APPG on Small Modular Reactors

UK SMR – the runners and riders

The meeting took place in Room M (Portcullis House) between 1pm and 2pm on Wednesday, 3rd May 2023.

Attendees:
Alastair Evans, Rolls-Royce SMR
Mike Drury, UK Atomics
Stephen Coates, X-Energy
Simon Barber, UK Managing Director, Assystem
Michael Zdanowski
Leon Flexman, X-Energy
Hugo FitzGerald, Newcleo

Virginia Crosbie MP
Heather Wheeler MP
Katherine Fletcher MP
Jill Mortimer MP
Staff member of James Wilde MP – William Falcon
Staff member for Craig Mackinlay MP - Harry Wilkinson
Lord Larry Whitty
Alan Whitehead MP

Zack Marshall, Secretariat
Daniel Paterson, Secretariat
Havard Hughes, Secretariat

The session focussed on the questions that surround the UK Government's recently announced national SMR competition and the most likely technologies to be selected.

VC opened the meeting by introducing Alastair Evans of Rolls-Royce SMR

AE: The topic was about the process. There will be two Final Investment Decisions (FIDs) in the next Parliament. There will be a selection process and market engagement process with a summer selection process.

- We think there will be 100 people in GBN.
- We think this will lead to negotiations
- What is a fleet – key question for shareholders
- What is the size of the prize. Are we talking about multiple units?
- What does co-funding mean
- What are the responsibilities? What is RR SMR being asked to do what is GBN seeking to do?

These are all things we need to know.

VC: Would like to work on written questions. Vested interested in getting nuclear on Anglesey.

APPG Secretariat: Barndoor Strategy
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HW: you are aware of the who the competitors are?

AE: selection process

VC: meeting with Grant Shapps on Wednesday – many talking about what happening with the SMR competition. In terms of British IP in terms of supply chain taken into account.

AE: this was helpful. RR majority shareholder and RR had a significant footprint in the UK. Want to utilize existing supply chain as well as building more factory facilities in the UK.

Mike Drury, UK Atomics, subsidiary Copenhagen atomics. Very different form the approaches being done by the other SMRs and AMRs. We have gone down the route of developing the physical technology. We sell products commercially.

Have data around multiple "vendors" who you might call competitors. The size of the market in the UK and worldwide was big enough to accommodate multiple technologies.

UK Atomics technology targeting £20 per MWH. Very different reactor core. It would also able to use spent fuel. Model for deployment was having multiple 40-foot iso containers with a reactor in. Deployment strategy was very different from conventional nuclear.

Looking for criticality test by 2025.

This started to bring in new nuclear into the UK.

Technology deployment ready by 2028.

Get a lot faster into deployment

Can separate heat generation from power generation so the footprint of the plant was much smaller. So, it was very possible to do this in the UK as nuclear waste processing at Trawsfynydd was also active.

Had entered into the GDA but there was a faster way of doing it using for example the innovation process.

GBN was a competition. 2012 saw the first SMR competition. Drury was part of the RR 2012 team then moved to the AMR competition. This was another chance to see how technology had moved on. Things were moving much quicker. To be able to bring out a molten salt reactor with evidenced product =- this was not there in 2012 nor in 2019 when the reviews were being done.

The Key thing for Mike Drury was that market access was not hampered or closed off to other technologies.

The last thing not get security of supply and electricity production by the time needed. Need to crack off with the work. Give access to sites and the regulator. If need a grid application or a CFD auction but give us the ability to go into that pricing.

The developer needed to commit. UK Atomics did not need funding. Because of the size of the unit and the need to deploy could do very fast modular build. 40" iso container and had already built two in Denmark.

There were things that would like to work on.

Heather Wheeler South Derbyshire. Never heard of you guys until a few months ago. Was walking around HMT.

Fascinated had reactors up and running.

Coming in at a stunningly low price. £20 a unit stunningly low.

For the first thing in the product development stage. For our first deployment it was a criticality test. This could be anywhere in the country with a site licence. 1974 legislation stated needed a site licence.

LF: X Energy already had a project in the US about to go into construction. £2billio of funding already. These AMRs could produce high temperature heat. Synthetic fuels, chemicals, heat etc.

One site on the gulf coast would see a four pack of these X-Energy reactors. Fuel manufacturing plant built in America. IPO on the NY Stock Exchange later this year.

Aspiration to follow quickly from the US.

This was a technology invented in the UK. Patented here and tested all around the world. High temperature heat had decades of demonstration across the world. Set sights on Hartlepool for the first site. Was in the national policy statement but also in the Tees Valley industrial cluster. Lots of uses of electricity and high temperature steam.

£2bn for four cluster could load follow. Think capacity for ten of these four packs in the UK.

Could be a roll to free up sites where there are industrial clusters for GBN.

One of the interesting things was that it built on unlike UK skillset. Hence discussions with EDF re Hartlepool.

SC:HT gas reactor using pebble bed technology. US, China, South Africa and Germany
The HT gas reactor had lots of knowledge and experience in EDF. Hence deploying in Hartlepool as Hartlepool had a two-year extension. So, at some point there would be a transfer of skills as EDF had this knowledge and experience at Hartlepool.

IT was pebble bed. Series of pool ball sized pebbles made of uranium oxycarbide pellets inside graphite moderator with a silicon carbide coating.

Tested to 1800 degrees – they don't melt. They fit nicely into the Hartlepool market place. **Triso X TRi-structural ISOtropic particle fuel**

Because of the offtake of high-quality steam this was perfect for the Tees Valley cluster. This could support a whole range of critical industries. High temperature steam and electricity.

This also built into the Tees Valley ambition by 2024??

Encouraged GBN to multiple technologies who were deployment ready.

Get running, moving and get some spades in the ground.

LF: mostly a developer, utilities pulled out, the developers…. Substantial role for GBN to play. However advanced reactors had lower capital costs.

Responded to the SMR technology selection process as ready to be deployed. Government support great if accelerates. If slows it down less so.

VC: Any update? Why delay?

LF: don't know why delay to F&F? Also, lots of R&D advanced funding too. Need to get activities co-ordinated in order to deliver.

AW: asked about the low power density of Triso reactors and how these could load follow.

SC: 80 mw electrical per reactor.
LF: Oldbury in the SW. Start with the easiest where get critical mass and then move to where don't need the same scale. Single units might be deployed on industrial sites.

MD: first customer not be a one-unit customer. Factory have right now can source 2. Next reactor can house 10. Ammonia production looking at 200 units.

Also, can serve places where can't have a gigawatt plant.

Stephen Coates – getting closer to the Tees Valley cluster to understand needs. Can build a four pack or a one but have the same issue – need to lease sites due to the legislation. Would need to change the policy and update and open up sites.

AE: have been taking about change. EN1 change for SMRs EN7 needs based so can deploy at Teeside. What don't want is some sort of expanded list.

MD: Back in 2015 there was a repot with 200 sites and now still have the same ones.

LF: there was still a journey to go on. The Fusion demonstrator was in non-nuclear areas. People were really up for it. Saw new developments as a pioneering endeavour. Needed to capture this endeavour.

VC: Welsh Affairs Select Committee – nuclear in Wales. Loud and clear in terms of the sites.

Looking at the NDA working with GBN. GBN had to get its brain about how to make these sites available.

Did feature in the Oliver Stone nuclear moving. On the fuel manufacturing point. Proposing to manufacture fuel here….. haven't fixed a location yet. Talking to a number of different parties.

Katherine Fletcher MP: Have been hearing about SMRs about a long time. Don't quite understand why not further faster with AMR /SMR

AE: only in the business for 2 years. The consortium bid for funding in 2016. They were trying to secure a big sum but it was 18 million. Then £250 million – you would think let's work out how to deploy.

This doesn't seem to have happened. GBN has picked up the mantle and challenge to make progress on SMRs at pace. But it was all being done late. There was no overarching strategy and planning.

Not necessary to have government investment. It was long term certainty on price which was needed.

People had done this and burned through funds (Hitachi / NuGen). What we need now isa contract that delivers certainty early in the process

KF: the idea Government an intelligent consumer etc and proof of purchase. That implied need government money to get off the ground.

MD: approach to the market to the technology was key. The problem had was that all the range was needed. There was no technology that fitted the whole of the market at the moment. AT the moment needed heat and electricity for industry and the grid respectively. There were also intermediate issues such as the need to load follow or to **deal with the intermittence of wind and solar.**

Why has it not progressed? I was in these meetings with Simon at the time it was all about large scale gigawatt. Then had a route map in 2015 for SMRs but SMRs didn't work the same as gigawatt.

Vendors now doing this work themselves.

RR had gone through the regulatory approach. Different vendors going through different processes. The regulatory approach was the standards route to market. Others were doing technology development and deploying that way.

So, there were now two different streams of development.

The big problem was that all the land was government owned. But don't have. Could get a site license but why would you apply for the site licence if you don't have the land yet?

Heather Wheeler: would national infrastructure team get involved, would that be helpful?

MD: Starts to but it depends on the size and scale. Needs to be of a scale where you deliver the economies

Larry Whitty: The short answer on the lack of development of SMRs and AMRs was the view that this was all about big reactors. The series of 3 included Bradwell before the Chinese pulled out. Would have had a long chain of very large reactors which squeezed everybody out. The whole field was designed for a series of very large reactors.

There was a discussion about how Government funding influenced the development of nuclear

LW: funding was required a guaranteed CFD

Simon Barber UK MD Assystem – supply chain – supporting delivery of SMR and other aspects of the nuclear sector. The money depended on the tech. Take GW – every single GW plant in the market today state funded. EDF, ROSATOM, China state etc. What seeing in nuclear with AMR and private fusion. Newcleo was a great place in point. Don't know how X Energy is funded but there was private investment coming in at a scale not seen before.

For Assystem the role of governed was an enabling role. The UK owned the sites and the policy for nominating new sites. One of the challenges for deploying SMRs as technology vendors as product developers. The product dev co role was quite often missed. The third one was who would operate the plant. How to get it off the drawing board on and into function.

Government had an enabling role. There was a lot of inertia in the sector being driven by completion after competition. Formation of GBN was welcome but the further competition process was not welcome. IF go back to 2016 RR being asked to jump through yet more hoops. As a supply chain firm what triggers to invest? Needed certainty on when things start and happen. IT was a bit like GW circa 2008 and 2009. When in reality 2014/15 was the time to invest.

The market wasn't there so there needed to be certainty to enable projects to move ahead. GBN had to complete its process and do so quickly with signals for the vendors. As otherwise the Key risk was that firms would go and build and deploy abroad as other market were much more inclusive and enabling.

Assystem was headquartered in France from where it supported the UK GW reactors. France would focus on EPR2. Hence resources needed to be developed in the UK to develop UK GW.

There was a real dilution of the UK's focus on too many different technologies big pull fusion, big pull defence and AUKUS. How focus to deliver value to the UK in terms of jobs and exports. The GBN process needed to complete quickly.

Virginia – How are you feeding into GBN?

Assystem attending the next supply chain session

LF: GBN doing market intelligence. Then doing the down selection. Lots of people have responded to this not with the expectation of clearing the first hurdle. GBN structuring the programme about the long term. This was really an opportunity to set out the stall.
The closing date for this was May 12th but it was not clear when GBN would report back on the next stage.

MD: GBN gave *very* short turnaround for questions, circa 34 questions with a two and half week deadline. They didn't give a lot of time.

Lord Whitty: You are expressing clearly your frustrations with a lack of signals from UK Government, are there governments around the world that do this better, if so, what can we learn from them?

[Check this should be included]

AE: Czech Republic has very clear process. It had a good regulator, good supply chain.

The US IRA was giving clarity and certainty. Compared to "maybe, maybe, maybe" approach in the UK.

LW: Can I just ask, the IRA is effectively the equivalent of a CFD, is there anything else the American's are doing?

Leon: X Energy was lucky enough to have a billionaire founder, their involvement in the space industry contributed to 10-15 years' worth of product development, so our technology is very mature. However, we have also taken money from Government, it's just that it was the U.S. government. They picked two projects to demonstrate a commercial basis, one was Terrapower, the other was us, both had $1.2bn in federal funding. That has given us the momentum, we don't have to spend that money here because we are ready to just deploy the next reactor in the UK.

Michael Drury: Similar programmes In the US, looking at early stage reactors and development. Much easier for them to invest $1bn just for hydrogen, as an example. They have a different scale to that of the UK, so UK has to have a different approach. You asked earlier, do you need the investment? No. what we want, is give us a contract for difference auction, access to planning and the regulator and we'll develop our technology. We don't need the cash, we need the security in knowledge of, if we build it can we sell the electricity, can we distribute it? It might be that the electricity is distributed by a utility company, not the reactor vendor.

SB: there were simply not enough people in defence, energy etc there was a massive skills gap which was starting to pinch. In terms of the role of government to deliver SMR was how do we bring in critical skills into the UK. Not programme managers or digital skills but critical nuclear skills and knowledge such as design and engineering operation and maintenance. Something had to be done in this space to enable global mobility.

Haven't commissioned a civil plant in the UK for 30 years. So, the skills didn't exist in the UK. However, they do exist overseas. At the Olkiluoto Nuclear Power Plant and Flamanville. Needed to think about international ability.

Leon: Energy issue transferring technology into the UK. There was a huge supply problem. Historically, there had been a demand problem. The UK government needed to hold its nerve and stick with its commitments. The only way to turn this into a genuine programme is to invest.

What can Heather, Katherine and Virginia do

What to support the industry – have the suggestions what can do:

AE: RR SMR want challenge to the arguments they are making. Nuclear industry often sits in an echo chamber. Really helpful to have holes picked in our arguments or highlight where we are not being clear. The fact that not explaining case not clearly enough pretty obvious. Industry not explaining well enough.

VC: Next time we are in from of Andrew Bowie, or Graham Stuart, or Grant Shapps, what do you want us to bring to them?

SB: Enable international mobility of critical skills, it's biting now.

MD: near term – site for a criticality test – will pay for and fund and crack on.

Bigger picture, Access to sites and regulatory access to get through the process. Not necessarily the GDA, better to have a faster route or CFD auctions. UK Atomics needed to use UF4 so given previous experience with this material would buy it from the UK. The UK needed lots of steel and UK Atomics could decarbonise the steel production too.

LF: agree and disagree – what we don't' want is to go into a bunker about re-doing the siting policy. Need to grip this quickly. X-Energy – if had a site available i.e., Hartlepool. Also need access to the regulator, that could be a great bottle neck.

SC: ONR a pinch point
From the regulatory perspective would like to see consistency. When deploying a 4 pack or 12 pack at Hartlepool – want to keep the same from US and UK without regulatory modifications.

HW: Are we gold-plating regulations?

SC: the UK authorities anglicise them

Michael Zdanowski: More flexibility in Government thinking, especially around the financing model. We have touched on it, but not simply putting all our eggs in one basket through this SMR competition. CFD model is very useful.

Hugo FitzGerald, Newcleo: Competition was not a panacea and the Government should be moving to investment in AMRs and creating a level playing field. TO do that, there is a need for a timeline so that investors come onboard – for that to be achieved, Treasury and No. 10 needs to be involved. Think back to last few years, we have seen tinkering for short term gains but there has been a lack of long-term thinking, Need for an enabling environment, allowing investors to come in so that we can get on with it. Key to that is siting, as discussed.

VC: New Energy and Net Zero Select Committee, are you feeding into this? They will be sitting down to work out what reports they are going to be writing and we want to ensure that SMR/AMR is on their agenda.

LW: We have the Energy Bill going through the House with Andrew Bowie batting for the government on it. There was not much in that Bill which addressed these sorts of things. Government should be doing path clearing. There was an opportunity to put material in that Bill. There was a lot about nuclear but not much about this specifically.

Secondly, CFDs – (the IRA had things that looked like them) were crucial and clear at what stage a DFC would be determined. At the moment a CFD came at the end of the process not at the beginning. Also, want to get the strike price correct. Particularly, we don't want a repeat of the Hinkley Strike Price.

MD: On strike price, this is why we are thinking of the wind auction model. All technologies could be included in such a pool, doesn't just have to be nuclear.

Meeting closed at 14:10