

Performance-based Energy Resource Feedback, Optimization, and Risk Management: PERFORM



Outline

- A Modern Grid with Modern Management Systems
- PERFORM Program Status
- The (tentative) PERFORM Program
- PERFORM Workshop Points



A Modern Grid with Modern Management Systems



If it works...

will it matter?



Grid Innovation

Future of Electric Power Systems

- Resource flexibility
- Quality of service

Decision Support / Management Systems

- Risk management
- Utilize <u>init</u> resources for all products and services
- Scalability

Market Redesign

- Risk-driven reform of electric energy markets
- Transparent, fair evaluation of all asset offers



Mathematical Second S

PERFORM Program Status



ARPA-E Program Development & Execution





Tentative Program Scope, Timeline, & Beyond





Outreach and Engagement

- We request: program design input
 - Feedback is key to improve the scope, focus, and goals of this tentative program
- Potential Involvement:
 - Workshop: June 17-18, New York City

-Data

- Partner with potential teams
- Pilot testing opportunity
- Benefit:
 - Ability to influence and direct program relative to your current and future challenges
 - Funding opportunity







The (tentative) PERFORM Program



Paradigm Shift: Quantify Risk of Essential Reliability Services at Look-Ahead Time Stages







PERFORM Program Overview

Program Thrust 2

System Risk Assessment:

Risk-based Energy Management System (REMS) to balance <u>collective</u> risk across the grid

Program Thrust 1

Asset Risk Assessment:

A standardized, transparent risk score to gauge each asset's relative performance

Tech to Market:

Pilot testing with utilities or ISOs willing to collect data and evaluate proposed software solutions to gauge program pursuits



Incorporating Risk Into Investments

Current Evaluation: Risk not Quantified



CHANGING WHAT'S

Value-Cost Ratio is used as a proxy for "Return" and is defined by the EIA as the ratio of Levelized Avoided Cost of Electricity (LACE) to Levelized Cost of Electricity (LCOE). Sample values derived from: <u>https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf</u>





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Traditional Reliability with Conventional Assets Traditional Risk Management with Conventional Assets P[AMW] Plant A Plant B Plant C Plant D Renew A P[ΔMW] Variable "All or Nothing" Generation on Chance of failure a Small Asset at each asset ΔMW ΔMW ΔMW ΔMW Conventional assets can secure system Not part of security policy with N-1 policy Renew A 70 System Risk -IMW Deviation Manage with Regulation Plant A 500 Manage with Plant B 180 Cont. Plant C 350 Chance of Reserves Cascading 600 Plant D Failure and Expected MW Blackout 0.93 Load Available **MW** Deviation 1.70 System Gen (Offers - Deliveries) Expected GW



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Traditional Reliability with Increasing Renewables





Traditional Reliability with Increasing Renewables













Matrix
 Matrix

PERFORM Workshop Points





≻ Data

- Pilot program who should be involved?
- > Team up with proposals
- Program input: what will move industry forward?

Transmission & Distribution

Where to focus? Start? Most impactful? Most in need?

>Bulk? Distributed energy resources?

➤T&D Interface?

>Wholesale? Retail markets?

PERFORM Program Metrics

	System	cost	reduction
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- System reliability improvement
- Reduction in ratio of stand-by thermal generation to scheduled renewable generation
- Reduction in ratio of thermal capacity to emerging resource capacity (long-term planning)
- Reduction in ratio of ancillary services from thermal resources to ancillary services from emerging technologies
- Improvement in quality of service metric: delivered energy to scheduled energy (for every resource)
- Improvement in quality of service metric: delivered ancillary service to scheduled ancillary service (for every resource)

What do you wish to see come from this potential program?

The ability to talk, with ease – similar to how it is handled in the finance sector, on the topic of risk

What can we learn from the past?

SPOT PRICING OF ELECTRICITY

Fred C. Schweppe Michael C. Caramanis Richard D. Tabors Roger E. Bohn

Kluwer Academic Publishers Boston/Dordrechi/London

and Locational Risk Premiums / Prices?

We seek your feedback and input!

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