

executive summary

The World Energy Assessment provides analytical background and scientific information for decision makers, in language relevant to all stakeholders. It describes energy's fundamental relationship to sustainable development and analyses how energy can serve as an instrument to reach that goal. It was prepared in order to provide scientifically based input to the intergovernmental processes that led up to the treatment of energy in the context of the World Summit for Sustainable Development (WSSD) in Johannesburg in September 2002.

Energy was indeed one of the most intensely debated issues at the WSSD. In the end, agreement was reached to significantly advance the attention given to energy in the context of sustainable development. These developments followed years of efforts to focus on energy as an instrument for sustainable development that intensified after the United Nations Conference on Environment and Development (UNCED) in 1992.

The decision of the institutions that established the World Energy Assessment to update the Overview of the report *World Energy Assessment: Energy and the Challenge of Sustainability* is testament to the Assessment's relevance.

Energy and Major Global Issues

The analysis presented here starts with the linkages between energy and the economy, social and health issues, including poverty alleviation and improvement of the situation of women, environmental protection, and security, and indicates and describes aspects of energy production and use that are incompatible with the goal of sustainable development:

- Access to affordable energy services is fundamental to human activities, development, and economic growth. It is access to energy services, not energy supply *per se* that matters.
- More than two billion people cannot access affordable energy services based on efficient use of electricity and gaseous and liquid fuels. Without access to energy, their opportunities for economic development and

improved living standards are constrained. Women and children, relatively more dependent on traditional fuels, suffer disproportionately.

- Wide disparities in access to affordable commercial energy and energy services in both urban centres and rural areas are inequitable, run counter to the concept of human development, and threaten social stability. Access to decentralised small-scale energy technologies is an important element of successful poverty alleviation.
- The environmental impacts of a host of energy-linked emissions – including suspended fine particles and precursors of acid deposition – contribute to local and regional air pollution and ecosystem degradation. Human health is threatened by high levels of air pollution resulting from particular types of energy use at the household, community, and regional levels.
- Emissions of anthropogenic greenhouse gases, mostly from the production and use of energy, are altering the atmosphere. There is new and stronger evidence that most of the warming observed over the last fifty years is attributable to human activities and that significant climate change would result if twenty-first century energy needs were met without a major reduction in the carbon emissions of the global energy system.
- Dependence on imported fuels leaves many countries vulnerable to disruption in supply, which might pose physical hardships and economic burdens; the weight of fossil fuel imports on the balance of payments is unbearable for many poorer countries. The current energy system of industrialised countries is heavily dependent on fossil fuels, which are geographically concentrated in a few regions of the world.¹

Finding ways to expand the quality and quantity of energy services while simultaneously addressing the environmental impacts associated with energy use represents a critical challenge to humanity. Major changes are required in energy system development world-wide.

Energy Resources and Technological Options

Physical resources and adequate technologies are available to meet the challenges of sustainable development. Without policy changes, cost differentials will favour

conventional fuels for decades to come. Options for using energy in ways that support sustainable development, which requires a consistent focus on social, economic, and environmental processes, include:

- More efficient use of energy, especially at the point of end use in buildings, transportation, and production processes.
- Increased reliance on renewable energy sources.
- Accelerated development and deployment of new energy technologies – particularly next-generation fossil fuel technologies that produce near-zero harmful emissions, but also nuclear technologies if the issues surrounding their use can be resolved.

All three options have considerable potential; however, realising this potential will require removing obstacles to their wider diffusion – including developing market signals that reflect environmental and other costs to society not already internalised in market prices – and encouraging technological innovation.

The relative importance of these options depends on the availability of natural resources. Irrespective of that, a more efficient use of energy is always essential, even in developing countries where increased access to modern energy carriers is top priority.

Are Sustainable Futures Possible?

Analysis using energy scenarios indicates that it is possible to address simultaneously the various sustainable development objectives, using available resources and technical options. The scenarios and subsequent analysis suggest that:

- Continuing along the current path of energy system development is not compatible with sustainable development objectives.
- Realising sustainable futures will require much greater reliance on some combination of higher energy efficiencies, renewable resources, and advanced energy technologies.
- A prerequisite for achieving an energy future compatible with sustainable development objectives is finding ways to accelerate progress for new technologies along the energy innovation chain, from research and development to demonstration, deployment, and diffusion.

1. In this report, the term industrialised countries refers primarily to high-income countries that belong to the Organisation for Economic Co-operation and Development (OECD). Developing countries generally refers to lower income countries that are members of the G-77 and China. Although many transition economies also have a high degree of industrialisation, they are often considered and discussed separately because of their specific development requirements.

- Providing access to affordable energy services to people in rural areas poses particular challenges. But it also offers considerable opportunity for improving the lives of billions of people within a relatively short period. Promising approaches include decentralised solutions, appropriate technologies, innovative credit arrangements, and local involvement in decision-making, and especially new mechanisms at the local level that have lower transaction costs.
 - Transportation is a key area with its rapid growth and high dependence on fossil fuels. By combining new fuels, both fossil and renewable, with near-zero greenhouse gas emissions and a better mix of improved modes of transportation and vehicle performance, it appears possible to meet sustainability criteria.
 - Extending access to electricity to ten million new customers per year is estimated to require investments on the order of \$10 billion per year. This offers considerable opportunity for improving the lives of billions of people within a relatively short period.²
- Creating market framework conditions (including continued market reform, consistent regulatory measures, and targeted policies) to encourage competitiveness in energy markets, to reduce total cost of energy services to end-users, and to protect important public benefits.
 - Cost-based prices, including phasing out all forms of permanent subsidies for fossil fuels and nuclear power and internalising external environmental and health costs and benefits.
 - Removing obstacles and providing incentives, as needed, with “sunset” clauses, to encourage greater energy efficiency and the development and/or diffusion to wider markets of new technologies for energy for sustainable development.
 - Reversing the trend of declining official development assistance and foreign direct investments, especially as related to energy for sustainable development.



Any conceivable energy system that would address all sustainable development objectives simultaneously will not be realised without changes in the current policy environment. Creating such an energy system will require policy action at national, regional, and global levels.

Policies and Actions to Promote Energy for Sustainable Development

The analysis presented here identifies key strategies and policies for globally achieving both economic growth and sustainable development. The actions needed include:

- Encouraging greater international co-operation in areas such as technology procurement, harmonisation of environmental taxes and emissions trading, and energy efficiency standards for equipment and products.
- Adopting policies and mechanisms to increase access to energy services through modern fuels and electricity for the two billion people without such access.
- Building capacity among all stakeholders, especially in the public sector, to address issues related to energy for sustainable development.
- Advancing innovation, with balanced emphasis on all steps of the innovation chain.

The challenges of sustainability are major ones. At the same time, there are hopeful signs. Clearly, energy can serve as a powerful tool for sustainable development. The World Energy Assessment shows that there are indeed combinations of resources and technologies that are capable of meeting most, if not all, of the sustainability changes simultaneously. The finding that measures related to energy can help address several major issues at the same time is highly significant, as it should add support for those measures from different groups in society. The decisive issues are not technology or natural resource scarcity, but the institutions, rules, financing mechanisms, and regulations needed to make markets work in support of energy for sustainable development.

Some governments and corporations have already demonstrated that policies and measures to promote energy solutions conducive to sustainable development work. The renewed focus and broad agreements on energy in the WSSD Plan of Implementation and at the eighteenth World Energy Congress are promising. The formation of many partnerships on energy between and among stakeholders at WSSD is another encouraging sign. A sustainable future in which energy plays a major positive role in supporting human well being is possible! ■

2. A billion equals a thousand million.