

ENERGEX'98

Report on the 7th global energy forum held in Bahrain under the auspices of the International Energy Foundation.

*By Peter Catania**

The ENERGEX'98 conference focused on the technical, economic and human dimensions related to the growth and development of all forms of energy. It was held under the patronage of His Excellency Sheikh Isa Bin Ali Al-Khalifa, Minister of Oil and Industry, Government of Bahrain with the conference chairman being Dr. Mohammed J. K. Al-Ghatam, President, University of Bahrain.

International experts from 50 countries discussing renewables, fossil fuels, case studies on the rational use of energy, risk assessment, energy modeling, energy economics, global climate change and other related topics formed the basis of the technical and plenary sessions.

The conference opened with statements from the Minister of Oil and Industry, the President of the University and the Chairman of the International Energy Foundation.

His Excellency Sheikh Isa Bin Ali Al-Khalifa, Minister of Oil and Industry, pointed out that the Government of Bahrain has always striven to exploit its native energy resources in order to develop their country, raise the standard of living of their citizens and create the necessary infrastructure for a modern, progressive state while at the same time avoiding negative ecological consequences.

He further noted that much importance was attached to developing and identifying the special needs of the workforce in the field of energy; in developing the institutional framework and encouraging research in the energy industry. And that Bahrain was especially concerned with the impact of energy on regional, inter-Arab and international relations.

His excellency went on to note that in spite of its successes, the government of Bahrain is now convinced that to continue to depend on oil and gas as its main source of revenue and the prime mover of the national economy requires revision and re-thinking during the coming years, especially with the constant instability in international prices. Thus, Bahrain intends to speed up its efforts to diversify its income sources and lessen dependence on oil as the major exportable commodity. He noted the Arab region has almost limitless possibilities in the field of renewable energy, especially solar, wind and biomass energy.

Dr. Al-Ghatam pointed out that the technology and industrial progress the Western countries have witnessed was due primarily to the discovery of new technologies which were basically built on the discovery of and refining of oil. While the Gulf states owe their rapid progress and advanced civilization over the past 50 years to the oil industry, that does not mean ignoring the pollution which this industry and its branches leave on the natural environment, human life, animals and plants. Bahrain, for its part, took a clear ecological direction when it decided to use oil in petrochemical industries and natural gas in generating electricity and water desalination by observing the standards applied internationally which ensure protecting its atmosphere from all types of pollutants. The utilization of energy has relieved Bahrain of a great deal of suffering and hard labor and

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doubled productivity to the degree that physical work contributes no more than 1 percent of the work accomplished in the industrialized countries. Although it is true that the oil industry has moved the Gulf Region States from poverty to prosperity, it is not true that the Gulf States are not concerned with the search for substitute and renewable energy sources, he noted. For, example the State of Bahrain has established an Energy Research Centre.

The conference also provided the opportunity to discuss the technological, economic, social and environmental impacts of the various forms of energy. The author indicated that following the Kyoto protocol, several major themes have emerged with researchers worldwide: These are; (1) A need for strong government leadership and vision in all countries in the promotion of energy efficiency and renewable energies, (2) Market distortions must be removed but these alone are not sufficient to promote energy efficiencies and the mass introduction of renewables. Government is needed to counterbalance those market structures which hinder energy developments. (3) It is essential that the developing countries be involved in the mitigation of global climate change. We must also recognize that these countries have priorities which are significantly different than those of developed nations. Their priorities are economic development from the ground level and the alleviation of poverty. (4) The protocol mechanisms must be flexible and transparent. (5) Business has a key role in the transformation from an oil economy to a renewable energy economy. (6) The importance of applied R & D in the mitigation of climate change cannot be overemphasized. (7) The diversity of many developing nations needs to be recognized and the costs of inaction or the "do nothing" approach will be far greater than that of action. (8) Developed countries must redirect their economies and technologies drastically and developing countries must start to do as well. (9) The most cost effective way is energy efficiency, that is, using less and using it wisely. (10) Low energy prices have undercut the motivation for energy efficiency.

The protocol is only a first and initial step towards a sustainable energy future, however ambitious it is. Nations will limit their emissions in accordance with their level of economic development. In the interim, effective policies and technical experts can assist in establishing more energy efficient systems whether or not climate change is considered a policy priority. The need is for reformation, transparent and flexible policies.

The expertise would have considerable value added if it helped regions within developing countries address their growing needs, alleviate poverty and strengthen their educational system.

Professor G. O. P. Obasi, Secretary General World Meteorological Organization presented the view that historic climate changes have been essentially free of human influence but the enormous growth in energy utilization since the industrial era, largely in the form of fossil fuel, has altered atmospheric chemistry by increasing the concentration of earth-warming greenhouse gases, particularly CO₂. Since pre-industrialized times, N₂O has increased by about 14 percent and methane by about 150 percent. The atmospheric lifetime for carbon dioxide is 50-200 years, methane 12 years and perfluorocarbon 50,000 years. It is clear that the only way of stabilizing these gases is through stopping the emissions completely. Based on energy utilization scenarios from

global population, economic land use growth, technological changes, energy availability and fuel mix through the next century, global warming is predicted to occur at a rate higher than in the last 10,000 years. For the mid-range scenario the minimum predicted global temperature increase is 2°C over the next 100 years. At a minimum it will take some 100 years to stabilize temperature changes and the effects on the mean sea level over this same time period will be a continued rise of a minimum of 50 cm. Stabilization of greenhouse gases as envisaged under the Kyoto Protocol marks only a first step towards curtailing this warming. Recognizing that fossil fuels will remain the major source of primary energy for the foreseeable future, the challenge is to find energy options, including cleaner and alternative technologies, renewable sources and more efficient utilization, which would provide legitimate long-term sustainable development while sharply reducing emissions to minimize or remove the threat of global climate change.

Dr. Moukhtar Al-Lababidi, Director of Technical Affairs, OAPEC, Kuwait stated that the Arab countries proved reserves were estimated at about 643 billion barrels of oil (BBO) and 32.5 trillion cubic meters (TCMG) of natural gas. About 220 BBO and 6 TCMG have been produced since 1914 and the current proven reserves represent 62 percent and 21.7 percent of the world's proved reserves of oil and gas, respectively. Undiscovered potential petroleum reserves in the Arab oil producing countries is estimated to range between 134 and 160 billion barrels of oil and more than 20 trillion cubic meters of gas. In other Arab countries the estimate is 29 billion barrels of oil. In addition, there are substantive reserves of oil in oil shale. These reserves will carry the world well into the next century.

Dr. Peter Doerell, World Energy Council and Editor of the International Coal Newsletter presented the view that there are three postulates of any energy source, that is, safety of supply, low cost, and environmental acceptability. Of these the first is the most critical since energy is the lifeblood of a modern society and any energy shortage can be very costly. However, with growing environmental awareness throughout the world, future energy will have to be as clean as technically possible and economically viable. Dr. Doerell put forth the concept that the accusations that a growing carbon dioxide concentration from the use of fossil fuels will lead to climate disaster is totally unfounded.

These and other technical and economic discussions related to the carbon tax were eloquently summarized in the plenary presentation by Dr. Anwar Al-Abdullah Director of Oil and Gas Department, Secretariat General, The Cooperation Council for the Arab States of the Gulf, Saudi Arabia. Protecting and nourishing the environment has been, and remains an integral part of our social and economic existence. Often the position of the oil producers is not adequately understood by those who are in a hurry to monopolize environmental concerns as if to suggest that we have no concern for our common home. We cannot hope to achieve meaningful co-operation without an understanding of each other's views and underlying concerns. Selfish interest makes no sense any more as the Earth's environment knows no boundaries and the world is truly more interdependent than ever. At the heart of the debate should be the issue of development. The World Bank estimates that more than one billion people still live in acute poverty and suffer grossly

inadequate access to resources required to give them an opportunity for economic development. It is unrealistic to attempt to envisage global economic development without the use of energy, especially oil. Oil is the lynchpin of industrial civilization. While there is an explosion of knowledge in the field of climate change, there is still general agreement that continued research is needed to reach an objective assessment of the causes and effects of climate change. We could argue forever about greenhouse gases and climate change but it is more relevant to focus on the issues on which we should all agree, namely creating a healthy environment for economic growth and development and creating the atmosphere for stability and predictability in the oil market.

Further taxation of energy or oil under different forms, whether it be carbon taxes, import fees or some combination of these, does not help us to achieve these goals. Such taxes, whether for environmental motives, efficiency gains, protecting domestic production or merely for budgetary reasons, often sacrifice the underlying objectives of economic growth.

Many studies have questioned the effectiveness of carbon taxes in reducing carbon dioxide concentrations, The rationale is that such taxes operate through the price mechanism and give appropriate market signals to cut consumption and clean the environment. However, in reality, the energy markets in most of the industrialized countries, and especially in Europe, are far from perfect. Further taxes would simply aggravate such market imperfections.

The discrimination against oil in many of these countries has reached a point where taxes on the barrel of petroleum products is three to four times the price of a barrel of oil. At the same time coal, which emits more carbon dioxide than oil per unit of energy, has received generous subsidies, especially in Germany and Japan. Had such petroleum taxes or coal subsidies been readjusted according to environmental criteria and not merely a budgetary objective, the world environment would be cleaner without constraining growth and the final consumer would now be paying less at the gasoline station.

The GCC's record on the environment shows that we are supportive of international efforts to bring the important issues of sustainable development and environmental protection into international energy policy. However, we feel that there is a growing danger that environmental tax policies are misguided and could have a potentially disastrous affect on the international economy. The OECD's own extensive studies show that indiscriminate consumer taxes are not the least-cost, most economically efficient approach to combating global warming and reducing air emissions. On average oil contains about 21 percent less carbon than coal. Yet, we find that there is still considerable prejudice against oil, as a front-line energy source. After all, oil is taxed heavily enough as it is and far in excess of any contribution it may have in the environmental degradation.

Dr. Al-Abdullah conclude by reference to the total aid given to the developing countries over the last two decades. This averaged some 5.5 percent of GDP which compares with the 0.7 percent of GDP recommended by the UN and seldom reached by the industrialized nations. The GCC shares the view of the World Bank that poverty in the developing countries rather than the carbon dioxide issue is the root of

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global degradation. The scope for environmental upgrading is much larger in the developing countries and the developed countries should help the developing countries in advancing in the most rapid way possible through the transfer of technologies rather than through the imposition of additional taxes on energy.

Guy Caruso, Executive Director, Strategic Energy Initiative, Center for Strategic International Studies, in his plenary session referred to the IEA projections that world energy demand will grow by 66 percent and carbon dioxide by 69 percent between 1995 and 2020 unless new policies are in place to curb energy use and greenhouse gas emissions. And fossil fuels are expected to provide 95 percent of additional global energy demand to 2020. Additionally he stated that the supply will be mainly from the Middle East and the liquid fuels from nonconventional sources like heavy oils and tar sands will continue to play an increasingly important role as 2020 is approached and that the price of fuel will continue to rise. Substantive reduction in greenhouse gases are required to meet the commitments agreed in the Kyoto Protocol.

Caruso also pointed out that new policies will be required if nuclear power and non-hydro renewable energy sources are to help to reduce the future rates of growth of fossil fuel consumption and greenhouse gas emissions. These policies would need to encourage the development and demonstrations of new designs for less costly nuclear power plants and determine the locations for permanent repositories for radioactive wastes. Unit costs of renewable energy must be reduced and, in some cases, environmental problems must be solved.

Energy intensity will continue to fall, as in the past, through the introduction of new technologies, economic and industrial restructuring and the substitution of commercial for non-commercial fuels. In light of the stability of past energy trends, major new policies will be required to provide the necessary market incentives to speed up reductions in energy intensity in order to stop the growth in carbon dioxide emissions. These policies will need to take account of economics, social and political constraints.

Rapidly growing electricity demand and the need for climate-friendly technologies in non OECD countries will require foreign investment to support financing from domestic sources. This, in turn, may require restructuring, privatization and regulatory changes in the electricity industries in these countries.

Michael Lynch, MIT, United States, presented evidence to show that the economic projections on the price of oil are inconsistent with reality. All projections since the 1970's have indicated that the price of oil will rise in the future and when one returns to the mid 70's projections we should now have prices in the order of \$90 per barrel! This is a far cry from the present value hovering about \$12. In spite of this reality, the economic projections still forecast escalating prices. Lynch pointed out that his forecasts on oil prices were the lowest, yet, still predicted prices which were beyond reality. Perhaps we need to revisit the many assumptions and assertions which are used in the computer generated forecasts in order to be able to predict with a reasonable degree of certainty the future costs of oil? These forecasts are driven in part by pessimistic supply forecasts. However, those supply

forecasts are flawed because of the omission of key variables, which invariably lead to predictions of a near-term peak and decline, almost without regard for the geological and economic circumstances of an area.

Unconventional energy producers should be careful, therefore, to avoid optimism about the future market environment, and must focus on cost reductions and other improvements in order to gain competitiveness, rather than relying on market changes to deliver market share to them.

The recent introduction of horizontal drilling as presented by Michael Wilson and Peter Catania clearly pointed out that the advances in technology due in part to incentives provided by government has had a positive effect on the reserves and productivity of wells which were economically marginal using the standard vertical well technology. In one region within the Province of Saskatchewan 50 percent of the annual production is from horizontal wells. This is just one of the many new technologies which will result in increasing reserves and enhance production with positive economic results.

Several presentations on renewable energies clearly indicated their economic viability and one such case was reported from Italy where geothermal energy was used in greenhouses. The most important conclusion was that production was possible when market prices for the products was four to five times more than the regular price in the normal growing season. Ziegelmann *et al.* Discussed the impact of renewables in Germany and concluded that the conventional power industry will suffer most from an extension of renewable energy systems. While the net employment effect is positive when reducing carbon dioxide emissions by 10 percent within 20 years (approximately +3,800 employees), the balanced net effect is negative in the case of a rapid expansion of renewable energy systems in order to lower the carbon dioxide emissions by 24.1 percent (approximately -9,100 employees).

The elements associated with the clean image of renewable energies was tackled by Dr S. A. Abbasi from India wherein he presented steps that should be undertaken to insure that the renewable energies do not suffer from the same environmental backlashes of the type we got from hydro-power projects.

John Tande, the representative of the Norwegian Electric Power Research Institute, discussed the implications of exploiting wind energy in proximity to weak electric grids. The number of ways to overcome this potential bottleneck are as follows: (1) Grid reinforcement by installation of new lines, (2) dissipation of wind energy, (3) application of energy storage, (4) introduction of load management and (5) regulation of reactive power. He described and illustrated these through the presentation of the results of actual experiences from relevant wind power projects. By applying the methods described above more wind power can be connected economically to weak grids.

In the case of biomass, Mohammed Sheya and Salvatory Mushi from Tanzania stated that biomass accounts for 92 percent of Tanzanian final energy consumption and will continue to dominate the national energy balance. Fuelwood and agricultural residues used to meet domestic energy needs account for 80 percent of the domestic energy requirements while commercial energy such as kerosene, electricity and liquefied petroleum gas account for 1 percent. Total biomass

resources for 1990 were 27.0 million tonnes of oil equivalent. While there are efforts to develop other renewable sources of energy such as solar, wind and minihydros, there are also problems hindering their development. They include the lack of adequate data on the actual potential of these sources as well as lack of local capacity to design and manufacture energy related equipment and spare parts. The comments of these and other authors and researchers reaffirmed the need for fostering the transfer of technologies and industrial capacity and capability to meet the needs of society within developing nations.

Dr. Boris Berkowski of the World Solar Commission described the work of UNESCO and presented the results of the World Solar Summit held in 1996. The three main results of the Solar World Summit can be summarized as follows: Renewable energies are recognized as being an important component of the energy sector in the 21st century and as being worthy of development and use on a large scale in the coming decade. The decision was made to launch Solar World Programme 1996-2005 as a common effort of national governments, specialized agencies and programmes of the United Nations, inter-governmental and non-governmental organizations, university and research institutions and the private sector. The outline of the World Solar Programme 1996-2005 was approved and a working decision was made to elaborate a full-fledged WSP document by July 1997. UNESCO was invited to continue to play a leading role in the WSP preparation. It is vital that each and every research organization in the world be actively involved in this programme by receiving a formal letter of invitation which can then be presented to the national government wherein the organization is headquartered so as to have substantive global input from both the developed and emerging nations.

Other authors presented case studies and experimental results on the utilization of renewable energies such as the characterization of photovoltaic generators in Switzerland (Dr. William Durisch), reverse osmosis using photovoltaic systems in Oman (V.K. Sharma).

Within the section on energy policies and economics several issues were presented in addition to those of the plenary speakers. Dr. Mandouh Salameh, an international oil market expert, said "In 1995, OPEC was producing at only 55 percent capacity. By 1997 utilization had risen to 95 percent. No wonder then, that the *capacity question* has been termed oil's perennial problem. The dilemma confronting producers is either they face the danger of over-investing if demand grows slowly or not at all, or they run the risk of investing too little, too late. Yet, without outright investment, the capacity constraint may start to bite at some point in the near future. One has to seriously consider the possibility of a third oil crisis capable of again disrupting the global economy, triggered by political upheaval in the Middle East.

Henrich Lund described the plans of Norway to move from a centralized power generating economy to a decentralized system based on energy efficiency at individual places of consumption and renewable energy systems adopted to local conditions. This change demands not only technical modifications, but also large organizational changes, which will often comprise the establishment of completely new organizations. The case of electric heating conversion illustrates how public regulation has resulted in reductions in carbon dioxide emissions together with the creation of 150 jobs. It is

projected that in the near future more than 1000 permanent jobs can be created without negative consequences for the balance of payments. This is one example that other countries should examine on how to transfer the concepts in Norway to their specific energy economy.

Klimenko from Russia presented a different perspective on the issue of a carbon tax. He concluded that for actual climate protection an implementation of a global carbon tax seems unnecessary. It was argued that adequate measures on forest preservation and restoration will be more effective and universal.

Barry Barton, School of law, New Zealand discussed the legal difficulties that may be encountered in reforms where the electricity and gas industries are being exposed to market liberalization. Contract law, energy sector regulation and competition law are some of the more obvious legal issues but he argues that a wider range of questions such as privacy and human rights must also be taken into account. This fresh approach allowed for a systems analysis of energy deregulation.

Many other perspectives on the systems analysis of energy were included in sessions related to waste energy and environmental control, architecture, coal, thermal storage, energy modeling and risk assessment.

The Jane Carter Prize

The British Institute of Energy Economics, the International Association for Energy Economics and the Association for the Conservation of Energy invite the submission of essays for the 1998-99 award of the Jane Carter Essay Prize. The prize for 1998-99 will be a cash award of US \$800 together with a plaque.

Essays can be on any aspect of energy efficiency and conservation or on aspects of general energy and environmental policy which are relevant to energy efficiency. The aim is to encourage new thinking on these subjects. The emphasis of the essay should, therefore, be on the policy, rather than the scientific or technical, aspects of the subject.

The competition is open to anyone under the age of thirty-five. Essays should not be more than 8,000 words long. They can be based on work done for another purpose, e.g., an academic thesis or policy report, but the results of that work should be presented in an original form. The winning essay will be considered for publication in a range of energy and environmental journals.

Essays should be submitted in English, in triplicate and typed form by 30 June 1999 to:

Mary Scanlan, Administration Secretary
British Institute of Energy Economics
37 Woodville Gardens
London W5 2LL
United Kingdom

Each essay should include a 150 word summary. The name, address and age of the author should be on a separate sheet which can be detached from the essay which will be judged anonymously. Manuscripts will not be returned.