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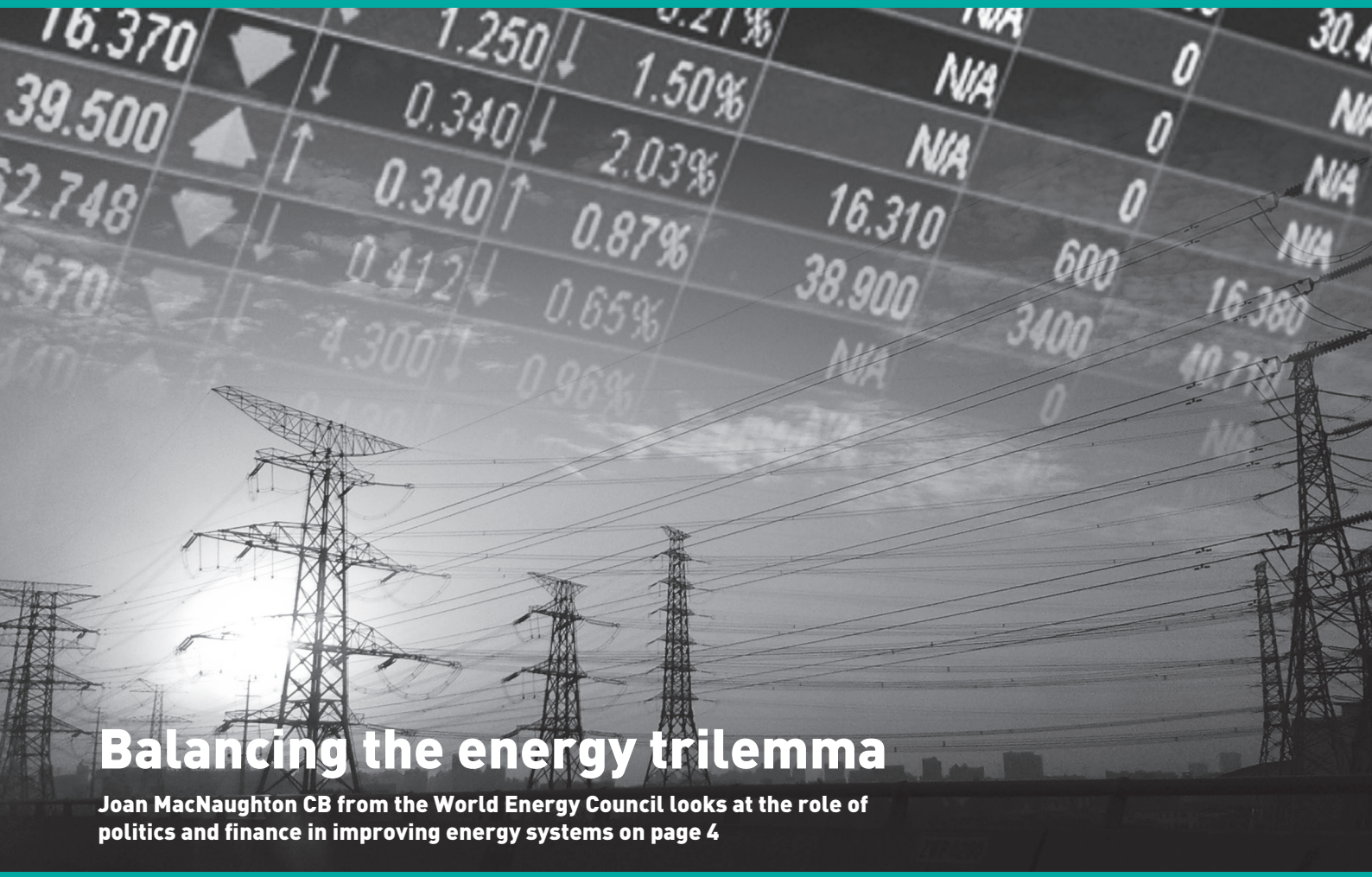
An interview with The Rt Hon Matthew Hancock MP
Balancing the energy trilemma Joan MacNaughton CB, World Energy Council
The fine particulates of air quality Dr Sayed Hayat, CEAMD

ENERGY FOCUS



Balancing the energy trilemma

Joan MacNaughton CB from the World Energy Council looks at the role of politics and finance in improving energy systems on page 4

The journal of the Parliamentary Group for Energy Studies

The Parliamentary Group for Energy Studies
Established in 1980, the Parliamentary Group for Energy Studies remains the only All Party Parliamentary Group representing the entire energy industry. We champion cross-sector energy research and development. The Group's membership is comprised of over 190 parliamentarians, 130 associate bodies from the private, public and charity sectors and a range of individual members.

Published three times a year, *Energy Focus* records the Group's activities, tracks key energy and environmental developments through Parliament, presents articles from leading industry contributors and provides insight into the views and interests of both parliamentarians and officials.

Executive Council

Contents

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CHAIRMAN'S FOREWORD

It's the end of another year, packed full of energy debates, both domestic and international, and I'm delighted that the Parliamentary Group for Energy Studies has managed to discuss so many of these important issues in *Energy Focus*, during speaker meetings and at our annual flagship dinner and reception.

At the end of 2013 *Energy Focus* looked towards the international energy stage to look at how policymakers around the world were grappling with similar issues in unique ways - from the Western Governors' Association in the United States, to Germany's drastic "energy turnaround" and Switzerland's "Energy Strategy 2050".

To round off 2014, this year we have taken a look with the World Energy Council's Joan MacNaughton CB at this year's Trilemma report, at LNG and global markets with Prof. Gavin Bridge, before bringing it to a more local level with Dr Syed Hayat to look at air quality in cities - an issue which the House of Commons Environmental Audit Committee recently recommended needed urgent and long term action.

Looking forwards, the beginning of 2015 will see parties begin to formally announce their manifestos and more specifically their energy policy, and we hope to hear more about these in our pre-election speaker meetings.

In the meantime you can see what our expert contributors have to say:

- Joan MacNaughton CB, Executive Chair, World Energy Trilemma, discusses how bringing politics and finance in sync can improve energy systems **(page 4)**;
- Prof. Gavin Bridge of Durham University, examines LNG and global markets **(page 6)**;
- Dr Syed Hayat, Director at CEAMD, looks at how air quality can be improved in our cities **(page 8)**; and
- The Rt Hon Matthew Hancock MP talks to us about learning from history, shale gas and renewables **(page 10)**.

We are always delighted to hear from members, so please do share your thoughts and feedback by emailing our Editor, Sophie Fernandes, at **sophiefernandes@pges.org.uk**.

I look forward to seeing you all at the annual House of Lords dinner!

Ian Liddell-Grainger MP
Chairman of the Parliamentary Group for Energy Studies

BALANCING THE ENERGY TRILEMMA

Joan MacNaughton CB, Executive Chair, World Energy Trilemma at the World Energy Council examines how bringing politics and finance in sync can improve energy systems

Energy systems around the globe are under significant strain because of the rise in energy demand and the pace and unpredictability of changes in energy supply, with governments struggling to find solutions to meet the unprecedented levels of investment needed in the energy sector.

In developing countries, 1.3 billion people are still without access to electricity whilst 2.9 billion lack cooking facilities. In developed countries, the replacement of ageing plants and the need to decarbonise the economy pose significant challenges. At the same time, technological and cost breakthroughs provide huge opportunities in the energy sector, as is the case with renewables and energy efficiency. Robust policy and regulatory frameworks that include the right investment conditions for the energy and financial sectors to create a sustainable energy future are key.

Energy Trilemma Index

Over the past six years, the World Energy Council, in partnership with global management consultancy firm Oliver Wyman, has assessed the sustainability of national energy systems through its Energy Trilemma Index, ranking 129 countries according to their success in meeting the three goals of the energy trilemma, i.e. the triple challenge of achieving energy security, energy equity and environmental sustainability. At the same time, the WEC has examined the drivers and risks preventing the development of sustainable energy systems and provided recommendations to overcome these barriers.

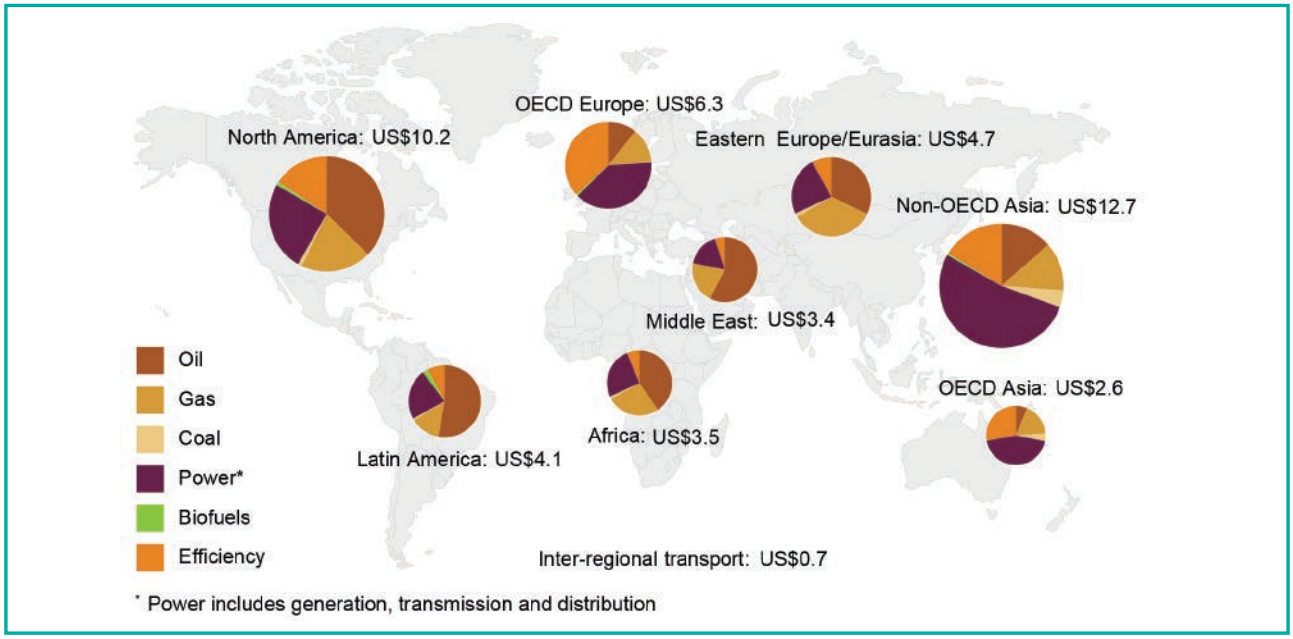
Through 2012 and 2013 over 100 global energy leaders were approached to provide insights on what works and what does not work in terms of policy design and implementation.

Balancing the energy trilemma

The resonance of themes between senior energy industry executives and policymakers highlighted the need for increased dialogue between public and private stakeholders. If on the one hand energy industry executives asked policymakers for coherent, predictable and long-term energy policy, on the other policymakers demanded that energy executives be more proactive in sharing their knowledge, insights and experiences. If business leaders longed for more public and private initiatives to foster research, development and demonstration (RD&D), public leaders wished the energy industry to be less risk averse.

The dialogue created between industry and policy executives pointed to another group of decision makers, key to pressing forward competitive and sustainable energy systems: the financial sector. This became the target for WEC's research in 2014. Once again, the similarity of the topics they addressed was striking.

With global energy demand predicted to increase and even double by 2050, an estimated cumulative investment of USD40.2 trillion is required across the energy infrastructure supply chain to 2035, with an additional USD8trn investment needed in energy efficiency. Although there is enough capital available from the private sector, it is extremely sensitive to political and regulatory risks. The message that policymakers must develop coherent, transparent and long-term energy policies resonated across the interviews. Well-enforced regulation and



independent regulatory bodies also prove to increase investors' confidence and reduce the perception of these risks.

A better risk alignment for investments can be ensured by greater information exchange between the financing community, the industry and policymakers. Representatives from the financial community should help policymakers and the energy sector understand the role of different financial investors in funding different stages of an energy infrastructure project life cycle. Given their expertise, they could support the development of financial mechanisms such as aggregation platforms for bundling smaller-scale projects with similar risk profiles or of specific financial regulation, such as standardized processes to rate energy projects. Investors also lamented the lack of project pipelines in the energy sector. Greater transparency from the energy industry, as well as well-maintained project pipelines and growth in human capacity, are all elements that can support increased financial investments in energy infrastructure projects.

UK on watch

In 2014 the United Kingdom (UK) ranked 4th overall in the Energy Trilemma Index and was awarded a triple 'A' rating, meaning it performs well on all three dimensions of the energy trilemma. It is implementing policies that aim at decarbonising the power sector while securing supply through comprehensive reforms in the Energy Act 2013, notably contracts for difference, to support low carbon generation, and the creation of a capacity market. A renewables energy target also applies (15% of energy consumption by 2020) and the fourth carbon budget has been confirmed, setting the UK on a path to meet its long-term objective of reducing greenhouse gas emissions by 80% compared to 1990 levels by 2050.

However, the UK faces significant challenges in securing its energy supply. The latest power plant outages last summer, which aggravated the already tightened capacity margins, are not yet reflected in the data. This, and the challenges of implementation of the complex reforms, is why the UK has been placed on WEC's 'watch list'. The watch list includes countries where recent policy changes or unscheduled events are expected to lead to a change in Index performance in the coming years.

There is no single solution to overcoming the energy trilemma; creating a policy framework to achieve those goals remains a challenge for all countries. But the common thinking we have uncovered among energy business leaders, policymakers and now the financial community gives us hope aligned approaches can be secured to scale up the flow of investment needed and deliver competitive and sustainable energy systems in the near future.

With special thanks to Diletta Giuliani at the World Energy Council for her assistance in the creation of this article.

The 2014 World Energy Trilemma report is available to download at http://www.worldenergy.org/publications/2014/world-energy-trilemma-2014-time-to-get-real-the-myths-and-realities-of-financing-energy-systems/.

The Energy Trilemma Index is also available as an interactive tool on the website at http://www.worldenergy.org/data/trilemma-index/.

LNG: EXPOSING UK CONSUMERS TO THE HIGHS (AND LOWS) OF GLOBAL MARKETS

Professor Gavin Bridge of Durham University looks at the vulnerability of UK gas security

How the UK gets its gas is changing. As domestic gas production from the UK Continental Shelf has declined (by nearly two-thirds from a peak in 2000), the UK has become increasingly dependent on imports. Like many goods demanded by UK consumers – from oil and wheat to laptops and mobile phones – the UK now sources most of its natural gas abroad: import dependency for gas – the ratio of imports to domestic consumption – hit an all-time high of 58% in 2013.

Gas is transported to the UK in two ways: via subsea pipelines from Norway's offshore gas fields and the European gas market; and via specially designed ships carrying liquefied natural gas (LNG) that ply the world's oceans. The international natural gas trade – and the UK's gas supply chain – are undergoing a profound globalisation in which LNG's much greater geographical flexibility versus pipeline gas plays an important role.

Liquefying natural gas transforms its physical state, improving the costs of transportation and storage. Natural gas, which is mainly methane, is cooled to below its boiling point of -162 degrees Celsius so that its volume is reduced 600-fold. LNG has an energy density (MJ/L) broadly similar to that of crude oil, making it commercially possible to move gas beyond the limits of the pipeline network by either road or ship. The technology of liquefaction is not new: there is a long history of using LNG as a way to store gas in order to manage daily and seasonal peaks in demand; the British Gas Council experimented in the late 1950s with LNG imports from the US prior to the development of the North Sea; and LNG has formed a substantial part of Japan's energy supply mix since the 1970s.

However, over the past decade major investments in the capacity to liquefy, transport and re-gasify LNG have driven a doubling of ocean-borne LNG trade. LNG is creating new options for gas importing and exporting countries. The number of countries exporting LNG (18) has grown by 50%; the number of regasification terminals worldwide (104) has doubled; and LNG now accounts for a third of all internationally-traded gas. Qatar expanded LNG capacity 80% since 2006 and is now the world's largest LNG exporter, leveraging the technology to acquire an economic and political status beyond its diminutive size. A handful of other countries, including Mozambique and Cyprus, now hope new gas discoveries and LNG technology will do the same for them.

By mobilising gas beyond the limits of pipelines, LNG is generating a more geographically complex and globally interconnected gas market. Major investments in the physical infrastructure to import and re-gasify LNG have drawn the UK into this globalizing gas trade in

the context of growing import dependency. The country has three active terminals – South Hook LNG and Dragon LNG near Milford Haven in Wales, and the Isle of Grain in Essex – that since 2009 are capable of importing more than two-thirds of annual gas consumption. Technical design and third-party access requirements mean these terminals are able to take delivery of liquefied gas from almost anywhere in the world. Development of this import capacity has re-positioned the UK with respect to established international trade in natural gas, extending the reach and diversity of UK gas supply beyond the North Sea and the European continent to the Atlantic Basin and Middle East.

Physical infrastructure is one thing; however, whether gas shows up is another. The volume of liquefied gas arriving in the UK has been a lot less than physical capacity would suggest and highly variable over time. Contracts concluded between LNG sellers and buyers in the UK allow cargoes to be diverted to take advantage of regional differences in gas prices. As a consequence, differences in price – and the strategies adopted by LNG producers in placing their gas – are important determinants of how much LNG flows to the UK and when. LNG inflows peaked in 2011, at which point they provided a third of UK consumption (and around half of all imports), as the UK took delivery of liquefied gas originally intended for the US but displaced by growing shale gas production. Imports quickly fell away, however, in the second half of 2011 as LNG sellers chose to place cargoes into more lucrative markets in Japan (and elsewhere) in the wake of the tsunami and the decision to take nuclear-fuelled electricity generating stations offline: by 2013, LNG accounted for only 20% of total imports and one eighth of UK domestic gas consumption. In the past six months or so, LNG cargoes have begun to arrive in the UK more frequently, as the large price differential between UK/European and Asian gas markets has sharply narrowed (in part because of falling oil prices). When the UK market is able to attract global LNG, its availability constrains the price ambitions of other suppliers. In a tight global market, however, LNG exerts limited influence over UK gas prices.

Japanese LNG Production

Liquefied gas, along with parallel investments in pipeline infrastructure, has transformed the connectivity and position of the UK with respect to global gas trade. By enlarging import capacity relative to demand, and enabling supply diversification at a time of growing import dependency, investment in LNG infrastructure has improved the resilience of the UK with regard to gas supply. Yet the way in which the UK is now inserted via LNG into global gas markets is also introducing new uncertainties and vulnerabilities, of which two are particularly significant. First, the waxing and waning of LNG flows indicates how the UK functions as a reserve market for global LNG: it has the physical infrastructure and market liquidity to absorb substantial cargoes, but many of those cargoes move elsewhere when more attractive opportunities are available. Second, the geographical flexibility of LNG has diversified the UK's supply options but, at the same time, it has also created new dependencies, with over 90% of the UK's LNG imports coming from Qatar. A substantial proportion of the UK's current LNG supply depends, therefore, on how Qatar Petroleum chooses to place cargoes into different geographical markets. Gas security increasingly requires understanding the UK's changing position in a globalizing gas market, and the implications for consumers of new developments in global LNG.

The full report, The UK's Global Gas Challenge, undertaken in collaboration with Michael Bradshaw, Warwick Business School and funded by the UK Energy Research Centre is available at www.ukerc.ac.uk/support/tiki-download_file.php?fileId=3717

THE FINE PARTICULATES OF AIR QUALITY

Dr Syed Hayat, Director at CEAMD looks at how fuel additives can help address low air quality

It is generally acknowledged by both Government and industry that the internal combustion engine will remain as the transport sector's prime mover for the foreseeable future and therefore the contribution this dominant sector makes to both local and global pollution needs to be addressed.

The House of Commons Environmental Audit Committee Report "Action on Air Quality" recently recommended urgent and long term actions, including changes to road planning laws to reduce traffic pollution, especially fine soot particles and their precursors (polycyclic aromatic hydrocarbons) from diesel vehicles, as these have the highest impact on human health.

Negative health effects

A US study also showed the negative health effect of these fine particulates[1], revealing that children living in areas with heavy traffic suffer reduced educational capacities than their peers [2]. Others found that in otherwise clinically healthy children, with no known risk factors for neurological disorders residing in a highly polluted urban environment exhibited deficits in fluid cognition, memory, and executive functions i.e. complex behaviour control, when compared to children living in a less polluted urban environment. The study concluded that fine particulate matter reaching the frontal cortex in the highly exposed young adults is likely entering the body, blood stream and brain causing neuro-inflammation [3, 4].

In order to reduce emissions of fine particulates, legislation has enforced diesel vehicles to be fitted with particulate traps which capture and burn the soot particles in the exhaust. However, the efficiency of such devices reduces over time and they need regeneration periodically. This regeneration consumes fuel and therefore increases carbon dioxide emissions, reducing the overall efficiency of the engine. Further, changes to engine injection pressures, engine combustion chamber geometry and fuel composition, in order to create better efficiencies, have also created a situation where greater numbers of fine particulate emissions are being generated.

Combustion enhancers

An existing solution to addressing these fine particle emissions is through the use of fuel additives which reduce exhaust emissions and/or improve fuel consumption. Additives act as 'combustion enhancers' which promote full and complete combustion and, in so doing, reduce unwanted exhaust pollutants and improve fuel use efficiency. They reduce after-treatment device loading, promoting higher activity, overall lifetime and improving specific fuel consumption thus reducing total carbon dioxide emission.

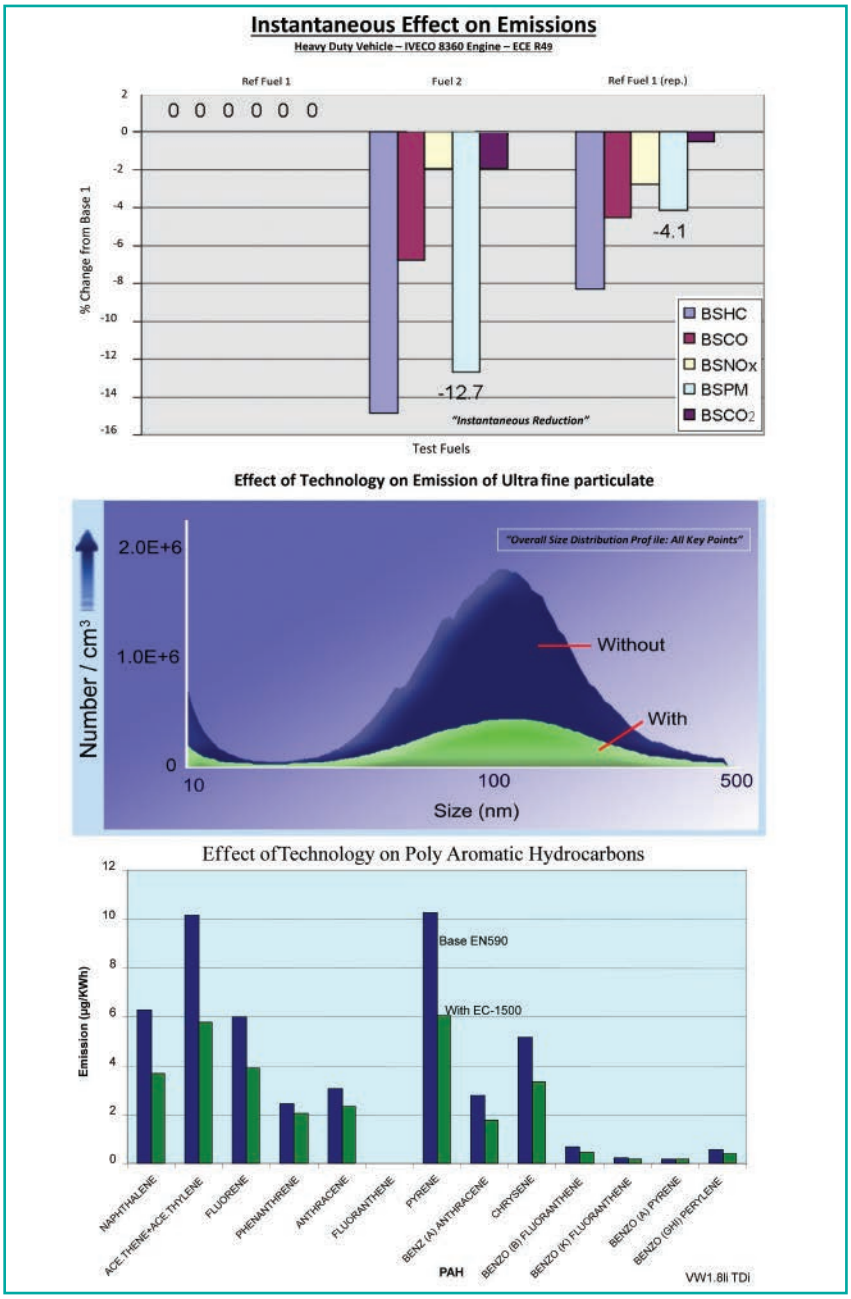
Although most combustion enhancer additives are metallic and therefore may cause other engine and/or environmental problems, there are now non-metallic additives which offer reduced fine particle number emissions. One such UK technology is the diesel additive treatment EC-1500 which is a non-metallic hydrocarbon based technology for use in all diesel fuels and gasoline direct injection engines. The treatment enhances combustion efficiency through the provision of competing chemical reaction chains in both the pre-combustion and true combustion zones. The effect is to reduce side reactions that lead to pollutants and increase effective combustion kinetics resulting in lower hydrocarbons, carbon monoxide and particulate matter. The improved combustion allows an improvement in fuel efficiency for the same work output from the engine and hence reduces carbon dioxide.

Test work on this additive in a variety of diesel fuel compositions, different types of light and heavy duty diesel engine in vehicles, and on dynamometers

over various EU test cycles demonstrated reductions in hydrocarbons averaging 14%, carbon monoxide down 10% and NOx down 2.5%. Significant carbon dioxide emissions or specific fuel consumption improvements in the range 1-3% were also measured. Work again carried out by independent laboratories using a variety of light and heavy duty engines quantified significant reductions in particulate emissions of 3-26% when the additive is in use. The building blocks of these particles are polycyclic aromatic hydrocarbons, of which the United States Environmental Protection Agency rates 16 of these as very harmful; being carcinogenic, mutagenic or otherwise toxic - and these are all significantly reduced.

Conclusion

In order to further reduce the total number of fine particles being emitted into the local environment, it is desirable for all vehicles to have strategies to reduce these particles. However, it may not be feasible or even appropriate to retrofit all vehicles with exhaust control technologies; but changes to fuel properties by means of fuel additives is possible as a cost effective and immediate approach. To promote such adoption there may be need for further legislation governing the total amount of particle emissions permitted from vehicles that do not have exhaust after-treatments. Such legislation should look at creating a more favourable tax regime which takes into account efforts by many transport companies to further reduce their present particle number and carbon emissions by adopting fuel additive technologies. If such a legislative framework was incorporated then this would have the added benefit of encouraging technology companies to accelerate their R&D programs to bring further advances in additive technologies and positively impact air quality.



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INTERVIEW WITH THE RT HON MATTHEW HANCOCK MP

The Minister of State for Energy and Minister of State for Business and Enterprise tells us about his priorities for the year ahead

Could the Minister give readers a quick overview of his role and responsibilities?

The job of Business, Enterprise and Energy Minister is to bring together our energy policy priorities, to ensure they support businesses across the board. In the almost six months that I've been doing this, I've found that the two sides of the portfolio are very close, not least because one of business' primary concerns is good-value and reliable energy, but also because the energy market is, of course, very much a business.

Within the energy portfolio, my two priorities are to: ensure the security of supply and the long-term strength of our energy supplies, and to make progress on the extraction of domestic shale gas. There are many other things which are necessary to the brief, but those are the two things that I concentrate on the most.

On that note: You have previously described shale gas as a "once in a generation opportunity". What do you think Government and industry need to get right in order to make the most of this opportunity?

The potential opportunity is huge. We won't know how big in reality it is until exploration begins, but the big picture is we have the potential for a significant domestic energy source – in the same way as we had 50 years ago when we started serious exploration of the North Sea.

To get it right, we need to ensure that there is a robust, safe and cautious regulatory system; that the technology works and the supply chain for the technology is built; and that the jobs and benefits from this exploration accrue here – hence the National College which we opened this month. We've put in place the correct fiscal regime, and we're putting in place a Sovereign Wealth Fund to ensure correct apportion of the financial benefits of extraction. Those in the local community will benefit, those who directly own land under which the shale sits will benefit, and producers' costs will be paid too.

Could you say a little more about the role of the National College?

The National College will be an important development for two reasons. Firstly, it will train people to work in the industry. It will also set the standards which that training has to meet, which is an important part of making sure we have a skilled workforce which can work across the industry. I'm delighted the College involves universities as well as colleges, that it has 'spokes' throughout the country, and I very much look forward to it getting started.

There are many other sources of our skilled workforce, not least our oil and gas expertise based – although not exclusively – in Aberdeen.

Are there lessons to learn from local opposition to onshore wind?

There are clearly lessons from lots of different places. There are lessons from offshore oil and gas in terms of getting a robust regulatory structure that works. It needs to work effectively so that companies can navigate through it, but also be robust. There are lessons from planning and the planning decisions taken, and there are lessons from abroad as well. There are examples of good and bad practice that we can learn from to make sure we have a world-class, robust regulatory infrastructure, which we're pretty close to.

Could you tell us a bit more about what you think the future key milestones might be, in terms of developing that infrastructure?

We have a good regulatory structure at the moment. We're strengthening it with the Infrastructure Bill, on the one hand enabling lateral wells to effectively be drilled but also to ensure any liabilities after the gas has been extracted can be effectively dealt with. At the same time, the Environment Agency and the HSE are getting very heavily involved on the ground, to make sure that the both can assess the proposals which come forward, and communicate with the local population.

You have publicly admired *This Time It's Different* by Reinhardt and Rogoff, which points to patterns of recurring behaviour throughout history and urges us to learn from these. What do you think is the most important lesson we need to learn from our energy past?

I think it's always important to remember who you're in it for. Energy policy is about making sure that we serve our customers, whether that's households or businesses, and do so in a way that's consistent with our international climate change obligations. The ultimate goal is the customer. That comes to the fore in discussions around the Big Six and retail pricing, but actually it needs to embed through policy all the way from the energy source. That can be about making sure the electricity market is highly competitive, so we get the best value generation, making sure that our renewables policy is consistent with reducing cost and carbon emissions, and indeed, as much as possible, cutting carbon and costs at the same time. That includes grid operators and distribution companies as much as those who charge consumers directly.

The cost of developing some of these new technologies you reference can be quite expensive. If the cost of CCS and nuclear do not come down as hoped and anticipated, what do you think is the answer?

It's important that those costs do come down. CCS is in the early stages of development. I recently met a team from Canada who have developed a commercial-scale, commercially viable CCS plant. We, of course, have our two demonstrator projects running.

In terms of new nuclear, we've got to make sure the cost of plants comes down, and of course with regard to offshore wind, where there's a huge amount of work to be done to reduce costs. The whole chain – from the Renewables Obligation to Contracts for Difference – precisely incentivises lower costs by requiring competition to get the subsidy.

Is it important for the credibility of renewables and nuclear that they are seen to pay back?

Of course. It's important that they are an increasingly optimistic part of the mix. I am optimistic that, over time, they will become increasingly cost-effective – not least because the marginal running costs of renewables is so low.

In 2012 John Hayes described his relationship with Ed Davey MP as "a wonderful cocktail of proper political tension". In 2013 Michael Fallon MP described it as "proper". How would you describe your relationship with him?

I'm tempted to say "proper"! Ed Davey is a very businesslike Secretary of State, and we have a good working relationship. We don't agree on all things, but we have a perfectly congenial relationship.

Finally – with the end of the year approaching, what are your three priorities for 2015?

1. Continuing to deliver secure supplies.

2. Opening up the exploration of shale gas further.

3. Winning the General Election.

REFLECTIONS ON A YEAR AT OFGEM

OCTOBER SPEAKER MEETING: Address to the Parliamentary Group for Energy Studies

By David Gray, Chair, Ofgem

Energy remains high on the political agenda. This debate is healthy, but it also has disadvantages. There is an understandable lack of trust by consumers, which becomes self-reinforcing: the media and political commentary turns hostile, which makes consumers trust companies less. Not surprisingly, Ofgem has faced criticism too.

We've been accused of doing too little too late, in the face of unacceptable behaviour by some energy suppliers. We've been accused of failing to prevent price rises – something over which we have no powers. But behind this there's been a more interesting debate about our interventions to simplify the market for consumers. A group of former regulators has argued that Ofgem's interventions are themselves responsible for increasing prices and profits. They argue that the market was working well before 2008, but then Ofgem started interfering and prices and margins rose.

I'd like to suggest that real life is rather more complicated than either line of argument recognises.

First, some background. The two big features of the last 10 years have been rising prices and poor customer service by the Big Six.

Price rises have been driven by increases in the price of gas on the international wholesale markets and by Government measures to support decarbonisation and fuel poverty objectives. There was nothing Ofgem could do about rising wholesale gas prices but this is the essential backdrop to events since about 2004, and it contrasts markedly with the period from privatisation until 2004: prices were falling, consumers were reasonably happy and politicians and the press felt no need to get involved.

Companies have failed to meet increasing consumer expectations. Customer service has improved, but not fast enough. There have been serious failures, especially with the introduction of new IT systems and mis-selling by the Big Six. Doorstep selling drove much of the switching in the early stages of retail competition, but this was beset by malpractices which meant that many consumers who switched were actually moving onto worse deals. Independent players have found it difficult to establish themselves with any substantial share of the market. There are encouraging developments, with one new supplier recently reaching 1 million customers. But I would like to see this sustained.

After we stepped in and contributed to the end of doorstep selling, consumers began to use price comparison sites for switching. This brought a new issue into focus – tariff complexity. Ofgem research showed consumers were confused and switching sites were overloaded by the range of tariffs on offer. The trend towards complex pricing structures is not unique to energy. In fact it is a feature of the modern world and one I would like to see the Competition and Markets Authority (CMA) look at. You may disagree with Ofgem's approach in this area but it's hard to argue that there isn't an issue to address.

The energy sector is inherently complex, because of the need to balance supply and demand in real time over a national system. So there is a need for the

complex system of market rules. But there are other aspects of increasing complexity: our duties have expanded in number and in scope, and include environmental objectives, security of supply and alleviating fuel poverty.

And Europe now has an increasing influence on GB energy markets. As well as our duties under UK statute we are now a National Regulatory Authority with duties under EU law.

Complexity is not going to go away. Smart metering and smart grids, and the potential they bring for the digital world to affect energy as it has other sectors, should produce major benefits for consumers. But we need to prepare for this.

The legal framework in which energy regulation now operates is very different from the early post-privatisation years. Regulators must consult extensively, do impact assessments, explain the reasons for every decision. All these take time and make it difficult for a regulator to respond rapidly to market developments. We accept this and want to become better at identifying when we should take risks, perhaps accepting a higher risk of legal challenge, to achieve better results for consumers, more quickly.

In energy regulation, as in anything else, there is always scope for improvement. I believe the CMA has an important role to play in this process, precisely because the issues facing the energy sector are so complex. My personal view is that referring the market to the CMA earlier would have allowed a wider examination of the features that may be reducing the effectiveness of competition in the sector. However, many decisions Ofgem takes are finely balanced and at the time there were good reasons why the market was not referred. In particular, concerns about the impact a market reference might have had on investment and security of supply and concerns about how best to protect vulnerable consumers.

I believe the arguments for independent regulation are clear. I thought Stephen Littlechild captured the essence of them last year, when he said that the purpose of independent economic regulation was to protect consumers from exploitation by privatised companies and to protect investors in those companies from interference by government.

The deal underpinning independent regulation should be for Parliament to delegate specific tasks to an expert body. That body, the regulator, can say no if the executive arm of government seeks to undermine that delegation. Companies play their part by not running to government whenever they disagree with the regulator's decision, and the regulator does its utmost to operate as an expert body and remain impartial to the interests of the industry it regulates.

If this works, there are advantages all round. Government should feel less need to intervene; companies should be confident enough to plan long-term investment, the cost of capital to finance that investment should reduce, and consumers should gain.

But for independent regulation to be effective, the regulator cannot put itself in an ivory tower. It needs to be engaged with and responsive to consumer experience, the public's concerns, and the business realities of the energy industry.

I very much hope that at the end of the CMA investigation we will see a reaffirmation of the principles of independent regulation, perhaps reinforced against some of the erosion we have seen under the pressures of recent years.

This is all difficult to achieve, but it's an ideal worth striving for. If the CMA review helps us reach it, that will be very good news for British energy consumers.

Ofgem published its draft Forward Work Programme and Corporate Strategy in December. It remains open for public consultation until 18th February 2015 and can be viewed at https://www.ofgem.gov.uk/publications-and-updates/ofgem-publishes-forward-work-programme-and-corporate-strategy

WHY CHEMICAL ENGINEERING MATTERS IN THE ENERGY SPACE

Professor Geoffrey Maitland, President of the Institution of Chemical Engineers, looks at the role of chemical engineers in the low-carbon energy transition

In the 1860s, a young high-schooler in St. Petersburg presented his maths teacher with an original proof of the Pythagorean Theorem. The boy was congratulated for his endeavours, but was punished for showing 'a lack of modesty'.

Luckily, young Vladimir Shukhov was undeterred and went on to become a great Russian polymath engineer, scientist and architect. In 1891 he patented the world's first method for 'cracking' – the process of breaking long-chain hydrocarbons into shorter ones. Cracking unleashed a revolution in the processing of crude oil, giving us the fuels and plastics that we now take for granted.

Today, the fruits of that revolution have turned sour. It is now a truism to say that we urgently need to rein in runaway global carbon emissions, yet progress remains glacial. A new revolution is needed. As President of the Institution of Chemical Engineers (IChemE), I have seen how chemical engineers are at the core of unleashing this low-carbon revolution.

The role of chemical engineers

In China, Hangzhou Energy & Engineering Technology are turning waste cooking oil into a low carbon aviation fuel. A cement plant in Texas recently started capturing its carbon dioxide and turning it into raw materials that are sold to industry - where once this company polluted, they now profit. In Norway, researchers have found a way to turn seaweed into a source of sustainable biofuel, compressing a process that usually takes millions of years into a few minutes.

Severn Trent Water has started cleaning the gas they collect from 2.5 million people's waste and pumping it back into the local gas supply, saving £1.7 million annually. In Teesside, Air Products are building a 'plasma gasification' facility that will turn landfill waste into enough energy to power 50,000 homes.

Chemical engineers are at the core of these successes and many more: from carbon capture and storage to improving renewable energy technologies, we are working hard to meet the energy supply challenges of the 21st Century.

On the demand side too, we are improving the efficiencies of the industrial processes that rumble on in the engine rooms of the global economy. Resource scarcity and the challenge of mitigating climate change pose an existential threat to energy intensive industries, which therefore must adapt to survive.

What is more, the 'all-of-the-above' energy strategy that pursues a number of technology options – a strategy sensibly favoured by many – requires a systems-thinking approach. Chemical engineers provide this. We are trained to ask whether a technology will work, what it will do to a system when we plug it in and what its lifecycle impacts are.

Chemical engineering matters

IChemE has been working over the last few years to promote its technical strategy, *Chemical Engineering Matters* (www.icheme.org/cem). This initiative demonstrates how chemical engineers are working to advance progress on the global challenges we face in food, water, energy and health and wellbeing.

As part of this, IChemE will be launching an 'Energy Centre' in the first half of 2015, to provide expert advice from the chemical engineering community to policy makers in governments around the world.

Chemical engineering matters in the energy space. If we recognise this, hopefully we can ensure that the Vladimir Shukhovs of the 21st Century, young or old, will not let modesty constrain their efforts to revolutionise our energy systems.

For more information, email afurlong@icheme.org
Follow IChemE on Twitter: @IChemE

EXTRACT FROM THE AUTUMN STATEMENT

The Rt Hon George Osborne MP, Chancellor of the Exchequer, 3rd December 2014

Mr Speaker, today, in the last Autumn Statement of this Parliament, I present a forecast that shows the UK is the fastest growing of any major advanced economy in the world.

Today, the British economy is forecast to grow by 3%. Over the last year we have grown 2 1/2 times faster than Germany; over 3 times faster than the Eurozone; and over 7 times faster than France.

Today we take steps to back business, support science, and invest in infrastructure.

Mr Speaker, we also want to help British businesses do more research and development – this is crucial to our productivity.

Today I am increasing the R&D tax credit for small and medium companies to 230% and the credit for large firms to 11%.

Mr Speaker, the fall in the global oil price has meant a welcome boost to much of the British economy and to families. There is record investment this year in the North Sea, but the lower oil price clearly presents a challenge to this vital industry.

But I can tell the House today that we will go ahead with an immediate reduction in the rate of the Supplementary Charge from 32% to 30%.We will expand the ring fenced expenditure supplement from 6 to 10 years. And we are introducing with immediate effect a new cluster area allowance.

This demonstrates our commitment to the tens of thousands of jobs that depend on this great British industry. But despite falling fuel prices let me make this clear: we've cut fuel duty and we will keep it frozen.

Improving productivity for all businesses also demands a major investment in our nation's infrastructure. This week we've set out plans for the biggest road building programme for a generation. We've committed billions to our flood defences.

And today we expand tax relief on business investment in those flood defences too. It's all brought together in the National Infrastructure Plan – that is now helping our country attract more investment from around the world than any other country in Europe.

Scientific advance is a human endeavour worthy of support in its own right. It is also crucial to our economic future. Today we commit to a massive, quarter of a billion investment in a new Sir Henry Royce Institute for advanced material science in Manchester, with branches in Leeds, Liverpool and Sheffield.

And we're announcing a new Sovereign Wealth Fund for the North of England so that the shale gas resources of the North are used to invest in the future of the North.

The full Autumn Statement can be found at https://www.gov.uk/government/speeches/chancellor-george-osbornes-autumn-statement-2014-speech

DEPARTMENTAL STATEMENTS

Written and Oral Statements from the Department for Energy and Climate Change – 9th August 2014 to 22nd December 2014

Written Ministerial Statement on 'Paris 2015: Securing our prosperity through a Global Climate Change Agreement'

9th September 2014 – Ed Davey MP published the UK Government's view on why a global deal on climate change is essential. It outlined the direct and indirect climate impacts for the UK and the world, the benefits of low carbon action, the scale of the challenge and the UK's vision for what a successful worldwide agreement needs to include.

Written Ministerial Statement on the Informal Energy and Environment Council

16th October 2014 – Ed Davey MP reported discussions from the Informal Energy and Environment Council. He said it put forward a number of medium and long-term measures to address energy security, with many nations wanting the measure to be in-line with climate change policies. An Internal Energy Market was also discussed.

Written Ministerial Statement on the impact of implementing the Wood Review proposals

3rd November 2014 – Ed Davey MP announced the publication of an Impact Assessment (IA) of the Wood Review proposals for UK offshore oil and gas regulation. The IA highlights the potential net benefits to business and calls for the Review proposals to be implemented as soon as possible.

Written Ministerial Statement on Offshore Licensing Round

6th November 2014 – Ed Davey MP announced an initial offer of 134 licenses for oil and gas production on the United Kingdom Continental Shelf. He added that oil and gas supplies around half of the UK's primary energy needs.

Written Ministerial Statement on the implementation of the Wood Review

6th November 2014 – Ed Davey MP published A Call for Evidence seeking recommendations on how best to implement the Wood Review proposals. He announced that Andy Samuel, currently the Managing Director of BG Group's Exploration and Production in Europe, will become the Chief Executive Officer of the new industry regulator, the Oil and Gas Authority (OGA), due to become an Executive Agency in April 2015.

Annual Energy Statement 2014

6th November 2014 – The Statement showcased the successes of the Government's energy policies over the past four years and calls upon parties to reach an energy consensus so the policies can continue to benefit the UK.

Written Ministerial Statement on the roll-out of smart meters

11th December 2014 - Ed Davey MP provided an update to Parliament on the roll-out of smart meters in the past year, highlighting that 900,000 are already in operation in homes and businesses, and the number installed is growing per month.

Written Ministerial Statement on regulatory justification of the UK ABWR nuclear reactor

11th December 2014 – Ed Davey MP outlined justification for generating electricity from the nuclear reactor design known as UK ABWR, by showcasing the contribution it would make to the nuclear programme, through increased energy security and reduced carbon emissions.

Written and Oral Statements from the Department for Communities and Local Government

Written Ministerial Statement on business rates retention for shale

24th October 2014 – Kris Hopkins MP announced the start of a consultation on draft regulations which would define the oil and gas sites where 100% local retention of business rates would apply, and set out arrangements for sharing shale oil and gas revenue between the different tiers of local government.

Written and Oral Statements from the Prime Minister

Speech to UN Climate Summit 2014

23rd September 2014 – David Cameron MP said that climate change is one of the most serious threats facing the world. He told of how the UK is on track to cut its emissions by 80% by 2050 and that he would be pushing EU leaders in Paris to agree to an emissions cut of 40% by 2030.

PARLIAMENTARY RECORD

SELECT COMMITTEES: REPORTS AND ENQUIRIES

9th August 2014 to 22nd December 2014

House of Commons

Business, Innovation and Skills Committee

Inquiry into the Extractive Industries Sector

28th October 2014 – The Committee published its report, urging the Government to champion the Extractive Industries Transparency Initiative (EITI) to encourage other industrialised nations to join up, as well as collaborate with the education sector to inspire the next generation of extraction workers.

Energy and Climate Change Committee

Inquiry into Network Costs

9th September 2014 – The second evidence session featured witnesses from the Northern Power Grid, the Energy Networks Association, the Energy Intensive Users Group, Wales and West Utilities, the National Grid and SP Energy Works.

4th November 2014 – The Committee focused on the impact of Ofgem and the Government's frameworks on network costs in the UK, hearing from representatives of Ofgem, as well as the Rt Hon Matthew Hancock MP, Minister for Energy, and John Fiennes, Director, Energy Strategy Networks and Markets, Department of Energy and Climate Change.

Inquiry into Small Nuclear Power

10th September 2014 – The Committee took evidence on the Government's role in developing small nuclear power and the potential next steps for Small Modular Reactors (SMRs) in the UK, hearing from the Rt Hon Matthew Hancock MP, Minister of State for Energy, Chris Pook, Head of the Green Economy Team at BIS, and Liz Keenaghan Clark, Head of Nuclear Decommissioning Waste and Safety at the Department of Energy and Climate Change.

17th December 2014 – The Committee published its report, finding that Small Modular Reactors (SMRs) are a viable proposition for future deployment in the UK in the next ten years, as they have the potential to improve manufacturing efficiency and costs, while reducing construction time and financing costs. The report recommends that Government takes a proactive role in driving forward their development and deployment.

Inquiry into the Green Deal: Watching Brief

15th September 2014 – The Committee published its report, demonstrating that carbon savings via the Green Deal finance scheme have been negligible. The policy has been slow to attract customers due to a combination of financial, communication and behavioural barriers. The Government responded to the report on the 9th December

2014, acknowledging the need for national, devolved and local government to engage consumers more effectively on the necessity and advantages of household energy efficiency, agreeing with the Committee that an appropriate communications strategy is vital in achieving this.

Inquiry into Linking Emissions Trading Systems

14th October 2014 – The first evidence session heard from representatives of the International Emissions Trading Association, the Grantham Research Institute on Climate Change and the Environment, London School of Economics, the Climate Markets and Investment Association, the Mineral Products Association, and SSE.

10th November 2014 – The Committee heard from Professor Robert N. Stavins, Albert Pratt Professor of Business and Government, Harvard Kennedy School.

11th November 2014 – The Committee took evidence from Professor Sir David King, the Foreign Secretary's Special Representative for Climate Change, and Niclas Svenningsen, Manager DSI, Sustainable Development Mechanisms Programme, UNFCCC Secretariat.

25th November 2014 – The Committee focussed on the EU Emissions Trading Systems (ETS) and heard from representatives of Shell Research Ltd, the European Commissioner for Climate Action, Industrial Energy Efficiency, Amber Rudd MP, Parliamentary Under-Secretary of State, and Ben Lyon, Head of International Negotiations, Department of Energy and Climate Change.

Inquiry into Implementation of Electricity Market Reform

18th November 2014 – The first evidence session featured witnesses from DONG Energy, the Renewable Energy Association, the Solar Trade Association, EDF Energy, Citizens Advice, as well as Professor David Newbery, University of Cambridge, and Andrew Buglass, Head of Energy, Royal Bank of Scotland, and Co-Chair of Low Carbon Finance Group.

9th December 2014 – The Committee heard from Chris Elder, Director, Energy Markets Group, InterGen, Sara Vaughan, Director of Strategy and Regulation, E.ON, Rupert Steele, Director of Regulation, ScottishPower, Sara Bell, Chief Executive, Tempus Energy, and Jeremy Nicholson, Director, Energy Intensive Users Group.

Inquiry into the New Climate Economy

26th November 2014 – The inaugural evidence session on the economic benefits and costs of acting on climate change heard from Professor Lord Stern, Chair of the Grantham Research Institute on Climate Change and the Environment and Co-Chair of the Global Commission on the Economy and Climate, and Jeremy Oppenheim, Global Programme Director of the New Climate Economy and Director of McKinsey & Co.

Inquiry into Progress on Smart Meter Roll-out

2nd December 2014 – The first evidence session featured witnesses from British Gas, Skanska, E.ON, Ovo Energy, National Energy Action and the Secure Meters Group.

16th December 2014 – The Committee heard from representatives from Smart DCC Ltd, Smart Energy GB, Ofgem and the Department of Energy and Climate Change, including Parliamentary Under-Secretary of State, Baroness Verma.

Environmental Audit Committee

Inquiry into an Environmental Scorecard

16th September 2014 – The Committee published its report, highlighting that satisfactory progress was being made in none of the 10 environmental areas examined. It urged the Government to take immediate action, claiming that improvements in data, processes, strategy and accountability are essential to improve the situation in all environmental areas.

Inquiry into Climate Change Adaptation

11th November 2014 – The inaugural evidence session heard from representatives of Kingston upon Hull City Council, Climate UK, the Local Adaptation Advisory Panel, and Kent County Council.

26th November 2014 – The Committee heard from representatives from the Environment Agency, the National Farmers Union and Natural England.

10th December 2014 – The Committee heard evidence for the third time, from John Slaughter, Director of External Affairs, Home Builders Federation, Professor Paul Cosford, Director for Health Protection and Medical Director, Public Health England, Dr Hugh Ellis, Head of Policy, Town and Country Planning Association, and Paul Everall, Chief Executive and Company Secretary, Local Authority Building Control.

Inquiry into Air Quality

8th December 2014 – The Committee published its third report on air quality in five years, highlighting that the Government has not met EU air quality targets in UK cities, some of which will not meet the required limits until 2030. The report advocates the need for better coordination between local authorities, communities and government to address the pollution problems in the UK.

Inquiry into Sustainable Development Goals

10th December 2014 – The Committee published its report, stating that if the UK Government is to achieve the global goals for 2030, it should rapidly phase out subsidies to carbon-intensive energy sources, raise awareness of sustainable development among young people in the UK and lead international efforts to improve air quality in cities.

House of Lords

Science and Technology Committee

Inquiry into Resilience of Electricity Infrastructure

4th November 2014 – The Committee took evidence from representatives of the National Grid, the Energy Networks Association, the UK Energy Research Centre (UKERC), the Energy Policy Research Group (EPRG) and Professor Michael Grubb, Professor of International Energy and Climate Policy, University College London.

18th November 2014 – The Committee heard from Nina Skorupska, the CEO of the Renewable Energy Association, as well as a number of academics specialising in energy policy.

2nd December 2014 – The Committee heard evidence on the issue of electricity storage from Electricity Storage Network, National Grid, the DEMAND Centre, BEAMA, BDO LLP and Professor Goran Strbac, Faculty of Engineering, Imperial College London.

PARLIAMENTARY ORAL QUESTIONS AND DEBATES

House of Commons

Energy Security
Tim Yeo MP (Con, South Suffolk)
4th September 2014, Col409

Sustainable Energy
Michael Fabricant MP (Con, Lichfield)
4th September 2014, Col414

Onshore Wind Farms
Henry Bellingham MP (Con, North West Norfolk)
4th September 2014, Col416

Energy Bills
Julie Hilling MP (Lab, Bolton West)
4th September 2014, Col417

Energy Efficiency
Jeremy Lefroy MP (Con, Stafford)
4th September 2014, Col418

Wind Farms (Payments)
Graham Stringer MP (Lab, Blackley and Broughton)
4th September 2014, Col419

Energy Efficiency
Clive Betts MP (Lab, Sheffield South East)
4th September 2014, Col419

European Interconnection
Oliver Colville MP (Con, Plymouth, Sutton and Devonport)
4th September 2014, Col421

Carbon and Renewable Energy Targets
David Mowat MP (Con, Warrington South)
4th September 2014, Col421

Fracking
Ian Lucas MP (Lab, Wrexham)
4th September 2014, Col422

Global Climate Agreement
Gavin Shuker MP (Lab, Co-op, Luton South)
4th September 2014, Col423

Renewable Energy Investment
Mark Menzies MP (Con, Fylde)
4th September 2014, Col442

Loan to UK Coal
Caroline Flint MP (Lab, Don Valley)
4th September 2014, Col425

Rural Energy Bills
Sir Alan Beith MP (LD, Berwick-upon-Tweed)
4th September 2014, Col425

Smart Meters
Graham Stringer MP (Lab, Blackley and Broughton)
4th September 2014, Col427

Coal Mining Industry
Dennis Skinner MP (Lab, Bolsover)
4th September 2014, Col427

Energy Efficient Rental Properties
Dr Alan Whitehead MP (Lab, Southampton Test)
4th September 2014, Col428

Solar Arrays (Impact on Landscape)
Dr Sarah Wollaston MP (Con, Totnes)
8th September 2014, Col645

Green Investment Bank
Diana Johnson MP (Lab, Kingston upon Hull North)
11th September 2014, Col1072

Green Economy
Barry Gardiner MP (Lab, Brent North)
11th September 2014, Col1074

Energy Prices
Paul Flynn MP (Lab, Newport West)
22nd October 2014, Col888

Climate Change
Wayne David MP (Lab, Caerphilly)
30th October 2014, Col382

Solar Power
Maria Eagle MP (Lab, Garston and Halewood)
30th October 2014, Col387

Renewables Targets
Douglas Carswell MP (UKIP, Clacton)
4th November 2014, Col660

Framework for Energy and Climate Policies
Dr Alan Whitehead MP (Lab, Southampton Test)
6th November 2014, Col945

Energy Security
David Rutley MP (Con, Macclesfield)
6th November 2014, Col948

Solar Energy
Sir Bob Russell MP (LD, Colchester)
6th November 2014, Col950

Fracking
Ian Lucas MP (Lab, Wrexham)
6th November 2014, Col951

Energy Bills
David Amess MP (Con, Southend West)
6th November 2014, Col953

Off-grid Gas Consumers
Sir Robert Smith MP (LD, West Aberdeenshire and Kincardine)
6th November 2014, Col954

Nuclear Power
Bob Blackman MP (Con, Harrow East)
6th November 2014, Col955

Carbon and Renewable Energy Targets
David Mowat MP (Con, Warrington South)
6th November 2014, Col955

Energy Generation
Andrew Jones MP (Con, Harrogate and Knaresborough)
6th November 2014, Col957

Energy Bills
Graeme Morrice MP (Lab, Livingston)
6th November 2014, Col958

Devolution of Energy Policy
Mark Lazarowicz MP (Lab, Edinburgh North and Leith)
6th November 2014, Col961

Electricity Costs
Nia Griffith MP (Lab, Llanelli)
6th November 2014, Col961

Wave Power
Ian Liddell-Grainger MP (Con, Bridgwater and West Somerset)
6th November 2014, Col973

Cold Homes
Caroline Lucas MP (Green, Brighton Pavilion)
25th November 2014, Col746

UK Energy Sources (Subsidy)
Douglas Carswell MP (UKIP, Clacton)
18th December 2014, Col1534

Energy Bills
Alan Reid MP (LD, Argyll and Bute)
18th December, Col1534

Energy Bills
Nia Griffith MP (Lab, Llanelli)
18th December, Col1535

Energy Bills
Andy Sawford MP (Lab/Co-op, Corby)
18th December, Col1535

Energy Bills
Kate Green MP (Lab, Stretford and Urmston)
18th December, Col1535

Energy Bills
Grahame M. Morris MP (Lab, Eastington)
18th December, Col1535

Tidal Lagoons
David Jones MP (Con, Clwyd West)
18th December, Col1537

Energy Companies Obligation
Jeremy Lefroy MP (Con, Stafford)
18th December, Col1538

Onshore Oil and Gas Exploration (Scotland)
Mike Weir MP (SNP, Angus)
18th December, Col1539

Clean Energy
Cathy Jamieson MP (Lab/Co-op, Kilmarnock and Loudoun)
18th December, Col1541

Energy Security
William Bain MP (Lab, Glasgow North East)
18th December, Col1542

Energy Bills (Low Carbon Energy)
Philip Davies MP (Con, Shipley)
18th December, Col1543

House of Lords

Energy Winter Supplies
Lord Ezra
20th October 2014, Col420

Green Climate Fund
Bishop of St Albans
27th October 2014, Col943

Wales: Fracking
Lord Wigley
3rd December, Col1225

LEGISLATION

9th August 2014 to 22nd December 2014

Private Members' Bills

Department of Energy and Climate Change (Abolition) Bill 2014-15
Robert Halfon MP
(Con, Harlow)

Commons

First reading
7th July 2014

Second reading
6th March 2015

Control of Offshore Wind Turbines Bill 2014-15
Christopher Chope MP
(Con, Christchurch)

Commons

First reading
2nd July 2014

Second reading
16th January 2015

Energy (Buildings and Reduction of Fuel Use) Bill 2014-15
Dr Alan Whitehead MP
(Lab, Southampton Test)

Commons

First reading
21st July 2014

Second reading
16th January 2015

Houses in Multiple Occupation (Energy Performance Certificates and Minimum Energy Efficiency Standards) Bill 2014-15
Dr Alan Whitehead MP
(Lab, Southampton Test)

Commons

First reading
21st July 2014

Second reading
16th January 2015

Wind Farm Subsidies (Abolition) Bill 2014-15
Peter Bone MP
(Con, Wellingborough)

Commons

First Reading
7th July 2014

Second Reading
6th March 2015

A LOOK AHEAD

The Commons is set to come straight out of recess and into 2015 with energy top on its priority list.

The Rt Hon Ed Davey MP begins by giving evidence on the 'Outcomes of Lima COP 20' to the Energy and Climate Change Select Committee on 7th January. This is set to be closely followed by a one-off evidence session on price comparison websites following a call for evidence launched by the Committee on 18th December. With questions over transparency and oversight on the agenda – questions more usually reserved for energy providers in recent years – it is sure to be an interesting session.

More broadly with the General Election looming, energy is sure to generate more debates as the manifestos begin to be published in late Q1.

And finally analysis published by Yatterbox, a social media monitoring service, showed that fossil fuels have continued to attract greater political attention on social media than renewables in the last year. This trend seems likely to continue in 2015 given recent news that since hitting its $116 peak in June 2014, the price of Brent crude oil has fallen by over 46% (at the time of writing). With a commitment by Ali al-Nami, the Saudi Oil Minister that the Organisation of the Petroleum Exporting Countries (OPEC) will not cut production from its target of 30 million barrels per day, the world is sure to be watching closely for the impact it will have on the global economy.

The year of 2015 – there's certainly plenty in store.

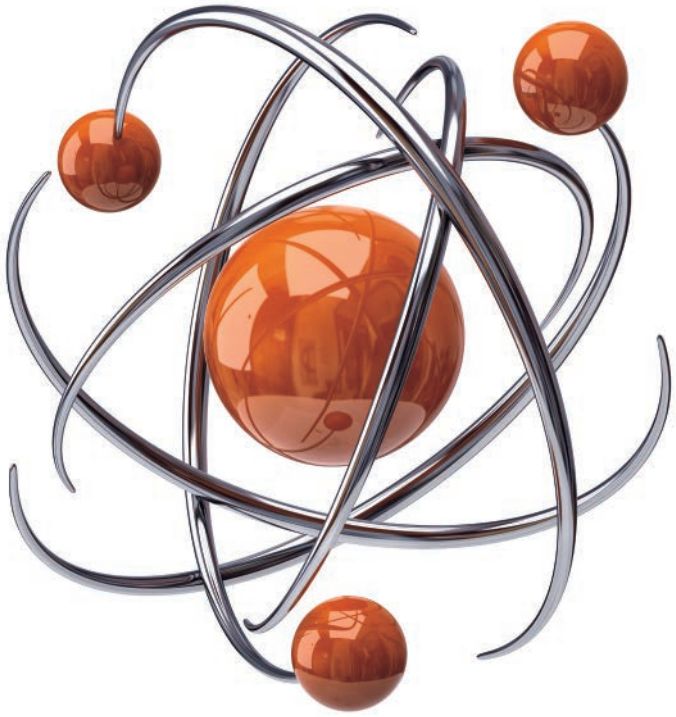
Thinking Big, Building Small

Fluor has a 50-plus year legacy of engineering, constructing and maintaining some of the world's largest and safest nuclear power plants. Fluor's investment in NuScale Power and its unique and passively safe small modular reactor plant design provides power generators a new nuclear power option for safe, efficient, new generation.

The small modular reactor market has never been more promising.

Developed more than a decade ago with the U.S. Department of Energy's support, NuScale Power's small modular reactors produce 45 megawatts of power apiece. NuScale Power, backed by Fluor, offers customers the opportunity to install nuclear power plants on a quicker, safer and fexible, as-needed basis.

With more than 250 engineers working to bring this safe, clean technology to market, NuScale Power pushes ingenuity forward to address the challenges of unlocking nuclear power in a way that is safer and simpler than ever before.



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