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Lao hydropower potential and policy in the GMS context

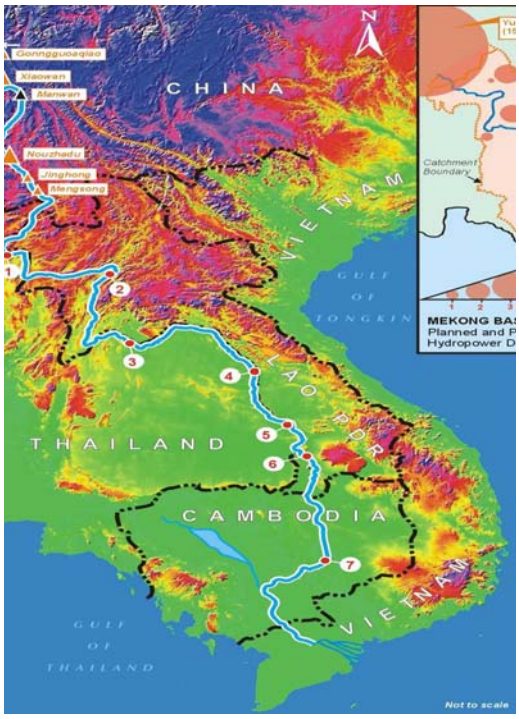
Presented by:

Mr. Sommano PHOLSENA
Dr. Daovong PHONEKEO

ELECTRICITÉ DU LAOS (EDL)

INTRODUCTION

Lao PDR is a mountainous, heavily forested country and without direct access to the sea. It has a superficies of 236,800 km^2 and a population of about 5.5 million which 80% lives in rural areas. Laos is engaged in rice-based agriculture and harvesting of forest products. The narrowly based economy is one of the least developed in Asia with an approximate per capita Gross National Product about US$ 330 per annum. In 2003, the agriculture sector contributed about 50% to GDP, followed by the services sector 30% and the GDP share of industrial sector 20%.



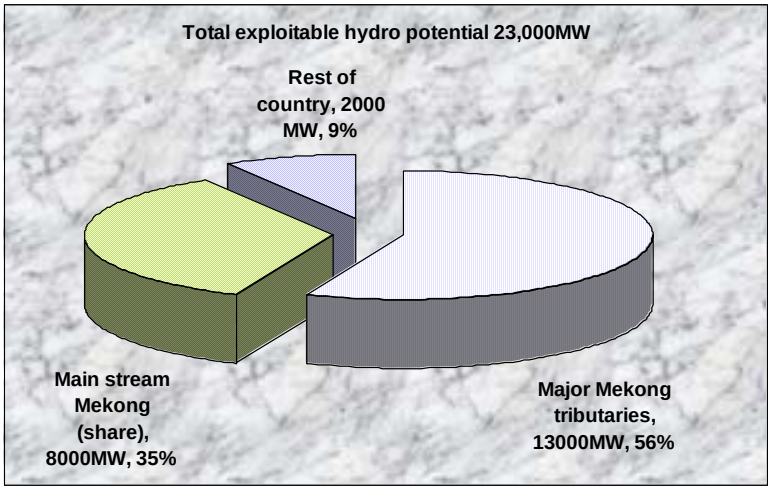
The large scale of tropical hardwood has been rejected as unsustainable and environmentally degrading in the long term.

In contrary, the development of hydropower facilities, with planned and managed environmental impacts, is seen as an ideal opportunity for Lao PDR to enhance its economic prosperity and improve the lives of its people.

Lao PDR possesses a large, almost untapped, hydropower potential beyond its own needs and has a central location in a regional market of the Greater Mekong Sub-region characterized by expanding electricity demand. Exports of electricity have been an important foreign exchange earner since 1971 however the Government of Lao PDR (GOL) is relying on an expansion of this activity to boost revenues to further its social objectives.

Hydropower Potential of the country

The theoretical hydropower potential of Lao PDR amounted about 26,000 MW (excluding mainstream Mekong) while the exploitable hydropower potential, including share of mainstream Mekong, around 23,000 MW. An inventory of promising hydropower development possibilities in the major Mekong tributaries was prepared by the Mekong Secretariat in 1970 [1], and updated by WATCO in 1984 [2], assuming an average plant factor of 0.6 (14.4 hours



[1] Mekong Secretariat, "*Inventory of Promising Tributary Projects in the Lower Mekong Basin - Volume II: Laos*", Bangkok, Thailand, Dec 1970.

[2] WATCO, "*Lower Mekong Water Resources Inventory - Summary of Project Possibilities*", Report to Mekong Secretariat, Bangkok, Thailand, Sep 1984.

peaking operation), it was estimated that a total installed capacity of around 13,000 MW could be developed in these basins.

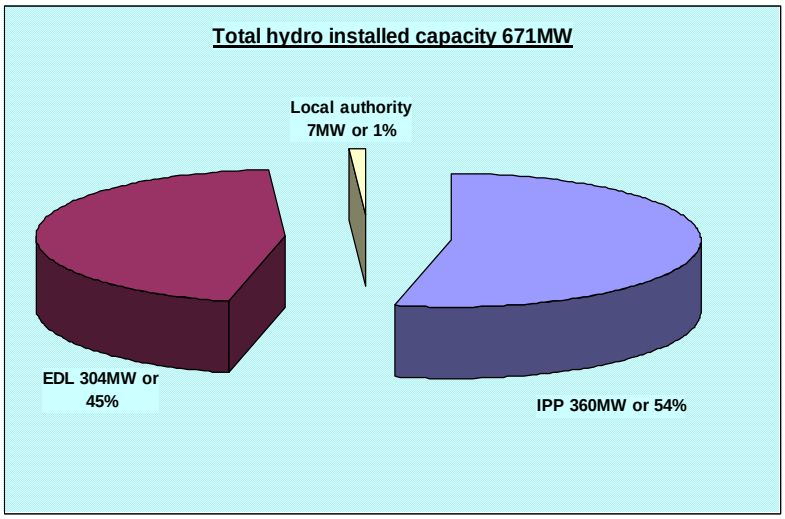
Development of the mainstream Mekong has been the subject of a number of studies since the 1950s (although likely to be realized only after the majority of developments on the major tributaries have been built). The latest investigations, presented in 1994[3], proposed a cascade of 10 run-of-river projects with a total installed capacity of 14,600 MW. Five of the projects are located entirely within Lao PDR while three projects lie on the Lao-Thai border. The total installed capacity of the Lao projects on the mainstream Mekong, with a 50% share of border projects, is about 8,000 MW.

In addition, other projects with an aggregate installed capacity of about 2,000 MW have been identified in minor Mekong basins and in non-Mekong watersheds draining into Vietnam.

The assessment of 23,000 MW as the total exploitable potential in Lao PDR is only an estimate. Some of the studies involved in this estimate are up to 30 years old and it must be borne in mind that limitations in hydrological, geological and other technical information render the estimate approximate. Furthermore, it represents an upper limit, bearing in mind that the socio-environmental impacts associated with development of some part of the total potential may be considered unacceptable by today's more stringent standards.

Of the many hydropower projects under consideration, Namtheun-2, is considered by independent experts as having greatest potential to achieve the country's development objectives and is expected to be commissioned by 2009.

Up to date only 671 MW of the estimated 23,000 MW of exploitable hydro potential has been harnessed so far. Compared with the total installed capacity of 685MW, the hydropower share of covers 98% and the rest of 2% is from diesel. From total of hydropower plants, 304MW (45%) are under EdL's responsibility and another 360MW (54%) are owned by Independent Power Producer-IPP (2 projects) and the rest of 7 MW (1%) under provincial authority.



Domestic Market

The reference point in formulating a development plan for the domestic market is the forecast of demand established by the Government's target of electrifying 90% of household by 2020

[3] Compagnie Nationale du Rhône, Acres International and Mekong Secretariat, "*Mekong Mainstream Run-of-River Hydropower*", Bangkok, Thailand, Oct 1994.

(currently only 41% of households in Lao PDR are electrified). This target will be achieved by:

(i) Off-grid development – a program of off-grid electrification targets 150,000 household installations by 2020.

(ii) Grid extension program to increase on-grid household electrification to meet the balance of households required to achieve the GOL's target.

Item	Unit	2002	2005	2010	2015	2020
EdL PDP Demand Forecast:						
Energy Consumption	GWh	968.8	1,839.3	2,775.9	3,716.8	4,834.2
Av. annual Growth Rate	%		24%	9%	6%	5%
Peak Load	MW	204.7	367.7	542.8	727.9	948.8
Av. annual Growth Rate	%		22%	8%	6%	5%
Load Factor	%	55.3%	55.6%	60.0%	60.0%	60.0%

GOL Hydropower Development Policy

Policy Goals

The main objectives of GOL power sector policy include:

1. Earn foreign exchange through electricity export to finance GOL's economic and social programs;
2. Increase access to electricity by grid extensions and off-grid rural electrification;
3. Satisfy growth in domestic demand;
4. Maintain an affordable tariff to promote economic and social development;
5. Operate EdL on sound commercial principles;
6. Replace dependence on imported fuels for energy generation.

As the main instrument of power sector policy, hydropower development in Lao PDR has been guided by these goals. Many promising hydropower sites have been studied and a number of projects identified.

Under GOL policy, hydropower projects in Lao PDR are classified into two distinct categories according to their primary purpose:

(i) *Domestic Generation Projects*: The primary purpose of domestic projects is to supply the national market. EdL using concessionary finance typically builds and operates these plants. Availability of capital normally limits their size to 100MW, as does the size of capacity increment that can be comfortably absorbed by demand growth in the grid.

(ii) *Export Generation Projects*: Export projects are primarily implemented by IPP groups specifically to meet commitments under the inter-governmental MOUs. The projects are large, generally in excess of 100MW, for two reasons at least; viz. power purchasers have expressed little interest in smaller increments, and low export tariffs generally require economies of scale for a project to be viable.

- The distinction between export and domestic projects has proven useful in defining and differentiating policy.

GOL Policy on Export Projects

The Greater Mekong Subregion (GMS), comprising Lao PDR, Thailand, Vietnam, Cambodia, Myanmar and Yunnan Province of the People's Republic of China, is endowed with substantial energy reserves, but they are unevenly distributed between member countries. Due to its energy surplus and geographical location at the hub of the GMS region, Lao PDR is strategically positioned to play a significant role in promoting regional power trade. The primary markets for Lao PDR are Thailand and Vietnam. These markets are large compared with the potential supply from Lao PDR. Sales of electricity to neighbors remain the main target for a reliable and sustainable revenue stream to give GOL some measure of financial self-sufficiency and a means to escape the poverty trap. Exports of surplus generation from domestic projects has long been making a valuable contribution and through the early and mid-nineties there was a natural correspondence in Thai and Lao policy to match the abundance of Lao hydropower potential with the high demand for electricity in Thailand.

In 1993 an MOU was signed with the Thai Government to supply 1,500 MW to Thailand by the year 2000, this being superseded in June 1996 by another to provide 3,000 MW by 2006. In 1995 an MOA was signed with the Vietnamese Government for electricity sales of 1,500 to 2,000 MW by the year 2010. With Cambodia, GOL signed an agreement on power sector cooperation with the Government of the Kingdom of Cambodia for least-cost supply of electricity to areas along the common border.

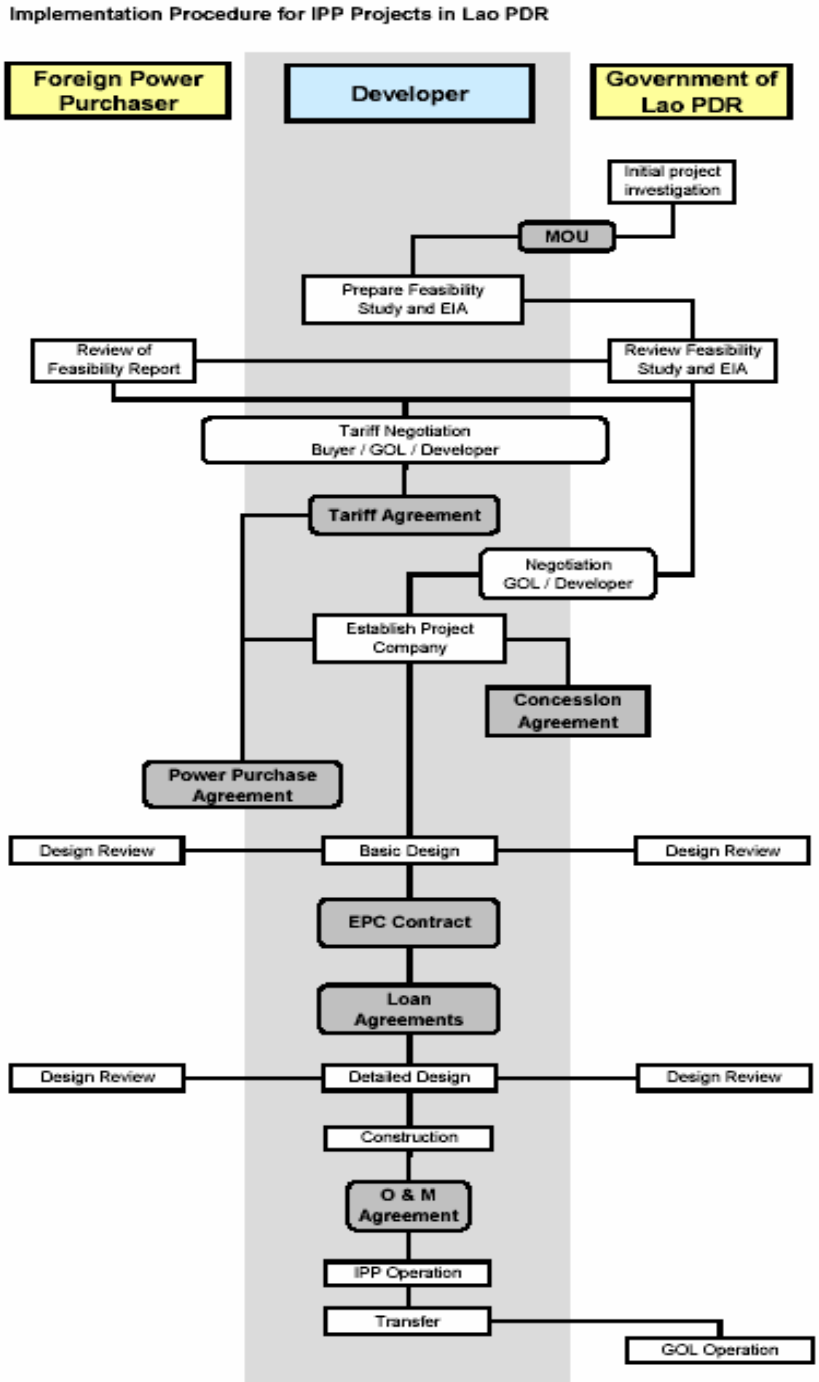
The projects needed to honor the terms of these inter-governmental agreements are large and the capital requirements are beyond the concessionary sources traditionally available to GOL. However, the momentum behind the world-wide trend towards private sector financing of power projects has provided an avenue and, accordingly, an invitation to the sector was extended for them to build and operate power projects on a BOT basis.

The award processes vary depending on the project but generally follows the procedure described in the following flow chart. Essentially, a developer is given a low level mandate through MOU to allow it to evaluate a site, to dimension and optimize a project and to assemble information about the project including its costs, environmental impacts and financial performance. This information provides a basis for opening up negotiations with GOL and the power purchaser for a Concession Agreement and PPA respectively. Power purchase negotiations are conducted in two stages with a binding Tariff Agreement signed first, then the full PPA. The concession negotiations also include an intermediate agreement, the Project Development Agreement (PDA), but this step is sometimes skipped. The purpose of the PDA is to lock in Concession terms before fixing the tariff so that royalties are not caught as a balancing item in the financial model between the purchaser's tariff and the developer's minimum return on equity.

Conclusion

It is obvious that hydropower has played a important role not only in the past but it will play a more vital role in the future in term of economic and social development in Lao PDR. So, it

is in the interest of the Lao government to provide and promote the development of hydropower in a sustainable way.



ATTACHMENT

Map on Interconnection hydropower project for export among in GMS