



Economic Evaluation of Palo Verde Devers Line #2 (PVD2)

by

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Topics

I Study Scope

II Purpose of TEAM Methodology

III Preliminary Study Results



I. Study Scope

- Focused on economic benefits
- Used CAISO's Transmission Evaluation Assessment Methodology (TEAM)
- Benefits quantified
 - Energy cost savings -- from simulations
 - Losses, emissions, capacity, operational benefits -- ex-post analyses
- Benefits recognized but not quantified
 - Future reliability requirements
 - Fuel diversity
 - Insurance value against future contingencies



II. Goals of TEAM Effort

- Develop a standard methodology to evaluate economic need for transmission upgrades.
- Present a framework which can be used today to make effective decisions on transmission upgrade.
- Provide transparency in methods, databases and models so a variety of stakeholders can understand the implications of a transmission upgrade.



Application of TEAM to PVD2 Study

- I. **Benefits Framework** -- Utilized standardized benefit cost frame to calculate WECC wide benefits and regional impacts.
- II. **Network representation** – PLEXOS, full network represented with 17,450 lines, with 3 DC lines and 284 lines 500KV or above enforced.
- III. **Market prices**- Dynamic hourly bidding based on empirically estimated price cost mark-up which vary by system conditions.
- IV. **Uncertainty**- 30+ sensitivity cases for 2008 based on various assumptions on load growth, gas prices, hydro conditions, and market pricing.
- V. **Resource substitution**- Alternative transmission and generation projects were studied



Input Assumptions

- Started with SSG-WI database
- Modifications to SSG-WI include:
 - Renewable Portfolio Standard (RPS) by state
 - 16% capacity reserve margin for each sub-region
 - Adjusted reserve margins to WECC projections (2003/2004 forecasts)
 - Evaluated economic entry and retirements
 - Network upgrades included short-term upgrades to Palo Verde Devers branch group and EOR 9000



III. Preliminary Study Results

- Are EOR 9000 and PVD2 projects substitutes or complementary?
 1. EOR 9000 economic feasibility- about \$30 million annual WECC energy benefits for 2008
 2. Evaluate energy benefits of PVD2
 - First-year 2008 results indicate benefits on expected value basis of \$43 million/yr
 - First year benefits range from \$7 to \$140 million based on 30+ sensitivity cases.
 - Levelized benefits not yet computed. Dependent on real escalation between 2008 and 2013, levelized benefits likely to range from \$50 to \$70 million per year.



Energy Benefit Summary for a High Gas Scenario in 2008

Summary of Benefits for Palo Verde Devers 2 Upgrade							
Case Description -- M05. 2008 BHM							
Perspective	Description	Consumer Benefit (mil. \$)	Producer Benefit (mil. \$)	Trans. Rental (mil. \$)	Total Benefit (mil. \$)	Production Cost Savings (mil. \$)	
<i>Societal</i>	<i>WECC</i>	516.05	(112.33)	(320.78)	82.94	82.875	
							27,636.10
							27,553.22
<i>Modified Societal</i>	<i>WECC</i>	516.05	(90.01)	(320.78)	105.26		
<i>California Competitive Rent</i>	<i>ISO Ratepayer Subtotal</i>	332.34	(100.81)	(154.21)	77.32		

Definitions:

Consumer Benefit – Reduction in energy cost to consumers. Producer Benefit – Increase in producer net revenue. Transmission Owner Benefit – Increase in congestion revenues.

WECC Societal – Sum of Consumer, Producer, and Transmission Owner Benefit in WECC.

Also equal to difference in total production costs for the “without” and “with upgrade cases.”

WECC Modified Societal – Same as Societal but excludes Producer Benefit derived from uncompetitive market conditions.

ISO Ratepayer – Includes ISO consumers and utility-owned generation and transmission revenue streams.

ISO Participant – Includes ISO Ratepayer plus the CA IPP Producer Benefit derived from competitive market conditions.



Total Societal Benefit

Two identities must be met:

1. The increase in social surplus as a result of the upgrade must equal the change in production cost.
2. The total benefit should sum up to the components which are determined independently

$$\Delta \mathbf{TS} = \mathbf{TB} = \Delta \mathbf{CS} + \Delta \mathbf{PS} + \Delta \mathbf{TR}$$

Where,

TS = Total Societal

CS = Consumer Surplus

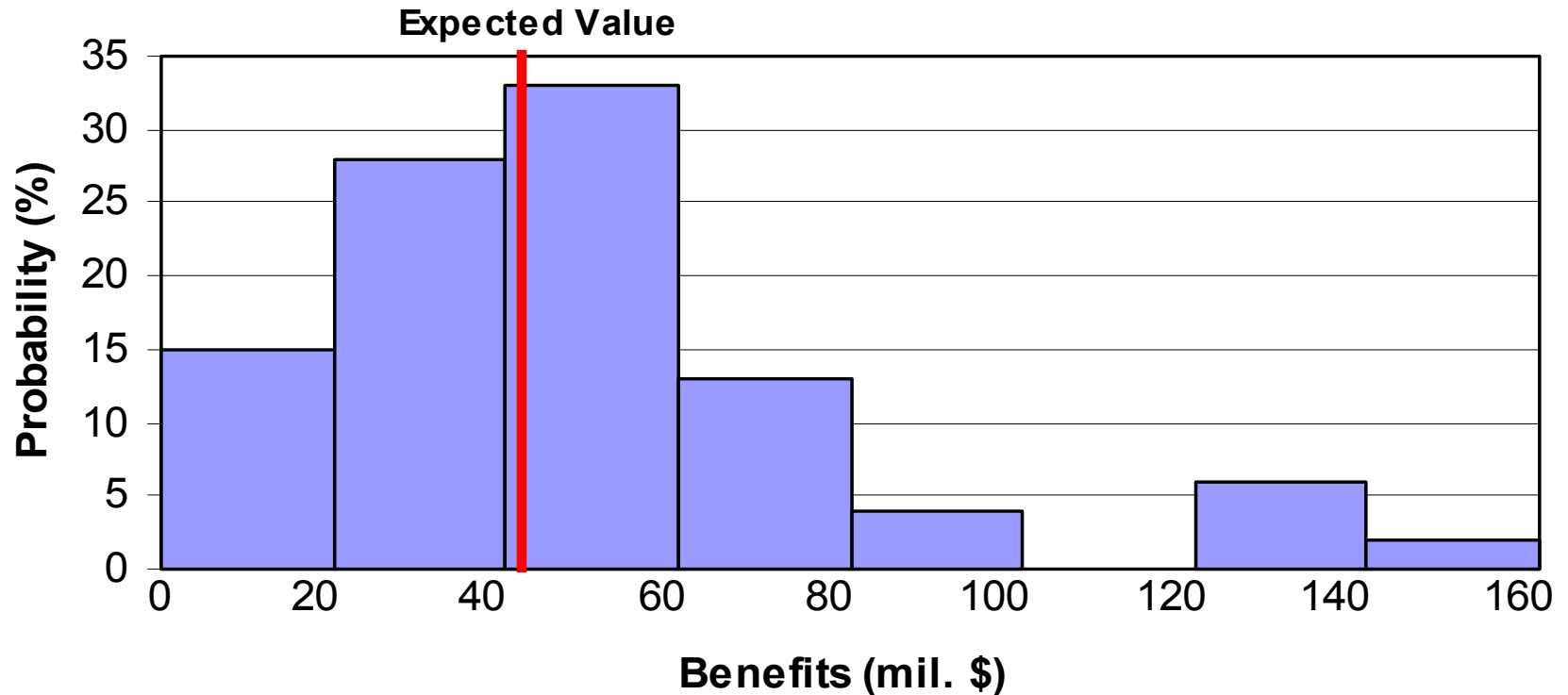
PS = Producer Surplus

TR = Transmission Rental



Range of 2008 Annual CAISO Participant Benefits and Expected Value of Benefits for PVD2 Upgrade

2008 WECC Benefit Range (2008 mil. \$)





Summary of Results To Date

2008 Estimated Societal Benefits:

- Energy savings -- \$40 to \$45 million
- System loss savings -- \$10 to \$15 million
- Capacity savings -- \$5 to \$10 million
- Emission reduction -- \$0 to \$5 million
- Operational benefits -- \$5 to \$15 million
- Total -- \$60 to \$90 million

Levelized Estimated Societal Benefits (depending on escalation rate):

- Total -- \$60 to \$100 million per year

2008 CAISO Benefits:

- Expected to be a large percentage of societal benefits

Staff PVD2 Recommendation:

- Recommendation to be formulated before CAISO Board meeting in February
- Based on current analysis, staff is optimistic about economic feasibility of PVD2