



DISRUPTION AND NEW INNOVATION TECHNOLOGIES

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The energy world is undergoing a Grand Transition driven by a combination of factors including the increasing pressure for decarbonisation, the fast-paced development of new technologies, an unstoppable digital revolution, emerging physical and virtual risks and changing growth and demographic patterns.

Energy leaders face and are increasingly acknowledging disruptive change. The one thing above everything else that is keeping energy leaders awake at night globally is the impact of digitalisation on the future of the energy system. Industry leaders and policymakers across the globe are considering the impact of innovation with a mixture of excitement and unease.

Innovation issues such as decentralisation, innovative market design, electric storage or blockchains are rapidly moving to the top on the list of CEO insomnia issues, while a more uncertain growth context and new physical and digital risks are posing ever greater threats to the energy sector, worldwide.

In such a context of acclaimed technology democratisation and a changing energy system we must re-think the role of the state and of companies in ensuring access to secure, affordable and environmentally sustainable energy. The World Energy Council's *World Energy Issues Monitor*, highlighted transition technologies, including renewable energies and energy efficiency, as top action priorities for energy leaders globally in 2017.

The world in which the Internet of Things and blockchains will enable direct and low-cost transactions between parties and between appliances is fast approaching, with at its core precisely recorded transactions in unfalsifiable ledgers that also open new possibilities for supply chain tracing and product labelling by fabrication origin, materials used or emissions caused.

A world where big data, machine learning, and artificial intelligence enable automated system analytics and instant demand response is very different from the analogue world where many leaders started their careers.

The next decade will begin to define the winners and losers of the energy transformation, making it crucial to understand the new realities for the energy sector now.

These new technologies not only change the way we operate the energy system but revolutionise the potential for a sharing and leasing economy through new platform solutions, which will affect traditional business models in energy and change the way we think about supply-

demand interaction. Mobile technology with cloud support already today enable new financing models, such as micro-leasing schemes in the developing world and greater customer choice and control for all.

For infrastructure and system-critical companies the digital revolution doesn't come for free: they face broader exposure to cyber risks due to a greater number of digital entry points into the system and increased planning uncertainty resulting from lowering entry barriers for new players across sectors.

The key issue however, is the question of peak demand for fossil fuels. A combination of electrification of final demand and decarbonisation lead to plausible peak demand for oil before 2040 as illustrated by two of the World Energy Council's three exploratory scenarios. Electricity is "the new oil" and electrons are increasingly replacing molecules in energy supply within a shifting demand pattern. We see a doubling of electricity volume by the mid-century.

While oil demand is directly affected by future growth of electric mobility, the natural gas side is more complex. Gas has a great opportunity to replace coal in power supply and contribute to decarbonisation; Asia has great hunger for more gas. Gas may increasingly become part of a decarbonisation strategy.

Key uncertainties remain. How quickly will decreasing battery costs help electric mobility break through to the point where more electric vehicles will be sold than fossil based cars? UK, France, Norway, India, China have all announced aggressive targets – and China has given itself the objective to manufacture 80 per cent of the world's electric cars by 2025. Will CCS manage to come out of its lethargy and prolong opportunities for fossil based electricity? Will Asia's hunger for gas be tamed by dependency ceilings in a tenser geopolitical context?

80 per cent of our primary energy mix are fossil fuel based. About half of the world's capital is invested into energy and related infrastructure that support an essentially fossil based economy. That this is a big steamer, and will take time to evolve, is providing a wrong sense of comfort to those holding on to the past.

A rapid transition is underway and shale, photovoltaic or digital and platform revolutions are a new reality. Many argue that we overestimate what new technology may deliver in the first few years, and underestimate longer term results. After all – who knows better than oil what incredible power technology innovation has? ■