The Greater Mekong Subregion Hydro Grid

A Review of the Asian Development Bank's 2003 Indicative Master Plan for Regional Power Interconnections and Power Trade in the Greater Mekong Subregion

Gráinne Ryder, Policy Director, Probe International
Energy Probe Research Foundation
Toronto, Canada
www.probeinternational.org
www.e-p-r-f.org

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1. Purpose

This report is a review of the Asian Development Bank's 2003 Regional Indicative Master Plan on Power Interconnections in the Greater Mekong Subregion. The purpose of this review is not to dispute potential merits of targeted investments in new transmission lines or the potential advantages of cross-border power trade in a region where 90 million people lack access to basic electricity service. The review examines whether Norconsult provides a credible economic justification for the GMS power grid, and whether the ADB Master Plan serves the interests of GMS power consumers.

2. Introduction

The US$1.4 million ***Regional Indicative Master Plan on Power Interconnections and Trade in the Greater Mekong Subregion*** was prepared by the Norwegian hydro consulting firm, Norconsult, and funded by the Norwegian government and the Asian Development Bank. It recommends a series of transmission studies and investments up to 2020, and provides policy advice on the development of regional power trade in the Greater Mekong Subregion.[1]

The proposed GMS power grid is a series of high-voltage transmission grid interconnections linked to future large hydro dams on the Lancang/Mekong (Yunnan), Mekong tributaries (Lao PDR and Vietnam), and the Salween River (Burma and China). Nordic-style institutional and regulatory reforms for developing competitive power markets and regional power trade are also recommended.

High-voltage (500 kilovolt) lines are designed for transporting large amounts of electricity over long distances. Costs will vary with the price of steel, aluminum, concrete, and labour, as well as terrain conditions and road accessibility. Norconsult reports that the capital cost of 500 kV lines ranges from US$ 230,000 to 615,000 per kilometre. A river crossing of one to two kilometres costs an additional US$2.8 to $10.5 million. In addition, there's the cost of the infrastructure required to "download" the power to consumers (i.e., individual households, factories, schools, office buildings, etc.). This includes: converter stations – the cost of one station to handle 3,000 MW output from Jinghong and Nouzhadu dams in Yunnan is estimated at US$248 million; substations – US$2 million; power transformers –

US$2 to 5 million; medium-voltage (230 kV) lines – US$115,000 to US$380,000 per kilometre; and low-voltage (115 kV) distribution lines – US$62,000 – 130,000 per kilometre.[2]

3. Probe's Summary Analysis

- Norconsult fails to demonstrate that the Greater Mekong Subregion grid connected to future large hydro stations is financially and economically viable.

- Norconsult's focus on centrally planned expansion of a regional power grid, aimed at boosting bulk power trade between the region's largest power utilities, obscures the enormous scale disparity between GMS systems, and between planned large hydro projects and the power needs of GMS consumers.

- Norconsult recommends grid investments while sidestepping critical power economics issues: the actual cost of the GMS power grid to consumers; the industrial demand for higher reliability than a central grid can provide; the demand for end-use energy efficiency improvements in Thailand; the advantages of smaller-scale gas-fired turbines and combined cycle plants to consumers; the public opposition to large hydro dams; the failure of GMS hydro developers, including ADB-backed power companies in Lao PDR, to internalize environmental costs associated with large dams, and to respect citizens' democratic and property rights; the reluctance of GMS utilities to open their power markets to competitive power producers, the lack of effective regulatory capacity, and the lack of financial and operating transparency on the part of GMS utilities, the future recipients of ADB loans and grants to build the GMS hydro grid.

- Norconsult promotes two incompatible agendas: one is the expansion of a regional grid linking large hydro dams that are viable only with monopoly privileges and taxpayer subsidies; the second is competitive power markets which, if implemented as recommended by Norconsult, would render the proposed GMS grid plus large hydro dams uncompetitive cost-wise and publicly unacceptable.

If the GMS hydropower grid goes ahead as planned by Norconsult and the Asian Development Bank, with ADB and World Bank subsidies, it would do the following:

- Inflate the profitability of large hydro projects favoured by the region's largest incumbent monopolies instead of accelerating the transition to competitive markets, lower costs, and better service for GMS consumers;

- Distort electricity investment decisions and deprive millions of would-be power consumers of choice in service providers better scaled to meet their needs;

- Delay utility reform and investment in service provision to rural areas;

- Increase the risk of monopoly abuse by concentrating ownership of the power generation business into too few hands, since only the region's largest utilities (and international partners) have the necessary technical and financial management capacity to build and operate large hydro projects and bulk power exchange via the regional grid.

4. Probe's Review & Analysis

4.1 Financial viability not established

Overall, the Master Plan is inconsistent and uncertain about the costs and benefits of the proposed GMS grid. Norconsult vacillates between promotion of the regional grid connected to large hydro schemes as inherently superior to other alternatives, and warning that not enough is known to assess actual costs and benefits.

Norconsult openly admits it does not have sufficient information to conclude "whether the total benefits are higher than the extra costs associated with power interconnections."[3] "Whether [interconnections are] economic or not," Norconsult states, "depends for each interconnection project not only on the generation project costs, but also on the domestic power demand and transmission development within each country. . . . [But] plant characteristics, construction cost estimates and possible environmental

implications are quite uncertain. This is important for consideration of potential risks associated with power interconnection investments."[4]

In terms of regional benefits, Norconsult calculates that investments in regional interconnections could eliminate the need for roughly 1000 to 2000 MW of installed capacity to meet peak power demand within the GMS. It estimates this is equivalent to a savings of about US$900 to 1300 million for the region compared to a total estimated cost of about US$1.2 billion for the interconnections.[5]

4.2 High financial risk

Norconsult warns that investments in high-voltage grid connections "carry a high financial cost (and risk) for limited initial benefits" because not all the planned generating plants would be built and connected to the grid at once. This would leave the grid initially underused, which means GMS power consumers may end up paying for grid capacity they don't need. [6]

Compounding this financial risk is the financial uncertainty associated with the hydropower projects that the GMS grid is intended to serve. Norconsult explains: "If further studies on hydropower projects reveal that some of them are not cost competitive with the thermal generation candidates, or environmental reasons make implementation impossible, there is a risk that such projects will not be implemented. Consequently, there is a risk of building up too strong interconnections between the countries."[7]

4.3 Flawed assumptions about reliability

The Master Plan is narrowly focused on boosting regional power trade via a regional power grid, without seriously considering how that expansion may actually be increasing national power system's vulnerability to failure, and thus increasing the very costs and risks the proposed grid interconnections were meant to reduce.

Norconsult promotes the regional grid as a way to boost power supply reliability. Yet what proponents refer to as the 'backbone' of the region's future electricity supply could turn out to be the least-suited option for delivering reliable power. First, a transmission grid is no more reliable than the generators connected to it which, in this case, would be remote hydro dams that are extremely vulnerable to disruption and in large increments.

Power output from large hydro dams can be crippled by natural drought, competing demands for water, technical accidents, and grid failures (caused by power lines overheating, shorting out, or getting knocked out by floods, high winds, falling trees, lightning strikes, landslides, earthquakes, vandals, or terrorists).

Certainly, interconnections can help avoid outages. If a problem occurs in one part of the region, interconnections allow utilities to dispatch power from neighbouring jurisdictions. But the interconnections can also work against reliability. The greater the reliance on remote large power plants, the more vulnerable the system becomes as a whole. A relay failure in any one part of the regional grid could, if not isolated from the rest of the grid, cause a blackout in another. The failure of a big plant is a more serious event than the failure of a small plant and could trigger other failures that could cascade across a whole region. The traditional utility response to this vulnerability has been to build more backup in case a big block of capacity should suddenly fail, which raises the cost of the system as a whole considerably.[8]

As the power system gets larger and more complicated, nobody can predict all the ways it can fail. Power system engineers normally design the grid to high reliability standards but increasing reliance on more centralized power plants, in this case large hydro dams, means that when the grid does fail, it can be disastrous. In 2002, for example, failed transmission from the 12, 600 MW Itaipu hydroelectric dam in Brazil, the world's largest, cut off nearly 20 percent of the country's electricity for several hours, "blacking out six major cities in five states," according to the US-based Rocky Mountain Institute.[9]

Norconsult acknowledges this risk, noting that the line connecting the 3600 MW Tasang dam on the Salween River to Thailand would be "quite vulnerable to the possibility of collapse of [the] steel [transmission] towers" making 3600 MW hydropower capacity unavailable to the Thai grid.[10] But Norconsult's solution is hardly satisfactory from a power consumers' standpoint. It recommends building two lines in case one fails.

In North America, the growing vulnerability to grid failure has become a major economic and political concern in recent years. In Canada, it took several weeks for Hydro-Quebec, one of North America's largest utilities, to restore power after a severe ice storm crippled its grid in 1998. Energy Probe attributed this crisis to the utility's excessive reliance on long distance lines linked to remote hydro dams.[11] According to US energy expert Amory

Lovins, the central grid itself (not the power stations it is linked to) is now the main source of increased costs and power quality problems in North American systems, especially now that consumers using digital equipment require extremely high levels of reliability.[12]

Another flawed assumption behind Norconsult's justification of the grid has to do with the level of reliability GMS power consumers need. Norconsult wrongly assumes that all GMS power consumers need the same degree of service reliability via a central grid. In reality, millions of GMS power consumers could do with less reliability than a central grid system is designed to provide, while others (especially high-tech industry) may require (and be willing to pay more for) a level of uninterrupted service the central grid can not technically deliver.[13]

4.4 Environmental winners and losers

"In principle," Norconsult writes, "all environmental costs related to hydropower should be quantified and evaluated in monetary terms and incorporated in the economic analysis of the various generation projects as well as the transmission line projects. This includes also social costs related to loss of habitat and resettlement, which are complex and difficult to handle in traditional cost-benefit analysis. . . . part of the accrued wealth from the project being developed should be floated back to the local communities that were harnessing the resources."[14]

In practise, however, Norconsult assumes the regional grid creates environmental winners (hydro importing countries) and environmental losers (hydro exporting countries), and that costs of mitigating environmental damage will be externalized onto citizens in the exporting countries. Norconsult states: the importing country (Thailand) gets "electricity without the harmful effects" of dams and power lines while the exporting countries "will have to face the inconvenience of the increased environmental impacts and the costs of necessary mitigation measures."[15]

4.5 Large hydro bias precludes cost comparative analysis

All the high-voltage grid interconnections recommended by Norconsult are linked to future large hydro dams or are designed to serve large hydro projects already underway, such as the 1070-megawatt Nam Theun 2 dam in Lao PDR.[16] The Master Plan fails to consider alternative investment

strategies for power supply expansion. Norconsult's and the Asian Development Bank's large hydro bias has effectively precluded serious analysis of options potentially available to GMS consumers. The chapter on economic analysis states only: "evaluation of a completely different approach with an exceptional reliance on conservation and domestic resources is outside the scope [of the study]."[17]

Key power economics questions are not addressed: the impact of high-voltage grid interconnections plus large hydro schemes on electricity rates, the cost of backup power, and the impact of regional grid investments on GMS countries with the least-developed power systems, such as Cambodia, which is trying to attract investment in rural power services. Also, no cost comparison of hydro imports via a regional grid versus local power and distribution investments is recommended for further study.

4.6 Preaching markets, promoting a GMS hydro cartel

The report's final volume advocates Nordic-style regulatory and institutional arrangements for a Nordic-style power market. Norconsult recommends a "stepwise development of the institutional structure . . . to get away from the present structure of one vertical state owned electricity supply regime that is monopolizing the electricity supply over the entire country."[18] Writes Norconsult: "Equal opportunities and just rules in a competitive regime are the best means to attract private investors to engage in power supply business. Such regimes are likely to provide the customers with low cost electricity."[19] The suggested target is "a flexible power market in operation in each of or in common for the GMS countries with a timeframe of five to ten years."[20]

The ADB Master Plan preaches market reform but promotes the opposite: centrally planned expansion by the region's incumbent power monopolists. Most of the report assumes centrally planned expansion of both generation and transmission by GMS utilities, which have government-conferred monopolies in generation and transmission.

What Norconsult overlooks is the impact of market reform on the financial and political viability of the GMS hydro grid. If competition among suppliers and regulatory oversight were introduced, many of the investments recommended by Norconsult would quickly be exposed as unattractive to investors and uncompetitive with other service providers. And if future large

hydro schemes are rendered uncompetitive, many of the planned regional grid interconnections would become unnecessary.

GMS grid proponents have little incentive to promote reforms that, if implemented, would jeopardize their expansion plans. Hydro developers, in particular, need the status quo – of government-guaranteed revenue, access to aid subsidies for transmission, and no effective regulatory oversight or public accountability mechanisms – if they are to attract investors and keep up the façade of commercial viability.

Norconsult is therefore only half-right when it says making regional power trade work would require either "market solutions or well-developed cooperation between the generation utilities of the countries involved."[21] Cooperation between GMS utilities is the more likely scenario. GMS utilities would cooperate to protect future large hydro schemes from competition by avoiding the introduction of market rules and regulatory oversight, by guaranteeing cost recovery from captive consumers, by obtaining taxpayer subsidies for grid and hydro projects, and by externalizing social and environmental costs onto powerless GMS citizens.

This cooperation would be more accurately described as a cartel of GMS utilities designed to shut out competitors and fix prices. A cartel is generally defined as "a combination of independent commercial or industrial enterprises designed to limit competition or fix prices."[22] Cartel agreements, according to the *Oxford Dictionary of Economics*, "may provide for setting minimum prices, setting limits on output or capacity, restrictions on non-price competition, division of markets between firms either geographically or in terms of type of product, or agreed measures to restrict entry to the industry."[23] Such agreements are usually designed by and for the interests of producers not consumers.

4.7 Economic winners and losers

Thailand is identified as a key beneficiary of the GMS grid but Norconsult fails to analyze the impact of the regional grid on power system development within Cambodia, which has the lowest rates of electrification and highest electricity prices in the GMS. Norconsult recommends several grid connections from Cambodia to neighbouring Thailand and Vietnam but also notes that Cambodia's "most attractive mid-term options requiring the lowest initial demand" would be natural gas imported from Vietnam to fuel

gas turbines. Norconsult estimates that the cost of power from a gas turbine or combined cycle plant installed at Kampot would be less than six US cents per kilowatt-hour. Compare this to 7.8 US cents per kilowatt-hour for power imported from Viet Nam via a GMS grid interconnection financed by the ADB in 2003.[24]

4.8 Rural electrification sidelined

Norconsult's focus on developing a system of bulk power trade between GMS utilities has effectively sidelined public demand for rural electricity service where there is currently none. Its recommendations also contradict what the World Bank's energy experts have advised Sub-Saharan African countries to focus on:

"In countries that have not achieved substantial household electrification, it will generally be more productive to focus on encouraging competition to serve those who do not presently have access to electricity. . . . For example, in poor, rural areas, the competition may be for the right to receive a government subsidy (whether it is capital, operating costs or both) in return for an obligation to provide level of grid or off grid service (Argentina and Chile)….In other countries, privately or cooperatively owned mini-grids with an accompanying generating unit in rural areas can be encouraged in rural areas if regulatory licensing requirements are kept to a minimum and the mini-grid providers are allowed to offer electrical service with lower quality of service standards than the main grid distribution companies. If the mini-grid operator wants the option of being connected to the main grid for enhanced reliability, then the key regulatory issue is the terms and conditions of the backup service that is provided to it by the main grid distribution company or a separate generation company."[25]

4.9 GMS powerless need cheaper, faster investments

According to Michael Brown, Executive Director of the industry-led World Alliance for Decentralized Energy, "increasing capacity at least economic and environmental cost is best done through substantial investment in on- and off-grid DE, and not in less efficient and more costly central power with its associated transmission and distribution network."[26]

With so much financial uncertainty surrounding the actual costs of large scale hydro and regional grid inter-connections, future electricity demand,

combined with fierce competition for capital and predictably devastating environmental costs, it seems reasonable that GMS governments would welcome new rules to attract investment in new generating capacity in smaller increments – power plants that can be built where power is needed, more quickly than large stations, and with far less risk to government finances (and the environment).

But the Asian Development Bank's promise of subsidies for the regional grid and the projects connected to it, has effectively preempted that much-needed analysis of rival technologies and strategies for delivering electricity service in the GMS. From a public perspective, the GMS Electric Forum appears to be a forum for the region's incumbent monopolies and a handful of its international partners and financiers. As a result, GMS consumers are denied access to information and analysis about global experience with and potential for DE (decentralized energy) systems in the GMS. (DE is defined as those systems that produce electricity at or close to the point of consumption and include high efficiency cogeneration (regardless of fuel, size or technology) and decentralized renewable generation (including solar photovoltaics, micro gas and hydro turbines, and wind.)[27]

The potential for DE systems deserve much closer analysis before GMS utilities sink investment capital into assets that could become "stranded" (An industry term for costs deemed unrecoverable from ratepayers. Stranded costs commonly occur when power consumers opt out of the utility-owned grid to pursue cheaper and more reliable options on-site or closer to customers).

DE options are no longer limited by cost or technology. They can provide power at lower cost and greater reliability than the cost of extending the central grid to individual households and communities. But DE in the GMS remains obstructed by state-sanctioned electricity monopolies and laws that have made wasteful large-scale power production the norm. The value of smaller scale generators and DE technologies is not yet reflected in system pricing – to reflect values such as voltage and frequency support, grid reliability and stability, reductions in transmission and distribution losses, and reduced requirements for reserve capacity.[28]

As Cambodia's 2003 Renewable Electricity Action Plan notes, the rules must be rewritten to provide a fair and stable investment environment for renewables and other decentralized service providers. "Now is the time to

ensure renewable technologies have a role to play. The regulatory framework must specifically lean toward renewable electricity technologies or the one-big system will inhibit all future growth. Plans to import power from Thailand and Vietnam, while on the surface appear better than using imported diesel fuels, still locks Cambodia into a future of dependence. Renewable electricity technologies offer the opportunity for Cambodia to be self reliant."[29]

5. GMS Electric Power Forum

The Master Plan forms the basis for the ADB's GMS power sector lending to 2020 and was officially endorsed at the ADB-sponsored GMS Electric Power Forum held in Rangoon (Burma) in October 2002.

The GMS Electric Power Forum was setup on Norconsult's advice over a decade ago as a technical experts' forum that could speed up decisions on Mekong dam construction and the development of Nordic-style regional power trade.[30] EPF meetings are held annually in the GMS, funded and coordinated by the Asian Development Bank.[31] Non-GMS participants in the Electric Power Forum have included non-GMS power companies and international financiers, such as Japan Bank for International Cooperation, Tokyo Electric Power Company, Sweden's power utility, Vattenfall, Swedish hydropower consultants, Swedpower International, and the World Bank.

Plans for the GMS power grid have progressed on several fronts since completion of the ADB Master Plan.

At the GMS Summit in Bangkok in November 2002 (months before the ADB published its final version of the Master Plan), GMS leaders signed an agreement to develop the necessary infrastructure, and institutional and regulatory framework for regional power trade.[32]

A year later, China's second largest transmission grid company, the China Southern Power Grid Company, hosted the EPF meeting in Guangzhou. At that meeting, the company reportedly signed an agreement with Thailand's national power utility, Electricity Generating Authority of Thailand (EGAT) to build a grid connection from the Jinghong dam to Thailand by 2009 (recommended by the ADB Master Plan). [33]

At the same EPF meeting, the World Bank's infrastructure director, Christian Delvoie, announced the Bank's willingness to support regional power trade, including loans for larger and smaller-scale infrastructure projects using funds from the "IDA 13 Regional Project Top Up Funds." The purpose of this new fund, Delvoie said, is "to spur trade and regional integration in addition to IDA country-specific resources."[34]

China's dam building industry would be a major beneficiary of the GMS power grid given its dam building program on the Lancang/Mekong (total planned capacity 15,400 MW), and its plans for up to 13 large hydro dams on the upper Nu/Salween River (maximum capacity 23, 158 MW).[35] Because Yunnan province has insufficient power demand to absorb the dams' massive output, the projects would require high-capacity long-distance connections to distant markets in China and neighbouring countries.

Thailand's electricity generating authority (EGAT) is another key beneficiary and proponent of the GMS power grid. EGAT plans to import "cheap" hydropower from neighbouring countries via grid connections paid for by the exporting country (borrowing money from the ADB and other international financiers). EGAT also benefits from project planning subsidies provided by international GMS donors. At the 2002 EPF meeting, for example, EGAT asked Japan Bank for International Cooperation to pay for feasibility studies for hydro and related transmission projects in Burma and Cambodia.[36]

EGAT has plans for up to five large dams on the lower Salween (maximum capacity 16,000 MW), three in Burma, two along the Thai-Burma border.[37] EGAT has included two of the five projects (with a combined installed capacity of 5,332 MW) in its Power Development Plan for 2003 to 2016. Both projects would require high-capacity connections to the Thai grid.[38]

6. ASEAN Power Grid

Linked to its plans for the Salween River, EGAT's other ambition is to become a regional power trader and investor beyond the GMS to all of Southeast Asia.[39] Initiated by Thailand's energy minister, Prommin Lertsuridej, EGAT has prepared its own master plan for an ASEAN-wide power grid, which includes five grid interconnections in the GMS between 2007 and 2016, and another six interconnection projects between Malaysia,

Sumatra, Singapore, Sabah/Sarawak, Brunei, and West Kalimantan (Indonesia).

To promote the ASEAN grid during the APEC summit in 2003, EGAT setup a special information centre at its headquarters outside Bangkok. It launched a public relations campaign, which included promotional CDs, radio, TV, and magazine ads, and bill boards at Bangkok's international airport.[40] The grid would be a "win-win economic relationship within ASEAN countries," writes EGAT.[41] Those countries with abundant natural resources but with little requirement for electric supply would generate income from selling power . . . countries with high power demand would meet their electricity shortfalls with power imports from neighbouring countries at reasonable prices. The ASEAN power grid would provide "cheaper electricity supply for all members and ensure sustainability of energy resources as well as energy efficiency" which will enable ASEAN "to be more competitive in the world markets," writes EGAT." [42]

EGAT's Thai-language briefing explains further. It reports that EGAT already has a large surplus capacity for meeting peak power demand and does not plan to increase its generating capacity (either by building power plants at home or purchasing power from neighbouring countries) until 2009. Thailand's power system as of 2003 had roughly 26,000 MW of installed capacity and an over-capacity of 4,500 MW (in addition to its 3,500 MW reserve capacity). EGAT thus envisions ASEAN to the south as its new market for 'surplus' hydropower from dams along the Salween and Mekong Rivers, given that its demand growth is expected to double within the next decade. [43]

But critics argue the ASEAN grid is at best wishful thinking. In 2003, Indonesia's energy minister, Purnomo Yusgiantoro, told Thai newspapers that the proposed grid would be too costly for governments to finance, noting the need for expensive underground cables across the sea.[44] By 2004, the *Financial Times* declared the "grand project for a power grid designed to link all 10 members of the Association of South-East Asia Nations physically and symbolically. . . dead, at least for a decade or two."[45] The article quotes energy experts saying the idea of transporting electricity over very long distances is too costly. As energy expert Mark Hutchison of Mullis Capital put it, "Why would I build a 500 MW power line from Kuala Lumpur to Bangkok when it would be much cheaper just to build another power station?" And a Thai Federation of Industries spokesperson is quoted

saying its members – Thailand's largest power consumers – were not convinced that linking Thailand's grid to weaker systems in Laos or Vietnam would boost reliability.

Thailand's hype about the ASEAN grid is linked to EGAT's latest privatization plan and its initial public offering (IPO) on the Stock Exchange of Thailand, which was originally scheduled for early 2004.[46] But the IPO was scuttled last May by Thailand's Prime Minister Thaksin Shinawatra following protests by EGAT workers about EGAT's share allocation formula, and criticism of its privatization plans by energy experts and industrialists.[47] Among the critics was Piyasvasti Amranand, former director of Thailand's National Energy Policy Office, and a longtime advocate of market-oriented power sector reform. As Piyasvasti explained to the *Bangkok Post*, "The [Thaksin Shinawatra] government is converting a public monopoly into a private monopoly with no competition and no proper regulatory framework. There will be uncertainty for consumers, no incentives to improve efficiency, and it looks like tariffs could actually go up."[48]

7. ADB Master Plan Recommendations

Table 1: Grid Interconnection Projects[49]

2003	US$44 million 230-kV line linking Cau Doc province in southern Vietnam to Phnom Penh (included in the ADB Master Plan and financed by the ADB)[50]
2006-2007	500-kV reinforcement of northeast Thailand grid to support additional hydro imports from Lao PDR
2008-2009	Subregional interconnection linking the 500kV systems of Thailand and Vietnam
2012	500kV lines from Tasang dam (lower Salween River) to 500-kV system at Mae Moh (northern Thailand)
2013	500kV line from Jinghong dam (Yunnan) to Thailand

Table 2: Recommended Hydro Projects

2008	Nam Theun 2	Lao PDR	Export to Thailand
2010	Xe Kaman 1	Lao PDR	Export to Thailand
2010	Xe Pian-Xe Namnoy	Lao PDR	Export to Thailand
2012	Nam Theun 1	Lao PDR	Export to Vietnam
2012	Nam Kong 1	Lao PDR	Export to Vietnam
2012	Xe Kaman 3	Lao PDR	Export to Vietnam

Table 3: Norconsult-Recommended Feasibility Studies[51]

LAO PDR – Feasibility Study of 500 kV Power Transmission Interconnection between Lao PDR, Thailand, and Vietnam
Feasibility Study Cost: US$900,000 Timeframe: 18 months. Status: ADB approved funding in December 2003.[52]

Estimated project cost: US$504 million. Implementation: 2008-2010. The feasibility study is expected to "confirm which hydro projects in Lao PDR should be implemented." The Lao PDR government is already exporting almost 500 MW via low and medium voltage lines to Thailand. Lao PDR has agreed to export another 3300 MW to Thailand and another 1000 MW to Viet Nam in the next decade. "To support these power exports, a number of hydroelectric power plants is anticipated to be developed north of Vientiane in Lao PDR, in the Nam Ngum and Nam Ngiep basins, in the middle Lao, in the Nam Theun basin and in Southern Lao in the Sekong Basin."(sic)[53]

YUNNAN, CHINA – Feasibility Study of Power Transmission Interconnection from Malutang Hydro Power Plant in Yunnan Province to Viet Nam.
Feasibility Study Cost: US$300,000 Timeframe: 10 months.

Estimated project cost: US$68 million. Purpose: To assess viability of exporting power from the future 460 MW Malutang dam (China) to Vietnam by 2019. "Critical success factors" for this study are described as "access to political considerations and agreements related to cooperation between Yunnan and Vietnam," as well as access to utility data, plans, and project sites.[54]

BURMA – Feasibility Study of Power Transmission Interconnection from Tasang dam (Salween) to Thailand's grid.
Feasibility Study Cost: US$400,00 Timeframe: 10 months.

Estimated project cost: US$323 million. "Critical success factors" for the feasibility study are described as access to data, earlier studies, etc. Burma has signed an agreement to export 1500 MW to Thailand by 2010.

CAMBODIA – Feasibility Study of Power Transmission Interconnection from Sambor dam in Cambodia to Viet Nam
Feasibility Study Cost: US$500,000 Timeframe: 12 months.

Estimated project cost: US$90.4 million. Purpose: To assess viability of a 230-kilovolt connection from proposed Lower Sre Pok and Sambor dams to Tan Dinh near Ho Chi Minh. Cambodia has already signed a power export agreement with Vietnam. This study is "expected to be one of the key elements to promote the development of potential hydropower resources in Cambodia."[55]

8. ADB Greater Mekong Subregion Flagship Initiative[56]

Based on the projects recommended by Norconsult in the ADB Master Plan, the ADB's Greater Mekong Subregion Department has developed a lending portfolio of US$4.58 billion worth of loans and grants for financing 32 grid and grid-related projects in the GMS countries to 2020.[57] The ADB breaks the portfolio down into four categories as follows:

- US$ 2.4 billion for regional transmission lines and switching stations;

- US$2 billion for "private sector mobilization" (read subsidies) for large hydro dam and transmission line construction. The ADB describes this as "institutional and policy support and co-financing for independent power producers (IPPs) through build-and-operate schemes for power generation and transmission." Included in this budget category as a "main component" is the US$1.2 billion Jinghong dam on the upper Mekong in China's Yunnan province, but no further details are provided.

- US$ 183 million for power market/power trade system development – power sector loans and grants to GMS utilities.

In addition to the projects recommended by Norconsult in the ADB Master Plan, the ADB's Greater Mekong Subregion Department has prepared a series of grants and loans for power sector development as follows:

Electricité du Cambodge

1. US$20 million Loan for Transmission Line (115-kV) from Thailand to northwestern Cambodia 2004

"Transmission lines will be the least-cost method of supplying power to consumers after 2006, according to ADB technical assistance to Cambodia – Update of Power Rehabilitation II Study (TA 3295-CAM)."

Electricity of Vietnam

1. US$ 145 million Power Transmission and Distribution Loan Project 2004

The project description states that the project will improve power supply and reliability in Vietnam's central region, and will be linked to: "power sector reform, including a new electricity law; financial performance of the executing agency, implementation of a new management structure in national transmission system which are expected to improve regional connectivity (sic). . . . There is a need to determine possible social/environmental issues or concerns. Plan for stakeholder participation in project design and implementation has yet to be developed."

2. US$800,000 Grant for Power Sector Development in Vietnam 2004
The TA "will help the Viet Nam government identify power sector projects suitable for funding in the context of plans to interconnect the Viet Nam system with the GMS power grid."

3. US$US500,000 Grant for Strengthening Power Transmission and Distribution 2005
The TA includes power sector reform and notes: "Recommended options for institutional and organization set-up for distribution/transmission may encounter political resistance from some quarters."[58]

Electricité du Laos

1. US$1.4 million Grant for Power Sector Development 2003

No project details are provided.

2. US$300,000 Grant for Private Sector Development in the Power Sector 2003

The TA will include strengthening regulatory capacity and developing "options for public-private partnerships in the power sector."

3. US$35 million Loan for Power Sector Development (for hydropower generation) 2005

No project details are provided.

END

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[1] Asian Development Bank (2000) "Regional Indicative Master Plan on Power Interconnection in the GMS TA No. 5920," www.adb.org

[2] Asian Development Bank (2003) *Regional Indicative Master Plan on Power Interconnection in the GMS,* Volume III, Chapter 6: Economic Analysis, Norconsult, p. 6-4 – 6-8.

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