



MWH

Hydro Finance & Public-Private Partnership

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By Bruno Trouille
Vice President



The Complexity of Hydropower Development

Before developing your contract strategy and negotiation, keep in mind the following:

- **Assess and mitigate project risks as much as possible in earlier project phases through detailed field investigations**
- **Develop a realistic construction schedule**
- **Individualize specifications & tender documents to your project characteristics**
- **Be aware of the constraints of the proposed financing structure (debt and equity)**
- **Projects often need to involve local communities and NGOs for public acceptance**

The Hydropower Paradox

Hydropower offers highly valuable economic benefits:

- Long-term low-cost
- Ancillary Benefits
- GHG emission savings
- Recreation
- Navigation
- Irrigation
- Water Supply and Flood Control

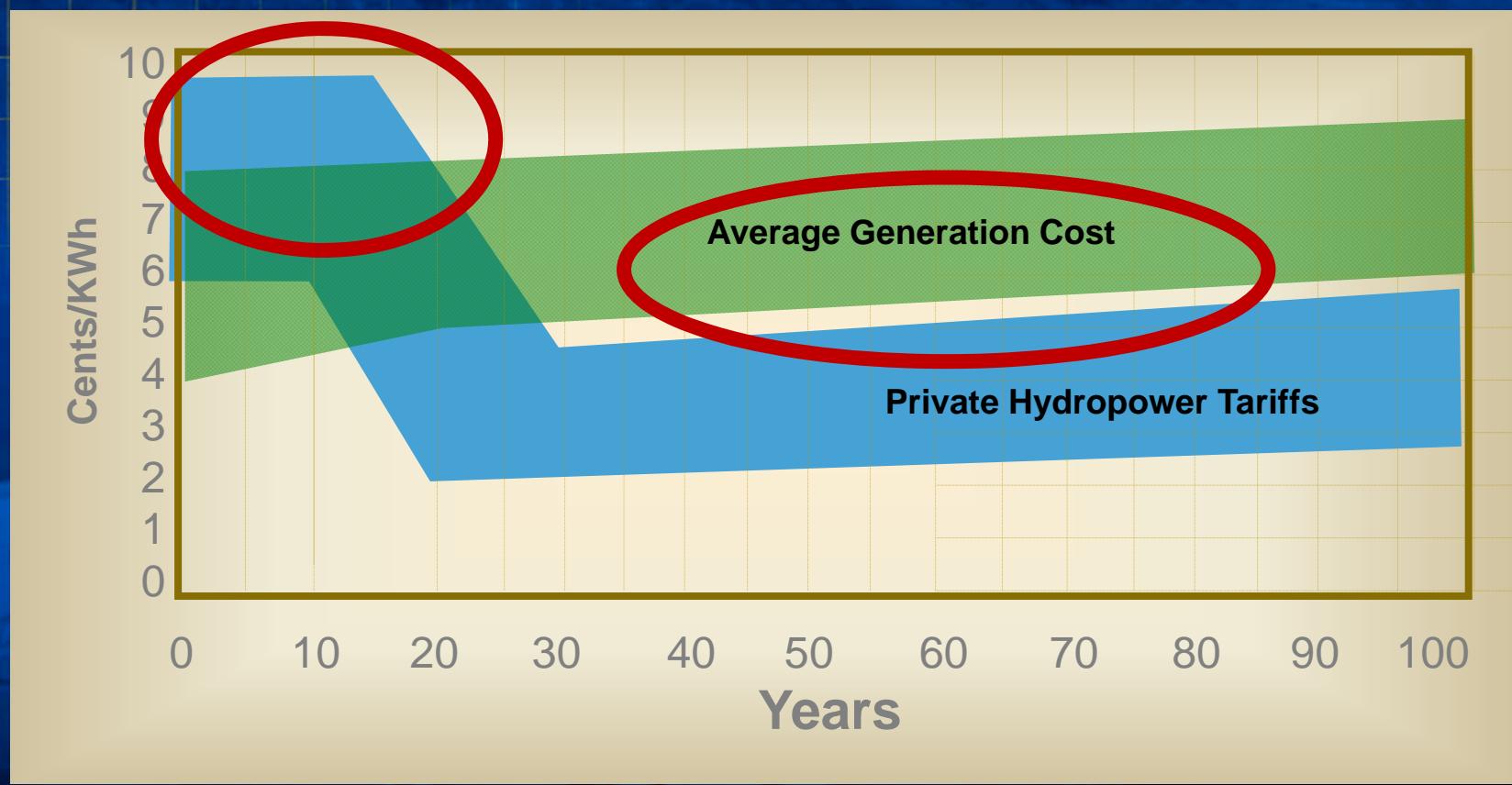


The Hydropower Paradox

However, new hydropower developments are facing many challenges:

- Lack of solid legal and institutional environment
- Lack of transmission interconnections
- It does not get full credit and revenues for all the economic benefits
- There is often a gap between long-term economic viability and short-term financial competitiveness
- The risk profile acts as a deterrent
- Lack of cost reflective tariff
- The contentious dam debate has deteriorated the image of hydropower

Public/Private Hydro Tariff Versus Average Generation Cost (Constant 2014\$)



So What are The Solutions?



Caruachi, Venezuela

The Solution Often Requires a Partnership Between the Public and Private Sectors

Nepal has a huge hydro potential and power needs where both public and private sectors can play a very active role

For instance...

Public Sector

- Enables legal and institutional frameworks
- Builds needed transmission networks
- Creates upstream storage reservoirs
- Assists in developing basic project knowledge and infrastructure
- Takes the hydrological and geological risk

Private Sector

- Develops storage and RoR power plants
- Responsible for plant O&M performance
- Pays higher royalties after debt repayment
- Attracts new players (legal, environmental, technical, economics, construction, etc.)

Why Does the **Public Sector** Want to Attract Private Investments?

- Compensate for a scarcity of public funds
- Increase national and regional economic development through much greater power construction
- Reduce power shortages and enhance industrial and commercial development
- Speed up development and implementation of much needed projects
- Promote competition and an efficient power market mechanism
- Stimulate dynamic and innovative local industries and local economic development

Why Would the Private Sector be Attracted by Investing in Hydro?

- Active player in national economic development
- Long-term return on equity investments
- Ambition to expand beyond the home territory and diversify beyond their core business
- Ensure asset-based long-term revenues
- Increase portfolio of renewable energy resources
- Be a successful player on the regional energy market

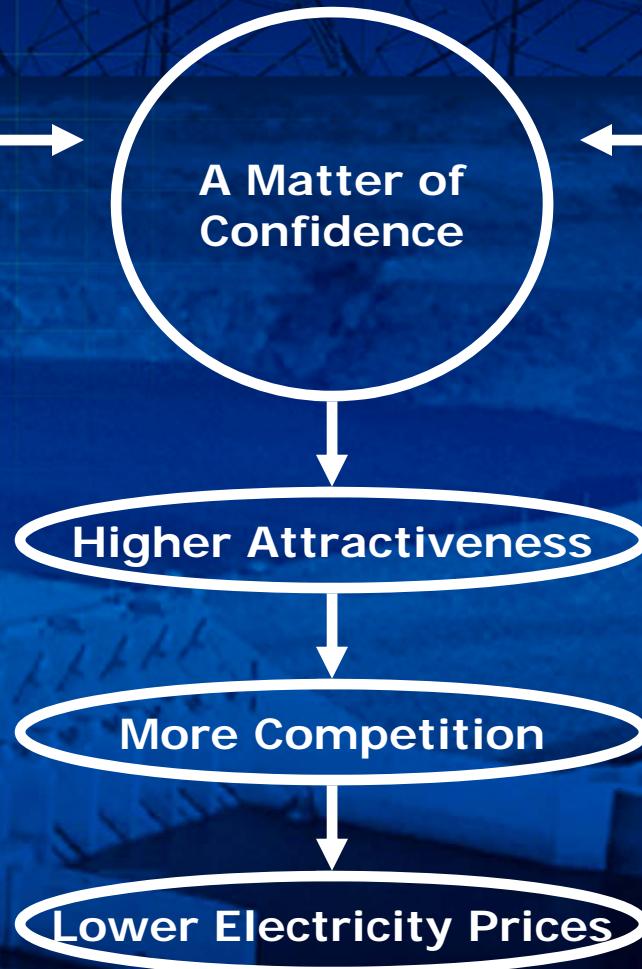
A Public Private Partnership is a Win-Win Arrangement

The Public Sector

- Achieves debt reduction
- Is in a better position to control issues of national interest, such as safety, water rights, resettlement, river basin development, etc.
- Obtains ownership of relatively new hydro at the end of the concession period

The Private Sector

- Accesses the project with an acceptable level of risk
- Provides efficiencies:
 - Funding
 - Industrial value added
- Rewarded for performance



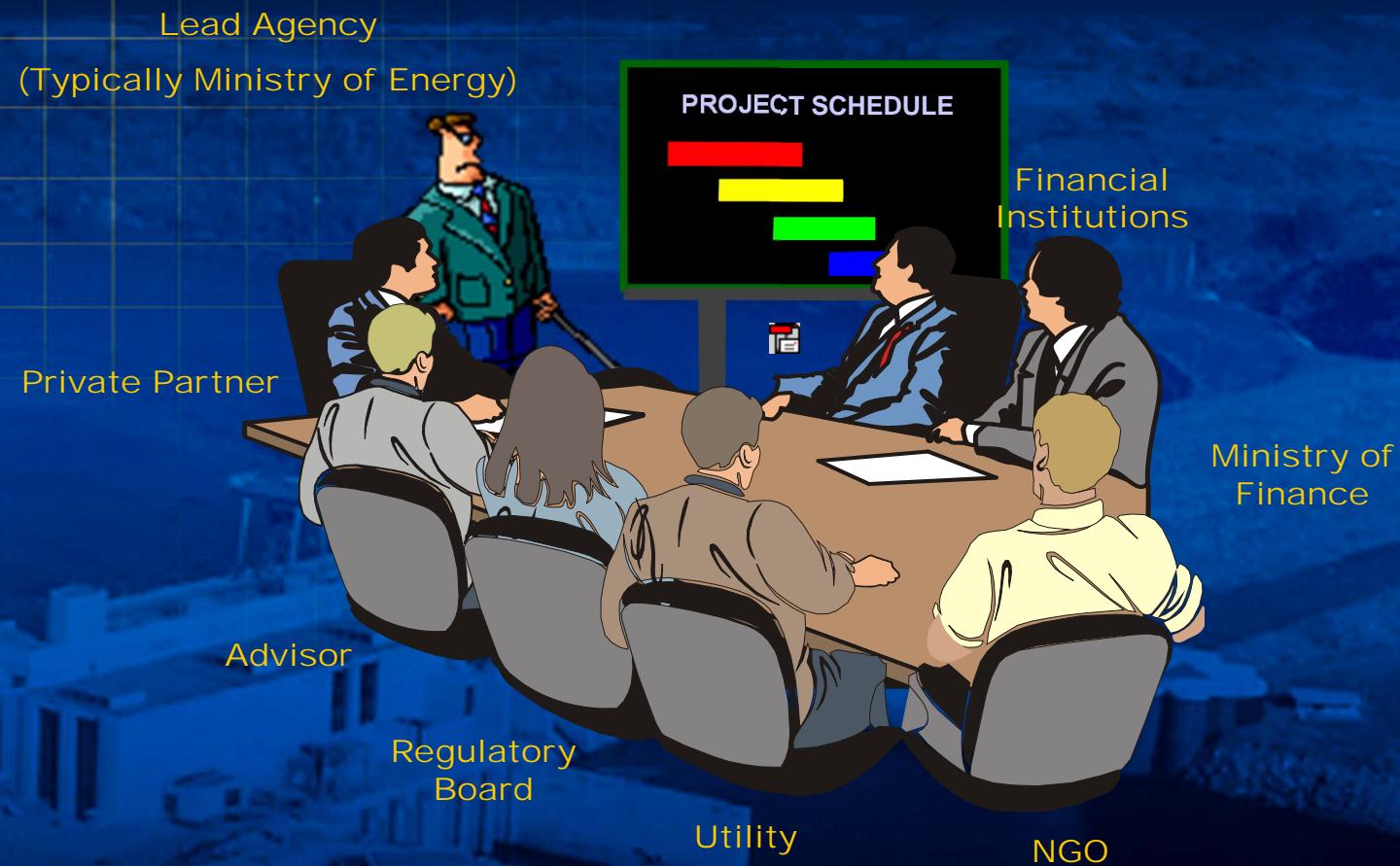
A Two-Phase Approach to the Solution

- Early Developmental Phases
- Project Implementation Phases

A Two-Phase Approach to the Solution

- **Early Developmental Phases**
 - Primarily public sector involvement
 - Advisory Team (Technical, Environmental, Socio-Economic, Legal, and Financial)
 - Field investigations (topo, geotechnical, seismic, environmental, resettlement, etc.)
 - Negotiate PDAs and PPAs
 - Prepare specifications and tender documents
 - Reach financial closing

Leadership and Authority is Needed



Extensive Up-Front Studies are Needed

Reconnaissance
Studies



Site Investigation



EIA Studies



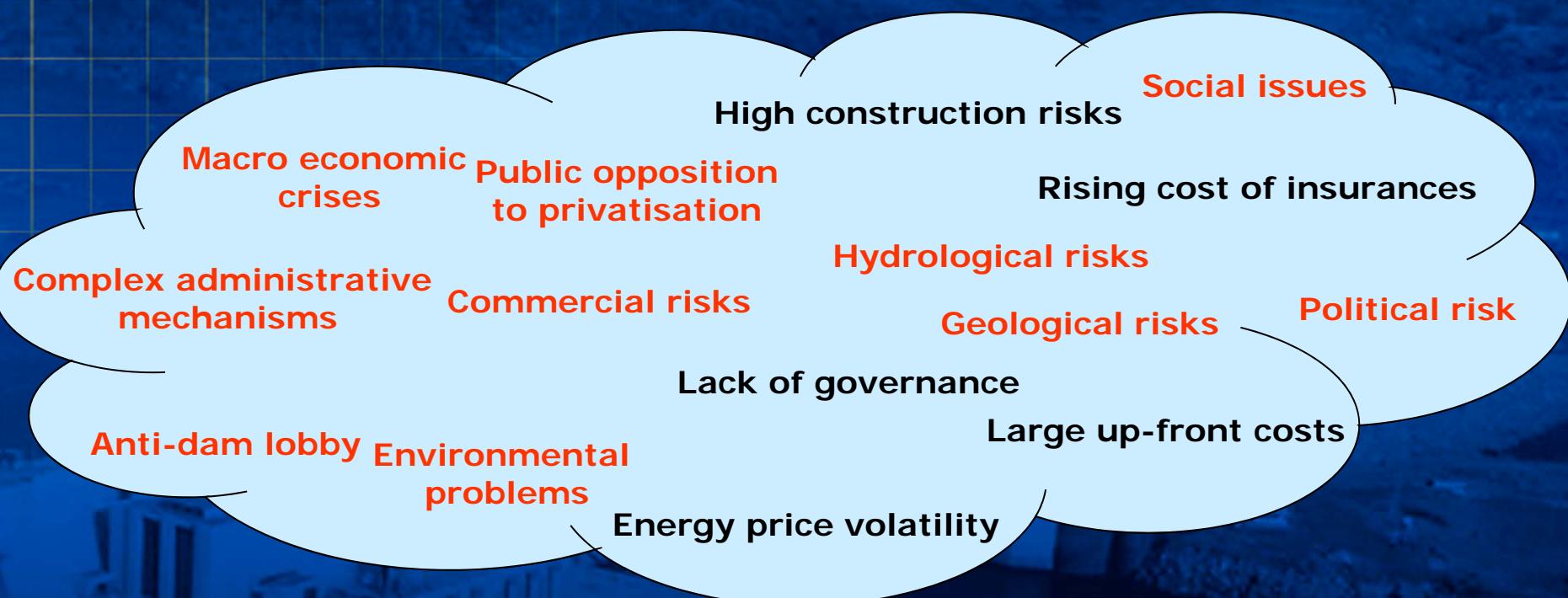
Project Concept
and Definition



TIMELINE

A well-thought public private partnership can allocate risk more equitably.

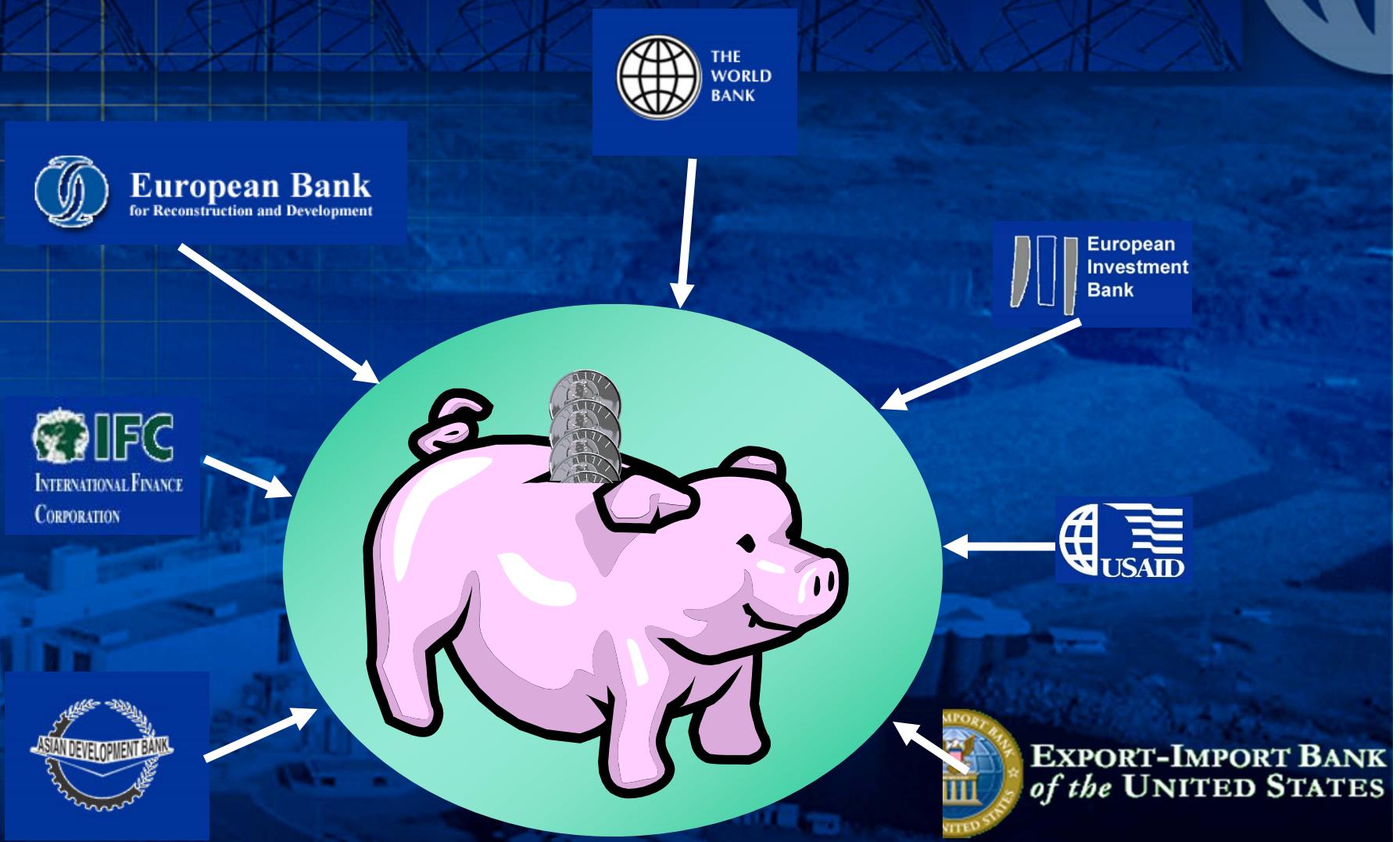
Each project is unique however.

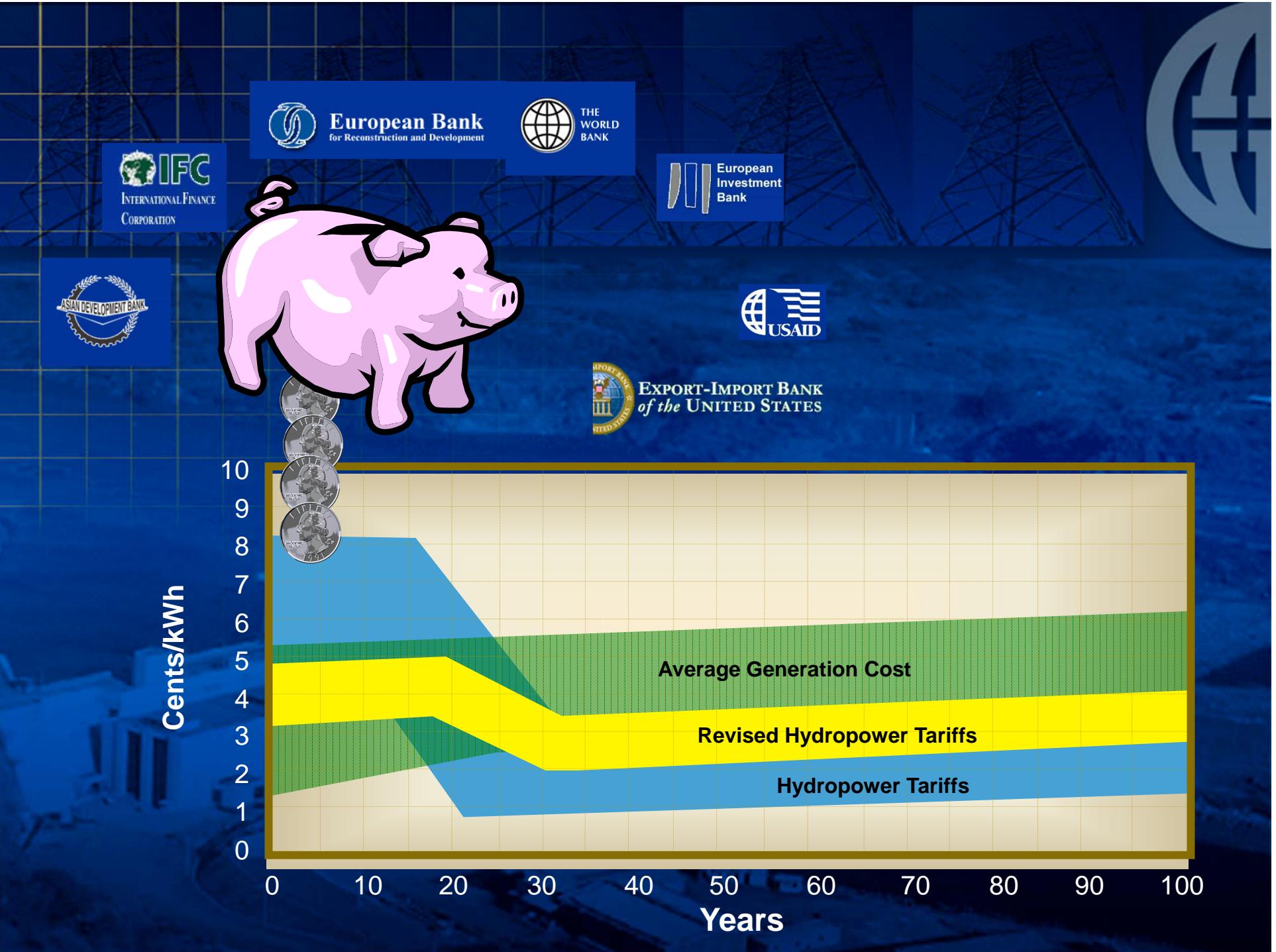


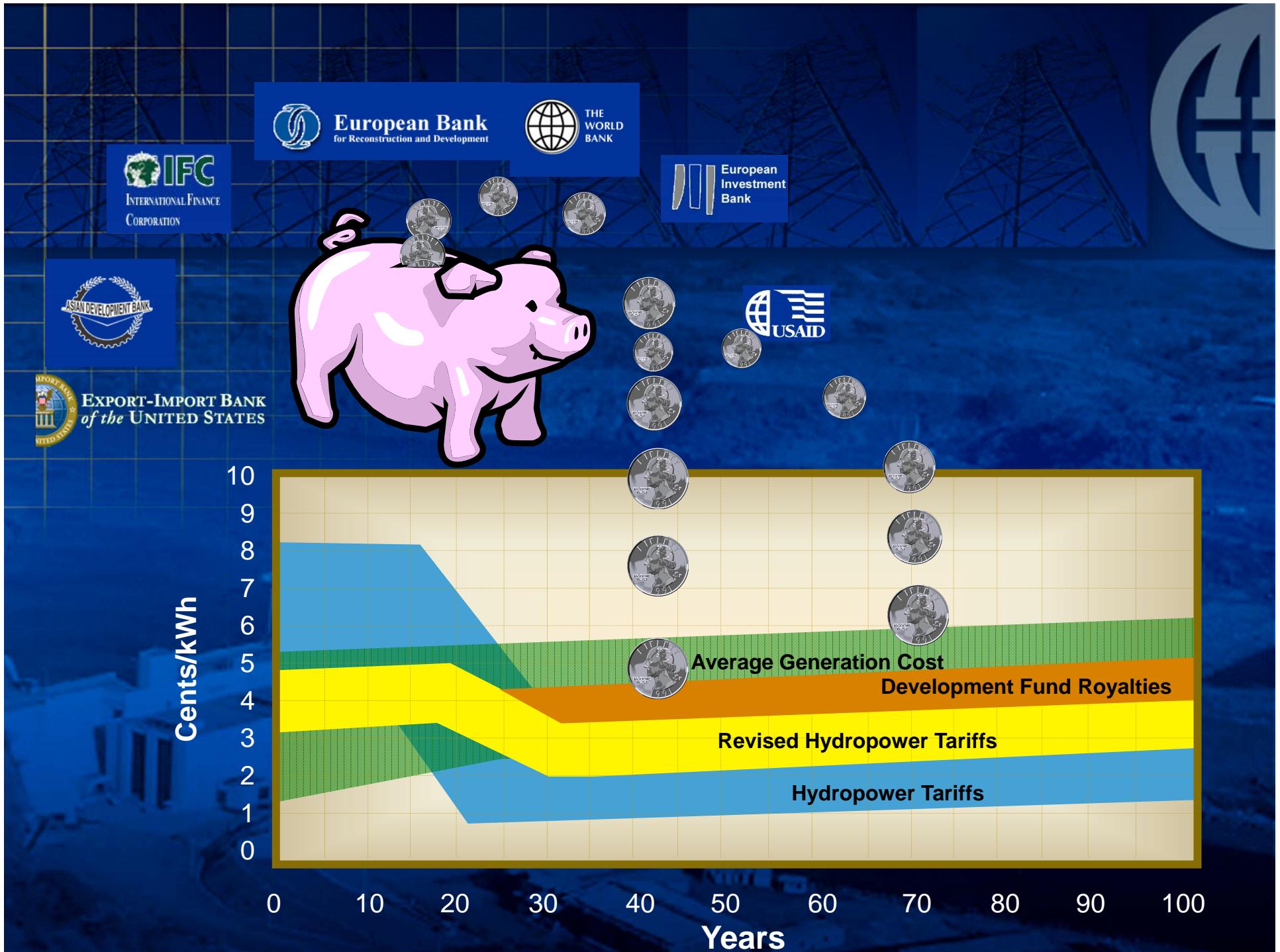
A Two-Phase Approach to the Solution

- **Project Implementation Phases**
 - Continued active public sector and private sector involvement
 - Integration of generation and transmission commissioning
 - Maintain project risk register
 - Monitor project construction progress and scheduling

Country and Regional Development Funds are Needed







Hydro Finance Articles

PROJECT FINANCE

The Need for a New Approach To Hydropower Financing

By Bruno Trouille

Historical data and trends of the past few years illustrate why a new approach to hydropower project financing is needed. In order to increase investments in hydropower, an effective approach must balance the market constraints of private financing with a need for a much more active role by the public sector.

Recent statements made by private developers canceling their hydroelectric power projects illustrate that the current model used to develop and finance private hydro projects is inadequate.

In order to create new ways to attract private hydropower financing, host governments and utilities, as well as multi-lateral and bilateral development agencies and donors, need to address several issues that are critical to the development of hydro projects. Some of these issues include:

- Securing the financial support of the development agencies and donors in all the front-end studies;
- Initiating all permit applications and contract negotiations that lead to project definition and acceptance;
- Necessity to have a clear strategy

Bruno Trouille is a vice president at MWH (Montgomery Watson Harza). He serves as senior project manager or lead economic/financial analysis on power projects, power system expansion studies, regional market analysis, and project financing. This article is the first of a two-part series by Mr. Trouille. Part 2 will present recommendations for the project implementation phase of hydro projects.

and policy set by the host government toward the development of hydro resources;

- Recognition of the hydro project's long-term benefits; and
- Early involvement of affected communities, environmental agencies, and non-governmental organizations.

Other issues to be addressed in the early development phase of hydro projects relate to the ability of utilities and consumers to pay market-based tariffs and the definition of a proper mix of public and private financing for the construction phase.

Once these issues have been fully addressed, the private sector can play an important role in developing and financing hydroelectric projects.

Summarizing hydro's current financing climate

One of the main reasons why private hydropower financing has not been very successful is illustrated in Figure 1. Figure 1 compares the average energy tariff required to make private hydropower financially viable and the average generation or production cost of most electric utilities. It does not represent all possible scenarios, but rather presents typical ranges of utility and project experience. The 100-year time frame shown in the figure reflects the long-

economic life of civil works associated with dams and hydropower facilities. Construction costs for the civil works often represent 50 to 75 percent of the total investment costs.

The high initial investment cost associated with hydropower typically requires high tariffs in the first ten to 20 years to repay the loans, satisfy the banks' debt coverage ratios, and provide an acceptable return on equity. Figure 1 shows a typical range of 4 to 8 cents per kilowatt-hour (kwh). Once the investment loans are repaid, the cost of hydropower drops dramatically since one needs only to pay for operations and maintenance (O&M) costs, royalty payments, and regular electro-mechanical refurbishments and upgrades. Over time, the cost is very stable and is not subject to fuel price fluctuations. Numerous examples show how inexpensive hydropower can be once the initial investment loans have been repaid. Average production costs are often below 1 U.S. cent per kwh.

In contrast to the high initial tariffs often required for hydro projects, the average cost of generation or production is currently between 1 and 5 cents per kwh, as shown in Figure 1. The comparison is made with the average overall generation cost rather than an alternative tariff for a thermal plant. This is to highlight the current low range of 1 to 2 cents per kwh found in many places with abundant existing hydropower facilities that have been fully depreciated and in other places where the construction of thermal power plants had been greatly subsidized. As new power plants are built, the lower range of the average genera-

PROJECT FINANCE

Completing the Job: Ideas for Advancing Hydro Development

By Bruno Trouille

Once a proposed hydro project is identified and accepted in principle by all parties involved, the work of implementation begins. Offering new and additional financing mechanisms and project implementation approaches will aid the completion of more new hydro projects.

Selecting the project development team

Once a proposed hydroelectric project is well defined and acceptable in principle to the host government, the utility, the non-governmental (NGO) community, and potential lenders, implementation can begin. During this phase, several actions are critical to ensure successful completion.

- These actions include:
- Selecting the development team
 - Negotiating the final financing package
 - Choosing the implementation program

Throughout project implementation, I recommend that the advisory team, selected during the development phase as outlined in Part 1 of this series, remains actively involved with the host government or utility. The team is needed to protect the interests of the government or utility and to expedite the transition to project implementation.

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In return for a 20- to 30-year concession for the proposed project, the project development team is asked by the host government or utility to pay an initial access fee and annual royalty payments. The royalty payments usually start once the project company re-pays all major debts to its lenders. The host government or utility tries to recover, through the access fee, all expenses incurred during the early development phase. One criterion a host government or utility can use in selecting a project development team is to the amount of access and royalty fees offered.

Negotiating the final financing and implementation package

If the recommendations offered in Part 1 of this series are followed, the technical, environmental, and legal issues surrounding the project will have been addressed during the early developmental phase. In addition, the advisory team will have already explored a range of financing options with interested international and local lenders. Consequently, at the project implementation phase, the project development team can focus on negotiating a final financing package.

I recommend that the host government or utility gives the project development team the flexibility to decide how it will construct the project — either by bidding separately for the civil works and procurement of electro-mechanical equipment, or by asking for an engineer-procure-construct (EPC)-type or design-build construction contract. Depending on the construction risks associated with a project, an EPC-type contract may be very expensive, whereas a risk-sharing

Hydro Finance Handbook

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Hydro Finance Handbook

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Many Challenges Face the Hydropower Development Community, so in Summary...

- **Refine the roles of the public and private sectors**
- **Enhance the legal and institutional frameworks to facilitate hydro implementation**
- **Expedite process to negotiate PDAs and PPAs**
- **Seek public private sector partnerships**
- **Mitigate project risks by involving the public sector in the early development phase**
- **Pursue open dialogue with multilateral and bilateral financial institutions**
- **Involve the local community and key stakeholders**



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Thank You

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