Nuclear Capacity Auctions

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Executive Summary

The global fleet of nuclear power plants is ageing. Many plants will retire between 2035 and 2050. With the long lead times in planning and construction, how to replace generation is a problem that countries with older nuclear power plants, like France, the UK and the US, need to address in the near future.

The Fukushima meltdowns following a massive earthquake and tsunami brought renewed attention to the complexity and dangers of operating nuclear power plants. The profitability of investing in nuclear plants has decreased, not least owing to the decline in wholesale electricity prices resulting from renewable electricity support schemes. These developments have caused observers to doubt the political and economic viability of new nuclear power and trigger two fundamental policy questions: How much new nuclear power should there be from a welfare point of view? How will investments, if socially desirable, come about?

In a liberalized electricity market, investment decisions are delegated to the market participants who will invest in nuclear capacity if and only if doing so is privately profitable. Market external effects are best corrected by an appropriate menu of taxes and subsidies. However, it is unlikely that investment decisions would be optimal even if the owners could be impelled to internalize the full social cost of nuclear power. Because of their size, every new reactor would reduce market prices and decrease the profitability of installed capacity. Market concentration implies that nuclear owners are likely to take the surplus reduction on existing generation into account in their investment decision. Exercise of such long-run market power would lead to nuclear underinvestment.

This paper proposes nuclear capacity auctions as a means to correcting investment incentives. In a nuclear capacity auction, a government agency auctions off a license to build and operate a nuclear reactor. The winner commits to constructing and operating the reactor according to specifications. The auction mitigates long-run market power compared to a situation in which nuclear investment is delegated to incumbents by introducing competition in the investment stage. Thereby the license may be allocated to a more efficient bidder - either in terms of lower investment costs or because the bidder expects to be able to produce more efficiently than its competitors. The bids also reveal information about the economic viability of nuclear power. In particular, the license remains unsold and no new nuclear power is built if bids are too low.

The analysis generates a number of guidelines for the design of nuclear capacity auctions: Efficiency is higher when the set of bidders is larger because of intensified bidding competition. An auction is more likely to produce an efficient result if the energy intensive industry participates in bidding consortia as a larger share of the consumer surplus then would be internalized. Requiring the licensees to sell a significant share of their capacity as virtual power plant contracts increases auction efficiency by weakening the incumbent producers' incentive to bid for short-term market power.