



World Energy Council
CONSEIL MONDIAL DE L'ENERGIE

**DELIVERING
SUSTAINABILITY:
CHALLENGES AND
OPPORTUNITIES FOR THE
ENERGY INDUSTRY**

WEC Statement 2005

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DELIVERING SUSTAINABILITY: CHALLENGES AND OPPORTUNITIES FOR THE ENERGY INDUSTRY

Sustainable energy systems are achievable, but the challenges are many and need to be tackled urgently if sustainability is to be achieved in this century. This was the principal conclusion reached by the 19th World Energy Congress, held in Sydney, Australia in September 2004.

The World Energy Council (WEC) endorses this conclusion but would add that we do not have a century to act! We can and must act now to put energy development on a fully sustainable path. The keys to delivering energy sustainability, as reaffirmed at Sydney, are to:

- **Keep all energy options open** No technology should be idolised or demonised and energy efficiency must be increased.
- **Ensure the necessary investment in energy infrastructure** For this, cost-reflective energy prices are essential – systems which do not pay for themselves are ultimately unsustainable.
- **Adopt a pragmatic approach to market reform** This would accommodate specific policy measures to achieve certain objectives, while allowing for the operation of the market to the maximum possible extent.
- **Place priority on the measures needed to ensure reliability of supply** Above all this depends on energy diversity, supported by sound market design and improved generating plant performance.
- **Promote regional integration of energy supply systems** This further supports reliability and calls for stronger regional collaboration.
- **Exploit the “win-win” opportunities of emerging climate change responses** The mechanisms, whether voluntary or regulated, should embrace least cost emissions reduction, encouraging transfer of clean technology from industrialised to developing countries.
- **Ensure technical innovation** It is vital to reconciling development with environmental protection and calls for strong, sustained support for R&D
- **Foster and sustain public understanding and trust** This in turn depends on energy sector transparency and better public information, starting in particular with young people.

No single player in the energy system can act alone: government policy, stable and clear regulation, industry investment, civil society and the final consumers of energy services all have their individual roles to play. As the sole global, non-governmental body looking at energy in its totality, it is WEC’s mission to pull the stakeholders together, to get the facts out, and to advocate action where this is necessary.

Introduction

This WEC Statement, examining the challenges and opportunities of delivering energy sustainability, draws on both the WEC's consideration of the many presentations and debates at the 19th World Energy Congress¹ and the reports which it published in the year leading up to that Congress.

Energy sustainability

While higher oil prices and renewed concerns about energy security have dominated recent public debate about energy, sustainability necessarily calls for a longer-term perspective which recognises its multi-dimensional nature. The need to balance the social, economic and environmental elements of sustainability is reflected in the WEC goals of energy *accessibility*, *availability* and *acceptability*.

Some 1.6 billion people are still entirely dependent on highly inefficient traditional forms of energy. An energy system embodying such inequities is not sustainable or acceptable. Without *access* to affordable modern energy services, the United Nations' Millennium Development Goals cannot be achieved, as clearly recognised at the 2002 World Summit on Sustainable Development in Johannesburg.

Beyond those who lack access altogether, there are millions more whose access is insufficient or highly unreliable. The frequent supply interruptions they suffer add a significant cost burden and severely hamper economic development. At the other end of the development spectrum, the dependence of high-tech, largely urbanised societies on uninterrupted energy supplies grows ever greater. Here too supply disruptions exact a heavy penalty, as seen in the blackouts in North America and Europe in 2003. Sustainable energy systems must offer security and reliability, the WEC's goal of energy *availability*.

The energy systems in both developing and developed countries can have significant environmental impact. Use of traditional energy sources, such as woodfuel, contributes to deforestation and results in health-damaging indoor pollution. Basic conventional energy forms are often a prime source of the urban pollution that afflicts many of the developing world's rapidly growing mega-cities. Energy conversion and use are the major contributor to anthropogenic greenhouse gas emissions. A sustainable global energy system must optimise efficiency and limit emissions, the WEC's goal of energy *acceptability*.

The overall challenge is, therefore, to deliver sufficient energy for equitable and secure social and economic development while avoiding environmental impacts which would compromise the capacity of future generations to enjoy the fruits of that development.

The context

Meeting this challenge may well be further complicated by a trend towards higher energy prices and by slower GDP growth. Recent high oil prices have been driven by strong demand, particularly in China, India and USA, and also by uncertainties about production, especially in Iraq, Venezuela and Russia. Longer-term, the WEC's analysis on *Drivers of the Energy Scene*² suggests that both price volatility and higher energy prices will be the likely result of several factors:

- Probable oil and gas supply bottlenecks, related principally to the peaking of production in some regions and uncertainties about infrastructure investments;
- Limits to the scope for substitution between fuels; and
- The gradual incorporation of carbon mitigation costs into the prices of fossil fuel energy services.

More volatile and higher energy prices will prompt renewed progress in achieving greater energy efficiency, virtually stalled during the past low-price decade. They are likely, however, to slow economic growth. Together with the lower global population growth now evident and institutional factors constraining economic growth in many of the poorer developing countries, it must be questioned whether the long-term declining trend already seen in global GDP growth can be reversed. Slower economic growth in its turn will add to the difficulties of achieving universal access to energy, seen by WEC as an essential condition for a more equitable and secure world.

The keys to delivering energy sustainability

WEC have concluded that energy systems which meet the criteria of sustainability are achievable in a matter of decades, if vigorous action is taken in the following areas.

1. Energy diversity and energy efficiency

All energy supply options must be kept open, including advanced fossil fuel systems, nuclear, hydro (whether large or small) and other renewable energy sources. Each option is subject to significant uncertainties – we cannot afford to jettison any one of them. Moreover, the different sources are often complementary. The best mix to meet expanding world needs will depend in part on technological advance, discussed below, but is also strongly location-specific. The optimum mix in one country or region may not be the same as in another, which may be differently endowed or where public attitudes may rule out certain options.

On the demand side, increased efficiency is a precondition of sustainable development. At the fuel conversion stage, WEC's report on *Performance of Generating Plant: New Realities, New Needs*³ makes clear that there are substantial operational efficiencies to be obtained simply by improving availability through the introduction of best practices at the world's existing power plants. Not only does this optimise fuel use, there are the corresponding reductions in carbon and other emissions and "savings" of up to \$80 billion in investment in new capacity per annum. Combined heat and power systems are a further way to optimise efficiency. Regarding end-use efficiency, the WEC/ADEME report on *Energy Efficiency: A Worldwide Review*⁴ identifies labelling and minimum efficiency standards as the most effective means for rapid improvement. However, these optimum conditions are far from being fully realised and even the rosier expectations will not avoid the need to expand supply if development aspirations are to be met.

2. Energy infrastructure investment and cost-reflective prices

Delivering sustainable energy to meet expanding global demand for energy services will require increased investment in energy infrastructure to replace capacity being retired, to expand supply where needed, and to cover the cost of cleaner energy systems. WEC's *2004 Survey of Energy Resources*⁵ suggests that the global resource base is not itself a constraint to expanded supply, but sharply increased investment is needed in the production, conversion and delivery systems. To achieve this, cost-reflective energy prices, including appropriate returns for investors, are essential.

Energy systems which do not cover their costs over the medium to long-term are not sustainable, and long periods of low prices may jeopardise future energy availability. Regulatory frameworks must recognise this and provide stability and transparency to attract the necessary investments in a timely manner. Transparency of costs, in particular, may be facilitated through unbundling the energy chain.

3. Market-sensitive interventions

At the same time, a more pragmatic approach to market reform is emerging. While cost-reflective prices must be the guiding principle of energy market design, it is now widely recognised that subsidies, or similar policy measures, may be needed in certain circumstances to achieve essential goals. These may address energy access, security of supply, the promotion of innovation, and the internalisation in final prices of the cost of emissions mitigation or environmental impacts. The more pragmatic approach to market reform allows for such interventions.

For example, it must be recognised that cost-reflective energy services may be beyond the reach of those at the bottom of the energy ladder. Just as the industrialised countries historically used subsidies to promote energy access for certain disadvantaged groups, so they may be justified in today's poorest countries. Where subsidies are provided, they should be designed to be transparent, tightly targeted and time-bound, so as to distort the operation of the market as little as possible.

There may be circumstances where a particular energy mix is seen as entailing supply vulnerability and greater energy source diversity may be sought. For example, where supply is dominated by a single, high-capital cost source, such as hydro electricity, and the capital cost has been depreciated, prevailing market prices may simply be too low to permit the timely entry of alternative sources without specific policy measures.

Another area is the promotion of R&D and emerging energy sources. On these grounds, renewable energy sources receive significant support in many industrialised countries. Wherever used, however, the same principles of subsidy design must apply.

It is also widely recognised that not all costs are reflected in normal market prices. That is particularly so of environmental impacts that may be distant in time and geography, as underlined in the WEC report on *Comparison of Energy Systems using Life Cycle Assessment*⁶. Life cycle analyses attempt to identify all environmental impacts from “cradle to grave” by primary energy source. Once identified, such impacts should be incorporated into the cost of energy delivered through policy intervention, just as the anticipated cost of radioactive waste management is now largely incorporated into the cost of the nuclear power kilowatt hour.

A further dimension of the new pragmatism is the growing recognition that market design must be adapted to each individual situation, and that a simple step-by-step approach is often best, especially in developing countries with under-capacity, as emphasised in the WEC report on *Energy Market Reform: Lessons Learned and Next Steps*⁷. Transitional market models are needed.

4. Supply reliability

As already noted, disruptions in the provision of energy services, whether in developing or industrialised countries, carry a heavy price. Measures to improve reliability of supply are an important priority.

Energy source diversity is the bedrock of a robust supply system. Excessive dependence on any one source or supplier is likely to entail vulnerability, for example, when the price of a particular source rises, a supply line is attacked or, for hydroelectricity, when drought strikes. Energy source diversity calls for keeping all energy options open and, where practicable, for cross border integration of energy systems. It also calls for market design which provides signals for timely investment in renewing and expanding supply and delivery capacity.

5. Regional integration of energy systems

Regional integration of energy supply systems can boost access and energy supply security. Meeting demand by the nearest available supply source supports improved access at the lowest possible price. It also often improves diversity of energy source by linking, for example, coal production to hydroelectricity capacity or solar potential to gas supply. Specifically in Africa it is also the key to optimising the water-energy nexus. As spelled out in the WEC report on *The Potential for Regionally Integrated Energy Development in Africa*⁸, the harnessing of the enormous energy potential of the Congo River cannot be achieved without it.

To realise the full benefits of energy system integration, regional collaboration also needs to be enhanced to promote harmonisation of the regulatory framework for energy and to create the necessary infrastructure. Regionally based energy market regulation may also be less prone to national government intervention, thereby providing a more stable base for investment. Care is needed, however, to avoid complexity through overlapping layers of regulation.

6. Market-based climate change responses

Climate change is a serious global concern, calling for changes in consumer behaviour, but offering potential “win-win” opportunities. As identified in WEC’s working paper on *Energy and Climate Change*⁹, these include increased transfer of efficient technologies from industrialised to developing countries and incentives to investment through emerging voluntary and regulated emissions trading or other mechanisms.

Much effort has been expended in recent years to reach agreement on an international greenhouse gas emissions governance system. Such a system should have at its core the principle of least-cost emissions reduction, with options ranked strictly by cost per tonne of greenhouse gas avoided. The aim of such a system should be to move towards more truly cost-reflective pricing, while encouraging the development and transfer of emissions reducing technologies.

WEC argues that the principal benefit of the Kyoto Protocol is that it provides a legal framework for national or regional emissions trading schemes and their eventual integration into a global system, as well as for the other envisaged mechanisms (Clean Development Mechanism and Joint Implementation). However, because fossil fuels will continue for many decades to be the major source of affordable and reliable energy services, especially in high growth developing countries, WEC sees the need for more flexible strategies that go beyond the focus and timelines of the Kyoto Protocol. The principal action endorsed by WEC is the strengthening of technological innovation, development and transfer.

7. Technological innovation and development

Technological innovation and development is the most appealing way to reconcile expanded energy services with protection of the environment, for it holds the promise of moderating the difficult choices to be made.

Ideally, technological advance can reduce both costs and environmental impact. The WEC report on *Energy End-Use Technologies for the 21st Century*¹⁰ examined industrial processes, buildings, transportation, and cross-cutting technologies, concluding that robust end-use technologies would permit worldwide energy savings of as much as 25% by 2020 and over 40% by 2050 compared with what may be required without these technologies. Technology advance is particularly vital to improving sustainability in the transport sector, which is one of the most rapidly growing sources of demand for energy as well as of atmospheric emissions. This challenge is particularly great for air transport.

With respect to supply, technological advance is vital to securing and maintaining discovery and production capacities, as well as reducing the environmental impact of present systems. In particular, given our expected future dependence on fossil fuels, a priority is systems for their cleaner use, including carbon capture and sequestration.

In practical terms, it is as urgent to improve the existing energy sources as it is to provide new “breakthrough” options which are unlikely to yield instant solutions. The sheer scale of the capital stock supplying the world’s energy services – it is calculated to be our largest industry – means that the timeframe of structural change is long. This is often underestimated, as is the time to commercialise new technologies which have been proven in the laboratory or at pilot-scale. In WEC’s view, while the Sydney Congress looked at important technology areas such as hydrogen energy and nuclear fusion, their promise is still too distant to avoid the need for more immediate solutions.

It is therefore urgent for energy research and development to be strongly and consistently supported by both governments and industry. Governments and industry need to renew and expand their partnerships. A further important step would be the reduction of R&D redundancies through international cooperation.

8. Public understanding and trust

Public trust must be won and retained. This in turn calls for energy sector transparency and the provision of better public information.

Energy systems serve the public, but the installation of the needed production and supply capacities often prompt “not in my backyard” (NIMBY) reactions. Greater public understanding of the broader issues, and recognition of the benefits derived from energy, are needed to put such reactions in perspective.

In addition, if pricing is to be cost-reflective, consumers will be directly affected by the increased energy prices which WEC believes likely in the coming decades. For reasons already discussed, it simply will not work to try to protect the consumer from the cost of environmental sustainability. Greater public understanding of the reasons underlying price increases will be needed to avoid political pressures that risk deflecting governments from cost-reflective pricing. Such understanding depends on an informed public.

Greater public understanding of energy realities may also assist in promoting energy efficiency. Historically price has been the main driver of energy efficiency. If WEC is right, higher real energy prices will bring both a renewed focus on efficiency and benefits for the environment, but moving beyond the ‘price effect’ would call for an informed public.

It should also be recognised that winning public understanding and trust must start with young people. It is they who have most at stake in the energy decisions we take today.

The World Energy Council’s Agenda

The WEC will play its part in delivering sustainability through its work programme in the three years leading to the next World Energy Congress in Rome in November 2007. Through both global and regional collaboration, it will undertake a major study on energy scenarios to 2050, with new underlying assumptions about the drivers of supply and demand, thus reinforcing the longer-term perspective essential for planning sustainable systems. This work will be fed into the deliberations of the 14th and 15th sessions of the UN Commission on Sustainable Development through the WEC’s collaboration with like-minded bodies in the Business Action for Energy initiative.

Through its regional action plans, WEC will work with other stakeholders of the energy sector towards the common goal of identifying and implementing sustainable energy solutions to regional energy challenges. Specifically, WEC will expand its network of Centres of Excellence for Sustainable Energy, pioneered in the Philippines with the support of the UK Government.

WEC believes there is more to do in the area of reliable integrated electricity systems. It undertakes to work with companies, regulators and other experts to design reliability frameworks and other schemes for adequate investments in natural gas and electricity infrastructure over the long-term.

Work cited in this Statement on worldwide energy resources, energy efficiency policies and enhancing generating plant performance will be continued, as will the provision of accessible and clear public information on the Global Energy Information System (www.worldenergy.org).

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THE WORLD ENERGY COUNCIL

The World Energy Council (WEC) is the leading global, non-governmental, multi-energy organisation. Its mission is to promote the sustainable supply and use of energy for the greatest benefit of all people. It covers all energy sources, together with energy efficiency and best practices, and conducts extensive research and analysis, typically with a longer-term perspective. Its triennial Congress, first held in 1924, is the most widely representative gathering of the world's energy decision makers.

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