

# Looking at Our Energy Future

*Over the next 20 years, energy consumption is expected to increase substantially. Meeting that demand will require the development of all forms of energy*

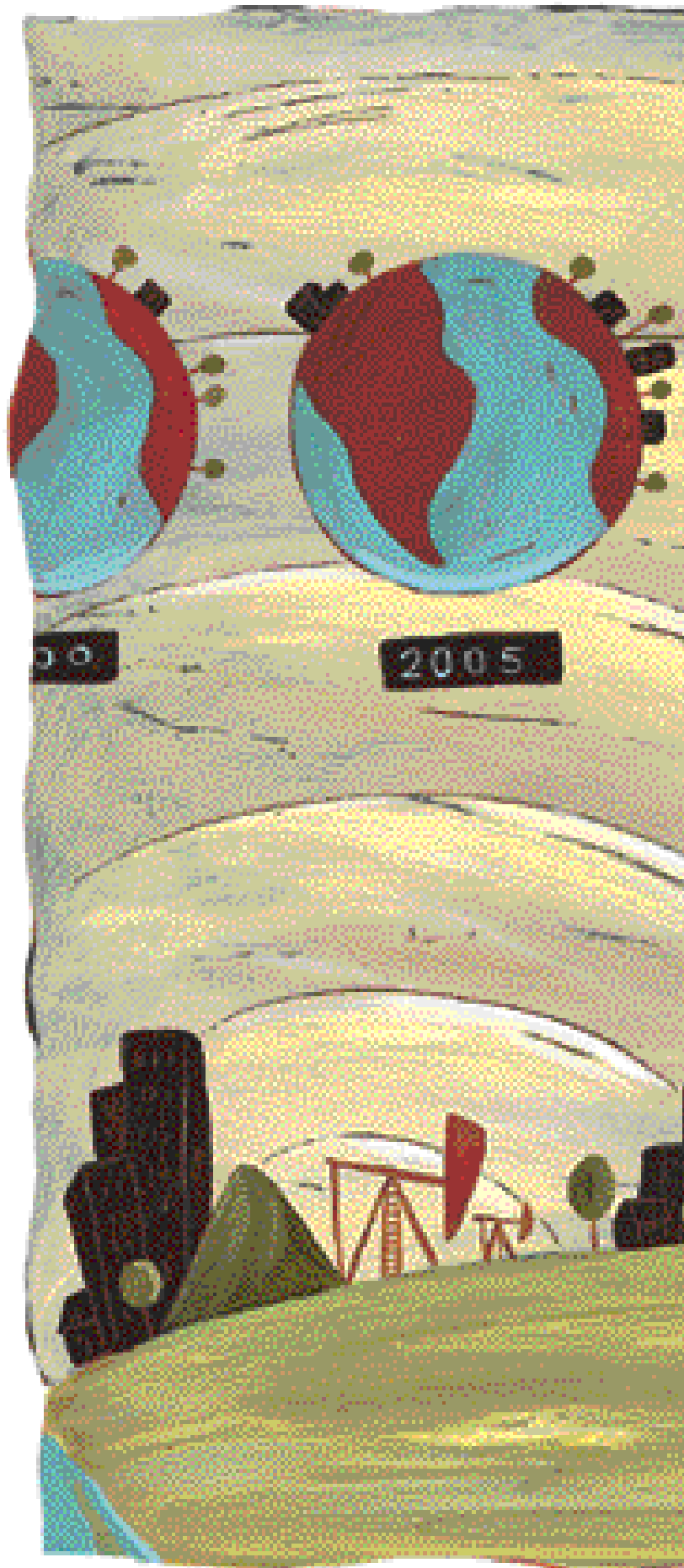
BY RUSSELL FELTON

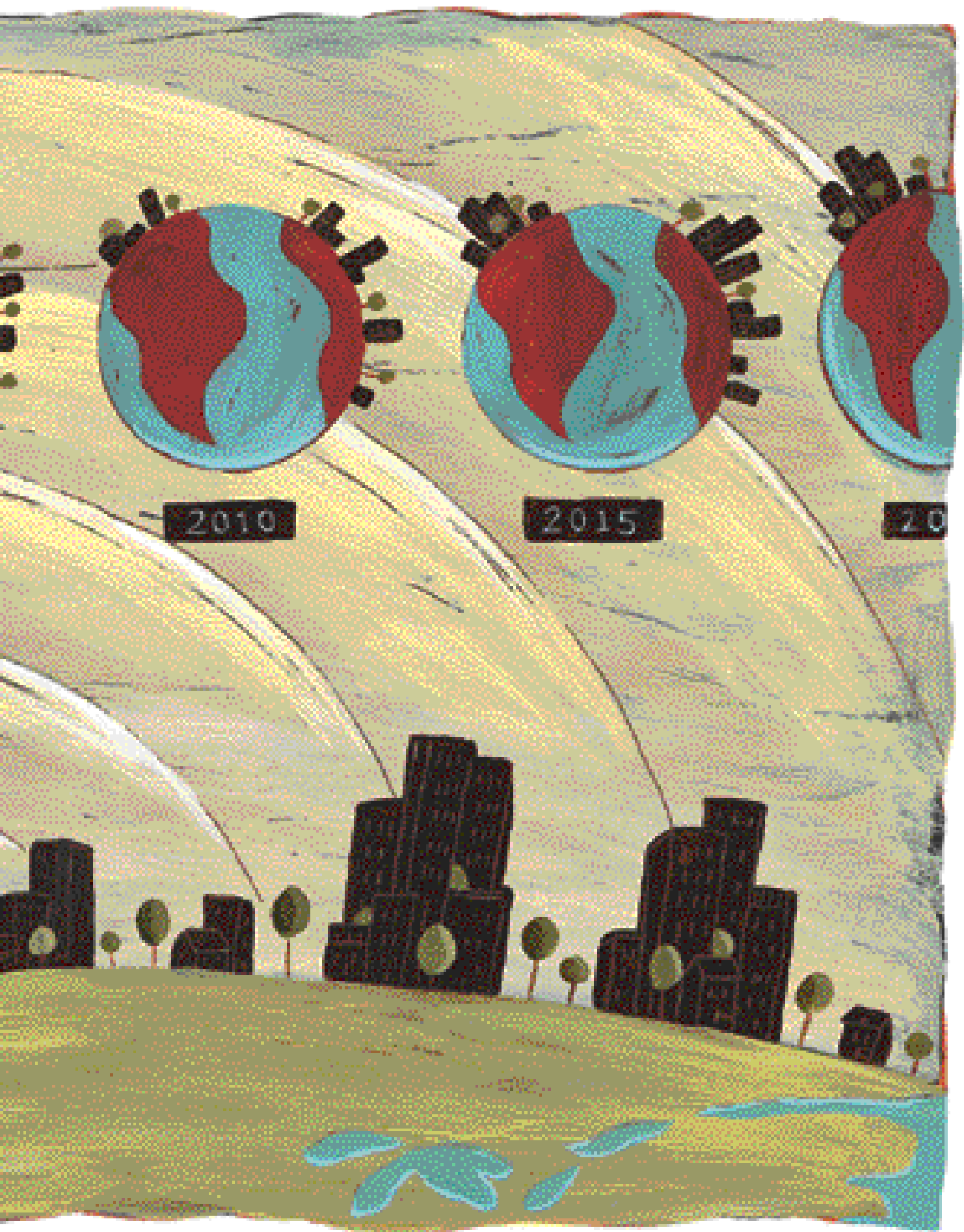


LET'S FACE IT," A FRIEND OF A FRIEND INSISTED at a recent and quite lively dinner party, "the end of the oil age is approaching. Twenty or 30 years from now, we'll all be driving electric cars and lighting our homes with power from solar panels and windmills. Oil was the fuel of the 20th century, but the 21st century will be different."

To support her argument, she cited a recent edition of the prestigious British magazine *The Economist*, which asserted that advances in hydrogen-powered fuel cells and so-called "biofuels" – alcohols derived from plants – represent "the first serious challenges to petrol [gasoline] in a century," and that they could supplant hydrocarbon-based fuels, essentially crude oil and natural gas, within the next few decades.

Speculation as to whether oil and gas can, or will, remain the dominant sources of the world's primary energy is hardly rare.







*The key point is that total consumption of all forms of energy over the next 20 years or so, both for the world as a whole and for Canada specifically, is expected to increase by about 45 percent”*

In recent decades, and especially since the so-called energy crisis of the early- to mid-1970s, experts and observers have been predicting that the world would soon run out of crude oil or that oil prices would rise to extraordinarily high levels – as much as (U.S.) \$100 a barrel – with either scenario precipitating economic and social calamity around the world. Others have speculated that far from facing oil shortages in the future, we are rapidly approaching a time when we will not need oil at all – the energy we’ll need will be drawn from other sources such as the sun and wind or from evolving new technologies like fuel cells.

In reality, history suggests that predicting future trends in the consumption and supply of energy, especially over terms of decades rather than years or months, is particularly difficult. Certainly, no one foresaw in the mid- to late-19th century that the viscous black liquid found oozing from the ground in various parts of the world would become its most relied upon and sought after commodity, fuelling not only undreamt-of forms of transportation but also unimaginable progress in almost every field of human activity, from agriculture and manufacturing to health care and communications.

Predicting energy trends is especially challenging because energy production and use can be dramatically affected by a broad range of factors, all of them subject to wide variability. Major scientific or technological breakthroughs, for example, can occur on either side of the equation – in energy use or in its production. And energy supply or demand can also be dramatically affected by unforeseen economic, political or military events.

To complicate matters further, crude oil is what is known as a “fungible” commodity, which is to say that supplies from one source can easily be replaced by supplies from another source. This was borne out during the energy-supply crisis of the 1970s, when the curtailment of oil shipments from the Middle East led to the rapid development of oil production in other parts of the world, which led in turn to relatively stable and declining – rather than rising – oil prices through the 1980s and 1990s.

These complications, however, don’t deter those who are directly or indirectly involved in the energy business from attempting to forecast supply and demand patterns over decades-long periods. As the U.S. media magnate Henry Luce once observed, “Business ... is a continual dealing with the future, a

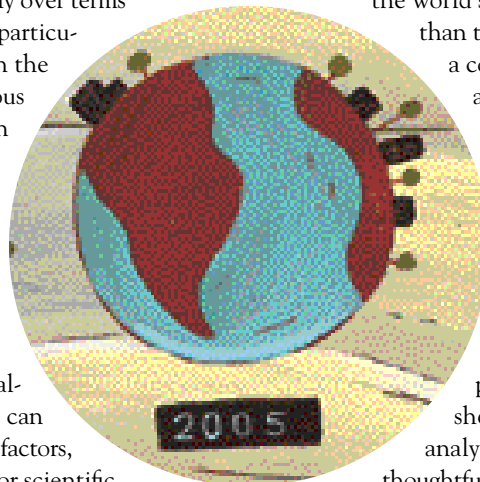
continual calculation, an instinctive exercise in foresight.” For the oil industry, gauging long-term demand for energy derived from oil and gas is critical to business planning, not least because developing new oil and gas resources requires long lead times and huge investments of capital and technology. To run out of oil would be disastrous to our economy and society. To spend billions of dollars now to produce oil 20, 30 or 40 years in the future that may not ever be sold or used would be disastrous to the industry and those who invest in it.

How realistic, then, is *The Economist’s* “end of the oil age” scenario? How likely is it that crude oil and its cleaner-burning cousin, natural gas, will be supplanted as the dominant source of the world’s energy over the next, say, 20 years? More than that, what is the outlook for Canada, as both a consumer and producer of oil and gas as well as other forms of energy?

Imperial Oil, on its own and through its affiliation with Exxon Mobil Corporation, annually contributes to the development of an outlook that assesses future economic growth and projected energy consumption both for Canada and the world in general over the next 20 years.

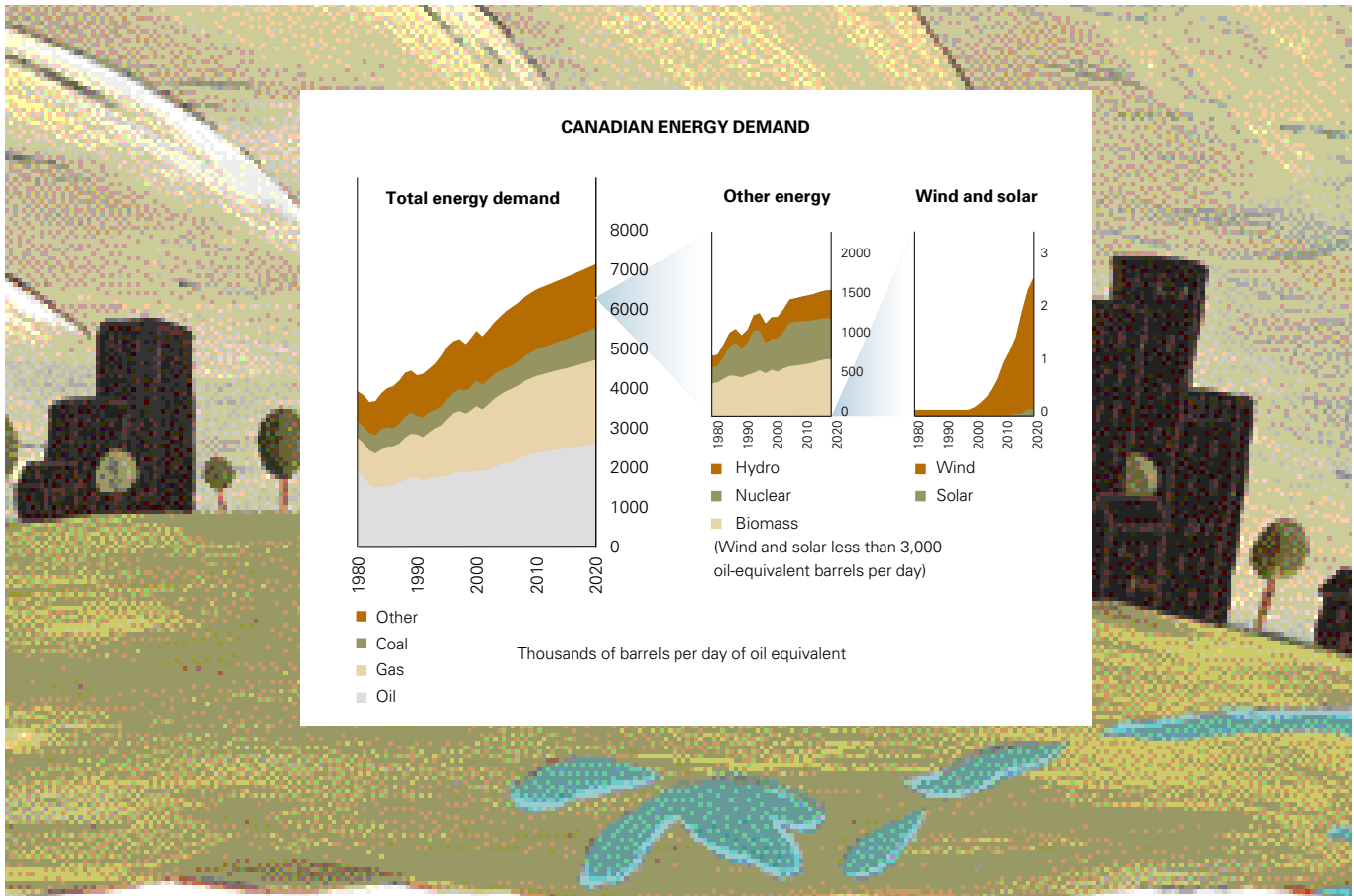
Jim Hughes is manager of the group that prepares Imperial’s outlook. A man whose shelves of heavy volumes on economics and analysis underscore his scholarly demeanour and thoughtful perspective on the industry, Hughes spends part of his time making the company’s views on future energy consumption and production available to governments and others with an interest in energy matters. That’s important, he says, because with the vast amounts of investment involved, projects to develop energy resources depend on a supportive – or at least not obstructive – approach by government policy-makers. “We exchange information with key ministries, which is helpful to both of us,” Hughes says. “Governments gain a better understanding of the challenges we face in the industry, and we gain an appreciation of government priorities.”

Broadly speaking, Hughes says, Imperial’s outlook focuses on future energy demand, which is an element that some who look primarily at the supply side – such as *The Economist* – tend to gloss over in favour of speculating on possible future sources of supply. “The key point is that total consumption of all forms of energy over the next 20 years or so, both for the world as a whole and for Canada specifically, is expected to increase by about 45 percent,”



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he points out. “Meeting such enormous demand will require an extraordinary effort. New sources of energy such as wind and solar power and biofuels may have to be developed, as will huge additional supplies of crude oil and natural gas.”

Improvements in energy-use efficiency and advances in new energy technologies, no matter how rapid, will likely be outpaced by increasing demand for all forms of energy. “That doesn’t mean that conserving energy, using it more efficiently and developing additional energy sources aren’t important or desirable objectives,” says Hughes. “They are. However, they probably won’t be sufficient to prevent further growth in the demand for energy from conventional sources such as oil and gas.”

The total amount of energy consumed in the world today from all sources, including oil and gas, coal, nuclear and hydro-

electric power and alternatives, is equivalent to about 200 million barrels of crude oil a day. According to Imperial’s outlook, by 2020, consumption will reach the equivalent of about 290 million barrels of crude oil a day, about 45 percent higher than today’s level.

Imperial’s assessment of future growth in energy consumption is relatively conservative compared with those of some other organizations. For example, a May 2003 report of the Energy Information Administration (EIA), a branch of the U.S. Department of Energy, projects that world energy consumption will increase by 58 percent from 2001 to 2025. Most of the growth – almost 70 percent of it – is expected to occur in the developing world, with the strongest growth projected for Asia, where demand for energy is expected to more than double over the forecast period, the EIA report states.

# "WE

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It's also important to recognize, Hughes notes, that Imperial's forecast takes into account both recent and yet to be achieved advances in energy technology and efficiency. For example, it assumes growing use of fuel cell powered vehicles and so-called "hybrid" or "dual-fuel" vehicles, as well as improved fuel systems in conventional internal combustion engines. In fact, it projects that, on average, automobiles will consume one-third less gasoline per kilometre by 2020 than they do today.

HUGHES LOOKS OUT OF HIS SIXTH-FLOOR OFFICE WINDOW IN DOWNTOWN Toronto, contemplating the far-reaching issues he grapples with daily. "Obviously, some people would prefer that the world use less energy rather than more, but that's very unlikely to be the case," he says, noting that the single most important factor leading to increased energy use will be population growth, coupled with improving standards of living in the developing world. "In parts of Asia, Africa and other regions, literally billions of people lack basic necessities such as food, shelter, heat and light, and as the world's population grows, the number of people living in these conditions will also increase. Providing developing countries with those necessities, let alone a standard of living that may approach our own, will require ever-increasing amounts of energy."

Imperial's chairman and chief executive officer, Tim Hearn, concurs. "We in the developed world all have a tremendous opportunity and responsibility to help improve the quality of life in developing countries by ensuring that the energy they need is available," he says. "Eighty-five percent of the world's people live in developing countries, where gross domestic product per capita is only six percent of that in the developed world. Some 1.6 billion people have no access to electricity, 2.5 billion are without proper sanitation and 18 percent of the world's population lacks access to safe drinking water.

"Those problems cannot be addressed without an increase in energy consumption," Hearn says. "Energy in all forms will be needed to build and run the industries and plants that will generate new wealth and create jobs, as well as to provide basics such as heat, light and motive power, housing, food production, clean water, health care and so on. Industrialization and modernization has already started in countries such as China, India, Brazil and Indonesia, and it will undoubtedly continue."

Canadians, too, will be consuming more energy by 2020, according to both Imperial and EIA outlooks. Total consumption of all forms of energy in Canada today is roughly equivalent to 5.4 million barrels a day of crude oil. Imperial's outlook is for total energy use to increase by about 45 percent by 2020, to the equivalent of about 7.3 million barrels of crude oil a day.

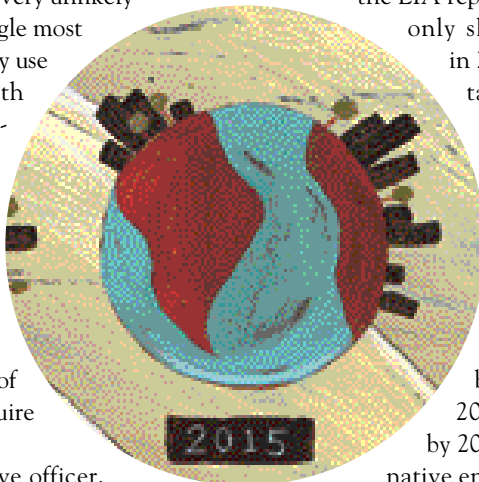
Imperial and the EIA also agree that most of the needed additional energy will come from oil and gas, which account for about 60 percent of all the energy consumed in the world today. "Over the past several decades, oil has been the world's foremost source of primary energy consumption, and it is expected to remain in that position throughout the 2001-2025 period," the EIA report says. "Oil's share of world energy drops

only slightly in the forecast, from 39 percent in 2001 to 38 percent in 2025, despite expectations that countries in many parts of the world will be switching from oil to natural gas and other fuels for their electricity generation."

"There doesn't seem to be much doubt that oil and gas will remain the dominant sources of the world's and Canada's energy throughout the first quarter of this century and probably well beyond that," says Hughes. "We might see a 20-fold increase in the use of wind and solar by 2020, but even with that growth, those alternative energy sources will account for less than one percent of total energy consumption around the world."

Perhaps the most significant aspect of both the Imperial and EIA outlooks, however, is that meeting the world's increasing demand for energy from crude oil will be a daunting challenge, to say the least. In a recent article in *World Energy* magazine, Lee R. Raymond, ExxonMobil chairman and chief executive officer, noted that while known crude oil reserves are sufficient to meet world demand until at least the middle of this century, bringing those reserves into production in time to meet growing demand will require a massive effort, involving rapid improvements in oil-recovery technology and staggering amounts of investment.

"About half the oil and gas volume needed to meet demand 10 years from now is not in production today," Raymond said, noting that as energy use rises, oil production from existing fields such as the North Sea and oil-producing regions of the United States and Canada is expected to decline. "The worldwide indus-





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try may need to add some 80 million oil-equivalent barrels a day over the next decade to meet projected demand – an amount equivalent to two-thirds of today’s production levels.”

The International Energy Agency, a quasi-governmental organization representing oil-consuming nations, estimates that the industry may need to invest as much as (U.S.) \$2.2 trillion over the next 30 years to find new oil fields and bring them into production. On the positive side, the technologies of oil and gas exploration and development – such as deep-sea seismic surveying, directional rather than vertical drilling, and undersea pipeline construction – have improved dramatically in recent decades, allowing production from fields and reservoirs that would otherwise have gone untapped. In fact, thanks to these improvements, there are more proved reserves of oil in the world today – oil that we know is there and can be recovered – than there were three decades ago. Yet in spite of the remarkable job that the industry has done in finding and developing new reserves, more must be found and developed quickly. And, says Hughes, “it is vital that we continue to find ways to use that energy wisely and efficiently. We need to continue working to find ways to make our energy go farther. This is an environmental and social imperative.”

THE NEED FOR INCREASED OIL PRODUCTION PRESENTS CANADA with a major opportunity. “Putting aside the Middle East, the most promising sources of new oil supply are West Africa, Russia, the Caspian sea region and Canada,” Hughes says, adding that of these prospective suppliers, Canada has some unique advantages.

“The oil sands of Western Canada represent one of three truly enormous deposits of liquid hydrocarbons in the world – the others being in the Middle East and in the oil sands deposits of Venezuela,” explains Hughes. “The challenge is recovering the oil at reasonable cost, but even the portion that is recoverable using current methods is a very substantial resource. And that’s only heavy oil. We also have significant resources of natural gas in the Arctic and offshore East Coast regions, with further discoveries highly possible.

“Consider, too,” he says, “that Canada has the advantage of bordering on the world’s biggest market for energy, the United States.” Canada today exports about 700,000 barrels of crude oil and natural gas liquids a day and more than three trillion cubic feet of natural gas a year to the United States through pipelines that have been in place for many years. “We have the resources, the infrastructure, the know-how and the experience

to become an even more important producer and supplier to a readily available and undersupplied market.”

A fly in the ointment, so to speak, is that the oil sands and oil and gas from Canada’s remote frontier regions will be relatively expensive to develop commercially. On the other hand, potential new sources of oil and gas in other parts of the world are even farther from major markets and are without existing pipelines and other facilities.

And, Hughes points out, Canada has yet another advantage over many other potential future sources of new oil supplies. “Canada is a stable and democratic country with a healthy, free-market economy that is hospitable to investors,” he explains. “It offers a degree of reliability and security that many other oil-producing countries do not, and that could be a significant factor over the long term.”

Fortunately for Canadians, oil and gas self-sufficiency is not an issue. “We have more than enough reserves to continue to meet our own needs and remain a net exporter,” Hughes notes. “For reasons having to do with economics and transportation, we import oil to Eastern Canada from abroad. But we export greater volumes from Western Canada to the United States than we import.” These energy exports are also vitally important to the Canadian economy. In fact, in 2001, Canada’s net energy exports contributed about \$37 billion to Canada’s economy – more than half of the country’s merchandise trade surplus.

In summary, Hughes says, Canada is a relatively oil-rich country in an increasingly energy-hungry world. “Given a hospitable climate for investors, which would include fiscal and other government policies that will not deter investment,” he adds, “Canada will be able to realize the true value of its hydrocarbon resources over time and contribute to increasing the standard of living in the developing world.”

SO, DO DEVELOPMENTS IN NEW ENERGY-USE TECHNOLOGIES SUCH as fuel cells and trends towards alternative fuels and energy sources truly signal the end of the oil age, as was suggested by the article in *The Economist*? Perhaps, but given the need for energy to improve standards of living in the developing world and the relatively slow pace at which alternatives and their use are growing, it seems unlikely that such a major change can occur before the middle of this new century. And considering that we have to develop our oil and gas resources while the world still needs them, that projection should be welcome news for Canada and Canadians. □