

NFLA New Nuclear Monitor Policy Briefing



Edition Number 58, September 2019

The financing of new nuclear energy – responding to the UK Government consultation on a Regulated Asset Base financial model

i. Overview of Policy Briefing

This edition of the NFLA New Nuclear Monitor has been developed by the NFLA Policy Advisor to respond to the UK Government's consultation on a Revenue Asset Base (RAB) financing model to support the development of new nuclear power stations (and possibly assist with the development of carbon capture and storage facilities).

The consultation comes amidst the failure to develop new nuclear reactors at the Moorside facility close to Sellafield in Cumbria or the Wylfa B facility in Anglesey. Funding issues still remain for EDF and its Chinese partners in developing Hinkley Point C, and in future consideration of potentially building Sizewell C or Bradwell B. It has also been considered that the development of Small Modular Reactors (SMRs) may be potentially financed through the RAB model. NFLA's joint briefing with the Nuclear Consulting Group (NCG) on the prospects for SMRs – New Nuclear Monitor 57 – is very much worth reading in conjunction with this report.

This briefing provides a model response to the consultation and NFLA's particular deep concerns with the RAB model.

ii. Background to this consultation

The UK Government is consulting on proposals to establish a Regulated Asset Base (RAB) funding model for new nuclear power stations. The Consultation Document is available here:

<https://www.gov.uk/government/consultations/regulated-asset-base-rab-model-for-nuclear>

The consultation closes on **14th October 2019**.

Responses can be sent to:

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1. Introduction

As late as May 2010, the Conservative Party, the senior partner in the 2010-15 Coalition Government, was saying that it was "*committed to allowing the replacement of existing nuclear power stations... provided that they receive no public subsidy*". (emphasis added) (1) In the same month Vincent de Rivaz, the chief executive of EDF in Britain, said he was committed to the same goal: new reactors without any subsidies and at a viable cost. (2)

In October 2010 Chris Huhne MP, the Liberal Democrat Secretary of State for Energy & Climate Change "...*reconfirm[ed] the Government's policy that there will be no public subsidy for new nuclear power.*" (3)

The Conservative Government finally confirmed five years later, on its election with single-party control, in October 2015, that it was dropping the 'no public subsidy policy' for nuclear power of the previous administration.

Ironically, just the day before, energy minister Andrea Leadsom (now recently appointed as Secretary of State for Business, Energy and Industrial Strategy) said: "*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 bill payer.*" Unfortunately she was not talking about nuclear power but was justifying 87% cuts to subsidies for solar power, just as they were on the verge of becoming cheaper than gas. (4)

In other words, as Dr Doug Parr, the chief scientist at Greenpeace, points out: "*The nuclear industry has gone in just 10 years from saying they need no subsidies to asking bill payers to fork out for expensive power plants that don't even exist yet and may never. This 'nuclear tax' won't lower energy bills – it will simply shift the liability for something going wrong from nuclear firms to consumers.*"

No financing model can disguise the fact that nuclear power is hideously expensive, and renewables are winning the price war. The regulated asset base (RAB) approach exposes consumers to the cost of overruns, and in effect also requires them to provide financing at zero interest. There are plenty of ways to provide flexible power without resorting to so-called secure "baseload" supplies such as nuclear. In fact what will be required in future will be flexible supplies which can balance cheap renewables. Always on 24/7 baseload supplies will simply cause renewable supplies to be constrained during windy, sunny periods with low demand. As we write a new study from Bloomberg New Energy Finance is predicting that the cost of producing hydrogen gas with renewables is likely to **plummet by 80% by 2030**. (5)

2. Nuclear cost escalation

The Hinkley Point C project has seen huge price escalation even before construction started. In 2008, the UK government White Paper on nuclear power (6) forecast that the construction cost of the two reactors planned for Hinkley, would be £4 billion. This was the 'overnight' cost excluding finance charges, which might add an additional 50% to the overnight cost. In 2012, EDF, the company leading the consortium to build Hinkley estimated the overnight cost would be £12 billion. This increased to £14 billion in 2013, £16 billion in 2015, £18 billion in 2016 and the most recent estimate (June 2018) was for £19.6-20.3 billion. The contracted price paid for power (strike price) would be £92.5/MWh (2012 money) index-linked to inflation for 35 years, nearly double the most recent bids (2017) for offshore wind (£57.5/MWh 2012 money), despite off-shore wind projects only being given 15-year contracts. (7)

The commonly quoted additional cost to consumers for Hinkley Point C is £30 billion (8) though this, oddly, is actually the net present value (discounted) of the total subsidy to Hinkley to be paid by consumers over the 35 years. The actual additional cost to consumers could be as much as **£100 billion** in today's money. This commitment on behalf of consumers is being made despite the fact that there is no reason to believe that the costs of subsequent projects, notably construction costs, will be any lower. According to Thomas et al. "*the only way the strike price can be significantly reduced is by reducing the risk to the developers and*

financiers, which will reduce the cost of capital at the expense of consumers and taxpayers.”

3. Problems with the RAB model

In summary, the main problems for the NFLA with the RAB model are:

- Consumers may end up paying for nuclear projects which are not completed;
- Risk is shifted to consumers, including those who don't use nuclear electricity;
- It will be difficult to define a credible cost overrun threshold when already two EPR projects have tripled in cost;
- Private finance may still not be forthcoming;
- There is limited experience of using the RAB model for anything as complex and risky as nuclear;
- The project developer will hold all the information, so the proposed Regulator will only be able to make token adjustments to projected costings;
- Setting up a new regulatory regime will mean the time it takes to provide any carbon savings will be far too long;
- The Revenue Stream will include a variable strike price – consumers forced to write a blank cheque.

Each of these will be considered in turn.

4. Consumers paying for nuclear projects not completed

The funding model proposed would let energy companies charge consumers a set amount, to be spent on future infrastructure provision. Councillors in Copeland, Cumbria, an area with the largest concentration of nuclear facilities in England, are worried residents could have to pay for plants that may never be built. The chairman of the council's strategic nuclear and energy board, Steven Morgan, says the public could end up paying *“for plants that haven't been built yet and may never be built.”* Endorsing a *“substantial increase in our electricity rates”* to pay for new nuclear plants was *“not something we should sleepwalk into”*, he said. (9)

Para 30 of the consultation document notes that in the case of cost overruns investors could decide not to provide further finance in which case the Government (i.e. taxpayers) could choose to either provide the finance required to complete the project or to discontinue the project. If the project is discontinued electricity consumers would presumably then lose the money they had already been forced to contribute.

5. Risk is shifted to consumers, including those who don't use nuclear electricity

It is clear that the RAB model is intended to shift risk from the nuclear companies to the UK public either as taxpayers or electricity consumers. RAB financing is more usually applied to projects where there is a natural monopoly, such as the Thames Tideway where Thames Water is a monopoly provider of water and sewage services to the ratepayers who bear the burden of the additional cost.

Applying a RAB model to a specific project in a competitive market would raise difficulties with the need to ensure that only those ratepayers who would benefit from the additional cost of a nuclear RAB would incur the additional cost. It would be difficult to explain to consumers on non-nuclear green tariffs, or people resident in Scotland where the policy of the Scottish Government is opposed to new nuclear power stations, why they were being compelled to pay an additional cost for generating capacity that was offering them no benefit. There also are no nuclear power stations in Northern Ireland and it is unlikely any will be built there.

The consultation document claims the system will *“ensure that those who make payments for a new nuclear project should directly benefit from doing so.”* But there is no suggestion that consumers on 100% renewable tariffs or living in Scotland can escape the nuclear surcharge and there is no attempt to define the term *“directly benefit”* in the above sentence.

6. It will be difficult to define a credible cost overrun threshold when already two EPR projects have tripled in cost

The consultation document proposes a Government Support Package “*offering protection to investors for specified low probability but high impact risks that the private sector would not be able to bear.*”

These risks include “*the risk of cost overrun above a remote threshold.*” This threshold for construction costs would set at a level which there was only a remote chance of reaching. It is difficult to see how this ‘remote chance’ can be defined given that the cost of EDF’s EPR project at Flamanville has exploded from €3.3 billion to €10.9 billion. (10) Olkiluoto in Finland, has proved a similar disaster. The original cost estimate was €3billion but this has now jumped to around €9 billion. (11) Thus the remote threshold would logically have to be above **triple the original cost estimate.**

7. Private finance may still not be forthcoming

The UK Government says few project developers have a balance sheet that can accommodate the £15-20bn cost of delivering a new nuclear project. It wants to attract private finance at a cost that represents value for money to consumers. (Page 9) All recent nuclear projects in the West, such as Flamanville and Olkiluoto, have been monumental disasters, and even the Chinese EPR projects were late. So there is no guarantee that private investors will be interested in investing in nuclear power.

Investors, however, will still get a reasonable rate of return on their investments when the inevitable cost overruns happen and the electricity consumers will pay most of the extra cost. But even with an assurance of minimal risk, it is not clear whether the investors targeted, for example, pension funds, sovereign wealth funds and investment funds, will be willing to invest the huge sums required. Such investors have never invested in nuclear projects so the RAB model may fail simply due to lack of investors.

The consultation document (para 18) admits that “*there remain significant challenges ...includ[ing] raising the scale of capital required and establishing an appropriate risk sharing arrangement between the project company, the supply chain, investors, taxpayers and energy suppliers and consumers.*” The new funding model won’t make any difference to the construction and operation record of nuclear reactors around the world, and the record of EPRs in particular is abysmal. Nor will it change the fact that nuclear vendors are in financial disarray. (12)

8. There is limited experience of using the RAB model for anything as complex and risky as nuclear

The greater complexity of nuclear projects, compared with, for instance, the Thames Tideway Tunnel, means they are much more prone to cost overruns than other projects funded under a RAB-type arrangement. The consultation document (para 25) recognises that new nuclear projects are greater in scale and face specific challenges that were not relevant to Thames Tideway Tunnel. The National Infrastructure Commission said: “*There is limited experience of using the RAB model for anything as complex and risky as nuclear*” and said that “*it is not clear what the best model*” for financing new nuclear power projects would be. (13)

9. The project developer will hold all the information, so the proposed Regulator will only be able to make token adjustments to projected costings

The Government will appoint a Regulator to ‘assure’ the public that proposed nuclear projects represent ‘value for money’. However the industry has a history of adopting ridiculously optimistic cost projections and construction time estimates. It is difficult to see how the Regulator can avoid adopting these without building a large organisation capable of estimating total construction cost targets and baselines. In practice the developer will then be able to run up whatever bills it wants and pass most of these onto the consumer. The project developer will hold all the information, so the Regulator will only be able to make token adjustments. When the time comes for consumer to pay cost overruns it will not be in the Regulator’s interests to point out that they failed to keep control of the developer’s costs. (14)

The cost of running the regulator, which presumably would have to be recouped from the nuclear project developer, will also have to be taken into account.

10. Setting up a new regulatory regime will mean the time it takes to provide any carbon savings will be far too long

The model involves establishing an Economic Regulatory Regime (ERR). It is already more than 11 years since the Government White Paper which announced the decision to go-ahead with new nuclear power stations. Yet EDF Energy has only just completed the pouring of concrete for the base for the first of two nuclear reactors at Hinkley Point C. Building a new ERR from scratch in which a licence will have to be granted to a project company entitling it to charge nuclear RAB payments, will take time. Time is a commodity that we do not have if we are going to tackle the climate emergency.

Almost all other methods of carbon abatement could be implemented much more quickly. With construction of nuclear power stations taking anything up to 10 to 15 years longer than renewable and energy efficiency projects the emissions not saved over those years should be taken into account. Utility scale solar or wind schemes take about 2-5 years to begin commercial operations – nuclear effectively emits 64-102g of CO₂ per kilowatt-hour of plant capacity just from grid emissions during the wait for projects to come online or be refurbished, compared to wind or solar farms. (15) There are nearly 800 renewable projects that are ready to go and have already won planning consent - a pipeline of shovel-ready onshore wind projects which can provide cheap power to consumers and help close the gap on our carbon targets. Together these would generate around 12 terawatt hours of energy a year; two thirds of what Wylfa would have produced and without leaving a toxic legacy. (16)

11. The Revenue Stream will include a variable strike price – consumers forced to write a blank cheque

The RAB model proposed would need a route for funding to flow from electricity suppliers to the project company – a ‘revenue stream’. Suppliers will need to decide how best to reflect these costs in their consumer tariffs. The proposal allows for the nuclear project company to receive payments even after the nuclear station begins operating. It would receive a fee in £/MWh, but unlike the strike price this would not be a fixed amount – it would be variable and set by the Regulator as circumstances change. This appears to be a way of forcing consumers to write a blank cheque for the possibility of escalating operating costs.

12. Other matters raised by the RAB Consultation Document -

Paragraph 4 says that electricity demand could potentially double by 2050.

The 2005 Energy White Paper was expecting that by 2020 electricity consumption would have increased by 15%. In reality it has decreased by 16% - so 31% lower than predicted. The Government now expects primary energy demand to continue falling by a further 11% by 2025. But after that projections revert to the bad old days. Government forecasters are essentially telling Government that their past energy efficiency policies have been rather effective. But since the Government has been systematically removing these policies the reductions trend is now going to go into reverse. This cannot be allowed to happen for fuel poverty and equity reasons. (17) The British Energy Efficiency Federation is calling for a 30 by 30 Energy Efficiency Act which means that 27m homes and 3m non-domestic buildings would be made completely energy efficient by 2030. (18)

Conventional wisdom seems to suggest that most of the 38 million vehicles currently on UK roads will be replaced by electric vehicles. But by doing this we could be introducing a whole new set of environmental and social problems. For instance Professor Paul S Monks, Chairman, Air Quality Expert Group says various factors such as emissions from tyre and road surface wear mean that air pollution problems will persist well into the future. (19)

The House of Commons Science and Technology Committee says “*the Government should not aim to achieve emissions reductions simply by replacing existing vehicles with lower-emissions versions.*” Many people will have to give up their cars, even electric ones, if Britain is to meet its target of net-zero emissions by 2050. The government must reduce car

ownership to meet the legally binding target. The Committee concluded: “*In the long-term, widespread personal vehicle ownership does not appear to be compatible with significant decarbonisation.*” (20)

A recent report by Redburn, a UK research and investment company suggests the increase in electricity demand as a result of the electrification of transport may be very limited and that electrification of cars will not dent the established trends towards reduced electricity consumption because ever more energy-efficient lighting and motors will offset any increases in electricity consumption due to EVs. (21)

Paragraph 5 says old nuclear power stations which are “*important contributors to our low carbon generation – are due to come offline by 2030 as they reach the end of their operational lives.*”

However, it would be virtually impossible to have a new nuclear power station, built under the RAB funding model, up and running by 2030. Nuclear electricity from existing nuclear stations will need to be replaced by renewables and efficiency measures.

EDF Energy is currently not expecting Sizewell C to begin commercial operation before 2031, assuming everything goes according to plan. The Energy and Climate Intelligence Unit (ECIU) argues that existing nuclear reactors could be phased-out before 2030 without pushing up emissions. The AGR fleet is nearing the end of its operational life. As the reactors get older safety concerns are growing, particularly with regard to keyway root cracking in the graphite core. It is likely that cracking may prove terminal for at least some of the reactors ahead of currently-scheduled closure dates. So we should be making contingency plans anyway to prepare for the probability of earlier closure.

A mixture of renewable generation technologies – onshore wind, offshore wind and solar PV – would be the lowest cost option, with cumulative savings to 2035 up to £18 billion compared with natural gas-fired power stations. (22) An accelerated programme to replace all the lights in the UK with LEDs could cut peak electricity demand by about 8GW – almost enough to replace all existing nuclear capacity. Even a much more restricted national campaign that just focused on domestic houses would have a dramatic impact. If we switched the lights in the parts of the house that are in use in early evening - essentially the kitchen and living areas - we would reduce home demand by more than 50%. We could cut the typical demand for electricity to run lights from today's evening average of 180W to 80W by replacing about 21 bulbs in the typical home. The impact would reduce peak electricity demand by 2.7GW – almost the capacity of Hinkley Point C. The payback period of such a scheme is about two years at 2015 LED prices. For an expenditure of around £60, the householder would typically save £30 a year. (23)

Paragraph 6 says there will be “a crucial role for low-carbon ‘firm’ (i.e. always available) power in 2050”.

Before his recent replacement, Business Secretary Greg Clark was reported to have disclosed estimates of the amount of firm power he thinks will be needed in 2050. He said Britain needs to build a fleet of nuclear or carbon-capture power plants equivalent to a dozen Hinkley Point Cs - up to 40GW of non-intermittent low carbon power stations to hit climate change targets. (24) To begin with this unpublished analysis needs to be made publicly available before the closure of this consultation.

Conventional wisdom used to be that supplying our electricity with 100% renewables was impossible. Now research in the design of 100% renewable energy systems in scientific articles was detailed in 180 articles published by May 2019. (25) Now, only a few months later, this number has jumped to 280. (26) However, it seems that for the Committee on Climate Change (CCC) it is a question of cost. It says you can only go so far with the proportion of our energy supplied by renewables before costs start to rise so we are going to need nuclear or Carbon Capture and Storage to provide some firm power. But the CCC is relying on its own estimate of nuclear costs in 2050, believing they will be 28% lower by then.

(27) Even EDF doesn't say it's not possible to supply our energy needs with renewables, just that it would be more expensive. (28) EDF Energy's cost calculations rely on its own estimate that Sizewell C will be 20% cheaper than Hinkley Point C. (29) Quite why anybody would take these cost projections seriously after the disasters at Flamanville and Olkiluoto is difficult to comprehend.

The CCC doesn't have a good record of estimating future energy costs. Its first report in 2008 said the 'economic case for nuclear power deployment is strong' and it is already 'close to competitive' on price with fossil fuels. It also predicted that three new generation reactors could feasibly be built by 2020 (with costs estimated at around £50/MWh). But with the industry beset with problems and delays, the latest CCC estimate of the cost of nuclear in 2020 is £98/MWh. (30)

The myth that a very high level of renewables can't be integrated into the electric grid is being demolished by the clean tech and battery storage revolution. *"By 2040, renewables make up 90% of the electricity mix in Europe, with wind and solar accounting for 80%,"* according to projections by Bloomberg New Energy Finance (BNEF) in their annual energy outlook. *"Cheap renewable energy and batteries fundamentally reshape the electricity system,"* explains BNEF. Since 2010, wind power globally has dropped 49% in cost. Both solar and battery prices have plummeted 85%. (31)

South Australia is providing a useful example to the rest of the world. More than 50% of its electricity needs are now generated by renewables. South Australia's grid provides real world evidence of how a new base load generator, such as the nuclear power station would now be impossible to incorporate into a system with high levels of variable renewable generation according to the National Energy Emissions Audit from The Australia Institute. *"The complement to variable renewable generation is not so-called "base load" generation (a meaningless term),"* the report said *"but energy storage in some of its many forms and spatial/climatic diversification of renewable generation."* (32)

Paragraph 7 says advances system flexibility may eventually provide additional options for fully decarbonising the power sector, but in the meantime we will need a significant capacity of new nuclear power stations and gas-fired power plants with CCUS.

Yet, neither of these will be making any contribution (apart from possibly Hinkley Point C) until well after 2030. The cost of renewables and electricity storage is falling far faster than anyone anticipated. Another Bloomberg New Energy Finance study published earlier this year showed that lithium-ion battery storage costs have dropped by 76% since 2012. (33) According to Tom Burke *"We are moving into a very different kind of electricity system, and the idea that nuclear power, which is essentially a 20th Century technology, is what you need to solve a 21st Century problem is simply wrong ... It's about five years since the then Chief Executive of Wood Mackenzie Steve Halliday, said baseload is an outmoded concept of how you manage an electricity grid, and that's because we have modern sensors, we have deep data, deep analytics, we have much more sophisticated software, and we are able to manage our electricity system in a way that delivers affordable and reliable electricity, much more efficiently than we were able to do in the past, and we simply don't need very big baseload power stations of any kind any more, and certainly not ones the size of the new Hinkley Station at 3.2 gigawatts."* (34)

13. Conclusion

This detailed and thorough analysis of the RAB model by the NFLA makes it quite clear it will be overly expensive, overly complicated, is completely unnecessary as the answer to our future energy needs, and is a licence to support the nuclear industry with huge levels of financial support in variance with support for the renewable energy sector. It will fundamentally require the public, either as taxpayers of electricity bill payers to foot the cost of new nuclear. The eye-watering current estimated costs of Hinkley Point C – which have grown from £4bn to £20bn in a decade – should have warned the Government of the endemic problems and weaknesses within the nuclear industry. Yet, it now wants to place the great bulk of this financial risk onto the public. This is without even mentioning the billions of pounds

already provided by public expenditure to deal with the radioactive waste and nuclear decommissioning legacy of the past 70 years of nuclear operation.

This all arises at a time when the financial costs of a wide range of renewable energy technologies are rapidly falling, while the time it takes for renewable projects to be realised is much quicker than anything the nuclear industry can deliver. It appears an unnecessary risk for the RAB model to be brought to deliver new nuclear expansion in this light. The ongoing nuclear weapon policy requirements of the UK Government and the close relationship it retains with the global nuclear industry appear to also be a part of why this new attempt to support the delivery of civil nuclear projects in England and Wales. In the NFLA's view, it should not be created as a new financial model for new nuclear projects given all the complexities and risks inherent within such developments.

14. Consultation Questions

Question 1: Have we identified a model which could raise capital to build a new nuclear power station and deliver value for money for consumers and taxpayers?

No. It is likely that there will still be too much risk for private investors. The best way to provide value for money for consumers and taxpayers would be to support renewables and energy efficiency, including onshore wind and solar which are now the cheapest way to generate electricity.

Question 2: Do you have any comments on the components of the Economic Regulatory Regime as described?

Setting up a whole new Economic Regulatory Regime will take far too long. We need to implement measures which can reduce carbon emissions immediately. The project developer will hold all the information. The industry has a history of adopting ridiculously optimistic cost projections and construction time estimates. It is difficult to see how the Regulator can avoid adopting these without building a large organisation capable of estimating total construction cost targets and baselines. In practice the developer will be able to run up whatever bills it wants and pass most of these onto the consumer

Question 3: Do you have views on how consumer interests are protected under the proposed approach? What else should be considered to protect consumer interests?

The best way to protect consumer interests is to support the cheapest ways to generate electricity i.e. renewables, and to launch an energy efficiency programme which can reduce the energy consumers require to keep warm and comfortable.

Question 4: Do you agree that consumer risk sharing could be value for money for consumers if it achieves a lower expected overall cost for consumers compared to a Contract for Difference model?

No. The outcome of a system which shifts risk to consumers and taxpayers in order to reduce the cost of borrowing is a gamble. Given the history of failure surrounding nuclear projects it is a gamble not worth taking.

Question 5: Do you have views on the potential way to design a revenue stream for a nuclear RAB model that we describe, and are there alternative models we should consider?

Consumers who have opted for 100% renewable tariffs or who live in Scotland will be outraged if they are forced to contribute to the construction of new nuclear power stations. The costs should be charged to those who are prepared to buy nuclear electricity.

Question 6: Do you have views on our proposed approach to assessing a new nuclear project under a nuclear RAB model and determining whether it is value for money for consumers and taxpayers?

The cost of offshore wind generation dropped to under £65/MWh in 2017, and onshore wind would be around £46/MWh. The cost of installing new solar PV capacity is now around £56/MWh. The CCC estimate that nuclear electricity will cost around £98/MWh in 2020. (35) The strike price Hinkley Point C has now reached around £106/MWh in today's prices. If Sizewell C could manage a 20% reduction it would still be £85/MWh. The value of nuclear power to consumers, therefore, depends on the argument that a certain amount of 'firm' power is required. At least 280 peer reviewed academic studies say otherwise.

Rather than proposing approaches to try to prove that the most expensive form of electricity generation can be value for money, the Government should be analysing whether it is worthwhile continuing with the Hinkley Point C project. It is not clear how much EDF has spent to date on the project but given that construction on the first reactor only started in December 2018, it can only be a small fraction of the total cost, and an even smaller fraction of the £50bn that Hinkley will add to consumer bills over its lifetime. The best deal for consumers could well be to cancel the project, despite the need to pay cancellation costs. (36)

15. References

- (1) Telegraph 13th May 2010 <https://www.telegraph.co.uk/finance/newsbysector/energy/7716666/Coalition-Government-Nuclear-plans-destabilised-by-Lib-Dem-energy-minister.html>
- (2) Guardian 27th May 2010 <https://www.theguardian.com/business/2010/may/27/edf-nuclear-huhne>
- (3) Written Ministerial Statement on energy policy: The Rt Hon Chris Huhne MP, 18 October 2010 <https://www.gov.uk/government/news/written-ministerial-statement-on-energy-policy-the-rt-hon-chris-huhne-mp-18-october-2010>
- (4) Guardian 22nd October 2015 <https://www.theguardian.com/environment/damian-carrington-blog/2015/oct/22/hinkley-point-uk-energy-policy-is-now-hunkering-in-a-nuclear-bunker>
- (5) Bloomberg 22nd Aug 2019 <https://www.bloomberg.com/news/articles/2019-08-21/cost-of-hydrogen-from-renewables-to-plummet-next-decade-bnef>
- (6) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228944/7296.pdf
- (7) Written evidence submitted by Professor Steve Thomas, Tom Burke CBE & Dr Paul Dorfman (FEI004) to the House of Commons, Business Energy and Industrial strategy Committee, "Is there a 'giant hole' in UK energy policy?" March 2019 <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/business-energy-and-industrial-strategy-committee/financing-energy-infrastructure/written/98710.pdf>
- (8) National Audit Office 23rd June 2017, <https://www.nao.org.uk/report/hinkley-point-c/>
- (9) BBC 24th Aug 2019 <https://www.bbc.com/news/amp/uk-england-cumbria-49460227>
- (10) Times 27th July 2019 <https://www.thetimes.co.uk/article/5268801e-afd9-11e9-84cf-31ddba0e0fae>
- (11) Nucnet 10th April 2019 <https://www.nucnet.org/news/finland-s-tvo-announces-further-delay-to-olkiluoto-3-epr-project> & Nucnet 17th July 2019 <https://www.nucnet.org/news/commercial-operation-delayed-six-months-to-july-2020-7-3-2019>
- (12) Op Cit Ref 7 paras 9-11
- (13) National Infrastructure Assessment, NIC, July 2018 p38 https://www.nic.org.uk/wp-content/uploads/CCS001_CCS0618917350-001_NIC-NIA_Accessible.pdf
- (14) Dr David Toke's Blog 23rd July 2019 <https://realfeed-intariffs.blogspot.com/2019/07/a-laymans-guide-to-regulated-asset-base.html>
- (15) Evaluation of Nuclear Power as a Proposed Solution to Global Warming, Air Pollution, and Energy Security by Mark Z Jacobson May 2019 <https://web.stanford.edu/group/efmh/jacobson/Articles/I/NuclearVsWWS.pdf> and PV Magazine 18th April 2019 <https://www.pv-magazine.com/2019/04/18/there-is-no-such-thing-as-a-zero-or-near-zero-emissionnuclear-power-plant/>
- (16) Guardian 18th January 2019 <https://www.theguardian.com/environment/2019/jan/18/windfarm-industry-urges-uk-to-lift-onshore-subsidies-ban>
- (17) "Don't let these energy use predictions come true", Andrew Warren Energy in Buildings and Industry June 2019
- (18) Net Zero by 2050? Let's go 30 by 30, Andrew Warren, Energy in Buildings and Industry July/August 2019 Reprinted on Dave Tokes's Blog 18th July 2019 <http://realfeedintariffs.blogspot.com/2019/07/zero-carbon-by-2050-make-it-30-by-30.htm>
- (19) Times 19th July 2019 <https://www.thetimes.co.uk/article/times-letters-tackling-the-harmful-effects-of-air-pollution-3jxx8z2fw>
- (20) House of Commons 22nd August 2019 <https://www.parliament.uk/business/committees/committees-a-z/commons-select/science-and-technology-committee/news-parliament-2017/clean-growth-report-published-17-19/>

- (21) Energy Post 6th November 2018 <https://energypost.eu/the-impact-of-electric-vehicles-onelectricitydemand/>
- (22) Cracks in the System, ECIU June 2019 [https://ca1-eci.edcdn.com/downloads/Cracks in the System FINAL 5 6 19.pdf?mtime=20190606145543](https://ca1-eci.edcdn.com/downloads/Cracks_in_the_System_FINAL_5_6_19.pdf?mtime=20190606145543)
- (23) Goodall, C The urgent case for a mass switch to LED lighting, Ecologist 8th June 2016 http://www.theecologist.org/blogs_and_comments/commentators/2987760/the_urgent_case_for_a_n_mass_switch_to_led_lighting.html
- (24) Times 24th July 2019 <https://www.thetimes.co.uk/article/142efc8a-ad84-11e9-b657-11944f524f2a>
- (25) Kenneth Hansena, Christian Breyer, and Henrik Lund, *Status and perspectives on 100% renewable energy systems*, Energy 15th May 2019 <https://www.sciencedirect.com/science/article/abs/pii/S0360544219304967>
- (26) See <https://twitter.com/ChristianOnRE/status/1155221794070126592>
- (27) James Richardson, Chief Economist, National Infrastructure Commission; Tom Thackray, Director of Infrastructure and Energy, CBI; Chris Stark, Chief Executive, Committee on Climate Change, Oral Evidence to the BEIS Committee 12th June 2019 <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/businessenergy-and-industrial-strategy-committee/financing-energy-infrastructure/oral/103082.pdf>
- (28) Ipswich Star 2nd July 2019 <https://www.ipswichstar.co.uk/news/business/sizewell-c-boss-says-allrenewables-approach-not-practical-1-6137126>
- (29) East Anglian Daily Times 14th July 2019 <https://www.eadt.co.uk/news/sizewell-c-edf-energy-tasc-1-6159158>
- (30) ECIU 16th July 2019 <https://eciu.net/blog/2019/decarbonisation-is-getting-cheaper-why>
- (31) Think Progress 21st June 2019 <https://thinkprogress.org/europe-will-be-90-renewable-powered-intwo-decades-experts-say-8db3e7190bb7/>
- (32) Renew Economy 27th Aug 2019 <https://reneweconomy.com.au/south-australia-an-example-to-the-world-of-how-to-move-beyond-baseload-14333/>
- (33) BNEF 26th March 2019 <https://about.bnef.com/blog/battery-powers-latest-plunge-costs-threatens-coal-gas/>
- (34) Tom Burke 25th June 2019 <http://tomburke.co.uk/2019/06/25/do-we-need-some-base-provision-from-nuclear-power-if-we-are-to-keep-the-lights-on-sky-news/>
- (35) ECIU 16th July 2019 <https://eciu.net/blog/2019/decarbonisation-is-getting-cheaper-why>
- (36) Letter from Prof Steve Thomas, Guardian 25th August 2019 <https://www.theguardian.com/uk-news/2019/aug/25/hs2-costs-and-benefits-a-search-for-clear-evidence>