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**A Fresh Start: Prospects for Financing Hydropower in  
Developing Countries**

by

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**Abstract**

In many countries lack of finance remains the overriding obstacle preventing the development of hydropower resources. In the developing world hydropower has traditionally been publicly funded using concessional loans, but in the current a situation these funds are becoming scarce and there is a need to mobilise other sources of finance, particular from the private sector. However the long-term, capital intensive nature of hydropower, and its high-risk profile, makes it unattractive to the private sector. This paper explores some of the issues arising from this dilemma, and suggests ways in which the situation might resolve in the future.

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## 1 Introduction

Despite the currently high level of activity on the construction of hydropower project in countries like China and India, over the last decade there has generally been a marked downturn in new-start hydro in many parts of the developing world. This is due to a number of factors including environmental opposition and competition from cheap gas-fired generation, but the overriding problem has been the difficulty of raising finance. Following the commercialisation of the state-owned utilities and the division of their functions into separate generation, transmission and distribution companies, there has been a widespread withdrawal of the public sector from the financing of new generating stations. In many countries power generation is now regarded as the responsibility of private companies.

For new power stations the most common form of private sector participation has been through the BOOT model. Under this model a “special-purpose” project company is created to Build, Own and Operate the power station before Transferring back to public ownership at the end of the concession period. While this formula worked well for thermal power stations, experience has shown that it is not well suited to hydropower for a variety of reasons. It is evident that alternative financing models are necessary if hydro is to get the funding it urgently needs.

This is a particularly serious problem in the developing world, where the lack of local capital markets means that any large project is inevitably heavily dependent on foreign funding. Quite apart from the reluctance of the private sector to lend into countries that are financially fragile, there are particular problems that arise when trying to finance infrastructure with hard currency loans, as we shall see later. Yet it is these same countries that desperately need the funds to develop their water resources, in order to break out of the vicious cycle of economic and social deprivation.

Against this background there is a lot of talk of Public-Private Partnerships as being the alternative way of attracting finance for hydropower projects. But this is only a concept, and we now need to think more about what it really means. There are undoubtedly many possible models for the sharing of the responsibilities, risks and revenues between the public and private sectors but we are still only at the early stages of exploring them. In a period of little more than a decade the philosophy in the power sector has swung from one of public ownership to one of total private ownership, but as far as hydropower is concerned the results have been disappointing. Perhaps the answer lies somewhere between these two extremes? This paper explores some of the issues.

## 2 Lessons of the last decade

It is now more than a decade since the restructuring of power utilities started in many parts of the world. That is long enough to take a view of the way it has impacted the hydropower sector. We need to learn from the lessons of the past before trying to shape the future.

Five years ago the World Bank launched a study into the private financing of hydropower projects<sup>1</sup>. It examined ten schemes in five countries and reported on a wide range of issues including their financing arrangements, the contract structure, risk apportionment, regulatory

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<sup>1</sup> *Financing of Private Hydropower Projects* by C R Head, published in Year 2000 by the World Bank as Discussion Paper no 420 and available on the web or in hard copy.

issues and, amongst others, the roles of the host government, the utility and the international financing agencies. The subject projects ranged in cost from US\$100m to US\$1,200m, and their financing arrangements varied considerably to reflect both this size variation and the stage of development of the host countries. For example, the projects in Laos and Nepal were totally depended upon external financing, whereas those in Brazil drew heavily on domestic funding. All were based on the BOOT financing model.

Amongst the many issues that emerged from the above study, the following are perhaps the most significant:

1. The private sector finds it difficult to finance hydro projects due to their high risk profile and the fact that the relatively low import content (traditionally financed by export credits) leaves large sums to be funded by commercial loans, which are expensive and difficult to arrange. As a result most "private" projects depend heavily on public sector support in terms of financing, guarantees and risk sharing.
2. There are many additional costs that have to be carried by private projects, in addition to the higher cost of the finance itself (debt interest and dividends). Projects are usually more expensive when developed in the private sector, and this is reflected in higher tariff charges that ultimately have to be passed on to the consumer.
3. It is important to distinguish between financial and economic viability when selecting a project for private development. Financial viability is a measure of a project's ability to repay debt and dividends, and is essentially the viewpoint of the project company over a relatively short time horizon. Economic ranking represents the long-term national viewpoint, and may not always prioritise the same project.
4. Hydropower sites are unique national assets, and the award of a concession to a private (often foreign owned) company can raise sensitive issues. The complexity and cost of formulating a private hydro proposal makes it very difficult to award such contracts through international competitive bidding, so most concessions are directly negotiated. This makes it hard to demonstrate transparency. There are few precedents for arriving at a formula for the sharing of risks and benefits between the public and private sectors.
5. There is a shortage of credible sponsors with the strength and experience - and appetite - for promoting large hydro projects. There were many "would-be" investors but a lot of them have melted away as the difficulties become apparent. This unresponsiveness of the private sector is often matched by unrealistic expectations on the part of host governments. The public sector sometimes fails to understand the central role it has to play in structuring private projects, or the commercial constraints under which private companies are forced to operate.
6. In order to make projects acceptable to private financiers many of the risks are migrating back to the public sector. There is a danger that under the existing arrangements the utilities are taking the same risks as before, but with the disadvantage that they are paying more for their power and, at the same time, forfeiting much of their control over the projects.

Combined together, these factors have resulted in a situation where many MOUs have been signed for private hydropower projects, but very few have been implemented. As already

noted, those that have successfully been completed have usually relied heavily on support from the Multilateral Development Banks (MDBs) and similar agencies whose participation has proved essential in most cases.

### 3 Some Hard Facts

The recent report by the World Commission on Dams contains some interesting figures in the backing documentation, which demonstrates the relative positions of fossil fuel and hydro in private power. Some of them are reproduced here.

**Fig 1** shows the annual distribution of private investment in power over the period 1994 to 2000, and the way in which it dropped dramatically in year 2000 as a result of economic crises in various parts of the world. The seven-year period covers the time immediately following the liberalisation of the power sector in many countries, when there was a pent-up demand that private investors stepped in to satisfy. It therefore represents the most active period to date for private investment in the developing world.

**Table 1** shows that only 4%, by capacity, of new private power projects signed during this period was hydro. The actual figure may be marginally higher because of the large uncategorized "Others" column, but on the basis of figures obtained from elsewhere it is unlikely to be more than about 6%. Likewise the actual figure for fossil fuels is probably higher than the 68% shown. This 10 to 1 fossil/hydro imbalance is occurring at a time when the world is urgently trying to reduce its dependence on fossil fuels and increase the production of renewable energy, so it clearly reflects a very unsatisfactory situation.

Location	Fossil	Hydro	Nuclear	Others	Renew-able	Total MW
Americas	31,591	1,648	0	9,866	600	<b>43,705</b>
Asia	35,726	1,860	0	11,654	2,466	<b>51,706</b>
Europe/Cen Asia	16,339	1,999	0	8,386	1,179	<b>27,903</b>
Mid.East/N Africa	5,791	0	0	3,112	0	<b>8,903</b>
Sub/S Africa	808	0	0	42	0	<b>850</b>
<b>Totals (MW)</b>	<b>90,255</b>	<b>5,507</b>	<b>0</b>	<b>33,060</b>	<b>4,254</b>	<b>133,067</b>
<b>Totals (as %)</b>	<b>68%</b>	<b>4%</b>	<b>0%</b>	<b>25%</b>	<b>3%</b>	<b>100%</b>

**Table 1: Installed Capacity for Signed Private Projects (1994-2000)**

**Fig 2** demonstrates a point that has already been made, to the effect that the Export Credit Agencies (ECAs) play a much smaller role in financing hydropower schemes than they do for thermal power stations. Conversely the role of the MDBs is proportionately much more important for hydro than for thermal.

In the period since the above reports were published the situation has, if anything, deteriorated. Within the last year the difficulties of private hydro have been graphically illustrated by the withdrawal of the sponsor from one high-profile project before reaching financial closure, and the near-collapse of another project. Although totally separate and on different continents, their stories are similar. Both sponsors had been working on their respective plans for about seven years, and each had each spent well over \$50m entirely at risk. Both are strong capable organisations with a lot of experience, and when the going got hard they showed a commitment to overcome problems that were far more severe than they

could ever have imagined at the outset. If sound projects like these come close to failure, there is clearly a problem.

## **4 The way forward - where do we go from here?**

It is important to emphasise that there can be no single solution to the problem of financing hydropower projects, as each situation is unique. There are a multitude of factors that will determine most appropriate model, including, for example, whether the energy is for domestic or export use, whether it is a single-purpose hydro project or a multipurpose scheme and, above all, the prevailing economic and regulatory environment in the host country. The diversity of situations is too great for a "one-size-fits-all" approach, but it is nevertheless possible to identify certain issues that point the way to the future. Some of these are briefly addressed below.

### **4.1 The need for a favourable enabling environment**

An absolute pre-requisite for any private sector participation in project financing, whether as a lender or an investor, is a positive enabling environment. The basic principles that need to be in place include the following:

- A legal regime that allows for an enforceable contract backed by provisions for the speedy resolution of disputes in an impartial environment and international arbitration.
- Established government policies that encourage local and foreign private investment, with clear provision for the convertibility of currency and remittance of monies overseas.
- A clearly defined framework of tax laws, import duties and incentives for private investors.
- Clearly defined procedures for interfacing with government, preferably through a "one-window" facility for a unified approach with respect to all matters relating to approvals, permits, clearances and the like.
- An established Regulator acting independently of government, together with a record of adequate financial performance of the public elements of the power sector, and tariffs established at realistic levels for cost recovery.

Although most countries that are serious about inward investment are now working towards these objectives, progress is understandably uneven and many remain in a situation where the enabling environment for private investment is not yet as favourable as it might be.

### **4.2 Need for more domestic funding**

Fear of devaluation is one factor that seriously inhibits the flow of international funds to projects in the developing world. The situation is difficult when financing is in hard currency and the revenue stream is in local currency. Devaluation of local currency was the primary reason for defaults on Power Purchase Agreements in a number of countries during the recent economic crises in Asia and South America. Countries like Indonesia and Argentina had borrowed heavily on the international markets, and were simply unable to service their hard currency debts. In contrast, states like Malaysia that had financed their projects in local currency from domestic capital markets were unaffected, even although their currency had devalued.

It is the least developed countries without domestic capital markets that are particularly affected because they are forced to finance virtually the whole project in hard currency, irrespective of the actual currency needs. By doing so they assume a large exposure to currency risk which usually rests with the utility and ultimately the host government. This creates a vicious downward spiral because the poorest countries with no domestic funds find it harder to obtain finance, pay more for it and carry the greater risk.

The irony is that for a typical hydropower project, with its high civil works element, a significant proportion of the construction cost is local. In this respect hydro is potentially a much more secure investment than thermal power, which has a high hard currency content. It would not be possible to entirely eliminate the exchange rate risk, even for hydro, but a substantial proportion of the financing could be local currency funding if it was available. The MDBs are working to develop domestic capital markets in certain countries, and some ECAs are supporting transactions in a limited range of local currencies. While these moves are welcome, there is a need to widen and deepen the process before domestic financing can play its full role in many of the poorer countries.

#### **4.3 Refinancing can be an attractive option**

One important use of domestic funds is the refinancing of projects that are already completed, which releases capital for further new developments. It is much easier to refinance an existing hydropower project that is fully operational, than a greenfield project because many of the risks that deter financiers occur at the construction stage. Once a project is built and has a secure revenue stream it becomes an attractive investment suitable for the long-term investments, such as bonds.

In established economies like China where there is a strong domestic debt market based on Government bonds, and where large hydro schemes are mainly financed in the public sector, the principle of refinancing hydro projects using is already well-established. A recent example was the successful refinancing of part of the debt on the Three Gorges project through a public bond offering which was heavily oversubscribed.

In weaker economies hydropower projects are still being refinanced, but on the regional and international markets. Two recent examples are the Houay Ho and Theun Hinboun hydro projects in Laos, both of which export power to EGAT in Thailand. The two projects are under separate ownership but both were successfully refinanced, largely on the Thai market, within a few years of completion. In a situation where there is an export project, there is an obvious advantage in refinancing on a regional market in the currency in which the revenue stream occurs. For the same reason in the future we can expect projects situated in Nepal and exporting power to India, to be financed on the Indian capital markets.

#### **4.4 The advantage of an existing revenue stream (Linked projects)**

An established revenue stream from an existing project is a major advantage when it comes financing a greenfield project, because it eases the cash flow and provides a tangible security for the lenders. This is used in some rehabilitation projects, where the private company takes over an old scheme with the obligation to upgrade as well as rehabilitating the existing works. This happened, for example, on the CBK project in the Philippines, where the private developer

rehabilitated and upgraded two conventional hydro schemes and a pumped storage project, almost doubling the original capacity.

In situations where utilities are privatising generation assets, there is at least the possibility of linking the acquisition of an operational project with a contractual obligation to develop a new one. This was the case in Panama when, in 1999, AES acquired the development rights to the Esti hydropower project, along with its acquisition of an existing 90MW project. In a separate transaction they also acquired another 150MW project. Pre-construction expenses for Esti were paid out of the revenue stream from the existing generating assets, but the actual financing plan was seriously jeopardised by a general loss of market confidence following the ENRON collapse and the events of 9/11. In the end construction was able to continue through 2001 with short-term financing eventually being secured through a syndicate of local banks in 2002. The project was refinanced on completion.

The formula works particularly well for rehabilitation projects but, as we see above, it also can be applied to greenfield situations. An obvious example would be the case of a cascade development where some projects are operational and others remain to be constructed. Where the right situation exists, the linkage of a completed project with an obligation to make further investments make it much easier to attract finance.

#### **4.5 The case for split ownership (Multipurpose projects)**

Multipurpose projects present the possibility of dividing the ownership between the public and private sectors. This was the case on the San Roque project in the Philippines, where the project was too expensive for the public sector, and not sufficiently attractive in its entirety for the private sector.

The project provides 345MW of hydropower and sufficient water for 87,000ha of irrigation, plus other benefits. In the end it was financed by dividing it geographically into two, with the public sector owning and financing the dam and ancillary works, while the private sector owned and financed the power complex. Notwithstanding this split ownership the whole project was built under a single EPC contract to avoid interface problems.

While it could be argued that under such an arrangement the public element that was financed under concessionary terms was subsidising the private element, which obviously could not exist without the dam. However the reality is that neither would have existed without the split ownership arrangement that was eventually adopted. It is probable that we shall see other multipurpose projects using the same formula.

#### **4.6 Risk sharing between the public and private sectors**

Despite the comments made in Section 2 above, there is no fundamental shortage of private money or lack enthusiasm to invest in hydropower - given the right conditions. But it all hinges around risk. This is demonstrated by the fact that commercial banks compete vigorously for export credit mandates when it comes, for example, to the supply of turbines or generators because it is essentially risk-free business. The message is very simple: if we can remove risk the financing problem disappears. In order to make private funding more accessible and less expensive; it has to be protected from serious risk exposure. Logically this has to be the strategy in developing any new financing models.

In the early days of private hydropower, many governments attempt to place virtually all the risks onto the private sector. However this idea failed because the commercial lenders simply rejected the proposition, or the end-price was simply too high. Although the governments were following what appeared to be a perfectly logical line of reasoning at the time, it was probably incorrect. On reflection there appears to be a good case for arguing that it is in the public sector's interest to assume more risks - not less - because in the end it is likely to result in a cheaper projects over which the utility retains more control. The reasons for this are explained below.

When schemes have been developed under the BOOT formula, risk has traditionally been handled by pushing it down the project structure away from the government and its utility, towards the project company and its contractors. To the maximum extent possible each party in the long contractual chain tries to pass the risk to those below him, but he also retains some contingency in case things go badly wrong. The result of this "ring fencing" is that the project cost is greatly increased as each party makes its own provision for the worst-case scenario. The layering of contingency upon contingency burdens the project with the cost a lot of eventualities that may never happen.

An example will illustrate the point. On a project currently being negotiated, any delay in commissioning will cost the owner \$20m/month in lost revenue. Although he would hope to recover some of this from the contractor, any prudent owner without recourse to other income will inevitably have to allow some contingency for late delivery. The cost will be significant (some tens of millions of dollars) and it will obviously reflect in the tariff, irrespective of whether the delay materialises or not. However the actual cost of delay to the utility itself is likely to be much less, because it would simply compensate by increasing generation at existing power stations elsewhere. In practice it would have been much cheaper for the utility to bear this risk, subject to certain safeguards, in return for a commensurate lowering of the tariff.

This is just one example to illustrate the fact that is always much less expensive to handle risk on a "pooled" basis by sharing it between a portfolio of similar risks, than by "ring fencing" it at the individual level. That is the basis of the insurance industry. Each situation has to be analysed individually, but translated into the terms of the hydro industry, this means that there will be situations where it is preferable for the public partner to carry more of the risks in the interest of reducing costs and making finance more accessible.

#### **4.7 Role of the Multilateral Development Banks**

As already indicated, the MDBs will be central to mobilising funds in the future, as they have been in the past. Their role has changed, from the traditional one of supplying concessionary finance to public projects, to one of facilitating access to a much wider range of funding from private sources through a system of guarantees and other forms of credit enhancement. The effect of these mechanisms is to increase the maturity of loans, typically doubling them (Fig 3) and to significantly reduce interest charges (Fig 4). Both of these have a major influence on the viability of hydropower.

The object of the MDBs is to leverage as much private funding as possible using the limited public resources available, but they also play an important role by supporting projects in many other ways. It is now common practice that MDBs provide support to projects based on a wide variety of models involving a mix of public and private funding. This can include:



**Assistance to host governments**

- advice on the structuring of projects

**Loans to the Project Company**

- direct lending on commercial terms (e.g. IFC “A” Loans)
- syndication of commercial lending (e.g. IFC “B” Loans)

**Loans to the Host Government (concessional)**

- project preparation (technical and environmental studies)
- public sector equity holding in the Project Company
- related investments (environmental management, etc)

**Guarantees and special investment funds**

- political risk guarantees (for debt and equity)
- commercial risk guarantees (for debt)
- regional funds for Public-Private infrastructure investment

Against a background of increasing demand for the financing of water infrastructure, the catalyst role of the MDBs is likely to become even more important in the future. The World Bank's New Water Sector Strategy of 2003 has been widely welcomed as a precursor to more active support for infrastructure development in the future.

**4 Prospects for the future**

What are the prospects for the future? Hazardous a few guesses, they might be as follows:

- Small hydro projects are likely to continue to be developed under BOOT or similar arrangements that involve private ownership. In many countries there are special funds offering favourable credit terms to stimulate small projects, and these are likely to grow in the future. Financing this type of project is much easier than for large schemes.
- For larger facilities we may be witnessing a swing away from privately owned (and privately funded) projects, towards a mix of public and private investment in what are still essentially public schemes. If this happens the principal role for the private sector would be as a lender rather than an investor.
- In order to stimulate private lending, projects will have to be structured with an underlying presumption that the lender is insulated from all risk. This will require a guarantee structure similar to the arrangements used under the BOOT formula (i.e. sovereign guarantees supported as necessary by international undertakings).
- Equity participation by the private sector will continue in the right circumstances, for example on multipurpose projects where split ownership may be used to attract private finance to the commercially viable element, or on linked projects where there is an existing revenue stream to assist financing.
- A lot more attention should be given to the issue of structuring Public-Private Partnerships, with particular reference to solicitation procedures and the relative

responsibilities of the parties in terms of risk assumption and revenue sharing. There is a need for public sector capacity building in this area.

- The role of the MDBs and other international funding agencies will continue to be central to the whole process, through directing their resources to leverage increasing amounts of private sector support. In a complex and changing situation, there is an ongoing need to examine their role to ensure that the products they are providing are appropriate.
- It is important for the MDBs to foster a favourable enabling climate for private participation, particularly in the least developed economies, and to pursue a strategy for improving the availability of local funding through domestic capital markets.

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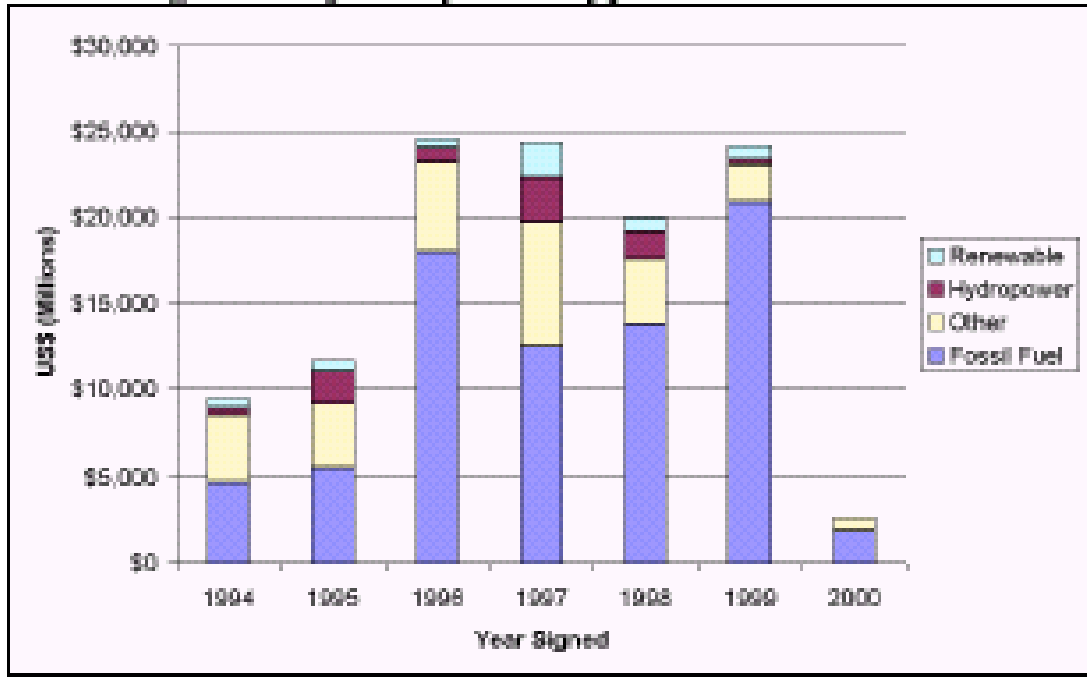
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Fig 1: Annual investment in signed (private power) projects (1994-2000).

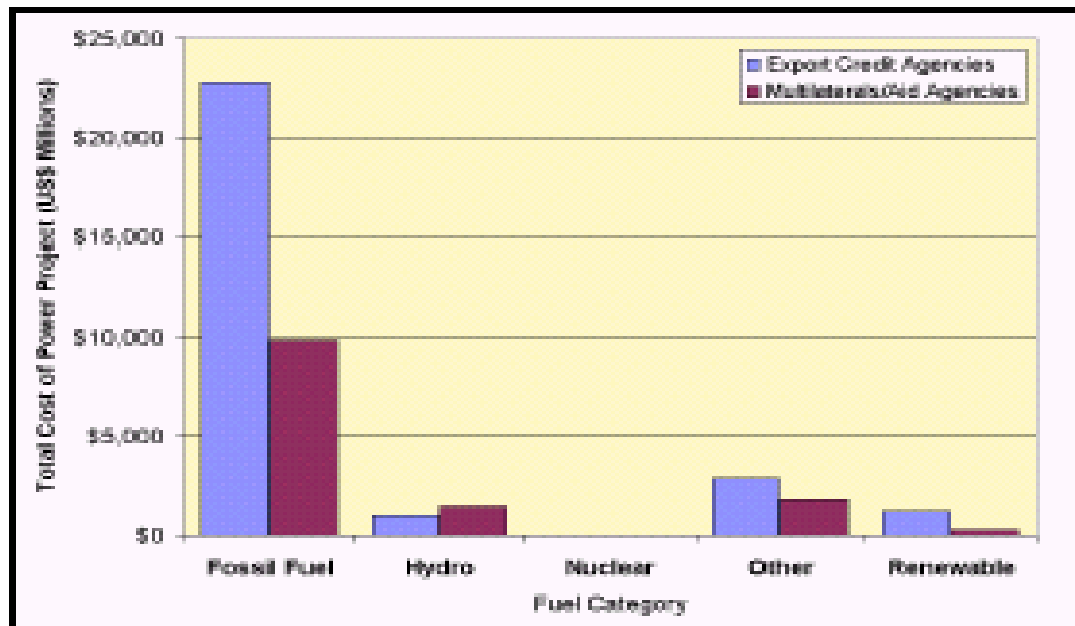
Fig 2: Investment (in private power) by ECAs and MDBs (1994-2000).

Fig 3: Effect of Guarantees on Loan Maturities for infrastructure projects.

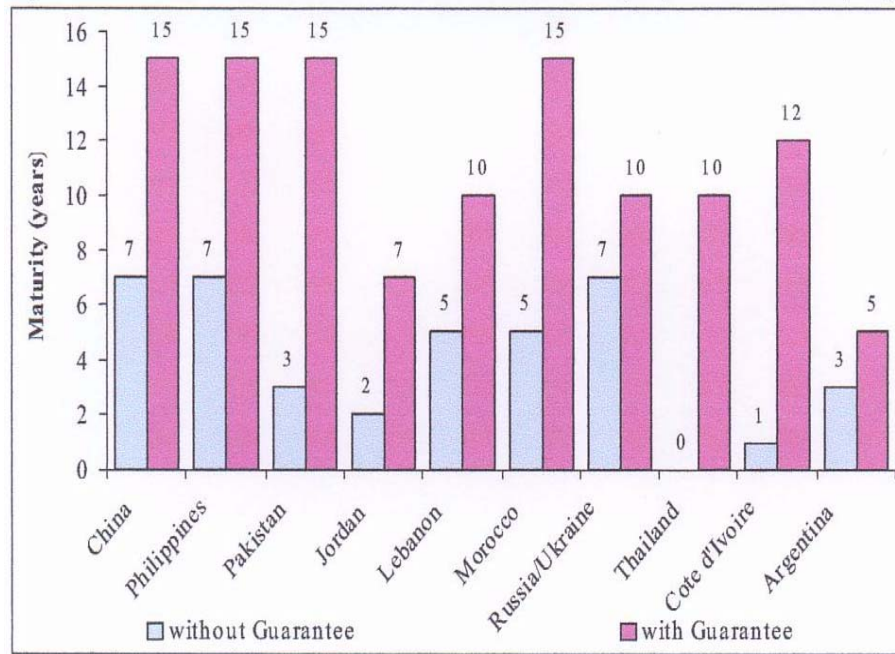
Fig 4: Effect of Guarantees on Interest Spread over US Treasury long term loans.



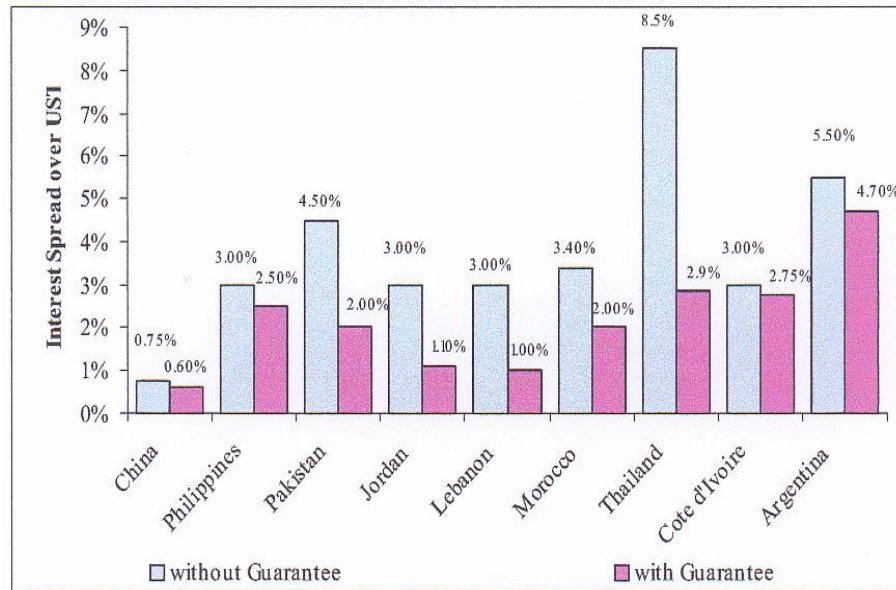
**Fig 1: Annual Investment in Private Power Projects (1994-2000)**  
 (source: Thematic review III.2 of the World Commission on Dams)



**Fig 2: Investment by ECAs and MDBs in private power (1994-2000)**  
 (source: Thematic review III.2 of the World commission on Dams)



**Fig 3: Effect of Guarantees in Loan Maturities for infrastructure projects**  
(source: World Bank 2001)



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