A SHARED US-EU VISION FOR ENERGY AND CLIMATE CHANGE

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Executive Summary

The broad issues surrounding the global need to achieve energy security in a world equally concerned over climate change and economic growth are well known and under intensive discussion in numerous forums and governmental official dialogues. The Atlantic Council of the United States, in partnership with the Clingendael International Energy Program at the Netherlands Institute for International Relations, initiated a series of workshops designed to broaden the discussion of energy issues to include the business community, governmental organizations and civil society organizations on both sides of the Atlantic.

The initial workshop was held in Brussels on May 28-29, 2009 to develop a "Shared Vision for Energy and Climate Change". The discussions brought to light many of the complex issues and intertwining relationships that need to be considered in addressing energy security, environmental degradation and economic prosperity. At the same time these issues are being addressed, the transatlantic community, as well as the rest of the world, is facing two simultaneous crises. One is financial and economic and the other is environmental. The former is making it difficult to make necessary environmental investments and to pay the higher energy costs that may be required. The latter is making it necessary to change radically how we produce and consume energy.

This situation provides a huge opportunity for positive change. In the coming years we cannot afford to continue with "business as usual" as the current path is unsustainable. There was strong sentiment that failure to transform the energy sector to address the threats of global warming adequately will have very costly consequences for future generations. The world already has to adapt to the impact of climate change and the impacts will continue to increase for many decades even under the best of scenarios.

Fortunately, there are many technologies that can be brought to bear. But development and deployment will not be easy, or inexpensive. Current infrastructures will need to be transformed. Transitions will take time and must be undertaken in a manner that avoids severe economic disruptions to industry and consumers. In the end, we may need a complete reorganization of our societies. Thus, it is essential that the United States and Europe provide the needed leadership. Cooperation in undertaking such a transformation is more urgent than ever before, as it will be easier to devise an effective and efficient way forward through cooperation than by going on separate and possibly conflicting paths. The government has a clear responsibility to create the framework for addressing the multiple challenges associated with transforming the energy industry.

- ✓ *The framework should be based on an implementation plan that is broadly supported by industry and the public.*

- ✓ *Obtaining such acceptance will require the creation of a clear vision of the broad objectives as well as the societal changes and economic transitions that will have to be undertaken by industry and the public.*
- ✓ *A coordinated set of communications across the transatlantic community will help overcome growing resistance to the building of new facilities and infrastructure, as well a reluctance to absorb higher per unit energy costs.*
- ✓ *The workshop discussion confirms that the numerous government –to – government dialogues that are being undertaken on subjects ranging from climate change to R&D cooperation on specific technologies are essential. But, they are not seen as sufficient by themselves to drive societies to undertake the radical transformations deemed necessary.*
- ✓ *Track II workshops involving a blend of business, NGOs and government experts have the potential to strengthen significantly the understanding of issues, broaden the political will, and provide governments with useful information related to the feasibility and implementation issues involved in creating the transition.*
- ✓ *A Transatlantic Forum or Council on Energy should be formed to coordinate the identification of critical subjects that could benefit from cooperative activities and to ensure that knowledge on technology and implementation issues is kept current.*
- ✓ *A holistic framework is needed for government-to-government dialogues.*

The report recommends that a number of essential enabling activities should be undertaken within a proposed framework as follows:

I - Establish a Transatlantic Energy Council

II- Foster Public Understanding & Acceptance

- ✓ ***Create the Vision***
- ✓ ***Coordinated Communications***

III- Identify Key Technologies

- ✓ ***Technology Assessments***
- ✓ ***Scenarios & Modeling***
- ✓ ***Develop Implementation Plans***

IV- Develop Policy

- ✓ ***Resource Availability***
- ✓ ***Research & Development budgets***
- ✓ ***Federal / EU versus State/National***
- ✓ ***Measurement***
- ✓ ***Renewable Portfolio Standards***
- ✓ ***Cap & Trade Schemes***
- ✓ ***Acceptable Economic Impacts***
- ✓ ***Expanded International Cooperation***

V- Determine Government Support Required

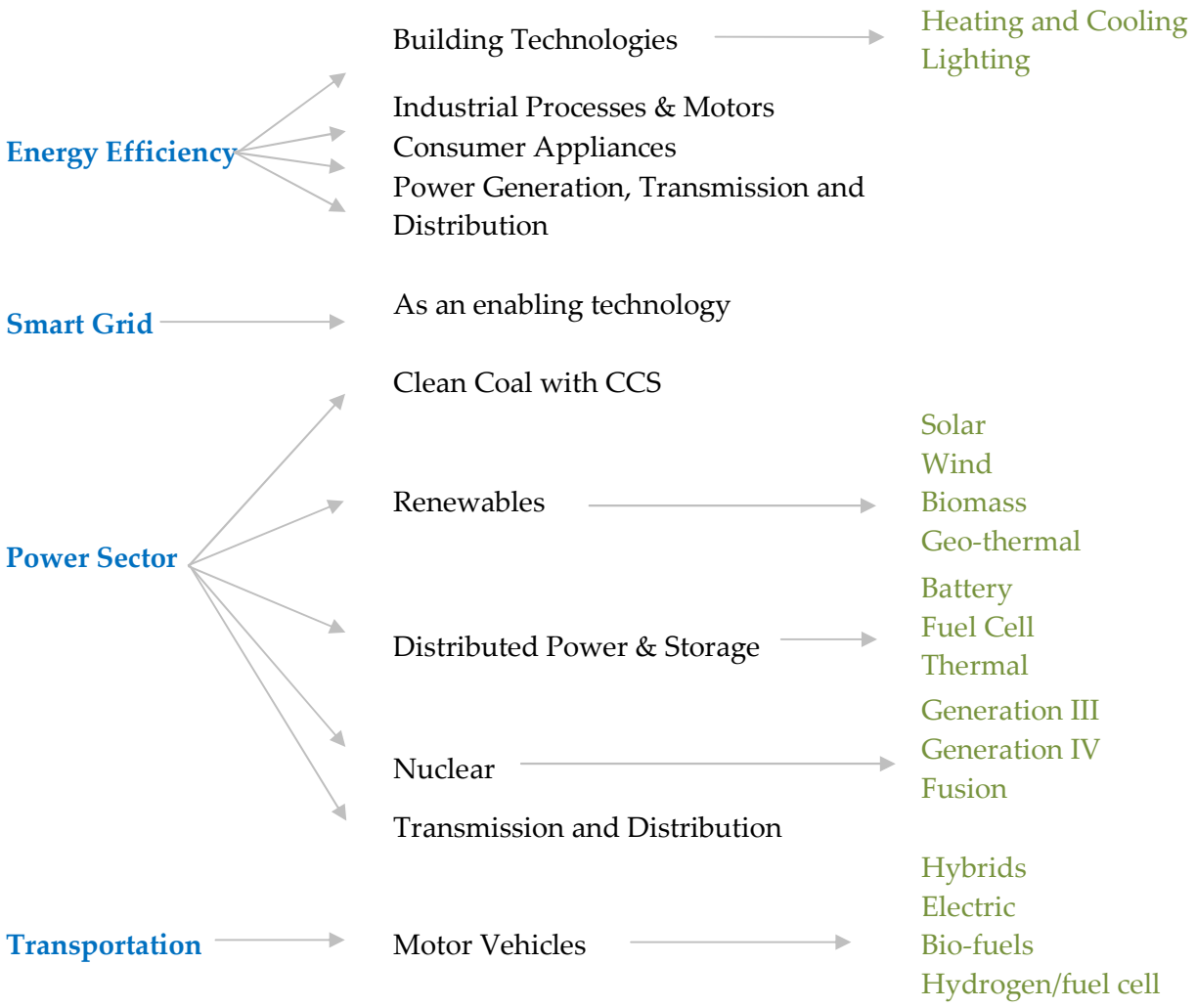
- ✓ ***Legislation***

- ✓ *Regulations*
- ✓ *Incentives*
- ✓ *Deployment*
- ✓ *Standards & Labeling*

The formation of a governmental umbrella council focused on energy cooperation should be created to ensure that critical interrelationships are understood and properly addressed in legislation, policies, regulations and programs throughout the transatlantic community. It is recommended that early attention of the Transatlantic Energy Council should be placed on:

- The design of "common, compatible and complementary" regulations
- R & D technology cooperation on a number of key technologies
- The development of common and compatible standards and labeling

There are many interactions between individual technologies as well as among enabling topics. Key technologies identified as particularly crucial included:



Although R &D cooperation on a number of these technologies has been initiated, it should be expanded by broadening the dialogues on specific technologies to include a full review of the

impact of various enabling factors as well as the interactions between technologies. Because of the complexity of these interactions, specific work groups should be established under the guidance of the Transatlantic Energy Council.

There was clear consensus that the two highest priority technologies that required immediate concentrated attention were those involving energy efficiency, and coal with carbon capture and storage. Without significant and timely progress in deploying these basic technologies on a massive scale, participants saw virtually no possibility of achieving the emission reduction targets proposed. Renewables, for both power and transportation fuels, were also viewed as critical transforming technologies. Smart grid developments were identified a necessary enabling technology in obtaining energy efficiencies and to reducing demand. The expansion of safe nuclear power with a secure fuel cycle was also seen as necessary. In short, the transformation of the energy sector will impact virtually all segments of the energy industry.

The transatlantic community essentially agrees on the magnitude of the energy and environmental challenges facing the world. However, there remains substantial uncertainty over what is achievable without a significant increase in cooperation and a greater dedication of resources. In the course of increasing transatlantic cooperation, a number of basic issues were identified that need to be addressed as fundamental to the required transformation of the energy sector. These contingent issues include recognizing that:

1. International cooperation is required
2. A price on carbon is required
3. Developing countries should be provided a convincing case for incurring higher energy costs
4. The cost and social impacts of adaptation need to be understood
5. Business input is critical to the creation of realistic legislation, regulations and programs
6. Major technological advances require government support
7. The transformation of electric power sector requires fundamental restructuring to replace ageing assets and accommodate renewables and distributed systems
8. Energy efficiency and conservation are top priorities
9. Governments must address the "BANANA Syndrome"
10. Clear legislation and policy direction will need to be accompanied by mandatory regulations
11. Only real economic costs will change behavior
12. Long-term rather than short-term solutions are required
13. There are uncertainties associated with the impact of transitions on global energy markets
14. An assessment of long-term availability of energy resources and ability to convert intermittent renewables to stable supply sources is needed
15. Governments need to assess costs of adaptation and develop policies to avoid most damaging impacts of climate change

Introduction

The broad issues surrounding the global need to achieve energy security in a world equally concerned over climate change and maintaining economic growth are well known and under intensive discussion in numerous forums and governmental official dialogues. Many of the non - governmental forums focus on the urgency of taking action or on particular solutions being advocated by the various organizations involved. The Atlantic Council of the United States in partnership with the Clingendael International Energy Program at the Netherlands Institute for International Relations has established a series of workshops designed to broaden the discussion of energy issues that are of vital importance to the transatlantic community to include the U.S. and European business community, governmental organizations and civil society organizations on both sides of the Atlantic. These track II workshops are intended to provide input and recommendations based on a joint consensus of multiple constituents to the governmental organizations that are engaged in official dialogues to develop effective global agreements to address the increasing demand for energy resources, the growing treat of climate change and environmental pollution, and the requirement to support economic growth.

The workshops are being specifically designed to ensure that the private sector has an opportunity to engage constructively on the issues related to ensuring transatlantic cooperation in achieving sustainable energy security. The program brings together U.S. and European business leaders and public policymakers to address issues significant to American and European commercial interest. The initial workshop was held in Brussels on May 28/29 and focused on developing a "Shared Vision for Energy and Climate Change". The workshop established a clear consensus on the magnitude and nature of the challenges. It also identified a number of areas where concrete actions, technologies and programs will be needed to transform the energy sector.

A Common Understanding of the Challenge

The transatlantic community essentially agrees on the magnitude of the energy and environmental challenges facing the world. However, there remains substantial uncertainty over what is achievable. It is accepted that if greenhouse gases rise to 550ppm there will be a 3-4 degree Centigrade rise in temperatures and that holding the increase in Greenhouse gases to 450ppm will still result in a 2 degree centigrade rise in temperatures. The economic consequences of such changes are enormous for both the developed and developing countries. While many attempts are being made to quantify the cost of reducing greenhouse gas emissions, very few efforts are being made to quantify the cost of adaptation or the ramifications of a failure to adapt. Hence, there is very little discussion of the cost/benefits of making the technological and societal transformations required. The underlying premise is that the costs and social consequences of not taking action will be significantly greater than the cost of dramatically altering the existing energy structures.

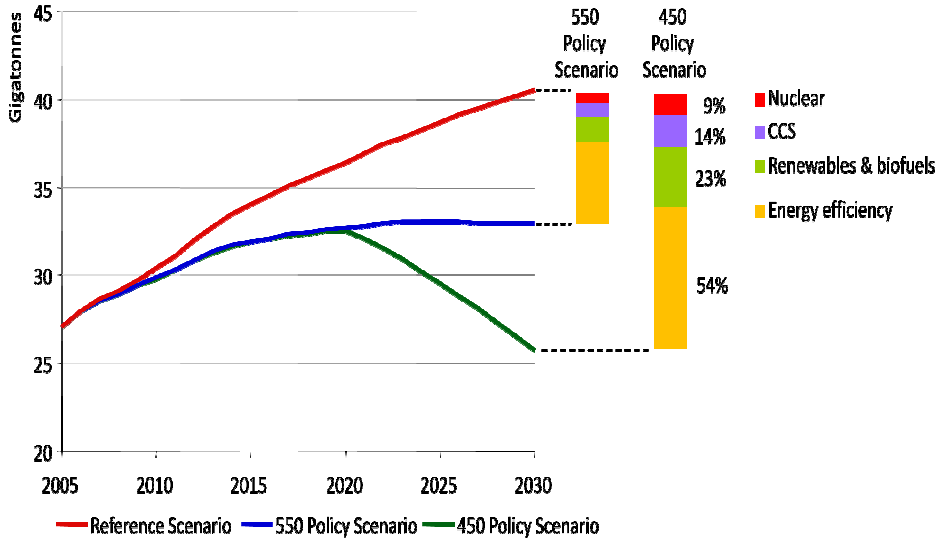
It is understood that if GHG's are to be held below 450ppm in 2050, world emission levels will need to be halved by that date. The OECD countries would need to reduce emissions by at least 75-80 percent versus 1990 levels by 2050, and developing countries will also have to peak and then decline between 2020 and 2050 to 50 percent of 1990 levels.
There was clear consensus agreement with the IEA positions that:

> "A global revolution is needed in ways that energy is supplied and used. Far greater energy efficiency is a core requirement. Renewables, nuclear power, and CO2 capture and storage (CCS) must be deployed on a massive scale, and carbon-free transport developed. A dramatic shift is needed in government policies, notably creating a higher level of long-term policy certainty over future demand for low carbon technologies, upon which industry's decisions makers can rely. Unprecedented levels of co-operation among all major economies will be critical." [i]

There was also broad transatlantic concurrence that a full portfolio of energy sources will be required even assuming that energy efficiency gains and renewables are proactively pursued as near term top priorities. Specifically fossil energy was seen as remaining prevalent though 2050, easing the transition to low carbon fuels. Nuclear power is seen as an important component of the energy mix and of growing importance in many countries. Maintaining supply diversity is viewed as not only prudent, but as essential to maintaining flexibility that will be critical to ensuring supply security. Similarly, a broad portfolio of technologies needs to be supported. Efforts by some advocacy groups to rule out some energy sources or to concentrate only a few technologies are viewed as counterproductive. At the same time "the current global financial crisis makes it even more critical that resources be applied to the most promising technologies and the most effective and efficient policies, programs, and regulations are implemented". [ii]

While substantial progress on reducing GHGs can be made using existing technologies, it is clear that significant further technology must be developed and implemented to even come close to meeting the 550ppm target by 2050. It is also clear that market forces alone will not be sufficient to transform the energy sector on a massive enough scale within the timeframes desired. On both sides of the Atlantic a similar set of economic policies are being pursued to support a dramatic transformation of the energy sector. Major governmental funding is being provided for research and development and for financial incentives to overcome the early cost penalties associated with the introduction of new technologies like wind and solar. Simultaneously, requirements to meet renewable portfolio standards have been established in Europe and are in place in many U.S. States and are under consideration in the U.S. at the Federal level. There is also general agreement on the need to price carbon in order to reduce the greenhouse gas emissions associated with fossil fuels.

Figure 1: Carbon Scenarios to 2030



Source: P. 446, International Energy Agency. World Energy Outlook: 2008. Paris, France: OECD/IEA, 2008.

The workshop did not attempt to duplicate the climate change discussions taking place as a prelude to the December Copenhagen Negotiations. However, it was noted that achieving a 450ppm target could require a CO2 price of $180/metric ton in 2030 to stimulate the investments in new technologies such as Carbon Capture and Storage Technology. (Aiming for 550ppm could require a CO2 price as high as $90/ton.) It was also noted that in order to hit even the 550ppm target by 2050, all developed countries would need to immediately start reducing emissions levels, and that developing countries would have to achieve peak emissions levels by 2020-2025.[iii]

Hence, there is a major concern on the magnitude and speed at which new technologies can be introduced and deployed. While existing technologies that could be applied to increase energy efficiency could be introduced relatively rapidly, others such as the introduction of Generation III+ nuclear and Carbon Capture and Storage Technologies will take more than a decade. Many of the renewable technologies to provide electricity will also take many years to become cost competitive and integrated into existing transmission and distribution systems. Although the time for building renewable facilities is considerably faster than for nuclear or clean coal plants with CCS, the scale of individual facilities is a fraction of the power from individual coal or nuclear plants. It is recognized that the magnitude of the transformation required will entail very substantial investments and an increase in energy costs for many economic sectors. Some increase in electricity costs is unavoidable if there is to be a reduction in greenhouse gases. The challenge is to minimize the cost increases and to faze them in over time while meeting the emissions objectives. Concerns over the economic impacts on various sectors are making the implementation of necessary legislation and regulations complicated.

Moreover, there were a number of different perspectives taken on the ability and pace of changes required to achieve a target of a 450ppm or 550ppm GHG by 2050. The EU Commission has already published a position that supports attaining the 450ppm goal through major societal changes and a decarbonization of the energy sector. It was noted that both the U.S. and Europe have officially agreed on the need to cut GHG's by 75-80 percent by 2050 if the 450ppm target is to be meet. The EU Commission has also proposed a 20 to 30 percent reduction versus 1990 by 2020.

However, there was considerable skepticism by a number of participants as to the ability to achieve such a target by 2050. Targets being proposed by the EU Commission for 2020 were seen as even more difficult to obtain by many participants including those who believe we need to try to meet tight objectives.[iv]

All participants recognized the need for a dramatic transformation of the energy sector in order to create a more sustainable energy future that protects the environment, provides energy security, and enables economic growth. There was general acceptance that a number of major issues need to be addressed if the broad objectives are to be achieved.

One, there is the recognition that international cooperation will be required as global warming presents a challenge bigger than any state or region can handle by itself. With the diversity in policies, capabilities, and responses at the national and state level, the nature of the cooperation required is a subject unto itself. The benefits of diversity are recognized to stimulate creativity and to allow for regional differences, but diversity can also greatly increase the cost of compliance to business and reduce the benefits from the pooling of resources.

Two, any serious effort to reduce GHGs will require a price on carbon. This is about recognizing the need to pay an economic price to reduce the emissions of carbon. In addition, a realistic restructuring of the international climate agreement is essential for the planet. A 50 percent reduction by 2050 is probably not achievable and may places unrealistic demand upon developing countries, but it is a goal worth aiming for.

Three, the United States and Europe need to develop clear reasons to convince less developed countries they should be being willing to incur higher energy costs. The developed countries needs to "put on the other guy's shoes" if they are to come up with a workable solution.

Four, the probable costs and societal impact of adaptation needs to be understood for both the developed and developing countries. Understanding these costs and impacts could booster the case for a workable solution.

Five, business will ultimately make the investments, create the markets and be the implementer of new technology in the transformation of the energy sector. Hence, business' input is critical to the creation of realistic legislation, policies, regulations, standards, and programs.

Six, major technological advances will be needed and in many cases will at least initially require government support. International cooperation could accelerate progress and speed deployment. There needs to be a major scale up in Research, Development, Deployment and Incentives for both new and existing technology between states.

Seven, in assessing the technology shift to accompany the transformation of the electric power sector, need to recognize the requirement to replace existing plant and equipment and to reassess the possible benefits of decentralized versus centralized systems. Large

scale buffering involving massive storage and expansion of transmissions systems will be required to accommodate the growth in renewables.

Eight, increased energy efficiency and conservation are clearly seen as the top priority, especially over the next decade, given the high rate of return and relative ease of physical implementation. However to change demand patterns requires a change in public mind-set and alterations in life styles. The benefits associated with such changes need to be clearly articulated, and broad public support will be essential for the adoption of necessary policies.

Nine, The BANANA SYNDROME (Build Absolutely Nothing Anywhere Near Anything) needs to be actively addressed and offset by clear government and political leadership if there is to be a transformation of the energy sector at reasonable costs. The adverse consequences of allowing this syndrome to fester will be serious power shortages and lower economic performance.

Ten, clear legislation, and policy direction accompanied by an imposition of mandatory regulations will be required. A reliance on voluntary actions in response to gradual market pressures will not be sufficient to accelerate the transformation of the energy sector to even come close to meeting multiple objectives of reducing emissions and increasing energy security.

Eleven, while the setting of regulations and standards can significantly impact behavior, the most effective lever to changing behavior is the imposition of economic costs, such as direct taxes. Arguments against such an approach often are predicated on the reluctance to recognize the cost of externalities or the greater cost of future remedial action.

Twelve, despite uncertainties regarding the outlook for economic growth, near- term energy supply, and price trends, nations need to focus on long-term policy in establishing legislative actions and regulations which are too often structured for short term solutions. Without policies and regulations focused on long-term solutions both consumers and investors will not make the necessary investments and changes in behavior required for a rapid transformation of energy markets. Compatible regulatory regimes could take advantage of economies of scale.

Thirteen, with 80 % of the world's population living in developing countries and continuing population growth, there are serious concerns related to the availability and cost of energy resources. (This may also be an even more critical problem for water and food supplies.) There needs to be a better understanding of the uncertainties associated the impact of transitions on global energy markets.

Fourteen, there should be an assessment of long -term energy resource availability and the extent to which renewable power sources currently considered intermittent can eventually be converted into stable supply sources.

Fifteen, governments should be assessing the potential costs of adapting to rising temperatures and developing policies and programs to avoid the most damaging impacts.

Despite considerable skepticism related to what emission targets could be realistically set, there was broad agreement on the nature of the challenge and on a number of key issues on which the U.S. and Europe should reach a common understanding. Appendix A provides a more comprehensive listing of the major areas that were identified for possible transatlantic cooperation.

Standards and Regulations in Consultation with Stakeholders

Coordination and cooperation among regulators and stakeholders in establishing standards and regulations is key to transforming the energy sector in a manner that also promotes economic prosperity. Transforming the energy sector on a scale that can lead to the massive shifts required over the coming decades will only be significant if market signals set by standards and regulations are aligned and market rigidities associated with regional differences can be reduced. Standards impact virtually all businesses. We must not end up with a multiplicity of standards and regulations that become barriers to global trade. It is useful to draw a distinction between terms that are often used interchangeably. Regulations relate to rules and procedures that are established by law. Standards refer to technical requirements that are usually developed by industry, for the production of products.

In Europe, governments set broad public policy that is then supported by legislation. Regional bodies like the European Standards Organizations –ESOs (CEN, CENELEC and ETSI) and national standards bodies like DIN then establish standards to support the legislation. Historically, European standards have been mostly focused on the interoperability, human interface, and safety, of retail products. This process supports harmonization at the product level within Europe. However, the process for developing standards can take up to 3 years, and historically the EU has only ENs- European Harmonized Standards developed by the ESOs can be referenced by EU legislation.

In the United States, standards are established by industry and business through the National Institute of Standards & Technology (NIST) in the Department of Commerce, and by the American National Standards Institute (ANSI). Over 6,500 laws establish regulations that refer to standards. In the U.S. standards are set by industry and are usually voluntary, whereas regulations are usually mandatory. In the U.S. regulations can reference any standard no matter where it was developed. This provides a relatively quick process for the adoption of standards.

Two general recommendations emerged:

First, most standards have been directed historically towards ensuring technical performance and meeting safety concerns. In the future, standard setting should increasingly focus on environmental standards and energy management and energy efficiency.

Second, the process for setting international standards should become more transparent. Countries should be committed to accepting international standards. Industries (sectors) should be encouraged to develop global sectoral standards through

forums and consortia, which would then summit these standards thru ANSI to ISO in order to have them adopted as international standards.

There are a number of areas where the competitiveness of the transatlantic community could be strengthened by greater coordination and common standards. These include the following:

1. The process for setting standards could be better aligned to enable the faster adaptation of consistent standards that would support desired regulations. The Transatlantic Economic Committee (TEC) has started to address this issue.
2. The Transatlantic community could collaborate on establishing energy efficiency standards.
    a. Efforts should be made to set higher standards for appliances and to develop new energy efficiency labels.
    b. While building standards should vary based on regional climate conditions, the standards associated with building product specifications and labeling could be made consistent. This would enable manufacturers to more easily engage in cross border trade and to more quickly obtain economies of scale in the introduction of products.
    c. There should be a coordinated focus on technical specification for industrial equipment. This should include communication standards and protocols needed for the advanced transmission, distribution and smart grid technologies that will be required by the electric power sector.
    d. The EU and the U.S. should create a unified labeling system that could then be used globally.
    e. Transatlantic Community could direct that only products with the highest efficiency ratings be eligible for public procurement.
3. An Efficient Emissions Trading System will ultimately depend upon establishing global carbon emissions trading.
    a. However, until there is a global system, various industries will need some free allowances to remain competitive. Free allowances should be gradually reduced and eliminated once emissions' trading becomes global.
    b. There needs to be a timetable for developing countries.
    c. It was noted that the setting of allocations for various sectors (industries) would need to be essentially identical for emissions trading to make sense to business.
    d. It was also suggested that free allowances should be allocated based on benchmarking that would provide the most efficient producers with the greatest portion of free allowances. Such a process would encourage investment in energy efficiency technology.
    e. The size and financial impact of Carbon Markets requires that they be regulated and monitored like other major financial markets.
4. An international agreement on benchmarking should be established. This would assist in developing criteria that could be applied globally to approving projects for CDM credits or Emission Reduction Credits under any global agreement.
5. Uniformity in measurement techniques, physical definitions, and monitoring procedures is required to establish confidence in data and in the rate of progress in reducing emissions.
6. A key question is what standards are needed to ensure the competitiveness of the transatlantic community? Standards should be considered relating to three types of regulation: Command and Control, Fiscal, and Emissions Trading.

At the policy level, the transatlantic community is finding convergence on the need to address climate change and to achieve early and significant improvements in energy efficiency in the near term. In the rush to achieve regulatory action must be careful not to deviate on standards or to establish regulations that make it difficult for business to meet obligations without reducing competitiveness. *The complexity of issues is such that some delay in achieving agreement is likely, but this should not be misconstrued as lack of intent. It is important that the U.S. and EU understand each other's views, and understand industries' concerns, as industry will pay a steep price if regulations are not carefully constructed.*

Moving too quickly may result in regulations that give rise to standards that prove to be ineffectual, counterproductive or to give rise to unintended consequences.
For example, Renewable Portfolio Standards (RPS) should vary by geographic region to reflect the physical availability of renewable sources. Hence, the decision of the EU to establish a broad EU goal that has then had specific targets established for each country. U.S. federal legislation will similarly need to provide for flexible renewable portfolio standards by states.

Several regulatory issues are of particular concern as they are impeding the ability to transform the energy sector. One is the need to streamline the regulatory structure. Currently, multiple administrative authorities often impose overlapping conflicting requirements that require lengthy negotiations to be reconciled. Two, in other instances, multiple jurisdictional authorities enable the permitting and approval process to be easily blocked by special interest groups. This has prevented the sitting of many newer renewable power projects as well as the building of more efficient and less polluting facilities relying on traditional fuels like coal and nuclear. A rethinking of Federal versus State authority in the United States and EU Commission versus National authorities in Europe is likely to be required.

Overall, at the policy level there is a growing convergence between the U.S. and Europe on the actions that will be required to mitigate climate change. There are also enough similarities between Europe's and the United States' public concerns and proposed policy directions to give us confidence that we can closely collaborate. Transatlantic leadership will be a key component to ensuring successful cooperation.

Utilities: Getting Ahead of the Power Curve

Utilities in Europe and the United States are expected to experience a growing demand for electric power and natural gas to 2050. There is clear consensus that the most immediate and economically productive step is to slow the growth in demand through a major drive to increase the efficiency with which power and natural gas is consumed. Opportunities for cooperation on improving energy efficiencies will be discussed in the next section.

In assessing the power industries' ability to transform to a low carbon economy, it is helpful to understand the magnitude of the projected growth in electricity in relation to the size of individual projects. The U.S. Energy Information Agency projects that between 2006 and 2030 U.S. power demand will increase by 29 %, or an average rate of 1.1% per annum with normal productivity improvements. Total electricity sales will grow from 3,659 billion kilowatt-hours in 2006 to 4,705 billion in 2030, or by 1046 TWh.[v] The table below helps put the sheer size of the activities that

needs to be undertaken into perspective by noting the scale of generation from typical new projects.[vi]

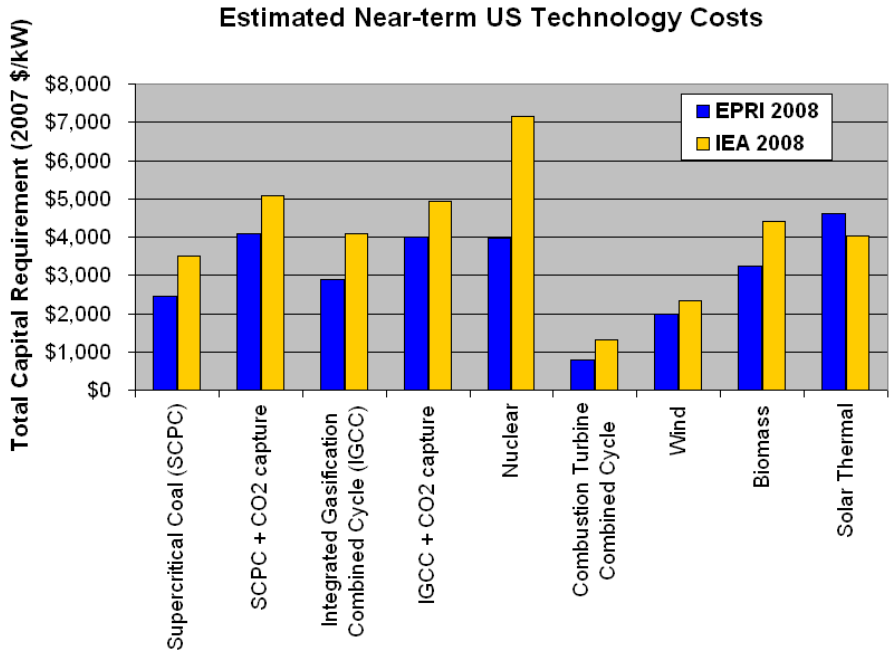
Table 1: Typical plant installations

Installation Type	Output	TWh Rate
One advanced light water nuclear plant	1400 MW @ 90% capacity factor	11TWh
One coal plant	500 MW @ 80 % capacity factor	3.5 TWh
One natural gas turbine	400 MW @ 40 % capacity factor	1.4 TWh
One 100 MW wind Farm	100 -1 MW turbines @ 40 % capacity factor	0.35 TWh

Source: Qtd in: James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.

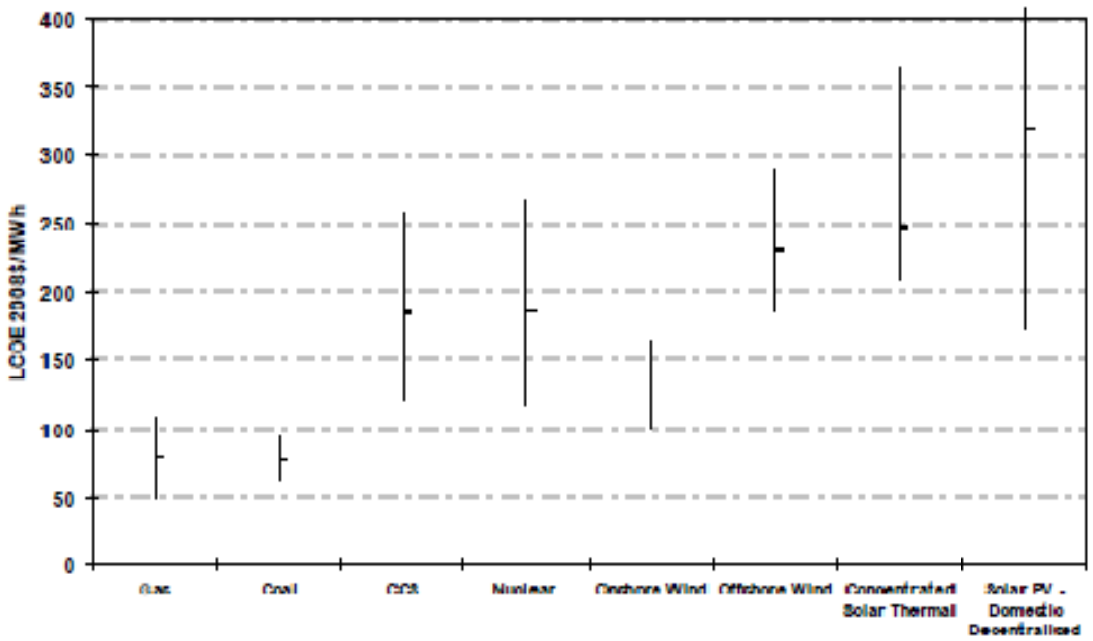
In both the U.S. and Europe, meeting utility requirements for electric power will require a substantial expansion in all major technologies in order to achieve emissions reductions and to meet demand growth. Technology diversity is seen as hedging the risk of unforeseen technical and non-technical obstacles to any one technology. There is considerable uncertainty over the cost of employing different technologies. Cost estimates vary by estimating sources as well as by technology and change over time. One such estimate of the near-term costs of technologies in the U.S. based on 2008 data was prepared by EPRI and the IEA and can be seen in figure 2. The Harvard Kennedy School has recently released a similar set of data.

Figure 2: Estimated Near-term U.S. Technology Costs



Source: James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.

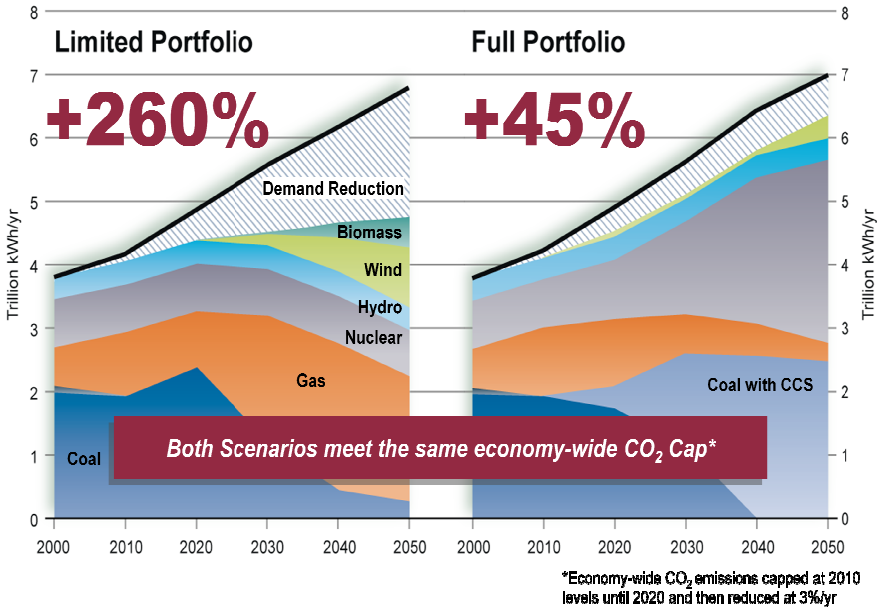
Figure 3: Relative Costs of Low Carbon Electricity Generation



Source: Al-Juaied, Mohammed. Whitmore, Adam. "Realistic Costs of Carbon Capture", Belfer Center Discussion Paper 2009-08, Energy Technology Innovation Policy, Belfer Center for Science and International Affairs, Harvard Kennedy School, Harvard University, July 2009.

Economic modeling presented by EPRI indicates that the choice of technology paths can make a significant difference on real electricity prices over the next four decades as seen in figure 4. While the analysis shows two extreme cases, EPRI concludes that advanced coal with Carbon Capture and Storage and nuclear power is likely to meet between 45% and 64% of U.S. electricity generation in 2050. Non-hydro renewables would be supplying between 17 % and 28 %[vii] of total power versus 10%[viii] in 2008.

Figure 4: Increases in Real Electricity Prices 2000-2050



James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.

In the discussion it was noted that some renewable technologies like onshore wind are already competitive in some circumstances and that with time others will become increasingly competitive. There are concerns that the EPRI forecasts may substantially underestimate the rate at which renewables will become competitive and increase their share of total electric power production. It was recognized that the eventual reliance on renewables will depend upon geographic factors as well as the ability to develop robust transmission and distribution systems using smart grids and storage systems that will broaden the reach on renewable power.

Currently, utilities are concerned over the reliability of renewables as customers expect uninterrupted availability. However, with large -scale storage technologies and imaginative configurations of multiple power sources, the reliability concerns associated with renewables could be greatly diminished. This leads some to believe that with technological advances, a substantially greater proportion of renewables could be utilized by 2050 than EPRI indicates.

Nevertheless, there is general consensus that commercialization of clean coal technologies with carbon capture and storage as well as the expansion on nuclear power will be critical to meeting the emission reduction goals and growing energy demands. This is particularly critical to ensure national security along with emissions reductions for many countries. Natural gas will also remain a major source of electric power in both the U.S. and Europe.

The sheer scale and scope of the transition required to meet goals such as an 80% reduction in emissions below 2005 levels by 2050 is a daunting problem. Not only does new infrastructure need to be developed to enable more distributed energy like wind, biomass, and solar, but much of the base load power plants will need to be replaced by 2050. While this adds to the capital requirements, it also presents an opportunity to introduce new generating plant technologies and speed the reduction in emissions.

There are a number of enabling events that will need to occur by 2050 for the power sector to cost effectively meet growing demand while drastically shrinking greenhouse gas emissions. These include the deployment of:

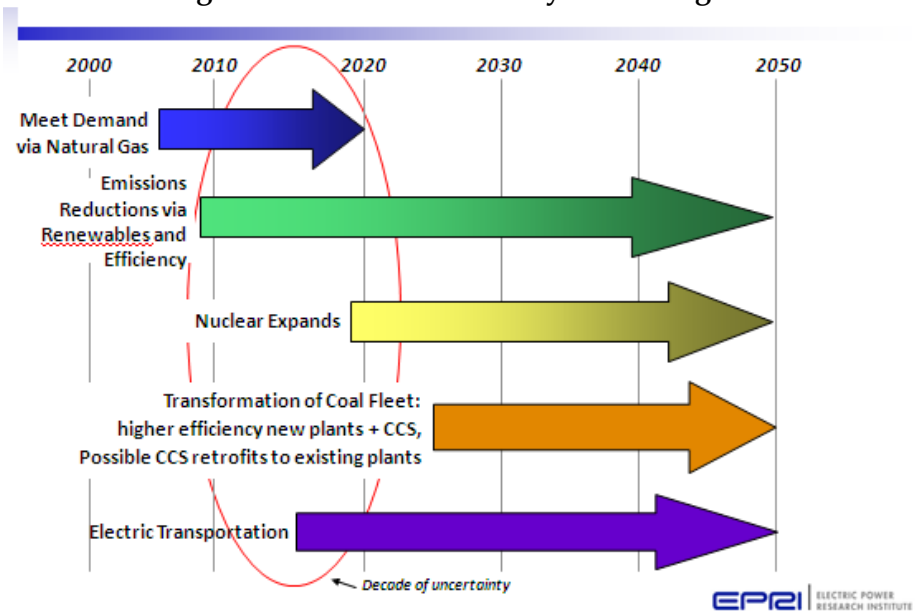
- Smart grids and communications infrastructures to enable end-use efficiency and demand response, distributed generation and plug in electric vehicles (PHEVs).
- Transmission grids and associated energy storage infrastructures with the capacity and reliability to operate with 20-30 % (or greater) intermittent renewables in specific regions.
- Advanced light-water reactors, enabled by continued safe and economic operation of the existing nuclear fleet, and a viable strategy for managing spent fuel.
- Coal-based generation with CCS operating with 90+% CO2 Capture and with associated infrastructure to transport and permanently store CO2.

Ensuring these developments will require regulatory changes and the setting of standards to enable commercialization and deployment of the necessary technologies.

Much of the needed technology is not yet available and sustained, substantial research, development and demonstration (RD&D) will be required. The pay off for sustained RD &D will be the designing of more cost effective solutions, and the avoidance of cost associated with poor policy decisions. International cooperation on RD&D will also make it easier to attain international consensus on establishing technical standards.

The next decade will be critical period to determining the technologies to be employed through 2050. Lead times for planning and building major large scare power plants are long. Where technology is proven can still take anywhere from 10-15 years in the US and Europe. (It should be note that the Chinese are now building new nuclear plants within 6-7 years).[ix] The introduction of clean coal technologies with CCS will take anywhere from 15-25 years. This is illustrated in a chart prepared by EPRI.

Figure 5: Timeframes for Key Technologies



Source: James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.

The United States should develop a strategic road map for technology development that assesses the major uncertainties associated with the many technology options being proposed. Given the urgency of taking action by 2050 and the financial desirability of focusing on the technologies most likely to be effective, government policy cannot afford the funding required to support "letting a thousand flowers bloom". However, it will also be important to not stifle entrepreneurial initiatives. Obtaining the "right" balancing in policies will be difficult. Europe developed its initial Strategic Energy Technology (SET) plan in 2007 and is expecting to update the Plan based on latest technology developments and changing economic conditions in the coming months. The United States is in the process of undertaking a similar comprehensive effort that will require a year or more for completion.

The infrastructure transformations necessary to meet demand and to reduce CO2 emissions will increase electricity production costs and will lower Gross Domestic Product (GDP). This cannot be avoided if we are to recognize the costs of externalities associated with the potential impacts of greenhouse gas emissions on global warming. The goal should be to accept this reality and to reduce these impacts to the greatest extent possible while meeting the long- term objectives, including job creation. Establishing the appropriate legislation is particularly daunting because of the multiple economic impacts that will be felt by various constituencies. The United States has multiple bills under consideration within Congress, but final resolution on obtaining a bill that will be approved by both the House and Senate remains uncertain. While the European Parliament has passed strong overarching legislation, national enthusiasm for implementing enabling regulations

and investments varies within Europe. These differences with Europe are seen in differing attitudes towards the willingness to expand nuclear and clean coal technologies with CCS and towards the appropriate level of reliance on natural gas from Russia.

Natural Gas

Both, the United States and Europe, are dependent upon Natural Gas for about a quarter of total primary energy supplies. From a climate change perspective, the ongoing availability of natural gas is critical to easing the transition to a low carbon economy, although the CO2 emissions from natural gas will eventually have to be captured and sequestered to meet 2050 objectives. Both utilize gas for electric power, where it provides both base and swing power capacity, and for residential, commercial and industrial consumers.

The United States is in the enviable position of having sufficient reserves of natural gas, primarily with the recent addition of shale gas, to be confident of adequate supplies without a heavy reliance on overseas imports. The development of technology to capture and sequester CO2 from natural gas remains a longer-term issue for the US as it is for Europe.

In contrast, Europe faces a major issue related to the long- term availability of natural gas supplies. Fortunately, Europe is geographically close to huge supplies in Russia, the Middle East, and Central Asia and to a lesser extent Africa[x]. Seventy five percent of known natural gas fields in the world are within 5,000 kilometers[xi] of the center of Europe.[xii] Europe will be diversifying natural gas supplies based on expanded LNG imports from Africa and the Middle East. In addition, the introduction of some pipeline gas from Central Asia could start to occur with the recent agreements on the Nabucco Pipeline.

However, Russia will remain the major source of substantial imported gas supplies. Recognizing and maintaining a strong commercial relationship between Europe and Russia is critical for Europe's energy security and could become increasingly so as European indigenous gas supplies decline. There is limited capacity for an expansion of shale gas in Europe, and there are estimates that European gas production could fall in half by 2020. [xiii] Hence, the diversification of European supplies and the creation of internal pipeline networks and more competitive natural gas market structures across national boundaries are critical to Europe's energy security.

At the same time the strong commercial ties that have been created, especially between Germany and Russia, need to be supported. Russia needs demand security for its energy resources as much as Europe need supply security. Currently, Russia provides 25 % of Europe's gas supplies. With Russian fields also facing declining production, there are opportunities to increase Russia's energy efficiency, to undertake new development, and to expand and modernize its pipeline infrastructure to free up more gas supplies for Europe.

European/Russian relationship should be premised on the need for interdependence. Unbundling is seen as a necessary step for building a more competitive European energy market. Russia needs to be convinced that control over local distribution and transmission with Europe is not required to maintain security of demand. Price transparency would go a long way to reducing tensions over Russian natural gas supplies. "Carrots" rather than "sticks" should lead to a smoother relationship and creates fewer tensions within Europe over security of supply.

The successful integration of European utility markets to ensure energy security and the establishment and enforcement of complimentary environmental laws and regulations will depend upon a number of developments and institutional changes that are under discussion.

For example, the expansion of cross-national utility infrastructures will require major projects to be evaluated in the larger context of the European grid, rather than on an isolated, individual project basis driven by a single nation's situation. There is need to create interdependences between nations and importers in order to have stability. Currently, member countries in Europe have more authority than the EU regulators, whereas in the US Federal regulators often supersede state regulators and have stricter enforcement mechanisms.

The creation of an efficient and secure utility infrastructure for power will require the creation of an expanded transmission and distribution system with smart grid capabilities[xiv]. Decisions will need to be made as to who will regulate the system and what standards and protocols will be set. There are considerations related to telecommunication protocols and information technology as well as the development of meters and smart appliances. The United States will need to address similar issues, but should have an easier time reconciling differences between states. Equally important will be the need for the United States and Europe to achieve common and complementary standards to the extent possible to encourage the movement of technology and trade as discussed on pages 5-8.

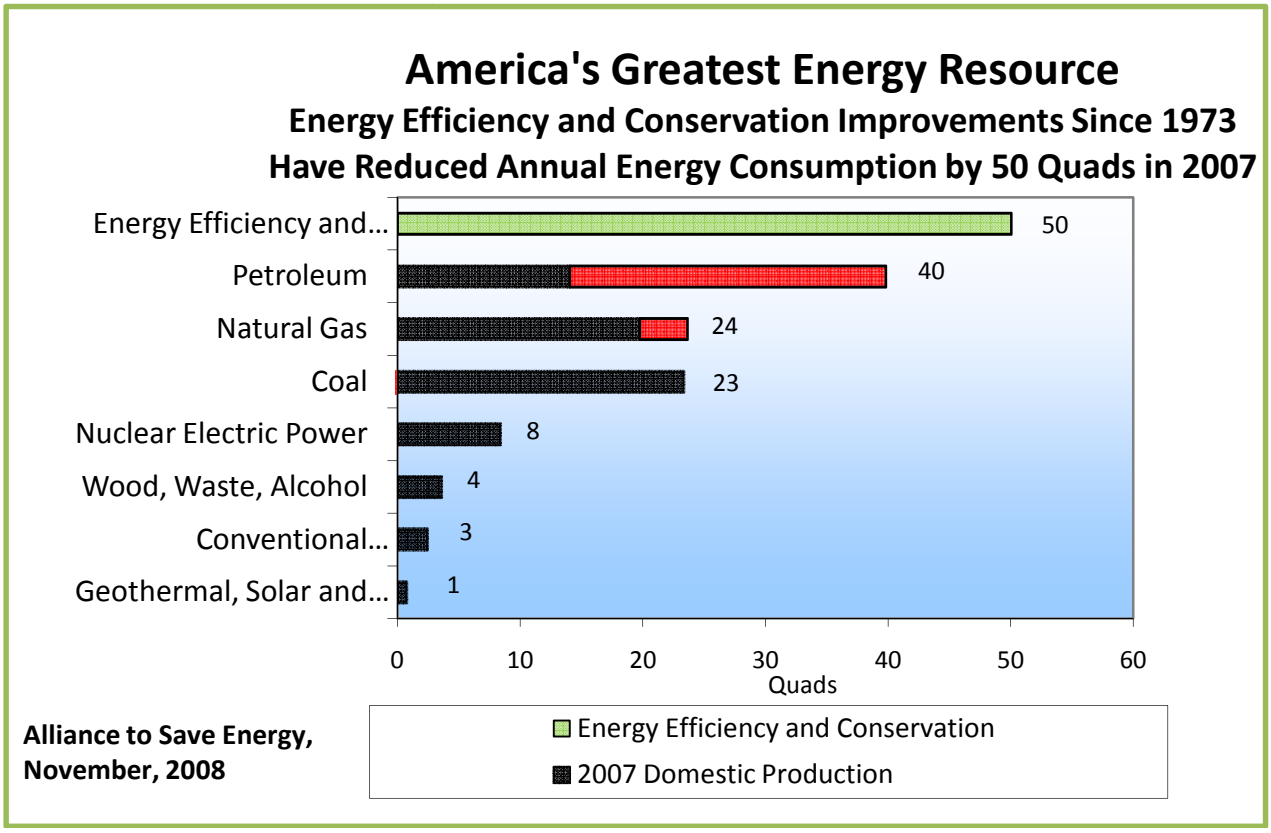
As renewable technologies are expanded through the use of mandatory feed in tariffs there will be situations where base load power will be decreased and utilities will incur additional costs. This will become more of an issue as the growth in power consumption is diminished through the successful implementation of energy efficiency programs. Hence, the careful matching of the growth in renewables/ storage technology and base load power operations will be necessary to moderating the increase in electric power costs. A key enabling event will be the establishment of new regulatory frameworks.

Despite governments' recognition of the need for research, development and deployment, the level of RD&D support may still be insufficient given the scale of investment requirements. International collaboration will be required to spread funding requirements and technological risks. Equally important is the need to stabilize policies and to provide regulatory certainty to enable private industry to move ahead with plans and investment. Governments must provide critical initial support to the development of technologies. But, ultimately it will be private capital that drives the transformation of the energy sector. Utilities' rate structures are heavily regulated and reliability, availability and accessibility standards are high. With the size of investment requirements, utilities cannot obtain necessary capital without a high level of project certainty. This makes utilities inherently risk adverse, especially when projects are based on new technology.

Energy Efficiency: Greatest New Energy Source

There is broad agreement that obtaining greater energy efficiency has the potential to make the largest contribution to achieving the goal of reducing carbon emissions, achieving energy security and creating a sustainable energy structure for the future.
Historically, US conservation and energy efficiency gains since 1973 totaling 50 quads has lowered US annual 2007 energy consumption by more than the energy supplied in 2007 by the combination of petroleum and nuclear, or by natural gas and coal.

Figure 6: Effects of Energy Efficiency and Conservation Improvements

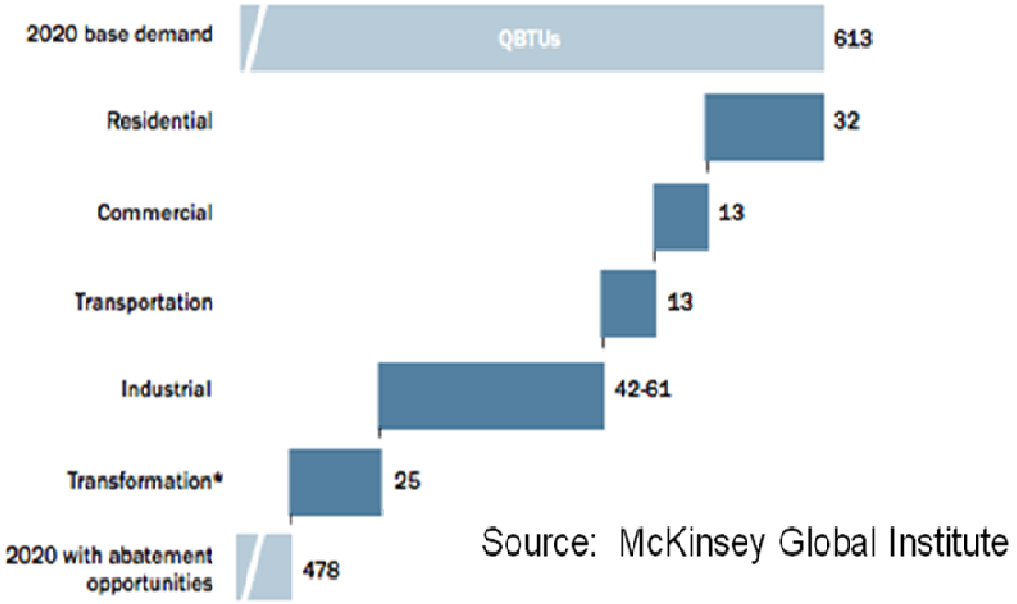


Source: Callahan, Kateri. "Mining America's 'Greatest Energy Resource' for Tomorrow's Green Economy". Brussels, Belgium, 2009.

While these savings have been dramatic, the pace of annual improvements needs to be raised significantly if the goal of a 75- 80 % reduction in US greenhouse gases is to be achieved by 2050.

Analysis by McKinsey in 2005 indicated that indeed it should be possible to make such further improvements. The chart below indicates global potential savings from energy efficiency could cut energy demand growth in half by 2020 utilizing existing technologies with an internal rate of return of 10 percent or more.

Figure 7: Potential Demand Reduction in 2020 Through Enhanced Energy Productivity



Qtd in: Callahan, Kateri. "Mining America's 'Greatest Energy Resource' for Tomorrow's Green Economy". Brussels, Belgium, 2009.

As a result of such studies, promoting energy efficiency, and greater reliance on electricity, is seen as potentially providing a major portion of any solution to mitigating climate change.[xv]

However, as many participants noted there are number of impediments to be overcome and policies to be implemented to realize the potential. These are relevant to both Europe and the United States and can be categorized as follows:

1. Market distortions and insufficient incentives
2. Support for research, development and deployment (RD&D)
3. Consumer education and outreach
4. Inadequate standards & codes
5. Need for government leadership by example
6. Development of workforce capability

Achieving a significant improvement in energy efficiencies will require a holistic approach to ensure that policies and programs are reinforcing. Many participants noted the disjoint between the potential for further cost-effective efficiency gains and the relatively slow pace of improvements.

The current economic downturn has lead many countries in Europe and the United States to undertake major stimulus programs aimed at revitalizing aging infrastructure. Increased funding is being provided for RD&D and incentive programs. Many technical solutions are ready to deploy and are being implemented. However, there are often market perceptions and distortions that negatively impact the adoption of efficiency measures.

The World Business Council for Sustainable Development (WBCSD) estimates that globally that 25 percent of primary energy usage and 40 percent of CO2 emissions are used in heating and

powering buildings. US buildings alone are estimated to be responsible for 8 percent of global emissions. However, perceptions do not match reality. Building sector professionals believe that the sector is only responsible for 19 percent of global emissions, not 40 percent. At the same time they believe the cost of building energy efficient buildings would add 17 percent to costs, whereas it is thought that the cost differential would be closer to 5 percent.[xvi]

In the Transatlantic Community buildings account for 30-40 percent of primary energy consumption, and the WBSCD estimates that there is the potential to increase building energy efficiencies by 2/3ds, including fuel switching and on site generation.
However, market incentives are weak as there are few incentives for utilities to save consumers' costs, and the utility costs are often not the concern of a landlord or builder who does not pay the utility bill. In France incentives designed to save at the sub-system level have not been found to be effective.

The French experience suggests that incentives need to be designed to affect a building systems' total energy usage. Moreover, WBSCD analysis suggests that a carbon penalty of $60/ton (which adds 2 cents/kwh) will not provide enough incentive to drive the decision processes to seek major efficiencies. At $170/ton significant investments in efficiency would become evident. This is an interesting conclusion given that the McKinsey analysis shows reasonable rates of return with carbon cost as low as $60/ton. This suggests that regulations may have to be developed to motivate different consumer and builder behavior to capture efficiencies at lower carbon prices. It is also consistent with the observation that the relationship between real prices and the energy efficiency use of electricity remains unclear.

There was general consensus that the price for carbon has to be set at a level that will drive behavior changes to increase energy efficiencies and to support the introduction of renewables, CCS and nuclear.

By 2050, the world has to become carbon neutral to reach a 450ppm goal. The IEA goal of achieving a 48 Gigatonnes reduction in annual global emissions required by 2050 to reach a 450 ppm stabilization level is viewed as demanding, but achievable by undertaking actions in the following three sectors:

Table 2: Reductions in Emissions by Sectors

Industry	**36%**	17.2 gigatonnes
Buildings	**38%**	18.2 gigatonnes
Transportation	**28%**	12.6 gigatonnes
TOTAL	**100%**	48.0 gigatonnes

Qtd in: Sission, William. "US EU Workshop on a Shared Vision for Energy and Climate Change." Brussels, Belgium, May 2009.

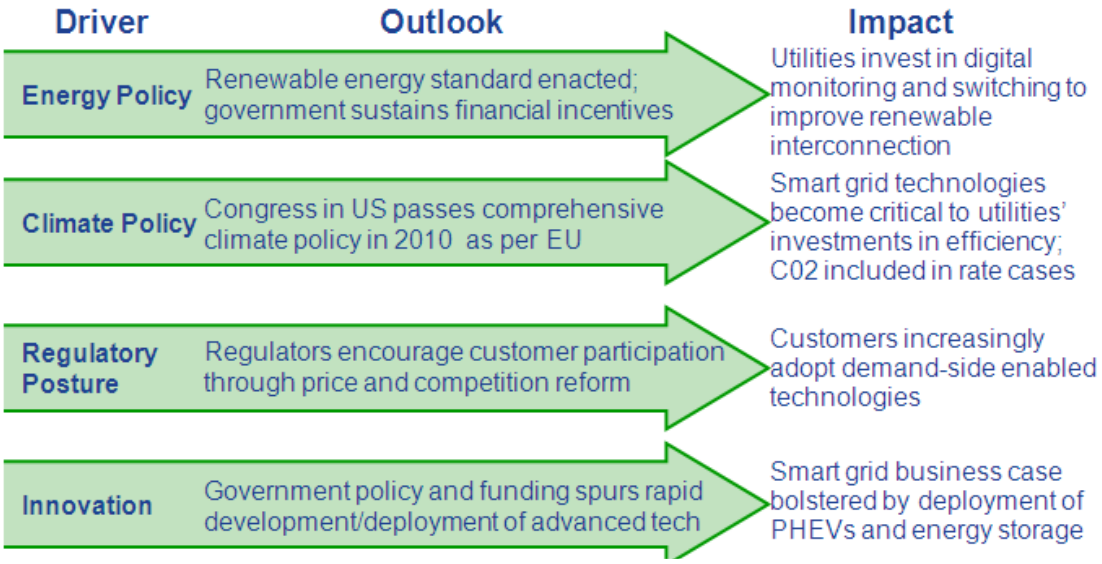
Major improvements in energy efficiency will be required to obtain these reductions. Today slightly less than 50 % of annual carbon emissions are being absorbed or compensated for by forests and other natural carbon sinks. Once carbon neutrality in annual emissions is achieved, forestry and other agricultural measures can be undertaken to reduce the stabilized level of GHG emissions in the atmosphere.[xvii]

Deployment of Smart Grids to be Critical

The development of and consumer acceptance of smart grid technology is seen as critical to the pace and extent to which the current energy infrastructure is transformed. Aging infrastructure in the US and Europe will not be able to deliver lower carbon emissions. The current global financial crisis has placed transatlantic governments and public at a critical juncture in their efforts to design and implement energy and climate policies.

Sustained economic growth, associated with strong fast co-coordinated government response, coupled with a rebound in commodity prices, and a global prioritization of climate change leading to accelerated implementation of carbon control measures could lead to the policies, regulations and innovation required to simultaneously achieve energy and climate objectives. This is graphically illustrated in the following chart.

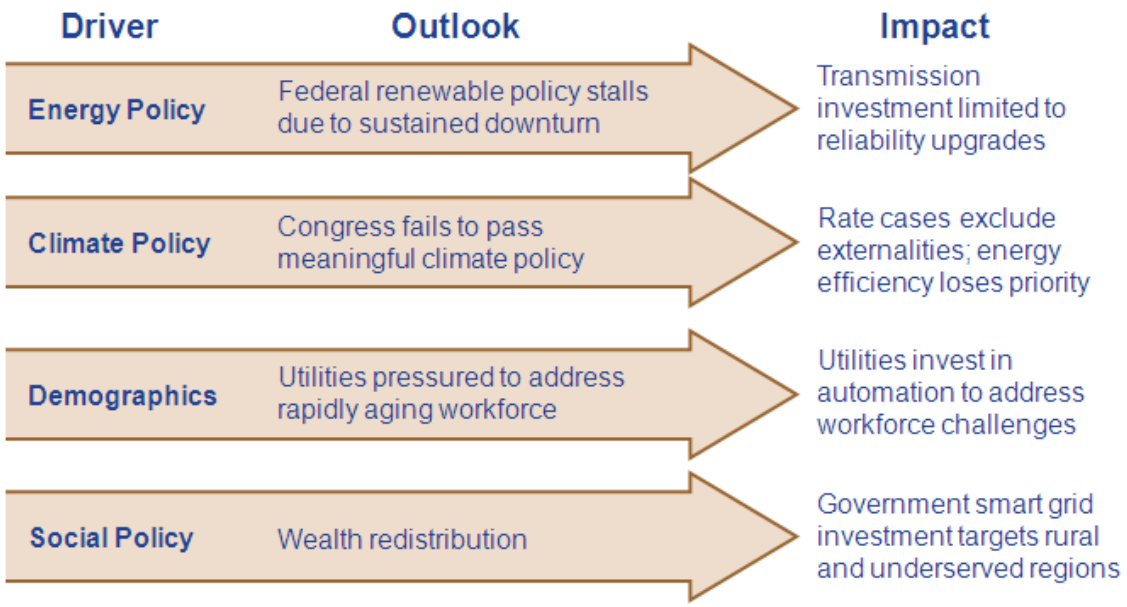
Figure 8: Positive Smart Grid Outlook



Source: Redfearn. Keith. "The Smart Grid in 2020." Brussels, Belgium, 2009.

On the other hand, negative or week global growth could keep commodity demand and prices low, leading governments to face a deteriorating economic environment and be unable or unwilling to invest in the infrastructure required. The failure to implement renewable energy and climate policies, a focus on wealth redistribution, and a focus on improving productivity rather than efficiency would make if very difficult to attain longer term energy and climate objectives. Much needed infrastructure investment would be delayed in favor of short -term low cost energy. This is illustrated in the following chart.

Figure 9: Negative Smart Grid Outlook



Source: Redfearn. Keith. "The Smart Grid in 2020." Brussels, Belgium, 2009.

A strong case was presented that given the alternatives, the preferred choice is clear. We need to face the challenge head on, and act decisively. The alternative of following a piecemeal approach to fixing infrastructure as it breaks is seen as an interim solution that will leave us all severely disadvantaged as the economy slowly recovers. Approximately 50 % of the US infrastructure is over 40 years old and beyond its design life. The existing electric power network has changed little in the last 100 years. (European networks also need to be updated, and new network configurations need to be built in developing countries.) Global requirements to expand capacity while replacing aging infrastructure require new rules. This dictates the adoption of smart grid technology that integrates information technology and electric power generation, transmission and distribution systems to enable the more efficient delivery and consumption of electric power.

Smart Grid technology addresses the increasing complexity of providing power associated with integration of renewable, distributed generation, electric power requirements for transportation and empowering consumers to actively control usage and costs. Grid reliability will remain paramount, but must be accompanied with greater efficiency. Consumer involvement and behavioral change will be crucial.

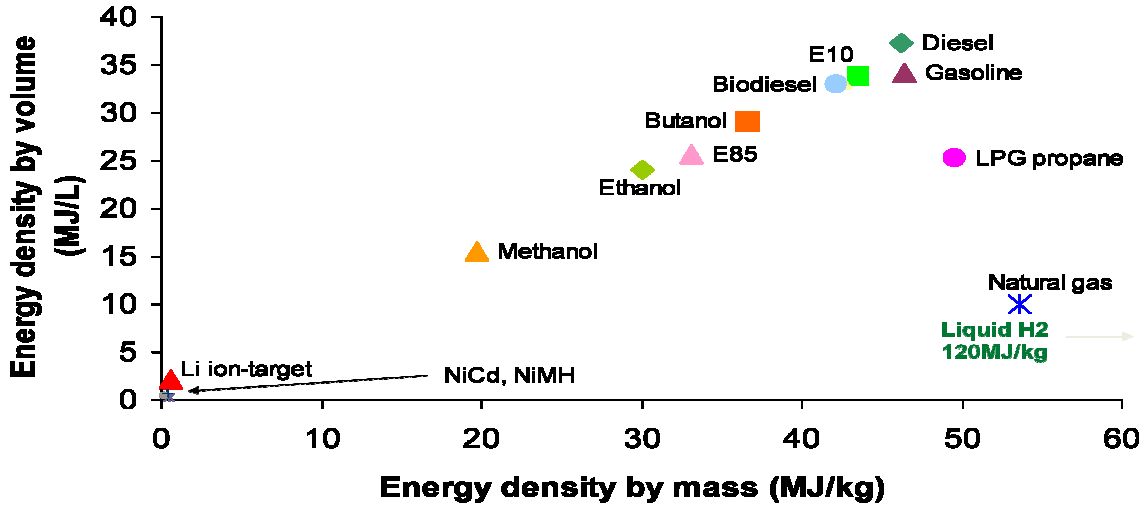
Globally, smart grid deployment will require the development of international standards to enable the faster introduction of lower costs solutions on a mass scale. International standards are also critical to enabling interoperability. Failure to establish international standards was thus seen as a potential road bloc to ensuring accessibility, reliability and availability of power across broader geographic regions. Cooperation and collaboration on research and development would also aid the adoption of international standards and procedures. This was seen as a more important issue for the Americans than the Europeans.

Transforming the Transportation Sector

The transportation sector in total provides between 20-28% of global carbon emissions.[xviii] Discussions focused on the policies and technologies to improve efficiencies and reduce carbon emissions from motor vehicles as they consume over 60%[xix] of the energy consumed in the transportation sector. Although important over the longer-term, issues relating to urban design and increasing mass transit versus road vehicle transportation were not covered, nor was air, marine or rail transportation.

Today, the transportation sector is virtually totally dependent upon petroleum. Oil will remain the main source of vehicle transportation fuels for many decades owing to its high energy density by volume and mass. However, energy security concerns as well as environmental concerns over carbon emissions are intensifying the drive to increase vehicle efficiency and to find lower carbon vehicle technologies. Consumers are looking for greater fuel efficiency to offset expected increases in oil prices and to reduce existing driving costs.

Figure 10: Energy Density of Storage



Source: Rendard, Jean Baptiste. "Transport Decarbonisation: Technology Options & Competition." Brussels, Belgium, May 2009.

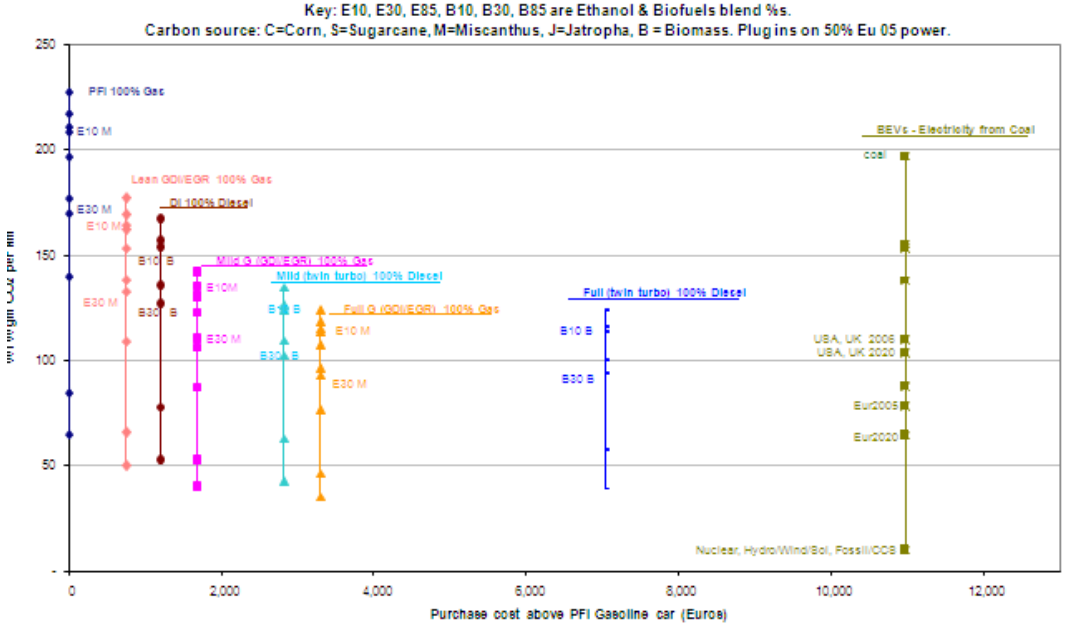
In Europe average vehicle fuel efficiencies are significantly greater than in the United States, 40 mpg and 20.4 mpg respectively, reflecting the impact of very high fuel taxes that are a major source of government general revenue. Almost 40 percent[xx] of the light duty vehicles run on diesel, taking advantage of the greater efficiency of diesel engines.

In the United States fuel taxes are substantially lower at an average of $.46[xxi] , as are vehicle efficiencies at 21 mpg[xxii]. Gasoline is used in 97% of light duty vehicles[xxiii] with diesel fuel mainly consumed by heavy-duty trucks.

Governments and manufacturers in both the US and EU are seeking to obtain further efficiency gains and to shift fuel technologies to reduce the dependency on oil.
A review of vehicle technologies and the potential to reduce well-to-wheel carbon emissions, as illustrated in figure 11, reveals several key observations:

- ***i)*** *Improvements in petroleum based engine technology can provide cost effective solutions to reducing CO2 emission per kilometer or mile driven.*
- ***ii)*** *The hybrid gasoline engine (not plug-in) provides reduced carbon emissions at relatively low incremental capital costs.*
- ***iii)*** *The blending of lignocellulosic ethanol (not corn based) is effective at reducing well-to-wheel carbon emissions across all vehicle technologies.*
- ***iv)*** *Diesel engines are relatively efficient but are also more expensive than gasoline engines and emit particulate matter.*
- ***v)*** *Hybridization is particularly effective with gasoline engine as it can be provided at much lower capital costs than in diesel engines. In other words, hybrid diesel engines provide only a small improvement over non -hybrid diesels but at high incremental costs.*
- ***vi)*** *A base line car (2007 Category C car, VW Golf, Ford Focus) will produce around 40 Tonnes of CO2 in its life through fuel use. The capital costs of all electric (non- hybrid) running on grid electricity could cost between 11,000-12,000 Euros extra which suggest one could pay about 300 Euros per Tonne to avoid CO2 if power was obtained from a non-carbon source like nuclear, hydro, wind or coal with CCS. The actual level of CO2 reductions associated with a 100% electric car depends on the source of electric power and could be significantly greater.*

Figure 11: WTW CO2 by Vehicle Technology and Fuel Blends for Medium Cars



Source: Rendard, Jean Baptiste. "Transport Decarbonisation: Technology Options & Competition." Brussels, Belgium, May 2009.

These observations suggest that advanced gasoline engines with some form of hybrid power train should and will play a major role for light-duty vehicles in both the US and the EU. In Europe the percentage consumption of diesel fuels may decline as hybrids increase in an effort to obtaining much greater kilometer per kiloliter ratings.

Second and third generation bio-fuels can provide significant additional benefits by further reducing carbon emissions and lowering the consumption of petroleum. In Europe as in the United States bio-fuels that do not compete with food will be favored. This suggests a limited role for diesel bio-fuels based on vegetable oils.

Over the longer term, all electric vehicles powered by non-carbon electricity sources would be needed to obtain the extremely low carbon emissions that may be required in 2050 and beyond. However, the high costs of removing carbon associated with all electric vehicles ($300 per tonne of CO2 and higher) suggest that they will penetrate the market slowly, as it will be significantly less costly to focus early CO2 emissions reductions on stationary sources. (In the EU Emissions Trading Scheme, which focuses on CO2 emissions from stationary sources, CO2 currently trades at around 15 Euros per Tonne.)

The gradual introduction of all electric vehicles, to reduce petroleum demand and carbon emissions, is seen as being easily accommodated by the electric power sector in the shorter term. This is true, even if 25 % of all new cars were Plug in Electric Vehicles (PEGVs) by 2020, which would be a much faster penetration of the market than currently anticipated.[xxiv] Moreover, a gradual build up in electric vehicle use will provide the longer-term transition time required to develop and deploy enabling smart grid technology.

The complexity of introducing a wide variety of possible new vehicle technologies and fueling options raises a particular challenge for automakers and fuel distributors in determining where to concentrate resources. This challenge has been greatly exacerbated by the current economic downturn that has severely limited the accessibility and availability of capital at the same time it has lead to dramatic reduction in cash flow from vehicle sales. While entrepreneurial ingenuity should not be discouraged, government and industry resources need to closely examine the various technologies and to concentrate support and R&D resources on the technologies that are most promising and have the greatest potential to materially alter the transportation sector. The balancing of priorities will be difficult as many technologies are under development and some diversity in technologies should be maintained.

Critical impact of policies, regulations and the consumer

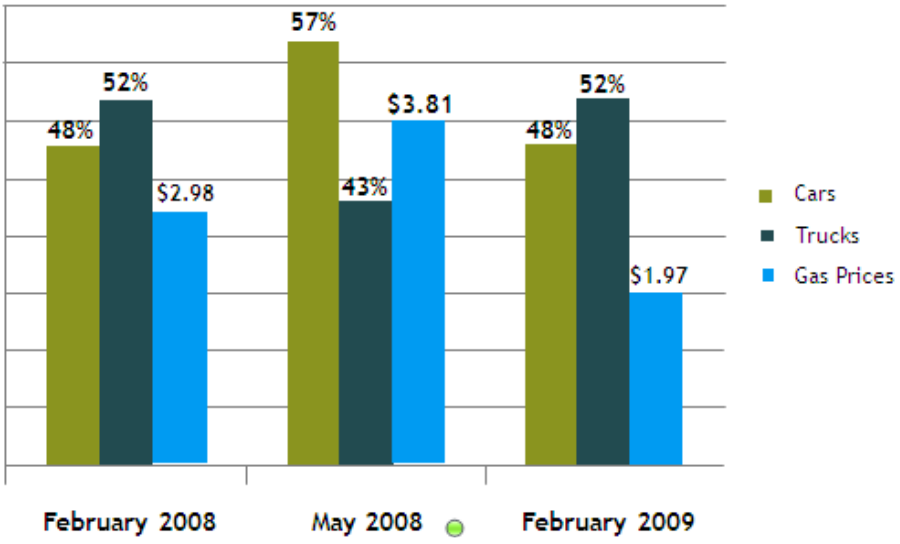
The pace at which new technologies will be adopted will be driven by policies, regulations and consumer response. Policy needs to provide consistent regulations, which automakers and consumers can rely on to make investment and purchasing decisions. Consumer engagement is essential and needs to be supported by clarity and predictability going forward.

US national policy currently sends conflicting and contradictory market signals. Automakers are mandated to manufacturer more fuel-efficient vehicles, while government promotes a policy of

"Cheap gas" thereby undermining demand for more efficient vehicles. Historically, in the US, proposals to raise fuel taxes have been the "Third rail" of American politics.

In 2008, US consumers responded rapidly to price signals by reducing purchases of light duty trucks in favor of cars. However, the shift towards more efficient cars was rapidly reversed when gasoline prices subsided in late 2008 with the reduction in crude oil prices accompanying the drop in demand associated with the global financial crisis. This is seen in the graph below:

Figure 12: Impact of Fuel Price on US Vehicle Sales



Source: Clay, Katherine. "Transforming the Transportation Sector Automotive Industry Perspective." Brussels, Belgium, May 2009.

Volatile crude oil prices have historically been a major concern for policy makers globally. Greater predictability would allow consumers, as well as automakers, to make more informed long-term decisions typically associated with vehicle purchases. The gradual introduction of higher CAFÉ standards recently introduced in the US, which raised the US light duty fleet average to 34.5 miles per gallon, is helpful to the auto industry in preparing for the retooling of the industry. European automakers are facing increasing requirements as well, although their current fleet average is already greater than the new US objectives for 2014. Europe is also facing increasing requirements to reduce carbon emissions per kilometer.[xxv]

While current economic conditions make it politically difficult to raise fuel taxes in the US, thought should be given to considering the introduction of a variable "security" fuel tax that would establish a floor price for vehicle fuels that would incent consumers to purchase more efficient vehicles. This could be gradually introduced and set to disappear when vehicle fuel costs reach a given level, like $3.50 - $4.00 a gallon.

The observation was made that consumers respond more rapidly to the capital costs of new vehicle purchases than to the costs of fuel consumption. While elasticity of demand for fuel is low at relatively low fuel price levels, over time there can be substantial shifts in demand as seen by the differences in fuel consumption rates in Europe versus the United States. In addition, the 4%

decline in gasoline demand over a few months following the 2008 run up in crude oil cost indicates a much higher elasticity of demand than seen before at lower oil prices.

As the global economy recovers, it is entirely possible that world crude prices will rise again to levels closer to those seen in 2008. This will depend upon many factors including the strategic investment decisions of the producing countries. In the United States the goal of raising vehicle efficiency standards has been mainly driven by national security concerns associated with balance of payment and oil import dependency issues. Europeans appear to be more focused on reducing carbon emissions, although crude oil price volatility is becoming an increasing issue, as evident from the 2008 protests over fuel price hikes. Under the existing ETS regulations in Europe, autos, trucks and trains are exempt, and there are questions in the United States as to whether transportation should be included in cap & trade legislation.

Transatlantic Cooperation within a Common Framework

If the challenges facing the transatlantic community were easily resolved they would be well on the way to being resolved through existing national regulations and market forces. The discussions brought to light many of the complex issues and intertwining relationships that need to be considered in addressing energy security, environmental degradation and economic prosperity. At the same time these issues are being addressed, the transatlantic community, as well as the rest of the world, is facing two simultaneous crises. One is financial and economic and the other is environmental. The former is making it difficult to make necessary environmental investments and to pay the higher energy costs that may be required. The latter is making it necessary to change radically how we produce and consume energy.

This situation also provides a huge opportunity for positive change. In the coming years we cannot afford to continue with "business as usual" as the current path is unsustainable. There was strong sentiment that failure to transform the energy sector to address the threats of global warming adequately will have very costly consequences for future generations. The world already has to adapt to the impact of climate change and the impacts will continue to increase for many decades even under the best of scenarios.

Fortunately, there are many technologies that can be brought to bear. But development and deployment will not be easy, or inexpensive. Current infrastructures will need to be transformed. Transitions will take time and must be undertaken in a manner that avoids severe economic disruptions to industry and consumers. In the end, we may need a complete reorganization of our societies.

It is essential that the United States and Europe provide the needed leadership. Cooperation in undertaking such a transformation makes more sense than ever before, as it will be easier to devise an effective and efficient way forward through cooperation than by going on separate and possibly conflicting paths. From a Transatlantic perspective the differences between the US and EU over the past 8 years have been greatly exaggerated, and over emphasizing differences in discussions and negotiations is often counterproductive. There is broad agreement that global warming exists and that technology is needed. Energy security remains a global as well as a transatlantic concern.

The EU published a Strategic Energy Technology (SET) Plan in 2007 that provides a list of eight technologies that were identified as essential to transforming the energy industry and delivering competitive economic growth with low carbon emissions. The list included wind energy, solar energy, bio-energy, capture, transport and storage of CO^2, the electricity network and nuclear fission. The EU is now proposing a Joint Integrated Planning and European Industrial Initiatives in the following areas:

- ✓ European Wind Initiative
- ✓ Solar Europe Initiative
- ✓ Bio-energy Europe Initiative
- ✓ European Electricity Grid Initiative
- ✓ European CO2 capture, transport and storage Initiative
- ✓ Sustainable Fission Initiative (Gen IV)
- ✓ Fuel cell and hydrogen (JTI on-going)
- ✓ Fusion (ITER on-going)

It is understood that the EU is in the process of updating the 2007 SET plan this fall. At the same time the US Department of Energy is understood to be initiating the development of a similar plan that will not be completed until 2010. In the meantime, the United States and the EU have held cooperative discussions on a Joint Action Plan for Energy R&D. Meetings initiated in the fall of 2008 focused on the following:

- Cooperation on Hydrogen and Fuel Cell Technology
- Cooperation on Carbon Capture and Storage Technology
- Cooperation on Solar Electric Technology
- Cooperation on Bio-energy Technology

The United States is also a partner in the ITER project on nuclear fusion and is a member of the Generation IV nuclear initiative, although greater attention is being focused in the United States on deployment of generation III nuclear facilities. The above efforts involve government undertakings that result in government-to-government discussions.

This is also true of the ongoing climate change discussions that are being held in preparation for Copenhagen in December 2009. The long-term objective of halving carbon emissions globally by 2050 has been broadly accepted. Given the expected growth in emissions from developing countries, this implies that the developed countries will need to achieve a decrease of 75-80 % by 2050. In the government-to -government discussions, uncertainty remains over the base line to be used in measuring reductions and over the speed at which decreases can be achieved. At the workshop, a number of industry and non- government experts expressed concern over the achievability of the 2050 goals, although the desirability of maintaining the 2050 objectives was supported.

Government has a clear responsibility to create the framework for addressing the multiple challenges associated with transforming the energy industry. *The framework should be based on an implementation plan that is broadly supported by industry and the public. Obtaining such acceptance will require the creation of a clear vision of the broad objectives as well as the societal changes and economic transitions that will have to be undertaken by industry and the public.* Because there is no way to precisely predict the future, wide spread concurrence with such a vision would be helpful in navigating the many twist and turns that will need to be taken in transforming the energy sector and people's lifestyles.

A coordinated set of communications across the transatlantic community could potentially prove very helpful in overcoming growing resistance to the building of new facilities and infrastructure as well a reluctance to absorb higher per unit energy costs. The public is often presented with a number of mixed messages regarding the financial and societal costs associated with various energy technologies and proposed policies. In addition the consequences of inaction are often not clearly or accurately discussed. Developing and delivering such messages represents a major challenge to government and political leadership, but may well prove crucial to the successful passage of legislation to support the policy objectives of the US and EU administrations.

The workshop discussion confirms that the numerous government –to – government dialogues that are being undertaken on subjects ranging from climate change to R&D cooperation on specific technologies are essential. But, they are not seen as sufficient by themselves to drive societies to undertake the radical transformations deemed necessary to address climate and energy security concerns in a world demanding growing economic prosperity for billions. Change that could potentially result in a complete reorganization of our society will require broad support. *Track II workshops involving a blend of business, NGOs and government experts have the potential to strengthen significantly the understanding of issues, broaden the political will, and provide governments useful information related to the feasibility and implementation issues involve in creating the transition.*

Such workshops should be held on similar topics to those being discussed at the government –to government level. They should allow for different point of view to be expressed and aim to increasing understanding among participants in an effort to create a clearer path forward. Discussions should focus on clarifying differing perspectives, identifying economic and social impacts, identifying bottlenecks, and seeking common ground. The active involvement of government experts is necessary to ensure effective cross communication. It is recognized that this will add an additional communications burden on government officials, but should result in more effective and efficient policies and regulations as well as assist in smoothing the legislative process.

A holistic framework is needed for government-to-government dialogues. A Transatlantic Forum or Council on Energy should be formed to coordinate the identification of critical subjects that could benefit from cooperative activities and to ensure that knowledge on technology and implementation issues is kept current.

Recommended Holistic Framework for Cooperation

Key Enabling Activities

I - Establish a Transatlantic Energy Council

II- Public Understanding & Acceptance
- **Create the Vision**
- **Coordinated Communications.**

III- Identify Key Technologies
- **Technology Assessments**
- **Scenarios & Modeling**
- **Develop Implementation Plans**

IV- Develop Policy

- **Resource Availability**
- **Research & Development budgets**
- **Federal / EU versus State/National**
- **Measurement**
- **Renewable Portfolio Standards**
- **Cap & Trade Schemes**
- **Acceptable Economic Impacts**
- **Expanded International Cooperation**

V- Determine Government Support Required

- **Legislation**
- **Regulations**
- **Incentives**
- **Deployment**
- **Standards & Labeling**

The discussions brought out the many interconnections between all these topics. That most enabling topics impact all the technologies was evident throughout the workshop. It was also evident that there were many interactions between individual technologies as well as among the enabling topics. *Dealing with such complexity requires a holistic examination of these interrelationships in establishing a creditable implementation plan.* This also implies that *a governmental umbrella forum or council focused on energy cooperation should be created to ensure that critical interrelationships are understood and properly addressed in legislation, policies, regulations and programs throughout the transatlantic community.*

The US and the EU have been active in undertaking dialogues on a number of these topics. For example, the US and the EU are moving forward on cooperating on R&D by building on existing relationships and expanding the scope and level of collaboration. *However, R&D and technology cooperation needs to be accompanied with the development of common and compatible standards and labeling.* This will be particularly helpful in the deployment of new technologies to boost energy efficiency, which is viewed as the major near term option available to reduce energy demand and emissions. Moreover, cooperation on developing common standards and labeling will be important across all energy sectors

Regulations and incentives will also be critical to the deployment and utilization of technology. There are many opportunities to coordinate on the design of regulations and incentives, but there is a danger that in the push to reach objectives the transatlantic community may create unnecessary differences in implementation that will stifle trade and reduce the potential to achieve economies of scale.

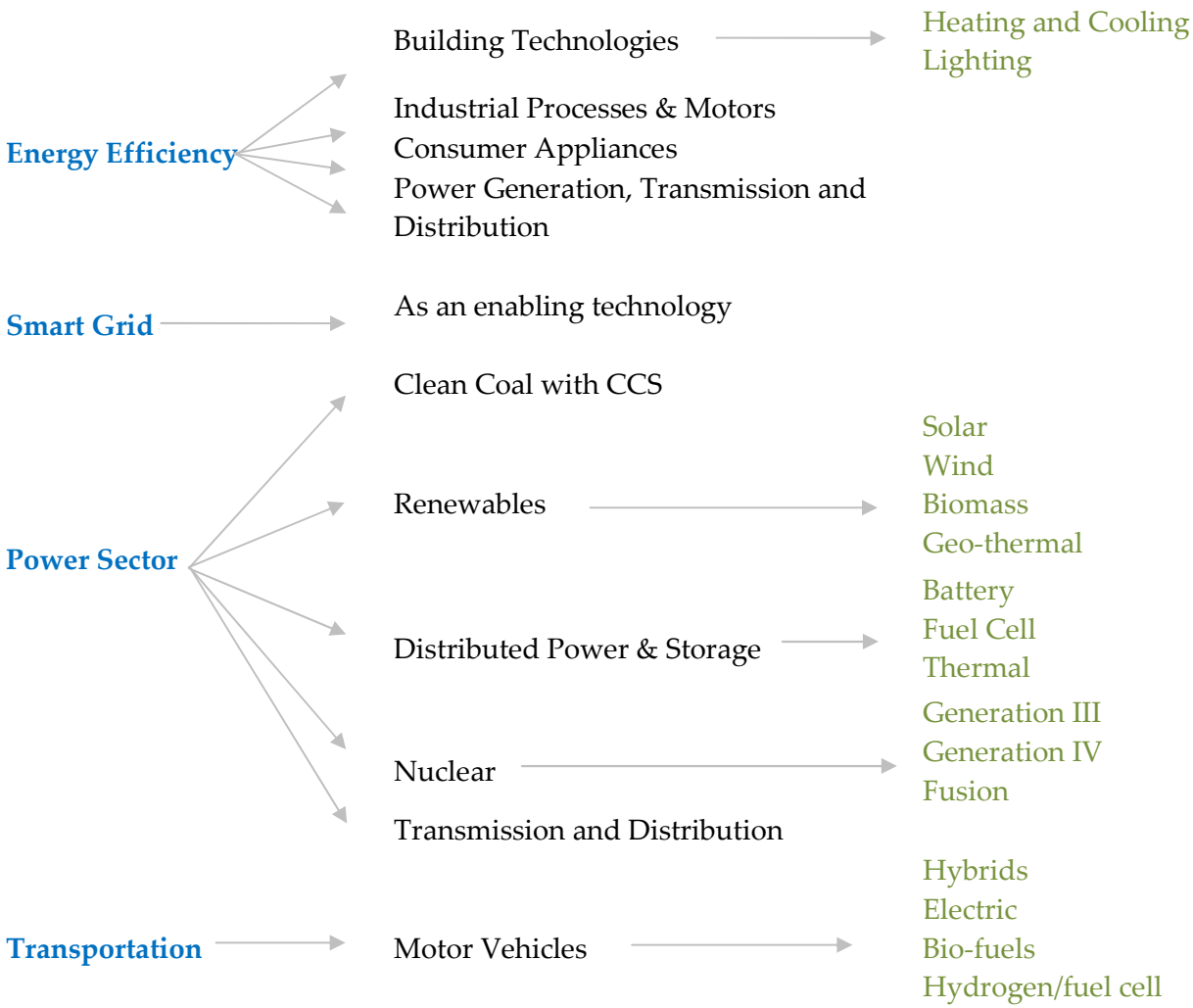
In a number of instances the design of "common, compatible and complementary" regulations will be essential to the successful implementation of policies. For example, the establishment of Cap and Trade systems in the United States and Europe will result in the setting of a price on CO2 emissions that will be traded internationally. There could be major market distortions if the systems are not

compatible. Similarly, differing regulations impacting Carbon Capture and Storage projects could stifle the flow of technologies and investments across borders.

In other cases there are opportunities to design more effective regulations and incentives by comparing the impact and implementation issues experienced by the US state regulators and European national regulators. Similarly, *the benchmarking of industries could lead to the design of better regulations and incentives.*

A robust list of technologies that will be required was discussed during the course of discussions, as follows:

Key Technologies Discussed in Workshop



As just noted, cooperation on R&D related to a number of these technologies has been initiated. However, cooperation should be expanded by broadening the dialogues on specific technologies to include a full review of the impact of various enabling factors. For example, discussions on Clean Coal Technologies with CCS should be expanded to include legal and regulatory issues, permitting issues, incentives required, the impact of market mechanisms, and public acceptance issues.

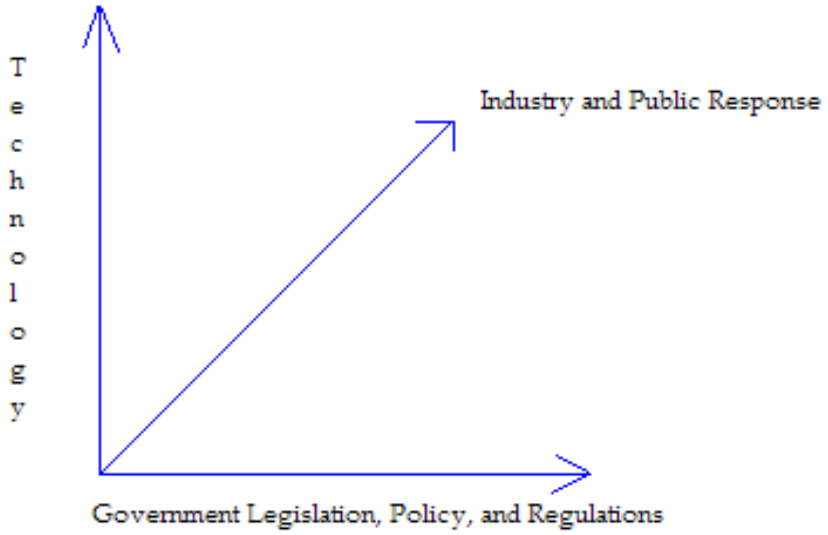
Carbon Capture and Storage will first be applied to coal power plants, but it will eventually have to be utilized by industries such as steel and cement, and eventually on natural gas power plants.

There was clear consensus that the two highest priority technologies that required immediate concentrated attention were those involving energy efficiency, and coal with carbon capture and storage. Without significant and timely progress in deploying these basic technologies on a massive scale, participants saw virtually no possibility of achieving the emission reduction targets proposed. Renewables for both power and transportation fuels were also viewed as critical transforming technologies. Smart grid technologies were identified as necessary to obtaining energy efficiencies and to reducing demand. The expansion of safe nuclear power with a secure fuel cycle was also seen as necessary. In short, the transformation of the energy sector will impact virtually all segments of the energy industry.

Energy efficiency involves a particularly large number of interrelating technologies that will require a number of supporting actions. Specifically, achieving the huge potential for energy savings associated with increasing energy efficiencies requires not only the development and deployment of new technologies, such as smart grids which involve the integration of the electric power industry with information technology, but also the setting of standards and regulations impacting many sectors, such as electric power, buildings, industry, transportation etc.

One participant described the challenge as undertaking a multi- dimensional chess game. Technology will be driven by government strategies, policies and regulations that will in turn determine industry and public response in investments and acceptance of the new technology. This is illustrated in the chart below:

Figure 13: Interactions Driving Transformation of Energy Industry



In addition, the framework needs to consider the fourth dimension of time. With such complexity we have to start unraveling the long-term solution by identifying and prioritizing key levers that result in the initial concrete steps. At the same time, we need to understand that as we take each step and proceed to implement, different steps and priorities will emerge that will lead us to further steps. These could involve new technologies, new government actions or changing societal responses. In visual terms at any point in time there is a three dimensional matrix of interrelated developments that will morph over time.

The framework will also be impacted by exogenous factors that will ultimately determine the size and capacity of the energy industry to sustain and provide for the world's energy needs. Such factors include: knowledge, physical resources, creativity and the willingness to listen and communicate. As the transatlantic community moves to transform our energy industries, early cooperative undertakings should be focused on major technologies and supportive government activities that are believed to be critical to enabling the transformation. In the workshop a large number of such areas were identified, as shown in the table on page 23.

Throughout the workshop there was clear consensus that the two highest priority technologies that required immediate concentrated attention were those involving energy efficiency, and coal with carbon capture and storage. Without significant and timely progress in deploying these basic technologies on a massive scale, participants saw virtually no possibility of achieving the emission reduction targets proposed. Renewables for both power and transportation fuels were also viewed as critical transforming technologies. Smart grid technologies were identified as necessary to obtaining energy efficiencies and to reducing demand. The expansion of safe nuclear power with a secure fuel cycle was also seen as necessary. In short, the transformation of the energy sector will impact virtually all segments of the energy industry.

While all enabling subjects were viewed as essential, some stood out as higher priority. A complete listing of activities viewed as important to ensuring a timely transition of the energy industry is presented in Appendix A. Cooperation on technology is viewed as relatively straight forward, but critical to accelerate and lower the cost of developing and deploying new technology. Much attention was given to aligning enabling factors to accelerate the transition process. It was also generally accepted that by themselves, market forces would not create the incentives to make the massive timely adjustments needed. It was further noted that for every technology there were a large number of enabling activities (policies, regulations etc) that would be critical for successful implementation. Cooperation on the establishment of Regulations and Standards was viewed as being especially important to the business community and early focus on these subjects is recommended as critical to accelerating an economic transition that will maintain the economic viability of the transatlantic community.

In the concluding session, the importance of developing a common transatlantic vision was emphasized as pivotal to achieving the stated objective of transforming the energy industry in a timely manner. Such a vision was seen as providing motivation and serving as an important anchor for guiding and judging the community's success at driving the transformation of the global energy industry towards a secure, affordable, sustainable future.

Annex A

Recommendations for US-EU Cooperation Based on a Holistic Framework

I- Establish a Transatlantic Energy Council

Council to serve as an umbrella forum focused on energy cooperation to ensure that critical interrelationships are understood and properly addressed in legislation, policies, regulations and programs throughout the transatlantic community

II - Public Understanding & Acceptance

a. **Create the Vision**
   1. The Transatlantic Community needs to embrace a shared vision of the magnitude of economic and societal changes associated with a transformation on the community's energy industries to meet the global challenges of addressing climate change, achieving energy security and maintaining prosperous and growing economies.
      I. Identify the societal and economic consequences of taking action; including that some increase in costs is unavoidable if there is to be a timely reduction in greenhouse gases
      II. Identify the adverse consequences of inaction, even if not universally agreed upon
      III. Identify the major actions that will probably be needed to avert the more serious consequences of climate change
      IV. Recognize international cooperation will be required
      V. Recognize challenge is bigger than any one state or region can achieve on its own
      VI. Address why less developed countries should be willing to incur higher energy costs
      VII. Include recognition of the costs and consequences of need to adapt as well as to mitigate
      VIII. Accept that transition will require relying on a full portfolio of energy sources what will morph over time

b. **Coordinated Communications**
   1. Similar messages need to be delivered on both sides of the Atlantic if the public and industry is going to respond in a supportive and effective manner to legislative and regulatory proposals designed to achieve the vision.
      I. Creation of such communications will require broad understanding and acceptance of facts and consequences by many elements of society, such as, individual consumers, industry and those involved in political and governmental processes.
      II. Governments need to involve multiple elements of society in the development of an effective communications strategy.
      III. Need to focus on longer term policy decisions to encourage consumers and investors to make the necessary investments and changes in behavior.

IV. Communications should set realistic expectations regarding the pace and extent of changes that might be achieved.
V. The adverse consequences of the BANANA SYNDROME (Build Absolutely Nothing Anywhere Near Anything) should be actively addressed and offset by clear government and political leadership.
VI. Clearly articulate the benefits associated with increasing energy efficiency and conservation

III - Identify Key Technologies

a. **Technology Assessments**
   1. Undertake periodic evaluations of the most promising short and longer- term technologies
   2. Undertake discussions to refine understanding of near and longer-term costs of various technologies, under differing circumstances

b. **Scenarios & Modeling**
   1. Joint examination of transitions that involve a full portfolio of energy sources and broad portfolios of technologies that will morph over time
   2. Incorporate the need to replace aging existing plant and equipment in the assessment of possible benefits of decentralized versus centralized power systems

c. **Develop Implementation Plans**
   1. There could be coordination in the development of EU and US Technology road maps (SET) plans that identifies areas of mutual concerns.
   2. Both the U.S. and the EU could share technology assessments behind proposed strategic road maps for technology development and deployment.
   3. Cooperate on assessing the pace at which technologies essential to implementation plans can be implemented, and on a realistic game plan for replacing aging infrastructure
   4. -Cooperate on identification of the sustained research, development and deployment support required to support technology implementation plans
   5. Coordinate on identification and funding of joint and /or complimentary research

IV- Cooperation on Key Technologies

a. ***Energy Efficiency***
   1. Establish a forum to develop holistic policies and programs to:
      I. Eliminate market distortions
      II. Create sufficient incentives
      III. Undertake consumer education and outreach
      IV. Develop standards and codes
      V. Provide government leadership
      VI. Increase capability of workforce

   2. Establish ongoing dialogue that involves industry and consumer groups on a number of specific technologies:

I. Building Technologies
    A. Heating and Cooling
    B. Lighting
II. Industrial Processes & motors
III. Consumer appliances
IV. Power generation, transmission and distribution

b. ***Smart Grid (Supports Energy Efficiency and Carbon Mitigation)***
1. Undertake focused dialogue on technologies, standards and regulations that will be critical to development and deployment of smart grids
2. Specifically, identify and coordinate on establishment of interoperability and cyber security standards required to join information technology with electric power operating processes.
3. Undertake joint assessment of impact on decentralized jurisdictional regulations on the ability to develop and deploy and efficient effective smart grids.
4. Cooperate on determining how smart grid technology can be used to efficiently and effectively expand power capacity while replacing aging infrastructure.

Power Sector

a. Clean Coal with CCS
1. Coordinate policies to clearly identify the criticality of developing technology to economically remove CO2 emissions from fossil fuel plants, especially coal.
2. Organized joint efforts to develop and deploy CCS with 90+% CO2 capture with associated infrastructure to transport and permanently store CO2
3. Coordinate on the creation of legal and regulations to enable the demonstration and deployment of CCS
4. Liability and insurability issues
5. Sitting and permitting issues
6. Pipeline development and cross border issues
7. Cooperate on encouraging public acceptance of the technology

b. Renewables
1. Share experiences on the cost impact upon consumers of integrating renewables into the power grid.
2. Undertake an assessment of the potential for smart grid technology to enable the cost effective integration of renewable power
3. Review experience and collaborate on designing policies to provide regulatory certainty that will encourage private industry investments without becoming dependent upon long -term subsidies
4. Cooperate on R & D designed to reduce the cost of deploying solar, wind, biomass, geo-thermal etc.
5. Utilize international cooperation to spread funding requirements and technological risk

c. Distributed power & Storage
1. Undertake joint assessment of potential to deploy large –scale storage technologies and imaginative configurations of multiple power sources to reduce reliability concerns with renewable power.

2. Develop a comprehensive transatlantic R&D program on multiple storage technologies, including battery, fuel cells and thermal

d. Nuclear
    1. Maintain focus on continues safe and economic operation of existing nuclear fleet and reach consensus on a viable strategy and procedures for managing spent fuel
    2. Coordinate policies to ensure generation III & IV plants are accepted as a creditable portion of the energy portfolio.
    3. Continue to maintain long- term support for Fusion R&D

e. Transmission and Distribution

Cooperate on the development and technical standards to incorporate storage infrastructures with the capacity and reliability to operate with 20-30%(or greater) intermittent renewables in specific regions

Transportation

a. Motor Vehicles
    1. Continue to cooperate on the identification of the most promising technologies to increase vehicle efficiency and develop cost competitive lower carbon vehicle technologies.
        i. Particular attention should be focused on:
        ii. Improvements in petroleum based engines and the development of gasoline hybrid technologies
        iii. The development of cost competitive lingo-cellulosic fuels
        iv. The development of fuels from algae
        v. The development of cost effective battery technology
    2. Cooperate on undertaking an assessment of the likely pace and cost impact of introducing all electric vehicles
    3. Coordinate on the development of consistent regulations to provide clarity and predictability without committing to long-term subsidies
    4. Undertake discussions to implement compatible carbon emissions regulations to include autos, trucks and rail in proposed Emission Trading Schemes.
    5. The US should create greater compatibility with Europe by reducing the conflicting market signals sent to manufacturers and consumers by considering the introduction of a variable "security" fuel tax that would establish a floor price that could be introduced gradually and set to disappear at a level judged necessary to encourage the purchase of more efficient vehicles.
    6. Coordinate on the development of consistent regulations to provide clarity and predictability without committing to long-term subsidies
    7. Undertake discussions to implement compatible carbon emissions regulations to include autos, trucks and rail in proposed Emission Trading Schemes.
    8. The US should create greater compatibility with Europe by reducing the conflicting market signals sent to manufacturers and consumers by considering the introduction of a variable "security" fuel tax that would establish a floor price that

could be introduced gradually and set to disappear at a level judged necessary to encourage the purchase of more efficient vehicles.

V - Develop Policy

Resource Availability

a. Regularly reassess the long-term availability, accessibility and affordability of energy resources, petroleum, natural gas, coal, uranium, hydro and other renewables
b. Assess the extent to which interment renewable power sources might be converted into stable supply sources.
c. Assess implications of energy sources on water requirements and agriculture
d. Recognizing Europe's continuing interdependence upon Russian Natural gas supplies, develop policies and multiple supply options that maintain Russian demand security while increasing the flow of supplies from other sources.
e. US-European cooperation on increasing Russia's energy efficiency, undertaking new development, and expand and modernize its pipeline infrastructure to free up more gas supplies for Europe.
f. Establish policies to maintain energy supply diversity to ensure flexibility and supply security

Research & Development budgets

a. Prioritize budgets based on most critical and most promising technologies
b. Determine areas where greatest leverage can be obtained through joint cooperation
c. Develop complimentary R&D budgets to ensure key technologies are provided adequate support
d. Reassess RD&D support need for priority technologies, determine where international cooperation, both transatlantic and third party, would be effective at accelerating progress and deployment, and increase funding for such international cooperative RD&D

Federal / EU versus State/National

a. Discuss options for streamlining regulatory structures
b. Identify dysfunctional impacts from existing regulations
c. Assess the appropriateness and effectiveness of regulations at the Federal/EU level, the state/national level and at the municipal level

Measurement

a. Review and establish uniform measurement techniques, including physical descriptions
b. Develop and deploy compatible and consistent monitoring procedures to establish confidence in data and the rate of progress at reducing emissions
c. Cooperate on establishing an international agreement on benchmarking.

Renewable Portfolio Standards

a. Create forum for reviewing the effectiveness of renewable portfolio standards
b. Assess the appropriateness of differing standards based on geographic conditions.

Cap & Trade Schemes

a. Establish an effective and efficient Emissions Trading System
b. Establish compatible schedules for the reduction of free allowances

c. Establish compatible schedules of the setting of allowances by sector
d. Utilized industry benchmarking to determine most efficient producers
e. Allocate the most efficient producers with the greatest portion of free allowances to encourage investments in energy efficiency
f. Impose regulations and monitoring that Treat Carbon Markets like other financial markets

Acceptable Economic Impacts

a. Evaluate the potential impact of carbon legislation on various industrial sectors
b. Establish a Transatlantic industry dialogue to assess appropriate price for carbon
c. -Establish a transatlantic assessment of impact of various carbon price levels on GHG emissions reductions
d. Reach transatlantic agreement on a timetable for developing countries that would be acceptable to transatlantic industry

Expanded International Cooperation

a. Develop game plan for expanding international cooperation through transatlantic cooperation
b. Establish an international agreement on benchmarking
c. Utilize benchmarking results to develop criteria that could be applied globally to approve projects for CDM credits of Emission Reduction Credits

VI -Determine Government Support Required

Legislation

a. Determine where market forces alone will be insufficient to produce the timely massive transitions required
b. Actively involve business community in the creation of realistic legislation
c. Transatlantic community should direct that only products with the highest efficiency ratings are eligible for public procurement

Regulations

a. Actively involve business community in the creation of realistic regulations
b. Actively involve states/nations and cities in the assessment of effective and efficient regulations
c. Determine where mandatory regulations will be required based on experiences in Europe and the United States

Incentives

a. Exchange information and determine when the imposition of real costs provide the most effective incentives
b. Cooperate on an assessment of the effectiveness of various incentives at the federal/EU, state/national and municipal level
c. Undertake an assessment of the effectiveness of incentives designed to impact total systems energy usage, rather than individual energy components

Deployment

a. Cooperate on legislation and regulations that would encourage and/or require aging facilities to be replaced with more efficient and less carbon intensive technology
b. Cooperate on the design of legislation and regulations that will provide consistent longer-term support for introduction on new technologies that avoids long-term reliance on subsidies
c. Cooperate on the design of legislation and regulations that could diminish the ability of special interest groups from blocking the introduction on new technologies deemed essential to meeting national objectives

Establish Standards & Labeling

a. Coordination and cooperation on the setting of common and compatible standards
b. Determine what standards are needed to ensure the competitiveness of the transatlantic community
c. Specifically, consider standards relating to three types of regulations: Command and Control, Fiscal, and Emissions Trading
d. Align the processes for setting standards to enable the faster adoption of consistent standards
e. Focus standard setting on environmental, and energy efficiency performance standards
f. Focus on creating international standards
g. Increase the transparency with which international standards are established
h. Encourage and support industry development of sectoral standards and support their being adopted as international standards
i. Establish higher energy efficiency standards for appliances and develop new energy efficiency labels
j. Create consistent standards and labeling for buildings and construction materials
k. Establish common and compatible technical specifications for industrial equipment
l. Focus on the establishment of communications standards and protocols for advanced transmission, distribution and smart grid technologies.
m. Create a unified labeling system that could be used globally

U.S.-EU Workshop on a Shared Vision for Energy and Climate Change

A joint project of the **Atlantic Council of the United States (ACUS)** and
Clingendael International Energy Program (CIEP)
In cooperation with the **Institute for 21st Century Energy,**

Supported by
The **U.S. Mission to the European Union**, the **European Commission**
And the TransAtlantic Business Dialogue (TABD)

First Workshop
Establishing a Common Transatlantic Agenda

May 28-29, 2009

Session I: Energy and Environmental Challenges: Establishing a Common Understanding

The opening session will focus on current assessments, as presented by the IEA and representatives from both sides of the Atlantic, of strategic challenges faced and the most likely technologies required in the first half of the 21st Century. While taking into account differences of European and U.S. opinions on the scope of the challenges and priorities, the session will attempt to establish a benchmark of commonly held views, from which this series of dialogues will build a foundation for future actions. The scale and timing of necessary investments and technological developments will also be reviewed, along with the financial limitations imposed by the global recession.

IEA World Outlook and Technology Options–Pieter Boot, CIEP, former IEA Director, Long-Term Co-operation and Policy Analysis, presented by Jacques de Jong, Clingendael International Energy Program

U.S. presentation – Glen E. Sweetnam, EIA, Director International, Economics and Greenhouse Gases Division

EU presentation– Artur Runge-Metzger, DG Env.C.1 Strategy, International negotiation and monitoring of EU action

Shell Scenarios - Hans Van der Loo, Shell Brussels Office

Open discussion - *Moderator*- John R Lyman, Director, Energy and Environment Program, Atlantic Council of the United States

Session II: Standards and Regulations: Different Approaches and Effectiveness

There are different approaches to the roles of standards and regulations. Presentations will examine how Standards and Regulations are developed. Discussion of the extent to which free market principles and incentives should be relied upon to stimulate technological advancements versus implementing through strict regulatory procedures. This session will focus on current debates

within the U.S. and Europe on these differences and on making regulatory structures simultaneously more effective and more efficient. Discussion will cover the benefits and limitations of regional and sector differences within the United States and the European Union, as well as the possibility of international standards.

EU presentation– Folker Franz, Senior Advisor, Energy & Climate Change, Business Europe

U.S. presentation– Stephen Eule, Vice President, Climate and Technology, Institute for 21st Century Energy

Energy Efficiency related Regulation and Standardization – Opportunities for transatlantic co-operation and harmonization— Markus Reigl, Head Corporate Standardization & Regulation, Siemens

Open discussion - *Moderator* – Erika Mann, MEPEU (Confirmed)

Session III: Utilities: Getting Ahead of the Power Curve

This session will provide a detailed assessment of the current and potential of primary energy supplies and renewable technologies to meet future power demand. The participants will address impact on investments in transmission and distribution system upgrades. Discussion on gas utilities will focus on challenges associated with longer-term supply of natural gas and the infrastructure and regulatory policies to ensure the availability and reliability of gas supplies for electricity, industry and final consumers

U.S. industry presentation- Revis James, EPRI, Director of Energy Technology Assessment Center

European industry presentation- Reiner Zwitserloot, CEO, Wintershall

Open discussion - *Moderator*- Louis Bono, Counselor for Energy, Environment, Science and Technology, U.S. Mission to the EU

Session IV: Energy Efficiency: Greatest New Energy Source

The greatest global source of new energy is the energy we waste. This *session will focus on the potential of energy efficiency and on specific U.S. and European plans to accelerate the pace of improvements. The presenters will review the effectiveness and appropriateness of using regulations and financial incentives as forcing mechanisms. The session will also highlight views on the value of establishing transatlantic standards for consumer and industry products to enable economies of scale and an increase in trade.*

Expert presentation-Kateri Callahan, President, Alliance to Save Energy (Confirmed)

Industry presentation–Hans ten Berge, Secretary General, Eurelectric (Confirmed)

Industry presentation– Keith Redfearn, GM of GE Energy's T&D Business (Confirmed)

EEB presentation– Bill Sisson, United Technology (Confirmed)

Open discussion- *Moderator* – Paulo Casaca, MEPEU (Confirmed)

Session V: Transforming the Transportation Sector: Higher Efficiency, Cleaner, and Greater Energy Security

The transportation sector consumes approximately 25 percent of total global energy use, the vast majority of which is provided by imported oil. Transformation can result in cleaner, more efficient modes of transportation, as well as enhanced energy security through less dependency on imported oil. This session will cover the need to accelerate the transformation of the transportation sector in the U.S. and Europe. Plans, policies, and opportunities will be discussed for greater cooperation on developing new technologies (both fuel and vehicles) for all transport sectors. The session will also include an assessment of the value of shifts in utilization of different transportation modes and improvements to intermodal transfers.

Oil industry presentation (20 minutes) - Jean Baptiste Renard,
Regional Group Vice President, Europe and South Africa BP (Confirmed)

Automotive industry presentation – Kathryn Clay, PhD, Director of Research, Alliance of Automotive Manufacturers

Open discussion - *Moderator* –Jaques de Jong, Senior Fellow Clingendael International Energy Program

Session VI: Wrap Up: A Common Framework Moving Forward

Presentations will identify a path for establishing greater and more comprehensive cooperation between the United States and Europe. The outcome will result in the establishment of future agendas for future dialogues.

EU presentation- Pierre Dechamps, Bureau of European Policy Advisers, EU Commission

U.S. presentation – Peter Chase, Minister-Counselor for Economic Affairs, U.S. Mission to the European Union

International industry presentation - Jeffries Bringinshaw, Executive EU Director, TABD

Open discussion - *Moderator* –General Richard Lawson, Vice Chairman, Atlantic Council of the United States

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[i] P. 1, The International Energy Agency. "Energy Technology Perspectives 2008: Scenarios and Strategies to 2050." Paris France: OECD/IEA Publishing, 2008.

[ii] Kramer, Franklin and John Lyman. "Transatlantic Cooperation for Sustainable Energy Security: A report of the Global Dialogue between the European Union and the United States." Washington, D.C.: The CSIS Press, 2009.

[iii] de Jong, Jacques. "Setting the scene." Brussels, Belgium, 2009.

[iv] Hans Van der Loo. "Atlantic Council and Energy." Brussels, Belgium, 2009.

[v]Qtd in: James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.
[vi] Qtd in: James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.
[vii] James, Revis. "Assessment of Current and Future Electricity Portfolio." Brussels, Belgium, May 2009.
[viii]"Renewable Electrical Generation Sources Soar; Non-Hydro Renewables Grow by Over 12% in 2009." July 2009. The American Council on Renewable Energy. 18 Sep 2009.
<http://www.acore.org/news/article/2009/06/29/renewable_electrical_generation_sources_soar_non_hydro_renewables_grow_over_.
[ix] The Atlantic Council. "U.S.-China Cooperation on Nuclear Power: An Opportunity for Fostering Sustainable Energy Security." August 2009. The Atlantic Council, 1 Sep 2009.
<http://www.acus.org/files/publication_pdfs/65/AtlanticCouncil-USChinaNuclearPower.pdf>
[x] Both Middle East and Central Asian supplies as well as eastern Russian supplies are also being, moved or under discussion for movement to Asia and South East Asia.
[xi] The ability to expand natural gas supplies is more certain than the ability to obtain additional oil supplies.
[xii] Zwitserloot, Reinier. "Utilities: Getting Ahead of the Power Curve." Brussels, Belgium, 2009.
[xiii] Zwitserloot, Reinier. "Utilities: Getting Ahead of the Power Curve." Brussels, Belgium, 2009.
[xiv]Systems issues and the establishment of incentives related to creating an effective smart grid may be in conflict with moves to unbundle generation, transmission and distribution.
[xv] A recent more comprehensive examination "Unlocking Energy Efficiency in the US Economy" completed in July 2009 continues to reaffirms the potential for dramatic savings equal to 18.4 quads (26 percent) of primary US energy demand in 2020 (McKinsey & Company, "Unlocking Energy Efficiency in the U.S. Economy." July 2009. McKinsey & Company.com. 1 Sep 2009.
<http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf >).

[xvi] Sission, William. "US EU Workshop on a Shared Vision for Energy and Climate Change." Brussels, Belgium, May 2009.
[xvii] ten Berge, Hans. "Energy Efficiency: Greatest New Energy Source." Brussels, Belgium, May 2009.
[xviii] (Footnote IEA data as 28% and BP data as 20%)
[xix] Us Department of Energy. Transportation Energy Data book. Table 2.6. 2008
[xx] Jones, Roland. "U.S. stuck in Reverse on fuel economy." 28 February. 2007. MSNBC.com, 9 Sept. 2009.
www.msnbc.com/id/173443681
[xxi] "Fuel tax" 8 Sept. 2009. Wikipedia, The free Encyclopedia. 9 Sept. 2009
[xxii] Benton, John. "U.S. Fuel Economy Stagnant for 12 Years." 18 July 2006.
Consumer Affairs. 10 Sept. 2009. http://www.consumeraffairs.com/news04/2006/07/fuel_economy.html
[xxiii] S.C. Davis, S.W. Diegel, and R.G. Boundy, Transportation Energy Data Book: Edition 27, ORNL-6981
(Oak Ridge, TN, 2008), web site http://cta.ornl.gov/data/index.shtml
[xxiv] Revis James; 25% of new car PEGV by 2020; it would only add a small % increased demand on the grid – shouldn't be a concern
[xxv] Shapley, Dan. "U.S. Will Still Lag Far Behind World in Fuel Efficiency." 20 May 2008. The Daily Green. 17 Sep 2009.
<http://www.thedailygreen.com/environmental-news/latest/obama-fuel-efficiency-47052002>