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1. 2015 – A Critical Year for New Nuclear
2. Lobbyists try to build a head of steam for Small Reactors
3. Nuclear Waste Update
4. Sellafield Catch Up 2015
5. Scotland could become renewable 'powerhouse' by 2030
6. Renewables vs Nuclear
7. Energy Costs
8. Capacity Market
9. Conservation, Proliferation and Responsible Science

1. 2015 – A Critical Year for New Nuclear

Last month we reported that it was still unclear exactly who would invest in EDF Energy's proposed new reactors at Hinkley Point in Somerset. According to the Department of Energy and Climate Change (DECC) China National Nuclear Corporation (CNNC) and China General Nuclear Power Corporation (CGNPC) could take up to a combined 40% share of the equity; (China Daily most recently said the Chinese are discussing an estimated 35% stake (1)) EDF could take 45-50%, and Areva 10%, and discussions have been ongoing with other interested parties – possibly the Saudis (2) and Qataris (3) - who might take 10-15%. But Building Magazine claimed that reports the Saudis might be interested in investing are untrue. (4) And Areva's financial problems make its 10% share look increasingly unlikely. (5) The Company is struggling to survive the ongoing mess of the Olkiluoto nuclear plant in Finland. The plant is years behind schedule and billions over budget. Areva's losses in Finland are currently estimated at €3.9bn and the excess costs involved are now the subject of a bitter dispute with the Finnish utility TVO.

Now, Nick Butler writing in the *Financial Times* says financing of the deal has still not been settled - several potential investors have backed away despite the promise of a 35-year index-linked price guarantee backed by the UK taxpayer. Butler says the Kuwaitis, the Qataris, the Saudi Electric Company and even Hermes, the UK based investment fund — have all been mentioned as possible investors but none has signed up. The fact that nothing has been said since the Chinese Premier's visit last June about the two Chinese nuclear companies investing suggests that they may have cooled on the prospective investment.

There is now deep uncertainty in the nuclear industry about EPR reactors and the complexity of the design. As well as the problems in Finland, the EPR reactor being built by EDF at Flamanville in Northern France is also years late. The concern has spread well beyond the UK. In India there is pressure for a renegotiation of the tentative deal under which Areva is due to build a new reactor at Jaitapur. In December, the Indian Prime Minister Narendra Modi signed a deal to bring in Russian technology which looks decidedly cheaper and more technically reliable.

In fact, the hiatus over the funding of Hinkley Point may not be such bad news for either UK consumers or the company, says Butler, Government backed funding would be materially cheaper than going to outside investors who would inevitably require a risk premium, or even more expensive financial guarantees. The UK government can borrow more cheaply than almost anyone in the world. A different approach to funding would allow the terms of the deal to be renegotiated and made less generous. And most important of all, as funders of last resort, the UK government could make their investment contingent on the company demonstrating that either Flamanville or Olkiluoto can actually be commissioned and start production and that all the lessons of the two failures have been learnt. That last step clearly requires a full, independent appraisal of what has gone wrong with the other projects. That will delay the start up of Hinkley, but a limited delay would be better than proceeding at huge expense with unproven technology. (6)

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2. Lobbyists try to build a head of steam for Small Reactors

Nuclear lobbyists have continued to try to build a head of steam behind Small Modular Reactors (SMRs) in the UK.

In NuClear News No.68 November 2014 (1) we reported that Jim Green of FoE Australia had described this pro-SMR campaign as an implicit admission that existing reactors aren't up to the job. SMRs are a new occupant in the graveyard of the nuclear renaissance – but the problem is no-one wants to buy one.

According to the House of Commons Energy and Climate Change Select Committee SMRs are designed in a way that allows them to be manufactured at a plant, brought to site fully constructed, and installed module by module, thereby potentially improving manufacturing efficiency and cost while reducing construction time and financing costs. (2) But in August NuClear News No.65 (3) reported that the Union of Concerned Scientists in the US point out that the economies of scale dictate that, all other things being equal, larger reactors will generate cheaper power. 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.

The Washington-based Institute for Energy and Environmental Research (IEER) says SMRs will probably require tens of billions of dollars in federal subsidies or government purchase orders and create serious concerns in relation to both safety and proliferation. 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. (4)

Feasibility Study

In July, the UK's outgoing Minister for Business and Energy, Michael Fallon, told Parliament that the National Nuclear Laboratory was carrying out a feasibility study which would make initial recommendations on the economic, technical and commercial case for SMRs. That feasibility study was published in December. The study considered four designs in detail - ACP100+ (designed by CNNC); mPower (B&W and Bechtel); Westinghouse SMR (Westinghouse); and NuScale (Fluor), and concluded that the UK has the opportunity "*to regain technology leadership*" in SMRs. (5)

The feasibility study (6) says there is a very significant market for SMRs in places where large reactors would be unsuitable. It calculates the size of the market to be approximately 65-85 GW of new capacity by 2035, valued at £250-£400 billion, with demand in the UK of around 7 GW by then. (See the Bonkers Scenario NuClear News No 58 http://www.no2nuclearpower.org.uk/nuclearnews/NuClearNewsNo58.pdf) NNL claims that "First-of-a-kind" SMRs could be cost comparable with conventional nuclear build, with the potential to become more cost competitive as more are built. But further evidence is required to make a policy decision or for business to make an investment. Paul Howarth, NNL managing director,

said the feasibility report is "*an important step on the way towards recognizing the role which SMR designs can play and helping to capitalize on the opportunities offered*."

Select Committee

The House of Commons Energy and Climate Change Select Committee published their report on Small Reactors on 17h December 2014. (7) The MPs want the Government to work with industry to better understand the economics of Small Modular Reactors (SMRs) and set out a clear explanation of the conditions under which they might become cost competitive in the UK. The report says it will be important to understand the future cost comparison with large-scale nuclear reactors as well as the comparison with other small-scale energy generation or demand management.

Deployment of SMRs is likely to be achieved through sharing the costs between the public and private sector and the Committee would like to see the Government steering industry towards deploying a demonstrator SMR in the UK. Government should help to establish the right conditions for investment in SMRs, for example through supporting the regulator to bring forward approvals in the UK, and by setting out a clear view of siting options. It might take six years to give regulatory approval (including a site-specific licence) for a small modular reactor. The Committee is calling on DECC to ensure that the Office for Nuclear Regulation is adequately resourced to support SMR developers in the early stages of preparing their designs for approval. (8)

Speaking at the Nuclear New Build conference yesterday, shadow energy minister Tom Greatrex warned the government that "*no one, including the Chancellor as he drafts his Autumn Statement, should be fooled into thinking that small nuclear reactors are somehow the answer to all our energy needs*." But he did concede that there are "*many opportunities" for small and medium scale reactor technologies"*. (9)

Meanwhile the energy minister for the Republic of Ireland, Alex White has said that nuclear power ought to be considered in a debate on the country's future energy needs. A Green Paper on Energy was published for consultation last summer. This asked whether it might now be time to consider the potential economic and technical implications, of introducing a small nuclear reactor to replace the Moneypoint coal-fired power station and to test public acceptance of nuclear generation located on the island of Ireland. (10) At the moment nuclear power is banned in Ireland.

White told the Irish Independent in an interview published on 31 December 2014 (11) "*We have a dependence on damaging carbon-based energy sources which are effectively destroying the planet. You cannot preside over a full debate by excluding anything*." (12) The Department of Communications, Energy and Natural Resources is currently working on a long-term energy strategy which will set out the role for conventional power generation from oil and gas; renewables including wind and energy; along with nuclear and other energy sources. This white paper will be a definitive statement on what the energy needs are for the future of Ireland, and this will be published in the summer of 2015. (13)

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11. Irish Independent 31st Dec 2014 http://www.independent.ie/irish-news/we-cannot-rule-out-use-of-nuclear-power-minister-30872861.html
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3. Nuclear Waste Update

The nuclear industry and its supporters believe that it is possible to "dispose" of nuclear waste deep underground in a so-called deep geological repository (DGR). The philosophy of deep disposal is based on the concept of multiple barriers: the waste containers themselves; the grout surrounding the containers; the surrounding rocks; and dispersal of any radioactivity penetrating these barriers away from the surface environment. Deep disposal, they say, would put this dangerous waste out of harm's way, remove a potential target for terrorist attack, and avoid leaving a problem of our making for future generations to deal with.

Environmentalists, on the other hand, say that this method cannot be described as 'disposal'. Disposal is "the act or means of getting rid of something". Since the deep disposal concept is based on the eventual dilution and dispersion of radioactivity throughout the environment, it is in fact a misnomer. Putting nuclear waste in a "repository" does not get rid of it at all. Any deep dump would have targets set for doses of radioactivity to the public during the thousands or even millions of years the waste remains dangerous. But a small miscalculation in the amount of radioactivity reaching the surface could have devastating consequences.

Environmentalists are concerned that the rate at which radioactivity would leak from a deep dump is poorly predictable, and likely to remain so for an indefinite period, despite many decades of expensive research. Instead they favour storage on the surface in dry above-ground stores where it can be monitored and retrieved and repackaged if necessary. This, they say, would give future generations a choice about how our nuclear legacy is managed whereas a below ground repository would just leave a legacy of a nuclear waste dump gradually releasing radioactivity into the environment, cutting off the options for future generations.

In the UK between 2003 and 2006 the Government's Committee on Radioactive Waste Management (CoRWM) carried out one of the most extensive public consultation exercises ever carried out. Unfortunately, the process which CoRWM followed was seriously flawed. It assumed, for instance, that disposal '*removed a burden from future generations*' and, hence, this attribute of disposal scored heavily in consultations with the public and in the multi-attribute decision analysis approach the committee took in determining its recommendations. Some felt that such weight given to a consequence of disposal which is at best questionable and at worst entirely wrong gave rise to a skewing of the process. In addition some felt that scoring disposal in this way tended to over-emphasise reducing the burden of cost, risk and effort on future generations despite the fact that there is no certainty that it will prove effective in doing so.

In June 2013, Nuclear Waste Advisory Associates (NWAA), which includes two former members of CoRWM, proposed a series of steps for the UK to move towards an open and transparent process for the management of nuclear waste. (1)

Does the Scientific Evidence Support the View that Radioactive Waste can be safely Disposed of Underground?

In September 2010, Greenpeace International published an extensive literature search on the science of deep geological disposal by Dr Helen Wallace (former campaigner in the Greenpeace UK Science Unit). The report – Rock Solid (2) – provided an overview of the status of research

and scientific evidence regarding the long-term underground disposal of highly radioactive wastes. It identified a number of phenomena that could compromise the containment barriers potentially leading to significant releases of radioactivity.

A similar exercise was carried out by the UK group Nuclear Waste Advisory Associates (NWAA) which published an Issues Register (March 2010) listing 100 issues which need resolution before any kind of safety case can be made for deep geological disposal. (3)

The issues raised by Rock Solid and the NWAA Issues Register have been included in the UK Nuclear Decommissioning Authority's Issues Register (See Appendix B Geological Disposal: RWMD (now Radioactive Waste Management Ltd (RWM)) Approach to Issues Management, March 2012 http://www.nuclearwasteadvisory.co.uk/wp-content/uploads/2013/02/Geological-Disposal-RWMD-approach-to-issues-management-March-2012.pdf) Each area has a response from RWM. This has now been developed into an Issues Register website (http://www.nda.gov.uk/rwm/issues/introduction/).The issues can be searched according to, for instance, the issue raiser. (4)

The nuclear industry appears to believe that any uncertainties associated with the science of deep disposal can be reduced sufficiently by carrying out further research. This is poor scientific method. It cannot be assumed that further research will produce the desired outcome. As is pointed out by the Environment Agency of England and Wales:

"F*urther research has the potential to increase uncertainties, e.g. by revealing unforeseen complexities or additional processes influencing the system under study. While a well defined and executed research programme can answer fundamental questions, uncertainty is a normal characteristic of science, and as such, additional questions (and uncertainties) are often raised.*" (5)

Corrosion

To illustrate the sorts of issues being raised by Rock Solid, NWAA and others, one of the many issues raised was a particular problem with copper corrosion which has been raised by some recent research.

The KBS-3V disposal concept using copper containers is one of the current disposal concepts under consideration by RWM, for High Level Waste/Spent Fuel (HLW/SF) in higher strength rock. (If the host rock for a DGR were clay then the Swiss NAGRA concept would be used and the German system if the host rock were salt).

Both SKB in Sweden and Posiva in Finland have selected the KBS-3V disposal concept as their reference design for use in a spent fuel repository. The KBS-3V disposal concept has been developed over a period of nearly four decades. In this concept, vertical copper canisters are used to store spent fuel, in vertical deposition holes. Adjacent to the canister Bentonite clay would be used to contain the canisters and retard any potential radionuclide migration. Bentonite is also used to backfill the deposition tunnels.

The copper canisters are supposed to be corrosion resistant, but in July 2009 Hultquist et al published research which suggested that a copper wall thickness of one metre would be required for long-term (100,000 years) durability. It is not clear how such a wall thickness would be either logistically or economically achievable. (6)

The Swedish NGO, MKG explains that after the emplacement of the canisters and clay the oxygen in the repository is quickly consumed by bacteria and chemical processes. The fundamental assumption in the KBS method is that very little corrosion takes place in an oxygen-free environment. The canister walls are 5 centimetres thick and only a millimetre or two of the copper is supposed to corrode in a million years.

Now new research shows that once copper begins to corrode, the process can proceed quickly through so-called pitting, which gives pox-mark indentations in the surface. The risk of pitting has led critical researchers to fear that the copper canisters may start to leak after only some hundreds of years — instead of after hundreds of thousands of years.

In November 2009 after various papers by Hultquist et al, the Swedish Council for Nuclear Waste, an independent scientific committee which advises the Government, organised a workshop. The conclusions of the expert panel invited to comment on the issues raised were not categorical. The Council states that:

"…mechanisms of copper corrosion in oxygen-free water must be investigated experimentally to determine whether corrosion of copper by hydrogen evolution can take place in pure, deionized, oxygen-free water and in groundwater with bentonite." (7)

Then in 2011 **t**he Swedish Radiation Safety Authority (SSM) published research which in principal reproduced parts of Hultquist at al. Exposure of copper in pure anoxic water (depleted of dissolved oxygen) resulted in a measureable gas production rate. The most obvious explanation for the results in this work is consequently that corrosion of copper occurs in pure anoxic water. (8)

In 2012 SSM explained that the copper canisters will need to meet to two completely different environments over the life of the geological disposal facility;

- an initial period of several hundreds of years when copper is exposed to gaseous corrosion
- and then a period when it is exposed to aqueous corrosion

From a corrosion point of view the first 1000 years are the most critical for the copper canister since pure, or phosphorus alloyed copper, is not designed to cope with corrosion at elevated temperatures. The outer copper surface temperature is expected to reach 100°C within some decades after closure of the repository and then slowly cool down to around 50°C after 1000 years.

SSM criticises SKB for only looking at oxygen when assessing gaseous corrosion. It says "*This simple model has no scientific support since several corrosive trace gases, such as sulphurous and nitrous compounds, operates together with water molecules (moisture) and the corrosion product consists mostly of oxides and hydroxides derived from water molecules. These trace gases are known to have an accelerating effect on copper corrosion. Any corrosion model describing the gaseous copper corrosion period must therefore be based on experimental data*." (9)

In 2013, SSM commissioned Hultquist and others to carry out further research. This indicated that corrosion of copper in anoxic water involves a mechanism in which hydrogen atoms present in water molecules form hydrogen gas which partly dissociate and diffuse into the copper metal as hydrogen atoms. (10)

In September 2014 SKB submitted a progress report to SSM on Copper Corrosion. SKB now admits that theoretically copper can corrode in anoxic water and that there are indications that the process does occur on the surface. But SKB claims that the corrosion stops very soon after starting and that hydrogen measured over longer time-scales comes from inside the copper and not from a continued corrosion process. Unfortunately SKB had no evidence to support this assertion. And according to microbiologist Karsten Pedersen in Gothenburg, who carried out the study for SKB, it is possible to interpret the results in different ways. (11)

SKB claimed that it was now scientifically proven that even if copper can react with oxygen-free water, this is only a short-lived surface effect. Hence, the corrosion process will not be a threat to the long-term safety of the planned repository for spent nuclear fuel at Forsmark.

This ongoing scientific debate on just one of many unresolved issues surely raises a question-mark over whether it will ever be possible to produce an adequate robust safety case in order to proceed with burying nuclear waste underground.

If not Sellafield then where?

In the wake of the publication of the Implementing Geological Disposal White Paper, NWAA member and former CoRWM member Professor Andy Blowers has been looking at political and policy developments in the search for a site for a geological disposal facility and argues that the White Paper leaves the way open for further procrastination. (12)

Blowers says that the White Paper (13) in striving to achieve a consensus, has ended up with a policy and process which is opaque, uncertain and unfathomable. DECC's team of officials have striven to meet many of the criticisms of the prior consultation document but the outcome could well be a recipe for political prevarication and procrastination.

The new process is to begin with a dumbed-down programme of raising public awareness, mainly confined to explaining the science of geological disposal. A national level geological screening guidance will be used to assist '*in engaging with communities across the country on early questions of their geological potential to host a GDF safely*' (p.35). So the White Paper has moved some way towards the demand that geology is given priority over voluntarism in the first instance.

There was also a subtle shift in emphasis on the priority accorded to the GDF. While achieving a GDF remains the central objective, there is explicit recognition in the White Paper that 'Interim waste storage is an essential component of higher activity radioactive waste management' (p.17) and safe and secure storage might well be required for more than 100 years. But there has been no movement on the inventory for the GDF, which would include spent fuel from new-build, up to a defined amount.

Although the White Paper repeats the mantra of voluntarism and partnership, the role of the new consultative partnership is unclear. Much of the detail of what constitutes a community, what will be the roles and responsibilities of community representatives, how and when a test of public support will be made, and what options there will be for disbursement of community investment is consigned to the deliberations of a 'community representation working group'. This will comprise 'experts in local democracy' drawn from government, local and national, the

developer and academia. On the recommendations of this group, the Government will decide all the practical details of 'the process of working with communities'.

The role of local government as representative authority has been much diminished. Under pressure from Cumbria and others, the leading role assigned to district councils in the consultative paper has been replaced in the White Paper by the woolly notion that all representative bodies should have a voice but 'no one tier of local government should be able to prevent the participation of other members of that community' (p.43). As a result, the elected local authorities have been disempowered.

It is intended to bring the GDF, as well as any borehole drilling, within the Nationally Significant Infrastructure Projects regime. The whole process will be guided by a non-site-specific National Policy Statement which will set out the planning parameters for a decision on the GDF. This proposal raised concerns that alternatives would be unconsidered and 'in principle' decisions would foreclose debates at an early stage.

Following publication of the White Paper RWM is holding two events, in Bristol (January 22) and Manchester (February 4), to discuss the national geological screening process. These meetings are supposed to provide an opportunity for the public to have an input into what is to be produced in addition to the specialist meetings they are holding. As well as seeking the views of the public they state that they hope to be able to address as many of the public's questions as possible. (14)

At the moment there are no plans to hold such a meeting in Cumbria in case this gives the impression that RWM is just looking at Cumbria, which is not the case. A letter to the Whitehaven News points out that as a result of repeated attempts over the years to foist a GDF upon Cumbria, there are now many people living in Cumbria who are quite knowledgeable on the subject. So it would be logical for RWM to hold one of their meetings in Cumbria. After all it is not only necessary for a proper NATIONAL geological survey to be carried out it is essential that it is also *seen* to be carried out. Without this there will be no trust in its findings. And trust already is something in short supply when considering the track record of the nuclear industry in West Cumbria

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4. Sellafield Catch Up 2015

2014 began with the publication of a new report (1) from the House of Commons Public Accounts Committee (PAC) which said progress at Sellafield has been poor, with missed targets, escalating costs, slipping deadlines and weak leadership. The MPs made a series of recommendations focusing on the role of Nuclear Management Partners (NMP) – the consortium of California-based URS, France's Areva and British engineer Amec which is overseeing the clean-up of Sellafield. The report concluded that the consortium was to blame for many of the escalating costs and said MPs could not understand why the NDA extended the consortium's contract in October 2013. (2) The bill for cleaning up Sellafield had risen to more than £70bn, according to the report.

A critical 292-page report by the accountancy firm KPMG in 2013 showed that nine of the 11 biggest projects on the site, including the construction of a storage facility for radioactive sludge, were a combined £2bn over-budget. Seven projects were also behind schedule. (3)

Whilst the PAC highlighted poor performance in clean-up and decommissioning work, Cumbrians Opposed to a Radioactive Environment (CORE) also sought to highlight how, over the last decade, commercial reprocessing operational targets have been missed and the record has been getting worse since the NDA took ownership of Sellafield in 2005. (4)

THORP to close in 2018

A consultation launched in March 2014 on the management of overseas spent fuel, confirmed that the NDA wants to close the THORP reprocessing plant in 2018. The NDA says operating the plant beyond 2018 would require the procurement of replacement highly active liquid storage tanks at a cost of around £500m. It expects to be able to reprocess the great majority of the remaining 300 tonnes of overseas origin spent fuel as originally intended by that time. However, a residual 30 tonnes of this fuel (out of the original 5000 tonnes overseas order book) is made up of small amounts of prototype fuels, experimental fuels, MOX fuels and some materials leftover from research programmes, which would be challenging to deal with, through reprocessing, before the planned closure of THORP in 2018. So the proposal is to store and later "dispose" of this residual 30 tonnes in the UK. Instead the NDA will enact "virtual reprocessing", and return a radiologically equivalent amount of waste to the customer as if the fuel has been reprocessed. (5)

The Government failed to explain why, if it can sanction "virtual reprocessing" for 30 tonnes of residual spent so that THORP can shut in 2018, why can't the same be done now for the remaining 300 tonnes of overseas fuel and any remaining AGR spent fuel which is still slated for reprocessing so that THORP can shut now. (See http://www.no2nuclearpower.org.uk/news/comment/time-to-end-reprocessing-at-sellafield/)

Figures released by Sellafield Ltd in May showed that both reprocessing plants again failed to meet their respective annual targets. The Company, however, maintains that the currently scheduled 'end of reprocessing' dates – 'around 2020' for Magnox and 2018 for THORP- will be met. (6)

The Magnox reprocessing plant missed its annual target of 664 tonnes for 2013/14 by 194 tonnes. The failure was blamed on an extended outage in summer 2013 and a 'blockage' accident which forced the plant to close from 23rd February to 16th April 2014. (7). Setting a target of 529 tonnes for the current financial year 2014/15, Sellafield Ltd calculated that such an annual rate would see the reprocessing of the remaining 2970 tonnes of magnox fuel completed on schedule by 2020.

THORP completed only 346 tonnes out of an annual target of 423 tonnes for 2013/14. The target for this current financial year (2014/15) has been set at 439 tonnes. A similar level has already been set for each year up to the plant's scheduled closure in late 2018. For a plant designed to reprocess 1200 tonnes per year, this low projected annual throughput reflects the catalogue of technical problems and accidents that have dogged THORP since it started operating in 1994.

Unacceptable levels of high level liquid waste

In March 2013 Friends of the Earth published a report entitled "*Towards a Safer Cumbria - How government, regulators and the Nuclear Decommissioning Authority have neglected nuclear waste in Cumbria*" (http://www.no2nuclearpower.org.uk/wp/wp-content/uploads/2013/03/Towards_a_Safer_CumbriaMarch2013.pdf). Since then Friends of the Earth North Lakes and West Cumbria has been pressing the Office for Nuclear Regulation (ONR) to use its regulatory powers to end reprocessing as quickly as possible.

Following the 9/11 terrorist attacks in 2001 a review was undertaken of the impact of similar attacks on vulnerable UK facilities. It found that a terrorist attack on the Sellafield Highly Active Liquid tanks could require the evacuation of an area between Glasgow and Liverpool, and cause around 2 million fatalities (8). The Massachusetts-based Institute for Resource and Security Studies (IRSS) reported that highly radioactive liquid stored in tanks contained around 2,400 kilograms (kg) of Caesium-137 compared with the 30 kg released during the Chernobyl accident (9).

The ONR's predecessor organisation, the Nuclear Installations Inspectorate (NII) warned in 2000 that the High Level Liquid Waste storage tanks at Sellafield needed to be emptied and the waste solidified "*as soon as reasonably practicable*", and levels must be reduced to a buffer level by 2015. Any shortfall would be "*publicly unacceptable*" (10). In January 2001, the NII issued BNFL with a legal requirement to reduce the level of dangerous, heat-generating, HLW stored on site at Sellafield down to a residual or buffer stock by 2015 (11). Stocks needed to be reduced from approximately 1600m3 at the time to a buffer stock of 200m3 by 2015.

Now, almost fifteen years later the ONR appears to be willing to allow Sellafield to hold a stock of 600m^3 in 2015 rather than a buffer stock of 200m^3 as originally specified. How can this be justified given that anything above 200m^3 was described as politically unacceptable in 2001?

In response to this question ONR simply refers to its Project Assessment Report. (12) This argues that in order to ensure that Sellafield Ltd continues to reduce hazard potential across the Sellafield site it needs appropriate 'operational flexibility' to accelerate reprocessing and vitrification programmes. In other words, the earlier recommendation for high level liquids to reach a buffer level by 2015 was based on the expectation that reprocessing would be completed by then.

ONR says it has revised the limit on the amount of high level liquid waste which can be stored at Sellafield in 2015 because it needed to ensure that the limit was not too tight so as to 'force' the cessation (or significant curtailment) of reprocessing because this would not be in the "*best interests of safety, **as there is currently no viable alternative to reprocessing existing stocks of irradiated Magnox or AGR fuel within reasonable timescales***" (emphasis added).

It is very hard to understand why the ONR has not spent the last fifteen years pressing the NDA and Sellafield Ltd to develop viable alternatives to reprocessing, rather than allowing itself to get into a position whereby it now feels forced to sanction something which fifteen years ago it deemed to be publicly unacceptable.

Dilapidated nuclear waste storage ponds

Dilapidated nuclear waste storage ponds (B29 and B30) abandoned 40 years ago containing hundreds of tonnes of fuel rods pose an immediate danger to public safety, says *The Ecologist* after receiving an anonymous clutch of photographs. The fuel and sludge in the ponds could spontaneously ignite if exposed to air, spreading intense radiation over a wide area.

The photographs show the state of spent nuclear fuel storage ponds that were commissioned in 1952 and used until the mid-1970's as short term storage for spent fuel until it could be reprocessed, producing plutonium for military use. However they were completely abandoned in the mid-1970s and have been left derelict for almost 40 years. The photographs show cracked concrete tanks holding water contaminated with high levels of radiation, seagulls bathing on the water, broken equipment, a dangerous mess of discarded items on elevated walkways, and weeds growing around the tanks. The fuel storage ponds, the largest measuring 20m wide, 150m long and 6m deep, are now completely packed with spent fuel in disastrously poor condition.

Nuclear expert John Large warns that massive and uncontrolled radioactive releases to the environment could occur.

"This pond is built above ground", he said. *"It's like a concrete dock full of water. But the concrete is in dreadful condition, degraded and fractured, and if the ponds drain, the Magnox fuel will ignite and that would lead to a massive release of radioactive material. Looking at the photos I am very disturbed at the degraded and run down condition of the structures and support services. In my opinion there is a significant risk that the system could fail. If you got a breach of the wall by accident or by terrorist attack, the Magnox fuel would burn [and] give rise to a very big radioactive release."* (13)

At the most recent Stakeholder Meeting held in October 2014, NDA Chief Executive, John Clarke said:

"In a general sense, we know what is in the ponds – spent fuel. Specifically we don't know what form the spent fuel is in. Lots of work is going on to characterise, however, uncertainties will remain until we get to the bottom of the ponds and see what is there. On the physical integrity of the structures, we have taken core samples and they are actually in pretty good condition. They wouldn't meet modern standards but they are not in imminent danger of falling down. We are using the most modern non-intrusive techniques and carrying out a raft of work to reduce risks, particularly on retrieving the waste. All sorts of techniques are being considered for retrievals from

the pond … we are deploying underwater remotely operated submarines but we are always looking at different techniques." (14)

Eddie Martin of the Cumbria Trust wrote to Stephen Henwood chair of the NDA in November about the spent fuel ponds. He said, given that the Sellafield "Legacy Ponds" are over 60 years old, contain significant amounts of spent Magnox nuclear fuel and other radioactively contaminated nuclear waste items, are covered with water for cooling purposes, were originally pronounced, in the mid 1970's as *for "short term storage until it can be reprocessed"*, are open to the elements, known to be leaking into the ground and, in the case of B30, are located within 150m of the River Calder, we would be obliged if the NDA would state what action it is taking to:-

- Prevent transfer of radioactive contamination, by birds or other creatures that may have access to the open contents of such ponds, to members of the public and/or property, outside the boundary of the nuclear licensed site.
- Prevent leakage, through the ground surrounding these old and known -to-have-leaked, ponds, to areas outside the nuclear licensed site and, specifically, into the River Calder.
- Recover the contents of these ponds for assay and assessment of their nuclear and radioactive status.
- Commence reprocessing of appropriate items of the recovered Magnox fuel
- Compact, encapsulate or vitrify, as appropriate, and the safe storage, of the contents of these ponds.
- Decommission, demolish and safely dispose of the existing outdated and insecure pond buildings, structures and equipment. (15)

In response Stephen Henwood said "*we categorically refute the suggestion … that insufficient attention or resources are being put into addressing this national priority which we inherited in 2005. Whilst we cannot turn the clock back to decisions that were made or not made in the past and which have left us with the challenges we now face, we are determined to be the people that resolve those challenges*." (16)

Cumbria Trust welcomed the NDA's response which it said included some reassurance that it is aware of the poor condition of these ponds, and is now working to reduce the significant risks posed by their appalling state of disrepair. However, the response also included a startling revelation: "*The pond's overhead crane, which had been out of action since the 1990s, has been fixed and is now being used again*."

"*The admission that a key tool required for the maintenance of this most hazardous facility has been unusable for two decades is remarkable. These ponds are so dangerous that they are currently the NDA's top priority, yet they have been left to decay and degrade without the most fundamental mechanical equipment. To put that time frame in context, it took just over 8 years from President Kennedy's speech to congress in 1961, declaring the ambition of man walking on the moon, to realising that feat of engineering*." (17)

Subsequently Eddie Martin wrote to Stephen Henwood again to ask why there is no clear outline of the remediation plans. "*It remains difficult to obtain clear, comprehensive and unexpurgated accounts of the "intolerable" risks which we, here in Cumbria, apparently face and, what is of equal importance, the time-frame in which those risks will be significantly reduced*".

Martin says the inability to place these legacy wastes in a Geological Disposal Facility (GDF) until at least 2075, even if it were built tomorrow, emphasises the urgent need to focus on long-term Secure Interim Storage at Sellafield. The argument around a GDF must not be allowed to distract from this primary requirement. The former Conservative leader of Cumbria County Council asks Henwood for some idea of when the NDA's actions will bear fruit, and the risk will be significantly reduced. (18)

It is worth noting that in 2002 *The Observer*, reporting on a document from Nirex, declared that "*almost 90 per cent of Britain's hazardous nuclear waste stockpile is so badly stored it could explode or leak with devastating results at any time*" (19). A decade later the National Audit Office (NAO) declared that:

"Some of the older facilities at Sellafield containing highly hazardous radioactive waste have deteriorated so much that their contents pose significant risks to people and the environment. The highest risks are posed by the ponds and silos built during the 1950s and 1960s to store fuel for early reprocessing operations and radioactive waste … the exact quantity and type of hazardous material on the site had yet to be fully investigated." (20)

NAO goes on to say that limited progress has been made on starting some key waste retrieval projects, and completing waste retrieval from legacy ponds and silos has been postponed by seven years until 2036.

Meanwhile CORE says Sellafield Ltd's announcement of two 'unusual finds' on West Cumbrian beaches in May and June 2014 (the discovery attributed to the new Groundhog Synergy 2 monitoring system introduced in May) should be ringing public health alarms in the corridors of those tasked to protect beach users from the radioactive materials routinely washed up on local beaches from Sellafield's historic discharges to the Irish Sea. Whilst the discovery of a radioactive stone in May – bearing the highest level of Caesium 137 yet discovered in over a decade of local beach monitoring - is of grave concern, the subsequent discovery in June of a radioactive particle discovered on the more publicly accessible beach at Seascale requires immediate action to be taken by the Authorities to protect the general public. (21)

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4. CORE 22nd Feb 2014 http://www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=335 CORE's submission to PAC 'Commercial Operations at Sellafield -Underperformance and Missed Targets' (which also includes Appendices on the individual facilities) can be accessed at

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5. Scotland could become renewable 'powerhouse' by 2030

Scotland's electricity system could be powered almost entirely by renewables by 2030 and without the need for any gas, coal or nuclear power stations, according to a new report published in January by WWF Scotland. (1)

Based on an independent technical analysis by leading engineering and energy consultancy DNV GL, (2) 'Pathways to Power: Scotland's route to clean, renewable, secure electricity by 2030' tested the Scottish Government's current policy to decarbonise the country's electricity generation by 2030. This is separate from the target to provide the equivalent of 100% of electricity demand from renewables by 2020, which still allows for coal, gas and nuclear to remain on the grid. (3) The DNV GL study found that an electricity system based on proven renewables and increased energy efficiency is a credible way of meeting Scotland's decarbonisation target.

Despite the slow pace of carbon capture and storage (CCS) development globally, the Scottish Government's Electricity Generation Policy Statement 2013 (EGPS) (4) assumes that CCS will be operating at scale in the next decade, and fitted progressively across 2.5GW of gas plant. The

Government has already risked high-carbon lock-in by granting consent to a major gas plant at Cockenzie as 'CCS-ready.' But with no guarantee that the technology will be commercialised in time, there is a high risk that the 2030 decarbonisation target will be missed.

Yet the DNV GL Study found that Scotland doesn't have to generate electricity from coal, gas or nuclear to ensure security of supply. In fact Scotland could maintain and build on its position as a net power exporter if it makes moderate progress to reduce demand for electricity and increase the roll out of hydro pumped storage. A renewable, efficient and flexible system has many advantages over the current Scottish Government scenarios: it is less dependent on imports from the rest of Great Britain at peak demand, is cheaper (the cost of new wind power is lower than the cost of CCS) and has lower emissions than the scenarios in the Scottish Government's Electricity Generation Policy Statement. And critically, it would make more of Scotland's abundant renewable resources and flourishing green energy industry, triggering economic, social and environmental benefits.

The technical analysis shows that a system with an extremely high proportion of renewable electricity generation located in Scotland could be secure and stable. There is no technical reason requiring conventional fossil and nuclear generation in Scotland. Scotland has plenty of renewables in the pipeline to cut the carbon from its power supply by 2030, particularly if we see progress on reducing electricity demand. And crucially, Scotland can continue to be an electricity exporting nation.

Meanwhile Scotland reached 140 Megawatts (MW) of installed solar capacity in 2014 - a rise of 32% over the year. Over 35,000 homes and 600 business premises in Scotland now have solar PV arrays fitted. In 2014 the total installed solar PV capacity on homes alone broke through the 100MW barrier – to now stand at 126MW. WWF Scotland, Lightsource Renewable Energy, and

the Solar Trade Association are now all calling on the Scottish government to do all it can to help ensure Scotland switches on to the full potential of solar power. Lightsource has already identified around 70 potential sites for ground-mounted solar PV farms in Scotland, as well as opportunity for commercial and domestic rooftop solar PV systems.

Leonie Greene of the Solar Trade Association said:

"*The Scottish Government has provided world class leadership on renewable energy so we urge them to throw their weight behind solar too. No other energy technology has delivered the scale of cost reductions seen in solar and no other technology has empowered such vast numbers of everyday people to take control of their power supply. It is vital to retain this momentum*."

Richard Dixon, director of Friends of the Earth Scotland told PV magazine: "*We will soon experience the growth of the Scottish solar PV sector and most possibly this will be initiated by city councils and some Scottish Universities that will develop solar arrays on the rooftops of buildings and empty sites, setting an example that will then be followed wider*." (6)

December was a record month for wind power in Scotland, according to environmentalists who have hailed 2014 as a "massive year" for renewable energy. The biggest day for output for wind was on December 10 when there was enough energy generated to supply 6.34 million homes for the whole day, analysis from WWF Scotland showed. The charity said wind turbines generated enough power to supply over 100% of Scottish households on 25 out of the 31 days of December. Throughout the year wind provided enough power for the electrical needs of 98% of Scottish households. (7)

The grid operator also announced that wind power generation across the UK rose 15% during 2014 from 24.5 terawatt hours to 28.1TWh - enough to supply the needs of more than 6.7 million UK households. Overall, grid-connected wind farms and standalone turbines met 9.3 per cent of UK electricity demand during 2014, up from 7.8 per cent in 2013. (8)

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1. WWF Scotland report Pathways to Power: Scotland's route to clean, renewable, secure electricity by 2030. http://assets.wwf.org.uk/downloads/pathwaystopower.pdf
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6. Renewables vs Nuclear

The Vienna Ombuds–Office for Environmental Protection commissioned a study for Cities for a Nuclear Free Europe (CNFE) to compare the costs of nuclear power with the costs of renewable electricity. The main question for the study was: "How much electricity can we get out of different energy sources for a given sum of money?" (1)

The study compares the costs of renewable energy and nuclear power generation in five countries - UK, Poland, Germany, France and the Czech Republic - and the EU 28 overall. The report concludes that, under the same budgetary conditions, it is almost always possible to generate more electricity from renewable sources than from nuclear power. It also concludes that generating electricity from a variety of renewable sources is more economical than using nuclear power right up to 2050 and beyond. Across the EU, end consumers can save up to 37% on their electricity costs, and some member states up to 74%. In order to achieve these goals it is vital that Governments act quickly, but with care, to create the infrastructure and regulatory framework this requires, or to adapt that which already exists.

For each of the countries analysed and for the EU as a whole (EU28), generating electricity using nuclear power requires more public support than renewables. The level of support required varies and mainly depends on the future electricity price; the future UK electricity price is predicted to be especially high.

1. Renewable Energies versus Nuclear Power: comparing financial support. Vienna Ombuds-Office for Environmental Protection, November 2014 Summary – http://www.wua-wien.at/images/stories/publikationen/renewable-energy-versus-nuclear-power-summary.pdf Full report - http://www.wua-wien.at/images/stories/publikationen/renewable-energy-versus-nuclear-power.pdf

7. Energy Costs

British renewable energy is a lot more costly compared to renewable energy in other European countries, according to the Vienna Ombuds-Office report. Why should this be the case?

Dave Toke, reader in Energy Politics at Aberdeen University agrees. He says the system of financing renewable energy schemes in the UK is designed (whether by intention or otherwise) to give a very large proportion of the income stream, earmarked for renewable energy and financed by effective levies on consumer electricity bills, to the major electricity suppliers rather than pay the renewable energy schemes themselves.

Under the Renewables Obligation (RO) (to cut a longer story short) the renewable energy (RE) generators are dependent on the major electricity suppliers to give them the long term contract they would need to raise the necessary bank loans and satisfy equity investors. They (the Big Six) take a big cut for doing this 'service' - which can amount to around 30% of the income stream dedicated to renewable energy. In other words, if we had a system of German style 'feed-in tariff' contract that was available to anybody the money needed to pay for a given amount of renewable energy would be up to 30% less.

The 'contract for differences' (CfD) system being introduced is only available to electricity suppliers, or companies who can effectively act like electricity suppliers by trading on the UK electricity markets. Even then banks will tend to lend money at reasonable rates only to projects that are backed by the biggest electricity companies. So, in short, the new CfD system replicates the existing ability of the electricity majors to siphon off up to 30% of the incomes supposedly paid by electricity consumers for renewable energy.

1. Dave Toke's Blog 31st Dec 2014 http://realfeed-intariffs.blogspot.co.uk/2014/12/so-why-is-renewable-energy-so-much-more.html

8. Capacity Market

The government has begun spending up to £4bn per year on power stations some of which we do not need. In doing so, it risks compromising all three of the objectives that energy policy is supposed to deliver: security of supply, affordability and low-carbon energy, says Catherine Mitchell Professor on Energy Policy at Exeter University. (1)

The UK capacity auction is a backdoor way of staving off the utility death spiral, says Chris Goodall on Carbon Commentary. The golden rule at The Treasury is 'No subsidy without additionality' which means you only give a business a cheque if it will do something it wouldn't otherwise do. The capacity auction flouts this rule. In December it agreed to give a billion pounds to generators in 2018 in return for doing precisely what they would have done anyway. Negligible amounts of new electricity generating capacity were drawn into the market and existing plants will not change their behaviour. EdF Energy put in bids to the capacity auction offering 7.9GW of power (not that it has actually delivered 7.9GW from its nuclear power stations at any stage of the winter so far). Nuclear power stations are meant to run all the time. It costs money to shut them down or run at a reduced load. No operator would ever voluntarily shut nuclear stations expect if there was a problem, or they needed re-fuelling. There was no point whatsoever in allowing these power plants into the capacity auction and paying them about £150m a year to carry on doing what they want to do anyway. In the UK it looks as though the major generators have staved off the death spiral a little by capturing another billion pounds from consumers. That billion could have gone into energy storage units, power to gas facilities or renewable generators, such as anaerobic digestion plants, that can modulate their output to help match supply and demand, thus easing the transition away from carbon-based fuels. Unfortunately, the auction just bought off the large generators instead. (2)

An idiot's guide to capacity markets would tell you they are essentially a game for idiots, says former Labour MP Alan Simpson. It's a game for gamblers not legislators. For most people, keeping the lights on remains a pretty important test of government competence — and energy companies know this. That is why, a couple of years ago, they started mothballing existing gas power stations, and permissions to build new ones. On the surface the explanation was that power prices were too low for the stations to remain viable. But behind the scenes energy companies were already preparing to "game" the system. If you can manufacture the prospect of a shortfall, you can manufacture the case for a new subsidy system to avoid it. Big energy invented the idea of capacity markets and sold it to civil servants in DECC.

The embarrassment is that the government fell for such an obvious sucker punch. It wasn't as though Parliament lacked other better choices. In various sectors of a modern economy, maintaining reserve capacity is just a legal obligation. Politicians could easily have changed the nature of the auction by specifying that 50 per cent of the contracts would go into an energy politics designed to consume less — but they didn't. No less boldly, they could have set a carbon cap on where this energy came from, or a minimum proportion that had to come from renewable sources — but they didn't do that either. Britain's capacity auctions were designed by and for energy producers. Interconnectors could have offered Britain a much cleaner energy-balancing act than the capacity market auctions. Norway, Iceland and increasing parts of the EU can already offer renewable energy surpluses through the use of their interconnectors. In the

EU, what also matters is that retail electricity prices are 50 per cent lower than in Britain. An increased use of interconnectors could keep Britain's lights on and cut electricity costs at the same time. But none of this would have propped up the rewards to Britain's old energy cartel. (3)

Catherine Mitchell says the capacity market was conceived as a way of "keeping the lights on" at a time of increasing renewable generation, and when old coal, gas and nuclear stations were set to close. However, it is designed around the out-dated and over-simplistic notion of 100 per cent renewables back-up: that every 1GW of wind power capacity, for example, needs 1GW of coal- or gas-fired capacity on standby. It is demonstrably untrue; but the myth persists, and the government has bought it, despite advice from legions of experts and counter-examples from more enlightened countries. (4)

The Capacity Market will add £11 to the average consumer bill, according to DECC, of which only £0.53 is funding new infrastructure, and £7.56 will go to the Big-6 for their existing power stations. Old coal plants are being given £293m which is encouraging them to remain open – despite no risk that their closure would impact security of supply. (5)

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9. Conservation, Proliferation and Responsible Science

A group of academics have argued that nuclear power is essential to save the planet from climate change, and preserve the world's biodiversity. But there's a mysterious omission in their analysis, writes Jim Green of Friends of the Earth Australia: nuclear weapons proliferation. And after a major exchange of nuclear bombs, and the 'nuclear winter' that would follow, exactly how much biodiversity would survive? (1)

Dr Green also attacks the paper for endorsing fast breeder reactor technology as the solution to climate change. He says that the "fast reactor techno-utopia presented by Brook and Bradshaw is theoretically attractive", but has already been tried unsuccessfully, and cannot be made to work in the real world. (2)

Greenpeace UK chief scientist Dr Doug Parr commenting on the plea from the academics for environmentalists to support nuclear power said: "*The 'next generation' of nuclear reactors are always clean, safe, cheap and just over the horizon. But, mysteriously, the reactors that get built are always the exact opposite. By contrast, photovoltaics are clean, safe, getting cheaper by the day and available now. They can be installed in heavily populated cities, on dual-use agricultural land and even in shallow water. And no-one will lie awake at night worrying about terrorists getting access to a solar panels or wind farms*." (3)

Put very simply, says David Elliott is Emeritus Professor of Technology Policy at the Open University, the academics argue that nuclear has lower land-use per unit of energy produced than renewables and so will leave more space for biodiversity. This assessment, like some of the other analysis in the paper, is debatable. It's true that some renewables are land-hungry, biomass especially, but that is not the case for offshore wind, wave and tidal stream or roof-top solar. And although onshore wind farm sites may be relatively large, the land around the wind turbines can be farmed or left wild. It has also been claimed that solar farm arrays on land can actually increase local biodiversity – protecting the area from other uses. By contrast with nuclear, it is not just the area of the plants and their security zones that has to be considered, but also the impact of uranium mining and fuel production and waste disposal activities. These activities and the operation of nuclear plants also have impacts beyond just land-use. The release of radioactive materials has a significant potential for long term damage to cellular and possibly genetic material and to the health of ecosystems. That is not the case with renewables. (4)

Norwich Green Party point out (5) that according to recent research published by Stanford University greenhouse gas emissions from the nuclear cycle can be up to 25 times higher per unit than wind power. (6) While Ian Ralls of Cambridge FoE says 70 per cent of carbon dioxide (CO2) emissions is not produced by electricity so nuclear power wouldn't make much difference. How about universal free household insulation for example, or proper integrated public transport? Both much cheaper, more effective and would have a greater positive impact on people's lives.

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