U.S.-EU Energy Council
Working Group on Technology, Research, Development, and Demonstration (RD&D)

Vision Paper and Work Plan

This working group will help meet energy security and climate change challenges by accelerating the research, development and demonstration of new clean energy supply technologies and new energy efficiency technologies, leveraging the very substantial RD&D budgets and laboratory expertise on both sides.

Areas and topics of cooperation are selected on the basis of common interest and mutual benefit criteria. Modes of cooperation will range from cross-participation in program review meetings and peer review of projects, to bidding on project solicitations issued by each side, to coordinated project activities.

According to the adopted terms of reference for the Energy Council, it is suggested that the Working Group on Technology, RD&D will start undertaking cooperative efforts in the following areas:

i) Carbon capture and storage technologies
ii) Hydrogen and fuel cell technologies
iii) Solar power technologies
iv) Biofuel technologies
v) Smart grid technologies
vi) Energy efficient buildings technologies
vii) Nuclear fission technologies
viii) Nuclear fusion technologies
ix) Advanced materials
x) Cooperation towards third countries and international organizations

Pursuant to the directive of the U.S.-EU Summit of 2006, **we are already working together on several low-carbon technologies** through the DOE-EC Implementing Agreement for Non-Nuclear Energy Scientific and Technological Co-operation. There are additional activities that should be explored in these areas:

- **Carbon Capture and Storage:** Both sides have recently committed very large sums to the demonstration of multiple CCS projects – for both capture and storage. An effective system for sharing information on the projects under development on each side would be of enormous benefit in avoiding mistakes and accelerating progress.
- **Fuel Cells and Hydrogen:** Besides automotive applications and the related hydrogen infrastructure many nearer-term stationary applications are of high interest. Both sides have ongoing R&D efforts to improve performance and durability, and to lower costs of fuel cells and hydrogen supply technologies. There is also active cooperation particularly through the International Partnership for the Hydrogen and Fuel Cells in the Economy (IPHE). *(recently new title for IPHE)*

Solar Power: Both sides have substantial research budgets to lower the costs of photovoltaic power systems, and potential synergies exist between the programs. The

costs of PV systems should be lowered substantially over the next five to ten years to allow substantial bulk application on electric power grids, along with wind power. Both sides are developing tools and models to support resources assessment and production forecasting, cooperation on this subject matter would benefit each.

- **Biofuels:** Both sides have demonstration projects for biorefineries producing fuel, power and products from a variety of non-food lignocellulosic feedstocks, and R&D underway on feedstock production and logistics and producing biofuels from lignocellulosic and algae using biochemical and thermochemical routes. Joint analysis of similar efforts would benefit each in helping to meet biofuel production targets in a cost-effective and sustainable manner.

We are also working together on nuclear technologies in multilateral organizations:

- **Nuclear Fission:** Both sides have substantial research efforts underway to enhance the safety and cost-predictability of civilian nuclear power plants. Technologies to enhance the safety and proliferation resistance of nuclear power would be of particular value in extending this low-carbon option to other countries.
- **Nuclear Fusion:** Both sides participate actively in ITER, the main multilateral fusion power initiative, as well as a variety of smaller fusion projects such as JET. Several technological developments are required before fusion becomes a practical option.

It also would be useful to **work together on additional low-carbon technologies:**

- **Smart Grids:** Both sides are working to integrate rapidly growing shares of intermittent renewable energy sources such as wind and photovoltaics onto the grid. New technologies for grid management also are creating opportunities for the more efficient energy use both on the grid itself and behind the meter in smart buildings.
- **Energy Efficient Buildings:** Both sides are working actively to develop near-zero-energy buildings. More sophisticated sensor systems could be used in commercial buildings to better regulate heating, ventilation and air conditioning loads.
- **Advanced Materials:** Advanced materials, including nanomaterials, hold great long-term potential to improve the efficiency of energy generation and transformation, e.g., for photovoltaic conversion, energy storage, more efficient chemical and electrochemical reactions as well as to reduce energy requirements, e.g. through using lighter materials for transport vehicles and in many other areas.

The Working Group on Technology, RD&D also includes cross-cutting cooperation such as on **cooperation towards third countries and international organizations**. The shared viewpoints and leadership of the EU and US should be reinforced even further if they 'join forces' with other key energy technology leaders who share common interests in many fields of energy RD&D. Cooperation towards developing and emerging economies is also essential for a really effective fight against climate change.

In this light, ten subgroups in all are proposed for technology cooperation with areas for work outlined below:

1. Carbon Capture and Storage Technologies
    a. Development of a common research information sharing protocol (CRISP) to facilitate sharing of lessons learned and accelerate technology progress.
    b. Technical aspects of CO2 compression, transportation and storage
    c. Strategies for development of CO2 transportation infrastructure
    d. Coordination of bilateral CCS efforts with China to find synergies.
    e. Coordination of efforts in the multilateral Global CCS Institute

2. Fuel Cell and Hydrogen Technologies
    a. Safety, regulations, codes and standards for hydrogen and fuel cells
    b. Materials for PEM fuel cells and hydrogen storage
    c. Solid oxide fuel cells [for stationary applications and CHP]
    d. Technology assessment methods for hydrogen and fuel cells
    e. Systems analysis of hydrogen and fuel cells

3. Solar Power Technologies
    a. Technical potential for grid integration of solar power
    b. Joint development, testing and improvement of highly efficient concentrating photovoltaic (CPV) systems
    c. Development of new materials and advanced concepts for high-efficiency and low cost solar cells
    d. Exploratory research on advanced concepts
    e. Development and standardization of solar technology characterization methods and testing procedures

4. Biofuel Technologies
    a. Joint projects and twinning of projects for research, development and demonstration of advanced biofuels, including lignocellulosic and algal biofuels
    b. Coordination on biofuel, bioproduct and biopower strategies
    c. Information exchange on modeling, tools, and data on biofuels, biopower, and bioproducts and their impacts

5. Smart Grid Technologies
    a. Experience with grid integration of distributed renewable energy sources such as wind and photovoltaics and concentrating solar power
    b. Experience with demand response and storage
    c. Technical standards for smart grids technologies

6. Energy Efficient Building Technologies
    a. Technologies for low- and near-zero-energy buildings
    b. Technologies for energy efficiency building retrofits
    c. ICT- based technologies for energy efficient buildings

7. Nuclear Fission Technologies

a. Technologies to enhance the safety of conventional nuclear power plants (including plant lifetime management and lifetime extension for current light water reactors)
b. Technologies for a proliferation-resistant nuclear fuel cycle
c. Geological disposal of high-level and long-lived radioactive waste
d. *(already in 7a)*Innovative nuclear reactor systems and non-electrical nuclear applications

8. Nuclear Fusion Technologies
    a. Coordinated approach to ITER
    b. Cooperation on JET operation and exploitation
    c. Plasma physics and control
    d. Plasma wall interaction
    e. Burning plasma

9. Advanced Materials
    a. Materials for efficient energy production, transformation, transport and storage
    b. Structural Materials under Extreme Environments *(solar already in 3)*
    c. Light weight materials
    d. Rational materials design through theory and modeling
    e.

10. Cooperation towards third countries and international organizations
    a. Cooperation with other major technology leaders such as Japan.
    b. Cooperation towards developing economies starting with China and India.
    c. Coordination of U.S. and EU positions in international fora

Some cross-cutting issues might also be considered by the working group as a whole:

- Both sides should implement flexible rules and mechanisms to deliver concrete results at operational level. They may include the implementing modalities for agreed forms of cooperation (such as exchange of information/knowledge, researchers, materials and/or equipment, peer-reviewers; technical visits; twinning of projects/programmes; and joint research and/or technology development). They may also include the rules for US participation in EU R&D programmes and vice versa.
- Both sides should exchange views to shape a global research agenda for new energy technologies. In particular, the methodology used for setting up technology roadmaps in the EU Strategic Energy Technology Plan (SET Plan) and in the United States could be coordinated, extended and replicated at a global level. This process could include activities devoted to facilitate dialogue between the European Energy Research Alliance and Industrial Initiatives of the SET Plan and corresponding US counter parts.
- Options to accelerate commercialization of R&D results should be considered.

Organization and working methods

- This working group should ideally meet twice a year including one meeting to prepare reporting to the Council. Ad hoc VDCs, can be organised if needed.
- Several sub-group corresponding to areas of cooperation could be established by the working group. Contact points on both sides will be appointed to that effect.
- For this working group, Directorate General Research and Innovation of the EC will be in the lead on the EU side. A close coordination with other relevant services in the European Commission and interaction with the EU Presidency will be implemented.
- The US DOE will be in the lead on the US side and will ensure adequate association of other interested US counter parts.