**Council on
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**Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038**

Reporting Period: February 1, 2009 - April 30, 2010

Submitted on: May 17, 2010

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- **DOE Award Number:** DE-EE0000038
- **Name of the Recipient:** Council on Competitiveness
- **Report Date:** May 17, 2010
- **Period Covered by Report:** February 1, 2009 - April 30, 2010
- **Goals and Objectives for the Period:**
 - Conduct 4 regional meetings as per Phase I of the initiative in California, Illinois, New Jersey and Texas.
 - Develop a comprehensive plan to achieve the Council's Energy Security, Innovation & Sustainability (ESIS) Initiative's goal as per Phase II of the initiative.
 - Convene a National Energy Summit as per Phase III of the initiative.
 - Conduct extensive outreach to widely disseminate the findings and the recommendations of *Drive*, a comprehensive policy plan that achieved the goal of the ESIS Initiative as per Phase II of the initiative.
- **Accomplishments:**
 - As per the Statement of Objectives, the Council, under the auspices of the ESIS Initiative, conducted four regional meeting around the country in 2009. As expected, these regional meeting received wide participation from experts from academia, labor, private and public sectors. Members of the audience were from similarly diverse backgrounds. The experts at each regional meeting focused on current energy policy challenges and identified potential policy changes that would result in creation of new industries, markets and jobs.
 - The first in this series of regional meeting was held on February 13, 2009, in Houston, Texas. The meeting was co-sponsored by Marathon Oil Corporation. This Southern Energy Summit focused on the path to energy diversification. This meeting was held in concert with CERAWeek 2009, the annual conference that brings executives from around the world together to discuss global energy issues. (See Appendix 1 for a complete report on the Southern Energy Summit, the Participant's list and the Agenda.)
 - The Eastern Energy Summit was held on April 15, 2009, in New Brunswick, New Jersey. Council members Public Service Enterprise Group and Rutgers, the State University of New Jersey, co-sponsored the meeting. The meeting was also covered by the Clean Skies TV network. The Eastern Energy Summit focused on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI). (See Appendix 2 for a complete report on the Southern Energy Summit, the Agenda and Participant's list.)

- The Council held the Midwest Energy Summit on May 13-14, 2009, at Argonne National Laboratory right outside of Chicago, IL. This event was co-sponsored by the University of Illinois, Argonne National Laboratory and Caterpillar Inc. The Midwest Energy Summit focused on using the region's unique energy resources and infrastructure to reduce greenhouse gas emissions and improve our nation's energy security. (See Appendix 3 for a complete report on the Midwest Energy Summit, the Agenda and Participant's list.)
- The last in the series of the regional meetings was held on July 30, 2009, in Mountainview, California. The Western Energy Summit was co-sponsored by NASA-Ames Research Center, CMEA Capital, Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory and the University of California System. The focus of the Western Energy Summit was on accelerating the development of breakthrough energy technologies – and reap the benefits of the jobs and industries they will create. (See Appendix 4 for a complete report on the Western Energy Summit, the Agenda and Participant's list.)
- **Phase II:** The Council developed a comprehensive plan, which achieved the objectives of goals of the ESIS Initiative. **Drive. Private Sector Demand for Sustainable Energy Solution: A Comprehensive Roadmap to Achieve Energy Security, Sustainability and Competitiveness** was released on September 23, 2009, at the National Energy Summit & International Dialogue. The release of Drive received wide-spread publicity including coverage by Newsweek Magazine, CNBC News Channel and Clean Skies News Network. (A complete copy of **Drive** is attached as Appendix 5.)
- **Phase III:** On September 23-24, 2009, the Council hosted the National Energy Summit & International Dialogue at the Mayflower Hotel in Washington, D.C. This widely publicized event was attended by nearly 400 members of the academia, labor, private and public sectors not only from the United States but around the world.

The Honorary Committee for the National Energy Summit & International Dialogue was composed of Senator Jeff Bingaman, NM; Senator Susan M. Collins, ME; Senator Chuck Grassley, IA; Senator Richard Lugar, IN; Senator Lisa Murkowski, AK; Senator Olympia J. Snowe, ME; Senator Debbie Stabenow, MI; Senator Mark R. Warner, VA; Representative Vernon J. Ehlers, MI; Representative Bart Gordon, TN; Representative Rush Holt, NJ; Representative Henry Waxman, CA; Governor Christine O. Gregoire, WA; Governor Jack Markell, DE and Governor Edward G. Rendell, PA.

Speakers at the two-day event were drawn from leaders from academia, labor, private and public sectors from the United States and around the world, including Steven Chu, Secretary, U.S. Department of Energy; Gary Locke, Secretary, U.S. Department of Commerce; Raymond LaHood, Secretary, U.S. Department of Transportation; Joseph Biden, Vice President of the United States of America; Dr. John Holdren, Assistant to the President for Science and Technology, Director, Office of Science and Technology Policy, Executive Office of the President of the United States; Senator Lisa Murkowski,

Alaska; Senator James Warner, Virginia; Kandeh Yumkella, Director General, United Nations Industrial Development Organization; Ólafur Ragnar Grímsson, President, Republic of Iceland; Mr. Ola Alterå, State Secretary for Energy, Ministry of Energy, Enterprise and Communications of the Government of Sweden; and, Maria Van der Hoeven, Minister of Economic, Government of the Netherlands. (Appendix 6 provides the complete program for the two-day event, including the agenda and speakers list. See Appendix 7 for a comprehensive listing of all participants and attendees at the National Energy Summit & International Dialogue.)

Partners for the National Energy Summit & International Dialogue included: the Brookings Institution, Center for the Study of the Presidency and Congress, Energy Future Coalition, National Academy of Sciences, Securing America's Future Energy, TransAtlantic Business Dialogue, United Nations Foundation, World Business Council for Sustainable Development and the World Resources Institute. On September 24, 2009, the Council, along with the partners, released a private sector *Call to Action for Prosperity and Competitiveness in a Low-Carbon World* to shape the outcome of the United National Climate Change Conference 2009 (COP15) in Copenhagen in December 2009 and negotiations yet to come. (See Appendix 7)

- **Phase IV:** The Council conducted a number of outreach activities since the launch of Phase IV of the project:
 - Every Member of Congress and over one thousand U.S. public and private sector leaders received a copy of *Drive* in October 2009. Subsequently, multiple briefings have been conducted with House and Senate congressional staff from both parties.
 - *Drive* has been personally delivered to numerous high-ranking Administration officials, including: Vice President Biden, three cabinet secretaries and the presidential science advisor.
 - Deborah Wince-Smith addressed the recommendations in *Drive* in her January 2010 testimony before the House Science Committee on reauthorizing the America COMPETES Act.
 - In concert with legislative hearings and other relevant developments, issue specific email blasts are being sent to key congressional staff, generating follow-up calls for additional information on the Council's broader recommendations.
 - ESIS Initiative co-chairs and Steering Committee members have delivered copies of *Drive* to members of their board of directors and referenced our comprehensive roadmap in speeches before distinguished audiences.
 - An increasing number of national organizations are reaching out to the Council to partner on various elements of the *Drive* roadmap, reflecting the recognition, credibility and influence that has been established on energy and sustainability issues. To this end, we recently entered into a partnership with Pew Charitable

- Trusts to co-sponsor and promote the importance of energy efficiency to national competitiveness at their conference in April.
- Media hits/interviews on *Drive* have occurred in the Los Angeles Times, Baltimore Sun, Harvard Business Review online, Sun-Sentinel, This is America, CNBC Closing Bell and Clean Skies TV.
- Deborah Wince-Smith and Susan Rochford are presenting the findings and recommendations of *Drive* and the *Call to Action* before numerous constituencies, including the Swedish government, UNIDO, the National Electrical Manufacturers Association, the ARPA-E Innovation Summit and a joint meeting of UN-Energy and the UN Secretary-General's Advisory Group on Energy and Climate Change.
- Within two weeks of the COP-15 meetings in Copenhagen, the Council and our partnering organizations sent a joint letter to 165 senior government officials in the U.S. and around the world conveying the *Call to Action*. Kandeh Yumkella, Director-General of UNIDO and UN-Energy, who participated in the International Dialogue, also hand delivered a copy to United Nations Secretary-General Ban Ki-moon. We have received positive responses from several officials, including most recently, U.S. Secretary of State Hillary Clinton and David Kappos, Under Secretary of Commerce for Intellectual Property and Director of the U.S. Patent and Trademark Office.

A comprehensive listing of all outreach activity is listed in Appendix 8.

• **Final Cost Status:**

	Total Cost to Date	Federal Share to Date	Recipient Share to Date	Third Party In-Kind Contribution to Date
Phase I	\$474,867.72	\$200,000.00	\$80,842.72	\$194,025.00
Phase II	\$119,974.19	\$80,000.00	\$39,974.19	\$0.00
Phase III	\$1,090,110.79	\$280,000.00	\$287,860.79	\$522,250.00
Phase IV	\$272,803.62	\$239,949.21	\$32,854.41	\$0.00
Total	\$1,957,756.32	\$799,949.21	\$441,532.11	\$716,275.00

- **Schedule Status:** All scheduled activities as described in the Project's statement of activities have been completed.
- **Changes in Approach or Aims:** None
- **Actual or Anticipated Problems or Delays:** None

- **Absence or Changes of Key Personnel or Changes in Consortium/Teaming Arrangement:** Steve Koerner, senior policy director, ESIS Initiative, left the Council for another position in October 2009.
- **Description of Any Product Produced or Technology Transfer Activities Accomplished During this Reporting Period:** None

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Appendix 1: Agenda, Participants List and Report on the Southern Energy Summit

Agenda

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Energy Security, Innovation & Sustainability Initiative Regional Summit Series

**The Path to Energy Diversification —
*Addressing Public Policy, Business and Technological
Challenges to Sustainable Energy Supplies***

Sponsored by Marathon Oil Corporation
February 13, 2009

Location: The Consort Ballroom
The Westin Oaks
5011 Westheimer at Post Oak
Houston, Texas 77056

- 9:30 a.m. **Registration**
- 10:00 **Sponsor Welcome and Introductions**
Mr. Clarence P. Cazalot Jr.
President and Chief Executive Officer
Marathon Oil Corporation
- 10:05 **Opening Remarks**
Ms. Deborah L. Wince-Smith
President
Council on Competitiveness
- 10:15 **Dialogue Session I – Exploring the Pathways to Achieving Sustainable
Energy Security**
- ✓ What is the path to sustainable energy security?
 - ✓ What role does low-carbon energy play in this future state?
 - ✓ Who will develop the key technologies necessary to deliver energy sustainability?
 - ✓ What will the energy sources and infrastructure look like in 2020?
- Moderator**
Mr. Roger Goodman
Senior Consultant
Cambridge Energy Research Associates

Commentators:

Mr. James Kinnear
President & Chief Executive Officer
Pengrowth

Ms. Mary Mujica
Senior Vice President, LNG Americas
Shell Gas & Power Americas

Dr. Kenan Sahin
President & Chief Executive Officer
TIAX LLC

Mr. Vic Svec
Senior Vice President, Investor Relations and Corporate
Communications
Peabody Energy

11:45 **Break**

12: 00 p.m. **Luncheon**

1:15 **Dialogue Session II – The Impact of Economic Stimulus on Achieving Sustainable Energy Security**

- ✓ How will economic reform and recovery efforts impact the United States' ability to transition to a clean energy economy?
- ✓ Who will “pay the bill” to drive this transition forward?
- ✓ What role will today’s energy companies play in meeting the nation’s sustainable energy needs?
- ✓ What are the trends for energy industry R&D? Is it enough?
- ✓ How can federal and state policies support the business case for diversification to low-carbon energy alternatives?

Moderator

Mr. Roger Goodman
Senior Consultant
Cambridge Energy Research Associates

Commentators:

Mr. Clarence P. Cazalot, Jr.
President and Chief Executive Officer
Marathon Oil Corporation

Dr. Thomas O. Hunter
Director
Sandia National Laboratories

Dr. William S. Rees, Jr.
Former Deputy Under Secretary for Laboratories & Basic Sciences
U.S. Department of Defense

2:30 **Concluding Remarks**
Mr. Clarence P. Cazalot Jr.,
President and Chief Executive Officer
Marathon Oil Corporation

2:45 **Adjourn**
Ms. Deborah L. Wince-Smith
President
Council on Competitiveness

Participants

Energy Security, Innovation & Sustainability Initiative Regional Summit Series

The Path to Energy Diversification —
*Addressing Public Policy, Business and Technological
Challenges to Sustainable Energy Supplies*

Sponsored by Marathon Oil Corporation
February 13, 2009

Location: The Consort Ballroom
The Westin Oaks
5011 Westheimer at Post Oak
Houston, Texas 77056

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Officer
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Director
Sandia National Laboratories

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Ziad Labban

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Officer
The Bi-National Sustainability Lab

Catherine Mosbacher

President
Center for Houston's Future

Mary Mujica

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Ram Ramanathan

Senior Strategy Consultant to Senior
Vice President, Gas Operations
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William S. Rees Jr.

Former Deputy Under Secretary for
Laboratories & Basic Sciences
Department of Defense

Kenan Sahin

President and CEO
TIAX LLC

Barry Smitherman

Chairman
Texas Public Utilities Commission

Vic Svec

Senior Vice President, Investor
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Uday Turaga

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University of Chicago

Reed Wood

Partner-in-Charge, Energy practice
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Michael Webber

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Members of the Press

Ben Casselman

Reporter
Wall Street Journal

Ed Klump

Reporter
Bloomberg

Kristen Hays

Reporter
Houston Chronicle

Jeff Kralowetz

Reporter
Argus Media Ltd.

Marathon Oil Corporation

Clarence P. Cazalot Jr.

President and Chief Executive Officer

Marilyn Harris

Vice President Federal &
International Government Affairs

Adel Chaouch

Director of Corporate Social Responsibility

Heather Loveman

Conference Services

Robert Estill

Vice President Strategic Planning and Portfolio
Mangement

Paul Weeditz

General Manager, Public Affairs

Hugo Gutierrez

Governmental Affairs Manager

Doug Thierwechter

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Council on Competitiveness

Matthew Faraci

Vice President, Communications

Betsy Thurston

Vice President, Strategic
Development

Susan Rochford

Vice President, Energy & Sustainability
Initiatives

Deborah Wince-Smith

President

Compete: Energy

Regional Energy Summit Series

Southern Energy Summit **The Path to Energy Diversification:** Addressing Public Policy, Business and Technological Challenges to Sustainable Energy Supplies

February 13, 2009

Compete.

Council on
Competitiveness

Energy Security, Innovation & Sustainability Initiative

In 2007, the Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative to explore the linkages between the United States' need for greater energy security, the global imperative for environmental sustainability and U.S. economic competitiveness at the enterprise and national levels. Through extensive dialogues, the ESIS Initiative brought together high-level experts from industry, labor, academe and the policy community to form conclusions and ideas on how to create the enabling conditions that will stimulate and accelerate private sector innovation and investment in sustainable energy solutions. Leveraging the insights generated at the dialogues and the wisdom of the ESIS Initiative Steering Committee, the Council crafted *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*. *Prioritize* was released at the National Press Club on September 9, 2008, and has since had a significant impact in shaping U.S. energy policy and priorities.

In an effort to broaden understanding of the drivers for innovation and investment in sustainable energy solutions in specific areas, the Council is holding a series of four regionally-based energy summits around the United States during the first half of 2009. The Southern Energy Summit was the first in this series.

The following are the highlights and key points captured at the Summit, which was held on February 13, 2009, in Houston, Texas, in conjunction with Cambridge Energy Research Associates (CERA) and CERAWEEK 2009.

The Council would like to express its gratitude to: Clarence Cazalot Jr., president and CEO of Marathon Oil Corporation and a member of the ESIS Initiative Steering Committee, for sponsoring and kicking off the first regional summit; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute, vice chairman of the Council and co-chair of the Council's ESIS Initiative, for her leadership and vision in conceptualizing the regional summit series; Robert Estill, vice president for strategic planning and portfolio management at Marathon and an advisor to the ESIS Initiative; the Marathon team for their strong support in planning and executing this event; CERA and its chairman Daniel Yergin for collaborating with the Council; Roger Goodman, senior consultant for CERA, for moderating our discussions; and, with sincere appreciation, each of the expert participants for their insights and contributions.

**Compete: Energy
Regional Energy Summit Series**

Table of Contents

The Road to the National Energy Summit & International Dialogue	4
Southern Energy Summit Participants List	6
Executive Summary	7
Summit Highlights	
The Energy Innovation Imperative	8
Energy Price Volatility: A Risk to Energy Innovation	10
Energy System Transformation Will Occur in Stages	10
Public-Private Collaboration is Needed	12
The American Recovery and Reinvestment Act: An Important Step Forward on Energy Investment	13
Sowing the Seeds of Sustainability	14
Energy Innovation Snapshot: Sandia National Laboratories	15
Recognizing Shared Roles and Responsibilities	16
About the Council on Competitiveness	19

Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

February 13, 2009
Houston, TX

Clarence P. Cazalot Jr., president and CEO of Marathon Oil Corporation, hosted a regional summit on the path to achieving sustainable energy supplies and the impact of the economic stimulus package on U.S. energy security. This meeting was held in concert with *CERAWeek 2009*, the annual conference that brings executives from around the world together to discuss global energy issues.

April 15, 2009
New Brunswick, NJ

Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group; and Richard L. McCormick, president of Rutgers, The State University of New Jersey, co-hosted a regional summit on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

May 13–14, 2009
Chicago, IL

James Owens, chairman and CEO of Caterpillar Inc.; Robert Zimmer, president of The University of Chicago; and Eric Isaacs, director of Argonne National Laboratory, co-hosted a regional summit focused on using the Midwest's unique energy resources and infrastructure to reduce greenhouse gas emissions and improve our nation's energy security.

Compete: Energy

The National Energy Summit & International Dialogue

July 30, 2009
Mountain View, CA

S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas Baruch, founder and managing director of CMEA Capital; co-hosted a regional summit on lessons that can be learned from the successes of California and other western states as front-runners in the development and deployment of sustainable energy technologies.

September 23–24, 2009
Washington, D.C.

The Council will convene its top experts in the energy field and representatives from countries around the world to address the interconnected challenges of energy security, innovation and sustainability. The Council's agenda for change will be rooted in a new relationship between the public and private sectors to deal with a defining challenge of the millennium.

Southern Energy Summit Participants List

CO-HOSTS

Clarence P. Cazalot Jr.
President and CEO
Marathon Oil Corporation

Deborah L. Wince-Smith
President
Council on Competitiveness

PARTICIPANTS

Mitchell T. Baer
Director
Office of Oil and Gas Analysis
U.S. Department of Energy

Roger J. Goodman
Senior Consultant
Cambridge Energy Research Associates

John D. Hofmeister
Founder and CEO
Citizens for Affordable Energy

Thomas O. Hunter
Director
Sandia National Laboratories

Shirley Ann Jackson
President
Rensselaer Polytechnic Institute

James Kinnear
President and CEO
Pengrowth Management Limited

Ziad Labban
President and CEO
Saudi Refining, Inc.

Joan MacNaughton
Senior Vice President, Power and Environmental Policies
Alstom Power Systems

Mary Mujica
Senior Vice President, LNG Americas
Shell Gas & Power Americas

Kenan Sahin
Founder and President
TIAX LLC

Vic Svec
Senior Vice President, Investor Relations and
Corporate Communications
Peabody Energy

William S. Rees, Jr.
Former Deputy Under Secretary of Defense
for Laboratories and Basic Sciences
U.S. Department of Defense

Daniel Yergin
Executive Vice President and Strategic Advisor
IHS Inc.

Executive Summary

The path to true energy sustainability will not be fast or easy and will require unprecedented cooperation between government, the private sector and the American public.

More than a dozen energy experts convened in Houston, Texas, on February 13, 2009, for the first in a series of four regionally-based energy summits being held by the Council on Competitiveness. The Southern Energy Summit was hosted by Marathon Oil Corporation, and participants explored the public policy, business and technological challenges to increasing the diversity and sustainability of U.S. energy supplies.

There was strong consensus that no single form of energy can satisfy the projected doubling, if not tripling, of demand by the year 2050 while also meeting pressing environmental challenges, including climate change. Innovative technology such as carbon capture and storage, new mitigation techniques and alternative forms of energy must all be brought to bear.

However, unlike breakthroughs in information technology, advancing broad-based energy innovation requires an enormous scale that must be factored into any equation that represents an energy solution.

Further, the time frame for developing alternative forms of energy is much longer than many believe and is not understood by the general public, whose support for sustainability is critical. Some panelists estimated that it will take more than 50 years to achieve the vision of an energy system that is locally tailored and has tremendous diversity in generation. A long-term commitment to energy sustainability

may also require some game-changing strategies that calm volatile energy markets and avoid political cycles. Taking a page from U.S. economic history, one panelist suggested the creation of an independent Federal Energy Reserve Board not unlike the Federal Reserve. The board would be independent and influence national decisions on energy supply, technology, infrastructure and the nation's carbon footprint to better calm the volatile energy market.

Public-private efforts are critical. Energy sustainability will require partnerships with the federal government, such as the U.S. Department of Energy's National Laboratories, that can provide real-world improvements in both the short- and long-term. Indeed, the roles of government and the private sector in energy sustainability were brought into sharper focus by the pending American Recovery and Reinvestment Act of 2009, also known as the economic stimulus bill. There was cautious optimism that the bill was moving the nation in the right direction by way of focusing on greater energy efficiency, alternative forms of energy and improved infrastructure. Nevertheless, there was concern over Congress picking energy winners and losers. Instead, Congress should challenge industry to produce solutions that will create a clear path forward to energy sustainability that the American people can support.

Southern Energy Summit Highlights

The Energy Innovation Imperative

Council on Competitiveness President Deborah L. Wince-Smith opened the morning's session by identifying three building blocks of competitiveness: innovation capacity, enterprise resiliency and sustainability.

Noting the nexus between energy, resiliency and the climate change imperative, she said that this is "one of the most important issues of our time that will not just drive our prosperity, but the future security and capabilities of the world, from the developing to the developed world."

A fundamental question is whether both energy security and energy sustainability can be achieved, or if there is an either/or proposition. The panel members pointed to obvious "tensions" between the two. For example, coal is the most "secure" fuel in the United States. It produces more than 48 percent of the electricity in the United States and unlike oil, provides a healthy five to ten billion dollar trade surplus. As Vic Svec, senior vice president for investor relations and corporate communications at Peabody Energy, noted, coal is an extremely important part of the nation's "asset base." Yet, coal is relatively carbon intensive which raises strong environmental questions about sustainability.

Innovation will provide some real-world solutions. Efforts are underway today to improve carbon capture and storage (CSS), which will move the nation from "clean coal" to so-called "green coal"—a major leap that goes beyond cutting particulate matter and sulfur to making major reductions in CO₂ emissions.

"In September 2008, the Council released a 100-day action agenda for the new president and the new Congress, and embedded in that action agenda were six key recommendations. Among them were recommendations that the federal government begin to draw the market to higher efficiency standards

through its procurement of goods and services, retrofits for buildings and so forth; that there be a level playing field for the development of all energy sources; that there be a clean energy bank created for long-term debt financing for private investment in sustainable energy solutions; that investment in energy R&D and commercialization be ramped-up dramatically; that we clear the way for the creation of a national transmission superhighway; and that there be a focus on developing the green workforce.

If one looks at the emerging stimulus package, we are actually quite pleased that a number of the Council's recommendations essentially are reflected in that legislation, including a focus on the electrical grid."

Shirley Ann Jackson

Rensselaer Polytechnic Institute

Vic Svec, Peabody Energy

Kenan Sahin, TIAX LLC

"It won't be easy. It won't be inexpensive, but it will be done in a way that satisfies society, and it needs to be done," concluded moderator Roger J. Goodman, a senior consultant at Cambridge Energy Research Associates.

Government, private industry and the academic community should all play a role in developing this new technology. The Obama administration has been discussing the need for five large demonstration projects to commercialize CSS. Similar projects are already taking shape in other parts of the world, such as China and Australia.

However, Kenan Sahin, founder and president of TIAX LLC, argued that with so much focus on CSS, not enough attention is being paid to financing

related projects. "There are many ideas to reduce the effects of carbon dioxide in the atmosphere, yet there is very little funding for them," he said.

Sahin also observed that most people confuse energy innovation with IT innovation. The difference is scale. Five people can come together and write a piece of software that can revolutionize information technology, but the same cannot be said about energy storage or an energy production facility. Scale is an enormous concern that must be factored into any equation that represents an energy solution.

In Sahin's view, a "free for all" approach to innovation could diffuse efforts. Energy innovation calls for what he characterized as "more directed" innovation in which research efforts are focused to achieve specific outcomes.

Energy Price Volatility: A Risk to Energy Innovation

The panelists expressed concern that the recent sharp drop in oil prices could harm innovation in alternative energy as some investors walk away from forward-thinking technologies, believing there will not be a good return on investment.

"There is nothing worse for innovation than complacency. Low oil, natural gas and coal prices can take the edge off of financing the development of new technology," warned Goodman. The same may be true for individual attitudes. Four-dollars-a-gallon gas prices drove many people away from their SUVs to more fuel efficient cars or mass transportation. Goodman questioned whether today's lower gas prices will bring them back, reversing a very environmentally-positive trend.

Energy System Transformation Will Occur in Stages

Alternative forms of energy have long development timelines—far longer than most people currently anticipate.

For example, if one looks at the history of energy development and use in the United States—all the way up the hydrocarbon chain, from wood to coal to oil and natural gas—one will see that it took years for a real shift in energy supply to occur. From the inception of oil consumption, it took 50 years for oil to provide 10 percent of overall energy requirements and another 25 years to supply a quarter of U.S. energy use. The same holds true with natural gas.

William S. Rees, Jr., former deputy under secretary for laboratories and basic sciences at the U.S. Department of Defense, puts energy sustainability into three buckets: short-term, mid-term and long-

"We are really missing the boat on energy efficiency. There is so much more we could do near-term without large investment, without really needing new technologies. Technologies are out there on the shelf and simply need to be encouraged and perhaps incentivized a bit so that a great deal can be done.

I want to use the example of what's been done here in the City of Houston, because we have a mayor who is very aggressive in terms of energy efficiency and sustainability. He gave some statistics the other night that Houston, the fourth largest U.S. city, has grown at a faster rate—in both percent and absolute terms—than virtually every other city in the United States, and something like 16 states.

And yet, in that time frame, electricity consumption has actually gone down, and the city has diversified the purchases of electricity to the point where 40 percent of Houston's electricity today comes from wind power.

My point is: this is one city led by one mayor who's doing far more than is being done in most other places, and yet it's all available to us. So, there's a lot more can be done with a short-term impact that could be achieved."

Clarence Cazalot Jr.
Marathon Oil Corporation

Roger J. Goodman, Cambridge Energy Research Associates

term. In the short-term—three to five years—there will probably be very little difference in the mix of how energy is generated. However, there could be some marginal improvements by mitigating impacts. In the mid-term—the 10-50 year window—he sees growth in nuclear power generation, especially if forecasts of increased world populations and per capita consumption in developing nations hold true. Fifty years plus, the energy system would bear little resemblance to today's system. It would have tremendous diversity in generation and would be locally tailored. One size would not fit all.

In the short-term, some experts foresee some real problems with the pace of energy efficiency efforts. During the past 20 to 30 years, there have been some incredible gains in energy efficiency in the U.S. residential sector. However, demand is outstripping these gains. Heating and air conditioning systems are more efficient, but as Goodman noted, "We're growing our electricity uses" through things such as plasma TVs and outdoor lighting.

John D. Hofmeister, Citizens for Affordable Energy

Affordable Energy noted that establishing non-volatile energy security will not work on a two- or four-year election cycle. Taking a page from U.S. economic history, he argued that the nation maintains financial stability, even in challenging economic times, through independent bodies with long-term interests.

Indeed, the need to ease financial and fiscal volatility drove the creation of the Federal Reserve system 95 years ago. The Fed has set monetary guidelines and has helped the U.S. maintain economic stability. Just as the Federal Reserve can calm volatility by controlling interest rates, maintaining an open market window and creating money, a Federal Energy Reserve Board could calm a volatile energy market by controlling supply, focusing resources on technology and infrastructure and setting goals for reducing the nation's carbon footprint. Hofmeister sees such a board as an independent body with presidential appointees coming from various sectors and appointed for seven-year terms.

Public-Private Collaboration is Needed

Mary Mujica, senior vice president of LNG Americas for Shell Gas & Power Americas, saw three hard truths about meeting the energy challenge in an economically, socially and environmentally responsible way.

The first is that the world will require every type of energy supply to meet a projected doubling if not trebling of energy needs by 2050. Second, supply will be difficult to keep up with demand, and moving into renewables will take time. Third, all this demand will place a strain on the environment.

Her solution: “The public and private sectors must work together and demonstrate ways where we can be innovative.” This will require government participation at all levels, enacting appropriate legislation to move us down that desired path to achieving sustainable energy security.

Wrapping around to the original question of how to achieve sustainable energy security, Ziad Labban, president and CEO of Saudi Refining, Inc., took a broader view. He argued that the only time you get everybody working together to change is when you have a crisis, such as the dramatic and steep rise of oil prices in 2008. That crisis also begat opportunities. People started to work together to become more efficient in their energy utilization and looked for other opportunities and solutions. “I think the challenge in trying to reach sustainability is to start talking to each other,” he concluded.

Clearly, policy-driven solutions that drive both security and sustainability require collaboration between private and public stakeholders. While there are

Joan MacNaughton, Alstom Power Systems

many energy sources, investments are needed to get the energy to consumers in a usable form, which requires infrastructure. The pathway to security and low-carbon energy is to focus the private sector on doing what it does best, with a market that provides incentives for innovation.

As Joan MacNaughton, senior vice president for power and environmental policies at Alstom Power Systems, noted, “We’re not going to manage this through the market alone. Energy security has public benefits which individual companies are not equipped to deliver, but are absolutely essential to everybody.”

Mary Mujica, Shell Gas & Power Americas

The American Recovery and Reinvestment Act: An Important Step Forward on Energy Investment

There is growing concern today that the momentum toward energy security and sustainability may slow due to the current global economic crisis. However, for the short-term, there was cautious optimism that the economic recovery legislation could produce some positive outcomes and keep the United States moving steadily forward on the bridge to the future.¹

“We’re very fortunate that a number of the elements that are coming out of the stimulus bill are absolutely moving us in the right direction in terms of energy efficiency, biofuels and infrastructure around the smart grid,” said Clarence Cazalot Jr., president and CEO of Marathon Oil Corporation. These actions are also in concert with the 100-day energy action plan that the Council put forth in September 2008.

There was general concern that Congress will get in the game of picking winners and losers, such as solar versus nuclear, or folding the energy crisis into the economic crisis. Goodman advocated a multi-pronged approach. “There is no silver bullet,” he said. In addition to carbon capture and storage, the nation also has to look at the full range of zero-carbon fuels, such as nuclear, hydroelectric and renewable power.

Hope was expressed that eventually there would be a fact-based, comprehensive, five- to ten-year energy plan that identifies where the nation wants to be and how to work together to get there. Mujica thought the stimulus bill is heading in the right direction but that more needs to be done, which is why Shell continues to invest billions in capital expenditures in search of energy.

Thomas Hunter, director of Sandia National Laboratories, thought the stimulus bill will do two things. First, it will provide the market with more confidence and stability. Second, it will allow for investment in infrastructure. The nation needs confidence that its infrastructure systems—much of which are ancient and fragile—will continue to support the economy. For example, in 2003 a tree limb fell on power lines in Ohio, and for 36 hours there was no power in the Northeastern United States and Eastern Canada, costing the region billions of dollars.

1. The American Recovery and Reinvestment Act of 2009 was passed by Congress and signed into law on February 17, 2009.

Thomas O. Hunter, Sandia National Laboratories; Shirley Ann Jackson, Rensselaer Polytechnic Institute; Deborah L. Wince-Smith, Council on Competitiveness; Clarence P. Cazalot Jr., Marathon Oil Corporation; Roger J. Goodman, Cambridge Energy Research Associates; Kenan Sahin, TIAX LLC; and James Kinnear, Pengrowth Management Limited.

Sowing the Seeds of Sustainability

Real energy sustainability and climate change solutions could take 50 years to fully accomplish. According to Goodman, the United States has been sowing a lot of seeds for the past five years. However, “we’ve got to get those seeds. They have to be fertilized.” But what about the long-term?

Although there is a clear tie between the stimulus bill and innovation, Goodman asked if all the activity around solar, wind and renewables will turn out to be a short-term bubble. There is a concern that while it is critical to get things moving quickly, long-term energy goals must not be forgotten.

On a positive note, the federal government is taking action beyond the stimulus bill. The U.S. Department of Energy’s (DOE) Mitchell Bayer stated that energy efficiency and emerging technologies already have a home at DOE and within the structure of the national laboratories.

Energy Innovation Snapshot

Sandia National Laboratories

Among America's assets are DOE's National Laboratories, which perform research and development "that is not well suited to university or private sector research facilities because of its scope, infrastructure requirements or multidisciplinary nature, but for which there is a strong public and national purpose." Hunter told the summit that the nation's 17 national laboratories represent a combination of values and capabilities.

"The laboratories' capabilities are largely scientific, with the ability to produce fundamental breakthroughs," he observed. Hunter said that Sandia is focusing on "small smart things" such as the integration of microelectronics and micromachines—"things that you can't see that do things you can't believe." They are also engaged in the new wave of engineering and science—high fidelity predictive simulation on supercomputers. These simulation techniques are being heralded as the third leg of science, beyond theory and experimentation.

Such efforts produce real-world applications beyond the laboratories' core mission of nuclear deterrence. For example, Sandia worked closely with The Goodyear Tire & Rubber Company. Together, using Sandia high performance simulation software adapted for tire applications, the company transformed from

Thomas O. Hunter, Sandia National Laboratories

a test-based to a computation-based design culture. This capability enables Goodyear to take novel tire designs from concept to market in less than a year.

"The values that we have at the laboratories start with national service. It's a place where people come and say 'I'm a scientist, I'm an engineer' and in some cases, 'I'm a manager, administrator. I want to commit myself to national service and look at a wide variety of applications, not for my own interest, but for the interest of something bigger and stronger around the country,' " he observed. "They represent excellence in science and technology."

William S. Rees, Jr., formerly with the U.S. Department of Defense

There are also programs in DOE's offices of Energy Efficiency and Renewable Energy and Fossil Energy addressing CCS and other new technologies. U.S. Secretary of Energy Steven Chu has indicated that climate change and emerging technologies will be a focus while he is leading the Department.

Recognizing Shared Roles and Responsibilities

Rees asked what should the Department of Defense (DOD) do in this area. Why should innovation be in it? And why should the Council on Competitiveness be involved?

First, he believes that it is impossible to "decouple" national security and energy security. Second, DOD, through the Defense Advanced Research Projects

Deborah L. Wince-Smith, Council on Competitiveness

Agency (DARPA), has a rich history of innovation. Third, the Council offers the right venue for this discussion. It brings stakeholders from across the globe and the entire spectrum of interests.

Looping back to the problem of government picking winners, participating experts expressed the strong sentiment that the government should not pick "paths." Rather, the government should set high-level, national goals with dates to reach them. This will pose challenges to stimulate the economy to produce solutions. If correctly framed, regulation does not have to be anathema to industry.

In the case of delivering ultra-low sulfur diesel, regulation stimulated innovation. "The industry doubled-down and developed new technologies in a cost-effective fashion," observed Sahin. Enhanced

Corporate Average Fuel Economy (CAFE) standards and the Partnership for a New Generation of Vehicles (PNGV) also improved efficiency and fostered new ideas and concepts.

Hunter added that the regulatory atmosphere should not be adversarial. “We’re in this together. Let’s do it right, and let’s not be punitive. Let’s find a path forward,” he said.

Of great concern is the general public’s lack of knowledge about climate change and sustainability. Grassroots movements have been crucial to solving some of the nation’s biggest problems—from civil rights to the environment.

Hofmeister believes that “grassroot efforts with respect to energy and the future of our environment will come from our citizens, but only if we take the time to communicate and to educate on a sustained basis.”

Lastly, there was consensus on the need to make the development of the nation’s “intellectual capital” part of the sustainability agenda. It is critical for more students to enter science and engineering programs.

Wince-Smith concluded the session by summarizing the discussion: all energy sources must be part of the national energy “portfolio,” and fossil fuels will be part of that portfolio for many years, but in a more sustainable form. It is critical to reduce energy market volatility. The nation must deal with the different time frameworks from the short to the long term and the scale and scope of the investments. And collaboration must occur between the public and private sector.

The Southern Energy Summit was held in conjunction with CERAWeek 2009. The Council was delighted that Daniel Yergin, chairman of CERA, was able to spend a few moments with participants at the conclusion of the Summit program. Yergin shared some off-the-record comments on highlights from CERA's events.

Robert Estill, Marathon Oil Corporation (left).

Ziad Labban, Saudi Refining, Inc.

Mitchell T. Baer, U.S. Department of Energy.

Experts from industry, academia, government and labor had several opportunities to pose questions to Summit participants.

About the Council on Competitiveness

WHO WE ARE

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans.

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to ensuring the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.

Council on Competitiveness

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HOW WE OPERATE

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

FOR MORE INFORMATION

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The Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in July 2007 with the firm belief that the crucial role of the private sector demand in driving the way America produces and uses energy has gone largely unrecognized in prior policy initiatives. The ESIS Initiative, which was called for in the Council's 2004 seminal report *Innovate America*, is led by a CEO-level steering committee comprised of approximately 40 chief executives from U.S. industry, academia, government laboratories and organized labor. The distinguished steering committee is led by James W. Owens, chairman and CEO of Caterpillar Inc.; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and D. Michael Langford, national president of the Utility Workers Union of America, AFL-CIO. The goal of the Initiative is to enhance U.S. competitiveness and energy security by developing a public-private action agenda to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs. It is underwritten by the U.S. Department of Energy and has benefited from the guidance of more than 200 executive-level energy experts.

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**Council on
Competitiveness**

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 2: Agenda, Participants List and Report on the Eastern Energy Summit

Agenda

Energy Security, Innovation & Sustainability Initiative

Regional Summit Series:

Energy Efficiency and the Regional Greenhouse Gas Initiative

Sponsored by Public Service Enterprise Group and Rutgers, The State University of New Jersey

April 15, 2009

**Location: Rutgers Student Center,
Rutgers, The State University of New Jersey
126 College Avenue,
New Brunswick, New Jersey**

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8:30 a.m.	Registration & Networking
9:00	Welcome Remarks • Dr. Richard L. McCormick
President, Rutgers, The State University of New Jersey• Ms. Deborah Wince-Smith
President, Council on Competitiveness
9:20	Overview of the Energy Security, Innovation & Sustainability Initiative • Dr. Shirley Ann Jackson
President, Rensselaer Polytechnic Institute
9:30	Opening Keynote • Assemblyman John F. McKeon (D)
27th District, New Jersey• Governor Jon Corzine
The State of New Jersey
10:00	Break
10:30	Panel Discussion #1: The Regional Greenhouse Gas Initiative: A Path to a National Program

- How is RGGI impacting the economic competitiveness of businesses in member states relative to businesses in neighboring states?
- What lessons can be learned for the rollout of RGGI?
- How should allowance auction revenues be used?
- What would a national version of RGGI look like? What changes would need to be made?
- What role does energy efficiency play in meeting the goals of RGGI?

Moderator:

- Ms. Jeanne Fox
President, State of New Jersey Board of Public Utilities

Panelists:

- Mr. W. Terry Boston
President and Chief Executive Officer, PJM Interconnection
- Ms. Caren Franzini
Chief Executive Officer, New Jersey Economic Development Authority
- Mr. Jared Synder
Assistant Commissioner for Air Resources, Climate Change and Energy,
New York State Department of Environmental Conservation
- Mr. Rafe Pomerance
President, Clean Air - Cool Planet

12:30 p.m. **Luncheon**

12:45 **Luncheon Keynote**

- Mr. Ralph Izzo
President and Chief Executive Officer, Public Service Enterprise
Group

2:00 **Panel Discussion #2: Unleashing the Potential for Energy Efficiency**

- Why do consumers and businesses forgo seemingly cost-effective energy-efficiency measures?
- What is the proper roll of government in encouraging energy efficiency, and what are the most promising strategies?
- What must happen in order for utilities to play a greater role in improving end-user efficiency?
- What is the proper role of the federal government in this area relative to that of state and local governments?

Moderator:

- Dr. Alice P. Gast
President, Lehigh University

Panelists:

- Assemblyman Upendra J. Chivukula (D)
17th District, New Jersey
- Ms. Sue Coakley
Executive Director, Northeast Energy Efficiency Partnerships, Inc.
- Mr. Wyatt Earp
President, Monmouth and Ocean Counties Central Labor Council
- Mr. Dominic Pileggi
President and Chief Executive Officer, Thomas & Betts Corporation

4:00

Closing Remarks

- Congressman Rush Holt (D-NJ)

4:15

Reception

Participants

Energy Security, Innovation & Sustainability Initiative Regional Summit Series: Energy Efficiency and the Regional Greenhouse Gas Initiative

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April 15, 2009

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Compete: Energy

Regional Energy Summit Series

Eastern Energy Summit Energy Efficiency and the Regional Greenhouse Gas Initiative

April 15, 2009

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Energy Security, Innovation & Sustainability Initiative

In 2007, the Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative to explore the linkages between the United States' need for greater energy security, the global imperative for environmental sustainability and U.S. economic competitiveness at the enterprise and national levels. Through a series of Progressive Dialogues, the ESIS Initiative brought together high-level experts from industry, labor, academia and the policy community to form conclusions and ideas on how to create the enabling conditions that will stimulate and accelerate private sector innovation and investment in sustainable energy solutions. Leveraging the insights generated at the dialogues and the wisdom of the ESIS Initiative Steering Committee, the Council crafted *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*. *Prioritize* was released at the National Press Club on September 9, 2008, and has since had a significant impact in shaping U.S. energy policy and priorities.

In an effort to broaden understanding of the drivers for innovation and investment in sustainable energy solutions in specific areas, the Council is holding a series of four regionally-based energy summits around the United States during the first half of 2009. The Eastern Energy Summit was the second of this series.

The following are the highlights and key points captured at the Summit, which was held on April 15, 2009, in New Brunswick, N.J., at Rutgers, The State University of New Jersey.

The Council would like to express its gratitude to Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group Incorporated (PSEG), and Richard McCormick, president of the Rutgers, the State University of New Jersey (Rutgers) for co-sponsoring the Eastern Energy Summit; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute, vice chairman of the Council and co-chair of the Council's ESIS Initiative, for her leadership and vision in conceptualizing the Regional Energy Summit Series; Thomas Moran, director of public policy at PSEG; Dunbar Birnie III, professor of Ceramic Engineering at Rutgers; Philip Furmanski, executive vice president for academic affairs at Rutgers; Scott Weiner, director of the Center for Energy, Environmental and Economic Policy at Rutgers; and the PSEG and Rutgers teams for their strong support in planning and executing this event. The Council would also like to thank Governor Jon Corzine and Representative Rush Holt for their wisdom that set the tone of this Summit and for their support of the National Energy Summit & International Dialogue in September 2009.

Compete: Energy Regional Energy Summit Series

Table of Contents

The Road to the National Energy Summit & International Dialogue	4
Eastern Energy Summit Participants List	6
Executive Summary	7
Eastern Energy Summit Highlights	
Governor Jon Corzine on New Jersey's Energy Master Plan	9
Panel I: The Regional Greenhouse Gas Initiative—A Path to a National Program	11
Key Takeaways	11
RGGI: Goals and Progress	12
RGGI Approaches to Manage Energy Price Volatility	12
Carbon Management Presents Pricing and Leakage Challenges	13
RGGI Design Underscores States' Ability to Innovate	13
Investing in Energy Infrastructure: Carbon Price Needed	14
Generating Funds to Invest in Green Technology	16
Beyond RGGI: A Call for Transformational Technologies	16
Transmission is Critical	17
Energy Challenges Present Great Opportunities	18
A Broad Spectrum of Education and Information is Needed to Support Energy System Transformation	19
Panel II: Unleashing the Potential for Energy Efficiency	20
Key Takeaways	20
Energy Efficiency and the RGGI Synergy	21
Plug-In Hybrid Vehicles Key Solution but Need Infrastructure	22
Regulatory Rehaul Can Add Value to Energy Efficiency	23
Energy Education Needed Early on and Throughout Life	24
About the Council on Competitiveness	27

Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

February 13, 2009
Houston, TX

Clarence P. Cazalot Jr., president and CEO of Marathon Oil Corporation, hosted a regional summit on the path to achieving sustainable energy supplies and the impact of the economic stimulus package on U.S. energy security. This meeting was held in concert with *CERAWeek 2009*, the annual conference that brings executives from around the world together to discuss global energy issues.

April 15, 2009
New Brunswick, NJ

Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group; and Richard L. McCormick, president of Rutgers, The State University of New Jersey, co-hosted a regional summit on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

May 13–14, 2009
Chicago, IL

James Owens, chairman and CEO of Caterpillar Inc.; Robert Zimmer, president of The University of Chicago; and Eric Isaacs, director of Argonne National Laboratory, co-hosted a regional summit focused on using the Midwest's unique energy resources and infrastructure to reduce greenhouse gas emissions and improve our nation's energy security.

Compete: Energy

The National Energy Summit & International Dialogue

July 30, 2009
Mountain View, CA

S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas Baruch, founder and managing director of CMEA Capital; co-hosted a regional summit on lessons that can be learned from the successes of California and other western states as front-runners in the development and deployment of sustainable energy technologies.

September 23–24, 2009
Washington, D.C.

The Council will convene its top experts in the energy field and representatives from countries around the world to address the interconnected challenges of energy security, innovation and sustainability. The Council's agenda for change will be rooted in a new relationship between the public and private sectors to deal with a defining challenge of the millennium.

Eastern Energy Summit Participants List

CO-HOSTS

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Ralph Izzo
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17th District, New Jersey

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Executive Director
Northeast Energy Efficiency Partnerships, Inc.

Governor Jon Corzine
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Jeanne Fox
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Caren Franzini
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Alice P. Gast
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Congressman Rush Holt
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Shirley Ann Jackson
President
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Assemblyman John F. McKeon
27th District of New Jersey

Dominic Pileggi
President and Chief Executive Officer
Thomas & Betts Corporation

Rafe Pomerance
President
Clean Air—Cool Planet

Jared Snyder
Assistant Commissioner for Air Resources, Climate
Change and Energy
New York State Department of Environmental
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Executive Summary

The Northern United States is aggressively seeking a lead in boosting energy efficiency and reducing carbon emissions.

More than a dozen policy makers, energy experts and corporate leaders met in New Brunswick, N.J., on April 15, 2009, for the second in a series of four regionally-based energy summits being held by the Council on Competitiveness under the auspices of the Energy Security, Innovation & Sustainability (ESIS) Initiative. The Eastern Energy Summit was co-hosted by Public Service Enterprise Group and Rutgers, The State University of New Jersey. Participants discussed initiatives aimed at boosting energy efficiency and reducing greenhouse gas (GHG) emissions, the progress of those initiatives and challenges and plans for the future.

A major focus of the Summit was the Regional Greenhouse Gas Initiative (RGGI), which is the first mandatory cap-and-trade program for carbon dioxide (CO₂) in the Western Hemisphere. Ten states in the Northeast and Mid-Atlantic regions, which collectively represent the eighth largest CO₂-emitting region in the world, are involved in RGGI. The program has created a market-driven auction system for electricity generators that allows the sale, purchase and trade of CO₂ allowances. This critical step of setting a price on carbon can eventually result in a market-driven reduction in carbon emissions. Though still in its infancy, RGGI is being viewed as a model for other regional and national approaches to reduce GHG emissions.

Richard L. McCormick, Rutgers, The State University of New Jersey; Shirley Ann Jackson, Rensselaer Polytechnic Institute; Governor Jon Corzine, The State of New Jersey; Deborah Wince-Smith, Council on Competitiveness; and Ralph Izzo, Public Service Enterprise Group.

As the Summit was hosted in New Jersey, the state served as a reference for energy and climate initiatives in the region. In October 2008, New Jersey Governor Jon Corzine issued an Energy Master Plan, which is driving dozens of initiatives in the state. The plan calls for a 20 percent reduction in the state's energy use by 2020, a 30 percent increase in the use of alternative energy and a reduction of about 25 percent of GHG emissions, also by 2020.

The plan—combined with funding opportunities created by revenue raised by RGGI, federal stimulus funding and private investors—is transforming the state's energy landscape. New Jersey's approach is to create a market for green technologies, then

provide funding and incentives to help keep manufacturing and jobs in the state. Summit participants described programs and private sector projects designed to reduce the need for fossil-fuel driven technologies, ranging from utility poles powered by attached solar panels and “smart” grid devices to supporting the use of hybrid electric vehicles.

There was overall agreement that energy efficiency requires not only the application of available technologies but also greater public awareness and understanding of the issues surrounding energy and its use. Many felt that if consumers better understood the true cost of energy and the value of energy savings, they would alter their behavior to save energy.

Participants also agreed that energy education is critical and should not be limited to science and engineering subject matter. For example, social science curriculums should explore energy. Learning should begin in kindergarten and persist throughout high school, but it should not end in the classroom. Businesses can also learn how to use energy more efficiently in their operations.

Utilities can also play a major part in energy conservation. They are closest to the consumers and can provide ways to make homes and buildings more efficient, but incentives are needed for them to support alternative energy sources.

While all agreed that the states have an active role to play in increasing energy efficiency, all felt that there is a need for a national energy policy. In addition to federal standards, more research and development (R&D) can create transformational technologies with a clear path to market. The Advanced Research Projects Agency for Energy (ARPA-E)—a new organization within the U.S. Department of Energy that is modeled after DARPA, the defense agency responsible for the Internet and stealth defense—was cited as an exciting opportunity to bring forth game-changing energy solutions.

However, all agreed there is a fine line between quality regulation and red tape. While standardization and improved building codes are beneficial, they should be developed and applied in a manner that does not become a burden for business.

Eastern Energy Summit Highlights

Governor Jon Corzine on New Jersey's Energy Master Plan

As the Summit was hosted in New Jersey, the state served as a reference for energy and climate initiatives in the region. Governor Jon Corzine discussed how the State of New Jersey's approach to "push back" GHG emissions in a cost effective way was the creation of an Energy Master Plan. Released in October 2008, the plan calls for a 20 percent reduction in the state's energy use by 2020, a 30 percent increase in the use of alternative energy and a reduction of about 25 percent of GHG emissions, also by 2020.

He noted that the Regional Greenhouse Gas Initiative (RGGI) contributes to the plan. RGGI recognizes that carbon can be reduced over a period of time, that carbon has a cost and that the dollars that are produced in that system can be reinvested in energy efficiency and infrastructure. But Corzine pointed out that in a state with high energy costs, getting the price range of allowances to function properly is very important. Businesses' locations, methods of operating and investment decisions are influenced by these prices.

He described solar farms cropping up throughout New Jersey, including ones installed by Merck & Co., Inc. and Rutgers, The State University of New Jersey. The state now generates 85 kilowatts of solar energy, up from 10 kilowatts when Corzine

New Jersey Governor Jon Corzine.

took office. According to Corzine, New Jersey is installing more solar panels than any other state besides California.

In addition, New Jersey is harvesting wind power off the coast that should generate 3,000 megawatts of electricity each year by 2020.

"Alternative energy efforts, which include cogeneration, geothermal and a whole series of items in the Energy Master Plan, are designed to recognize that there is an economic opportunity at the same time that we need to provide for energy security, independence and sustainability," he said.

Corzine noted that many companies are moving forward in boosting their energy efficiency, according to construction plans filed in the state. However, the ultimate success in energy efficiency lies in the 3.6 million houses in New Jersey. Many feel that building codes must be updated to address energy efficiency.

It is understood that innovation and regulation can cost ratepayers, but efforts are underway with the state public advocate to set utility rates in a way that does not drive business away but can support a broad-scale energy efficiency program.

“New Jersey and other states have taken very aggressive stands,” he concluded. “We’ve had great cooperation from our private sector partners. Our legislature has also taken aggressive steps in working with public buildings, whether it’s on cogeneration or funding clean energy programs. Our energy economy can be the basis for a very prosperous America, and certainly a prosperous New Jersey, in the years to come.”

The Regional Greenhouse Gas Initiative: Cap-and-Trade in Action

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based CO₂ emissions reduction program in the Western Hemisphere. Designed to limit GHG emissions, RGGI was started in 2008 and is now made up of ten Northeast and Mid-Atlantic states, which collectively represent the eighth largest GHG-emitting region in the world.

RGGI’s multi-state CO₂ emissions budget, or cap, will decrease gradually until it is ten percent lower than it was at the start. Electric power generators hold allowances covering their CO₂ emissions and participate in a market-based emissions auction and trading system where they can buy, sell and trade allowances. RGGI just held its fourth auction in mid-2009.

Proceeds from the auctions support low-carbon-intensity solutions, including energy efficiency and clean renewable energy, such as solar and wind power.

Panel I: The Regional Greenhouse Gas Initiative—A Path to a National Program

Key Takeaways

- Reinvesting proceeds of carbon management can reduce the cost of the program.
- The price of carbon must go up enough to affect behavioral change and ultimately reduce emissions.
- Energy efficiency can prevent carbon “leakage.”¹
- Volatility can be managed through longer compliance periods and a reserve price for allowances. Another approach is a “price collar.”²
- States must maintain the ability to innovate.
- Funding, coupled with regulatory and statutory requirements, can foster new industries.
- Research and development is critical for new, zero carbon technology to meet emission reduction goals and for the United States to compete internationally.
- Infrastructure is needed to support a diverse portfolio of energy sources. Transmission of electricity is crucial in the solution equation.

¹ Carbon leakage occurs when there is an increase in carbon dioxide emissions in one region as a result of an emissions reduction by another region with a strict climate policy. If policies in one region add a premium to certain fuels or commodities, then the demand may decline and their price may fall. Regions that do not place a premium on those items may then take up the demand and use the same supply, negating any benefit.

² A price collar is also known as a symmetrical safety valve. It creates both ceilings and floors for carbon prices so costs are contained and incentives are not lost.

RGGI: Goals and Progress

What can decision makers learn from RGGI? Is it meeting its goals? What kind of progress has it made, and what are the lessons learned that can help the federal government as it explores emission options? According to Jared Snyder, assistant commissioner for air resources, climate change and energy, New York State Department of Environmental Conservation, RGGI has broken ground in important areas.

According to Snyder, the program is successful in showing that the cap-and-trade concept can set a target goal on reducing carbon emissions and a price on carbon using free-market principles while addressing price volatility. The idea is to get businesses to start to consider what effect their emissions have and to incorporate those considerations in their planning. A stable price signal on carbon promotes cleaner energy. Instead of absorbing the cost of carbon emissions, businesses can see benefit in dollars and cents by reducing their GHG emissions.

RGGI uses an allowance auction to create the primary market and set a price for carbon. According to Snyder, it is an efficient method of allocating allowances. Electric generators who need an allowance can get it, for a price. Revenues from the auctions are reinvested in clean energy programs, and so far, New York has raised approximately \$40 million in energy efficiency programs, which can reduce the cost of the program.

RGGI Approaches to Manage Energy Price Volatility

One important aspect RGGI tackled in its design was price volatility. Learning lessons from the early days of volatility in the European cap-and-trade program, RGGI set a three-year compliance period to accommodate wild market swings due to short-term events. For example, a very hot summer results in higher demand for air conditioning. Emission levels rise, and so can the total cost of allowances. By creating a longer-period of compliance, the cost averages out over time. Another approach is allowing unused allowances to be “banked.” In addition, there is a “reserve” price for allowances. If they fall below the reserve, they are not auctioned and are reserved until demand grows and the price rises.

Rafe Pomerance, president of Clean Air—Cool Planet, added that an emissions cap without a price ceiling creates volatility. He recommends the government establish a price collar, so that when prices reach designated high or low points, allowances are added or restricted to stabilize the price. Pomerance noted that a price ceiling will dampen the competitive impact of the emissions cap, while steep price reductions that would shock the economy can be mitigated by the floor amount.

According to Snyder, the first three auctions were extremely successful, and there has been robust demand for the allowances and their prices have been relatively consistent. In each auction, allowances have ranged from \$3.00 to \$3.50 a ton, higher than the reserve prices. This demonstrates that allowance prices are not being propped up artificially.

Carbon Management Presents Pricing and Leakage Challenges

Two challenges relating to cap-and-trade are pricing and “leakage” (i.e. lower cost and higher-carbon generators flooding the higher-cost market). RGGI estimates that about one quarter of energy in the system is due to leakage. And while the RGGI has been successful in setting a price for carbon in its auctions, most agree that a higher price, as much as \$50 per ton, is needed to cause behavioral change and ultimately reduce carbon emissions.

Jeanne Fox, president of the States of New Jersey Board of Public Utilities commented that an effective way to eliminate leakage is through energy efficiency. Reducing the demand for power through efficiency measures is one important way to lower the level of leakage. Renewable portfolio standards, which require the production of energy from renewable energy sources, vary from state to state but are complementary to more energy conservation and less leakage, all of which strengthen a cap-and-trade system.

The proper architecture of a national cap-and-trade system is critical, said Pomerance. He called for a workable, equitable, allowance allocation plan as an essential part of the system.

RGGI Design Underscores States Ability to Innovate

RGGI creates a model for federal action as support for auctioning allowances seems to be growing. Synder noted that when Congressional representatives started talking about legislating cap-and-trade

Jeanne Fox, New Jersey Board of Public Utilities.

programs a few years ago, no one was talking about auctioning 100 percent of the allowances. Now the president is calling for full auctioning of allowances.³

RGGI also demonstrates the importance of states maintaining their ability to innovate. Synder commented that RGGI is a premier example of what happens when states are allowed to create new programs.

³ On June 26, 2009, the House of Representatives passed the American Clean Energy and Security Act, which includes a nationwide cap-and-trade program designed to reduce greenhouse gas emissions by 17 percent by 2020. Other provisions include new renewable requirements for utilities, studies and incentives regarding new carbon capture and sequestration technologies, energy efficiency incentives for homes and buildings and grants for green jobs, among other things.

Investing in Energy Infrastructure

Carbon Price Needed

The nation faces three daunting problems: energy security, climate change and an economic downturn. And the common solution to all is investment in sustainable energy infrastructure.

Recent data shows that it is unlikely for consumers to turn around the economic downturn through consumption alone. Economic recovery should instead be more investment driven. In the case of federal investment, the borrowing should reward future generations who will have to pay off that debt through projects that leave the environment every bit as productive and capable of supporting the vast variety of ecosystems that we have today. With this perspective, climate change becomes a natural investment opportunity.

What activities need to take place to invest in a green and sustainable future? The best way to get the marketplace to work and apply the creativity that will be needed is by setting a price for carbon. A price on CO₂ emissions would result in substantially higher energy prices, particularly in coal-intensive parts of the country. However, we should not run away from the fact that sending a carbon price signal is a policymaker's way of saying we need to raise the cost of fossil fuel-based electricity. Whether cap-and-trade or a carbon tax, it is about time that those of us in the policy debate make clear that high carbon prices will affect behavior around energy use in the future and ultimately reduce GHG emissions.

Ralph Izzo, Public Service Enterprise Group.

In order to keep customers' electric bills from rising dramatically, the nation will need to continue to drive energy efficiency measures. Higher electricity prices through a carbon price signal would direct consumer behavior toward more efficient usage. If command and control approaches to increasing energy efficiency, such as prohibiting the use of incandescent light bulbs, are not politically acceptable, another approach is to allow utility companies that have the expertise to make investments on behalf of consumers. At PSEG, we have employees with that expertise; who know what investments need to be made. We have a great brand. We have a relationship with our customers, and we have patient capital that

we can deploy to help bring about energy efficiency in ways that are far more significant than we have seen in the previous decades.

In addition to reflecting the price of carbon in our energy prices, setting efficiency standards and driving utilities to invest in consumers' efficiency, the United States also needs to invest in renewable energy. Renewable energy responds to policy and health challenges relating to CO₂, NO_x and CO₂. Investment in renewables will also help stimulate the economy and expand the green workforce. Given the supply chain involved in renewable energy development, there are significant opportunities in the sector, but at a cost.

In the push to expand the nation's renewable energy capacity, the United States should be mindful of the costs and trade-offs involved in expanding the transmission infrastructure to transport renewable energy to distant load areas. One needs to consider both the costs of producing electricity as well as the costs of transporting the electricity to end users in order to make the most economically- and environmentally-efficient decision. When the true costs of transmission are accounted for, renewables located closer to customer demand may in fact be more cost effective and environmentally sustainable.

Regardless of the options—energy efficiency, renewables, a higher carbon price—solving our challenges will require a tremendous effort. To put

this in perspective, even if electricity consumption remains flat for 40 years, and fossil fuels are not used, and the use of anything that requires an electric outlet is outlawed, the United States would still not be on course to make the 80 percent reduction in carbon by 2050. Reaching that goal will take solutions on the scale of the complete electrification of our transportation system and the complete de-carbonization of our methods of producing electricity in the next 40 years.

So as we stand here at 2009, thinking 41 years ahead, I hope no one in this room believes we have the luxury of time to achieve the kind of change I just described. The time is now.

Ralph Izzo

Public Service Enterprise Group (PSEG)

Generating Funds to Invest in Green Technology

So far, the RGGI auctions have generated \$40 million in revenues earmarked for energy efficiency programs. Another approach to fund technology that reduces CO₂ emissions is through the New Jersey Economic Development Authority (NJEDA), the state's financing agency for businesses and non-profits, in partnership with the Board of Public Utilities.

NJEDA manages 60 percent of the state's revenues from RGGI. It provides grants and low- or no-interest loans for companies that meet a menu of criteria to support the state's Energy Master Plan's goals. This could include commercial, institutional or industrial projects with the combination of heat and power, modern electric generation facilities, innovative carbon emission technology and significant carbon emission reduction avoidance technologies.

To ensure private buy-in on the loan applicants, a portion of non-public funding is required. Caren Franzini, CEO of NJEDA, stated that private equity and financing confirm to a state that a project is a good investment.

She noted that the state is creating its own demand for such technologies through its Energy Master Plan and is also striving to serve as a "go to" state when it comes to green technology. For that reason, it created the Edison Clean Energy Manufacturing Fund, a \$60 million fund dedicated to developing clean technology industries in New Jersey. The funding is in two parts, totaling \$3.3 million for any one project. Of that,

"Using its Energy Master Plan, New Jersey is creating a market for more clean energy technology—and is seeking to keep that expertise and manufacturing in state by helping to finance companies that produce 'green' products and services."

Caren Franzini

New Jersey Economic Development Authority

\$300,000 can be used for pre-development costs to site and design a facility. The project can then be eligible for a \$3 million zero-interest, ten-year loan to support facility improvements, equipment, purchases or facility construction. One third of the loan can even be in the form of a no-interest grant awarded for the facility's energy performance and the ability of the project to attract outside funding.

Beyond RGGI: A Call for Transformational Technologies

According to Pomerance, what is needed to take on GHG emissions is transformational research and development that will lead to increased availability of zero-carbon technologies while driving down the cost of low-carbon energy production.

"We have a huge untapped potential to innovate and bring about transformational technologies if the scientific and engineering components in our universities are supported," he said, lauding the creation of the Advanced Research Project Agency for Energy, which is similar to the Department of Defense's DARPA initiative that helped introduce such innovations as the Internet and unmanned surveillance aircraft.

Factoring in international issues cannot be ignored. Pomerance pointed out that other countries, most notably India and China, are striving to reach consumption levels like that in the United States and are increasing their emissions dramatically. For that reason, R&D on zero-carbon solutions is even more critical. The United States needs to design and develop new technologies in order to compete internationally, against all the other countries that are advancing in this new long-term market.

Meanwhile, negotiations are underway in preparation for the United Nations Framework Convention on Climate Change in Copenhagen. At hand are amendments to the Kyoto Protocol, which set binding targets for industrialized nations to reduce GHG emissions. It is critical that China and India be at the table, Pomerance said.

Transmission is Critical

Participants agreed that while alternative energies, including wind power and plug-in hybrid electric vehicles, are part of the solution, transmission

W. Terry Boston, PJM Interconnection.

is critical. Connecting energy sources to energy demand requires infrastructure. However, building electricity transmission has dropped 50 percent in the past decade.

W. Terry Boston, president and CEO of PJM Interconnection, pointed out that in addition to a diverse energy portfolio, the United States needs a robust and flexible grid to move power. While much needed focus and investment is being placed on making the grid smart, he noted that it is more expensive to make the grid robust.”⁴

⁴ The Obama Administration included funding to build a new “smart grid” in its economic stimulus package, approved earlier this year.

Energy Challenges Present Great Opportunities

We are in a triple bind; a convergence of global developments. There is a critical need for national and global energy security, but alarm over our planet's climate change complicates taking that from Point A to Point B. This now is further complicated by a global economic crisis.

These challenges are our major drivers of a global energy system restructuring. We have the opportunity to develop new energy markets, new trading schemes, new alignments and new technologies. There are extraordinary opportunities in spite of economic stress.

Now is the time to build collaboration between the varied public and private sectors to step forward together to find genuine and permanent solutions that make sense for private enterprises and create new jobs that draw on the capabilities of our great research universities. Learning from initiatives in the states that are designed to create a new energy future at the state level, and ultimately at the national level, is a key strategy we all must embrace.

Shirley Ann Jackson

Rensselaer Polytechnic Institute

Alice P. Gast, Lehigh University, and Dominic Pileggi, Thomas & Betts Corporation.

A Broad Spectrum of Education Needed to Support Energy System Transformation

New technology is critical in combating GHG emissions, but perhaps more important is the energy workforce of tomorrow.

Alice P. Gast, president of Lehigh University, reported that students are demanding a non-traditional approach to study energy, the environment and infrastructure. They seek a holistic approach that brings science, engineering and social sciences together so they can look at the entire cost benefit analysis of energy issues.

Lehigh University is creating the Science and Technology for Energy, Policy and Society building to bring together disparate groups and to think about new technologies and approaches that can emerge

Richard L. McCormick, Rutgers, The State University of New Jersey.

and be adapted by society either through policy, regulations or the economic realities and viability of new technologies.

Richard L. McCormick, president of Rutgers, said that, as a state university, Rutgers has a responsibility to partner with the state and the nation to advance both the technology and the public policies needed to help the state meet its ambitious Energy Master Plan targets. He reported that faculties, students and staff are actively engaged in the laboratories, classrooms and field to combat global warming and explore alternative energy solutions. Every aspect—from purchasing green products for schools to building the largest campus-based solar farm—demonstrates a growing commitment to find solutions.

“Efficiency is the future. It is the thing that’s going to allow the United States to afford the other clean energy, renewable and smart grid technologies that we need. The more we invest in efficiency, the more we’ll be able to devote to other carbon-lowering measures. It will take a whole range of policies, codes, standards, energy building ratings and performance requirements to improve the energy efficiency of our homes, buildings and factories.”

Sue Coakley

Northeast Energy Efficiency Partnerships, Inc.

Energy Efficiency and the RGGI Synergy

Energy efficiency goes hand in hand with RGGI. Policies to deliver meaningful, end-use energy efficiency measures are effective in reducing total electricity usage by households so as to overcome price increase impacts caused by RGGI.

RGGI requires that revenues from the sale of emission allowance allocations go to carbon reduction and energy conservation initiatives. Participants outlined a number of initiatives and approaches, from the mundane, such as installing attic insulation, to the revolutionary, such as plug-in sites for electric cars.

Commented Sue Coakley, executive director of the Northeast Energy Efficiency Partnerships, Inc., it will take a whole range of policies, codes, standards, energy building ratings and performance requirements to improve the energy efficiency and performance of homes and buildings.

Many agreed that utilities are the key to reaching consumers, including helping them make their homes and businesses more efficient. “Utilities in New Jersey need to play a major role. They have information about their customers and they want them to be able to afford their energy bills. Ramping up energy efficiency as a resource is critical,” Coakley said.

"There are enormous opportunities for making energy generation and consumption more sustainable and improving efficiency. ... We're going to have to look at food and agriculture, not just for the generation of biofuels, but to understand carbon sequestration in soils and all of the other energy or energetic aspects of agriculture. We've got to look at transportation and work schedules, and we've got to look at construction and manufacturing. There are going to be dramatic changes in our lives and our behavior comparable to the changes brought about by the internal combustion engine in the early 20th century."

Congressman Rush Holt
U.S. House of Representatives

Finding incentives for utilities to act is important, participants agreed. In the majority of states, profitability is related directly to how much electricity or gas a utility sells. Rather, conservation and approaches to support alternative energies should be rewarded.

Another systemic change needed relates to building codes. Older codes do not support efforts to reduce GHG emissions. Updating building codes should strengthen energy efficiency. Several participants, including Assemblyman Upendra J. Chivukula of the 17th District of New Jersey, noted that a great deal of heating and cooling is wasted in many buildings. Using new material, such as volcanic ash insulation, and using geothermal energy in heating and cooling are available options to boost energy efficiency. Existing building codes encourage outdated construction approaches and do not favor efficiency enforcement.

Plug-In Hybrid Vehicles Key Solution but Need Infrastructure

Currently there is room for 25 million plug-in hybrid vehicles in the mid-Atlantic region, without new generation capacity, if there was the ability to control when they are charged. Without that control, if 25 million PHEV owners plugged in their hybrids to charge at the same time, the electric system could collapse. A solution is a "smart" electric grid that can direct power to where it is needed from its closest source and "smooth" peak periods of electricity use, via two-way communication systems.

Dominic Pileggi, Thomas & Betts Corporation.

According to Boston—head of the PJM Interconnection which manages the high voltage electric grid and the wholesale electricity market that serves 13 states and the District of Columbia—electric hybrid vehicles will have one of the largest impacts on increasing energy security and reducing CO₂ emissions. To get sufficient market penetration requires investment in infrastructure.

Corzine noted that there are great opportunities to revolutionize transportation in New Jersey—via electric vehicles and charging stations along the New Jersey Turnpike, Garden State Parkway and Atlantic City Expressway.

Chivukula recommended a national master plan to use electrified transportation systems, such as the railroad, to transport more goods.

Regulatory Rehaul Can Add Value to Energy Efficiency

Regulatory requirements, and the bureaucracy they entail, cost a significant amount in terms of time, human resources and money. As a public company and a manufacturer, Thomas & Betts would like to see less red tape from the government, particularly as it relates to its customers, who are having problems with issues like right-of-way regulations for transmission lines and other permits. Dominic Pileggi, president and CEO of Thomas & Betts Corporation, encouraged government research and development grants and tax credits as a way to subsidize industry to address those issues and recommended that standards and codes be harmonized not just nationally, but internationally.

Coakley agreed, noting that there is a need for a major program and supportive regulatory environment to reach goals such as those set by the New Jersey Energy Master Plan. She believes that the United States needs a regulatory environment that makes energy efficiency as attractive an investment as any other investment that a utility might make on behalf of their customers.

She also called for a New Jersey Energy Efficiency Utility, similar to programs in other states that work with customers by providing services, incentives and assistance in financing to help companies become more energy efficient. She also suggested a regulation that houses and buildings be given an energy rating before being sold, so that the buyer can understand what its performance may be like.

“Utility companies have credibility and are accountable to the public. They should lead efforts to help consumers be more energy efficient.”

Wyatt Earp

Monmouth and Ocean Counties Central Labor Council

This will create market value for energy efficiency. Some argue that a national policy is needed—that a quilt of different regulations and requirements state-by-state will ultimately be detrimental. Some also view states like New Jersey as the bellwether for future national policy. For example, state appliance efficiency standards required in the Northeast region have become federal standards.

Energy Education Needed Early On and Throughout Life

Participants in the first panel, which discussed RGGI, embraced the concept of holistic education that links social science, economics and science in reshaping university curriculums. The second panel, which focused on energy efficiency, also agreed that much

needs to be done in energy education early on and throughout life. There was also agreement that the public needs to be educated in understanding the cost of energy use and approaches to conservation. Education starting as young as kindergarten and continuing throughout high school to address energy usage was encouraged. Another concept was better transparency so all users could better understand their energy usage and how much it is costing them.

Additionally, there is opportunity through vocational training and retraining blue collar workers for green jobs, such as building and installing solar panels, doing energy audits and weatherizing homes. Boston noted that, in his opinion, attic insulation is the most cost-effective method to reduce carbon emissions and can lead to hundreds of jobs.

Assemblyman John F. McKeon (D), 27th District, New Jersey; Shirley Ann Jackson Rensselaer Polytechnic Institute; and Deborah Wince-Smith, Council on Competitiveness.

Ralph Izzo, Public Service Enterprise Group.

Richard L. McCormick, Rutgers, The State University of New Jersey, and Shirley Ann Jackson, Rensselaer Polytechnic Institute.

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Shirley Ann Jackson, Rensselaer Polytechnic Institute; Richard L. McCormick, Rutgers, The State University of New Jersey; New Jersey Governor Jon Corzine; and Deborah Wince-Smith, Council on Competitiveness.

Dominic Pileggi, Thomas & Betts Corporation; Alice P. Gast, Lehigh University; Assemblyman Upendra J. Chivukula, 17th District, New Jersey; and Sue Coakley, Northeast Energy Efficiency Partnerships.

Shirley Ann Jackson, Rensselaer Polytechnic Institute, and Susan McGinnis, CleanSkies.tv.

About the Council on Competitiveness

WHO WE ARE

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans.

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to ensuring the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.

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HOW WE OPERATE

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

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The Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in July 2007 with the firm belief that the crucial role of the private sector demand in driving the way America produces and uses energy has gone largely unrecognized in prior policy initiatives. The ESIS Initiative, which was called for in the Council's 2004 seminal report *Innovate America*, is led by a CEO-level steering committee comprised of approximately 40 chief executives from U.S. industry, academia, government laboratories and organized labor. The distinguished steering committee is led by James W. Owens, chairman and CEO of Caterpillar Inc.; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and D. Michael Langford, national president of the Utility Workers Union of America, AFL-CIO. The goal of the Initiative is to enhance U.S. competitiveness and energy security by developing a public-private action agenda to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs. It is underwritten by the U.S. Department of Energy and has benefited from the guidance of more than 200 executive-level energy experts.

Council on Competitiveness

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**Council on
Competitiveness**

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 3: Agenda, Participants List and Report on the Midwest Energy Summit

**Council on
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Energy Security, Innovation & Sustainability Initiative

Regional Energy Summit Series

Midwest Energy Summit

*Investing in a Midwest Renaissance: The Future of Energy
Security and Sustainability*

**Sponsored by The University of Chicago, Argonne National Laboratory
and Caterpillar Inc.**

May 13-14, 2009

**Location: Argonne National Laboratory
9700 S. Cass Avenue
Lemont, Illinois**

Overview

Investing in a Midwest Renaissance: The Future of Energy Security and Sustainability

The Midwest Energy Summit brings together regional leaders to discuss how forward-looking investments and policy will make possible a more successful and sustainable Midwest – and a more competitive United States of America.

The Summit will provide regional leaders with a unique opportunity to contribute to the Council on Competitiveness' action agenda for addressing our nation's energy security and sustainability challenges. This public-private action agenda, which will be released at the Council's National Energy Summit on September 23-24, will identify ways to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs.

As with the nation generally, the Midwest's long-term economic competitiveness will depend on its ability to simultaneously promote energy security *and* sustainability. Our ability to create new manufacturing and transportation opportunities will depend on a variety of factors, including increased base-load capacity from a mix of existing stationary and renewable resources (biomass, coal, natural gas, nuclear, solar, wind), as well as infrastructure upgrades – most notably the creation of a smart power grid.

Agenda

Wednesday, May 13, 2009

Welcome Reception and Kickoff Dinner

Location: Argonne Guest House

- 3:30 p.m. **Optional Tours**
Location: guests to meet at Guest House Lobby, transported to tours
- Argonne Transportation Research Center
 - Advanced Photon Source
- 5:30 **Reception**
Location: Argonne Guest House dining room
- 6:30 **Dinner**
- 6:35 **Welcoming Remarks**
- Ms. Deborah Wince-Smith, President, Council on Competitiveness
 - Dr. Eric Isaacs, Director, Argonne National Laboratory
- 7:00 **Additional Welcoming Remarks and Introduction of Keynote Speaker**
- Dr. James Owens, Chairman and CEO, Caterpillar Inc.
- 7:10 **Keynote Address**
- Mr. Steven Leer, CEO and Chairman, Arch Coal, Inc.
- 8:30 **Adjourn**
- Dean Robert Fefferman, Physical Sciences Division, The University of Chicago

Thursday, May 14, 2009

Midwest Energy Summit

Location: Advanced Photon Source (APS), Building 402, Room E-1100 & E-1200 (1st Level)

- 7:45 a.m. **Buses leave Guest House and run continuously transporting guests to APS**
- 8:00 **Registration and Check-in**
Location: lobby area outside of E-1100 & E-1200
- 8:30 **Networking Breakfast**
- 9:00 **Welcome Remarks**
 - Dr. Robert Zimmer, President, The University of Chicago
- 9:10 **Introduction of Speaker**
 - Dr. Eric Isaacs, Director, Argonne National Laboratory
- 9:15 **Opening Keynote**
 - Mr. John Rowe, CEO and Chairman, Exelon Corporation
- 9:40 **Overview of the Day**
 - Mr. David Hobbs, Head of Research, CERA
- 9:45 **Plenary 1:** What investments in energy production, storage, and transmission *technologies* will have the greatest impact on regional and national competitiveness?
 - What are some success stories from the region? What can be learned from them?
 - What can state and local government do to encourage these investments?
 - What can the federal government do to spur investment and innovation in these areas?
 - Why should any specific investment receive priority treatment, and how would it contribute to a Midwest Renaissance?
- 11:15 **Break**
- 11:30 **Plenary 2:** What investments in *infrastructure* will have the greatest impact on regional and national competitiveness?
 - What are some success stories from the region? What can be learned from them?
 - What do state and local governments need to do to facilitate these investments?
 - What can the federal government do to spur investment and innovation?
 - Why should any specific investment receive priority treatment, and how would it contribute to a Midwest Renaissance?

- 1:00 p.m. **Luncheon**
Location: Advanced Photon Source, Building 402 Lower Gallery
- 1:15 **Introduction of Speaker**
- Dr. Donald Levy, Vice President for Research and for National Laboratories, The University of Chicago
- 1:35 **Closing Keynote**
- Dr. Robert Topel, Brown Professor in Urban and Labor Economics, The University of Chicago
- 2:30 **Adjourn**
- Ms. Deborah Wince-Smith, President, Council on Competitiveness

Participants

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Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

Midwest Energy Summit

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and Caterpillar Inc.**

May 13-14, 2009

Leadership Roundtable Participants List

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Executive Director
O'Hare Modernization Program

Gregory L. Geoffroy
President
Iowa State University

Reginaldo Arcuri ***
President
Brazilian Industrial Development Agency –
ABDI

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Chairman and Chief Executive Officer
World Agricultural Forum-St. Louis

Hardik Bhatt
Chief Information Officer
City of Chicago

James Hagedorn **
Chairman and Chief Executive Officer
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Linda Blair
Executive Vice President and Chief
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ITC Holdings Corp.

Richard H. Herman
Chancellor
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Gas Technology Institute

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* Tentative; ** Not Attending Dinner on May 13; *** Not Attending Meeting on May 14

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Michael Krauss

President
Market Strategy Group

Leon Lederman *

Director Emeritus
Fermi National Accelerator Laboratory

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Chief Executive Officer
Arch Coal, Inc.

Donald Levy

Vice President for Research and National
Laboratories
University of Chicago

John McCarter **

President and Chief Executive Officer
The Field Museum

Sidney Nagel

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Robert J. Zimmer **

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* Tentative; ** Not Attending Dinner on May 13; *** Not Attending Meeting on May 14

Participants

Energy Security, Innovation & Sustainability Initiative Regional Summit Series – Investing in a Midwest Renaissance: The Future of Energy Security and Sustainability

**Sponsored by The University of Chicago, Argonne National Laboratory
and Caterpillar Inc.**

May 13-14, 2009

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*** Not Attending Dinner on May 13*

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Compete: Energy

Regional Energy Summit Series

Midwest Energy Summit Investing in a Midwest Renaissance: The Future of Energy Security and Sustainability

May 13–14, 2009

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Energy Security, Innovation & Sustainability Initiative

In 2007, the Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative to explore the linkages between the United States' need for greater energy security, the global imperative for environmental sustainability and U.S. economic competitiveness at the enterprise and national levels. Through a series of Progressive Dialogues, the ESIS Initiative brought together high-level experts from industry, labor, academia and the policy community to form conclusions and ideas on how to create the enabling conditions to stimulate and accelerate private sector innovation and investment in sustainable energy solutions. Leveraging the insights generated at the dialogues and the wisdom of the ESIS Initiative Steering Committee, the Council crafted *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*. *Prioritize* was released at the National Press Club on September 9, 2008, and has since had a significant impact in shaping U.S. energy policy and priorities.

In an effort to broaden understanding of the drivers for innovation and investment in sustainable energy solutions in specific areas, the Council is holding a series of four regionally-based energy Summits around the United States during the first half of 2009. The Midwest Energy Summit was the third of this series.

The following are the highlights and key points captured at the Summit, which was held on May 14, 2009, in Argonne, Illinois at Argonne National Laboratory.

The Council would like to express its gratitude to: Robert J. Zimmer, president of the University of Chicago; James W. Owens, chairman and CEO of Caterpillar Inc.; and Eric D. Isaacs, director of Argonne National Laboratory for cosponsoring the Midwest Energy Summit; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute, vice chairman of the Council and co-chair of the Council's ESIS Initiative, for her leadership and vision in conceptualizing the Regional Energy Summit Series; Robert Rosenberg, associate vice president for Public Affairs Communications for the University of Chicago; Timothy L. Elder, director of corporate Public Affairs for Caterpillar; Norman D. Peterson, assistant to the director at Argonne National Laboratory; and the Chicago, Caterpillar and Argonne teams for their strong support in planning and executing this event.

Compete: Energy Regional Energy Summit Series

Table of Contents

The Road to the National Energy Summit & International Dialogue	4
Midwest Energy Summit Participants List	6
Executive Summary	7
Summit Highlights	
Answering Big Questions at Argonne	9
Facts Are Stubborn When It Comes to the Economics of Energy	10
Plenary I: What Investments in Energy Production, Storage and Transmission Technologies Will Have the Greatest Impact on Regional and National Competitiveness?	12
Key Takeaways	12
The Role of Research and Development	13
Government Research and Development Efforts	13
Midwest Strengths: Coal, Wind and Shale Gas	14
A Cultural Shift?	15
Workforce Investments	16
Plenary II: What Investments in Infrastructure Will Have the Greatest Impact on Regional and National Competitiveness?	17
Key Takeaways	17
The O'Hare Modernization Program: An Example of How to Build Greener Infrastructure	18
The Manufacturing Gap	19
Systems Thinking	19
Prospects for the Future	20
About the Council on Competitiveness	23

Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

February 13, 2009
Houston, TX

Clarence P. Cazalot Jr., president and CEO of Marathon Oil Corporation, hosted a regional summit on the path to achieving sustainable energy supplies and the impact of the economic stimulus package on U.S. energy security. This meeting was held in concert with *CERAWeek 2009*, the annual conference that brings executives from around the world together to discuss global energy issues.

April 15, 2009
New Brunswick, NJ

Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group; and Richard L. McCormick, president of Rutgers, The State University of New Jersey, co-hosted a regional summit on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

May 13–14, 2009
Chicago, IL

James W. Owens, chairman and CEO of Caterpillar Inc.; Robert J. Zimmer, president of The University of Chicago; and Eric D. Isaacs, director of Argonne National Laboratory, co-hosted a regional summit focused on using the Midwest's unique energy resources and infrastructure to reduce greenhouse gas emissions and improve our nation's energy security.

Compete: Energy

The National Energy Summit & International Dialogue

July 30, 2009
Mountain View, CA

S. Pete Worden, director of NASA Ames Research Center; Mark G. Yudof, president of the University of California; George H. Miller, director of Lawrence Livermore National Laboratory; A. Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas R. Baruch, founder and managing director of CMEA Capital; co-hosted a regional summit on lessons that can be learned from the successes of California and other western states as front-runners in the development and deployment of sustainable energy technologies.

September 23–24, 2009
Washington, D.C.

The Council will convene its top experts in the energy field and representatives from countries around the world to address the interconnected challenges of energy security, innovation and sustainability. The Council's agenda for change will be rooted in a new relationship between the public and private sectors to deal with a defining challenge of the millennium.

Midwest Energy Summit Participants List

CO-HOSTS

Eric D. Isaacs

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James W. Owens

Chairman and Chief Executive Officer
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Robert J. Zimmer

President
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Executive Summary

Participants discussed which energy technology and infrastructure investments would have the greatest impact on the region's—and the nation's—sustainability and competitiveness.

Energy experts, corporate leaders and academics met at Argonne National Laboratory outside Chicago on May 14, 2009 for the third in a series of four regionally-based energy Summits held by the Council on Competitiveness under the auspices of the Environmental Security, Innovation & Sustainability Initiative. This Midwest Summit was co-hosted by the University of Chicago, Argonne National Laboratory and Caterpillar Inc.

Robert J. Zimmer, president of the University of Chicago, opened the meeting with an explanation of why Argonne National Laboratory was such a fitting location for the deliberations. Argonne has long been a place where people have come together to address significant technological challenges, dating back to the development of the first atomic bomb. The intertwined challenges of energy security and sustainability, he noted, would require a similar degree of collaboration.

In a keynote speech, John W. Rowe, chairman and chief executive officer of Exelon Corporation, explained the stubborn facts associated with the economics of energy and carbon emissions. The challenge of reducing emissions is complex, and a price signal on carbon—while critically important—does not solve all the problems. Well regulated competitive markets, he concluded, offer the best mechanism for encouraging economically sound solutions and innovation.

Participants in the Summit's plenary sessions agreed on the need for increased research and development

Eric D. Isaacs, Argonne National Laboratory; Deborah L. Wince-Smith, Council on Competitiveness; and David Hobbs, IHS Cambridge Energy Research Associates, Inc.

activity, as the current menu of available technologies is inadequate to meet the nation's energy security, sustainability and competitiveness challenges. To that point, two of the Midwest's greatest energy resources—coal and shale gas—both require enabling technologies that have not yet been perfected. A third, wind, relies largely on technology that has matured but is limited in its capacity to meet future clean energy needs.

There was a general consensus among participants that more R&D funding is needed, but money is only part of the problem. One challenge is to use scarce resources to develop a diverse portfolio of energy technologies, rather than picking winners and losers. Another is to make sure that R&D projects have clear commercial application. With the latter point in mind, a number of participants recommended that technologies be developed in collaboration with private-sector partners.

Participants generally agreed that a cultural shift was taking place around energy issues, particularly among the young, but there was disagreement over its import. Some equated it to changing mores associated with smoking, which led to significant changes in behavior. Others questioned the depth of commitment behind the rhetoric, and suggested that behavior is more likely to change in response to clear price signals.

There was universal agreement that the United States is falling behind the rest of the world when it comes to the manufacturing of clean energy technologies—an issue of particular importance in the industrial Midwest. No consensus emerged as to how to address this problem, but a few participants advocated copying the aggressive industrial policies instituted by several other countries in their efforts to grab market share.

On the infrastructure side, the O'Hare Modernization Program was offered up as an example not only of how to build greener infrastructure, but also of how green infrastructure improvements can improve regional competitiveness. There was, however, general agreement that federal leadership is necessary to overcome financial and jurisdictional challenges to building the kind of large-scale infrastructure projects that would meaningfully advance the nation's energy security and sustainability goals. A number of participants also pointed out that meeting these goals will require that the nation's energy challenges be examined at the systems level, rather than simply considering the particulars.

Midwest Energy Summit Highlights

Answering Big Questions at Argonne

*Remarks by Dr. Robert J. Zimmer, President,
The University of Chicago*

Argonne National Laboratory, the site of the Midwest Energy Summit, has a proud history of helping to solve big problems, and the intertwined challenges of energy security and sustainability are big problems indeed.

Energy issues are global in scope and exceedingly complex. No single solution—whether technological, political or cultural—can solve America's, or the world's, energy challenges. They will instead be solved over time, and only by integrating a variety of approaches. In that respect, Argonne is a fitting place to convene thought leaders from a variety of fields, disciplines and sectors to explore possible energy security and sustainability solutions.

Argonne grew out of the Manhattan Project. The University of Chicago produced the world's first self-sustained controlled nuclear reaction, and the lab was established after World War II to develop the peaceful use of nuclear energy. Since then, Argonne has maintained a major research program in both nuclear energy and nuclear reactor design, and over the years it has evolved into a multi-purpose laboratory—including the evaluation of a broad range of technologies to improve energy production, storage, transmission and efficient use.

The development of these technologies is critical not only for our economic growth, but for our national security. There are two billion people in Asia who are in the midst of pulling themselves out of poverty. This process has major implications for world energy demand, international trade and global geopolitical stability.

James W. Owens, Caterpillar Inc., and Robert J. Zimmer, The University of Chicago.

As it has in the past, Argonne will continue to be a place that engages in the broad collaborative effort to develop technological answers to the world's biggest problems. Seventy years ago, it was the effort to harness the power of the atom. Today, it is the effort to find better, cleaner ways to produce and use energy.

As we search for solutions to these problems, we should keep in mind a concept that underlies all successful inquiry: questioning, not deference, is the route to clarity. The challenges we confront are not simple, and as wise and expert as some of us may be, successful answers will require the infusion and integration of multiple perspectives.

Facts Are Stubborn When It Comes to the Economics of Energy

Remarks by John W. Rowe, President and CEO, Exelon Corporation

Someone once said that facts are very stubborn things. What makes facts in the energy marketplace particularly stubborn is that some of them change very slowly, and some change every time you turn around. They are very uncooperative, and they greatly complicate the challenge of addressing climate change.

The United States is heavily dependent on fossil fuels, and thus a major contributor to the increased concentration of greenhouse gases in the earth's atmosphere. If this dependence is to change, we will need to reinvent our energy infrastructure—which will not be easy and certainly will not come cheap.

Complexity and Changing Circumstances

The economics of reducing carbon emissions is complex, and under current regulatory conditions not very encouraging. Incumbent coal-fired power is cheap, and without a price on carbon, every alternative is more expensive—most of them considerably so. Accordingly, a price on carbon is essential, and the sooner one is instituted, the better.

But even if a clear and consistent price signal is put in place, the cost of competing power generation options will continue to vary, due to changing commodity prices, improvements in technology, new economies of scale and of course, fluctuations in

John W. Rowe, Exelon Corporation.

the price of carbon. As a result, it will remain difficult for utilities to make wise decisions when it comes to building new energy infrastructure, most of which represents thirty-to-fifty-year investments.

Even straightforward investments can be problematic. Several years ago, for instance, Exelon pursued a gas-fired cogeneration¹ project with Argonne. Argonne looked like the ideal customer. It needs steam, it needs electricity, it uses natural gas and it is a public-spirited operation. But in the end, Argonne rejected the deal due to concerns that a new combined heat and power system might compromise the reliability of its operations. In principle, it should have worked. But it is hard to get from principle to engineering, and from engineering to good economics.

1. Cogeneration is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

The Role of Competitive Markets

The fluidity and complexity of energy economics underscore the value of keeping and expanding competitive energy markets. While deregulation has led to some high-profile problems, competitive markets create an ongoing test for what actually works economically. This is not to say that there is not a place for regulation. Indeed, the only way competitive markets will result in lower emissions is if the external costs of those emissions are built into the price of electricity. But markets will also unleash far more creativity than any central planner ever could, no matter how smart that central planner might be.

The competitive marketplace creates great opportunities for ingenuity—in trying and testing new approaches, and in creating and destroying new products. If you have the market in place, the questions become: How much do we regulate? How much do we tax? How much should we spend developing new technologies? And how much should we leave for the marketplace to decide? We will need to incorporate all four of these approaches, but it will be very hard to get the right mix.

Plenary I: What Investments in Energy Production, Storage and Transportation Technologies Will Have the Greatest Impact on Regional and National Competitiveness?

Key Takeaways:

- Focused research and development is critical for simultaneously addressing all three legs of energy's "triangle of needs": security, sustainability and competitiveness.
- The Midwest's regional strengths are coal, wind and shale gas—but each has limitations or liabilities.
- Cultural norms related to energy use appear to be changing, particularly among young people, but the significance of this shift remains unclear.
- Additional education and training will be needed to prepare workers for the energy jobs of the future.
- The goal of federal energy funding is to develop a diverse portfolio rather than focusing on a single winning technology.

Deborah L. Wince-Smith, Council on Competitiveness, David Hobbs, IHS Cambridge Energy Research Associates, Inc., and other participants at the Midwest Energy Summit discuss energy technology and infrastructure.

The Role of Research and Development

David Hobbs, vice president and managing director of Global Research at IHS Cambridge Energy Research Associates, Inc., framed the competing priorities in the energy space as a triangle. One leg of that triangle represents energy security, a second leg represents environmental sustainability and the third represents economic competitiveness. In this conception, you can move towards any two of those legs, but not without moving away from the third. The only solution is to find a way to make this triangle into a pyramid, in which all three goals meet at a central point. The best hope for finding this solution is the development of new technologies.

Accordingly, increased investment in energy research and development activities is a must. Major research universities—including many located in the Midwest—have an important role to play in conducting the long-term basic research necessary to spur game-changing innovations. These research ef-

“We need to invest seriously in research that probably won’t fully mature today, tomorrow or within five years, but will lead to a real solution to the problem in eight or twenty or 25 years.”

B. Joseph White
University of Illinois

orts, according to a number of Summit participants, should also be undertaken in partnership with private sector enterprises. Private sector firms can provide a unique perspective on the risk-reward ratios of each research option, and can help identify real-world applications for emerging technologies.

Government Research and Development Efforts

When it comes to allocating federal funding for energy projects, the government is not seeking to pick winners and losers. Instead, it is trying to develop a diverse portfolio of energy technologies, according to David E. Rodgers, director of Strategic Planning and Analysis in the Department of Energy’s Office of Energy Efficiency and Renewable Energy. Part of this approach requires looking not only at the risk profile of certain technologies, but also at their potential impact. Carbon capture and storage (CCS) technology, for instance, is risky, but if it is successfully developed, the benefits would be enormous.

Deborah L. Wince-Smith, Council on Competitiveness, and Richard H. Herman, University of Illinois at Urbana-Champaign.

A number of participants agreed that applied research is especially critical in the energy space, and that research efforts ought to be conducted in concert with private-sector partners. In many cases, states and localities can play an important role in this area, since they are critical gatekeepers when it comes to the siting and rollout of new technologies.

Midwest Strengths: Coal, Wind and Shale Gas

The Midwest's industrial economy was built on the abundance and affordability of coal. Coal-fired power is still the dominant source of electricity across the region, as many Summit participants noted, and efforts are underway to develop and test a variety of CCS technologies. The successful commercialization of CCS is critical if coal is to continue to play a major role in the U.S. economy under carbon caps.

However, CCS is expected to be very expensive. Capturing and compressing CO₂ is itself energy intensive, requiring 20-40 percent of a plant's energy

output—a dramatic loss of efficiency. Questions also remain about the efficacy and impact of long-term geological storage, including the possibility of leakage and corresponding liability issues. Demonstration projects currently under construction will provide some answers, but it is unclear how the economics of CCS will ultimately play out.

Wind is the Midwest's best hope for large-scale renewable power generation, absent technological breakthroughs in other areas. But the siting of commercial-scale wind farms is almost always contentious, and the best wind resources are generally located far from population centers and are isolated by a lack of transmission infrastructure. Additionally, wind is an intermittent resource that is most abundant at night, when demand is low. Thus, while wind will clearly have a role in the energy future of the Midwest and the nation, that role is likely to be limited.

Shale gas—natural gas that can be produced from coal shale—is also a major Midwestern resource,

“Applied R&D and the linking of basic sciences have to be informed by the end results that we need and the solutions that we desire, and those in turn must be informed by business and manufacturing needs.”

David E. Rodgers

U.S. Department of Energy

Steven F. Leer, Arch Coal, Inc.

and is seen by many of the Summit participants as playing a critical role in the region's economy while new technologies are developed. As David C. Carroll, president and chief executive officer of the Gas Technology Institute, commented, natural gas can have a big impact on the Midwest and the nation, and offers a bridge to a sustainable energy future.

Shale gas is abundant regionally and nationally, and perhaps most importantly, it produces half the CO₂ emissions per megawatt that coal does when burned for power generation. Nevertheless, shale gas has its drawbacks. The use of hydraulic fracturing² to release natural gas from shale may be having a negative effect on groundwater in some areas. Moreover, natural gas' carbon footprint is still considerable, making it a resource that will buy time in the race to

develop lower-carbon energy technologies, rather than a long-term solution for carbon reduction.

Natural gas is abundant in North America, and it has roughly half the carbon intensity of other fossil fuels. Wind is already cost competitive with coal in some locations, and has a negligible carbon footprint. Both have their drawbacks, however. Natural gas' low density makes it difficult to transport and store, and new drilling techniques may negatively impact groundwater.

A Cultural Shift?

Summit participants argued that a change in cultural norms is an important step towards a more sustainable future. As B. Joseph White, president of the University of Illinois, pointed out, cultural norms have shifted dramatically in the past, and may be shifting on energy use right now. Cigarette smoking was once an acceptable practice, but it became less socially acceptable and behavior changed. The same sort of cultural pressures appear to be building when it comes to energy issues as well, especially on college campuses.

"We are going to use a lot of coal around the world. We will use it all, ultimately. The question is: will we use this coal in a low carbon way? That is Peabody's focus. It's time to get serious about research funding and actual applications for carbon capture and storage."

Vic Svec

Peabody Energy

2. Hydraulic fracturing is a technique used to create fractures in rock or coal formations. These fractures allow the oil or gas to travel more easily from the rock where the oil or gas is trapped to the production well. Typically, in order to create fractures, a mixture of water, sand and chemicals (some of which may be toxic) is pumped into the rock or coal formation.

"I am not sure we are teaching our kids the full story when it comes to energy issues. It is wonderful to be so committed to sustainability, and it is great to talk about changing the world. But we need a serious intellectual debate about the choices we face and their potential costs."

Douglas R. Oberhelman
Caterpillar Inc.

John T. Disharoon, Caterpillar Inc., and Douglas R. Oberhelman, Caterpillar Inc.

Douglas R. Oberhelman, group president of Caterpillar Inc. seconded the notion that new ideas on energy are prevalent among students, but expressed concern that only part of the story is being told. He recalled a discussion he had with a group of graduate students who were committed to environmental change, but balked at the idea of \$4 per gallon gasoline as a means of reducing carbon emissions. Oberhelman lauded the commitment of these students, but pointed out that there needs to be a serious intellectual debate regarding the costs and choices involved in environmental sustainability.

Another participant agreed and suggested that a clear and compelling price signal would ultimately drive behavior. Market solutions, the participant continued, can have a huge impact, since a lot of this comes down to fundamental economics.

Workforce Investments

Consumer education was not the only educational issue brought up by Summit participants. They also identified the need to train workers for the low-carbon energy economy. Pamela Tate, president and chief executive officer for the Council for Adult and Experiential Learning, noted that efforts have been underway for years within the energy industry to train members of the existing energy workforce to work on new energy technologies and to provide pathways for workers looking to transition into energy careers. Nevertheless, even people working in energy-related fields lack a good understanding of what new skills they need to learn to prepare themselves for the future.

There is a need to invest not only in technology, Tate said, but in people, from students to adult workers. People at every rung will need to learn and develop new skills to achieve the goal of a clean energy future.

Plenary II: What Investments in Infrastructure Will Have the Greatest Impact on Regional and National Competitiveness?

Key Takeaways:

- The O'Hare Modernization Program provides an example of how infrastructure can be built to be greener and lead to more sustainable outcomes.
- The United States is falling behind many other nations when it comes to the manufacturing of alternative energy technologies.
- Systems thinking needs to be applied to the overall energy impact of proposed infrastructure investments.
- Federal leadership is required to overcome barriers to large-scale infrastructure projects that would benefit the region and the nation.

“There were no LEED standards or comparable energy efficiency guidelines for a heavy civil construction project like ours, so the O’Hare Modernization Program team developed its own. We ended up creating a green design manual that incorporated sustainability into every stage of our project, from concept design through construction.”

Rosemarie Andolino
O’Hare Modernization Program

Midwest Energy Summit attendees participate in a roundtable discussion.

The O’Hare Modernization Program: An Example of How to Build Greener Infrastructure

The multi-billion dollar effort to modernize O’Hare International Airport in Chicago began without much concern for environmental impacts, but when Rosemarie Andolino was appointed by the Mayor to head up the project, she made them a central focus of the initiative.

When the modernization team searched for LEED-quality standards by which to measure their proposals, they found none. So they created their own, which became the O’Hare Modernization Program Sustainable Design Manual (SDM). This manual is now being used in similar construction and remodeling projects looking to improve environmental performance.

According to Andolino, the O’Hare Modernization Program incorporated sustainable practices into both design and construction, and addressed every

facet of the operation—earth movement, the placement of concrete, onsite recycling, building the control tower, water storage and lighting. Just as importantly, the project was completed on time and under budget.

The infrastructure improvements have also made O’Hare a more fuel-efficient airport for airline operations. O’Hare is one of the most delayed airports in the country, and its increased capacity has improved reliability by fifteen percent—which means less fuel wasted by airplanes forced to circle waiting to land or to sit on the tarmac waiting for takeoff.

Aside from its obvious commercial and environmental impacts, this improvement has had a positive effect on the entire Chicago region. Airlines are more likely to treat O’Hare as a hub, and retaining those flights makes Chicago and its surrounding areas more economically competitive.

The Manufacturing Gap

For solar, wind, nuclear or any of the other energy alternatives, there is a significant gap between the manufacturing capabilities that the United States has today and what we will need in the near future, according to Craig A. Giffi, vice chairman and national industry leader for Consumer & Industrial Affairs with Deloitte & Touche, USA LLP.

Many participants, including Giffi, believe the federal government can play an important role in closing that gap. He noted that other countries have instituted aggressive policies designed to develop and retain critical manufacturing capacity, but in the United States this effort is left to states, localities and private sector actors. As an example, he cited Germany's successful effort to develop its photovoltaic industry, which has become a major source of job growth in a nation not previously known for its solar resources.

Policy formation at this level also needs to include consultation up and down the industrial supply chain, according to Richard B. Jarman, president and chief

Craig A. Giffi, Deloitte & Touche, USA LLP, and David E. Rodgers, U.S. Department of Energy.

executive officer of the National Center for Manufacturing Sciences. Manufacturers and end users should be part of the research and development decision-making process, and every new investment should have clear technology users, developers and providers.

Systems Thinking

A number of Summit participants noted a lack of systems thinking when it comes to energy investments. Solutions for most energy-efficiency problems are designed in isolation from the larger energy production, delivery and end-use systems. Addressing these issues at a systems level can yield greater overall efficiencies and more scalable solutions.

As one participant noted, the energy-related components of most buildings—windows, lighting, layout, heating and air-conditioning—are designed independently. Coordinating these features offers the prospect of greater savings than would be realized by optimizing each feature individually. The same holds

“Manufacturing executives across the country say that they would rather stay in the United States. But manufacturers are looking for leadership at the highest level to coordinate the next generation of capabilities that are necessary, from an energy standpoint, so we can build out the solutions we need to be truly competitive.”

Craig A. Giffi

Deloitte & Touche, USA LLP

James W. Owens, Caterpillar Inc.

true at a macro level, for a large company with many different facilities, or even for the design and execution of regional transportation infrastructure.

Prospects for the Future

There was universal agreement among Summit participants that investments in infrastructure and innovative capacity can boost the Midwest's economic prospects. But these investments need to be well conceived, well coordinated and well financed.

The scale of these challenges requires federal leadership. Only the federal government can end the balkanization of authority that is holding back large-scale initiatives that could benefit the entire region. The federal government is better positioned than any individual state or locality to provide financial support for projects that will not only benefit the region, but serve the national interest as well.

But even in the absence of that leadership, regional players have and will continue to make advances. The O'Hare Modernization Program is one such accomplishment. Another success story in the works is ITC Holdings Corp.'s "Green Power Express," a high-voltage power transmission network that has been designed to move up to 12,000 megawatts of renewable energy from wind-rich areas in the upper Midwest to the region's major population centers. According to Linda Blair, executive vice president and chief business officer of ITC Holdings, the Green Power Express will also result in a reduction of up to 34 million metric tons of carbon emissions—the equivalent of the annual emissions of about seven to nine 600 megawatt coal plants, or nine to 11 million automobiles.

But even here, a lack of supportive public policy is a problem. The \$12 billion project is facing numerous siting issues, and cost-sharing among its regionally and sectorally diverse stakeholders is still a work in progress.

"We know we need smart grid infrastructure. We know we need transmission. We know we need energy storage. We know we need better, stronger fuels, processing and transportation facilities, particularly here in the Midwest. If the ethanol industry is to grow, we need more feedstock-handling systems. We need the solar and wind manufacturing facilities, and we need the whole supply chains that feed each of those. The challenge is to turn those aspirations into reality."

David E. Rodgers

U.S. Department of Energy

Eric D. Isaacs, Argonne National Laboratory.

Summit participants tour Argonne National Laboratory and learn about its cutting-edge research.

Robert H. Topel, The University of Chicago.

Donald H. Levy, The University of Chicago.

About the Council on Competitiveness

WHO WE ARE

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans.

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to ensuring the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.

Council on Competitiveness

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HOW WE OPERATE

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

FOR MORE INFORMATION

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The Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in July 2007 with the firm belief that the crucial role of the private sector demand in driving the way America produces and uses energy has gone largely unrecognized in prior policy initiatives. The ESIS Initiative, which was called for in the Council's 2004 seminal report *Innovate America*, is led by a CEO-level steering committee comprised of approximately 40 chief executives from U.S. industry, academia, government laboratories and organized labor. The distinguished steering committee is led by James W. Owens, chairman and CEO of Caterpillar Inc.; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and D. Michael Langford, national president of the Utility Workers Union of America, AFL-CIO. The goal of the Initiative is to enhance U.S. competitiveness and energy security by developing a public-private action agenda to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs. It is underwritten by the U.S. Department of Energy and has benefited from the guidance of more than 200 executive-level energy experts.

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**Council on
Competitiveness**

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 4: Agenda, Participants List and Report on the Western Energy Summit

Agenda

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Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

Western Energy Summit

*Accelerating Energy Innovation: Spurring the Development
and Commercialization of New Energy Technologies*

**Sponsored by the NASA Ames Research Center, Lawrence Livermore
National Laboratory, Lawrence Berkeley National Laboratory, the
University of California and CMEA Capital**

July 30, 2009

NASA Ames Research Center
Mountain View, California

Co-Hosted By:

S. Pete Worden
Director, NASA Ames
Research Center

Mark Yudof
President, University
of California

George Miller
Director, Lawrence
Livermore National
Laboratory

Paul Alivisatos
Interim Director,
Lawrence Berkeley
National Laboratory

Thomas Baruch
Founder and
Managing Director,
CMEA Capital

Deborah Wince-Smith
President, Council on
Competitiveness

Leadership Roundtable

8:00 a.m.	Registration and Networking Breakfast
8:30	Welcoming Remarks
Dr. S. Pete Worden, Director, NASA Ames Research Center
Ms. Deborah L. Wince-Smith
8:45	Overview of the Day
Mr. Tyler Suiters, Chief Correspondent, Clean Skies News
8:50	Simple Round Robin Self-Introductions
8:55	Opening Co-Host Comments
9:15	Session I – Sustainable Energy Solutions Research and Development
<i>Lessons from the California Innovation Incubator</i>   • Why is California leading the way on sustainable energy R&D activity?• How have partnerships (public-private and between private firms) contributed to this success? What are the attributes of these partnerships and how have they come together?

Western Energy Summit

*Accelerating Energy Innovation: Spurring the Development
and Commercialization of New Energy Technologies*

Agenda

Page 2 of 3

- How successful have Western states been in **capturing the economic development value** of the innovations they have helped to foster?
- How are California and other Western states addressing the shortage of **scientific and engineering talent** necessary for fulfilling the sustainable energy R&D agenda?
- **What can the federal government learn** from the states' efforts?
- How should state and federal policies be aligned to best advance the sustainable energy R&D agenda?

10:35 **Networking Break**

10:50 **Session II – Deployment at Scale**
Identifying Enabling Conditions for Energy Efficiency and Sustainable Energy Development

- What lessons can other states learn from **energy efficiency policies** adopted by California and other Western states?
- What lessons can state and federal policymakers draw from Western states' efforts to ramp up **sustainable energy production**?
- How is California's **agricultural sector** be being tapped for energy production and as a carbon sink?
- How are California and other Western states addressing the **shortage of skilled workers** necessary for advancing its energy efficiency and sustainable energy goals?
- How have the **businesses, universities and laboratories** participating in the Summit handled the "skills gap" challenge?
- How should **state and federal policies be aligned** to support deployment at scale?

12:10 p.m. **Adjournment and Networking Break**

12:30 **Summit Luncheon**

1:10 **Introduction of Keynote Speaker**
Mark Yudof, President, University of California

1:15 **Luncheon Keynote**
Steven E. Koonin, Under Secretary for Science, U.S. Department of Energy

Experts Workshop – A Deeper Dive

- 2:00 **Moderator Overview and Simple Round Robin Self-Introductions**
- 2:05 **Session I – Research and Development in Sustainable Energy Solutions**
- What can other states learn from California and other Western states’ R&D efforts?
 - How do – or should – state and federal policies support these efforts?
 - What **opportunities are being missed** for lack of supportive public policies?
 - Are California and other Western states successfully addressing the **“valley of death”** between development and commercialization?
 - How do California’s and other Western states’ **research and financial communities** approach research, development, and deployment?
- 3:20 **Networking Break**
- 3:35 **Session II – Deploying Sustainable Energy Solutions at Scale**
- Have energy prices driven the **business case for adoption** of energy efficient and sustainable energy technologies, or has public policy created the business case – or has it been a combination of both?
 - How have developers addressed **key hurdles to the deployment of sustainable energy production** such as siting and the need for supportive infrastructure?
 - What else should be done to encourage the **installation of more renewable energy production**, both large-scale and distributed?
 - What hurdles have **domestic manufacturers** of energy-efficient or sustainable energy generation equipment faced? How have they addressed those challenges?
 - How can state and federal policies be better aligned/coordinated?
 - What has been done to keep the **new energy technology companies** and jobs in-state, in the region or even in the country?
- 4:50 **Closing Remarks**
Dr. James E. McMahon, Department Head, Energy Analysis, Lawrence Berkeley National Laboratory
Dr. Jeffrey D. Smith, Deputy Chief, Entrepreneurial Initiatives Division, NASA Ames Research Center
- 5:00 **Reception**

Participants

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July 30, 2009

NASA Ames Research Center
Mountain View, California

Leadership Roundtable

Thomas Baruch

Founder and Managing Director
CMEA Capital

George Blumenthal

Chancellor
University of California, Santa Cruz

Lucien Y. Bronicki

Chairman and Chief Technology Officer
Ormat Technologies, Inc.

Steve Cardona

Chief Executive Officer/Managing
Partner
Orange County Green Fund

Mike Chrisman

Secretary
California Natural Resources Agency

John Denniston

Partner
Kleiner Perkins Caufield & Byers

Vinod Dham

Founder and Executive Managing
Director
NEA-IndoUS Ventures, LLC.

Harrison Dillon

President and Chief Technology Officer
Solazyme, Inc.

Craig A. Giffi

Vice Chairman and National Industry
Leader, Consumer & Industrial Products
Deloitte & Touche USA LLP

Marc Edward Gottschalk

Partner
Wilson Sonsini Goodrich & Rosati

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President, University
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Director, Lawrence
Livermore National
Laboratory

Paul Alivisatos
Interim Director,
Lawrence Berkeley
National Laboratory

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Deborah Wince-Smith
President, Council on
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Western Energy Summit

*Accelerating Energy Innovation: Spurring the Development
and Commercialization of New Energy Technologies*

Participants – Leadership Roundtable

Page 2 of 2

Jim Hawley

Senior Vice President, General Counsel &
Acting Chief Executive Officer
TechNet

Alan Hecht

Director, Sustainable Development
Office of Research and Development
U.S. Environmental Protection Agency

Paul Kimball

President
Sagebrush Capital

Michael Kluse

Director
Pacific Northwest National Laboratory

Steven E. Koonin (Keynote Speaker)

Under Secretary for Science
US Department of Energy

Dave Lazovsky

Founder, President and Chief Executive
Officer
Intermolecular, Inc.

Arun Majumdar

Director, Environmental Energy
Technologies Division
Lawrence Berkeley National Laboratory

George Miller

Director
Lawrence Livermore National Laboratory

David Rodgers

Director, Strategic Planning and Analysis
Office of Energy Efficiency and Renewable
Energy
U.S. Department of Energy

John P. Selldorff

President and Chief Executive Officer
Legrand North America

Alan Shaw

President and Chief Executive Officer
Codexis, Inc.

Les Shephard

Vice President for Energy, Resources and
Nonproliferation
Sandia National Laboratories

Harry Sim

Founder and Chief Executive Officer
Cypress Envirosystems

Tyler Suiters (Moderator)

Chief Correspondent
Clean Skies News

Richard Swanson

President and Chief Technical Officer
SunPower, Corp.

Larry Vanderhoef

Chancellor
University of California, Davis

Deborah Wince-Smith

President
Council on Competitiveness

S. Pete Worden

Director
NASA Ames Research Center

Mark Yudof

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University of California

Participants

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July 30, 2009

NASA Ames Research Center
Mountain View, California

Experts Workshop Session I – Research and Development in Sustainable Energy Solutions

Harry Atwater

Howard Hughes Professor and Professor of
Applied Physics and Materials Science
California Institute of Technology

Charles Calitri

Senior Director, Global Engineering
Pfizer Inc.

Steve Cardona

Chief Executive Officer/Managing Partner
Orange County Green Fund

J. Michael Davis

Associate Laboratory Director, Energy
and Environment Directorate
Pacific Northwest National Laboratory

Julio Friedmann

Leader, Carbon Management Program
Lawrence Livermore National Laboratory

Craig A. Giffi

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Western Energy Summit

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Participants Bios – Experts Workshop

Page 2 of 3

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Physical Scientist and Consulting Professor
NASA Ames Research Center

Martha Krebs

Executive Director for Energy and
Environmental Research Development
University of California, Davis

Jane Long

Fellow, Center for Global Strategic
Research and Principal Associate Director at
Large
Lawrence Livermore National Laboratory

Terry Michalske

Director, Energy Innovation Initiatives
Sandia National Laboratories

James Newcomb

Leader, Market and Policy Impact Analysis
National Renewable Energy Laboratory

Bruce Pasternack (Moderator)

Venture Partner
CMEA Capital

Joshua Raffaelli

Associate
Draper Fisher Jurvetson

Susan Rochford

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Office of Energy Efficiency and Renewable
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U.S. Department of Energy

Stephen Selkowitz

Department Head, Building Technologies
Department
Lawrence Berkeley National Laboratory

Experts Workshop Session II – Deploying Sustainable Energy Solutions at Scale**Arun Banskota**

Vice President, Business
Development
First Solar, Inc.

Josh Becker

General Partner and Co-founder
New Cycle Capital

Marty Brown

Director, Global Energy & Climate
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Pfizer Inc.

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Solazyme, Inc.

Robert E. Estill

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Marathon Oil Corporation

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Western Energy Summit

*Accelerating Energy Innovation: Spurring the Development
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Participants – Experts Workshop

Page 3 of 3

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IDEO

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Carl Wood

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Regulatory Affairs
Utility Workers Union of America, AFL-
CIO

Compete: Energy

Regional Energy Summit Series

Western Energy Summit **Accelerating Energy Innovation:** Spurring the Development and Commercialization of New Energy Technologies

July 30, 2009

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Competitiveness

Energy Security, Innovation & Sustainability Initiative

In 2007, the Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative to explore the linkages between the United States' need for greater energy security, the global imperative for environmental sustainability and U.S. economic competitiveness. Through a series of Progressive Dialogues, the ESIS Initiative brought together high-level experts from industry, labor, academe and the policy community to form conclusions and ideas on how to create the enabling conditions will stimulate and accelerate private sector innovation and investment in sustainable energy solutions. Leveraging the insights generated at the Dialogues and the wisdom of the ESIS Initiative Steering Committee, the Council crafted *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*. The Council on Competitiveness leadership released *Prioritize* at the National Press Club on September 9, 2008, and it has since had a significant impact in shaping U.S. energy policy and priorities.

In an effort to broaden understanding of the drivers for innovation and investment in sustainable energy solutions, the Council has held a series of four regionally-based energy summits around the United States during the first half of 2009. The Western Energy Summit was the fourth of this series.

Following are highlights and key points captured from the Western Energy Summit at the NASA Ames Research Center in Moffett Field, California, on July 30, 2009.

The Council would like to express its gratitude to: S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas Baruch, founder and managing director of CMEA Capital for co-sponsoring the Western Energy Summit; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute, vice chairman of the Council and co-chair of the Council's ESIS Initiative, for her leadership and vision in conceptualizing the Regional Energy Summit Series; Gary Martin, director, New Ventures and Communications at the NASA Ames Research Center; Bruce Darling, executive vice president at the University of California System; Tomás Díaz de la Rubia, chief research and development officer at Lawrence Livermore National Laboratory; James E. McMahon, head of the Energy Analysis Department at Lawrence Berkeley National Laboratory; Rachael Sheinbein, senior associate at CMEA Capital; and the NASA Ames, University of California, Lawrence Livermore, Lawrence Berkeley, and CMEA Capital teams for their strong support in planning and executing this event.

Compete: Energy
Regional Energy Summit Series

Table of Contents

The Road to the National Energy Summit & International Dialogue	4
Western Energy Summit Participants List	6
Executive Summary	8
Western Energy Summit Highlights	10
Setting the Stage	10
Executing an Energy Systems Transformation	12
The Trillion Dollar Question: Financing Energy Innovation	13
Luncheon Keynote: Energy Innovation in America	15
Roles and Responsibilities	19
Solutions	20
Lessons from California	22
About the Council on Competitiveness	27

Energy Security, Innovation & Sustainability Initiative Regional Energy Summit Series

February 13, 2009
Houston, TX

Clarence P. Cazalot Jr., president and CEO of Marathon Oil Corporation, hosted a regional summit on the path to achieving sustainable energy supplies and the impact of the economic stimulus package on U.S. energy security. This meeting was held in concert with *CERAWeek 2009*, the annual conference that brings executives from around the world together to discuss global energy issues.

April 15, 2009
New Brunswick, NJ

Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group; and Richard L. McCormick, president of Rutgers, The State University of New Jersey, co-hosted a regional summit on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

May 13–14, 2009
Chicago, IL

James Owens, chairman and CEO of Caterpillar Inc.; Robert Zimmer, president of The University of Chicago; and Eric Isaacs, director of Argonne National Laboratory, co-hosted a regional summit focused on using the Midwest's unique energy resources and infrastructure to reduce greenhouse gas emissions and improve our nation's energy security.

Compete: Energy

The National Energy Summit & International Dialogue

July 30, 2009
Mountain View, CA

S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas Baruch, founder and managing director of CMEA Capital; co-hosted a regional summit on lessons that can be learned from the successes of California and other western states as front-runners in the development and deployment of sustainable energy technologies.

September 23–24, 2009
Washington, D.C.

The Council will convene its top experts in the energy field and representatives from countries around the world to address the interconnected challenges of energy security, innovation and sustainability. The Council's agenda for change will be rooted in a new relationship between the public and private sectors to deal with a defining challenge of the millennium.

Western Energy Summit Participants List

LEADERSHIP ROUNDTABLE PARTICIPANTS

Thomas R. Baruch

Founder and Managing Director
CMEA Capital

George Blumenthal

Chancellor
University of California, Santa Cruz

C. Wm. Booher, Jr.

Executive Vice President and
Chief Operating Officer
Council on Competitiveness

Lucien Y. Bronicki

Chairman and Chief Technology Officer
Ormat Technologies, Inc.

Steve Cardona

Chief Executive Officer / Managing Partner
Orange County Green Fund

Mike Chrisman

Secretary
California Natural Resources Agency

John Denniston

Partner
Kleiner Perkins Caufield & Byers

Harrison Dillon

President and Chief Technology Officer
Solazyme, Inc.

Robert E. Estill

Vice President, Strategic Planning & Portfolio Management
Marathon Oil Corporation

Marc Edward Gottschalk

Partner
Wilson Sonsini Goodrich & Rosati

Jim Hawley

Senior Vice President, General Counsel & Acting Chief
Executive Officer
TechNet

Alan Hecht

Director, Sustainable Development, Office of Research and
Development
U.S. Environmental Protection Agency

Paul Kimball

President
Sagebrush Capital

Michael Kluse

Director
Pacific Northwest National Laboratory

Steven E. Koonin (Keynote Speaker)

Under Secretary for Science
U.S. Department of Energy

Dave Lazovsky

Founder, President and Chief Executive Officer
Intermolecular, Inc.

George H. Miller

Director
Lawrence Livermore National Laboratory

Arun Majumdar

Director
Environmental Energy, Technologies Division, Lawrence
Berkeley National Laboratory

James Newcomb

Leader, Market and Policy Impact Analysis
National Renewable Energy Laboratory

David Rodgers

Director, Strategic Planning and Analysis
Office of Energy Efficiency and Renewable Energy,
U.S. Department of Energy

John P. Sellendorff

President and Chief Executive Officer
Legrand North America

Alan Shaw

President and Chief Executive Officer
Codexis, Inc.

Les Shephard

Vice President for Energy, Resources and Nonproliferation
Sandia National Laboratories

Harry Sim

Founder and Chief Executive Officer
Cypress Envirosystems

Tyler Suiters (Moderator)

Chief Correspondent
Clean Skies News

Richard Swanson

President and Chief Technical Officer
SunPower Corporation

Larry Vanderhoef

Chancellor
University of California, Davis

S. Pete Worden

Director
NASA Ames Research Center

Mark Yudof

President
University of California

EXPERTS WORKSHOP SESSION I—RESEARCH AND DEVELOPMENT IN SUSTAINABLE ENERGY SOLUTIONS

Harry Atwater

Howard Hughes Professor and Professor of Applied
Physics and Materials Science
California Institute of Technology

C. Wm. Booher, Jr.

Executive Vice President and Chief Operating Officer
Council on Competitiveness

Steve Cardona

Chief Executive Officer / Managing Partner
Orange County Green Fund

J. Michael Davis

Associate Laboratory Director, Energy and Environment
Directorate
Pacific Northwest National Laboratory

Julio Friedmann

Leader, Carbon Management Program
Lawrence Livermore National Laboratory

Alan Hecht

Director, Sustainable Development
Office of Research and Development, U.S. Environmental
Protection Agency

Barbara Heydorn

Director, Center for Excellence in Energy
SRI International

John Hogan

Physical Scientist and Consulting Professor
NASA Ames Research Center

Martha Krebs

Executive Director for Energy and Environmental Research
Development
University of California, Davis

Jane Long

Fellow, Center for Global Strategic Research and Principal
Associate Director at Large
Lawrence Livermore National Laboratory

Terry Michalske

Director, Energy Innovation Initiatives
Sandia National Laboratories

James Newcomb

Leader, Market and Policy Impact Analysis
National Renewable Energy Laboratory

Bruce Pasternack (Moderator)

Venture Partner
CMEA Capital

Joshua Raffaelli

Associate
Draper Fisher Jurvetson

Susan Rochford

Vice President, Energy and Sustainability Initiatives
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David Rodgers

Director, Strategic Planning and Analysis
Office of Energy Efficiency and Renewable Energy,
U.S. Department of Energy

Stephen Selkowitz

Department Head, Building Technologies Department
Lawrence Berkeley National Laboratory

Carl Wood

National Director, Government and Regulatory Affairs
Utility Workers Union of America, AFL-CIO

**EXPERTS WORKSHOP SESSION II-
DEPLOYING SUSTAINABLE ENERGY
SOLUTIONS AT SCALE****Arun Banskota**

Vice President, Business Development
First Solar, Inc.

Josh Becker

General Partner and Co-founder
New Cycle Capital

Marty Brown

Director, Global Energy & Climate Change Program
Pfizer Inc

Steve Cardona

Chief Executive Officer / Managing Partner
Orange County Green Fund

Matthew Frome

Director, Business Development
Solazyme, Inc.

Robert E. Estill

Vice President, Strategic Planning & Portfolio Management
Marathon Oil Corporation

Christine Gulbranson

Director, Advancing Innovation
Ewing Marion Kauffman Foundation

Maurice Gunderson

Senior Partner
CMEA Capital

Thomas C. Halbouty

Vice President and Chief Information Officer
Pioneer Natural Resources Company

Alan Hecht

Director, Sustainable Development
Office of Research and Development
U.S. Environmental Protection Agency

Ted Howes

Sustainability Lead
IDEO

Glen A. Lewis

Energy and Supply Chain Management Advisor, California
Institute of Food & Agriculture Research, University of
California, Davis

James E. McMahon

Head, Energy Analysis Department
Lawrence Berkeley National Laboratory

James Newcomb

Leader, Market and Policy Impact Analysis
National Renewable Energy Laboratory

Bruce Pasternack (Moderator)

Venture Partner
CMEA Capital

Christopher Perkins

Chief Executive Officer
Unimodal Systems

Dean Pournaras

Vice President, Marketing,
WattStopper / Legrand

Susan Rochford,

Vice President, Energy and Sustainability Initiatives
Council on Competitiveness

David Rodgers

Director, Strategic Planning and Analysis
Office of Energy Efficiency and Renewable Energy, U.S.
Department of Energy

Carl Wood

National Director, Government and Regulatory Affairs
Utility Workers Union of America, AFL-CIO

Executive Summary

Participants discussed the lessons that could be learned from California's experience as a front-runner in sustainable energy technology development and deployment, as well as the relative roles of the private and public sectors in addressing the conjoined challenges of energy security and sustainability.

A distinguished assembly of corporate chief executives, university presidents, national lab directors and energy experts met on July 30, 2009, at the NASA Ames Research Center in Silicon Valley, for the last in a series of four regionally-based energy Summits held by the Council on Competitiveness under the auspices of the Environmental Security, Innovation & Sustainability Initiative. The Western Summit was co-hosted by the NASA Ames Research Center, CMEA Capital, the University of California, Lawrence Livermore National Laboratory and Lawrence Berkeley National Laboratory.

During his opening remarks, NASA Ames Research Center Director S. Pete Worden set the tone by framing the nation's space program as a catalyst for planetary environmental awareness, and by sharing some of NASA Ames' successes in developing clean energy technologies. Dr. Steven E. Koonin, Under Secretary for Science in the U.S. Department of Energy, gave the keynote address, emphasizing the unique scale of the energy security and sustainability challenge, and the importance of reinvigorating the nation's basic science and energy programs.

Apropos of the location, much of the Summit's plenary discussion focused on technology research and development. Participants generally agreed on the existence of a de facto division of labor among universities, national labs and the private sector,

with the universities focused on basic research, national labs specializing in technology development and private sector firms engaged in applied research projects with relatively short-time horizons. All agreed that government funding was essential for long-term and high-risk projects, and there was a strong consensus in favor of creating institutions that would provide "connective tissue" for researchers working on similar projects at different institutions, such as the Bay Area's Joint BioEnergy Institute. Similarly, participants expressed support for increased public-private research partnerships and the need for greater international collaboration.

There was also considerable discussion of the underappreciated complexity of the joint energy security and sustainability challenge. A number of participants took issue with the "moon shot" and "Manhattan Project" metaphors commonly invoked when discussing the urgent need for solutions. As each pointed out in different ways, the Apollo Program and the Manhattan Project were well-financed government programs designed to produce a handful of technologies for non-commercial use, and for which there were no incumbent competitors. New energy technologies, on the other hand, must compete in the commercial marketplace on price and performance against mature incumbents that operate on a massive scale with an equally massive supportive infrastructure.

In line with this assessment, a number of participants sounded a call for realism when it came to the commercial development of sustainable technologies. Many—including top executives from a few local startups—emphasized the need for robust business models for new market entrants, such as

Western Energy Summit attendees listen to a diverse panel of experts discuss the development of innovative energy technology.

a focus on technologies that are compatible with existing infrastructure or technologies that have multiple commercial applications. Many participants also acknowledged that most clean energy production technologies will require government support as technologies scale up and mature, or until externalities like carbon emissions are fully factored into energy prices. Accordingly, they recommended seeking a sound alignment of federal R&D spending, regulatory and other energy policies, and the capital requirements of private sector investors.

Looking at California's experience, there was at least one clear example where technology, policy and capital successfully aligned: the state's effort to allow utilities to profit from energy-efficiency

activities. But participants pointed out a number of missed opportunities as well, such as the failure to put stronger energy-efficiency codes into place prior to the state's recently completed construction boom. With the issue of policy alignment clearly in mind, a number of participants also spoke to the importance of public education on energy issues—not simply to improve consumer behavior, but to build public support for otherwise politically unpalatable choices.

Western Energy Summit Highlights

Setting the Stage

C. Wm. Booher, Jr.

Council on Competitiveness

The Council's ESIS Initiative began nearly two years ago—after the culmination of our National Innovation Initiative—when we recognized the important role that energy issues were likely to play on American prosperity and the global economy in the 21st century. Today, we are going to discuss ways to improve the energy technology innovation ecosystem all along the research, development and deployment continuum. The goal of this event will be to provide recommendations both for spurring the development of technologies that address the nation's energy and environmental challenges, and for capturing all the associated economic benefits that these innovations can bring to the United States.

Your insights will feed into the Council on Competitiveness National Energy Summit and International Dialogue on September 23 and 24—convening over 250 CEOs, university presidents, government leaders, and labor leaders to catalyze the market, policy and other actions that will be necessary to build a strong, sustainable and competitive energy and climate change agenda for America.

S. Pete Worden

NASA Ames Research Center

During the Apollo 8 mission, Astronaut Bill Anders looked at the Earthrise over the moon and said that, while we came all this way to explore the moon, the most important thing is that we discovered the Earth.

NASA since then has really taken that message to heart. Efficiency, sustainability and renewable energy have been critical elements to all of our human and

robotic explorations—for example, the two rovers we have on Mars: Spirit and Opportunity. They have been there for over five years. They need only an average of 100 watts of energy to keep going. This is an incredible example of power management and integrated renewable systems working in a pretty harsh environment.

We live off the grid when we go to space. We have, I think, today, a full complement of astronauts on board at our International Space Station. They live and work in one of the most sustainable habitats on or off Earth. It costs about \$10,000 a pound to take hardware to space, so we do not have a lot of spares.

In aeronautics, NASA has a long history of technology development for sustainable aircraft systems. Those of you who flew into San Francisco International for this Summit may have come in a “continuous descent landing pattern” that considerably reduces both noise and fuel consumption. This innovation, the development of this pattern, was a NASA-led effort, with many others, to help increase the efficiency of our transport system.

Today, airplanes only produce about 3 or 4 percent of the world's greenhouse gas emissions. However, if the rest of the world starts to travel as much as the people in this room, that will rise to about 50 percent. So we have embarked on a major initiative in NASA to develop low-carbon transport systems.

We are also bringing NASA down to Earth—constructing what we call the first lunar building on Earth using NASA technology to build a 40,000 square foot facility that will be among the greenest in the federal government, exceeding LEED Platinum certification.

Bill Booher, Council on Competitiveness; Tyler Suiters, Clean Skies Network, LLC; and Pete Worden, NASA Ames Research Center.

Tyler Suiters

Clean Skies TV

We are clearly at an intersection between our need for energy and the needs of the environment—never more so than now, as Washington and would-be Washingtonians make the rest of the American public aware. On the campaign trail, President Obama was quick to point out that we use 25 percent of the world's oil and possess only 3 percent of the world's oil reserves. But even the headline of clean energy, which tests extremely well with voters, has its challenges. If you look at the wind sector, out of the top ten wind turbine manufacturers in the world, the United States has exactly one. If you turn to the solar sector, we are falling behind in terms of photovoltaic manufacturing. Some have said that we need to turn our focus to the next generation of solar technology in order to catch up. We have already been surpassed for this generation.

Since Clean Skies News is based in Washington, I thought it might be fitting to begin with a political quote of sorts. Paraphrasing House Majority Leader Steny Hoyer, I hope America will be selling clean technology to China and India—and not the other way around. I believe that is why we are here: to find the answers to make America the world leader in clean energy technology.

Executing an Energy Systems Transformation

David E. Rodgers

U.S. Department of Energy

It is very easy to compare ourselves to others around the world and come out with a negative point of view, “Oh, the poor United States of America. We lost our mojo. We cannot really pull things together, and everybody else has beaten us.” I believe that just the reverse is true.

Folks around the world are looking to the United States—including our national laboratories and our universities—as leaders of the green energy revolution. The technologies that are now so popular in Europe to reduce carbon emissions were invented in the United States. The technologies that, in fact, China may use to out-compete us in silicon solar panels and battery technologies, were invented here.

We have the capacity to move forward. We have the capacity to lead. In order for the United States to lead, we have to do the things that will put us on track to meet the President’s goal for 80 percent reduction of carbon emissions by 2050.

Arun Majumdar

Lawrence Berkeley National Laboratory

We need an industrial revolution in energy technologies. Although we cannot compete with the rest of the world in terms of numbers of people, we can certainly compete in ideas and innovation. The magnitude of the energy technology challenges we confront over the next 10 to 20 years—whether renewable, energy efficiency or carbon capture and storage—are analogous to the invention and discoveries of the airplane, the transistor and the Internet.

Alan D. Hecht, U.S. Environmental Protection Agency.

Alan D. Hecht

U.S. Environmental Protection Agency

Over four decades, successive administrations have emphasized the need for sustainability and secure sources of energy to little avail. It is extremely important to understand why. Three key elements—science and technology, regulation and policy, and green business strategy—must converge.

Robert Estill

Marathon Oil Corporation

Working together is going to be the key for all of us. In terms of this recession and what is going on with energy prices, when energy prices are low, there is no incentive to develop some of these new technologies because the economic return is not there. So government help is necessary in creating a range of incentives.

The Trillion Dollar Question: Financing Energy Innovation

Alan Shaw

Codexis, Inc.

Recent estimates of the cost of getting next generation biofuels to market—just in order to just satisfy the renewable fuels standard—are somewhere between \$50 and \$100 billion. That is a huge amount of capital investment. The capital intensive requirements for clean tech will kill off many innovative companies long before they get a chance to go to market. We are seeing that happening literally as we speak.

So what do we do to protect innovation? I think companies need to look toward consolidation. Sustainability can mean many things in this sector, but businesses themselves needed to be sustainable. We cannot look for a hand out. If the business model does not make sense, the products probably will not get to market.

I also see the role of big oil becoming increasingly important in this sector. Exxon's recent \$600 million investment in bio-based fuels is a step in that direction. The problem is that we are currently going through a kind of musical chairs game in which there are not that many chairs to begin with; and, when those chairs are gone, there will be nowhere left to sit.

I think we have also got to look to the government. Typically, that is the last place I would look. By the time the money come out, it could be too late for a lot of innovative companies. Getting a grant does not always equate to getting a check. It would help to speed up disbursements.

But we need ultimately to look to industry—the big, well-funded oil majors and the large industrial conglomerates—to save this sector and take it to where it should be in solving some of the world's biggest problems.

Thomas R. Baruch

CMEA Capital

We are not going to solve these problems simply by running the printing presses in Washington. We absolutely need to have enlightened economic policies. We need to have tax policies that encourage innovation rather than discourage innovation. Investment in technology alone cannot solve the problem. You need to combine it with enlightened policies that encourage entrepreneurs to take risks and the creation of incentives in order for the markets to furnish the capital required to do what we have to do. I think it is absolutely critical that we do not kill the goose that lays the golden egg.

Venture capital is one asset class that has contributed greatly to the technology and product innovation that has occurred over the past 50 years. Just in terms of order of magnitude, in 2008, venture capital funded companies accounted for \$2.9 trillion of revenues in our economy and over 12 million jobs. The leverage that has been obtained from relatively small investments is huge.

Paul G. Kimball

Sagebrush Capital Holdings, LLC

The concept of raising taxes to pay for future energy infrastructure has been so widely rejected that it has held back a thoughtful discussion of how to solve this problem. We want clean energy, and we want to be able to reduce reliance on foreign sources of energy—pretty simple things. But if you cannot raise taxes or apply some sort of an energy tax, then all of a sudden, the capital requirements of solving those two questions are impossible to square.

George H. Miller

Lawrence Livermore National Laboratory

I think one of the fundamental issues that the country has to come to grips with is: what is the role of government in developing these technologies? As a backdrop, when there were long gas lines in the

Paul G. Kimball, Sagebrush Capital Holdings, LLC.

George H. Miller, Lawrence Livermore National Laboratory.

1970's, our laboratory had probably 30 percent of its science and technology devoted to energy technology sequestration of carbon and underground cold gasification material science. We have essentially lost 30 years because the government, when the gas lines shortened, decided not to invest. So the real issue is the power of the national laboratory system to develop the truly revolutionary technologies that require sustained investments over decades.

Steve Cardona

Orange County Green Fund

I think we are facing a very unique situation right now. There has always been something in the intellectual property, IPO, or commercialization ecosystem called the Valley of Death. Many of us received initial grants from the government but relied on angel and seed capital to become venture capital-ready. For the most part, that has dried up because the folks who have high net worth, who traditionally played that role, have been bludgeoned in both the real estate and stock markets. So the Valley of Death is wider and deeper than it has ever

been. Despite all the monies that the Department of Energy and the government are putting into research, the technologies will languish if there is not a bridge to from research grants to venture capital.

Dave Lazovsky

Intermolecular, Inc.

What is fundamental for companies that are just starting up is to move as quickly as possible to sustainable profitability and to eliminate reliance on outside funding agencies, be they government or venture capital. The key is biting off chunks that are realistic and achievable in terms of driving grounded business models, moving to a structure that is cash-flow positive, and effectively setting your own destiny—not relying on others. That is obviously very challenging. But with the right technology and the right team, and with a clear understanding of the application space that the company is targeting, it can be achieved and should be a priority for any early stage company.

Luncheon Keynote

Energy Innovation in America

Steven E. Koonin

Under Secretary for Science, U.S. Department of Energy

Circumstances today demand radical innovation in this country's energy system. We are importing more than 60 percent of our crude oil: draining our economy of \$600 million each day, and rendering us subject to the actions and fortunes of governments in distant lands. Continuing the conventional burning of fossil fuels imperils the globe by increasing the atmospheric concentration of greenhouse gases.

The Obama Administration has set concrete goals for responding to these challenges. Within a decade, we seek to reduce oil consumption by some 3.5 million barrels a day or about 40 percent of what passenger transport consumes. We seek to reduce greenhouse gas emissions by some 20 percent in 2022, relative to 2005, and by about 80 percent by mid-century.

How can we bring about the required revolution in our energy system? What technologies do we need, and what institutions will best facilitate their development? What policies will be required to hasten the development and deployment of those technologies? What will be the costs? How long will it take, and how can we meet those goals while creating jobs and fostering prosperity?

By now, it is well understood that the commonly invoked silver bullet in energy technologies is just wrong. Our nation has limited resources—whether it is financial, human capital or tolerance for change—and has limited time in which to address the dual challenges of energy security and emissions. And while there is no silver bullet, neither can we let 1000 flowers bloom indiscriminately. We have to assess technologies according to their ability to scale, their economics, their readiness and their technical headroom.

That does not mean we cannot pursue research and development for technologies for the longer term. But we do need to distinguish carefully between what is ready for prime time now and what might be ready in the future. The deployment of ineffective, feel-good technologies is doubly bad in that it creates the illusion of doing something even as it diverts resources from more effective measures.

Our two energy challenges are quite de-coupled. Energy security is almost exclusively about oil for transport, while the bulk of greenhouse gas emissions arise from fossil fuel use for heat and power. It is convenient to talk about those two separately.

Let me start with transportation and energy security. Liquid hydrocarbons are important for transport not because of government regulation but because of their high energy density. It's almost two orders of magnitude more than the best batteries anybody is talking about right now. So, liquid hydrocarbons

are unlikely to disappear from transport anytime soon. Fortunately, engine efficiency can be improved dramatically at low cost using existing technologies like homogeneous charge compression ignition, variable valve timings, selective cylinder deactivation, light weighting. Increasing the CAFE standards will drive the development and deployment of those technologies during the next decade.

To supply energy for transport, biofuels—particularly those from lignocellulose and perhaps algae and thermo-chemical processes—can plausibly be brought to economic cost and commercial scale. That will reduce transportation's greenhouse footprint and enhance energy security through a diversification of sources. Beyond those steps, there will be electrification of the drive train from mild to full to plug-in hybrids and perhaps, eventually, to all electric vehicles. The pace for that will be driven by advances in electrical storage technologies and reductions in their cost. That is rather difficult to predict.

On the stationary side, about 40 percent of the nation's energy is consumed in buildings for heat, light or ventilation. Again, there are already many technologies to enable more efficient use of that energy. The cool roofs much in the news are just one example. But the nation is not deploying efficiency measures aggressively—the barriers to this are economic and social.

Urban energy systems are another potential big win. Today, half of the world's population lives in big cities. By 2030, 70 percent of the population will be similarly situated. Building or retro-fitting cities with careful attention to building design, the integration of residential, commercial and industrial spaces, and transport systems for people, goods and information could, in principle, significantly reduce energy use.

On the stationary supply side, coal provides much of U.S. global and electrical power. It is available. It is where the demand centers are. It is easy to use, and it is inexpensive. It is, therefore, not going

to disappear anytime soon even if it is the most carbon-laden of fossil fuels. If we are going to reduce significantly CO₂ emissions from coal-fired power, we need to demonstrate and deploy at commercial scale carbon capture and storage, both pre and post-combustion. That technology is more than a notion, as all of the above ground elements have been demonstrated but not yet integrated on a commercial scale. The integrity of the below-ground containment is plausible but also remains to be demonstrated. When mature, the technology is expected to have a cost comparable to that of nuclear power.

Natural gas is a better fossil fuel than coal for power. It emits about half the CO₂ per kilowatt hour produced. Fortunately, new, sub-surface access technologies have vastly expanded U.S. natural gas reserves by a factor of four or more. So in my mind, substitution of gas for coal seems a viable and material option.

Hydro-electric power, I was surprised to learn in the last month or two, is also effective for low-emission production, and there are tens of gigawatts of small and medium hydro-power capacity that could be installed in the United States.

Wind power is quite a mature technology that is competitive with fossil fuels at good sites on shore. It is being deployed rapidly and currently constitutes about two percent of US electrical generation—not capacity, but actual kilowatt hours produced. When I started giving talks on energy, the number was about 0.8 percent. It is going up significantly. The number 20 percent was quoted recently as perhaps an intermediate stop to which we can imagine wind power growing, and I would subscribe to that number. It is difficult to see how we could get higher than 20 percent.

Fission currently supplies about 20 percent of the nation's electricity but has not grown at all in the past two decades. To my mind, it is a proven technology

that produces material amounts of emissions-free power, at competitive economics. If the world is going to address CO₂ emissions seriously, nuclear will almost certainly be a part of the picture. It is not yet without its drawbacks—safety, waste management, non-proliferation concerns—these are all real issues, but I think renewed attention to them on both a national and international scale should reduce concern significantly.

Beyond the near-term menu, there are power technologies that are still maturing in cost and scale. Photovoltaics and enhanced geo-thermal systems are particularly relevant to northern California. Another is concentrated solar thermal power, which is perhaps on the cusp of wide scale deployment.

An important part of our electrical power future is the so-called smart grid. Right now, the power grid that has grown up over almost a century is a patchwork of technologies and regulation. Its modernization is sorely needed to better manage demand, to reduce transmission and distribution losses, to integrate a growing fraction of intermittent renewables, and to enhance reliability and security.

We, who aspire to revolutionize the energy system, have to realize that it is in several ways fundamentally different from other realms that have seen great innovation in the past few decades—IT and biotech, for example. The good news is that the energy use changes in response to technology, economics and policy. The bad news is that it changes slowly on decade-long scales—very different from the few years that characterize Moore's Law.

Energy is perhaps uniquely distinguished by a large and costly infrastructure. A single power plant or one offshore oil field can be a multi-billion dollar investment. There are large amounts of material (coal production is on the order of giga-tons per year around the world) and large numbers of units (150 million passenger cars in the United States,

250 million road vehicles in total). This scale requires large amounts of capital and/or the ability to leverage existing infrastructure.

The second feature of this energy system is its ubiquity—energy-enabling heat, light and mobility is so ubiquitous that we hardly give it a thought. But that very ubiquity generates direct interest from many different players—industry, consumers, governments, NGOs. As those interests are not often aligned, change occurs slowly.

The third feature is one of longevity. The lifetimes of large equipment—from a century for buildings, 50 years for power plants, 20 years for automobiles—make it difficult to effect rapid changes.

Just to give you one example: hybrid vehicles. The Prius was introduced about seven years ago. I think there are right now less than a million Priuses in the world altogether. There are a billion vehicles in the world right now. Change takes a long time.

The need for inter-operability also inhibits change. For example, my former employer, BP, cannot make arbitrary changes in the fuels that it sells because they have to work in all vehicles. Consider that while the carbon problem has decadal to millennial time scales, the infrastructure lifetime is measured in decades. The political cycle is a few years. The business cycle is a quarter of a year, and the news cycle is a day or even less. Society is not very experienced, or, in my opinion, well-suited to managing problems that have this kind of duration.

Finally, the fourth feature of energy that makes it different is one of incumbency. From a consumer point of view, there are already perfectly good ways of providing heat, light and power. Any new technologies that get introduced which will not provide qualitatively new services have to compete on cost and against existing interests.

The idea that we can recreate a Manhattan Project to solve the energy and climate grand challenges is entirely specious. The Manhattan Project was set up to produce a few gadgets for a single customer. It did not have to compete with an existing capability, was carried out in secret and had an almost unconstrained budget. The moon shot had more or less a similar set of caveats.

What lessons do we draw from that discussion? First, there is the lesson that transformation is going to take a long time. For that reason, consistency of purpose, policy, and funding are very important. Second, if we are going to accelerate changes in the energy system, we must better couple basic research with development, demonstration, and deployment. Third, because scale requires large capital and access to existing infrastructures, big corporations will necessarily be involved. Finally, technology alone is not enough. Economic, political and social dimensions are at least as important.

So who is going to do all of this transforming, and how will they work together? To discuss that, I think you really need to understand the differing roles of the various actors—the universities, the national labs, the private sector, and the state and federal governments.

We largely look to the universities for new basic knowledge in science and technology and for training next generation of researchers. However, in my mind, universities have other important roles. They help educate the citizenry. They can be trusted voices in energy matters, both to the public and to the Congress. Perhaps uniquely, they can be centers for the kind of multi-disciplinary thinking that energy transformation requires. It is also worth noting that it is no accident that the great centers of innovation in this country—here in Silicon Valley; Cambridge, Massachusetts; San Diego; and, Austin—have grown up around some of its great universities.

The national laboratories are unique U.S. assets. They can focus research on missions and projects in ways that are not well-suited to universities, and they can construct and operate unique major facilities such as those close by to us. The national labs were born of the nuclear weapons program and have grown since to span basic research, applied research and national security.

Turning now to the for-profit sector, that group of organizations exists to make money. Period. To do otherwise would be irresponsible to the share-holders. Corporations are superb optimizers given the rules of the playing field. This playing field, of course, is set by consumer demand and modulated by government policies and economics. That modulation of the playing field is the most important thing that governments can do to stimulate energy transformation.

Consistent and significant carbon prices, renewable or low-carbon power portfolio standards, and oil production tax regimes are all examples of how governments can determine what the energy future will look like. Beyond setting the rules, the government should support basic science, the development of human capital, and the development and demonstration of pre-competitiveness technologies.

However, it is important to realize that government capital is pretty feeble. For example, BP capital spending a year ago was \$20 billion in one year. That is just about two-thirds of the total budget in the Department of Energy.

In sum, all of the players have current conceptions of their roles that are hard to change, but indeed must change if energy innovation is to proceed at the pace to which we aspire.

Roles and Responsibilities

The Executive Branch: Catalyze Transformation

Steve Koonin

U.S. Department of Energy

The government's role is to set the playing field through regulation, through economics, through the tone of the discussion, and to catalyze with the relatively feeble funds that it has. Twenty-eighty billion dollars in the Department of Energy sounds like a lot of money, but on the scale of what business spends on energy, it is small potatoes. The government really needs to catalyze through technology funding, through human capital, through bringing together partnerships.

Congress: Focus on Goals not Routes

Harrison Dillon

Solazyme, Inc.

Too many times, entrepreneurs are actually blocked from doing something very innovative because the policy from Washington, D.C., is to focus on the route rather than the goal.

For example, if you can take a pile of saw dust, which is made out of cellulose, you can use some technologies to turn it into ethanol. You can use others to turn it into crude oil. You can use others to turn it into, say, other hydrocarbon fuels. What is the right thing to do with that pile of cellulose? The rule of thumb should be: Let us turn that into the best fuel, at the lowest cost, that has the highest energy density, and that is compatible with the existing infrastructure.

Universities: Create the Foundations

George Blumenthal

University of California, Santa Cruz

The role of the university is to do basic research and to educate. We have seen an evolution in terms of basic research. Two to three decades ago, a great

George Blumenthal, University of California, Santa Cruz

deal of basic research was performed in industry laboratories. Bell Labs was one of the great centers of innovative research. But industry has moved into more applied research and left open ground for universities. This is an evolution that we must understand and make use of as we address these grand challenges. The university's second major mission is education—an educated and technically-capable workforce is a critical ingredient in innovation and economic competitiveness.

National Laboratories: Poised to Deploy

George Miller

Lawrence Livermore National Laboratory

The national laboratories have an incredible ability to go from fundamental basic science to a deployed idea very quickly. I think that is what their strength is, and as we have said before, they do it with teams—not only teams of scientists and chemists and physicists and computational scientists, but also engineers and technicians. That is, in fact, truly our unique set of capabilities.

Thomas R. Baruch, CMEA Capital

The Private Sector: Pursue Sound Business Models

Thomas R. Baruch

CMEA Capital

There are better and worse strategies to pursue when it comes to the commercialization of new technologies. For instance, it is absolutely critical to have a sustainable and highly differentiated platform—technologies that can leverage material sciences in a very disruptive way. Without a sustainable differentiated platform, it is impossible for companies to attract the capital they require.

Here in Silicon Valley, we are extremely fortunate to have available to us entrepreneurs who understand the value of highly differentiated platforms. We have almost a bottomless reservoir of highly-skilled, outstanding entrepreneurs—several of whom are with us at this Summit. We just need to continue to be disciplined in the way we approach investments.

Solutions

Partner Globally

Michael Kluse

Pacific Northwest National Laboratory

We have to recognize how complex the challenges are that we face in energy and the fact that these challenges have been long in the making. We have to recognize that, as a country, we cannot solve these problems alone. We have to reach out to our world partners and engage the global R&D community to assemble the needed multi-disciplinary teams and novel public-private partnerships. In particular, I think there is a huge opportunity with respect to China. The whole idea is to bring together the best minds and talents to address these challenges. We must employ collaborative technologies to work across organizational lines and national boundaries.

Educate Policymakers and the Public

Steve Koonin

U.S. Department of Energy

My solution is education about energy. There are so many misconceptions, even among policymakers. We need to educate the policy makers and educate the public to achieve a common recognition of the problems. Without that, making progress is much more difficult.

Richard Swanson

SunPower Corporation

Energy is a funny concept. The public is not very aware of what energy is. We understand the other physical concepts like space and time and weight, but what is energy? I think people viscerally know the difference between gallons of gasoline and miles per gallon, but they do not know the difference between kilowatts and kilowatt hours—and this lack of public understanding trickles up through the entire system. We owe it to the world to start educating people on what energy is, what the issues are, and how we as a global community need to go forward.

Lucien Bronicki, Ormat Technologies, Inc.

Lucien Bronicki

Ormat Technologies, Inc.

A very interesting idea for the mid-term is internships in industry, particularly in power plants. Ormat Technologies has an internship program with the University of Nevada in geothermal power plants. It provides an opportunity for the students, before they pursue a master's degree, to get hands-on experience and hone their problem-solving skills. Incentives for these kinds of internships could be an important tool in getting students ready to work in industry.

Build Connective Tissue

Michael Kluse

Pacific Northwest National Laboratory

I would agree there is tremendous technological capacity. What we need is that connective tissue to bring the best minds and ideas together, and focus them on the various elements of the energy challenge. In fact, the notion of the innovation hubs has begun to evolve around this concept. It has already created a level of dialogue among the national labs that I do not think would have otherwise happened.

James Newcomb, National Renewable Energy Laboratory.

James Newcomb

National Renewable Energy Laboratory

In many ways, the Manhattan Project is exactly the wrong metaphor for clean energy challenges. In that case, the process was government-driven, highly secretive and very closed. The forces that drive innovation in Silicon Valley are exactly the opposite: a combination of technologies, across a very wide spectrum, in a networked environment.

Create Outcome-Based Models

Les E. Shephard

Sandia National Laboratories

The Joint Bioenergy Institute started a couple of years ago through the Office of Science. It is one example of an outcome-focused model. The concept was to bring the very best ideas, capabilities, and intellect from across the region to work on biofuels development. The goal was large-scale deployment and commercialization of lignocellulosic technologies over some specified period of time. The Institute's governing structure looked much like a start-up company—enabling it to look at technology very quickly, and to make

decisions in an accelerated way about which technologies could make significant or sizeable impact—and which could not.

Ensure Infrastructure Compatibility

Harrison Dillon

Solazyme, Inc.

Compatibility with the existing infrastructure is something that needs to be at the forefront of every aspect of energy solutions from laboratory research to small-scale pilots to commercialization. You can succeed in every aspect of technology development, including achieving a competitive price, and still utterly fail because the technology does not fit into the existing infrastructure and there is no funding for a duplicate one. Hydrogen is an example of this.

Align Incentives

Arun Majumdar

Lawrence Berkeley National Laboratory

I think if you look across the whole landscape of energy and alignment, there are many places where the incentives are misaligned. One example is energy efficiency for buildings. That is why you do not see many of the things that could happen. One of the brilliant strokes of innovation policy in California was to enable the utilities to make money by selling less energy. Every dollar invested by the utilities in efficiency measures has generated more than two dollars in savings for customers, while giving utilities an incentive to boost energy efficiency.

Martha Krebs, University of California, Davis and Les E. Shephard, Sandia National Laboratories.

Lessons from California

Martha Krebs

University of California, Davis

I think the most significant difference between California and the federal government in the energy technology space is that California has had a consistent energy policy for the last 35 years, particularly when it comes to energy efficiency. The state de-coupled gross energy sales from utility profits in the 1970s; and, this has enabled utilities to put energy-efficiency incentive programs in place with their customers and allowed them to get a fair rate of return on that investment.

The legislature also empowered the California Energy Commission to put in building and appliance energy performance standards, which are renewed and upgraded every three years. It is very, very different from what has taken place at the federal level.

Marc Edward Gottschalk, Wilson Sonsini Goodrich & Rosati.

Marc Edward Gottschalk

Wilson Sonsini Goodrich & Rosati

We established the Clean Tech Open in 2006, and we have had approximately 200 companies come through as finalists. The companies have raised over \$130 million in venture capital support, and many of the success stories started with an entrepreneur or a scientist who had an idea, who was sitting on the couch, had no idea how he was going to take this idea forward. They came to us. We put them through a training program—our boot camp—on how you start a business, and then we were able to bring in the resources of the national labs, the Department of Energy and our sponsors in the venture capital world.

It has been a very successful model. We have since rolled it out in the Pacific Northwest and in the Rocky Mountain region, and we do think it has been very effective in catalyzing the commercial development of a number of innovative technologies.

Mike Chrisman

California Natural Resources Agency

Here in California we have managed to keep per-capital electricity use flat over the last thirty years, even as the population has grown from about 22 million to about 38 million. And it is because of energy efficiency regulations and power plant requirements put in place during the 1970s—standards that have driven technology. In retrospect, then, California has shown that a properly structured regulatory system can make a difference.

Carl Wood

Utility Workers Union of America, AFL-CIO

While there have been many successes, there have also been missed opportunities. One is in the deployment of solar thermal water heating. This is about as low-tech as you can possibly get. It is a technology that has been in existence for a century. You can always improve technologies. But this one is quite ready to go and it has been deployed in this state, around the country and in different parts of the world over many years. And it is proven. If it were deployed in the area where I live in southern California, it could obviate the need for about 40 percent of the natural gas use in the region.

The economics of it are extremely persuasive because the initial capital investment gets paid back in a very short period of time. All that is needed is a public policy that makes initial capital investment available to homeowners—perhaps encumbering the utility bill as a means to securitize the investment. It seems to me it is a no-brainer, but somehow—and I have had discussions about this when I was an Energy Commissioner—although people nodded and agreed with me, the idea never seemed to capture anyone's imagination.

Mike Chrisman, California Natural Resources Agency, and John Denniston, Kleiner Perkins Caufield & Byers.

Thomas R. Baruch, CMEA Capital, and Robert E. Estill, Marathon Oil Corporation.

Another, probably bigger area which the region and the nation are just beginning to address is weatherization and building codes. California does more than any other state in terms of low-income home weatherization, but it really is not enough. And we missed the opportunity of a lifetime during the recent housing boom because we did not have in place strong enough energy efficiency standards for homes. If the strong codes had been in place, we would have a housing stock that was world class.

Jonathan Trent, NASA Ames Research Center; Christopher Perkins, Unimodal, Inc.; Ted Howes, IDEO; James E. McMahon, Lawrence Berkeley National Laboratory; Susan Rochford, Council on Competitiveness; and Bruce Pasternack, CMEA Capital.

About the Council on Competitiveness

WHO WE ARE

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans.

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to ensuring the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.

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HOW WE OPERATE

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

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The Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in July 2007 with the firm belief that the crucial role of the private sector demand in driving the way America produces and uses energy has gone largely unrecognized in prior policy initiatives. The ESIS Initiative, which was called for in the Council's 2004 seminal report *Innovate America*, is led by a CEO-level steering committee comprised of approximately 40 chief executives from U.S. industry, academia, government laboratories and organized labor. The distinguished steering committee is led by James W. Owens, chairman and CEO of Caterpillar Inc.; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and D. Michael Langford, national president of the Utility Workers Union of America, AFL-CIO. The goal of the Initiative is to enhance U.S. competitiveness and energy security by developing a public-private action agenda to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs. It is underwritten by the U.S. Department of Energy and has benefited from the guidance of more than 200 executive-level energy experts.

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**Council on
Competitiveness**

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 5: Drive. Private Sector Demand for Sustainable Energy Solution: A Comprehensive Roadmap to Achieve Energy Security, Sustainability and Competitiveness

Energy Security, Innovation & Sustainability Initiative
COMPETE: Energy

Drive.

Private Sector Demand for Sustainable Energy Solutions

A Comprehensive Roadmap to Achieve Energy Security, Sustainability
and Competitiveness

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Competitiveness

Drive. Private Sector Demand for Sustainable Energy Solutions

The Council on Competitiveness would like to acknowledge and express appreciation for the excellent contributions of James L. Wolf in the crafting of this report.

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ISBN 1-889866-47-4

THE COUNCIL ON COMPETITIVENESS is a nonprofit, 501(c) (3) organization as recognized by the U.S. Internal Revenue Service. The Council's activities are funded by contributions from its members, foundations, and project contributions. To learn more about the Council on Competitiveness, visit our home page at www.compete.org.

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DESIGN Soulellis Studio

Printed in the United States of America

Drive.

Private Sector Demand for Sustainable Energy Solutions

A Comprehensive Roadmap to Achieve Energy Security, Sustainability
and Competitiveness

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**Council on
Competitiveness**

Drive: Private Sector Demand for Sustainable Energy Solutions

Table of Contents

Letter from the Council on Competitiveness Leadership	5
Executive Summary	8
Summary of Recommendations	12
Introduction	19
Create the Foundation for Success	23
Global Prerequisites	23
American Prerequisites	26
Reinforce the Six Pillars Critical to Energy System Transformation	28
Pillar 1: Setting the Global Bar for Energy Efficiency	28
Recommendation: Reward Efficiency	31
Pillar 2: Assuring Access to Clean and Competitive Energy	32
Recommendation: Use It All and Price It Right	37
Pillar 3: Jumpstarting Energy Infrastructure and Manufacturing Investments	38
Recommendation: Capitalize Growth and Make It Here	42
Pillar 4: Clearing Obstacles to a National Transmission Superhighway and Smart Grid	44
Recommendation: Build It Fast and Smart	46
Pillar 5: Spawning Technological Breakthroughs and Entrepreneurship	46
Recommendation: Discover the Future and Break the Technology Barriers	50
Pillar 6: Mobilizing a World-Class Energy Workforce	51
Recommendation: Bridge the Skills Gap and Build the Talent	55
Conclusion	56
Acknowledgements	57

Notes	58
Road to the National Energy Summit & International Dialogue	60
Appendices	62
A. Recommendations from <i>Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States</i>	62
B. 2009 Council on Competitiveness Scorecard	64
C. Executive Summary: Highlights from the Southern Energy Summit	65
D. Executive Summary: Highlights from the Eastern Energy Summit	66
E. Executive Summary: Highlights from the Midwest Energy Summit	67
F. Executive Summary: Highlights from the Western Energy Summit	68
ESIS Initiative Steering Committee List	69
ESIS Initiative Advisors List	70
Council Membership, National Affiliates and Council Staff	71
About the Council on Competitiveness	75
Energy Security, Innovation & Sustainability Initiative Program Leadership	76

Letter from the Council on Competitiveness Leadership

In July 2007, the Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in recognition of the critical linkages among these three issues and their profound impact on future U.S. productivity, standard of living and global market success. The genesis for the Initiative was the Council's 2004 groundbreaking National Innovation Initiative (NII). The NII recognized energy as a significant challenge on the horizon—one that if left unaddressed could undermine America's competitiveness in the years ahead.

Energy consumption is rising exponentially, driven by worldwide population growth, swiftly developing economies, improving global living standards and the burgeoning use of ever more energy-dependent technologies. Consumption of nearly every major energy source is up markedly. If current trends continue, humans will use more energy over the next 50 years than in all of previously recorded history.

In the United States, growing dependence on imports to meet our energy needs is a major factor in the trade deficit and results in the loss of precious capital from our economy. Increases in energy prices erode the competitive cost structure of energy-intensive industries, increasing the risk that these industries and the jobs they represent will move offshore. Our growing dependence on foreign sources of natural gas and petroleum also poses a serious challenge to U.S. national and economic security. Moreover, we must lower the risk of climate change by reducing carbon dioxide (CO₂) emissions resulting from the combustion of fossil fuels.

Energy efficiency must be our first priority, but our goals will not be achieved through efficiency alone. Without a plentiful and affordable supply of energy

in the future, the United States will lose current and future jobs and entire industries and see the further erosion of U.S. innovation capacity and our manufacturing base. Prices for goods and services will go up, our ability to create wealth will decline, and our very way of life may be threatened. If we allow this to happen, we will lose both the investment and the technological capacity we need for new energy solutions, goods and services. This is why we must establish an energy policy focused on expanding domestic production and making all energy sources more available, while employing efficiency and technology to protect the environment.

There is no one single solution to providing abundant, secure, clean and reasonably-priced energy. It will require legal, regulatory, policy and tax changes at both the federal and state levels that will support technological advances that improve the way energy is produced and used. If true change is going to occur, citizens and businesses will have to adapt to new circumstances, and it will require U.S. leadership to forge consensus and a commitment to global action to address climate change and economic development together.

While government policies can help enable the right conditions for progress, ultimately the private sector and the research community must come together to develop and deploy solutions. We must ensure that our best companies, experts, researchers, inventors and entrepreneurs have the freedom, the flexibility and the resources to develop cleaner, more secure energy—and more of it. We need to encourage innovation that leads to new sources of energy and improved use of existing, abundant resources. The way to accomplish this—the way to achieve game-

winning innovation, higher energy productivity, economic growth and stronger national security—is by driving demand for sustainable energy solutions in the private sector.

Drawing upon over a year's work of inquiry and real-time research and analysis, and in anticipation of the new administration, the Council issued *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States* in September 2008. The plan identified six “pillars” as integral to U.S. energy transformation and as top priorities for presidential action upon taking office. At that time, the Council stressed that the action plan recommended in *Prioritize* marked the beginning, not the end, of a concerted commitment to ensure the United States achieves energy security in a sustainable manner, while ensuring the competitiveness of its workers, industries and economy.

Drive: A Comprehensive Roadmap to Achieve Energy Security, Sustainability and Competitiveness builds upon the energy action plan in *Prioritize* and sets forth the next set of integrated building blocks for America's energy transformation, sustainability and competitiveness in a low-carbon world. We believe that the recommendations presented in *Drive* will unleash a new era of American innovation, create new industries, revitalize and re-build manufacturing jobs across our nation, keep and grow high-skilled jobs for this generation and the next and accelerate economic prosperity for all Americans as we lead global growth, environmental stewardship and security.

We are pleased to have the opportunity to present these recommendations at the National Energy Summit on September 23, 2009, in Washington, D.C. The recommendations set forth within *Drive* represent the voice of a very broad cross-section of America's preeminent business, academic and labor leaders, and citizens across the nation, committed to America's future prosperity and security. We urge policymakers to assign them the highest priority.

Moving forward, in the next phase of its work under the ESIS Initiative, the Council will delve deeper into the manufacturing, workforce and technology issues that will determine the success with which our nation converts today's energy and sustainability challenges into tomorrow's opportunity for economic growth and prosperity.

We would not have arrived at this point were it not for the contributions and dedicated commitment of so many individuals. We commend the reader to the Acknowledgements section of this report, as it reflects the breadth and stature of leading business, research, labor, academic, government and non-governmental leaders who gave so generously of their time and expertise to help us shape this roadmap. The ESIS Initiative Steering Committee has our gratitude for their leadership, with particular thanks to those members who generously hosted the Regional Energy Summit Series.

Reflecting the spirit and purpose of the Council, we declare, as leaders of industry, universities, national laboratories and labor, that we have come together to address this great challenge of our time—one that

will determine the future of our nation and shape the lives of our children. We are filled with hope and optimism, but grounded in reality. We stand at the crossroads of the 21st century energy and sustainability revolutions. We ask our nation's leaders and citizens to join us as we embark upon this great journey of discovery, opportunity and transformation.

Charles O. Holliday, Jr.
Council Chairman
Chairman
DuPont

D. Michael Langford
ESIS Initiative Co-Chair
National President
Utility Workers Union of America, AFL-CIO

James W. Owens
ESIS Initiative Co-Chair
Chairman and Chief Executive Officer
Caterpillar Inc.

Shirley Ann Jackson
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President
Rensselaer Polytechnic Institute

Deborah L. Wince-Smith
President
Council on Competitiveness

Executive Summary

Energy is the lifeblood of our economy. America's competitiveness cannot be separated from energy issues. The efficiency with which we use energy affects our industrial and manufacturing cost competitiveness. Our dependence on foreign oil translates into an outflow of \$439 billion dollars annually—accounting for over 45 percent of our trade deficit. Fully utilizing energy resources at home would direct precious capital to grow our domestic economy. In developing new industries to supply the sustainable energy and related services needed here and abroad, America can drive economic growth, create millions of new jobs and enhance the competitiveness and prosperity of the entire nation.

The United States must invest, create, commercialize and market the new products and services of the low-carbon energy future. We must actively engage in the intense global competition well underway in Asia, Europe, the Middle East and the Americas to capture the economic value, jobs and global market share for these new industries and infrastructure. As an example of what is at stake, within the past decade the United States has fallen from first to fifth among top solar manufacturing countries and now imports solar cells from the European Union and Asia.

Revenue in just three clean energy sectors—wind, solar and biofuels—is projected to nearly triple over the next decade, from \$116 billion in 2008 to \$325 billion in 2018. Markets for clean technologies like carbon capture and sequestration for coal plants will expand exponentially as demand for this abundant energy resource continues to grow. These markets and the employment and economic growth they bring can be ours if we act now with the right set of policies and programs to catalyze research and

development (R&D), investment, manufacturing and commercial deployment.

Our national security is challenged and will increasingly be compromised by our energy supply and usage—ranging from our dependence on oil imports and the vulnerability of our energy infrastructure to the impact on our armed forces on the land, sea and air. In 2008, we imported over 66 percent of our oil, much of it from areas of the world that are insecure and not always friendly to American interests.

Energy's impact on the environment is pervasive, particularly from the combustion of fossil fuel energy. If we are to mitigate climate change and keep changes in global temperatures to a safe level, we need to limit the concentrations of CO₂ in the atmosphere from using fossil fuels. Using old technologies to supply energy for the next few decades will lock in increases of emissions and make any needed reductions more expensive and harder in the future.

The Council identified six critical “pillars” as integral to U.S. energy system transformation in *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States* issued last September. These pillars are listed in Figure A. Recommendations for actions on each pillar were made.

Over the past year, Congress and the new Administration have made considerable efforts to reinforce and strengthen these pillars, and progress has been made and several of the Council's recommendations adopted. Nonetheless, the Council believes that additional critical actions in each of these six areas are necessary if true breakthroughs in U.S. performance are to be achieved. In many respects these pillars are interdependent. Progress in one area cannot be achieved without progress in one or more of the other areas.

Drive Recommendations

Create the Foundation for Success—at Home and Abroad

Expand trade, demonstrate leadership in Copenhagen and collaborate with the developing world. To have maximum impact, we need to lay the foundation for success. This includes actions in both the international and domestic arenas. Internationally, we must act to expand trade, remove tariff and non-tariff barriers and protect intellectual property rights. The United States needs to demonstrate leadership at the United Nations (UN) conference in Copenhagen on climate change by committing to reduce greenhouse gases. We should seek an agreement that all major greenhouse gas-emitting countries agree to targets to limit emissions and confirm that the United States will provide technical and financial support to developing countries so they may achieve their aims of economic growth with cleaner technologies.

Clarify policies and inform the public. Here in America, we need to clarify and coordinate policies across federal agencies and take a systems approach to policy and funding decisions. The American public must be better educated on energy and environmental issues and technologies, and the consequences of policy choices.

Drive: Private Sector Demand for Sustainable Energy Solutions builds upon the six pillars of the energy system described in *Prioritize* (summarized in Figure A). This report details specific actions with assigned responsibilities under each overall recommendation.

Reward Efficiency. Efficiency is the cleanest, cheapest and most abundant energy “resource” available. Electric utilities are uniquely positioned

to promote energy efficiency because they touch virtually every consumer and business in the United States. We must make sure that regulation gives utilities the right incentives to promote efficiency and that they can profit from helping their customers reduce their energy bills. Appliance standards should be set to match the best current appliance, and corporate average fuel economy (CAFE) standards for cars should be increased over time to 100 miles per gallon (mpg) by 2030. States which are most effective in reducing vehicle miles traveled per person should get additional funding from the federal government. And consumers of all types should be provided information and tax incentives to purchase the most efficient vehicles, equipment, appliances and homes.

Use It All and Price It Right. The future will likely include all the fuels we use now, although some in different forms. We must use coal-fired electricity generated with carbon capture and sequestration technologies, advanced nuclear power, natural gas and oil as well as renewables like biofuels, wind and solar power. A roadmap to rationalize state and federal siting, permitting and planning processes for critical energy infrastructure must be developed, as well as expediting nuclear approvals and commissioning and resolving the disposal of nuclear waste must be developed. A low carbon standard, including requiring a percentage of electricity generation be from renewable sources coupled with assuring equal access to the grid for all renewables, must be adopted. A clear legal and regulatory structure for the storage of carbon emissions, including appropriate long term responsibilities and liability caps, must be established.

Figure A:

<i>Prioritize Pillar</i>	<i>Drive Recommendation</i>
1. Setting the Global Bar for Energy Efficiency	Reward Efficiency
2. Assuring Access to Clean and Competitive Energy	Use It All and Price It Right
3. Jumpstarting Energy Infrastructure and Manufacturing Investments	Capitalize Growth and Make It Here
4. National Transmission Superhighway and Smart Grid	Build It Fast and Smart
5. Spawning Technological Breakthroughs and Entrepreneurship	Discover the Future and Break the Technology Barriers
6. Mobilizing a World-Class Energy Workforce	Bridge the Skills Gap and Train the Talent

Energy prices should include the costs that are not currently reflected in their prices such as the impact of oil imports to our national security and trade deficit and the impacts of carbon emissions on the climate. A gasoline price floor should be established with a gasoline tax indexed to CAFE standards and inflation, and a price on carbon emissions should be set as we seek an international agreement in which all major emitters, including developing countries, agree to emission targets.

Capitalize Growth and Make It Here. The magnitude of investment needed to achieve energy system transformation is immense. Access to patient capital is essential if investors are to move forward on large-scale, long-term infrastructure projects. The financial risks associated with capitalizing large scale, high risk projects need to be addressed through a comprehensive suite of policies including lowering corporate tax rates from 35 to 25 percent and limiting liability damages for clean energy technologies. Individual investors should be encouraged to

invest in the clean energy future through tax-exempt CompeteAmerica savings bonds. To ensure that the technologies of tomorrow will be manufactured in the United States, a steady stream of financing support should be provided, including 40 percent of the revenues derived from any future carbon pricing program. Supported programs should include: federal, state or local clean manufacturing initiatives; the creation of clean energy development zones; financial assistance for the first two to three commercial manufacturing facilities for energy technologies; the expensing of the costs of retooling for production of qualified products, equipment or energy options; operating Regional Manufacturing Centers to promote advanced manufacturing technology; and dedicating a high performance computing (HPC) center for clean energy manufacturing.

Build It Fast and Smart. The transmission system is the backbone of the electric system. As we move to an energy system with more renewable and other advanced technologies such as plug-in hybrids, we

need to ensure that power may move easily and with minimum losses from where and when it is produced to where it is consumed. We need to set national criteria for transmission siting, have the costs for new transmission lines recovered regionally and set national standards so the devices that enable advanced energy management are secure and capable of being used on any smart grid.

Discover the Future and Break the Technology

Barriers. America's technological leadership was built on a strong commitment to scientific discovery and collaboration across the triad of the nation's research community: universities, industry and national laboratories. That commitment waned in the last few decades of the 20th century as federal R&D investment experienced starts and stops. To ensure continued U.S. leadership we need to guarantee a long-term, stable source of funding. In the future, 30 percent of any revenue from carbon pricing should be allocated to R&D, including the demonstration of technologies. Three technologies—energy storage including batteries, carbon capture and storage and advanced nuclear reactors—are enabling technologies that are critical to develop if we are to fully exploit our renewable, coal and nuclear resources. Several demonstrations at commercial scale of each technology should be fast tracked with set dates for timely completion.

Bridge the Skills Gap and Train the Talent.

Education is critical to develop the skilled workforce that will be required in the transformed energy system. DOE should establish a permanent early career research program. Twenty percent of any revenue from carbon pricing should be allocated to programs such as state and regional workforce training initiatives, funds to provide financial aid to American students pursuing education in career paths for energy disciplines and a national youth energy corps. Immigration laws should be modified

so that foreign students graduating from U.S. higher education institutions with a specialty in sustainable energy-related disciplines may receive a United States Permanent Resident Card (i.e. green card). Tax incentives should be given to businesses which provide mentoring, internships and on the job training for new entrants into clean energy careers. The entire continuum of America's educational system—from community colleges and technical schools to our most preeminent research institutions—must be actively engaged in the mobilization of a world class energy workforce. Job and career training programs should be supported that position state entities, including Workforce Investment Boards, as the galvanizing force behind local coalitions including industry, educational institutions, government and labor.

Drive sets forth, in its comprehensive roadmap, specific recommendations that we believe if implemented will achieve the trifecta of simultaneously promoting America's economic competitiveness, enhancing our national security and improving the global environment. The payoff will be huge. Now is the time for action. Delay puts us at unacceptable risk to realizing these goals. Harnessing the power of America—its businesses of all sizes, its academic and laboratory excellence and its talented workforce—is the most effective way to seize this opportunity and achieve results.

Summary of Recommendations

Create the Foundation for Success

Global Prerequisites

Recommendation: Expand Trade and Global Growth

- *Remove tariffs and non-tariff barriers for sustainable energy products and services while not creating a dual track for preferential trade liberalization.* The World Trade Organization should re-launch the Doha Round of trade talks with the leadership of the Group of Twenty (G-20) Finance Ministers and Central Bank Governors to ensure that tariff reductions and removal of non-tariff barriers are transparent, reciprocal and provide access to all national markets, where strong worker and consumer protections are provided.
- *Assure intellectual property rights (IPR) for all industrial products and services, copyrights and sustainable energy solutions.* The Secretary of State should coordinate with the U.S. Trade Representative to obtain strong IPR protection for all international R&D cooperative programs and technology transfer agreements for sustainable energy and carbon mitigation.

Recommendation: Take the Lead in Copenhagen

- *Commit to reduce U.S. emissions on a set timetable.* The President should demonstrate leadership by agreeing to reduce U.S. emissions on a set timetable in the process of creating an effective successor agreement to the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC).
- *Promote reduction targets for all major emitters.* The President should seek an agreement that all major greenhouse gas emitters, not just industrialized nations, are subject to emissions targets and that developing countries agree to actions to limit their emission growth.

Recommendation: Collaborate with Developing Nations in Reducing Emissions

- *Provide financial and technical support.* The President should agree to provide financial and technical support to those developing nations that agree to targets to limit their growth in emissions. This support should be provided to foster economic development, access to sustainable energy and carbon mitigation in the developing world.

American Prerequisites

Recommendation: Clarify Policies and Inform the Public

- *Clarify and coordinate energy and environmental policies across federal agencies.* The President should establish a sub-cabinet level joint task force of the National Security Council, National Economic Council and Council on Environmental Quality to integrate energy security and sustainability-related policies and programs across the executive branch.
- *Take a “systems approach” to policy and funding decisions.* Congress and the Administration should assess the appropriate timeframe, sequence of and interdependence between energy-related policies and public investments.
- *Increase America’s energy knowledge.* The Secretary of Education, in coordination with the Secretary of Energy, should issue guidelines for integrating energy-related curriculum at all education levels, from grade school through post-graduate education tracks—including vocational schools.
- *Disclose energy and carbon data for buildings and products.* Congress should require that by 2015 there is full disclosure of energy use and carbon impacts to consumers prior to their purchase of products, homes or buildings.

Setting the Global Bar for Energy Efficiency

Recommendation: Reward Efficiency

- *Provide tax credits and federal financing for home efficiency improvements.* Congress should expand and extend long-term tax credits for qualified energy-efficient home improvements and the availability and funding for federally-backed financing programs that lower the cost of energy efficiency upgrades to residential, commercial and industrial property.
- *Provide tax credits to accelerate the turnover to advanced technology vehicles.* Congress should extend tax credits for the purchase of hybrids or other advanced technology vehicles that represent significant advances over current corporate average fuel economy (CAFE) standards or other regulatory requirements.
- *Make a step change in vehicle efficiency standards and vehicle miles traveled.* Congress should set the 2030 CAFE standard to 100 mpg and provide more federal transportation funding to states that are the most effective in reducing vehicle miles traveled per person.

- *Peg appliance standards to best-in-class.* Congress should require that future efficiency standards on appliances are set to current best-in-class products and are updated at regular intervals of at least every seven years.
- *Allow utilities to profit from energy efficiency so customers receive incentives.* All states should decouple utility rates from gross energy sales and focus on providing utilities with a reasonable rate of return on all their investments—including consumer energy-efficiency programs and emissions-reducing R&D investments.

Assuring Access to Clean and Competitive Energy

Recommendation: Use It All and Price It Right

- *Rationalize federal and state regulatory policies.* The National Governors Association (NGA) should develop by 2012—in conjunction with the U.S. Departments of Energy (DOE), the Interior (DOI) and Agriculture (USDA) and the Environmental Protection Agency (EPA)—a roadmap to rationalize state and federal siting, permitting and planning processes for critical energy infrastructure.
- *Drive diversification to low-carbon energy sources.* Congress should establish a national, low-carbon energy standard for electric utilities that encompass a minimum of 25 percent renewables by 2025 to promote the development of low-carbon energy from wind, solar, geothermal, biomass and nuclear power, clean coal and natural gas, while ensuring the retention of U.S. manufacturing and jobs.
- *Assure renewables access to the grid.* DOE should ensure that utility-grade solar, wind, geothermal and biomass power generation facilities are provided access to the grid on a non-discriminatory basis, as has been the case with utility-scale hydropower.
- *Expedite nuclear power plant approvals and re-commissioning.* The Nuclear Regulatory Commission (NRC) should set appropriate review schedules for permitting of new nuclear construction.
- *Eliminate regulatory uncertainty for nuclear waste.* The President should create a commission to examine and make recommendations for new alternatives for dispensing of proliferation-resistant spent nuclear fuel from existing reactor sites, including potential storage alternatives.
- *Expedite construction of carbon capture and storage facilities.* Congress should designate the Federal Energy Regulatory Commission (FERC) as the agency responsible for the authority to approve, in consultation with DOE, applications for the long-term geological storage of carbon emissions and enact legislation that establishes a clear legal and regulatory structure for the storage of these emissions, including appropriate liability caps, long term responsibilities, short-term exemptions and safe harbor provisions.

- *Establish a price floor for gasoline.* Congress should establish a price floor for gasoline that is sufficient to accelerate demand for fuel-efficient vehicles and provide incentives for R&D and private sector investment in alternative fuels.
- *Link the gasoline tax to CAFE standards.* Congress should link any federal gasoline tax to the CAFE standard and direct its usage to transportation-related energy efficiency and R&D.
- *Price carbon emissions.* Congress should enact legislation that will result in the establishment of a consistent, predictable and transparent price on carbon emissions in conjunction with the President obtaining commitments from all developed and developing countries at international negotiations to limit their current and future emissions growth.

Jumpstarting Energy Infrastructure and Manufacturing Investments

Recommendation: Capitalize Growth and Make It Here

- *Reduce the corporate tax rate.* Congress should cap the federal corporate tax rate at 25 percent for all businesses regardless of size, make the R&D tax credit permanent and establish accelerated depreciation treatment for all capital investments.
- *Generate a revenue pool for infrastructure financing.* Congress should establish a CompeteAmerica savings bond to allow individual investors to purchase tax-exempt, federally guaranteed bonds, the proceeds of which would be invested in the building of America's next generation of clean energy infrastructure and manufacturing.
- *Enable high-risk, high-return energy projects.* Congress should authorize adequate funding to ensure a National Clean Energy Bank can provide insurance and other needed risk management or credit enhancements such as loan guarantees for the construction or utilization of sustainable energy resources or facilities, such as geological storage projects for carbon emissions and renewable purchase power agreements.
- *Invest in nuclear industry expansion.* Congress and the Administration should devote more resources to activities including long-term waste storage, R&D and deployment activities related to proliferation-resistant spent fuel re-cycling and interim storage technologies, improvements to reactor design and the financing of new nuclear power plants.
- *Provide a steady stream of manufacturing and job creation financing.* In addition to its current funding, Congress should allocate 40 percent of the annual revenue generated from carbon pricing to federal, state and regional clean energy manufacturing initiatives.

- *Designate Clean Energy Technology Manufacturing Development Zones.* Congress should establish and fund a program to allow states to establish clean energy economic development zones by offering incentives such as waivers of corporate and employment taxes, worker training assistance, regulatory simplification and interest-free, long-term debt financing guarantees and liability insurance.
- *Establish Clean Energy Manufacturing Centers of Excellence.* Congress should expand the 21st Century Energy Leadership Initiative to encompass dedicated funding for the operation of fifteen federally-sponsored regional manufacturing centers to drive advanced manufacturing technology and best practices through the clean energy supply chain, leveraging the National Institute of Standards and Technology's (NIST) Manufacturing Extension Partnership program.
- *Provide federal financial investment in initial manufacturing facilities for clean energy technologies.* The U.S. government should coordinate and leverage all available instruments such as loan guarantees, grants or other financing vehicles available from any federal agency or state program, including the DOE, DOI, USDA and the U.S. Export-Import Bank, to facilitate construction of the first two to three manufacturing plants for any new or significantly improved sustainable energy technology.
- *Incentivize production retooling and efficiency for clean energy technology production.* Congress should allow manufacturers to fully expense the retooling of production lines to produce qualified energy-efficient products or qualified sustainable energy options.
- *Enhance industrial access to HPC resources.* Put the power of high performance computing (HPC) into the hands of American producers, innovators and entrepreneurs by expanding access to U.S. facilities and expertise in this critical field. Through the utilization of powerful HPC tools like modeling and simulation, the U.S. can lower the cost of innovation, develop high value products and services impossible without HPC and jumpstart U.S. manufacturing.

Clearing Obstacles to a National Transmission Superhighway and Smart Grid

Recommendation: Build It Fast and Smart

- *Set national criteria for transmission siting.* Congress should create independent regional planning authorities overseen by FERC, with FERC issuing standards for transmission siting and having the final determination and approval for siting, while retaining and strengthening current consumer and worker protections.
- *Recover transmission costs on a regional basis.* FERC should require regional planning authorities to allocate costs to construct and upgrade transmission regionally, spreading costs across all jurisdictions served by the new lines.

- *Develop standards for device interoperability and security.* FERC should develop standards so that energy management devices can be operated on any smart grid and so that the grid architecture will be adaptive and secure.

Spawning Technological Breakthroughs and Entrepreneurship

Recommendation: Discover the Future and Break the Technology Barriers

- *Provide a steady, robust stream of R&D funding.* In addition to current funding, allocate 30 percent of the annual revenue generated from carbon pricing to turbo-charge R&D energy investment in technologies and to demonstrate new technological solutions within the national laboratories, research universities and industry.
- *Launch clean energy research consortia for enabling energy technologies.* The director of the White House Office of Science and Technology Policy (OSTP) should lead and coordinate across all government departments and agencies the establishment of cross-sector consortia with industry, academic and national laboratory partners to solve critical technical challenges in energy storage, including batteries and fuel cells, carbon capture and storage and proliferation-resistant nuclear waste re-cycling and spent fuel disposal.
- *Fast-track technology demonstrations and pilots for CCS and energy storage.* Congress should support ten commercial-scale carbon capture demonstrations to be completed by 2020 by expanding the DOE regional partnership network and three to five at-scale demonstrations of energy storage technologies. Industry and universities should be strategic partners and investors in these pilots, with proper allocation of intellectual property rights (IPR).
- *Fast-track demonstrations of new nuclear reactors.* Congress should support the timely completion of three to five demonstrations of new designs of commercial-scale nuclear reactors that include passive safety features and other new design components, including consideration of closed loop fuel cycles and other means of proliferation-resistant nuclear waste re-cycling and spent fuel disposal.

Mobilizing a World-Class Energy Workforce

Recommendation: Bridge the Skills Gap and Build the Talent

- *Boost funding for workforce training in clean technology.* Congress should allocate 20 percent of the annual future revenue generated from carbon pricing to fund state and regional workforce training initiatives in clean technologies and related middle skills and direct the U.S. Department of Labor (DOL) and workforce boards to coordinate and accelerate their investments.

- *Develop and nurture world-class energy researchers and educators.* DOE should establish a permanent early career research program to support top emerging energy scientists and engineers at U.S. academic research institutions and DOE national laboratories.
- *Provide full scholarships for energy-related education.* The Departments of Energy and Defense and the National Science Foundation should allocate one percent of their R&D budgets to offer full scholarships to American students who successfully complete accredited undergraduate and graduate studies in energy-related disciplines and commit to a minimum period of service in an energy-related career.
- *Make worker training benefits portable.* Congress should establish a program that will allow eligible participants to secure a CompetePass through DOL's one-stop training centers that will be redeemable at certified employer, academic or labor-sponsored training programs that meet industry-driven skills requirements in current and future high growth job sectors, including clean energy.
- *Harness global talent by amending U.S. immigration laws.* To help fill the talent pipeline, the United States should grant green cards to foreign students receiving undergraduate and advanced degrees in scientific and engineering disciplines from U.S. institutions.
- *Cultivate youth interest in clean energy and environmentally-sound industry.* Government, industry and education coalitions should encourage and support high-school students to participate in sustainable energy projects; educate students on energy issues (i.e. use, production, conservation and impact on economy); and orient high school graduates towards work in energy-related fields.
- *Give private industry a stake in creating a pipeline of workers.* Provide federal, state and local tax incentives to U.S. companies offering mentoring, internships and on the job training for new entrants into clean energy careers.
- *Bridge funding gaps for community colleges.* Maximize community college potential to create pathways for rewarding jobs and higher pay by financially supporting surging interest in their programs.
- *Galvanize local coalitions.* Fund job and career training programs that position state entities, including Workforce Investment Boards, as the galvanizing force behind local coalitions including industry, educational institutions, state and local government and labor.

Introduction

Energy is at the center of every issue that matters most to Americans—whether it is our long-term economic competitiveness, national security or the environment. The leaders of the Energy Security, Innovation & Sustainability (ESIS) Initiative at the Council on Competitiveness believe that manufacturing and service companies of all sizes, academia, national laboratories and our national workforce will play the central role in meeting these challenges at scale.

As an organization comprised of business, academic and labor leaders, the Council is made up of the very people who will play the central role in meeting America's energy challenges—and that is how we know that if anyone can meet these challenges, it is us. That is why the government must set policies that unleash America's unique capacity to innovate, create and invest.

The goal of the ESIS Initiative is to create a roadmap for game-changing actions that enable American businesses to innovate and bring about energy systems transformation. The rewards for America and all our citizens will be great—the creation and global market success of new and existing industries, business innovation across all sectors and the growth of 21st century manufacturing and high value jobs all while improving our national security and the environment.

The ESIS Initiative has provided a remarkable journey of discovery, engagement and action. The members of the Steering Committee, supported by their advisors and Council staff, created a unique, new network of diverse and committed leaders to identify the critical challenges and create high-leverage solutions for America's energy and competitive future. With wisdom, insight, trust and creativity, these leaders asked the tough “what if?” questions and

“While producing and using energy in a sustainable manner represents the seminal challenge of our generation, the transition to a new energy framework also represents tremendous economic prospects. The opportunities in our energy future present Americans the chance to do what we do best—lead. Leadership is essential in energy, and I am pleased the Council on Competitiveness is once again guiding the nation on a critical issue to our economic future. Given the serious complexities surrounding the path forward to achieve economic and energy security, we will not be able to forge consensus on every issue; however, the stakes are too high for our nation to not press ahead.”

Charles O. Holliday, Jr.

Chairman, DuPont, and Chairman, Council on Competitiveness, at the ESIS Initiative Steering Committee meeting, November 2008.

brought a complex systems-level approach to framing the problems and shaping the solutions. While there has not always been unanimity of views or policy consensus for all the issues explored, the ESIS Initiative members shared their business imperatives, experiences, successes and failures to create this roadmap and chart a new path forward.

The Initiative began with the launch of the Progressive Dialogue Series—three consecutive sessions engaging a diversity of high-level experts to examine the energy security and sustainability nexus from multiple angles. Dialogue I explored the energy-competitiveness relationship at the international, national, industry and workforce levels. Dialogue II documented the factors influencing energy-related decision

making and investments from the energy “users” perspective. Dialogue III examined these same issues from the perspective of energy suppliers. The Council is enormously grateful to the U.S. Department of Energy’s (DOE) Office of Energy Efficiency & Renewable Energy (EERE) for not only supporting the dialogues, but for their active participation and manifold contributions.

The Progressive Dialogue Series laid the foundation for the release, on September 9, 2008, at the National Press Club, of the Council’s recommendations to the next president. In a keynote speech, Council vice chairman and co-chair of the ESIS Initiative, Shirley Ann Jackson presented *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*. Well in advance of the 2008 election, *Prioritize* identified six pillars critical to energy system transformation and exhorted our next President to lead the way to our nation’s energy future.

In the year that has followed, much has changed. The prices of oil, natural resources, industrial commodities and even some global food supplies have skyrocketed, crashed and risen again. Private investment for expansion in manufacturing capacity, inventory and sustainable energy technology has ebbed from historic highs as access to credit markets and risk capital shriveled in the face of a worldwide financial crisis. These stark economic realities have been further exacerbated by the collapse of global trade talks, growing protectionism and the rise of tariff and non-tariff barriers to U.S. industrial products and services. In short, robust economic growth has been replaced by a painful, global recession.

In the United States, we have witnessed some of the highest levels of unemployment, housing foreclosures and bank failures since the Great Depression

“It is clear that achieving a sustainable global and national energy framework capable of meeting the energy needs of our citizens without causing irreparable environmental damage will require the right policy framework from a legal, regulatory and tax perspective at both the state and federal levels, but particularly coherence at the federal level. It will require continuing technological advances that can help modify current production and uses of energy. It is a given that at least in the long term, there will be no one single solution to providing abundant, clean and reasonably-priced energy. It will require a portfolio-based approach.”

Shirley Ann Jackson

President, Rensselaer Polytechnic Institute, and Co-Chair, ESIS Initiative, at the inaugural ESIS Initiative Steering Committee meeting, July 2007.

of the 1930’s. We have seen bankruptcies in the iconic American auto industry, contributing to growing economic distress of communities across the country. Tackling big national problems and needs from aging infrastructure and health care to clean energy and climate change have become focal points for the political agenda and economic recovery plans of both the president and Congress.

The clean energy agenda has moved to center stage with funding for research and development (R&D), building domestic manufacturing and supply chain capacity, training a high skilled workforce and efforts to establish a price for carbon emissions all receiving attention. The U.S. House of Representatives has passed legislation to cap domestic greenhouse gas (GHG) emissions, and hearings are being held in the

Senate. The world community is meeting in Copenhagen this December to try to shape an international agreement to limit GHG emissions while ensuring economic growth, and the Council believes that enhancing energy security should also be part of the negotiation calculus at this pivotal forum.

Throughout this time of domestic and global turmoil and turbulence, a new duality has emerged. A rapidly growing global population is demanding more energy to improve their standard of living and develop. At the same time, this demand is coupled with the global imperative to mitigate climate change and ensure greater energy security for all nations.

Together these new realities are reshaping the global competitiveness landscape, and they will determine the future prosperity and security of nations and their citizens. The United States must enter the game with leadership from our government and the prowess of our private sector. We must field a high performing team to compete and collaborate as we play for skilled jobs, manufacturing, future industries and innovation leadership.

On the heels of the release of *Prioritize*, the leaders of the ESIS Initiative joined forces to carry their findings and recommendations across the nation and to learn first-hand the regional challenges and priorities driving energy-related investment and action across America. They tapped into the talent and expertise of an ever-expanding network of CEOs, university presidents, national laboratory directors and labor leaders who are forging new coalitions and partnerships across the nation. The Council consulted with our members and expert advisors and conducted a series of four regional energy summits designed to cull new perspectives and ideas from people with hands-on experience across the energy landscape.

"We need to make sure that energy jobs are good jobs. We cannot cut corners when it comes to training the workforce that will tackle the challenges of the future. Encouraging innovation, investing in our workforce, providing consumers with broader choices, will give us the tools to help move America toward real energy security and economic competitiveness in the 21st century."

D. Michael Langford

National President, Utility Workers Union of America, AFL-CIO, and Co-Chair, ESIS Initiative, at the inaugural ESIS Initiative Steering Committee meeting in Washington, D.C., July 2007.

We launched this Regional Energy Summit Series in February with a Southern Energy Summit in Houston, Texas. This daylong event—hosted by Clarence P. Cazalot Jr., the CEO of Marathon Oil Corporation and held in collaboration with Daniel Yergin, Chairman of IHS CERA, during **CERAWeek 2009**—focused on the need for energy diversification and the future of the oil and natural gas industry in a carbon-constrained economy.

Our second summit took place at Rutgers University, The State University of New Jersey in April, with Rutgers' President Richard L. McCormick and the CEO of Public Service Enterprise Group (PSEG), Ralph Izzo, co-hosting the event, and New Jersey Governor Jon Corzine keynoting. This Eastern Energy Summit explored the challenges and opportuni-

ties for scaling up energy efficiency efforts and the lessons that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

In May we convened our Midwest Energy Summit at Argonne National Laboratory, which was co-hosted by Eric Isaacs, director of Argonne National Laboratory; James W. Owens, chairman and CEO of Caterpillar Inc.; and Robert J. Zimmer, president of the University of Chicago. This event focused on the economics of reducing carbon emissions in the electricity industry and the need for strategic investments in energy and transportation infrastructure.

In July we concluded the series with our Western Energy Summit at the NASA Ames Research Center in Silicon Valley, co-hosted by S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George L. Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas R. Baruch, founder and managing director of CMEA Capital. This event explored the lessons that could be gleaned from California's success as a front-runner in sustainable energy solutions and sought to discover ways to improve the energy technology innovation system all along the R&D and deployment continuum.

All these efforts have contributed to the development of the comprehensive energy action agenda presented in this document.

"Without a plentiful and affordable supply of energy in the future, the United States will lose current and future jobs, entire industries and see the further erosion of U.S. innovation capacity and our manufacturing base. Prices for goods and services will go up, our ability to create wealth will decline and our very way of life may be threatened. If we allow this to happen, we will lose both the investment and the technological capacity we need for new energy solutions, goods and services. This is why we must establish an energy policy focused on expanding domestic production and making all energy sources more available, while employing efficiency and technology to protect the environment."

James W. Owens

Chairman and CEO, Caterpillar Inc.; and Co-Chair, ESIS Initiative, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

The Council is honored to present this groundbreaking effort to address the grand challenge of this generation. The issues are complex and difficult decisions must be made. Forward progress will not be easy and consensus will not be achieved easily—but it must be done.

Create the Foundation for Success

There are several conditions or prerequisites that must be met to be successful in developing and deploying large-scale sustainable energy solutions worldwide. Meeting these conditions—on both the international and domestic fronts—lays the foundation for success in achieving a sustainable and secure energy future. Meeting the prerequisites is also necessary to achieve competitive success.

Global Prerequisites

All nations share a responsibility to promote sustainable economic growth and expand global prosperity and improve the quality of life, economic opportunity and security for their citizens. Energy is fundamental to the achievement of these objectives. All people of the world share a responsibility to serve as custodians of the planet; the challenges of energy security, sustainability and climate change cannot be met independently.

Global demand for energy is projected to increase with economic growth. Nations around the world are striving to enhance their energy security and manage their carbon emissions. The shift to a low-carbon economy has the potential to drive the next generation of technological innovation and sustainable development. Talent, capital and innovation are essential to the development and wide-scale deployment of sustainable technologies.

The major challenge for all nations is to achieve the optimal balance between the imperative for energy security and economic development, to provide food, health, education, jobs and prosperity for their citizens, while assuming shared responsibility for environmental stewardship and climate mitigation.

The big hurdle for developing nations is to what extent they will participate in global commitments to

“Energy consumption is rising exponentially—driven by population growth, swiftly developing economies, improving global living standards and the burgeoning use of ever more energy-dependent technologies. It is not difficult to cite jaw-dropping illustrations of growth in energy consumption: e.g., each year, for the past few years, China has added 60,000 to 90,000 megawatts of electrical generating capacity—roughly the equivalent of the throughput of the entire electrical grid of England. Consumption of nearly every major energy source is up markedly. If current trends continue, humans will use more energy, over the next 50 years, than in all of previously recorded history.

Shirley Ann Jackson

President, Rensselaer Polytechnic Institute, and Co-Chair, ESIS Initiative, at the public release of *Prioritize* at the National Press Club, September 2008.

limit their GHG emissions, deforestation and non-sustainable agricultural production. The big hurdle for developed nations is to what extent they will agree to set GHG emission levels that could damage their domestic manufacturing, increase job loss and drive innovation and technology development to noncompliant, polluting nations. Residing between these two challenges is the extent to which technical and financial assistance will flow to developing economies, allowing them to meet their commitments.

While these challenges impact individual nations, their resolution is global in scope and impact and will require consensus and cooperation. It requires all nations to be at the table and to take measurable actions.

This dual challenge is particularly daunting for developing countries who must deliver growth to meet the needs of their growing populations, but who are constrained by limited financial resources, infrastructure, lack of skilled talent, research institutions and social and gender inequality issues. However, the economic development opportunity is great, for the technologies that will enable all nations to have a secure and sustainable energy system will also enable each to spur its own competitiveness.

Markets for technology development, production and deployment are increasingly worldwide. Reducing the barriers to trade and investment, protecting intellectual property and deploying new technologies and services is in all nations' interest as we transition to a sustainable, secure and competitive energy system. The following are enabling conditions that will accelerate this global transition and ensure that all nations share in its opportunities and economic and social benefits.

Recommendation: Expand Trade and Global Growth

- **Remove tariffs and non-tariff barriers for sustainable energy products and services while not creating a dual track for preferential trade liberalization.** The World Trade Organization should re-launch the Doha Round of trade talks with the leadership of the Group of Twenty (G-20) Finance Ministers and Central Bank Governors to ensure that tariff reductions and removal of non-tariff barriers are transparent, reciprocal and provide access to all national markets, where strong worker and consumer protections are provided.
- **Assure intellectual property rights (IPR) for all industrial products and services, copyrights and sustainable energy solutions.** The Secretary of State should coordinate with the U.S. Trade Representative to obtain strong IPR protection for all international R&D cooperative programs and technology transfer agreements for sustainable energy and carbon mitigation.

"The first thing the United States should do is to stop being a bad example. As the richest country in the world, we ought to start addressing the problem in a moderate and constructive way. I do not believe we can be hypocritical in negotiating with China or India or with the Africa nations. I am not in favor of open-ended subsidies to any of those countries, but neither would I be smug. After all, what they are demanding is the right to do what we have already done."

John W. Rowe, Chairman

President and CEO, Exelon Corporation, at the Midwest Energy Summit at Argonne National Laboratory, May 2009.

Recommendation: Take the Lead in Copenhagen

- **Commit to reduce U.S. emissions on a set timetable.** The President should demonstrate leadership by agreeing to reduce U.S. emissions on a set timetable in the process of creating an effective successor agreement to the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC).
- **Promote reduction targets for all major emitters.** The President should seek an agreement that all major greenhouse gas emitters, not just industrialized nations, are subject to emissions targets and that developing countries agree to actions to limit their emission growth.

Recommendation: Collaborate with Developing Nations in Reducing Emissions

- **Provide financial and technical support.** The President should agree to provide financial and technical support to those developing nations that agree to targets to limit their growth in emissions. This support should be provided to foster economic development, access to sustainable energy and carbon mitigation in the developing world.

Figure 1: Global Energy Demand is Projected to Increase by 44 Percent by 2030

Source: Energy Information Administration

Note: 2030 international energy consumption is projected to be 678 quadrillion BTU, a 44 percent increase over 2006 levels of 472 quadrillion BTU. Non-OECD countries are expected to contribute to 83 percent of this growth.

"We ought to make all the relevant goods and services—energy, pollution prevention, environmental clean-up, energy efficiency technologies—duty- and tariff-free to create really robust global trade. The G-20 economies have more than 90 percent of the world markets in all of these areas. We should open trade and let it flourish. That would probably be the best single thing we could do both for the environment and the economy."

Frederick W. Smith

Chairman and CEO, FedEx Corporation, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., November 2008.

American Prerequisites

Because the energy system is so complex, and because energy sources are so diverse, responsibility and oversight for energy is often confusing and even inconsistent. Jurisdictional responsibility is often split among many federal agencies, and at times with state agencies as well. What's needed is a common-sense, clear system of jurisdictional responsibility. This will not only lead to a more affordable, predictable energy future, it will also help us achieve that future faster. By bypassing bureaucratic roadblocks, we can pave the way for smarter, faster solutions.

Transitioning to a low carbon, sustainable, secure, competitive energy economy will not happen overnight—which is why we must start immediately. However, we should recognize that policies and actions need to occur in the right order. Acting either too quickly or too slowly imposes needless costs on the economy. An understanding of the implications of policy options will allow us to avoid unintended consequences down the road.

Moreover, all tax and other financial incentives should be provided for a limited amount of time, taking into account market developments, the market share of the different products, and the costs entailed to the purchaser, manufacturer and the Treasury. There should be clear specifications as to which products are “eligible” for any financial incentive.

If the American public is informed, aware and educated about its energy choices and their relationship to climate change, we can reach solutions that Americans comprehend and wholeheartedly support.

“What is lacking is coordination [on energy] at the national level. You have every agency doing something very different—different models, different things—without a whole lot of coordination. This is certainly something that needs a lot of attention.”

Dan E. Arvizu

Director, National Renewable Energy Laboratory, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

Recommendation: Clarify Policies and Inform the Public

- **Clarify and coordinate energy and environmental policies across federal agencies.** The President should establish a sub-cabinet level joint task force of the National Security Council, National Economic Council and Council on Environmental Quality to integrate energy security and sustainability-related policies and programs across the executive branch.
- **Take a “systems approach” to policy and funding decisions.** Congress and the Administration should assess the appropriate timeframe, sequence of and interdependence between energy-related policies and public investments.

“The energy challenge is an exceedingly complex one. It is not going to be solved by technology alone, by policy alone or by changes in the social and cultural environment. The solution will require the integration of all of these approaches.”

Robert J. Zimmer

President, The University of Chicago, at the Midwest Energy Summit at Argonne National Laboratory, May 2009.

- **Increase America's energy knowledge.** The Secretary of Education, in coordination with the Secretary of Energy, should issue guidelines for integrating energy-related curriculum at all education levels, from grade school through post-graduate education tracks—including vocational schools.
- **Disclose energy and carbon data for buildings and products.** Congress should require that by 2015 there is full disclosure of energy use and carbon impacts to consumers prior to their purchase of products, homes or buildings.

Reinforce the Six Pillars Critical to Energy System Transformation

The Council on Competitiveness identified six critical “pillars” as integral to U.S. energy system transformation in *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*, issued in September 2008. In many respects, these pillars are interdependent. Progress in one area cannot be achieved without progress in one or more of the other areas.

Over the past year, Congress and the new Administration have made considerable efforts to reinforce and strengthen these pillars; progress has been made. Nonetheless, the Council believes that additional critical actions in each of these six areas are necessary if true breakthroughs in U.S. performance are to be achieved.

Pillar 1: Setting the Global Bar for Energy Efficiency

Energy efficiency is the cleanest, cheapest and most abundant energy resource available to the United States. Fully exploiting it will promote multiple objectives—from increasing our energy security to enhancing our competitiveness and promoting a cleaner environment.

- Investments in energy efficiency today can support an orderly energy system transition period over the next half-century. Accelerating broad deployment of existing energy-efficient technologies and practices will buy time to develop and deploy the transformative energy technologies of the future, while helping reduce carbon emissions.¹
- Investment in energy efficiency will also relieve pressure on production capacity, which is under increasing stress in the transportation fuel and power generation sectors.

- Improvements in energy efficiency lower or stabilize energy expenses, freeing up precious investment capital for other uses.²
- While efficiency investments require initial capital outlays, they will provide a very attractive return over the life of the investment. It is estimated that energy savings of \$1.2 trillion dollars could be achieved through 2020 with the expenditure of \$520 billion on efficiency in all sectors on efficiency. This would reduce end use energy consumption roughly 23 percent from projected demand.³
- Energy efficiency represents a very large and growing global market, and this market already supports numerous American jobs.⁴ (See Figure 2.)

Despite the many benefits increased energy efficiency can offer, the United States has failed to fully realize them and ranks behind many of its economic competitors in terms of energy productivity, meaning the economic value produced for every input of energy consumed. (See Figure 3.)

Market failures inhibit energy efficiency. Energy efficiency opportunities have not been pursued for many reasons—ranging from a lack of upfront investment capital and/or technical information to classic market barriers like landlord-tenant situations where the purchaser of the equipment may not pay the energy bills. This is not insignificant as residential and commercial buildings in the United States account for almost 48 percent of U.S energy consumption and approximately 76 percent of electricity use.⁵ There are some programs operating to provide incentives to consumers, such as mortgage programs which allow improvements to be financed as part of the mortgage when purchasing a home, but these

Figure 2: U.S. Energy Efficiency Investments Totaled an Estimated \$300 Billion in 2004

Source: American Council for an Energy-Efficient Economy

are not widely known or available.⁶ Failure to pursue efficiency opportunities imposes needless costs on the economy significantly harming our competitiveness as well as our security.

Incentives and regulation can address market failures. Market demand for energy efficiency can be “pulled” by increasing the financial incentive to invest. Demand can also be “pushed,” through the establishment of targets, standards and/or regulations that must be met as a pre-condition to participating in the marketplace or earning market share. For example, Japan uses a “top runner” approach to appliance standards and sets the new standard for an appliance to be at least that of the best domestic product available in the market.⁷ Plug-in hybrids will enable a 100 mpg CAFE standard to be achieved.

“Increased energy efficiency creates a more cost-efficient and competitive economy with improved energy security and reduced emissions. The United States is five percent of the global population, consuming on the order of twenty-five percent of the world’s energy. Closing this gap between our own energy supply capability and demand creates a big first step towards greater energy productivity—what we get from the energy we produce. There’s too much waste in the system today.”

James W. Owens

Chairman and CEO, Caterpillar Inc.; and Co-Chair, ESIS Initiative, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

Figure 3: The United States Trails Developed Nations in Energy Productivity

Source: Central Intelligence Agency; Energy Information Administration

What is energy productivity?

According to the U.S. Bureau of Labor Statistics, productivity is a measure of economic efficiency which shows how effectively economic inputs are converted into output. Advances in productivity, that is the ability to produce more with the same or less input, are a significant source of increased potential national income. Energy productivity is the ratio of production (or service) output in dollars to energy input. Energy productivity of the United States is expressed as GDP (\$)/unit of energy.

Under draft EPA regulations to calculate how to rate a plug-in hybrid, the Chevy Volt scheduled for production next year would be rated 230 mpg city driving and received a combined city/highway rating of over 100 mpg.⁸ By implementing transparent, coordinated and consistent measures, the government can drive market behavior and greater efficiency across the economy.

Utilities could be national change agents. Utilities are uniquely positioned to aid their customers in becoming more energy efficient, both by delivering energy efficiency services and technologies directly to customers and by helping customers acquire them through others. However, in many states, the regulation of utilities provides disincentives for the utility to do this because the utility's profits increase as they sell more energy to customers. Utilities that promote

efficiency in these states lose money. Many states have revised their regulations so that utilities have incentives to promote efficiency, but not all have done so. In states where well-crafted “decoupling” measures have been enacted, utility expenditures on energy efficiency programs have risen dramatically.

Recommendation: Reward Efficiency

- **Provide tax credits and federal financing for home efficiency improvements.** Congress should expand and extend long-term tax credits for qualified energy-efficient home improvements and the availability and funding for federally-backed financing programs that lower the cost of energy efficiency upgrades to residential, commercial and industrial property.
- **Provide tax credits to accelerate the turnover to advanced technology vehicles.** Congress should extend tax credits for the purchase of hybrids or other advanced technology vehicles that represent significant advances over current CAFE standards or other regulatory requirements.
- **Make a step change in vehicle efficiency standards and vehicle miles traveled.** Congress should set the 2030 CAFE standard to 100 miles per gallon (mpg) and provide more federal transportation funding to states that are the most effective in reducing vehicle miles traveled per person.
- **Peg appliance standards to best-in-class.** Congress should require that future efficiency standards on appliances are set to current best-in-class products and are updated at regular intervals of at least every seven years.
- **Allow utilities to profit from energy efficiency so customers receive incentives.** All states should decouple utility rates from gross energy sales and focus on providing utilities with a reasonable rate of return on all their investments—including consumer energy-efficiency programs and emissions-reducing R&D investments.

Figure 4: U.S. Per Capita Energy Consumption Is Highest Among Developed Economies

Source: Energy Information Administration

Primary energy consumption refers to the direct use at the source, or energy supplied to users without transformation (i.e. energy that has not been subjected to any conversion or transformation process).

"We are really missing the boat on efficiency. There is so much more we could do near-term without large investments in new technologies. The technologies are out there on the shelf. Their deployment simply needs to be encouraged and perhaps incentivized."

Clarence P. Cazalot Jr.

Chairman and CEO, Marathon Oil Corporation, at the Southern Energy Summit in Houston, TX, February 2009.

"Capital export is a daunting, seldom-discussed problem for the United States that is inherent in our conventional, petroleum-based economy. Capital export results in the loss of American jobs and greater foreign control of U.S. firms and real estate. Capital export must be considered in combination with other strategic factors, such as the instability of the Middle East and finite supplies of petroleum."

Lou Anna Simon

President, Michigan State University, at Progressive Dialogue I in Warrenton, VA, September 2007.

Pillar 2: Assuring Access to Clean and Competitive Energy

The basic proportions of U.S. energy supply have remained fairly stable for the last thirty years, with fossil fuels (coal, natural gas and petroleum) comprising more than 80 percent of total energy production and consumption and a combination of nuclear and renewables accounting for the remainder.⁹ Currently, the transportation sector is 94 percent dependent upon petroleum-based liquid fuel to operate. The electric power sector utilizes primarily coal, followed by nuclear and then renewables to operate.

The United States will depend on hydrocarbon-based energy for years to come. The U.S. energy system has been designed around and operates principally on the basis of hydrocarbon, or fossil, based fuels. The Energy Information Administration projects that, in a BAU case, coal, natural gas and petroleum will continue to supply 81 percent of our nation's energy needs in 2030. With over 23 percent of the world's coal reserves and significant natural gas reserves, it is imperative that we develop the technologies that allow America to fully utilize these national resources.

Diversification is essential for energy security. The nation needs to move to a much more balanced and diversified portfolio of resources, including oil, gas, coal, nuclear, hydro, wind, solar, biofuels, geothermal, laser fusion-fission and other advanced energy sources. The energy security and sustainability challenges are far too pervasive and complex to be transformed by a single technology, fuel or practice. All options must remain on the table and be exercised. In exercising these options, consideration must be given to the full life-cycle impact of the technology—from development to deployment and through retirement and reuse. There is a carbon footprint in all methods and sources of energy production, whether fossil, nuclear or renewable.

There are many other advantages to a diversified energy portfolio. A diversity of sources promotes competition and can lower prices. Restrictions on access to any particular energy source or limits on the ability to build any particular power generation facility will raise the overall price of energy to all consumers as supply options are reduced. Diversification of sources will also help ameliorate price volatility. In addition, it promotes security, as over-reliance on

Figure 5: The United States' Current Energy Reality: Growing Import Dependence and Higher Costs

Source: Energy Information Administration

Fast Facts

- The United States relies almost entirely upon liquid fuel for transportation and on electric power for a large portion of the rest of its energy use.
- The U.S. transportation sector, including fuel for cars, trucks and jets, is 94 percent reliant on petroleum for primary fuel consumption.¹⁰ The United States imports 56 percent of its petroleum.¹¹ Under a “business as usual” scenario, petroleum is projected to account for approximately 36 percent of the U.S. energy portfolio through 2030.¹²
- Coal currently accounts for 50 percent of the energy consumed in electric power production, and coal is projected to remain at 23 percent of total U.S. energy consumption in 2030, accounting for 49 percent of electric power.¹³
- Twenty-four percent of U.S. energy consumed in 2008 came from natural gas; this proportion is projected to be 22 percent of total energy in 2030.¹⁴ The Energy Information Administration projects that the largest source of U.S. natural gas supply to 2030 will be from unconventional production, such as gas from tight sand formations.¹⁵
- Nuclear power supplied 21 percent of U.S. electricity in 2008. Under a business-as-usual (BAU) scenario, nuclear will supply 18 percent of electricity by 2030, constituting 8 percent of the total U.S. energy portfolio.¹⁶
- Already accounting for almost 10 percent of U.S. electricity consumed (and 7 percent of total U.S. energy consumption) in 2008, renewables are the fastest growing segment of the U.S. energy portfolio.¹⁷ By 2030, under a BAU scenario, renewables are projected to account for 15 percent of U.S. electric power and 9 percent of the total U.S. energy portfolio.¹⁸
- Currently, the United States imports about 26 percent of its energy, which accounted for 45 percent of the U.S. merchandise trade deficit in 2008.¹⁹

Figure 6: U.S. Energy Demand Is Projected to Grow 11 Percent by 2030, with Coal and Renewable Energy Consumption Experiencing the Fastest Growth

Source: Energy Information Administration

any one source is risky because its supply may be disrupted by many factors—from natural events such as earthquakes or hurricanes to terrorism.

Energy prices do not reflect their full costs. The price of oil does not reflect its harmful impacts on our national security or the effect on our economy of sending vast amounts of money overseas for imports. Energy prices today also do not reflect the costs inherent in the carbon emissions that result from the combustion of fossil fuels. While industries are concerned about the high costs of complying with carbon constraints, leading experts predict that the costs of non-action or delay will be far higher.²⁰ Scientists predict a range of severe impacts on water supplies, food production and sea levels and

highly disruptive patterns of extreme weather, infectious disease and related immigration, all of which will carry a high economic toll.²¹

Price stability influences energy investments. The price volatility of oil inhibits both investments in current alternative sources of energy that would be more sustainable and secure as well as funding for research, innovation and investment to develop and pursue new ones.

Low gasoline prices also reduce the incentive to purchase fuel-efficient cars. As cars become more efficient due to regulatory requirements, the effect of the gasoline tax is diminished in both real and absolute terms. Incentives for a driver to minimize vehicle miles traveled are decreased.

Figure 7: Power From Renewable Energy Sources Was the Fastest Growing Portion of U.S. Electricity Production in 2008, but Renewables Still Only Account for 9 Percent of Electricity Generation

Source: Energy Information Administration

U.S. Electricity Net Production by Source, 2007-2008

Electricity Net Production Per Billion Kilowatts		2007	2008	Percent
FOSSIL FUELS	Nuclear Power	806.4	806.2	0.0%
	Coal	2,016.5	1,994.4	-1.1%
	Natural Gas	896.6	876.9	-2.2%
	Petroleum	65.7	45.4	-31.0%
	Other Gases	13.5	11.6	-14.0%
	Fossil Fuels Subtotal	2,992.2	2,928.3	-2.1%
RENEWABLE ENERGY	Conventional Hydropower	247.5	248.1	0.2%
	Wood and Other Biomass	39.0	38.8	-0.6%
	Wind	34.4	52.0	51.0%
	Geothermal	14.6	14.9	1.5%
	Biogenic Municipal Waste	16.5	17.1	3.4%
	Solar	0.6	0.8	37.8%
	Renewables Subtotal	352.7	371.7	5.4%
Total		4,156.7	4,110.3	-1.1%

Wind Electricity Production Grew the Fastest in the United States in 2008 at 51%, but Still Only Accounts for 1% of Electricity Generation

Note: Other Gases include blast furnace gas, propane gas and other manufactured waste gases derived from fossil fuels. Totals may not equal sum of components due to independent rounding.

“Price and taxation levels incentivize innovation and drive different behavior. The Europeans and Japanese are significantly more energy efficient than us, and that results, in large part, from the price at the pump and the price at home for electricity.”

James W. Owens

Chairman and CEO, Caterpillar Inc.; and Co-Chair, ESIS Initiative, at the ESIS Initiative Steering Committee meeting in Washington, D.C., January 2008.

Similarly, inflation has significantly decreased the real impact of the tax. In real terms, the tax of 18.4 cents per gallon established in 1993 is the equivalent of 12 cents per gallon today—a reduction of approximately 33 percent. This both decreases incentives to drive less as well as affects the ability of the federal highway trust fund to have the needed money for road infrastructure improvements and public transit funding.

Failure to price carbon emissions in the United States perpetuates market uncertainty, which carries an economic toll, increases risk and undermines the private sector's ability to make long-term strategic investments at scale. The European Union, on the

other hand, has capped carbon emissions from their electrical generation and industrial sectors, and has an active emissions trading regime.

Absent a clear picture of the future, market actors are inhibited from making investment decisions. Investments not made today may incur larger costs due to later price increases; infrastructure not sited may cripple the economic competitiveness of entire regions; choosing conventional technology today may strand other investments, if clean technologies become the new standard.

Stable, long-term price signals are perhaps the most important pre-condition for driving increased levels of investment required to meet growing energy demands in a more sustainable manner.

“If we are going to drive policies that optimize the use of the most energy, we must have a clear understanding of the full costs. We need a positive, transparent, long-term and hopefully relatively predictable price on carbon emissions. This alone will be a huge factor in helping drive private sector investment in efficient and low-carbon technologies.”

James W. Owens

Chairman and CEO, Caterpillar Inc., and Co-Chair, ESIS Initiative, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

Energy Permitting: The Regulatory Picture

Environmental impact statements for coal-fired power plants can be up to 1700 pages in length. One hundred planned coal power plants have been cancelled because of stalled permitting or financial unfeasibility.²²

No streamlined regulations exist for small power projects. Small wind power projects in Massachusetts are subject to more than a dozen stakeholder permitting decisions. The Berkshire Wind Power project has been delayed for more than a decade because of permitting holdups.²³

The Nuclear Energy Institute estimates that even with new licensing procedures, the permitting process for a new nuclear reactor could take eleven years, with four of those years devoted to the review of the license by the Nuclear Regulatory Commission. Even with tax credits in place, it is hard for a company to make an investment that takes eleven years to recoup.²⁴

Energy Challenges: Spotlight on Nuclear Industry

Nuclear currently accounts for 21 percent of our electric generation, but we have not started construction on a new reactor in over 30 years. The workforce is nearing retirement age with few replacements coming in. Global competition for the workforce and materials to construct reactors is intense. Public perceptions on nuclear safety inhibit the siting of new facilities, and the approval process for renewal and expansion is often quite lengthy, with delays increasing financing costs.

30/30 Goal: The nation needs to maintain and expand the use of this low-carbon resource and raise the contribution of nuclear to our electricity supply by 30 percent by 2030, while ensuring all safety, security and emergency operations.

New energy production faces a multitude of barriers. Energy industry incumbents and market entrants both face challenges to deploying new energy production. Most of the nation's energy production facilities—such as power plants, refineries and oil and gas fields—are several decades old. Siting modern replacements for those facilities today is complex, time-consuming and expensive. Federal-state regulatory conflicts, environmental concerns, aesthetic preferences, highly localized planning processes, investment risks and preferences and regional policy differences have all played roles in driving current patterns of infrastructure development and make it difficult to permit and build major energy facilities in many parts of the United States.²⁵

Recommendation: Use It All and Price It Right

- **Rationalize federal and state regulatory policies.** The National Governors Association (NGA) should develop by 2012—in conjunction with the Departments of Energy (DOE), the Interior (DOI), Agriculture (USDA) and the Environmental Protection Agency (EPA)—a roadmap to rationalize state and federal siting, permitting and planning processes for critical energy infrastructure.
- **Drive diversification to low-carbon energy sources.** Congress should establish a national, low-carbon energy standard for electric utilities that encompasses a minimum of 25 percent renewables by 2025 to promote the development of low-carbon energy from wind, solar, geothermal, biomass and nuclear power, clean coal and natural gas, while ensuring the retention of U.S. manufacturing and jobs.
- **Assure renewables access to the grid.** DOE should ensure that utility-grade solar, wind, geothermal and biomass power generation facilities are provided access to the grid on a non-discriminatory basis, as has been the case with utility-scale hydropower.
- **Expedite nuclear power plant approvals and re-commissioning.** The Nuclear Regulatory Commission (NRC) should set appropriate review schedules for permitting of new nuclear construction.
- **Eliminate regulatory uncertainty for nuclear waste.** The President should create a commission to examine and make recommendations for new alternatives for dispensing of proliferation-resistant spent nuclear fuel from existing reaction sites, including potential storage alternatives.
- **Expedite construction of carbon capture and storage facilities.** Congress should designate the Federal Energy Regulatory Commission (FERC) as the agency responsible for the authority to approve, in consultation with DOE, applications for the long-term geological storage of carbon emissions and enact legislation that establishes a clear legal and regulatory structure for the storage of these emissions, including appropriate liability caps, long-term responsibilities, short-term exemptions and safe harbor provisions.
- **Establish a price floor for gasoline.** Congress should establish a price floor for gasoline that is sufficient to accelerate demand for fuel-efficient vehicles and provide incentives for R&D and private investment in alternative fuels.
- **Link the gasoline tax to CAFE standards.** Congress should link any federal gasoline tax to the CAFE standard and direct its usage to transportation-related energy efficiency and R&D.
- **Price carbon emissions.** Congress should enact legislation that will result in the establishment of a consistent, predictable and transparent price on carbon emissions in conjunction with the President obtaining commitments from all developed and developing countries at international negotiations to limit their current and future emissions growth.

Figure 8: As of 2007, Many Countries Had Set Targets to Diversify the Energy Consumed for Electricity Production with Cleaner, Renewable Sources

Source: New Energy Finance, International Energy Agency and Brazil National Energy Plan 2030.

	“Green Electricity” Target Proportions	Status
Spain	29.4% by 2010; 12%* of TPES by 2010	17.2%*
Italy	25% by 2010; no national target for 2020	16.5%*
France	21% by 2010; 20% by 2020	11%*
EU-25	20% TPES by 2020	20%*
Germany	12.5% by 2010; 20% by 2020	10.4%*
United Kingdom	10.4% by 2010; 20%** by 2020	4.1%*
Brazil	43.3%** by 2030, 25.4%** by 2030 excl. hydro	80%–90% hydro only; 37%* of TPES; 2% excl. hydro
China	15% of TPES by 2020	7.7%* of TPES
United States	15% by 2020 (investor-owned utilities only)	10%*, >5% excl. hydro
India	10% by 2012; 15% by 2032	5.9%* of TPES
Japan	3% by 2010 (excl. geo & hydro); 7% by 2010 (incl. geo & hydro)	3% incl. geo & hydro, 2% excl.
Russia	Absence of national renewable energy strategy	18.9%*; 3.6% of TPES, 1.2% excl. hydro

TPES: total primary energy supply including transportation fuel

* Including large hydro

**Strategic goals, not binding targets

Pillar 3: Jumpstarting Energy Infrastructure and Manufacturing Investments

Transformation of the U.S. energy system will require massive, steady investments over a period of several decades, but the nature, timeframes, dollar amounts and financing models of these investments will vary considerably. Innovative financial models and instruments, along with supportive public policies, are needed to move the energy industry forward, ensuring the global competitiveness of the U.S. manufacturing base and supply chains and domestic job retention and creation.

The U.S. energy system is vast. America’s energy infrastructure is vast, complex and vital to virtually

every facet of modern life and to the functioning of the U.S. economy. The scale is staggering: 20 million barrels per day of oil, 17 million barrels per day of refining capacity, 200,000 miles of oil pipeline—all aimed at fueling the more than 220 million cars and trucks now on U.S. roadways. The nation’s infrastructure for extracting and transporting natural gas encompasses some 1,300 drilling rigs and over 300,000 miles of pipeline. Thousands of power plants, 200,000 miles of interconnected transmission lines and countless transformer substations operate in sync to power millions of homes and businesses.²⁶ The nation’s existing energy infrastructure embodies an enormous capital investment, and simply maintaining and expanding it will require financial and institutional resources of comparable scale.

Upgrades and new infrastructure are needed

across the board. Maintenance and expansion of our existing energy infrastructure is a very large, but relatively incremental undertaking. The need to upgrade facilities and turn over aging, obsolete and heavily polluting equipment is a continuous process, as more advanced technologies are always coming on line. Companies across the energy industry will need to invest heavily in new and more efficient production, generation, refining and other equipment to improve operating efficiencies and meet environmental requirements.

Capital requirements are immense. The capital required for the transition is very large both in the U.S. and worldwide. Estimates are that worldwide, over \$45 trillion of new investment, on top of BAU spending, will be needed from 2010-2050 to decarbonize the energy sector by 50 percent.²⁷ The investments are along the whole energy delivery system, including extraction, transport, distribution and power production from sustainable sources. Some new types of infrastructure will be also needed, such as facilities to sequester carbon.

A challenging operating environment for business.

A fundamental disadvantage for U.S.-based manufacturing is the average combined federal and state corporate tax rate, which, at 39.3 percent, is the second highest among Organisation for Economic Co-operation and Development (OECD) nations.²⁸ There are long depreciation schedules, an impermanent R&D tax credit as well as a package of regulatory impediments, from liability risks and costs to complex and lengthy regulatory approvals for siting and permitting. No other advanced industrial nation has a comparable burden of risk and costs imposed on their manufacturing and service industries. Collectively these tax, fiscal and regulatory policies inhibit expansion, new technology investments and are contributing factors in driving American businesses offshore.

“If we allowed the expensing of capital investment by business, there would be many projects that would be advanced by CEOs and boards of directors. Why? Because the ability to expense capital projects would reduce overall risk by creating a faster return on investment.”

Frederick W. Smith

Chairman and CEO, FedEx Corporation, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., November 2008.

To get American industry expanding here at the needed scale requires more than just energy specific incentives. The United States must establish the optimal tax, fiscal and regulatory environment that does not disadvantage U.S. producers and inadvertently create comparative advantage to other nations vying to attract and subsidize advanced technology development, manufacturing infrastructure and jobs.

Risk must be reduced along the whole energy value chain. To successfully develop and deploy sustainable energy technologies, the costs and regulatory uncertainty risks for investment should be reduced along the whole energy value chain. Investments in new energy technologies and associated enabling infrastructure are so massive and long term in nature that they will require financing assistance, including debt guarantees, product liability protection and transparent, predictable regulatory coherence to be successfully deployed in the United States. Without these policies and safeguards, the cost of capital and risk hurdles to private investors will simply be too great and capital will flow elsewhere. Investment capital will always seek out the optimal risk-reward ratio.

"We are not putting out enough incentives for markets to furnish the capital that's going to be required to do what we have to do. We absolutely need to have enlightened economic policies. We need to have tax policies, at both the state and federal level, which encourage, rather than discourage, innovation."

Thomas R. Baruch

Founder and Managing Director, CMEA Capital, at the Western Energy Summit at NASA Ames Research Center, July 2009.

Financing for projects and other financing tools in the federal toolkit must be mobilized to facilitate financing for sustainable energy projects. Moreover, until regulatory issues concerning the siting of infrastructure investments are simplified and facilitated, deployment is inhibited and the risks—and consequently costs—of constructing and maintaining the infrastructure will be higher than necessary.

Failure to finance means lost manufacturing and jobs. A more sustainable and secure national energy system will require a state-of-the-art manufacturing base and skilled workers if U.S. technological breakthroughs are to be transformed into U.S. manufactured equipment, components and services that can be deployed at scale here and around the world to create wealth, secure high paying jobs and grow the productivity and competitiveness of the nation's economy.

Figure 9: A Decade Ago, U.S. Solar Power Manufacturers Captured the Entire Domestic Market and 40 Percent of the World Market

Source: Renewable Energy World, Worldwatch Institute

We must bridge the “valley of death” between the first demonstration plant and prototype production for a technology. The inability to obtain financing for the first few commercial manufacturing plants or facilities is well known. It is a recognized research and technology problem in many areas, not just energy.

Failure to grow, retain and attract investment capital in the United States would result in large scale, long horizon debt financing, venture capital and private equity capital being deployed in competitive markets outside our economy, thereby financing clean energy infrastructure, building new industries and supporting next generation innovation offshore. This outcome would only further compound the loss of clean energy manufacturing and jobs in America.

Many financing options are required. Financing for all of these investments can be jumpstarted through a variety of means. The instruments could include loan guarantees, insurance or other means. A portfolio of techniques should be developed so that each infrastructure investment that is necessary can utilize the type of jumpstart that is most appropriate to its requirements. Regulators need to provide clear financial incentives for investments in energy infrastructure. Without such risk-reducing policies, essential private capital will not be available to build essential facilities.

The United States must shift to a low carbon energy-manufacturing base. Globalization has contributed to the erosion of the U.S. manufacturing base as companies have moved offshore to reduce costs, get closer to markets and other reasons. This has left the United States without a strong base of basic industries that may prove essential to building a 21st century energy system, such as steel for wind turbines, silicon and glass for solar panels, electric transformers for high-voltage transmission and advanced building materials. Many of these

“Manufacturing executives across the country say that they would rather stay in the United States. But manufacturers are looking for leadership at the highest level to help coordinate the development of the next generation of capabilities and sustainable solutions, taking into account energy needs and constraints, so we [the United States] can be truly competitive for decades to come.”

James H. Quigley

CEO, Deloitte Touche Tohmatsu, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., November 2008.

Did You Know...?

China now constructs more of the most efficient coal fired-power plants than any other country and is therefore driving down its costs of using these technologies. The energy-hungry nation is also building more nuclear power plants than the rest of the world combined.²⁹

Figure 10: China Has Big Plans for Its Renewable Energy Industry

Source: New Energy Finance

technologies are simply too large and expensive to cost-effectively import, giving domestic production a strong competitive advantage.

In addition, the entire U.S. manufacturing base must reduce its carbon footprint, or risk reduced competitiveness in global markets. The enhanced energy management resulting from these efforts will also support U.S. manufacturing competitiveness as a key resource is optimized and financial savings result.³⁰

Increase access to advanced manufacturing tools.

The ability of the United States to model and simulate the complexity of the energy transformation can accelerate time to market and turbo-charge design of new energy efficient and sustainable products for competitive advantage. By increasing the capability of U.S. manufacturers to utilize high performance computing (HPC), we will leapfrog competitors and achieve advantage in time to market, complex design, safety and validation testing of complex materials and huge cost reductions.

Recommendation: Capitalize Growth and Make It Here

- **Reduce the corporate tax rate.** Congress should cap the federal corporate tax rate at 25 percent for all businesses regardless of size, make the R&D tax credit permanent and establish accelerated depreciation treatment for all capital investments.
- **Generate a revenue pool for infrastructure financing.** Congress should establish a CompeteAmerica savings bond to allow individual investors to purchase tax-exempt, federally-guaranteed bonds, the proceeds of which would be invested in the building of America's next generation of clean energy infrastructure and manufacturing.

- **Enable high-risk, high return energy projects.** Congress should authorize adequate funding to ensure a National Clean Energy Bank³¹ can provide insurance and other needed risk management or credit enhancements such as loan guarantees for the construction or utilization of sustainable energy resources or facilities, such as geological storage projects for carbon emissions and renewable purchase power agreements.
- **Invest in nuclear industry expansion.** Congress and the Administration should devote more resources to activities including long-term waste storage, R&D and deployment activities related to spent fuel re-cycling and interim storage technologies, improvements to reactor design and the financing of new nuclear power plants.
- **Provide a steady stream of manufacturing and job creation financing.** In addition to its current funding, Congress should allocate 40 percent of the annual revenue generated from carbon pricing to federal, state and regional clean energy manufacturing initiatives.
- **Designate Clean Energy Technology Manufacturing Development Zones.** Congress should establish and fund a program to allow states to establish clean energy economic development zones by offering incentives such as waivers of corporate and employment taxes, worker training assistance, regulatory simplification and interest-free, long-term debt financing guarantees and liability insurance.
- **Establish Clean Energy Manufacturing Centers of Excellence.** Congress should expand the 21st Century Energy Leadership Initiative³² to encompass dedicated funding for the operation of fifteen federally-sponsored regional manufacturing centers to drive advanced manufacturing technology and best practices through the clean energy supply chain, leveraging the National Institute of Standards and Technology's (NIST) Manufacturing Extension Partnership program.
- **Provide federal financial assistance for the initial manufacturing facilities for clean energy technologies.** The U.S. government should coordinate and leverage all available instruments such as loan guarantees, grants, or other financing vehicles available from any federal agency or state program, including DOE, DOI, USDA and the U.S. Export-Import Bank, to facilitate construction of the first two or three manufacturing plants for any new or significantly improved sustainable energy technology.
- **Incentivize production retooling and efficiency for clean energy technology production.** Congress should allow manufacturers to fully expense the retooling of production lines to produce qualified energy-efficient products or qualified sustainable energy options.
- **Enhance industrial access to HPC resources.** Put the power of high performance computing (HPC) into the hands of American producers, innovators and entrepreneurs by expanding access to U.S. facilities and expertise in this critical field. Through the utilization of powerful HPC tools like modeling and simulation, the U.S. can lower the cost of innovation, develop high value products and services impossible without HPC and jump-start U.S. manufacturing.

Pillar 4: Clearing Obstacles to a National Transmission Superhighway and Smart Grid

The transmission system is the backbone of the electric system. It is a fundamental component of our energy infrastructure. It has suffered from under-investment for decades. The antiquated U.S. transmission and distribution systems are causing severe economic losses to the economy. For example, it is estimated that the cost of the power blackout in the Northeast in August of 2003 was \$6-10 billion dollars.³³ Using new technologies, a transmission superhighway may also improve reliability and significantly reduce line losses. Especially as we move to an energy system with more renewable and other advanced technologies, we need to ensure that power may move easily and with minimum losses from where and when it is produced to where it is consumed.

Transmission enables deployment of renewables.

A new transmission system is needed if we are to bring on line large amounts of new renewable resources, which are often best sited far from the demand centers. In addition, many renewable resources are intermittent. They may not produce power if the wind is not blowing or the sun not shining. Balancing the power produced by these intermittent resources with the other power supplies to meet the demand for energy will require more transmission.

Grid governance is balkanized and siting embroiled in controversy. Unlike the federal highway system, the U.S. electric power system was not designed from the top down. It is a mosaic that has been stitched together year over year, from one community to the next and one transmission tower to another. It is a system comprised of large for-profit corporations with billion dollar revenues to small, non-profit rural electrical cooperatives serving a community of less than one hundred. The elec-

Figure 11: Snapshot—The U.S. Electricity Transmission System

The U.S. has three different electricity transmission interconnections with 273,564 miles of high voltage transmission lines. Electricity is distributed by 3,139 utilities, with 50 public utility commissions, either publicly elected or governor-appointed, providing regulatory oversight. A hundred and forty separate “balancing authorities” manage the electricity load, making inter-jurisdiction transport very difficult.

Sources: “The Changing Structure of the Electric Power Industry 2000; an Update,” U.S. Energy Information Administration, 2000; Wood, P., Church, R., Building the 21st Century Transmission Super Grid; Technical and Political Challenges for Large Scale Renewable Electricity Production in the U.S., Washington, D.C.; American Council on Renewable Energy, April 2009.

tric power system is disaggregated, balkanized and governed by a veritable patchwork of regulation and legislation. As such, the siting of transmission lines has been delayed by continuing disputes over jurisdictional authority, environmental impact and the allocation of construction costs.

"The U.S. electric power infrastructure is plagued by loose bolts and cables, rotten wood, overgrown vegetation, wind damage, rust, missing conductors, cracked footings, flooded stations, out-dated and inefficient equipment and collapsing towers. The current condition of the grid is contributing to a significant loss of energy efficiency and reliability. Further compounding the situation is the fragmented grid system that prohibits moving around electricity, creates congestion and causes huge penalties across regions."

Joseph L. Welch

President and CEO, ITC Holdings Corp., at Progressive Dialogue II in Chantilly, VA, March 2008.

Holistic approach to planning required. The development of a transmission superhighway should be done in parallel with the development and implementation of a smart grid so power dispatch and use can be managed with 21st century technology, empowering all types of consumers and providing more reliable and secure power. And the planning to evaluate the need and location of transmission lines should incorporate the capabilities of a smart grid to maximize energy efficiency and demand response.

Smart grid requirements. The market is beginning to demand tools and options to better manage energy at the point of consumption. Standards need to be developed so that devices are compatible and capable of being used by all consumers and any grid operator; security needs to be ensured so that hackers or others cannot access the devices or grid control points; and the design should incorporate an ability to be self-healing and adaptive so brownouts and blackouts are minimized.

Figure 12: Transmission Line Locations

Transmission lines are not sited in convenient locations to move abundant renewable energy to population centers. Investor owned utilities invest, on average, about 6.5 percent of their transmission budget on transmission to and from power sources. The American Wind Energy Association estimates that there are 300,000 MW of wind projects stalled because there is inadequate electric transmission capacity. That represents 20 percent of U.S. electricity consumption.

Sources: Wood, P., Church, R., Building the 21st Century Transmission Super Grid; Technical and Political Challenges for Large Scale Renewable Electricity Production in the U.S., Washington, D.C.; American Council on Renewable Energy, April 2009; American Wind Energy Association, 2009 Report Card, Washington, D.C.; American Wind Energy Association, July 2009.

Excitement has been building over the past several years about the prospects of plug-in hybrid electrical vehicles (PHEVs) as a means to reduce U.S. dependence on petroleum-based fuels, along with their CO₂ emissions. Numerous major car manufacturers are poised to introduce plug-in hybrids to the U.S. market over the next 2-3 years. A smart grid will be essential to help manage the power flow between

vehicles, charging stations and utilities. Experts believe that PHEVs represent an integral part of the nation's future power delivery system to help manage peak loads.³⁴

Recommendation: Build It Fast and Smart

- **Set national criteria for transmission siting.** Congress should create independent regional planning authorities overseen by FERC, with FERC issuing standards for transmission siting and having the final determination and approval for siting, while retaining and strengthening current consumer and worker protections.
- **Recover transmission costs on a regional basis.** FERC should require regional planning authorities to allocate costs to construct and upgrade transmission regionally, spreading costs across all jurisdictions served by the new lines.
- **Develop standards for device interoperability and security.** FERC should develop standards so that energy management devices can be operated on any smart grid and so that the grid architecture will be adaptive and secure.

Did You Know...?

A pilot program of smart meters and thermostats among customers in New Jersey was conducted by the Public Services Enterprise Group, the state's largest utility. The utility recorded a 47 percent drop in peak electricity usage among the test group.

The Wall Street Journal, June 30, 2008.

"Transmission is so important because, whether you are talking about nuclear or clean coal, renewables or prioritizing efficiency, ultimately there has to be a shift in the country to greater electron liquidity—delivering clean electrons where and when we want them to fuel industry and homes, and even portions of our vehicle sector."

Alexander A. Karsner

Former Assistant Secretary for Energy and Energy Efficiency and Renewable Energy, U.S. Department of Energy, and Distinguished Fellow, Council on Competitiveness, at the ESIS Initiative Steering Committee meeting, July 2008.

Pillar 5: Spawning Technological Breakthroughs and Entrepreneurship

The need to meet growing U.S. demand for energy, assuring access to stable, affordable supply and achieving economic, environmental and national security needs present a set of unparalleled national and global grand challenges. The time scale, magnitude and complexity of the energy transformation will require investment and accomplishment at the frontiers of science and discovery. American businesses, academic institutions and our national laboratories are unrivaled in the world and have the capacity to tackle these grand, large-scale energy and sustainability challenges and in turn create new industries and grow them into global business opportunities.

Technology needs are great. The development of new technologies will require the fusion of multidisciplinary work from advanced materials, biotechnology, optics and biomimicry, to atomic and large-scale

“The national laboratories have a unique set of capabilities. What they really need is the mandate to do it. The labs have many ideas about how we can apply technologies that already exist to the problems we face, whether it is the understanding of geothermal reservoirs or carbon capture or underground coal gasification. Those are all things that we have done. We’re ready to apply those technologies.”

George H. Miller

Director, Lawrence Livermore National Laboratory, at the Western Energy Summit at NASA Ames Research Center, July 2009.

systems engineering, scalable software codes and hardware to enable modeling and simulation at the edge of the exascale world,³⁵ and the understanding of human behavior and social systems.

There are a myriad of technologies that will drive and accelerate the solution pathways to a low-carbon energy future and U.S. economic competitiveness. These include: commercially-viable, low- or no-carbon fuels and conversion/production processes, advanced energy storage technologies for intermittent resources like wind and solar, light weight rechargeable batteries and fuel cells for electric vehicles, carbon capture and storage for coal and other fossil fuels, bio-based and other alternative fuels for jet aircraft, integrated real-time energy information and management systems and practical and affordable alternative-fueled vehicles.

Time is short. Moving to a low-carbon future will require a much expanded research portfolio. Within the next ten years, we need to have cracked the codes to achieve transformative technological innovations across the entire energy system, encompassing the

“Regardless of the options—energy efficiency, renewables, a price on carbon —solving the primary challenges are extremely complex. To put this in perspective, even if electricity consumption remains flat for 40 years, and fossil fuels are not used, and the use of anything that requires an electric outlet is outlawed, the United States will still not make the target of 80 percent reduction in carbon emissions by 2050. Reaching that goal will take solutions on the scale of the complete electrification of our transportation system and the complete de-carbonization of our methods of producing electricity in the next 40 years. So as we stand here at 2009, thinking 41 years ahead, I hope no one in this room believes we have the luxury of time to achieve the kind of change I just described. The time is now.”

Ralph Izzo

Chairman, President and CEO, Public Service Enterprise Group (PSEG), at the Eastern Energy Summit at Rutgers University, The State University of New Jersey, April 2009.

total earth, the seas and the atmosphere. Especially as we move closer to mid-century, new technological options are likely to be required to meet carbon constraints and the increased worldwide demand for energy resources. That research needs to begin now to develop technologies if they are to achieve significant deployment levels by mid-century. We need, however, to support efforts along the whole innovation chain—from basic and applied research to demonstration, commercialization and deployment—to achieve success. If we do not begin now, the environmental and economic consequences are likely to be catastrophic.

Priorities must be set. There are several “enabling” technologies that need to be focused on to address the technological and policy challenges that must be met for certain resources to achieve their potential. Each of these will unlock a vast energy resource. They also present great export opportunities in terms of technologies and services.

- **Energy storage**, including flywheels, pump water storage and batteries, is an enabling technology that will benefit intermittent renewable technologies like wind or solar.
- **Carbon capture and storage (CCS)** of carbon emissions from coal-fired power plants is an enabling technology for the United States to be able to fully exploit its vast coal reserves in a carbon-constrained world. American universities

and national laboratories have made tremendous progress in CCS research and development, but industry has not yet invested in the scale up of research pilots to justify commercial deployment.

- **Nuclear waste** is a political and technical issue on which the United States, unlike other advanced nations and developing nations, has made little progress for decades. The future of the use and expansion of nuclear energy in the United States hinges on technological development, coupled to political will, to accomplish its resolution.

Federal R&D pays big dividends. Many of the energy technologies that we use today started with research—often begun several decades ago. This research has been both public and private as well as in universities. Often it has been done in partnership

Figure 13: U.S. Energy R&D Investment by Both Public and Private Sectors Has Declined Significantly Since the 1980s

- Between 1991 and 2003, U.S. private sector investments in energy R&D fell by 50 percent.
- Energy R&D as a percentage of total U.S. R&D fell from 10 percent to 2 percent between 1980 and 2005.
- Federal funding for energy R&D received just 2 percent of total federal R&D funds in 2009, compared with 21 percent dedicated to health R&D.

among the sectors. There are dramatic successes. The National Research Council estimated that just the energy efficiency program at DOE produced net economic benefits of \$30 billion in 1999 dollars from an expenditure of \$7 billion over the period of 1978-1999. Security and environmental benefits were in addition to those economic benefits, and technological options for future deployment were also developed that could enter the market as conditions changed.³⁶

U.S. energy R&D has flagged. The flow of federal research dollars has fluctuated dramatically with changes in administrations. In real terms, not including the recently enacted stimulus legislation, it has declined dramatically. Federal energy R&D funding was 0.0067 percent of GDP in 2008 while forty

years ago in the late 1970s it was around 0.111 percent.³⁷ And while the stimulus research funds are commendable, they are a one time boost. From the perspective of the private sector, universities and national laboratories, greater and more dependable short- and long-term research funding is needed. Research, some of which by its nature is longer term, cannot be effective with wild year to year gyrations in funding for individual projects. (See Figures 14 and 15.)

While recently there has been an increase in both energy companies and venture capital firms investing in clean technology, the R&D component must be increased and maintained at an appropriate level if we are to transform the energy system to a sustainable, secure competitive future.

Figure 14: U.S. Department of Energy Funding for Applied R&D Fell Off Sharply Over the 1980s and 1990s but Has Since Rebounded Slightly

Source: Government Accountability Office analysis of Department of Energy data.

Note: Budget authority is in real terms, adjusted to fiscal year 2008 dollars to account for inflation. The budget data focuses on development of advanced energy technologies and excludes such R&D areas as Vehicle Technologies, because its focus is improving the energy efficiency of vehicles.

Figure 15: Nearly Half of U.S. Stimulus Spending on Energy R&D Will Go Toward Energy Efficiency and Renewables

Sources: American Association for the Advancement of Science

"The reason the United States did so well after World War II is because of the foundation that was laid through massive federal investments in research and development. We invested massively up through the mid-sixties and then the R&D just trailed off."

Susan Hockfield

President, Massachusetts Institute of Technology, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., November 2008.

Recommendation: Discover the Future and Break the Technology Barriers

- **Provide a steady stream of R&D funding.** In addition to current funding, allocate 30 percent of the annual revenue generated from carbon pricing to accelerate breakthroughs in technologies and to demonstrate the new technological solutions.
- **Launch clean energy research consortia for enabling energy technologies.** The director of the White House Office of Science and Technology Policy (OSTP) should lead and coordinate across all government departments and agencies the establishment of cross-sector consortia with industry, academic and national laboratory partners to solve critical technical challenges in energy storage, including batteries and fuel cells, carbon capture and storage and proliferation-resistant nuclear waste re-cycling and spent fuel disposal.
- **Fast-track technology demonstrations and pilots for CCS and energy storage.** Congress should support ten commercial-scale carbon capture demonstrations to be completed by 2020 by expanding the DOE regional partnership network and three to five at-scale demonstrations of energy storage technologies. Industry and universities should be strategic partners and investors in these pilots, with proper allocation of IPR.
- **Fast-track demonstrations of new nuclear reactors.** Congress should support the completion by 2018 of three to five demonstrations of new designs of commercial-scale nuclear reactors that include passive safety features and other new design components, including consideration of closed loop fuel cycles and other means of proliferation-resistant nuclear waste re-cycling and spent fuel disposal.

Pillar 6: Mobilizing a World-Class Energy Workforce

America currently lacks an energy workforce of sufficient size and capabilities to meet the needs of a sustainable, secure energy system.³⁸ With increasing demand come abundant job opportunities in both traditional and emerging energy industries. Unfortunately, U.S. workers are neither aware nor sufficiently prepared to take them. Moreover, with an aging population and the retirement of the baby boomers well under way, there is an inadequate pipeline of replacement workers, technicians and managers to succeed them.

Traditional Energy Industry Needs. The United States stands to lose half of its electric power industry workforce within the next five to ten years due to retirement. America's oil and gas workforce averages 50 years in age. Half are likely to retire soon. Workers in these conventional energy sector jobs, from power plant operators to transmission line and pipeline workers, are retiring at a much faster rate than they are being replaced.³⁹ The introduction of any new energy technologies will not compensate for this workforce shortage.⁴⁰

For example, in the nuclear industry, the fact that there has been no new construction of a nuclear facility in the United States in over 30 years has led to the atrophy of skills, the loss of technicians, the dearth of American students in nuclear engineering and a national security risk for the primarily nuclear-powered U.S. Navy.

"We do not have the workforce that is trained to build the next generation of nuclear plants at present, and that is going to cost us dearly."

Robert Rosner

Chairman Emeritus, Argonne National Laboratory, and former ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

Emerging Energy Industry Needs. The development, installation and maintenance of new technologies requires skills at all levels of educational training. The required skills will range from engineers to vocationally-trained personnel. Many of these jobs, such as building new power plants, making buildings more energy efficient and installing renewable energy technologies, cannot be exported and will remain in the United States. So-called "green collar" jobs could fill this gap over time and provide for significant domestic employment growth. Capitalizing on the sustainable energy-related "green jobs opportunity" will require government being proactive in developing programs to provide the necessary skills. Government should provide a 21st century education to match the 21st century job opportunities, requirements and needs.

Advanced Energy Research and Engineering Needs. Industry executives cite the lack of scientific, engineering and skilled talent as among the most serious challenges facing their businesses today. There is growing global competition for scientific

Figure 16: Spotlight: Aging Nuclear Industry Workforce

The United States stands to lose half of the electric power industry workforce within the next 5-10 years due to retirement. America's oil and gas workforce averages 50 years in age. Half are likely to retire soon. Workers in these conventional energy sector jobs, from power plant operators to transmission line and pipeline workers, are retiring at a much faster rate than they are being replaced. The introduction of any new energy technologies will not compensate for this workforce shortage.

- By 2013, 35 percent of the nuclear industry workforce will be eligible to retire.
- Forty-six 2-year university and 4-year colleges in the United State offer nuclear engineering programs, out of the 4,314 total (i.e. just over 1 percent of all programs).
- In 2007-2008, 415 bachelors degrees in nuclear engineering were awarded out of a total of 74,170 bachelors degrees across all engineering disciplines (i.e. 0.56 percent of all engineering degrees.)

Sources: "Job Creation in the Nuclear Renaissance," CASEnergy Coalition, June 2008; "2007 Tables and Figures," National Center of Education Statistics, July 2007; "Engineering by the Numbers," American Society for Engineering Education, June 2009

and engineering talent today,⁴¹ and the U.S. pipeline of students is slowing.⁴² For example, universities in nations controlling vast hydrocarbon resources managed by state-owned energy companies produced more than 12,000 petroleum-engineering and geosciences graduates in 2008, double the roughly 6,000 in the United States, Canada and Europe—a

striking change from 2000, when the United States, Canada and Europe produced 4,000 energy-related graduates compared with a total of about 6,000 in other nations.⁴³

The private sector, where the overwhelming majority of careers will be, knows best the current opportunities that are not being met. It knows the future

"The question of ensuring access to talent, developing talent, building talent is critical for this country. We have a domestic crisis in that we are simply not developing our own talent at multiple levels to meet our own expectations and needs."

John J. DeGioia

President, Georgetown University, and ESIS Initiative Steering Committee member, at the ESIS Initiative Steering Committee meeting in Washington, D.C., January 2008.

requirements in terms of skills that will be required. It can assist in developing the workforce of the future by working closely with universities and high schools as well as within their own organizations.

Opportunities for all energy portfolio and service jobs must be mapped and matched with current and future workforce needs along the entire continuum of need, from skilled tradesmen to advanced scientific researchers. There is an enormous opportunity and need for universities, national laboratories, energy companies, community colleges, state school systems and the federal government to join forces and develop the energy workforce of tomorrow, while investing in the energy workforce of today.

Figure 17: The Number of New Green Jobs in the United States May Reach 2.5 Million by 2018

Source: U.S. Conference of Mayors, 2008

Note: In 2006, there were an estimated 127,000 and 419,000 green jobs respectively in the areas of Renewable Power Generation and Engineering, Legal, Research and Consulting.

Community College Opportunities. Nearly half of the nation's undergraduate education students are enrolled in community colleges.⁴⁴ Community colleges are scrambling for more classrooms, instructors and resources to meet the exploding demand as workforce preparedness puts a premium on just-in-time learning, industries push for skills credentials and state cash-strapped universities push their current students and new applicants toward shorter certificate programs with faster delivery.

Galvanize Local Coalitions. Federal funds for jobs programs run through state agencies such as the Workforce Investment Boards (WIBs). WIBs must actively engage state and local business leaders, labor representatives, learning institutions (training institutes, community colleges and universities) and municipal and state leaders to ensure that trainers/educators are more targeted in their curricula, industry is better tuned into the job market, workers are better equipped with the portable skills they need and local and state economic planners enable the drivers of economic growth.

"Over the past two decades we have experienced significant attrition in the U.S. population of scientific and engineering professionals who possess expertise in the fields critical to sustaining the nation's energy system. Our energy security and innovative capacity will be at risk if the nation's reservoir of brain power and experience is allowed to dwindle. More Americans need to be attracted into the energy industry, including skilled operators, linemen, energy engineers and geo-scientists. There is a growing global competition for scientific and engineering talent today, and the United States is producing fewer graduates with energy-related degrees and disciplines. The United States must take measures to ensure that it continues to attract the best and brightest from around the world."

D. Michael Langford

National President, Utility Workers Union of America, AFL-CIO, and Co-Chair, ESIS Initiative, at the ESIS Initiative Steering Committee meeting in Washington, D.C., July 2008.

Recommendation: Bridge the Skills Gap and Build the Talent

- **Boost funding for workforce training in clean technology.** Congress should allocate 20 percent of the annual future revenue generated from carbon pricing to fund state and regional workforce training initiatives in clean technologies and related middle skills and direct the U.S. Department of Labor (DOL) and workforce boards to coordinate and accelerate their investments.
- **Develop and nurture world class energy researchers and educators.** DOE should establish a permanent early career research program to support top emerging energy scientists and engineers at U.S. academic research institutions and DOE national laboratories.
- **Provide full scholarships for energy-related education.** DOE, the Department of Defense and the National Science Foundation should offer full scholarships to American students who successfully complete accredited undergraduate and graduate studies in energy-related disciplines and commit to a minimum period of service in an energy-related career in the governmental, academic or non-profit sectors.
- **Make worker training benefits portable.** Congress should establish a program that will allow eligible participants to secure a CompetePass through DOL's one-stop training centers that will be redeemable at certified employer, academic or labor-sponsored training programs that meet industry-driven skills requirements in current and future high growth job sectors, including clean energy.
- **Harness global talent by amending U.S. immigration laws.** To help fill the talent pipeline, the United States should grant green cards to foreign students receiving undergraduate and advanced degrees in scientific and engineering disciplines from U.S. institutions.
- **Cultivate youth interest in clean energy and environmentally-sound industry.** Government, industry and education coalitions should encourage and support the participation of high school students in sustainable energy projects; educate students on energy issues (i.e. use, production, conservation and impact on economy); and orient high school graduates towards work in energy-related fields.
- **Give private industry a stake in creating a pipeline of workers.** Provide federal, state and local tax incentives to U.S. companies offering mentoring, internships and on the job training for new entrants into clean energy careers.
- **Bridge funding gaps for community colleges.** Maximize community college potential to create pathways for rewarding jobs and higher pay by financially supporting surging interest in their programs.
- **Galvanize local coalitions.** Fund job and career training programs that position state entities, including Workforce Investment Boards, as the galvanizing force behind local coalitions including industry, educational institutions, state and local government and labor.

Conclusion

Drive sets forth, in its comprehensive roadmap, specific recommendations that we believe if implemented will achieve the trifecta of simultaneously promoting America's economic competitiveness, enhancing our national security and improving the global environment. The payoff will be huge. Now is the time for action. Delay puts us at unacceptable risk to realizing these goals. Harnessing the power of America—its businesses of all sizes, its academic and laboratory excellence and its talented workforce—is the most effective way to seize this opportunity and achieve results.

In the next phase of its work under the ESIS Initiative, the Council will delve deeper into the manufacturing, workforce and technology issues that will determine the success with which our nation converts today's energy and sustainability challenges into tomorrow's opportunity for economic growth and prosperity.

Acknowledgements

The Council on Competitiveness would like to extend its sincere appreciation to the many individuals who gave so generously of their time, wisdom and resources since the launch of the Energy Security, Innovation & Sustainability Initiative in July 2007.

ESIS Initiative Co-Chairs

Shirley Ann Jackson, Michael Langford and Jim Owens maintained an unflagging dedication to the success of the ESIS Initiative. Their leadership, vision and genuine commitment to the goal to the ESIS Initiative and the mission of the Council on Competitiveness have been vital to the success of this effort. We thank them and their key staff, Allison Newman, George Manoogian and Tim Elder, for the tremendous support they have provided over the past two years.

ESIS Initiative Steering Committee

These distinguished leaders convened for extensive sessions on seven occasions to guide the Council's efforts and provide invaluable expertise on the many facets of the energy security, innovation and sustainability nexus. They offered the resources of their organizations, including dedicating senior executives to serve as advisors to the Council. We thank the members who committed time to attend the Progressive Dialogues and Regional Energy Summits.

ESIS Initiative Advisors

The Council benefited enormously from the contributions of the ESIS Initiative Advisors, who convened on multiple occasions in Washington, D.C. and around the country, served on task teams for specific issues, participated in the Progressive Dialogues and Regional Energy Summits and were always on hand to offer critical input and guidance when needed.

Regional Energy Summit Series Hosts

A number of the ESIS Initiative Steering Committee members served as hosts of the Regional Energy Summit Series, conducted over the first half of 2009 in the four regions of the nation. We thank them and their staff for the considerable contribution of resources that allowed the Council to tap the insights and ideas of a broad cross-section of the nation's business, academic, research, labor and state government leaders.

Progressive Dialogue Series and Regional Energy Summit Series Participants

We are very grateful to the many leaders who participated in these important ESIS Initiative forums. The process of inquiry and discovery was pivotal to the development of the findings and recommendations within *Drive*.

U.S. Department of Energy

Throughout the ESIS Initiative, the Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) has been a stalwart and strategic partner, providing essential funding for the Progressive Dialogue Series and co-funding for the Regional Energy Summit Series and the National Energy Summit, as well as the direct involvement and contributions of the Office's leadership through the course of all ESIS Initiative program activities.

Council on Competitiveness Staff

The Council on Competitiveness would like to recognize the outstanding efforts of the ESIS Initiative team, Susan Rochford, Kara Jones, Steve Koerner, Lars-Eric Rödén, Gourang Wakade and the many talented interns who demonstrated uncommon dedication and perseverance on the road to the National Energy Summit.

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Compete:Energy

Road to the National Energy Summit & International Dialogue

Since the launch of the ESIS Initiative in July 2007, the Council has drawn heavily upon the expertise and wisdom of the Initiative's CEO-level Steering Committee, a high-level advisory group, as well as the research and analysis of many expert organizations in the United States and abroad to inform the development of a comprehensive action agenda designed to enhance U.S. energy security, sustainability and competitiveness.

Progressive Dialogue Series

Through the generous support of the Department of Energy, and under the auspices of the ESIS Initiative, the Council conducted a progressive series of cross-cutting, high-level expert dialogues in 2007-2008 to examine the intersection of energy, sustainability and competitiveness.

Sept. 13–14, 2007
Warrenton, VA

Progressive Dialogue I examined the various ways in which energy has become a driver of competitiveness in the 21st century, looking at industry, workforce and international marketplace impacts.

March 6–7, 2008
Chantilly, VA

Progressive Dialogue II discovered factors influencing business decision-making and investments related to energy and identified the conditions that would enable enterprise-level **energy users** to move forward in adopting sustainable energy solutions.

June 3–4, 2008
Chantilly, VA

Progressive Dialogue III determined factors influencing business decision-making and investments in the energy industry and identified the conditions that would enable **energy suppliers** to move forward in deploying more sustainable energy solutions.

Release of *Prioritize*

September 9, 2008
Washington, D.C.

Drawing upon the findings from the Progressive Dialogues and the wisdom of the Initiative's Steering Committee and advisory group, the Council synthesized the new intellectual capital generated in 2007–2008 into a set of priority actions for government leadership. This plan, titled *Prioritize*, outlined action steps for the president to take within his first 100 days in office to move the nation forward toward a comprehensive energy security roadmap.

The National Energy Summit & International Dialogue

September 23–24, 2009
Washington, D.C.

The Council convenes a distinguished assembly of U.S. cabinet officials, international ministers and global business, labor, university and non-governmental organization leaders at an invitation-only event to address the interconnected challenges of energy security, innovation and sustainability. At the Summit, the Council presents this comprehensive action agenda designed to enhance U.S. energy security, sustainability and competitiveness.

Regional Energy Summit Series

February 13, 2009 Houston, TX

Clarence P. Cazalot Jr., president and CEO of Marathon Oil Corporation, hosted a regional summit on the path to achieving sustainable energy supplies and the impact of the economic stimulus package on U.S. energy security. This meeting was held in concert with CERAWEEK 2009, the annual conference that brings executives from around the world together to discuss global energy issues.

April 15, 2009 New Brunswick, NJ

Ralph Izzo, chairman, president and CEO of Public Service Enterprise Group, and Richard L. McCormick, president of Rutgers, The State University of New Jersey, co-hosted a regional summit on ways to promote energy efficiency in the utility industry and lessons for the nation that can be learned from the rollout of the Regional Greenhouse Gas Initiative (RGGI).

May 13–14, 2009 Chicago, IL

James Owens, chairman and CEO of Caterpillar Inc.; Robert Zimmer, president of The University of Chicago; and Eric Isaacs, director of Argonne National Laboratory, co-hosted a regional summit focused on forward-looking energy investments and policy that will make possible a more successful and sustainable Midwest—and a more competitive United States of America.

July 30, 2009 Mountain View, CA

S. Pete Worden, director of NASA Ames Research Center; Mark Yudof, president of the University of California; George Miller, director of Lawrence Livermore National Laboratory; Paul Alivisatos, interim director of Lawrence Berkeley National Laboratory; and Thomas Baruch, founder and managing director of CMEA Capital, co-hosted a regional summit on lessons that can be learned from the successes of California and other western states as front-runners in the development and deployment of sustainable energy technologies.

Appendix A

Recommendations from *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*

Setting the Global Bar for Energy Efficiency

Issue an executive order mandating that the Federal Government use the procurement process to lead the market toward efficient energy standards for goods and services, as well as in the construction and retrofitting of facilities, while reducing the carbon load. Using its purchasing power, the government can move the marketplace.

- Direct the Secretaries of Energy and Commerce and the Administrators of the Environmental Protection Agency and General Services Administration, in coordination with the Secretaries of State and Defense and the U.S. Trade Representative, to work together with private sector standard-setting bodies to accelerate the development, rapid adoption and international recognition of the world's leading energy efficiency standards, together with a labeling, measurement and verification system.
- Direct all federal agencies and U.S. Government contractors to procure the most advanced and cost-competitive energy efficient equipment and vehicle fleets and to purchase low carbon fuel and electric power where available.
- Direct the Administrator of the General Services Administration, the Secretary of Defense and the Administrator of the National Aeronautics and Space Administration to amend the Federal Acquisition Regulation to require comprehensive energy efficiency compliance provisions in all U.S. Government contracts, without undue regulatory burden on small and medium-sized businesses.

Assuring Access to Clean and Competitive Energy

Immediately develop and utilize all sources of energy in America in sustainable ways—including oil, gas, coal, nuclear, hydro, wind, solar, biofuels, geothermal, laser fusion-fission and other advanced energy sources—and level the playing field on subsidies while creating incentives to discover and deploy new energy sources, consistent with environmental standards and safeguards.

- Direct the Secretary of Treasury to lead a Cabinet-level working group on “Clean Energy Incentives” to construct a transparent, non-discriminatory, long-term

and consistent investment framework to promote affordable clean energy, taking into account full life-cycle costs and environmental impact, as well as regulatory compliance, legal liability, tax rates, incentives and depreciation schedules and market distortion from global trade subsidies and tariffs.

- Direct the Office of Management and Budget to create a cross-governmental task group to identify barriers to various sources of energy production and to issue a Presidential Executive Order, or propose legislation as necessary, to optimize federal agency regulatory regimes.

Jumpstarting Energy Infrastructure Investments

Throughout history, our government has set aside loans for Americans to afford homes, start small businesses and pursue higher education in order to strengthen and stabilize our nation. Today, our country requires a \$200 billion National Clean Energy Bank to provide debt financing and drive private investment in the development of sustainable energy solutions and supporting infrastructure.

- Direct the Secretaries of Treasury and Energy to propose legislation to establish and capitalize a \$200 billion National Clean Energy Bank, modeled on the U.S. Export-Import Bank and Overseas Private Investment Corporation, to provide long-term financing—including loan guarantees, lines of credit, equity investments and insurance—for the market deployment of breakthrough energy efficiency and clean energy products, technologies, services and projects that reduce, avoid or sequester carbon.

Spawning Technological Breakthroughs and Entrepreneurship

From the Great Depression to 9/11, Americans have come together to address threats to our nation's security and prosperity. Today, energy is the biggest national and economic security issue facing our country, and America needs to answer the call again. To ensure the American way of life is preserved, we need to drastically ramp up investment in R&D and market commercialization to deliver secure, sustainable and affordable clean energy while generating well paying domestic jobs.

Direct the Secretary of Energy to create the “21st Century Clean Energy Leadership Initiative,” a public-private partnership funded at \$250 million and matched by state and private sector investments, to create regionally-based R&D test-beds and large-scale commercial pilots, while leveraging the existing federal R&D infrastructure.

- Expand the Small Business Innovation and Research (SBIR) Program, which allocates 2.5 percent of eleven cabinet agencies’ extra-mural R&D budgets, to provide critical “Phase III” mezzanine financing for clean energy start-up businesses.
- Create a Small Business Administration “Clean Energy Entrepreneurs Initiative” to support the job engines of America’s economy—small- and medium-sized businesses—in the development and deployment of clean energy technologies.
- Allocate at least 10 percent of the existing funding for technology pre-commercialization programs across all federal agencies to accelerate development and deployment of mature clean energy technologies across the R&D portfolio.
- Triple the current federal investment in basic and applied energy R&D across all federal agencies and departments.
- Direct the Secretary of Energy to establish and operate a web-based “Clean Energy Resource Center” to serve as a one-stop clearinghouse for information on all federally-funded energy programs, pilots, test-beds, projects and RD&D and to track international energy initiatives and developments.

Mobilizing a World-Class Energy Workforce

Much as computer scientists and aerospace engineers were crucial to winning the space race in the 1960s, we will win the clean energy race by educating the next generation of science and technology researchers, game-changing innovators and professionally trained workers, thereby filling the workforce pipeline with a new generation of skilled talent.

- Direct the Secretary of Labor to create a \$300 million “Clean Energy Workforce Readiness Program,” augmented by state and private sector funding, to foster partnerships between the energy

industry, universities, community colleges, workforce boards, technical schools, labor unions and the U.S. military to attract, train and retain the full range of skilled workers for America’s clean energy industries.

- Require all federal agencies to commit 1 percent of their R&D budgets to competitive, portable undergraduate and graduate fellowships in energy-related disciplines for American students.
- Direct the Secretary of Labor to assess, classify and widely publicize the demand-driven needs for energy-related occupations and align federal workforce investment programs and state-directed resources to support skills training and career path development in energy fields for American citizens.

Clearing Obstacles to a National Transmission Superhighway

As with the interstate highway system and the information superhighway, our leaders must knit together the current patchwork of regulations and oversight into a seamlessly connected electrical power highway that is technologically capable of allowing both on and off ramps for all energy sources in the 21st century, while retaining and strengthening current consumer and worker protections.

- Direct the Federal Energy Regulatory Commission (FERC) to appoint a fully independent regional planning entity for the transmission superhighway, with FERC having final regulatory authority on determining the need for siting of transmission facilities.
- Direct the FERC to set national interconnection standards for a 21st century interoperable grid and transmission system capable of connecting multiple new energy sources and devices to the system.
- Direct the President’s Science Advisor to establish the “High-Performance Computing Transmission Initiative,” creating a consortium of national laboratories, universities, industry and organized labor to model and simulate the design, construction and operation of an intelligent, self-healing, electrical grid—integral to a national high-performance transmission system.

Appendix B

Council on Competitiveness Scorecard

Competitiveness Scorecard for Congress and the Administration

Key Council on Competitiveness recommendations included in the American Recovery and Reinvestment Act

	Compete	Prioritize	Rebound
<ul style="list-style-type: none"> • More than \$22 billion for scientific research—including NASA, NIH, NSF, NIST, NOAA—and for energy efficiency and renewable energy research.
<ul style="list-style-type: none"> • \$750 million for job training programs, including \$500 million for “green” jobs.
<ul style="list-style-type: none"> • \$6 billion to fund the Innovation Technology Guarantee program, including the Advanced Technology Vehicles Manufacturing Loan Program.
<ul style="list-style-type: none"> • Innovation Fund—\$650 million in incentives awarded to schools who close the performance gap in low income schools.
<ul style="list-style-type: none"> • \$3.4 billion for carbon capture and sequestration technology demonstration projects.
<ul style="list-style-type: none"> • \$11 billion for research and development, pilot projects and federal matching funds for the Smart Grid Investment Program.
<ul style="list-style-type: none"> • \$6 billion for loans for renewable energy power generation research.
<ul style="list-style-type: none"> • More than \$4.8 billion to improve the energy efficiency of government buildings and fleets.
<ul style="list-style-type: none"> • Temporary increase in limitations on expensing of certain depreciable business assets.
<ul style="list-style-type: none"> • \$5 billion for low-income families to weatherize their homes.
<ul style="list-style-type: none"> • \$300 million to provide consumers with rebates for buying energy efficient Energy Star products to replace old appliances.

Appendix C

Executive Summary: Highlights from the Southern Energy Summit

The path to true energy sustainability will not be fast or easy and will require unprecedented cooperation between government, the private sector and the American public.

More than a dozen energy experts convened in Houston, Texas, on February 13, 2009, for the first in a series of four regionally-based energy summits being held by the Council on Competitiveness. The Southern Energy Summit was hosted by Marathon Oil Corporation, and participants explored the public policy, business and technological challenges to increasing the diversity and sustainability of U.S. energy supplies.

There was strong consensus that no single form of energy can satisfy the projected doubling, if not tripling, of demand by the year 2050 while also meeting pressing environmental challenges, including climate change. Innovative technology such as carbon capture and storage, new mitigation techniques and alternative forms of energy must all be brought to bear.

However, unlike breakthroughs in information technology, advancing broad-based energy innovation requires an enormous scale that must be factored into any equation that represents an energy solution.

Further, the time frame for developing alternative forms of energy is much longer than many believe and is not understood by the general public, whose support for sustainability is critical. Some panelists estimated that it will take more than 50 years to achieve the vision of an energy system that is locally tailored and has tremendous diversity in generation. A long-term commitment to energy sustainability may also require some game-changing strategies that calm volatile energy markets and avoid political cycles. Taking a page from U.S. economic history, one panelist suggested the creation of an independent Federal Energy Reserve Board not unlike the Federal Reserve. The board would be independent and influence

national decisions on energy supply, technology, infrastructure and the nation's carbon footprint to better calm the volatile energy market.

Public-private efforts are critical. Energy sustainability will require partnerships with the federal government, such as the U.S. Department of Energy's National Laboratories, that can provide real-world improvements in both the short- and long-term. Indeed, the roles of government and the private sector in energy sustainability were brought into sharper focus by the pending American Recovery and Reinvestment Act of 2009, also known as the economic stimulus bill. There was cautious optimism that the bill was moving the nation in the right direction by way of focusing on greater energy efficiency, alternative forms of energy and improved infrastructure. Nevertheless, there was concern over Congress picking energy winners and losers. Instead, Congress should challenge industry to produce solutions that will create a clear path forward to energy sustainability that the American people can support.

Appendix D

Executive Summary: Highlights from the Eastern Energy Summit

The Northern United States is aggressively seeking a lead in boosting energy efficiency and reducing carbon emissions.

More than a dozen policy makers, energy experts and corporate leaders met in New Brunswick, N.J., on April 15, 2009, for the second in a series of four regionally-based energy summits being held by the Council on Competitiveness under the auspices of the Energy Security, Innovation & Sustainability (ESIS) Initiative. The Eastern Energy Summit was co-hosted by Public Service Enterprise Group and Rutgers, The State University of New Jersey. Participants discussed initiatives aimed at boosting energy efficiency and reducing greenhouse gas (GHG) emissions, the progress of those initiatives and challenges and plans for the future.

A major focus of the Summit was the Regional Greenhouse Gas Initiative (RGGI), which is the first mandatory cap-and-trade program for carbon dioxide (CO₂) in the Western Hemisphere. Ten states in the Northeast and Mid-Atlantic regions, which collectively represent the eighth largest CO₂-emitting region in the world, are involved in RGGI. The program has created a market-driven auction system for electricity generators that allows the sale, purchase and trade of CO₂ allowances. This critical step of setting a price on carbon can eventually result in a market-driven reduction in carbon emissions. Though still in its infancy, RGGI is being viewed as a model for other regional and national approaches to reduce GHG emissions.

As the Summit was hosted in New Jersey, the state served as a reference for energy and climate initiatives in the region. In October 2008, New Jersey Governor Jon Corzine issued an Energy Master Plan, which is driving dozens of initiatives in the state. The plan calls for a 20 percent reduction in the state's energy use by 2020, a 30 percent increase in the use of alternative energy and a reduction of about 25 percent of GHG emissions, also by 2020.

The plan—combined with funding opportunities created by revenue raised by RGGI, federal stimulus funding and private investors—is transforming the state's energy landscape. New Jersey's approach is to create a market for green technologies, then provide funding and incentives

to help keep manufacturing and jobs in the state. Summit participants described programs and private sector projects designed to reduce the need for fossil-fuel driven technologies, ranging from utility poles powered by attached solar panels and "smart" grid devices to supporting the use of hybrid electric vehicles.

There was overall agreement that energy efficiency requires not only the application of available technologies but also greater public awareness and understanding of the issues surrounding energy and its use. Many felt that if consumers better understood the true cost of energy and the value of energy savings, they would alter their behavior to save energy.

Participants also agreed that energy education is critical and should not be limited to science and engineering subject matter. For example, social science curriculums should explore energy. Learning should begin in kindergarten and persist throughout high school, but it should not end in the classroom. Businesses can also learn how to use energy more efficiently in their operations.

Utilities can also play a major part in energy conservation. They are closest to the consumers and can provide ways to make homes and buildings more efficient, but incentives are needed for them to support alternative energy sources.

While all agreed that the states have an active role to play in increasing energy efficiency, all felt that there is a need for a national energy policy. In addition to federal standards, more research and development (R&D) can create transformational technologies with a clear path to market. The Advanced Research Projects Agency for Energy (ARPA-E)—a new organization within the U.S. Department of Energy that is modeled after DARPA, the defense agency responsible for the Internet and stealth defense—was cited as an exciting opportunity to bring forth game-changing energy solutions.

However, all agreed there is a fine line between quality regulation and red tape. While standardization and improved building codes are beneficial, they should be developed and applied in a manner that does not become a burden for business.

Appendix E

Executive Summary: Highlights from the Midwest Energy Summit

Participants discussed which energy technology and infrastructure investments would have the greatest impact on the region's—and the nation's—sustainability and competitiveness.

Energy experts, corporate leaders and academics met at Argonne National Laboratory outside Chicago on May 14, 2009 for the third in a series of four regionally-based energy Summits held by the Council on Competitiveness under the auspices of the Environmental Security, Innovation & Sustainability Initiative. This Midwest Summit was co-hosted by the University of Chicago, Argonne National Laboratory and Caterpillar Inc.

Robert J. Zimmer, president of the University of Chicago, opened the meeting with an explanation of why Argonne National Laboratory was such a fitting location for the deliberations. Argonne has long been a place where people have come together to address significant technological challenges, dating back to the development of the first atomic bomb. The intertwined challenges of energy security and sustainability, he noted, would require a similar degree of collaboration.

In a keynote speech, John W. Rowe, chairman and chief executive officer of Exelon Corporation, explained the stubborn facts associated with the economics of energy and carbon emissions. The challenge of reducing emissions is complex, and a price signal on carbon—while critically important—does not solve all the problems. Well regulated competitive markets, he concluded, offer the best mechanism for encouraging economically sound solutions and innovation.

Participants in the Summit's plenary sessions agreed on the need for increased research and development activity, as the current menu of available technologies is inadequate to meet the nation's energy security, sustainability and competitiveness challenges. To that point, two of the Midwest's greatest energy resources—coal and shale gas—both require enabling technologies that have not yet been perfected. A third, wind, relies largely on technology that has matured but is limited in its capacity to meet future clean energy needs.

There was a general consensus among participants that more R&D funding is needed, but money is only part of the problem. One challenge is to use scarce resources to develop a diverse portfolio of energy technologies, rather than picking winners and losers. Another is to make sure that R&D projects have clear commercial application. With the latter point in mind, a number of participants recommended that technologies be developed in collaboration with private-sector partners.

Participants generally agreed that a cultural shift was taking place around energy issues, particularly among the young, but there was disagreement over its import. Some equated it to changing mores associated with smoking, which led to significant changes in behavior. Others questioned the depth of commitment behind the rhetoric and suggested that behavior is more likely to change in response to clear price signals.

There was universal agreement that the United States is falling behind the rest of the world when it comes to the manufacturing of clean energy technologies—an issue of particular importance in the industrial Midwest. No consensus emerged as to how to address this problem, but a few participants advocated copying the aggressive industrial policies instituted by several other countries in their efforts to grab market share.

On the infrastructure side, the O'Hare Modernization Program was offered up as an example not only of how to build greener infrastructure, but also of how green infrastructure improvements can improve regional competitiveness. There was, however, general agreement that federal leadership is necessary to overcome financial and jurisdictional challenges to building the kind of large-scale infrastructure projects that would meaningfully advance the nation's energy security and sustainability goals. A number of participants also pointed out that meeting these goals will require that the nation's energy challenges be examined at the systems level, rather than simply considering the particulars.

Appendix F

Executive Summary: Highlights from the Western Energy Summit

Participants discussed the lessons that could be learned from California's experience as a front-runner in sustainable technology development and deployment, as well as the relative roles of the private and public sectors in addressing the conjoined challenges of energy security and sustainability.

A distinguished assembly of corporate chief executives, university presidents, national lab directors and energy experts met on July 30, 2009, at the NASA Ames Research Center in Silicon Valley, for the last in a series of four regionally-based energy Summits held by the Council on Competitiveness under the auspices of the Environmental Security, Innovation & Sustainability Initiative. The Western Summit was co-hosted by the NASA Ames Research Center, CMEA Capital, the University of California, Lawrence Livermore National Laboratory and Lawrence Berkeley National Laboratory.

During his opening remarks, NASA Ames Research Center Director S. Pete Worden set the tone by framing the nation's space program as a catalyst for planetary environmental awareness, and by sharing some of NASA Ames' successes in developing clean energy technologies. Dr. Steven E. Koonin, Under Secretary for Science in the U.S. Department of Energy, gave the keynote address, emphasizing the unique scale of the energy security and sustainability challenge, and the importance of reinvigorating the nation's basic science and energy programs.

Apropos of the location, much of the Summit's plenary discussion focused on technology research and development. Participants generally agreed on the existence of a de facto division of labor among universities, national labs and the private sector, with the universities focused on basic research, national labs specializing in technology development and private sector firms engaged in applied research projects with relatively short-time horizons. All agreed that government funding was essential for long-term and high-risk projects, and there was a strong consensus in favor of creating institutions that would provide "connective tissue" for researchers working on similar projects at different institutions, such as the Bay Area's Joint BioEnergy Institute. Similarly, participants expressed support for increased public-private research partnerships and the need for greater international collaboration.

There was also considerable discussion of the underappreciated complexity of the joint energy security and sustainability challenge. A number of participants took issue with the "moon shot" and "Manhattan Project" metaphors commonly invoked when discussing the urgent need for solutions. As each pointed out in different ways, the Apollo Program and the Manhattan Project were well-financed government programs designed to produce a handful of technologies for non-commercial use, and for which there were no incumbent competitors. New energy technologies, on the other hand, must compete in the commercial marketplace on price and performance against mature incumbents that operate on a massive scale with an equally massive supportive infrastructure.

In line with this assessment, a number of participants sounded a call for realism when it came to the commercial development of sustainable technologies. Many—including top executives from a few local startups—emphasized the need for robust business models for new market entrants, such as a focus on technologies that are compatible with existing infrastructure or technologies that have multiple commercial applications. Many participants also acknowledged that most clean energy production technologies will require government support as technologies scale up and mature, or until externalities like carbon emissions are fully factored into energy prices. Accordingly, they recommend seeking a sound alignment of federal R&D spending, regulatory and other energy policies and the capital requirements of private sector investors.

Looking at California's experience, there was at least one clear example where technology, policy and capital successfully aligned: the state's effort to allow utilities to profit from energy-efficiency activities. But participants pointed out a number of missed opportunities as well, such as the failure to put stronger energy-efficiency codes into place prior to the state's recently completed construction boom.

With the issue of policy alignment clearly in mind, a number of participants also spoke to the importance of public education on energy issues—not simply to improve consumer behavior, but to build public support for otherwise politically unpalatable choices.

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About the Council on Competitiveness

WHO WE ARE

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans.

The Council on Competitiveness is the only group of corporate CEOs, university presidents and labor leaders committed to ensuring the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.

Council on Competitiveness

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HOW WE OPERATE

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system, and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

FOR MORE INFORMATION

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Energy Security, Innovation and Sustainability Initiative Program Leadership

Deborah L. Wince-Smith is the president of the Council on Competitiveness, a group of CEOs, university presidents and labor leaders committed to driving U.S. competitiveness. She is a Senate confirmed member of the IRS Oversight Board and a member of the Board of Directors of the NASDAQ OMX Group, Inc. and the NASDAQ Stock Exchange. Ms. Wince-Smith also serves on the Secretary of State's Advisory Committee on International Economic Policy, the Board of Governors for the Argonne National Laboratory, and the boards of several private equity startup companies. She has more than 20 years of experience as a senior U.S. government official, including as Assistant Secretary for Technology Policy in the Department of Commerce during the George H.W. Bush administration. Ms. Wince-Smith earned a degree in classical archaeology and graduated Magna cum Laude and Phi Beta Kappa from Vassar College, and earned her master's degree from King's College, Cambridge University. In December 2006 she received an honorary Doctor of Humanities degree from Michigan State University.

Susan Rochford is vice president for energy and sustainability initiatives and joined the Council on Competitiveness in 2006 to launch and lead the Council's flagship project: the Energy Security, Innovation & Sustainability (ESIS) Initiative. Ms. Rochford spearheaded the development of this comprehensive action agenda designed to accelerate innovation and investment in sustainable energy solutions across the U.S. private sector. Prior to joining the Council, Ms. Rochford served as vice president of government, regulatory and industry affairs for Underwriters Laboratories Inc. (UL). Before UL, she served for more than 10 years as director of international affairs for Honeywell Inc. Ms. Rochford holds a Bachelor of Arts in political science from the University of Connecticut and a master's degree in international management from Thunderbird, The Garvin School of International Management.

Steve Koerner is the policy director for energy and sustainability initiatives, responsible for monitoring energy, environmental and economic issues efforts across all levels of government. He also evaluates academic, government and relevant think tank literature and participates in the drafting and execution of the project's publications. Prior to joining the Council, Dr. Koerner spent six years working on Capitol Hill as a legislative assistant, first to Rep. Rick Lazio of New York, and then to Sen. Richard Lugar of Indiana. He has also managed political campaigns at the state and federal levels, and has worked as a headhunter in the pharmaceutical industry. Dr. Koerner holds a doctorate in American history from the University of Virginia and a Bachelor of Arts from Georgetown University.

Kara Jones is the senior research associate for energy and sustainability initiatives. She conducts research across the spectrum of energy and climate issues and contributes to the data analysis and writing of the project's reports and white papers, including this action agenda. Ms. Jones also supports initiative events and was instrumental in planning and executing the National Energy Summit & International Dialogue. Prior to joining the Council, she spent two years teaching English as a second language classes at a private language school and managing her own private tutoring business. Ms. Jones holds a Bachelor of Arts in anthropology and philosophy-neuroscience-psychology from Washington University in St. Louis.

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Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 6: National Energy Summit & International Dialogue Program

**Council on
Competitiveness**

**The National
Energy Summit
& International
Dialogue**

Driving Competitiveness through Sustainable Energy

September 23–24, 2009
Renaissance Mayflower Hotel
Washington D.C.

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The future economic prosperity of the United States is inextricably tied to our ability to create a sustainable and balanced energy system. The private sector is the pivotal actor in achieving energy system transformation with speed and at scale.

Creating the conditions that foster investment in 21st century energy infrastructure, propel private sector innovation and elevate energy management to a more strategic level will help to dramatically improve the U.S. economy, environment, national security and standard of living. It will also lead the nation to the forefront of a remarkable new era of technological advances, market and industrial transformation and innovation on every scale.

The Council on Competitiveness launched the Energy Security, Innovation & Sustainability (ESIS) Initiative in 2007 to bring together a cross section of national leaders to address one of the most important issues facing our country. The Initiative is guided by a CEO-level steering committee comprised of a diverse group of chief executives from business, labor and academia. It is co-chaired by James W. Owens, chairman and CEO of Caterpillar Inc.; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; and D. Michael Langford, national president of the Utility Workers Union of America, AFL-CIO. These leaders bring strategic domestic and global perspectives to the multiple facets of the energy-competitiveness equation.

The goal of the Initiative is to enhance U.S. competitiveness and energy security by developing a public-private action agenda to drive private sector demand for sustainable energy solutions and create new markets, industries and jobs.

The National Energy Summit

September 23, 2009

Day 1

National Leaders to Seek Breakthroughs on U.S. Energy Transformation

In the past few years, the national debates on energy security and climate change, once occurring separately, have now been joined. The United States has largely moved beyond the period of intensive diagnosis of the issues and challenges inherent in energy system transformation and carbon mitigation. Through the efforts of the Council, its distinguished partners and other organizations, a range of recommendations has been identified to convert these challenges into economic opportunities.

A broad consensus has emerged in several core areas. The time for debate is over. The United States must take decisive action to:

- Drive energy efficiency through all sectors of the economy;
- Incorporate externalities in energy pricing and remove unnecessary barriers to the sustainable production of new sources of energy;
- Provide competitive financing for energy-related infrastructure and manufacturing investments;
- Ramp up energy R&D and foster the innovative capacity of the nation's research and entrepreneurial communities;
- Retool workforce education and training for a clean energy economy; and
- Build out an advanced transmission and smart grid system.

The task now before the nation is implementation. The United States must come to terms on how these objectives will be achieved. A step-change in system transformation requires new coalitions to support systemic change at every level—especially in the technological, commercial, policy and political arenas.

The goal of the National Energy Summit is to convene a broad range of industry, academic, scientific and labor leaders and top administration officials to identify and catalyze the market, policy and/or political breakthroughs necessary to achieving transformational change in the way the United States produces and consumes energy.

The National Energy Summit: Agenda

The future economic prosperity of the United States is inextricably tied to our ability to create a sustainable and balanced energy system. The private sector is the pivotal actor in achieving energy system transformation with speed and at scale. One year after the release of its landmark *Prioritize: A 100-Day Energy Action Plan for the 44th President of the United States*, the Council on Competitiveness is convening a broad range of industry, academic, scientific and labor leaders and top administration officials to evaluate the nation's progress in creating the enabling conditions and policy predictability necessary to achieving energy system transformation.

Renaissance Mayflower Hotel

1127 Connecticut Avenue, NW
Washington, D.C. 20036

MORNING

7:15 Registration and Networking Breakfast
Location: Promenade, Lobby Level

7:45 Welcoming Remarks
Location: East/State Room, Lobby Level

- The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness

7:50 Introductory Remarks

- Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont

8:00 ESIS Initiative Co-Chairs Roundtable
Drive. Private Sector Demand for Sustainable Energy Solutions: A Comprehensive Roadmap to Achieve Energy Security, Sustainability and Competitiveness

Moderator: Ms. Eleanor Clift, Contributing Editor, Newsweek

- Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont
- The Hon. Shirley Ann Jackson, Vice Chairman, Council on Competitiveness; Co-Chair, ESIS Initiative; President, Rensselaer Polytechnic Institute
- Mr. James W. Owens, Co-Chair, ESIS Initiative; Chairman and CEO, Caterpillar Inc.
- The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness

8:25 Leadership Dialogue I:
Setting the Global Bar for Energy Efficiency

Moderator: Mr. Richard M. Smith, Chairman, Newsweek

- Mr. George A. David, Chairman, United Technologies Corporation
- Mr. John Krenicki, Jr., Vice Chairman, General Electric Company; President and CEO, GE Energy Infrastructure
- Mr. Jonathan Lash, President, World Resources Institute
- Mr. Frederick W. Smith, Chairman and CEO, FedEx Corporation

9:20 Leadership Dialogue II:
Assuring Access to Clean and Competitive Energy

Moderator: Mr. Nisid Hajari, Director of Editorial Development, Newsweek

- Mr. Clarence P. Cazalot Jr., President and CEO, Marathon Oil Corporation
- Mr. Steven F. Leer, Chairman and CEO, Arch Coal, Inc.
- Mr. Kevin Parker, CEO, Deutsche Asset Management, Deutsche Bank
- Mr. Mayo Shattuck III, Chairman, President and CEO, Constellation Energy

10:15 Leadership Dialogue III:
Jumpstarting Energy Infrastructure and Manufacturing

Moderator: Ms. Becky Quick, Co-anchor, Squawk Box, CNBC

The National Energy Summit: Agenda

	<ul style="list-style-type: none"> Mr. Neil Z. Auerbach, Founder and Managing Partner, Hudson Clean Energy Dr. Mary Sue Coleman, President, University of Michigan The Hon. Alexander "Andy" Karsner, Member, Board of Directors, Applied Materials, Inc. Mr. Edward J. McElroy, CEO, ULLICO Inc. 		<ul style="list-style-type: none"> The Hon. John P. Holdren, Assistant to the President for Science and Technology; Director, Office of Science and Technology Policy, Executive Office of the President of the United States Dr. George H. Miller, Director, Lawrence Livermore National Laboratory
11:15	Leadership Dialogue IV: Mobilizing a World-Class Energy Workforce Moderator: Mr. Daniel McGinn, Senior Articles Editor, Newsweek <ul style="list-style-type: none"> Dr. Michael M. Crow, President, Arizona State University Mr. Kevin Surace, CEO, Serious Materials Ms. Randi Weingarten, President, American Federation of Teachers, AFL-CIO Dr. Robert J. Zimmer, President, The University of Chicago 	2:30	Presentation by the U.S. Secretary of Energy <ul style="list-style-type: none"> The Hon. Steven Chu, U.S. Secretary of Energy
		3:30	Break
		4:00	Leadership Dialogue VI: Clearing Obstacles to a National Transmission Superhighway and Smart Grid Moderator: Mr. Daniel Gross, Economics Editor, Newsweek <ul style="list-style-type: none"> Mr. Russell M. Artzt, Vice Chairman and Founder, CA Inc. Dr. Richard H. Herman, Chancellor, University of Illinois at Urbana-Champaign Dr. Ralph Izzo, Chairman, President and CEO, Public Service Enterprise Group Incorporated Mr. Andrew C. Taylor, Chairman and CEO, Enterprise Holdings, Inc. Mr. Joseph L. Welch, Chairman, President and CEO, ITC Holdings Corp.
AFTERNOON			
12:15	Luncheon Location: Grand Ballroom, Lobby Level		
12:25	Luncheon Remarks <ul style="list-style-type: none"> The Hon. Lisa Murkowski, U.S. Senator, Alaska The Hon. Mark R. Warner, U.S. Senator, Commonwealth of Virginia 		
1:00	Luncheon Keynote <ul style="list-style-type: none"> The Hon. Raymond H. "Ray" LaHood, U.S. Secretary of Transportation 	5:00	Closing Comments
1:30	Leadership Dialogue V: Spawning Technological Breakthroughs and Entrepreneurship Location: East/State Room, Lobby Level Moderator: Mr. Daniel Lyons, Technology Editor, Newsweek <ul style="list-style-type: none"> Mr. Thomas R. Baruch, Founder and Managing Director, CMEA Capital Dr. Ralph J. Cicerone, President, National Academy of Sciences 	5:05	Adjourn

An International Dialogue

September 24, 2009

International Leaders to Forge Shared Principles for Collaboration

The energy security, climate change and other sustainability challenges confronting the world transcend national boundaries. No nation is able to meet these challenges through actions taken only within its own borders. Nor is any nation unique in its desire or its efforts to convert these challenges into economic opportunity.

- Countries around the world are striving to retool and reboot their economies, while also taking measures to enhance their energy security and manage their carbon footprint.
- Governments are employing various strategies to stimulate the capital formation necessary to fund the development of next generation energy technologies and supporting infrastructure.
- Leading global companies are acting upon the business case for sustainable energy and driving these best practices down and across global supply chains, putting in motion a powerful multiplier effect that will accelerate carbon mitigation and enhance energy security.
- Global scientific and engineering talent is on the move, as public-private partnerships and research collaborations are forming to harness knowledge and transfer solutions across markets.

As the world migrates to a low-carbon economy, all nations must reimagine and transform energy production and consumption. This transformation presents a tremendous opportunity for worldwide economic development, growth and prosperity if the terms and conditions on which nations join efforts to develop and deploy sustainable energy solutions are conducive to this outcome.

The goal of the International Dialogue will be to build on the insights and findings of the National Energy Summit and initiate a global exchange on the public policies, innovative partnerships and best practices that will unleash innovation in and accelerate market adoption of sustainable energy solutions across the globe.

Going forward, the Council and its global partners will work together to ensure that the private sector plays a key role in shaping the outcome of the United Nations Climate Change Conference 2009 (COP15) in Copenhagen and negotiations yet to come.

An International Dialogue: Agenda

The Council's leadership recognizes the global context and linkages in which U.S. efforts will be undertaken and the importance of shaping a global vision to guide collective action in addressing the world's shared economic, environmental and energy challenges. Transformation of the global energy system presents a tremendous opportunity for worldwide economic development, growth and prosperity if the terms on which nations join efforts and share sustainable energy solutions are conducive to this outcome.

Renaissance Mayflower Hotel

1127 Connecticut Avenue, NW
Washington, D.C. 20036

MORNING

7:15 Registration and Networking
Location: Promenade, Lobby Level

7:45 Global Leadership Breakfast
Location: Grand Ballroom, Lobby Level

8:00 Welcoming and Introductory Remarks

- Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont
- The Hon. Shirley Ann Jackson, Vice Chairman, Council on Competitiveness; Co-Chair, ESIS Initiative; President, Rensselaer Polytechnic Institute
- The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness

8:15 A Call to Action for Prosperity and Competitiveness in a Low-Carbon World

- Dr. David M. Abshire, President, Center for the Study of the Presidency and Congress
- Mr. Raphael Diamond, President and CEO, Securing America's Future Energy
- Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont
- The Hon. Shirley Ann Jackson, Vice Chairman, Council on Competitiveness; Co-Chair, ESIS Initiative; President, Rensselaer Polytechnic Institute
- The Hon. Alexander "Andy" Karsner, Member, Steering Committee, Energy Future Coalition; Member, Board of Directors, Applied Materials, Inc.
- Mr. Jonathan Lash, President, World Resources Institute

- Mr. James H. Quigley, Co-Chair, TransAtlantic Business Dialogue; CEO, Deloitte Touche Tohmatsu
- Mr. Björn Stigson, President, World Business Council for Sustainable Development
- Mr. Strobe Talbott, President, The Brookings Institution
- The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness
- The Hon. Timothy E. Wirth, President, United Nations Foundation

8:35 Ministers Roundtable:
Energy and Competitiveness Outlook

Moderator: Newsweek

- Mr. Ola Alterå, State Secretary for Energy, Ministry of Energy, Enterprise and Communications of Sweden
- H.E. Maria van der Hoeven, Minister of Economic Affairs of the Netherlands

9:30 Leadership Roundtable I:
The Global Economic Development Opportunity
Location: East/State Room, Lobby Level

Moderator: Mr. Michael Hirsh, National Economics Correspondent, Newsweek

- Ms. Cynthia Carroll, CEO, Anglo American PLC
- Dr. John J. "Jack" DeGioia, President, Georgetown University
- Mr. Jamshyd N. Godrej, Chairman and Managing Director, Godrej & Boyce Manufacturing Company Limited

An International Dialogue: Agenda

	<ul style="list-style-type: none"> The Hon. Edward G. Rendell, Governor of Pennsylvania Ms. Hélène Pelosse, Director-General, International Renewable Energy Agency 		<ul style="list-style-type: none"> Mr. Helmy Abouleish, Chairman, Board of Directors, Egyptian National Competitiveness Council; Managing Director, Sekem Group Mr. Meyer S. "Sandy" Frucher, Vice Chairman, The NASDAQ OMX Group Dr. Susan Hockfield, President, Massachusetts Institute of Technology H.E. Kandeh Yumkella, Director-General, United Nations Industrial Development Organization
10:30	Break		
11:00	Leadership Roundtable II: The Business Case for Pursuing Sustainability Strategies Moderator: Mr. Björn Stigson, President, World Business Council for Sustainable Development <ul style="list-style-type: none"> Mr. Ahmet Dördüncü, CEO, Hacı Ömer Sabancı Holding A.S. Mr. Pierre L. Gauthier, CEO, ALSTOM Inc. Mr. S. Gopalakrishnan, CEO and Managing Director, Infosys Technologies Limited Mr. James H. Quigley, CEO, Deloitte Touche Tohmatsu 		
		3:15	Break
		3:45	Leadership Roundtable IV: Enabling Technology Cooperation and Deployment to Achieve Energy Security, Sustainability and Competitiveness Moderator: The Hon. Timothy E. Wirth, President, United Nations Foundation <ul style="list-style-type: none"> Dr. Dan E. Arvizu, Director, National Renewable Energy Laboratory H.E. Ólafur Ragnar Grímsson, President of Iceland Mr. Robert Edward "Ted" Turner III, Chairman, Turner Enterprises, Inc.
AFTERNOON			
12:00	Question & Answer with Council President: Analysis of Newsweek's Inaugural Green Rankings of the 500 Largest U.S. Companies <ul style="list-style-type: none"> Ms. Kathleen Deveny, Deputy Editor and Global Business Editor, Newsweek The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness 		
12:30	Luncheon Location: Grand Ballroom, Lobby Level		
1:05	Luncheon Keynote <ul style="list-style-type: none"> The Hon. Gary Locke, U.S. Secretary of Commerce 		
1:40	Luncheon Presentation <ul style="list-style-type: none"> Mr. James Clifton, CEO, Gallup Inc. 		
2:00	Break		
2:15	Leadership Roundtable III: Strategies to Drive Investment in Sustainable Energy Solutions Location: East/State Room, Lobby Level Moderator: Ms. Rana Foroohar, Senior Editor, Business, Newsweek International		
		5:15	Closing Remarks <ul style="list-style-type: none"> Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont
		5:30	Adjourn
		4:45	Forging Global Cooperation and Partnership <ul style="list-style-type: none"> Mr. Walter P. Havenstein, CEO, Science Applications International Corp. Mr. Charles O. Holliday, Jr., Chairman, Council on Competitiveness; Chairman, DuPont The Hon. Shirley Ann Jackson, Vice Chairman, Council on Competitiveness; Co-Chair, ESIS Initiative; President, Rensselaer Polytechnic Institute Mr. Lee A. McIntire, President and CEO, CH2M HILL Dr. Luis M. Proenza, President, The University of Akron The Hon. Deborah L. Wince-Smith, President, Council on Competitiveness

Speakers

Mr. Helmy Abouleish

Chairman, Board of Directors, Egyptian National Competitiveness Council
Managing Director, Sekem Group

Mr. Helmy Abouleish, graduated Business Administration from the Faculty of Commerce, Cairo University, is deputy chair and managing director of SEKEM Holding. In May 2005, Mr. Abouleish was appointed as the executive director of the Industrial Modernization Center of Egypt, the largest development fund of the country, where he still holds the position of the chair of Managing Council.

He has founded and co-founded various organizations and councils in the field of national development, international trade partnerships and sustainability; one of the most outstanding examples is the establishment of the Egyptian National Competitiveness Council.

Mr. Abouleish is a member of the Social Entrepreneurship Council (Schwab Foundation), the Arab Sustainability Leadership Group and the Climate & Energy Commission of the World Future Council. He furthermore underlines his engagement in facing world challenges like water scarcity and climate change on a national and international level by founding the EcoTec Holding for different renewable energy activities in 2007.

Mr. Ola Alterå

State Secretary for Energy
Ministry of Energy, Enterprise and Communications

Ola Alterå is State Secretary at the Ministry of Enterprise, Energy and Communications in Sweden. His background includes studies in Engineering Physics at Chalmers University of Technology. As Secretary General for the Center Party, Mr Alterå initiated a reform process in terms of politics and organisation. In order to put into practice one of his core interests, renewable energy, he then moved on to a position as the managing director of the Swedish District Heating Association. As of 2006, he holds the position as State Secretary with responsibility for Energy, State Ownership Policy, Primary Industries and Sustainable Development.

Speakers

Dr. Dan E. Arvizu

Director, National Renewable Energy Laboratory

Dan Arvizu is the director of the National Renewable Energy Laboratory (NREL). NREL is the U.S. Department of Energy's primary laboratory for energy efficiency and renewable energy research and development. NREL is operated for DOE by Alliance for Sustainable Energy, LLC (Alliance). Dr. Arvizu is president of Alliance and is executive vice president at the Midwest Research Institute.

Prior to joining NREL, he was the chief technology officer with CH2M HILL Companies, Ltd. and was an executive with Sandia National Laboratories. He started his career at the AT&T Bell Telephone Laboratories. In 2004, Dr. Arvizu was appointed by the president for a six-year term to serve on the National Science Board, the governing board of the National Science Foundation and the national science policy advisory body to the President and the Congress.

He has a B.S. in Mechanical Engineering from New Mexico State University and a M.S. and Ph.D. in Mechanical Engineering from Stanford University.

Mr. Russell M. Artzt

Vice Chairman and Founder, CA Inc.

Russ Artzt is vice chairman and founder at CA and also provides counsel on strategic partnerships, product development leadership, community and public affairs, board relations and corporate strategy.

Mr. Artzt co-founded CA in 1976 and wrote the code for some of CA's first products. Throughout much of his career at CA, he served as executive vice president of research and development. Prior to his current position, Mr. Artzt served as executive vice president of products. Earlier, he led CA's eTrust security brand and also ran CA's BrightStor storage product line.

Mr. Artzt chairs the Advisory Board of Stony Brook University's Center of Excellence for Wireless and Information Technology and is also a member of the Board of Directors for the Advanced Energy Research Group. In March 2008, he was inducted into the Long Island Technology Hall of Fame. Mr. Artzt received a B.S. in mathematics from Queens College and a M.S. in computer science from New York University.

Speakers

Mr. Neil Z. Auerbach
Founder and Managing Partner
Hudson Clean Energy

Neil Auerbach is founder and managing partner of Hudson Clean Energy. Formerly, he was a partner at Goldman Sachs & Co. where he co-founded the U.S. alternative energy investment business within the Special Situations Group and worked in the company's Debt Capital Markets and Credit Derivatives units.

Mr. Auerbach has served as managing director and head of Structured Capital Markets at Barclays Capital and as principal of a joint venture between Morgan Stanley's Derivatives & Debt Capital Markets groups. He has worked as tax attorney for several law firms and in the Internal Revenue Service.

Mr. Auerbach has an L.L.M from New York University School of Law, a J.D. from Boston University School of Law and a B.S. from the State University of New York at Albany. He is a member of the CEO Council, American Council on Renewable Energy and serves on the Advisory Council of the Prince of Wales' Rainforest Project.

Mr. Thomas R. Baruch
Founder and Managing Director
CMEA Capital

Tom Baruch founded CMEA Capital in 1989. He heads the firm's energy & materials investments to include fuel cells, solar power generation/management, biofuels and rechargeable batteries, among others. He serves as chairman of the board of materials and energy companies including: Codexis, Inc., Cnano Technologies, Intermolecular and Wildcat Discovery Technologies. Mr. Baruch also serves on the boards of Biolight, Draths, Entropic Communications, Exela, Luminus Devices and Solyndra.

Mr. Baruch holds an engineering degree from Rensselaer Polytechnic Institute and a J.D. degree from Capital University. He is a registered patent attorney and is also a member of the Board of Trustees of Rensselaer Polytechnic Institute, the Berkeley Institute for Synthetic Biology, That Man May See Foundation and UC San Diego's Dean's Leadership Council, the Division of Biological Sciences. He also serves as a board member of the Energy Security, Innovation & Sustainability Initiative Steering Committee of the Council on Competitiveness.

Speakers

Ms. Cynthia Carroll
Chief Executive Officer
Anglo American PLC

Cynthia Carroll became chief executive of Anglo American plc in March 2007. The company is a leader in the global mining industry, ranking in the top 20 companies on the London Stock Exchange's FTSE 100 Index. It is the world's biggest producer of platinum and, through its associate, De Beers, diamonds. It is a major producer of coal and copper and is developing a significant stake in iron ore.

Ms. Carroll has a Master of Science in Geology from the University of Kansas and a Master of Business Administration from Harvard Business School. Her career began with Amoco as a petroleum geologist. In 1989, Ms. Carroll joined Alcan Inc where she spent 18 years. Under her leadership, the Primary Metal Group became Alcan's biggest and most profitable division.

Ms. Carroll is a non-executive director of BP plc, a member of the British Council for Britain and a former director of Sara Lee Corporation.

Mr. Clarence P. Cazalot Jr.
President and Chief Executive Officer
Marathon Oil Corporation

Clarence Cazalot is president and chief executive officer of Marathon Oil Corporation and a member of Marathon's Board of Directors.

Mr. Cazalot graduated from Louisiana State University in 1972 with a bachelor's degree in geology and was awarded an Honorary Doctorate of Humane Letters from Louisiana State University in 2007.

He began his career with Texaco Inc. in 1972 year as a geophysicist. While with Texaco, he held a number of senior management positions, including president of Texaco Exploration and Production Inc., president of Texaco International Marketing and Manufacturing, president of International Production and chairman of London-based Texaco Ltd., president of Texaco's worldwide production operations and a vice president of Texaco Inc.

Mr. Cazalot serves on the boards of Baker Hughes Incorporated, the U.S.-Saudi Arabian Business Council, the American Petroleum Institute and the Greater Houston Partnership. He is a member of The Business Council and serves on the Advisory Board of the World Affairs Council of Houston.

Speakers

The Honorable Steven Chu
U.S. Secretary of Energy

Steven Chu, distinguished scientist and co-winner of the Nobel Prize for Physics (1997), was appointed by President Obama as the 12th Secretary of Energy and sworn into office on January 21, 2009.

Prior to his appointment, Dr. Chu was director of Lawrence Berkeley National Lab and professor of Physics and Molecular and Cell Biology at the University of California. He recently led the Lab in pursuit of new alternative and renewable energies. Previously, he held positions at Stanford University and AT&T Bell Laboratories.

Secretary Chu is a member of the National Academy of Sciences, the American Philosophical Society, the Chinese Academy of Sciences, Academia Sinica, the Korean Academy of Sciences and Technology and numerous other civic and professional organizations. He received an A.B. degree in mathematics, a B.S. degree in physics from the University of Rochester, a Ph.D. in physics from the University of California, Berkeley as well as honorary degrees from 10 universities.

Dr. Ralph J. Cicerone
President
National Academy of Sciences

Ralph Cicerone is president of the National Academy of Sciences and chair of the National Research Council. His research has focused on atmospheric chemistry, the radiative forcing of climate change due to trace gases and the sources of atmospheric methane, nitrous oxide and methyl halide gases. The Franklin Institute recognized his fundamental contributions to the understanding of greenhouse gases and ozone depletion and his public policy leadership to protect the global environment with the 1999 Bower Award and Prize for Achievement in Science.

The American Geophysical Union, the world's largest society of earth scientists, awarded Dr. Cicerone its 1979 James B. Macelwane Award for outstanding contributions to geophysics by a young scientist and its 2002 Roger Revelle Medal for outstanding research contributions to the understanding of Earth's atmospheric processes, biogeochemical cycles and key elements of the climate system. The World Cultural Council honored him with the 2004 Albert Einstein World Award in Science.

Speakers

Ms. Eleanor Clift
Contributing Editor
Newsweek

Eleanor Clift became a contributing editor in September 1994. She writes on the Washington power structure, the influence of women in politics and other issues. She is currently assigned to follow the jockeying over policy and politics in the Democratic-controlled Congress, and last year reported extensively on the 2008 presidential election with analyses of the Republican and Democratic party nominees. Clift also writes frequently for Newsweek.com, where she analyzes the political news of the week.

Formerly *Newsweek's* White House correspondent, Ms. Clift also served as congressional and political correspondent for six years. She was a key member of the magazine's 1992 election team, following the campaign of Bill Clinton from its start to inauguration day. Ms. Clift previously served as Deputy Washington Bureau Chief for *Newsweek*.

Mr. James Clifton
Chief Executive Officer
Gallup Inc.

Jim Clifton is best known in the polling and survey research field for leading the acquisition of The Gallup Organization in 1988, at which time he became chief executive officer of the organization founded by the renowned polling pioneer, Dr. George H. Gallup.

Mr. Clifton is best known in the business world as the creator of The Gallup Path, a metric-based economic model that establishes the linkages among human nature in the workplace, customer engagement and business outcomes. His most recent innovation, the Gallup World Poll, is designed to give the world's 6 billion citizens a voice in key global issues.

Mr. Clifton serves on several boards and is Chairman of the Thurgood Marshall Scholarship Fund. He has received honorary degrees from a number of institutions, including a Doctor of Commerce degree from Bellevue University and Doctor of Humane Letters degrees from Medgar Evers College in New York and Jackson State University in Mississippi.

Speakers

Dr. Mary Sue Coleman

President

University of Michigan

Mary Sue Coleman has led the University of Michigan since 2002. She has unveiled several major initiatives that will have an impact on future generations of students, the intellectual life of the campus, and society at large. These include the interdisciplinary richness of U-M, student residential life, ethics in our society, the economic vitality of the state and nation and issues related to health care.

Dr. Coleman led a groundbreaking partnership between U-M and Google, which will enable the public to search U-M's 7-million-volume library and will open the way to universal access of recorded human knowledge. She is also regarded as a national spokesperson on the educational value of diverse perspectives in the classroom.

She previously was president of the University of Iowa. She holds a chemistry degree from Grinnell College and a doctorate in biochemistry from the University of North Carolina.

Dr. Michael M. Crow

President, Arizona State University

Michael Crow became the sixteenth president of Arizona State University in 2002. He is guiding the transformation of ASU into one of the nation's leading public metropolitan research universities, an institution combining academic excellence, inclusiveness to a broad demographic and maximum societal impact. During his tenure, ASU has established major interdisciplinary research initiatives such as the Biodesign Institute, the Global Institute of Sustainability (GIOS) and more than a dozen new interdisciplinary schools and witnessed an unprecedented research infrastructure expansion and doubling of research expenditures.

He was previously executive vice provost of Columbia University, where he oversaw Columbia's research enterprise and technology transfer operations. A fellow of the National Academy of Public Administration and member of the Council on Foreign Relations, he is the author of books and articles analyzing research organizations and science and technology policy. Crow received his Ph.D. in Public Administration (Science and Technology Policy) from the Maxwell School of Citizenship and Public Affairs, Syracuse University.

Speakers

Mr. George A. David
Chairman
United Technologies Corporation

George David is chairman of United Technologies Corporation. He was elected UTC's president in 1992 and served as chief executive officer from 1994 to 2008. He joined UTC's Otis subsidiary in 1975 and became its president in 1986.

He received his B.A. from Harvard and M.B.A. from the University of Virginia. He is a board member of BP, a member of The Business Council and Vice Chairman of the Peterson Institute for International Economics. He has chaired the boards of the Graduate Business School at the University of Virginia, the National Minority Supplier Development Council, the U.S.-ASEAN Business Council, the TransAtlantic Business Dialogue and the Wadsworth Atheneum Museum of Art.

Mr. David was awarded in 1999 the Order of Friendship from the Russian Federation for contributions to that nation's economy and especially its aerospace industry. France named him to its Legion of Honor in 2002.

Dr. John J. "Jack" DeGioia
President
Georgetown University

John J. DeGioia is the 48th President of Georgetown University. Under his leadership, the University completed a one billion dollar capital campaign, launched the largest expansion of campus facilities in the institution's history, significantly increased student financial aid and strengthened endowments for faculty research. Dr. DeGioia has also helped to deepen Georgetown's engagement with the global community, supporting initiatives ranging from interreligious dialogue to global health. Beyond the Hilltop, he is a member of the Council on Foreign Relations, chair of the Board of Campus Compact, a board member of the Forum for the Future of Higher Education and a board member of the Knight Commission on Intercollegiate Athletics. In 2008, Dr. DeGioia was honored by Washingtonian magazine as a "Washingtonian of the Year."

Speakers

Ms. Kathleen Deveny

Deputy Editor and Global Business Editor
Newsweek

Kathleen Deveny was named deputy editor and global business editor in May 2009 and oversees the business, economics and technology coverage of *Newsweek*, including Enterprise, an expanded business section aimed at high-income readers. She created the "Green Rankings" franchise for the magazine, in which Newsweek ranks the impact that 100 companies have on the environment.

Ms. Deveny was named assistant managing for the back-of-the-book sections in August 1997. She created "The Tip Sheet," and at various times, she has top edited environment, society, lifestyle, health and arts coverage. Ms. Deveny came to *Newsweek* from *The Wall Street Journal*, where she served as editor of the paper's Marketplace page and earlier as reporter and writer covering consumer-products marketing. Prior to joining The Journal, she was a staff editor and a correspondent at *BusinessWeek*, where she began her journalism career in 1983.

Mr. Ahmet Dördüncü

Chief Executive Officer
Hacı Ömer Sabancı Holding A.S.

Ahmet Dördüncü graduated from the Çukurova University Faculty of Business Administration. After his post-graduate studies in Mannheim/Hanover Universities, he began his career in 1981 in Germany. Upon his return to Turkey he continued his career in the automotive industry.

Mr. Dördüncü, who joined Sabancı Group in 1987 attained various managerial posts at Kordsa A.S. between 1987-1999. From 1999 and until his appointment as executive vice president / Business Development and Strategic Planning of Sabancı Holding in August 2004, he served as the chairperson and the general manager of Dusa Argentina and Dusa Brasil and later assumed responsibility of all operations of Dusa International in North America as the general manager.

Mr. Dördüncü has been appointed as chief executive officer of Sabancı Group as of May 2005.

Speakers

Ms. Rana Foroohar
Senior Editor, Business
Newsweek International

Rana Foroohar is a senior editor in charge of all international business and economics coverage for *Newsweek's* overseas editions. She conceives and edits a weekly section of breaking news stories, features and guest pieces. She also writes economic cover stories and opinion pieces.

Ms. Foroohar also oversees *Newsweek's* team of several dozen global correspondents and stringers, directing their reporting on the week's business news. She edits well-known columnists such as hedge fund manager Barton Biggs, Morgan Stanley emerging markets head Ruchir Sharma, Yale professor Jeffrey Garton and PIMCO's Mohamed El-Erian.

In her position, Ms. Foroohar also develops strategic partnerships and plans special issues with content providers such as the McKinsey Global Institute, INSEAD business school and others. She oversees economic coverage for the annual Davos curtain-raiser issue, which has featured articles by Bill Gates, Tony Blair and other VIPs.

Ms. Foroohar chairs panel discussions when in attendance at the annual World Economic Forum in Davos.

Mr. Meyer S. "Sandy" Frucher
Vice Chairman
The NASDAQ OMX Group

Meyer "Sandy" Frucher is vice chairman of The NASDAQ OMX Group. In this role, Mr. Frucher is responsible for global exchange relationships and serves as a senior advisor to NASDAQ OMX's senior management team.

From 1998, Mr. Frucher was chairman and CEO of the PHLX. Before coming to the PHLX, he served as a management consultant to major organizations and as executive vice president of development for Olympia and York. Mr. Frucher also led two major, quasi-public authorities in New York, served as president and CEO of the Battery Park City Authority and was chief labor negotiator for the state.

Mr. Frucher is the founding chairman and trustee emeritus of the Board of the Massachusetts Museum of Contemporary Art and also sits on the Board of the Saratoga Performing Arts Center. He received a Bachelor's degree in Government from Columbia University. He earned a Master of Public Administration degree from the John F. Kennedy School of Government, Harvard University.

Speakers

Mr. Pierre L. Gauthier
Chief Executive Officer
ALSTOM Inc.

Pierre Gauthier joined GEC Alstom in 1996, after various functions in Marketing, Technology, Quality and General Management with Gulf Canada, Gaz Métropolitain and ABB. After a short period of time as vice president Marketing and Sales, he was appointed president of GEC Alstom Electromechanical, president of Alstom Energy and president of ABB Alstom Power Canada Inc. Since the acquisition by ALSTOM of ABB's shares within ABB Alstom Power in 2000, he was appointed president of the Power Division of ALSTOM Canada Inc. In 2002, Mr. Gauthier became North America Hydro Managing Director. In June 2003, he was appointed president and CEO of ALSTOM Canada and as of April 2008, president and CEO of ALSTOM US Inc.

Pierre L. Gauthier is a graduate of École Polytechnique de Montréal in Mechanical Engineering with further studies in Administration at McGill University and the European Institute of Administration. He is Chair of the National Electricity Round Table and member of many other associations.

Mr. Jamshyd N. Godrej
Chairman and Managing Director
Godrej & Boyce Manufacturing Company Limited

Jamshyd N. Godrej is the chairman of the Board of Godrej & Boyce Manufacturing Co. Ltd. of India, which manufactures and markets home appliances, furniture, security equipment and precision tools.

Mr. Godrej is the chairman of the Aspen Institute-India. He is the vice president of World Wide Fund for Nature-International and is a trustee and president emeritus of the World Wide Fund for Nature-India. He is also a director of the World Resources Institute, USA; director of ClimateWorks Foundation, USA; and the chairman of the CII Sohrabji Godrej Green Business Centre. He is the past president of the Confederation of Indian Industry (CII) and the past president of the Indian Machine Tool Manufacturers' Association. He is an ardent yachting enthusiast and has done extensive cruising along the west coast of India. The president of India conferred on Mr. Godrej one of its highest civilian awards, the Padma Bhushan, in 2003.

Speakers

S. Gopalakrishnan

Chief Executive Officer and Managing Director
Infosys Technologies Limited

Kris Gopalakrishnan is the co-founder and currently the chief executive officer of Infosys Technologies Limited. Previously he was the COO, president and joint managing director.

Mr. Gopalakrishnan is part of the International Business Council at the World Economic Forum which identifies and addresses globally relevant business issues and develops practical solutions. IBC also acts as an advisory body providing intellectual stewardship to the World Economic Forum.

He is also currently the chairman of the Indian Institute of Information Technology and Management, Kerala, and vice chairman of the Board for Information Technology Education Standards set up by the Government of Karnataka. Mr. Gopalakrishnan is the vice chairman of the Confederation of Indian Industries Southern Regional Council. He is also a member of ACM, IEEE and IEEE Computer Society. He holds a master's degree in Physics and Computer Science from the Indian Institute of Technology Madras.

His Excellency Ólafur Ragnar Grímsson

President of Iceland

Speakers

Mr. Daniel Gross
Economics Editor
Newsweek

Daniel Gross is one of the most widely read financial and economic writers working today. He is the Economics Editor at *Newsweek*, where he writes "The Money Culture" column. He writes the twice-weekly "Moneybox" column for *Slate*.

Before joining Newsweek in the spring of 2007, Mr. Gross wrote the "Economic View" column in the *New York Times*, was a contributing writer to *New York*, and contributed regularly to magazines such as *Fortune* and *Wired*. He has also served as the editor of *STERNBusiness*.

Gross is the author of five books: *Forbes Greatest Business Stories of All Time*, which was a *New York Times* Business bestseller and a finalist for the *Financial Times* "Lex" award; *Bull Run: Wall Street, the Democrats, and the New Politics of Personal Finance*; *The Generations of Corning: The Life and Times of an American Company*; *Pop! Why Bubbles Are Great for the Economy*; and the ebook *Dumb Money: How our Greatest Financial Minds Bankrupted the Nation*.

Mr. Nisid Hajari
Director of Editorial Development
Newsweek

Nisid Hajari was named director of editorial development in May 2009. In that role, he edits feature stories for the main section of the magazine and supervises special issues and other brand extensions. Previously, Mr. Hajari was foreign editor and continues to oversee international news coverage in this new position.

During his tenure as foreign editor, the magazine won several awards for his foreign coverage, including a Deadline Club Award for "The Hunt for Bin Laden" and multiple honors for the "Voices of the Fallen" special issue, both of which he edited. Previous to that position, Mr. Hajari served as managing editor of *Newsweek International* and as Asia Editor. During his tenure, the overseas edition also won several editorial, photo and design awards, including one for General Excellence for the 2001 Asia Special Issue, "East Meets West" which he top-edited.

Mr. Hajari holds a B.A. in English from Princeton University and an M.A. in Comparative Literature from Columbia University.

Speakers

Mr. Walter P. Havenstein

Chief Executive Officer

Science Applications International Corp.

Walter Havenstein joined Science Applications International Corp. as chief executive officer on September 21, 2009. He is also a member of SAIC's board of directors.

Mr. Havenstein previously served as COO and member of the board of directors for BAE Systems plc, a \$34 billion global aerospace and defense company, and president and CEO of BAE Systems Inc., the company's wholly owned U.S. subsidiary. He was president of the Sanders defense electronics business prior to it being acquired by BAE from Lockheed Martin in 2000 and has held management roles at Raytheon and ITT. He served on active duty in the U.S. Marine Corps from 1971 to 1983 and completed his career in the Marine Corps Reserve in 1999 retiring as a colonel.

He received a bachelor's degree in aerospace engineering from the U.S. Naval Academy and a master's degree in electrical engineering from the Naval Postgraduate School.

Dr. Richard H. Herman

Chancellor

University of Illinois at Urbana-Champaign

Richard Herman is the Chancellor of the University of Illinois at Urbana-Champaign, where he actively promotes excellence in education through innovation, diversity, public engagement, environmental sustainability and a global perspective primed for the 21st century.

Dr. Herman recently served on President's Bush's Council of Advisors on Science and Technology (PCAST). Currently, Dr. Herman serves as chair of the Association of Public and Land-grant Universities' Science and Math Teacher Imperative with the goal of ensuring more and better STEM teachers in grades K-12.

Dr. Herman assists the Council on Competitiveness as co-chair of its High Performance Computing Initiative and as a member of the Steering Committee for the Council's Energy Security, Innovation & Sustainability Initiative. This year Dr. Herman received the prestigious Michael P. Malone International Leadership Award, sponsored by the Association of Public and Land-grant Universities.

Speakers

Mr. Michael Hirsh
National Economics Correspondent
Newsweek

Michael Hirsh covers international affairs for *Newsweek*, reporting on a range of topics from Homeland Security to postwar Iraq. He co-authored the November 3, 2003, cover story, "Bush's \$87 Billion Mess," about the Iraq reconstruction plan. The issue was one of three that won the 2004 National Magazine Award for General Excellence.

Hirsh serves as Washington Web Editor for *Newsweek* and also edited *Newsweek's* "Issues 2007" special issue, which explores all facets and issues of globalization.

Hirsh was the magazine's Foreign Editor from January 2001 to January 2002, and helped guide *Newsweek's* award-winning coverage of the September 11 attacks and the war on terror.

Hirsh was co-winner of the 2002 Ed Cunningham Award for best magazine reporting from abroad for *Newsweek's* terror coverage and contributed to the team of *Newsweek* reporters who earned the magazine the prestigious 2002 National Magazine Award for General Excellence, also for the magazine's coverage of the war on terror.

Dr. Susan Hockfield
President
Massachusetts Institute of Technology

Susan Hockfield, serving since 2004 as the 16th president of the Massachusetts Institute of Technology, is a noted neuroscientist whose research has focused on the development of the brain. Dr. Hockfield is the first life scientist to lead MIT and holds a faculty appointment as professor of neuroscience in the Institute's Department of Brain and Cognitive Sciences. Under her leadership, MIT has launched a major Institute-wide initiative in energy research and education.

Before assuming the presidency of MIT, she was provost at Yale University, where she had taught since 1985 and had also served as dean of the Graduate School of Arts and Sciences. A member of the American Academy of Arts and Sciences, she serves as a director of the General Electric Company and the World Economic Forum Foundation, as a trustee of the Carnegie Corporation of New York and the Woods Hole Oceanographic Institution and as an overseer of the Boston Symphony Orchestra.

Speakers

The Honorable John P. Holdren

Assistant to the President for Science and Technology;
Director, Office of Science and Technology Policy
Executive Office of the President of the United States

John Holdren is Assistant to the President for Science and Technology and director of the White House Office of Science and Technology Policy. Trained in aerospace engineering and theoretical plasma physics at MIT and Stanford, he is a member of the National Academy of Sciences, the National Academy of Engineering and the American Academy of Arts and Sciences, as well as a foreign member of the Royal Society of London and a former president of the American Association for the Advancement of Science. Prior to joining the Obama administration, Dr. Holdren was a professor in both the Kennedy School of Government and the Department of Earth and Planetary Sciences at Harvard University, as well as Director of the Woods Hole Research Center. From 1973 to 1996, he was on the faculty of the University of California, Berkeley, where he co-founded and co-led the interdisciplinary graduate-degree program in energy and resources.

Mr. Charles O. Holliday, Jr.

Chairman, Council on Competitiveness;
Chairman, DuPont

Chad Holliday became chair of the board of Dupont in January 1999. He retired from DuPont as chief executive officer in January 2009. He is a member of the National Academy of Engineering, and he is past chairman of: the Business Roundtable's Task Force for Environment, Technology and Economy; the World Business Council for Sustainable Development; The Business Council; and the Society of Chemical Industry – American Section. Mr. Holliday serves on the board of directors of Deere & Co., CH2MHILL Inc., ClimateWorks Foundation and is chair emeritus of the board of directors of Catalyst. In addition, he is chairman of the U.S. Council on Competitiveness and is a founding member of the International Business Council. He co-authored "Walking the Talk," a book which details the business case for sustainable development and corporate responsibility.

Speakers

Mr. Ralph Izzo

**Chairman, President and Chief Executive Officer
Public Service Enterprise Group Incorporated**

Ralph Izzo was elected chairman and chief executive officer of Public Service Enterprise Group Incorporated in April 2007. He had been the company's president and chief operating officer and a director of PSEG since October 2006.

Mr. Izzo is a well-known leader within the utility industry and the public policy arena. He served as an American Physical Society Congressional Science Fellow in the office of U.S. Senator Bill Bradley. He served four years as a senior policy advisor in the Office of New Jersey Governor Thomas H. Kean.

Mr. Izzo's career began as a research scientist at the Princeton Plasma Physics Laboratory. He has published or presented over 35 papers on magnetohydrodynamic modeling. Mr. Izzo received bachelor and master of science degrees in mechanical engineering and a doctorate in applied physics from Columbia University. He also earned an M.B.A. from the Rutgers Graduate School of Management.

The Honorable Shirley Ann Jackson

**Vice Chairman, Council on Competitiveness; Co-Chair, ESIS Initiative;
President, Rensselaer Polytechnic Institute**

Shirley Ann Jackson is president of Rensselaer Polytechnic Institute. President Obama has appointed Dr. Jackson to serve on the President's Council of Advisors on Science and Technology.

A theoretical physicist, she was chairman of the U.S. Nuclear Regulatory Commission. She serves on the boards of the Smithsonian Institution and the Council on Foreign Relations, is vice chairman of the Council on Competitiveness and co-chairs its Energy Security, Innovation & Sustainability Initiative. She is past president and chairman of the board of the American Association for the Advancement of Science; a member of the National Academy of Engineering and the American Philosophical Society; and a fellow of the American Academy of Arts and Sciences, the American Physical Society and AAAS. She is a member of the board of directors of the NYSE Euronext and a director of IBM, FedEx, Marathon Oil, Medtronic and PSEG.

Dr. Jackson holds a S.B. in physics and a Ph.D. in theoretical elementary particle physics from MIT.

Speakers

The Honorable Alexander "Andy" Karsner

Member, Board of Directors

Applied Materials, Inc.

Andy Karsner served as America's ninth Assistant Secretary for Energy Efficiency and Renewable Energy (EERE) from 2005 to 2008, during a period of unprecedented growth in clean energy technologies, investments and policy formulations. He distinguished himself as a principal architect and contributor to international climate change deliberations toward achieving a post-2012 global energy framework and as America's top regulator for energy efficiency. Mr. Karsner brings twenty years of experience in global energy development and project financing across a wide array of conventional and renewable sources. Previously, he served as chief executive officer of the power development and consulting firm Enercorp, and both director and senior development manager for Wartsila Diesel. Mr. Karsner is currently on the board of directors of Argonne National Laboratory, Conservation International and Applied Materials, the world's leading nanomanufacturer. He is a distinguished fellow at the Council on Competitiveness and a leader of the Energy Future Coalition.

Mr. John Krenicki, Jr.

Vice Chairman, General Electric Company;

President and Chief Executive Officer, GE Energy Infrastructure

John Krenicki is vice chairman of GE and president and chief executive officer of GE Energy Infrastructure. This business segment includes Energy, Oil & Gas and Water & Process Technologies. Prior to his current position, Krenicki served as president and chief executive officer of GE Energy.

Mr. Krenicki's GE career began in the Technical Marketing Program, and he held a number of leadership roles with GE's chemicals & materials businesses and was vice president of the Americas for Lighting, vice president of Superabrasives and president and chief executive officer of Transportation. He also served as senior vice president of GE and president and chief executive officer of GE's Plastics business and president and chief executive officer of GE Advanced Materials.

He is a member of GE's Corporate Executive Council and the GE Capital Board of Directors. Mr. Krenicki earned a B.S. degree in Mechanical Engineering from the University of Connecticut and an M.S. degree in Management from Purdue University.

Speakers

The Honorable Raymond H. "Ray" LaHood

U.S. Secretary of Transportation

Ray H. LaHood became the 16th Secretary of Transportation on January 23, 2009. Secretary LaHood leads an agency with more than 55,000 employees and a \$70 billion budget that oversees air, maritime and surface transportation missions. Secretary LaHood's primary goals in implementing President Obama's priorities for transportation include safety across all modes, restoring economic health and creating jobs.

Before his appointment, Secretary LaHood served for 14 years in the U.S. House of Representatives from the 18th District of Illinois. During that time, he served on the House Transportation and Infrastructure Committee and, after that, on the House Appropriations Committee. He has also served as chief of staff to U.S. Congressman Robert Michel, whom he succeeded in representing the 18th District; as district administrative assistant to Congressman Thomas Railsback; and in the Illinois State Legislature.

Before his career in government, Secretary LaHood was a high school teacher, having received his degree from Bradley University in Peoria, Illinois.

Mr. Jonathan Lash

President

World Resources Institute

Jonathan Lash serves as president of the World Resources Institute in Washington D.C. and is a leading figure and influential voice in the U.S. and international environmental community. Under his leadership, WRI's research and policy analysis have provided innovative, practical solutions to global sustainability challenges.

Mr. Lash is a recognized expert on climate change, energy security and environment and development policies. In 2005, he was named one of the world's Top 100 Most Influential People in Finance in Treasury & Risk Management magazine, the only leader of a non-profit environmental organization to make the list. The same year Rolling Stone included him among "Twenty-five leaders who are fighting to stave off planet-wide catastrophe."

A former co-chair of President Clinton's Council on Sustainable Development, Secretary of Natural Resources for the State of Vermont, Federal Prosecutor, law professor, and Peace Corps volunteer, Mr. Lash serves on the Advisory Board of Generation Investment Management.

Speakers

Mr. Steven F. Leer

Chairman and Chief Executive Officer
Arch Coal, Inc.

Steven Leer is chairman and chief executive officer of Arch Coal, Inc. The second largest U.S. coal producer, Arch generated revenues of \$3.0 billion in 2008 and supplied the fuel for roughly 6 percent of the nation's electricity.

In addition to his executive and board responsibilities with Arch Coal, Mr. Leer serves on the boards of Norfolk Southern Corporation, USG Corporation, Washington University in St. Louis, the National Coal Council, the National Mining Association, the CIAB of the International Energy Agency in Paris and the University of the Pacific. He is vice-chairman of the American Coalition for Clean Coal Electricity.

Mr. Leer graduated from the University of the Pacific with a B.S. in electrical engineering. He received his M.B.A. from Washington University's Olin School of Business. The University of the Pacific awarded him an honorary doctorate in May 1993.

The Honorable Gary Locke

U.S. Secretary of Commerce

Gary Locke was appointed by President Obama as the 36th Secretary of Commerce and sworn into office on March 26, 2009. At the Department of Commerce, Secretary Locke is charged with helping implement President Obama's ambitious agenda to turn around the economy and put people back to work.

Prior to his appointment, Secretary Locke helped U.S. companies break into international markets as a partner in the Seattle office of international law firm Davis Wright Tremaine LLP. There, he co-chaired the firm's China practice and was active in its governmental relations practice. As the popular two-term governor of Washington, the nation's most trade-dependent state, Secretary Locke broke down trade barriers around the world to advance American products. As part of his considerable trade and economic development efforts, he launched Washington's Competitiveness Council.

Locke earned a bachelor's degree in political science from Yale University and a law degree from Boston University.

Speakers

Mr. Daniel Lyons
Technology Editor
Newsweek

Dan Lyons joined Newsweek in August 2008 as a senior editor and columnist, covering technology. He writes the biweekly column "Tectonic Shifts" for the magazine and articles for Newsweek.com.

Before coming to Newsweek, Lyons was a senior editor at Forbes, where he also wrote a column called "Digital Tools." He is best known for the blog he created in 2006 called "The Secret Diary of Steve Jobs," which attracted more than one million page views a month. Lyons is also the author of an award-winning collection of short stories, called "The Last Good Man" and two novels *Dog Days and Options: The Secret Life of Steve Jobs*. Prior to Forbes, Lyons was a freelance journalist covering technology, senior writer at PC Week, a copy editor at the Boston Herald and a reporter at the Eagle-Tribune in North Andover, Mass.

Lyons earned an MFA from the University of Michigan and a B.A. from Bradford College.

Mr. Edward J. McElroy
Chief Executive Officer
ULLICO Inc.

Edward McElroy, life-long educator and labor leader, is chief executive officer of the Union Labor Life Insurance Company (ULLICO Inc.), an insurance and financial services holding company serving the American labor movement. Having served as a director and chairman of the Audit Committee, McElroy provides perceptive vision, strategic positioning and financial management for ULLICO.

Mr. McElroy is also president emeritus of 1.4 million-member American Federation of Teachers, AFL-CIO. In addition, Mr. McElroy served on the AFL-CIO executive council. During his tenure as a national officer, the AFT added more than 500,000 new members. The union's commitment to professionalism and to advancing the well-being of its members, as well as the people they serve, was consistently reflected in Mr. McElroy's priorities and accomplishments.

Mr. McElroy began his career as a teacher in Warwick, R.I. and at age 30, he became president of the Rhode Island Federation of Teachers.

Speakers

Mr. Daniel McGinn
Senior Articles Editor
Newsweek

Daniel McGinn is a senior articles editor at *Newsweek* and based in Boston. He edits the magazine's coverage of business, technology and the economy and continues to write frequently himself.

Mr. McGinn joined *Newsweek* as a summer intern and became an editorial researcher in New York the following year. From 1996 to 1999 he was a correspondent and bureau chief in Detroit, primarily covering the auto industry. From 1999 until 2009 he was a national correspondent in Boston. He specializes in coverage of business and the economy, but has written on a wide range of topics.

Mr. McGinn is a graduate of Boston College and holds an MBA from Auburn University. His freelance work has appeared in *Wired*, *Inc.*, and other magazines. He has appeared on NBC's Today Show, The CBS Morning Show and other radio and television programs. His first book, *HOUSE LUST*, was published by Doubleday in 2008.

Mr. Lee A. McIntire
President and Chief Executive Officer
CH2M HILL

Lee McIntire is the president and CEO of CH2M HILL. The firm is a recognized global leader in program management, consulting, engineering, procurement, construction, and operations.

Mr. McIntire's priorities for the firm are the highest of ethical behavior, safety, quality and a positive client experience. The firm is frequently recognized for its focus on sustainability and work-place satisfaction. Mr. McIntire's professional affiliations include the Obama Administration's U.S.-Brazil CEO Forum, The National Academy of Construction, the Council on Competitiveness and the World Economic Forum. Prior to joining CH2M HILL, Mr. McIntire was an executive at Bechtel Group Inc.

Mr. McIntire's academic background includes a Bachelor's degree in Civil Engineering from the University of Nebraska, a Master's degree from Garvin School of Management (Thunderbird) in Arizona and the Executive Management Program at Dartmouth's Tuck School of Business.

Speakers

Dr. George H. Miller

Director

Lawrence Livermore National Laboratory

As director of the Lawrence Livermore National Laboratory, Dr. George Miller is responsible for the management of the Laboratory and is committed to carrying on its tradition of scientific and technical excellence in service to the nation. He also serves as president of Lawrence Livermore National Security, LLC, the Laboratory's management contractor.

Throughout his 35-year career at LLNL, Dr. Miller has provided the leadership to integrate national security programs to meet national security objectives of maintaining the U.S. nuclear deterrent without nuclear testing, advance national nonproliferation and arms control goals through the development and application of effective scientific and technical solutions and support U.S. Department of Defense programs.

Under Dr. Miller's leadership, LLNL is continuing to provide cutting-edge capabilities through its world-class workforce and facilities, including the National Ignition Facility, the Terascale Simulation Facility and the High Explosives Applications Facility, to achieve breakthroughs for counterterrorism and nonproliferation, defense and intelligence, domestic security and energy and environmental security.

The Honorable Lisa Murkowski

U.S. Senator

Alaska

Senator Lisa Murkowski is the first Alaskan-born Senator to serve the state and only the 33rd female to serve in the U.S. Senate. Appointed in 2002, she was elected to a full six-year term in 2004. She is the senior Republican member of the Senate Energy and Natural Resources Committee. She also serves on the Senate Appropriations Committee; the Senate Health, Education, Labor and Pensions Committee; and the Senate Indian Affairs Committee. She was elected to serve as the vice chair of the Senate Republican Conference for the 111th Congress.

Senator Murkowski has served as Anchorage District Court attorney, worked in Alaska commercial law for eight years and opened her own practice. She was elected to three terms in the Alaska State House of Representatives and named House Majority Leader during the 2003-2004 term.

She earned a B.A. in economics from Georgetown University and a law degree from Willamette University and is a member of the Alaska Bar Association.

Speakers

Mr. James W. Owens

Co-Chair, ESIS Initiative, Council on Competitiveness;
Chairman and Chief Executive Officer, Caterpillar Inc.

Jim Owens is chairman and chief executive officer of Caterpillar Inc. After joining the company in 1972 as a corporate economist, he has held numerous management positions, including serving as a corporate vice president, president of Solar Turbines Incorporated and vice president and chief financial officer with administrative responsibility for the Corporate Services Division.

In 1995, Mr. Owens was named a group president and member of Caterpillar's Executive Office. In 2003, the Caterpillar Board of Directors named Mr. Owens vice chairman and appointed him chairman and chief executive officer effective February 1, 2004.

Dr. Owens graduated from North Carolina State University with a Ph.D. in economics. Mr. Owens is a director of Alcoa Inc. and IBM Corporation. He is a director of the Peterson Institute for International Economics; chairman of the International Trade and Investment Task Force of the Business Roundtable; chairman of The Business Council; and a member of the President's Advisory Committee for Trade Policy and Negotiations.

Mr. Kevin Parker

Chief Executive Officer, Deutsche Asset Management
Deutsche Bank

Kevin Parker is a member of the Group Executive Committee of Deutsche Bank and head of Asset Management since 2002.

After attending New York University, he joined Morgan Stanley where he was appointed head of the firm's equity derivatives business in Japan and Asia in 1988, based in Tokyo. He became a managing director in 1991 and held a variety of positions including head of Asian Derivatives, global head of Equity Derivatives Trading and chief information officer.

He joined Deutsche Bank in June of 1997. Prior to his current role at Deutsche Asset Management, he served as the global head of Institutional Equities and was responsible for building and developing Deutsche Bank's Equity Derivatives, Prime Brokerage Services, Equity Trading and Equity Proprietary Trading Businesses.

He serves on the Executive Committee of the New York Police & Fire Widows' & Children's Benefit Fund, and is an Advisory Board Member of the New York Metropolitan Opera.

Speakers

Ms. Hélène Pelosse

Director-General

International Renewable Energy Agency

In June 2009, Hélène Pelosse was elected Interim Director-General of the International Renewable Energy Agency by member states.

Prior to IRENA, Ms. Pelosse served in the French Ministry of Finance, with the Saint Gobain Group and in the French Prime Minister's office. In 2006-07, she was advisor in Angela Merkel's private office and helped adopt EU political objectives on energy efficiency, renewable energy and GHG emissions. Since 2007, Ms. Pelosse has been deputy head of staff in the Private Office of the French Minister for Ecology, Energy, Sustainable Development and Town and Country Planning. She also managed the French negotiations for the EU's Climate and Energy package and was responsible for designing the Renewable Energy Plan for France.

Mrs. Pelosse graduated from the Ecole Nationale d'Administration. Prior to that, she did her Master's in public law and political sciences from the Institut d'Etudes Politiques in Paris as well as a Master's degree from the Essec Business School of Management.

Dr. Luis M. Proenza

President

The University of Akron

Luis Proenza is president of The University of Akron. He has led UA to become one of only 12 Carnegie Cluster Leaders nationally.

Previously, Dr. Proenza was study director of the National Research Council-National Academy of Sciences' Committee on Vision; The University of Georgia's liaison for science and technology policy; a member of the National Biotechnology Policy Board-National Institutes of Health; and advisor for Science and Technology Policy to the Governor of Alaska. In 1992, President George H. W. Bush appointed Dr. Proenza to the U.S. Arctic Research Commission. He became its vice chairman. He later was chair of the Science and Mathematics Education Task Force for the Secretary of Energy Advisory Board. In 2001, President George W. Bush named him to the President's Council of Advisors on Science and Technology, where he has co-chaired the committee on Public-Private Partnerships.

Dr. Proenza is a member of numerous distinguished organizations, including the Council on Competitiveness Executive Committee.

Speakers

Ms. Becky Quick
Co-anchor
Squawk Box, CNBC

Becky Quick is co-anchor of “Squawk Box,” (M-F, 6 -9 a.m. ET) CNBC's signature morning program.

Previously, Ms. Quick, a seven-year veteran of The Wall Street Journal, covered the Wall Street beat for CNBC as part of the network's partnership with Dow Jones. Prior to joining CNBC in 2001, she spent three years working the retail and e-commerce beat at the Journal. She has also covered various Internet issues ranging from online privacy to domain-name disputes; played a crucial role in the launch of The Wall Street Journal Online in 1996; served as the site's International News Editor; and worked at the Journal's overseas copy desk where she served as a copy editor, copyreader and a research assistant.

Ms. Quick received a B.A. degree in Political Science from Rutgers University in 1993. As an undergraduate, she was awarded the Times Mirror Fellowship from the Journalism Resources Institute at Rutgers and served as editor-in-chief of the school's newspaper.

Mr. James Quigley
Chief Executive Officer
Deloitte Touche Tohmatsu

Jim Quigley is chief executive officer of Deloitte Touche Tohmatsu and has been with the organization for 34 years. Prior to his current role, Jim was the CEO of Deloitte United States.

Mr. Quigley is actively engaged in a number of international business organizations and committees. He is U.S. co-chairman of the TransAtlantic Business Dialogue and a member of the board of trustees of the U.S. Council for International Business and the German Marshall Fund of the United States. He is also a member of the Council on Competitiveness and served on the U.S. Securities and Exchange Commission Advisory Committee on Improvements to Financial Reporting. He is regularly asked to join discussion panels to share his perspective on global business trends and challenges.

Mr. Quigley is also involved with the board of the Financial Accounting Foundation, Japan Society and Economic Club of New York, the Business Roundtable and the National Advisory Committee—Brigham Young University.

Speakers

The Honorable Edward G. Rendell

Governor of Pennsylvania

Edward Rendell is the Governor of Pennsylvania and has served in this capacity since 2003. After serving in the U.S. Army, he earned a bachelor's degree from the University of Pennsylvania and a law degree from Villanova Law School.

Governor Rendell was elected to two terms as district attorney for Philadelphia from 1978 to 1985. From 1992 through 1999, Rendell served as mayor of Philadelphia, where he eliminated a \$250-million deficit, balanced the city's budget and generated five straight budget surpluses. During his tenure, Philadelphia saw the end of a six-year job loss trend and enjoyed six consecutive years of job gains. Under his leadership, the city won the hosting of the 2000 Republican National Convention.

Governor Rendell served as the general chair of the Democratic National Committee during the 2000 presidential election. He also was a partner at Ballard Spahr Andrews & Ingersoll, LLP, and taught two government and politics courses at the University of Pennsylvania.

Mr. Mayo A. Shattuck III

Chairman, President and Chief Executive Officer
Constellation Energy

Mayo Shattuck joined Constellation Energy in 2001 and is chairman, president and chief executive officer.

Previously, he was with Deutsche Bank as chairman of the Board of Deutsche Bank Alex. Brown and, during his tenure, served as global head of Investment Banking and global head of Private Banking. From 1997 to 1999, he was vice chairman of Bankers Trust Corporation, which merged with Deutsche Bank in June 1999. From 1991 until 1997, Mr. Shattuck was president and chief operating officer of Alex. Brown Inc., which merged with Bankers Trust in September 1997.

He received his B.A. from Williams College and his MBA from Stanford University, where he graduated as an Arjay Miller Scholar. Mr. Shattuck is a director of Gap Inc. and Capital One Financial Corporation. He is a board member of the Edison Electric Institute, the Nuclear Energy Institute and the Institute of Nuclear Power Operations.

Speakers

Mr. Frederick W. Smith

Chairman and Chief Executive Officer
FedEx Corporation

Frederick W. Smith is chairman and chief executive officer of FedEx Corporation, a global transportation, business services and logistics company. He is responsible for providing strategic direction for all FedEx Corporation operating companies, including FedEx Services, FedEx Express, FedEx Ground and FedEx Freight. Since founding FedEx in 1971, he has been an active proponent of regulatory reform, free trade and “open skies agreements” for aviation around the world. Most recently, he has advocated for vehicle energy-efficiency standards and a national energy policy. Mr. Smith was formerly chairman of the Board of Governors for the International Air Transport Association and the U.S. Air Transport Association. He served as chairman of the U.S.-China Business Council, is co-chairman of the Energy Security Leadership Council and is the current chairman of the French-American Business Council.

Mr. Smith attended Yale University, where he earned a B.A. in 1966. Smith served as an officer in the U.S. Marine Corps from 1966-1970.

Mr. Richard M. Smith

Chairman
Newsweek

As chairman of Newsweek, Richard M. Smith works closely with the magazine’s editor and CEO as senior adviser on all editorial, business and media industry issues. He has also served as Newsweek’s editor-in-chief, president and CEO, editor of the magazine’s international editions and a writer in the International and National Affairs departments.

Mr. Smith is a former chairman of the Magazine Publishers of America and a past member of the board of the American Society of Magazine Editors. In 2002, he received the magazine industry’s highest honor, the Henry Johnson Fisher Award for Lifetime Achievement. He continues to serve on the MPA’s Executive Committee.

Mr. Smith graduated Phi Beta Kappa from Albion College (Michigan), attended Columbia University’s School of International Affairs and received an M.S. from Columbia’s Graduate School of Journalism. He is a member of the board of directors of Temple-Inland, Inc., the Forestar Group and TalkMarket.com.

Speakers

Mr. Björn Stigson

President

World Business Council for Sustainable Development

Björn Stigson has extensive experience in international business. He began his career as a financial analyst with the Swedish Kockums Group. From 1971 until current appointment, he held various positions in finance, operations and marketing with ESAB; was president and CEO of the Fläkt Group; was executive vice president and a member of ABB Asea Brown Boveri's Executive Management Group, and ran his own management consultancy. In 1995 he was appointed President of the World Business Council for Sustainable Development, a coalition of some 200 leading international corporations.

Björn Stigson is a member of the Board of the International Risk Governance Council and Prince Albert II of Monaco Foundation. He is also chair of the Peer Review of German Sustainability Policies, co-chair of the China Low Carbon Economy Task Force. He is a member of numerous advisory boards/councils, including the The Copenhagen Climate Council, Dow Jones Sustainability Indexes and the Executive Director's Industry Advisory Group of the International Energy Agency.

Mr. Kevin Surace

Chief Executive Officer

Serious Materials

Kevin Surace, a noted speaker and writer on climate change and the built environment, is on a mission to significantly reduce the use of fossil fuels and their effect on the environment. As chief executive officer of Serious Materials, Kevin leads the company in its mission to reduce energy usage and CO2 generation of the world's largest contributor, our buildings by developing new materials and processes that require little energy to manufacture.

Before joining Serious Materials in 2002, Mr. Surace held executive and technical positions with Perfect Commerce, General Magic, Air Communications, National Semiconductor and Seiko-Epson.

He received his degree in electrical engineering technology from Rochester Institute of Technology where he currently serves on the Board of Trustees, and has been awarded multiple patents. Mr. Surace also serves on the boards of FreeLight, Array Converter, Zeta Communities and Integrity Block; chairs the Sunnyvale Mayoral Green Ribbon Committee and co-chaired the CCTO Building Materials contest.

Speakers

Mr. Andrew C. Taylor
Chairman and Chief Executive Officer
Enterprise Holdings, Inc.

Andy Taylor, who became involved in the automotive business more than 40 years ago, took on the role of chief executive officer of Enterprise Rent-A-Car in 1991, and was named chairman in 2001. Enterprise was founded in St. Louis in 1957 by his father Jack Taylor. Under Taylor's leadership, the company, now called Enterprise Holdings, has grown to become the largest rental car company in North America. The Taylor family acquired the National Car Rental and Alamo Rent A Car businesses in 2007, bringing its network of locations to nearly 8,000 worldwide.

Outside of his professional duties, Mr. Taylor is trustee of the Saint Louis Symphony Orchestra, trustee of Washington University in St. Louis, trustee for the Naval Aviation History Foundation, life trustee of the Missouri Botanical Garden and Director of Commerce Bancshares.

Mr. Robert Edward "Ted" Turner III
Chairman
Turner Enterprises, Inc.

Throughout his career, Ted Turner has received recognition for his entrepreneurial acumen, sharp business skills, leadership qualities and his unprecedented philanthropy.

Mr. Turner is co-chairman of the Nuclear Threat Initiative, a charitable organization working to reduce the global threats from nuclear, biological and chemical weapons; chairman of the Turner Foundation, Inc., which is committed to preventing damage to the natural systems—water, air, and land—on which all life depends; chairman of the United Nations Foundation, which promotes a more peaceful, prosperous and just world; and a partner in the Ted's Montana Grill restaurant chain, which operates more than 55 locations nationwide.

Mr. Turner is also chairman of Turner Enterprises, Inc., which manages his business interests, land holdings and investments, including the oversight of two million acres in 12 states and in Argentina and more than 50,000 bison head.

Speakers

Her Excellency Maria van der Hoeven

Minister of Economic Affairs of the Netherlands

Maria Josephina Arnoldina (Maria) van der Hoeven is the Netherlands Minister of Economic Affairs.

From 1985 to 1991, Ms. Van der Hoeven was a member of the municipal council of Maastricht for the Christian Democratic Alliance (CDA) and, from 1991 to 2002, member of the House of Representatives of the States General.

From 22 July, 2002 to 21 February, 2007 Ms. Van der Hoeven held the post of Minister of Education, Culture and Science in the first, second and third Balkenende governments. On 22 February, 2007 she was appointed Minister of Economic Affairs in the fourth Balkenende government.

The Honorable Mark R. Warner

U.S. Senator

Commonwealth of Virginia

Mark R. Warner was elected to the U.S. Senate in November 2008, and serves on the Senate's Banking, Budget, Commerce and Rules committees. He served as Governor of Virginia from 2002-2006 after spending 20 years in the high-tech industry.

As a private citizen and philanthropist, Mark Warner helped create the Virginia Health Care Foundation, which has provided health care to more than 600,000 under-served Virginians, and SeniorNavigator.com, a referral network for older Virginians and their caregivers.

As Governor of Virginia, Mark Warner left office with a budget surplus that allowed Virginia to make key investments in public education at all levels, as well as record investments in the clean-up of the Chesapeake Bay.

In 2004, Warner chaired the National Governors Association, and was later named one of "America's Five Best Governors" by TIME Magazine. Governor Warner's bipartisan, results-oriented focus resulted in Virginia being designated as the nation's "best managed state" and its "best state for business."

Speakers

Ms. Randi Weingarten

President

American Federation of Teachers, AFL-CIO

Randi Weingarten is president of the 1.4-million-member American Federation of Teachers, AFL-CIO. She was elected in 2008, following 11 years of service as an AFT vice president.

Ms. Weingarten served for 12 years as president of the United Federation of Teachers, AFT Local 2. For 10 years, she chaired New York City's Municipal Labor Committee, an umbrella organization for the city's 100-plus public sector unions. As a member of the AFT executive council since 1997, Ms. Weingarten has been involved in every major AFT policy initiative of the last decade. She has also served as counsel to UFT President Sandra Feldman, taught history at Clara Barton High School in Brooklyn's Crown Heights and worked as a lawyer for Stroock & Stroock & Lavan.

Weingarten holds degrees from Cornell University's School of Industrial and Labor Relations and the Cardozo School of Law. She is an active member of the Democratic National Committee and numerous professional, civic and philanthropic organizations.

Mr. Joseph L. Welch

Chairman, President and Chief Executive Officer

ITC Holdings Corp.

As chairman, president and chief executive officer, Joe Welch is responsible for the strategic vision and overall business operation of ITC Holdings Corp. Under his leadership, ITC has been singularly focused on investing in the transmission system to provide best-in-class service to customers. ITC is pursuing transmission infrastructure improvements that will increase reliability, reduce constraints and lower the total cost of delivered energy.

Since the beginning of his career in 1971, Mr. Welch has held positions of increasing responsibility in the electricity transmission, distribution, rates, load research, marketing and pricing areas and regulatory affairs that included the development and implementation of regulatory strategies. He established ITC as a stand-alone entity from its parent corporation in 2003 and as the country's first publicly-traded, independent transmission company in 2005.

Mr. Welch has a B.S. degree in Electrical Engineering from the University of Kansas and is a licensed professional engineer in the state of Michigan.

Speakers

The Honorable Deborah L. Wince-Smith

President

Council on Competitiveness

Deborah Wince-Smith is the president of the Council on Competitiveness, a group of CEOs, university presidents and labor leaders committed to driving U.S. competitiveness.

She is a Senate-confirmed member of the IRS Oversight Board and a member of the Board of Directors of the NASDAQ OMX Group, Inc. and the NASDAQ Stock Exchange. Ms. Wince-Smith also serves on the Secretary of State's Advisory Committee on International Economic Policy, the Board of Governors for the Argonne National Laboratory and the boards of several private equity startup companies. She has more than 20 years of government experience and was Assistant Secretary for Technology Policy in the Department of Commerce during the George H.W. Bush administration.

Ms. Wince-Smith earned a degree in classical archaeology and graduated Magna cum Laude and Phi Beta Kappa from Vassar College and earned her master's degree from King's College, Cambridge University. In December 2006 she received an honorary Doctor of Humanities degree from Michigan State University.

The Honorable Timothy E. Wirth

President

United Nations Foundation

Timothy Wirth is the president of the United Nations Foundation and the Better World Fund. Both organizations were founded in 1998 through a major financial commitment from Ted Turner to support and strengthen the work of the UN.

Mr. Wirth began his political career as a White House Fellow under President Lyndon Johnson and was Deputy Assistant Secretary for Education in the Nixon Administration. He served in the U.S. House of Representatives from 1975-1987 and was elected to the U.S. Senate in 1986 where he focused on environmental issues. Following two decades of elected politics, Mr. Wirth was national co-chair of the Clinton-Gore campaign and served in the U.S. Department of State as the first Undersecretary for Global Affairs.

He is a graduate of Harvard College and received a Ph.D. from Stanford University. The recipient of numerous awards and honorary degrees, he was recently honored as a Champion of the Earth by the United Nations Environment Programme.

Speakers

His Excellency Kandeh Yumkella

Director-General

United Nations Industrial Development Organization

Kandeh K. Yumkella is the Director-General of the United Nations Industrial Development Organization (UNIDO). He is an advocate for increased international cooperation in the field of sustainable industrial development, trade capacity building, UN-business partnerships, renewable energy and energy efficiency, as well as climate change mitigation and adaptation.

Dr. Yumkella currently serves as Chairman of UN-Energy, a UN system coordination body dealing with energy-related issues and the UN Secretary General's Advisory Group on Energy and Climate Change, composed of leading experts from both the public and private sector. He served as Minister for Trade, Industry and State Enterprises, Republic of Sierra Leone and has held various academic positions at Michigan State University and the University of Illinois where he received a Ph.D. in Agricultural Economics and holds a M.Sc. in Agricultural Economics from Cornell University and a B.Sc. from Njala University College, Sierra Leone.

Dr. Robert J. Zimmer

President

The University of Chicago

Robert J. Zimmer became president of the University of Chicago in 2006. Prior to his appointment as president, he served more than two decades as a faculty member in the Mathematics Department and administrator at the University, and was provost at Brown University from 2002-2006.

As president of the university, Dr. Zimmer chairs the governing boards of both Argonne National Laboratory and Fermi National Accelerator Laboratory. Among his scholarly, academic and civic affiliations, he is chairman of the Board of Directors of the Consortium on Financing Higher Education, is on the executive committee of the Council on Competitiveness, serves on the President's Committee on the National Medal of Science and is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science.

A specialist in mathematical fields of geometry—particularly ergodic theory, Lie groups and differential geometry—Zimmer is the author of two books and more than 80 articles.

Acknowledgments

To all our partners, the Council on Competitiveness would like to express our appreciation for your support, your vision, your time and your commitment to putting America on the path toward energy security and sustainability. The coalition assembled for the National Energy Summit & International Dialogue represents a tremendous diversity of perspectives and the successful collaboration of these groups is testament to the strength of purpose necessary to achieve America's energy goals. The Council, quite simply, could not have asked for better partners in this undertaking. Thank you.

In particular, the Council would like to thank the U.S. Department of Energy (DOE) for its support of the studies and activities of the Energy Security, Innovation & Sustainability (ESIS) Initiative, including the 2007-2008 Progressive Dialogue Series and the 2009 Regional Energy Summit Series and National Energy Summit & International Dialogue. The work of the ESIS Initiative is funded by an award from the U.S. Department of Energy National Energy Technology Laboratory (#DE-EE0000038). The Council would like to recognize U.S. Secretary of Energy Steven Chu for his former commitment on the ESIS Initiative Steering Committee during his tenure as director of the Lawrence Berkeley National Laboratory and his continued support of the program.

The Council also would like to thank our exclusive media

partner for the National Energy Summit & International Dialogue, Newsweek. Newsweek offers comprehensive coverage of world events with a global network of correspondents, reporters and editors covering national and international affairs, business, science and technology, society and the arts and entertainment. Newsweek has a worldwide circulation of more than 4 million and holds more prestigious National Magazine Awards, given by the American Society of Magazine Editors, than any other newsweekly.

Finally, behind every organization are individuals whose dedication, character and intellect have helped to make the National Energy Summit & International Dialogue a success. The Council would like to thank Reid Detton from the Energy Future Coalition; Tim Wirth and Ryan Hobart from the United Nations Foundation; Robbie Diamond and Sam Ori from Securing America's Future Energy; Jonathan Lash and Robin Murphy from the World Resources Institute; Bjorn Stigson and Margaret Flaherty from the World Business Council for Sustainable Development; Strobe Talbott and Charlie Ebinger from the Brookings Institution; David Abshire and Tom Kirlin from the Center for the Study of the Presidency and the Congress; Ralph Cicerone and Peter Blair from the National Academy of Sciences; and Jim Quigley and Kathryn Hauser from the TransAtlantic Business Dialogue.

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About the Council

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CEOs, university presidents and labor leaders working to ensure U.S. prosperity.

The Council's mission is to set an action agenda to drive U.S. competitiveness, productivity and leadership in world markets to raise the standard of living of all Americans

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The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

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- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

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Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

**Appendix 7: Comprehensive listing of all participants and attendees at the National Energy Summit
& International Dialogue**

Name	Title	Company
Abel, Ric, Mr.	Managing Director	Prudential Capital Group
Abouleish, Helmy, Mr.	Chairman of the Board of Directors and Managing Director of Sekem Group	Egyptian National Council on Competitiveness
Abu Ibrahim, Feras N.,	Policy Advisor	Prime Minister's Office of the UAE
Afrikan, Gayane, Ms.	Director	Dubai Competitiveness Council
Al Hawi, Mohammad, Mr.	Associate Project Manager	Emirates Competitiveness Council
Al Nowais, Saud, Mr.	Director and Commercial Counselor	United Arab Emirates Trade Office
Alger, Monty, Dr.	Vice President and Chief Technology Officer	Air Products and Chemicals, Inc.
Ali, Tamer Mostafa, Mr.	Second Commercial Secretary	Embassy of Egypt, Economic & Commercial Office
Allen, Joseph, Mr.	Director of Marketing and Sustainable Development	Remanufacturing Division, Caterpillar, Inc.
Allen, Paul, Mr.	SVP, Corporate Affairs	Constellation Energy
Al-Tamimi, Sarah F., Ms.	Competitiveness Strategy Officer	Saudi Arabian General Investment Authority
Altenburg, Deborah, Ms.	Director of Federal Relations	Rensselaer Polytechnic Institute
Alterå, Ola, His Excellency	State Secretary for Energy	Ministry for Energy and Enterprise of Sweden
Ambegaonkar, Prakash, Dr.	Chief Executive Officer	Bridging Nations
Anderson, Paul, Mr.		Newsweek
Andolino, Rosemarie S., Ms.	Commissioner	City of Chicago, Department of Aviation
Andrews, George E., Mr.	President	American Mathematical Society
Annab, Leo, Mr.	Corporate Senior Vice President, CA Global Support	CA, Inc
Antholis, Bill, Mr.	Project Manager	The Brookings Institution
Arafune, Lisa, Ms.	Director, Federal Relations	Purdue University
Araujo, Daniella, Ms.	Secretary	Embassy of Brazil
Artzt, Russell M., Mr.	Vice Chairman and Founder	CA, Inc.
Arvizu, Dan E., Dr.	Director	National Renewable Energy Laboratory
Ashby, Steven F., Dr.	Deputy Director for Science and Technology	Battelle Pacific Northwest National Laboratory
Auerbach, Neil Z., Mr.	Founder and Managing Partner	Hudson Clean Energy
Bade, Doug, Mr.	Regional Managing Principal-Strategic Relationship Management	Deloitte Touche Tohmatsu
Badman, Daniel, Mr.	Desk Officer	Ministry for Energy and Enterprise of Sweden
Bagley, Rebecca O., Mrs.	President and CEO	NorTech
Baker, Rush, Mr.	Associate	Deutsche Bank
Bala, VJ, Mr.	Head – Marketing, Manufacturing Practice	Infosys Technologies
Barbour, Robert, Mr.	Director and Chief Executive	Centre for Competitiveness

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Baruch, Thomas R., Mr.	Founder and Managing Director	CMEA Capital
Bayer, Judith,	Director, Government Business Development	United Technologies
Beaudry-Losique, Jacques, Mr.	Deputy Assistant Secretary for Renewable Energy	U.S. Department of Energy
Belqazi, Khawla, Ms.	Manager, Special Projects	Dubai Competitiveness Council
Belz, Dave, Mr.	Director of Customer Requirements, Electronis, Intelligence & Support	BAE Systems, Inc.
Berdahl, Robert, Dr.	President	Association of American Universities
Blair, Peter,	Executive Director	National Research Council
Blakey, Marion, The Honorable	President & CEO	Aerospace Industries Association
Boggs, George, Dr.	President & Chief Executive Officer	American Association of Community Colleges
Bond, Drew, Mr.	Vice President, Public Policy	Battelle
Bono, Jim,	Director, Public Affairs	Lawrence Livermore National Laboratory
Bonvillian, Bill, Mr.	Director, Washington Office	Massachusetts Institute of Technology
Boras, Kenneth, Mr.	Chief Executive Officer	BCS, Incorporated
Borchardt, Jerry Lee,	Blackbelt	Honeywell International
Boston, Stephen B., Mr.	Vice President, Worldwide Operations Strategy Program Office	CA, Inc.
Boudrias, Claude Paul,		CA, Inc.
Brake, William, Mr.	Chief Executive Officer	renewaFUEL LLC
Bridge, Nick,	Counsellor for Global Issues	British Embassy
Brinkman, William, The Honorable	Director of the Office of Science	U.S. Department of Energy
Broad, Molly,	President	American Council on Education
Brooks, Margaret, Ms.	Vice President	CA, Inc
Brown, Jacob Noah,	President and Chief Executive Officer	Association of Community College Trustees
Brown, Marilyn, Dr.	Director, Public Policy	Georgia Institute of Technology
Brown, Timothy S.,	Director of Communications - North America	Alstom, Inc.
Bruce, Michael,	Director	Manifest Energy
Buchan, Claire, Ms.	Vice President, Public Strategy	Constellation Energy
Buchanan, Herbert, Dr.	Venture Partner	Paladin Capital Group
Buizer, James, Mr.	Science Policy Advisor to the President and Executive Director for Strategic Institutional Advancement, Office of the President	Arizona State University
Bulu, Melih, Dr.	General Coordinator	International Competitiveness Research Institute
Burnham, Christopher B.,	Vice Chairman and Managing Director	Deutsche Bank
Caldwell, Barry,		Newsweek

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Campanhola, Clayton, Dr.	Director	Brazilian Agency for Industrial Development
Capuano, Linda Ann,		Marathon Oil Corporation
Carnes, Kelly H.,	President and Chief Executive Officer	TechVision21, Inc.
Carroll, Cynthia, Ms.	Chief Executive Officer	Anglo American PLC
Carroll, David, Mr.	President and Chief Executive Officer	Gas Technology Institute
Castelli, Brian T., Mr.	Executive Vice President for Programs and Development	Alliance to Save Energy
Chappell, Beth,	President and Chief Executive Officer	Detroit Economic Club
Chapple-Brown, Meghan,	Director, Office of Sustainability	George Washington University
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Chiang, Amy, Ms.	Director	Honeywell International
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Clift, Eleanor, Ms.	Contributing Editor	Newsweek
Clifton, James, Mr.	Chief Executive Officer	Gallup Inc.
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Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 8: A Call to Action for Prosperity and Competitiveness in a Low-Carbon World

A Call to Action For Prosperity and Competitiveness In a Low-Carbon World

Whereas all nations share a responsibility to promote sustainable economic growth and expand global prosperity; and whereas all nations share a responsibility to improve the quality of life, economic opportunity, and security for all men, women, and children; and whereas energy is fundamental to the achievement of these objectives:

- All nations should support efforts to promote affordable access to clean energy technologies, reliable energy supplies, and the financing and tools for sustainable development.
- All nations should invest in, and encourage the wide-scale adoption of cost-effective energy-efficient, environmentally benign technologies and practices.
- All nations should increase their investment in research and development to spur sustainable innovation and build up the capacity of people around the world to learn, create, and thrive.
- All nations should support the expansion of global trade and investment, and remove all trade barriers that inhibit the creation of jobs, innovation, and sustainable economic growth.

Whereas all the people of the world share a responsibility to serve as custodians of our planet and protectors of biodiversity on land, in the oceans, and in the skies; and whereas the challenges of energy security, sustainability, and climate change cannot be met independently:

- All nations should work to develop a consensus that fosters the responsible stewardship of earth's natural resources.
- All nations should seek an international agreement that slows, stops, and reverses the growth of greenhouse gases in our atmosphere.
- All nations should strive to establish clear and transparent price signals that reflect the external environmental costs of greenhouse gas emissions.
- All governments and private-sector enterprises should incorporate sustainability and life-cycle energy costs into their strategic plans and publicly commit to minimizing their carbon footprint.

Whereas the global demand for energy is projected to increase with economic growth; whereas nations around the world are striving to enhance their energy security and manage their carbon emissions; whereas the shift to a low-carbon economy has the potential to drive the next generation of technological innovation and sustainable development; and whereas the private sector's talent, capital and innovation are essential to the development and wide-scale deployment of sustainable technologies:

- All governments should increase their understanding of the enabling conditions for sustainable economic development.
- All nations should seek to unleash the capacity of educators, researchers, and entrepreneurs to spur the deployment of sustainable solutions by removing regulatory barriers and providing incentives for innovation.
- All nations should commit to the protection of and respect for intellectual property rights, which are an enabler of private-sector investment and innovation.
- All nations should commit to providing their citizens with the education and training necessary to develop and deploy the next generation of sustainable energy solutions.

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Appendix 9: Comprehensive Listing of all Outreach Activity

Distribution and Outreach Undertaken by Council/ESIS Team to Promulgate Findings and Recommendations of DRIVE, the Comprehensive Policy Roadmap *(Chronological order)*

Audiences	Completed
All attendees to the National Energy Summit & International Dialogue	September 23-24, 2009
Hand-delivered to Rep. Steve Israel (D-NY), U.S. House of Representatives [2 copies of <i>Drive</i> sent to office]	October 2, 2009
Hand-delivered to Al Gore [<i>Drive</i> , <i>Energy is Everything</i> , thumb drive with CoC info and <i>Call to Action</i>]	October 2, 2009
Hand-delivered to Rajendra K. Pachauri, head of IPCC [2 copies of <i>Drive</i>]	October 2, 2009
20 copies at the US-India Partnership Energy Summit	October 2, 2009
Hand-delivered to: Mark Ginsberg/DOE, Frances Beinecke/NRDC, Gurmeet Naroola/SunPower, Jennifer Bowman/Dow, P. Balasubramanian/Theme Word Analytics, Lillian Chege/The Rockefeller Foundation	October 2, 2009
Email link of <i>Drive</i> to 150 Congressional Staffers	October 5, 2009
Green Power Breakfast Hosted by Applied Materials and Atlantic magazine	October 8, 2009
Briefing to Senate energy staffers on <i>Drive</i> (attendance list not provided, but staffers from Sen. Conrad and Sen. Holmes offices present)	October 9, 2009
Center for Energy Workforce Development Annual Summit [80 copies of <i>Drive</i> , to go to their member utilities and trade associations]	October 13, 2009
Address by Ernest Moniz at Second Annual AAAS-Hitachi Lecture on Science & Society: "Energy Technology for a Low Carbon	October 14, 2009

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Future"	
Hand-delivered to John Kerry [plus send 2 copies of <i>Drive</i> to office]	October 26, 2009
<i>Drive</i> distributed to all Senators and Senate Committee members	October 26, 2009
Deborah Wince-Smith speech at the Swedish Embassy [distributed 30 copies of <i>Drive</i> , <i>Energy is Everything</i> and the <i>Call to Action</i>]	November 3, 2009
Susan Rochford is panelist in <i>PlantSuccess</i> managers conference in Wilmington, DE [distributed 25 copies of <i>Drive</i>] discussing "Operational Excellence and Sustainable Energy Management"	November 5, 2009
David Rodgers, Director of Strategic Planning and Analysis, EERE, DOE, 25 copies of <i>Drive</i> and <i>Energy is Everything</i>	November 9, 2009
ESIS Initiative Advisors, Progressive Dialogue Series Participants, Regional Energy Summit Series Participants	November 9, 2009
ESIS Initiative Steering Committee, CoC Executive Committee and General Members	November 9, 2009
<i>Drive</i> distributed to all Representatives in the House	November 9, 2009
Hand-delivered to Jon Wellinghoff, Chairman, Federal Energy Regulatory Commission	November 9, 2009
Briefing to Council's Federal Affairs Committee and ESIS Advisors on <i>Drive</i> (in Council offices)	November 10, 2009
NEMA Annual Conference [delivered 50 copies of <i>Drive</i> and 10 copies of <i>Discover</i> to distribute]	November 13, 2009
Duke Corporate Sustainability Initiative Workshop, Durham, NC [specifically to John Formisano, VP, Global Vehicles, FedEx Express and Gary Helm, Sr. Environ. Consultant, Connectiv Energy (Pepco Holdings)]	November 13, 2009
Institute for the Analysis of Global Security (IAGS) 2009 <i>Energy Security Roundtable</i> , 20 copies of <i>Drive</i>	December 3, 2009

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

UNIDO General Conference, 70 copies of the <i>Call to Action</i>	December 8, 2009
Swedish Embassy in Vienna, Austria, 50 copies of the <i>Call to Action</i>	December 8, 2009
Hardcopies to 29 members of DC energy policy community, incl. heads of ACEEE, NCEP, EEL, EPRI, CAP, CERES, NRDC, NARUC, Pew, Aspen, RFF, etc.	December 9, 2009
Under Secretary for Energy Steve Koonin	December 16, 2009
Handout #1 released in <i>CompeteWeek</i> and posted online	December 17, 2009
Don McGroth, SVP Communications at Eaton Corporation	January 5, 2010
Richard Kidd, Program Manager, Federal Energy Management Program (DOE)	January 8, 2010
Participants of Battelle Workshop on Manufacturing Technologies from: Battelle, Edison Welding Institute, Idaho National Lab, Joint Global Change Research Institute, LLNL, NREL, ORNL, Ohio State U, PPNL	January 12, 2010
Email blast to Congressional energy LA's of Handout #3	January 19, 2010
Deborah Wince-Smith testified before the House Science & Technology Committee on reauthorization of the America COMPETES Act	January 20, 2010
Handout #3 released in <i>CompeteWeek</i> and posted online	January 20, 2010
U.S. Ambassador to Saudi Arabia	January 24, 2010
Spoke about <i>Drive</i> at Global Competitiveness Council and 2010 Global Competitiveness Forum in Saudi Arabia	January 24-27, 2010
Individual briefing on <i>Drive</i> to Rob Blair of the House Appropriations Subcommittee on Energy & Commerce	January 25, 2010
Co-Sponsoring Clean Energy Innovation Consortia event on Capital Hill	January 26, 2010
Brownbag luncheon presentation to Women's Council on Energy and the Environment	January 27, 2010

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Jim Tankersley, Tribune Newspapers	January 27, 2010
Bob Baugh, Executive Director, AFL-CIO Industrial Union Council	January 27, 2010
Handout #6 released in <i>CompeteWeek</i> and posted online	January 28, 2010
<i>Drive</i> given to Thomas A. Kalil, Deputy Director of Policy, Office of Science and Technology Policy, at meeting	January 28, 2010
Deborah Wince-Smith panel discussion with Secretary of Environment of New Mexico	January 30, 2010
Debra K. Tune, Assistant Secretary, Installations, Environment and Logistics, U.S. Department of the Air Force	February 1, 2010
Email blast to Congressional energy LA's of Handout #6	February 2, 2010
Chris Adamo, Legislative Counsel and Legislative Assistant, Agriculture, Office of Senator Debbie Stabenow	February 4, 2010
Ana Unruh Cohen, Deputy Staff Director, House Select Committee on Energy Independence and Global Warming	February 17, 2010
Toffler Manufacturing Roundtable, February 24, 2010	February 24, 2010
Casey B. Fromson, Legislative Assistant, Brian J. Raymond, Deputy Chief of Staff, Office of Representative Anna Eshoo	February 25, 2010
Lorie J. Schmidt, Senior Counsel Environment and Energy, House Energy & Commerce Committee	February 25, 2010
Lloyd Rodenbaugh, with the Mayor of La Jolla, CA	March 1, 2010
Deborah Wince-Smith speaking at ARPA-E Summit	March 2, 2010
Susan Rochford moderating panel at ARPA-E Summit	March 3, 2010
Handout #5 released in <i>CompeteWeek</i> and posted online	March 3, 2010
Office of Senator Sherrod Brown (D-OH)	March 4, 2010
Handout #2 released in <i>CompeteWeek</i> and posted online	March 10, 2010

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Office of Representative Mark MacMahon (D-NY). Peter Rocco, an LA, and Sam Morgante, a Legislative Correspondent	March 11, 2010
Office of Representative John Boehner (R-OH)	March 11, 2010
Senate Commerce Minority Staff	March 11, 2010
Individual briefing on <i>Drive</i> to Karena Neubauer (LC) of Senator Kerry's office	March 12, 2010
Toffler Manufacturing Roundtable	April 1, 2010
Deputy Assistant Secretary for International Energy Phyllis G. Yoshida	April 5, 2010
CoC signed onto letter supporting Regional Energy Innovation Consortia – ACES Section 171	April 16, 2010
“Grand Opening” of the Michigan State University Bioeconomy institute in Holland. MI	April 22, 2010
U of Akron Manufacturing Roundtable	April 27, 2010
Deborah Wince-Smith speech at the United Nations Industrial Development Organization, Advisory Group on Energy and Climate Change	April 28, 2010

Distribution and Outreach Undertaken by Council Members / ESIS Network to Promulgate Findings and Recommendations of DRIVE, the Comprehensive Policy Roadmap
(Chronological order)

Outreach	Completed
Jim Owens, Caterpillar to distribute to Board of Directors at meeting and other colleagues [50 copies of <i>Drive</i>]	10/2/09
Speech by Shirley Ann Jackson, RPI, at Detroit Economic Club referenced <i>Drive</i>	10/8/09
Keynote address by Shirley Ann Jackson, RPI, at the 2009 annual meeting of the RPI Center for Economic Growth referenced <i>Drive</i>	10/29/09
100 copies of <i>Energy is Everything</i> and 20 of <i>Drive</i> to Lisa Jacobson, Business Council for Sustainable Energy	11/2/09
Hand-delivered <i>Drive</i> to Jonathan	11/17/09

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Pershing, Deputy Special Envoy for Climate Change, U.S. Department of State	
Duane Ackerman, Chairman Emeritus, Council on Competitiveness, and Former CEO of BellSouth requested 15 copies of <i>Drive</i> to distribute to AT&T Board of Directors	11/19/09
Duane Ackerman to share <i>Drive</i> with David Ratcliffe, chairman, president and CEO of Southern Company	12/3/09
Pete Halpin, former ESIS Steering Committee member, purchased 15 copies of <i>Drive</i> for distribution	12/10/09
Kandeh Yumkella, Director-General of UNIDO and UN-Energy, and NES&ID speaker handed copy of <i>Call to Action</i> to UN Secretary-General Ban Ki-moon	12/8/09

Media Outreach by Council to Promulgate Findings and Recommendations of DRIVE, the Comprehensive Policy Roadmap
(Chronological order)

Audiences	Completed
Extensive media coverage at the National Energy Summit & International Dialogue	9/23-24/09
The Tribune Media Service released story quoting Chad Holliday, Jim Owens, Crag Giffi and Ralph Izzo to 10 daily newspapers and 23 television stations, as well as online properties. (Tribune newspapers include: The Los Angeles Times, Chicago Tribune, The Baltimore, Sun-Sentinel (South Florida), Orlando Sentinel, Hartford Courant, Allentown Morning Call.) The Baltimore Sun ran full article and Los Angeles Times ran abbreviated version.	10/23/09
Susan Rochford Interview on CleanSkiesTV—The Energy Report - 12/10/09: Morning Edition with Susan McGinnis	12/10/09

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
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Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Press/Media Coverage

Highlights

- CleanSkies.tv live broadcast of the September 23-24 event, including the release of *Drive*.
- Baltimore Sun, Sun-Sentinel and Los Angeles Times article quoting Chad Holliday, Jim Owens, Crag Giffi and Ralph Izzo

VIDEO: "Drive Private Sector Demand for Sustainable Energy Solutions Morning Roundtable"

CleanSkies.tv

September 23, 2009

The Council on Competitiveness presents the roundtable "Drive Private Sector Demand for Sustainable Energy Solutions: A comprehensive action agenda to achieve energy security, sustainability, and competitiveness." Participants include Charles Holliday, Hon. Shirley Ann Jackson, James Owens, Hon. Deborah Wince-Smith. Eleanor Clift of Newsweek moderates.

ASU helps shape debate on energy and competitiveness

ASU News

October 7, 2009

...A major portion of the summit was to deliver the Council on Competitiveness's report, "Drive. Private Sector Demand for Sustainable Energy Solutions." The report details what needs to be done to build the U.S. economy, but to do so in a manner that is sensitive to the environment and to make the economic recovery more sustainable. A copy of the report will be given to President Obama as a pathway for energy and sustainability policy. ...

Is US Losing Out in Race to Produce Greener Energy Systems?

Sun-Sentinel

Jim Tankersley

October 23, 2009

...But business leaders say Obama must craft his next step carefully, with both the environment and the economy in mind. "Don't just say, how do we get carbon out of the air," said James Owens, chairman and CEO of construction equipment giant Caterpillar. "That could get the wrong answer."...

Is US Losing Out in Race to Produce Greener Energy Systems?

The Baltimore Sun

Jim Tankersley

October 23, 2009

...A study by analysts at Deloitte illustrates several areas where the United States is struggling, including light bulbs, solar photovoltaics, advanced vehicle batteries and geothermal turbines. One specific example: The nation isn't close to producing enough undersea cables to link power customers with the rows of offshore wind farms that the Obama administration hopes to string along the Atlantic Coast. "In case after case that we looked at," said Craig Giffi, Deloitte's national industry leader for consumer and industrial products, "we have nowhere near the capacity required right now to ramp up."...

Reframing green as competitive

SmartPlanet.com

By Dana Blankenhorn

Oct 26, 2009

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

...Much as conservatives tried to replace liberal-leaning organizations with more pliable groups over the last 8 years, the Obama Administration is trying focus on groups like the Council on Competitiveness, which has published a white paper supporting more incentives for new industries and fewer for old ones.

[Obama to detail stimulus spending on 'smart grid'](#)

The Los Angeles Times

Jim Tankersley

October 27, 2009

A \$3.4-billion chunk will go toward grants to modernize the U.S. power system to more easily use renewable resources. The president will speak at a solar facility in Arcadia, Fla. ...Federal and state regulators still must resolve issues of where to put power lines and how to price the energy that travels along them, among other regulatory challenges, said Deborah Wince-Smith, president of the Council on Competitiveness, which has urged the administration to make the smart grid a centerpiece of its clean-energy efforts....

[Washington Must Help the U.S. Regain the Lead in Manufacturing](#)

Harvard Business Review, Online Debate

By Deborah L. Wince-Smith

November 5, 2009

... By game-changing technologies, I mean new process tools like [high-performance supercomputing technology](#) for modeling and simulation, laser-based tools, and ultra-sophisticated smart materials that can self-assemble. These technologies are being pioneered by the [Department of Energy's national laboratories](#), in partnership with companies such as Boeing, DreamWorks, Pixar, Pratt & Whitney, Ford, and Procter & Gamble. They have the potential to transform the competitiveness of America's manufacturing sector by radically reducing costs and increasing productivity and turbo-charging innovation.

[Keeping America's Innovative Edge](#)

CNBC, Closing Bell

December 31, 2009

..."We need to create incentives to ensure that the R&D that we're investing, for instance, in clean energy, is deployed here in the United States," Council on Competitiveness President Deborah L. Wince-Smith.

[NES&ID Coverage](#)

CNBC, Squawk Box

Click to watch interviews with:

[Deborah Wince-Smith](#)

[John Hofmeister](#)

[Jim Owens and Chad Holliday](#)

[Mayo Shattuck](#)

[Steven Leer](#)

[John Engler](#)

[U.S. Secretary of Commerce Gary Locke](#)

[Clean Skies News](#)

September 23-24, 2009

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Clean Skies [interviews](#) with Deborah, Chad Holliday, David Rodgers, Pierre Gauthier, Sen. Murkowski, Joe Romm, Kevin Surace, Andy Karsner, Shirley Ann Jackson, Ralph Cicerone, John Holdren, Tom Wallace, Secretary Locke, Kevin Parker, Elliott Gue, and many more.

FedEx CEO: Tax carbon, end foreign dependence on oil

Memphis Commercial Appeal

September 23, 2009

Bartholomew Sullivan

FedEx CEO Frederick W. Smith made his case Wednesday for a tax on carbon, a reduction in the payroll tax and expensing of capital equipment, speaking at a panel discussion with other CEOs at the Council on Competitiveness National Energy Summit.

National Energy Summit & International Dialogue

Center for the Study of the Presidency and Congress

September 23, 2009

Megan Hemler

...Working towards energy security and sustainability is an integral part of the Center's work on Strengthening America's Future Initiative. Our Vice President of Operations and co-chair of the Energy issue team, Dr. Thomas Kirlin, will be participating this week in the National Energy Summit & International Dialogue held in Washington, DC, hosted by the Council on Competitiveness and sponsored by CSPC, among others....

NAM's John Engler: US, Administration, Need a Growth Strategy

ShopFloor.org

September 23, 2009

John Engler, president of the National Association of Manufacturers, packed a lot of policy perspective into [his seven-and-a-half minute interview](#) with CNBC's Becky Quick on Squawk Box. The discussion included green jobs, nuclear energy, infrastructure, trade and the Administration's need to develop a "growth strategy. Watch interview with Deborah Wince-Smith, president of the Council on Competitiveness, at the National Energy Summit.

Warner Criticizes Murkowski Amendment

The National Journal Blog

September 23, 2009

The two politicians both made remarks today at a two-day energy conference hosted by the Council on Competitiveness in Washington.

Industry Leaders Consider Why America Has Fallen Behind at National Climate Summit

TreeHugger

September 23, 2009

David DeFranza

Recent announcements that [China would be dramatically curbing carbon emissions and investing heavily in nuclear and renewable energy](#) highlighted a central theme of the Council on Competitiveness' National Energy Summit: that the United States had fallen behind in important industries shaping the world's future.

Senators Argue Over Murkowski Bid to Block EPA Action on Climate

Solve Climate

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

September 24, 2009

Juliana Williams

At the National Energy Summit yesterday, where Murkowski appeared back to back with Mark Warner (D-Va.), the Alaska Republican declared: "I believe that global warming is happening. I can see the effects on my home state." When it comes to the world taking action, she said, "the next 10 years could matter as much as the next 100 years."

Georgetown University Speaks to Business Leaders

Get Energy Smart Now!

September 24th, 2009

This morning, at the Council on Competitiveness [National Energy Summit](#), Georgetown University President John DeGioia appeared on a [panel on "the Global Economic Development Opportunity"](#).

Energy Executives Complain They Are in Regulatory Limbo

Houston Chronicle

September 24, 2009

Academics and business leaders, meeting at the National Energy Summit in Washington on Wednesday, agreed that the federal government needs to take a stronger role in outlining a new green industrial and energy policies or risk being left in the dust by other nations.

This is America with Dennis Wholey

October 2009

A special two-part energy series featured Andy Karsner, Lou Ann Simon and David Rodgers (Show 1301: Energy Summit and Show 1302: Energy Summit).

Final Progress Report
Council on Competitiveness
Energy Security, Innovation & Sustainability Initiative
DOE Award Number: DE-EE0000038
Reporting Period: February 1, 2009- April 30, 2010
Submitted on: May 17, 2010

Appendix 10: Letters received by the Council commending the work under taken under this Grant.

USAID
FROM THE AMERICAN PEOPLE

DEC - 9 2009

President Deborah L. Wince-Smith
Council on Competitiveness
1500 K Street, NW
Suite 850
Washington, D.C. 20005

Dear President Wince-Smith:

Thank you for your letters dated 24 November 2009 to Acting Administrator Alonzo Fulgham and Deputy Administrator James Michel on issues related to the Conference of the Parties in Copenhagen. We appreciate the commitment of the participants in the National Energy Summit and International Dialogue as well as the time and energy that went into the preparation of the Call for Action for Prosperity and Competitiveness in a Low-Carbon World. Your goal for the development and deployment of broad-based market-driven solutions to global climate change mitigation and adaptation coincides with the view expressed by President Barack Obama in his speech at MIT in October in which he pointed out that the United States was making its "largest investment in clean energy in history."

At the international level, there is broad agreement that clean technology will be at the core of international efforts to address climate change. The United States and other developed countries also recognize that the private sector will be strongly involved in the development and deployment of any new technologies for clean energy, mitigation and adaptation.

With regard to the issue of intellectual property rights which is addressed in the Call for Action, the United States is on record as strongly opposing any treaty language that would undermine the protection and enforcement of intellectual property rights. Our position is that recognition of intellectual property rights is, in fact, a prerequisite for motivating the development and transfer of needed technologies.

The United States is fully engaged with the issues on the complex topic of trade barriers. We are working with other parties to remove trade barriers for environmental goods and services without creating economic displacement in either developed or developing countries. The United States also recognizes the importance of establishing clear and transparent price signals so that private enterprise in this country and abroad can function in more stable investment environments.

Finally, the United States recognizes that building intellectual and market capacity is critical not only to meeting the goals of any agreement on climate change mitigation and adaptation but also to "unleashing" vibrant and sustainable global economic growth.

We recognize the value of your interest in this important development issue.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael J. Yates", written over a horizontal line.

Michael J. Yates
Senior Deputy Assistant Administrator
Bureau for Economic Growth,
Agriculture and Trade

cc:

Charles Holliday, Jr., Chairman, Council on Competitiveness
William Antholis, Managing Director, The Brookings Institution
David M. Abshire, President, Center for the Study of the Presidency and Congress
James H. Quigley, Co-Chair, TransAtlantic Business Dialogue; Chief Executive Officer, Deloitte Touche Tohmatsu
Reid Detchon, Executive Director, Energy Future Coalition
Timothy E. Wirth, President, United Nations Foundation
Bjorn Stigson, President, World Business Council for Sustainable Development
Jonathan Lash, President, World Resources Institute

MINISTERIO
DE ASUNTOS
EXTERIORES Y DE
COOPERACIÓN

EMBAJADA DE ESPAÑA
EN WASHINGTON

The Ambassador of Spain

Washington, DC, December 4, 2009

Compete
Council on Competitiveness
1500 K Street, NW
Ste 850
Washington, DC 20005

Dear Mr. *John*,

Thank you for your kind letter encouraging world economies to act for prosperity and competitiveness in a Low-Carbon World.

The Government of Spain, like the United States' Administration, shares the goal of sustainable global economic growth. Spain is one of the leaders in the technological and industrial development of renewable energies and our regulatory framework favors investment in the renewable sector. We are confident that clean energy will bring prosperity and a better quality of life.

Therefore, the Government of Spain shares your concerns and rest assured that we are fully committed to reach a broad and comprehensive agreement at the COP15 negotiations in Copenhagen.

Thank you very much.

Sincerely *Jorge*,

Jorge Dezcallar

THE SECRETARY OF STATE
WASHINGTON

February 27, 2010

Ms. Deborah L. Wince-Smith
President
Council on Competitiveness
1500 K Street, NW, Suite 860
Washington, DC 20005

Dear Ms. Wince-Smith:

Thank you for your letter in which you forwarded the Council's *Call to Action*.

I share your conviction that climate change is one of the greatest threats facing our planet. The United States is taking significant action to meet this challenge. Under President Obama, the U.S. government is doing more to reduce greenhouse gas emissions than ever before, both by supporting domestic policies that advance clean energy, climate security, and economic recovery, and by vigorously engaging with our international partners.

The Accord reached in Copenhagen was a significant step forward. For the first time, all major participants have made commitments to curb greenhouse gas emissions and to report on these actions in a transparent fashion. The Accord provides for a "fast start" as well as longer-term financing, with a particular focus on forestry and the adaptation needs of vulnerable countries. It also calls for the establishment of new financing and technology institutions.

As a next step, it is critical that we put the Accord into action as quickly as possible. The continued efforts of civil society, including organizations such as the Council on Competitiveness, will be crucial to our achieving success.

Sincerely yours,

Hillary Rodham Clinton

> P.O. Box 20101 2500 EC Den Haag The Netherlands

The Council on Competitiveness
Attn. Ms. Deborah Wince-Smith
President
1500 K Street NW, Suite 850
Washington DC, 2005
United States

**Interdepartemental
Directorate for Energy
Transition**

Bezuidenhoutseweg 30
P.O. Box 20101
2500 EC Den Haag
The Netherlands
T +31 (0)70 379 8911
www.creative-energie.nl

**Dealt with by
mevr. J.G. Kal**

T +31 (0)70 379 6337
F +31 (0)70 379 7423
j.g.kal@minez.nl

Date 14 December 2009

Re Cooperation with the Council on Competitiveness

**Our ref.
IPET / 9223162**

Your ref.

Dear Deborah,

Cc

Let me start by expressing on behalf of Maria van der Hoeven, the Netherlands Minister for Economic Affairs, and myself our sincere gratitude and admiration for the Energy and Climate summit the Council on Competitiveness organised last September. We think that the number and weight of the speakers and participants the Council managed to attract to the event, only underlines its importance and success. For us, working with the Council was – once again – an inspiring and fruitful experience. Mrs. Van der Hoeven was also very pleased that she had the opportunity to speak with Secretary Chu and other representatives from the US administration en marge of the Council summit. Most importantly, the summit underlined the importance of private sector involvement in dealing with energy and climate challenges, and showed how well public private partnership can help to not just maintain competitiveness, but transform these challenges into innovative opportunities for firms.

Encl.

Let me express my gratitude to Ms. Cynthia McIntyre in particular, whose support and admirably hard work has been highly appreciated.

I look forward to continue working with the Council in this – and other – areas, and I would like to express our willingness at the Ministry and the Netherlands Embassy in Washington DC to continue the cooperation. To illustrate this: in the past couple of months we have been in close contact with our colleagues in Washington in order to focus on some strategic themes of mutual interest. It is our plan to discuss these themes at a US-Netherlands seminar in the Fall of 2010. We intend to also consult the Council on Competitiveness in this process.

Best regards,

Chris Buijink
Secretary General

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JAN 28 2010

OFFICE OF
AIR AND RADIATION

Ms. Deborah L Wince-Smith
President
Council on Competitiveness
1500 K Street, N.W.
Washington D.C. 20005

Dear Ms. Wince-Smith:

Thank you for your letter of November 20, 2009 to Deputy Administrator Perciasepe of the U.S. Environmental Protection Agency (EPA) concerning the release of your publication *A Call to Action for Prosperity and Competitiveness in a Low-Carbon World*, and the principles that are articulated in it. I am pleased to respond on his behalf.

President Obama has made climate change mitigation a priority of his Administration. The President has stated his support for comprehensive climate and energy legislation, with the goal of reducing U.S. greenhouse gas emissions by 20 percent by 2020 and 80 percent by 2050. The Administration is already on a path towards enduring, pragmatic solutions to reduce greenhouse gases. EPA has set in motion groundbreaking initiatives such as the light duty vehicle rule – with the nation's first-ever proposed limits on greenhouse gases from passenger vehicles – and the creation of a nationwide greenhouse gas reporting system.

At the United Nations Climate Change Conference in Copenhagen, I communicated these messages during a side event on domestic climate change activities in the United States. Because of the actions we are taking at home, the United States went to Copenhagen with an ambitious target to reduce our emissions. We agreed to join an international effort to provide financing to help developing countries adapt to climate change, and we reaffirmed the necessity of listing our national actions and commitments in a transparent way. These three components -- transparency, mitigation and finance -- form the basis of the approach that the United States and our partners embraced in Copenhagen. With prominent organizations like yours helping to lead the way on this issue, I am confident that the global community will continue to make progress, building upon what was achieved in Copenhagen.

Again, we appreciate your providing the principles developed by the Council on Competitiveness. This set of principles will continue to be a useful guide in future international discussions that will follow from the Copenhagen conference. As we continue to engage with the international community on climate change, we will value feedback and communication with organizations such as yours, as you are leaders on this issue.

Sincerely,

A handwritten signature in black ink, appearing to read 'Gina McCarthy', written over the printed name.

Gina McCarthy
Assistant Administrator

Jones, Marcy S.

From: Caroline Moore [caroline.moore@intertradeireland.com]
Sent: Thursday, October 01, 2009 9:25 AM
To: Wince-Smith, Deborah
Subject: Note from Liam Nellis

Dear Deborah

Congratulations to you and your excellent team at the Council on Competitiveness for involving me in two outstanding events last week in Washington, the Energy Summit and the Global Council.

The Summit was of the highest quality in terms of organisation and content and was also very timely in raising the level of debate on this increasingly important issue.

The Global Council's inaugural meeting got the initiative off to a great start. We reached broad consensus on the general remit of the Council, its areas of particular focus and a way forward. We need some further clarification on some 'housekeeping' issues but as I said I don't think the Friday meeting was the right occasion to air these.

I look forward to seeing the report on the Global Council meeting and to working with you going forward.

Best regards

Liam

Caroline Moore
Chief Executive's Office
InterTradeIreland
Trade and Business Development Body
The Old Gasworks Business Park
Kilmorey Street
Newry
T: 028 3083 4104 (048 from Ireland)
F: 028 3083 4155 (048 from Ireland)
W: www.intertradeireland.com

Jones, Marcy S.

From: Jay Hamilton [Jay.hamilton@marriott.com]

Sent: Thursday, September 24, 2009 6:03 PM

To: Booher, Bill; Wince-Smith, Deborah

Subject: WOW! Homerun!!

What a successful energy summit. I appreciate all the hard work that went into it. My congratulations to the council. The CNBC segment yesterday looked great. Nice pub.

Once the dust settles lets grab lunch. Jay

Jay Hamilton
Global Communications
Marriott International
240-515-1816

www.youtube.com/marriottnews

Jones, Marcy S.

From: porterjb@comcast.net

Sent: Tuesday, November 03, 2009 8:46 PM

To: Wince-Smith, Deborah

Subject: Re: Thank You for Attending the National Energy Summit & International Dialogue

Thanks for inviting me!!! It was the best session of it's kind I've ever attended!!!!!!

Cheers,Jim

----- Original Message -----

From: "Deborah Wince-Smith" <DWince-Smith@compete.org>

Cc: "Bill Booher" <BBooher@compete.org>, "Sandy K. Baruah" <SBaruah@compete.org>, "Cynthia McIntyre" <CMcIntyre@compete.org>, "van Opstal, Debbie" <DvanOpstal@compete.org>, "Susan Rochford" <SRochford@compete.org>, "Betsy Thurston" <BThurston@compete.org>, "Bill Bates" <BBates@compete.org>, "Chad Evans" <CEvans@compete.org>

Sent: Tuesday, November 3, 2009 2:30:11 PM GMT -05:00 US/Canada Eastern

Subject: Thank You for Attending the National Energy Summit & International Dialogue

Dear National Energy Summit & International Dialogue Attendee:

On behalf of Chad Holliday, chairman of DuPont; Shirley Ann Jackson, president of Rensselaer Polytechnic Institute; James W. Owens, chairman and CEO of Caterpillar, Inc.; D. Michael Langford, president of the Utility Workers Union of America, AFL-CIO; myself, and all of us here at the Council on Competitiveness, I would like to thank you for joining us at our National Energy Summit & International Dialogue on September 23-24, 2009. The event was a spectacular success, and we greatly value your participation in our national and international energy conversations.

The Summit was the culmination of two years of intellectual exploration dedicated to improving America's energy security, sustainability and competitiveness. It also served as a high-level platform for the release of Drive, our comprehensive roadmap for achieving energy systems transformation. We have been thrilled by the response to this document and look forward to working with you to ensure the adoption of its recommendations.

We were also delighted that so many experts from around the world traveled to Washington to share their thoughts regarding the transition to a clean energy economy. As our discussions drove home, global problems require global solutions, and we have a great deal to learn from each other as each nation tries to reduce its greenhouse gas emissions and capture the economic benefits of sustainable development.

The intertwined challenges of energy security and sustainability are great, but after two days of deliberations among some of the world's top energy thought leaders, I am more optimistic than ever that we will succeed. The National Energy Summit & International Dialogue was designed to solicit and disseminate ideas to drive demand for sustainable energy solutions. It is my great hope that it has also expanded the coalition for turning those ideas into reality.

Thank you again for your thoughtful contributions to our ongoing dialogue, and I look forward to your continued engagement in our broad-based effort to transform the global energy system

11/5/2009

and enhance U.S. competitiveness.

With warm regards,

Deborah Wince-Smith

Jones, Marcy S.

From: Proenza,Luis [proenza@uakron.edu]
Sent: Friday, October 23, 2009 1:59 PM
To: Wince-Smith, Deborah
Subject: Belatedly . . .

Deborah . . .

I have been much to remiss in sending you this note. My apologies.

First of all, congratulations on a splendid summit on energy and sustainability! It was, as Chad publicly acknowledged, the best organized such meeting I've ever attended. You and your staff should be very proud of how you brought together an exceptionally distinguished group of people from around the world and how the meeting itself was orchestrated with all of the latest tools and approaches to communicating its central messages.

Diane Palmintera has been keeping me apprised of various conversations on our regional innovation leadership and I want you to know I am ready to take whatever next steps you determine are in the best interests of the Council. Please let me know if I have been remiss in anything that needs action.

I am off to the Beijing Forum next week and hope we shall have an opportunity to visit sometime after I get back on November 10th.

All good wishes,
Luis

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Jones, Marcy S.

From: Mona El Baradei [mona.elbaradei@gmail.com]
Sent: Thursday, November 05, 2009 2:47 AM
To: Wince-Smith, Deborah
Cc: Booher, Bill; Baruah, Sandy K.; McIntyre, Cynthia; van Opstal, Debbie; Rochford, Susan; Thurston, Betsy; Bates, Bill; Evans, Chad; dina; hebazayed@yahoo.com
Subject: Re: Thank You for Attending the National Energy Summit & International Dialogue

Dear Deborah,

I would like to congratulate you on the very successful National Energy Summit and thank you for inviting myself and my colleagues from the Egyptian National Competitiveness Council to join you. It was a very interesting and fruitful conference and we benefited very much from the exceptional speakers and dynamic discussions.

I wish you continued success with your future events and I look forward to hosting you here in Cairo next May.

Best regards,

Mona El Baradei

On Tue, Nov 3, 2009 at 9:30 PM, Wince-Smith, Deborah <DWince-Smith@compete.org> wrote:

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Thank you again for your thoughtful contributions to our ongoing dialogue, and I look forward to your continued engagement in our broad-based effort to transform the global energy system and enhance U.S. competitiveness.

With warm regards,

Deborah Wince-Smith

Jones, Marcy S.

From: Tomas Diaz De La Rubia [delarubia@llnl.gov]
Sent: Friday, September 25, 2009 11:07 PM
To: Wince-Smith, Deborah
Cc: Tomas Diaz de la Rubia; George H. Miller
Subject: Follow on

Dear Deborah,

Congratulations on a very successful ESIS initiative, capped with an spectacular series of events this week. The Drive document is a powerful conclusion to two years worth of outstanding work. Thank you for your leadership all you do for us and for the entire community to promote American competitiveness through sound policy that is informed by science-based ideas, concepts and results. It's truly an outstanding effort by you and the entire Council staff. Please extend my congratulations to everyone.

On Thursday, I attended a meeting at DOE HQs with Undersecretaries Johnson and Koonin where the President of China's ENN described how his company has entered into a partnership with Duke Power (announced at the Clinton Global Initiative meeting in NY the day before) where ENN will sell Duke tens to hundreds of MWs worth of thin film silicon solar photovoltaic panels, first manufactured in China, later in North Carolina, using Applied Materials equipment. Interesting that U.S. innovation and capital equipment find their way to China where state owned enterprises then turn them into low cost, high valued added, manufactured high tech products for the energy revolution for use in the U.S. They also understand that they need to create jobs in the U.S. so they'll put up a plant in NC. However, it will be a Chinese owned and controlled plant. It's an interesting market dynamic.

After that meeting, it occurred to me that one of the things that is often neglected in this debate is the issue of the cost of not acting, as opposed to the cost of acting, to mitigate and adapt to climate change. It is hard to find a truly quantitative debate on the issue. It's relatively easy to put a cost on the deployment of technology. So many dollars for a nuclear power plant or a solar farm, etc. However, it's very hard to put a price on the cost of inaction, i.e. on the cost of opportunity lost. The topic was of course discussed this week at the Summit. However, I wonder if a more vigorous debate involving industry, academia and National Labs, led by the council, might not be interesting. It's a tough subject but the Council clearly is masterful at tackling complex subject successfully.

By the way, I very much look forward to my and LLNL's continued participation in the TLSI.

Cheers,
Tomás