

Energy Security and the Role of Fossil Fuels Revisited

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Introduction

This paper looks at the evolving contribution of fossil fuels to the global energy mix in the context of the challenges posed by the transition to a low carbon energy system. It does not address questions around the operation of oil, gas and coal markets which broadly speaking are currently effective in delivering those sources of energy to where they are consumed. That is not to say they are free of challenges, for example in terms of driving the development of the necessary infrastructure, and we know they are evolving to take account of new and sometimes disruptive technologies including those driving the huge growth of unconventional sources. However the focus of this piece is on the future likely evolution of the role of fossil fuels during the low carbon transition and associated system issues, along with the key question of how the policy framework should evolve to facilitate the necessary scale up in investment while maintaining security and affordability of energy services.

The Low Carbon Transition

There can no longer be any doubt that the low carbon transition is well under way (though surely few would argue the pace is yet commensurate with the challenge of managing the risks posed by climate change). But a few examples suffice to illustrate the breadth of the change

- While the amount invested in clean energy in 2016 fell by 18% from the \$287 billion seen in 2015, it nevertheless funded the installation of a record amount of capacity, owing to the marked reduction in renewable energy costs;
- The United Kingdom, the cradle of the industrial revolution, has recently had its first day since then with no electricity produced from coal;
- Several countries including India have announced the phase out of vehicles powered by fossil fuels.

The 2015 Paris Agreement is both a symbol and a cause of the transition. At the heart of this wide ranging agreement is a commitment by virtually every country to act to keep global temperature increases to 'well below' 2 degree Celsius by the end of this century, compared to pre-industrial levels. This represents a new level of ambition compared to any previous discussions, and countries are making visible efforts to deliver the requisite emission reductions. It also entails the achievement of 'net zero' Greenhouse Gas Emissions by about the middle of the century -

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meaning that emissions from fossil fuels must be minimised, through reduced usage, increased efficiency, and the use of carbon capture and storage (CCS) technologies; and that any such emissions must be offset by the use of carbon sinks or by removal of carbon from the atmosphere (for example through the use of CCS with bio-energy). This alone implies a much reduced role for fossil fuels in the future.

According to analysis by the International Energy Agency, the majority of emission reductions to deliver a 2 degree scenario to 2040 are likely to come from increased use of renewables and a ramp up in energy efficiency, contributing about a third each (with smaller contributions from other sources such as nuclear energy and carbon capture and storage). In fact, the IEA estimates that half of the increased demand for energy to 2040 will be met by low or zero carbon fuels and technologies, mostly renewables. Of course that means that half of the increase in demand will be met from fossil fuels. So they continue to play an important role in the energy mix over the next 25 years, but a decreasingly significant one.

These figures for the 2 degree scenario emission reductions are compared to the baseline of the IEA's central (or 'New Policies') scenario, which assumes no action beyond already announced or legislated policies. That is not what will happen however - countries are continually announcing new measures to fulfil their Paris commitments, such as the announcement this week by Finland that it will legislate next year to phase out the use of coal by 2030 and to increase carbon taxes. Rather, the IEA analysis helps policymakers to identify the gap between what is being done and what else needs to be done to make the low carbon transition.

The Implications for Investment

We have seen a steep climb in investment in renewable energy, predominantly solar and wind, in both developing and developed countries - from \$46bn in 2004 to \$287bn in 2015, and a more than corresponding increase in volume because of dramatic cost reductions. At the same time, investment in fossil fuels has not increased - and, driven by the low oil price, is greatly reduced in the upstream sector. Without a rebound in capital expenditure this may pose issues in the next decade for the availability of oil and gas supply - at which time we will still be dependent on them in many sectors.

The investment challenge is magnified by the need to create low carbon infrastructure at the same time as maintaining, at least in developed countries, much of our legacy capital stock and, in developing and emerging economies, the need to build out infrastructure to deliver modern energy services to all. The IEA estimates that cumulatively up to \$44 trillion will be needed by 2040 in energy supply alone, which is a doubling of the trend rate. Sixty per cent of that will be for the supply of fossil fuels, compared to a historical share of over 70%; already a dramatic shift, which will only become more marked.

What does This Mean for Energy Security?

In addressing this question it is important to remember that energy security must be interpreted in a wider sense than has sometimes been the case in the past, with a focus solely on the adequacy of energy sources such as oil and gas. This approach is no longer sustainable given the imperatives of the low carbon transition; and nor is it likely to maximise the competitiveness of a country's economy or its prospects for economic growth and jobs. As well as environmental sustainability, we must also pay due regard to securing affordable access to modern energy services for the 1.1 billion who do not have access to electricity and the 2.6 billion who lack clean cooking facilities. A sustainable energy future depends on addressing all three goals of energy security, environmental sustainability, and energy access.

This will require sophisticated policymaking. The World Energy Council's annual assessment of the quality of 130 countries' energy policies analyses a suite of authoritative data pertaining to outcomes (the 'World Energy Trilemma'). This illustrates that balancing these three goals is difficult for all countries regardless of wealth, geography or natural resource endowments. But a few countries do manage to perform consistency well across the three goals and what they have in common is sound policy approaches backed by consistent and transparent regulation. They tend, relative to others, to invest in good coordination of different aspects of policy on overall energy supply and use, and to aim for consistency of approach over time. This enables energy companies to make investments in long term projects with confidence in the stability of policy frameworks, lowering the perception of risk and hence the cost of capital.

Investment in, or privileged access to fossil fuel sources, is no longer the best or only route to energy security. Diversity of sources, techniques and routes to market all have a key role to play. Perhaps above all the effective management of demand, which succeeds in decoupling growth in energy consumption from GDP growth, is key to achieving energy security and a competitive economy.

Currently, the power generation sector is leading the low carbon transition with investment in renewables in 2015 exceeding that in fossil fuels and nuclear combined. Many have questioned whether this represent a threat to the security of the electricity system. This however overlooks just how many new instruments have emerged to manage the impact of intermittent sources of power. Better forecasting methodologies; more sophisticated tools for flexing the system; the increasing use of demand side management; and the availability of utility scale storage options are all reducing the reliance on thermal baseload and peaking plant. Cost reductions on battery technology have been breathtaking - down 73% over the last 6 years, with further falls promised over the near future. As the digitalisation of the power sector gathers increasing momentum, facilitating even greater penetration of intermittent sources of generation, this poses challenges for policymakers and regulators on how to act so as to facilitate innovation while protecting the security of the

system overall and the interests of consumers.

Other sectors - notably transport and heating and cooling - lag behind the power sector, but embody huge potential. The growth of electric vehicles is at an inflection point. In the US and Europe sales in the first quarter of 2017 were up 49% and 30% respectively year on year, and although this is from a small baseline such exponential growth will not be long in making an impact. purchasers of such vehicles are as enthralled by the quality of the driving experience as by cheap running costs. China too is forging ahead, with half a million electric vehicles sold in 2016. Its strategy incorporates huge investment in charging infrastructure, and the creation of an indigenous industry and the jobs which go with that. A co-benefit of the decarbonisation of transport for many countries will be reduced oil import expenditure, removing some of the dollar exchange rate risk to which they are currently exposed.

Conclusions

It is clear that fossil fuels will have a continued role to play in the energy system for decades to come, but the pace at which its significance is diminishing seems to be accelerating. Who can tell how much faster this will get? The answer will depend on policy decisions and consumer choices, which in the future will shape the energy system to an unprecedented degree. Policy will need to be resilient to the possibility of as yet unforeseen user preferences and behaviours.

Diversity will be the name of the game. Thus the path to energy security will lie in thoughtful policymaking effectively delivered; within a context of well functioning markets open to innovation in technologies and how energy services are delivered to the end user.

Managing energy consumption effectively will distinguish the more competitive, high value add, economies from the rest, underpinning productivity and reducing import dependence.

In the final analysis, looking beyond the sources of fossil fuel supply will prove far more beneficial in delivering energy security than the once fashionable concept of 'energy independence'.

Writer's Profile

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She chairs the International Advisory Board of the Energy Academy of Europe, sits on the Boards of The James Hutton Institute and is a member of the Council of Warwick University. She sits or has sat on several other boards in the academic, public and corporate sectors and lectures and speaks widely on energy and climate policy. She is one time Vice Chair of the UN High Level Panel on the CDM, Chair of the Governing Board of the IEA, and a former Director General of Energy in the UK Government.