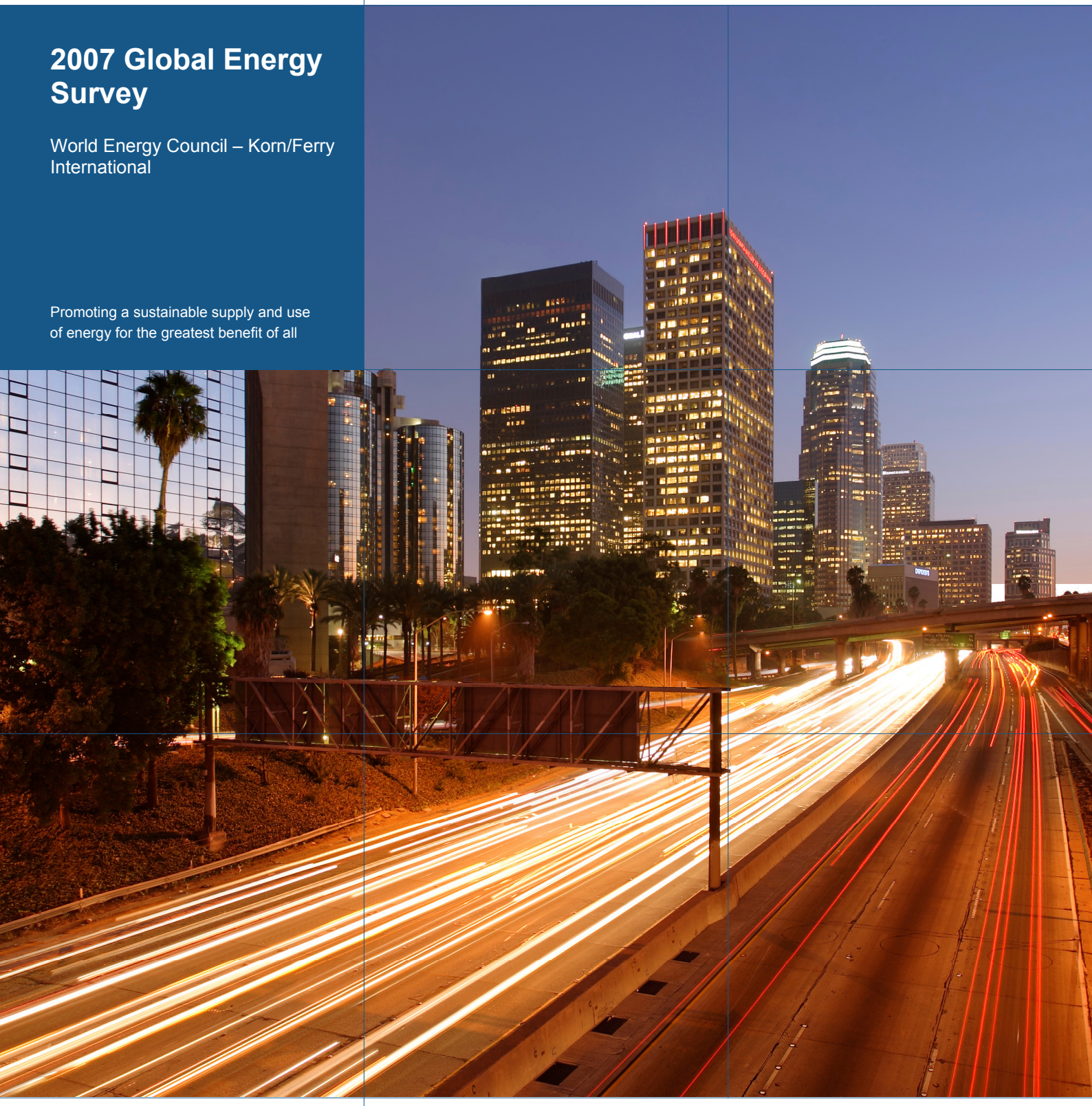
WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ENERGIE

2007 Global Energy Survey

World Energy Council – Korn/Ferry International

Promoting a sustainable supply and use of energy for the greatest benefit of all



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2007 Global Energy Survey

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2007 Global Energy Survey

Published June 2007 by:

World Energy Council
Regency House 1-4 Warwick Street
London W1B 5LT United Kingdom

ISBN: 0 946121 25 7

Based on a survey of more than 50 executives from the world's top energy companies and their key suppliers, the research is designed to stimulate and enhance debates about current and future challenges facing energy companies.

Executive Summary

The World Energy Council (WEC) and Korn/Ferry International worked together during the past 24 months to conduct research designed to help energy-company leaders better understand and respond to the challenges confronting their industry. The research assesses the executives' outlooks and insights related to demand, supply, environmental as well as geopolitical issues.

Change represented a consistent force throughout much of the past four decades. However, recent shifts, including the rapid development of Asian economies, geopolitical uncertainty in oil-rich regions and the increasing interconnectedness of global markets, are forcing energy companies to rethink fundamental strategies. The survey results suggest that some energy companies are hungry for innovative solutions, such as seeking out collaborative relationships – involving exploration and the development of new technology – with energy companies in other parts of the world.

Those and other insights contained in this report are complemented by comments gleaned from executives during interview sessions that accompanied the survey process. These candid (and anonymous) remarks amplify the issues, concerns and challenges confronting today's energy industry.

Research Methodology:

The World Energy Council and Korn/Ferry International jointly interviewed more than 50 senior executives from the world's top energy companies and their strategic suppliers. Interviewers participated in a survey and also responded to questions in person and via telephone. The bulk of the research took place during the past 18 months. The interview remarks represent a wide range of views of the survey respondents and do not necessarily represent the industry perspectives of either WEC or Korn/Ferry.

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"Everything is on the table. There must be no more taboos."

Introduction

As pressures bearing down on the global energy industry reach new heights, leading companies are looking for help from a new source – each other. "There needs to be more cooperation between Western and non-Western companies," asserts one energy executive who participated in the 2007 Global Energy Survey. "We live in an interconnected world, we need connected solutions."

The need for greater global collaboration on major challenges, such as exploration and the development of new technology, is one of many insights generated by the survey, which was one facet of research conducted by the World Energy Council (WEC) and Korn/Ferry International.

The study aims to add to the debate on the future of energy. To that end, energy executives and key trading partners shared their thoughts and concerns on four important forces influencing the industry:

- Demand pressures;
- Supply pressures
- Sustainability and environmental pressures
- Political pressures

The findings shed light on the nature of major challenges, areas of controversy and opportunities that leading energy companies already are beginning to pursue. Interviews with the participating executives accompanied the survey and add a qualitative context to the survey results. Select portions of those remarks, which represent a wide cross-section of global, regional and local views, have been included in the shaded "Executive Insights" boxes that follow several of this report's sections.

Those insights are telling. As one survey participant noted in his assessment of the strategic challenges that lie ahead, "Everything is on the table."

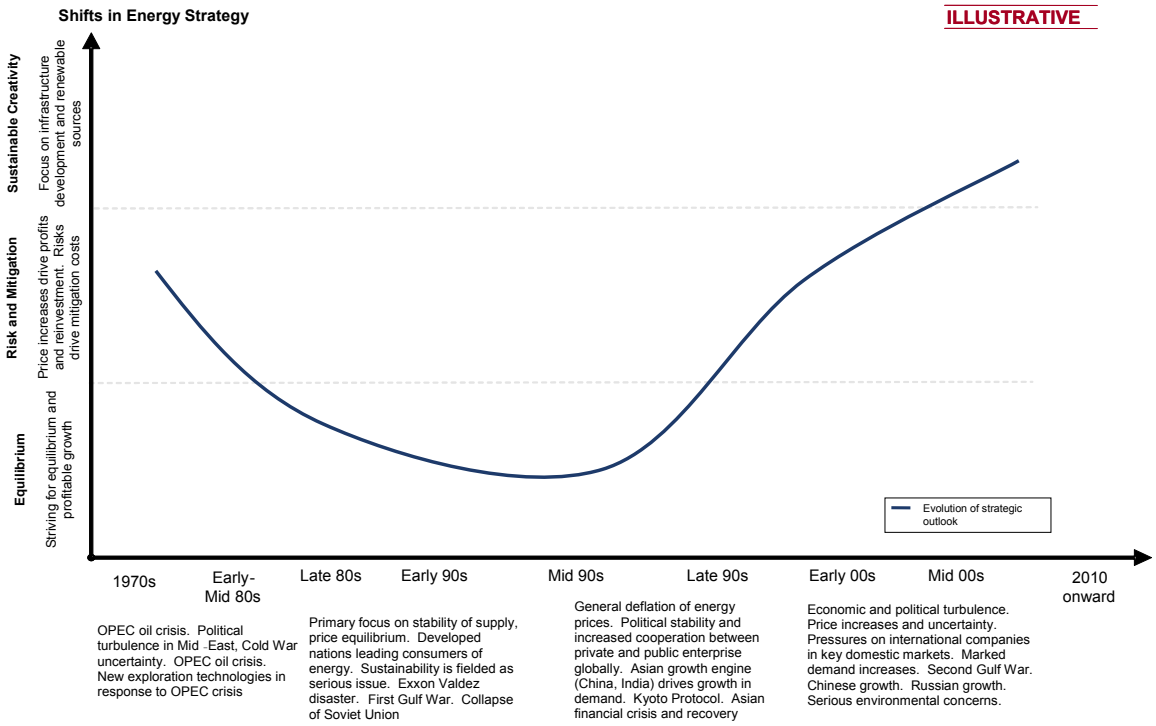
Rising to the challenge will require the use of innovative and unprecedented strategies and solutions.

At the Cross Roads: Major shifts in prices, geopolitical conditions and environmental concerns propel the industry into new territory.

The energy industry faces a challenging future. Over the last 35 years numerous factors have grown more urgent, and those issues now require energy executives to adjust their strategies. The rise of the Far Eastern economies, continued political crises in oil rich regions, the increasing Interconnectedness of the global markets as well as a strengthened social awareness of environmental issues are converging to create a fundamentally different industry landscape. Rising to the challenge will require the use of innovative and unprecedented strategies and solutions.

Global primary energy demand is expected to increase by at least 50 percent between now and 2030, an average annual rate of 1.6 percent, according to the International Energy Agency (IEA). The IEA suggests that more than 70 percent of that demand increase will come from developing countries; China along will account for 30 percent of the increase. Meanwhile, China's share of world oil demand alone is expected to jump from 7.6 percent in 2004 to almost 11 percent in 2020, according to *The Economist*. India's share has also increased last year. Global oil consumption increased at 3.4 percent,

Figure 1 Shifts in Energy Strategy



more than the typical annual growth rate of 1-2 percent. Most surveyed executives link escalating demand to the East Asian economic boom (in China, India and Pakistan). Respondents predict an increase in demand for all energy types, including a renewed focus on nuclear energy.

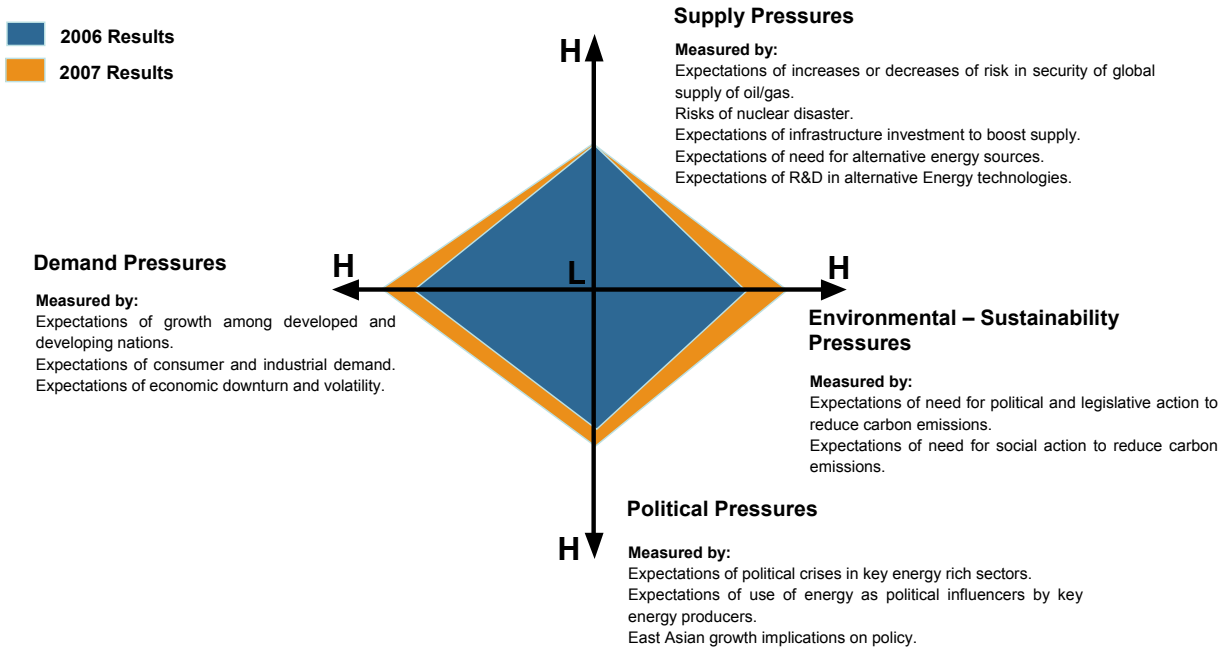
Most survey respondents believe that booming demand will further strengthen calls for emission controls from consumers and governments. The stage where industry executives will face environmental challenges while simultaneously addressing the increased demand pressures has been labelled by a number of our respondents as a period of "Sustainable Creativity" (Figure 1). This period will test the industry's inventiveness, its ability to reach out across regional and competitive lines and its ability to shape economic and social dialogue.

Sense and Simplicity: Clarifying the complex and interrelated nature of pressures facing the industry

Through discussions with survey respondents and industry analysts, Korn/Ferry identified the following four areas of influence as highly correlated to the future strategic considerations of policy makers:

- **Supply Pressures** were measured through a number of related attributes including expected increases or decreases in predicted future supply of various energy sources. In addition, supply pressures were measured through related attributes such as the infrastructure investment outlook, the outlook on alternative energy sources, research and development activities, the introduction of new technologies, and government pressures to control supply.
- **Demand Pressures** were measured through a number of related attributes, including economic growth forecasts, expectations related to consumer and industrial demand, the possibility of an economic downturn or global volatility in key regional markets.
- **Environmental-Sustainability Pressures** were identified as all factors related to a likelihood of political, legislative and social action to reduce carbon emissions in the near future.
- **Geopolitical Pressures** were linked to executives' anticipation of political crises in key regions, including the Middle East, Russia, Latin America and the Niger Delta. In addition, Korn/Ferry probed further into our respondents' views on whether national governments will use energy resources to increase their political influence on global policy.

Figure 2 Korn/Ferry "Expectations Diamond"



While qualitative in nature, the expectation results were quantified along the four related axes. Korn/Ferry measured the shift in expectations from 2006 to 2007 (Figure 2.). Demand pressures, environmental-sustainability pressures and political pressures are expected to rise. Supply pressures are seen as remaining constant from last year, across various energy types, with a special mention made of coal and nuclear.

Demand Pressures:
The sleeping giant awakens – and turns on the lights

More than 90 percent of respondents identified China and its dizzying growth forecasts as the primary demand driver over the next five years. While India is also expected to experience solid growth, Chinese industrial forecasts remain extremely high, fuelling speculation that actual growth will outstrip projections.

According to the IEA, globally, fossil fuels will remain the dominant source of energy through 2030. Fossil fuels are estimated at 83 percent of the overall increase in energy demand between 2004 and 2030. The IEA expects the demand share of oil to drop, although oil will remain the largest single fuel in the global energy mix through 2030. Global oil demand is predicted to reach 99 million barrels per day (MB/D) in 2015 and 116 MB/D in 2030 - up from 84 mb/d in 2005. In contrast to IEA's numbers from 2005, coal will see the biggest increase in demand in absolute terms, driven mainly by power generation. China and India account for almost four-fifths of the incremental demand for coal. It remains the second-largest primary fuel, its share in global demand increasing slightly.

Western demand is expected to grow conservatively. However, when that conservative growth is compounded with Chinese and Asian growth, rising overall global demand is expected to generate price increases across most energy types.

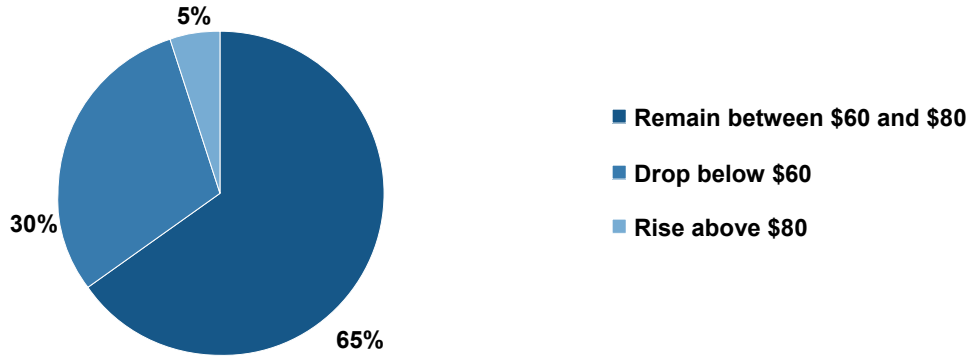
The following sub-sections provide breakdowns of those price projections by energy type:

Oil Prices

More than 65 percent of respondents predict that global oil prices will remain in the $60-$80 per barrel range during the next 5 years (Figure 3). Less than 5 percent of respondents believe that the oil prices will move above $80 per barrel in the next 5 years, while fewer than 30 percent believe that the oil prices may dip below $60 per barrel.

Most important, however, the vast majority of respondents believe that the $60-$80 per barrel range may be the new "basis" looking beyond the horizon, suggesting that over the long-term oil prices will only move upward rather than decrease.

Figure 3 Oil Price Projections



Coal Prices

Unlike oil, coal is viewed by the vast majority of executives (80 percent) as the key stabilizing demand factor over the medium term. The ubiquity of coal supply, new extraction technologies and rich, accessible reserves have led a number of respondents to identify the next five years as a "Coal Renaissance" on a global scale. While most respondents (seven in 10) predict coal to range between $50 and $60 per ton, coal is expected to make up a significantly larger share of the overall global energy mix, putting some downward pressure on oil and gas prices. In addition, some executives believe that coal prices could range as low as $30 per ton due to reserve abundance and global investment in coal extraction technology.

Gas Prices

The survey outlook on gas prices represents a purely North American view. Most respondents (approximately eight in 10) believe that natural gas prices will range between $10 and $15 MM BTU over the next five years. Approximately one in 10 predict prices to be significantly lower – between $3 and $9 MM BTU, while another one in 10 predict higher prices (higher than $15 MM BTU). Most respondents believe that gas will be indexed on fuel prices.

In addition, six in 10 executives believe that natural gas will not play as an important fuel for electricity production. More than 60 percent of executives believe that natural gas will remain in commodity use in buildings and residential sector as well as a commodity for other goods (chemical processes).

Respondents also indicated that the anticipated proliferation of LNG facilities and transportation infrastructure will have a significant impact on the supply/pricing of natural gas in the coming years (i.e., probably three years and beyond).

Electricity Prices

Most executives surveyed (eight in 10) do not see major increases in electricity prices over the next five years (no more than inflation). However, more than 60 percent of respondents warn that electricity demand will grow significantly in the developing economies, forcing some governments to subsidize either nuclear or hydroelectric development to ensure stable electricity supply.

"Coal needs to be clean to be viable. Technologies already exist; the issue is their application."

Executive Insights on Demand Pressures

- "Global demand is directly linked to China's growth. China shows no signs of a slowdown, and in an interconnected market, we will all feel the impact."
- "The Chinese will quickly have to react and think creatively about their demand explosion and how to secure long term oil and gas supply. We are already seeing Chinese involvement in Africa and with Russia, and we will see even more."
- "The acceptable range [for oil prices] is $60 to $80 [per barrel]. However this is also the new floor. We are not expecting serious downturn in prices over the next while."
- "Demand and risk are the primary drivers for oil pricing, while supply has always been the most controllable factor. However, the next five years will see slow increases in prices within the $60 to $80 [per barrel] range."
- "Coal needs to be clean to be viable. Technologies already exist; the issue is their application."
- "We are seeing an increasing readiness in India, China, Russia and the U.S. to reinvest into coal extraction and to rely on coal in a significant way over the medium term."
- "In the U.S. alone we have over 15 years of coal supply at a minimum from exploitation of existing sources. If we were to develop the accessible reserves, our supply span increases to over 75 years. Exploring net new reserves could increase that number to hundreds of years."
- "Natural gas remains very price sensitive, and will continue to be so over the next three to five years."
- "Electricity demand will grow globally. Countries with best mixes of energy supply will be able to provide most stable electricity provision. Other countries will need to get involved directly to ensure continued supply."
- "In certain areas, electricity prices may vary closely with natural gas. However, with entry of nuclear, this correlation should ease over the next 10 years."

"Coal can be the new oil, without the risk premium."

Supply Pressures: Re-enter Nuclear? Coal Accelerated?

While eight in 10 survey respondents do not expect serious supply shortages in any of the major energy bundles, the medium term holds significant promise for the nuclear sector. More than seven in 10 executives believe that nuclear energy is extremely important, compared to other energy types, when considering a sustainable energy strategy. Not surprisingly, more than 80 percent of respondents believe that nuclear energy will re-enter serious discussions throughout the world during the next three years. Further more, 72 percent of respondents expect a 1-10 percent increase in nuclear to occur during the next decade. The long term impact of nuclear waste on the environment remains a risk factor: three in 10 executives do not believe that an adequate model to price the cost of disposal and effects of nuclear waste on posterity – as well as potential for nuclear disaster (accidental or purposeful) – exists today. That shortcoming could deter public confidence.

Half of executives surveyed believe that coal will provide the most reliable backbone for electricity supply to consumer and industrial users over the medium term, while six out of every 10 respondents identified hydroelectric as a very important source of energy over the same period.

In addition, more than 90 percent of executives surveyed expect significant investment increases (more than 5 percent annually) in infrastructure development across energy sectors. These expectations are reflected in the IEA's Outlook study, which suggests a cumulative, global investment of $20 trillion over next 25 years in energy-supply infrastructure. This projection is approximately $3 trillion higher than previous projections. China's investment requirements are estimated at $3.7 trillion or 18 percent of the global total. More than half of all energy investments worldwide are needed in developing countries.

Increases in alternative fuels (e.g., bio fuels) are expected to be significant, according to 60 percent of respondents. In absolute terms, though, alternative fuels will remain a small portion of the overall energy mix. That said, 40 percent of respondents expect serious government involvement and pressure to encourage development and investment in alternative fuels throughout the world.

On the issue of alternative energy sources, 40 percent of respondents identify wind as very relevant from a supply perspective over the next three to five years. Another 40 percent of respondents describe solar power as "somewhat important."

While most executives believe serious environmental considerations will affect the energy industry, most do not believe that a global treaty of agreement on reduction of emissions will occur in the near future.

Executive Insight on Supply Pressures

- "Supply issues are resolved through careful planning: maintain strategic reserves, encourage optimal use of local energy sources and reduce dependency on imports (maintain an appropriate level of imports only), as well as focus on energy diversification and efficiency initiatives."
- "We must be willing to invest into technical innovations and ability to get maximum recovery from existing resources. Conservation is key. In addition, ethanol, wind power, solar power - development of alternatives – these are the key words in being creative and encouraging sustainability."

Environmental Sustainability Pressures: Looming Carbon Emission Standards?

The survey indicates a divided and uncertain picture in terms of environmental and sustainability concerns in the energy industry. While most executives believe in serious environmental considerations in the energy industry, most do not believe that a global treaty of agreement on reduction of emissions will occur in the near future.

Executives remain divided on the need for adoption of global emissions standards over the next three to five years: 70 percent of respondents believe that it is important to adopt standards, but more than 80 percent asserts that that none will be adopted within the next three to five years.

That said, an overwhelming majority of respondents (more than 90 percent) indicate that environmental considerations will influence industry economics in the short term. Similarly, 90 percent of executives surveyed agree that environmental considerations will affect their future decisions.

More than half of respondents cite a lack of technology as the major obstacle for the development of more environmentally acceptable energy practices, prodding governments to play a larger role in fomenting advancement in sustainable technologies. *The Economist* cites a leading energy executive explaining that national governments will be "responsible to push the use of renewables in a world where globalization stalls and national interests come to the fore.

More than 80 percent of respondents indicate that global political risk will continue to have significant to somewhat significant impact on security of energy supply.

As long as markets remain open and security of supply is less threatened, slower-acting market mechanisms such as emissions trading will be the primary vehicles for developing alternative energy sources."

Executive Insight on Environmental Sustainability Pressures

- "Governments need to assist with cost; focus on building technology and less on credits."
- "Governments need to put policies in place and subsidize technology."
- "Governments need to offer tax incentives to encourage sustainable energy development."
- "Cooperation on tax incentives and other fiscal policy to enhance development."
- "The coherence of carbon energy policies requires better communications. The subject that will only bore everyone is the implementation of a segmented policy."
- "The train has left the station in terms of sustainable development. The public knows it, the governments know it, we know it. It is up to us to act on it."
- "I do not believe in a government role in business. The government should not influence companies to change their operations in order to alleviate environmental concerns. However, the governments have the responsibilities to create mechanisms that will govern and regulate our behaviours. Mechanisms are needed to give proper guidelines to manage development and the environment. We can participate, but we cannot be the only leaders."

Political Pressures: A Slow Boil

More than nine in ten executives agree that the global political situation will remain tense; 50 percent of respondents suggest that there will be a slight increase in political risks over the next three to five years.

Eighty percent of respondents identified the Middle East, Russia and the nuclear stand-off with Iran as the top three security issues over the medium term.

Although 70 percent of respondents do not expect to see any resolution to the Iraq conflict, the Israel-Palestine conflict or the nuclear stand-off with Iran in the short term, respondents also do not expect to see any immediate deterioration in the crisis zones. A new potential geopolitical hot zone, Saudi Arabia, appears on the radars of 20 percent of respondents this year.

Among 75 percent of the survey's European-based respondents, Russian supply worries are viewed as having a potentially significant impact on the supply of natural gas to the EU over the next three to five years. These concerns, however, are not expected to increase over the medium term, and almost all

"If Coal will be the new oil, what will be the new coal? Energy companies have the capacity, the capital and the intellect to think ahead. We are truly global players and as such require global strategy. This is easier said than done."

respondents believe that political and economic mechanisms will be finalized in the upcoming period.

Approximately six in ten respondents expressed concern that a nuclear accident or attack could severely endanger the prospects of a nuclear renaissance globally in the medium term.

Latin America, terrorism and some aggressive national oil companies (NOCs) register as geopolitical risks among a smaller group of survey respondents. Roughly three in 10 respondents identified Latin America, specifically Venezuela, as a potential area for concern. Meanwhile, around 30 percent of respondents (up from 20 percent last year) identified terrorist attacks on energy installations or nuclear facilities as potential dangers to security of supply.

Conclusions

As energy company executives re-evaluate almost every facet of their strategies, they ought to keep in mind that the success of new approaches depends on execution as well as communications. Approximately 80 percent of energy executives surveyed believe that the global energy industry, while re-evaluating its strategies, also needs to focus on re-branding its image, and refreshing its face to the consumer. As much as a global strategy is required, a global image and consistent messages are needed to communicate the industry's next steps to the world.

As the industry dynamics fundamentally shift to higher uncertainty regarding numerous factors, energy executives recognize the need to change their approaches. The question remains: What is to be done?

The answer, according to survey respondents, involves innovation and collaboration: 90 percent of executives agree that the current period of increasing uncertainty requires greater creativity in all aspects of strategy and planning.

Executives agree that creative approaches are not only needed in addressing new alternative energy supplies or investing into innovative technologies to deal with dwindling or less secure supply, rather, more cooperation and facilitation is invited globally and between private and public institutions.

For example, more than half of survey respondents assert that a need exists for a global energy policy – but not, necessarily, additional regulations based on a global energy policy. Such a policy would require exhaustive and constructive dialogue among the private sector, the public sector, consumer groups and other stakeholders. However, 40 percent of respondents remain wary of opening the door to more intense governmental involvement. This suggests a possible "third way" in the form of a "soft" public-private partnership designed to create new innovations and approaches in areas such as technology development, sustainability and supply insurance.

To many, those approaches would have been unthinkable a few years ago. But times have changed. And if energy companies are to thrive in the current era of uncertainty, "there must be no taboos" (as one survey respondent declared) when it comes to crafting solutions and rethinking strategy.

"Governments should work with energy companies to create common agendas and workable standards against which we should measure our environmental footprints. The public private dialogue is essential in addressing global warming."

Executive Insights on Solutions

- "There needs to be more cooperation between western and non-western companies. We live in an interconnected world, we need connected solutions."
- "Comprehensive and collaborative approach to renewal of regulatory process."
- "Government needs to facilitate the policy instruments required to create the enabling environment to foster the cooperation from the private sectors. This can be established through international cooperation."
- "Help solve labour shortage issues (immigration policies instead of restrictions), Cooperation on education and training, Cooperation on tax incentives and other fiscal policy to enhance development."
- "Encourage all possible sources and forms of energy; better communicate to public the issues - the public not industry is the problem for CO_2. Industry only 15 percent of the problem."
- "Governments should work with energy companies to create common agendas and workable standards against which we should measure our environmental footprints. The public private dialogue is essential in addressing global warming."
- "It is our responsibility to lead and to create regional mechanisms to address environmental challenges. While we are far off on a global agreement, which, in any case would be hardly workable in practical terms, we are steps away from putting in place regional mechanisms for reducing and monitoring emissions and providing solid guidelines for the future."
- "Energy companies do not have a global strategy; many of them do not even work together in any region. However, there is a global perception that exists on the role of the energy industry and it affects all companies, Western, Eastern, independents and NOCs. The energy industry is in a need of a proper branding strategy, and if branding strategy is a goal too ambitious, than at least a consistent and clear message."

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ISBN: 0 946121 25 7