Blueprint for American Prosperity

Unleashing the Potential of a Metropolitan Nation

Metropolitan Policy Program
at BROOKINGS

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Energy Discovery-Innovation Institutes: A Step Toward America's Energy Sustainability

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Two key points:

The federal government is underinvesting in energy R&D by an order of magnitude, putting the future of the nation at great risk

Beyond increasing federal energy R&D, new research paradigms are needed to augment the work of the national laboratories and corporate R&D centers

America’s challenge

America faces an interrelated set of serious energy challenges

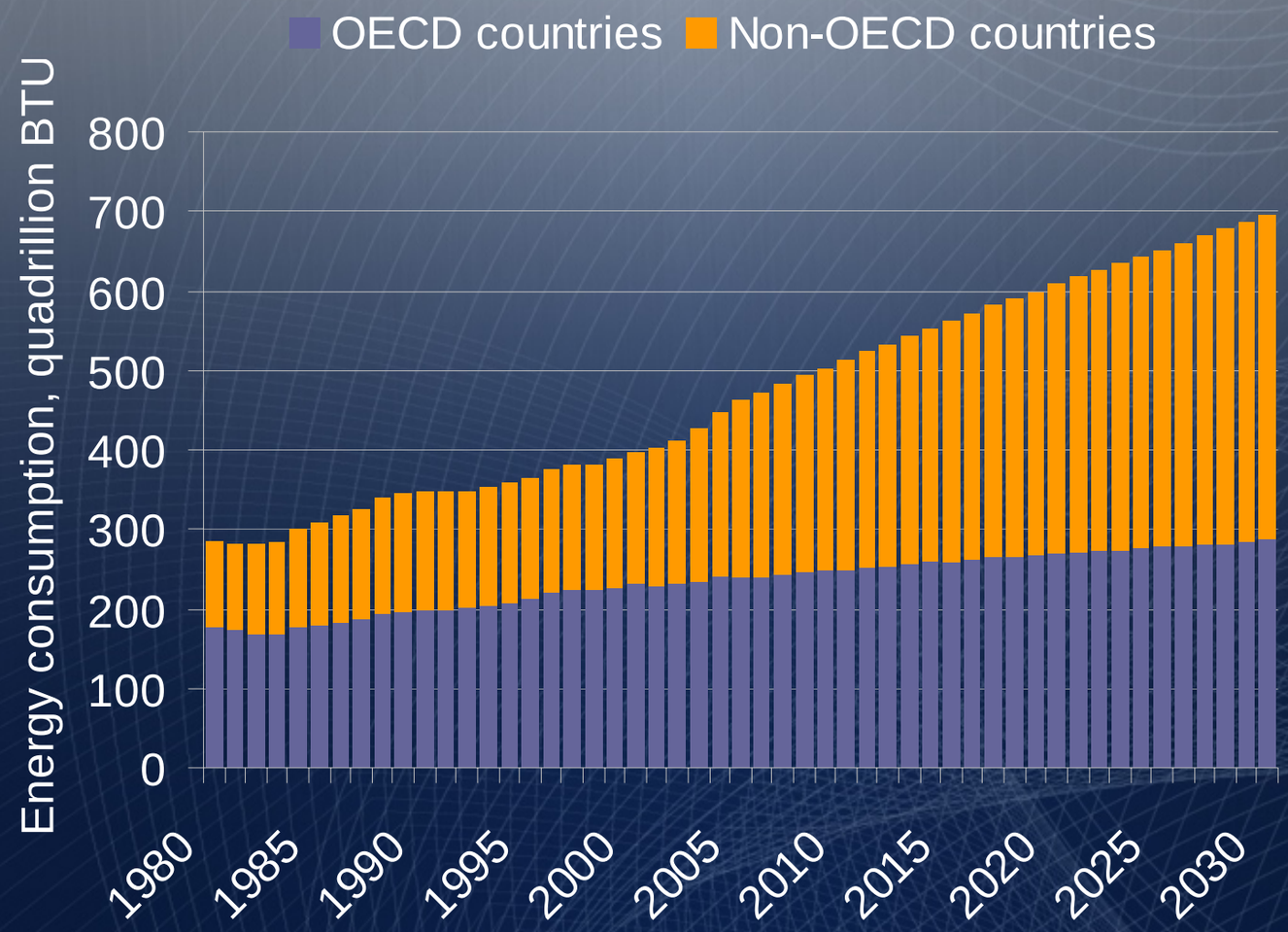
Supply, security, and environmental challenges plague the world's energy production and delivery system

Transformative innovation is required to commercialize and deploy energy breakthroughs

Multiple market and government failures hinder energy innovation investments and problem-solving

The supply challenge

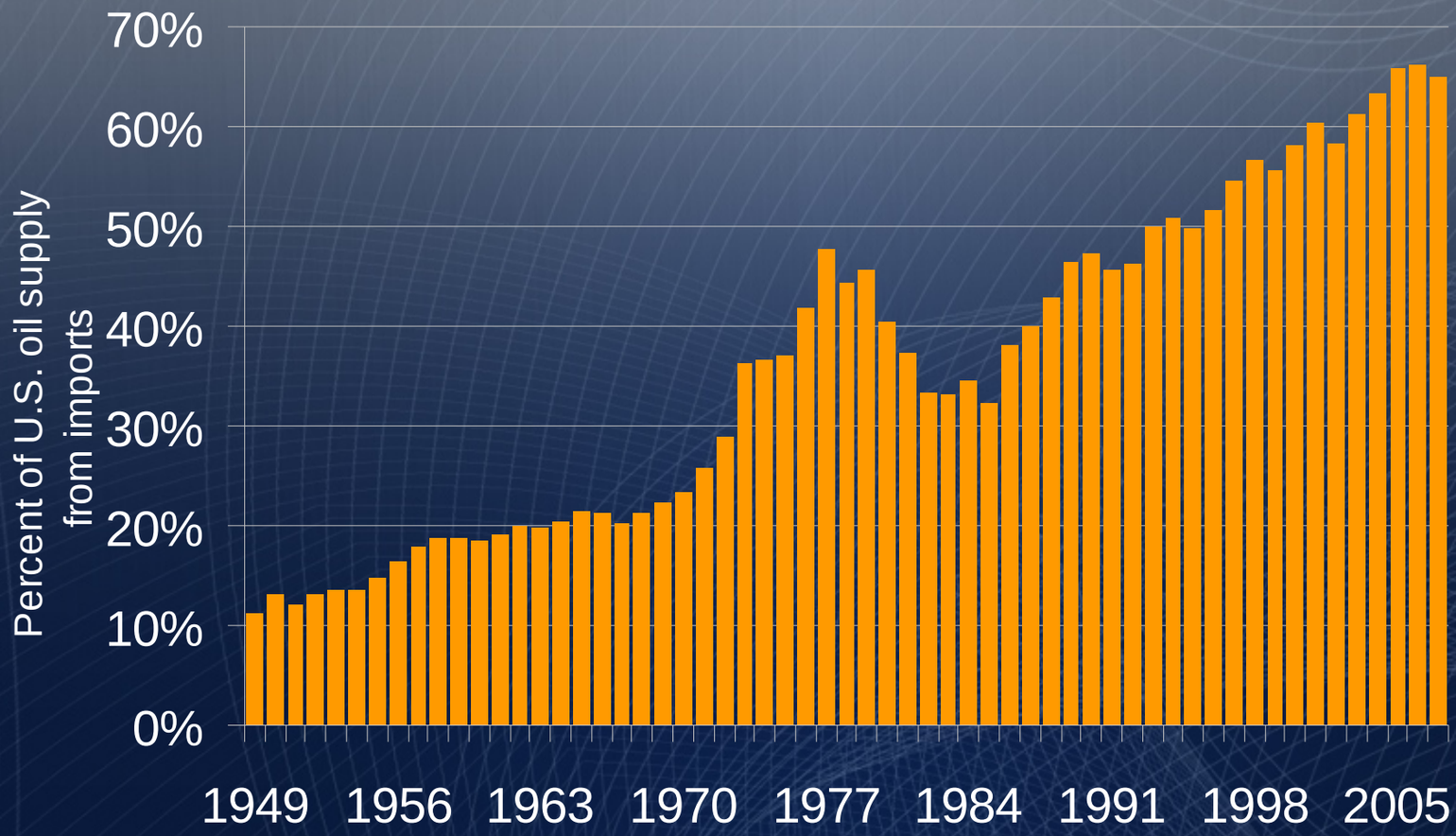
Rapidly increasing global energy demand exacerbates already serious supply challenges



Projected energy consumption, quadrillion BTUs (*Source: Energy Information Administration)*

The security challenge

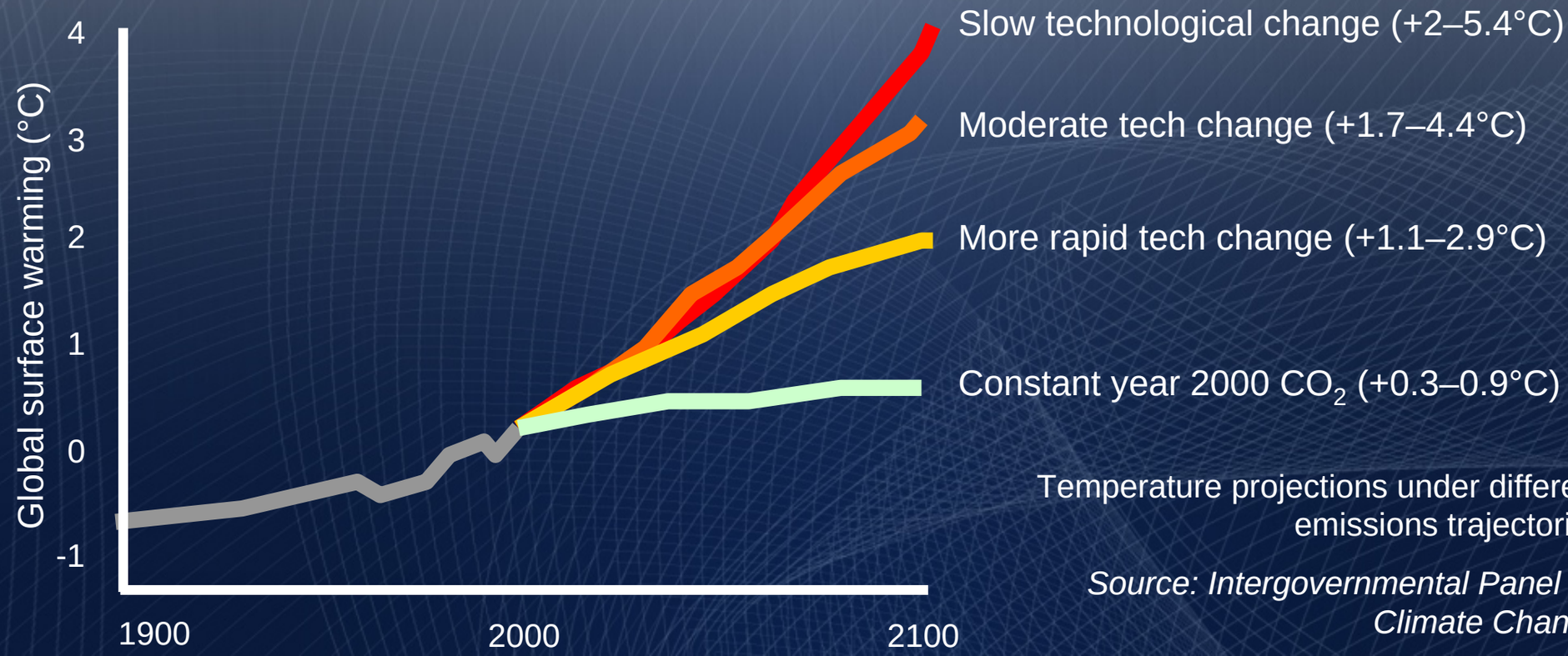
America's dependence on oil from politically volatile regions makes it vulnerable to supply shocks and military interventions



Percent of U.S. oil supply from imports, 1949-2007 (*Source: Energy Information Administration)*

The environmental challenge

Global average temperatures may rise by 6 degrees Celsius or more over pre-industrial levels—with devastating consequences—if carbon emissions continue to grow at current rates



Temperature projections under different emissions trajectories

Source: Intergovernmental Panel on Climate Change

The technology challenge

Current energy technologies have not yet achieved either the scale or the cost structures necessary for commercialization

The market failure challenge

Two enormous, uncorrected market failures exist:

- Energy prices do not internalize all costs
- Firms under-invest in R&D

The complexity challenge

The large scale deployment of sustainable energy technologies will involve not only advanced scientific research and the development of new technologies…

…but also careful attention to complex social, economic, legal, political, behavioral, consumer, and market issues…

…all characterized by complex regional, national, and international relationships

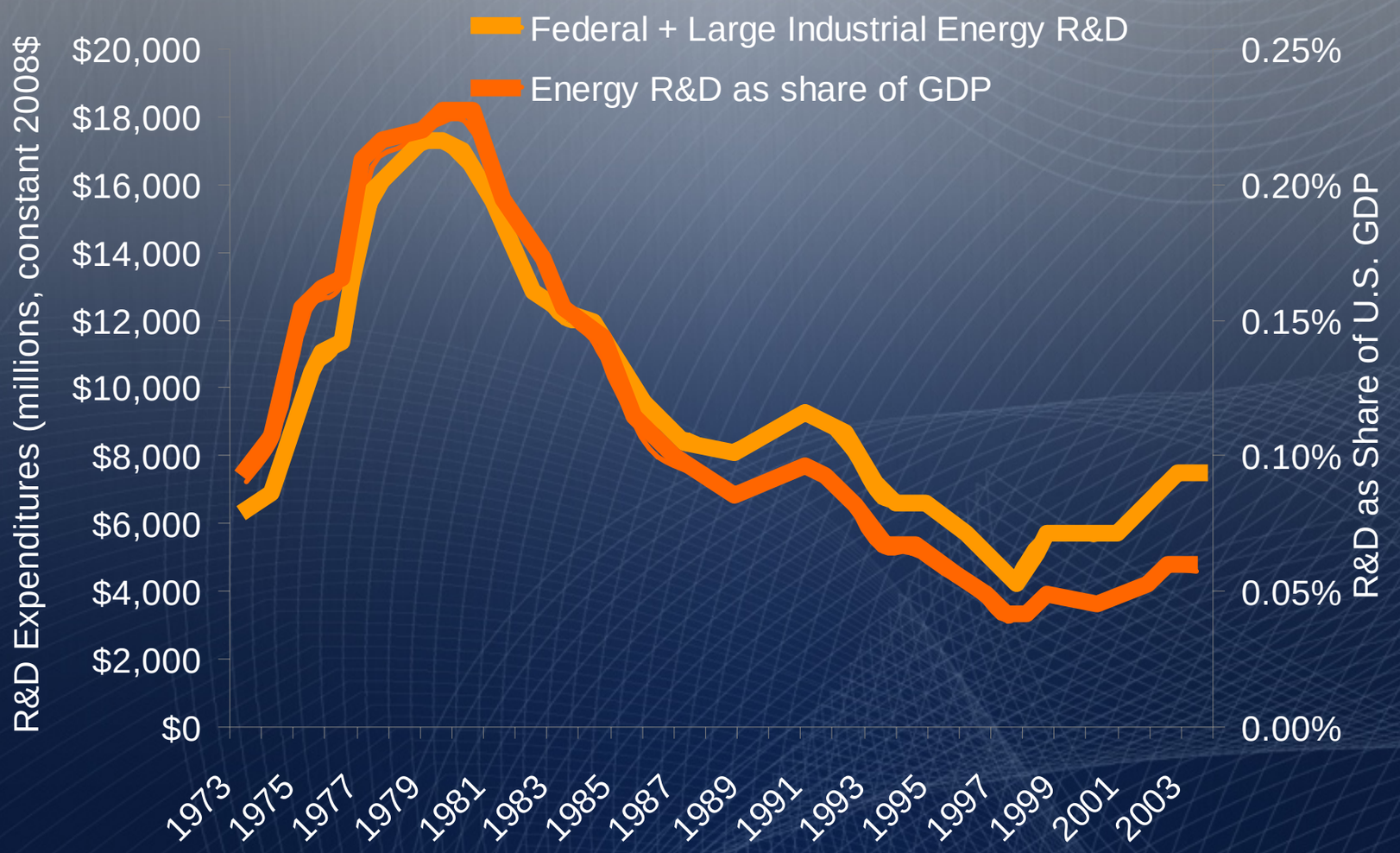
Limitations of existing federal policy

Existing federal energy innovation policies are hampered by problems of scale and structure

The magnitude of U.S. investment in energy research is woefully inadequate

The unusual complexity of the energy challenge requires new research paradigms in addition to the science and technology R&D of the national labs and industry

The magnitude of U.S. energy research is inadequate



Federal energy R&D spending, in dollars and as a share of GDP (*Source: National Science Foundation)*

The character and format of U.S. energy research remain inadequate

Historically, the federal lab system has had neither the mission nor the capacity to promote commercialization as its lead task

Broader issues such as economics, public policy, social behavior, and human capital development have received scant attention

Key segments of the nation's R&D capacity—such as universities—have not been fully engaged

A new federal approach

The U.S. must move now to address the two main shortcomings of its energy innovation policies

The federal government should increase energy R&D investment by an order of magnitude

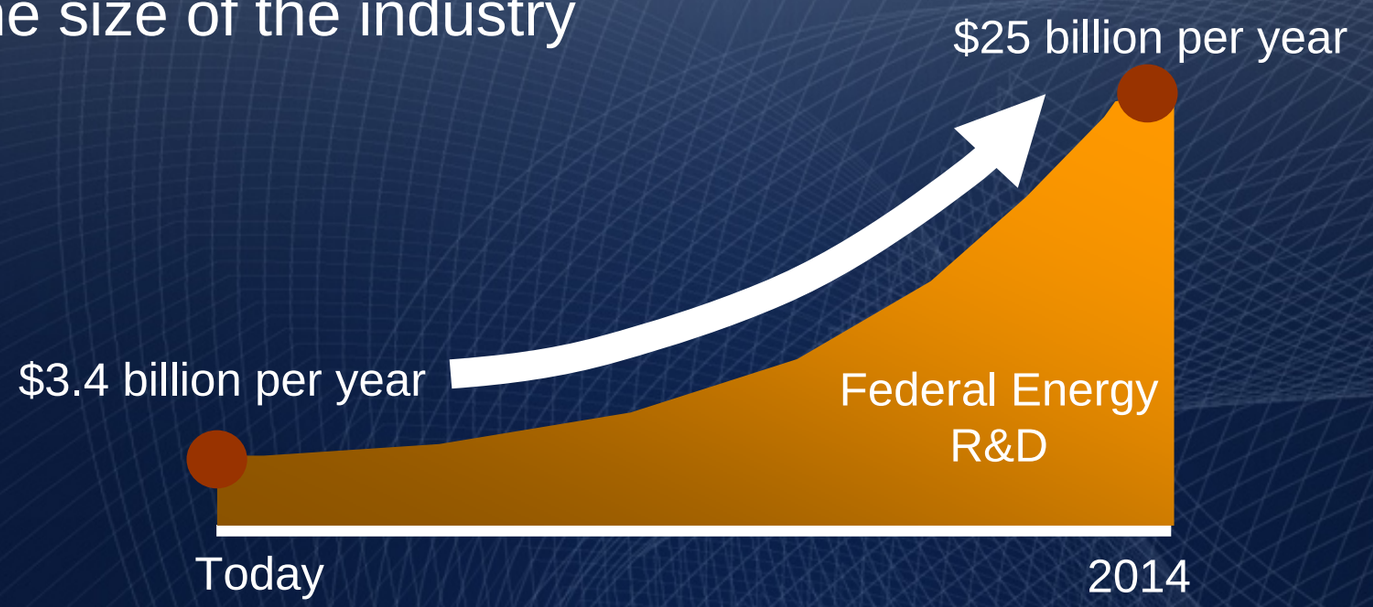
The federal government should supplement and enhance the energy research efforts of the national labs and industry with new research paradigms

Magnitude: Federal investment in energy R&D should grow to between $20 and $30 billion annually

This would address the ‘scale’ component of the energy challenge

The increase would bring energy R&D investments closer to levels in other priorities, such as health, defense, and space

The increase would bring total funding up to a level consistent with the size of the industry

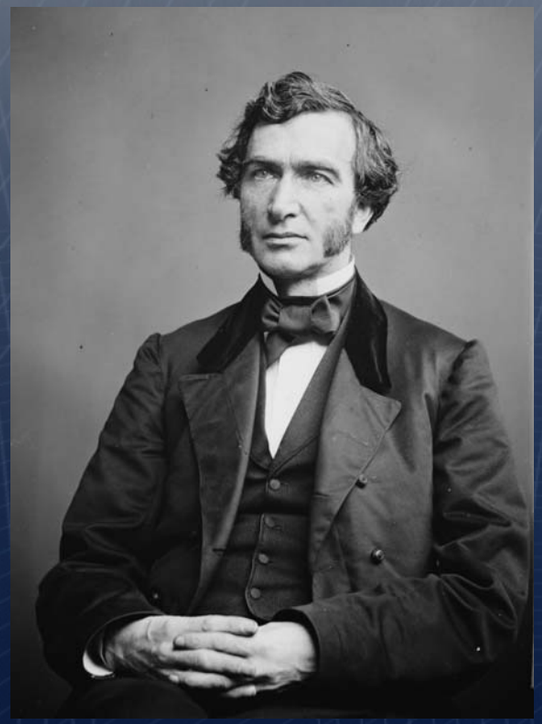


Paradigm: The federal government should direct a portion of the increased energy R&D funding toward a new research paradigm—Energy discovery-innovation institutes

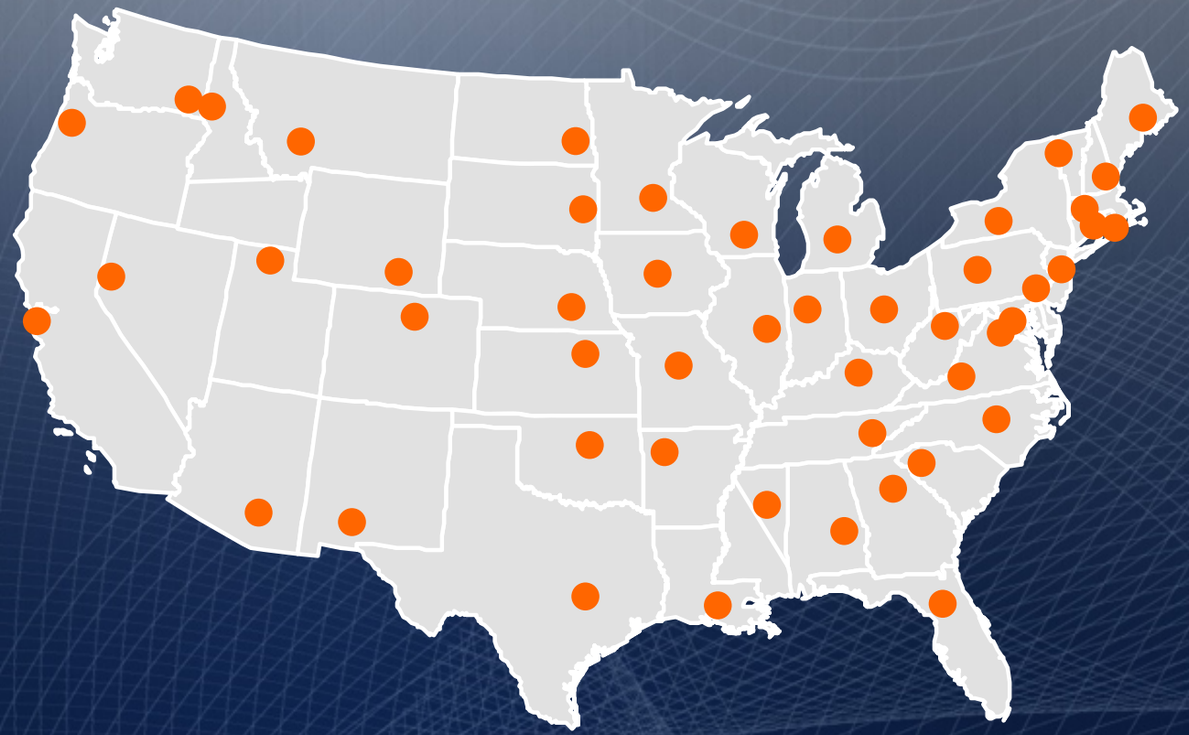
e-DIIs

The DII concept—developed by the National Academy of Engineering—aims to link scientific discoveries with technological innovation to create products, processes, and services needed by society

The DII concept is a contemporary adaptation of a successful research paradigm created over a century ago through the Morrill Land-Grant Act



Justin Smith Morrill



The original Land-Grant colleges and universities (1862)

Energy DIIs would combine the best qualities of current R&D institutions

Like agricultural experiment stations, they would be responsive to societal priorities

Like academic medical centers, they would link research, education, and practice

Like corporate research and development labs, they would link discoveries with the applied research necessary to produce innovative products, but would also educate the next generation of hi-tech workers

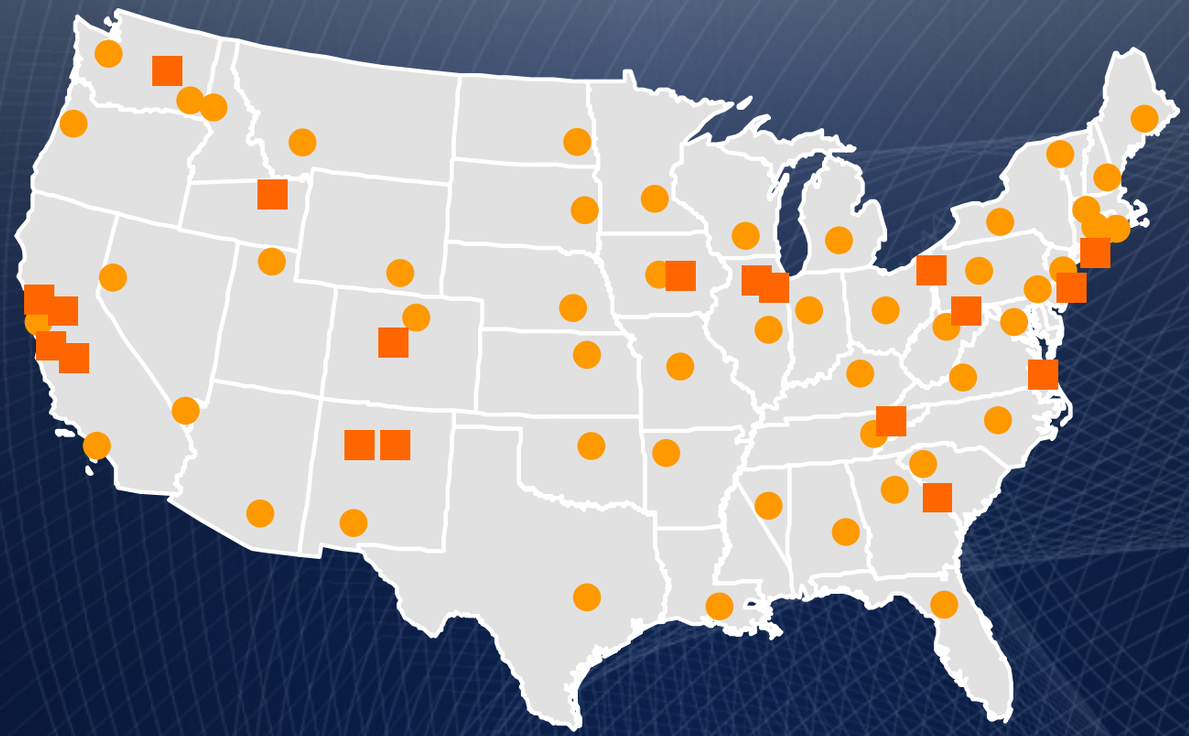
The energy DIIs should be distributed competitively among the nation's universities and federal laboratories

Several types of institutes would anchor the national network:

- University-based e-DIIs
- Federal lab-based e-DIIs
- Federal lab–university partnerships
- Satellite energy research centers

Core federal support would range from $10s of millions per year for small institutes to $200 million per year for larger university or laboratory consortia and partnerships

Total federal commitments would approach $6 billion per year—about 25 percent of the total recommended energy R&D funding goal of $20 to $30 billion annually



Energy DIIs will be created through a competitive process

Award process:

- Proposals evaluated by an interagency panel
- Peer review
- Led by NSF

Award criteria:

- Scientific merit and capability
- Strength of management plan
- Commercialization strategies
- Integration into the regional economy

Phase in: The e-DII network should be phased in over time to allow for ongoing evaluation and management

The E-DIIs' organizational structures will be tiered, with strong network characteristics

Tiered organization:

- Independent institutional and management structure
- Strong external advisory board
- Commitment to encouraging competition

Linked external relationships:

- Network should be undergirded by powerful information and communications technology
- Overlaid by a network of virtual organizations

Several e-DII administration and funding options exist

Administration:

- Established, managed, and funded as an interagency effort
- DOE would likely play a lead role

Funding:

- Diversion of existing energy-related subsidies?
- General revenue?
- Carbon tax or cap-and-trade scheme?

Policy briefs and full reports are available on the Brookings website

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www.blueprintprosperity.org

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