

Small Nuclear Reactors – The Future

Notes arising from the expert review organised on the 23rd of November 2017 by the Windsor Energy Group (WEG). The meeting was chaired by Lord Howell, chairman of WEG.

Speakers included:

- **Mr. David Orr (Senior Vice President)**, Rolls-Royce
- **Dr. David Powell (Vice President)**, GE Hitachi Nuclear Energy
- **Baroness Neville-Rolfe DBE CMG**, Former Commercial Secretary in the UK Treasury and Minister for energy and Intellectual Property
- **Dr. Paul Dorfman**, The UCL Energy Institute
- **Ms. Maxine Symington (Director)**, Gowling WLG
- **Mr. Biplab Rakshi (Managing Director)**: Atomic Acquisitions

Points arising:

- Why small modular reactors (SMR)? Pressing need for low-carbon electricity; Easiest sector to decarbonise through modern implementation of proven nuclear capability and technology.
- Nuclear was responsible for producing more than 20% of the UK's electricity. Much is produced in reactors whose life will be over by the early 2030s.
- Potential problems in new large scale nuclear stations indicate that there is an opening for SMRs - the Royal Navy has been using SMRs successfully for decades.
- A modular approach offers opportunity to scale up and control costs by standardised production.
- SMR developers need UK government backing if they are to meet domestic needs and be competitive in international energy markets.

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- This requires a UK industrial policy that supports IP, advanced manufacturing and long term high value jobs in the UK;
 - A Generic Design Assessment (**GDA**) slot – licensing;
 - A suitable site to develop a First of a kind (**FOAK**);
 - A policy supporting a UK electricity market of at least **7 GWe** for SMRs;
 - Deferral of decommissioning costs on existing NDA licensed sites;
 - Export opportunity for UK technology (IP) and supply chain;
 - Major UK R&D and manufacturing GVA £70Bn over the lifetime, highly skilled long term jobs; UK self-reliance for critical energy infrastructure;
 - Sustainment of UK defence nuclear skills and supply chain.
- Rolls-Royce has offered to match development funding costs.
- GE/Hitachi's PRISM reactor would be fuelled by the UK's plutonium stockpile. PRISM is an advanced generation IV SMR which uses sodium as coolant and is based on technology proven through operation of an experimental reactor which operated for over 30 years in the US. PRISM can generate from 150MW to 300MW.
- The consortium is ready to pursue near-term licensing of the VSBWR and deployment by 2030 utilizing existing design and licensing; and provide an opportunity for US and UK to cooperate and bring a cost-competitive SMR to a global market.
- Large nuclear reactors offer *economies of scale while* SMRs will be more expensive than large reactors per kW – which is a key parameter.
- Significant up-front investment is needed for an entire SMR supply chain to produce scores of reactors needed to compete with large-scale economies of scale.
- Tooling up for modular reactors is expensive and the investment risk will be even bigger than for planned large Gen 3 reactors.
- The Government of Canada supports the development of SMRs, as a clean and reliable power for remote communities.

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- In addition to more than 250 remote communities, Canada is heavily involved in the energy-intensive extractive industries.
- Canadian Nuclear Laboratories (CNL) has received a funding commitment of \$1.2 billion over the next ten years to support a range of projects to make Canada an SMR Technology Global Leader.
- CNL is discussing with seven partners with a view to having an SMR on site by 2026
- Initial site selection and licensing process to begin late 2017/early 2018
- A challenge ahead: Aboriginal consultation required for new nuclear projects;
- The world is moving towards distributed generation. SMR have inherent system benefits (could be in excess of 20%) over centralised generation as there no need to invest in new grid infrastructure. SMR also offer lower capital outlay and the biggest benefit for SMR's is due to lower financing costs during construction.

Questions arising:

- Is the technology choice correct or should Britain go for more long term, innovative solutions like salt water SMRs which might also develop UK intellectual property?
- How to ensure a security and waste disposal system a number fo smaller reactors that wins public support?
- How to ensure that wherever SMRs are built that job, skills and value added make a significant contribution to the Industrial strategy?
- How to ensure continued cross party support – and Treasury acceptance - for investment in a long-term term industry?

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If you would to contribute to the on-going review of new energy developments and would like more information then please contact the WEG Secretariat on info@meconsult.co.uk .