

WEF Seminar Review of UK Nuclear Policy, Delivery & Risk

Westminster Energy Report

4 February 2016

Session 1

Welcoming Remarks

Chris Lambert, Director, Westminster Energy Forum, opened proceedings, stating that each WEF event had focused on policy conversions, delivery and the surrounding risks that grew ever more complicated in terms of policy, infrastructural need, value and investment requirement. He highlighted that the main policy, to be revealed at the end of June, would detail the strategic direction of UK energy policy and infrastructure in the context of international trends, where a 'Super-group' of organisations responsible for design, delivery of policy and infrastructure would meet.

Darryl Murphy, Partner, KPMG, expressed his hope that WEF had become an annual fixture in the nuclear calendar. He identified similarities between current topics of interest and those that had been topics of interest in prior years, but hoped that the agenda would move on in the years to follow. He reflected that, since the prior year, the Government and Secretary of State had changed, noting that the latter had made positive statements towards nuclear, which had been good for those in the industry.

Government review of key milestones, deliverables and issues ahead

Matt Clarke, Deputy Director, Office for Nuclear Development, DECC, stated that the UK faced an energy challenge trilemma comprising the need for secure energy supplies, maintaining affordability and tackling climate change. Noting that the issues were interlinked, he identified that the Government's priority was to create a coherent energy policy. Nuclear provided energy security, was affordable low-carbon energy, and reduced consumer electricity bills.

Building new nuclear was imperative in light of the planned plant closures in the coming decade. There were eight nuclear sites generating 16% of the country's energy facing closure, and without new nuclear builds nuclear generation could dip to 3% by 2030.

The last siting process had identified eight suitable sites for new nuclear power generators. There were six new nuclear project proposals with the collective potential to provide up to 18 gigawatts of new nuclear and over 30,000 jobs at the peak of construction.

Hinkley Point C would pioneer new nuclear. EDF and CGN had signed a Strategic Investment Agreement (SIA) confirming their commitment to developing new nuclear power stations in the UK. Hinkley Point C was intended to provide low-carbon electricity to six million homes for 60 years, with no consumer cost until the mid-2020s. The plant would carry two reactors with a combined capacity of 3.2 gigawatts, 7% of the UK's electricity needs, whilst boosting national and local economy through the creation of 25,000 jobs.

There was scepticism around the project's 2025 completion deadline, but Mr Clarke optimistic that it would be met. He noted that EDF had learned from similar projects undertaken across the globe and had informed their design process accordingly. There were other projects in development by EDG and CGN, Horizon and NuGen.

The Government recognised SMR potential, and Mr Clarke noted vendors' suggestions that SMRs could offer cost reduction and commercial benefits to the UK, alongside high-value commercial opportunities. SMR policy was under development alongside assessments to validate vendors' claims and inform policy definitions. It had been announced that the Government would invest up to £250 million in nuclear R&D, and a proportion would be used in a competition to identify the SMR design that offered the best value.

The Government was committed to delivering GDF as the safest and most secure method of long term nuclear waste management. The intention was to dispose of waste underground; GDF would take waste from existing and new nuclear sites. A draft National Policy Statement was under preparation for consultation in spring.

Government was working with industries and promoting the UK as a credible nuclear provider in the global market, but there were other challenges and opportunities to be addressed. The Government recognised of the difficulty of being cost competitive in a global market and also identified initiatives in place to help the UK supply chain deliver capability and capacity.

A skilled workforce was also essential in delivering new nuclear projects on time, and action needed to be taken to prevent skills gaps occurring over the course of the new nuclear programme; and keep up with the projects' increasing labour demands. Initiatives had been put in place in anticipation of such demand.

Revisiting the energy trilemma, Mr Clarke stated that new nuclear was one means of addressing the challenge, which was essential to progressing with the energy mix. He affirmed his confidence in the policies and delivery of nuclear programmes.

Government was committed to meeting the international carbon targets in a manner that provided a reliable baseload supply at affordable prices, alongside signalling that the UK was welcoming of overseas investment. There were efforts to address the potential skills gap in nuclear, and the aim to make nuclear a sector which embraced diversity and equal opportunities.

Darryl Murphy asked if the state aid and Austria challenge could be overcome. Mr Clarke stated that it was a challenge, but he was confident that they would reach the right conclusion.

A participant asked if the Government would look at floating SMRs. Mr Clarke responded that everything was under consideration in the techno-economic assessment.

It was asked what form the Government's recognition of the tension between supply chain input and affordability had taken. Mr Clarke explained that he expected contracts to be open to UK companies to compete for cost competitively. The questioner continued that there was a question of priority and that maximising the supply chain required the Government to recognise that through the strike price. Mr Clarke agreed that there was tension and that a balance was needed.

Asked how risks of delay and resource shortage had been discussed within DECC, Mr Clarke explained that international build experience was available for reference and that risks were focused on intently by the Government. He added that a framework involving developers, supply chain, and skills providers was in place to address such risk.

A participant praised DECC's interest in developing women in nuclear. Mr Clarke affirmed the initiative and acknowledged steps in the direction of broader diversity across the industry. The participant asked what had prevented progress in nuclear thus far. Mr Clarke was unsure, but noted that there was currently considerable work underway in the area.

A participant asked what proportion of the £250 million Government investment would go towards the SMR development competition and asked what work was underway to encourage consumer acceptance. Mr Clarke said that it was too soon to state the proportion and noted the importance of consumer acceptance and public engagement.

Another participant asked whether flexible nuclear generation featured in DECC's considerations. Mr Clarke replied that it did and said that decisions would be made on information gathered from the techno-economic study. Asked for his view on the upcoming Levy Control Framework and its impact on nuclear, Mr Clarke said that announcements on the LCF would be made in due course.

Mr Murphy asked what the industry could do for the Government. Mr Clarke stated that they needed to work together, sharing criticisms and ideas, through the available channels and direct contact with DECC.

New Build Project Delivery Industry Panel

Darryl Murphy introduced the session, welcoming the three principal developers in new nuclear.

Update on Hinkley Point C

Nigel Knee, Head of Nuclear New Build Policy, EDF Energy, stated the importance of visualising their final goal, of building a power station to provide low-carbon energy. The scale of the project was enormous and would require exceptional project management and organisation to be executed. Parties were keen to begin the project, despite the scale of the challenge.

The project had begun with work around the site to ensure that the necessary infrastructure was in place for people and materials to be brought to the site. Works carried out in the local area had included significant road infrastructure optimisation, whereas onsite works had included archaeological surveying which had revealed a 9th century burial site. The discovery had generated local interest in both the project and local history.

Public opinion on new nuclear was tracked through monthly surveys, which consistently revealed a 2:1 pro-new nuclear trend. Despite this, Mr Knee affirmed the importance of continuous emphasis on why new nuclear was desirable and what contributions it could make to long term energy security. A survey of Parliamentary opinion on Hinkley Point C and other projects had revealed 3:1 overall support.

EDF had signed a SIA with CGN for Hinkley Point C, with shares of 66.5% for EDF and 33.5% for CGN. Other Heads of Terms agreements had been made on other developments.

The aim of the Hinkley Point C project was to provide low-carbon electricity to meet 7% of the UK's needs, EDF would act as the responsible designer and that the total construction cost was estimated at a nominal £18 billion. He continued that final terms had been agreed with suppliers and that the project's first operation was scheduled for 2025. Ongoing works included finalisation of long-form documentation, finalisation of EDF's financing plan, approval by boards of EDF and CGN, and clearances about the merger.

Concluding, Mr Knee stated that the project would only be successful if all involved parties were aligned in their ambition.

Delivering Wylfa Newydd

David Stearns, Business Development Director, Horizon, stated that the broader nuclear industry was on the cusp of great opportunity. The energy market was dynamic, but also faced challenges in terms of the energy mix and future consumer energy bills. Nuclear offered the opportunity to untether consumer bills from fossil and the volatility of renewables. He acknowledged the challenge of finance, but if they did their work and lowered risks then the money from investors would arrive.

The Horizon project was primarily to deliver a power station, using the framework that the UK Government had developed. The site licence application would be submitted in the current year, alongside local public consultations to gather feedback.

GDA had entered stage four and that they intended to finish the process by 2017. A noted challenge was that a significant amount of work needed to go in to that process, involving hundreds of individuals from across the world. The end design would be as close to the Japanese model as they could get, whilst remaining absolutely compliant with ONR requirements.

The organisation forecasted growth from 350 to 550 members in the following two years. Various schemes that had been put in place in order to aid that growth.

In previous conferences on nuclear Mr Stearns had been asked to talk about financing where recurring problems had arisen, such as where the money came from. There was a trade-off between cost of capital and liquidity, driven by what kinds of investors they were looking for.

Mr Stearns was pleased with where Hitachi stood. There had been significant progress across successive administrations and, despite anticipated shortcomings in Government policy, there had been great consistency in support of the nuclear industry. Financial markets were responding with interest to the nuclear industry and the infrastructure was in place. Mr Stearns was certain that all participants at the conference would be successful.

Delivering Moorside

Robert Armour, Deputy Chairman, NuGen, opened with the identification that each of the consortia differed. EDF had led the way in research; Hitachi had come with vendor and supplier skills; NuGen approached developments with a range of skills and investors to draw upon.

Planning the project's structural configuration across the 250-300 acre site had exercised his engineers over the prior year, and the completed build would produce 7% of the UK's energy requirement. Each of the various nuclear projects in development were working to similar timescales.

NuGen was part of the Northern Powerhouse, with a base in Manchester and representation in Cumbria. The first task for the project had been evaluating the site to ensure that it was fit for purpose. Cumbria had been extremely supportive in the first consultation. In the second consultation in May site mock-ups would be revealed, amongst other details.

Other AP1000 projects were ongoing around the world which they were gaining experience from. Other developments would be completed earlier and Mr Armour hoped that the lessons learned from them would help to alleviate the prominent technology risk that the industry faced.

NuGen had been recruiting in both Manchester and Cumbria. There was a contract underway looking at the groundwork for the design of the project, whilst the financial aspect was also under review. He added that nuclear power stations were notoriously unattractive buildings and that they would look in to improving appearances. In the following stage of the development they would be drilling holes in to the site to confirm the ground's capability of supporting the intended structures.

Finding a balance between gas, nuclear and renewable energy was essential in creating a secure energy supply for the future. There was a real need for new nuclear, and finance was one challenge they faced. Overcoming that challenge required work to be put in to de-risk the projects whilst creating conditions to encourage funding. Hopefully those who had considered funding Hinkley but had changed their minds could invest in other new nuclear developments.

Q&A

Mr Armour was asked what differences and changes they could expect to see in the delivery of Hinkley, based on the lessons learned from the delivery of projects in Finland. He related that the lesson learned had been to be clear about what they were capable of delivering. The issues faced with Flamanville had been around accountability and incomplete designs prior to the beginning of construction. There had been value in a test-build, which had helped raise awareness of logistical and regulatory issues.

A participant asked how the three major nuclear bodies on the panel would ensure that the relationships between people of the nuclear industry across the world were successful. Mr Armour said that prior projects had seen mixes of individuals from a wide range of nationalities in single organisations and that the challenges of language and culture barriers had been overcome. Lessons had been learned, but that was a challenge to be addressed as the organisations grew. Mr Stearns added that nuclear was an increasingly global industry, and global standardisation was one viable responses to the tension. Mr Knee felt that the answer was about people and that having a good project would attract good people. He explained that culture assimilations were difficult, but that EDF had experience of doing so.

Darryl Murphy asked if **Matt Clarke** received advice requests from other countries, on nuclear. Mr Clarke responded that he was regularly invited as a speaker to offer advice to other countries.

Asked what impact recent safety concerns from other countries had had on the UK nuclear industry, Mr Stearns said that the current nuclear framework was reliant on investors, who had to consider the risk and reward as in any other investment.

Mr Murphy commented that the global industry was tightly linked. Mr Knee replied that that the best defence against objections to development was to develop robust licensing documents and share advice and experience internationally. Mr Armour said they were in a jurisdiction of clear policy and that a lot of activity had gone in to nuclear global safety culture.

Mr Murphy asked each panel member what kept them awake at night. **Mr Knee** reported that he slept well; **Mr Stearns** was kept awake by the worry of things beyond the industry's control; Mr Clarke slept well because of the strong Government ambitions and level of activity going in to nuclear.

Session 2:

Opening Remarks

Mark Popplewell, Managing Director, Nuclear Risk Insurers, stated that in talking about the session, two risks had come to light: cyber risk in the context of nuclear; and nuclear liability risk.

Nuclear Risk Insurers formed in 1956 and currently comprised 26 members. It was the largest international nuclear pool and one of the largest nuclear insurers, involved in all stages of the nuclear process. It was part of their responsibility that they considered construction for nuclear risk, in support of the industry.

Cybersecurity challenges in the context of nuclear power: hype versus reality

Sam Kirby-French, Lead, UK Cyber Security Capability, Thales, stated that a quarter of his team worked in the nuclear sector, both onsite and doing research for DECC in Industrial Control Systems.

Asking the team about hype and cyber security would have been fruitless because of the language they would have used to explain their responses, so Mr Kirby-French had asked his mother instead what would happen if somebody hacked a nuclear power station and she had described a widely destructive post-apocalyptic scene, which had aptly characterised the unfortunate public perception around cyber and nuclear interaction.

In the past year there had been more conversation around safety rather than security, but that since then the debate had moved to focus on a tripartite of safety, security and resilience. It was important to recognise that safe systems were not necessarily secure and resilient, secure systems were not necessarily safe, and so on. However, it was important to be aware of the high profile cyber-attacks against the energy sector.

An attack required, by definition in the relevant sense, physical damage to occur, thus cyber-attacks were not necessarily attacks. It was anticipated that they would see an increasing number of cyber-attacks resulting in destruction of property and life. Mr Kirby-French referenced the Aurora experiment and highlighted a real-life instance of that kind of attack in Germany.

The nuclear industry was an attractive target and was financially unable to develop independent, isolated IT networks, which justified the hype of cyber-attacks, but perhaps not the focus. The software world was growing, with regulators and consumers demanding more. The boundaries between IT and OT were converging rapidly, but the problem was that the nuclear industry did not tend to move fast.

Mr Kirby-French felt the equation that risk was equal to probability multiplied by impact summarised the situation of cyber security in the nuclear sector. Many factors were driving dependence on technology, widespread use of technology was driving its evolution, and that that was to the advantage of both the nuclear industry and its enemies. As such, the greater interconnectivity of infrastructure, alongside consolidation of data, dramatically increased both the probability and impact of attacks.

The Red Queen hypothesis demonstrated that, with regards to cyber security risk, the industry needed to keep moving forward in order to remain where it was.

There were many challenges in the industry that were not unique to nuclear. IT people and ICS engineers were very different and communicated poorly and, although cyber had historically been an IT problem, the IT and engineering worlds were clearly converging.

There were other challenges, but Mr Kirby-French noted that best practice in cyber was not necessarily common practice in nuclear. There was a lot of positive activity in cyber security and the nuclear industry had specific constraints and nuances, but, as with the Red Queen, they had to keep moving forward.

Nuclear Risk Insurers

Mark Popplewell stated that nuclear conventions and national laws had emerged around the world to manage nuclear liabilities. The Vienna and Paris Conventions were the most significant, with the Paris convention supplemented by the Brussels Convention.

Mr Popplewell outlined the liabilities of the three tiers in the Paris/Brussels Joint Protocol. In the current year they anticipated the amendment of the Nuclear Installations Act and the subsequent ratification of the Paris Convention of 2004. Those developments would result in significant changes. Over five years the Government would extract itself from the second tier, leaving the industry financially responsible for it. Insurers had a role to play in continuing to support the nuclear industry in the first tier, whilst potentially looking to support it in a fourth tier.

With Paris 2004, the prescription period for injury to people would increase from 10 to 30 years, which had been a challenge for insurers. In response, they had investigated the possibility of DECC providing reinsurance to allow insurers to provide the 30 year cover to the industry. With regard to claims, work was ongoing to ensure that should the need arise in the future claims could be made.

Developments in nuclear risk provision: the UK in a changing global landscape

Jonathan Bellamy, Barrister, 39 Essex Chambers, stated that he would discuss future legal liabilities under the amended Nuclear Installations Act 1965. The Paris Convention 2004 Protocol was the driver for the new legal provisions, and

1 January 2017 was the likely date for the changes to take effect. However, the process by which states ratified the convention was to some extent beyond the Government's control.

The current position under the Nuclear Installations Act 1965 was that there was potential for claims for personal injury and damage to property, with a limitation extinction period of 30 years. That position would change in respect of all matters, other than personal injury. With regard to personal injury, the likely consequences of a catastrophic event included mass instances of cancer, causing death or serious injury. If any claims were to be made, they would be significant both individually and due to their likely high number. Future development of cancer due to nuclear, and subsequent claims, could raise difficult questions of attribution of responsibility. The other heads of damage had an extinction period of 10 years.

Changes in the Nuclear Installations Act implemented in the following year would apply to the new nuclear projects that had been discussed at the present event. Claimants, residents and other parties injured would be affected by the changes, as well as licensed operators. The concept of channelization applied to the liabilities between claimant and defendant as well as between jurisdictions and was in place to avoid conflicts of jurisdiction.

Suppliers, insurers, reinsurers and the Government were further parties affected by the changes. One challenge faced by insurers was underwriting nuclear risk, principally because there was currently little claims data available.

He explained that the Convention was only binding on the countries signed up to it, which meant, for example, that the principles relating to allocation of jurisdiction and channelization of liability applied as between France and the UK, but not the UK and the Republic of Ireland. However, the new Act permitted claims against UK operators by parties resident in non-convention countries with no nuclear installations of their own, such as the Republic of Ireland.

Under the new Act, a claim for 'significant impairment of the environment' could only be brought by a qualifying public authority such as the Government department with geographical responsibility for the affected area. 'Measures of reinstatement' were part of the new environmental responsibilities and liabilities. Whilst there may not be disputes over liability, Mr Bellamy anticipated strong disputes over causation and reasonable practice in terms of remediation.

Mr Bellamy said he had wanted to communicate that a lot of the Act was new and included particular heads of claim that had not existed in the past; the limits were now higher and operators would need to act to ensure that potential liabilities for which they were not at fault were recoverable by contractual rights of action.

Q&A

A participant asked if there were laws which clarified what constituted nuclear damage to property. Mr Bellamy responded that property did not have to be completely destroyed. Damages requiring repair, being beyond repair and damages amounting to destruction, were all considered as damages that could be claimed for.

A participant asked what level of insurance protection there was for nuclear risks that fell outside of the treatise, such as that of the ROI. Mr Popplewell responded that the cover provided was for the treatise under the Act and that he was unsure that his policy would respond to claims that fell outside of the UK. A further participant suggested that a person in Ireland who had suffered an injury could come to the UK and make a claim. Mr Popplewell agreed, but clarified that they could not make the claim in Ireland.

Management of UK plutonium: an update

Clive Nixon, Lead, Plutonium Disposition, NDA, outlined that DECC was the accountable nuclear decommissioning authority that the NDA worked with on the nuclear clean-up. He stated that the clean-up was tax-funded, but carried out in the most cost-effective manner possible. They had just received a spending review settlement from DECC of around £11.5 billion over five years, within which they were expected to deliver around £1 billion in efficiencies. They were also expected to deliver £2-3 billion in revenue from activities in receiving fuel from old nuclear stations.

Sellafield was about to become an NDA-wholly owned subsidiary, which would create a very different relationship between the NDA and Sellafield. Mr Nixon emphasised the importance of Sellafield and its associated risks, and noted that the transition to a subsidiary would require a lot of management and regulatory attention.

They were also currently launching Strategy Three, which would set the long-term plans for the work to be completed over the next 100 years, including transitions to NDA and refocusing of objectives. He noted that new build sites were co-located to old build sites, which offered huge opportunities and threats and required special considerations to be undertaken to ensure that sites did not negatively impact each other.

The programmes of production of reprocessed material, which were coming to an end, had generated a stockpile of around 140 tonnes of separated plutonium. The stock had been produced over several decades, which meant that some parts differed and therefore its disposal had to be treated in a sophisticated manner.

The current NDA priorities were outlined as, firstly, consolidation of stock at Sellafield in order to manage risk and security, amongst other considerations. The second priority was the development of safe and secure long-term storage, which primarily involved moving stock in to high quality, well-engineered, modern, Sellafield product and residue stores. The initiative also required a large repackaging programme. The final objective was in investigating disposition options, of which HMG's preliminary preferred policy was to reuse the majority of the stock. However, reuse could not deal with the entire stockpile, as some segments were not of a reusable standard. After consideration of various factors, the NDA had decided not to engage in an acquisition process for a MOX plant.

The NDA and DECC remained committed to looking after and progressing the disposition of the materials and explained that decisions around reuse or immobilisation had to be taken at the right time. The NDA continued to work closely with DECC and HMG on a shared work programme.

Update on the SMR programme: evaluating future pathways; and other future technology developments

Paul Littler, Technical Director, Atkins, outlined that no SMRs were deployment-ready. However, they provided financial advantages through low investment burdens, fast build times and fast revenue capabilities. They also benefited from economically favourable buildability possibilities and flexibility of location options. Further, SMRs had multiple uses, through the potential of providing both heat and energy. An additional advantage was in their smaller emergency response zones, although Mr Littler acknowledged that the truth of that aspect was contended.

The driver behind SMRs had been their mention in the Nuclear Industrial Strategy 2013, which had gathered significant interest in SMRs, particularly from the Government. The key interest from the Government was from DECC and BIS, and a credible SMR programme needed to meet the requirements set out by both of those groups.

There were various SMR activities ongoing, alongside mounting interest at recent conferences. Government support had been announced in the autumn statement, which he considered a great boost in input to the nuclear industry in general, as well as a great push in the development competition for SMRs.

The original paper by the NNL showed that there were four options. Options 1-3 were of the greatest interest to the UK, as they were best placed for regeneration of UK nuclear reactor design capability, would hopefully generate IP and result in products produced which the UK could benefit from in the global market. However, that 1-3 also faced challenges: whether they were from meeting the desired timescales, uncertain purchase and ownership models, or other issues.

Independent of which options were considered, there would be risks to deployment. The key to deployment of new technologies was the economic case: both in terms of capital build cost and the price of the energy output. Risks around the economic case included initial cost of design, taking best suited technologies in to commercial arenas and which utility model was chosen, amongst others. Further risks were present around the Government's and vendors' ability to create market conditions which encouraged investment interest.

Over the next five years, the direct requirements were centred on co-ordination and co-operation between Government, UK academia, industry and vendors. However, most important were the roles that the Government could play in the future. There was a driver for the UK to meet its nuclear strategy and the recent autumn statement had provided some comfort that the Government was willing to invest in nuclear. Mr Littler asked if the Government could go further, perhaps towards fully or partially funding an SMR solution.

There were various near-term goals for the industry. By 2050, there was expected to be a credible involvement in the design for Generation IV reactors. It was his understanding that there had been little work in the Generation IV arena thus far and he felt that development of SMRs should be used, as much as possible, to support the UK's eventual turn to the Generation IV programme.

A final request was that they did not lose sight of the Generation IV programme.

Darryl Murphy commented, on the role of Government, that it loved competition, but that if they were serious about supporting the industry then they needed to invest serious money in development. He felt that progress would only go so far, before being starved of the final capital injection needed. Mr Littler agreed. He felt that there were a lot of questions posed and hoped that some of them would be answered in the following two years, but he noted the fact that everything in the energy market was cost-driven.

Summary and Close

Chris Lambert thanked the speakers for their presentations and participants for their contributions, and closed the meeting.