

Background Paper
International Energy Agency
Experts Group on Science for Energy Workshop
4-5 May 2009
IEA Secretariat, Paris

Background

Secure, reliable and affordable energy resources are fundamental to sustained economic development. The threat of disruptive climate change, the erosion of energy security and the world's growing demand for energy all pose major challenges to energy and environmental decision makers. The International Energy Agency's (IEA) *Energy Technology Perspectives 2008* publication calls for nothing less than an energy revolution to achieve global greenhouse gas stabilization goals.

In 2005, the IEA Committee on Energy Research and Technology (CERT) created the Ad-Hoc Group on Science and Energy Technologies (AHGSET), to help address these challenges by linking energy technology to breakthroughs in basic science (e.g., nanotechnology for low-cost solar, thermochemical/biochemical process advances for efficient and flexible bioenergy, and others (see Table 1 below). The AHGSET's mandate was to bridge the gap between the basic science and applied energy communities through information exchange and outreach. AHGSET hosted a series of successful workshops, including the November 2005 Oak Ridge workshop, which sought to challenge the science community to identify priority opportunities for broad-based crosscutting scientific research areas that could "push" energy technology solutions.

Table 1: Selected findings from AHGSET's Oak Ridge Workshop, Nov. 2005

<i>Energy Technology Challenges</i>	<i>Basic Energy Research Opportunities</i>
<ul style="list-style-type: none"> ■ Energy storage ■ Low-cost photovoltaics ■ Electricity transmission/grid management ■ Biofuels and other advanced fuels ■ Lighting ■ Technology-enabling materials ■ Advanced fission and fusion ■ Carbon sequestration, separation and monitoring 	<ul style="list-style-type: none"> ■ Photon capture Nano-science ■ Post-genomic/proteomic sciences ■ Superconductivity/conductivity ■ Electrochemistry/electrophysics ■ Advanced computation ■ Catalysis ■ Biophysics/biochemistry ■ Complex, adaptive systems

The Oak Ridge event concluded with a list of common priorities for basic research areas that offer the most promise for energy technology advances, summarized in Table 1. ¹ The AHGSET workshop series concluded with a workshop in May 2008,

¹ International Energy Agency, *Science for Today's Energy Challenges: Accelerating Progress for a Sustainable Energy Future* (2006).

which confirmed the need to make science for energy efforts a more permanent fixture of the IEA CERT.

In October 2009, the CERT approved the creation of a new Experts Group on Science for Energy (EGSE). The EGSE, which will focus on bridging the gap between basic science and applied energy research and development, created a CERT-approved Strategic Plan, detailing barriers and future EGSE activities. The EGSE held its first meeting via conference call in January 2009; the group currently has over 40 members and is open to additional nominations from CERT members. The EGSE will report to the CERT regularly by providing updates at CERT meetings and other informal interaction.

Purpose and format of meeting on 4-5 May 2009

This workshop is the EGSE's first workshop designed to engage science and energy experts. The meeting will focus on the key research, collaboration, and networking issues that affect energy technologies. Participants will discuss how new discoveries in science can enable energy efficiency technologies to play a major role in meeting the demand for energy worldwide; and brainstorm how the EGSE can enable development and coordination of these technology-based solutions. The meeting will involve a facilitated breakout session designed to provide input on priority activities for the EGSE in the coming years, including the following issues:

- Input into the IEA's forthcoming *Energy Technology Perspectives 2010* publication on energy R&D, including basic science for energy
- Mapping research and R&D collaborative efforts underway to identify gaps and recommend future opportunities
- Workshops and networking designed to increase opportunities for collaboration

This document was designed to frame the issues that will be discussed at the meeting on 4-5 May. Please review this document prior to your arrival at the meeting, and be prepared to discuss your answers to the questions that are outlined below for each issue.

For more information regarding the EGSE, contact Tom Kerr, IEA, tel. +33 40 57 67 84; email tom.kerr@iea.org.

Breakthroughs in Science for Energy: What is Needed?

A threshold question for the EGSE is how to bridge the gap between scientific research and energy applications. Which scientific research areas hold promise? The first brainstorming session will focus on these questions. One output for these results is the IEA's *Energy Technology Perspectives* publication series that examines energy scenarios and strategies to achieve global stabilization of greenhouse gas concentrations by 2050.

Key questions to consider:

- What are the major barriers in transitioning ideas from the science research communities to energy applications?
- What are the major technology barriers that, if overcome by science, could result in significant innovation?

- Given these barriers, what are the priority solutions for policy makers that hold the most promise?

Mapping Science for Energy Efforts

A first step in expanding international collaboration is to improve understanding of existing efforts that link science and energy research, to better understand what is working and to identify gaps. As such, the EGSE has begun identifying and documenting current basic science for energy activities, hoping that this “mapping” exercise would identify good practice examples and gaps that exist. The documenting efforts are not yet complete, so this workshop must decide where to go from here.

Key questions to consider:

- What are the features of successful efforts that link science to energy?
- What are good examples of current activities or best practices that we can point to?
- Is mapping a useful exercise?

Expanding International Collaboration and Linkages between Science and Energy

The EGSE can help expand opportunities for science and R&D by expanding opportunities for collaboration. During last year’s AHGSET meeting, participants discussed whether governments should create a new organization/network for increased international collaboration. They also discussed the need for governments to provide seed funding to allow exploratory teams to identify areas or ‘mine’ science for collaborative opportunities. The EGSE will work to address these needs by fostering a closer working relationship with a variety of audiences within the IEA and externally. Targeted workshops are a natural opportunity for information exchange. Therefore, the EGSE will explore a set of workshops in key basic science/applied energy cross-cutting areas that will focus on brainstorming ideas for increasing international collaboration.

Key questions to consider:

- How can we efficiently “mine” scientific discoveries?
- What are the conflicts with regards to competition concerns or intellectual property issues when sharing scientific discoveries and R&D?
- What measures and incentives can be implemented to address these challenges?
- What are the institutional barriers to open international collaboration?
How can the IEA be used?