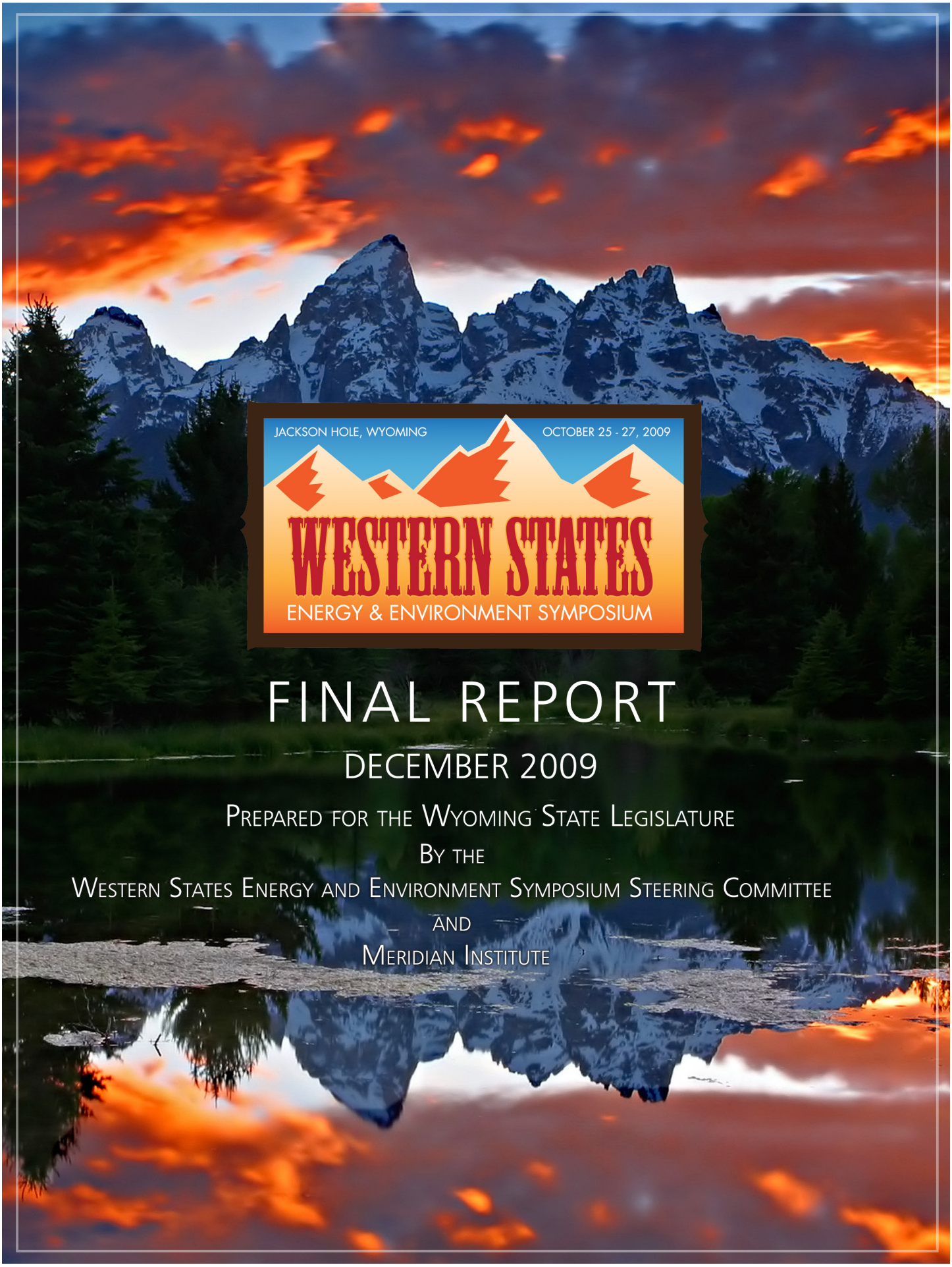

FINAL REPORT

DECEMBER 2009

Prepared for the Wyoming State Legislature

By the

Western States Energy and Environment Symposium Steering Committee

and

Meridian Institute

ACKNOWLEDGEMENTS

I would like to acknowledge the efforts of all of those that helped make the Western States Energy and Environment Symposium a reality. Thank you to my fellow Steering Committee members for their time and wisdom in planning the event: Senator John Schiffer, State of Wyoming; Kyle Davis, PacificCorp; Nancy Ryan, California Public Utilities Commission; and Bill Schilling, Wyoming Heritage Foundation. Special thanks to Speaker Colin Simpson and President John Hines, and the Wyoming State Legislature for their leadership in creating the foundation for the symposium to happen.

Many thanks to the following for providing expertise and services for the event: Hip Performance Group, Brimmer Communications, Hotel Terra Resort Group, Snake River Lodge and Spa, Walk Festival Hall, and Hughes Production. Thank you to Meridian Institute for providing facilitation at the meeting and drafting the final report.

Special appreciation to the University of Wyoming School of Energy Resources for coordinating all of the moving pieces and ensuring a successful symposium.

And, of course, thank you to all of the state legislators, presenters, panelists and participants who took time out of their busy schedules to travel to Jackson Hole and engage in thoughtful and constructive dialogue at the symposium.

Sincerely,

Representative Tom Lubnau
Wyoming State House of Representatives
Chair, Western States Energy and Environment Symposium Steering Committee

TABLE OF CONTENTS

APPENDICES

Appendix 1: Wyoming House Bill No. HB 295

Appendix 2: Steering Committee Membership

Appendix 3: Final Agenda

Appendix 4: Attendee List

Appendix 5: Roles of Participating State Legislators: State Legislative Committees and Council of State Governments

Appendix 6: Robert N. Stavins Presentation

Appendix 7: Work Session III Summary Presentation

Appendix 8: Monte Atwell Presentation

Appendix 9: Selected Pre-Meeting Background Resources

Appendix 10: Tom Lubnau Welcome Presentation

Appendix 11: Break Time Slide Show: U.S. Energy Resource Maps

Please visit www.wsees.com to download the Western States Energy & Environment Final Report (pdf). Information about follow-on activities and additional resources will also be posted here periodically.

PART I: SYMPOSIUM BACKGROUND

WYOMING HOUSE BILL NO. HB0295

The Western States Energy & Environment Symposium convened at Teton Village in Jackson Hole, Wyoming from October 25–27, 2009. The Symposium was sponsored by the State of Wyoming as authorized by the Wyoming Legislature in House Bill No. 295. HB 295 established a steering committee to guide the planning of the symposium and charged the University of Wyoming, School of Energy Resources with conducting the symposium at the direction of the steering committee. The bill also authorized legislative participation in the planning process, required a report after the symposium, and provided appropriations in support of the process. See Appendix 1 for the full text of the Wyoming HB 295.

STEERING COMMITTEE AND PLANNING PROCESS

The Western States Energy & Environment Symposium (WSEES) Steering Committee guided the planning of the symposium in conjunction with the University of Wyoming (UW) School of Energy Resources. Its responsibilities included overseeing the logistical aspects of the event, identifying expert panelists and speakers, and designing the agenda and format for the sessions. The committee created a forum in which participating state legislators could engage in working sessions similar to a legislative session rather than a conventional conference format. In addition to deliberative participation by legislators and panelists, the steering committee sought to provide opportunities for other stakeholders to engage in the discussions. The steering committee and UW School of Energy Resources were also assisted by Hip Performance Group (logistics), Meridian Institute (facilitation), and Brimmer Communications (media relations) in planning and conducting the symposium. See Appendix 2 for the WSEES Steering Committee membership.

OBJECTIVES AND DESIRED OUTCOMES

Nearly 250 participants convened for the symposium, including state legislators from fourteen Western states and representatives from local and federal government, private industry, non-governmental organizations, and academic institutions. The WSEES was designed to accomplish the following objectives in recognition of the importance of the Western states establishing a cooperative capacity to generate, transport and utilize energy in an economically viable, reliable, and environmentally sensitive manner.

1) Bring together public officials, key stakeholders and notable thought leaders to examine state energy policies from a regional perspective and work toward establishing a common regional vision;
2) Explore opportunities for and impediments to coordinating a Western states energy policies to advance regional and sub-regional economic performance of a Western energy system;
3) Identify state, regional and federal policy challenges and potential solutions for delivering energy resources to consumers;

4) Develop potential regional policy solutions to mitigate the environmental impacts of energy resource development, delivery and consumption in the West; and
5) Work to establish a cooperative agreement among the participants to develop a high-level cost/benefit economic analysis assessing the challenges of energy development, production, reliability, marketing, use and environmental protection within these states.

In pursuit of the objectives above, the Western States Energy & Environment Symposium sought to produce the following desired outcomes:

1) A common understanding of each state's respective interests and concerns with regards to the stated objectives;
2) A commitment to carry out clear actions steps (blueprint) to address stated objectives one through four; and
3) A cooperative agreement among the 13 Western states that make up Council of State Governments–WEST, as well as North Dakota and South Dakota, to work toward a high-level cost-benefit economic and other analyses assessing the challenges of energy development, production, reliability, marketing, use and environmental protection within these states.

See Appendix 3 for the WSEES agenda, Appendix 4 for the participant list and Appendix 5 for a detailed list of participating state legislators.

The balance of this report summarizes the proceedings and key outcomes of the Western States Energy & Environment Symposium, highlighting areas on which participating states agreed cooperative action is feasible and promises mutual benefits.

PART II: SESSION OVERVIEWS

OPENING REMARKS, SENATOR JOHN BARRASSO

Senator John Barrasso of Wyoming welcomed participants and delivered opening remarks to kick off the Western States Energy & Environment Symposium on Sunday evening, October 25, 2009. Senator Barrasso emphasized the need for the nation to produce energy in a manner that is as clean as possible and is delivered reliably without raising prices for American families. He highlighted the Wyoming State Legislature's efforts to develop model legislation for carbon capture and storage, as well as efforts to work with federal agencies to identify transmission corridors on public lands to connect wind energy to the grid. Senator Barrasso said the nation needs to take advantage of all forms of available energy in developing a reliable mix of energy. He expressed his appreciation to participating state legislators for convening at the WSEES to work together on balancing energy development and environmental protection in the West.

KEYNOTE SPEAKER, ROBERT N. STAVINS

Robert N. Stavins, Albert Pratt Professor of Business and Government at the Harvard Kennedy School, director of the Harvard Environmental Economics Program, and chairman of the Environment and Natural Resources Faculty Group delivered a keynote address on Sunday, October 25. Professor Stavins explained foundational concepts of environmental economics, emphasizing the notion that the causes of environmental problems are fundamentally economic and the consequences of environmental problems have economic dimensions. Professor Stavins illustrated how pollution is an economic externality using a number of everyday examples. He noted the economic value of health damages from pollution are best estimated based upon what people truly feel that they are (not necessarily what they say they are, however). In addition, he described federally required and validated methods for quantifying the value of damages from environmental pollution.

Professor Stavins suggested people tend to choose an efficient level of cleanup based on perceived costs and benefits when they themselves receive the benefits and pay the costs. The point at which the difference between costs and benefits is maximized is the efficient level of pollution control. However, the fact that markets fail to deal efficiently with pollution is a legitimate reason for government intervention and public policy. Professor Stavins concluded that an economic perspective is essential for a full understanding of environmental problems, and economic analysis is critical to the design of solutions that are environmentally effective, economically sensible, and politically pragmatic.

See Appendix 6 for Professor Stavins' presentation slides.

PLENARY SPEAKER, WYOMING GOVERNOR DAVE FREUDENTHAL

Wyoming Governor Dave Freudenthal spoke to WSEES participants on Monday, October 26, 2009. Governor Freudenthal said cooperation on the issues that were the focus of the WSEES is extremely important and the common ground for cooperation exists, but it is also a great challenge because states normally compete for resources and jobs. He noted participating legislators must keep in mind that there are other important stakeholders who must be involved in actions coming out of the symposium. The governor said regardless of the debate around climate change, the market is demanding certain types of electrons and that states must determine how to provide the most desirable energy at the best possible price. He emphasized the limits of the current electrical transmission grid are a key hurdle the nation must address to meet market demand and move clean electrons around the country. The governor encouraged WSEES participants to consider the facts and be realistic about state sovereignty issues as they worked to identify solutions with mutual benefits. He also encouraged participants to pick a few priorities to focus on as outcomes from the symposium.

STATE ENERGY CHALLENGES IN THE WEST

To initiate the plenary discussions, a designated legislative representative from each participating state provided a brief overview of the vision for his or her state's current energy mix and vision for their energy future, while highlighting key energy challenges facing their respective states. The following section summarizes the statements made by each state.

Alaska

Alaska possesses the largest oil deposit in the United States, 160 billion short tons of coal, as much as 300 trillion cubic feet of natural gas reserves, 44,000 miles of coastline with potential for tidal and/or wave power, abundant hydropower resources near its population centers as well as major wind and geothermal potential. The majority of the population lives in the central part of the state, which is served by six different electrical utilities, while there are small electrical grids in southeast Alaska and more than 200 small standalone grids serving villages around the state. The current breakdown of electrical generation in the state is 54 percent from natural gas, 24 percent from hydropower, 19 percent from petroleum products (diesel and naphtha), and 3 percent from coal. While Alaska does not have a renewable portfolio standard (RPS), the state aims to build on its hydropower base and produce 50 percent of electricity statewide from renewables by 2025. Alaska is a net energy exporter, but it does not have a state energy department or overarching energy policy, both of which are likely to be priorities in the state's next legislative session. The greatest challenge for the future will be defining the state's role as an energy exporter while keeping adequate energy supply in the state, as well as determining how to cover the cost of bringing renewable sources online.

Arizona

Arizona continues to grow rapidly and will need additional energy resources to meet future demands. The state has the largest nuclear facility in the nation and is currently a net exporter of energy. Arizona plans to draw on a variety of energy sources in the future, including solar, wind, coal and expanded nuclear power, as well as biomass and geothermal. The state's RPS requires that regulated electric utilities generate 15 percent of their energy from renewables by 2025. More than ten years ago, state buildings were required to reduce energy consumption by 15 percent by 2011. The state is incentivizing energy efficiency and renewables, with many projects under development. There are already numerous success stories. A solar installation near the Grand Canyon allows visitors to see the energy generated by the system, the first wind farm in the state was completed recently, and a biomass facility produces energy from forest fuels in the northeast part of the state. Arizona faces several challenges to meeting its RPS target, including siting projects on federal land and the availability of project financing. The state also faces challenges in developing a comprehensive energy strategy that integrates the needs of urban and rural areas.

California

California consumes more than 34 percent of the energy produced in the Western United States. California gets 46 percent of its energy from natural gas, 13.5 percent from renewables, 15 percent from nuclear, 10 percent from hydropower, and 15.5 percent from coal. The state is a net importer of energy with most of the coal-based energy being transmitted from outside the state. However, California exports energy at certain times of the year, which is important to making the state's energy system work. Most of California's energy decisions are now tied to the state's ambitious greenhouse gas (GHG) emissions reduction target of 80 percent by 2030. The state also has an RPS of 20 percent by 2010, which has not yet been achieved, but may be attainable by 2013. Energy efficiency is the primary strategy for meeting these targets, as the siting of transmission lines and generation facilities for renewables remains a challenge. In addition, there are currently no coal-fired power plants that meet California's emissions standards for bringing new coal sources online. However, advancement of carbon capture and storage technology could help meet that standard.

Colorado

Colorado's energy vision is focused on providing stable and predictable energy for the state and reducing the boom-bust volatility of the energy supply. The state legislature has passed a number of bills to foster the state's new energy economy, including an RPS of 20 percent renewable energy by 2020. Colorado is taking a variety of steps to make clean energy the cheapest form of energy available. The state has created incentives to encourage homeowners to install renewables and to sell energy back to the utility, mapped its renewable energy resources, and created grant programs and tax incentives to encourage bioscience and clean technology companies to locate in Colorado. New homes are required to be solar-ready, and the state is improving energy efficiency in state buildings and schools. Colorado incorporates both traditional forms of energy in the New Energy Economy, which is being driven by the development of new technology, the RPS, and state carbon goals. Pipeline capacity and transmission are the greatest challenges for the state.

Hawaii

Hawaii is the most geographically isolated and the most oil-dependent state in the nation and has the highest energy prices of any state. Petroleum generates 78 percent of Hawaii's energy, with 13 percent coming from coal, 5 percent from renewables, 1 percent from hydropower and 2 percent from other sources. Hawaii currently imports 96 percent of its oil and 100 percent of its coal. Hawaii's 2020 energy vision is embedded in the Hawaii Clean Energy Initiative, which aims to transform Hawaii into a global model for energy independence and sustainability. The goal is to meet 70 percent of Hawaii's energy needs with clean energy by 2030. Hawaii's statutory RPS sets a 2020 target of 25 percent electricity generation from renewable resources. The state's energy efficiency portfolio standard sets a target of reducing electricity use by 4300 gigawatt hours (GWh) by 2030, with the Hawaii Public Utility Commission setting interim goals for 2015, 2020, and 2025. The major challenge in realizing Hawaii's clean energy vision is

maintaining the political will and adequate level of funding for staff and other resources to carry out its long-term clean energy goals and objectives.

Idaho

Idaho's long-term energy plan has five main objectives, which are to: ensure a secure, reliable and stable energy system for the citizens and businesses of Idaho; maintain Idaho's low-cost energy supply and ensure access to affordable energy for all Idahoans; protect Idaho's public health, safety and natural environment and conserve Idaho's natural resources; promote sustainable economic growth, job creation and rural economic development; and provide the means for Idaho's energy policy to adapt to changing circumstances. The major energy challenges Idaho faces relate to its status as an importer of energy. Idaho has enjoyed low-cost hydropower energy due to abundant hydroelectric dams, but developing new large-scale hydro resources in the state is unlikely, and much of the state's baseload is met with coal. With transportation fuel included, Idaho currently relies on imported fossil fuel for 80 percent of its energy needs, which exposes consumers to volatility related to geopolitical events such as instability in oil-producing regions. It also means that most of what Idahoans spend each year on energy is sent to other states, providing little secondary economic benefit. Idaho seeks to develop new energy sources such as wind, geothermal, and biomass for which the continued development and modernization of the western electrical grid is critical.

Montana

Montana is a net energy exporter, producing 3,800 megawatts (MW) of energy and consuming 1,800 MW. The state has oil reserves as well as wind energy resources with a new wind project coming online in October 2009. Montana established a RPS in 2005 with the goal of 15percent renewables by 2015. In addition to wind power, the state has potential for hydropower, geothermal, solar and biomass energy. Montana does not have good access to energy markets, making transmission an extremely important issue for the state. The state is also working with Canadian interests to import energy from the oil sands, an opportunity that Montana believes warrants the consideration of other Western states.

Nevada

Nevada was the third state in the nation to adopt a RPS and one of the first to allow energy efficiency measures to count toward compliance with the RPS. The state's current RPS stands at 25percent by 2025 with a solar carve-out that increases to 6percent by 2025. Nevada has rich geothermal and solar energy resources and some wind, but still imports 33 percent of its electricity and all of its transportation fuel. A key feature of Nevada's energy vision is the recognition of the link between transportation and energy production. The state is working toward converting transportation sector to electric vehicles as well as ramping up energy efficiency in both the electric and transportation sector. An important challenge for Nevada is that 80percent of the land is federal so the state is working to gain ownership over public land suitable for renewable energy development. Transmission, facilities siting and environmental issues such as sage grouse protection are also challenges for Nevada.

North Dakota

North Dakota is a net exporter of energy but faces ongoing challenges in getting its energy to market. The state stands as the fourth-leading producer of oil in the United States while also possessing natural gas, coal (lignite), geothermal, wind, and hydropower resources. The state has developed many high-efficiency coal-fired power plants but faces transmission challenges as well as challenges meeting emissions standards of importing states to the East. North Dakota is interested in advancing carbon capture and storage technology and policy to facilitate the export of its coal energy. The state also needs to improve the efficiency of its pipelines for exporting its oil.

Oregon

Oregon's energy vision is to be a leader in the energy transformation of the United States. The state is focused on moving energy, improving energy efficiency, and creating market certainty to promote innovation and increase demand for clean energy. Oregon is focused on fostering access to a variety of affordable and reliable energy sources for electricity and transportation, as well as investment in research and development and educating today's consumers and the next generation about energy issues. Key themes for Oregon's energy future include treating efficiency as another form of power generation, making smart grid technology work, and letting the market choose winners. The state has abundant hydropower resources as well as wind energy, but it will need to continue importing natural gas well into the future, which creates opportunities for collaboration with other Western states.

South Dakota

South Dakota both imports and exports energy, hosting several federally operated hydropower dams along the Missouri River with a portion of that power exported to surrounding states. The state's imported power comes from coal-fired plants in Wyoming and North Dakota. South Dakota has a Renewable Energy Objective (REO) of 10 percent by 2015. Differing from many states, the objective holds a caveat that any renewable energy production put into operation for this REO should be cost effective. Maintaining affordable rates and reliable energy for South Dakota citizens is the primary goal of the state PUC. Overall, South Dakota is currently a net importer of energy, producing 6,136,605 megawatt hours (MWh) and consuming 10,603,301 MWh in 2007. However, the state's wind energy resources have the potential to transform the energy import/export balance of South Dakota. Increasing demand for clean wind energy in the Mid-West and East, promises to unleash South Dakota's wind resources. Transmission and related siting and land use issues stand as challenges to realizing this vision, while also creating opportunities for cooperation with neighboring states.

Utah

Utah's energy vision focuses on ensuring adequate, reliable, affordable, sustainable, and clean energy resources for the state. Utah residents get 80 percent of their electricity from coal-fired power plants, while natural gas is being used for most new energy generation in the state. Wind

and geothermal projects have recently been developed in Utah, but that energy is currently exported. Utah is committed to research and development to find ways to cleanly use existing resources such as natural gas, coal, oil, oil shale, and tar sands, as well as expand the development of renewable energy resources, including geothermal, solar, wind, biomass, biodiesel, and ethanol. The state also promotes further study of nuclear power generation. Utah will allow market forces to drive prudent use of energy resources, while also developing incentives to develop natural gas infrastructure for the transportation sector. The state will also pursue energy conservation, energy efficiency, and environmental protection. Utah is committed to state regulatory processes that balance economic costs with the level of review necessary to ensure protection of the state's various energy interests, and it is willing to collaborate with federal agencies when federal action is required. The state is also committed to maintaining affordable and stable consumer prices that provide suppliers a fair return on investment. Utah's primary challenges are federal regulatory barriers to development of energy resources on public lands, including uncertainty of federal environmental permitting processes.

Washington

Washington has natural gas and wind energy resources and is one of the most progressive states on climate change legislation. 72 percent of the state's carbon emissions from electricity come from a single coal plant, while transportation produces the state's largest carbon footprint. Washington has a RPS of 15 percent by 2020, but hydropower does not count making this an ambitious target. All utilities in the state are required to promote energy efficiency and conservation as a first fuel. Washington is interested in promoting integration of new technologies into the Pacific Northwest energy mix. Development of renewable energy in Washington is hindered by transmission issues and environmental protection concerns.

Wyoming

Wyoming's energy vision is to provide reliable, affordable, and secure energy to other Western states while protecting the state's unique wildlife and natural resources through best practices and innovation. The largest coal producer in the United States, the state also aims to ensure it receives fair value for its mineral resources. The need to protect Wyoming's unique natural resources and adhere to the Endangered Species Act, present challenges to fully developing the state's abundant energy resources including wind energy. Lack of consistency in permitting for transmission (power lines and pipelines) is also a challenge for Wyoming. The state is working on policy and technological innovation for carbon capture and storage in anticipation of a future carbon-constrained world in which coal and natural gas will be more expensive. Wyoming is also researching ways in which co-generation of wind and/or solar with natural gas and/or coal can meet market demand for clean energy and maximize mineral revenues in Wyoming.

WORK SESSION I: DEFINING CHALLENGES AND OPPORTUNITIES

Work Session I explored challenges and opportunities for coordinating Western states' energy policies to advance regional and sub-regional economic performance of a Western energy system. A panel of experts offered its views on the session topic and engaged in a facilitated discussion with legislative representatives from each participating state. The panelists for Work Session I were:

- John Schiffer, Wyoming State Senate (Session Chair)
- Ted Boyer, Chairman, UT Public Service Commission
- Kurt Hallead, Co-Head of Global Energy Research, RBC
- Vickie Patton, Deputy General Counsel, Environmental Defense Fund
- James Roberts, Board of Directors, Alpha Natural Resources, and former Chairman & CEO, Foundation Coal
- Jay Shogren, Distinguished Professor of Natural Resource Conservation and Management, University of Wyoming
- Richard Walje, President, Rocky Mountain Power

From the challenges identified during the "State Energy Challenges in the West" session and the Work Session I discussion emerged potential opportunities for cooperation among Western states. The following potential opportunities served as the foundation for further discussion in subsequent work sessions (in no particular order):

- Conducting economic and policy research to generate better information for decision makers about energy policy trade-offs including impacts on biodiversity and ecosystem services, and the potential costs of climate change impacts.
- Conducting technology research and development for carbon capture and storage, co-production plants, and renewable energy and energy efficiency technologies.
- Developing and implementing carbon capture and storage policy.
- Developing a better understanding of how to address cost implications for rate payers and tax payers.
- Influencing federal energy and carbon management policy including adding more perspective from energy producing states, leveraging the influence of Westerners currently in key federal positions, and improving communication between federal land management agencies and state and local agencies.
- Streamlining and increasing the efficiency of state and federal regulatory, siting, and permitting processes for transmission lines, pipelines, and energy generation facilities. Key issues include exploring potential legislative actions to facilitate cost allocation agreements between PUCs for transmission development, and improved handling of endangered species concerns.
- Developing a consistent energy loading order across the West.
- Coordinating state tax and incentive policies for energy efficiency and renewable energy development.
- Establishing state legislative resolutions to support a regional infrastructure authority.

WORK SESSION II: POLICIES AND ACTIONS FOR MOVING FORWARD WITH REGIONAL COOPERATION

Work Session II refined understanding of the opportunities identified in Work Session I and explored potential legislative actions participating states could take to pursue them in a cooperative manner. The following expert panelists offered their views on potential actions and engaged in a facilitated discussion with legislative representatives from each participating state:

- Mark Northam, Director, University of Wyoming School of Energy Resources (Session Chair)
- Sally Benson, Director, Global Climate & Energy Project, Stanford University
- Joel Bladow, Senior Vice President of transmission for Tri-State Generation and Transmission Cooperative.
- Audrey Chang, Director, California Climate Program, Natural Resources Defense Council
- Michael Early, Executive Director, Industrial Customers of Northwest Utilities
- Don McClure, Vice President of Government & Stakeholder Relations, EnCana
- Paul Newman, Commissioner, Arizona Corporation Commission

During the session, participating legislators and panelists added detail and focus to the potential opportunities from Work Session I. Through this discussion a better sense of the priority areas for state cooperation emerged. Transmission; carbon capture and storage; economic, legal, policy, and technological research; energy efficiency, and regulatory and permitting processes were highlighted throughout the session as issues on which states could gain mutual benefits through cooperation and legislative action. Rate payer protection and adopting a common loading order of energy resources (all cost-effective energy efficiency first, followed by renewable energy, then by cleaner fossil-fueled generation) were also raised as possible areas for cooperation, as was information sharing about how to incentivize community energy projects.

WORK SESSION III: ACTIONS AND AGREEMENTS FOR MOVING FORWARD

Work Session III solidified the final outcomes of the Western States Energy & Environment Symposium. As with the previous sessions, expert panelists offered their views and engaged in a facilitated discussion with legislative representatives from each participating state. The panelists for Work Session III were:

- Bill Schilling, President, Wyoming Heritage Foundation (Session Chair)
- Tim Considine, School of Energy Resources Professor of Energy Economics, University of Wyoming
- Scott Farris, Director of Government Relations in the Western United States, TransCanada
- John Nielsen, Energy Project Director, Western Resource Advocates
- Wayne Shirley, Director, Regulatory Assistance Project
- Jim Sims, President and CEO, Western Business Roundtable
- Mario Villar, Executive of Transmission, NV Energy

The session concentrated on refining the outcomes of Work Session II and reaching general agreement among participating legislators on the priority opportunities for legislative action and cooperation to optimize energy resource development while mitigating environmental impacts. These opportunities constituted the core elements for cooperative action and agreement to be captured in this report. See Appendix 7 for the summary presentation derived from Work Session III.

Part III of this report describes the rationale and foci for action for each of the priority opportunities on which participating states committed to cooperating moving forward.

PLENARY SPEAKER, MONTE ATWELL

Monte Atwell, President of Clean Coal Division at General Electric, delivered a presentation drawing on historical and current examples to examine what the United States must do to position itself to lead on energy policy and technology development into the future. Mr. Atwell posited the U.S. needs a major domestic marketplace for new energy technologies, and domestic agendas drive leadership while market dynamics drive innovation and bring costs down over time. He compared the United States' current investment in energy research and development (R&D) to other domestic spending and to investment by Japan and Europe. Mr. Atwell argued that the United States must invest more in energy research and development and policy implementation to create domestic markets for a suite of cleaner energy technologies and to assume a global leadership position on energy.

Mr. Atwell examined the United States' positioning to lead in different energy sectors. While the wind industry has grown rapidly in recent years, wise policy decisions and continued focus are required to ensure an ongoing market for wind energy and technologies. The high costs of solar power along with supply outweighing demand and a lack of a clear leader in the sector poses challenges to the viability of commercial-scale solar power. Mr. Atwell noted that biogas is a potentially large U.S. market He also showed that the country is making significant investment in transmission and smart grid technology and is positioned well to lead in this area if permitting and regulatory issues can be overcome. Nuclear power development has stalled, but there is a place for it in the nation's energy mix.

Mr. Atwell highlighted the country's interest in maintaining the viability of coal as an energy resource. It is the nation's most abundant and secure energy resource, and the economic implications of displacing coal-based energy generation are potentially severe. The balance of Mr. Atwell's presentation focused on policy and R&D steps the United States ought to take to lead in the development of carbon capture and storage (CCS) technology so that coal remains a vital part of the country's energy mix. Key steps include assigning a monetary value to carbon, creating incentives for commercial deployment of CSS, initiating large CCS demonstration projects, and requiring mandatory greenhouse gas emissions reporting.

See Appendix 8 for Mr. Atwell's presentation slides.

PART III: ITEMS FOR COOPERATIVE ACTION AMONG PARTICIPATING WESTERN STATES

PREAMBLE: COMMON INTERESTS AMID DIVERSITY

This section of the report outlines actions within the spectrum of energy and environment issues discussed during the WSEES that legislators from participating states agreed they could pursue in a cooperative manner. In pursuing these actions, legislators will assess the costs and benefits of various options with respect to energy development, production, reliability, marketing, use and environmental protection. Western states can learn from one another's successes and challenges, and recognize that in addition to collaboration between all participating states, there may be opportunities for subsets of states to work together. All participating states also recognize the importance of involving other stakeholders including regional organizations, respective state executive branches, and federal agencies, as their respective legislatures take action on these important issues.

CARBON MANAGEMENT POLICY

Participating state representatives at the Western States Energy & Environment Symposium offered a range of perspectives on the economic and environmental implications of potential federal carbon management legislation. A number of representatives expressed concern about potential costs to consumers and adverse impacts on state economies, as well as the creation of new federal bureaucracy, new financial markets, and loss of state autonomy. Others expressed support because of the need to establish market certainty and to avoid a patchwork of regulation across the nation, as well as concerns about the possible costs of inaction to ecosystems and people. Given the diversity of views, it was evident that cooperative action on this issue is unlikely. Therefore, the issue was set aside in favor of a focus on genuine and promising opportunities for cooperative action among Western states on energy development, production, reliability, marketing, use and environmental protection.

Participating states recognize there is great diversity among Western states with regard to energy and environmental issues. Some are net exporters, while others are net importers. Overall population and population density varies significantly across states, ranging from states with multiple concentrated urban centers (e.g., California) to others with mostly dispersed rural communities (e.g., Alaska). Each state has a different mix of existing and desired energy resources, while all states respect one another's right to choose different combinations of energy resources. Finally, each state has different intrastate politics and internal decision-making processes.

While this great diversity poses challenges to interstate cooperation, Western states also recognize their diversity presents opportunities for mutually beneficial interactions and positive collective outcomes as states pursue their individual energy and environmental priorities. Participating states acknowledged the following common interests with regard to energy and environmental issues:

- To ensure the prosperity of our individual states and the region by acknowledging the inextricable link between energy, economic welfare and environmental stewardship.
- To protect the interests of our citizens.
- To sustain or develop a diverse mix of energy resources.
- To provide affordable, reliable and environmentally responsible energy.
- To facilitate the establishment of market certainty to enable business decision making and access to capital.

OPPORTUNITIES FOR LEGISLATIVE ACTION AND COOPERATION AMONG PARTICIPATING STATES

Action Item 1: Advance the Development of New Transmission Lines

Rationale

Electrical transmission was the predominant theme of the WSEES, with nearly all participating states citing challenges related to electrical transmission. The most fundamental challenge is that new transmission lines are needed in most states to meet additional demand using in-state resources, export surplus energy to markets, or import energy from neighboring states. Additional transmission is needed by states striving to meet RPS targets. Several states are already developing and/or possess significant potential to develop renewable energy resources but need to increase the capacity of the grid by building new lines to transmit the energy to load centers. For example, Montana, South Dakota and Wyoming all possess excellent wind resource potential, but development and distribution of the resource are constrained by the lack of capacity on the existing transmission lines. The same scenario exists for solar power in Arizona and Nevada, and for geothermal in Idaho, Nevada and Utah.

Transmission projects are complex and long-term and Western states face a number of common challenges in pursuing the construction of new transmission lines. Identifying feasible land corridors within and across states, and negotiating not-in-my-backyard (NIMBY) attitudes among the public are basic issues that must be overcome. Cost allocation and disjointed and slow state and federal permitting processes are also hindrances to transmission siting and development. The existing structure of state public utility commissions (PUCs) is a challenge because they are not designed to consider regional energy challenges when setting rates. Therefore, cost allocation is a key issue since PUCs that will not benefit directly from bringing new energy resources online are less likely to support the development of new transmission lines that cross their territory.

Focus for Action

Participating legislators identified a number of potential opportunities for legislative action and interstate cooperation to advance transmission development in the West. Legislators acknowledged that states must work together to bring new energy to Western population centers. Many efforts are under way to address various aspects of the transmission challenge, such as the Western Governors' Association's Western Renewable Energy Zones project. Therefore, a key element of the focus for action on transmission is for the state legislators to

identify opportunities for legislative action in their respective states, while coordinating those actions with neighboring states and other ongoing initiatives. Options discussed for legislative action and cooperation between participating Western states to address transmission challenges include:

- Providing legislative direction to state PUCs to consider regional energy challenges when setting rates and to expedite development of new transmission lines.
- Empowering PUCs to engage in joint fact-finding with PUCs in neighboring states which would enable developers and utilities to simplify their presentations and permit applications to different states.
- Establishing a regional process to coordinate the planning and siting of transmission lines.
- Working together to influence federal land management policy and guidelines for transmission siting and well as policy making at the Federal Energy Regulatory Commission.
- Sharing information about workable strategies for streamlining permitting processes within individual states so that similar processes evolve throughout the region.
- Exploring options and mechanisms for bundling electricity from multiple renewable energy projects to meet RPS targets.
- Examining the rate implications of renewable energy credits derived from bundled versus unbundled interstate transmission sources.

Action Item 2: Accelerate the Development and Deployment of Carbon Capture and Storage Technology

Rationale

Coal fuels baseload electricity generation for many power plants in the West and around the nation. Fossil fuels will remain a critical component of the West's energy portfolio well into the future as work continues to increase the reliability of renewables, scale them up and connect them to the grid. Carbon capture and storage (CCS) holds promise as a method to ensure the West and the nation continue to benefit from the nation's most abundant domestic energy source. With federal carbon management regulation likely in the near future, Western states recognize the need to accelerate CCS development so it can serve to reduce carbon dioxide emissions from fossil fuel energy generation facilities.

CCS is a complex technical challenge requiring effective technology for capturing carbon emissions and injecting them into underground geologic formations, and ensuring that storage wells will remain stable and safe to people and the environment over time. A number of entities are engaged in CCS research and development including multiple regional carbon sequestration partnerships in the West sponsored by the U.S. Department of Energy, companies such as Rocky Mountain Power and General Electric, and university research programs such as the University of Wyoming School of Energy Resources and Zero Emissions Research and Technology (ZERT) Center at Montana State University. In February 2009, the Wyoming State Legislature passed legislation to address ownership and liability issues related to geological

storage of carbon dioxide, helping to clarify the legal and regulatory issues related to geologic storage of carbon dioxide. Nonetheless technology, public opinion and regulatory hurdles pose significant challenges to commercial deployment of CCS. Given the current status, pace and high cost of CCS technology research and development in the United States as well as unresolved regulatory challenges, experts estimate that commercial scale deployment of CCS could take as long as 20 years.

Focus for Action

Most participating legislators acknowledged a common interest in developing and deploying CCS technology and called for greater interstate coordination and cooperation to accelerate ongoing efforts. States supported taking action to explore the feasibility and potential scope of a formal collaborative effort to address priority CCS issues and develop other carbon dioxide mitigation technologies. Priority issues that such an interstate collaboration might consider include:

- Engagement of state legislative bodies with existing regional CCS partnerships to better understand existing challenges and support collaboration between regional partnerships.
- Development of similar regulatory frameworks and permitting processes for CCS to facilitate future siting of underground storage wells that cross state borders, including a common definition of property rights and liability rules.
- Development of incentives and/or creative financing approaches (e.g., public-private partnerships) to support research and development of CCS technology and other emissions limiting technologies, including pilot CCS demonstration projects.

Given the estimated time frame for commercial viability of CCS, some states suggested that such an interstate collaboration around new technologies not focus solely on CCS at the expense of deploying readily available technologies for energy efficiency and renewables, including geothermal.

Action Item 3: Streamline and Harmonize Energy-Related Regulatory Processes

Rationale

Utilities and developers need regulatory consistency and certainty to move ahead with confidence on major transmission, pipeline and energy generation facilities projects. State and federal permitting processes for these large-scale energy projects are complex and confusing, and obtaining approval can take a long time. A number of companies are eager to move ahead with new projects, but the uncertainty and extended time frame associated with permitting is a major deterrent to making such business decisions. For example, the proposed Gateway West Transmission Project aims to build eleven transmission line segments with a total length of approximately 1,000 miles across southern Wyoming and southern Idaho. The route, jointly proposed by Idaho Power and Rocky Mountain Power, crosses approximately 500 miles of public land. The Bureau of Land Management (BLM) and U.S. Forest Service are currently conducting the National Environmental Policy Act (NEPA) process for the project. The overall

project timeline, from permitting through construction, is on track to take eight to ten years. Other electrical transmission projects can take three to five years, and natural gas pipelines typically take one to two years to permit. These kinds of extended time frames and the associated uncertainty create financing challenges for utilities as well as making it difficult to decide which resources to develop.

The lack of a consistent regulatory framework for CCS could become an obstacle to deploying that technology as well, but it also offers an opportunity for states to cooperate on the development of streamlined and aligned permitting processes between states. Development of similar regulatory frameworks and permitting processes for CCS, possibly modeled after the legislation develop by the State of Wyoming, could help facilitate future siting of underground storage wells that cross state borders.

Focus for Action

Participating states agreed they need to work together to identify defects in the current regulatory system and establish simpler, clearer and more expeditious ways to process permits within individual states and coordinate permitting processes between states, as well as with federal agencies enforcing laws such as the Endangered Species Act. State legislatures have oversight over siting and permitting decisions so they can take action to enable industry to get to the construction phase with more confidence. Streamlining and harmonizing permitting processes at a regional scale promises to bring benefits to energy exporting states seeking to deliver new energy generation, including renewables, to market, as well as importing states that need to meet growing energy demands. Legislators at the WSEES outlined the following possibilities for cooperative action to streamline and harmonize regulatory processes for large-scale energy projects:

- Identify feasible legislative actions to improve the efficiency of regulatory and permitting processes within states and between states for transmission, pipeline and facilities siting;
- Explore interstate/regional cooperation for management and mitigation of endangered species issues such as those related to sage grouse protection;
- Develop uniform approaches to emerging issues and opportunities that are common across states such as siting for geologic storage of carbon dioxide and geothermal facilities;
- Share information about successful streamlining measures for facilities siting;
- Ensure that state regulatory/permitting agencies are adequately staffed with properly trained people so that applications can be processed more quickly; and
- Enhance common understanding of the role of private property rights in siting and permitting decisions.

Action Item 4: Facilitate the Creation of Mechanisms for Rate Payer Protection

Rationale

The primary mission of utilities is to ensure the delivery of reliable and affordable power to their customer base. In several Western states, utility companies are seeking opportunities to bring renewables online to diversify their portfolios and meet RPS targets. Many utilities are legislatively allowed to pass along some added costs to their customers to develop renewables. However, they are reluctant to move ahead with the development of interstate transmission lines because of the financial risk involved and the long-term cost burden that will be passed on to their customers. Utilities need to find ways to reduce or share the costs of new transmission to connect renewables to the grid.

Focus for Action

In addition to the interstate cooperation to align and streamline transmission siting and permitting processes discussed above, participating states also agreed to explore legislative actions that could help defray the costs of building new transmission lines that cross the territories of different utilities. The focus should be to determine what adjustments to state PUC regulations may be necessary to facilitate and accommodate interstate arrangements that enable utilities to invest safely in the construction of new transmission. Potential outcomes include the creation of incentives or interstate mechanisms that serve to allocate the financial risk and actual costs of constructing new transmission lines among multiple stakeholders (e.g., utility companies, state governments or federal government).

Action Item 5: Promote Energy Efficiency as a Critical Strategy

Rationale

Promoting and increasing energy efficiency and conservation in all sectors of society is a low cost, low risk, zero emissions strategy that all states can use to reduce energy demand and meet future load growth. Improved energy efficiency can be achieved at a cost of approximately 2 to 3 cents per kilowatt hour, less than half of typical baseload generation costs. Implementing energy efficiency measures also promises to stimulate state economies as it reduces energy costs for consumers and increases their buying power. Energy efficiency initiatives also stimulate development of new technologies and creation of new jobs as workers are needed to retrofit homes and buildings for enhanced energy efficiency, as well as manufacture and sell high-efficiency technologies such as home appliances and insulation. Some experts estimate the nation could achieve an 18 percent reduction in energy use nationwide through the use of off-the-shelf technologies available on the market today.

Focus for Action

Participating states at the WSEES recognized that setting and committing to the attainment of energy efficiency goals are actions on which Western states generally agree and can support one another in executing. Legislators suggested they could support one another in identifying ways to implement and/or expand energy efficiency programs in individual states throughout the

region. Participating legislators called for cooperative action around energy efficiency on the following fronts:

- Share information about updated building standards and codes, cost-effective energy efficiency program strategies to engage the public and private sectors, as well as incentives that successfully motivate utilities to promote energy efficiency.
- Explore options for the development of a regional energy efficiency public education and media campaign.

Action Item 6: Conduct Cooperative Research to Overcome Energy-Related Economic, Legal, Policy and Technology Challenges

Rationale

States throughout the West are facing a range of challenges related to energy production, reliability, marketing, use and environmental protection, many of which are shared across state lines. Challenges range from the economic impacts of shifting energy portfolios to legal issues such as private property rights related to facility siting. Research can also inform the creation of wise and durable policies for incentivizing renewable energy development and energy efficiency. Furthermore, the energy sector is in the midst of dramatic technological innovation and additional research and development is needed to advance emerging technologies so that that can be deployed affordably on a commercial scale.

Universities, research institutions and national laboratories throughout the West are working hard to understand energy-related challenges and to develop workable solutions to them. There were several examples of ongoing cooperative energy research in the West noted during the symposium. For example, the State of Colorado has helped forge a partnership among the National Renewable Energy Laboratory (NREL), the University of Colorado at Boulder, Colorado State University and the Colorado School of Mines to accelerate the commercial deployment of renewable energy and energy efficiency technologies. The three universities also are exclusive partners with Alliance for Sustainable Energy, which manages and operates NREL. ZERT is a research collaborative focused on understanding the basic science of underground (geologic) carbon dioxide storage to mitigate greenhouse gasses from fossil fuel use and to develop technologies that can ensure the safety and reliability of that storage. ZERT is a partnership involving several U.S. DOE laboratories as well as Montana State and West Virginia University.

Focus for Action

Legislators at the WSEES agreed that fostering collaborative research between state universities and research institutions on energy challenges is a very promising area for cooperative action. Such endeavors can be expensive for a single institution to undertake, while the results have the potential to benefit state governments, companies and citizens across the region and nation. State legislatures in the West can leverage resources and accelerate the development of solutions to energy production, reliability, marketing, use and environmental protection challenges by carrying out the following actions:

- Direct state-funded universities to explore cooperative research arrangements with other Western institutions;
- Appropriate funds to address high priority technology research and development needs (e.g. CCS, battery and energy storage, concentrated solar, etc.); and
- Engage in dialogue with research institutions in their respective states to identify priority research questions relevant to legislative decision makers on specific issues such as:
    - The feasibility of a Western regional loading order that prioritizes energy efficiency as the "first fuel";
    - The potential costs, benefits and complexities of decoupling the sales and revenue of investor-owned electric utilities in order to motivate the promotion of energy efficiency;
    - Energy bundling to support attainment of renewable energy portfolio standards;
    - The relative potential value of investment in CCS research and development compared to investment in other research and development efforts;
    - The economic implications of different carbon management policies for different Western states and the region as a whole; and
    - The potential economic and environmental impacts of climate change in the West.

Other Opportunities for Exploration

The following areas of potential cooperative action among participating states were raised during the symposium and considered worth further exploration, but legislators did not discuss them in depth, nor reach clear resolution on a path forward:

- Establishment of uniform rules for emissions reporting throughout the region and nation;
- Influencing federal energy-related policy from a regional perspective;
- Development of natural gas vehicle refueling infrastructure in the Western region;
- Promoting and creating incentives for community/distributed energy projects; and
- Coordinating state tax policies and incentives to promote common action on energy issues across Western states.

SUMMARY OF ACTION ITEMS

In summary, states participating in the WSEES identified the following six categories (as detailed above) to pursue in a cooperative manner because doing so is likely to generate mutual benefits throughout the Western region:

1) Advance the development of new transmission lines;
2) Accelerate the development and deployment of carbon capture and storage technology;
3) Streamline and harmonize energy-related regulatory processes;
4) Facilitate the creation of mechanisms for rate payer protection;

5) Promote energy efficiency as a critical strategy; and
6) Conduct cooperative research to overcome energy-related economic, legal, policy, and technology challenges.

In pursuing legislative action on these items, states will assess the costs and benefits of various options with respect to energy development, production, reliability, marketing, use and environmental protection.

SUMMARY OF NEXT STEPS

The WSEES concluded with a final round of comments from state legislative representatives to affirm each state's commitment to pursuing the opportunities for legislative action and cooperation outlined above. During their final statements, a number of legislators made specific commitments to follow-up through possible hearings in their respective legislatures and/or drafting legislation. Legislators acknowledged all states will not engage on every opportunity, but several said they intended to reach out to other states to work together, including cooperating with subsets of participating states to address issues on which there was less collective agreement. Participating legislators also acknowledged there is an opportunity to consult with leaders from the West that are serving important roles in the current administration, including Secretary of the Interior Ken Salazar, FERC Chairman Jon Wellinghoff, and Senator Harry Reid. Despite some divergence regarding priorities for action, states participating in the WSEES generally agreed that the time is ripe for cooperative action to assess and address a number of common challenges in the region related to energy development, production, reliability, marketing, use and environmental protection.

In addition to the commitments of individual states, The Council of State Governments-WEST (CSG-WEST), upon approval of the CSG-WEST Officers and Executive Committee, will incorporate the ideas and opportunities identified by participating legislators at the WSEES into the agenda of the CSG-WEST Energy and Environment Committee. A primary focus of the CSG-WEST Energy and Environment Committee will be integrating ideas from the Symposium on the critical need for new electrical transmission infrastructure in the Western electrical grid into the ongoing collaborative effort by CSG-WEST and the Western Governors' Association to develop a Western Renewable Energy Zones project.

WESTERN STATES ENERGY & ENVIRONMENT SYMPOSIUM FINAL REPORT

APPENDICES

HOUSE BILL NO. HB0295

Western states energy and environment symposium.

Sponsored by: Representative(s) Simpson, Buchanan, Lubnau, Meyer and Stubson and Senator(s) Bebout, Burns, Coe and Schiffer

A BILL

for

AN ACT relating to the western states energy and environment symposium; authorizing a western states energy and environment symposium as specified; establishing a steering committee to develop plans and funding for the symposium; providing that the University of Wyoming school of energy resources shall conduct the symposium at the direction of the steering committee; authorizing legislative participation in the planning as specified; requiring a report after the symposium; providing appropriations; and providing for an effective date.

Be It Enacted by the Legislature of the State of Wyoming:

Section 1.

(a) A symposium steering committee is hereby created consisting of one (1) member of the Wyoming house of representatives appointed by the speaker of the house, one (1) member of the Wyoming senate appointed by the president of the senate, one (1) member representing energy producers, one (1) member representing energy consumers and one (1) member representing general business. The last three (3) members shall be appointed jointly by the president of the senate and the speaker of the house. The steering committee shall develop plans and funding for a western states energy and environment symposium to be held by November 1, 2010. The symposium shall be conducted by the University of Wyoming school of energy resources at the direction of the steering committee. The steering committee shall:

(i) Develop plans and funding for the western states energy and environment symposium;

(ii) Solicit public and private funding to supplement public funding appropriated under this act for the western states energy and environment symposium;

(iii) Invite the following persons or representatives to attend and participate in the western states energy and environment symposium:

(A) Select legislators and executive branch members from the governments of the thirteen (13) western states that are members of the council of state governments-west;

(B) Experts from all key energy industries;

(C) Experts from conservation, environmental and other concerned interest groups;

(D) Top experts in the field of energy development, energy use, environment and economics;

(E) A representative from state or regional chambers of commerce and business roundtables;

(F) A representative from county government and a representative from municipal government from the thirteen (13) western states that are members of the council of state governments-west;

(G) Any other persons and representatives of entities or organizations the steering committee may determine have an interest in contributing to or participating in the western states energy and environment symposium, including members of the general public.

(iv) Solicit advice and opinions from experts and technical resources on energy development and use, and environmental protection consistent with the purposes of the symposium;

(v) Solicit participation by national and regional organizations and think tanks, including but not limited to the energy council, the interstate oil and gas compact commission, the energy foundation, the national conference of state legislatures, the council of state governments-west and the western governors association;

(vi) Work to establish a cooperative agreement among the participants to develop a high level cost/benefit economic analysis assessing the challenges of energy development, production, marketing, use and environmental

protection within the western states, including an analysis of:

(A) Renewable energy development, production and use;

(B) Fossil fuel development, production and use;

(C) Nuclear energy development, extraction and use;

(D) Carbon management and impacts on cost of energy development, production, use and environmental protection;

(E) Air quality in the context of energy development, production and use;

(F) Projected demands and costs of energy.

(vii) Submit a report no later than forty-five (45) days after the symposium adjourns to the legislatures,

governors and congressional delegations of participating states and to all participants in the conference.

(b) Legislative members assisting the school of energy resources under subsection (a) of this section shall receive salary and reimbursement for per diem and travel expenses incurred in the performance of their duties, as provided in W.S. 28-5-101.

(c) The school of energy resources may contract with consultants as necessary to facilitate the western states energy and environment symposium and its purposes.

(d) The western states energy and environment symposium may be held within Wyoming or in any other state that may be participating in the symposium.

Section 2.

(a) There is appropriated two hundred fifty thousand dollars ($250,000.00) from the general fund to the University of Wyoming school of energy resources. This appropriation shall be for the period beginning with the effective date of this act and ending December 31, 2010.

This appropriation shall only be expended for the purpose of providing the staffing, technical support, including contracting with consultants as necessary, and costs of planning, conducting and reporting on the western states energy and environment symposium authorized under section 1 of this act. Notwithstanding any other provision of law, this appropriation shall not be transferred or expended for any other purpose and any unexpended, unobligated funds remaining from this appropriation shall revert as provided by law on December 31, 2010.

(b) There is appropriated two hundred thousand dollars ($200,000.00) from the general fund to the legislative service office. This appropriation shall be for the period beginning with the effective date of this act and ending December 31, 2010. Notwithstanding any other provision of law, this appropriation shall not be transferred or expended for any other purpose and any unexpended, unobligated funds remaining from this appropriation shall revert as provided by law on December 31, 2010. This appropriation shall be used for:

(i) Salary and per diem expenses of legislative members appointed pursuant to subsection (a) of this section for the performance of their duties under this act;

(ii) Payment of the actual expenses of Wyoming legislators who attend the western states energy and environment symposium;

(iii) The award of scholarships, fellowships or other financial aid or honoraria to provide for the attendance of select legislators and executive branch members from the other thirteen (13) western states at the symposium. At the direction of the steering committee, the legislative service office shall transfer funds from this appropriation to the University of Wyoming as necessary so that the university may award the scholarships, fellowships or other financial aid or honoraria as provided under this paragraph.

Section 3. This act is effective immediately upon completion of all acts necessary for a bill to become law as provided by Article 4, Section 8 of the Wyoming Constitution.

(END)

Western States Energy & Environment Symposium

Steering Committee Membership

Chairman

Representative Tom Lubnau
Wyoming State House of Representatives
Attorney at Law

Members

Senator John Schiffer
Wyoming State Senate
Rancher

Kyle Davis
Director, Environmental Policy and Strategy
PacifiCorp

Nancy Ryan
Deputy Executive Director for Policy and External Relations
California Public Utility Commission

Bill Schilling
President
Wyoming Heritage Foundation

Western States Energy & Environment Symposium

Teton Village
Jackson, Wyoming
October 25-27, 2009

Agenda

Objectives:

The following objectives should be accomplished in recognition of the importance of the Western states establishing a cooperative capacity to generate, transport and utilize energy in an economically viable, reliable, and environmentally sensitive manner.

1) Bring together public officials, key stakeholders and notable thought leaders to examine state energy policies from a regional perspective and work towards establishing a common regional vision;
2) Explore opportunities for and impediments to coordinating Western states' energy policies to advance regional and sub-regional economic performance of a Western energy system;
3) Identify state, regional and federal policy challenges and potential solutions for delivering energy resources to consumers;
4) Develop potential regional policy solutions to mitigate the environmental impacts of energy resource development, delivery and consumption in the west; and
5) Work to establish a cooperative agreement among the participants to develop a high-level cost/benefit economic analysis assessing the challenges of energy development, production, reliability, marketing, use and environmental protection within these states.

Desired Outcomes:

1) A common understanding of each states respective interests and concerns with regards to the stated objectives;
2) A commitment to carry out clear actions steps (blueprint) to address stated objectives one through four; and
3) A cooperative agreement among the 13 Western states that make up Council of State Governments – WEST, as well as North Dakota and South Dakota, to work towards a high-level cost-benefit economic and other analysis assessing the challenges of energy development, production, reliability, marketing, use and environmental protection within these states.

Sunday, October 25, 2009

******Registration will be open from 9:00 a.m. to 6:00 p.m. in the main lobby of Hotel Terra.******

Pre-Symposium Activities at Teton Village Hotels

3:00 p.m. **Press Conference at the Teton Club Great Room**

4:00 – 5:45 p.m. **Exhibitors Hall and Cash Bar at Hotel Terra**
Cash Bar at Teton Mountain Lodge

5:45 – 7:30 p.m. **Dinner at Hotel Terra *or* Teton Mountain Lodge**
Please see the personal agenda in your meeting packet for your dinner location.

Symposium Opening Session at Walk Festival Hall

7:45 – 9:00 p.m. **Welcome**
Tom Lubnau, Representative, Wyoming State House of Representatives

Opening Remarks
Senator John Barrasso, State of Wyoming

Keynote Speaker: Harnessing Economics for Energy and the Environment
Robert N. Stavins, Albert Pratt Professor of Business and Government at the Harvard Kennedy School; Director of the Harvard Environmental Economics Program; and Chairman of the Environment and Natural Resources Faculty Group

Monday, October 26, 2009

******Registration will be open from 6:30 a.m. to 11:00 a.m. in the main lobby of Hotel Terra.******

Morning Symposium Session at Walk Festival Hall

8:00 a.m. **Welcome**

Tom Lubnau, Representative, Wyoming State House of Representatives

8:15 a.m. **Opening Remarks**

John Hines, President, Wyoming State Senate

8:30 a.m. **Plenary Speaker: Western Energy Challenges – Why Regional Cooperation?**

The Governor of Wyoming will provide an overview of Western energy challenges and reasons why regional cooperation is critical to overcoming them.

Governor Dave Freudenthal, State of Wyoming

9:00 a.m. **Plenary Session: State Energy Challenges in the West**

A legislative representative from each participating state will provide a 5-minute overview of the vision for their state's energy future in 2020, highlighting what they see as major challenges to achieving that vision.

10:15 a.m. **Break**

10:45 a.m. **Work Session I: Defining the Challenges and Opportunities**

This session will explore challenges and opportunities for coordinating Western states' energy policies to advance regional and sub-regional economic performance of a Western energy system. Topics covered may include regional challenges of RPS, carbon management, grid management, assuring reliability, environmental concerns and the implications of having some states in the region that are net exporters of energy resources and those that are expected to be net-importers.

The session will begin with each panelist giving a 5-minute overview of their perspective on the issues outlined for the session. Legislative representatives from each state will join the panel of experts for an initial facilitated discussion, which will then be open to audience of stakeholders and other policy makers for participation.

Desired Outcome: *Delineate the major challenges and opportunities for regional cooperation.*

Session Chair: John Schiffer, Senator, Wyoming State Senate

Panel of Experts:

- Kurt Hallead, Co-Head of Global Energy Research, RBC
- James Roberts, Board of Directors, Alpha Natural Resources, and former Chairman & CEO, Foundation Coal
- Richard Walje, President, Rocky Mountain Power
- Vickie Patton, Deputy General Counsel, Environmental Defense Fund
- Ted Boyer, Chairman, UT Public Service Commission
- Jay Shogren, Distinguished Professor of Natural Resource Conservation and Management, University of Wyoming

12:30 p.m. **Break for Lunch**

Lunch Break at Teton Village Hotels

12:45 p.m. **Networking Lunch at Hotel Terra *or* Teton Mountain Lodge *or* Snake River Lodge**

Please see the personal agenda in your meeting packet for your lunch location.

1:30 p.m. **Press Conference at the Teton Club Great Room**

Afternoon Symposium Session at Walk Festival Hall

2:00 p.m. **Summary of Challenges and Opportunities from Work Session I**

John Ehrmann, Senior Partner, Meridian Institute

2:30 p.m. **Work Session II: Policies and Actions for Moving Forward with Regional Cooperation**

This session will explore potential regional solutions to address the challenges identified in Work Session I. Topics covered may include regional policy options, actions to facilitate infrastructure development, approaches to anticipate and mitigate environmental impacts.

The session will begin with each panelist giving a 5-minute overview of their perspective on the issues outlined for the session. Legislative representatives from each state will join the panel of experts for an initial facilitated discussion, which will then be open to audience of stakeholders and other policy makers for participation.

Desired Outcome: *Identify potential policies and actions for Western states to cooperatively advance regional solutions to energy challenges.*

Session Chair: Mark Northam, Director, University of Wyoming School of Energy Resources

Panel of Experts:

- Michael Early, Executive Director, Industrial Customers of Northwest Utilities
- Joel Bladow, Senior Vice President of transmission for Tri-State Generation and Transmission Cooperative.
- Audrey Chang, Director, California Climate Program, NRDC
- Paul Newman, Commissioner, Arizona Corporation Commission
- Don McClure, Vice President of Government & Stakeholder Relations, EnCana
- Sally Benson, Director, Global Climate & Energy Project, Stanford University

4:15 p.m. **Review of Day 1 and Preview of Day 2**

John Ehrmann, Senior Partner, Meridian Institute

4:30 p.m. **Adjourn**

Evening Activities at Teton Village Hotels

4:30 – 5:45 p.m. **Exhibitors Hall and Cash Bar at Hotel Terra**
Cash Bar at Teton Mountain Lodge

5:45 – 7:30 p.m. **Dinner at Hotel Terra *or* Teton Mountain Lodge**
Please see the personal agenda in your meeting packet for your dinner location.

Networking at Mangy Moose Pub

Tuesday, October 27, 2009

****Registration will be open from 6:30 a.m. to 11:00 a.m. in the main lobby of Hotel Terra.****

Morning Symposium Session at Walk Festival Hall

7:30 a.m. **Welcome**
Tom Buchanan, President, University of Wyoming

7:45 a.m. **Summary of Potential Policies and Actions from Work Session II**
John Ehrmann, Senior Partner, Meridian Institute

8:00 a.m. **Work Session III: Actions and Agreements for Moving Forward**

This session will explore ways in which Western states can collaborate to optimize energy resource development while mitigating environmental impacts on water, air, and wildlife resources.

The session will begin with each panelist giving a 5-minute overview of their perspective on the issues outlined for the session. Legislative representatives from each state will join the panel of experts for an initial facilitated discussion, which will then be open to audience of stakeholders and other policy makers for participation.

***Desired Outcome:** Identify high priority recommendations for cooperative action and agreement contributing to a Western regional energy vision.*

Session Chair: Bill Schilling, President, Wyoming Heritage Foundation

Panel of Experts:

- Scott Farris, Director of Government Relations in the Western United States, TransCanada
- John Nielsen, Energy Project Director, Western Resource Advocates
- Mario Villar, Executive of Transmission, NV Energy
- Wayne Shirley, Director, Regulatory Assistance Project
- Jim Sims, President and CEO, Western Business Roundtable
- Tim Considine, School of Energy Resources Professor of Energy Economics, University of Wyoming

9:15 a.m. **Break**

9:45 a.m. **Work Session III Continued**

The Work Session III facilitated discussion will continue.

11:00 a.m. **Plenary Speaker**

Monte Atwell, President of Clean Coal Division, General Electric

11:30 a.m. **Break for Lunch**

Lunch Break at Teton Village Hotels

11:45 a.m. **Networking Lunch at Hotel Terra *or* Teton Mountain Lodge *or* Snake River Lodge**

Please see the personal agenda in your meeting packet for your lunch location.

Press Conference at the Teton Club Great Room

Afternoon Symposium Session at Walk Festival Hall

12:15 p.m. **Plenary Session: Commitments for Cooperative Action**

The facilitator will review of the recommendations from the work sessions and summarize the key conclusions from the Symposium. A representative from each participating state will identify actions their state will take to further the cooperative actions identified during the Symposium.

Desired Outcome: *Participants commit to individual and cooperative actions to advance recommendations.*

12:45 p.m. **Closing Remarks**

Colin Simpson, Speaker, Wyoming State House of Representatives

1:00 p.m. **Adjourn**

Western States Energy & Environment Symposium Approved Attendee List

	First Name	Last Name	Title	Company/Organization	Email	Work Phone
1	Bryr	Aiken	Guest	WSGS	bryr_patch@hotmail.com	
2	Marilyn	Aiken	Financial Specialist	Geological Survey	maiken@uwyo.edu	(307) 766-2286
3	Jim	Anderson	Majority Floor Leader	Wyoming Senate	jamesda1@msn.com	(307) 436-9618
4	Jim	Anderson	Majority Floor Leader	Wyoming Senate	jamesda1@msn.com	(307) 436-9618
5	Shannon	Anderson	Organizer	Powder River Basin Resource Council	sanderson@powderriverbasin.org	(307) 672-5809
6	Mike	Ashton	Government Relations Manager - Rockies Region	Exxon Mobil Corporation	michael.d.ashton@exxonmobil.com	(307) 638-0067
7	Monte	Atwell	General Manager	GE Energy - Gasification	monte.atwell@ge.com	(713) 803-0557
8	Pat	Aullman	Field Rep.	US Rep. Cynthia Lummis	Pat.Aullman@mail.house.gov	(307) 883-1088
9	Jules	Bailey	State Representative	Oregon State Legislature	rep.julesbailey@state.or.us	(503) 236-3681
10	Aaron	Bannon	Stewardship Coordinator	NOLS	aaron_bannon@nols.edu	
11	Mark	Barron	Mayor	Town Of Jackson	mbarron@ci.jackson.wy.us	
12	Roger	Barrus	Representative	Utah House of Representatives	rogerbarrus@utah.gov	(801) 556-3311
13	Reagen	Bebout	Feild Rep	Senator Enzi	Reagen-Bebout@enzi.senate.gove	
14	Sally	Benson	GCEP Director	Stanford University	smbenson@stanford.edu	(650) 725-0358
15	Rosie	Berger	Representative	Wyoming Legislature	rberger@wyoming.com	
16	Bob	Berger	Representative	Wyoming Legislature	rberger@wyoming.com	
17	Allen	Best	journalist	Planning Magazine/Colorado Biz Magazine, and others	allen.best@comcast.net	(303) 463-8630
18	Jerry	Black	Senator	State of Montana	blacks@3rivers.net	(406) 434-5363
19	Joel	Bladow	Senior Vice President, Transmission	Tri-State Generation & Transmission	jbladow@tristategt.org	(303) 254-3315
20	Stan	Blake	Representative	Wyoming Legislator	sblake@wyoming.com	
21	Dustin	Bleizeffer	Energy reporter	Casper Star-Tribune	dustin.bleizeffer@trib.com	(307) 577-6069
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Committee Member: Rules
CSG-WEST Committee Member: Executive

Senator Jerry Black
Montana State Senate
Committee Chair: Energy and Telecommunications
Committee Member: Committee on Committees; State Administration; Taxation
CSG-WEST Committee Member: Energy & Environment

Assemblyman David Bobzien
Nevada State Assembly
Committee Vice Chair: Government Affairs
Committee Member: Education; Natural Resources, Agriculture and Mining
CSG-WEST Committee Member: Executive; Energy & Environment; Trade & Transportation; Water & Public Lands

Senator Roy Brown
Senate Majority Whip
Montana State Senate
Committee Chair: Public Health, Welfare and Safety
Committee Member: Energy and Telecommunications; Business, Labor, and Economic Affairs; Rules
CSG-WEST Committee Member: Energy & Environment

Senator Robert Burns
Senate President
Arizona State Senate
Committee Chair: Rules
CSG-WEST Committee Member: Executive
CSG Membership: Governing Board

Representative Al Carlson
House Majority Leader
North Dakota State House of Representatives
Committee Chair: Committees; Delayed Bills
Committee Member: Rules
CSG Membership: Governing Board

Representative Denny Coffman
Hawaii State House of Representatives
Committee Vice-Chair: Energy & Environmental Protection
Committee Member: Finance; Housing; Water, Land, & Ocean Resources
CSG Membership: Energy and Environment Task Force

Representative Brad Dee
Majority Whip
Utah State House of Representatives
Committee Member: Executive Appropriations; Capital Facilities and Government Operations Appropriations Subcommittee; House Education; House Natural Resources, Agriculture, and Environment; House Ethics

Representative Lawerence Denney
Speaker of the House
Idaho State House of Representatives
CSG-WEST Committee Member: Executive

Representative Bryce Edgmon
Alaska State House of Representatives
Committee Chair: House Special Committee on Fisheries
Committee Co-Chair: House Special Committee on Energy
Committee Member: Resources
CSG-WEST Committee Member: Energy & Environment

Representative George Eskridge
Idaho State House of Representatives
Committee Member: Appropriations, Environment, Energy & Technology, Resources & Conservation

Senator Jeff Essmann
Montana State Senate
Committee Chair: Taxation
Committee Vice Chair: Local Government
Committee Member: Committee on Committees; Rules
CSG-WEST Committee Member: Executive; Energy & Environment; Trade & Transportation

Representative Randy Fischer
Colorado State House of Representatives
Committee Member: Transportation & Energy; Appropriations

Senator Mike Gabbard
Hawaii State Senate
Committee Chair: Energy and Environment
Committee Vice-Chair: Transportation, International and Intergovernmental Affairs
Committee Member: Joint Task Force to Conduct a Review of the State Highway Fund; Judiciary and Government Operations; Public Safety and Military Affairs

Senator Robert Geddes
President Pro Tempore
Idaho State Senate
Committee Member: State Affairs
CSG-WEST Committee Member: Executive

Representative Brian Gosch
House Majority Whip
South Dakota State House of Representatives
Committee Member: Judiciary; State Affairs
CSG-Midwest Committee Member: Economic Development

Senator Jim Honeyford
Washington State Senate
Ranking Minority Committee Member:
Environment Water & Energy
CSG-WEST Member: Legislative Council on River Governance
CSG Membership: Governing Board

Senator Scott Jenkins
Senate Majority Whip
Utah State Senate
Committee Chair: Senate Judiciary, Law Enforcement and Criminal Justice
Committee Member: Senate Ethics; Senate Education; Senate Government Operations and Political Subdivisions
CSG Membership: International Committee

Representative Kyle Johansen
House Majority Leader
Alaska State House of Representatives
Committee Member: Transportation; House Special Committee on Energy; House Special Committee on Economic Development, Trade, and Tourism
CSG-WEST Committee Member: Executive; Energy & Environment; Trade & Transportation

Senator Stanley W. Lyson
North Dakota State Senate
Committee Chair: Judiciary; Natural Resources

Senator Marty Martin
Wyoming State Senate
Committee Member: Senate Revenue Committee; Senate Minerals, Business and Economic Development Committee; Select Committee on Legislative Technology and Process; Select Water Committee; Select Committee on Local Government Financing; Energy Council
CSG-WEST Committee Member: Water & Public Lands; Committee on the Future of Western Legislatures
CSG Membership: International Committee

Representative Lucy Mason
Arizona State House of Representative
Committee Chair: Water & Energy
Committee Member: Environemnt

Representative John McCoy
Washington State House of Representatives
Committee Chair: Technology Energy & Communications
Member: Agriculture & Natural Resources; Financial Institutions & Insurance
CSG-WEST Member: Legislative Council on River Governance

Senator Curtis D. McKenzie
Idaho State Senate
Committee Chair: State Affairs
Member: Local Government & Taxation

Representative Charisse Millett
Alaska State House of Representatives
Committee Co-Chair: House Special Committee on Energy
Committee Member: Community & Regional Affairs; Rules
CSG-WEST Committee Member: Energy & Environment

Representative David Monson
Speaker of the House
North Dakota State House of Representatives
Committee Member: Committees; Delayed Bills; Rules

Representative Hermina Morita
Hawaii State House of Representatives
Committee Chair: Energy & Environmental Protection
Committee Member: Consumer Protection & Commerce; Housing Judiciary; Water, Land, & Ocean Resources

Representative Jeff Morris
Speaker Pro Tempore
Washington State House of Representatives
Committee Member: Audit Review & Oversight; Ecology & Parks; Rules; Technology Energy & Communications; Transportation
CSG-WEST Committee Member: Executive; Energy & Environment

Representative Dell Raybould
Idaho State House of Representatives
Committee Chair: Environment, Energy & Technology
Committeee Member: Resources & Conservation; Revenue & Taxation
CSG-WEST Member: Legislative Council on River Governance

Senator Tony Ross
Senate Vice President
Wyoming State Senate
Committee Chair: Senate Judiciary
Committee Chair: Select Committee on Legislative Facilities
Committee Member: Senate Rules and Procedures; Management Council; Management Audit
CSG Member: Public Safety & Protection Task Force

Senator Mike Schneider
Nevada State Senate
Committee Vice Chair: Commerce & Labor
Committee Chair: Energy, Infrastructure & Transportation
Committee Member: Taxation
CSG-WEST Committee Member: Executive; Energy & Environment; Trade & Transportation
CSG Member: Transporation Advisory Group

Senator Gail Schwartz
Colorado State Senate
Committee Chair: Local Government and Energy *Committee Member:* Agriculture and Natural Resources; Capital Development; Legal Services
CSG-WEST Member: WESTRENDS
CSG Member: Energy & Environment Task Force

Senator Brandon Shaffer
President of the Senate
Colorado State Senate
Committee Chair: Senate Services; Legislative Council
Committee Member: Education
CSG-WEST Committee Member: Executive

Representative Colin Simpson
Speaker of the House
Wyoming State House of Representatives
Committee Chair: House Rules and Procedures
Committee Member: Management Council
CSG-WEST Committee Member: Executive

Senator Bob Stenehjem
Senate Majority Leader
North Dakota State Senate
Committee Chair: Committees
CSG-Midwest Committee Member: Resolutions & Innovations Selection
CSG Membership: Governing Board

Representative Tim Stubson
Wyoming State House of Representatives
Committee Member: House Corporations, Elections & Political Subdivisions Committee; House Minerals, Business and Economic Development Committee; Task Force on Wind Energy

Senator Michael Waddoups
President of the Senate
Utah State Senate
Committee Member: Senate Judiciary, Law Enforcement, and Criminal Justice; Senate Workforce Services and Community and Economic Development
CSG-WEST Committee Member: Executive; Committee on the Future of Western Legislatures
CSG Membership: Governing Board

Harnessing Economics for Energy and the Environment

Robert N. Stavins
Albert Pratt Professor of Business and Government
John F. Kennedy School of Government, Harvard University
Director, Harvard Environmental Economics Program

Western States Energy and Environment Symposium
Jackson Hole, Wyoming
October 25-27, 2009

“What business are you in?”

“I’m an environmental economist.”

"Environmental economics" is *not* oxymoronic.

1. The *causes* of environmental problems (in a market economy) are economic.

2. The *consequences* of environmental problems have important economic dimensions.

- Therefore, an economic perspective is *essential* for
  - *Understanding* environmental problems
  - And therefore can be *exceptionally helpful* for the design of *solutions* that will be *effective*, *economically sensible*, *and politically pragmatic*.

The Causes of Environmental Pollution are Economic

May firms go beyond full compliance with the law (sacrifice profits in the social interest)?

For publicly-owned firms:

- Fiduciary responsibility to shareholders
- But the business-judgment rule

Can firms – public or private – go beyond full compliance on a sustainable basis?

- Increase prices?
- Reduce profits?
- But some firms can pass on price increase monopolists

	12/31/95	12/31/96	12/31/97	12/31/98	12/31/99	12/31/00
SALES						
5 Self Service Bays	0	72,000	96,000	108,000	120,000	132,000
1 Automatic Bay	0	18,000	24,000	30,000	36,000	42,000
7 Vacuums	0	16,800	25,200	33,600	33,600	33,600
Total Annual Revenue	0	106,800	136,800	171,600	189,600	206,700
OPERATING EXPENSES						
Chemical and Vending	0	5,300	6,800	8,600	9,500	10,400
Gas and Electric	0	6,400	8,200	10,300	11,400	12,500
EDU Fees	24,000	0	0	0	0	0
Water & Sewer	0	3,200	4,100	5,200	5,700	6,300
Utility Connections/Permits	5,000	0	0	0	0	0
Telephone	0	250	250	300	350	400
Trash Removal	0	1,100	1,400	1,700	1,900	2,100
Insurance	0	3,200	4,100	5,200	5,700	6,200
Real Estate Taxes	0	5,000	5,500	6,000	6,500	7,000
Accounting & Legal	500	300	500	600	700	800
Repairs & Maintenance	0	2,100	2,700	3,400	5,700	6,200
Labor	0	8,000	9,400	10,700	12,100	13,500
Depreciation	0	39,800	39,800	39,800	39,800	39,800
Bank Charges	0	250	250	300	350	400
Bank Loan Costs	8,200	0	0	0	0	0
Advertising and Promotion	2,000	2,300	2,500	2,500	2,500	2,500
Total Operating Expenses	39,700	72,400	85,500	94,600	102,200	108,100
Operating Profit/Loss	(39,700)	29,400	51,300	77,000	87,400	99,500
Interest Expense	0	35,100	33,300	31,300	29,100	26,800
Pre-Tax Loss/Income	(39,700)	(5,700)	18,000	45,700	58,300	72,700
Taxes	0	0	7,200	18,300	23,300	29,100
NET INCOME(LOSS)	(39,700)	(5,700)	10,800	27,400	35,000	43,600

Where does the pollution go?

- Commercial laundry next door
- Does cost (to laundry) show up in annual report of steel producer?

Pollution is an *externality*.

The Consequences of Environmental Pollution have important Economic Dimensions

1. Producer → Producer
   (steel production & laundry services – $)
2. Producer → Consumer
   (paper production & recreational fishing)
3. Consumer → Consumer
   (secondary exposure to cigarette smoke)
4. Consumer → Producer
   (littering in a movie theatre – $)

- Economic consequences ≥ financial consequences
  - Economics is *not* the same as accounting

- When carrying out economic analysis, don't act like the drunk under the street lamp!

Economic Valuation of the human health impacts of environmental pollution

- You drink dirty water: feel sick for two days, stay home from work, go see the doctor
- How should we economically value the damages of your exposure to this pollution?

1. Lost wages (reduced productivity)?
2. Medical costs (whether paid, insured, or "free")? [Opportunity Cost]
3. "Pain-and-suffering"?

- Economics takes a *holistic* view, because #3 cannot be observed
  - The *economic value of the damages* are whatever you *truly* feel (believe) that they are!
  - *Not* what you *say* the damages are, but what you *really feel* that they are.
    - Your minimum *willingness to accept* (WTA) *compensation* to tolerate exposure
    - Your maximum *willingness to pay* (WTP) to avoid exposure

Can meaningful numbers be put on these concepts?

- There's good news and bad news. First, some good news …
  - Over the past 50 years, economists have developed rigorous methods for *reliably estimating* people's WTA and WTP associated with a wide range of environmental threats and damages
  - Now, some bad news: you'll have to take a course in environmental economics — or at least read part of a book — to learn about those methods
- Are these methods just the province of pointy-headed academics?
  - No, the concepts and specific methods are *validated*, even *required* by:
    - *Executive Orders* by Presidents Reagan, Bush, Clinton, Bush, and Obama
    - *Federal statutes*, including parts of Clean Air Act, Clean Water Act, CERCLA, and many others
    - *Best analytic methods* are laid out by Guidelines of U.S. Office of Management and Budget, U.S. Environmental Protection Agency, and others
- If we have concepts and methods for valuing *damages* of environmental pollution, then we have methods for valuing ***benefits*** of public policies.

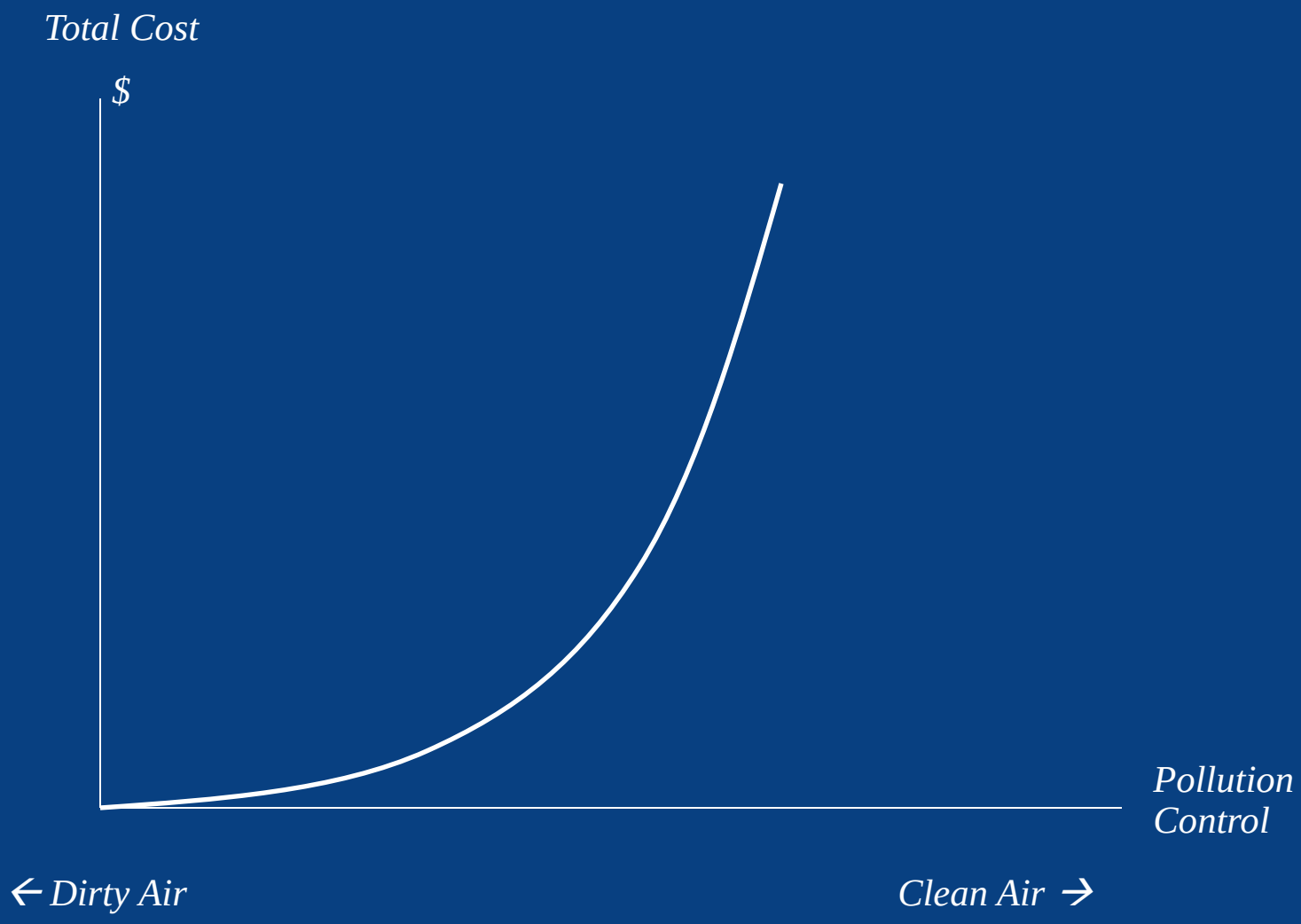
What about the costs of environmental policies?

- How much does it cost to reduce a ton of SO_2?
- Total costs increase at an increasing rate.
- In other words, incremental or *marginal costs increase*.

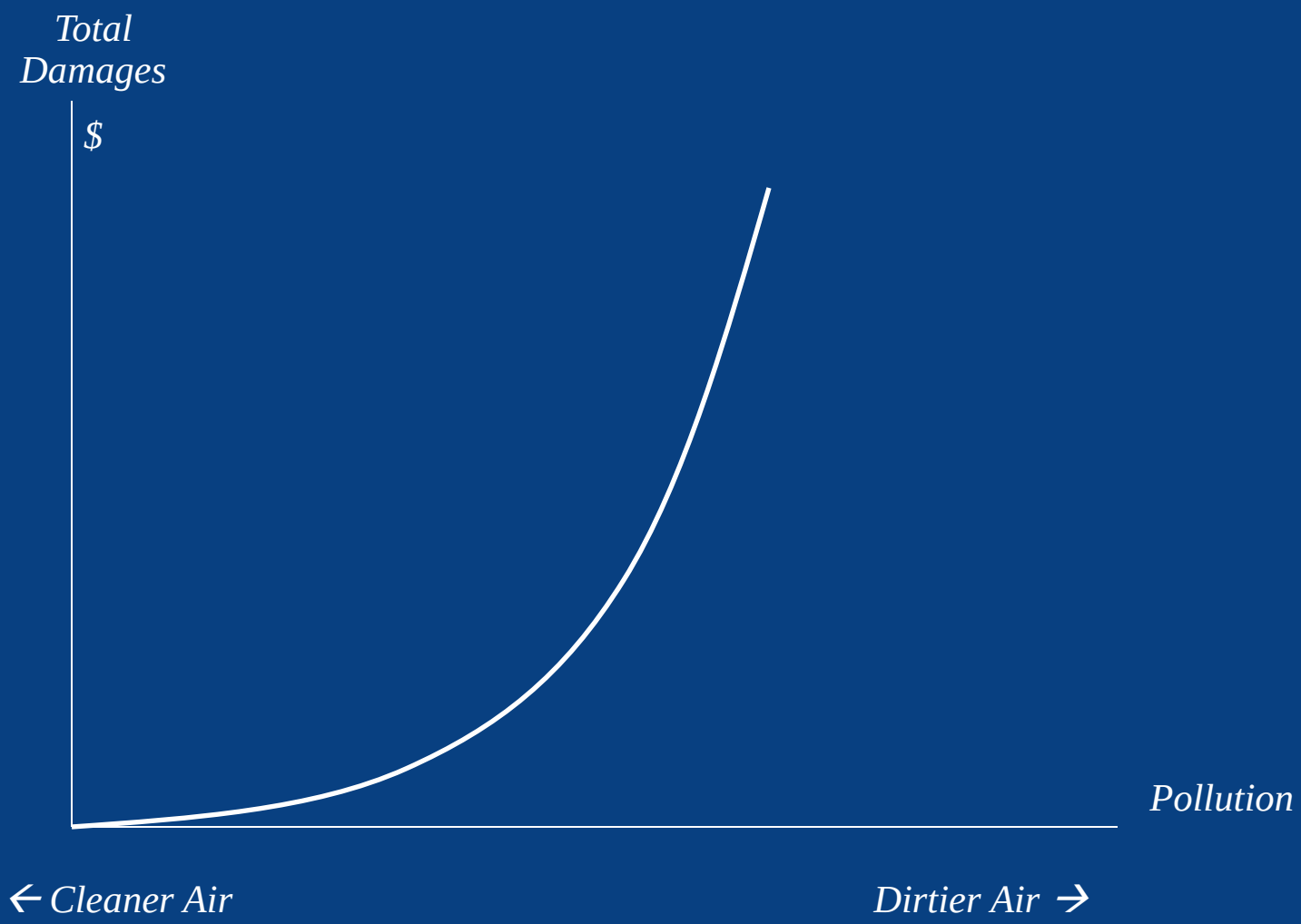
Emission Reduction (million tons)	Total Cost ($ billion)	Average Cost ($/ton)	Marginal Cost ($/last ton)
8	$2.2	$270	$270
10	$3.6	$360	$720
12	$9.3	$720	$2,775

- This general pattern is *ubiquitous* – for virtually all environmental policies:
  - Increasing marginal costs

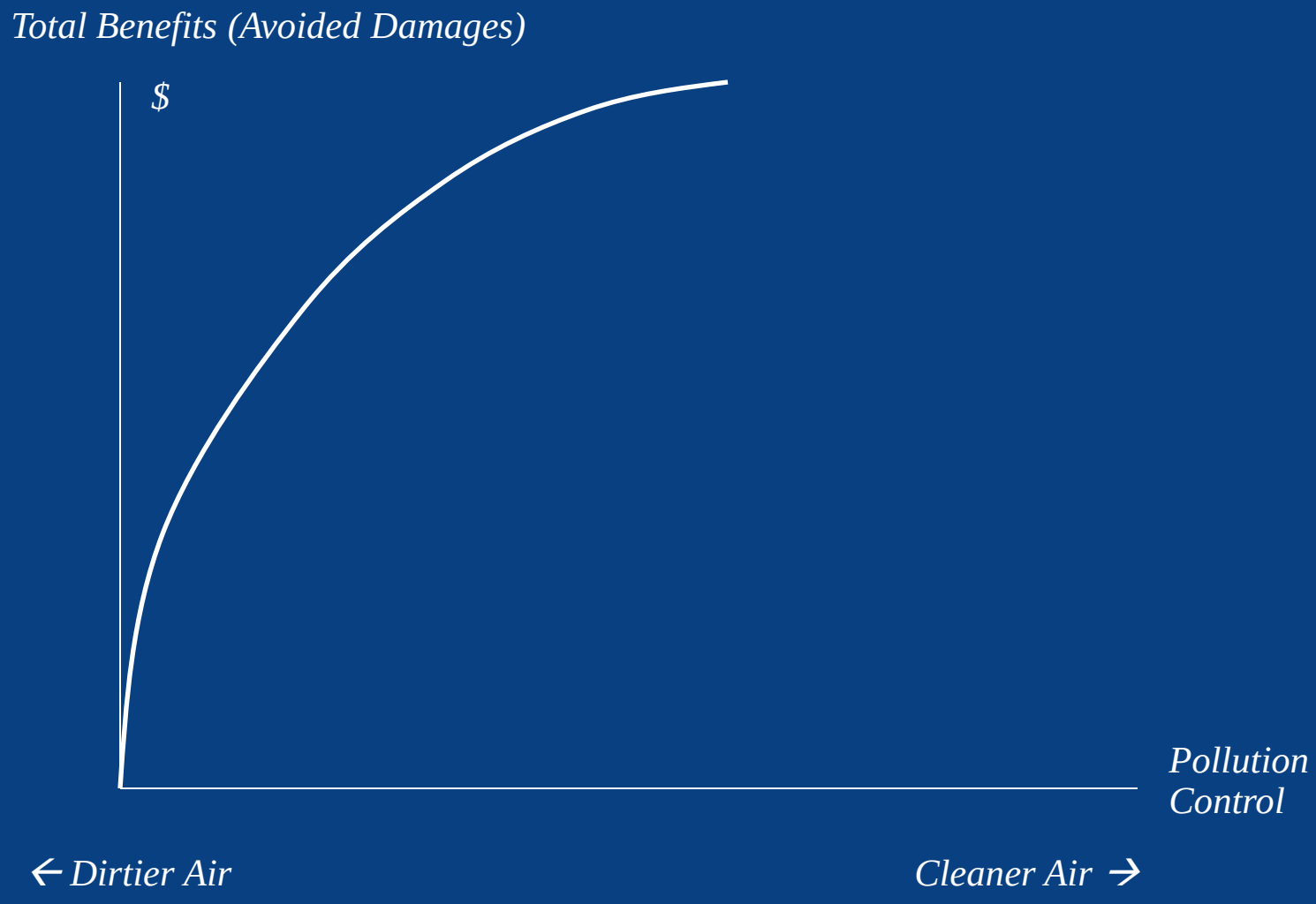
The Costs of Pollution Control



The Damages of Pollution



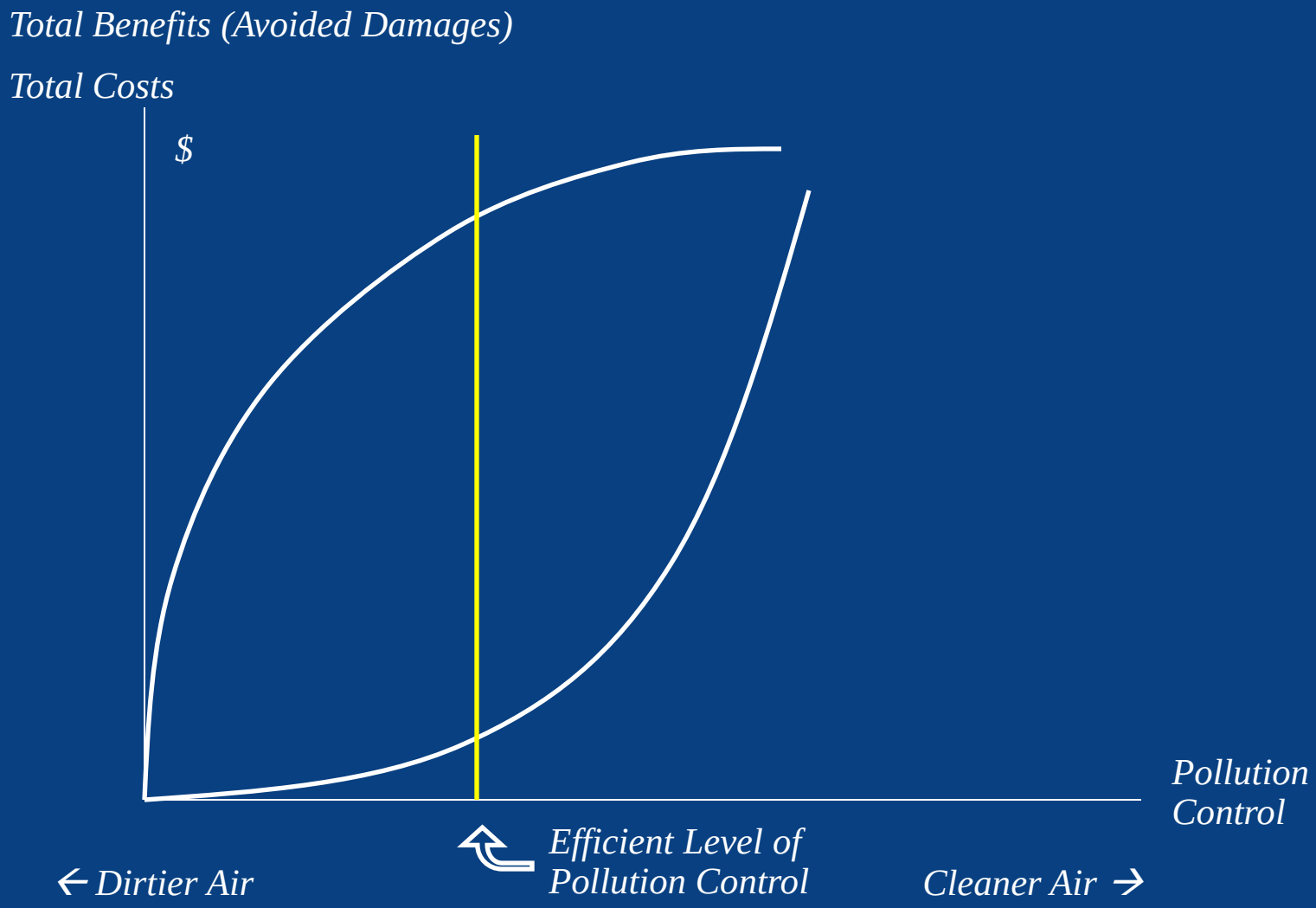
The Benefits of Pollution Control



Think about your own pollution-control policies.

- We all exercise pollution control policies, where we get the benefits and we pay the costs
  - Keeping the *kitchen floor* clean
  - Do you keep it *perfectly* clean?
  - *Why not?*
- And how clean do you keep your *garage* floor?
- What about the cleanliness you expect in a *surgical theatre*?
- *Why* do we individually and collectively choose different levels (standards) of acceptable cleanliness in these different cases?
  - It seems that *benefits and costs* matter.
  - In fact, we behave *as if* we're doing a very specific kind of analysis!

Benefits and Costs of Pollution Control



The Efficient Level of Pollution Control

- Maximizing the difference between benefits and costs: the *efficient* level of pollution control effort is *not* an infinite level.
  - The efficient amount of pollution is *not* zero.
  - Interest groups on both sides of the policy spectrum may be dissatisfied
    - Not enough benefits to please Greenpeace
    - Too much cost to please the Chamber of Commerce
- Markets produce this quantity of goods and services for most products,
  - But *not* for *externalities.*
- So, this is *not* a call for laissez-faire, but for a *legitimate* role for public (government) intervention.
  - But not all government intervention is created equal.
  - There are some *very costly* forms of environmental regulation,
  - … and other approaches that *harness market forces* on behalf of environmental protection, and hence are *cheaper* – example is "cap-and-trade" (for SO_2)
  - But that's a story – or after-dinner speech – for another day.

Wait! *Who* Gets the Benefits? *Who* Pays the Costs?

- Economics can also examine the *distribution* of benefits and costs

- Are all *efficient* policies *fair*?

  - *No*
  - Hypothetical: Improving Los Angeles visibility by increasing electricity rates
  - Who gets the benefits?
    - The "wine, cheese, and Gortex set"
  - Who pays the costs?
    - Beverly Hills mansion?
    - Inner-city low-income housing
  - An efficient, but *regressive* policy (transfer from poor to rich)

- Does this mean that *all* environmental policies are *regressive*?
  - *No*
  - Example of a *progressive* environmental policy: Superfund, cleaning up abandoned hazardous waste sites (transfer from rich to poor)

Summary: An Economic Perspective of Environmental Policy

1. The *causes* of environmental pollution are economic
   - Pollution is an *externality*
2. The *consequences* of environmental pollution are economic
   - The most important pathways are *not* the easiest to analyze
3. *Economic value* of health damages are whatever people *truly feel* that they are (*willingness to accept*, *willingness to pay*)
4. Reliable methods exist for *quantifying* these values
   - Methods are *validated and required* by Federal laws and regulations
5. When we get the benefits and pay the costs, we *choose* our own standards of cleanup in different situations based upon perceived *benefits and costs*
   - We tend to choose the "*efficient*" level of cleanup
6. *Markets* provide the efficient amount of many goods & services,
   - But *not* when there are externalities; markets *fail* to deal efficiently with pollution
   - That's a *legitimate* reason for government intervention
7. Economics can examine the *distribution* of benefits and costs of policies

- "Environmental Economics" is *not* an oxymoron.

- An economic perspective is *essential* for a
  - full *understanding* of environmental problems.
- Economic analysis is key for design of *solutions* that are:
  - *environmentally effective*
  - *economically sensible*
  - *politically pragmatic*

For More Information

The Harvard Environmental Economics Program

www.hks.harvard.edu/m-rcbg/heep/

www.stavins.com

Elements For Cooperative Agreement Among Participating States

Western States Energy & Environment Symposium
October 27, 2009

WSEES Implementation Timeline

Circulate revised draft report to participating legislators and panelists	Week of November 23
Panelists and legislators return comments on revised draft report	Friday, December 4
Distribute final Symposium report to legislators, Governors, panelists and participants by email	Friday, December 11
Request lead state representatives to report to Symposium convenors on actions taken	January 31, 2010

PREAMBLE

- This summary presents the outline of the key elements of the final report of the Western States Energy & Environment Symposium and contains recommendations for specific actions to be pursued by legislators from participating states.
- In pursuing these actions, legislators will assess the costs and benefits of various options with respect to energy development, production, reliability, marketing, use and environmental protection.
- Western states can learn from one another's successes and challenges, and in addition to collaboration between all participating states there may be opportunities for subsets of states to work together.
- We recognize the importance of involving other stakeholders going forward on these important issues.

State Diversity

- **We recognize there is great diversity among our states with regard to energy and environmental issues:**
  - Some are exporters
  - Some are importers
  - Population size and distribution varies (e.g. concentrated urban centers, dispersed rural communities)
  - Different mix of existing and desired energy resources
  - Respect the right to choose different combinations of energy resources
  - Different politics and decision-making processes

- **We also recognize that this diversity offers opportunities for mutually beneficial interactions and results in pursuit of our individual state energy and environmental priorities.**

Common Interests Among States

- **We also recognize the following common interests among our states with regard to energy and environmental issues:**
  - To ensure the prosperity of our individual states and the region by acknowledging the inextricable link between energy, economic welfare and environmental stewardship.
  - To protect the interests of our citizens.
  - To sustain or develop a diverse mix of energy resources.
  - To provide affordable, reliable and environmentally responsible energy.
  - To facilitate the establishment of market certainty to enable business decision making and access to capital.

Opportunities for Legislative Action and Cooperation among Participating States

Transmission

- ***Focus for action:*** We recognize that many efforts are underway to address various aspects of the transmission challenge, therefore it is important that state legislatures identify appropriate partners and focus on areas where they can make a difference.
- ***Options discussed include:***
  - Legislative direction to PUCs;
    - Taking regional considerations into account in rate making;
    - Hold regional fact-finding hearings;
  - Streamlining permitting procedures within individual states;

Opportunities for Legislative Action and Cooperation among Participating States

Transmission (continued)

- ***Options discussed include:***
  - Bundling to meet RPS;
  - Rate implications of renewable energy credits (e.g. bundled, unbundled);
  - Interstate process to better coordinate siting of transmission lines; and
  - Influencing Federal agencies and policy
    - Land management agencies (e.g. siting practices)
    - Federal Energy Regulatory Commission (FERC)

Opportunities for Legislative Action and Cooperation among Participating States

Carbon Capture and Storage

- ***Focus for action:*** Explore the creation of a formal state collaborative effort to address priority CCS issues.
- ***Elements to be considered:***
  - Engagement with existing regional CCS partnerships;
  - Research and technological development;
  - Similar regulatory processes and framework;
  - Common definition of property rights;
  - Liability;
  - Financing; and
  - Interstate cooperation on siting.

Opportunities for Legislative Action and Cooperation among Participating States

Economic, Legal, Policy and Technological Research

- ***Focus for action:*** Engage in dialogue with research institutions to identify priority research questions relevant to legislative decision makers.
- ***Focus for action:*** Direct state-funded universities to explore cooperative research arrangements with other western institutions.
- ***Focus for action:*** Appropriate funding to address high priority research needs (e.g. CCS, battery and energy storage, concentrated solar, etc.)

Opportunities for Legislative Action and Cooperation among Participating States

Regulatory and Permitting Processes

- ***Focus for action:*** Explore opportunities for legislative action to improve the efficiency of regulatory and permitting processes within states and between states for transmission and facilities siting (other?).
- ***Focus for action:*** Explore interstate cooperation for management and mitigation of endangered species issues (e.g. sage grouse).
- ***Focus for action:*** Explore uniform approaches to emerging issues and opportunities that are common across states (e.g. geothermal siting).

Opportunities for Legislative Action and Cooperation among Participating States

Regulatory and Permitting Processes (continued)

- ***Focus for action:*** Share information about successful streamlining measures for facility siting.
- ***Focus for action:*** Ensure adequate staffing for state regulatory / permitting agencies.
- ***Focus for action:*** Enhanced understanding of the role of private property rights.

Opportunities for Legislative Action and Cooperation among Participating States

Energy Efficiency

- ***Focus for action:*** Identify ways to implement and/or expand energy efficiency programs within individual states and across the region.
- ***Options include:***
  - Share information about successful energy efficiency program strategies;
  - Develop a regional public education / media campaign; and
  - Examine de-coupling.

Opportunities for Legislative Action and Cooperation among Participating States

Rate Payer Protection

- ***Focus for action:*** Determine if adjustments are needed to state PUC regulations to facilitate and accommodate interstate arrangements.

Opportunities for Legislative Action and Cooperation among Participating States

Loading Order

- ***Focus for action:*** Determine whether there is potential for a Western regional collaboration regarding load orders (e.g. energy efficiency, renewables, fossil fuels).

Opportunities for Legislative Action and Cooperation among Participating States

- ***Other areas for exploration:***
  - Provide a summary of states' views on Federal carbon management policy options;
  - Uniform emissions reporting;
  - Influencing Federal policy from a regional perspective;
  - Distributed energy generation / community energy projects; and
  - Coordinated tax policies and incentives.

GE Energy

The future of energy

Monte Atwell
General Manager
Gasification & IGCC, GE Energy

October 2009

Will the U.S. lead the world? …

What it will take:

A **Big** domestic marketplace

A scalable, competitive **supply chain**

The best **technologies**

Strong **intellectual property** protection

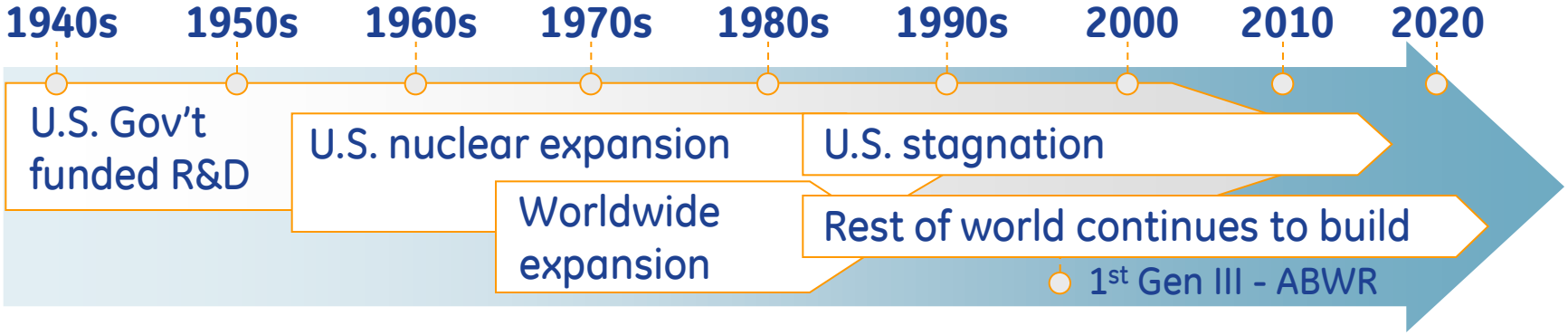
Free trade and competition

…. Only if we create a large domestic marketplace

imagination at work

Long history, but will we continue our leadership in Energy?

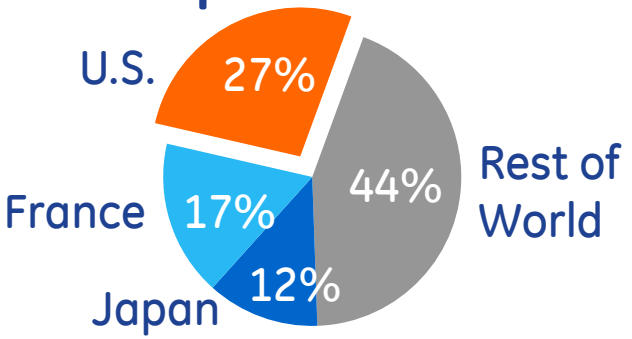
Nuclear industry born from U.S. government R&D



Today:

- 370 GW of nuclear generation worldwide
- 436 reactors in 31 countries
- 104 reactors in U.S.

Nuclear plants worldwide



U.S. government investment has created the technology used for majority of nuclear plants worldwide

imagination at work

Source: WNA, IAEA

Heavy duty gas turbine – byproduct of defense spend

U.S. government funding jet engine during WWII


First Gas Turbine 1949-1980
American Society of Mechanical Engineers Landmark

Leading to ...

1941
First U.S. jet engine built

1940s
Development of land based technology ... beginning of commercial application for energy generation

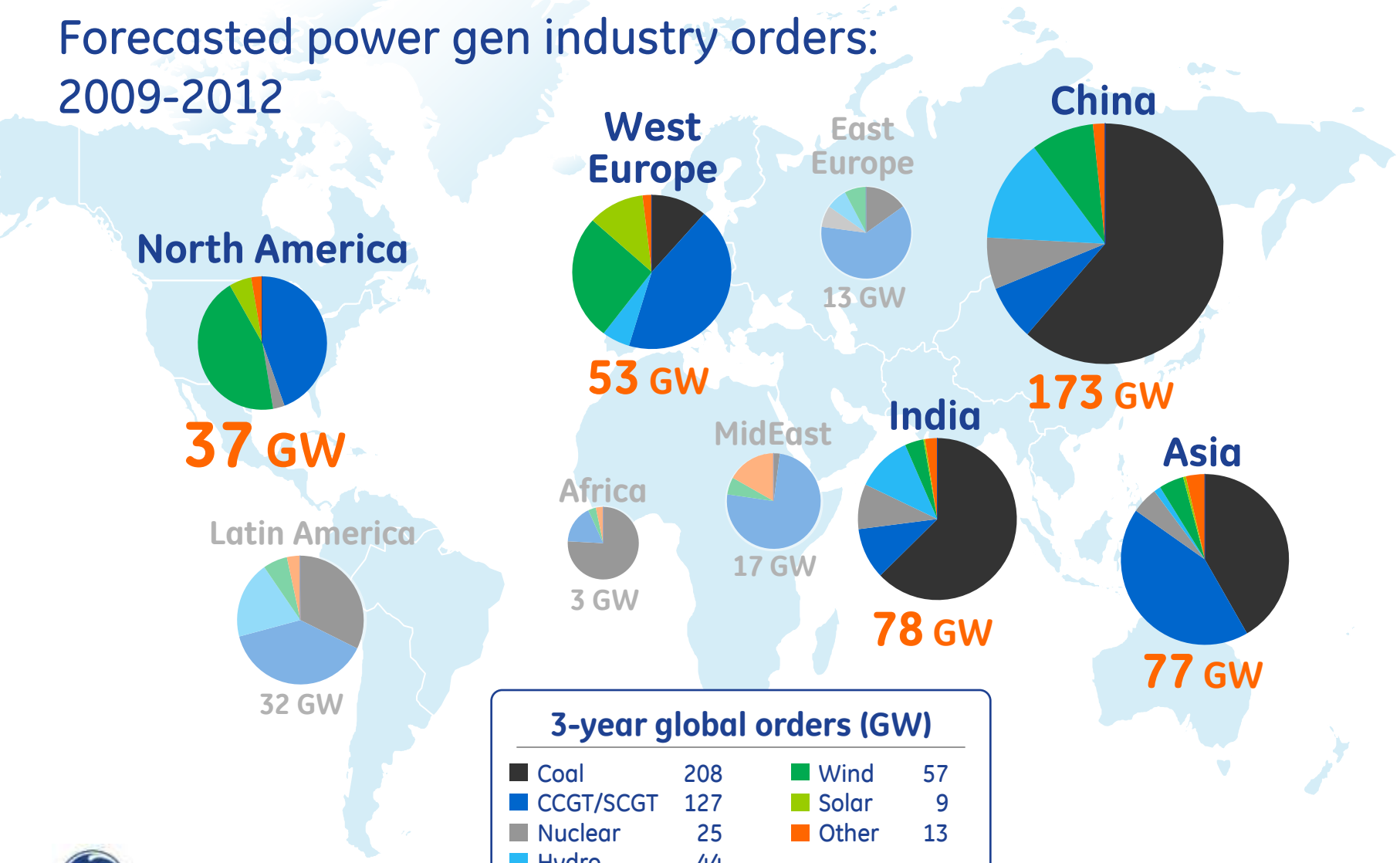
1949
First gas turbine connected to U.S. grid

2009
- Gas turbine technology generates 20% of all U.S. electrical power
- ~600 GW of combined-cycle generation operating worldwide

imagination at work

Domestic Agendas Drive Leadership

Forecasted power gen industry orders: 2009-2012



3-year global orders (GW)

Coal	208	Wind	57
CCGT/SCGT	127	Solar	9
Nuclear	25	Other	13
Hydro	44	TOTAL	483

imagination at work

Source: GE Energy forecast, 2009

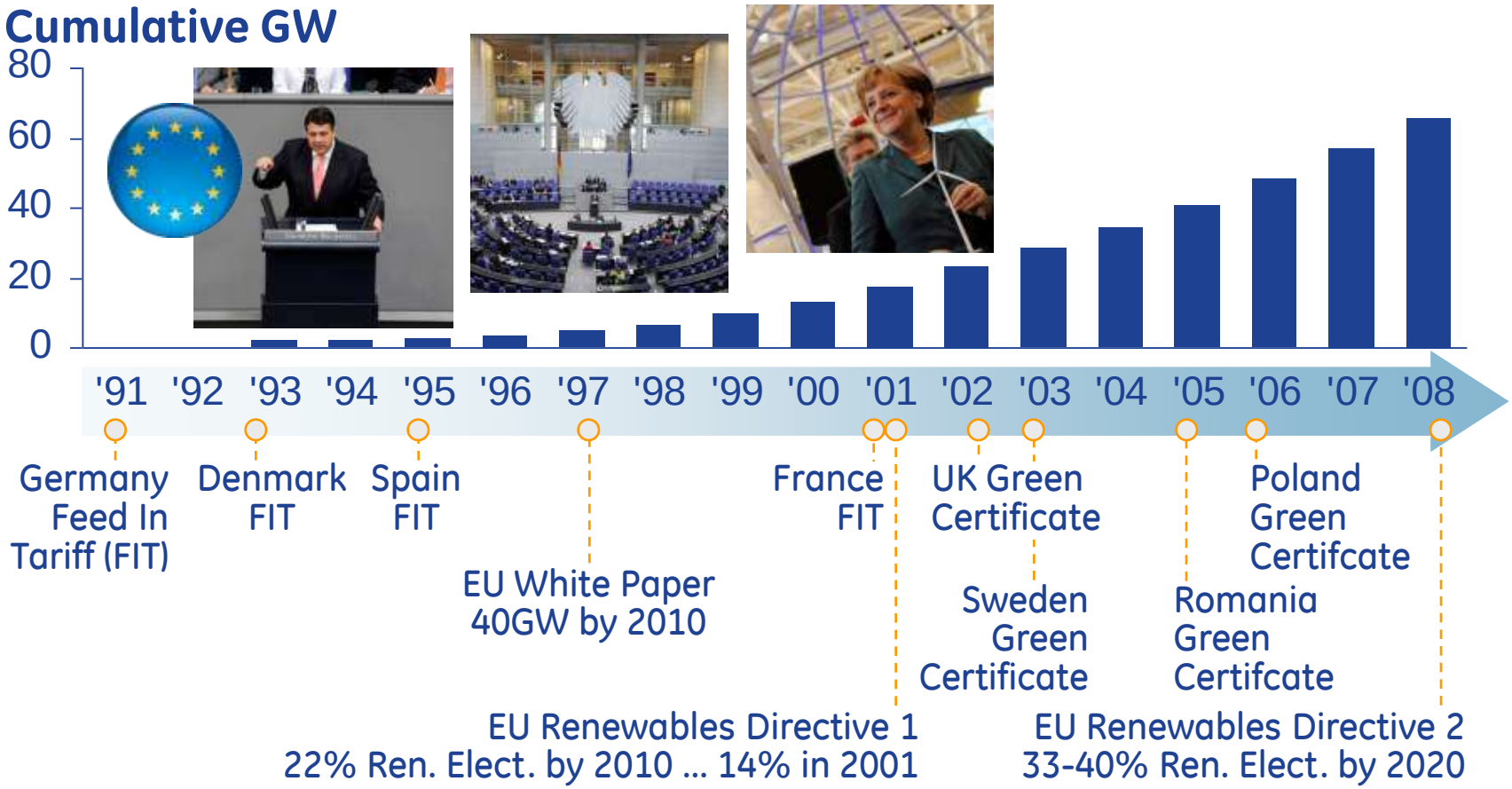
Market dynamics drive innovation

- Essential to addressing energy issues at lower cost
- Requires return on investment
- Drives competitiveness and jobs
- Results primarily from private R&D
- Based on intellectual property protection
- Investments, Incentives and project financing gets it started

imagination at work

The cleaner energy leadership race… policy & investment

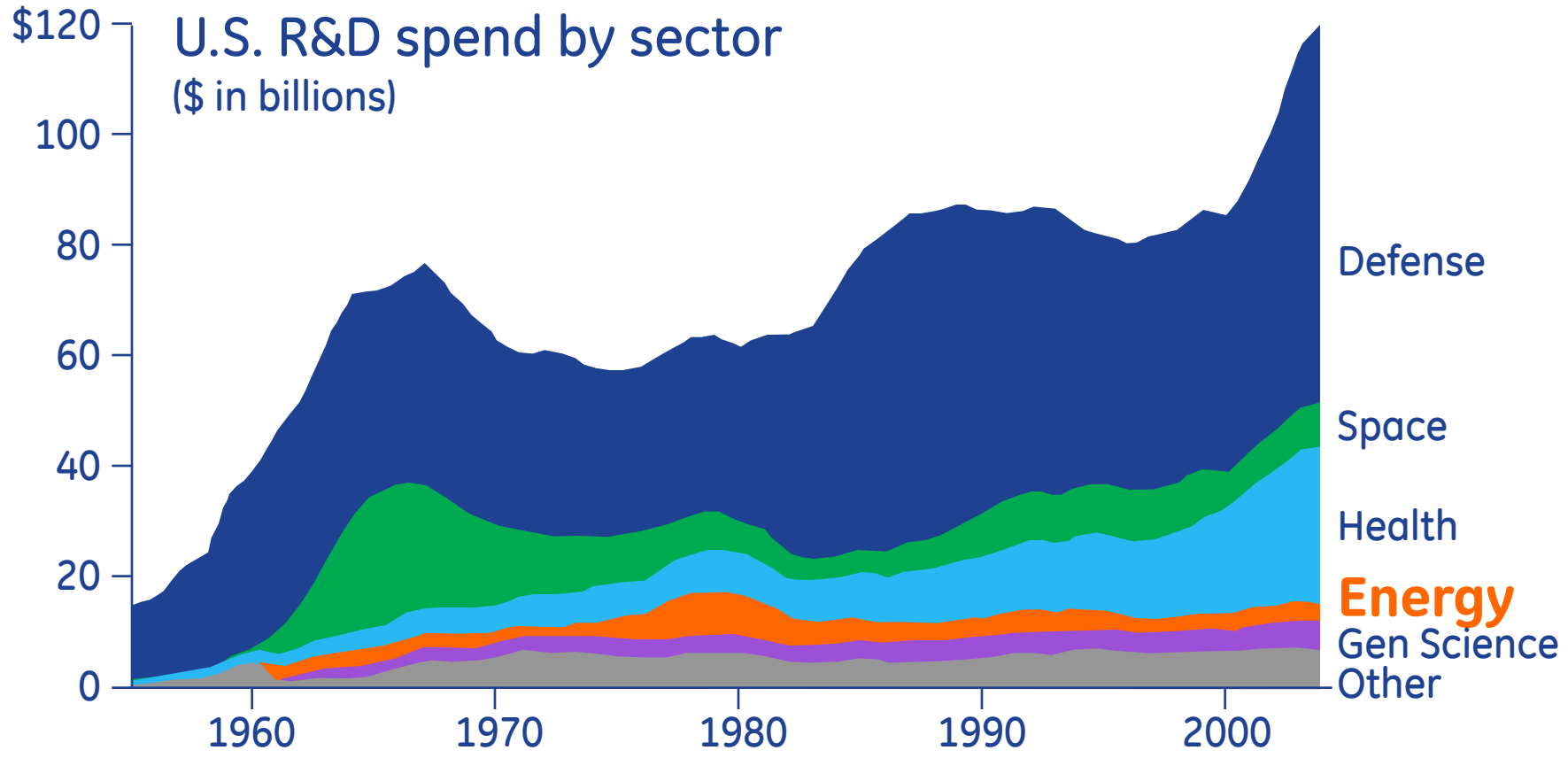
Consistent Europe policy created wind industry



Today wind is ~17% of Europe's electricity generation

imagination at work

U.S. energy R&D funding relative to other priorities

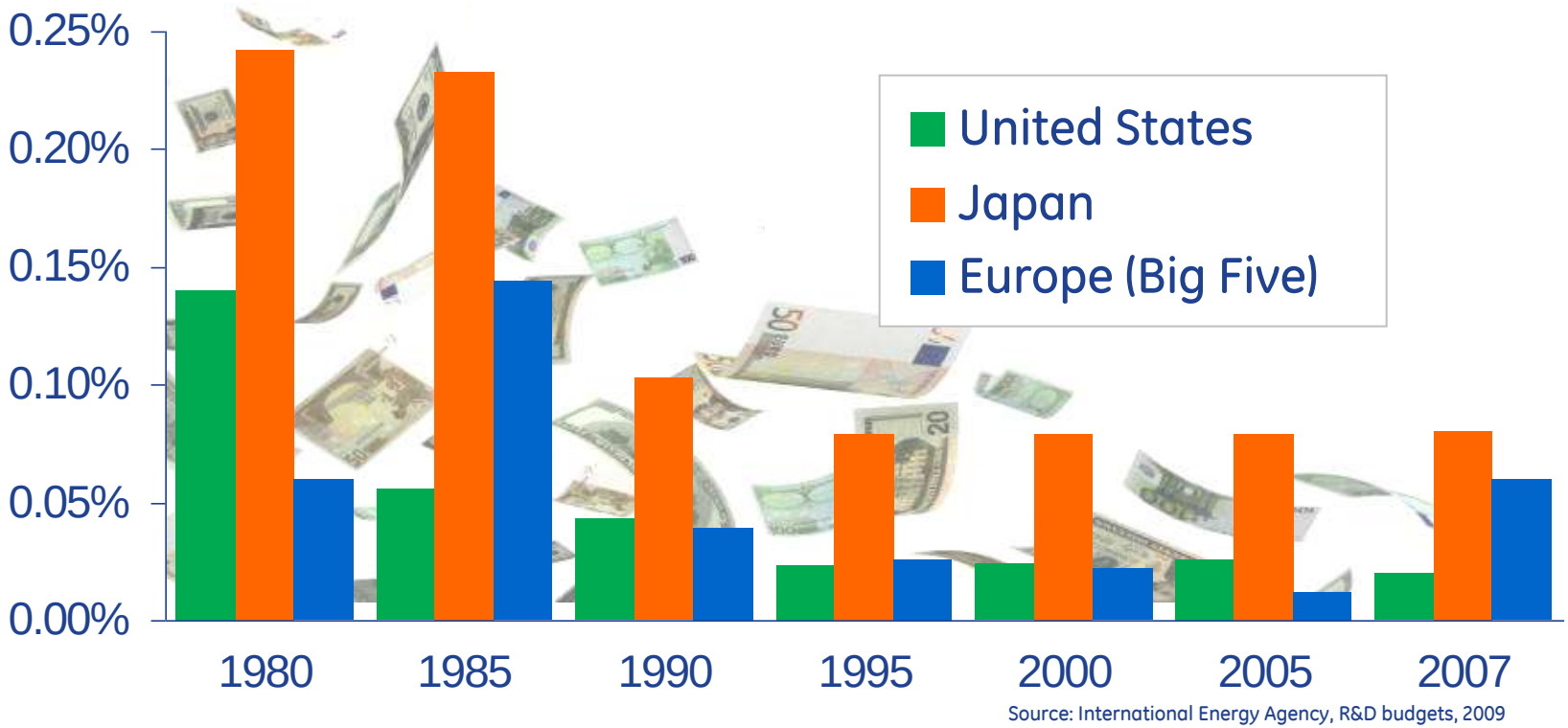


imagination at work

Source: Kammen and Nemet, 2005
R&D (billion 2002 $'s)

Is the U.S. doing enough in R&D?

Government funded energy R&D by country (as % of GDP)



Source: International Energy Agency, R&D budgets, 2009

Japan investing ~3X more than U.S. in energy R&D (as % of GDP)

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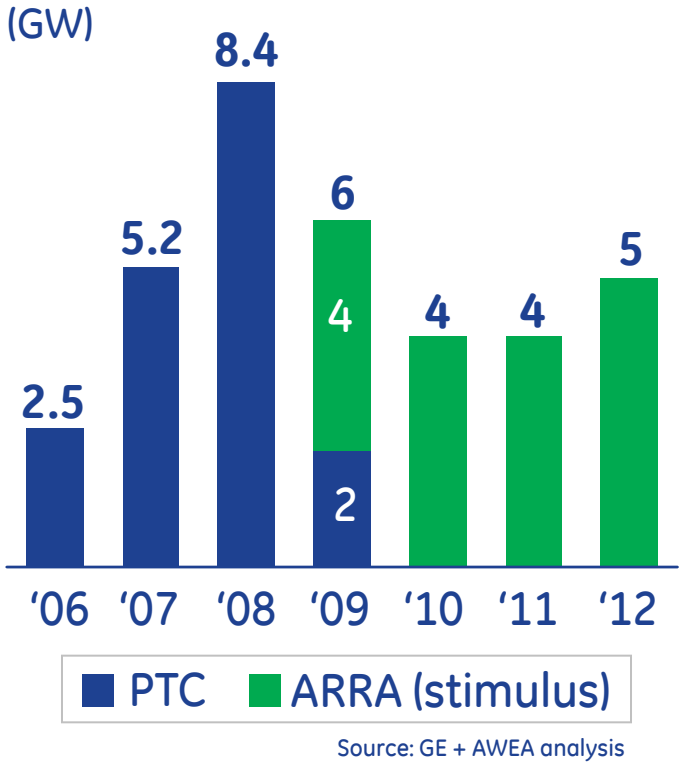
Are we positioned to lead?

U.S. wind industry

U.S. wind installs



Source: GE + AWEA analysis

Key points

U.S. at ~5% renewable electricity now

- 2.7% Wind (end of '09 est.)
- 1.7% Biomass
- 0.5% Geothermal
- 0.1% Solar

2012 target in H.R. 2454 drives zero renewable installs

- Waxman/Markey
  - > 6% by 2012 … 4.5% net after efficiency

12% by 2012 RES target maintains 2008 production and job levels

Proposed RES targets require ZERO new renewables

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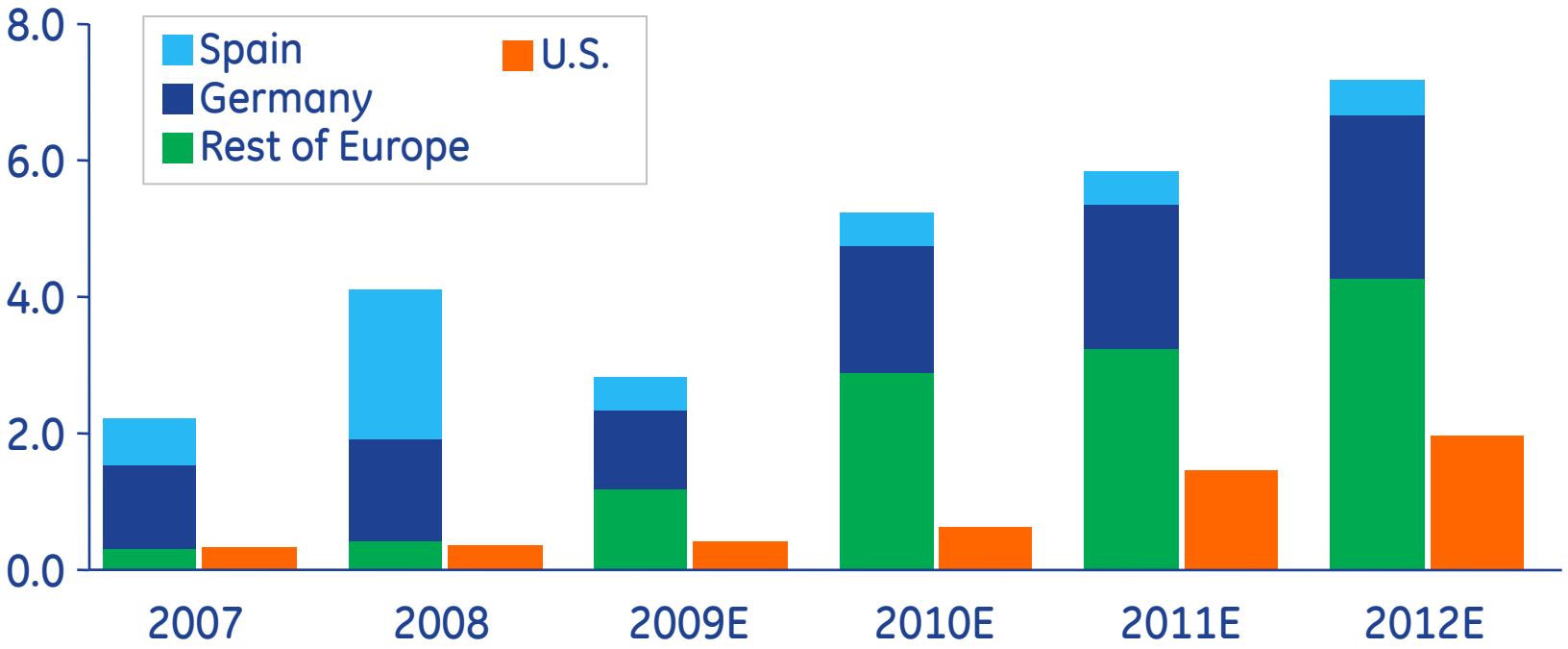
Solar

Installations (GW)



Source: Navigant Consulting & IEA

Industry dynamics

- Silicon (cSi) – 80% of installs
- Thin Film – fastest growing segment
- Price ↓ 50% from '08 peak
- '09 capacity 2X demand

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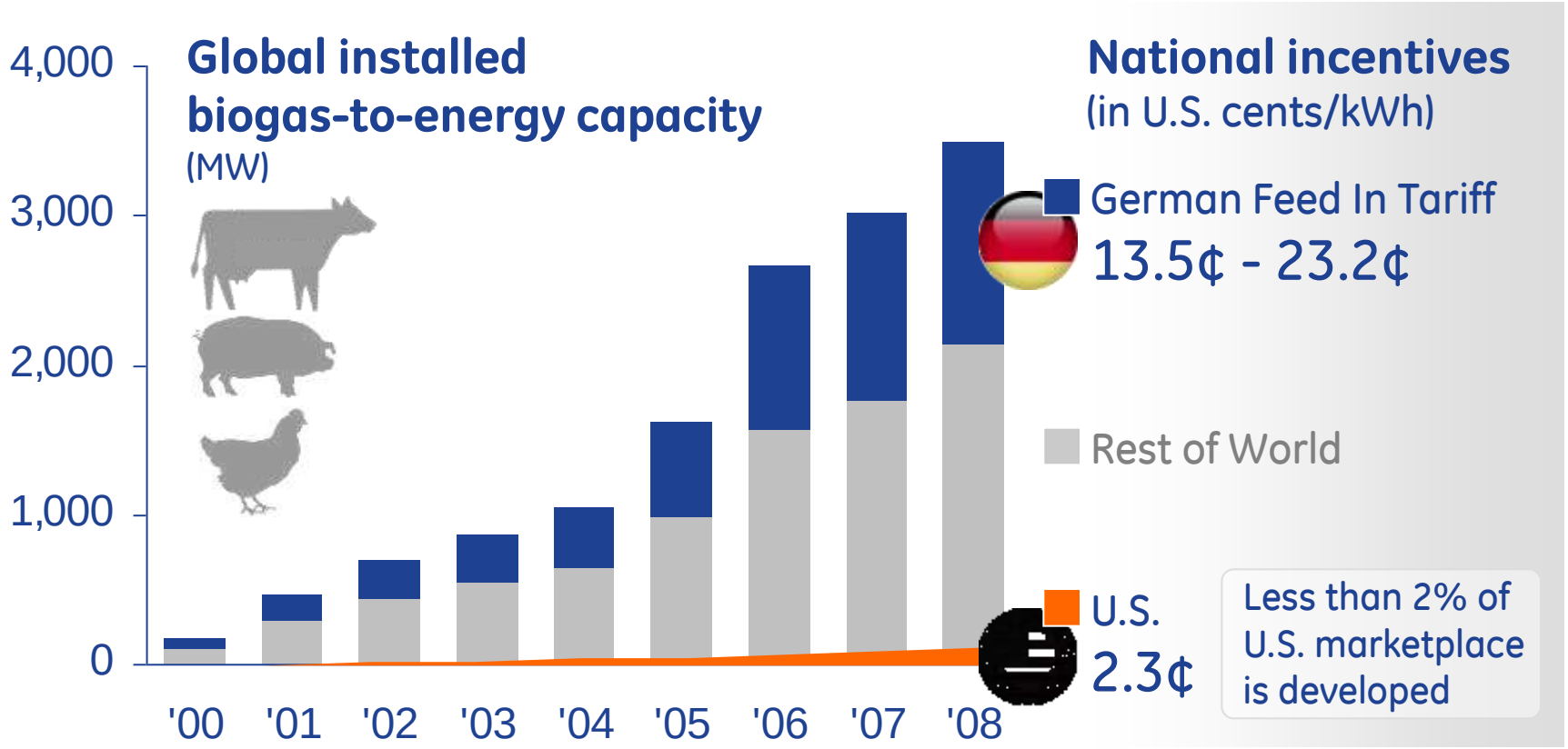
Biogas



- Policy and incentives driving leadership in Germany, Italy, UK and Poland
- The potential in the U.S. is big … BUT comparable incentives are needed

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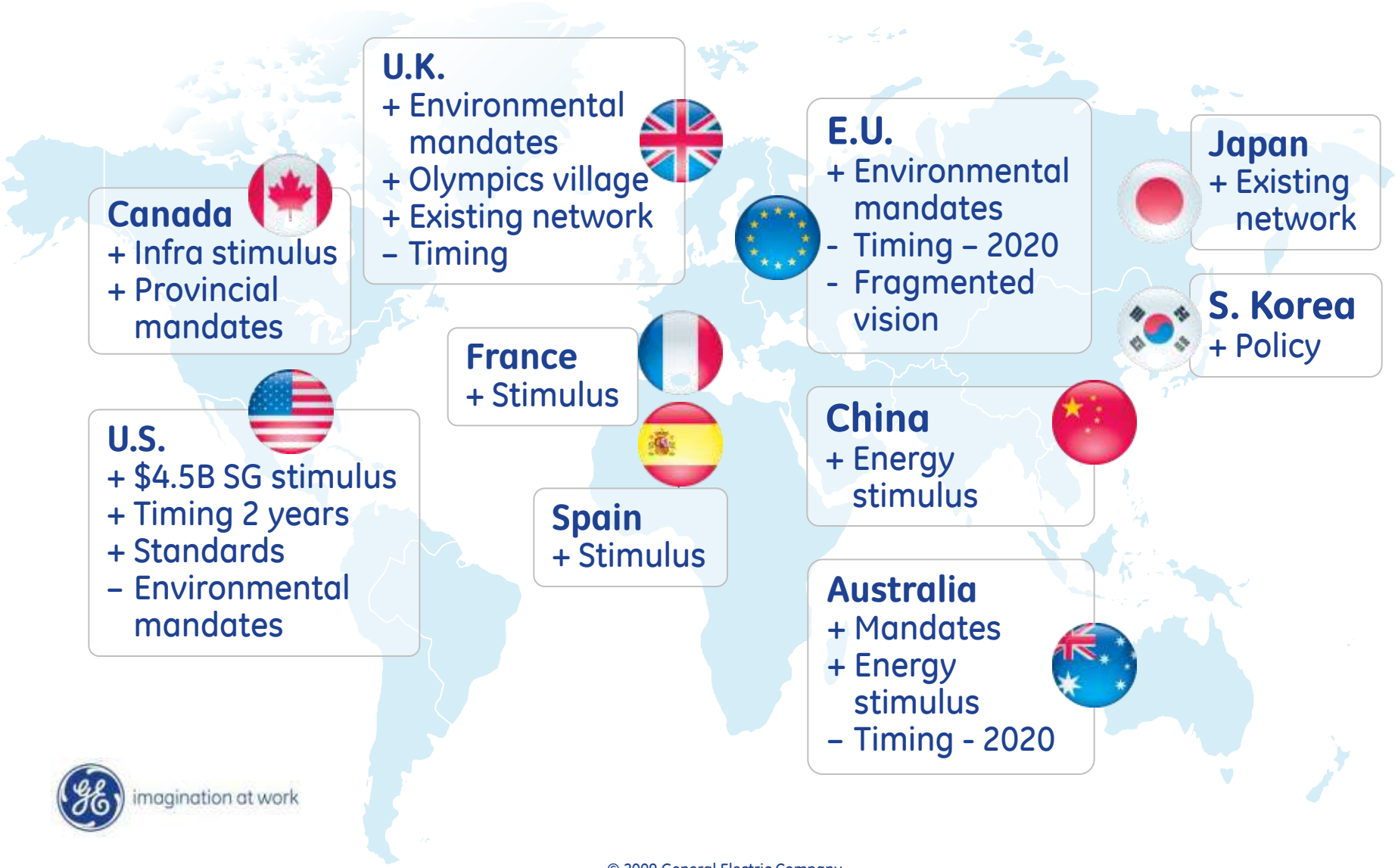
Source: EurObserv'ER, EPA AgSTAR

T&D… Smart Grid landscape



U.K.
+ Environmental mandates
+ Olympics village
+ Existing network
– Timing

Canada
+ Infra stimulus
+ Provincial mandates

U.S.
+ $4.5B SG stimulus
+ Timing 2 years
+ Standards
– Environmental mandates

France
+ Stimulus

Spain
+ Stimulus

E.U.
+ Environmental mandates
- Timing – 2020
- Fragmented vision

China
+ Energy stimulus

Australia
+ Mandates
+ Energy stimulus
– Timing - 2020

Japan
+ Existing network

S. Korea
+ Policy

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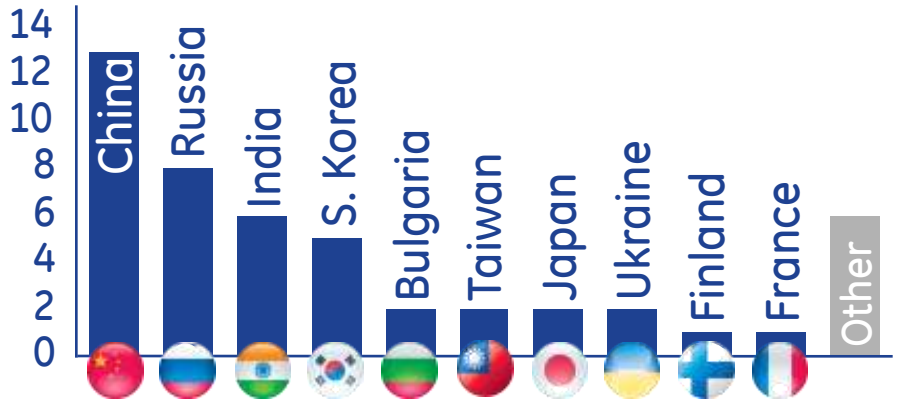
Nuclear

Units under construction



Today, around the world:

- 48 units (= 42 GW) under construction
- Pro-nuclear national policies in China, Russia, Japan, S. Korea, France, UK, India

U.S. snapshot

U.S. has largest installed base but falling behind rapidly in new build and relevance

- 100 GW operating today = 20% of U.S. electricity supply
- 32 GW planned to retire by 2035
- Construction license applications for ~36 GW in new build
- $122B in loan guarantee applications for ~29 GW in new build (only $18.5B available today)

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Data sources: NEI, EIA, UxC

What's the future of our most abundant energy resource?

Coal landscape

Coal faces decline…

The Year in Coal 2008: 24 New Plants Killed in the U.S.

by Stacy Feldman - Jan 1st, 2009 in Clean Energy No More Dirty Coal Sierra Club

U.S. coal output to fall in 2009: EIA

Tue Dec 9, 2008 11:13am EST

… without carbon capture

Coal power plants may have to limit emissions

E.ON delays coal-fired power plant to await carbon capture ruling

Since 2001, ~86GW in the US have been cancelled or postponed

What's the impact

- Jobs…?
- Lost GDP…?
- Which state is most impacted?

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Our largest and most secure energy resource

The economic impact of losing coal

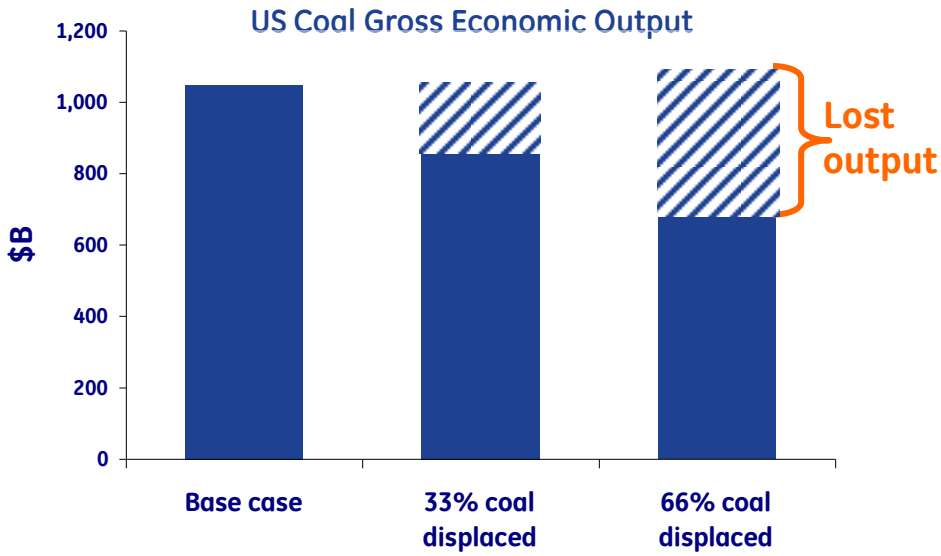
The impact of displacing coal-based generation in 2015[1]:

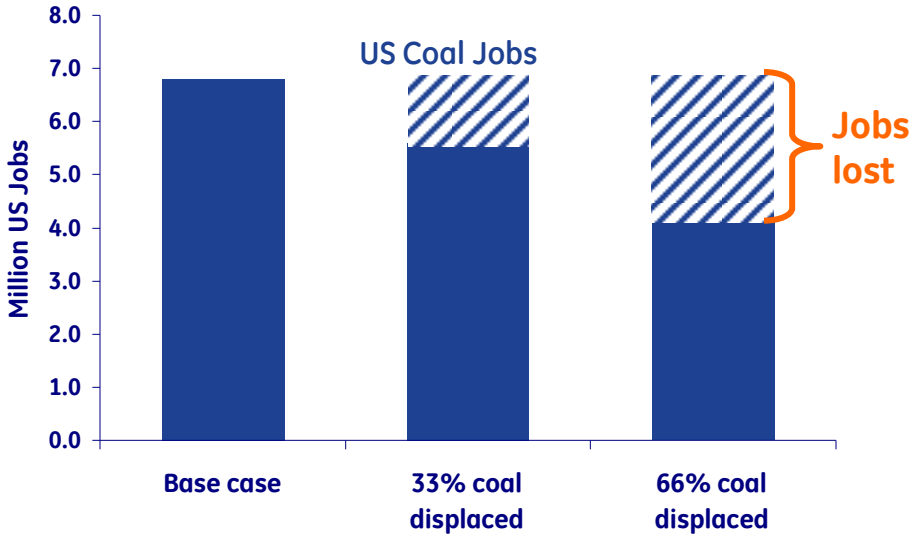
If we displace 33% of coal

- $166 billion (2005 $) reduction in US gross economic output
- $64 billion reduction of annual household incomes
- 1.2 million job losses

If we displace 66% of coal

- $371 billion (2005 $) reduction in US gross economic output
- $142 billion reduction of annual household incomes
- 2.7 million job losses





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1 Adam Z Rose and Wei, D.; The Economic Impacts of Coal Utilization and Displacement in the Continental United States, 2015, Pennsylvania State University, July 2006

What has to happen…?

- **Follow through…Obama, "5 first of a kind" coal plants with CCS**
  - Legislate or regulate?
- **Create Value for carbon**
  - Cap & Trade…bonus allowances for coal CCS
  - Clean Energy Standard…double credits for early movers
- **Start commercial deployment… all pieces ready NOW**
  - Incentives equal to the challenge
    - ITC
    - Loan guarantees
    - Grant funding for FEED/site characterization

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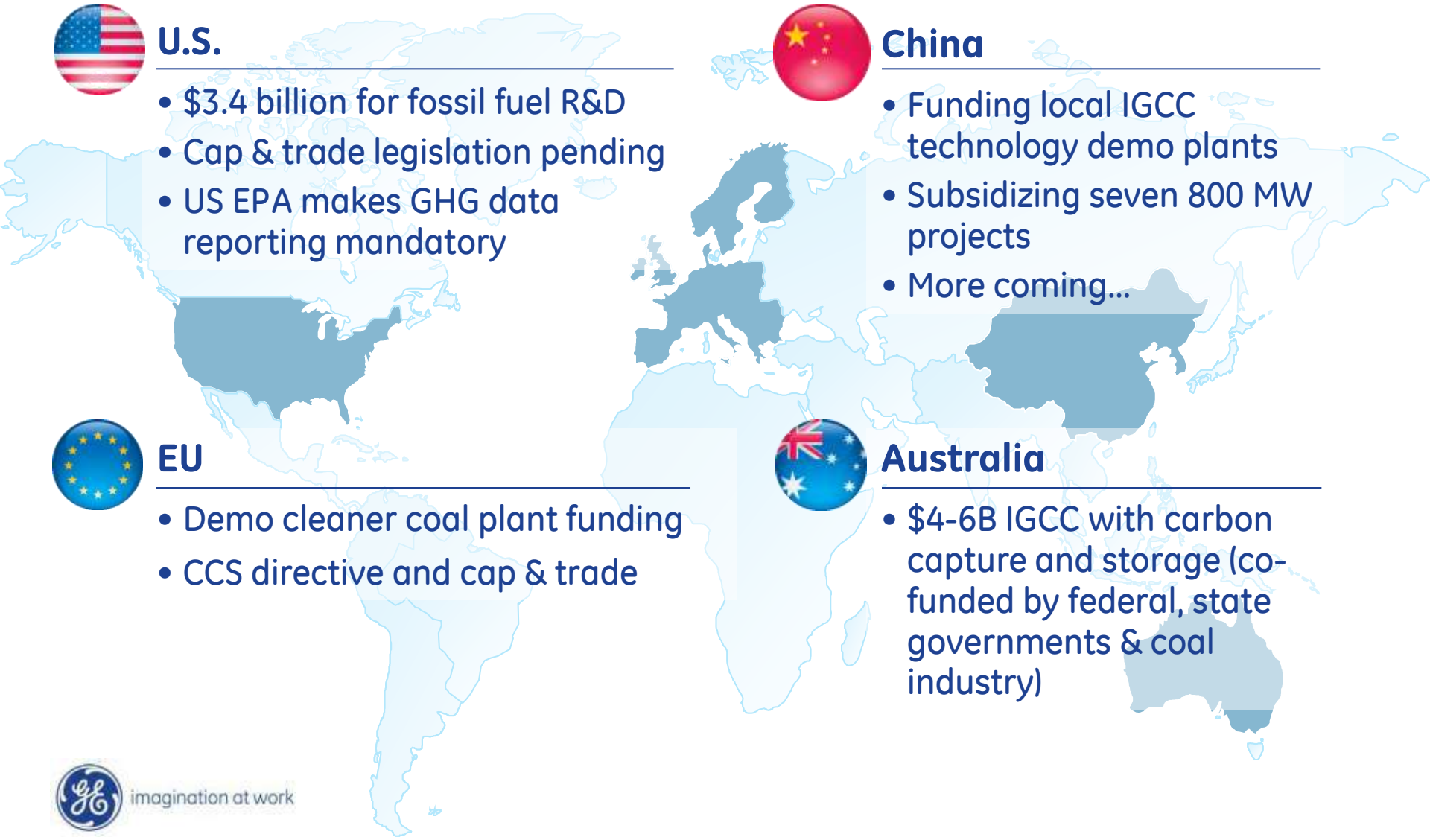
Cleaner coal: incentives & policy critical



U.S.

- $3.4 billion for fossil fuel R&D
- Cap & trade legislation pending
- US EPA makes GHG data reporting mandatory

China

- Funding local IGCC technology demo plants
- Subsidizing seven 800 MW projects
- More coming…

EU

- Demo cleaner coal plant funding
- CCS directive and cap & trade

Australia

- $4-6B IGCC with carbon capture and storage (co-funded by federal, state governments & coal industry)

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Technologies

Pulverized coal

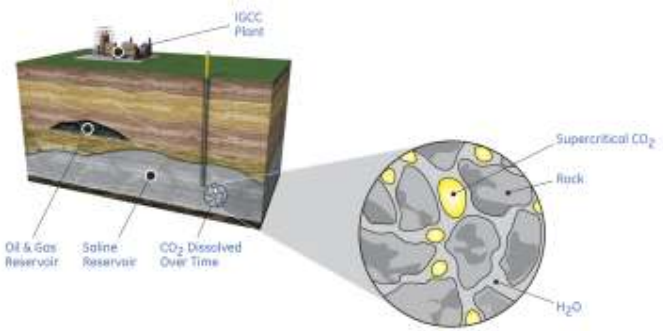
- Technology is 100+ years old
- Fuel: coal
- Carbon Capture & Emissions: Post-combustion

IGCC

- Technology is 20+ years old
- Fuel: many carbon-based materials
- Limited commercial deployment
- Carbon Capture & Emissions: Pre-combustion

Carbon storage

- Technology used for decades in oil recovery
- Small scale demos underway globally
- Large scale demos needed



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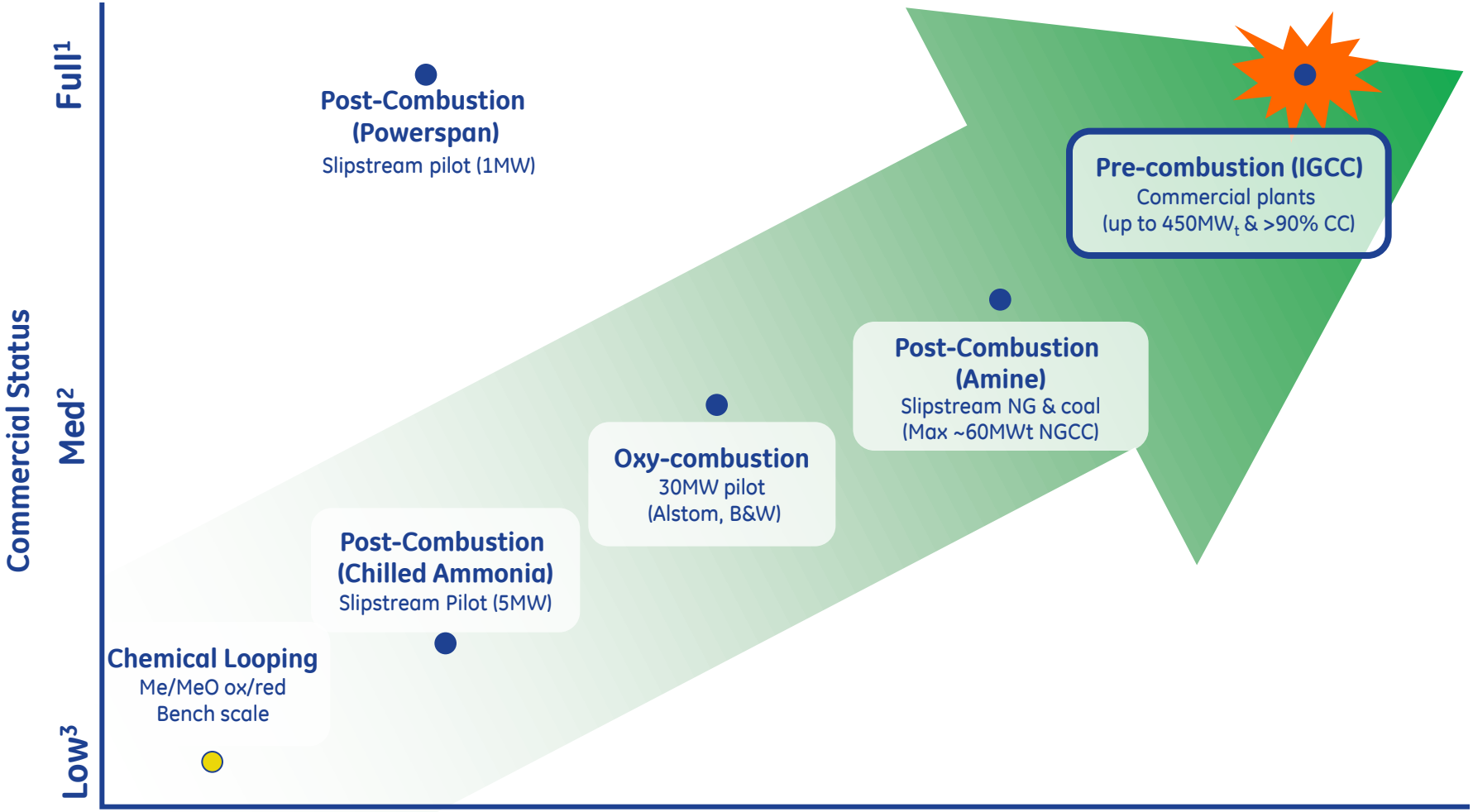
Carbon capture technology maturity



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[1]Commercially offered... guaranteed cost & performance
[2] Requires shared risk & cost for scale-up to pre-or-full commercial
[3] Technical feasibility only... unknown cost, performance & integration barriers

Summary

- The game has started…must face into the realities
- We are a BIG market…must use to our advantage
- Opportunities abound…must find common ground
- Market forces will drive our leadership…must get OUR game started

imagination at work

GE Energy

The future of energy

Monte Atwell
General Manager
Gasification & IGCC, GE Energy

October 2009

Western States Energy & Environment Symposium

Selected Pre-Meeting Background Resources:
Energy-Related Initiatives and Activities in the West

The background materials listed below were suggested by state legislators, panelists and other participants who were in attendance at the Western States Energy & Environment Symposium. All participants were encouraged to browse and review the selected materials to help inform their participation in the Symposium. The list is also available online at: http://legisweb.state.wy.us/2009/Interim/Wsees/WSEESBackground.htm.

Google Earth Map Green Energy Application

- Jointly developed by Google and environmental groups Natural Resources Defense Council and the National Audubon Society, this application maps areas in 13 Western states that the groups believe are potentially suitable for solar power plants, wind farms, transmission lines and other green energy projects. The application will also pinpoint areas classified by the groups as critical habitat for protected wildlife such as the desert tortoise in California and Wyoming's sage grouse. http://earth.google.com/gallery/kmz/protected_areas_energy_development.kmz

Northwest Power & Conservation Coordinating Council 6th Draft Plan (September 2009)

- Long-term regional energy plan for OR, WA, ID, MT. http://www.nwcouncil.org/energy/powerplan/6/default.htm

PacifiCorp Energy Gateway

- PacifiCorp has created several maps as a means of explaining its Energy Gateway transmission project. The maps depict Western states' potential for biomass, geothermal, solar, and wind, relying on data from the National Renewable Energy Laboratory. http://www.pacificorp.com/tran/tp/eg.html

Pew Center on Global Climate Change, U.S. Climate Policy Maps

- Offers maps and descriptions of U.S. state and regional climate actions (RPS, emissions standards, energy efficiency programs, etc). http://www.pewclimate.org/what_s_being_done/in_the_states/state_action_maps.cfm

U.S. Department of Energy, Carbon Sequestration Regional Partnerships

- http://fossil.energy.gov/sequestration/partnerships/index.html

U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy (EERE)

- State Activities and Partnerships – links to information on energy efficiency, renewable energy, alternative fuel vehicle initiatives in all 50 states and the District of Columbia. http://apps1.eere.energy.gov/states/

U.S. Department of Energy, National Energy Technology Lab, Carbon Sequestration Atlas for the United States and Canada

- This Atlas presents the first coordinated assessment of carbon capture and storage (CCS) potential across the majority of the U.S. and portions of western Canada. The Atlas also provides an introduction to the carbon storage (sequestration) process, summarizes the DOE's Carbon Sequestration Program, and gives information about the CCS contributions from each Regional Carbon Sequestration Partnership (RCSP) to date. http://www.netl.doe.gov/technologies/carbon_seq/refshelf/atlas/

Western Governors' Association, Western Renewable Energy Zones (WREZ) – Phase 1 Report (June 2009)

- The zones are meant to guide new project development and transmission investment in the West. A map depicting the WREZs may be found on pages 12-13. http://www.westgov.org/wga/publicat/WREZ09.pdf

West-Wide Energy Corridor Programmatic EIS Information Center, Final Maps

- This collaborative effort of U.S. Department of Energy, U.S. Department of Interior, U.S. forest Service and U.S. Department of Defense, offers maps of proposed "West-wide" energy corridors. http://corridoreis.anl.gov/eis/fmap/index.cfm

Tom Lubnau

WESTERN STATES ENERGY AND ENVIRONMENT SYMPOSIUM

Trivia Question

- What region of the world supplies 10% of the United State energy needs or about 10.6 quadrillion btu's of energy?

Here are a couple of hints

- Canada supplies 7.08 quadrillion btu's per year
- Mexico supplies 3.04 quadrillion btu's of energy

Wyoming

- More than
  - Saudi Arabia
  - Venezuela
  - Iraq
  - Nigeria

Net Domestic Energy

Export vs. Import

= 4 quadrillion Btu's from fossil fuel

ENERGY

- Cheap, available and environmentally responsible energy is one of the underpinnings of economic prosperity
- We have the opportunity over the next couple of days to lay groundwork for solutions to huge problems facing all of our states
- Method to the madness
- Our expectation is we all roll up our sleeves and work

THE COMMITTEE

- Sen. John Schiffer
- Kyle Davis – Pacificorp
- Nancy Ryan – California Public Utilities Commission
- Bill Schilling – Wyoming Heritage Foundation
- Rep. Colin Simpson – Speaker of the House
- Mark Northam – School of Energy Resources
- Mary Byrnes – School of Energy Resources

Our Consultants

- Hip Consulting
- Brimmer Communications
- Meridian Institute

Housekeeping Items

- Sen. Clifford P. Hansen's Funeral
- Meals
- Transit between facilities
- Get out of your comfort zone
- Everyone who is here, is here for a reason

Advice from the Chairman

- You are not going to all hear what you want to hear, but you will hear what you need to hear
- Keep an open mind – right now, everything is possible
- An once in a lifetime opportunity
- Roll up your sleeves – we intend to work
- Thank you in advance

Ground Rules and Expectations

- We have asked panelists to keep prepared comments to 5 minutes to optimize the time for discussion and interchange of ideas
- Following those remarks, there will be a facilitated discussion between the panelists and participating legislators and then we will open the discussion to all participants.

Ground Rules and Expectations

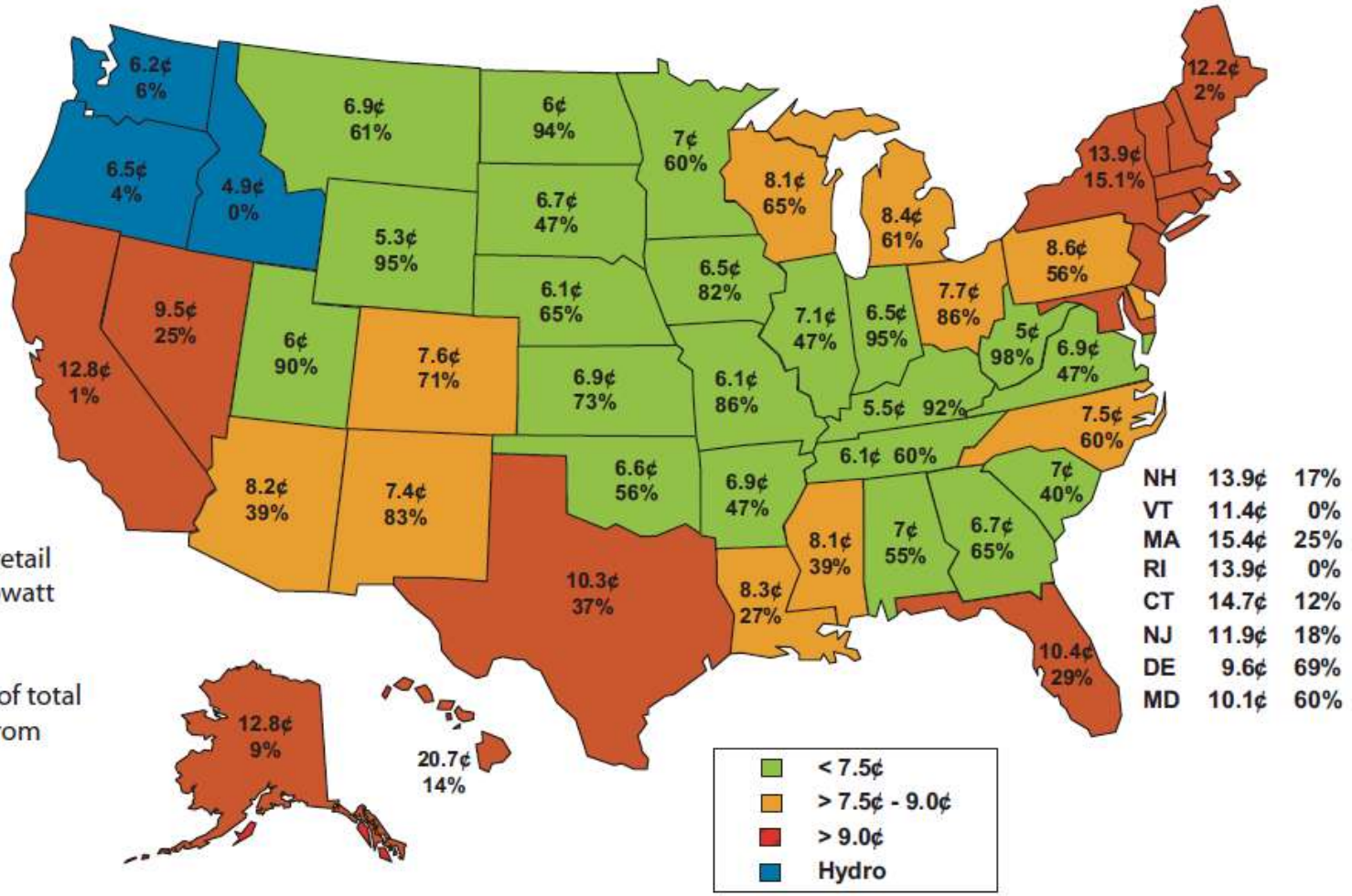
- Be concise and focused in your comments
- Listen carefully and respectfully to others
- A summary of key highlights and recommendations will be prepared and distributed to all participants within 45 days

Western States Energy & Environment Symposium

Break Time Slide Show: U.S. Energy Resource Maps

October 25-27, 2009
Jackson Hole, WY

Cost per kWh and Percent Generated by Coal



¢ = average retail price per kilowatt hour, 2006.

% = percent of total generation from coal, 2006.

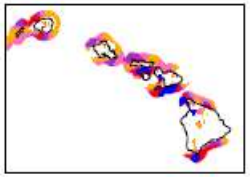
NH	13.9¢	17%
VT	11.4¢	0%
MA	15.4¢	25%
RI	13.9¢	0%
CT	14.7¢	12%
NJ	11.9¢	18%
DE	9.6¢	69%
MD	10.1¢	60%

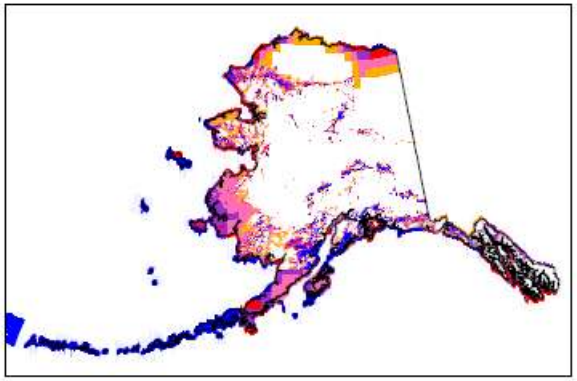
Source: Energy Information Administration, March 2007.

Source: National Mining Association

United States - Wind Resource Map

This map shows the annual average wind power estimates at a height of 50 meters. It is a combination of high resolution and low resolution datasets produced by NREL and other organizations. The data was screened to eliminate areas unlikely to be developed onshore due to land use or environmental issues. In many states, the wind resource on this map is visually enhanced to better show the distribution on ridge crests and other features.





Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed [a] at 50 m m/s	Wind Speed [a] at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

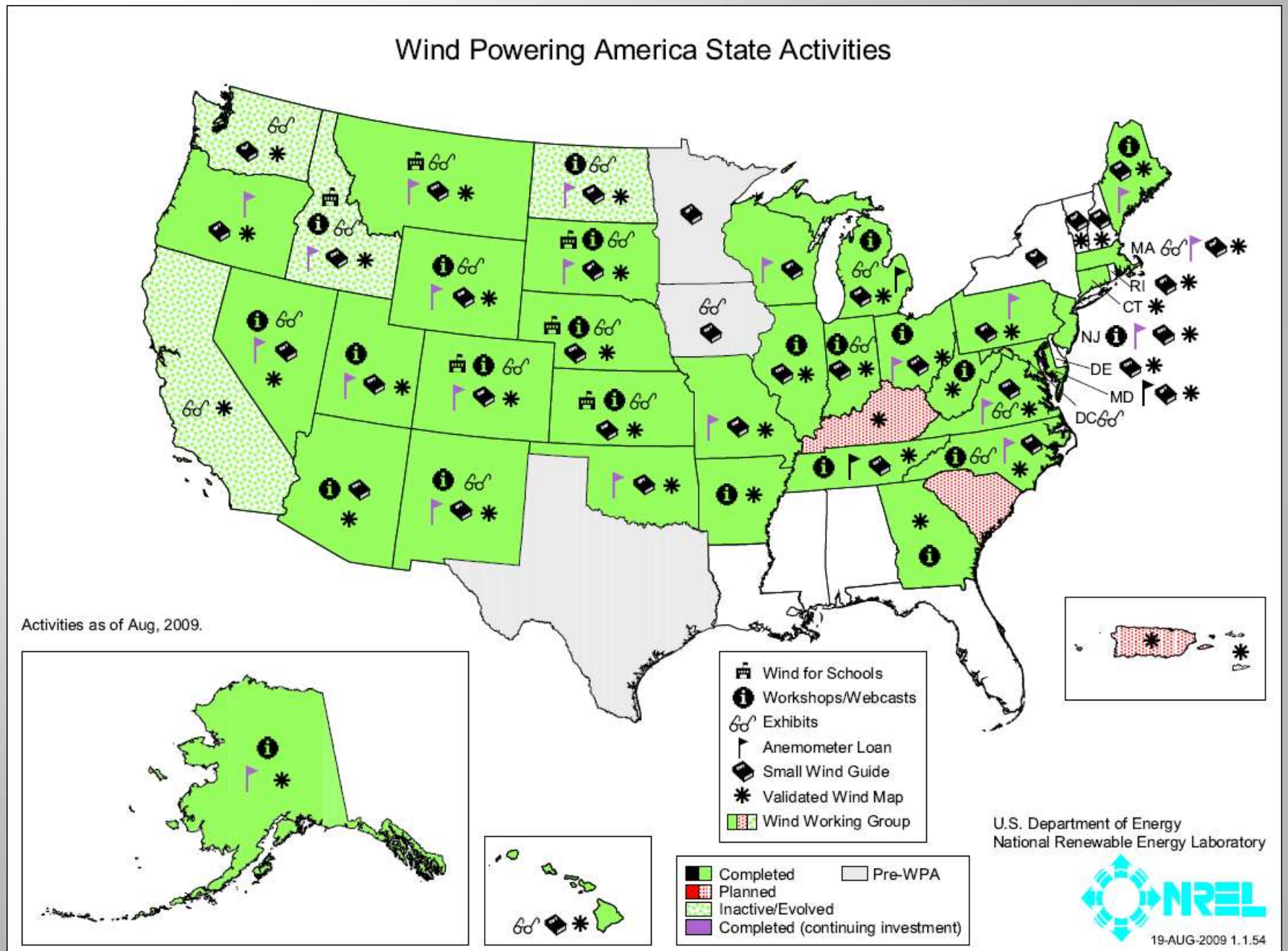
[a] Wind speeds are based on a Weibull k value of 2.0

NREL

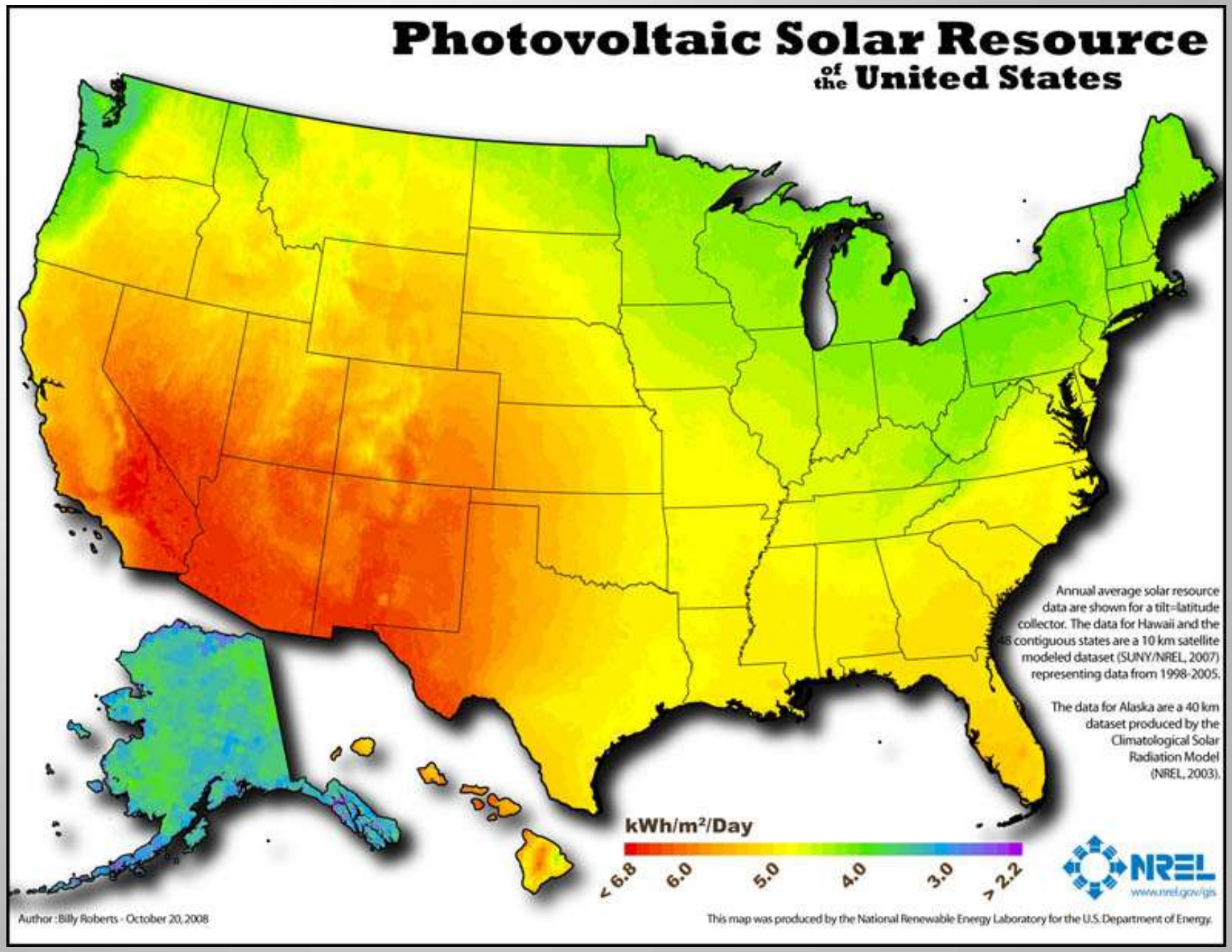
U.S. Department of Energy
National Renewable Energy Laboratory

08-MAY-2008 1.1.9

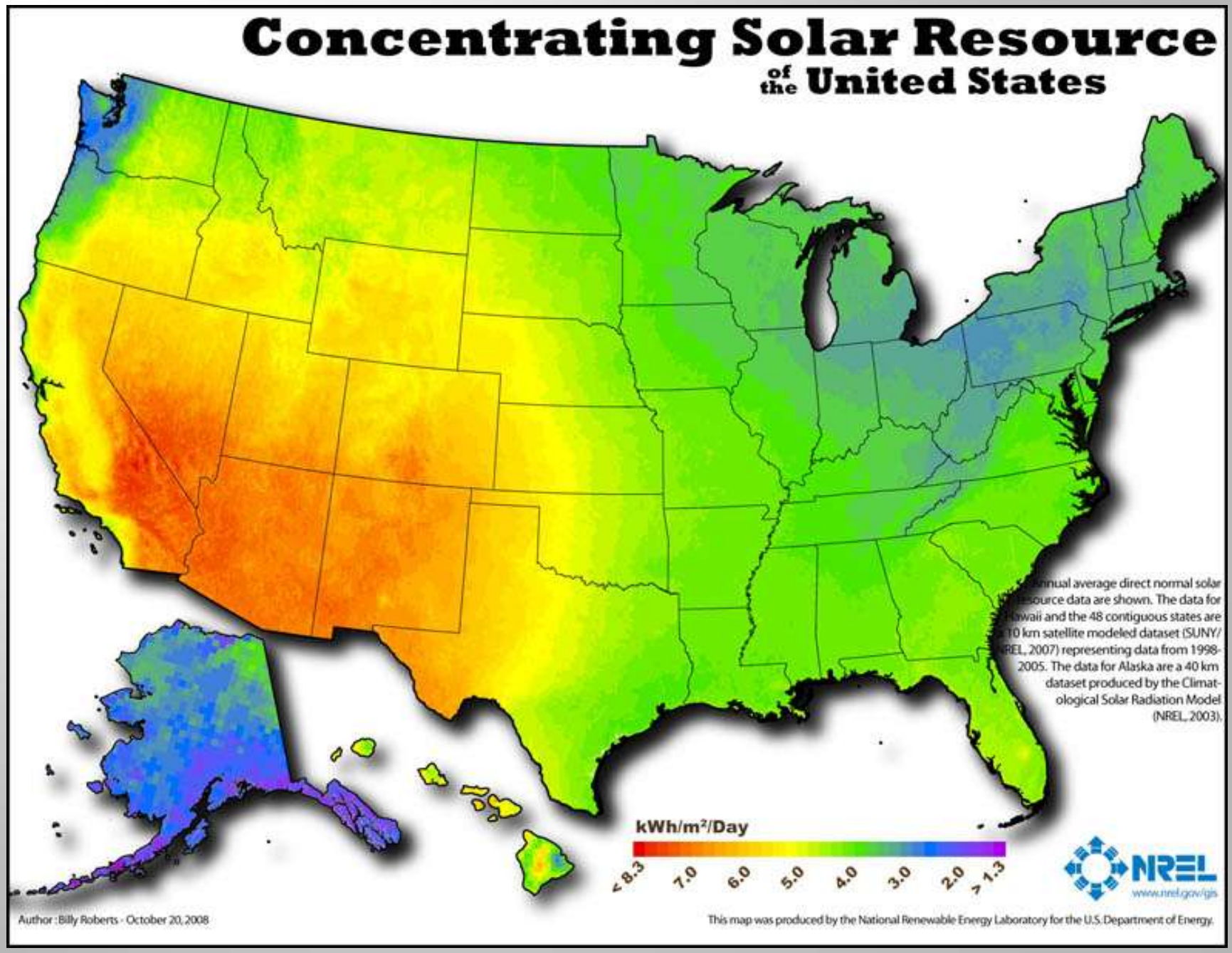
Source: U.S. DOE National Renewable Energy Laboratory



Source: U.S. DOE National Renewable Energy Laboratory

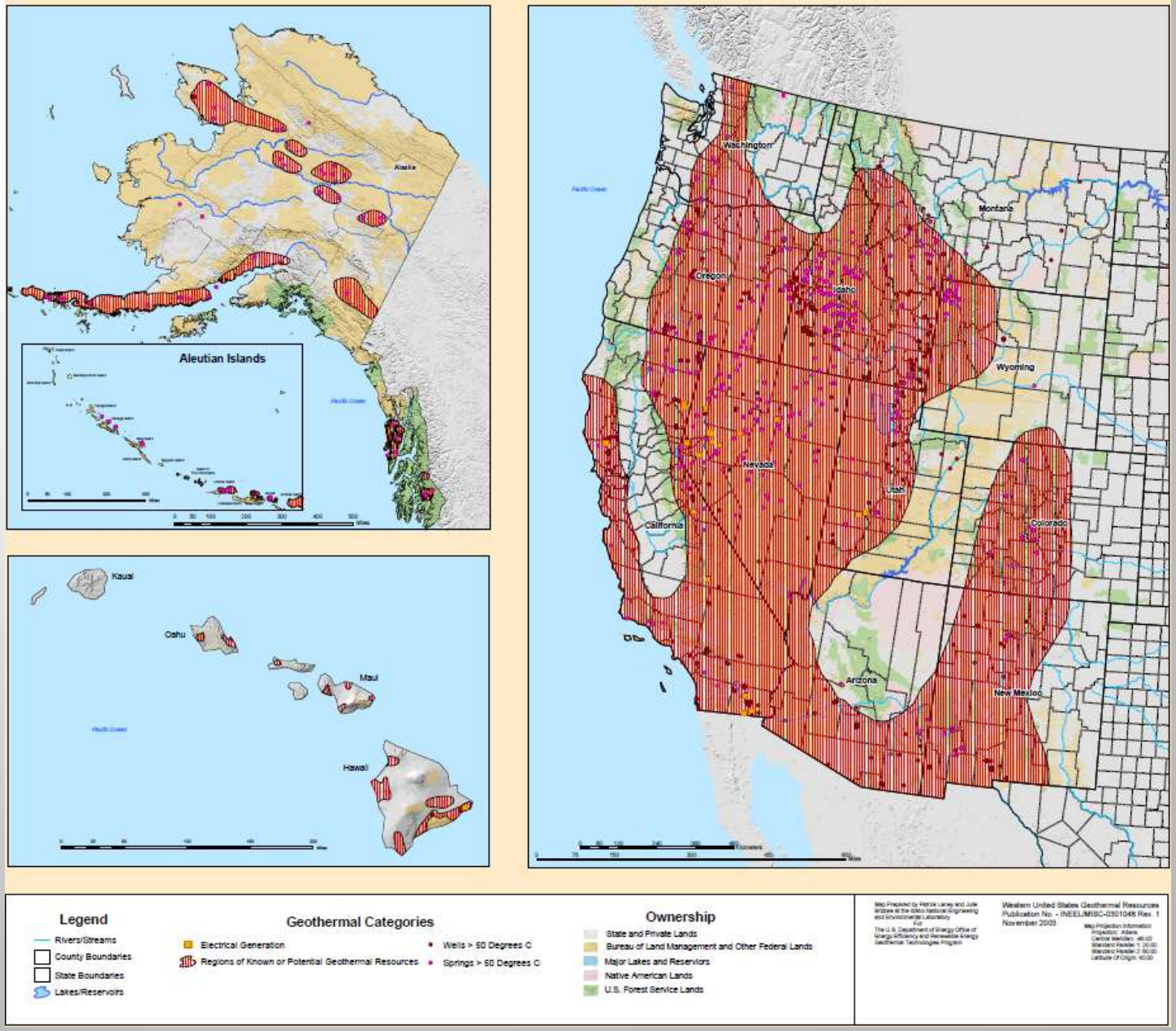


Source: U.S. DOE National Renewable Energy Laboratory

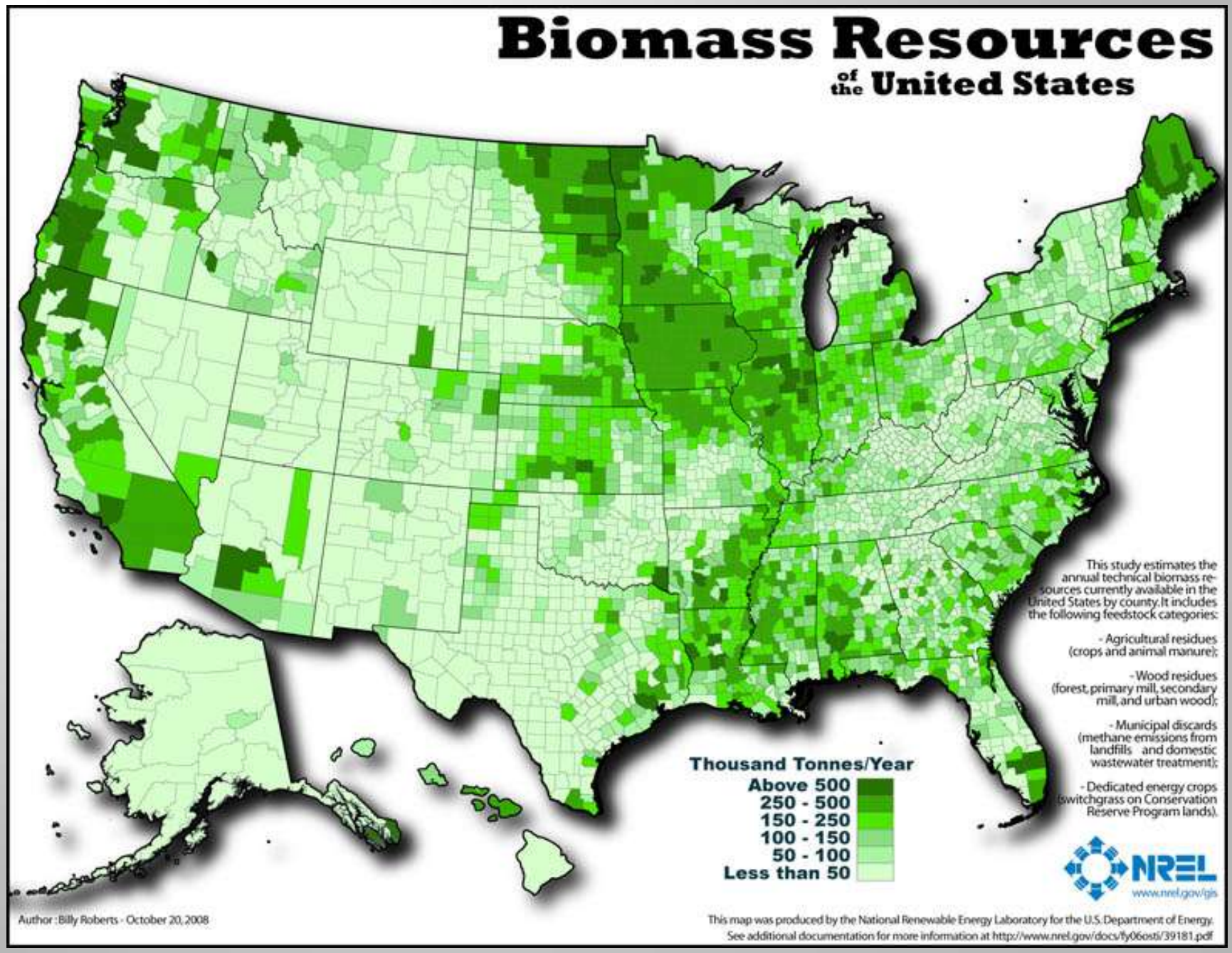


Source: U.S. DOE National Renewable Energy Laboratory

Western United States Geothermal Resources

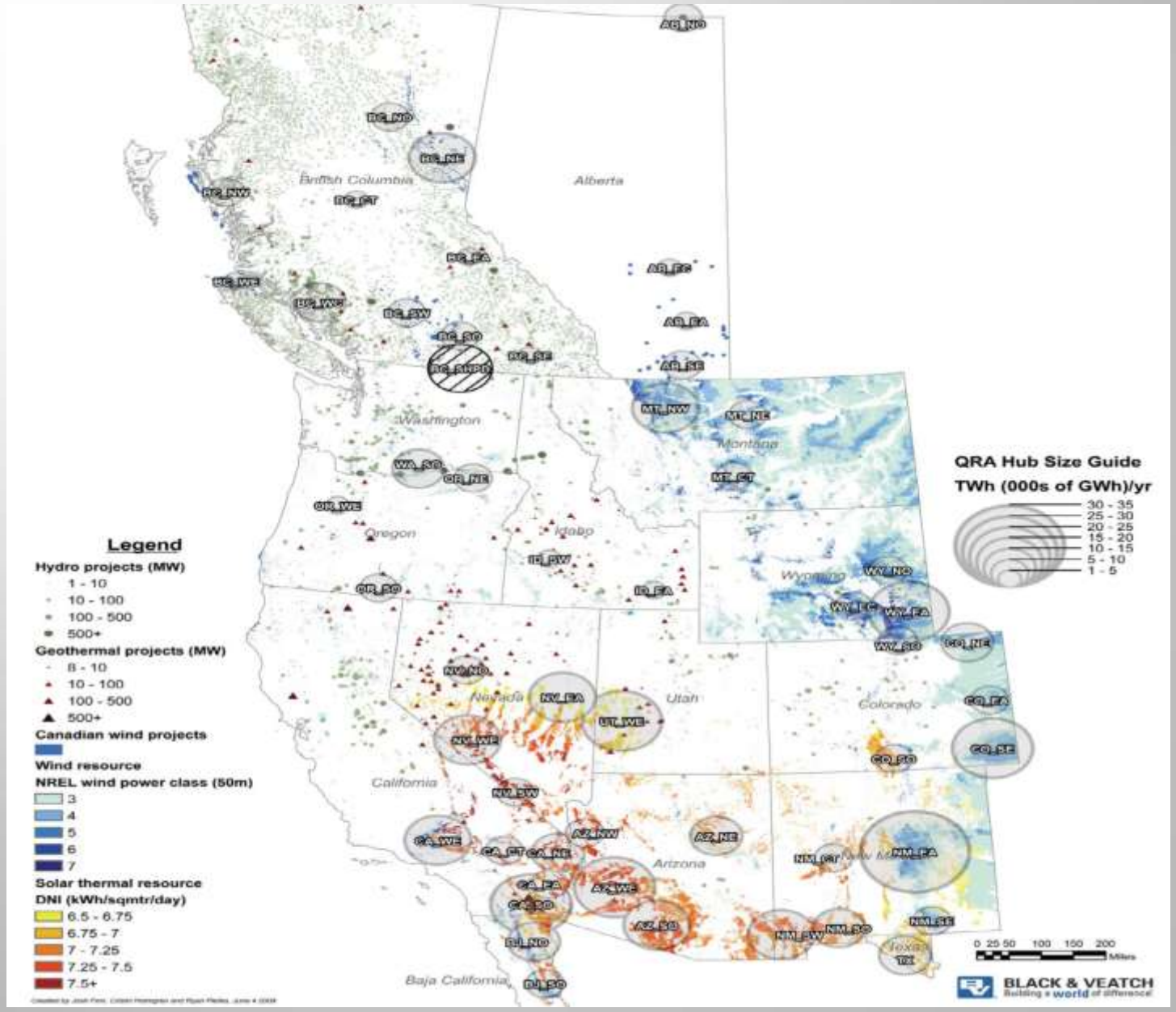


Source: U.S. DOE Idaho National Laboratory

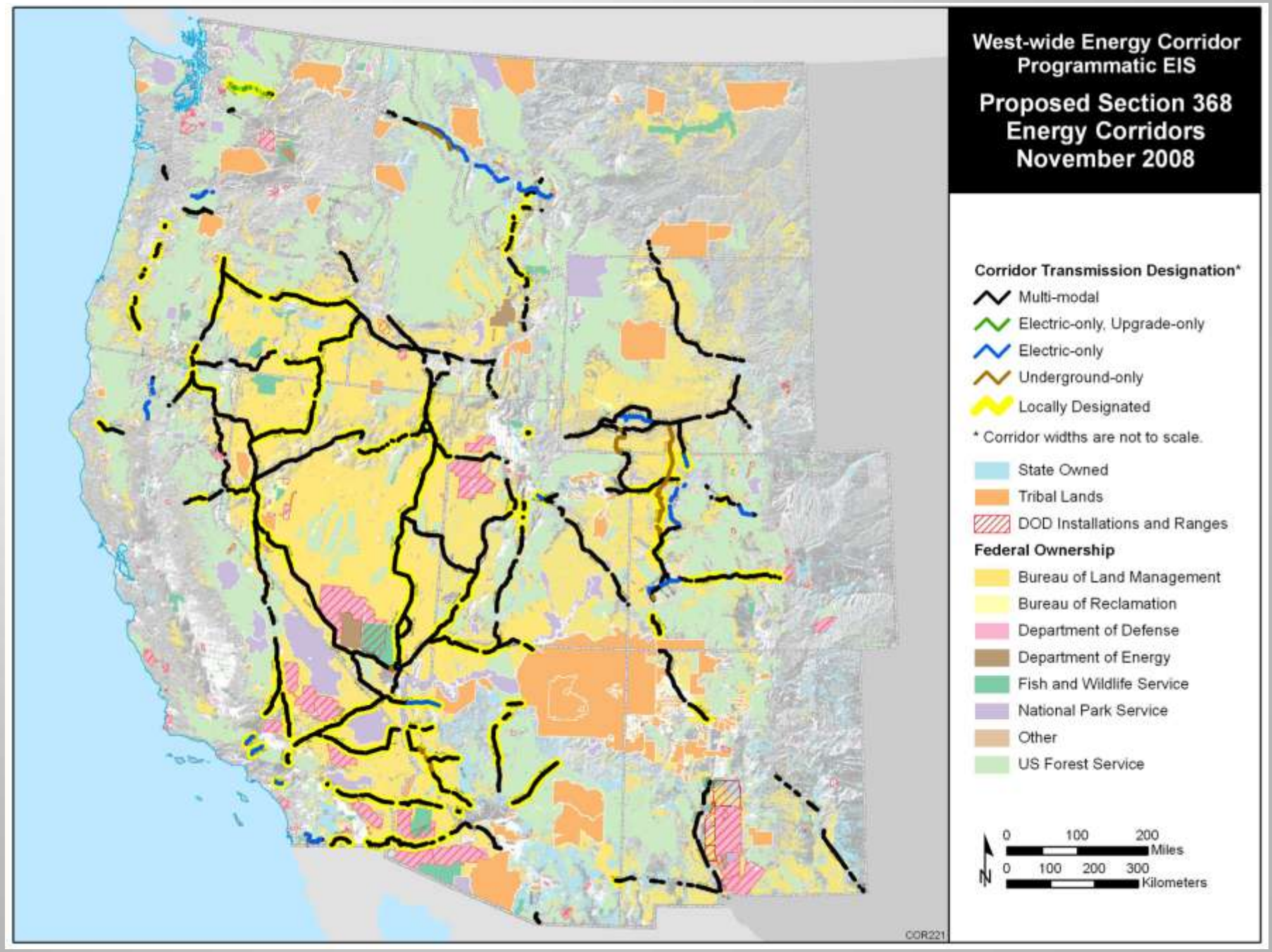


Source: U.S. DOE National Renewable Energy Laboratory

Western Renewable Energy Zones

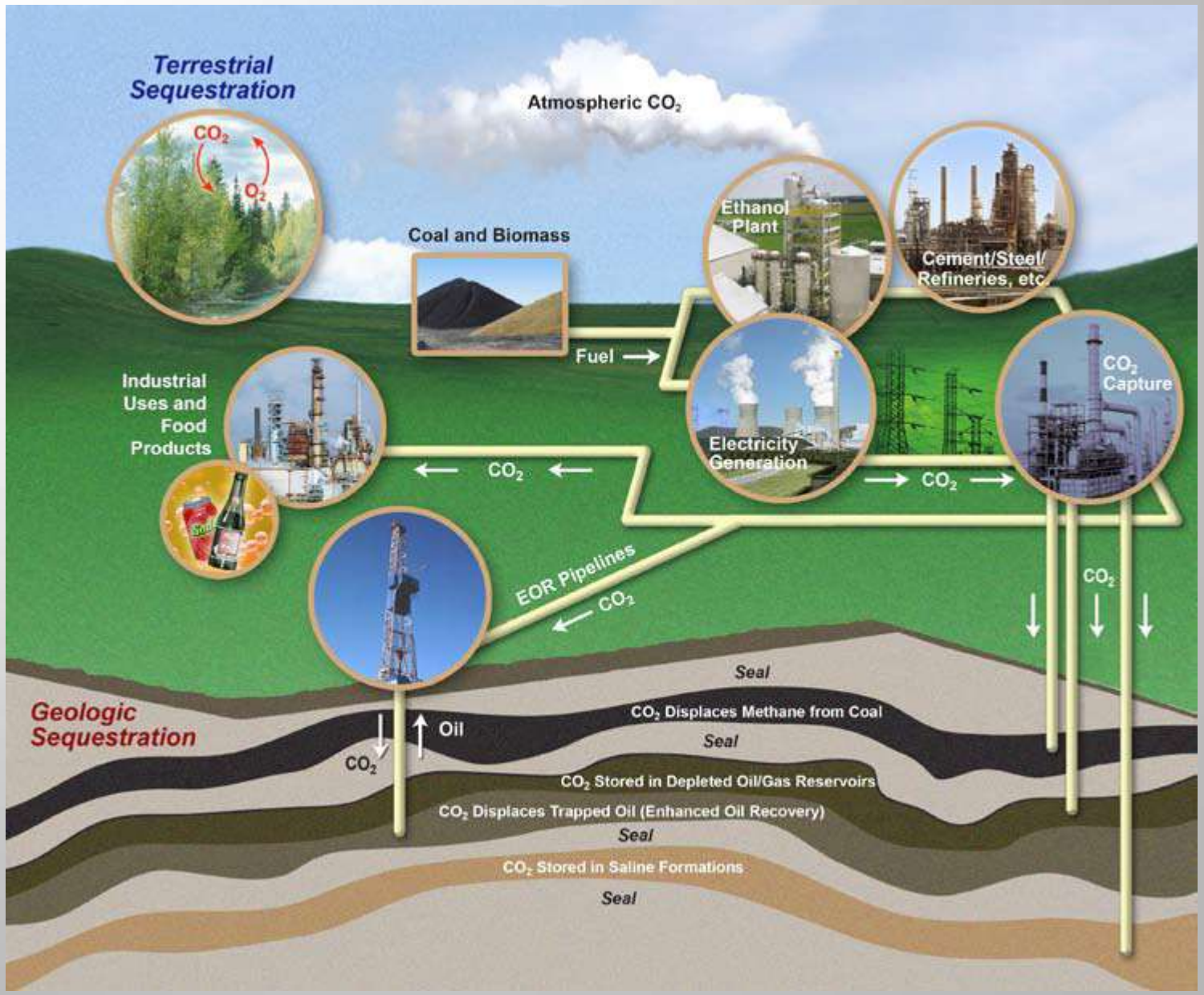


Source: Western Governors Association, Western Renewable Energy Zones Initiative



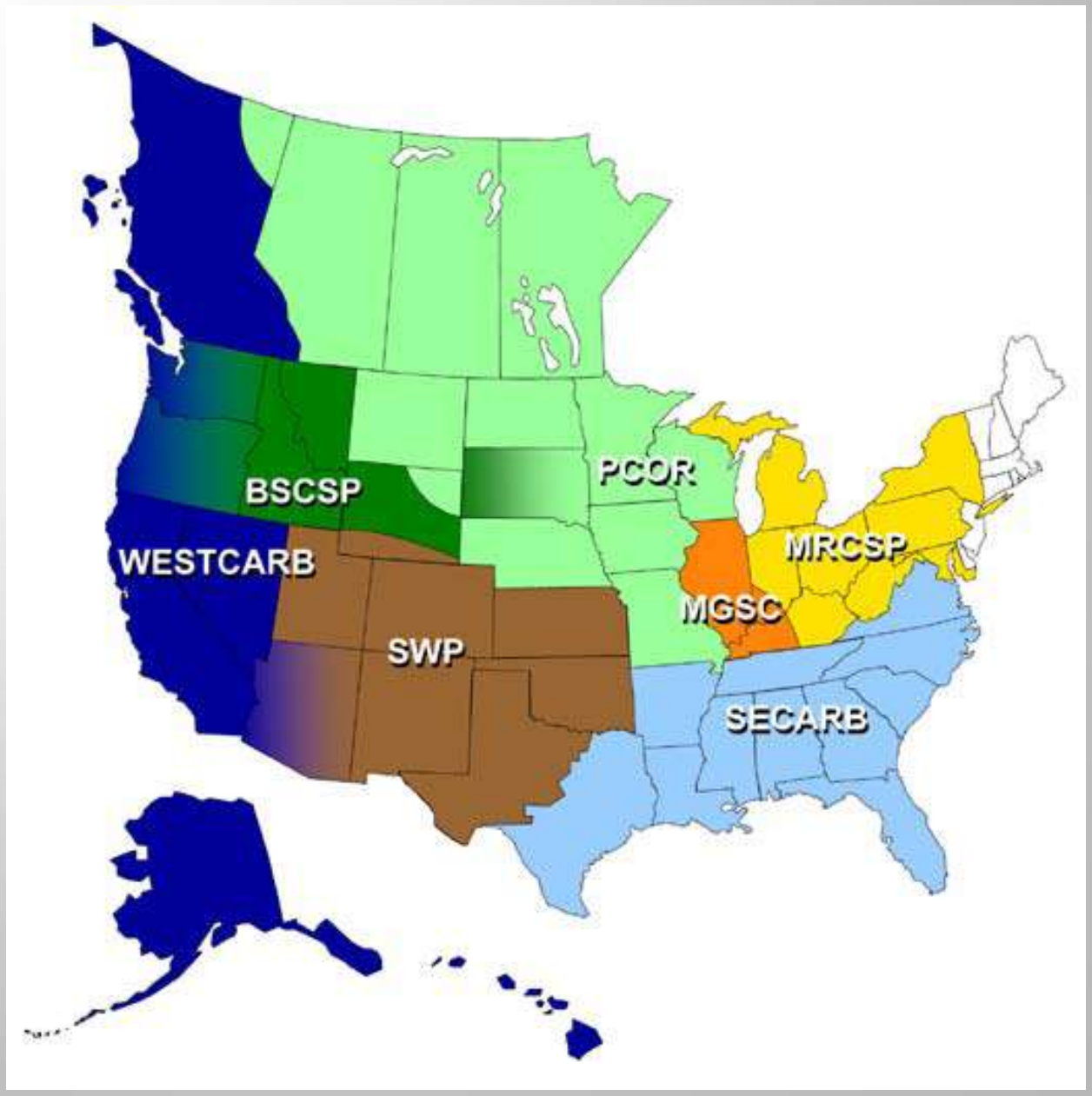
Source: West-wide Energy Corridor Programmatic EIS, Argonne National Laboratory

What is Carbon Sequestration?



Source: U.S. DOE National Energy Technology Laboratory

DOE-Sponsored Carbon Sequestration Partnerships



Source: U.S. DOE National Energy Technology Laboratory

The Big Sky Carbon Sequestration Partnership

BIG SKY CARBON SEQUESTRATION PARTNERSHIP

MONTANA STATE UNIVERSITY

1:6,000,000

BIG SKY CARBON SEQUESTRATION PARTNERSHIP INVOLVES RESEARCH IN 6 CORE STATES: SD, WY, MT, ID, WA, OR

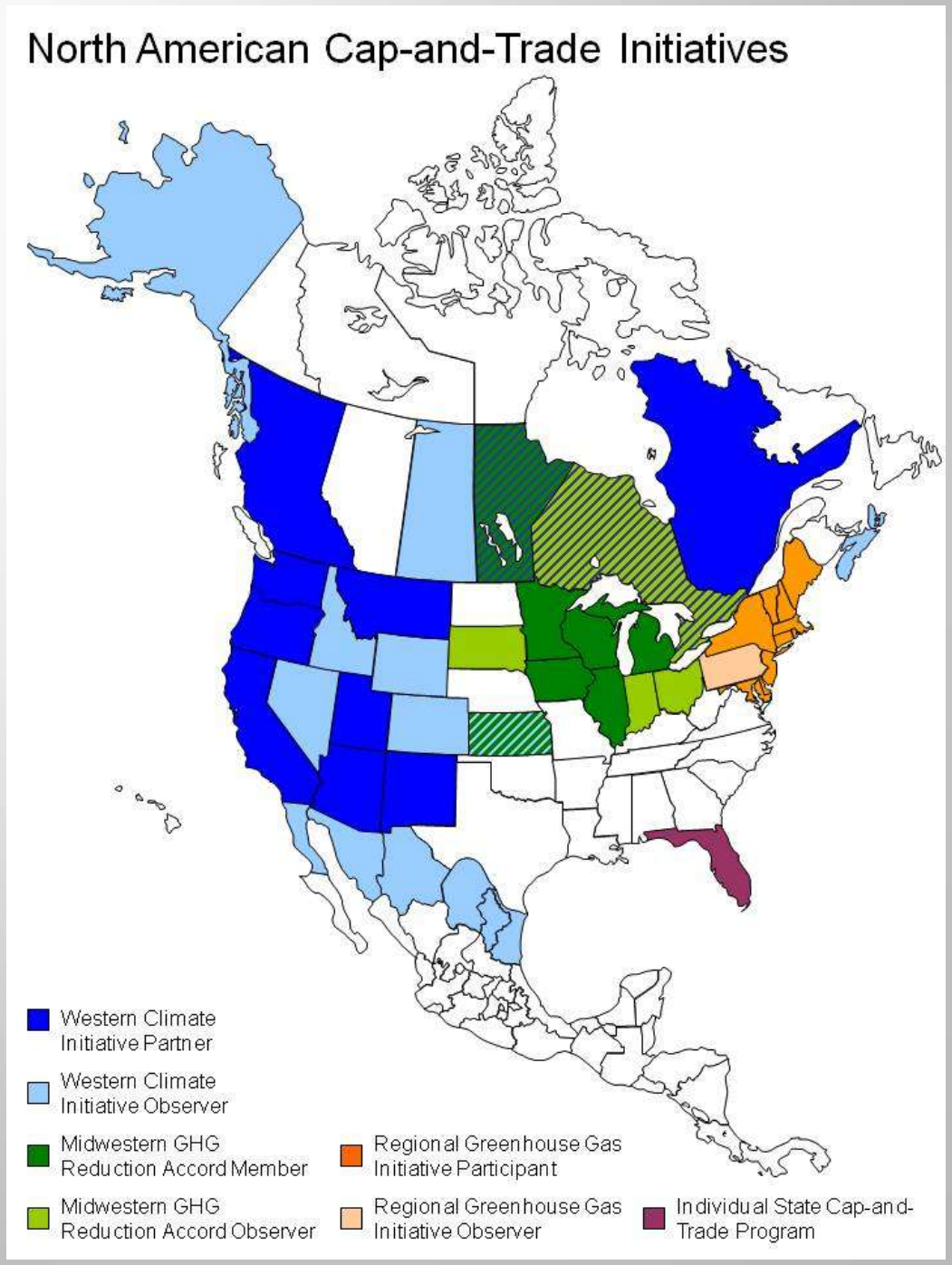
INDEX MAP

N

Source: Big Sky Carbon Sequestration Partnership

Plains CO_2 Reduction Partnership

Source: Plains CO_2 Reduction (PCOR) Partnership



Source: Pew Center on Global Climate Change