



**Accelerating the Pace of Change in
Energy Technologies through an
Integrated Federal Energy Policy**

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PCAST Energy Technology Innovation System Working Group

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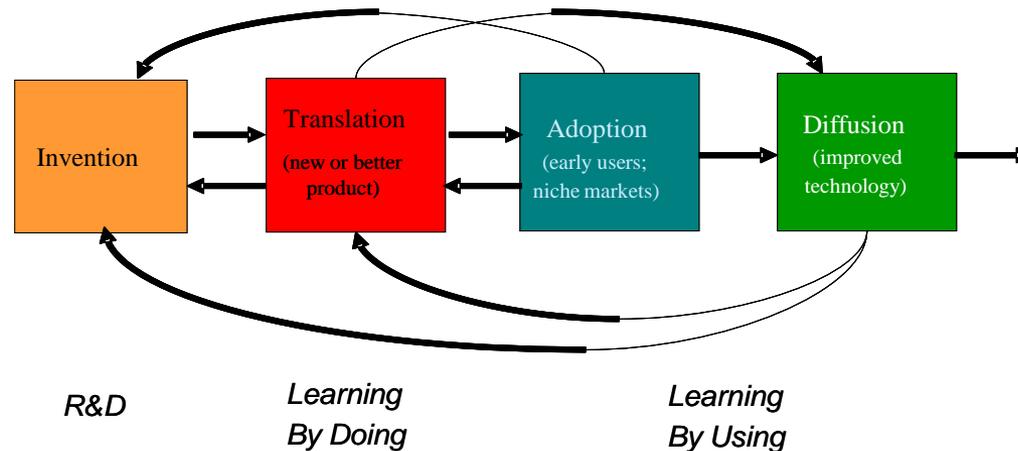
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New energy systems typically take a half century to move from initial development to thorough integration in the economy. Imperative to speed up the end-to-end innovation process for reasons of:

- *Economic Competitiveness*
- *The Environment*
- *Security*

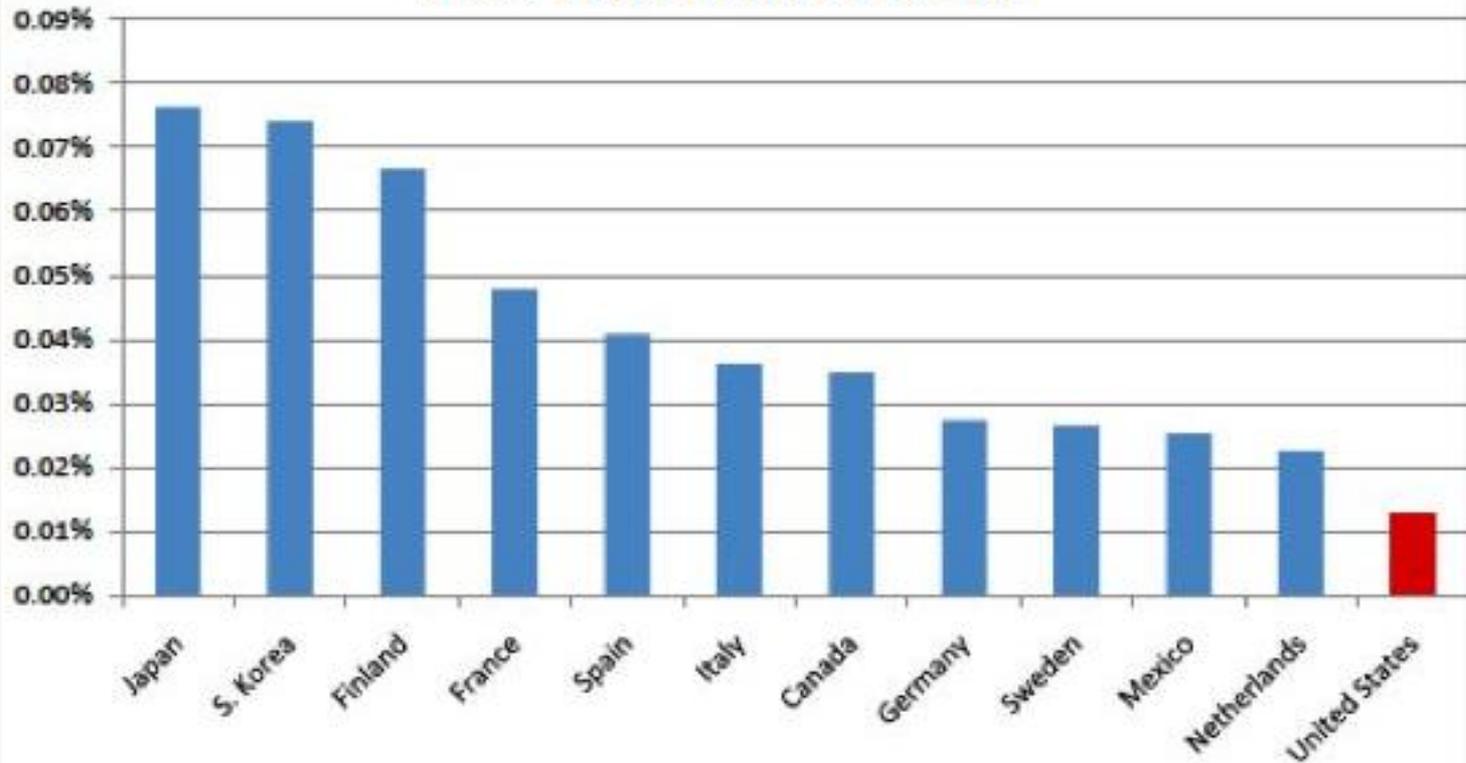
Stages of Technological Change and Their Interactions



Source, E.S. Rubin

- Invention:* Discovery; creation of knowledge; generation of prototypes
Translation: Creation of a commercial product or process
Adoption: Deployment and initial use of the new technology
Diffusion: Increasing adoption and use of the technology

Government Budget Appropriations or Outlays for Energy Research and Development, Average from 2004-2008 as % GDP



Source: OECD Government Budget Appropriations or Outlays for R&D (BAORD), Data by Socio-Economic Objective, expenditures on "Production, distribution and rational utilization of energy"

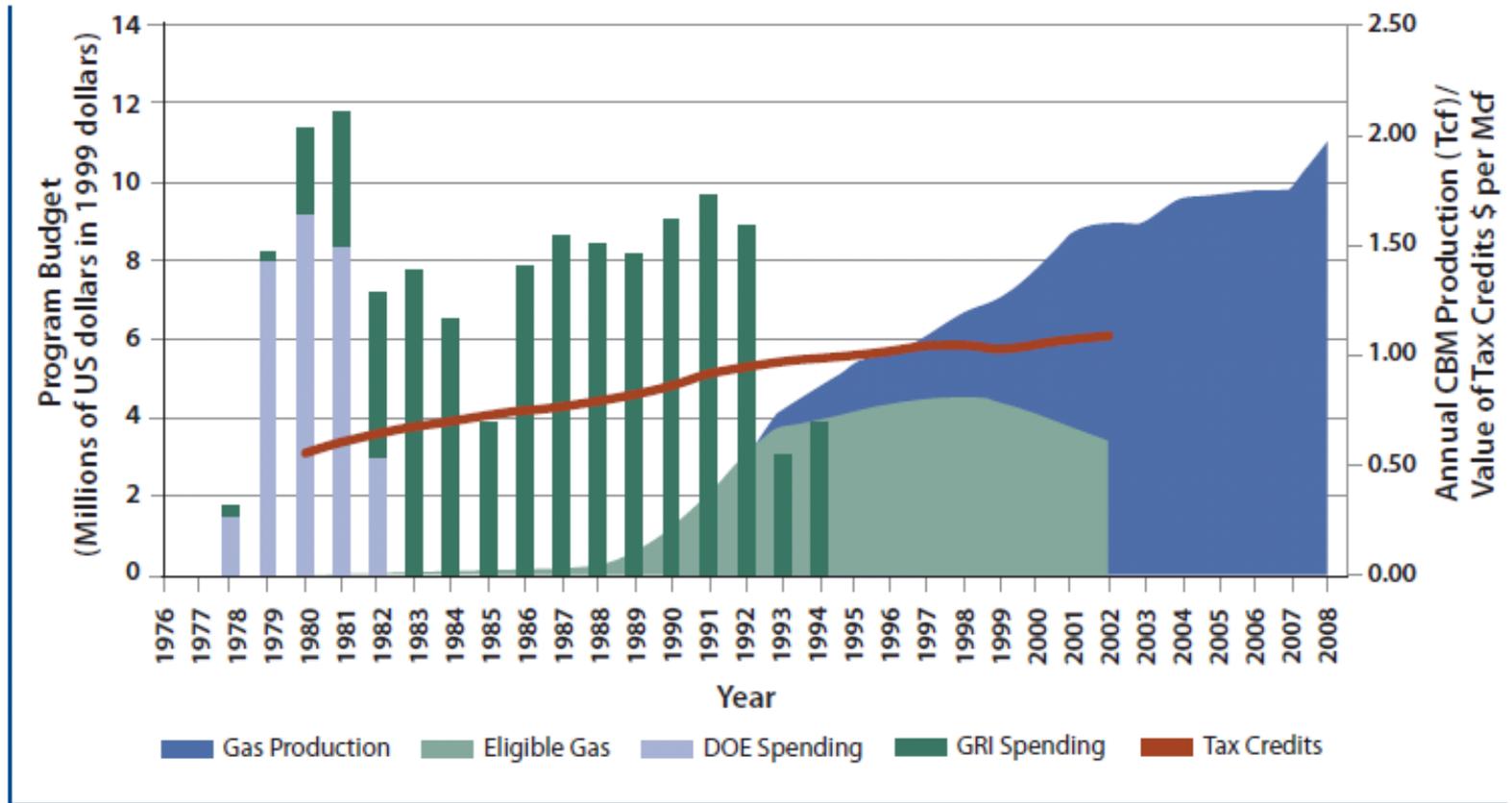
GDP from World Bank World Development Indicators.

Data not available for Canada 2008, Russian Fed. 2004-2006, Mexico 2007-2008.

Chapter 2: Recommendations for the Federal Government

- 2.1 Establish a Quadrennial Energy Review (QER)
- 2.2 Increase the annual energy RDD&D funding to \$16 billion
- 2.3 Generate \$10 of the \$16 billion through new revenue sources
- 2.4 Realign energy subsidies and incentives
- 2.5 Enhance the Federal Government's ability to purchase new energy technologies
- 2.6 Reestablish the Committee on International Science, Engineering, and Technology (CISSET)

Coal Bed Methane



Chapter 3: Recommendations for DOE

- 3.1 Develop and implement an energy technology QER at DOE.
- 3.2 \$12 billion should be allocated for RD&D, with emphasis on DOE competitive programs
- 3.3 Exercise authorities to align internal processes and organization with energy objectives
- 3.4 Establish a DOE Training Grant Program
- 3.5 Initiate a multidisciplinary social science research program