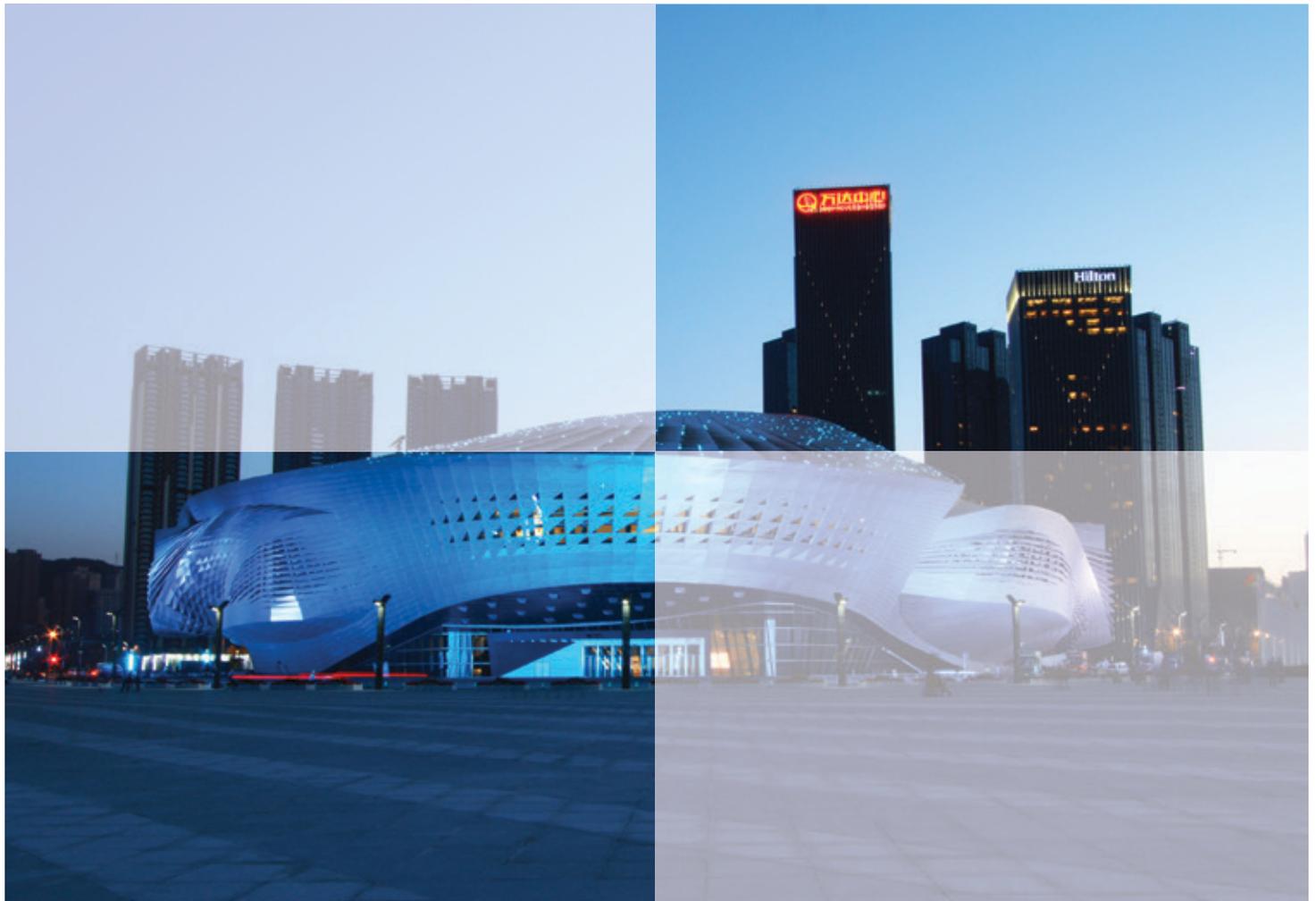


Industry Agenda

# The Energy Summit Preliminary Summary Report

Dalian, People's Republic of China 11-13 September



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REF 140913

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During the Annual Meeting of the New Champions, the Forum's Energy Industry community convened an Energy Summit on 11-12 September 2013. The summit comprised a series of energy and cross-industry sessions that brought together senior executives from Partner companies, government, academia and civil society in structured discussions and informal gatherings.

# Innovation and Protection in the Hyperconnected World: The ICT-Energy Nexus

11 September, 19.00 - 21.00, Hilton-Conrad Hotel, Davos Room

## Key Points

- Information and communication technologies are playing an increasingly disruptive role in the energy system and affecting the traditional way we manage energy.
- Opportunities unlocked by ICT innovations have to be balanced with associated risks, such as cyber crime.
- The convergence of energy and ICT calls for the development of collaborative business models.

## Synopsis

### Disruption Potential of Information and Communication Technologies

We live in the era of the “Internet of things” and information and communication technologies (ICT) are increasingly posing a disruptive challenge to various sectors, including energy. ICT innovations like big data, cloud computing, demand

management, intelligent efficiency, grid digitalization or traffic regulation are affecting the traditional way we manage energy.

The energy sector, traditionally very stable and slow to change, has recently seen an incredible pace of innovation that is transforming the foundations of the system and challenging its capacity to adapt. The innovation required to face these challenges will require convergence and collaboration. Innovation often happens outside organizational and sectorial boundaries; therefore, it is critical to understand the cross-sector areas where key innovations are taking place (convergence) and to ensure the appropriate shared business models and frameworks enable the implementation of these innovations (collaboration). The energy system needs to become intelligent to tackle the challenges of the future.

To fully realize the potential of ICTs in the energy sector, business leaders need to collaborate in a systematic and integrated manner. The World Economic Forum offers cross-sector opportunities to understand and manage changes arising beyond the boundaries of each sector.

### Enablers and Barriers for Realizing the Potential of ICT Innovations

According to the US American Depository Trust & Clearing Corporation, the most imminent threat to the global financial system is computer hackers. Attacks to a hyperconnected energy system could result in blackouts, with catastrophic results to the economy and society. Cybersecurity is thus a big challenge for the Energy-ICT nexus. How do we capture opportunities enabled by ICT while ensuring system security to minimize cybersecurity risks? What are the enablers of incorporating ICT innovations in the energy system?





### **Standardization Process**

The convergence of energy and ICT currently leads to market-driven quasi-standards. But energy critical infrastructure requires a multistakeholder approach to guarantee strict security demands. It is crucial that IT processes and protocols are developed under internationally recognized standards that comply with stringent security demands. The energy industry has a responsibility to contribute to the development of ICT and to share experiences with this sector.

### **Fostering Cooperation between Energy and ICT Industries**

Partnerships to execute projects along the value chain can unlock the potential benefits and build resilience to tackle the risks. Collaboration will increase mutual learning from both industries and build the trust needed to implement technological innovations. A successful example of the collaboration between ICT and energy is the EU Cyber Security Strategy.

### **Stable Regulatory Frameworks that Guarantee Legal Certainty**

Due to the high pace of innovation, a multistakeholder approach is needed to cope with the implications of these changes. There are also barriers

that will slow this process, such as resistance to organizational change, scarcity of capacity skills and the limited ability to transfer knowledge between sectors.

### **Opportunities for Collaboration between Energy and ICT Sectors**

Collaborative business models among sectors are currently not in place. For example, an area of common activity is shared operational tasks. Development of collaborative and mutually beneficial business models can result in improvements in system efficiency.

An example of this collaboration is the potential for wireless technologies to provide better information in oil & gas drilling operations that could result in better informed decisions leading to economic gains. Another example of the ICT and energy cooperation is the development of intelligent electricity grids to better manage loads, which can result in an improved reliability of the system and lower capital requests.

The World Economic Forum is calling for ideas for effective development of the ICT-energy nexus, and proposes to use its multistakeholder platform to promote a dialogue on collaboration initiatives.

# CEO Roundtable on Strategic Energy Sector Development in China

12 September, 07.30 - 08.45, Dalian International Convention Center, WorkSpace

## Key Points

- China's ongoing energy reforms will impact its energy mix and demand, with implications for global energy markets. In the coming two years, the key things to watch are efficiency standards, electricity sector reforms and possible introduction of a resource tax on coal.
- The key challenge for China is how it can cope with growing energy demand and high reliance on coal while mitigating environmental impact and maintaining a cost effective energy mix.
- Although the potential for renewable energy is very significant, coal will still dominate the mix in the mid-term, and the push to curb energy demand will be driven mainly by the introduction of efficiency standards.

## Synopsis

### Current Trends in China's Energy Sector

Three trends are defining China's energy sector: government-backed efforts to reduce emissions; the introduction of energy reforms, such as for natural gas and electricity prices; and decreasing economic growth rates, which will impact the country's energy consumption.

China will likely follow through on points highlighted in its current Five-Year Plan. The main challenge will be to balance the country's growing energy dependency – which has seen increasing imports in gas, coal and oil – with critical environmental concerns. While emissions associated with a coal-dominated mix (69% of electricity is generated from coal) are forcing China to advance the introduction of lower-carbon energy sources, the replacement of coal will prove challenging.

Natural gas represents only 4% of the country's energy mix compared to a global average of 25%. Its share could



increase up to 10% given efforts to increase gas imports. Further increase depends on how fast and to what extent China can develop its abundant unconventional gas resources. However, a shale gas revolution like that in the United States is unlikely in China in the short term due to market, land use and infrastructure constraints. Renewables are expected to increase rapidly due to new incentives; however, they cannot replace the base-load provided by coal. As a result, we are likely to see continued domination of coal in the mix combined with a geographic shift of coal-based power generation from East to West in China.

China has consistently pursued an economically driven policy in its energy sector, choosing the lowest cost alternative while diversifying energy sources and geographies. Through consistent policy-making and efficient capital allocation, China has managed to reduce uncertainty and eliminate the risk premium associated with energy investments.

### The Global Implication of China's Energy Evolution

China is such a big energy consumer that any changes in its growth affect global commodity prices, while the country's strategy for coal and gas has an impact on energy corporations globally. Moreover, China is consistently pursuing an array of

projects for expanding access to oil, gas and other energy sources from other countries to maximize fuel options and energy security.

In the case of oil, demand growth will most likely slow down, driven by the introduction of fuel efficiency standards and saturation of car ownership. In the case of coal, reduced consumption by China will put downward pressure on price, affecting the price differential between gas and coal globally. This, in turn, will affect the competitiveness of gas power generation in other geographies and China itself.

In terms of nuclear, almost 50% of new capacity will come from China. As a result, it is likely that China will soon become a net exporter of nuclear technology, affecting the competitiveness of existing nuclear exporters.

On the renewable side, China has become a global champion, with very significant cost reductions and capacity additions, especially in solar and offshore wind. The combined effect of anti-dumping investigations and a falling demand in Europe has pushed the Chinese government to increase the deployment of solar domestically, with an emphasis on small-scale decentralized generation.

## Considerations of China's Future Energy Mix

Economic growth in China implies an increase in energy demand; accordingly, the country's energy system needs to be reliable, environmentally sustainable and contributing to economic growth.

The potential role for renewable energy in achieving these objectives is very significant. The cost of solar panels today is one-fifth of the cost in 2004. While this cost is still double the price of conventional resources, the fast pace of decline in solar prices could bring grid parity sooner than expected. As such, it is expected that, by 2020, China could in a best case scenario add as much as 150 GW of solar, thereby making renewables up to 10% of the energy mix.

However, renewable energy alone is not yet sufficient to provide low-cost energy for China's industrial economy. Load generation provides the basis for economic growth and, of the load generation technologies, coal is the most abundant. As such, in the short term, a high dependency on coal will continue. Given these dynamics, the introduction of efficiency standards will be critical to meeting China's growing energy demand.

## Regulatory Reforms to Increase Competition

China is seriously concerned about climate change, as it will be seriously affected by changing water availability. The current government has put forward a number of reforms to reduce emissions, including plans for a cap on energy consumption focused on coal consumption. Furthermore, eight large cities have been running a pilot carbon trade mechanism programme. Although a carbon tax could be more effective than trading mechanisms, it will take longer due to the complexity of interests.

The centralized grid in China is managed by one national grid company and a southern grid company. The reform to unbundle transmission from distribution businesses (thus breaking monopolies) will foster competition of technologies and open the field to new entrants.

Participants concluded that, over the next two years, the key things to watch include:

- Possible introduction of a resource tax on coal, which could happen quite soon
- Reform of the electricity sector to introduce more competition
- Further measures and standards to promote energy efficiency



# Power Innovation WorkSpace: Breakthrough Energy Technologies that Will Shape Future Electricity Systems

12 September, 09.00 - 10.30, Dalian International Convention Center, WorkSpace

## Key Points

- While the electricity industry was previously known for being slow-moving and having well-established technologies and business models, today, much faster development and adoption of new technologies impact the way electricity is generated, distributed and consumed.
- Four scenarios for expected electricity technology innovation by 2035 were discussed; key themes that emerged include distributed generation (with a high content of solar and wind), smart grids across the electricity value chain and efficiency.
- Regarding the innovation shift to emerging markets, industry players are testing out new concepts to serve the needs of emerging economies and – where successful – deploying them in developed economies.

## Synopsis

In this interactive workshop, participants debated what innovation breakthroughs could transform the electricity industry by 2035 and what their likely impact will be on electricity systems and business models in the industry. Four scenarios were explored:

### 1. Industrialized mature economy with carbon price and expensive fossil fuels

The group approached this scenario from the perspective of a highly urbanized country. High prices for fossil fuel and carbon would generally drive R&D and efficiency. More local self-sufficiency of energy, especially through cheap distributed solar, self-sufficient buildings and possibly energy storage would notably emerge. This group also projected the full development of smart grids that integrate distributed generation, low loss distribution systems and smart data management. Consumers will increasingly become “prosumers”, meaning they will also produce significant levels of energy to use or deliver back to the grid.

### 2. Industrialized mature economy without carbon price and with fossil fuel prices as today

This group looked into what could be the real innovation incentive if there were to be no hikes in carbon and fossil fuel prices. They concluded that policy and energy security are critical variables. The group felt confident that electricity storage at the consumer level and distributed generation would materialize in combination with smart grids and smart energy consumption solutions. Another characteristic would be greater cross-border regional grid connectivity.

### 3. Emerging economy with high fossil fuel price and no carbon price

The emerging economies groups discussed the 2035 scenarios from a perspective of a rural but rapidly urbanizing economy. The group, which worked under the assumption of high fossil fuel prices, highlighted distributed energy solar solutions as being core in both rural and urban environments. More modern and efficient solutions for



cooking were expected to be a game-changer in rural areas, while smart urban planning, intelligent city concepts and stricter building codes would be a determinant in urban areas. Energy storage for local use – not the grid – is likely to mature by 2035.

Making use of existing technologies with innovative financing and policy models was seen as more important than fundamental technology breakthroughs. Policies that seek efficiency, makes the best use of natural resources and diversifies from fossil fuels would form a basis in this scenario.

#### 4. **Emerging economy with fossil fuel price as today and no carbon price**

Looking at China specifically, this group found that, despite fairly moderate fossil fuel prices and no carbon price, local air pollution, energy security and occasionally water shortages will drive environmentally friendly solutions.

Coal would play a significant role, but would move more out of urban areas, which increases the need for efficient high-voltage transmission technology. Distributed co-generation and thermal storage is expected to play a significant role in more urban areas. On the industrial side, heat recovery would be standard. Nuclear would expand from today's level in China and emerging markets. We can expect to see more international grid connectivity, possibly through regional supergrids. The group was also "bullish" on the prospects for intelligent efficiency enabled by ICT and smart grids.



#### **Cross-cutting Insights**

Across the four scenarios, key themes that emerged were distributed generation (with a high content of solar and wind), smart grids connecting generation, distribution and consumption, and more efficient use of energy.

In a low fossil fuel price scenario, policies will be a much more important factor than in the higher fossil fuel price scenario. Even absent carbon pricing, other drivers such as energy security, local air pollution and delivering access to energy in rural areas of emerging economies will drive innovation and new solutions. Urbanization provides an opportunity to drive electricity efficiency, if smart urban planning and integration of ICT is more systematic than today.

Some technology breakthroughs can be expected although, contrary to the past, new technology and business models are likely to come from emerging countries. Established industry players are already testing out new concepts to serve the needs of emerging economies and – where successful – deploying them in developed economies.

While many were optimistic on distributed solar, others highlighted that other local sources such as small scale biomass, hydropower and wind will be important. There was no clear conclusion on whether innovation will be led by business models or, rather, by policy.

Last but not least, participants highlighted the uncertainty of the scenarios and assumptions themselves. Business and policy planning will need to happen in an environment of fundamental uncertainty on energy prices, climate policies and other fundamental parameters.

# Strategic Shifts in the Energy Ecosystem

11 September, 09.00 - 10.00, Dalian International Convention Center, Davos room

What trends, business models and emerging technologies are transforming the energy industry?

## Key Points

- Sub-Saharan Africa has far wider mobile phone coverage than energy coverage; converging the two could dramatically increase energy access there.
- Unconventional oil – like Canadian oil sands and offshore fields in Africa – is playing a larger role in the global energy industry.
- The use of renewable energies like wind, solar and hydropower continues to grow.

## Synopsis

Energy markets are facing a massive transformation – similar to what happened to the communications industry after the advent of the Internet. The energy industry, built around the needs of countries' policy-makers, previously focused on securing energy supplies to guarantee that energy insufficiency would not stymie growth. The arrival of shale gas "created a dramatic shift in energy strategies," said Giuseppe Recchi, Chairman of Italy's Eni and a Mentor of the Annual Meeting of the New Champions. And the financial crisis, especially in Europe, "crashed usual projections of growth and demand," he said. Now, the industry is looking for the "new normal".

Outside North America, natural gas production – especially in Asia and Europe – is growing slowly. Natural gas prices in Asia are roughly five times more expensive than in the United States; in Europe, roughly four times more expensive than the United States. Arbitrage opportunities, at least in the near term, will remain. Gas can't be transported from the United States to Europe through a pipeline, said Recchi. If countries with comparable shale gas reserves to the United States – like China, Argentina and Algeria – increase production, it would reduce prices; but environmental concerns remain an issue.

Another challenge faced by energy producers and consumers is access: 1.3 billion people lack access to electricity, "a serious predicament" for Africa, said Zola Tsotsi, Chairman of South Africa's Eskom Holdings and Mentor of the Annual Meeting of the New Champions 2013. As a result, he said, "there's a focus on renewable energy because of the ease of access, as opposed to grid power."

For the majority of humanity on the grid, energy transmission is often inefficient. Technology that allows products – like mobile phones, everyday items, even automobiles – to draw energy from the grid instead of using batteries could save a lot of electricity.

How can business leaders implement strategies that lead to consumers using energy more sustainably? Better technology, like that involving improved carbon capture and storage, would help reduce coal pollution; but challenges remain. "People continue to demand more energy – we are producing more barrels because people want the product," said Alison Redford, Premier of Alberta, the Canadian province that has the world's third-largest proven crude oil reserves, behind Saudi Arabia and Venezuela. She suggests further educating consumers on the difference between renewables and conventional energy, and the choices they have between them. "When people flip a switch, they need to know that it may or may not be clean energy," she said.

# Asia Energy Outlook

12 September, 17.15 - 18.15, Dalian International Convention Center, Lugano

You can view the webcast by clicking on the following link:  
<http://www.weforum.org/sessions/summary/asia-energy-outlook>

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