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1. Implementing Geological Disposal

The launch of a new White Paper called "*Implementing Geological Disposal*" opens up a whole new chapter in the UK's 40-year long failed search for a solution to the problem of what to do with nuclear waste. (1)

The White Paper says the Government will commission a national (excluding Scotland) screening process based on known geological information. This sounds good for Cumbria where several geologists have said we already know enough to rule out the possibility of finding a suitable site. But the Government's view is that in poor geology we could rely more heavily on engineered barriers. (2) Radioactive Waste Management Ltd (RWM), formerly the Radioactive Waste Management Division (RWMD) of the Nuclear Decommissioning Authority (NDA), has made clear it is only looking for a site which is "*sufficiently good*". Its view is that "*although characterising and demonstrating safety is more challenging for a comparatively complex site* [as sites in West Cumbria would be geologically speaking] *than for a simpler site this does not prevent complex sites from being considered*". (3) This issue is too important to be left to RWMD and DECC to decide between them. There should be a national debate about whether we are looking for the best geology for the job or whether we are happy to use mediocre geology and rely more heavily on engineered barriers.

Professor Neil Hyatt of Sheffield University and a member of the Government's Nuclear Innovation and Research Advisory Board recently told Radio 4's You and Yours that "*We need the geology to be very simple. We need a sufficient volume of rock, of appropriate rock type, with an absence of major faults. Then the third characteristic is really slow moving groundwater at the facility depth, so we have a long return time to the environment.*" (4)

But there has been no discussion about this. There should be a national debate about whether we are looking for the best geology for the job or whether we are happy to use mediocre geology and rely more heavily on engineered barriers.

Over the next two years, the Government intends to develop the detail of a process for working with communities with experts in the field of community decision making. The Government will convene a community representation working group in the near future to address the challenging and complex issues that have been raised in relation to community representation and engagement at potential Geological Disposal Facility (GDF) sites. Formal discussions will begin between the developer (RWM) and communities in 2016 after the initial geological screening has been carried out. The Government says it is committed to addressing these issues because the GDF siting process is reliant upon working co-operatively with communities, and ensuring that all levels of local government have a voice in the process. This all sounds great, but as reported by some of the media, this means that strategic planning authorities, like Cumbria County Council will lose their veto. (5)

The final decision on siting a GDF in a community "*will not be taken until there has been a test of public opinion that demonstrates community support for development at a specific site*." But the White Paper doesn't say how public opinion will be tested. In 2012 the West Cumbria Managing Radioactively Waste Safely Partnership commissioned an opinion poll which found that a small majority of those asked were in favour of moving on to a search for a site in Cumbria. But 19% of those asked had never heard of the proposals; and 61% had either just 'heard of it or knew

'just a little' about it. (6) Would an opinion poll result like this be considered adequate for a go-ahead?

The Government says a mechanism will be devised to allow communities to get third party advice. Unfortunately this independent technical advice appears to be restricted to "*Learned Societies*" so is likely to be restricted to an 'establishment view'. This is nothing like the mechanism in Sweden which allows opposition groups to apply for funding from the Nuclear Waste Fund which is set up by the waste producers. (7)

Finally, the development of a future GDF will be through the Government's National Infrastructure Planning (NIP) process. A non-site-specific National Policy Statement will be produced at some point over the next two years. The NIP process is a highly centralised planning system reducing the amount of local decision-making on projects deemed to be in the national interest, which could create real tensions with the more decentralised and consensual voluntarist system that a GDF siting process should be trying to encourage. It has the potential as well to create confusion over the primary role of County / Unitary Councils as Waste Planning and Minerals Planning Authorities under the NIP process.

Much of the media focused on the £40m 'bribe' which could be paid to local communities considering the building of a GDF in their area. The plan allows for communities to get up to £1m a year for about five years whilst local consultations take place. Then, if the community moves to accepting exploratory drilling, which would take five to 15 years they would get up to £2.5m a year, meaning a total of over £40m before a decision is taken on whether or not to build the waste burial facility. (8)

So the stage could be set for the imposition of a dump made to look like democracy. The question is will £40m be enough to persuade a local authority to accept a GDF? It's pretty small beer really when you consider what it would cost to insulate every house in Cumbria, for instance or build a MOX plant.

Eddie Martin, Chair of Cumbria Trust, and former leader of Cumbria County Council said:

"The new policy is clearly aimed at preventing such an "inconvenient" democratic decision affecting the process again, yet still claims to be based on voluntarism. The "incentives" being offered are a transparent attempt to divide and conquer communities such as Cumbria. It won't work." (9)

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2. Small Reactors

On 14th July the UK's outgoing Minister for Business and Energy, Michael Fallon, told Parliament that:

"*The* [UK] *Government is in the early stages of its consideration of small modular reactors (SMRs) and is awaiting the outcome of a feasibility study, led by the National Nuclear Laboratory with the support of a consortium formed from industry. The study will make initial recommendations on the economic, technical and commercial case for SMRs, and will inform the evidence base for any further development or action. Should industry or any other body propose to deploy an SMR in the UK then the independent regulators will ensure compliance of the design with safety, security and environmental legislation*." (1)

The International Atomic Energy Agency defines a small reactor as one with a capacity under 300MW.

The House of Commons Energy and Climate Change Committee is taking evidence at the moment on SMRs. (2) The three companies developing SMRs which gave evidence to the Committee on 14th July called for greater co-operation between the UK and US regulators to smooth the reactors' path through the licensing process. (3)

The Generic Design Assessment (GDA), which was carried out by the Office for Nuclear Regulation and the Environment Agency, of the EPR reactor-type EDF Energy is proposing to build at Hinkley Point took almost five years from March 2008 to December 2012. The Regulators started preparatory steps to carry out a GDA for the Advanced Boiling Water Reactor-type which Hitachi-GE wants to build at Wylfa on Anglesey and Oldbury in Gloucestershire, in January 2013. This process is expected to take until 2017. A GDA for an SMR reactor might also be expected to take at least four years, so is unlikely to be ready before around 2020.

Economics of SMRs

The idea behind these Small Modular Reactors (SMRs) is that by mass-producing major components as standard modules in factories, and shipping the modules to sites for assembly rather than having each reactor custom-designed and built, substantial cost savings can be realised. Supporters also say they would be inherently safer than conventional designs.

SMRs have been receiving a lot of attention in the USA and elsewhere as a possible way of introducing nuclear generating capacity in smaller and more affordable increments. But the Union of Concerned Scientists (UCS) say small isn't necessarily beautiful (4)

UCS says just because these reactors are cheaper doesn't mean to say they are cost effective. Economies of scale dictate that, all other things being equal, larger reactors will generate cheaper power. SMR proponents suggest that mass production of modular reactors could offset economies of scale, but a 2011 study concluded that SMRs would still be more expensive per kWh than current reactors. (5) Even if SMRs could eventually be more cost-effective than larger reactors due to mass production, this advantage will only come into play when many SMRs are in operation. But utilities are unlikely to invest in SMRs until they can produce competitively

priced electric power. This Catch-22 suggests the technology will require significant government financial help to get off the ground. Dr. Mark Cooper, senior fellow for economic analysis at the Vermont Law School's Institute for Energy and the Environment agrees with UCS that SMRs are likely to have higher costs per unit of output than conventional reactors. (6)

SMRs are unlikely to breathe new life into the increasingly moribund U.S. nuclear power industry, according to the Washington-based Institute for Energy and Environmental Research (IEER). They will probably require tens of billions of dollars in federal subsidies or government purchase orders, they will create new reliability vulnerabilities, as well as serious concerns in relation to both safety and proliferation. (7) By spreading SMRs around the globe we will increase the proliferation risk because safeguarded spent fuel and numerous small reactors would be a much more complex task than safeguarding fewer large reactors. (8)

Safety of SMRs

The safety of the proposed compact designs is unproven—for instance, most of the designs call for weaker containment structures. And the arguments in favour of lower overall costs for SMRs depend on convincing the US Nuclear Regulatory Commission to relax existing safety regulations. The Fukushima accident has resulted in new safety requirements for existing and new reactors around the world. So the challenge is to lower the cost of nuclear reactor systems while increasing their levels of safety and security. (9)

Proponents also point out that smaller reactors are inherently less dangerous than larger ones. While this is true, it is misleading, because small reactors generate less power than large ones, and therefore more of them are required to meet the same energy needs. Multiple SMRs may actually present a higher risk than a single large reactor, especially if plant owners try to cut costs by reducing support staff or safety equipment per reactor.

Because of SMRs' alleged safety advantages, proponents have called for shrinking the size of the emergency planning zone (EPZ) surrounding an SMR plant from the current standard of 10 miles (in the USA) to as little as 1000 feet, making it easier to site the plants near population centres and in convenient locations such as former coal plants and military bases. However, the lessons of Fukushima, in which radiation levels high enough to trigger evacuation or long-term settlement were measured at as much as 20 to 30 miles from the accident, suggest that these proposals, which are based on assumptions and models that have yet to be tested in practice, may be overoptimistic.

UCS argues that promoting the idea that SMRs do not require 10-mile emergency planning zones and encouraging the NRC to weaken other safety requirements just to facilitate SMR licensing and deployment is not the way forward. (10)

The Future for SMRs does not look promising

The trouble is that there isn't a market for SMRs in the US, so it is difficult to find business for a technology that hasn't been developed, licensed or proven. The Nuclear Regulatory Commission doesn't even have requirements or guidelines in place to license SMRs. For the nuclear industry it costs a lot of money to be innovative. Building a supply chain from scratch, with few investors willing to bank on an unknown technology or customers willing to buy is virtually impossible. (11)

Of the four companies looking at SMR designs in the US, the Babcock & Wilcox Company (B&W) with their 180MW mPower reactor was the first company to receive cost-sharing funds from the U.S. Department of Energy (USDOE), but has now cut 200 from its workforce, and slashed spending from $60 to $80 million per year to less than $15 million, and restructured its management. It is currently trying to sell up to 70% of the business (B&W plans to keep a 20 percent share and Bechtel will still own 10 percent), but it doesn't seem that anyone is taking the bait. As of November 2013, B&W had already invested more than $360 million in the Tennessee Valley Authority's Clinch River site in Tennessee, which was to be home to two mPower SMRs.

Westinghouse, which was once considered a shoo-in to win the second round of USDOE funding, was not only passed over for consideration, but eventually decided to pass up the opportunity to develop its 225-MW SMR in exchange for focusing on its booming global AP1000 market.

The Holtech SMR 160MW reactor lost out in the battle for USDOE funding to NuScale Power LLC which appears to be the only company staying in the race. NuScale just completed negotiations with the USDOE for its cost-sharing program, and is opening a regional operations centre in Charlotte. The company has signed an agreement with the USDOE to build a NuScale Power SMR demonstration unit at the Savannah River Site. The USDOE said it would provide $217 million in matching funds over five years to NuScale. But NuScale only gets the federal funds if it can match them with money from private investors, who so far have been wary of the technology. The company hopes to submit its design certification in the latter half of 2016. And it plans to have its first plant operating commercially by 2023. (12)

The Executive Director of the Bulletin of Atomic Scientists, Kennette Benedict, concluded that:

"*Without a clear-cut case for their advantages, it seems that small nuclear modular reactors are a solution looking for a problem. Of course in the world of digital innovation, this kind of upside-down relationship between solution and problem is pretty normal. Smart phones, Twitter, and high-definition television all began as solutions looking for problems. In the realm of nuclear technology, however, the enormous expense required to launch a new model as well as the built-in dangers of nuclear fission require a more straightforward relationship between problem and solution. Small modular nuclear reactors may be attractive, but they will not, in themselves, offer satisfactory solutions to the most pressing problems of nuclear energy: high cost, safety, and weapons proliferation*." (13)

Diverting Resources

Dr. Mark Cooper expresses perhaps the most serious problem from the point of view of developing an effective climate and energy policy for Ireland. He says that large-scale development of "small modular reactors" (SMRs) in the USA would cost around $90 Billion–an amount that likely would be diverted from development of much more cost- and climate-effective renewable energy. It would undermine the effort needed to create the physical and institutional infrastructure to support the emerging electricity systems based on renewables, distributed generation and intensive system and demand management. Whether the reactor is large or small, nuclear power is among the least attractive climate change policy options because it is too costly, too slow, and too uncertain. (14)

Tackling Climate Change Quickly

When it comes to tackling climate change, early reductions in carbon emissions are much more beneficial than reductions just prior to 2050 because this will mean a much more dramatic cut in cumulative emissions by 2050. Unlike nuclear power most renewables can be installed in a very short period of time.

For instance, while Hinkley Point C won't be able to contribute to energy security and reducing dependence on fossil fuels for another ten years, the solar industry could deliver the same amount of electricity every year as is expected to be produced Hinkley Point C within 24 months and at a comparable cost, according to Mark Turner, a director of Lightsource Renewable Energy. Solar could provide energy security quickly, reduce electricity bills and protect the environment at the same time. Turner says that while solar power will not be the entire solution it could provide quite a large percentage of the energy mix completely free from the vagaries of the global fossil fuel markets. (15)

Nuclear supporters tend to argue that without an energy storage breakthrough renewables cannot provide the same level of base load power as nuclear. (16) The argument that renewable energy isn't up to the task because "the sun doesn't shine at night and the wind doesn't blow all the time" is overly simplistic. There are a number of renewable energy technologies which can supply baseload power. The intermittency of other sources such as wind and solar photovoltaic can be addressed by interconnecting power plants which are widely geographically distributed, and by coupling them with peak-load plants such as gas turbines fuelled by biofuels or natural gas which can quickly be switched on to fill in gaps of low wind or solar production. Numerous regional and global case studies – some incorporating modelling to demonstrate their feasibility – have provided plausible plans to meet 100% of energy demand with renewable sources. (17)

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3. PRISM and Plutonium Updates

Iberdrola has agreed to work with GE Hitachi (GEH) towards getting two PRISM reactors, which would be fuelled with plutonium, built at Sellafield as GEH gives evidence to the House of Commons Energy and Climate Change Committee. (1)

Dr Eric Loewen Chief Consulting Engineer at GEH was one of three people representing small reactor builders who gave evidence to the House of Commons Energy and Climate Change Committee investigation into small reactors. The other two represented companies promoting small versions of traditional Light Water Reactors whereas the GE-Hitachi (GEH) reactor is a fast breeder reactor (2)

As we reported in nuClear News No.59 (February 2014), the Nuclear Decommissioning Authority (NDA) has declared that the PRISM reactor is a credible option for managing the UK's embarrassing stockpile of 140 tonnes of plutonium, although reusing the plutonium as MoX fuel remains the preferred option. That is more than half of the world's stockpile of 260 tonnes. (3)

GEH says it offers PRISMs on the world market - but there aren't any takers and none have been built. GEH is proposing to build two 311 MWe PRISM reactors with the following processes:

• conversion of separated plutonium to a sodium-bonded U/Pu/Zr metal fuel using Direct Electrolytic Reduction, Pyroprocessing and metal casting techniques;

• irradiation of this metal fuel in PRISM reactors, in a burn rather than breed mode; and

• storage of the spent fuel pending disposal (no recycle of spent fuel, in line with current UK new nuclear build assumptions). (4)

The NDA notes that the facilities required by the PRISM approach have not been industrially demonstrated, so further development work to be undertaken with the cost and time to complete this work still to be defined in detail. GEH estimates that licensing these first of a kind PRISM reactors would take around six years. GEH envisages first irradiation (following development, licensing and construction) in 14-18 years but the NDA considers that timeframe "*ambitious considering delivery performance norms currently seen in the UK and European nuclear landscape*".

Fast Reactors have been failures in most places they have been built. The main problem relates to what is used to cool them—liquid sodium in the case of GE's PRISM and many others. Sodium reacts explosively with air and water, necessitating elaborate safety controls in places where it must get close to water in order to create steam to turn a turbine to make electricity. As a result of numerous fires from leaking systems, operating sodium-cooled fast reactors to date have been shut down more than they have run.

Ultimately, however, the core problem will be that PRISM reactors don't eliminate the nuclear waste that has piled up – it only changes it. It is uncertain whether PRISM spent fuel would be suitable for geological disposal and further processing might be required to achieve disposability in the nonexistent Geological Disposal Facility, i.e. sodium removal, generating another waste stream.

Meanwhile the Government has agreed to allow the NDA to conduct a series of plutonium title transfers with overseas reprocessing customers. Britain will take ownership of 800 kg of material from a Swedish utility and 140 kg from a German research organisation. Both stocks are already kept in Britain and no more plutonium would be brought into the country. Former Energy Minister, Michael Fallon, said the deal was beneficial because it would allow the government to exert more national control over the future of plutonium stockpiles on British soil. Britain took charge of nearly three tonnes of German, Dutch and French plutonium in a deal last year. (5)

The UK is free to withdraw any amount of material from safeguards any time, so once it has taken title to foreign plutonium, there will be no distinction between UK origin and foreign origin plutonium. The UK has a history of withdrawing nuclear materials - mainly plutonium, enriched uranium and depleted uranium - from safeguards hundreds of times since 1978, when the tripartite voluntary safeguards agreement came into force. In the first announcement to Parliament in 1998, twenty years after the withdrawal option became activated, it was revealed that 591 withdrawals had been carried out over that period. (6)

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More on PRISM reactors (with thanks to Ian Ralls of the FoE Nuclear Network):

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4. Capacity Markets and Kickstarting Negawatts

At the end of July two UK energy subsidy schemes got the green light from the European Commission - not including the nuclear subsidy scheme - a decision on that will come later. Nevertheless the two schemes are at the heart of the government's plans to reform the electricity market. They are the Capacity Market and Contracts for Difference (CfDs). If they hadn't been signed off, four years of work would have gone out the window and the future of the UK's energy system would have been thrown up in the air. (1)

The Government argues that it needs the Capacity Market to stimulate sufficient investment to ensure security of supply. In a nutshell, because traditional generators, such as gas plants, will go from running almost constantly at base load to a role that will serve just to back up renewables they will need some form of payment to help them remain economic to operate, rather than only being paid when they run. The capacity market is designed to help ensure that there is enough generating capacity to meet peak demand, by providing predictable payments to capacity providers. This market will be implemented later in 2014.

The first market auction will be for 53.3 GW in December 2014 for capacity to be available in 2018-19. Professor Catherine Mitchell says the GB capacity market is another example of poor energy policy decision-making. It suits the interests of companies who are the losers in the move to a sustainable future whilst again being unsupportive to those actors within the energy world who are trying to be innovative. And of course, it is the customers who will pay considerable amounts for something they should not be paying for. (2) Mitchell says enabling more big energy users to be paid for cutting demand at crunch times and building more interconnectors to other countries has worked better elsewhere.

Greenpeace's Dr Jimmy Aldridge agrees:

"...we could be making much better use of the demand-side of the power system – so rather than assuming that levels of demand are fixed we could be using smart metering and contracting to shift the times when power is used. We could be encouraging increased use of storage technologies so that power is stored when there is an excess and then used when renewables aren't providing. We could also increase the capacity of our interconnectors with Europe so that we can use their power rather than maintain high-carbon power stations in the UK that hardly ever run." (3)

Benedict de Meulemeester, CEO of international energy procurement consultancy E&C says it is understandable that energy companies lobby for capacity schemes, but governments should not heed them. Capacity mechanisms are an unnecessary subsidy that will only drive prices up for end consumers: they are an expensive solution for a problem that does not exist. Similar plans are now being prepared in other countries, including Belgium, France and Germany. (4)

Commission vice-president in charge of competition policy Joaquín Almunia said:

"*The UK capacity market embraces the principles of technology neutrality and competitive bidding to ensure generation adequacy at the lowest possible cost for consumers, in line with EU state aid rules*."

One major concern about the capacity market is its potential to help old coal plants stay open into the late 2020s and beyond, when the UK is supposed to be decarbonising its electricity supply by 2030. For instance, Drax, which generates about 7% of Britain's electricity, wants its generating units that have not converted from burning coal to biomass to receive new capacity subsidies. (5) But some hope that the UK will have had to make some concessions - like limiting capacity payments to coal - in order to get approval for the schemes. We will have to wait to find out, because the details of the EC's ruling won't be available for a few months.

This loophole will be closed according to Damian Carrington in *The Guardian*, who has been told by officials. But some coal payments will remain and critics say the policy still undervalues energy saving measures. DECC says "*Existing plants undertaking refurbishment can access a maximum of three-year agreements.*" A three-year deal would provide insufficient subsidy to make upgrading old coal plants financially viable. (6)

Meanwhile plans for a new generation of gas-fired power plants have been thrown into doubt after ministers warned that such projects may not be awarded crucial subsidies in December's capacity market auction. More than a dozen gas plants are awaiting construction but are uneconomic to build in the current market. Developers have pinned their hopes on being awarded "retainer"-style payments under the Capacity Market scheme.

DECC is now saying that the vast majority — perhaps all — of the capacity winning the auction will be made up of existing plant and demand side response with factories being paid to switch off at peak times. If it turns out to be "*cheaper to buy a new plant than to keep an old, run-down existing plant on the system, then that is what will happen*". But it's likely to be the older plants that are cheaper at this stage.

Carlton Power which had been planning to bid its proposed 2GW plant near Manchester into the auction and have the plant running by 2018 said if the auction brought no new plants on, it would have failed. "*In the short term it might be cheaper to [keep old plants running] but in the long term it won't be*," said the director, Keith Clarke. Old plants are significantly less efficient and less able to run flexibly to cope with intermittent wind power.

A second auction will be held next year to recruit plants for 2019-20, and ministers have suggested that more new plants may bid then. But Mr Clarke said it would be risky for developers to wait as it was not clear what would have changed by then. "*We have spent time, effort and resources to be prepared to bid in this auction*," he said. (7)

Most industry experts had been assuming that the "capacity market" scheme was designed to ensure that the many gas-fired power stations threatened with closure would be kept open. But DECC has now admitted the scheme will be open to all forms of generation including nuclear. So EDF could be in line for an £800m windfall. Cornwall Energy, a power industry consultant, estimates that successful bids by EDF using all seven of its existing plants could be worth £223m in the 2018-19 financial year and £818m in total by 2023. Tory MP Tim Yeo, chairman of the energy and climate change select committee, said "*the capacity market is designed to provide*

flexibility and this is a rather perverse consequence of that. DECC seem to have rather a lot on their plate and they're quite an under-resourced team." (8)

Kickstarting Negawatts

On the plus-side the government is establishing a £20m two year pilot to see whether and how energy demand reduction (EDR) measures, resulting in what we call negawatts, could be part of the capacity market, or whether another mechanism, such as an electricity efficiency feed-in tariff (FiT), might be more suitable. Demand Side Response (DSR) measures (shifting demand away from peak periods rather than reducing it permanently) and energy storage will all be eligible to participate in the pilot.

The UK has great electricity saving potential which current policies are not exploiting sufficiently. By 2030, if that potential is realised, government figures estimate conservatively, that almost 39 TWh, around ten per cent of the country's total electricity demand, could have been reduced.

Different Sectors' Electricity Saving Potential in 2030

Sector	**Electricity Saving in TWh**
Commercial Lights	5.160
Insulation	1.701
Industrial Pumps	8.422
Industrial Motors	3.875
Industrial Low Temp Processes	2.778
Industrial Iron & Steel	0.422
Industrial glass	1.664
Industrial compressed air	1.526
Industrial aluminium process	0.825
Heating, ventilation and air conditioning	2.950
LED Street Lighting	1.742
Public Administration Electronics	0.429
Domestic Appliances	4.344
Commercial refrigeration	0.167
Commercial electronics	2.619
TOTAL	**38.624 TWh**

Although the UK has a vast potential to reduce electricity demand, it is no help from a capacity point-of-view to reduce demand at non-peak times. So, for example, if you replace an incandescent light bulb with an LED bulb, it wouldn't be eligible for a capacity payment if that light isn't used at peak times. However, experience from the US shows that negawatts can be relied upon to deliver significant demand reduction at peak consistently. (9)

A new analysis by the Green Alliance suggests that peak load could be reduced by 6.4GW – equivalent to Hinkley Point C and Sizewell C. Their report draws on experience from the United States to show how the capacity market could work to promote energy saving and how the Government's pilot scheme needs to be improved.

Demand Side Response

KiWi power makes a laptop-sized piece of equipment that helps 650 plants or buildings in Britain save on energy bills. The firm monitors the energy being used by its customers and can cut their power usage at short notice. This could mean turning off lights or air conditioning during peak times of national energy demand for up to an hour at a time - if agreed by the customer. This is known as demand reduction (DR) and KiWi users - including several NHS hospitals, Marriott hotels and industrial groups - are paid by the National Grid for the energy they save. (10)

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5. Contracts for Difference

The other subsidy scheme which got the go-ahead from the European Competition Commission was of course the Contracts for Difference (CfDs) scheme. CfDs are the government's new system for supporting low-carbon electricity. They will provide a guaranteed 'strike price' for each unit of electricity generated. The ruling does not include nuclear subsidies.

Seven large projects were offered early CfDs in May and regular auctions for other projects will begin in the autumn. As with the Capacity Market, the details of the ruling from the Competition Commission won't be available for a few months, making detailed analysis impossible. Basically the CfD system means that by 2017 all large-scale renewables will have to compete for subsidies.

Competition Commissioner Joaquin Almunia said the CfD scheme "*…is a fine example of how to promote the decarbonisation of the economy with market-based support mechanisms, at the lowest possible cost for consumers*."

State aid legal expert, Erika Szyszczak, barrister at Littleton Chambers and professor of law at the University of Sussex explained to the *Carbon Brief* website that:

"Established technologies including onshore wind, solar panels and small hydropower plants will compete for contracts in a common auction. Less established, new and innovative technologies like offshore wind, wave, tidal stream and geothermal energy will initially benefit from allocated budgets in order to promote their development. Coal plants converting to burn biomass will be supported through dedicated tenders up to 2017. After that date the UK will evaluate whether biomass can be included in the common tenders for established technologies." (1)

In June the UK National Audit Office (NAO) complained that early CfDs had been allocated "*without price competition*". These early allocations will eat up 58% of the total budget for renewables support. There are fears there will be hardly any money for other schemes. Only £50m per year will be available for onshore wind and solar until 2020 with £155 million for things like offshore wind.

Leonie Green, head of external affairs at the Solar Trade Association said the £200m/yr ceiling placed on subsidies to renewable energy from this autumn is dwarfed by the £80bn guaranteed to the nuclear industry under a similar contract struck by the government. She said: "*The message the government is sending out today is clear. It is backing nuclear and other more expensive renewables over value-for-money solar. This is an absurd decision that will ultimately hit energy bill payers across Britain. Solar is already cheaper than offshore wind; it will soon be cheaper than onshore wind, and it stands a realistic chance of being cheaper than gas by the end of the decade. But this is only achievable with stable government support and a level playing field*." (2)

The Telegraph reported the funds would only be sufficient to fund one offshore wind project this year, throwing plans for many offshore farms into doubt. The £155m budget underlines a growing realisation in the industry that the finite budget for green subsidies is now on the verge of exhaustion and there is simply not enough cash left for many projects now in the pipeline to be built this decade. (3)

There are five offshore wind farms with planning consent that are likely to want to secure a contract, plus a further six projects which are still in the planning system. One of the projects with consent is Scottish Power's East Anglia proposal, which has capacity of 1.2GW and therefore appears unable to secure full funding for the entire project this year. Until now, offshore wind farms have been subsidised through the Renewables Obligation (RO) scheme, but this will be closed to projects built after April 2017.

The budget also represents a cut of around 50% in the amount of onshore wind which will be installed. Since 2010 the installation rate has been around 1000 MW (1GW) per year. But with only £50 million per year of extra money allocated for new projects for so-called 'mature' technologies such as onshore wind and solar farms, there will only be enough money for around 500 MW of onshore wind to be deployed each year until 2020 – a total of around 2500 MW, less than half the 7000 MW of consented onshore windfarms (and none of the many proposed solar farms,) can be deployed, according to calculations by Dave Toke, reader in Energy Politics at Aberdeen University. (4)

For solar schemes above 5MW the RO scheme is being removed from 31st March 2015, two years ahead of the deadline for other renewable technologies. Solarcentury, TGC Renewables, Lark Energy and Orta Solar are challenging the decision in Court. (5) But large-scale solar schemes will still be able to apply for the new Contracts for Difference (CfD) scheme, which starts in April next year. Solar PV will struggle to compete with onshore wind and hydro under the contracts for difference mechanism, according to industry analysts HIS, but between 2015 and 2017 the RO scheme will be more profitable for onshore wind developers. This could potentially leave solar without much competition for the initial £50 million pot in 2015/16. But after that PV could see its share of projects "gradually squeezed out by onshore wind projects". (6)

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6. Can Japan learn from Germany?

Amory Lovins says Japan thinks of itself as famously poor in energy, but this national identity rests on a semantic confusion. Japan is indeed poor in fossil fuels—but among all major industrial countries, it's the richest in renewable *energy* like sun, wind, and geothermal. For example, Japan has nine times Germany's renewable energy resources. Yet Japan makes about nine times less of its electricity from renewables (excluding hydropower) than Germany does.

That's not because Japan has inferior engineers or weaker industries, but only because Japan's government allows its powerful allies—regional utility monopolies—to protect their profits by blocking competitors. Since there's no mandatory wholesale power market, only about 1% of power is traded, and utilities own almost all the wires and power plants and hence can decide whom they will allow to compete against their own assets, the vibrant independent power sector has only a 2.3% market share; under real competition it would take most of the rest. These conditions have caused an extraordinary divergence between Japan's and Germany's electricity outcomes.

As Japanese officials distribute iodine tablets to residents in the area around the Sendai nuclear plant in preparation for the re-opening of the reactors, (1) probably in the autumn, Amory Lovins reflects on how the Fukushima disaster has been turned into a win for Germany, but a loss for Japan. (2)

Before March 2011 both countries produced nearly 30% of their electricity with nuclear power. Then, with the concurrence of all political parties, 41% of Germany's nuclear power capacity—eight units out of 17, including five similar to those at Fukushima and seven from the 1970s—got promptly shut down, with the rest to follow during 2015–22.

Japan struggled to re-open its reactors, and its economy wilted while Germany's thrived, adding several hundred thousand clean-energy jobs—part of the energy transition's net macroeconomic benefit. Japan's electricity prices soared while Germany's wholesale electricity prices fell more than 60%—including 13% in 2013 alone, when year-ahead prices hit eight-year lows.

Germany also uses energy more efficiently. In each of the past three years, German electricity consumption fell while GDP grew. During 1991–2013, i.e. since reunification, German real GDP grew 33% using 4% less primary energy and 2% less electricity, and emitting 21% less carbon. Even more ambitious savings are available and planned. Japan's sky-high energy prices make energy efficiency very profitable, most of all in buildings. Semiconductor company Rohm's office opposite Kyoto Station, for example, cut its energy use 46% and repaid its cost in two years. With a few exceptions, like the Tokyo Metropolitan Government's efficiency efforts, few Japanese buildings have received the kind of *kaizen* (continuous improvement) that has long distinguished Japanese industry.

To revitalize its economy and politics, Japan needs an efficiency-and-renewables leapfrog that enables the new energy economy, not protects the old one. Come to think of it, an efficiency-and-renewables leapfrog wouldn't go amiss in Britain either.

Meanwhile Canadian TV reports that 3,000 employees have left Tokyo Electric Power since the Fukushima disaster. The financial strain of the disaster has led to brutal salary cuts while ongoing problems at Fukushima, such as substantial leaks of irradiated water, have reinforced the image of a bumbling and irresponsible organization. But now there's another reason to leave - better paid jobs in the feel good solar energy industry. Two top U.S. solar companies doing business in Japan, First have interviewed former TEPCO employees for possible posts. Besides their experience, knowledge of how the utility industry works and their contacts, with both private industry and government bureaucracy, are prized assets. "It's about the human network and the TEPCO employees have all the contacts," said one solar executive who says he has recruited about 20 people from TEPCO and is hoping to get more. (3)

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7. PLEX

We reported last month that the Office for Nuclear Regulation (ONR) had approved a change to rules which govern graphite bricks that line the core of the reactors at Dungeness B. Now EDF Energy has released information about the ageing of the graphite blocks in the reactor core of all its AGRs.

These reactors consist of thousands of interconnected graphite blocks with circular channels for fuel and control rods. The graphite blocks slow down (moderate) neutrons generated in fission. Over time, as a result of being bombarded by radiation, the bricks lose weight and can crack. If the cracking makes the blocks slip out of place, it could become difficult to insert the control rods when necessary.

The ONR strictly regulate the state of the bricks and don't normally allow the bricks at Dungeness to lose more than 6.2% before they are classed as having reached the end of their life – as they line the reactors core, they cannot be replaced which means the bricks signal the end of the power station's life. However, EDF applied to the regulator, and received permission, to increase this limit to 8% in order to extend the life of the power plant. (1)

The current limits for graphite weight loss and the current estimated average weight loss at each power station are as follows (2):

Power station	**Estimated average weight loss**	**Current Limit**
Dungeness B	5.75%	8%
Hunterston & Hinkley Point B	12.8%	15%
Hartlepool	13.7%	17%
Heysham 1	10.5%	12%
Heysham 2 & Torness	9.4%	14%

EDF Energy said that the differences in limits between stations reflects the difference in the design of the plant. The limits are approved during formal safety reviews which happen at least every three years. It also said that it has a continuous programme of monitoring, sampling and modelling graphite behaviour in conjunction with academic institutions in the UK.

"*We work continuously with scientists and UK universities to understand how materials in our nuclear reactors change over time and how that will affect the stations' operations. We regularly refine our own safety assessments as we uncover new information. All our findings and new research feed into mathematical models based on pessimistic assumptions, and maximum safety margins*," said Brian Cowell, Director of Nuclear Operations, EDF Energy.

EDF expects the new 8% limit for Dungeness B will have to be raised again to at least 11% to allow the reactor to continue operating until 2028, ten years after its currently scheduled closure. Steve Thomas, professor of energy policy at the University of Greenwich, said that the company had given average weight loss figures, but this masked the fact that some parts of the graphite core had lost up to 40 per cent of their weight. "*It just smells bad when you hit the limit and then you try to change it and then you change it again," he said. "It looks a little bit compliant that the nuclear industry asks for it and the regulator says 'OK yes, you can have that'. The [regulator] looks a bit captured to me*." (3)

A major study of reactor hazards published by Greenpeace in April 2005, concluded that risks from ageing reactors are higher because age-related degradation mechanisms are not well understood and are difficult to predict. AGRs do not have a secondary containment, so there is a high potential for large radioactive releases. (4)

A report by Large Associates – an independent nuclear engineering consultancy –analysed a bundle of documents received under the Freedom of Information Act about Hinkley Point B and Hunteston B. It concluded that there are "*…significant uncertainties over the structural integrity and residual strength of the moderator cores in …AGR plants … in view of the increased risk presented by continued operation of these nuclear plants, the reactors should be immediately shut down and remain so until a robust nuclear safety case free of such uncertainties has been established.*" (5)

John Large said it was "*gambling with public safety*" to allow Hinkley Point and Hunterston to continue operating. (6) The documents, written by the former Nuclear Installations Inspectorate, reveal that AGRs are structurally defective and their continued operation is increasing the risk of a radioactive accident. (7)

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8. Energy Efficiency – from cashback to Russian gas

The scandal that is the lack of action on energy efficiency has continued with the UK Government closing its Green Deal Cashback scheme and the European Commission agreeing to an unambitious target for 2030.

European Commissioners have agreed the EU should cut its energy consumption 30% by 2030, in a bid to slash carbon emissions and boost energy security in response to the escalating security crisis in Ukraine. Currently, the EU spends more than €400bn (£315bn) a year on imports of fossil fuels, a large proportion of which come from Russia through gas pipelines. The commission has calculated that for every 1% in energy savings, EU gas imports could be expected to fall by 2.6%. (1)

Monica Frassoni, president of the European Alliance to Save Energy, said: "*The European commission appears to have lost credibility. Its supposedly leading role aiming to build a low carbon economy around an energy efficiency target shows an obvious lack of ambition in the final proposal. The proposal is clearly not based on a real scientific assessment and a serious cost-benefit analysis, otherwise a target between 35% and 40% would have been proposed*."

According to Friends of the Earth Europe, the decision to recommend a 30% target ignores the European Commission's own analysis, which shows a higher target of 40% for 2030 would bring greater environmental and economic benefits. The 40% model sees gas imports fall by 40%, rather than 22% under the current proposals. It has called on the European Parliament, which in January voted for a 40% energy reduction target, to push for more ambitious measures. (2)

Frederic Thoma, energy policy adviser at Greenpeace, was scathing of the deal, and also invoked the EU's reliance on Russian gas. "*In its dying days, the outgoing commission has tabled another gutless plan on energy that is a gift to the oligarchs of this world. An ambitious efficiency target would drastically cut the need for expensive imports of fossil fuels from Russia and elsewhere and help Europe stand up to bullies like Putin. The commission's own research shows efficiency could also create three-and-a-half million jobs, while helping tackle climate change. It's a no-brainer that EU leaders cannot ignore. They must put Europe's energy policy back on track*." (3)

A 30% target will only reduce gas imports by 22% whereas a 40% target would cut imports by 40% - the equivalent to total current Russian gas imports, according to an analysis by a German energy institute. (4)

Meanwhile, in England and Wales the £120m Green Deal cashback scheme for installing energy-efficient home improvements was shut down with immediate effect on 24th July because the funds were exhausted in just six weeks. The scheme offered households up to £7,600 each - enough to cover the majority, or in some cases all, of the cost of various measures such as wall insulation or new doors and windows. (5) And the Green Deal and Energy Company Obligation have failed to put the UK on the right track to meet its commitments on cutting greenhouse gases, according to the Committee on Climate Change. (6)

Proposals to lift fuel poor homes to an Energy Performance Certificate rating of at least C by 2030 have been heavily criticised by Ed Matthew director of the Energy Bill Revolution. He said: "*…this strategy is so full of holes they will never plug the UK's fuel poor homes. The target to bring all fuel poor homes up to EPC Band C by 2030 is too far away and they have not committed to bringing homes up to this standard in one go, killing off the prospect of whole house retrofits and condemning millions of people to suffer the scourge of fuel poverty for yet another generation. Also by saying the government only has to do what is 'reasonably practicable' they don't have to spend a penny on the programme. This makes the targets they are setting meaningless.*" (7)

Jenny Saunders, of the charity National Energy Action (NEA) warns that under these plans more than a million fuel-poor households will still be living in hard-to-heat homes by 2025 and £1bn savings on bills will be missed. The Association for the Conservation of Energy point out that in addition to the 2.3 million deemed to be in fuel poverty, another 2 million households are far too poor to afford a Green Deal loan to upgrade their home. (8)

Friends of the Earth says a really effective energy efficiency scheme would need a secure funding stream of about £4bn per year until 2025. Expensive perhaps but a long-term, large-scale insulation programme would bring major, long-term, financial benefits which would pay back the initial investment. It would do, in spades, everything Infrastructure UK says major investment is meant to, and which the country needs so badly: strengthen the economy, create jobs, and increase living standards. (9)

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9. Energy Revolution

Major cities could be the game-changer we've been waiting for by opening up the market and driving investment in low carbon energy, according to IPPR, the centre-left think tank. Cities should invest in green energy production to compete with the main UK energy suppliers. A new IPPR report explores the options and the potential for cities to engage in the energy supply market and raise finance for investment in low-carbon energy infrastructure – particularly in local energy generation. Many of these opportunities can be delivered under existing local authority powers, and are just waiting to be realised. However, there is more that the national government can do to help unlock the full potential of cities. (1)

Some of the UK's largest cities and local authorities are already moving into the energy business. Current projects are small-scale and may be doing little to trouble the Big Six utilities, but in future they could disrupt the business model of massive commercial players by investing significant sums in low-carbon energy. (2)

The report found authorities including Aberdeen, Bristol, London, Manchester and Cornwall are increasingly investing in low carbon forms of energy, or setting themselves up as suppliers through a diverse range of schemes. London is looking to become the first city to sell its own power whilst Bristol is investing in Wind and Solar power and is looking to invest in 500,000 solar panels across the city.

Further north, Lancashire has invested around £200m from its pension fund into low-carbon projects and in Scotland Aberdeen says it is creating one of the world's first "Hydrogen hubs" converting wind from nearby offshore turbines into hydrogen to power the cities' bus fleet. In Cornwall the local authority is backing various community energy projects whilst in Leeds the council has led the delivery of home insulation measures, traditionally a role played by the major energy companies.

The schemes also come at a time when UK councils are facing increasing financial pressures on their spending. (3)

Another new report from ResPublica reveals that businesses looking to become energy suppliers face major barriers to entry in the UK. 12 new businesses have entered into the domestic supply market since 2011, taking the total number to 25, but the six largest energy companies still capture 93.5% of the market share. In stark contrast, Germany is home to 1100 electricity suppliers, and the four largest energy businesses hold only 44% of the retail market. Households in Germany can choose from an average of 72 energy suppliers, most of which are established locally.

The ResPublica Essay, 'Creating Local Energy Economies: Lessons from Germany', argues that the UK can deliver on greater transparency, lower household bills and genuine competition if communities, local authorities, housing associations and small businesses could enter into the supply market and sell their energy locally. At present, there are no local suppliers in the UK. (4)

In Germany between 2010 and 2012 90 communities and municipalities entered into the supply market and 190 communities bid to run their local electricity distribution network. A growing number of local groups are appealing to private energy companies to put their local

utility back into public hands. This is a movement that reaches far beyond the community ownership of generation and municipal governance of public services toward a much more holistic and embedded approach to the very composition of the energy market.

Of course one resource which local authorities do have is roof space. The total amount of solar PV installed in the UK now exceeds 4.6GW. In comparison, the total in Germany exceeds 30GW. Roughly half of the UK solar is ground-mounted, and half on roofs. Of roof-mounted solar, by far the majority is on residential buildings. According to Solar Century only around 400 commercial-scale (100kWp or larger) solar PV systems have been installed out of approximately 1.8m commercial properties in the UK. As the cost of solar energy plunges, the solar industry is growing at what some describe as "lightning speed". But that is a global picture. Using commercial rooftops for solar generation is especially important, for three reasons. First, there is enormous vacant, functionless, roofspace on warehouses, factories and the like and a quarter of a million hectares of it faces south. Second, companies can save money by solarising their roofspace - and third, commercial roofs are where the Department of Energy and Climate Change (DECC) says it wishes to see much of the solar installed in the future. (5)

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10. Nuclear Transports by Sea from Dounreay to Sellafield

Controversial plans to ferry radioactive nuclear fuel and waste by sea from Dounreay to Sellafield have been attacked by local authorities. The Nuclear Decommissioning Authority (NDA) insists that a successful trial could give them two potential routes for transporting material between the two sites with contentious shipments already being made by rail. But critics are warning against the risks of navigating rough seas around Cape Wrath and the Minch. Highland MSP John Finnie said he had particular concerns, given the loss of the Coastguard's Stornoway-based emergency tug. (1)

Comhairle nan Eilean Siar (the Western Isles Council) is to write to the NDA to seek reassurance that transportation by sea will be safe.(2) Councillor Mark Hackett, chairman of the Nuclear Free Local Authorities, said: "*Rail transports of such materials are bad enough, but at least there is the possibility of reasonably prompt emergency response with such an incident*." Norman McDonald, of Western Isles Council and who is president of Kimo International (The European Local Authorities Environmental Organisation) said the possibility of a fire, collision and subsequent radiation leak would have potentially devastating and harmful effects on one of the most sensitive parts of the north east Atlantic. (3)

The Ramsden Dock Stakeholder meeting at Barrow-in-Furness on 17th July 2014 was told that trials will be undertaken at Barrow Docks this Autumn to assess the viability of sending Dounreay fuels – already earmarked for transport to Sellafield by the NDA – by sea through the port's nuclear terminal at Ramsden Dock. Peter Buchan of International Services (INS – a wholly owned subsidiary of the NDA) confirmed that the upcoming trials related to the 'exotic fuels' currently held at Dounreay. Providing the trials at Barrow docks prove successful, sea shipments to Sellafield from Dounreay could start as early as 'a few months after the trials' and continue for a number of years.

The exotic fuels, a sub-set of Dounreay's nuclear materials holdings now owned by the NDA, comprise a total of around 26 tonnes which include unirradiated plutonium bearing fuels, unirradiated high enriched uranium (HEU) and irradiated fuels (oxide and carbide) – some from Dounreay's Prototype Fast Reactor (PFR). (4)

1. Scotsman 21st July 2014 http://www.scotsman.com/news/environment/fears-over-plan-to-ship-nuclear-waster-from-dounreay-1-3483291
2. West Highland Free Press 26th July 2014 http://www.whfp.com/2014/07/25/concern-over-nuclear-waste-shipments/
3. Herald 30th July 2014 http://www.heraldscotland.com/news/home-news/plans-for-radioactive-waste-by-sea-are-criticised.24898732
4. CORE 17th July 2014 http://www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=341

11. Leukaemia increases in young children near nuclear power stations

The British Journal of Cancer (BJC) has published a second article purporting to show there were no leukemia increases in young children near UK nuclear power plants but a close reading of the actual data in the report reveals statistically significant cancer increases measured across all years and ages.

The first article was published in 2013. Radiation consultant Dr Ian Fairlie criticised the article at the time stating that it should not have been published. (1) The BJC has now printed a similar article (Bunch et al, 2014) which, according to Fairlie is, if anything, even worse than the 2013 one. A close reading of the actual data in the report's table 3 in fact reveals statistically significant cancer increases measured across all years and ages. The data layout in their table 3 hides these increases so Fairlie has laid out the data more clearly together with p values kindly added by Dr Alfred Körblein. Given the lack of statistical power in its chosen analyses and given the fact that increases were actually found, the report should not have concluded that people were not at risk. Instead it should have reported the cancer increases but added that the results of its own chosen analyses were not statistically significant as they were underpowered. However, it should also have added that, over all cancers and all years, observed cancer increases in fact were highly statistically significant. (2)

In March 2014, Dr Fairlie, writing in the *Journal of Environmental Radioactivity* said that over 60 epidemiological studies world-wide have examined cancer incidences in children near nuclear power plants (NPPs) and most of them have indicated leukemia increases. These include the 2008 KiKK study commissioned by the German Government which found relative risks (RR) of 1.6 in total cancers and 2.2 in leukemias among infants living within 5 km of all German NPPs. The KiKK study has retriggered the debate as to the cause(s) of these increased cancers. (3)

Fairlie says "*I can think of no other area of toxicology (e.g. asbestos, lead, smoking) with so many studies, and with such clear associations as those between NPPs and child leukemias. Yet many nuclear Governments and the nuclear industry refute these findings and continue to resist their implications*." (4) Dr Fairlie's Journal of Environmental Radioactivity article has been downloaded 482 times, which is quite a lot for a scientific journal article costing $36. (5)

1. Ian Fairlie 15th September 2013 http://www.ianfairlie.org/news/leukemias-near-nuclear-power-stations-new-study-by-bithell-et-al-september-2013/
2. Ian Fairlie 25th July 2014 http://www.ianfairlie.org/news/comments-on-another-bjc-article/
3. A Hypothesis to explain childhood cancers near nuclear power plants, by Dr Ian Fairlie, Journal of Environmental Radioactivity, Volume 133, July 2014, Pages 10–17
4. Ian Fairlie 25th July 2014 http://www.ianfairlie.org/news/childhood-leukemias-near-nuclear-power-stations-new-article/
5. Ian Fairlie 25th July 2014 http://www.ianfairlie.org/news/childhood-leukemias-near-nuclear-power-stations-482-downloads/