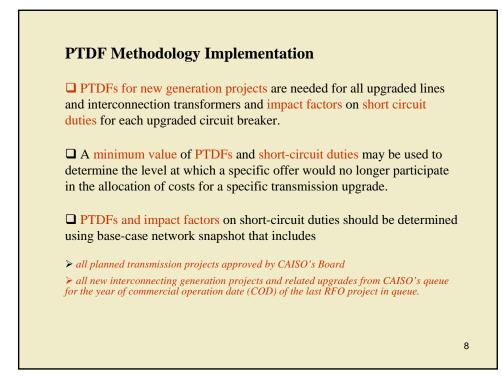
Network Upgrade costs

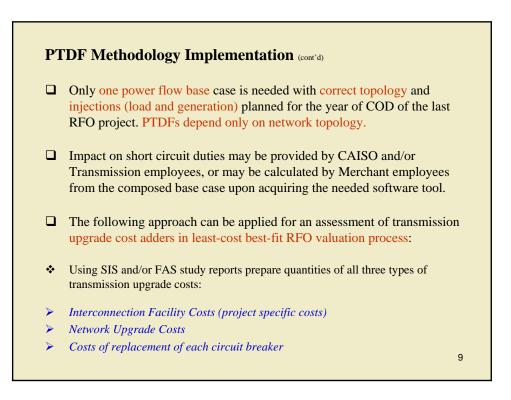
Transmission Valuation Methodology

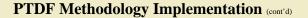
- □ A simplistic approach that can be used by IOUs to incorporate transmission Network Upgrade costs into the overall valuation process can be based on cost MW-based sharing mechanism.
- Certain transmission costs estimates will be subject to revisions if there is a change in the queued generation projects that were included in the study.
- This simplistic protocol can assess this uncertainty by considering several scenarios when developing adders to allocate the transmission network upgrade costs.
- □ If the valuation order of the offers in a given cluster matches the queue order of the offers, then there should be no conflict between FERC's interconnection process and least-cost, best-fit planning.

6

Transmission Valuation Methodology (cont'd)
Transmission network upgrade costs can be shared on:
MW loading factor basis for upgraded transmission lines and interconnection transformers (ratio between multiple of generation capacity and power transfer distribution factor (PTDF) and sum of multiple of generation capacity and PTDF for all new generation projects that have countable influence on line/transformer MW flow loading), and
Projects impact factors on short-circuit duty basis for each breaker's upgrade cost (calculated by project contribution to the three-phase short-circuit current).
The transmission upgrade costs calculated this way would reflect the physical impact of new generation projects to the MW loading of upgraded network elements and short-circuit duties.

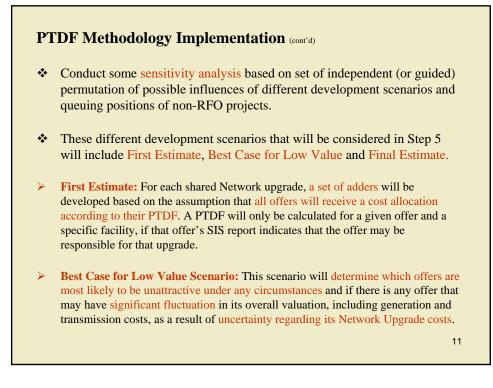


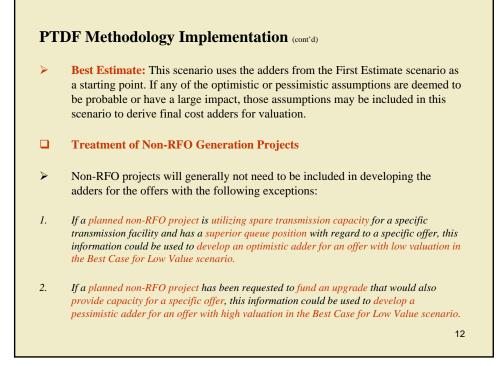


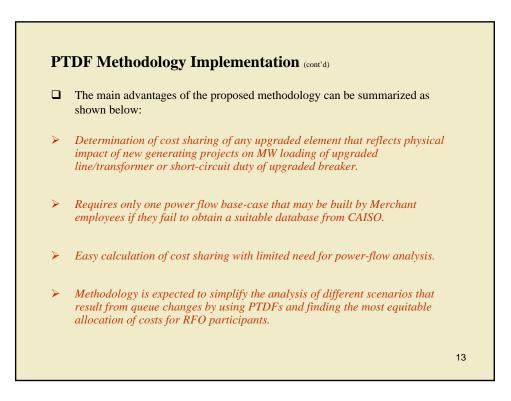


- Determine MW loading factors for each upgraded transmission facility (for new generation projects with countable influence on flow) and calculate cost share for each new generation project
- Determine impact factors on short-circuit duties for each new generation project and calculate generation project's cost share due to replacement of circuit breakers
- Run overall valuation and selection process with transmission costs adders determined in the three steps listed above.
- Repeat steps 1-4 (if necessary) to perform sensitivity analysis of possible influence of different development scenarios of project that participate in RFO.









Sample Cal	culation	of line/t	ransformer	<u> </u>		listribution l ork Upgrade	•	oading fac	ctors and PTI
	w neration)ject	PTDF Factor	• •			MW Loadin Factor	U	pgrade C	ost
Α	А		100	20.0		0.250		\$250,000	
В	В		50	12.5		0.156		\$156,250	
С	С		500	17	7.5	0.219		\$218,750	
D	D		200	30.0		0.375		\$375,000	
То	Total		-	80.0		1.000		\$1,000,000	
Sample Ca	alculation	of sho	r <mark>t-circuit dut</mark> Total Brea				ring of b		upgrade costs
	New		Three-phas	e SC	·]
	Genera	ation c	urrent Contri						
	Project A B C		[A] 2000 3500 4500		Impact Factor		Cost per project		
						0.20		0000	
					0.35		\$350000 \$450000		
	C Total		4500			0.45 1.00	<u>\$450</u> \$100		14
	rotai		10000			1.00	\$100	0000	

	For each Offer Variation, the input will be:
≻	Size of the Offer Variation
≻	Offer Valuation
≻	SIS/FAS costs and study results
	Information from the CAISO's deliverability studies may be used
	The output will be:
≻	A set of impacted transmission facilities for each offer
۶	A monthly value in dollars per month for transmission upgrade costs for each scenario
≻	A report that provides a summary for each Offer Variation and explains the uncertainty associated with the Transmission Adders

Data Requirements for Long-Term RFO Valuation

- 1. Interconnection Study Correspondence
- 2. Queue Information
- 3. Overload Information
- 4. FERC 2004 waivers
- 5. Study Conditions
- 6. Generation Redispatch
- 7. Geographical Maps showing project locations
- 8. Protection Upgrades
- 9. Fault Study Results
- 10. Network Upgrades
- 11. Cost Information
- 12. Tentative Construction Schedule
- 13. Supporting Documentation

Conclusion

□ Development of a suitable methodology is highly beneficial for including transmission costs in the RFO valuation process for the procurement of new resources.

□ The transmission network upgrade costs for the new generators must be incorporated to ensure that an offer's valuation reflects the relevant total wholesale cost of power to the consumer including any impacts on the transmission system.

□ The main intent of developing a Transmission Protocol is to ensure that a consistent valuation methodology has been applied by IOU for all the Offers from generation developers to comply with the least-cost, best-fit criteria advocated by CPUC.

□ The cost estimates for transmission network upgrades can vary dramatically due to development and schedule changes in the proposed generation projects.

□ To help mitigate this uncertainty, adders need to be developed by IOU for various scenarios to better characterize the amount of uncertainty involved with the transmission interconnection costs for new generation developments.

16