Briefing: A Call for Strategic, Basin-wide Energy Planning in Laos

The Stimson Center's "Letters from the Mekong" series challenges the prevailing narrative that the current rapid pace of dam construction on the Mekong River will continue until the entire river is turned into a series of reservoirs. The construction of even a few large dams will severely impact food security in the world's most productive freshwater fishery and sharply reduce the delivery of nutrient-rich sediment needed to sustain agriculture, especially in the Mekong Delta. However, our team's research strongly suggests that not all of the planned dams will be built. Rising risks such as decreased financing capabilities of foreign investors, drought and climate change impacts, and shifts in regional energy demand impact indicate reduced profitability and investor interest.

Falling fall far short of current plans for more than 100 dams on the Mekong mainstream and tributaries will have particular implications for Lao PDR, which has set the export of hydropower as its top development priority in its quest to become the "Battery of Southeast Asia". The lack of a strategic plan has created a situation in which Lao PDR is likely to fall far short of its revenue targets while at the same time severely damage downstream rice and fish production in Vietnam and Cambodia. Stimson's most recent report, "A Call for Strategic, Basin-wide Energy Planning in Laos," concludes that it is not too late for a new approach that optimizes the nexus of tradeoffs among energy, export revenues, food security, and fresh water and protects the integrity the Mekong for the benefit of all riparian countries.

A new approach in Lao PDR would maintain the existing focus on exporting energy to regional markets but also involve setting a realistic target of total electricity production from a mix of sources: notably hydropower, solar, and wind. The portfolio mix would be optimized by (1) incorporating sound political, financial, environmental, and social risk analysis into the decision making process; (2) integrating multiple uses of water such as hydropower, transportation, irrigation, and flood control at a basin-wide scale in ways that addresses the needs of downstream countries; and (3) avoid building unnecessary dams in Lao PDR given the associated social and environmental risks.[i] With this strategy in mind, dams with high exposure to financial risk or the greatest environmental impacts would be replaced by alternative projects and, increasingly, efficiency gains from smart infrastructure systems such as effective power grid management.

The Lao PDR government currently lacks the capacity and resources to implement a strategic, basin-wide energy plan because it depends almost entirely on outside developers to build out its planned inventory of dams under commercial build-own-operate-transfer or BOOT concessions for export to neighboring countries. All of its dams are being constructed in an uncoordinated, project-by-project manner with no prior input from the intergovernmental Mekong River Commission or neighboring countries. As a result, there is at present little opportunity for synergistic planning to optimize the benefits of water usage on a basin-wide scale.

To support a transition toward a strategic basin-wide energy plan, the United States should allocate more resources towards water-energy capacity building in Lao PDR, promote investment in a Lao national power grid, and utilize its regional leadership to marshal support from other donors and regional states like Vietnam. Downstream countries such as Cambodia and Vietnam, which have previously opposed mainstream Mekong dams, can gain a seat at the negotiating table by increasing power purchases from Lao PDR, thus giving them a stake in determining which dams Lao PDR decides to build and in expanding the use of non-hydro renewables such as solar and wind.

Regional Electricity Demand Dynamics

Laos PDR's plans for economic development are almost entirely premised on exporting most of its 24 GW of hydropower potential to neighboring countries. However, regional energy policy shifts call into question whether the anticipated demand for Lao hydropower will materialize. Thailand is currently the primary purchaser of Lao hydropower, but it has a history of overestimating demand. As Thailand refines its energy projections and starts to actively pursue energy efficiency gains, demand for Lao electricity is likely to drop substantially. Cambodia and Myanmar are potential export markets as both face significant domestic electricity shortages. But energy security concerns are prioritizing the development of domestic sources to avoid future dependency on imports. Myanmar is already developing its large natural gas, hydropower, and solar potential, which is likely outstrip its domestic needs. In the medium to long-term, therefore, Myanmar is likely to become a net power exporter and a competitor to Lao PDR.

Vietnam stands out as possibly the largest future market for electricity from Lao PDR. Vietnam's electricity consumption is growing by 10-12% per year and its rapid economic growth requires year-on-year energy consumption by 7-10% through 2030. In 2015, Vietnam moved from being a net exporter of energy to a net importer as domestic coal demand sky-rocketed.[ii]

Vietnam included this expected growth in its updated Power Development Plan VII, which projects that it will need 130 GW of energy by 2030.[iii] The updated plan responds to market and climate change pressures by increasing funding for renewable energy and eliminating some proposed coal power plants. But coal will still play a major role, growing from 28% of national energy generation in 2014 to more than 50% in 2030.[iv] Furthermore, PDP VII focuses on meeting demand growth with domestic resources and fails to fully account for regional trade opportunities. Electricity subsidies currently discourage imports of electricity from Lao PDR, but these will be probably phased out as Vietnam runs out of domestic options for electricity generation.

PDP VII includes 860 MW of power from Lao PDR by 2020.[v] This is negligible given Lao PDR's hydropower potential and the relative affordability of its power pricing. Vietnam recently signed an MOU with Lao PDR to buy 5,000 MW of electricity by 2020 but this still represents less than 3% of Vietnam's electricity demand. [vi] Vietnam could meet its power needs at low financial and environmental cost by substantially increasing its imports of Lao hydropower. Vietnam could take advantage of its role as a major importer to protect its highly productive Mekong Delta.

Recently, the global price of solar and wind energy has declined significantly, with solar panel costs dropping more than 40% from 2010 to 2014.[vii] These prices will continue to fall, making solar and wind competitive with fossil fuel energy. Vietnam's energy prices are estimated to rise to $0.092/kWh by 2020 due to the higher cost of imported coal. This would make both Lao hydropower, which sells for $0.06-$0.07/kWh, and domestic or imported solar, which sells for $0.072/kWh, affordable alternatives to coal.[viii]

Making the Case for a Lao National Power Grid

A key element of a Lao hydropower strategy is a national power grid that provides reliable electricity exports to regional markets and meeting domestic power needs. Despite building over 30 large dams, Lao PDR's electricity distribution infrastructure is poor. The main barrier to selling significant amounts of electricity to Vietnam is the lack of a national grid that would allow the country to respond flexibly to demand fluctuations from neighboring countries and managing a potential excess in hydropower supply. This problem is well understood by the Lao government, which seeks greater flexibility but struggles to predict or maximize revenues from power sales.

Lao PDR's transmission network is fragmented into largely unconnected sub-grids.[ix] As of 2016, these sub-grids sell and buy power over low voltage connections along sections of its international border. A few 500 kV lines link dams in Lao PDR directly to major markets in Thailand, and several cross-border 220 kV lines from Thailand transmit electricity to high demand areas in Lao PDR. In order for Lao PDR to efficiently export electricity, these lines need to be upgraded. Without a national grid, its ability to negotiate favorable export prices is limited.

An ADB study found that with a national grid, Lao PDR could sell power from existing and planned dams on Mekong tributaries and receive export revenue equal to what could be earned from building nine mainstream dams. This would require investment in upgrading older tributary dams and linking them to the national grid, but would give Lao PDR the short-term revenue that it needs without further disruption to the Mekong.[x] A grid would also allow solar and wind projects to feed in and complement hydropower.

The weakness of Lao PDR's existing patchwork of small grids is why the ADB's number one bilateral investment project is the "Design and Funding of a Background Grid for the Lao PDR." This would involve "completing the north-south 500 kV line in the Lao PDR, to enable the Lao national grid to transmit power across the country and provide high value-added services from its hydropower plants to neighbors in the Greater Mekong Subregion." The project summary states that the 500 kV line at a cost of $400 million will make it possible for Lao PDR to more efficiently generate power both exports and rural areas while supporting the development of a regional electrical power grid.[xi]

Recommendations

Many observers think the door is closing on influencing in Lao hydropower development, but Stimson's conversations with senior government officials reveal a renewed interest in external engagement on a suite of issues, including power generation optimization, power distribution management, and public participation in

dam resettlement. While the space for civil society and non-government engagement is limited, there are new opportunities for government-to-government engagement on hydropower development.

Given the growing recognition within the Lao government of the risk and uncertainties in the current hydropower development trajectory, the time is right to present alternatives that would meet its development needs and support the optimization of resources at the regional scale. Accordingly, Stimson recommends:

1. **ADB, US, and other donors should fund a feasibility study and design of a national power grid for Lao PDR**. A national grid has been an ADB priority for years and it should consider a broader investment to better connect Lao PDR's sub-grids, improve linkages with neighboring countries, and provide smart grid technology for most efficient deployment of power. This should happen within the next four years so that Lao PDR, Thailand, and Vietnam can adjust energy development plans accordingly.
2. **Vietnam should substantially increase its power purchase agreements with Lao PDR.** Vietnam should see this as an opportunity to meet its international climate change commitments and to gain a seat at the table when in deciding which dams get built. Lao hydropower could replace the expensive coal power plants currently in PDP VII. Given that power purchase agreements are a major factor in determining the feasibility of a dam, Vietnam could use these PPAs to ensure that dams that threaten the Mekong Delta are not built.

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[i]Costanza, et al. "Planning Approaches for Water Resource Development in the Lower Mekong Basin." Portland State University, 2011.
[ii]Vu Trong Khanh, "Vietnam coal imports poised for possible early start" Wall Street Journal, August 14, 2014.
[iii]Doan Phac Le, Vietnam Presentation at the Technical Meeting on Country Nuclear Power Profiles, International Atomic Energy Association, Vienna, Austria, May 10-13, 2016, slide 18.
[iv]Current figures taken from Ministry of Industry and Trade (MOIT), General Directorate of Energy, "Vietnam Energy Policy," August 2015, slide 7. Analysis of Power Development Plan VII projections taken from Nguy Thi Khanh, "Vietnam needs a 21st century electricity plan," *RenewEconomy*, May 23, 2016.
[v]MOIT, slide 13.
[vi]Saigoneer, "Facing Power Shortage, Vietnam Plans to Import Electricity from Laos," *Saigoneer*, November 26, 2016; and Xaypaseuth Phomsoupha, "Hydropower Development Plans and Progress in Lao PDR," *HydroNepal*, Issue No. 4, January 2009.
[vii]International Renewable Energy Agency, Renewable Power Generation Costs in 2014, January 2015, p.75.
[viii]Private conversation with World Bank official, Hanoi, Vietnam, March 2016.
[ix]Dandu V.S.N. Raju and M Manoj Kumar, "Laos expands the grid," *Transmission & Distribution*, Nov. 25, 2013; ADB, Evaluation Study: Energy Sector in the Lao People's Democratic Republic. Reference Number: SAP: LAO 2010-42, October 2010pp. ii, 4.
[x]Personal conversation with ADB official, Manila, the Philippines, September 2014.
[xi]ADB GMS Secretariat, Regional Investment Framework: Pipeline of Potential Projects (2013–2022), Vientiane, Laos, Dec. 10-11 2013, p. 30.