



Funding and Economic Aspects of a New Nuclear Power Programme

Potential Financing Models for Small Nuclear Reactors (“SMRs”)

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Introduction

- Amjad has more than 25 years of banking and development finance experience in the power sector. He is currently affiliated with the Nuclear Energy Consulting Group (“NECG”) based in London - www.nuclear-economics.com;
- Between January and July 2018, Amjad served as part of the Expert Finance Working Group (“EFWG”) created to independently advise UK Government on framework for attracting private sector financing for small nuclear projects and technologies;
- EFWG concluded that UK could be well placed to develop First-of-a-Kind (“FOAK”) small reactor projects with overnight costs of less than GBP 2.5 billion by 2030. “Market Framework for Financing Small Nuclear,” a report to HMG by the EFWG, was published on August 7, 2018 (www.uk.gov);
- Small Modular Reactor (“SMR”) technologies and projects:
 - Vary in size from micro projects (4MW) to 600MW with costs ranging between GBP 100mn to GBP 2.0bn;
 - Benefit from smaller scale, on smaller sites with shorter time to delivery...lower capital cost;
 - Have operational flexibility to deliver base-load or on-demand clean energy - all attributes which help de-risk projects to attract financing; and,
 - Can deliver LCOE between GBP 40MwH and GBP 80MwH for NOAK projects.
- What are some of the potential financial models recommended by EFWG?

Potential Financing Models for SMRs



The variety of SMR technologies does not give rise to a “one-size-fits-all” financing model or structure. In addition, the reluctance of the private sector to finance FOAK risk necessitates a strong Government role to motivate / catalyze financing for SMRs;

With this very realistic backdrop, EFWG examined nine (9), financing models / structures employed in the financing of large scale energy and infrastructure projects and “tested” them against a set of the dozen criteria listed below, including State Aid:

Impact on HMG balance sheet	Risk Allocation
Impact on Policy	Revenue risk
Ability to attract equity / debt (2)	Applicability to small nuclear
Impact on cost to consumers / taxpayers (2)	Maximum gearing
Ease of setting up	WACC

Of the 9 potential financial models / structures examined, four were derivations off a Project Finance approach (reliance on cash flow for repayment of equity/debt), while others were models / structures previously employed to finance nuclear on a global basis;

EFWG concluded that four potential models/structures could be adapted for financing small nuclear in the UK. On the next pages, we will review three of the most promising of these models.

PF base w/Cfd / PPA with HMG as Investor



<u>Criteria</u>	<u>Impact</u>	<u>Criteria</u>	<u>Impact</u>
Impact on HMG balance sheet	High	Risk Allocation	Positive – more genuine partnership between public and private sectors
Impact on Policy	Low if Cfd / High if PPA – legislation requirement	Revenue risk	Low
Ability to attract equity	High – will provide confidence to co-investors	Applicability to small nuclear	Medium – HMG role positive for FOAK Low to Medium NOAK
Ability to attract debt	High – will help rating and confidence to lenders	Maximum gearing	FOAK 50/50 NOAK 60/40
Impact on cost to consumers	Low - CfD well established	WACC	Medium – subject to HMG return requirements
Impact on cost to taxpayers	Low – reduces overall cost of project	State Aid	High – State Aid challenge likely
Ability to set up	High – markets well versed		

Comments:

- HMG as equity investor strengthens transaction in eyes of co-investors, lenders and other project participants
- High impact on balance sheet but will catalyze private sector finance
- Very helpful for FOAK projects

PF Based with CfD/PPA and HMG Guarantee



<u>Criteria</u>	<u>Impact</u>	<u>Criteria</u>	<u>Impact</u>
Impact on HMG balance sheet	Very High – depending on depth of guarantee provided	Risk Allocation	Medium – subject to construction risk
Impact on Policy	Low if CfD / High if PPA legislation requirement	Revenue risk	Low – lower long term price risk
Ability to attract equity	Medium – helps rating structure and availability of finance	Applicability to small nuclear	Low – FOAK Medium to High - NOAK
Ability to attract debt	High – increases availability of finance across classes of debt	Maximum gearing	FOAK 60/40 NOAK 70/30
Impact on cost to consumers	Low - CfD well established	WACC	High – lower financing costs
Impact on cost to taxpayers	Low – reduces overall cost of project	State Aid	High – State Aid challenge likely
Ability to set up	High – markets well versed		

Comments:

- Very helpful to attract debt; 100% coverage of bonds and 80% coverage of debt
- Very high balance sheet impact – subject to depth and amount of guarantee provided
- Positive WACC impact due to lower financing costs on larger quantum of debt

Regulated Asset Base Model (“RAB”)



<u>Criteria</u>	<u>Impact</u>	<u>Criteria</u>	<u>Impact</u>
Impact on HMG balance sheet	Low to Medium – depending on level of top-up payment and CfD risk structure	Risk Allocation	Medium – careful structuring of decommissioning risk
Impact on Policy	High – need to create new regulatory regime	Revenue risk	Low – transparency in price calculation
Ability to attract equity	High – easier to raise equity and easier to secure rating	Applicability to small nuclear	High – for both FOAK And NOAK
Ability to attract debt	High – debt would be raised with lower cost of capital	Maximum gearing	FOAK 70/30 NOAK 80/20
Impact on cost to consumers	High – will bear the costs not established on market basis	WACC	High – low rate of return
Impact on cost to taxpayers	Low to No Impact	State Aid	High – State Aid approval required if straightforward
Ability to set up	Medium – Have TTT example with permutations for nuclear		

COMMENTS:

- Growing debate that RAB model is best suited for small and large nuclear
- Existence of precedent (TTT Project) allows for adjustments for nuclear to achieve success
- Strong rating potential will attract different classes of investors / financiers – competitive tension

Conclusions and Recommendations

- SMRs offer many advantages over nuclear megaprojects based on smaller size, modularity, shorter time to delivery all serving to de-risk projects and lower costs;
- Establish transparent regulatory framework that addresses nuclear liability issues
- Assess use of HMG balance sheet to catalyze financing at each stage of small nuclear project lifecycle;
 - Design risk – support in return for IP rights
 - Manufacturing risk – create/incentivize supply-chain dynamic for job creation and skills development
 - Development – mitigate construction risk
 - Operations – accept responsibility for regulatory risk
 - Financing – participate as investor or guarantor or through RAB model all of which will attract private sector financing
- Create a baseline financing support structure that clearly addresses allocation, mitigation and management of associated that can be fine-tuned for project and technology specificity.
- Support for SMR development is growing evidenced by Dominion Energy's to provide funding for GEH BWRX 300 reactor and US DOE's US\$ 40mn funding for NuScale Power's SMR.

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