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HYDRO DEVELOPMENT IN SRI LANKA: PRESENT AND FUTURE
MANAGING SEDIMENT ~ DAM SAFETY ~ GLACIAL HAZARDS IN THE HIMALAYAS

Cross-border hydro projects in Asia: legal issues, hurdles and solutions

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The authors discuss progress, challenges and legal aspects in relation to the development of cross-border hydropower schemes in Asia, with particular lessons that can be learned from the Lao PDR-Thailand model. As these countries were pioneers for power trading based on hydropower development, their path to partnership has relevance for others throughout the region, such as Myanmar, China, Cambodia, Vietnam, and also the Indian Sub-Continent (India, Bhutan and Nepal).

Hydropower in South and Southeast Asia has an enormous potential, on both a large and small scale, to address regional energy requirements in a significant capacity. Waterways sourced in relatively untapped mountain ranges combined with the numerous Mekong Delta tributaries together represent a natural resource that, if properly harnessed, could transform both hydropower producing and consuming nations through newfound energy commerce. Asian nations have become increasingly interdependent in harnessing this engine for economic prosperity by constructing cross-border hydropower projects in an effort to meet growing regional energy demands.

However, as a result of differences in regulatory and legal environments between the power importer and exporter, unique legal issues in cross-border hydropower projects occur irrespective of the countries involved. Additional legal issues arise from the general international nature of a hydropower project, where many different players are frequently governed by the different legal and regulatory systems of their home jurisdictions. To assist in elucidating the legal issues and trends that are unique to cross-border projects, we draw here on historical lessons from the evolution of the Lao PDR-Thailand model. This model will be compared with recent cross-border projects in Myanmar in relation to export to China, as well as progress between Bhutan and India. From this analysis, a list of potential pitfalls and resulting resolutions will be built that can then be extrapolated to assist stakeholders to mitigate issues in future cross-border projects between Bhutan, Myanmar, Nepal and their neighbours.

1. Definition of cross-border hydropower projects

Because of their size and complexity, hydro projects are by anybody's definition, very international in nature, with many cross-border elements. Unless 100 per cent domestic debt and equity financing is available, there will be large flows of investment capital from foreign shareholders and foreign banks into the producing country, to finance these projects. Foreign engineers, geologists, lawyers, environmentalists, financial advisers, and so on, will be engaged to lend their expertise to the project developer, the government and lenders. Developers may seek Clean Development Mechanism (CDM) registration, and the sale of Carbon Credits on international markets. There will be offshore bank accounts, as well as offshore insurance of onshore risks. The contractual arrangements that glue the project and its many participants together, and the associated legal and political risks, are truly international in nature.

While all of these factors would certainly make the project international, we do not, for the purposes of this article, consider such a project as cross-border. The key factors necessary for that characterization are:

- the export of electricity produced by a hydropower facility for consumption in a bordering country;
- the use of a dam and reservoir on the border to produce electricity for sale to one or both of the neighbouring countries; or,
- the export of water across borders for the production of electricity.

The most common model by far is the first one, where the reservoir, dam and production facility are in one country and some or all of the electricity produced by the facility is transmitted across the border to a utility in a neighbouring country.

A less common model is where the reservoir and dam share a border. In such cases, the production facilities are likely to be on one side with the electricity export to the neighbouring country, but the production facilities may also be on both sides of the border. The third model, although quite rare, is one on which the authors have been advised, where the reservoir and dam are on one side of the border, with the water from the reservoir being transported through a cross-border chase tunnel to the neighbouring country, where the electricity is produced and water is used. This last model presents unique cross-border issues in its own right, which are beyond the scope of this article.

2. Regional perspective

Only a limited number of countries in South and Southeast Asia have the capacity to generate significantly more electricity than their existing and future domestic consumption. Fewer still enjoy the enviable position of being located next to countries with the opposite energy profile: electricity consumption that is considerably greater than production capacity from local resources. These countries are:

- *Nepal*: exporting primarily to India;
- *Bhutan*: exporting to India and possibly Bangladesh;
- *Lao PDR*: exporting to Thailand primarily, Vietnam secondarily, and possibly China; and,
- *Myanmar*: existing hydropower exports to China with potential exports to India, Bangladesh and Thailand.

Myanmar is in a more difficult position in relation to the others, in that its existing and projected domestic demand is also very strong and may require a considerable amount of its capacity.

Of all the countries in South and Southeast Asia, Lao PDR has had the most experience with the development of privately owned and financed cross-border hydropower projects. From Table 1, it is clear that Lao

hydropower potential is quite large, and comparable with the figures in Myanmar (46 000 MW), Bhutan (30 000 MW) and Nepal (43 000 MW). see Tables 1 and 2. However, two noteworthy factors make Lao PDR unique in comparison with its regional power-exporting peers:

- First, the number of projects, investment value and capacity that has been developed or is under development (construction or advanced negotiation prior to financial closing) is significantly greater than its peers.
- Second, the development model used by Lao PDR to achieve this accelerated pace of development is primarily a private ownership private financing model. The Government of Lao PDR holds a minority stake in most projects, but does so through corporatized entities, one of which is publicly listed. For these reasons, analysis and assessment of the Lao model may prove useful in predicting or informing the development of hydropower capacities in other regional power-exporting nations.

3. Cross-border power trading

It is important to draw a distinction between grid exports and independent hydropower project exports, as the typical types of trades that exist in relation to cross-border hydropower projects.

The first type of power trade consists of power sales and purchases between state-owned utilities in adjacent countries under government to government (G2G) agreements. For example, notwithstanding the significant amount of power imported into Thailand from Lao PDR, to satisfy its load requirements Electricité de Laos (EDL) must still purchase power from the Electricity Generating Authority of Thailand (EGAT) at a significant cost.

However, this sort of trading is limited, and is not linked to the sale of independent hydropower project power, which is by definition sold by the producer directly to the foreign purchaser under a cross-border take-or-pay power purchase agreement (PPA). Using Lao PDR as an example, these types of projects were developed primarily for purposes of exporting power; first to Thailand and now to other adjacent countries, but with a certain amount of the power to be produced by such projects required to be sold to the state-owned utility for domestic power consumption. These projects included the Theun Hinboun, Houay Ho, Nam Ngum 2, Nam Thuen 2, and the Xe Kaman 3 hydro projects, ranging in capacity from 150 to 1000 MW.

While this structure is a fundamental pillar of the rapid development of hydropower resources in the region, it is also a key inhibitor of long-term growth. Allocation of hydropower resources through a regional or bilateral power trading system is necessary for efficient allocation of supply and demand. For an efficient regional or bilateral power trading system to succeed, the practice of longer term cross-border, take-or-pay PPAs would need to give way to a system of domestic sale and market trading, or at a minimum PPAs that allow for a transition to a structure supportive of a regional trading system in the future.

Currently, there is no clear framework for an integrated regional power trading market, and for the time being, electricity imports and exports require approval on a case-by-case basis. Regional power trading is effectively precluded by the absence of integrated national transmission grids that can support power sales by multiple suppliers to multiple off-takers. With

Country	Myanmar	Lao PDR
Hydropower capacity (2013)	3048.5 MW	3000 MW
Operational hydro projects >5 MW	20 (17 government, 1 local, 2 joint venture)	11 (6 joint venture, 5 government)
Identified hydro potential	46 101 MW 92 projects	26 500 MW 50 projects
Planned capacity (2020)	44 722 MW	12 500 MW
Planned hydro projects	13 government, 7 local, 44 joint venture	All joint venture on a Build Operate Transfer (BOT) basis
Basic structure (per cent)	Free shares - 25 Royalties/free power - 10 Sold to Myanmar - 50 30 year concession Joint venture - BOT model	Paid shares: 15-25 Royalty/tax exemptions - 1 Sold to Lao PDR: ~5 30 year concession Special purpose vehicle, BOOT model
Total generating capacity from hydro (per cent)		
2007	53.9	97.3
2030	97.7	100
Average annual hydro growth (per cent)	17.9	8.4

the exception of Thailand, which has a well developed national transmission grid (albeit with limited regional connectivity), those facilities that do exist in the region are of relatively small voltage with limited transfer capabilities.

Even if the physical infrastructure were to be constructed, regional power trading would predominantly exclude the private sector, as state-owned utilities are the common practice throughout South and Southeast

Country	Nepal	Bhutan
Hydropower capacity (2013)	704 MW	1602 MW
Population with grid access (per cent)	63 (2013)	89 (2012)
Operational hydro projects >5 MW	23	22
Identified hydro potential	43 000 MW	30 000 MW
Planned capacity (2020)	2200 MW	>12 500 MW
Planned capacity (2030)	25 000 MW	>20 000 MW
Planned hydro projects	>30	The power system Masterplan 2003-22 shortlisted 76 projects, 70 run-of-river and 6 reservoir schemes. The total estimated capacity is 23 760 MW.
Basic structure	Built Own Operate Transfer (BOOT)	Built Own Operate Transfer (BOOT)
Total generating capacity from hydro (per cent)		
2007	<1	96 (grid capacity)
2030	75	99
Average annual hydro growth (per cent)	5	12.8

Asia. These government entities are the only permitted purchaser of power in their respective nations, and thus would dominate negotiations. The exception is Cambodia, which has a more liberal legal structure for private sector participation in power trading. Whether it is EGAT in Thailand, EDL in Lao PDR, or NEA in Nepal, a single state-owned entity controls the availability and pricing of all power emanating from their countries into regional power trading. This would give these state-owned utilities a monopolistic role as both power supplier and power purchaser of all imports into their country resulting from such regional trading. As the sole distributor and retail power supplier within their power sectors, the key issue for regional power trading is the termination of the monopolistic electricity distribution.

The transmission facilities built to support the development of such projects and the intended export of power are project specific, and cannot be used to transmit power for third parties. Power from Thailand cannot be transmitted to Vietnam and Cambodia, and vice versa, through Lao PDR. Even if potential power suppliers were contractually and legally permitted to engage in regional power trading, EGAT and others currently have no legal obligation to provide the transmission services that would be required for such suppliers to export power. Each state-owned utility is both the owner and operator of the transmission network, and its direct and indirect ownership of generation plants would (absent control of the transmission network) give it a vested interest in using its transmission network to its own advantage.

A more detailed analysis of regional power trading is beyond the scope of this article, but has been the focus of a number of studies by the Asian Development Bank (ADB) and other organizations.

4. Background on the Lao-Thai model

The development of the Lao hydropower industry can be divided into three phases. The first is characterized by government ownership of domestic supply, financed by international financial institutions (IFIs). This was from 1971 to 1998. The second was a transitional phase, starting in the early 1990s and extending through to the early 2000s, and was characterized by increased private ownership, reduced government ownership, and the export of electricity, with financing from commercial and IFI lenders alongside political risk guarantees (PRG) from IFIs.

The third 'consolidation' phase was characterized by a reduced role of IFIs in direct financing, and a reduced need for PRG, and an increased role of Thai lenders and other commercial lenders, but continued export of production.

A fourth phase seems to be beginning now, which is being characterized by reduced incentives and increased pressure for domestic sale (with partial re-export by the Lao Government off-taker).

In comparing Lao PDR with its peers, it would seem that other power-exporting nations in the region are currently operating at phase one, or perhaps phase two, of the development process observed in Lao PDR, where the governments and IFIs (primarily bilateral) play a predominant role in the development of the project. In the light of this analogous comparison between the path of Lao PDR's hydropower development and that of its regional counterparts, this article examines a few projects that are responsible for taking

Lao PDR through the transitional phase and draw some conclusions applicable throughout the region.

5. Evolution and transformation

Lao PDR has a socialist system of government, where one party exerts total control over all assets and resources that are owned by the State. The first hydropower project in Lao PDR was Nam Ngum 1, a purely domestic supply project of 155 MW capacity, located just north of Vientiane. It was completed in 1971 and is owned by the Government of Lao PDR through EDL, and financed by international bilateral aid grants and loans. Five more hydro projects were developed in Lao PDR between 1971 and 1995 all of which are government owned and developed, with financing by debt and grant aid from various IFIs and BFIs.

In 1988, the Lao Government opened the hydropower sector to foreign investment through the implementation of a new foreign investment law and a policy favourable to foreign investment in the energy sector. Since that time, more than 100 Memoranda of Understanding (MoUs) have been signed to develop hydropower projects, although the exact number is difficult to discern given that there is no public or private tender in Lao PDR and no information regarding negotiations is publicized. However, it is known that Lao hydropower has significant appeal, and international investors are regularly being courted, especially from Thailand and Vietnam which have signed bilateral MoUs with Lao PDR.

The transitional stage of Lao hydropower development began with the Theun-Hinboun (210 MW) and Houay Ho (152 MW) projects, which came online in 1998 and 1999 respectively. This was followed by the famous Nam Theun 2 project, a large, internationally financed dam that set the precedent in a number of areas, including legal and financial structure, resettlement, and environmental management. The transitional phase could be seen as being completed with the Nam Ngum 2 project (615 MW), which was the first project financed entirely by Thai lenders and Thai sponsors, with no IFIs or PRGs. The Nam Ngum 5 and Nam Lik 1-2 projects also came to fruition during this period, which although smaller at 120 MW and 50 MW, respectively, were designed entirely for domestic supply yet completely financed by Chinese sponsors and Chinese development banks.

Below we will look at some of these projects in brief to draw out key factors related to the transformation of the Lao hydropower industry.

5.1 Theun-Hinboun

Theun-Hinboun is a 210 MW project which came online in 1998, and represents the first non-recourse financed public-private partnership project in Lao PDR. At the time, this was a significant step away from the traditional financing model which had been pursued by the Government up to this point. EDL, the publicly traded state-owned utility, holds a 60 per cent majority that was financed as equity funding from loans granted by the ADB and bilateral financial institutions (BFIs). The other 40 per cent of project shares are held privately by international commercial banks and Thai banks, through their role as the debt financiers. Thailand's state-owned EGAT is the off-taker for this project on a 25-year take-or-pay agree-



The Nam Theun 2 powerplant in Lao PDR, the country's largest scheme. It supplies electricity to EGAT in Thailand.

ment which is based on electrical availability. To manage the exchange rate risk over the course of this agreement, it was decided to use a 50/50 THB/US\$ fixed rate with a set tariff increase of only 1 per cent, which could be renegotiated after ten years.

5.2 Nam Theun 2

Nam Theun 2 is the largest hydropower project in Lao PDR to date, with a generating capacity of 1080 MW. Opening in 2009, Nam Theun 2 was the first mega project in Lao PDR to follow or exceed international standards on a non-recourse lending basis with major environmental and social issues, World Bank involvement, and political risk guarantees. 80 percent of the equity financing for this project came from private shareholders with the other 20 percent being provided by the Lao Government through a commercial holding company. Debt financing was structured with a combination of 26 banks and IFIs together providing US\$ 1.15 billion in funding while the PRG came from the World Bank and the ADB. Prior to the Nam Theun 2 project, the World Bank had not financed a project in Laos for decades. EGAT again was the primary off-taker for this project while five percent of the generated electricity was allocated for domestic supply over the 25 year agreement. Nam Theun 2 was also unique in that, due to the financial involvement of the ADB and World Bank, international pressure was placed on the Government of Lao PDR to reform its securities laws for the lenders. This marked the beginning of broader institutional reforms that aligned the processes of negotiations, decision-making, and responsibility-taking with those of international practices.

5.3 Nam Ngum 2

Commissioned in 2010, the 615 MW Nam Ngum 2 project was the first wholly Thai-financed and developed independent hydropower project in Lao PDR. Although the Government of Lao PDR via EDL retains 25 per cent ownership, EGAT is the off-taker for more than 95 per cent of the electricity generated.

5.4 Nam Lik 1-2 and Nam Ngum 5

Nam Lik 1-2 (50 MW) and Nam Ngum 5 (120 MW) both came online since the start of the last decade (2010 and 2012 respectively). These represent the first two hydro projects that were financed entirely for domestic supply within Lao PDR. These projects also mark the emergence of China into the Lao hydropower industry. Chinese state-owned enterprises are the majority shareholder in both projects, and not only

acted as the project sponsors as well as the lenders, but a Chinese government financial institution also provided the PRG in both instances. One Chinese state-owned company insuring another in relation to the financing by a third is quickly proving to be the industry standard for Chinese energy investment into the region.

6. Lessons learned

6.1 Key role of the foreign off-taker

One of the first lessons learned in a study of the Lao hydropower industry that can be applied regionally is the importance of a strong and credit worthy off-taker with regard to raising financing. EGAT paved the way for the eventual structuring of domestic supply projects in Lao PDR. Even today, only EGAT projects are able to move forward on a pure project-financed basis with commercial lenders, as a result of the time-tested reputation of EGAT in its cross-border power ventures. In the case of Myanmar, a similar model is possible, as its power-exporting industry is at the same stage as that on which Lao began building 20 years ago.

The most fundamental sector where legal issues often arise in cross-border hydropower projects is in securing initial project financing. Capital funding for hydropower projects often requires the involvement of multi-national lenders and guarantors, to structure the necessary loan package. This is especially the case in nations where state-owned entities are not fiscally strong and lack historically tested credit records. In Lao PDR, for example, it is significantly easier to secure financing for cross-border power projects with Thailand than domestic power projects, because international lenders are willing to accept the credit risk of EGAT in Thailand, to whom the majority of the power is sold, without guarantees. This is because of their excellent credit record in comparison with their Lao counterpart, EDL, who is not time-tested and will not be accepted without guarantees from the Government of Lao PDR or project shareholders. A similar scenario is likely in the case of Myanmar, and in any other cross-border hydropower project where the energy-originating country is still in early developmental stages.

6.2 Key role of the IFIs

A second lesson is the key role played by IFIs in fostering the necessary legal and legislative framework for commercial lenders to enter into an emerging economy's energy export market. This is especially apparent in the Nam Thuen 2 project, where the presence of the ADB and World Bank gave comfort to a wide range of private lenders to provide financing for this mega project in addition to the fact that these IFIs were



The 50 MW Nam Lik 1-2 scheme in Laos. The first two schemes which were financed entirely for domestic supply within Lao PDR.

also financing the government equity portion of the project's cost through loans. Improvements in the Lao financial and legal systems, such as the clearing up of securities registration and enforcement uncertainties were required in order to meet international practices and the IFIs were paramount in helping to institute that reform. IFIs were also key in developing a standardized approach to contracts and policies based on international practices. The involvement of IFIs eventually paved the way for wholly Thai-financed hydropower projects as the framework had already been set in place to mitigate the risk to an acceptable level for financial institutions investing in Lao PDR. Finally, because of the scale and costs associated with Nam Thuen 2, the political risk guarantees provided by the World Bank resulted in an environment where lenders felt comfortable placing a financial stake in the Lao hydropower industry.

6.3 Financial incentives

Exemptions from taxes and royalties are also an issue of critical importance when analysing a power export industry in a developing country. Because of its socio-economic status, a large majority of the revenue for the government tends to be the export of its natural resources or the products derived from them. Thus, it is in the interest of the government to exact as many taxes and royalties on the export of power as possible. However, to do so may scare away potential investment. Thus, most countries will need to offer generous incentives during the early phases of hydropower development, but can reduce those incentives, without discouraging additional investment, once the development of the sector matures somewhat. This has been seen in Lao PDR. Initially, a broad 'tax-free' environment existed, to incentivize foreign investment in the country. However, decades later Lao PDR is no longer nearly as hungry for investors as it once was, and is becoming increasingly bold with its demands in hydropower projects being built within its borders. In addition to its equity stake, which some consider as royalty, a value-added tax (VAT) has become mandatory, and tax incentives are now granted on a discretionary basis but not routinely. There is no standard rate of exemptions set by law, but a royalty exemption of one per cent of gross revenue is generally considered the minimum.

6.4 Exemptions from the law

This issue is always one that creates a considerable amount of local sensitivity and is rife with political pitfalls. However, exemptions from law are also important considerations in encouraging large-scale foreign lending into a developing country whose legal system may not provide the protections lenders necessitate. Required approvals, especially in countries with heavy bureaucratic structures and a litany of overlapping yet segmented departments, can prove too burdensome for some investors interested in financing projects in the developing Southeast Asian markets. Lao PDR has been successful in spite of National Assembly approval being necessary for most large hydropower projects, although a single party system is likely the reason behind that.

Although in Myanmar no such equivalent approvals are required, it is also an emerging democracy, and competing parties within government may come with their own bureaucratic delays. The Lao model is one

where exemptions require a National Assembly Resolution. As more companies are entering the Lao hydropower industry, the Government has been reducing the number and scope of available exemptions, so as to begin regulating the industry more in their favour.

A key issue in this debate is whether governments are willing to grant a blanket exemption to all existing and future legislation which conflicts with the concession agreement and other transaction documents, or grant only itemized exemptions to specifically identified laws and regulations which conflict with the transaction documents. Issues of sovereignty and national interest are important, both for the local government as well as IFIs involved in the process. Lao PDR is again a good example of this important issue. Early Lao hydropower projects received blanket exemptions: clauses which state that the project developer, and to a certain extent the lenders and other parties, are exempt from complying with any local laws or regulations which conflict with the terms of the concession agreement and other transaction documents. The concession agreement containing such a clause would be approved by the National Assembly, which would imply agreement with the blank exemption. However, Nam Thuen 2 changed that, moving from a blanket exemption to itemized exemptions. The rationale was that Lao PDR is a sovereign nation and cannot grant blanket exemptions to all its laws, a position supported by the IFIs involved in the project.

This rejection of the blanket exemption model has led to a complex process, whereby desired exemptions are inserted into the concession agreement, with the government counterparty agreeing to obtain these exemptions from the government body with authority to grant such exemptions. As lenders enter the transaction, they will request additional exemptions. Once all exemptions are agreed, the process of obtaining them from the National Assembly, the cabinet and the ministries, proceeds. This can be time consuming, but provides certainty to both lenders and sponsors that provisions of the concession agreement are enforceable even if conflicting with local law.

6.5 Financing of government equity participation

Solving the issue of government equity financing is often a vital component for solidifying investor confidence in seeing a project through to completion, because if the government has a financial stake in the project, delays and other such hold-ups that are traditionally caused by the government would, in theory, be mitigated. One method is to provide the government with dividend-financed shares, based on the resulting funds from tariffs, which would then be reinvested into the project through share ownership. Another method is tax and royalty-financed shares, whereby the government purchases its equity shareholding stake through the taxes accrued by the project and the sale of the electricity generated or the royalties given. This method is illegal in Lao PDR, but has been used in other countries in the region. Some projects in Lao PDR have used a Free Share Policy, which is common in Myanmar, whereby the government is simply given a shareholding percentage in the company, therefore taking a vested interest in the success of the project. There are many issues to consider when looking at the best model for financing the government participation in a power project, which will be addressed in a future issue of *Hydropower & Dams*.

6.6 Managing political risks

There are also lessons that can be drawn from examining the debt financing component of Lao hydropower projects. Early on in the power-exporting industry life-cycle for a developing country, it is necessary to have political risk guarantees, as the project development framework both legally and financially has not yet been extensively tested. Especially when there is a domestic off-taker, it is necessary for IFIs and other financial institutions to be protected against nationalization or other unforeseen political upheavals that have the potential to disrupt either the construction of the project or the flow of energy once the project is in operation. As seen in the Nam Theun 2 case, this is where organizations such as the ADB and World Bank play a pivotal role in reassuring investors that they will not suffer unnecessary capital losses resulting from political risks. Investors also have increased reassurance in a project if the government is willing to provide additional guarantees, especially when the off-taker is domestic.

Other typical methods of reducing exposure include offshore bank accounts and security structures, but these are beyond the scope of this article.

7. Regional comparison

Nepal's national grid capacity predominantly comprises hydropower (93 per cent) but is far short from meeting the electricity demands of the population. Grid access for the Nepalese people was 63 per cent in 2013, and blackouts remained frequent in the capital. Nepal has enormous hydropower potential at 43 000 MW, but is also burdened with an excessively bureaucratic and fragmented governing structure that has fallen short in advancing projects through to operation, with only 704 MW of total generating capacity in 2013. Although Nepal has 23 hydropower projects with more than 5 MW of capacity currently in operation, they are all relatively small. Reasons for this appear to be political instability and an almost exclusive reliance on India for funding and an export market.

Similar to Nepal and Lao PDR, the vast majority of electrical grid capacity in Bhutan comes from hydropower and also represents the bulk of export revenue. Despite a moratorium on the traditional type of mega dams that require a reservoir, Bhutan's current capacity is more than twice that of Nepal. This reservoir ban was implemented because of the importance of environmental protection for the Bhutanese government, and the potential for negative socio-environmental impacts. However, it appears as though national economic interests now weigh more heavily against the preservation of natural resources, as there are currently six large and mega reservoir-type hydropower projects in various phases of construction throughout Bhutan in an effort to reach its 2020 target capacity of 10 000 MW.

7.1 Government and policy

As a single party Socialist state, Lao PDR enjoys a level of parliamentary unification which does not exist in the young democracies of Bhutan, Myanmar and Nepal. The evolution of the Lao hydropower industry since first opening up to foreign investment in the late 1980s has resulted in the streamlining of legislation and bureaucratic processes, to prioritize the continued development of hydropower for both domestic con-

sumption and export purposes. A similar approach can be observed in both Bhutan and Myanmar, each of which at present are all but exclusively reliant on a regional power, India and China respectively, to further the development of their hydropower industry. The turnkey approach of these countries towards their resource-rich neighbours is to provide everything that is required to plan, finance, construct, and operate a hydropower project, and then allocate a portion of the electrical generation for domestic use while exporting the vast majority to fulfill its own insatiable energy demands. From the policy perspective of the host nation, especially when political cohesion exists, it is both economically prudent and profitable to create a fast-track 'one-stop shop' mechanism, through which project developers can acquire permits and approvals, negotiate contacts, and package tariff structures.

This simplified approach is contrasted by Nepal, where the development of its hydropower industry has been met with delays and setbacks which can, in many ways, be attributed to convoluted bureaucratic processes. Currently it is necessary for foreign power developers to approach as many as 10 Nepalese government agencies, along with navigating 15 national laws for registration, licence procurement, and development for each hydropower project. The unnecessary overhead costs for legal and consulting services and the time involved to secure a wealth of required documentation and government approvals may be turning potential investors away even before the project feasibility study is completed.

7.2 Export market

Although the majority of the cross-border hydropower projects in Lao PDR are being exported to Thailand, Lao PDR also shares a border with Vietnam and China; both of these countries have begun investing in Lao hydropower for export purposes. Therefore, although Lao PDR is currently heavily reliant on Thailand for funding and an export market, there is potential for regional diversification.

A similar case exists in Myanmar, which for the last decade has almost exclusively received its hydropower funding from China, and in unprecedented amounts. In addition to China, Myanmar borders both Thailand and India, equating to enormous potential for Myanmar to continue expanding its hydropower industry through multiple funding sources and export markets, rather than reliance on a single foreign entity.

In contrast are Nepal and Bhutan which are asymmetrically reliant on India for hydropower funding, as their sole power purchaser, and the only realistic opportunity for grid-to-grid connections. India as the single buyer has the ability to set the price and the quantity of the exported energy as Nepal and Bhutan are positioned without feasible export alternatives. Current Nepalese cross-border power trade with India stands at 80 MW, with surprisingly, energy-rich Nepal importing 50 MW annually from India because of an incomplete national transmission grid.

Bhutan has managed its hydropower resources and negotiations with India in quite a different way compared with Nepal, as a long-term mutually beneficial strategy is in place and the project development process significantly quicker. With the exception of one dam, every operational hydropower project in Bhutan has been funded entirely by the Indian Government. Energy relations between the two nations

have been based on the terms set forth in the Indo-Bhutan Joint Initiative that began in 1987. Phase 1 of the Initiative, from 1987 to 2007, saw India provide total investment for Bhutanese hydropower on a turnkey basis with a mixture of grants and loans. Phase 2 of this agreement outlines Bhutan's commitment to providing 10 000 MW of hydropower to India by 2020, which includes five hydropower projects totalling 4860 MW which are currently under construction. One fundamental difference in the ability of Bhutan and India to cooperate more effectively in the energy sector as compared to Nepal is the political stability Bhutan provides, which allows for bilateral trade agreements to be more comprehensive and long-term investment more far-reaching.

Myanmar has historically used its limited hydropower for domestic consumption, but the major projects that have recently been completed or are under development are primarily for export to China and, to a lesser extent, Thailand. Unique to Myanmar in comparison to the other countries examined here, is a very high and growing unmet domestic electricity demand. Therefore, the government is now requiring that any hydropower projects designed for export must provide a percentage of the generating capacity to the Myanmar government, usually at no cost.

7.3 Foreign involvement

Like Lao PDR, the first hydropower projects in Nepal were funded by a mix of IFIs such as the World Bank, ADB, the United Nations Development Programme and bilateral efforts from a dominant power-purchaser like India. Kali Gandaki, the most recent project to come online, was the first Nepalese project to surpass the 100 MW capacity threshold. Historically, hydropower projects in Nepal have tended to be small and medium-sized in design. This is reflective of the early stages of the Lao hydropower industry which began with similar-sized projects funded through IFIs and bilaterally via Thailand. Over time, as the procedural framework was solidified and more projects became operational, investor confidence increased, and both the capacity and quantity of Lao hydropower projects grew. This trend is observable in Nepal, as reflected in the Nepalese hydropower projects that are currently in various stages of planning.

The history of hydropower in Myanmar, from its inception in the 1960s through to 2005, is similar to that of Nepal. However, recently China has begun to invest heavily into Myanmar hydropower using the similar turnkey model as India uses in Bhutan. Although still a fledgling industry, a number of large and mega hydropower projects are currently operating in Myanmar following the Chinese turnkey model. However, these projects are dwarfed in comparison with those that are under construction today on every major waterway in Myanmar. The largest three dams alone account for more than 15 000 MW of Myanmar's planned capacity. Myanmar and Lao PDR both currently generate around 3000 MW of annual hydropower capacity. However, while Laos foresees impressive growth to around 12 500 MW by 2020, Myanmar is anticipating a 2020 capacity of more than 44 000 MW. In a country where less than one-third of the population has access to the electrical grid, and blackouts still hit major cities daily, this amount of electrical capacity makes the future look very bright.

All the power-producing countries examined in this article have received, in varying amounts, hydropower funding from multiple IFIs and other sources; with the exception of Bhutan. The Bhutanese hydropower industry simply would not exist without India. Initially India provided project funding on a 100 per cent grant basis through the Indo-Bhutan Joint Initiative. As Bhutan generated revenue through the electrical tariffs on the initial projects, India transitioned to a 60 per cent grant 40 per cent loan scenario to fund new projects. Recently, the balance has shifted to a 40 per cent grant 60 per cent loan package. India appears committed to investing heavily into the Bhutanese hydropower industry, and continues to offer grants as well as favourable loans, but also recognizes that the Bhutanese hydropower industry is beginning to mature, and there is a decreased need for interest-free grants in order to support its growth.

8. Conclusion

In conclusion, we can say that since Lao PDR pioneered the development of an export hydropower industry in Asia, much can be learned from examining the development of the hydropower sector there. These lessons learned can be used by developers, lenders and governments in the development of similar export-focused hydropower industries throughout the region, as South and Southeast Asia move towards a more robust and integrated energy future. ◇



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