

CITIZEN-ORIENTED POWER SECTOR REFORM IN THAILAND

Sheila Bijoor, Chris Greacen¹, Chuenchom Greacen

PALANG THAI

A paper written for the blue moon foundation workshop,
“Integrated Environmental Policy Packages in the GMS”.

July 11-13, 2007

Imperial Queens Park Hotel, Bangkok, Thailand

1 INTRODUCTION: “OUR VISION”

Thailand, like its counterparts in the Mekong region, struggles to balance economic development with ideals of social welfare and environmental stewardship. Rapid industrialization of the past several decades has brought prosperity, but has also had a severe impact on local livelihoods and the environment. Urban pollution, deforestation, and water contamination affect all parts of Thai society. As Thailand continues to develop in the next century, we must ask ourselves, “How can we continue to prosper, but in a way that is conscious of social equity and environment?”

The power sector is one area in which Thailand and the rest of the Mekong region can achieve a balance between prosperity, environmentalism, and equity. It is also arguably the most important area to achieve this balance—power plants and dams have too often been at the heart of social and political conflicts in the Mekong Region. We envision a power planning process in which demand side management and clean decentralized energy compete on an equal footing with conventional centralized power plants. Electricity infrastructure investments in the region will provide reliable energy services at the lowest economic cost to society, including social and environmental costs—not just the lowest cost to investors. Major decisions will be made through a process that includes informed, rigorous, and meaningful public participation. Thailand will develop, and this vision will lead to a power sector that meets energy demands while providing fair access to and judicious use of resources.

Economic development does not have to come at the expense of social equity and environmental protection. The Mekong Region now has a unique opportunity to define a development path that is conscious of social and environmental impact. This paper describes citizen-oriented power sector reform in the Mekong region, focusing largely on Thailand. We believe this focus on Thailand is appropriate because of all Mekong countries, Thailand’s power sector planning process is already probably the most participatory – yet still falls far short of achievable and desirable levels of public participation. At the same time, power sector processes in Thailand share key similarities to those in other Mekong countries. Thailand is

¹ chris@palangthai.org

also one of the largest financiers, developers, producers and consumers of energy in the Mekong, and is a significant (and growing) importer of electricity from neighbours, so energy planning decisions have significant implications beyond its borders. Finally, Thailand's energy regulatory environment is in flux, opening new opportunities for the types of reforms we envision.

Section 2 outlines the goals of the power sector in Thailand as articulated by Thai government. Section 3 explains current power sector planning processes, and Section 4 describes actual outcomes. Section 5 analyzes these outcomes in light of the original goals and builds the case for planning reform. Section 6 introduces Integrated Resource Planning (IRP) as a power sector planning tool to systematically optimize power development choices in Thailand. Section 7 provides describes "big picture" changes that are likely to be necessary to construct a citizen-oriented power sector that meets each country's goals. Section 8 describes barriers or risks in achieving these goals. Section 9 suggests immediate steps that move us toward reforms to improve the environmental, social and economic performance of the power sector.

2 GOALS OF THE POWER SECTOR FOR THAILAND

The Thai power sector strives to provide fair access to and judicious use of its energy resources. In this spirit, the Ministry of Energy outlined the following goals for the power sector in November 2006 (Energy 2006):

- To improve reliability and security of energy supply
- To provide services at reasonable cost
- To promote energy efficiency and conservation
- To balance development with environmental conservation
- To contribute to regional economic goals
- To promote development and utilization of alternative energy
- To promote competition in the energy business
- To diversify fuel supplies and reduce risk
- To promote a self-sufficient economy and reduce import dependence

These broader goals are further reflected in the Regulations for Power Purchase from Small Power Producers (SPPs), which were approved by the Thai Cabinet in 1992. These regulations, in addition to specifying policies for SPPs, state the following goals:

- To promote greater use of non-conventional and by-product energy in the country
- To promote more efficiency in power generation

- To reduce the Government's burden of investment in the generation and distribution systems

3 CURRENT POWER SECTOR SITUATION IN THAILAND

Power planning in Thailand follows essentially a two-step process. First, electric load forecasts are generated to predict future energy demand, and these forecasts in turn form the basis for a long-term Power Development Plan (PDP) that determines what centralized power plants are built, when. Power plants specified in the plan are supplemented by electricity savings from Demand Side Management (DSM) programs, and by small combined heat and power (CHP) and renewable energy generators enabled by Small Power Producer (SPP) and Very Small Power Producer (VSPP) regulations.

3.1 Load Forecasting

Future electricity demand in Thailand is projected by the Thai Load Forecasting Committee (TLFS). The TLFS is comprised of representatives from government agencies, industrial and business sectors, consultants, academics, and the state's three utilities. The latter refers to the state-owned generating/transmission utility, Electricity Generation Authority of Thailand (EGAT), and two state-run distribution utilities, the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA).

The TLFS bases its forecasts on a combination of methodologies, depending on the distribution utility (MEA or PEA) and consumer class. For residential and office buildings, which comprise 20% and 30% of consumption, future electricity demand is derived from surveys of electricity usage in households and office buildings last conducted in 1998. The remainder of consumption comes from business and industry. For these consumer classes, TLFS bases consumption on broad macroeconomic trends. These trends are fundamentally derived from economic growth forecasts, especially long-term forecasts (Vernstrom 2005). The long-term economic growth forecasts are provided by a non-profit policy research institute, the Thailand Development and Research Institute (TDRI), which is funded by EGAT, MEA, and PEA. Short-term economic growth forecasts (less than five years) are provided by government's National Economic and Social Development Board (NESDB).

3.2 Power Development Plan

EGAT uses the load forecast as the primary basis for the Power Development Plan (PDP), which specifies how and when new power plants are to be built over the next fifteen years. The PDP is reviewed by the Ministry of Energy and approved by the National Energy Policy Council (NEPC) and Council of Ministers.

The PDP is developed using a computer modelling program called Strategist. The program adds power plants to the system in order to optimize lowest costs (defined as investment, fuel, operation and maintenance (O&M) costs). Plants are added subject to two criteria. The first criterion is that the planned reserve margin is at least 15%. The reserve margin indicates the amount of generating capacity available in excess of the annual peak demand (which occurs

once a year in early afternoon sometime during the hot months of March, April or May). When EGAT defines its reserve margin, it counts only plants that it considers “dependable”. The amount considered “non-dependable” includes certain percentage of hydroelectric projects since the availability of hydropower during the dry season differs from year to year. The second criterion is that the loss of load probability (LOLP) is less than one hour per year. The LOLP addresses the fact that there are regional differences in the availability of transmission and generation and everywhere in the country should have sufficient generation and transmission to have power 99.99% of the time.

3.3 Key Renewable Energy & CHP Programs and Potential in Thailand

Thai has two key programs to encourage grid-connected renewable energy: the Small Power Producer (SPP) program and the Very Small Power Producer (VSPP) program.

3.3.1 Small Power Producer (SPP) program

Thailand’s Small Power Producer (SPP) regulations were passed in 1992, allowing grid-interconnection and sale of electricity by private sector renewable energy or clean combined heat and power (CHP) installations up to 90 MW per facility.

In 2001 the government further encouraged renewable energy by offering a bidding program that provided subsidies to biomass generators. The program was capped at 300 MW, and the subsidy averaged 0.17 baht per kWh sold to EGAT for the first 5 years of operation. Because bids were only solicited once, prior to the bid evaluation in 2002, all projects after this cutoff date have not been eligible for the subsidy. Sixteen currently operational SPPs were awarded subsidy.

In April 2007 the National Energy Policy Council (NEPC) issued a new SPP regulation that called for a new SPP subsidy program. Subsidies shown below in Table 1 are in addition to wholesale and “Ft” tariffs – around 2.65 baht/kWh (Narupat 2007).

Table 1: Subsidy arrangement for SPP announced 9 April, 2007. Source: (Narupat 2007).

Fuel Type	Adder (baht/kWh)	Purchase capacity (MW)
MSW	2.5 (fixed)	100
Wind	2.5 (fixed)	115
Solar	8.0 (fixed)	15
Other RE	0.3 (bidding)	300
Total		530

3.3.2 Very Small Power Producer (VSPP) program.

In May 2002, Thailand was the first developing country to adopt net metering regulations (known in Thailand as the Very Small Power Producer (VSPP) program) that facilitate interconnection of renewable energy generators under 1MW in size. Under these regulations, generators can offset their own consumption at retail rates. If net surplus of electricity is generated, the VSPP regulations stipulate that MEA and PEA must purchase this electricity at the same tariff as they purchase electricity from EGAT. This is typically about 80% of the retail rate. An important feature of the tariff structure is that there is no firm versus non-firm distinction as for the SPP programme. Instead, generators receive higher tariffs during peak times.

In December 2006, VSPP regulations were further expanded to provide similar terms for renewable energy projects and fossil-fueled CHP projects up to 10MW per installation, as well as an additional "feed-in tariff" adder for specific renewable energy fuels (Table 2). The feed-in adder is additional to rates previously paid to VSPP generators and will be paid for the first seven years after each generator's commissioning date for all projects submitted before December 2008.

Table 2: Subsidy addition for renewable VSPP

Fuel	Renewable energy adder (Baht/kWh)
Biomass & biogas	0.3
Hydropower <50 kW	0.8
Hydropower >50 kW but <200 kW	0.4
Wind and municipal waste	2.5
Solar	8

A NEPC resolution on 4 June 2007 provided an additional incentive of 1.0 to 1.5 baht/kWh for projects located in the three southern provinces (Pattani, Yala, Narithiwat) in an effort to stimulate investment in the region which has suffered in the past few years from considerable violence.

The influential "Energy Strategy for Competitiveness" workshop set a goal that 8% of Thailand's energy consumption would be derived from renewable sources by the year 2011. The workshop also released a Thai Ministry of Energy estimate that Thailand's potential renewable energy resources exceed 14,000MW (Thai Ministry of Energy 2003). To put this in perspective, Thailand's peak demand in 2007 is 22,586MW.

The potential of each technology identified is described in table 5.

Resource	Potential (MW)
Biomass	7000
Solar PV	> 5000
Wind	1600
Micro- & Mini- hydro	700

Table 5: Renewable energy potential. Source: (Thai Ministry of Energy 2003)

CHP potential in Thailand is significant. A study commissioned by the Thai Ministry of Energy's Energy Planning and Policy Office (EPPO) and carried out by the Joint Graduate School on Energy and Environment (JGSEE) estimated the quantity of commercially viable *new* natural gas-fired CHP in 817 existing factories and 966 existing commercial buildings located in areas that will be served by planned Thai natural gas pipeline expansion (Menke, Gvozdenac et al. 2006). The study is thorough, but is likely to underestimate potential by year 2015 because (a) it overlooks opportunities for CHP in large government buildings, residences, etc; (b) because the study disregards hundreds of potential industrial and commercial sites for which data was incomplete; and (c) and because the study considers only existing buildings and not new facilities that will be built between now and 2015. Commercially viable CHP new potential capacity is estimated to be 3,271MW.

3.4 DSM Programs and Potential

EGAT launched a DSM program in the mid-1990s supported by the Global Environmental Fund. This program provided over 735MW of demand reduction by 2001 at a cost of 0.5 baht per kWh (Phumaraphand 2001). This is about one third the cost of electricity generation from natural gas combined cycle gas turbines. EGAT still operates the same program using its own revenues or budgets. As of March 2006, the program has saved 1,305MW ((EGAT 2006).

Thailand's Department of Energy and Distributed Energy (DEDE) initiated its DSM program in 2001. In contrast to EGAT's DSM savings, which come primarily from the residential sector, DEDE's DSM savings come from the commercial and residential sectors. In June 2005, the total targets exceeded 6,200 GWh/year by 2006 and 1,100 peak MW (du Pont 2005).

A World-Bank commissioned study of DSM potential in Thailand estimates that 2,5929MW (11,468Wh/year) of DSM is "economic and achievable" by 2011 (du Pont 2005). This study heavily discounted commercially viable DSM measures, which suggests that an aggressive nationwide DSM program could lead to savings significantly higher than 2,529MW.

4 OUTCOMES OF POWER SECTOR PROCESSES

Table 3 shows the PDP (main plan) for 2007. The plan calls for a total of 31,791 MW of increased capacity by the year 2021. The growth is approximately exponential, with 10,541 MW required in the first five years and the remainder in the subsequent six years. Most new domestic power plants will be coal (8.8%) or natural gas (57.2%), and a small percentage

(5.3%) will be from SPPs. Imports from neighbouring countries account for 16% of the new capacity. Nuclear power is introduced to the PDP as part of the additional capacity for 2020, accounting for 12.6% of the total additions.

This additional capacity is expected to increase carbon dioxide emissions in Thailand by 78% from its current level by the year 2021.

Table 3: Summary of Approved 2007 PDP.

Year	New Domestic Plants					Power Purchase from other countries	Increased Capacity	Total Capacity	Peak Demand	Reserve Margin (%)
	Gas	Coal	Nuclear	GT	SPP					
2011	-	-	-	-	-	597	597	34,037	27,996	18.0
2012	1,400	-	-	-	200	220	1,820	35,857	29,625	17.4
2013	1,400	-	-	-	200	963	2,563	37,800	31,384	16.5
2014	1,400	700	-	-	200	261	2,561	40,361	33,216	17.7
2015	1,400	1,400	-	-	200	-	3,000	42,186	35,251	16.1
Total	5,600	2,100	-	-	800	2,041	10,541			
2016	1,400	700	-	-	200	390	2,690	44,127	37,382	16.4
2017	3,500	-	-	-	200	500	4,200	47,119	39,560	15.6
2018	2,100	-	-	-	200	510	2,810	49,888	41,795	15.6
2019	3,500	-	-	-	200	530	4,230	52,829	44,082	16.5
2020	1,400	-	2,000	-	100	550	4,050	55,251	46,481	16.7
2021	700	-	2,000	-	-	570	3,270	58,321	48,958	15.4
Total	12,600	700	4,000	-	900	3,050	21,250			
Grand Total	18,200	2,800	4,000	-	1,700	5,091	31,791			

Figure 1: Breakdown of Capacity Addition in 2011-2021 (PDP 2007 Main Plan)

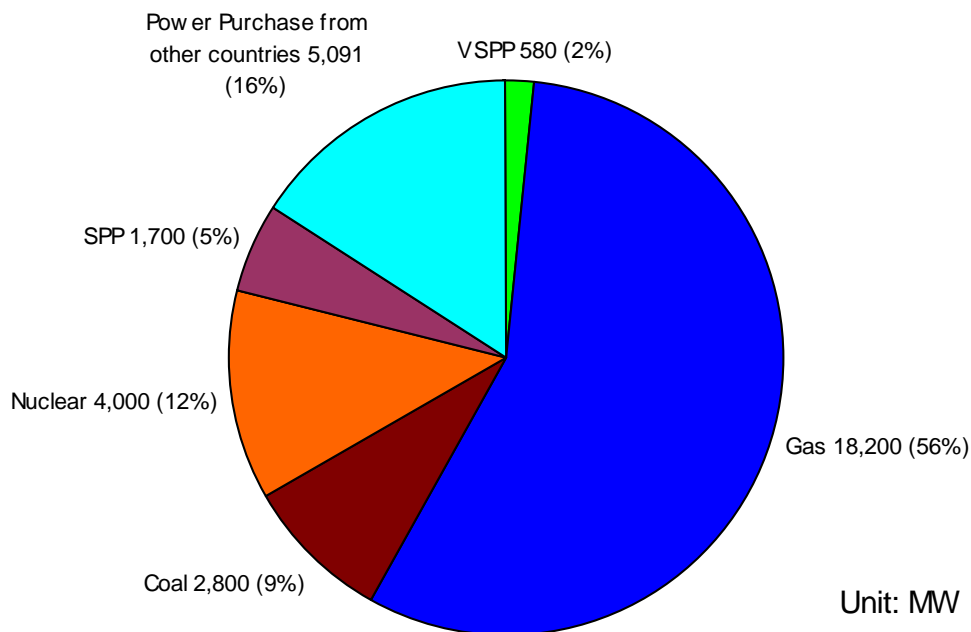


Table 4 shows the Back-Up PDP for 2007. The back-up plan calls for relatively more (hydropower) imports from neighbouring countries and relatively less natural gas. The distribution of additional capacity is shown in Figure 2

Table 4: Approved 2007 Back-Up PDP.

ปี	โรงไฟฟ้าใหม่ในประเทศ				ซื้อไฟฟ้า จาก ต่างประเทศ	กำลัง ผลิต ที่เพิ่ม	กำลัง ผลิต รวม	ความ ต้องการ ไฟฟ้า	Reserve Margin (%)
	Gas	Coal	Nuclear	SPP					
2554	-	-	-	-	597	597	34,102	27,996	18.2
2555	1,400	-	-	200	-	1,600	35,702	29,625	16.9
2556	1,400	-	-	200	963	2,563	37,645	31,384	16.0
2557	1,400	700	-	200	-	2,300	39,945	33,216	16.5
2558	1,400	1,400	-	200	380	3,380	42,150	35,251	15.8
รวม	5,600	2,100	-	800	1,940	10,440			
2559	1,400	-	-	200	1,190	2,790	44,191	37,382	16.3
2560	1,400	-	-	200	2,600	4,200	47,883	39,560	17.3
2561	1,400	-	-	200	1,210	2,810	49,952	41,795	15.6
2562	-	-	-	200	4,030	4,230	52,893	44,082	16.4
2563	-	-	2,000	100	1,950	4,050	55,335	46,481	16.7
2564	-	-	2,000		1,270	3,270	58,405	48,958	15.4
รวม	4,200	-	4,000	900	12,250	21,350			
รวมทั้งสิ้น	9,800	2,100	4,000	1,700	14,190	31,790			

Figure 2: Breakdown of Capacity Addition in 2011-2021 (PDP 2007 Back-Up Plan)

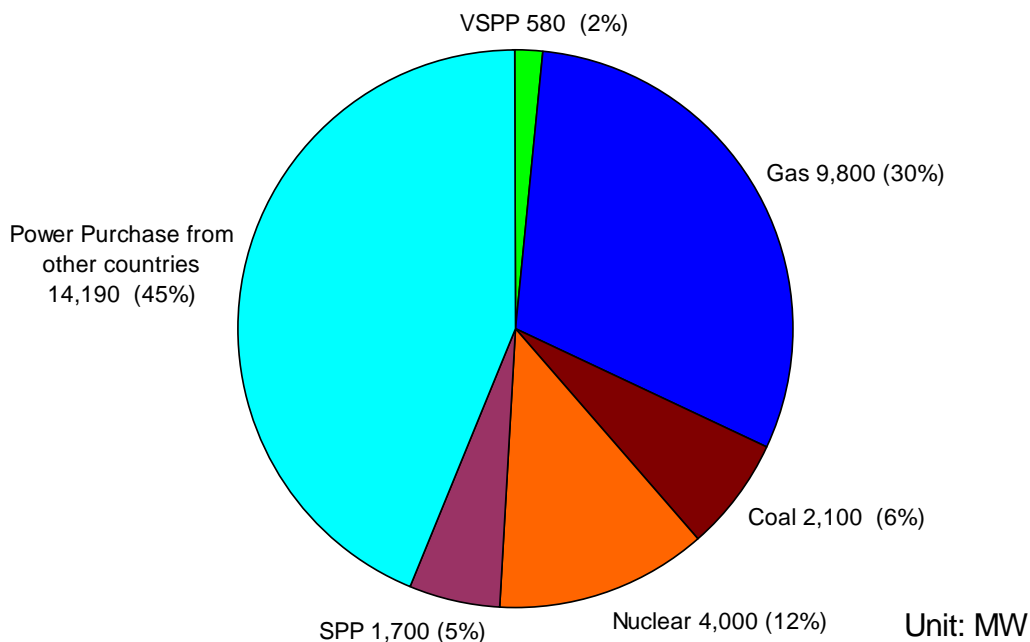
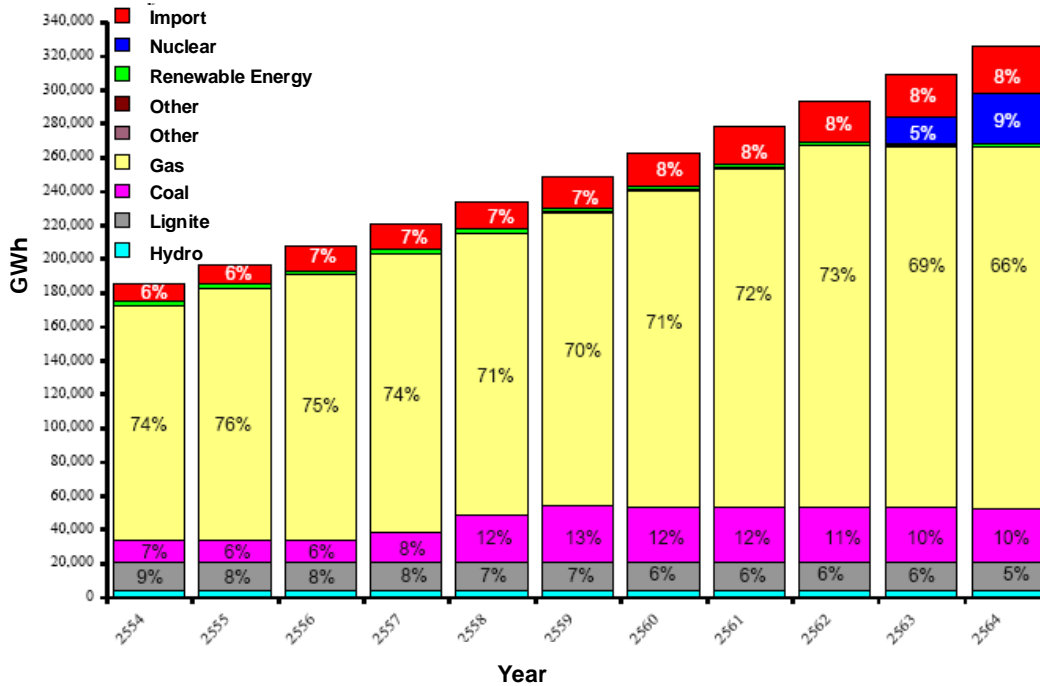


Figure 3 shows the year-by-year changes in the overall fuel mix in Thailand’s power generation as projected in the main plan of the current PDP. Thailand is expected to continue strong reliance on fossil fuels.

Figure 3: Fuel Mix in Power Generation



5 COMPARING OUTCOMES WITH GOALS

In theory, the load forecast and PDP set objectives for the energy sector that meet the specific goals of the power sector and synchronize with the country’s overall economic and social vision. In practice, however, the historic evolution of the Thai power sector and the PDP process fall short of these targets. The following section describes the positive attributes and shortcomings of power sector performance and planning in light of the power sector goals.

5.1 Positive Attributes

Positive outcomes of the contemporary power sector practices include:

- There is no shortage of electricity generating capacity;
- In the short term, projected high need for power plants stimulates GDP growth through power plant construction;
- In the long term, revenues from power projects have the potential to be allocated to fuel equitable social and economic development.

- Electricity tariffs in Thailand have historically been reasonable compared with international experience.
- Thailand has achieved high electrification rates, with over 99% of villages (but not necessarily village households) electrified by 2006.

5.2 Shortcomings

In addition to its positive attributes, the power sector practice and planning have several critical shortcomings:

- The TLFS consistently overestimates demand. Twelve of the past thirteen load forecasts have overestimated actual demand, sometimes by as much as 48%. Discrepancy for forecasts made in the mid and late 1990s has been attributed to repeated failure by the TLFS to appreciate the extent and severity of the Asian Financial Crisis in 1997-98 (Vernstrom 2004). But forecasts made after the turn of the millennium continue the over-estimation trend. (The very latest forecast (July 2007) is the sole exception. The July 2007 forecast actually underestimated year 2007 peak demand (by 0.X%) but since this forecast was issued after the peak (which occurred in April) it is difficult to consider it a "forecast" for the year in which it was issued. In some cases, demand is overestimated by proposed industrial loads that apply for new hook-ups, but later are not built or delayed (Bangkok Post 2002). In 2003, Prime Minister Thaksin Shinawatra estimated that accumulated unnecessary investment in the power sector totalled 400 billion baht (US\$10 billion)(The Nation 2003).
- As employed by EGAT, the PDP modelling software only considers conventional sources: coal, natural gas, oil, and nuclear. It includes only a token, fixed amount of DSM, renewable energy, or cogeneration. The software's optimization routine is not allowed to select more of these environmentally friendly alternatives, even in cases when these options are cheaper than conventional sources. EGAT's own experiences with DSM indicate that DSM provides capacity at about a third the cost of natural gas combined cycle gas turbines (CCGT) (Phumaraphand 2001). EGAT's top-down PDP planning process envisions a minor role for DSM, in contrast to high achievable and cost-effective potential for Thai DSM demonstrated in World Bank studies (du Pont 2005). Short changing energy efficiency may stem from a fundamental conflict of interest: EGAT gets more revenues from more electricity sales. DSM means lower electricity sales. Reform is needed to better incentivize EGAT to pursue DSM investments that are good for the country.
- EGAT considers a very limited set of costs in the PDP process. EGAT considers only the cost of generation when comparing options. Transmission costs, distribution costs, global warming costs, social impacts, and environmental externality costs should also be considered.
- The load forecast and PDP are not generated in participatory, transparent processes. In Europe and North America, load forecasts are debated in public forums and verified by multiple, independent sources. The final load forecasts are determined through an open and participatory process. In Thailand, however, citizens have very little meaningful opportunity to participate in the forecasting process. The TLFS operates behind closed doors, and the eventual load forecast is finalized without external approval. The PDP is

approved by state officials, but in practice it is seldom questioned. In fact, journalists and consumer groups are concerned that EGAT has virtually no oversight in creating the PDP (Crispin 2001). Thailand's cost-plus power structure ensures that costs, including those from unnecessary supply, are paid by consumers.

- The PDP does not substantially reduce import dependence; in fact the latest April 2007 "back-up" plan proposes a significant increase in fuel imports (Table 4). These imports would come primarily from Laos, China and Burma, which generally have weaker social and environmental safeguards than Thailand.
- Some power plants have been the source of considerable suffering. Sulfur emissions from Mae Moh coal in Lampang Province have caused respiratory diseases and reportedly led to the hospitalization of over 600 local villagers. Villagers have sued EGAT for compensation, but as the case drags on in court many of the plaintiffs have already died. Villagers affected by the Pak Mun dam in Ubon Ratchatani have lost their fishing livelihood and protested for over ten years to have the dam's gates seasonally opened to allow fish to migrate. Planned power plants at Bo Nok and Hin Krud in Prachuap Kirikan Province were the site of violent protests. In the ensuing dispute, a community leader was gunned down by assassins, hardening the bitter feelings harboured by villagers against developers of large fossil-fuel power plants. Controversial dams planned or under construction throughout the Mekong Region threaten the hydrology of key rivers in the region, and the dams' reservoirs will inundate villages and farmland requiring relocation and changes in livelihoods for tens or hundreds of thousands of villagers.

5.3 Positive Attributes and Shortcomings of the SPP/VSPP Programs

As of March 2006, nearly 1 gigawatt (GW) of installed renewable energy capacity was built under the SPP program.² This is significant, considering that Thailand's total peak load in 2006 was just over 21GW. Renewable energy projects developed under the SPP programme so far have been exclusively biomass fuelled, with the majority (31 projects) using bagasse from sugar mills.

Under the "1 MW VSPP regulations," as of March 2007 (just over four years), 98 generators had received notification of acceptance with a total of 17.8 MW generating capacity. Compared with SPP generators, the VSPP programme involves a much wider range of fuels from solar photovoltaic (PV) (66 installations) through biogas (16 installations) to various types of biomass (total of 15 installations). As of April 2007, 43 projects with installed generating capacity of 364 MW have submitted applications for the "10 MW VSPP regulations".

Experience from capped programs in Thailand and other countries, however, indicates that the SPP cap (100 MW for MSW, 115 MW for wind, 15 MW for solar, 300 MW for biomass) will likely present a barrier at some point. As the total number of applicants approaches each particular cap, the risk that the project is unable to qualify to receive the subsidy becomes high, raising costs (Mitchell, Bauknecht et al. 2003). This cap prevents the SPP Programs from reaching its true potential.

² Of which 447MW was sold to the grid, with the remainder providing electricity directly to factories.

Further, the contributions of SPPs and VSPPs are not adequately considered in the development of the PDP. The programs operate separately from the power planning process, making it difficult for clean, renewable energies to offset construction of conventional energy in any significant way.

Figure 1 shown in the previous section, displayed the breakdown of capacity addition for the 2007 PDP. Only 5% of the capacity addition is attributed to SPP, and 2% to VSPP.

6 TRANSFORMATION STRATEGIES TOWARDS A CLEAN, DEMOCRATIC POWER SECTOR

The section five above argues that there is a gap between the goals of power sector planning (reliability, affordable power, environmental conservation, poverty alleviation, greater democratic decentralization) and power sector outcomes (over-investment, failure to consider key costs borne by society, lack of public participation, opaque decision-making, conflict of interest, environmental and health impacts, and community conflicts).

6.1 Integrated Resources Planning (IRP)

We believe that a variety of reforms are both desirable and possible. Some key reforms are implied or embodied in reforms to the power sector planning process so that options chosen are *truly least cost*. True least-cost planning means a public planning process and a framework within which *all costs and benefits of all options* are considered. An often-used framework for least-cost planning is Integrated Resource Planning (IRP). IRP differs from conventional supply planning in four ways:

1. Traditionally, growing energy demand in the power sector is met by expanding energy supply. In an IRP process, energy efficiency by users, or demand side management (DSM), is evaluated on an equal basis as supply expansion. (In contemporary planning in Thailand energy efficiency is not assessed on a level playing field with coal, gas, and nuclear. Instead, only a token, fixed amount is added to the plan).
2. IRP is technology and method neutral; cogeneration, renewable energy, centralized, and local generation are assessed on a level playing field with conventional supply side resources. (In contemporary planning in Thailand these options are not assessed on a level playing field with coal, gas, and nuclear. Instead, only a token, fixed amount is added to the plan)
3. IRP redefines "least-cost" planning to not only consider costs incurred by investors, but also to consider environmental, equity, reliability, and other costs specific to the region. (In contemporary planning in Thailand only investor costs are considered).
4. IRP functions most effectively as a transparent, participatory process. Public authorities, private shareholders, and citizens work together to identify priorities and evaluate costs. (In contemporary planning in Thailand key decisions are made behind closed doors by insider "experts").

6.2 IRP process

What is the IRP process and how does it work? IRP processes in other countries have followed more or less the following process (Hippel 1999):

1. Collection of reliable data including information on:
 - a. electricity use by different groups;
 - b. factors that affect energy use such as population growth, industrial production, building areas, commercial output;
 - c. how factors that affect energy use will change in the future;
 - d. supply resources and options, environmental performance;
 - e. Costs (including social and environmental costs) of all options – including DSM, renewable energy, chp, and conventional sources;
2. Public discussion of objectives for the future electricity provision. Some candidates include: reliability; stable and low rates for consumers; enhanced energy security; enhanced flexibility in the face of uncertainties in the national/global economy, technology change, and regional cooperation; minimized environmental and human health impacts, maximized use of local resources, poverty reduction and contributions to local employment, minimized foreign exchange costs, contributing to national social goals such as reducing rural-to-urban migration and extending opportunities for rural industry.
3. Projection of future electricity demand forecast. This would use improved bottom-up methods that address the systematic bias problems of past forecasts, and include greater public participation, transparency and accountability than current practices.
4. Investigation of costs and electric load impacts of demand side management (DSM) alternatives and opportunities
5. Investigation of economic costs and environmental impacts of conventional and alternative supply options.
6. Design integrated supply-side and demand-side plans that satisfy the criteria identified in Step 2. These are candidate IRPs that meet the electricity needs of consumers for 15 years.
7. Selection of preferred and contingency plans and preparation of an IRP report.
8. Implementation of the plan. Implementing the plan requires coordination and “buy in” from utilities, private sector, various government agencies, and customers of various categories.

6.3 Benefits of IRP

IRP helps investors make more informed choices about which energy options are appropriate and timely. As such, it would help address specific problems in the Thai (and Mekong) power sectors. These include: reducing costs; furthering environmental protection; improving reliability; reducing supply-side losses.

6.3.1 Reducing costs

IRP has the potential to reduce costs through reducing more accurate assessment of demand; through helping ensure that options chosen are truly least-cost, and through choosing options that are flexible in the face of uncertainties. The costs considered in determining the “least cost” option need to be broadened to include a full accounting of costs incurred by society.

As discussed above, TLFS overestimation of future electric demand leads to construction of excess capacity. It is important to note who pays these costs. Investors bear little risk of over-construction – “take or pay” tariffs are structured so that investors are paid regardless of whether their power plants are dispatched. The cost of over-construction is thus passed directly to the consumer in the form of higher tariffs.

One way to increase the accuracy of demand estimates – and thus lower costs from over/under construction -- is to incorporate more input from consumers in the forecasting process. In Thailand, however, small consumers such as residential and small business customers comprise 98% of all electricity customers, but have no representation in the process. In an IRP process, consumers, authorities, and investors decide load forecasts in a transparent and participatory process. In North America and Europe, for example, forecasts are contested in public rate cases or market price referent proceedings. This has resulted in greater accuracy of load forecasting, thereby providing effectively for demand and cutting costs.

In addition to improved load forecasts, an IRP would lower costs by considering more options. Currently the planning process in Thailand considers only four technologies/capacity packages: combined cycle natural gas (700 MW), gas turbines (230 MW), coal (700 MW) and nuclear (1000 MW). But it is well known that some alternatives such as DSM provide electricity services at lower costs than these supply side options – even if the only “costs” considered are investment and operations costs.

But for optimal choices for society require a broader definition of costs to include essential costs borne by society but not currently considered in the current PDP process. These costs include transmission and distribution costs, social and environmental costs. Transmission and distribution costs are substantial when power is generated in a centralized power plant and transmitted hundreds of kilometres to distant loads. These costs are considerably less for distributed generation (DG) located close to customer loads. IRP could be structured in a way to include consideration of the higher cost burden that centralized generation imposes.

A important element of the IRP process requires the calculation of social and environmental “externality costs” of each fuel – costs such as crop damages, increased morbidity and mortality, global climate change – that accrue to society even if they are not internalized by power plant owners. A comprehensive assessment of the external costs of each fuel source that is specific to Thailand has yet to be conducted, but studies from Europe suggest that externality costs of fossil fuel generation can be considerably higher than the capital and fuel

costs of these technologies. A key recommendation of this that a bottom-up, Thailand-specific externality study be carried out by a respected and unbiased institution as part of baseline data for an IRP.

6.3.2 Furthering environmental protection

The government has expressed a desire to protect and conserve natural areas in Thailand, but there is still a wide disconnect between environmental policies and actions in the power sector. In 2002, the Ministry of Natural Resources and Environment (MONRE) was established to protect and conserve protected areas, water resources, mineral resources, marine and coastal resources, and environmental quality. The Government Administrative Plan (GAP) for 2005-2008 includes specific targets for natural resources and the environment, including "building a balance between development and conservation, protecting biodiversity, rehabilitating land resources, managing water resources, and including local communities and the private sector in resource management." (World Bank 2006)

IRP can achieve these targets through inclusion of either actual costs (such as the cost of pollution controls) or surrogate values (such as charges levied for negative impacts) in the comparison of costs. This practice results in cleaner options being relatively less expensive and therefore constituting a larger portion of the generation mix.

6.3.3 Improving fuel supply diversity

A key objective of the Ministry of Energy is to reduce Thailand's reliance on fossil fuel imports through diversification of electricity generating sources. Currently Thailand relies on fossil fuels for 89% of its electricity (of which natural gas accounts for 67%), The EIA estimates that US\$10 increase in oil prices decreases global GDP by 0.5% (US\$255 billion damage) (Awerbuch 2006). Not surprisingly, Thailand's past economic crises' shows strong links to fossil fuel prices. Even small percentage increases in fossil prices can yield sizeable economic losses through unemployment and lost income, as well as the loss of value for financial and other assets. Fuel costs are the greatest burden at precisely the times when Thailand's economy is weakest. Other Mekong countries rely strongly on imported fossil fuels as well. For example, most of Cambodia's electric generation is by expensive diesel generators.

IRP can improve fuel supply diversity by incorporating consideration of portfolio-based techniques to minimize energy price risk, or by using risk-adjusted costs in determining which options to choose. Portfolio analysis is widely used by financial investors to create robust portfolios that produce efficient outcomes under various economic conditions. In essence, an efficient portfolio takes no unnecessary risk relative to its expected return. Traditional energy planning in Thailand is roughly analogous to trying to identify yesterday's single best performing stock and investing in it exclusively for the next 30 years. A superior alternative is to use an astute combination of sources to minimize overall generation cost relative to the risk. Through use of portfolio approaches, energy planning under IRP could focus less on finding the single lowest cost alternative and more on developing efficient (i.e. optimal) generating portfolios.

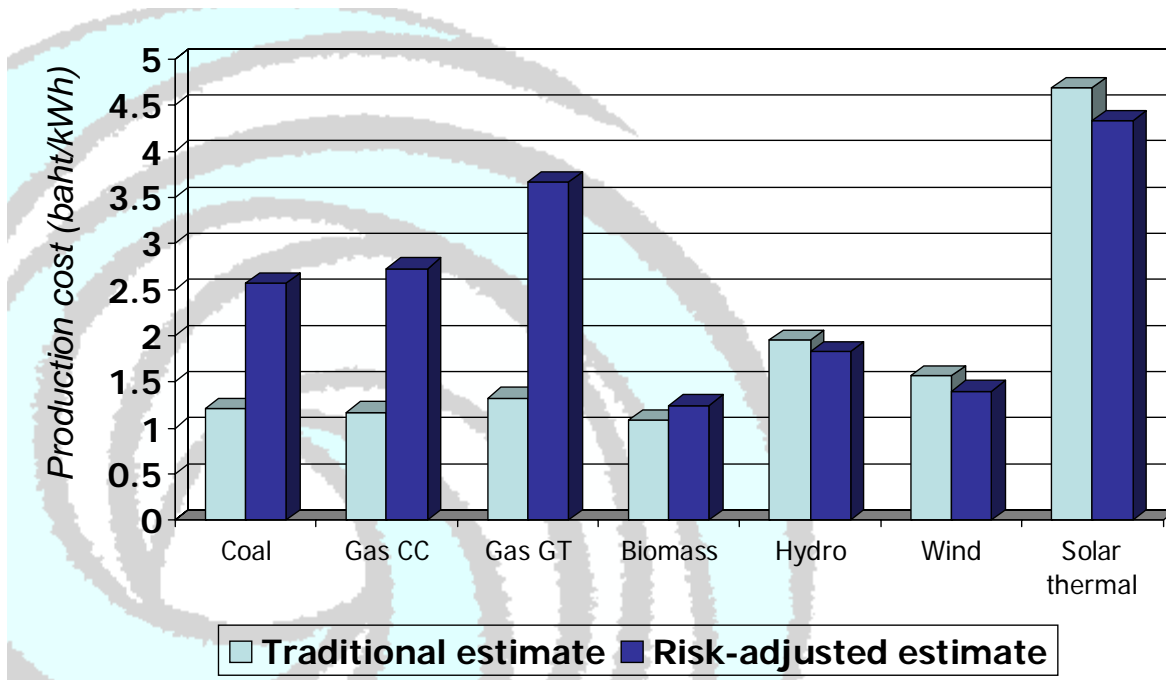


Figure 4: risk adjusted costs for different fuels in USA. Risks are adjusted using Capital Asset Pricing Model (CAPM), a widely used tool in corporate finance. Source: (Awerbuch 2003) converted to Thai baht using year 2005 exchange rate.

6.3.4 Reducing supply-side losses

Because DSM and distributed generation provide electricity services where they are needed, IRP can decrease losses in the generation and transmission system by valuing local resources higher than distant centralized options.

7 THE BIGGER PICTURE: REGULATORY AND INSTITUTIONAL REFORM FOR CLEAN, AFFORDABLE, DEMOCRATIC ENERGY

Reform for the planning process, as described in the IRP discussion above, will go a long way to helping the power sector move towards democratic, sustainable practices. But there are regulatory and institutional changes that must be made before, or in parallel, with implementation of IRP. These include forming an independent regulator, and reforming ways that utilities are incentivised.

7.1.1 Independent Regulatory Authority

The creation of impartial, independent energy regulatory authorities is the first step to implement IRP in Mekong countries. Indeed this key reform is essential regardless of whether IRP is pursued, and is consistent with good governance reforms suggested by the World Bank and the Asian Development Bank. Each country's energy regulator must have the authority to enforce law, and the political will to do so. The regulator should be responsible for carrying out IRP, and should be adequately trained to do so.

Currently the only Mekong country with an independent regulatory authority is Cambodia, and the independence and capacity of this body has been questioned. In Thailand utilities are currently largely self-regulated, but a new Energy Industry Act under discussion would provide the legal basis for establishing a regulatory authority.

The responsibilities of the regulatory authority would include, but are not limited to, the following:

1. *Public Discussion.* The authority should facilitate public discussion on the future of the energy usage, including issues such as reliability, affordable power, risk management, minimizing human health impacts, minimizing ecosystem damage including climate change from CO₂ emission, and quality jobs for rural sector. It should promote and improve communication between stakeholders, for example by coordinating public meetings. The authority should assist regional efforts to foster new partnerships among the state and local governments, NGOs, and businesses to promote integrated resource use. The body may choose to utilize media to engage the public, for example by direct consumer contact or advertising via television, newspapers, and radio.
2. *Data collection.* The authority is responsible for collecting reliable data about end-use patterns, costs, and technical alternatives for improving their energy-efficiency or load profiles. The data must be publicly available and easily accessible at an impartial location. The database must be regularly updated to reflect useful information, for example, changing prices in technologies or new technological advances.
3. *IRP planning.* The authority and utilities – together with public input – would be responsible for constructing the candidate IRPs and helping facilitate choice of a preferred IRP as discussed in section 6.2.
4. *Implement IRP.* The implementation of the plan should be the ultimate responsibility of the regulatory body, though many details of implementation may be left to utilities. Thus the regulator needs adequate authority to levy fines and penalties to ensure utility compliance with key IRP provisions.
5. *Tariff setting.* The regulatory authority should balance economic, environmental and social goals to determine appropriate tariff structures for generators, industry, commercial, and residential customers.
6. *Monitoring and evaluation.* The IRP plan should be periodically re-evaluated to assess its effectiveness and manage with unforeseen problems. The body may also hold regulatory reviews of utilities to ensure that proper practices are being followed. The regulator should also be responsive to reviews by external independent organizations to help ensure its own accountability and competence.

7.1.2 Harmonizing industrial development policy with energy and resource concerns

Currently Thailand provides corporate income tax holidays and other board of investment privileges to a variety of heavy industry, regardless of its impact on the environment. Sometimes these subsidize the development of factories that offer little economic benefit to

Thailand while inflicting high levels of pollution and energy consumption on the country. An example is the Sahaviraya Steel refinery planned for Prachuap province. This single factory will require 2,000 MW of electricity, yet produces a commodity with little value added. Economic analysts have determined that this project would likely not proceed were it not for Thai government subsidies (tax breaks and other investment privileges).

We recommend Thailand review its Board of Investment (BOI) and other industrial support policies to include consideration of energy and resource requirements, and withhold support or increase taxes for ecologically damaging, low value-added industries. We are not sure how – but this should be done through a transparent, impartial, consistent framework.

7.1.3 Consistent standards for domestic and imported electricity

The social and environmental standards for electricity produced domestically and imported should be consistent. Environmental Impact Assessments (EIA), compensation to displaced communities, transparency and accountability standards, and environmental and social safeguards that have been developed and applied to power projects built in Thailand should also apply to projects built outside of Thailand but export electricity to Thailand.

7.1.4 Transmission governance

Access to the transmission and distribution system is the only way that electricity generators can get their product to consumers. If this system is owned and operated by an entity that also owns and controls generation assets, there is potential for substantial conflict of interest: the transmission operator may make decisions that favour construction or dispatch of its own generation assets. For this reason, in international experience, it is generally viewed as necessary to split apart (“unbundle”) power utilities that generate and transmit power as one single company into separate generation and transmission companies that are independent of each other in order to encourage competition and to achieve significant efficiency gains. Often transmission is operated by a separate entity (non-profit or for-profit) that is rewarded for efficiency in providing transmission services and serving all customers and generators. Unbundling of generation and transmission has been adopted by the Asian Pacific Economic Cooperation (APEC) as power sector “Best Practice Principle” agreed by member country Energy Ministers – including Thailand -- in August 1997 (APEC 1997) and reaffirmed in 2004 (Peter Smiles & Associates 2003).

7.1.5 Reform tariff structure and discount rates to be fair to clean energy

Currently the tariff structural is biased towards fossil-fuel generation. In Thailand the “FT charge” lowers the risk for fossil-fuelled generators by passing fuel price volatility to consumers. Renewable energy generator tariffs also include the FT. This means that renewable generators that purchase fuels (rice husk, etc.) have to absorb both renewable fuel price risk (because the renewable fuel prices do not necessarily correlate with fossil fuel prices) and risk associated with fossil fuel prices. Besides being bad for renewable energy generators, this is bad for the Thai economy because it fails to take advantage of fuel price diversity that renewables offer.

A related issue is power sector planning by the Thai government uses a high discount rate (10 to 12%). High discount rates make choices with low upfront costs but high ongoing costs (fossil fuels) appear relatively attractive compared to choices with high upfront costs and low ongoing costs (renewables).

7.1.6 Streamline interconnection process for renewable energy generators.

The right to interconnect and sell electricity back to utilities is essential for substantial on-grid renewable energy deployment. In most Mekong countries there are currently no laws requiring utilities to allow interconnection. Thailand's Very Small Power Producer (VSPP) laws³ provide a useful precedent, but even in Thailand there are onerous requirements of questionable relevance to become a VSPP generator, and timelines for application approval are often not adhered to by agencies whose duty it is to approve applications. These issues should be systematically identified and resolved. VSPP generators also have also asked for changes to metering arrangements so that all electricity produced by the renewable energy generator is counted.

7.1.7 Reduce/remove import taxes for renewable energy equipment.

Import taxes of 30% or more and associated paperwork and corruption are a key barrier to renewable energy in the Mekong region. Besides increasing costs, the uncertainties and delays associated with customs introduce risks to project development. In theory in Thailand renewable energy equipment is exempt from import tax. Users "pay upfront and reclaim later," but in practice, the "reclaiming later" is uncertain and difficult.

8 BARRIERS AND RISKS TO IRP IN THAILAND

8.1.1 Historic bias towards expanding supply

IRP requires planners to view demand-side management and expanding supply as two different but equal solutions to meeting additional energy demand. In Thailand (as in many countries), however, there is an historic bias towards augmenting supply resources as opposed to lowering demand through appropriate efficiency measures. It will be challenging to transition to IRP gracefully considering that long established, well-entrenched careers and practices will be rendered less relevant.

8.1.2 Political risk

Thailand's government is likely to undergo future structural and leadership changes. One risk to successful implementation of IRP is that subsequent governments may discontinue the program. Not only would this ruin any previous efforts for IRP, but it could also lead to the false perception that IRP was tried in Thailand, but failed.

8.1.3 Insufficient regulatory capacity and risk of regulatory capture

A serious risk in Mekong Countries is that regulators lack capacity and expertise to effectively carry out their duties. Establishing and implementing legal and policy procedures, evaluating plans, facilitating public discourse, assessing and managing risk, setting tariffs, and protecting environment require a diverse set of skills. If regulators lack ability or independence, there is the significant risk that the same groups which are being regulated gain disproportionate influence over the regulatory authority leading to decisions that are neither independent nor in

³ English and Thai text of the laws are available at: <http://www.netmeter.org/en/regs>

the public interest. This has been a significant problem with electricity regulatory authorities in other countries, accentuated by the high level of technical expertise and monopoly on key data enjoyed by utilities. Education for regulators and mechanisms to ensure accountability, transparency, and public participation are essential to help address this issue.

9 IMMEDIATE STEPS FORWARD

IRP are and other reforms discussed above require key decisions by government. But even before this occurs, a variety of immediate steps should be taken regarding data collection and analysis, public dialogue, and capacity building.

9.1.1 Data collection and analysis

Studies needed include:

- Comprehensive country-specific externality studies that quantify and monetize the impacts to health, livelihood, ecosystems, impacts to crops and damage to buildings from acid rain, etc. from different fuels used to generate electricity in order to determine appropriate full costs to use in planning. Excellent work along these lines has been done in Europe in the “Extern-E” set of studies.
- Studies to improve accounting practices in order to separate cost of generation, transmission, distribution, and metering costs.
- Bottom-up studies on electricity end-use demands and trends in order to create more accurate demand forecasts.
- Studies on the potentials and benefits of decentralized generation

9.1.2 Consistent standards

Voluntary agreements are needed by government/utilities/consumers to adopt consistent environmental, social, and governance standards for projects within and outside Thailand.

9.1.3 Capacity building on IRP

Training is needed for members of the regulatory authority, civil society, utilities, and the business community on the tools and practices of IRP. This could start with workshops and study tours to countries/regulators/utilities that have successfully adopted IRP. Training is needed to better understand that IRP process and how oversight and evaluation is conducted, training on inclusion of externality costs, training on how to best develop and integrate demand and supply side options.

9.1.4 Public dialogue

Currently utilities, government, businesses and civil society have diverse views on the performance, challenges and opportunities of the power sector. Public dialogue is necessary to share different perspectives and form a common foundation for collaborative work to improve the social, environmental and economic performance of the power sector. This could happen

through a series of workshops to air differences, exchange data, and build a common vision. Activities to educate the broader public through media channels are also necessary.

10 BIBLIOGRAPHY

- APEC (1997). Manual of Best Practice Principles for Independent Power Producers. <http://www.eppo.go.th/inter/apec/int-APEC-IPPmanual.pdf>
- Awerbuch, S. (2003). "Determining the real cost: why renewable power is more cost-competitive than previously believed." *Renewable Energy World* 6(2): 52. http://www.xj.com/magsandj/rew/2003_02/real_cost.html
- Awerbuch, S. (2006). "Risky business: Fossil risk mitigation and enhanced energy security from renewables." *Renewable Energy World*(July). http://www.renewable-energy-world.com/articles/article_display.cfm?Section=ARCHI&C=PoMaF&ARTICLE_ID=271577&KEYWORDS=%7Bawerbuch%7D
- Bangkok Post (2002). "Power Profligacy." *Bangkok Post*: 6 January.
- Crispin, S. W. (2001). "Power Politics Trump Reform." *Far Eastern Economic Review*: September 27.
- du Pont, P. (2005). "Nam Theun 2 Hydropower Project (NT2) Impact of Energy Conservation, DSM, and Renewable Energy Generation on EGAT's Power Development Plan." World Bank. 24 March. <http://siteresources.worldbank.org/INTLAOPRD/Resources/DSMmarch2005.pdf>
- EGAT (2006). DSM in Thailand: The EGAT experiences. Electricity du Vietnam.
- Energy, M. o. (2006). "Goals of Power Sector." <http://www.energy.go.th/th/a.htm>. Accessed on July 4
- Hippel, D. V. (1999). Overview Of The Integrated Resource Planning Process. IIE 1999 IRP Course "Least Cost Planning for Electrical Utilities", Cambridge/Boston MA, USA.
- Menke, C., D. Gvozdenac, et al. (2006). "Potentials of Natural Gas Based Cogeneration in Thailand." *JGSEE*. August. 35.
- Mitchell, C., D. Bauknecht, et al. (2003). "Risk, Innovation and Market Rules: A Comparison of the Renewable Obligation in England and Wales and the Feed-In System in Germany." Warwick Business School.
- Narupat, A. (2007). Renewable Energy Policy: Recent policies on SPP/VSSP. Renewable Energy: Technology, Markets and Policies in Southeast Asia, BITEC, Bangkok, Thailand. http://www.thai-exhibition.com/entech/conference/document/session1_pdf/narupat_session1.pdf
- Peter Smiles & Associates (2003). Electricity Reform in APEC Economies – The Way Ahead. http://www.worldenergy.org/wec-geis/wec_info/work_programme2004/studies/emr/resources/apec.pdf
- Phumaraphand, N. (2001). Evaluation Methods and Results of EGAT's Labeling Programs. Lessons Learned in Asia: Regional Conference on Energy Efficiency Standards and Labeling.

Organized by Collaborative Labeling and Appliance Standards Program (CLASP) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Bangkok, Thailand. http://www.un.org/esa/sustdev/sdissues/energy/op/clasp_egatppt.pdf

Thai Ministry of Energy (2003). "Energy Strategy for Competitiveness." Ministry of Energy. August 23. <http://www.eppo.go.th/admin/moe-workshop1/index.html>

The Nation (2003). "PM Pressing for Egat IPO this year." The Nation: March 14.

Vernstrom, R. (2004). "Nam Theun 2 Hydro Power Project Regional Economic Least-Cost Analysis Draft Final Report." World Bank. June.
<http://siteresources.worldbank.org/INTLAOPRD/491761-1094074854903/20251513/Economic.pdf>

Vernstrom, R. (2005). "Nam Theun 2 Hydro Power Project Regional Economic Least Cost Analysis: Final Report." World Bank. March.

World Bank (2006). "Thailand Environment Monitor 2006."
<http://www.worldbank.or.th/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/THAILAND/EXTN/0,,contentMDK:20194499~pagePK:141137~piPK:141127~theSitePK:333296,00.html>