



Global energy scenarios to 2050

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Much has transpired since *World Energy Insight 2010* was published — the US is beginning to come to terms with its gargantuan debt, the EU is attempting to staunch financial contagion from spreading beyond Portugal, Ireland, and Greece, commodity prices which have surged over the past year are beginning to slow, the price of gold is soaring as markets react to global financial instability, the events at Fukushima have caused Germany and Switzerland to exit future nuclear plans, and old regimes in the Middle East and North Africa are being toppled. In addition, there is increasing consensus that over the next 2-3 years global economic growth is going to decelerate. In such an environment companies are finding it challenging to plan and commit themselves to long-term energy projects. This uncertainty will undoubtedly have an impact on the future of the global energy system.

In September 2010 the World Energy Council launched its new flagship scenarios project which aims to make sense of this uncertainty by providing policy makers with potential scenarios to 2050, to aid them in making better strategic decisions. Since then, an energy scenario study group has been formed, which organised itself into five major work-streams, covering the areas of economics/finance/trade, energy systems & technologies, resource availability and access, consumer behaviour and acceptance, and government policies. The work-streams then identified a total of twenty-nine critical issues for the energy system that have been allocated for research and write-up to members of the global study group. Additionally, four regional scenario workshops have been conducted so far in Johannesburg, Bangkok, Thessaloniki, and Washington DC. The scenarios core team has used the input from WEC members as well as external participants to collect local feedback during these workshops and gain valuable insights on regional and global driving forces that will guide the construction of the scenarios in the second phase of the project. In the coming months, three more regional workshops are being planned in Rio de Janeiro, Paris and Houston, after which the first phase of orientation and identification of the scenarios project will be completed. This first phase has been work intensive and involved extensive research of the energy system by study group members. Results are being documented in issues papers that will be used together with all the insights from the regional

workshops to identify predetermined trends, regional and global drivers and critical uncertainties of the energy system. During the next phase of the scenarios project the study group will construct a first set of scenario assumptions, which will then be discussed and challenged for robustness and logic with a wider audience of WEC members and experts.

It is evident that different regions around the world have different priorities with respect to energy. In Africa, the sentiment that affordable energy access has to precede other factors, e.g. accelerated renewable energy rollout, is very strong. Currently, many countries in sub-Saharan Africa are grappling with the problem of providing universal energy access. A basket of solutions has been proposed, which includes a strong fossil fuel component. There is no ambiguity that Africa will exploit its fossil fuel reserves to fuel its economic growth, as reserves are abundant, technologies are mature, costs in comparison to renewable energy are cheaper, and the required labour is available. At the same time the challenge of expanding centralised transmission systems is being overcome by the construction of smaller decentralised grids. The number of mini-hydro projects has sharply increased over the past decade and interregional power sharing pools between countries are also being developed. We will see the formation of a regional South African power grid in a few years' time. The solar market in Africa has huge potential and a large number of Chinese firms have already established a significant presence in the region. Problems with logistics, lack of local manufacturing capacities and skilled labour, as well as deficient government frameworks and local corruption continue to be problems that need to be overcome in many countries. With regard to North Africa, in the aftermath of recent political uprisings it remains to be seen how the new governments will develop their energy policies. It is expected that gas exports will continue to play a major role in this region in the years to come. The Gulf Cooperation Council has been taking measures to include some of the North African countries in its membership. This could eventually lead to the formation of a powerful MENA regional energy trading bloc.

In Asia, the story is similar to that of Africa — providing secure, affordable and universal energy access is the main challenge for the rapidly growing continent, followed closely by efforts to minimise energy-related pollution

levels where possible. Coal mining in India has intensified, helped along with market support, as was evident when Coal India's IPO was oversubscribed 15 times. Chinese consumption of coal doubled between 2000 and 2010, and currently stands at 1713.5 Mtoe (2010). Both China and India have plans of significantly expanding their nuclear portfolio, with the former planning to build 28 nuclear plants by 2015 and the latter planning to bring 20,000MWe of nuclear generating capacity online by 2020. It is apparent that Asia will continue to consume fossil fuels along with nuclear as countries fuel their economic growth with cheap energy and also attempt to provide affordable electricity to significant sections of their population. In Japan, the Fukushima incident has affected the future of nuclear in the country. Since Japan lacks fossil fuel resources, the decline in nuclear capacity will have to be offset by an increase in LNG consumption. South Korea will also continue to depend heavily on LNG. In addition, both Japan and Korea will continue to depend on coal for meeting their energy needs. Australia will rely on its abundant coal and gas reserves to fuel its growth, while the potential to invest in solar projects remains high. China is leading regional and global growth in most energy sectors including efforts to add capacity in renewables. China's investments in renewables are on par with the US and the largest globally in absolute terms.

The transition to a renewables-dominated energy future also remains uppermost in the minds of Europe's policy-makers. The 2020 targets are binding on all EU states and will require significant investment to build up the needed infrastructure. The policy however gives freedom to EU-states in the manner in which they will meet these targets. For example, the recent decision of Germany to exit nuclear will drive it towards dependence on gas-fired power stations to provide base-load as renewables capacity increases. The UK on the other hand, has no intention of exiting nuclear and has plans of building potentially 10 new reactors. Gas will continue to play an important role in the rest of Europe complemented by the Alpine hydro systems in the move towards a low carbon future. The construction of the "Nabucco" and "South Stream" gas pipelines has the potential to bring needed additional gas volumes to Europe. Energy transformation will come at a cost, however, and politicians in some European countries may soon be faced with the spectre of having to

compensate for energy poverty within the weaker parts of their society. This will require new policy instruments that balance incentives for new and cleaner technologies with the need for social equity and affordable prices.

The role of unconventional gas and oil will be of high importance in North America. Canada has surged ahead in the development of its oil sands and is consolidating its position as the largest oil exporter to the US by developing its transnational oil pipeline infrastructure. In the US, the shale gas revolution has impacted the gas picture worldwide. Shale gas is estimated to account for half of domestic US gas production by 2030. As a result of the US weaning itself off gas imports a large amount of LNG has become available on the worldwide LNG spot market. These volumes have made landfall in Europe, driving down the spot price of gas and have affected European gas and electricity markets considerably. It has become apparent through these developments that LNG will play a crucial role in the years to come, especially with floating LNG terminals recently coming online.

In South America biofuels will play an important role in Brazil, gas in Bolivia, and oil in Venezuela & Brazil. The IEA (*New Policies Scenario: WEO 2010*) expects regional power infrastructure investment in the region to be over US\$700 billion from 2010–2035, while the figure for oil is around US\$1.5 trillion. The region is experiencing a growth spurt in its mining industry in order to service Chinese demand. We expect to see new infrastructure projects being constructed and the level of electrification increasing.

The above are only a limited excerpt of some of the regional messages the scenarios team has collected so far in the first phase of the project. The second phase will try to identify the most critical drivers and describe their interactions with each other, in order to be able to describe potential pathways for the energy future to 2050. This will be carried out over a series of scenario building workshops scheduled towards the end of this year and the beginning of the next. WEC members and selected energy experts and professionals will be invited to participate in these workshops with the scenarios study group. Once the scenarios have been framed, work begins on drawing the storylines and testing & reaffirming the assumptions. The scenarios will be rigorously tested to be plausible, structurally sound, consistent, and challenging. WEC hopes to have these energy scenarios ready by the middle of next year. 