

STRUCTURING AND FINANCING ADVANCED, CLEAN POWER GENERATION PROJECTS IN TODAY'S COMPLEX INTERNATIONAL MARKET PLACE¹

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International power projects, particularly independent power projects (IPPs), are highly dependent on availability of financing. In addition, the power projects utilizing advanced, clean technologies must mitigate the perceived or real risks associated with the technology due to the lack of long term operating data before they can obtain financing. In today's market, financiers and insurers insist that the risks be mitigated at the source and not by an incremental increase in the owners' equity or by imposing higher lending margins. This paper first addresses an approach for mitigating advanced power generation project technological risks by building into the project structure a "technology support package." Then, the potential financing sources particularly those favoring clean power generation are discussed.

INTRODUCTION

Advance power generation technologies such as those developed under the U. S. Clean Coal Technology (CCT) program offer several advantages over existing conventional coal power generation technologies. These advantages include:

- Higher plant efficiency,
- Fuel flexibility,
- Improved environmental performance,
- Continued utilization of plentiful indigenous resources.

However, proposed projects utilizing advance technologies such as integrated advance combined cycle (IGCC) continue to face difficulties in attracting financing. The main reasons are:

- Higher financial outlay requirements compared to conventional technologies,
- Lack of long-term performance data with different fuels,
- Lack of extensive experience in constructing, operating and maintaining advanced coal-fired power generation projects.

These issues along with other project finance fundamentals must be carefully considered, project risks must be identified, risk mitigation strategies developed and integrated into the project structure before advanced power generation projects can achieve financial close.

In general two different financing methods: "on balance sheet" or "project finance" - - a form of "off balance sheet" financing can be used to finance advanced power generation projects. On balance sheet financing means that whatever loans or credit raised for the project will be a direct

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liability/obligation of the owner and will show on the project owner's balance sheets. If the project performs poorly, or fails, the lenders can claim against other assets of the owner in the event of default on payment. In other words, owners take all or most of the project technical, financial, market and political risks. Historically, regulated and state-owned utilities have relied on this type of financing. However, in today's market, because of limited public funds and competing priorities, new power projects are more likely to be financed using "off balance sheet" financing.

In "project finance" (which may be "non-recourse" or "limited recourse"), lenders rely on the cash flows generated by the project for the repayment of the loan and only project assets and contracts are pledged as collateral for the loan. Using non-recourse project financing, lenders may not look to cash or assets outside of the project as additional collateral for the loan. In limited recourse project financing, some pre-determined amount of specific assets or cash is pledged as collateral for the project.

In project finance, careful attention is given by the lenders to structuring the project so that project risks are quantified, not taken by lenders, and are shared properly among various parties. The sources of technical, financial, market, political and other risks are identified and allocated to the party or parties best suited and capable of reducing or mitigating them.

Both types of financing will continue to be used for new projects due to the magnitude of investment required for new power generation. Utilization of project financing for advanced technology projects will permit the successful development of major projects in the near term.

Implementing clean coal power generation technology projects supports local and regional economic development in the coal producing countries due continued industrial activities in the indigence coal mining and other related industries. It also improves the quality of human life by improving the quality of our environment and reducing the environmental health impacts locally, nationally and internationally. Because of these social and economic benefits, the coal producing countries as well as international community should be expected to share some of the risks associated with the deployment of advanced coal power generation technologies with sponsors of those projects.

PROJECT STRUCTURE

Figure 1 presents a typical project structure for a conventional coal-fired IPP project. The legal and contractual requirements must be satisfied and contracts must be harmonized before financial closing and disbursement of loan funds. In addition to ownership agreement, other requirements generally include:

- Firm long-term Power Purchase Agreement (PPA) or Energy Conversion Agreement (ECA)
- Long-term Fuel Supply Agreement (FSA)
- Date certain fixed-price, turnkey EPC contract
- Guarantees, warranties or bonds for project completion and performance.
- O&M Agreement
- Concession or Implementation Agreement
- Assigning of all contracts and insurance policies to the bank.

It should be noted that some new IPP projects are being developed as "merchant" plants -- without a long-term PPA. In these cases, other means of assuring project viability are necessary.

These requirements are designed to manage many types of risks involved in a power generation project. These risks are:

- Non-completion, late completion and construction cost overrun risks.
- Sponsor or project developers risks;
- Economic risks;
- Fuel supply risks;
- Sales/off-take risks;
- Technology risks;
- Operating risks;
- Environmental risks;
- Country risks;
- Political risks;
- Foreign exchange risks;
- Inflation risks;
- Force Majeure risks.

Structuring and financing an advanced technology power generation project is similar to any other power project except lenders perceive these projects to have higher technical, operating, construction and economic risks compared to conventional technology projects. Innovative approaches must be used to address these risks. These approaches must be tailored for different technological risks. For example several ways to address these risks are:

- Technical Support Package
- Financial Support Package
- Insurance Support Package
- Combination of the above

Technology support package

A Project Company may require and negotiate a technology support package with various parties involved and incorporate the provision of any such support package in the turnkey construction contract, operation and maintenance agreement, waste management agreement and other contractual agreements (Figure 2). Should the technology support package not mitigate new technology risks, lenders will require additional equity (more than 20 to 30%) which could make the project unfeasible from the project sponsors' view point. In addition, it should be noted that lenders' preference is to address new technology risks at their source (i.e., technology supplier) rather than asking project sponsors to support a new coal power generation technology through additional equity. Based on K&M's experience, the package may include:

- An On-Site Spare Parts Package -- This package may include specific spare parts for the new technology portion of the plant as well as spare parts for equipment that may be damaged should the new technology fail or malfunction. The total cost of all spare parts required to be stocked by the project should be competitive with costs for a project utilizing a conventional technology. In other words, the technology supplier(s); equipment vendor(s); and EPC contractor(s) are asked to bear the risks of additional costs of the spare parts package above and beyond that required for the conventional technology.
- An Extended EPC contract Forced Outage Warranty Provision - - The EPC contractor may provide a forced outage warranty which remains in force for an extended time period with regard to the new technology portion of the plant. In addition, the forced outage warranty may include an "evergreen" provision, which would extend the period of

the new technology portion of the plant. Furthermore, the new technology supplier, new equipment vendor(s), and/or EPC contractor(s) may be obligated to remedy any latent defects and improperly designed or fabricated components.

- Business Interruption Provision with Respect to New Technology – The technology supplier may bear the financial risk of any revenue loss or any additional costs resulting from delay in commercial operation, reduced availability or performance attributable to the new technology including the incremental cost of obtaining such insurance. For example, revenue losses could include foregone revenues from sale of power and additional costs could include fees associated with fuel inventory carrying costs or costs of failure to purchase specified amounts stipulated in fuel purchase agreement as well as any maintenance and repair costs.
- Long-term Major Maintenance and Overhaul Agreement with Technology Supplier – Such an agreement could cover long-term major maintenance and overhaul of new technology as well as on-going technical support. Costs for such support above and over that for a similar service involving a conventional technology could be borne by the technology supplier. This provision would:
 - Minimize the risk of technology supplier escaping warranty liability by alleging improper maintenance and repair. The agreement should detail the means of allocating responsibility for poor plant performance.
 - Have designated experts by new technology supplier on site during major maintenance and overhauls to ensure work is performed properly and expeditiously.
 - Protect the Project Company against the risk of invalidation of insurance coverage.

Financial support package

As noted earlier, deployment of advanced coal power generation technologies contribute to local and national economic development of coal producing countries by supporting continued or increased industrial activities in coal mining and related industries. It also contributes to improving environmental quality and human life locally and worldwide. Therefore, it is justifiable for the Project Sponsors, technology suppliers, equipment vendors, and EPC contractors to seek financial support individually or collectively from cognizant local, regional, national and international agencies or financial institutions in order to minimize their financial exposure. This financial support could be provided as grants, long-term/low-interest loans, investment tax credits, tax holidays, lower import tariffs, etc., depending on the source and project development stage. Packages including some of the financial components mentioned above are provided or are being considered by national and local governments in support of certain advanced technologies. Multilateral financial institutions also provide support for certain technologies reducing environmental pollution. Sources of funding are discussed later.

Insurance support package

A necessity for project financing is Business Interruption Insurance. Business Interruption Insurance covers loss of revenues and additional costs, which may incur as a consequence of stoppage of normal business operation. The cost of obtaining and providing such insurance could be prohibitive for an advanced technology. However, a technology or project-specific insurance

be prohibitive for an advanced technology. However, a technology or project-specific insurance or risk fund that would be available to the Project for a limited period during start-up and initial commercial operations if properly structured could serve as the basis for a reasonable business interruption insurance program. This fund only could be used to offset costs for repair, modification and replacement of equipment and for certain business interruption losses due to the new technology failure in meeting performance specification. These funds will only be used after customary and commercially available warranties and insurance are exhausted. They would not cover the cost of any equipment repair, modification or replacement required (1) as a part of normal or major maintenance procedures, (2) due to any failure caused by faults in equipment fabrication, manufacturing and/or other parties responsible for mechanical design, engineering and/or construction contract agreements.

Off course, various elements of the technical, financial, insurance support packages can also be combined, as needed, to mitigate advance power technology project risks.

FINANCING SOURCES

Structuring a project-finance package entails identifying project risks, developing risk mitigation strategies, and establishing how much of the required funding for the project should be provided as equity. Project sponsors would like to minimize equity outlay while lenders would like to minimize their risks by maximum equity without causing the project sponsors to take undue risks. When a new or advanced technology is involved resources may include equity, debt, and grants. The project is also most likely to be a joint venture between private and public sector corporations.

Sources of funds play a key role in project structuring and are a major consideration. Financing sources should be carefully matched with supply, materials, and services and the impact of other factors such as local participation, and trade imbalances between the host and the country of the origin of lending institutions or credit suppliers on project financing should be carefully evaluated.

For equity the following sources are usually considered:

- Sponsor's own capital
- Special funds
- Investment funds
- Multilateral Institutions (e.g., IFC, regional development banks)
- International equity markets
- Institutional Investors
- Local Capital Markets
- Project Suppliers and Contractors

Debt financing, during the recent years has become more difficult than equity financing particularly for large projects in the developing countries. Commercial banks view coal-fired power projects, especially when a new technology is involved, to carry a significant risk. Banks limit their exposure to different business sectors in each country. So it is very unlikely for one commercial bank to meet the debt financing need of a large coal-fired project. Commercial banks generally offer terms of 5 to 10 years, where as most coal-fired projects need financing for much longer periods. However, commercial banks may provide finance through syndication of lenders. Faced with these difficulties, project sponsors utilize a variety of other sources of debt financing including:

- Specialized funds sponsored by governments
- International Finance Corporation (IFC)/Global Environmental Facility (GEF)

- Regional Development banks (e.g., ADB)
- Suppliers' credit
- International Bond markets
- Local banks and bond markets
- Institutional Investors
- International commercial banks
- Project Contractors
- Bilateral Agencies (e.g., export - import banks)

Specialized energy funds and GEF could play a significant role in financing of advanced power generation projects.

Specialized funds are sponsored both by governments and private groups for special purposes, such as financing independent energy, environmental or clean energy projects.

The Global Environment Facility (GEF) provides a significant opportunity for financing clean coal power generation projects such as IGCC. For example, GEF support for energy projects, among other things, includes reducing the costs of technologies that are not yet cost-effective but that hold promise for reducing greenhouse gas emissions. GEF support is however limited to the amount that would not have been provided under "business-as-usual" conditions.

CONCLUSIONS

Clean coal projects, including advanced power generation projects, can be structured and financed provided project fundamentals are addressed, risks are clearly defined, and mitigating strategies developed. In addition, a key ingredient to successful project finance and implementation is determination, endurance, and problem-solving capabilities by project sponsor and advisors. K&M has demonstrated the importance of adhering to sound principles of project finance, as well as its determination, endurance, and problem-solving capabilities through its many pioneering IPP projects throughout the world. While conditions may vary from country to country, or project to project, the fundamentals remain constant.

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AUTHOR

John Rezaiyan is a senior project manager with K&M Engineering and Consulting Corporation, one of the fastest growing private engineering and consulting firms in the United States. K&M is an internationally recognized leader in private infrastructure project development, primarily in the energy, telecommunications, and environmental sector.

Mr. Rezaiyan has over 19 years of engineering and management experience in energy, environmental and pharmaceutical fields. His experience includes both technical and management roles in power sector restructuring, technical feasibility studies and economic evaluation of clean coal technologies, and process design and operations.

Mr. Rezaiyan currently is responsible for oversight and quality control for power sector restructuring projects, technical feasibility and economic evaluation of clean coal projects, and technical support to infrastructure development projects. He has conducted studies to identify barriers to commercializing clean coal technologies and to develop strategies for mitigating these barriers. He has also conducted due diligence evaluations of first-of-a-kind projects on behalf of investment-banking firms. These evaluations included technical and financial viability assessments, review of key project agreements for their completeness and harmonization, raw material availability, and product marketability and value.

Prior to joining K&M, Mr. Rezaiyan, as founder and president of Columbia Engineering & Technology Group, he led an effort for preparing bid documents, evaluating proposal, and negotiating contracts for construction of a \$10 million pharmaceutical facility for the manufacture and bottling of oral products. In addition, he provided consulting services for the U.S. Trade and Development Agency, U.S. Department of Energy, School of Pharmacy of University of Maryland, Bechtel International and other clients in the private sector.

Mr. Rezaiyan is fluent in Farsi and English, holds a B.S. in Chemical Engineering from University of Maryland at College Park and has completed graduate course work in MBA with concentration in Finance at University of Baltimore.

当今复杂的国际市场上先进洁净的发电项目

国际电力项目,特别是独立的电力项目,对于项目资金的可获性有很强的依赖性。此外,采用先进洁净技术的电厂项目必须要减少由于在获得资金之前缺乏长期运行数据而产生的能预见到或实际存在的技术风险。在当今市场上,投资者和承保人坚持要技术提供者减少技术风险,而不是通过递增其担保低押或追加较苛刻的贷款条件。本文首先提出了一种减少先进洁净发电项目技术风险的途径,即为项目结构配置一套“技术支持措施”。然后讨论了一些潜在的,特别是那些偏爱洁净发电技术的资金来源。

Figure 2-- Project Structure, Advanced Technology Project

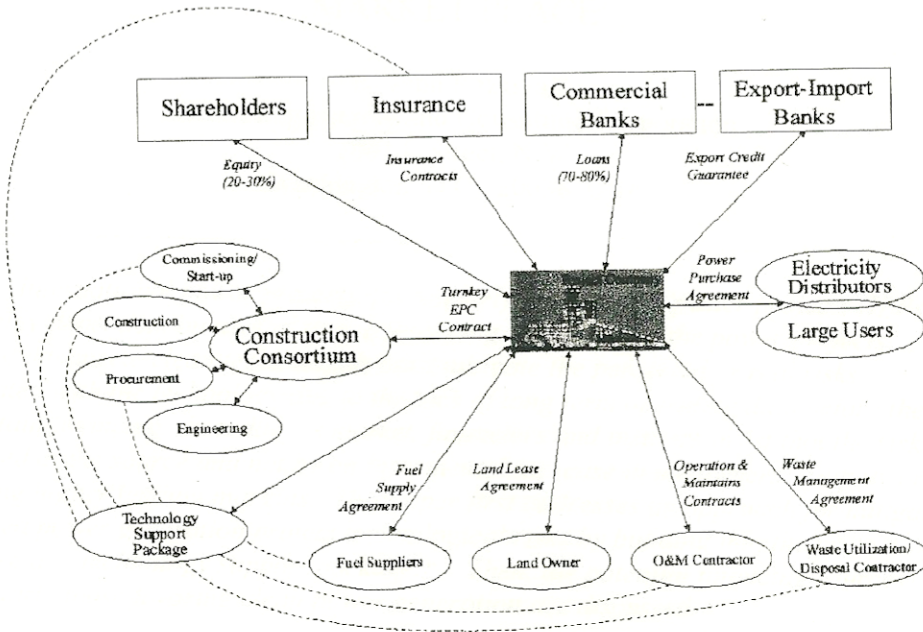


Figure 1-- Project Structure, Conventional Private Power Project

