

The State of the Art of Energy Modeling: Past, Present and Future

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Outline

- Appreciation
- Parallels
- The Modeling World in 1977
- Models in 2008
- Trends Over the Last 30 Years
- Present Challenges
- Future Opportunities

Parallels Between USAEI/IAEI and JPW

- Started in 1977
- Humble Beginnings
- Problem Focus
- Interdisciplinary Orientation
- Business-Industry-Academia Collaboration
- Hard to Assign Individual Credit

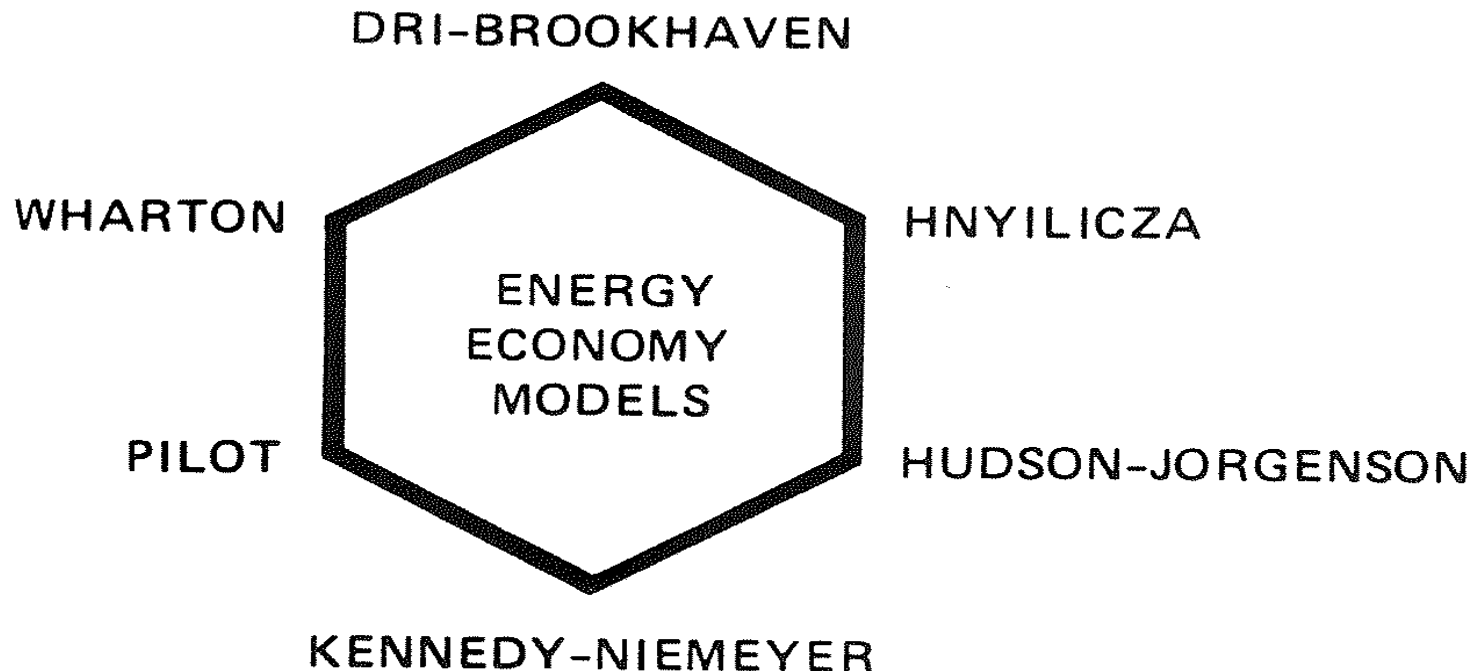
Models in 1977

- NAS CONAES Modeling Resource Group
 - ETA (Energy Technology Assessment)
 - Nordhaus
 - DRI
 - SRI-Gulf
 - Brookhaven
 - PIES (Project Independence Evaluation System)
- EMF #1
 - Hudson Jorgenson
 - Kennedy-Niemeyer
 - PILOT
 - Wharton
 - DRI-Brookhaven
 - Hnyilicza

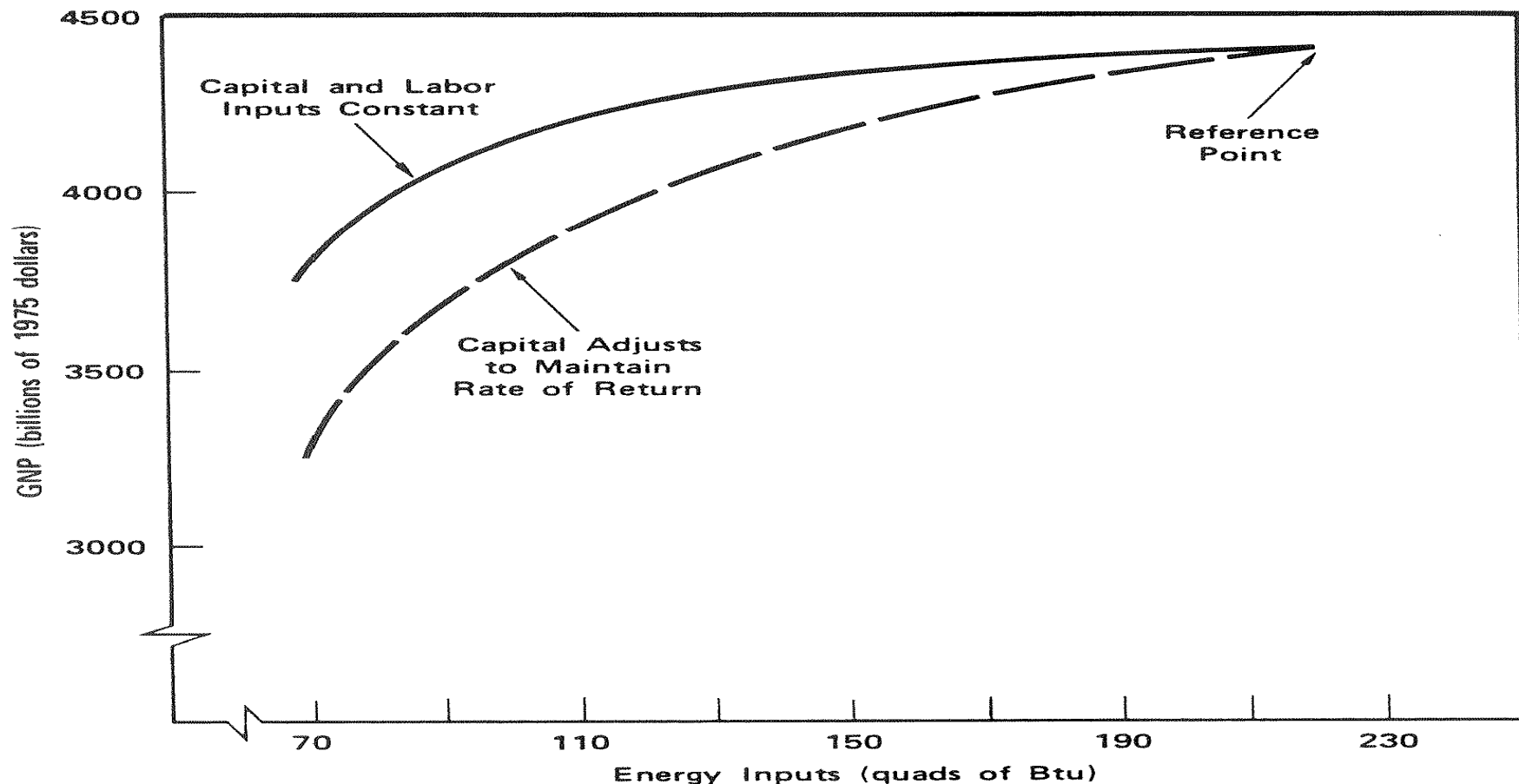
Energy Modeling Forum #1

Energy and the Economy

Volume 1



EMF 1: Elasticity of Substitution and Capital Accumulation Effects



SOURCE: See Note 2.

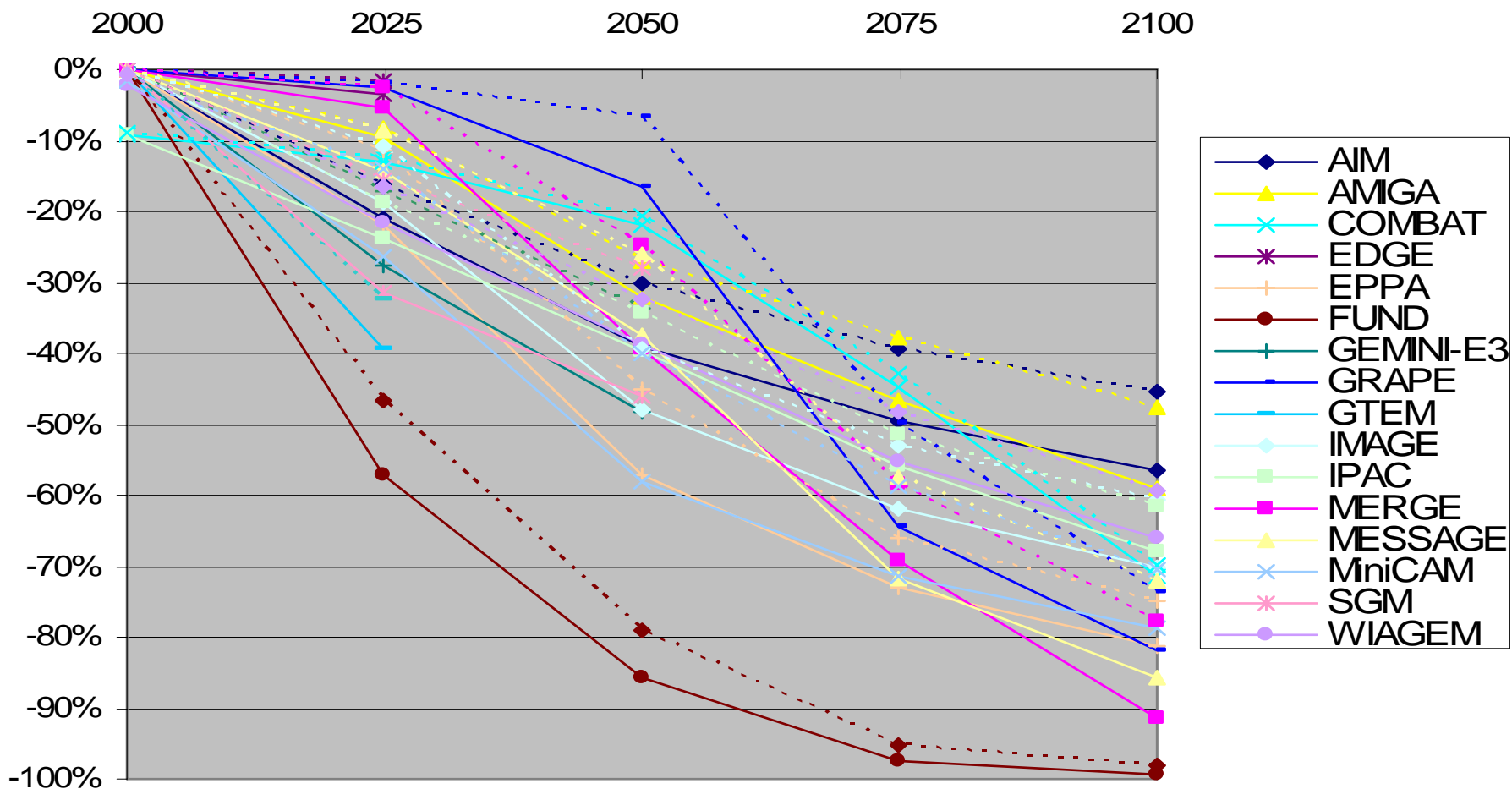
Figure 4 Economic Impact of Energy Scarcity in the Year 2010 for Alternate Capital Assumptions (Elasticity of Substitution $\sigma = 0.3$)

Models in 2008

- Around 300-400 National/International
- ETSAP Technology Group
- GTAP Based CGE Group
- MERGE-MiniCAM-DICE-MESSAGE Group
- Other Independents

EMF 21: Multi Gas Mitigation 4.5 w/m² Global Target

% Reduction from Reference in Global CO₂ in CO₂-Only (solid) and Multigas (dashed) Scenarios



Trends Over Last 30 Years

- Global ization
- Environmental ization
- Input-Output ization
- Technology ization
- Popular ization
- Extreme Cycles of Interest ization

Challenges

- Data Availability and Quality
- Dealing With Uncertainty
- Understanding Trends in Demand
- Understanding Technology Change
- Model Assessment
- Insights Not Numbers or Not

Directions for the Future

- Policy Driven Data, Model and Analysis Development
 - What's a good model? scenario? way to deal with uncertainty? approach to model assessment?
 - **Answer: It depends on the question being asked.**
 - Need more implementation level modeling.
- Demand, behavior, and incentives
- Sequential decision making under uncertainty
- Integrated technology assessment
- Better integration of data and structural models
- Put additional computational power to good use
 - Hardware, software, graphics/GIS