# Towards an Integrated Energy Agenda Beyond 2020

*International Energy Conference, Vienna, Austria, 22-24 June 2009*

*Conference Report*

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Federal Ministry
for Foreign Affairs

International Institute for
Applied Systems Analysis
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# BACKGROUND AND OBJECTIVES

## Context

Energy is central to every economic, environmental, security and developmental issue today. Energy is a prerequisite for meeting the challenges facing the international community in the 21st century—poverty alleviation; economic prosperity and sustainable development; climate change; and global environmental and food security. The world requires clean, efficient, affordable, and reliable energy services to meet its long-term needs for sustainable development. Such energy services are essential for achieving developing countries' aspirations to alleviate poverty and increase productivity, to enhance competitiveness and economic growth, and to reduce adverse impacts on the environment including the climate system.

As such, there is no single energy challenge, and energy issues cannot be addressed in isolation. There is no "easy fix". The inter-relationships between energy, climate change, poverty, security, and economic development require that the energy challenges facing humanity be considered as part of an integrated environmental, economic, and social sustainability agenda. Integrated strategies and solutions are needed to meet multiple objectives simultaneously—failure to do so will mean that humanity and the planet will continue on their treacherous path of unsustainability.

The objective of the Vienna Energy Conference therefore was to provide an opportunity for public-sector policy makers, together with private sector, civil society representatives, experts from United Nations organizations, and energy communities and experts, from developing and industrialized countries, to discuss energy issues and related development challenges in the context of the current global economic crisis. In addition, the Conference explored mechanisms for greater international cooperation and the role of the United Nations in the field of energy.

## Why now?

There have been many international energy conferences over the past two decades, many of them covering the same topics as discussed at this Conference and making similar recommendations. Unfortunately, not a lot has happened in response. The Vienna Energy Conference was convened against a backdrop of heightened urgency.

There is growing awareness/consensus that the world is reaching a series of economic, environmental, and political "tipping points". The current global economic crisis has highlighted the fragility and unsustainability of economic markets worldwide thus requiring a fundamental rethinking and restructuring of the global economy. Climate change predictions indicate that global carbon emissions need to peak within a decade to ensure there is a reasonable chance of keeping temperature increases below 2°C. Political instability will continue to increase as more of the world's population face increasing problems of resource insecurity, particularly in relation to food, energy, and water.

The confluence of these multiple crises and challenges present a unique context and series of opportunities to move to a sustainable, low-carbon future. The centrality of energy to these challenges ensures that nothing less than an energy revolution will be sufficient to meet these challenges. However, the time to act is now. The upcoming United Nations Climate Change Conference (COP15) in Copenhagen in December 2009 represents a critical forum to mobilize political will to address multiple energy issues in a cooperative way. However, Kyoto-type implementation time lags are widely felt to no longer be an option. To address this urgency the Vienna Energy Conference aimed to shift the debate on energy and development beyond generalities and to identify specific courses of action.

## The Conference and this Report

The Vienna Energy Conference—Towards an Integrated Energy Agenda Beyond 2020—co-organized by the United Nations Industrial Development Organization (UNIDO), the Austrian Government, and the International Institute of Applied Systems Analysis (IIASA), brought together 778 participants from 93 countries, representing policymakers, civil servants, scientists, energy experts, and NGOs. The Conference, held over two and half days at the Hofburg Imperial Palace in Vienna, consisted of five plenary sessions, six parallel sessions, and one high-level panel covering the topics:

High Level Panel

- An integrated energy agenda beyond 2020

Plenary Sessions

- The global energy challenges of the 21st century
- Energy strategies to combat climate change
- Towards a sustainable, low-carbon path to development
- Financing energy in times of crisis
- Recommendations and closing

Parallel Sessions

- Renewable energy
- Energy access for productive uses
- Energy efficiency in industry
- Towards a renewable energy vision for West Africa
- Energy in Central and Eastern Europe
- Strengthening sustainability and energy security in small island developing States

This conference report is not intended to review all the topics or issues discussed at the meeting. Rather it will focus on the key outcomes from the Conference using discussion material from the meeting to support the recommendations. For those interested a full summary of the program, panel members, and presentations can be found at www.viennaenergyconference.org and a concise summary of panel discussions at www.iisd.ca/ymb/energy/iec2009.

# KEY RECOMMENDATIONS

## 1. Energy Development Goals for 2030

*To create Energy Development Goals (EDGs) for energy access, targeting 2030. To develop a 20-year plan with milestones to reach these targets focused at country and regional levels and establish mechanisms for rapid dissemination of best practice and capacity building.*

Currently, approximately two billion people have no access to modern forms of energy at affordable prices, with the majority of these in rural areas of sub-Saharan Africa, and South Asia. In the absence of new policies, in 2030, 1.4 billion people will remain without access to electricity and essential energy services. An estimated 2.6 billion people rely on traditional biomass for heating and cooking. Of these, 1.6 million die annually from indoor air pollution, putting air pollution second only to malnutrition as the major cause of death among the world's poor. In addition, the use of traditional biomass as an energy source contributes significantly to global greenhouse gas emissions due to formation of products of incomplete combustion. Energy access is therefore central for addressing the inter-related issues of poverty alleviation, improving health outcomes, environmental sustainability, climate change, and economic development and as such is directly, or indirectly, related to multiple Millennium Development Goals (MDGs). Therefore, the co-benefits of addressing the energy access issue needs to be constantly highlighted.

However, providing reliable, equitable, and secure energy services to those currently without access is not simply about supplying electricity for lighting or more efficient stoves for heating and cooking, although both of these goals are critical. To promote economic development and growth these energy services need to be put to productive use–for providing power for industry, for improving health care and education, and for improving transportation. In addition, simply supplying the power source will be insufficient if the necessary equipment and appliances are not part of the access agenda.

Providing energy access is primarily not a technological issue. In the majority of cases the technology is already available, whether it is through the introduction of renewable sources such as solar, wind, hydro, or geothermal, the use of localized distribution grids and networks, or through extension of existing fossil fuel-based grids. Similarly, for the case of fuel stoves, new efficient low-cost stoves are readily available. The major factors preventing the implementation of an energy access agenda are: political will; the necessary policy and institutional frameworks; access to financing, necessary technology transfer and diffusion; and a lack of human capability and capacity. However, none of these factors are insurmountable. One only has to look at the speed and the amount of resources that have been mobilized in response to the current economic crisis to realise that world governments can respond quickly and effectively to address real global challenges.

What is needed is:

- International recognition among policymakers that access to reliable, affordable energy is critical to address the issues of poverty alleviation, climate change, and economic and environmental sustainability;
- A robust international understanding and framework that clearly articulates an energy access target, e.g., "Universal Energy Access by 2030";
- A detailed implementation roadmap, with interim targets and milestones on a by country and/or by region basis;
- Identification of the most appropriate technologies for deployment–"the right technology in the right place", considering both demand and supply factors;
- A mechanism for rapid technology transfer and diffusion of best practice;
- A mechanism for building in-country capacity and capability across political, governmental, technological, financial and operational sectors;
- Identifying and securing the necessary financing options.
- A mechanism for enhancing the investment and financing toward universal access linked to fulfilment of MDGs.

In addressing energy access no technology should be excluded a priori and nobody should be left out.

# 2. Energy Efficiency Fast Track

*To establish energy efficiency targets with particular focus on sectors (e.g. power generation, transport, buildings, industry) at the country and regional levels. Establish mechanisms for identification and dissemination of best practice and capacity building.*

Energy efficiency is a crucial first step towards addressing climate change, energy, and competitiveness challenges simultaneously. The critical role that energy efficiency can play is well understood and recognized. Energy efficiency also needs to be considered in any energy access agenda. Provision of new modern energy sources to those currently without access should, wherever possible, take advantage of the best available efficient technologies. The provision of access to modern energy services itself is an important step toward substantially increasing energy efficiencies and thereby reducing the primary energy needs and adverse emissions.

Improving energy efficiency is often viewed as the "low hanging fruit" within the energy debate. The technologies required to make substantial savings, in terms of energy savings, greenhouse gas reductions, and cost, are already available. For example, the application of best available technologies throughout the industry sector worldwide would result in cost-efficient avoidance of approximately 20–30% of current CO2 emissions. A move towards "passive" buildings, such as is occurring throughout much of Europe, has the potential to reduce greenhouse gas emissions by up to 90% from the building sector. Replacing incandescent lighting with compact fluorescent lights (CFLs) could save up to 10% of total household energy consumption. As an example, the Cuban government has recently replaced incandescent lights with CFLs across the entire country with an estimated saving of one power plant's generation capacity. Potential emissions savings in the transport sector are estimated at 20–30% if current technologies were deployed globally and could be substantially increased with the introduction of new fuel-efficient vehicles and widespread use of alternative cleaner fuels.

Arguably, the biggest savings could be made in the power generation sector. Currently, the energy supply sector, primarily based on fossil fuels, accounts for approximately 25% of global greenhouse gas emissions (up to more than 50% of some individual countries' emissions) yet it is estimated that emissions savings of up to 20% could be generated using current best available technologies. Obviously, increasing the share of renewable energy options for power generation and the introduction of carbon capture and storage would significantly further reduce emissions.

Given that the energy sector as a whole accounts for approximately 70% of total global greenhouse gas emissions, even a moderate increase in efficiency would have enormous benefits for combating the impacts of climate change.

The impacts of increasing energy efficiency are not limited to reducing greenhouse gas emissions. It also makes good economic sense. Using less energy means spend-

ing less money for energy. Energy related costs worldwide are equivalent to approximately 13% of global GDP. In some small countries, which rely on fossil fuels for power generation, their energy bill can often exceed their total GDP. Energy efficiency can be the key to increasing competitiveness. In addition, given that increasing energy efficiency can generate significant cost savings, in many cases implementing efficiencies can be cost neutral or even income generating.

Despite the significant benefits of increasing energy efficiency, the rate of implementation of energy efficiency policies and the deployment of energy efficient technologies lag well behind their potential. New policies, institutional support, and instruments must be deployed to counteract such a development.

However, increasing energy efficiency is not simply a matter of introducing new energy efficient technologies such as compact fluorescent bulbs or efficient cooking stoves. The entire energy management system needs to be considered; from how the power is generated, through supply chain and industrial process optimization, waste management, total life cycles costs, energy efficient products and appliances, through to patterns of consumer use. The focus needs to be on energy management, particularly end use.

The introduction of mandatory international, national, and sector-based standards and regulations is seen as being essential for increasing energy efficiency. In addition, there is an urgent need to build capacity and awareness in governments and industry of the importance of energy efficiency and its many benefits. Governments, often the biggest consumers of energy nationally, can play a critical role, both as role models and sending market signals, through their own procurement and energy use polices.

What is needed:

- Robust baseline data on current levels of energy efficiency and improvement potentials;
- Internationally agreed energy efficiency targets at sectoral, country, and regional level, e.g., a 20% increase in energy efficiency for industry by 2020;
- Development of national/regional energy efficiency policies for different energy sectors;
- Development of sector-based implementation plans with milestones;
- Identification of best practice energy management systems and technologies;
- A mechanism for rapid diffusion of best practice and technology transfer;
- A mechanism for building in-country capacity and capability across political, governmental, technological, and industrial sectors.

# 3. Accelerate Energy Research and Development

*To identify technologies needed to address climate change, energy access and other technologies. To monitor developments, especially best policy and practices. To recommend new areas for government support and consideration.*

Global public expenditure on research and development (R&D) is forecast to be around US$1.1 trillion in 2009 or approximately 2% of global GDP, with the USA, Europe, Japan, and China accounting for over 80% of this investment. The share of global public R&D investment devoted to energy is estimated to be around 1%, or $US 10 billion (0.02% of global GDP) per annum. Almost half of these investments are in the nuclear energy sector, with the remainder split among energy conservation/efficiency, renewables, and fossil fuels. Worldwide, although total R&D investments have been growing, total energy-related R&D investment has been falling over the past two decades, across both public and private sectors. Only investment in renewables-related R&D has remained reasonably steady over this period. R&D investment in relation to energy access is virtually non-existent. In terms of R&D intensity, that is, the proportion of total investment spent on R&D, the energy sector is one of the least intensive, being roughly equivalent to the footwear sector. Sir Nicholas Stern has forecast that a five-fold increase in energy-related R&D over the next decade will be required to have any significant impact on climate change.

Research and development is the driving force behind innovation. Highly innovative companies spend between 10 and 15% of their budget on R&D. The investment in energy R&D falls well short of this benchmark. Moreover, the vast majority of energy-related R&D is devoted to the development of new technologies and products. However, although critically important, it is not only innovation in these areas that is needed. New technologies alone will not solve the energy crisis. There is a desperate need for policy-oriented R&D that can provide governments, policy- and decision-makers with a range of options and scenarios from which to make robust decisions. Innovation is needed in the financial system to develop new modes of financing energy solutions across both private and public sectors. The issue of how to scale up from small pilot and demonstration projects to full-scale deployment needs to be addressed. Social research is needed to understand patterns of consumer energy demand and use and acceptance of new technologies. These areas have seen very little R&D effort in the past, yet are critical if the necessary revolution in energy is to be achieved. Given the complexity of the energy system, an integrated package of R&D is required. Any research effort needs to have a global focus–it must not be concentrated or restricted to those countries with a capacity to pay.

R&D is often associated with long lead times. Therefore, in addition to addressing the short to medium term energy objectives thought needs to be given to future needs. The ultimate energy future will likely be one based on carbon-free energy carriers such as electricity and hydrogen; therefore, investing in R&D for zero-emissions and hydrogen-based energy technologies needs to happen now. Waiting for the next energy crisis is not an option.

What is needed:

- Identification of current gaps in research and technology needs across a broad range of sectors, e.g., renewables, policy, finance, engineering, energy services, etc;
- Internationally and nationally coordinated energy research agenda to address these gaps;
- A mechanism for influencing governments to incorporate energy-related research into their national research priorities;
- Financial incentives to promote increased investment by the private sector in all spheres of energy-related research, not only new technologies and products, e.g., taxation relief, matching funds requirements, etc;
- A mechanism for monitoring R&D developments worldwide, reassessing priorities, and enabling rapid dissemination of research outcomes.
- A mechanism for linking and financing basic R&D to applied R&D, both public and private, and to deployment.

## 4. Diffusion of Energy Technologies

*To catalyze diffusion of technologies needed to address climate change, energy access and other energy targets. To propose solutions to more rapid diffusion of technologies that avoids "technology lock-in", including financing options.*

As stated previously, many technologies required to address many of the energy issues of today, particularly energy access and energy efficiency, already exist. The real problem is one of getting these technologies deployed more widely. It is primarily an issue of technology transfer and diffusion. This is particularly evident for small and developing nations with little internal human and infrastructure capacity. Similarly, the results of any R&D programme are of little use if they are restricted to publication in academic journals or presentation at international conferences. In addition to R&D, investment in deployment and diffusion requires stronger institutional mechanisms and investments.

Moreover, the issue is not only one of transfer and diffusion of relevant technologies. It also includes knowledge sharing on policy formulation and implementation, best practice energy efficiency strategies and management systems, project development, financing options, and risk management. In addition, the information being shared needs to be aligned to local conditions—solutions developed for industrialized countries cannot be simply transferred unchanged to developing nations. They need to be adapted to local political, geographic, economic, and social conditions.

Despite its name, diffusion is not a passive activity. Simply providing information on a website, publishing instruction manuals and guidelines, or holding conferences is insufficient. Technology transfer and diffusion is more often than not an active two-way process. It requires close interaction between people and an understanding of how diffusion operates in different economic and social contexts. There is a large body of literature on cultural diffusion and adoption rates associated with new technologies, which will need to be taken into consideration. One critical limiting factor to technology diffusion is the availability of local human and infrastructure capacity. As such, technology transfer and diffusion must go hand-in-hand with capacity building. Building local skills is essential. The stories of equipment lying idle due to a lack of skills to service and maintain it are all too familiar. For technology or best practice solutions to be adopted they must be implemented and supported locally using local skills and support networks. Above all diffusion is a cumulative learning process.

Any diffusion process also needs to consider the issue of "technology lock-in", that is, the process where adoption of a certain technology restricts the future adoption of more modern or efficient technologies. This is particularly relevant for developing countries that may only have "one chance to get it right". However, this needs to be balanced against the need for urgent action—people cannot continually wait for the next-best technology.

A major impediment to rapid transfer and diffusion of technologies, particularly to the developing world, relates to ownership and protection of intellectual property. Quite legitimately, most modern technologies are protected by patents and license agreements. However, this often poses a barrier to widespread diffusion due to a lack of financial capacity of those wishing to adopt the technology as has been clearly evident in the case of access and adoption of modern pharmaceuticals in developing countries.

What is needed:

- Identification of relevant knowledge and information on best available technologies and practices across the range of fields relating to energy issues;
- An understanding of diffusion processes across a range of cultural and economic situations;
- Adaptation and deployment of locally-relevant technologies avoiding the problems of technology lock-in;
- A mechanism to overcome impediments due to intellectual property restrictions;
- An intensive programme of capacity building across all spheres of the energy sector, e.g., policy, technology, engineering, project management, finance and risk, etc.

## 5. Strengthen UN-Energy

*The recently constituted UN-Energy is an inter-agency mechanism uniquely placed to influence global energy developments. The legitimacy of the UN, allied with a strengthened proactive secretariat is needed to address the challenges of the coming decade. The area of focus would be energy and its links to security, environment (including climate change), resources (including water and food), and poverty.*

To have any chance of achieving the ambitious agenda laid out at this Conference, as articulated in the recommendations above, a level of international cooperation and coordination hitherto unknown in the sector is required. Little can be achieved by a handful of countries no matter how strong the political will or financial resources. The global energy agenda needs a global voice—one with the legitimacy able to influence policy formulation at the highest international and national levels. Robust, stable policy frameworks are a critical prerequisite for achieving sustainable energy outcomes.

Given the complex nature of the energy agenda and its links to security, climate change, sustainable development, and poverty alleviation, any coordinating mechanism must be able to present the need for an energy revolution across all these spheres.

UN-Energy was established in 2004 to help ensure coherence in the UN system's multidisciplinary response to the World Summit on Sustainable Development (WSSD) and to ensure the effective engagement of non-UN stakeholders in implementing WSSD energy-related decisions. It aims to promote system-wide collaboration in the area of energy with a coherent and consistent approach. UN-Energy is focused on substance and collaborative actions both in regard to policy development in the energy area and its implementation as well as in maintaining an overview of major ongoing initiatives at global, regional, subregional and national levels. Since January 2008, UN-Energy has been chaired by the Director-General of UNIDO.

What is needed:

- A stronger UN-Energy, supported by a well-resourced, expert secretariat, with the mandate to drive an integrated and coordinated energy agenda internationally and across the UN system.

## 6. Global Energy Support

*UN-Energy needs a deep understanding of all aspects of global energy. The Global Energy Assessment provides a valuable support structure that could be expanded and institutionalized to meet UN-Energy's needs.*

The strength of UN-Energy and its ability to influence the international and national energy policy agenda will only be as good as its access to the most robust up-to-date information and highly-experienced experts. Just as the international climate change agenda is supported by the Intergovernmental Panel on Climate Change (IPCC) series of assessments, UN-Energy will require a similar type of support. It needs to have access to the best available staff, integrated knowledge on policy options, research outcomes, patterns of current and future energy demand and use, and available technologies. The knowledge needs to be non-partisan and unbiased. The recently-launched Global Energy Assessment (GEA) has the potential to fulfil this critical support role.

The GEA is a major international initiative seeking to redefine the global energy policy agenda. This multi-year and multi-stakeholder activity aims to help decision makers address the challenges of providing energy services for sustainable development throughout the world. The GEA will go beyond existing authoritative studies on energy issues by presenting a comprehensive and integrated analysis of energy challenges, opportunities and strategies, for developing, industrialized and emerging economies.

The GEA seeks to examine: the major global challenges and their linkages to energy; the technologies and resources available for providing energy services; future energy systems that address the major challenges; and the policies and other measures to realize sustainable energy futures. The GEA is scheduled to release its initial assessments in 2011.

At present the GEA is essentially a voluntary international network of individuals, institutions and agencies, coordinated by the International Institute of Applied Systems Analysis (IIASA) in Austria and its international partners including government agencies, international organizations, including the UN family and private sector. There is considerable scope for expanding the GEA in terms of both representation and the range of energy-related topics under consideration.

What is needed:

- Consideration be given to the formal institutionalization of the Global Energy Assessment with a dedicated secure funding base.

# OTHER RECOMMENDATIONS

Following the presentation of the six major recommendations during the closing plenary session Vienna Energy Conference participants were invited to provide comments and suggestions in writing on the Conference website www.viennaenergyconference.org.

# CLOSING STATEMENT

Energy is at the core of every major economic, environmental, security, and developmental challenge facing humanity in the 21st century. Current levels of access to energy services and patterns of energy use are unsustainable. Nothing less than an energy revolution will be sufficient to address these challenges and it needs to happen quickly.

In order to further global consensus on the need and the feasibility of an energy revolution the co-sponsors of this Conference have resolved to host the Vienna Energy Conference biennially with the aim to make Vienna a global energy hub.

Printed in Austria
V.09-85899—September 2009—1,000

Cooperazione Italiana Sviluppo
Ministero degli Affari Esteri

Global Forum on Sustainable Energy
GFSE – www.gfse.at

Ministry of Economy
Republic of Poland

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