The outlook for oil and gas supply and demand in a global energy context

How the world produces and consumes energy is among the most divisive issues of our time. It is the nexus of converging, hot-button issues centered on the health of both the global economy and the global ecosystem. Often the associated rhetoric encompasses the fate of the planet and the survival of humanity.

No reasonable person disputes, however, that the world will need more energy in the decades to come. Even the rosiest of scenarios for the benefits from energy conservation and efficiency cannot overcome the certainty of increased demand for energy demand due to global population growth.

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Introduction

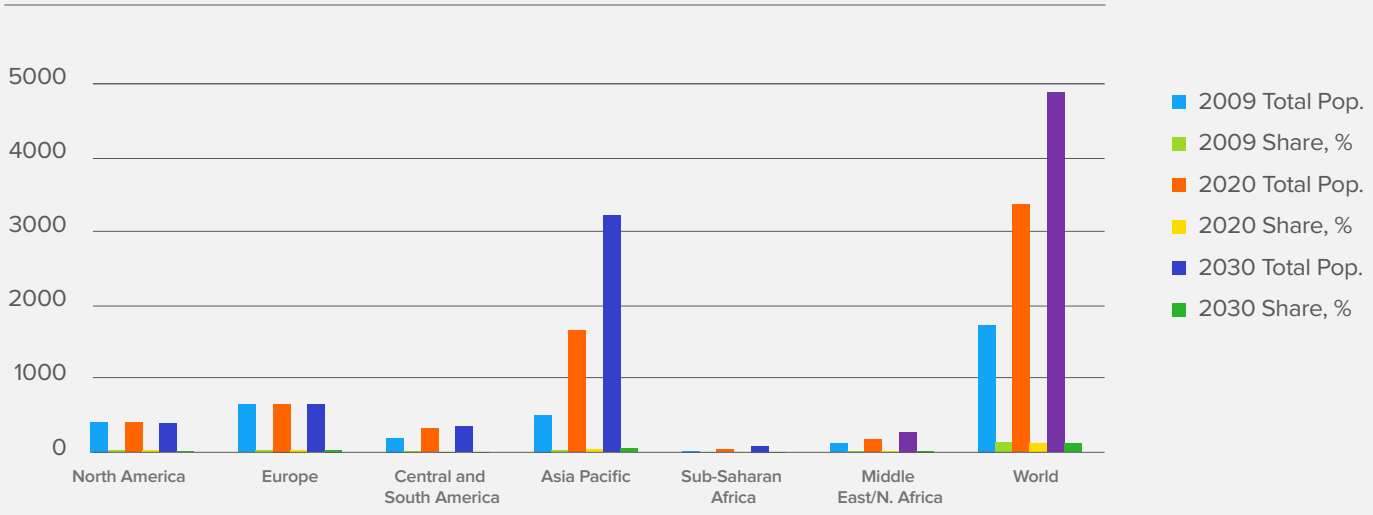
The United Nations estimates the world's population reached 7.2 billion in early 2014 and that 82 million people are added each year, with 25% of this growth occurring in the least developed countries. At current rates, the total population of the planet will reach 8.1 billion in 2025 and 9.6 billion in 2050. By 2050, annual global population growth of will fall to 49 million people per year—but more than 50% of that growth will happen in the least-developed countries, according to the UN.[1]

All of these people will need affordable energy—none so direly as those in the least-developed countries. The UN also estimates that 40% of the world's population depends on traditional biomass fuels—animal dung, firewood, charcoal, crop residue—for indoor cooking and heating.

This commonplace practice accounts for 2.7% of the world's total disease burden, killing 4 million people each year; worsens deforestation and soil erosion; and increases greenhouse gas emissions. More than 20% of the world's population—1.3 billion people—lack electricity, and countless millions more have access to electricity but can't pay for it.[2]

Those deprived of affordable energy also lack running water, basic sanitation, food and medicine preservation, and protection from the elements. At the same time, a vast new middle class is emerging in the developed world, with total population expected to grow by more than 250%, according to the Organization for Economic Cooperation & Development (OECD).[3]

Global middle class growth outlook



Source: Khara, Homi, "The Emerging Middle Class in Developing Countries," OECD Development Centre, 2010

These challenges are compounded when intertwined with white-hot environmental controversies and geopolitical strife. And yet, somehow, the energy sector must meet these challenges in ways that:

- Are cost-effective for consumers yet allow a decent return for producers;
- Help support global energy security without undermining global trade—or the economies of nations critical to the world's energy supply stability;
- Optimize environmental stewardship to balance energy affordability with environmental impacts.

It's not an overstatement to say that meeting the world's energy needs in the 21st century looms as one of the most complex, overarching issue of our time. To gain a deeper perspective on it, it's important to understand how we got to this point on energy supply and demand, as well as what lies ahead.

Historic energy use patterns

Today's challenge of meeting energy demand—and the consequences that flow from that effort—didn't happen overnight, nor is it a recent development. Certainly we can trace it back more than a century, when the demand for superior illumination nearly drove several species of whales to extinction before petroleum products provided a better alternative. The 1911 decision by Winston Churchill, as First Lord of the Admiralty, to switch British warships to oil from coal sowed the seeds of future conflict over Middle Eastern oil. In 1954, the Suez Crisis demonstrated the first modern example of Middle Eastern nationalism as a threat to the West's oil supply.

But it was the oil crises of the 1970s that truly made energy security a pivotal issue on the world stage. The Arab oil embargo of 1973 and the Iranian revolution of 1978–79 sent shock waves through the world's economies, underscoring how critical oil was to sustaining the economic health and well-being of all consuming nations.

The damage done to the global economy by spiking energy prices is clear. Each major, sustained spike in the price of oil has helped precipitate a consequent drop in annual growth of the world's gross domestic product.

It has been said that the 1970s oil crises resulted in the biggest transfer of wealth in history. Certainly, before 1973, almost all of the global supply of oil outside the Communist bloc was in the hands of the private sector, almost exclusively US and European companies. After the 1970s oil crises, two-thirds of that private oil ownership moved to state oil companies, mainly in the Middle East.

Beyond the change in ownership of these resources, the rise of the Organization of Petroleum Exporting Countries (OPEC) and energy nationalism also changed the dynamics between oil suppliers and oil consumers. Instead of being governed solely by market forces, the world's most critical supply of energy was now subject to the political and economic circumstances of the suppliers. Consequently, the real price of oil today is more than fourfold what it was in 1972.

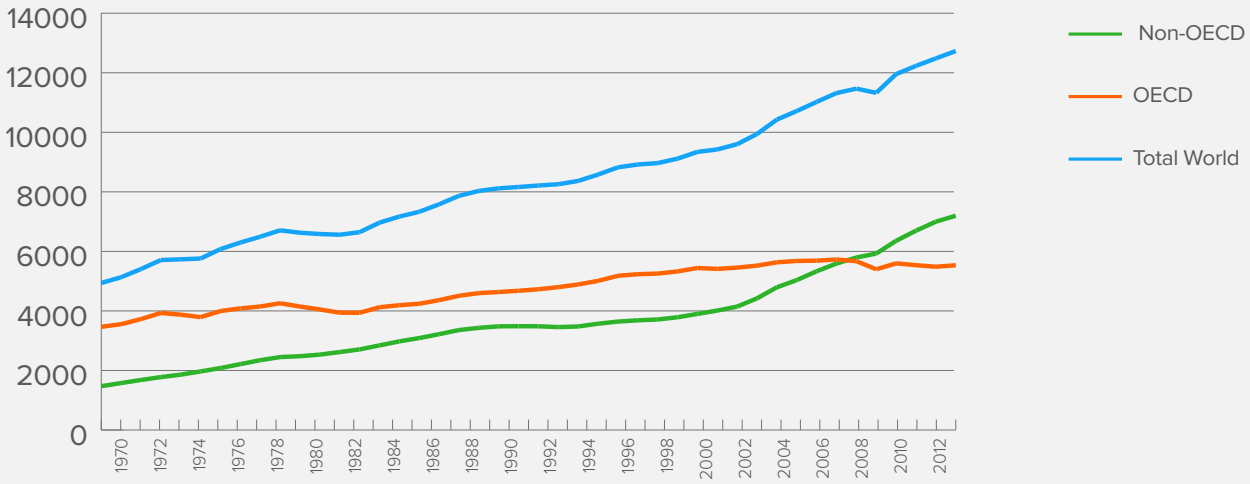
The most immediate effect of higher energy prices beyond their economic impact was the affirmation of energy conservation as a guiding principle for governments, businesses, and people alike, initially intended as a bulwark against oil price shocks. This new principle culminated in the OECD's creation of the International Energy Agency, a body devoted primarily to establishing and maintaining vast emergency stocks of oil and implementing mechanisms for securing and sharing oil supplies in the event of a major oil supply disruption.

The OECD nations' conservation and energy efficiency efforts certainly dampened their energy consumption growth. In the decade that followed the Arab oil embargo, the average annual consumption of energy among OECD nations was only 2% greater than in 1973. In the years following the oil price shocks, year-over-year energy consumption actually declined before starting to inch forward again. It wasn't until the mid-1980s, with the devastating oil industry collapse, that OECD energy consumption returned to historic growth patterns.[4]

It was a different story for the non-OECD nations—a proxy for the developing world. Despite the fact that poorer nations were hit much harder by the 1970s oil price spikes than their wealthier brethren, non-OECD energy demand has trebled, while OECD energy increased by a mere one-third. In fact, non-OECD nations have been the driver for virtually all of the global energy demand growth in the early years of the 21st century.

Even with that impressive rate of growth, however, developing nations still lag well behind their developed counterparts in terms of energy use per capital. While China's per capita energy use soared by more than 300% since the Arab oil embargo, it nevertheless remains less than half that of the OECD average and less than a third that of the United States.[5] India's per capita energy use has more than doubled in that same timeframe but still languishes at less than 10% that of the United States.

World Primary Energy Consumption, 1970-2013



Source: BP Statistical Review of Energy, June 2014

And these two countries are universally acknowledged as having by far the fastest growth among the world's ten largest economies.[6] From 1990 to 2010, China's economy grew by an average of 10.4% per year and India's by 6.4% per year. Even with the slowdown from the Great Recession, their economic growth rates in 2012 were 7.2% and 5.5%, respectively, far surpassing the OECD average economic growth rate of 1.5% that year.[7]

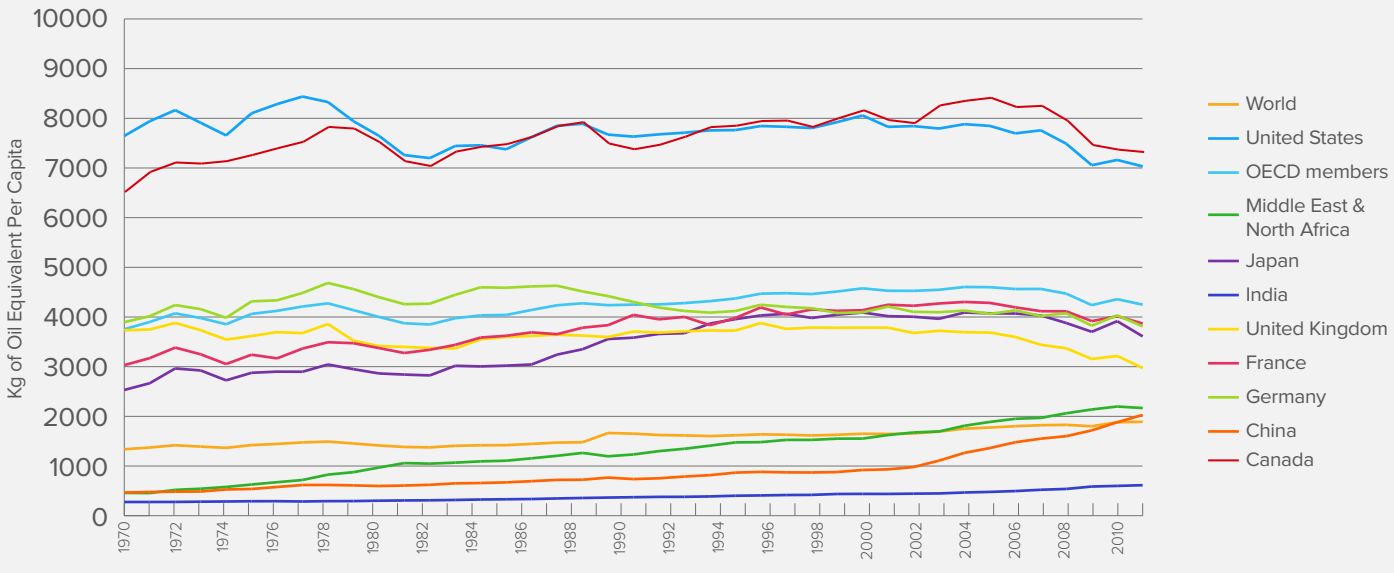
Wild card: Developing nations' middle class

What happens when such emerging economic powerhouses "catch up" with the developed nations in terms of per capita energy use? Depending on one's perspective, that question could be tantalizing or profoundly disturbing.

A popular meme for energy forecasters of recent years has been China's 1 billion-car milestone, often expressed as the question: What if China's 1 billion people traded in their bicycles for automobiles? Some projections have China increasing its current population of vehicles fivefold, from 200 million today to 1 billion by midcentury. That compares with a world total vehicle population today of about 1.2 billion. Since half of all the oil consumed worldwide today—about 90 million barrels per day (b/d)—is burned in motor vehicles, what would that explosion in vehicle use do to global oil consumption?

This single forecasted element perfectly encapsulates the global energy challenge that looms on the horizon: How to accommodate the rapidly growing energy demand of emerging economies that aspire to a burgeoning middle class while the much greater need for energy exists for the least-developed countries—and to do so in a way that still balances global economic and environmental concerns?

Energy Use Per Capita, Selected Countries/Regions



Source: USDA Economic Research Service

Can the developed nations be justified in telling the emerging economies to simply throttle back their growth?

Should the affluent nations simply eschew any growth in fossil fuel use and thus imperil their own economic futures by assuming the lion's share of responsibility for reducing carbon emissions, in deference to the developing world's fossil energy growth?

Changing global energy mix

There is little doubt that energy demand will grow worldwide in the coming decades, and all of the credible energy forecasts call for not just continued growth in fossil energy use but also fossil fuels' continued dominance of the world's energy mix.

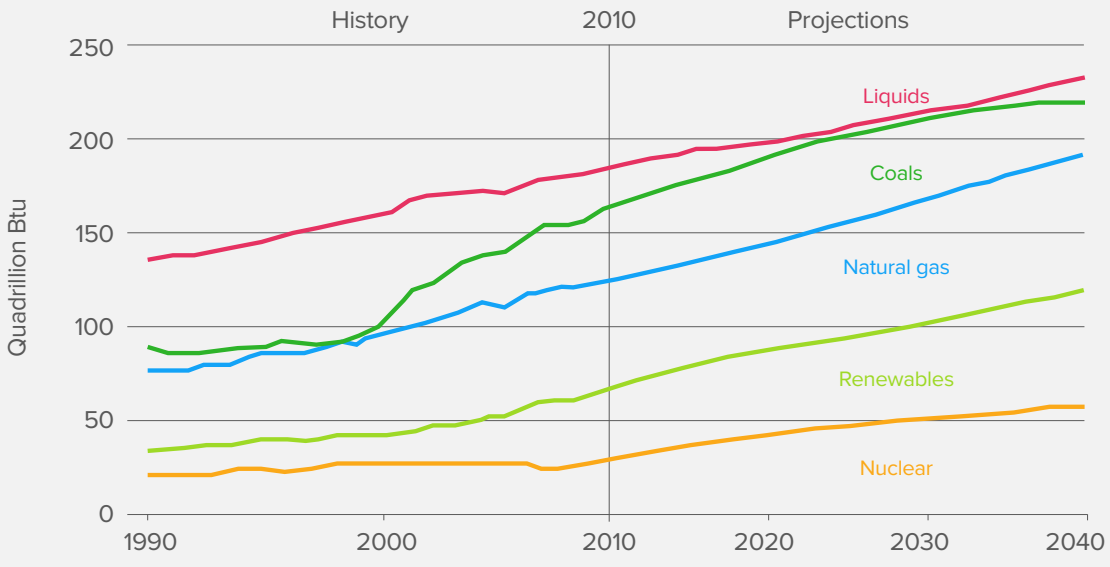
Fossil fuels—oil, natural gas, and coal—will lose some market share in that time span, but that means just a drop from 82% of the total energy mix to 78%.[8]

Oil and natural gas together will account for 52% of the 2040 total, accounting for 28% and almost 24%, respectively, compared with 33% and 15% today. Coal's share remains static at roughly 27% throughout the forecast period.

For all of the enthusiasm and aggressive energy policy initiatives, the likelihood is that renewable energy sources will not exceed 15% of the energy mix by 2040. Additionally, nuclear energy will have less than half that market share.

From a purely economic and logistics standpoint, it's easy to see why fossil energy would continue to dominate the world's energy mix for the foreseeable future. When the full cost to the energy grid is factored in, the costs of popular renewable energy sources such as onshore wind and photovoltaic solar can be anywhere from 50% to more than 250% greater than fossil energy sources.[9]

World energy consumption by fuel type, 1990-2040



*About 4% of the liquids in 2040 will be nonpetroleum-based.

Source: US Energy Information Administration.

However these costs are calculated—and there are many different methodologies for calculating them that often have opposing results—there is no escaping the fact that countries with the highest market share for renewables in their energy mix, such as Germany and Denmark, also have the world's highest energy costs.

As for nuclear power, development costs were already skyrocketing and opposition was widespread even before Japan's Fukushima nuclear plant disaster. The nuclear power industry today is in decline, and investment cost estimates have jumped in the past decade from $1,000 per installed kilowatt to about $8,000 per installed kilowatt. [10]

But fossil energy has its challenges as well. Looking at energy usage forecasts and current events, is it reasonable to expect the world's oil and gas supplies to be any more secure than they are today? By the same token, how can the world be expected to drastically reduce its carbon load in the next 50 years without low-cost fossil fuels?

Oil and Gas: Pivoting to a middle path?

There is a middle path forward that embraces a realistic, measured energy strategy—one that recognizes the challenges for all energy sources, yet eschews the rhetoric and political posturing by focusing on economics and environmental impacts. And the oil and natural gas industry will play a pivotal role in helping the world develop solutions to these seemingly conflicting energy, economic, and environmental goals.

A decade ago, the widespread expectation was that oil and gas resources were entering into a permanent period of scarcity. Some maintained that a forced switch to costly renewable energy sources was necessary not only to reduce atmospheric carbon load but to stave off future price shocks because of the looming conventional energy shortfall.

But advances in technology, know-how, and best practices in the North American petroleum industry have turned the global energy picture on its head by rendering vast, hitherto intractable, "unconventional" oil and gas resources economically recoverable. In less than a decade, scarcity has turned to plenty.

Discovery risk has been reduced essentially to zero. Oil and gas companies have reinvented themselves and adopted a whole new business model in proving up and monetizing these massive resources. And now the unconventional oil and gas revolution is on the brink of being exported to other countries with similar untapped unconventional resources.

The scope of these resources has dramatically altered the oil and gas landscape. Some analysts postulate that the center of gravity for world energy is shifting inexorably to North America and away from the conflagrations of the Middle East.

Yet there remain enormous challenges for oil and gas companies. These newly commercial resources are extremely expensive to develop, and costs continue to spiral upward for regulatory compliance, taxes, equipment, services, and labor. The oil and gas industry must cope with all of this despite the ongoing "Great Crew Change"—an aging cadre of nearly overwhelmed industry veterans handing the reins to tech-savvy but green youngsters in the absence of a bridging generation—the "lost generation" that fled or avoided the oil and gas industry from the late 1980s to the early 2000s.

It all adds up to a business environment in which oil and gas operating companies, and the service and supply firms that support them, must make business decisions increasingly at the economic margin. Monitoring costs, optimizing supply and service logistics, flattening organizational structures, eliminating information and data silos—all will be of paramount importance in this new energy era.

[1] http://www.un.org/en/development/desa/population/publications/pdf/trends/Concise%20Report%20on%20the%20World%20Population%20Situation%202014/en.pdf

[2] http://www.se4all.org/our-vision/our-objectives/universal-energy/

[3] Khara, Homi, "The Emerging Middle Class in Developing Countries," OECD Development Centre, 2010

[4] BP Statistical Review of Energy, June 2014

[5] USDA Economic Research Service

[6] 2013 estimate, CIA World Factbook.

[7] US Energy Information Administration's International Energy Outlook 2014

[8] World energy consumption by fuel type, 1990-2040; US Energy Information Administration

[9] http://theenergycollective.com/barrybrook/201991/counting-hidden-costs-energy

[10] http://www.worldnuclearreport.org/

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