

Analysing Our Energy Future

Some Pointers for Policy-makers



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Printed on Forest Stewardship Council-certified paper with vegetable-based inks

ISBN: 978-92-807-2812-5

[April 2007]

Policy-makers increasingly rely on prospective studies to support their efforts to set policy goals and identify the most appropriate measures to achieve them. The United Nations Environment Programme and the International Energy Agency advocate this approach and over the years have contributed, each in its own domain, a range of scenario studies.

The Track Record on Scenario-supported Policy

Scenarios of all types have become an integral part of the policy-making process. By looking at plausible future trends in a systematic manner, scenarios support the early detection of emerging issues and help policy-makers prepare for otherwise surprising developments. They provide a bridge between science and policy.

Companies such as Shell, IBM and General Motors have successfully used scenarios to frame their business strategies. For example, in the late 1960s Shell introduced scenario-based multi-annual planning that served it particularly well during the oil price shocks of the following decade.

Similarly, public policy is increasingly being supported by scenario analyses. These have been used in areas as diverse as technology and public health – for instance, to scope out the potential role that nanotechnologies could play in a wide range of societal areas and to develop remedies for infectious diseases, notably AIDS and SARS.

Last but not least, scenarios have become a central part of the climate change policy debate. The **Special Report on Emission Scenarios** produced by the Intergovernmental Panel on Climate Change in 2000 is often quoted as a landmark publication that paved the way for the widespread use of scenarios in this area.

scenarios



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In particular, the International Energy Agency's *World Energy Outlook* has become a key reference in energy policy worldwide. *Analysing Our Energy Future* is a summary of some of the main findings in the 2006 edition of the *World Energy Outlook*. It also draws on related materials in order to set the findings in the wider context of energy for sustainable development.

The report focuses on the *World Energy Outlook*'s Alternative Policy and Beyond the Alternative Policy Scenarios – a deliberate choice aimed to spur action by underscoring the impacts on the future of the policy decisions made today. It is written in non-technical language to make it accessible to as wide an audience as possible.

One important conclusion of this report is that the major challenges facing the global energy system today are interlinked – both financially, through global energy and capital systems, and politically, in future agreements under the United Nations Framework Convention on Climate Change. Dealing with these challenges requires both a comprehensive approach and co-ordinated action.

Today's Pressing Energy Needs

Scenario results have helped develop a consensus on today's most pressing energy needs:

- ensuring continued access to energy supplies¹
- reducing emissions of greenhouse gases and
- providing universal access to modern forms of energy.

First, rising oil and gas demand, if unchecked, will accentuate consuming countries' vulnerability to supply disruptions and price shocks. Poorer countries will be especially at risk: the loss of real income and the adverse impacts on the budget deficits and current account balances of importing countries are proportionally greater for them.²

Second, the energy sector is the main contributor of emissions of greenhouse gases. Stabilising the concentrations of these gases at a level that would avoid human-induced interference with Earth's climate³ requires drastic changes in the fuel mix, more-efficient production and use of energy and measures that prevent carbon dioxide from being released to the atmosphere over geological timescales.

Third, almost 1.6 billion people in developing countries, about one-quarter of the world's population, do not have access to electricity in their homes. Some 2.5 billion people rely on traditional fuels and technologies for cooking and heating. This threatens the realisation of the development goals agreed to as part of the United Nations Millennium Declaration.

Identifying cost-effective policies to meet these needs is a difficult task. Nonetheless, successful approaches do exist that warrant wider replication. Yet implementing these policies is even more difficult, as they often encounter resistance from industry and consumer interests.

While the benefits of taking corrective action toward a sustainable energy path would for the most part accrue in the future,⁴ the costs would be felt today, which limits their appeal to policy-makers. Yet the costs of inaction outweigh those of implementing the needed policies, so there is clearly a need for improved dialogue between government, industry and consumers to develop effective, long-term policies.

1 In a recent publication (**Energy Security and Climate Change – Assessing Interactions**), the International Energy Agency puts forward a methodology for countries to assess the vulnerability of their energy systems.

2 For comparison, the estimated US\$7-billion increase from 2002 to 2005 in import costs for oil-importing sub-Saharan African countries is about seven times the total annual savings in debt payments received by the 14 African countries included in the 2005 G8 debt agreement.

3 There is broad agreement that this can be achieved at concentrations in the range of 450 parts per million by volume (ppmv) of carbon dioxide equivalents or below. (Carbon dioxide equivalents are used to compare emissions of various greenhouse gases based upon their global warming potential.)

4 Measures to promote energy savings and energy efficiency are an exception, in that the payback times are short. However, mobilising the funds required to realise technically feasible and economically viable energy efficiency improvements remains a challenge, even in industrialised countries. This is partly because a range of barriers, including competition for finance with entrenched industries, stifles investment in energy efficiency projects.

Today's Pressing Energy Needs

The long life of a good deal of energy infrastructure means that the system changes only very slowly. This heightens the need for governments to establish a clear, long-term policy framework – one that, while favouring sustainable investments, allows industry to plan for the future.

The private sector, not government, has the capacity to mobilise the funds required to address today's pressing energy needs. However, industry investments will only be forthcoming if governments set targeted policies to this effect. This is all the more important in developing countries, where the perceived risks are higher and it is thus harder to attract investment.

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The World Energy Outlook's Alternative Policy Scenario



The *World Energy Outlook 2006* describes at length two scenarios: a **baseline** case – the Reference Scenario, which assumes that no new government measures are implemented to alter underlying energy trends – and a **policy** case, the Alternative Policy Scenario. They are both **quantitative, exploratory** scenarios that provide projections through 2030, with an emphasis on 2015, and they contain regional and sectoral breakdowns.

This section summarises the findings of the Alternative Policy Scenario. It outlines which measures are taken into account in the scenario; presents the main projections by fuel, sector and region; and introduces key cost-effectiveness considerations emerging from the analysis. It sets these results against those of the Reference Scenario.

2.1 Policy Measures

The Alternative Policy Scenario takes into account policies and measures that countries are currently considering and are assumed to adopt and implement. While every effort was made to determine which policies are likely to be implemented at some point during the projection period and to translate those into formal assumptions for modelling, a degree of judgement was inevitable. If the assumed set of policies and measures are not implemented in a timely manner, the energy savings and emission reductions in the Alternative Policy Scenario will not be achieved.

The analysis reveals that some policies are far more effective than others: for example, two-fifths of the emission reductions in the Alternative Policy Scenario are achieved by implementing only a dozen policies. Not surprisingly, these are found in regions where energy demand is high, such as the United States, the European Union and China.

Examples of Policies with Large Emission Reductions in the Alternative Policy Scenario

	Energy efficiency	Power generation
United States	■ tighter Corporate Average Fuel Economy standards ■ improved efficiency of electricity use in the residential and commercial sectors	■ increased use of renewable sources of energy
European Union	■ increased vehicle fuel economy ■ improved efficiency of electricity use in the commercial sector	■ increased use of renewable sources of energy ■ extended lifetime for nuclear plants
China	■ improved efficiency of electricity use by industry ■ improved efficiency of electricity use in the residential sector	■ increased efficiency of coal-fired plants ■ increased use of renewable sources of energy ■ increased reliance on nuclear energy

The World Energy Outlook's Alternative Policy Scenario

Notwithstanding this conclusion, the scope for improving the cost-effectiveness of the energy system is enormous in all regions. From the removal of subsidies that encourage the wasteful use of energy to the introduction of economic incentives for low-carbon technologies, a wide range of policies has proved to be particularly successful and thus merit replication.

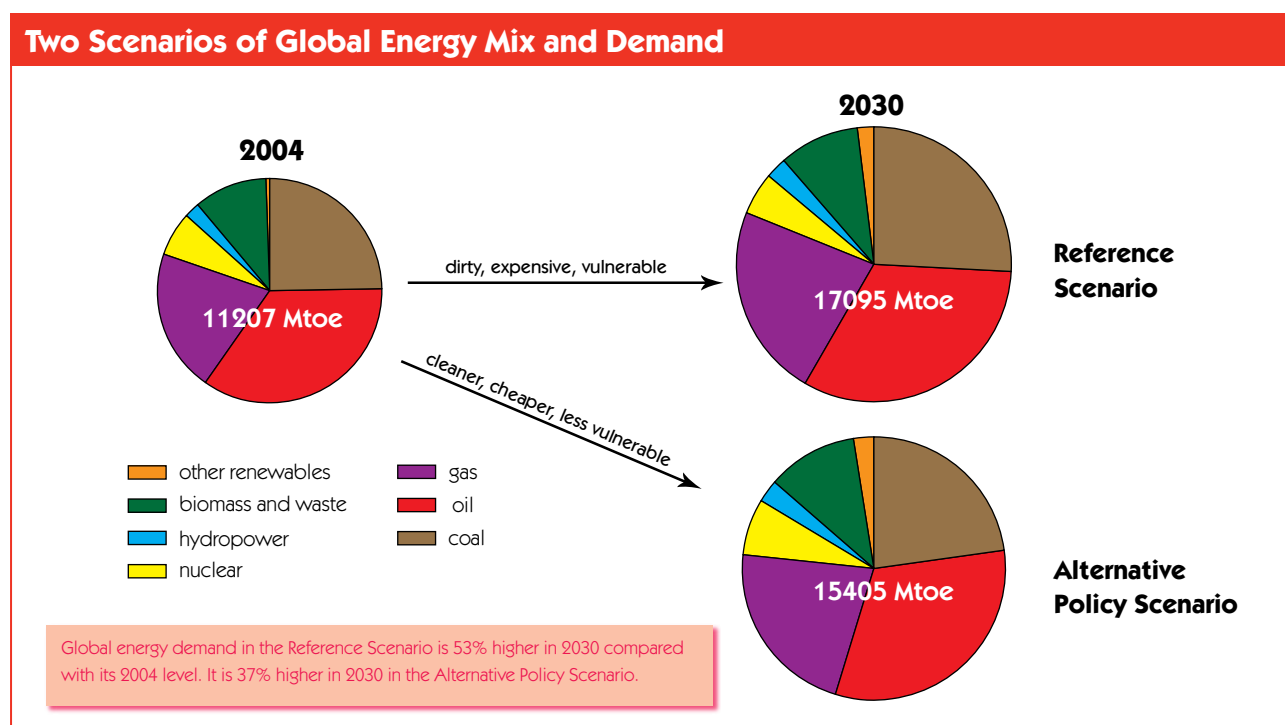
It is important to bear in mind that the Alternative Policy Scenario does not reflect the ultimate technical or economic potential: a more sustainable energy system is indeed possible, as described later, but it requires strong policy efforts that go beyond those currently enacted or proposed.

2.2 Projections

Oil, coal and gas demand are lower in the Alternative Policy Scenario than in the Reference Scenario, but these sources continue to dominate the global energy mix. Coal loses most ground, mainly to nuclear energy and to biomass and waste. Hydropower expands its share slightly. Renewable sources of energy other than hydropower and biomass and waste see their share more than double but remain insignificant contributors to total primary energy supply.⁵

cost-effective policies 
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data tables 
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⁵ These sources of energy include wind, solar, geothermal, tide and wave energy. Their Alternative Policy Scenario aggregated shares in 2004, 2015 and 2030 are, respectively, 0.5%, 1.1% and 2.4%.

The World Energy Outlook's Alternative Policy Scenario

In the Alternative Policy Scenario, growth in energy demand is much greater in developing countries (particularly in Asia) than in OECD countries. All the major net oil-importing regions continue to become more dependent on oil imports in 2030 than they were in 2004. The volume of interregional trade continues to expand – albeit considerably less than in the Reference Scenario.⁶

Energy demand from power generation and heat plants is almost 12% lower in 2030 in the Alternative Policy Scenario than in the Reference Scenario, mainly due to greater end-use efficiency. The policies that bring about these changes are mostly driven by efforts to increase the use of low-carbon technologies or to reduce dependence on imported fuels.

Transport energy consumption in 2030 is almost 10% lower in the Alternative Policy Scenario than in the Reference Scenario⁷. Road transport continues to dominate the modal split.⁸ Policies resulting in improved new-vehicle fuel efficiency produce more than two-thirds of the fuel savings.

Industrial energy demand in 2030 is 9% lower in the Alternative Policy Scenario than in the Reference Scenario. Over half of global energy savings in the industry sector are the result of more energy-efficient production of iron and steel, chemicals and non-metallic products. Industry structure and plant size are key determinants of the sector's energy efficiency potential.

Energy use in the residential and services sectors in 2030 is 11% lower in the Alternative Policy versus the Reference Scenario. Introduction of more-efficient appliances, air conditioning and lighting account for the bulk of the savings in electricity demand, which is the main driver of energy demand growth in the sector. Stricter building codes are key to cutting oil and gas use.

The policies considered in the Alternative Policy Scenario significantly curb the growth of

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