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How will your future be fuelled?

However, with time it has become evident that we have developed an insatiable appetite for energy with, on average, each one of us in our gargantuan 6.3 billion global population using four times as much energy today as our forefathers did 100 years ago, which in terms of coal consumption has translated into the amount of coal burnt each year on a worldwide basis equalling the amount formed geologically over a million years during the Carboniferous Period.

This intensive use of coal-generated electricity as a power source, has become a double-edged sword as coal produces more carbon dioxide than oil, gas or other feedstocks when burnt for power generation, and a significant enough quantity of carbon dioxide has been formed to adversely affect the biosphere and atmosphere.

From a human perspective, the repercussions of a carbon-based energy regime could be mass human migrations, and a major climate refugee and international relations problem as water stress and food insecurity tighten their hold in the wake of rising temperatures.

Although electricity has undoubtedly been a boon to the modern lifestyle underpinning significant social development and powering an unprecedented pace and scale of global economic output, the electricity generation sector has become the world's single largest source of carbon emissions and with coal-fired power projected to double by 2030, contributing 50% of total global emissions, an estimated nine billion tons of carbon dioxide will be added to the atmosphere. This trend is patently not sustainable and if we are to avoid overwhelmingly calamitous social and environmental consequences from burning fossil fuels, tomorrow's energy will have to be cleaner than today's.

Risks to security of energy supply

Compounding the threat to a sustainable future posed by man-made carbon emissions that could bring about a fundamental and irreversible shift in world climate are risks to the security of energy supply with their knock-on environmental and global warming effects.

In terms of the fossil triumvirate of coal, oil and gas, coal is our planet's most abundant and widely distributed fossil fuel, with oil and gas being less abundant than coal, although the peak oil debate notwithstanding, at this time there are adequate reserves to meet world energy demand. However by 2020, almost 67% of traded oil supplies, two barrels in every three, will be met by imports from just four regions – North and West Africa, Russia, the Caspian and the five states around the Persian Gulf, namely the United Arab Emirates, Kuwait, Saudi Arabia, Iran and Iraq.

This is an uncomfortable degree of concentration in the supply of such a crucial commodity, especially as Saudi Arabia will be required to supply at least 15 million barrels of oil a day by then, with this figure rising steeply if, for any reason, either Iran or Iraq were producing below capacity.

An associated risk of dependence is that with more than 80% of the world's remaining oil and gas reserves lying in areas that are controlled by national governments, decisions taken on the development of the resources needed to meet growing demand may not be taken on the basis of rational market economics, but on the grounds of narrow national interest.

This could mean that from a national perspective it would be more lucrative to limit development and to

allow prices to rise, which in turn would mean that energy shortage, expressed in very high prices, would hinder economic progress and reduce living standards around the world. This, in turn, would hamper the reduction of poverty in developing countries, which is a key factor in helping to ease pressures on the planet.

Another risk relating to the flow of secure supplies relates to the distances that energy travels between the energy sources and points of consumption, as the pipelines and terminals necessary to bring oil and gas supplies to customers are sometimes situated vast distances from their markets necessitating the crossing not only of continents, but also political and cultural boundaries along the way. These enormous distances create a host of challenges from oil-related political instability to the environmental risks of long-distance pipelines.

In the case of shipping, major oil spills constitute not only severe risks to marine ecosystems, they also contribute to energy insecurity and, for this reason, single-hulled vessels are being phased out in line with international requirements.

Soaring crude prices, which could be caused by a host of factors such as volatile markets, political agendas, instability caused by continued conflict in the Middle East, terrorism and extreme weather conditions that cause damage to wells and offshore platforms, hampering extraction, could force us into using whatever resources were available regardless of environmental consequences. This would affect not only emissions of carbon dioxide; it would also cripple our ability to finance the clean energy infrastructure that we need to fight global warming.

Another way of doing things

Worldwide carbon emission levels reflect the billions of decisions we make on heating, electric power and travel every day in our homes, offices and factories around the globe. From a positive perspective, this power of choice gives us the ability to actively influence our energy future through fundamental social and behavioural changes that enable us to minimise the environmental impact of energy production and consumption, thereby creating a sustainable future through innovative measures, such as cultural developments and sophisticated technological advances.

Since the transport sector accounts for around a third of global carbon emissions, an important cultural innovation that is assisting in the reduction of emissions from transportation is New Urbanism. This is a design concept adopted by many of the world's leading cities, such as Venice and Copenhagen, whereby compact, pedestrian-friendly urban areas are created by converting streets into pedestrian thoroughfares.

Known as pedestrian cities, these densely populated urban centres provide a diverse mix of residences, shops, services and open-air markets within networks of car-free neighbourhoods and work centres, transforming the cityscape from a car-orientated area to a people-friendly one, in the process eliminating pollution and saving millions of litres of transportation fuel.

Another area where considerable energy savings can accumulate in the built environment is in the field of architectural design, and in this capacity BP's award-winning Africa region head office at the V&A Waterfront ranks among the world's most innovative and sustainable buildings as it employs the latest thinking and most up-to-date



PHOTOGRAPH COURTESY OF BP

BEYOND 2007: A hydrogen bus takes transportation into the future.

technology to optimise energy efficiency and conservation. Some of the noteworthy aspects of this low-rise building include the installation of more than 400 solar panels on the roof, which is the largest solar power array in Africa; double glazing of the windows which is unusual for South Africa, but which plays a vital role in keeping the building's indoor temperature within a reasonable range; a passive air-handling system whereby air moves naturally through the building rather than being pumped; significant use of natural light through atrium roof lights, the provision of light shelves to reduce the requirement for artificial lighting and a lighting system that is both movement- and light-sensitive thus reducing energy load.

Advanced technological solutions

Throughout the ages, the universal need for energy and the development of various energy technologies has had a considerable impact on the shaping of humankind, with different methods of energy production creating different consequences for humanity and the environment alike.

The steam-driven Industrial Revolution, for example, revolutionised methods of production, initiating changes from manual to machinery-based manufacturing processes which stimulated productivity enormously. It was also the catalyst behind the creation of complex systems of transportation and communication.

The Industrial Revolution spurred the corporate form of business enterprise and effectively marked the beginning of urbanisation, democratisation, trade unionism and social reform, becoming the fore-runner of our modern industrial society.

From an environmental perspective, the change from wood burning as an energy source to coal-fired steam

power, meant the swapping of one set of problems for another.

The progressive technologies that we employ this century could well have just as significant an impact on our cultural and environmental future as steam and electricity had in the past. Certainly because worldwide, around half of the power capacity needed by 2030 has yet to be built, significant opportunities for reductions in carbon emissions can be created by making a sizeable amount of this new capacity from low carbon-generating technologies.

In this regard, groundbreaking technologies that reduce carbon emissions, such as offshore "wave farms", offer considerable potential. Amalgamating technologies from the offshore oil and gas sector, a 30MW wave-farm consisting of 40 wave energy converters designed to swing head-on into incoming waves while spanning successive wave crests, can provide sufficient power for more than 20 000 homes. Moored in waters five to 10km from shore, the 150 metre-long, semi-submerged, articulated and cylindrically shaped wave energy converters access the high energy levels found in deep swell waves, providing a steady power output from the machines' generators.

An energy revolution

Earlier this month, oil prices topped \$81 a barrel for the first time and although the price of crude has since dropped back into the high \$70s, the barrier to \$80 a barrel has been breached, with some analysts forecasting a 2007 year-end price of \$85 a barrel despite the Organisation of the Petroleum Exporting Countries' (Opec's) announcement earlier in the month that it would pump an extra 500 000 barrels a day from November to keep pace with demand as winter approaches in the northern hemisphere.

Although limits to tolerance for high oil prices have yet to be reached, with the potentially catastrophic repercussions of climate change acting with geopolitics and its associated threats of supply cuts as urgent incentives, the majority of nations around the world are making a push towards reshaping their energy policies in what could amount to a global energy revolution in which alternative forms of energy feature significantly in the energy supply mix in order to secure energy supplies with sufficient diversity and reduce carbon emissions.

Along with economic imperatives and political will, the main drivers of an energy revolution will be the lowering of psychological barriers towards renewable forms of energy and changes in human behaviour and lifestyle, together with significant advances in technology.

Until a relatively short time ago, concepts such as a carbon footprint, carbon market, carbon neutral summit, emissions capping and trading, food miles and carbon taxes on flights, were virtually unknown except to a select few.

Now, however, they have become a widely accepted part of our 21st century world, a world that is becoming greener by the day and, as such, they are indicators of just how far we have come in reconfiguring our energy future.

Creating a sustainable future within the context of a carbon-constrained world is a complex challenge for all of humankind. However, it is not insurmountable, for with a radically decarbonised power sector that utilises renewable sources of energy that are clean, efficient and safe, energy security and enduring long-term sustainability can be attained. We just need the will to reduce our carbon footprint, reconfiguring the energy supply mix in a worldwide programme of action in which everyone is involved and everyone has a role to play.

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PHOTOGRAPH COURTESY OF BP

INNOVATIVE AND SUSTAINABLE DESIGN: BP's award-winning Africa region head office at the V&A Waterfront.



PHOTOGRAPH COURTESY OF ESKOM

INFLUENCING OUR ENERGY FUTURE: Worldwide carbon emissions levels reflect the billions of decisions we make on heating, electric power and travel every day in our homes, offices and factories around the globe.

What on earth is a carbon footprint?

Everybody in the world has one. It's the amount of **carbon dioxide emitted each year** due to the energy we use. Calculate the size of your household carbon footprint, learn how you can reduce it, and how we're reducing ours at bp.com/carbonfootprint



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