

Financing arrangements and industrial organisation for new nuclear build in electricity markets

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Under the former regulated utility regime and regulatory arrangements, many of the risks associated with power plant construction costs, operating performance, fuel price changes, and other factors were borne by consumers rather than investors. The current context for new nuclear build in power markets is significantly different with producers bearing much of the risks unless some are transferred onto other stakeholders through long term contracts and/or innovative financing arrangements. A potential nuclear power renaissance in liberalised markets will face a number of hurdles associated with the specificities of the technology and the legacy of past experiences. Nuclear power suffers indeed from some specific risks: i) the regulatory risk associated with the instability of safety regulations and design licensing; ii) the policy risk where electoral cycles could undermine the commitment to nuclear power and the development of nuclear waste disposal facilities; and iii) the construction and operation risks associated with the necessary re-learning of the technology. Besides, the large size of a nuclear project and the capital intensity of the technology make it relatively more sensitive to some critical market risks such as the electricity price and volume risks.

The paper analyses four case studies to illustrate the range of alternative consistent combinations of contractual and financial arrangements for new nuclear build. The suitability of the different alternatives largely depends on the industrial organization of the electricity industry and the institutional environment which are specific to one country's nuclear policy. We study the contractual and financing choices for new nuclear build in four typical market cases:

- The decentralised Texas market, wherein the NRG Energy South Texas merchant project of constructing two General Electric-Toshiba ABWRs is based on a project finance approach. The critical factors enabling such financing structure are the federal loan guarantees,



federal tax credits, and long term fixed price contracts with credible counterparts (historic suppliers and unregulated large municipalities);

- The Nordic market, wherein the Finnish TVO project to build an EPR uses an hybrid financing approach. The project relies on two special arrangements: a turnkey contract by which the constructor bears a large part of the construction and performance risks, and the financing by a consumers' consortium whose members will in return pay electricity at cost-price over the life of the plant;
- The imperfectly reformed French market, wherein the project of the Flamanville EPR is managed and lead by the large size and vertically integrated historical incumbent, EDF using a corporate financing approach. With its expertise of nuclear build and operation, its portfolio of existing assets and its large base of 'sticky' consumers, and its strong balance sheet, EDF is in a good position to manage or transfer the different risks associated with the construction of the new EPR reactor;
- Finally, the case of oligopolistic markets of mid-size vertical companies (such as the British market) or of small markets dominated by incumbent companies in Central and Eastern Europe. Candidates to nuclear build and their potential lenders in such markets would likely seek to share costs and risks by e.g. investing in a producers consortium, and would search to have some market risks (such as the CO2 price risk) transferred onto the state.

The four case studies highlight that there remain many critical factors specific to each country's industrial and regulatory environment, such that the reproducibility of some current innovative approaches can be questioned (e.g. the consortium of industrial users and the turnkey contract in Finland, or the "merchant" project in Texas backed by federal loan guarantees). There is no optimal "once-for-all" contractual and financing arrangement for investing in nuclear in liberalised markets. The decisive factor in the success of nuclear investment will be the ability of the power industry to engage with regulatory and safety authorities, plant vendors and construction companies, and consumers to mitigate political and regulatory risks on one hand-side and to allocate risks onto parties which are best able to manage them on the other side. By shifting part of the pre-construction, construction, operating, and market risks onto other parties, electricity producers are in a better position to attract potential investors. Plant vendors and the different equipment contractor companies play a key role during the construction phase, while long term power offtake contracts with large consumers or with creditworthy suppliers with a stable retail consumer base can greatly contribute to the success of a nuclear plant project.

The allocation of the different construction, operating and market risks in turn influences the selection of the financial arrangements among different options. While in the past regulated utilities financed their

investments using corporate financing with recourse debt and bonds, a wide range of options ranging from project finance with non-recourse debt and with high gearing to corporate and hybrid financing approaches are now available to investors. During the initial phase of nuclear “re-learning”, the range of viable contractual and financing arrangements appears quite limited. In the perspective of project financing of new nuclear plants, loan guarantees by government and power purchase agreements at fixed price for almost all the off-take power will likely be required. Turnkey contract for the FoAK reactors could also provide a guarantee during the construction phase, followed by refinancing for the plant operation phase. At least during this first phase of nuclear “re-learning”, banks and lenders are therefore likely to favour corporate financing or some form of hybrid arrangement backed by the balance sheet of one or a consortium of large vertically integrated companies.

This implies that countries where electricity reform has been partial and which have preserved industrial champions could be the most favourable ground for new nuclear investment. The irony is that competition authorities have been worried about industry concentration in the energy sector while it might have the positive side effect of creating companies of the size required to manage specific risks and finance the large and capital intensive carbon-free technologies needed. This observation does not exclude nuclear development in countries with a more fragmented industry, but more original models for risk pooling and/or risk transfer are likely to emerge in such countries, such as consortium of consumers and suppliers with long term arrangements to lower the cost of capital and increase leverage as in the Finnish EPR project. But it is not so sure that development of these arrangements in the same market will remain indefinitely compatible with competition policy principles. Nuclear build in liberalised markets is going to bring some new light on some critical issues associated with the maturing of European electricity markets.

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