Power Sector Innovation

What Role for Regulators?

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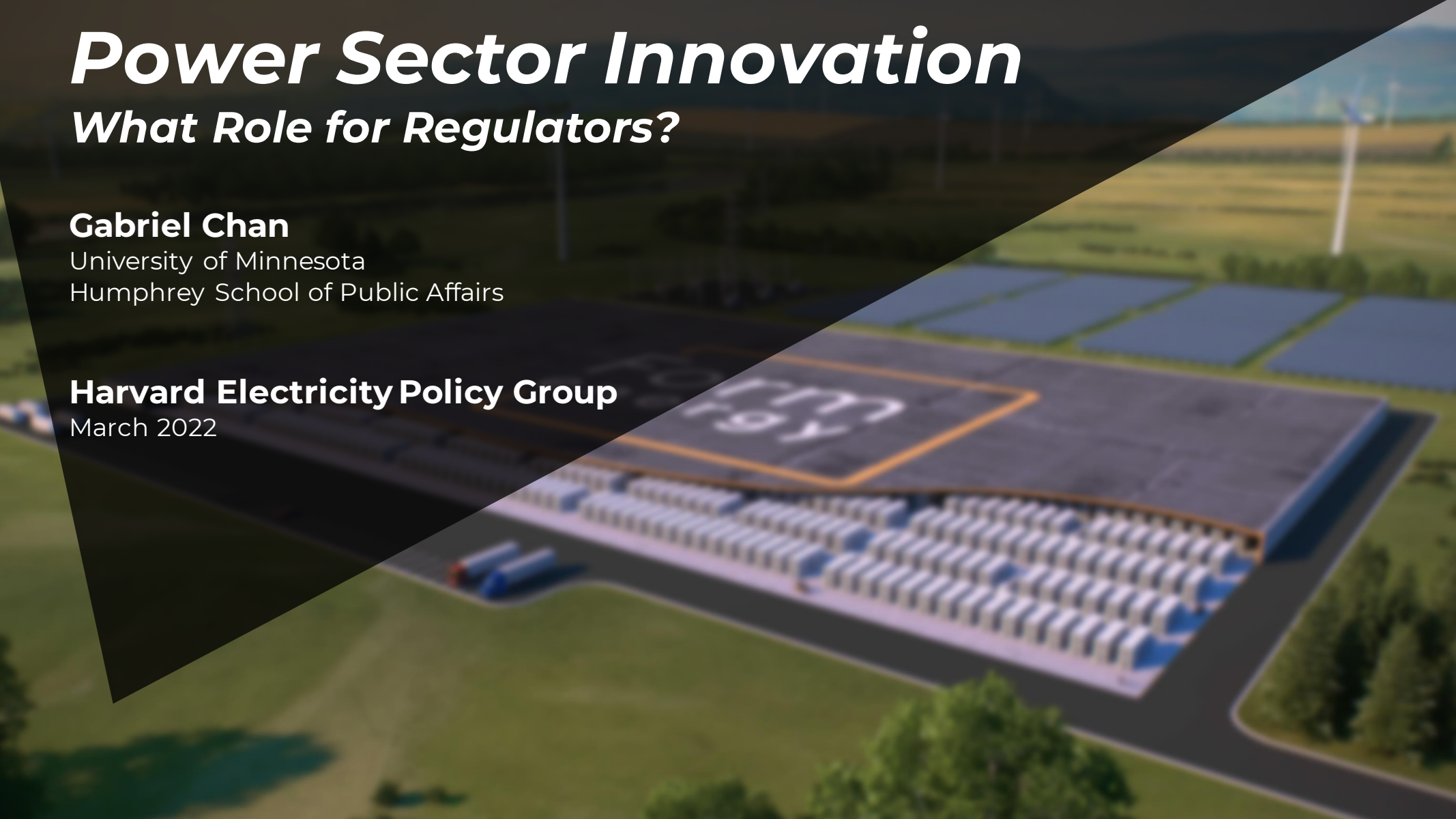
March 2022



“A Tale of Two Market Failures” (Jaffe, Newell, Stavins 2005)

“Market failures associated with environmental pollution interact with **market failures associated with the innovation and diffusion** of new technologies.

These combined market failures provide a strong rationale for a **portfolio of public policies** that foster emissions reduction as well as the development and adoption of environmentally beneficial technology …

Positive knowledge and adoption spillovers and information problems can further weaken innovation incentives.

While environmental technology policy is fraught with difficulties, a long-term view suggests a strategy of **experimenting with policy approaches** and systematically evaluating their success.”

A tale of two market failures: Technology and environmental policy

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Received 1 May 2004; accepted 1 December 2004
Available online 9 March 2005

A Portfolio of Approaches to Cross the "Valley of Death"

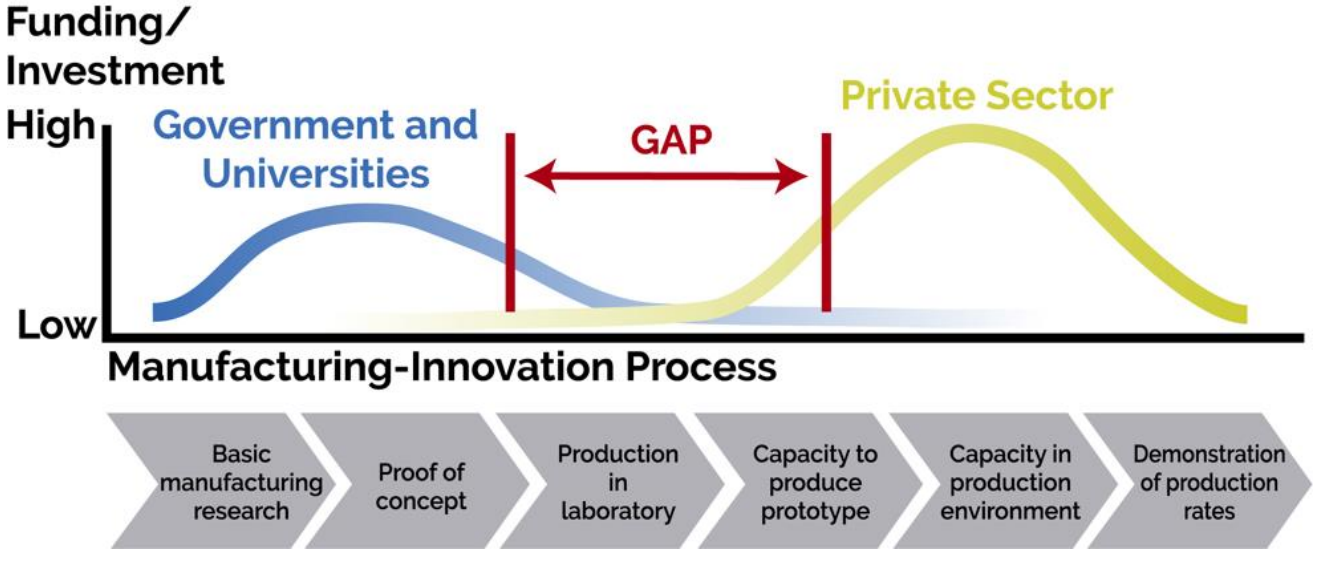


Fig. Source: NIST

Technology Push

Public R&D
Private R&D
Human capital
VC & Angel

Demand Pull

Subsidies
Industrial policy
Market structure
Business model reform
Collaboration

Energy Market Structure Compounds the Issue

1. Heavily regulated sector with low competition
2. Selling a commodity with minimal differentiation
3. Most energy technology is long-lived and owned by consolidated corps., leading to risk aversion

Technology Sector Spending on R&D as a Percentage of Sales

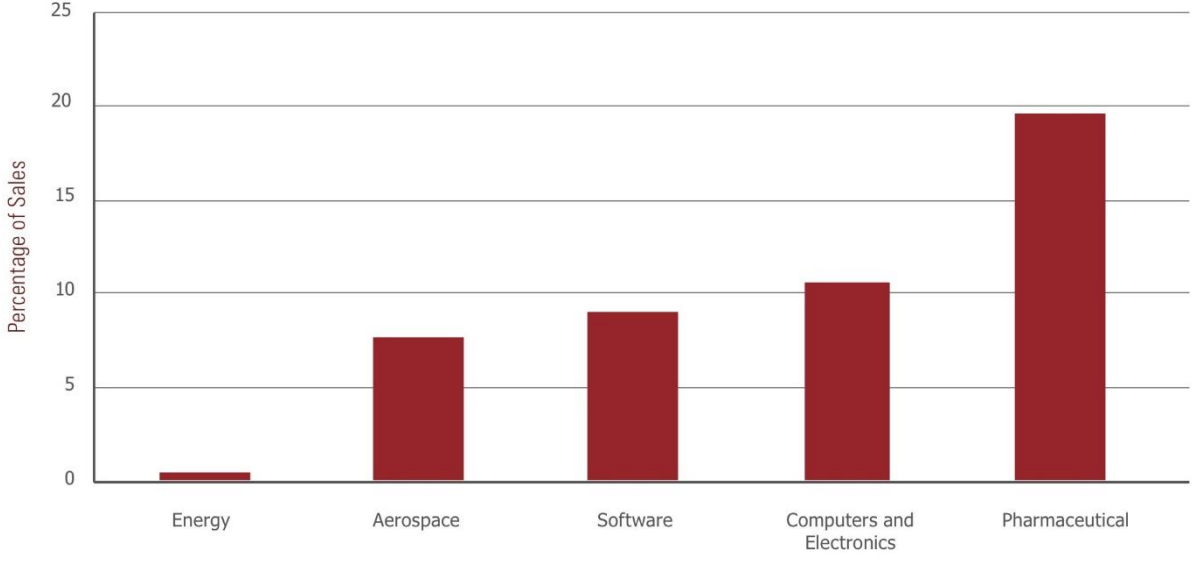


Fig. Source: AEIC

Will the energy transition change the equation for R&D?

“Cost Recovery” Is No Longer Just a Utility Problem

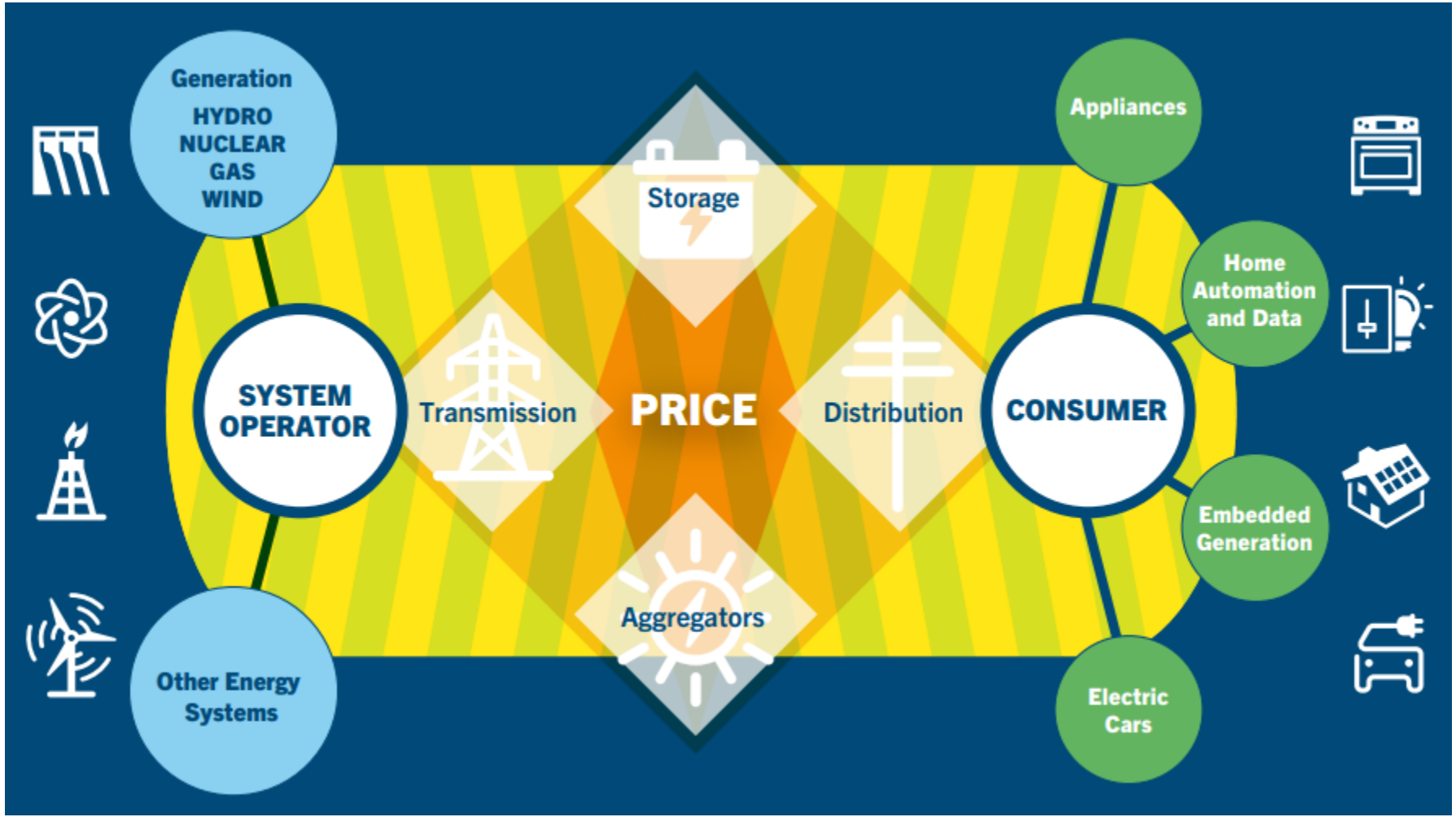
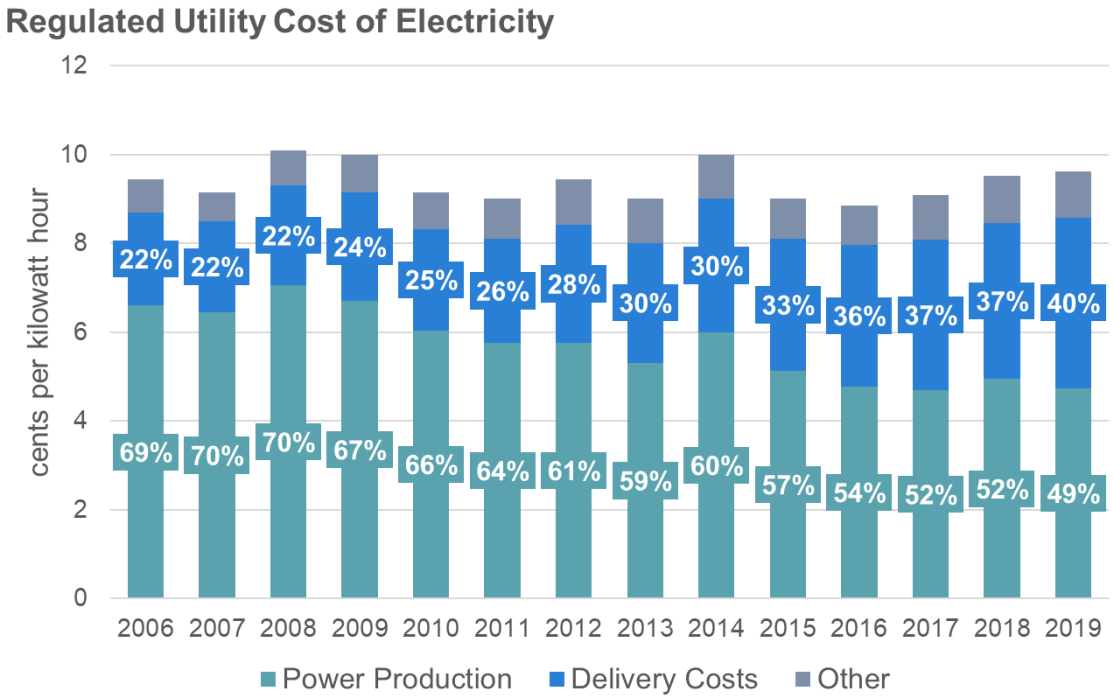
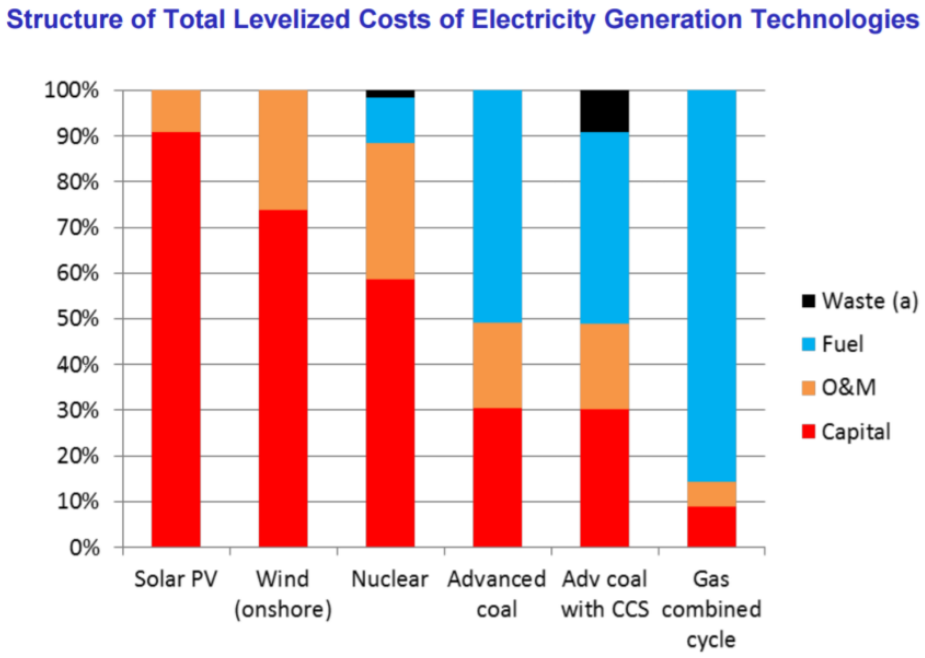


Fig. Source: CoBank

Transition to Clean & Distributed Energy: Non-Divisible Costs Dominate



Source: FERC, EIA and CoBank estimates



Source: Global Energy Assessment

What role for utilities, regulators, and legislators?

The energy transition is rapidly introducing complexity in the capital structure and pricing regimes of the energy system

Innovation is disrupting the viability of legacy commitments and raising questions about how to support new technology

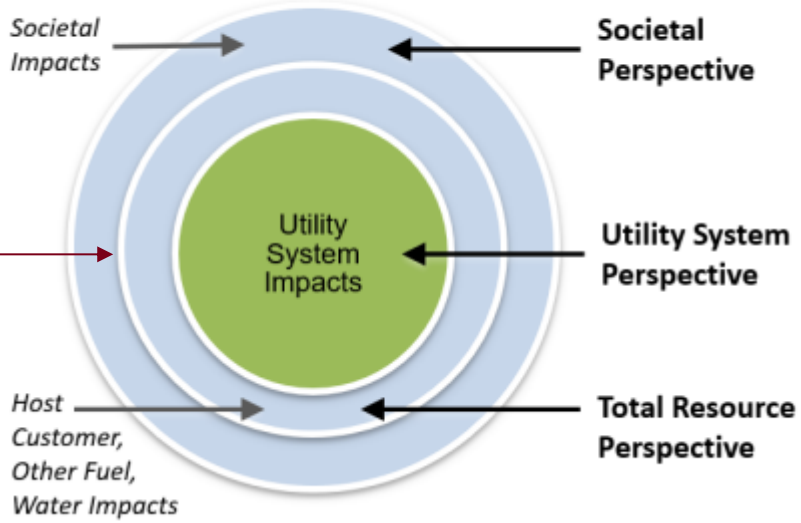
Continued innovation is needed for decarbonization, but who should pay for innovation and who should benefit?

- Legislators should direct public funding for R&D
- *Should regulators also allow cost recovery for innovation?*

Should regulators consider innovation externalities?

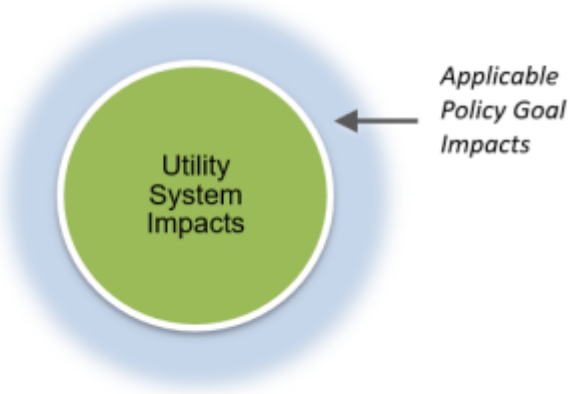
Innovation spillovers

Traditional Perspectives



- Three perspectives define the scope of impacts to include in the most common traditional cost-effectiveness tests.

Regulatory Perspective

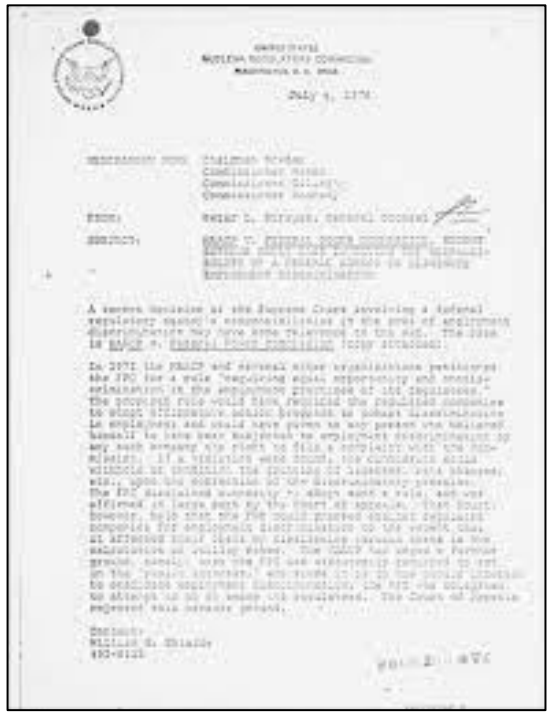


- Perspective of public utility commissions, legislators, muni/coop boards, public power authorities, and other relevant decision-makers.
- Accounts for utility system plus impacts relevant to a jurisdiction's applicable policy goals (which may or may not include host customer impacts).
- Can align with one of the traditional test perspectives, but not necessarily.

Fig. Source: NSPM

Should regulators consider innovation externalities?

Regulators are limited in their ability to advance “social policy” unless there is an impact on ability to set just and reasonable rates (*NAACP vs. FPC* 1976)

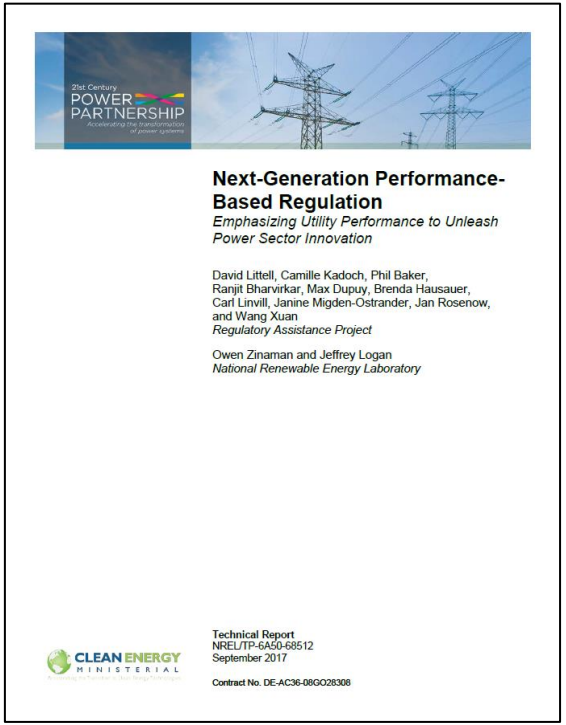


Effective regulators can lead utility-system actors toward **innovation diffusion**, **upstream innovation activities**, and **social innovation** under existing authority because innovation can support long-run just and reasonable rates

What Role for Regulators?

Traditional perspective:
regulators should get out of the way of technological innovation

Modern regulated industry perspective:
regulators should define "innovation performance" and develop the sophistication needed to embrace their role at the center of allowing disruptive innovation in a rapidly changing environment *(summarized in 21st Century Power Partnership)*



Defining “Innovation Performance”

Regulators should allow for experimentation in defining the upstream scope of innovation performance

- Consider: short-term costs, long-term costs, absorptive capacity, long-term capability, learning, workforce readiness, diversity, R&D, etc.
- Consider supporting “**social innovation**” that contributes to new structures that support energy transition (e.g., innovative policy and financing) and “**community innovation**” that broadens participation in energy programs

Example: Minnesota PUC allowed $4mil in utility cost-recovery for a training center to attract women and BIPOC community members (M-21-558)

How should regulators support energy innovation?

Encouraging Utility Innovation

- allow for protected "niches" for utility innovation to encourage utilities to propose innovation investments
- support systems of innovation that build iterative feedback into innovation processes
- develop metrics to scale up utility pilots and avoid "pilot washing"

Developing New Structures for Third Party and Bottom-Up Innovation

- allow fair competition to meet innovation performance goals
- create protected "niches" for community innovation
- innovation has upside and downside risk; regulators need to be prepared to allocate the costs of bad luck equitably without falling back to rick-averse bureaucratic rules ("insisting on certainty undermines innovation" Hempling)
- consider new institutional structure like B-corps, green banks, utility accelerators (e.g. Ameren Accelerator)

Building a utility-system innovation ecosystem

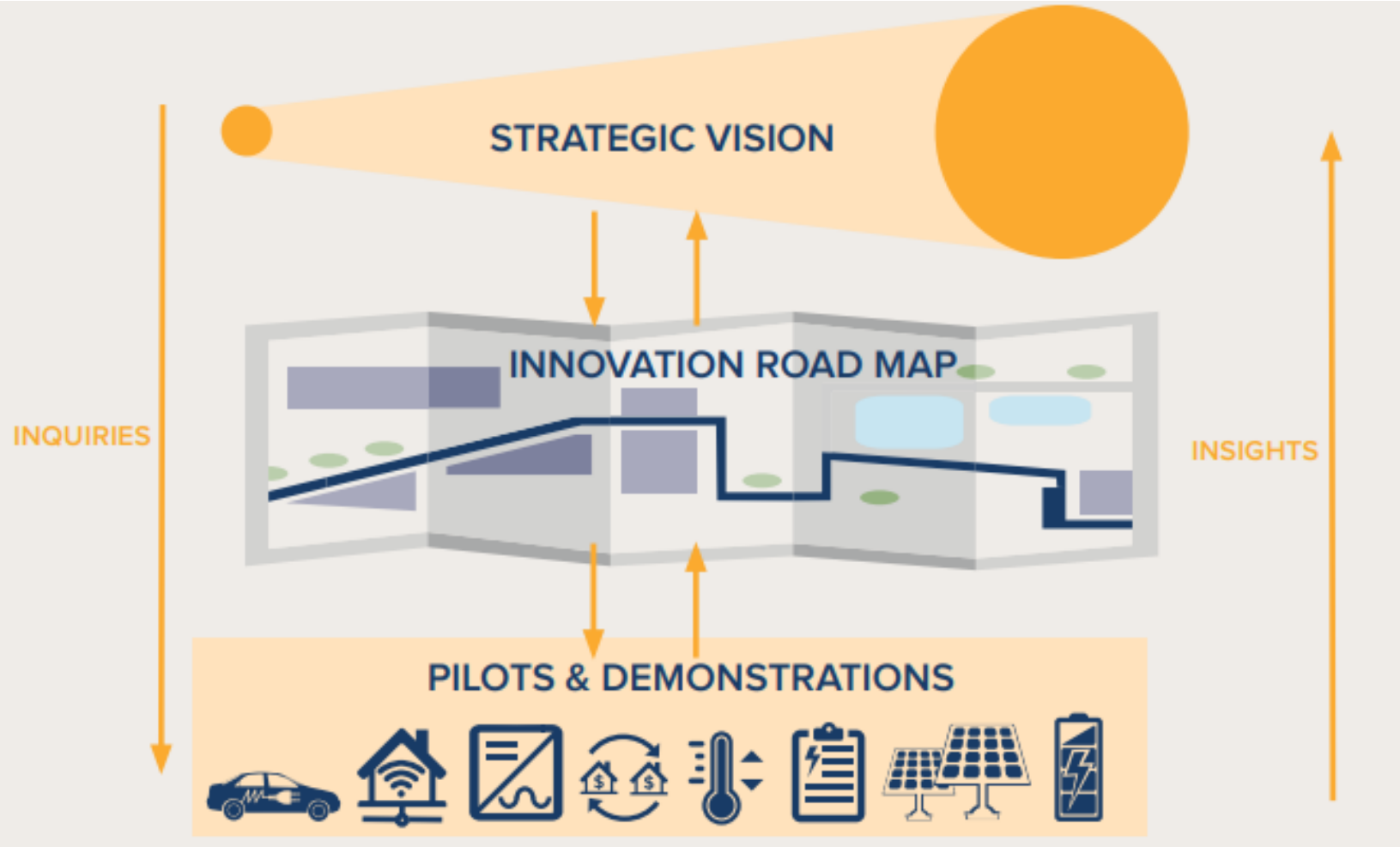


Fig. Source: RMI