WILEY FINANCE

PROJECT FINANCING

Asset-Based Financial Engineering

SECOND EDITION

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CHAPTER 5

Analyzing Project Viability

Obtaining the financing needed to fund the construction cost of a project requires satisfying prospective long-term lenders (and prospective outside equity investors, if any) of the project's technical feasibility, economic viability, and creditworthiness. Investors are concerned about all the risks a project involves, who will bear each of them, and whether their returns will be adequate to compensate them for the risks they are being asked to bear. Both the sponsors and their financial adviser must be thoroughly familiar with the technical aspects of the project and the risks involved, and they must independently evaluate the project's economics and its ability to service project-related borrowings. This chapter discusses the factors that are relevant to such an assessment.

TECHNICAL FEASIBILITY

Prior to the start of construction, the project sponsor(s) must undertake extensive engineering work to verify the technological processes and design of the proposed facility. If the project requires new or unproven technology, test facilities or a pilot plant will normally have to be constructed to test the feasibility of the processes involved and to optimize the design of the full-scale facilities. Even if the technology is proven, the scale envisioned for the project may be significantly larger than existing facilities that utilize the same technology. A well-executed design will accommodate future expansion of the project; often, expansion beyond the initial operating capacity is planned at the outset. The related capital cost and the impact of project expansion on operating efficiency are then reflected in the original design specifications and financial projections.

The design, and ultimately the technical feasibility, of a project may be influenced by environmental factors that may affect construction or operation. Arctic pipelines and North Sea oil production facilities illustrate the impact that extreme environmental conditions can have on the construction and operation of production facilities. Although large-scale oil pipelines and offshore drilling and production platforms had a history of successful operation, the environmental conditions present in the Alaskan Arctic and in the North Sea necessitated significant design modifications.

Project sponsors often retain outside engineering consultants to assist with design work and to provide an independent opinion concerning the project's technological feasibility. It is not unusual for long-term lenders to require confirming opinions from independent experts that (1) the project facilities can be constructed within the time schedule proposed; (2) upon completion of construction, the facilities will be capable of operating as planned; and (3) the construction cost estimates, together with appropriate contingencies for cost escalation, will prove adequate for completion of the project. The project's financial adviser must be apprised fully of any technological uncertainties and their potential impact on the project's financing requirements, operational characteristics, and profitability.

Project Construction Cost

The detailed engineering and design work provides the basis for estimating the construction costs for the project. Construction cost estimates should include the cost of all facilities necessary for the project's operation as a free-standing entity. If the project is to be located in a remote area or if it will require additional infrastructure, such as roads, electricity, schools, or housing, the project sponsors must determine whether the cost of the necessary infrastructure will be borne by the project or by others (such as the host government, perhaps with some form of international financial assistance). If the project must bear these costs, they might substantially increase the projected overall construction cost (especially for projects with a lengthy construction period). Consequently, appropriate escalation factors should be applied to the relevant cost components. Construction cost estimates should also include a contingency factor adequate to cover possible design errors or unforeseen costs. The size of this factor depends on uncertainties that may affect construction but, in most major projects, a 10 percent contingency factor (i.e., 10 percent of direct costs) is normally viewed as sufficient if the design of the project facilities has been finalized. Larger contingency factors will be necessary if the project is still in the design phase; the more preliminary the design, the larger the contingency factor that will be appropriate. Finally, the aggregate capital cost estimates must adequately provide for the project's working capital requirements as well as for interest payable during construction.

Project sponsors or their advisers generally prepare a time schedule detailing the activities that must be accomplished before and during the construction period. A quarterly breakdown of capital expenditures normally accompanies the time schedule. The time schedule should specify (1) the time expected to be required to obtain regulatory or environmental approvals and permits for construction, (2) the procurement lead time anticipated for major pieces of equipment, and (3) the time expected to be required for preconstruction activities—performing detailed design work (which typically must conform to permit stipulations), ordering the equipment and building materials, preparing the site, and hiring the necessary manpower. The project sponsor should examine the critical path of the construction schedule to determine where the risk of delay is greatest and then assess the potential financial impact of any projected delay.

ECONOMIC VIABILITY

The critical issue concerning economic viability is whether the project's expected net present value is positive. It will be positive only if the expected present value of the future free cash flows exceeds the expected present value of the project's construction costs. All the factors that can affect project cash flows are important in making this determination.

Assuming that the project is completed on schedule and within budget, its economic viability will depend primarily on the marketability of the project's output (price *and* volume). To evaluate marketability, the sponsors arrange for a study of projected supply and demand conditions over the expected life of the project. The marketing study is designed to confirm that, under a reasonable set of economic assumptions, demand will be sufficient to absorb the planned output of the project at a price that will cover the full cost of production, enable the project to service its debt, and provide an acceptable rate of return to equity investors. The marketing study generally includes (1) a review of competitive products and their relative cost of production; (2) an analysis of the expected life cycle for project output, expected sales volume, and projected prices; and (3) an analysis of the potential impact of technological obsolescence. The study is usually performed by an independent firm of experts. If the project will operate within a regulated industry, the potential impact of regulatory decisions on production levels and prices—and, ultimately, on the profitability of the project—must also be considered.

The cost of production will affect the pricing of the project output. Projections of operating costs are prepared after project design work has been completed. Each cost element, such as raw materials, labor, overhead, taxes, royalties, and maintenance expense, must be identified and quantified. Typically, this estimation is accomplished by dividing the cost element into fixed and variable cost components and estimating each category separately. Each operating cost element should be escalated over the term of the projections at a rate that reflects the anticipated rate of inflation. From a financing standpoint, it is important to assess the reasonableness of the cost estimates and the extent to which the pricing, and hence the marketability, of the project output is likely to be affected by estimated cost inflation rates.

In addition to operating costs, the project's cost of capital must be determined. The financial adviser typically is responsible for this task. The financial adviser develops and tests various financing plans for the project in order to arrive at an optimal financing plan that is consistent with the business objectives of the project sponsor(s). Those objectives typically include producing a competitively priced product while at the same time realizing the highest possible rate of return on the sponsors' equity investment.

The project financial adviser develops a base case financial plan, as described in Chapter 8, and then assesses the sensitivity of the profitability of the project and the projected return on the sponsors' equity investment to various contingencies. Analysis of these factors almost always requires computer modeling and extensive sensitivity analysis, for which the project financial adviser is responsible. Computer modeling is used to analyze the effects of cost overruns, delays in completion, interruptions of project operations, fluctuations in product price, changes in operating costs, and other significant factors. The projected price in relation to the project's "breakeven price"—calculated by dividing total cash costs of production by the number of units produced—associated with various output levels is often used to gauge the project's operating margin of safety.

Adequacy of Raw Material Supplies

Lenders will insist, at a minimum, that the project have access to sufficient supplies of raw materials to enable it to operate at design capacity over the term of the debt. For natural resource projects, lenders generally insist that the project sponsors engage independent geologists or engineering consultants to evaluate the quantity, grade, and rate of extraction that the mineral reserves available to the project are capable of supporting. The accuracy of the reserve estimates is subject to a margin of error; its range depends on the nature of the engineers' examination. This uncertainty is typically taken into account by dividing the reserve estimates into proven, probable, and possible. Lenders may also ask the sponsors to employ independent experts to analyze the extraction and production technologies and determine whether they are appropriate in light of the particular characteristics of the reserves. In addition to demonstrating that adequate reserves are available, the project sponsors will have to establish the project's ability to access these reserves. Proof of such access might be evidenced by direct ownership, lease, purchase agreement, or some other form of contractual undertaking that affords the project, at a minimum, an unconditional legal right to secure specified quantities over the term of the debt.

CREDITWORTHINESS

A project has no operating history at the time of its initial debt financing (unless its construction was financed on an equity basis and the project debt financing funds out some portion of the construction financing). Consequently, the amount of debt the project can raise is a function of the project's expected capacity to service debt from project cash flow—or, more simply, its credit strength. In general, a project's credit strength derives from (1) the inherent value of the assets included in the project, (2) the expected profitability of the project, (3) the amount of equity project sponsors have at risk (after the debt financing is completed), and, indirectly, (4) the pledges of creditworthy third parties or sponsors involved in the project.

Credit Derived from the Inherent Value of Project Assets

In a production payment financing, which is often used in connection with the development of resource properties, the loans are secured by proven resource reserves and are repaid from funds generated from the production and sale of the resource. This type of indebtedness is incurred by the owner of a working interest in proven reserves, where possible, on a nonrecourse basis. The purchaser of a production payment is entitled to a percentage of production revenues as reserves are recovered during the specified production period. Such financing, often employed in the oil and gas industry, has also been used to finance the development of other types of mineral reserves. Requirements for securing this type of financing include (1) adequate proven reserves, (2) a proven technology to recover these resources, and (3) an assured market for the product.

Expected Profitability of the Project

The expected profitability of a project represents the principal source of funds to service project debt and provide an adequate rate of return to the project's equity investors. Lenders generally look for two sources of repayment for their loans: (1) the credit strength of the entity to which they are loaning funds and (2) the collateral value of any assets the borrower pledges to secure the loans. In a project financing, there is a third source: the credit support derived indirectly from pledges of third parties.

Amount of Equity Project Sponsors Have at Risk

Debt ranks senior to equity. In the event a business fails, debt holders have a prior claim on the assets of the business. Given the value of project assets, the greater the amount of equity, the lower the ratio of debt to equity. Therefore, the lower the degree of risk lenders face.

Credit Support Derived Indirectly from Pledges by Third Parties

Although lenders look principally to the revenues generated from the operations of a project to determine its viability and creditworthiness, supplemental credit support for a project may have to be provided by the sponsors or other creditworthy parties benefiting from the project. The contractual agreements among the operator/borrower, the sponsors, other third parties, and the lender(s), which are designed to ensure debt repayment and servicing, as well as the credit standing of these guarantors, are necessary to provide adequate security to support the project's financing arrangements.

CONCLUSION AS TO VIABILITY

To arrange financing for a stand-alone project, prospective lenders (and prospective outside equity investors, if any) must be convinced that the project is technically feasible and economically viable and that the project will be sufficiently creditworthy if financed on the basis the project sponsors propose. Establishing technical feasibility requires demonstrating, to lenders' satisfaction, that construction can be completed on schedule and within budget and that the project will be able to operate at its design capacity following completion. Establishing economic viability requires demonstrating that the project will be able to generate sufficient cash flow so as to cover its overall cost of capital. Establishing creditworthiness requires demonstrating that even under reasonably pessimistic circumstances, the project will be able to generate sufficient revenue both to cover all operating costs and to service project debt in a timely manner. The loan terms—in particular, the debt amortization schedule lenders require—will have a significant impact on how much debt the project can incur and still remain creditworthy.

ASSESSING PROJECT RISKS

As a rule, lenders will not agree to provide funds to a project unless they are convinced that it will be a viable going concern. A project cannot have an established credit record prior to completion—in fact, it cannot have such a record prior to having operated successfully for a long enough period to establish its viability beyond any reasonable doubt. Consequently, lenders to a project will require that they be protected against certain basic risks. Lending to a project prior to the start-up of construction, without protection against the various business and financial risks, would expose project lenders to equity risks. But lenders, who are often fiduciaries, find it imprudent to assume technological, commercial, or other business risks. Therefore, they require assurances that creditworthy parties are committed to provide sufficient credit support to the project to compensate fully for these contingencies.

Legal investment requirements will also affect the ability of certain institutional lenders to extend funds to a project. The major life insurance companies have historically supplied the largest portion of the long-term fixed-rate debt funds for major projects. The statutory provisions governing their permissible reserve investments therefore represent a significant constraint on the design of security arrangements. The legal investment requirements imposed on life insurance companies doing business in the State of New York (the location of most major life insurance companies) are among the most restrictive in the United States. They consequently serve as the guideline most often followed in structuring project security arrangements. (Appendix C contains the relevant sections of the New York State Insurance Law.)

In light of the business and financial risks associated with a project, lenders will require security arrangements designed to transfer these risks to financially capable parties and to protect prospective lenders. The various risks are characterized here as: completion, technological, raw material supply, economic, financial, currency, political, environmental, and force majeure risks. Each is discussed in the sections that follow.

COMPLETION RISK

Completion risk entails the risk that the project might not be completed. Lenders to projects are particularly sensitive to becoming creditors of a "dead horse." They will therefore insist on being taken out of their investment if completion fails to occur.

Completion risk has a monetary aspect and a technical aspect. The monetary element of completion risk concerns the risk either (1) that a higher-than-anticipated rate of inflation, shortages of critical supplies, unexpected delays that slow down construction schedules, or merely an underestimation of construction costs might cause such an increase in the capital expenditures required to get the project operational that the project would no longer be profitable; or (2) that a lower-than-expected price for the project's output or a higher-than-expected cost for a critical input might reduce the expected rate of return to such an extent that the sponsors no longer find the project profitable. For a major project, a cost overrun of even 25 percent, which in recent years would have been considered a modest overrun for a large construction project, may well equal or exceed the sponsors' total equity contribution.

The other element of completion risk relates to the technical processes incorporated in the project. In spite of all the expert assurances provided to the lenders prior to the financing, the project may prove to be technically infeasible or environmentally objectionable. Alternatively, it may require such large expenditures, in order to become technically feasible, that the project becomes uneconomic to complete. For example, a large petrochemical project was abandoned when it was discovered that the production processes did not operate properly. A small pilot plant had worked well. But the scaled-up project never performed as designed because the chemicals involved did not react properly in large quantities.

An Example

Completion risk is a serious concern, particularly when a facility will incorporate a new technology or a significant scale-up of an existing technology. For example, Cominco Ltd., a Canadian lead and zinc producer, announced in April 1993 that it had abandoned any hope of restarting its new lead smelter, which had been shuttered for three years because of production problems.[1] It also announced that it was considering converting the smelter to a "more promising" smelting process, which would cost an estimated $100 million Canadian, and that it might seek compensation from the manufacturer of the smelter.

TECHNOLOGICAL RISK

Technological risk exists when the technology, on the scale proposed for the project, will not perform according to specifications or will become prematurely obsolete. If the technological deficiency causes the project to fail its completion test, the risk element properly belongs in the category of completion risk. However, the project may meet its completion requirement but nevertheless not perform to its technical specifications. Such failures impair equity returns.

The risk of technical obsolescence following completion becomes particularly important when a project involves a state-of-the-art technology in an industry whose technology is rapidly evolving. Normally, such technical risks would preclude project financing. However, lenders might be willing to fund the project in spite of these risks, if creditworthy parties (such as output purchasers) are willing to protect lenders from these risks.

RAW MATERIAL SUPPLY RISK

Particularly in connection with natural resource projects, there is a risk that the natural resources, raw materials, or other factors of production necessary for successful operation may become depleted or unavailable during the life of the project. As a general rule of thumb, minable reserves should be expected to last at least twice as long as the reserves that will be mined during the project loan servicing period. Prospective lenders to a project will almost always require an independent reserve study to establish the adequacy of mineral reserves for a natural resource project.

ECONOMIC RISK

Even when the project is technologically sound and is completed and operating satisfactorily (at or near capacity), there is a risk that demand for the project's products or services will not be sufficient to generate the revenue needed to cover the project's operating costs and debt service and provide a fair rate of return to equity investors. Such a development might result, for example, from a decline in the price of the project's output or from an increase in the cost of an important raw material. Depending on the economics of a particular project, there might be very little margin for a price change to occur before any return to equity is eliminated and the project's ability to service its debt becomes impaired. Project lenders are often willing to permit a mine to close down—and defer repayment of principal—if cash revenue from the mine falls short of the cash operating cost. Repayments resume when the mine becomes capable of generating positive net cash flow.

An important element of economic risk is the efficiency with which the project's facilities will be operated. Lenders will insist that the project sponsors arrange for a competent operator/manager.

A project has no inherent creditworthiness before operations commence. Lenders have no past operating history that they can study to evaluate the project's economic risks. They will therefore require undertakings from creditworthy parties sufficient to ensure that project debt service requirements will be met. These undertakings take the form of security arrangements, which are described in Chapter 6.

Hedging with Forwards and Futures

A *forward contract* obligates the contract seller to deliver to the contract buyer (1) a specified quantity (2) of a particular commodity, currency, or some other item (3) on a specified future date (4) at a stated price that is agreed to at the time the two parties enter into the contract. A *futures contract* is similar to a forward contract except that (1) a futures contract is traded on an organized exchange (whereas forwards are traded over-the-counter) and (2) a futures contract is standardized (whereas forward contracts are customized as to the item involved or the time of delivery).

Forwards and futures enable project sponsors to sell their output for future delivery. They are, at least, guaranteed quantity and price for items that can be sold on this basis. Forwards and futures are available for most commodities and all major currencies. The market for natural gas futures has exploded within the past fifteen years. A market for electricity futures has also developed within the past 10 years. Other markets will develop if there is a demand for them.[2]

Gold Loans

Among the other strategies for transferring risks to others through the financial markets, the gold loan is worth noting.[3] A sponsor of a gold mining project can borrow gold (i.e., the physical commodity) and sell the gold to raise cash to finance construction. The gold loan is repaid out of production from the mine. For example, Inmet Mining arranged a 180,000-ounce 8½-year gold loan to finance part of the cost of its Troilus Gold Project. The project involved development of a gold mine in Quebec, Canada, with annual production of 150,000 ounces.

FINANCIAL RISK

If a significant portion of the debt financing for a project consists of floating-rate debt, there is a risk that rising interest rates could jeopardize the project's ability to service its debt. However, during the 1980s, various new financial instruments were developed that would enable a project's sponsors to eliminate the project's interest rate risk exposure. The traditional method of eliminating (or at least controlling) such risk exposure involved arranging fixed-rate debt for the project. However, floating-rate lenders, typically commercial banks, are often more willing to assume greater completion or other business risks than fixed-rate lenders, such as life insurance companies and pension funds. The availability of interest rate risk hedging vehicles enables project sponsors to eliminate interest rate risk without having to accept a trade-off involving other risk exposures. Interest rate risk hedging instruments are discussed in more detail in Chapter 13.

Interest Rate Cap Contract

An *interest rate cap contract* obligates the writer of the contract to pay the purchaser of the contract the difference between the market interest rate and the specified cap rate whenever the market interest rate exceeds the cap rate. For example, a 3-month LIBOR cap contract that specifies a cap rate of 6 percent would pay the holder whenever 3-month LIBOR rises above 6 percent. LIBOR is the London Interbank Offer Rate at which banks lend each other dollar deposits in the London money market. It is a widely used benchmark for pricing dollar loans. Suppose the loan agreement specifies an interest rate of LIBOR +1.25 percent with quarterly resets. If LIBOR is, say, 8 percent on the interest rate reset date, the borrower will have to pay the lender 9.25 percent interest for that interest period but will receive 2 percent (8 percent – 6 percent) interest under the cap contract. The borrower's true interest cost can never rise above 7.25 percent, the cap rate plus 1.25 percent.[4]

Interest Rate Swap Agreement

An *interest rate swap agreement* involves an agreement to exchange interest rate payment obligations based on some specified notional principal amount. A project that borrows funds from a commercial bank on a floating-rate basis can enter into an agreement with a financial institution under which it agrees to pay a fixed rate of interest and receive a floating rate of interest. The floating-rate receivable under the swap agreement is designed to cancel out the floating-rate payable under the bank loan agreement.

Figure 5.1 illustrates how an interest rate swap agreement can convert a floating-rate obligation into a (net) fixed-rate obligation. The project borrows funds from a bank at an interest rate of LIBOR +1 percent. It agrees to pay 8 percent and receive LIBOR under the swap agreement. Its (net) interest cost is 9 percent (fixed rate).

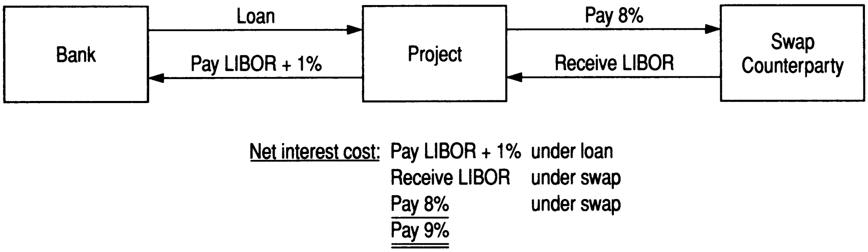

FIGURE 5.1 An Interest Rate Swap

CURRENCY RISK

Currency risk arises when the project's revenue stream or its cost stream is denominated in more than one currency, or when the two streams are denominated in different currencies. In such cases, a change in the exchange rate(s) between the currencies involved will affect the availability of cash flow to service project debt. For example, if the project's revenues are denominated in U.S. dollars and its costs must be paid in a currency other than U.S. dollars, there is foreign currency risk exposure. If the U.S. dollar depreciates relative to the other currency without any changes in dollar price per unit of output, and if project debt is denominated in the same nondollar currency as the project's operating costs, the depreciation in value will increase the risk that the project will not be able to service its debt in a timely manner.

This risk can be managed by (1) borrowing an appropriate portion of project debt funds in U.S. dollars, (2) hedging using currency forwards or futures, or (3) arranging one or more currency swaps.[5] Figure 5.2 illustrates how a currency swap agreement can convert a loan obligation from one currency to another. Converting the loan into one that is denominated in

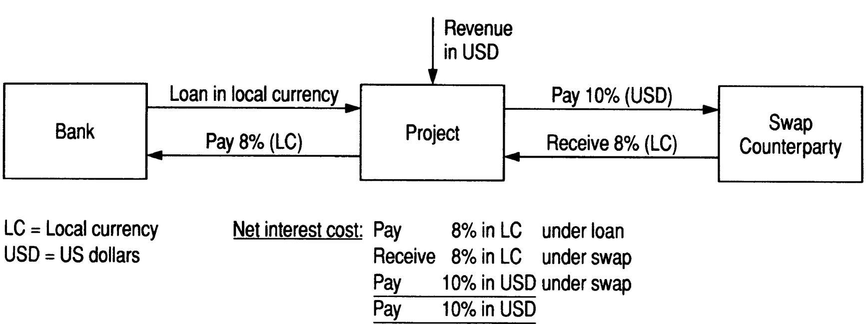

FIGURE 5.2 A Currency Swap

U.S. dollars reduces the project's currency risk because the U.S. dollar revenues can be used to meet the project's U.S.-dollar swap obligation, and the local currency payments under the swap agreement can be used to meet the debt service obligations under the loan agreement.[6] Currency risk hedging instruments are discussed in more detail in Chapter 13.

POLITICAL RISK

Political risk involves the possibility that political authorities in the host political jurisdiction might interfere with the timely development and/or long-term economic viability of the project. For example, they might impose burdensome taxes or onerous legal restrictions once the project commences operation. In the extreme case, there is a risk of expropriation. Political risk can be ameliorated by borrowing funds for the project from local banks (which would suffer financially if the project is unable to repay project debt because its assets were expropriated). It can also be mitigated by borrowing funds for the project from the World Bank, the Inter-American Development Bank, or some other multilateral financing agency, if the host country is relying on such agencies to fund public expenditures (expropriation would jeopardize such funding). In addition, project sponsors can often arrange political risk insurance to cover a wide range of political risks (see Chapter 12).

Often, the project sponsors must devote considerable time and effort to obtaining the appropriate legislative and regulatory approvals to allow a project to proceed. The existence of such hurdles can have a significant impact on the sponsors' decision on where to build the project. Making the appropriate arrangements with the host country government can reduce substantially, or even eliminate, this element of political risk.

Example

Enron Corporation's experience with the Dabhol Power Project in India illustrates how political risk can affect a project.[7] Enron, with backing from Bechtel Enterprises Inc. and General Electric Capital Corporation, decided to build a 2,015-megawatt power project at a cost of $2.8 billion in the Indian state of Maharashtra. The national government had given the project its blessing and had recognized Enron as a "showcase investor." Upon completion, the project would have been the largest foreign investment in India. Three thousand workers were at the site, and the foundations for two of the three enormous generators had already been laid. The sponsors had spent $600 million by the time the project was 23 percent complete. Nevertheless, a newly elected state government announced, in August 1995, that its cabinet had canceled the second half of the two-stage project and repudiated the power contract for the first phase because of concerns that: The project had not been awarded through competitive bidding, the power tariffs in the power purchase contract were too high, and the project was environmentally risky. On the third issue, the environmental lawsuits previously filed against the project's developers had been dismissed by Indian courts. Press reports noted that "the project got caught in a political swamp" when the Congress Party lost control of the Maharashtra state government in the March 1995 elections.[8] The Dabhol Power Project has never been completed. Meanwhile, Enron has gone bankrupt and been liquidated.

Political Risk in the United States

Some people think that political risk exists only in the emerging markets. This is not so. Political risk is not even limited to foreign countries: It also exists in the United States. The federal government and state governments have a troubling tendency to make changes in law retroactively. Environmental laws are an example. Many project finance professionals believe the United States has perhaps the highest level of political risk of any developed country.

Consider the Tenaska Power Project in Tacoma, Washington. The Bonneville Power Administration (BPA), an agency of the U.S. Government, entered into an agreement to purchase the electric output from a new plant. Chase Manhattan Bank lent more than $100 million to finance construction. BPA broke the contract because it had lost customers to other independent power producers.[9] By October 1995, the plant was still about half a year from completion. But construction had been halted, and both the project sponsors and the Chase Manhattan Bank had sued the BPA. Eventually the project was abandoned after the BPA decided to sell only hydro and nuclear power to its customers.

The Tenaska Power Project illustrates what became a trend. Because of falling oil and gas prices during the 1990s, power production costs came down. The broad deregulation of the utility industry caused competition to increase. As a result of both factors, utilities stepped up pressure on independent power suppliers to cut their electricity charges or cancel new projects. The heightened competition caused many independent power producers to fail between 2000 and 2005. Deregulation, in particular, reflects political risk because it requires the government's authorization.

How Other Risks Can Turn into Political Risk

Other risks, such as economic risk or currency risk, can be transformed into political risk. For example, suppose an electric power project in an emerging market borrows funds in U.S. dollars. It charges electricity tariffs in the local currency, but the tariff is indexed to the local currency/U.S. dollar exchange rate. If the local currency depreciates, the tariff goes up. But will the project company be able to charge the full tariff if the local currency devalues sharply (as happened in Mexico in 1995), or will the government step in and block the tariff increase?

ENVIRONMENTAL RISK

Environmental risk is present when the environmental effects of a project might cause a delay in the project's development or necessitate a costly redesign. For example, in connection with a mining project, disposal of tailings is often a very sensitive environmental issue that can add significantly to the cost of operations. Interestingly, the frequent changes in environmental regulations in the United States (at both the state and federal levels), and, often, the aggressive lobbying activities and legal challenges mounted by environmental groups, have given rise to significant environmental risks for environmentally sensitive projects in the United States. To the extent environmental objections are voiced through the political process, they give rise to political risk.

FORCE MAJEURE RISK

This category concerns the risk that some discrete event might impair, or prevent altogether, the operation of the project for a prolonged period of time after the project has been completed and placed in operation. Such an event might be specific to the project, such as a catastrophic technical failure, a strike, or a fire. Alternatively, it might be an externally imposed interruption, such as an earthquake that damages the project's facilities or an insurrection that hampers the project's operation.

Lenders normally insist on being protected from loss caused by force majeure.[10] Certain events of force majeure, such as fires or earthquakes, can be insured against. Lenders will require assurances from financially capable parties that the project's debt service requirements will be met in the event force majeure occurs. If force majeure results in abandonment of the project, lenders typically require repayment of project debt on an accelerated basis. In the case of events covered by insurance, lenders will require the project sponsors to pledge the right to receive insurance payments as part of the security for project loans. Project sponsors will have to rebuild or repair the project—or else repay project debt—out of the insurance proceeds, if one of these insured events occurs.

Most of the aforementioned risks represent business risks (as opposed to credit risks). Business risks are not normally accepted knowingly by lenders. However, by means of guarantees, contractual arrangements, and other supplemental credit support arrangements, the project's business risks can be allocated among the various parties involved in the project (i.e., project owners, purchasers of the project's output, suppliers of raw materials, governmental agencies), thus providing the indirect credit support the project needs to attract financing.

IMPLICATIONS FOR PROJECT FINANCING

The magnitude of certain project-related risks may exceed the financial capacity of the project's sponsors and/or the purchasers of its output to bear them. In that event, project lenders will insist that some third party cover those risks in order for the project to proceed. For example, public utilities that operate in a highly regulated environment generally have limited financial resources. They therefore seek to pass a portion of project risks on to the ultimate consumer by having the regulatory authorities agree to set prices at a level that will cover project operating costs and debt service. Alternatively, a host government might agree to provide credit support to the project or to lend funds at a subsidized interest rate. The former could take the form of a guarantee of project debt. As a third alternative, such financial support might consist of an undertaking to advance funds to the project during certain events that the sponsors do not have the financial strength to backstop. However, the host government will agree to provide such financial support only if it believes that the social benefits it will derive from the project justify the cost implicit in providing this support.

THE COGENERATION PROJECT

The Cogeneration Project is a relatively low-risk project as compared to project financings generally. The project's technology is proven: Many projects utilizing this particular technology are operating successfully in the United States. Engineering Firm, which has built several such facilities, will build the cogeneration facility under a fixed-price turnkey contract and will guarantee that the cogeneration facility will operate according to its design specifications. Engineering Firm has designed and built several such plants recently. Its performance will be backed by a performance bond. Technological risk during operations will be minimal; cogeneration facilities similar in design and size have demonstrated their capability to operate successfully.

Local Utility will supply gas to the cogeneration facility under a 15-year gas supply agreement. This contract will insulate the Cogeneration Project from raw material supply risk. Natural gas represents the largest component of the facility's operating cost. The gas supply agreement links the price the Cogeneration Project will pay Local Utility for gas to the price Local Utility will pay Cogeneration Company for electricity. This linking mitigates the risk that a divergence of gas and electricity prices could harm the project's profitability.

Local Utility will purchase electricity under a 15-year electric power purchase agreement. Chemical Company will purchase steam under a 15-year steam purchase agreement. Both companies are strong creditworthy entities. They will be obligated contractually to take all of the Cogeneration Project's output that is offered to them, except for a very limited right to refuse deliveries during exceptional periods (e.g., when the chemical plant is not operating, to allow scheduled maintenance). Local Utility will enter into a 15-year agreement to operate the plant. The operating charges will be linked to changes in the producer price index (PPI), but these charges represent only a relatively small percentage of the cogeneration facility's operating costs. Also, the steam purchase agreement provides that the price of steam will escalate with changes in the PPI, which will at least partially offset inflation in the operating charges. The nexus of contracts is designed to minimize the Cogeneration Project's exposure to economic risk as well as raw material supply risk.

The Cogeneration Project's financial risk is largely a function of the chosen capital structure. Financial projections, which are discussed in Chapter 10, must be made in order to address this issue. (The Cogeneration Project's financial risk will be examined in Chapter 10.)

The Cogeneration Project involves no currency risk. The provisions of PURPA make the political risk, or regulatory risk, minimal. However, it is important for Chemical Company to purchase sufficient steam to qualify the Cogeneration Project under PURPA. The steam purchase agreement accomplishes this requirement. Environmental risk will be handled by making sure the Cogeneration Project receives all necessary environmental permits prior to the start of construction.

Force majeure risk is of two principal types: (1) force majeure asserted by one of the parties contractually obligated to Cogeneration Company to supply inputs or purchase output and (2) force majeure asserted by Cogeneration Company due to a natural calamity, such as an earthquake, or a catastrophic event, such as a fire. Cogeneration Company can purchase insurance to cover these risks. The insurance proceeds will be pledged to the Cogeneration Project's lenders, to help secure the loans.

CONCLUSION

Lenders will generally not lend funds to a project if their loans would be exposed to business or economic risks. Lenders are typically willing to bear some financial risk but they will insist on being compensated for bearing such risk. A critical aspect of financial engineering for a large project involves identifying all significant project risks and then crafting contractual arrangements to allocate those risks (among the parties who are willing to bear them) at the lowest ultimate cost to the project. Recent innovations in finance, including currency futures, interest rate swaps and caps, and currency swaps, have provided project sponsors with new vehicles for managing certain types of project-related risks cost-effectively.