



Future of Energy Series

Managing uncertainty in the energy sector

Energy underpins every aspect of modern life, driving economic growth and prosperity and as a result has a direct link to people's standard of living. The energy sector faces significant change which brings a different level of uncertainty to long-term sources of growth.

In this report, we have explored five key trends impacting the energy industry which will drive significant change. We also cover implications that senior management can consider when making decisions about the future.

The five trends utilize the energy trilemma as the

guiding framework within which energy policy and investment decisions are typically made:

- ▶ Security of supply
- ▶ Affordability
- ▶ Sustainability

Trade-offs are made within this framework, depending on regional priorities. For example 16% of the global population don't have access to a reliable electricity supply; in Sub-Saharan Africa this proportion rises to two-thirds of the population.¹ For the governments of these countries the emphasis will lie on cost and reliability to secure growth, whereas in developed countries there is a

greater emphasis on sustainability.

With this context in mind, let's explore the five key trends that we have identified as guiding energy investment over the next 10–20 years:

- ▶ Global decarbonization drive
- ▶ A shift toward decentralization
- ▶ Disruptive innovation and technological advancement
- ▶ Relentless focus on efficiency
- ▶ The rise of an ever more interconnected world

¹ "World Energy Outlook: Energy Access database," *World Energy Outlook*, 16 November 2016, International Energy Agency.

Global decarbonisation drive

In the past, one of the key barriers to decarbonisation was a lack of commitment at global level. However in December 2015, at COP21 in Paris, 198 countries signed a directionally binding contract to limit the temperature rise on the planet to 2°C. This was astonishing because the global primary energy demand is forecast to rise by 48% between 2012 and 2040, with non-OECD countries experiencing a 71% increase, where rapid economic growth is paired with increasing population.²

Fossil fuels continue to be the cheapest energy source and they will remain a large proportion of the world's energy system. Natural gas will be the biggest winner with consumption globally rising by 50% by 2040 as the world shifts away from coal.³

By 2040, zero-emission energy sources will make up 60% of installed generation, with wind and solar accounting for 64% of the 8.6TW capacity increase over the next 25 years.⁴ What is particularly incredible is the pace of this change; in the UK for example, predictions made in 2012 for the level of solar in 2030 were surpassed more than 15 years ahead of schedule.⁵

A movement toward decentralisation

Within the power and utilities sector, the trend for installing smaller generation plants will continue as the growing economies of scale, combined with government subsidies, support the rollout of greener technologies. The rate at which costs are coming down for these technologies will further support their growth (onshore wind costs are falling by 41% and solar PV costs predicted to fall by 60% by



2040).⁶ This is leading to predictions that in the UK up to 49% of capacity will be on the distribution network by 2030 compared to just 16% now.⁷ This trend also extends beyond developed countries with companies like M-KOPA in Kenya, who are bringing solar power solutions to market with low-cost commercial offerings.

This shift in power supply will require significant, continued investment in conventional sources, to address the intermittent nature of renewables. This will lead to a portfolio of supply that will need to feature flexible centralized power plants, capable of ramping to compensate for varying renewable supply. There will also be pressure on these large infrastructure investments for a more agile method of delivery, given the

² "Chapter 1. World energy demand and economic outlook," *International Energy Outlook*, 11 May 2016, U.S. Energy Information Administration.

³ "World Energy Outlook 2016," *World Energy Outlook 2016*, 16 November 2016, International Energy Agency.

⁴ "New Energy Outlook 2016," *Bloomberg New Energy Finance*, June 2016, Bloomberg Finance L.P.

⁵ "Ofgem challenges power grid companies to connect more renewables," Ofgem website, www.ofgem.gov.uk/publications-and-updates/ofgem-challenges-power-grid-companies-connect-more-renewables, accessed 19 March 2016.

⁶ "New Energy Outlook 2016," *Bloomberg New Energy Finance*, June 2016, Bloomberg Finance L.P.

⁷ "Future Energy Scenarios," *Future Energy Scenarios 2016*, July 2016, National Grid.

increasing number of variables that can affect output.

Continued innovation and technological advancement

New developments are unlocking potential right across the energy sector, creating opportunities for those who can adapt and scale fast. That said, it is important to bear in mind that innovation does not necessarily come from new technology; in many cases it can be from a radically new approach to a problem, which results in a new business model or operating procedure.

A whole new range of offerings have been unlocked for utilities, with the gradual rise of the connected home both unlocking demand-side response and attracting new players to the energy scene in the form of telecommunications and technology companies. Electric vehicle cost parity, which is expected between 2022 and 2026,⁸ along with



other technologies, will cause the traditional roles in the electricity value chain to be eroded with new opportunities and positions will need to be filled.

Across asset management, new offerings are being created that allow full advantage to be taken of the progress being made in the fields of machine learning, analytics and advanced maintenance methods. Using remote sensors and the Supervisory Control and Data Acquisition (SCADA) systems it is possible to manage assets more precisely, running the components at the optimal compromise between output and asset degradation. The rise of drones and artificial intelligence will allow both significant cost reductions in labor-intensive activities and the de-risking of operations conducted in dangerous environments.

An unrelenting focus on efficiency

In terms of energy efficiency the drive to do more with less is more important than ever, if we are to achieve growth while avoiding the destruction of our planet. Progress on energy efficiency has been striking yet the potential is still vast. Improvement in energy efficiency since the 1970s in 11 of the IEA member countries saved 1.4b tonnes of oil in 2011, worth USD \$743b.⁹ Energy efficiency is a major area of investment with circa USD \$221b invested worldwide in 2015, up 6% from 2014.¹⁰

In the world of infrastructure, workforce productivity and effective asset maintenance can be combined with lean asset design. All too often assets are “gold plated” and bespoke. By focussing on a standard design, greater efficiency can be built in.

Decommissioning of oil and gas infrastructure is increasingly rising up the boardroom agenda as exposure to significant costs from mature fields are starting to be realized. The cost

⁸ “Bloomberg New Energy Finance Forecasts Rocky Shift toward Solar,” Clean Energy Finance Forum website, <http://www.cleanenergyfinanceforum.com/node/1851>, accessed 19 March 2016.

⁹ “Invisible fuel: The biggest innovation in energy is to go without,” *The Economist website*, <http://www.economist.com/news/special-report/21639016-biggest-innovation-energy-go-without-invisible-fuel>, accessed 19 March 2016.

¹⁰ “Energy Efficiency Market Report 2016,” *Energy Efficiency Market Report 2016*, 2016, International Energy Agency.

estimate for decommissioning the UK Continental Shelf (UKCS) basin has been rising steadily and now stands at more than £50b.¹¹ For cost efficiency, “specialist decommissioners” need to exist; these companies will need to build experience, develop innovative techniques and use portfolio effects to drive economies of scale. This is a new industry, and combined with an appropriate commercial model, it can significantly reduce costs.

The rise of an ever more interconnected world

As systems become evermore intelligent, the possibility opens up for the actions of all connected users to be seamlessly integrated to efficiently deliver secure, sustainable and economic supply of energy. In the US, LO3 Energy is trialling a system that allows microgenerators to sell their power directly to residential consumers. This initiative uses blockchain-enabled smart contracts to resolve peer-to-peer trading without a central reconciliation authority. These new technologies build on the digitalization of the grid to transform the traditional roles in the value chain.

In their *Future Energy Scenarios*, National Grid predicts that by 2030, the UK could be up to 80% dependent on imports for natural gas,¹² which, without additional investment in production or import capacity (beyond that included in the forecast), would mean the UK would be reliant on storage for periods of peak demand. With more renewable electricity coming online, there will be an increased need to facilitate flows from areas of low demand to areas of high demand with our continental neighbours. This will be achieved by investing in more interconnectors in order to avoid

curtailment, with capacity expected to rise up to 23.25GW by 2040 from 3.95GW today.¹³

How should companies adapt to these changes?

As a result of these five trends, the energy market will change and become more fragmented than ever before. There will be implications on industry roles, investor landscape, regulatory policies, customer preferences, competitive landscape, etc.

In order to adapt to the changing world, energy companies will need to:

- ▶ Decide where they fit in the market, what their role is and their business models in the future
- ▶ Reevaluate how they operate, and their consequent operating models
- ▶ Align toward a medium-term change journey to steer the mothership at the right pace for their organizations

In the Economist *Thriving Through Disruption Report*, 60% of executives said their senior management view disruption as a threat, not an opportunity.¹⁴ In this period of high uncertainty, there is one thing that is certain: inaction is not an option. Those firms who are forward-looking and embrace change at pace, will thrive and prosper in the new world, creating value for their shareholders, employees and wider stakeholders.

Our sector knowledge, combined with our strategy and customer-growth capabilities, enables us to help you understand your biggest opportunities and risks, and develop thinking for a sustainable future.

¹¹ “Decommission planned for North Sea Brent oil field,” BBC News website, <http://www.bbc.com/news/uk-scotland-scotland-business-38902204>, accessed 19 March 2016.

¹² “Future Energy Scenarios,” Future Energy Scenarios 2016, July 2016, National Grid.

¹³ “Future Energy Scenarios,” Future Energy Scenarios 2016, July 2016, National Grid.

¹⁴ “Thriving Through Disruption Report,” <http://eydisrupters.filmseconomist.com/thriving/>, part of the Economist Disrupters program, supported by EY. Research based on 1000 decision makers from across three global industries, December 2016, accessed 19 March 2017.

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