Evaluating the Risks of Alternative Energy Policies: A Case Study of Industrial Energy Efficiency

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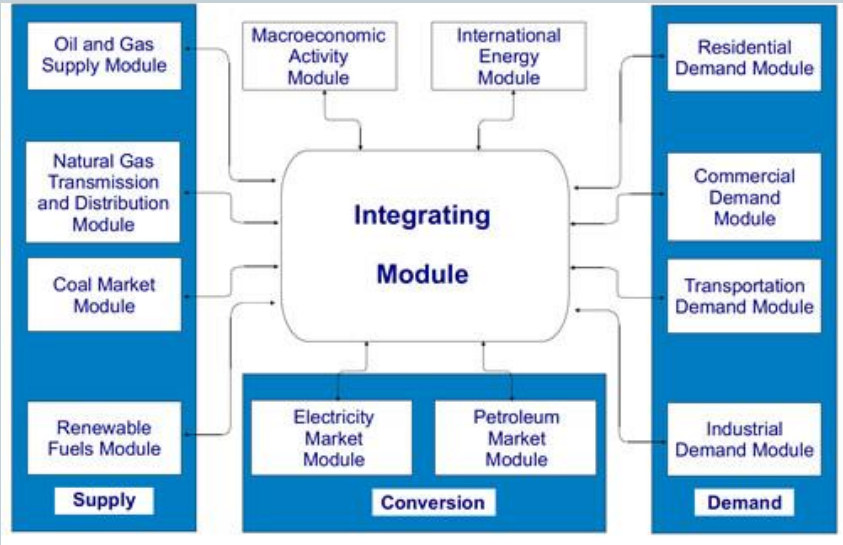
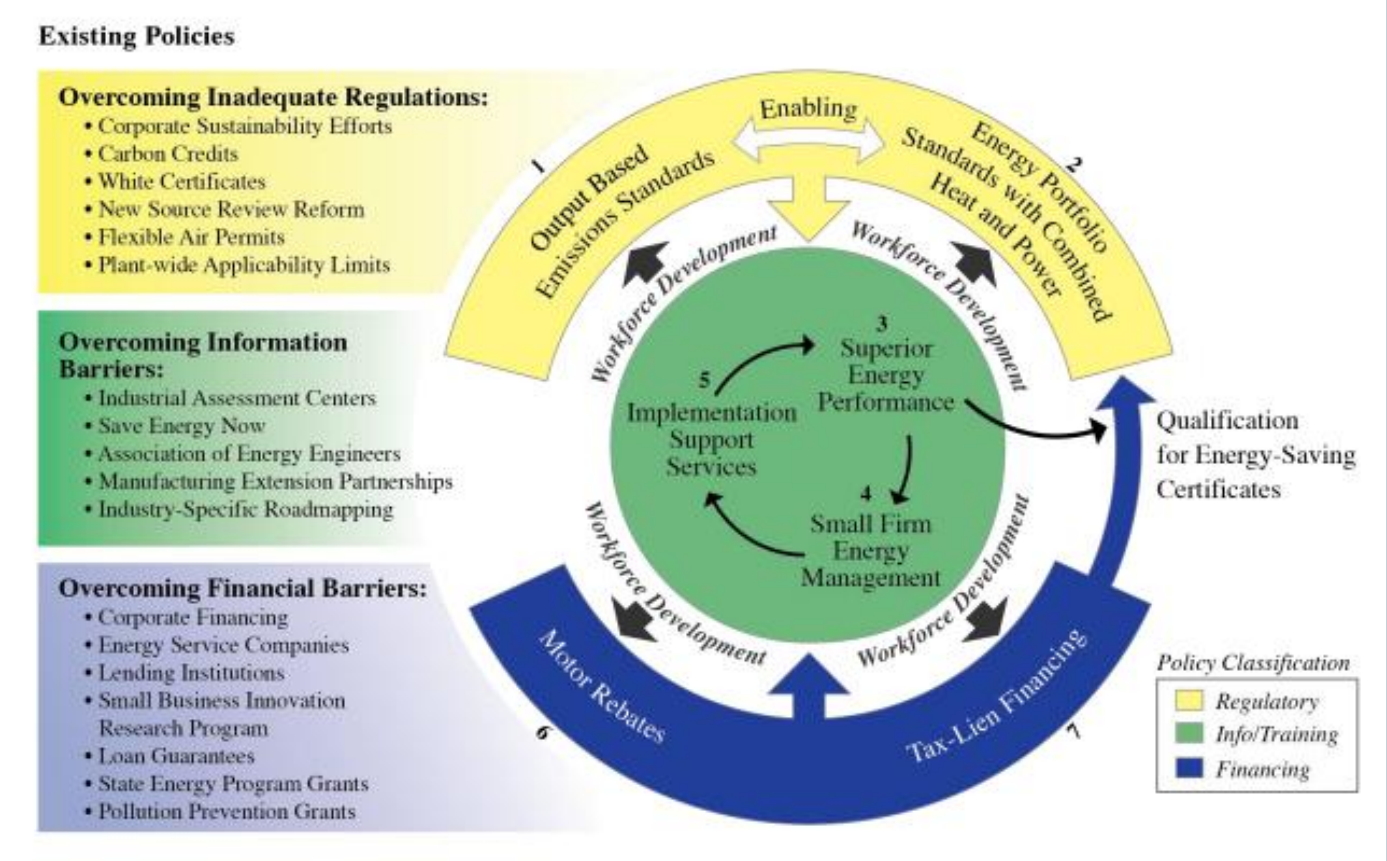
NEMS(National Energy Modeling System)

- **NEMS(**National Energy Modeling System) is a forecasting model that EIA uses to develop its annual long-term projections for energy supply, demand, and prices
- On Location performs NEMS modeling for many agencies: **Georgia Tech**, Duke University, LBNL, PNNL, and ORNL run NEMS



Industrial Energy-Efficiency Policy Options



Industrial Energy-Efficiency Policy Options

Output-Based Emissions Standards (OBES) would provide financial incentives and technical assistance to states to spur adoption of OBES – as authorized by the EPA – to reduce energy consumption, emissions of criteria air pollutants and GHG, and regulatory burdens. This program would use authorities of the State Energy Program to achieve this regulatory change. Anational effort could lead to widespread cogeneration at factories and large facilities over the near and long terms.

A **Federal Energy Portfolio Standard (EPS) with CHP** would require federal legislation that mandates electric distributors to meet an EPS with CHP as an eligible resource and to extend and expand the current investment tax credits for CHP. This policy option would concurrently establish measurement and verification methods for qualifying CHP resources and encourage a national market for trading energy-efficiency credits.

Industrial Energy-Efficiency Policy Options

Superior Energy Performance (SEP) program uses the newly released ISO 50001 as the energy management standard. The program would establish incentives such as energy-efficiency credits for compliance with energy portfolio requirements, grants to subsidize required training and eligible adoption costs, and recognition programs.

Implementation Support Services (ISS) would work with existing Industrial Assessment Centers (IAC) to increase the implementation of energy-saving opportunities identified in IAC energy audits. ISS would foster higher implementation rates by leveraging existing relationships between industrial facilities, financial institutions, and engineering firms.

Small Firm Energy Management (SFEM) would provide small manufacturing firms (five to 49 employees) with energy management software tools to build in-house capacity to manage energy use, identify potential energy savings opportunities, and qualify small firms to be part of IAC assessments.

Industrial Energy-Efficiency Policy Options

Tax Lien Financing of industrial energy-efficiency improvements, also known as Property Assessed Clean Energy (PACE) financing, would require federal enabling legislation to allow municipalities to establish clean energy taxation districts, which can issue tax-free bonds for certified energy-efficiency and alternative energy projects. Municipalities have established PACE financing within their communities; however, the industrial sector has not yet been able to participate in these beneficial programs that would help increase access to capital for energy-efficiency projects.

Energy-Efficient Industrial Motor Rebates, similar to recent legislative proposals, would authorize and appropriate funding for DOE to implement a program to provide industrial firms and motor manufactures with rebates for purchases of certified high-efficiency motors of 25 to 500 horsepower that replace motors that predate the Energy Policy Act of 1992.

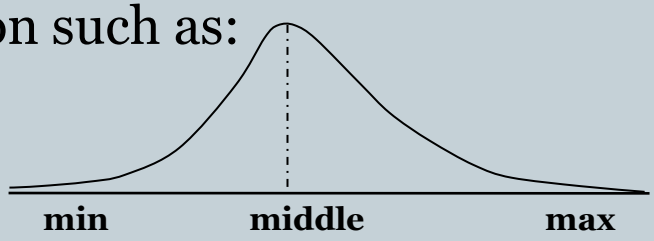
Treatment of Uncertainty in Cost-Benefit Analysis

- **Monte Carlo Simulation** is about modeling uncertain inputs with a range of values rather than just a "point estimate.“
- Simple representation of key risky variables

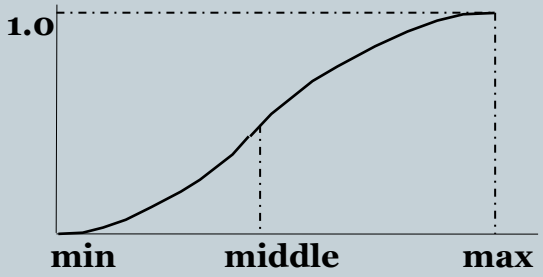
  1) **Energy prices** are assumed to have an uncertain time trend

  2) **Damage costs from criteria pollutants** are assumed to be uncertain but not to have strong time trends

  3) **The social cost of carbon** is both uncertain in the present and can be assumed to grow at a rate that is also uncertain.
- When you have little or no historical data for a random variable assume a distribution such as:



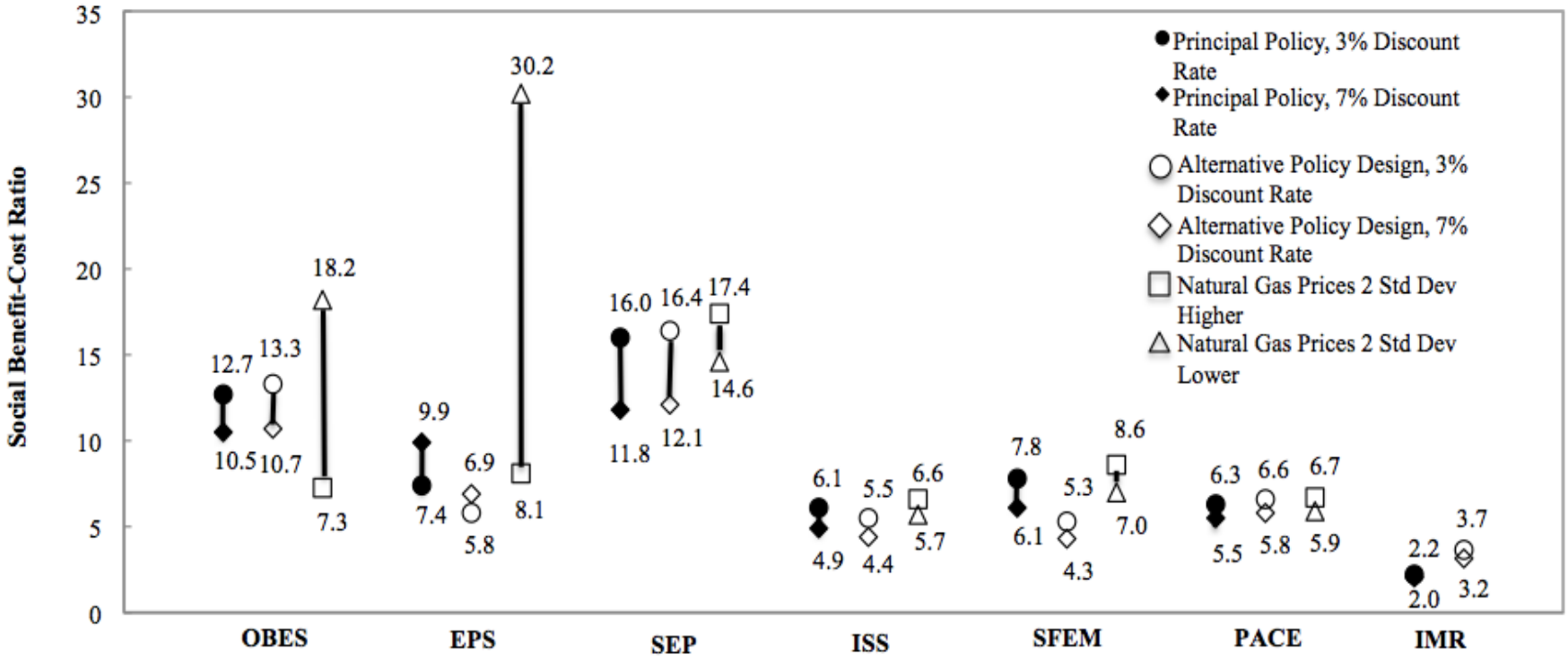
Probability Density Function (PDF)



Cumulative Distribution Function (CDF)

Source: Richardson, J. W. (2008). Simulation for applied risk management with an introduction to SIMETAR. Department of Agricultural Economics, Texas A&M University.

Social Benefit-Cost Ratios of Seven Industrial Efficiency Policy Options



OBES = Output Based Emissions Standards
EPS = Energy Portfolio Standards with an ITC for CHP
SEP = Superior Energy Performance
ISS = Implementation Support Services
SFEM = Small Firm Energy Management
PACE = Tax-Lien Financing
IMR = Industrial Motor Rebates

Conclusion

- The energy-efficiency gap in the U.S. industrial sector is large. If key barriers could be removed, industry could expand its role in solving the global climate challenge.
- The deterministic calculations of cost-effectiveness conclude that seven federal policies are highly desirable.
- We explicitly model the stochastic nature of several key risk factors including future energy prices, damages from climate change, and the cost of criteria pollutants.
- For the range of uncertainties we believe to be plausible, seven Federal policy options are estimated to be cost-effective, offer significant economic and environmental benefits, under the array of stress testing.
- Societal cost-effectiveness of policies is more sensitive to alternative assumptions about damages from criteria pollutants and climate change compared with energy prices.

Source: Brown, M. A., Baer, P., Cox, M., and Kim, Y. Working Paper. "Evaluating the Risks of Alternative Energy Policies: A Case Study of Industrial Energy Efficiency"

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http://www.spp.gatech.edu/faculty/workingpapers/wp68.pdf

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