UTILITY VS. IPP PROJECT FINANCING IN EAST ASIA—AN ECONOMIC COMPARISON

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ABSTRACT

In this paper we review recent studies conducted by Bechtel regarding the relative economics of nuclear and fossil-fired power plants in East Asia, when such projects are utility-financed or built by Independent Power Producers (IPPs). Both financing models need to be evaluated as the financing requirements for the energy and infrastructure proposed in East Asia become very large. Conventional utility and governmental funding, with export credit agencies' (ECAs) participation, may not suffice for all needs, and additional private sector funding will prove essential. This assertion has been reinforced by recent financial events in East Asia, the response to which may point the way to facilitating private investor participation in various infrastructure projects once growth in the affected countries is resumed.

In an earlier study we compared the economics of 600 MWe class advanced light water reactors (ALWR), gas-fired combined cycle plants and coal-fired plants, each plant built under utility or IPP type financing arrangements. The comparison centers on three elements of overall competitiveness: generation costs, hard currency requirements, and employment requirements. Each of these aspects is considered from a front end (construction period) perspective, as well as from a total lifetime perspective. Year-by-year generation cost history over plant lifetimes are shown in some cases.

It was found in that study that utility-financed ALWRs are broadly competitive with IPP-financed gas-fired combined cycle plants or coal-fired plants. Front end hard currency requirements of an ALWR are 2.5 times higher than for a combined cycle plant. However, on a lifetime basis, ALWR net hard currency requirements are two times lower than for a combined cycle plant. This result is based on the assumption that the East Asian country can sell its domestic natural gas supply, displaced from local generation by the nuclear plant, on the world markets as LNG. The hard currency obtained from LNG sales could be considered as a credit against the total ALWR hard currency requirements. A similar result is obtained for an East Asian country not endowed with domestic natural gas, and having to import oil or LNG fuel supplies at world market prices over the lifetime of the combined cycle plant. The results are sensitive to the ALWR capital cost assumptions. Pricing considerations for domestically produced fossil fuels also affect these observations. If local fossil fuels are purchased in-country at low (subsidized) prices for domestic generation then the ALWR advantage is that much lower. The effects of domestic vs. world price of fossil fuels on relative nuclear competitiveness are reviewed in this nuclear/fossil competitiveness analysis. Employment requirements in an ALWR, during both the construction period and lifetime operation, exceed the requirements for oil or gas fired plants by a factor of five. While contributing to overall plant cost, employment requirements can also be viewed as an opportunity to increase national employment and improve the technical qualification of the work force. These and other issues are discussed.

In a separate study we considered in greater detail the economics of a first-of-a-kind 900 MWe class nuclear power plant built either as a utility project or as an IPP under a Build, Own, Operate (BOO) arrangement. The conventional utility-financed model assumes financing provided by external ECAs and the host country government for the plant's foreign content, and by the host country government and commercial banks for the local content. It is understood that the host government is unconditionally committed to repay all project loans. Under the IPP model a project company is created to build, own and operate the plant. All loans to the project company are secured by the project's cashflow only, and lenders' recourse to the project's owners is limited to the owner's equity in the project. A major consideration in a nuclear IPP project is reducing the nuclear-specific risks to the project owners to the same level of risk accepted in fossil IPP projects. To that end it is assumed that the host government will carry nuclear-specific risks and their related costs. Nuclear-specific risks include the regulatory, licensing and permitting changes and delay risks, operating risks related to the possibility of protracted shutdowns for equipment and materials modifications, decomissioning risks and nuclear accident liability risks. The nuclear IPP project owners will, however, carry the additional nuclear premium component to the lending rate and equity return rates assigned to such projects. It is generally expected that a nuclear premium of 1-3% for debt and 5-10% for equity are assessed on IPP financing rates, above and beyond debt and equity rates applicable to fossil IPP projects, due to the higher overall risk expectations in nuclear projects.

Given the numerical data derived from the above-listed assumptions, it was found that the total generation costs of a first-of-a-kind nuclear IPP are slightly higher than the generation costs of a conventional utility-funded nuclear plant. While fuel, operating and maintenance and decommissioning costs for the two nuclear financing models are about similar, the higher capital recovery charges and taxes computed for the nuclear IPP make this option more expensive for first-of-a-kind nuclear projects. Capital recovery charges are, in fact, more than twice as high for the nuclear IPP than for the conventional funding option. These high charges are dominated by the return on equity requirements. Even though equity share of the nuclear IPP investment is only 25%, the high return rate required by the investors significantly increases the overall capital recovery charges.

Such results indicate that first-of-a-kind IPP projects, particularly yet-untried nuclear projects, may require a cost premium due to higher perceived risks by lenders and investors. In order to reduce such cost premiums the host government may want to clarify the rules related to investing in such projects, and explicitly define the project risks the government is willing to assume, in order to reduce the presumed incremental nuclear risks. If a part of the project structure involves government-to-government contracting, this will tend to reduce the overall project risk. If pollutant emission charges are applied to fossil-fired IPP projects, then nuclear IPPs become relatively more cost-competitive. Finally, the choice of well-experienced and reputable contractors who can assume and succeed in carrying out lump sum turnkey jobs will be essential to the ultimate technical and financial success of the project.