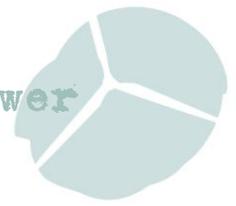


No.92 February 2017

1. **Sizewell C – you’ve got to be kidding!**
2. **Nuclear companies struggle with finances but solar is fast becoming the cheapest form of power everywhere**
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1. Sizewell C – you’ve got to be kidding!

EDF Energy has been running its second stage local consultation on its proposal to build two more EPR reactors at Sizewell in Suffolk. The consultation closes on 3rd February.

You can read the response from Together Against Sizewell C (TASC) here:

<http://tasizewellc.org.uk/index.php/the-planning-process/stage-2-consultation-response/173-response-to-the-stage-2-consultation-from-tasc>

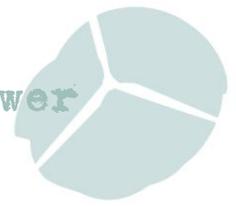
There are growing concerns over the impact that building Sizewell C could have on one of the region's most beautiful areas of countryside. (1) Both Suffolk County Council and Suffolk Coastal District Council have been frustrated by the short period of the Stage 2 consultation, which they say made it challenging for the councils to coordinate their response. Council leaders now look set to withhold their backing for Sizewell C because EDF Energy hasn't done enough work to reassure the public.

Councillors and officials are voicing “deep concerns” over some aspects of the latest consultation and how the impacts of the massive development will be mitigated. There were many areas of concern flagged up during the woefully inadequate 1st stage consultation which should have been addressed in this second consultation, but haven't been. The consultation document for stage 2 consists of 321 pages, but the bulk of the document contains the same information as the stage 1 document. Questions raised by many respondents during stage 1 have not been answered. Originally EDF's intention was to have only 2 stages of consultation before applying to build the new reactors, but we now learn there will be a stage 3 consultation. This consultation appears to have been called simply because EDF felt it needed to do something because it had been so long since the first one.

Suffolk County Council and Suffolk Coastal District Council describe the Stage 2 Consultation document as “*disappointing in that it fails to recognise or truly acknowledge the environmental challenge that development at this site faces, nor the likelihood of residual impacts in a number of areas*”. The Councils say there is a “lack of information” on a range of vital issues, including traffic and transport, the environment, and design of the plant. They say it is unclear how social and economic benefits will be delivered to communities, and some areas of concern have not been covered at all. Councillors are not yet fully convinced that the benefits of EDF's proposals outweigh the impacts on the community.

The two Councils say: “*Some environmental issues are hardly covered at all, for example – some ecological surveys appear to have been overlooked. There needs to be further significant work to seek to survey, understand, quantify and qualify these impacts.*”

At Hinkley Point C, EDF is spending £92million on compensation and mitigation – just 0.6% of the total cost of the project – but as yet the benefits from Sizewell C have not been costed. The council says: “*Sizewell C is, in comparison with Hinkley Point, a much more complex site with more demanding mitigation requirements for its impacts on the AONB.[Area of Outstanding Natural Beauty]*” Serious concerns are raised by Suffolk County and Suffolk Coastal District councils over the effects the huge scheme would have on the Suffolk Coast & Heaths Area of Outstanding



Natural Beauty (AONB), the economically important tourism that the designated beauty attracts and the area's internationally acknowledged natural habitats and rare and protected wildlife.

Among a wide range of other environmental concerns, the councils say the area of the Sizewell Marshes Site of Special Scientific Interest (SSSI) expected to be permanently lost had increased from 4.6 hectares in Stage 1 to 5.55ha, and some habitat now proposed to be lost was "*much harder to replace*" elsewhere.

Both Suffolk County Council and Suffolk Coastal District Council are urging EDF to allow significantly more time for the Stage 3 consultation, the final stage, given the large amount of material expected to be released at that point. (2)

The Suffolk Preservation Society (SPS) also believes that the project will have major implications for the special qualities of the AONB and a permanent road crossing over the Sizewell Marshes and the workers' campus will destroy the tranquillity and remote character of the area. It believes the construction phase will threaten environmental damage on an unprecedented scale across a wide range of highly sensitive locations. (3)

National Policy Statement is out of date

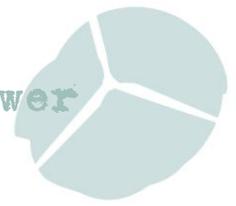
As we pointed out in [nuClear News No.88](#) the Overarching National Policy Statement (NPS) on Energy (July 2011) is in urgent need of review. (4). It claimed that demand for electricity could double by 2050 because of the "*need to electrify large parts of the industrial and domestic heat and transport sectors*". Total UK electricity demand was about 360TWh in 2014, so, according to the NPS it could reach 720TWh - by 2050.

Yet the latest Government scenarios only envisage increases in demand of between 29.6% and 52.9% by 2050 – taking demand to between 467TWh and 550TWh. (5) A nuclear power station the size of Sizewell C might be expected to produce up to 25TWh of electricity, and an 18GW programme of new reactors about 140TWh. So clearly with a fall of at least 170TWh in predicted demand in 2050, we could manage without any new reactors.

Britain is consuming 17% less energy than it was in 1998, (6) and 15% less in 2014 than it was in 2000. (7) Official projections in 2006 were that today's electricity consumption levels would be more than 25% higher than they currently are. Despite our GDP having increased by 18% over the decade, demand for electricity has consistently fallen year on year, largely due to far more efficient usage. (8)

Germany, which is planning an entirely non-nuclear route, even with the same 2050 objective of an 80% reduction in greenhouse gases, expects electricity demand to be 25% below present levels by 2050 – compared with our doubling – by implementing energy efficiency programmes. (9) If, instead of planning for increases in electricity demand by 2050, the UK Government was planning for a reduction of 25%, as in Germany, then the capacity required by 2025 would fall by around 15%, removing the need for new reactors.

And there appears to be plenty of opportunity in the UK to continue reducing energy demand. The Government's own Energy Efficiency Strategy says 196TWh could be saved by in 2020, equivalent to 22 power stations (or 8 nuclear stations the size of Sizewell C) (10) There are 100 TWh of electricity savings available for which there are currently no plans to capture which are



detailed in a report for the Government by McKinsey. (11) A crash programme just on lighting efficiency which replaced all the lights in the UK with LEDs could cut peak electricity demand by about 8GW, a saving of about 15% of all power consumption. (12) These are the kinds of cost effective efficiency improvements which drove consultancy Utilitywise to describe Hinkley Point C as an “unnecessary expense”. In fact energy efficiency improvements could save £12 billion compared to the cost of building Hinkley Point C. (13)

Energy efficiency programmes could also be a good vehicle to stimulate the economy – if delivered as part of a major infrastructure investment programme for £1 invested by government in efficiency £3.20 is returned through increased GDP resulting in increased employment of up to 108,000 net jobs per annum. Public subsidies for energy efficiency are more than offset by the increase in tax revenues and savings in welfare spending due to lower unemployment. Now is the time to do this in the UK, according to Jan Resnow at the Science Policy Research Unit at Sussex University. The economic uncertainty caused by the Brexit vote will prevail for some time until Britain’s new status becomes clearer. At the same time, there will be no energy efficiency programme for the able-to-pay sector after 2017 and funds for fuel poverty alleviation are falling short of what is required to achieve the target. The economic evidence is clear – energy efficiency provides a golden opportunity for an economic stimulus in the UK. (14)

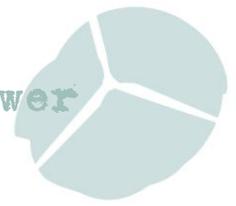
Cost of Renewables is falling

The other big change since the NPS was published in July 2011 is that the cost of renewable energy has fallen much more quickly than expected. The Government needs to deliver new low carbon generation capacity as cheaply as possible around 150TWh (terawatt hours = 1,000 million kWh) per year of electricity will be needed by 2030 – around half of all current output. All plausible scenarios imply that this can best be achieved by deploying a significantly increased volume of renewable generation – likely to be around 50GW, predominantly from a combination of onshore and offshore wind and solar PV. A recent study by the think-tank E3G shows this would be the cheapest way to deliver it as well even when taking system integration costs into account. (15)

Even the government expects solar and wind power to be cheaper than new nuclear power by the time Hinkley Point C is completed according to its own projections. An unpublished report by the energy department shows that it expects onshore wind power and large-scale solar to cost around £50-75 per megawatt hour of power generated in 2025. New nuclear is anticipated to be around £85-125/MWh. On previous forecasts, made in 2010 and 2013, the two renewable technologies were expected to be more expensive than nuclear or around the same cost. Now the government expects them to be a cheaper option - onshore wind and solar will be significantly better value than all other large scale sources of power in the UK by 2025. (16)

Solar Costs

According to the latest data from Bloomberg New Energy Finance (BNEF), *unsubsidized* large-scale solar is beginning to beat not only wind but also coal and natural gas at current prices. As the same begins to apply elsewhere, it will be a turning point in global electricity markets making solar-generated power the cheapest form of electricity generation. (17)



Solar power is expected to be the cheapest form of energy (not just electricity) everywhere in the world by around 2030. Cheap solar panels and advances in storage technology are transforming the world. By 2030 or 2040 solar will be the cheapest way to generate electricity, indeed any form of energy EVERYWHERE. The proportion of global electricity provided by solar is likely to grow from 2% now to at least 50% by 2030. (18) In Britain the dramatic fall in the cost of solar PV has already pushed the cost almost to cost parity with planned gas-fired power stations. And solar farms can be financed at far lower rates of interest than other sources of electricity because they are so reliable and almost maintenance-free – a perfect investment for pension funds. (19)

Onshore Wind

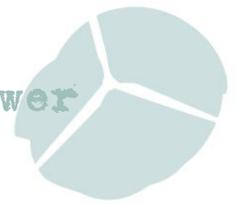
In Europe onshore wind has become one of the most competitive sources of new electricity. Mott MacDonald estimated in 2011 that costs would fall to around £52-55/MWh by 2040 compared with £83-90/MWh in 2011. (20) But according to Bloomberg New Energy Finance (BNEF) new onshore windfarms were the cheapest way for a power company to produce electricity in Britain by 2015 with costs dropping to £55/MWh. (21) The trade body, Scottish Renewables, has shown that costs could be cut by a further 20% if government, industry and regulators work together to make sure we can use the latest generation of turbines on suitable sites, reduce grid charges, and deploy energy storage technologies. (22)

Offshore wind

The cost of electricity produced by offshore wind turbines has fallen by a third in just four years, according to an analysis, by Dong Energy of Denmark, the world's largest offshore wind company. The average cost during 2015/16 was £97/MWh. In 2012, the industry was asked by the UK Government to reduce prices to £100/MWh within eight years, but the target has been reached in about half that time. The Hinkley Point C guaranteed 'strike price' of £92.50/MWh is at 2012 prices over a period of 35 years. Inflation means this is worth over £100 today. (23)

In 2016 Dong won a bid to build two wind farms 22 kilometres off the Dutch coast. The company says power will be produced for less than any other offshore scheme to date. It is estimated that when the scheme is fully operational, electricity will cost €72.70 per megawatt hour (MWh) and €87 MWh when transmission costs are included. (24) At the time this was described as the cheapest offshore wind electricity in the world: "*beyond even the most optimistic expectations in the market.*" (25) Since then Swedish utility Vattenfall has agreed to build a giant offshore wind farm in Denmark that would sell power for €49.50 per MWh. Vattenfall has broken its own previous record of €60 per MWh.

The UK's cheapest offshore windfarm so far will produce power at roughly £120/MWh, which is far more than the projects being built in Denmark and the Netherlands. Part of the reason for that is that those governments cover transmission costs, which costs about £25/MWh. And then to address offshore wind's intermittency, you've got to add another £7.60/MWh — according to the UK government's top climate advisers - to cover the cost of the 'balancing' the system. (26) So we can see that the latest Vattenfall bid is coming in at £75.50/MWh.



Energy Storage

The Government argues that we need nuclear to provide non-intermittent, low carbon electricity. It says whether or not the sun is shining or the wind is blowing nuclear will provide a secure base load. (27) In fact, what a renewable system needs is not baseload but flexible back-up which can be turned on and off quickly to provide electricity at peak times when renewables are not producing much.

Michael Liebreich, CEO of Bloomberg New Energy Finance agrees “...*there are plenty of ways of managing intermittency in renewables without resorting to expensive backup power.*” (28)

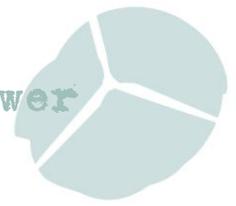
He says renewable energy has clearly achieved the long-awaited goal of grid competitiveness. More than that, in many countries it now undercuts every other source of new generating capacity, sometimes by very considerable margins. “*The old rules were all about locking in cheap base-load power, generally from coal or hydro plants, then supplementing it with more expensive capacity, generally gas, to meet the peaks. The new way of doing things will be about locking in as much locally-available base-cost renewable power as possible, and then supplementing it with more expensive flexible capacity from demand response, storage and gas, and then importing the remaining needs from neighbouring grids.*” (29)

There are at least five ways green energy can be balanced:-

1. By using the right mix of renewables intermittency can be reduced – it’s about more than just wind and solar;
2. By increasing grid connections to other countries so that electricity can be imported at peak times when indigenous renewable production is low, and so that surpluses can be exported;
3. By storing surplus renewable electricity which can be called upon when wind and solar production is low. This can be done by expanding pumped hydro electric storage or by using batteries;
4. Demand management – using various techniques to reduce demand at peak times;
5. By calling on combined heat and power stations working in conjunction with heat storage to generate electricity at peak times. (30)

One recent development illustrates the potential role of combined heat and power in balancing variable renewables. An arms-length council-owed district heating company in Gateshead is set to boost its projected life-time income by nearly £1m after signing up to a power demand-response scheme run by Flextricity based in Edinburgh. The Gateshead District Energy Scheme, which is currently being commissioned, and will be fully operational by mid-2017, has become part of Flextricity’s demand response network netting the company more than £60,000/yr over the next 15 years for smoothing out peaks and troughs in national electricity demand. (31)

Another possible solution to the energy storage problem is Power to Gas (or P2G) which generates hydrogen from surplus renewable energy and then combines it with carbon dioxide to make methane. There is a P2G plant which is already being operated by Audi in Lower Saxony. The CO₂ comes from a neighbouring anaerobic digestion plant. The resultant methane



can then either be injected into the gas grid to provide green gas, or it can be used to generate electricity when renewables are not producing sufficient electricity. (32)

According to a report by Energy Brainpool for Greenpeace Energy, surplus wind power could be used in wind-to-gas facilities to produce hydrogen (H₂) and methane (CH₄) which is then fed into the conventional gas distribution system or stored in already existing gas storage facilities and later reconverted into electricity in combined-cycle gas turbine (CCGT) power plants when the need arises. Comparing this system with Hinkley Point C, Energy Brainpool showed that savings of €7.2 billion over 35 years are available. (33)

What the Government should be asking is not “*how are we going to provide baseload power in future*” but what are we going to do with the expensive electricity from nuclear and other centralised power stations when renewables are supplying lots of electricity at very low or zero marginal cost?

A system powered 100% by renewables supported by a backbone of electricity storage, smart grid technology, demand management, energy efficiency, and 21st century technology is feasible now. In fact, not only is it feasible, but strong market and social forces are moving our energy systems in the decentralised direction very rapidly. As Rainier Baake, Germany’s minister in charge of the Energiewende, points out, solar and wind have already won the technology race. (34)

Large centralised power stations are fast becoming the dinosaurs of the energy system. If EDF Energy continues to cling to the old large-scale, centralised utility business model which is fast becoming obsolete it will put at risk the very existence of the company.

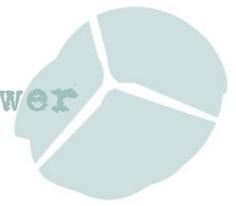
Radioactive waste

The consultation document (summary) states that the EPR design reduces the amount of spent fuel produced. The spent fuel and intermediate level radioactive waste would be kept on-site until a national geological disposal facility becomes available. This is seriously misleading. Spent nuclear waste fuel could be stored in wet storage ponds on-site for 160 years.

The Government says the job of emplacing legacy wastes in the Geological Disposal Facility, which would probably have to be done first, may not be complete until 2130 – 90 years after the GDF is expected to be available. (35). New reactors will use high-burn up fuel which could require up to 100 years of cooling before it can start to be disposed of anyway. (36) So assuming Sizewell C comes on stream around 2030, disposal could not start until 2130 in any case.

The Government and nuclear industry have argued that the volume of waste produced which will be generated by an 18GW new nuclear programme will be small - only approximately 10% of the volume of existing wastes. (37) This implies that the additional amount will not make a significant difference to finding an underground dump for the wastes the UK’s nuclear industry has already created. The use of volume as a measure of the impact of radioactive waste is, however, highly misleading.

Volume is not the best measure to use to assess the likely impact of wastes and spent fuel from a new reactor programme, in terms of its management and disposal. New reactors will use so-called ‘high burn-up fuel’ which will be much more radioactive than the spent fuel produced by



existing reactors. So rather than using volume as a yardstick, the amount of radioactivity in the waste – and the space required in a deep geological repository to deal with it - are more appropriate ways of measuring the impact of nuclear waste from new reactors.

Radioactive Waste Management Ltd (RWM) has developed a detailed inventory of radioactive waste for disposal in its proposed geological disposal facility (GDF) which it calls the 'Derived Inventory'. This inventory is subject to uncertainty due to a range of factors such as uncertainty about the life of the AGR reactors and what happens to the UK's plutonium inventory, and, of course proposals for new reactors. (38)

However, we can see from RWM figures that the radioactivity of waste from existing nuclear facilities is expected to be 4.77 million TBq in 2200. Yet the radioactivity in spent fuel alone from a 16GW new reactor programme is expected to be 19 million TBq. Thus the radioactivity in spent fuel from a 3.2GW Sizewell would be around 3.8 million TBq – roughly equivalent to 80% of the waste from existing facilities. (39)

Spent fuel could be stored on the Sizewell site for up to 140 years after the end of power generation (i.e. until around 2225). That means Suffolk could play host to waste with a radioactive content equivalent to 80% of the UK's existing radioactive waste inventory for the next two hundred years.

Waste Footprint

Another way of looking at the impact of radioactive waste produced by new reactors is the estimate the area of space required by the wastes if emplaced in a deep geological repository in various different rock types.

RWM has looked at the repository footprint of a baseline inventory (total waste expected to be created by the existing programme). (40) Using NDA figures this can be compared with the repository footprint of an upper inventory which estimates that the repository footprint for a 16GW new reactor programme (41):-

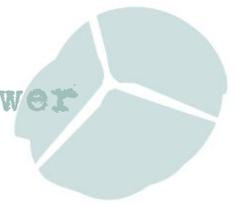
	Baseline Inventory	Maximum Inventory	Sizewell C responsible for
High strength rock	5.6km ²	12.3km ²	1.3 km ²
Lower strength rock	10.3km ²	25.0km ²	2.9 km ²
Evaporite	8.8km ²	24.1km ²	3.1 km ²

Table 3: Repository Footprint for Maximum Inventory which includes a 16GW New Build programme.

Thus, it can be seen that Sizewell C alone could require anywhere between about 20 and 35% of the underground space required by existing waste.

Conclusion

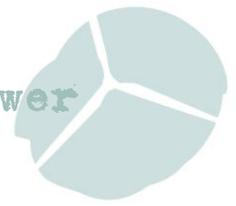
It is widely regarded as good practice when carrying out an Environmental Impact Assessment to consider the alternatives to a project. If this were done for Sizewell C it would be seen that there are plenty of opportunity to reduce energy demand instead. For instance, a crash programme just on lighting efficiency which replaced all the lights in the UK with LEDs could cut peak electricity



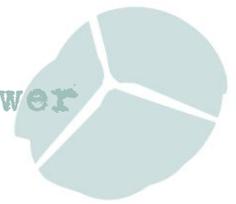
demand by about 8GW, a saving of about 15% of all power consumption. The cost of renewable energy has fallen much more quickly than expected with solar, onshore wind and offshore wind now cheaper than nuclear power. And intermittency need not be a problem – there are plenty of ways to manage it.

A major impact of building Sizewell C will be the production of nuclear waste with a radioactive content equivalent to 80% of the UK's existing radioactive waste inventory which could require anywhere between 20 and 35% of the underground space required by existing waste in a deep geological disposal facility.

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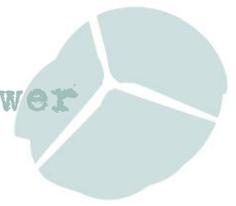


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http://www.westcumbriamrws.org.uk/documents/88.2-Inventory_presentation_to_West_Cumbria_MRWS_Partnership_Issue_2.pdf
41. Higher Level Radioactive Waste: Likely inventory range; the process for altering it; how the community might influence it and understanding the implications of new nuclear build. Presented to West Cumbria Managing Radioactive Waste Safely Partnership, by Pete Roche, 5th August 2010 2nd Version with reactions to NDA responses http://www.nuclearwasteadvisory.co.uk/wp-content/uploads/2011/05/Inventory_presentation_to_WCMRWS_Aug2010.pdf



2. Nuclear companies struggle with finances but solar is fast becoming the cheapest form of power everywhere

The three companies seeking to build new nuclear reactors at Hinkley Point, Sizewell, Moorside, Wylfa and Oldbury are under growing financial pressure, raising doubts about whether the UK's nuclear renaissance will ever get off the starting blocks.

Areva & EDF

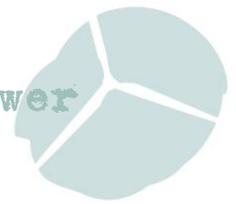
The French nuclear regulator – ASN – has been investigating the growing nuclear scandal in France involving steel components made at Areva's Le Creusot factory which have been found to contain excessive carbon levels which could make them vulnerable to cracking. There is also evidence that some of the quality-assurance documentation for some components may have been falsified. Although all French nuclear reactors which were temporarily closed as a result have now re-started, the *Financial Times* reports that ASN now wants to dig further into several issues before they are willing to give a clean bill of health to the French nuclear industry.

In addition, the results of an investigation by EDF at Flamanville will be delivered to the ASN in the coming weeks. The regulator will then analyse the findings and issue a report in the first half of this year. If the structural weaknesses initially found on the reactor pressure vessel are as serious as feared it could have an effect on the development of the Hinkley Point C. Any significant problems could be catastrophic for EDF as replacing this important piece of the plant would mean restarting much of the construction work, which is already billions of euros over budget and several years late. (1)

If Flamanville's start up is pushed beyond 2020 this would be bad news for Hinkley Point C. EDF's plans depend partly on £2bn of financing from the UK government. To take this funding and get any more there is a condition: Flamanville must be operational by end 2020 at the latest, according to an agreement with the European Commission over state aid. This last point raises questions as to whether EDF could complete Hinkley without the aid. (2)

Areva, which is 87% owned by the French state, has been grappling with an abrupt downturn in the nuclear industry following the 2011 Fukushima nuclear accident as well as big losses on some of its projects, particularly the EPR it is building at Olkiluoto in Finland. The Company has been negotiating a government-backed rescue package worth €5bn in cash. It is also selling a majority stake in its reactor-making division Areva NP, valued at €2.5bn, to EDF. In February 2016 it reported a €2bn net loss for 2015 after taking further write-downs on Olkiluoto as well as impairments related to restructuring and weak market conditions. The Finnish project is already 10 years behind schedule and €5bn over budget, helping to push the group to a record €4.8bn net loss for 2014. (3)

It was hoped that the Chinese group CNNC would invest in Areva, but it has now announced that it won't participate. The decision has been described as a diplomatic crisis between the two



countries - a small earthquake in Franco-Chinese relations. CNNC said it was not ready to invest the capital on the conditions set by the French state. The Areva shareholders AGM to be held on 3rd February is expected to ratify a capital increase of €5bn with 500 million coming from the Japanese groups Mitsubishi and JNFL. In the absence of the Chinese the French government will have to pay the balance of €4.5 bn. The French government refused to allow CNNC to have their representative on Areva's board of directors. (4)

Toshiba and Engie

Another planned new nuclear power station is located at Moorside, adjacent to Sellafield in Cumbria. This is being promoted by a consortium of companies known as NuGen which was originally owned by the French company GDF Suez, the Spanish company Iberdrola, and Scottish and Southern Energy (SSE). Scottish and Southern Energy (SSE) withdrew from the consortium in September 2011 and sold its stake to GDF Suez and Iberdrola. Then in January 2014 Toshiba-owned Westinghouse Electric Company agreed to buy all Iberdrola's stake and another 10% from GDF-Suez (now called ENGIE) giving it a 60% controlling stake. The plan was to build three AP1000 reactors with a total capacity of around 3.6 GW. Nugen had been expecting to take its final investment decision by the end of 2018.

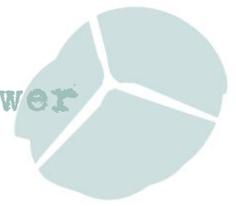
In December it was reported that the French company – Engie – would like to abandon its 40% share of Nugen. (5) Engie is now targeting councils, museums and corporate offices seeking to sell energy services. Wilfrid Petrie, Engie's UK chief executive, said the energy industry was undergoing a "revolution" in which optimising and reducing gas and electricity usage was becoming more valuable than actually supplying it. The Company has recently signed a deal with Wakefield council that will see it introduce energy saving systems such as lighting controls across 500 council buildings and 100 schools, as well as providing them with conventional services. (6)

Nuclear power has turned into a financial quagmire for Toshiba. (7) Shares in the Japanese company plunged at the end of December wiping 40% off its value after an announcement that it may have to write down billions due to its acquisition of Westinghouse Electric which is struggling with 4 new reactors in the US which are late and over-budget. (8)

Now Toshiba has announced that it will cease taking orders related to the building of nuclear power stations, in a move that effectively marks its withdrawal from the nuclear plant construction business. It will instead focus on maintenance and decommissioning operations. The company will continue work on four nuclear plants under construction in the United States that are expected to be completed by 2020. (9)

A spokesman for Toshiba told the Carlisle News & Star that it is re-examining all of its nuclear projects outside Japan, and this includes the proposed nuclear reactors at Moorside, near Sellafield. (10)

Tim Yeo, who chaired the Energy and Climate Change Committee from 2010-2015 and is now chairman of the trade group, New Nuclear Watch Europe, described the situation as "*an anxiety*" but he said "*there is a solution, albeit probably at the cost of a little bit of time ... bringing a new partner into the NuGen consortium*". South Korean utility Kepco was reported to be close to investing in the project in October, and in December the *Times* reported that representatives



from the company had met with business and energy secretary Greg Clark. “They’ve been a bit discouraged, I think, by the reception they’ve had in the UK,” said Yeo. “But my understanding is they are now talking to Toshiba about taking a stake ... I think there’s no doubt that Kepco, with the full backing of the Korean government, is interested.” He said Kepco’s involvement could delay the project if it insisted on using its own reactor technology as it would have to go through the lengthy Generic Design Assessment process. “That would set the programme back a bit,” he added. (11)

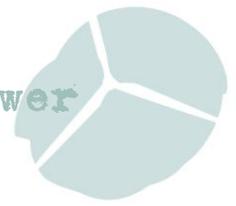
In 2013 Korea's nuclear sector had to weather scandals related to falsification of documentation relating to various components, which led to the temporary shutdown of several reactors for investigations and replacements of the affected components. With several reactors off line for maintenance at the same time, the country found itself struggling to meet electricity demand as summer temperatures peaked. In late September, Korea Hydro and Nuclear Power (KHNP) CEO Cho Seok issued a public apology and announced a three-pronged reformation of corporate culture in efforts to regain public support, saying that Korea's nuclear sector was facing its "utmost crisis." (12) In the past nuclear power in South Korea enjoyed high levels of public support but in recent years this has been disappearing. Two local referenda in 2015 and 2016 voted overwhelmingly against the construction of new nuclear reactors. (13)

Hitachi

Horizon nuclear, is proposing to build two Advanced Boiling Water Reactors with a total capacity of 2.7MW at Wylfa on Anglesey. It expects to make its final investment decision in early 2019. (14) Horizon nuclear was originally a consortium of two German companies – Eon and RWE. Hitachi Ltd bought the project for about £700m in March 2012. Investing billions in new reactors would have forced a credit-rating downgrade on RWE, said Volker Beckers, CEO at RWE npower in May 2012 and Tony Cocker, CEO of E.ON UK said E.ON lacks the “*financial firepower*”. (15)

Horizon has now gone cap in hand to the UK and Japanese Governments. The two governments are to review investment and lending for Horizon through the Japan Bank for International Cooperation and the Development Bank of Japan. Financing of the project from the Japanese side is expected to reach Y1 trillion (£7 billion). Japan is particularly keen for the projects to go ahead after its previous attempt to export nuclear energy technology, to Vietnam, fell through. (16) The UK Government might decide to fund up to 25% of the project according to the *Telegraph*. The likely cost of the proposed twin-reactor development at Wylfa has not been disclosed but a source close to the negotiations insisted a *Reuters* report that put the figure at £19bn was wide of the mark. (17)

Hitachi Ltd. is set to lose tens of billions of yen this financial year after withdrawing from a uranium enrichment joint venture in the US. Hitachi is expected to report a 70 billion yen (\$620 million) non-operating loss by the time books are closed at the end of March. The deficit is largely attributed to the joint venture GE Hitachi Nuclear Energy Inc. withdrawing from the uranium enrichment project. Hitachi no longer expects any profits from the North Carolina-based company, of which it owns 40% and the rest by General Electric. Hitachi and GE were expecting more nuclear power plants to be built when they launched the joint fuel enrichment business, but orders have been sluggish across the globe, forcing the project to be shelved. Nevertheless, Hitachi says it will be



sticking with its nuclear power business. The company said that it plans to proceed with its project to build a plant in Britain by ensuring costs are thoroughly managed. (18)

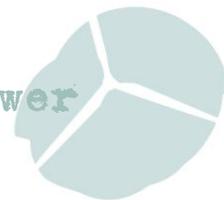
Renewable costs

The Financial Times commented that “*all this comes as offshore wind progressively looks cheaper to run, even with all the subsidies, than Hinkley ever will.*” (19) Swedish utility Vattenfall has agreed to build a giant offshore wind farm in Denmark that would sell power for €49.50 per MWh. Vattenfall has broken its own previous record of €60 per MWh. Once the cost of transmission is included this works out at around £75.50/MWh compared with £100.50/MWh for Hinkley Point C (once inflation has been added to the £92.50 at 2012 prices). (20)

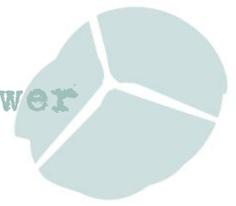
The cost of solar and wind continues to fall. The World Economic Forum reports that solar and wind are now the same price or cheaper than new fossil fuel capacity in more than 30 countries. As prices for solar and wind power continue their precipitous fall, two-thirds of all nations will reach the point known as “grid parity” within a few years, even without subsidies. (21)

Bloomberg reports that solar is now cheaper than coal in some parts of the world and in less than a decade is likely to be cheaper everywhere. (22)

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 2. FT (LEX Column) 4th Jan 2017 <https://www.ft.com/content/da093f3e-d26b-11e6-b06b-680c49b4b4c0>
 3. FT 19th July 2016 <https://www.ft.com/content/8d650906-4dcd-11e6-88c5-db83e98a590a>
 4. BFM TV 31st Jan 2017 <http://bfmbusiness.bfmtv.com/entreprise/la-chine-n-entrera-pas-chez-areva-1093084.html>
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 6. Telegraph 2nd Jan 2017 <http://www.telegraph.co.uk/business/2017/01/02/engie-chief-sets-uk-expansion-plans/> See also Time for Engie to get the hell out of nuclear, nuClear News No.88 <http://www.no2nuclearpower.org.uk/nuclearnews/NuClearNewsNo88.pdf>
 7. Energy Collective 2nd January 2017 <http://www.theenergycollective.com/dan-yurman/2395561/toshibas-financial-meltdown-puts-its-nuclear-projects-at-risk-worldwide>
 8. In Cumbria 30th December 2016 <http://www.in-cumbria.com/Concern-for-Moorside-nuclear-project-as-Toshiba-shares-plunge-53b94005-449f-4355-a3a0-df7b69ecb142-ds>
 9. Japan Times 28th Jan 2017 <http://www.japantimes.co.jp/news/2017/01/28/business/corporate-business/toshiba-chairman-resign-struggling-u-s-nuclear-business/>
 10. Carlisle News and Star 31st Jan 2017 <http://www.newsandstar.co.uk/news/business/New-Cumbrian-nuclear-project-in-doubt-as-Toshiba-reviews-projects-bad89e7b-4e16-4895-b1ad-7c48a357166e-ds>
 11. Utility Week 31st Jan 2017 <http://www.utilityweek.co.uk>
 12. World Nuclear News 10th December 2013 <http://www.world-nuclear-news.org/NP-Nuclear-to-remain-Korean-mainstay-1012137.html>
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 14. Telegraph 14th Feb 2016 <http://www.telegraph.co.uk/finance/newsbysector/energy/12156773/UK-new-nuclear-plan-will-fail-without-private-investors-says-Horizon-chief.html>



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17. Telegraph 15th December 2016 <http://www.telegraph.co.uk/business/2016/12/15/government-mulls-stake-horizon-nuclear-plant/>
18. Asahi Shimbun 2nd Feb 2017 <http://www.asahi.com/ajw/articles/AJ201702020042.html>
19. FT (LEX Column) 4th Jan 2017 <https://www.ft.com/content/da093f3e-d26b-11e6-b06b-680c49b4b4c0>
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3. Bradwell B – the Chinese are coming

The Office for Nuclear Regulation and the Environment Agency have been asked by the government to begin the Generic Design Assessment (GDA) for the reactor proposed for use at Bradwell B in Essex – the HPR1000 reactor or Hualong One reactor. (1) The power station is being developed by China General Nuclear Power Corporation (CGN) and EDF. CGN and EDF submitted an application to the Department for Business, Energy and Industrial Strategy (BEIS) through their joint venture, General Nuclear System, last October. The reactor design was jointly developed by CGN and China National Nuclear Corporation (CNNC). The ONR's review is expected to take about four years (or 5 years according to Reuters) (2), after which the reactor design could be granted a licence to be built in Britain. The reference plant for the assessment is the third unit at CGN's Fangchenggang nuclear power station which is currently being built in China and is scheduled to start up in 2021.

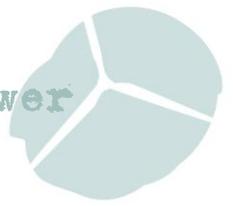
Under a strategic investment agreement signed last October, CGN agreed to take a 33.5% stake in EDF Energy's Hinkley Point C project in Somerset, as well as jointly develop new nuclear power plants at Sizewell in Suffolk and Bradwell in Essex. The Hinkley Point C and Sizewell C plants will be based on France's EPR reactor technology, while the new plant at Bradwell in Essex will feature the Hualong One design. As part of that agreement, CGN agreed to form a joint venture company with EDF Energy to seek regulatory approval for a UK version of the Hualong One design. (3)

In a joint statement, EDF Energy and CGN said the request to regulators "*marks a first step in the robust and thorough process*" to seek permission to build a nuclear power plant at Bradwell. The proposed project is in an early pre-planning stage which will involve years of investigative works and public consultations before detailed proposals are produced allowing a planning application to be made, they said.

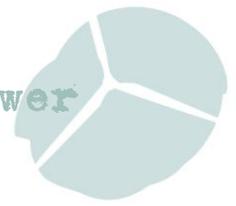
Chinese reactors are not the solution says the GMB union. It has called for "*considerable caution*" over Chinese involvement in the Bradwell B reactor design. The UK will not benefit from "*Chinese pop-up power stations*" it said. National Secretary for Energy for GMB Justin Bowden said "*GMB has for years urged government to exercise considerable caution over Chinese involvement in terms of the technology, financing, security and the jobs - both during construction and once built*". (4)

The Colchester Gazette said that GNS has vowed to listen carefully to the community before drawing up proposals for a new power station at Bradwell. Of course listening and acting on public opinion are two entirely different things. (5)

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1. Utility Week 10th Jan 2017 <http://utilityweek.co.uk/news/Nuclear-regulators-to-begin-assessment-of-Bradwell-reactor-design/1292442> and Times 11th Jan 2017 <http://www.thetimes.co.uk/edition/business/chinese-reactor-faces-review-before-britain-presses-the-button-zr27hr2f3> and Telegraph 10th Jan 2017 <http://www.telegraph.co.uk/business/2017/01/10/chinese-plans-build-essex-nuclear-plant-move-step-closer/>



2. Reuters 13th Jan 2017 <http://uk.reuters.com/article/uk-china-nuclear-idUKKBN14X0E6?rpc=401&>
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5. Colchester Gazette 14th Jan 2017 http://www.gazette-news.co.uk/news/15019689.Energy_company_vows_to__listen_carefully__to_residents_ahead_of_new_power_station_at_Bradwell/



4. Where does the Government get its information?

Neil Crumpton – the People Against Wylfa B representative on the Department for Business Energy and Industrial Strategy (BEIS)-NGO nuclear Forum – has been re-reading a *Guardian* interview with the late Professor Sir David Mackay - the ex Chief Scientific Adviser (CSA) - to try to understand some of the things the Government says about nuclear power and renewables. The interview by 'climate writer' Mark Lynas can be found here:

<https://www.theguardian.com/environment/2016/may/03/idea-of-renewables-powering-uk-is-an-appalling-delusion-david-mackay>

Crumpton concludes that if this is the kind of advice he was giving ministers, then it's not surprising they are so nuclear and baseload focussed.

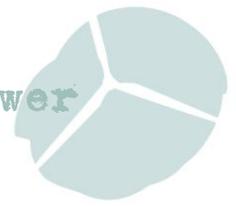
Mackay's views were essentially:

- * that the optimal amount of solar PV and wind is ZERO - because the UK is one of the darkest countries in the world (solar does not 'add up' - whatever that means) and when the wind blows you have to turn something else down;
- * UK energy policy should focus on nuclear power and CCS;
- * that PV, wind and biomass would take up too much land, huge battery back-ups and would cost too much to be a viable UK option (so no mention or acceptance of the vast area of sea around the UK);
- * renewable energy powering the UK is 'an appalling delusion' and he denigrates those that hold the view that renewables could power the UK;
- * he says a plan has to add up (yet the very Hot Air book that brought him fame makes a basic and large adding up error (disfavouring renewables because wind and PV don't have massive conversion losses) - by confusing PRIMARY and FINAL energy demand.

These views, particularly on the cost of PV and wind compared to nuclear, do not tally with the very many reports on the reducing costs of renewables including offshore wind.

What we don't know is whether he rebutted criticisms of the potentially 'unconstructable' Hinkley scheme. We don't know if he looked into storage of Synthetic Natural Gas, or the use of carbon capture from biomass for instance. Did he rebut the criticisms of his electric / heat pump heat sector scenario?

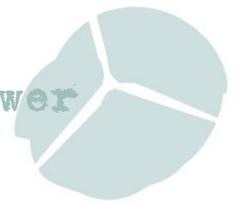
That's the problem with Scientific and Parliamentary Advisers in the current UK governance system - they are not held directly to account - particularly under cross-examination at public inquiries on their advice to ministers. Put anyone in that position and they will become law unto themselves. Yes, various committees of (mostly technologically challenged) MPs or Lords can call them to give written and oral evidence and ask them questions. However, MPs and most



Lords are hardly energy technology or systems specialists and are unlikely to be able to hold anyone's feet close enough to the fire. And even if they did the CSAs can simply walk away and maintain their view (inquiry reports can take ages to materialise and be lost in chaff by the end of their publication day). Advisers, elected by no-one, need to be challenged by those who hold different views directly in front of ministers and cameras and an 'inspector' who could identify the points of contention for further scrutiny and due diligence.

Furthermore, Mackay had little, or nothing, to say on the wider security, national defence or proliferation issues associated with nuclear power. Such issues may well have a major adverse security impact for tens of billions of people of future generations if other countries follow a nuclear example set by the UK during his period of formal advice.

Mackay's view that those who don't agree with him about an energy system based on nuclear and CCS with little or no wind and PV are essentially delusional, as elucidated in the *Guardian* interview was simplistic, condescending, and insulting.



5. Scotland and Hinkley

A report, called 'Scotland's Wind' (1), by Dr David Toke - Reader in Energy Politics at Aberdeen University and published by the Scottish Greens shows that UK, electricity consumers are set to pay around £16 a year for 35 years to subsidise Hinkley Point C. If Scottish consumers could go it alone their £16 levy could fund almost twice as much power from onshore and offshore wind farms.

The report says:

"If Scottish consumer s money was spent on supporting renewable energy rather than paying for their share of Hinkley Point C ... then, even on conservative calculations, nearly double the amount of electricity would be generated from wind power as from Hinkley C".

The costs of onshore windfarms and also offshore windfarms even on current prices need much less support from consumer surcharges to generate an equivalent amount of electricity compared to HPC. Wind power costs are falling rapidly, with some especially low prices being reported in Denmark and The Netherlands. Under such a programme organised by the Scottish Government the cheapest onshore windfarms could start generating in 2020 and offshore windfarms organised under a new, Danish-style framework, could be online in 2026.

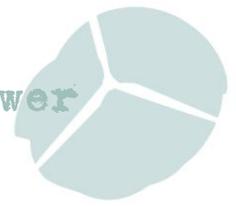
The Scottish Government s own preference for renewable energy over nuclear power lends support to the suggestion that the Scottish Government should be able to use Scottish consumers money to pay for new renewable energy rather than new nuclear power. Moreover the best value for money for Scottish consumers in terms of generating non-fossil fuels is likely to come from the Scottish Government having powers to fund its own renewable energy programme from Scottish consumer bills. This is because the Scottish Government will be able to decide on what contract length to offer wind developers, for example offering to pay guaranteed prices for 20 years rather than 15 years as done by the Westminster Government now with renewable energy. Also, the Scottish Government will be able to organise a much more effective offshore windfarm programme than is being done by the Westminster Government. The Westminster Government's methods are increasing the costs of offshore wind by leaving too much uncertainty to be dealt with by developers. The Scottish Government could organise a much cheaper offshore wind programme on the lines done by the Danish Energy Agency. This is likely to lead to lower costs and less confrontation in the courts over planning issues than is the case with the current offshore windfarm programme. (2)

In January the Scottish Government published

- A draft Climate Change Plan (RPP3) <http://www.gov.scot/Publications/2017/01/2768>
- A consultation of a Draft Scottish Energy Strategy: <http://www.gov.scot/Publications/2017/01/3414>
- A consultation on Fracking: <http://www.gov.scot/Publications/2017/01/8538>



1. Scotland's Wind by Dr Dave Toke 9th Jan 2017
<https://greens.scot/sites/default/files/Scotland%2527s%20Wind.pdf>
2. Dave Toke's Blog 9th Jan 2017 <http://realfeed-intariffs.blogspot.co.uk/2017/01/how-scotland-could-double-amount-of-low.html>



6. Small Modular Reactors

Engineering giant Rolls-Royce is teaming up with a host of rivals including Amec Foster Wheeler and Arup and nuclear specialist Nuvia to develop mini-nuclear reactors. Rolls Royce believes the so-called next generation technology could support as many as 40,000 jobs if the industry flourishes. The consortium is entering a £250m competition started last March by the Government, which wants to find the best SMR design for civil use. It is hoped the technology will be more cost-effective than conventional plants. (1) The companies believe SMRs will strengthen the UK's energy security by reducing reliance on foreign gas imports and smoothing out the impact of 'intermittent generation' technologies.

In November 2015, the British government announced plans to invest at least £250 million over the next five years in a nuclear research and development program including a competition to identify the best value SMR design for the UK. Rolls-Royce submitted a paper to the Department of Business, Energy and Industrial Strategy, outlining its plan to develop a fleet of 7 GWe of SMRs with its partners. Other participants in the UK's SMR competition include French-owned EDF Energy and its Chinese partner CNNC, Westinghouse and US developer NuScale Power. (2)

In the US NuScale has formally completed its design submission to the Nuclear Regulatory Commission. The 12,000-page application will now undergo a lengthy review by the NRC, which must approve the design before construction can begin. (3)

According to City AM the Government's work on SMRs appears to have slowed down, and many companies were expecting mention of plans in the industrial strategy published in January, but there was nothing specific. (4)

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1. Telegraph 8th Jan 2017 <http://www.telegraph.co.uk/business/2017/01/08/rolls-royce-partners-rivals-mini-nuclear-reactors/>
 2. World Nuclear News 9th Jan 2017 <http://www.world-nuclear-news.org/NN-Rolls-Royce-names-partners-for-UK-SMR-09011701.html>
 3. NPR 13th Jan 2017 <http://www.npr.org/sections/thetwo-way/2017/01/13/509673094/miniatuized-nuclear-power-plant-u-s-reviewing-proposed-design>
 4. City AM 8th Jan 2017 <http://www.cityam.com/256579/rolls-royce-launches-partnership-engineering-giants-amec>