

## Energy Advisory Board Background Document

*A background paper prepared for the World Economic Forum's Energy Community by Members of the Advisory Board:*

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## Enabling an Effective Energy Transition amid a Shifting Landscape

### Context

The global energy map is changing, with potentially far-reaching consequences for energy markets and trade. It is being redrawn by the resurgence of oil and gas production in the United States and Iraq, the retreat from nuclear power in some countries following Fukushima Daiichi, and fresh policy measures in several major energy-consuming countries aimed at improving energy efficiency.<sup>1</sup>

Amid these shifts – some of which contribute positively to a more secure and cleaner energy future – the past 12 months have also shown that many symptoms of a broadly unsustainable energy system persist. At well over US\$ 100 per barrel, oil prices for the year averaged an all-time high, acting as a brake on the global economic recovery. High prices and pressure on governments in the Middle East, North Africa and elsewhere caused fossil-fuel subsidies to balloon to US\$ 523 billion – rising by some 30% year-on-year – exacting a high cost for policies that promote wasteful consumption and are, in most cases, regressive.

Meanwhile, 1.3 billion people still lack access to electricity. And climate change has slipped down the policy agenda at the same time renewables have experienced growing pains and CO<sub>2</sub> emissions have risen to a new record. How governments and industry respond to this shifting landscape in 2013 and beyond will be critical to shaping our energy future for years to come.

### What does resurgent US oil and gas production mean for North America and the world?

Resilient oil and gas production in the United States is one of the most striking features of the changing energy landscape. The innovative application of horizontal drilling and hydraulic fracturing technologies has unlocked unconventional resources that had once been considered too difficult or costly to access. Consequently, a surge in the production of light tight oil and shale gas has reversed the long trend of declining US oil and gas output. There are still some questions about the sustainability of light tight oil output growth given the current state of knowledge about the resource base, but analyses increasingly expect that unconventional sources will support US oil and gas production growth at least into the 2020s. These developments position the US to overtake Saudi

<sup>1</sup> These topics are analyzed and discussed in detail in the International Energy Agency's *World Energy Outlook 2012*.

Arabia as the world's largest oil producer and Russia as its top gas supplier by the end of this decade – a possibility that would have been all but unthinkable just a few years ago.

The effects of resurgent US oil and gas production will be felt in the North American energy sector and well beyond. In North America, it promises to spur further economic activity not only in upstream oil and gas, but also among energy-intensive industries that gain a competitive edge from cheaper gas and electricity prices. Several chemicals firms, for example, have in the last year announced substantial new investments in facilities located in the United States. Booming oil production, in combination with the more rigorous vehicle fuel-economy standards that were recently adopted, also set the US on a path to dramatically reduce its oil imports (and related financial transfers).

With oil output in Canada expected to rise steadily, North America could become a net oil exporter in future years. Bullish gas supply prospects and the opportunity to capitalize on wide price differentials between regional markets have motivated proposals to build new LNG export capacity in North America. Nonetheless, the reversal of increasing US oil and gas import dependence stands in stark contrast to the trends expected in other importing countries.

Rebalancing of the North American energy market will have major implications for global energy markets, international trade and geopolitics. Diminishing oil imports would accelerate the shift of oil trade flows toward Asia, putting increasing strategic emphasis on the security of shipping routes to Asian markets from the Middle East as well as the relationships of emerging trading partners. Rising volumes of LNG, from North America and elsewhere, can be expected to hasten the globalization of the gas market and strengthening price linkages between regions. With gas prices in Europe and Japan in 2012 reaching five and eight times those in the United States, there remains significant scope for convergence.

### **What is needed to enable the spread of the unconventional gas revolution?**

Natural gas is poised for a bright future, but only if the world's huge resources of unconventional gas can be developed profitably and in an environmentally acceptable way. The unconventional gas industry is still in its formative years, particularly outside North America, and the extent and quality of the resource base is unknown in many countries. There are significant public concerns over associated social and environmental impacts, with serious hazards that include the potential for air pollution and contamination of surface and groundwater. Some of these hazards are not unique to unconventional gas; efforts to minimize venting or leaking of methane into the atmosphere, for example, are required by the gas industry as a whole throughout the supply chain. But if not adequately addressed, these hazards threaten to curb, if not halt, development of unconventional resources. Such an outcome would waste an important opportunity to diversify the energy mix, widen the global base of suppliers, reduce (if only to a small degree) carbon emissions and make energy more affordable.

The technologies and know-how exist for unconventional gas to be produced in a way that satisfactorily meets environmental and social challenges, but a continuous drive from governments and industry is required to ensure an exemplary level of performance. Industry needs to commit to the highest practicable environmental and social standards at all stages of development. And governments, for their part, need to design appropriate regulatory frameworks based on sound science, with sufficient compliance staff and public access to information. An IEA special report, *Golden Rules for a Golden Age of Gas*, estimated that implementing necessary measures adds only 7% to a typical well's overall cost, with that percentage falling as developments scale up. This will invariably require decision-makers to balance their own energy security, economic and environmental objectives. However, if the unconventional gas revolution is to spread, such efforts will be crucial to achieving a level of environmental performance and public acceptance that can earn the industry a "social license to operate".

### **Will the power sector take on an increasingly green profile?**

The power sector is another focal point of a shifting energy landscape. Almost two years after Fukushima Daiichi, the future of nuclear power continues to dim. Japan and France joined other countries in announcing their intentions to reduce their use of nuclear power. Meanwhile, its competitiveness in North America is challenged by an extended outlook of relatively cheap gas. These actions and conditions will have varying degrees of consequences related to spending on

imports of fossil fuels, electricity prices and the level of effort needed to achieve climate targets. Nevertheless, there has been no change to policies among the countries expected to be the main drivers of the industry – namely China, India, Russia and Korea.

Substantial capacity additions and investments are required to enable renewables' continued push into the mainstream. These investments, however, are not assured. Renewables are gaining in competitiveness versus conventional energy sources, but many types are still more expensive than conventional sources and rely upon government support – in the form of policy measures and financial subsidies – to aid their deployment and help deliver cost reductions. Subsidies to renewable energy, which totalled US\$ 88 billion in 2011, would have to increase to US\$ 240 billion per year in 2035 to meet existing targets. But weak economic conditions and tightening government budgets, particularly in OECD countries, mean that some of the government support to renewable energy, including for research, is now in danger of being eroded.

Support schemes for renewables must be carefully designed to ensure their success. They should be based on predictable and transparent frameworks that focus on a portfolio of technologies best suited to meet short- and long-term objectives. These should be backed up by ambitious yet credible targets and support differentiated according to the maturity of each technology. And as cost reductions for renewable technologies are achieved, the level of support provided for new installations needs to decline to avoid excessive and unnecessary increases in the cost of energy services.

Today's energy infrastructure must respond to a shifting energy landscape. The IEA's *World Energy Outlook 2012* projects that US\$ 37 trillion (US\$ 1.6 trillion per year on average) of investment is needed in the world's energy supply infrastructure to 2035, with investment in the power sector absorbing almost half of the total. A significant portion is needed to replace existing power plants, more than a third of which will be retired by 2035. Additional renewables capacity means that system flexibility will be critical, and must be supported by robust transmission and distribution grids. The majority of necessary investment will have to come from the private sector, but there is a clear role for policymakers to provide priorities and frameworks that send the appropriate signals.

### **Can we tap vast energy efficiency potential?**

Energy efficiency is widely recognized as a key option for simultaneously meeting energy security, economic and environmental objectives, yet current measures fall well short of tapping its full potential, representing an epic failing by policy-makers. Several large energy-consuming countries have in the last year announced new measures aimed at improving energy efficiency: China is targeting a 16% reduction in energy intensity by 2015; the United States has adopted more ambitious fuel-economy standards; the European Union has committed to cut its energy demand 20% by 2020; and Japan plans to decrease electricity consumption by 10% by 2030. Such policies will help to accelerate the slow progress on energy efficiency seen over the last decade, but even with these and other new measures in place, two-thirds of the world's economic potential to improve energy efficiency would remain unrealised.

Global action to remove obstructions to energy efficiency could be game-changing for global energy and climate trends. Based on the IEA's *World Energy Outlook 2012*, implementing economically viable energy efficiency measures could halve the growth in global energy demand, with the amount of oil saved equivalent to current combined production of Russia and Norway, and similarly impressive savings for coal and gas. Energy efficiency gains would cut emissions of local pollutants and carbon dioxide significantly, postponing (by up to five years, to 2022) the date at which the world would become locked in by existing energy infrastructure to an average temperature increase of at least 2°C.

Buying such time may be critical to securing a global agreement to cut greenhouse-gas emissions. Importantly, gains from energy efficiency could be achieved without sacrificing the quality of energy-related services to consumers and at a net cost savings, as additional investments in more energy-efficient technologies would be more than offset by reduced fuel expenditures. Moreover, a further boost could be expected from the freed resources put to productive use elsewhere in the economy and a reorientation towards less energy-intensive goods and services.

As highlighted in the World Economic Forum Energy Vision Update 2010,<sup>2</sup> investments in many energy-efficient technologies and practices are economically attractive, but their deployment and implementation is obstructed by barriers that discourage decision-makers from making the best economic choices. These must be removed in order to unleash energy efficiency's vast untapped potential. Common barriers include a lack of information, split incentives that fall on different actors, subsidies to energy consumption, limited financial capacity and know-how; and the fragmentation of energy consumption across different end-uses and users, suppliers and business models.

Overcoming these barriers will take a broad and sustained effort. Economic gains from energy efficiency must be made more visible by improving measurement and disclosure. Furthermore, efficiency concerns need to be elevated so that they are integrated into decision-making throughout government, industry and society. Policy-makers should create and support business models, financing vehicles and incentives that ensure investors see an appropriate share of energy efficiency's rewards. And governments can introduce more ambitious standards that are regularly monitored, verified and enforced to help make energy efficiency the norm.

## **Conclusion**

Trends in the past year point to major shifts in the global energy landscape, but the hard truth is that the world remains on course for an energy future that is broadly unsustainable, marked by insecurity – particularly for 1.3 billion people that lack electricity access – squandered energy efficiency opportunities and dangerous levels of climate change.

The imperative to enable a transition to a more secure and cleaner energy economy is clear and urgent. Doing so requires that decision-makers reconcile sometimes conflicting energy security, economic and environmental objectives to adopt much stronger policies and measures than currently envisaged. Weakened economies and the spectre of “an age of austerity” provide tempting excuses to delay making the necessary investments in a more sustainable energy future. Nevertheless, it must be recognized that our various objectives are compatible on several fronts, particularly in the realm of energy efficiency. Furthermore, the consequences of waiting to take action are costs that are ultimately much higher and options that are considerably more limited.

The World Economic Forum's Energy Architecture Performance Index 2013 found that, globally, sustainability is the weaker part of the triangle of imperatives related to affordability, security and sustainability of energy.<sup>3</sup> The energy industry partnership programme in Davos will have sessions on energy efficiency, the transition to the new energy architecture, silent fuels, energy access, and unconventional oil and gas in addition to the traditional Governors Meetings.

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<sup>2</sup> *Energy Vision Update 2010: Towards a More Energy Efficient World*, World Economic Forum in collaboration with IHS CERA.

<sup>3</sup> *Energy Architecture Performance Index 2013*, World Economic Forum in collaboration with Accenture.