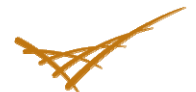


Innovation, Integration and Investment for Clean Energy

Mike Davis
Associate Laboratory Director
Energy and Environment Directorate
Pacific Northwest National Laboratory

Washington Future Energy Conference
November 9, 2010

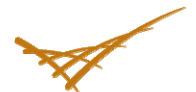


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An outline of my remarks

- ▶ A quick look at PNNL
- ▶ Despite remarkable progress, incremental approaches aren't delivering solutions fast enough
- ▶ Innovation is at the heart of making an impact
- ▶ Rich opportunities for Washington and the Northwest
- ▶ Investments are needed, but require well-thought and stable policies
- ▶ Integration of policy, capital and technology needed to make it happen



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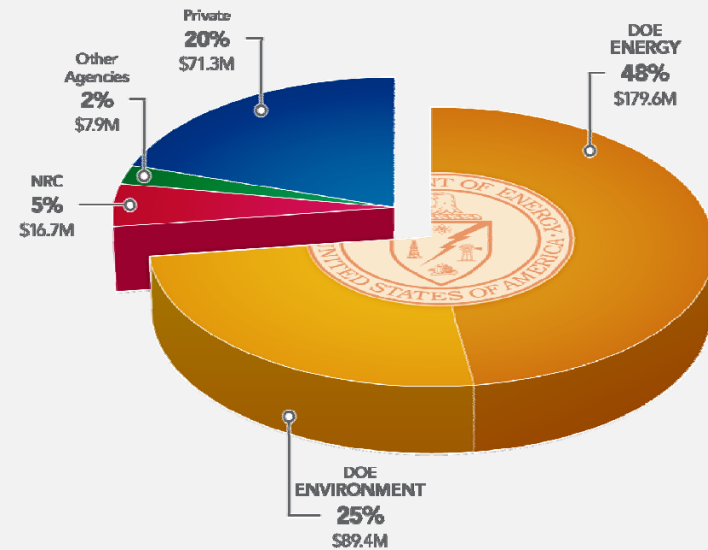
PNNL FY2010 Snapshot

- ▶ \$1.1 billion in R&D
- ▶ More than 4,900 staff and a payroll of more than \$410 million
- ▶ Voted one of Washington's Best Places to Work
- ▶ 930 peer-reviewed publications
- ▶ 46 patents issued
- ▶ Ranked 43rd on *InformationWeek's* 500 most innovative users of business information technology



Energy and Environment Business

- ▶ FY10 Sales: \$365 million



- ▶ Business areas include:

- Clean Fossil Energy
- Electricity Infrastructure
- Energy Efficiency and Renewable Energy
- Environmental Health and Remediation
- Nuclear Energy
- Nuclear Regulatory

Strengthen U.S. Scientific Foundations for Innovation

Increase U.S. Energy Capacity and Reduce Dependence on Imported Oil

Prevent and Counter Acts of Terrorism and the Proliferation of Weapons of Mass Destruction



Reduce Environmental Effects of Human Activity and Create Sustainable Systems

As a nation, innovation has led to remarkable progress...

- ▶ Safe, reliable, affordable and secure electric system
- ▶ Criteria emissions dramatically reduced in last 4 decades
 - Transportation
 - Electricity generation
- ▶ Renewable generation deployment on the rise



...However, we are not solving the big problems fast enough



▶ **World population**

- Today: 6 billion people, 1.5 billion without electricity
- 2040: 9 billion people, doubling electricity customers

▶ **Global energy use projected to increase 49% (2007-2035)**

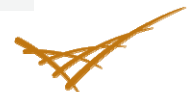
- India and China total energy consumption projected to grow from 20% of world's total in 2007 to 30% in 2035
- The U.S. is projected to be at 5% of world's total in 2035

▶ **Fossil fuels** account for more than 80% of world's energy supply, a trend projected to 2025

▶ **Coal** is the largest source of domestic energy in U.S., China and India—these nations account for 88% of projected net increase in coal consumption

Unaligned time cycles

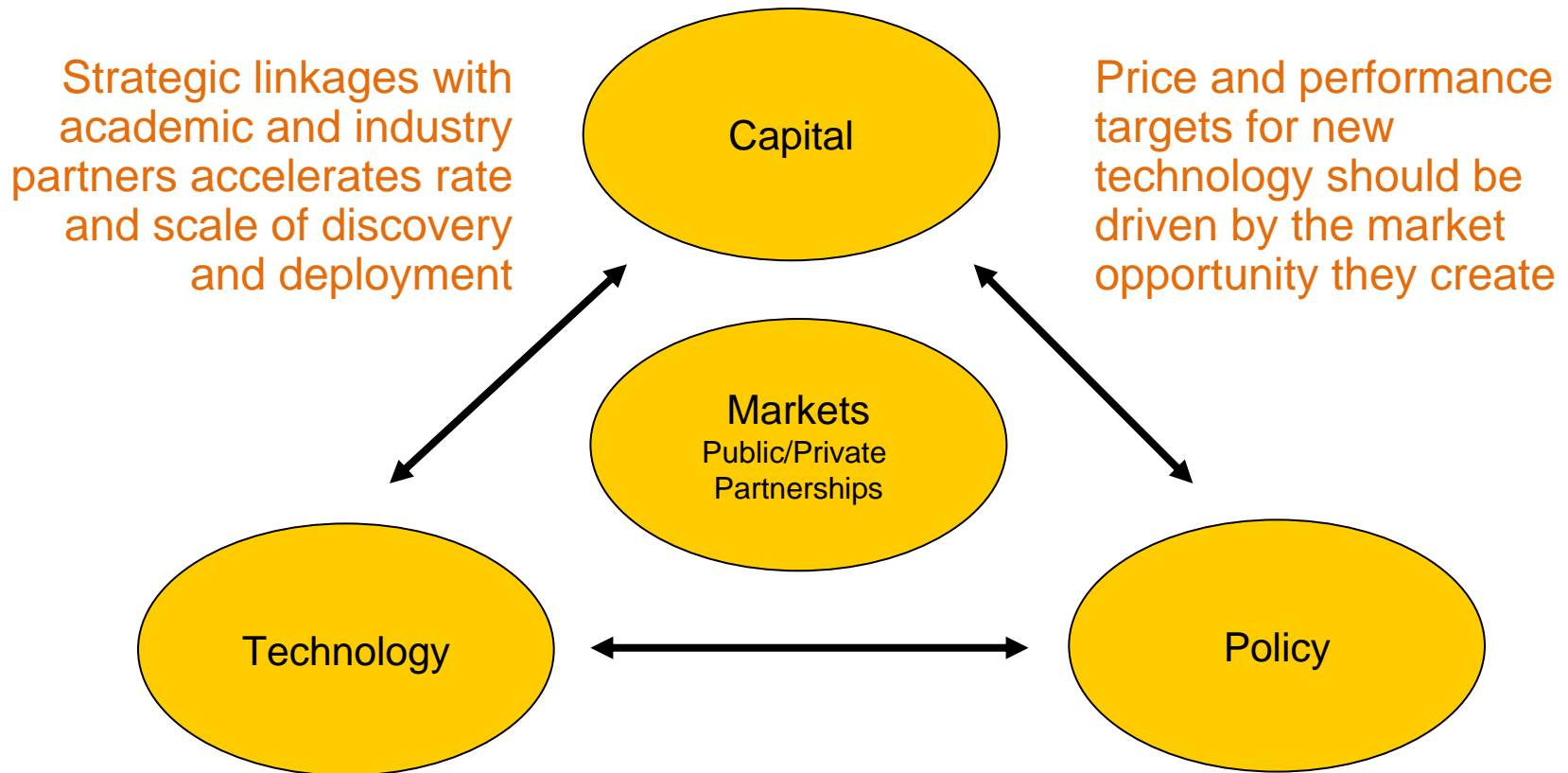
We need to focus on outcomes



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Aligning elements of change
Innovation can lead to outcomes



Research productivity will be enhanced by moving beyond incremental advancements in what we know, to the new thing we *need* to know

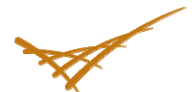
Need to focus on innovation, not incremental improvements

Key truths -- innovation:

- ▶ Requires farsighted leadership
- ▶ Requires investment
- ▶ Creates jobs
- ▶ No longer has to reside in the same region as the markets for it
- ▶ Can be a key export for Washington



Washington and the Northwest are leaders of energy innovation. We have a clean energy portfolio built on the region's hydro system. ***We are at an advantage when it comes to inventing the future.***



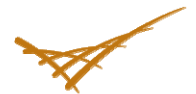
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Let's pick our shots...

Where can we invent the future?

- ▶ What innovations can revolutionize how nations with extensive coal reserves can meet growing energy demand while simultaneously reducing emissions?
- ▶ What can we do to transform the existing electricity generation and transmission infrastructure to optimize the assets we have today?
- ▶ How do we design the grid of the future to be amenable to intermittent and variable renewable generation?
- ▶ How can we use electricity and alternative fuels to cost-effectively meet the needs of a cleaner transportation sector while addressing our dependence on imported oil?
- ▶ Can we use information and communication technology to make end use both smart *and* efficient?

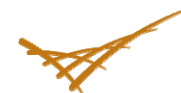


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Questions?



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