ATLANTIC COUNCIL

REPORT TO U.S. AND EU LEADERS

US-EU COOPERATION TOWARD SMART GRID DEPLOYMENT

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Based on outcomes from the September 11, 2009 workshop hosted by
The Atlantic Council of the United States and the U.S. Department of Commerce

Supported by
The Transatlantic Business Dialogue (TABD)

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

This report, based on the September 11, 2009 workshop on "U.S.-EU Cooperation toward Smart Grid Deployment" recommends that U.S. and EU leaders work in concert with the private sector to enhance the development and deployment of smart grid technologies across the Atlantic. The need for undertaking a holistic approach requires transatlantic cooperation in a number of complex areas, which warrant the establishment of specific public-private working groups focused on creating a common architecture with compatible standards, including those for cyber security, that can be applied in the transatlantic community and rolled out globally.

INTRODUCTION

The world has reached a critical junction. The dual crises spawned from the global economic recession and the potentially catastrophic impacts of climate change has forced nations the world over to restructure their economies. As the world's two largest economies, The United States and the EU have taken unprecedented measures to address the economic and climate change challenges facing the world in ways that are mutually reinforcing. They are now taking key steps toward a low-carbon economy that would create high wage jobs, world-class exports and sustainable economic growth. These long-term strategies will not only lead to a cleaner and healthier environment for our citizens, but will also improve energy security and uphold our competitive primacy on the global stage.

To effectively meet these goals, new sources of energy will need to be incorporated in the power system- both to transition towards an industry that emits lower levels of CO_2, and to restore global economic demand. Smart Grids represent the integration of information technology with the generation, transmission, distribution and consumption of electric power. The 21st Century electric power industry expects the deployment of such an integrated system to dramatically alter the production and consumption of electricity. Smart grids are seen as having the potential to increase energy efficiency, utilization of renewable and distributed power, energy security, and lower carbon emissions. Numerous activities are underway in the United States and Europe to develop the key components necessary for the successful deployment of smart grids.

RECOMMENDATIONS FOR U.S.-EU COOPERATION

A one-day workshop hosted by the Atlantic Council of the United States and the Department of Commerce was held on September 11, 2009 to identify key areas where U.S.-EU cooperation could prove instrumental in ensuring the successful, timely deployment of smart grid technologies on a large scale. Given the considerable smart grid investments already underway in the U.S. and Europe, the U.S. and both the EU Commission and the EU's 27 member states should engage with each other in this promising field. The United States government already has a number of mechanisms in place to facilitate this cooperation, including a multi-agency smart grid task force and the National Institute of Standards and Technology's (NIST) smart grid interoperability panel. This report recommends the establishment of an appropriate transatlantic liaison with these existing efforts to ensure compatible standards and regulations based on international standards wherever possible. These recommendations are similar to those suggested in the February 2009 Atlantic Council/CSIS report, entitled "Transatlantic Cooperation for Sustainable Energy Security" [1] and in a soon to be released report on a "US-EU Workshop on a Shared Vision for Energy and Climate Change, " which recommends a government-to-government council with additional representation at the working group level of industry representatives. [2]

The following concrete recommendations were discussed throughout the September 11 workshop:

Architecture and Standards

1. ***Interoperability***
   a. Build on the progress made by both the USG Smart Grid Task Force and NIST's Interoperability Panel by incorporating a transatlantic dimension that will foster common/compatible interoperability standards based on international standards wherever possible.
   b. Current USG forums, the EU Commission, relevant Member States, and the transatlantic business community should cooperate in efforts to:
      - ✓ Identify existing standards that can be applied.
      - ✓ Identify gaps in existing standards. (Sharing of experience and knowledge could generate a more robust set of standards.)
      - ✓ Foster common measurements and tests that could be applied worldwide.

2. ***Cyber Security***

   The European Commission and relevant Member States are invited to participate in NIST's Smart Grid Interoperability Panel and the NIST cyber security coordination task group, in order to facilitate the development of common security standards;

3. ***Regulatory Issues***

   a. Incorporate smart grids as a topic for consideration in present U.S.-EU regulatory cooperation efforts, including the U.S.-EU High-Level Regulatory Cooperation Forum. Within this context, U.S. and EU regulators and policy makers should:
      - ✓ Share experiences from establishing feed-in tariffs and other policies for renewable power.
      - ✓ Review pros and cons of various rate designs for:
         - Net metering;
         - Uneconomic feed-in tariffs;
         - Utility cost recovery for infrastructure and backup for net zero homes;
         - Calculating net present value of future benefits.

   b. Review and recommend effective approaches to phasing out subsidies.
   c. Assess experience with setting rates when infrastructure investments and smart grid technology investments are being made simultaneously.
   d. Develop methods for recognizing financing costs in rates to encourage investments
   e. Share experiences and approaches to addressing political pressures slowing progress in deployment

4. ***Private Sector Focus***

   a. Work with transatlantic business and consumers to develop a better understanding of private sector acceptance of technology and developing best practices.
   b. Assess private sector reaction to:
      - ✓ Demand management, mandatory or voluntary
      - ✓ Costs for smart meters
      - ✓ Remote connects and disconnects
      - ✓ Costs for automatic devices in appliances, heating, cooling etc.
      - ✓ Providing storage for the grid
      - ✓ Investment for Net-zero home
      - ✓ Utility control of time of day pricing
      - ✓ Net billing
      - ✓ Current investments for future savings
      - ✓ Concern over privacy
      - ✓ Concern over cyber security
      - ✓ Benefits of energy efficiency

Additional Recommendations

1. Develop a clear quantitative and qualitative case for undertaking the deployment of smart grid.
2. Share experiences on demand management programs, lowering consumption and lowering capital requirements
3. Provide assessments of customer demand elasticity in different markets

4. Undertake joint studies on the short- and long-term cost impacts and potential for lower customer bills.
5. Share experiences with different business models
6. Undertake cost analyses of employing various smart grid technologies to provide more accurate data that will assist the insurance industry in determining appropriate rates
7. Evaluate the impact of:
    - ✓ Greater reliability on reducing consumer losses
    - ✓ Integrating renewables and slower growth in electric power consumption on lowering GHG emissions
8. Assess potential for new jobs and growth in GDP.
9. Evaluate issues related to technical obsolescence.
10. Develop approaches to ensuring privacy of consumers' data including: procedures, controls and monitoring of data miners, and standards for controlling access to customer data for both individual and industry.
11. Expand international cooperation by establishing links to smart grid alliances in other countries, namely Korea, China, India, Brazil, Australia, Canada and the EU.

It is understood that such an extensive list of recommendations would have to be undertaken over a period of years. Hence, these recommendations should be undertaken gradually within the current smart grid frameworks already in place on both sides of the Atlantic. Initial discussions on U.S.-EU Cooperation should focus on the issues raised under Architecture and Standards and under Cyber Security.

Challenges and Benefits of Deploying Smart Grid Technologies

Successful economic deployment will ultimately depend upon addressing a large number of technological, regulatory and social issues in a holistic process. The transatlantic community could greatly strengthen its ability to deliver the potential benefits of smart grid technologies though closer cooperation. The challenges are very complex and involve redesigning the manner in which various segments of the industry interrelate as well as addressing regulatory, social, and security issues related to the building and operation of a 21st Century power industry.

At this time, the power industry is in the process of defining what will be entailed in a smart grid. Clearly, it will be far wider than a refinement of the transmission and distribution systems. The objective will be to transform the existing system with intelligence provided by telecommunications, automation and information technologies to include sensors and smart devices linking all aspects of the grid, from generator to consumer and delivering enhanced operational capabilities such that:

- *Customers* will be provided the information and tools necessary to help themselves and utilities meet changing cost and reliability requirements.
- *Efficiency* will be improved by optimizing assets while integrating emerging technologies such as renewables and storage devices.
- *Reliability* will be enhanced by increasing power quality, promoting early detection and self diagnosis, autonomous but coordinated automated corrective actions, and protecting the grid from cyber attacks and acts of nature. [3]

Ideally, the trans-active nature of a smart grid will:

- ✓ Enable active participation by customers to optimize use of demand response
- ✓ Accommodate all generation and storage options
- ✓ Enable new business models by expanding products, services and markets
- ✓ Improve reliability for the digital economy
- ✓ Optimize asset utilization and operational efficiency
- ✓ Provide for remote disconnects and reconnects
- ✓ Relieve operational pressures caused by aging work force
- ✓ -Anticipate & respond to system disturbances (self-heal)
- ✓ Operate resiliently against attack and natural disaster. [4]

Ultimately smart grid technology should aim to optimize the electric system for the benefits of all customers and to maximize the benefits from new technology investments.

Currently, there are many countries and a wide variety of companies showing very active interest in developing and implementing smart grid technology to obtain a more efficient and effective electric power industry. In Europe, a number of countries are actively engaged in deploying smart grid technology. The EU Commission has developed a European Technology Platform (www.smartgrids.eu) as well as the EU Strategic Energy Technology Plan, which has just been updated. In the United States, a GridWise Alliance was formed in September 2003 to increase knowledge among industry stakeholders, promote understanding of roles, benefits, costs and supporting RD&D initiatives, and public-private partnerships. There are currently 100 members representing utilities, equipment and information technology companies, and academic organization in the United States. The Alliance has recently exchanged information with similar organizations being formed in Australia and South Korea, with interest also being shown by Brazil, China, India and Northern Ireland.

Implementation and successful commercialization will depend upon involving the *CUSTOMER* and *ALTERING UTILITY ECONOMICS*. For customers this will require them to be:

- ✓ Engaged through effective communication, education and debate to create understanding of concepts and issue.
- ✓ Allowed to impact the direction of the transition within their respective areas.
- ✓ Motivated by the value proposition and the cost/penalties of not participating.
- ✓ Ensuring involvement through collaborative engagement that actively addresses customers' questions and issues.[5]

At the individual level, customers should see more reliable service, reduced business losses, potential bill savings, possible transportation cost saving, options for managing electricity consumption, and options to sell customer owned generation and storage resources. At the societal level, there should be downward pressure on electricity prices through improved operating and market efficiencies, increased reliability leading to a reduction in consumer losses (estimated at $135 Billion), increased grid robustness and improved grid security, reduced emissions through the integration of renewables and smaller system losses, new jobs, and growth in GDP. With the gradual introduction of Plug in Hybrid Electric Vehicles (PHEVs) there will also be an opportunity to reduce the country's dependence on imported oil through the utilization of electric vehicles as generation and storage devices.[6]

Altering utility economics raises a number of regulatory issues. First, utilities will need to be able to recover the cost of installing the meters and devices that will ultimately lead to energy savings and reduce the expansion in generating capacity that would otherwise be required. Customers will need to understand the future benefits and accept new rate designs and demand management programs. Customers often find it difficult to understand the value of equipment investments and may not be comfortable with rate designs that vary during the day.

Regulators may find themselves in a political dilemma, as rate increases associated with new infrastructure cost may be needed along with additional fees for smart grid meters and devices. In addition, there will be concerns over the impact of higher and more complex rates on low and fixed income customers. For example, new rate structures will have to be designed to allow for net metering that provide for feed-in tariffs that may generate subsidies for customer provided higher cost power. The EU has also been facing the issue of designing the phase out of subsidies. Another related issue is designing net billing systems that are clear and are accepted as reliable by customers.

If energy policies are established that encourage customers to build "net-zero' homes, regulations will have to determine who pays for infrastructure (including backup facilities), and what banking options will be available and what financing costs will be allowed. Eventually, regulators could have to accommodate deregulation that allows for house-to-house sales that move electricity fro solar panels to battery storage. There will also be decisions to be made over who decides technology options versus functional choices to be made available to customers. Is this to be done by utilities, regulators or through legislative action?

Additionally, regulators will have to cope with a number of issues related to cost recovery. One, for some equipment and facilities, technology is now changing faster than current depreciation schedules. Two, proper assignment of costs and benefits is not always readily identifiable. Three, the proper allocation of cost involves decisions on who should pay as well who should decide. Should FERC or the states have this authority? Fourth, there are also decisions to be made on the net present value of future benefits and how they should be handled in rates.

The electric backbone of smart grids is modern transmission and distribution grids. Regulators will also have to develop policies which allow utilities to recover investments in the physical electric grid with modern equipment, including transformers with lower losses, zero pollution from cooling medium, and advanced solid state devices for efficient power flow and grid protection. In some cases, achieving the benefits of the smart grid could require building new power transmission lines.

Potential Road Blocks

Besides the regulatory and customer acceptance hurtles, there are a number of other road blocks to be overcome before the benefits of smart grid technology can be widely achieved. On top of dealing with an aging infrastructure, the industry's work force is also aging and needs to be retrained. As experienced workers retire, the efficiency of the workforce declines. At the same time, new skills will be required to effectively develop and deploy new technologies.

There are also physical restraints like limited space in densely populated areas to build new transmission and distribution lines. Deployment is also hindered by the long lead times it takes to obtain approvals and construct new facilities. It currently takes about ten years from planning to completion.

In addition, it is not yet clear whether or not the cost of building the necessary new facilities can be offset through the deployment of smart grid technology. In any case there will be significant up front investments that will be required while aging infrastructure is upgraded and expanded. The necessity for near-term rate increase may prove difficult for the public to understand and accept, especially under current economic conditions. However, the grid will continue to age, and the expected rebounding of demand could trigger serious reliability problems, as well as the potential for major power blackouts. Customers should be made aware that paying for a reliable grid is like buying insurance. There are industry concerns over a smart grid backlash that could occur if the introduction of smart grid technologies is not accompanied by a significant upgrading of old devices.

Although the rationale for deploying smart grid technology to increase efficiencies and maintain competitiveness is compelling, politics could slow down the pace of deployment. Conditions vary by state and region such that deployment often has to be designed to optimize across local jurisdictions. However, local interest often will lobby Federal authorities and will trump efforts to optimize the electricity system over a broader area.

The Department of Energy is currently examining a number of grid integration and sub-optimization issues. Smart grid technology would provide extensive information that will allow for more efficient management of the grid. Some countries in Europe, like the United Kingdom, are successfully utilizing such information to design a more efficient system. In a more distributed system relying increasingly on intermittent power sources, storage becomes critical to building a reliable system. Further research is needed to understand the most cost efficient storage systems under various circumstances. Today, no one in the United States has determined when to use water, thermal or compressed air for storing power. It was noted that German utilities are experimenting with placing batteries at transformers to increase reliability. Similar experimentation is being done in the United States by American Electric Power.[7] Eventually, the aggregation of storage available in plug- in hybrid vehicle batteries might provide an effective source of storage for some portions of the grid.[8]

Most of these roadblocks can be resolved through technology solutions. However, the effectiveness of smart grid deployment will depend heavily on customer acceptance.

Customers Must be Involved

With the deployment of customer based smart grid technology, customers will become much more involved in the management and utilization of the grid. Customers will need to be involved in smart grid planning processes, and customer education will be critical for successful implementation. Customer will have concerns over issues like the following that will have to be addressed:

- ✓ New devises and procedures cannot be perceived to be burdensome.
- ✓ Customers must trust the system to perform as claimed.
- ✓ Data miners may want to access records for marketing purposes.
- ✓ There will be privacy concerns as their personal habits are tracked.
- ✓ Utilities will have control of prices that change frequently.
- ✓ How can customers trust utilities to bill correctly under new structure?
- ✓ How soon will the new devices become technologically obsolete?

At the same time, customer understanding of smart grid technology will depend upon creating firm definitions that will involve product services that vary by market. Also, customers need to understand that the reliability of power will improve, but that electricity outages will still occur as many are the result of inclement weather. The new technology will allow for quicker identification of problems, and hence the faster restoration of power; thereby significantly reducing the estimate of over $79 billion in losses currently associated with outages.

The relationship between the cost of installing the technology and the customers' role in realizing financial benefits will have to be clear. Studies are underway to determine customers' likely demand response to price signals. It is expected that European and US customers will behave similarly, but this has not yet been verified.

Studies on customer attitudes will be valuable in determining their willingness to make the investments required to obtain relatively small decreases in electricity bills. Customers will also be impacted by insurance rates on their homes, business and plants. For the insurance industry, the multiplicity of services and devices creates a particular problem in setting rates for homeowners, commerce, and industry.

Open Architecture and Standards

For the customers and utilities to embrace smart grid technology, it must operate seamlessly and reduce concerns over the reliability and availability of service. This will require new open architecture with standards and security that allows for interoperability and ease of operation. Current infrastructure is working, and while it is being improved there is a need to ensure it keeps working throughout the transition. The new architecture and standards to accommodate smart grid technologies will have to be plugged in without causing disruptions to operations and service.

The ultimate goal is to achieve interoperability throughout the system. The system has to change from a focus on one-way energy flows to one that accommodates a two-way flow of power and information. Investments must be able to become operational quickly and easily and be highly reliable. There is strong incentive to reduce peak power usage in order to decrease the requirements for additional generating capacity. However, for this to happen, information must flow to, as well as from, the customer. There is a policy push by the Department of Energy to develop standards quickly to accelerate the system's capability of becoming significantly more efficient at the earliest possible date. In cooperation with the DOE, NEMA, IEEEE, GWAC, and other stakeholders, the National Institute for Standards and Technology (NIST) has been given "primary responsibility to **coordinate development of a framework** that includes protocols and model standards for information management **to achieve interoperability of smart grid devices and systems**".[9]

NIST is working with industry to measure and test the implementation on new standards to ensure consistency throughout the system. NIST is also collaborating with a number of countries, like the United Kingdom and Germany, in an effort to make new standards and architecture as accepted as possible. Industry and technology innovators are very interested in being able to market internationally. This will require an expansion of international collaboration.

NIST has established a one-stop internet clearinghouse that will be maintained by Virginia Tech. The website will share the results of numerous pilot projects. NIST has also set up the first testing lab to determine how technology that is developed and being employed by private corporations measures up to the evolving standards.

These efforts are all part of a government initiative to instill a more open government culture that will coordinate policy development with transparency, participation, and collaboration. Government platforms are being established to facilitate the reuse of best practices though a platform for open government tools.[10]

Today there is an absence of concrete standards. It is urgent that this situation be rectified. The deployment of smart meters will cost between $40-50 billion nationwide, and is already underway. There will be a rapid technology evolution that is being financially supported by the American Recovery and Reinvestment Act of 2009.

At a May 18, 2009 meeting at the White House, a game plan was agreed upon for moving forward rapidly. Open standards were accepted as being essential, consensus was not to require unanimity, variations for circumstances was to be allowed, and it was agreed that today's regulatory assumptions may have to evolve.
On September 24, 2009, NIST[11] presented an initial set of existing consensus standards, and a roadmap to fill the gaps. The roadmap focused on the following areas:

- ✓ *FERC Identified Priority Applications*
  - Demand Response
  - Wide-Area Situational Awareness
  - Electric Storage
  - Electric Transportation
- ✓ *Additional Priority Applications*

- Advanced Metering Infrastructure
- Distribution Grid, including Distributed Energy Resource Integration

✓ *Cross-cutting Priorities*
- Cybersecurity
- Data Networking

Activities during Phase I include three public workshops with more than 1500 participants. A draft report has been issued identifying 16 initial standards with more than another 50 identified. In addition, 70 gaps and issues were identified. High priority was assigned to 14 standards, and Cybersecurity was selected for immediate action.

Phase 2 is to be completed in the balance of 2009. A public/private Standards Panel forum is being used to provide ongoing recommendations for new/revised standards. This phase will last into 2010 and will be complemented with testing and the creation of a certification framework. A Smart Grid Interoperability Panel (SGIP) has been established and funded for the initial period with an additional 2-year option period. A NIST Smart Grid Interoperability Framework Document was released on September 24, and the first meeting of the SGIP will be held on November 17 at Grid-Interop '09 in Denver. By mid December, the initial steps to establish a Smart Grid Testing and Certification Framework will have been taken.

It is evident that the US government, utilities, private innovators, and regulators are off to a rapid start in developing the standards and open architecture required for testing and certifying the technology and information protocols that will be needed. It is also evident that the task is complex and will require ongoing efforts for several years. One of the most urgent and most complex tasks is the development of architecture and standards to ensure cyber security.

Cyber Security and Privacy Issues[12]

One of the most challenging aspects of deploying smart grid technology is the need to completely reassess and deploy much more robust cyber security to protect physical operations and the data associated with its operation. The Federal government has the responsibility to ensure that standards are developed and adopted to avoid creating unexpected opportunities for adversaries to penetrate Smart Grid systems or to conduct large-scale attacks on the system. NIST has established a Cyber Security Coordination Task Group (CSCTG) to focus on creating a comprehensive set of cyber security requirements for the Smart Grid.

Currently, there is a large knowledge gap between those who operate the grid and the knowledge that is required to run a cyber secure safe grid. The vulnerability caused by this gap is compounded by today's reliance on joint research groups in Asia (namely, India and China) for a lot of the cyber security software. The current grid is managed with a legacy SCADA system with limited cyber security in place for specific domains, like bulk power generation and transmission. Existing vulnerabilities, and even unintentional errors, could result in the destabilization of the grid.

Fortunately, modernization provides an opportunity to dramatically improve the security of the grid. The integration of new information technology and networking technologies brings both new risks and an array of security standards, processes, and tools. However, required security architecture and control must be designed into the system from the start. It cannot be added later.

There are numerous well known threats to the grid that include:

I. Deliberate attacks
   - Disgruntled employees
   - Industrial espionage
   - Unfriendly states
   - Terrorists
   - Electromagnetic Pulse (EMP)

II. Inadvertent threats
   - Equipment failures
   - User errors

III. Natural phenomena
   - Hurricanes
   - Earthquakes
   - Floods
   - Solar activity

In addition, there are a number of new risks to the grid:

- ✓ Greater complexity increases exposure
- ✓ Linked networks introduce common vulnerabilities
- ✓ "Denial of service" attacks
- ✓ Increased number of entry points and data paths
- ✓ Compromise of data confidentiality and customer privacy
- ✓ Disruption of information technology equipment by EMP, electromagnetic interference (EMI), and geomagnetically induced currents.

The CSCTG has developed a game plan for systematically identifying and tailoring the requirements and assessing the standards to address the above noted cyber security and privacy issues. The group has 200 participants from the private sector, academia, regulatory organizations, and federal agencies. Several sub-working groups have been established to focus on specific issues, including a group focused on electromagnetic disturbances. The CSCTG is performing a series of risk assessments and developing security architecture linked to the smart grid interface diagrams that will lead to the identification of cyber security requirements and risk mitigation measures to provide adequate protection. The final product will be a set of cyber security requirements.

The CSCTG will review the many existing applicable standards and combine the cyber security coordination strategy with the advanced security automation program to determine gaps and interrelationships. A testing and conformity assessment program will then be undertaken. While this activity is heavily focused on the domestic situation, it will also be necessary to address international interfaces, especially involving remote access and power sharing. There will also be knowledge to be gained through dialogues with other countries dealing with the same issues. The United States would be economically impacted by serious power failures elsewhere in the world.

Holistic Solutions Require Cross-functional Task Forces[13]

The development and deployment of Smart Grids is an undertaking that will be critical to our ability to improve energy efficiency, accommodate intermittent and distributed energy sources, and mitigate GHG emissions. The workshop identified the immensity and complexity of the issues that will require holistic solutions involving many participants. The integration of the customer through demand reduction processes and as a potential supplier of power means all segments of society will need to be involved. Smart Grid technology is an enabler to achieving social goals such as 20/20/20 in Europe, and sustainable low carbon energy security in the United States. The technology promises higher quality power supplies that will drive economic growth and allow economies to become more competitive. Customers will embrace the technology only if it is perceived to be providing tangible benefits. In turn, the realization of tangible benefits will drive policy, which should include incentives.

There has been underinvestment in the grid over the past 25 years. For example, in the EU 50% of the grid is over 38 years old, and 20% is greater than 50 years old. The US is in similar position and under current economic conditions there is not enough capital to upgrade the current systems to meet modern requirements.

Public/private partnerships will help to facilitate industries' efforts to create new business models that will have to adapt to many different market conditions. These business models must provide the profitability to support the necessary investments at costs the customers can afford while meeting social goals. Deregulation and unbundling of the industry creates many different markets that will require differing business models. However, even if countries and companies have differing business models, there is much that can be learned from comparing experiences and knowledge.

The creation of smart grids will be an evolutionary process that relies on basic technology that can be expanded as the grid becomes more robust. The process of innovation creates new standards that will have to be accommodated. However, it will be important to focus on the basic technology foundations that can help us now. Agreement on an open architecture and a process of testing and certifying standards and devices will be critical to successful evolution of the power system. Moreover, it will be important to anticipate future technology needs as smart grid technology is being installed to avoid stranded investments and expensive rebuilds that could be avoided.

An awareness of the full complexity of the issues and interrelationships points to the need for utilizing holistic processes in the development and deployment of smart grid technologies. This will require numerous cross- functional, multi-disciplinary task forces in which knowledge and experience can be readily exchanged. Within the United States, transparent, collaborative processes are being utilized that involve a wide variety of participants. Similar processes are being evolved in many European nations. Technology innovation will be fostered by the broad exchange of information and ideas and by the creation of standards that provide for interoperability internationally.[14]

U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment

A joint project of the Atlantic Council of the United States (ACUS) and the U.S. Department of Commerce for the U.S. Government, European Commission and the transatlantic business community

Supported by:
The Transatlantic Business Dialogue (TABD)

Summary:

Smart Grids represent the integration of information technology with the generation, transmission, distribution and consumption of electric power. They are seen as having the potential to increase energy efficiency, improve the utilization of renewable and distributed power, lower carbon emissions and enhance energy security. Numerous activities are underway in the United States and Europe to develop the key components necessary for the successful development and deployment of smart grids.

Achieving this success, however, will ultimately depend upon addressing a large number of technological, regulatory and social issues in a holistic process. The transatlantic marketplace could greatly strengthen its ability to deliver the potential benefits of smart grid technologies though closer cooperation. The challenges are very complex and involve redesigning the manner in which various segments of the industry interrelate as well as addressing regulatory, social and security issues related to the building and operation of a 21st century power industry.

This one-day workshop will help identify some of the key areas where U.S.-EU cooperation could prove instrumental in ensuring the successful, timely development and deployment of such technology on a large scale. Recommendations at the conclusion of the event will be offered in advance of the upcoming U.S.-EU Summit.

Friday, September 11, 2009

8:00 *Opening Remarks*: Mary Saunders, Deputy Assistant Secretary for Manufacturing and Services, U.S. Department of Commerce (Confirmed)

8:15 *Session I: Lessons to be learned from Deployments to Date*

Mike Oldak, Edison Electric Institute

9:00 *Session II: Road blocks associated with expanding Transmission and Distribution lines.*

Weston Sylvester, Director, Distribution Solutions, Siemens Energy, Inc.

10:00 ***Session III:*** *Impacts on Generation of Power: Reliability, Storage, Balancing Loads, Fuel Mix & Water*

Dan Ton, Smart Grid Research and Development Program Manager, U.S. Department of Energy

12:00 ***Session IV:*** *Involving the Consumer and Demand Side Management: Consumer Incentives, Altering Utility Economics*

Steve Bossart, Director, Integrated Electric Power Systems Division, National Energy Technology Lab

1:00 ***Session V:*** *Standards and Security*

Open Architecture to ensure Interoperability and avoid Equipment Limitations
David Wollman, National Institute for Standards and Technology (Confirmed)

Cyber Security and Privacy Issues
Annabelle Lee, Senior Cyber Security Strategist, National Institute for Standards and Technology

2:30 ***Session VI:*** *Task Forces and Industry Cooperation required to Design the Modern Grid*

Holistic Solutions and the need for Cross-functional Task Forces
Mark Hura, General Electric Energy

CSCTG	Cyber Security Coordination Task Group
DOE	Department of Energy
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
FERC	Federal Energy and Regulatory Committee
GDP	Gross Domestic Product
GHG	Green-House Gas Emissions
GWAC	GridWise Architecture Council
IEEE	Institute of Electrical and Electronics Engineers
NEMA	National Electrical Manufacturers Association
NIST	National Institute of Standards and Technology
PHEV	Plug in Hybrid Electric Vehicles
RD&D	Research Development and Deployment
SCADA	Supervisory Control and Data Acquisition
SGIP	Smart Grid Interoperability Panel

[1] Pg 9. Kramer, Franklin and Lyman. "Transatlantic Cooperation for Sustainable Energy Security: A Report of the Global Dialogue between the European Union and The United States." Washington, D.C. CSIS Press. 2009.
[2] Lyman, John. "Report on US-EU Workshop on a Shared Vision for Energy and Climate Change." Washington, D.C. The Atlantic Council of the United States, 2009.
[3] Oldak, Mike. "Lessons to be Learned from Smart Grid Deployments." *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[4] Bossart, Steve. "Involving the Consumer in Smart Grid." *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[5] *Ibid.*
[6] *Ibid*.
[7] Further information can be obtained at: http://www.aeptechcenter.com/ces
[8] Ton, Dan. "U.S.-EU Cooperation on Smart Grid Deployment" *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[9] Wollman, David. "NIST Coordination and Acceleration of Smart Grid Standards." *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[10] *Ibid*
[11] More information can be obtained at www.nist.gov/smartgrid
[12] Lee, Anabelle. "Smart Grid and Cyber Security." *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[13] Hura, Mark. "Smart Grid. . .Smarter Energy Choices" *U.S.-EU Workshop on Cooperation toward Smart Grid Development and Deployment*. U.S. Chamber of Commerce Washington, D.C., 11 Sep 2009. Lecture.
[14] More information can be found at www.smartgrids.eu