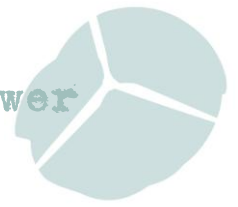


No.79 November 2015

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1. Hinkley, Sizewell, Bradwell - A game of Chinese Roulette

China will take a one-third stake in EDF's project to build a new £24bn nuclear power station at Hinkley Point in Somerset, expected to be the most expensive ever built. The deal was signed between state-owned companies from China and France just hours before the Chinese president, Xi Jinping, arrived in London for a state visit. The Press reported that it will lead to a final investment decision - the point of no return - by the end of 2015, and there is now a new completion date for the two reactors at Hinkley Point - 2025 - which is eight years later than first suggested. (1)

The deal also allows for Chinese involvement in the two EPRs planned at Sizewell in Suffolk and a Chinese reactor-design at Bradwell in Essex to showcase the design and help it sell its technology further afield.

The scale of China's on-the-ground involvement at Hinkley is a closely guarded secret, but sources close to the talks suggest that Chinese staff will be 'embedded' within teams on the Somerset site. Its involvement is likely to increase at Sizewell, and will take the helm at Bradwell - providing both the workforce and the technology for the plant. George Osborne, who has been the driving force behind the open doors policy to Chinese funds sloshing into Britain, is pushing for nuclear authorities to fast-track approval for its reactors design which it wants to build at Bradwell. (2)

Meanwhile Private Eye (Issue 1404) has published a story about Corporate Investigator, Peter Humphrey who was imprisoned in China after upsetting powerful figures. He told the BBC that corruption is endemic in China. The consequences of this aren't just financial. Quality and safety become equal casualties. Humphrey gave Private Eye an insight into the Chinese Nuclear Industry. A fraudster he knew from his time in Shanghai jail had been a senior official in the State procurement company paid to source high quality materials for new nuclear plants. Instead he had bought cheap inferior local alternatives and split the difference with equally corrupt suppliers. (3)

The China General Nuclear Power Corporation (CGN), which has signed the agreement with EDF, left out hundreds of critical steel rods when building its first reactor near Hong Kong in 1987 because workers misread the blueprint. The missing parts were added in a higher layer of the foundation, with extra steel to reinforce them, after the extraordinary mistake was discovered. The plant has now been operating safely for more than two decades. But the nature and scale of the error raises serious questions about the rigour of Chinese nuclear firms and the country's oversight regime. Professor Steve Tsang, senior fellow of the China Policy Institute at Nottingham University says "*I understand there are rules, but there were rules in Hong Kong too when you had the problems in Daya Bay. You are not building a gazebo, it's really dangerous, serious stuff.*" (4)

Senior military and intelligence figures have warned ministers that plans to give China a big stake in Britain's nuclear power industry pose a threat to national security, according to *The*



Times. Giving China such influence within national infrastructure is causing alarm in security circles. Senior figures have accused the government of rushing into a nuclear partnership with Beijing without proper consideration of potential threats. "There is a big division between the money men and the security side," a security source said. "The Treasury is in the lead and it isn't listening to anyone — they see China as an opportunity, but we see the threat." A well-placed defence source said that senior military officers were very concerned by the prospect of China building a nuclear power station in Britain. There are fears that "trapdoors or backdoors" could be inserted into computer systems, which might allow the Chinese to bypass British control of a nuclear plant in the event of a diplomatic row and shut it down. Britain's intelligence agencies still see China as a threat, especially in the area of cyber-espionage. MI5, which has been consulted over the projects, says publicly that "the intelligence services of China ... continue to work against UK interests at home and abroad". (5)

Steve Hilton, a former policy adviser to David Cameron, said the UK should be imposing sanctions on China over issues such as its "vicious political oppression" and its "relentless cyber attacks", instead of "rolling out the red carpet. This is one of the worst national humiliations we've seen since we went cap in hand to the IMF in the 1970s," said Mr Hilton, who left Downing Street in 2012. "The truth is that China is a rogue state just as bad as Russia or Iran, and I just don't understand why we're sucking up to them rather than standing up to them as we should be." (6)

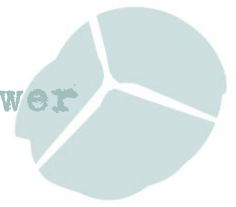
Deal could spell Doom for EDF

With China only taking a one-third stake in Hinkley rather than the 40% expected, EDF will now have to find the rest of the construction bill. (7) It plans to sell as much as €10bn of assets over 5 years to shore up its balance sheet. It is considering the sale of the exploration and production operations of Edison, its Italian subsidiary, as well as its stake in American nuclear group CEGN, as part of efforts to maintain its credit rating. EDF has also agreed in principle to buy between 51% and 75% of Areva NP, which will cost between €1.3bn and €2bn and it is looking for other partners to take a stake alongside it in Areva NP. (8)

EDF's apparent obsession with continuing with the increasingly financially toxic European Pressurised Reactor (EPR) programme could spell doom for EDF. Further drastic losses on Hinkley C similar to the mounting losses accrued by AREVA and EDF on the EPRs being built at Olkiluoto and Flamanville might lead to what hitherto has seemed also unthinkable - the break-up of EDF. At least a major sell-off of assets seems certain if EDF is to finance Hinkley C, but if the project then went badly then both privatisation and a break seems a plausible outcome. (9)

Dr David Toke says people assume that EDF has learnt lessons from the previous two reactors and that next time will be different. Why? If anything, things seem to be getting worse with the other two schemes, with construction times becoming ever longer. A better question would be to turn it around and ask. Isn't it likely that Hinkley C will be another disaster? EDF say they are going to build two reactors at once at Hinkley C! To cap it all, people have no idea whether the reactors will actually work (very well)!

Investment bank Investec has advised clients to sell shares in EDF amid fears that its connection with Hinkley could put payouts to shareholders under threat. Investec issued a 'sell' note on EDF, advising clients to dump the stock. The bank said: "We are unconvinced about the commercial logic of EDF's investment in Hinkley Point C". (10) Moody's and Standard and Poor



have also issued warnings that EDF and its Chinese partners will face credit downgrades if it goes ahead with Hinkley C (11)

Despite the enthusiasm greeting the Hinkley Point C investment announcement, there still remains the matter of lawsuits filed by the Austrian government (now joined by Luxembourg and Greece), Greenpeace Energy and nine German and Austrian utilities. The parties contesting the decision to facilitate the nuclear power project hold that the European Commission has breached the EU's state aid guidelines, and if their challenge is successful it would make the project much more expensive as well as lead to potential, costly delays. One top Austrian lawyer has told *Power Engineering International* that he felt the lawsuit had a good chance of success, And Dr Dorte Fouquet, Partner, BBH Brussels who has been advising Vienna told an audience at Platts Power Summit in central London that the challenge it could set back construction of the Hinkley Point C project for around four years. (12)

For all the claims that EDF's 'final investment decision' is a mere formality that will be made in weeks, it is no such thing. In fact, there is more reason than ever to doubt it. The official announcement, speeches and press releases may give the firm impression that it's all a done deal. But look harder and it's all stitched together with paperclips and sellotape and could fall apart at any moment. Under the deal agreed with the Commission, the Flamanville EPR project must be up and running before the guarantees come into effect. And until that time, the shareholders must provide billions in 'contingent equity' to cover the bondholders' risk, protecting UK taxpayers. (13)

It's consumers who will loose

The proposed deal to build a new fleet of three nuclear power stations will cost the average bill-payer more than £30 a year in new subsidies – according to a Greenpeace Energydesk analysis – a total subsidy of £2.6bn per year. The deal which stretches over 30 years could single-handedly push up bills by over 5%. (14)

Britain could have six times the power-generation capacity for the same money by investing in wind turbines instead of Hinkley according to *Bloomberg New Energy Finance* (NEF). It estimates that the cost of power from renewables in the U.K. is rivalling fossil fuels even without subsidy. Wind easily beats Hinkley. (15)

The Solar Trade Association has undertaken analysis showing that solar PV could provide the same amount of electricity for half the subsidy cost of Hinkley. The analysis shows that a combination of solar, storage and other flexibility mechanisms would cost consumers roughly 50% less than Hinkley Point C over the 35 year lifetime of the Hinkley subsidy. The Government needs to explain why it is drastically cutting support for solar energy whilst offering double the subsidy to Hinkley Point C. It also needs to explain why it is championing overseas state-backed utilities over British solar companies which given stable support would have considerable growth prospects. (16)

Meanwhile Britain has won EU regulatory approval from the European Commission for a pricing model to set the cost of disposing of nuclear waste from new reactors. The pricing formula limits the price that plant operators will pay for disposing of nuclear waste. The Commission, responsible for setting a level playing field in the 28-country bloc, gave the green



light, saying that the plan was in line with EU state aid rules. Greenpeace however said the regulator should have sought more feedback before issuing its decision and the taxpayer was likely to face a huge long-term bill. *"It's a transfer of risk to the taxpayer,"* Doug Parr, Greenpeace policy director, said. *"It's odd that the Commission did not see the need to have a full enquiry when other countries are facing different circumstances."* (17)

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2. Why are the Tories obsessed with nuclear?

Why is the Government persevering with the world's most expensive power plant ever, dubbed by Britain's conservative press as a big white elephant, and at the same time slashing support for renewable energy? (1)

"We remain mystified" said Stop Hinkley Spokesperson, Alan Jeffery said "about why George Osborne wants to throw good money after bad on this project. In the process, he has devastated the UK's burgeoning renewable energy industry, threatening up to 20,000 jobs in the process. He is doing his best to kill off an innovative industry of the future in order to keep alive a technology of the past. It makes about as much sense as funding a telegram service whilst killing off the mobile phone industry ... going cap in hand to a country with such a lamentable human rights and health and safety record is bad enough, but doing so to fund the biggest white elephant in history and kill off the industry which offers the UK's best hope of tackling climate change is just insane. Surely it must only be a matter of time before this crazy scheme collapses under the weight of argument." (2)

The Government claims it will produce cheap low carbon baseload electricity which we need. But there is growing concern that it will saddle UK consumers with an expensive relic with little relevance to the radical new energy landscape beginning to emerge. Here we look at the Government's arguments and find them wanting. We also examine three different theories about what the Government's real motivation might be.

The only successful thing about Hinkley Point C is EDF's media management (3)

Stop Hinkley Campaign spokesperson Roy Pumfrey says *"There is still every possibility that this reckless plan will be defeated. This will be the eighth time that EDF Energy has announced that a final investment decision is just around the corner."* (4) The campaign is far from over.

Pumfrey continues *"Jean-Bernard Levy, chairman of EDF, claims that hundreds of workers could be starting work on the construction of two new reactors at the site by the end of the year. But given the number of issues still to be resolved one has to wonder which year he is talking about."*

All national newspapers have expressed disquiet about these proposals. *The Guardian*, for instance, described the deal with China as *"sheer folly"*. (5) The former director of strategy for David Cameron, Steve Hilton, has called the deal with China *"one of the worst national humiliations"*. He said we should impose sanctions on China, rather than *"rolling out the red carpet"*. (6)

Pumfrey says *"Renewable energy is going from strength to strength. Solar photovoltaics could provide the same amount of electricity as Hinkley Point C for half the subsidy cost (7) and onshore wind and solar are both likely to be competitive without subsidy in the next decade. (8) Apart from the archaeological discoveries on site the only successful thing about the Hinkley Point C project is*



EDF's news management ... we now know it won't be ready before 2025 at the earliest; that the Chinese are not willing to invest as much as EDF wanted; so there is a £10bn black hole in the finances and there is still no signed contract with the UK Government. So not really any progress at all – a false dawn.” (9)

Tory Energy Policy on the Wrong Side of History

One day, it would be great to write something positive about Government energy policy, writes Jeremy Cresswell on the Energy Voice website. *“But so long as it carries on the way it is, that won't happen. The sycophantic fawning that occurred during the state visit of Xi Jinping, with yet more major UK opportunities peddled in Beijing's direction was nothing short of disgusting.” (10)*

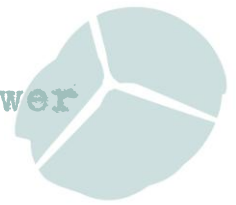
Cresswell was incandescent with “Brutus” Osborne who claimed that nuclear power is cost competitive with other low carbon technology when he appeared in front of the House of Lords economic affairs committee. Yet the International Renewable Energy Agency has determined that the cost of onshore wind in the UK is well under £80 per MWh even after all the costs of managing intermittency are included. In addition, onshore wind and ground-based solar projects have bid and been awarded UK government contracts at a price of around £80 per MWh – with no government guarantees at all – compared with £92.50/MWh for nuclear at 2012 prices. (11)

The UK Government *“is on the wrong side of history”* by supporting nuclear and cutting subsidies for green energy, says Frans Van Den Heuvel, CEO of Solarcentury. Subsidising nuclear power will lead to increased energy bills for consumers. The company claims the government's proposed £7 million budget for solar is equivalent to subsidising Hinkley Point for just two days. We know already from the Contracts for Difference that the offers made with solar are already lower than the strike price – the minimum guaranteed price for investors – than nuclear. 10 years from now imagine what the price will be for solar. It has been reduced by 50% in the last seven, eight years. (12)

Government has lost the plot

The UK Government's pursuit of Hinkley Point C represents not just a colossal waste of money, but it could also be real danger to the UK's national security, according to Professors Alex Russell and Peter Strachan of Robert Gordon University. The Conservative government, arguably, has completely lost the plot. George Osborne might be seeking an entry in the Guinness Book of Records as the Chancellor who commissioned the world's most expensive nuclear power station. He says the project represents good value for money, but the facts suggest otherwise. And not enough attention appears to have been given to national security issues.

The Hinkley Point C subsidy package could cost up to £76 bn. This apparent blank cheque for new nuclear build is all the more surprising coming at a time when the Treasury has slashed support for onshore wind and solar power and other low carbon projects. EDF has been guaranteed an inflation proof strike price of (initially) £92.50/MWh (at today's prices £94/MWh) over 35 years. More than double current wholesale electricity prices, and at a time when onshore wind costs are already much lower at around £80/MWh (with a significantly shorter contract). Furthermore these costs are set to fall and be largely subsidy free in the near



future, if not for Amber Rudd's (the Secretary of State for Energy and Climate Change) onslaught against all things renewable and energy efficient since May.

It is clear that this unprecedented handover of power and money to Chinese hands will prompt a justified reaction from those thousands of UK steel workers whose jobs are about to disappear due in part to the global dumping of steel by China. Will the remnants of the steel industry and its workers see a fraction of the £76 billion to be spent by the Chancellor on his nuclear boondoggle? Not likely. Let us hope that the Prime Minister and Chancellor's actions do not lead to the radicalisation of unemployed steel workers who are now being joined by unemployed renewable industry personnel. (13)

If it's not cost, then what is it?

Secretary of State for Energy, Amber Rudd, in an admission that cheap electricity isn't the reason for building new reactors, told the House of Commons Energy and Climate Change Committee that *"We have to have secure baseload [electricity] so you should not be surprised that we are prepared to pay for it."* (14)

But the energy market has changed dramatically over the last 7 years since EDF Energy first consulted local residents in October 2008 (15). Concerns have grown that the UK may be about to saddle energy consumers with an expensive relic with little relevance to today's energy landscape.

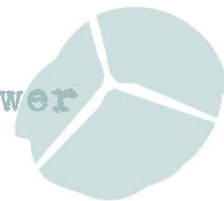
Bloomberg New Energy Finance says:

"What you need is not bulk supply that is on forever but flexible supply which can balance the variable and very cheap supply that renewable can supply in the future."

Nuclear fails to provide that.

The National Grid plans to use demand-side response for the majority of its balancing by the end of the next decade. *"From a consumer's point of view"*, says CEO Steve Holliday, *"the solar on the rooftop is going to be baseload"*. Peakload will be managed by shifting demand and ramping up flexible generation. Centrica, which backed out of investing in Hinkley, has already announced a new decentralised energy strategy. (16)

The argument that renewables are intermittent, so we also need baseload ignores one of the biggest technological developments of our climate-stressed times: storage. In nuClear News No.78 we looked at Pumped Hydro-Electric Storage (PHES). Britain already has 2.8GW of PHES. Increasing the PHES capacity would be part of a more flexible grid system which exploited other storage technologies as well as demand management techniques. A UK survey has identified suitable locations with low planning risk for 10-50GWh of PHES. Professor Phil Taylor of Newcastle University and Dave Holmes of the Quarry Battery Company writing in Utility Week (18th – 24th September 2015) looked at two scenarios – one in which a further 10GW off offshore wind is added to the 28-30GW that is already likely to be deployed by 2020 and backed up by 10GW of fossil fuelled generation. The second scenario halts offshore wind development at 31GW and the fossil fuelled back-up is replaced by 10GW/50GWh of PHES storage. Both scenarios deliver the same amount of useful electricity, but the second scenario is £3.6billion a year cheaper and produces 5million tonnes of carbon dioxide less.



Big battery storage is taking off stateside, according to the Greenpeace Energydesk website, because grids want ways to hold onto energy to be deployed at peak times – without having to build big expensive power plants. Lithium-ion batteries are winning in the market, turning both commercial and residential buildings into power-providers. The Tesla Powerpack has already started transforming grids in California. Orange County's biggest landlord, Irvine Co., announced this autumn the installation of Tesla Powerpacks in up to 24 of its office buildings later this year. The scheme is expected to provide Southern California Edison with 10MW reserve capacity and reduce peak power demand by 25% across their portfolio. Taking up no more room than five parking spaces, the system also allows the building owner to buy electricity when it's cheap and store it for peak times.

Bloomberg New Energy Finance says that by 2020, global investment for stationary-grid energy storage is expected to be worth \$5.1 billion, a 17-fold increase from investment levels in 2013. Tesla may be sold out of batteries until mid-2016, but they're not the only player in the market. But with major companies like Wal-Mart, Amazon, and Target also piloting Powerpack installations, the company has certainly carved out a place for itself. To continue making these batteries Tesla is building its "gigafactory" in Nevada, which will start producing batteries in 2016. Analysts say that this factory alone will reduce the costs of lithium-ion batteries by 50%. (17)

Interconnectors

Another way of dealing with the intermittency of renewables is by improving grid connections to other countries. The GB market currently has an interconnection level of 5% - around 4GW. The European Union has set a target to increase this to 10%. So the UK is planning to provide 9.7GW of interconnection capacity by 2025. This will have significant implications and will benefit UK consumers by providing imports of cheap low carbon electricity from Europe including Norway and possibly even Iceland. If all potential grid connections come to fruition by 2025, a quarter of total GB electricity requirements could be met by imports. (18)

It's not cheap and the baseload concept is obsolete, so what is it?

The other part of the pro-nuclear argument has been that electricity consumption will increase because of the need to electrify heat and transport. Germany, which is planning an entirely non-nuclear route, even with the same 2050 objective of an 80% reduction in greenhouse gases, expects electricity demand to be 25% below present levels by 2050 whereas the UK Government has talked about a possible doubling or tripling of demand. If, instead the UK Government planned for a reduction of 25%, as in Germany, then the capacity required by 2025 would fall by around 15%, removing the need for new reactors. (19)

In fact, as we pointed out in nuClear News No.77 (National Policy Statement on Energy should be reviewed) the claims that electricity demand will double are not borne out by the latest information from DECC. The pathways evidence on the DECC website in 2014 shows circumstances have changed radically since 2010. In fact the four latest government scenarios show increases in demand of only 29.6 to 52.9%. Together Against Sizewell C (TASC) shows that it is possible to meet carbon targets without building new nuclear stations by relying more heavily on demand-side measures. These 'demand-side-led' pathways, which are all non-



nuclear, *more successfully* achieve government policy objectives than all the government pathways, all of which involved more nuclear power stations. (20)

According to the Government we need our buildings to be virtually zero carbon by 2050, so we need to change the way we generate, distribute and use heat in our buildings. (21) But we are not going to be able to do this, at the same time as tackling fuel poverty by converting everyone with gas central heating to an air source heat pump. According to the Energy Saving Trust installing a typical system can cost around £7,000 to £11,000. (22) Parliamentary Under Secretary of State for Climate Change, Lord Bourne says:

“It’s vitally important that we meet our statutory carbon budgets in the most cost effective way possible...and that means tapping into the many advantages that heat networks have over more traditional heating systems, which serve individual buildings. Our view on decarbonising the energy system needs to be long term...and heat networks provide a unique opportunity to exploit large-scale low carbon heat sources, that otherwise cannot be used, as they become technically and commercially viable. I am excited by the potential for heat networks to use such a wide range of sources like recovered industrial heat, heat from canals or even the London Underground.”

New heat networks in our towns and cities will need to become the backbone of an energy system dominated by renewables. These networks can be fed with heat from a variety of sources – geothermal, heat pumps, and Combined Heat and Power (CHP) stations powered by gas including green gas produced by anaerobic digestion. CHP plants can produce both saleable heat to feed into district heating networks as well as electricity. They can rapidly ramp up and down over short periods of time. This means they can be used to balance power grids in order to compensate for fluctuating renewables like wind and solar power. (23) In addition when there is a surplus of renewable electricity district heating networks could use it in heat pumps to generate heat which can be stored (24)

In any case, providing electricity supplies more quickly than Hinkley Point C would not be a problem. For instance over recent months we have reported the following:

- Forum for the Future, Nottingham Trent University and Farmers’ Weekly estimated that UK farms could have a generating capacity of 20GW by 2020 compared with Hinkley’s 3.2GW capacity (which is not expected to be ready until 2025 at the earliest). (25)
- Britain’s solar industry has the capability to deliver the same energy production at Hinkley Point C within 24 months and at comparable cost. Hinkley won’t be able to contribute to reducing dependence on fossil fuels for ten years. Solar power, on the other hand, could provide energy security quickly, reduce electricity bills and protect the environment at the same time. (26)
- A study for the UK Government by consultants McKinsey showed a massive 155TWh/yr of electricity available for saving – 140TWh of which could be saved at negative cost. (compared with the 25TWh Hinkley Point C might be able to produce at a high load factor) This compares to a UK electricity demand in 2010 of 370TWh. There are around 100TWh of electricity savings detailed in the McKinsey report which the UK Government currently has no plans to capture. (27)



Jobs

Somerset County Council predicts Hinkley Point C will 'provide 25,000 jobs during construction and 900 jobs in its planned 60-year operating life' and says the project will prove an 'immeasurable benefit' to the area. (28)

Around 2,000 jobs have already been lost across the UK's insulation and energy efficiency industries since the summer, according to the National Insulation Association, which blames the 'void' in domestic energy efficiency policies created by the government's decision to 'reset' a raft of green policies. (29)

The Government's Feed-in Tariff review which proposes reducing subsidies for small-scale solar is threatening up to 20,000 jobs in the solar industry alone. (30)

The South West region has the renewable energy resources to meet more than 100% of its total energy needs, including replacement of liquid fuels and electrifying railways. We should aim to do this by 2050. According to a recent report by The Resilience Centre the South West has the potential to generate an estimated 68TWh of energy made up of 43TWh of electricity energy, and 25TWh of thermal energy. This equates to just over 100% of total future energy needs for South West assuming a 40% powering down due to energy efficiency measures by 2050. A programme to deliver a 100% renewable energy target would create 122,000 jobs. The capital cost of delivering such a programme would be £59,484m, including £8,784m on Smart Grid energy storage. This is 72% of equivalent nuclear costs for delivering the same amount of energy. (31)

So what is the real motive for Hinkley?

Over the past few weeks, three potential motives for the Government's determination have been put forward: firstly the need to maintain a nuclear industrial complex to support the UK's nuclear deterrent; secondly an ideological desire to prevent ordinary people taking control of their energy from big corporations, and thirdly the deal with China will open up opportunities for the expansion of financial speculation for George Osborne's friends in the City.

Phil Johnstone & Andy Stirling at Sussex University say George Osborne's nuclear obsession really does require some kind of explanation. Perhaps the best clue lies in Osborne's trip up the Clyde to Faslane; maybe the real commitment here is to maintaining Britain's nuclear arsenal. Amid the clamour of the recent China visit, it was also announced that a big slice of Hinkley contracts would go to Rolls Royce – the makers of Britain's nuclear submarine reactors. The calculation seems to be, that trickle-down from foreign power reactor manufacturers may be just enough to sustain a national industrial capability sufficient to continue the nuclear-armed status that current debates remind is so emotively cherished both by Tories and at the top of Labour. There are tantalising signs that this lay behind the strange reversal between nuclear white papers in the Blair era. If this is not at the bottom of Osborne's mind, it is difficult to know what is. (32)

Paying billions to avoid democratising the energy industry

The Tories are paying the Chinese billions to avoid democratising the energy industry, says Jane Fae on the Politics website. (33) The deal with China is remarkable. It will see us stump up some



£18 billion on a "flagship project of cooperation", commit to a new generation of nuclear power plants and make us dependant on a major power whose politics and strategic interests are a world away from our own. We are investing in the potentially ruinous white elephant of Hinkley Point and simultaneously slashing support for solar at precisely the point when the latter looks set to start paying its way.

The government argues we need to keep the lights on, but it clearly has a preference for central control and big business over anything which smacks of democracy. In place of this top down command-and-control structure, imagine a world in which individual citizens capture electricity through small scale home initiatives and community co-operatives. Faced with a choice between encouraging technologies that will in time reduce the power of the utilities and introduce some rudimentary democracy to our electricity contracts, the government has opted to pile most of its eggs into one very expensive Chinese nuclear basket. Even allowing for the traditional Conservative distaste for renewables, which has only focussed on price so long as it worked in their favour, this looks remarkably like a desperate attempt to maintain the status quo. So this isn't just a bad deal when it comes to traditional accounting measures. It's a bad deal all round. It fails to take account of where the electricity industry is headed or recognise that, as this century unwinds, power will, bit by bit, return to the people.

Osborne has given the Chinese government a big bundle of post-dated cheques to build a nuclear power station at Hinkley Point. Just like PFI (though with guaranteed payments, not even reductions if it does not perform as it should). And so a successor to PFI has emerged in CFI – sadly not a community finance initiative but a communist finance initiative as the Tory government commits us to paying exorbitant sums to the ruling party of China for years to come. In his latest attack on renewables Osborne has decided to remove eligibility for tax relief from community energy projects, coming at the same time as it is clearing the way (contrary to pre-election pledges) for privately owned, profit-driven fracking businesses to operate wherever they choose, makes explicit the government's preference to allow private equity, venture capital and hedge funds to profit rather than allow individuals and families to invest in their own communities.

Expansion of opportunities for financial speculation

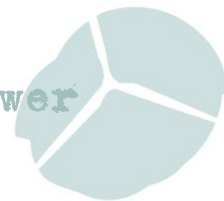
Jeffrey Henderson, Professor of International Development at Bristol University asks why a right-wing British government would want to invite companies controlled by the Chinese Communist Party – and in one case, the Chinese military – into the heart of the UK's strategically vital energy infrastructure. The nuclear deal between Britain and China goes against the advice of the security services, the military and the US government. So to explain this paradox, we must look carefully at another major deal in the British government's flirtation with President Xi Jinping: the inter-penetration of the two countries' financial services.

Henderson says the decision to involve Chinese companies only makes sense if it is seen as part of a quid pro quo for the previously announced financial services deal. In 2012, estimates of the wealth of Cabinet members suggested that 62% were very wealthy individuals whose family fortunes were largely wrapped up in financial and real estate speculation. In the current Cabinet, that is likely to be even more the case. And they belong to a Conservative Party that obtains a significant part of its funding from hedge funds and other City institutions. It is hard



not to conclude that there are material interests in place that encourage government policy towards the expansion of opportunities for financial speculation. This is now so much the case, it seems, that it is allowed to override some of the Conservative Party's most deeply held ideological positions. (34)

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3. No Public Subsidy Policy Ditched

The government has confirmed that it is not continuing the ‘no public subsidy policy’ [for nuclear power] of the previous administration. That little footnote, tucked away at the end of the announcement of the French-Chinese deal to build a new nuclear power station at Hinkley point, detonates an atomic bomb under the UK government’s already bewildering energy policy and leaves ministers hunkered down in a nuclear bunker, says Damian Carrington in *The Guardian*. (1)

Energy minister Andrea Leadsom told the Energy and Climate Change Committee: “*It is vital that industries over time stand on their own two feet. I don’t think anyone here would advocate an industry that only survives because of a subsidy paid by the billpayer.*” She was justifying 87% cuts to subsidies for solar power, just as they are on the verge of becoming cheaper than gas. She told MPs that firms might see the cuts as useful because they would “*focus the industry on the most fruitful areas*”. She appeared to suggest that small solar companies in her constituency supported Tory plans to cut subsidies for the industry.

But those very same firms have rounded on Leadsom. Graciously, they stopped short of accusing the minister of lying. Rather, she hadn’t a clue. They told the Energydesk at Greenpeace that the minister had “*no idea what she is talking about*” if she thought companies supported the cuts. In August, figures published by the International Monetary Fund (IMF) showed that the UK Government may not be looking in the right place if it wants to cut energy subsidies! As noted by the London School of Economics: “*The IMF’s latest analysis estimates that the UK will spend about £26billion, equivalent to 1.37% of its GDP, on subsidies for fossil fuels this year.*” So what are the renewables subsidies cuts really about? (2)

The contradiction does not need spelling out. Nuclear power has had 60 years to stand on its own two feet. The admission it still needs subsidy (after five years of ministers denying precisely that) shows that traditional nuclear power can barely crawl. Whether this admission strengthens the EU challenge against the UK that it is providing illegal state aid remains to be seen.

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4. Office for Nuclear Regulation-ish

Last year, non-economic regulators were handed guidance entitled “*Duty to have regard to growth*” by the Department for Business, Innovation & Skills. Anti-nuclear campaigners fear regulators have been forced to cosy up to the industry and sacrifice some of their safety responsibilities as a result of government changes to their role.

At a meeting in Manchester in October, executives from the Office for Nuclear Regulation (ONR), which oversees civil reactors and decommissioning, told representatives from NGOs that they now have to encourage the industry’s economic growth in addition to promoting safety. Last year, non-economic regulators were handed guidance entitled “*Duty to have regard to growth*” by the Department for Business, Innovation & Skills (BIS), but this still requires secondary legislation to come into force. The Government also introduced a Regulators’ Code, which asks them to support the growth of those businesses they oversee.

Attendees told *The Independent* they were immediately concerned that this could mean loosening safety procedures if it stifled work in an industry that is set to boom in the coming years. Professor Andy Blowers, who chairs the Blackwater Against New Nuclear Group that opposes plans for a new reactor in Essex, said: “*There’s a kind of dichotomy here, possibly a conflict, between regulating and accelerating [industry growth].*” Another attendee, nuclear expert Dr David Lowry, warned that the ONR seemed to be getting “*too close*” to the industry. He added: “*The ONR needs to stand up to Government pressure to act as an arm of the nuclear cheerleaders at the Treasury now making all the nuclear decisions, and carry on implementing the robust UK nuclear safety rules. Nuclear industry regulation is totally unsuitable to the Business Department’s misguided crusade to cut red tape in regulations. During the Manchester meeting, the ONR seemed to be dangerously edging towards the corporate financial interests of the nuclear industry rather than the public interests of ensuring national nuclear safety.*” (1)

Andrea Leadsom told Labour’s Paul Flynn, that “*safety and security in the civil nuclear industry are of paramount importance to the Government*”. But the Government is insisting on cutting the resources of the nuclear regulator, which is already struggling to find people with the right skills to become power plant inspectors. Minutes of a 13 October board meeting of the Office for Nuclear Regulation (ONR), which is sponsored by the Department for Work & Pensions (DWP), show this to be the case: “*DWP has been tasked with saving £590m by mid-2019, and this target will include the activities of ONR. The board set a very clear expectation that ONR would need to contribute to the efficiency savings and that we needed to be looking for efficiencies across all of ONR and not just the back office functions.*”

The ONR may be able to charge the industry for the work it carries out whilst regulating the industry but cutting the budget at the ONR, when we are on the cusp of building a new generation of nuclear power plants, does not seem the cleverest way to ensure safety, let alone openness and transparency. (2)

Meanwhile, ONR launched a new regulatory strategy for Sellafield in April 2014 which is described as being based on a “*collaborative approach between key stakeholders to deliver agreed objectives*”. The ONR Board wanted a new strategy which could deliver accelerated



hazard and risk reduction - not something a regulator would normally do. In July 2014 the six stakeholder groups – DECC, Environment Agency, NDA, Sellafield Ltd, the Shareholder Executive and ONR - gathered at Sellafield as part of a conference to share best practice. The conference was attended by more than 150 people – mostly Sellafield workers – so it was a key event for ONR to engage directly with all levels of the workforce and discuss the way forward.

March 2015 saw the start of highly radioactive sludge removal from an ageing fuel storage pond - the First Generation Magnox Storage Pond - to a brand new facility. (3)

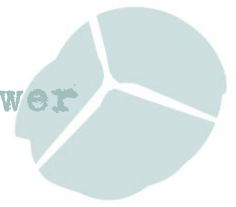
The Nuclear Decommissioning Authority (NDA) says a four year study has resulted in a breakthrough that will save the taxpayer hundreds of millions of pounds. The research focused on the chemical behaviours of the pyrophoric (bursting into flames spontaneously) Intermediate Level Waste (ILW) stored in the Magnox Swarf Storage Silo (MSSS) – one of the UK's most hazardous buildings. It was previously thought a 22-step mechanical treatment and encapsulation process would be needed to manage and ultimately dispose of the ILW stored in silos constructed over 50 years ago. However, the study's findings suggest an alternative three step solution that stores the waste 'raw' with concrete grout inside a shielded container is possible. The process would speed up decommissioning of the silo by several years and provide huge savings. (4)

A machine that will scoop out the Magnox Swarf from the silo - the Silo Emptying Plant will be brought from Wolverhampton, where it was manufactured, to the Sellafield site in 33 different parts and assembled by nuclear experts. The concept of building a machine to grab the waste was first agreed in 1997. The machine will be responsible for collecting 60,000 items of Miscellaneous Beta Gamma Waste including radioactive magnesium swarf, irradiated uranium metal and contaminated engineering debris out of the building and into safer, more modern containment. This process will start in 2017 and take until around 2038 and marks an important step forward in the decommissioning programme at Sellafield. (5)

The new alternative three step process means that the NDA has been able to cancel the contract for a Silos Direct Encapsulation Plant which would have cost £3.2bn and could have potentially held up the Magnox Swarf retrieval by another decade.

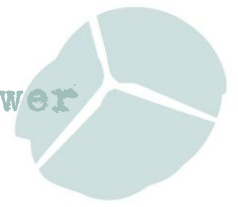
Whether the ONR's new strategy to deliver accelerated hazard and risk reduction is being done with ONBR's duty to have regard to growth in mind and will mean corner cutting and perhaps more accidents in the short-term remains to be seen.

- Meanwhile the latest in the catalogue of chronic failures to be notched up by Sellafield's Thermal Oxide Reprocessing Plant (THORP) was confirmed by Sellafield in October when it admitted to local stakeholders that the projected completion date for overseas fuel reprocessing of November 2016 could no longer be met. Instead, the outstanding overseas contracts would be completed by November 2018 – the date set for the final closure of THORP itself. Answering questions put by CORE to Sellafield at a meeting of the West Cumbria Sites Stakeholder Group (Spent Fuel Management) on 20th October, it emerged that despite earlier scheduling no foreign fuel would be reprocessed by the plant this financial year and that technical problems within THORP had resulted in preference having to be given to reprocessing UK AGR power station fuel – leaving the estimated 150 tonnes of overseas fuel to be dealt with closer to the plant's closure. The



overseas fuel is understood to be almost wholly sourced from German utilities, some of whom could now see their contracts completed up to 14 years late. (6)

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5. Bradwell B will trash the Blackwater Estuary

Conservation charities have expressed alarm at plans for a Chinese-built nuclear power station on the heavily protected Blackwater estuary in Essex, with one saying it could have “major impacts” on the estuary location, a haven for birds and marine life. Objectors say the proposed reactor would be massively more powerful than the closed Magnox station, so would require huge amounts of cooling water and could badly affect the delicate ecology of the shallow and slow-moving estuary. The Royal Society for the Protection of Birds said it feared a new reactor could have a significant effect on the environment and wildlife in the Blackwater and Dengie sites of special scientific interest, as well as wider nature protection areas, including the outer Thames. The Marine Conservation Society, says the estuary is designated a site of special scientific interest, a special area of conservation and a special protection area for birds, as well as a marine conservation zone for its native oyster beds. (1)

Andy Blowers, Chair of the Blackwater Against New Nuclear Group (BANNG), says “*The government is basically saying: ‘We’d like to sacrifice the Blackwater estuary in order to lever-in Chinese investment, for them to do a demonstration on how good their plant is, to flog it elsewhere.’ I don’t understand why we should be a platform for that.*” He continues: “*Why put this on a site that is so vulnerable to climate change, storm surges, all of that? What people forget, this thing isn’t here today, gone tomorrow. It’s got something like a 60-year lifespan, and beyond that you’re going to have radioactive waste on that site, I would say, indefinitely.*”

Blowers has written to the President of the People’s Republic of China, Xi Jinping, to urge him to consider whether it is worth proceeding with such a difficult project. The Chinese strategy presupposes that the reactor, along with spent fuel storage and other facilities would secure consent at all stages of regulation, but given the circumstances of the site, it is by no means certain that it would. (2)

Harwich & North Essex Tory MP Bernard Jenkin has told protesters he remains opposed to a new nuclear plant at Bradwell. He said “*This is a rotten site because of the risk to the estuary. It is a high damage risk and the plans are unacceptable. One of the problems we have is land subsidence and the imminent rise in sea level we are already experiencing. We are already protected by the sea wall so how long is this a viable site?*” (3) But the MP for the Maldon Constituency on the other side of the estuary, John Whittingdale, says the deal “*is the most exciting thing that has happened in the district*” in more than 20 years. (4)

China's top two nuclear power companies are combining their technologies in the country's flagship reactor – the Hualong 1 - to avoid competing for business abroad. Beijing is embarking on an ambitious plan to export its locally developed technology as well as its equipment manufacturing capacity potentially worth hundreds of billions of dollars. As part of the agreement, EDF will help CGN gain a licence to build its own nuclear reactor. The Office for Nuclear Regulation (ONR) is seen as one of the most stringent nuclear regulatory regimes in the world.



CNNC started building the first Hualong 1 reactor in Fujian on the southeast coast. China has already lined up two preliminary deals to supply the reactor to Pakistan and Argentina. (5)

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6. Energy Policy in a Mess

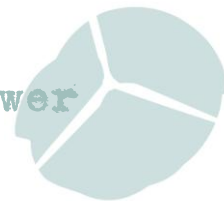
Subsidy cuts to the UK's growing army of small and medium-size "green" companies have been causing havoc. The true scale of these destructive policies became clear when one of the largest providers of solar panels in Britain, the Mark Group, collapsed into liquidation with the loss of almost 1,000 jobs. It was not long before a second solar and insulation provider, Climate Energy, bit the dust and now the Solar Trade Association predicts that dozens of firms and 27,000 employees are in danger. Mark Group was happy to make clear where the blame should lie, saying the government's "*draconian policy proposals... will essentially eliminate the solar PV market in the UK*".

The Department of Energy and Climate Change has denied this, claiming it's all down to "*commercial decisions*". But the latest proposal, to cut solar subsidies by 87%, is just another in a long line of changes that have hit energy efficiency, onshore wind, biomass and many other sectors that create jobs and a lower-carbon economy. These cuts look particularly irresponsible in the run-up to the UN climate change talks in Paris, but at any time it is odd to see a party that wants to make Britain greater showing little time for nurturing a new business sector. (1)

Energy companies have warned that 15 "illogical" policy changes introduced by the new Conservative government since May have made some renewable power sector projects "uninvestable" - causing them to cancel billions of pounds worth of investment. RWE Innogy - the renewable energy unit of Germany's RWE Group - has scrapped nine onshore wind projects in England in the past four months, halting investments of more than £250m. Although onshore wind is a core growth area for the business, it has instead switched money earmarked for the UK to projects in the Netherlands and Germany. (2)

The UK Government's energy policy is delusional - slashing support for renewables and going all-out for shale gas and nuclear power, say Peter Strachan and Alex Russell of Robert Gordon University in Aberdeen and Geraint Ellis of Queen's University in Belfast. Whilst fixated on the need to deliver a new £25 billion nuclear power project at Hinkley Point C, the UK nuclear landscape in recent years has witnessed significant political and policy support in the form of market restructuring. Even so, we only slowly inch towards delivering the project, while the outcome of the legal challenge from Austria, has the potential to further embarrass the free-market credentials of the Chancellor. (3)

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7. Cybersecurity

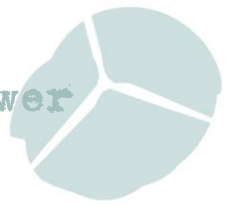
The risk of a serious cyber attack on civil nuclear infrastructure is growing, as facilities become ever more reliant on digital systems and make increasing use of commercial 'off-the-shelf' software, according to a new Chatham House report.

The report finds that the trend to digitization, when combined with a lack of executive-level awareness of the risks involved, means that nuclear plant personnel may not realize the full extent of their cyber vulnerability and are thus inadequately prepared to deal with potential attacks. (1)

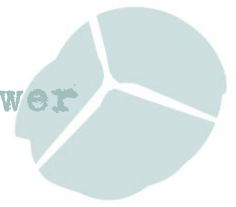
The conventional belief that all nuclear facilities are isolated from the public internet is a myth. Nuclear power plants around the world are harbouring a "culture of denial" about the risks of cyber hacking, with many failing to protect themselves against digital attacks. A focus on safety and high physical security means that many nuclear facilities are blind to the risks of cyber attacks, according to the report which cites 50 incidents globally of which only a handful have been made public. (2)

There have been a rising number of security breaches at nuclear power plants over the past few years, according to the report. As critical infrastructure and facilities such as power plants become increasingly complex they are, directly or indirectly, linked to the internet. This opens up a channel through which malicious hackers can launch attacks – potentially with extremely serious consequences. For example, a poorly secured steel mill in Germany was seriously damaged after being hacked, causing substantial harm to blast furnaces after the computer controls failed to shut them down. The notorious malware, the Stuxnet worm, was specifically developed to target nuclear facilities. Unauthorised access by hackers to important systems in a power plant is a serious matter: anything that damages or disturbs the balance of operations within the plant could lead to a shutdown or even dangerous situations when shutdown routines fail, while power surges within the plant could affect transmission infrastructure outside. Whether we are talking about a nuclear power plant or not, the end result is likely to be production failures or financial losses, or even injury and death in. Of course, with a nuclear power plant the risks are that much greater because of the radioactive fuel in use. (3)

By far the most worrying aspect of the Hinkley Point nuclear power plant is the risk to national security, with cybersecurity experts warning Beijing could use the deal to threaten the UK's critical infrastructure and endanger its physical safety. One of the most significant threats, according to Justin Harvey, chief security officer at Fidelis Cybersecurity, is that of so-called logic-bombs. "The US has been seeing Chinese state sponsored attackers leaving behind 'trapdoors' for years, but in recent times, it has also been leaving behind something much more sinister: logic-bombs," he told IBTimes UK. "The theory is that these logic-bombs are being left behind so that in the event of a military strike, China would have the capability to render its foes incapacitated." (4)



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8. Plutonium Conundrum

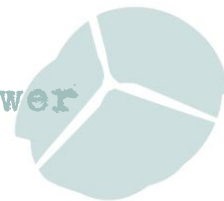
Officials from the Nuclear Decommissioning Authority (NDA) were joined by several academics on 4th November to discuss options for dealing with the 140 tons of plutonium currently stored at Sellafield - the largest stockpile of civil plutonium in the world.

There are several competing technologies for dealing with this stockpile vying for endorsement, none of which are well proven as financially viable. Top of the list – and the government’s current preference – is for some application that uses mixed oxide fuel, or MOX. But past experience with the Sellafield MOX Plant (SMP) is not good. SMP only managed to deliver 5 tons of MOX in its first five years despite having a design capacity of 120 tons a year. Total construction and operating cost was around £1.2bn. While France has had a degree of success in producing MOX, construction on the US’s MOX production facility at the Savannah River Site was recently pushed back a decade, and may not be in operation until 2033.

Another option on the table is PRISM. Developed by GE Hitachi (GEH), PRISM is a sodium-cooled fast reactor that uses a metallic fuel alloy of zirconium, uranium, and plutonium. GEH claims PRISM would reduce the plutonium stockpile quicker than MOX and be the most efficient solution for the UK. The problem is, despite being based on established technology, a PRISM reactor has yet to be built, and the UK is understandably a little reluctant to commit in this direction. Seen as something of a gamble, it remains in the running alongside MOX. (1)

Candu Energy’s CANMOX solution which would also involve building a MOX plant, represents a third option. The MOX would fuel four 700 MW Generation III EC6 reactors, which are heavy-water moderated and heavy-water cooled. The EC6 reactor has a 60-year design life and it has completed its formal regulatory design review against modern safety standards by the Canadian Nuclear Safety Commission (CNSC). The EC6 Reactor is based on the CANDU 6 reactor model which has a proven deployment and operation record and the company argues its plutonium processing facility can be implemented earlier than the other reuse options. *“Based on their worldwide experience, the overall implementation timetable to first irradiation is claimed by Candu to be in the range of 10-12 years,”* NDA said in January 2014. (2)

Amid all the uncertainty, one thing is for sure. Regardless of what decision is taken, a proportion of the plutonium will end up as waste and will need to be safely disposed of. One of the speakers at the press conference was Professor Neil Hyatt from the University of Sheffield. A materials science specialist, Hyatt is currently developing an immobilisation technique that can be used to render the plutonium unsuitable for weaponisation, allowing it to be more safely stored in the longer term. Using a form of hot isostatic pressing (HIP), the process mimics the formation of ancient minerals by using extreme heat and pressure to lock the plutonium inside ceramic based wastefoms. According to Hyatt, the HIP technology is about a decade away from operation. Unlike MOX and PRISM, immobilisation has no prominent industry backers. In comparison to exploiting the plutonium for our energy needs, there is no great fortune to be made from disposing of it safely. But immobilising the entire plutonium stockpile may in fact be the most economically sound approach, says Hyatt.



Some, such as the Sellafield Trade Unions, see the idea of throwing away plutonium - putting all that potential energy beyond the use of future generations - as madness. Others believe the technology needed to exploit that energy is decades away, by which point fusion and renewables will be better options. Just about the only thing the NDA could say with certainty, was that the right decision is more important than a quick one. (3) Tim Abraham, professor of nuclear fuel technology at the University of Manchester, told the NDA briefing that that Cumbria is sitting on a stockpile of what could be thousands of years of energy in the bank. But re-using it would require new reactors that are able to use plutonium as fuel to be built, a complex and expensive process. Professor Abram said: "*Having [a store of] separated plutonium without a declared end use represents a poor international example. We should at least keep the process moving forward and not give the impression to the world that we have stalled.*" (4)

The UK government was expected to make a decision on its preferred plutonium research option by the end of June 2015. Having failed to meet this deadline it is now expected to provide more direction in the coming months on its preferred solution. The government would prefer to re-use the plutonium rather than dispose of it, and it has labelled Areva's CONVERT plan as the "preferred option." The government is expected to reveal more detail on its plutonium processing plan by the end of 2015.

The MoX plant under construction at Savannah River Site in South Carolina is no longer affordable, according to two top US Energy Department officials. (5) It was originally expected to cost \$1.6 billion, but DOE has already spent \$4.5 billion on construction and building is only 70% complete. The final price tag, which includes finishing construction and operating the plant over the next 20 years, is now estimated to be between \$25.1 billion and \$47.5 billion.

Meanwhile, Japan is still planning to open its reprocessing plant which could separate enough plutonium to make as many as 1,000 bombs a year. The plutonium is supposed to be for generating electricity, but Japan already has tonnes it can't use since its reactors have been at a virtual halt since Fukushima. Local politicians are aggressively backing the plant, eager for investment in a remote northern region. Meanwhile, the U.S. is renewing civil nuclear agreements with China and South Korea on less restrictive terms. (6)

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1. Engineer 6th Nov 2015 <http://www.theengineer.co.uk/blog/sellafield-plutonium-a-multi-layered-problem/1021371.article>
 2. Nuclear Energy Insider 8th Oct 2015 <http://analysis.nuclearenergyinsider.com/waste-management/uk-steer-plutonium-processing-projects-year-end>
 3. Engineer 6th Nov 2015 <http://www.theengineer.co.uk/blog/sellafield-plutonium-a-multi-layered-problem/1021371.article>
 4. In Cumbria 9th Nov 2015 <http://www.in-cumbria.com/Plutonium-stockpile-is-energy-in-the-bank-17c14127-eedb-4109-8897-56e74c44aeb0-ds>
 5. Greenville Online 7th Oct 2015 <http://www.greenvilleonline.com/story/news/2015/10/07/federal-officials-say-mox-project-no-longer-affordable/73532402/> and Pogo 7th Oct 2015 <http://www.pogo.org/blog/2015/10/not-only-foolish-its-fiscally-irresponsible.html>
 6. AP 7th Oct 2015 <http://news.yahoo.com/us-experts-warn-plutonium-stocks-could-soar-east-041252665.html>



9. Small Modular Reactors (SMRs)

The Government's long-term nuclear strategy envisages the UK working in international partnerships leading the direction of future technology advances across the nuclear fuel cycle and being a key partner in commercialising new reactor-types such as Small Modular Reactors (SMR) worldwide. A nuclear research and development programme has been sketched out which would give the UK the option of promoting a high-nuclear scenario for the country with up to 75GW of nuclear capacity in 2050 providing 86% of the UK's electricity supply. (1)

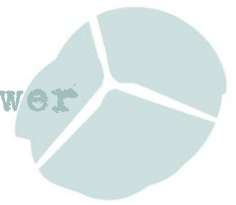
Disquiet over the high cost and delays at Hinkley Point C – some of it from within the nuclear community – and signs of a faltering global nuclear renaissance – have led to questioning whether the long-established conventional wisdom that bigger units are cheaper than small reactors is any longer true. The US Department of Energy (DOE) has built up a momentum for SMRs by throwing hundreds of millions of dollars in cost-shared funding to jump-start the industry.

The eventual cost of SMRs is essentially unknowable at the moment, but there is some evidence to suggest they will be even more expensive than existing reactors. Former CoRWM Chair, Professor Gordon Mackerron says the idea that the UK could become a major technological player in SMR technology seems tinged almost with fantasy, given that all significant SMR development to date has been outside the UK. In the USA for example the Obama administration has pledged a further \$217 million to NuScale, following substantial earlier Federal funding for two SMR designs.

Now the Energy Technologies Institute (ETI), a public-private partnership between the UK Government and energy and engineering companies has just produced an 'insights' report on the future UK role of nuclear power. (2)

Although the report is about all potential future nuclear technologies, it gives little attention to the large scale reactors - what the report is really interested in exploring is the potential for SMRs. ETI argues that 21 GWe of these SMRs might be in place by 2050, compared to a 'theoretical capacity' of 63 GWe. However there are at least two serious problems – according to ETI's own account – that could prove destructive to the SMR ambition. The first is that ETI only expects SMRs to be economically viable if there were a pre-existing district heating network at city-scale. SMRs could feed otherwise wasted heat from the nuclear reaction into this network – in addition to feeding electricity into the grid. But this network would already have to exist and have been paid for. The costs of adding this network to the costs of SMRs is, implicitly but clearly, enough to render SMRs economically unviable. There is no obvious reason to expect these multiple heating networks to be so conveniently available as a 'free good' to SMRs on so large a scale, if at all.

Second there is the economic appraisal itself since the construction costs of SMRs are as yet entirely unknown. Gordon Mackerron says this report may reflect the growing disillusion within the nuclear community with the large reactors currently proving so hard to finance and deploy. ETI says 'action needs to be taken now if the option to deploy SMRs ...is not to be closed off', but this makes no sense at all. It would be much more prudent to wait and see whether other countries' proposed deployment of SMRs proves successful before premature commitments are made to a



technology that is economically and socially high-risk. By advocating early development of SMRs in the UK ETI has in practice demonstrated quite how thin the current case for SMR pursuit really is. (3)

There are about 45 small modular reactor (SMR) designs under development around the world, half of them under preparation for deployment over the next 10 years, and the first three expected to become operational over the next four years, an International Atomic Energy Agency meeting heard. These would be the KLT-40S in Russia, the HTR-PM in China, and the Carem-25 in Argentina.

The KLT-40S is a 150-megawatt (thermal) pressurised water reactor unit designed for floating nuclear power plants. The construction of China's first demonstration HTR-PM -high-temperature gas-cooled reactor - began last year at Shidaowan in China's Shandong province. Carem-25, a domestically-designed and developed 25-MW small pressurised water reactor with natural coolant circulation, is under construction on a site next to the Atucha nuclear power station in Lima, about 100 km northwest of Buenos Aires.

Several countries new to nuclear power are considering SMRs not only for electricity generation but also for other uses such as district heating, desalination and hydrogen production. Countries looking at cogeneration include Saudi Arabia and Indonesia. (4)

Meanwhile an American nuclear power company has set out its ambition to bring its SMR to the UK as part of a market it says could be worth £400bn by 2035. NuScale Power, which is backed by primary investor Fluor Corporation sees the UK as one of the most attractive places globally to do nuclear business, and says Britain has the opportunity to grab a share of the future high value global SMR market. NuScale says it is on track to submit its technology for design certification in the US in 2016 and expects to receive regulatory approval in the early 2020s with deployment for its first customer in Idaho by late 2023. (5)

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1. See nuclear News No.72 March 2015 <http://www.no2nuclearpower.org.uk/nuclearnews/NuClearNewsNo72.pdf> and the Nuclear Free Local Authorities briefing on Small Modular Reactors: http://www.nuclearpolicy.info/docs/nuclearmonitor/NFLA_New_Nuclear_Monitor_No37.pdf
 2. Energy Technologies Institute *Nuclear – the role for nuclear within a low carbon energy system* An insights report, October 2015 <http://www.eti.co.uk/wp-content/uploads/2015/09/3511-ETI-Nuclear-Insights-Lores-AW.pdf>
 3. SPRU 9th Oct 2015 <http://blogs.sussex.ac.uk/sussexenergygroup/2015/10/09/small-modular-reactors-a-real-prospect-by-gordon-mackerron/>
 4. NucNet 17th Sept 2015 <http://www.nucnet.org/all-the-news/2015/09/17/first-three-smr-designs-will-be-online-within-four-years-iaea-meeting-told>
 5. New Civil Engineer 7th Oct 2015 <http://www.nce.co.uk/news/energy/small-scale-nuclear-market-could-be-worth-400bn/8689990.article>