Energy, the environment, and the economy

At the 14th World Energy Congress, conclusions underscored the magnitude of a "three dimensional" problem

by W. Kenneth Davis

The principal energy questions addressed by the 14th World Energy Congress were: Does the world have adequate economic energy resources to support the socio-economic needs of both the developing and industrialized countries? Are energy resources in the forms needed available at reasonable prices to all countries wanting them? Will research and development produce new energy supply options and more efficient use of energy — and when will such development be likely to be applied on a significant scale? Can energy be produced, transported, and used in an environmentally acceptable manner—and at costs which allow for economic health and growth?

Energy resources and supply

It must be said at the very outset and very positively that the energy resource base is not a basic problem in the foreseeable future.

Oil and natural gas. There was general agreement (at the Congress) with Mr Boiteux's suggestion that oil will continue to be the dominant energy resource throughout the first half of the 21st century. The supply and utilization of oil will have the greatest social and economic impact, will undoubtedly be at the centre of geopolitical deliberations, and will be a major factor in all environmental considerations.

While proven reserves of oil and gas in many areas are not large as compared with the rate of use, there are usually substantial additions with time. This is because it is generally not economic to establish proven reserves more than 10 or 15 years in advance of their expected production. In those cases where domestic unproven resources do not allow reserve additions to keep up with production, there are large worldwide resources. These are usually available on the market at competitive prices. One important issue is making the maximum use of market forces in establishing prices and assuring availability. However, there is considerable support for international dialogue between producers and consumers to manage prices.

New technologies for finding and producing oil and gas are continuing to evolve. New technologies for

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enhancing (increasing) the recovery of oil in place are continuing to evolve and be applied. Some, however, are costly and, in any case, the effect on production rates (as distinguished from ultimate recovery) is not large.

New technologies are continuing to be explored to make available, at prices which may be acceptable soon or in a few years, hydrocarbons from such non-conventional sources as tar sands, very heavy oil, shales, and ultimately coal. The resources of such hydrocarbon sources greatly exceed those of conventional crude oil and, in addition, are located in quite different geographic locations. They do provide reassurance that liquid (and gaseous) hydrocarbons will be available for needed uses, particularly transport fuels, far into the 21st century.

Gas is relatively plentiful (as compared with its rate of consumption) on a worldwide basis. However, the costs of transport may be a major factor for the consumers remote from the source of supply.

Energy prices. Many energy prices such as those for gas and coal are related to the world price of crude oil and will be in the foreseeable future. The price of crude oil, in real terms, will probably increase gradually over the next decade or more. While the possibility cannot be discounted, there are not expected to be large or sudden increases. Stability and predictability are very important to those countries which do not have adequate indigenous energy resources.

In a market-driven economy, the prices of energy sources will increase to provide for the exploration, development, and production of future supplies. If the market fails to provide high enough incentives, the effect may be a larger increase in prices over those that might otherwise have prevailed. Free markets and free trade seem to be highly advantageous in accomplishing this matching of supply and demand although there is some support for managed oil markets.

Uranium resources and fusion. In terms of potential energy, uranium vastly exceeds fossil energy resources. The energy available from using uranium in current reactors is very large and the known reserves of uranium have been increasing despite very slack demand. If uranium is utilized in breeders, a reactor type already quite well developed in several countries, the energy available is very large. The potential energy from fusion is even higher but fusion is unlikely to be applied practically during the next several decades.

Coal resources. Coal is one energy resource that is reasonably well defined at least as compared with oil, gas, and uranium. While the recovery can be increased at added costs by going deeper, mining smaller seams, etc., the resource base is quite well known. Transport costs and provision of necessary shipping facilities are an important factor in the use of coal, domestically and internationally.

Alternate and renewable energy sources. There is no question but that alternate and renewable energy resources will contribute to the world's energy supply. There will be many applications for such energy sources in special circumstances where they are appropriate and economic as compared with other alternatives. For example, many developing countries will utilize biomass (wood, etc.) and biogas to support their developing economies for a long time into the future. In the long run, these renewable resources will be supplemented by more conventional energy sources.

One important message from the Congress is that there was general agreement that solar energy was unlikely to be a major source of economic and environmentally benign energy for several decades.

It must be recognized from a realistic point of view that alternate and renewable energy sources are not likely to provide a major part of the world's future energy requirements in the foreseeable future except for hydroelectric power. Hydroelectric power is likely to play a major role in some areas although the potential has largely been exploited in others. It must also be recognized that not all alternate and renewable energy sources are environmentally benign either, in the short or long term.

The WEC

In January 1990, the World Energy Conference (WEC) formally changed its name to the World Energy Council. Headquartered in London, the WEC is a nongovernmental organization representing more than 80 countries that studies global energy matters. Congresses are held every three years, with the next one scheduled in 1992 in Madrid, Spain.

The 14th World Energy Congress was held in Montreal from 18–22 September 1989. Technical sessions provided much up-to-date and valuable information on a great variety of important energy-related subjects, Mr W. Kenneth Davis, Chairman of the Programme Committee, noted in his concluding statement. He said this information should be of particular use to many of the developing countries in terms of energy technology and information on sources of technical information. The sessions, he added, also provided a considerable amount of background data when viewing "energy for tomorrow" in the broad context of future energy issues. Mr Davis further credited Prime Minister Brian Mulroney of Canada with starting participants "down the right path" with his address to the Congress: "In Canada," the Prime Minister said, "we believe that environmental sensitivity and economic growth go hand in hand. We no longer have the luxury of trying to have one without the other. But, we also believe that if we are to have it both ways, as we must, we will have to change our attitudes — and change them profoundly."

More information about the Congress may be obtained from the WEC, 34 St. James Street, London, SW1A 1HD, United Kingdom.

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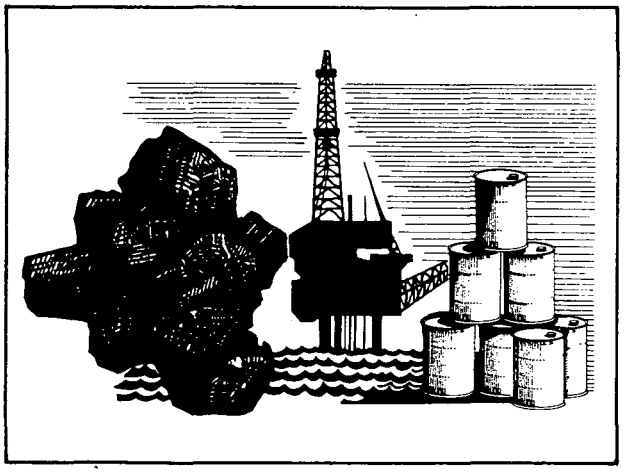
Electricity and nuclear power

The special role of electricity is an important subject for consideration. While total energy use in the industrialized countries is growing slowly, the use of electricity has increased steadily due to its convenience and efficiency for a variety of tasks. Electricity has become the lifeblood of both developing and industrialized societies.

The increased use of electricity in many of the smaller and poorer developing countries represents a particular problem. This problem is due to the high cost of importing the necessary generating equipment, as well as the generally high cost of the equipment *utilizing* electricity — most of which must be imported as well. In contrast to the development of some other forms of energy, the use of electricity does not directly produce foreign exchange to repay investments. This issue is not well understood despite numerous studies, and the institutional assistance for the developing world is inadequate.

Nuclear power. It is anticipated by most, but not all, observers that as the electricity demand continues to grow in the industrialized countries nuclear power increasingly will be recognized as an essential means of producing economic and safe electric power. This view has received significant impetus from concern about the potential global warming because of the negligible emissions of carbon dioxide from the overall nuclear cycle.

The use of nuclear power in certain developing countries may be rational, but does not seem logical or timely for countries with limited resources and technical training, and small power demands. The support of nuclear power operations is proving a demanding task. The Institute of Nuclear Power Operations (INPO) in the United States and the World Association of Nuclear Operators (WANO) on an international scale have been established to assist the owners of nuclear plants in safe and efficient operations, including excellence in management, training, and maintenance.



The worldwide problems with adverse public opinion on nuclear power need to be addressed by all. The lack of understanding of the available information, as well as a feeling that there is no reason to take any additional risks, however small, unless there is a need to do so — a need now becoming evident in the USA, the USSR, and elsewhere — remains an obstruction to its orderly development.

Energy efficiency

Energy efficiency or "conservation" is an important issue. It is necessary to be realistic about it in as much as few subjects have been or are the object of as much wishful thinking. Energy efficiency/conservation is being widely promoted as the complete and obvious solution to the environmental and potential global warming problems, as well as to the long-term availability of energy resources. While there is no doubt that there are substantial further improvements in energy efficiency which can be achieved on an economic basis, and that these can contribute to the alleviation of the environmental problems, these possibilities must be kept in a real world perspective. The potential impact on the economies of the world and the various countries, especially the developing countries, must be taken into consideration.

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Historically, the principal driving force for improving energy efficiency has been relative increases in the real prices of energy as compared with other economic factors. While this is ignored by many observers it also leads to many suggestions for driving conservation by increases in energy prices by taxes and fees — and by regulation. The result inevitably is a "reoptimization" between energy use and capital investment which shows improved energy efficiency — but at a higher total cost. The increase in total cost generally has an adverse effect on the economy.

Energy and the environment

The subject most discussed at the Congress was the environment (generally including health and safety as well). The environmental issue attracting the most attention was the potential for global warming due to the

accumulation of the "greenhouse" gases, notably carbon dioxide.

A basic point was made by the Prime Minister of Canada (Mr Brian Mulroney) who stressed that environmental costs should be paid by the polluter and that the polluter was "us", the consumer.

It was noted that (1) many, but not all, of the "greenhouse gases" (carbon dioxide, nitrous oxides, methane, chlorofluorocarbons, etc.) are associated with the production and the use of energy; (2) much more research is needed both on definitions of the problems as well as on potential solutions; and (3) the problem to the extent it exists is international in character and its alleviation requires effective international agreements on policies and particularly implementation and control.

The importance of the principal "greenhouse gas", carbon dioxide, was noted (but not stressed), as well as the very crucial technical issue of making accurate predictions in view of the effect of clouds and the interactions of carbon dioxide with the oceans and vegetation.

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It was also suggested that the potential increase in global warming might be advantageous for some geographic regions, for agriculture, etc. Thus, there is not complete agreement on the necessity for a "solution".

It was also pointed out that, in any case, reasonable measures to alleviate the effect of the "greenhouse gases" would be most unlikely to reduce the problem, to the extent it might exist, enough to be more cost effective in the long run. Clearly this requires much further realistic and objective analysis.

Attention was directed to the important environmental research programmes conducted by the World Meteorological Organization (WMO) as an example of the types of institutions and systems that are needed in other fields of environmental research and analysis.

Many other environmental issues were raised relating to "acid rain"; the disposal of high-level radioactive wastes; air pollution in general, especially as the result of the use of automobiles (ozone and smog); and the disposal of the increasingly vast amount of solid and liquid wastes. These are critical issues that are with us now and which must be dealt with urgently by strong measures — market driven and, where necessary, by regulation.

The price of energy should include all of the costs associated with its production and use, including environmental costs. These costs often are not paid directly by the producer or consumer. Means should be established to accomplish this. There is substantial logic in capturing environmental costs through user fees or taxes — *the income from which is specifically devoted to meeting these external costs.*

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An additional important observation was that many environmental laws and regulations, particularly those in the United States and in those countries following the USA's example, are "absolute" in the sense that they are not arrived at by comparisons of the benefits with the costs and do not permit cost–benefit analyses in their application. In many cases, they are arbitrary as well in setting wholly unrealistic requirements without regards to actual probabilities and conditions.

It is suggested that institutions and systems need to be established at the international as well as the national levels to make objective analyses and to set rational environmental standards. The simple fact is that adherence to many of the existing standards is not only unrealistic but prohibitively expensive — and if pursued can only have adverse economic consequences.

Developing countries

A very important environmental issue concerns the developing countries. Mr A.Churchill of the World Bank suggested that the developing world will need approximately US $1 trillion dollars to meet their electric power needs over the next decade and that about US $200 billion will come from the World Bank and other multinational and bilateral sources. This raises the question of where the remaining US $800 billion will come from.

The industrialized countries must engage in a much broader dialogue with the developing countries than in the past. They can and must provide assistance in environmental and energy technology and training — as well as investments to assist in developing and using energy efficiently and with minimum environmental impacts. Such dialogue should be handled systematically *now,* under the auspices of the United Nations.

Energy research and development

Past concerns about energy resources and supplies, national energy security, and the perceived high future cost of crude oil stimulated massive research and

development programmes on new energy sources, new energy conversion processes, etc., in the period from 1973–81. While substantial research is continuing, much of the driving force arising from prospective high crude oil prices has disappeared and many programmes have been reduced or abandoned. More attention is being given to alternate and improved energy sources as well as processes leading to greater energy efficiency — in the context of economic applications in the next decade or two with oil prices only expected to increase moderately in real terms.

There is a growing realization that research and development is largely evolutionary and that applications on a significant scale take a long time. The hoped for "magic solution" from energy research and development is no longer regarded as a realistic prospect.

Closing observations

From what we have observed from the Congress, it seems clear that the next decade, the 1990s, will focus on trying to resolve the "three dimensional problem" of energy, the environment, and the economy. While it is easy, at least in a relative way, to analyse the balance of trade-offs between energy and the environment, or between energy and economies (including social aspects) — two dimensional analyses — the problem involves all three components and must be treated in that way.

There was agreement that while technology could assist in resolving energy problems, particularly in the long term, the basic issues with respect to energy were institutional. As the Lord Marshall of Goring asserts: "...in the energy sector our progress or lack of progress in the future will depend upon our success in solving institutional problems."

The major issue is how to "orchestrate" the decision-making process both at the national and international levels. Suitable institutions and processes do not, in fact, exist at the international level and at the national level in most countries today. It is, of course, not enough to make decisions — they must be implemented. This is likely to be difficult on the international scale as well as nationally. This is the realistic and formidable challenge of the 1990s.

Energy decisions are no longer the sole domain of governments and industry. The public must be informed and involved in the key decisions. Simplistic or emotionally driven solutions are not likely to either be correct or feasible. There is a great abundance of such suggestions today. Our future depends on careful and considered actions based on the best information and analyses available — and, as is always the case, the judgement of experienced and able people in dealing with issues which are not simple and may not necessarily have one "right answer".

The World Energy Conference views its role as providing international studies of energy matters and a forum for international dialogues on energy matters, including environmental and economic aspects, to provide objective and broadly based data for those who have the burden of making the decisions. The WEC can identify and define the issues, collect, discuss, and analyse the relevant data, provide options, and make recommendations.

However, it will be up to the national and international political systems to take and implement the decisions.

The WEC carries out studies on a uniquely broad basis as a non-governmental organization which nevertheless has participation from many government representatives as well as those from industry, academia, and other sectors. It represents 87 countries ranging from the West to the East, to the Far East, and from the North to the South, and has attracted representatives of more than 100 countries to this Congress.

We have been encouraged by a message from E.Shevardnadze, Minister for Foreign Affairs of the USSR: "We consider that the World Energy Conference makes an important contribution to the solution of global energy problems and this is of vital importance for the whole of mankind and will influence the fate of future generations."

To this end, the WEC is instituting an ambitious new study ... on "Energy for Tomorrow's World — Realities, Real Options, The Agenda for Achievement". Every effort will be made to present the results of this study for critical discussion at the 15th World Energy Congress to be held in Madrid in September 1992.

Finally, it seems fair to say that while the WEC is well aware of the magnitude of the world's energy problems, it ends this Congress with a broadly shared feeling of solid optimism that the issues will be successfully resolved over time to the benefit of us all.

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