



Global Renewable Energy Forum

Scaling up Renewable Energy
León, Mexico, 7-9 October 2009



conference report

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GLOBAL RENEWABLE ENERGY FORUM

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FINAL REPORT

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BACKGROUND AND OBJECTIVES

Context

Within the overall context of the global energy system, renewable energy has assumed a critical role in the energy supply chain in meeting the rising demand for energy in both developed and developing countries, in addition to addressing serious environmental and economic threats of climate change. The potential renewable Energy¹ supply largely exceeds current, or projected, world energy demand. Recent studies have shown that, even allowing for the inherent conversion inefficiencies of many modern renewable technologies, there is sufficient potential renewable energy supply to meet global energy demand many times over.

However, despite dramatic increases in the deployment of renewable energy technologies over the last decade, they still account for only approximately 13% of total global primary energy supply in 2007². Given their huge promise, and in the context of the increasing cost of fossil fuel resource extraction as well as the need to address climate change, one must ask what needs to be done to ensure renewable technologies realize their full potential.

Why now?

Energy is fundamental for addressing the multiple challenges of the 21st century - poverty alleviation, global peace and stability, climate change, social and economic development, environmental sustainability, and food security. Current energy systems and patterns of energy use are clearly unsustainable and inadequate to meet these challenges.

Seventy percent of all global greenhouse gas emissions come from energy related uses. The International Energy Agency (IEA) has projected that the share of total primary energy supply met by renewable energies will need to double by 2030 to meet the climate change targets required to keep temperature increases below 2°C compared to pre-industrial levels. Concomitantly, investments in renewable energy will need to increase approximately six-fold over the same period.

Renewable energy services will clearly be a critical component of any integrated energy solution going forward - solutions that

will play a key role in enhancing economic development and alleviating poverty for the almost two billion people currently without access to modern forms of energy. However, there is an urgent need to scale up renewable energy systems, investments and deployment if the world is to achieve any significant impact on the critical issues outlined above.

Despite the very high potential for renewable energy in most regions of the world and the urgency with which the transition to a low-carbon energy path needs to occur, the sector faces numerous challenges and barriers of various types. Profound changes are needed in the way humanity produces and uses energy today and in the future.

It is in this context and sense of urgency that the Secretary of Energy of Mexico and the Director-General of United Nations Industrial Development Organization (UNIDO) decided to organize a Global Renewable Energy Forum with the specific objective of addressing the requirements for, and barriers to, scaling up the deployment of renewable energy. The meeting follows on from the first Global Renewable Energy Forum held in Brazil in 2008 and the 2006 Ibero-American Ministerial Meeting on Energy Security in the Latin American Region. Related events focusing on renewable energy have also been held in Europe, Africa, and Asia over the past two years.

The Forum and this Report

The main purpose of this Global Renewable Energy Forum was to discuss the role of renewable energy in the context of the most pressing global challenges. Specifically to:

- » create a suitable environment for proactive dialogue to strengthen interregional cooperation and encourage innovative multi-stakeholder partnerships aimed at scaling up renewable energy;
- » provide a platform for highlighting leadership in regard to the promotion of renewable energy, thereby increasing the visibility of political commitments towards the development of alternative energy systems;
- » promote the exchange of views among various stakeholders and encourage partnerships, as well as facilitate the development of innovative frameworks aimed at supporting initiatives related to renewable energy.

¹ For the purposes of this report, renewable energy refers to energy derived from resources that naturally regenerate or are virtually inexhaustible and include hydro, solar, wind, biomass (including biofuels), geothermal, and oceans (tidal and wave motion).

² Key World Energy Statistics 2009

The Forum - Scaling up Renewable Energy - co-organized by UNIDO and the Mexican Ministry of Energy (SENER), brought together over 2500 participants from 73 countries, representing policymakers, civil servants, scientists, energy experts, and civil society. The Forum held over two and half days at the Poliforum in León, Mexico, consisted of seven plenary sessions and three parallel sessions covering the following topics:

Plenary Sessions

- » Energy poverty, economic and financial crisis, and climate change
- » Renewable energy and energy transition
- » Renewable energy potential - reality or utopia
- » Renewable energy and the access agenda
- » Future of biofuels: potential and challenges
- » Scaling up investments in renewable energy
- » Innovative policy and institutional framework

Parallel Sessions

- » Transition to a low-carbon economy - new technologies
- » Renewable energy for industrial applications
- » Energy efficiency

A series of side-events were held alongside the Forum. Additionally, a Business and Technology exhibition featuring a number of companies active in the field of renewable energy took place simultaneously.

This report is not intended to be a complete summary of all the topics or issues discussed at the meeting. Rather it provides a synthesis of the key issues and recommendations from the Forum. For those interested a full summary of the program, panel members, and presentations can be found at www.grefmexico2009.org and a concise summary of panel discussions at www.iisd.ca/yimb/energy/greb2009.

KEY ISSUES

1. Energy Transition

The need to transition from the current energy system based on the unsustainable use of fossil fuels to a more sustainable low-carbon energy future is irrefutable. 'Business-as-usual' patterns of energy use predict that energy consumption is likely to increase in excess of 50% between 2005 and 2030, with almost three-quarters of the increased demand coming from developing countries. Projections from the IEA indicate that even if all current policy options being considered by governments worldwide were implemented, energy demand would still increase by almost 40% and greenhouse gas emissions in 2030 would still be 27% higher than 2005 levels. In order to limit the average increase in global temperature to 2°C above pre-industrial levels by 2030 global emissions need to peak by 2015 and fall by 50-85% compared to 2000 levels by 2050.

To achieve this necessary transition, energy efficiency improvements are required across all sectors as well as a widespread deployment of renewable energy. By the same token, other technologies such as carbon capture and storage (CCS) and nuclear power must be considered. The share of total energy demand met by renewables would need to increase by an average of 3% per annum between 2005 and 2030, to double current levels. Electricity generation from renewable energy sources would need to increase from approximately 18% of total generation in 2005 to 40% by 2030, representing a more than three-fold increase over the current installed capacity.

Although increasing energy efficiency, both on the supply- and demand-side, will be a significant factor in curbing global energy demand, it is not enough by itself. Lifestyles and patterns of consumer use will also need to change. An extensive education program is required to alert consumers of the benefits of being more energy aware, reducing energy consumption, and switching to more energy efficient appliances and vehicles.

Scaling up the deployment of renewable energy technologies is critical to the energy transition. In order for this undertaking to succeed, efforts must not only be geared towards technological advancement and cost reduction, but to access financial and human capital as well. The transition to a low-carbon economy presents multiple challenges. The IEA state that, "Exceptionally quick and vigorous policy action by all countries, and unprece-

*ded technological advances, entailing substantial costs, would be needed to make this case a reality."*³

2. The Renewable Energy Potential

As mentioned above, the planet has significantly more renewable energy potential than needed to meet demand. However, there are a number of factors that impede the scaling up of renewable energy systems to realize this potential. Among them are high costs, inadequate policy and institutional frameworks, unavailability of financial and human capital, access to land, inadequacy of infrastructure, as well as environmental and social issues.

Currently, in the absence of both a strong carbon price signal or any realistic factoring in of 'externalities', electricity generated from most renewable energy technologies is more expensive than that generated from fossil fuels, particularly coal. Although the cost-competitiveness of renewables has improved in recent years, there is still a significant perception that renewable energy is an expensive option, especially given the high initial capital costs. With an increase in the price on carbon, renewable technologies will become more cost-competitive.

Unlike fossil-fuel based energy supply systems, which can be located almost anywhere, large-scale renewable energy systems, particularly solar, wind, hydro, and geothermal, need to be located at the source of supply. This often raises issues of access to adequate land resources for both installation and transmission. However, many renewable technologies, particularly solar and wind, are able to be deployed off-grid on smaller scales, which is especially important in terms of providing energy access in remote areas and meeting local demand.

Electricity generation from many renewable energy sources, notably solar, wind and hydro, is intermittent, that is that they can only generate power when there are sufficient sun, wind or water resources. Recent droughts in many parts of the world have seen output from hydro power plants reduced significantly. In addition, peak generation times often do not coincide with periods of peak demand. The inability of adequately storing electricity for later use has undoubtedly prevented a greater expansion of the renewables sector. Technological advances, including in regard to the deployment of smart-grids, are urgently required to address this issue.

³ World Energy Outlook 2007

Environmental and food security concerns have been raised around increased deployment of renewables, particularly large-scale hydro and biofuels. Installation of hydropower schemes have been implicated in changing hydrological patterns, damaging riparian systems, and loss of biodiversity. Biofuels are often seen as competing with agricultural food production and high fertilizer and water use. These issues require serious considerations, but should also be weighed against the potential environmental benefits for climate change mitigation and the environmental costs of large-scale extraction, transport, and burning of fossil fuels.

3. The Access Agenda

Approximately two billion people have no access to modern forms of energy, with the majority of these in rural areas of Sub-Saharan Africa, South Asia and Latin America. In the absence of more effective policies, by 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 prematurely from indoor air pollution annually, 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, improved health conditions, environmental sustainability, climate change and economic development. As such, it is directly related to various Millennium Development Goals (MDGs). Therefore, the combined benefits of addressing the energy access agenda need to be constantly highlighted.

Energy access is related to the concept of Energy Justice, that is, the moral right for all people to have equal and affordable access to energy. Energy Justice would imply that the poor are not disadvantaged by energy policies that seek to reduce energy demand and combat climate change.

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 healthcare and education, and for improving transportation.

It should be noted that energy access solutions ought to be tailored to the needs of local communities. Access cannot be technology driven, but rather based on local energy requirements. In other words, they should be demand-driven rather than supply-driven. There is no “one size fits all solution” and what may prove right in one case may not necessarily be right for another due to both geographical and social conditions.

In addition, providing energy access is not primarily a technological issue. In the majority of cases, the technology is already available, whether it is through the introduction of renewable sources, 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 barriers to the implementation of an energy access agenda might include the lack of: political will and the necessary policy and institutional frameworks; access to financing, lack of technology transfer mechanisms; and human capability and capacity.

4. New Technologies

Many current renewable energy technologies may be considered ‘mature’, especially wind, hydro, flat-panel solar photovoltaics, and first generation biofuels. To meet the energy transition challenge new technologies will need to be developed, piloted, and deployed. These new technologies include inter alia, concentrating solar thermal and photovoltaics; second-generation biofuels; biomass gasification geothermal, oceanic, tidal, and wave power; and hydrogen fuel. Many of these technologies remain in early development stages and are yet to be demonstrated on a commercial scale.

In addition to new renewable technologies, significant technological advances will also need to be made in the related areas of energy efficiency, energy storage, and carbon capture and storage (CCS). Projections by the International Energy Agency suggest that in order to meet 2030 emissions targets almost 30% of power generated from coal-fired plants and 13% from gas-fired plants will need to come from facilities equipped with CCS. To date CCS has not been demonstrated on a commercial scale.

There is considerable scope for deployment of demonstration projects to be based in areas of greatest need. For example, a demonstration project for large-scale solar thermal or offshore wind generation could greatly assist in meeting energy demands and reduce the reliance on imported fossil fuels for many small island in developing states and coastal urban centers.

Demonstration of new energy efficiency measures or renewable energies for industry could be undertaken in developing countries where many industries are inherently inefficient or without access to reliable power supplies. Such approaches have the added advantage of promoting technology transfer, but should be preceded or accompanied by trainings and other capacity building undertakings.

5. Biofuels

Biofuels include solid, liquid, or gaseous fuels produced from a range of biomass materials. The biofuels industry currently comprises two distinct sectors: ethanol – produced from sugar or starch derived primarily from sugar cane and maize respectively;

and biodiesel – produced from vegetable oils derived primarily from soybean, rapeseed, palm oil, and jatropha. Current biofuel production processes rely on so-called first generation conversion pathways which use only a part of the plant material resulting in a significant amount of waste (stalks, leaves etc), or lignocellulosic material. Because the land or feedstock dedicated to the production of biofuels could also be used for agricultural production, a competition is created between food and energy markets in some instances.

Second-generation technologies are being developed to convert this lignocellulosic material to energy (primarily ethanol). In addition, dedicated lignocellulosic feedstock crops (e.g., grasses and fast-growing trees such as poplars and willows) are being investigated. It is estimated that these second-generation biofuels would not be commercially viable for another 10–15 years. Biofuels have a significant global potential as an alternative to fossil-based fuels, particularly in the transport sector. This sector currently accounts for approximately 15% of global greenhouse gas emissions, excluding the upstream emissions associated with extraction and refining.

The global demand for biofuels is increasing rapidly as many countries have introduced mandatory or voluntary blending or production targets for biofuel use. For example, in the EU – 10% of total fuel use by 2020, Brazil – mandatory 25% ethanol blend with gasoline, India – 20% ethanol blend by 2018, and the USA – production target of 130 billion liters/year by 2022. In addition, many governments have active programs that include tax-incentives and exemptions, tariffs, and production subsidies designed to promote the biofuel industry.⁴

6. Scaling up Investments

A background paper – *Scaling up Low-Carbon Investments* – was provided to Forum participants. This paper can be found at www.grefmexico2009.org.

Globally, current annual investments in the energy sector are around US\$650 billion, representing roughly 1.5 % of total Gross Domestic Product (GDP). More than half of these total investments are directed towards exploration, mining, and power generation from fossil fuels. Investments in the renewable energy sector in 2008 were approximately US\$125 billion, a 20% increase over 2007 and almost double that of 2006. However, investments in new renewables have fallen sharply in the first quarter of 2009 due mainly to the recent economic crisis. Though, these have

rebounded during the second quarter, primarily through investments emerging as part of numerous governments' 'green' stimulus packages. Energy related investments are currently at around a global average of 1.5 % of total Gross Domestic Product (GDP) and have remained at these levels for the past decade.

Approximately US\$80 billion worth of new renewable energy capacity was installed globally in 2008, mainly in the areas of wind, solar and biofuels. Developed countries (mainly Germany, USA, Spain, and Japan) contribute to around 80% of total renewable energy investments, while developing countries (mainly China and India) make up the remaining share. Sources of investment for renewable energy currently come from a range of public and private funds. The extents of scale up of investments into renewable energy required will necessitate new models of financing that effectively include sustainable development and climate change concerns.

To meet the necessary targets required to limit global warming to 2°C compared to pre-industrial levels and ensuring universal energy access has been estimated to require annual total energy investments of \$US2–3 trillion over the 2020–2030 period, less than 3% of estimated GDP in 2030. Annual investments across the renewable energy sectors of approximately \$US600 billion will be required – a near 6 fold increase over current levels.

To achieve this level of funding, a number of issues will need to be addressed: Firstly, there will need to be new models of development financing. The recent economic crisis has provided an opportunity for rethinking of public finance mechanisms for clean energy. A range of innovative approaches are required, for example, providing loan guarantees; co-investment; raising new finance through 'green bonds'; and developing new products for both institutional and retail investors.

Secondly, private sector participation is crucial. It is important that public finance catalyze larger flows of private sector resources, especially from the leading corporations to complement the effort of start-up firms and venture capitalists who have been driving the low carbon sector so far.

Thirdly, carbon markets will be essential. There will need to be a stronger push for regional and possibly global prices on carbon to speed up the uptake of low carbon technologies.

Fourthly, technology will need to be at the forefront of the policy debate. A massive scaling up of worldwide activities in R&D on renewables including efficient use of energy is necessary. In addition, options to scale up technology deployment levels would need to be clearly defined.

Investments in new renewable energy projects are often seen as being high-risk compared with more traditional energy investments, especially in the absence of long-term stable government

⁴ The production of biofuels has been growing rapidly worldwide over the past decade, particularly over the last three years. Current installed capacity is over 100 Mtoe or approximately 5% the global transport sector fuel use, with ethanol accounting for approximately 80% of current production. Today, there are more than 1000 biofuels production plants operating in 62 countries. However, the USA and Brazil account for more than two-thirds of global production, primarily ethanol (87% of global production). The European Union is the largest producer and consumer of biodiesel, with 60 percent of global production.

policies. New methods of risk assessment, risk mitigation, and risk sharing will be required to stimulate investments in the sector.

7. Innovative Policies

A background paper – *Policy Considerations for Scaling up Renewable Energy in Latin America* – was provided to Forum participants. This paper can be found at www.grefmexico2009.org.

Ultimately, the ability to deploy sustainable energy solutions to meet energy challenges at the scale and pace required will be determined by policies and frameworks set by national governments. Favorable long-term national policy agendas are necessary to support the transition to clean energy technologies. This will not only be required to provide support through public sector financing, but also to provide a clear signal to private investors, thus enabling sustained investments. It is only when such policies and frameworks are in place that industries, investors, financiers, and researchers will be in a position to move forward. However, that is not to say that these groups cannot play a critical role in the shaping national energy policies. Ideally, these national policies, although tailored to address local issues, should form part of, and be consistent with, an overall global energy policy framework and agenda. In addition, given the centrality of energy to many of the global challenges of the 21st century, energy policy needs to be closely integrated with other policy portfolios such as environment, finance, development, agriculture, and security.

Currently 64 countries have some type of policy to promote renewable energy and increase the share of renewables within their domestic energy mix. These policies include initiatives such as mandated targets, feed-in tariffs, tax credits, direct subsidies, mandated purchase of renewable supply by utilities, grid connection priority, investment incentives, and soft loans. In addition, many individual states, municipalities, and cities have introduced renewable energy policies themselves. However, it must be emphasized that, in order to realize their potential, renewable energy policies should not be developed in isolation, but must form part of a larger energy agenda.

Effective energy policies, particularly in the area of renewables, require: a long-term, stable view and commitment; specific legal provisions and regulations; strong and transparent institutions and governance structures with clearly defined roles; mechanisms for involving private sector across multiple sectors; and efficient markets and pricing. In addition, these policies need to be flexible and adaptable to take into account future technological advances and other changes (social, economic, etc.).⁵

National energy policy development cannot take place in a vacuum. To do so would risk derailing any integrated global energy agenda required for transition. Policy needs to be developed in a learning environment where best practice is shared and governments learn from one another. There are many excellent examples of energy policy worldwide, particularly in relation to renewables, which should be considered when new policies are being formulated. Although sensitive to local considerations policy development should be undertaken in an atmosphere of regional and global coordination and collaboration. Strong policy requires strong leadership. Ultimately, it will be the commitment and creativity of policy makers and regulators that provides the driving force for the promotion of renewable energy.

⁵ In addition to setting policy, governments, often large holders of real estate assets and consumers of energy nationally, can play a critical role, as both role models and sending market signals, through their own procurement and energy use policies.

KEY RECOMMENDATIONS

1. Global Access Fund

Complementary to the proposed Energy Development Goals (EDGs) and inspired by the concept of Energy Justice, establish a Global Access Fund to target energy access in the most chronic situations.

Providing clean, affordable, and reliable energy services to those currently without access is a priority. As such, the recent Vienna International Energy Conference cosponsored by UNIDO recommended the formulation of Energy Development Goals for 2030 (similar to the Millennium Development Goals) with specific energy access targets, e.g., "Universal Energy Access by 2030" (see Appendix and www.viennaenergyconference.org for more information).

In order to achieve such a goal, access to the necessary finance is critical. Nothing will be achieved if funds are not available and easily accessible for providing the necessary capital for infrastructure, development of appropriate policies, and capacity building. It is therefore recommended that an Energy Access Fund be established. What is needed is:

- » Development of the necessary legal and financial instruments to establish an Energy Access Fund;
- » International commitment to provide the necessary, and adequate, funding to the Fund;
- » Identification and prioritization of areas of greatest need, nationally, regionally and locally;
- » Transparent rules and regulations for access.

2. Biofuels

Support international initiatives aimed at developing a coherent set of standards and guidelines for sustainable biofuels production and use and promote active participation by developing countries in this process.

Biofuels will clearly play a critical role in the transition to a low-carbon sustainable energy future. However, the growth of the biofuel industry has not been without controversy, particularly in the areas of food security and sustainability. With the exception of a few specialist feedstock crops such as jatropha, most plants used as feedstocks (e.g., sugar cane/beet, maize, soybean, rapeseed, etc) share the same agricultural requirements as food crops

and thus the two are often seen as being in competition. Some have argued that recent global increases in food prices (primarily staples such as rice and wheat) are attributable to the increase in biofuel production, as more and more agricultural land is diverted away from traditional food crops to biofuel crops.

In addition, the sustainable production of biofuels has come into question particularly in relation to water, fertilizer, and pesticide use, land and soil degradation, deforestation, and social development and prosperity. Clearly, rigorous sustainability criteria for biofuel production and use are required. A number of international, regional, and national initiatives aimed at developing such criteria are currently being undertaken by various bodies, agencies, and governments. There is however, a serious risk that without some form of coordination and oversight from an internationally acknowledged institution, such an approach could result in multiple sets of criteria that are incompatible, inconsistent, or even contradictory to each other which may hinder sustainable global expansion and trade in biofuels.

At the international level, two major initiatives are addressing the sustainability of biofuels and bioenergy. The Roundtable on Sustainable Biofuels (RSB) is an international multi-stakeholder process focusing on the development of a set of internationally applicable sustainable biofuels criteria, indicators, and certification standards, with the first set of standards due to be released in 2010. The Global Bioenergy Partnership (GBEP), which brings together public, private and civil society stakeholders in a joint commitment to promote bioenergy for sustainable development, represents the G8 member countries plus China, Brazil, India, Mexico and South Africa with numerous partners from many other countries and a range of international organizations, such as the IEA, UNEP, FAO, and UNIDO. Many other countries and organizations are participating as observers. In an effort to ensure consistency and avoid duplication between these major initiatives the RSB have recently offered to work with the GBEP in their standards and indicators development.

It is necessary to make efforts to adopt a set of criteria based on sustainable standards to facilitate trade in biofuels. In that light, it is important that countries seeking to develop an export market for biofuels or biofuel feedstocks display an active participation in the development of these criteria and carefully examine the possible impacts for their biofuels strategies and policies.

To be effective, any sustainability criteria, standards, or certification schemes for biofuels need to be integrated into sound

national and regional policies and be consistent with existing environmental and development policy frameworks.

What is needed is:

- » Strengthened international support of the current initiatives for developing comprehensive internationally acknowledged sustainability criteria, indicators, and standards for biofuels;
- » Mechanisms for raising awareness, generating acceptance, and rapid diffusion of these criteria internationally;
- » Support developing countries to actively participate in the international efforts to develop sustainable criteria for biofuels.

3. Institutional Framework

Strengthen institutional framework for promotion of a rapid transition towards the widespread and sustainable use of renewable energy.

The field of renewable energy is fast moving and the need to significantly scale up both investments and deployment of renewable energy systems is urgent. Governments need to develop the necessary stable and long-term policies and institutional frameworks required to support renewable energy development. In such an environment, strengthening of the institutional framework for promotion of renewable energy as a means of meeting multiple energy-related challenges of the coming decades is crucial.

At the international level, the International Renewable Energy Agency (IRENA) was officially established in January 2009. As of October 2009, 137 States have signed the Statute of the Agency, with Mexico announcing at this Forum that it would become the 138th member. The role of IRENA is to promote a rapid transition towards the widespread and sustainable use of renewable energy on a global scale. Acting as the global voice for renewable energies, IRENA activities include: developing a comprehensive knowledge base; providing policy advice; promoting technology transfer and providing financial advice; enhancing capacity building; stimulating research; and cooperating with other organizations, institutions and networks.

Given the enormity of the challenges surrounding the necessary scale and pace with which renewable energies need to be deployed, IRENA cannot be left alone to provide the answers. UN-Energy, with its mandate to coordinate energy-related issues across the UN system, can also play a critical role in ensuring renewables have a 'seat at the table' in international forums. Other initiatives promoting renewable energy such as those by the IEA, World Energy Council (WEC), the Renewable Energy Policy Net-

work for the 21st (REN21), and the Renewable Energy and Energy Efficiency Partnership (REEEP) etc., should also be strengthened and supported.

Bodies and agencies already established at regional, bilateral and national levels for the promotion and development of renewable energy need to work closely and cooperatively with the multilateral initiatives to ensure the maximum uptake of their services.

What is needed is:

- » Mechanisms for fast-tracking the operationalization of IRENA in terms of staffing and logistics and rapid diffusion and uptake of IRENA's services;
- » Development of strong, cooperative working relationships among all renewable energy promotion initiatives, internationally, regionally, and nationally, to promote the widespread and sustainable use of renewable energies.

4. Regional Research Networks

Strengthen regional research capabilities by building on a recommendation to accelerate energy Research, Development and Deployment (RD&D) and ensure regional and local focus on the development of sustainable renewable energy projects.

Total global investment in energy related research, development and deployment (RD&D) has been gradually declining over the last two decades across both public and private sectors and has recently stabilized at a relatively low level. Many OECD countries spend less than 0.03% of GDP on energy research. Currently, private sector funding far exceeds public sector investments. Latest data from the UNEP's *Global Trends in Sustainable Energy Investments 2009* indicate that total RD&D investment in sustainable energies (biomass, biofuels, wind, solar, geothermal, hydro, marine, energy efficiency) for 2008 was approximately US\$17 billion. This figure, although nearly 20% higher than that for 2006 is relatively unchanged from 2007. In 2008, RD&D expenditure accounted for approximately 13% of total new investment for the sector, compared with 15% in 2006 and 35% in 2004.

The Vienna International Energy Conference called for an acceleration of energy-related R&D. Although no targets were set, independent studies have indicated that increases in RD&D investments between two and ten times current levels will be needed to achieve the levels of renewable energy deployment necessary to mitigate climate change and provide energy access. Much of this increased expenditure will be required to advance technologies from small-scale pilot plants, through demonstration phase and subsequent commercial deployment (e.g., carbon capture and storage, solar thermal, advanced biofuels, hydrogen production, etc).

The vast majority of current research effort, and resulting intellectual property, is concentrated in the USA, Europe, Japan, and China. Therefore, there is a serious risk that without appropriate mechanisms for technology transfer and diffusion and capacity building, other regions with less internal capacity will be 'left out' of the solution or required to pay beyond their means. Additionally, technologies developed in industrialized nations may be inapplicable to developing countries or other geographies. It is critical that research agencies, both public and private, recognize that the energy challenges are global in nature but that the development and deployment of renewable energy solutions have a regional focus taking into account local demand requirements.

In addition to the requirements articulated by the Vienna International Energy Conference to accelerate energy-related R&D, the following are needed:

- » Establishment of regional research networks and partnerships to ensure that research outcomes can be delivered locally;
- » Identification of priority areas where deployment of demonstration projects could have greatest beneficial impact, e.g., in terms of meeting energy demands, or having environmental or social benefit, etc.

IRENA could play a critical role in coordinating the international renewable energy research agenda and facilitating the establishment of regional research networks.

5. UN-Energy and Industry Partnerships

UN-Energy to develop a strong working relationship with other international organizations, private and public sectors as well as civil society, in its drive to foster sustainable energy solutions around the world.

Over 100 energy related conferences are currently scheduled to take place around the world over the next nine months, over half of which are specifically related to renewable energy. In 2008, there was an average of three energy conferences held per week. Organizers for these meetings include inter alia: national, regional, and local governments; universities and research agencies; industries and companies; NGOs and special interest groups; and international organizations. Many of these meetings will undoubtedly develop a set of recommendations for moving the energy agenda forward, some of which will be consistent and others contradictory. With all this activity it must be asked - "Should there be a global coordinating and governance mechanism for the global energy agenda?" and if so "what form should it take?"

UN-Energy clearly has a critical international role in helping coordinate and oversee the global energy agenda, particularly in relation to policy development. UN-Energy was established in 2004 and aims to promote collaboration, coherence and consistency across the UN system in the area of energy. 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, sub-regional, and national levels.

The Vienna International Energy Conference called for "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". However, UN-Energy cannot do it alone.

What is needed is:

- » UN-Energy to develop strong working relationships with other international organizations (e.g., IRENA, IPCC, etc), industry groups, and research agencies, particularly in the areas of policy development and deployment of global sustainable energy solutions.

Clearly, a prerequisite is the rapid development and agreement on a global energy agenda.

OTHER RECOMMENDATIONS

At the Vienna International Energy Conference, six recommendations were proposed for developing an integrated energy agenda beyond 2020. A summary of these recommendations are provided in the Appendix. Full details of these recommendations can be found at www.viennaenergyconference.org.

Following the presentation of the five major recommendations during the closing plenary session Forum participants were invited to provide comments and suggestions in writing on the Forum website www.grefmexico2009.org.

CLOSING STATEMENT

The energy challenges of the 21st century cannot be understated. Providing energy justice to one-third of the world's population without access to affordable energy sources, addressing the energy-related issues around climate change, and gaining the necessary increases in energy efficiency are not easy tasks. To accomplish these in a sustainable and timely fashion is all the more challenging. The need to transition to a sustainable low-carbon path is undeniable and the time to act is now.

Fostering renewable energies will be a key strategy as part of this transition. It is no longer a question of whether or not to move to renewable energy, but rather a question of how to deploy them at the scale and pace required to meet these challenges. The rapid development of government and institutional policies, investments strategies, and technological advancement are paramount. The next decade will be critical for the future of renewable energy.

Appendix - Recommendations from the Vienna International Energy Conference, June 2009

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.

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.

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.

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.

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.

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.



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