INTERACTION COUNCIL

Established in 1983

31st Annual Plenary Meeting
9-11 May 2013
Manama, Bahrain

REVISED

ENERGY IN THE 21ST CENTURY: CHALLENGES AND OPPORTUNITIES

by

Majid Al-Moneef
Secretary-General,
Supreme Economic Council of Saudi Arabia

My remarks today will cover two main topics: the changing global energy landscape and the emerging energy challenges of the 21st century.

Over the years, energy has powered the sweeping economic changes that have transformed the world. The dominant fuel in the energy mix transitioned from biomass to coal to oil. Each new fuel was in some way better, faster, cheaper or more suited to its purpose than its predecessor. Technological innovation brought new uses to fuels that transformed the energy system. Today Some 87% of total world primary energy demand is met by fossil fuels – oil, coal and natural gas. Wind, solar, geothermal and other non-hydro renewable resources provide just 1.6% of total world energy.

The global consumption and production of energy in general and oil and gas in particular have shaped in a way or another, the patterns of global economic growth, international trade and geopolitics throughout the last century. The forces of globalization besides enhancing trade, allowed the diffusion of technology across borders, brought standardization, ensured efficiency gains and unprecedented flexibility in energy production and consumption.

However, the energy landscape of the 21st century looks distinctly different than that of the past century. **First,** the rate of growth in energy consumption of the advanced economies which averaged 2.3 percent annually during the second half of the past century slowed down and averaged 0.2 percent annually in the first decade of the 21st century against a global and Non-OECD growth of 2.5 and 5.2 percent annually respectively. The emerging economies have accounted for almost all the net incremental global demand of 13 million barrels per day (MBD) and 70 percent to the incremental global gas demand of 814 billion cubic meters (BCM) over the period 2000-20110. The developing countries are projected to contribute 82 percent to incremental global primary energy consumption through 2035 and to overtake the OECD in the level of oil and gas demand before 2020. This means that the dynamics of energy markets are increasingly determined by countries outside the OECD. This energy demand shift is fueled by the remarkable endogenous growth increasing being decoupled from the growth of the economies of the OECD.

The second feature of the energy landscape of the 21st century is the increasing role of technology in enhancing efficiency, diversifying the energy demand mix and responding to environmental concerns. The great technological advances in the

transportation sector (whether electric or hybrid or more efficient vehicles) and in the power generation and transmission sectors (the smart grid, combined cycle, green buildings, etc.) are contributing to efficiency improvements worldwide. Technology is also playing major role in increasing and diversifying the sources of energy supply and solidifying energy security. Thanks to technology the energy resources today are more plentiful and diversified. Exploration and production technologies such as horizontal drilling, hydraulic fracturing, 4D seismic, etc. have contributed to increasing oil and gas resource base substantially and increasing supplies worldwide, putting to rest at least for now the concern over "Peak Oil". Global proven oil reserves increased from 667 billion barrels in 1980 to 1.6 trillion barrels in 2011 after an accumulated production of around 800 billion barrels over the period, so did gas reserves from 81 to 208 trillion cubic meters (TCM). The non-conventional oil and gas resources (such as oil sands, shale oil and gas, extra heavy oil, etc.) considered difficult to extract and uneconomic in the past century are contributing the lion's share of incremental supply today and are projected to contribute 44 and 39 percent of incremental oil and gas production by 2035.

The third important feature of the emerging energy system and relations is the central role of markets in finding solutions to the underlying energy challenges. The remarkable growth performance of the developing countries the past few decades wouldn't have been achieved without the open market policies, the prudent macroeconomic policies and the trade and price reforms undertaken in many of those countries the past few decades. Similarly, technological innovations wouldn't have been achieved without the proper market signals, fiscal incentives, transparency of energy prices and the favorable investment climate in many parts of the world. This trend is projected to continue with new developments in the form of reexamining and redesigning the energy subsidies in many developed and developing countries to ensure efficiency, equity and environmental protection. The international prices of oil and gas, long a concern to producers and consumers, are becoming more transparent with the regulatory framework governing the interaction between the physical market of oil and the financial markets undergoing overhaul following the financial crisis of 2008.

The fourth feature is the increasing integration of the environmental concerns into the energy and economic policymaking framework in the national and international levels and into the business decision making. This integration is becoming less costly to governments and businesses due to the advances in technology and the efficiency of

markets. This integration runs across all countries and all businesses and most likely to continue irrespective of the economic downturns or crises in different parts of the world. One reason for this is the growing environmental awareness worldwide exemplified by the post Kyoto framework as well as the New Millennium Development Goals (MDG). Today almost all future global energy outlooks of the international organizations, the national energy projections and the businesses incorporate in some way or another either an environmental impact assessment or scenarios in their world, national or business energy outlook.

The fifth feature is the growing role of the national energy companies in the production of energy resources worldwide. These companies are totally or partially owned by the governments of the producing and consuming countries and are run commercially and expand globally. Their operations currently in local oil and gas production and processing, are expected to expand globally and into renewables as well.

The sixth feature of the emerging energy relations is the political strategies associated with the shifting consumption and production patterns. The central role of the Middle East in global oil supply the past century which through its excess production capacities eased the frequent supply interruptions is being reconsidered due to the declining role of oil in the energy mix and the increasing North American energy independence. However, the strategic importance of oil exports is not dependent on whether petroleum goes from one nation to another at any given time, but rather it is dependent on the supply of the overall global market to which oil exports mainly from the Middle East will increase steadily in spite of any shifts in North American energy balance. The IEA estimates that there will be a steady increase in Gulf production capacity through 2030 –from 25 million barrels a day of capacity today to some 35 million in 2035.

Challenges

The coming decades of the 21st century will certainly face numerous challenges of increasing accessibility, affordability and reliability and reducing environmental impacts. **The first** of such challenges is forecasting global energy balances in face of the mounting uncertainties. The poor record of long term energy forecasting is partly due to the extrapolation of historical trends into the future. This necessitates that policymakers and industry consider forecasts with caution by understanding their inherent assumptions and methodologies. This might also necessitates some

coordination among the forecasting agencies and between them and the stakeholders to examine and reconcile the different methodologies and assumptions.

The challenge of forecasting global, regional or national energy balances poses the important issue resource pessimism or abundance. The escalation of oil and gas prices in the second half of the 2000-2010 decade and the supply interruptions and demand surges then, gave rise to notions of resource pessimism such as the "peak oil" hypothesis. This soon gave way to a yet overly optimistic notion of the abundance of hydrocarbons resources following the development of the non-conventional resources such as the shale oil and gas as well as the oil sands. The fact of the matter is that conventional and non-conventional oil and gas are finite resources, the recoverable reserves of which depend on economics and technology, both changing considerably.
The second challenge is the dilemma of transition to a new energy system less reliant on fossil fuels. The transition to a different mix of energy sources like renewables is unavoidable but will require important changes and will take decades. Generally speaking, the energy system has historically evolved much more slowly than other technology-dependent sectors. It took eight decades for oil to overtake coal as the US primary energy source. Moving to wind and solar involves replacing the lower cost oil and gas which have higher energy density, with a more expensive lower energy density substitutes. Since renewables by and large need subsidization to compete, their ability to acquire durable market share will be impaired. The long-term challenge will be in improving the productivity of renewables relative to fossil fuels.

The third challenge relates to the role of governments in response to the underlying challenges. The decisions by some governments during the oil price escalation of 2005-2008 to embark on developing biofuels through systems of incentives and subsidies proved to be hasty and unsustainable, to which many governments soon rescinded and the outlook for such fuels became more modest. Likewise the decisions of many governments in response to the oil and gas price increases and to the public demands then to introduce systems of energy subsidies soon became burdens to the budgets and fostered inefficient energy uses, to which many governments try to phase out. In order to shape the energy system, governments must accurately understand the risk/reward perspective of industry before embarking on decisions involving subsidies, incentives, and regulation.

The fourth challenge is the need to tackle energy poverty defined as the lack of adequate, accessible and affordable energy to promote economic growth and satisfy

basic human needs. For example, electricity coverage in 2008 stood at 100 percent in the high income countries, 90 percent in the middle income countries, but was available to (45 percent) of the population in the low income countries. Likewise, per capita energy consumption in terms of tonnes of oil equivalent (toe) was 1.4 worldwide (and 3.6 toe in the OECD) but stood at only 0.49 toe per capita in Africa and 0.66 in Asia . Today it is estimated that around 1.3 billion people in the developing world do not have access to modern energy. The alleviation of energy poverty should therefore form a key pillar in strategies to achieve sustainable development and should be central to the achievement of the internationally embraced Millennium Development Goals (MDGs). International cooperation in this area, especially among the national, regional and international financial institutions is essential.

The fifth challenge is the integration, penetration and the spread of technology, which will be central to addressing the other energy and environmental challenges. Despite the technological advances in the recovery of hydrocarbons and the advancements in reducing their carbon footprints they alone won't be enough to meet expected long term energy demand growth. The world will need all safe and reliable supplies of fossil fuels, nuclear energy and renewables. The integration of different IT and transportation technologies into the energy systems will make energy accessible, affordable and clean and its use more efficient.

The sixth challenge is the water-energy nexus covered elsewhere in this meeting. Water is essential to the production and processing of conventional or non-conventional oil and gas resources, biofuels and nuclear energy. Likewise, energy is as essential in the production of ground or sea water. In all energy process, water resources are either depleted or contaminated, while energy resources are also depleted or misused in the production and consumption of water. The main challenge will be to internalize the costs of water depletion and pollution in the production of energy.

The last challenge to the emerging energy system is the impact of the policy initiatives related to climate change on energy consumption, production and investment patterns. This is reflected in the European Union's low-carbon energy transition and its carbon trading system. The U.S.'s wide range of mandates, incentives and regulations for low-carbon energy and China's energy and emissions targets in the12th Five Year plan. These and other national initiatives, if translated into policy

actions and regulations and if integrated into the global framework of UNFCCC will have profound impact on the energy mix and use as well as the technologies and investments associated with both.

The new energy system with all it challenges will require timely and adequate investment in all conventional and non-conventional hydrocarbon resources along their entire value chain. The transition to less carbon intensive system will also require investments in renewable and nuclear energies as well as energy efficiency. Advancements and penetration of technologies such as Carbon Capture and Sequestration (CCS), smart grids, PVs, EVs will make the energy system of this century more diversified, environmentally friendly and sustainable.