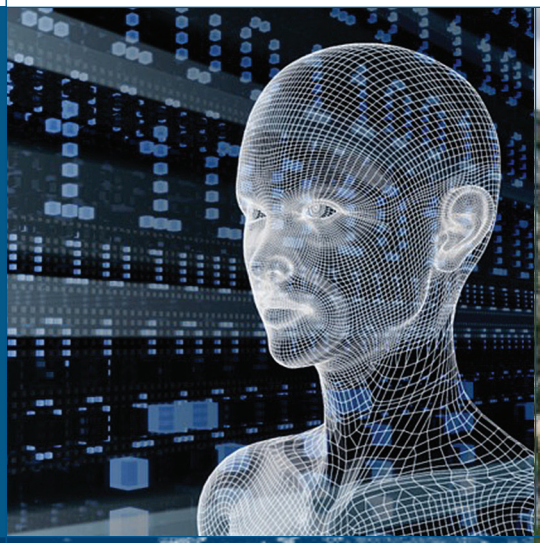
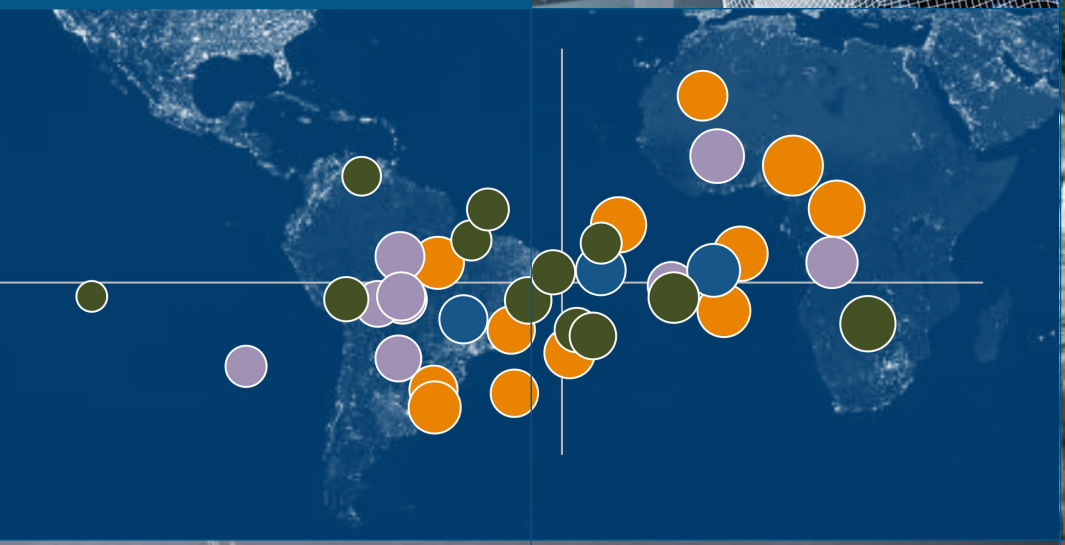
WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ÉNERGIE
For sustainable energy.

2013 World Energy Issues Monitor

World Energy Council





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1 Introduction

Introduction

Even with improvements in energy efficiency we expect global energy demand to double by 2050. This is the inevitable consequence of global population growth, global economic growth, continued urbanisation, as well as the resulting increased demand on mobility and other energy dependent services. During the same period we will need to reduce global greenhouse gas emissions by half if we want to keep a global temperature increase below two degrees Celsius. And, there are still 1.3 billion people without access to electricity.

What seemed unimaginable two decades ago has become reality: energy is again on the top of the political agenda in many countries such as Japan, Russia and Germany, now becoming a priority for prime ministers and presidents. The post Fukushima nuclear future, the game changing shale gas, supply uncertainty and price volatility related to the “Arab Decade”, the shift of demand to East, tumbling solar cell prices and related trade disputes between Europe and China or the US and China, climate framework uncertainty, and global recession are rocking the foundation of what many believed two decades ago to be a steady roadmap into our energy future.

The global energy sector will need to invest half of current world GDP over the next two decades in order to address these challenges and expand, transform and adapt the energy infrastructure. In the absence of global agreements and regulations on energy or climate policy that would guide such a transition, the main policy decisions remain in the hands of national and sub-national policy makers. The World Energy Council supports policymakers around the world in their efforts to develop adequate energy policy frameworks capable of attracting the needed investments and balancing between the conflicting objectives. By developing our World Energy Trilemma framework, supported by our annual Energy Sustainability Index, we are able to provide a coherent framework to help address the challenges of what we call the “World Energy Trilemma”. The World Energy Council’s definition of energy sustainability is based on three core dimensions - energy security, social equity, and environmental impact mitigation. We translate the Energy Trilemma to national contexts and benchmark progress towards the Trilemma objectives over time to enable policymakers to deliver a sustainable energy system for the greatest benefit of all.

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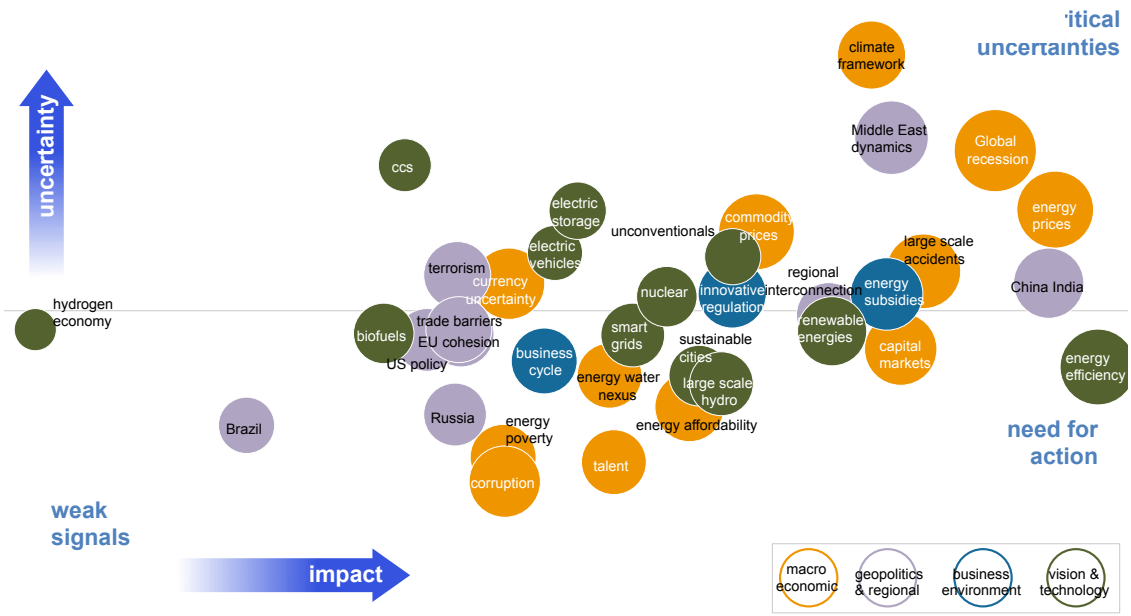
Decision makers face a multitude of choices and possible actions, some of which will succeed through sheer market forces while others require coordination between market signals and policy frameworks. The breakthrough of shale gas in the US exemplifies the market forces driver and the slow progress of energy efficiency measures, in a context where energy prices are subsidised, illustrates the potential role of policy drivers, or what can happen when the signals are not strong enough. We can only advance a meaningful dialogue among the Global Energy Leaders Community if we focus on a set of clearly identified priorities. WEC's World Energy Issues Monitor provides a snapshot on what keeps Energy Ministers, CEOs and leading experts in over 90 countries awake at night and therefore defines the *World Energy Agenda* and its evolution over time.

Figure 1
Global Map



World Energy Issues Monitor
Global, 2012

How to read the issue map

The maps are developed from an annual survey of our global membership network, which includes thirty-six issues covering macroeconomic risks, geopolitics, business environment as well as energy vision to provide a high-level "helicopter perspective". It reflects the views and insights of Ministers, CEOs, and leading experts in over 90 countries that represent the WEC community. The responses are translated into issue monitors with the three assessed dimensions as its axes (see Figure 1). The three dimensions are the impact of an issue on the energy sector, the degree of uncertainty related to its impact, and the urgency with which we need to address the specific issue.

Issues with high uncertainty and high impact (in the north-eastern quadrant) are the "critical uncertainties" which keep Energy Leaders most awake at night as there is no clear path of action. These issues need to be part of the Energy Leaders' dialogue and scenario analysis. The issues on the high-impact/low uncertainty side are issues that keep Energy Leaders most busy (south-eastern quadrant, "action issues"). The low impact/low uncertainty issues include these of perceived lesser importance which also include the "weak signals". These may be issues that are still badly understood and need further investigation. The urgency of an issue is proportional to the size of its bubble. Finally, issues are grouped in four different categories, which are represented in different colours: macroeconomic risks (orange), geopolitics and regional issues (purple), business environment (blue), and energy vision & technology (green). In addition to the critical uncertainties, issues of particular interest for dialogue include these with rapid evolution over time and these with large differences across regions.

The arrows illustrate the evolution of selected issues and issues clusters over three years. Regionalised issues mapping shows the difference in regional perceptions with the global perception in the centre.

2 Assessing the Global Energy Agenda by Christoph Frei

This years' issues survey has been conducted in the context of a global recession that is symbolised by the lowest GDP growth in China for a decade, only 2% real growth in Brazil and, the Euro-crisis and related currency uncertainty. The geopolitical interests were focused on continued tensions and conflict in the MENA region, a new government in Egypt, a new old President in Russia, US elections and a new Chinese government, as well as the accentuated trade disputes regarding renewables and airline emissions.

Closer to the energy business there were ample headlines related to the continued boom of unconventionals, numerous reports on companies (solar in particular) struggling for survival or going into insolvency. One year after the Fukushima accident the public debate continues on the nuclear front. The Doha Conference of Parties has prolonged the Kyoto protocol until 2020, but in absence of the largest emitters. Finally, UN Secretary General Ban Ki-moon has called energy "the golden thread that runs through development" in the UN declared year of sustainable energy for all, bringing energy back to the centre of the development discussion, 20 years after the Rio Earth Summit.

WEC's latest Issues Monitor reflects the impacts of this backdrop on the leadership of the energy sector. The four top *insomnia* issues are the continued uncertainty towards a future climate framework, the fear of a lack of political stability in the Middle East / North Africa region, the high energy price volatility, as well as the global recessionary context, which has replaced post-Fukushima nuclear that was among the key critical uncertainties.

It is worth noting that energy price volatility is much more than just the question of low natural gas prices and high differentials between regions that highlight transport bottlenecks, particularly to Asia. The coal to gas substitution in the US electricity mix has resulted in a higher gas than coal share for the first time in US history, with the consequence that US greenhouse gas emissions have decreased. This development has led to a push of discount-priced coal from the US to Europe where it has changed the competitiveness of the companies who took advantage of the changing dynamics compared to those who were locked into natural gas at European prices. This development has however pushed up Europe's greenhouse gas emissions further away from previously reducing levels. Meanwhile,

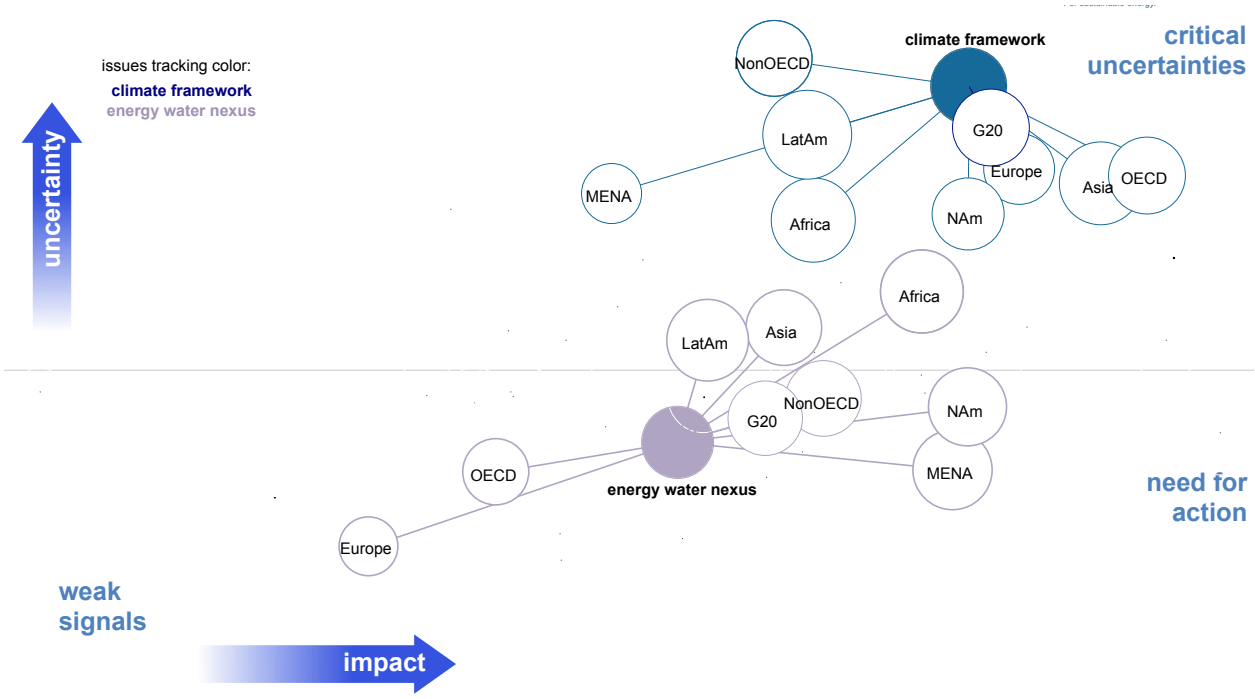
Australia, on the way to become one of the world's largest LNG exporters, has re-directed its interest from North America to Asia and Canada's infrastructure companies have also started watching out for Asian customers. Price volatility is also about solar, where module costs have collapsed since 2008 from over 4.5 $/Wp to as low as 0.6 $/Wp. This is largely driven by low-cost production in China but has been accentuated by the fact that 2012 demand has not kept up with expectations and absorbed less than half of the global manufacturing capacity of about 100 GWp.

Where Energy Leaders have changed their views most radically

The issue with the most dynamic change over the past years is carbon capture, utilisation and storage (CCS/CCUS) which is almost *flying off the map*: without a formal price for CO2 emission avoidance this technology is at risk of simply being seen as adding cost and bringing down energy efficiency. This must be of highest concern as we lock ourselves into a high CO2 emission future for the next 40 to 50 years with every new coal and other carbon emitting plant that is built. Only a combination of CCS/CCUS and, possibly, a partial substitution of coal input with solid biomass can mitigate CO2 emissions of existing plants.

The issue that is most clearly identified as a game changer, with its solid trend towards the action space, is unconventionals. This is about unconventional oil (shale oil, tight oil, beyond Canadian oil sands or Venezuelan heavy or extra-heavy oil) as much as it is about the still-hot topic of shale gas. The technology revolution is continuing and while further progress is needed to address the energy-water nexus and the costs associated with mitigating greenhouse gas emissions, production volumes continue to increase. This has given rise to North American energy supply independence becoming a possibility within less than a decade. Such supply independence is however put into perspective as crude markets, and therefore prices are global and US prices will continue to depend on international developments. Meanwhile, we do not see other regions replicate the US success at the same speed for a number of reasons including geological, legal, logistical, financial and issues related to the water nexus. However, projects are being developed around the world which will eventually change the global supply map.

Figure 2
Global Map – geographical-tracking



World Energy Issues Monitor
Global, 2012

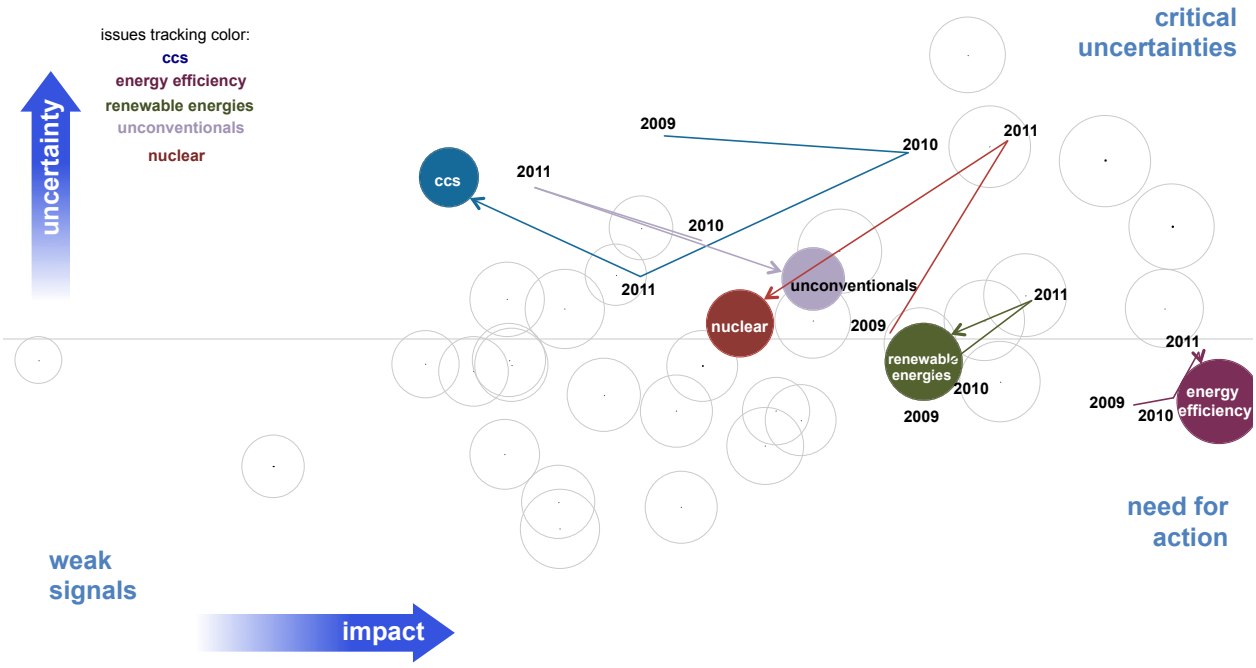
Post Fukushima nuclear remains a closely observed and debated issue. Last year's map saw nuclear jump into the high uncertainty space. This year's position of nuclear on the monitor shows that uncertainty is almost back to where it was before Fukushima. However, a slightly lower perceived impact indicates that the nuclear renaissance has been slowed down – a message that also came out of WEC's *World Energy Perspective: Nuclear Energy One Year After Fukushima* report. Recent signals from Japan suggest a re-evaluation of the role for nuclear in the country's energy mix, even though only two out of fifty-four plants have resumed operation.

China has cancelled 2nd generation plants that are not already under construction and is concentrating on 3rd generation along the coastline. In India we see continued local manifestations against nuclear and there are active discussions about the right share of nuclear in both France and South Korea. Meanwhile, more supportive signals for nuclear come from countries including the UAE and Saudi Arabia, with recently announced ambitious 2030 objectives. In the US the low gas prices make nuclear more expensive and therefore not an attractive option and Germany is continuing to implement its decision of the Energiewende, with increasing concern that the transition could fail if it comes at too high a cost.

What keeps Energy Leaders most busy

Renewable energies and energy efficiency have stayed dominant issues in the action space. Renewables are not only driven by climate policy as shown by the weak regional correlation between climate framework uncertainty and renewables. Renewables are seen as a contribution to diversity and security of supply as well as a critical enabler to enhancing access for the 1.3 billion without access to energy. Large hydro is moving into the action space, explained by huge un-used potential in central Africa, Latin America, Russia and Canada. Regional interconnection, which is often the feasibility basis for large energy projects, is also robust in the action space.

Figure 3
Global Map – time-tracking



World Energy Issues Monitor
Global, 2012

What should make us think further…

Last but not least, it is interesting to note that concerns for climate and water issues seem not to be shared by the same people. Many of the regions that are mostly concerned about the energy-water nexus are among the least concerned when it comes to climate framework uncertainty. This should make us think, acknowledging the IPCC's statement that the first thing that we will see from a changing climate is a changing availability of water. Or, does it simply mean that the regions most concerned about water and less about climate framework uncertainty have simply accepted that it is all about adaptation?

In summary, many of the issues that were emerging over the past years have stabilised their position or confirmed their trend, both up and down:

Among the big question marks that hasn't settled yet remains what will happen to nuclear post Fukushima.

Making sense of the energy sector is fundamental to the wealth of nations and this report is one of the only tools available to policymakers to enable them to understand the global, regional and national trends affecting their decisions. I pledge the support of the World Energy Council to those tasked with taking the hard decisions required to transition to a better future.

Climate framework uncertainty →
CCS/CCUS ↓
Renewables or energy efficiency →
Unconventionals ↑

3 Assessing Regions' Critical Energy Agenda – Analysis of WEC's six Regions for Issues Maps

3.1 Africa's Critical Agenda

While global recession has affected Africa heavily, the economic growth and energy poverty/access issues remain major concerns. They have been affecting the continent because its electricity demand has grown, and energy security has tightened as the result of the lack of the required investment and increasing power shortages across the continent. In addition to this, with economic cooperation with China and India intensifying, more exploration activities in a number of countries, particularly in Southern, West and Central Africa are turning out positively and have unveiled huge potential of hydrocarbon prospects and new potential markets. In contrast climate change issues have been considered as a lower priority on the overall agenda.

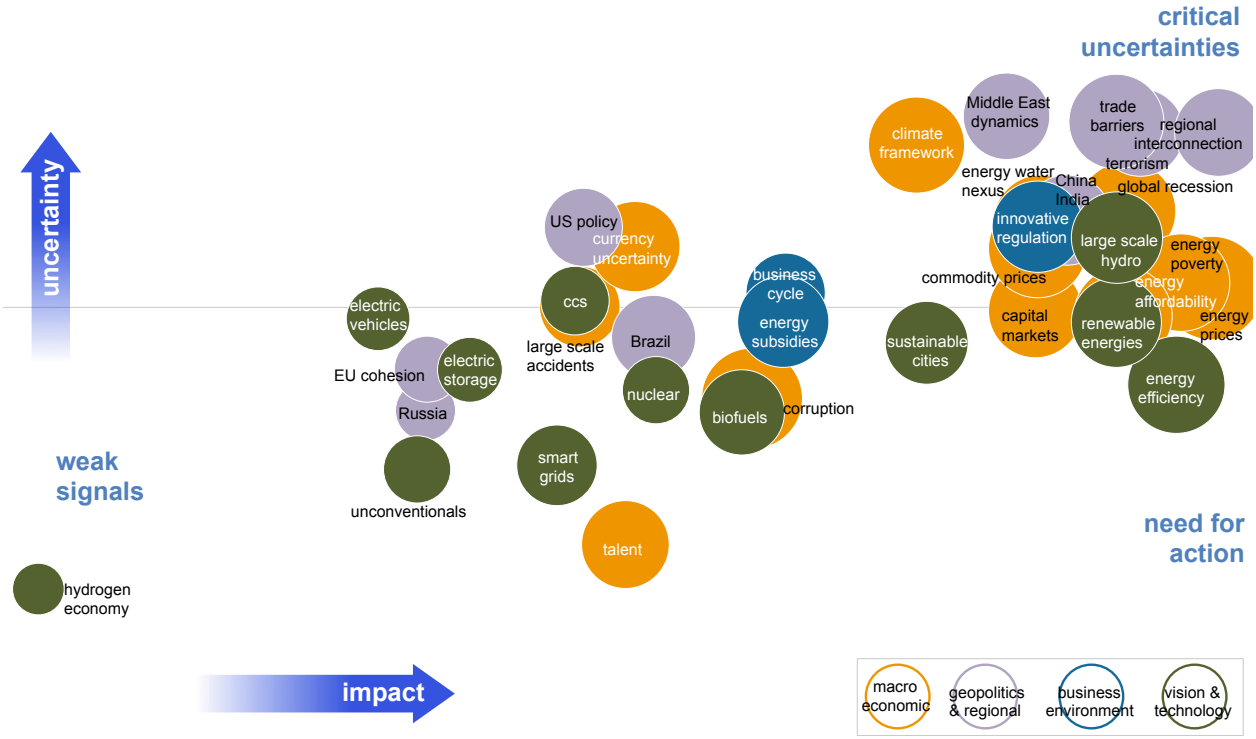
Middle East dynamics and global recession issues are coming as high critical uncertain issues to Africa as a continent. The continent has seen trade barriers and terrorism as similarly uncertain issues as both of them have been strongly affecting the sustainable development of the African economy as a whole.

Large scale hydro and regional interconnection are the issues that are highly uncertain and have seen significant changes recently. Large scale hydro is considered as the most inexpensive, efficient and affordable form of renewable energy, with a large potential yet to develop in Africa (only 7% potential developed – the lowest rate of the world's regions). While uncertain it seems many policymakers and energy experts have voiced the importance of large scale hydro development, along with taking a realistic approach to forming and developing projects, to build necessary capacity and infrastructure, and to implement them as timely as possible. Otherwise it would take such a long time before coming on stream, whilst energy demand is catching up much faster than expected leading to a widening gap between supply and demand for electric energy. In addition to large scale hydro, regional interconnection is gaining ground with the development maturity of the five power pools.

Moreover, with huge gas reserves and its new discoveries, further development and prospects of LNG markets and cross-border pipelines are anticipated.

Energy efficiency, renewable energy, energy prices and energy poverty are also viewed as requiring bold immediate actions in the issues map. Energy poverty, in particular,

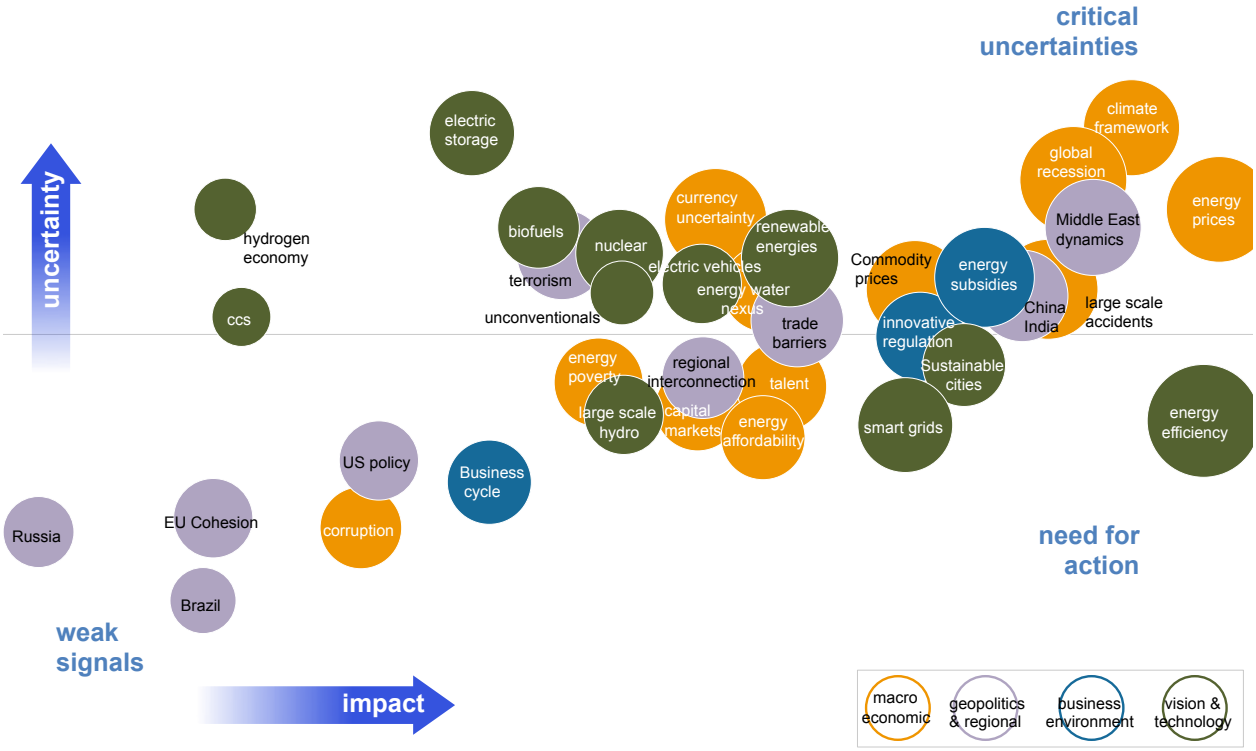
Figure 4
Regional Map – Africa



World Energy Issues Monitor
Africa, 2012

has been an immediate priority for Africa as the population with access to electricity is no more than 30% in Sub-Saharan Africa.

Figure 5
Regional Map – Asia



World Energy Issues Monitor
Asia, 2012

3.2 Asia's Critical Agenda

The region has witnessed strong and rapid economic growth in some of its states, including China and India. Such rapid growth has created some problems like energy shortages and energy gaps between "the haves" and "the have-nots." The renewable energy growth, pilot Emission Trading System (ETS) and energy efficiency targets in China, as well as India's Perform Achieve Trade (PAT) - Energy Efficiency Certificates Trading Scheme - may also have some influence over their future energy policy and economy in this part of the world.

Energy prices, climate framework, global recession and Middle East dynamics are considered as the most critical uncertainty issues for the region. Recent developments in the Middle East are certainly viewed as critical, as Saudi Arabia may export more oil to states like China and India where there would be expected much demand for those resources. As a result, Saudi Arabia might be shifting its exports away from European states, and also Japan and Korea may be importing more LNG from overseas sources like Qatar. To meet the energy demand of their continuously growing economies, India and China will further increase the share of imported coal and hence rely on cheap energy sources to fuel their own economic development. This in turn, has negative impacts on climate change although both countries have set their targets.

India has mandated the early retirement of inefficient coal-fired power plant in their National Action Plan on Climate Change, while in China, according to U.S. EIA statistics & analysis, the government's 12th Five-Year Plan calls for a production ceiling of 4.4 billion short tons 3.9 billion metric tons and capacity ceiling of 4.1 billion metric tons by 2015 in an attempt to control the production growth of coal.

In this part of the world, issues that have seen the highest changes are electric storage and smart grids which have gained ground as people may expect that technology to solve electricity shortage of some states. This is followed by currency uncertainty and global recession, both of which have been quite affected by the European economic crises. CCS, on the contrary, has continued to lose its ground and as a result, its importance on the overall issues map.

Energy subsidies and energy efficiency are issues that are viewed by politicians and energy leaders in the region to require action. Some countries have experienced rapid electricity demand growth under their distorted energy price structures where the electricity tariff has been kept low, below its production cost, and therefore does not properly reflect the cost of all energy resources for electricity. This is basically due to government regulation. Even worse, the incentive for enhancing energy efficiency of the high energy intensive industries does not work well under such electricity price regulation schemes, with subsidised and hence cheap electricity prices, as it creates disincentives for investment. To overcome this dilemma, governments in the region should build up a cost-reflective energy price policy to attract voluntary energy saving from consumers which in turn could lead to a reduction of imports of primary energy sources. In addition to energy efficiency, the two issues requiring action are smart grids and sustainable cities models as they may deal with increasing demand for electricity and shortage of electricity supply issues more effectively.

While not strongly represented on the issue map for its actions, energy poverty in the South Asia and Pacific region needs to be dealt with most immediately.

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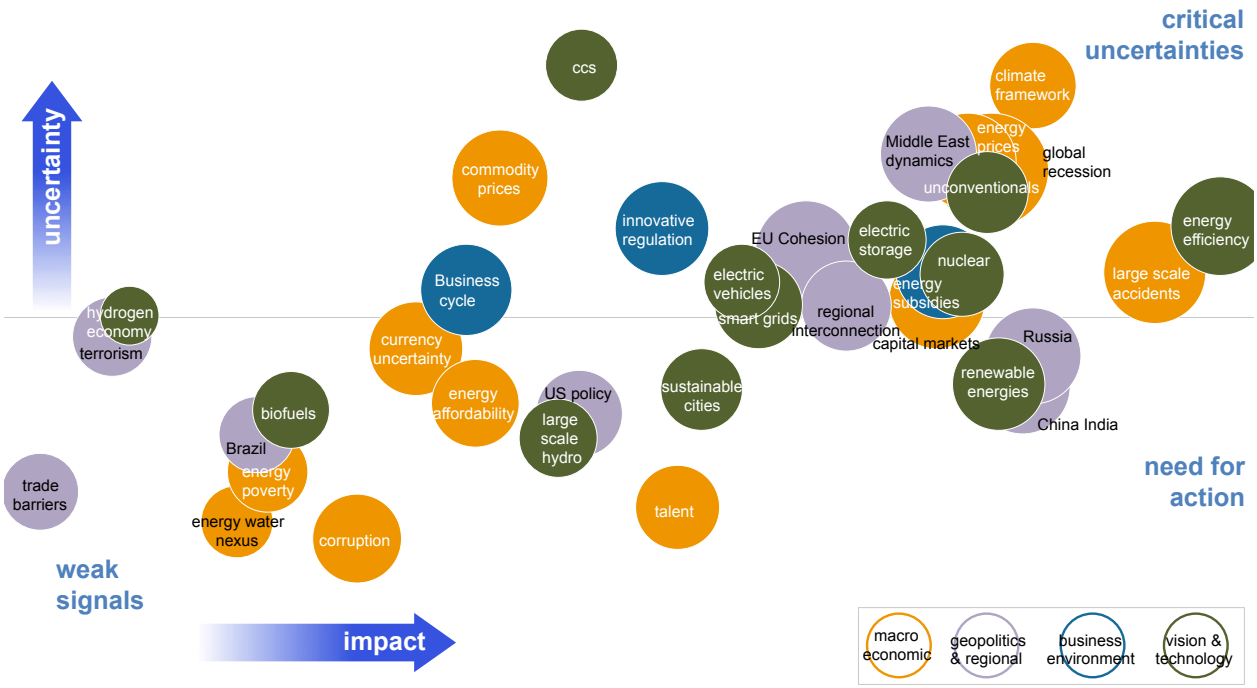
Figure 6
Regional Map – Europe



World Energy Issues Monitor
Europe, 2012

3.3 Europe's Critical Agenda

Energy consumption has been shrinking in Europe in particular in the energy intensive industries. This has led to an over-supply of energy, and a weakening of the profitability of investments already undertaken. Climate framework is quite an uncertainty, since no significant progress has been made with the ETS which has not provided sufficient incentives for investors with no goals beyond 2020. A low carbon price does not support the long-term goals of GHG gas emissions, making CCS or more efficient gas power plants "less-investable." The increasing share of renewables in the total electricity production also fuelled a debate about electric system's upgrading and ancillary cost due to increasing technical and market integration. Shale as development in Europe is much contested out of environmental concerns underlining the potential importance of and dependency on gas imports in the future.

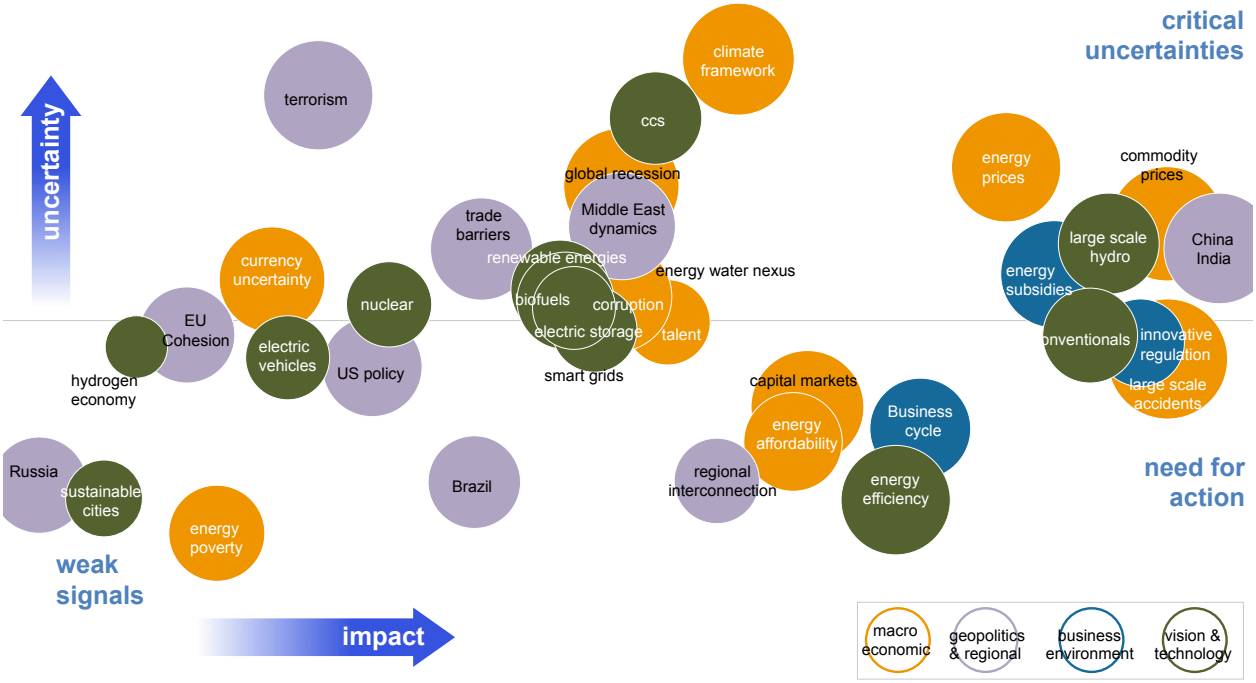
The two top critical uncertainties in Europe are the climate framework and energy efficiency. The climate roadmap 2050 helps Europe to describe the future obligations more precisely. However, the uncertainty is still high as the 2012 EU-Energy efficiency Directive [*1] does not provide any ambitious binding incentives. As a result, the achievement of final objectives is doubtful. While Europe is also in the midst of an investment cycle in order to replace old generation assets, the fact that some local consumers have been paying for the highly polluting and inefficient power plants that are required to flexibly cope with unstable power supply (which typically happens in cold winters), while promoting renewables at the same time seems to go against the overall goal of climate agenda.

One of the highest change issues is unconventionals i.e. the use of and the generation of electric energy from unconventional energy sources, such as shale oil and shale gas. While the shale gas development has been much contested in many European states, low gas prices have continued in the US. If this is the case, the economic impact of the unconventionals could be felt in two ways: Firstly, as a pressure on the gas prices in the European market, and consequently it would also add pressure on the existing long-term contracts with price indices that do not reflect changes in market prices for natural gas. Secondly, due to the relatively cheaper gas of the US, some large gas-consuming companies are considering building their new industrial sites in the US, leading to lower demand for natural gas in Europe. Nuclear is another issue that has changed significantly, which has lost importance, although many European countries have taken nuclear as part of the solution for climate change equation. A declining economic outlook for Europe, however, has also slowed down the progress of developing new nuclear projects. With shale gas becoming more available in the US, the coal exports to Europe have increased significantly from 2010 to 2011. The US continues to become a global coal supplier, especially to Europe.

According to leading energy experts and policy makers, the following issues require actions to be taken. First, regarding renewables, some renewable energy producers are in economic trouble because of the economic downturn and retroactive cuts of the European promotion schemes such as feed-in-tariffs. These schemes should be more aligned with each other and with the internal European market. Second, as far as Russia is concerned, it would be necessary to establish price-indexed formulas for natural gas imports without compromising the objectives of long-term gas contracts, i.e. to find a balance between competitive gas prices and secure delivery/supply-relations. Third, with regard to China, as it has become an enormous energy consumer (which affects European energy markets and prices), Europe must get ready for it by reducing the fossil fuel demand in the long term, this may be encouraged by a strong price signal for CO_2.

(*1) Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC

Figure 7
Regional Map – Latin America



World Energy Issues Monitor
Latin America, 2012

3.4 Latin America & Caribbean's Critical Agenda

The global recession, energy prices, unconventionals and development of large scale hydro systems are the major issues or concerns for leading energy experts and policymakers in the Latin American and Caribbean region (LAC). Moreover, the region's economy has strong ties with that of China as the region exports coal, oil, gas and other commodities to the country to guarantee their prosperity. With the nationalization of Repsol YPF oil company in Argentina (which turned Argentina from an exporter of oil and gas about a decade ago to an importer of much needed fuel,) state intervention (subsidies, price caps and export excises) may have led to hampering some investors for their willingness to invest in E&P.

As far as unconventional energy resources are concerned -- in particular for shale gas and oil shale -- finding shale resources and developing these sources and then bringing the energy to the market are two separate issues. Whilst in some countries of LAC, shale gas exploration might be a more economic and hence a viable option, in others, investment in hydro will become more significant (e.g. Brazil).

The region's critical uncertain issues are large scale hydro, energy prices, and commodity prices, all of which could have quite an influence in terms of energy security and the economy. In particular, the potentiality of large scale hydropower to meet future electricity demands would be more critical as it may offer competitive energy prices for the region. Commodity prices, including

crude oil, may become another critical uncertain issue as it would be affected by struggling global economy or China/India economy which may not going as fast as previous years.

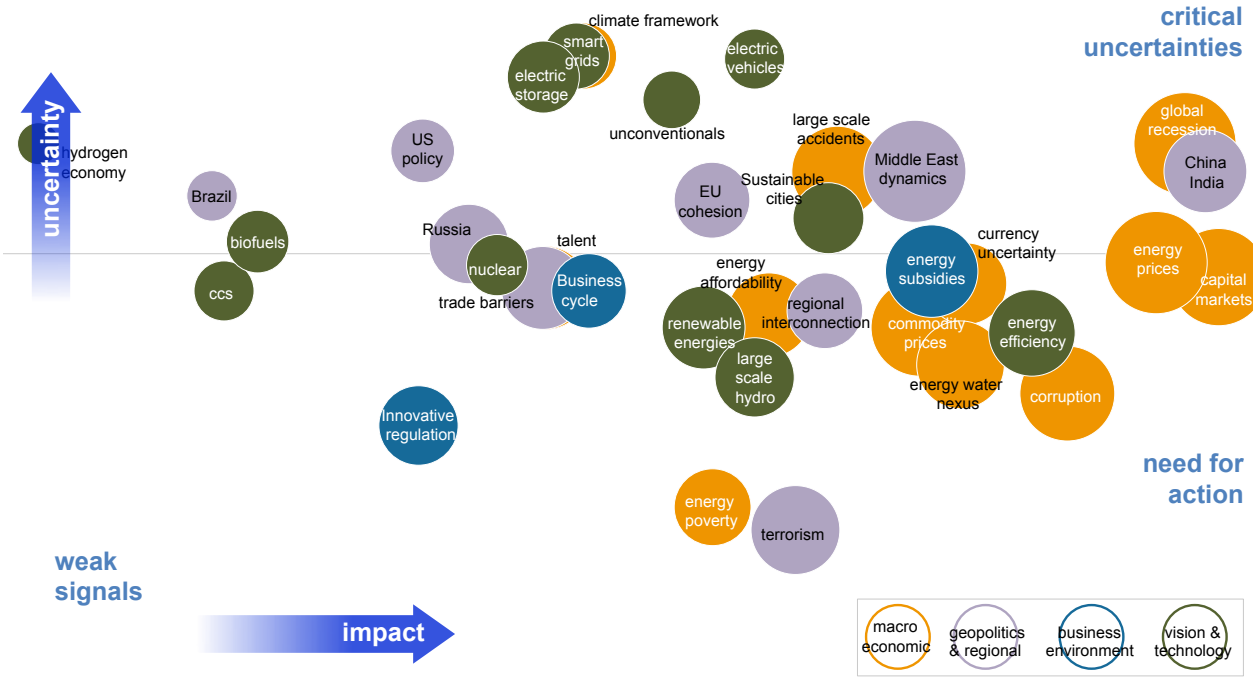
As an issue on the energy policy agenda, climate framework does not seem to have such a high impact as it has on the global agenda or in other regions or as of in previous years, though it still remains in a high uncertainties area on the issues map.

High change issues are renewables, CCS and electric vehicles. Renewables and CCS have moved down to a lower impact area on the issues map. In contrast, large scale hydro moves up straight to the high impact, uncertain area, receiving much more attention than renewables. In terms of price competitiveness, hydro would be far stronger than photovoltaic/solar or wind. The electric vehicles become an issue with far less impact or uncertainty attached to it.

Therefore, while still in the uncertainty area on the issues map, large scale hydro may be one of the most important issues that require immediate action to be taken as it might be a major source of electric energy for countries in the LAC region. Problems often associated with the construction of new large scale hydro power, such as social issues, environment issues, technologies and capital market situations need to be solved altogether. Accordingly, innovative regulation and regional interconnection need action as they are related to this issue of investment in and the construction of new large scale hydro power

Though energy poverty may look less important as an issue in this year's issue map, the importance of this issue may be still felt as it might require more action than can be seen on the map.

Figure 8
Regional Map – MENA



World Energy Issues Monitor
MENA, 2012

3.5 Middle East and North Africa's Critical Agenda

The region accounts for 52% of the world proven oil reserves, 42% of the gas reserves; and its sustainable growth depends on steady oil and gas demand, which has been influenced by global recession, as well as by China and India economy. Given future climate framework of some European countries, to promote de-carbonization by replacing oil and gas resources with renewables, this may also have negative effects on the demand for primary energy sources from this region. However, like the cases of Saudi Arabia, it would be possible to minimize such adverse effect on demand reduction as they could divert their export of fossil fuel to other destinations, such as China or India where there is strong and increasing demand.

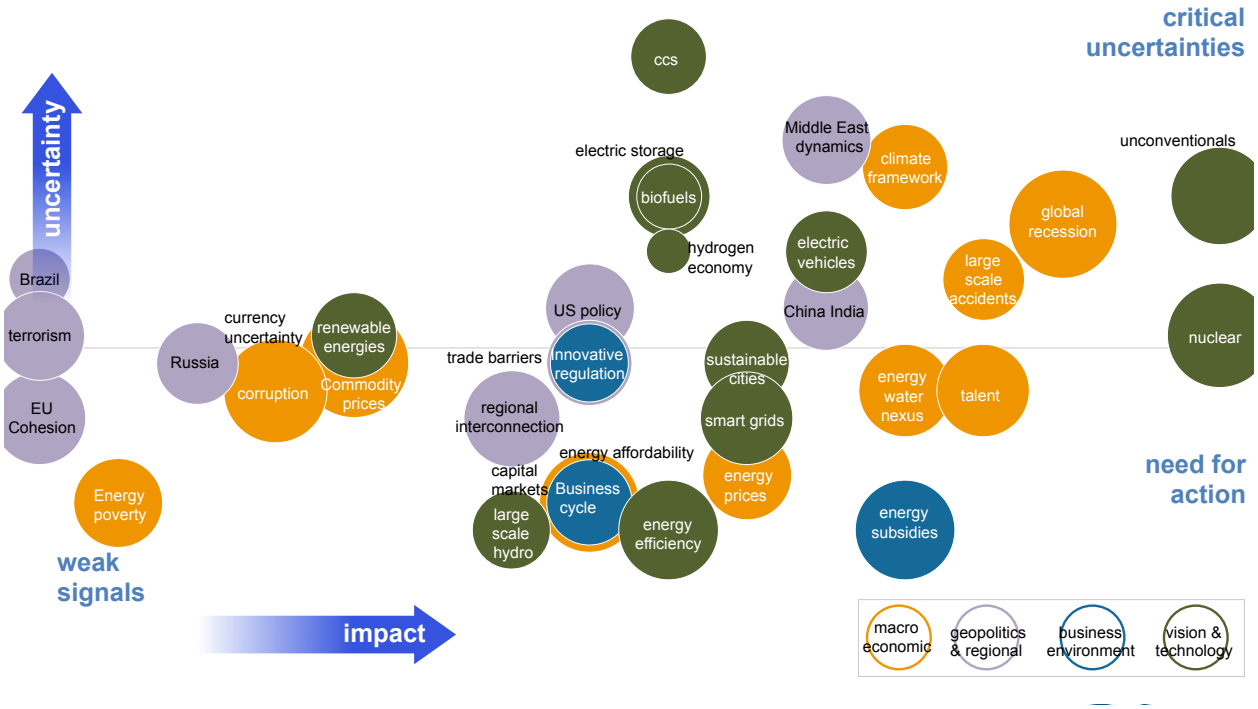
Middle East dynamics, as geo-political issues, notably sabre-rattling over the Iranian nuclear industry, is a critical uncertainty on the issues map, particularly for the states the Cooperation Council for the Arab States of the Gulf (GCC) as the GCC member states feel that they have little influence over the issue but face huge risks in the event of conflict. Other critical uncertainties include energy prices, and global recession, i.e., lower economic growth in key markets.

High change issues on the issues map are nuclear, CCS and unconventionals. Nuclear, one year after the Fukushima accident, has gone to a low uncertain and lower impact area. It is picking up in UAE or Saudi Arabia reflecting a growing acceptance that nuclear energy remains a valid alternative and strategically effective towards diversifying the potential future energy mix, where rapidly-growing domestic power demand has eaten into

hydrocarbons available for export. While the issue of CCS is becoming less prominent on the issues map. GCC member states are now implement the region's first Carbon Capture and Storage projects, such as UAE testing the enhanced oil recovery performance which may add more value to CCS. As far as unconventionals are concerned, regional oil and gas producers see its reserves as the way forward. Ultra-sour gas in very tight reservoirs hitherto considered non-commercial is now being developed to supply growing markets.

The region has seen the importance of renewables grow, such as solar to make up for domestic oil consumption growth. While countries are highly dependent on oil/gas exports for their economic growth, energy efficiency should be another issue to be dealt with to cope with local demand for energy. Ensuring electricity supply for both air conditioning and desalination purposes is a priority. The region also needs investment to cope with the energy poverty or access issues. The region could be a real front runner, as we have seen in the Masdar Project in Abu Dhabi, UAE which seeks to deliver the concept of a "green city". Similar growth of renewables may also be observed if they could successfully develop DESERTEC for example. The benefit could be to further strengthen ties with Europe in terms of economy, energy security, technology and mutual goal of decarbonisation.

Figure 9
Regional Map – North America



World Energy Issues Monitor
North America, 2012

3.6 North America's Critical Agenda

As the global recession goes on, a massive shift from coal to natural gas utilisation in United States has made it possible for them to be on target to achieve their goal of CO_2 reduction with respect to the Copenhagen accord although the US government has not set a climate change policy. The demand for energy, electricity and gasoline has dropped in part due to the recession and also due to significant efficiency gains in automobiles, building, and appliances. Unconventional gas development in the US has been successful, providing natural gas at far lower prices for domestic consumption than other regional markets around the globe. Thus, the US will become more self-sufficient due to shale gas development and domestic petroleum production.

In Canada, hydro power business remains significant. 10,000MW of hydro power plant is under construction with additional major transmission lines being planned to be constructed across the border e.g. from Quebec to New York City, aiming at the US market. In Mexico, with respect to climate change policy, the government enacted a climate change law in 2012 in which one of its goals is that by 2024, 35% of the electricity generation will be carried out with clean fuels; renewables, nuclear and fossil fuels with CCS.

Mexico has also shifted to natural gas to replace aging fuel oil electricity generation as well as to satisfy the continuous growing energy demand; its participation in the gross internal supply has increased from 33% in 2000 to 42% in 2010.

The most critical uncertainty in the region on the issues map is global recession, where and when the recovery or strengthening of the economy happens. The impacts on the energy sector from tax reform in the U.S. and timing of

mandates for GHG reductions are also a critical uncertainty with some impact across the region where cross border enterprise in wind power pertains.

As far as Nuclear, it appears as a more critical uncertainty in North America as compared to the global level. This is likely to be because North America has the largest number of nuclear plant (U.S. over 100) and they are aging. Even with life extension granted for 20 more years, most existing plants will be retired by 2050 when the U.S. power system is expected to be decarbonized. Questions therefore arise if these facilities can be replaced. The current and projected future price of natural gas calls into question the economic viability of new nuclear and if the country will pay a price premium for zero CO2 emission power and for diversity of supply.

Canada's nuclear industry remains uncertain, with aging infrastructure, some closures and slow decision making on refurbishment, let alone on the creation of new facilities.

Access to and diversification of markets for Canada's energy products is a continuing uncertainty. Renewables markets have a large domestic element but cross border activity, particularly with the United States presents challenges. Again, as illustration, the U.S. wind power production tax credit and its renewal will influence the development of wind power in Canada. The tax credit represents an incentive to some of the Canadian wind power industry that will turn upon renewal. Larger development of the domestic market for renewables, broadly speaking, rests upon the increase and continued existence of subsidies.

Regarding oil and gas, for both conventional and nonconventional, Canada's primary market the United States is shifting with its own capacity on the increase. International markets outside of the continent present opportunity. However, the ability for Canada to export its oil and gas product outside of North America is constrained through insufficient infrastructure.

In North America unconventional oil and gas are a rising issue, which is more predominant than anywhere else in the world given that its prospects look much more successful. However, questions arise over the environmental regulatory treatment of hydraulic fracturing and this issue might in turn be linked to the issue of the energy-water nexus. This technology is essential to tap into unconventional resources. Hence, if

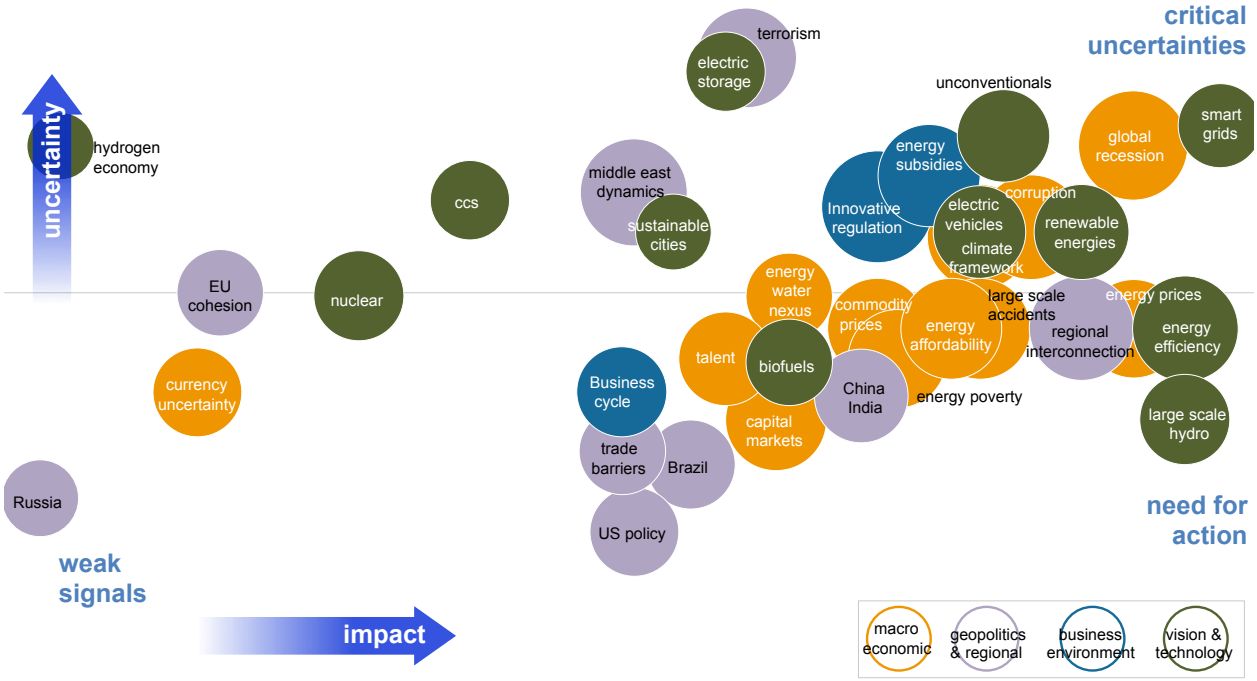
banned (as in the case of parts of New York state) its future production levels are threatened. It should be noted that decades of experience indicate that fracturing is safe and water issues can be properly addressed if industry "best practices" are followed.

Additionally, CCS, is seen as both uncertain and impactful, given that it is critical to continue the use of fossil fuels in a carbon constrained world and because North America has by far the largest number of CCS demonstration plants: 8 industrial scale units in the U.S. and 2 industrial scale units in Canada will become operational by 2020. And since 6 of those units are intended for enhanced oil recovery CCS becomes more highlighted in the context of utilizing CCUS technology (with utilization adding value to CCS by providing a revenue stream to CCS plants). However, a more progressive roadmap or actions will be required to enable the CCS/CCUS technology to become established, rather than remaining in the demonstration phase.

In Mexico the large fossil fuels and electricity subsidies are an important economic issue with a high degree of uncertainty to reduce or eliminate them due to the political implications.

4 Assessing Countries' Critical Energy Agenda - Analysis of five selected countries for Issues Maps

Figure 10
National Map – Colombia



World Energy Issues Monitor
Colombia, 2012

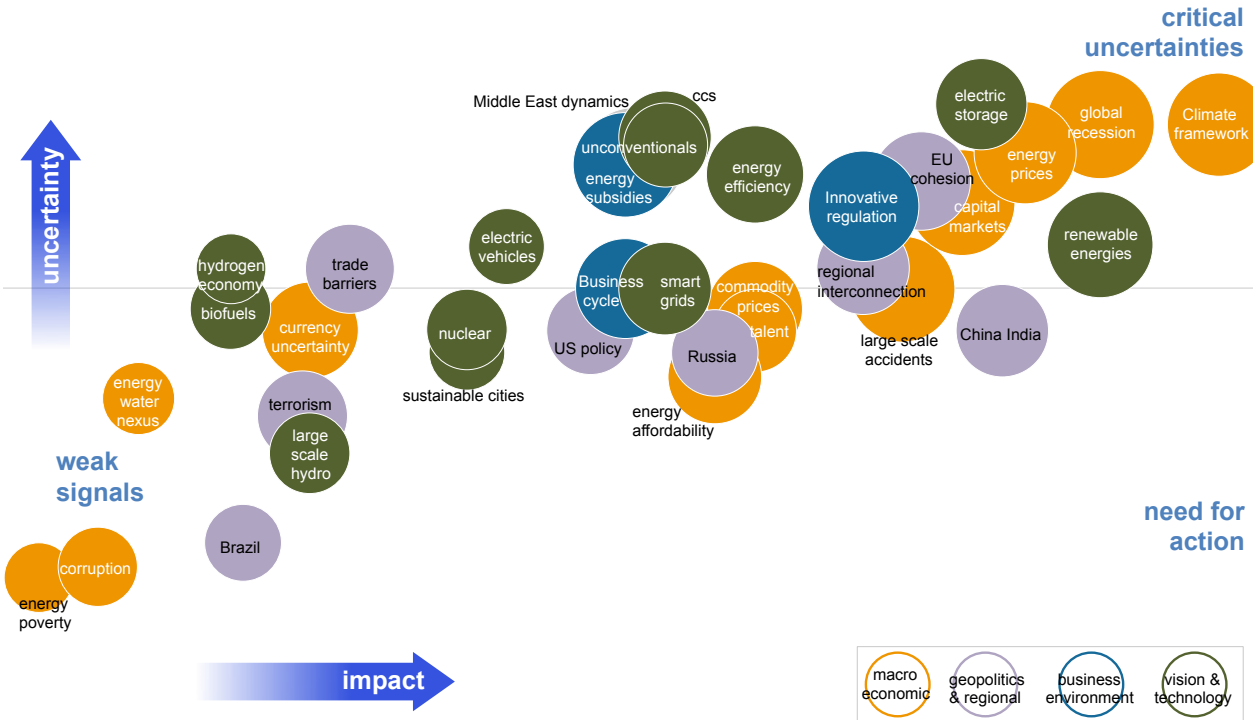
4.1 Colombia's Critical Agenda

Energy subsidies and high energy prices are critical uncertainty issues as they are both affecting social equity, although energy subsidies could be effective and efficient when applied in the right way.

Smart grid is also quite a critical uncertainty issues as it lacks regulation for proper return on investment or financial support. Energy efficiency may be an important factor in influencing smart energy consumption and might help to achieve overall sustainability.

In addition, large scale hydro needs action as it is an uncertainty issue. Though Colombia has potential to develop this resource, only a small fraction of the overall potential resources has been developed so far. In order to develop these sources further, it will be necessary to reconcile with regulation as the dam puts impact on society, animals and environment by flooding of farmland and forests.

Figure 11
National Map – Germany



World Energy Issues Monitor
Germany, 2012

4.2 Germany's Critical Agenda

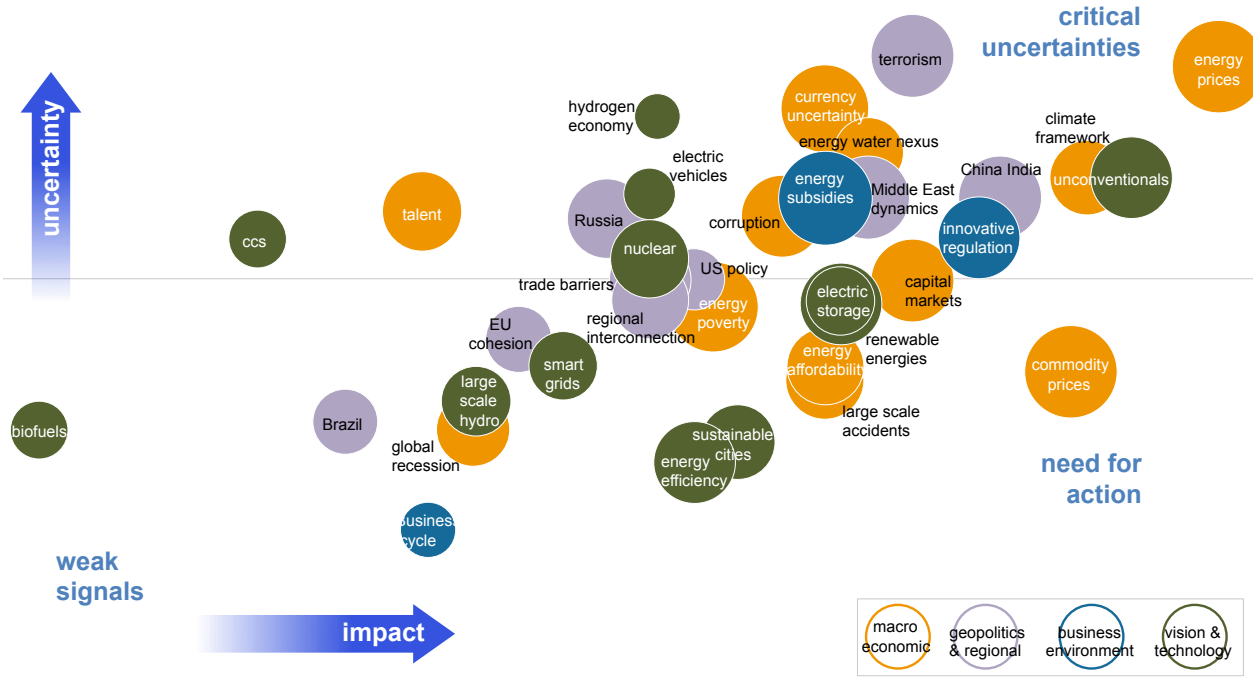
"Energiewende (Energy turnaround)" takes place in the country, and it seems to further accelerate the building of new power plants as they have decided to fully exit out of nuclear power by 2022. "Energiewende" is not Germany's sole issue, and it might affect other neighbour countries as it is not confined within the country. With 30GW of Solar PV plus 20GW of wind power installed, on windy sunny holidays, the German electricity transmission network might need to get ready for more frequent cross-border exchanges of power with its neighbours while conventional plants have to stop and stay in stand-by. It would also require the grid expansion of transmission and distribution lines as well. All of them would result in costing consumers much.

Energy price is significant issue. The investors to renewables are well covered as they have guaranteed fixed prices for 20 years ahead, they get paid whether or not the power has been picked up, and they will not pay the transportation of electricity. The country has been paying 5 cents/kWH for wholesale plus the premium of above 5 cents/kWH for renewables.

The necessary action includes that the market model/grid need to be re-designed. Though some investment is happening, it is mostly encouraged by the feed-in tariffs, and the down side is the country or most of other Europe countries can't cope with it so easily.

The removal of trade barriers and the protection of intellectual property rights for inventions [patents and license] are priorities as the country is more tied to China/India economy.

Figure 12
National Map – India



World Energy Issues Monitor
India, 2012

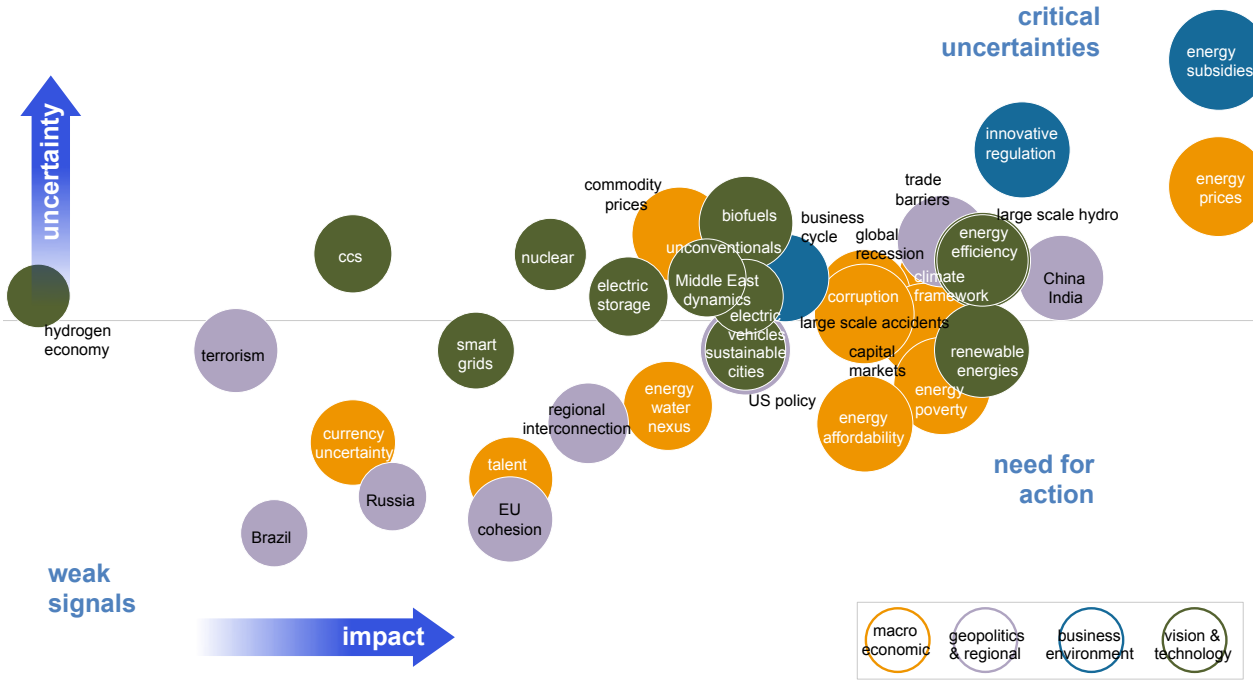
4.3 India's Critical Agenda

Critical uncertainties are volatile energy prices, climate framework, energy–water nexus and currency uncertainties, all of which affect the energy sector. As the country highly depends on import of natural gas, oil and coal, weakening India Rupee (i.e. currency uncertainty) is quite an important issue because it affects energy prices.

Though being positioned at lower impact, less uncertain because of local oppositions to project, large scale hydro may require some actions to be considered as it is perceived as a viable solution to meet the energy needs in relatively environment friendly manner as compared to fossil fuel based power generation considering the immense hydro potential that India has.

Other issues that need action are energy efficiency, sustainable cities and commodity prices. Energy poverty should be looked at as well. In fact, the issue is closely linked to climate framework and energy efficiency because many poor households still use wood for their cooking purposes. This issue needs to be also addressed in terms of both CO_2 emission and energy efficiency aspects.

Figure 13
National Map – Indonesia



World Energy Issues Monitor
Indonesia, 2012

4.4 Indonesia's Critical Agenda

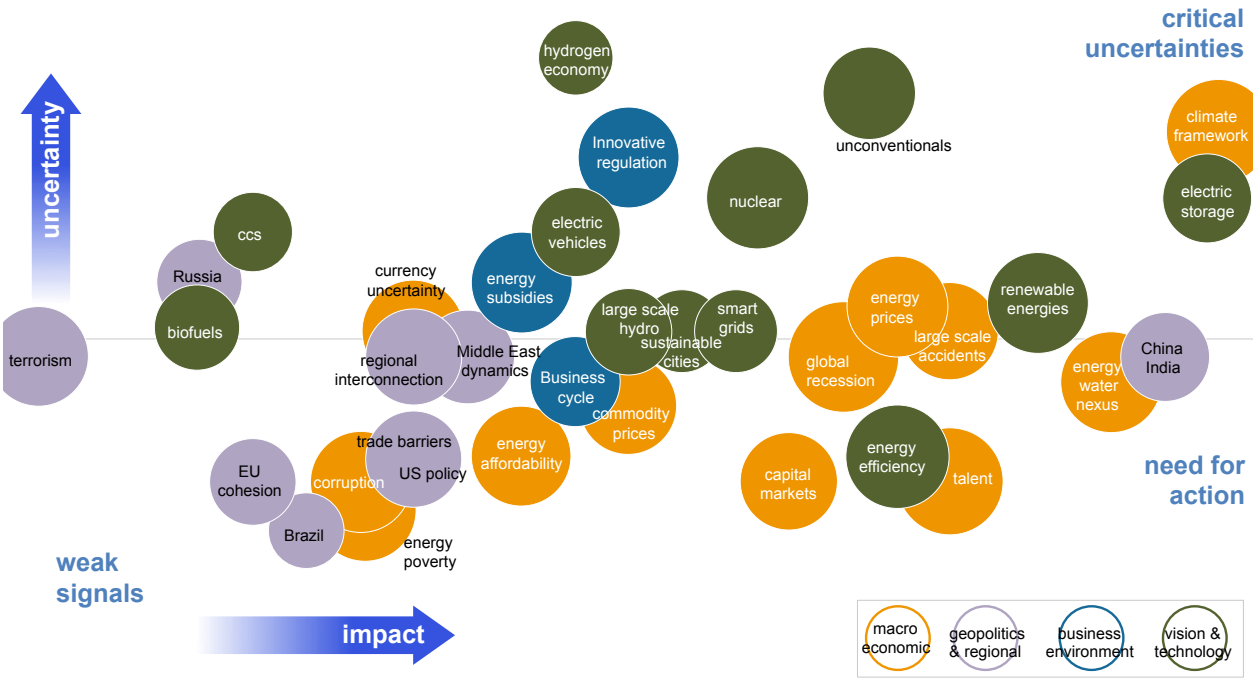
Energy subsidy and energy pricing are perceived as two most critical, underlying issues facing Indonesia's energy landscape. Numerous studies and assessments clearly have shown that the money spent on subsidies could have been far more productively spent on infrastructure as shown by the public call to divert subsidy budget into public service and energy infrastructure. It seems it would be difficult to change the current practices of the subsidies as it has been met with political opposition. Consequently the country's challenges have been to expand their reliable energy infrastructure for sufficient, secure and affordable energy supply.

As for CCS, even though not much progress has been made despite

Indonesia's strong support of CCS to be included in the Clean Development Mechanism, a pilot project and its roadmap are strongly needed as a necessary early step for development. The roadmap should provide broad guidance such as capture site, transportation, storage site, technical availability of **enhanced oil recovery** (EOR), risk monitoring, or financial framework, etc. with specific timeframe to be defined for each stage of the pilot development. As for Nuclear, it would be necessary to improve public understanding and acceptance of nuclear technology, including its costs and risks. The promotion of energy efficiency for both supply and demand sides has been more acknowledged in this year's issue map survey than previously.

Since renewable energies, energy poverty and energy affordability are all found in the action areas of the map, there should be stronger actions to showcase that energy subsidies have such adverse impacts on them. With proper budget allocation, there would be more secure source of energy supply resources including new and renewable energy growth and more reliable power grid systems development.

Figure 14
National Map – South Africa



World Energy Issues Monitor
South Africa, 2012

4.5 South Africa's Critical Agenda

The Republic of South Africa (RSA) has a fragile electricity supply system and is building 8GW coal fired power stations to alleviate the problem. However, these projects are running behind schedule. In parallel, the government process to introduce wind, solar and concentrated solar power (CSP) provided by independent power producers (IPP) to the market is also running very late.

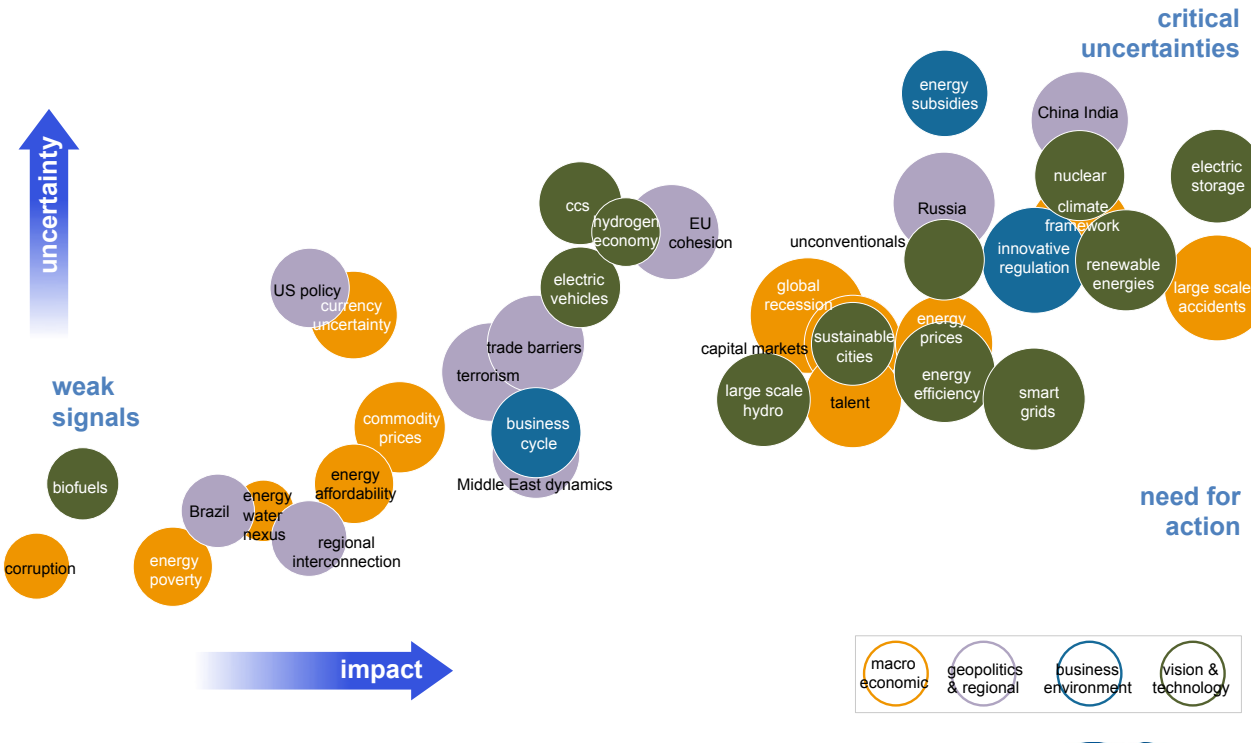
Electricity prices are rising sharply to support the new build, and the global recession including the slow recovery in the OECD countries is suppressing the demand for commodities, while liquid fuel prices are suffering from the volatility and high levels in the global markets. They are having a negative effect on the RSA economy.
Furthermore the government is determined to deliver on carbon mitigation strategies that many believe are unrealistically optimistic in the context of the poor performance on energy security and energy equity. Furthermore, such strategies are likely to cause a reduction in coal mining with a consequent reduction in jobs, further worsening the unemployment issue.

About the critical uncertainties, climate framework is very topical because the government is considering introducing a carbon tax, which mechanism is uncertain. Unconventionals are important because there has been a moratorium on the exploration for shale gas and many court challenges are expected when the moratorium has been lifted. Shale gas could be a game changer for South Africa since there is no indigenous oil or natural gas. Electric storage is important because of the fragile electricity supply system with the moves to introduce wind, solar and CSP to the energy mix.

In action areas of the issues map, the energy-water nexus is addressed as it is very much related to RSA's energy supply to achieve energy equity and energy security while at the same time RSA is already struggling to maintain security of water supply. This is also probably why biofuels are a low priority because their stress on water supply means they may never be a significant part of the RSA energy mix.

Other issues in the action areas are renewables and China and India. In particular, the government in RSA is expected to facilitate the process of introducing wind, solar and CSP, otherwise it would threaten the necessary financial arrangement to materialize.

Figure 15
National Map – Switzerland



World Energy Issues Monitor
Switzerland, 2012

4.6 Switzerland's Critical Agenda

In May 2011 – only two months after Fukushima – the Swiss Government drafted its «Energy Strategy 2050», which, for the moment being, is under consideration of all stakeholders. A final draft should be presented to Parliament in 2013 or early 2014. Most probably, there will be a referendum, where the Swiss citizens will accept or reject the strategy and its legal consequences.
Although the strategy contains some important changes concerning the sectors mobility and heating and cooling, the main part is aimed at a rapid change in the electricity production. Switzerland until now has produced its electricity by and large without CO_2-emissions, up to 60 per cent being hydro, up to 40 per cent nuclear. Unlike the German «Energiewende», the Swiss strategy does not propose to close down the existing nuclear power plants, but to abandon the planned construction of new ones. This means to develop energy efficiency measures and to foster electricity production by renewables. It means also to rely in part on gas-fired electricity production. The electricity grid has to get smarter, to be redesigned and strengthened. For the time being, however, there are little incentives to invest in the electricity sector.

On this political background, the World Energy Issues Monitor for Switzerland shows that «nuclear« and «electric storage» are important critical uncertainties as well as «renewable energies». Furthermore – as Switzerland's economy is highly export-oriented – a reliable carbon price system and «climate framework» are also a predominant critical uncertainty.

The issues of «smart grids», «energy efficiency», «sustainable cities» and «large scale hydro» being central elements for achieving the aims and

vision of the «Energy Strategy 2050», are considered as a need for action.

«Renewable energies» together with «energy subsidies» remain listed under uncertainties, whereas the need for action for installing smart grids seems to be accepted today. There are only weak signals concerning «regional interconnection». This is rather surprising, as regional interconnection is a condition for embedding electricity from renewable sources into the supply system and as the negotiations between Switzerland and the European Union on an agreement for the electricity sector are pending.

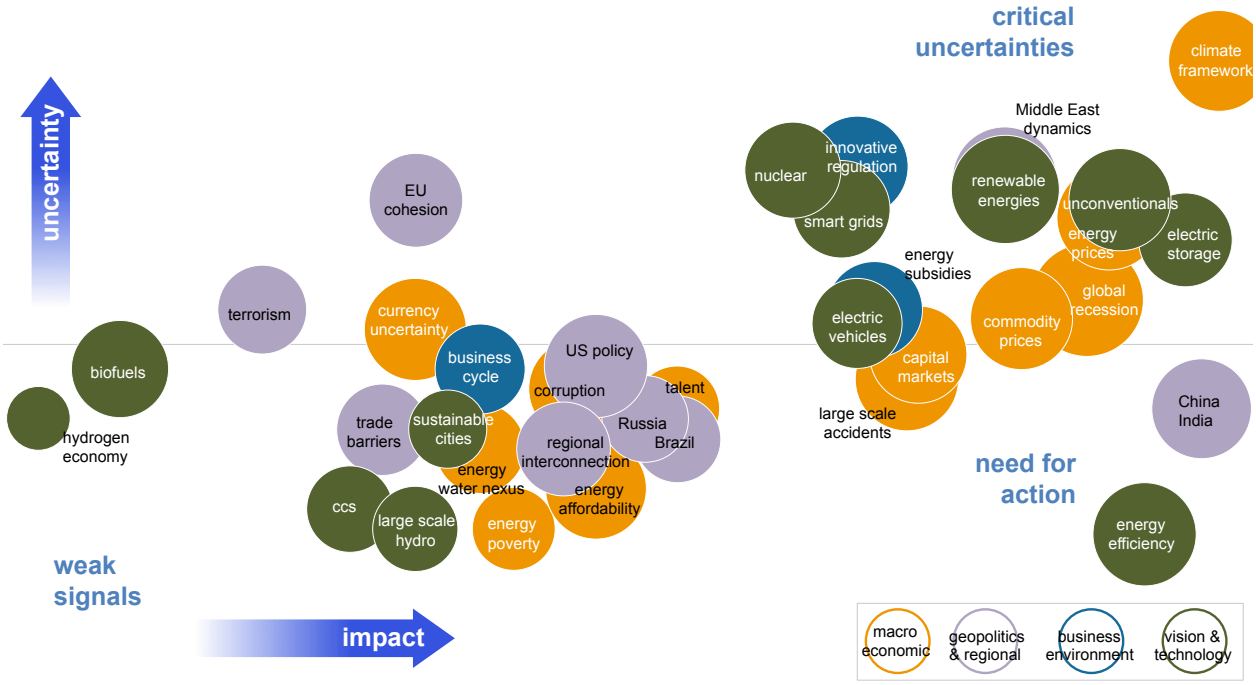
5 Assessing the Global Agenda - Feedback from our Future Energy Leaders (FELs)

The climate framework and mitigating the negative impact of climate change are among the most critical uncertainties for the Future Energy Leader (FEL) community. This is unsurprising given the insolvency of on-going debates around a new “Kyoto” agreement and the lack of collective commitment from countries to address and tackle climate change issues. Future Energy Leaders pay much attention to the development of unconventional energy resources, renewables, and electric storage technologies. The development of these innovative technologies can be expensive and time consuming however; so there is some doubt as to whether they will ever replace conventional resources altogether and meet growing energy demands of the future. Future Energy Leaders place importance on global macroeconomic factors, the rise of energy prices and commodity prices that directly impact development of the energy industry.

The FEL perspective shares a number of parallels with that of the Global Energy Leader. Both communities consider climate framework to be a fundamental global uncertainty. Fluctuating energy prices and the global recession are other key instabilities that jeopardise development of the energy sector and feature in both maps. High growth rates in China and India have increased the demand for energy in the region which will significantly impact the global energy industry. The advent of unconventional resources such as shale oil & shale gas highlights the need for future investment in energy efficient technologies. Future Energy Leaders identify unconventional, renewables and energy storage technologies as critical issues and should therefore be understood as key drivers for the future.

The Future Energy Leaders’ outlook suggests that immediate investment into energy efficient and energy saving technologies is necessary. Recognising and acknowledging such technologies as energy sources of the future will enable global populations to use energy effectively and provide consumers with a reliable, future energy supply at an affordable rate.

Figure 16
Global Map – Future Energy Leaders



World Energy Issues Monitor
Global, 2012, Future Energy Leaders

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