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Abstract

The energy world has been going through some “game-changing” developments arising from strong demand growth in emerging economies, new supply sources, fuel diversification, technological innovations, “resource nationalism”, investment decline, climate change and CO₂ trading, as well as changing geopolitical dynamics. This paper discusses the changing dynamics of the world energy, and emerging new risks in the energy industry and major regions of production, transit and consumption. It also elaborates on the problems of energy “dependence,” “independence,” and “interdependence” before setting out the future path in the world energy and messages for key stakeholders on key energy dynamics and risks.

2.1 Introduction

As the world struggles to emerge from a global recession and financial crisis, countries are looking for solutions to improve domestic economic performance and put people back to work. The energy sector constitutes a relatively modest share of GDP in most countries, except for those in which oil and gas income loom large. However, the energy sector’s impact on the economy is greater than the sum of its parts. Most importantly, almost none of the economy’s goods and services could be provided without it. Thus, stable and reasonable energy supply and prices are needed to reignite, sustain and expand economic growth.

The energy debate is increasingly focused on new factors that could prove transformative for global supply and demand, and could alter longstanding assumptions about energy security and geo-economics. The new dynamics in world energy include, *inter alia*, even greater demand growth over the long-term

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emerging outside the OECD area, continued dominance of fossil fuels, new supply sources beyond the Middle East and what was formerly the Soviet Union, strong growth of unconventional fuels (particularly shale oil and gas), price volatility, inadequate investment due to uncertainties and the global economic downturn, conflicts among International Oil Companies (IOC) vs. National Oil Companies (NOC), geopolitical tensions, and heightened concerns with climate change. The revival of nuclear power and new initiatives in renewable energy sources are also expected to play a crucial role in this new order.

In particular, widespread discovery and usage of shale gas, the rise of LNG as a global commodity, and the emergence of an Atlantic energy market in the natural gas industry will considerably change the way energy is consumed and how countries' global competitiveness is enhanced or eclipsed.

Trade patterns are changing visibly. For example, a quarter of Iraqi oil, about 2.5 million barrels-a-day (mbd), will be heading for China by 2035. Saudi Arabia is already a major supplier to Beijing. This relationship is part of a shift that is tipping the balance of power in the energy world (Ögütçü 2013). As its oil demand grows and its own reserves run out, China is becoming increasingly dependent on crude imports (projected to reach 13 mbd by 2030 – more than today's Saudi total production) from the Middle East and Africa (KPMG 2011). That is coinciding with an equally historic process in the western hemisphere – North America's gradual transition towards self-sufficiency in energy and its waning reliance on imported oil (Exxon Mobile 2012).

Price competitiveness, supply security and environmental quality have become major energy industry challenges around the world. However, these goals are not always consistent. The world needs to cut greenhouse gas emissions in half by mid-century to avoid the worst effects of climate change. Thus, the world will need twice as much energy, but with half the emissions (International Energy Agency 2012).

Solutions favourable to the environment, such as photovoltaic solar energy, may have significant effects on price competitiveness. Other solutions favourable to supply security, such as using local coal, may not be favourable to the environment. Energy security and the environment can also come into conflict, such as when the power system relies too heavily on intermittent renewable energy sources. Foreign policy and energy security goals may also often come into head-on confrontation. There is no single ideal solution to achieve these energy policy goals, but at best an optimal mix of solutions.

In the new, energy-centric world, the price and availability of oil and gas will continue to dominate our lives and power will reside in the hands of those who control the global ownership, financing, production, transportation, and marketing of energy.¹

¹ It will determine when, and for what purposes, we use our cars; how high (or low) we turn our thermostats; when, where, how or even if, we travel; increasingly, what foods we eat (given that the price of producing and distributing many meats and vegetables is profoundly affected by the cost of oil or the allure of growing corn for ethanol); for some of us, where to live; for others, what businesses we engage in; for all of us, when and under what circumstances we go to war or avoid foreign entanglements that could end in war. See "The end of the world as we know it," Michael Klare, August 2008, <http://www.redpepper.org.uk/The-end-of-the-world-as-we-know-it/>

The world of 2030 will be radically transformed from our world today. By 2030, no country – whether the US, China, or any other large country – will be a hegemonic power. The empowerment of individuals and the diffusion of power among states, and from states to informal networks will have a dramatic impact, possibly halting the historic rise of the West since 1750, and restoring Asia's weight in the global economy (U.S. National Intelligence Council 2012).

As globalization lifts millions out of poverty and the demand for energy world-wide continues to grow, the world risks ending up with a volatile, “beggar thy neighbour” style of competition among countries to control sources of supply, especially in the developing world, giving rise to more conflict and confrontation than co-operation and collaboration.

Two key *megatrends* will shape our world out to 2030: demographic patterns, especially rapid aging; and growing resource demands which, in the cases of food, energy and water, might lead to scarcities. These trends, which are virtually certain, exist today, but during the next 15–20 years they will gain much greater momentum. These changes will not occur without serious risks, particularly above-the-ground risks, that will threaten the energy sector seriously in today's inter-connected world (U.S. National Intelligence Council 2012).

This is not the first time that the energy sector has faced uncertainty – recall the oil shocks of the 1970s and 1980s. Nonetheless, uncertainty is at its height now. Uncertainties are particularly dangerous in a sector where investments are long-lived and take a long lead-time to pay off. Considerable uncertainty also extends to global gas markets.

Overall, severe income disparity, chronic fiscal imbalances, geopolitical tensions, technology hazards and natural resources security concerns are among the top risks facing business and government leaders over the next decades. Deeper problems could be brewing in much of the developed world, where overextended governments face political, economic and demographic pressures to reduce social protections, pensions and other commitments.²

The aim of the paper is to elaborate on the “game-changing” dynamics in world energy and how it will create new risks in the energy industry, and to draw conclusions for policy- and decision-makers in government and business to mitigate these risks.

The paper is divided into eight sections. In Sect. 2.2, changing dynamics in world energy are explained, then the new developments in natural gas sector and the role of nuclear energy are discussed in Sects. 2.3 and 2.4. Current positions of Russia and Europe are evaluated in Sects. 2.5 and 2.6. Section 2.7 discusses the future of the Southern Corridor and Sect. 2.8 concludes the paper.

² Further economic shocks, social upheaval and energy shortages could roll back the progress globalization has brought over the past few decades as the world's institutions are ill-equipped to cope with today's rapidly evolving risks that require effective risk mitigation and management.

2.2 Changing Dynamics in World Energy

The fundamental transformation currently underway in the global energy scene will not only change the rules of the game; it will also change the game itself, and its players. Four great trends are likely to define the new energy landscape (U.S. National Intelligence Council 2012):

- The rise of new economic dynamos like China and India, with voracious appetites for energy and other raw materials;
- The emergence of the US as the next energy superpower in oil and gas due to an “unconventional gas/oil revolution”;
- The reluctance of the mature industrial powers, led by the US, Europe, and Japan, to abandon their privileged status atop the resource-consumption pyramid; and
- The gradual depletion of many of the world’s vital resources.

About 1.4 billion people worldwide still lack access to energy. Projections, be they from IEA, EIA or Shell, Exxon, BP, indicate that global energy demand will nearly double in the first half of this century. According to the U.S. Department of Energy, there already has been a 47 % rise in the past 20 years alone, and this is expected to grow by 35–46 % between 2010 and 2035. Most of that growth will come from the new engines of the world economy – China, India and partly the Middle East, where the consuming class is growing rapidly (U.S. National Intelligence Council 2012).

The world will be home to about nine billion people in 2050, up from 6.8 billion today, fuelling further growth in demand for energy. At the same time, increasing wealth is improving living standards and raising millions of people out of poverty in developing regions. As incomes grow and living standards improve, people are buying their first cars, air conditioners or refrigerators – which need massive amounts of energy. Worldwide, the number of cars and trucks on the roads is expected to rise from around 900 million today to around two billion by the mid-century (The Independent 2010).

The relative distribution of power is changing with the erosion of America’s margin of superiority in economic, military, and ‘soft power’ terms. Few financial concepts have caught on as quickly as “BRICs,” a term coined by a Goldman Sachs economist, which stands for Brazil, Russia, India and China, the “Big Four” fastest-growing economies in the world today. By dint of their sheer size and population – and their collective decision to embrace their own particular brand of capitalism – BRICs are seen as the economic future of the world. Together, the BRICs encompass more than 25 % of the world’s land mass and 40 % of the world’s population (Press Release, United Nations 2009)³.

³ China and India will become the dominant global suppliers of manufactured goods and services. Economic aspirations in Brasilia, Moscow, New Delhi and Beijing are inextricably linked to the strength of their national energy sectors.

As the economies of the BRIC nations continue to grow, their demand for energy will rise sharply. According to data from the U.S. Energy Information Administration, by 2025 the BRICs will account for nearly 38 % of global primary energy demand, up from 27 % in 2005 (Ebinger et al. 2012). Hence, unless massive investments and new technologies are mobilized in the next few decades, energy supplies are likely to get tighter for all economies (BizShift-Trends 2011).

An increase of this sort would not be a matter of deep anxiety if the world's primary energy suppliers were capable of producing the needed additional fuels. Instead, we face a frightening reality: a marked slowdown in the expansion of global energy supplies just as demand rises precipitously. These supplies are not exactly disappearing – though that will occur sooner or later – but they are not growing fast enough to satisfy soaring global demand (Dejevsky 2012).

While demand is growing, new suppliers are appearing on the horizon. Of particular importance is the resurgence of US oil and gas production, particularly through the unlocking of new reserves of oil and gas found in shale rock. One should also take into account the Arctic region, Brazil, Australia, Central Asia, the east Mediterranean and East Africa as additional suppliers.

The emergence of powerful new energy consumers- global energy supply increases only gradually, is creating an energy-deficit world, characterized by fierce international competition for dwindling stocks of oil, natural gas, coal and uranium, as well as by a tidal shift in power and wealth to energy-surplus states like Russia, Saudi Arabia and Venezuela. As the demand for energy accelerates, an energy revolution is needed on the demand side as well, where big changes should be effected relatively quickly to improve energy efficiency (The Independent 2013).

Geopolitics has gained the upper-hand once again in world energy. The root-causes for most geopolitical tensions are the scarcity of resources that fuel competition among nations for a bigger pie, particularly in energy, water and food. Throughout history, major shifts in power have normally been accompanied by violence – in some cases, protracted violent upheavals. Either states at the pinnacle of power have struggled to prevent the loss of their privileged status, or challengers have fought to topple those at the top of the heap.

Disputes in the Caspian basin, the South China Sea, the Arctic, the Strait of Hormuz, and the Eastern Mediterranean are largely instigated by energy resources and how they should be developed, extracted, distributed and transported among bordering nations. The most explosive one seems to be the South China Sea. China is already the world's largest energy consumer and imports a growing share of its oil and gas, so the question of how much oil and gas is under the South China Sea is hardly an idle one. Beijing is keen to make the country more self-sufficient in energy and to this end has encouraged domestic sources of power, including hydropower, nuclear energy, wind and solar energy (Solar Energy 2012).

Aside from geopolitical disputes, the economics of extraction are also set to play a big role in the development of disputed areas. Some countries have a strong urge not to procure energy for their own use, but to dominate the flow of energy to others. In particular, Moscow seeks a monopoly on the transportation of Central Asian/Caspian gas to Europe via Gazprom's vast pipeline network. It also wants to tap

into Iran's mammoth gas fields, further cementing Russia's control over the trade in natural gas (Kilyakov 2012).

The danger, of course, is that such endeavors, multiplied over time, will provoke regional arms races, exacerbate regional tensions and increase the danger of great-power involvement in any local conflicts that erupt, as they currently do.

2.3 Natural Gas as a Game-Changer

The share of natural gas among sources of primary energy is rising faster than that of oil and coal. At the same time, the gas industry is undergoing immense changes as new technologies, demand and supply patterns create new market forces.

In 2011, after the Fukushima nuclear accident, the International Energy Agency heralded the arrival of a "golden age" of gas in the period until 2035 due to enormous economic growth in China combined with significant gas consumption, a low share of nuclear energy in the generation of electricity, an increase in the use of gas in the transportation sector, and a boom in unconventional gas production and subsequently lower prices. Electricity from renewable resources still requires natural gas as a back-up energy source because an uninterrupted supply of renewable energy is not available – at least until technology enabling the high-efficiency storage of electricity is discovered and commercialized (Ögütçü and Ögütçü 2010).

Unconventional gas is becoming a real game changer in the US gas market. The widespread adoption of techniques such as hydraulic fracturing and horizontal drilling, have made those reserves much more accessible, and, in the case of natural gas, has resulted in a glut that has sent prices plunging. The "shale gale" sweeping across North America the past few years has more than doubled the size of discovered natural gas resources in North America – enough to satisfy more than 100 years of consumption at current rates, according to a major new analysis of the leading unconventional gas plays in North America by IHS Cambridge Energy Research Associates (Williams 2012).

In 2010, 12 billion cubic meters (bcm) of LNG was imported into the US. Before this unconventional gas revolution, this number was expected to reach 140 bcm by 2020. Now, the US is set to become a major natural gas exporter, transforming the global gas market. The price of gas sold by Henry Hub in the U.S. dropped in 2012 to a level of \$2 per million metric British thermal unit (MMBtu), its lowest level in the past decade, while the European average spot price and oil-indexed price have fluctuated between \$8 and \$10, and the Japanese averaged around \$17 (Foss 2011).

If the Henry Hub price remains near \$3, LNG exports of domestic production look very competitive at anticipated prices in Europe. If the Henry Hub price is raised and a higher price event or set of events happens, such that a \$10 spike is tenable, then exports look out of the question.⁴ A future price level that could

⁴ The exception could be Asia with the most logical route being from western Canada (or Alaska, if backers of an "all Alaska" solution for monetizing North Slope natural gas with a pipeline to Cooke Inlet won out).

accommodate a \$10 price spike also could be more attractive to LNG imports (Foss 2011).

The US success story has inspired many other countries, including Argentina, China, Poland, South Africa and the UK, to develop their own reserves. Shale development in China, home to the world's largest shale deposits, has been slower than predicted by the government. China may produce 6.5 bcm of shale gas annually by 2015 and has set a target of 60–100 bcm of production annually by 2020, according to China's National Development and Reform Commission (Enoe et al. 2012).

However, as yet, no country other than the US has what could be termed a shale gas industry – gas production from tight oil and shale plays is still negligible outside the US. Most production increases will only come after 2020, as countries need time to develop the commercial unconventional gas sector due to various geological, logistical and regulatory challenges. The countries where shale gas is presumed to exist in the EU are Germany, Poland, Sweden, France, Austria, Hungary and the UK. Warsaw is harbouring major ambitions to develop shale gas, the switch towards which is like “the twenty-first century's gold rush” (Oswald et al. 2012).

But, shale gas cannot yet be seen as a game changer in Europe as it is in the US, where roughly 50 % of the country's needs are met by developing unconventional gas. To illustrate the possible impact of developing shale gas in Europe, the U.S. Geological Survey pointed out that in an area the size of the Benelux countries, there would have to be up to 6,000 wells, an impact that would probably attract environmental opposition. The reason for such concentration is that unlike natural gas, unconventional gas needs a high density of wells, including horizontal wells (Oswald et al. 2012).

Another development that has transformed and continues to transform the landscape of the natural gas industry is the advent of Liquefied Natural Gas (LNG). This mode of transport allows gas-exporting countries to ship their gas over long distances and releases them from the traditional dependence issues associated with pipelines. Pipelines are expensive and, once built, tie producers and consumers together indefinitely, while LNG allows both exporting and importing countries to escape this form of captivity. Understandably, this has both commercial as well as geopolitical consequences.

Between now and through 2015, several Southeast Asian countries will emerge as new LNG importers and demand in existing markets will increase steadily. On the supply side, however, only a small number of new projects are coming on line; these are the Pluto LNG project in West Australia, the Angolan LNG project, and the Algerian LNG project. Consequently, the world LNG market will likely tighten up. However, the final impact remains uncertain: the prevailing European economic crisis may keep demand sluggish or prolonged shutdowns of nuclear power plants in Japan may keep demand for LNG high (World Economic Forum 2011).

In 2011, final investment decisions were made for several LNG plants that will go on stream in the Pacific basin in 2015 or later. These projects, if commissioned

without delay, would contribute to stabilize the LNG market in the long-run.⁵ In addition, new prospective supply sources are coming up in East African countries like Mozambique. At the same time, LNG exports from North America are emerging rapidly as a next-generation supply source. The Sabine Pass project, which has recently fixed sales agreements for 16 million tonnes, uses low-cost gas brought about by the shale gas revolution.⁶

Despite the rise of LNG, pipelines are still the backbone of the gas industry. Transport by pipeline is not as flexible as by LNG tanker, but is often the cheapest method, depending on the geographical location.⁷ Coal, oil and gas, particularly natural gas, will continue to play an important role. Abundant, affordable and acceptable – gas is a triple-A source of energy. It is cleaner than coal; gas-fired generation is relatively quick and inexpensive to build; and the shale revolution in North America has raised hopes that gas is abundant in geological formations the world over (Bettinger et al. 2010).

2.4 Nuclear ‘Key’ to the World’s Energy Future

The holy grail of alternative energy sources is nuclear fusion, where power is generated by fusing atomic nuclei together in a reaction that releases immense amounts of energy. Fusion is the same reaction powering the Sun. It has the advantage over conventional nuclear fission power in that it is clean and virtually waste-free – but it only seems to work at the intensely high temperatures found in the Sun, a problem for a reactor on Earth.

Nuclear power stations have proven to provide a steady “base load” whether the wind is blowing or the sun is shining, and of course, they do not require fossil fuels – although there is the question about continued supplies of uranium and what to do with the nuclear waste.

Despite Japan’s Fukushima accident following the tsunami in March 2011, the latest projections by the International Atomic Energy Agency show that the global use of nuclear power will grow significantly in the coming decades. Power produced from nuclear fission is now a mature technology that provides about 16 % of the world’s electricity and almost a third of that in the EU. Many emerging market

⁵ The overall LNG production capacity of Australia – including the Ichthys project, which was given the green light in early 2012 – will exceed 80 million tonnes a year around 2018, making the country the largest LNG exporter in the world. The Ichthys LNG project, to be operated by INPEX with its primary export destination being Japan, is considered virtually a *Japan-made* project. As some of the Japanese buyers have formed a consortium for joint purchasing, it could provide a model case for structuring future purchasing strategies.

⁶ Its cost is estimated to be about 30–40 % lower than the LNG procurement cost of Japan. Other LNG projects coming up in North America, if materialized as proposed, could have a sizeable impact on the LNG pricing system in the Asia-Pacific region.

⁷ The development of a number of new pipeline projects in Europe, starting with Nord Stream, is helping to bolster transmission capacity and security of supply. Recent agreement for new pipelines in emerging markets, particularly between Russia and China, underline the importance of natural gas in the twenty-first century energy landscape.

governments have committed to a fresh round of building nuclear fission power stations, despite opposition from environmentalists and those concerned about nuclear proliferation. Over 30 countries benefit substantially from nuclear energy. In addition to the 400 or so nuclear power plants around the world, many more are to be built over the next 30 years (Trajonowska 2012).

Nuclear power plants are being given lifetime-extensions in Spain and in the UK and new ones are not only being considered or actively planned in Slovakia, Hungary, the Czech Republic, Bulgaria, Romania, Poland and Lithuania, but in the UK too. And they are under construction in France and Finland. In other parts of the world, new nuclear power projects are more visible still. The dynamic economic growth of Asia has seen the most rapid expansion of nuclear programmes, with China, India and Korea basing their development to a very large extent on nuclear energy, just as Japan did 40 years ago. Japan also intends to restart its nuclear plants after the post-Fukushima safety review (The World Nuclear Industry Status Report 2012).

The same even applies to oil and gas producing states, like the United Arab Emirates and Saudi Arabia. Although its ambitious goals are still only on paper, the Emirates have already begun to earmark nuclear investment. Even in the US, despite the shale-gas rush, licenses have just been approved for four new reactors. Nuclear power development is making progress in Russia too.

Every time there is an accident, proponents of nuclear power point out that risks are also associated with other forms of energy. Coal mining implies mining disasters, and the pollution from coal combustion results in some ten thousand premature deaths in many countries including China, USA and Russia each year. Oil rigs explode, sometimes spectacularly, and so, on occasion, do natural gas pipelines. Moreover, burning any kind of fossil fuel produces carbon-dioxide emissions, which, in addition to changing the world's climate, alters the chemistry of the oceans.

Among those who argue most passionately for nuclear power these days are some environmentalists, who see the uncertain threat that it presents as preferable to the certain harm of climate change. An objective comparison might indeed suggest that a well-designed and vigorously regulated nuclear power plant poses less danger than, say, a coal-fired plant of comparable size.

For countries such as Japan, the contribution of nuclear energy to enhancing energy security is not small in view of its low cost, large scale, and high energy density. To date, Japan has been working on energy security by concentrating on ensuring supply of oil and stabilizing its price. However, following the Great East Japan Earthquake, unexpected problems have surfaced such as shutdowns of nuclear power plants and the huge Asian premium on LNG prices. The market mechanism alone is insufficient to guarantee energy security and Japan needs to mobilize other measures including subsidies and grants on R&D, resource diplomacy, and safety regulations (Kolbert 2011).

This made it necessary to rebuild Japanese energy policy carefully by re-examining what measures are practicable, feasible and effective. Nuclear option is now diminishing and can no longer be considered as the single central pillar, while renewable energy could not be a leading source. Other feasible options

include construction of domestic trunk gas pipelines, as well as piped natural gas imports from Russia, though substantial reform of the Japanese gas and electricity industries is a prerequisite “bundle” wholesalers and independent gas buyers.⁸

Nuclear energy is no silver bullet for resolving all of the world’s energy problems. But it is a crucial part of the global solution of a sustainable and diversified energy mix. And greater diversification of electricity generation technologies means greater security of supply. Hence, nuclear energy must be seen as essential to a common solution, and not as a rival to other technologies. It has already contributed to the development of other, mainly renewable, energy sources.⁹

2.5 Is Russia on the Losing End?

Russia holds the world’s largest proven reserves of natural gas and continually alternates with Saudi Arabia as the top oil producer. The country supplies a third of Europe’s oil and natural gas and is starting to export more to the energy-hungry East Asian markets. The energy sector is far more than a commercial asset for Moscow; it has been one of the pillars of Russia’s stabilization and increasing strength for more than a century.

The future of Russia’s ability to remain a global energy supplier and the strength that the Kremlin derives from the Russian energy sector are increasingly in question. After a decade of robust energy exports and revenues, Russia is cutting natural gas prices to Europe while revenue projections for Gazprom are declining starting this year. Gas is available on a spot basis today in Europe at prices lower than the oil-indexed prices of long-term contracts signed with Russia (Kilyakov 2012).¹⁰

With the US on its way to replacing Russia as the world’s top gas-producing superpower by 2015 – and coming close to Saudi Arabia as leading oil producer by 2017 – Russia seems to be on the side of those who will suffer most from the game-change in energy.

Currently, energy revenues make up half of the Russian government’s budget. This capital influx was and continues to be instrumental in helping Russia build the military and industrial basis needed to maintain its status as a regional – if not

⁸ In this regard, particular attention will need to be paid to development of Japan-Russia relations in the era of Putin’s new administration. See Asian premium on gas strikes LNG importing countries, <http://eneken.ieej.or.jp/en/jeb/1203.pdf>

⁹ In Germany, nuclear operators pay a special “renewable energy” tax, and in Poland legal arrangements designed for the development of nuclear power plants are used to improve the electrical grid so as to connect renewable sources to it.

¹⁰ None of the major energy industries – oil, gas or power – developed on the basis of a spot market alone. The search for balance between competition and security is central to an understanding of the role of spot markets and long-term contracts in the global gas trade. See http://www3.weforum.org/docs/WEF_EN_EnergyVision_NewGasEra_2011.pdf

global – power. However, as the Russian governments became dependent on energy, the revenues also became a large vulnerability (Goodrich et al. 2013).

The energy sector also contributes to Russia's ability to expand its influence to its immediate neighbors. Moscow's use of energy as leverage in the buffer states differs from country to country and ranges from controlling regional energy production (as it previously did in the Azerbaijani and Kazakh oil fields) to subsidizing cheap energy supplies to some countries and controlling the energy transport infrastructure. Russia has used similar strategies to shape relationships beyond the former Soviet states (Gorenburg 2013).

As things stand, Gazprom's unparalleled prosperity and dominant market position in Europe have been seriously upset by the "shale energy revolution" and emergence of new suppliers/competitors both within Russia (i.e., Novatek and Rosneft) and outside. Domestic competitors challenge Gazprom's dominance. The share of gas supplied by independent producers has increased to 25 %. Novatek (Russia's largest independent producer of natural gas) has put an end to Gazprom's monopoly on gas exports by signing a 10-year contract with Germany's EnBW Group worth 6 billion euros. Rosneft too is a significant new power to reckon with for Gazprom. Russia has also lost a great deal of its influence in Central Asia or the "near-abroad" to China (Kilyakov 2012).

A set of EU-wide policies, including the Third Energy Package, have started to give EU member nations the political and legal tools to mitigate Gazprom's dominance in their respective natural gas supply chains. This common framework also allows European nations to present a more unified front in challenging certain business practices they believe are monopolistic – the latest example being the EU Commission's probe into Gazprom's pricing strategy in Central Europe.¹¹

New gas production set to begin in Azerbaijan, Turkmenistan, Australia, Tanzania, and East Mediterranean may further aggravate the gas glut problem for Gazprom, driving the prices downward and changing the geopolitical dynamics.

The Kremlin appears keenly aware of the challenges that Russia will face in the next two decades as another energy cycle draws to an end. Unlike Brezhnev and Gorbachev, Putin has proven capable of enacting effective policy and strategy changes in the Russian energy sphere. While Russia's dependence on high oil prices continues to worry Moscow, Putin has so far managed to respond proactively to the other external shifts in energy consumption and production patterns – particularly those affecting the European natural gas market. However, the long-term sustainability of the Russian model remains doubtful.

¹¹ This, coupled with the EU-funded efforts to physically interconnect the natural gas grids of EU members in Central Europe, has made it increasingly difficult for Russia to use natural gas pricing as a foreign policy tool. This is a major change in the way Moscow has dealt with the region for the past decade, when it rewarded closer ties with Russia with low gas prices (as with Belarus) and increased rates for those who defied it (the Baltics).

2.6 Europe at a Crossroad

Europe appears to be missing out on the natural gas boom that is transforming energy use in the US and Asia. A European boom in shale gas extraction remains unlikely in the near future due to low levels of support among politicians and the public. Bulgaria and France have already banned exploratory drilling that employs controversial hydraulic fracturing technology. Similarly perplexing information is also coming from Poland, an advocate of shale gas in Europe, where ExxonMobil recently declared an end to exploratory work due to insufficient commercial quantities.

European utilities' preference for burning coal to generate electricity is pushing up carbon emissions even though the region has invested twice as much in renewable energy as the US since 2004. In Europe, gas costs three times as much as in the US, cutting competitiveness for industrial users such as Germany's BASF, the world's largest chemical maker, which intends to relocate some of its facilities to the US (Ögütçü 2013).

Gas is becoming too expensive a fuel for Europe. More than half of Europe's supply of fuel is bought through long-term contracts linked to the price of oil, and that will remain the case until 2014 (Ögütçü 2013).¹² Even after a wave of renegotiations, most prices for gas from Gazprom, which meets about a third of the EU's needs through contracts tied to oil, were reduced no more than 10 %.¹³ Disputes remain with RWE, Germany's second-largest utility, and the Polish gas company PGNiG (Badida 2013).

All EU member states are free to shape their own domestic energy mix, so decisions concerning the share of renewables in energy generation need to take national circumstances into account. Decisions on increasing the share of renewables obviously have to fit into the overall infrastructure development strategy. Both domestic and cross-border grids and energy storage arrangements need to be strengthened so they are able to absorb projected levels of unstable electric power.

Increasing the share of renewables looks set to be an important element in the strengthening of Europe's energy independence, in line with other sources like nuclear, coal and gas. And it has to be borne in mind that, if not correctly handled, boosting renewables could yet result in increased dependence on imported technologies and equipment. Over-optimistic assumptions about renewables can place a significant financial burden on the economies of many EU countries by decreasing their competitiveness, and causing a drastic increase in electricity prices unless corresponding actions are taken elsewhere in the world.

¹² Note that Brent crude has climbed 72 % over the past 4 years.

¹³ The planned construction of LNG export terminals in Australia and the US in 2015 should lead to an increase in the security of supplies to Europe but the overall positive effect on European prices is questionable as LNG is more expensive than pipeline gas. LNG prices must fall to \$9–\$11 per MMBtu if it is to be affordable for buyers in the EU, India and China.

The importance of coal to future power engineering in Europe must be stressed. Coal is set to remain a significant fuel in the EU for decades to come, not just in the energy sector but for industries like steel or pulp and paper. But the rising costs of CO₂ will at the same time create a major threat to the competitiveness of these key industries.

Forced “European” solutions that do not consider the domestic situations of all are not in line with the democratic principles of the EU. Unless we take serious account of global circumstances, such solutions could even halt the economic growth of some member states and eventually the EU as a whole. Without a sustainable energy mix that includes different forms of energy, the European economy will be less competitive, industry will move abroad and jobs will inevitably be lost.

2.7 The Future of the Southern Corridor

The Southern Corridor is important for Europe in terms of diversifying its gas suppliers and routes – particularly away from Russia. Natural gas imports are likely to occupy an increasingly central role in Europe’s energy portfolio, necessitating multiple alternatives such as a new Southern Corridor. Europe’s reliance on natural gas imports has been exacerbated by a steep decline in natural gas production within Europe, Germany’s decision to phase out nuclear power (France, too, is considering a scaling back of nuclear energy), and opposition to shale gas in several EU countries.

Development of a Southern Corridor to link the Caspian to Europe with oil and natural gas pipelines was an early element of a western strategy to reduce dependence on Russia. The first stage was achieved with the completion of the Baku-Tbilisi-Ceyhan oil pipeline from Azerbaijan to a Turkish Mediterranean port and the South Caucasus Gas Pipeline from Azerbaijan to Turkey. The next stage of Southern Corridor development is to use expanded production of natural gas in Azerbaijan as a supply anchor. This stage envisions the expansion of the South Caucasus Pipeline. There is also a prospect of additional gas from Turkmenistan and Iraq to further supply the Southern Corridor.

From the US perspective, this Corridor would further isolate Iran, assist in cultivating partners in the Caucasus and Central Asia and bolster their sovereign independence, and perhaps most importantly, curtail Russia’s energy leverage over European NATO allies.¹⁴ Among EU countries, Austria, Bulgaria, the Czech Republic, Estonia, Finland, Latvia, Lithuania, Poland, and Slovakia all depend on Russia for over 60 % of their gas imports; EU aspirants such as Moldova, Turkey,

¹⁴ “Energy and Security from the Caspian to Europe,” a minority staff report prepared for the use of the Committee on Foreign Relations, United States Senate, Washington: 2012, <http://www.gpo.gov/fdsys/>

and Ukraine rely on Russia for over 65 % of their imports (World Economic Forum 2011).

Some critics may argue that the Southern Corridor should be a lower priority: US shale gas and global LNG trade is producing more market liquidity, thus tending to lower prices and improve Europe's negotiating position with Russia. Russia's Gazprom has been forced to change its domestic strategy, including abandoning its flagship Stockman project in the Arctic, and it has had to contend with plummeting market value and a new EU antitrust investigation. These trends may or may not last, but their existence today gives an unprecedented opportunity to advance broad natural gas diversification and break Russia's control over European gas markets (World Economic Council 2013).

Turkey's rapidly growing domestic energy demand has been a central dynamic of the Southern Corridor. In particular, its willingness to allow transit of significant amounts of natural gas to Europe, even when its own domestic market could easily consume the gas, has bolstered the prospects for the Southern Corridor. Azerbaijan is the pivotal supplier for the Southern Corridor and is positioned to be a long-term transit hub for potential trans-Caspian supplies from Turkmenistan and Kazakhstan. For the past two decades, Azerbaijan's leadership has made a strategic decision to use new pipelines to forge closer ties with the West (Ögütçü 2013).

Beyond Shah Deniz II gas, securing additional supplies for the Southern Corridor is crucial. Turkmenistan's conventional natural gas supply, the world's fourth largest, has high potential for being joined to the Southern Corridor by constructing a Trans-Caspian Pipeline from Turkmenistan to Azerbaijan's energy infrastructure.

However, a combination of inscrutable leadership, geopolitical pressure by Russia, and an investment climate unfriendly to energy majors has hampered progress, and the window for Turkmenistan's participation in the Southern Corridor may be closing. Most critically, the President of Turkmenistan must be willing to assert his nation's political independence from Russia by executing the necessary reforms that will make increased production and trans-Caspian transit a reality.

Conclusion and Key Messages

As the preceding sections clearly indicate, world energy risks multiply and become increasingly difficult to mitigate as a result of complex issues at hand, resource constraints and a multitude of new actors in search of a place in the system.

The global energy sector will transform through 2050 and will become increasingly complex and risky. The pressure on decision makers in both the public and private sectors will increase and, in particular, the demands on those responsible for energy policy will intensify. Policies formulated today and the resulting actions and behaviours of citizens will have effects and consequences far into the future (World Energy Council 2013).

Not so long ago the global energy map looked simple and – for the Western world – somewhat intimidating. There were the Gulf States and there were the Russians exporting fossil fuels who could dictate their terms. There were the resource-hungry Chinese preparing to plunder Africa for raw materials; there

was Norway showing us all how a small petro-state should be run; and there were the environmentalists and climate change people (not always the same) whose chief preoccupations were reducing carbon emissions and promoting renewables. Much policy was determined by fear of an energy shortage that always lurked just below the surface (Ögütçü and Ögütçü 2010).

The economics of energy internationally are changing beyond recognition, and the political shifts and risks will not be far behind.

Major shifts of power between states, not to mention regions, occur infrequently and are rarely peaceful. In the early twentieth century, the imperial order and the aspiring states of Germany and Japan failed to adjust to each other. This conflict resulted in the devastation of large parts of the globe. Today, the transformation of the international system will be even bigger and the rising new powers are nationalistic, seeking redress of past grievances, and will want to claim their place under the sun.

The uneven distribution of energy resources among countries is a constant source of friction, giving rise to significant vulnerabilities such as the ones that occur in the Strait of Hormuz, the Malacca Straits, the East China Sea, the Caspian Sea, the Kurdistan Regional Government versus Baghdad and the east Mediterranean, as well as the domestic instabilities triggered by the Arab Spring, the Nigerian labor strikes, the attacks in Algeria, the breach of contract sanctity in Kazakhstan and the ongoing Iraqi unrest. They all vividly illustrate how above-the-ground factors could inhibit hydrocarbon development (Hook 2012).

The signs indicate more confrontation than collaboration, particularly over resources as the gap between supply and demand widens. Additionally, most resource-holders want to change the balance of interests with international extraction companies in order to maximize their gains through so-called “resource nationalism.”

It is not only resource-rich countries that are firing the shots in the new energy game. Industrialized importing countries are also resorting to what is called “economic patriotism” to protect their strategic sectors. The expansion of government-owned companies from hydrocarbon-importing developing countries such as China and India into oil and gas exploration activities on a global scale is gaining added momentum.

The most spectacular actual transformation so far is the impact in the U.S., where the exploitation of shale gas and oil has already reduced domestic energy prices by as much as half and could make the U.S. a net exporter. This is a happy outcome not just for American consumers, but for manufacturers, too. As production costs in China and elsewhere rise, this could lead to the repatriation of some industry. But the trend has already prompted grumbling from Europeans and, without following the U.S. example, the EU may find itself uncompetitive in the global market.

There could be a knock-on effect on the Gulf and the Middle East. Saudi Arabia has recently reduced its oil production, partly in response to the drop in U.S. demand. It finds itself in a similar position to Russia – as dependent on Western demand as the West is dependent on supply – but with an economy even

more reliant on energy exports, a less-educated population, and the winds of political change blowing all around.

Western countries are producing less and less of their own energy, and are, therefore, having to import more and more. This is having a massive impact on the transfer of wealth. What we know is that these massively increased energy revenues not only mean more economic power for the oil producers, but also, of course, increasing political power and influence in shaping the new global security order.

The coercive manipulation of energy supplies, competition over energy sources, the tendency of energy producing countries to political instability, attacks on supply infrastructure, competition for market dominance, accidents, and natural disasters are all adding significant risks to global energy security. Increased competition over energy resources may also lead to the formation of security compacts to enable an equitable distribution of oil and gas between major powers.

The evolution of energy economics in the U.S. casts doubt on the sustainability of Europe's investment in renewables. Germany leads the field here, with its renunciation of nuclear energy – a political decision made when the Fukushima disaster in Japan coincided with a sensitive regional election – and pledges to draw 50 % of its energy from renewables by 2050. But the temptation for even the most green-minded European governments to retreat from the development of wind and wave power could become hard to resist if gas and oil can suddenly be produced or bought much more cheaply.

In this new stage of energy competition, the advantages long enjoyed by Western energy majors has been eroded by vigorous, state-backed upstarts from the developing world. The rising economic dynamos will have to compete with the mature economic powers for access to remaining untapped reserves of exportable energy – in many cases, bought up long ago by the private energy firms of the mature powers like Exxon Mobil, Chevron, BP, Total of France and Royal Dutch Shell. Of necessity, the new contenders have developed a potent strategy for competing with the Western “majors”: they've created state-owned companies of their own and fashioned strategic alliances with the national oil companies that now control oil and gas reserves in many of the major energy-producing nations.¹⁵

Both unilaterally and through the EU, European countries began developing strategies that would allow them to mitigate not only Europe's vulnerability to disputes between Moscow and intermediary transit states, but also its general dependence on energy from Russia. The accelerated development of new

¹⁵ China's Sinopec, for example, has established a strategic alliance with Saudi Aramco to explore for natural gas in Saudi Arabia and market Saudi crude oil in China. Likewise, CNPC will collaborate with Gazprom, to build pipelines and deliver Russian gas to China. Several of these state-owned firms, including CNPC and India's Oil and Natural Gas Corporation, are now set to collaborate with Petroleos de Venezuela SA in developing the extra-heavy crude of the Orinoco belt once controlled by Chevron.

and updated LNG import facilities is one such effort. This will give certain countries – most notably, Lithuania and Poland – the ability to import natural gas from suppliers around the globe and bypass Russia's traditional lever: physical connectivity.

This is particularly significant in light of the accelerated development of several unconventional natural gas plays in the world, particularly the shale reserves in the U.S. The development of a pipeline project that would bring non-Russian Caspian natural gas to the European market is another attempt – albeit less successful so far – to decrease European dependence on Russian natural gas.

The future is far from certain and the rate of technology change in both the supply and the demand sides of the energy sector is increasing. Government policies must therefore be quite clear in their intent and less prescriptive in terms of the means, permitting those responsible for implementation the requisite degree of freedom to apply the best technology solutions and systems to meet the objectives. Countries or corporations where policy explicitly favours or restricts certain technology options may find it difficult to keep up with the evolution of the global energy sector.

Industry leaders have to ensure that corporate policy, investment criteria, and business practices are all geared to deliver the goods and services that support the government's policy intent. Policy initiatives are not only necessary at the national level but also must consistently cascade down to sub-national and local levels. These initiatives have to pay particular attention to the development of transportation systems, planning towns and cities, modernisation of communication systems, and work practices.

Energy sustainability is a golden thread that runs through the long-term survival of economies and indeed society. Clear and consistent policies that respect the environment while providing the energy necessary are required. An integrated view across the many facets of government is necessary. In fact, it is difficult to identify any one facet of government that does not contribute to and at the same time depends on a sustainable supply of energy.

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