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Tackling U.S. Energy Challenges and Opportunities
Preliminary Recommendations for Enhancing Energy Innovation

8th CMI Meeting, Princeton University

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Overview

1. Context

2. Short-term ERD&D Budget Recommendations for DOE

3. Improving Management and Coordination

4. Stimulating Private Sector Investment

5. Expanding international Cooperation

6. Increasing and Targeting Incentives for Large-scale Deployment
Context of the ERD3 Project
Funded by the Doris Duke Charitable Foundation

- Part of the ETIP Group.
  - Directed by Kelly Sims Gallagher
  - John Holdren and Henry Lee are co-principal investigators
  - Robert Stowe is the Associate Director

- Managed by:
  - Laura Diaz Anadon

- ERD3 staffed by three post-doctoral fellows:
  - Melissa Chan
  - Charles “Skuk” Jones
  - Jose Condor
  - Draw on other ETIP Fellows and research assistants

- Helped by a distinguished Advisory Committee with 20 members from academia, industry, and NGOs.

- Project will last for three years (completion in December 2010).
Context of our Understanding of Innovation
The “stages” of energy-technology innovation

- Relatively modest investments to find out what improvements are possible.
- Larger investments to find out how the most promising possibilities work out at larger scales.
- Government role in early deployment is critical.
- Determined in the marketplace, based on characteristics & information arising from previous stages, and on cost & price signals.

→ Private sector engagement increases further down the chain

It is crucial to assess the system as a whole
Refrigerator/Freezer RD&D and Efficiency Standards
A successful story of coordination

Kilowatt-hours and cost in 2003 U.S.$

Cubic feet

Brown et al. 2005
Context of the Role of the U.S Government
A simplistic picture

Congress
*Deployment*
- Tax credits
- Loan guarantees
- Federal cap-and-trade proposal

States
*A mixture*
- Building codes
- Electricity regulation, e.g. RPS
- Siting permission
- RD&D

Department of Energy
(and other Depts.)
*Mainly RD&D*
- National Labs
- Partnerships
- Appliance standards
- Administering guarantees

EPA, NHTSA
*Waste, air and water quality*
- National CAFE standards
- CO₂ emission control
- CO₂ injection

International cooperation
State, DOE, Commerce, etc.

Lack of a strategy and coordination between agencies reduces efficiency
Policy Alignment is Essential to Speed up Technology Deployment

New Energy and Climate Whitehouse Coordinator, Energy Secretary, Science Advisor, and others must coordinate a unified approach

ERD3 funding in 2007 in the United States (by energy source)

Data from Federal Financial Interventions and Subsidies in Energy Markets 2007 (EIA) & Gallagher 2008
Context of the Recommendations
Essential ingredients, and short-term recommendations for budgets

- **Timing and objective**
  - Informing the process at a crucial time

- **Content**
  - Key initiatives needed to start upgrading the U.S. energy-technology innovation system
  - Short-term budget recommendations for DOE
    - We have ongoing detailed work on the design of long-term portfolios of investments in ERD&D which include a bottom-up expert elicitation and modeling

- **Relationship with “American Recovery and Reinvestment Act 2009”**
  - Stimulus package being discussed addresses many of the recommendations, e.g.:
    - CCS demos
    - Funding for storage and geothermal
    - Deployment (production tax credits, transmission funding)
  - We are recommending minimum feasible levels for FY 2010

http://belfercenter.ksg.harvard.edu/publication/18826/tackling_us_energy_challenges_and_opportunities.html
Department of Energy RD&D Budgets 1978-2009R
FY 2009 request was 45% of that in 1978

Gallagher, 2008
DOE ERD&D Budget Recommendations for Fiscal Year 2010
Longer-term recommendations to come from more detailed analysis

<table>
<thead>
<tr>
<th>Area</th>
<th>FY08 in current million $</th>
<th>Suggested for FY10 in current million $</th>
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<tbody>
<tr>
<td>Basic Energy Sciences</td>
<td>1,177</td>
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<td>Fossil Energy</td>
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<td>Electric Transmission &amp; Distribution</td>
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<td>Energy Efficiency</td>
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<td>Renewable Energy</td>
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<td>Hydrogen (part of EERE)</td>
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<td>Nuclear Fission</td>
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<td>350</td>
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<tr>
<td>Nuclear Fusion</td>
<td>287</td>
<td>450</td>
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<tr>
<td>Total BES + ERD&amp;D</td>
<td>4,173</td>
<td>6,060</td>
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Improving Management and Coordination
Need for a coherent strategy, coordination, and new mechanisms

- **Develop, publish, and implement a U.S. energy-innovation strategy**
  - Coherent strategy using a wide range of policy tools across the chain
  - Strategy balancing the role of the public and private sectors, and integrating international cooperation

- **Improve energy policy coordination government-wide**
  - Recently created post for Whitehouse Coordinator for Energy and Climate Change is an important step
  - Need to delineate its role, and that of other key actors (OSTP, DOE, etc.)

- **Create mechanisms to manage demonstration projects and high-risk, high-potential R&D**
  - The government should create mechanisms to adequately manage technology demonstration projects
  - A mechanism to fund high-risk high-potential R&D is needed. ARPA-E might serve this function
Encouraging Private Sector Investment
Policy certainty, R&D tax credits, and improve partnerships

- Set economy-wide carbon constraints

- Make permanent and expand Research and Experimentation tax credits
  - In 1980s, the United States had the most generous R&D tax credit; by 2004 it was the 17th most generous country

- Adopt good partnership models
  - Work on this area is ongoing
Strengthening International Cooperation
Current effort is small and uncoordinated

- **Many drivers for international cooperation**
  - Share costs and risks of basic research (e.g. ITER)
  - Increase the utilization of facilities
  - Share the costs of technologies expected to provide public benefits (e.g. CCS, fission R&D)
  - Promote interaction and discussion with partner countries
  - But most importantly, the environmental, macroeconomic, and national-security risks of the energy sector are global

- **Government should develop a cooperation strategy with priorities**

- **Administration should take early cooperation steps with China**
  - Make an early Presidential trip to China with energy and climate change high on the agenda, followed by high-level meetings
  - Set up a major cooperative effort in CCS;
  - Establish a U.S.-China Center for Clean Power Innovation
  - Set up new cooperation mechanisms in advanced vehicles, batteries, renewables, and efficiency
Targeting and Better Coordinating Deployment Incentives
Options for sectoral approaches

- **Economy-wide carbon constraints**

- **Electricity sector**
  Obama advocated a national RPS of 10% of renewable electricity by 2012, and 25% by 2025
  Investment tax credits have been extended to 2016, production tax credits likely to be extended for 3 years
  - Assess the effectiveness of loan guarantees
  - Evaluate how to best incentivize needed investments in transmission and distribution

- **Transportation sector**
  - Consider
    - Replacing CAFE standards with CO₂ emission standards
    - Creating a feebate system to promote the purchase of efficient vehicles
    - Setting a floor on oil prices
    - Setting a federal mandate for a fraction of vehicles sold to be flex-fuel, or plug-in hybrids
    - Promoting mass transport: e.g. expanding bus and subway, reducing public transportation fares, building a high-speed intercity rail

- **Buildings sector**
  - Consider
    - Encouraging states to place stringent building codes and DSM programs
    - Retrofitting public and low-income buildings
Thank you for your attention.

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