



Decision Making for Demonstration Funding

Risks and Portfolio Analysis

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Risks and Portfolio Analysis

- How should the federal government look at risk when evaluating projects?
- How should the federal government develop a portfolio of projects?



What is the right risk tolerance for the government?

- Ultimately a political decision – how much failure can the political system handle?
- Likely to be a correlation between the level of risk and the potential benefits, and maximizing benefits will mean taking on some level of risk
- But venture capital risk (10% success) is probably too much
- Some failures, but not too many?



How do you measure risk?

- Risk aversion can be thought of as a concave utility function
- Many metrics for risk from finance, variance, value-at-risk, ..., but may not be applicable
- Rating agencies have existing methodologies for rating debt, but does that apply where DOE is directly providing funding?
- DOE doesn't want a direct return on its investment; the spillover benefits are an essential reason to do demonstration projects



Why choose a diverse portfolio?

- Individual projects are risky, and a diverse portfolio can hedge that risk
- Spillover benefits may be duplicative



Just pick the best projects?

- A lot of fancy ways to look at risk and portfolios, but maybe the right answer is simple – pick the best projects
- High returns and low downside risks are almost always going to be desirable
- Combined with a naïve notion of diversification, that may be enough
- Data might not exist for more complex analysis



How do you select a portfolio?

Some ideas:

- Can explicitly quantify uncertainty and do stochastic optimization to select a portfolio – expert elicitation [Erin Baker *et al*]
- Can do modern portfolio theory and optimize for expected benefits minus a constant times variance to model risk aversion
- More sophisticated approaches exist – are there benefits from additional complexity?
- What are the lessons we can learn from these approaches if we don't have the data to apply them explicitly?



Our Speakers

Erin Baker

- Distinguished Professor of Industrial Engineering and Operations Research at the University of Massachusetts, Amherst, and the Faculty Director of the Energy Transition Institute
- Research on “combin[ing] operations research methods and economics to decision-making under uncertainty, with a focus on Energy Justice and publicly-funded energy technology Research & Development portfolios in the face of climate change

Jim Cabot

- Leads policy and communications at Breakthrough Energy Ventures
- “BEV is an investment firm seeking to finance, launch, and scale companies that will eliminate greenhouse gas emissions throughout the global economy. Part of Breakthrough Energy’s network of investment vehicles, BEV has raised more than \$2 billion in committed capital to support more than 90 cutting-edge companies.”





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