

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

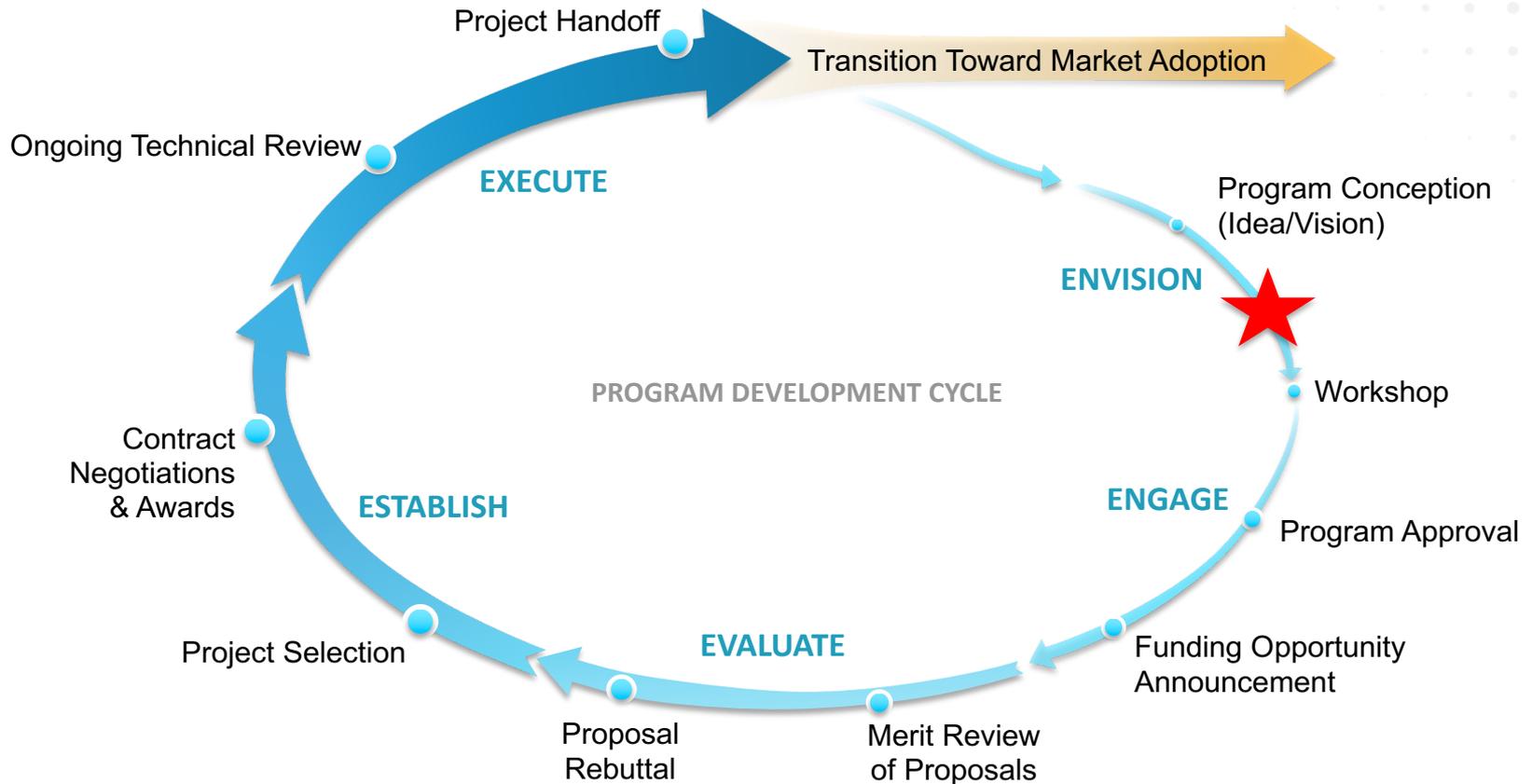




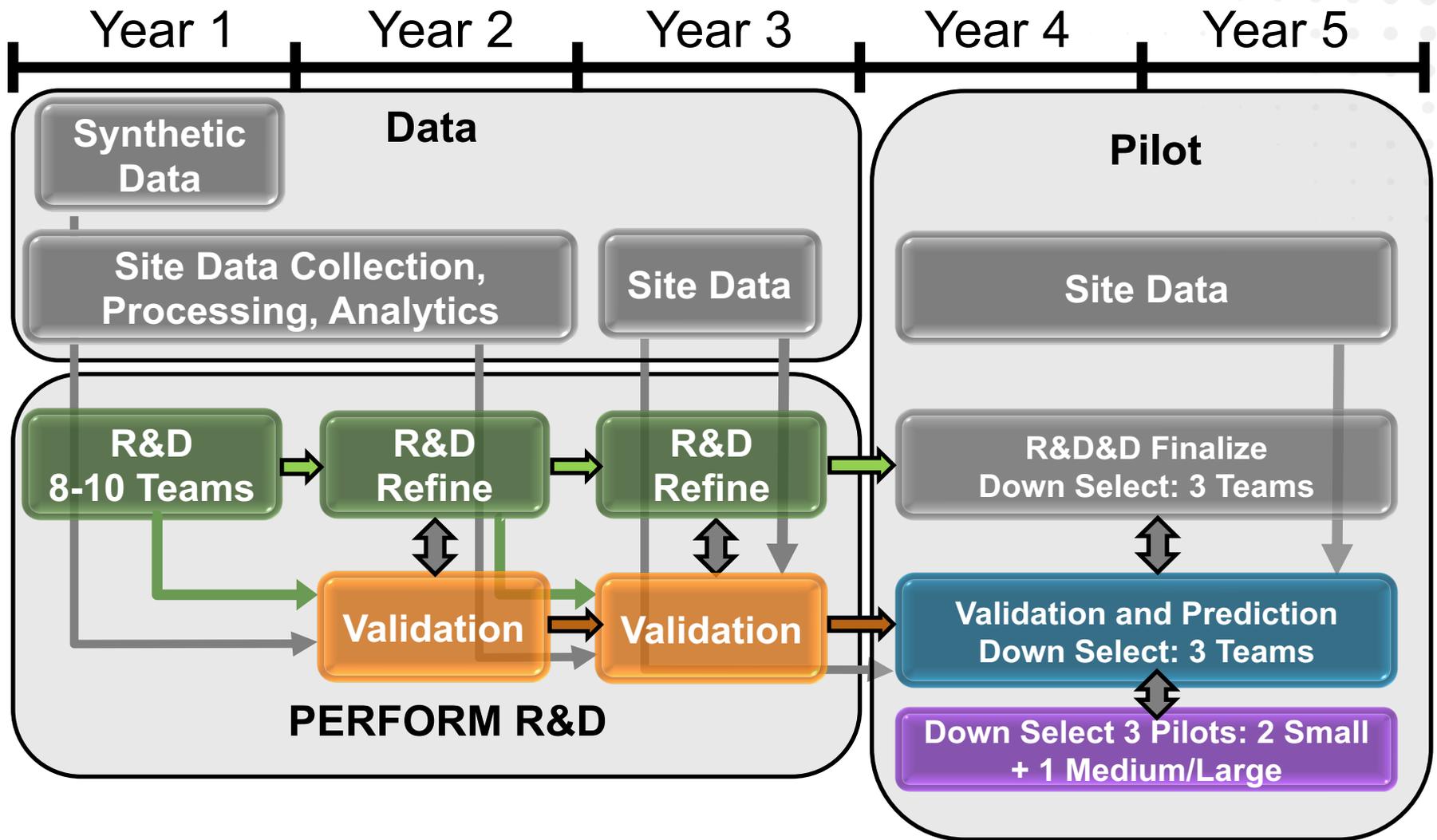
If it works...

*will it matter?*

# ARPA-E Program Development and Execution



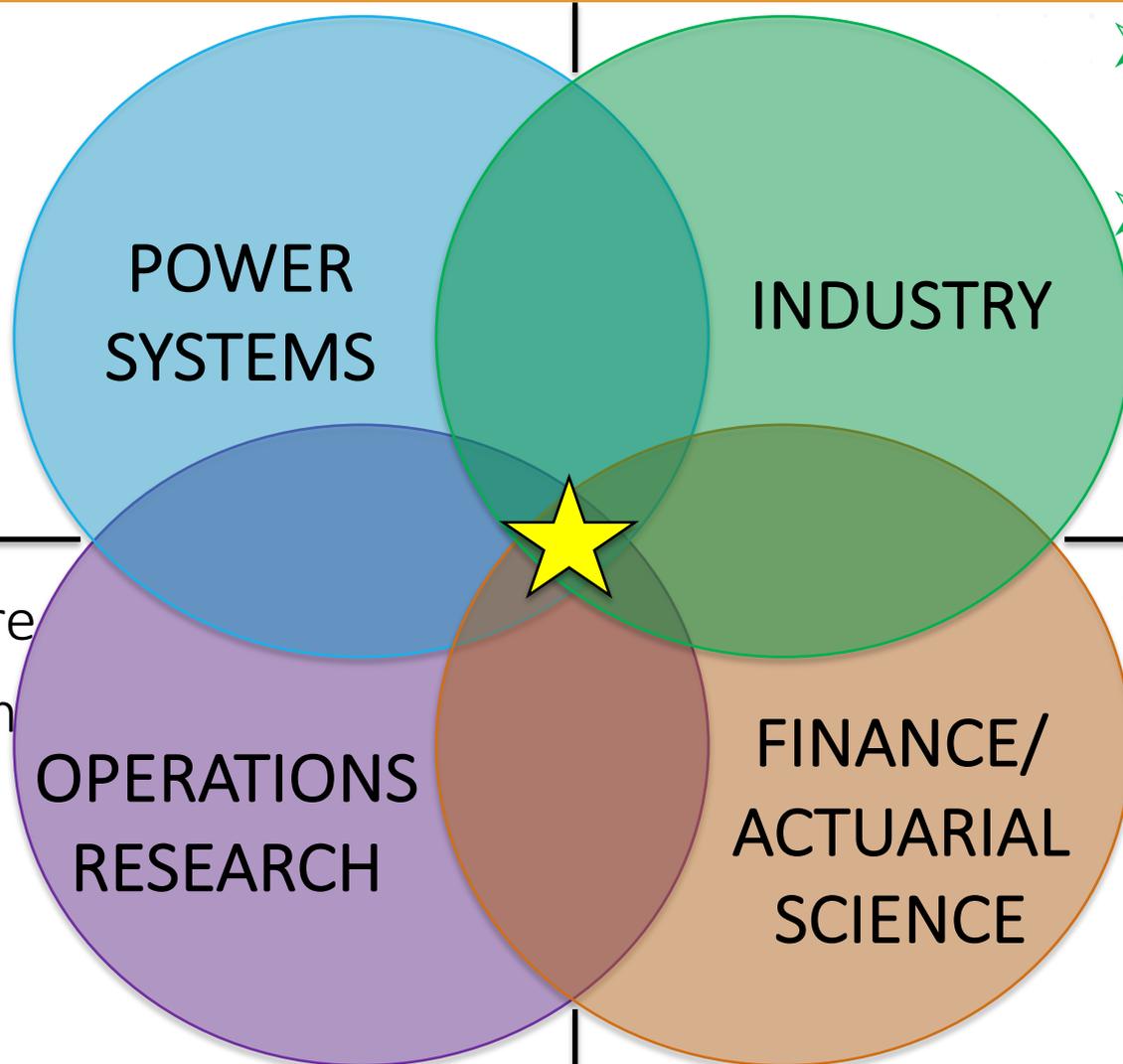
# Tentative Program Scope, Timeline, and Beyond



# PERFORM Teams

- Advanced tech
- Asset / system modeling

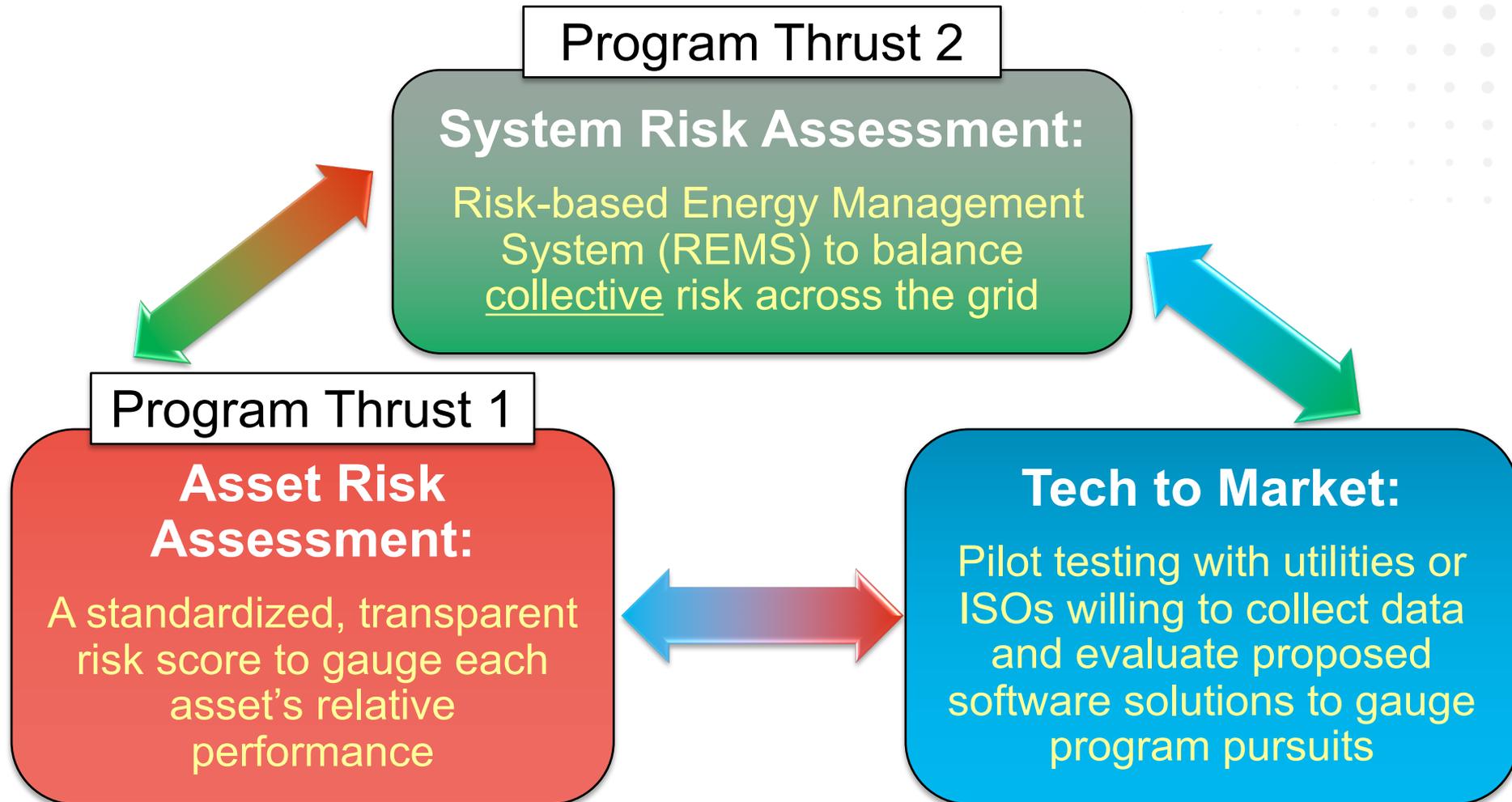
- Targeted pilot locations
- Data / validation



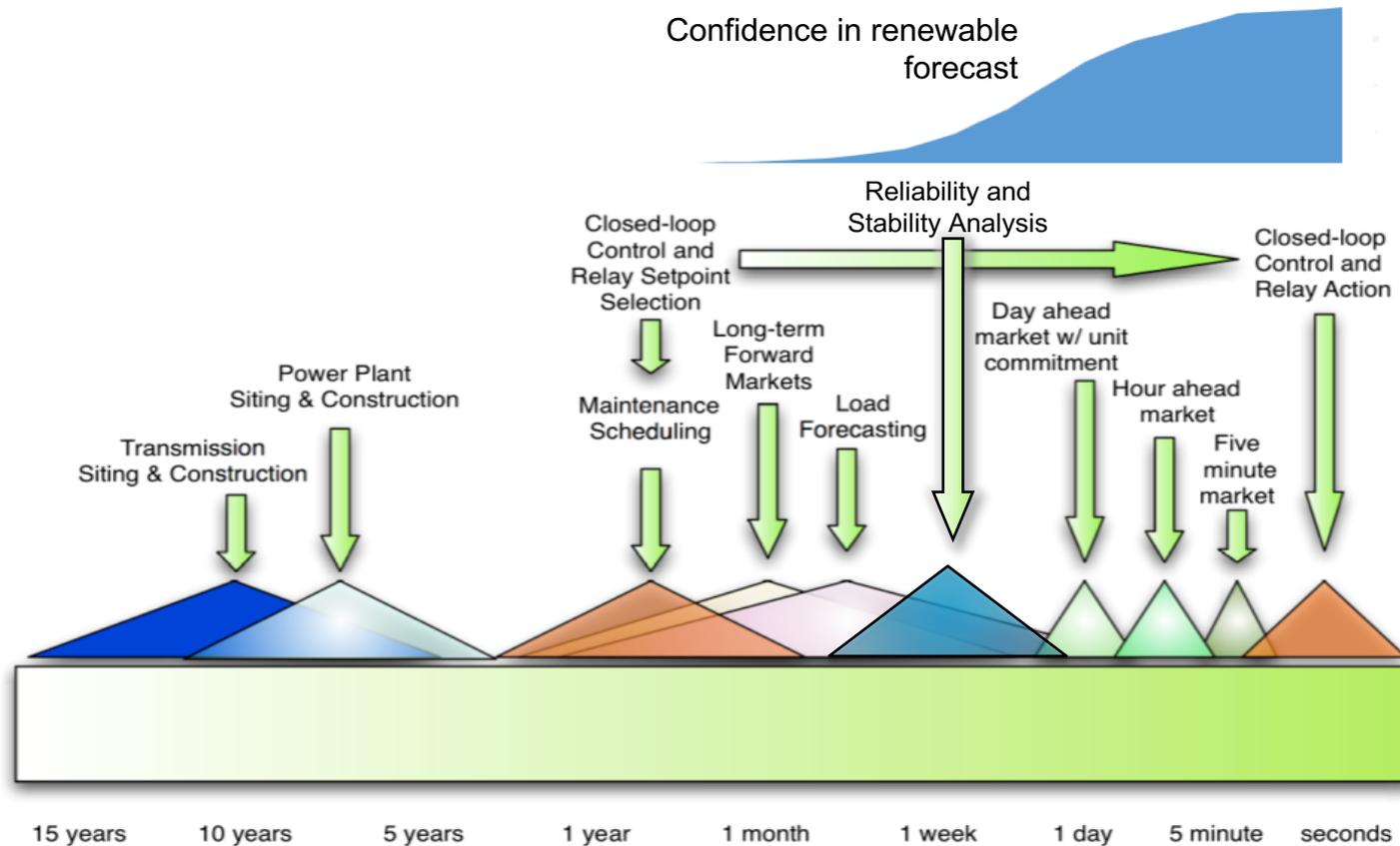
- Grid software
- Optimization under uncertainty

- Risk metric
- System risk assessment
- Uncertainty quantification and valuation

# PERFORM Program Overview



Renewables mainly show up in real-time and do not schedule in advance; operators **guess** at how much backup capacity is needed.



Assumed % of installed renewable capacity guaranteed



Operators procure additional resources to protect against forecast risk exposure



Renewable forecast error hedged with conservative operations, excessive ancillary services requirements, and on-line back-up conventional generators

# Industry participation in PERFORM

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## ➤ *Data*

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

# Transmission & Distribution

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- Where to focus? Start? Most impactful? Most in need?
- Bulk? Distributed energy resources?
- T&D Interface?
- Wholesale? Retail markets?

# PERFORM Program Metrics

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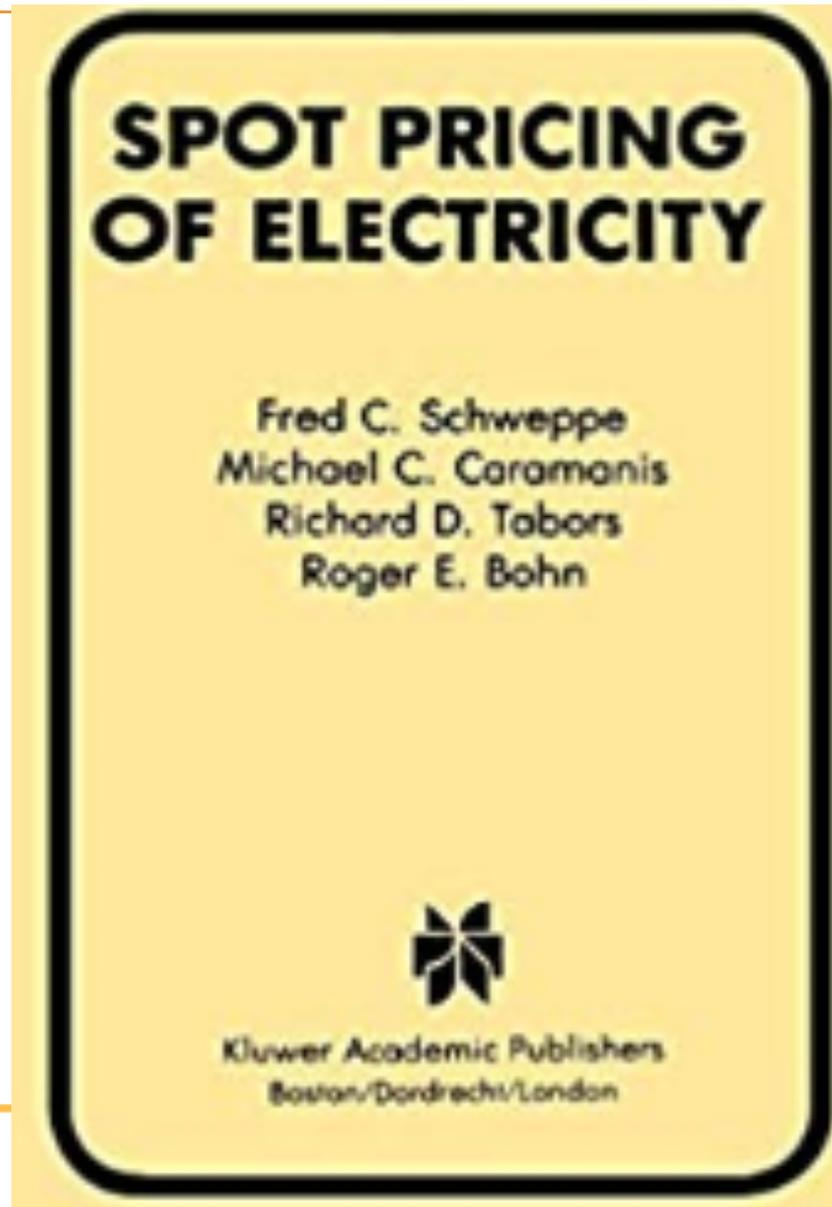
- System cost reduction
- System reliability improvement
- Reduction in ratio of stand-by thermal generation to scheduled renewable generation
- Reduction in ratio of thermal capacity to emerging resource capacity (long-term planning)
- Reduction in ratio of ancillary services from thermal resources 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?

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- Mahesh Morjaria,  
Studio 1, Breakout Session 3:
  - 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?



**What do we see in the future?**

Locational Marginal  
Prices...

and Locational Risk  
Premiums / Prices?