

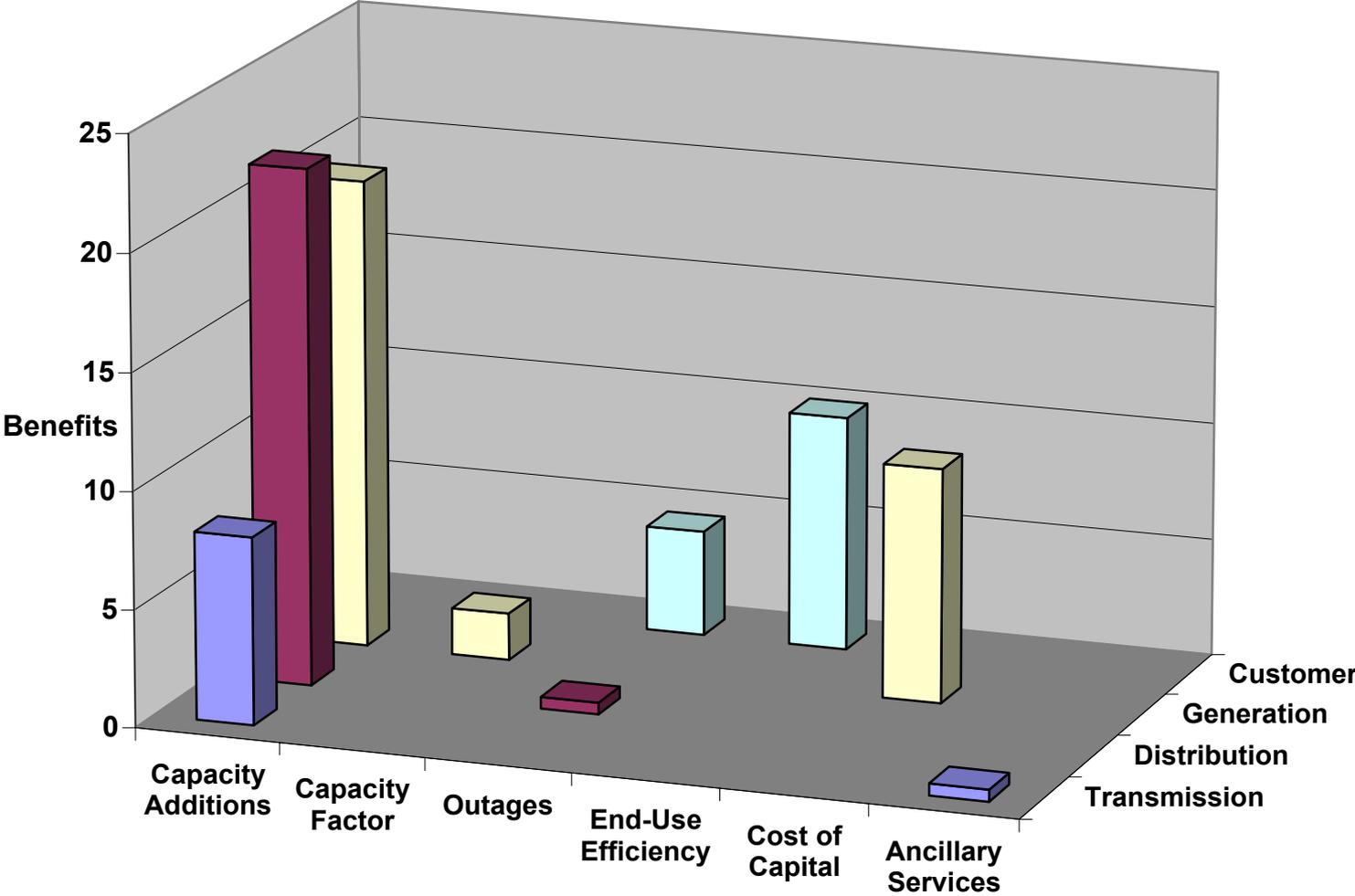
Electric Distribution Transformation Program Review FY04

Characterizing GridWide Benefits

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Coronado CA

Matrix of GridWise Benefits (PNNL, 2002)



Relevance to Problems & Needs

- ▶ Quantitative estimates of GridWise benefits needed to inform R&D investment decisions

- ▶ A wide range of prospective benefits must be considered
 - To generators, ISOs, DISCOs, other industry stakeholders
 - Deferred capital costs, lower O&M costs, higher capacity factors, ...
 - To end users of electricity
 - Lower power expenditures, fewer outages, end use efficiencies, ...
 - To society at large
 - Increased energy security, reduced emissions, greater confidence in power system, ...

Technical Challenges to Estimating Benefits from GridWise

- ▶ Benefits often difficult to characterize and quantify
- ▶ Some benefits are interrelated
 - E.g., reduced peak load => deferred capital costs and lower end user expenditures
 - Important to avoid double counting
- ▶ Need to distinguish intermediate from final benefits
 - Better system diagnostics (intermediate) lead to reduced O&M costs (final) and lower costs from outages (final)
 - Utilizing load for spinning reserve leads to lower generation reserve margin (intermediate), deferred costs of capacity additions (final)

Project Objectives

- ▶ Develop framework for characterizing and assessing net benefits from GridWise
- ▶ Make quantitative estimates of benefits and costs
 - Based on best available data and plausible assumptions about future trends and developments
- ▶ Document results, with particular emphasis on assumptions, methods, uncertainties, and ways to improve the estimates

Technical Approach

- ▶ Analytic framework to assess benefits
 - Models focus on system peak demand, capacity, prices
 - Include both market and behavioral responses
 - System benefits shared between suppliers and customers to avoid double counting

- ▶ Quantitative estimates
 - EIA projections to 2025 used as baseline
 - GridWise phased in over 20 years
 - New 20-year projections compared with baseline
 - Benefits summarized using present value of 20-year cash flows

Life-Cycle Project Timeline with Milestones and Budget, by FY

▶ FY03: Phase I

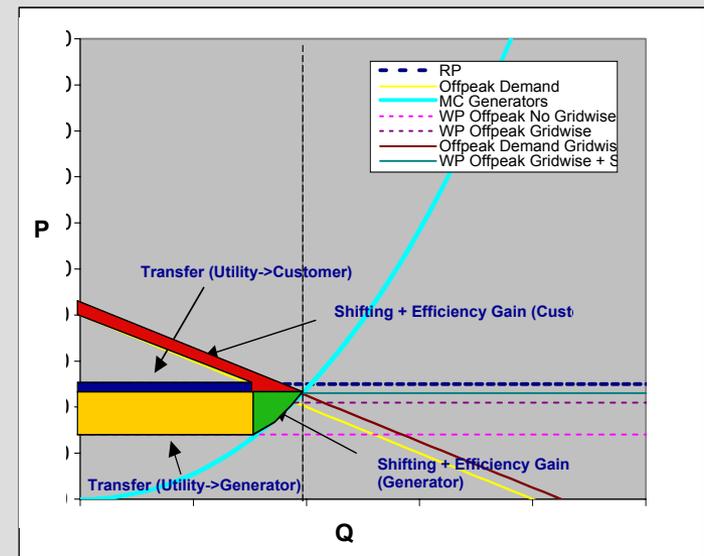
- Project start: June 2003
- Budget: \$125K
- Initial framework completed: September 30, 2003
- Phase I report with preliminary benefit estimates: November 30, 2003

▶ FY04: Phase II

- Budget: TBD
- Final report with net benefit estimates: September 2004

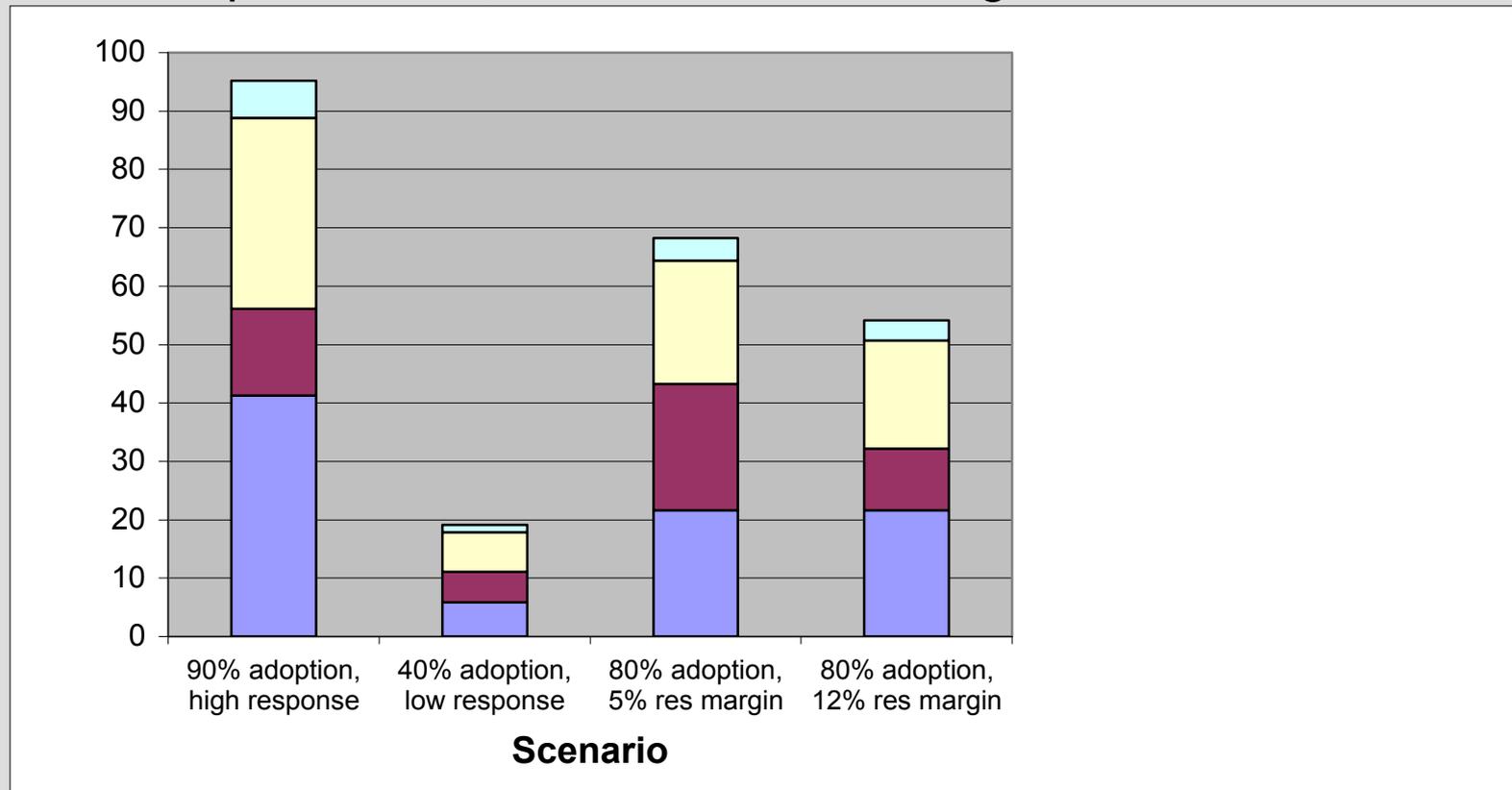
FY03 Progress and Accomplishments

- ▶ Initial benefits framework completed
 - Links demand response to system capacity decisions
 - Incorporates both intermediate and final benefits
 - Reduced peak loads from demand response
 - Load shifting to offpeak
 - Reduced peak generation, T&D requirements
 - Lower generation reserve margins
 - End use efficiency gains
 - Deferred capital costs
 - Reduced O&M, fuel costs
 - Lower end user expenditures



Deferred Capital Costs Drive Estimates of System Benefits

- ▶ 20-year present values of \$20 - \$100 billion
 - Sensitive to inputs for supply and demand elasticities, GridWise market penetration, feasible reserve margins

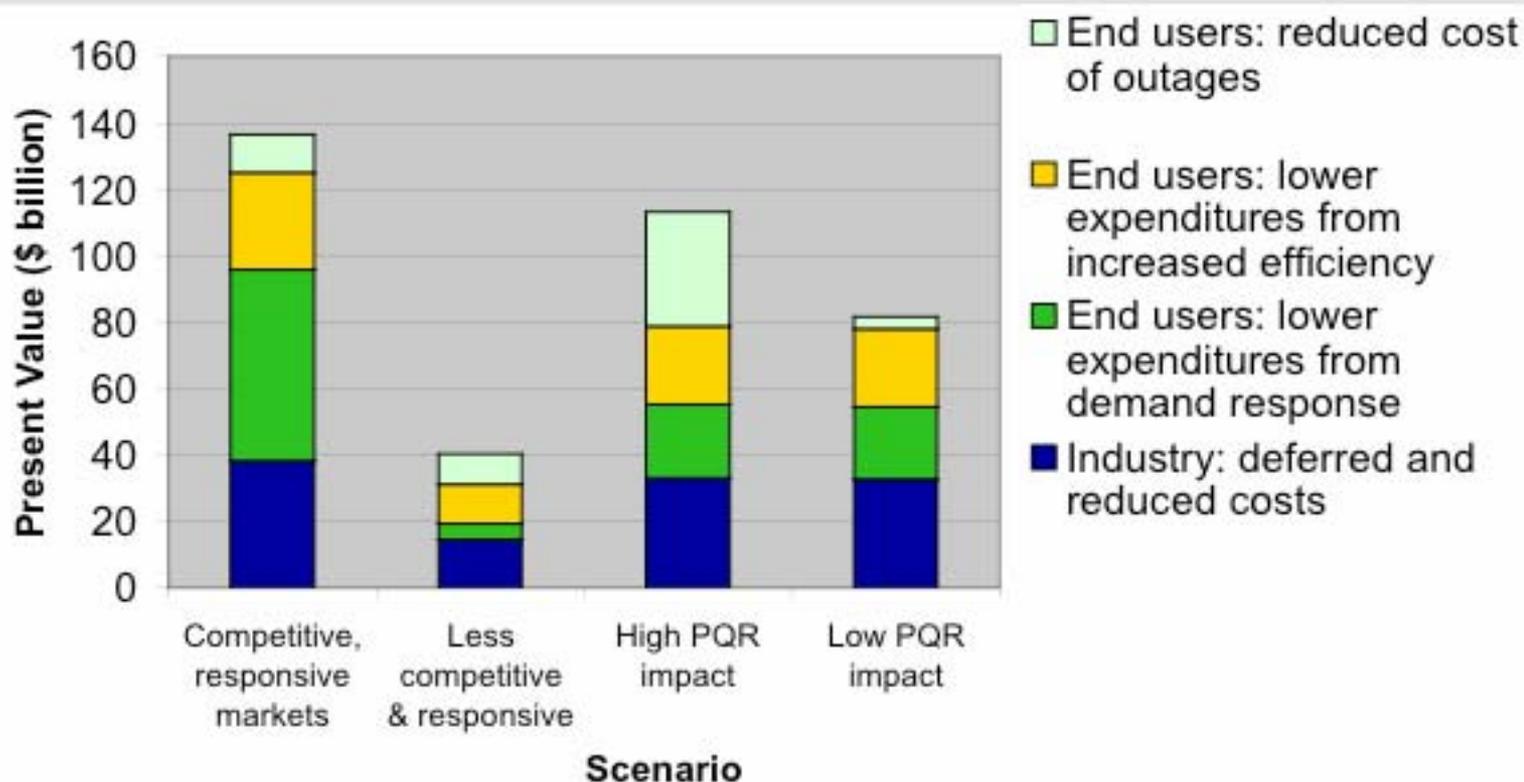


Benefits of Improved Reliability from GridWise Can Be Substantial

- ▶ Key is reducing outages from system overloading
 - Relatively few events but often very costly
 - August 14 may warn of more frequent occurrences
 - GridWise has less impact on weather-related outages
- ▶ Present values of \$5 - \$40 billion seem plausible
 - Benefits very sensitive to inputs for outage probabilities, direct and indirect costs, GridWise impacts
 - Additional analysis here could have high payoff

FY03 Progress: Preliminary Estimates of GridWise Benefits

► Present values from \$40 to well over \$100 billion



Planned Activities for FY04

- Reduce uncertainties in underlying assumptions
 - Assess new results on demand response, price elasticities
 - Incorporate estimates of costs of August 14 blackout
 - Convene expert panel to review assumptions
- Conduct additional analysis to improve benefit estimates
 - Incorporate RAND results on value of energy security
 - GridWise impacts on DER deployment, benefits and costs
 - GridWise influence on efficiency and productivity gains
- Refine benefit calculations, integrate with other models
- Report net present values including estimates of GridWise implementation cost and timing
- Project to be completed in FY04

Impacts and Benefits

- ▶ Benefit estimates inform R&D priority setting
 - Based on sound economic principles
 - Analytically supportable
 - Assumptions and uncertainties clearly delineated
- ▶ Simulations test robustness of GridWise concepts
 - Explore impacts of technical, economic, institutional and behavioral assumptions
 - Compare benefits among different scenarios
- ▶ Prospects of significant benefits can mobilize public and industry support

Interactions & Collaborations

- ▶ FY03 interactions primarily as sources of data, advice
 - PNNL
 - EIA
 - EPRI
 - GridWise Alliance Board

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