Modeling the Impacts of Voluntary Agreements & Information Programs on US Industry's Energy Intensity

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Gale A. Boyd

Argonne National Laboratory

Modeling Voluntary Agreements & Information Programs (VAIP) Face a Series of Challenges

- **There are a wide variety of VAIP**
  - **R&D [3]**
    - R&D technology introduction
    - D&D technology adoption
  - **Regulatory Relief**
- **Translation to Modeling**
  - **Quantify new technological possibilities**
  - **Quantify penetration**
  - **Distinguish from other 'economic and technical' drivers**
  - **Goals of specific VAIP**
    - Lower 'barriers' and 'no regrets'
    - Social optimum
- **Assessing performance of VAIP**
  - **Payoff for R&D is high**
  - **DSM assessments and case studies**   Decision and Information Sciences Division

Top-down and Bottom-up Modeling Approaches Both Have Similar Challenges
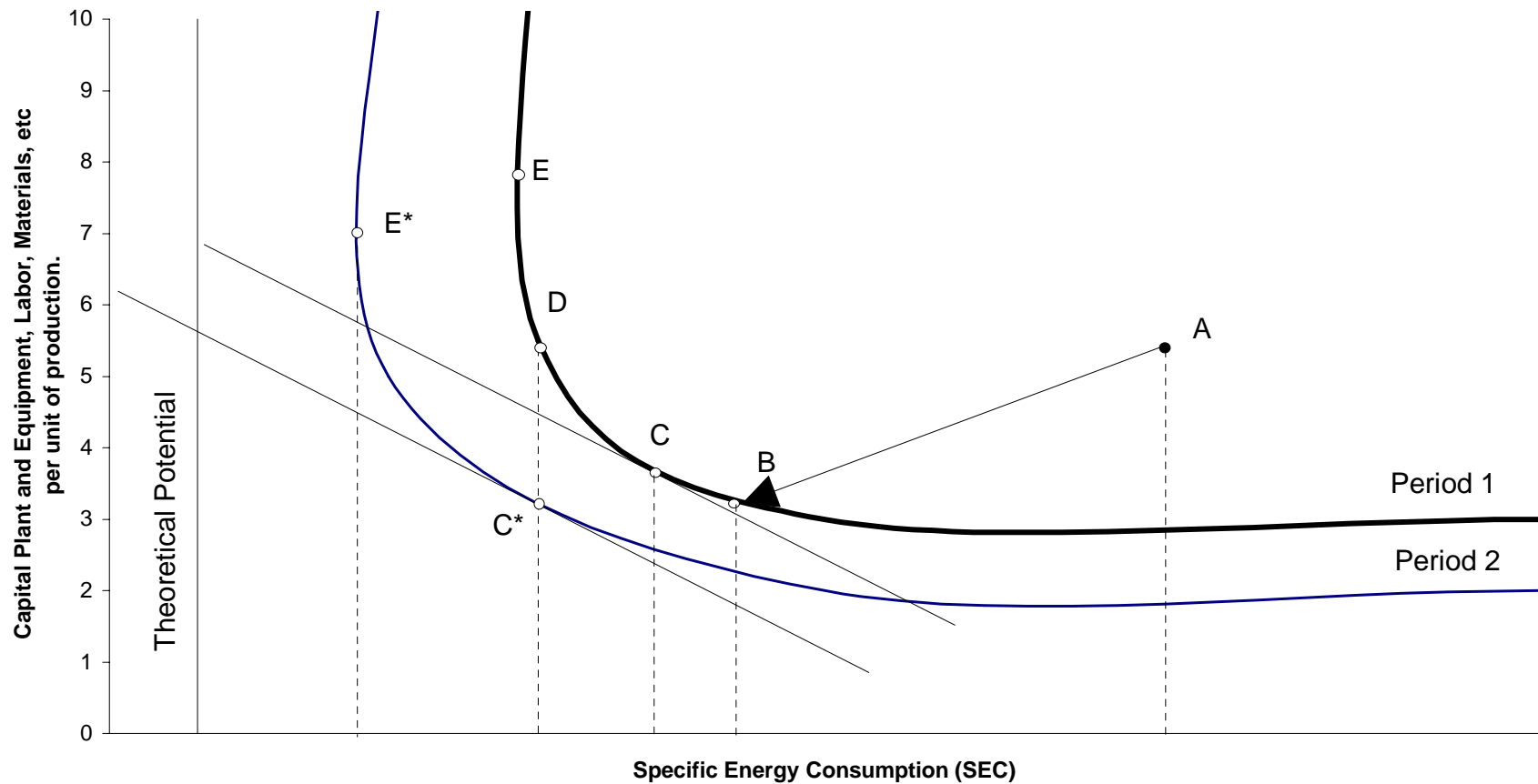
- **Characterizing the status quo**
  - Static: Actual performance / state of practice
  - Dynamic: "autonomous" change

- **Characterize technical possibilities**
  - Static: Difference between actual and potential performance
  - Dynamic: Changing over time

- **Operationalize the observed behavior**
  - Optimization or Statisficing
  - Stock adjustment?

In Economic Terms, these Challenges can be Represented Via Frontier Production Functions

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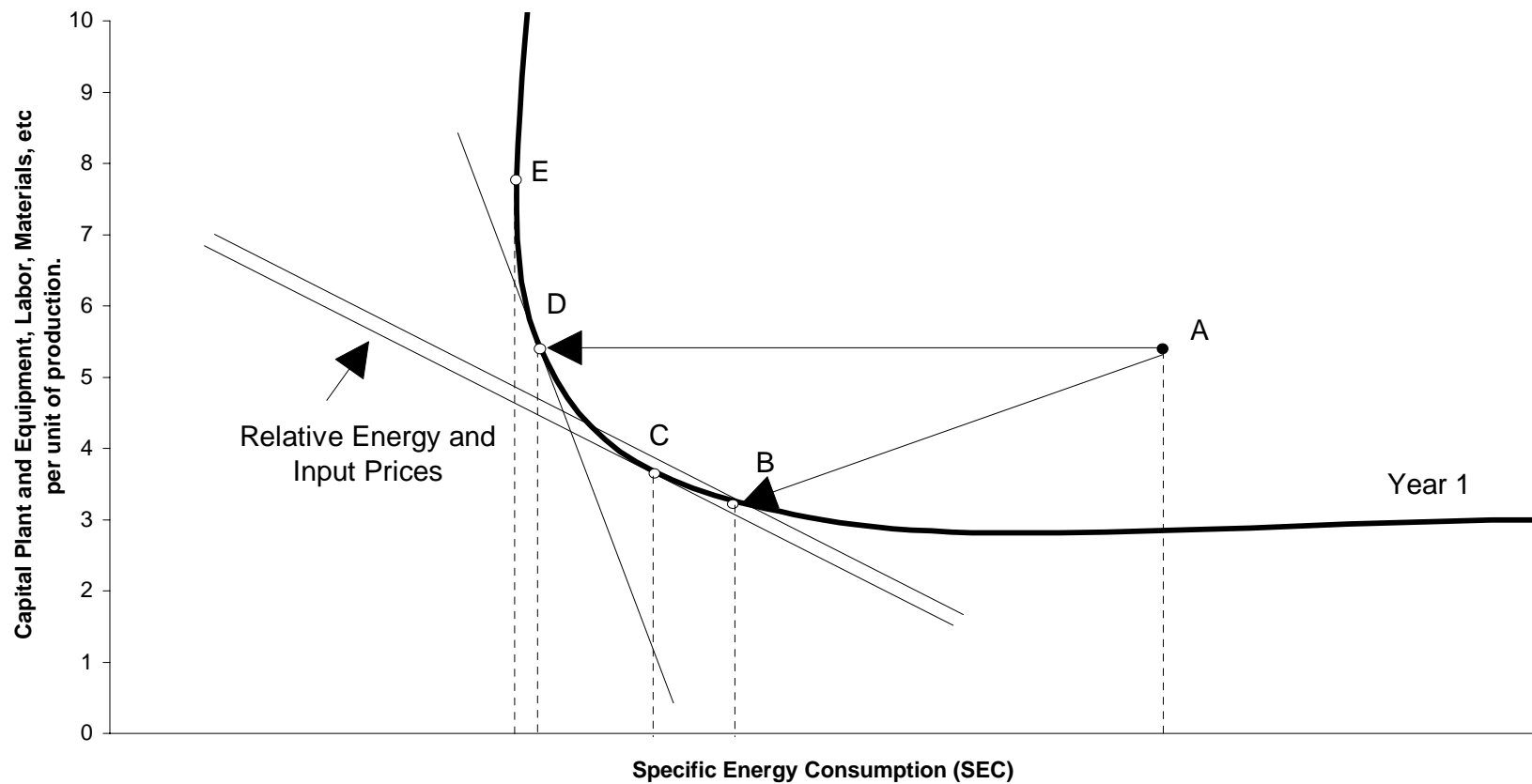
New technology shifts the picture

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Different Models Provide Placeholders to Represent the Impact of VAIP

- **The status quo in LIEF is characterized by the 'Gap'**
  - **The Gap is the ratio of actual to 'ideal' energy intensity**
  - **Ideal energy intensity is function of**
    - Capital Recovery Factor and
    - Energy price
- **Dynamic elements in LIEF include**
  - **Penetration (stock turnover, etc.) which represents 'closing the gap'**
  - **Autonomous shifts**
- **Compared to NEMS**
  - **TPC and UEC combines notions of the Gap and autonomous shift but without price effects**
  - **Stock turnover provides a similar modeling role to penetration**
- **LIEF and NEMS produce similar results in the 5-Lab study**
  - **LIEF double penetration and cut CRF from 33% to 15%**
  - **NEMS double stock turnover and TPC**

The Real Challenge to Modeling is in Assessing the Performance of VAIP

- **Information on participants, but not non-participants**
  - **Sample selection bias**
  - **Case studies cannot be relied upon to generalize to a population**
  - **Separating the role of other economic drivers from program effects**

- **VAIP do something, but how much?**
  - **Morgenstern & Al Jurf (1999) - Information accelerates adoption**
  - **DeCanio & Watkins (1998) - Participation related to firm characteristics**
  - **Other environmental literature (TRI 33/50)**
  - **Analysis of IAC show that rebates also serve signaling function**

- **Market transformation**

Combining Participant and Non-participant Data at the Census Provides a Research Opportunity

- Past research has measured the range of plant level energy and productivity performance in many industries

- Separating a variety of effects, e.g. vintage, energy prices, and learning by doing, on productivity and energy efficiency is feasible.

- New research for EPA EnergyStar identifies the range of performance within an industry for benchmarking purposes, i.e. identifying the status quo and potential.

- Identifying program participants vs. non-participants within an industry group can measure:
    - Between group differences, controlling for external factors
    - Within group performance over time
    - Representations of the "GAP", autonomous change, CSC, TPC, etc.
    - *The impact of VAIP participation on these estimates.*

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