The Experience with Independent Power Projects (IPPs) in Developing Countries: Introduction and Case Study Methods

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Working Paper #23

April 2004

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David G. Victor, Thomas C. Heller, Joshua House and Pei Yee Woo[1]

1. Introduction

Starting in the late 1980s many nations began to reform their electric power markets away from state-dominated systems to those with a greater role for market forces. In developing countries, especially, these reforms have proved challenging. Successful reform requires a complex set of institutions and complementary reforms, such as in public finance and corporate governance. State-dominated systems typically create their own powerful constituencies that block or redirect the reform process. In an earlier detailed study of reform in five key developing countries, the Program on Energy and Sustainable Development (PESD) found that the result of these pressures, in most cases, is a "hybrid" outcome—an electric power system that is partly reformed and partly dominated by the state[2]. Almost always the first step in hybrid reform is the encouragement of private investors to build independent power projects (IPPs)—generators that are hooked to the main power system and, typically, supply electricity according to long-term power purchase agreements (PPAs).

[1] For comments on multiple drafts we thank our collaborators engaged in country studies for this project. We are also grateful to Anton Eberhard, Adilson de Oliveira, P.R. Shukla and Jessica Wallack for comments and discussions.

[2] http://pesd.stanford.edu/research/5country

During the 1990s dozens of developing and reforming countries adopted the legal or financial arrangements to allow IPPs. In part, these efforts were animated by the desire to attract private sector capital without first requiring the Herculean task of complete reform and privatization of the power sector. In many of these countries the lack of banking and macroeconomic reforms made locally available capital scarce, which put a premium on foreign participation in power projects. For those with rapidly growing demand for power, IPPs offered a quick way to alleviate power shortages. In many cases, IPPs not only helped to raise capital to fill a yawning gap in power production but they were also a vehicle for accelerating reform. IPPs, it was thought, would provide benchmarks for managerial efficiency. They would ease access to foreign technology that would be more environmentally benign, more efficient and more reliable.

Animated by these visions, investors rushed in. In the 1990s IPPs accounted for a large share—perhaps one-tenth—of the surge in private foreign direct investment (FDI) in developing countries. Then, in the late 1990s, this market crashed. In 1999 the dollar value of all private electricity generation project closings fell to less than $3 billion—down from a high of $14 billion just three years earlier (Sader, 1999). Even projects that went ahead often found themselves facing government demands to renegotiate PPAs that, in effect, squeezed investors' equity and made further investments toxic. Despite all these troubles, the experience with IPPs has been widely varied. According to a recent World Bank study, investors are evenly divided in their satisfaction with their experience investing in developing country power projects (Lamech and Saeed, 2003). Anecdotal

evidence also suggests that some investors, builders and operators have profited handsomely and hosts have gained badly needed power, while in other cases most key stakeholders have left dissatisfied.

This paper presents the research protocol for a large PESD study on the IPP experience. PESD's earlier research has included attention to the broad spatial and temporal patterns in IPP investment; we have also examined the roles of IPPs in the process of power sector reform.[3] The present study, however, will focus on the IPPs themselves—through in-depth studies of about three dozen projects we will explore the factors that explain the highly variable outcomes for IPP investors and host countries. Following the Protocol outlined here, during much of 2004 the PESD IPP team will undertake detailed case studies. With initial results in hand, late in 2004 we intend to hold consultations with key stakeholders to review the results and focus on an additional question—the path ahead for the industry and host countries. Evidence is mounting that the crash of the IPP market has reached its nadir, and we expect that the industry and hosts will be searching for new models. This study and consultations with key stakeholders, we hope, will help to chart this future territory.

[3] For more on the broad patterns see Beery and Crow (2003); for more on the role of IPPs in power sector reform see Victor and Heller (2004).

Explaining IPP Outcomes: Our Strategy

A fine-grained assessment of the factors that explain success and failure requires looking at individual projects and players. Earlier studies have sought these answers in various ways. Some have sought the power of large numbers, such as by surveying large numbers of stakeholders about their experiences (Lamech and Saeed 2003). These large N approaches, however, yield broad and general conclusions—such as the importance of "stability and enforceability of contracts"—that are often difficult to apply in specific circumstances. Indeed, anecdotal evidence often leads to opposite conclusions in particular cases—for example, foreign investors appear to be successful in many instances by using the political influence of local joint venture partners as a substitute for stable and enforceable contracts. Moreover, surveys always raise the question of weighting—should all opinions count equally, in which case the survey may merely measure the pulse of the herd, or do some observers have special knowledge that better approaches the truth? Alternative methods are available, but they appear difficult to apply in large N studies of IPPs. One could, perhaps, develop survey techniques that focus on issues related to certain tightly specified hypotheses about the factors that explain success and failure. However, as we will show later, the leading hypothesis are difficult to transform into simple survey techniques that are usable with large samples. One could develop regression or other statistical models that could be applied to the documented experience with IPPs (Qiao et al 2001). However most of the key indicators of IPP experiences are difficult to quantify and compare systematically, and the databases of IPP experiences that are available (or could

conceivably be assembled) do not contain such systematic information. Still another approach that could be applicable to a large N study is the "Delphi" method, which involves iteration of interviews with key experts; each round begins with the answers from the last and lead, ideally, to convergence—thus avoiding the problem of many surveys that agreement is found only in the most catholic (and least insightful) statements (Linstone and Turoff 1975). That method works best in areas where expert knowledge is scattered and disorganized, and where applying the method is likely to yield organization and convergence. The key factors related to IPPs—such as the willingness of foreigners to invest capital in long-lived projects when contracts are difficult to enforce—are old subjects on which there has been extensive debate and convergence on meaningful insights is unlikely to be achieved through sampling the experts.

At the other extreme are individual case studies.[4] When done well, such studies provide detailed insights into the factors at work in particular projects. Even the best of these case studies, however, yield conclusions that are typically specific to context and personalities and thus difficult to generalize.

In short, the existing literature reflects the classic tradeoff in empirical research on complex phenomena. Large sample sizes yield broad conclusions that are often difficult to apply in specific circumstances, unless these conclusions arise in the context of well-specified theories about cause and effect. Small sample sizes fall victim to the tyranny of

[4] For example see Woo (2003) and references therein.

detail—all trees, no forest.

In this study we aim to strike a new balance. We will rely on case studies because they offer the detail needed to draw specific conclusions in specific settings. However, we will also adopt a rigorous method for selecting the cases and performing the case studies so that the conclusions have general application to important hypotheses about the factors that seem to explain the variation in IPP outcomes We are mindful that it will be difficult to employ the standard techniques of case study analysis—to identify all the major independent variables and select a sample of cases from the known universe of all possible cases. Many of the independent variables will be difficult to quantify and work in subtle ways; despite efforts to compile databases of all IPP projects (e.g., the World Bank's PPI Database[5]), the universe of valid projects is not well known. Sampling on an unknown universe with unwieldy key variables is a tricky process.

We start by identifying the major hypotheses that this study will explore. We have culled these from the literature and from a series of open-ended interviews that we have conducted with key stakeholders in industry, government and elsewhere over the last two years. In the coming months we will use this list of hypotheses for another round of interviews to ensure that this study is exploring the issues that are most relevant for practitioners

[5] The World bank's Private Participation in Infrastructure Database can be found at http://rru.worldbank.org/PPI/Reports/customQueryData.asp

Those hypotheses point to a series of factors—independent variables—that we expect will vary across countries and across projects. We will then study specific countries and projects to test whether (and under what conditions) those factors actually explain the variation in IPP outcomes—that is, we will test the hypotheses. Proper selection of projects (cases) for study is crucial to ensuring that our study is tractable and not laden with bias that will color our results. Selection is difficult when the universe of cases is not well known and the hypotheses are wooly. We address these deficiencies with a three-stage selection process.

- First, we will identify the universe of all developing countries that have experience with IPPs, and from that universe we select countries that have variation in country-level factors—for example, variation in regulatory systems, variation in IPP financing arrangements, and variation in the role of IPPs as part of broader power sector reform. At this stage, we arrive at 10 key countries.
- Second, for each country within our sample we select a sample of 4-6 IPP projects for limited review. Ideally, our sample will vary on all the project-level factors (independent variables) that we think are related to outcomes--such as types of PPAs, fuel contracts, financing arrangements, investors and investor structure (e.g., wholly foreign, joint venture, wholly local). Many countries offer opportunities for natural experiments—they have, for example, multiple generations of IPP laws, allowing for comparison of projects under partly

different regulatory arrangements even as we control for a host of country-related factors. However, we expect that these project-level factors will be difficult to identify and control precisely; despite the hypotheses that guide our study, key factors may go unnoticed. For example, in some countries there may be subtle differences in payment schemes or in fuel contracts that explain differences in outcomes. To avoid prematurely selecting biased cases, in this second stage we select a large number of projects and rely on interviews to explore the sample so that we can update our understanding of the key independent variables at work in the country.

- Third, with the knowledge from the second stage we select 2-3 projects in each country for more in-depth analysis, with on-the-ground interviews and all the other elements of a proper full case study. Thus our final sample will involve 20-30 projects (2-3 projects per country, 10 countries).

We plan to publish the empirical material from this study in two tranches. One tranche will consist of working papers—one per country—that will report the result of the first two stages of case selection and analysis. The second tranche will consist of the individual project studies—one per project. With this empirical material we will prepare several analytical papers that assess the hypotheses and offer potential visions for the future.

The rest of this paper provides more detail on each of the key elements—the major hypotheses that we will examine, the selection of countries, and finally a protocol for the thin and detailed studies of projects within countries. We begin with a short discussion of key concepts so that the scope and focus of our study are clear.

2. Definitions and Classifications

In this study, we are interested in greenfield independent power projects. By "independence", we mean projects that are built and operated by a private entity—local or foreign—other than the state-owned enterprises (SOEs) that dominate in the power sector. It must be noted that in China's case, we only consider projects by foreign IPPs falling within this definition. This is mainly attributed to the fact that China has been a socialist country in the midst of its transition towards a market economy, and former SOEs (though corporatized) have continued to be closely tied to government funding and control. Power companies such as Huaneng Power International, Huadian or Beijing Datang, which have been considered "IPPs" by the industry for several years, have been funded (and to much extent, controlled) by the government and are still receiving asset injections from the State Power Corporation. As such, we will not examine projects from national companies in China, other than for the purpose of providing context and benchmarks in our consideration of the projects of foreign IPPs.

We are careful to examine IPPs with three types of ownership structures: wholly local, wholly foreign, and joint. Much of the literature in this field has focused on foreign investors. The foreigner faces special difficulties—without local rooting he may be vulnerable to various schemes for expropriation of his assets, and with shareholders who work in different currencies he is exposed to special macroeconomic risks. Local private investors may face similar risks of expropriation. Typically it is assumed that locals have better political connections and thus can better insulate the project against this class of risks. However, when government is worried about its foreign reputation, foreigners may actually have greater leverage—especially in high profile projects and in projects that have exposure for critical outside actors (e.g., multilateral development banks, government-backed risk insurers, and recourse to transnational investment treaties). We must explore these assumptions by looking at projects with different ownership structures.

We are interested in power projects. In principle, this could include generation, transmission lines, and distribution networks. However, we are interested in focusing on the ways that a country and investors have carved out niches within their power systems for actors other than the SOE. Almost everywhere those efforts to create independence from the rest of the power system begins with generation of power as that does not require the constant intervention by ministries and regulators that is typical in the natural monopoly parts of the business—transmission lines and distribution. We will focus on projects that are created and operated principally for the purpose of generating electricity,

and thus we exclude those cogeneration projects and other investments whose electric production is incidental to some other activity. Many cogeneration projects are sized for the heat requirements; typically they generate relatively little electricity, and often most of that electricity is used by the investor firm itself. Insights into why investors support such projects probably have little direct application to understanding the factors at work in predominantly electric plants.

Our focus here is on greenfield projects—that is, projects involving investment in new facilities. Brownfield investments often play a large role in the power system[6], especially when government is in the midst of privatizing state assets. Brownfield assets have established working relationships and relatively well understood potential returns to the investor, which often makes them attractive for buyers. Sellers, too, are often attracted to brownfield projects as a way to raise quick cash. However, in most of the developing world the most pressing need is for new power capacity. Greenfield projects can introduce special challenges—distinct from brownfield projects—as a greenfield project requires fresh building and operating licenses, labor contracts, and power purchase arrangements.

Finally, and importantly, we are interested in variation in outcomes. We focus on these outcomes from two perspectives:

- *Investment Outcome*. Did the project meet the investors' expectations at the

[6] For a lengthier discussion on the differences between greenfield and brownfield investment, see Gray (2001).

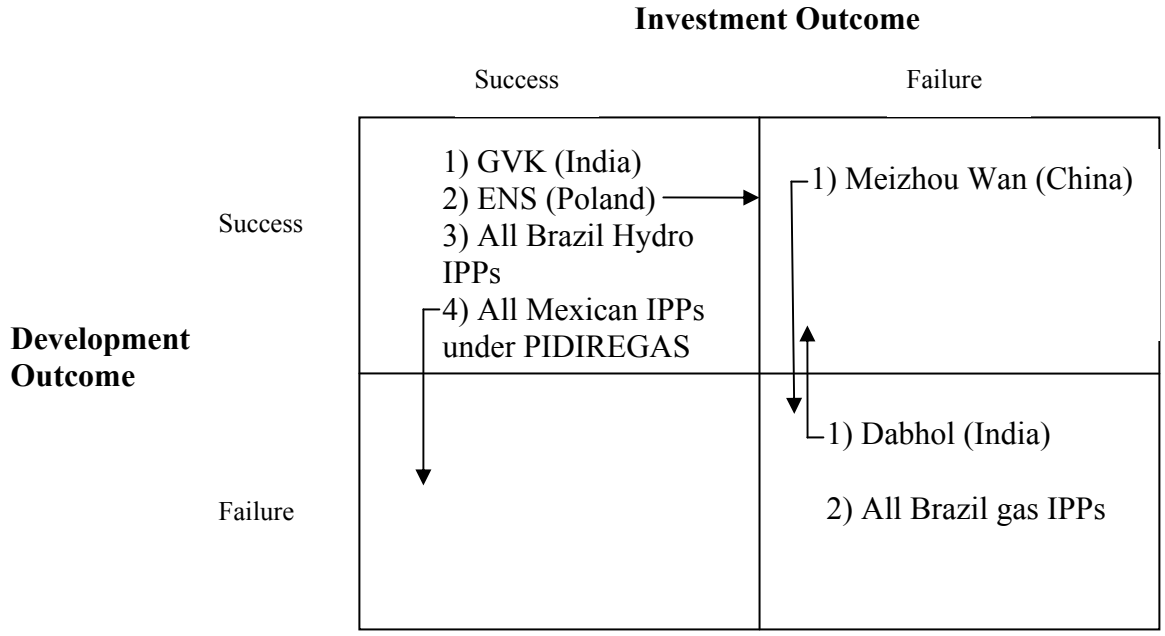
time they made financial commitment to the project? We expect that this question must be addressed both narrowly (i.e., the project itself) and broadly (e.g., as part of the investor's country strategy—perhaps he backed a loser project to gain a larger future presence in the country). In some cases, evaluating success from the investor's perspective will require both hypothetical calculations. Looking at other projects in other countries, or other projects in the same country, what might the sober investor expect to achieve? We must look at reasonable expectations, not the published (often inflated) expectations. We are mindful that the "investor" is often a coalition of banks, equity investors, builders and operators. Moreover, "investment" involves many different activities. In some cases, the investor may get his money by providing construction services or fuel—not from operating the power project itself—and we must be attentive to those expectations.

- *Development Outcome.* Development outcome primarily refers to whether or not the project met the expectations of the host country government, defined at two different levels. First, was the project successful as measured by the level of new capacity, price for power, number of jobs created, environmental impact etc.? Second, if the project were multiplied in number to constitute a substantial fraction of the power sector, would it be financially and politically sustainable? The former (narrow) question is critical to evaluating the project itself, but the latter will reveal whether or not the project's success is the result of unique,

special arrangements or it is a viable part of a broader strategy. Development outcome also implies consideration of the expectations of and impact on labor unions, environmental groups, and indigenous peoples.

The framework for the definition of success above implies four different outcomes for IPP investment: success from only the investment or development standpoint but not both, success from both standpoints, and failure from both standpoints. Figure 1 below presents this information graphically, and gives examples of IPP Projects that fit into the different categories.

Figure 1: IPP Outcome Matrix



In the case of GVK, the company was a financial success and the state electricity board received badly needed power at a competitive rate. ENS—an Enron IPP—has a pass through clause in its contract that shifts the gas price risk to its customers. Poland benefits because this new gas fired capacity replaces dirty coal capacity. To a project, every IPP under the Mexican PIDIREGAS system has been a financial success for investors. For the moment these projects are also successful for the host country as they have supplied badly needed power. As suggested with the arrow, however, over time these projects are prone to fail. The PIDIREGAS scheme places all of the currency and off-take risk on the government's balance sheet—a bonanza for investors but increasingly unsustainable from the government's perspective. As for Meizhou Wan, the project could be considered a success from the development perspective, as the Chinese provincial government compelled the investors (once they had sunk their capital) to supply electricity at a much lower than contracted price when the plant started operation just at the time of a glut in available power. (As that glut has diminished investors have been able to offset part of their losses through fuller dispatching of their plant.) And Enron's Dabhol plant is perhaps the most spectacular failure in IPP history—a project that, in mothballs, is delivering neither power nor returns to investors. Of course, all these projects have dynamic elements that a more complicated diagram could illustrate with many arrows. With time, the Meizhou Wan experience may deter other investors, which could be a bad outcome for China's development; with time, Dabhol may become a boon for development since the plant is undergoing financial restructuring and may generate power with written-down capital costs. And ENS is currently fighting the Polish government over the cancellation of

its PPA. Under the current arrangement the plant functions as a baseload generator and sells all of its output to the grid; should the cancellation go through it would be forced to compete against lower-cost coal fired capacity, making ENS-produced power suitable only for peaking.

3. Hypotheses to be Explored

We have culled the literature on foreign investment and begun a process of interviews with key players in investment firms, builders and operators of projects, regulators in host countries, and other stakeholders. Here we focus on five clusters of hypotheses that have emerged. Each points to different key factors (independent variables) in explaining outcomes. We summarize those factors in an appendix that will aid in the selection of cases and the conduct of case studies. Although these hypotheses are subject to revision, to the extent possible we must articulate the main hypotheses before the case study work begins to ensure that our selection of cases and the conduct of individual case studies is responsive to the factors that we think explain outcomes.

Obsolescing Bargain. Following Ray Vernon's *Sovereignty at Bay*, much of the literature on the difficulties of foreign investment in heavy infrastructure projects is rooted in the idea that the investor's bargaining position changes once it has poured concrete and bolted infrastructure to the ground. The original deal becomes obsolete and the host country can

expropriate the benefits. In Vernon's time the fear was nationalization, but today much of that expropriation takes the form of forced contract renegotiations or other unanticipated changes in circumstance that squeeze all the returns away from the investor. There are many variants of this hypothesis; we seek to explore whether the central dismal conclusion is valid as well as the efficacy of strategies adopted by investors in an attempt to avoid the squeeze, notably:

- *Tailored contracts (PPAs).* Investors, knowing that the bargain is prone to obsolesce, can try to create special arrangements to secure their power purchase agreements (PPAs)—such as sophisticated renegotiation clauses, linkage across issues, offshore arbitration, etc. Investors may also demand rapid paybacks and other schemes that minimize the time and extent of their exposure (Wells and Gleason 1995).
- *Technological selection.* One solution to the obsolescing bargain is to take steps to insure that the investor will be needed long after the project has been built (Wells and Gleason 1995). IPP investors may select technologies that have sophisticated ongoing maintenance requirements that typically require outsiders to perform. Specifically, gas turbines may be favored because they have low capital costs but high variable costs (i.e., fuel) and require proprietary software and experienced management. In contrast, a pulverized coal plant has high capital costs and can be operated by anyone with an advanced training in mechanical engineering.

- *Joint Investment.* A standard remedy for the obsolescing bargain is to find a partner who is well connected and give them a stake in the outcome (Wells 1998). Often their partners are local firms—the main investor supplies capital and expertise, and the local partner provides political cover. However, this might work against the investor, as a change in government might turn yesterday's political insiders into today's political liabilities (Shanks 1998). In some cases these golden partners are multilateral development banks that many hosts rarely annoy (Powers 1998). Another strategy is to sell shares to the local public or to include a local bank in the project debt.

The Investment Climate. Perhaps IPP outcomes are merely the result of the investment climate. By this hypothesis, countries that have created favorable climates should see strong performance of IPPs. Standard investment surveys (e.g., the World Bank's Investment Climate Assessments) tend to focus on these factors:

- *Legal Context*. This includes provisions for protecting contracts and the availability of remedies against corruption.
- *Public Finance*. IPPs sell to state-owned enterprises whose solvency depends on the broader state of public finance.
- *Financial Markets*. Investors may need access to local capital markets and transparent exchange arrangements, without which they are unable to raise and

deploy capital.

- *Management context*. Where there are strict requirements for transparent accounting, financial reporting, and other hallmarks of "corporate governance", outside investors may best be able to manage their projects.
- *FDI Experience*. The public perception of private investment—foreign investment, especially—may also affect the prospects for IPPs. It may be harder for investors to make and sustain deals in societies that are hostile to private investment—a likely condition where earlier attempts at privatization are seen to have backfired.

The World Bank recognizes that a good investment climate—which they define as a sound legal and regulatory framework, functioning financial, product and factor markets, and adequate infrastructure—as the key pillar in promoting economic growth.[7] To that, we add this somewhat wooly notion of "FDI experience" since preliminary interviews have repeatedly indicated that investors have drawn the folk wisdom that some countries are hostile to private investment and others are not. A country's investment climate not only affects IPPs, but all private investments—foreign and domestic.

The Electricity Market. The World Bank's survey of foreign IPP investors points to the regulatory environment as a major factor in explaining outcomes (Lamech and Saeed 2003). Could the variation in outcomes in IPP projects simply reflect variation in the

[7] See http://www.worldbank.org/privatesector/ic

regulatory and electricity market context in which different investors have worked? This factor includes several elements:

- *IPP Framework*. There may be variations in the regulatory framework for IPPs, which in turn may explain outcomes. Some IPP laws may provide fast-track approvals, guaranteed returns on investment or other inducements such as special tax treatment. Some countries may have adopted IPP strategies that envision transforming these plants into merchant generators at some future point, which could expose investors to merchant risks and possibly unfavorable renegotiation of their PPAs while the government migrates to a new merchant power system
- *Estimated demand*. Governments often over-state demand for power because they over-state economic growth, fail to account for rising efficiency and structural changes in the economy. High estimates of demand imply soaring investment in infrastructure (including electricity projects) and jobs. If real demand is lower than expected a project could be left in a glutted market—and under pressure to cut its price or hours of operation.
- *Independent regulator*. Can the regulator be expected to make decisions according to the rules that govern the power market, or is the regulator unable to deviate from politically determined outcomes?
- *Payment systems*. In many countries, the electricity context includes certain payment arrangements that could enhance the prospects for investors. Mexico's

PIDIREGAS scheme makes it easier for investors to get the money they are promised under PPAs while reducing dispatch and currency risks.

Project management. Perhaps the variation in IPP experience stems not from *structural* factors but, rather, the visions and behavior of the senior management and project managers in *each particular project*. To assess that possibility, we must survey at least two dimensions—the process of negotiating the original deal, and the process of managing the project once the basic deal is struck. Much of the business school literature focuses on the art of dealmaking itself—the structure of the PPA and how it hedges against some risks, the enlistment of partners to help hedge against other risks. Such deals require attention to a wide array of factors, not least the cost of the IPP's supply versus the cost of incumbent electric suppliers—where IPPs are much more expensive it may be harder to make contracts hold. In addition to the art of dealmaking, there may be wide variation in the nuts and bolts of managing the project. Assessing these two aspects of project management is akin to an analytical level in Standard & Poor's project ratings where the design and management of a project is assessed. We evaluate how well the project has been designed to sustain ongoing commercial operations throughout its contracted term and how well it has been managed to service its obligations (financial and operational) (Standard and Poors 2001). Some ideas can also be gleaned from how Moody's rate companies in the power industry – by looking at certain fundamental project management factors which affect the IPP's ability to maintain sufficient earnings and cash flow (Moody's Investors Services, Global Credit Analysis 1991). Collectively, these project-

level factors span six fundamental areas: (1) evaluation of the service areas; (2) assessment of the asset base and plant performance in relation to demand and operational efficiency; (3) forecasting operating costs; (4) dealing with regulatory actions; (5) flanking or reacting to competitors; and (6) putting in a suitable company structure and management. (Moody's Investors Services, Global Credit Analysis 1991)

Exogenous events and contagions. This refers to various shocks and triggers external to the projects themselves, notably the Asian Financial Crisis in relation to the Asian developing countries under study. Another example is how the infamous collapse of Enron, the subsequent erosion of the merchant power market in the U.S., and the difficulties in the U.K. market have created a contagion affecting the whole IPP market and resulting in power companies like AES and Mirant disposing potentially promising international projects in order to prevent their credit quality from further plummeting. In general, super-macroeconomic events, non-systematic political events, terrorist attacks, oil crises, price spikes in the spot coal market and such factors have explanatory power but cannot be systematized within an analytical framework. They should not be left out and deserve their own category to highlight the vulnerability of power projects to such events. It must be noted, however, that parties in many projects have tried to deal with some categories of exogenous events through the use of contractual clauses capturing force majeure or political force majeure. Traditional "acts of God" like floods and earthquakes can also affect IPP outcome; these events, however, can be insured against. In the course of analyzing this cluster of factors, we will spend some time evaluating the effect of such

contractual mechanisms in practice to see how effective they have been in mitigating or allocating the risks of exogenous events.

4. Dynamic Storylines

We are cognizant of the fact that while sometimes IPP outcome can be explained by one cluster of factors and one alone, it is often in the interaction of the clusters that determine an IPP's outcome. With this in mind, we offer two different stories that illustrate how these factors can interact.

Adaptation through Learning and Innovation

One model rests on the interplay of experience, study and innovation. In principle, IPPs—like any private investment in infrastructure—offer the potential for substantial mutual gain (World Bank 1994). Investors and hosts alike have an interest in making the system work, and over time through learning they have sought (and often found) effective models. Of course, the investors are large firms (often consortia of firms), and like any large organization learning can be a slow and complicated process that is tempered by bureaucratic procedures and quirks that explain, in part, the wide variation in organizational behavior. Host countries, too, are populated by complex organizations

whose behavior is additionally complicated by popular and party elections and other such gale winds of political change.

Within the investor organizations, managers who have been making decisions about the location and design of projects since the late 1980s were all taught the lessons of "obsolescing bargain" in overseas investment and project finance courses at business school. They were highly sensitive to the danger of nationalization, and thus much effort was focused on hedging against that outcome. The market for investors was poor when interest rates were high in the 1970s and much of the developing world was stagnant in the 1980s (the famous "lost decade" in Latin America, for example). Thus the 1990s offered the first opportunity to apply these insights on a grand scale. With experience, investors have rapidly seen that nationalization is less of a risk than a squeeze on tariffs that, because of the structure of project finance arrangements, first hits the equity holders. Smart investors also knew that it would be difficult to enforce contracts, so they adopted measures such as joint ventures and offshore arbitration in an attempt to circumvent such problems. With time, they have learned—as they expected—that some JV partners are not reliable and offshore arbitration is not a panacea. Investors have thus adjusted course again. In some cases they sought ever more complicated PPAs—not least because their lawyers, who offer that service, advise that a "bombproof PPA" is a remedy against regulatory and political uncertainty. In some projects they have sought to front-load PPAs, although that strategy has met limits because the high tariffs make it difficult to gain the consent of host countries. Consortia of investors that include builders and equipment

suppliers—such as Intergen or Dabhol Power Company—have also allowed project developers to extract profits through control over the rents in the full chain of project costs.

This litany of responses to the obsolescing bargain is, in effect, a decentralized search mechanism. To be sure, there have been disasters along the way. Enron's Dabhol project, for example, took frontloading and the skimming of rents from construction to an extreme—in part, perhaps, because Enron's strategists were blind to the dangers of overreaching and in part, perhaps, because the firm's internal incentives put a premium on closing deals rather than ensuring that they wouldn't explode in the future. But in the wreckage of such experiences more learning takes place. Enron, itself, is erased from the map and through bankruptcy a new vehicle for managing the project is emerging. Business schools have added project finance courses, and strategists have sought to better combine the insights of law, finance, and political science when planning projects. Today's generation of business school students learns the ropes from disastrous cases such as Dabhol, and the dialogue in the classroom forces them to focus on the glaring problems created by high tariffs, the insolvency of the offtaker, the gridlock of public interests lawsuits, and all the other colorful roadblocks that Enron and its hosts erected for themselves.

Host countries, too, learn how to play this game better. Moreover, the "learning" hypothesis articulated here suggests that the lessons learned tend to favor the creation of a sustainable investment climate—host countries learn how to attract investors, not simply

how to squeeze them better. Until around 1990 there was essentially no market for IPPs and no vehicle for host countries to learn. The wave of IPPs—animated, in part, by the World Bank—has revealed a host of problems as well as aggressive efforts by many countries to address them. Experiences such as Dabhol have redoubled efforts to make offtakers solvent and to increase the ability of regulatory authorities to assess projects and to harness market forces through bidding. Thus in India (and many other countries) recent laws have done better in targeting the root causes of unsustainable power offtakers—they have not solved all the problems, to be sure, but the situation today is dramatically different from 1990.

Host countries—especially democracies—have also learned that they must create mechanisms to protect against themselves. Thus Mexico has created a special funding mechanism to protect investors against currency changes; a few countries have established escrow arrangements; most countries have increase the authority of regulators and given them quasi-judicial powers that (in effect) make it possible to enforce PPAs and other contracts more readily. The professionalization of regulatory authorities is creating a cadre of powerful authorities who view their allegiance to a sustainable power sector and not simply political expediency. The effort to make contracts enforceable has even led to new provisions in some trade agreements, although those remain largely untested. The new wave of learning has focused on the interface of independent investors with reform in the power sector more generally—only a few countries (e.g., The Philippines) are far advanced in the process of sequencing PPA-based IPPs into a merchant power market environment.

But already the countries that are contemplating such transitions have revealed—as in the past—intense concern for their reputation and thus a special effort to protect the transition process from attempts to squeeze or expropriate the rents. To be sure, such protections are not failsafe; nor were they in the industrialized world when efforts to liberalize gas and electricity markets created vast "stranded assets" in the form of long term contracts—in only a few cases were the original investors fully compensated for the evaporation of their assets.

The learning model envisions that such processes will continue into the future. It sees the process as guided, fundamentally, by the demand for electric power and the basic willingness of hosts to accept private investment. In the 1990s those stars aligned, investment flowed liberally, and many lessons were learned. The best and the worst of that experience have become teaching tools, and as the market recovers they will guide a more savvy next round of investment.

Dynamic Squeeze

An alternative model is less optimistic—it sees the 1990s as simply the latest cycle in a perpetual process by which investors are enticed into markets and convince themselves that entry will be profitable, only to find diminishing returns and financial failure. According to this hypothesis—which we call dynamic squeeze—foreign equity investors can expect to see their rate of return gradually diminishing over the lifetime of a multi-year investment. All flood into the market in the early stages—perhaps because they "forgot"

the experience of earlier periods or because they convinced themselves that this time they have found a durable solution to the structural problems of the obsolescing bargain. The variation in outcomes reflects a variation in investors' counter strategies.

Obsolescing bargain theory centers on the expropriation of entire foreign investment projects, usually in a cataclysmic or one-time fashion. Dynamic squeeze tends to focus on gradual or sporadic acts that do not terminate investor interest in a project as much as they lower the once expected (or formally expected) income flows derived from an investment. Squeezes might involve gradual ratcheting up of factor or supply costs, lowering of guaranteed quotas for power purchase, elevated financial risks through the inability to establish off-shore reserves, regulatory re-interpretation of tariff formulas or adjustments in tax regimes. Such smaller-scale and multiple incursions are less visible than expropriation until a cumulative pattern emerges—often long after the investor is fully committed. As such, standard investment insurance practices and international legal regimes—created usually with classical expropriation in mind—often do not offer recourse.

The dynamic squeeze may not result from a single strategic decision by the host government but, rather, be the product of complex organizational forces that lead to creeping expropriation. For example, the actual capital and operating costs of relatively less familiar technologies (e.g. combined cycle gas plants) may be difficult for independent regulators to know with confidence. In an atmosphere in which charges of corruption in

the awarding of franchises and the specification of tariffs are often rife, regulators will face mounting pressure to lower the investors' allowable return over time. In other words, foreign investment in regulated infrastructure is a dynamic game played out under imperfect information that alters the motivations that lie beneath dynamic squeeze from those in more simple obsolescing bargain scenarios.

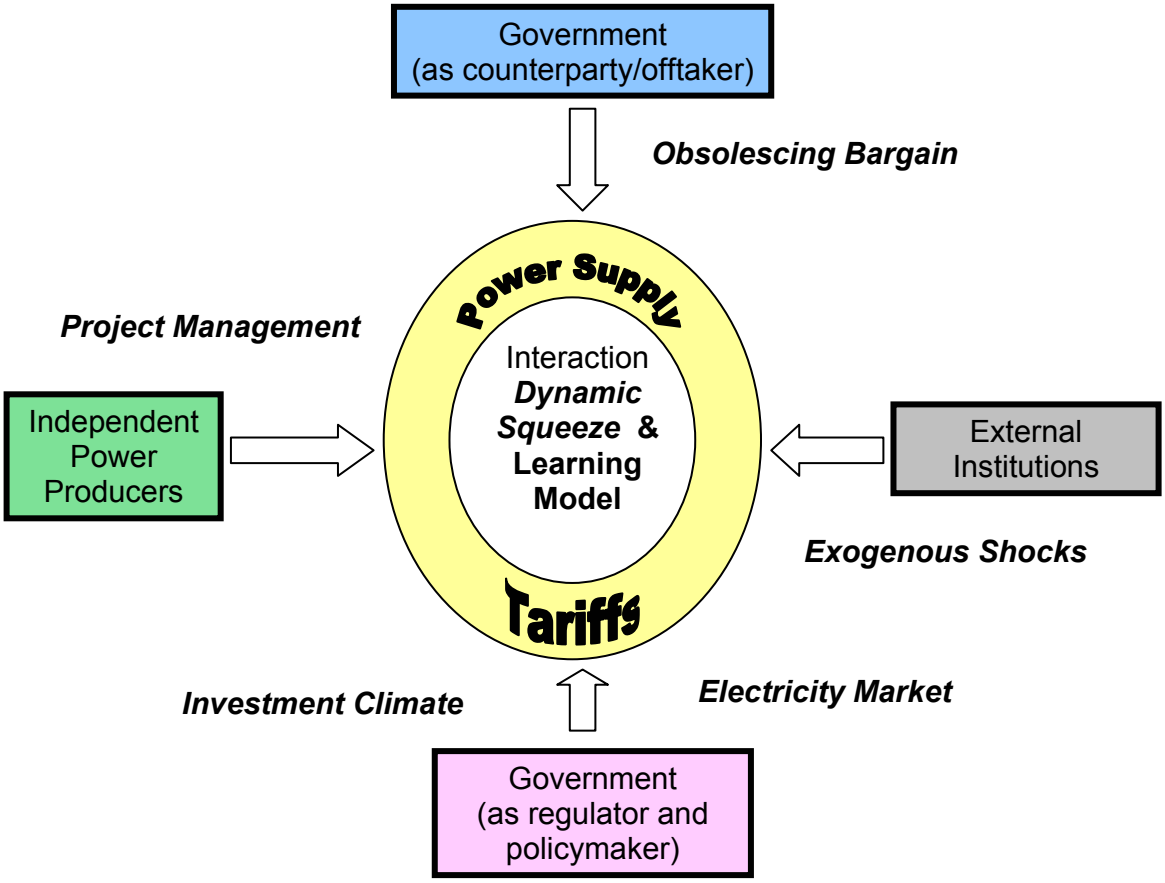
The investor, also, is typically a complex organization that may not behave strategically. For example, managers in the investing companies may receive financial bonuses or job career credit for closing large deals; such incentives may resonate with politicians in the host country seeking to advance their election prospects (if not their personal bank accounts) by subscribing to high estimates of electric power demand which they propose to satisfy with large IPPs. These actors have an interest in building projects but may be long gone by the time that oversupply or charges of excessive tariffs come home to plague project operations. Each new generation of actors will have incentives to launch a new round of building with new demand estimates and book new infrastructure projects—leading to congenital oversupply and diminished returns.

These dynamic games involving foreign investors may be particularly unstable because the IPP market is global. Investors demand a higher return on each country investment to hedge against country risk factors. Each host, knowing this, abhors the premium it must pay to bear others' risks. Responding to such incentives, all actors involved can easily degrade into conduct emphasizing short-run incentives within each

nation, making it hard for global players to pursue a rational portfolio. In one sense, this dynamic squeeze hypothesis may simply be seen as obsolescing bargain theory, after one period of institutional learning and adjustment. In another sense, it highlights the possibility that in a world of competitive politics and markets, of organizations with short memories, and of the eternal promise of legal reform just around the next investment vintage, the long-run never comes.

Figure 2 below presents the interaction graphically. In the next section we outline our strategy for selecting cases. In that context, we identify all of the major country and project level factors that these hypotheses suggest will be related to outcomes.

Figure 2



5. Selecting Cases: A Four Stage Process

In an ideal world, we could compile a list of all of the factors (independent variables) that we think are related to IPP outcomes (the dependent variable). We could then compile a list of all greenfield IPPs and select a handful cases for variation on the independent and dependent variables. Our task would be to elicit the cause and effect

relationships between the independent variables and the outcomes. If the sample size were large enough, we could isolate the particular effects of each independent variable on the project outcomes.

The real world is not so orderly. We do not know, exactly, all of the independent variables that may be related to outcomes. Our discussion of key hypotheses has indicated those factors that we think are most important, but many are difficult to measure and highly contextual. The number of relevant variables is likely to be large; yet it is impractical for us to examine more than perhaps one or two dozen cases in depth—if that. Cause-and-effect relationships and interactions between the independent variables are likely to be complex, which raises particularly difficult problems of isolating the influence of a particular variable on outcomes. Often the scholar attempts to focus on key variables by "controlling" for others—for example, looking at two projects adopted in the same legal regime with the same financing structure but with different fuel choices, which would allow for a focused examination of the impact of fuel choice on outcome. However, with a large number of important variables and complex contexts it is difficult to arrange such elegant controls.

Thus we adopt a strategy that differs slightly from the standard method, but which has the benefit that it has practical application within the constraints of available data. First, we identify a set of *country-level* factors that help us to select a representative sample of 10 countries. Second, we identify *project-level* factors that we can use to select a

relatively large representative sample of specific projects within each country. Third, after obtaining some information about those projects, we re-select a smaller sample of projects in each country—those final samples will be small enough that our team can conduct case studies yet broadly representative of the range of relevant variables.

We adopt this approach because we can readily identify the universe of developing countries that have experience with IPPs. And, with some work, we can identify the full universe of IPPs within each selected country. However, we are unable to identify readily the full universe of projects—all IPPs in all developing countries—and to make a reliable selection from that full universe. This staged process allows us to ensure that we have a representative sample of projects while avoiding the need to undertake a costly and unwise effort to compile a single universe of all IPPs in all developing countries. Most of the project work will occur within these stages, but we add a fourth stage that returns to the global level to make it possible to explore hypotheses—such as the dynamic squeeze—that require a macro perspective.

Stage 1: Country Selection

In this first stage, we focus on *country-specific* factors and use them to select a sample of countries. From our discussion of hypotheses, several country-specific factors emerge:

- Political and Institutional Context for Investors: As described in our hypotheses, this is a multifaceted variable, including financial, legal, and organizational elements.
- Country Electricity Reform Strategy: Countries have adopted different approaches to restructuring their power systems. Some view IPPs as devices to fill gaps in investment and do not envision these projects as an integral part of power sector reform (or even anticipate a broader reform of the power sector). Others view IPPs as stepping stones to reform and thus have a strong interest in the success of IPPs; these stepping stone strategies also entail different risks for investors as their PPAs may be renegotiated during the evolving reforms. Our sample must have variation in IPP strategies, as different strategies entail different risks for investors in and operators of IPPs.
- Incumbent fuel: The economic context for IPPs often depends critically on the incumbents. If incumbent technologies have extremely low operating costs then the IPP will look especially expensive, particularly when reformers are simultaneously trying to undo existing subsidies. In practice, the incumbent fuel is often a good indicator of that economic context. In hydro systems, where operating costs are extremely low, all new entrants that burn fossil fuels look expensive—especially if stewards of the power system do not include the risk of drought in the price of hydro power. Similarly, paid off coal plants with few or no environmental controls are much cheaper to operate than state-of-the

art new entrants that are powered by advanced coal processes or gas.

- Macroeconomic shock and contagion: To test the hypothesis that patterns in IPP investment are mainly the result of exogenous macroeconomic factors, we must include in our sample countries that have been exposed to substantial shocks and those that stayed outside the slipstream. We should look, in particular, at variation in whether IPP and finance policies exposed investors to such macroeconomic risks (e.g., currency devaluation) or whether the government adopted policies to insulate investors (e.g., hard currency-denominated payment schemes).

Through the World Bank's PPI database we have prepared a full list of all developing countries that have at least one greenfield IPP project. We think that the World Bank PPI database is accurate in indicating country experience with IPPs, although we avoid using that database for detailed information on the projects where we think there is a substitute for preparing country-specific databases. Table 1 lists the countries, and figure 3 shows the information graphically on a world map.

Table 1: Developing Countries With Greenfield IPPs

Argentina	Croatia	India	Nicaragua	Sri Lanka
Bangladesh	Cuba	Indonesia	Nigeria	Tanzania
Belize	Czech Republic	Ivory Coast	Oman	Thailand
Bolivia	Dominican Republic	Jamaica	Pakistan	Trinidad and Tobago
Brazil	Ecuador	Kenya	Panama	Tunisia
Burkina Faso	Egypt	Laos	Papua New Guinea	Turkey
Cambodia	El Salvador	Malaysia	Peru	Vietnam
Chile	Ghana	Mauritius	Philippines	West Bank and Gaza
China	Guatemala	Mexico	Poland	
Colombia	Honduras	Morocco	Rep. Congo	
Costa Rica	Hungary	Nepal	Senegal	

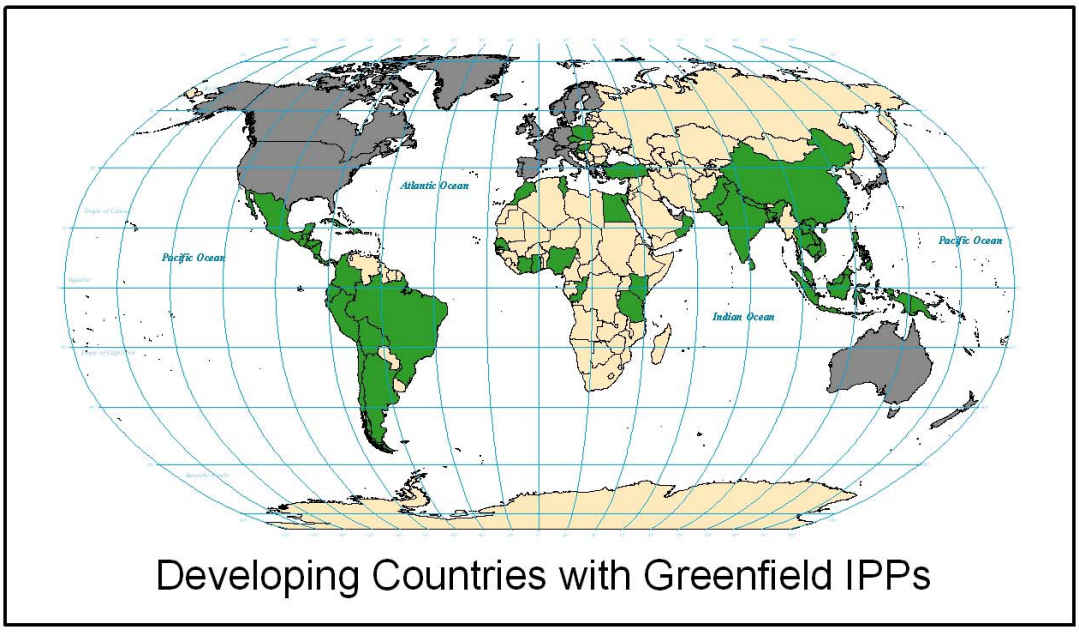


Figure 3: World Map of Developing Countries with Greenfield IPPs. Source: World Bank PPI Database

Out of this list, we have identified 10 that will be included in our sample, and below we summarize the reasons for selecting these cases:

- Mexico. Mexico has had had three versions of its IPP law. Each has adjusted

the terms for foreign participation and (notably) the arrangements for fuel contracts while holding other factors constant—in particular, the PIDIREGAS scheme for paying investors in dollars while absorbing the risk of currency change on the state's balance sheet. The Mexican case allows for comparison across the three variants of the IPP law; it also allows comparison with other countries that have not sheltered investors from currency risk (Carreon-Rodriguez, Jimenez, and Rosellon 2004).

- Brazil. The Brazilian power sector is presently dominated by hydroelectricity, which makes it particularly difficult for new entrants who will be expected to burn gas and thus have higher variable costs. Brazil has extensive experience with gas and hydro IPPs, and thus the case allows comparison between these two types of projects. Brazil's reform strategy has introduced much uncertainty for investors—early rules have been changed as the state discovered new interests. In times of crisis, the state has suspended the authority of the independent regulator. Dispatch rules for generators are dominated by the interests of (hydroelectric) incumbents, which creates a market that is difficult for non-hydro outsiders to penetrate. Over time, the political and institutional context for IPPs has changed—in general, it has become more unfavorable (De Oliveira 2004).
- Argentina. In the middle 1990s Argentina adopted what was widely seen as an "ideal" IPP law—it created clear rules for investors and allowed generators to

be paid both for providing capacity and for the actual power they generated. The capacity payments helped to encourage investment in standby capacity that is essential to ensuring the integrity of power systems. Argentina's recent macroeconomic crisis exposed investors to enormous currency risks and allows the examination of macroeconomic factors while controlling for most others. The macroeconomic crisis has, in turn, sharply deteriorated the political and institutional context for IPPs; the studies will explore whether those political and institutional factors have been important, or if the currently difficulties are principally macroeconomic.

- China. China is the world's largest IPP market and has been widely seen as a strategic market. Foreign investors have been willing to pursue risky projects in China because it is a "must" market. Investor strategies have varied, from sole foreign projects to joint ventures to local only projects, and thus China allows for a controlled analysis of how these different investor strategies affect outcomes (Woo 2003 and Zhang and Heller 2004).
- India. India is a federal system in which authority over power projects is shared between the center and the states. Thus it is possible to compare IPP projects in different states and derive partially controlled conclusions, as the political and institutional context for private investors varies substantially across the states. India is site of the most spectacular disaster in foreign greenfield IPPs—Enron's Dabhol project—and the pathology of failure is always revealing. But

India has also attracted successful IPP projects, with a wide range of investor strategies. India also reveals some variation in IPP regulatory arrangements, with some projects operating under the 1991 "fast track" law that eased regulatory approval while other projects have labored under procedures that are less generous to foreigners (Tongia 2004).

- Malaysia. Of all the countries in our sample, Malaysia is the only one that has an IPP law that is exclusive to local nationals. The lack of any foreign investment allows for comparison with other countries—such as The Philippines—that have actively sought foreign involvement while also reforming their power sector.
- The Philippines. Most countries in our sample are in the middle of broader market reforms, and IPP investors do not know how their projects will fare as new rules for power generators are adopted. The Philippines, however, is the only country in our sample that is far advanced in the renegotiation of the PPAs from earlier IPPs to a new form that is more compatible with a merchant market. (Argentina has also adopted and applied clear rules for IPPs in a reformed market, but the Argentine approach involved adopting those rules at the same time that IPP projects were tendered.)
- Turkey. Facing shortages in the power sector and unable to finance capacity expansion on its own, Turkey adopted an IPP law that aggressively sought foreign investment while at the same time it was envisioning the eventual

reform of the power sector as part of its bid to join the EU. Constitutional limits on private provision of a public service (electricity) led Turkey to create carve-outs for IPPs that allowed for treasury guarantees, tax exemptions, and long term contracts at favorable tariffs, somewhat akin to the special payment arrangements created in Mexico (Atiyas and Dutz 2003). Overbuilding under this law—along with economic slowdown catalyzed in part by several major earthquakes—led to a power glut and a change in the law in 2001.[8] Newer IPPs do not have access to the favorable policies, which were grandfathered for older projects, and thus Turkey provides an opportunity to control for a host of country-specific factors while examining the effect of the two markedly different IPP regimes. This case is also interesting because of the presence of large (and growing) supplies of natural gas; whereas in most countries new gas-fired capacity often has to struggle to get a gas allocation at acceptable cost, in Turkey these supplies are abundant.

- Thailand. Thailand has a unique fuel mix, compared to the other Asian countries in our sample, due to its heavy reliance on gas-fired facilities. Investigation of the various issues faced by IPPs in Thailand in respect of gas-fired generation can help shed light on how the growing trend towards the use of natural gas in the two biggest IPP markets in Asia (namely, China and India) will turn out. Moreover, Thailand can serve as a useful counterpoint to other

[8] It would be interesting to include as part of the case an investigation as to why Turkey does not simply renegotiate the terms of the unfavorable PPAs.

East Asian countries. Currently enjoying robust economic growth and power demand growth–despite being worst hit during the Asian Financial Crisis– Thailand provides an interesting contrast to the Philippines and Malaysia. On the other hand, Thailand is a good controlling case study to China, another high-growth country, in light of its stronger institutional environment and rule of law.

- Poland: Poland's power system is dominated by coal, but a new gas pipeline from Russia built in the 1990s made gas-based power generation possible on a large scale. At the same time, Poland sought to attain outside investors through IPPs. Environmental considerations are driving interest in natural gas, but Poland's IPPs include a gas-fired and a coal-fired project. These IPPs were built in the context of negotiations over EU accession, which requires Poland to liberalize its power market according to a strict schedule; EU accession also means that investors anticipate the arrival of strong legal institutions which, in principle, should alter, over time, perceptions about the enforceability of contracts.

Stage 2: Initial Project Selection

Having selected a sample of countries, we then compile the universe of all IPP

projects within each selected country. We will use official sources for these lists of in-country sources and then check the list with selected interviews to verify its accuracy.

Having identified the universe of country IPPs we then select a large sample for initial study. That selection should reflect a range of project-level factors, related to the earlier hypotheses that we think are related to project outcomes:

- Investor: We will need to select projects for variance on investor, defined by the following sub-categories:
    - *Strategy and competence*: Project sponsors expecting extraordinary returns have different strategies than those that view IPPs as loss leaders. Likewise, the competence of the investor (i.e., whether it is a utility company, a private equity firm, or an energy company) will impact the project outcome. Some investors may be more or less likely to exhibit certain pathologies that, perhaps, explain the boom and bust cycle in investment.
    - *Makeup*: whether or not the foreign investor takes on a domestic partner is thought to have a huge impact on the project outcome. We will select projects that have a range of partnership structures—for example, those that are FDI only versus those that are joint ventures between foreigners and domestic partners.

- *Facility*: Project economics are very different for investors acting solely as builders than they are for investors acting as builders and operators. We will select projects for variation on the responsibility of the investor, commonly denoted by acronyms: BOO (build, own, operate), BOT (build, operate, transfer), or BOOT (build, own, operate, transfer). A subcategory of investor facility is whether or not the investor is also the fuel supplier.

- Financial Structure: A common strategy for investors in developing countries is to include multilateral lending agencies, like the World Bank, or government sponsored export-import banks as financial backers. The means by which the investors structure the project's funding has a large impact on outcome. The choice of project finance versus balance sheet finance is another example of financial decisions that impact success or failure.
- Regulatory Framework: Within countries, there are often different laws (introduced at different times) that impact IPP success. For example, in Mexico there are three distinct IPP laws; in India there are fast-track and non fast-track projects with different approval and legal review processes; in Turkey there are pre-2001 and post 2001 projects. Where different regulatory frameworks within countries exist, we will select projects for variation on this key factor.
- Fuel and Technology: Since fuel and technology are the primary drivers of fixed costs, they are a vital component of project economics and have a huge

effect on outcome. Fuel and technology may also have an effect on the potential for a host country to change the terms of the contract without consulting the project's investors. For example, because of the relatively low capital cost of natural gas turbines, the expertise required to operate them, and the high cost of gas as an energy carrier, they are favorites of IPP investors because host countries have less power when it comes to changing the terms of the original deal. Investors may select technologies that aid in retaining control over the project, such as technologies that require foreign expertise to operate or maintain or technologies that require portable (and deletable) software codes. Where possible, we will select for variation in these fuels and technologies.

- Power Purchase Agreements (PPAs) These are the agreements investors sign with host countries detailing, among other things, the quantity and price of purchased power, timing of payment issues, and dispute settlement procedures. If there are different PPA arrangements we will aim to select cases that span the range. Our sample should include first-of-a-kind projects that set standard models for PPAs, if those exist in the country, as well as projects that break that mold.

The result of this initial country selection process will be a paper that describes all of the major country factors (IPP laws, reform strategy, context for investment, etc.) and

provides a brief review of the experiences with the selected projects. Those brief project reviews, based on available literature and limited interviews, will address at least each of the major factors identified above. The appendix to this paper provides a brief synopsis of the items to be addressed in each country study. We will err on the side of an overly inclusive selection since the process of preparing these country papers may reveal other factors that are critical explanators—requiring, perhaps, revision of the present essay or, at least, care in project selection for the particular country.

Stage 3: Final Project Selection

Finally, from the large sample for each country we will select 2-3 projects for in-depth research as a complement to the thin project studies already done. Those in-depth studies will allow for focused consideration of whether the project supports or refutes the main hypotheses identified earlier in this paper. We have no set structure for those in-depth case studies, which will be published as separate standalone working papers, but we expect them (at minimum) to address the major country-level factors and project-level factors identified in bullet points above. The appendix to this paper provides a brief synopsis of the factors to be addresses in each project study.

Stage 4: Global Analysis

We are mindful that the strategy we have chosen for selecting cases will emphasize country-level factors and (especially) project-level factors. Fundamentally, our unit of analysis is the individual project—with most of our attention focused on the 20-30 projects selected in the 10 countries—and therefore even an imperfect method for case selections allows rigor in drawing conclusions about project factors. In a fourth stage we will re-asses the project studies according to two other units of analysis: countries (thus allowing examination of hypotheses about investor climate and macroeconomic shock) and investors. We may find that this re-aggregation requires additional data, especially for investors. (We expect that all of the necessary data at the country level will emerge from Stage 2 of the study.)

6. Next Steps

With the results from the country studies and individual case studies we will hold meetings of key stakeholders to discuss results and begin to chart a new path for IPP investment. Specifically, we expect that our insights and analysis will be used to answer many of the thorny, multi-dimensional questions that arise when investors and host countries alike consider possible projects. Among them:

- How do new plants compete against established, usually lower-cost

incumbents?

- How can host countries craft agreements that compel investors to deliver expected power and to provide the other services—such as electrification, environmental protection, and new technology—that are implied in the "social contract" that accompanies private investment in public infrastructure?
- What effect does planned market reform (such as that implied by EU accession) have on the tariffs and off-take given to IPPs by host governments?
- If costs are passed through, how does a host government determine what level of cost is appropriate?
- Under what conditions should investor and host alike believe that commitments made by the other side are credible?

Such questions are resurfacing as the world recovers from recession and the need for investment in new power grows. Answers will be needed if the IPP model is to be sustainable, and the attempts to provide answers may yield alternative models that could be useful to apply in the next wave of investment.

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Appendix 1: Brief Outline for Country Studies

Power System Context:
Brief history of the power system in the country, including projections for future demand and discussion of the adequacy of the incumbent (state owned) power system in meeting demand. Discuss the history of reforms and introduce the roles that reformers thought IPPs would play in the power system.

Investor Context:
Discuss the experience of private investors (foreign and local) in the country, with particular attention to patterns in private investment and the factors—such as "rule of law," and corporate governance—that investors think are important to governing whether they will invest. (EIU reports on the country may be helpful.) Give an overview of the macroeconomic context, focusing in particular on economic shocks and contagions. Discuss the experience of investors with infrastructure projects, the ability to secure long-term contracts, the reputation of the country (and key states/provinces, where appropriate) as places for investment. Discuss the perception of key host country institutions—regulators, political parties, government ministries—about the need for and experience with private sector investment in infrastructure. Provide a breakdown of the fuels used in electric power generation; identify the incumbent and briefly describe how politically powerful it appears (i.e., strength of labor unions, etc.).

The Universe of Cases:
Introduce the full universe of all IPPs in the country and discuss the methods used to compile that universe. Where those methods have resulted in excluding some projects, indicate whether/how those exclusions may affect results. Provide a table that lists all the projects, major investors for the project, investment structure (foreign, local, joint), size of the project, choice of fuel and technology, and type of PPA (for countries where PPAs vary). Provide start date and commission date of the project. If available, provide information on outcomes—returns to investors, reliability of the power, or other pertinent factors (we expect this information will not be available for projects without substantial digging, but check the available data from regulatory authorities and industry news services just in case).

Initial Assessment:
Select a sample of up to 4-6 cases using the criteria in this research protocol. Write approximately one to two pages on each with an eye to the factors that *appear* to explain outcomes. Interview a limited number of country experts and investors to get their assessment of the factors that explain the broad patterns in outcomes. If there is no discernible broad pattern then say so.

Selection for in-depth assessment:
Propose a sample of 2-3 projects for more in-depth work, using the criteria suggested in this research protocol as well as other factors that may be related to project outcomes that may be idiosyncratic to this country. Ensure that your proposed sample has variation on the major independent variables related to project outcomes.

Appendix 2: Issues to Consider in Individual Case Studies

Obsolescing Bargain

Revenue Risks (Payments under the PPA)
1. Was the host government power bureau (or its affiliate) the sole offtaker of the project?
2. How was the tariff structured? What components of costs were passed through to the host government?
3. How was the creditworthiness of the offtaker assessed? What was the history or track record of the offtaker?
4. Did the host government furnish any guarantees? In the event of bankruptcy of the offtaker, how were risks mitigated or allocated (both planned and as materialized)?
5. In the event of renegotiation of the PPA or refusal to pay according to the terms of the PPA, what were the reasons (both official and actual)?

Political Risks
1. Who were the political or governmental entities/individuals involved in the project? Did the project have the support of significant political or governmental entities/individuals?
2. Did the country have any record of discriminatory change of law, withholding/refusal to renew licenses/permits for the development or operation of an IPP, or political force majeures?
3. Did the country have any record of prior expropriations, renegotiations of PPAs or events in other industries which resulted in a "squeeze" on foreign investors' returns? Specifically, what was the record of sovereign compliance with contracts? If the record was weak, what were the developers' view of the risks and risks-hedging mechanisms?

Joint Ventures
1. Were there local joint venture partners? Why were the partners selected? Consider, in particular: (a) Value brought to the project; (b) Track record, creditworthiness and experience; (c) Relationship with the host government.
2. What role(s) was played by the partners? For example, were the partners merely shareholders, or were they involved in the fuel supply/O&M/construction/offtake contracts?
3. What were the costs and profits sharing arrangements?
4. What rights did the partners have in the project? How was the authority to make decisions divided? Consider their proportion of control of the board, voting rights, veto rights, minority shareholder rights, degree of management control, etc.
5. To what extent were the interests of all parties to the joint venture aligned? Did they have other conflicting interests?

Contractual Mechanisms

1. What kind of contractual mechanisms did the developers institute to prevent expropriation (both direct and creeping), protect drivers of revenue generation and their returns on equity? To what extent did these mechanisms work in practice?

Investment Climate

General Investment Climate
1. What was the long-term outlook for the country's stability in terms of socio-economics and politics?
2. What were forecasted key aspects of the investment/regulatory framework which could affect the project adversely? Did any of such risks materialize and affect the project?
3. What were the mechanics, willingness and limitations of the host government to change the legal and regulatory framework?
4. What was the host country's history and experience of privatization efforts? Did actual or potential political roadblocks to privatization, especially that of the power sector, exist?

PPA Compliance
1. Were there enforceability risks of the PPA in the country? For example, consider sovereignty immunity of the government-related offtaker, electricity regulations that did not allow parties to fix tariffs, arbitration rules, etc.
2. Did the PPA protect against change of law? Did any contractual protection mechanisms work in practice?
3. Did developers have recourse in the event of breach of the PPA – both on paper and in reality?

Investment Incentives
1. Did the government initiate investment incentives to encourage FDI investment in the country? What were these incentives?
2. Was such favorable treatment maintained? What was the host country's track record in terms of creating and maintaining investment incentives? To what extent did developers expect and rely on the favorable treatment to be maintained?

Corporate Governance
1. To what extent did the quality of corporate governance and financing reporting in the host affect the assessment of the credit quality and other financial variables of the offtaker and other counterparties?
2. To what extent did the quality of the corporate governance framework in the host country contribute to problems in joint ventures with local partners?

Financial Risks

1. Were there any interest rate risks? How were such risks mitigated or allocated? Specifically, to what extent did parties mitigate this risk through the use of swaps, collars and caps?
2. Were there any currency exchange and convertibility risks? How were such risks mitigated or allocated? Specifically, to what extent did parties mitigate this risk by matching the currency of the borrowings with the currency of the revenues or through other hedging arrangements?
3. To what extent were the financial markets (both equity and debt) open to private and governmental bodies?
4. To what extent were there restrictions on the repatriation of profits to the foreign home country of the investors?

Taxation
1. What was the tax structure, the risks associated with it and mechanisms used to mitigate or allocate such risks? Were there any changes in the tax structure which adversely affected the project?

Inflation
1. Did the project suffer from inflation risks which significantly increased material costs, fuel, labor, etc? If so, how did the materialization of such risks affect the revenue stream?

Labor Relations
1. What has been the environment for labor relations in the country?
2. Did the project suffer labor relations risks such as strikes, lock-outs, riots and work stoppage? How active (or 'activist') were the labor or trade unions?

Dispute Resolution
1. What has been the experience of private or foreign entities attempting to resolve disputes through litigation or arbitration in the host country?
2. Did the project allow for litigation or arbitration in an international forum?
3. Would the host country accept and enforce a foreign judgment from a foreign court or arbitral forum?
4. What has been the experience of private or foreign entities attempting to enforce judgments in the host country? Did they have ease of access to local courts?

The Electricity Market

Electricity Market Regulation
1. What was the regulatory structure of the electricity market? What was the experience of IPPs under such regulatory structure? What was the treatment of IPPs in terms of dispatch of capacity?

2. What was the industry structure in terms of ownership and control? How did industry players "compete" in the market?
3. What were expected reforms in the industry at the time the project was developed? Specifically, was the government moving towards a larger degree of privatization and some form of deregulation and competitive power pooling? Were they expected to adversely affect the project, and were there any risks-hedging mechanisms were put in place? Consider project participants' attitude towards stranded costs at that time and whether there has been any change in this attitude.

Tariff Structure
1. What were the components of the tariff structure? How were tariffs established and reviewed? If the government determined tariffs, to what extent were the regulatory/political risks that the government would not authorize price increases?
2. What has been the tariffs history in the market? What factors could occur to alter historical patterns?
3. How competitive were the tariffs charged by the IPP compared to existing producers or generation companies?
4. Were the tariffs charged by the IPP too high in the overall scheme of generation tariffs, transmission costs and end-user tariffs, leading to electricity pricing risks? Did the project suffer the risks of resulting in end-user tariffs at a level too high for consumers to afford?

Transmission Access
1. Who was the transmission provider? Were there expected reforms to unbundled transmission and generation functions of the public utility?
2. How were transmission costs determined and allocated? Was the transmission provider earning a very low return such that it was essentially subsidizing the generation companies?
3. How adequate and interconnected was the transmission network? Could excess capacity in a region be transferred to another region? To what extent did the transmission provider suffer transmission and distribution losses?
4. Did the project suffer the risks associated with transmission access such as not being able to deliver due to transmission problems?

Project Management

Technology Selection (did they pick the right technology?)
1. *Fit*: Was the technology selected an appropriate fit? Why was it selected by the parties? What was the existing local level of technology? How did the selected technology compare to the technology of comparable/existing plants in terms of cost-competitiveness?
2. *Performance*: What is the performance history of the selected technology? Did any new technologies emerge to have a detrimental impact on the feasibility of the selected technology? In considering plant performance, take into account: (a) Heat rate; (b)

Availability; (c) Capacity factor; (d) Startup time; (e) Load ramp rates; (f) Load following capability; (g) Load efficiency; (h) Load environmental performance.
3. *Risks*: Were there any extraordinary construction, operation and performance risks? What was the potential for catastrophic failure? How were these risks mitigated and allocated among parties?
4. *Joint Venture*: If a joint venture to exist between the developers and the equipment suppliers or the EPC contractors, was it a positive or negative factor for the project?

Site Selection
1. Environmental: Were there any site-specific environmental risks, and measures taken to prevent and reduce adverse environmental effects? Did environmental risks-hedging mechanisms and measures increase the construction and operation costs? What were the risks associated with existing environmental laws (and potential changes), and the plans to allocate or mitigate these risks?
2. Transmission: Were there extraordinary risks associated with transmission access, including construction costs, voltage requirements, permitting, reliability and special maintenance requirements? If so, what was the extra cost incurred to mitigate such risks?
3. Infrastructure: Were the local infrastructure, water, raw materials and labor sufficient to support the facilities? Specifically, was there adequate transportation available during the construction and operation, including railway, roads, docks, warehouses?
4. Fuel: How did the location of the plant affect fuel purchase plans? Was the project cost-competitive in terms of fuel transportation and storage?
5. Government/community support: Was the local government/community supportive of the project? Was rezoning of the region and relocation of the local residents required? Were there protests by public interest lobbies and local residents?

Counterparty/Offtaker Risks
1. Was the counterparty a creditworthy entity? What was its track record in terms of credit quality?
2. Could the plant sell electricity to third parties, other than the offtaker? Consider both regulatory and contractual issues.

Power Supply-demand Situation
1. How were capacity additions determined and approved? What was the national generation capacity expansion plan? Did the project suffer from an over-supply in the region, leading to lower generation output and thereby revenues?
2. How huge were typical incremental additions in generation capacity?
3. What was the forecasted and expected supply-demand situation? Did the project suffer from the risks (e.g., a squeeze on the PPA) when it changed fundamentally? Were there inherent information asymmetries that made it difficult for developers to accurately predict future demand?

4. What was the power consumption structure of the host country? Was the electricity market tied to a few key industries or the dispatch of the plant's capacity tied to a few key industrial users (owing to transmission constraints)?
5. Were there key economic and industrial developments that developers considered in making demand forecasts? Did this change leading to a fall in demand growth?

Contractor Selection
1. Who were selected as: (a) construction contractors; (b) fuel suppliers; and (c) O&M contractor? Consider the contractor's experience (both general and specific to that country/region), financial condition and ability to perform according to plans.
2. Were contracts with these contractors cost-competitive?

Construction Risks
1. Did the project suffer from extraordinary risks for costs overruns and schedule delays?
2. Did developers lose the security deposit to the host country for failure to meet construction milestones or performance standards? To what extent were there risks that the plant would not be adequately constructed or operated leading to an exposure to liability?
3. How were the risks mitigated or allocated?

Operation & Maintenance (O&M) Risks:
1. Did the project suffer from extraordinary O&M risks, e.g., requirements for major overhauls, onerous waste disposal requirements, higher O&M costs than projected, etc?
2. How were the risks mitigated or allocated?

Fuel Risks
1. What were the risks of hikes in the price of fuel used? What was the fuel strategy – the mix of fuel contracts and purchase on spot markets? Were fuel costs passed through to the government?
2. What were the risks of interruption of supply and transportation of fuels? Were costs increased by mechanisms to hedge such risks?
3. Could costs savings have been achieved through utilization of different fuels? How did the project's fuel strategy compare to existing/comparable plants in terms of capital costs of the power plants, O&M costs and environmental costs?

Fuel Mix
1. What was the fuel mix of generating capacity in the host country and the specific region? How could this fuel mix have affected the profitability or cost-competitiveness of the plant?
2. Were there any major changes in the fuel mix, or plans to change the fuel mix?

Exit Strategy
1. What was the developers' strategy for exiting the project or disposing of interest during the development, construction or operations stage? Consider any termination clauses, buy-

out provisions and disposition restrictions (both contractual and regulatory) imposed on the developers.
2. What losses or exposure to liability would the developers have if they exit the project prematurely?
3. Did developers expect a market to exist for the disposition of their interests in the project?

Exogenous Shocks

1. Were there exogenous events which adversely affected the project?
2. To what extent were such risks expected and could have been mitigated or allocated? To what extent did developers try to pass through the impact of exogenous shocks to the host government?
3. Did the developers put a margin of safety into the project or institute a strategy to bolster its ability to survive exogenous shocks?