Asia/North America Partnerships for Clean Energy Research and Development

Pacifichem 2010
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PNNL-SA-76857

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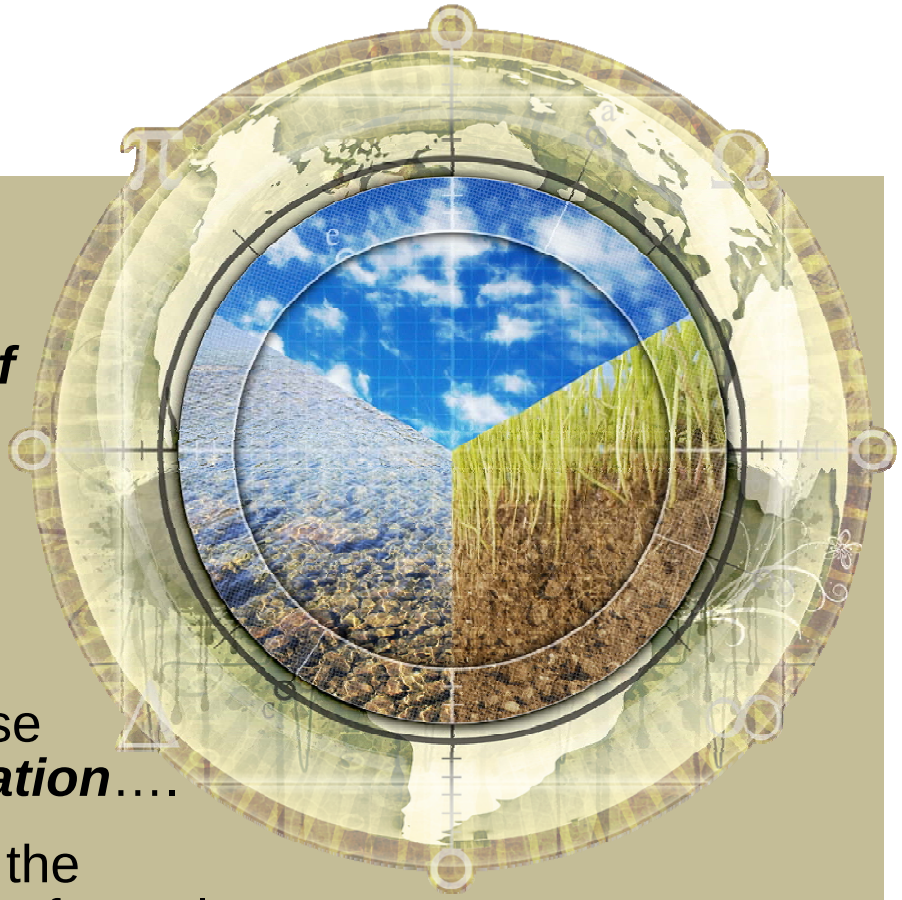
Overview of my talk

- Traditional approaches will not deliver solutions at necessary rate and scale
- A global solution to emissions from new and existing energy-related sources is critical
- We have an opportunity to invent the future
- International partnerships are essential

The challenge



"Business as usual cannot be tolerated, for it would ***condemn millions — no, billions — billions of children, women and men*** around the world to shrinking horizons and smaller futures…."

"Now, more than ever, we need to ***connect the dots*** between climate, poverty, energy, food and water. These issues ***cannot be addressed in isolation***….

"The ***stability*** of the global economy, the well-being of your citizens, the ***health*** of our planet, all this and more depend on you. ***I count on your leadership***, your sense of flexibility and your sense of compromise to make this world better for all…."

--UN Secretary-General Ban Ki-moon's remarks to the high-level segment of the Sixteenth Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC), in Cancún, Mexico, December 7, 2010

- **World population projected to grow from 6 billion today to 9 billion in 2040**
- **Global energy use** projected to increase 49% (2007-2035)
- How the nations represented here fit into that projected growth (percentage of total projected global energy consumption in 2035)
  - Australia/New Zealand - 1.2%
  - Canada – 2.4%
  - China – 24.6% (largest increase)
  - Japan – 3.0%
  - Korea – 2% (second largest increase)
  - United States – 15%

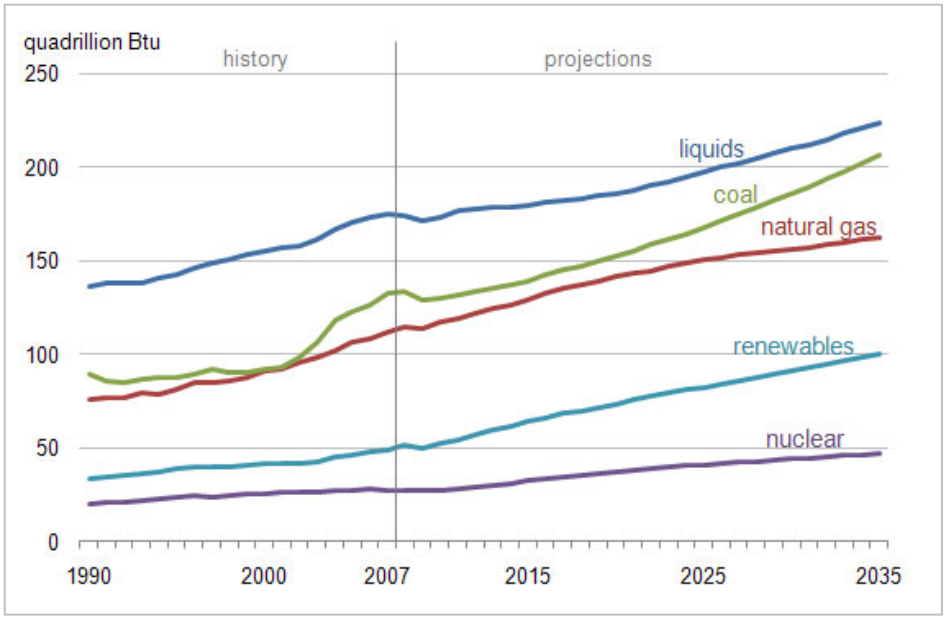
Source: EIA International Energy Outlook 2010

- **Fossil fuels** account for more than 80% of world's energy supply, a trend projected to 2025
- **Global coal use** estimated to grow by 53% by 2025
  - Coal is largest source of domestic energy in the U.S. and two of the fastest growing economies--China and India
  - China's coal consumption projected to represent 55% of total global consumption in 2035
  - Coal consumption in Canada and Japan expected to decrease by 2035

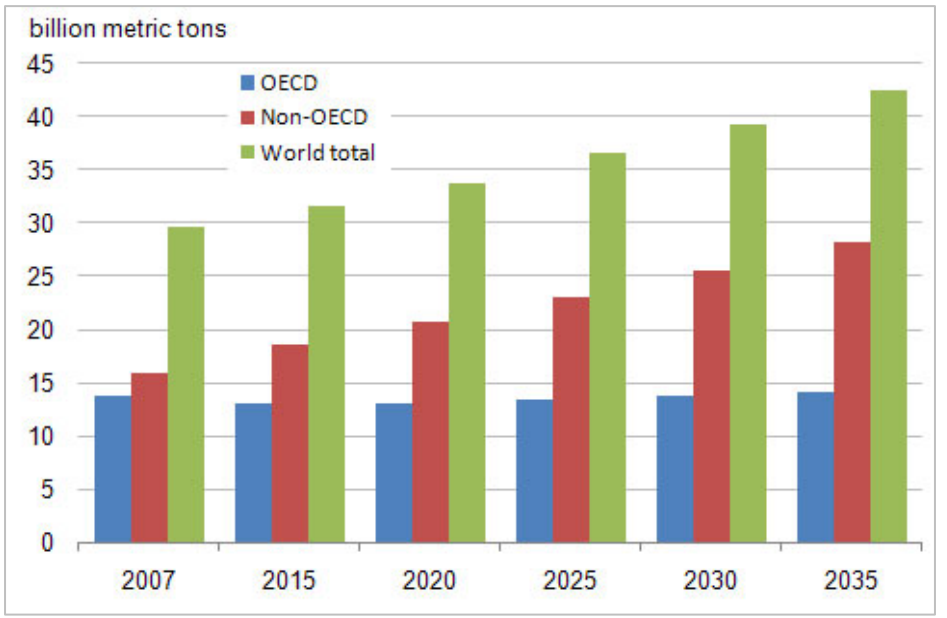
Source: EIA International Energy Outlook 2010; Platts Worldwide Power Plant Database

Population and increased energy demand are drivers for change

- Global development and population growth is placing unprecedented stress on resources
- Absent new policies and technical solutions, global energy related CO_2 emissions are projected to grow by 43 percent by 2035



World marketed energy use by fuel type



World energy-related carbon dioxide emissions

Source: EIA International Energy Outlook 2010

The impact is global

…In China

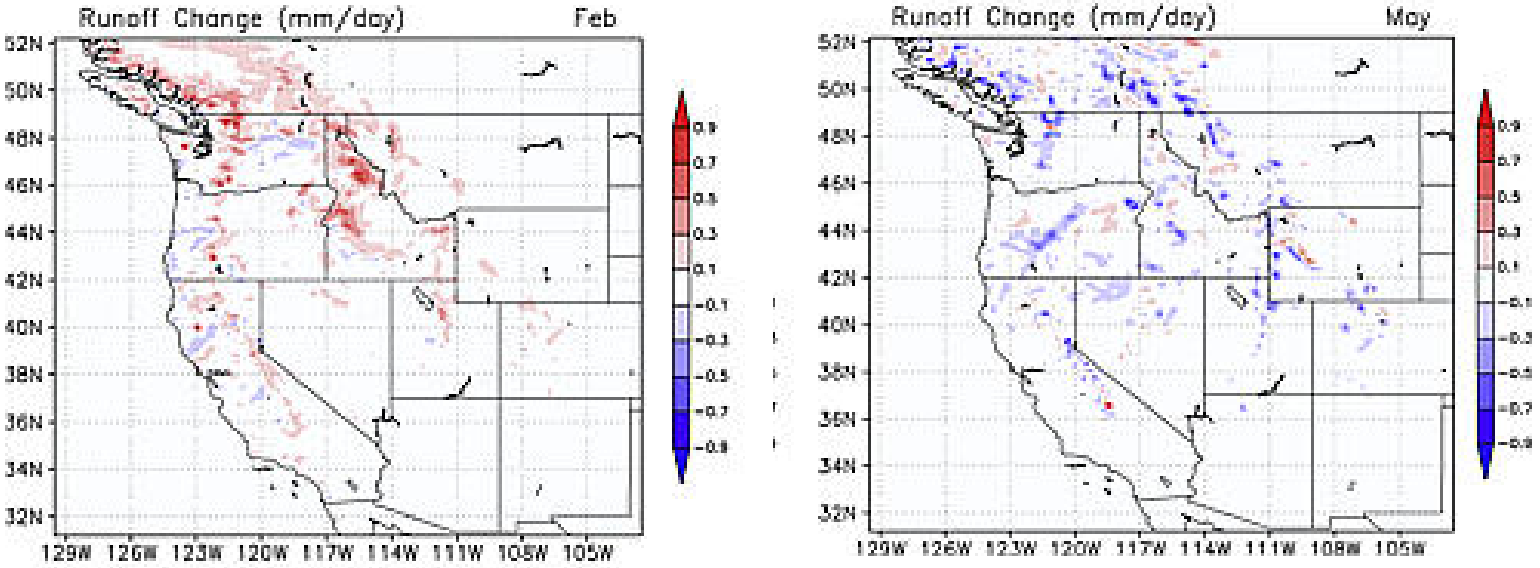
50 years of data observing rainfall patterns show that particulates, mainly from coal, in the smog above China interfere with formation of water droplets.

**Air pollution in eastern China has suppressed light rainfall by 23% over the past five decades, contributing to drought and decreased crop production.*

*Author: Yun Qian, L. Ruby Leung, Pacific Northwest National Laboratory;
Journal of Geophysical Research, 2009

…In Western North America

*Soot from pollution is already affecting our winter snowpacks—snow is melting as much as a month early



February

May

*Author: Yun Qian, Pacific Northwest National Laboratory; *Journal of Geophysical Research - Atmospheres, 2009*

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Understanding the dilemma--

China

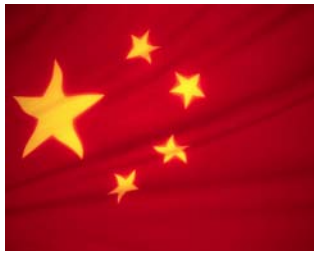
"At our current pace, we could increase production by 200 million tons of coal a year. We can reach that target. But problems with emissions make us wonder if we should set that target…. ***We have to think about the environment***."

—Zhang Guobao, NEA

United States

"America still has the opportunity to lead in a world that will need essentially a new industrial revolution to give us the energy we want inexpensively but carbon-free," Chu said. "But ***I think time is running out***," he warned. "***We face a choice today***. Are we going to continue America's innovation leadership or are we going to fall behind?"

—Steven Chu, DOE



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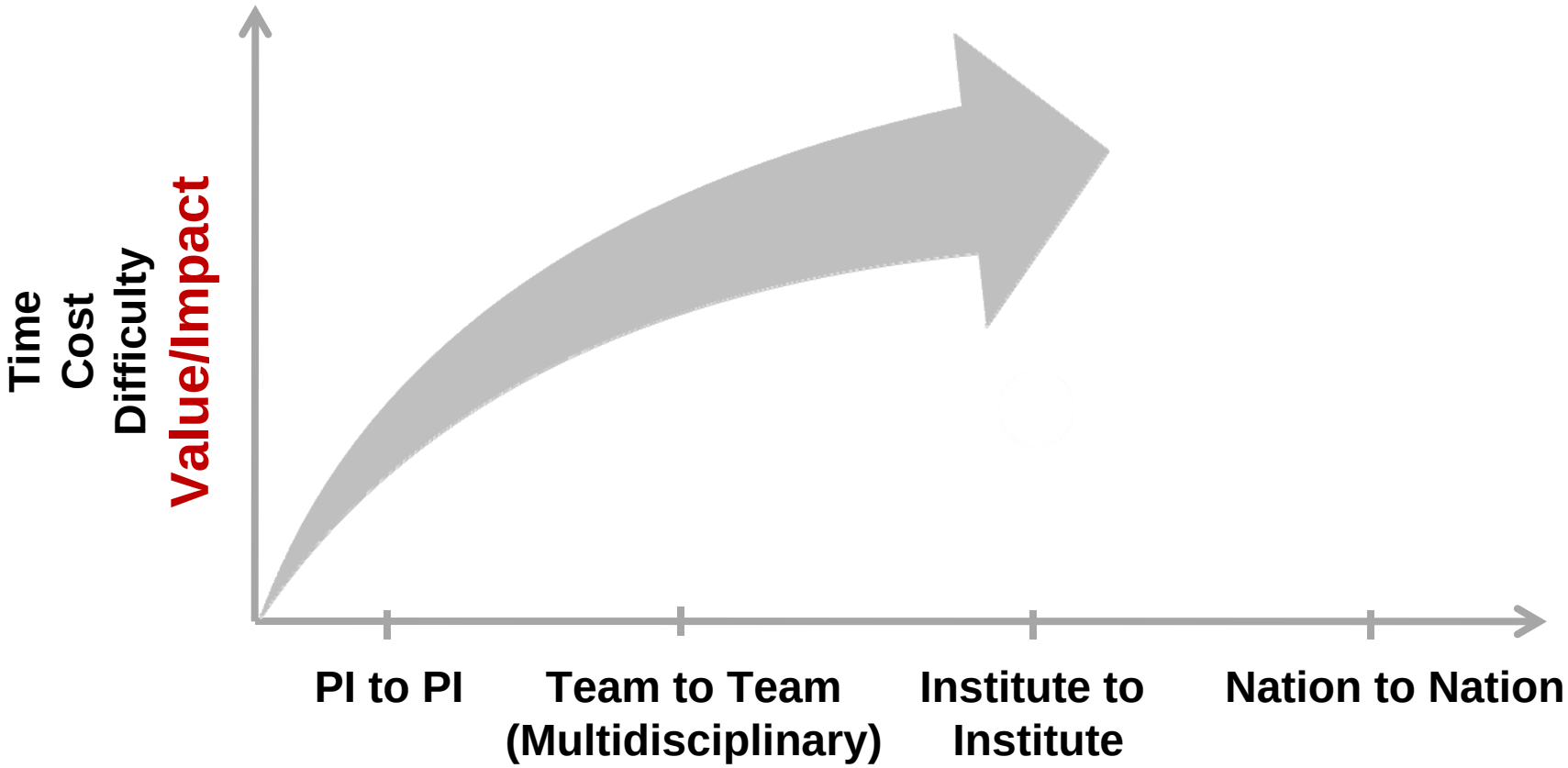
Asia/North America partnerships imperative to developing and deploying solutions

- Obviously, **we** will continue to use the vast coal resources across the world
- The organizations represented here ***must*** partner in science and technology to enable clean and affordable utilization of those resources

One man's view of partnerships



Partnership highlight

National Institute of Clean-and-Low Carbon Energy/Pacific Northwest National Laboratory

- **Partners:** National R&D institutions in China and U.S.
- **Objective**: Deliver technologies to enable clean coal conversion for electricity
- **Challenges**
  - Clear definition and agreement on outcomes
  - Continuity in funding

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Partnership highlight

International Consortium for Clean Energy

- **Partners**: Multiple Chinese Academy of Sciences institutions and R&D institutions in the United States

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- **Objective:** Deliver clean energy solutions from coal, biomass and renewable resources

- **Challenges**
  - Multiple organizations agreeing to objectives
  - Multiple sources of funding

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Partnership highlight

U.S.-China Clean Energy Research Center

- **Partners:**
  - Three U.S. consortia, each to receive (over five years):
    - $12.5 million from the Department of Energy
    - ~$12.5 in cost share from consortia partners
  - Additionally, China to contribute $25 million to each technology area
- **Objective:** Joint U.S.-China R&D in key technology areas:
  - Clean vehicles (Lead: University of Michigan)
  - Clean coal (Lead: West Virginia University)
  - Energy-efficient buildings technology (Lead: Lawrence Berkeley National Laboratory)
- **Challenges**
  - Underfunded in US; continuity in funding
  - Intellectual property
  - Sharing of information across governments
  - Language barriers
  - Complexity in coordination

In summary

Challenges – yes. But the pay off is enormous and I believe *essential.* We know:

- There is no silver bullet—a portfolio of innovative solutions requires all the talents and resources represented here
- As partners, we must focus on *special outcomes*, not *special interests*
- Policy, S&T, capital and markets all play a critical role in making progress
- There is no energy solution absent an environmental solution
- The potential impact our societies can have on this challenge is profound – we have an *opportunity* and *obligation* to demonstrate leadership at all levels

“We have just enough time…

….starting now.”

--Dana Meadows

Environmental scientist, teacher and lead author of “The Limits of Growth”