

**Strategic Plan
International Energy Agency
Experts Group on Science for Energy
February 2009**

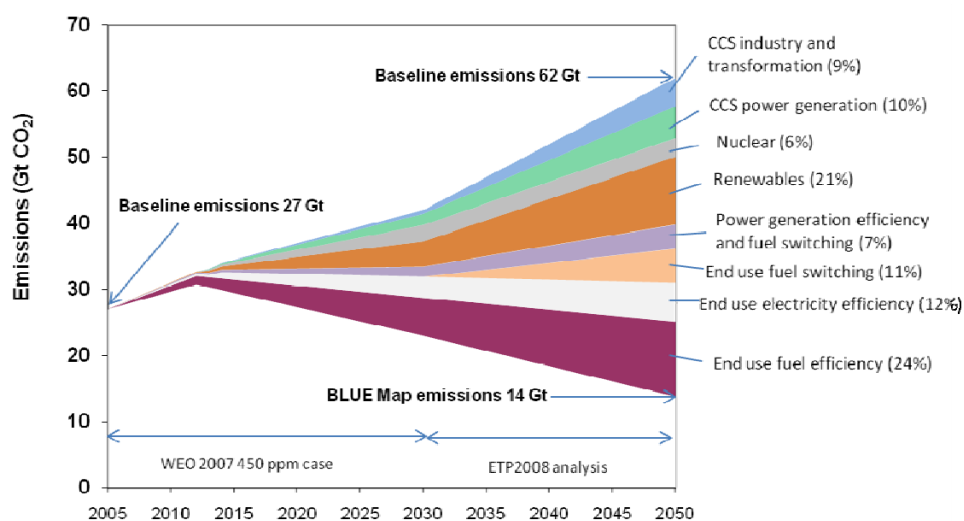
Purpose of this Document

This Strategic Plan has been developed by the International Energy Agency (IEA) Expert Group on Science for Energy (EGSE), a newly created advisory body to the IEA's Committee on Energy Research and Technology (CERT). The EGSE has presented this document to CERT at their meeting in February 2009 for review and approval.

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 IEA's *Energy Technology Perspectives 2008* publication calls for nothing less than an energy revolution to achieve our global greenhouse gas stabilization goals. Figure 1 below highlights the rapid growth in the use of a portfolio of energy technologies that will be required to achieve international climate goals by 2050.

Figure 1. A New Energy Revolution: Cutting Energy-Related CO₂ Emissions



Source: *Energy Technology Perspectives*, OECD/IEA, Paris (2008).

While many technologies are available today to begin to reduce emissions, there will clearly be a need for energy breakthroughs to achieve our sustainable energy goals at lowest cost. In Figure 2, the IEA sees a wide range in possible technology costs to achieve greenhouse gas (GHG) stabilization. In addition, there is a strong urgency to this work, as nations will need to rapidly ramp up investments in energy-related research and development (R&D) today to achieve energy technology goals for the future.

Figure 2. A New Energy Revolution: The Challenge to Cut CO₂ Emissions

Source: *Energy Technology Perspectives*, OECD/IEA, Paris (2008).

A key component of this research is basic science investigation in several promising areas. Figure 3 identifies key energy technology challenges and basic energy research areas. Other items may be added to the list in the future. Issues like technology assessment and basic research into social sciences, as well as advanced fossil energy systems, for example, are under consideration.

Figure 3. Selected Findings from AHGSET 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

Source: IEA, *Science for Today's Energy Challenges* (2006).

Most major economies recognise this and have put in place a suite of energy R&D programmes designed to identify and advance energy technology breakthroughs. The U.S. Department of Energy's recent report *New Science for Secure and Sustainable Energy Future* (USDOE 2008) is just one example, as it calls for a bold new initiative on basic science for energy advances:

Development of these advances will require scientific breakthroughs that come only with fundamental understanding of new materials and chemical processes that govern the transfer of energy between light, electricity, and chemical fuels. Such breakthroughs will require a major national mobilization of basic energy research. A working transistor was not developed until the theory of electronic behavior on semiconductor surfaces was formulated. Lasers could not be developed until the quantum theory of light emission by materials was understood. Similar breakthroughs can be achieved for sustainable energy, but only if we invest in basic research now.

However, while these national efforts are laudable and necessary, to achieve the type of energy technology breakthroughs that are needed from basic science in a rapid time frame, there is a critical need for expanded international collaboration on basic science for energy, and in particular increased linkages and communication between the basic science and applied energy communities.

In 2005, the IEA CERT created the Ad-Hoc Group on Science and Energy Technologies (AHGSET), to help address these challenges. 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, concluding with a workshop in May 2008, which confirmed the need to change AHGSET from an ad-hoc to 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) (see notes and mandate in Annex below); and asked for a Strategic Plan.

EGSE Strategic Plan

While there is broad agreement that there will be many benefits that result from increased integration between basic science and applied energy research, there are a number of barriers that make these linkages difficult, including:

- **Different goals, incentives, and time horizons.** Basic science is concerned with advancing scientific knowledge within broad disciplines; applied energy R&D is mainly concerned with utility—i.e., producing devices, products and services that solve energy challenges.
- **Organisational issues.** Basic research and applied energy functions are often managed and budgeted separately and located in different organisational units within government and corporate R&D laboratories. These two groups have separate professional networks, hindering opportunities for increased interaction.
- **Intellectual property rights.** Basic scientists and applied energy researchers related to intellectual property rights (IPR) in different ways. Basic science tends to be open in reporting results to the peers in the research community. In contrast, as it approaches technology production, applied R&D becomes increasingly concerned with proprietary information and data related to the protection of IPR. These two approaches can be difficult to reconcile.

Activities

The EGSE's Strategic Plan is designed to address these barriers through a set of targeted activities, including the activities outlined below.

- **Mapping science for energy efforts.** A first step in expanding international collaboration is to improve understanding of existing efforts. As such, the EGSE will identify and document current basic science for energy activities, study their lessons learned, and publish the results. This "mapping" exercise will also identify good practice examples and gaps that exist. **Timing and expected results:** February 2009 - Develop a template for collecting information about basic science for energy efforts and send to EGSE members, CERT and other stakeholders; April 2009 - collect results and publish in new EGSE web page; late 2009 – explore possible publications or other output to raise awareness about these efforts.
- **Linking science and energy research communities via workshops and other networks.** To improve linkages, the EGSE will foster a closer working relationship with a variety of audiences, including within the IEA (e.g., Working Parties and Implementing Agreements) as well as externally (e.g., increasing network with science and education ministries, as well as energy ministries, also engaging the private sector and academia). Targeted workshops are a natural opportunity for information exchange, the EGSE will explore a set of workshops in key basic science/applied energy cross-cutting areas. Note that these workshops will focus on brainstorming and ideas for increasing collaboration rather than simple presentations of current research underway. **Timing and expected results:** February-May 2009 – engage WPs and the IAs to identify specific cross-cutting areas for possible workshops; develop a short list of possible events (with potential sponsors and other resource needs). June-September 2009 – host workshop in Germany on advanced modeling and computation.
- **Providing input into the IEA's *Energy Technology Perspectives* and other publications.** The EGSE will work with the *Energy Technology Perspectives* team to provide technical input on basic science for energy needs into the cross-cutting section on energy R&D policies, as well as in the individual Roadmaps. **Timing and expected results:** May-June 2009 – outline and draft input into ETP 2010 chapter on Energy RD&D. End of 2009 – explore other possible publication opportunities.
- **Communicating high-level messages.** The EGSE will explore the possibility of creating and disseminating messages about the need for increased science and energy collaboration, funding, and networking. The issue of how and whether IPR rights can be addressed will also be discussed at the next EGSE meeting. **Timing and expected results:** May 2009 – host EGSE meeting to discuss strategic issues, including outreach; make decision on messages and timing.

Governance

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 IEA will host an in-person meeting in May 2009 to allow for increased networking and exchange of information and ideas about the EGSE's activities. The EGSE also will elect a Chair and Vice Chair at its meeting in May 2009.

Reporting to CERT

The EGSE will report to the CERT regularly by providing updates at CERT meetings and other informal interaction.

For More Information

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References

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