



# The Future of Energy



## The Global Challenge

The energy system is at the beginning of an inevitable transition, with increasing contributions from renewable energy, energy efficiency and sustainable development. While global transition will evolve over many decades, this will be built from a series of individual transitions in particular countries and sectors which will occur more rapidly and look different in different parts of the world. Driving the transitions is a range of factors including growing prosperity, changes in resource availability, technology & cost developments, political imperatives, shifting social norms and ever increasing environmental concerns.

The two fundamental and strongest influences behind the energy system transition is an increasingly prosperous and growing population, and concerns about climate change. The world's population is expected to grow to 9 billion people by 2050, with more people coming out of poverty and having access to commercial energy for the first time. This will be more so in emerging economies such as China and India, where people will want access to basic 'luxuries' that many high income countries enjoy such as electricity, a TV set, a fridge. According to The International Energy Agency (IEA), energy demand could double by 2050, from a baseline just a few years ago.

Following publication of a series of reports from the Intergovernmental Panel on Climate Change (IPCC) there is now significant consensus over the scale of the threat of climate change. If greenhouse gas emissions continue to rise, the impacts will be severe, irreversible and will include more extreme weather events such as floods, droughts and storms, along with rising sea levels and acidity. The publications from the IPCC bring a necessary wake-up call warning that 'warming of the climate system is unequivocal and unprecedented, with emissions rising faster than ever before'.

Key questions that need to be asked are how are we going to tackle rising energy demand and global warming? How do we build a sustainable energy future? How do we ensure we act now and swiftly before time runs out? The hard truth is that time is passing and CO2 emissions are accelerating.

There is little doubt that these issues are of great concern to governments, civil society and to the private sector. However the debate is polarized on many fronts, for example between the governments of advanced and emerging economies, each of which insist that the other should shoulder more of the burden than they are willing to agree to. This delays meaningful action at scale, and in the meantime the stresses continue to mount.

### Inevitable Transition

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### Transition or Delay?

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## Options and Possibilities

### **Fuelling Prosperity**

The benefits of energy cannot be forgotten. It is one of the enablers of our prosperity and wellbeing, and you cannot have a functioning, productive, efficient, modern economy without reliable energy.

### **Less Carbon, More Energy**

The climate change debate is serious but needs to be broader, focused not solely on reducing CO2 emissions, but on developing a low carbon, high-energy future to ensure prosperity for all.

### **Collaboration at Scale**

To bring about a shift and to broaden the frame of discussion, pragmatic collaboration is needed, between government, society and industry at an unprecedented scale. prosperity for all.

For some of those who can afford to take it for granted, energy has unjustly become almost a dirty word and is projected in very narrow terms, with images of bleak industrial landscapes and pollution-filled cities. Yet in many under-developed countries, access to energy is the difference between prosperity and poverty, sickness and health, life and death. The benefits of energy cannot be forgotten. It is one of the enablers of our prosperity and wellbeing, and you cannot have a functioning, productive, efficient, modern economy without reliable energy.

The World Bank estimates, for example, that the growth of around ten million small and medium-sized businesses in Africa is hampered by the lack of available energy.

Ben van Beurden, Shell's Chief Executive Officer, recently shared his strong views that the climate change debate is serious but needs to be broader, focused not solely on reducing CO2 emissions, but on developing a low carbon, high energy future to ensure prosperity for all.

Discussion frequently focusses only on the need to reduce CO2 emissions and centers on policy levers and mechanisms to accelerate the shift from fossil fuels to other energy sources such as renewables. This does not address the urgent need for there to be more energy overall to enable a decent quality of life for the many people currently excluded from having access to energy. Far less discussion is devoted to the related, parallel and central imperative of securing sufficient additional energy not only to maintain current energy affluence for those who have it but also provide it for the 3 billion who live in energy poverty today and the additional billions yet to be born.

Many countries, such as India, and China before it, are entering into the phase of development in which their energy consumption will surge as key infrastructure and the pillars of their modern economies are built. We need to ensure the dialogue about the global energy system is well informed and balanced, with greater understanding of the drivers and possibilities for economies in all different phases of development.

We are missing the necessary long-term global, regional and national policy frameworks – which may look different in different parts of the world- to guide and support building a cleaner, global energy system which is capable of meeting growing energy demand. We need long term solutions, and we need to avoid knee-jerk late responses that create avoidable disruption and destroy value for society. It is unsurprising that thus far international climate policy negotiations have so far failed to deliver significant change.

To bring about a shift and to broaden the frame of discussion, pragmatic collaboration is needed, between government, society and industry at an unprecedented scale. Building a sustainable, low carbon energy system will involve a lot of attention from a lot of people, aimed at realistic and achievable outcomes. Cross-sector groups need to convene, and develop mutual understanding, to move beyond the polarized debate. It will be a difficult task, but it is necessary and urgent. A positive step is that in late 2015 governments will converge at the 21st Conference of the Parties on Climate Change in Paris, to sign what is hoped will be a binding agreement to address climate change and reduce CO2 emissions.

## Proposed Way Forward

### **Extended Period of Transition**

An extended period of co-evolution and co-existence of renewables and fossil fuels is likely as new energy infrastructures supplement or supplant old.

The fact is that the world will need oil and gas to help meet rising energy demand well into the second half of this century, and beyond. In terms of practical solutions and for an informed debate we need to understand that not all fossil fuels are the same, and we

should not use fossil fuels as an umbrella term. An extended period of co-evolution and co-existence of renewables and fossil fuels is likely as new energy infrastructures supplement or supplant old.

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Natural gas emits half the CO<sub>2</sub> emissions compared to coal, another fossil fuel, when used to generate power. As gas plants can be switched on and off in response to demand, these can help provide the essential back up, and be the back bone needed to accelerate deployment of intermittent energy sources, such as solar and wind power. As the window on reducing emissions closes, switching out coal and replacing it with natural gas-fired plants is the single fastest way to slow emissions.

The reality is that there are also significant technological and economic obstacles, which need to be accounted for as part of an informed global warming discussion. Historically new energy sources have taken around 30 years to establish even a 1% share of the market. The scale and cost of energy infrastructure is simply too large to have quick turnaround times. Today, wind and solar together constitute less than 1% of global primary energy. Renewables will play increasingly important roles, however currently the IEA estimates that 13% of today's global energy comes from renewable energy sources, and the bulk of that is from traditional sources like wood, peat and dung as well as hydro-power. But it also estimates that, even by 2040 that number will have increased to only 19%. Shell's New Lens Scenarios say that figure could be over 25% by 2050, but that still leaves about 70-75% of energy demand needing to be met by traditional sources like oil, gas and nuclear. We need to moderate our expectations of a wholly renewable energy future in the near term with the understanding that there are significant technological and economic obstacles. It will not be possible to underpin a low carbon, high energy future solution to renewables alone, especially in the short term. Growing energy while reducing emissions will also involve shifting the balance from higher emission coal to lower emission gas and deploying technologies such as carbon dioxide capture and storage (CCS).

A recently released report from the Calderon Commission's New Climate Economy initiative highlights that the economic costs of inaction are substantial, whereas the costs of taking action are relatively modest and delaying

action significantly raises costs. The report identifies the energy sector as significant from the perspective of both the economy and climate change. The study also emphasises that economic growth and action to tackle climate change are not mutually exclusive.

It sets ambitious goals for emissions reductions from renewable energy and energy efficiency measures. For example, it recommends that, by 2030, all new generation capacity in high-income countries comes from renewables or other zero-carbon sources and at least 25% of new power in fast-growing middle-income countries come from non-hydro renewables. However, the report also recognises that fossil fuels will still continue to account for a significant share of the energy system between now and 2030, and beyond. The report identifies reducing coal use and increasing gas use as important 'seeds of change' for decarbonizing the energy system. However, the report finds that natural gas is likely to provide net climate benefits only if it is backed by robust climate policy and environmental regulations.

The trend of urbanisation will also play a key role in the future of energy, and the energy transition. More than three quarters of the world's population in 2050 are expected to be living in cities, and we will be building the equivalent of a new city of over 1.4 million people every week for the coming decades. Urbanisation can bring many benefits, but if managed poorly can cause greater environmental degradation and accelerate global warming. There are many differences between cities - for example Houston will never be the same as Hong Kong. However compact, well planned cities with effective integrated infrastructure and services are significantly more resource- efficient than sprawling metropolises. This is in part due to needing less energy per person in transport because people live closer to where they work, and shop, and public transport infrastructure is easier to implement. While existing urban centres will need to focus on retro-fitting, the many new urban developments in the world can, in principle, be designed to be more resource efficient from the outset.

#### **Moderating Expectations**

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#### **Urbanisation**

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#### Serious Change Required

Change will need to happen on many fronts, from the energy supply mix to energy demand management. Serious attention, optimism and swift collaborative action is needed to ensure a sustainable, clean global energy system that is capable of meeting growing energy demand and underpinning prosperity for all.

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### Lead Expert – Jeremy Bentham

#### Vice President Global Business Environment, Shell.

*Lead expert on the Future of Energy.*

Jeremy is Vice President Global Business Environment at Shell. He has been responsible for Shell's Global Business Environment team since 2006. His team is best known for developing forward-looking scenarios to support the company's strategic thinking and direction setting. He joined Shell in 1980 following post-graduate experience at the California Institute of Technology. He had read Physics at Oxford University, UK, and holds a Master's degree in Management from the Massachusetts Institute of Technology, USA. His previous roles at Shell involved research and technology, manufacturing economics, industry analysis and commercial information technology. He has also coordinated commercial and production activities at a number of refineries.



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## About Future Agenda

### *Context – Why Foresight?*

In an increasingly interconnected, complex and uncertain world, many organisations are looking for a better understanding of how the future may unfold. To do this successfully, many companies, institutions and governments are working to improve their use of strategic foresight in order to anticipate emerging issues and prepare for new opportunities.

Experience shows that change often occurs at the intersection of different disciplines, industries or challenges. This means that views of the future that focus on one sector alone have limited relevance in today's world. In order to have real value, foresight needs to bring together multiple informed and

credible views of emerging change to form a coherent picture of the world ahead. The Future Agenda programme aims to do this by providing a global platform for collective thought and innovation discussions.

#### **Get Involved**

To discuss the future agenda programme and potential participation please contact:

**Dr. Tim Jones**  
**Programme Director**

Future Agenda  
84 Brook Street, London. W1K 5EH  
+44 203 0088 141 +44 780 1755 054  
tim.jones@futureagenda.org  
@futureagenda

### *Future Agenda 1.0*

The Future Agenda is the world's largest open foresight initiative. It was created in 2009 to bring together views on the future from many leading organizations. Building on expert perspectives that addressed everything from the future of health to the future of money, over 1500 organizations debated the big issues and emerging challenges for the next decade. Sponsored globally by Vodafone Group, this groundbreaking programme looked out ten years to the world in 2020 and connected CEOs and mayors with academics and students across 25 countries. Additional online interaction connected over 50,000 people from more than 145 countries who added their views to the mix. All output from these discussions was shared via the [futureagenda.org](http://futureagenda.org) website.

### *Future Agenda 2.0*

The success of the first Future Agenda Programme stimulated several organizations to ask that it should be repeated. Therefore this second programme is running throughout 2015 looking at key changes in the world by 2025. Following a similar approach to the first project, Future Agenda 2.0 builds on the initial success and adds extra features, such as providing more workshops in more countries to gain an even wider input and enable regional differences to be explored. There is also a specific focus on the next generation including collaborating with educational organizations to engage future leaders. There is a more refined use of social networks to share insights and earlier link-ups with global media organizations to ensure wider engagement on the pivotal topics. In addition, rather than having a single global sponsor, this time multiple hosts are owning specific topics either globally or in their regions of interest. Run as a not for profit project, Future Agenda 2.0 is a major collaboration involving many leading, forward-thinking organisations around the world.

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