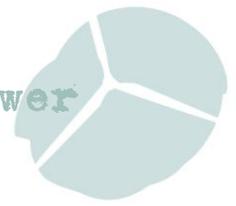


No.74 May 2015

1. **100% Renewables in the South-West is Possible**
2. **Next Generation Reactors**
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5. **The Cost of Decarbonisation**
6. **Renewable Heat, heat storage and grid balancing**
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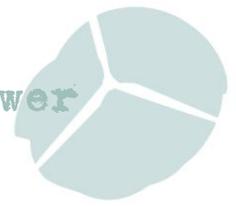
1. 100% Renewables in the South-West is Possible

Former advisor to Gordon Brown at the Treasury and No.10 Damian McBride revealed that Ed Balls, having been warned by Treasury officials that the costs for Hinkley Point C are frighteningly out of control, especially for waste disposal, would have reviewed the spiralling costs with a view to scrapping the project if Labour had won the election and he had become Chancellor. (1)

Perhaps the new Secretary of State for Energy and Climate Change, Amber Rudd, and the Tory Chancellor George Osborne won't want to go that far, but investors remain reluctant to commit especially after the recent technical problems in the reactor vessel at Flamanville. According to Nick Butler writing in the *Financial Times* the challenge for the new government is that development that is already seven years behind schedule will be further delayed - no station here can go ahead until at least one EPR reactor is working somewhere in the world. The new problems are likely to increase still further the amount of financial guarantees required. This will all push up the final price consumers will have to pay. At worst, the current regulatory tests could require the reactor vessels to be redesigned and rebuilt. (2)

In recent weeks we have learnt that:

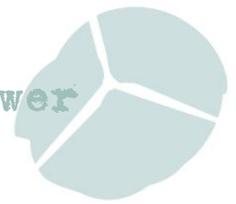
- Anomalies have been found in the bottom and lid of the reactor pressure vessel (RPVs) of a similar nuclear plant being built at Flamanville in Normandy. This means weaknesses in the vital metal structure protecting the outside world from the highly radioactive reactor core. (3)
- Pierre-Franck Chevet, head of France's nuclear safety inspectorate revealed that the same manufacturing technique was used in the steel for the identical safety casings destined for Hinkley Point, which "*have already been manufactured*". (4)
- China says it won't approve the initial loading of fuel into two reactors until possible safety issues with the RPVs are resolved. The Taishan 1 and 2 RPVs were fabricated at the same factory as the RPV for Flamanville. (5)
- Steve Thomas, professor of energy policy at the University of Greenwich, said. "*How much more can go wrong before they say it's time to give up on this?*" He called Hinkley Point "*a project that needs an exit strategy*". (6)
- The two Chinese companies considering investing in Hinkley Point C have serious concerns about the European Pressurised water Reactor (EPR) design, and the financial health of the French company Areva which designed the reactor. (7)
- Areva is now in such a bad state (with a €4.8bn loss in 2014) that it looks as if it might have to withdraw as a co-investor in the Hinkley project. (8)



- Luxembourg (9) is to join Austria (10) in filing a complaint against the UK's proposed subsidies for Hinkley Point C.
- A German electricity supply company - Greenpeace Energy - has also decided to take legal action against the Hinkley subsidies. A number of municipal energy utilities, such as Stadtwerke Schwäbisch Hall, are considering joining the lawsuit. About 7% of electricity generated in Britain would be highly subsidised nuclear electricity if Hinkley goes ahead thus distorting the European electricity market. (11)
- EDF Energy and the UK Government have a list of problems to sort out which is daunting before the project can go-ahead. For instance they need permission from the European Commission for the financial arrangements to transfer title to the nuclear waste from EDF to the Government in future. EDF's £10bn loan facility from the Government also needs to be finalised. (12)
- On top of this the Government is seeking European Commission approval to hold a "golden share" in EDF's £24.5bn Hinkley Point C nuclear power station, which could have the effect of strengthening pending legal challenges against the plant's construction. (13)

Meanwhile the huge renewable resources available in the South-West are becoming clearer. It has some of the world's best renewable energy resources, capable of boosting our rural economy and ensuring our energy security. All that is holding us back from the renewable revolution is a failure of political will.

- Regen South West points out that if the Government puts in place the policies needed to meet 15% of the South West's energy requirements (N.B. Energy, not just electricity, i.e. including heat and transport) this will deliver £10bn of investment and 24,000 jobs. The UK is committed, under EU rules, to meeting a 15% target for energy by 2020.
- At current rates of growth the South-West will only produce just over 14TWh (terawatt hours or billion kWh) of renewable energy whereas it needs to produce 19TWh to meet the 15% target.
- At current rates of growth the number of jobs will be 16,000 by 2020, whereas it could be 34,000. (14)
- The South West region has the renewable energy resources to meet more than 100% of its total energy needs, including replacement of liquid fuels and electrifying railways. We should aim to do this by 2050. According to a recent report by The Resilience Centre the South West has the potential to generate an estimated 68TWh of energy made up of 43TWh of electricity energy, and 25TWh of thermal energy. This equates to just over 100% of total future energy needs for South West assuming a 40% powering down due to energy efficiency measures by 2050. (15)
- A programme to deliver a 100% renewable energy target would create 122,000 jobs. The capital cost of delivering such a programme would be £59,484m, including £8,784m



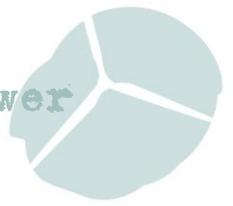
on Smart Grid energy storage. This is 72% of equivalent nuclear costs for delivering the same amount of energy.

“The new Government has a choice – go-ahead with the financial millstone of nuclear power with consumers paying for decades to come with much of the expenditure flowing out of the region, or develop a sustainable energy programme which will boost local jobs and the local economy. We urge them to choose the latter,” said Stop Hinkley Spokesperson Allan Jeffery

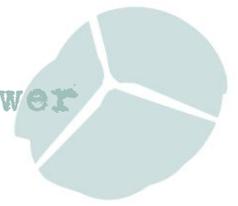
Despite the fact that Ed Balls was planning to review the Hinkley deal, Shadow energy secretary Caroline Flint made clear that *“nuclear is an important part of the energy mix going forward”*. She said the Labour party ruled out conceding this issue to the SNP, in the event of any coalition or policy negotiations, and that Labour stands by its pledge made in the last government that new nuclear is needed to help the UK to reduce its carbon emissions and meet future electricity demand. (16)

- 100% Green Power is now possible for Somerset. Theo Simon explores how, from Hydro to Biogas, we can start moving towards a zero-carbon economy NOW, with huge benefits for work and for local communities. See <https://www.youtube.com/watch?v=2t3ALTpdb1Q&feature=youtu.be&app=desktop>

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1. Sunday Times 10th May 2015 <http://www.thesundaytimes.co.uk/sto/news/focus/article1554408.ece>
 2. FT 10th May 2015 <http://blogs.ft.com/nick-butler/2015/05/10/beyond-the-election-the-energy-agenda-for-the-new-government/>
 3. Reuters 17th April 2015 <http://uk.reuters.com/article/2015/04/17/areva-nuclear-idUKL5N0XE11320150417> and Ecologist 14th April 2015 http://www.theecologist.org/News/news_round_up/2829257/nuclear_reactor_flaws_raise_hinkley_c_safety_fears.html
 4. Independent 18th April 2015 <http://www.independent.co.uk/news/uk/home-news/uk-nuclear-strategy-faces-meltdown-as-faults-are-found-in-identical-french-project-10186163.html>
 5. ECNS 15th April 2015 <http://www.ecns.cn/2015/04-15/161760.shtml>
 6. Times 18th April 2015 <http://www.thetimes.co.uk/tto/business/industries/utilities/article4415175.ece>
 7. Times 7th February 2015 <http://www.thetimes.co.uk/tto/business/industries/utilities/article4346816.ece>
 8. Telegraph 5th March 2015 <http://www.telegraph.co.uk/finance/newsbysector/energy/11453149/EDF-Areva-investment-not-existential-for-Hinkley-Point.html>
 9. Luxemburger Wort 29th April 2015 <http://www.wort.lu/en/politics/hinkley-point-c-luxembourg-to-file-complaint-against-uk-nuclear-power-subsidies-5540aa250c88b46a8ce584ac>
 10. Argus Media 29th April 2015 <http://www.argusmedia.com/News/Article?id=1030825>
 11. Becker Buttner-Held 12th March 2015 <http://www.beckerbuettnerheld.de/en/article/state-aid-for-hinkley-point-nuclear-power-plant-bbh-to-prepare-a-lawsuit-against-the-eu-commission/> and Ecologist 5th March 2015 http://www.theecologist.org/News/news_round_up/2780807/greenpeace_energy_to_launch_legal_challenge_to_uk_nuclear_subsidies.html



12. Ecologist 11th March 2015
http://www.theecologist.org/blogs_and_comments/Blogs/2787780/the_end_is_nigh_last_rites_for_hinkley_c.html
13. Independent 5th March 2015 <http://www.independent.co.uk/news/business/news/governments-golden-share-request-could-stall-construction-of-hinkley-c-nuclear-plant-10086821.html>
14. RegenSW Manifesto http://www.regensw.co.uk/wp-content/uploads/2015/04/Manifesto_2015.pdf
15. The Power to Transform the South West, Resilience Centre and European Greens April 2015
http://mollymep.org.uk/wp-content/uploads/The-power-to-transform-the-South-West_FINAL1.pdf
16. Utility Week 20th April 2015 <http://www.utilityweek.co.uk/news/labour-draws-nuclear-red-line/1123332>



2. Next Generation Reactors

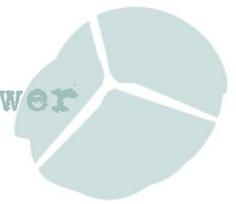
The Generation IV International Forum (GIF) is a co-operative international endeavour which was set up to carry out the research and development needed to establish the feasibility and performance capabilities of the next generation nuclear reactors. Six reactor types have been selected for further development. These include: the Gas-cooled Fast Reactor (GFR), the Lead-cooled Fast Reactor (LFR), the Molten Salt Reactor (MSR), the Supercritical Water-cooled Reactor (SCWR), the Sodium-cooled Fast Reactor (SFR) and the Very High Temperature Reactor (VHTR). (1)

The French Radiological Protection Agency (IRSN) has carried out a review of these systems from the point of view of safety and radiation protection. On the basis of its examination, IRSN considers the SFR system to be the only one of the six to have reached a degree of maturity compatible with the construction of a Generation IV reactor prototype during the first half of the 21st century. Even then this will depend on further studies. (2)

This is hardly a ringing endorsement, let alone anything like a quickly deployable climate solution - ie the SFR is the best possibility depending on further studies leading to a prototype before 2050!

DECC estimate in their 2013 Nuclear Energy Research and Development Roadmap (3) that the first commercial Generation IV reactors should be operating by 2040. That is still years away considering the timescale for dealing with the climate change threat. Yet pro-nuclear environmentalists still promote these new fast reactors as if they are just around the corner. (*"It may take ten years for these reactors to prove their potential"* according to Kirsty Gogan writing in Nuclear Engineering International.)(4)

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1. Generation IV International Forum https://www.gen-4.org/gif/jcms/c_40465/generation-iv-systems
 2. IRSN 27th April 2015 http://www.irsn.fr/EN/newsroom/News/Pages/20150427_Generation-IV-nuclear-energy-systems-safety-potential-overview.aspx
 3. Nuclear Energy Research and Development Roadmap: Future Pathways, Dec 2013 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/168043/bis-13-632-nuclear-energy-research-and-development-roadmap-future-pathway.pdf
 4. Nuclear Engineering International 2013 <http://www.neimagazine.com/opinion/opinionwhy-the-environmental-movement-is-important-for-nuclear-power-4559455/>



3. Tackling Fuel Poverty

An estimated 15,000 people died unnecessarily between December 2014 and March 2015 because they were living in homes they couldn't afford to heat. The news has led campaigners to hit out at what they claim is an inadequate The Conservatives have pledged to insulate just 1 million homes which represents an 80 per cent decline in the rate of home insulation compared to the last Parliament when 5 million homes were insulated.

Fuel poverty campaigners reckon the number of excess winter deaths surged last winter to 49,260, of which around 14,780 were due to people living in cold homes. The Energy Bill Revolution estimates that the average number of excess winter deaths over the previous five years was 27,830, so last winter saw an increase of 77 per cent above the five year average. (1)

The cheapest way of all to cut carbon emissions and tackle fuel poverty is energy efficiency, but the coalition's market-based approach, the Green Deal, was a complete flop. Most insulation was delivered by forcing the big energy companies to do it. A Tory aversion to regulation also rules out improving building regulations to provide warmer homes. However, according to *The Guardian* the new Secretary of State for Energy and Climate Change, Amber Rudd, does place a high priority on delivering energy efficiency.

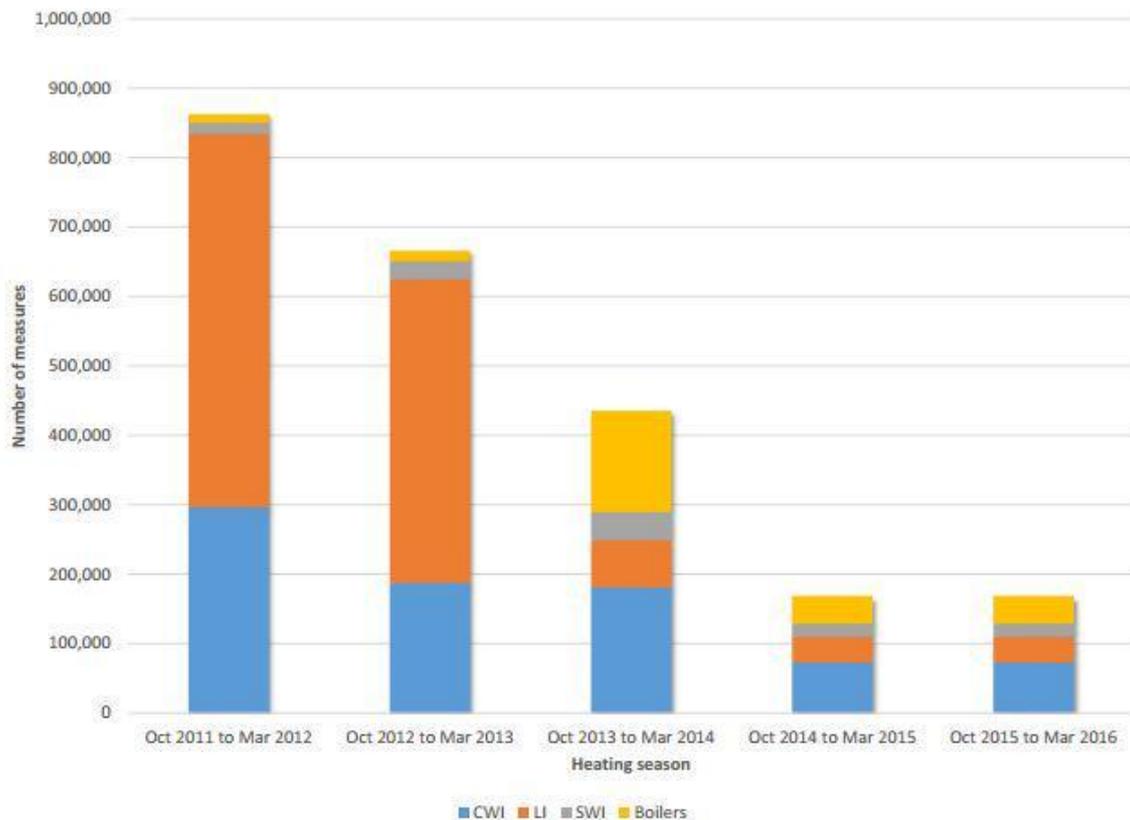
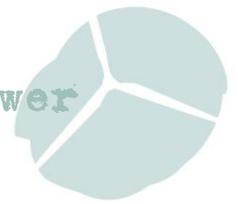


Figure 1: Major energy efficiency measures delivered to all households

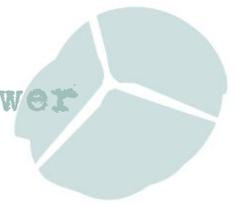
CWI = Cavity Wall Insulation LI = Loft Insulation SWI = Solid Wall Insulation (3)



For those who think Ed Davey was an effective Secretary of State when it comes to energy efficiency the above chart shows what he achieved.

The UK Treasury plans to spend £100 billion of public money on infrastructure over the course of the next Parliament. *“Investing just 3 per cent of the budget in making homes highly energy efficient, alongside existing energy efficiency budgets, can bring two million UK low income homes up to a high standard of energy efficiency by 2020. All six million low income homes should be brought up to this standard by 2025,”* according to Energy Bill Revolution. Such a move would not only cut cold home deaths, it would slash energy bills and carbon emissions, create more 100,000 jobs, help end fuel poverty, and reduce costs for the NHS.

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1. Independent 30th April 2015 <http://www.independent.co.uk/news/uk/home-news/fuel-poverty-killed-15000-people-last-winter-10217215.html>
 2. Guardian 11th May 2015 <http://www.theguardian.com/environment/damian-carrington-blog/2015/may/11/amber-rudds-appointment-as-climate-secretary>
 3. See <https://twitter.com/MartynWilliams2>



4. Levy Control Framework

A new report from the Policy Exchange think-tank says the Levy Control Framework budget may already be exhausted. The £7.6bn budget that is meant to provide subsidies for renewable energy schemes through to 2020/1 using money raised from consumers' bills may already have been allocated. A host of large renewable energy projects already in the pipeline may have to be abandoned unless more money is provided.

The think tank's analysis centres on concerns the currently relatively low wholesale cost of electricity means the government's system of price support contracts, known as contracts for difference (CfD), will be more costly than expected. It also warns the feed-in tariff scheme is in danger of exceeding its budget and the latest generation of offshore wind farms are designed to deliver a higher load factor than DECC expects, (closer to 45% than the 38% assumed by DECC) putting further upward pressure on the LCF subsidy budgets. So the LCF budget could be exhausted just as a system of contract auctions promises to push down the cost of clean energy subsidies.

Whilst the renewable energy industry is hopeful that some of the budget would remain available for the coming years, the fluctuating nature of wholesale power prices makes it extremely difficult to predict the precise size of the budget with any confidence.

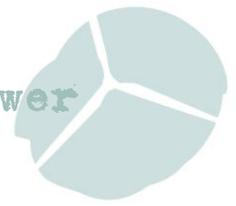
The green levies that underpin the LCF only account for around 7% of average household bills and are not the primary factor behind increases in energy bills in recent years, which were largely driven by increases in the cost of wholesale gas. However, any attempt to increase green levies to extend the LCF cap would likely prove politically toxic, while attempts to free up more of the budget by watering down existing subsidies would almost inevitably spark legal challenges.

Dr Gordon Edge, director of policy at trade association RenewableUK, said Policy Exchange's analysis could prove overly pessimistic, but he acknowledged there was considerable uncertainty over the current state of the LCF budget.

On top of this there are fears that energy efficiency schemes could grind to a halt later this year as energy companies meet their 2017 targets ahead of schedule. (1) (2)

Nearly 5GWe of onshore wind power schemes already given planning permission and a further 5 GWe awaiting planning consent face the prospect of not having the finance to be installed according to Dave Toke, reader in energy policy at Aberdeen University. The Tories are promising that onshore wind will not be funded after 2020. Their manifesto proclaimed a desire 'to halt the spread of onshore windfarms'. Yet the Conservative manifesto pronounced that; 'We will cut emissions as cost-effectively as possible'. The contrast between the pledge to give local people a say over proposed windfarms and a refusal to allow the same for fracking is breathtaking, says Toke.

There was no mention at all of solar power in the Conservative manifesto, and the only specific renewables that appear in the manifesto are offshore wind and the Swansea tidal power

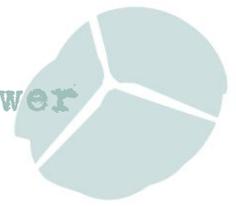


scheme. So, the Conservatives, even on paper are heading for a more expensive carbon reduction strategy. (3)

Shortly after the election the new government will have to decide the level of Levy Control Framework cap for the decade after 2020, says Tom Burke. In the current state of the public finances only an optimist will assume a rise much above the current level, if any at all. The fatal flaw with this policy is clearly revealed by the proposed agreement with EDF to build a £24bn nuclear power station at Hinkley Point. To go ahead EDF needs an index-linked guarantee of twice today's wholesale price of electricity for the next thirty five years. This will cost about £1.2bn per year. If the wholesale price of electricity goes up then the cost of the guarantee goes down. But if the wholesale price of electricity goes down, then the cost of the government's guarantee goes up. This provides the government with a massive, and perverse, incentive to drive the wholesale cost of electricity up. However, the next government, like the present one, will be under much political pressure to drive energy bills down. DECC assumes the wholesale price of electricity will go up. But government policies and static wages are already combining to drive energy demand down.

In Germany we have seen that as more renewables enter the electricity system they drive the wholesale price of electricity down. This would definitely be good for the climate and would be better for consumers if the cost of the guarantee for Hinkley were not being driven up. DECC is currently planning another four nuclear power stations the size of Hinkley. Simple arithmetic suggests that even if wholesale electricity prices remain the same this would consume £6bn of the £7.6bn currently available. Unless you assume an unusually generous Treasury the next government will have very little to spend on anything other than nuclear. If, however, the wholesale price of electricity goes down then there would quickly be nothing left for other electricity investments. No-one knows what the wholesale price of electricity will be in 2020 let alone 2060 when the Hinkley guarantee would expire. (4)

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1. Business Green 12th May 2015 <http://www.businessgreen.com/bg/news/2407992/is-the-clean-energy-sector-facing-a-subsidy-budget-crisis>
 2. Business Green 12th May 2015 <http://www.businessgreen.com/bg/opinion/2407936/dear-energy-secretary-im-afraid-to-tell-you-there-is-no-money>
 3. Dave Toke 19th April 2015 <http://realfeed-intariffs.blogspot.co.uk/2015/04/tories-plan-huge-waste-of-uk-renewable.html>
 4. Business Green 29th April 2015 <http://www.businessgreen.com/bg/opinion/2405902/apres-moi-le-deluge>



5. The Cost of Decarbonisation

It may seem academic now, but two days before the General Election *The Telegraph* attacked Labour's plans to decarbonise electricity by 2030 estimating that this would cost consumers over £200bn. Ed Miliband also promised to freeze energy prices until 2017. *The Telegraph* said:

"If the British public are going to the polls in the belief that the Labour Party will keep a cap on fuel bills, they are liable to get a very nasty shock come 2018 ... Labour's drive to go cold turkey on fossil fuels could result in a huge redistribution of wealth from poor to rich" because green levies are regressive. (1)

Of course the decarbonisation pledge was in line with the recommendations of the Committee on Climate Change (CCC). Labour would mandate a reduction from the 450 grammes of carbon dioxide emitted per megawatt hour of electricity generated today, to between 50 and 100 grammes in 2030. *The Telegraph* analysis rests on a series of shaky assumptions says the *Carbon Brief* website. More significantly, however, it is flawed because it ignores the cost of the alternatives.

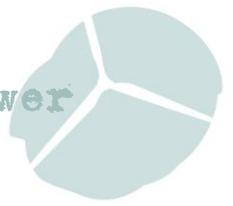
The Telegraph says wholesale electricity prices will rise from around £40 per megawatt hour today to £55 in 2030. The paper does not explain how it arrived at this figure. DECC's central projection is £73, which would make top-up subsidies for low-carbon energy sources relatively cheap. National Grid scenarios cover a range of £50 to £100 per megawatt hour in 2030. The reality is that future prices are highly uncertain.

The Telegraph then assumes without offering any justification that half of the UK's zero-carbon power in 2030 would be nuclear, up from 19% last year. It estimates the cost as the same as for building a new nuclear plant at Hinkley Point C in Somerset. The government says new nuclear plants will become cheaper through the 2020s, though nuclear has a poor record on cost.

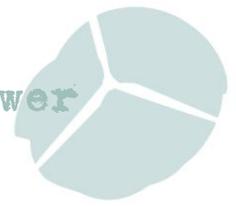
The Telegraph estimates the additional cost of nuclear electricity as the capital cost of building new reactors. It ignores the costs of generating power from other sources if nuclear plants are not built, for instance, the capital cost of new gas plant and the cost of gas to fuel them.

The Telegraph takes a completely different approach for renewables, where it uses the additional cost of subsidies on top of wholesale electricity prices. Without explanation, it assumes that onshore wind, offshore wind and solar will each generate one-sixth of the UK's electricity in 2030 and that costs will remain constant at 2014 levels – despite the recent falls in the cost of renewables. Carbon Capture and Storage was ignored.

What will it actually cost the UK to decarbonise its electricity supplies by 2030? The CCC thinks it can be met for an additional £15 per year on the average household energy bill in 2030. It says this spending would put the UK on a path to falling electricity prices after 2030, whereas prices would continue to rise if we rely on gas. That's in part because renewable sources generate very cheap power once they're built. (2)



1. Telegraph 5th May 2015 <http://www.telegraph.co.uk/finance/11582411/Milibands-green-pledges-could-wreak-havoc-with-the-UKs-finances.html>
2. Carbon Brief 5th May 2015 <http://www.carbonbrief.org/blog/2015/05/flawed-assumptions-blight-telegraph-analysis-of-uk-decarbonisation-costs/>



6. Renewable Heat, heat storage and grid balancing

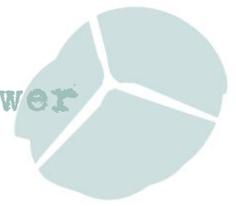
The UK is falling short on its targets for renewable heat. In an effort to comply with a legally binding EU target to source 15% of energy from renewables, the UK has set itself sub-targets of 30% of electricity from renewables, 12% of heat, and 10% of transport fuel. While the country is on track to hit its electricity targets, Ed Davey admitted that we are behind on heat and transport. The most recent figures for heat (2012) suggest that just 2.3% of the UK's heat comes from renewable sources. (1) The Climate Change Committee has warned that the UK is unlikely to meet its 12% target by 2010. (2)

Scotland is struggling too and in danger of missing its 11% renewable heat target by 2020 unless a “*major change of mindset*” is adopted, according to Scottish Renewables. The trade body says the country will need to “*kick its addiction*” to gas-fired boilers if it is to meet the ambitious target from its current renewable heat use of just 3%. The benefits of decarbonising heat use are not only related to the environment, but could save consumers money and boost the local economy, said the group's policy manager Stephanie Clark. “*Most of our homes, businesses and public buildings are warmed by conventional gas boilers, and we must kick that addiction. District heating, for example, is a great way for hundreds of homes to share one heat source, but we have yet to see a consensus on its importance in Scotland,*” Clark added. The group said it will lobby for a “re-think” on Scotland's approach to heat. (3)

“More than half of the energy consumed in Scotland is in the form of heat. As a society, we take warm homes and workplaces and constant hot water for granted, but the time is now right for us to re-think our relationship with heat and the way it is generated, transported and used”. (4)

Combined heat and power (CHP) generators, built to provide heat for district heating networks, could provide the backbone technology for an energy system dominated by renewables. Because they can produce both saleable heat and electricity and can rapidly ramp up and down over short periods of time, CHP stations could be used to balance power grids in order to compensate for fluctuating renewables like wind and solar power. (5) In Germany, for instance, as wind and solar PV take on a greater proportion of total electricity production, CHP plants are expected to take on the role of providing more flexible electricity generation. At the moment CHP plants focus on meeting the demand for heat. Electricity production is seen as a useful by-product. In future the focus will switch to providing electricity when the output from wind and solar is low. (6)

At a UK level, the Energy Technologies Institute (ETI) - a public private partnership between the UK Government and various energy corporations including EDF Energy, BP and Shell - points out that around 20% of the UK's carbon emissions are generated by domestic heating. By 2050 we need to see the near total elimination of carbon emissions from the domestic sector, if we are to meet our climate change objectives, yet 90% of existing houses are expected to be still in use by then. In more densely populated urban and suburban areas, and potentially some rural towns the solutions are likely to involve shared heat networks. With 26 million UK households needing some kind of treatment to decarbonise heating that means treating 20,000 homes every week between



2025 and 2050. The challenge will be to build the social and political momentum necessary to introduce new local energy production and distribution on the scale required. (7)

The successful combination of CHP and renewables elsewhere in Europe has been attracting increasing attention. (8) For instance Denmark currently relies on wind power for nearly 30% of its electricity and combined heat and power (CHP) plants supply 50%. Plans are in place to increase wind power up to 50% by 2050. The challenge associated with this system is that as the share of wind power rises, there will be less demand for electricity from CHP plants, meaning that this energy could be wasted. One solution, known as a smart energy system, requires flexible energy conversion and storage technologies to be incorporated. CHP plants could be provided with heat pumps and additional storage capacity to store additional energy on windy days. (9) So district heating systems could absorb large quantities of surplus wind-generated electricity by using heat pumps and electric heaters for heating water. When demand for electricity is high, but the wind is low, CHP plants could sell electricity but store heat if there is no demand for it at the time. (10)

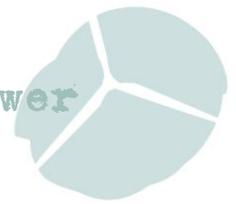
Micro-CHP (mCHP) could also play a similar role as a grid support mechanism to cope with capacity constraints and short-term spikes in demand and meet the electrical requirements of other new technologies which require electricity such as electric vehicles and heat pumps. mCHP is an innovative new technology, which has significant potential to reduce carbon emissions. There are several competing technologies, but all would replace a conventional domestic central heating boiler, and produce electricity as well as hot water for heating. (11)

City-scale Heat Pumps

Star Renewable Energy, based in Glasgow, is the first company to offer a city-scale heat pump. This is being used in Drammen, in Norway, to harvest heat from a fjord and deliver it to a district heating network which is heating 6,000 houses. The project has successfully delivered 85% of the heat required by the district heating scheme at one seventh of the cost of gas. Director Dave Pearson says: “*The River Clyde, for example, could offer enough heat for 500,000 houses. The Forth Estuary, being in effect the North Sea is larger than required for all of Edinburgh.*” Pearson is calling for an extension to the Renewable Heat Incentive and for consideration to be given to funding similar projects from general taxation. He says any notion that new district heating networks need to start off based on gas is a colossal mistake that will consign a generation to burning fossil fuels. (12)

Lerwick, on the Shetland Islands, which is already host to the largest district heating scheme in Scotland, could soon be expanded by using a city-scale heat pump. The system is currently heated by burning the islands' household and industrial rubbish, but even though it is importing rubbish from neighbouring Orkney as well as from the Highlands, the sparse population of the north of Scotland means that there is insufficient waste to burn to meet demand from the town's district heating system. (13)

In Germany Lichtblick, an energy supplier, is already implementing a novel commercialisation model for mCHP with a view to creating a ‘virtual power station’ of mCHP units to balance wind in the network. LichtBlick has announced its goal to place 100,000 micro CHP systems with an electric output of 20 kW each into homes and buildings in Germany. The property owner will be

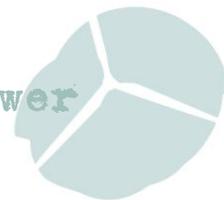


provided with the cogeneration unit and a heat storage unit and be guaranteed that the home will be supplied with heat as required. LichtBlick would maintain ultimate control over the cogeneration unit with remote capability to manage the unit. A large heat store decouples the production of heat from that of electricity when necessary. The multiple small units give a sensitive and responsive network of immediate capacity to create a supply of up to 2 GW. (14)

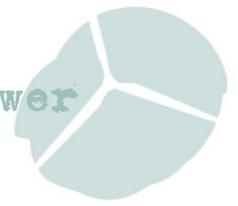
Similarly, in areas not connected to district heating networks, Air Source Heat Pumps (ASHP) could be used to generate heat. But if used in conjunction with heat stores the heat pumps could be operated when electricity demand is low, and therefore cheap rather than at peak times. Sunamp has installed its heat batteries in seven homes owned by Berwickshire Housing Association (mostly electric heated) and three staff homes. The goal was to shift 100% of the electricity demand to power an ASHP heating system to off-peak electricity. Because Sunamp heat batteries are compact they are practical to use in ordinary homes. Initial results are showing significant savings to householders. (15)

Once District Heating networks have been established all kinds of different heat sources can be used to add heat to the system. Researchers in Nottingham have discovered how abandoned coal mines could produce renewable heating for tens of thousands of homes and offices in the UK. As part of a two-year project, researchers at Nottingham Trent University worked with renewable energy firm Alkane Energy to explore how water at the former Markham Colliery in North East Derbyshire could be condensed in a heat pump and fed through a district heating network. (16)

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7. Energy Storage

"Did Tesla just kill off nuclear power?" asked Forbes on 1st May. Tesla Motors CEO Elon Musk had announced an industrial-scale battery that will cost about 2¢ per kilowatt hour to use, putting the final nail in the coffin of nuclear power. The news first broke in the middle of a debate on the future of nuclear power. It was Arnie Gundersen vs. Jordi Roglans-Ribas, the director of the Nuclear Engineering Division of Argonne National Laboratory. Gundersen said:

"We all know that the wind doesn't blow consistently and the sun doesn't shine every day, but the nuclear industry would have you believe that humankind is smart enough to develop techniques to store nuclear waste for a quarter of a million years, but at the same time human kind is so dumb we can't figure out a way to store solar electricity overnight. To me that doesn't make sense."

Then Gundersen told the audience about Tesla's large batteries at about 2¢ per kilowatt hour. *"That's an enormous breakthrough,"* Gundersen said. *"So the nuclear argument that they're the only 24-7 source is off the table now."*

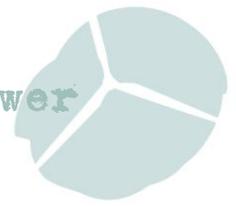
The UK government just signed an agreement guaranteeing a price of 16 cents per kilowatt hour for power generated by Hinkley Point. That fresh contract represents an example, Gundersen argued, of the market price of new nuclear power. Solar power costs six to seven cents, he said, and wind costs four or five cents. Add 2¢ for the cost of a utility-scale Tesla battery, and renewables with reliable storage are still at half the price of new nuclear power. (1)

Catherine Mitchell, professor of energy policy at the University of Exeter, called the announcement "a nail in the coffin" for conventional utilities. (2)

The US Nuclear Information and Resource Service reposted the Forbes piece on Facebook and Twitter—with the added comment: *"Yes. And fossil fuels too."* And it quickly became the most popular item it had ever posted. Clearly, Tesla has tapped into something. (3)

Musk also launched a household battery pack that could slash electricity bills by storing electricity from solar panels and other renewable sources and extract electricity from the grid overnight to be used in peak daytime hours. The announcement of two domestic-scale lithium batteries, rated at 7kWh and 10kWh of energy storage was widely trailed. But what no one expected was the price - which came in at a half to a quarter of market expectations: *"Tesla's selling price to installers is \$3,500 for 10kWh and \$3,000 for 7kWh. (Price excludes inverter and installation.) Deliveries begin in late Summer."* (4)

Dr Jonathan Radcliffe an energy storage expert at Birmingham University, says for UK consumers the costs are still a bit high. And the UK's regulatory situation is particularly unfriendly to the technology as it does not include a variable tariff that favours those that can shift their electricity demand to off-peak times. Consumers would be unwise to invest in the technology before the UK's rollout of smart meters is underway. The energy storage revolution is coming and Musk and Tesla are in the vanguard. But consumers will only make this switch if Tesla (or someone else) makes it an economic no-brainer. What Radcliffe doesn't mention is that most domestic solar producers get paid a notional amount for electricity exported, which they would still get even if they used all the electricity themselves. So this will help the



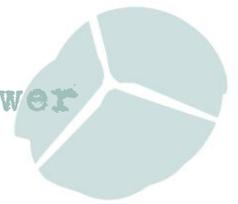
economics. But you would still be paying around £2,000 to store 7kWh of electricity (which is worth about £1). (5)

In 2014, a chorus of analyses from major financial institutions—including Bank of America, Barclays, Citigroup, Fitch Ratings, Goldman Sachs, Morgan Stanley, and UBS—found that solar-plus-battery systems pose a real and present threat to traditional utility business models. Their perspectives varied, but all echoed the common theme of increasing challenges for the current utility business model. (6)

Tesla is not the only company working on battery storage. The Faroe Islands are set to host Europe's first ever commercial deployment of a wind farm-connected battery storage system, as part of an effort to cut the archipelago's dependence on oil, while meeting its growing energy needs with renewables. A 2.3MW lithium-ion energy storage system (ESS) will be installed in a joint effort by industrial battery maker Saft and German wind turbine maker Enercon, together with the islands' power producer and distributor, SEV. (7)

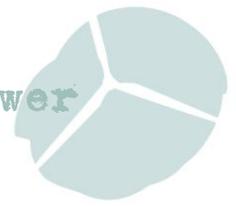
Phil Taylor, Professor of Electrical Power Systems and Director of the Institute for Sustainability at Newcastle University, has called on new UK government to invest in energy storage. He says if the government is going to address fair pricing of energy for consumers then changes in energy regulation and policy are needed to make the price of energy reflect the current grid carbon mix, and demand should be more flexible to match low carbon generation. The UK has a massive opportunity to become a global leader in energy storage similar to what Germany has done for the deployment of renewable energy generation, but there are steps that government needs to take in order for the country to realise the wider benefits of energy storage for the economy. (8)

- The influence of the Big Six energy companies in Whitehall is so strong that they are dictating policy and preventing the electricity system from getting the radical overhaul it desperately needs, according to Sir Jonathon Porritt. He said executives from the energy companies have permeated the civil service, locking the electricity system into a status quo that boosts their profits at the expense of UK households. He said the major challenge for the next government would be to break the dominance of the Big Six energy providers - British Gas, SSE, Scottish Power, RWE, E.ON and EDF - and totally change the way the electricity grid operates. (9)
- Former Labour MP and microgeneration enthusiast, Alan Simpson, says it doesn't matter whether the Tesla Powerwall turns out to be the ultimate answer or not. It is a game changer. Marketed in conjunction with WalMart in the US, and partnering with Lichtblick in Germany, Musk aims to turn "storage" into the same mass-market product that solar has become. The biggest changes in tomorrow's energy systems aren't even waiting for politicians. Soon homes will have generation and storage systems that are as "normal" as central heating. We will be heading away from today's centralised energy cartels and into a different era of energy democracies. Add to this the technology partnerships across Germany (and in Manchester!) that are creating local power "systems" (virtual power plants) to serve whole towns and cities, and you begin to get a picture of a different energy economics — one that will deliver massive increases in employment, energy security and interconnectedness. Clean "heat" networks will follow



next. And within it all, communities will compete around reduced carbon footprints and lower consumption. (10)

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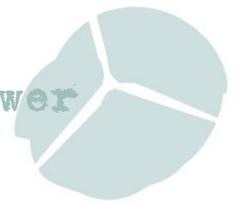


8. Moorside

A public consultation on plans to construct a new nuclear power station will start on May 16th. NuGen's proposed Moorside Project, which would be Europe's largest new nuclear development, is proposed for land surrounding the existing Sellafield Site. The consultation will start with an event at the Moorside Information Centre in Whitehaven's Civic Hall. More than 20 consultation events are to be held across Cumbria and the process is expected to last for 10 weeks. (1)

Every paper in Cumbria carried a double page spread about the plan to build 3 AP1000 reactors on ancient green fields and hedgerows next to Sellafield. Radiation Free Lakeland caught NuGen out claiming that the project would provide approximately "7% of the UK's current energy requirement" when, in fact, what they should have said is 7% of the UK's electricity. (2)

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9. French Nuclear Companies in Trouble

The French, mostly state-owned, company, charged with designing the EPR reactors for Hinkley Point C is in trouble. For decades, France has been a living laboratory for atomic energy, getting nearly three-quarters of its electricity from nuclear power — a higher proportion by far than in any other country. And France's nuclear companies have long been star exporters and ambassadors of French technological prowess. But in the last few years, the French nuclear mojo has started to stall. New plants that were meant to showcase the industry's most advanced technology are years behind schedule and billions of euros over budget. Worse, recently discovered problems at Flamanville have raised new doubts about when, or even if, they will be completed.

Areva was created in 2001 through a consolidation of the state-controlled industry. Construction of its first EPR reactor began in 2005 with a 2009 target date to begin operations. The earliest it is now expected to go into service is 2018 — at a cost that could be three times the 3 billion euros originally estimated.

Another stumble came in 2009, when France failed to land an estimated \$20 billion deal to supply four EPR reactors to Abu Dhabi. That job was won by a South Korean group led by Korea Electric Power, which offered a simpler, less expensive technology; the first of those reactors is scheduled to begin operating in 2017.

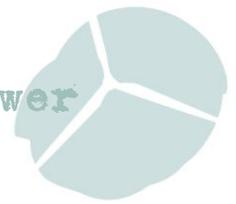
And Areva badly overpaid for UraMin, a Canadian uranium-mining company, and later took a write-down of almost €1.9 billion as a result. The matter is still under investigation by French financial prosecutors.

The company's loss last year was €4.8 billion, so ignoring Areva's problems any longer would be impossible. (1)

Areva's La Hague plant is in crisis as clients shun nuclear reprocessing. La Hague needs to cut costs as its international customers disappear, and its sole remaining big customer, fellow state-owned French utility EDF, pressures it to cut prices. This year, La Hague expects to reprocess 1,205 tonnes of spent fuel, of which just 25 tonnes will come from abroad. That leaves Areva with EDF virtually as its sole customer, and although both firms are state-owned - Areva 87%, EDF 85% - EDF has played hardball in contract negotiations. (2)

Alarmed by Areva's problems, the Socialist government of President François Hollande is expected to announce an industry overhaul soon. The government will aim not only to put the companies on a firmer financial footing but also to reorganize them in hopes of restoring the French industry's role-model luster. China National Nuclear Corporation says it would be interested in making a financial investment in Areva.

One possible solution would be for EDF, to take over Areva's reactor building operations leaving a scaled-down Areva to focus on the steadier, if less glamorous, tasks of mining and refining uranium, supplying fuel to plant operators and disposing of radioactive waste. But it is unclear whether the reorganization could salvage France's nuclear leadership or merely stop Areva's financial free fall. (3)



To begin with Areva is to cut 6,000 jobs ahead of the announcement of a rescue plan. (4)

But talks about EDF buying Areva's reactor business are being held up by disagreements about its value. The companies are discussing two scenarios. The first is a takeover Areva's nuclear engineering arm. The second is a takeover of Areva's entire nuclear reactors business, which includes the engineering business. Both sources said EDF had made a firm offer of 280 to 300 million euros for the engineering arm, which employs about 10,000 staff and which Areva values at 1 billion euros (\$1.13 billion). The second scenario would involve a complete takeover of Areva's nuclear reactor division, Areva NP, which employs about 17,000 people, of which 10,000 are in France. (5)

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