

## EMBRACING THE NEW FRONTIERS FOR ENERGY

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The world is undergoing a Grand Transition driven by a combination of factors including the fast-paced development of new technologies, an unstoppable digital revolution, global environmental challenges and changing growth and demographic patterns. Over the coming years this energy transformation has the potential to change the way in which we produce and consume energy. This will impact operating models and the economic foundation of both nation states and businesses, leading to a rebalancing across sectors and regions with knock-on effects on the wider global economy.

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.

### THE NEW REALITIES FOR ENERGY

#### 1. From Peak Oil to Peak Demand

**The new reality:** The peak oil debate belongs to the past: the reality is that per capita demand for energy will peak before 2030. Energy intensity reductions supported by primary energy substitution effects are set to increase at a faster rate than the demand increase from a growing global middle class. This therefore shifts the discussion from peak oil to peak demand with anticipated growth limited to only a 20% increase over the next 45 years. This will have significant implications for energy companies in terms of their ability to achieve their growth expectations, which will need to be factored into investment strategies.

#### 2. Spending the Carbon Budget

**The new reality:** We haven't done enough to decarbonise our economies: the world will have to accelerate the decarbonisation of the global GDP to a rate of 6%/yr in order to remain within the carbon budget associated with 2°C global warming. This will take considerable effort since with current trends we could reach and surpass the carbon budget between 2045 and 2055, even with optimistic assumptions on energy intensity reductions. The Nationally Determined Contributions (NDCs) agreed at COP21 provide about 1/3rd of the required ambition level. Rapid and successful transitioning of global transport to low carbon solutions presents the biggest obstacle or opportunity in achieving climate goals.

Current market signals alone are not enough to improve critical areas such as energy efficiency, improved electrical storage, penetration of clean transport and much needed adoption of Carbon Capture, Utilisation and Storage (CCUS). Clear, focused and unambiguous policies and institutional frameworks are required to reinforce a wider deployment of solutions that accelerate the transition and drive consumer choice towards the most carbon and cost effective solutions.

#### 3. From Stranded Assets to Stranded Resources

**The new reality:** Changes in the way we produce energy define a risk for existing assets to end up stranded. But looking ahead we can see a growing number of primary resources, particularly in coal, possibly in oil, remaining unused. While fossil fuels will continue to have a significant role in the energy mix, contributing between half and two third of our energy needs in 2060, coal could potentially only represent 5% in the overall mix. Oil will still be needed for transportation providing

over 60% of energy needs but overall oil demand will flatten out. The golden age of gas will continue, with expected output growth between 25% and 70% by 2060.

With stagnating growth potential in the oil sector and with coal likely to be of little importance by 2060, there will be a shift in the discussion from stranded assets (predominantly enterprise owned) to stranded resources in oil & coal (predominantly state owned). This has the potential to cause significant stress to the current global economic and geopolitical equilibrium and will need to be part of a broadened carbon and climate dialogue.

#### 4. Shifting System Resilience

**The new reality:** We have seen a fourfold increase in extreme weather events over the past 30 years, increasing pressure on use of water in energy production and increasing levels of cyber threat that are all contributing to a new reality for the energy sector.

With increasing systems integration, resilience is no longer just about building systems stronger and returning single assets to full operation after a disruptive event. When interdependent systems are blacked out, by extreme weather or cyber-attack, the system as a whole is at risk of being deadlocked. Black-starting capability, decentralised decision autonomy and local empowerment have become key concepts of a new “soft resilience” approach as opposed to the traditional “hard resilience” practice of simply building systems stronger. Operating in this new landscape requires different tools and new approaches to manage risk.

#### 5. A Path of Innovation

**The new reality:** We are beyond the tipping point of a technology revolution in the energy sector. Energy markets are further increasing in complexity, accelerated by fragmented energy policy, fast moving technological innovation, and shifting consumer expectations. New realities are increasingly characterised by growing zero marginal cost supply, low entry barriers, greater focus on decentralisation and local empowerment, digitalisation and commoditisation of technology, more flexible and rapid pay back solutions, increasingly active investors and servicing of emancipated consumers.

Solar and wind power will continue their rapid growth with the electrification of energy use an unstoppable trend. As a percentage of total final production, electricity could reach penetration levels by 2060 as high as 30%, with up to 98% coming from non CO<sub>2</sub> emitting technologies, a 3-fold increase over the current share with 40% coming from solar and wind technologies alone, representing a 10-fold increase over current share. Current market designs and business models are unable to cope with these new realities and will require entirely new skills-sets, business models and financing solutions. Meanwhile, we will still depend on up to 45% of our generated electricity being provided from fossil fuels supplemented by CCUS.

To truly realise the potential, we need more focused Research, Development and Demonstration (RD&D). Coordinated innovation initiatives will be critical to the credibility of the decarbonisation agenda.

#### 6. Changing Global Governance

**The new reality:** The centre of gravity in energy has moved outside OECD countries: China, India and Africa define tomorrow’s agenda for energy and must take their due place in global energy governance. The world is witnessing a trend to more inclusive global energy governance with more global governance tools available than even five years ago: The United Nations have

agreed a sustainable development goal on energy (SDG7), the Conference of the Parties (COP) process has achieved a deal in Paris, and organisations such as the IEA have been reaching out to new key energy players, including China. The G20 has energy security on the agenda and the Clean Energy Ministerial is including countries beyond the G20.

Meanwhile, many of the substantive agendas remain a work in progress: minimising international tariff and non-tariff trade barriers for clean energy goods & services to enable clean energy deployment; introducing carbon pricing mechanisms to ensure adequate investment signals; reinforcing regional infrastructure integration and market harmonisation measures to ensure effective resources sharing. Focus will be required in this area, along with improved capability to respond sympathetically to increasing public activism, if we are to enable the energy transformation.

## **7. Entrepreneurship Driving Access for all**

**The new reality:** Progress has been made, but we still have 1.1 billion people without access to energy. The recognition of energy as the 7<sup>th</sup> development goal by the United Nations has provided additional focus on high impact opportunities as well as the rapid deployment of best technology solutions. The recent rise of innovative and disruptive business models for rural off-grid power solutions is providing a formidable opportunity to places with greatest need in Sub-Saharan Africa or South Asia. The roll-out of these solutions will define key entry points into tomorrow's markets and are a great contribution to keep equity gaps from increasing. Empowered trade and climate policy will be important for technology transfer to ensure the mistakes of the past are not repeated. Robust policy and institutional frameworks are urgently needed to de-risk and support entrepreneurial approaches and enable them to access large scale investors.

### **A CALL TO ACTION**

The Grand Transition is unstoppable and requires a global response and careful management, building on the principles of the Energy Trilemma. A successful energy transformation calls for worldwide political and economic collaboration at an unprecedented scale. Leaders and society need to embrace these new realities and strive for continued innovation while maintaining stable investment frameworks. There will be intense pressure on the three dimensions of the Energy Trilemma as individual countries aspire to improve energy security, expand energy equity and reduce carbon emissions. One-sided focus on selective priorities creates additional tensions and undermines broad political support and the stability needed to encourage investments. Novel approaches will be needed to keep the three dimensions of the Energy Trilemma balanced. Only with positive leadership can we manage the Grand Transition and avoid a low growth, inward looking scenario resulting in a stagnating energy sector.

**Governments, business leaders, investors, and society will have to rethink the energy contract and find new ways to avoid deadlocks, allowing for timely decisions and delivery of integrated, effective and efficient infrastructure. Innovative urban planning solutions, adequate resilience response, as well as enabling policies and trade frameworks will all be required. Solutions will not solely come from within energy but energy has a historic opportunity to provide leadership to power the broader industrial revolution.**

**Adapting to these new realities will require massive effort and our ability to respond will define both winners and losers.**