

Optimising the Energy Mix to Meet the Trilemma Goals

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Introduction

Following the historic agreement on climate change at COP 21 in December, when virtually all countries entered into commitments to reduce their greenhouse gas emissions, the challenges for energy policymakers and business leaders got much harder. As well as delivering secure and affordable energy supplies, they must now also manage the transition to a lower carbon energy sector with defined goals and on a defined timetable. This will pose issues across all forms of energy supply and use, since the sector accounts for such a high proportion of emissions - up to 40% of CO₂ emissions, not to mention other gases such as the methane associated with fossil fuel retrieval. The issues are particularly acute in relation to power generation, for decarbonising heat and transport will depend to a major degree on them using electricity in place of existing energy sources - electricity which will have to be low or zero carbon.

I will offer some views on how best to optimise the energy mix, including in the power sector, to secure this transition while maintaining security and affordability of supply, drawing on five years of research into the Energy Trilemma which I have been leading for the World Energy Council. The views expressed however are mine alone.

What the Decarbonisation Commitments Imply

There are two ways of approaching this question

- to analyse the commitments submitted by countries to the UNFCCC in the context of COP 21, now known as Nationally Determined Contributions, or NDC's, or
- to look at what will be needed if we are to fulfil the promises made in the Paris Agreement to keep the global temperature rise to "well below 2 degrees Celsius" compared to pre-industrial levels, and further "to pursue 1.5 degrees". To make good on those promises, the Paris Agreement provides for a review process and a ratcheting up of ambition beyond the NDC's. That process starts with a report from the Intergovernmental Panel on Climate Change in 2018 and will be followed in 2023 by new commitments which are expected to be more ambitious than NDC's.

It therefore seems to me to be more relevant to consider what is implied by that more ambitious level of action rather just looking at the sum of the NDC's, which commentators assess would result in a temperature rise of at least 2.7 degrees.

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The key point here is that the “well below 2 degrees” goal entails peaking emissions as soon as possible and achieving net zero emissions during the second half of this century. That will need to occur within the lifetime of most energy projects under consideration now (apart from small renewables), so should be factored into all investment decisions with immediate effect. The implications for fossil fuels are telling. Research suggests that if the 2 degree target is to be met a significant proportion of already proven or probable (2P) reserves (amounting to one third of oil, one half of gas, and four fifths of 2P coal) will have to remain in the ground over the period until 2050 (see ‘The geographical distribution of fossil fuel unburned when limiting global warming to 2degree C, Christophe McGlade and Paul Ekins, 190 Nature Vol 517 8 January 2015). These figures would be much reduced if the will existed to make progress on an existing technology which only needs the right economic incentives to be proven at scale - namely carbon capture and storage (CCS).

What This Means For the Energy Mix

Replacing the legacy infrastructure in OECD countries, and building out new infrastructure in emerging and developing economies, presents a great opportunity to pick up the pace of the transition to a low carbon energy mix. The precise path to be taken will depend for each individual country on its current assets, its natural resource endowments, and its economic, political and social context.

Our work on the Trilemma shows that, regardless of these factors, it is stable policies backed by predictable regulation which enable a country to progress towards balancing the three goals of security, sustainability and affordability, and extending energy access where that has not yet been achieved. The annual survey of business leaders’ concerns (World Energy Issues Monitor) has consistently highlighted the lack of a global agreement on how to tackle climate change as one of the most important of these. While the Paris Agreement is a very welcome step towards meeting that, it is not quite enough on its own. The energy sector needs to see more detail from countries on the actions they will take in pursuance of their NDC’s, detail which is notably lacking in some cases. The challenge is to marry enough detail on the specific short and medium term policies with a consistent longer term strategy.

For example, it is striking that the best performers on sustainability in the Trilemma Energy Index are concentrated in Europe. The European Union has had a clear policy on this since 2008 when it set targets for renewables, emissions reduction, and energy efficiency by 2020 - with the targets for renewables and emissions reductions being legally binding on Member States. One Member State, the UK, has an interesting approach in the Climate Change Act, introduced by the Labour Government, in 2008. The Act makes provision for rolling five year carbon budgets which are legally binding. Changing the Act carries higher political cost than merely changing some individual policies, and this may be why neither the Conservative/Liberal coalition of 2010-2015, nor the Conservative Government which succeeded it, has sought to repeal the Act even though constitutionally this is perfectly possible. (It must be acknowledged that the Liberal

Party would have made life difficult for their coalition partners had this been attempted.) The draft fifth carbon budget, for the period 2028 - 2032, proposes a cut in average annual emissions of 57% compared to 1990 levels, and the independent Climate Change Committee has analysed that the power sector will need to achieve a carbon intensity of generation of 200-250g/kWh in 2020, and below 100g/kWh in 2030, down from around 450g/kWh currently. This will involve 75% of power generation coming from low carbon sources - which could be a mix of renewables, nuclear and fossil fuel plant fitted with carbon capture and storage (provided there is investment in how to demonstrate this at scale, leading to cost reductions through learning by doing and by greater deployment). The draft fifth carbon budget is at present under consideration by the Government. Their decision, due this year, is being watched closely for the signal it will send: it is certainly the case that up to now confidence to invest has benefited from having a policy framework which looks stable over a significant period of project lifetimes. But investor confidence has taken a knock in the wake of recent policy changes reducing subsidies to renewables. Post Paris, however, governments might like to consider adopting the UK approach for the benefits it brings in terms of transparency and the resultant impact on perceived risk and the cost of capital.

As well as governments, companies and investors also need to adopt a longer term horizon to their investments in energy. It is to be hoped that the review being conducted by Michael Bloomberg for the Financial Stability Board, of how to give investors better information to evaluate the exposure of companies to climate risks, will make recommendations to help drive a longer term perspective.

Companies which do take a far sighted approach are laying the foundations for future success in a world where carbon emissions will be regulated and/or priced. Both regulation and carbon pricing are necessary - they have different roles to play. There is an ongoing discussion about how to price carbon, whether this should be through the tax system or through a market based mechanism, sometimes called cap and trade and sometimes emissions trading. The value of emissions trading has been adversely impacted by the problems experienced in the early adopting jurisdictions, where carbon prices are some way below the level needed to transform investment decisions. But these problems are not an intrinsic feature of such mechanisms. Rather they reflect the political caution applied in the early years of the first of such schemes which resulted in over allocation of allowances - an approach whose impact was compounded by the global financial crisis and consequent slowing of consumption. There are advantages to a market based approach, and a majority of those CEO's we interviewed for the 2015 Trilemma Report consider the expectation of a robust price on carbon one of the best tools to drive the transition because it leaves space for the market to innovate and to optimise the energy mix. And this picks up a theme of our 2014 Report, in which many policy makers told us that they were finding it difficult to keep up with the changing dynamics of supply and demand, and the pace of technological change, in the energy sector. A large part of the solution lies in the use of market mechanisms to price carbon wherever possible, thus engaging the expertise of businesses in making the right decisions. It is therefore very encouraging that the Paris Agreement sets out an overarching framework so that this can happen at least regionally, and, it is to be hoped, ultimately globally.

Future Role of Fossil Fuels in the Energy Mix

Notwithstanding the urgency of increasing the proportion of low carbon sources in the energy mix, it is clear that for the next few decades fossil fuels will have a considerable part to play. Not only will coal and gas continue to be important as baseload for power generation in most countries, several years will be needed to build the infrastructure to allow us to cease relying on oil as the predominant fuel in transport by electrification. Some might expect this to take decades, not years, but the pace of deployment of hybrid and electric vehicles might outstrip by some way recent predictions and I wouldn't be surprised if it did, based on the recent rate of innovation in battery development and also the 'word of mouth' factor. Current users of those vehicles report very high levels of satisfaction with them and we may soon reach a tipping point in cost and fashion.

This however again underscores the importance of decarbonising the grid. Countries whose policies currently allow for, or even incentivise, investment in fossil fuel power generation plant are building in obsolescence, certainly by 2050 and possibly even earlier, and with it the additional expense of stranded assets. While policymakers may be forgiven for prioritising the large scale additions to electricity supply which conventional plant represents, or use of indigenous coal reserves for reasons of affordability, the position of companies taking such investment decisions seems pretty inexplicable. Why, it might be asked, do they do it, especially when they see for example what has happened to the share prices of coal miners? One possible reason might be that they perhaps still do not regard it as credible that countries will take action commensurate with the 'well below 2 degrees' goal in the Paris Agreement. In that case they might want to ask themselves why the trend for greater public and political consensus on the need to engage in climate mitigation actions should go into reverse. Confidence in the robustness of climate science, the greater understanding of the observed impacts of climate change, and the vividness of extreme weather events associated with them, are all driving in one direction only. I think it inherently unlikely that the consensus will weaken and the Bloomberg Review for the Financial Stability Board may give a jolt to investors. Would company boards not be well advised to insist on starting to planning for this, lifting their sights beyond the treadmill of quarterly results reporting to thinking about strategies for evolving their business models to cope with the ever increasing emphasis on reducing GHG emissions?

Conclusion

Our evaluation of initially 90, latterly 130, countries' energy policies for the World Energy Council Trilemma has shown that all countries find it a challenge to balance the goals of energy security, environmental sustainability, and access at affordable prices. Optimising the energy mix in the new paradigm post Paris 2016 is even more challenging, but there is cause for optimism. At last we have a truly global consensus on the need for action. We have the technologies to tackle the challenges if we make the right policy and investment decisions. And experience shows that the pace of investment growth may - subject to those decisions be adequate to meet the case. As the

2015 UNEP/BNEF Report into global trends in investment in renewable energies shows, annual investment over the decade from 2004 to 2014 grew sixfold, which implies a more than sixfold increase in the contribution of low carbon technologies to the energy mix, given the cost reductions being achieved in technologies like solar and wind. We accordingly seem to be capable of picking up the pace to what will be required to deliver on the ‘well below 2 degree’ goal. Whether we succeed in doing so will require enlightened and collaborative approaches to policymaking, regulation and investment decisions. Policymakers need to engage more systematically with energy business leaders and the investment community to this end. All three groups must work together to create greater public understanding of the true nature of the trade offs and their true costs, and public acceptance of the changes which need to be made - including to habits and behaviours of us all.

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 Climate Group and 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 Honorary Fellow of the Energy Institute (of which she is a Past President) and of the International Emissions Trading Association, a Distinguished Fellow of the Global Forum of Competitiveness Councils, 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.