Volume 32 Number 2 December 2015 An interview with Angus McNeil MP Chairman of the Energy & Climate Change Select Committee Wind works Matthew Knight, Siemens The value of flexibility in achieving law carbon energy. Drefessor Caren Stehes, Imperial College

The value of flexibility in achieving low carbon energy Professor Goran Strbac, Imperial College

FOCUS

Keeping the Christmas Lights on - Flexi<mark>bl</mark>e demand?

Goran Strbac from Imperial College explains the importance and value of flexibility in supporting cost-effective transition to lower carbon energy future on Page 6

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The journal of



The All-Party 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 100 parliamentarians, 100 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.

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CHAIRMAN'S FOREWORD



Welcome to a new session of the All-Party Parliamentary Group for Energy Studies. There have been some changes in Westminster that I would like to summarise.

We are now an All-Party Parliamentary Group. Due to the new

rules set by the Committee on Standards, there are no longer any Associate Groups. What this means to you as members is very little, except that at our AGM and EGMs, only Parliamentarians are allowed to vote. However, we intend to run our group much as before, allowing industry and academia to express their views at those meetings, so that any vote is taken based on knowledge. Memberships will continue unchanged with Associate members from industry and academia, Individual and Life members by invitation and Parliamentarians.

We use the new APPG logo and are following the new rules on publication of information, see our website **www.pges.org.uk**.

With this edition, we are resuming the publication of Energy Focus, I hope you will continue to find it a valuable source of information, with its insight in articles from our Speaker meetings, submitted by sponsors and authoritative reports, as well as the Parliamentary Record section. All-Party Parliamentary Groups have all fallen under much more close scrutiny. As PGES has always run as an open and transparent body, this presents us with no extra challenges. Our system of accounting and auditing is as exacting as in business.

On top of that, we have a new secretariat. We have opted for an individual to act as the Secretariat. Matthew Gordon, of Tamesis Services Ltd, will be our Administrator, working as the PGES. He is not new to the Group, as he has been a member for over ten years and has served on the Executive Council for many of those, so he has a real understanding of the needs of industrial and other members. I would like to thank Bellenden for running the group for the last few years. Under their watch, our membership has increased and we are financially secure. I would also like to welcome Matthew in his new role and wish him every success.

We are always delighted to hear from members, so please do share your thoughts and feedback by emailing our new editor, Matthew Gordon, at **matthew@pges.org.uk**.

Have a wonderful Christmas and New Year and I look forward to seeing you all at the annual House of Lords dinner on 1st February 2016.

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

WIND ENERGY WORKS

Matthew Knight BEng, CEng, MIET, Director of Energy Strategy and Government Affairs, Siemens plc Matthew.Knight@Siemens.com

NOVEMBER SPEAKER MEETING: Address to the All-Party Parliamentary Group for Energy Studies

The world must stop emitting greenhouse gases. This requires fundamental changes to our economies. Every country wanting to be competitive in the low carbon world must look at the low carbon energy resources available to it. Fortunately for the UK, our latitude and geography has a great renewable resource – wind.

Air is invisible and powerful. Just an armful of air weighs a kilogram. The energy produced is proportional to the cube of the wind speed. This means that even slightly windier sites can deliver a lot more energy and wind speeds in the UK are among the highest in Europe.

Modern wind turbines build on foundations of science and engineering. Wing-like blades have replaced sails. The tip of a modern turbine blade moves at 180 miles per hour, much slower nearer the hub, hence its twisting shape. Advanced aerodynamic design more complex than that of an aeroplane wing allows these blades to start to turn in a gentle breeze we hardly notice, and survive a storm that would knock us over.

The blades on a 7MW wind turbine are twice the length of an aeroplane wing, weigh 25 tonnes and are designed to go round 150 million times. They are lighter and more flexible, yet built for less than 100th of the cost of a wing. These blades drive electricity generators based on principles laid down by British engineers such as Faraday and Maxwell. Today, the latest permanent magnet generators are designed in Sheffield, the power converters at Keele in Staffordshire.

A modern wind turbine repays all the energy used in its manufacture in around half a year. This means wind farms have lifecycle greenhouse gas emissions less than 100th of those from a coal fired power station.

Good sites in the UK deliver load factors well over 30%, so that last year wind provided 10% of all the electricity used in the UK.

Weather forecasting means wind energy output can be accurately predicted, making it relatively easy to integrate into our electricity system. National Grid can predict tomorrow's wind power more accurately than tomorrow's electricity demand. The idea that there is spinning fossil back up for wind is just a dinner party myth. Wind works and the cost of wind energy has fallen at least 40% each decade.

When I hear talk of "letting the energy market decide" between generation technologies, I fear a misunderstanding of how the wholesale electricity market works. There is no "natural" market for electricity. It is a set of rules that includes some



costs and not others. It results in a price that is insufficient, on its own, to build **any** type of new power station.

Our market is a set of levers with Government on the end of some of them. Investors know that the market will deliver exactly what it is programmed to do. When that turns out not to be what Government wants, it will inevitably reconfigure the market to favour something else.

But energy investments typically take a couple of parliaments to develop, consent and build, then operate for another 5 or more. That's why political risk is so significant for energy long after the politicians have gone.

Trying to hold a "fair" competition between gas, nuclear, solar, coal and wind generation is like trying to hold a fair race between horses, camels and greyhounds. Choosing the length of the race favours one or the other. Handicapping them differently to allow them to run in the same race just slows them all down. We know we need a mixture of technologies. We should run separate races and use competition to find the best horses, the best camels and the best greyhounds. Government

has the tools to do that. What's missing is an indication of which races will be run and when.

The Committee on Climate Change recently stated that wind energy should be regarded as subsidy free below £85/MWh. That figure includes £10 to cover the cost of intermittency. The CfD auction at the turn of this year already awarded contracts to onshore wind farms at below that price.

We can expect further cost reduction. Not least if we relax arbitrary planning restrictions on tip height which would allow the UK to use technology already deployed on the continent, knocking another few pounds off the price.

What is the impact on customer bills? Payments to all existing wind farms cost the average customer around £25 last year – for that 10% of all their electricity. Polling tells us that on average people assume they pay 14 times more than this in subsidy and still onshore wind remains popular (66% support, Nov 2015).

Around 58% of that £25 headline figure came straight back to bill payers due to the "merit order effect". i.e the wholesale price is reduced when wind displaces the most expensive generation.

So the subsidies paid to wind farms in the past have brought us to the point where new onshore wind is close to subsidy free. That's exactly what subsidies were there for. New wind farms will bring down future bills.

The challenge for Government and industry is to explain that wind still needs what is known as a Contract for Difference to make up for structural features of the wholesale electricity market but that is not a subsidy.

Onshore wind works, it is popular, it is low cost and we should do

more of it. In addition, this is the best place to build offshore wind but why do we need to do that as well as onshore? *There are three main reasons; reliability, diversity and scale.*

- More consistent winds offshore provide higher load factors (they generate at full power for greater periods of time). The newest offshore wind farms deliver annual load factors around 50%. Projects such as Dogger Bank have the potential to be even higher. Higher load factors reduce the cost of integrating wind into the electricity system.

- The geographic spread of offshore wind farms extends further than we could achieve on land. This increases the number of days when wind is strong enough to generate somewhere, again reducing the cost of integration.

- By 2030 we need to substantially decarbonise our electricity production. Coal will be switched off by the early 2020s and we can't allow ourselves to burn much unabated gas by 2030. That needs large scale sources of low-carbon electricity. Offshore wind farms are not constrained for size in the way they are onshore. It is hard to see any viable scenario for the UK's needs that does not involve significant offshore wind as part of a balanced mix.

Potential for further cost reduction

Offshore wind is at an earlier stage of development than onshore and the potential to get costs down further is significant. Offshore wind in the UK is barely a decade old. In that time we have gone from small projects close to shore, to huge sites well beyond the horizon. Cost reduction has come from a range of factors.

Increasing the size of offshore wind farms reduces installation time and cost per turbine. Purpose built "jack-up" installation vessels can operate in rougher weather. Companies like Siemens and Vestas have invested billions of Euros in new wind turbine designs, resulting in step-changes in cost.

For example, Siemens' 7MW wind turbine generates more than twice the energy of its predecessor, is a third lighter per MW and has half the number of parts, reducing offshore maintenance. The offshore substation used a design that saves 40% of the cost.

We know this cost reduction can continue but it requires a visible future pipeline of projects to make further investments. We know the UK will probably need offshore wind. We know we can get the cost down to a subsidy-free level by the mid 2020s, if we have a pipeline. We are waiting to see if the Government also recognises this.

Creating skilled jobs in coastal towns

The offshore wind industry is delivering significant industrial benefits too. It employs over 13,000 people in UK already and that could rise to 50,000 by 2030. The number of jobs and the speed of cost reduction will be maximised if Government is clear about future policy.

Siemens has created over 1,000 jobs in offshore wind in the last four years. We will employ a further 1,000 at the Greenport Hull site which is now under construction – if there is continuity.

Nature has blessed us with a great resource and wind is already contributing 10% of the nation's electricity. It will be a vital part of our energy future. Government needs to recognise this clearly too so that the industry can invest to bring down costs and maximise the industrial and environmental benefits.