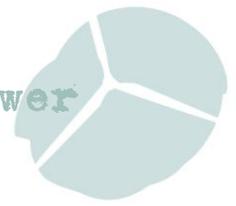


No.87 August 2016

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1. Hinkley : A dramatic turn of events

It has now been a few days since the Government shocked the energy industry by announcing a further review of the Hinkley Point C nuclear power station just a few hours after EDF approved the project.

Although we may never know exactly what has gone on behind the scenes it is clear that EDF had moved its final investment decision forward from September in order to bounce the new UK Government into giving its approval quickly (1) before mounting problems become even more obvious to everyone.

Stop Hinkley spokesperson, Roy Pumfrey said:-

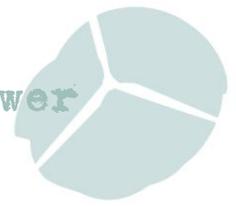
“Much of the media seems to think this is just a temporary pause and that Hinkley Point C will eventually go ahead, but if Theresa May gives this scheme just a cursory glance she will see that we are being asked to buy a pig in a poke.”

According to the *Financial Times* (2) the head of EDF, Jean-Bernard Lévy gave his fellow board members only two days to read 2,500 pages of contracts for a deal which one investment analyst described as “*verging on insanity*”. (3)

The decision to review the project has been attributed by some to security concerns about Chinese involvement in the sector expressed by Mrs May’s chief of staff, Nick Timothy. The Stop Hinkley Campaign has itself expressed concerns in the past about making nuclear deals with a country with such a poor health and safety record. (4)

Writing on the *Conservative Home* website last October Timothy said the Hinkley deal could lead to the Chinese designing and constructing a third nuclear reactor at Bradwell in Essex. Security experts – reportedly inside as well as outside government – are worried that the Chinese could use their role to build weaknesses into computer systems which will allow them to shut down Britain’s energy production at will. (5) For those who believe that such an eventuality is unlikely, the Chinese National Nuclear Corporation – one of the state-owned companies involved in the plans for the British nuclear plants - says on its website that it is responsible not just for “*increasing the value of state assets and developing the society*” but the “*building of national defence*.” MI5 believes that “*the intelligence services of...China...continue to work against UK interests at home and abroad*.”

Mandiant, a US company that investigates computer security breaches around the world, looked into the operations of just one Chinese cyber espionage group, believed to be the Second Bureau of the People’s Liberation Army of China, or ‘Unit 61398’. Mandiant found that Unit 61398 has compromised 141 different companies in twenty major industries. There were 115 victims in the United States and five in the UK. The intellectual property stolen included technology blueprints, manufacturing processes, test results, business plans, pricing documents, partnership agreements, and emails and contact information. Timothy said “*evidence like this makes it all the more baffling that the British Government has been so welcoming to Chinese state-owned companies in sensitive sectors. The Government, however, seems intent on ignoring the evidence and presumably the advice of the security and intelligence agencies. But no amount of*



trade and investment should justify allowing a hostile state easy access to the country's critical national infrastructure. Of course we should seek to trade with countries right across the world – but not when doing business comes at the expense of Britain's own national security.” (6)

EDF's future threatened

Perhaps of more immediate concern is that a go-ahead for Hinkley could threaten the future of the company itself. EDF is a company in a very precarious financial situation. The ratings agency, S&P, postponed a decision to downgrade its credit rating when the UK Government announced the review. (7) EDF has €37 billion of debt. The collapse in energy prices has pushed earnings down 68% in 2015. The Company needs to spend €50 billion upgrading its network of 58 ageing reactors by 2025. It is scrambling to sell €4 billion of new shares and €10 billion of assets to strengthen its balance sheet. EDF is also expected to participate in the €5 billion bailout of Areva, the bankrupt developer of EPR technology, by taking a 75 per cent stake. (8) About the last thing it needs is a new €15 billion millstone around its neck. (9)

Roy Pumfrey said *“The EDF Board should take the opportunity presented by this pause to see that its Nuclear SatNav has taken the Company down a dead end; it's only a matter of time before we hear that voice saying "At the next opportunity, turn round!"”*

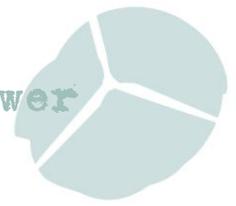
He continues: *“Perhaps most disappointing if not unexpected has been the reaction of the big UK Union leaders. Whilst confessing themselves 'baffled' by the government's 'bonkers' decision, they should ask why the French union leaders representing EDF's own workers were (and are) solidly and vocally opposed to HPC. This project involves a reactor which many of EDF's own staff regard as unconstructable, selling off the family silver to fund it and putting EDF and therefore their own livelihoods at risk. UK unions do not seem to appreciate that the fantasy 25,000 jobs on HPC are a conjurer's trick. Only 30% will be 'local', which means 90 minutes drive time from HPC, and with only 5,600 on site on any one day, a job with a particular skill set will only be good for two years at most. That's assuming that HPC can be built in an optimistic ten years, even that too long to keep the lights on.”*

Over recent months several different alternative to building Hinkley Point C have been detailed (10) Most recently consultancy firm Utilitywise has described the proposed nuclear station as an *“unnecessary expense”* Energy efficiency measures could save the equivalent amount of electricity along with £12bn (11)

Roy Pumfrey said: *“This Government review of Hinkley Point C provides us with a wonderful opportunity to turn Somerset into a sustainable energy hub for England. The alternatives would be better for jobs, better for consumers, would reduce the mountain of dangerous waste we don't know how to deal with and save Somerset from a decade of disruption caused by one of the biggest construction projects in the world The sooner EDF and the UK Government come to their senses the better.”*

Anti-Hinkley Tories

Perhaps most interesting amongst recent events has been the emergence of Conservative figures calling on the government to call time on the Hinkley proposals. The think-tank Bright Blue, whose advisory board includes Francis Maude, Nicky Morgan and former DECC minister



Greg Barker, has said the government needs a new “plan A”. The group stresses that its position is not necessarily endorsed by all members of the organisation, which includes more than 100 parliamentarians. *“The Government should abandon Hinkley C – pursuing it in light of all the evidence of cost reductions in other technologies would be deeply irresponsible,”* said Ben Caldecott, associate fellow, Bright Blue. *“We need a new ‘Plan A’. This must be focused on bringing forward sufficient renewables, electricity storage, and energy efficiency to more than close any gap left in the late 2020s by Hinkley not proceeding. This would be sensible, achievable, and cheap.”* Zac Goldsmith, also a Bright Blue member, has welcomed the government’s rethink. (12)

Ben Caldecott said *“we seem to be re-entering reality, there is an opportunity to develop a new ‘Plan A’ ... A range of technologies can easily fill the envisioned capacity that Hinkley would have provided in the late 2020s had it been successfully delivered on the current (and already significantly delayed) construction schedule. They can also do this much more cheaply. Cancelling Hinkley would provide greater certainty for investors in other technologies thereby encouraging investment in new capacity today.”* (13)

He said the price of onshore wind is already much cheaper than nuclear (£85/MWh today and expected to fall to £60/MWh by 2020), with large-scale PV (expected to fall to £80/MWh by 2020) and offshore wind (expected to fall to £80/MWh by 2025) set to do the same – all well before Hinkley would start to receive its staggeringly high guaranteed and index-linked £92.50/MWh.

He goes on to say that Bright Blue will be publishing specific recommendations on energy efficiency soon, and that small modular nuclear reactors are very unlikely to be commercially available at all, let alone before the 2030s in any scalable, cost-competitive or politically acceptable way. They are too uncertain in terms of likelihood and cost for us to place too much faith in them yet, apart from perhaps investing in more R&D. *“Blind faith in new nuclear and shale gas have yielded precisely zero for UK security of supply, despite constant rhetoric to the contrary, and yet more punts in high risk areas would not be prudent.”*

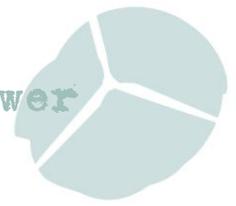
Take Action

Friends of the Earth – Scotland is asking people to write to Theresa May to express opposition to Hinkley Point C going ahead <http://act.foe-scotland.org.uk/lobby/StopHinkley>

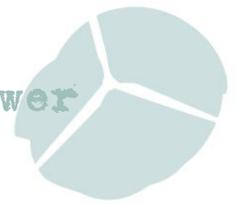
Greenpeace UK is asking supporters to sign a petition to Chancellor Philip Hammond to help convince him to abandon the project and back renewable energy instead.

<https://secure.greenpeace.org.uk/page/s/osborne-dont-waste-billions-nuclear>

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6. Conservative Home 20th October 2015
<http://www.conservativehome.com/thecolumnists/2015/10/nick-timothy-the-government-is-selling-our-national-security-to-china.html>
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8. Times 7th May 2016 <http://www.thetimes.co.uk/edition/business/sparks-to-fly-as-edf-board-faces-critics-over-hinkley-point-8wtzch2gq>
9. The Street 25th April 2016 <http://www.thestreet.com/story/13542318/1/edf-can-t-affordhinkley.html>
10. Stop Hinkley 16th May 2016 <http://www.stophinkley.org/PressReleases/pr160516.pdf>
11. See Edie 1st August 2016 <http://www.edie.net/news/6/Energy-efficiency-would-be-cheaper-than-Hinkley/30645/>
12. Solar Portal 29th July 2016
http://www.solarpowerportal.co.uk/news/conservative_think_tank_turns_back_on_hinkley_c
13. Conservative Home 30th July 2016 <http://www.conservativehome.com/platform/2016/07/ben-caldecott-lets-seize-this-chance-to-scrap-hinkley-and-choose-a-clean-green-and-efficient-alternative.html>



2. Alternatives to Hinkley

Over the last few months Hinkley Point C (HPC) has been described as a white elephant; a deal whose flaws have become increasingly apparent; verging on insanity; a project which should be ringing alarm bells deafeningly loudly; too expensive and unproven; likely to kill British manufacturing; bad for consumers, the taxpayer, business and potentially the environment; beyond any commercial logic; and a total waste of money. (1)

Even the *Financial Times* has called this project “a laughing stock”. It is at least eight years behind schedule and billions over budget, and cost estimates seem to rise every month, just as the date for a final investment decision disappears into the future. (2)

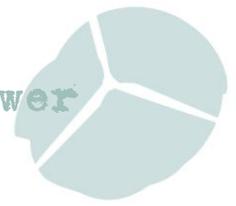
A recent devastating report from the Government’s spending watchdog – the National Audit Office (NAO) should provide a perfect excuse to ditch HPC. The NAO estimates that energy consumers could end up paying £29.7bn in top-up payments rather than £6.1bn estimated in October 2013 when the strike-price for the 35-year contract was originally agreed. The increase is due to the fact that wholesale energy prices are now expected to be much lower. (3) The Government itself estimated this figure could be even higher at £37bn. (4)

In May 2012 Charles Hendry MP, Minister of State, for Energy and Climate Change at the time told the House of Commons Select Committee that “*We do not have five years. We need to get moving on [building new reactors] now to make up for the failure of investment and new plant over previous decades.*” (5)

The five years is almost up but almost nothing has happened. Renewable energy and energy efficiency projects could be implemented very quickly and much more cheaply. Britain’s solar industry said three years ago it could install the same capacity as HPC in 24 months and at comparable cost. (6)

Other recent developments include:

- Solar energy has been advancing considerably faster than anyone expected just a few years ago. The American website, Climate Progress, says you’ll never believe how cheap solar energy is – in some parts of the world it costs less than 2p/kWh without subsidies. Because the cost of renewable energy has been falling so quickly “*almost everything you know about climate change solutions is probably outdated,*” (7)
- Offshore Wind Farms in the North Sea off the coast of the Netherlands are now expected to cost €87/MWh (£73/MWh) compared with £100/MWh for Hinkley Point C. (8)
- A crash programme to replace all the lights in the UK with LEDs could cut electricity bills, and cut peak electricity demand by about 8GW, a saving of about 15% of all power consumption. (9)
- Tidal Lagoon Power says the lifetime cost to consumers of its proposed Swansea Bay tidal lagoon would be the same as the Hinkley Point C. (10)

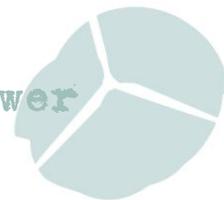


- Research by Forum for the Future, *Farmers Weekly* and Nottingham Trent University estimates that it would be relatively simple to get 20 GW onto the grid from farm-based solar and wind and some anaerobic digestion by 2020. (11)
- Domestic energy efficiency alone could save 40TWh/yr by 2030 and help eliminate fuel poverty into the bargain. (12)
- There are around 100 TWh of electricity savings detailed in a report for the Government by McKinsey for which there are currently no plans to capture. (13)
- Consultancy firm Utilitywise says Hinkley is an “*unnecessary expense*”. Energy efficiency measures could save the equivalent amount of electricity along with £12bn. (14)
- Plans for alternatives to HPC have been published by Molly Scott Cato, the Green MEP for South West England (15); the Intergenerational Foundation (16); the E3G Think Tank (17); and Green Hedge – a leading developer and operator of low carbon electricity generation and storage projects. (18) The Green Hedge plan says transforming weather-dependent solar and wind into a stable generator is possible with energy storage and backup gas generators.
- Writing on *The Independent* website Keith Barnham, Emeritus Professor of Physics at Imperial College says six bio-electricity technologies, all capable of continuous power operation, could provide ten times 3.2 GW before 2025. (19)

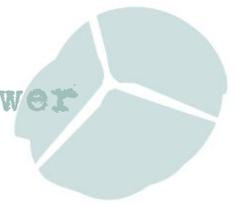
Ditching EDF’s plans for HPC would provide us with a wonderful opportunity to turn Somerset into a sustainable energy hub for England. The Stop Hinkley Campaign urged Clark to get on with it as soon as possible.

Unfortunately Greg Clark wasted little time nailing his colours to the mast. Welcoming EDF’s announcement that it would announce a Final Investment Decision on 28th July he said: “*New nuclear is an essential part of our plan for a secure, clean and affordable energy system that will power the economy throughout this century.*” (20) However, other senior figures within Mrs May’s administration are less convinced. Last year, Boris Johnson attacked the project as “disgraceful” and an “extraordinary amount of money” to spend. (21)

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1. See <http://www.stophinkley.org/PressReleases/pr160415.pdf> for a full list
 2. FT 18th July 2016 <http://blogs.ft.com/nick-butler/2016/07/18/energy-policy-under-a-new-government-a-chance-to-think-again/>
 3. Guardian 13th July 2016 <https://www.theguardian.com/business/nils-pratley-on-finance/2016/jul/13/poundlands-bid-decision-is-fine-but-please-dont-use-brexit-as-the-excuse>
 4. Business Green 8th July 2016 <http://www.businessgreen.com/bg/news/2464269/hinkley-cost-estimate-rises-to-gbp37bn>
 5. See page Ev 17 “Building New Nuclear: the Challenges Ahead”, Energy and Climate Change Committee, Volume 1, 4th March 2013 <http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenergy/117/117.pdf>



6. Click Green 24th October 2013 <http://reskin-cg.class-media.co.uk/opinion/opinion/123982-renewable-energy-boss-tells-pm-solar-power-could-match-hinkley-in-2-years.html>
7. Climate Progress 18th July 2016 <http://thinkprogress.org/climate/2016/07/18/3797907/solar-energy-miracle-charts/>
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9. Ecologist 8th June 2016 http://www.theecologist.org/blogs_and_comments/commentators/2987760/the_urgent_case_for_an_mass_s witch_to_led_lighting.html
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11. Farm Power: Exploring the size of the prize, Forum for the Future, November 2014 http://www.forumforthefuture.org/sites/default/files/Farm%20Power_Size%20of%20the%20Prize%20report_Nov-2014.pdf
12. Energy Efficiency: Fighting to keep Bills Down Permanently, ACE November 2011 <http://ukace.org/wp-content/uploads/2013/11/ACE-November-2013-Energy-efficiency-fighting-to-keep-bills-down-permanently.pdf> (See table 16, page 54)
13. McKinsey, 2012 Capturing the full electricity efficiency potential of the U.K Draft report. <http://www.decc.gov.uk/assets/decc/11/cutting-emissions/5776-capturing-the-full-electricity-efficiency-potentia.pdf>
14. Edie 1st August 2016 <http://www.edie.net/news/6/Energy-efficiency-would-be-cheaper-than-Hinkley/30645/>
15. The Power to Transform the South West, http://mollymep.org.uk/wp-content/uploads/The-power-to-transform-the-South-West_FINAL1.pdf
16. Toxic Times Capsule by Andrew Simms, Intergenerational Foundation, April 2016 <http://www.newweather.org/wp-content/uploads/2016/04/Toxic-Time-Capsule.pdf>
17. Guardian 18th Mar 2016 <http://www.theguardian.com/environment/damian-carrington-blog/2016/mar/18/five-ways-to-power-the-uk-that-are-far-better-than-hinkley-point>
18. Regen SW 22nd April 2016 <https://www.regensw.co.uk/blog/2016/04/hinkley-point-through-the-looking-glass/>
19. Independent 11th May 2016 <http://www.independent.co.uk/voices/the-government-should-scrap-its-costly-hinkley-point-deal-and-accept-renewables-can-keep-the-lights-a7021196.html>
20. Guardian 22nd July 2016 <https://www.theguardian.com/uk-news/2016/jul/22/edf-at-decision-point-over-hinkley-point-nuclear-power-station>
21. Times 25th July 2016 <http://www.thetimes.co.uk/edition/business/new-government-new-minister-and-a-new-test-for-hinkley-point-3xmj79306>



3. Renewable costs still falling

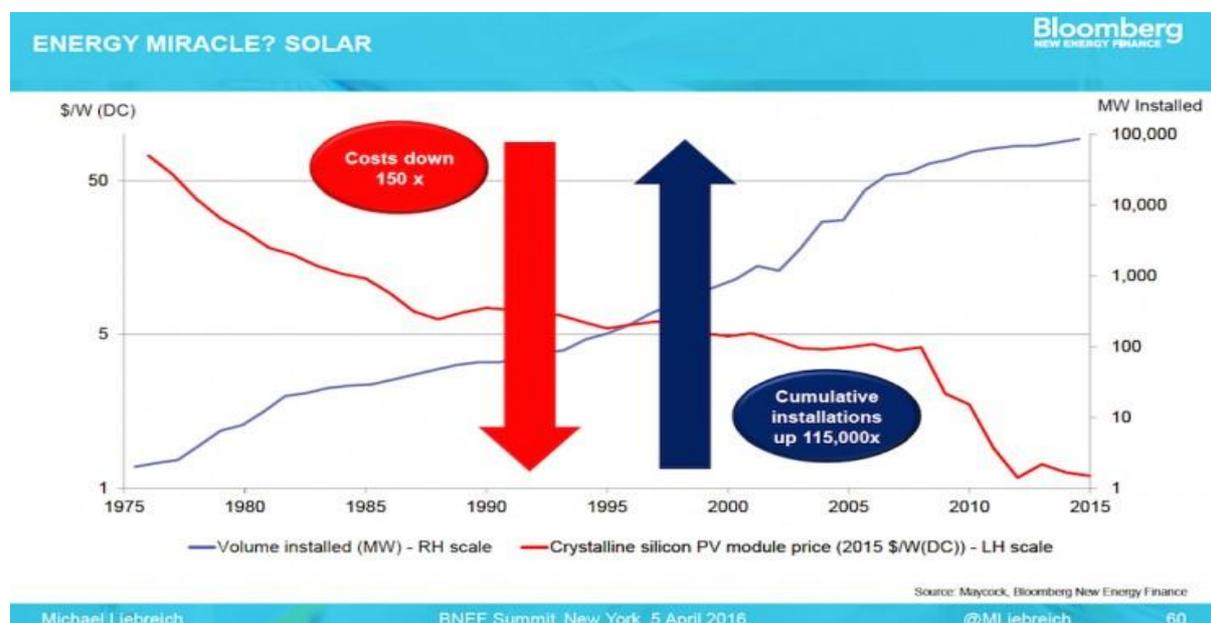
The cost of offshore wind power in the North Sea is now 30% lower than that of new nuclear - helped along by low oil and steel prices, reduced maintenance and mass production. By 2030 the sector is expected to supply 7% of Europe's electricity. A building boom is underway offshore in Europe. Up to 400 giant wind turbines are due to be built off the northeast coast of the UK in what will be the world's largest offshore wind development. Output from the Dogger Bank project will be 1.2 GW (gigawatts) - enough to power more than a million homes.

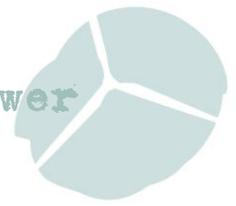
Next year, a 150-turbine wind farm off the coast of the Netherlands is due to start operating, and other schemes along the Dutch coast are in the works. Costs have also dropped due to lower prices on the world market for steel, a major building component in offshore installations. And new methods have been adopted for laying foundations for pylons at sea. The industry says that as projects have grown in size, economies of scale have been achieved. The cost of cables connecting the wind pylons to power networks onshore has also been reduced. Initially, cables were produced to operate at full capacity at all times, but new cables that are less bulky and less expensive are able to cope with the intermittent power produced.

DONG Energy of Denmark, the world's largest offshore wind company, won a bid to build two wind farms 22 km 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 €87/MWh when transmission costs are included. At present, the cheapest offshore power is €103/MWh, generated by a wind farm off the coast of Denmark. (1)

Solar

Solar energy has been advancing considerably faster than anyone expected just a few years ago.. It's hard to keep up with the speed-of-light changes, but one chart sums up the whole solar energy miracle from Bloomberg New Energy Finance (BNEF) Chairman Michael Liebreich.





Thanks to sustained long-term deployment programs, Liebreich explained, “We’ve seen the costs come down by a factor of 150 since 1975. We’ve seen volume up by 115,000.” “How much more miracle-y do you need your miracles to be,” Liebreich added. What that chart doesn’t reveal is that the price drop and the sales volume increase are directly linked. There is a learning curve: Over the past four decades, for every doubling in scale of the solar industry, the price of solar modules has dropped roughly 26%. Because clean energy has been moving at the speed of light “almost everything you know about climate change solutions is probably outdated.”

Demand Management

Businesses could provide electricity equivalent to output of six new power stations by flexing demand and utilising better-enhance onsite generation projects, a new report from the Association for Decentralised Energy (ADE) has claimed. The Flexibility on Demand report, released reveals that businesses venturing in to demand response initiatives could establish a 10-fold increase in revenue streams – having already gained £100m from the Government’s Capacity Market. The report notes that UK energy consumers would save £2.3bn by 2035 and that more business-led demand response initiatives would reduce demand on the electricity grid and lower national costs by £8.1bn by 2030 – more than £300 per household.

ADE’s director Tim Rotheray said: “*Keeping the lights on and our factories running is becoming increasingly challenging as the electricity market changes. We are building more wind and solar, which cannot always be depended on, and we are seeing our traditional large nuclear and coal power plants close down.*” (3)

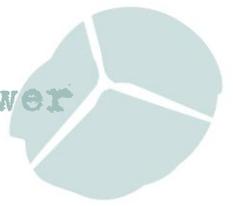
Local Energy

Local Authorities across the UK have been showing an increasing interest in energy for several reasons. Firstly, as large consumers of energy themselves high energy prices have been having a big impact on council budgets. Secondly by generating their own energy or reducing consumption or encouraging community projects to generate energy or reduce consumption, they can bolster the local economy and generate revenue at a time of severe budget constraints. Thirdly decentralised energy and energy efficiency projects allow them to bring money into the local economy by making the most of grants and financial support available. Fourthly Councils want to assist local residents suffering from fuel poverty, and finally many have local climate change objectives.

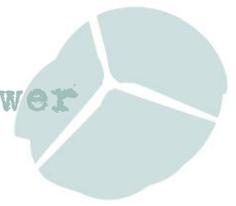
Local Authorities could transform efforts to create a cleaner, smarter and more affordable energy system, provide an alternative to the big utilities, and boost their local economies in the process. The emergence of a number of innovative local energy initiatives presents a challenge to UK energy policy but also an opportunity to move to a more democratic, locally-controlled sustainable energy market. Local Authorities have a unique ability to be visionary and pragmatic at the same time.

A new report from *Microgen Scotland* looks into local energy in more detail:

<http://www.microgenscotland.org.uk/news/news-2016/role-local-authority-energy-companies-community-energy-co-operatives-building-low-carbon-energy-system-scotland/>



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1. **Ecologist 19th July 2016**
http://www.theecologist.org/News/news_round_up/2987919/offshore_wind_powers_ahead_as_prices_drop_30_below_nuclear.html
 2. **Climate Progress 18th July 2016** <http://thinkprogress.org/climate/2016/07/18/3797907/solar-energy-miracle-charts/>
 3. **Edie 20th July 2016** <http://www.edie.net/news/6/Business-led-demand-response-system-could-generate--8bn-for-the-UK/>



4. Renewable Targets for 2030

Britain can produce 85% of its electricity with renewable energy by 2030 provided it undergoes significant changes in energy production and use, according to a study by Demand Energy Equality (DEE) for Greenpeace.

If we are going to move to a low carbon energy system, as well as decarbonising electricity we are also going to have to decarbonise heat and transport. The focus of the (DEE) scenario is to look at the electrification of heat and transport. The majority of "renewables" produce energy in the form of electricity, so looking at using renewable electricity to fuel heat and transport is both logical and intuitive.

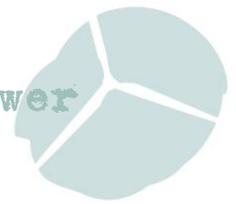
About 83% of UK homes are currently heated by gas boilers and 60% of the average UK household annual energy bill involves paying for them. This is despite the fact that boilers are predominantly used to heat homes during the winter months. The size of gas demand, in comparison to the total electricity demand, makes it clear that electrification will be problematic. The variation in peak demand for gas over a day can be huge especially during the winter. The largest delivered domestic heating peaks reach 160GW in the mornings and evenings of the coldest winter days whereas the UK's total electricity generation capacity in January 2015 was only 85GW. Even accounting for the performance gains enabled by heat-pump technologies, to substitute electricity for gas as the principle energy form for domestic heating delivery requires over a 60% increase in our entire electricity generation capacity.

The DEE report suggests demand for energy to heat our homes needs to fall by more than half over the next 15 years through a revolution in home insulation measure, saving people lots of money. That fall in home heat demand would allow technology like heat pumps to provide a quarter of our heating, but rolling out this technology at that scale in the next 15 years would be challenging.

The report's targets for onshore renewables are actually fairly modest. It suggests a 47% increase from the number of onshore wind turbines that were built or approved for building at the end of 2014; and a target for solar panels only a bit larger than one once put forward by a Conservative minister (before they went off the idea). When it comes to oceans, though, it's ambitious. Most of our power capacity, 55GW, would be in offshore wind farms located around the UK, building more than twice as much as currently exists or consented. This would amount to a world-leading revolution in technology and would be roughly in line with the "high renewables" estimates from the government's climate advisers.

In order to reduce the UK's reliance on imports from other countries the scenario still uses some gas backup. But conventional gas plants create a lot of heat, which is partially lost. The report suggests rolling out a fleet of new gas plants which would combine power generation with industrial or district heating.

They would sometimes operate alongside pumped-storage facilities – where water is pumped up-hill when there is too much power and allowed to flow down when there's too little – to help



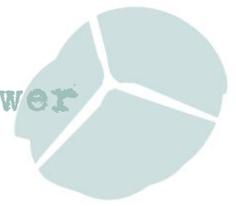
provide backup if the weather doesn't deliver all we need. Conventional plants would remain on the system, but would be barely used, running just 2.1% of the time.

The study also looks at how smart meters, batteries and demand-side management can be used to reduce the need for extra gas power stations at key moments. Essentially, what this report shows with unprecedented accuracy is that, contrary to popular belief, renewables can keep the lights on. (1)

WWF Scenario

A WWF report published in October 2011, came up with a similar number (between 60 and 90%) for a renewable energy target for 2030. GL Garrad Hassan (GL GH) was commissioned to develop six scenarios for where the UK's electricity will come from in 2030. The scenarios all achieve the near decarbonisation of the power sector by 2030 without new nuclear power. The generation mix differs according to the level of electricity demand and the use of different methods for ensuring system security. In all cases, the scenarios make full provision for ambitious increases in electric vehicles (EVs) and electric heating. Energy efficiency and behavioural change lead to the reductions in demand in the ambitious demand scenarios.

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1. Greenpeace Energydesk 21st September 2015 <http://energydesk.greenpeace.org/2015/09/21/4-ways-the-uk-can-get-almost-all-its-power-from-renewables/> Greenpeace 2030 Energy Scenarios, Demand Energy Equality, September 2015 <http://www.demandenergyequality.org/2030-energy-scenario.html> Guardian 20th September 2015 <https://www.theguardian.com/environment/2015/sep/20/85-of-british-power-can-be-via-renewables-by-2030-says-greenpeace>
 2. Positive Energy: how renewable electricity can transform the UK by 2030, WWF Report, October 2011 http://assets.wwf.org.uk/downloads/positive_energy_final_designed.pdf?_ga=1.17245754.2082993807.1470046759



5. The Folly of the Final Investment Decision

The Final Investment Decision made by the EDF Board on 28th July has been described by the Stop Hinkley Campaign as *“little more than EDF spin. The company has a long list of problems to sort out before construction can begin. EDF says there will no concrete poured until at least mid-2019 and this will depend on the start-up of the EPR (the European Pressurised Reactor) at Flamanville, scheduled for the end of 2018 – six years late.”*

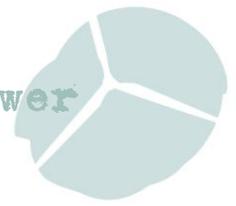
First the EPR design has not yet been built successfully anywhere in the world. It has been described by a nuclear engineering professor as ‘unconstructable’. (1) In France concerns over the safety of the reactor pressure vessel at Flamanville have arisen after tests “revealed the presence of a zone in which there was a high carbon concentration, leading to lower than expected mechanical toughness values”. Further tests will continue until the end of this year. (2) The French safety regulator ASN is making no promises about what remedial action might be required. In the worst case scenario the entire project may need to be abandoned. (3)

And secondly EDF doesn’t have the money to pay for it. French finance authorities raided the offices of EDF as part of a probe into EDF’s disclosure of information to the market. Investigators are said to be concerned about the reporting of its domestic nuclear maintenance costs as well as the plans to develop new nuclear reactors in Somerset. (4)

The EU has opened a State Aid investigation into the French Government’s rescue plan for Areva. (5) And any financial support to EDF to enable the company to build the Hinkley Point C will almost certainly be blocked by the European Commission. (6)

Two legal challenges: from Austria and Luxembourg, (7) and a group of German renewable energy companies (8) against the European Commission decision to allow to subsidise Hinkley Point C have yet to be resolved.

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1. Carbon Commentary 22nd October 2014
<http://www.carboncommentary.com/blog/2014/10/22/cambridge-nuclear-engineer-casts-doubt-on-whether-hinkley-point-epr-nuclear-plant-can-be-constructed>
 2. World Nuclear News 14th April 2016 <http://www.world-nuclear-news.org/RS-Flamanville-EPR-vessel-tests-extended-1404165.html>
 3. WISE International 15th October 2015 <https://www.wiseinternational.org/nuclear-monitor/812/epr-fiasco-unravelling-france-and-uk>
 4. Telegraph 22nd July 2016 <http://www.telegraph.co.uk/business/2016/07/22/edf-raided-by-french-authorities-ahead-of-hinkley-greenlight/>
 5. FT 19th July 2016 <https://next.ft.com/content/8d650906-4dcd-11e6-88c5-db83e98a590a>
 6. FT 22nd April 2016 <https://next.ft.com/content/c1cbfcca-0716-11e6-9b51-0fb5e65703ce>
 7. Guardian 6th July 2015 <https://www.theguardian.com/world/2015/jul/06/austria-files-legal-complaint-against-uk-hinkley-point-c-nuclear-plant>
 8. Guardian 2nd July 2015 <https://www.theguardian.com/environment/2015/jul/02/greenpeace-utilities-launch-suit-against-hinkley-nuclear-plant>



6. New Nuclear: Wylfa, Moorside, Sizewell and Bradwell.

Horizon and NuGen are both insisting that their projects at Wylfa and Moorside are not dependent on EDF getting the go-ahead for Hinkley. But Industry experts have warned that confidence across the sector would be damaged if Theresa May pulls the plug, especially given the French energy giant has already invested £2.4bn in Hinkley with unstinting Government support until now. If Hinkley were cancelled without any reimbursement for EDF, this would “*significantly undermine*” other developers’ confidence and might prompt them to seek some sort of financial guarantee. (1)

Greg Clark flew to Tokyo at the end of July on a three-day mission to convince Hitachi and Toshiba of the government’s commitment to new nuclear power stations in Wales and Cumbria and drumming up funds for the reactors, which he says are needed to replace Britain’s ageing coal and nuclear plants.

Hitachi and Toyota are understood to be concerned about Britain’s commitment to nuclear power. They hope to use the reactors as a showcase for their nuclear technology – Advanced Boiling Water Reactors and AP1000s. But the funding for the schemes has yet to be found, and both are scrabbling for investment. (2)

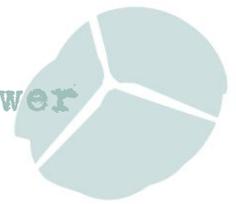
Meanwhile prominent nuclear lobbyist and former chair of the House of Commons energy select committee - Tim Yeo - says Russian, Chinese and South Korean nuclear companies should be offered subsidy contracts to build reactors in the UK if they are cheaper than other projects already under development. Yeo who chairs New Nuclear Watch Europe, a lobby group whose members include the Korean nuclear firm Kepco, urged the Government to “urgently examine which nuclear vendors can deliver the cheapest electricity, maximise the number of UK supply chain jobs and minimise the risk of construction delays”. (3)

Welsh Affairs Select Committee

The Welsh Affairs Select Committee said Wylfa Newydd should only be built if its electricity costs no more than that from Hinkley Point C, or from renewable sources. Committee chairman David Davies said “*The [UK] government must prove that the cost of any nuclear development is well understood and competitive with renewable sources. These costs must be made public in a format that can be easily understood.*” (4)

Bradwell

The Blackwater Against New Nuclear Group says if Hinkley is ditched it is not clear whether it would take down Bradwell in its wake or whether Bradwell would rise as a Phoenix among the Hinkley ashes. Bradwell finds itself tied up in a complex web of economic, technical, security and, above all, political issues. It is a Chinese-designed, though unproven, Hualong 1 reactor that is proposed for Bradwell and it is conceivable that it might get through the allegedly rigorous UK regulatory requirements and be a more cost-effective proposition than the hopelessly overblown EPR.



Professor Andy Blowers, Chair of the Blackwater against New Nuclear Group (BANNG) said “*We need to draw attention to the reasons why Bradwell is simply neither acceptable nor sustainable as a site for a new nuclear power station and highly radioactive waste store. The site is too vulnerable, the environmental impact too severe, the risk of accident and incident too prevalent and the potential for catastrophe too disturbing for a new nuclear power station to be built by the Chinese on this site. At this present juncture, the question of whether Bradwell is more or less likely to be developed by the Chinese as a consequence of the Hinkley review is too close to call. In such an atmosphere of uncertainty the opportunity is presented to redouble our efforts.*” (5)

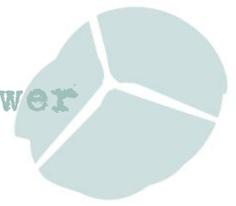
Sizewell

At Sizewell, the Stage two consultation was expected to start in late September and run until Christmas. Suffolk businesses are worried that the Hinkley review will delay its start. (6)

GDA

UK regulators expect to complete the Generic Design Assessment (GDA) process for the Westinghouse AP1000 and Hitachi-GE's UK Advanced Boiling Water Reactor (UK ABWR) in March and December of 2017, respectively. In its quarterly GDA report for February to April 2016, the Office for Nuclear Regulation also said it has "developed 'entry criteria' to provide transparency on the factors that underpin our decision on readiness to commence GDA" for China General Nuclear's HPR1000 design. (7)

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1. Telegraph 2nd August 2016 <http://www.telegraph.co.uk/business/2016/08/02/uk-new-nuclear-programme-not-dependent-on-hinkley-say-rivals/>
 2. Times 24th July 2016 <http://www.thetimes.co.uk/edition/business/minister-heads-to-tokyo-on-nuclear-energy-mission-rkcw82gwx>
 3. Telegraph 23rd July 2016 <http://www.telegraph.co.uk/business/2016/07/23/russia-china-and-south-korea-should-be-invited-to-build-uk-nucle/>
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 5. BANNG 2nd Aug 2016 <http://www.banng.info/uncategorized/if-hinkley-goes-can-bradwell-be-far-behind/>
 6. East Anglian Daily Times 31st July 2016 http://www.eadt.co.uk/news/suffolk_businesses_urge_government_not_to_delay_sizewell_c_as_edf_chief_executive_writes_open_letter_about_hinkley_point_c_1_4638541
 7. World Nuclear News 13th July 2016 <http://www.world-nuclear-news.org/RS-UK-regulators-provide-update-on-reactor-design-assessments-13071601.html>



7. Keeping the Lights On

"Britain's creaking power grid is an expensive and self-inflicted injury caused by the ill-considered interconnection of intermittent non-dispatchable wind and solar resources in pursuit of the Miliband green fantasy," according to one commentator at the bottom of *The Times* story about Tim Yeo (1) Not an untypical reaction. The solution for this person is gas-fired generation in conjunction with fracking which would *"vastly improve security of supply at a far lower cost than nuclear, wind, solar or tidal energy schemes,"* while we wait for a new generation of modular nuclear plants which may take 50 years to introduce.

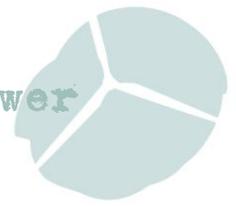
Balancing Green Energy

Dave Elliott Emeritus Professor of Technology Policy at the Open University says intermittency and the cost of dealing with it may not be the problem previously thought. For example, since balancing systems allow variable energy supply and demand to be matched more efficiently and can avoid the need for expensive new generation, the UK National Infrastructure Commission's influential new report 'Smart Power' says a mix of storage, smart grid demand management and supergrid interconnectors could save UK consumers up to £8bn per year by 2030.

The International Renewable Energy Agency suggests that on-shore wind would be cheaper than anything else, even with full balancing costs added. It is also often claimed that renewables will need 100% fossil (and/or nuclear) backup. However, the influential Energy Research Partnership study says that, while backup will be needed, only a 12% fossil input would be required to meet occasional demand peaks in a hypothetical 100% UK renewable scenario with wind and PV solar meeting most electricity needs most of the time, assuming that the necessary balancing facilities were in place. That translates to almost the same small fossil capacity figure as had been suggested as being needed in an earlier Poyry 2050 scenario, with renewables supplying 94% of electricity The Pugwash 80% by 2050 UK renewables study came to a similar conclusion, although it suggested that the fossil residual could be reduced further using Power to Gas conversion of surpluses.

Short-term solar PV output variations caused by clouds can be reduced if there are PV units scattered widely across a region. Heat storage is much more efficient than storage as electricity, and, with CHP plants, can aid flexible power and heat balancing. Like heat, gas (including green gas/syngas) can also be easily stored and for long periods, offering one way to deal with longer term lulls in renewable availability.

Shorter term variations can be dealt with by other types of storage, demand response, smart grid and supergrid balancing, often at low cost. For example, the Pugwash UK study found, with around 100GW of wind capacity in place by 2050, there would be times when this generated a surplus that could be exported on the supergrid, potentially earning the UK £15bn per year. Alternatively, some of the excess could be converted to hydrogen gas and other syngases, creating valuable new fuels for heating, grid balancing or use in vehicles – the so-called Power to Gas idea being developed in Germany.



Overall emerging studies seem to conclude that balancing variable renewables may not be a major constraint on the expansion of the use of renewables or add unduly to the cost. In fact, the need to provide balancing may lead to a system that is more efficient overall and save money, not least since it would enable increasingly cheap renewables to expand to replace most if not all fossil and nuclear sources. (2)

Pumped Hydro Electric Storage

Prof Phil Taylor Siemens Professor of Energy Systems at Newcastle University says massive changes to how we make and use energy are paving the way for a transition to a 100% renewable electricity system. *“We need to build a new energy system to support the transition from fossil fuels to low carbon sources”*, he says

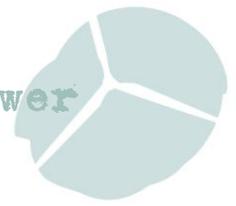
Taylor’s vision relies on Smart Energy: *“If the wind isn’t blowing or the sun isn’t shining then we may be asked to use less electricity and our pre-programmed appliances will react as instructed,”* he explains, but we won’t be asked to turn off Coronation Street or Match of the Day. *“Just moving the time we use a washing machine, or switching off the fridge for a few minutes can substantially reduce the strain on the grid. This type of flexibility on the demand side of the domestic and commercial system can have major savings in energy use.”*

Newcastle University is currently working with a transmission company on a smart-plug trial which has seen 250 homes in the North East adopt wi-fi enabled household plugs in a trial designed to evaluate smart electricity possibilities. *“Some estimate that by 2025 a household which is operating smartly in the way it uses its electricity could be saving £150 a year,”* said Taylor

As well as demand-side response there are a further two key ingredients to this new energy system transition; continental interconnectors and abundant storage, while all these measures are set to cost a lot of money with some estimated the total bill at over £30bn. (3)

Taylor, writing with Dave Holmes of the Quarry Battery Company in Utility Week last year (18th – 24th September 2015 – See nuClear News No.78) called for more Pumped Hydro Electricity Storage (PHES). They looked at two scenarios – one in which a further 10GW off offshore wind is added to the 28-30GW that is already likely to be deployed by 2020 and backed up by 10GW of fossil fuelled generation. The second scenario halts offshore wind development at 31GW and the fossil fuelled back-up is replaced by 10GW/50GWh of PHES storage. Both scenarios deliver the same amount of useful electricity, but the second scenario is £3.6billion a year cheaper and produces 5million tonnes of carbon dioxide less

The hydroelectric dam at Ben Cruachan in Argyll is one such PHES system. For 51 years it has served as a key piece of Britain's infrastructure, churning out electricity to meet peaks in UK demand. Cruachan and a similar scheme at Dinorwig in Snowdonia play an increasingly important role helping to balance the UK grid. These days it is being used more than ever, and ScottishPower, its owner, wants to expand it. ScottishPower wants to expand Cruachan's capacity from 440 megawatts to 1,040 megawatts. It will submit a planning application this autumn. The UK's total pumped storage capacity is 2,800MW, with Scottish plants at Cruachan and Foyers, and Welsh schemes at Ffestiniog and Dinorwig. At least double that level is needed to provide enough storage to cope with the amount of wind being developed.



Other projects are also being considered that could boost the UK's overall pumped storage capacity to 4,400MW. SSE plans to build an £800 million plant at Coire Glas in the Great Glen that could generate 600MW, while the Duke of Buccleuch is planning to build another in a disused quarry in Dumfriesshire. (4)

Scottish Renewables say: *“A whole series of changes are needed if we are to ensure that the cheapest and most efficient technologies provide the services that a modern clean electricity system requires. While batteries today are 94% cheaper than they were in 1990, and a range of pumped storage projects are ‘shovel-ready’ or in the planning process, the current market arrangements are at risk of favouring more expensive sources of flexibility for our network.”* (5)

Storage technology is changing fast. The cost of lithium-ion batteries - the most common type - plunged by 53% between 2012 and 2015 and are predicted to half again by 2019, according to energy analysts IHS. It's estimated that storage could help to bring about a saving of £8bn to British consumers, secure energy supply for a generation and meet carbon targets.

It might seem that those with less money have far less to gain from the great future battery revolution. But if somebody can be found to purchase the infrastructure, it could help poorer people to save significant amounts on their energy bills. In the former coal-mining town of Stanley in County Durham, this somebody has arrived in the form of a partnership between the local authority and a start-up called North Star Solar, which has the former CEO of RWE Npower at its helm. In the first project of its kind, last month the town's 35,000 residents became the first to be offered solar panels and a home battery system, free of charge. Combined with the effect of replacement LED lightbulbs, the systems are expected to cut residents' energy bills by a fifth. (6)

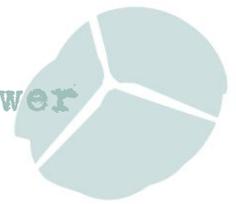
The National Grid's Energy Revolution

The National Grid's latest Future Energy Scenarios (FES) report, says the UK could adopt solar, electric vehicles and batteries much faster than expected just a year ago. Marcus Stewart, National Grid's head of energy insights, says in a foreword to the report: *“We are in the midst of an energy revolution.”*

The usually conservative National Grid is the latest of several industry and government groups to use the language of “revolution”. In February, a report for industry group Energy UK talked of a coming “revolution”, similar to those that have overtaken telecomms and banking. In March, the National Infrastructure Commission said embracing a “smart power revolution” could save the UK £8bn a year by 2030.

National Grid now sees up to 39 gigawatts (GW) of solar installed by 2035, up from around 12GW today and up 7GW from last year's maximum expectation for 2035 of 32GW. Two years ago, National Grid expected as little as 8GW and no more than 17GW of solar in 2030. Now, its minimum is 15GW.

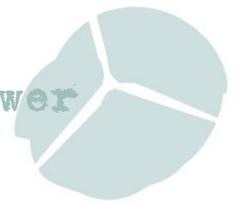
National Grid's outlook has shifted in other important ways in this year's scenarios. Notably, its range for gas demand in 2030 has been cut by up to 12%. By 2040, the need for gas is seen falling by between 8 and 33%, compared to today's levels. All this suggests the National Grid sees the UK's increasing dependence on imported gas, as highlighted by Reuters and Bloomberg,



as being less severe than expected last year. This year's scenarios also trim expectations for electricity demand, seen being some 3-4% lower in 2030 than thought last year. Demand in 2030 is now expected to be no more than 4% higher and up to 5% lower than today's levels, easing the UK's pressing need for new generating capacity.

This year's scenarios also include, for the first time, a significant future role for battery electric storage. Last year's outlook merely noted that storage was important and said new capacity could be unlocked with technological improvements, regulatory change and subsidies. This year the report says the cost of lithium ion batteries could halve by around 2019, and halve again by the early 2020s. It says commercial and regulatory changes which are expected in the next 12 months will be key to the successful large-scale deployment of new storage technologies. If battery cost reductions continue and if attempts to remove regulatory barriers are successful, then the UK's base of electricity storage capacity could increase from 3GW today to 11GW in 2030 and 18GW in 2040. (7)

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1. Times 24th July 2016 <http://www.thetimes.co.uk/edition/business/minister-heads-to-tokyo-on-nuclear-energy-mission-rkcw82gwx>
 2. Ambient Energy 7th July 2016 <http://www.tandfonline.com/doi/full/10.1080/01430750.2016.1201910>
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 7. Carbon Brief 5th July 2016 <https://www.carbonbrief.org/national-grid-sees-major-boost-for-solar-electric-vehicles-and-batteries>



8. District Heating – delivering heat 30% cheaper than individual gas boilers

Scotland's leading district heat network is set to grow with an £11 million investment plan, after Aberdeen councillors unanimously backed plans to expand the network into the south of the city – offering hundreds of homes savings on their energy bills.

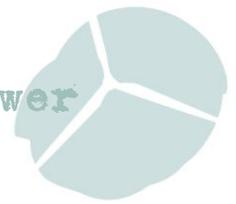
The combined heat and power scheme is expected to deliver low cost, low carbon energy to at least 350 homes in Torry as well as a primary school, swimming pool, community centre and various commercial properties in the East Tullis Industrial estate. The existing combined heat and power system has reduced the city's carbon emissions and saved the average electrically heated home up to £18 a week on energy bills – therefore helping thousands of residents climb out of fuel poverty. Aberdeen Heat and Power (AHP) has grown substantially since the initiative began in 2002 and currently provides for 2,361 flats in 33 multi-story blocks and two sheltered housing blocks in Seaton, Tillydrone, Hazlehead and Stockethill and 13 public buildings. (1)

Big Six utility SSE has published a new report (2) which makes the case for increased use of district heating to help combat heating efficiency and affordability. The report – *'Sustainable Heating: Reducing Costs, Improving Comfort and Lowering Carbon Emissions'* – found that one retrofit project at the Wyndford housing scheme in Glasgow has delivered a 62% reduction in CO₂ emissions since it was installed in 2012. The results also show that lives have significantly improved, comfort has increased, and jobs and economic value have been created. (3)

SSE says it is one of the UK's leading providers of district heat networks, with 11 heat networks serving over 5,000 customers across the UK and this number set to treble in the near future. Heat accounts for a significant proportion of final energy demand and is one of the major contributors of emissions across the UK. In Scotland alone, heat is the largest element of energy use (more than 55%), and contributes 47% of total carbon emissions, with Scottish households and business spending £2.6bn on heating and cooling. Changing the way heating requirements are met presents a significant source for potential decarbonisation.

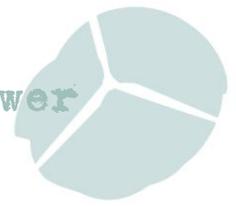
The Westminster government has now launched a consultation on how best to allocate £320m of funding for low-carbon heating projects in urban areas over the next five years. Heat can be taken from a range of sources including large heat pumps, combined heat and power plants and deep geothermal plants, which take heat from underground rocks miles below the surface of the earth. It is then pumped around homes and businesses bringing down the cost of energy bills and reducing carbon emissions. Without a network, it is impossible to re-use this heat and it simply gets dumped into the atmosphere. In Islington for example, they are expanding their existing heat network at Bunhill so that it can take heat that comes out of the London Underground (Northern line) and put it into their network. (4)

DECC's aim (it was still DECC when the consultation was launched) is to support the development of heat networks and help create a market that will become self-sustaining, while providing the reliable, clean, and affordable energy we need. (5)



Dr Tim Rotheray, Association for Decentralised Energy director, said district heating has a key role to play decarbonising heat in the UK. "*Industry will continue to work with Government to make sure that this money can bring forward low carbon heating projects at best value to the consumer,*" he promised. In the UK currently only about two per cent of heat is supplied via heating networks - in comparison, in Denmark 60 per cent of the population is connected to a heat network. As well as delivering significant carbon savings, district heating systems can also cut energy costs for billpayers – heating a flat via a gas-fired district heating system costs around 30 % less than it would be using individual gas-fired boilers. (6)

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1. Scottish Energy News 4th July 2016 <http://www.scottishenergynews.com/scotlands-leading-housing-heat-network-set-to-grow-with-11-million-investment-plan/>
 2. Reducing Costs, Improving Comfort, and Lowering Carbon Emissions: Learning from the impacts of the Wyndford Estate district heating project, <http://sse.com/media/408769/WYNDFORD-REPORT.PDF>
 3. Scottish Energy News 30th June 2016 <http://www.scottishenergynews.com/glasgow-tenants-warmer-and-happier-with-district-heating-scheme/>
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 5. DECC (accessed) 30th June 2016 https://econsultation.decc.gov.uk/decc-policy/decc-consultation-on-heat-network-investment/supporting_documents/HNIP%20consultation%20vFINAL.pdf
 6. Business Green 30th June 2016 <http://www.businessgreen.com/bg/news/2463289/urban-heat-networks-set-to-receive-gbp320m-government-funding-boost>



9. Renewable Heat – Electrification vs Green Gas

Government plans to electrify domestic heating and encourage a switch away from gas-fired boilers and radiators are "mad", says Iain Conn, chief executive of Centrica. (1) The National Policy Statement on Energy (July 2011) says much of our heating will need to be electrified if we are to reduce emissions of greenhouse gases by 80% by 2050. (2) *"This whole idea of electrifying everything is mad,"* Mr Conn told the Utility Week Energy Summit conference in London. *"We shouldn't allow government to chase after the electrification of heat too quickly. They [will] get it wrong."*

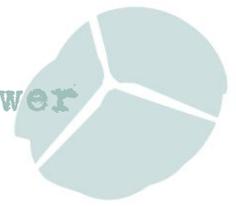
Nearly 70% of all of the UK's space heating comes from natural gas, contributing about a third of the nation's total greenhouse gas emissions. The majority of domestic heating is provided by gas-fired boilers, with only 7% of homes using electric heating. Mr Conn said that there were better alternatives available and suggested that more money should be channelled into research to find new ways of tackling the problem.

Former MP, Mike Foster, writing in the new *Green Gas Book* produced by the former Parliamentary Labour Party Energy and Climate Change Committee, asks why we would want to ditch the UK's gas distribution grid, developed over many years and only recently upgraded with new pipes. Surely it makes more sense to see how we can make the gas "green".

The *Green Gas Book* is a series of essays exploring the development of "green gas" (or more accurately, "green gases"), written by experts in the field. It looks at the range of those green gases – biomethane, hydrogen, bio-substitute natural gas (bioSNG) and biopropane – their uses, benefits and potential challenges in their application. While no one of these green gases is the perfect solution, we may think of them as "10% solutions," which, together with developments such as district heating schemes, would go a long way towards helping us decarbonise the heat sector. (3)

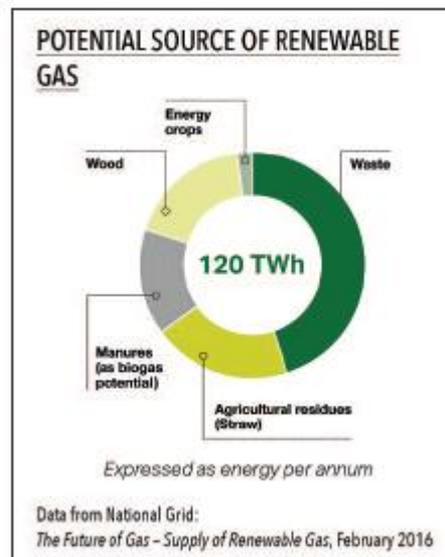
Alan Whitehead MP points out that the additional electricity capacity required to electrify heating would be enormous. And there would be huge variation in the daily and seasonal demand. Foster says peak heat demand would require the equivalent of an additional 30 nuclear power stations and the UK's current distribution network would require a significant upgrade. Studies suggest that around 80% of households would require financial assistance to change their heating system.

Nearly a third more biogas is being produced in the UK compared to a year ago, according to the Anaerobic Digestion and Bioresources Association (ADBA). The UK now has 617MW of biogas capacity - enough to power 800,000 homes. But growth in the industry has slowed due to government policy decisions and investment uncertainty. (4) The bio-methane sector has only just started to develop and has significant scope to increase the production of green gas. National Grid highlights the potential for a 10-fold increase in the number of green gas connections with approximately 40TWh/year of green gas from AD injected to the grid by 2035 – around 5% of UK gas demand or around 10% of UK domestic gas demand.



The National Grid says green gas could produce 30-50% of domestic gas demand in future. Biomethane produced by anaerobic digestion (AD) is the main current source of green gas, and Caroline Flint calls for more of this to be injected into the gas grid rather than wastefully being used to generate electricity.

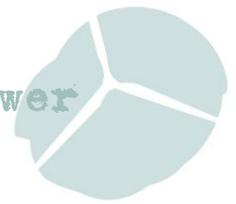
Foster and Flint also advocate the use of Advanced Plasma Technology to generate a methane-based gas from rubbish. This would require domestic waste to be diverted from landfill to a local bio-SNG plant. The National Grid says this Synthetic Natural Gas (SNG) could offer ten times more green gas than AD with the potential to increase the annual production of renewable gas in the UK to 100TWh – 30-50% of future domestic demand. (5)



Hydrogen

A new report has proposed that the city of Leeds should convert its gas grid to an all-hydrogen version by 2030 in order to test the viability of using hydrogen to help meet national carbon reduction targets. The Northern Gas Networks (NGN) has fronted the H21 Leeds City Gate project, which lays out the blueprints to convert Leeds into a “hydrogen city”. A new feasibility report from the project organisers has established that a switch away from methane would be “economically viable”. NGN has claimed that the city should be considered as it has the optimal size and location for the conversion, which could start in Leeds by 2026 at the cost of £2bn, before being rolled-out nationally. (6)

The two year project, undertaken by Northern Gas Networks, Kiwa Gastec, Amec Foster Wheeler and Wales & West Utilities, assessed the prospects for using hydrogen in place of natural gas for cooking in heating – beginning in Leeds and eventually covering the entire UK. However, the report points out that generating hydrogen from fossil fuels would require that the CO₂ generated during this process be securely stored in order for the hydrogen to be truly low carbon. An alternative method of producing hydrogen from water using electricity would be far more expensive – even if generated using renewable energy (7) However Dr Keith MacLean in his chapter in the *Green Gas Book* says that using onshore wind and solar PV has the potential

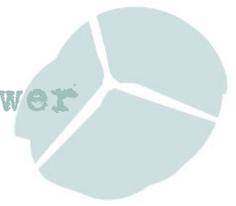


to become a cost effective alternative. Using renewable electricity to generate hydrogen at times of surplus could be done in conjunction with CCS development.

Doug Stewart, chief executive of Green Energy, claims green gas is 15 years behind renewable electricity – but is poised for stellar growth in the UK. In April Green Energy became the first company in the UK energy market to supply only renewable green gas to its residential and business customers, a move it claims makes it the only supplier to provide both renewable electricity and renewable gas as standard. The offer of 100% green gas - even for a small company like Green Energy, with around 25,000 customers - was not possible even two years ago. There are now 200 AD plants operating on farms across the UK, which Stewart estimates is enough to supply around 100,000 homes with green gas. By 2035, the government plans for green gas generation to have increased 10-fold. "We are the beginning of another renewables revolution," Stewart says. (8)

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1. Times 6th July 2016 <http://www.thetimes.co.uk/edition/business/gas-chief-fires-up-row-over-switch-to-electric-heating-wt6f002xw>
 2. National Policy Statement on Energy EN-1 DECC July 2011 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf
 3. Alan Whitehead 14th July 2016 https://alansenergyblog.files.wordpress.com/2016/07/final-the-green-gas-book_96pp_v5.pdf
 4. Utility Week 7th July 2016 <http://utilityweek.co.uk/news/Biogas-production-increases-by-30-percent/1259562>
 5. Alan Whitehead 14th July 2016 https://alansenergyblog.files.wordpress.com/2016/07/final-the-green-gas-book_96pp_v5.pdf
 6. Edie 12th July 2016 <http://www.edie.net/news/4/Is-Leeds-ready-to-become-the-UK-s--Hydrogen-city--hub-/>
 7. Scottish Energy News 12th July 2016 <http://www.scottishenergynews.com/leeds-city-study-shows-that-using-hydrogen-and-storing-carbon-could-cut-uk-heating-emissions-by-70/>
 8. Business Green 28th June 2016 <http://www.businessgreen.com/bg/interview/2462965/green-energy-ceo-we-are-at-the-beginning-of-a-green-gas-revolution>

Renewable Gas: The Transition to Low Carbon Energy Fuels” by Jo Abbess, Palgrave, 2015
<http://www.palgrave.com/br/book/9781137441799>



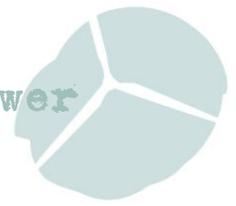
10. Carbon Reduction Targets

The government has won plaudits from green businesses, after announcing it has agreed to set a new legally binding target to cut emissions 57% against 1990 levels by 2032. Before it was abolished the Department of Energy and Climate Change (DECC) confirmed that Ministers had approved the recommendations for the fifth carbon budget put forward by the independent Committee on Climate Change (CCC). The UK's Climate Change Act of 2008 sets the ambitious target of reducing carbon emissions by 80% by 2050. It requires the government to set legally-binding carbon budgets, which limit the country's emissions for consecutive five-year periods. The budgets are designed to put emission reductions on an appropriate and cost-effective path to meeting the 2050 target.

Greenpeace commented that *"...it's no good having numbers on spreadsheets without the delivery to match. The absence of clear government plans and support for action on renewable energy, homes, cars, agriculture and planes shows how far the rhetoric of climate action has drifted from anything real. The only plan the government seems to have is expensive and dodgy nuclear power stations where the Committee now says the government need a plan B because they might not happen."* (1)

Committee on Climate Change itself warned that the Government must tackle the 'policy shortfall' to meet new carbon targets. Its annual update detailed the challenges Ministers will have to overcome if they are to meet the new target. So far emissions reductions have been achieved almost entirely through the power sector, thanks to record investment in renewables and a reduction in coal use. CCC warns that progress on other fronts, including low carbon heat, energy efficiency and transport, has "stalled". *"Rates of installing insulation in homes has fallen by 60-90 per cent, take-up of low-carbon heating remains below 2.5 per cent of demand and, in the past year, emissions have been rising in the transport and agriculture sectors,"* the CCC said. The policy gap represents around half the emissions savings that are required through to 2030 and the CCC warned that the gap could be larger if current policies fail to deliver anticipated emissions savings. (2)

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1. Business Green 30th June 2016 <http://www.businessgreen.com/bg/news/2463335/green-industries-celebrate-as-government-backs-bold-new-carbon-target>
 2. Business Green 30th June 2016 <http://www.businessgreen.com/bg/news/2463283/committee-on-climate-change-warns-uk-must-tackle-policy-shortfall-to-meet-new-carbon-targets>



11. Small Modular Reactors (SMRs)

Britain's ambition to build small modular nuclear plants took a step forward as the nation's last independent steelmaker said it will work with Fluor Corp.'s NuScale Power to make components. Sheffield Forgemasters International Ltd. will forge a large civil nuclear reactor vessel head by the end of 2017. It is part of a £4m programme funded by the government-backed Innovate U.K. agency. NuScale is providing an undisclosed sum of additional funding. (1)

In the USA, NuScale says it is "*at an advanced stage*" of development compared to its nearest competitors. NuScale is the only SMR developer to be currently receiving US Department of Energy match funding (\$217 million over five years), the only SMR developer to be close to submitting a Design Certification Application to the US Nuclear Regulatory Commission - which NuScale says will happen later this year - and it has "multiple active customer deployment projects under way". The first NuScale facility is planned to be in operation in 2024 in the state of Idaho. (2)

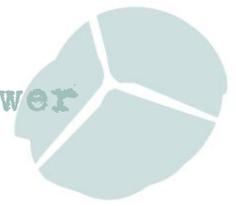
New "mini" nuclear reactor technology should be built at Trawsfynydd – the site of a closed Magnox station – according to the Welsh Affairs Select Committee. The nuclear plant in Snowdonia National Park has been shut down since 1991 and is undergoing the lengthy process of decommissioning. The Welsh Affairs select committee said the site would make an "ideal" location to build small modular reactors, and urged the Government to designate it as a site for their construction. Trawsfynydd was not included on the list of approved sites for new nuclear construction drawn up by the Government in 2009, due to its inland, national park location and small size. But there is growing support in Wales for the idea that it could be suitable for small module reactor (SMR) technology, which is by definition smaller and proponents say will be much easier to construct. (3)

NuScale Power has become a supporting partner of the Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC) in Sheffield. The two bodies said the move, which follows several years of informal collaboration, will further enable the two organisations to support each other's ambitions to bring SMR technology to the UK. The announcement was made on the same day that Nuclear AMRC hosted NuScale Power's first UK Supplier Day at its facility at the University of Sheffield. (4)

For further information on SMRs see the NFLA Briefing:

http://nuclearpolicy.info/docs/nuclearmonitor/NFLA_New_Nuclear_Monitor_No37.pdf

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1. Bloomberg 7th July 2016 <http://www.bloomberg.com/news/articles/2016-07-07/mini-nuclear-reactors-to-be-built-by-sheffield-forgemasters>
 2. World Nuclear News 8th July 2016 <http://www.world-nuclear-news.org/NN-Sheffield-Forgemasters-and-NuScale-collaborate-on-SMRs-08071602.html>
 3. Telegraph 26th July 2016 <http://www.telegraph.co.uk/business/2016/07/26/please-build-mini-nukes-in-wales-say-welsh-mps/>
 4. Business Green 13th July 2016 <http://www.businessgreen.com/bg/news/2464642/nuscale-power-eyes-uk-small-modular-reactor-opportunity>



12. Integral Fast Reactors (IFRs)

George Monbiot told the Radio 4's Today Programme on the 29th July that the "*humungous waste problem at Sellafield could be turned into a humungous asset by using a technology such as Integral Fast Reactors (IFR) to turn it into an energy source.*" He said "*it gets rid of the waste, and according to one estimate could provide all the UK's energy needs for 500 years.*" He said that instead of wasting our money on Hinkley Point C Government should invest in the development of IFRs to "*see if we can use it to crack two problems at once – our nuclear waste mountain [and] create a massive source of low carbon energy*". The only problem is, as Professor Catherine Mitchell just had time to point out, it wouldn't work. To claim that they are proliferation resistant and help "*use up waste*" is just plain wrong.

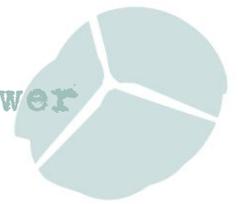
The IFR would be a liquid-sodium-cooled fast-neutron reactor. The use of liquid sodium as a coolant has proved to be a huge problem in the past – it catches fire on contact with air. Over the years the world's leading nuclear technologists have built about three dozen sodium-cooled fast reactors. Of the 22 whose histories are mostly reported, over half had sodium leaks, four suffered fuel damage (including two partial meltdowns), several others had serious accidents, most were prematurely closed, and only six succeeded. As Dr. Tom Cochran of NRDC notes, fast reactor programs were tried in the US, UK, France, Germany, Italy, Japan, the USSR, and the US and Soviet Navies. All failed. After a half-century and tens of billions of dollars, the world has one operational commercial-sized fast reactor (Russia's BN600) out of 438 commercial power reactors, and it's not fuelled with plutonium.

IFRs would require an ambitious new nuclear fuel cycle because they would be fuelled with a metallic alloy of uranium and plutonium. In theory they would operate in conjunction with on-site 'pyroprocessing' to separate plutonium and other long-lived radioisotopes. Unlike the reprocessing plants currently at Sellafield they wouldn't separate pure plutonium, but would keep the plutonium mixed with other long-lived radioisotopes.

Its novel technology, replacing solvents and aqueous chemistry of current reprocessing with high-temperature pyrometallurgy and electrorefining, would incur different but major challenges, greater technical risks and repair problems, and speculative but probably worse economics. Reprocessing of any kind makes waste management more difficult and complex, increases the volume and diversity of waste streams, increases by several- to many-fold the cost of nuclear fuelling, and separates bomb-usable material that can't be adequately measured or protected.

In the UK the Government would be unlikely to want to see more plutonium separated so any IFR built here – at least to begin with - would probably just be used to use up our huge stockpile of plutonium. The problem is that the plutonium is stored as plutonium oxide which would have to be converted to plutonium metal probably involving the fluorination of plutonium dioxide, normally with highly corrosive hydrogen fluoride, to produce plutonium fluoride, which is subsequently reduced using high purity calcium metal to produce metallic plutonium and a calcium fluoride slag.

IFRs are often claimed to "*burn up nuclear waste*" and make its "*time of concern ... less than 500 years*" rather than 10,000-100,000 years or more. That's wrong: most of the radioactivity comes



from fission products, including very long lived isotopes like iodine-129 and technicium-99, and their mix is broadly similar in any nuclear fuel cycle.

IFRs' wastes may contain less transuranics, but at prohibitive cost and with worse occupational exposures, routine releases, accident and terrorism risks, proliferation, and disposal needs for intermediate- and low-level wastes. It's simply a dishonest fantasy to claim, that such hypothetical and uneconomic proposals can deal with the humungous waste problem at Sellafield.

It is claimed that IFRs could produce lots of greenhouse-friendly energy and while they're at it they can 'eat' nuclear waste and convert fissile materials, which might otherwise find their way into nuclear weapons, into useful energy. Too good to be true? Sadly, yes. Nuclear engineer Dave Lochbaum from the Union of Concerned Scientists writes: "*The IFR looks good on paper. So good, in fact, that we should leave it on paper. For it only gets ugly in moving from blueprint to backyard.*"

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1. Ecologist 12th April 2016
http://www.theecologist.org/essays/2987536/new_nuclear_reactors_same_old_story.html
 2. Integral Fast reactors FoE Australia <http://www.foe.org.au/anti-nuclear/issues/nfc/power/ifrs>
 3. See also No2 Nuclear Power Briefing on PRISM Reactors, September 2012.
<http://www.no2nuclearpower.org.uk/wp/wp-content/uploads/2012/12/PRISM-reactors4.pdf>